Cat. No. I544-E1-06

OMRON

USER’S MANUAL

OMNUC W SERIES

MODELS R88M-W☐
(AC Servomotors)
MODELS R88D-WN☐-ML2
(AC Servo Drivers)

AC SERVOMOTORS/SERVO DRIVERS WITH BUILT-IN MECHATROLINK-II COMMUNICATIONS

Thank you for choosing this OMNUC W-series product. Proper use and handling of the product will ensure proper product performance, will length product life, and may prevent possible accidents.
Please read this manual thoroughly and handle and operate the product with care.

1. To ensure safe and proper use of your OMRON Servomotors and Servo Drivers, please read this manual (Cat. No. I544-E1) to gain sufficient knowledge of the products, safety information, and precautions before actual use.
2. The products are illustrated without covers and shieldings to enable showing better detail in this manual. For actual use of the products, make sure to use the covers and shieldings as specified.
3. Copies of this manual and other related manuals must be delivered to the actual end users of the products.
4. Please keep a copy of this manual close at hand for future reference.
5. If a product has been left unused for a long time, please consult with your OMRON sales representative.

NOTICE

1. This manual describes the functions of the product and relations with other products. You should assume that anything not described in this manual is not possible.
2. Although care has been given in documenting the product, please contact your OMRON representative if you have any suggestions on improving this manual.
3. The product contains dangerous high voltages inside. Turn OFF the power and wait for at least five minutes to allow power to discharge before handling or working with the product. Never attempt to disassemble the product.
4. We recommend that you add the following precautions to any instruction manuals you prepare for the system into which the product is being installed.
   - Precautions on the dangers of high-voltage equipment.
   - Precautions on touching the terminals of the product even after power has been turned OFF. (These terminals are live even with the power turned OFF.)
5. Specifications and functions may be changed without notice in order to improve product performance.
6. Positive and negative rotation of AC Servomotors described in this manual are defined as looking at the end of the output shaft of the motor as follows: counterclockwise rotation is positive and clockwise rotation is negative.
7. Do not perform withstand-voltage or other megameter tests on the product. Doing so may damage internal components.
8. Servomotors and Servo Drivers have a finite service life. Be sure to keep replacement products on hand and to consider the operating environment and other conditions affecting the service life.
9. The OMNUC W Series can control both incremental and absolute encoders. Differences in functions or specifications according to the encoder type are indicated in this manual. Be sure to check the model that is being used, and follow the relevant specifications.
   - Servomotors with incremental encoders: R88M-W□H-□
   - Servomotors with absolute encoders: R88M-W□T-□

Items to Check After Unpacking

1. Check the following items after removing the product from the package:
   - Has the correct product been delivered (i.e., the correct model number and specifications)?
   - Has the product been damaged in shipping?
   - Are any screws or bolts loose?

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WITH BUILT-IN MECHATROLINK-II COMMUNICATIONS

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Additionally, there may be severe property damage.

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.

⚠ Caution Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PC” means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

General Warnings

Observe the following warnings when using the OMNUC Servomotor and Servo Driver and all connected or peripheral devices.

This manual may include illustrations of the product with protective covers removed in order to describe the components of the product in detail. Make sure that these protective covers are on the product before use.

Consult your OMRON representative when using the product after a long period of storage.

⚠ **WARNING** Always connect the frame ground terminals of the Servo Driver and the Servomotor to a class-3 ground (to 100 Ω or less). Not connecting to a class-3 ground may result in electric shock.

⚠ **WARNING** Do not touch the inside of the Servo Driver. Doing so may result in electric shock.

⚠ **WARNING** Do not remove the front cover, terminal covers, cables, Parameter Units, or optional items while the power is being supplied. Doing so may result in electric shock.

⚠ **WARNING** Installation, operation, maintenance, or inspection must be performed by authorized personnel. Not doing so may result in electric shock or injury.

⚠ **WARNING** Wiring or inspection must not be performed for at least five minutes after turning OFF the power supply. Doing so may result in electric shock.

⚠ **WARNING** Do not damage, press, or put excessive stress or heavy objects on the cables. Doing so may result in electric shock.

⚠ **WARNING** Do not touch the rotating parts of the Servomotor in operation. Doing so may result in injury.

⚠ **WARNING** Do not modify the product. Doing so may result in injury or damage to the product.

⚠ **WARNING** Provide an appropriate stopping device on the machine side to secure safety. (A holding brake is not a stopping device for securing safety.) Not doing so may result in injury.

⚠ **WARNING** Provide an external emergency stopping device that allows an instantaneous stop of operation and power interruption. Not doing so may result in injury.

⚠ **WARNING** Do not come close to the machine immediately after resetting momentary power interruption to avoid an unexpected restart. (Take appropriate measures to secure safety against an unexpected restart.) Doing so may result in injury.

⚠ **Caution** Use the Servomotors and Servo Drivers in a specified combination. Using them incorrectly may result in fire or damage to the products.

⚠ Caution Do not store or install the product in the following places. Doing so may result in fire, electric shock, or damage to the product.

- Locations subject to direct sunlight.
- Locations subject to temperatures or humidity outside the range specified in the specifications.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to shock or vibration.
- Locations subject to exposure to water, oil, or chemicals.

⚠ Caution Do not touch the Servo Driver radiator, regeneration resistor, or Servomotor while the power is being supplied or soon after the power is turned OFF. Doing so may result in a skin burn due to the hot surfaces.

Storage and Transportation Precautions

⚠ Caution Do not hold the product by the cables or motor shaft while transporting it. Doing so may result in injury or malfunction.

⚠ Caution Do not place any load exceeding the figure indicated on the product. Doing so may result in injury or malfunction.

⚠ Caution Use the motor eye-bolts only for transporting the Motor. Using them for transporting the machinery may result in injury or malfunction.

Installation and Wiring Precautions

⚠ Caution Do not step on or place a heavy object on the product. Doing so may result in injury.

⚠ Caution Do not cover the inlet or outlet ports and prevent any foreign objects from entering the product. Doing so may result in fire.

⚠ Caution Be sure to install the product in the correct direction. Not doing so may result in malfunction.

⚠ Caution Provide the specified clearances between the Servo Driver and the control panel or with other devices. Not doing so may result in fire or malfunction.

⚠ Caution Do not apply any strong impact. Doing so may result in malfunction.

⚠ **Caution** Be sure to wire correctly and securely. Not doing so may result in motor runaway, injury, or malfunction.

⚠ **Caution** Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.

⚠ **Caution** Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.

⚠ **Caution** Always use the power supply voltage specified in the User's Manual. An incorrect voltage may result in malfunction or burning.

⚠ **Caution** Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.

⚠ **Caution** Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.

⚠ **Caution** Take appropriate and sufficient countermeasures when installing systems in the following locations:

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields and magnetic fields.
- Locations subject to possible exposure to radioactivity.
- Locations close to power supplies.

⚠ **Caution** Do not reverse the polarity of the battery when connecting it. Reversing the polarity may damage the battery or cause it to explode.

Operation and Adjustment Precautions

⚠ **Caution** Confirm that no adverse effects will occur in the system before performing the test operation. Not doing so may result in equipment damage.

⚠ **Caution** Check the newly set parameters for proper execution before actually running them. Not doing so may result in equipment damage.

⚠ **Caution** Do not make any extreme adjustments or setting changes. Doing so may result in unstable operation and injury.

⚠ **Caution** Separate the Servomotor from the machine, check for proper operation, and then connect to the machine. Not doing so may cause injury.

⚠ **Caution** When an alarm occurs, remove the cause, reset the alarm after confirming safety, and then resume operation. Not doing so may result in injury.

⚠ **Caution** Do not use the built-in brake of the Servomotor for ordinary braking. Doing so may result in malfunction.

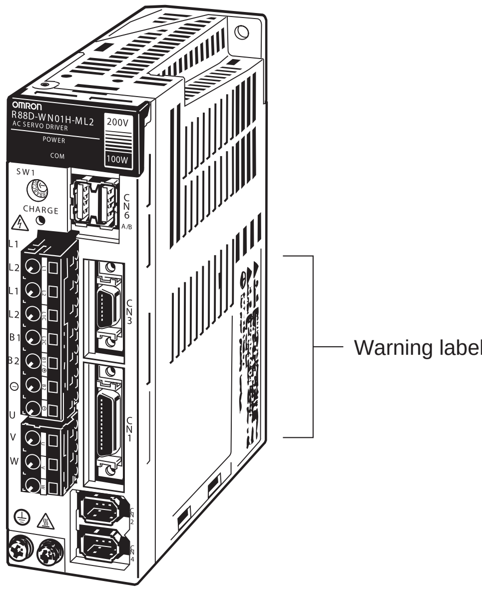
Maintenance and Inspection Precautions

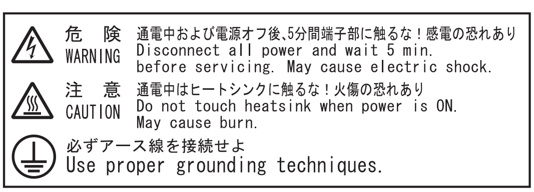
⚠ **Caution** Resume operation only after transferring to the new Unit the contents of the data required for operation. Not doing so may result in an unexpected operation.

⚠ **Caution** Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock.

Warning Labels

Warning labels are pasted on the product as shown in the following illustration. Be sure to follow the instructions given there.





Precautions for Safe Use

Dispose of the product and batteries according to local ordinances as they apply.

Have qualified specialists properly dispose of used batteries as industrial waste.

廢電池請回收

Read and Understand this Manual

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

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Chapter 1

Introduction

1-1 Features

OMNUC W-series AC Servo Drivers with built-in MECHATROLINK-II Communications are designed specifically for use with the MECHATROLINK-II high-speed motion field network.
Combining these Servo Drivers with MECHATROLINK-II-compatible Motion Control Units (CS1W-MCH71 or CJ1W-MCH71) or Position Control Units (CJ1W-NCF71) is an easy way to create a high-speed servo control system with a communications link between the Servo Drivers and the Controllers.

■ Data Transfer by MECHATROLINK-II Communications

When a Servo Driver is combined with a MECHATROLINK-II-compatible Motion Control Unit (CS1W-MCH71 or CJ1W-MCH71) or Position Control Unit (CJ1W-NCF71), all control data is transferred between the Servo Driver and the Controller by means of data communications.

Control commands are transferred by means of data communications, so Servomotor performance is not limited by control interface specifications, such as response frequencies for input pulses and encoder feedback pulses. This allows the Servomotor to perform to its fullest capacity.

Moreover, system data control is simplified by having all Servo Driver parameters and monitor data managed by the host controller.

■ Built-in Communications Interface

The MECHATROLINK-II communications interface has been built into the Servo Driver. In comparison with earlier W-series Servo Drivers, in which the MECHATROLINK-II Application Module is installed, only 60% of the installation surface area is required. (for 200-V/100-W Servo Drivers). This allows a great saving of space in the control panel.

■ W-series Servomotor Compatibility

A W-series Servomotor can be used as is, including the encoder cable and power cable, so the system can be upgraded without changing the structural design.

The W-series product line offers 3,000-r/min Servomotors (Cylinder-style: 50-W to 3-kW; Flat-style: 100-W to 1.5-kw), 1,000-r/min Servomotors (300-W to 2-kW), and 1,500-r/min Servomotors (450-W to 1.8-kW). Also, IP67 (waterproof) Servomotors can be connected in the same way.

■ High-speed, High-precision Motion Control Capability

A less-deviation control function and a predictive control function are provided to shorten the Servomotor's settling time and achieving high tracking capability.

The W-series Servomotors handle motion control with increased speed and precision, including synchronous control in combination with CS1W-MCH71 or CJ1W-MCH71 Motion Control Units.

■ Regenerative Power Processing

In addition to the built-in regenerative power processing function using regeneration resistance, external regeneration resistance can also be connected, allowing the W Series to be used for applications with high regenerative energy on vertical axes.

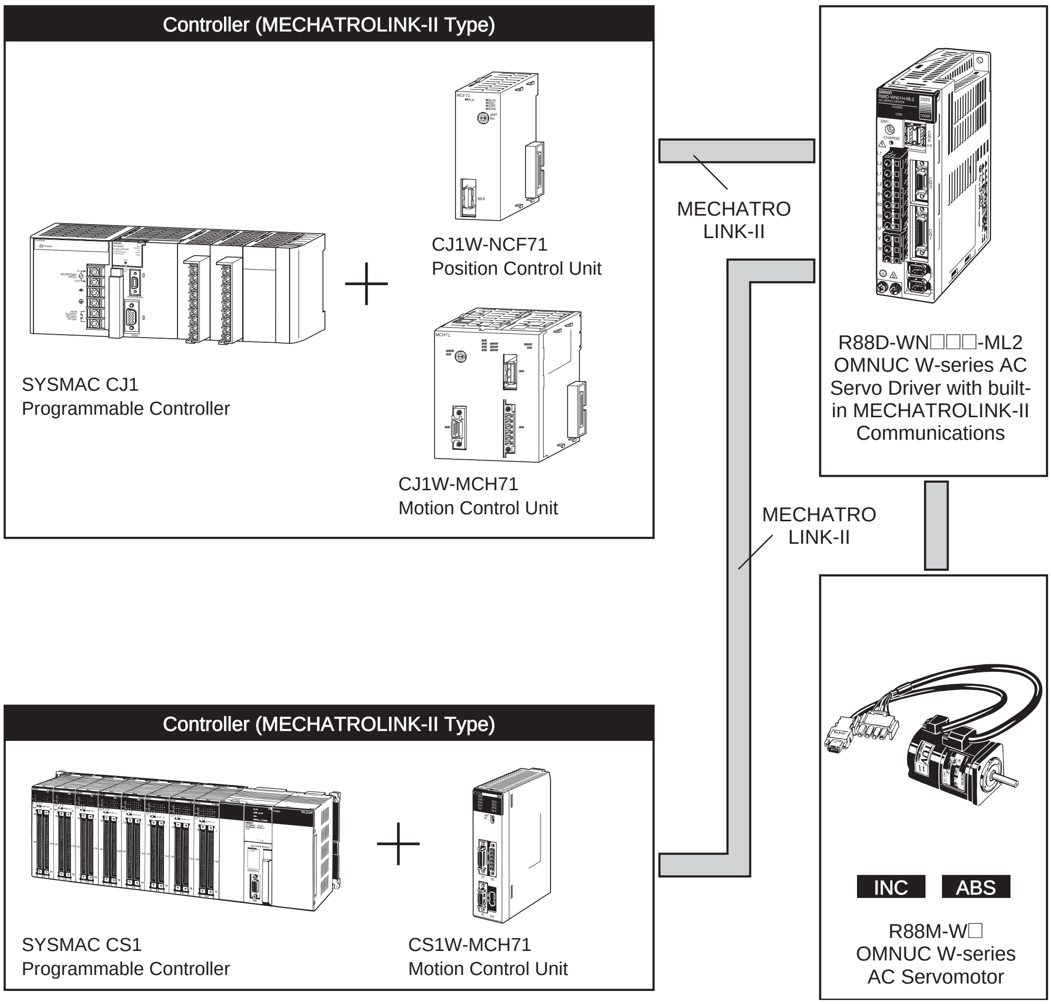
■ Conformity to Standards

The W Series conforms to EC Directives (both low-voltage and EMC) as well as to UL and cUL requirements, thereby assisting the user in meeting required standards.

■ High-frequency Current Countermeasures

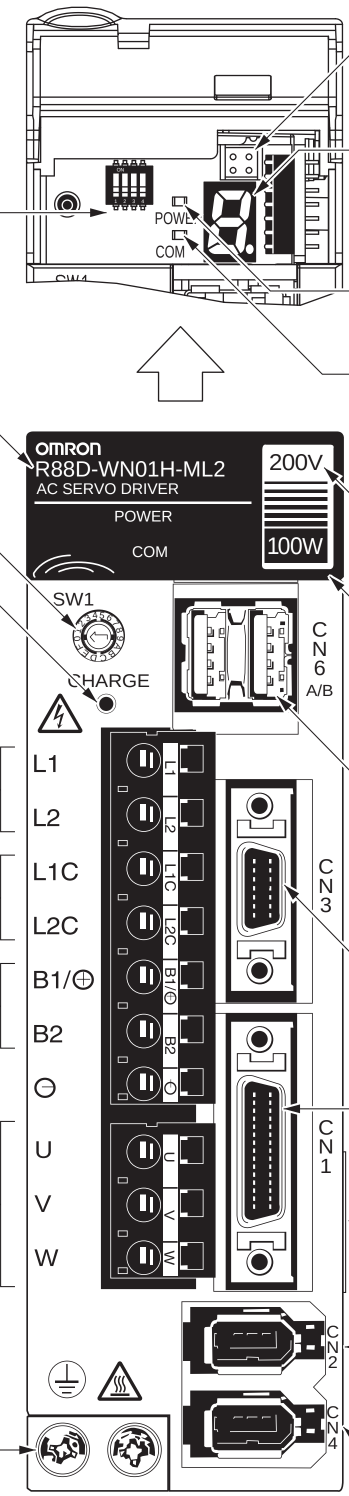
On Servo Drivers of 1 kW and above, a current reactor connection terminal is provided to assist the user in controlling high-frequency current.

1-2 System Configuration



1-3 Servo Driver Nomenclature

With Top Cover Open



DIP Switch
Used for MECHATROLINK-II communications settings.

Model Number

Rotary Switch (SW1)
Used for setting MECHATROLINK-II node address.

Charge Indicator
Lit when the main-circuit is powered. Also, for Servo Drivers of 1 kW or less, the indicator lights dimly when only the control power supply is ON. Even after the power is turned OFF, it remains lit as long as an electric charge remains in the main-circuit capacitor, so do not touch the Servo Driver's terminals during this period.

Main-circuit Power Terminals
These are the input terminals for the main-circuit power supply.

Control Power Terminals
These are input terminals for the control power supply.

Regenerative Resistance Terminals
These are terminals for external regenerative resistance.

Servomotor Connector Terminals
These are connector terminals for Servomotor power line.

Ground Terminals
These are ground terminals for preventing electrical shock. Connect to 100 Ω or less.

Analog Monitor Connector (CN5)
Motor rotation speeds, torque command values, etc., can be monitored using a special cable.

Panel Display
Displays Servomotor status with a 7-segment LED display.

Power Indicator (POWER)
Lit when the control power is being supplied.

Communications Indicator (COM)
Lit when MECHATROLINK-II communications are in progress.

Input voltage

Top cover

MECHATROLINK-II Communications Connectors (CN6A, CN6B)
Connect either a special cable for a MECHATROLINK-II system or a Terminating Resister.

Personal Computer Connector (CN3)
This is the connector for communications with a personal computer.

I/O Signal Connector (CN1)
This is the connector for command input signals and sequence I/O signals.

Nameplate (Side Panel)
The nameplate shows the Servo Driver model number and ratings.

Encoder Connector (CN2)
This is the connector for the encoder provided for the Servomotor.

Expansion Connector (CN4)
This is a supplementary connector for future expansion. It cannot presently be used, so do not connect anything to it.

1-4 Applicable Standards and Models

■ EC Directives

EC Directive	Product	Applicable standard	Remarks
Low Voltage	AC Servo Drivers	EN50178	Safety requirements for electrical equipment for measurement, control, and laboratory use.
	AC Servomotors	IEC60034-8 EN60034-1, -5, -9	Rotating electrical machines.
EMC	AC Servo Drivers and AC Servo-motors	EN55011 class A group 1	Limits and methods for measuring radio disturbance characteristics of industrial, scientific, and medical (ISM) radio-frequency equipment.
		EN61000-6-2	Electromagnetic compatibility generic immunity standard in industrial environments

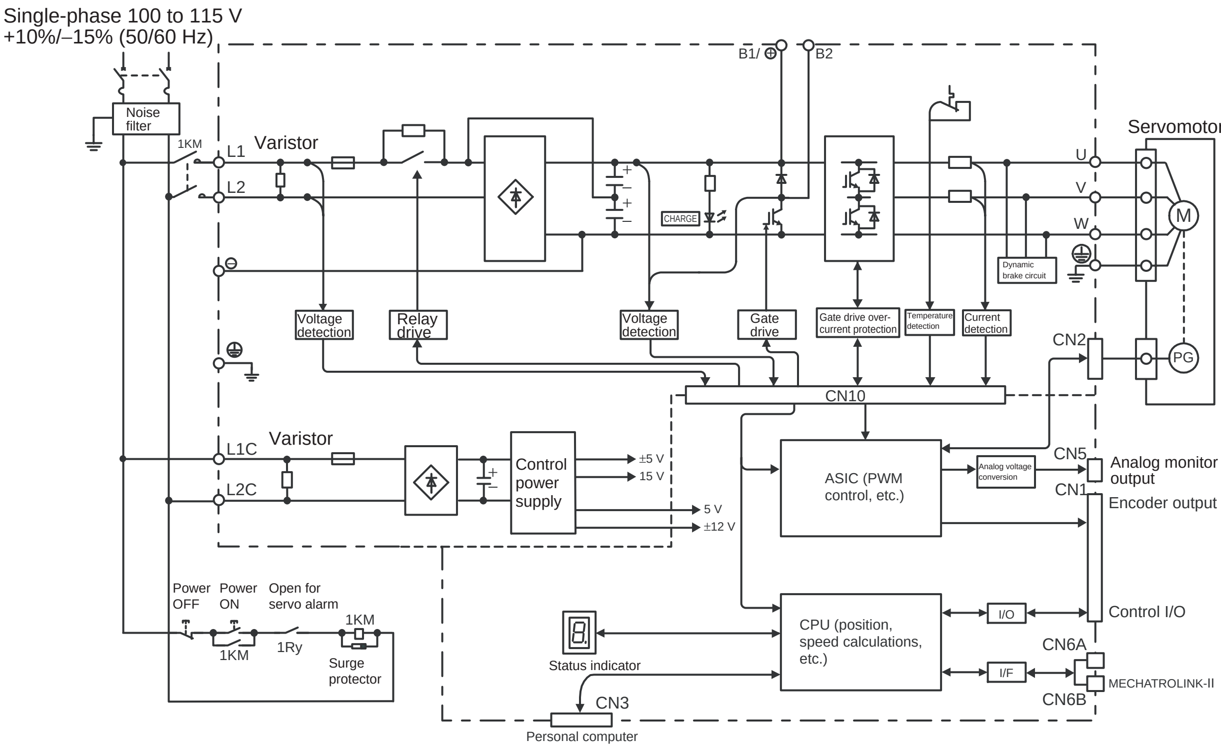
Note Installation under the conditions specified in *3-2-5 Wiring for Conformity to EMC Directives* is required to conform to EMC Directives.

■ UL/cUL Standards

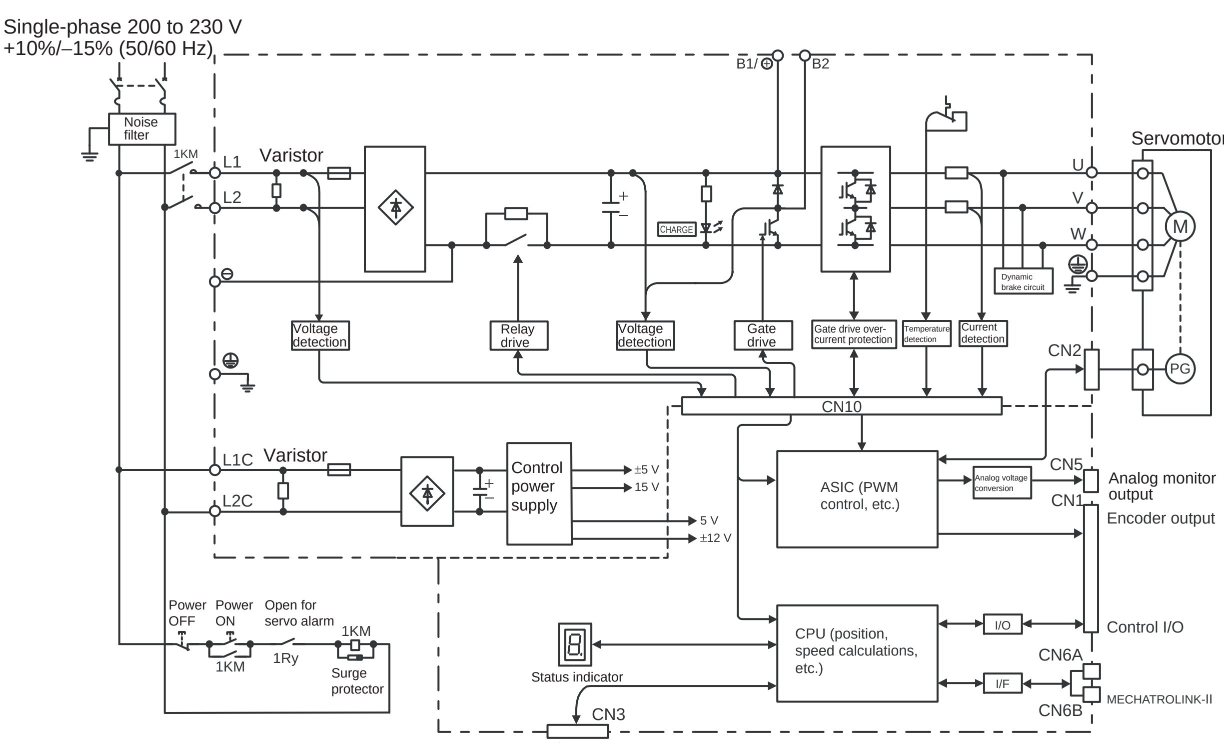
Standards	Product	Applicable standard	File No.	Remarks
UL	AC Servo Drivers	UL508C	E179149	Power conversion equipment
	AC Servomotors	UL1004	E179189	Electric motors
cUL	AC Servo Drivers	cUL C22.2 No. 14	E179149	Industrial control equipment
	AC Servomotors	cUL C22.2 No. 100	E179189	Motors and generators

1-5 System Block Diagrams

■ 100 V AC: R88D-WNA5L-ML2/WN01L-ML2/-WL02L-ML2/-WN04L-ML2

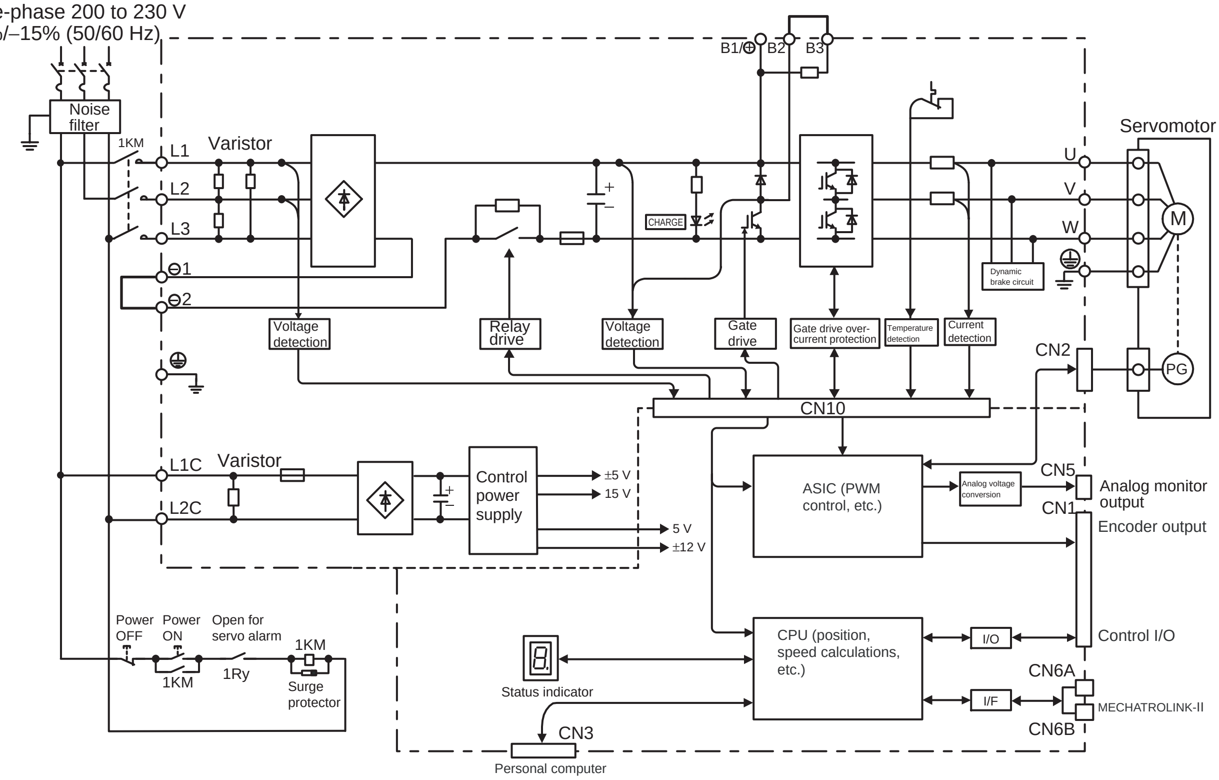


■ 200 V AC: R88D-WNA5H-ML2/WN01H-ML2/-WL02H-ML2/-WN04H-ML2



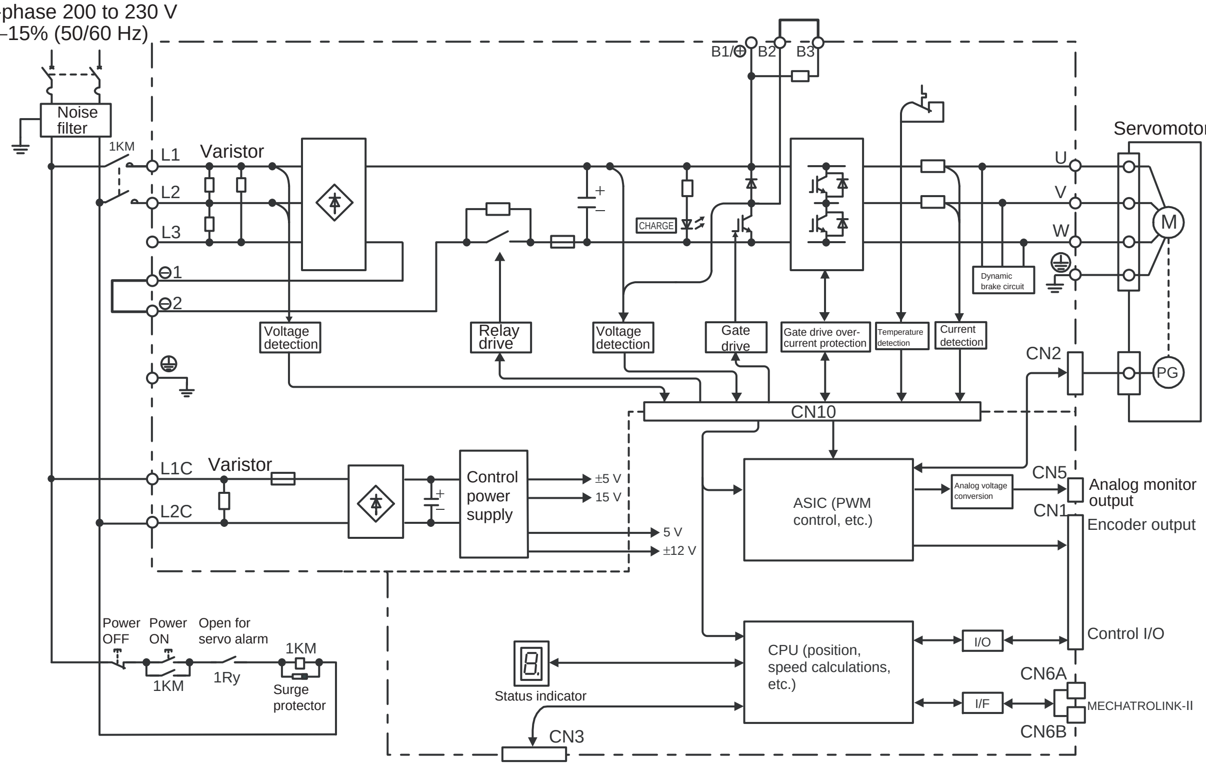
■ 200 V AC: R88D-WN05H-ML2/WN10H-ML2

Three-phase 200 to 230 V
+10%/–15% (50/60 Hz)

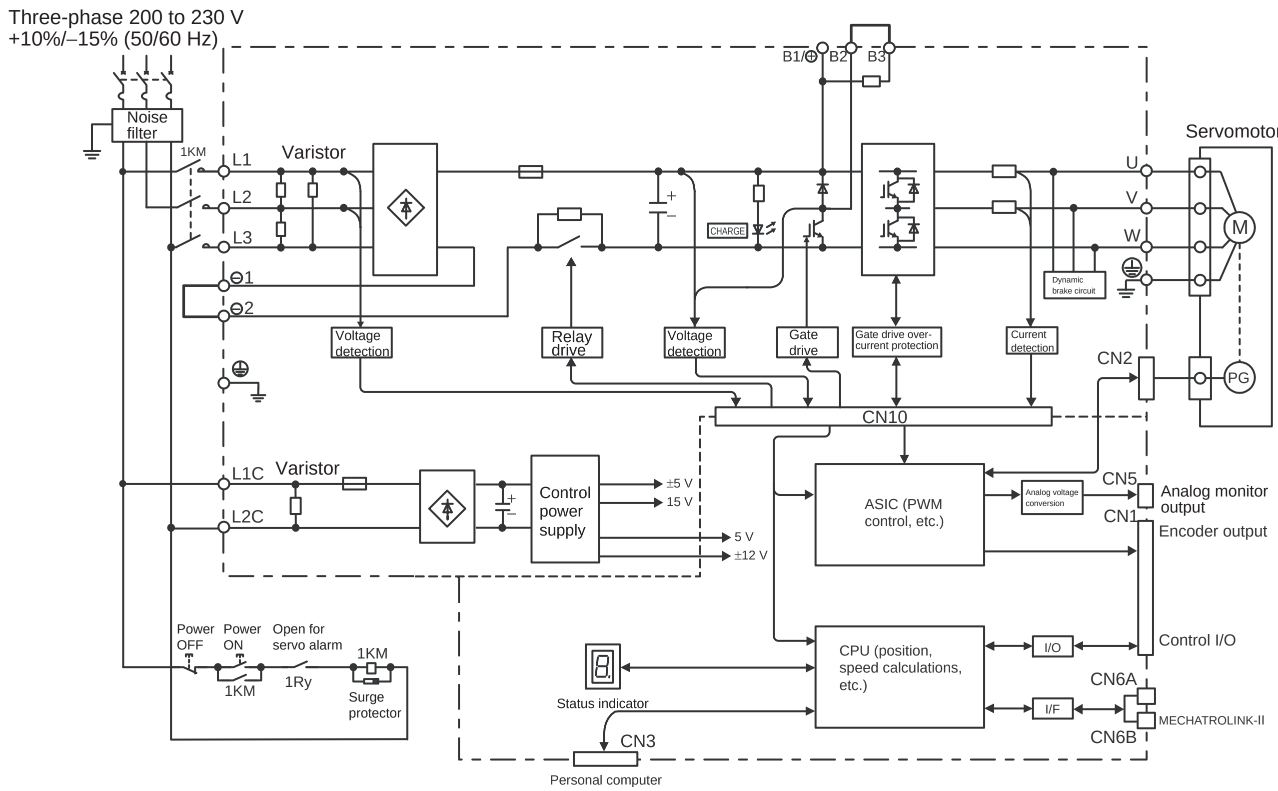


■ 200 V AC: R88D-WN08H-ML2

Single-phase 200 to 230 V
+10%/–15% (50/60 Hz)



■ 200 V AC: R88D-WN15H-ML2/-WN20H-ML2/-WN30H-ML2



Chapter 2

Standard Models and Specifications

2-1 Standard Models

■ Servo Drivers

Specifications		Model
Single-phase 100 V AC	50 W	R88D-WNA5L-ML2
	100 W	R88D-WN01L-ML2
	200 W	R88D-WN02L-ML2
	400 W	R88D-WN04L-ML2
Single-phase 200 V AC	50 W	R88D-WNA5H-ML2
	100 W	R88D-WN01H-ML2
	200 W	R88D-WN02H-ML2
	400 W	R88D-WN04H-ML2
	750 W	R88D-WN08H-ML2
Three-phase 200 V AC	500 W	R88D-WN05H-ML2
	1.0 kW	R88D-WN10H-ML2
	1.5 kW	R88D-WN15H-ML2
	2.0 kW	R88D-WN20H-ML2
	3.0 kW	R88D-WN30H-ML2

■ Peripheral Cables and Connectors

Specifications			Model
Analog Monitor Cable (CN5)		1 m	R88A-CMW001S
Computer Monitor Cable (CN3)	DOS/V	2 m	R88A-CCW002P2
Control I/O Connector (CN1)			R88A-CNW01C
Encoder Connector (CN2)			R88A-CNW01R
Encoder Connector for Motor End			R88A-CNW02R
Absolute Encoder Battery Cable (with Battery)			R88A-CRWC0R3C

Note In order to use a personal computer to monitor a Servo Driver and set its parameters, Computer Monitor Cable and Computer Monitor Software are required. Please ask an OMRON representative for details.

■ Absolute Encoder Backup Battery

Specifications	Model
1,000 mA·h, 3.6 V	R88A-BAT01W

Note Required when using a Servomotor with an absolute encoder. The cable and connector are included.

■ Reactors

Specifications	Model
For R88D-WNA5L-ML2/01L-ML2/02H-ML2	R88A-PX5053
For R88D-WN02L-ML2/04H-ML2	R88A-PX5054
For R88D-WN04L-ML2/08H-ML2	R88A-PX5056
For R88D-WNA5H-ML2/01H-ML2	R88A-PX5052
For R88D-WT04H-ML2	R88A-PX5069
For R88D-WN05H-ML2/10H-ML2	R88A-PX5061
For R88D-WN15H-ML2/20H-ML2	R88A-PX5060
For R88D-WN30H-ML2	R88A-PX5059

■ Front-panel Brackets

Specifications	Model
For R88D-WNA5L-ML2 to 04L-ML2	R88A-TK05W
For R88D-WNA5H-ML2 to 10H-ML2	R88A-TK05W
For R88D-WN15H-ML2	R88A-TK06W
For R88D-WN20H-ML2/30H-ML2	R88A-TK07W

Note Required when mounting a Servo Driver from the front panel.

■ Standard Encoder Cables (for Incremental and Absolute Encoders)

Specifications			Model
For 3,000-r/min Servomotors	30 to 750 W	3 m	R88A-CRWA003C
		5 m	R88A-CRWA005C
		10 m	R88A-CRWA010C
		15 m	R88A-CRWA015C
		20 m	R88A-CRWA020C
		30 m	R88A-CRWA030C
		40 m	R88A-CRWA040C
		50 m	R88A-CRWA050C
	1 to 3 kW	3 m	R88A-CRWB003N
		5 m	R88A-CRWB005N
		10 m	R88A-CRWB010N
		15 m	R88A-CRWB015N
		20 m	R88A-CRWB020N
		30 m	R88A-CRWB030N
		40 m	R88A-CRWB040N
		50 m	R88A-CRWB050N
For 3,000-r/min Flat-style Servomotors	100 W to 1.5 kW	3 m	R88A-CRWA003C
		5 m	R88A-CRWA005C
		10 m	R88A-CRWA010C
		15 m	R88A-CRWA015C
		20 m	R88A-CRWA020C
		30 m	R88A-CRWA030C
		40 m	R88A-CRWA040C
		50 m	R88A-CRWA050C
For 1,000-r/min Servomotors For 1,500-r/min Servomotors	300 W to 2.0 kW 450 W to 1.8 kW	3 m	R88A-CRWB003N
		5 m	R88A-CRWB005N
		10 m	R88A-CRWB010N
		15 m	R88A-CRWB015N
		20 m	R88A-CRWB020N
		30 m	R88A-CRWB030N
		40 m	R88A-CRWB040N
		50 m	R88A-CRWB050N

■ Standard Power Cable

● Power Cable for 3,000-r/min Servomotors

Specifications		Model	
		Without brake	With brake
30 to 750 W	3 m	R88A-CAWA003S	R88A-CAWA003B
	5 m	R88A-CAWA005S	R88A-CAWA005B
	10 m	R88A-CAWA010S	R88A-CAWA010B
	15 m	R88A-CAWA015S	R88A-CAWA015B
	20 m	R88A-CAWA020S	R88A-CAWA020B
	30 m	R88A-CAWA030S	R88A-CAWA030B
	40 m	R88A-CAWA040S	R88A-CAWA040B
	50 m	R88A-CAWA050S	R88A-CAWA050B
1 to 2 kW	3 m	R88A-CAWC003S	R88A-CAWC003B
	5 m	R88A-CAWC005S	R88A-CAWC005B
	10 m	R88A-CAWC010S	R88A-CAWC010B
	15 m	R88A-CAWC015S	R88A-CAWC015B
	20 m	R88A-CAWC020S	R88A-CAWC020B
	30 m	R88A-CAWC030S	R88A-CAWC030B
	40 m	R88A-CAWC040S	R88A-CAWC040B
	50 m	R88A-CAWC050S	R88A-CAWC050B
3 kW	3 m	R88A-CAWD003S	R88A-CAWD003B
	5 m	R88A-CAWD005S	R88A-CAWD005B
	10 m	R88A-CAWD010S	R88A-CAWD010B
	15 m	R88A-CAWD015S	R88A-CAWD015B
	20 m	R88A-CAWD020S	R88A-CAWD020B
	30 m	R88A-CAWD030S	R88A-CAWD030B
	40 m	R88A-CAWD040S	R88A-CAWD040B
	50 m	R88A-CAWD050S	R88A-CAWD050B

● Power Cable for 3,000-r/min Flat-style Servomotors

Specifications		Model	
		Without brake	With brake
100 to 750 W	3 m	R88A-CAWA003S	R88A-CAWA003B
	5 m	R88A-CAWA005S	R88A-CAWA005B
	10 m	R88A-CAWA010S	R88A-CAWA010B
	15 m	R88A-CAWA015S	R88A-CAWA015B
	20 m	R88A-CAWA020S	R88A-CAWA020B
	30 m	R88A-CAWA030S	R88A-CAWA030B
	40 m	R88A-CAWA040S	R88A-CAWA040B
	50 m	R88A-CAWA050S	R88A-CAWA050B

Specifications		Model	
		Without brake	With brake
1.5 kW	3 m	R88A-CAWB003S	R88A-CAWB003B
	5 m	R88A-CAWB005S	R88A-CAWB005B
	10 m	R88A-CAWB010S	R88A-CAWB010B
	15 m	R88A-CAWB015S	R88A-CAWB015B
	20 m	R88A-CAWB020S	R88A-CAWB020B
	30 m	R88A-CAWB030S	R88A-CAWB030B
	40 m	R88A-CAWB040S	R88A-CAWB040B
	50 m	R88A-CAWB050S	R88A-CAWB050B

● Power Cable for 1,000-r/min Servomotors

Specifications		Model	
		Without brake	With brake
300 to 900 W	3 m	R88A-CAWC003S	R88A-CAWC003B
	5 m	R88A-CAWC005S	R88A-CAWC005B
	10 m	R88A-CAWC010S	R88A-CAWC010B
	15 m	R88A-CAWC015S	R88A-CAWC015B
	20 m	R88A-CAWC020S	R88A-CAWC020B
	30 m	R88A-CAWC030S	R88A-CAWC030B
	40 m	R88A-CAWC040S	R88A-CAWC040B
	50 m	R88A-CAWC050S	R88A-CAWC050B
1.2 to 2 kW	3 m	R88A-CAWD003S	R88A-CAWD003B
	5 m	R88A-CAWD005S	R88A-CAWD005B
	10 m	R88A-CAWD010S	R88A-CAWD010B
	15 m	R88A-CAWD015S	R88A-CAWD015B
	20 m	R88A-CAWD020S	R88A-CAWD020B
	30 m	R88A-CAWD030S	R88A-CAWD030B
	40 m	R88A-CAWD040S	R88A-CAWD040B
	50 m	R88A-CAWD050S	R88A-CAWD050B

● Power Cable for 1,500-r/min Servomotors

Specifications		Model	
		Without brake	With brake
450 to 1.3 kW	3 m	R88A-CAWC003S	R88A-CAWC003B
	5 m	R88A-CAWC005S	R88A-CAWC005B
	10 m	R88A-CAWC010S	R88A-CAWC010B
	15 m	R88A-CAWC015S	R88A-CAWC015B
	20 m	R88A-CAWC020S	R88A-CAWC020B
	30 m	R88A-CAWC030S	R88A-CAWC030B
	40 m	R88A-CAWC040S	R88A-CAWC040B
	50 m	R88A-CAWC050S	R88A-CAWC050B
1.8 kW	3 m	R88A-CAWD003S	R88A-CAWD003B
	5 m	R88A-CAWD005S	R88A-CAWD005B
	10 m	R88A-CAWD010S	R88A-CAWD010B
	15 m	R88A-CAWD015S	R88A-CAWD015B
	20 m	R88A-CAWD020S	R88A-CAWD020B
	30 m	R88A-CAWD030S	R88A-CAWD030B
	40 m	R88A-CAWD040S	R88A-CAWD040B
	50 m	R88A-CAWD050S	R88A-CAWD050B

■ Encoder Cables for Robot Cables (for Incremental and Absolute Encoders)

Specifications			Model
For 3,000-r/min Servomotors	30 to 750 W	3 m	R88A-CRWA003CR
		5 m	R88A-CRWA005CR
		10 m	R88A-CRWA010CR
		15 m	R88A-CRWA015CR
		20 m	R88A-CRWA020CR
		30 m	R88A-CRWA030CR
		40 m	R88A-CRWA040CR
		50 m	R88A-CRWA050CR
	1 to 3 kW	3 m	R88A-CRWB003NR
		5 m	R88A-CRWB005NR
		10 m	R88A-CRWB010NR
		15 m	R88A-CRWB015NR
		20 m	R88A-CRWB020NR
		30 m	R88A-CRWB030NR
		40 m	R88A-CRWB040NR
		50 m	R88A-CRWB050NR

Specifications			Model
For 3,000-r/min Flat-style Servomotors	100 W to 1.5 kW	3 m	R88A-CRWA003CR
		5 m	R88A-CRWA005CR
		10 m	R88A-CRWA010CR
		15 m	R88A-CRWA015CR
		20 m	R88A-CRWA020CR
		30 m	R88A-CRWA030CR
		40 m	R88A-CRWA040CR
		50 m	R88A-CRWA050CR
For 1,000-r/min Servomotors For 1,500-r/min Servomotors	300 W to 2.0 kW 450 W to 1.8 kW	3 m	R88A-CRWB003NR
		5 m	R88A-CRWB005NR
		10 m	R88A-CRWB010NR
		15 m	R88A-CRWB015NR
		20 m	R88A-CRWB020NR
		30 m	R88A-CRWB030NR
		40 m	R88A-CRWB040NR
		50 m	R88A-CRWB050NR

■ Power Cable for Robot Cables

● Power Cable for 3,000-r/min Servomotors

Specifications		Model	
		Without brake	With brake
30 to 750 W	3 m	R88A-CAWA003SR	R88A-CAWA003BR
	5 m	R88A-CAWA005SR	R88A-CAWA005BR
	10 m	R88A-CAWA010SR	R88A-CAWA010BR
	15 m	R88A-CAWA015SR	R88A-CAWA015BR
	20 m	R88A-CAWA020SR	R88A-CAWA020BR
	30 m	R88A-CAWA030SR	R88A-CAWA030BR
	40 m	R88A-CAWA040SR	R88A-CAWA040BR
	50 m	R88A-CAWA050SR	R88A-CAWA050BR
1 to 2 kW	3 m	R88A-CAWC003SR	R88A-CAWC003BR
	5 m	R88A-CAWC005SR	R88A-CAWC005BR
	10 m	R88A-CAWC010SR	R88A-CAWC010BR
	15 m	R88A-CAWC015SR	R88A-CAWC015BR
	20 m	R88A-CAWC020SR	R88A-CAWC020BR
	30 m	R88A-CAWC030SR	R88A-CAWC030BR
	40 m	R88A-CAWC040SR	R88A-CAWC040BR
	50 m	R88A-CAWC050SR	R88A-CAWC050BR

Specifications		Model	
		Without brake	With brake
3 kW	3 m	R88A-CAWD003SR	R88A-CAWD003BR
	5 m	R88A-CAWD005SR	R88A-CAWD005BR
	10 m	R88A-CAWD010SR	R88A-CAWD010BR
	15 m	R88A-CAWD015SR	R88A-CAWD015BR
	20 m	R88A-CAWD020SR	R88A-CAWD020BR
	30 m	R88A-CAWD030SR	R88A-CAWD030BR
	40 m	R88A-CAWD040SR	R88A-CAWD040BR
	50 m	R88A-CAWD050SR	R88A-CAWD050BR

● Power Cable for 3,000-r/min Flat-style Servomotors

Specifications		Model	
		Without brake	With brake
100 to 750 W	3 m	R88A-CAWA003SR	R88A-CAWA003BR
	5 m	R88A-CAWA005SR	R88A-CAWA005BR
	10 m	R88A-CAWA010SR	R88A-CAWA010BR
	15 m	R88A-CAWA015SR	R88A-CAWA015BR
	20 m	R88A-CAWA020SR	R88A-CAWA020BR
	30 m	R88A-CAWA030SR	R88A-CAWA030BR
	40 m	R88A-CAWA040SR	R88A-CAWA040BR
	50 m	R88A-CAWA050SR	R88A-CAWA050BR
1.5 kW	3 m	R88A-CAWB003SR	R88A-CAWB003BR
	5 m	R88A-CAWB005SR	R88A-CAWB005BR
	10 m	R88A-CAWB010SR	R88A-CAWB010BR
	15 m	R88A-CAWB015SR	R88A-CAWB015BR
	20 m	R88A-CAWB020SR	R88A-CAWB020BR
	30 m	R88A-CAWB030SR	R88A-CAWB030BR
	40 m	R88A-CAWB040SR	R88A-CAWB040BR
	50 m	R88A-CAWB050SR	R88A-CAWB050BR

● Power Cable for 1,000-r/min Servomotors

Specifications		Model	
		Without brake	With brake
300 to 900 W	3 m	R88A-CAWC003SR	R88A-CAWC003BR
	5 m	R88A-CAWC005SR	R88A-CAWC005BR
	10 m	R88A-CAWC010SR	R88A-CAWC010BR
	15 m	R88A-CAWC015SR	R88A-CAWC015BR
	20 m	R88A-CAWC020SR	R88A-CAWC020BR
	30 m	R88A-CAWC030SR	R88A-CAWC030BR
	40 m	R88A-CAWC040SR	R88A-CAWC040BR
	50 m	R88A-CAWC050SR	R88A-CAWC050BR

Specifications		Model	
		Without brake	With brake
1.2 to 2 kW	3 m	R88A-CAWD003SR	R88A-CAWD003BR
	5 m	R88A-CAWD005SR	R88A-CAWD005BR
	10 m	R88A-CAWD010SR	R88A-CAWD010BR
	15 m	R88A-CAWD015SR	R88A-CAWD015BR
	20 m	R88A-CAWD020SR	R88A-CAWD020BR
	30 m	R88A-CAWD030SR	R88A-CAWD030BR
	40 m	R88A-CAWD040SR	R88A-CAWD040BR
	50 m	R88A-CAWD050SR	R88A-CAWD050BR

● Power Cable for 1,500-r/min Servomotors

Specifications		Model	
		Without brake	With brake
450 to 1.3 kW	3 m	R88A-CAWC003SR	R88A-CAWC003BR
	5 m	R88A-CAWC005SR	R88A-CAWC005BR
	10 m	R88A-CAWC010SR	R88A-CAWC010BR
	15 m	R88A-CAWC015SR	R88A-CAWC015BR
	20 m	R88A-CAWC020SR	R88A-CAWC020BR
	30 m	R88A-CAWC030SR	R88A-CAWC030BR
	40 m	R88A-CAWC040SR	R88A-CAWC040BR
	50 m	R88A-CAWC050SR	R88A-CAWC050BR
1.8 kW	3 m	R88A-CAWD003SR	R88A-CAWD003BR
	5 m	R88A-CAWD005SR	R88A-CAWD005BR
	10 m	R88A-CAWD010SR	R88A-CAWD010BR
	15 m	R88A-CAWD015SR	R88A-CAWD015BR
	20 m	R88A-CAWD020SR	R88A-CAWD020BR
	30 m	R88A-CAWD030SR	R88A-CAWD030BR
	40 m	R88A-CAWD040SR	R88A-CAWD040BR
	50 m	R88A-CAWD050SR	R88A-CAWD050BR

■ Servomotors

Specifications	Model			
	With incremental encoder		With absolute encoder	
	Straight shaft without key	Straight shaft with key	Straight shaft without key	Straight shaft with key

● 3,000-r/min Servomotors

Without brake	200 V	50 W	R88M-W05030H	R88M-W05030H-S1	R88M-W05030T	R88M-W05030T-S1
		100 W	R88M-W10030H	R88M-W10030H-S1	R88M-W10030T	R88M-W10030T-S1
		200 W	R88M-W20030H	R88M-W20030H-S1	R88M-W20030T	R88M-W20030T-S1
		400 W	R88M-W40030H	R88M-W40030H-S1	R88M-W40030T	R88M-W40030T-S1
		750 W	R88M-W75030H	R88M-W75030H-S1	R88M-W75030T	R88M-W75030T-S1
		1 kW	R88M-W1K030H	R88M-W1K030H-S2	R88M-W1K030T	R88M-W1K030T-S2
		1.5 kW	R88M-W1K530H	R88M-W1K530H-S2	R88M-W1K530T	R88M-W1K530T-S2
		2 kW	R88M-W2K030H	R88M-W2K030H-S2	R88M-W2K030T	R88M-W2K030T-S2
		3 kW	R88M-W3K030H	R88M-W3K030H-S2	R88M-W3K030T	R88M-W3K030T-S2
With brake	200 V	50 W	R88M-W05030H-B	R88M-W05030H-BS1	R88M-W05030T-B	R88M-W05030T-BS1
		100 W	R88M-W10030H-B	R88M-W10030H-BS1	R88M-W10030T-B	R88M-W10030T-BS1
		200 W	R88M-W20030H-B	R88M-W20030H-BS1	R88M-W20030T-B	R88M-W20030T-BS1
		400 W	R88M-W40030H-B	R88M-W40030H-BS1	R88M-W40030T-B	R88M-W40030T-BS1
		750 W	R88M-W75030H-B	R88M-W75030H-BS1	R88M-W75030T-B	R88M-W75030T-BS1
		1 kW	R88M-W1K030H-B	R88M-W1K030H-BS2	R88M-W1K030T-B	R88M-W1K030T-BS2
		1.5 kW	R88M-W1K530H-B	R88M-W1K530H-BS2	R88M-W1K530T-B	R88M-W1K530T-BS2
		2 kW	R88M-W2K030H-B	R88M-W2K030H-BS2	R88M-W2K030T-B	R88M-W2K030T-BS2
		3 kW	R88M-W3K030H-B	R88M-W3K030H-BS2	R88M-W3K030T-B	R88M-W3K030T-BS2

● 3,000-r/min Flat-style Servomotors

Without brake	200 V	100 W	R88M-WP10030H	R88M-WP10030H-S1	R88M-WP10030T	R88M-WP10030T-S1
		200 W	R88M-WP20030H	R88M-WP20030H-S1	R88M-WP20030T	R88M-WP20030T-S1
		400 W	R88M-WP40030H	R88M-WP40030H-S1	R88M-WP40030T	R88M-WP40030T-S1
		750 W	R88M-WP75030H	R88M-WP75030H-S1	R88M-WP75030T	R88M-WP75030T-S1
		1.5 kW	R88M-WP1K530H	R88M-WP1K530H-S1	R88M-WP1K530T	R88M-WP1K530T-S1
With brake	200 V	100 W	R88M-WP10030H-B	R88M-WP10030H-BS1	R88M-WP10030T-B	R88M-WP10030T-BS1
		200 W	R88M-WP20030H-B	R88M-WP20030H-BS1	R88M-WP20030T-B	R88M-WP20030T-BS1
		400 W	R88M-WP40030H-B	R88M-WP40030H-BS1	R88M-WP40030T-B	R88M-WP40030T-BS1
		750 W	R88M-WP75030H-B	R88M-WP75030H-BS1	R88M-WP75030T-B	R88M-WP75030T-BS1
		1.5 kW	R88M-WP1K530H-B	R88M-WP1K530H-BS1	R88M-WP1K530T-B	R88M-WP1K530T-BS1

● 1,000-r/min Servomotors

Without brake	200 V	300 W	R88M-W30010H	R88M-W30010H-S2	R88M-W30010T	R88M-W30010T-S2
		600 W	R88M-W60010H	R88M-W60010H-S2	R88M-W60010T	R88M-W60010T-S2
		900 W	R88M-W90010H	R88M-W90010H-S2	R88M-W90010T	R88M-W90010T-S2
		1.2 kW	R88M-W1K210H	R88M-W1K210H-S2	R88M-W1K210T	R88M-W1K210T-S2
		2 kW	R88M-W2K010H	R88M-W2K010H-S2	R88M-W2K010T	R88M-W2K010T-S2
With brake	200 V	300 W	R88M-W30010H-B	R88M-W30010H-BS2	R88M-W30010T-B	R88M-W30010T-BS2
		600 W	R88M-W60010H-B	R88M-W60010H-BS2	R88M-W60010T-B	R88M-W60010T-BS2
		900 W	R88M-W90010H-B	R88M-W90010H-BS2	R88M-W90010T-B	R88M-W90010T-BS2
		1.2 kW	R88M-W1K210H-B	R88M-W1K210H-BS2	R88M-W1K210T-B	R88M-W1K210T-BS2
		2 kW	R88M-W2K010H-B	R88M-W2K010H-BS2	R88M-W2K010T-B	R88M-W2K010T-BS2

● 1,500-r/min Servomotors

Without brake	200 V	450 W	---	---	R88M-W45015T	R88M-W45015T-S2
		850 W	---	---	R88M-W85015T	R88M-W85015T-S2
		1.3 kW	---	---	R88M-W1K315T	R88M-W1K315T-S2
		1.8 kW	---	---	R88M-W1K815T	R88M-W1K815T-S2
With brake	200 V	450 W	---	---	R88M-W45015T-B	R88M-W45015T-BS2
		850 W	---	---	R88M-W85015T-B	R88M-W85015T-BS2
		1.3 kW	---	---	R88M-W1K315T-B	R88M-W1K315T-BS2
		1.8 kW	---	---	R88M-W1K815T-B	R88M-W1K815T-BS2

■ IP67 (Waterproof) Servomotors

Specifications			Model			
			With incremental encoder		With absolute encoder	
			Straight shaft without key	Straight shaft with key	Straight shaft without key	Straight shaft with key

● 3,000-r/min Servomotors

Without brake	200 V	1 kW	R88M-W1K030H-O	R88M-W1K030H-OS2	R88M-W1K030T-O	R88M-W1K030T-OS2
		1.5 kW	R88M-W1K530H-O	R88M-W1K530H-OS2	R88M-W1K530T-O	R88M-W1K530T-OS2
		2 kW	R88M-W2K030H-O	R88M-W2K030H-OS2	R88M-W2K030T-O	R88M-W2K030T-OS2
		3 kW	R88M-W3K030H-O	R88M-W3K030H-OS2	R88M-W3K030T-O	R88M-W3K030T-OS2
With brake	200 V	1 kW	R88M-W1K030H-BO	R88M-W1K030H-BOS2	R88M-W1K030T-BO	R88M-W1K030T-BOS2
		1.5 kW	R88M-W1K530H-BO	R88M-W1K530H-BOS2	R88M-W1K530T-BO	R88M-W1K530T-BOS2
		2 kW	R88M-W2K030H-BO	R88M-W2K030H-BOS2	R88M-W2K030T-BO	R88M-W2K030T-BOS2
		3 kW	R88M-W3K030H-BO	R88M-W3K030H-BOS2	R88M-W3K030T-BO	R88M-W3K030T-BOS2

● 3,000-r/min Flat-style Servomotors

Without brake	200 V	100 W	R88M-WP10030H-W	R88M-WP10030H-WS1	R88M-WP10030T-W	R88M-WP10030T-WS1
		200 W	R88M-WP20030H-W	R88M-WP20030H-WS1	R88M-WP20030T-W	R88M-WP20030T-WS1
		400 W	R88M-WP40030H-W	R88M-WP40030H-WS1	R88M-WP40030T-W	R88M-WP40030T-WS1
		750 W	R88M-WP75030H-W	R88M-WP75030H-WS1	R88M-WP75030T-W	R88M-WP75030T-WS1
		1.5 kW	R88M-WP1K530H-W	R88M-WP1K530H-WS1	R88M-WP1K530T-W	R88M-WP1K530T-WS1
With brake	200 V	100 W	R88M-WP10030H-BW	R88M-WP10030H-BWS1	R88M-WP10030T-BW	R88M-WP10030T-BWS1
		200 W	R88M-WP20030H-BW	R88M-WP20030H-BWS1	R88M-WP20030T-BW	R88M-WP20030T-BWS1
		400 W	R88M-WP40030H-BW	R88M-WP40030H-BWS1	R88M-WP40030T-BW	R88M-WP40030T-BWS1
		750 W	R88M-WP75030H-BW	R88M-WP75030H-BWS1	R88M-WP75030T-BW	R88M-WP75030T-BWS1
		1.5 kW	R88M-WP1K530H-BW	R88M-WP1K530H-BWS1	R88M-WP1K530T-BW	R88M-WP1K530T-BWS1

● 1,000-r/min Servomotors

Without brake	200 V	300 W	R88M-W30010H-O	R88M-W30010H-OS2	R88M-W30010T-O	R88M-W30010T-OS2
		600 W	R88M-W60010H-O	R88M-W60010H-OS2	R88M-W60010T-O	R88M-W60010T-OS2
		900 W	R88M-W90010H-O	R88M-W90010H-OS2	R88M-W90010T-O	R88M-W90010T-OS2
		1.2 kW	R88M-W1K210H-O	R88M-W1K210H-OS2	R88M-W1K210T-O	R88M-W1K210T-OS2
		2 kW	R88M-W2K010H-O	R88M-W2K010H-OS2	R88M-W2K010T-O	R88M-W2K010T-OS2
With brake	200 V	300 W	R88M-W30010H-BO	R88M-W30010H-BOS2	R88M-W30010T-BO	R88M-W30010T-BOS2
		600 W	R88M-W60010H-BO	R88M-W60010H-BOS2	R88M-W60010T-BO	R88M-W60010T-BOS2
		900 W	R88M-W90010H-BO	R88M-W90010H-BOS2	R88M-W90010T-BO	R88M-W90010T-BOS2
		1.2 kW	R88M-W1K210H-BO	R88M-W1K210H-BOS2	R88M-W1K210T-BO	R88M-W1K210T-BOS2
		2 kW	R88M-W2K010H-BO	R88M-W2K010H-BOS2	R88M-W2K010T-BO	R88M-W2K010T-BOS2

● 1,500-r/min Servomotors

Without brake	200 V	450 W	---	---	R88M-W45015TO	R88M-W45015T-OS2
		850 W	---	---	R88M-W85015TO	R88M-W85015T-OS2
		1.3 kW	---	---	R88M-W1K315TO	R88M-W1K315T-OS2
		1.8 kW	---	---	R88M-W1K815TO	R88M-W1K815T-OS2
With brake	200 V	450 W	---	---	R88M-W45015T-BO	R88M-W45015T-BOS2
		850 W	---	---	R88M-W85015T-BO	R88M-W85015T-BOS2
		1.3 kW	---	---	R88M-W1K315T-BO	R88M-W1K315T-BOS2
		1.8 kW	---	---	R88M-W1K815T-BO	R88M-W1K815T-BOS2

■ Servomotors with Gears

● Combination Table for Servomotors with Standard Gears

Standard Gears are highly accurate gears, with a maximum backlash of 3 degrees. The standard shaft is a straight shaft with a key. (Models without keys can also be manufactured for 3,000-r/min motors from 30 to 750 W and for 3,000-r/min flat-style motors. Models without keys have a suffix of -G□□B.)

Note A check mark in a box indicates that the two models can be combined. If the box is unchecked, then the models cannot be combined.

3,000-r/min Servomotors

Specifications		Basic model	Gear (deceleration rate)							
			1/5	1/9	1/11	1/20	1/21	1/29	1/33	1/45
			-G05BJ	-G09BJ	-G11BJ	-G20BJ	-G21BJ	-G29BJ	-G33BJ	-G45BJ
200 V	50 W	R88M-W05030H/T	Yes	Yes			Yes		Yes	
	100 W	R88M-W10030H/T	Yes		Yes		Yes		Yes	
	200 W	R88M-W20030H/T	Yes		Yes		Yes		Yes	
	400 W	R88M-W40030H/T	Yes		Yes		Yes		Yes	
	750 W	R88M-W75030H/T	Yes		Yes		Yes		Yes	
	1 kW	R88M-W1K030H/T	Yes	Yes		Yes		Yes		Yes
	1.5 kW	R88M-W1K530H/T	Yes	Yes		Yes		Yes		Yes
	2 kW	R88M-W2K030H/T	Yes	Yes		Yes		Yes		Yes
	3 kW	R88M-W3K030H/T	Yes	Yes		Yes		Yes		Yes

3,000-r/min Flat-style Servomotors

Specifications		Basic model	Gear (deceleration rate)							
			1/5	1/9	1/11	1/20	1/21	1/29	1/33	1/45
			-G05BJ	-G09BJ	-G11BJ	-G20BJ	-G21BJ	-G29BJ	-G33BJ	-G45BJ
200 V	100 W	R88M-WP10030H/T	Yes		Yes		Yes		Yes	
	200 W	R88M-WP20030H/T	Yes		Yes		Yes		Yes	
	400 W	R88M-WP40030H/T	Yes		Yes		Yes		Yes	
	750 W	R88M-WP75030H/T	Yes		Yes		Yes		Yes	
	1.5 kW	R88M-WP1K530H/T	Yes		Yes		Yes		Yes	

1,000-r/min Servomotors

Specifications		Basic model	Gear (deceleration rate)							
			1/5	1/9	1/11	1/20	1/21	1/29	1/33	1/45
			-G05BJ	-G09BJ	-G11BJ	-G20BJ	-G21BJ	-G29BJ	-G33BJ	-G45BJ
200 V	300 W	R88M-W30010H/T	Yes	Yes		Yes		Yes		Yes
	600 W	R88M-W60010H/T	Yes	Yes		Yes		Yes		Yes
	900 W	R88M-W90010H/T	Yes	Yes		Yes		Yes		Yes
	1.2 kW	R88M-W1K210H/T	Yes	Yes		Yes		Yes		Yes
	2 kW	R88M-W2K010H/T	Yes	Yes		Yes				

1,500-r/min Servomotors

Specifications		Basic model	Gear (deceleration rate)							
			1/5	1/9	1/11	1/20	1/21	1/29	1/33	1/45
			-G05BJ	-G09BJ	-G11BJ	-G20BJ	-G21BJ	-G29BJ	-G33BJ	-G45BJ
200 V	450 W	R88M-W45015T	Yes	Yes		Yes		Yes		Yes
	850 W	R88M-W85015T	Yes	Yes		Yes		Yes		Yes
	1.3 kW	R88M-W1K315T	Yes	Yes		Yes		Yes		Yes
	1.8 kW	R88M-W1K815T	Yes	Yes		Yes		Yes		

■ Combination Table for Servomotors with Economy Gears

Economy Gears are low-cost gears, with a maximum backlash of 45 degrees. The shaft is a straight shaft with key. Models without keys are not available.

Note 1. The 1,000-r/min and 1,500-r/min Servomotors cannot be combined with Economy Gears.

Note 2. A check mark in a box indicates that the two models can be combined. If the box is unchecked, then the models cannot be combined.

3,000-r/min Servomotors

Specifications		Basic model	Gear (deceleration rate)			
			1/5	1/9	1/15	1/25
			-G05CJ	-G09CJ	-G15C	-G25CJ
200 V	50 W	R88M-W05030H/T				
	100 W	R88M-W10030H/T	Yes	Yes	Yes	Yes
	200 W	R88M-W20030H/T	Yes	Yes	Yes	Yes
	400 W	R88M-W40030H/T	Yes	Yes	Yes	Yes
	750 W	R88M-W75030H/T	Yes	Yes	Yes	Yes
	1 kW	R88M-W1K030H/T				
	1.5 kW	R88M-W1K530H/T				
	2 kW	R88M-W2K030H/T				
	3 kW	R88M-W3K030H/T				

3,000-r/min Flat-style Servomotors

Specifications		Basic model	Gear (deceleration rate)			
			1/5	1/9	1/15	1/25
			-G05CJ	-G09CJ	-G15C	-G25CJ
200 V	100 W	R88M-WP10030H/T	Yes	Yes	Yes	Yes
	200 W	R88M-WP20030H/T	Yes	Yes	Yes	Yes
	400 W	R88M-WP40030H/T	Yes	Yes	Yes	Yes
	750 W	R88M-WP75030H/T	Yes	Yes	Yes	Yes
	1.5 kW	R88M-WP1K530H/T				

● Servomotors with Standard Gears (Straight Shaft with Key)

3,000-r/min Servomotors

Specifications			Model			
			With incremental encoder		With absolute encoder	
			Without brake	With brake	Without brake	With brake
200 V	50 W	1/5	R88M-W05030H-G05BJ	R88M-W05030H-BG05BJ	R88M-W05030T-G05BJ	R88M-W05030T-BG05BJ
		1/9	R88M-W05030H-G09BJ	R88M-W05030H-BG09BJ	R88M-W05030T-G09BJ	R88M-W05030T-BG09BJ
		1/21	R88M-W05030H-G21BJ	R88M-W05030H-BG21BJ	R88M-W05030T-G21BJ	R88M-W05030T-BG21BJ
		1/33	R88M-W05030H-G33BJ	R88M-W05030H-BG33BJ	R88M-W05030T-G33BJ	R88M-W05030T-BG33BJ
	100 W	1/5	R88M-W10030H-G05BJ	R88M-W10030H-BG05BJ	R88M-W10030T-G05BJ	R88M-W10030T-BG05BJ
		1/11	R88M-W10030H-G11BJ	R88M-W10030H-BG11BJ	R88M-W10030T-G11BJ	R88M-W10030T-BG11BJ
		1/21	R88M-W10030H-G21BJ	R88M-W10030H-BG21BJ	R88M-W10030T-G21BJ	R88M-W10030T-BG21BJ
		1/33	R88M-W10030H-G33BJ	R88M-W10030H-BG33BJ	R88M-W10030T-G33BJ	R88M-W10030T-BG33BJ
	200 W	1/5	R88M-W20030H-G05BJ	R88M-W20030H-BG05BJ	R88M-W20030T-G05BJ	R88M-W20030T-BG05BJ
		1/11	R88M-W20030H-G11BJ	R88M-W20030H-BG11BJ	R88M-W20030T-G11BJ	R88M-W20030T-BG11BJ
		1/21	R88M-W20030H-G21BJ	R88M-W20030H-BG21BJ	R88M-W20030T-G21BJ	R88M-W20030T-BG21BJ
		1/33	R88M-W20030H-G33BJ	R88M-W20030H-BG33BJ	R88M-W20030T-G33BJ	R88M-W20030T-BG33BJ
	400 W	1/5	R88M-W40030H-G05BJ	R88M-W40030H-BG05BJ	R88M-W40030T-G05BJ	R88M-W40030T-BG05BJ
		1/11	R88M-W40030H-G11BJ	R88M-W40030H-BG11BJ	R88M-W40030T-G11BJ	R88M-W40030T-BG11BJ
		1/21	R88M-W40030H-G21BJ	R88M-W40030H-BG21BJ	R88M-W40030T-G21BJ	R88M-W40030T-BG21BJ
		1/33	R88M-W40030H-G33BJ	R88M-W40030H-BG33BJ	R88M-W40030T-G33BJ	R88M-W40030T-BG33BJ
	750 W	1/5	R88M-W75030H-G05BJ	R88M-W75030H-BG05BJ	R88M-W75030T-G05BJ	R88M-W75030T-BG05BJ
		1/11	R88M-W75030H-G11BJ	R88M-W75030H-BG11BJ	R88M-W75030T-G11BJ	R88M-W75030T-BG11BJ
		1/21	R88M-W75030H-G21BJ	R88M-W75030H-BG21BJ	R88M-W75030T-G21BJ	R88M-W75030T-BG21BJ
		1/33	R88M-W75030H-G33BJ	R88M-W75030H-BG33BJ	R88M-W75030T-G33BJ	R88M-W75030T-BG33BJ
	1 kW	1/5	R88M-W1K030H-G05BJ	R88M-W1K030H-BG05BJ	R88M-W1K030T-G05BJ	R88M-W1K030T-BG05BJ
		1/9	R88M-W1K030H-G09BJ	R88M-W1K030H-BG09BJ	R88M-W1K030T-G09BJ	R88M-W1K030T-BG09BJ
		1/20	R88M-W1K030H-G20BJ	R88M-W1K030H-BG20BJ	R88M-W1K030T-G20BJ	R88M-W1K030T-BG20BJ
		1/29	R88M-W1K030H-G29BJ	R88M-W1K030H-BG29BJ	R88M-W1K030T-G29BJ	R88M-W1K030T-BG29BJ
		1/45	R88M-W1K030H-G45BJ	R88M-W1K030H-BG45BJ	R88M-W1K030T-G45BJ	R88M-W1K030T-BG45BJ
	1.5 kW	1/5	R88M-W1K530H-G05BJ	R88M-W1K530H-BG05BJ	R88M-W1K530T-G05BJ	R88M-W1K530T-BG05BJ
		1/9	R88M-W1K530H-G09BJ	R88M-W1K530H-BG09BJ	R88M-W1K530T-G09BJ	R88M-W1K530T-BG09BJ
		1/20	R88M-W1K530H-G20BJ	R88M-W1K530H-BG20BJ	R88M-W1K530T-G20BJ	R88M-W1K530T-BG20BJ
		1/29	R88M-W1K530H-G29BJ	R88M-W1K530H-BG29BJ	R88M-W1K530T-G29BJ	R88M-W1K530T-BG29BJ
		1/45	R88M-W1K530H-G45BJ	R88M-W1K530H-BG45BJ	R88M-W1K530T-G45BJ	R88M-W1K530T-BG45BJ
	2 kW	1/5	R88M-W2K030H-G05BJ	R88M-W2K030H-BG05BJ	R88M-W2K030T-G05BJ	R88M-W2K030T-BG05BJ
		1/9	R88M-W2K030H-G09BJ	R88M-W2K030H-BG09BJ	R88M-W2K030T-G09BJ	R88M-W2K030T-BG09BJ
		1/20	R88M-W2K030H-G20BJ	R88M-W2K030H-BG20BJ	R88M-W2K030T-G20BJ	R88M-W2K030T-BG20BJ
		1/29	R88M-W2K030H-G29BJ	R88M-W2K030H-BG29BJ	R88M-W2K030T-G29BJ	R88M-W2K030T-BG29BJ
		1/45	R88M-W2K030H-G45BJ	R88M-W2K030H-BG45BJ	R88M-W2K030T-G45BJ	R88M-W2K030T-BG45BJ
	3 kW	1/5	R88M-W3K030H-G05BJ	R88M-W3K030H-BG05BJ	R88M-W3K030T-G05BJ	R88M-W3K030T-BG05BJ
		1/9	R88M-W3K030H-G09BJ	R88M-W3K030H-BG09BJ	R88M-W3K030T-G09BJ	R88M-W3K030T-BG09BJ
		1/20	R88M-W3K030H-G20BJ	R88M-W3K030H-BG20BJ	R88M-W3K030T-G20BJ	R88M-W3K030T-BG20BJ
		1/29	R88M-W3K030H-G29BJ	R88M-W3K030H-BG29BJ	R88M-W3K030T-G29BJ	R88M-W3K030T-BG29BJ
		1/45	R88M-W3K030H-G45BJ	R88M-W3K030H-BG45BJ	R88M-W3K030T-G45BJ	R88M-W3K030T-BG45BJ

3,000-r/min Flat-style Servomotors

Specifications			Model			
			With incremental encoder		With absolute encoder	
			Without brake	With brake	Without brake	With brake
200 V	100 W	1/5	R88M-WP10030H-G05BJ	R88M-WP10030H-BG05BJ	R88M-WP10030T-G05BJ	R88M-WP10030T-BG05BJ
		1/11	R88M-WP10030H-G11BJ	R88M-WP10030H-BG11BJ	R88M-WP10030T-G11BJ	R88M-WP10030T-BG11BJ
		1/21	R88M-WP10030H-G21BJ	R88M-WP10030H-BG21BJ	R88M-WP10030T-G21BJ	R88M-WP10030T-BG21BJ
		1/33	R88M-WP10030H-G33BJ	R88M-WP10030H-BG33BJ	R88M-WP10030T-G33BJ	R88M-WP10030T-BG33BJ
	200 W	1/5	R88M-WP20030H-G05BJ	R88M-WP20030H-BG05BJ	R88M-WP20030T-G05BJ	R88M-WP20030T-BG05BJ
		1/11	R88M-WP20030H-G11BJ	R88M-WP20030H-BG11BJ	R88M-WP20030T-G11BJ	R88M-WP20030T-BG11BJ
		1/21	R88M-WP20030H-G21BJ	R88M-WP20030H-BG21BJ	R88M-WP20030T-G21BJ	R88M-WP20030T-BG21BJ
		1/33	R88M-WP20030H-G33BJ	R88M-WP20030H-BG33BJ	R88M-WP20030T-G33BJ	R88M-WP20030T-BG33BJ
	400 W	1/5	R88M-WP40030H-G05BJ	R88M-WP40030H-BG05BJ	R88M-WP40030T-G05BJ	R88M-WP40030T-BG05BJ
		1/11	R88M-WP40030H-G11BJ	R88M-WP40030H-BG11BJ	R88M-WP40030T-G11BJ	R88M-WP40030T-BG11BJ
		1/21	R88M-WP40030H-G21BJ	R88M-WP40030H-BG21BJ	R88M-WP40030T-G21BJ	R88M-WP40030T-BG21BJ
		1/33	R88M-WP40030H-G33BJ	R88M-WP40030H-BG33BJ	R88M-WP40030T-G33BJ	R88M-WP40030T-BG33BJ
	750 W	1/5	R88M-WP75030H-G05BJ	R88M-WP75030H-BG05BJ	R88M-WP75030T-G05BJ	R88M-WP75030T-BG05BJ
		1/11	R88M-WP75030H-G11BJ	R88M-WP75030H-BG11BJ	R88M-WP75030T-G11BJ	R88M-WP75030T-BG11BJ
		1/21	R88M-WP75030H-G21BJ	R88M-WP75030H-BG21BJ	R88M-WP75030T-G21BJ	R88M-WP75030T-BG21BJ
		1/33	R88M-WP75030H-G33BJ	R88M-WP75030H-BG33BJ	R88M-WP75030T-G33BJ	R88M-WP75030T-BG33BJ
	1.5 kW	1/5	R88M-WP1K530H-G05BJ	R88M-WP1K530H-BG05BJ	R88M-WP1K530T-G05BJ	R88M-WP1K530T-BG05BJ
		1/11	R88M-WP1K530H-G11BJ	R88M-WP1K530H-BG11BJ	R88M-WP1K530T-G11BJ	R88M-WP1K530T-BG11BJ
		1/21	R88M-WP1K530H-G21BJ	R88M-WP1K530H-BG21BJ	R88M-WP1K530T-G21BJ	R88M-WP1K530T-BG21BJ
		1/33	R88M-WP1K530H-G33BJ	R88M-WP1K530H-BG33BJ	R88M-WP1K530T-G33BJ	R88M-WP1K530T-BG33BJ

1,000-r/min Servomotors

Specifications			Model			
			With incremental encoder		With absolute encoder	
			Without brake	With brake	Without brake	With brake
200 V	300 W	1/5	R88M-W30010H-G05BJ	R88M-W30010H-BG05BJ	R88M-W30010T-G05BJ	R88M-W30010T-BG05BJ
		1/9	R88M-W30010H-G09BJ	R88M-W30010H-BG09BJ	R88M-W30010T-G09BJ	R88M-W30010T-BG09BJ
		1/20	R88M-W30010H-G20BJ	R88M-W30010H-BG20BJ	R88M-W30010T-G20BJ	R88M-W30010T-BG20BJ
		1/29	R88M-W30010H-G29BJ	R88M-W30010H-BG29BJ	R88M-W30010T-G29BJ	R88M-W30010T-BG29BJ
		1/45	R88M-W30010H-G45BJ	R88M-W30010H-BG45BJ	R88M-W30010T-G45BJ	R88M-W30010T-BG45BJ
	600 W	1/5	R88M-W60010H-G05BJ	R88M-W60010H-BG05BJ	R88M-W60010T-G05BJ	R88M-W60010T-BG05BJ
		1/9	R88M-W60010H-G09BJ	R88M-W60010H-BG09BJ	R88M-W60010T-G09BJ	R88M-W60010T-BG09BJ
		1/20	R88M-W60010H-G20BJ	R88M-W60010H-BG20BJ	R88M-W60010T-G20BJ	R88M-W60010T-BG20BJ
		1/29	R88M-W60010H-G29BJ	R88M-W60010H-BG29BJ	R88M-W60010T-G29BJ	R88M-W60010T-BG29BJ
		1/45	R88M-W60010H-G45BJ	R88M-W60010H-BG45BJ	R88M-W60010T-G45BJ	R88M-W60010T-BG45BJ
	900 W	1/5	R88M-W90010H-G05BJ	R88M-W90010H-BG05BJ	R88M-W90010T-G05BJ	R88M-W90010T-BG05BJ
		1/9	R88M-W90010H-G09BJ	R88M-W90010H-BG09BJ	R88M-W90010T-G09BJ	R88M-W90010T-BG09BJ
		1/20	R88M-W90010H-G20BJ	R88M-W90010H-BG20BJ	R88M-W90010T-G20BJ	R88M-W90010T-BG20BJ
		1/29	R88M-W90010H-G29BJ	R88M-W90010H-BG29BJ	R88M-W90010T-G29BJ	R88M-W90010T-BG29BJ
		1/45	R88M-W90010H-G45BJ	R88M-W90010H-BG45BJ	R88M-W90010T-G45BJ	R88M-W90010T-BG45BJ
	1.2 kW	1/5	R88M-W1K210H-G05BJ	R88M-W1K210H-BG05BJ	R88M-W1K210T-G05BJ	R88M-W1K210T-BG05BJ
		1/9	R88M-W1K210H-G09BJ	R88M-W1K210H-BG09BJ	R88M-W1K210T-G09BJ	R88M-W1K210T-BG09BJ
		1/20	R88M-W1K210H-G20BJ	R88M-W1K210H-BG20BJ	R88M-W1K210T-G20BJ	R88M-W1K210T-BG20BJ
		1/29	R88M-W1K210H-G29BJ	R88M-W1K210H-BG29BJ	R88M-W1K210T-G29BJ	R88M-W1K210T-BG29BJ
		1/45	R88M-W1K210H-G45BJ	R88M-W1K210H-BG45BJ	R88M-W1K210T-G45BJ	R88M-W1K210T-BG45BJ
	2 kW	1/5	R88M-W2K010H-G05BJ	R88M-W2K010H-BG05BJ	R88M-W2K010T-G05BJ	R88M-W2K010T-BG05BJ
		1/9	R88M-W2K010H-G09BJ	R88M-W2K010H-BG09BJ	R88M-W2K010T-G09BJ	R88M-W2K010T-BG09BJ
		1/20	R88M-W2K010H-G20BJ	R88M-W2K010H-BG20BJ	R88M-W2K010T-G20BJ	R88M-W2K010T-BG20BJ

1,500-r/min Servomotors

Specifications			Model			
			With incremental encoder		With absolute encoder	
			Without brake	With brake	Without brake	With brake
200 V	450 W	1/5	---	---	R88M-W45015T-G05BJ	R88M-W45015T-BG05BJ
		1/9	---	---	R88M-W45015T-G09BJ	R88M-W45015T-BG09BJ
		1/20	---	---	R88M-W45015T-G20BJ	R88M-W45015T-BG20BJ
		1/29	---	---	R88M-W45015T-G29BJ	R88M-W45015T-BG29BJ
		1/45	---	---	R88M-W45015T-G45BJ	R88M-W45015T-BG45BJ
	850 W	1/5	---	---	R88M-W85015T-G05BJ	R88M-W85015T-BG05BJ
		1/9	---	---	R88M-W85015T-G09BJ	R88M-W85015T-BG09BJ
		1/20	---	---	R88M-W85015T-G20BJ	R88M-W85015T-BG20BJ
		1/29	---	---	R88M-W85015T-G29BJ	R88M-W85015T-BG29BJ
		1/45	---	---	R88M-W85015T-G45BJ	R88M-W85015T-BG45BJ
	1.3 kW	1/5	---	---	R88M-W1K315T-G05BJ	R88M-W1K315T-BG05BJ
		1/9	---	---	R88M-W1K315T-G09BJ	R88M-W1K315T-BG09BJ
		1/20	---	---	R88M-W1K315T-G20BJ	R88M-W1K315T-BG20BJ
		1/29	---	---	R88M-W1K315T-G29BJ	R88M-W1K315T-BG29BJ
		1/45	---	---	R88M-W1K315T-G45BJ	R88M-W1K315T-BG45BJ
	1.8 kW	1/5	---	---	R88M-W1K815T-G05BJ	R88M-W1K815T-BG05BJ
		1/9	---	---	R88M-W1K815T-G09BJ	R88M-W1K815T-BG09BJ
		1/20	---	---	R88M-W1K815T-G20BJ	R88M-W1K815T-BG20BJ
		1/29	---	---	R88M-W1K815T-G29BJ	R88M-W1K815T-BG29BJ

● Servomotors with Economy Gears (Straight Shaft with Key)

3,000-r/min Servomotors

Specifications			Model			
			With incremental encoder		With absolute encoder	
			Without brake	With brake	Without brake	With brake
200 V	100 W	1/5	R88M-W10030H-G05CJ	R88M-W10030H-BG05CJ	R88M-W10030T-G05CJ	R88M-W10030T-BG05CJ
		1/9	R88M-W10030H-G09CJ	R88M-W10030H-BG09CJ	R88M-W10030T-G09CJ	R88M-W10030T-BG09CJ
		1/15	R88M-W10030H-G15CJ	R88M-W10030H-BG15CJ	R88M-W10030T-G15CJ	R88M-W10030T-BG15CJ
		1/25	R88M-W10030H-G25CJ	R88M-W10030H-BG25CJ	R88M-W10030T-G25CJ	R88M-W10030T-BG25CJ
	200 W	1/5	R88M-W20030H-G05CJ	R88M-W20030H-BG05CJ	R88M-W20030T-G05CJ	R88M-W20030T-BG05CJ
		1/9	R88M-W20030H-G09CJ	R88M-W20030H-BG09CJ	R88M-W20030T-G09CJ	R88M-W20030T-BG09CJ
		1/15	R88M-W20030H-G15CJ	R88M-W20030H-BG15CJ	R88M-W20030T-G15CJ	R88M-W20030T-BG15CJ
		1/25	R88M-W20030H-G25CJ	R88M-W20030H-BG25CJ	R88M-W20030T-G25CJ	R88M-W20030T-BG25CJ
	400 W	1/5	R88M-W40030H-G05CJ	R88M-W40030H-BG05CJ	R88M-W40030T-G05CJ	R88M-W40030T-BG05CJ
		1/9	R88M-W40030H-G09CJ	R88M-W40030H-BG09CJ	R88M-W40030T-G09CJ	R88M-W40030T-BG09CJ
		1/15	R88M-W40030H-G15CJ	R88M-W40030H-BG15CJ	R88M-W40030T-G15CJ	R88M-W40030T-BG15CJ
		1/25	R88M-W40030H-G25CJ	R88M-W40030H-BG25CJ	R88M-W40030T-G25CJ	R88M-W40030T-BG25CJ
	750 W	1/5	R88M-W75030H-G05CJ	R88M-W75030H-BG05CJ	R88M-W75030T-G05CJ	R88M-W75030T-BG05CJ
		1/9	R88M-W75030H-G09CJ	R88M-W75030H-BG09CJ	R88M-W75030T-G09CJ	R88M-W75030T-BG09CJ
		1/15	R88M-W75030H-G15CJ	R88M-W75030H-BG15CJ	R88M-W75030T-G15CJ	R88M-W75030T-BG15CJ
		1/25	R88M-W75030H-G25CJ	R88M-W75030H-BG25CJ	R88M-W75030T-G25CJ	R88M-W75030T-BG25CJ

3,000-r/min Flat-style Servomotors

Specifications			Model			
			With incremental encoder		With absolute encoder	
			Without brake	With brake	Without brake	With brake
200 V	100 W	1/5	R88M-WP10030H-G05CJ	R88M-WP10030H-BG05CJ	R88M-WP10030T-G05CJ	R88M-WP10030T-BG05CJ
		1/9	R88M-WP10030H-G09CJ	R88M-WP10030H-BG09CJ	R88M-WP10030T-G09CJ	R88M-WP10030T-BG09CJ
		1/15	R88M-WP10030H-G15CJ	R88M-WP10030H-BG15CJ	R88M-WP10030T-G15CJ	R88M-WP10030T-BG15CJ
		1/25	R88M-WP10030H-G25CJ	R88M-WP10030H-BG25CJ	R88M-WP10030T-G25CJ	R88M-WP10030T-BG25CJ
	200 W	1/5	R88M-WP20030H-G05CJ	R88M-WP20030H-BG05CJ	R88M-WP20030T-G05CJ	R88M-WP20030T-BG05CJ
		1/9	R88M-WP20030H-G09CJ	R88M-WP20030H-BG09CJ	R88M-WP20030T-G09CJ	R88M-WP20030T-BG09CJ
		1/15	R88M-WP20030H-G15CJ	R88M-WP20030H-BG15CJ	R88M-WP20030T-G15CJ	R88M-WP20030T-BG15CJ
		1/25	R88M-WP20030H-G25CJ	R88M-WP20030H-BG25CJ	R88M-WP20030T-G25CJ	R88M-WP20030T-BG25CJ
	400 W	1/5	R88M-WP40030H-G05CJ	R88M-WP40030H-BG05CJ	R88M-WP40030T-G05CJ	R88M-WP40030T-BG05CJ
		1/9	R88M-WP40030H-G09CJ	R88M-WP40030H-BG09CJ	R88M-WP40030T-G09CJ	R88M-WP40030T-BG09CJ
		1/15	R88M-WP40030H-G15CJ	R88M-WP40030H-BG15CJ	R88M-WP40030T-G15CJ	R88M-WP40030T-BG15CJ
		1/25	R88M-WP40030H-G25CJ	R88M-WP40030H-BG25CJ	R88M-WP40030T-G25CJ	R88M-WP40030T-BG25CJ
	750 W	1/5	R88M-WP75030H-G05CJ	R88M-WP75030H-BG05CJ	R88M-WP75030T-G05CJ	R88M-WP75030T-BG05CJ
		1/9	R88M-WP75030H-G09CJ	R88M-WP75030H-BG09CJ	R88M-WP75030T-G09CJ	R88M-WP75030T-BG09CJ
		1/15	R88M-WP75030H-G15CJ	R88M-WP75030H-BG15CJ	R88M-WP75030T-G15CJ	R88M-WP75030T-BG15CJ
		1/25	R88M-WP75030H-G25CJ	R88M-WP75030H-BG25CJ	R88M-WP75030T-G25CJ	R88M-WP75030T-BG25CJ

2-2 Servo Driver and Servomotor Combinations

The tables in this section show the possible combinations of OMNUC W-series Servo Drivers (with built-in MECHATROLINK-II communications) and Servomotors. No other combinations are possible.

Note The boxes (-☐) at the ends of the model numbers are for options such as shaft type, brake, waterproofing, decelerator, and so on.

■ 3,000-r/min Servomotors and Servo Drivers

Voltage	Servomotor			Servo Driver
	Rated output	With incremental encoder	With absolute encoder	
200 V	50 W	R88M-W05030H-☐	R88M-W05030T-☐	R88D-WNA5H-ML2/A5L-M2
	100 W	R88M-W10030H-☐	R88M-W10030T-☐	R88D-WN01H-ML2/01L-ML2
	200 W	R88M-W20030H-☐	R88M-W20030T-☐	R88D-WN02H-ML2/02L-ML2
	400 W	R88M-W40030H-☐	R88M-W40030T-☐	R88D-WN04H-ML2/04L-ML2
	750 W	R88M-W75030H-☐	R88M-W75030T-☐	R88D-WN08H-ML2
	1 kW	R88M-W1K030H-☐	R88M-W1K030T-☐	R88D-WN10H-ML2
	1.5 kW	R88M-W1K530H-☐	R88M-W1K530T-☐	R88D-WN15H-ML2
	2 kW	R88M-W2K030H-☐	R88M-W2K030T-☐	R88D-WN20H-ML2
	3 kW	R88M-W3K030H-☐	R88M-W3K030T-☐	R88D-WN30H-ML2

■ 3,000-r/min Flat-style Servomotors and Servo Drivers

Voltage	Servomotor			Servo Driver
	Rated output	With incremental encoder	With absolute encoder	
200 V	100 W	R88M-WP10030H-☐	R88M-WP10030T-☐	R88D-WN01H-ML2/01L-ML2
	200 W	R88M-WP20030H-☐	R88M-WP20030T-☐	R88D-WN02H-ML2/02L-ML2
	400 W	R88M-WP40030H-☐	R88M-WP40030T-☐	R88D-WN04H-ML2/04L-ML2
	750 W	R88M-WP75030H-☐	R88M-WP75030T-☐	R88D-WN08H-ML2
	1.5 kW	R88M-WP1K530H-☐	R88M-WP1K530T-☐	R88D-WN15H-ML2

■ 1,000-r/min Servomotors and Servo Drivers

Voltage	Servomotor			Servo Driver
	Rated output	With incremental encoder	With absolute encoder	
200 V	300 W	R88M-W30010H-☐	R88M-W30010T-☐	R88D-WN05H-ML2
	600 W	R88M-W60010H-☐	R88M-W60010T-☐	R88D-WN10H-ML2
	900 W	R88M-W90010H-☐	R88M-W90010T-☐	R88D-WN10H-ML2
	1.2 kW	R88M-W1K210H-☐	R88M-W1K210T-☐	R88D-WN15H-ML2
	2 kW	R88M-W2K010H-☐	R88M-W2K010T-☐	R88D-WN20H-ML2

■ 1,500-r/min Servomotors and Servo Drivers

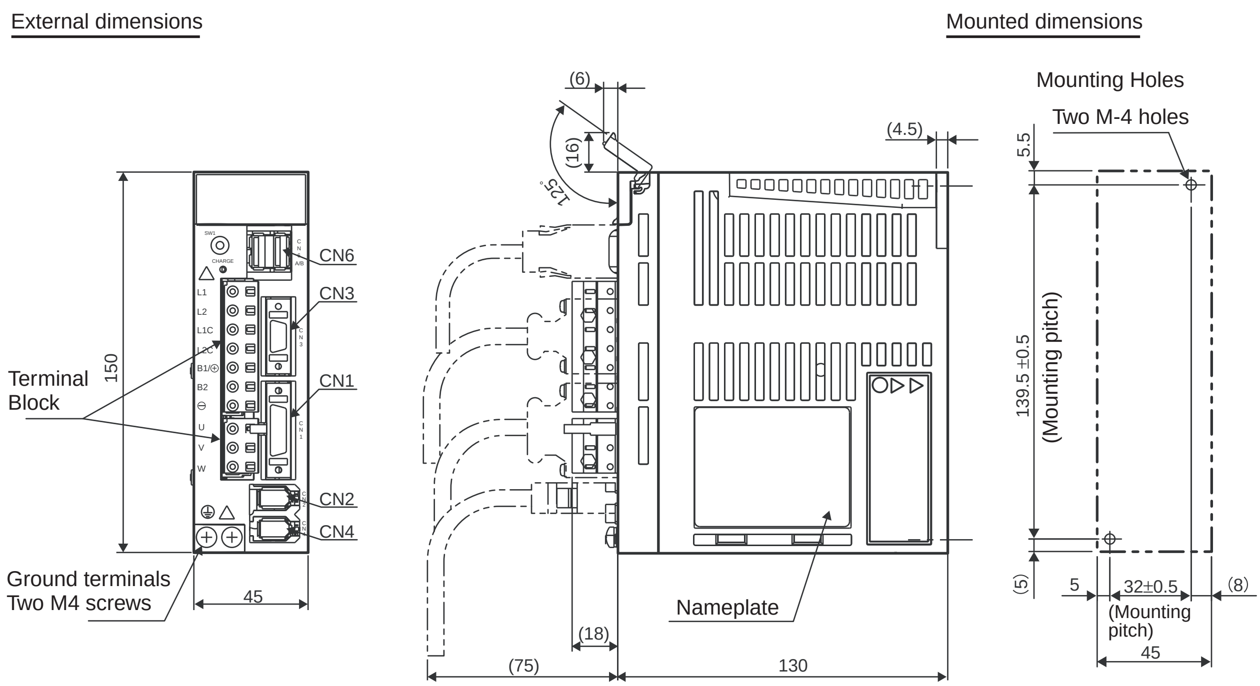
Voltage	Servomotor			Servo Driver
	Rated output	With incremental encoder	With absolute encoder	
200 V	450 W	---	R88M-W45015T-□	R88D-WN05H-ML2
	850 W	---	R88M-W85015T-□	R88D-WN10H-ML2
	1.3 kW	---	R88M-W1K315T-□	R88D-WN15H-ML2
	1.8 kW	---	R88M-W1K815T-□	R88D-WN20H-ML2

2-3 External and Mounted Dimensions

2-3-1 AC Servo Drivers

■ Single-phase 100 V: R88D-WNA5L-ML2/-WN01L-ML2/-WN02L-ML2 (50 to 200 W) Single-phase 200 V: R88D-WNA5H-ML2/-WN01H-ML2/-WN02H-ML2 (50 to 200 W)

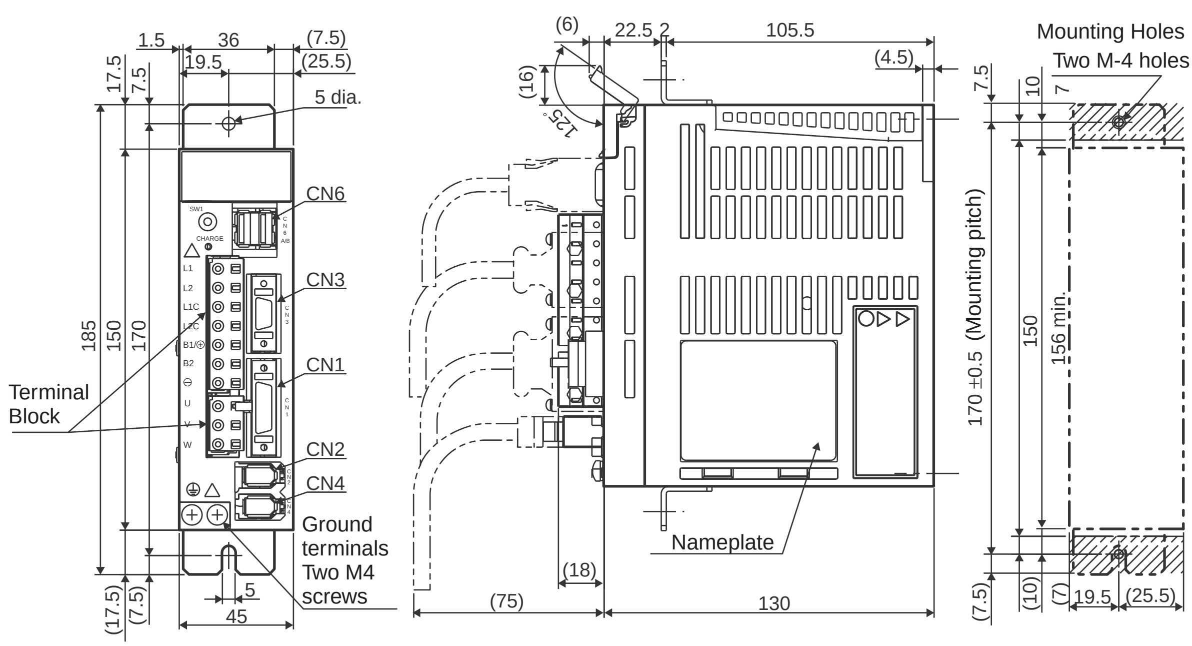
● Wall Mounting



● Front Panel Mounting (Using Mounting Brackets)

External dimensions

Mounted dimensions

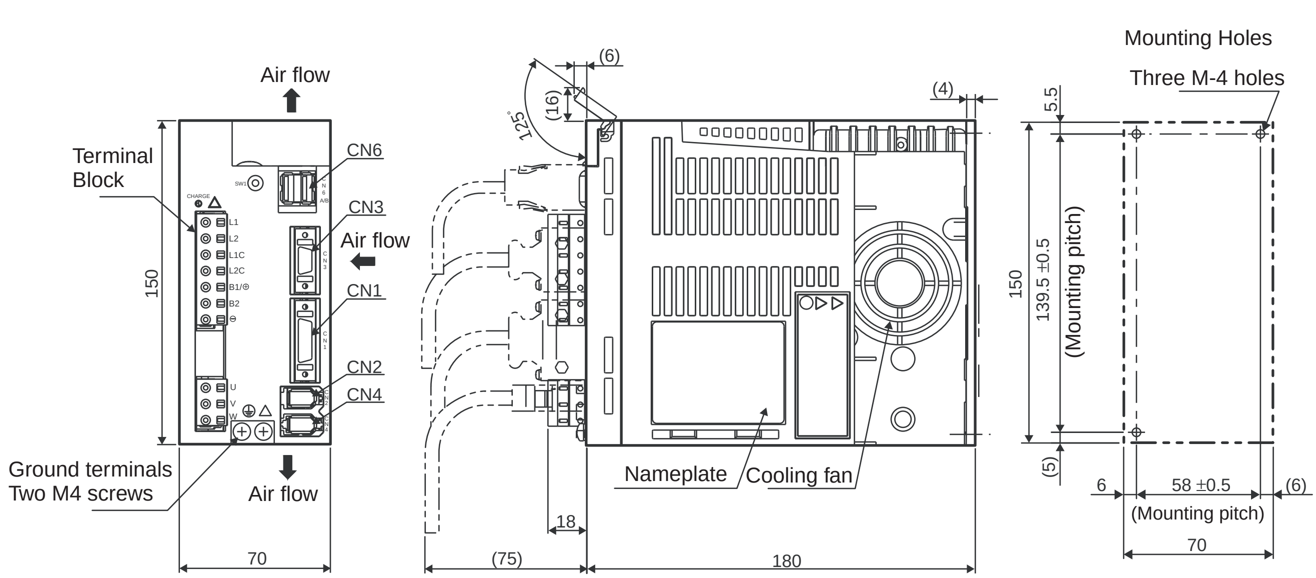


■ Single-phase 100 V: R88D-WN04L-ML2 (400 W)

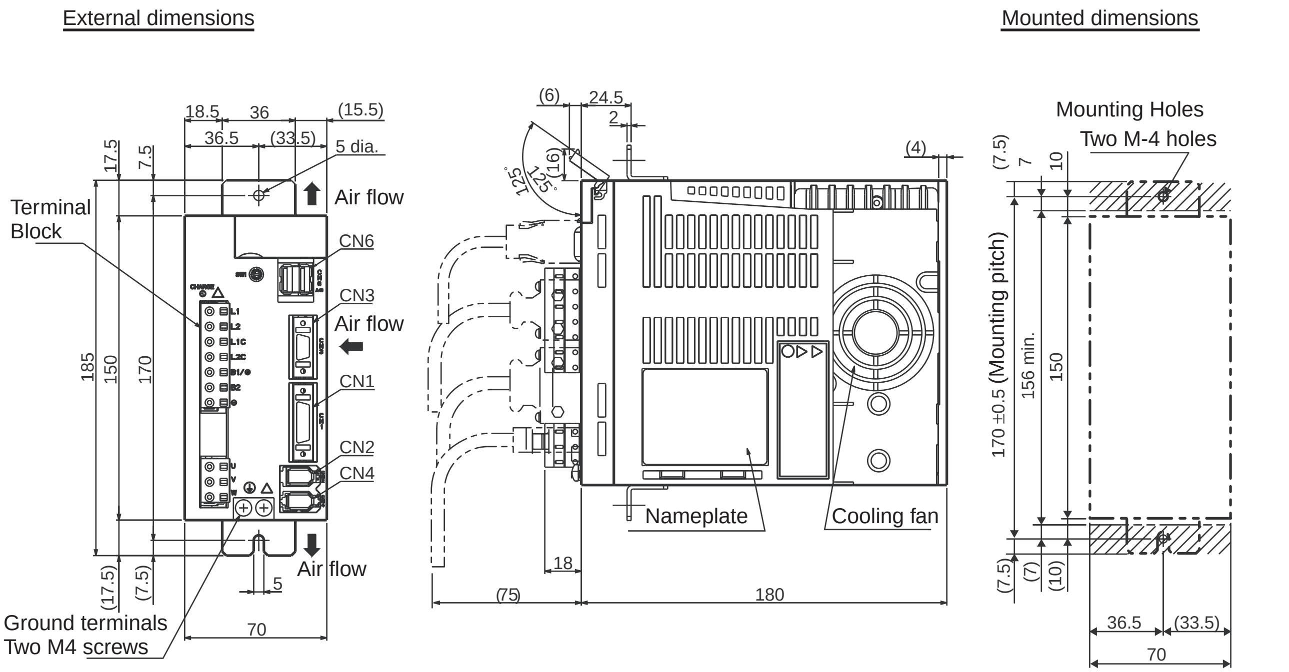
● Wall Mounting

External dimensions

Mounted dimensions

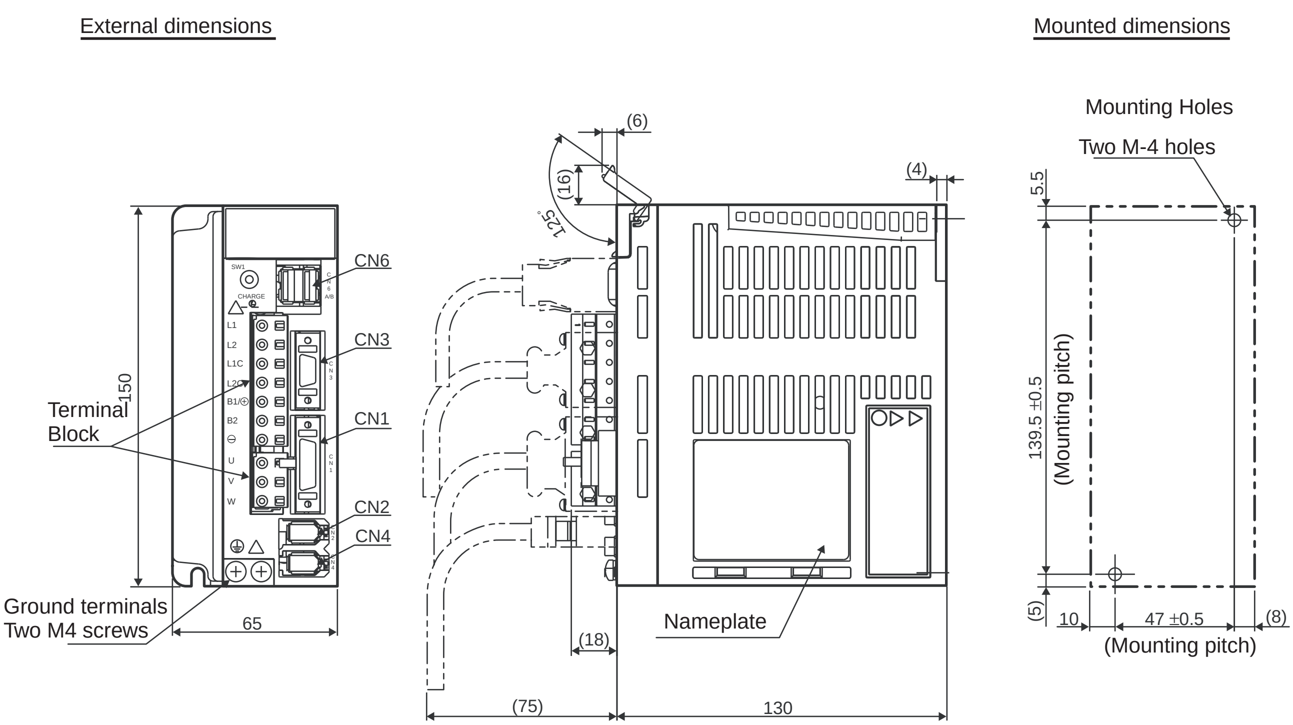


● Front Panel Mounting (Using Mounting Brackets)



■ Single-phase 200 VAC: R88D-WN04H-ML2 (400 W)

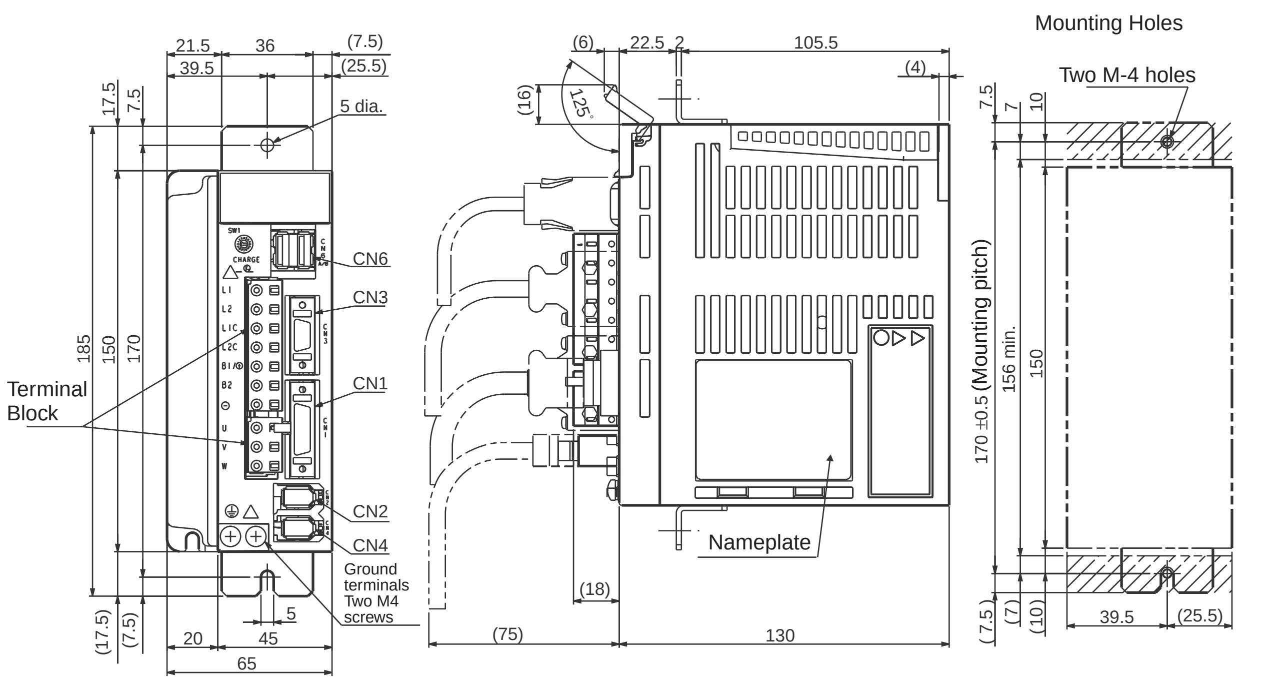
● Wall Mounting



● Front Panel Mounting (Using Mounting Brackets)

External dimensions

Mounted dimensions

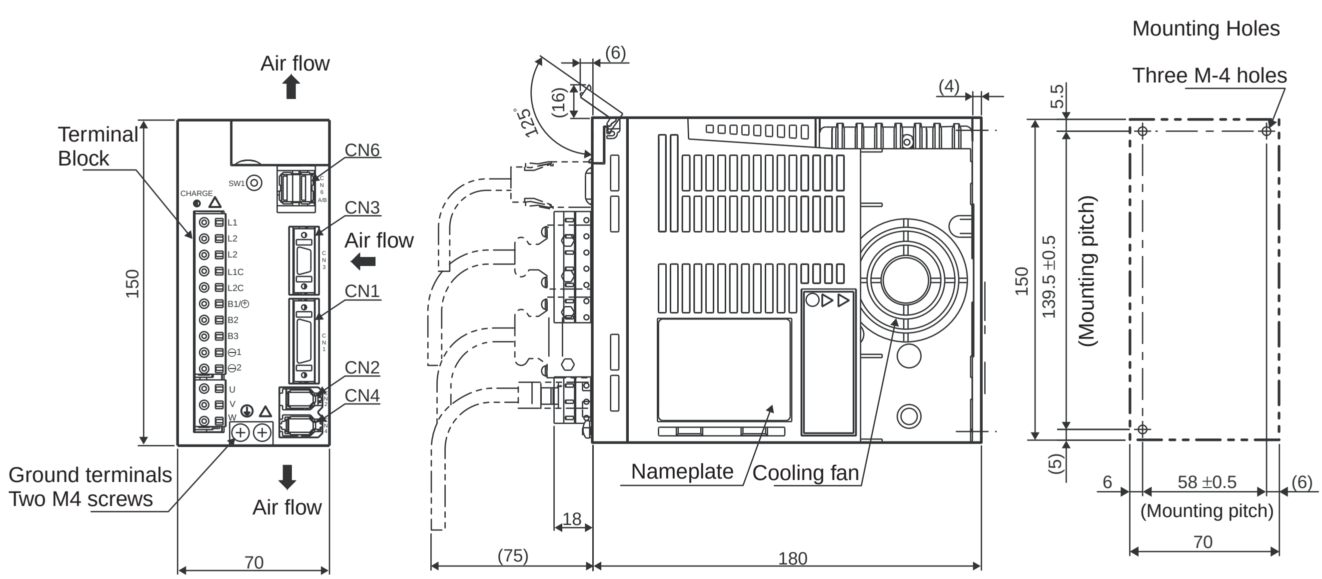


■ Single-phase 200 VAC: R88D-WN08HML2 (750 W) Three-phase 200 VAC: R88D-WN05H-ML2/-WN10H-ML2 (500 W to 1 kW)

● Wall Mounting

External dimensions

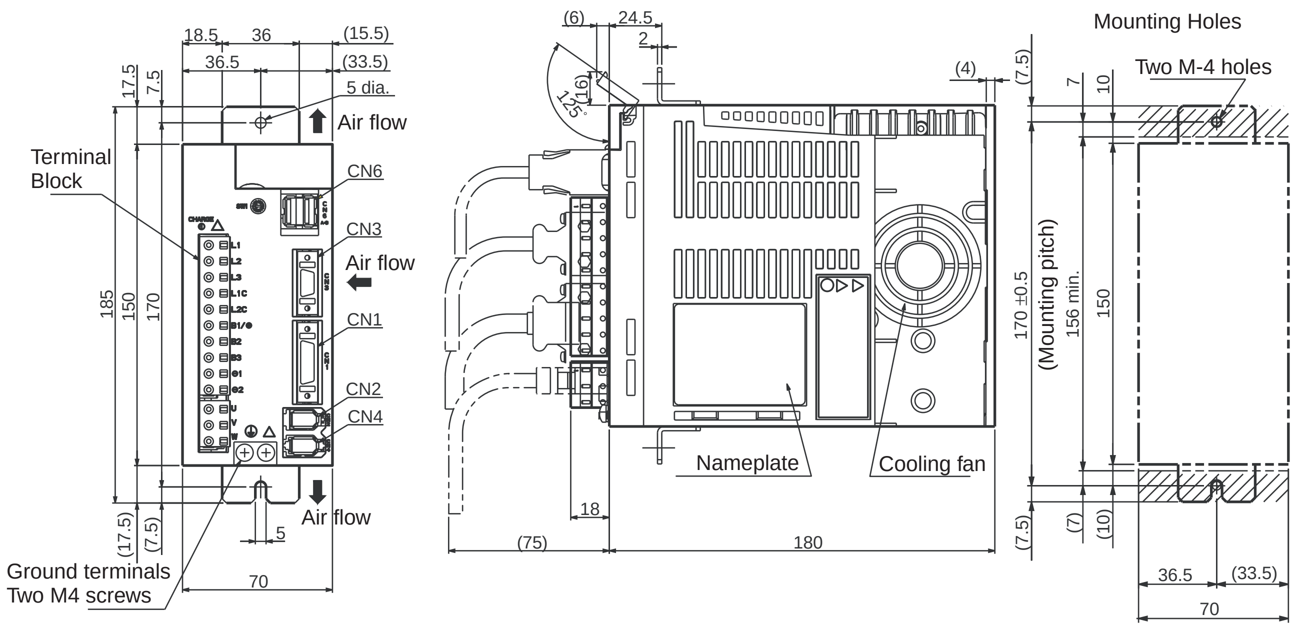
Mounted dimensions



● Front Panel Mounting (Using Mounting Brackets)

External dimensions

Mounted dimensions

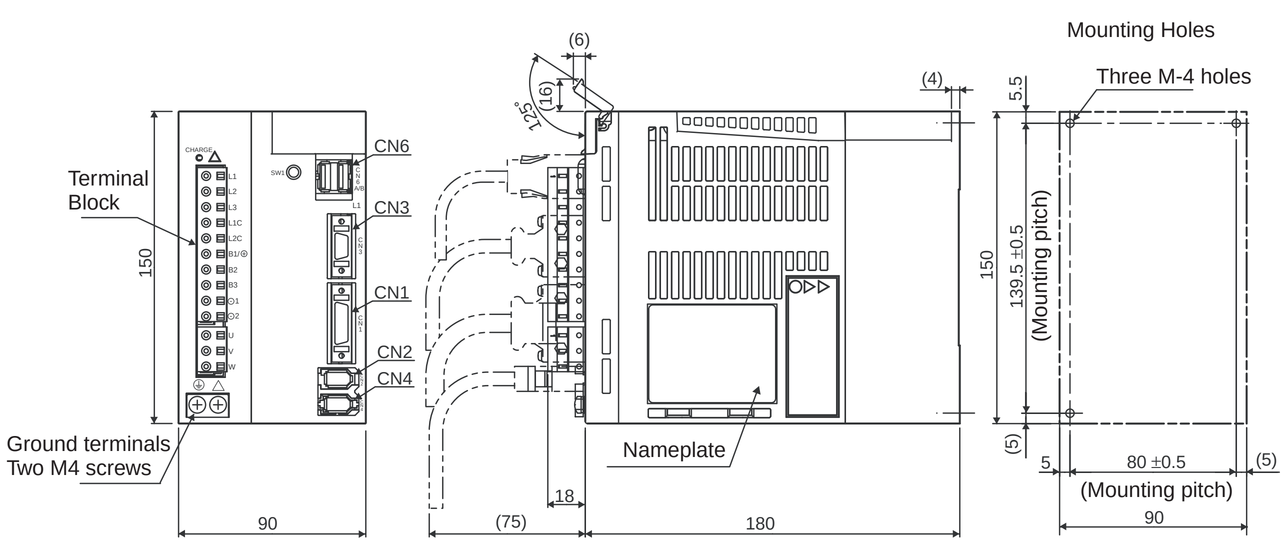


■ Three-phase 200 V: R88D-WN15H-ML2 (1.5 kW)

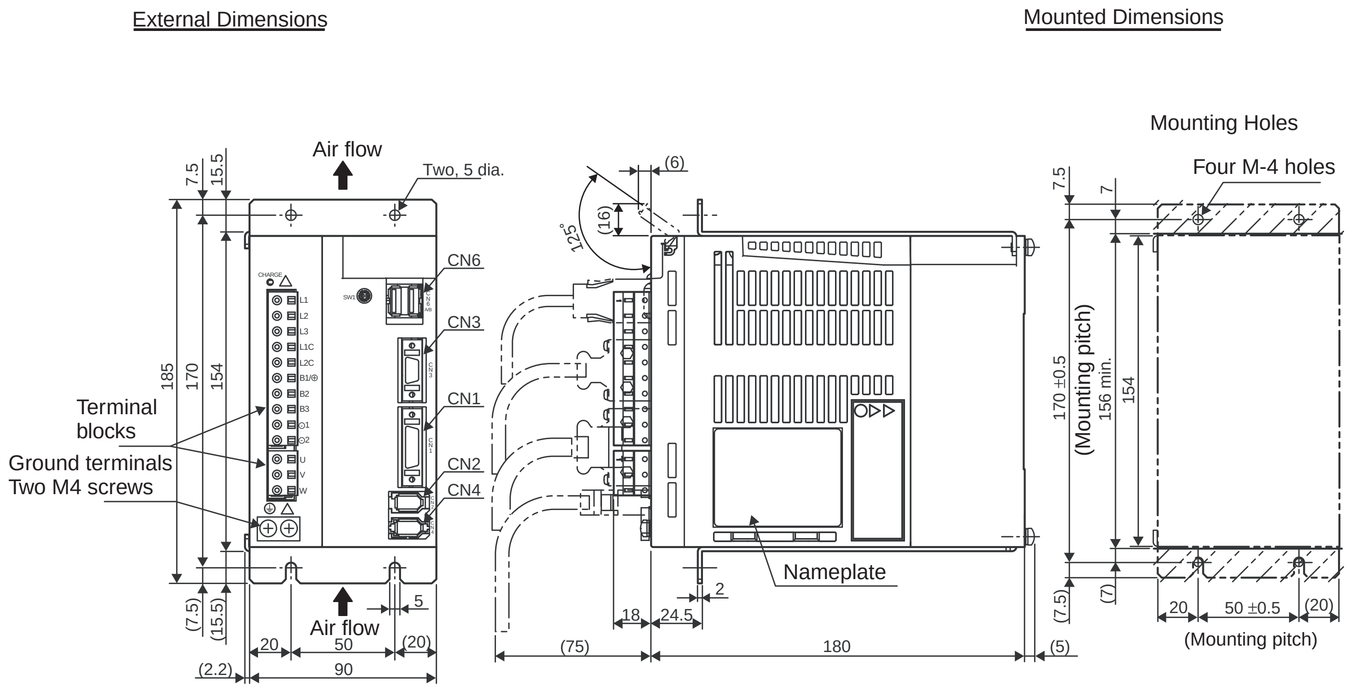
● Wall Mounting

External dimensions

Mounted dimensions

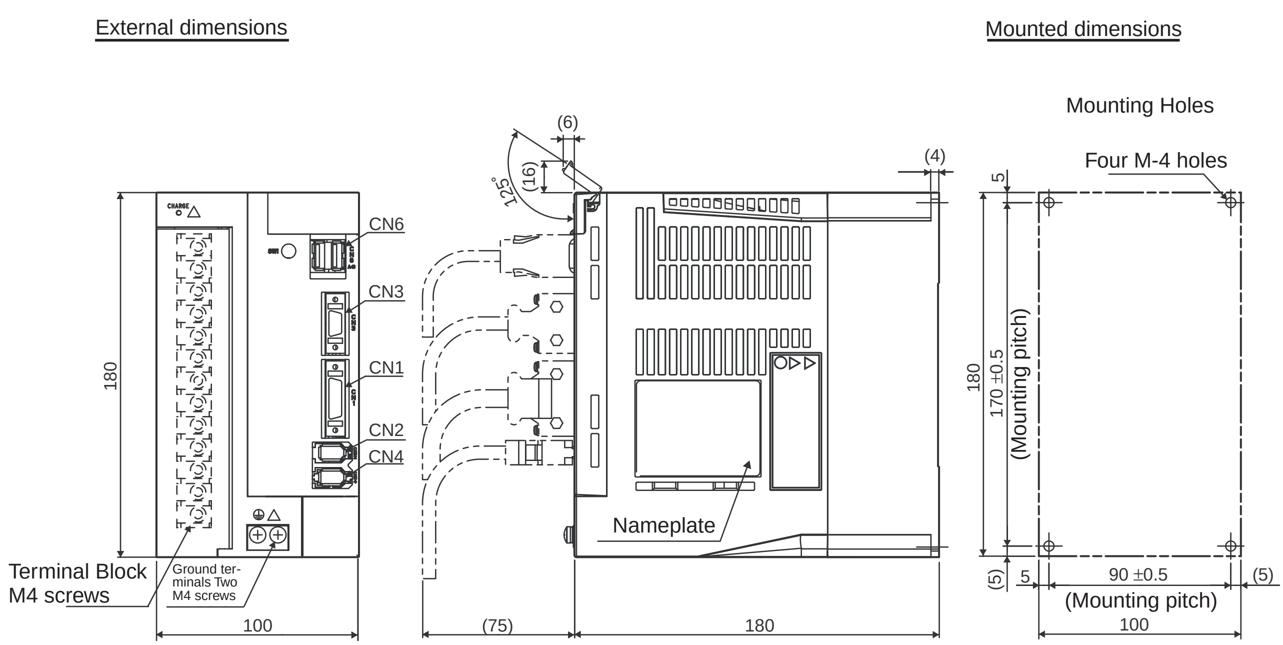


● Front Panel Mounting (Using Mounting Brackets)

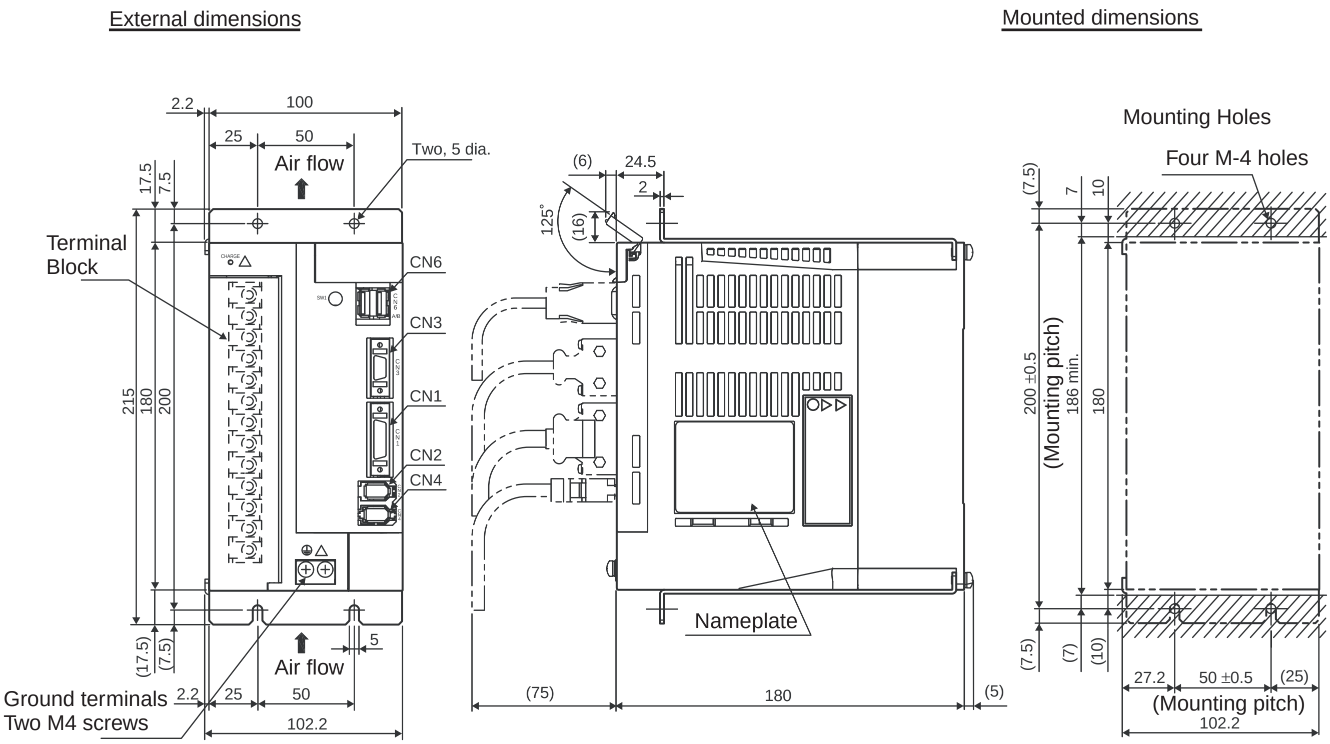


■ Three-phase 200 V: R88D-WN20H-ML2/-WN30H-ML2 (2 to 3 kW)

● Wall Mounting



● Front Panel Mounting (Using Mounting Brackets)

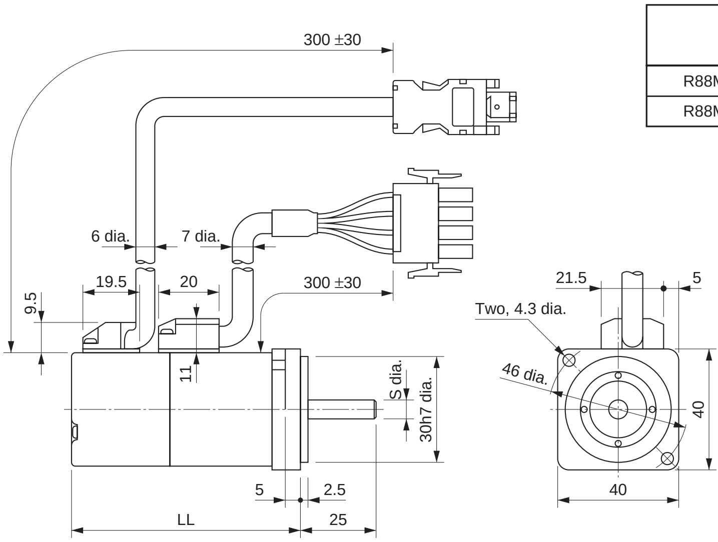


2-3-2 AC Servomotors

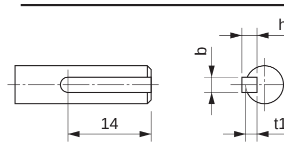
■ 3,000-r/min Servomotors without a Brake

● 200 V AC: 50 W/100 W
R88M-W05030H(-S1)/-W10030H(-S1) [Incremental]
R88M-W05030T(-S1)/-W10030T(-S1) [Absolute]

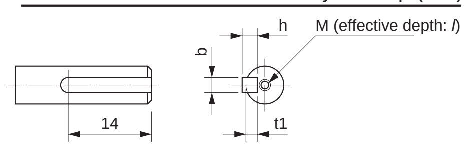
Model	Dimensions (mm)						
	LL	S	b	h	t1	M	*l*
R88M-W05030□-□	77	6^{h6}	2	2	1.2	M2.5	5
R88M-W10030□-□	94.5	8^{h6}	3	3	1.8	M3	6



Dimensions of shaft end with key (-S1)



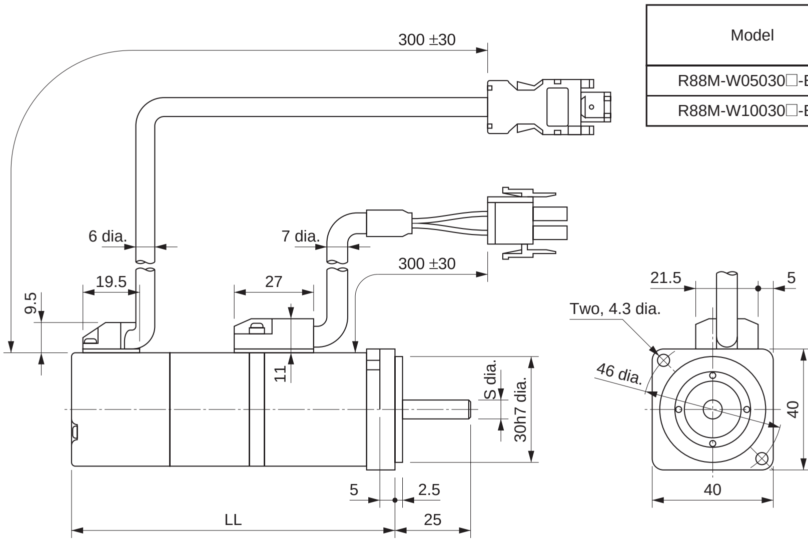
Dimensions of shaft end with key and tap (-S2)



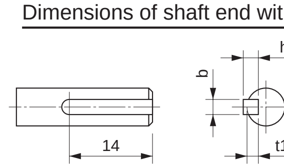
■ 3,000-r/min Servomotors with a Brake

● 200 V AC: 50 W/100 W
R88M-W05030H-B(S1)/-W10030H-B(S1) [Incremental]
R88M-W05030T-B(S1)/-W10030T-B(S1) [Absolute]

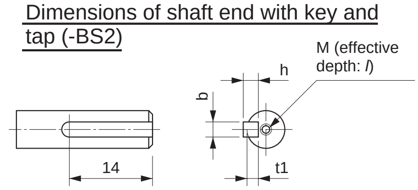
Model	Dimensions (mm)						
	LL	S	b	h	t1	M	*l*
R88M-W05030□-B□	108.5	6^{h6}	2	2	1.2	M2.5	5
R88M-W10030□-B□	135	8^{h6}	3	3	1.8	M3	6



Dimensions of shaft end with key (-BS1)



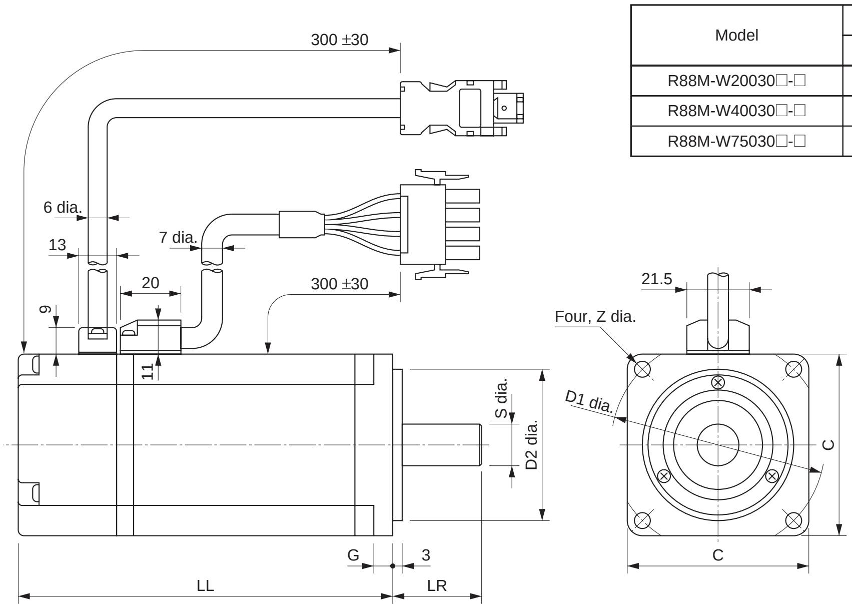
Dimensions of shaft end with key and tap (-BS2)



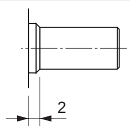
■ 3,000-r/min Servomotors without a Brake

● 200 V AC: 200 W/400 W/750 W
R88M-W20030H(-S1)/-W40030H(-S1)/-W75030H(-S1) [Incremental]
R88M-W20030T(-S1)/-W40030T(-S1)/-W75030T(-S1) [Absolute]

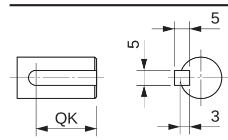
Model	Dimensions (mm)								
	LL	LR	C	D1	D2	G	Z	S	QK
R88M-W20030□-□	96.5	30	60	70	50h7	6	5.5	14h6	20
R88M-W40030□-□	124.5	30	60	70	50h7	6	5.5	14h6	20
R88M-W75030□-□	145	40	80	90	70h7	8	7	16h6	30



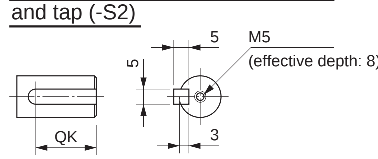
Dimensions of output section of 750-W Servomotors



Dimensions of shaft end with key (-S1)



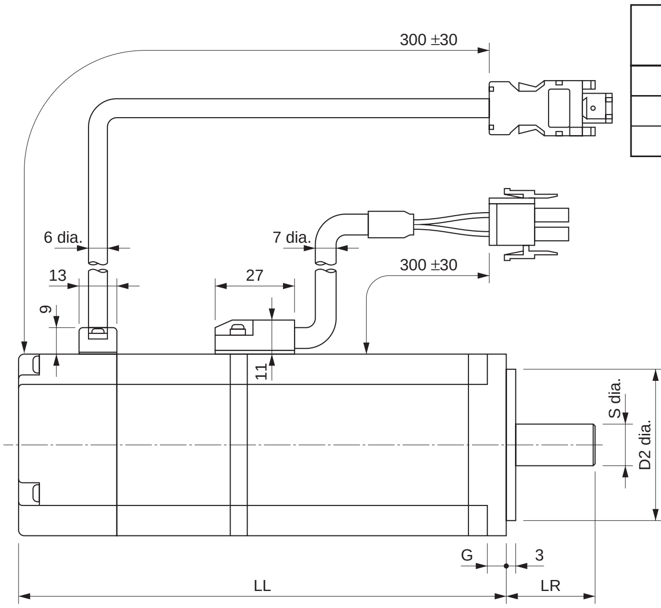
Dimensions of shaft end with key and tap (-S2)

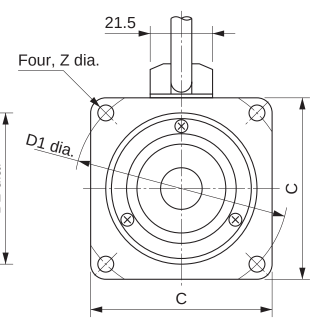


■ 3,000-r/min Servomotors with a Brake

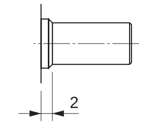
● 200 V AC: 200 W/400 W/750 W
R88M-W20030H-B(S1)/-W40030H-B(S1)/-W75030H-B(S1) [Incremental]
R88M-W20030T-B(S1)/-W40030T-B(S1)/-W75030T-B(S1) [Absolute]

Model	Dimensions (mm)								
	LL	LR	C	D1	D2	G	Z	S	QK
R88M-W20030□-B□	136	30	60	70	50h7	6	5.5	14h6	20
R88M-W40030□-B□	164	30	60	70	50h7	6	5.5	14h6	20
R88M-W75030□-B□	189.5	40	80	90	70h7	8	7	16h6	30

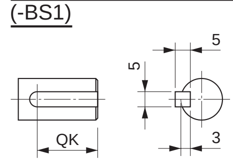




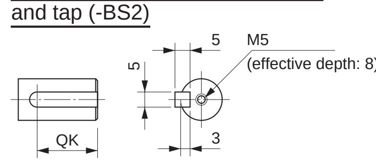
Dimensions of output section of 750-W Servomotors



Dimensions of shaft end with key (-BS1)

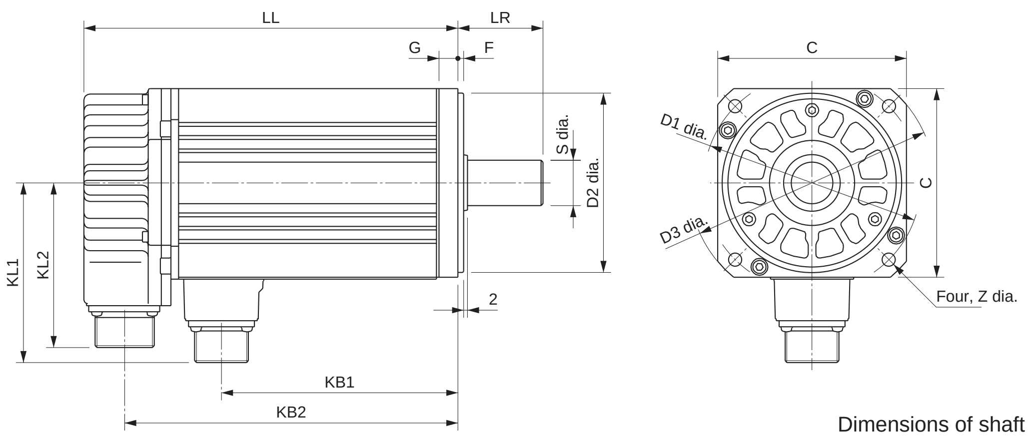


Dimensions of shaft end with key and tap (-BS2)

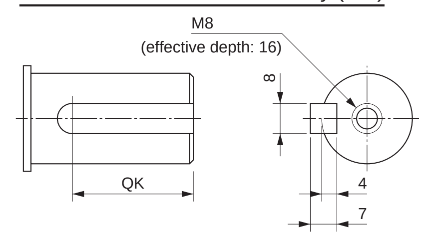


■ 3,000-r/min Servomotors without a Brake

● 200 V AC: 1 kW/1.5 kW/2 kW/3 kW
R88M-W1K030H(-S2)/-W1K5030H(-S2)/-W2K030H(-S2)/-W3K030H(-S2) [Incremental]
R88M-W1K030T(-S2)/-W1K5030T(-S2)/-W2K030T(-S2)/-W3K030T(-S2) [Absolute]



Dimensions of shaft end with key (-S2)

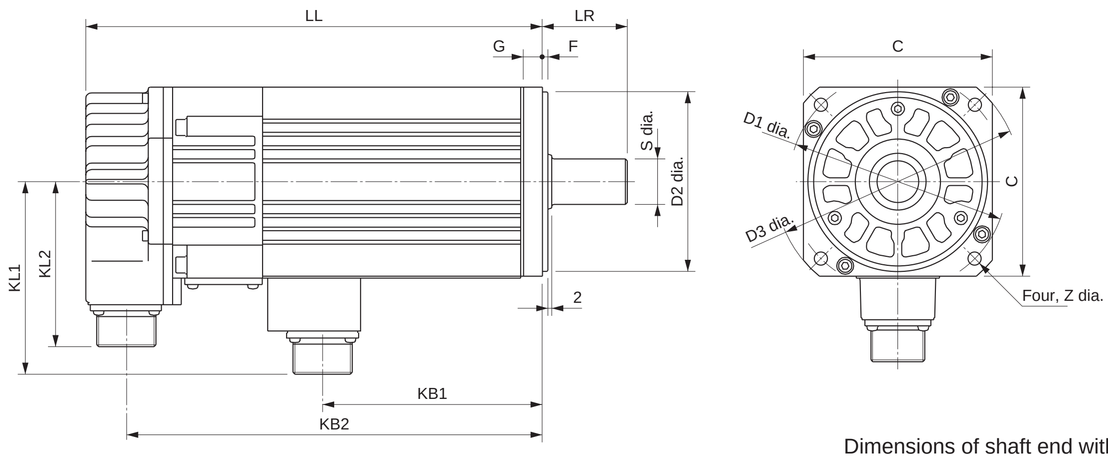


Model	Dimensions (mm)														
	LL	LR	KB1	KB2	KL1	KL2	C	D1	D2	D3	F	G	Z	S	QK
R88M-W1K030☐-☐	149	45	76	128	96	88	100	115	95^{h7}	130	3	10	7	24^{h6}	32
R88M-W1K530☐-☐	175		102	154											
R88M-W2K030☐-☐	198		125	177											
R88M-W3K030☐-☐	199	63	124	178	114	88	130	145	110^{h7}	165	6	12	9	28^{h6}	50

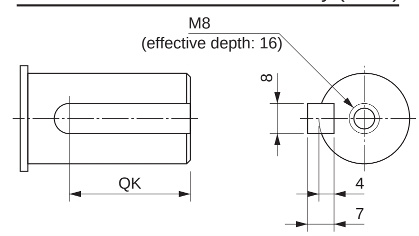
Note: The external dimensions are the same for IP67 (waterproof) models (-O☐).

■ 3,000-r/min Servomotors with a Brake

● 200 V AC: 1 kW/1.5 kW/2 kW/3 kW
R88M-W1K030H-B(S2)/-W1K5030H-B(S2)/-W2K030H-B(S2)/-W3K030H-B(S2) [Incremental]
R88M-W1K030T-B(S2)/-W1K5030T-B(S2)/-W2K030T-B(S2)/-W3K030T-B(S2) [Absolute]



Dimensions of shaft end with key (-BS2)



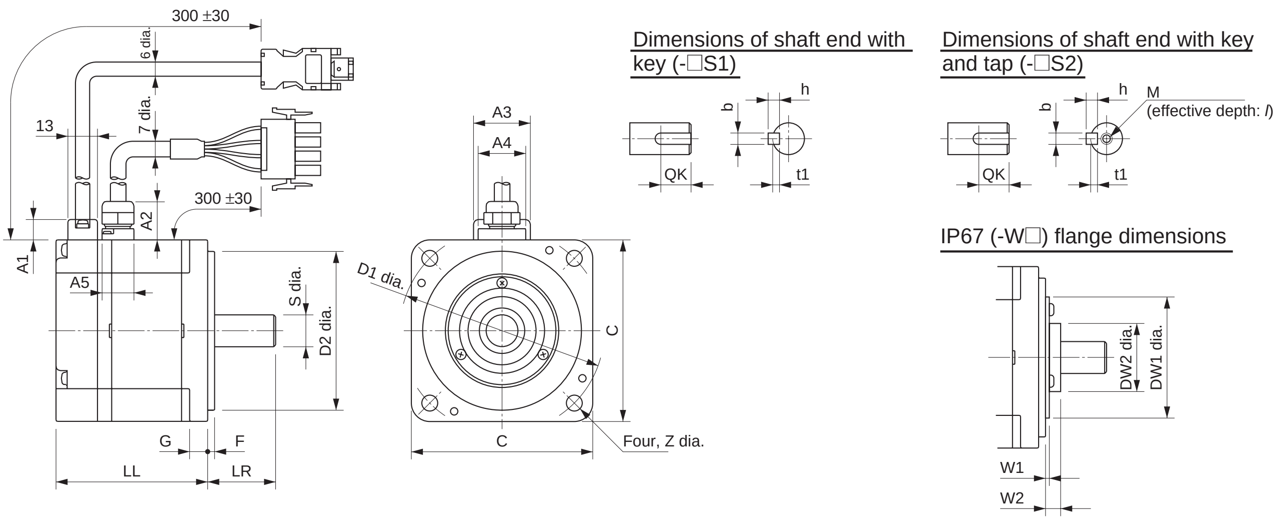
Model	Dimensions (mm)														
	LL	LR	KB1	KB2	KL1	KL2	C	D1	D2	D3	F	G	Z	S	QK
R88M-W1K030□-B□	193		67	171											
R88M-W1K530□-B□	219	45	93	197	102	88	100	115	95^{h7}	130	3	10	7	24^{h6}	32
R88M-W2K030□-B□	242		116	220											
R88M-W3K030□-B□	237	63	114	216	119	88	130	145	110^{h7}	165	6	12	9	28^{h6}	50

Note: The external dimensions are the same for IP67 (waterproof) models (-BO□).

■ 3,000-r/min Flat-style Servomotors without a Brake

● 200 V AC: 100 W/200 W/400 W/750 W/1.5 kW R88M-WP10030H(-S1)/-WP20030H(-S1)/-WP40030H(-S1)/-WP75030H(-S1)/ -WP1K530H(-S1) [Incremental] R88M-WP10030T(-S1)/-WP20030T(-S1)/-WP40030T(-S1)/-WP75030T(-S1)/ -WP1K530T(-S1) [Absolute]

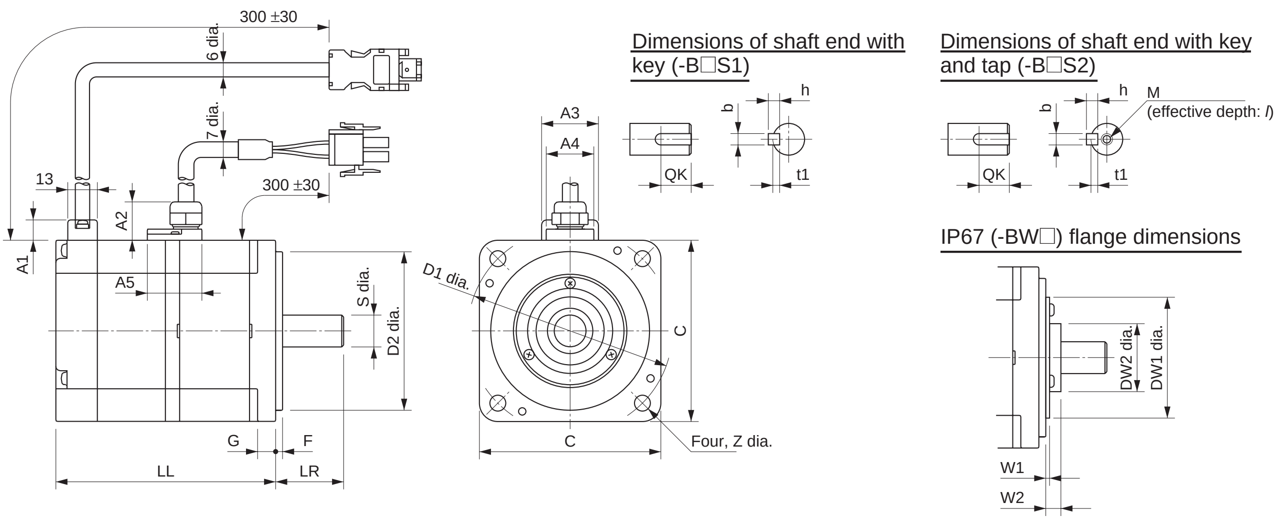
<table>
<tr><th rowspan="3">Model</th><th colspan="24">Dimensions (mm)</th></tr>
<tr><th colspan="9">Basic servomotor dimensions</th><th colspan="4">With key (shaft end dimensions)</th><th colspan="4">Waterproof type (flange dimensions)</th><th colspan="5">Cable lead-in section</th><th colspan="2">Tap</th></tr>
<tr><th>LL</th><th>LR</th><th>C</th><th>D1</th><th>D2</th><th>F</th><th>G</th><th>Z</th><th>S</th><th>QK</th><th>b</th><th>h</th><th>t1</th><th>W1</th><th>W2</th><th>DW1</th><th>DW2</th><th>A1</th><th>A2</th><th>A3</th><th>A4</th><th>A5</th><th>M</th><th>l</th></tr>
<tr><td>R88M-WP10030□-□</td><td>62</td><td>25</td><td>60</td><td>70</td><td>50^{h7}</td><td>3</td><td>6</td><td>5.5</td><td>8^{h6}</td><td>14</td><td>3</td><td>3</td><td>1.8</td><td>1</td><td>4</td><td>39</td><td>22</td><td rowspan="5">9</td><td rowspan="3">18</td><td rowspan="5">25</td><td rowspan="3">21</td><td rowspan="3">14</td><td>M3</td><td>6</td></tr>
<tr><td>R88M-WP20030□-□</td><td>67</td><td rowspan="2">30</td><td rowspan="2">80</td><td rowspan="2">90</td><td rowspan="2">70^{h7}</td><td rowspan="2">3</td><td rowspan="2">8</td><td rowspan="2">7</td><td rowspan="2">14^{h6}</td><td rowspan="2">16</td><td rowspan="2">5</td><td rowspan="2">5</td><td rowspan="2">3</td><td rowspan="2">3.5</td><td rowspan="2">7</td><td rowspan="2">49</td><td rowspan="2">35</td><td rowspan="3">M5</td><td rowspan="3">8</td></tr>
<tr><td>R88M-WP40030□-□</td><td>87</td></tr>
<tr><td>R88M-WP75030□-□</td><td>86.5</td><td rowspan="2">40</td><td rowspan="2">120</td><td rowspan="2">145</td><td rowspan="2">110^{h7}</td><td rowspan="2">3.5</td><td rowspan="2">10</td><td rowspan="2">10</td><td>16^{h6}</td><td rowspan="2">22</td><td>5</td><td>5</td><td>3</td><td rowspan="2">1.5</td><td rowspan="2">7</td><td rowspan="2">77</td><td rowspan="2">55</td><td rowspan="2">28</td><td rowspan="2">38</td><td rowspan="2">19</td></tr>
<tr><td>R88M-WP1K530□-□</td><td>114.5</td><td>19^{h6}</td><td>6</td><td>6</td><td>3.5</td><td>M6</td><td>10</td></tr>
</table>



■ 3,000-r/min Flat-style Servomotors with a Brake

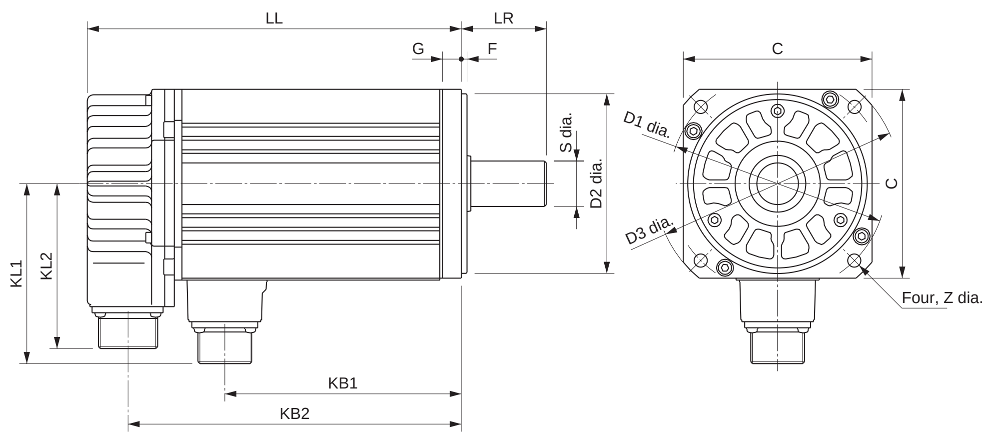
● 200 V AC: 100 W/200 W/400 W/750 W/1.5 kW R88M-WP10030H-B(S1)/-WP20030H-B(S1)/-WP40030H-B(S1)/-WP75030H-B(S1)/ -WP1K530H-B(S1) [Incremental] R88M-WP10030T-B(S1)/-WP20030T-B(S1)/-WP40030T-B(S1)/-WP75030T-B(S1)/ -WP1K530T-B(S1) [Absolute]

Model	Dimensions (mm)																							
	Basic servomotor dimensions									With key (shaft end dimensions)				Waterproof type (flange dimensions)				Cable lead-in section					Tap	
	LL	LR	C	D1	D2	F	G	Z	S	QK	b	h	t1	W1	W2	DW1	DW2	A1	A2	A3	A4	A5	M	*l*
R88M-WP10030□-B□	91	25	60	70	50^{h7}	3	6	5.5	8^{h6}	14	3	3	1.8	1	4	39	22	9	18	25	21	23	M3	6
R88M-WP20030□-B□	98.5	30	80	90	70^{h7}	3	8	7	14^{h6}	16	5	5	3	3.5	7	49	35						M5	8
R88M-WP40030□-B□	118.5																							
R88M-WP75030□-B□	120	40	120	145	110^{h7}	3.5	10	10	16^{h6}	22	5	5	3	1.5	7	77	55		28		38	26		
R88M-WP1K530□-B□	148								19^{h6}		6	6	3.5										M6	10

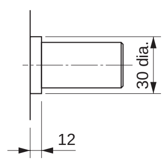


■ 1,000-r/min Servomotors without a Brake

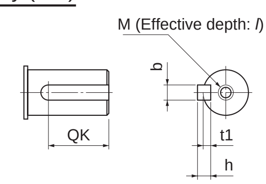
● 200 V AC: 300 W/600 W/900 W/1.2 kW/2.0 kW
R88M-W30010H(-S2)/-W60010H(-S2)/-W90010H(-S2)/-W1K210H(-S2)/-W2K010H(-S2) [Incremental]
R88M-W30010T(-S2)/-W60010T(-S2)/-W90010T(-S2)/-W1K210T(-S2)/-W2K010T(-S2) [Absolute]



Dimensions of output section of 300-W to 900-W Servomotors



Dimensions of shaft end with key (-S2)

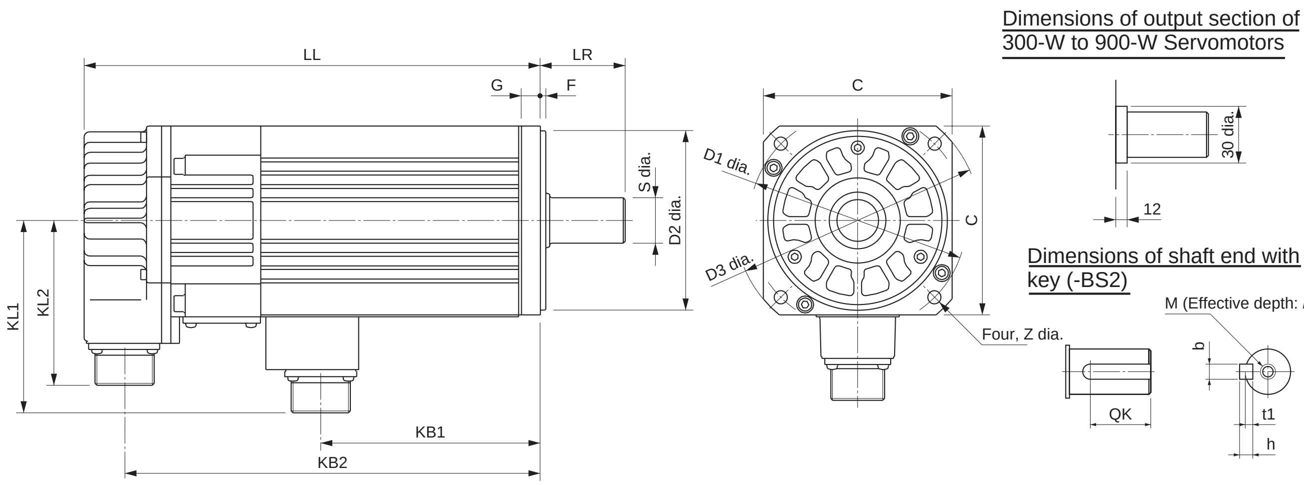


Model (mm)	Dimensions (mm)																			
	LL	LR	KB1	KB2	KL1	KL2	C	D1	D2	D3	F	G	Z	S	QK	b	h	t1	M	*l*
R88M-W30010□-□	138	58	65	117	109	88	130	145	110^{h7}	165	6	12	9	19^{h6}	25	5	5	3	M5	12
R88M-W60010□-□	161		88	140																
R88M-W90010□-□	185		112	164										22^{h6}		6	6	3.5		
R88M-W1K210□-□	166	79	89	144	140	88	180	200	$114.3^{\ 0}_{-0.025}$	230	3.2	18	13.5	$35^{+0.01}_{\ 0}$	60	10	8	5	M12	25
R88M-W2K010□-□	192		115	170																

Note: The external dimensions are the same for IP67 (waterproof) models (-O□).

■ 1,000-r/min Servomotors with a Brake

● 200 V AC: 300 W/600 W/900 W/1.2 kW/2.0 kW R88M-W30010H-B(S2)/-W60010H-B(S2)/-W90010H-B(S2)/-W1K210H-B(S2)/-W2K010H-B(S2) [Incremental] R88M-W30010T-B(S2)/-W60010T-B(S2)/-W90010T-B(S2)/-W1K210T-B(S2)/-W2K010T-B(S2) [Absolute]

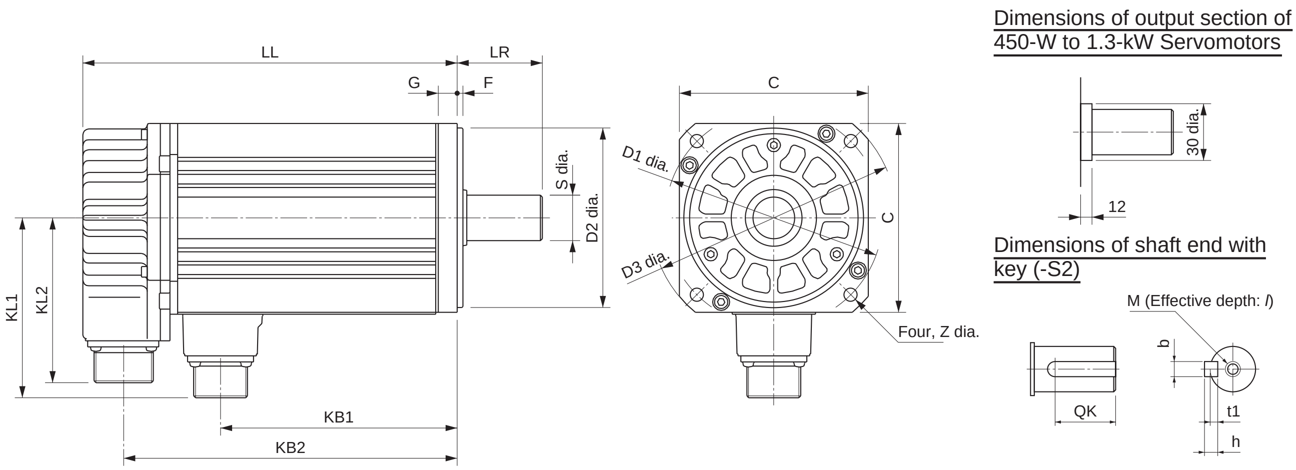


Model (mm)	Dimensions (mm)																		
	LL	LR	KB1	KB2	KL1	KL2	C	D1	D2	D3	F	G	Z	S	QK	b	h	t1	M	*l*
R88M-W30010□-B□	176	58	56	154	120	88	130	145	110^{h7}	165	6	12	9	19^{h6}	25	5	5	3	M5	12
R88M-W60010□-B□	199		79	177																
R88M-W90010□-B□	223		103	201										22^{h6}		6	6	3.5		
R88M-W1K210□-B□	217	79	79	195	146	88	180	200	$114.3^{\ 0}_{-0.025}$	230	3.2	18	13.5	$35^{+0.01}_{\ 0}$	60	10	8	5	M12	25
R88M-W2K010□-B□	243		105	221																

Note: The external dimensions are the same for IP67 (waterproof) models (-BO□).

■ 1,500-r/min Servomotors without a Brake

● 200 V AC: 450 W/850 W/1.3 kW/1.8 kW R88M-W45015T(-S2)/-W85015T(-S2)/-W1K315T(-S2)/-W1K815T(-S2) [Absolute]

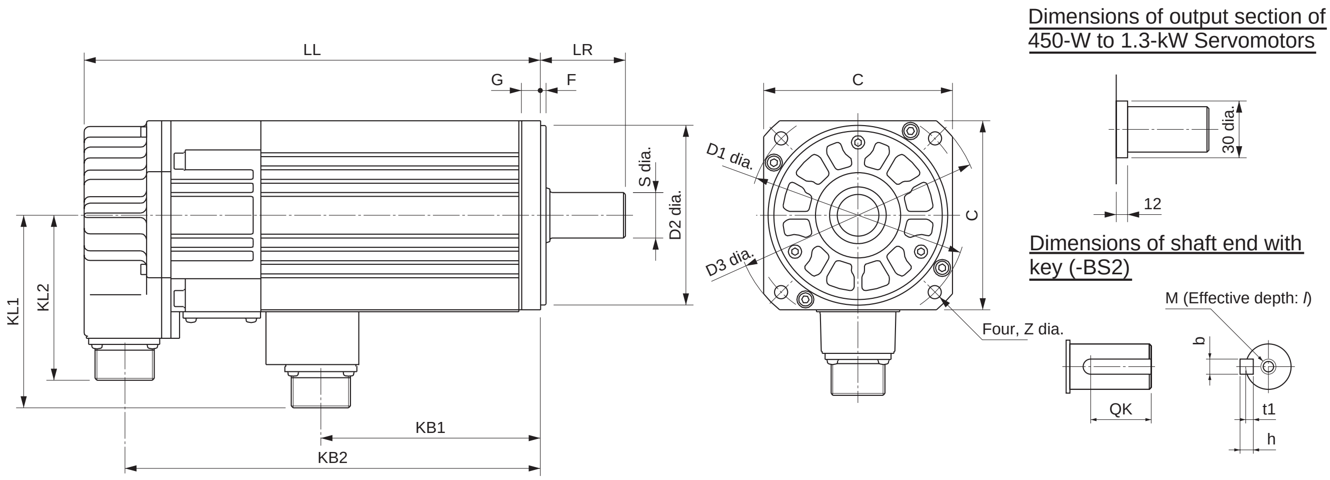


Model (mm)	Dimensions (mm)																			
	LL	LR	KB1	KB2	KL1	KL2	C	D1	D2	D3	F	G	Z	S	QK	b	h	t1	M	*l*
R88M-W45015T-☐	138	58	65	117	109	88	130	145	110^{h7}	165	6	12	9	19^{h6}	25	5	5	3	M5	12
R88M-W85015T-☐	161		88	140																
R88M-W1K315T-☐	185		112	164										22^{h6}		6	6	3.5		
R88M-W1K815T-☐	166	79	89	144	140	88	180	200	$114.3^{\ 0}_{-0.025}$	230	3.2	18	13.5	$35^{+0.01}_{\ 0}$	60	10	8	5	M12	25

Note: The external dimensions are the same for IP67 (waterproof) models (O☐).

■ 1,500-r/min Servomotors with a Brake

● 200 V AC: 450 W/850 W/1.3 kW/1.8 kW R88M-W45015T-B(S2)/-W85015T-B(S2)/-W1K315T-B(S2)/-W1K815T-B(S2) [Absolute]



Model (mm)	Dimensions (mm)																		
	LL	LR	KB1	KB2	KL1	KL2	C	D1	D2	D3	F	G	Z	S	QK	b	h	t1	M	l
R88M-W45015T-B□	176	58	56	154	120	88	130	145	110^{h7}	165	6	12	9	19^{h6}	25	5	5	3	M5	12
R88M-W85015T-B□	199		79	177																
R88M-W1K315T-B□	223		103	201										22^{h6}		6	6	3.5		
R88M-W1K815T-B□	217	79	79	195	146	88	180	200	$114.3^{\ 0}_{-0.025}$	230	3.2	18	13.5	$35^{+0.01}_{\ 0}$	60	10	8	5	M12	25

Note: The external dimensions are the same for IP67 (waterproof) models (-BO□).

2-3-3 AC Servomotors with Gears

■ AC Servomotors with Standard Gears

● 3,000-r/min Servomotors (30 to 750 W) with Standard Gears

Model			Diagram No.	Dimensions (mm)												
				LL		LM	LR	C1	C2	D1	D2	D3	D4	D5	D6
				WOB*	WB*										
50 W	1/5	R88M-W05030□-□G05BJ	1, 1-1	77	108.5	28	55	60	40	80	70	56	55.5	40	---
	1/9	R88M-W05030□-□G09BJ		77	108.5	29	60	70	40	95	80	65	64.5	50	---
	1/21	R88M-W05030□-□G21BJ	1, 1-2	77	108.5	46	60	70	40	(92)	80	65	64.5	40	8
	1/33	R88M-W05030□-□G33BJ		77	108.5	46	60	70	40	(92)	80	65	64.5	40	8
100 W	1/5	R88M-W10030□-□G05BJ		94.5	135	29	60	70	40	(92)	80	65	64.5	40	8
	1/11	R88M-W10030□-□G11BJ		94.5	135	46	60	70	40	(92)	80	65	64.5	40	8
	1/21	R88M-W10030□-□G21BJ		94.5	135	55	74	90	40	(120)	105	85	84	59	9
	1/33	R88M-W10030□-□G33BJ		94.5	135	55	74	90	40	(120)	105	85	84	59	9
200 W	1/5	R88M-W20030□-□G05BJ	2	96.5	136	38	74	90	60	(120)	105	85	84	59	9
	1/11	R88M-W20030□-□G11BJ		96.5	136	55	74	90	60	(120)	105	85	84	59	9
	1/21	R88M-W20030□-□G21BJ		96.5	136	63	84	105	60	(139)	120	100	96	59	12
	1/33	R88M-W20030□-□G33BJ		96.5	136	63	84	105	60	(139)	120	100	96	59	12
400 W	1/5	R88M-W40030□-□G05BJ	2	124.5	164	38	74	90	60	(120)	105	85	84	59	9
	1/11	R88M-W40030□-□G11BJ		124.5	164	63	84	105	60	(139)	120	100	96	59	12
	1/21	R88M-W40030□-□G21BJ		124.5	164	71	105	120	60	(158)	135	115	112	59	14
	1/33	R88M-W40030□-□G33BJ		124.5	164	71	105	120	60	(158)	135	115	114	84	14
750 W	1/5	R88M-W75030□-□G05BJ	2	145	189.5	42	84	105	80	(139)	120	100	96	59	12
	1/11	R88M-W75030□-□G11BJ		145	189.5	71	105	120	80	(158)	135	115	112	59	14
	1/21	R88M-W75030□-□G21BJ		145	189.5	78	142	145	80	(192)	165	140	134	84	16
	1/33	R88M-W75030□-□G33BJ		145	189.5	78	142	145	80	(192)	165	140	134	84	16

Note The values in parentheses are reference values.

Diagram 1

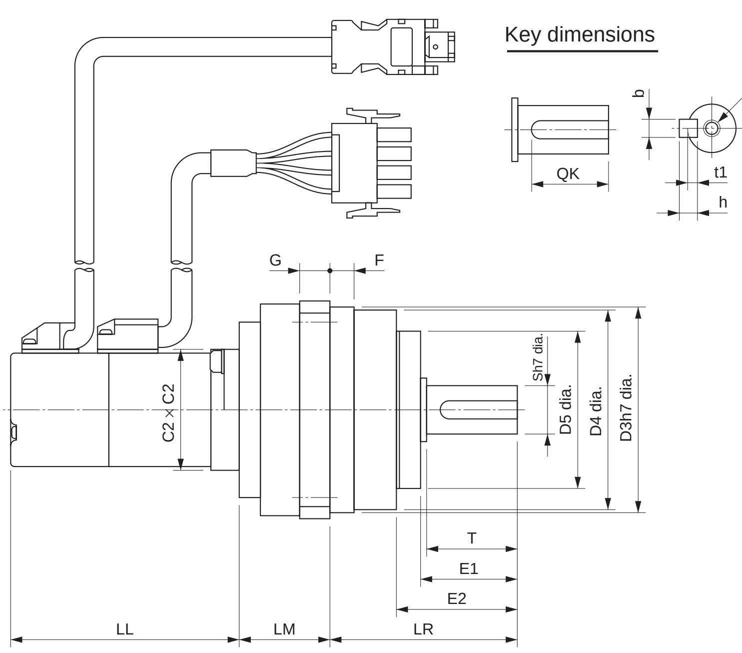


Diagram 1-1

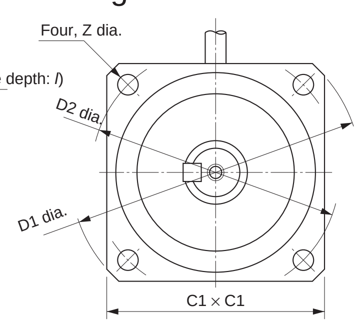
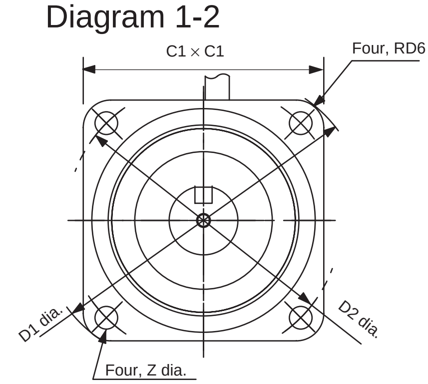


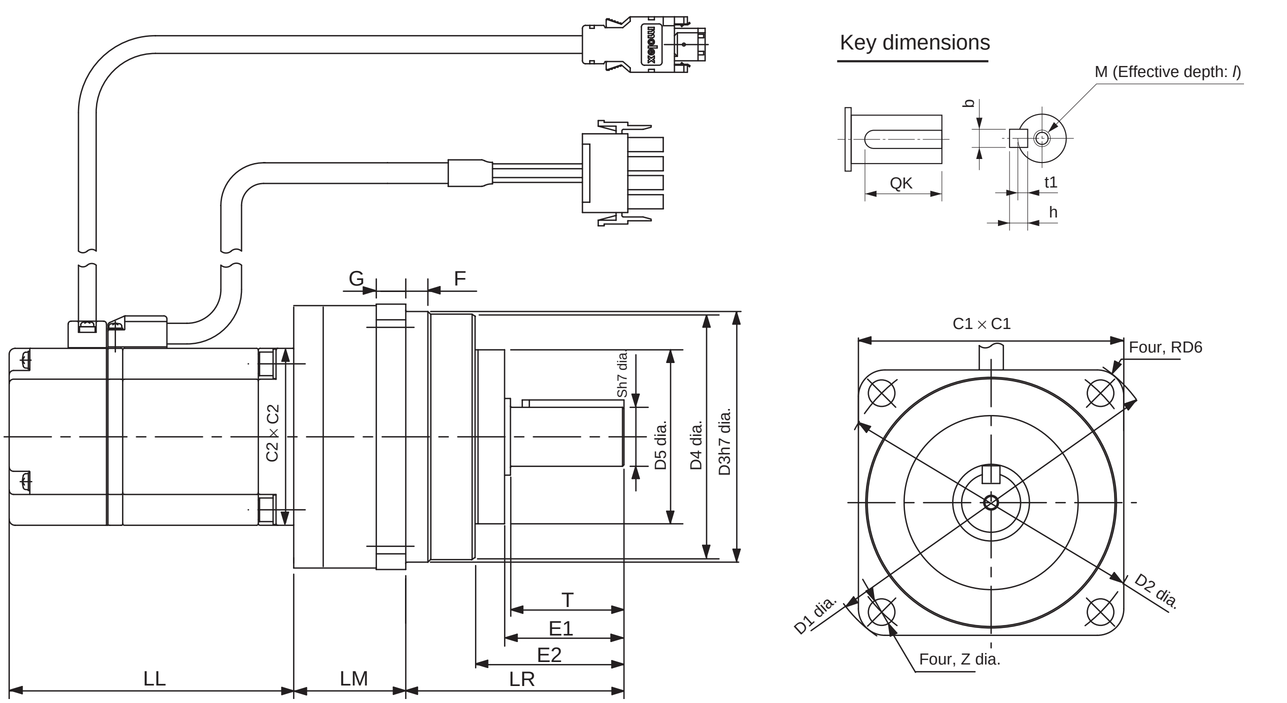
Diagram 1-2



Note WOB and WB mean “without brake” and “with brake” respectively.

Dimensions (mm)													Model		
E1	E2	F	G	S	T	Z	Key dimensions								
							QK	b	h	t1	M	*l*			
27	35	6	8	14	25	5.5	20	5	5	3	M4	8	R88M-W05030□-□G05BJ	1/5	50 W
30	38	8	9	16	28	6.6	25	5	5	3	M4	8	R88M-W05030□-□G09BJ	1/9	
30	39	8	9	16	28	6.6	25	5	5	3	M4	8	R88M-W05030□-□G21BJ	1/21	
30	39	8	9	16	28	6.6	25	5	5	3	M4	8	R88M-W05030□-□G33BJ	1/33	
30	39	8	9	16	28	6.6	25	5	5	3	M4	8	R88M-W10030□-□G05BJ	1/5	100 W
30	39	8	9	16	28	6.6	25	5	5	3	M4	8	R88M-W10030□-□G11BJ	1/11	
38	48	7.5	10	20	36	9	32	6	6	3.5	M5	10	R88M-W10030□-□G21BJ	1/21	
38	48	7.5	10	20	36	9	32	6	6	3.5	M5	10	R88M-W10030□-□G33BJ	1/33	
38	48	7.5	10	20	36	9	32	6	6	3.5	M5	10	R88M-W20030□-□G05BJ	1/5	200 W
38	48	7.5	10	20	36	9	32	6	6	3.5	M5	10	R88M-W20030□-□G11BJ	1/11	
44	55	12	12	25	42	9	36	8	7	4	M6	12	R88M-W20030□-□G21BJ	1/21	
44	55	12	12	25	42	9	36	8	7	4	M6	12	R88M-W20030□-□G33BJ	1/33	
38	48	7.5	10	20	36	9	32	6	6	3.5	M5	10	R88M-W40030□-□G05BJ	1/5	400 W
44	55	12	12	25	42	9	36	8	7	4	M6	12	R88M-W40030□-□G11BJ	1/11	
60	72	14	13	32	58	11	50	10	8	5	M8	16	R88M-W40030□-□G21BJ	1/21	
60	72	12.5	13	32	58	11	50	10	8	5	M8	16	R88M-W40030□-□G33BJ	1/33	
44	55	12	12	25	42	9	36	8	7	4	M6	12	R88M-W75030□-□G05BJ	1/5	750 W
60	72	14	13	32	58	11	50	10	8	5	M8	16	R88M-W75030□-□G11BJ	1/11	
85	102	10	15	40	82	14	70	12	8	5	M10	20	R88M-W75030□-□G21BJ	1/21	
85	102	10	15	40	82	14	70	12	8	5	M10	20	R88M-W75030□-□G33BJ	1/33	

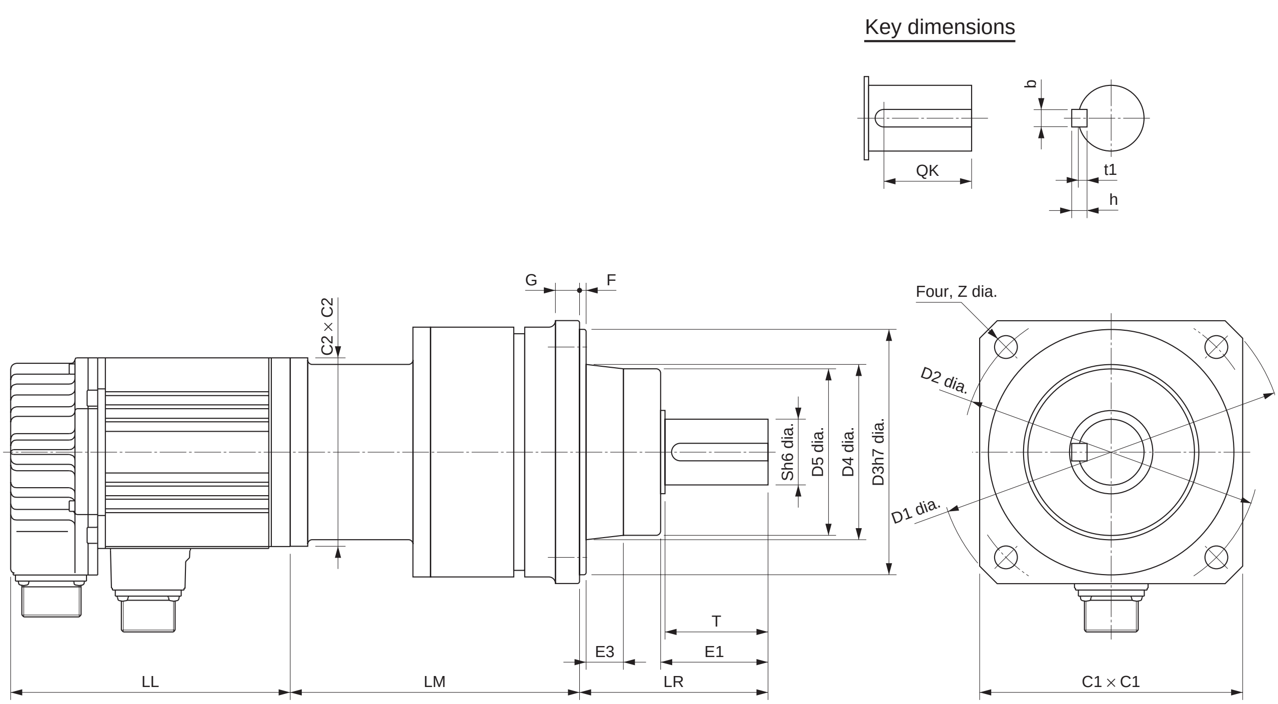
Diagram 2



● 3,000-r/min Servomotors (1 to 5 kW) with Standard Gears

Model			Diagram No.	Dimensions (mm)										
				LL		LM	LR	C1	C2	D1	D2	D3	D4	D5
				WOB*	WB*									
1 kW	1/5	R88M-W1K030□-□G05BJ	1	149	193	154	100	140	100	185	160	130	94	91
	1/9	R88M-W1K030□-□G09BJ		149	193	166	100	140	100	185	160	130	94	91
	1/20	R88M-W1K030□-□G20BJ	2	149	193	207	140	---	100	245	220	190	135	130
	1/29	R88M-W1K030□-□G29BJ		149	193	207	140	---	100	245	220	190	135	130
	1/45	R88M-W1K030□-□G45BJ		149	193	217	140	---	100	245	220	190	135	130
1.5 kW	1/5	R88M-W1K530□-□G05BJ	1	175	219	154	100	140	100	185	160	130	94	91
	1/9	R88M-W1K530□-□G09BJ	2	175	219	203	140	---	100	245	220	190	135	130
	1/20	R88M-W1K530□-□G20BJ		175	219	207	140	---	100	245	220	190	135	130
	1/29	R88M-W1K530□-□G29BJ		175	219	207	140	---	100	245	220	190	135	130
	1/45	R88M-W1K530□-□G45BJ		175	219	238	160	---	100	310	280	240	186	182
2 kW	1/5	R88M-W2K030□-□G05BJ	1	198	242	154	100	140	100	185	160	130	94	91
	1/9	R88M-W2K030□-□G09BJ	2	198	242	203	140	---	100	245	220	190	135	130
	1/20	R88M-W2K030□-□G20BJ		198	242	207	140	---	100	245	220	190	135	130
	1/29	R88M-W2K030□-□G29BJ		198	242	228	160	---	100	310	280	240	186	182
	1/45	R88M-W2K030□-□G45BJ		198	242	238	160	---	100	310	280	240	186	182
3 kW	1/5	R88M-W3K030□-□G05BJ	2	199	237	201	140	---	130	245	220	190	135	130
	1/9	R88M-W3K030□-□G09BJ		199	237	228	140	---	130	245	220	190	135	130
	1/20	R88M-W3K030□-□G20BJ		199	237	253	160	---	130	310	280	240	186	182
	1/29	R88M-W3K030□-□G29BJ		199	237	253	160	---	130	310	280	240	186	182
	1/45	R88M-W3K030□-□G45BJ		199	237	263	160	---	130	310	280	240	186	182

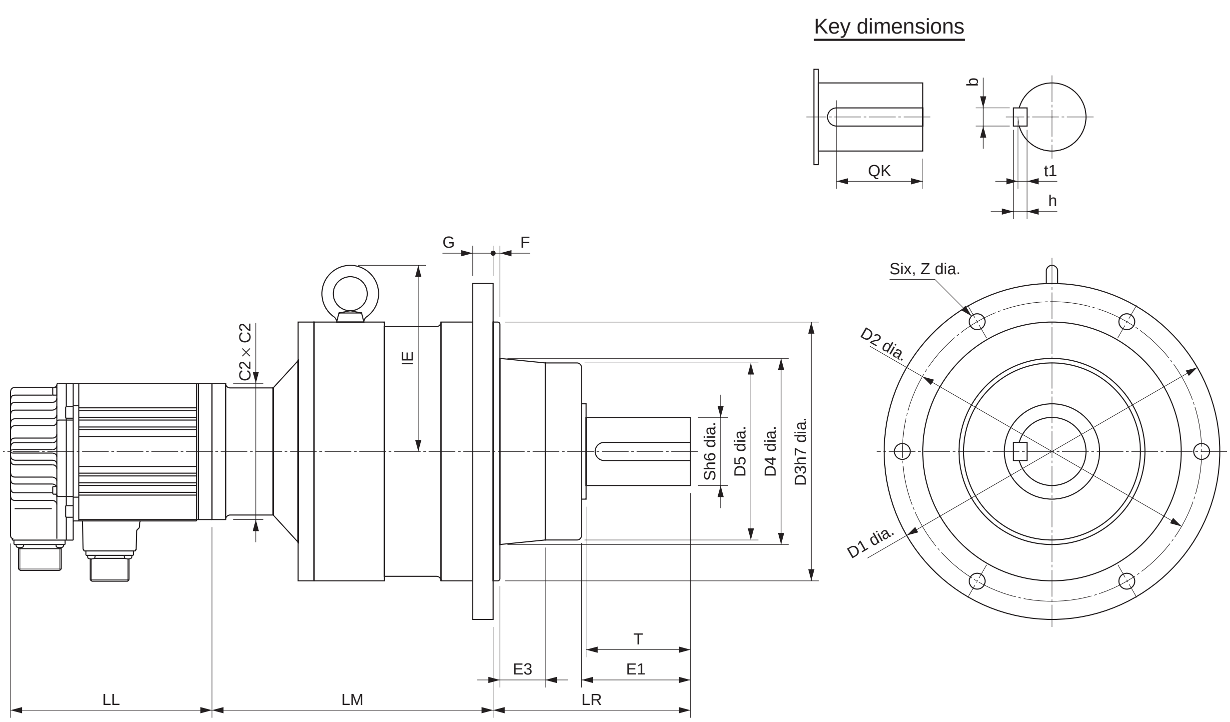
Diagram 1



Note WOB and WB mean “without brake” and “with brake” respectively.

Dimensions (mm)												Model		
E1	E3	F	G	S	T	Z	IE	Key dimensions						
								QK	b	h	t1			
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W1K030□-□G05BJ	1/5	1 kW
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W1K030□-□G09BJ	1/9	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K030□-□G20BJ	1/20	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K030□-□G29BJ	1/29	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K030□-□G45BJ	1/45	
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W1K530□-□G05BJ	1/5	1.5 kW
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K530□-□G09BJ	1/9	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K530□-□G20BJ	1/20	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K530□-□G29BJ	1/29	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W1K530□-□G45BJ	1/45	
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W2K030□-□G05BJ	1/5	2 kW
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W2K030□-□G09BJ	1/9	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W2K030□-□G20BJ	1/20	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W2K030□-□G29BJ	1/29	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W2K030□-□G45BJ	1/45	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W3K030□-□G05BJ	1/5	3 kW
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W3K030□-□G09BJ	1/9	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W3K030□-□G20BJ	1/20	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W3K030□-□G29BJ	1/29	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W3K030□-□G45BJ	1/45	

Diagram 2

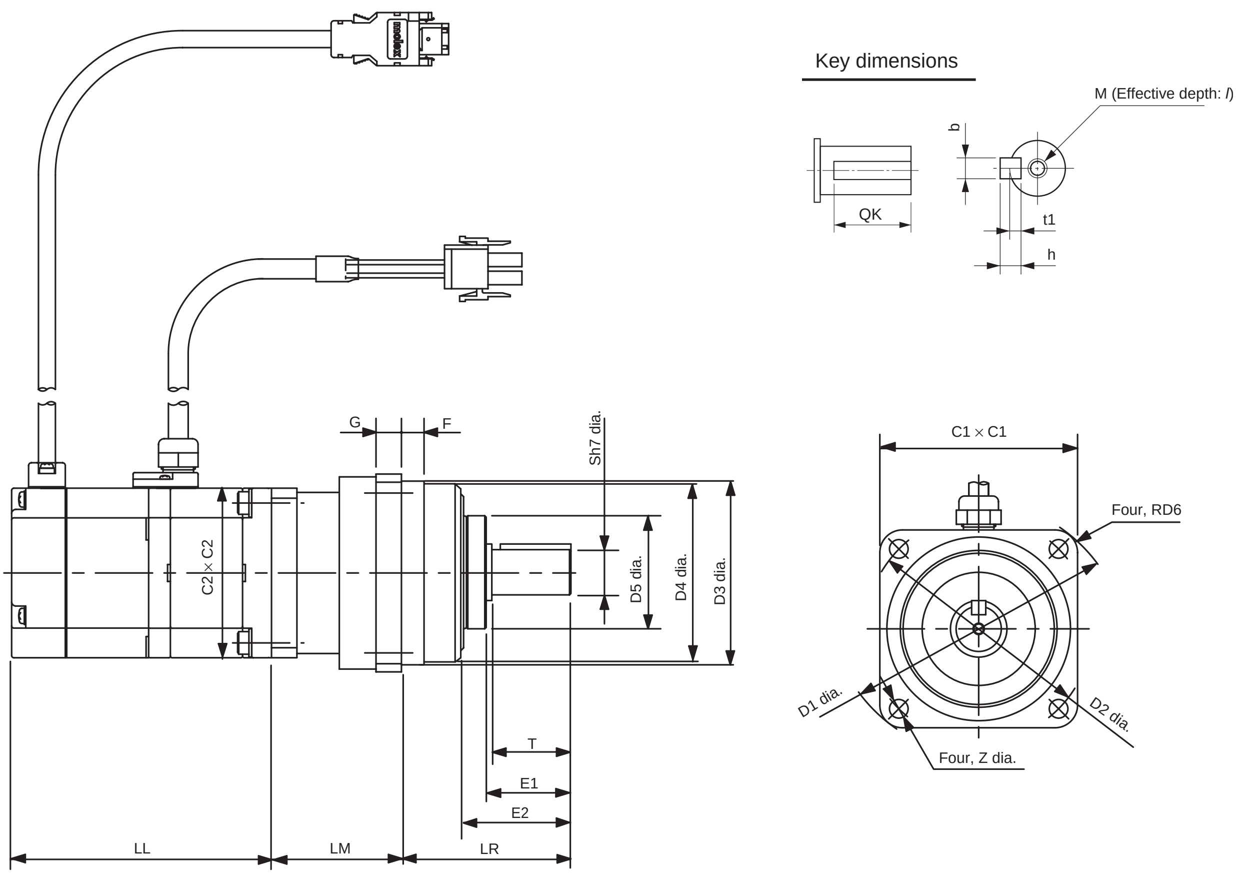


● 3,000-r/min Flat-style Servomotors (100 W to 1.5 kW) with Standard Gears

Model			Diagram No.	Dimensions (mm)											
				LL		LM	LR	C1	C2	D1	D2	D3	D4	D5	D6
				WOB*	WB*										
100 W	1/5	R88M-WP10030□-□G05BJ	1	62	91	46	60	70	60	(92)	80	65	64.5	40	8
	1/11	R88M-WP10030□-□G11BJ		62	91	46	60	70	60	(92)	80	65	64.5	40	8
	1/21	R88M-WP10030□-□G21BJ		62	91	55	74	90	60	(120)	105	85	84	59	9
	1/33	R88M-WP10030□-□G33BJ		62	91	55	74	90	60	(120)	105	85	84	59	9
200 W	1/5	R88M-WP20030□-□G05BJ	1	67	98.5	56	74	90	80	(120)	105	85	84	59	9
	1/11	R88M-WP20030□-□G11BJ		67	98.5	56	74	90	80	(120)	105	85	84	59	9
	1/21	R88M-WP20030□-□G21BJ		67	98.5	64	84	105	80	(139)	120	100	96	59	12
	1/33	R88M-WP20030□-□G33BJ		67	98.5	64	84	105	80	(139)	120	100	96	59	12
400 W	1/5	R88M-WP40030□-□G05BJ	1	87	118.5	56	74	90	80	(120)	105	85	84	59	9
	1/11	R88M-WP40030□-□G11BJ		87	118.5	64	84	105	80	(139)	120	100	96	59	12
	1/21	R88M-WP40030□-□G21BJ		87	118.5	71	105	120	80	(158)	135	115	112	59	14
	1/33	R88M-WP40030□-□G33BJ		87	118.5	72	105	120	80	(158)	135	115	114	84	14
750 W	1/5	R88M-WP75030□-□G05BJ	1	86.5	120	64	84	105	120	(139)	120	100	96	59	12
	1/11	R88M-WP75030□-□G11BJ		86.5	120	72	105	120	120	(158)	135	115	112	59	14
	1/21	R88M-WP75030□-□G21BJ		86.5	120	88	142	145	120	(192)	165	140	134	84	16
	1/33	R88M-WP75030□-□G33BJ		86.5	120	88	142	145	120	(192)	165	140	134	84	16
1.5 kW	1/5	R88M-WP1K530□-□G05BJ	1	114.5	148	72	105	120	120	(158)	135	115	114	84	14
	1/11	R88M-WP1K530□-□G11BJ		114.5	148	88	142	145	120	(192)	165	140	134	84	16
	1/21	R88M-WP1K530□-□G21BJ	2	114.5	148	94	156	170	120	215	190	165	163	135	---
	1/33	R88M-WP1K530□-□G33BJ		114.5	148	94	156	170	120	215	190	165	163	135	---

Note The values in parentheses are reference values.

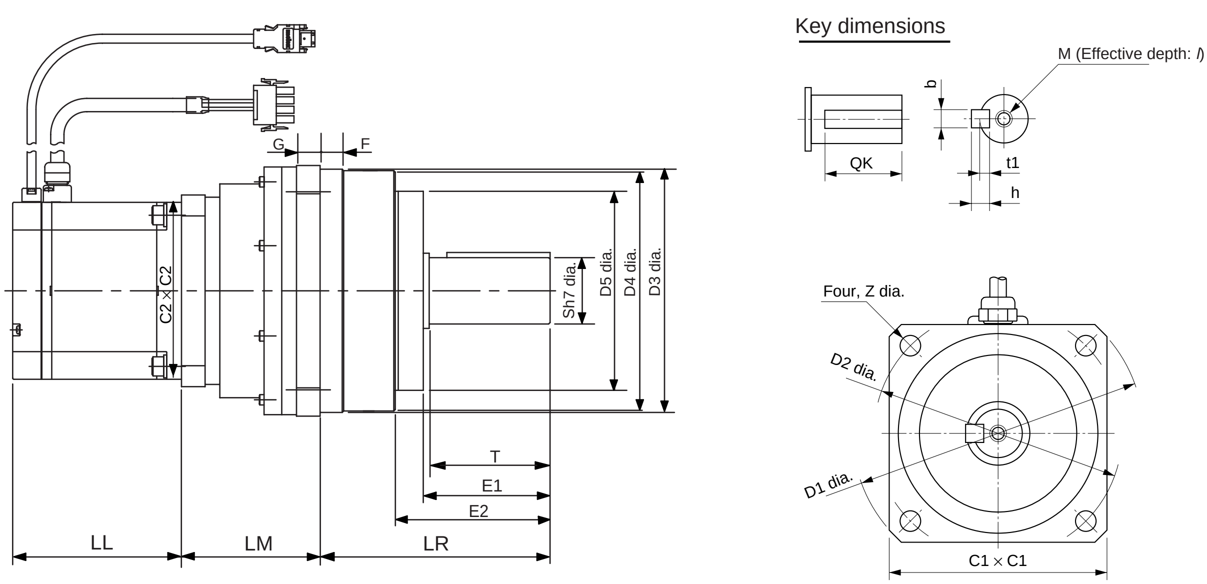
Diagram 1



Note WOB and WB mean “without brake” and “with brake” respectively.

Dimensions (mm)													Model		
E1	E2	F	G	S	T	Z	Key dimensions								
							QK	b	h	t1	M	*l*			
30	39	8	9	16	28	6.6	25	5	5	3	M4	8	R88M-WP10030□-□G05BJ	1/5	100 W
30	39	8	9	16	28	6.6	25	5	5	3	M4	8	R88M-WP10030□-□G11BJ	1/11	
38	48	7.5	10	20	36	9	32	6	6	3.5	M5	10	R88M-WP10030□-□G21BJ	1/21	
38	48	7.5	10	20	36	9	32	6	6	3.5	M5	10	R88M-WP10030□-□G33BJ	1/33	
38	48	7.5	10	20	36	9	32	6	6	3.5	M5	10	R88M-WP20030□-□G05BJ	1/5	200 W
38	48	7.5	10	20	36	9	32	6	6	3.5	M5	10	R88M-WP20030□-□G11BJ	1/11	
44	55	12	12	25	42	9	36	8	7	4	M6	12	R88M-WP20030□-□G21BJ	1/21	
44	55	12	12	25	42	9	36	8	7	4	M6	12	R88M-WP20030□-□G33BJ	1/33	
38	48	7.5	10	20	36	9	32	6	6	3.5	M5	10	R88M-WP40030□-□G05BJ	1/5	400 W
44	55	12	12	25	42	9	36	8	7	4	M6	12	R88M-WP40030□-□G11BJ	1/11	
60	72	14	13	32	58	11	50	10	8	5	M8	16	R88M-WP40030□-□G21BJ	1/21	
60	72	12.5	13	32	58	11	50	10	8	5	M8	16	R88M-WP40030□-□G33BJ	1/33	
44	55	12	12	25	42	9	36	8	7	4	M6	12	R88M-WP75030□-□G05BJ	1/5	750 W
60	72	14	13	32	58	11	50	10	8	5	M8	16	R88M-WP75030□-□G11BJ	1/11	
85	102	10	15	40	82	14	70	12	8	5	M10	20	R88M-WP75030□-□G21BJ	1/21	
85	102	10	15	40	82	14	70	12	8	5	M10	20	R88M-WP75030□-□G33BJ	1/33	
60	72	12.5	13	32	58	11	50	10	8	5	M8	16	R88M-WP1K530□-□G05BJ	1/5	1.5 kW
85	102	10	15	40	82	14	70	12	8	5	M10	20	R88M-WP1K530□-□G11BJ	1/11	
86	105	16	16	45	82	14	70	14	9	5.5	M10	20	R88M-WP1K530□-□G21BJ	1/21	
86	105	16	16	45	82	14	70	14	9	5.5	M10	20	R88M-WP1K530□-□G33BJ	1/33	

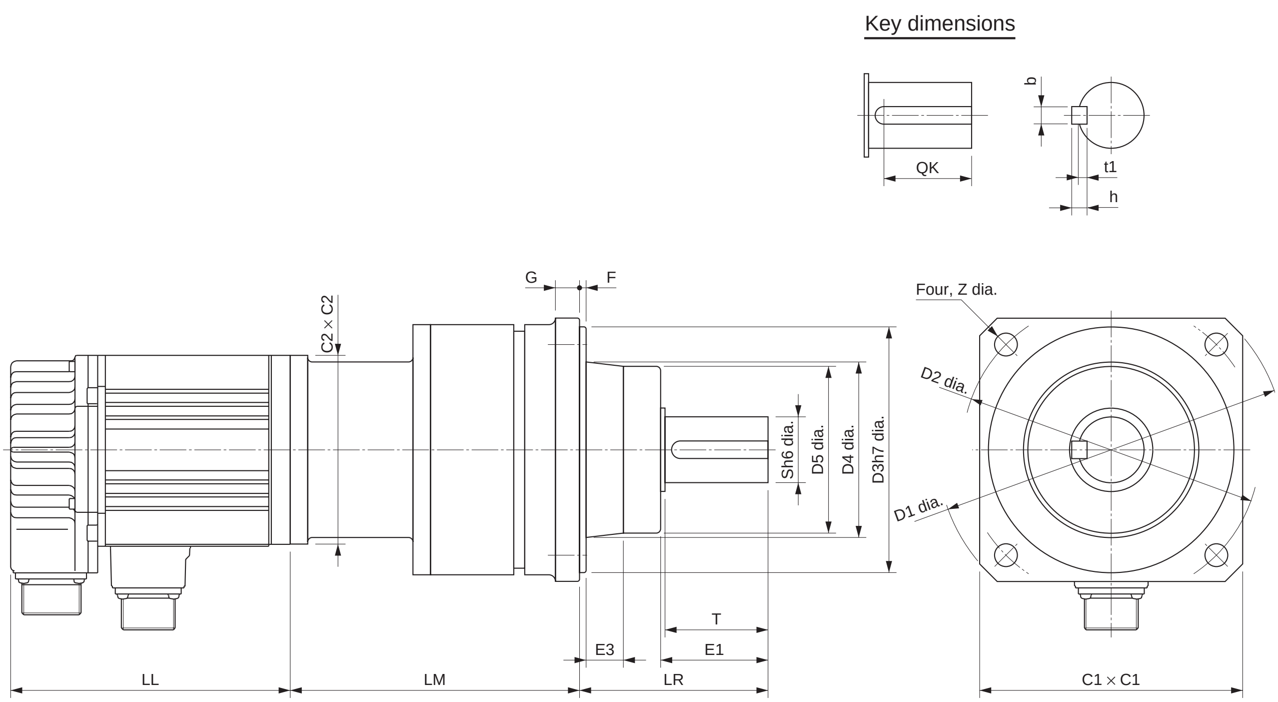
Diagram 2



● 1,000-r/min Servomotors (300 to 3 kW) with Standard Gears

Model			Diagram No.	Dimensions (mm)										
				LL		LM	LR	C1	C2	D1	D2	D3	D4	D5
				WOB*	WB*									
300 W	1/5	R88M-W30010□-□G05BJ	1	138	176	156	100	140	130	185	160	130	94	91
	1/9	R88M-W30010□-□G09BJ		138	176	168	100	140	130	185	160	130	94	91
	1/20	R88M-W30010□-□G20BJ		138	176	187	100	140	130	185	160	130	94	91
	1/29	R88M-W30010□-□G29BJ	2	138	176	213	140	---	130	245	220	190	135	130
	1/45	R88M-W30010□-□G45BJ		138	176	223	140	---	130	245	220	190	135	130
600 W	1/5	R88M-W60010□-□G05BJ	1	161	199	156	100	140	130	185	160	130	94	91
	1/9	R88M-W60010□-□G09BJ		161	199	168	100	140	130	185	160	130	94	91
	1/20	R88M-W60010□-□G20BJ	2	161	199	213	140	---	130	245	220	190	135	130
	1/29	R88M-W60010□-□G29BJ		161	199	213	140	---	130	245	220	190	135	130
	1/45	R88M-W60010□-□G45BJ		161	199	244	160	---	130	310	280	240	186	182
900 W	1/5	R88M-W90010□-□G05BJ	1	185	223	156	100	140	130	185	160	130	94	91
	1/9	R88M-W90010□-□G09BJ	2	185	223	209	140	---	130	245	220	190	135	130
	1/20	R88M-W90010□-□G20BJ		185	223	213	140	---	130	245	220	190	135	130
	1/29	R88M-W90010□-□G29BJ		185	223	234	160	---	130	310	280	240	186	182
	1/45	R88M-W90010□-□G45BJ		185	223	244	160	---	130	310	280	240	186	182
1.2 kW	1/5	R88M-W1K210□-□G05BJ	2	166	217	203	140	---	180	245	220	190	135	130
	1/9	R88M-W1K210□-□G09BJ		166	217	230	140	---	180	245	220	190	135	130
	1/20	R88M-W1K210□-□G20BJ		166	217	255	160	---	180	310	280	240	186	182
	1/29	R88M-W1K210□-□G29BJ		166	217	255	160	---	180	310	280	240	186	182
	1/45	R88M-W1K210□-□G45BJ		166	217	265	160	---	180	310	280	240	186	182
2 kW	1/5	R88M-W2K010□-□G05BJ	2	192	243	203	140	---	180	245	220	190	135	130
	1/9	R88M-W2K010□-□G09BJ		192	243	230	140	---	180	245	220	190	135	130
	1/20	R88M-W2K010□-□G20BJ		192	243	255	160	---	180	310	280	240	186	182

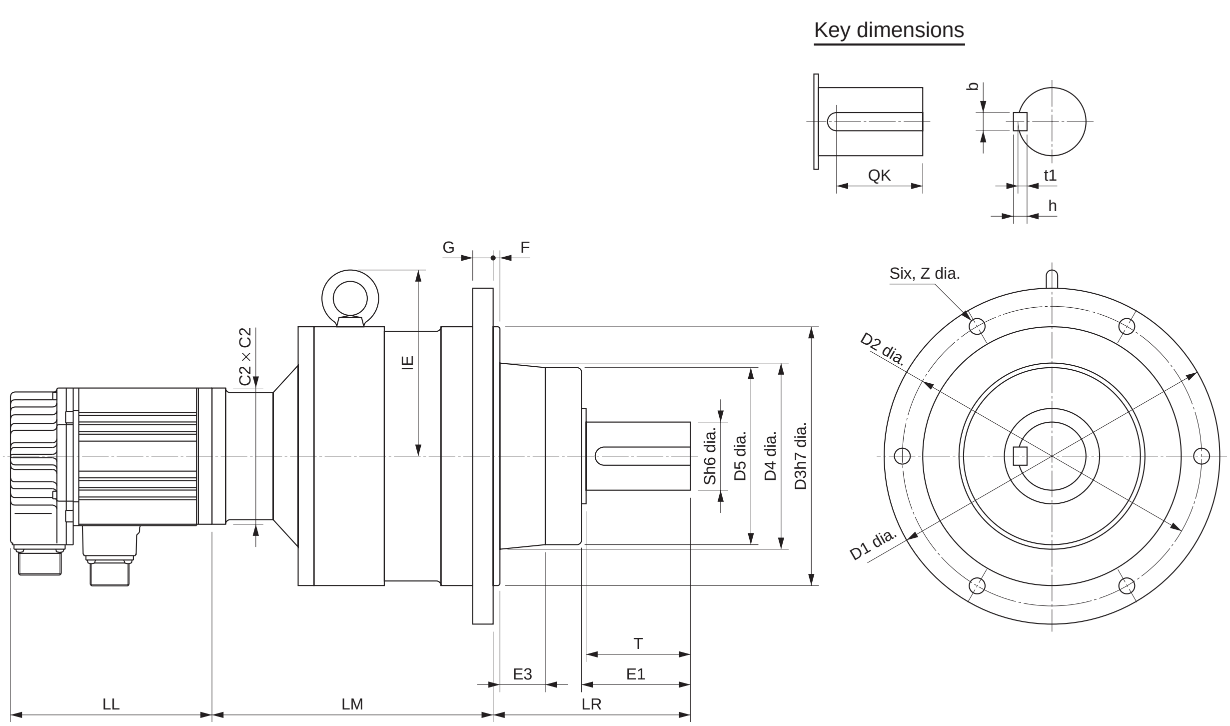
Diagram 1



Note WOB and WB mean “without brake” and “with brake” respectively.

Dimensions (mm)												Model		
E1	E3	F	G	S	T	Z	IE	Key dimensions						
								QK	b	h	t1			
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W30010□-□G05BJ	1/5	300 W
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W30010□-□G09BJ	1/9	
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W30010□-□G20BJ	1/20	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W30010□-□G29BJ	1/29	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W30010□-□G45BJ	1/45	
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W60010□-□G05BJ	1/5	600 W
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W60010□-□G09BJ	1/9	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W60010□-□G20BJ	1/20	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W60010□-□G29BJ	1/29	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W60010□-□G45BJ	1/45	
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W90010□-□G05BJ	1/5	900 W
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W90010□-□G09BJ	1/9	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W90010□-□G20BJ	1/20	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W90010□-□G29BJ	1/29	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W90010□-□G45BJ	1/45	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K210□-□G05BJ	1/5	1.2 kW
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K210□-□G09BJ	1/9	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W1K210□-□G20BJ	1/20	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W1K210□-□G29BJ	1/29	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W1K210□-□G45BJ	1/45	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W2K010□-□G05BJ	1/5	2 kW
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W2K010□-□G09BJ	1/9	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W2K010□-□G20BJ	1/20	

Diagram 2

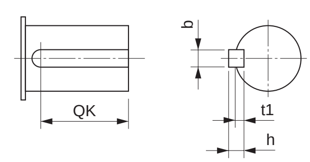


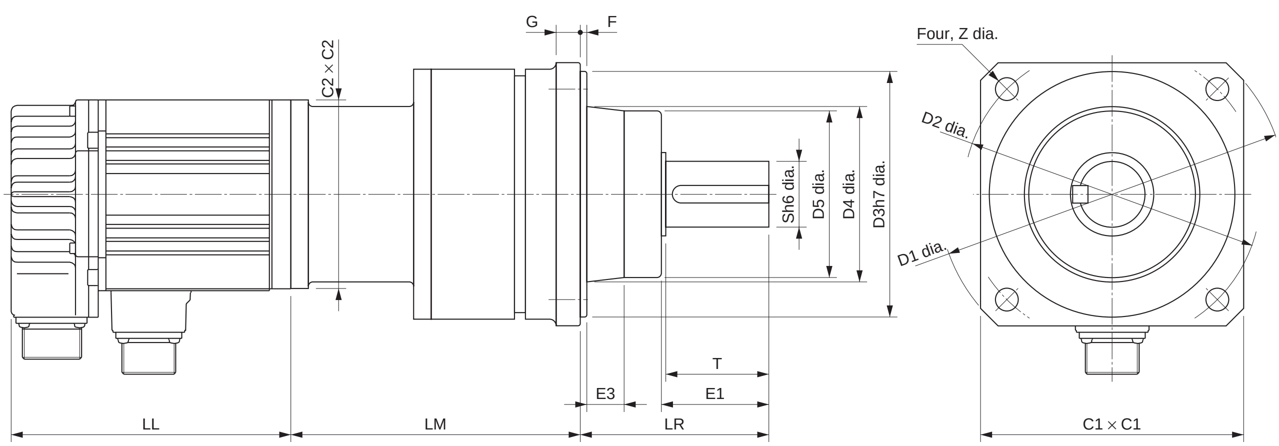
● 1,500-r/min Servomotors (450 W to 4.4 kW) with Standard Gears

Model			Diagram No.	Dimensions (mm)										
				LL		LM	LR	C1	C2	D1	D2	D3	D4	D5
				WOB*	WB*									
450 W	1/5	R88M-W45015T-□G05BJ	1	138	176	156	100	140	130	185	160	130	94	91
	1/9	R88M-W45015T-□G09BJ		138	176	168	100	140	130	185	160	130	94	91
	1/20	R88M-W45015T-□G20BJ	2	138	176	213	140	---	130	245	220	190	135	130
	1/29	R88M-W45015T-□G29BJ		138	176	213	140	---	130	245	220	190	135	130
	1/45	R88M-W45015T-□G45BJ		138	176	223	140	---	130	245	220	190	135	130
850 W	1/5	R88M-W85015T-□G05BJ	1	161	199	156	100	140	130	185	160	130	94	91
	1/9	R88M-W85015T-□G09BJ		161	199	168	100	140	130	185	160	130	94	91
	1/20	R88M-W85015T-□G20BJ	2	161	199	213	140	---	130	245	220	190	135	130
	1/29	R88M-W85015T-□G29BJ		161	199	213	140	---	130	245	220	190	135	130
	1/45	R88M-W85015T-□G45BJ		161	199	244	160	---	130	310	280	240	186	182
1.3 kW	1/5	R88M-W1K315T-□G05BJ	2	185	223	182	140	---	130	245	220	190	135	130
	1/9	R88M-W1K315T-□G09BJ		185	223	209	140	---	130	245	220	190	135	130
	1/20	R88M-W1K315T-□G20BJ		185	223	213	140	---	130	245	220	190	135	130
	1/29	R88M-W1K315T-□G29BJ		185	223	234	160	---	130	310	280	240	186	182
	1/45	R88M-W1K315T-□G45BJ		185	223	244	160	---	130	310	280	240	186	182
1.8 kW	1/5	R88M-W1K815T-□G05BJ	2	166	217	203	140	---	180	245	220	190	135	130
	1/9	R88M-W1K815T-□G09BJ		166	217	230	140	---	180	245	220	190	135	130
	1/20	R88M-W1K815T-□G20BJ		166	217	255	160	---	180	310	280	240	186	182
	1/29	R88M-W1K815T-□G29BJ		166	217	255	160	---	180	310	280	240	186	182

Diagram 1

Key dimensions

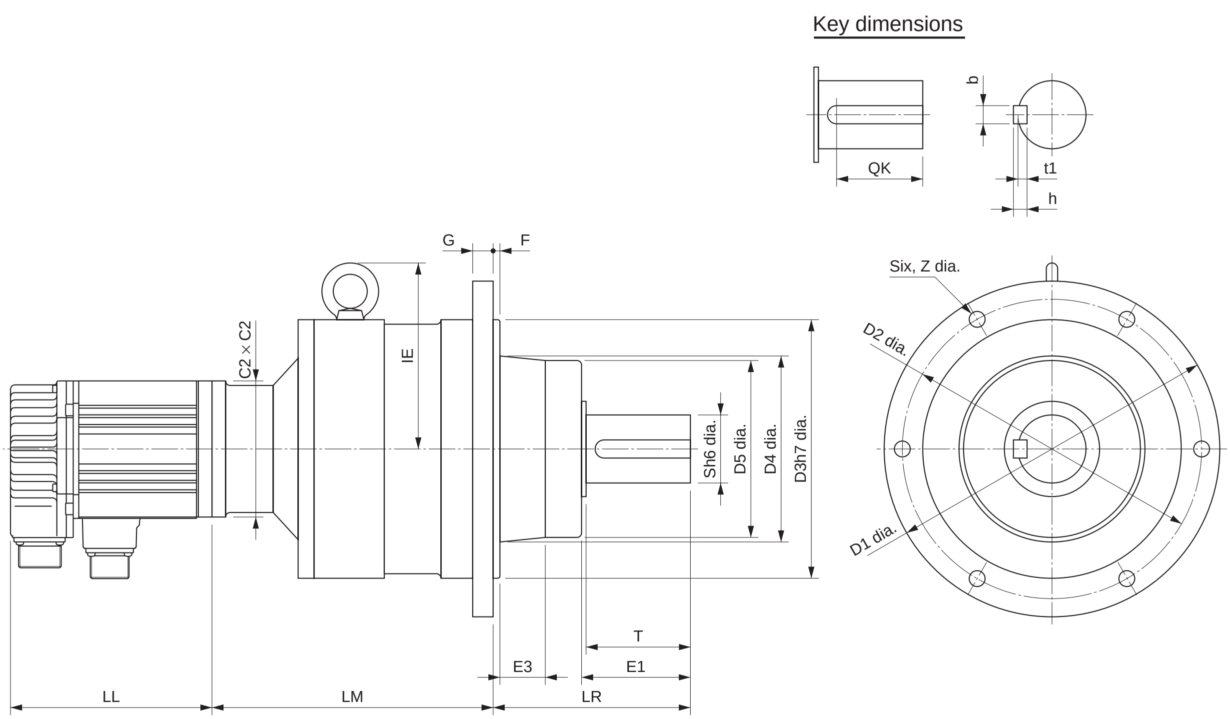




Note WOB and WB mean “without brake” and “with brake” respectively.

Dimensions (mm)												Model		
E1	E3	F	G	S	T	Z	IE	Key dimensions						
								QK	b	h	t1			
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W45015T-□G05BJ	1/5	450 W
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W45015T-□G09BJ	1/9	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W45015T-□G20BJ	1/20	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W45015T-□G29BJ	1/29	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W45015T-□G45BJ	1/45	
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W85015T-□G05BJ	1/5	850 W
57	20	3	12	35	55	12	---	47	10	8	5	R88M-W85015T-□G09BJ	1/9	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W85015T-□G20BJ	1/20	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W85015T-□G29BJ	1/29	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W85015T-□G45BJ	1/45	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K315T-□G05BJ	1/5	1.3 kW
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K315T-□G09BJ	1/9	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K315T-□G20BJ	1/20	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W1K315T-□G29BJ	1/29	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W1K315T-□G45BJ	1/45	
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K815T-□G05BJ	1/5	1.8 kW
77	33	5	15	50	75	12	137	65	14	9	5.5	R88M-W1K815T-□G09BJ	1/9	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W1K815T-□G20BJ	1/20	
92	38	5	18	60	90	14	171	78	18	11	7	R88M-W1K815T-□G29BJ	1/29	

Diagram 2



■ AC Servomotors with Economy Gears

● 3,000-r/min Servomotors (100 to 750 W) with Economy Reduction Gears

Model			Diagram No.	Dimensions (mm)								
				LL		LM	LR	C1	C2	D2	D3	D4
				WOB*	WB*							
100 W	1/5	R88M-W10030□-□G05CJ	1	94.5	135	67.5	32	52	40	60	50	45
	1/9	R88M-W10030□-□G09CJ		94.5	135	67.5	32	52	40	60	50	45
	1/15	R88M-W10030□-□G15CJ		94.5	135	78	32	52	40	60	50	45
	1/25	R88M-W10030□-□G25CJ		94.5	135	92	50	78	40	90	70	62
200 W	1/5	R88M-W20030□-□G05CJ	2	96.5	136	72.5	32	52	60	60	50	45
	1/9	R88M-W20030□-□G09CJ		96.5	136	89.5	50	78	60	90	70	62
	1/15	R88M-W20030□-□G15CJ		96.5	136	100	50	78	60	90	70	62
	1/25	R88M-W20030□-□G25CJ		96.5	136	100	50	78	60	90	70	62
400 W	1/5	R88M-W40030□-□G05CJ	2	124.5	164	89.5	50	78	60	90	70	62
	1/9	R88M-W40030□-□G09CJ		124.5	164	89.5	50	78	60	90	70	62
	1/15	R88M-W40030□-□G15CJ		124.5	164	100	50	78	60	90	70	62
	1/25	R88M-W40030□-□G25CJ		124.5	164	104	61	98	60	115	90	75
750 W	1/5	R88M-W75030□-□G05CJ	2	145	189.5	93.5	50	78	80	90	70	62
	1/9	R88M-W75030□-□G09CJ		145	189.5	97.5	61	98	80	115	90	75
	1/15	R88M-W75030□-□G15CJ		145	189.5	110	61	98	80	115	90	75
	1/25	R88M-W75030□-□G25CJ		145	189.5	135	75	125	80	135	110	98

Model			Dimensions (mm)										
			E1	E3	F	S	T	Z	*l*	Key dimensions			
										QK	b	h	t1
100 W	1/5	R88M-W10030□-□G05CJ	22	10	3	12	20	M5	12	16	4	4	2.5
	1/9	R88M-W10030□-□G09CJ	22	10	3	12	20	M5	12	16	4	4	2.5
	1/15	R88M-W10030□-□G15CJ	22	10	3	12	20	M5	12	16	4	4	2.5
	1/25	R88M-W10030□-□G25CJ	33	17	3	19	30	M6	20	22	6	6	3.5
200 W	1/5	R88M-W20030□-□G05CJ	22	10	3	12	20	M5	12	16	4	4	2.5
	1/9	R88M-W20030□-□G09CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/15	R88M-W20030□-□G15CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/25	R88M-W20030□-□G25CJ	33	17	3	19	30	M6	20	22	6	6	3.5
400 W	1/5	R88M-W40030□-□G05CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/9	R88M-W40030□-□G09CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/15	R88M-W40030□-□G15CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/25	R88M-W40030□-□G25CJ	43	18	5	24	40	M8	20	30	8	7	4
750 W	1/5	R88M-W75030□-□G05CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/9	R88M-W75030□-□G09CJ	43	18	5	24	40	M8	20	30	8	7	4
	1/15	R88M-W75030□-□G15CJ	43	18	5	24	40	M8	20	30	8	7	4
	1/25	R88M-W75030□-□G25CJ	58	17	5	32	55	M10	20	45	10	8	5

Note WOB and WB mean “without brake” and “with brake” respectively.

Diagram 1

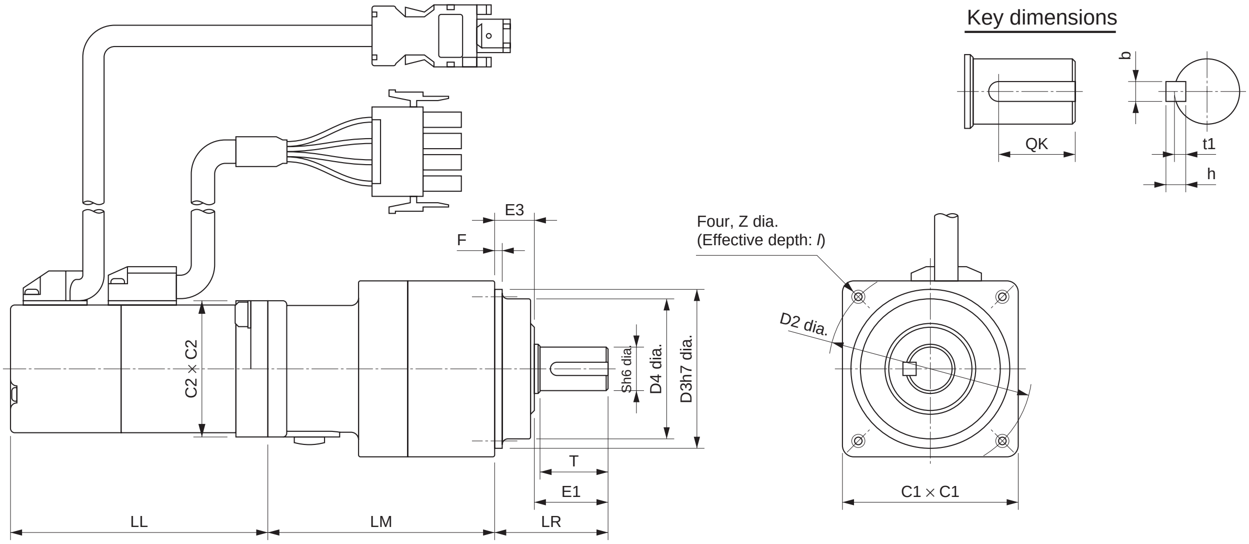
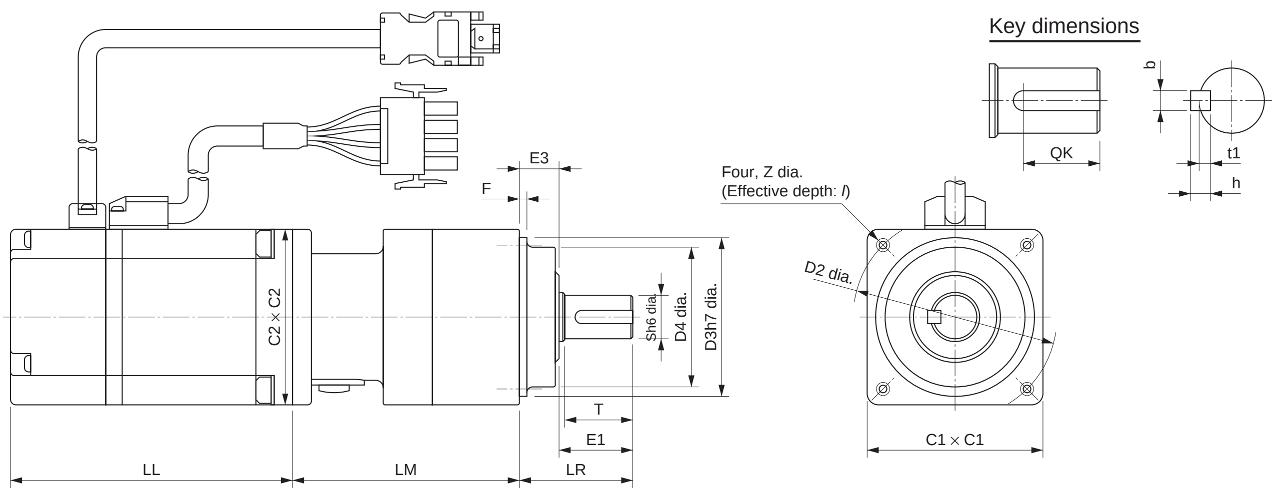


Diagram 2



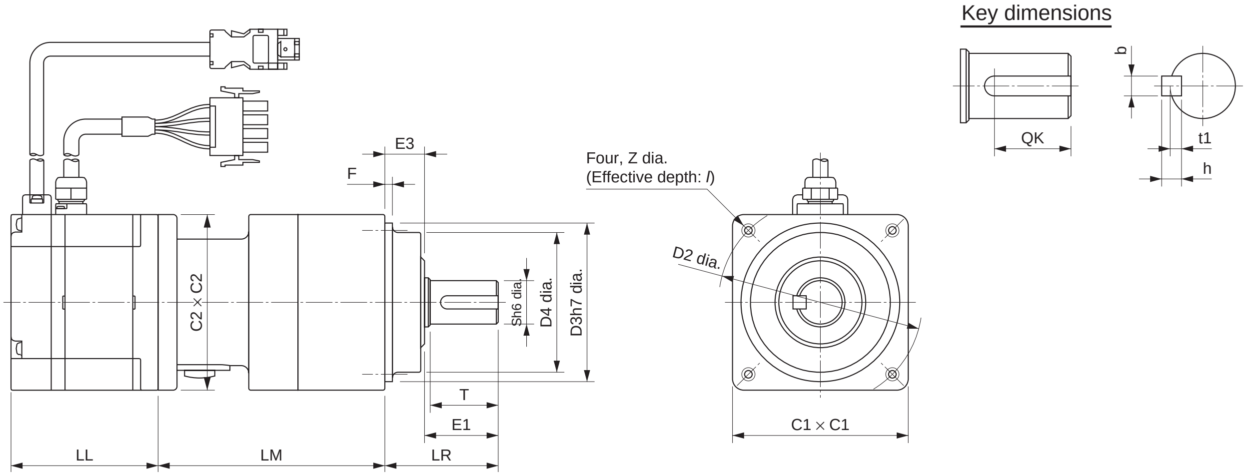
● 3,000-r/min Flat-style Servomotors (100 to 750 W) with Economy Gears

Model			Dimensions (mm)								
			LL		LM	LR	C1	C2	D2	D3	D4
			WOB*	WB*							
100 W	1/5	R88M-WP10030□-□G05CJ	62	91	72.5	32	52	60	60	50	45
	1/9	R88M-WP10030□-□G09CJ	62	91	72.5	32	52	60	60	50	45
	1/15	R88M-WP10030□-□G15CJ	62	91	78	32	52	60	60	50	45
	1/25	R88M-WP10030□-□G25CJ	62	91	92	50	78	60	90	70	62
200 W	1/5	R88M-WP20030□-□G05CJ	67	98.5	72.5	32	52	80	60	50	45
	1/9	R88M-WP20030□-□G09CJ	67	98.5	89.5	50	78	80	90	70	62
	1/15	R88M-WP20030□-□G15CJ	67	98.5	100	50	78	80	90	70	62
	1/25	R88M-WP20030□-□G25CJ	67	98.5	100	50	78	80	90	70	62
400 W	1/5	R88M-WP40030□-□G05CJ	87	118.5	89.5	50	78	80	90	70	62
	1/9	R88M-WP40030□-□G09CJ	87	118.5	89.5	50	78	80	90	70	62
	1/15	R88M-WP40030□-□G15CJ	87	118.5	100	50	78	80	90	70	62
	1/25	R88M-WP40030□-□G25CJ	87	118.5	104	61	98	80	115	90	75
750 W	1/5	R88M-WP75030□-□G05CJ	86.5	120	93.5	50	78	120	90	70	62
	1/9	R88M-WP75030□-□G09CJ	86.5	120	97.5	61	98	120	115	90	75
	1/15	R88M-WP75030□-□G15CJ	86.5	120	110	61	98	120	115	90	75
	1/25	R88M-WP75030□-□G25CJ	86.5	120	135	75	125	120	135	110	98

Model			Dimensions (mm)										
			E1	E3	F	S	T	Z	*l*	Key dimensions			
										QK	b	h	t1
100 W	1/5	R88M-WP10030□-□G05CJ	22	10	3	12	20	M5	12	16	4	4	2.5
	1/9	R88M-WP10030□-□G09CJ	22	10	3	12	20	M5	12	16	4	4	2.5
	1/15	R88M-WP10030□-□G15CJ	22	10	3	12	20	M5	12	16	4	4	2.5
	1/25	R88M-WP10030□-□G25CJ	33	17	3	19	30	M6	20	22	6	6	3.5
200 W	1/5	R88M-WP20030□-□G05CJ	22	10	3	12	20	M5	12	16	4	4	2.5
	1/9	R88M-WP20030□-□G09CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/15	R88M-WP20030□-□G15CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/25	R88M-WP20030□-□G25CJ	33	17	3	19	30	M6	20	22	6	6	3.5
400 W	1/5	R88M-WP40030□-□G05CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/9	R88M-WP40030□-□G09CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/15	R88M-WP40030□-□G15CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/25	R88M-WP40030□-□G25CJ	43	18	5	24	40	M8	20	30	8	7	4
750 W	1/5	R88M-WP75030□-□G05CJ	33	17	3	19	30	M6	20	22	6	6	3.5
	1/9	R88M-WP75030□-□G09CJ	43	18	5	24	40	M8	20	30	8	7	4
	1/15	R88M-WP75030□-□G15CJ	43	18	5	24	40	M8	20	30	8	7	4
	1/25	R88M-WP75030□-□G25CJ	58	17	5	32	55	M10	20	45	10	8	5

Note WOB and WB mean “without brake” and “with brake” respectively.

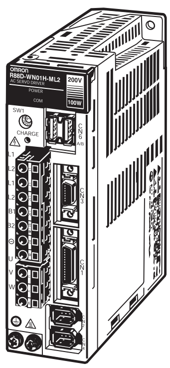
Diagram


Key dimensions
b
QK
t1
h
E3
F
Four, Z dia.
(Effective depth: *l*)
D2 dia.
C2 × C2
Sh6 dia.
D4 dia.
D3h7 dia.
T
E1
LL
LM
LR
C1 × C1

2-4 Servo Driver Specifications

■ R88D-WN□-ML2/OMNUC W-series AC Servo Drivers (with Built-in MECHATROLINK-II Communications)

Referring to *2-2 Servo Driver and Servomotor Combinations*, select a Servo Driver to match the Servomotor that is being used.



2-4-1 General Specifications

Item		Specifications
Ambient operating temperature		0° to 55°C
Ambient operating humidity		90% max. (with no condensation)
Ambient storage temperature		–20° to 85°C
Ambient storage humidity		90% max. (with no condensation)
Storage and operating atmosphere		No corrosive gasses.
Vibration resistance		10 to 55 Hz in X, Y, and Z directions with 0.1-mm double amplitude; acceleration: 4.9 m/s^2 max.
Impact resistance		Acceleration 19.6 m/s^2 max., in X, Y, and Z directions, three times
Insulation resistance		Between power line terminals and case: 0.5 MΩ min. (at 500 V DC)
Dielectric strength		Between power line terminals and case: 1,500 V AC for 1 min at 50/60 Hz Between each control signal and case: 500 V AC for 1 min
Protective structure		Built into panel (IP10).
EC directives	EMC directive	EN55011 class A group 1
		EN61000-6-2
	Low-voltage directive	EN50178
UL standards		UL508C
cUL standards		cUL C22.2 No. 14

Note 1. The above items reflect individual evaluation testing. The results may differ under compound conditions.

Note 2. Absolutely do not conduct a withstand voltage test with a Megger tester on the Servo Driver. If such tests are conducted, internal elements may be damaged.

Note 3. Depending on the operating conditions, some Servo Driver parts will require maintenance. Refer to *5-5 Periodic Maintenance* for details.

Note 4. The service life of the Servo Driver is 50,000 hours at an average ambient temperature of 40°C at 80% of the rated torque.

2-4-2 Performance Specifications

■ Control Specifications

● 100-V AC Input Type

<table>
<tr><th colspan="3" rowspan="2">Item</th><th colspan="4">Model R88D-</th></tr>
<tr><th>WNA5L-ML2</th><th>WN01L-ML2</th><th>WN02L-ML2</th><th>WN04L-ML2</th></tr>
<tr><td colspan="3">Continuous output current (rms)</td><td>0.66 A</td><td>0.91 A</td><td>2.1 A</td><td>2.8 A</td></tr>
<tr><td colspan="3">Momentary maximum output current (rms)</td><td>2.1 A</td><td>2.8 A</td><td>6.5 A</td><td>8.5 A</td></tr>
<tr><td rowspan="2">Input power supply</td><td colspan="2">Main circuits</td><td colspan="4">Single-phase 100/115 V AC (85 to 127 V) 50/60 Hz</td></tr>
<tr><td colspan="2">Control circuits</td><td colspan="4">Single-phase 100/115 V AC (85 to 127 V) 50/60 Hz</td></tr>
<tr><td rowspan="2">Heating value</td><td colspan="2">Main circuits</td><td>5.2 W</td><td>12 W</td><td>16.4 W</td><td>24 W</td></tr>
<tr><td colspan="2">Control circuits</td><td>13 W</td><td>13 W</td><td>13 W</td><td>13 W</td></tr>
<tr><td colspan="3">Control method</td><td colspan="4">All-digital Servo</td></tr>
<tr><td colspan="3">Inverter method</td><td colspan="4">PWM method based on IGBT</td></tr>
<tr><td colspan="3">PWM frequency</td><td colspan="4">10.667 kHz</td></tr>
<tr><td colspan="3">Weight</td><td>Approx. 0.7 kg</td><td>Approx. 0.7 kg</td><td>Approx. 0.7 kg</td><td>Approx. 1.4 kg</td></tr>
<tr><td colspan="3">Maximum applicable Servomotor wattage</td><td>50 W</td><td>100 W</td><td>200 W</td><td>400 W</td></tr>
<tr><td rowspan="7">Applicable Servomotor (R88M-)</td><td rowspan="2">3,000-r/min</td><td>[Incremental]</td><td>W05030H</td><td>W10030H</td><td>W20030H</td><td>W40030H</td></tr>
<tr><td>[Absolute]</td><td>W05030T</td><td>W10030T</td><td>W20030T</td><td>W40030T</td></tr>
<tr><td rowspan="2">3,000-r/min Flat-style</td><td>[Incremental]</td><td>---</td><td>WP10030H</td><td>WP20030H</td><td>WP40030H</td></tr>
<tr><td>[Absolute]</td><td>---</td><td>WP10030T</td><td>WP20030T</td><td>WP40030T</td></tr>
<tr><td rowspan="2">1,000-r/min</td><td>[Incremental]</td><td>---</td><td>---</td><td>---</td><td>---</td></tr>
<tr><td>[Absolute]</td><td>---</td><td>---</td><td>---</td><td>---</td></tr>
<tr><td>1,500-r/min</td><td>[Absolute]</td><td>---</td><td>---</td><td>---</td><td>---</td></tr>
<tr><td rowspan="6">Performance</td><td colspan="2">Speed control range</td><td colspan="4">1:5,000</td></tr>
<tr><td colspan="2">Load fluctuation rate</td><td colspan="4">0.01% max. at 0% to 100% (at rated rotation speed)</td></tr>
<tr><td colspan="2">Voltage fluctuation rate</td><td colspan="4">0% at rated voltage ±10% (at rated rotation speed)</td></tr>
<tr><td colspan="2">Temperature fluctuation rate</td><td colspan="4">±0.1% max. at 0 to 50°C (at rated rotation speed)</td></tr>
<tr><td colspan="2">Frequency characteristics</td><td colspan="4">600 Hz (at the same load as the rotor inertia)</td></tr>
<tr><td colspan="2">Torque control repeatability</td><td colspan="4">±1%</td></tr>
</table>

● 200-V AC Input Type (Single-phase Input)

Item			Model R88D-				
			WNA5H-ML2	**WN01H-ML2**	**WN02H-ML2**	**WN04H-ML2**	**WN08H-ML2**
Continuous output current (rms)			0.66 A	0.91 A	2.1 A	2.8 A	5.5 A
Momentary maximum output current (rms)			2.1 A	2.8 A	6.5 A	8.5 A	16.9 A
Input power supply	Main circuits		Single-phase 200/230 V AC (170 to 253 V) 50/60 Hz				
	Control circuits		Single-phase 200/230 V AC (170 to 253 V) 50/60 Hz				
Heating value	Main circuits		4.6 W	6.7 W	13.3 W	20 W	47 W
	Control circuits		13 W	13 W	13 W	13 W	15 W
PWM frequency			10.667 kHz				
Weight			Approx. 0.7 kg	Approx. 0.7 kg	Approx. 0.7 kg	Approx. 0.9 kg	Approx. 1.4 kg
Maximum applicable Servomotor wattage			50 W	100 W	200 W	400 W	750 W
Applicable Servomotor (R88M-)	3,000-r/min	[Incremental]	W05030H	W10030H	W20030H	W40030H	W75030H
		[Absolute]	W05030T	W10030T	W20030T	W40030T	W75030T
	3,000-r/min Flat-style	[Incremental]	---	WP10030H	WP20030H	WP40030H	WP75030H
		[Absolute]	---	WP10030T	WP20030T	WP40030T	WP75030T
	1,000-r/min	[Incremental]	---	---	---	---	---
		[Absolute]	---	---	---	---	---
	1,500-r/min	[Absolute]	---	---	---	---	---
Control method			All-digital Servo				
Inverter method			PWM method based on IGBT				
Performance	Speed control range		1:5,000				
	Load fluctuation rate		0.01% max. at 0% to 100% (at rated rotation speed)				
	Voltage fluctuation rate		0% at rated voltage ±10% (at rated rotation speed)				
	Temperature fluctuation rate		±0.1% max. at 0 to 50°C (at rated rotation speed)				
	Frequency characteristics		600 Hz (at the same load as the rotor inertia)				
	Torque control repeatability		±1%				

● 200-V AC Input Type (Three-phase Input)

Item			Model R88D-				
			WN05H-ML2	**WN10H-ML2**	**WN15H-ML2**	**WN20H-ML2**	**WN30H-ML2**
Continuous output current (rms)			3.8 A	7.6 A	11.6 A	18.5 A	18.9 A
Momentary maximum output current (rms)			11.0 A	17.0 A	28.0 A	42.0 A	56.0 A
Input power supply	Main circuits		Three-phase 200/230 V AC (170 to 253 V) 50/60 Hz				
	Control circuits		Single-phase 200/230 V AC (170 to 253 V) 50/60 Hz				
Heating value	Main circuits		27 W	55 W	92 W	120 W	155 W
	Control circuits		15 W	15 W	15 W	15 W	15 W
PWM frequency			10.667 kHz	8.000 kHz	4.000 kHz		
Weight			Approx. 1.4 kg	Approx. 1.4 kg	Approx. 2.1 kg	Approx. 2.8 kg	Approx. 2.8 kg
Maximum applicable Servomotor wattage			500 W	1 kW	1.5 kW	2 kW	3 kW
Applicable Servomotor (R88M-)	3,000-r/min	[Incremental]	---	W1K030H	W1K530H	W2K030H	W3K030H
		[Absolute]	---	W1K030T	W1K530T	W2K030T	W3K030T
	3,000-r/min Flat-type	[Incremental]	---	---	WP1K530H	---	---
		[Absolute]	---	---	WP1K530T	---	---
	1,000-r/min	[Incremental]	W30010H	W60010H W90010H	W1K210H	W2K010H	---
		[Absolute]	W30010T	W60010T W90010T	W1K210T	W2K010T	---
	1,500-r/min	[Absolute]	W45015T	W85015T	W1K315T	W1K815T	---
Control method			All-digital Servo				
Inverter method			PWM method based on IGBT				
Performance	Speed control range		1:5,000				
	Load fluctuation rate		0.01% max. at 0% to 100% (at rated rotation speed)				
	Voltage fluctuation rate		0% at rated voltage ±10% (at rated rotation speed)				
	Temperature fluctuation rate		±0.1% max. at 0 to 50°C (at rated rotation speed)				
	Frequency characteristics		600 Hz (See note.)		400 Hz (See note.)		
	Torque control repeatability		±1%				

Note At a load inertia equivalent to the Servomotor's rotor inertia.

■ Protective and Diagnostic Functions

Error detection function	Contents
Parameter checksum error 1	The Servo Driver's internal parameter data is abnormal.
Parameter format error 1	The Servo Driver's internal parameter data is abnormal.
System parameter checksum error 1	The Servo Driver's internal parameter data is abnormal.
Parameter password error 1	The Servo Driver's internal parameter data is abnormal.
Parameter checksum error 2	The Servo Driver's internal parameter data is abnormal.
System parameter checksum error 2	The Servo Driver's internal parameter data is abnormal.
Main circuit detection error	There is an error in the detection data for the power supply circuit.
Parameter setting error 1	A parameter value exceeds the setting range.
Parameter setting error 2	A parameter value exceeds the setting range.
Dividing pulse output setting error	The encoder divider rate setting is out of range or the set conditions are not satisfied.
Parameter combination error	A combination of multiple parameters is set out of range.
Combination error	The combined capacity of the Servomotor and the Servo Driver is unsuitable.
Servo ON command invalid alarm	After a function for executing Servo ON by means of Computer Monitor Software was used, an attempt was made to execute Servo ON using a host command.
Overcurrent or overheating of radiation shield	An overcurrent has occurred, or the Servo Driver's radiation shield has overheated.
Regeneration error	The regeneration resistor is disconnected or the regeneration transistor is faulty.
Regeneration overload	The regenerative energy exceeds the regeneration resistance.
Main circuit power supply setting error	The method for providing power to the main circuit does not match the Pn001 setting.
Overvoltage	The main-circuit DC voltage is abnormally high.
Low voltage	The main-circuit DC voltage is low.
Overspeed	The Servomotor's rotation speed is abnormally high.
Dividing pulse output overspeed	The Servomotor rotation speed upper limit set for the encoder divider rate setting (Pn212) was exceeded.
Vibration alarm	Abnormal vibration was detected in the Servomotor rotation speed.
Auto-tuning alarm	The inertia ratio was in error during auto-tuning.
Overload (momentary maximum load)	Operated for several seconds to several tens of seconds at a torque greatly exceeding the rating.
Overload (continual maximum load)	Operated continually at a torque exceeding the rating.
DB overload	During DB (dynamic braking) operation, rotation energy exceeds the DB capacity.
Inrush resistance overload	The main-circuit power supply has frequently and repeatedly been turned ON and OFF.
Overheat	The Servo Driver's radiation shield overheated.
Encoder backup error	The encoder power supply was completely down, and position data was cleared.
Encoder checksum error	The encoder memory checksum results are in error.
Encoder battery error	The absolute encoder backup battery voltage has dropped.
Encoder data error	The encoder's internal data is in error.

Error detection function	Contents
Encoder overspeed	The encoder rotated at high speed when the power was ON.
Encoder overheat	The encoder's internal temperature is too high.
Current detection error 1	The phase-U current detector is in error.
Current detection error 2	The phase-V current detector is in error.
Current detection error 3	The current detector is in error.
MECHATROLINK communications ASIC error 1	The MECHATROLINK communications ASIC is in error.
MECHATROLINK communications ASIC error 2	A fatal error occurred in the MECHATROLINK communications ASIC.
System alarm 0	Servo Driver internal program error 0 occurred.
System alarm 1	Servo Driver internal program error 1 occurred.
System alarm 2	Servo Driver internal program error 2 occurred.
System alarm 3	Servo Driver internal program error 3 occurred.
System alarm 4	Servo Driver internal program error 4 occurred.
Runaway detected	Servomotor runaway occurred.
Multi-turn data error	Absolute encoder multi-turn data was cleared or could not be set correctly.
Encoder communications error	No communication possible between the encoder and Servo Driver.
Encoder communications position data error	An error occurred in the encoder's position data calculations.
Encoder communications timer error	An error occurred in the timer for communications between the encoder and Servo Driver.
Encoder parameter error	Encoder parameters are corrupted.
Encoder echo-back error	The contents of communications with the encoder are wrong.
Multi-turn limit discrepancy	The multi-turn limits for the encoder and the Servo Driver do not match.
Deviation counter overflow	Position deviation pulses exceeded the level set for Pn520.
Deviation counter overflow alarm at Servo ON	When Servo ON was executed, the accumulated number of position deviation pulses reached or exceeded the number set for Pn526.
Deviation counter overflow alarm by speed limit at Servo ON	If Servo ON is executed with position deviation pulses accumulated, the speed is limited by the setting in Pn529. A command pulse was input during this period, without the limit being cleared, and the setting in Pn520 was exceeded.
COM alarm 0	Servo Driver COM error 0 occurred.
COM alarm 1	Servo Driver COM error 1 occurred.
COM alarm 2	Servo Driver COM error 2 occurred.
COM alarm 7	Servo Driver COM error 7 occurred.
COM alarm 8	Servo Driver COM error 8 occurred.
COM alarm 9	Servo Driver COM error 9 occurred.
MECHATROLINK-II transmission cycle setting error	There is an error in the setting for the MECHATROLINK-II communications transmission cycle.
MECHATROLINK-II synchronization error	A synchronization error occurred during MECHATROLINK-II communications.
MECHATROLINK-II synchronization failure	A synchronization failure occurred during MECHATROLINK-II communications.
MECHATROLINK-II communications error	Communications errors occurred consecutively during MECHATROLINK-II communications.
MECHATROLINK-II transmission cycle error	An error occurred in the transmission cycle during MECHATROLINK-II communications.

Error detection function	Contents
DRV alarm 0	Servo Driver DRV error 0 occurred.
DRV alarm 1	Servo Driver DRV error 1 occurred.
DRV alarm 2	Servo Driver DRV error 2 occurred.
Internal command error	A command error occurred in the Servo Driver.
Missing phase detected	One phase from the three-phase main circuit power supply is not connecting.

2-4-3 Terminal Block Specifications

Symbol	Function	Condition	
L1	Main circuits power supply input	R88D-WN□H-ML2 (50 to 400 W): Single-phase 200/230 VAC (170 to 253 V), 50/60 Hz (No L3 terminal) R88D-WN08H-ML2 (750 W): Single-phase 200/230 VAC (170 to 253 V), 50/60 Hz Note: The L3 terminal is not used, so do not connect it. R88D-WN□H-ML2 (500 W to 3.0 kW): Single-phase 200/230 VAC (170 to 253 V), 50/60 Hz R88D-WN□L-ML2 (50 to 400 W): Single-phase 100/115 VAC (85 to 127 V), 50/60 Hz (No L3 terminal)	
L2			
L3			
⊖1	DC Reactor terminal for power supply harmonic control	R88D-WN□H-ML2 (500 W to 3.0 kW) Normally short-circuit between –1 and –2. If harmonic control measures are required, connect a DC Reactor between –1 and –2.	
⊖2			
B1/⊕	Main circuit positive terminal	Used for DC power supply input. The R88D-WN□H-ML2 (500 W to 3.0 kW) does not have a – terminal. Use the –2 terminal.	
⊖	Main circuit negative terminal		
L1C	Control circuits power supply input	R88D-WN□H-ML2: Single-phase 200/230 V AC (170 to 253 V AC) 50/60 Hz R88D-WN□L-ML2: Single-phase 100/115 V AC (85 to 127 V AC) 50/60 Hz	
L2C			
B1/⊕	External regeneration resistance connection terminal	R88D-WN□H-ML2 (50 to 400 W) R88D-WN□L-ML2 (50 to 400 W) This terminal does not normally need to be connected. If regenerative energy is high, connect an External Regeneration Resistor between B1 and B2. (There is no B3 terminal.) R88D-WN□H-ML2 (500 W to 3.0 kW) Short-circuit between B2 and B3. If regenerative energy is high, remove the short bar between B2 and B3 and connect an External Regeneration Resistor between B1 and B2.	
B2			
B3			
U	Servomotor connection terminals	Red	These are the terminals for outputs to the Servomotor. Be sure to wire these terminals correctly.
V		White	
W		Blue	
⏚		Green/ Yellow	
⏚	Frame ground	This is the ground terminal. Ground to a minimum of 100 Ω (class-3).	

2-4-4 Communications Specifications (CN6)

■ MECHATROLINK-II Communications Specifications

Item	Specifications
Communications specifications	MECHATROLINK-II
Baud rate	10 Mbps
Maximum transmission distance	50 m (See note.)
Minimum distance between nodes	0.5 m
Transmission medium	2-core shielded twisted-pair cable
Number of connected devices	30 Slaves max.
Topology	Bus
Transmission time	250 μs to 8 ms
Communications method	Master/Slave total synchronization method
Encoding	Manchester encoding
Data length	Either 17 or 32 bytes can be selected.

Note This is the total length of cable for connecting between devices. The maximum length will vary depending on the number of devices connected. For details, refer to the section on wiring in *2-6-1 MECHATROLINK-II Communications Cable Specifications*.

The following table shows whether or not a Communications Repeater is required in various combinations of numbers of connected MECHATROLINK-II devices and maximum transmission distances.

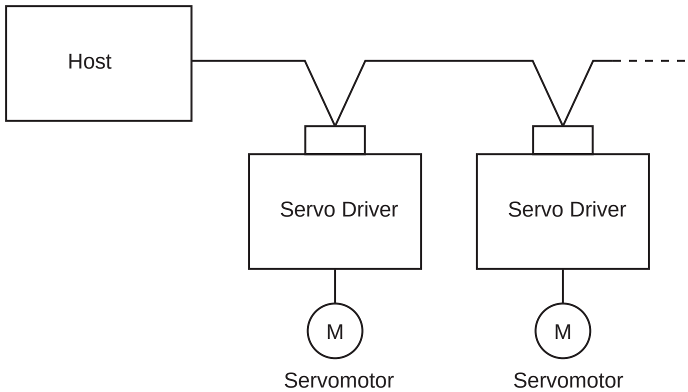
		Maximum transmission distance	
		0 to 30 m	**30 to 50 m**
Number of connected devices	1 to 15	Repeater not required	Repeater not required
	16	Repeater not required	Repeater required
	17 to 30	Repeater required	Repeater required

Maximum transmission distance	OMRON model number	Yaskawa Electric model number
Communications Repeater	FNY-REP2000	JEPMC-REP2000

■ System Configuration

The following diagram shows the basic system configuration. For details on the number of devices that can be connected, refer to *Transmission Time* below.

● Connection Example: Connecting to a SYSMAC CS1W-MCH71, CJ1W-MCH71, or CJ1W-NCF71



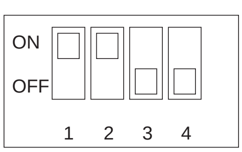
■ MECHATROLINK-II Communications Setup

This section describes the required switch settings for MECHATROLINK-II communications.

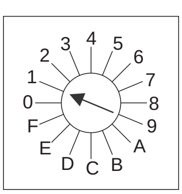
● Communications Specifications

MECHATROLINK-II communications specifications are set using DIP switch SW2. The settings are shown below. Changes to settings go into effect when the power is turned ON again.

Bit	Name	Setting	Contents	Default setting
Bit 1	Reserved for system.	ON	---	ON
Bit 2	Reserved for system.	ON	---	ON
Bit 3	Node address setting	OFF	Node address: 40H + SW1	OFF
		ON	Node address: 50H + SW1	
Bit 4	Reserved for system.	OFF	---	OFF



SW2 (default setting)



SW1 (default setting)

● Transmission Time

The following table shows the transmission times that can be used with the Servo Driver, and the number of nodes that can be connected.

Transmission time and number of connectable devices

Number of connectable devices	Transmission time								
	0.25 ms (See note 1.)	0.5 ms	1.0 ms	1.5 ms	2.0 ms	2.5 ms	3.0 ms	3.5 ms	4.0 ms
	0	3	8	14	20	25	30	30	30

Note 1. When the transmission time is 0.25 ms, set a communications time that is a multiple of 0.5 ms.

Note 2. If the actual number of connected devices is less than the possible number, the extra words can be used as communications retry words. The number of communication retries equals the number of connectable devices minus the number of devices actually connected plus 1.

Note 3. When there are no communications retries, the number of connectable devices equals the normal number of connectable devices plus 1.

Note 4. When a C2 Master is connected, the number of connectable devices equals the normal number of connectable devices minus 1.

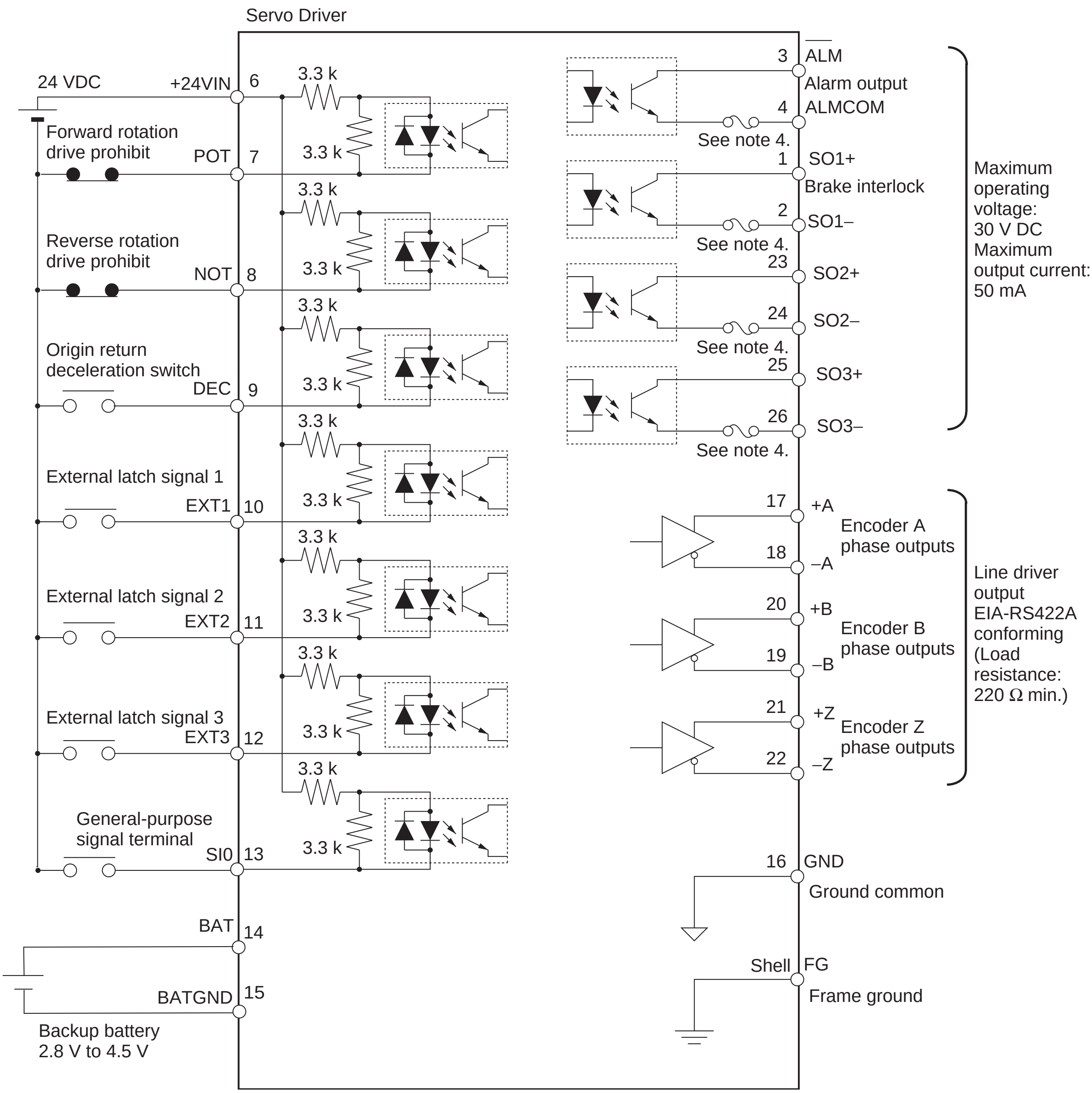
The node address is set as shown in the following table, using the rotary switch (SW1) and the DIP switch (bit 3 of SW2). Changes in settings go into effect when the power is turned ON again. The default setting for the node address is 41H (bit 3 of SW2: OFF; SW1: 1).

Node address settings

SW2 bit 3	SW1	Node address	SW2 bit 3	SW1	Node address
OFF	0	Disabled	ON	0	50H
OFF	1	41H	ON	1	51H
OFF	2	42H	ON	2	52H
OFF	3	43H	ON	3	53H
OFF	4	44H	ON	4	54H
OFF	5	45H	ON	5	55H
OFF	6	46H	ON	6	56H
OFF	7	47H	ON	7	57H
OFF	8	48H	ON	8	58H
OFF	9	49H	ON	9	59H
OFF	A	4AH	ON	A	5AH
OFF	B	4BH	ON	B	5BH
OFF	C	4CH	ON	C	5CH
OFF	D	4DH	ON	D	5DH
OFF	E	4EH	ON	E	5EH
OFF	F	4FH	ON	F	5FH

2-4-5 I/O Signal Specifications (CN1)

■ External Signal Processing



Note 1. The inputs at pins 7 to 12 and the outputs at pins 1,2, and 23 to 26 can be changed by parameter settings. The settings in the diagram are the defaults.

Note 2. Connect pin Nos. 14 and 15 when providing an external backup power supply for the absolute encoder.

Note 3. The general-purpose input at pin No. 13 can be monitored through MECHATROLINK-II.

Note 4. An automatic reset fuse is provided to protect output. If the fuse is activated for overcurrent, it will automatically reset after a fixed period of time has lapsed without current flowing.

■ Control I/O Signals

● CN1 Control Inputs

Pin No.	Signal name	Function	Contents	Control mode
7 to 9	DEC (9) [SI3]	Origin return deceleration switch signal	This is the deceleration input for origin return.	All
	POT (7) [SI1]	Forward drive prohibit input	Forward rotation overtravel input.	All
	NOT (8) [SI2)]	Reverse drive prohibit input	Reverse rotation overtravel input.	All
10 to 12	EXT1 (10) [SI4]	External latch signal 1	This is the external signal input for latching the present feedback pulse counter.	All
	EXT2 (11) [SI5]	External latch signal 2		
	EXT3 (12) [SI6]	External latch signal 3		
6	+24VIN	Sequence signal control power supply	This is the 24-VDC power supply input terminal for sequence inputs (pin Nos. 7 to 13).	All
14	BAT	Backup battery inputs	These are the battery connection terminals for the absolute encoder power backup. **Note:** Connect the battery either to these terminals or to the absolute encoder battery cable.	All [absolute]
15	BATGND			
13	(Not allocated) [SI0]	General-purpose input	This terminal can be monitored in the MECHATROLINK-II I/O monitor field.	All

Note 1. Input signal DEC, POT, and NOT functions can be allocated to pin Nos. 7 to 13 [SI0 to SI6] by setting parameters Pn50A, Pn50B, and Pn511.

Note 2. Input signal EXT1, EXT2, and EXT3 functions can be allocated to pin Nos. 10 to 12 [SI4 to SI6] by setting Pn511.

Note 3. The general-purpose input at pin No. 13 [SI0] can be monitored through MECHATROLINK-II.

Note 4. The numbers in parentheses ( ) show the default pin number allocations. The terminal name is shown in brackets [ ].

● CN1 Control Outputs

Pin No.	Signal name	Function	Contents	Control mode
3	$\overline{\text{ALM}}$	Alarm output	When an alarm is generated for the Servo Driver, the output is OFF.	All
4	ALMCOM			
1 to 2 23 to 26	INP1	Positioning completed output 1	ON when the position deviation is within the positioning completed range (Pn500).	Position
	INP1COM			
	INP2	Positioning completed output 2	ON when the position deviation is within the positioning completed range (Pn504).	Position
	INP2COM			
	VCMP	Speed conformity output	ON when the Servomotor speed error is within the speed conformity signal output range (Pn503).	Speed
	VCMPCOM			
	TGON	Servomotor rotation detection output	ON when the Servomotor rotation speed exceeds the value set for the Servomotor rotation detection speed (Pn502). **Note:** TGON is always ON when the encoder of the Servo Driver is not connected.	Speed
	TGONCOM			
	READY	Servo ready output	ON if no errors are discovered after powering the main circuits.	All
	READYCOM			
	CLIMT	Current limit detection output	ON if the output current is limited.	All
	CLIMTCOM			
	VLIMT	Speed limit detection output	ON if the speed is limited.	Torque
	VLIMTCOM			
	BKIR (1) [SO1+]	Brake interlock output	Holding brake timing signals are output according to user parameters Pn506, Pn507, and Pn508.	All
	BKIRCOM (2) [SO1–]			
	WARN	Warning output	ON when an overload warning or regeneration overload warning is detected.	All
	WARNCOM			
	(Not allocated) (23) [SO2+]	General-purpose outputs	Allocations are set by the user parameters.	All
	(Not allocated) (24) [SO2–]			
	(Not allocated) (25) [SO3+]			
	(Not allocated) (26) [SO3–]			
Shell	FG	Frame ground	Connection terminal for cable's shielded wire and FG line.	All

Note 1. Output signal INP1, INP2, VCMP, TGON, READY, CLIMT, VLIMT, BKIR, and WARN functions can be allocated to pin Nos. 1 to 2 or 23 to 26 [S01 to S03] by setting parameters Pn50E to Pn510.

Note 2. The numbers in parentheses ( ) show the default pin number allocations. Terminal names are shown in brackets [ ].

■ CN1: Pin Arrangement

1	BKIR(SO1+)	Brake interlock output (See note 1.)	2	BKIRCOM (SO1–)	Brake interlock output (See note 1.)	14	BAT [absolute]	Backup battery + input (See note 3.)	15	BATGND [absolute]	Backup battery – input (See note 3.)
3	$\overline{ALM}$	Servo alarm output	4	ALMCOM	Servo alarm output	16	GND	Ground common	17	+A	Encoder phase-A + output
5		(See note 2.)	6	+24VIN	Sequence signal control power supply	18	–A	Encoder phase-A – output	19	–B	Encoder phase-B – output
7	POT(SI1)	Forward drive prohibit input (See note 1.)	8	NOT(SI2)	Reverse drive prohibit input (See note 1.)	20	+B	Encoder phase-B + output	21	+Z	Encoder phase-Z + output
9	DEC(SI3)	Origin return deceleration switch signal (See note 1.)	10	EXT1(SI4)	External latch signal 1 (See note 1.)	22	–Z	Encoder phase-Z – output	23	SO2+	General-purpose output (See note 1.)
11	EXT2(SI5)	External latch signal 2 (See note 1.)	12	EXT3(SI6)	External latch signal 3 (See note 1.)	24	SO2–	General-purpose output (See note 1.)	25	SO3+	General-purpose output (See note 1.)
13	SI0	General-purpose input (See note 1.)				26	SO3–	General-purpose output (See note 1.)			

Note 1. Function allocations for pin 7 to 13 sequence inputs and pin 1, 2, and 23 to 26 sequence outputs can be set by means of user parameters Pn50A Pn50B, Pn511, and Pn50E to Pn510, respectively. The allocations shown in this table are the defaults.

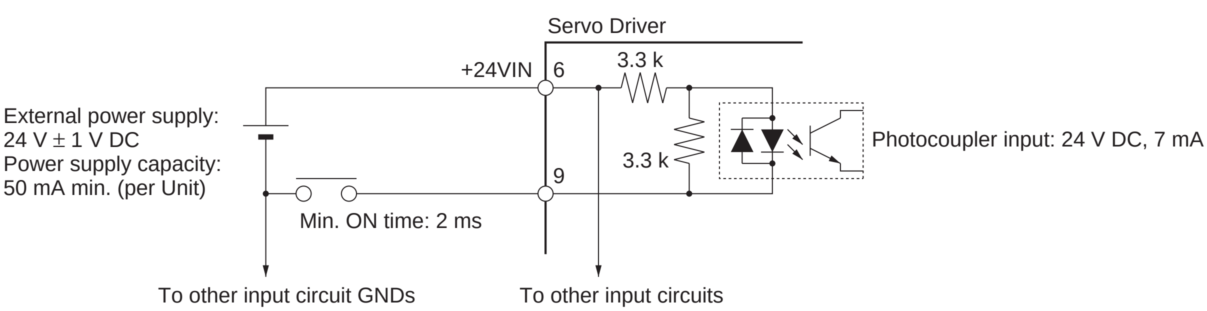
Note 2. Do not wire the empty pins.

Note 3. When using an absolute encoder, connect a battery (2.8 to 4.5 V) either to the backup battery inputs at pin Nos. 14 and 15 or to the absolute encoder battery cable. (Do not connect it to both of these locations.)

● CN1 Connectors (26P)

Servo Driver receptacle	10226-52A2JL (Sumitomo 3M)
Cable solder plug	10126-3000VE (Sumitomo 3M)
Cable case	10326-52A0-008 (Sumitomo 3M)

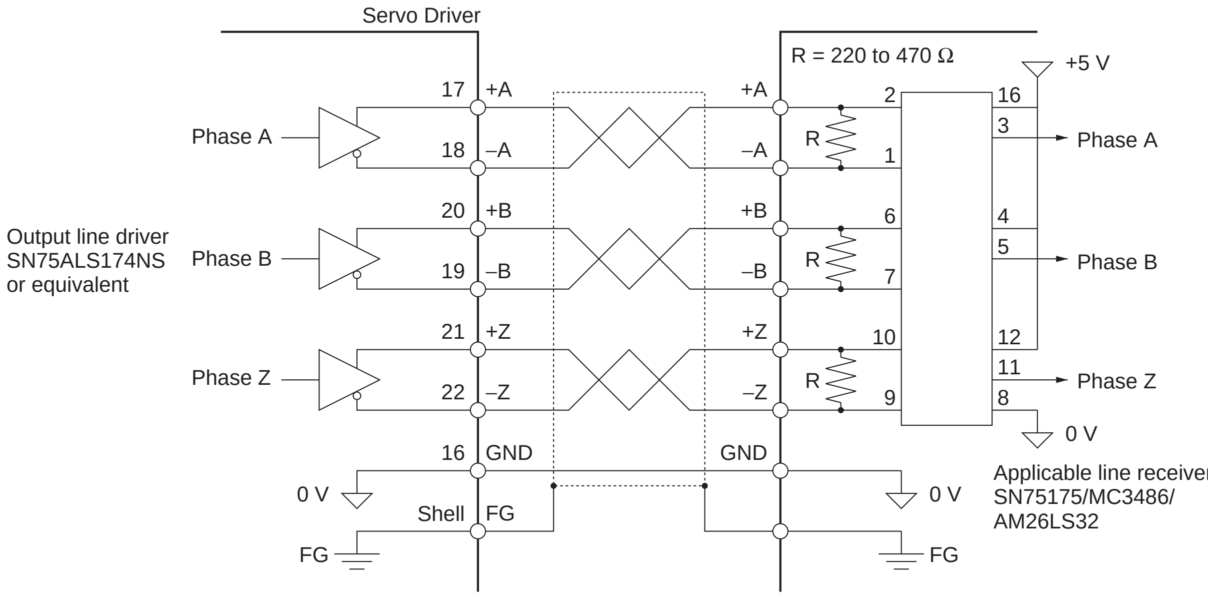
● Sequence Inputs



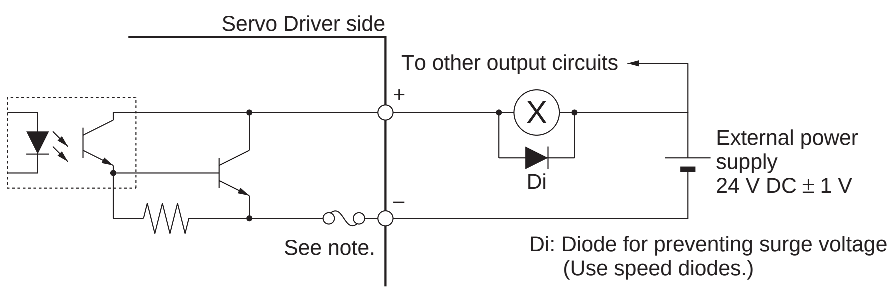
Signal Levels ON level: Minimum (+24VIN–11) V
OFF level: Maximum (+24VIN–1) V

■ Control Output Circuits

● Position Feedback Output



● Sequence and Alarm Outputs



Maximum operating voltage: 30 V DC
Maximum output current: 50 mA

Note An automatic reset fuse is provided to protect output. If the fuse is activated for overcurrent, it will automatically reset after a fixed period of time has lapsed without current flowing.

■ Backup Battery + Input (14: BAT)
Backup Battery – Input (15: BATGND)

• These are the connection terminals for a backup battery for when power to the absolute encoder is interrupted.

• Normally a Backup Battery Unit is used and the battery is connected to the battery holder for the absolute encoder battery cable, so do not connect anything to these terminals. (Absolutely do not connect to both of them, or it will cause damage.)

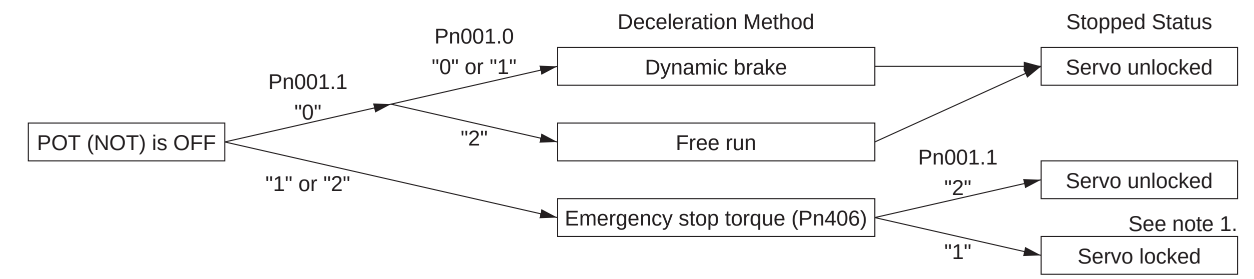
• The battery voltage is 2.8 to 4.5 V.

■ Forward Drive Prohibit (7: POT) Reverse Drive Prohibit (8: NOT)

Note This is the default allocation. For either signal, the drive prohibition is normally disabled. This setting can be changed by Pn50A.3/Pn50B.0.

- These two signals are the inputs for forward and reverse drive prohibit (overtravel).
- When they are input, driving is possible in the respective direction.
- When driving is prohibited, movement will stop according to the settings of Pn001.0 and Pn001.1. Refer to the diagram below.)
- Alarm status will not be generated at the Servo Driver while driving is prohibited.

Stopping Methods when Forward/Reverse Drive Prohibit is OFF



Note 1. The position loop will not operate for position control when stopping in this mode.

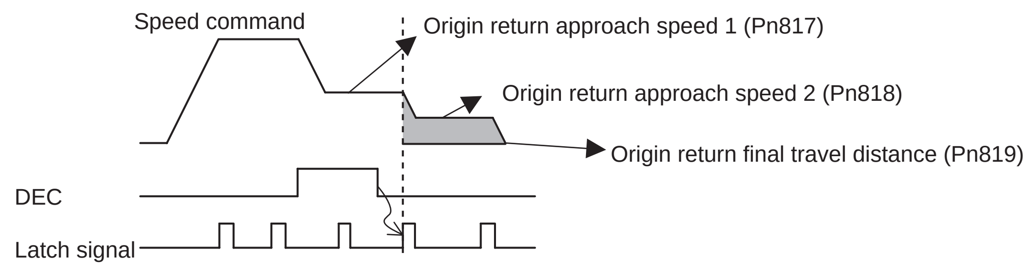
Note 2. When torque control is being used, the stopping method is determined by Pn001.0 setting. (The Pn001.1 setting is irrelevant.)

Note 3. With a vertical load, the load may fall due to its own weight if it is left at a drive prohibit input. We recommend that you set the stop method for the drive prohibit input (Pn001.1) for decelerating with the emergency stop torque, and then set stopping with the servo locked (SV: 1) to prevent the load from falling.

■ Origin Return Deceleration Switch Signal (9: DEC)

Note This is the default allocation. The DEC signal is allocated in Pn511.0.

- This is the deceleration signal for origin search.
- When DEC is input (DEC: 1) during an origin search, the Servomotor speed is changed according to the origin return approach speed 1 (Pn817). Then, when the signal is turned OFF (DEC: 0), the Servo Driver is switched to latch operation.



■ External latch signal 1 (10: EXT1) External latch signal 2 (11: EXT2) External latch signal 3 (12: EXT3)

Note This is the default allocation. The EXT1, EXT2, and EXT3 signals are allocated in Pn511.1, Pn511.2, and Pn511.3 respectively.

- This is the signal for latching the present feedback pulse counter.

■ Encoder Output (17: Phase A +) Encoder Output (18: Phase A –) Encoder Output (20: Phase B +) Encoder Output (19: Phase B –) Encoder Output (21: Phase Z +) Encoder Output (22: Phase Z –)

■ Alarm output (3: $\overline{\text{ALM}}$) Alarm output ground (4: ALMCOM)

- When the Servo Driver detects an error, outputs are turned OFF.
- This output is OFF at the time of powering up, and turns ON when the Servo Driver's initial processing is completed.

■ Positioning Completed Outputs 1, 2 (INP1, INP2)

Note As the default setting, these INP signals are not allocated. The INP1 signal is allocated in Pn50E.0, and the INP2 signal in PN510.0.

- The INP1 signal turns ON when the number of accumulated pulses in the deviation counter is less than the value set in Pn522 (Positioning completed range 1). INP2 turns ON when the number is less than Pn524 (Positioning completed range 2).
- When the speed command is a low speed and the set value for the positioning completed range is large, the positioning completed outputs stay ON.

Note These outputs are always OFF when the control mode is any mode other than position control.

■ Speed Conformity Output (VCMP)

Note As the default setting, the VCMP signal is not allocated. It is allocated in Pn50E.1.

- The VCMP signal turns ON when the difference between the speed command and the Servomotor rotation speed is equal to or less than the value set for Pn503 (Speed conformity signal output range).
- For example, if the speed command is for 3,000 r/min and the set value is for 50 r/min, it turns ON when the Servomotor rotation speed is between 2,950 and 3,050 r/min.

Note This output is always OFF when the control mode is any mode other than speed control.

■ Servomotor Rotation Detection Output (TGON)

Note As the default setting, the TGON signal is not allocated. It is allocated in Pn50E.2.

- The TGON signal turns ON when the Servomotor rotation speed exceeds the value set for Pn502 (Rotation speed for motor rotation detection).

Note TGON is always ON when the encoder of the Servo Driver is not connected.

■ Servo Ready Output (READY)

Note As the default setting, the READY signal is not allocated. It is allocated in Pn50E.3.

- The READY signal turns ON if no errors are detected after the main circuits are powered up.

■ Current Limit Detection Output (CLIMT)

Note As the default setting, the CLIMT signal is not allocated. It is allocated in Pn50F.0.

- The CLIMT signal is turned ON in any of the following four cases.
    - The output torque reaches the limit value set in Pn402 (Forward torque limit) or Pn403 (Reverse torque limit).
    - With the CJ1W-NCF71, the output torque reaches the limit value set in Pn404 (Forward rotation external current limit) or Pn405 (Reverse rotation external current limit) while the torque limit (forward/reverse rotation current limit designation) is ON.
    - With the CJ1W-NCF71, the output torque reaches the torque limit value specified by option command value 1 when Pn002.0 (Torque command input change) is set to 1.
    - With the CJ1W-NCF71, the output torque reaches the torque limit value specified by option command value 1 or 2 with the torque limit (forward/reverse rotation current limit designation) set to ON when Pn002.0 (Torque command input change) is set to 3.

■ Speed Limit Detection Output (VLIMT)

Note As the default setting, the VLIMT signal is not allocated. It is allocated in Pn50F.1.

- The VLIMT signal is turned ON in either of the following two cases.
  - The Servomotor rotation speed reaches the limit set in Pn407 (speed limit).
  - With the CJ1W-NCF71, the Servomotor rotation speed reaches the speed limit specified by option command value 1 when Pn002.1 (speed command input change) is set to 1.

Note This output is always OFF when the control mode is any mode other than torque control.

■ Brake Interlock Output (1: BKIR) Brake Interlock Output Common (2: BKIRCOM)

Note This is the default allocation. The BKIR signal is allocated in Pn50F.2.

- External brake timing signals are output according to the settings in Pn506 (Brake timing 1), Pn507 (Brake command speed), and Pn508 (Brake timing 2).

Note For details on the brake interlock function, refer to *4-4-6 Brake Interlock (All Operating Modes)*.

■ Warning Output (WARN)

Note As the default setting, the WARN signal is not allocated. It is allocated in Pn50F.3.

- The WARN signal is turned ON in any of the following three cases.
  - The Servomotor output torque (effective value) exceeds 115% of the rated torque.
  - The regenerative energy exceeds the tolerance of the internal regeneration resistance.
  - When external regeneration resistance is used, the regenerative energy exceeds the value set for Pn600 (Regeneration resistance capacity).

2-4-6 Encoder Input Specifications (CN2)

Pin No.	Symbol	Signal name	Function/Interface
1	E5V	Encoder power supply +5 V	Power supply outlet for encoder: 5 V, 180 mA **Note:** An automatic reset fuse is provided to protect output. If the fuse is activated due to overcurrent, it will automatically reset after a fixed period of time has lapsed without current flowing.
2	E0V	Encoder power supply GND	
3	BAT+	Battery + [absolute]	Backup power output for encoder (3.6 V, 20 μA for backup or when stopped; 3 μA when Servo Driver is being powered)
4	BAT–	Battery – [absolute]	
5	S+	Encoder + phase-S input	Line driver input (conforming to EIA-RS422A) (Input impedance: 120 Ω)
6	S–	Encoder – phase-S input	
Shell	FG	Shielded ground	Cable shielded ground

● CN2 Connectors Used (6P)

Receptacle at Servo Driver 53460-0611 (Molex Japan Co., Ltd.)
Cable plug 55100-0670 (Molex Japan Co., Ltd.)

2-4-7 Personal Computer Monitor Connector Specifications (CN3)

Pin No.	Symbol	Signal name	Function/Interface
1, 8	TXD+	Transmission data +	This is data transmitted to a personal computer. Line receiver input
2, 9	TXD–	Transmission data –	
3, 10	RXD+	Reception data +	This is data received from a personal computer. Line receiver input
4, 6	RXD–	Reception data –	
5	PRMU	Unit switching	This is the terminal for switching the connection.
7	RT	Termination resistance terminal	This is the termination resistance terminal for the line receiver. 6-pin connection for RS-422 communications (final Servo Driver only).
11, 12	---	(Not used.)	(Do not connect.)
13	+5V	+5 V output	This is the +5-V power supply output.
14	GND	Ground	
Shell	FG	Shielded ground	Cable shielded ground

● CN3 Connectors Used (14P)

Receptacle at Servo Driver 10214-52AJL (Sumitomo 3M)
Cable plug with solder 10114-3000VE (Sumitomo 3M)
Cable case 10314-50A0-008 (Sumitomo 3M)

2-4-8 Analog Monitor Output Connector Specifications (CN5)

Pin No.	Symbol	Signal name	Function/Interface
1	NM	Analog Monitor 2	Default setting: Servomotor rotation speed, 1 V per 1,000 r/min (Can be changed by Pn007.)
2	AM	Analog Monitor 1	Default setting: Torque command: gravity compensation torque, 1 V per 100% of rated torque (Can be changed by Pn006.)
3	GND	Analog Monitor Ground	Grounds for analog monitors 1 and 2
4	GND	Analog Monitor Ground	

● CN5 Connectors Used (4P)

Pin header at Servo Driver DF11-4DP-2DS (Hirose Electric)
Cable connector socket DF11-4DS-2C (Hirose Electric)
Cable connector contact DF11-2428SCF (Hirose Electric)

● Monitored Items and Scaling Changes

Monitored item	Monitor output specifications	Pn006, Pn007 setting
Servomotor rotation speed	1 V per 1,000 r/min; forward rotation: – voltage; reverse rotation: + voltage	00
Speed command	1 V per 1,000 r/min; forward command: – voltage; reverse command: + voltage	01
Torque command: gravity compensation torque (Pn422)	1 V per 100% of rated torque; forward acceleration: – voltage; reverse acceleration: + voltage	02
Position deviation*	0.05 V / 1 command unit; plus error: – voltage; reverse error: + voltage	03
Position amp error*	0.05 V per encoder pulse unit; plus error: – voltage; minus error: + voltage	04
Position command speed (rotation speed calculated value)	1 V per 1,000 r/min; forward rotation: – voltage; reverse rotation: + voltage	05
Not used.	---	06
Not used.	---	07
Positioning completed	Positioning completed: 5 V; positioning not completed: 0 V	08
Speed feed forward	1 V per 1,000 r/min; forward rotation: – voltage; reverse rotation: + voltage	09
Torque feed forward	1 V per 100% of rated torque; forward acceleration: – voltage; reverse acceleration: + voltage	0A
Not used.	---	0B to 1F

Note 1. The table shows the specifications with no offset adjustment or scaling changes.

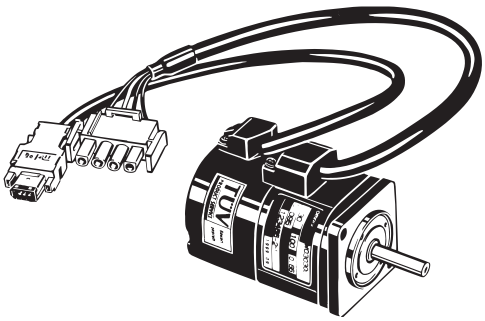
Note 2. The maximum output voltage is ±8 V. Normal outputs will not be possible if this value is exceeded.

Note 3. The output accuracy is approximately ±15%.

Note 4. For items marked with an asterisk (*), the position deviation monitor signal is 0 when speed control is in effect.

2-5 Servomotor Specifications

■ OMNUC W-series AC Servomotors (R88M-W□)



There are three kinds of OMNUC W-Series AC Servomotors, as follows:

- 3,000-r/min Servomotors
- 3,000-r/min Flat-style Servomotors
- 1,000-r/min Servomotors
- 1,500-r/min Servomotors

These Servomotors also have optional specifications, such as shaft type, with or without brake, waterproofing, with or without reduction gears, and so on. Select the appropriate Servomotor for your system according to the load conditions and installation environment.

2-5-1 General Specifications

Item	3,000-r/min Servomotors		3,000-r/min Flat-style Servomotors	1,000-r/min and 1,500-r/min Servomotors
	50 to 750 W	1 to 3 kW		
Ambient operating temperature	0° to 40°C			
Ambient operating humidity	20% to 80% (with no condensation)			
Ambient storage temperature	–20° to 60°C			
Ambient storage humidity	20% to 80% (with no condensation)			
Storage and operating atmosphere	No corrosive gasses.			
Vibration resistance (See note 1.)	10 to 2,500 Hz in X, Y, and Z directions with acceleration 49 m/s^2 max.	10 to 2,500 Hz in X, Y, and Z directions with acceleration 24.5 m/s^2 max.	10 to 2,500 Hz in X, Y, and Z directions with acceleration 49 m/s^2 max.	10 to 2,500 Hz in X, Y, and Z directions with acceleration 24.5 m/s^2 max.
Impact resistance	Acceleration 490 m/s^2 max., in X, Y, and Z directions, two times	Acceleration 490 m/s^2 max., in X, Y, and Z directions, two times	Acceleration 490 m/s^2 max., in X, Y, and Z directions, two times	Acceleration 490 m/s^2 max., in X, Y, and Z directions, two times
Insulation resistance	Between power line terminals and FG: 10 MΩ min. (at 500 V DC)			
Dielectric strength	Between power line terminals and FG: 1,500 V AC for 1 min at 50/60 Hz			

Item		3,000-r/min Servomotors		3,000-r/min Flat-style Servomotors	1,000-r/min and 1,500-r/min Servomotors
		50 to 750 W	1 to 3 kW		
Run position		All directions			
Insulation grade		Type B	Type F	Type B	Type F
Structure		Totally-enclosed self-cooling			
Vibration grade		V-15			
Mounting method		Flange-mounting			
EC Directives	EMC Directive	EN55011 class A group 1			
		EN61000-6-2			
	Low-voltage Directive	IEC60034-8, EN60034-1, -5, -9			
UL standards		UL1004			
cUL standards		cUL C22.2 No. 100			

Note 1. Vibration may be amplified due to sympathetic resonance of machinery, so use the Servomotor Driver under conditions which will not exceed 80% of the specification values over a long period of time.

Note 2. Water-proof connectors must be used on the Power and Encoder Cables when used in environments subject to direct contact with water. Refer to *3-1-2 Servomotors* for the recommended connectors.

Note 3. The above items reflect individual evaluation testing. The results may differ under compound conditions.

Note 4. The Servomotors cannot be used in misty environments.

■ Protective Structure

The protective structure depends on the type of Servomotor, as shown in the following tables. Servomotors are available with and without oil seals. The oils seals prevent oil and grease from penetrating around the shaft. They do not prevent the penetration of water.

● 3,000-r/min Servomotors

	30 to 750 W	1 to 5 kW
Without oil seal	IP55 (except for through-shaft parts)	IP67 (except for through-shaft parts)*
With oil seal	IP55 (except for through-shaft parts)	IP67 (including through-shaft parts)*

● 3,000-r/min Flat Servomotors

Without oil seal	IP55 (except for through-shaft parts)
With oil seal	IP55 (except for through-shaft parts)
With water-resistance processing	IP67 (except for through-shaft parts)

● 1,000-r/min and 1,500-r/min Servomotors

Without oil seal	IP67 (except for through-shaft parts)*
With oil seal	IP67 (including through-shaft parts)*

Note The user can attach and remove oil seals for the Servomotors marked with an asterisk.

2-5-2 Performance Specifications

■ 3,000-r/min Servomotors

● Performance Specifications Table

Item		Unit	200 V AC				
		Model (R88M-)	W05030H	W10030H	W20030H	W40030H	W75030H
			W05030T	W10030T	W20030T	W40030T	W75030T
Rated output*		W	50	100	200	400	750
Rated torque*		N·m	0.159	0.318	0.637	1.27	2.39
Rated rotation speed		r/min	3,000				
Momentary maximum rotation speed		r/min	5,000				
Momentary maximum torque*		N·m	0.477	0.955	1.91	3.82	7.16
Rated current*		A (rms)	0.64	0.91	2.1	2.8	4.4
Momentary maximum current*		A (rms)	2.0	2.8	6.5	8.5	13.4
Rotor inertia		$kg{\cdot}m^2$ ($GD^2/4$)	2.20×10^{-6}	3.64×10^{-6}	1.06×10^{-5}	1.73×10^{-5}	6.72×10^{-5}
Torque constant*		N·m/A	0.268	0.378	0.327	0.498	0.590
Power rate*		kW/s	11.5	27.8	38.2	93.7	84.8
Mechanical time constant		ms	0.88	0.53	0.39	0.25	0.26
Electrical time constant		ms	1.1	1.2	4.6	5.4	8.7
Allowable radial load		N	68	78	245	245	392
Allowable thrust load		N	54	54	74	74	147
Weight	Without brake	kg	Approx. 0.4	Approx. 0.5	Approx. 1.1	Approx. 1.7	Approx. 3.4
	With brake	kg	Approx. 0.7	Approx. 0.8	Approx. 1.6	Approx. 2.2	Approx. 4.3
Radiation shield dimensions (material)			t6 × □250 mm (Al)				
Applicable load inertia			(See note 6.)				
Applicable Servo Driver (R88D-)		100 V AC	WNA5L-ML2	WN01L-ML2	WN02L-ML2	WN04L-ML2	---
		200 V AC	WNA5H-ML2	WN01H-ML2	WN02H-ML2	WN04H-ML2	WN08H-ML2
Brake specifications	Brake inertia	$kg{\cdot}m^2$ ($GD^2/4$)	8.5×10^{-7}	8.5×10^{-7}	5.8×10^{-6}	5.8×10^{-6}	1.4×10^{-5}
	Excitation voltage	V	24 V DC ±10%				
	Power consumption (at 20°C)	W	6	6	6.9	6.9	7.7
	Current consumption (at 20°C)	A	0.25	0.25	0.29	0.29	0.32
	Static friction torque	N·m	0.2 min.	0.34 min.	1.47 min.	1.47 min.	2.45 min.
	Attraction time (See note 3.)	ms	30 max.	30 max.	60 max.	60 max.	80 max.
	Release time (See note 3.)	ms	60 max.	60 max.	20 max.	20 max.	20 max.
	Backlash		1° (reference value)				
	Rating	---	Continuous				
	Insulation grade	---	Type F				

Item		Unit	W1K030H / W1K030T (200 VAC)	W1K530H / W1K530T (200 VAC)	W2K030H / W2K030T (200 VAC)	W3K030H / W3K030T (200 VAC)
Model (R88M-)			W1K030H	W1K530H	W2K030H	W3K030H
			W1K030T	W1K530T	W2K030T	W3K030T
Rated output*		W	1,000	1,500	2,000	3,000
Rated torque*		N·m	3.18	4.9	6.36	9.8
Rated rotation speed		r/min	3,000			
Momentary maximum rotation speed		r/min	5,000			
Momentary maximum torque*		N·m	9.54	14.7	19.1	29.4
Rated current*		A (rms)	5.7	9.7	12.7	18.8
Momentary maximum current*		A (rms)	17	28	42	56
Rotor inertia		kg·m^2 (GD^2/4)	1.74×10^{-4}	2.47×10^{-4}	3.19×10^{-4}	7.00×10^{-4}
Torque constant*		N·m/A	0.64	0.56	0.54	0.57
Power rate*		kW/s	57.9	97.2	127	137
Mechanical time constant		ms	0.87	0.74	0.62	0.74
Electrical time constant		ms	7.1	7.7	8.3	13.0
Allowable radial load		N	686	686	686	980
Allowable thrust load		N	196	196	196	392
Weight	Without brake	kg	Approx. 4.6	Approx. 5.8	Approx. 7.0	Approx. 11.0
	With brake	kg	Approx. 6.0	Approx. 7.5	Approx. 8.5	Approx. 14.0
Radiation shield dimensions (material)			t12 × □300 mm (Al)			t20 × □400 mm (Al)
Applicable load inertia			(See note 6.)			
Applicable Servo Driver (R88D-)		100 V AC	---	---	---	---
		200 V AC	WN10H-ML2	WN15H-ML2	WN20H-ML2	WN30H-ML2
Brake specifications	Brake inertia	kg·m^2 (GD^2/4)	3.25×10^{-5}	3.25×10^{-5}	3.25×10^{-5}	2.1×10^{-4}
	Excitation voltage	V	24 V DC ±10%			
	Power consumption (at 20°C)	W	7	7	7	9.8
	Current consumption (at 20°C)	A	0.29	0.29	0.29	0.41
	Static friction torque	N·m	7.8 min.	7.8 min.	7.8 min.	20 min.
	Attraction time (See note 3.)	ms	180 max.	180 max.	180 max.	180 max.
	Release time (See note 3.)	ms	100 max.	100 max.	100 max.	100 max.
	Backlash		1° (reference value)			
	Rating	---	Continuous			
	Insulation grade	---	Type F			

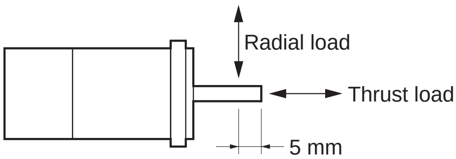
Note 1. *The values for items marked by asterisks are the values at an armature winding temperature of 100°C (for models of 750 W or less) or 20°C (for models of 1 kW or more), combined with the Servo Driver. Other values are at normal conditions (20°C, 65%). The momentary maximum torque shown above indicates the standard value.

Note 2. The brakes are the non-excitation operation type (released when excitation voltage is applied).

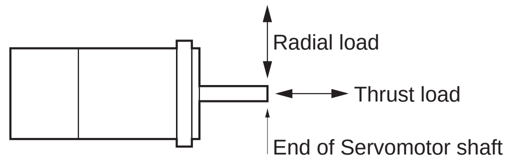
Note 3. The operation time is the measured value (reference value) with a surge killer (CR50500, by Okaya Electric Industries co. LTD) inserted.

Note 4. The allowable radial and thrust loads are the values determined for a service life of 20,000 hours at normal operating temperatures.

Note 5. The value indicated for the allowable radial load is for the positions shown in the following diagrams.



(Models of 750 W or less)



(Models of 1 kW or more)

Note 6. Applicable Load Inertia

1) The drivable load inertia ratio (load inertia/rotor inertia) changes depending on the mechanical configuration being driven and its rigidity. Highly rigid machines can operate with a large load inertia. Select a Servomotor and verify operation.

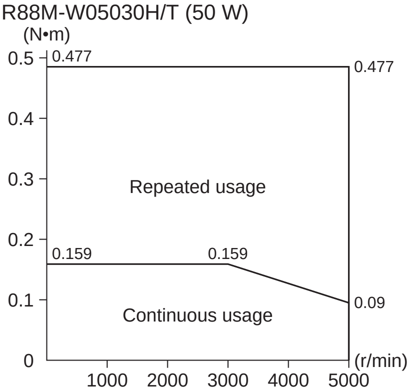
2) If the dynamic brake is used frequently with a large load inertia, it may lead to burnout of the dynamic brake resistor. Do not repeatedly turn the Servo ON and OFF with the dynamic brake enabled.

● Torque and Rotation Speed Characteristics

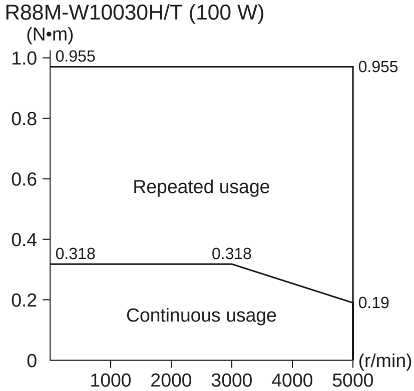
3,000-r/min Servomotors (With a 100-VAC Servo Driver)

The following graphs show the characteristics with a 3-m standard cable and 100-V AC input.

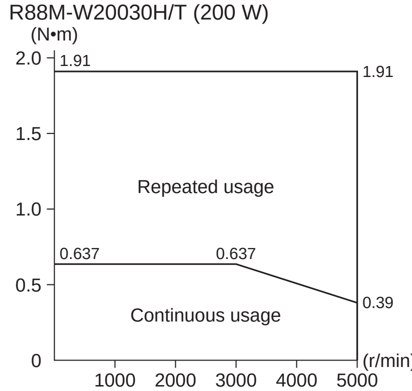
R88M-W05030H/T (50 W)



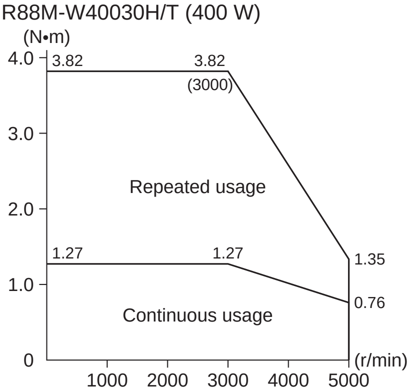
R88M-W10030H/T (100 W)



R88M-W20030H/T (200 W)



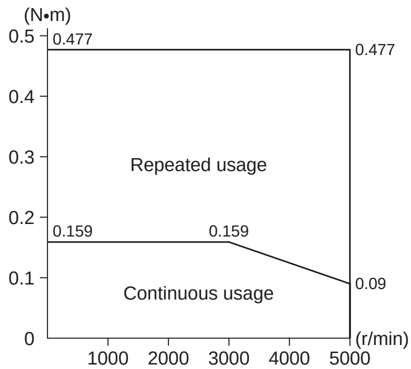
R88M-W40030H/T (400 W)



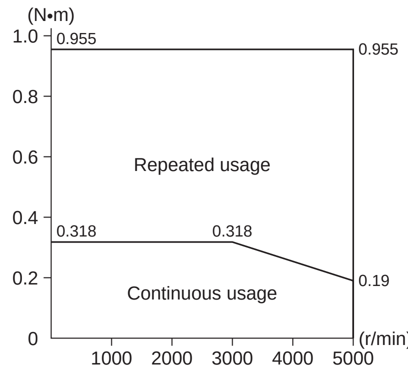
3,000-r/min Servomotors (With a 200-VAC Servo Driver)

The following graphs show the characteristics with a 3-m standard cable and 200-V AC input.

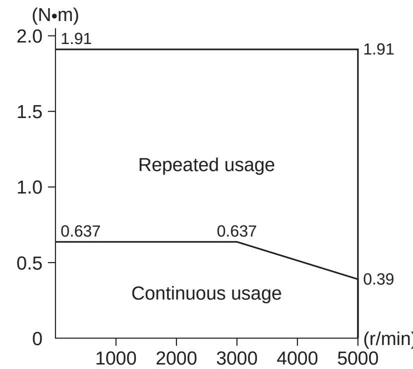
R88M-W05030H/T (50 W)



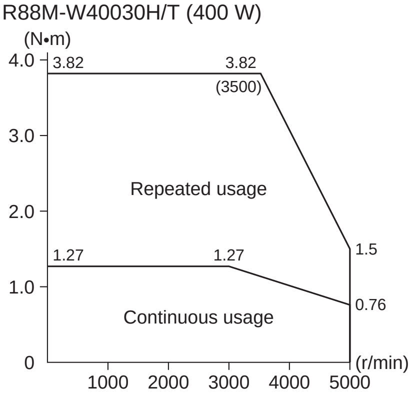
R88M-W10030H/T (100 W)



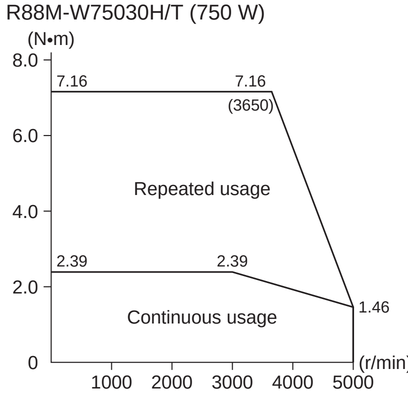
R88M-W20030H/T (200 W)



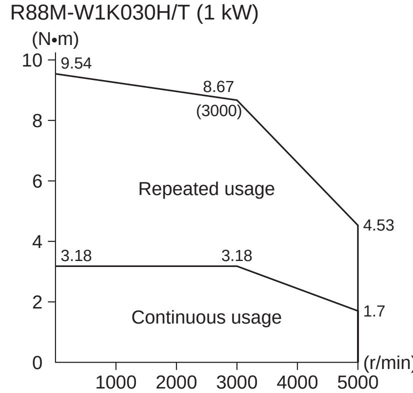
R88M-W40030H/T (400 W)



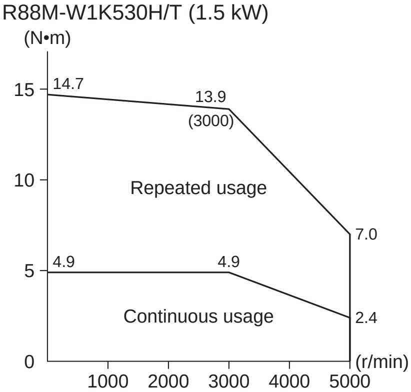
R88M-W75030H/T (750 W)



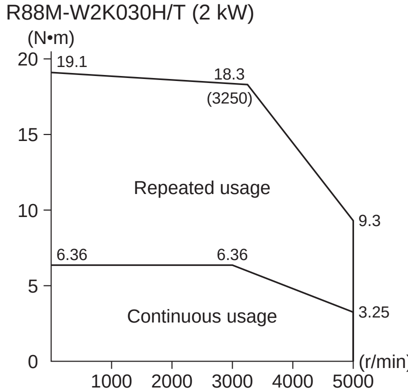
R88M-W1K030H/T (1 kW)



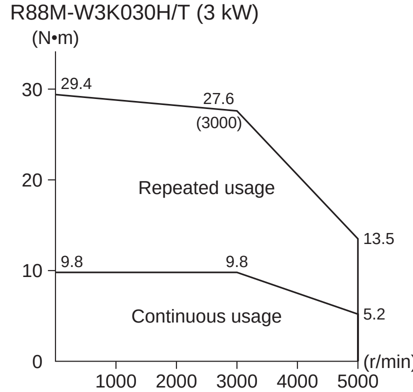
R88M-W1K530H/T (1.5 kW)



R88M-W2K030H/T (2 kW)



R88M-W3K030H/T (3 kW)

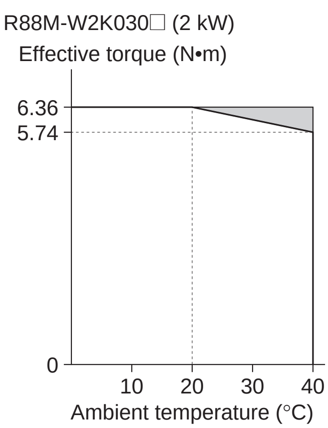


● Servomotor and Mechanical System Temperature Characteristics

- W-series AC Servomotors use rare earth magnets (neodymium-iron magnets). The temperature coefficient for these magnets is approximately –0.13%/°C. As the temperature drops, the Servomotor's momentary maximum torque increases, and as the temperature rises the Servomotor's momentary maximum torque decreases. When the normal temperature of 20°C and –10°C are compared, the momentary maximum torque increases by approximately 4%. Conversely, when the magnet warms up to 80°C from the normal temperature of 20°C, the momentary maximum torque decreases by approximately 8%.

- Generally, in a mechanical system, when the temperature drops the friction torque increases and the load torque becomes larger. For that reason, overloading may occur at low temperatures. In particular, in systems which use deceleration devices, the load torque at low temperatures may be nearly twice the load torque at normal temperatures. Check with a current monitor to see whether overloading is occurring at low temperatures, and how much the load torque is. Likewise, check to see whether there abnormal Servomotor overheating or alarms are occurring at high temperatures.
- An increase in load friction torque visibly increases load inertia. Therefore, even if the Servo Driver parameters are adjusted at a normal temperature, there may not be optimal operation at low temperatures. Check to see whether there is optimal operation at low temperatures too.

⚠ **Caution** Do not use 2-kW Servomotors within the shaded portions of the following diagrams. If used in these regions, the Servomotor may heat, causing the encoder to malfunction.



■ 3,000-r/min Flat-style Servomotors

● Performance Specifications Table

Item	Model (R88M-) / Unit	200 V AC				
		WP10030H	**WP20030H**	**WP40030H**	**WP75030H**	**WP1K530H**
		WP10030T	**WP20030T**	**WP40030T**	**WP75030T**	**WP1K530T**
Rated output*	W	100	200	400	750	1,500
Rated torque*	N·m	0.318	0.637	1.27	2.39	4.77
Rated rotation speed	r/min	3,000				
Momentary maximum rotation speed	r/min	5,000				
Momentary maximum torque*	N·m	0.955	1.91	3.82	7.16	14.3
Rated current*	A (rms)	0.89	2.0	2.6	4.1	7.5
Momentary maximum current*	A (rms)	2.8	6.0	8.0	13.9	23.0
Rotor inertia	kg·m^2 (GD^2/4)	4.91×10^{-6}	1.93×10^{-6}	3.31×10^{-5}	2.10×10^{-4}	4.02×10^{-4}
Torque constant*	N·m/A	0.392	0.349	0.535	0.641	0.687
Power rate*	kW/s	20.6	21.0	49.0	27.1	56.7
Mechanical time constant	ms	0.53	0.54	0.36	0.66	0.46
Electrical time constant	ms	3.7	7.4	8.6	18	22
Allowable radial load	N	78	245	245	392	490

Item		Model (R88M-) / Unit	200 V AC				
			WP10030H	**WP20030H**	**WP40030H**	**WP75030H**	**WP1K530H**
			WP10030T	**WP20030T**	**WP40030T**	**WP75030T**	**WP1K530T**
Allowable thrust load		N	49	68	68	147	147
Weight	Without brake	kg	Approx. 0.7	Approx. 1.4	Approx. 2.1	Approx. 4.2	Approx. 6.6
	With brake	kg	Approx. 0.9	Approx. 1.9	Approx. 2.6	Approx. 5.7	Approx. 8.1
Radiation shield dimensions (material)			t6 × □250 mm (Al)			t12 × □300 mm (Al)	
Applicable load inertia			(See note 6.)				
Applicable Servo Driver (R88D-)		100 V AC	WN01L-ML2	WN02L-ML2	WN04L-ML2	---	---
		200 V AC	WN01H-ML2	WN02H-ML2	WN04H-ML2	WN08H-ML2	WN15H-ML2
Brake specifi-cations	Brake inertia	kg·m^2 (GD^2/4)	2.9×10^{-6}	1.09×10^{-5}	1.09×10^{-5}	8.75×10^{-5}	8.75×10^{-5}
	Excitation voltage	V	24 V DC ±10%				
	Power consumption (at 20°C)	W	8.2	7.6	8.2	7.5	10
	Current consumption (at 20°C)	A	0.34	0.32	0.34	0.31	0.42
	Static friction torque	N·m	0.4 min.	0.9 min.	1.9 min.	3.5 min.	7.1 min.
	Attraction time (See note 3.)	ms	20 max.	20 max.	60 max.	20 max.	20 max.
	Release time (See note 3.)	ms	40 max.	40 max.	20 max.	40 max.	40 max.
	Backlash		1° (reference value)				
	Rating	---	Continuous				
	Insulation grade	---	Type F				

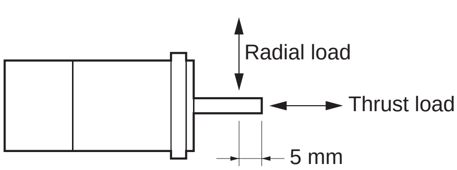
Note 1. *The values for items marked by asterisks are the values at an armature winding temperature of 100°C, combined with the Servo Driver. Other values are at normal conditions (20°C, 65%). The momentary maximum torque shown above indicates the standard value.

Note 2. The brakes are the non-excitation operation type (released when excitation voltage is applied).

Note 3. The operation time is the measured value (reference value) with a surge killer (CR50500, by Okaya Electric Industries co. LTD) inserted.

Note 4. The allowable radial and thrust loads are the values determined for a service life of 20,000 hours at normal operating temperatures.

Note 5. The value indicated for the allowable radial load is for the position shown in the following diagram.



Note 6. Applicable Load Inertia

1) The drivable load inertia ratio (load inertia/rotor inertia) changes depending on the mechanical configuration being driven and its rigidity. Highly rigid machines can operate with a large load inertia. Select a Servomotor and verify operation.

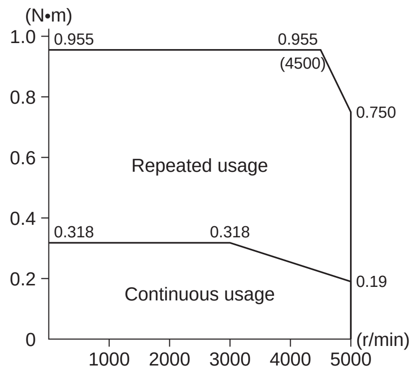
2) If the dynamic brake is used frequently with a large load inertia, it may lead to burnout of the dynamic brake resistor. Do not repeatedly turn the Servo ON and OFF with the dynamic brake enabled.

● Torque and Rotation Speed Characteristics

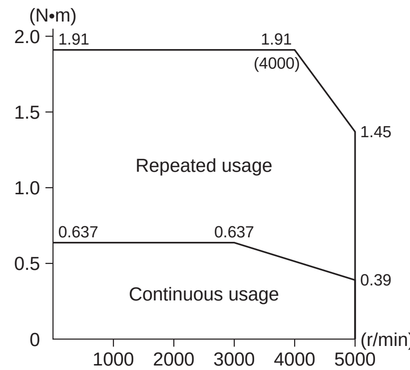
3,000-r/min Flat-style Servomotors (With a 100-VAC Servo Driver)

The following graphs show the characteristics with a 3-m standard cable and 100-V AC input.

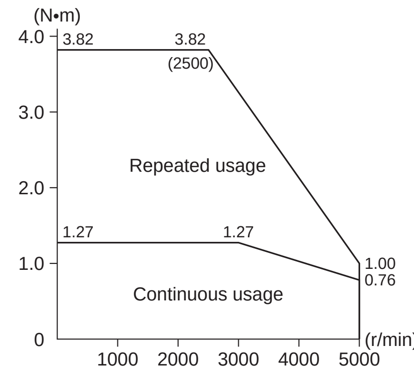
R88M-WP10030H/T (100 W)



R88M-WP20030H/T (200 W)



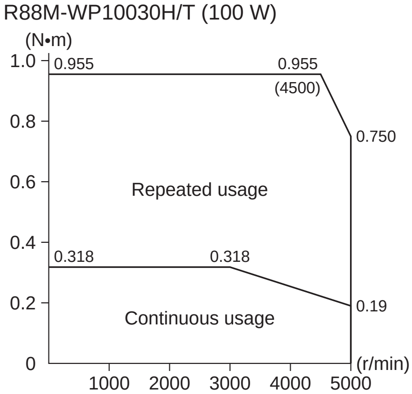
R88M-WP40030H/T (400 W)



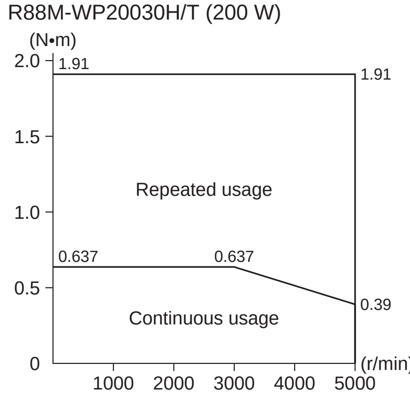
3,000-r/min Flat-style Servomotors (With a 200-VAC Servo Driver)

The following graphs show the characteristics with a 3-m standard cable and 200-V AC input.

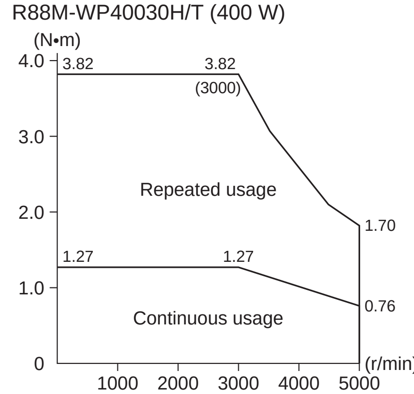
R88M-WP10030H/T (100 W)



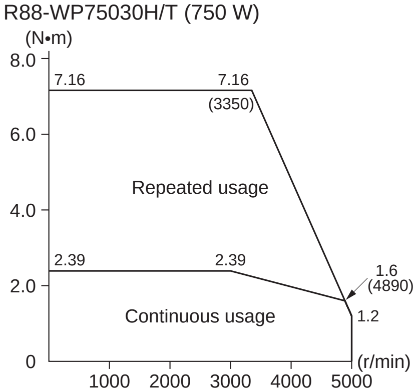
R88M-WP20030H/T (200 W)



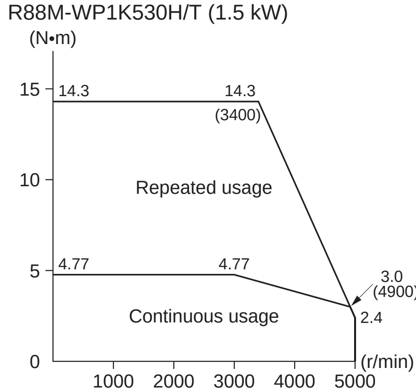
R88M-WP40030H/T (400 W)



R88-WP75030H/T (750 W)



R88M-WP1K530H/T (1.5 kW)



● Servomotor and Mechanical System Temperature Characteristics

- W-series AC Servomotors use rare earth magnets (neodymium-iron magnets). The temperature coefficient for these magnets is approximately –0.13%/°C. As the temperature drops, the Servomotor's momentary maximum torque increases, and as the temperature rises the Servomotor's momentary maximum torque decreases. When the normal temperature of 20°C and –10°C are compared, the momentary maximum torque increases by approximately 4%. Conversely, when the magnet warms up to 80°C from the normal temperature of 20°C, the momentary maximum torque decreases by approximately 8%.
- Generally, in a mechanical system, when the temperature drops the friction torque increases and the load torque becomes larger. For that reason, overloading may occur at low temperatures. In particular, in systems which use deceleration devices, the load torque at low temperatures may be nearly twice the load torque at normal temperatures. Check with a current monitor to see whether overloading is occurring at low temperatures, and how much the load torque is. Likewise, check to see whether there abnormal Servomotor overheating or alarms are occurring at high temperatures.
- An increase in load friction torque visibly increases load inertia. Therefore, even if the Servo Driver parameters are adjusted at a normal temperature, there may not be optimal operation at low temperatures. Check to see whether there is optimal operation at low temperatures too.

■ 1,000-r/min Servomotors

● Performance Specifications Table

Item		Model (R88M-) / Unit	200 V AC				
			W30010H	W60010H	W90010H	W1K210H	W2K010H
			W30010T	W60010T	W90010T	W1K210T	W2K010T
Rated output*		W	300	600	900	1,200	2,000
Rated torque*		N·m	2.84	5.68	8.62	11.5	19.1
Rated rotation speed		r/min	1,000				
Momentary maximum rotation speed		r/min	2,000				
Momentary maximum torque*		N·m	7.17	14.1	19.3	28.0	44.0
Rated current*		A (rms)	3.0	5.7	7.6	11.6	18.5
Momentary maximum current*		A (rms)	7.3	13.9	16.6	28	42
Rotor inertia		$kg{\cdot}m^2$ ($GD^2/4$)	7.24×10^{-4}	1.39×10^{-3}	2.05×10^{-3}	3.17×10^{-3}	4.60×10^{-3}
Torque constant*		N·m/A	1.03	1.06	1.21	1.03	1.07
Power rate*		kW/s	11.2	23.2	36.3	41.5	79.4
Mechanical time constant		ms	5.1	3.8	2.8	2.0	1.7
Electrical time constant		ms	5.1	4.7	5.7	13.5	13.9
Allowable radial load		N	490	490	686	1,176	1,470
Allowable thrust load		N	98	98	343	490	490
Weight	Without brake	kg	Approx. 5.5	Approx. 7.6	Approx. 9.6	Approx. 14	Approx. 18
	With brake	kg	Approx. 7.5	Approx. 9.6	Approx. 12	Approx. 19	Approx. 23.5
Radiation shield dimensions (material)			t20 × □400 mm (Fe)			t30 × □550 mm (Fe)	
Applicable load inertia			(See note 6.)				
Applicable Servo Driver (R88D-)			WN05H-ML2	WN10H-ML2	WN10H-ML2	WN15H-ML2	WN20H-ML2

Item		Model (R88M-) / Unit	200 V AC				
			W30010H	W60010H	W90010H	W1K210H	W2K010H
			W30010T	W60010T	W90010T	W1K210T	W2K010T
Brake specifi-cations	Brake inertia	kg·m^2 (GD^2/4)	2.1×10^{-4}	2.1×10^{-4}	2.1×10^{-4}	8.5×10^{-4}	8.5×10^{-4}
	Excitation voltage	V	24 V DC ±10%				
	Power consumption (at 20°C)	W	9.8	9.8	9.8	18.5	18.5
	Current consumption (at 20°C)	A	0.41	0.41	0.41	0.77	0.77
	Static friction torque	N·m	4.41 min.	12.7 min.	12.7 min.	43.1 min.	43.1 min.
	Attraction time (See note 3.)	ms	180 max.	180 max.	180 max.	180 max.	180 max.
	Release time (See note 3.)	ms	100 max.	100 max.	100 max.	100 max.	100 max.
	Backlash		1° (reference value)				
	Rating	---	Continuous				
	Insulation grade	---	Type F				

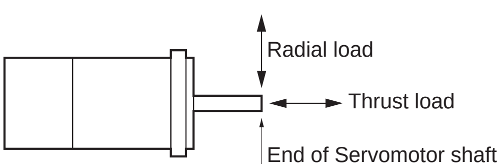
Note 1. *The values for items marked by asterisks are the values at an armature winding temperature of 100°C, combined with the Servo Driver. Other values are at normal conditions (20°C, 65%). The momentary maximum torque shown above indicates the standard value.

Note 2. The brakes are the non-excitation operation type (released when excitation voltage is applied).

Note 3. The operation time is the measured value (reference value) with a surge killer (CR50500, by Okaya Electric Industries Co. LTD.) inserted.

Note 4. The allowable radial and thrust loads are the values determined for a service life of 20,000 hours at normal operating temperatures.

Note 5. The value indicated for the allowable radial load is for the position shown in the following diagram.



Note 6. Applicable Load Inertia

1) The drivable load inertia ratio (load inertia/rotor inertia) changes depending on the mechanical configuration being driven and its rigidity. Highly rigid machines can operate with a large load inertia. Select a Servomotor and verify operation.

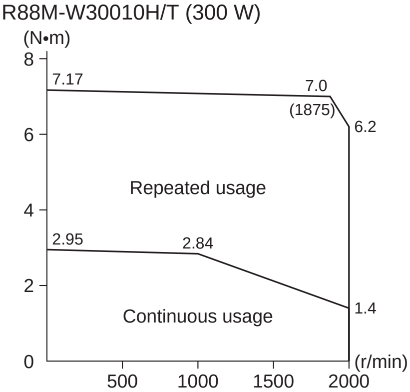
2) If the dynamic brake is used frequently with a large load inertia, it may lead to burnout of the dynamic brake resistor. Do not repeatedly turn the Servo ON and OFF with the dynamic brake enabled.

● Torque and Rotation Speed Characteristics

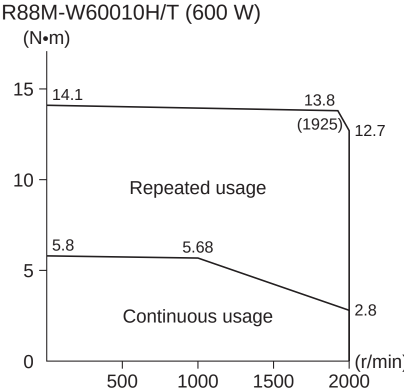
1,000-r/min Servomotors (With a 200-VAC Servo Driver)

The following graphs show the characteristics with a 3-m standard cable and 200-V AC input.

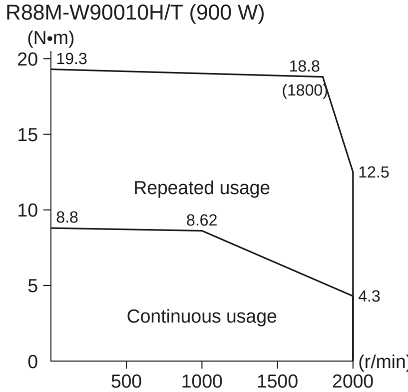
R88M-W30010H/T (300 W)



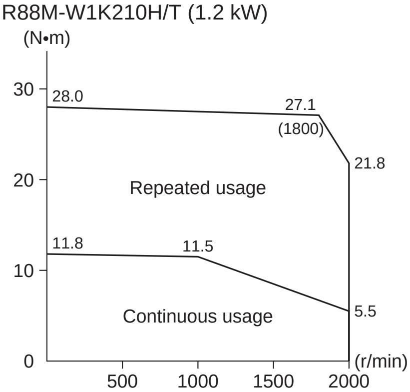
R88M-W60010H/T (600 W)



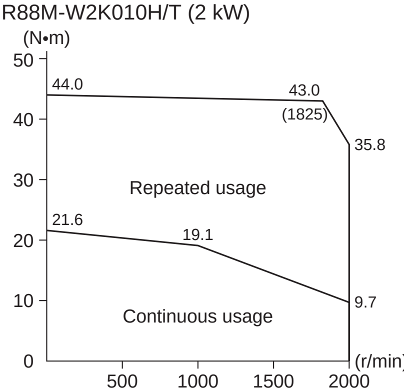
R88M-W90010H/T (900 W)



R88M-W1K210H/T (1.2 kW)



R88M-W2K010H/T (2 kW)

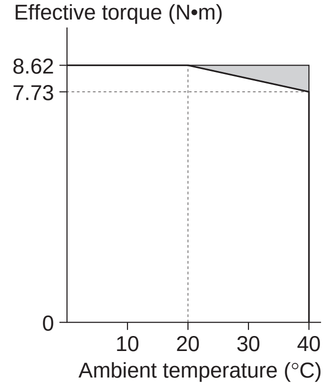


● Servomotor and Mechanical System Temperature Characteristics

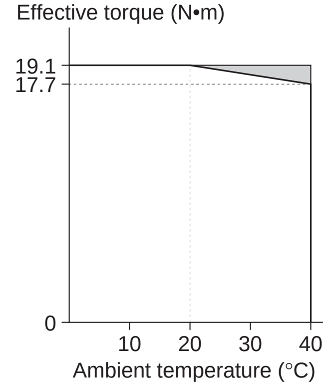
- W-series AC Servomotors use rare earth magnets (neodymium-iron magnets). The temperature coefficient for these magnets is approximately –0.13%/°C. As the temperature drops, the Servomotor's momentary maximum torque increases, and as the temperature rises the Servomotor's momentary maximum torque decreases. When the normal temperature of 20°C and –10°C are compared, the momentary maximum torque increases by approximately 4%. Conversely, when the magnet warms up to 80°C from the normal temperature of 20°C, the momentary maximum torque decreases by approximately 8%.
- Generally, in a mechanical system, when the temperature drops the friction torque increases and the load torque becomes larger. For that reason, overloading may occur at low temperatures. In particular, in systems which use deceleration devices, the load torque at low temperatures may be nearly twice the load torque at normal temperatures. Check with a current monitor to see whether overloading is occurring at low temperatures, and how much the load torque is. Likewise, check to see whether there abnormal Servomotor overheating or alarms are occurring at high temperatures.
- An increase in load friction torque visibly increases load inertia. Therefore, even if the Servo Driver parameters are adjusted at a normal temperature, there may not be optimal operation at low temperatures. Check to see whether there is optimal operation at low temperatures too.

⚠ **Caution** Do not use 900-W or 2-kW Servomotors within the shaded portions of the following diagrams. If used in these regions, the Servomotor may heat, causing the encoder to malfunction.

R88M-W90010□ (900 W)



R88M-W2K010□ (2 kW)



■ 1,500-r/min Servomotors

● Performance Specifications Table

Item	Unit	200 V AC: W45015T	200 V AC: W85015T	200 V AC: W1K315T	200 V AC: W1K815T
Rated output*	W	450	850	1,300	1,800
Rated torque*	N·m	2.84	5.39	8.34	11.5
Rated rotation speed	r/min	1,500			
Momentary maximum rotation speed	r/min	3,000			
Momentary maximum torque*	N·m	8.92	13.8	23.3	28.7
Rated current*	A (rms)	3.8	7.1	10.7	16.7
Momentary maximum current*	A (rms)	11	17	28	42
Rotor inertia	kg·m^2 (GD^2/4)	7.24×10^{-4}	1.39×10^{-3}	2.05×10^{-3}	3.17×10^{-3}
Torque constant*	N·m/A	0.82	0.83	0.84	0.73
Power rate*	kW/s	11.2	20.9	33.8	41.5
Mechanical time constant	ms	5.0	3.1	2.8	2.2
Electrical time constant	ms	5.1	5.3	6.3	12.8
Allowable radial load	N	490	490	686	1,176
Allowable thrust load	N	98	98	343	490
Weight: Without brake	kg	Approx. 5.5	Approx. 7.6	Approx. 9.6	Approx. 14
Weight: With brake	kg	Approx. 7.5	Approx. 9.6	Approx. 12	Approx. 19
Radiation shield dimensions (material)		t20 × □400 mm (Fe)			t30 × □550 mm (Fe)
Applicable load inertia		(See note 6.)			
Applicable Servo Driver (R88D-)		WN05H-ML2	WN10H-ML2	WN15H-ML2	WN20H-ML2

Item		Model (R88M-) Unit	200 V AC W45015T	W85015T	W1K315T	W1K815T
Brake specifi- cations	Brake inertia	$kg \cdot m^2$ ($GD^2/4$)	2.1×10^{-4}	2.1×10^{-4}	2.1×10^{-4}	8.5×10^{-4}
	Excitation voltage	V	24 V DC ±10%			
	Power consump- tion (at 20°C)	W	9.8	9.8	9.8	18.5
	Current consump- tion (at 20°C)	A	0.41	0.41	0.41	0.77
	Static friction torque	N·m	4.41 min.	12.7 min.	12.7 min.	43.1 min.
	Attraction time (See note 3.)	ms	180 max.	180 max.	180 max.	180 max.
	Release time (See note 3.)	ms	100 max.	100 max.	100 max.	100 max.
	Backlash		1° (reference value)			
	Rating	---	Continuous			
	Insulation grade	---	Type F			

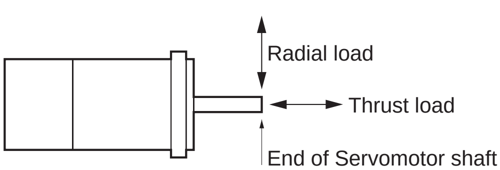
Note 1. *The values for items marked by asterisks are the values at an armature winding temperature of 20°C, combined with the Servo Driver. Other values are at normal conditions (20°C, 65%). The momentary maximum torque shown above indicates the standard value.

Note 2. The brakes are the non-excitation operation type (released when excitation voltage is applied).

Note 3. The operation time is the measured value (reference value) with a surge killer (CR50500, by Okaya Electric Industries Co. LTD.) inserted.

Note 4. The allowable radial and thrust loads are the values determined for a service life of 20,000 hours at normal operating temperatures.

Note 5. The value indicated for the allowable radial load is for the position shown in the following diagram.



Note 6. Applicable Load Inertia

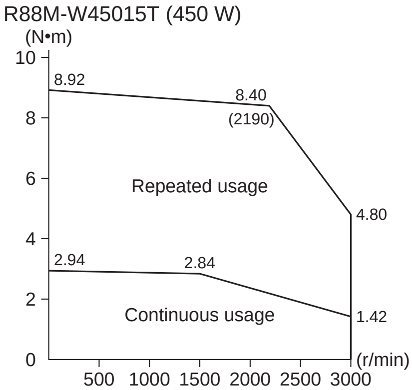
1) The drivable load inertia ratio (load inertia/rotor inertia) changes depending on the mechanical configuration being driven and its rigidity. Highly rigid machines can operate with a large load inertia. Select a Servomotor and verify operation.

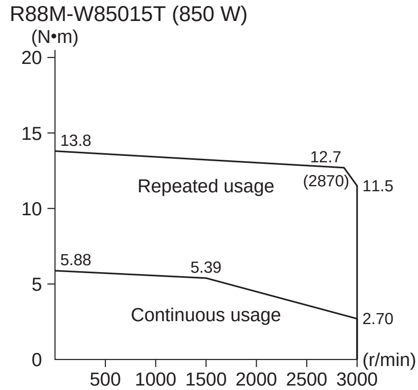
2) If the dynamic brake is used frequently with a large load inertia, it may lead to burnout of the dynamic brake resistor. Do not repeatedly turn the Servo ON and OFF with the dynamic brake enabled.

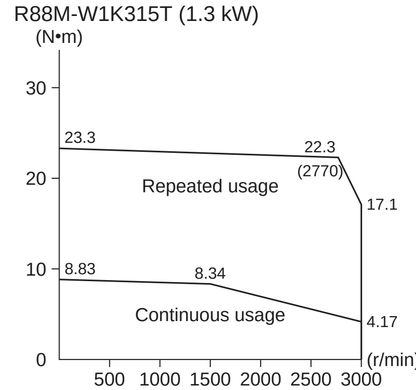
● Torque and Rotation Speed Characteristics

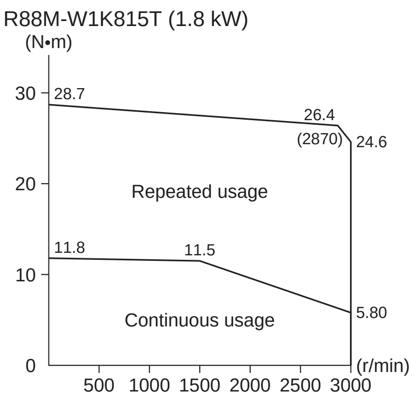
1,500-r/min Servomotors (With a 200-VAC Servo Driver)

The following graphs show the characteristics with a 3-m standard cable and 200-V AC input.







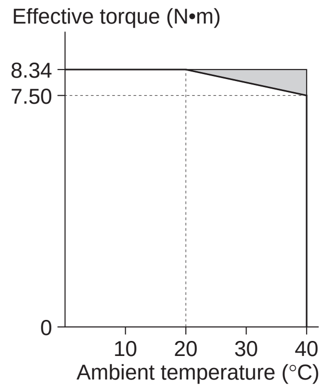


● Servomotor and Mechanical System Temperature Characteristics

- W-series AC Servomotors use rare earth magnets (neodymium-iron magnets). The temperature coefficient for these magnets is approximately –0.13%/°C. As the temperature drops, the Servomotor's momentary maximum torque increases, and as the temperature rises the Servomotor's momentary maximum torque decreases. When the normal temperature of 20°C and –10°C are compared, the momentary maximum torque increases by approximately 4%. Conversely, when the magnet warms up to 80°C from the normal temperature of 20°C, the momentary maximum torque decreases by approximately 8%.
- Generally, in a mechanical system, when the temperature drops the friction torque increases and the load torque becomes larger. Therefore, overloading may occur at low temperatures. In particular, in systems which use deceleration devices, the load torque at low temperatures may be nearly twice the load torque at normal temperatures. Check with a current monitor to see whether overloading is occurring at low temperatures, and how much the load torque is. Likewise, check to see whether there is abnormal Servomotor overheating or alarms are occurring at high temperatures.
- An increase in load friction torque visibly increases load inertia. Therefore, even if the Servo Driver parameters are adjusted at a normal temperature, there may not be optimal operation at low temperatures. Check to see whether there is optimal operation at low temperatures too.

Caution Do not use 1.3-kW Servomotors within the shaded portions of the following diagrams. If used in these regions, the Servomotor may overheat, causing the encoder to malfunction.

R88M-W1K315T (1.3 kW)



2-5-3 Specifications for Servomotors with Reduction Gears

■ 3,000-r/min Servomotors with Standard Reduction Gears (50 W to 3 kW)

Model			Rated rotation speed	Rated torque	Ratio	Maximum momentary rotation speed	Maximum momentary torque	Reduction gear inertia	Allowable radial load	Allowable thrust load	Weight	
											Without brake	With brake
			r/min	N·m	%	r/min	N·m	kg·m^2	N	N	kg	kg
50 W	1/5	R88M-W05030□-□G05BJ	600	0.557	70	800	1.67	3.60×10^{-6}	137	127	1.1	1.4
	1/9	R88M-W05030□-□G09BJ	333	1.00	70	444	3.01	3.30×10^{-6}	206	147	1.4	1.7
	1/21	R88M-W05030□-□G21BJ	143	2.67	80	190	8.01	1.80×10^{-6}	235	147	1.6	1.9
	1/33	R88M-W05030□-□G33BJ	91	4.20	80	121	12.6	1.3×10^{-6}	235	147	1.6	1.9
100 W	1/5	R88M-W10030□-□G05BJ	600	1.27	80	800	3.82	7.76×10^{-6}	167	147	1.4	1.7
	1/11	R88M-W10030□-□G11BJ	273	2.80	80	364	8.40	4.76×10^{-6}	216	147	1.7	2.0
	1/21	R88M-W10030□-□G21BJ	143	5.34	80	190	16.0	4.26×10^{-6}	392	235	2.7	3.0
	1/33	R88M-W10030□-□G33BJ	91	8.40	80	121	25.2	3.26×10^{-6}	431	235	2.7	3.0
200 W	1/5	R88M-W20030□-□G05BJ	600	2.55	80	800	7.64	3.35×10^{-5}	245	235	3.0	3.5
	1/11	R88M-W20030□-□G11BJ	273	5.96	85	364	17.9	8.50×10^{-6}	323	235	3.5	4.0
	1/21	R88M-W20030□-□G21BJ	143	11.4	85	190	34.1	1.10×10^{-5}	549	294	3.7	4.2
	1/33	R88M-W20030□-□G33BJ	91	17.9	85	121	53.6	6.50×10^{-6}	608	294	3.8	4.3
400 W	1/5	R88M-W40030□-□G05BJ	600	5.40	85	800	16.2	3.35×10^{-5}	245	235	3.6	4.1
	1/11	R88M-W40030□-□G11BJ	273	11.9	85	364	35.7	1.95×10^{-5}	441	294	4.3	4.8
	1/21	R88M-W40030□-□G21BJ	143	22.7	85	190	68.2	1.95×10^{-5}	568	314	4.7	5.2
	1/33	R88M-W40030□-□G33BJ	91	33.5	80	121	101	1.73×10^{-5}	657	314	7.1	7.6
750 W	1/5	R88M-W75030□-□G05BJ	600	10.2	85	800	30.4	5.83×10^{-5}	343	294	5.8	6.7
	1/11	R88M-W75030□-□G11BJ	273	22.3	85	364	67.0	5.28×10^{-5}	451	314	6.6	7.5
	1/21	R88M-W75030□-□G21BJ	143	42.7	85	190	128	5.93×10^{-5}	813	490	9.9	10.8
	1/33	R88M-W75030□-□G33BJ	91	67.0	85	121	201	2.63×10^{-5}	921	490	9.9	10.8

Model			Rated rotation speed	Rated torque	Ratio	Maximum momentary rotation speed	Maximum momentary torque	Reduction gear inertia	Allowable radial load	Allowable thrust load	Weight	
											Without brake	With brake
			r/min	N·m	%	r/min	N·m	kg·m^2	N	N	kg	kg
1 kW	1/5	R88M-W1K030□-□G05BJ	600	12.7	80	800	38.2	3.44×10^{-4}	833	1,280	13	14.4
	1/9	R88M-W1K030□-□G09BJ	333	22.9	80	444	68.7	3.11×10^{-4}	980	1,570	13	14.4
	1/20	R88M-W1K030□-□G20BJ	150	50.9	80	200	153	6.79×10^{-4}	2,650	4,220	30	31.4
	1/29	R88M-W1K030□-□G29BJ	103	73.8	80	138	221	4.88×10^{-4}	2,940	4,900	30	31.4
	1/45	R88M-W1K030□-□G45BJ	67	114	80	89	343	3.92×10^{-4}	3,430	5,690	30	31.4
1.5 kW	1/5	R88M-W1K530□-□G05BJ	600	19.6	80	800	58.8	3.44×10^{-4}	833	1,280	14	15.7
	1/9	R88M-W1K530□-□G09BJ	333	35.3	80	444	106	4.77×10^{-4}	1,960	3,000	31	32.7
	1/20	R88M-W1K530□-□G20BJ	150	78.4	80	200	235	6.79×10^{-4}	2,650	4,220	31	32.7
	1/29	R88M-W1K530□-□G29BJ	103	114	80	138	341	4.88×10^{-4}	2,940	4,900	31	32.7
	1/45	R88M-W1K530□-□G45BJ	67	176	80	89	529	6.58×10^{-4}	8,040	8,830	51	52.5
2 kW	1/5	R88M-W2K030□-□G05BJ	600	25.4	80	800	76.4	3.44×10^{-4}	833	1,280	15	16.5
	1/9	R88M-W2K030□-□G09BJ	333	45.8	80	444	138	4.77×10^{-4}	1,960	3,000	32	33.5
	1/20	R88M-W2K030□-□G20BJ	150	102	80	200	306	6.79×10^{-4}	2,650	4,220	32	33.5
	1/29	R88M-W2K030□-□G29BJ	103	148	80	138	443	1.03×10^{-3}	6,860	7,350	52	53.5
	1/45	R88M-W2K030□-□G45BJ	67	229	80	89	688	6.58×10^{-4}	8,040	8,830	52	53.5
3 kW	1/5	R88M-W3K030□-□G05BJ	600	39.2	80	800	118	1.02×10^{-3}	1,670	1,960	29	32
	1/9	R88M-W3K030□-□G09BJ	333	70.6	80	444	212	7.80×10^{-4}	1,960	3,000	36	39
	1/20	R88M-W3K030□-□G20BJ	150	157	80	200	470	2.02×10^{-3}	6,080	6,370	56	58.5
	1/29	R88M-W3K030□-□G29BJ	103	227	80	138	682	1.34×10^{-3}	6,860	7,350	56	58.5
	1/45	R88M-W3K030□-□G45BJ	67	353	80	89	1,058	9.70×10^{-4}	8,040	8,830	56	58.5

Note 1. The reduction gear inertia indicates the Servomotor shaft conversion value.

Note 2. The enclosure rating for Servomotors with reduction gears is IP55 for 50- to 750-W models, and IP44 for 1- to 3-kW models.

Note 3. The maximum momentary rotation speed for the motor shaft of Servomotors with reduction gears is 4,000 r/min.

Note 4. The maximum momentary torque values marked by asterisks are the maximum allowable torque for the reduction gears. Use torque limits so that these values are not exceeded.

Note 5. The allowable radial loads are measured at a point 5 mm from the end of the shaft for 50- to 750-W Servomotors and in the center of the shaft for 1- to 3-W Servomotors.

■ 3,000-r/min Flat-style Servomotors with Standard Reduction Gears (100 W to 1.5 kW)

Model			Rated rotation speed	Rated torque	Effi-ciency	Maxi-mum momen-tary rotation speed	Maxi-mum momen-tary torque	Reduction gear inertia	Allow-able radial load	Allow-able thrust load	Weight	
											Without brake	With brake
			r/min	N·m	%	r/min	N·m	kg·m^2	N	N	kg	kg
100 W	1/5	R88M-WP10030□-□G05BJ	600	1.27	80	800	3.82	9.29×10^{-6}	167	147	1.5	1.7
	1/11	R88M-WP10030□-□G11BJ	273	2.80	80	364	8.40	4.79×10^{-6}	216	147	1.5	1.7
	1/21	R88M-WP10030□-□G21BJ	143	5.34	80	190	16.0	4.29×10^{-6}	392	235	3.0	3.2
	1/33	R88M-WP10030□-□G33BJ	91	8.40	80	121	25.2	3.29×10^{-6}	431	235	3.0	3.2
200 W	1/5	R88M-WP20030□-□G05BJ	600	2.55	80	800	7.64	3.60×10^{-5}	245	235	3.5	4.0
	1/11	R88M-WP20030□-□G11BJ	273	5.96	85	364	17.9	8.80×10^{-6}	323	235	3.8	4.3
	1/21	R88M-WP20030□-□G21BJ	143	11.4	85	190	34.1	1.10×10^{-5}	549	294	4.1	4.6
	1/33	R88M-WP20030□-□G33BJ	91	17.9	85	121	53.6	6.50×10^{-6}	608	294	4.1	4.6
400 W	1/5	R88M-WP40030□-□G05BJ	600	5.40	85	800	16.2	3.60×10^{-5}	245	235	4.2	4.7
	1/11	R88M-WP40030□-□G11BJ	273	11.9	85	364	35.7	1.95×10^{-5}	441	294	4.8	5.3
	1/21	R88M-WP40030□-□G21BJ	143	22.7	85	190	68.2	1.95×10^{-5}	568	314	5.2	5.7
	1/33	R88M-WP40030□-□G33BJ	91	33.5	80	121	101	1.72×10^{-5}	657	314	7.7	8.2
750 W	1/5	R88M-WP75030□-□G05BJ	600	10.2	85	800	30.4	7.65×10^{-5}	343	294	6.9	8.4
	1/11	R88M-WP75030□-□G11BJ	273	22.3	85	364	67.0	5.23×10^{-5}	451	314	8.0	9.5
	1/21	R88M-WP75030□-□G21BJ	143	42.7	85	190	128	6.63×10^{-5}	813	490	11.0	12.5
	1/33	R88M-WP75030□-□G33BJ	91	67.0	85	121	201	4.55×10^{-5}	921	490	11.0	12.5
1.5 kW	1/5	R88M-WP1K530□-□G05BJ	600	20.3	85	800	60.8	1.54×10^{-4}	353	314	11.6	13.1
	1/11	R88M-WP1K530□-□G11BJ	273	44.6	85	364	134	2.09×10^{-4}	647	490	13.7	15.2
	1/21	R88M-WP1K530□-□G21BJ	143	80.1	80	190	270	1.98×10^{-4}	1,274	882	23.6	25.1
	1/33	R88M-WP1K530□-□G33BJ	91	126	80	121	353	1.12×10^{-4}	1,274	882	23.6	25.1

Note 1. The reduction gear inertia indicates the Servomotor shaft conversion value.

Note 2. The enclosure rating for Servomotors with reduction gears is IP55.

Note 3. The maximum momentary rotation speed for the motor shaft of Servomotors with reduction gears is 4,000 r/min.

Note 4. The maximum momentary torque values marked by asterisks are the maximum allowable torque for the reduction gears. Use torque limits so that these values are not exceeded.

Note 5. The allowable radial loads are measured at a point 5 mm from the end of the shaft.

■ 1,000-r/min Servomotors with Standard Reduction Gears (300 W to 2 kW)

Model			Rated rotation speed	Rated torque	Effi-ciency	Maxi-mum momen-tary rotation speed	Maxi-mum momen-tary torque	Reduction gear inertia	Allow-able radial load	Allow-able thrust load	Weight	
											Without brake	With brake
			r/min	N·m	%	r/min	N·m	kg·m^2	N	N	kg	kg
300 W	1/5	R88M-W30010□-□G05BJ	200	11.4	80	400	28.7	1.26×10^{-4}	883	1,280	14	16
	1/9	R88M-W30010□-□G09BJ	111	20.4	80	222	51.6	9.40×10^{-5}	980	1,570	14	16
	1/20	R88M-W30010□-□G20BJ	50	45.4	80	100	115	1.40×10^{-4}	1,270	2,260	16	18
	1/29	R88M-W30010□-□G29BJ	34	65.9	80	69	166	2.76×10^{-4}	2,940	4,900	31	33
	1/45	R88M-W30010□-□G45BJ	22	102	80	44	258	1.81×10^{-4}	3,430	5,690	31	33

Model			Rated rotation speed	Rated torque	Effi-ciency	Maxi-mum momen-tary rotation speed	Maxi-mum momen-tary torque	Reduction gear inertia	Allow-able radial load	Allow-able thrust load	Weight	
											Without brake	With brake
			r/min	N·m	%	r/min	N·m	$kg{\cdot}m^2$	N	N	kg	kg
600 W	1/5	R88M-W60010□-□G05BJ	200	22.7	80	400	56.4	1.30×10^{-4}	833	1,280	16	18
	1/9	R88M-W60010□-□G09BJ	111	40.9	80	222	82.5*	9.00×10^{-5}	980	1,570	16	18
	1/20	R88M-W60010□-□G20BJ	50	90.9	80	100	226	4.70×10^{-4}	2,650	4,220	33	35
	1/29	R88M-W60010□-□G29BJ	34	132	80	69	327	2.80×10^{-4}	2,940	4,900	33	35
	1/45	R88M-W60010□-□G45BJ	22	204	80	44	508	4.50×10^{-4}	8,040	8,830	53	55
900 W	1/5	R88M-W90010□-□G05BJ	200	34.5	80	400	77.2	3.40×10^{-4}	833	1,280	18	20.4
	1/9	R88M-W90010□-□G09BJ	111	62.1	80	222	139	4.80×10^{-4}	1,960	3,000	35	37.4
	1/20	R88M-W90010□-□G20BJ	50	138	80	100	309	6.90×10^{-4}	2,650	4,220	35	37.4
	1/29	R88M-W90010□-□G29BJ	34	200	80	69	448	1.04×10^{-3}	6,860	7,350	55	57.4
	1/45	R88M-W90010□-□G45BJ	22	310	80	44	695	6.70×10^{-4}	8,040	8,830	55	57.4
1.2 kW	1/5	R88M-W1K210□-□G05BJ	200	46.0	80	400	112	1.02×10^{-3}	1,670	1,960	32	37
	1/9	R88M-W1K210□-□G09BJ	111	82.8	80	222	202	7.80×10^{-4}	1,960	3,000	39	44
	1/20	R88M-W1K210□-□G20BJ	50	184	80	100	448	2.02×10^{-3}	6,080	6,370	59	64
	1/29	R88M-W1K210□-□G29BJ	34	267	80	69	650	1.34×10^{-3}	6,860	7,350	59	64
	1/45	R88M-W1K210□-□G45BJ	22	414	80	44	1,008	9.70×10^{-4}	8,040	8,830	59	64
2 kW	1/5	R88M-W2K010□-□G05BJ	200	76.4	80	400	176	1.02×10^{-3}	1,670	1,960	36	41.5
	1/9	R88M-W2K010□-□G09BJ	111	138	80	222	317	7.80×10^{-4}	1,960	3,000	43	48.5
	1/20	R88M-W2K010□-□G20BJ	50	306	80	100	704	2.02×10^{-3}	6,080	6,370	63	68.5

Note 1. The reduction gear inertia indicates the Servomotor shaft conversion value.

Note 2. The enclosure rating for Servomotors with reduction gears is IP44.

Note 3. The maximum momentary torque values marked by asterisks are the maximum allowable torque for the reduction gears. Use torque limits so that these values are not exceeded.

Note 4. The allowable radial loads are measured in the center of the shaft.

■ 1,500-r/min Servomotors with Standard Reduction Gears (450 W to 1.8 kW)

Model			Rated rotation speed	Rated torque	Effi-ciency	Maxi-mum momen-tary rotation speed	Maxi-mum momen-tary torque	Reduction gear inertia	Allow-able radial load	Allow-able thrust load	Weight	
											Without brake	With brake
			r/min	N·m	%	r/min	N·m	$kg{\cdot}m^2$	N	N	kg	kg
450 W	1/5	R88M-W45015T-□G05BJ	300	11.4	80	600	35.7	1.26×10^{-4}	883	1,280	14	16
	1/9	R88M-W45015T-□G09BJ	167	20.4	80	333	64.2	9.40×10^{-5}	980	1,570	14	16
	1/20	R88M-W45015T-□G20BJ	75	45.4	80	150	143	4.66×10^{-4}	2,650	4,220	31	33
	1/29	R88M-W45015T-□G29BJ	52	65.9	80	103	207	2.76×10^{-4}	2,940	4,900	31	33
	1/45	R88M-W45015T-□G45BJ	33	102	80	67	321	1.81×10^{-4}	3,430	5,690	31	33
850 W	1/5	R88M-W85015T-□G05BJ	300	21.6	80	600	55.2	1.30×10^{-4}	883	1,280	16	18
	1/9	R88M-W85015T-□G09BJ	167	38.8	80	333	74.5*	9.00×10^{-5}	980	1,570	16	18
	1/20	R88M-W85015T-□G20BJ	75	86.2	80	150	221	4.70×10^{-4}	2,650	4,220	33	35
	1/29	R88M-W85015T-□G29BJ	52	125	80	103	320	2.80×10^{-4}	2,940	4,900	33	35
	1/45	R88M-W85015T-□G45BJ	33	194	80	67	497	4.50×10^{-4}	8,040	8,830	53	55

Model			Rated rotation speed	Rated torque	Effi-ciency	Maxi-mum momen-tary rotation speed	Maxi-mum momen-tary torque	Reduction gear inertia	Allow-able radial load	Allow-able thrust load	Weight	
											Without brake	With brake
			r/min	N·m	%	r/min	N·m	$kg \cdot m^2$	N	N	kg	kg
1.3 kW	1/5	R88M-W1K315T-□G05BJ	300	33.4	80	600	93.2	7.20×10^{-4}	1,670	1,960	28	30.4
	1/9	R88M-W1K315T-□G09BJ	167	60.0	80	333	168	4.80×10^{-4}	1,960	3,000	35	37.4
	1/20	R88M-W1K315T-□G20BJ	75	133	80	150	373	6.90×10^{-4}	2,650	4,220	35	37.4
	1/29	R88M-W1K315T-□G29BJ	52	193	80	103	541	1.04×10^{-3}	6,860	7,350	55	57.4
	1/45	R88M-W1K315T-□G45BJ	33	300	80	67	839	6.70×10^{-4}	8,040	8,830	55	57.4
1.8 kW	1/5	R88M-W1K815T-□G05BJ	300	46.0	80	600	115	1.02×10^{-3}	1,670	1,960	32	37
	1/9	R88M-W1K815T-□G09BJ	167	82.8	80	333	207	7.80×10^{-4}	1,960	3,000	39	44
	1/20	R88M-W1K815T-□G20BJ	75	184	80	150	459	2.02×10^{-3}	6,080	6,370	59	64
	1/29	R88M-W1K815T-□G29BJ	52	267	80	103	666	1.34×10^{-3}	6,860	7,350	59	64

Note 1. The reduction gear inertia indicates the Servomotor shaft conversion value.

Note 2. The enclosure rating for Servomotors with reduction gears is IP44.

Note 3. The maximum momentary torque values marked by asterisks are the maximum allowable torque for the reduction gears. Use torque limits so that these values are not exceeded.

Note 4. The allowable radial loads are measured in the center of the shaft.

■ 3,000-r/min Servomotors with Economy Reduction Gears (100 to 750 W)

Model			Rated rotation speed	Rated torque	Effi-ciency	Maxi-mum momen-tary rotation speed	Maxi-mum momen-tary torque	Reduction gear inertia	Allow-able radial load	Allow-able thrust load	Weight	
											Without brake	With brake
			r/min	N·m	%	r/min	N·m	$kg \cdot m^2$	N	N	kg	kg
100 W	1/5	R88M-W10030□-□G05CJ	600	1.19	75	1,000	3.58	4.08×10^{-6}	392	196	1.05	1.35
	1/9	R88M-W10030□-□G09CJ	333	2.29	80	556	6.88	3.43×10^{-6}	441	220	1.05	1.35
	1/15	R88M-W10030□-□G15CJ	200	3.82	80	333	11.5	3.62×10^{-6}	588	294	1.2	1.5
	1/25	R88M-W10030□-□G25CJ	120	6.36	80	200	19.1	3.92×10^{-6}	1,323	661	2.2	2.5
200 W	1/5	R88M-W20030□-□G05CJ	600	2.71	85	1,000	8.12	1.53×10^{-5}	392	196	1.82	2.32
	1/9	R88M-W20030□-□G09CJ	333	3.78	66	556	11.3	2.68×10^{-5}	931	465	2.8	3.3
	1/15	R88M-W20030□-□G15CJ	200	6.31	66	333	18.9	2.71×10^{-5}	1,176	588	3.2	3.7
	1/25	R88M-W20030□-□G25CJ	120	11.1	70	200	33.4	2.67×10^{-5}	1,323	661	3.2	3.7
400 W	1/5	R88M-W40030□-□G05CJ	600	5.40	85	1,000	16.2	3.22×10^{-5}	784	392	3.4	3.9
	1/9	R88M-W40030□-□G09CJ	333	9.49	83	556	28.5	2.68×10^{-5}	931	465	3.4	3.9
	1/15	R88M-W40030□-□G15CJ	200	15.8	83	333	47.6	2.71×10^{-5}	1,176	588	3.8	4.3
	1/25	R88M-W40030□-□G25CJ	120	26.4	83	200	79.3	2.79×10^{-5}	1,617	808	4.9	5.4
750 W	1/5	R88M-W75030□-□G05CJ	600	10.8	90	1,000	32.2	7.17×10^{-5}	784	392	5.5	6.4
	1/9	R88M-W75030□-□G09CJ	333	18.2	85	556	54.7	6.50×10^{-5}	1,176	588	6.8	7.7
	1/15	R88M-W75030□-□G15CJ	200	30.4	85	333	91.2	7.09×10^{-5}	1,372	686	7.2	8.1
	1/25	R88M-W75030□-□G25CJ	120	50.7	85	200	152	7.05×10^{-5}	2,058	1,029	10.6	11.5

Note 1. The reduction gear inertia indicates the Servomotor shaft conversion value.

Note 2. The enclosure rating for Servomotors with reduction gears is IP44.

Note 3. The allowable radial loads are measured in the center of the shaft.

■ 3,000-r/min Flat-style Servomotors with Economy Reduction Gears (100 to 750 W)

Model			Rated rotation speed	Rated torque	Efficiency	Maximum momentary rotation speed	Maximum momentary torque	Reduction gear inertia	Allowable radial load	Allowable thrust load	Weight	
											Without brake	With brake
			r/min	N·m	%	r/min	N·m	kg·m^2	N	N	kg	kg
100 W	1/5	R88M-WP10030□-□G05CJ	600	1.19	75	1,000	3.58	1.60×10^{-5}	392	196	1.42	1.62
	1/9	R88M-WP10030□-□G09CJ	333	2.29	80	556	6.88	1.37×10^{-5}	441	220	1.42	1.62
	1/15	R88M-WP10030□-□G15CJ	200	3.82	80	333	11.5	3.38×10^{-6}	588	294	1.47	1.67
	1/25	R88M-WP10030□-□G25CJ	120	6.36	80	200	19.1	3.68×10^{-6}	1,323	661	2.5	2.7
200 W	1/5	R88M-WP20030□-□G05CJ	600	2.71	85	1,000	8.12	1.53×10^{-5}	392	196	2.25	2.75
	1/9	R88M-WP20030□-□G09CJ	333	3.78	66	556	11.3	2.56×10^{-5}	931	465	3.2	3.7
	1/15	R88M-WP20030□-□G15CJ	200	6.31	66	333	18.9	2.71×10^{-5}	1,176	588	3.6	4.1
	1/25	R88M-WP20030□-□G25CJ	120	11.1	70	200	33.4	2.67×10^{-5}	1,323	661	3.6	4.1
400 W	1/5	R88M-WP40030□-□G05CJ	600	5.40	85	1,000	16.2	3.23×10^{-5}	784	392	3.9	4.4
	1/9	R88M-WP40030□-□G09CJ	333	9.49	83	556	28.5	2.56×10^{-5}	931	465	3.9	4.4
	1/15	R88M-WP40030□-□G15CJ	200	15.8	83	333	47.6	2.71×10^{-5}	1,176	588	4.3	4.8
	1/25	R88M-WP40030□-□G25CJ	120	26.4	83	200	79.3	2.79×10^{-5}	1,617	808	5.4	5.9
750 W	1/5	R88M-WP75030□-□G05CJ	600	10.8	90	1,000	32.2	7.17×10^{-5}	784	392	6.7	8.2
	1/9	R88M-WP75030□-□G09CJ	333	18.2	85	556	54.7	6.50×10^{-5}	1,176	588	8.0	9.5
	1/15	R88M-WP75030□-□G15CJ	200	30.4	85	333	91.2	6.86×10^{-5}	1,372	686	8.4	9.9
	1/25	R88M-WP75030□-□G25CJ	120	50.7	85	200	152	7.05×10^{-5}	2,058	1,029	11.8	13.3

Note 1. The reduction gear inertia indicates the Servomotor shaft conversion value.

Note 2. The enclosure rating for Servomotors with reduction gears is IP44.

Note 3. The allowable radial loads are measured in the center of the shaft.

2-5-4 Encoder Specifications

■ Incremental Encoder Specifications

Item	3,000-r/min Servomotors		3,000-r/min Flat-style Servomotors	1,000-r/min Servomotors
	50 to 750 W	1 to 3 kW		
Encoder method	Optical encoder			
	13 bits	17 bits	13 bits	17 bits
Number of output pulses	A, B phase: 2,048 pulses/revolution Z phase: 1 pulse/revolution	A, B phase: 32,768 pulses/revolution Z phase: 1 pulse/revolution	A, B phase: 2,048 pulses/revolution Z phase: 1 pulse/revolution	A, B phase: 32,768 pulses/revolution Z phase: 1 pulse/revolution
Power supply voltage	5 V DC ±5%			
Power supply current	120 mA	150 mA	120 mA	150 mA

Item	3,000-r/min Servomotors		3,000-r/min Flat-style Servomotors	1,000-r/min Servomotors
	50 to 750 W	1 to 3 kW		
Maximum rotation speed	5,000 r/min			
Output signals	+S, –S			
Output impedance	Conforming to EIA RS-422A. Output based on LTC1485CS or equivalent.			
Serial communications data	Position data, poll sensor, U, V, W phase, encoder alarm, Servomotor data			
Serial communications method	Bi-directional communications in HDLC format, by Manchester method			

■ Absolute Encoder Specifications

Item	3,000-r/min Servomotors		3,000-r/min Flat-style Servomotors	1,000-r/min Servomotors 1,500-r/min Servomotors
	50 to 750 W	1 to 3 kW		
Encoder method	Optical encoder			
	16 bits	17 bits	16 bits	17 bits
Number of output pulses	A, B phase: 16,384 pulses/revolution Z phase: 1 pulse/revolution	A, B phase: 32,768 pulses/revolution Z phase: 1 pulse/revolution	A, B phase: 16,384 pulses/revolution Z phase: 1 pulse/revolution	A, B phase: 32,768 pulses/revolution Z phase: 1 pulse/revolution
Maximum rotational speed	–32,768 to +32,767 rotations or 0 to 65,534 rotations			
Power supply voltage	5 V DC ±5%			
Power supply current	180 mA			
Applicable battery voltage	3.6 V DC			
Battery current consumption	20 µA (for backup, when stopped), 3 µA (when Servo Driver is powered)			
Maximum rotation speed	5,000 r/min			
Output signals	+S, –S			
Output impedance	Conforming to EIA RS-422A. Output based on LTC1485CS or equivalent.			
Serial communications data	Position data, poll sensor, U, V, W phase, encoder alarm, Servomotor data			
Serial communications method	Bi-directional communications in HDLC format, by Manchester method			
Absolute value communications data	Amount of rotation			

2-6 Cable and Connector Specifications

2-6-1 MECHATROLINK-II Communications Cable Specifications

■ MECHATROLINK Communications Cable (With Connectors at Both Ends and a Core) (FNY-W6003-□□)

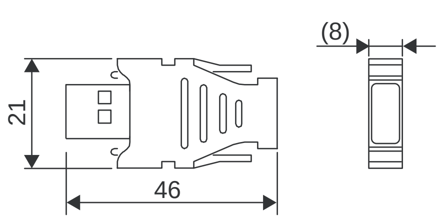
● Cable Models

Name	Model	Length (L)
MECHATROLINK-II Cable	FNY-W6003-A5	0.5 m
	FNY-W6003-01	1.0 m
	FNY-W6003-03	3.0 m
	FNY-W6003-05	5.0 m
	FNY-W6003-10	10 m
	FNY-W6003-20	20 m
	FNY-W6003-30	30 m
MECHATROLINK-II Terminating Resistor	FNY-W6022	---

● Connection Configuration and External Dimensions

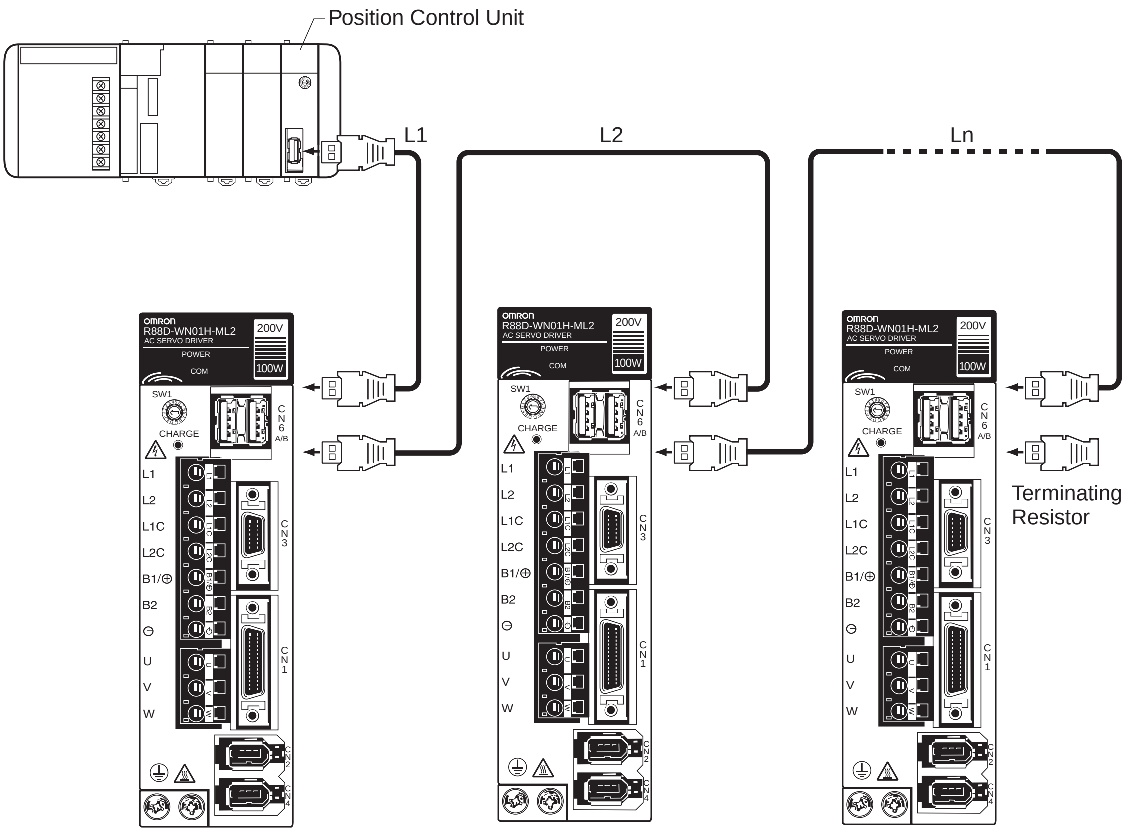
MECHATROLINK-II Cable

MECHATROLINK-II Terminating Resistor



● Wiring

The following example shows the MECHATROLINK-II Communications Cable connections between a host device and Servo Drivers.



Note 1. Use a minimum cable length of 0.5 m between any two devices (L1, L2 ... Ln).

Note 2. The total cable length (L1, L2 ... Ln) must not exceed 50 m.

■ Servo Driver Cable (XW2Z-□J-B16)

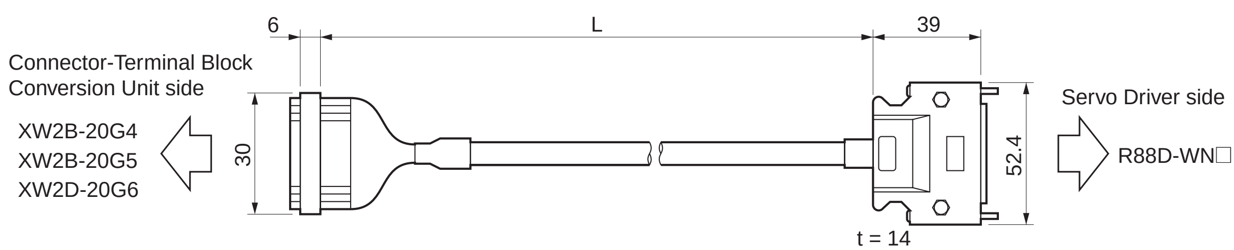
This Cable is for the Connector-Terminal Block Conversion Unit for W-series Servo Drivers (with built-in MECHATROLINK-II communications).

● Cables

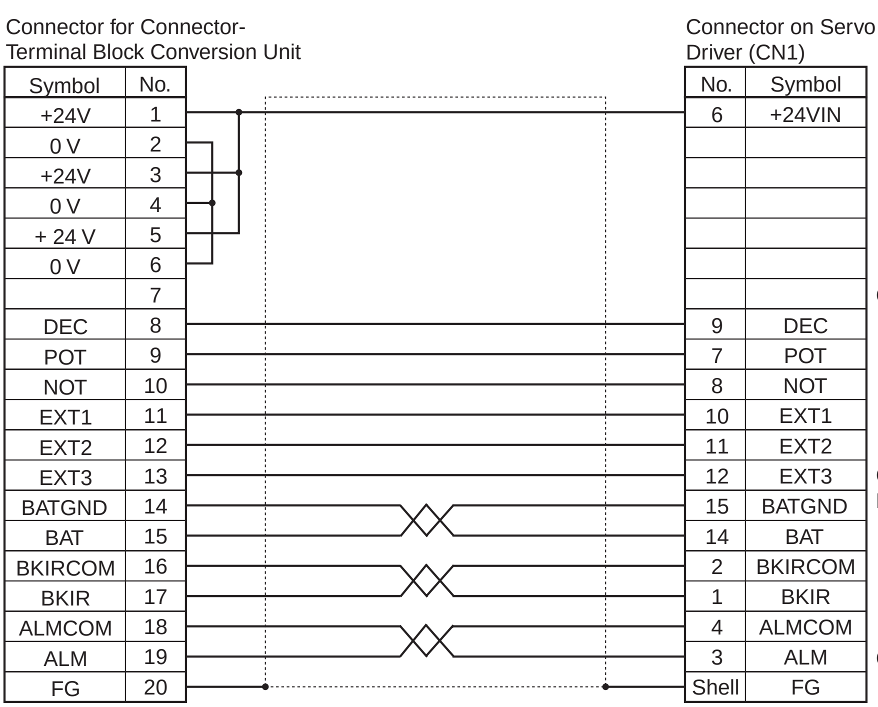
XW2Z-□J-B16

Model	Length (L)	External sheath diameter	Weight
XW2Z-100J-B16	1 m	8.0 dia.	Approx. 0.1 kg
XW2Z-200J-B16	2 m		Approx. 0.2 kg

● Connection Configuration and External Dimensions



● Wiring



Connector on Servo Driver
  Connector plug model
    10126-3000VE (Sumitomo 3M)
  Connector Case model
    10326-52A0-008 (Sumitomo 3M)

Connector on Connector-Terminal Block Conversion Unit
  Connector Socket Model
    XG4M-2030 (OMRON)
  Strain Relief Model
    XG4T-2004 (OMRON)

Cable
  AWG28 × 3P + AWG28 × 7C, UL2464

Note Set and use the signal names listed above for the Servo Driver connectors.

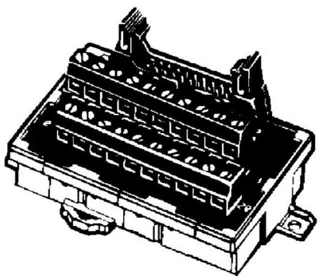
■ Connector-Terminal Block Conversion Unit (XW2B-20G□)

Control input signals from WN-series Servo Drivers (CN1) can be converted to a terminal block by using the Connector-Terminal Block Conversion Unit with the XW2Z-□J-B16 Cable for Connector-Terminal Block Conversion Units.

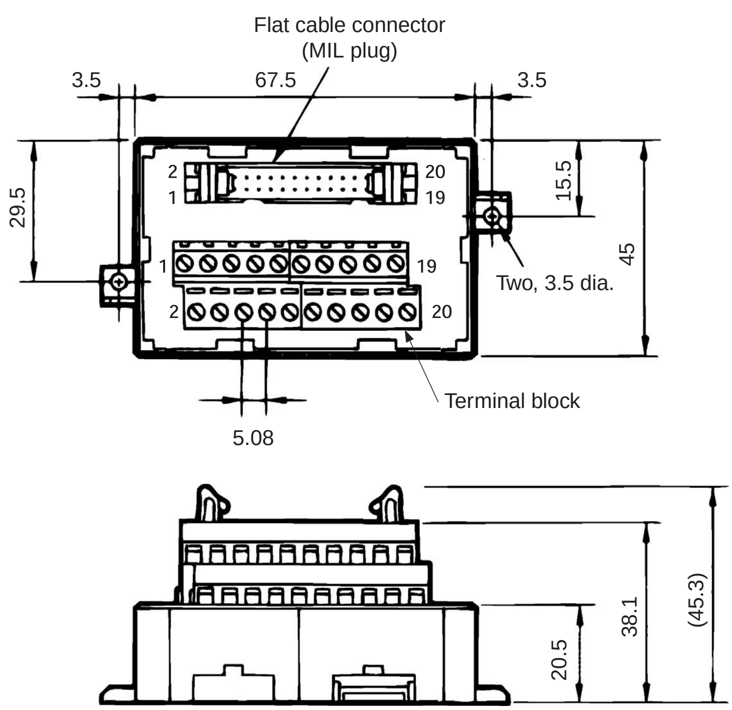
● Connector-Terminal Block Conversion Units

XW2B-20G4

The XW2B-20G4 is a Connector-Terminal Block Conversion Unit with a M3 screw terminal block.

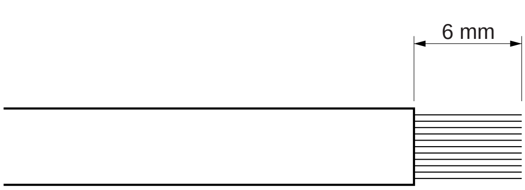


● External Dimensions



Precautions

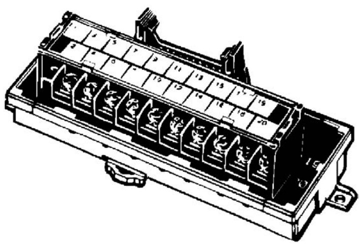
- Use 0.30 to 1.25 mm^2 wire (AWG22 to AWG16).
- The wire inlet for M3 screw terminal blocks is 1.8 × 2.5 mm (vertical × horizontal).
- Strip the sheath as shown in the following diagram.



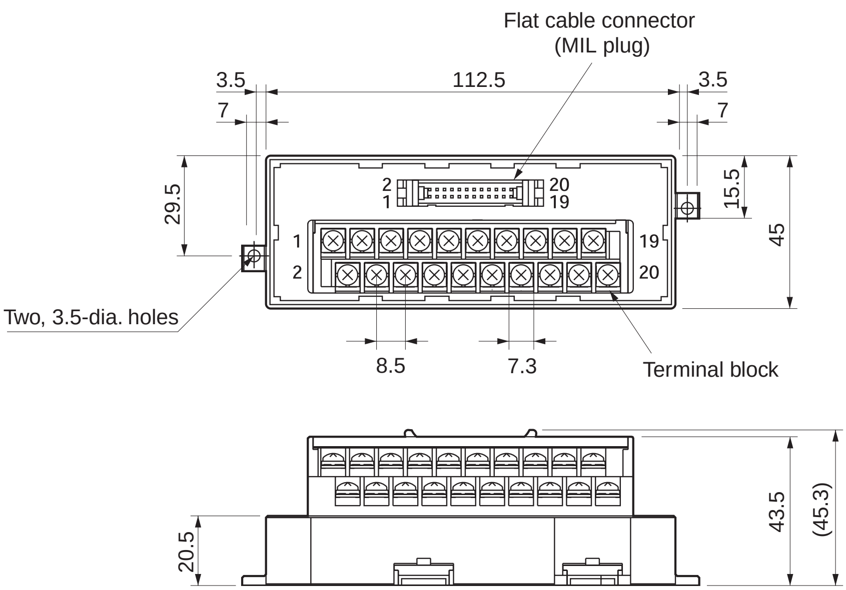
● Terminal Block Model

XW2B-20G5

The XW2B-20G5 is a Connector-Terminal Block Conversion Unit with a M3.5 screw terminal block.



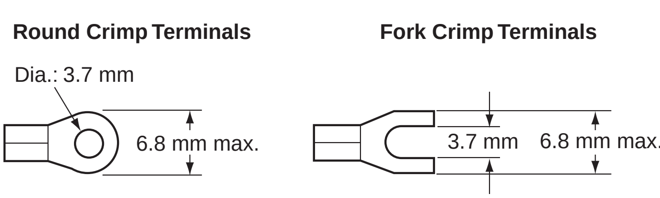
● External Dimensions



Note The terminal pitch is 8.5 mm.

Precautions

• When using crimp terminals, use crimp terminals with the following dimensions.



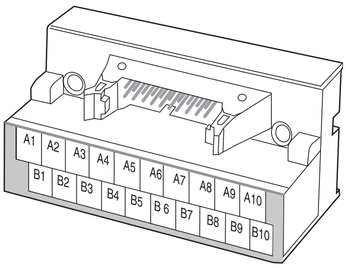
Applicable Crimp Terminals		Applicable Wires
Round Terminals	1.25 to 3	AWG22 to AWG16 (0.30 to 1.25 mm^2)
	2 to 3.5	AWG16 to AWG14 (1.25 to 2.0 mm^2)
Fork Terminals	1.25Y to 3	AWG22 to AWG16 (0.30 to 1.25 mm^2)
	2 to 3.5	AWG16 to AWG14 (1.25 to 2.0 mm^2)

• Use a tightening torque of 0.59 N·m when connecting wires and crimp terminals to the terminal block.

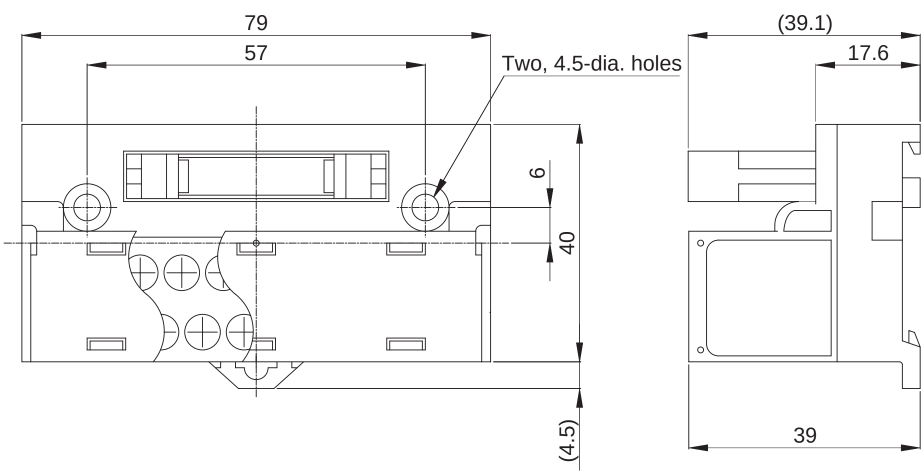
● Terminal Blocks

XW2D-20G6

The XW2D-20G6 is an M3 screw terminal block.



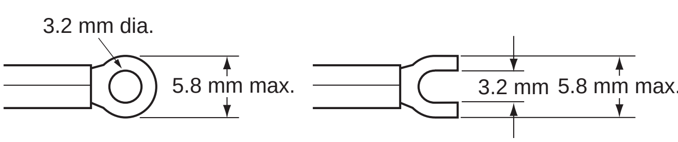
● External Dimensions



Precautions

- When using crimp terminals, use crimp terminals with the following dimensions.

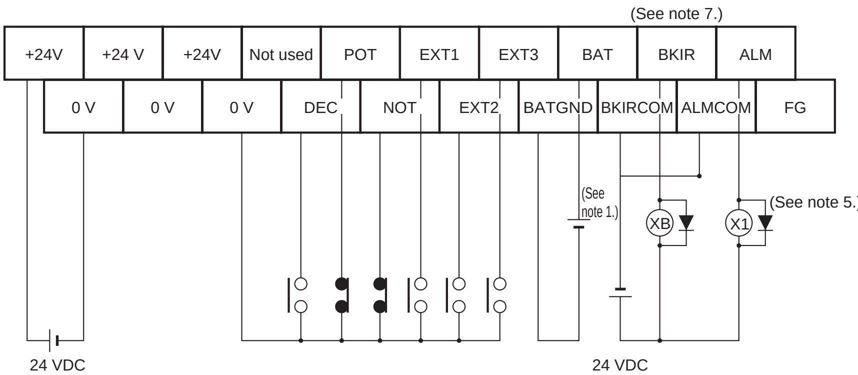
Round Crimp Terminals **Fork Crimp Terminals**



Applicable Crimp Terminals		Applicable Wires
Round Terminals	1.25 to 3	AWG22 to AWG16 (0.30 to 1.25 mm^2)
Fork Terminals	1.25Y to 3	AWG22 to AWG16 (0.30 to 1.25 mm^2)

- Use a tightening torque of 0.7 N·m when connecting wires and crimp terminals to the terminal block.

● Terminal Block Wiring Example (for XW2B-20G4/XW2B-20G5 and XW2D-20G6)



Note 1. Backup battery for absolute encoders (2.8 to 4.5 V).

Note 2. A backup battery for absolute encoders is not required for motors with incremental encoders.

Note 3. Connect a backup battery for an absolute encoder to either the Connector-Terminal Block Conversion Unit or to the battery cable for absolute encoder backup (with battery), but not to both.

Note 4. Secure the backup battery for an absolute encoder with cable clips with double-sided tape or a similar means.

Note 5. The XB contact is used to turn the electromagnetic brake ON and OFF.

Note 6. Do not wire unused terminals.

Note 7. Allocate BKIR (brake interlock) to CN1-1.

2-6-2 Motor Cable Specifications

The motor cable is used to connect the Servo Driver and Servomotor. Select the appropriate cable for the Servomotor. The maximum distance between Servo Driver and Servomotor is 50 m.

Note Use a Robot Cable if the cable needs to bend.

● Bend Resistance of Robot Cables

Robot Cables use wire that has a bending life of 20 million times when used at the minimum bending radius (R) or greater under the following conditions.

Note 1. The bending resistance data was compiled under test conditions and must be used as a guide only. An extra margin must always be allowed.

Note 2. The life expectancy is the number of uses without cracks or damage to the sheath that would affect performance while current is applied to the wire conductor. This value does not apply to cut shield strands.

Note 3. Note: If Robot Cables are used at a bending radius smaller than the minimum bending radius, mechanical malfunctions, ground faults, and other problems may occur due to insulation breakdown. Contact your OMRON representative if you need to use a Robot Cable with a bending radius smaller than the minimum bending radius.

● Power Cables

	Model	Minimum bending radius (R)
Without brake	R88A-CAWA□□□SR	55 mm
With brake	R88A-CAWA□□□BR	55 mm
Without brake	R88A-CAWB□□□SR	96 mm
With brake	R88A-CAWB□□□BR	96 mm
Without brake	R88A-CAWC□□□SR	96 mm
With brake	R88A-CAWC□□□BR	96 mm
Without brake	R88A-CAWD□□□SR	150 mm
With brake	R88A-CAWD□□□BR	150 mm

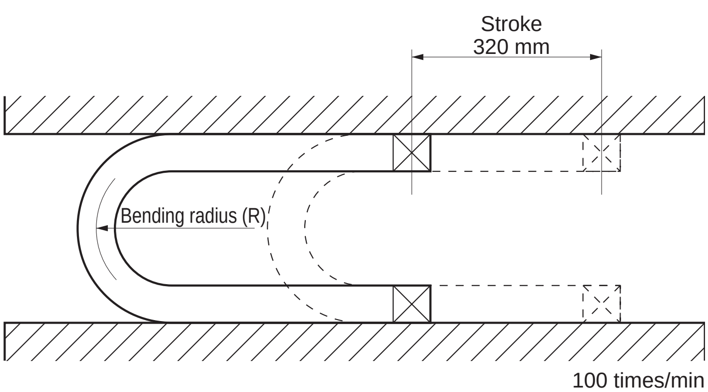
□□□: 003 to 050

● Encoder Cables

Model	Minimum bending radius (R)
R88A-CAWA□□□CR	46 mm
R88A-CAWAΔΔΔCR	78 mm
R88A-CAWB□□□NR	46 mm
R88A-CAWBΔΔΔNR	78 mm

□□□: 003 to 020
ΔΔΔ: 030 to 050

● Moving Bending Test



Standard Encoder Cable Specifications

Select an Encoder Cable to match the Servomotor being used. The cables range in length from 3 to 50 meters. (The maximum distance between the Servomotor and Servo Driver is 50 meters.)

● Cable Models

R88A-CRWA☐C

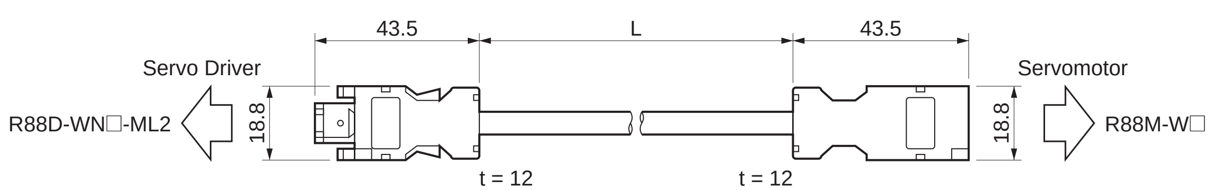
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CRWA003C	3 m	6.5 dia.	Approx. 0.2 kg
R88A-CRWA005C	5 m		Approx. 0.4 kg
R88A-CRWA010C	10 m		Approx. 0.7 kg
R88A-CRWA015C	15 m		Approx. 1.0 kg
R88A-CRWA020C	20 m		Approx. 1.3 kg
R88A-CRWA030C	30 m	6.8 dia.	Approx. 2.5 kg
R88A-CRWA040C	40 m		Approx. 3.3 kg
R88A-CRWA050C	50 m		Approx. 4.1 kg

R88A-CRWB☐N

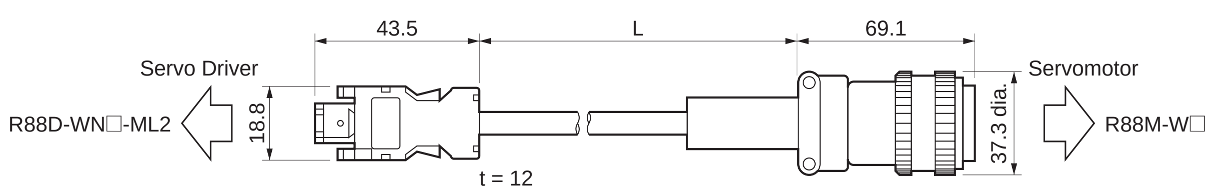
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CRWB003N	3 m	6.5 dia.	Approx. 0.4 kg
R88A-CRWB005N	5 m		Approx. 0.5 kg
R88A-CRWB010N	10 m		Approx. 0.8 kg
R88A-CRWB015N	15 m		Approx. 1.1 kg
R88A-CRWB020N	20 m		Approx. 1.4 kg
R88A-CRWB030N	30 m	6.8 dia.	Approx. 2.6 kg
R88A-CRWB040N	40 m		Approx. 3.4 kg
R88A-CRWB050N	50 m		Approx. 4.2 kg

● Connection Configuration and External Dimensions

R88A-CRWA☐C



R88A-CRWB☐N



● Wiring

R88A-CRWA☐C

Cable:
AWG22 × 2C + AWG24 × 2P UL20276 (3 to 20 m)
AWG16 × 2C + AWG26 × 2P UL20276 (30 to 50 m)

Servo Driver Signal	No.	Wire	Servomotor No.	Signal
E5V	1	Red	1	E5V
E0V	2	Black	2	E0V
BAT+	3	Orange	3	BAT+
BAT–	4	Orange/White	4	BAT–
S+	5	Open	5	S+
S–	6	Open/White	6	S–
FG	Shell		Shell	FG

Connector plug: 3 to 20 m ... 55101-0600 (Molex Japan)
30 to 50 m ... 55100-0670 (Molex Japan)
Crimp terminal: 50639-8091 (Molex Japan)

Cable
Connector socket:
54280-0609 (Molex Japan)
Servomotor
Connector plug:
55102-0600 (Molex Japan)

R88A-CRWB☐N

Cable:
AWG22 × 2C + AWG24 × 2P UL20276 (3 to 20 m)
AWG16 × 2C + AWG26 × 2P UL20276 (30 to 50 m)

Servo Driver Signal	No.	Wire	Servomotor No.	Signal
E5V	1	Red	H	E5V
E0V	2	Black	G	E0V
BAT+	3	Orange	T	BAT+
BAT–	4	Orange/White	S	BAT–
S+	5	Open	C	S+
S–	6	Open/White	D	S–
FG	Shell		J	FG

Connector plug: 3 to 20 m ... 55101-0600 (Molex Japan)
30 to 50 m ... 55100-0670 (Molex Japan)
Crimp terminal: 50639-8091 (Molex Japan)

Cable
Straight plug:
N/MS3106B20-29S (JAE Ltd.)
Cable plug:
N/MS3057-12A (JAE Ltd.)
Servomotor
Receptacle:
MS3102A20-29P (DDK Ltd.)

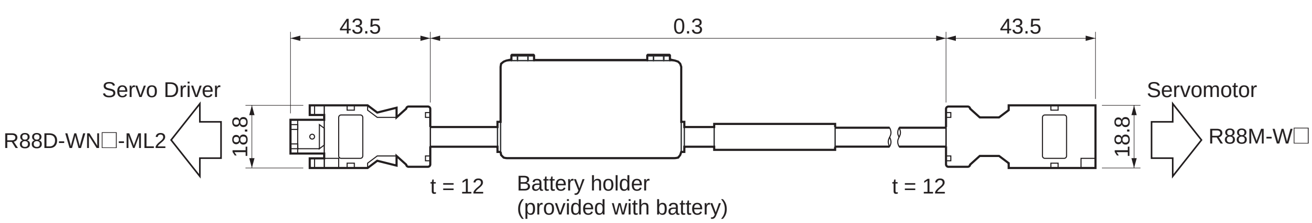
Absolute Encoder Battery Cable Specifications [ABS]

● Cable Models

Model	Length (L)
R88A-CRWC0R3C	0.3 m

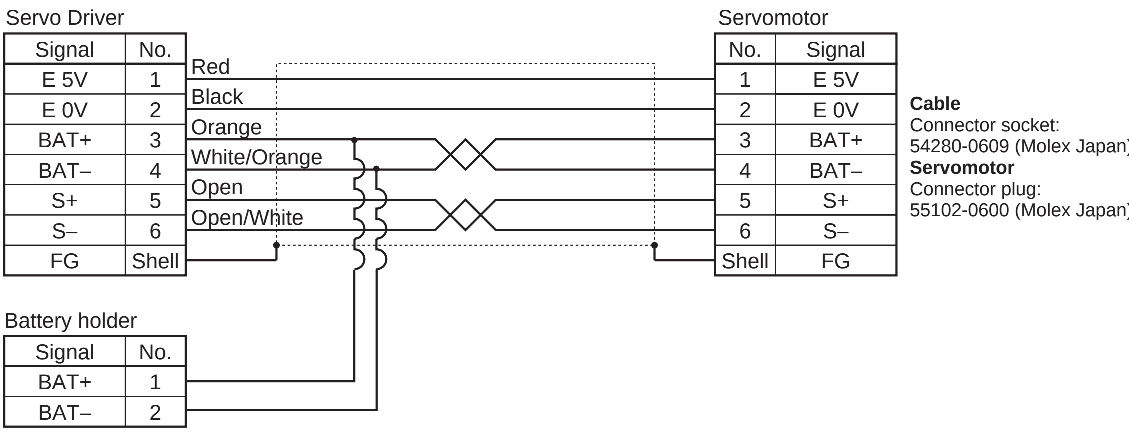
● Connection Configuration and External Dimensions

R88A-CRWC0R3C



● Wiring

R88A-CRWC0R3C



Connector plug: 3 to 20 m ... 55101-0600 (Molex Japan)
30 to 50 m ... 55100-0670 (Molex Japan)
Crimp terminal: 50639-8091 (Molex Japan)

Standard Power Cable Specifications

Select a Power Cable to match the Servomotor being used. The cables range in length from 3 to 50 meters. (The maximum distance between the Servomotor and Servo Driver is 50 meters.)

■ R88A-CAWA☐

The R88A-CAWA☐ Cables are for 3,000-r/min Servomotors (30 to 750 W) and 3,000-r/min Flat-style Servomotors (100 to 750 W).

● Cable Models

For Servomotors without Brakes

Model	Length (L)	Outer diameter of sheath	Weight
R88A-CRWA003S	3 m	6.2 dia.	Approx. 0.2 kg
R88A-CRWA005S	5 m		Approx. 0.3 kg
R88A-CRWA010S	10 m		Approx. 0.6 kg
R88A-CRWA015S	15 m		Approx. 0.9 kg
R88A-CRWA020S	20 m		Approx. 1.2 kg
R88A-CRWA030S	30 m		Approx. 1.8 kg
R88A-CRWA040S	40 m		Approx. 2.4 kg
R88A-CRWA050S	50 m		Approx. 3.0 kg

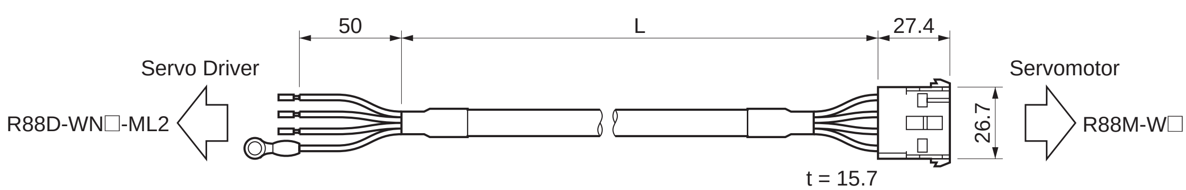
For Servomotors with Brakes

Model	Length (L)	Outer diameter of sheath	Weight
R88A-CRWA003B	3 m	7.4 dia.	Approx. 0.3 kg
R88A-CRWA005B	5 m		Approx. 0.5 kg
R88A-CRWA010B	10 m		Approx. 0.9 kg
R88A-CRWA015B	15 m		Approx. 1.3 kg
R88A-CRWA020B	20 m		Approx. 1.7 kg
R88A-CRWA030B	30 m		Approx. 2.5 kg
R88A-CRWA040B	40 m		Approx. 3.3 kg
R88A-CRWA050B	50 m		Approx. 4.1 kg

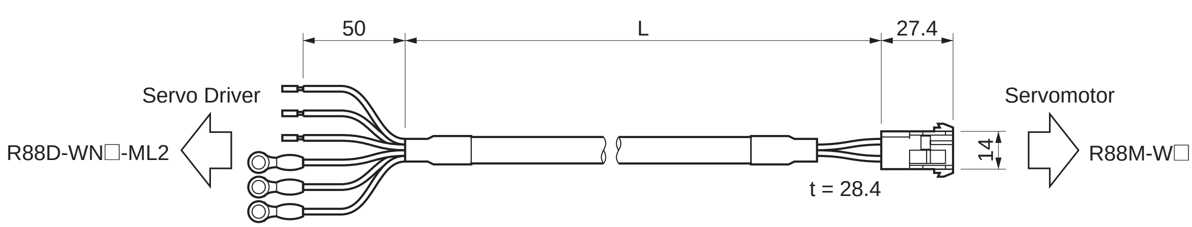
Note If a 750-W Servomotor is to be wired at a distance of 30 meters or more, use R88A-CAWB□□ Cable.

● Connection Configuration and External Dimensions

For Servomotors without Brakes

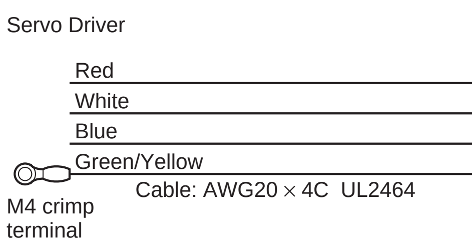


For Servomotors with Brakes



● Wiring

For Servomotors without Brakes

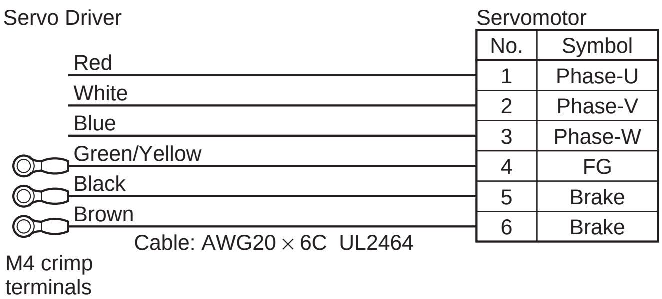


Servomotor

No.	Symbol
1	Phase-U
2	Phase-V
3	Phase-W
4	FG

Cable
Connector cap: 350780-1 (Tyco Electronics AMP KK)
Connector socket: 350689-3 (Tyco Electronics AMP KK)
Servomotor
Connector plug: 350779-1 (Tyco Electronics AMP KK)
Connector pins 1 to 3: 350690-3 (Tyco Electronics AMP KK)
Connector pin 4: 770210-1 (Tyco Electronics AMP KK)

For Servomotors with Brakes



Cable
Connector cap: 350781-1 (Tyco Electronics AMP KK)
Connector socket: 350689-3 (Tyco Electronics AMP KK)
Servomotor
Connector plug: 350715-1 (Tyco Electronics AMP KK)
Connector pins 1 to 3, 5, 6: 350690-3 (Tyco Electronics AMP KK)
Connector pin 4: 770210-1 (Tyco Electronics AMP KK)

■ R88A-CAWB☐

The R88A-CAWB☐ Cables are for 3,000-r/min Flat-style Servomotors (1.5 kW).

● Cable Models

For Servomotors without Brakes

Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWB003S	3 m	10.4 dia.	Approx. 0.6 kg
R88A-CAWB005S	5 m		Approx. 1.0 kg
R88A-CAWB010S	10 m		Approx. 1.9 kg
R88A-CAWB015S	15 m		Approx. 2.8 kg
R88A-CAWB020S	20 m		Approx. 3.7 kg
R88A-CAWB030S	30 m		Approx. 5.5 kg
R88A-CAWB040S	40 m		Approx. 7.3 kg
R88A-CAWB050S	50 m		Approx. 9.2 kg

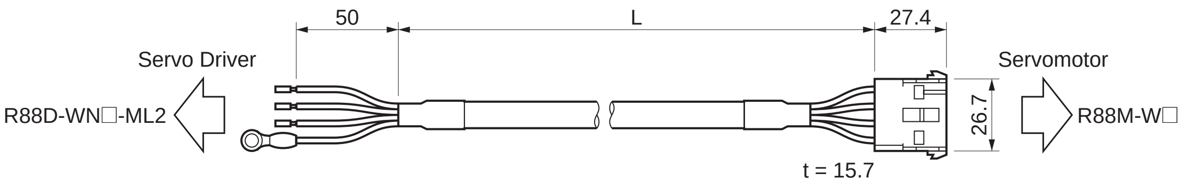
For Servomotors with Brakes

Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWB003B	3 m	14.5 dia.	Approx. 1.0 kg
R88A-CAWB005B	5 m		Approx. 1.6 kg
R88A-CAWB010B	10 m		Approx. 3.2 kg
R88A-CAWB015B	15 m		Approx. 4.8 kg
R88A-CAWB020B	20 m		Approx. 6.4 kg
R88A-CAWB030B	30 m		Approx. 9.5 kg
R88A-CAWB040B	40 m		Approx. 12.7 kg
R88A-CAWB050B	50 m		Approx. 15.8 kg

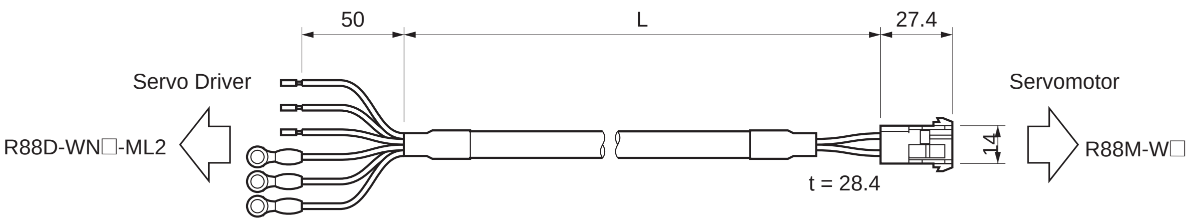
Note Use these cables if a 750-W Servomotor is to be wired at a distance of 30 meters or more.

● Connection Configuration and External Dimensions

For Servomotors without Brakes



For Servomotors with Brakes



● Wiring

For Servomotors without Brakes

Servo Driver — Servomotor

Red, White, Blue, Green/Yellow

M4 crimp terminal

Cable: AWG14 × 4C UL2463

No.	Symbol
1	Phase-U
2	Phase-V
3	Phase-W
4	FG

Cable
Connector cap: 350780-1 (Tyco Electronics AMP KK)
Connector socket:
Pins 1 to 3: 350551-6 (Tyco Electronics AMP KK)
Pin 4: 350551-3 (Tyco Electronics AMP KK)
Servomotor
Connector plug: 350779-1 (Tyco Electronics AMP KK)
Connector pins 1 to 3: 350547-6 (Tyco Electronics AMP KK)
Connector pin 4: 350669-1 (Tyco Electronics AMP KK)

For Servomotors with Brakes

Servo Drivers — Servomotors

Red, White, Blue, Green/Yellow, Black, Brown

M4 crimp terminals

Cable: AWG14 × 6C UL2463

No.	Symbol
1	Phase-U
2	Phase-V
3	Phase-W
4	FG
5	Brake
6	Brake

Cable
Connector plug: 350781-1 (Tyco Electronics AMP KK)
Connector socket:
Pins 1 to 3: 350551-6 (Tyco Electronics AMP KK)
Pins 4 to 6: 350551-3 (Tyco Electronics AMP KK)
Servomotor
Connector plug: 350715-1 (Tyco Electronics AMP KK)
Connector pins 1 to 3: 350547-6 (Tyco Electronics AMP KK)
Connector pin 4: 350669-1 (Tyco Electronics AMP KK)
Connector pins 5 and 6: 350690-3 (Tyco Electronics AMP KK)

■ R88A-CAWC☐

The R88A-CAWC☐ Cables are for 3,000-r/min Servomotors (1 to 2 kW), 1,000-r/min Servomotors (300 to 900 W), and 1,500-r/min Servomotors (450 W to 1.3 kW).

● Cable Models

For Servomotors without Brakes

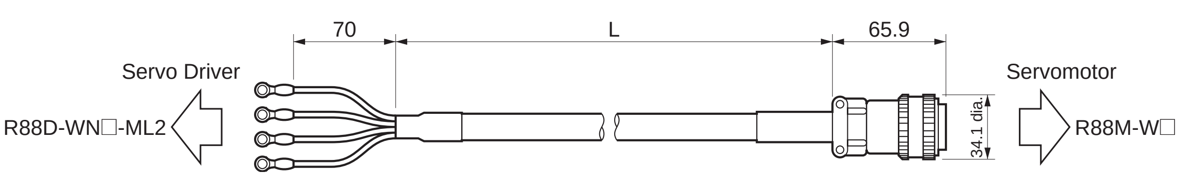
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWC003S	3 m	10.4 dia.	Approx. 0.6 kg
R88A-CAWC005S	5 m		Approx. 1.0 kg
R88A-CAWC010S	10 m		Approx. 1.9 kg
R88A-CAWC015S	15 m		Approx. 2.8 kg
R88A-CAWC020S	20 m		Approx. 3.7 kg
R88A-CAWC030S	30 m		Approx. 5.6 kg
R88A-CAWC040S	40 m		Approx. 7.4 kg
R88A-CAWC050S	50 m		Approx. 9.2 kg

For Servomotors with Brakes

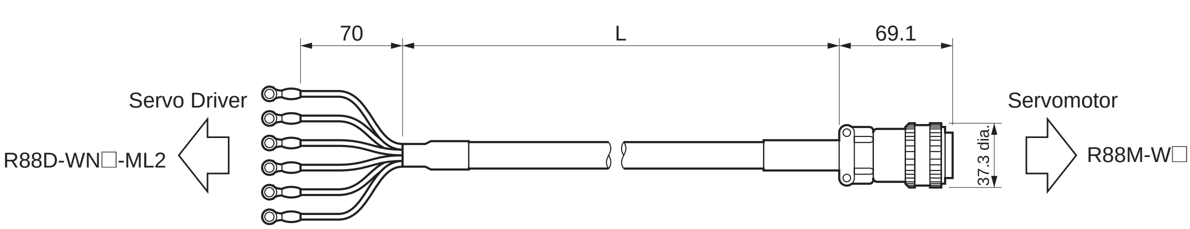
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWC003B	3 m	14.5 dia.	Approx. 1.1 kg
R88A-CAWC005B	5 m		Approx. 1.7 kg
R88A-CAWC010B	10 m		Approx. 3.3 kg
R88A-CAWC015B	15 m		Approx. 4.9 kg
R88A-CAWC020B	20 m		Approx. 6.4 kg
R88A-CAWC030B	30 m		Approx. 9.6 kg
R88A-CAWC040B	40 m		Approx. 12.7 kg
R88A-CAWC050B	50 m		Approx. 15.9 kg

● Connection Configuration and External Dimensions

For Servomotors without Brakes

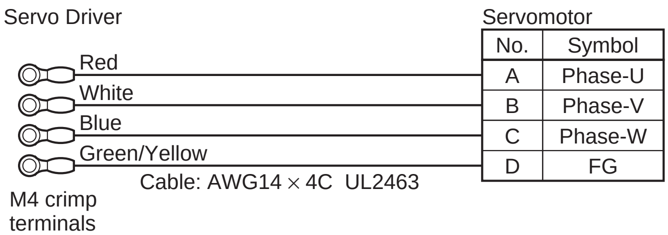


For Servomotors with Brakes



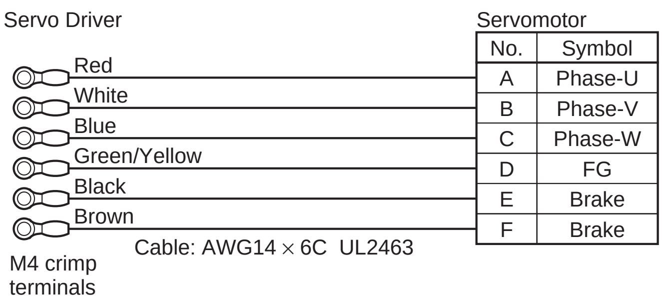
● Wiring

For Servomotors without Brakes



Cable
Straight plug: N/MS3106B18-10S (JAE Ltd.)
Cable clamp: N/MS3057-10A (JAE Ltd.)
Servomotor
Receptacle: MS3102A18-10P (DDK Ltd.)

For Servomotors with Brakes



Cable
Straight plug: N/MS3106B20-15S (JAE Ltd.)
Cable clamp: N/MS3057-12A (JAE Ltd.)
Servomotor
Receptacle: MS3102A20-15P (DDK Ltd.)

Note Connector-type terminal blocks are used for Servo Drivers of 1.5 kW or less, as shown in *Terminal Block Wiring Procedure* under *3-2-3 Terminal Block Wiring*. Remove the crimp terminals from the phase-U, phase-V, and phase-W wires for these Servo Drivers.

■ R88A-CAWD☐

The R88A-CAWD☐ Cables are for 3,000-r/min Servomotors (3 to 5 kW), 1,000-r/min Servomotors (1.2 to 3 kW), and 1,500-r/min Servomotors (1.8 to 4.4 kW).

● Cable Models

For Servomotors without Brakes

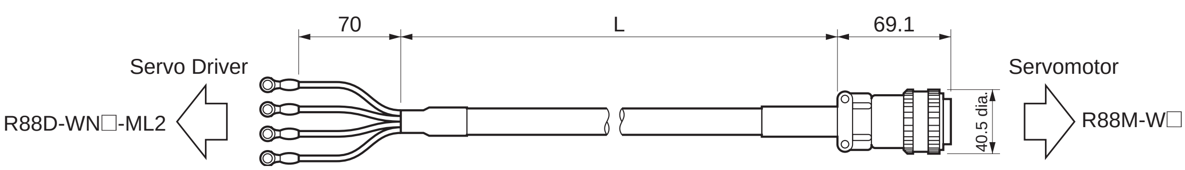
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWD003S	3 m	14.7 dia.	Approx. 1.3 kg
R88A-CAWD005S	5 m		Approx. 2.1 kg
R88A-CAWD010S	10 m		Approx. 4.1 kg
R88A-CAWD015S	15 m		Approx. 6.0 kg
R88A-CAWD020S	20 m		Approx. 8.0 kg
R88A-CAWD030S	30 m		Approx. 11.9 kg
R88A-CAWD040S	40 m		Approx. 15.8 kg
R88A-CAWD050S	50 m		Approx. 19.7 kg

For Servomotors with Brakes

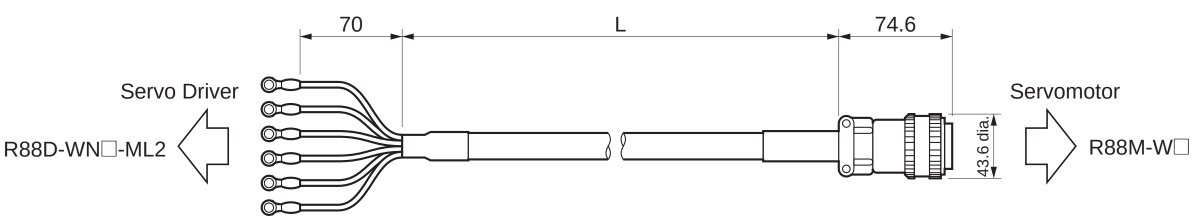
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWD003B	3 m	17.8 dia.	Approx. 1.9 kg
R88A-CAWD005B	5 m		Approx. 3.0 kg
R88A-CAWD010B	10 m		Approx. 5.8 kg
R88A-CAWD015B	15 m		Approx. 8.6 kg
R88A-CAWD020B	20 m		Approx. 11.4 kg
R88A-CAWD030B	30 m		Approx. 17.0 kg
R88A-CAWD040B	40 m		Approx. 22.6 kg
R88A-CAWD050B	50 m		Approx. 28.2 kg

● Connection Configuration and External Dimensions

For Servomotors without Brakes

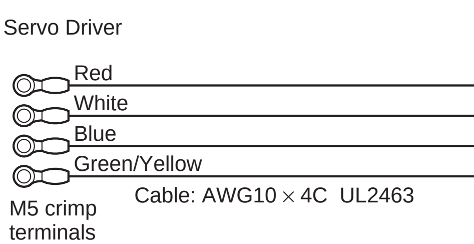


For Servomotors with Brakes



● Wiring

For Servomotors without Brakes

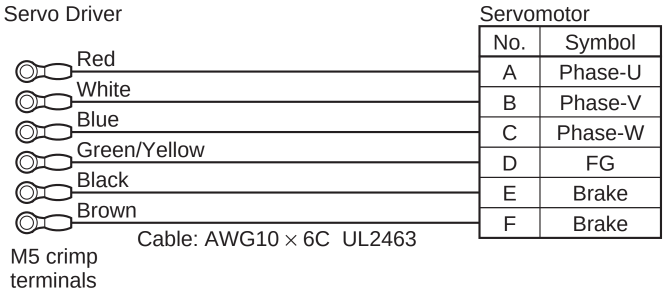


Servomotor

No.	Symbol
A	Phase-U
B	Phase-V
C	Phase-W
D	FG

Cable
Straight plug: N/MS3106B22-22S (JAE Ltd.)
Cable clamp: N/MS3057-12A (JAE Ltd.)
Servomotor
Receptacle: MS3102A22-22P (DDK Ltd.)

For Servomotors with Brakes



Cable
Straight plug: N/MS3106B24-10S (JAE Ltd.)
Cable clamp: N/MS3057-16A (JAE Ltd.)
Servomotor
Receptacle: MS3102A24-10P (DDK Ltd.)

Note Connector-type terminal blocks are used for Servo Drivers of 1.5 kW or less, as shown in *Terminal Block Wiring Procedure* under *3-2-3 Terminal Block Wiring*. Remove the crimp terminals from the phase-U, phase-V, and phase-W wires for these Servo Drivers.

Robot Cable Encoder Cable Specifications

Select an Encoder Cable to match the Servomotor being used. The cables range in length from 3 to 50 meters. (The maximum distance between the Servomotor and Servo Driver is 50 meters.)

● Cable Models

R88A-CRWA☐CR

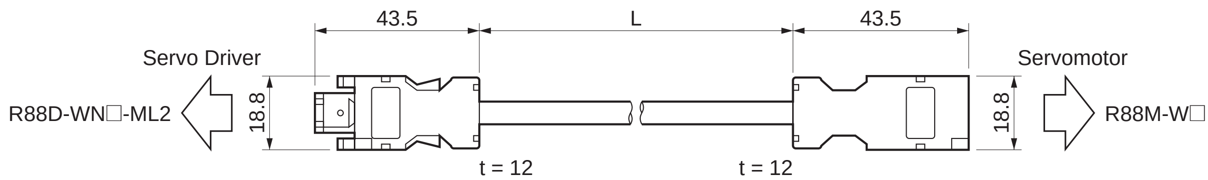
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CRWA003CR	3 m	7.0 dia.	Approx. 0.2 kg
R88A-CRWA005CR	5 m		Approx. 0.3 kg
R88A-CRWA010CR	10 m		Approx. 0.6 kg
R88A-CRWA015CR	15 m		Approx. 0.9 kg
R88A-CRWA020CR	20 m		Approx. 1.2 kg
R88A-CRWA030CR	30 m	6.7 dia.	Approx. 1.8 kg
R88A-CRWA040CR	40 m		Approx. 2.4 kg
R88A-CRWA050CR	50 m		Approx. 3.0 kg

R88A-CRWB☐NR

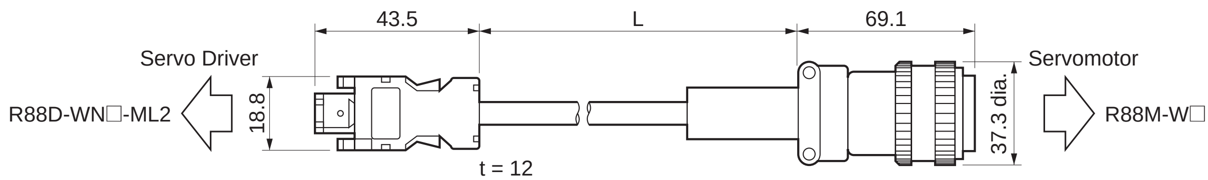
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CRWB003NR	3 m	6.5 dia.	Approx. 0.3 kg
R88A-CRWB005NR	5 m		Approx. 0.4 kg
R88A-CRWB010NR	10 m		Approx. 0.7 kg
R88A-CRWB015NR	15 m		Approx. 1.0 kg
R88A-CRWB020NR	20 m		Approx. 1.3 kg
R88A-CRWB030NR	30 m	6.8 dia.	Approx. 1.9 kg
R88A-CRWB040NR	40 m		Approx. 2.5 kg
R88A-CRWB050NR	50 m		Approx. 3.1 kg

● Connection Configuration and External Dimensions

R88A-CRWA☐CR



R88A-CRWB☐NR



● Wiring

R88A-CRWA☐CR

Cable:
AWG22 × 2C + AWG24 × 2P UL20276 (3 to 20 m)
AWG16 × 2C + AWG26 × 2P UL20276 (30 to 50 m)

Servo Driver Signal	No.	Wire	Servomotor No.	Signal
E5V	1	Red	1	E5V
E0V	2	Black	2	E0V
BAT+	3	Orange	3	BAT+
BAT–	4	Orange/White	4	BAT–
S+	5	Open	5	S+
S–	6	Open/White	6	S–
FG	Shell		Shell	FG

Connector plug: 55100-0670 (Molex Japan)
Crimp terminal: 50639-8091 (Molex Japan)

Cable
Connector socket:
54280-0609 (Molex Japan)
Servomotor
Connector plug:
55102-0600 (Molex Japan)

R88A-CRWB☐NR

Cable:
AWG22 × 2C + AWG24 × 2P UL20276 (3 to 20 m)
AWG16 × 2C + AWG26 × 2P UL20276 (30 to 50 m)

Servo Driver Signal	No.	Wire	Servomotor No.	Signal
E5V	1	Red	H	E5V
E0V	2	Black	G	E0V
BAT+	3	Orange	T	BAT+
BAT–	4	Orange/White	S	BAT–
S+	5	Open	C	S+
S–	6	Open/White	D	S–
FG	Shell		J	FG

Connector plug: 55100-0670 (Molex Japan)
Crimp terminal: 50639-8091 (Molex Japan)

Cable
Straight plug:
N/MS3106B20-29S (JAE Ltd.)
Cable plug:
N/MS3057-12A (JAE Ltd.)
Servomotor
Receptacle:
MS3102A20-29P (DDK Ltd.)

Robot Cable Power Cable Specifications

Select a Power Cable to match the Servomotor being used. The cables range in length from 3 to 50 meters. (The maximum distance between the Servomotor and Servo Driver is 50 meters.)

■ R88A-CAWA☐R

The R88A-CAWA☐R Cables are for 3,000-r/min Servomotors (30 to 750 W) and 3,000-r/min Flat-style Servomotors (100 to 750 W).

● Cable Models

For Servomotors without Brakes

Model	Length (L)	Outer diameter of sheath	Weight
R88A-CRWA003SR	3 m	6.5 dia.	Approx. 0.2 kg
R88A-CRWA005SR	5 m		Approx. 0.3 kg
R88A-CRWA010SR	10 m		Approx. 0.6 kg
R88A-CRWA015SR	15 m		Approx. 0.8 kg
R88A-CRWA020SR	20 m		Approx. 1.1 kg
R88A-CRWA030SR	30 m		Approx. 1.7 kg
R88A-CRWA040SR	40 m		Approx. 2.2 kg
R88A-CRWA050SR	50 m		Approx. 2.8 kg

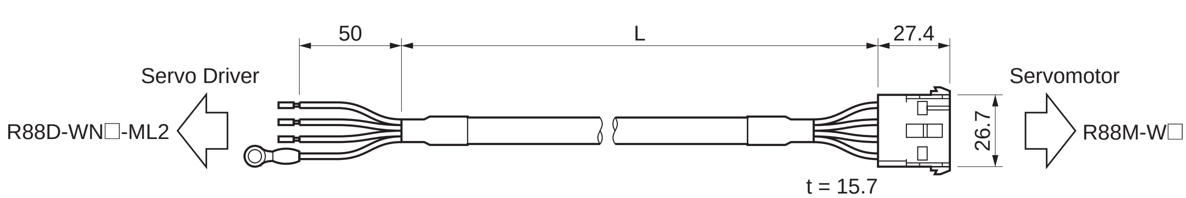
For Servomotors with Brakes

Model	Length (L)	Outer diameter of sheath	Weight
R88A-CRWA003BR	3 m	7.0 dia.	Approx. 0.2 kg
R88A-CRWA005BR	5 m		Approx. 0.4 kg
R88A-CRWA010BR	10 m		Approx. 0.8 kg
R88A-CRWA015BR	15 m		Approx. 1.1 kg
R88A-CRWA020BR	20 m		Approx. 1.5 kg
R88A-CRWA030BR	30 m		Approx. 2.3 kg
R88A-CRWA040BR	40 m		Approx. 3.0 kg
R88A-CRWA050BR	50 m		Approx. 3.8 kg

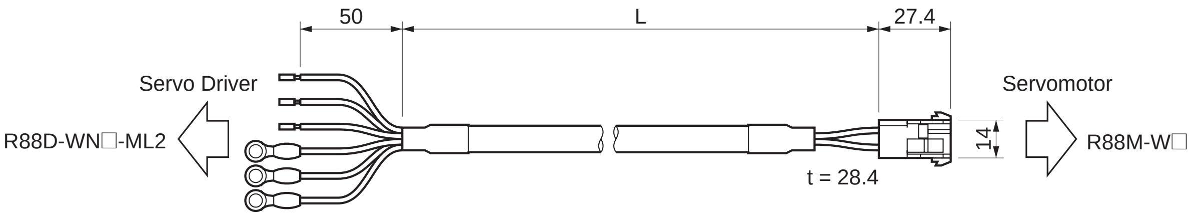
Note If a 750-W Servomotor is to be wired at a distance of 30 meters or more, use R88A-CAWB☐R Cable.

● Connection Configuration and External Dimensions

For Servomotors without Brakes

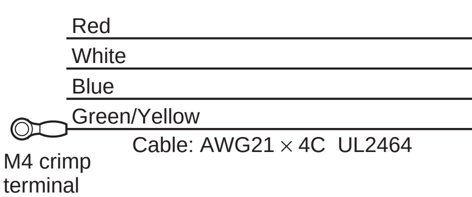


For Servomotors with Brakes



● Wiring

For Servomotors without Brakes

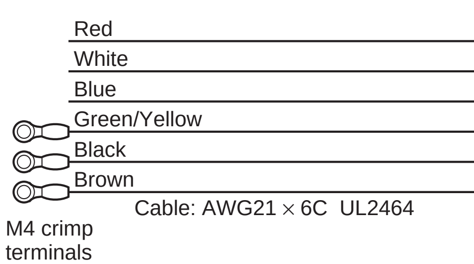


Servomotor

No.	Symbol
1	Phase-U
2	Phase-V
3	Phase-W
4	FG

Cable
Connector cap: 350780-1 (Tyco Electronics AMP KK)
Connector socket: 350689-3 (Tyco Electronics AMP KK)
Servomotor
Connector plug: 350779-1 (Tyco Electronics AMP KK)
Connector pins 1 to 3: 350690-3 (Tyco Electronics AMP KK)
Connector pin 4: 770210-1 (Tyco Electronics AMP KK)

For Servomotors with Brakes



Servomotor

No.	Symbol
1	Phase-U
2	Phase-V
3	Phase-W
4	FG
5	Brake
6	Brake

Cable
Connector cap: 350781-1 (Tyco Electronics AMP KK)
Connector socket: 350689-3 (Tyco Electronics AMP KK)
Servomotor
Connector plug: 350715-1 (Tyco Electronics AMP KK)
Connector pins 1 to 3, 5, 6: 350690-3 (Tyco Electronics AMP KK)
Connector pin 4: 770210-1 (Tyco Electronics AMP KK)

■ R88A-CAWB☐R

The R88A-CAWB☐R Cables are for 3,000-r/min Flat-style Servomotors (1.5 kW).

● Cable Models

For Servomotors without Brakes

Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWB003SR	3 m	9.5 dia.	Approx. 0.5 kg
R88A-CAWB005SR	5 m		Approx. 0.8 kg
R88A-CAWB010SR	10 m		Approx. 1.5 kg
R88A-CAWB015SR	15 m		Approx. 2.2 kg
R88A-CAWB020SR	20 m		Approx. 3.0 kg
R88A-CAWB030SR	30 m		Approx. 4.5 kg
R88A-CAWB040SR	40 m		Approx. 5.9 kg
R88A-CAWB050SR	50 m		Approx. 7.4 kg

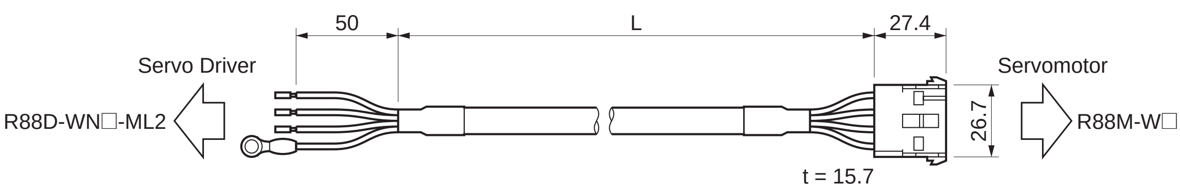
For Servomotors with Brakes

Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWB003BR	3 m	11.5 dia.	Approx. 0.7 kg
R88A-CAWB005BR	5 m		Approx. 1.1 kg
R88A-CAWB010BR	10 m		Approx. 2.2 kg
R88A-CAWB015BR	15 m		Approx. 3.3 kg
R88A-CAWB020BR	20 m		Approx. 4.4 kg
R88A-CAWB030BR	30 m		Approx. 6.6 kg
R88A-CAWB040BR	40 m		Approx. 8.8 kg
R88A-CAWB050BR	50 m		Approx. 11.0 kg

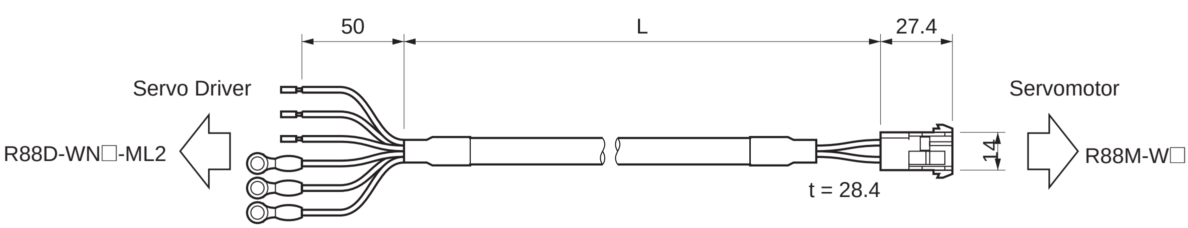
Note Use these cables if a 750-W Servomotor is to be wired at a distance of 30 meters or more.

● Connection Configuration and External Dimensions

For Servomotors without Brakes

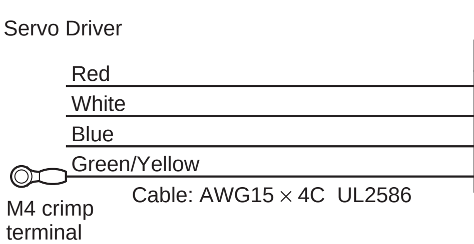


For Servomotors with Brakes



● Wiring

For Servomotors without Brakes

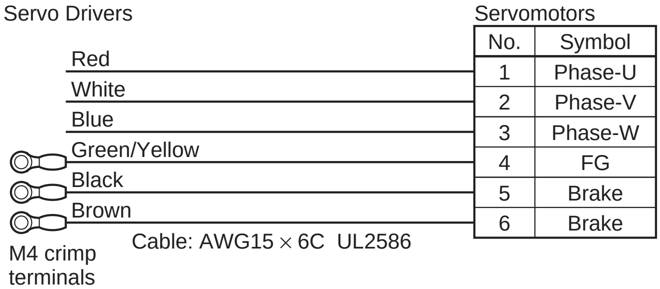


Servomotor

No.	Symbol
1	Phase-U
2	Phase-V
3	Phase-W
4	FG

Cable
Connector cap: 350780-1 (Tyco Electronics AMP KK)
Connector socket:
Pins 1 to 3: 350550-6 (Tyco Electronics AMP KK)
Pin 4: 350551-3 (Tyco Electronics AMP KK)
Servomotor
Connector plug: 350779-1 (Tyco Electronics AMP KK)
Connector pins 1 to 3: 350547-6 (Tyco Electronics AMP KK)
Connector pin 4: 350669-1 (Tyco Electronics AMP KK)

For Servomotors with Brakes



Cable
Connector plug: 350781-1 (Tyco Electronics AMP KK)
Connector socket:
Pins 1 to 3: 350550-6 (Tyco Electronics AMP KK)
Pins 4 to 6: 350550-3 (Tyco Electronics AMP KK)
Servomotor
Connector plug: 350715-1 (Tyco Electronics AMP KK)
Connector pins 1 to 3: 350547-6 (Tyco Electronics AMP KK)
Connector pin 4: 350669-1 (Tyco Electronics AMP KK)
Connector pins 5 and 6: 350690-3 (Tyco Electronics AMP KK)

■ R88A-CAWC☐R

The R88A-CAWC☐R Cables are for 3,000-r/min Servomotors (1 to 2 kW), 1,000-r/min Servomotors (300 to 900 W), and 1,500-r/min Servomotors (450 W to 1.3 kW).

● Cable Models

For Servomotors without Brakes

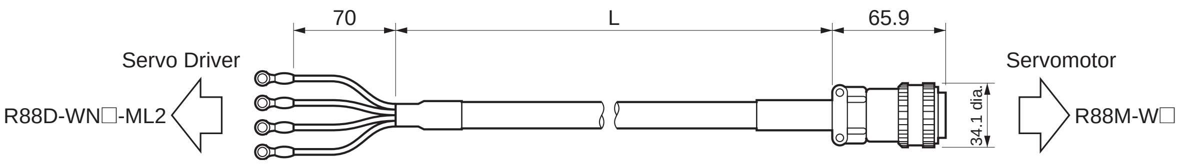
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWC003SR	3 m	9.5 dia.	Approx. 0.6 kg
R88A-CAWC005SR	5 m		Approx. 0.9 kg
R88A-CAWC010SR	10 m		Approx. 1.6 kg
R88A-CAWC015SR	15 m		Approx. 2.4 kg
R88A-CAWC020SR	20 m		Approx. 3.1 kg
R88A-CAWC030SR	30 m		Approx. 4.6 kg
R88A-CAWC040SR	40 m		Approx. 6.1 kg
R88A-CAWC050SR	50 m		Approx. 7.5 kg

For Servomotors with Brakes

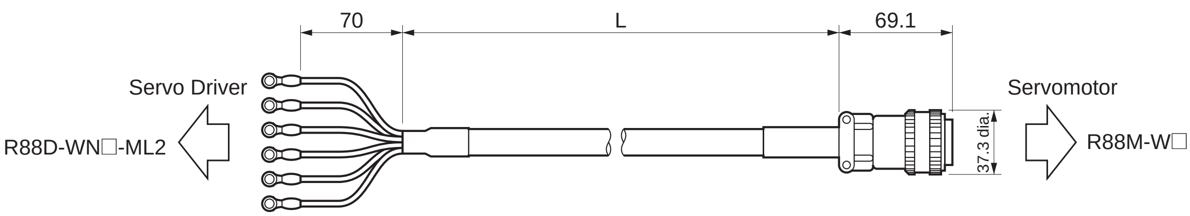
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWC003BR	3 m	11.5 dia.	Approx. 0.8 kg
R88A-CAWC005BR	5 m		Approx. 1.3 kg
R88A-CAWC010BR	10 m		Approx. 2.4 kg
R88A-CAWC015BR	15 m		Approx. 3.5 kg
R88A-CAWC020BR	20 m		Approx. 4.6 kg
R88A-CAWC030BR	30 m		Approx. 6.8 kg
R88A-CAWC040BR	40 m		Approx. 9.0 kg
R88A-CAWC050BR	50 m		Approx. 11.2 kg

● Connection Configuration and External Dimensions

For Servomotors without Brakes

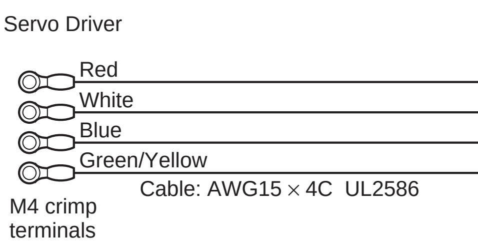


For Servomotors with Brakes



● Wiring

For Servomotors without Brakes

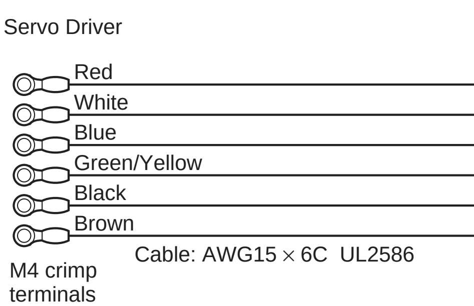


Servomotor

No.	Symbol
A	Phase-U
B	Phase-V
C	Phase-W
D	FG

Cable
Straight plug: N/MS3106B18-10S (JAE Ltd.)
Cable clamp: N/MS3057-10A (JAE Ltd.)
Servomotor
Receptacle: MS3102A18-10P (DDK Ltd.)

For Servomotors with Brakes



Servomotor

No.	Symbol
A	Phase-U
B	Phase-V
C	Phase-W
D	FG
E	Brake
F	Brake

Cable
Straight plug: N/MS3106B20-15S (JAE Ltd.)
Cable clamp: N/MS3057-12A (JAE Ltd.)
Servomotor
Receptacle: MS3102A20-15P (DDK Ltd.)

Note Connector-type terminal blocks are used for Servo Drivers of 1.5 kW or less, as shown in *Terminal Block Wiring Procedure* under *3-2-3 Terminal Block Wiring*. Remove the crimp terminals from the phase-U, phase-V, and phase-W wires for these Servo Drivers.

■ R88A-CAWD☐R

The R88A-CAWD☐R Cables are for 3,000-r/min Servomotors (3 to 5 kW), 1,000-r/min Servomotors (1.2 to 3 kW), and 1,500-r/min Servomotors (1.8 to 4.4 kW).

● Cable Models

For Servomotors without Brakes

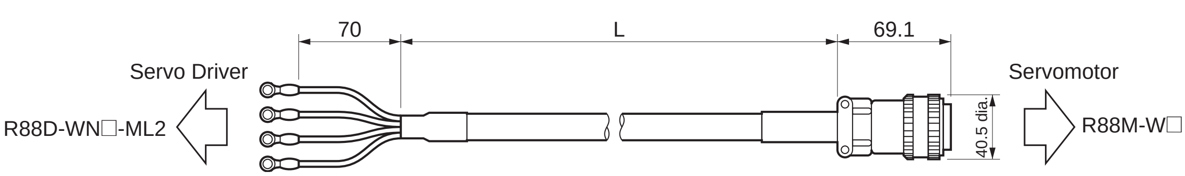
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWD003SR	3 m	13.5 dia.	Approx. 1.1 kg
R88A-CAWD005SR	5 m		Approx. 1.7 kg
R88A-CAWD010SR	10 m		Approx. 3.3 kg
R88A-CAWD015SR	15 m		Approx. 4.9 kg
R88A-CAWD020SR	20 m		Approx. 6.4 kg
R88A-CAWD030SR	30 m		Approx. 9.5 kg
R88A-CAWD040SR	40 m		Approx. 12.6 kg
R88A-CAWD050SR	50 m		Approx. 15.7 kg

For Servomotors with Brakes

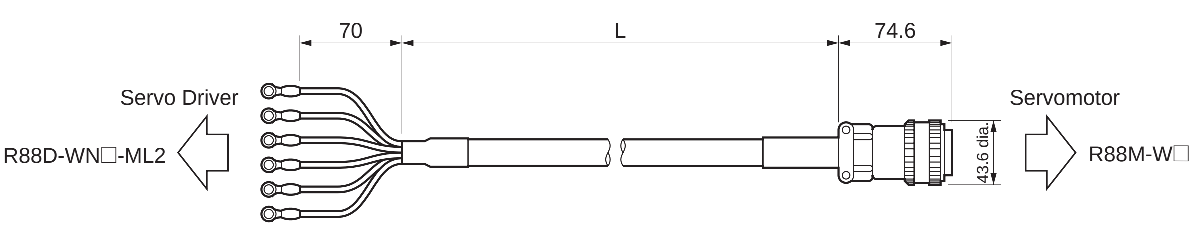
Model	Length (L)	Outer diameter of sheath	Weight
R88A-CAWD003BR	3 m	16.5 dia.	Approx. 1.7 kg
R88A-CAWD005BR	5 m		Approx. 2.6 kg
R88A-CAWD010BR	10 m		Approx. 4.9 kg
R88A-CAWD015BR	15 m		Approx. 7.2 kg
R88A-CAWD020BR	20 m		Approx. 9.4 kg
R88A-CAWD030BR	30 m		Approx. 14.1 kg
R88A-CAWD040BR	40 m		Approx. 18.7 kg
R88A-CAWD050BR	50 m		Approx. 23.3 kg

● Connection Configuration and External Dimensions

For Servomotors without Brakes

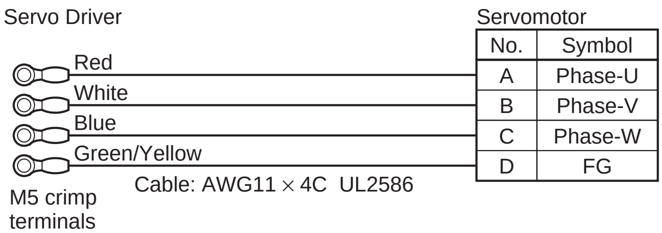


For Servomotors with Brakes



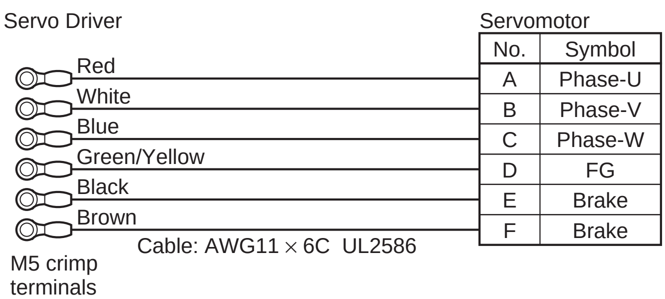
● **Wiring**

For Servomotors without Brakes



Cable
Straight plug: N/MS3106B22-22S (JAE Ltd.)
Cable clamp: N/MS3057-12A (JAE Ltd.)
Servomotor
Receptacle: MS3102A22-22P (DDK Ltd.)

For Servomotors with Brakes



Cable
Straight plug: N/MS3106B24-10S (JAE Ltd.)
Cable clamp: N/MS3057-16A (JAE Ltd.)
Servomotor
Receptacle: MS3102A24-10P (DDK Ltd.)

Note Connector-type terminal blocks are used for Servo Drivers of 1.5 kW or less, as shown in *Terminal Block Wiring Procedure* under *3-2-3 Terminal Block Wiring*. Remove the crimp terminals from the phase-U, phase-V, and phase-W wires for these Servo Drivers.

2-6-3 Peripheral Cables and Connector Specifications

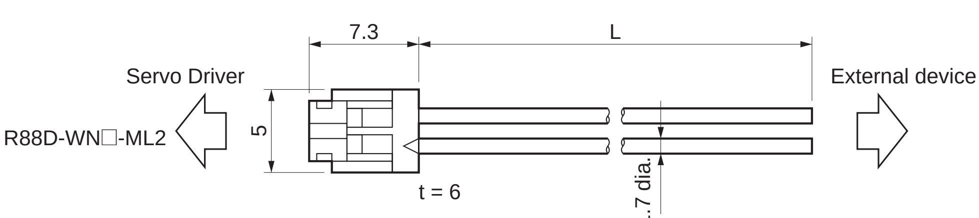
■ Analog Monitor Cable (R88A-CMW001S)

This is cable for connecting to the Servo Driver's Analog Monitor Connector (CN5). It is required for connecting analog monitor outputs to external devices such as measuring instruments.

● **Cable Models**

Model	Length (L)	Weight
R88A-CMW001S	1 m	Approx. 0.1 kg

● **Connection Configuration and External Dimensions**



● Wiring

Servo Driver

Symbol	No.	Wire color
NM	1	Red
AM	2	White
GND	3	Black
GND	4	Black

Cable: AWG24 × 4C UL1007

Connector socket: DF11-4DS-2C (Hirose Electric)
Connector contacts: DF11-2428SCF (Hirose Electric)

■ Computer Monitor Cables (R88A-CCW002P2)

In order to set Servo Driver parameters and monitor a Servo Driver from a personal computer, the Computer Monitor Software and Computer Monitor Cable are required.

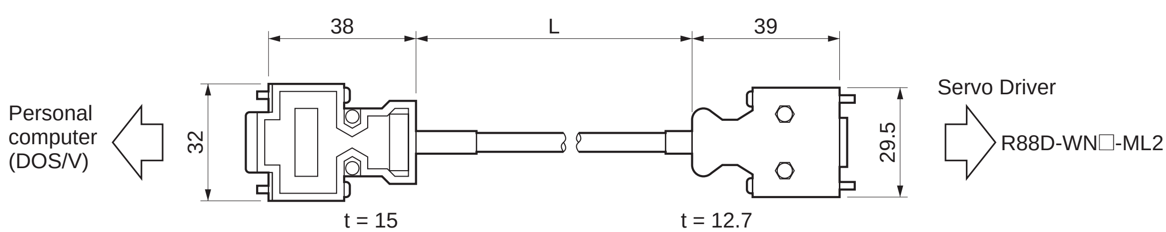
● Cable Models

For DOS/V Computers

Model	Length (L)	Outer diameter of sheath	Weight
R88A-CCW002P2	2 m	6 dia.	Approx. 0.1 kg

● Connection Configuration and External Dimensions

For DOS/V Computers



● Wiring

For DOS/V Computers

Computer Symbol	Computer No.	Servo Driver No.	Servo Driver Symbol
RXD	2	2	TXD
TXD	3	4	RXD
RTS	7		
CTS	8		
GND	5	14	GND
FG	Shell	Shell	FG

Cable: AWG26 × 3C UL2464

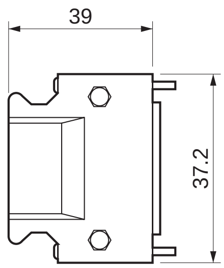
Connector: 17JE-13090-02 (D8A) (DDK Ltd.)

Connector plug: 10114-3000VE (Sumitomo 3M)
Connector case: 10314-52A0-008 (Sumitomo 3M)

■ Control I/O Connector (R88A-CNW01)

This is the connector for connecting to the Servo Driver's Control I/O Connector (CN1). This connector is used when the cable is prepared by the user.

● External Dimensions



t = 14

Connector plug: 10126-3000VE (Sumitomo 3M)
Connector case: 10326-52A0-008 (Sumitomo 3M)

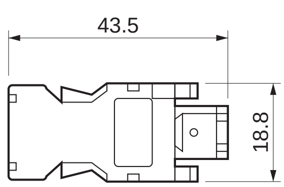
■ Encoder Connectors (R88A-CNW0□R)

These are the connectors for the encoder cable. These connectors are used when the cable is prepared by the user. They are solder-type connectors. Use the following cable.

- Wire size: AWG16 max.
- Stripped outer diameter: 2.1 mm max.
- Outer diameter of sheath: 6.7 ± 0.5 mm

● External Dimensions

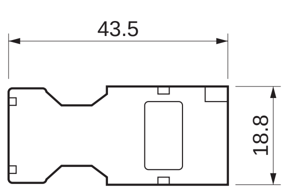
R88A-CNW01R (For Driver's CN2 Connector)



t = 12

Connector Plug Model Number
55100-0670 (Molex)

R88A-CNW02R (For Motor Connector)



t = 12

Connector Plug Model Number
54280-0609 (Molex)

2-7 External Regeneration Resistor Specifications

If the Servomotor's regenerative energy is excessive, connect an External Regeneration Resistor.

■ R88A-RR22047S External Regeneration Resistor

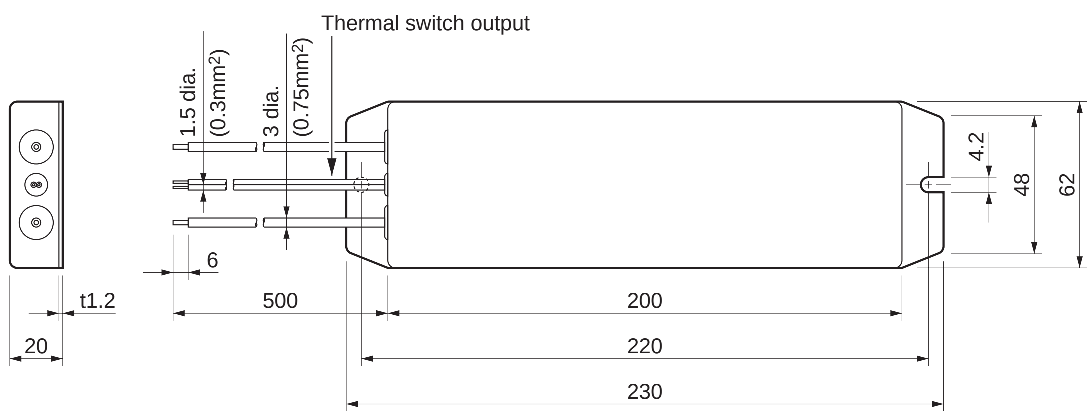
■ Specifications

Model	Resistance	Nominal capacity	Regeneration absorption for 120°C temperature rise	Heat radiation condition	Thermal switch output specifications
R88A-RR22047S	47 Ω ±5%	220 W	70 W	t1.0 × □350 (SPCC)	Operating temperature: 170°C±3%, NC contact, Rated output: 3 A

■ External Dimensions

All dimensions are in millimeters.

● R88A-RR22047S External Regeneration Resistor



2-8 Absolute Encoder Backup Battery Specifications

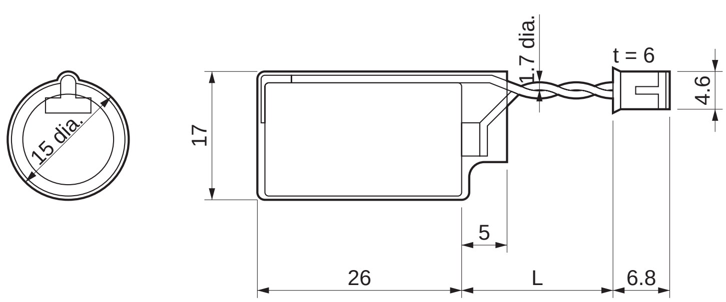
A backup battery is required when using a Servomotor with an absolute encoder. Install the Battery Unit in the battery holder for the Absolute Encoder Battery Cable (R88A-CRWC0R3C, 0.3 m), and connect the provided connector to the connector in the battery holder.

■ R88A-BAT01W Absolute Encoder Backup Battery Unit

■ Specifications

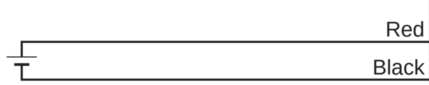
Item	Specifications
Battery model number	ER3V (Toshiba)
Battery voltage	3.6 V
Current capacity	1,000 mA·h

■ Connection Configuration and External Dimensions



Model	Length (L)
R88A-BAT01W	20 mm

■ Wiring

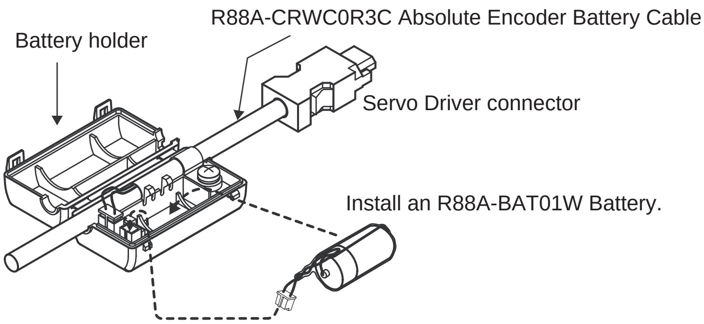


No.	Symbol
1	BAT
2	BATGND

Cable: AWG24 × 2C UL1007

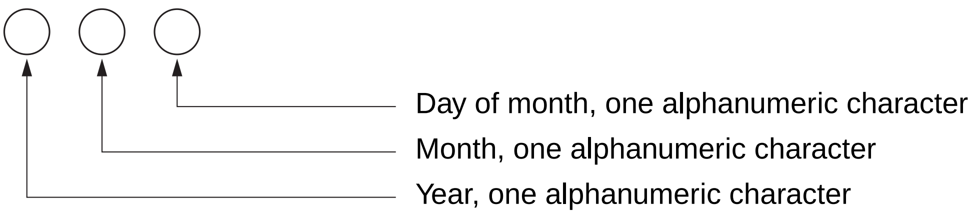
Connector housing: DF3-2S-2C (Hirose Electric)
Contact pin: DF3-2428SCFC (Hirose Electric)

■ Installation



■ Manufacturing Code

The manufacturing code gives the manufacturing date as shown below.



The alphanumeric characters have the following meanings.

Year	Code	K	L	M	N	O	P	Q	R	S	T
	Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008

Month	Code	R	A	Y	D	L	I	T	E	S	H	U	M
	Month	1	2	3	4	5	6	7	8	9	10	11	12

Day of month	Code	A	B	C	D	E	F	G	H	I	J	K	L
	Day	1	2	3	4	5	6	7	8	9	10	11	12
	Code	M	N	O	P	Q	R	S	T	U	V	W	X
	Day	13	14	15	16	17	18	19	20	21	22	23	24
	Code	Y	Z	2	3	4	5	6					
	Day	25	26	27	28	29	30	31					

Note Some Servomotors manufactured before 2001 have a two-character code.
Example1: OMR = 2003 December 18
Example 2: LU = 2000 November

2-9 Reactor Specifications

Connect a DC Reactor to the Servo Driver's DC Reactor connection terminal as a harmonic current control measure. Select a model to match the Servo Driver being used.

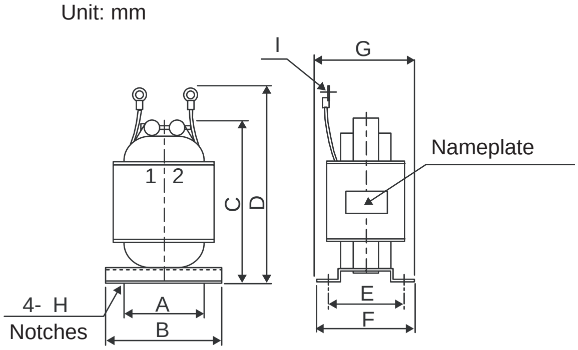
■ R88A-PX□ AC/DC Reactors

■ Specifications

Servo Driver model		AC/DC Reactor			
		Model	Rated current (A)	Inductance (mH)	Weight (kg)
Single-phase, 100 V AC	R88D-WNA5L-ML2	R88A-PX5053	2.0	20.0	Approx. 0.6
	R88D-WN01L-ML2	R88A-PX5053	2.0	20.0	Approx. 0.6
	R88D-WN02L-ML2	R88A-PX5054	3.0	5.0	Approx. 0.4
	R88D-WN04L-ML2	R88A-PX5056	5.0	2.0	Approx. 0.4
Single-phase, 200 V AC	R88D-WNA5H-ML2	R88A-PX5052	1.0	45.0	Approx. 0.4
	R88D-WN01H-ML2	R88A-PX5052	1.0	45.0	Approx. 0.4
	R88D-WN02H-ML2	R88A-PX5053	2.0	20.0	Approx. 0.6
	R88D-WN04H-ML2	R88A-PX5054	3.0	5.0	Approx. 0.4
	R88D-WN08H-ML2	R88A-PX5056	5.0	2.0	Approx. 0.4
Three-phase, 200 V AC	R88D-WN05H-ML2	R88A-PX5061	4.8	2.0	Approx. 0.5
	R88D-WN10H-ML2	R88A-PX5061	4.8	2.0	Approx. 0.5
	R88D-WN15H-ML2	R88A-PX5060	8.8	1.5	Approx. 1.0
	R88D-WN20H-ML2	R88A-PX5060	8.8	1.5	Approx. 1.0
	R88D-WN30H-ML2	R88A-PX5059	14.0	1.0	Approx. 1.1

■ External Dimensions

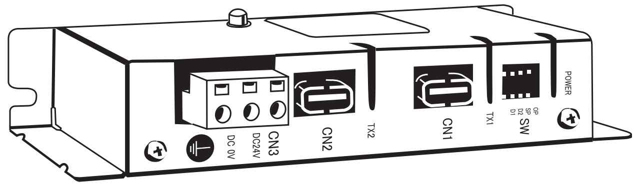
Unit: mm



Model	A	B	C	D	E	F	G	H dia.	I dia.
R88A-PX5052	35	52	80	95	30	40	45	4	4.3
R88A-PX5053	35	52	90	105	35	45	50	4	4.3
R88A-PX5054	35	52	80	95	30	40	45	4	4.5
R88A-PX5056	35	52	80	95	30	40	45	4	4.3
R88A-PX5059	50	74	125	140	35	45	60	5	5.3
R88A-PX5060	40	59	105	125	45	60	65	4	4.3
R88A-PX5061	35	52	80	95	35	45	50	4	4.3

2-10 MECHATROLINK-II Repeater Specifications

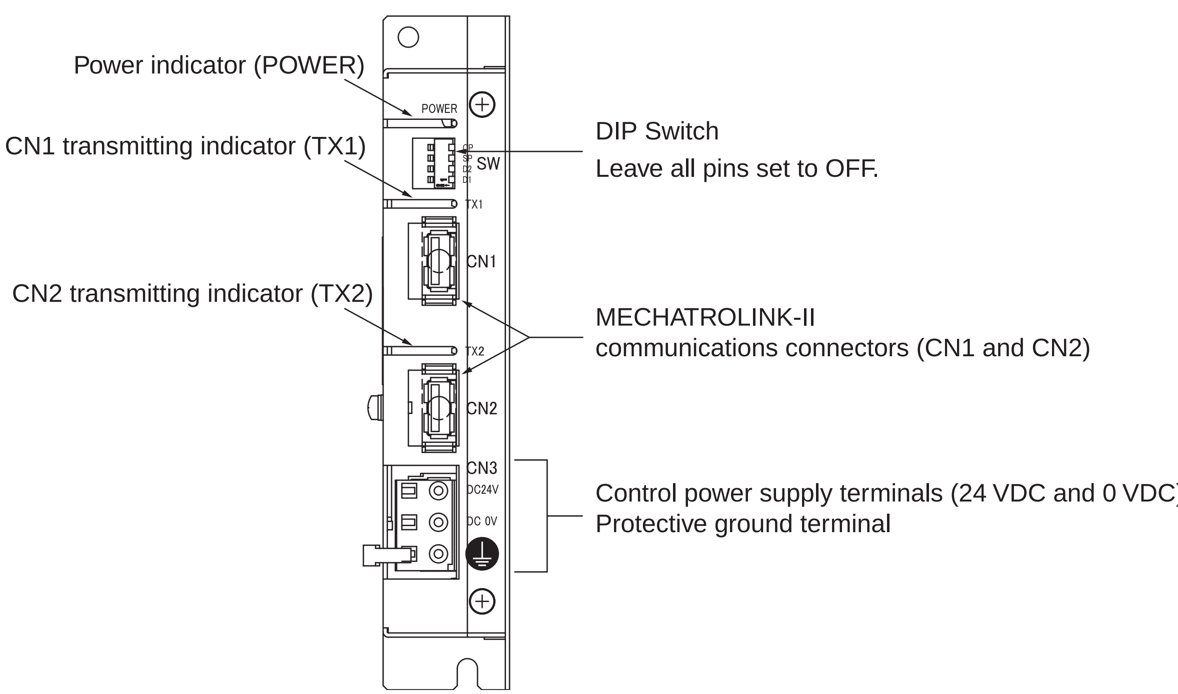
The MECHATROLINK-II Repeater is required to extend the MECHATROLINK-II connection distance.



■ FNY-REP2000

Item	Specification
Cable lengths	Controller to Repeater: 50 m max. Repeater to terminating resistance: 50 m max.
Maximum number of stations	14 stations over 50 m or 15 stations over 30 m from Controller to Repeater 15 stations over 50 m or 16 stations over 30 m from Repeater to terminating resis-tance Also, the number of stations on both sizes of the Repeater must not exceed the maximum number of stations for the Controller. (The maximum is 16 stations for the CS1W/CJ1W-NCF71.)
Indicators	Three: Power, CN1 transmitting, and CN2 transmitting
Power supply current	180 mA max.
External power supply	100 mA at 24 VDC (±4.8 V)
Weight	0.5 kg

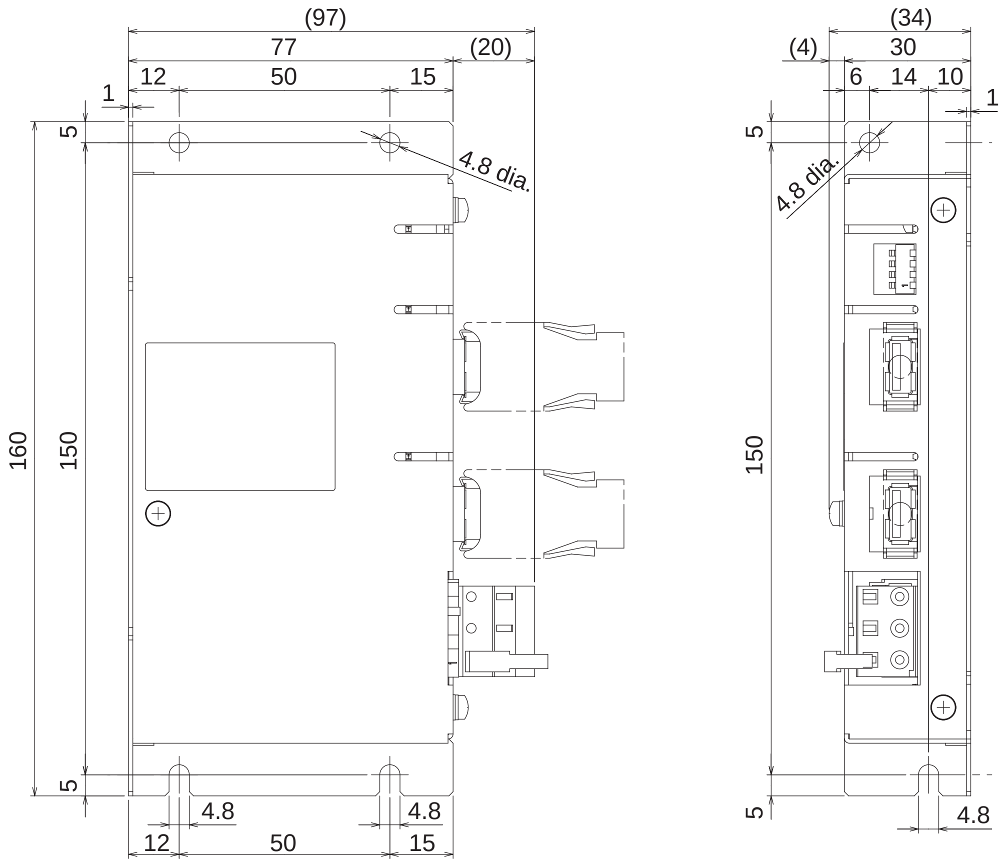
Repeater Part Names



MECHATROLINK-II Repeater Dimensions

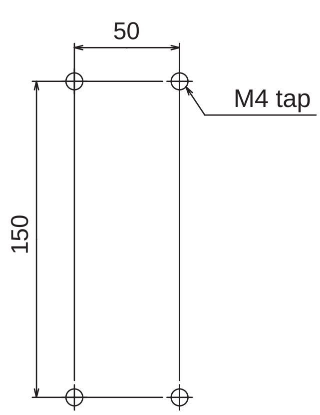
■ FNY-REP2000

Dimensions

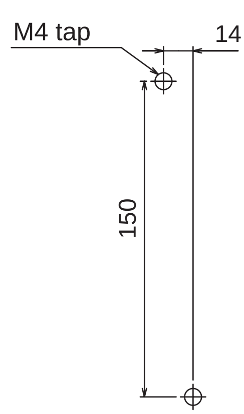


Dimensions

Mounting on Bottom

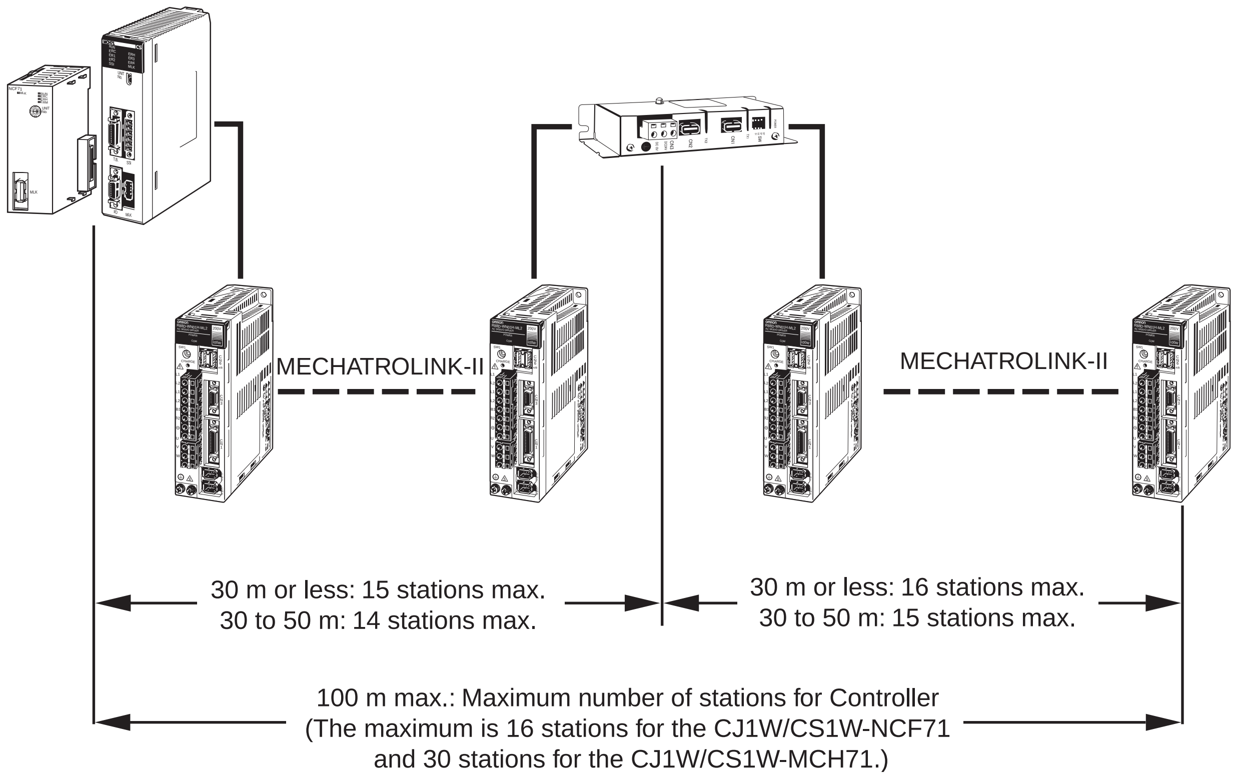


Mounting on Back



Connections

An example of connections between the host controller, servo drives, and a Repeater is shown below.



Chapter 3

System Design and Installation

Installation and Wiring Precautions

⚠ **Caution** Do not step on or place a heavy object on the product. Doing so may result in injury.

⚠ **Caution** Do not cover the inlet or outlet ports and prevent any foreign objects from entering the product. Failure to observe this may result in fire.

⚠ **Caution** Be sure to install the product in the correct direction. Not doing so may result in malfunction.

⚠ **Caution** Provide the specified clearances between the Servo Driver and the control box or other devices. Not doing so may result in fire or malfunction.

⚠ **Caution** Do not apply any strong impact. Doing so may result in malfunction.

⚠ **Caution** Be sure to wire correctly and securely. Not doing so may result in motor runaway, injury, or malfunction.

⚠ **Caution** Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.

⚠ **Caution** Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.

⚠ **Caution** Always use the power supply voltages specified in the this manual. An incorrect voltage may result in malfunctioning or burning.

⚠ **Caution** Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunctioning.

⚠ **Caution** Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.

⚠ **Caution** To avoid damage to the product, take appropriate and sufficient countermeasures when installing systems in the following locations:

- Locations subject to static electricity or other sources of noise.
- Locations subject to strong electromagnetic fields and magnetic fields.
- Locations subject to possible exposure to radiation.
- Locations close to power supply lines.

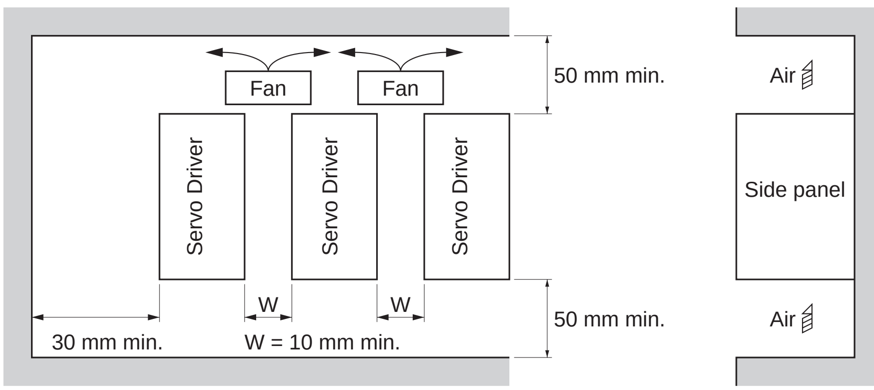
⚠ **Caution** When connecting the battery, be careful to connect the polarity correctly. Incorrect polarity connections can damage the battery or cause it to explode.

3-1 Installation Conditions

3-1-1 Servo Drivers

■ Space Around Drivers

- Install Servo Drivers according to the dimensions shown in the following illustration to ensure proper heat dispersion and convection inside the panel. Also install a fan for circulation if Servo Drivers are installed side by side to prevent uneven temperatures from developing inside the panel.
- Take the control cable's connector direction into account when installing the Servo Drivers.



■ Mounting Direction

Mount the Servo Drivers in a direction (perpendicular) such that the lettering for the model number, and so on, can be seen.

■ Operating Environment

The environment in which Servo Drivers are operated must meet the following conditions.

- Ambient operating temperature: 0 to +55°C (Take into account temperature rises in the individual Servo Drivers themselves.)
- Ambient operating humidity: 20% to 90% (with no condensation)
- Atmosphere: No corrosive gases.

■ Ambient Temperature

- Servo Drivers should be operated in environments in which there is minimal temperature rise to maintain a high level of reliability.
- Temperature rise in any Unit installed in a closed space, such as a control box, will cause the ambient temperature to rise inside the entire closed space. Use a fan or a air conditioner to prevent the ambient temperature of the Servo Driver from exceeding 55°C.
- Unit surface temperatures may rise to as much as 30°C above the ambient temperature. Use heat-resistant materials for wiring, and keep separate any devices or wiring that are sensitive to heat.

- The service life of a Servo Driver is largely determined by the temperature around the internal electrolytic capacitors. The service life of an electrolytic capacitor is affected by a drop in electrolytic volume and an increase in internal resistance, which can result in overvoltage alarms, malfunctioning due to noise, and damage to individual elements.
  If a Servo Driver is always operated at the maximum ambient temperature of 40°C and at 80% of the rated torque, then a service life of approximately 50,000 hours can be expected. A drop of 10°C in the ambient temperature will double the expected service life.

■ Keeping Foreign Objects Out of Units

- Place a cover over the Units or take other preventative measures to prevent foreign objects, such as drill filings, from getting into the Units during installation. Be sure to remove the cover after installation is complete. If the cover is left on during operation, heat buildup may damage the Units.
- Take measures during installation and operation to prevent foreign objects such as metal particles, oil, machining oil, dust, or water from getting inside of Servo Drivers.

3-1-2 Servomotors

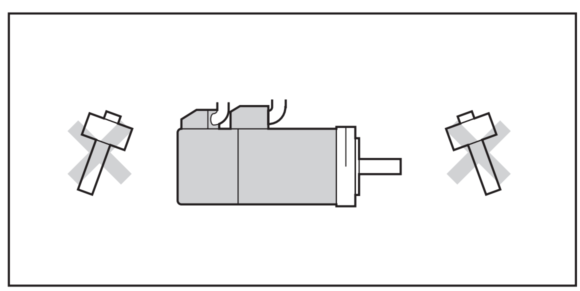
■ Operating Environment

The environment in which the Servomotor is operated must meet the following conditions.

- Ambient operating temperature: 0 to +40°C
- Ambient operating humidity: 20% to 80% (with no condensation)
- Atmosphere: No corrosive gases.

■ Impact and Load

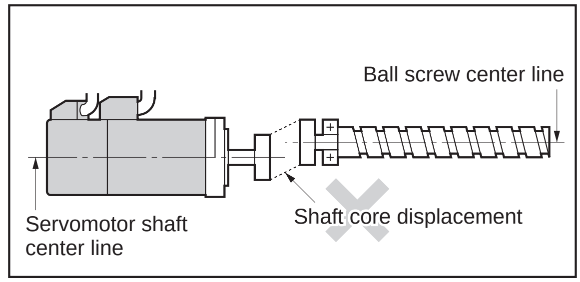
- The Servomotor is resistant to impacts of up to 490 m/s^2. Do not subject it to heavy impacts or loads during transport, installation, or removal. When transporting it, hold onto the Servomotor itself, and do not hold onto the encoder, cable, or connector areas. Holding onto weaker areas such as these can damage the Servomotor.



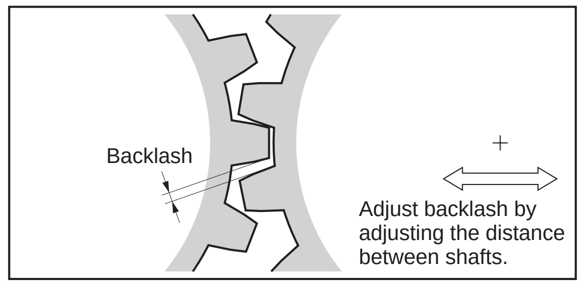
- Always use a pulley remover to remove pulleys, couplings, or other objects from the shaft.
- Secure cables so that there is no impact or load placed on the cable connector areas.

■ Connecting to Mechanical Systems

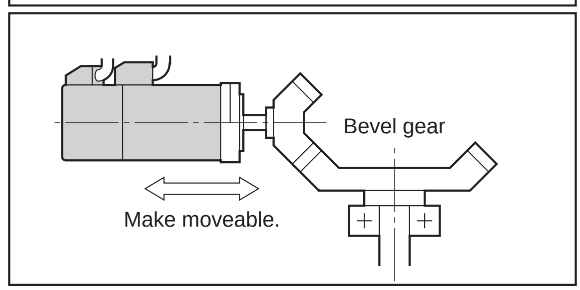
- The axial loads for Servomotors are specified in *2-5-2 Performance Specifications*. If an axial load greater than that specified is applied to a Servomotor, it will reduce the service life of the motor bearings and may damage the motor shaft.



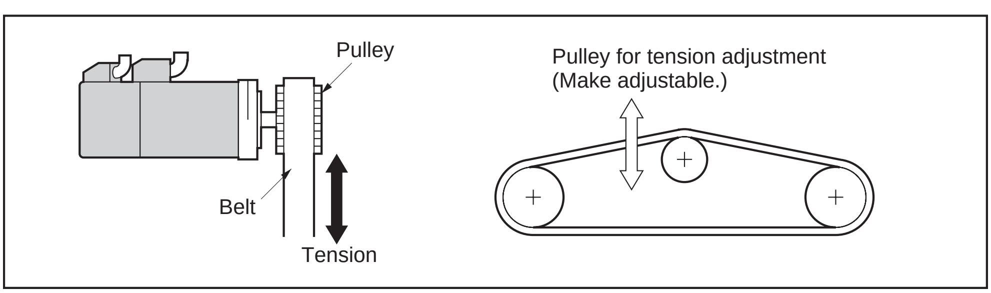
- When connecting to a load, use couplings that can sufficiently absorb mechanical eccentricity and variation.
- For spur gears, an extremely large radial load may be applied depending on the gear precision. Use spur gears with a high degree of accuracy (for example, JIS class 2: normal line pitch error of 6 µm max. for a pitch circle diameter of 50 mm). If the gear precision is not adequate, allow backlash to ensure that no radial load is placed on the motor shaft.



- Bevel gears will cause a load to be applied in the thrust direction depending on the structural precision, the gear precision, and temperature changes. Provide appropriate backlash or take other measures to ensure that no thrust load is applied which exceeds specifications.



- Do not put rubber packing on the flange surface. If the flange is mounted with rubber packing, the motor flange may separate due to the tightening strength.
- When connecting to a V-belt or timing belt, consult the maker for belt selection and tension. A radial load twice the belt tension will be placed on the motor shaft. Do not allow a radial load exceeding specifications to be placed on the motor shaft due to belt tension. If an excessive radial load is applied, the motor shaft may be damaged. Set up the structure so that the radial load can be adjusted. A large radial load may also be applied as a result of belt vibration. Attach a brace and adjust Servo Driver gain so that belt vibration is minimized.



■ Connectors Conforming to EC Directives

The Power Cable and Encoder Cable connectors listed in the following table are recommended for conforming to EC Directives.

Note The connectors for the Servomotor models not listed below, i.e., 3,000-r/min Servomotors (50 to 750 W) and all 3,000-r/min Flat-style Servomotor models, already conform to EC Directives and do not need to be changed.

● Recommended Connectors

For Power Cables

Servomotor type			Servomotor model	Connector model	Cable clamp model	Maker
Without brake	3,000-r/min	1 kW	R88M-W1K030□-□	Angled type CE05-8A18-10SD-B-BAS Straight type CE06-6A18-10SD-B-BSS	For sheath external diameter of 6.5 to 8.7 dia.: CE3057-10A-3 (D265) For sheath external diameter of 8.5 to 11 dia.: CE3057-10A-2 (D265) For sheath external diameter of 10.5 to 14.1 dia.: CE3057-10A-1 (D265)	DDK Ltd.
		1.5 kW	R88M-W1K530□-□			
		2 kW	R88M-W2K030□-□			
	1,000-r/min	300 W	R88M-W30010□-□			
		600 W	R88M-W60010□-□			
		900 W	R88M-W90010□-□			
	1,500-r/min	450 W	R88M-W45015T-□			
		850 W	R88M-W85015T-□			
		1.3 kW	R88M-W1K315T-□			
	3,000-r/min	3 kW	R88M-W3K030□-□	Angled type JL04V-8A22-22SE-EB Straight type JL04V-6A22-22SE-EB	For sheath external diameter of 6.5 to 9.5 dia.: JL04-2022CK (09) For sheath external diameter of 9.5 to 13 dia.: JL04-2022CK (12) For sheath external diameter of 12.9 to 15.9 dia.: JL04-2022CK (14)	Japan Aviation Electronics Industry, Ltd. (JAE)
	1,000-r/min	1.2 kW	R88M-W1K210□-□			
		2 kW	R88M-W2K010□-□			
	1,500-r/min	1.8 kW	R88M-W1K815T-□			
With brake	3,000-r/min	1 kW	R88M-W1K030□-B□	Angled type JL04V-8A20-15SE-EB Straight type JL04V-6A20-15SE-EB	For sheath external diameter of 6.5 to 9.5 dia.: JL04-2022CK (09) For sheath external diameter of 9.5 to 13 dia.: JL04-2022CK (12) For sheath external diameter of 12.9 to 15.9 dia.: JL04-2022CK (14)	Japan Aviation Electronics Industry, Ltd. (JAE)
		1.5 kW	R88M-W1K530□-B□			
		2 kW	R88M-W2K030□-B□			
	1,000-r/min	300 W	R88M-W30010□-B□			
		600 W	R88M-W60010□-B□			
		900 W	R88M-W90010□-B□			
	1,500-r/min	450 W	R88M-W45015T-B□			
		850 W	R88M-W85015T-B□			
		1.3 kW	R88M-W1K315T-B□			
	3,000-r/min	3 kW	R88M-W3K030□-B□	Angled type JL04V-8A24-10SE-EB Straight type JL04V-6A24-10SE-EB	For sheath external diameter of 9 to 12 dia.: JL04-2428CK (11) For sheath external diameter of 12 to 15 dia.: JL04-2428CK (14) For sheath external diameter of 15 to 18 dia.: JL04-2428CK (17) For sheath external diameter of 18 to 20 dia.: JL04-2428CK (20)	Japan Aviation Electronics Industry, Ltd. (JAE)
	1,000-r/min	1.2 kW	R88M-W1K210□-B□			
		2 kW	R88M-W2K010□-B□			
	1,500-r/min	1.8 kW	R88M-W1K815T-B□			

For Encoder Cables

Servomotor type	Servomotor model	Connector model	Cable clamp model	Maker
3,000-r/min (1 to 3 kW)	R88M-W1K030☐-☐ to R88M-W3K030☐-☐	Angled type JA08A-20-29S-J1-EB Straight type JA06A-20-29S-J1-EB	For sheath external diameter of 6.5 to 9.5 dia.: JL04-2022CKE (09) For sheath external diameter of 9.5 to 13 dia.: JL04-2022CKE (12) For sheath external diameter of 12.9 to 16 dia.: JL04-2022CKE (14)	Japan Aviation Electronics Industry, Ltd. (JAE)
1,000-r/min (300 W to 2.0 kW)	R88M-W30010☐-☐ to R88M-W2K010☐-☐			
1,500-r/min (450 W to 1.8 kW)	R88M-W45015T-☐ to R88M-W1K815T-☐			

■ Water and Drip Resistance

The enclosure ratings for the Servomotors are as follows:

3,000-r/min Servomotors (50 to 750 W): IP55 (except for through-shaft parts).

3,000-r/min Servomotors (1 to 3.0 kW): IP67 (except for through-shaft parts). Models are also available with IP67 ratings that include through-shaft parts.

3,000-r/min Flat-style Servomotors (100 W to 1.5 kW): IP55 (except for through-shaft parts). Models are also available with IP67 ratings that include through-shaft parts.

1,000-r/min Servomotors (300 W to 2.0 kW): IP67 (except for through-shaft parts). Models are also available with IP67 ratings that include through-shaft parts.

1,500-r/min Servomotors (450 W to 1.8 kW): IP67 (except for through-shaft parts). Models are also available with IP67 ratings that include through-shaft parts.

The standard cable conforms to IP30. When selecting an IP67-rated Servomotor for use in a wet environment, install waterproof connectors for the power and Encoder Cables. The recommended connectors are the same as for the EC Directives, listed in the tables above.

■ Oil Seals

If the Servomotor is to be used in a location where it may be exposed to oil or grease, select an IP67-rated Servomotor or a Servomotor with an oil seal.

■ Other Precautions

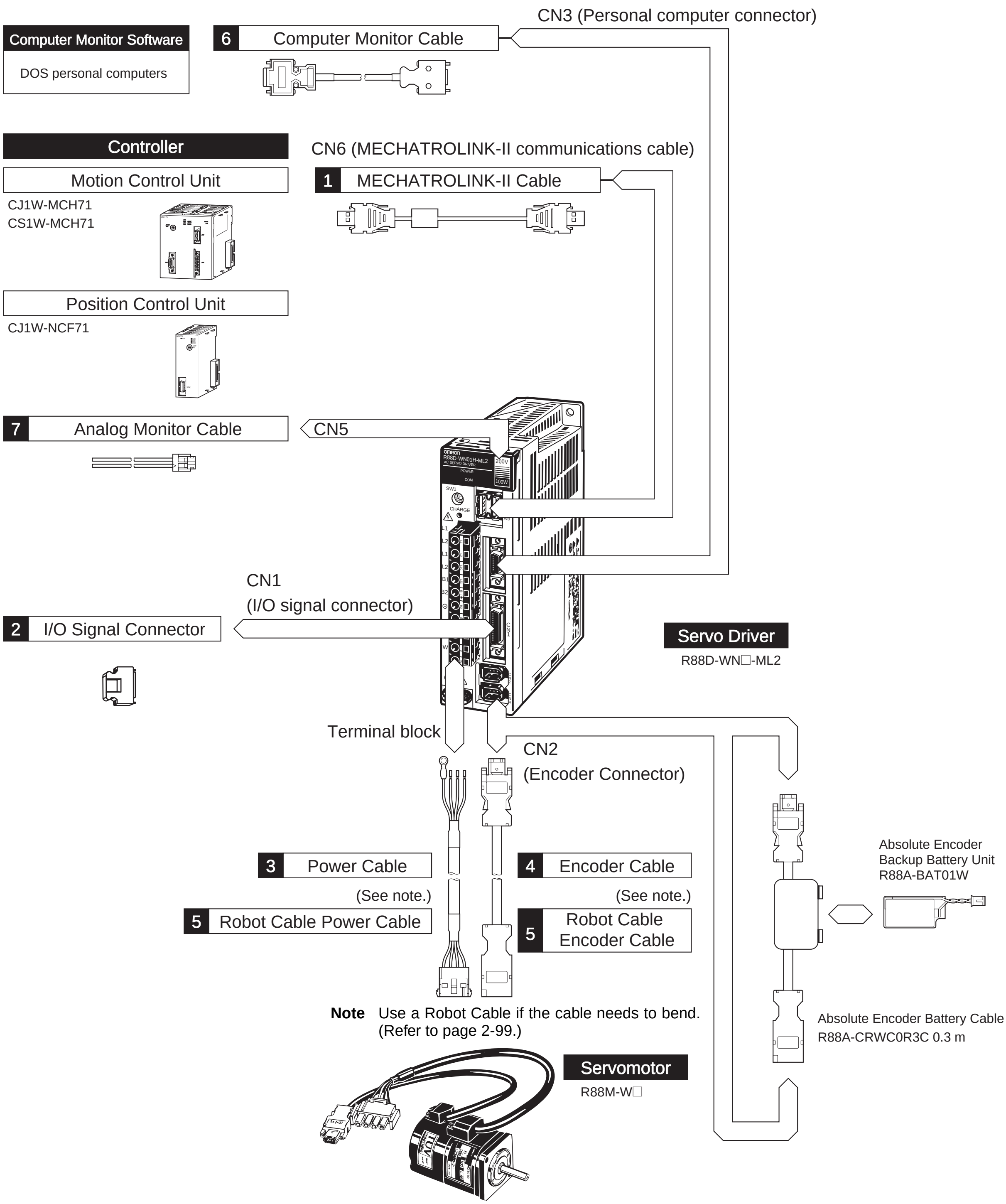
- <u>Do not apply commercial power directly to the Servomotor.</u> The Servomotors run on synchronous AC and use permanent magnets. Applying commercial power directly will burn out the motor coils.
- Take measures to prevent the shaft from rusting. The shafts are coated with anti-rust oil when shipped, but anti-rust oil or grease should also be applied when connecting the shaft to a load.
- <u>Absolutely do not remove the encoder cover or take the motor apart.</u> The magnet and the encoder are aligned in the AC Servomotor. If they become misaligned, the motor will not operate.

3-2 Wiring

3-2-1 Connecting Cable

This section shows the types of connecting cable used in an OMNUC W-series Servo System. The wide selection of cables provided for configuring a Servo System using a Motion Control Unit or Position Unit makes wiring simple.

■ Servo System Configuration



● 1. MECHATROLINK-II Cable

Special MECHATROLINK-II Cables

Use the following cables to connect to MECHATROLINK-II devices.

Unit	Cable model	Length
CJ1W-NCF71 CJ1W-MCH71 CS1W-MCH71	FNY-W6003-A5	0.5 m
	FNY-W6003-01	1.0 m
	FNY-W6003-03	3.0 m
	FNY-W6003-05	5.0 m
	FNY-W6003-10	10 m
	FNY-W6003-20	20 m
	FNY-W6003-30	30 m

Terminating Resistor

Use the following terminating resistor at the end of the MECHATROLINK-II communications line.

Name	Model
MECHATROLINK-II Terminating Resistor	FNY-W6022

● 2. I/O Signal Connector

Use the following connector to make your own cable for the Servo Driver I/O connector (CN1).

Name	Model	
I/O Signal Connector	R88A-CNW01C	Connects to the I/O signal connector (CN1). (Connector only)

● 3. Power Cable

Select a Power Cable to match the Servomotor that is to be used.

Servomotor type		Power Cables for Servomotors without Brakes	Power Cables for Servomotors with Brakes
3,000-r/min Servo-motors	30 to 750 W	R88A-CAWA□□□S	R88A-CAWA□□□B
	1 to 2kW	R88A-CAWC□□□S	R88A-CAWC□□□B
	3.0 kW	R88A-CAWD□□□S	R88A-CAWD□□□B
3,000-r/min Flat-style Servomotors	100 to 750 W	R88A-CAWA□□□S	R88A-CAWA□□□B
	1.5 kW	R88A-CAWB□□□S	R88A-CAWB□□□B
1,000-r/min Servo-motors	300 to 900 W	R88A-CAWC□□□S	R88A-CAWC□□□B
	1.2 to 2.0 kW	R88A-CAWD□□□S	R88A-CAWD□□□B
1,500-r/min Servo-motors	450 W to 1.3 kW	R88A-CAWC□□□S	R88A-CAWC□□□B
	1.8 kW	R88A-CAWD□□□S	R88A-CAWD□□□B

Note 1. The empty boxes in the model numbers are for cable length. The cables can be 3, 5, 10, 15, 20, 30, 40, or 50 meters long. (For example, R88A-CAW003S is 3 meters long.)

Note 2. For 750-W Servomotors, use R88A-CAWB□ Power Cable if the wiring distance will be 30 meters or more.

● 4. Encoder Cable

Select an Encoder Cable to match the Servomotor that is to be used.

Servomotor type		Encoder Cable	Remarks
3,000-r/min Servomotors	30 to 750 W	R88A-CRWA□□□C	The empty boxes in the model numbers are for cable length. The cables can be 3, 5, 10, 15, 20, 30, 40, or 50 meters long. (For example, R88A-CRWA003C is 3 meters long.)
	1 to 3.0 kW	R88A-CRWB□□□N	
3,000-r/min Flat-style Servomotors	100 W to 1.5 kW	R88A-CRWA□□□C	
1,000-r/min Servomotors	300 W to 2.0 kW	R88A-CRWB□□□N	
1,500-r/min Servomotors	450 W to 1.8 kW	R88A-CRWB□□□N	

Use the following cable for an absolute encoder.

Name/specifications		Model	Remarks
Absolute Encoder Battery Cable	0.3 m	R88A-CRWC0R3C	Only 0.3-meter cables are available.

● 5. Robot Cables

Use a Robot Cable if the encoder or power cables need to bend.

• Encoder Cables

Motor		Encoder Cable	Remarks
3,000-r/min Servomotors	30 to 750 W	R88A-CAWA□□□CR	The "□□□" in the model number indicates the cable length. There are 8 cable lengths: 3 m, 5 m, 10 m, 15 m, 20 m, 30 m, 40 m, and 50 m. (Example model number: R88A-CRWA003CR (3 m))
	1 to 3.0 kW	R88A-CAWB□□□NR	
3,000-r/min Flat-style Servomotors	100 to 1.5 kW	R88A-CAWA□□□CR	
1,000-r/min Servomotors	300 to 2.0 kW	R88A-CAWB□□□NR	
1,500-r/min Servomotors	450 W to 1.8 kW	R88A-CAWB□□□NR	

• Power Cables

Motor		Power Cable for Motors Without Brakes	Power Cable for Motors With Brakes
3,000-r/min Servomotors	30 to 750 W	R88A-CAWA□□□SR	R88A-CAWA□□□BR
	1 to 2 kW	R88A-CAWC□□□SR	R88A-CAWC□□□BR
	3.0 kW	R88A-CAWD□□□SR	R88A-CAWD□□□BR
3,000-r/min Flat-style Servomotors	100 to 750 W	R88A-CAWA□□□SR	R88A-CAWA□□□BR
	1.5 kW	R88A-CAWB□□□SR	R88A-CAWB□□□BR
1,000-r/min Servomotors	300 to 900 W	R88A-CAWC□□□SR	R88A-CAWC□□□BR
	1.2 to 2.0 kW	R88A-CAWD□□□SR	R88A-CAWD□□□BR
1,500-r/min Servomotors	450 W to 1.3 kW	R88A-CAWC□□□SR	R88A-CAWC□□□BR
	1.8 kW	R88A-CAWD□□□SR	R88A-CAWD□□□BR

Note The "□□□" in the model number indicates the cable length. There are 8 cable lengths: 3 m, 5 m, 10 m, 15 m, 20 m, 30 m, 40 m, and 50 m.
(Example model number: R88A-CAWA003SR (3 m))

● 6. Computer Monitor Cable

A Computer Monitor Cable and Computer Monitor Software are required to set or monitor parameters from a personal computer.

Name/specifications			Model	Remarks
Computer Monitor Cable	For DOS personal computers	2 m	R88A-CCW002P2	Only 2-meter cables are available.

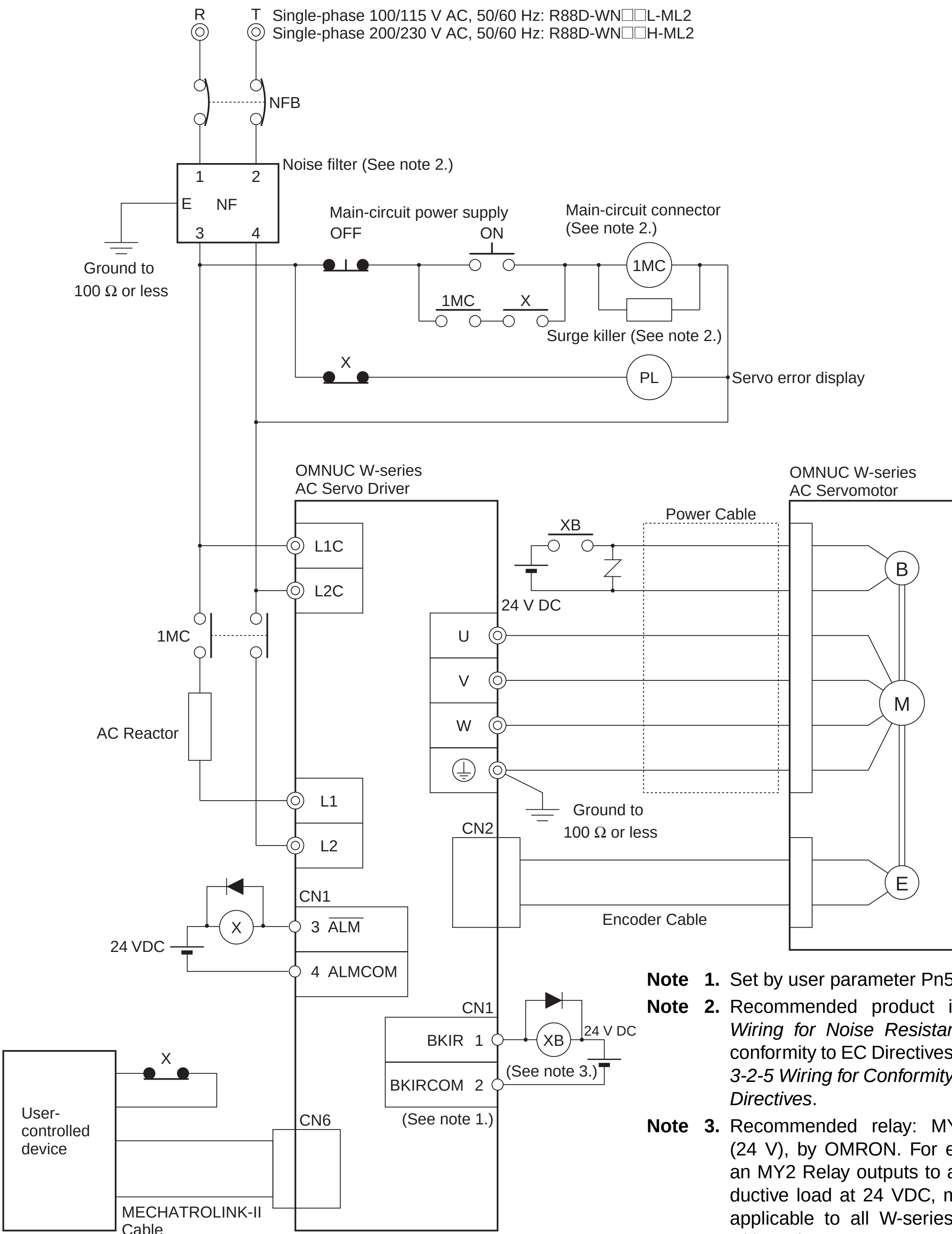
● 7. Analog Monitor Cable

This cable connects to the Servo Driver's Analog Monitor Connector (CN5). It is required for connecting analog monitor outputs to an external device (such as a measuring instrument).

Name/specifications		Model	Remarks
Analog Monitor Cable	1 m	R88A-CMW001S	Only 1-meter cables are available.

3-2-2 Peripheral Device Connection Examples

■ R88D-WNA5L-ML2/-WN01L-ML2/-WN02L-ML2/-WN04L-ML2/ -WNA5H-ML2/-WN01H-ML2/-WN02H-ML2/-WN04H-ML2

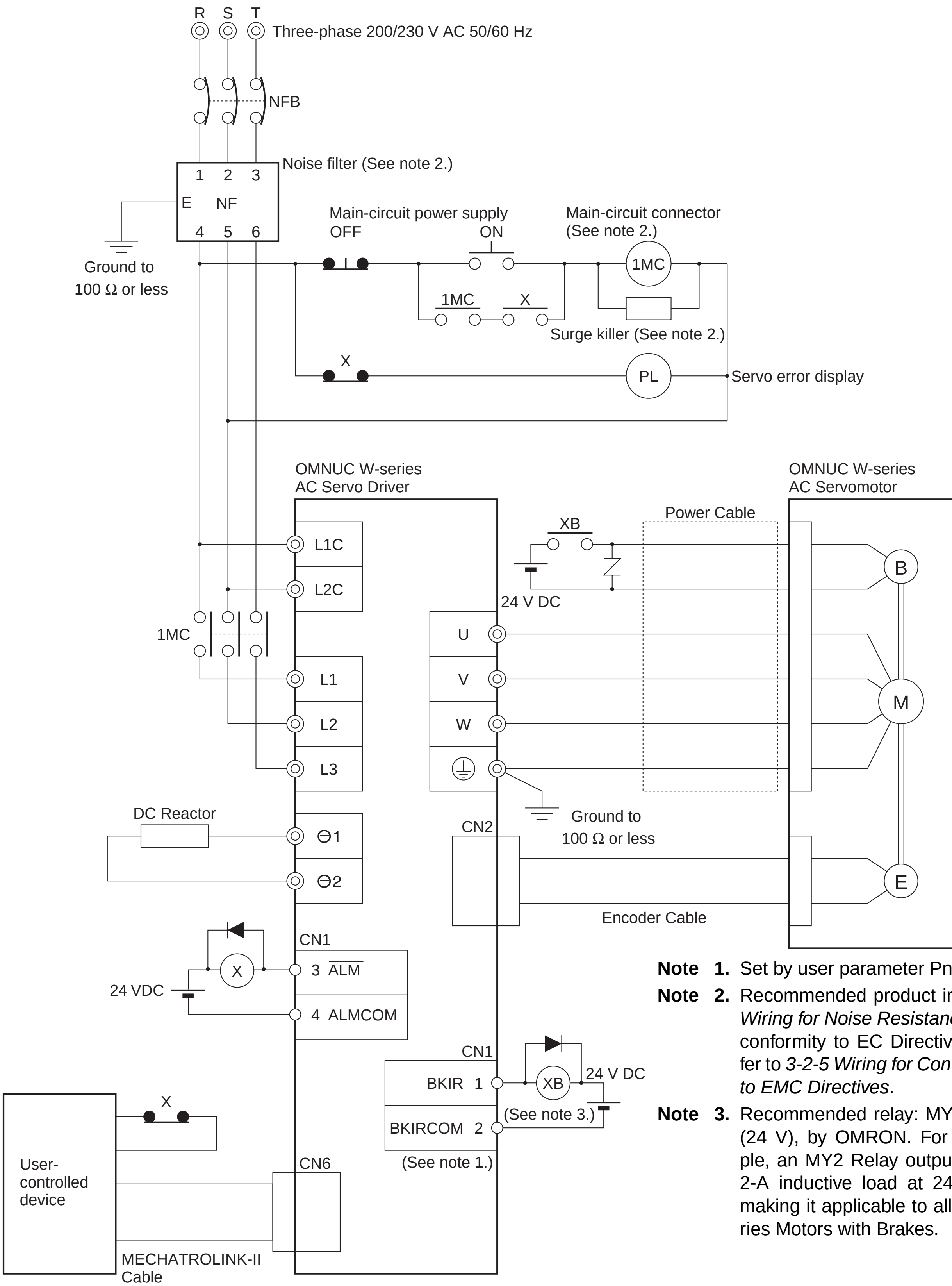


Note 1. Set by user parameter Pn50F.

Note 2. Recommended product in *3-2-4 Wiring for Noise Resistance*. For conformity to EC Directives, refer to *3-2-5 Wiring for Conformity to EMC Directives*.

Note 3. Recommended relay: MY Relay (24 V), by OMRON. For example, an MY2 Relay outputs to a 2-A inductive load at 24 VDC, making it applicable to all W-series Motors with Brakes.

■ R88D-WN05H-ML2/-WN10H-ML2/-WN15H-ML2/-WN20H-ML2/ -WN30H-ML2

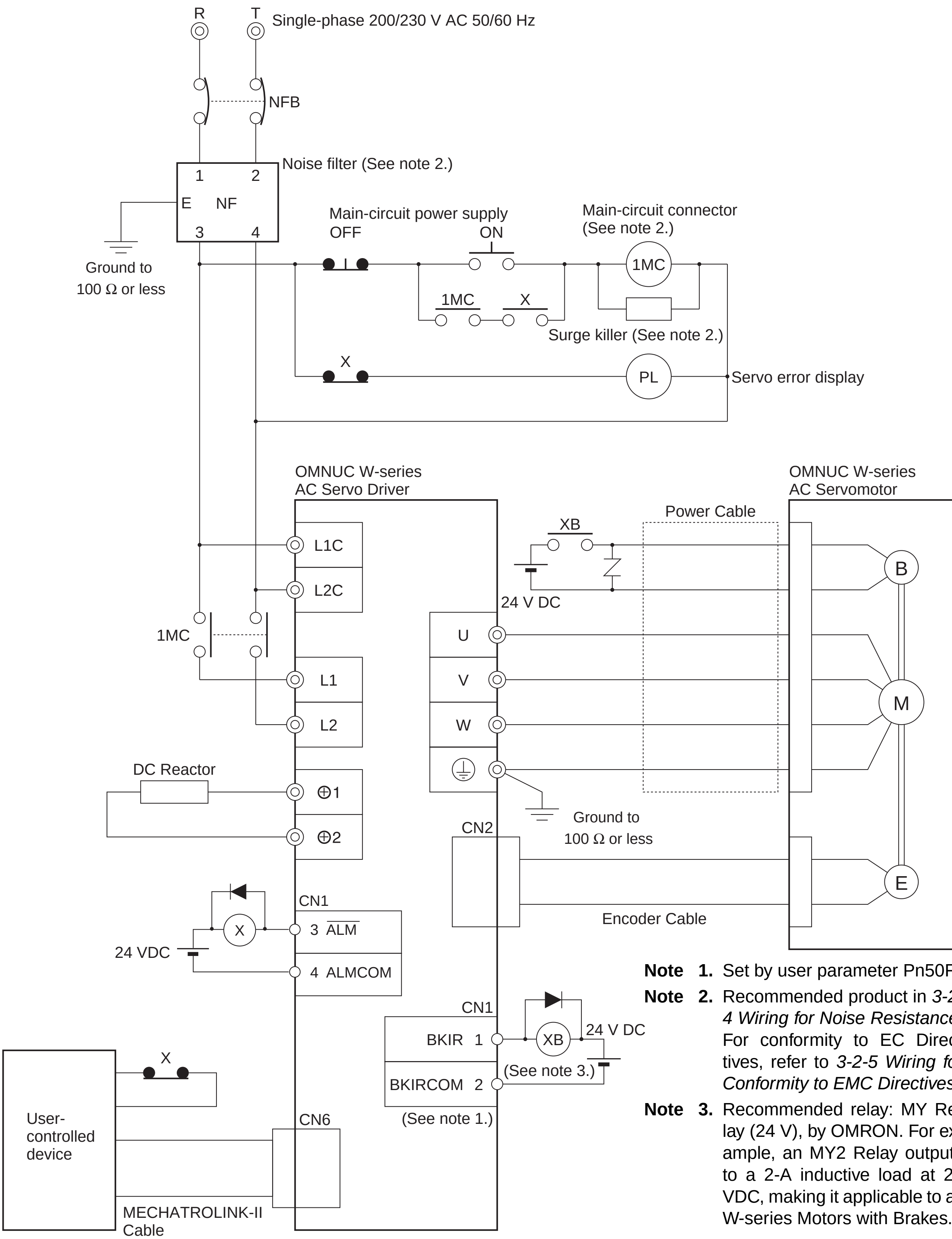


Note 1. Set by user parameter Pn50F.

Note 2. Recommended product in *3-2-4 Wiring for Noise Resistance*. For conformity to EC Directives, refer to *3-2-5 Wiring for Conformity to EMC Directives*.

Note 3. Recommended relay: MY Relay (24 V), by OMRON. For example, an MY2 Relay outputs to a 2-A inductive load at 24 VDC, making it applicable to all W-series Motors with Brakes.

■ R88D-WN08H-ML2



Note 1. Set by user parameter Pn50F.

Note 2. Recommended product in *3-2-4 Wiring for Noise Resistance*. For conformity to EC Directives, refer to *3-2-5 Wiring for Conformity to EMC Directives*.

Note 3. Recommended relay: MY Relay (24 V), by OMRON. For example, an MY2 Relay outputs to a 2-A inductive load at 24 VDC, making it applicable to all W-series Motors with Brakes.

3-2-3 Terminal Block Wiring

When wiring a Terminal Block, pay attention to wire sizes, grounding systems, and anti-noise measures.

■ Terminal Block Names and Functions

Terminal label	Name	Function
L1 L2 L3	Main circuit power supply input	R88D-WN□H-ML2 (50 to 400 W) Single-phase 200/230 V AC (170 to 253 V), 50/60 Hz (There is no L3 terminal.) R88D-WN08H-ML2 (750 W) Single-phase 200/230 V AC (170 to 253 V), 50/60 Hz (The L3 terminal is not used; do not connect it.) R88D-WN□H-ML2 (500 W to 3.0 kW) Three-phase 200/230 V AC (170 to 253 V), 50/60 Hz R88D-WN□L-ML2 (50 to 400 W) Single-phase 100/115 V AC (85 to 127 V), 50/60 Hz (There is no L3 terminal.)
⊖1 ⊖2	Connection terminals for DC Reactor for power supply harmonic control	R88D-WN□H-ML2 (500 W to 3.0 kW) Normally short between ⊖1 and ⊖2. When harmonic control measures are required, connect a DC Reactor between ⊖1 and ⊖2.
B1/⊕	Main circuit terminal, positive	Used to connect a DC power supply input. (The R88D-WN□H-ML2 (500 W to 3.0 kW) do not have the ⊖ terminal. Connect the ⊖2 terminal.)
⊖	Main circuit terminal, negative	
L1C L2C	Control circuit power supply input	R88D-WN□H-ML2 Single-phase 200/230 V AC (170 to 253 V), 50/60 Hz R88D-WN□L-ML2 Single-phase 100/115 V AC (85 to 127 V), 50/60 Hz
B1/⊕ B2 B3	External regeneration resistance connection terminal	R88D-WN□H-ML2 (50 to 400 W) R88D-WN□L-ML2 (50 to 400 W) These terminals normally do not need to be connected. If there is high regenerative energy, connect an External Regeneration Resistor between B1 and B2. (There is no B3 terminal.) R88D-WN□H-ML2 (500 W to 3.0 kW) Normally short between B2 and B3. If there is high regenerative energy, remove the short bar between B2 and B3 and connect an External Regeneration Resistor between B1 and B2.
U V W ⏚	Servomotor connection terminals	Red White Blue Green/Yellow These are the output terminals to the Servomotor. Be careful to wire them correctly.
⏚	Frame ground	This is the ground terminal. Ground to 100 Ω or less.

■ Terminal Block Wire Sizes

● 100-V AC Input (R88D-WN□L-ML2)

Item		Model (R88D-) Unit	WNA05L-ML2	WN01L-ML2	WN02L-ML2	WN04L-ML2
Power supply capacity		kVA	0.25	0.4	0.6	1.2
Main circuit power supply input (L1, L2) (See note 1.)	Rated current	A (rms)	1.2	2.4	4.7	9.4
	Wire size	mm^2	1.25	1.25	2	2
	Screw size	---	---			
	Torque	N·m	---			
Control circuit power supply input (L1C, L2C)	Rated current	A (rms)	0.13	0.13	0.13	0.13
	Wire size	mm^2	1.25	1.25	1.25	1.25
	Screw size	---	---			
	Torque	N·m	---			
Servomotor connection terminal (U, V, W, ⏚) (See note 2.)	Rated current	A (rms)	0.66	0.91	2.1	2.8
	Wire size	mm^2	1.25	1.25	1.25	1.25
	Screw size	---	---			
	Torque	N·m	---			
Frame ground (⏚)	Wire size	mm^2	2	2	2	2
	Screw size	---	M4	M4	M4	M4
	Torque	N·m	1.2	1.2	1.2	1.2
Non-fuse breaker or fuse capacity		A (rms)	4	4	6	12

Note 1. Use the same wire sizes for ⊖1, ⊖2, B1, and B2.

Note 2. Connect special OMRON Power Cable to the Servomotor connection terminals.

● 200-V AC Input (R88D-WT□H-ML2)

Item		Model (R88D-) Unit	WNA5H-ML2	WN01H-ML2	WN02H-ML2	WN04H-ML2	WN08H-ML2	WN05H-ML2	WN10H-ML2	WN15H-ML2	WN20H-ML2	WN30H-ML2
Power supply capacity		kVA	0.25	0.4	0.75	1.2	2.1	1.4	2.3	3.2	4.3	5.9
Main circuit power supply input (L1, L2 or L1, L2, L3) (See note 1.)	Rated current	A (rms)	0.6	1.2	2.4	4.7	8.8	2.5	4.9	7.3	9.7	15.0
	Wire size	mm^2	1.25	1.25	1.25	2	2	2	2	2	3.5	3.5
	Screw size	---	---								M4	M4
	Torque	N·m	---								1.2	1.2
Control circuit power supply input (L1C, L2C)	Rated current	A (rms)	0.13	0.13	0.13	0.13	0.15	0.15	0.15	0.15	0.15	0.15
	Wire size	mm^2	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
	Screw size	---	---								M4	M4
	Torque	N·m	---									
Servomotor connection terminal (U, V, W, ⏚) (See note 2.)	Rated current	A (rms)	0.66	0.91	2.1	2.8	5.5	3.8	7.6	11.6	18.5	18.9
	Wire size	mm^2	1.25	1.25	1.25	1.25	1.25	2	2	2	3.5	5.5
	Screw size	---	---								M4	M4
	Torque	N·m	---								1.2	1.2
Frame ground (⏚)	Wire size	mm^2	2	2	2	2	2	2	2	2	2	2
	Screw size	---	M4	M4	M4	M4	M4	M4	M4	M4	M4	M4
	Torque	N·m	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
No-fuse breaker or fuse capacity		A (rms)	4	4	4	8	11	4	7	10	13	17

Note 1. Use the same wire sizes and tightening torques for ⊖1, ⊖2, B1, B2, and B3.

Note 2. Connect special OMRON Power Cable to the Servomotor connection terminals.

■ Wire Sizes and Allowable Current

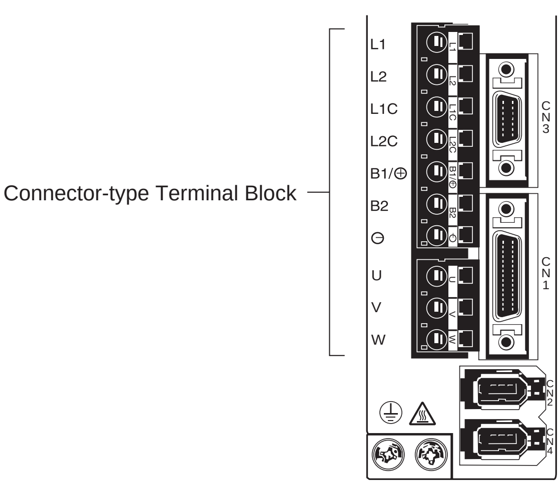
The following table shows the allowable current for when there are three wires.

● 600-V Heat-resistant Vinyl Wiring (HIV) (Reference Values)

AWG size	Nominal cross-sectional area (mm^2)	Configuration (wires/mm^2)	Conductive resistance (Ω/km)	Allowable current (A) for ambient temperature		
				30°C	40°C	50°C
20	0.5	19/0.18	39.5	6.6	5.6	4.5
---	0.75	30/0.18	26.0	8.8	7.0	5.5
18	0.9	37/0.18	24.4	9.0	7.7	6.0
16	1.25	50/0.18	15.6	12.0	11.0	8.5
14	2.0	7/0.6	9.53	23	20	16
12	3.5	7/0.8	5.41	33	29	24
10	5.5	7/1.0	3.47	43	38	31
8	8.0	7/1.2	2.41	55	49	40
6	14.0	7/1.6	1.35	79	70	57
4	22.0	7/2.0	0.849	99	88	70

■ Terminal Block Wiring Procedure

Connector-type Terminal Blocks are used for Servo Drivers of 1.5 W or less (except for the R88D-WN20H-ML2 to R88D-WN30H-ML2). The procedure for wiring these Terminal Blocks is explained below.

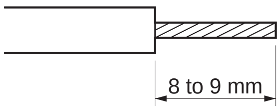


(Example: R88D-WN01H-ML2)

1.Remove the Terminal Block from the Servo Driver.

⚠ **Caution** The Terminal Block must be removed from the Servo Driver before being wired. The Servo Driver will be damaged if the wiring is done with the Terminal Block in place.

2. Strip the covering off the ends of the wires.
Prepare wires of the right sizes, according to the tables provided under *Terminal Block Wire Sizes* above, and strip off 8 or 9 mm of the covering from the end of each wire.



3. Open the wire insertion slots in the Terminal Block
There are two ways to open the wire insertion slots, as follows:

- Pry the slot open using the lever that comes with the Servo Driver (as in Fig. A).
- Insert a flat-blade screwdriver (end width: 3.0 to 3.5 mm) into the opening for Servo Driver installation, and press down firmly to open the slot (as in Fig. B).

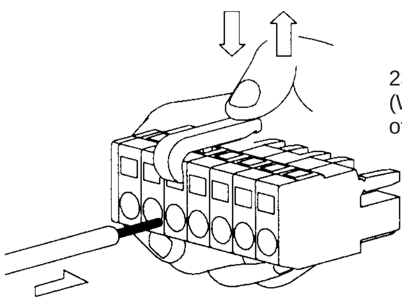


Fig. A

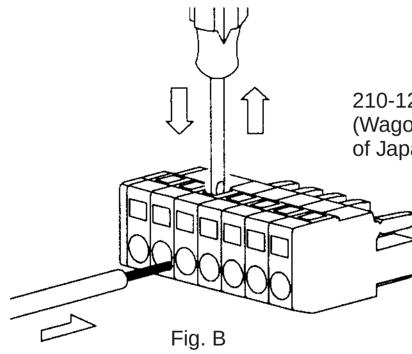


Fig. B

4. Insert the wire into the slot.
With the slot held open, insert the end of the wire. Then let the slot close by releasing the pressure from the lever or the screwdriver.

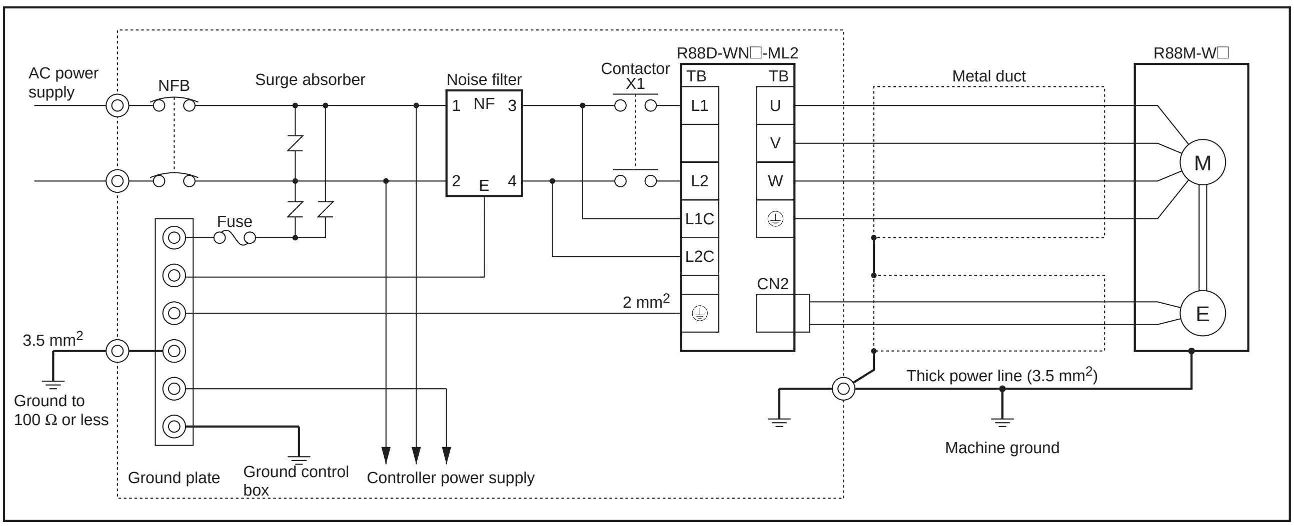
5. Mount the Terminal Block to the Servo Driver.
After all of the terminals have been wired, return the Terminal Block to its original position on the Servo Driver.

3-2-4 Wiring for Noise Resistance

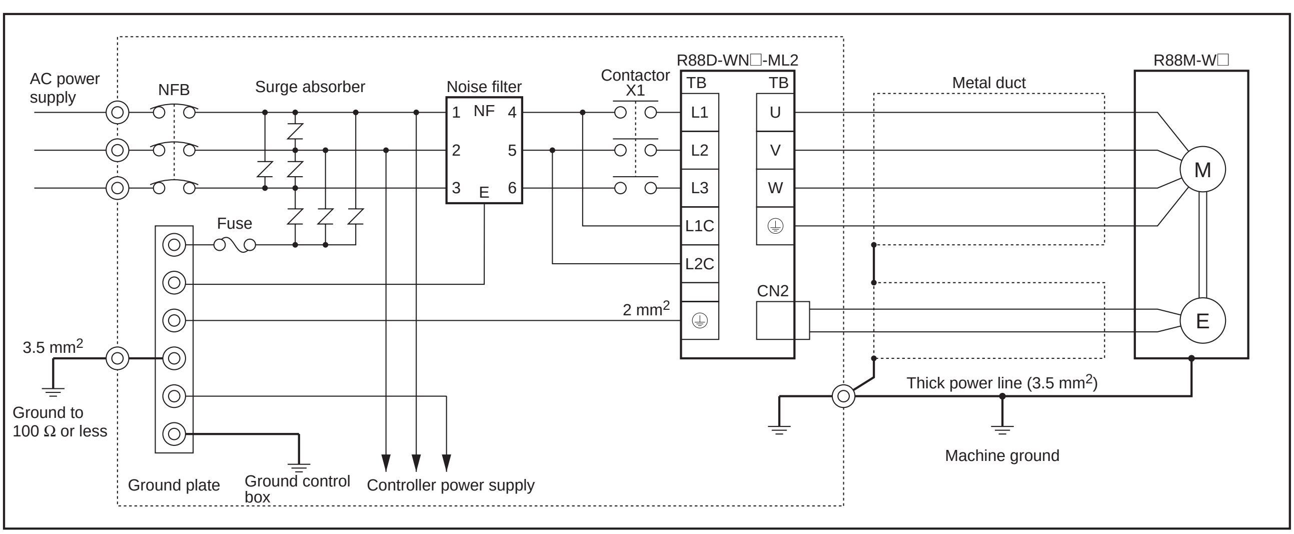
System noise resistance will vary greatly depending on the wiring method used. This section explains how to reduce noise through proper wiring.

■ Wiring Method

● R88D-WNA5L-ML2 to R88D-WN04L-ML2, R88D-WNA5H-ML2 to R88D-WN04H-ML2, and R88D-WN08H-ML2 Servo Drivers (Single-phase Power Supply Input)



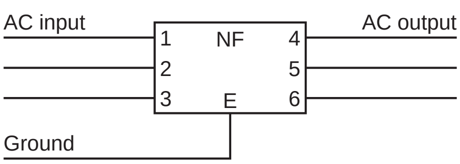
● R88D-WN05H-ML2 to R88D-WN30H-ML2 Servo Drivers (Three-phase Power Supply Input)



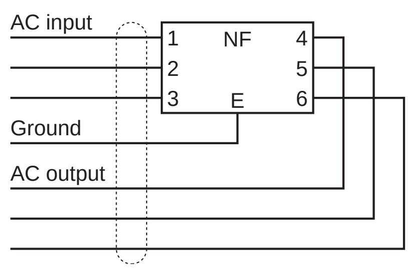
- Ground the motor's frame to the machine ground when the motor is on a movable shaft.
- Use a grounding plate for the frame ground for each Unit, as shown in the above diagrams, and ground to a single point.

- Use ground lines with a minimum thickness of 3.5 mm^2, and arrange the wiring so that the ground lines are as short as possible.
- If no-fuse breakers are installed at the top and the power supply line is wired from the lower duct, use metal tubes for wiring and make sure that there is adequate distance between the input lines and the internal wiring. If input and output lines are wired together, noise resistance will decrease.
- No-fuse breakers, surge absorbers, and noise filters (NF) should be positioned near the input terminal block (ground plate), and I/O lines should be isolated and wired using the shortest distance possible.
- Wire the noise filter as shown at the left in the following illustration. The noise filter should be installed at the entrance to the control box whenever possible.

Correct: Separate input and output

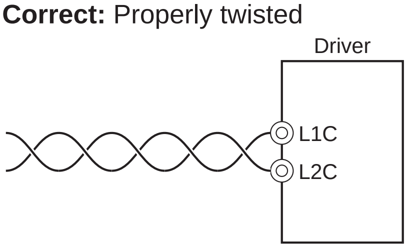


WRONG: Noise not filtered effectively

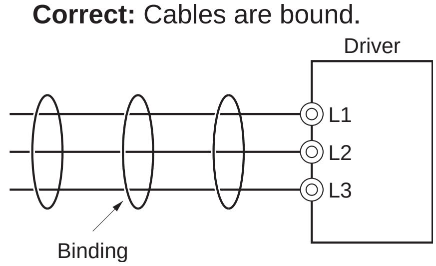


- Use twisted-pair cables for the power supply cables whenever possible, or bind the cables.

Correct: Properly twisted



Correct: Cables are bound.



- Separate power supply cables and signal cables when wiring.

■ Selecting Components

This section explains the criteria for selecting the connection components required for improving noise resistance. These criteria include capacity performance, applicable range, and so on. For more details, contact the manufacturers directly.

● No-fuse Breakers (NFB)

When selecting no-fuse breakers, take into consideration the maximum output current and the inrush current.

W	Power supply voltage	Model	Capacity	Rated current A (rms)	Inrush current (main circuit) A (0-p)	From rated current (*125%)
Single-phase	100	WNA5L	50 W	1.2	14.3	1.5
	100	WN01L	100 W	2.4	14.3	3
	100	WN02L	200 W	4.7	14.3	5.875
	100	WN04L	400 W	9.4	14.3	11.75
Single-phase	200	WNA5H	50 W	0.6	27.6	0.75
	200	WN01H	100 W	1.2	27.6	1.5
	200	WN02H	200 W	2.4	27.6	3
	200	WN04H	400 W	4.7	27.6	5.875
	200	WN08H	750 W	8.8	27.6	11
Three-phase	200	WN05H	500 W	2.5	27.6	3.125
	200	WN10H	1.0 kW	4.9	27.6	6.125
	200	WN15H	1.5 kW	7.3	27.6	9.125
	200	WN20H	2.0 kW	9.7	27.6	12.125
	200	WN30H	3.0 kW	15.0	27.6	18.75

Maximum Input Current:

- The momentary maximum output for a Servo Driver is approximately three times that of the rated output, and a maximum output of three seconds can be executed. Therefore, select no-fuse breakers with an operating time of at least five seconds at 300% of the rated maximum output. General-purpose and low-speed no-fuse breakers are generally suitable (e.g., Mitsubishi S Series).
- The table in *3-2-3 Terminal Block Wiring* shows the rated power supply input currents for each Servomotor. Select a no-fuse-breaker with a rated current greater than the total effective load current (when multiple Servomotors are used).
- When making the selection, add in the current consumption of other controllers, and so on.

Servo Driver Inrush Current:

- The Servo Driver inrush currents are shown in the above table.
- With low-speed no-fuse breakers, an inrush current 10 times the rated current flows for 0.02 second.
- For a simultaneous inrush current for multiple Servo Drivers, select a non-fuse breaker with a 20-ms allowable current greater than the total inrush current shown in the above table for the applicable Servomotor models.

● Noise Filters for Servomotor Output

- Use noise filters without built-in capacitors on the Servomotor output lines.
- Select a noise filter with a rated current at least two times the total rated current of the Servo Driver's continuous output current.

• The following table shows the noise filters that are recommended for Servomotor output.

Maker	Model	Rated current	Remarks
NEC TOKIN	LF-310KA	10 A	Three-phase block noise filter
	LF-320KA	20 A	
	LF-350KA	50 A	
	LF-3110KB	110 A	

Note 1. Servomotor output lines cannot use the same noise filters used for power supplies.

Note 2. Typical noise filters are used with power supply frequencies of 50/60 Hz. If these noise filters are connected to outputs of 11.7 kHz/5.9 kHz (the Servo Driver's PWM frequency), a very large (about 100 times larger) leakage current will flow through the noise filter's condenser and the Servo Driver could be damaged.

● Harmonic Current Countermeasures (Reactor)

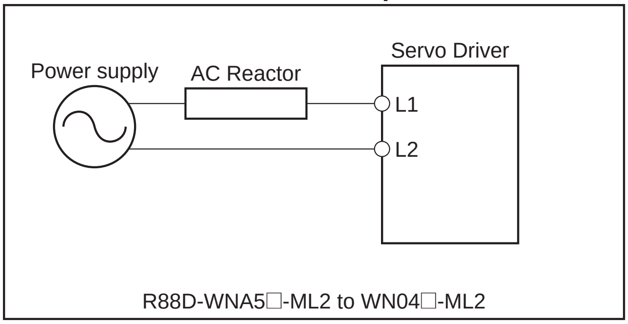
• The AC Reactor is used for suppressing harmonic currents. It suppresses sudden and quick changes in electric currents.

• In September 1994, the Ministry of International Trade and Industry established guidelines for the suppression of harmonic waves emitted from home and general electric appliances. To comply with the guidelines, appropriate measures are required to suppress the influence of harmonic waves on power supply lines.

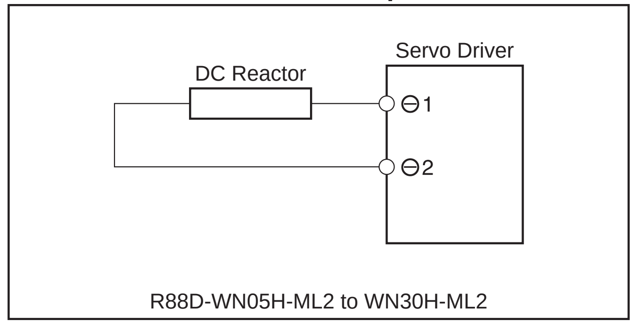
• Select the proper AC Reactor or DC Reactor model according to the Servo Driver that is to be used.

Servo Drive	Reactor specifications			
	Model number	Rated current (A)	Inductance (mH)	Reactor type
R88D-WNA5L-ML2	R88A-PX5053	2.0	20.0	AC Reactor
R88D-WN01L-ML2	R88A-PX5053	2.0	20.0	
R88D-WN02L-ML2	R88A-PX5054	3.0	5.0	
R88D-WN04L-ML2	R88A-PX5056	5.0	2.0	
R88D-WNA5H-ML2	R88A-PX5052	1.0	45.0	
R88D-WN01H-ML2	R88A-PX5052	1.0	45.0	
R88D-WN02H-ML2	R88A-PX5053	2.0	20.0	
R88D-WN04H-ML2	R88A-PX5054	3.0	5.0	
R88D-WN08H-ML2	R88A-PX5056	5.0	2.0	DC Reactor
R88D-WN05H-ML2	R88A-PX5061	4.8	2.0	
R88D-WN10H-ML2	R88A-PX5061	4.8	2.0	
R88D-WN15H-ML2	R88A-PX5060	8.8	1.5	
R88D-WN20H-ML2	R88A-PX5060	8.8	1.5	
R88D-WN30H-ML2	R88A-PX5059	14.0	1.0	

AC Reactor Connection Example



DC Reactor Connection Example



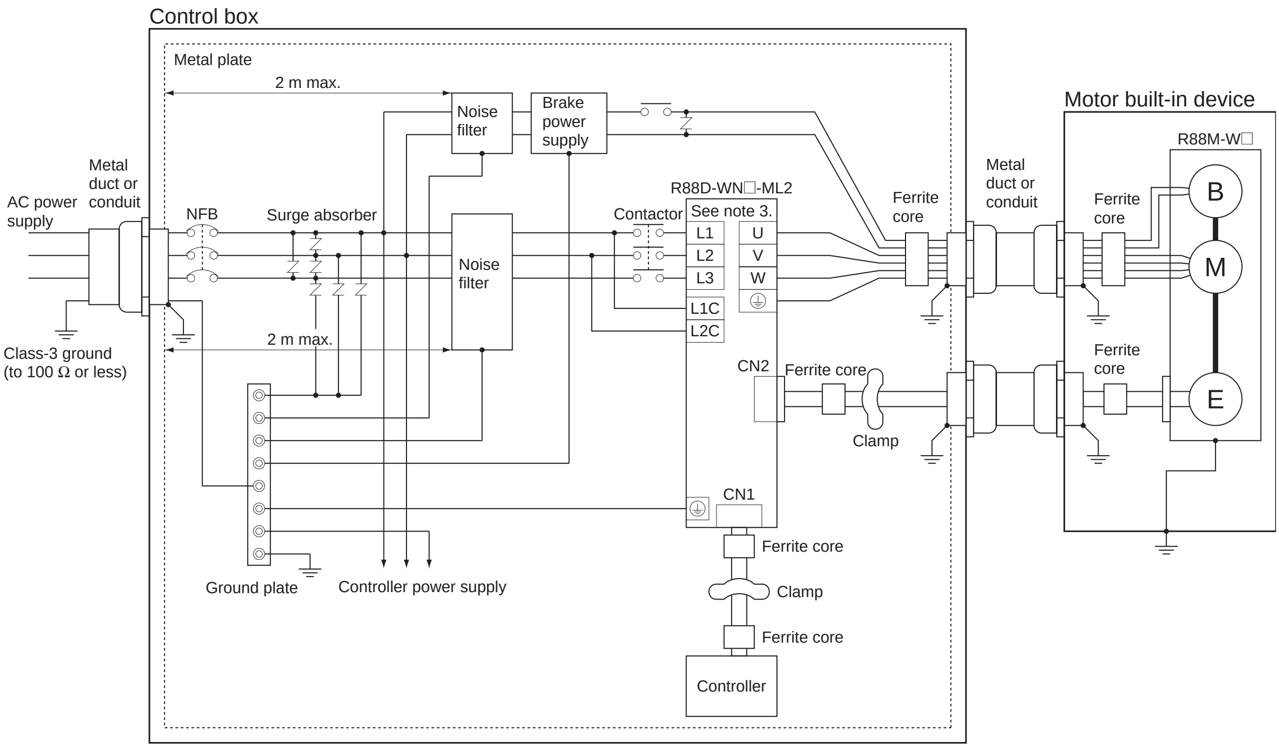
3-2-5 Wiring for Conformity to EMC Directives

When the wiring conditions provided in this section are satisfied, the wiring will conform to EMC Directives (EN55011 Class A Group 1 (EMI), EN61000-6-2 (EMS)). These conditions were stipulated when EMC Directive approval was obtained for the W Series. They will be affected by the installation and wiring conditions resulting from the connected devices and wiring when the W Series is built into the system. Therefore, the entire system must be checked for conformity.

The following conditions must be satisfied in order to conform to the EC Directives.

- The Servo Driver must be mounted in a metal case (control box). (It is not necessary to mount the Servomotor in a metal box.)
- Noise filters and surge absorbers must be inserted in power supply lines.
- Shielded cable must be used for I/O signal cables and encoder cables. (Use tinned soft steel wire.)
- Cables leading out from the control box must be enclosed within metal ducts or conduits with blades. (It is not necessary to enclose the 30-cm power cable, encoder cable, or connectors in a metal duct or conduit.)
- Ferrite cores must be installed for cables with braided shields, and the shield must be directly grounded to a ground plate.

■ Wiring Method



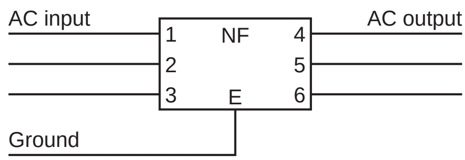
Note 1. Make 1.5 turns for the ferrite core's cable winding.

Note 2. Peel the insulation off the cable at the clamp, and directly connect the shield to the metal plate.

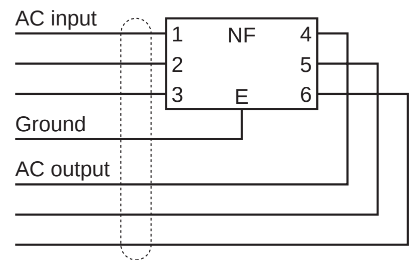
Note 3. For single-phase power supply input models (R88D-WNA5□ to R88D-WN04□, R88D-WN08H), the main-circuit power supply input terminals will be L1 and L2.

- Ground the motor's frame to the machine ground when the motor is on a movable shaft.
- Use a grounding plate for the frame ground for each Unit, as shown in the above diagrams, and ground to a single point.
- Use ground lines with a minimum thickness of 3.5 mm^2, and arrange the wiring so that the ground lines are as short as possible.
- If no-fuse breakers are installed at the top and the power supply line is wired from the lower duct, use metal tubes for wiring and make sure that there is adequate distance between the input lines and the internal wiring. If input and output lines are wired together, noise resistance will decrease.
- No-fuse breakers, surge absorbers, and noise filters should be positioned near the input terminal block (ground plate), and I/O lines should be isolated and wired using the shortest distance possible.
- The noise filter should be installed at the entrance to the control box whenever possible. Wire the noise filter as shown in the following illustrations.

Correct: Separate input and output

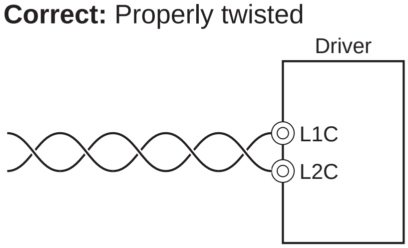


WRONG: Noise not filtered effectively

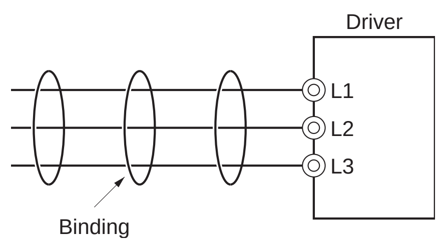


- Use twisted-pair cables for the power supply cables whenever possible, or bind the cables.

Correct: Properly twisted



Correct: Cables are bound.



- Separate power supply cables and signal cables when wiring.

■ Control Box Structure

If there are gaps in the control box from cable openings, operating panel installation holes, gaps around the door, and so on, it may allow electric waves to penetrate. In order to prevent this from occurring, take the measures described below.

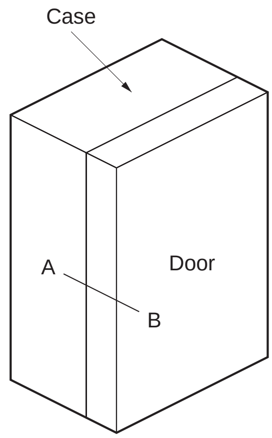
● Case Structure

- Construct the control box case of metal, and weld the joints between the top, bottom, and sides so that they will be electrically conductive.
- For assembly, strip the paint off of joined areas (or mask them during painting), to make them electrically conductive.
- If gaps are opened in the control box case when tightening down screws, make adjustments to prevent this from occurring.
- Do not leave any conducting part unconnected.
- Connect to the case all Units inside of the case.

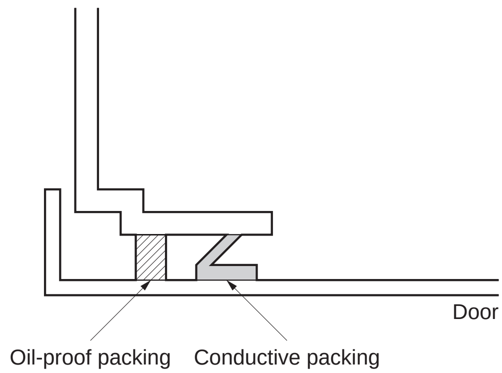
● Door Structure

- Construct the door of metal.
- Use a water draining structure where the door and case fit together, and leave no gaps. (Refer to the diagrams below.)
- Use conductive packing between the door and the case, as shown in the diagrams below. Strip the paint off of the sections of the door and case that will be in contact with the conductive packing (or mask them during painting), so that they will be electrically conductive.

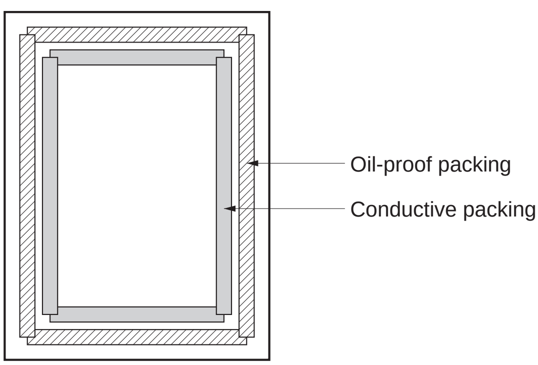
• Be careful not to let gaps be opened in the control box while tightening down screws.



Control box



Cross-sectional view of A-B



Door (interior view)

■ Selecting Components

This section explains the criteria for selecting the connection components required for improving noise resistance. These criteria include capacity performance, applicable range, and so on. For more details, contact the manufacturers directly.

● No-fuse Breakers (NFB)

When selecting no-fuse breakers, take into consideration the maximum output current and the inrush current.

Maximum Input Current:

• The momentary maximum output for a Servo Driver is approximately three times that of the rated output, and a maximum output of three seconds can be executed. Therefore, select no-fuse breakers with an operating time of at least five seconds at 300% of the rated maximum output. General-purpose and low-speed no-fuse breakers are generally suitable (e.g., Mitsubishi S Series).

• The table in *3-2-3 Terminal Block Wiring* shows the rated power supply input currents for each Servomotor. Select a no-fuse-breaker with a rated current greater than the total effective load current (when multiple Servomotors are used).

• When making the selection, add in the current consumption of other controllers, and so on.

Servo Driver Inrush Current:

The Servo Driver inrush currents are listed in the following table.

• With low-speed no-fuse breakers, an inrush current 10 times the rated current flows for 0.02 second.

• For a simultaneous inrush for multiple Servo Drivers, select a no-fuse-breaker with a 20-ms allowable current greater than the total inrush current shown in the following table for the applicable Servomotor models.

Servo Driver	Inrush current (A0-p)	
	Control-circuit power supply	Main-circuit power supply
R88D-WNA5L-ML2	22.2	14.3
R88D-WN01L-ML2	22.2	14.3
R88D-WN02L-ML2	22.2	14.3
R88D-WN04L-ML2	22.2	14.3
R88D-WNA5H-ML2	41.6	27.6
R88D-WN01H-ML2	41.6	27.6
R88D-WN02H-ML2	41.6	27.6
R88D-WN04H-ML2	41.6	27.6
R88D-WN08H-ML2	41.6	27.6
R88D-WN05H-ML2	41.6	27.6
R88D-WN10H-ML2	41.6	27.6
R88D-WN15H-ML2	41.6	27.6
R88D-WN20H-ML2	41.6	27.6
R88D-WN30H-ML2	41.6	27.6

● Surge Absorbers

• Use surge absorbers to absorb surges from power supply input lines due to lightning, abnormal voltages, etc.

• When selecting surge absorbers, take into account the varistor voltage, the amount of surge immunity, and the amount of energy resistance.

• For 200-V AC systems, use surge absorbers with a varistor voltage of 470 V.

• The surge absorbers shown in the following table are recommended.

Maker	Model	Max. limit voltage	Surge immunity	Type	Remarks
Okaya Electric Industries Co., Ltd.	R·A·V-781BYZ-2	783 V	1,000 A	Block	Between power supply lines
	R·A·V-781BXZ-4	783 V	1,000 A		Between power supply line grounds

Note 1. Refer to the manufacturers' documentation for operating details.

Note 2. The surge immunity is for a standard impulse current of 8/20 µs. If pulses are wide, either decrease the current or change to a larger-capacity surge absorber.

● Noise Filters for Power Supply Input

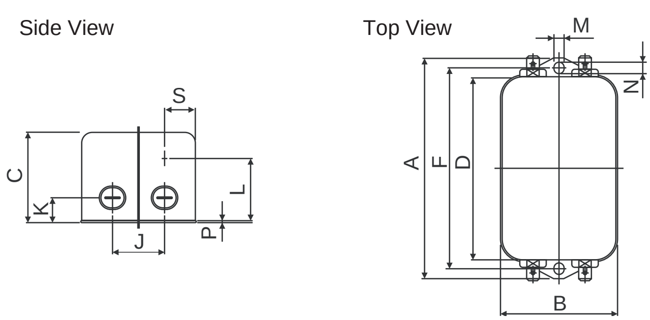
Use the following noise filters for the Servo Driver power supply.

Servo Driver model	Noise Filter				
	Model	**Rated current**	**Rated voltage**	**Leakage current**	**Maker**
R88D-WNA5L-ML2	FN2070-6/07	250 V	6 A	0.40 mA (at 230 Vrms, 50 Hz)	Schaffner
R88D-WN01L-ML2					
R88D-WN02L-ML2	FN2070-10/07		10 A		
R88D-WN04L-ML2	FN2070-16/07		16 A		
R88D-WNA5H-ML2	FN2070-6/07		6 A		
R88D-WN01H-ML2					
R88D-WN02H-ML2					
R88D-WN04H-ML2	FN2070-10/07		10 A		
R88D-WN08H-ML2	FN2070-16/07		16 A		
R88D-WN05H-ML2	FN258L-7/07	480 V	7 A	4.30 mA (at 450 Vrms, 50 Hz)	
R88D-WN10H-ML2	FN258L-16/07		16 A	4.40 mA (at 450 Vrms, 50 Hz)	
R88D-WN15H-ML2					
R88D-WN20H-ML2					
R88D-WN30H-ML2	FN258L-30/07		30 A	4.30 mA (at 450 Vrms, 50 Hz)	

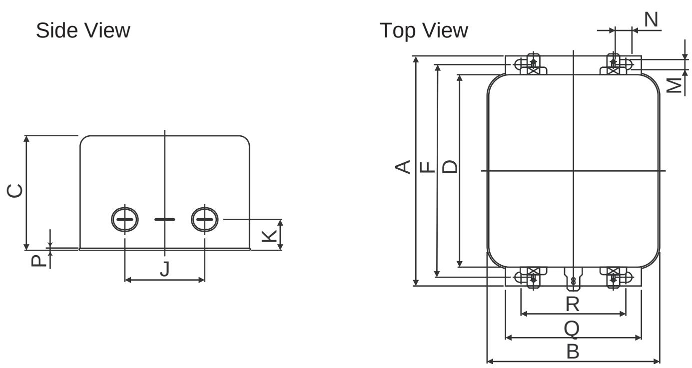
Note The leakage currents shown for Schaffner noise filters are the values for when a three-phase power supply uses a Y connection. The leakage current will be greater for a X connection.

External Dimensions

• FN2070-6/07, FN2070-10/07 Noise Filters (by Schaffner)



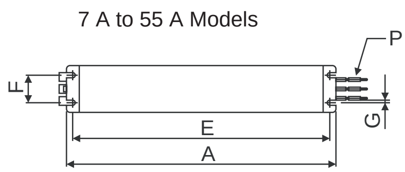
• FN2070-16/07 Noise Filters (by Schaffner)



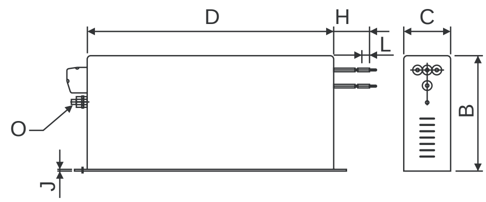
Model	Dimensions (mm)													
	A	B	C	D	F	J	K	L	M	N	P	Q	R	S
FN2070-6/07	113.5	57.5	45.4	94	103	25	8.4	32.4	4.4	6	0.9	---	---	38
FN2070-10/07	156			130.5	143				5.3					
FN2070-16/07	119	85.5	57.6	98.5	109	40	8.6	---	4.4	7.4	1.2	66	51	---

- **FN258L-7/07, -16/07, -30/07 Noise Filters (by Schaffner)**

Side View



Top and Side Views



Model	Dimensions (mm)										
	A	B	C	D	E	F	G	H	J	L	O	P
FN258L-7/07	255	126	50	225	240	25	6.5	300	1	9	M5	AWG16
FN258L-16/07	303	142	55	275	290	30						AWG14
FN258L-30/07	335	150	60	305	320	35		400				AWG10

● Surge Killers

- Install surge killers for loads that have induction coils, such as relays, solenoids, brakes, clutches, etc.
- The following table shows types of surge killers and recommended products.

Type	Features	Recommended products
Diode	Diodes are used for relatively small loads when the reset time is not an issue, such as relays. The reset time is increased because the surge voltage is the lowest when power is cut off. Used for 24/48-V DC systems.	Use a fast-recovery diode with a short reverse recovery time. Example: Fuji Electric Co., ERA22-06
Thyristor or varistor	Thyristors and varistors are used for loads when induction coils are large, as in electromagnetic brakes, solenoids, etc., and when reset time is an issue. The surge voltage when power is cut off is approximately 1.5 times the varistor voltage.	Select the varistor voltage as follows: 24 VDC system: 39 V 100 VDC system: 200 V 100 VAC system: 270 V 200 VAC system: 470 V
Capacitor + resistor	The capacitor + resistor combination is used to absorb vibration in the surge when power is cut off. The reset time can be shortened by selecting the appropriate capacitance and resistance.	Okaya Electric Industries Co., Ltd. XEB120020.2 µF – 120 Ω XEB120030.3 µF – 120 Ω

Note Thyristors and varistors are made by the following companies. Refer to manufacturers' documentation for operating details.
Thyristors: Ishizuka Electronics Co.
Varistors: Ishizuka Electronics Co., Matsushita Electric Industrial Co.

● Contactors

- When selecting contactors, take into consideration the circuit's inrush current and the maximum momentary current.
- The Servo Driver inrush current is covered in the preceding explanation of no-fuse-breaker selection, and the maximum momentary current is approximately twice the rated current.
- The following table shows the recommended contactors.

Maker	Model	Rated current	Coil voltage
OMRON	LC1D09106	11 A	200 V AC
	LC1D25106	26 A	
	LC1D40116	35 A	
	LC1D50116	50 A	
	LC1D80116	80 A	
	LC1D09106	11 A	24 V DC
	LP1D25106	26 A	
	LP1D40116	35 A	
	LP1D50116	50 A	
	LP1D80116	80 A	

● Leakage Current and Leakage Breakers

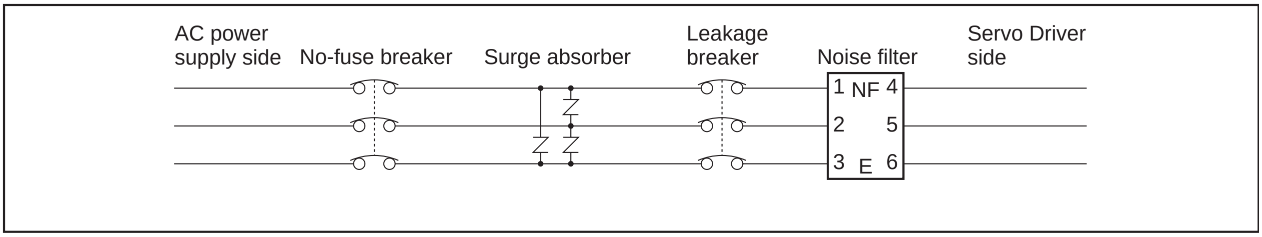
- Use a surge-resistant leakage breaker designed for Inverters that will not operate for high-frequency currents
- The detection current of a leakage breaker is set to approximately 60% of the normal rated current. You should thus allow a leeway of approximately two times the rated current.
- Leakage current will also flow to the input noise filter, switch mode power supply, and other devices. Be sure to allow for these devices as well.

Servo Driver model	*Leakage current (for 10-m cable)	*Additional leakage current per 10 m of cable	PWM frequency	Input power supply voltage
R88D-WNA5L-ML2	3.0 mA	0.5 mA	10.667 kHz	Single-phase 100/115 VAC (85 to 127 V) 50/60 Hz
R88D-WN01L-ML2				
R88D-WN02L-ML2	5.0 mA			
R88D-WN04L-ML2				
R88D-WNA5H-ML2				Single-phase 200/230 VAC (170 to 253 V) 50/60 Hz
R88D-WN01H-ML2				
R88D-WN02H-ML2	8.0 mA			
R88D-WN04H-ML2				
R88D-WN05H-ML2				
R88D-WN08H-ML2				
R88D-WN10H-ML2	10 mA	0.6 mA	8.0 kHz	
R88D-WN15H-ML2		0.7 mA	4.0 kHz	
R88D-WN20H-ML2				
R88D-WN30H-ML2	12 mA	0.8 mA		

Note 1. Values indicated with asterisks are measured using the UL (JIS) methods.

Note 2. The installation conditions of the power cable and the measurement methods greatly affect these values. Use these values only for reference. The values differ by a factor of approximately 3 between standard breakers and inverter breakers.

Leakage Breaker Connection Example



■ Improving Encoder Cable Noise Resistance

The OMNUC W Series uses serial encoders, with phase-S signals from the encoder. The phase-S communications speed is 4 Mbits/s.

In order to improve the encoder's noise resistance, take the following measures for wiring and installation.

- Always use the specified Encoder Cables.
- If lines are interrupted in the middle, be sure to connect them with connectors, making sure that the cable insulation is not peeled off for more than 50 mm. In addition, always use shielded cable.
- Do not coil cables. If cables are long and are coiled, mutual induction and inductance will increase and will cause malfunctions. Always use cables fully extended.
- When installing noise filters for Encoder Cables, use clamp filters. The following table shows the recommended clamp filter models.

Maker	Name	Model
NEC TOKIN	EMI core	ESD-SR-25
TDK	Clamp filter	ZCAT2032-0930
		ZCAT3035-1330
		ZCAT2035-0930A

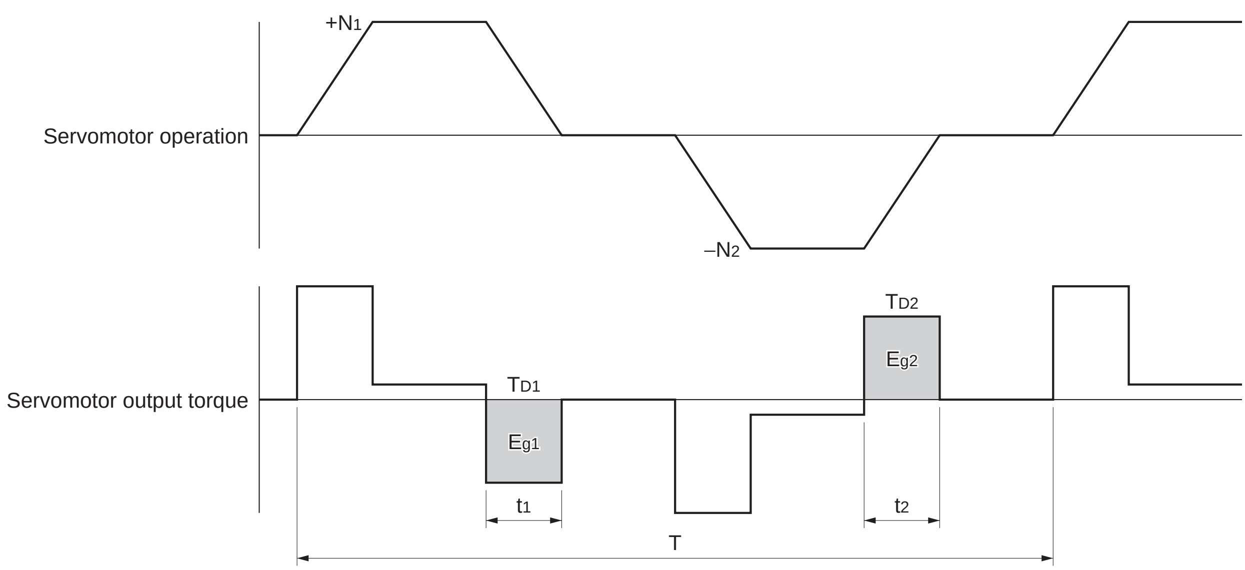
- Do not place the Encoder Cable in the same duct as Power Cables and Control Cables for brakes, solenoids, clutches, and valves.

3-3 Regenerative Energy Absorption

The Servo Drivers have internal regenerative energy absorption circuitry for absorbing the regenerative energy produced during time such as Servomotor deceleration, and thus preventing the DC voltage from increasing. An overcurrent error is generated, however, if the amount of regenerative energy from the Servomotor is too large. If this occurs, measures must be taken to reduce the regenerative energy produced by changing operating patterns, and so on, or to improve the regenerative energy absorption capacity by connecting external regeneration resistance.

3-3-1 Regenerative Energy Calculation

■ Horizontal Axis



Note In the output torque graph, acceleration in the positive direction is shown as positive, and acceleration in the negative direction is shown as negative.

• The regenerative energy values for Eg1 and Eg2 are derived from the following equations.

- $E_{g1} = \frac{1}{2} \bullet \frac{2\pi}{60} \bullet N_1 \bullet T_{D1} \bullet t_1$ [J]
- $E_{g2} = \frac{1}{2} \bullet \frac{2\pi}{60} \bullet N_2 \bullet T_{D2} \bullet t_2$ [J]

N_1, N_2: Rotation speed at beginning of deceleration [r/min]
T_{D1}, T_{D2}: Deceleration torque [N·m]
t_1, t_2: Deceleration time [s]

Note There is some loss due to winding resistance, so the actual regenerative energy will be approximately 90% of the values derived from these equations.

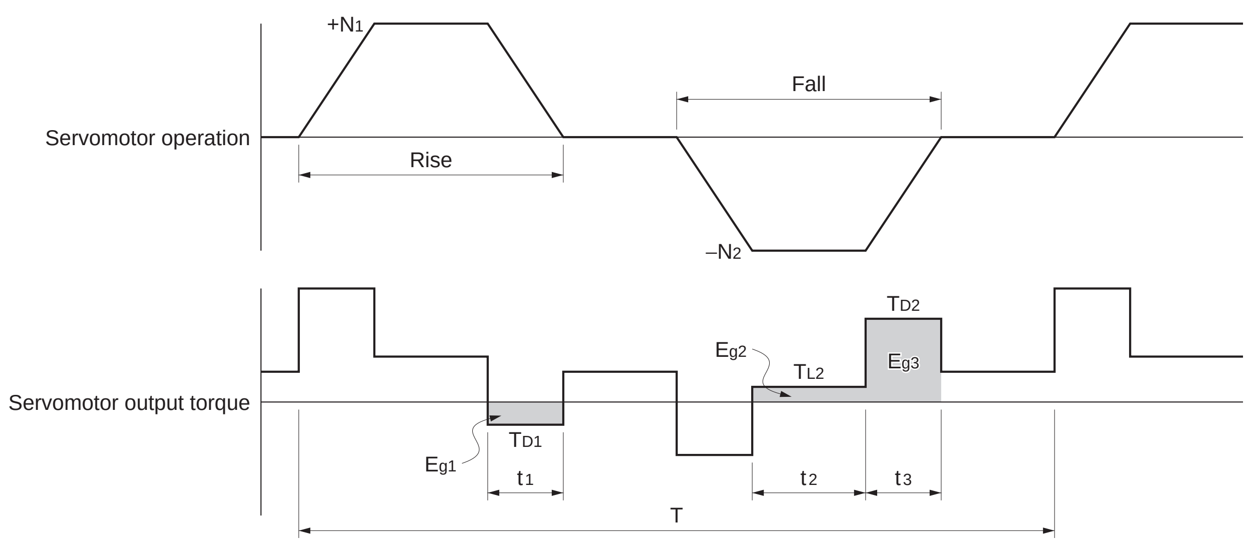
- For Servo Driver models with internal capacitors for absorbing regenerative energy (i.e., models of 400 W or less.), the values for both E_{g1} or E_{g2} (unit: J) must be lower than the Servo Driver's regenerative energy absorption capacity. (The capacity varies depending on the model. For details, refer to *3-3-2 Servo Driver Regenerative Energy Absorption Capacity*.)
- For Servo Driver models with internal regeneration resistance for absorbing regenerative energy (i.e., models of 500 W or more), the average amount of regeneration P_r (unit: W) must be calculated, and this value must be lower than the Servo Driver's regenerative energy absorption capacity. (The capacity varies depending on the model. For details, refer to *3-3-2 Servo Driver Regenerative Energy Absorption Capacity*.)

  The average amount of regeneration (P_r) is the power consumed by regeneration resistance in one cycle of operation.

  $P_r = (E_{g1} + E_{g2})/T$ [W]

  T: Operation cycle [s]

■ Vertical Axis



Note In the output torque graph, acceleration in the positive direction (rise) is shown as positive, and acceleration in the negative direction (fall) is shown as negative.

- The regenerative energy values for Eg1, Eg2, and Eg3 are derived from the following equations.

- $E_{g1} = \frac{1}{2} \bullet \frac{2\pi}{60} \bullet N_1 \bullet T_{D1} \bullet t_1$ [J]
- $E_{g2} = \frac{2\pi}{60} \bullet N_2 \bullet T_{L2} \bullet t_2$ [J]
- $E_{g3} = \frac{1}{2} \bullet \frac{2\pi}{60} \bullet N_2 \bullet T_{D2} \bullet t_3$ [J]

N_1, N_2: Rotation speed at beginning of deceleration [r/min]
T_{D1}, T_{D2}: Deceleration torque [N·m]
T_{L2}: Torque when falling [N·m]
t_1, t_3: Deceleration time [s]
t_2: Constant-velocity travel time when falling [s]

Note There is some loss due to winding resistance, so the actual regenerative energy will be approximately 90% of the values derived from these equations.

- For Servo Driver models with internal capacitors for absorbing regenerative energy (i.e., models of 400 W or less.), the values for both E_{g1} or E_{g2} (unit: J) must be lower than the Servo Driver's regenerative energy absorption capacity. (The capacity varies depending on the model. For details, refer to *3-3-2 Servo Driver Regenerative Energy Absorption Capacity*.)
- For Servo Driver models with internal regeneration resistance for absorbing regenerative energy (i.e., models of 500 W or more), the average amount of regeneration P_r (unit: W) must be calculated, and this value must be lower than the Servo Driver's regenerative energy absorption capacity. (The capacity varies depending on the model. For details, refer to *3-3-2 Servo Driver Regenerative Energy Absorption Capacity*.)

  The average amount of regeneration (Pr) is the power consumed by regeneration resistance in one cycle of operation.

  $P_r = (E_{g1} + E_{g2} + E_{g3})/T$ [W]
  T: Operation cycle [s]

3-3-2 Servo Driver Regenerative Energy Absorption Capacity

■ Amount of Internal Regeneration Resistance in Servo Drivers

W-series Servo Drivers absorb regenerative energy by means of internal capacitors or resistors. If the regenerative energy is more than can be processed internally, an overvoltage error is generated and operation cannot continue. The following table shows the regenerative energy (and amount of regeneration) that the individual Servo Drivers themselves can absorb. If these values are exceeded, take the following measures.

- Connect external regeneration resistance (to improve the regeneration processing capacity).
- Reduce the operating rotation speed. (The amount of regeneration is proportional to the square of the rotation speed.)
- Lengthen the deceleration time (to decrease the regenerative energy produced per time unit).

• Lengthen the operation cycle, i.e., the cycle time (to decrease the average regenerative power).

Servo Driver	Regenerative energy (J) that can be absorbed by internal capacitor (See note.)	Internal regeneration resistance	
		Average amount of regeneration that can be absorbed (W)	Resistance (Ω)
R88D-WNA5L-ML2	28.6	---	---
R88D-WN01L-ML2	28.6	---	---
R88D-WN02L-ML2	28.6	---	---
R88D-WN04L-ML2	39.0	---	---
R88D-WNA5H-ML2	15.2	---	---
R88D-WN01H-ML2	30.5	---	---
R88D-WN02H-ML2	30.5	---	---
R88D-WN04H-ML2	30.5	---	---
R88D-WN08H-ML2	---	12	50
R88D-WN05H-ML2	---	8	50
R88D-WN10H-ML2	---	12	50
R88D-WN15H-ML2	---	14	20
R88D-WN20H-ML2	---	28	12
R88D-WN30H-ML2	---	28	12

Note These are the values at 100 V AC for 100-V AC models, and at 200 V AC for 200-V AC models.

3-3-3 Regenerative Energy Absorption by External Regeneration Resistance

If the regenerative energy exceeds the absorption capacity of the Servo Driver by itself, then external regeneration resistance must be connected. A Resistor or Unit can be used alone or in combination with other Resistors/Units to provide the required regeneration processing capacity.

⚠ **Caution** Connect the External Regeneration Resistor or External Regeneration Resistance Unit between the Servo Driver's B1 and B2 terminals. Check the terminal names carefully when connecting to the terminals. If the Resistor or Unit is connected to the wrong terminals it will damage the Servomotor.

Note 1. The External Regeneration Resistor can reach a temperature of approximately 120°C, so install it at a distance from heat-sensitive devices and wiring. In addition, a radiation shield must be installed according to the radiation conditions.

Note 2. For external dimensions, refer to *2-7 External Regeneration Resistor Specifications*.

■ External Regeneration Resistors

● Specifications

Model	Resistance	Nominal capacity	Regeneration absorption at 120°C	Heat radiation	Thermal switch output
R88A-RR22047S External Regener-ation Resistor	47 Ω ± 5%	220 W	70 W	t1.0 × □350 (SPCC)	Operating temper-ature: 170°C NC contact

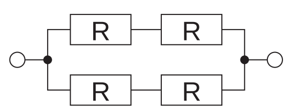
Note The following external regeneration resistors are recommended products from another manufacturer, Iwaki Musen Kenkyusho Co., Ltd. For details, refer to the manufacturer's documentation.

- RH120N50ΩJ 50 Ω ± 5% 30 W (Amount of regeneration at 120°C)
- RH300N50ΩJ 50 Ω ± 5% 75 W (Amount of regeneration at 120°C)
- RH500N50ΩJ 50 Ω ± 5% 100 W (Amount of regeneration at 120°C)

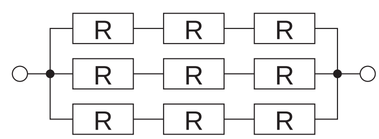
● Combining External Regeneration Resistors (R88D-RR22047S)

1 70 W (47 Ω)

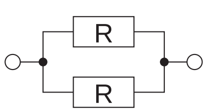
2 280 W (47 Ω)



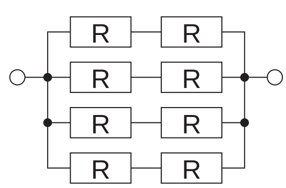
3 630 W (47 Ω)



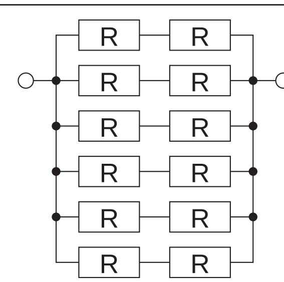
4 140 W (23.5 Ω)



5 560 W (23.5 Ω)



6 840 W (15.7 Ω)



Note A combination cannot be used if the resistance is less than the minimum connection resistance for any given Servo Driver. Refer to the following table for the minimum connection resistance values for each Servo Driver, and select a suitable combination.

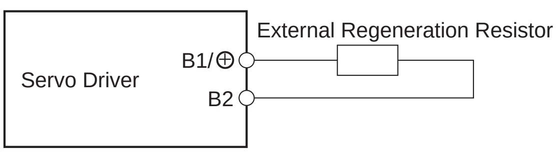
■ Servo Driver Minimum Connection Resistance and External Regeneration Resistor Combinations

Servo Driver	Minimum Connection Resistance (Ω)	External Regeneration Resistor Combinations
R88D-WNA5L-ML2 to WN01L-ML2	40	1
R88D-WN02L-ML2 to WN04L-ML2	40	1, 2
R88D-WNA5H-ML2 to WN01H-ML2	40	1
R88D-WN02H-ML2 to WN04H-ML2	40	1, 2
R88D-WN05H-ML2 to WN10H-ML2	40	1, 2, 3
R88D-WN15H-ML2	20	1, 2, 3, 4, 5
R88D-WN20H-ML2 to WN30H-ML2	12	1, 2, 3, 4, 5, 6

■ Wiring External Regeneration Resistance

● R88D-WNA5L-ML2/01L-ML2/02L-ML2/04L-ML2/A5H-ML2/01H-ML2/02H-ML2/04H-ML2

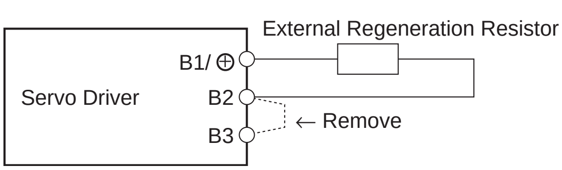
Connect an External Regeneration Resistor between the B1 and B2 terminals.



Note When using the R88A-RR22047S, connect the thermal switch output so that the power supply will be shut off when open.

● R88D-WN05H-ML2/08H-ML2/10H-ML2/20H-ML2/30H-ML2

Remove the short-circuit wiring between B2 and B3, and then connect an External Regeneration Resistor between the B1 and B2 terminals.



Note 1. The short-circuit wiring between B2 and B3 must be removed.

Note 2. When using the R88A-RR22047S, connect the thermal switch output so that the power supply will be shut off when open.

■ Setting Pn600 (Regeneration Resistor Capacity) for an External Regeneration Resistor

Pn600 (Regeneration Resistor Capacity) must be set correctly when using an external regeneration resistor. The regenerative energy in the Servo Driver is calculated based on the assumption that the regeneration resistance that is built into the Servo Driver is connected. The following settings are therefore recommended for Pn600 (Regeneration Resistor Capacity).

Servo Driver model	External regeneration resistance (Ω)	Absorption capacity of external regeneration resistor (W)	Regeneration resistance built into Servo Driver (Ω)	Recommended setting for Pn600
R88D-WN05H/08H/10H-ML2	47	70	50	7
	47	280	50	26
	47	630	50	59
R88D-WN15H-ML2	47	70	20	16
	47	280	20	66
	47	630	20	148
	23.5	140	20	16
	23.5	560	20	66
R88D-WN20H/30H-ML2	47	70	12	27
	47	280	12	110
	47	630	12	247
	23.5	140	12	27
	23.5	560	12	110
	15.7	840	12	110

3-4 Adjustments and Dynamic Braking When Load Inertia Is Large

The value that is given for the Servomotor's applicable load inertia is the value that will not damage the Servo Driver's internal circuits (dynamic brake circuit, regenerative circuit, etc.) when control is basically stable and the operating status is normal. When the Servomotor is used at the applicable load inertia or below, there are certain operating conditions and precautions that must be observed when making adjustments and using the dynamic brake. For details on regenerative energy processing, refer to *3-3 Regenerative Energy Absorption*.

3-4-1 Adjustments When Load Inertia Is Large

Operation is possible with a large load inertia as long as the load torque is within a range that allows Servo Driver control (i.e., no larger than the rated torque and within the electronic thermal range: these depend on the motor speed and acceleration/deceleration). If the load inertia ratio is large, however, adjustment becomes difficult using only the rigidity setting and autotuning, as shown below. The following table lists the adjustment criteria according to the load inertia.

Load inertia ratio	Adjustment criteria
Below 500%	Adjustment is possible using mainly the factory settings or the rigidity setting function (Fn001).
500% to 1,000%	Adjustment is possible using mainly the rigidity setting and autotuning.
1,000% to 3,000%	Adjustment may be possible using the rigidity setting and autotuning, but it may be necessary to manually adjust settings such as the gain.
Above 3,000%	Adjustment will be difficult using the rigidity setting and autotuning. Set the load inertia based on mechanism settings, and manually adjust the gain.

3-4-2 Dynamic Braking When Load Inertia Is Large

Dynamic braking is used to brake the Servomotor by consuming rotational energy using a resistor. The Servomotor's rotational energy can be found by using the following equation.

Servomotor rotational energy - $(1/2 \times J \times \omega^2) = 1/2 \times J \times (2 \times \pi)^2 \times (N/60)^2$

J: Load inertia + Servomotor rotor inertia

N: Servomotor speed [r/min]

Therefore, if the load inertia ratio is large and the motor speed is high, the load on the dynamic brake circuit will be great and there will be a risk of burnout. Burnout may also occur if the dynamic brake is used repeatedly within a short period of time. Do not use the dynamic brake under conditions where the maximum speeds or load inertia ratios shown in the following table are exceeded. For operating conditions other than these, use the following equation: $1/2 \times J \times \omega^2$ = Constant.

Servomotor	Load inertia ratio
3,000-r/min Servomotors, 30 to 400 W	3,000% max.
3,000-r/min Servomotors, 750 W	2,000% max.
3,000-r/min Servomotors, 1 k to 3 kW	1,000% max.
3,000-r/min Flat-type Servomotors, 100 W	2,500% max.
3,000-r/min Flat-type Servomotors, 200 W or 400 W	1,500% max.
3,000-r/min Flat-type Servomotors, 750 W or 1.5 kW	1,000% max.
1,000-r/min Servomotors, 300 W to 2 kW	1,000% max.
1,500-r/min Servomotors, 450 W to 1.8 kW	1,000% max.

For Servomotors of 1.5 kW or less, observe the following precautions if there is a possibility of the power being turned ON while the Servomotor is rotating.

In Servomotors of 1.5 kW or less, the dynamic brake circuit uses a relay. Normally, if an alarm occurs while the Servo is OFF, the dynamic brake operates according to the function selection application switch (Pn001.0, 1) when drive prohibition is being input. At 1.5 kW or less, however, the dynamic brake operates regardless of this setting even if the main circuit power supply or the control power supply is OFF.

Current flows to the relay while the dynamic brake is operating. If 2 (Stop Servomotor by free run) is selected for the function selection application switch (Pn001.0: Stop selection for alarm generation with Servo OFF), the relay turns OFF when the power is turned ON again.

If the power is turned from OFF to ON while the Servomotor is rotating, the relay operates while current is flowing to it. This may cause the relay contacts to fuse.

For Servomotors of 1.5 kW or less, if there is a possibility of the power being turned ON during Servomotor rotation, either set 0 (Stop Servomotor by dynamic brake) for the function selection application switch (Pn001.0: Stop selection for alarm generation with Servo OFF) or make sure that the power will not be turned ON until the Servomotor has stopped.

Chapter 4

Operation

Precautions

⚠ **Caution** Confirm that there will be no effect on the equipment, and then perform a test operation. Not doing so may result in equipment damage.

⚠ **Caution** Check the newly set parameters for proper execution before actually running them. Not doing so may result in equipment damage.

⚠ **Caution** Do not make any extreme adjustments or setting changes. Doing so may result in unstable operation and injury.

⚠ **Caution** Separate the Servomotor from the machine, check for proper operation, and then connect to the machine. Not doing so may cause injury.

⚠ **Caution** When an alarm occurs, remove the cause, reset the alarm after confirming safety, and then resume operation. Not doing so may result in injury.

⚠ **Caution** Do not use the built-in brake of the Servomotor for ordinary braking. Doing so may result in a malfunction.

4-1 Operational Procedure

After mounting, wiring, and connecting a power supply, check the operation of the Servomotor and Servo Driver. Then make the function settings as required according to the use of the Servomotor and Servo Driver. If the parameters are set incorrectly, there is a risk of an unforeseen Servomotor operation. Set the parameters in accordance with the instructions in this manual.

1. Mounting and installation
   Install the Servomotor and Servo Driver according to the installation conditions. (Do not connect the Servomotor to the mechanical system before checking the no-load operation.) Refer to *3-1 Installation Conditions*.
2. Wiring and connections
   Connect to power supply and peripheral devices. Specified installation and wiring requirements must be satisfied, particularly for models conforming to the EC Directives. Refer to *3-2 Wiring*.
3. Preparing for operation
   Before turning ON the power supply, check the necessary items. Check by means of the displays to see whether there are any internal errors in the Servo Driver. If using a Servomotor with an absolute encoder, first set up the absolute encoder. Refer to *4-4-2 Speed Control (Speed)*.
4. Checking operation
   Check the operation of the Servomotor and Servo Driver alone by performing a jogging operation without a load. Refer to *4-4-5 Encoder Dividing Function (All Operating Modes)*.
5. Function settings
   By means of the user parameters, set the functions according to the operating conditions. Refer to *4-4-3 Torque Control (Torque)* and *4-4-4 Forward and Reverse Drive Prohibit (All Operating Modes)*.
6. Trial operation
   Turn the power OFF then ON again to enable the parameter settings. If using a Servomotor with an absolute encoder, set up the absolute encoder and set the Motion Control Unit's initial parameters. Turn ON the power, and check to see whether protective functions such as emergency stop and operational limits are working reliably. Check operation at both low speed and high speed (using instructions from the Host Controller). Refer to *4-4-5 Encoder Dividing Function (All Operating Modes)*.
7. Adjustments
   Manually adjust the gain as required. Further adjust the various functions to further improve the control performance as required. Refer to *4-4-6 Brake Interlock (All Operating Modes)* and *4-4-7 Torque Limit Function (All Operating Modes)*.
8. Operation
   Operation can now begin. If any trouble should occur, refer to *Chapter 5 Troubleshooting*.

4-2 Preparing for Operation

This section explains the procedure following installation and wiring of the Servomotor and Servo Driver, to prepare the mechanical system for operation. It explains what you need to check both before and after turning ON the power. It also explains the setup procedure required if using a Servomotor with an absolute encoder.

4-2-1 Turning Power ON and Checking Indicators

■ Items to Check Before Turning ON the Power

● Checking Power Supply Voltage

• Check to be sure that the power supply voltage is within the ranges shown below.

R88D-WN☐L-ML2 (Single-phase 100 V AC input)

Main-circuit power supply: Single-phase 100/115 V AC (85 to 127 V) 50/60 Hz
Control-circuit power supply: Single-phase 100/115 V AC (85 to 127 V) 50/60 Hz

R88D-WNA5H-ML2/01H-ML2/02H-ML2/04H-ML2/08H-ML2 (Single-phase 200 V AC input)

Main-circuit power supply: Single-phase 200/230 V AC (170 to 253 V) 50/60 Hz
Control-circuit power supply: Single-phase 200/230 V AC (170 to 253 V) 50/60 Hz

R88D-WN05H-ML2/10H-ML2/15H-ML2/20H-ML2/30H-ML2 (Three-phase 200 V AC input)

Main-circuit power supply: Three-phase 200/230 V AC (170 to 253 V) 50/60 Hz
Control-circuit power supply: Single-phase 200/230 V AC (170 to 253 V) 50/60 Hz

● Checking Terminal Block Wiring

• The main-circuit power supply inputs (L1/L2 or L1/L2/L3) and the control-circuit power supply inputs (L1C/L2C) must be properly connected to the terminal block.

• The Servomotor's red (U), white (V), and blue (W) power lines and the yellow/green ground wire (⏚) must be properly connected to the terminal block.

● Checking the Servomotor

• There should be no load on the Servomotor. (Do not connect to the mechanical system.)

• The power lines at the Servomotor must be securely connected.

● Checking the Encoder Connectors

• The Encoder Cable must be securely connected to the Encoder Connector (CN2) at the Servo Driver.

• The Encoder Cable must be securely connected to the Encoder Connector at the Servomotor.

● Checking the I/O Connector

• The I/O Signal Cable must be securely connected to the I/O Connector (CN1).

● Checking the MECHATROLINK-II Connections

- The MECHATROLINK-II Connector must be securely connected to the MECHATROLINK-II Connector at the host controller.
- The MECHATROLINK-II Cable must be securely connected to the MECHATROLINK-II Connector (CN6) at the Servo Driver.
- The termination resistance must be securely connected to the final Servo Driver.

■ Turning ON Power

- First carry out the preliminary checks, and then turn ON the control-circuit power supply. It makes no difference whether or not the main-circuit power supply is also turned ON.
- The $\overline{\text{ALM}}$ output will take approximately 2 seconds to turn ON after the power has been turned ON. Do not attempt to detect an alarm using the Host Controller during this time (when power is being supplied with the Host Controller connected).

■ Checking Displays

- When the power is turned ON, one of the codes shown below will be displayed at either the indicators or the Parameter Unit.

Normal	Error (Alarm Display)
-	A.020

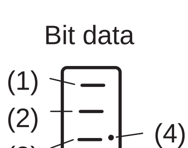
Note 1. The alarm code (the number shown in the alarm display) changes depending on the contents of the error.

Note 2. When using a Servomotor with an absolute encoder for the first time, A.810 (backup error) will be displayed. Clear this error by setting up the absolute encoder. (Refer to *4-2-2 Absolute Encoder Setup and Battery Changes*).

- If the display is normal (i.e., no errors), manually turn the Servomotor shaft forward and reverse, and check to be sure that it agrees with the positive and negative on the speed display. Display the speed feedback with the Computer Monitor Software and manually turn the Servomotor shaft forward and reverse.

■ Panel Operator Status Display

- Status Display (Bit Data)



Item	Bit data	Display contents
(1)	Servomotor rotation detection	Lit while Servomotor is rotating.
(2)	Servo ON/OFF	Lit when Servo is OFF. Unlit when Servo is ON.
(3)	Command input detection	Lit while a command is being input.
(4)	CONNECT	Lit when CONNECT is complete.

• Code Display

Code	Details
P	Forward rotation drive prohibited (POT is OFF) or the forward software limit has been exceeded.
n	Reverse rotation drive prohibited (NOT is OFF) or the reverse software limit has been exceeded.
A.□□	Alarm display (Refer to *5-2 Alarms*.)

• Codes are displayed one character at a time on the Servo Driver's front panel display, as shown below.

Example: When both forward rotation drive prohibit (P) and reverse rotation drive prohibit (n) are ON:

Status display (Status display (bit data) → Not lit) → Code display (P → Not lit → n) → Not lit

Status display (bit data) → Not lit → P → Not lit → n → Not lit

Example: A.E60

Status display (bit data) → Not lit → A. → Not lit → E → Not lit → 6 → Not lit → 0 → Not lit

4-2-2 Absolute Encoder Setup and Battery Changes

You must set up the absolute encoder if using a Servomotor with an absolute encoder. Perform the setup if connecting a Battery Unit (R88A-BAT01W) to an absolute encoder for the first time, or when setting the mechanical rotation data to 0 for a trial operation. For the absolute encoder setup, refer to Computer Monitor Software procedure.

■ Cases where Setup is Required

● During Trial Operation

The absolute encoder's multi-turn data may become too large when connecting the Servomotor to the mechanical system for trial operation, so the setup must be executed again.

● When Replacing the Battery Unit

The setup must be executed again if an alarm (A.810) occurs after the Battery Unit has been replaced.

Note If no alarm occurs after the Battery Unit has been replaced, there is no need to execute the setup again or to initialize the Motion Control Unit settings.
For details on the Battery Units service life and replacement method, refer to *5-6 Replacing the Absolute Encoder Battery (ABS)*.

● Other Cases

- If the Encoder Cable is removed from the connector (on either the Servo Driver or Servomotor side), the data within the absolute encoder will be cleared. In this case, perform the setup once again.
- If the Battery Unit has completely worn down, the data within the absolute encoder will be cleared. In this case, replace the Battery Unit and perform the setup once again.

4-3 User Parameters

Set and check the user parameters using the Setting Mode. Make sure you fully understand the parameter meanings and how to set them before setting user parameters in the system. Some parameters are enabled by turning OFF the Unit, then turning it ON again. When changing these parameters, turn OFF the power (check that the power lamp is not lit), then turn ON the power again.

4-3-1 Parameter Tables

- Some parameters are enabled by turning OFF the Unit, then turning it ON again. (See the tables below.) When changing these parameters, turn OFF the power (check that the power lamp is not lit), then turn ON the power again.
- The specific digit number of a parameter for which each digit number must be set separately is displayed in the table with ".0" added to the digit number. For example, Pn001.0 (i.e., digit No. 0 of parameter No. Pn001).
- The default setting for parameters set using 5 digits are displayed in the table with the leftmost digits not shown if they are 0 (e.g., if the default setting is 00080, 80 is entered in the table).
- Do not set parameters or digit numbers shown as "Not used."

■ Function Selection Parameters (from Pn000)

Parameter No.	Parameter name	Digit No.	Name	Setting	Explanation	Default setting	Unit	Setting range	Restart power?
Pn000	Function selection basic switches	0	Reverse rotation	0	CCW direction is taken for positive command	0000	---	---	Yes
				1	CW direction is taken for positive command				
				2 to 3	Not used.				
		1	Not used.	0	(Do not change setting.)				
		2	Unit No. setting	0 to F	Servo Driver communications unit number setting (necessary for multiple Servo Driver connections when using personal computer monitoring software)				
		3	Not used.	0	(Do not change setting.)				
Pn001	Function selection application switches 1	0	Stop selection if an alarm occurs when Servomotor is OFF	0	Servomotor stopped by dynamic brake.	0002	---	---	Yes
				1	Dynamic brake OFF after Servomotor stopped				
				2	Servomotor stopped with free run				
		1	Stop selection when drive prohibited is input	0	Stop according to Pn001.0 setting (release Servomotor after stopping)				
				1	Stop Servomotor using torque set in Pn406, and lock Servomotor after stopping				
				2	Stop Servomotor using torque set in Pn406, and release Servomotor after stopping				
		2	AC/DC power input selection	0	AC power supply: AC power supplied from L1, L2, (L3) terminals				
				1	DC power supply: DC power from +, –(2) terminals				
		3	Not used.	0	(Do not change setting.)				

Param-eter No.	Parame-ter name	Digit No.	Name	Setting	Explanation	Default setting	Unit	Setting range	Restart power?
Pn002	Function selection application switches 2	0	Torque command input change (during speed control)	0	Do not use option command value.	0000	---	---	Yes
				1	Use option command value 1 as the torque limit value.				
				2	Use option command value 1 as the torque feed forward command value.				
				3	Use option command value 1 or 2 as the torque limit value, according to the forward and reverse torque limits that are specified.				
		1	Speed command input change (during torque control)	0	Do not use option command value.				
				1	Use option command value 1 as the speed limit value.				
		2	Operation switch when using absolute encoder	0	Use as absolute encoder				
				1	Use as incremental encoder				
		3	Not used.	0	(Do not change setting.)				
Pn004	Function selection application switches 4	0	Not used.	0	(Do not change setting.)	0110	---	---	Yes
		1	Not used.	1	(Do not change setting.)				
		2	Not used.	1	(Do not change setting.)				
		3	Not used.	0	(Do not change setting.)				
Pn006	Function selection application switches 6	0 to 1	Analog monitor 1 (AM) signal selection	00	Servomotor rotation speed: 1V/1000 r/min	0002	---	---	---
				01	Speed command: 1 V/1000 r/min				
				02	Torque command: gravity compensation torque (Pn422) (1 V per 100%)				
				03	Position deviation: 0.05 V/1 command unit				
				04	Position amp error (after electronic gear) (0.05 V per encoder pulse unit)				
				05	Position command speed (1 V/1,000 r/min)				
				06	Not used.				
				07	Not used.				
				08	Positioning completed command (Positioning completed: 5 V; positioning not completed: 0 V				
				09	Speed feed forward (1 V/1,000 r/min)				
				0A	Torque feed forward (1 V per 100%)				
				0B to 1F	Not used.				
		2	Analog monitor 1 signal multiplier selection	0	1x				
				1	10x				
				2	100x				
				3	1/10x				
				4	1/100x				
		3	Not used.	0	(Do not change setting.)				

Param-eter No.	Parame-ter name	Digit No.	Name	Setting	Explanation	Default setting	Unit	Setting range	Restart power?
Pn007	Function selection application switches 7	0 to 1	Analog monitor 2 (NM) signal selection	00	Servomotor rotation speed: 1V/1000 r/min	0000	---	---	---
				01	Speed command: 1 V/1000 r/min				
				02	Torque command: gravity compensation torque (Pn422) (1 V per 100%)				
				03	Position deviation: 0.05 V/1 command unit				
				04	Position amp error (after electronic gear) (0.05 V per encoder pulse unit)				
				05	Position command speed (1 V/1,000 r/min)				
				06	Not used.				
				07	Not used.				
				08	Positioning completed command (Positioning completed: 5 V; positioning not completed: 0 V				
				09	Speed feed forward (1 V/1,000 r/min)				
				0A	Torque feed forward (1 V per 100%)				
				0B to 1F	Not used.				
		2	Analog monitor 2 signal multiplier selection	0	1x				
				1	10x				
				2	100x				
				3	1/10x				
				4	1/100x				
		3	Not used.	0	(Do not change setting.)				
Pn008	Function selection application switches 8	0	Lowered battery voltage alarm/warning selection	0	Regard battery voltage drop as alarm (A.830).	4000	---	---	Yes
				1	Regard battery voltage drop as warning (A.930).				
		1	Not used.	0	(Do not change setting.)				
		2	Warning detection selection	0	Warnings detected.				
				1	Warnings not detected.				
		3	Not used.	4	(Do not change setting.)				

■ Servo Gain Parameters (from Pn100)

Param-eter No.	Parameter name	Explanation (See note 1.)				Default setting	Unit	Setting range	Restart power?
		Digit No.	Name	Setting	Explanation (See note 2.)				
Pn100	Speed loop gain	Adjusts speed loop response.				800	× 0.1 Hz	10 to 20000	---
Pn101	Speed loop integration constant	Speed loop integral time constant				2000	× 0.01 ms	15 to 51200	---
Pn102	Position loop gain	Adjusts position loop response.				400	× 0.1/s	10 to 20000	---
Pn103	Inertia ratio	Set using the ratio between the machine system inertia and the Servomotor rotor inertia.				300	%	0 to 20000	---
Pn104	Speed loop gain 2	Adjusts speed loop response (enabled by gain switching input).				800	× 0.1 Hz	10 to 20000	---
Pn105	Speed loop integration constant 2	Speed loop integral time constant (enabled by gain switching input).				2000	× 0.01 ms	15 to 51200	---
Pn106	Position loop gain 2	Adjusts position loop response (enabled by gain switching input).				400	× 0.1/s	10 to 20000	---
Pn107	Bias rotational speed	Sets position control bias.				0	r/min	0 to 450	---

Parameter No.	Parameter name	Explanation (See note 1.) Digit No.	Name	Setting	Explanation (See note 2.)	Default setting	Unit	Setting range	Restart power?
Pn108	Bias addition band	Sets the position control bias operation start using deviation counter pulse width.				7	Command unit	0 to 250	---
Pn109	Feed-forward amount	Position control feed-forward compensation value				0	%	0 to 100	---
Pn10A	Feed-forward command filter	Sets position control feed-forward command filter.				0	× 0.01 ms	0 to 6400	---
Pn10B	Speed control setting	0	P control switching conditions	0	Sets internal torque command value conditions (Pn10C).	0004	---	---	---
				1	Sets speed command value conditions (Pn10d).				
				2	Sets acceleration command value conditions (Pn10E)				
				3	Sets deviation pulse value conditions (Pn10F)				
				4	No P control switching function				
		1	Speed control loop switching	0	PI control				Yes
				1	IP control				
				2 to 3	Not used.				
		2	Position loop control method	0	Standard position control				
				1	Less deviation control				
				2 to 3	Not used.				
		3	Not used.	0	(Do not change setting.)				
Pn10C	P control switching (torque command)	Sets level of torque command to switch from PI control to P control.				200	%	0 to 800	---
Pn10D	P control switching (speed command)	Sets level of speed command to switch from PI control to P control.				0	r/min	0 to 10000	---
Pn10E	P control switching (acceleration command)	Sets level of acceleration command to switch from PI control to P control.				0	r/min/s	0 to 30000	---
Pn10F	P control switching (deviation pulse)	Sets level of deviation pulses to switch from PI control to P control.				10	Command unit	0 to 10000	---
Pn110	Normal autotuning switches	0	Normal autotuning method	2	(Do not change setting.)	0012	---	---	Yes
		1	Speed feedback compensation function selection	0	ON				
				1	OFF				
				2 to 3	Not used.				
		2	Not used.	0	(Do not change setting.)				
		3	Not used.	0	(Do not change setting.)				
Pn111	Speed feedback compensating gain	Adjusts speed loop feedback gain.				100	%	1 to 500	---
Pn119	Not used.	(Do not change setting.)				500	---	---	---
Pn11A	Not used.	(Do not change setting.)				1000	---	---	---
Pn11E	Not used.	(Do not change setting.)				1000	---	---	---
Pn11F	Position integral time constant	Position loop integral time constant				0	× 0.1 ms	0 to 50000	---
Pn12B	Not used.	(Do not change setting.)				400	---	---	---

Parameter No.	Parameter name	Explanation (See note 1.) Digit No.	Name	Setting	Explanation (See note 2.)	Default setting	Unit	Setting range	Restart power?
Pn12C	Not used.	(Do not change setting.)				2000	---	---	---
Pn12D	Not used.	(Do not change setting.)				400	---	---	---
Pn12E	Not used.	(Do not change setting.)				400	---	---	---
Pn12F	Not used.	(Do not change setting.)				2000	---	---	---
Pn130	Not used.	(Do not change setting.)				400	---	---	---
Pn131	Gain switching time 1	Switching time from No. 1 gain to No. 2 gain				0	ms	0 to 65535	---
Pn132	Gain switching time 2	Switching time from No. 2 gain to No. 1 gain				0	ms	0 to 65535	---
Pn135	Gain switching waiting time 1	The time from when gain switching condition A is satisfied until switching from the No. 1 gain to the No. 2 gain begins.				0	ms	0 to 65535	---
Pn136	Gain switching waiting time 2	The time from when gain switching condition B is satisfied until switching from the No. 2 gain to the No. 1 gain begins.				0	ms	0 to 65535	---
Pn139	Automatic gain changeover related switches 1	0	Gain switching selection switch	0	Manual gain switching	0000	---	---	Yes
				1	Automatic switching pattern 1 Automatic switching from No. 1 gain to No. 2 gain when gain switching condition A is satisfied. Automatic switching from No. 2 gain to No. 1 gain when gain switching condition B is satisfied.				
				2 to 4	Not used.				
		1	Gain switching condition A	0	Positioning completed output 1 (INP1) ON				
				1	Positioning completed output 1 (INP1) OFF				
				2	Positioning completed output 2 (INP2) ON				
				3	Positioning completed output 2 (INP2) OFF				
				4	The position command filter output is 0, and also the position command input is 0.				
				5	The position command input is not 0.				
		2	Gain switching condition B	0 to 5	Same as above.				
		3	Not used.	0	(Do not change setting.)				
Pn144	Not used.	(Do not change setting.)				1000	---	---	---
Pn150	Predictive control selection switches	0	Predictive control selection	0	Predictive control not used.	0210	---	---	Yes
				1	Predictive control used.				
				2	Not used. (Do not change setting.)				
		1	Predictive control type	0	Predictive control for tracking				
				1	Predictive control for positioning				
		2	Not used.	2	(Do not change setting.)				
		3	Not used.	0	(Do not change setting.)				
Pn151	Predictive control acceleration/deceleration gain	Adjusts acceleration and deceleration response for predictive control.				100	%	0 to 300	---
Pn152	Predictive control weighting ratio	Adjusts position deviation for predictive control.				100	%	0 to 300	---
Pn1A0	Servo rigidity	Adjusts the Servo rigidity for the No. 1 gain.				60	%	1 to 500	---

Parameter No.	Parameter name	Explanation (See note 1.)				Default setting	Unit	Setting range	Restart power?
		Digit No.	Name	Setting	Explanation (See note 2.)				
Pn1A1	Servo rigidity 2	Adjusts the Servo rigidity for the No. 2 gain.				60	%	1 to 500	---
Pn1A2	Speed feedback filter time constant	Sets the filter time constant for No. 1 gain speed feedback.				72	× 0.01 ms	30 to 3200	---
Pn1A3	Speed feedback filter time constant 2	Sets the filter time constant for No. 2 gain speed feedback.				72	× 0.01 ms	30 to 3200	---
Pn1A4	Torque command filter time constant 2	Sets the filter time constant for the torque command.				36	× 0.01 ms	0 to 2500	---
Pn1A7	Utility control switches	0	Integral compensation processing	0	Integral compensation processing not executed.	1121	---	---	---
				1	Integral compensation processing executed.				
				2	Integral compensation is executed for No. 1 gain and not for No. 2 gain for less-deviation gain switching.				
				3	Integral compensation is executed for No. 2 gain and not for No. 1 gain for less-deviation gain switching.				
		1	Not used.	2	(Do not change setting.)				
		2	Not used.	1	(Do not change setting.)				
		3	Not used.	1	(Do not change setting.)				
Pn1A9	Utility integral gain	Adjusts the auxiliary integral responsive.				37	Hz	0 to 500	---
Pn1AA	Position proportional gain	Adjusts the position proportional responsive.				60	Hz	0 to 500	---
Pn1AB	Speed integral gain	Adjusts the speed integral responsive.				0	Hz	0 to 500	---
Pn1AC	Speed proportional gain	Adjusts the speed proportional responsive.				120	Hz	0 to 2000	---
Pn1B5	Not used.	(Do not change setting.)				150	---	---	---

Note 1. Explanation for parameters set using 5 digits.

Note 2. Explanation for parameters requiring each digit No. to be set separately.

■ Position Control Parameters (from Pn200)

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?
		Digit No.	Name	Setting	Explanation				
Pn200	Not used.	0	Not used.	0	(Do not change setting.)	0100	---	---	Yes
		1	Not used.	0	(Do not change setting.)				
		2	Not used.	1	(Do not change setting.)				
		3	Not used.	0	(Do not change setting.)				
Pn205	Absolute encoder multi-turn limit setting	Sets the multi-turn limit for when a Servomotor with an absolute encoder is used.				65535	Rotation	0 to 65535	Yes

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?
		Digit No.	Name	Setting	Explanation				
Pn207	Position control settings 2	0	Not used.	0	(Do not change setting.)	0010	---	---	Yes
		1	Not used.	1	(Do not change setting.)				
		2	Backlash compensation selection	0	Disabled				
				1	Compensates to forward rotation side.				
				2	Compensates to reverse rotation side.				
		3	INP 1 output timing	0	When the position deviation is below the INP1 range.				
				1	When the position deviation is below the INP1 range and also the command after the position command filter is 0.				
				2	When the absolute value for the position deviation is below the INP1 range (Pn522) and also the position command input is 0.				
Pn209	Not used.	(Do not change setting.)				0	---	---	---
Pn20A	Not used.	(Do not change setting.)				32768	---	---	Yes
Pn20E	Electronic gear ratio G1 (numerator)	Sets the pulse rate for the command pulses and Servomotor movement distance. $0.001 \leq Pn20E/Pn210 \leq 1000$				4	---	1 to 1073741824	Yes
Pn210	Electronic gear ratio G2 (denominator)					1	---	1 to 1073741824	Yes
Pn212	Encoder divider rate	Sets the number of output pulses per Servomotor rotation.				1000	Pulses/ rotation	16 to 1073741824	Yes
Pn214	Backlash compensation amount	Mechanical system backlash amount (the mechanical gap between the drive shaft and the shaft being driven)				0	Command unit	–32767 to 32767	---
Pn215	Backlash compensation time constant	Sets the backlash compensation time constant.				0	× 0.01 ms	0 to 65535	---
Pn216	Not used.	(Do not change setting.)				0	---	---	---
Pn217	Not used.	(Do not change setting.)				0	---	---	---
Pn281	Not used.	(Do not change setting.)				20	---	---	Yes

■ Speed Control Parameters (from Pn300)

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?
		Digit No.	Name	Setting	Explanation				
Pn300	Not used.	(Do not change setting.)				600	---	---	---
Pn301	Not used.	(Do not change setting.)				100	---	---	---
Pn302	Not used.	(Do not change setting.)				200	---	---	---
Pn303	Not used.	(Do not change setting.)				300	---	---	---
Pn304	Jog speed	Sets rotation speed during jog operation.				500	r/min	0 to 10000	---
Pn305	Soft start acceleration time	Sets acceleration time during speed control soft start.				0	ms	0 to 10000	---
Pn306	Soft start deceleration time	Sets deceleration time during speed control soft start.				0	ms	0 to 10000	---

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?
		Digit No.	Name	Setting	Explanation				
Pn307	Not used.	(Do not change setting.)				40	---	---	---
Pn308	Speed feed-back filter time constant	Sets constant during filter of speed feedback.				0	× 0.01 ms	0 to 65535	---
Pn310	Vibration detection switches	0	Vibration detection selection	0	Vibration detection not used.	0000	---	---	---
				1	Gives warning (A.911) when vibration is detected.				
				2	Gives warning (A.520) when vibration is detected.				
		1	Not used.	0	(Do not change setting.)				
		2	Not used.	0	(Do not change setting.)				
		3	Not used.	0	(Do not change setting.)				
Pn311	Vibration detection sensitivity	Sets the vibration detection sensitivity.				100	%	50 to 500	---
Pn312	Vibration detection level	Sets the vibration detection level				50	r/min	0 to 5000	---

■ Torque Control Parameters (from Pn400)

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?
		Digit No.	Name	Setting	Explanation				
Pn400	Not used.	(Do not change setting.)				30	---	---	---
Pn401	1st step 1st torque command filter time constant	Sets the filter time constant for internal torque commands.				40	× 0.01 ms	0 to 65535	---
Pn402	Forward torque limit	Forward rotation output torque limit (rated torque ratio).				350	%	0 to 800	---
Pn403	Reverse torque limit	Reverse rotation output torque limit (rated torque ratio).				350	%	0 to 800	---
Pn404	Forward rotation external current limit	Output torque limit during input of forward rotation current limit (rated torque ratio)				100	%	0 to 800	---
Pn405	Reverse rotation external current limit	Output torque limit during input of reverse rotation current limit (rated torque ratio)				100	%	0 to 800	---
Pn406	Emergency stop torque	Deceleration torque when an error occurs (rated torque ratio)				350	%	0 to 800	---
Pn407	Speed limit	Sets the speed limit in torque control mode.				3000	r/min	0 to 10000	---
Pn408	Torque command setting	0	Selects notch filter 1 function.	0	Notch filter 1 not used.	0000	---	---	---
				1	Notch filter 1 used for torque commands.				
		1	Not used.	0	(Do not change setting.)				
		2	Selects notch filter 2 function.	0	Notch filter 2 not used.				
				1	Notch filter 2 used for torque commands.				
		3	Not used.	0	(Do not change setting.)				
Pn409	Notch filter 1 frequency	Sets notch filter 1 frequency for torque command.				2000	Hz	50 to 2000	---
Pn40A	Notch filter 1 Q value	Sets Q value of notch filter 1.				70	× 0.01	50 to 1000	---
Pn40C	Notch filter 2 frequency	Sets the notch filter 2 frequency for torque commands.				2000	Hz	50 to 2000	---

Parameter No.	Parameter name	Explanation: Digit No.	Name	Setting	Explanation	Default setting	Unit	Setting range	Restart power?
Pn40D	Notch filter 2 Q value	Sets Q value of notch filter 2.				70	× 0.01	50 to 1000	---
Pn40F	2nd step 2nd torque command filter frequency	Sets the filter frequency for internal torque commands.				2000	Hz	100 to 2000	---
Pn410	2nd step 2nd torque command filter Q value	Sets the torque command filter Q value.				70	× 0.01	50 to 1000	---
Pn411	3rd step torque command filter time constant	Sets the filter time constant for internal torque commands.				0	µs	0 to 65535	---
Pn412	1st step 2nd torque command filter time constant	Sets the filter time constant for No. 2 gain internal torque commands.				100	× 0.01 ms	0 to 65535	---
Pn413	Not used.	(Do not change setting.)				100	---	---	---
Pn414	Not used.	(Do not change setting.)				100	---	---	---
Pn420	Damping for vibration suppression on stopping	Sets the vibration suppression value while stopped.				100	%	10 to 100	---
Pn421	Vibration suppression starting time	Sets the time from when the position command becomes 0 until damping for vibration suppression on stopping begins.				1000	ms	0 to 65535	---
Pn422	Gravity compensation torque	Sets the gravity compensation torque.				0	× 0.01%	–20000 to 20000	---
Pn456	Sweep torque command amplitude	Sets the sweep torque command amplitude.				15	%	1 to 800	---

■ Sequence Parameters (from Pn500)

Parameter No.	Parameter name	Explanation: Digit No.	Name	Setting	Explanation	Default setting	Unit	Setting range	Restart power?
Pn501	Not used.	(Do not change setting.)				10	---	---	---
Pn502	Rotation speed for motor rotation detection	Sets the number of rotations for the Servomotor rotation detection output (TGON).				20	r/min	1 to 10000	---
Pn503	Speed conformity signal output width	Sets the allowable fluctuation (number of rotations) for the speed conformity output (VCMP).				10	r/min	0 to 100	---
Pn506	Brake timing 1	Sets the delay from the brake command to the Servomotor turning OFF.				0	× 10 ms	0 to 50	---
Pn507	Brake command speed	Sets the number of rotations for outputting the brake command.				100	r/min	0 to 10000	---
Pn508	Brake timing 2	Sets the delay time from the Servomotor turning OFF to the brake command output.				50	× 10 ms	10 to 100	---
Pn509	Momentary hold time	Sets the time during which alarm detection is disabled when a power failure occurs.				20	ms	20 to 1000	---

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?
		Digit No.	Name	Setting	Explanation				
Pn50A	Input signal selections 1	0	Not used.	1	(Do not change setting.)	1881	---	---	Yes
		1	Not used.	8	(Do not change setting.)				
		2	Not used.	8	(Do not change setting.)				
		3	POT (forward drive prohibited input) signal Input terminal allocation	0	Allocated to CN1, pin 13: Valid for low input				
				1	Allocated to CN1, pin 7: Valid for low input				
				2	Allocated to CN1, pin 8: Valid for low input				
				3	Allocated to CN1, pin 9: Valid for low input				
				4	Allocated to CN1, pin 10: Valid for low input				
				5	Allocated to CN1, pin 11: Valid for low input				
				6	Allocated to CN1, pin 12: Valid for low input				
				7	Always enabled.				
				8	Always disabled.				
				9	Allocated to CN1, pin 13: Valid for high input				
				A	Allocated to CN1, pin 7: Valid for high input				
				B	Allocated to CN1, pin 8: Valid for high input				
				C	Allocated to CN1, pin 9: Valid for high input				
				D	Allocated to CN1, pin 10: Valid for high input				
				E	Allocated to CN1, pin 11: Valid for high input				
				F	Allocated to CN1, pin 12: Valid for high input				
Pn50B	Input signal selections 2	0	NOT (reverse drive prohibited input) signal Input terminal allocation	0 to F	Same as Pn50A.3. NOT (reverse drive prohibited) signal allocation	8882	---	---	Yes
		1	Not used.	8	(Do not change setting.)				
		2	Not used.	8	(Do not change setting.)				
		3	Not used.	8	(Do not change setting.)				
Pn50C	Input signal selections 3	0	Not used.	8	(Do not change setting.)	8888	---	---	Yes
		1	Not used.	8	(Do not change setting.)				
		2	Not used.	8	(Do not change setting.)				
		3	Not used.	8	(Do not change setting.)				
Pn50D	Input signal selections 4	0	Not used.	8	(Do not change setting.)	8888	---	---	Yes
		1	Not used.	8	(Do not change setting.)				
		2	Not used.	8	(Do not change setting.)				
		3	Not used.	8	(Do not change setting.)				

Parameter No.	Parameter name	Explanation: Digit No.	Explanation: Name	Explanation: Setting	Explanation: Explanation	Default setting	Unit	Setting range	Restart power?
Pn50E	Output signal selections 1	0	INP1 (positioning completed 1) signal output terminal allocation	0	Not used.	0000	---	---	Yes
				1	Allocated to CN1 pins 1, 2				
				2	Allocated to CN1 pins 23, 24				
				3	Allocated to CN1 pins 25, 26				
		1	VCMP (speed conformity) signal output terminal allocation	0 to 3	Same as Pn50E.0. VCMP (speed coincidence) signal allocation				
		2	TGON (servomotor rotation detection) signal output terminal allocation	0 to 3	Same as Pn50E.0. TGON (Servomotor rotation detection) signal allocation				
		3	READY (servo ready) signal output terminal allocation	0 to 3	Same as Pn50E.0. READY (servo ready) signal allocation				
Pn50F	Output signal selections 2	0	CLIMT (current limit detection) signal output terminal allocation	0 to 3	Same as Pn50E.0. CLIMT (current limit detection) signal allocation	0100	---	---	Yes
		1	VLIMT (speed limit detection) signal output terminal allocation	0 to 3	Same as Pn50E.0. VLIMT (speed limit detection) signal allocation				
		2	BKIR (brake interlock) signal output terminal allocation	0 to 3	Same as Pn50E.0. BKIR (brake interlock) signal allocation.				
		3	WARN (warning) signal output terminal allocation	0 to 3	Same as Pn50E.0. WARN (warning) signal allocation				
Pn510	Output signal selections 3	0	INP2 (positioning completed 2) signal output terminal allocation	0 to 3	Same as Pn50E.0. INP2 (positioning completed 2) signal allocation	0000	---	---	Yes
		1	Not used.	0	(Do not change setting.)				
		2	Not used.	0	(Do not change setting.)				
		3	Not used.	0	(Do not change setting.)				

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?
		Digit No.	Name	Setting	Explanation				
Pn511	Input signal selections 5	0	DEC signal input terminal allocation	0	Allocated to CN1, pin 13: Valid for low input	6543	---	---	Yes
				1	Allocated to CN1, pin 7: Valid for low input				
				2	Allocated to CN1, pin 8: Valid for low input				
				3	Allocated to CN1, pin 9: Valid for low input				
				4	Allocated to CN1, pin 10: Valid for low input				
				5	Allocated to CN1, pin 11: Valid for low input				
				6	Allocated to CN1, pin 12: Valid for low input				
				7	Always enabled.				
				8	Always disabled.				
				9	Allocated to CN1, pin 13: Valid for high input				
				A	Allocated to CN1, pin 7: Valid for high input				
				B	Allocated to CN1, pin 8: Valid for high input				
				C	Allocated to CN1, pin 9: Valid for high input				
				D	Allocated to CN1, pin 10: Valid for high input				
				E	Allocated to CN1, pin 11: Valid for high input				
				F	Allocated to CN1, pin 12: Valid for high input				
		1	EXT1 signal input terminal allocation	0 to 3	Always disabled.				
				4	Allocated to CN1, pin 10: Valid for low input				
				5	Allocated to CN1, pin 11: Valid for low input				
				6	Allocated to CN1, pin 12: Valid for low input				
				7	Always enabled.				
				8	Always disabled.				
				9 to C	Always disabled.				
				D	Allocated to CN1, pin 10: Valid for high input				
				E	Allocated to CN1, pin 11: Valid for high input				
				F	Allocated to CN1, pin 12: Valid for high input				
		2	EXT2 signal input terminal allocation	0 to F	Same as for Pn511.1. EXT2 signal allocation				
		3	EXT3 signal input terminal allocation	0 to F	Same as for Pn511.1. EXT3 signal allocation				

Parameter No.	Parameter name	Explanation: Digit No.	Explanation: Name	Explanation: Setting	Explanation: Explanation	Default setting	Unit	Setting range	Restart power?
Pn512	Output signal reverse	0	Output signal reverse for CN1 pins 1, 2	0	Not reversed.	0000	---	---	Yes
				1	Reversed.				
		1	Output signal reverse for CN1 pins 23, 24	0	Not reversed.				
				1	Reversed.				
		2	Output signal reverse for CN1 pins 25, 26	0	Not reversed.				
				1	Reversed.				
		3	Not used.	0	(Do not change setting.)				
Pn513	Not used.	(Do not change setting.)				0321	---	---	Yes
Pn515	Not used.	(Do not change setting.)				8888	---	---	Yes
Pn51B	Not used.	(Do not change setting.)				1000	---	---	---
Pn51E	Deviation counter overflow warning level	Sets the detection level for the deviation counter overflow warning. (A warning is output for Pn520 × Pn51E/100 or higher.)				100	%	10 to 100	---
Pn520	Deviation counter overflow level	Sets the deviation counter overflow alarm detection level. Pn520 ≥ (Max. feed speed [command unit/s]/Pn102) × 2.0				262144	Command unit	1 to 1073741823	---
Pn522	Positioning completed range 1	Setting range for positioning completed range 1 (INP1)				3	Command unit	0 to 1073741823	---
Pn524	Positioning completed range 2	Setting range for positioning completed range 2 (INP2)				3	Command unit	1 to 1073741823	---
Pn526	Deviation counter overflow level at Servo-ON	Sets the deviation counter overflow alarm detection level for Servo ON.				262144	Command unit	1 to 1073741823	---
Pn528	Deviation counter overflow warning level at Servo-ON	Sets the deviation counter overflow warning detection level for Servo ON.				100	%	10 to 100	---
Pn529	Speed limit level at Servo-ON	Sets the speed limit for when the Servo turns ON with position deviation accumulated.				10000	r/min	0 to 10000	---
Pn52A	Not used.	(Do not change setting.)				20	---	---	---
Pn52F	Not used.	(Do not change setting.)				FFF	---	---	---

Parameter No.	Parameter name	Explanation: Digit No.	Explanation: Name	Explanation: Setting	Explanation: Explanation	Default setting	Unit	Setting range	Restart power?
Pn530	Program JOG operation related switches	0	Program JOG operating pattern	0	(Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536	0000	---	---	---
				1	(Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536				
				2	(Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536 (Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536				
				3	(Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536 (Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536				
				4	(Waiting time Pn535 → Forward movement Pn531 → Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536				
				5	(Waiting time Pn535 → Reverse movement Pn531 → Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536				
		1	Not used.	0	(Do not change setting.)				
		2	Not used.	0	(Do not change setting.)				
		3	Not used.	0	(Do not change setting.)				
Pn531	Program JOG movement distance	Sets the program JOG movement distance.				32768	Command unit	1 to 1073741824	---
Pn533	Program JOG movement speed	Sets the program JOG operation movement speed.				500	r/min	1 to 10000	---
Pn534	Program JOG acceleration/deceleration time	Sets the acceleration/deceleration time for program JOG operation.				100	ms	2 to 10000	---
Pn535	Program JOG waiting time	Sets the delay time from the program JOG operation start input until operation starts.				100	ms	0 to 10000	---
Pn536	Number of program JOG movements	Sets the number of repetitions of the program JOG operations.				1	Times	1 to 1000	---
Pn540	Gain limit	Sets the gain limit.				2000	× 0.1 Hz	10 to 2000	---
Pn550	Analog monitor 1 offset voltage	Sets the analog monitor 1 offset voltage.				0	× 0.1 V	–10000 to 10000	---
Pn551	Analog monitor 2 offset voltage	Sets the analog monitor 2 offset voltage.				0	× 0.1 V	–10000 to 10000	---

■ Other Parameters (from Pn600)

Param-eter No.	Parame-ter name	Explanation: Digit No.	Explanation: Name	Explanation: Setting	Explanation: Explanation	Default setting	Unit	Setting range	Restart power?
Pn600	Regener-ation resistor capacity (See note 1.)	Setting for regeneration resistance load ratio monitoring calcula-tions				0	× 10 W	0 to (varies by model) (See note 2.)	---
Pn800	Communi-cations control	0	MECHA-TROLINK-II communica-tions check mask	0	Normal	0040	---	---	---
				1	Ignore communications errors (A.E6□).				
				2	Ignore WDT errors (A.E5□).				
				3	Ignore communications errors (A.E6□) and WDT errors (A.E5□).				
		1	Warning check mask	0	Normal				
				1	Ignore data setting warning (A. 94□).				
				2	Ignore command warning (A. 95□).				
				3	Ignore A.94□ and A.95□.				
				4	Ignore communications warn-ing (A. 96□).				
				5	Ignore A.94□ and A.96□.				
				6	Ignore A.95□ and A.96□.				
				7	Ignore A.94□, A.95□ and A.96□.				
		2	Communi-cations error count at sin-gle trans-mission	0 to F	Detects communications errors (A.E60) if they occur consecu-tively for the set value plus two times.				
		3	Not used.	0	(Do not change setting.)				
Pn801	Function selection applica-tion 6 (software LS)	0	Software limit function	0	Software limit enabled.	0003	---	---	---
				1	Forward software limit disabled.				
				2	Reverse software limit disabled.				
				3	Forward/reverse software limits disabled.				
		1	Not used.	0	(Do not change setting.)				
		2	Software limit check using refer-ence	0	No software limit check using reference				
				1	Software limit check using refer-ence				
		3	Not used.	0	(Do not change setting.)				
Pn802	Not used.	(Do not change setting.)				0000	---	---	---
Pn803	Zero point width	Sets the origin position detection range.				10	Command unit	0 to 250	---
Pn804	Forward software limit	Sets the software limit for the positive direction. **Note:** Pn806 must be set lower than Pn804.				8191 91808	Command unit	–1073741823 to 1073741823	---
Pn806	Reverse software limit	Sets the software limit for the negative direction. **Note:** Pn806 must be set lower than Pn804.				–8191 91808	Command unit	–1073741823 to 1073741823	---
Pn808	Absolute encoder zero point position offset	Sets the encoder position and machine coordinate system offsets for when an absolute encoder is used.				0	Command unit	–1073741823 to 1073741823	---

Parameter No.	Parameter name	Explanation: Digit No.	Explanation: Name	Explanation: Setting	Explanation: Explanation	Default setting	Unit	Setting range	Restart power?
Pn80A	First step linear acceleration parameter	Sets the step 1 acceleration for when two-step acceleration is used.				100	× 10000 Command unit/s^2	1 to 65535	---
Pn80B	Second step linear acceleration parameter	Sets the step 2 acceleration for when two-step acceleration is executed, or the one-step acceleration parameter for when one-step acceleration is executed.				100	× 10000 Command unit/s^2	1 to 65535	---
Pn80C	Acceleration parameter switching speed	Sets the switching speed for the step 1 and step 2 acceleration when two-step acceleration is executed. **Note:** When used as one-step acceleration, 0 must be set.				0	× 100 Command unit/s	0 to 65535	---
Pn80D	First step linear deceleration parameter	Sets the step 1 deceleration for when two-step deceleration is used.				100	× 10000 Command unit/s^2	1 to 65535	---
Pn80E	Second step linear deceleration parameter	Sets the step 2 deceleration for when two-step deceleration is executed, or the one-step deceleration parameter for when one-step deceleration is executed.				100	× 10000 Command unit/s^2	1 to 65535	---
Pn80F	Deceleration parameter switching speed	Sets the switching speed for the step 1 and step 2 deceleration when two-step deceleration is executed. **Note:** When used as one-step acceleration, 0 must be set.				0	× 100 Command unit/s	0 to 65535	---
Pn810	Exponential acceleration/deceleration bias	Sets the bias for when an exponential filter is used for the position command filter.				0	Command unit/s	0 to 32767	---
Pn811	Exponential acceleration/deceleration time constant	Sets the time constant for when an exponential filter is used for the position command filter.				0	× 0.1 ms	0 to 5100	---
Pn812	Moving average time	Sets the average movement time for when S-curve acceleration/deceleration is used, and an average movement filter is used for the position command filter.				0	× 0.1 ms	0 to 5100	---
Pn813	Not used.	(Do not change setting.) (See note 3.)				0	---	---	---
Pn814	Final travel distance for external positioning	Sets the distance from the external signal input position when external positioning is executed. **Note:** For a negative direction or if the distance is short, operation is reversed after decelerating to a stop.				100	Command unit	–1073741823 to 1073741823	---
Pn816	Zero point return mode settings	0	Zero point return direction	0	Forward direction	0000	---	---	---
				1	Reverse direction				
		1	Not used.	0	(Do not change setting.)				
		2	Not used.	0	(Do not change setting.)				
		3	Not used.	0	(Do not change setting.)				
Pn817	Zero point return approach speed 1	Sets the origin search speed after the deceleration limit switch signal turns ON.				50	× 100 Command unit/s	0 to 65535	---
Pn818	Zero point return approach speed 2	Sets the origin search speed after the deceleration limit switch signal turns ON.				5	× 100 Command unit/s	0 to 65535	---

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?
		Digit No.	Name	Setting	Explanation				
Pn819	Final travel distance to return to zero point	Sets the distance from the latch signal input position to the origin, for when origin search is executed. **Note:** If the final travel distance is in the opposite direction from the origin return direction or if the distance is short, operation is reversed after decelerating to a stop.				100	Command unit	–1073741823 to 1073741823	---
Pn81B	Not used.	(Do not change setting.)				0	---	---	---
Pn81C	Not used.	(Do not change setting.)				0	---	---	---
Pn81D	Not used.	(Do not change setting.)				0	---	---	---
Pn81E	Not used.	(Do not change setting.)				0000	---	---	---
Pn81F	Not used.	(Do not change setting.)				0	---	---	---
Pn820	Not used.	(Do not change setting.)				0	---	---	---
Pn822	Not used.	(Do not change setting.)				0	---	---	---
Pn824	Not used.	(Do not change setting.) (See note 4.)				0000	---	---	---
Pn825	Not used.	(Do not change setting.) (See note 5.)				0000	---	---	---
Pn900 to Pn910	Not used.	(Do not change setting.)					---	---	---
Pn920 to Pn95F	Not used.	(Do not change setting.)					---	---	---

Note 1. The normal setting is 0. If an external regeneration resistor is used, refer to *3-3-3 Regenerative Energy Absorption by External Regeneration Resistance* for the recommended setting.

Note 2. The upper limit is the maximum output capacity (W) of the applicable Servo Driver.

Note 3. If the Servo Driver is used with the CJ1W-MCH71 or CS1W-MCH71, this parameter will be set to 0032.
If parameters are edited with the WMON-ML2 connected, this parameter will set to 0000.
If this happens, you must reset this parameter to 0032 from the CJ1W-MCH71 or CS1W-MCH71.

Note 4. If the Servo Driver is used with the CJ1W-MCH71 or CS1W-MCH71, this parameter will be set to 0023. If parameters are edited with the WMON-ML2 connected, this parameter will set to 0000. If this happens, you must reset this parameter to 0023 from the CJ1W-MCH71 or CS1W-MCH71.

Note 5. If the Servo Driver is used with the CJ1W-MCH71 or CS1W-MCH71, this parameter will be set to 0024. If parameters are edited with the WMON-ML2 connected, this parameter will set to 0000. If this happens, you must reset this parameter to 0024 from the CJ1W-MCH71 or CS1W-MCH71.

4-3-2 Important Parameters

This section explains the user parameters you need to set and check before using the Servomotor and Servo Driver. If these parameters are set incorrectly, there is a risk of the Servomotor not rotating, and of a malfunction. Set the parameters to suit your system.

■ Reverse Rotation Mode Settings (Pn000.0)

Pn000.0	Function selection basic switches -- Reverse rotation (All operation modes)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	CCW direction is taken for positive command (counterclockwise seen from the Servomotor output shaft)
1	CW direction is taken for positive command (clockwise seen from the Servomotor output shaft)

- This parameter sets the Servomotor's direction of rotation.
- Even if 1 is set, the Servo Driver's encoder output phase (A/B phase) does not change (i.e., the Servomotor's direction of rotation is simply reversed).
- For example, with a pulse command, the motor will rotate counterclockwise for a counterclockwise command if the Reverse Rotation Mode Setting is set to 0 and will rotate clockwise for a counterclockwise command if the Reverse Rotation Mode Setting is set to 1.

■ Alarm Stop Selection (Pn001.0)

Pn001.0	Function selection application switches 1 -- Stop selection if an alarm occurs when Servomotor is OFF (All operation modes)						
Setting range	0 to 2	Unit	---	Default setting	2	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Stop Servomotor using dynamic brake (dynamic brake stays ON after Servomotor has stopped).
1	Stop Servomotor using dynamic brake (dynamic brake released after Servomotor has stopped).
2	Stop Servomotor using free run.

- Select the stopping process for when the Servo is turned OFF or an alarm occurs.

Note Dynamic Brake Operation when Power Is Turned OFF

The dynamic brake will remain ON if the main circuit or control circuit power supplies are turned OFF for Servo Drivers of the capacities listed below. This means that it will be slightly more difficult to turn the motor shaft by hand than it is when the dynamic brake is OFF. To release the dynamic brake, disconnect the Servo Motor wiring (U, V, or W). Always confirm that any disconnected wires are connected properly before turning ON the power supplies again.

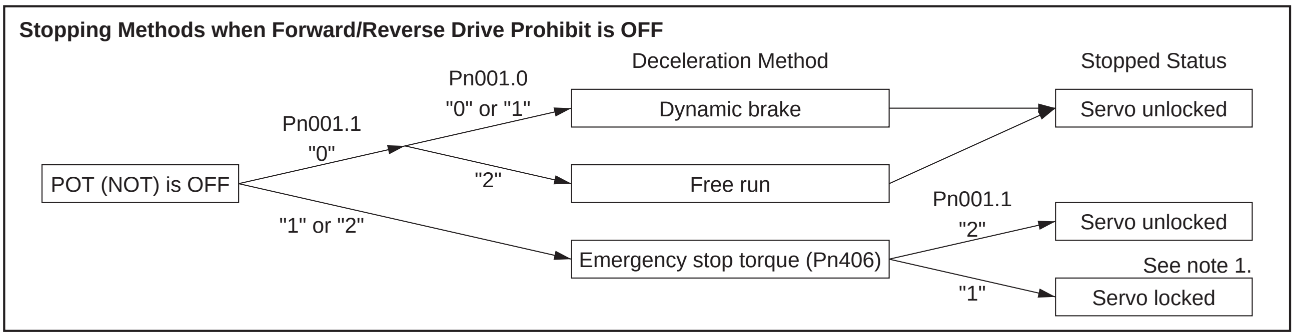
■ Overtravel Stop Selection (Pn001.1)

Pn001.1	Function selection application switches 1 -- Stop selection when drive prohibited is input (Position, speed)						
Setting range	0 to 2	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Stop according to the setting of Pn001.0 (Servo released after Servomotor has stopped)
1	Stop the Servomotor using the torque set in Pn406 (emergency stop torque), then locks the Servo.
2	Stop the Servomotor using the torque set in Pn406 (emergency stop torque), then releases the Servo (dynamic brake is turned OFF).

• Select the stopping process for when overtravel occurs.



Note 1. The position loop is disabled when the Servo stops in servolock mode during position control.

Note 2. During torque control, the stopping process depends on Pn001.0 (the Pn001.1 setting does not matter).

Note 3. With a vertical load, the load may fall due to its own weight if it is left at a drive prohibit input. We recommend that you set the stop method for the drive prohibit input (Pn001.1) for decelerating with the emergency stop torque, and then set stopping with the servo locked (SV: 1) to prevent the load from falling.

■ I/O Signal Allocation (Pn50A, Pn50B, Pn50E to Pn512)

• With the OMNUC W Series, you can freely change the I/O signal allocation.

• If using an OMRON position controller (Position Control Unit or Motion Control Unit), you do not need to change the default settings.

• The default allocations are as follows:

	CN1, pin No.	Signal name	Condition
Input signal	7	POT (Forward drive prohibit input)	Enabled when the CN1-7 input signal turns ON (L level).
	8	NOT (Reverse drive prohibit input)	Enabled when the CN1-8 input signal turns ON (L level).
	9	DEC (Origin return deceleration LS)	Enabled when the CN1-9 input signal turns ON (L level).
	10	EXT1 (External latch signal 1)	Enabled when the CN1-10 input signal turns ON (L level).
	11	EXT2 (External latch signal 2)	Enabled when the CN1-11 input signal turns ON (L level).
	12	EXT3 (External latch signal 3)	Enabled when the CN1-12 input signal turns ON (L level).
Output signal	1/2	BKIR (Brake interlock output)	
	23/24	General-purpose output signal	(Not allocated.)
	25/26	General-purpose output signal	(Not allocated.)

● Input Signal Selections (Pn50A, Pn50B, Pn511)

Pn50A.0	Input signal selections 1 -- Not used.						
Setting range	---	Unit	---	Default setting	1	Restart power?	Yes

Note Do not change setting.

Pn50A.1	Input signal selections 1 -- Not used.						
Setting range	---	Unit	---	Default setting	8	Restart power?	Yes

Note Do not change setting.

Pn50A.2	Input signal selections 1 -- Not used.						
Setting range	---	Unit	---	Default setting	8	Restart power?	Yes

Note Do not change setting.

Pn50A.3	Input signal selections 1 -- POT (forward drive prohibited) signal input terminal allocation (All operation modes)						
Setting range	0 to F	Unit	---	Default setting	1	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Allocated to CN1-13 pin: enabled using L input
1	Allocated to CN1-7 pin: enabled using L input
2	Allocated to CN1-8 pin: enabled using L input
3	Allocated to CN1-9 pin: enabled using L input
4	Allocated to CN1-10 pin: enabled using L input
5	Allocated to CN1-11 pin: enabled using L input
6	Allocated to CN1-12 pin: enabled using L input
7	Always ON
8	Always OFF
9	Allocated to CN1-13 pin: enabled using H input
A	Allocated to CN1-7 pin: enabled using H input
B	Allocated to CN1-8 pin: enabled using H input
C	Allocated to CN1-9 pin: enabled using H input
D	Allocated to CN1-10 pin: enabled using H input
E	Allocated to CN1-11 pin: enabled using H input
F	Allocated to CN1-12 pin: enabled using H input

- If set to 7 (always ON), the Servo is in always overtravel status (i.e., forward rotation is always drive-prohibited).
- If set to 8 (always OFF), the Servo drive prohibition is OFF (i.e., the forward rotation drive is permitted).
- The POT signal permits forward rotation drive upon input.

Pn50B.0	Input signal selections 2 -- NOT (reverse drive prohibited) signal input terminal allocation (All operation modes)						
Setting range	0 to F	Unit	---	Default setting	2	Restart power?	Yes

- Settings are the same as for Pn50A.3.
- If set to 7 (always ON), the Servo is in always in overtravel status (i.e., reverse rotation is always drive-prohibited).
- If set to 8 (always OFF), the Servo drive prohibition is OFF (i.e., the reverse rotation drive is permitted).
- The NOT signal permits reverse rotation drive upon input.

Pn50B.1	Input signal selections 2 -- Not used.						
Setting range	---	Unit	---	Default setting	8	Restart power?	Yes

Note Do not change setting.

Pn50B.2	Input signal selections 2 -- Not used.						
Setting range	---	Unit	---	Default setting	8	Restart power?	Yes

Note Do not change setting.

Pn50B.3	Input signal selections 2 -- Not used.						
Setting range	---	Unit	---	Default setting	8	Restart power?	Yes

Note Do not change setting.

Pn511.0	Input signal selections 5 -- DEC (origin return deceleration LS) signal input terminal allocation (All operation modes)						
Setting range	0 to F	Unit	---	Default setting	3	Restart power?	Yes

- Settings are the same as for Pn50A.3.
- When “7” (always enabled) is set, the deceleration switch is always enabled.
- When “8” (always disabled) is set, the deceleration switch is always disabled.

Pn511.1	Input signal selections 5 -- EXT1 (external latch signal 1) signal input terminal allocation (All operation modes)						
Setting range	0 to F	Unit	---	Default setting	4	Restart power?	Yes

Setting Explanation

Setting	Explanation
0 to 3	Always OFF
4	Allocated to CN1-10 pin: enabled using L input
5	Allocated to CN1-11 pin: enabled using L input
6	Allocated to CN1-12 pin: enabled using L input
7	Always ON
8	Always OFF
9 to C	Always OFF
D	Allocated to CN1-10 pin: enabled using H input
E	Allocated to CN1-11 pin: enabled using H input
F	Allocated to CN1-12 pin: enabled using H input

- When “7” (always enabled) is set, the external latch signal is always enabled.
- When “8” (always disabled) is set, the external latch signal is always disabled.

Pn511.2	Input signal selections 5 -- EXT2 (external latch signal 2) signal input terminal allocation (All operation modes)						
Setting range	0 to F	Unit	---	Default setting	5	Restart power?	Yes

- Settings are the same as for Pn511.1.
- When “7” (always enabled) is set, the deceleration switch is always enabled.
- When “0 to 3” or “8 to C” (always disabled) is set, the deceleration switch is always disabled.

Pn511.3	Input signal selections 5 -- EXT3 (external latch signal 3) signal input terminal allocation (All operation modes)						
Setting range	0 to F	Unit	---	Default setting	6	Restart power?	Yes

- Settings are the same as for Pn511.1.
- When “7” (always enabled) is set, the deceleration switch is always enabled.
- When “0 to 3” or “8 to C” (always disabled) is set, the deceleration switch is always disabled.

● Output Signal Selections (Pn50E to Pn510, Pn512)

- Output signal selection is performed in Pn50E to Pn510, and whether each signal should be reversed is set in Pn512.
- You can allocate multiple output signals to the same pin. Such signals are output separately as an OR operation.
- The default setting is for BKIR (brake interlock output) to be allocated to pins No. 1 and 2.

Pn50E.0	Output signal selections 1 -- INP1 (positioning completed 1) signal output terminal allocation (Position)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	No output
1	Allocated to pins CN1-1 and 2 (pin 2 is the COM port)
2	Allocated to pins CN1-23 and 24 (pin 24 is the COM port)
3	Allocated to pins CN1-25 and 26 (pin 26 is the COM port)

Pn50E.1	Output signal selections 1 -- VCMP (speed conformity) signal output terminal allocation (Speed)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	Yes

Pn50E.2	Output signal selections 1 -- TGON (Servomotor rotation detection) signal output terminal allocation (All operation modes)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	Yes

Pn50E.3	Output signal selections 1 -- READY (Servo ready) signal output terminal allocation (All operation modes)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	Yes

Pn50F.0	Output signal selections 2 -- CLIMT (current limit detection) signal output terminal allocation (All operation modes)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	Yes

Pn50F.1	Output signal selections 2 -- VLIMT (speed limit detection) signal output terminal allocation (Torque)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	Yes

Pn50F.2	Output signal selections 2 -- BKIR (brake interlock) signal output terminal allocation (All operation modes)						
Setting range	0 to 3	Unit	---	Default setting	1	Restart power?	Yes

Pn50F.3	Output signal selections 2 -- WARN (warning) signal output terminal allocation (All operation modes)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	Yes

Pn510.0	Output signal selections 3 -- INP2 (positioning completed 2) output terminal allocation (Position)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	Yes

• Parameter settings are the same as for Pn50E.0.

Pn512.0	Output signal reverse -- Pins CN1-1 and 2 output signal reverse (All operation modes)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Not reversed.
1	Reversed.

• Select the characteristics of the output signal allocated to pins CN1-1 and 2.

• If you set 1 (reverse), ON/OFF outputs are reversed.

Pn512.1	Output signal reverse -- Pins CN1-23 and 24 output signal reverse (All operation modes)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Not reversed.
1	Reversed.

Pn512.2	Output signal reverse -- Pins CN1-25 and 26 output signal reverse (All operation modes)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Not reversed.
1	Reversed.

4-3-3 Parameter Details

This section explains all user parameters not already explained in *4-3-2 Important Parameters*. Make sure you fully understand the meaning of each parameter before making any changes to parameter settings. Be sure not to change parameters designated “Not used.”, and digit No. settings.

■ Function Selection Parameters (from Pn000)

● Function Selection Basic Switches (Pn000: Default Setting 0010)

Pn000.0	Function selection basic switches -- Reverse rotation (All operation modes)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Note Refer to *4-3-2 Important Parameters*.

Pn000.1	Function selection basic switches -- Not used						
Setting range	---	Unit	---	Default setting	0	Restart power?	Yes

Note Do not change setting.

Pn000.2	Function selection basic switches -- Unit No. setting (All operation modes)						
Setting range	0 to F	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0 to F	Sets the Servo Driver unit number

- This setting is required when multiple Servo Drivers are connected and Computer Monitor Software is used.

Pn000.3	Function selection basic switches -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	Yes

Note Do not change setting.

● Function Selection Application Switches 1 (Pn001: Default setting 0000)

Pn001.0	Function selection application switches 1 -- Stop selection if an alarm occurs when Servomotor is OFF (All operation modes)						
Setting range	0 to 2	Unit	---	Default setting	2	Restart power?	Yes

Note Refer to *4-3-2 Important Parameters*.

Pn001.1	Function selection application switches 1 -- Stop selection when drive prohibited is input (Position, speed)						
Setting range	0 to 2	Unit	---	Default setting	0	Restart power?	Yes

Note Refer to *4-3-2 Important Parameters*.

Pn001.2	Function selection application switches 1 -- AC/DC power input selection (All operation modes)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	AC power supply: AC power supplied from L1, L2, (L3) terminals
1	DC power supply input: DC power from B1/⊕, ⊖ terminals, or DC power from B1/⊕, ⊖2 terminals.

- Select setting 1 if using a DC power supply.
- If using a DC power supply, perform the following operations.

  Control circuit power supply: Supply DC power to L1C and L2C. There is no polarity.

  Main circuit power supply: Supply DC power as follows: Positive voltage to B1/⊕1 terminal, and ground to ⊖ or ⊖2 terminal.

  External regeneration resistance terminals: Remove the short bar from between B2 and B3 so that B1, B2, and B3 are open. (For Servo Drivers without B3, open B1 and B2.)

  Use 270 to 320 VDC as the input voltage. (100-V input models do not handle DC inputs.)

Note 1. Always set this parameter to 1 when using a DC power supply. If a DC power supply is connected with this parameter set to 0, the regeneration absorption circuit will operate, possibly damaging the Servo Driver. When changing the setting from 0 to 1, either the main circuit power supply must be OFF, or the external regeneration resistance terminals must be open.

Note 2. If using a DC power supply, the regeneration absorption circuit inside the Servo Driver will not operate. The regeneration power returns to the DC power supply, so make sure the DC power supply can absorb the regeneration power.

Note 3. If using a DC power supply, the residual voltage in the main-circuit power supply is not discharged rapidly when the power is turned OFF. Be sure to mount a discharge circuit on the DC power supply. Also, check that the charge indicator is not lit before storing the power supply input when the power supply has been turned OFF (the discharge time for the Servo Driver is approximately 30 minutes.)

Pn001.3	Function selection application switches 1 -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	Yes

Note Do not change setting.

● Function Selection Application Switches 2 (Pn002: Default Setting 0000)

Pn002.0	Function selection application switches 2 -- Torque command input change (Speed)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Function not used.
1	Option command value used as torque limit value.
2	Option command value used as torque feed forward command value.
3	Option command value used as torque limit value, according to forward/reverse rotation current limit designation.

- This parameter sets the option command value function for speed control.
- When 1 or 3 is set, the torque limit operates according to the option command value.
- When 2 is set, the torque feed forward operates according to the option command value.
- For details on the torque limit function, refer to *4-4-7 Torque Limit Function (All Operating Modes)*. For details on the torque feed forward function, refer to *4-7-3 Torque Feed-forward Function (Speed)*.

Note Other torque limit functions include Pn402 (forward torque limit), Pn403 (reverse torque limit), Pn404 (Forward rotation external current limit), and Pn405 (Reverse rotation external current limit). The smallest output torque from among the enabled limitations is limited.

Pn002.1	Function selection application switches 2 -- Speed command input change (Torque)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Function not used.
1	Option command value used as analog speed limit.

- This parameter sets the option command value function for torque control.
- When 1 is set, the speed limit operates according to the option command value.
- For details on the speed limit function, refer to *4-4-10 Speed Limit Function (Torque)*.

Note Other speed limitation functions include Pn407 (speed limit). The speed is limited to the lower value.

Pn002.2	Function selection application switches 2 -- Operation switch when using an absolute encoder (All operation modes, absolute)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Use as an absolute encoder.
1	Use as an incremental encoder.

• When 1 is set, the absolute encoder operates as an incremental encoder (backup battery not necessary).

Pn002.3	Function selection application switches 2 -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	Yes

Note Do not change setting.

● Unused Parameters (Pn004)

Pn004	Not used.						
Setting range	---	Unit	---	Default setting	0110	Restart power?	Yes

Note Do not change setting.

● Function Selection Application Switches 6 (Pn0006; Default 0002)

Pn006.0-1	Function selection application switches 6 -- Analog monitor 1 signal selection (All operation modes)						
Setting range	00 to 1F	Unit	---	Default setting	02	Restart power?	No

Setting Explanation

Setting	Explanation
00	Servomotor rotation speed: 1 V/1000 r/min
01	Speed command: 1 V/1000 r/min
02	Torque command: gravity compensation torque (Pn422): (1 V per 100%)
03	Position deviation: 0.05 V/1 command unit
04	Position amp error (after electronic gear) (0.05 V per encoder pulse unit)
05	Position command speed (1 V/1,000 r/min)
06	Not used.
07	Not used.
08	Positioning completed command: (Positioning completed: 5 V; positioning not completed: 0 V)
09	Speed feed forward (1 V/1,000 r/min)
0A	Torque feed forward (1 V per 100%)
0B to 1F	Not used.

Note 1. The value derived from subtracting the Pn422 gravity compensation torque from the torque command value output from the Servopack is output for monitoring.

Note 2. For speed control, the position deviation monitor signal is 0.

Pn006.2	Function selection application switches 6 -- Analog monitor 1 signal multiplier selection (All operation modes)						
Setting range	0 to 4	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0	1x
1	10x
2	100x
3	1/10x
4	1/100x

Pn006.3	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

● Function Selection Application Switches 7 (Pn007; Default: 0000)

Pn007.0-1	Function selection application switches 7 -- Analog monitor 2 signal selection (All operation modes)						
Setting range	00 to 1F	Unit	---	Default setting	00	Restart power?	No

Setting Explanation

Setting	Explanation
00	Servomotor rotation speed: 1 V/1000 r/min
01	Speed command: 1 V/1000 r/min
02	Torque command: gravity compensation torque (Pn422): (1 V per 100%)
03	Position deviation: 0.05 V/1 command unit
04	Position amp error (after electronic gear) (0.05 V per encoder pulse unit)
05	Position command speed (1 V/1,000 r/min)
06	Not used.
07	Not used.
08	Positioning completed command: (Positioning completed: 5 V; positioning not completed: 0 V)
09	Speed feed forward (1 V/1,000 r/min)
0A	Torque feed forward (1 V per 100%)
0B to 1F	Not used.

Note 1. The value derived from subtracting the Pn422 gravity compensation torque from the torque command value output from the Servopack is output for monitoring.

Note 2. For speed control, the position deviation monitor signal is 0.

Pn007.2	Function selection application switches 7: Analog monitor 2 signal multiplier selection (All operation modes)						
Setting range	0 to 4	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0	1x
1	10x
2	100x
3	1/10x
4	1/100x

Pn007.3	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

● Function Selection Application Switches 8 (Pn008; Default: 4000)

Pn008.0	Function selection application switches 8 -- Lowered battery voltage alarm/warning selection (All operation modes)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Regard battery voltage drop as alarm (A.830).
1	Regard battery voltage drop as warning (A.930).

Pn008.1	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	Yes

Note Do not change setting.

Pn008.2	Function selection application switches 8 -- Warning detection selection (All operation modes)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Warnings detected.
1	Warnings not detected.

- When 1 (warnings not detected) is set, the following warnings are not detected.
  A.900, A.901, A.910, A.911, A.920, A.930

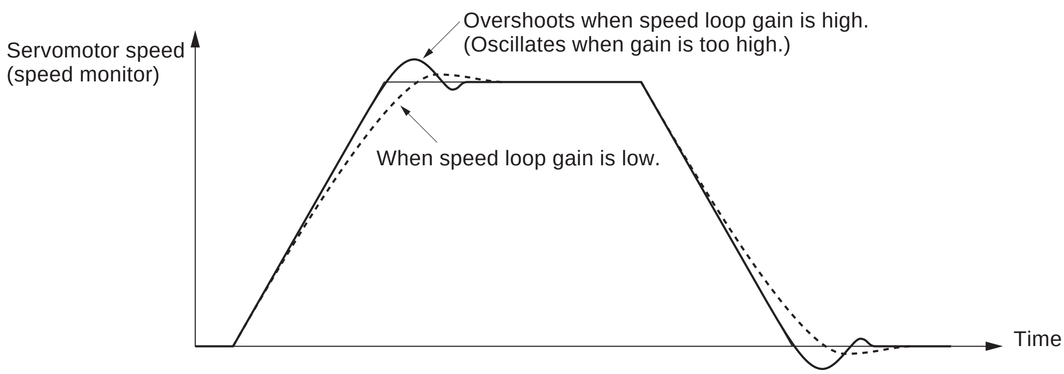
Pn008.3	Not used.						
Setting range	---	Unit	---	Default setting	4	Restart power?	Yes

Note Do not change setting.

■ Gain Parameters (from Pn100)

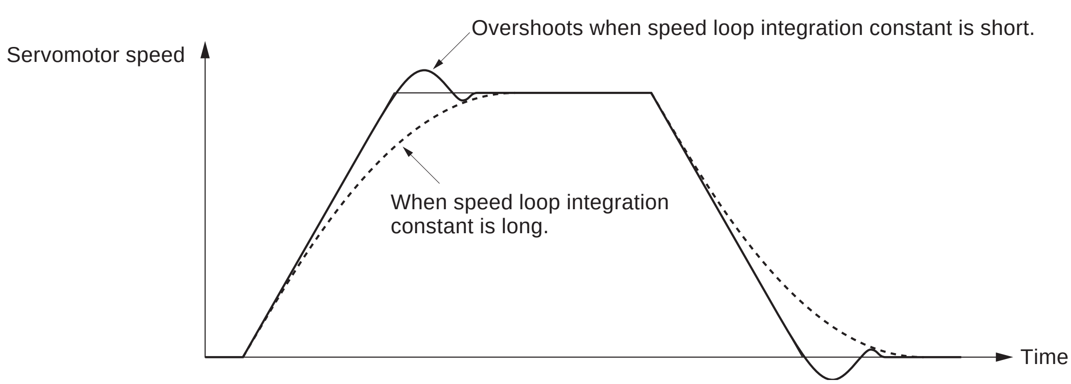
Pn100	Speed loop gain (Position, speed)						
Setting range	10 to 20000	Unit	× 0.1 Hz	Default setting	800	Restart power?	No

- This gain adjusts the speed loop response.
- Increase the setting (i.e., increase the gain) to raise Servo rigidity. Generally, the greater the inertia ratio, the higher the setting. There is a risk of oscillation, however, if the gain is too high.



Pn101	Speed loop integration constant (Position, speed)						
Setting range	15 to 51200	Unit	× 0.01 ms	Default setting	2000	Restart power?	No

- Sets the speed loop integral time constant.
- The higher the setting, the lower the response, and the lower the resiliency to external force. There is a risk of oscillation if the setting is too low.



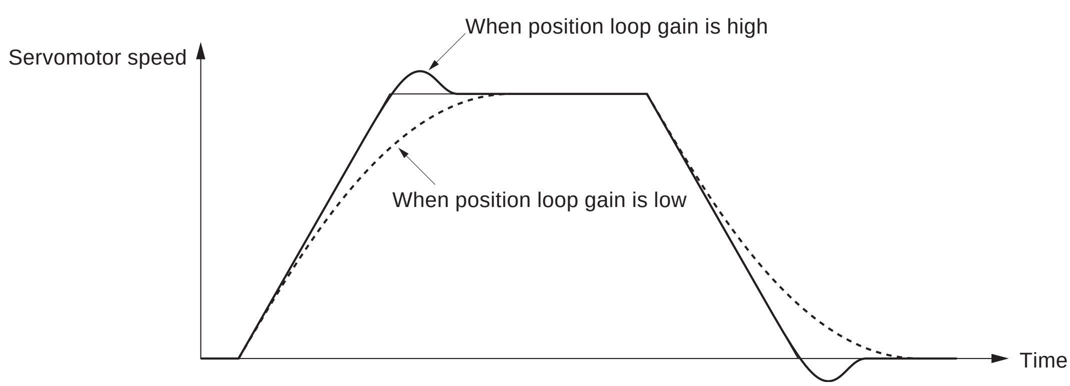
Pn102	Position loop gain (Position)						
Setting range	10 to 20000	Unit	× 0.1/s	Default setting	400	Restart power?	No

- Adjust the position loop response to suit the mechanical rigidity.
- Servo system response is determined by the position loop gain. Servo systems with a high loop gain have a high response, and positioning is fast. To raise the position loop gain, you must improve mechanical rigidity and raise the specific oscillation. This should be 500 to 700 (0.1/s) for ordinary machine tools, 300 to 500 (0.1/s) for general-use and assembly machines, and 100 to 300 (0.1/s) for production robots. The default position loop gain is 400 (0.1/s), so be sure to lower the setting for machines with low rigidity.
- Raising the position loop gain in systems with low mechanical rigidity or systems with low specific oscillation may result in machine resonance, causing an overload alarm to occur.
- If the position loop gain is low, you can shorten the positioning time using feed forward. You can also shorten the positioning time using the bias function.

Position loop gain is generally expressed as follows:

$$\text{Position loop gain (Kp)} = \frac{\text{Command pulse frequency (pulses/s)}}{\text{Deviation counter residual pulses (pulses)}} \text{ (0.1/s)}$$

When the position loop gain is manipulated, the response is as shown in the diagram below.



Pn103	Inertia ratio (Position, speed)						
Setting range	0 to 20000	Unit	%	Default setting	300	Restart power?	No

- Set the mechanical system inertia (load inertia for Servomotor shaft conversion) using the ratio (%) of the Servomotor rotor inertia. If the inertia ratio is set incorrectly, the Pn103 (inertia ratio) value will also be incorrect.

Pn104	Speed loop gain 2 (Position, speed)						
Setting range	10 to 20000	Unit	× 0.1 Hz	Default setting	800	Restart power?	No

Pn105	Speed loop integration constant 2 (Position, speed)						
Setting range	15 to 51200	Unit	× 0.01 ms	Default setting	2000	Restart power?	No

Pn106	Position loop gain 2 (Position)						
Setting range	10 to 20000	Unit	× 0.1/s	Default setting	400	Restart power?	No

- These parameters are gain and time constants selected when using gain switching under the following conditions.
    - When automatic gain switching is set, and the switching conditions are met.
      → Pn139.2 (Gain switching condition B) must be set.
      Refer to *4-7-4 Automatic Gain Switching (Position)* for details.
- If the mechanical system inertia changes greatly or if you want to change the response for when the Servomotor is rotating and when it is stopped, you can achieve the appropriate control by setting the gain and time constant beforehand for each of these conditions, and then switch according to the conditions.

Note 1. Automatic gain switching is enabled for position control only. When position control is not used, the Servomotor operates using No. 1 gain (Pn100, Pn101, Pn102).

Note 2. When automatic gain switching is used, set No. 1 gain for gain during operation, and set No. 2 gain for gain while stopped.

Pn107	Bias rotational speed (Position)						
Setting range	0 to 450	Unit	r/min	Default setting	0	Restart power?	No

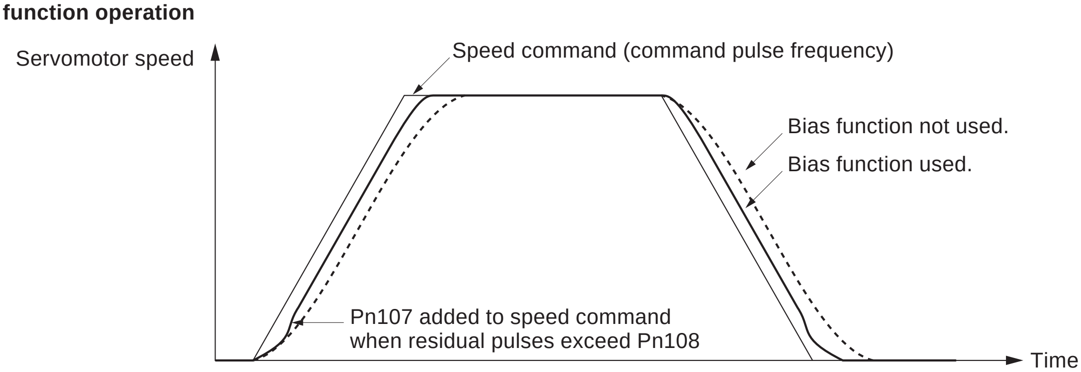
Pn108	Bias addition band (Position)						
Setting range	0 to 250	Unit	Command unit	Default setting	7	Restart power?	No

- These two parameters set the position control bias.
- This function shortens the positioning time by adding the number of bias rotations to the speed command (i.e., commands to the speed control loop).
- When the deviation counter residual pulses exceed the Pn108 (bias addition band) setting, the speed set in Pn107 (bias rotational speed) is added to the speed command, and when they are within the limits for Pn108, it stops being added.

Note 1. Set Pn107 to 0 if not using bias function.

Note 2. If the bias rotation speed is too great, the Servomotor operation may become unstable. The optimum value will vary depending on the load, gain, and bias addition range, so check and adjust the Servomotor response. (Gradually increase the value, starting from Pn107 = 0.)

Bias function operation



Pn109	Feed-forward amount (Position)						
Setting range	0 to 100	Unit	%	Default setting	0	Restart power?	No

- Sets the feed-forward compensation value during positioning.
- When performing feed-forward compensation, the effective Servo gain rises, improving response. There is almost no effect, however, on systems where the position loop gain is sufficiently high.
- Use to shorten positioning time.

Note Setting a high value may result in machine vibration. Set the feed-forward amount for general machinery to 80% maximum. (Check and adjust machine response.)

Pn10A	Feed-forward command filter (Position)						
Setting range	0 to 6400	Unit	× 0.01 ms	Default setting	0	Restart power?	No

- Sets the feed-forward primary (lag) command filter during position control.
- If the positioning completed signal is interrupted (i.e., repeatedly turns ON and OFF) because of performing feed-forward compensation, and a speed overshoot is generated, alleviate the problem by setting the primary lag filter.

● Speed Control Setting (Pn10B: Default Setting 0004)

Pn10B.0	Speed control setting -- P control switching conditions (Position, speed)						
Setting range	0 to 4	Unit	---	Default setting	4	Restart power?	No

Setting Explanation

Setting	Explanation
0	Internal torque command (Pn10C) condition (Position, speed)
1	Speed command (Pn10D) condition (Position, speed)
2	Acceleration command (Pn10E) condition (Position, speed)
3	Deviation pulse (Pn10F) condition (Position)
4	P control switching function not used. (Position, speed)

- Sets the speed control loop switching function from PI control to P control.
- Normally, using the speed loop gain and the position loop gain set by means of the auto-tuning operation will provide adequate control. (Consequently, there is normally no need to change the setting.)
- When PI control is always being used, switching to P control may help if the Servomotor speed overshoots or undershoots (i.e., the effective Servo gain is reduced by switching to P control to stabilize the Servo System). The positioning time can also be shortened in this way.
- If the output torque is saturated during acceleration and deceleration, set speed control to 0 (switching by internal torque command), or 2 (switching by acceleration command).
- If the speed control overshoots or undershoots without the output torque being saturated during acceleration and deceleration, set speed control to 1 (switching by speed command), or 3 (switching by deviation pulse value).

- If the setting is made from 0 to 3 (i.e., if P control switching is used), set the switching condition to Pn10C to Pn10F.

Note Setting Pn10B.1 (speed control loop switching) to 1 (IP control) changes the parameter to switch from IP control to P control.

Pn10B.1	Speed control setting -- Speed control loop switching (Position, speed)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	PI control
1	IP control

- Set the speed control loop to either PI control or IP control.
- There is normally no need to change the setting.
- If you cannot shorten positioning time in PI control, change the setting to 1 (IP control).

Pn10B.2	Speed control setting -- Position loop control method (Position)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Standard position control
1	Less-deviation control
2	Not used.
3	Not used.

Pn10B.3	Speed control setting -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn10C	P control switching (torque command) (Position, speed)						
Setting range	0 to 800	Unit	%	Default setting	200	Restart power?	No

- You must set Pn10C if you set Pn10B.0 (P control switching condition) to 0 (switching by internal torque command).
- Set the condition to switch to P control using Servomotor rated torque ratio (%).
- The Servo switches to P control if the internal torque command exceeds the setting level.

Pn10D	P control switching (speed command) (Position, speed)						
Setting range	0 to 10000	Unit	r/min	Default setting	0	Restart power?	No

- You must set Pn10D if you set Pn10B.0 (P control switching condition) to 1 (switching by speed command).
- Set the speed to switch to P control.
- The Servo switches to P control if the speed command exceeds the setting level.

Pn10E	P control switching (acceleration command) (Position, speed)						
Setting range	0 to 30000	Unit	r/min/s	Default setting	0	Restart power?	No

- You must set Pn10E if you set Pn10B.0 (P control switching condition) to 2 (switching by acceleration command).
- Set the acceleration to switch to P control.
- The Servo switches to P control if the acceleration command value exceeds the setting level.

Pn10F	P control switching (deviation pulse) (Position)						
Setting range	0 to 10000	Unit	Command unit	Default setting	10	Restart power?	No

- You must set Pn10F if you set Pn10B.0 (P control switching condition) to 3 (switching by deviation pulse).
- Set the deviation pulse to switch to P control.
- The Servo switches to P control if the deviation counter residual pulses exceed the setting level.

Pn110.0	Normal autotuning switches -- Not used.						
Setting range	---	Unit	---	Default setting	2	Restart power?	Yes

Note Do not change setting.

Pn110.1	Normal autotuning switches -- Speed feedback compensation function selection (Position, speed)						
Setting range	0, 1	Unit	---	Default setting	1	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Speed feedback compensation function ON
1	Speed feedback compensation function OFF

- This function shortens positioning time.
- Use this function to lower speed loop feedback gain, and to raise speed loop gain and position loop gain. In this way, you can improve command response and shorten positioning time. Positioning time cannot be shortened, however, when external force is applied as with the vertical shaft, because response to external interference is lowered.
- If 0 (function ON) is set, set Pn111 (speed feedback compensating gain).

Pn110.2	Normal autotuning switches -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	Yes

Note Do not change setting.

Pn110.3	Normal autotuning switches -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	Yes

Note Do not change setting.

Pn111	Speed feedback compensating gain (Position, speed)						
Setting range	1 to 500	Unit	%	Default setting	100	Restart power?	No

- Use this parameter to adjust the speed loop feedback gain for when Pn110.1 (speed feedback compensation function selection) is set to ON.
- The smaller the setting, the higher you can raise the speed loop gain and position loop gain. If the setting is too small, however, responses may be unstable.

Note **1.** Correctly set Pn103 (inertia ratio), perform the usual manual adjustment, then adjust the speed feedback compensation. After manual adjustment, manually readjust the setting to approximately 90%. Then, readjust repeatedly while gradually reducing the setting to find the optimum setting.

Note **2.** Refer to *4-7-5 Speed Feedback Compensation (Position, Speed)* for details.

Pn119	Not used.						
Setting range	---	Unit	---	Default setting	500	Restart power?	No

Note Do not change setting.

Pn11A	Not used.						
Setting range	---	Unit	---	Default setting	1000	Restart power?	No

Note Do not change setting.

Pn11E	Not used.						
Setting range	---	Unit	---	Default setting	1000	Restart power?	No

Note Do not change setting.

Pn11F	Position integral time constant (Position)						
Setting range	0 to 50000	Unit	× 0.1 ms	Default setting	0	Restart power?	No

- Set the integral time constant for the position loop.

Note Enabled for synchronous operations such as electronic cam and electronic shaft.

● Unused Gain Parameters (Pn12B to Pn130)

Note Do not change the settings of the following parameters.

Pn12B	Not used.						
Setting range	---	Unit	---	Default setting	400	Restart power?	No

Pn12C	Not used.						
Setting range	---	Unit	---	Default setting	2000	Restart power?	No

Pn12D	Not used.						
Setting range	---	Unit	---	Default setting	400	Restart power?	No

Pn12E	Not used.						
Setting range	---	Unit	---	Default setting	400	Restart power?	No

Pn12F	Not used.						
Setting range	---	Unit	---	Default setting	2000	Restart power?	No

Pn130	Not used.						
Setting range	---	Unit	---	Default setting	400	Restart power?	No

● Automatic Gain Switching (Pn131 to Pn139)

Pn131	Gain switching time 1 (Position)						
Setting range	0 to 65535	Unit	ms	Default setting	0	Restart power?	No

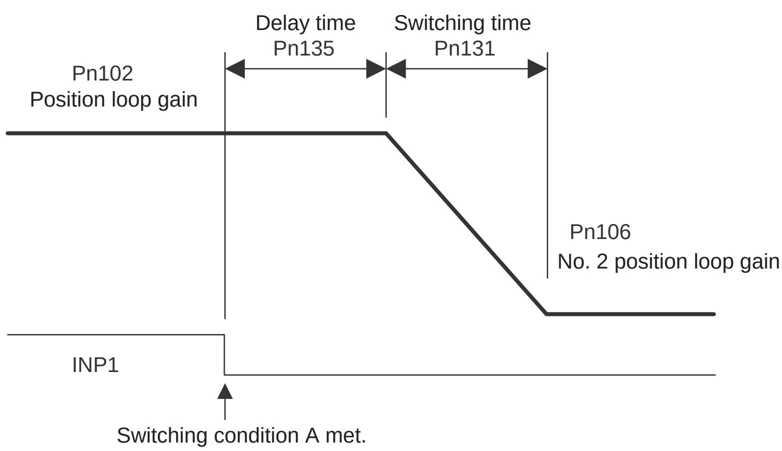
Pn132	Gain switching time 2 (Position)						
Setting range	0 to 65535	Unit	ms	Default setting	0	Restart power?	No

Pn135	Gain switching waiting time 1 (Position)						
Setting range	0 to 65535	Unit	ms	Default setting	0	Restart power?	No

Pn136	Gain switching waiting time 2 (Position)						
Setting range	0 to 65535	Unit	ms	Default setting	0	Restart power?	No

- The following diagram shows the relation between the gain switching waiting time and the gain switching time constant. In this example, the gain is switched from position loop gain (Pn102) to No. 2 position loop gain (Pn106) in automatic gain switching pattern 1, in which the turning ON of the positioning completed signal (INP1) is taken as the switching condition. From the point at which the INP1 signal turns ON and the switching condition is met, operation is paused for the delay time set in Pn135, and then, during the switching time set in Pn131, the gain is changed in a straight line from Pn102 to Pn106.

Switching Delay Time and Switching Time



- In addition to the standard PI and I-P control, automatic gain switching is also possible with less-deviation control. The gain combinations for less-deviation control are provided in *4-7-4 Automatic Gain Switching (Position)*. The settings for the switching condition, the gain switching waiting time, and the switching time are the same as for PI and I-P control. For details on adjustment methods for less-deviation control, refer to *4-7-9 Less-deviation Control (Position)*.

Pn139.0	Automatic gain changeover related switches 1 -- Gain switching selection switch (Position)						
Setting range	0 to 4	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Manual gain switching
1	Automatic switching pattern 1 Automatic switching from No. 1 gain to No. 2 gain when gain switching condition A is satisfied. Automatic switching from No. 2 gain to No. 1 gain when gain switching condition B is satisfied.
2 to 4	Not used.

Pn139.1	Automatic gain changeover related switches 1 -- Gain switching condition A (Position)						
Setting range	0 to 5	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Positioning completed output 1 (INP1) ON
1	Positioning completed output 1 (INP1) OFF
2	Positioning completed output 2 (INP2) ON
3	Positioning completed output 2 (INP2) OFF
4	The position command filter output is 0, and also the position command input is 0.
5	The position command input is not 0.

Pn139.2	Automatic gain changeover related switches 1 -- Gain switching condition B (Position)						
Setting range	0 to 5	Unit	---	Default setting	0	Restart power?	Yes

• Settings are the same as for Pn139.1.

Pn139.3	Automatic gain changeover related switches 1 -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	Yes

Note Do not change setting.

Pn144	Not used.						
Setting range	---	Unit	---	Default setting	1000	Restart power?	No

Note Do not change setting.

● Predictive Control (Pn150 to Pn152)

Pn150.0	Predictive control selection switches -- Predictive control selection. (Position)						
Setting range	0 to 2	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Predictive control not used.
1	Predictive control used.
2	Not used.

Pn150.1	Predictive control selection switches -- Predictive control type (Position)						
Setting range	0, 1	Unit	---	Default setting	1	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Predictive control for tracking
1	Predictive control for positioning

Pn150.2	Predictive control selection switches -- Not used.						
Setting range	---	Unit	---	Default setting	2	Restart power?	Yes

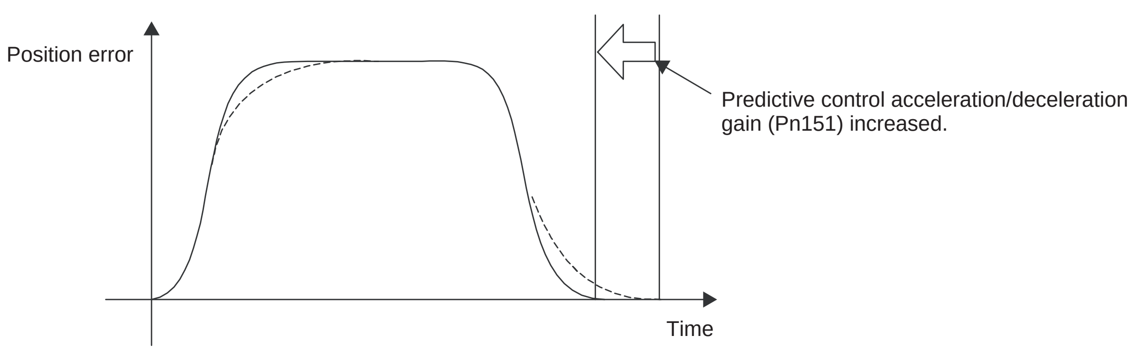
Note Do not change setting.

Pn150.3	Predictive control selection switches -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	Yes

Note Do not change setting.

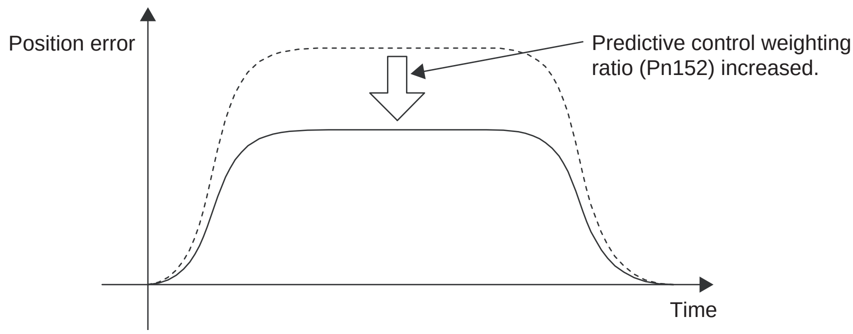
Pn151	Predictive control acceleration/deceleration gain (Position)						
Setting range	0 to 300	Unit	%	Default setting	100	Restart power?	No

- If the value is increased, the settling time will be shortened, but the maximum position deviation will not significantly change. If the set value is too large, overshooting will occur. The diagram shows an example of position deviation during operation by trapezoidal speed command. By increasing the predictive control acceleration/deceleration gain, the position deviation is changed from the broken line to the solid line, i.e., the settling time is shortened.



Pn152	Predictive control weighting ratio (Position)						
Setting range	0 to 300	Unit	%	Default setting	100	Restart power?	No

- If the value is increased, tracking deviation will be reduced. If the positioning completed range is large, the settling time will also be reduced. If the set value is too long, the torque may oscillate and overshooting may occur. The diagram shows an example of position deviation during operation by trapezoidal speed command. By increasing the predictive control weighting ratio, the position deviation is changed from the broken line to the solid line and the settling time is shortened.



● Less-deviation Control Parameters (Pn1A0 to Pn1AC)

Pn1A0	Servo rigidity (Position)						
Setting range	1 to 500	Unit	%	Default setting	60	Restart power?	No

Pn1A1	Servo rigidity 2 (Position)						
Setting range	1 to 500	Unit	%	Default setting	60	Restart power?	No

Pn1A2	Speed feedback filter time constant (Position)						
Setting range	30 to 3200	Unit	× 0.01 ms	Default setting	72	Restart power?	No

Pn1A3	Speed feedback filter time constant 2 (Position)						
Setting range	30 to 3200	Unit	× 0.01 ms	Default setting	72	Restart power?	No

Pn1A4	Torque command filter time constant 2 (Position)						
Setting range	0 to 2500	Unit	× 0.01 ms	Default setting	36	Restart power?	No

• For details on the less-deviation control function, refer to *4-7-9 Less-deviation Control (Position)*.

Pn1A7.0	Utility control switches -- Integral compensation processing (Position)						
Setting range	0 to 3	Unit	---	Default setting	1	Restart power?	No

Setting Explanation

Setting	Explanation
0	Integral compensation processing is not executed.
1	Integral compensation processing is executed.
2	Integral compensation is executed for No. 1 gain and not for No. 2 gain for less-deviation gain switching.
3	Integral compensation is executed for No. 2 gain and not for No. 1 gain for less-deviation gain switching.

Pn1A7.1	Utility control switches -- Not used.						
Setting range	---	Unit	---	Default setting	2	Restart power?	No

Note Do not change setting.

Pn1A7.2	Utility control switches -- Not used.						
Setting range	---	Unit	---	Default setting	1	Restart power?	No

Note Do not change setting.

Pn1A7.3	Utility control switches -- Not used.						
Setting range	---	Unit	---	Default setting	1	Restart power?	No

Note Do not change setting.

Pn1A9	Utility integral gain (Position)						
Setting range	0 to 500	Unit	Hz	Default setting	37	Restart power?	No

Pn1AA	Position proportional gain (Position)						
Setting range	0 to 500	Unit	Hz	Default setting	60	Restart power?	No

Pn1AB	Speed integral gain (Position)						
Setting range	0 to 500	Unit	Hz	Default setting	0	Restart power?	No

Pn1AC	Speed proportional gain (Position)						
Setting range	0 to 2000	Unit	Hz	Default setting	120	Restart power?	No

Pn1B5	Not used.						
Setting range	---	Unit	---	Default setting	150	Restart power?	No

Note Do not change setting.

■ Position Control Parameters (from Pn200)

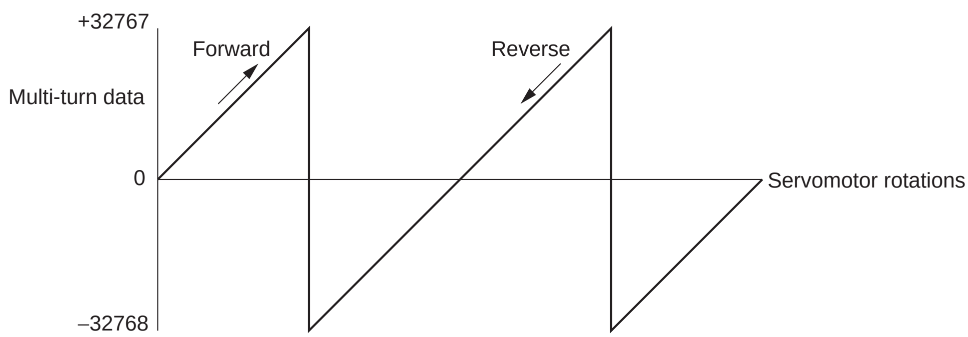
● Position Control Setting 1 (Pn200: Default Setting 0100)

Pn200	Not used.						
Setting range	---	Unit	---	Default setting	0100	Restart power?	Yes

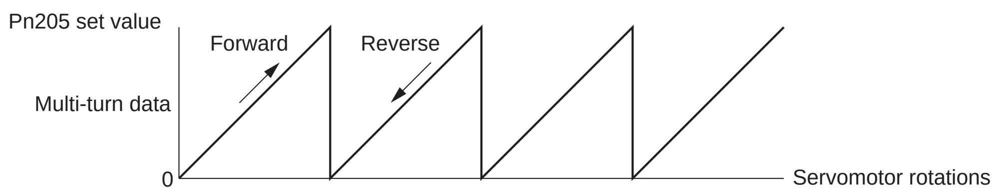
Note Do not change setting.

Pn205	Absolute encoder multi-turn limit setting (All operation modes, absolute)						
Setting range	0 to 65535	Unit	Rotation	Default setting	65535	Restart power?	Yes

- Sets the amount of multi-turn rotation when using a Servomotor with an absolute encoder.
- If using an absolute encoder, the counter counts the number of rotations from the setup position, and outputs the number of rotations from the Servo Driver.
- With the default setting (Pn205 = 65535), the Servomotor multi-turn data will be as follows:



- With the default settings changed (i.e., Pn205 ≠ 65535), the Servomotor multi-turn data will be as follows:



That is, when the default settings are changed (i.e., Pn205 ≠ 65535), the Servomotor multi-turn data will be only in the positive direction. If you want to set the multi-turn limit as high as possible, with the entire operating area positive, set a number such as 65534. To return multi-turn data to 0 at every m turns of the motor (e.g., turn-tables), set Pn205 to m-1.

Note If Pn205 is changed, the limit to the number of rotations in the encoder memory and the limit to the number of rotations in the Servo Driver memory will no longer agree, so an A.CC0 alarm (multi-turn limit nonconformity) will be generated. To cancel this alarm, the setting for the number of multi-turns must be changed in the System Check Mode.

● Position Control Settings 2 (Pn207: Default Setting 0010)

Pn207.0	Position control settings 2 -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	Yes

Note Do not change setting.

Pn207.1	Position control settings 2 -- Not used.						
Setting range	---	Unit	---	Default setting	1	Restart power?	Yes

Note Do not change setting.

Pn207.2	Position control function 2 -- Backlash compensation selection (Position)						
Setting range	0 to 2	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	Disabled
1	Compensates to forward rotation side.
2	Compensates to reverse rotation side.

- For details, refer to *4-7-12 Backlash Compensation (Position)*.

Pn207.3	Position control function 2 -- INP 1 output timing (Position)						
Setting range	0 to 2	Unit	---	Default setting	0	Restart power?	Yes

Setting Explanation

Setting	Explanation
0	When the position deviation is below the INP1 range.
1	When the position deviation is below the INP1 range and also the command after the position command filter is 0.
2	When the absolute value for the position deviation is below the INP1 range (Pn522) and also the position command input is 0.

Pn209	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn20A	Not used.						
Setting range	---	Unit	---	Default setting	32768	Restart power?	Yes

Note Do not change setting.

Pn20E	Electronic gear ratio G1 (numerator) (Position)						
Setting range	1 to 1073741824	Unit	---	Default setting	4	Restart power?	Yes

Pn210	Electronic gear ratio G2 (denominator) (Position)						
Setting range	1 to 1073741824	Unit	---	Default setting	1	Restart power?	Yes

- Sets the pulse rate for command pulses and the Servomotor travel amount.

- When G1/G2 is 1, inputting (encoder resolution × 4) pulses will rotate the Servomotor once. (The Servo Driver operates internally at a multiple of 4.)
- Set within a range of 0.001 ≤ G1/G2 ≤ 1,000.

Note For details on the electronic gear function, refer to *4-4-9 Electronic Gear Function (Position)*.

Pn212	Encoder divider rate (All operation modes)						
Setting range	16 to 1073741824	Unit	Pulses/rotation	Default setting	1000	Restart power?	Yes

- Sets the number of output pulses from the Servo Driver.
- The encoder resolution for each Servomotor is shown below. Set this resolution as the upper limit.

INC 3,000-r/min Servomotor (30 to 750 W): 2,048 pulses/rotation
3,000-r/min Servomotor (1 to 3 kW): 32,768 pulses/rotation
3,000-r/min flat-type Servomotor: 2,048 pulses/rotation
1,000-r/min Servomotor: 32,768 pulses/rotation

ABS 3,000-r/min Servomotor (30 to 750 W): 16,384 pulses/rotation
3,000-r/min Servomotor (1 to 3 kW): 32,768 pulses/rotation
3,000-r/min flat-type Servomotor: 16,384 pulses/rotation
1,000-r/min Servomotor: 32,768 pulses/rotation
1,500-r/min Servomotor: 32,768 pulses/rotation

Note 1. If a value greater than the encoder resolution is set, the encoder resolution will be taken as the divider rate.

Note 2. For details on the encoder divider rate, refer to *4-4-5 Encoder Dividing Function (All Operating Modes)*.

Pn214	Backlash compensation amount (Position)						
Setting range	–32767 to 32767	Unit	Command unit	Default setting	0	Restart power?	No

Pn215	Backlash compensation time constant (Position)						
Setting range	0 to 65535	Unit	× 0.01 ms	Default setting	0	Restart power?	No

Note For details, refer to *4-7-12 Backlash Compensation (Position)*.

Pn216	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn217	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn281	Not used.						
Setting range	---	Unit	---	Default setting	20	Restart power?	Yes

Note Do not change setting.

■ Speed Control Parameters (from Pn300)

Pn300	Not used.						
Setting range	---	Unit	---	Default setting	600	Restart power?	No

Note Do not change setting.

Pn301	Not used.						
Setting range	---	Unit	---	Default setting	100	Restart power?	No

Note Do not change setting.

Pn302	Not used.						
Setting range	---	Unit	---	Default setting	200	Restart power?	No

Note Do not change setting.

Pn303	Not used.						
Setting range	---	Unit	---	Default setting	300	Restart power?	No

Note Do not change setting.

Pn304	Jog speed (All operation modes)						
Setting range	0 to 10000	Unit	r/min	Default setting	500	Restart power?	No

- Sets the speed for when the jog operation is used.

Note If a value that exceeds the maximum Servomotor rotation speed is set, that value will be regarded as the maximum Servomotor rotation speed.

Pn305	Soft start acceleration time (Speed)						
Setting range	0 to 10000	Unit	ms	Default setting	0	Restart power?	No

Pn306	Soft start deceleration time (Speed)						
Setting range	0 to 10000	Unit	ms	Default setting	0	Restart power?	No

- Sets the acceleration and deceleration time for soft start using speed control.
- Set the acceleration time from Servomotor rotation speed = 0 (r/min.) to the maximum rotation speed in Pn305, and set the deceleration time from the maximum rotation speed to the Servomotor rotation speed = 0 (r/min.) in Pn306.
- Set both Pn305 and Pn306 to 0 if using a position controller with acceleration and deceleration functions, or if not using speed control and internally-set speed control.

Note Refer to *4-4-8 Soft Start Function (Speed)* for details.

Pn307	Not used.						
Setting range	---	Unit	---	Default setting	40	Restart power?	No

Note Do not change setting.

Pn308	Speed feedback filter time constant (Position, speed)						
Setting range	0 to 65535	Unit	× 0.01 ms	Default setting	0	Restart power?	No

- Sets the filter time constant (primary filter) for speed feedback.
- Set this parameter if the speed loop gain cannot be raised due to factors such as mechanical system vibration.

Pn310.0	Vibration detection switches -- Vibration detection selection (All operation modes)						
Setting range	0 to 2	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0	Vibration detection not used.
1	Gives warning (A.911) when vibration is detected.
2	Gives warning (A.520) when vibration is detected.

Pn310.1	Vibration detection switches -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn310.2	Vibration detection switches -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn310.3	Vibration detection switches -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn311	Vibration detection sensitivity (All operation modes)						
Setting range	50 to 500	Unit	%	Default setting	100	Restart power?	No

Pn312	Vibration detection level (All operation modes)						
Setting range	0 to 5000	Unit	r/min	Default setting	50	Restart power?	No

- Pn312 is set by the vibration detection level initialization by Computer Monitor Software, so there is no need for the user to directly adjust this parameter. Detection sensitivity is set by Pn311 (Vibration detection sensitivity).
- Detection level initialization for vibration detection:
  This function detects vibration in machine operation and automatically sets the vibration detection level (Pn312) so that the vibration alarm (A.520) and vibration warning (A.911) can be more accurately detected.
  Use this function when the vibration alarm (A.520) and vibration warning (A.911) are not output with the appropriate timing when vibration is detected at the default setting for the vibration detection level (Pn312). Aside from that situation, there is no need to execute this function.
  When the vibration detection function detects a certain level of vibration at the Servomotor rotation speed and the detection level in the equation below is exceeded, an alarm or warning is generated according to the vibration detection switches (Pn310) setting.
  Depending on the conditions of the machinery being used, there may be a difference in detection sensitivity between vibration alarms and warnings. If that occurs, a minute adjustment in detection sensitivity can be set in Pn311 (detection sensitivity) in the equation below.

$$\text{Detection level} = \frac{\text{Vibration detection level (Pn312 [r/min])} \times \text{Pn311 [\%])}}{100}$$

Note 1. Vibration may be difficult to detect due to an inappropriate Servo gain setting. Moreover, not all vibration that occurs can be detected. Use a uniform criterion for detected results.

Note 2. Set the appropriate inertia rate (Pn103). If the setting inappropriate, it may result in erroneous detection of vibration alarms or warnings, or in detection failure.

Note 3. To execute this function, the commands that the user is actually using must be input.

Note 4. Execute this function in the operating conditions under which the vibration detection level is to be initialized. If this function is executed with the Servomotor rotating at low speed, vibration will be detected as soon as the Servo is turned ON. “Error” will be displayed if this function is executed while the Servomotor is operating at 10% or less of its maximum rotation speed.

■ Torque Control Parameters (from Pn400)

Pn400	Not used.						
Setting range	---	Unit	---	Default setting	30	Restart power?	No

Note Do not change setting.

Pn401	1st step 1st torque command filter time constant (All operation modes)						
Setting range	0 to 65535	Unit	× 0.01 ms	Default setting	40	Restart power?	No

- Sets the (primary) filter time constant for the internal torque command.
- When the mechanical resonance frequency is within the response frequency of the Servo loop, Servomotor vibration will occur. In order to prevent this from occurring, set the torque command filter time constant.
  The relationship between the filter time constant and the cut-off frequency can be found by means of the following formula:
  $fc\ (Hz) = 1 / (2\pi T)$: T= Filter time constant (s), fc: cut-off frequency.
  Set the cut-off frequency to below the mechanical resonance frequency.

Pn402	Forward torque limit (All operation modes)						
Setting range	0 to 800	Unit	%	Default setting	350	Restart power?	No

Pn403	Reverse torque limit (All operation modes)						
Setting range	0 to 800	Unit	%	Default setting	350	Restart power?	No

- Set Pn402 (forward torque limit) and Pn403 (reverse torque limit) using the ratio (%) of the Servomotor rated torque for each.

Note These following torque limit functions are available: Analog torque limit (Pn002.0 = 1 or 3), Pn402 (forward torque limit), Pn403 (reverse torque limit), Pn404 (forward rotation external current limit), and Pn405 (reverse rotation external current limit). The output torque is limited by the smallest of the enabled limit values. Refer to *4-4-7 Torque Limit Function (All Operating Modes)* for details.

Pn404	Forward rotation external current limit (All operation modes)						
Setting range	0 to 800	Unit	%	Default setting	100	Restart power?	No

Pn405	Reverse rotation external current limit (All operation modes)						
Setting range	0 to 800	Unit	%	Default setting	100	Restart power?	No

- Set in Pn404 the torque limit for when the forward torque limit is input, and set in Pn405 the torque limit for when the reverse torque limit is input, using the ratio (%) of the Servomotor rated torque for each.

Note The following torque limit functions are available: Analog torque limit (Pn002.0 = 1 or 3), Pn402 (forward torque limit), Pn403 (reverse torque limit), Pn404 (forward rotation external current limit), and Pn405 (reverse rotation external current limit). The output torque is limited by the smallest of the enabled limit values. Refer to *4-4-7 Torque Limit Function (All Operating Modes)* for details.

Pn406	Emergency stop torque (Position, speed)						
Setting range	0 to 800	Unit	%	Default setting	350	Restart power?	No

• Set the deceleration torque if overtravel occurs using the ratio (%) of the Servomotor rated torque.

Note This parameter is enabled when Pn001.1 (stop selection when drive prohibited is input) is set to 1 or 2 (i.e., stop using Pn406).

Pn407	Speed limit (Torque)						
Setting range	0 to 10000	Unit	r/min	Default setting	3000	Restart power?	No

• Set the speed limit for Torque Control Mode.

Note The following speed limit functions are available: Analog speed limit (when Pn002.1 = 1), and Pn407 (speed limit). The speed limit is set to whichever is the smaller. Refer to *4-4-3 Torque Control (Torque)* for details.

● Torque Command Setting (Pn408: Default Setting 0000)

Pn408.0	Torque command settings -- Selects notch filter 1 function (All operation modes)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0	Notch filter 1 function not used.
1	Notch filter 1 used in torque commands. (Set the frequency using Pn409, and set the Q value using Pn40A).

• Set whether or not to use notch filter 1 for internal torque commands (current loop commands).

• Use the notch filter to prevent mechanical resonance. This function can be used to raise the speed loop gain and to shorten positioning time.

Note 1. With W-series AC Servo Drivers, two notch filters can be set: notch filter 1 and notch filter 2.

Note 2. For details on notch filters, refer to *4-7-10 Torque Command Filter (All Operating Modes)*.

Pn408.1	Torque command settings -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn408.2	Torque command settings -- Selects notch filter 2 function (All operation modes)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0	Notch filter 2 function not used.
1	Notch filter 2 used in torque commands. (Set the frequency using Pn40B, and set the Q value in Pn40C.)

- Set whether or not to use notch filter 2 for internal torque commands (current loop commands).
- Use the notch filter to prevent mechanical resonance. This function can be used to increase the speed loop gain and to shorten positioning time.

Note 1. With W-series AC Servo Drivers, two notch filters can be set: notch filter 1 and notch filter 2.

Note 2. For details on notch filters, refer to *4-7-10 Torque Command Filter (All Operating Modes)*.

Pn408.3	Torque command settings -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn409	Notch filter 1 frequency (All operation modes)						
Setting range	50 to 2000	Unit	Hz	Default setting	2000	Restart power?	No

- Enabled when Pn408.0 (notch filter 1 function selection) is set to 1.
- Sets the mechanical resonance frequency.

Note For details on notch filters, refer to *4-7-10 Torque Command Filter (All Operating Modes)*.

Pn40A	Notch filter 1 Q value (All operation modes)						
Setting range	50 to 1000	Unit	$\times$ 0.01	Default setting	70	Restart power?	No

- Enabled when Pn408.0 (notch filter 1 function selection) is set to 1.
- Sets the Q value for notch filter 1.

Note For details on notch filters, refer to *4-7-10 Torque Command Filter (All Operating Modes)*.

Pn40C	Notch filter 2 frequency (All operation modes)						
Setting range	50 to 2000	Unit	Hz	Default setting	2000	Restart power?	No

- Enabled when Pn408.2 (notch filter 2 function selection) is set to 1.
- Sets the mechanical resonance frequency.

Note For details on notch filters, refer to *4-7-10 Torque Command Filter (All Operating Modes)*.

Pn40D	Notch filter 2 Q value (All operation modes)						
Setting range	50 to 1000	Unit	$\times$ 0.01	Default setting	70	Restart power?	No

- Enabled when Pn408.2 (notch filter 2 function selection) is set to 1.
- Set the Q value for notch filter 2.

Note For details on notch filters, refer to *4-7-10 Torque Command Filter (All Operating Modes)*.

Pn40F	2nd step 2nd torque command filter frequency (All operation modes)						
Setting range	100 to 2000	Unit	Hz	Default setting	2000	Restart power?	No

Pn410	2nd step 2nd torque command filter Q value (All operation modes)						
Setting range	50 to 1000	Unit	× 0.01	Default setting	70	Restart power?	No

Pn411	3rd step torque command filter time constant (All operation modes)						
Setting range	0 to 65535	Unit	μs	Default setting	0	Restart power?	No

Pn412	1st step 2nd torque command filter time constant (All operation modes)						
Setting range	0 to 65535	Unit	× 0.01 ms	Default setting	100	Restart power?	No

Pn413	Not used.						
Setting range	---	Unit	---	Default setting	100	Restart power?	No

Note Do not change setting.

Pn414	Not used.						
Setting range	---	Unit	---	Default setting	100	Restart power?	No

Note Do not change setting.

Pn420	Damping for vibration suppression on stopping (Position)						
Setting range	10 to 100	Unit	%	Default setting	100	Restart power?	No

Pn421	Vibration suppression starting time (Position)						
Setting range	0 to 65535	Unit	ms	Default setting	1000	Restart power?	No

Note For details on vibration suppression when stopped, refer to *4-7-11 Vibration Suppression when Stopping (Position)*.

Pn422	Gravity compensation torque						
Setting range	–20000 to 20000	Unit	× 0.01%	Default setting	0	Restart power?	No

Pn456	Sweep torque command amplitude						
Setting range	1 to 800	Unit	%	Default setting	15	Restart power?	No

Note Detection accuracy tends to increase with a higher command amplitude, but mechanical vibration and noise are temporarily increased. When changing the command amplitude, increase the amplitude value little by little while observing the conditions.

■ Sequence Parameters (from Pn500)

Pn501	Not used.						
Setting range	---	Unit	---	Default setting	10	Restart power?	No

Note Do not change setting.

Pn502	Rotation speed for motor rotation detection (All operation modes)						
Setting range	1 to 10000	Unit	r/min	Default setting	20	Restart power?	No

- Set the rotation speed for outputting TGON (Servomotor rotation detection output).
- TGON turns ON when the Servomotor rotation speed is greater than the set value.

Note Related parameter: Pn50E.2 (TGON signal output terminal allocation).

Pn503	Speed conformity signal output width (Speed)						
Setting range	0 to 100	Unit	r/min	Default setting	10	Restart power?	No

- Set the allowable fluctuation range (rotation speed) for outputting VCMP (speed conformity output) during speed control.
- VCMP turns ON when the difference between the speed command value and Servomotor rotation speed is less than the set value.

Note Related parameter: Pn50E.1 (VCMP signal output terminal allocation).

Pn506	Brake timing 1 (all operation modes)						
Setting range	0 to 50	Unit	× 10 ms	Default setting	0	Restart power?	No

Pn507	Brake command speed (all operation modes)						
Setting range	0 to 10000	Unit	r/min	Default setting	100	Restart power?	No

Pn508	Brake timing 2 (all operation modes)						
Setting range	10 to 100	Unit	× 10 ms	Default setting	50	Restart power?	No

- This parameter sets the BKIR (brake interlock output) timing to control the electromagnetic brake ON/OFF when a Servomotor with a brake is used.
- This setting prevents damage to the machinery and the Servomotor holding brake.
- Pn506 (brake timing 1): Set the lag time from BKIR OFF to Servo OFF.
- Pn507 (brake command speed): Set the rotation speed for turning OFF BKIR.
- Pn508 (brake timing 2): Set the standby time from Servo OFF to BKIR OFF.
- When RUN is OFF while the Servomotor is stopped, first turn OFF BKIR, wait for the duration set in Pn506, then turn OFF the Servo.
- When RUN is OFF while the Servomotor is stopped, if a Servo alarm occurs, and the main circuit power supply is OFF, the Servomotor will decelerate and the rotation speed will fall. When the rotation speed falls to below the Pn507 setting, BKIR will be turned OFF.

Note 1. Related parameter: Pn50F.2 (BKIR signal output terminal allocation).

Note 2. Refer to *4-4-6 Brake Interlock (All Operating Modes)* for details of brake interlock functions.

Pn509	Momentary hold time (All operation modes)						
Setting range	20 to 1000	Unit	ms	Default setting	20	Restart power?	No

- Sets the time during which alarm detection is disabled if a momentary power failure occurs.
- When the power supply voltage to the Servo Driver is OFF, the Servo Driver detects that the power supply is OFF and turns OFF the Servo. The 20 ms default setting means that if the power supply voltage is recovered within 20 ms, operation will continue without the Servo being turned OFF.
- In the following cases, the Servo is turned OFF regardless of the Pn509 setting:
  - If the load is too great, and A.410 (insufficient voltage) occurs during a momentary power stoppage.
  - If the control power supply falls during a momentary power stoppage, and cannot be controlled.

Pn50A	Input signal selection 1 (All operation modes)	Default setting	1881	Restart power?	Yes

Pn50B	Input signal selection 2 (All operation modes)	Default setting	8882	Restart power?	Yes

Note Refer to *4-3-2 Important Parameters*.

Pn50C	Input signal selection 3 (All operation modes)	Default setting	8888	Restart power?	Yes

Pn50D	Input signal selection 4 (All operation modes)	Default setting	8888	Restart power?	Yes

Note Do not change setting.

Pn50E	Output signal selection 1 (All operation modes)	Default setting	0000	Restart power?	Yes

Pn50F	Output signal selection 2 (All operation modes)	Default setting	0100	Restart power?	Yes

Pn510	Output signal selection 3 (All operation modes)	Default setting	0000	Restart power?	Yes

Pn511	Input signal selection 5 (All operation modes)	Default setting	6543	Restart power?	Yes

Pn512	Output signal reverse (All operation modes)	Default setting	0000	Restart power?	Yes

Note Refer to *4-3-2 Important Parameters*.

Pn513	Not used.	Default setting	0321	Restart power?	Yes

Note Do not change setting.

Pn515	Not used.	Default setting	8888	Restart power?	Yes

Note Do not change setting.

Pn51B	Not used.						
Setting range	---	Unit	---	Default setting	1000	Restart power?	No

Note Do not change setting.

Pn51E	Deviation counter overflow warning level (Position)						
Setting range	10 to 100	Unit	%	Default setting	100	Restart power?	No

- Set the deviation counter overflow warning detection level using the ratio (%) for Pn520 (deviation counter overflow level).
- When the deviation counter residual pulses exceed the set value, a deviation counter overflow warning (A.900) will occur.

Pn520	Deviation counter overflow level (Position)						
Setting range	1 to 1073741823	Unit	Command unit	Default setting	262144	Restart power?	No

- Set the deviation counter overflow alarm detection level for position control.
- A Servo alarm occurs when the accumulated pulses in the deviation counter exceed the set value.
- Set the deviation counter overflow level to the number of command units suitable for the system and operation pattern (e.g., the number of command units required for 2 to 3 rotations).

Pn522	Positioning completed range 1 (Position)						
Setting range	0 to 1073741823	Unit	Command unit	Default setting	3	Restart power?	No

• Set the deviation counter value for outputting INP1 (positioning completed 1) during position control.

• INP1 turns ON when the accumulated pulses in the deviation counter fall below the set value.

Note Related parameters: Pn50E.0 (INP1 signal output terminal allocation), Pn524 (Positioning completed range 2)

Pn524	Positioning completed range 2 (Position)						
Setting range	1 to 1073741824	Unit	Command unit	Default setting	3	Restart power?	No

• Set the deviation counter value for outputting INP2 (positioning completed 2) during position control.

• INP2 turns ON when the accumulated pulses in the deviation counter fall below the set value.

• For example, using INP2 as a near signal output, processing time can be shortened by receiving the INP2 signal and preparing the next sequence by the time positioning is completed (i.e., by the time INP1 turns ON). In that case, set a number greater for Pn524 that is greater than the setting for Pn522.

Note Related parameters: Pn510.0 (INP2 signal output terminal allocation), Pn522 (Positioning completed range 1)

Pn526	Deviation counter overflow level at Servo-ON (Position)						
Setting range	1 to 1073741823	Unit	Command unit	Default setting	262144	Restart power?	No

• Set the deviation counter overflow alarm detection level for Servo ON.

• A Servo alarm occurs when the accumulated pulses in the deviation counter exceed the set value.

Pn528	Deviation counter overflow warning level at Servo-ON (Position)						
Setting range	10 to 100	Unit	%	Default setting	100	Restart power?	No

• Set the deviation counter overflow warning detection level for Servo ON to a percentage of Pn526 (deviation counter overflow alarm level at Servo-ON).

• The deviation counter overflow warning at Servo ON (A.901) is generated when the accumulated pulses in the deviation counter exceed the set value.

Pn529	Speed limit level at Servo-ON (Position)						
Setting range	0 to 10000	Unit	r/min	Default setting	10000	Restart power?	No

• Set the speed limit to use if the Servo is turned ON when there are position deviation pulses in the deviation counter.

Pn52A	Not used.						
Setting range	---	Unit	---	Default setting	20	Restart power?	No

Note Do not change setting.

Pn52F	Not used.						
Setting range	---	Unit	---	Default setting	FFF	Restart power?	No

Note Do not change setting.

■ Program JOG: Pn530 to Pn536

Pn530.0	Program JOG operation related switches -- Program JOG operating pattern (All operation modes)						
Setting range	0 to 5	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0	(Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536
1	(Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536
2	(Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536 (Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536
3	(Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536 (Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536
4	(Waiting time Pn535 → Forward movement Pn531 → Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536
5	(Waiting time Pn535 → Reverse movement Pn531 → Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536

Pn530.1	Program JOG operation related switches -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn530.2	Program JOG operation related switches -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn530.3	Program JOG operation related switches -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn531	Program JOG movement distance (All operation modes)						
Setting range	1 to 1073741824	Unit	Command unit	Default setting	32768	Restart power?	No

Pn533	Program JOG movement speed (All operation modes)						
Setting range	1 to 10000	Unit	r/min	Default setting	500	Restart power?	No

Pn534	Program JOG acceleration/deceleration time (All operation modes)						
Setting range	2 to 10000	Unit	ms	Default setting	100	Restart power?	No

Pn535	Program JOG waiting time (All operation modes)						
Setting range	0 to 10000	Unit	ms	Default setting	100	Restart power?	No

Pn536	Number of program JOG movement (All operation modes)						
Setting range	1 to 1000	Unit	Times	Default setting	1	Restart power?	No

Note For details on the program JOG function, refer to *4-4-13 Program JOG Operation*.

Pn540	Gain limit (Position, speed)						
Setting range	10 to 2000	Unit	× 0.1 Hz	Default setting	2000	Restart power?	No

- As the value is increased, response improves but vibration becomes easier. Likewise, as the value is decreased, operation becomes more stable but response declines.

Pn550	Analog monitor 1 offset voltage (All operation modes)						
Setting range	–10000 to 10000	Unit	× 0.1 V	Default setting	0	Restart power?	No

Pn551	Analog monitor 2 offset voltage (All operation modes)						
Setting range	–10000 to 10000	Unit	× 0.1 V	Default setting	0	Restart power?	No

- When Pn006 is set to 0102, Pn422 [%] to 10.0, and Pn550 to 3.0 [V]:
  Analog monitor 1: Torque command
  = {(–1) × (Torque command [%] – 10%) × 10} + 3 [V]
  If the torque here is 52%
  = {(–1) × (52 [%] – 10 [%]) × 1 [V]/100 [%]} + 3 [V]
  = –7.2 [V] (Analog monitor 1 output voltage)

■ Other Parameters (from Pn600)

Pn600	Regeneration resistor capacity (All operation modes)						
Setting range	0 to (varies by model)	Unit	× 10 W	Default setting	0	Restart power?	No

- If using an External Regeneration Resistor or External Regeneration Resistance Unit, set the regeneration absorption amount. Set the regeneration absorption amount for when the temperature rises above 120°C, not the nominal amount. (Refer to *3-3-3 Regenerative Energy Absorption by External Regeneration Resistance* for details.)
- A.920 (Regenerative overload warning and A.320 (Regenerative overload alarm) are detected based on the set value.

Note If an External Regeneration Resistor or External Regeneration Resistance Unit is not connected, set Pn600 to 0.

Pn800.0	Communications control -- MECHATROLINK-II communications check mask (All operation modes)						
Setting range	0 to 3	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0	Normal
1	Ignore communications errors (A.E6□).
2	Ignore WDT errors (A.E5□).
3	Ignore communications errors (A.E6□) and WDT errors (A.E5□).

- This function is used for ignoring communications alarm checks in operations such as debugging during trial operation.
  When it is used for normal operation,0 (with check) must be set.

Pn800.1	Communications control -- Warning check mask (All operation modes)						
Setting range	0 to 7	Unit	---	Default setting	4	Restart power?	No

Setting Explanation

Setting	Explanation
0	Normal
1	Ignore data setting warning (A. 94□).
2	Ignore command warning (A. 95□).
3	Ignore A.94□ and A.95□.
4	Ignore communications warning (A. 96□).
5	Ignore A.94□ and A.96□.
6	Ignore A.95□ and A.96□.
7	Ignore A.94□, A.95□ and A.96□.

- Depending on the setting for Pn800.1, warnings are not detected for A. 94□, A. 95□, and A. 96□. (Warnings are detected for A. 94□ and A. 95□ A. in the default settings.)

- When connecting to the CJ1W-NCF71 or CS1W-NCF71, always use the default setting (4) or a setting of 0.

Pn800.2	Communications control -- Communications error count at single transmission (All operation modes)						
Setting range	0 to F	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0 to F	Detects communications errors (A.E60) if errors occur consecutively for the set value plus two times.

Pn800.3	Communications control -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn801.0	Function selection application 6 (software LS) -- Software limit function (All operation modes)						
Setting range	0 to 3	Unit	---	Default setting	3	Restart power?	No

Setting Explanation

Setting	Explanation
0	Software limit enabled.
1	Forward software limit disabled.
2	Reverse software limit disabled.
3	Forward/reverse software limits disabled.

- Enables or disables software limits. Software limit function settings are executed according to the next user constant. Software limits are enabled in the cases described below. In all other cases, software limits do not go into effect even when the software limit range is exceeded.

  When the origin is established (when the No-origin Flag is OFF for the CJ1W-NCF71, CS1W-MCH71, CJ1W-MCH71)

  When an infinite length axis is used (CS1W-MCH71, CJ1W-MCH71)

  Set enable/disable with the above setting method described above.

Pn801.1	Function selection application 6 (software LS) -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn801.2	Function selection application 6 (software LS) -- Software limit check using reference (Position)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0	No software limit check using reference
1	Software limit check using reference

- Sets whether or not the software limit check will be in effect when position commands are input. If the software limit is reached or exceeded when the target position is input, the specified target value is decelerated to a stop at the software limit's set position.
- When connecting to the CJ1W-NCF71 or CS1W-NCF71, always use the default setting (0: No software limit check using reference).

Pn801.3	Function selection application 6 (software LS) -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn802	Not used.						
Setting range	---	Unit	---	Default setting	0000	Restart power?	No

Note Do not change setting.

Pn803	Zero point width (Position)						
Setting range	0 to 250	Unit	Command unit	Default setting	10	Restart power?	No

Note This parameter sets origin position detection (ZPOINT).

Pn804	Forward software limit (All operation modes)						
Setting range	–1073741823 to 1073741823	Unit	Command unit	Default setting	819191808	Restart power?	No

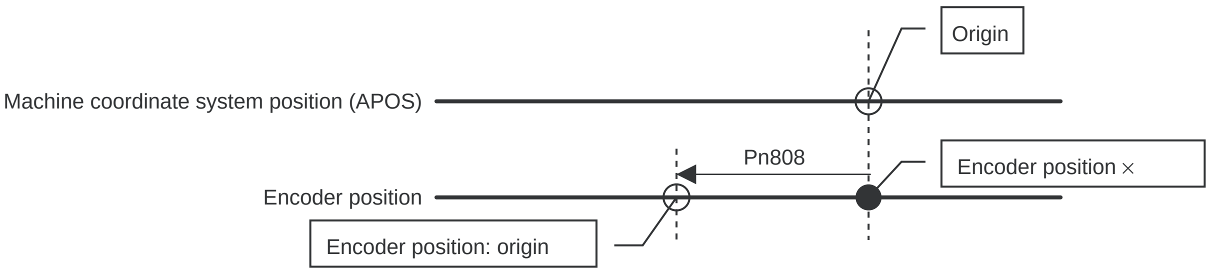
Pn806	Reverse software limit (All operation modes)						
Setting range	–1073741823 to 1073741823	Unit	Command unit	Default setting	–819191808	Restart power?	No

- This parameter sets the software limits in the + and – directions. The area is set to match the direction, so be sure to set the – direction limit lower than the + direction limit.

Pn808	Absolute encoder zero point position offset (All operation modes, absolute)						
Setting range	–1073741823 to 1073741823	Unit	Command unit	Default setting	0	Restart power?	No

- The encoder position and machine coordinate system position (APOS) offsets for when an absolute encoder is used can be set.

• The settings are shown below. To take the machine coordinate system origin (0) as the encoder position (X), set Pn808 to –X.



● Acceleration/Deceleration Speed Parameters (Pn80A to Pn812)

Pn80A	First step linear acceleration parameter (Position)						
Setting range	1 to 65535	Unit	× 10000 Command unit/s^2	Default setting	100	Restart power?	No

• Sets the step 1 acceleration speed for when two-step acceleration is used.

Pn80B	Second step linear acceleration parameter (Position)						
Setting range	1 to 65535	Unit	× 10000 Command unit/s^2	Default setting	100	Restart power?	No

• Sets the step 2 acceleration for when two-step acceleration is executed, or the one-step acceleration parameter for when one-step acceleration is executed.

Pn80C	Acceleration parameter switching speed (Position)						
Setting range	0 to 65535	Unit	× 100 Command unit/s	Default setting	0	Restart power?	No

• Sets the switching speed for the step 1 and step 2 acceleration for when two-step acceleration is executed. When using one-step acceleration, set the acceleration parameter switching speed (Pn80C) to 0.

Pn80D	First step linear deceleration parameter (Position)						
Setting range	1 to 65535	Unit	× 10000 Command unit/s^2	Default setting	100	Restart power?	No

• Sets the step 1 deceleration for when two-step acceleration is used.

Pn80E	Second step linear deceleration parameter (Position)						
Setting range	1 to 65535	Unit	× 10000 Command unit/s^2	Default setting	100	Restart power?	No

• Sets the step 2 deceleration for when two-step deceleration is executed. When using one-step acceleration, set Pn80E as the one-step deceleration parameter.

Pn80F	Deceleration parameter switching speed (Position)						
Setting range	0 to 65535	Unit	× 100 Command unit/s	Default setting	0	Restart power?	No

- This parameter sets the switching speed for the step 1 and step 2 deceleration when two-step deceleration is executed. When using one-step acceleration, set the deceleration parameter switching speed (Pn80F) to 0.

Pn810	Exponential acceleration/deceleration bias (Position)						
Setting range	0 to 32767	Unit	Command unit/s	Default setting	0	Restart power?	No

- Sets the bias for when an exponential filter is used for the position command filter.

Pn811	Exponential acceleration/deceleration time constant (Position)						
Setting range	0 to 5100	Unit	× 0.1 ms	Default setting	0	Restart power?	No

- This parameter sets the time constant for when an exponential filter is used for the position command filter.

Pn812	Moving average time (Position)						
Setting range	0 to 5100	Unit	× 0.1 ms	Default setting	0	Restart power?	No

- Sets the average movement time for when and an average movement filter is used for the position command filter. Set when using S-curve acceleration/deceleration.

Pn813	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

- If the Servo Driver is used with the CJ1W-MCH71 or CS1W-MCH71, this parameter will be set to 0032.
  If parameters are edited with the WMON-ML2 connected, this parameter will set to 0000.
  If this happens, you must reset this parameter to 0032 from the CJ1W-MCH71 or CS1W-MCH71.

Note Do not change setting.

Pn814	Final travel distance for external positioning (Position)						
Setting range	–1073741823 to 1073741823	Unit	Command unit	Default setting	100	Restart power?	No

- Sets the distance from the external signal input position when external positioning is executed. For a negative direction or if the distance is short, operation is reversed after decelerating to a stop.

● Origin Search Parameters (Pn816 to Pn819)

Pn816.0	Zero point return mode settings -- Zero point return direction (Position)						
Setting range	0, 1	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0	Forward
1	Reverse

• Sets the direction for executing origin search.

Pn816.1	Zero point return mode settings -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn816.2	Zero point return mode settings -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn816.3	Zero point return mode settings -- Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn817	Zero point return approach speed 1 (Position)						
Setting range	0 to 65535	Unit	× 100 Command unit/s	Default setting	50	Restart power?	No

• Sets the origin search speed after the deceleration limit switch signal turns ON.

Pn818	Zero point return approach speed 2 (Position)						
Setting range	0 to 65535	Unit	× 100 Command unit/s	Default setting	5	Restart power?	No

• Sets the origin search speed from when the deceleration limit switch signal turns ON until it turns OFF.

Pn819	Final travel distance to return to zero point (Position)						
Setting range	–1073741823 to 1073741823	Unit	Command unit/s	Default setting	100	Restart power?	No

• Sets the distance from the latch signal input position to the origin, for when origin search is executed. If the final travel distance is in the opposite direction from the origin return direction or if the distance is short, operation is reversed after decelerating to a stop.

Pn81B	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn81C	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

Pn81D	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

● Input Signal Monitor Parameter (Pn81E)

Pn81E	Not used.						
Setting range	---	Unit	---	Default setting	0000	Restart power?	No

Note Do not change setting.

Pn81F	Not used.						
Setting range	---	Unit	---	Default setting	0	Restart power?	No

Note Do not change setting.

● Latch Area Parameters (Pn820, Pn822)

Pn820	Not used.						
Setting range	---	Unit	---	Default setting	00000000	Restart power?	No

Pn822	Not used.						
Setting range	---	Unit	---	Default setting	00000000	Restart power?	No

Note Do not change setting.

● Option Monitor Parameters (Pn824, Pn825)

Pn824	Not used.						
Setting range	---	Unit	---	Default setting	0000	Restart power?	No

- If the Servo Driver is used with the CJ1W-MCH71 or CS1W-MCH71, this parameter will be set to 0032. If parameters are edited with the WMON-ML2 connected, this parameter will set to 0000. If this happens, you must reset this parameter to 0032 from the CJ1W-MCH71 or CS1W-MCH71.

Note Do not change setting.

Pn825	Not used.						
Setting range	---	Unit	---	Default setting	0000	Restart power?	No

- If the Servo Driver is used with the CJ1W-MCH71 or CS1W-MCH71, this parameter will be set to 0024. If parameters are edited with the WMON-ML2 connected, this parameter will set to 0000. If this happens, you must reset this parameter to 0024 from the CJ1W-MCH71 or CS1W-MCH71.

Note Do not change setting.

● Other Unused Parameters

Pn900 to Pn910	Not used.						
Setting range	---	Unit	---	Default setting	---	Restart power?	No

Note Do not change setting.

Pn920 to Pn95F	Not used.						
Setting range	---	Unit	---	Default setting	---	Restart power?	No

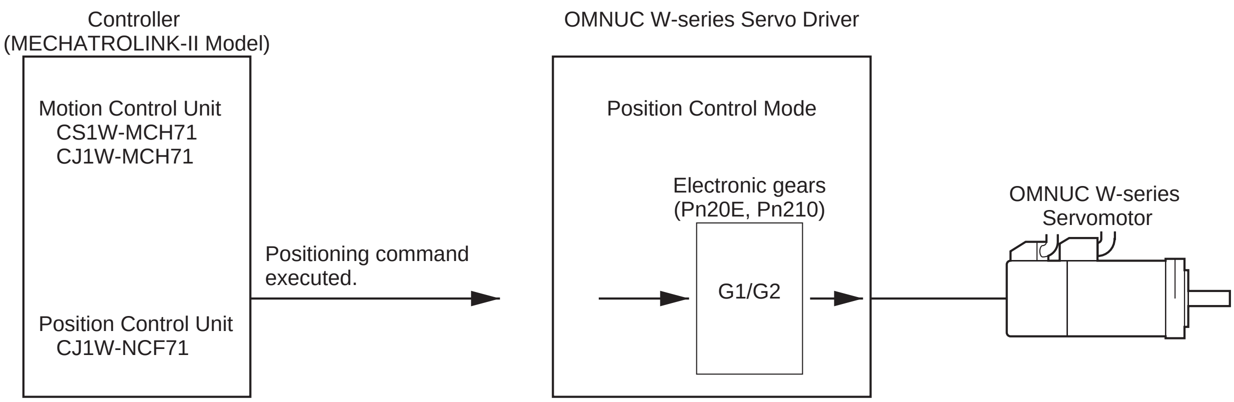
Note Do not change setting.

4-4 Operation Functions

4-4-1 Position Control (Position)

■ Functions

- Position control is performed according to commands from MECHATROLINK-II.
- The motor is rotated by the command value multiplied by the gear ratio (Pn20E, Pn210).



■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn20E	Electronic gear ratio G1 (numerator)	Set the pulse rates for the position command value and the Servomotor travel amount. $0.001 \leq G1/G2 \leq 1000$	*4-4-9 Electronic Gear Function (Position)*
Pn210	Electronic gear ratio G2 (denominator)		

■ Related Functions

- The main functions related to position control that can be used during position control are as follows:

Function name	Explanation	Reference
Feed-forward function	Adds the position command value differential to the speed loop to reduce positioning time.	*4-7-2 Feed-forward Function (Position)*
Bias function	Calculates number of bias rotations for the speed loop to reduce positioning time.	*4-7-1 Bias Function (Position)*
Torque limit function	Limits the Servomotor's torque output.	*4-4-7 Torque Limit Function (All Operating Modes)*
P control switching function	Switches the speed control loop automatically from PI control to P control to lower Servo rigidity. (Switching conditions can be selected.)	*4-7-7 P Control Switching (Position, Speed)*

■ Applicable Controller Commands

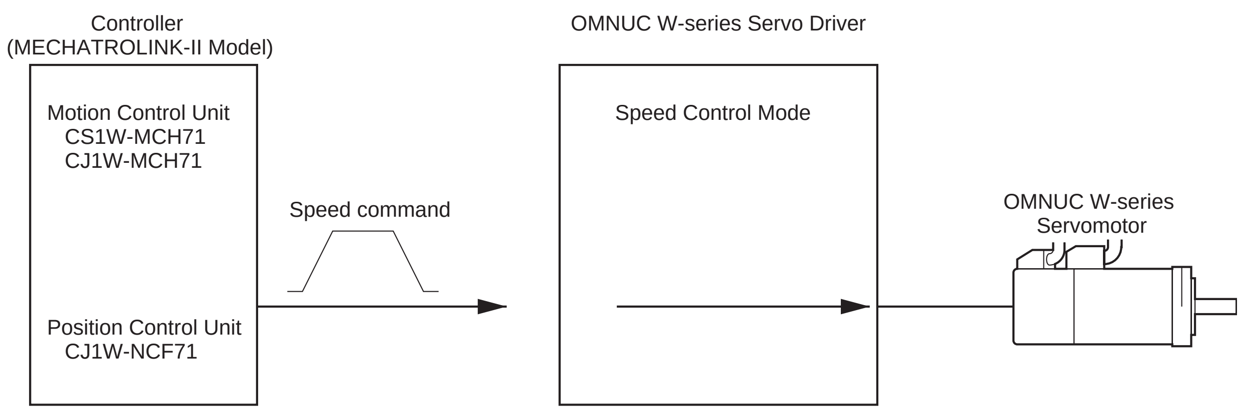
Controller	Commands and instructions
CJ1W-NCF71	According to absolute and relative move commands.
CS1W-MCH71 CJ1W-MCH71	According to axis move instructions (MOVE, MOVL, MOVEC, etc.).

Note For details on commands and instructions, refer to the manual for the specific Unit.

4-4-2 Speed Control (Speed)

■ Function

• Speed control is performed according to commands from MECHATROLINK-II.



■ Related Functions

• The main functions related to speed control that can be used during speed control are as follows:

Function name	Explanation	Reference
Soft start function	Sets the soft start for the speed command.	*4-4-8 Soft Start Function (Speed)*
Torque limit function	This function limits the Servomotor's output torque output.	*4-4-7 Torque Limit Function (All Operating Modes)*
P control switching function	Switches the speed control loop automatically from PI control to P control to lower Servo rigidity (you can select the switching conditions).	*4-7-7 P Control Switching (Position, Speed)*

■ Applicable Controller Commands

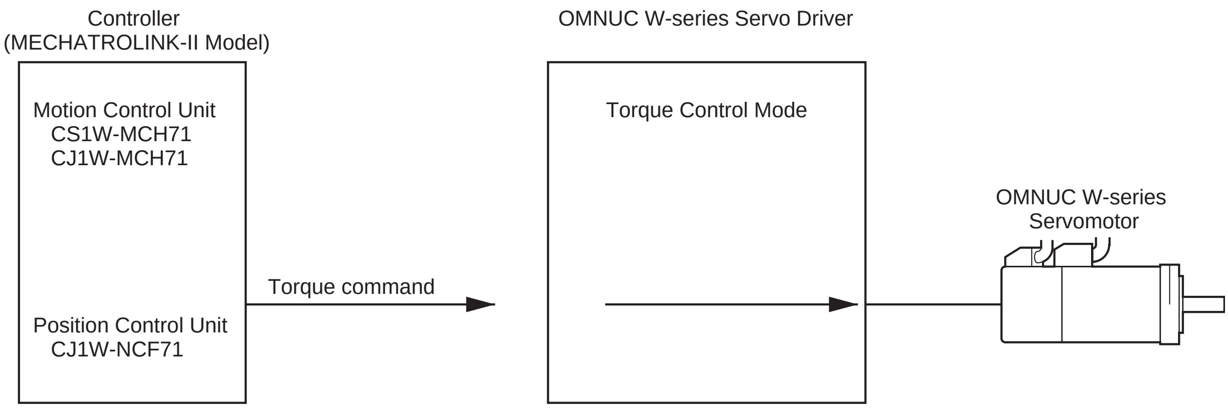
Controller	Commands and instructions
CJ1W-NCF71	According to speed control instructions.
CS1W-MCH71 CJ1W-MCH71	According to speed control instructions (SPEED, SPEEDR).

Note For details on commands and instructions, refer to the manual for the specific Unit.

4-4-3 Torque Control (Torque)

■ Function

• Torque control is performed according to commands from MECHATROLINK-II.



■ Related Functions

• Functions related to torque control that can be used during torque control are as follows:

Function name	Explanation	Reference
Torque limit function	This function limits the Servomotor's torque output.	*4-4-7 Torque Limit Function (All Operating Modes)*
Speed limit function	This function limits the Servomotor rotation speed from becoming too high.	*4-4-10 Speed Limit Function (Torque)*

Note Servomotor rotation speed during torque control changes depending on the Servomotor load conditions (friction, external force, inertia). Apply safety measures at the machinery to prevent Servomotor runaway.

■ Applicable Controller Commands

Controller	Commands and instructions
CJ1W-NCF71	According to torque control commands.
CS1W-MCH71 CJ1W-MCH71	According to torque control commands (TORQUE, TORQUER).

Note For details on commands and instructions, refer to the manual for the specific Unit.

4-4-4 Forward and Reverse Drive Prohibit (All Operating Modes)

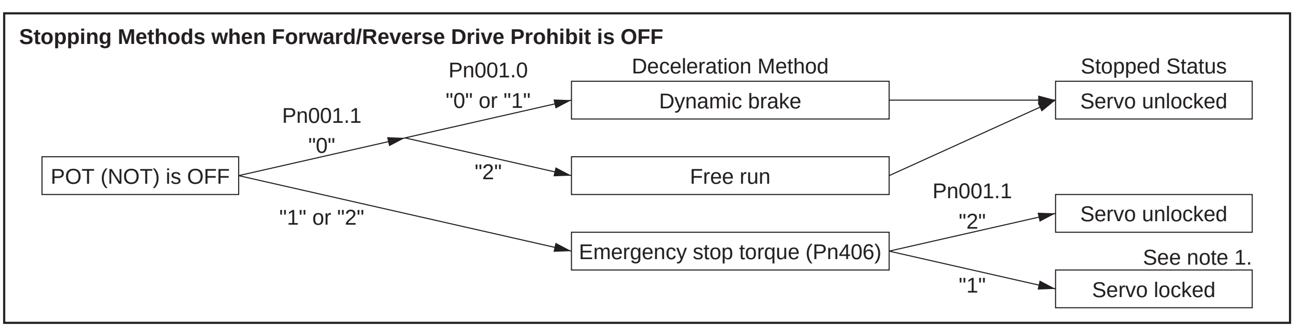
■ Functions

- When forward drive prohibit (POT: CN1-7) and reverse drive prohibit (NOT: CN1-8) are OFF, stops the Servomotor rotating (Pin No. is allocated in the default settings).
- You can stop the Servomotor from rotating beyond the device's movement range by connecting a lit input.

■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn50A.3 Pn50B.0	Input signal selection 1: POT signal selection Input signal selection 2: NOT signal selection	You must allocate both POT and NOT. **Note:** As the default setting, they are allocated to CN1 pins 7 and 8.	*4-3-2 Important Parameters*
Pn001	Function selection application switch 1	Set the stop method when POT and NOT in Pn001.1 (stop selection for drive prohibition input) are OFF. If Pn001.1 is set to 0 (stop according to Pn001.0 setting), be sure to set Pn001.0 (stop selection for alarm generation with Servo OFF).	*4-3-2 Important Parameters*
Pn406	Emergency stop torque	If Pn001.1 is set to 1 or 2, set emergency stop torque in Pn406.	*4-3-3 Parameter Details*

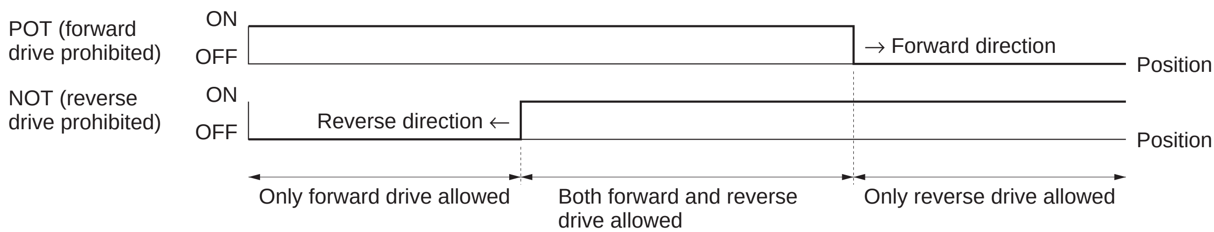
■ Operation



Note 1. If the Servomotor stops in this mode during position control, the position loop is disabled.

Note 2. The position method used during torque control depends on Pn001.0 setting (the P001.1 setting is unrelated).

Note 3. With a vertical load, the load may fall due to its own weight if it is left at a drive prohibit input. We recommend that you set the stop method for the drive prohibit input (Pn001.1) for decelerating with the emergency stop torque, and then set stopping with the servo locked (SV: 1) to prevent the load from falling.



Note 1. When a command to travel in a prohibited direction within the drive prohibit area is input, the Servomotor is stopped using the method set in Pn001.1. If a command to travel in the opposite direction is input, the Servomotor automatically resumes operation.

Note 2. With position control, the feedback pulses and command pulses continue to be counted without the deviation counter's residual pulses being reset. If the drive prohibit input turns ON in this state (i.e., drive permitted), the position will be shifted by the amount of the residual pulses.

4-4-5 Encoder Dividing Function (All Operating Modes)

■ Functions

- With this function, any number of pulses can be set for encoder signals output from the Servo Driver.
- The number of pulses per Servomotor revolution can be set within a range of 16 to (number of encoder resolution pulses). The upper limit is 1,073,741,824 pulses/rotation.
- Use this function for the following applications:
  When using a controller with a low response frequency.
  When it is desirable to set a pulse rate that is easily divisible.
  (For example, in a mechanical system in which a single Servomotor revolution corresponds to a travel of 10 mm, if the resolution is 5 μm/pulse, set the encoder divider rate to 2,000 (pulses/revolution).

■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn212	Encoder divider rate	Set the number of encoder pulses to be output. (See notes 1, 2, and 3).	*4-3-3 Parameter Details*

Note 1. The default setting is 1,000 (pulses/rotation), and the setting range is 16 to 1,073,741,824 (pulses/rotation).

Note 2. These parameters are enabled when the power is turned ON again after having been turned OFF. (Check to see that the LED display has gone OFF.)

Note 3. If a value greater than the encoder resolution is set, operation will proceed according to the formula: (divider rate setting) = (encoder resolution)

- For Servomotors with encoders of 17-bit resolution (32,768 encoder pulses/rotation) or greater, set the value at the increments shown below when the encoder divider rate (Pn212) is set.

Conforming encoder resolution	Encoder divider rate Pn212 (Pulses/revolution)	Pn212 setting conditions	Servomotor rotation speed upper limit (r/min) at the set encoder divider rate
17 bits min.	16 to 16384	1-pulse increments	6000
	16386 to 32768	2-pulses increments	984×10^5/Pn212
18 bits min.	32772 to 65536	4-pulse increments	
19 bits min.	65544 to 131072	8-pulse increments	
20 bits	131088 to 262144	16-pulse increments	

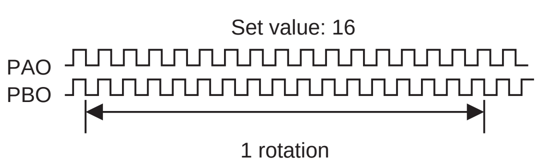
Note If the above setting range or setting conditions are not satisfied, a dividing pulse output setting error alarm (A.041) will be output. Also, if the Servomotor rotation speed upper limit for the set encoder divider rate is exceeded, a dividing pulse output overspeed alarm (A.511) will be output.

■ Setting Example

- Encoder with 17-bit resolution:
  Pn212 can be set to 25,000 pulses/rotation, but Pn212 cannot be set to 25,001 pulses/rotation or A.041 will be output.

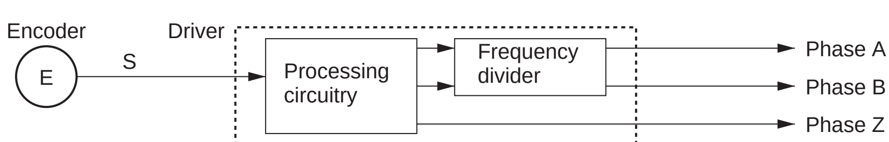
■ Output Example

- When Pn212 is set to 16 (16 pulse outputs per rotation)

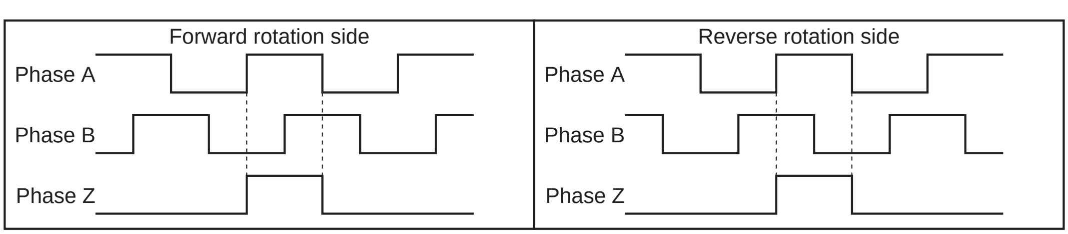


■ Operation

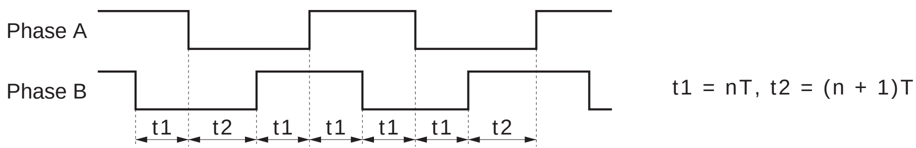
- Incremental pulses are output from the Servo Driver through a frequency divider.



- The output phases of the encoder signal output from the Servo Driver are as shown below (when divider ratio Pn212 = encoder resolution).

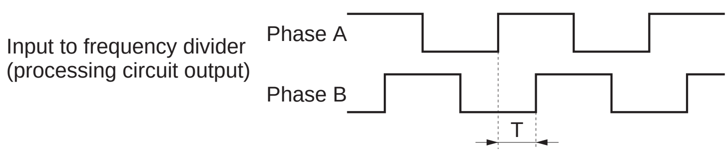


• When the encoder divider rate is set to other than 2^n (16,384, 8,192, 4,096, 2,048, 1,024, etc.), the phase difference for phases A and B is not 90°, but scatters for time T. (See the diagram below.)



In this diagram, T represents the processing circuit output between phase A and phase B, and n is an integer that satisfies the following formula (with digits below the decimal point discarded).

n = resolution/encoder divider rate



4-4-6 Brake Interlock (All Operating Modes)

■ Precautions for Using Electromagnetic Brake

• The electromagnetic brake Servomotor with a brake is a non-excitation brake especially for holding. First stop the Servomotor, then turn OFF the power supply to the brake before setting the parameters. If the brake is applied while the Servomotor is operating, the brake disk may become damaged or malfunction due to friction, causing damage to the Servomotor.

■ Function

• You can set the BKIR (brake interlock) signal output timing to turn ON and OFF the electromagnetic brake.

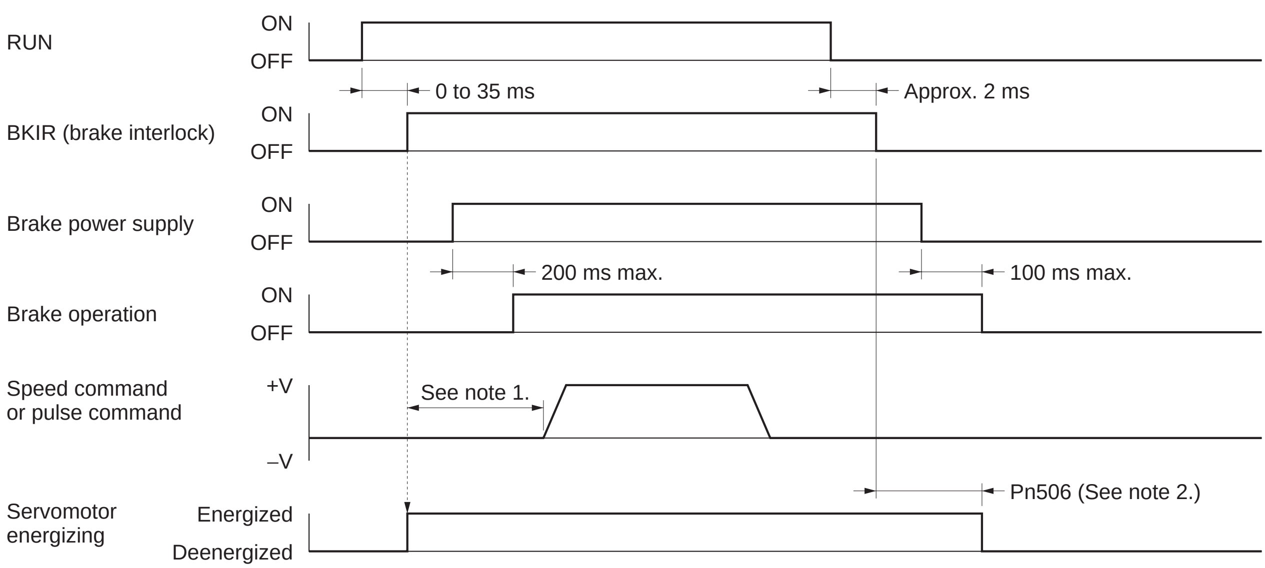
■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn50F.2	Output signal selections 2: BKIR signal selection	Be sure to allocate BKIR. (See note.)	*4-4-3 Torque Control (Torque)*
Pn506	Brake timing 1	This parameter sets the BKIR output timing. Pn506: Sets lag time from BKIR OFF to Servo OFF. Pn507: Sets the rotation speed for turning BKIR OFF. Pn508: Sets the standby time from Servo OFF to BKIR OFF.	*4-4-4 Forward and Reverse Drive Prohibit (All Operating Modes)*
Pn507	Brake command speed		
Pn508	Brake timing 2		

Note As the default setting, BKIR is allocated to CN1 pins 1 and 2.

■ Operation

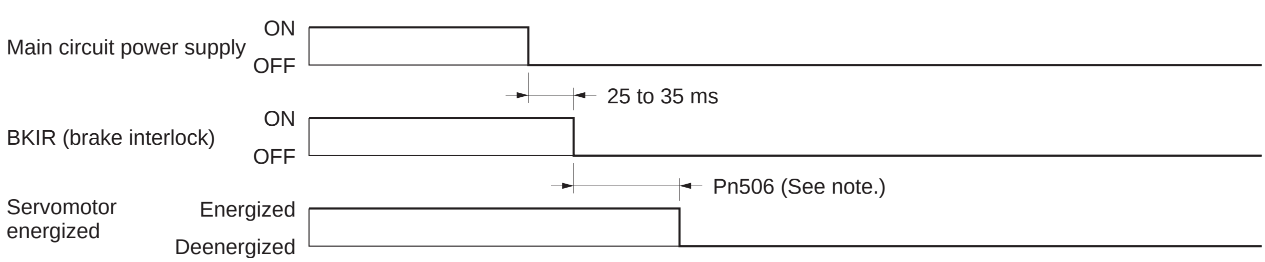
● RUN Timing (When Servomotor Is Stopped)



Note 1. The time from turning ON the brake power supply to the brake being released is 200 ms max. Set the speed command (pulse command) to be given after the brake has been released, taking this delay into account.

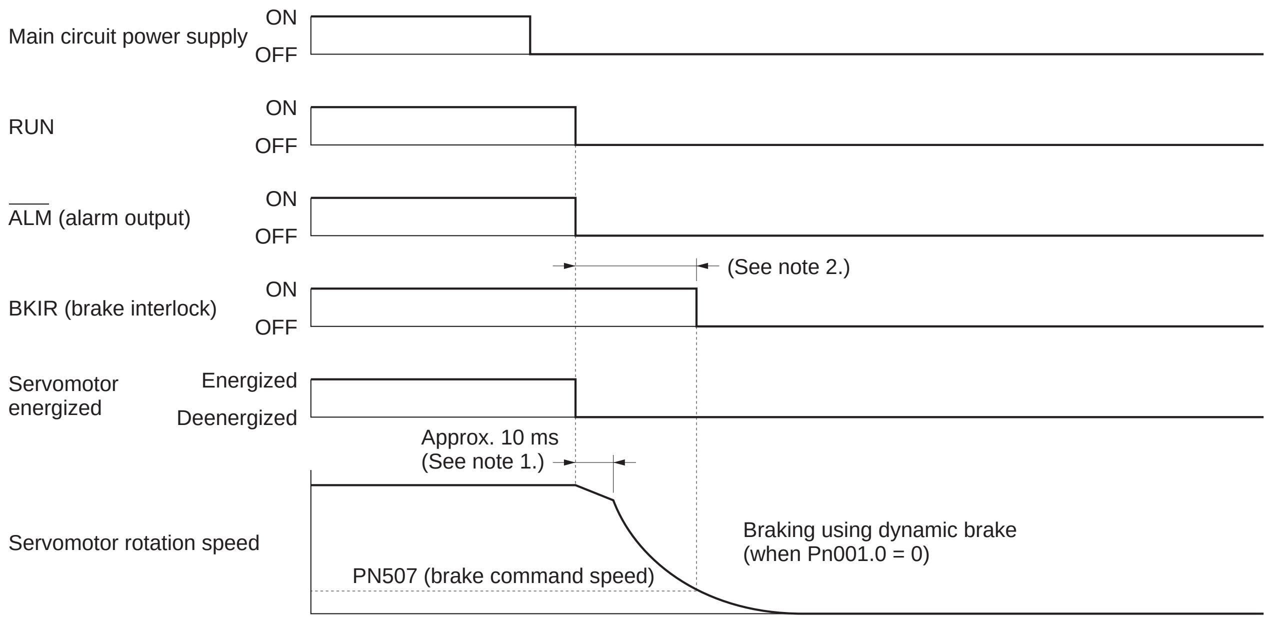
Note 2. The time from turning OFF the brake power supply to the brake engaging is 100 ms max. If using the Servomotor on a vertical axis, set Pn506 (brake timing 1) so that the Servomotor deenergizes after the brake has engaged, taking this delay into account.

● Power Supply Timing (when Servomotor Is Stopped)



Note The time from turning OFF the brake power supply to the brake engaging is 100 ms max. If using the Servomotor on a vertical axis, set Pn506 (brake timing 1) so that the Servomotor deenergizes after the brake has engaged, in consideration of this delay.

● RUN, Error, and Power Supply Timing (When Servomotor Is Stopped)



Note 1. During the approximately 10 ms from the Servomotor deenergizing to dynamic brake being applied, the Servomotor will continue to rotate due to its momentum.

Note 2. If the Servomotor rotation speed falls below the speed set in Pn507 (brake command speed) or the time set in Pn508 (brake timing 2) after the Servomotor deenergizes is exceeded, the BKIR (brake interlock) signal is turned OFF.

4-4-7 Torque Limit Function (All Operating Modes)

■ Functions

- The torque limit function limits the Servomotor's output torque.
- This function can be used to protect the Servomotor and mechanical system by preventing excessive force or torque on the mechanical system when the machine (moving part) pushes against the workpiece with a steady force, such as in a bending machine.

• There are four methods that can be used to limit the torque (pin No. is allocated at the factory):

<table>
<tr><th>Function</th><th>CJ1W-NCF71</th><th>CS1W-MCH71
CJ1W-MCH71</th></tr>
<tr><td>Limiting steady torque during operation with user parameters (all operation modes)</td><td colspan="2">Limit the steady force applied during normal operation with user parameters Pn402 (forward torque limit) and Pn403 (reverse torque limit).</td></tr>
<tr><td>Limiting torque when an external signal turns ON with user parameters (all operation modes)</td><td>Limit the torque with user parameters Pn404 (Forward rotation external current limit) and Pn405 (Reverse rotation external current limit), by turning ON the axis operation output bit area's forward and reverse rotation current limit designation and starting axis operation.</td><td>---</td></tr>
<tr><td>Limiting torque with option command values (speed)</td><td>Use option command values as torque limit values.</td><td>---</td></tr>
<tr><td>Limiting torque when an external signal turns ON with option command values (speed)</td><td>Limit torque using option command values as torque limit values by turning ON the axis operation output bit area's forward and reverse rotation current limit designation and starting axis operation.</td><td>---</td></tr>
</table>

Note For details on commands and instructions, refer to the manual for the specific Unit.

• When torque limit is ON, CLIMT (current limit detection) signal is output (if the signal has been allocated using parameter Pn50F.0).

• If multiple torque limits are enabled, the output torque is limited to the minimum limit value.

■ Parameters Requiring Settings

● Limiting Steady Torque During Operation with User Parameters (All Operating Modes)

Parameter No.	Parameter name	Explanation	Reference
Pn402	Forward torque limit	Set the output torque limit for the forward direction as a percentage of the rated torque (setting range: 0% to 800%).	*4-3-3 Parameter Details*
Pn403	Reverse torque limit	Set the output torque limit for the reverse direction as a percentage of the rated torque (setting range: 0% to 800%).	*4-3-3 Parameter Details*

Note 1. Set these parameters to 350 (the default setting) when the torque limit function is not being used.

Note 2. If the connected Servomotor is set to a value greater than the maximum momentary torque, the maximum momentary torque will become the set limit.

● Limiting Operation with External Signals (All Operating Modes) (CJ1W-NCF71 Only)

Parameter No.	Parameter name	Explanation	Reference
Pn404	Forward rotation external current limit	Set the output torque limit when the forward rotation current limit designation is ON as a percentage of the Servomotor rated torque (setting range: 0% to 800%).	*4-3-3 Parameter Details*
Pn405	Reverse rotation external current limit	Set the output torque limit when the reverse rotation current limit designation is ON as a percentage of the Servomotor rated torque (setting range: 0% to 800%).	*4-3-3 Parameter Details*

Note If the connected Servomotor is set to a value greater than the maximum momentary torque, the maximum momentary torque will become the set limit.

● Limiting Torque with Option Command Values (Speed) (CJ1W-NCF71 Only)

- When 1 is set for Pn002.0 (Torque command input change), torque limit values can be specified with option command values.
  Unit: %; command range: 0 to 399% (% of Servomotor momentary maximum torque)
- Limiting torque by option command values operates by taking option command value 1 as the forward torque limit and option command value 2 as the reverse torque limit.

Parameter No.	Parameter name	Explanation	Reference
Pn002.0	Torque command input switching	Set Pn002.0 to 1 (option command value used as torque limit command).	*4-3-3 Parameter Details*

● Limiting Torque with Option Command Values by Turning ON External Signals (Speed) (CJ1W-NCF71 Only)

- If 3 is set for Pn002.0 (Torque command input switching), torque limit values can be specified with option command values when the forward or reverse rotation current limit designation is turned ON.
  Unit: %; command range: 0 to 399% (% of Servomotor momentary maximum torque)
- When the forward rotation current limit designation turns ON, option command value 1 is taken as the forward torque limit and the torque limit functions for forward rotation.
- When the reverse rotation current limit designation turns ON, option command value 2 is taken as the reverse torque limit and the torque limit functions for reverse rotation.

Parameter No.	Parameter name	Explanation	Reference
Pn002.0	Torque command input switching	Set Pn002.0 to 3 (Option command value used as torque limit value, according to the forward/reverse rotation current limit designation).	*4-3-3 Parameter Details*

4-4-8 Soft Start Function (Speed)

■ Functions

- This function accelerates and decelerates the Servomotor in the set acceleration and deceleration times.
- You can set the acceleration and deceleration independently of each other using the trapezoidal acceleration and deceleration curve.
- The soft start processes speed command value switching to reduce shock during acceleration and deceleration.
- This function is effective for simple positioning and speed switching operations.

Note Do not use this function for a position controller with an acceleration/deceleration function.

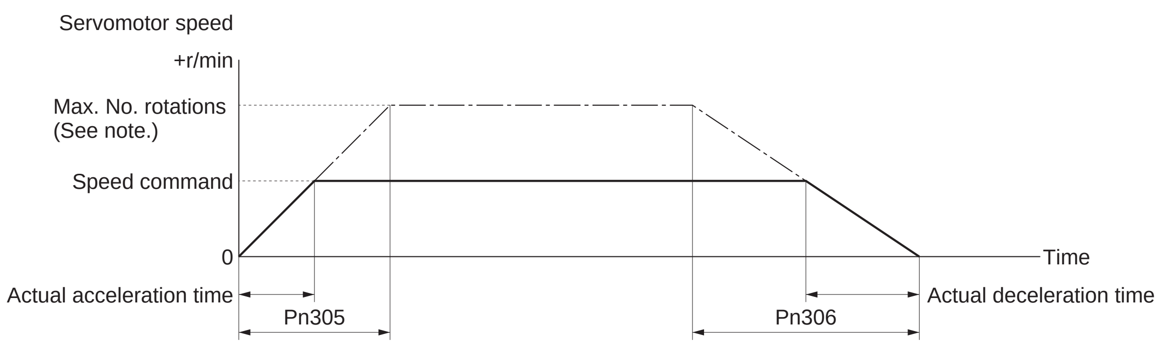
■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn305	Soft start acceleration time	Set the acceleration time from 0 (r/min.) to the maximum rotation speed (setting range: 0 to 10,000 (ms)).	*4-4-4 Forward and Reverse Drive Prohibit (All Operating Modes)*
Pn306	Soft start deceleration time	Set the deceleration time from maximum rotation speed to 0 (r/min.) Setting range: 0 to 10,000 (ms).	*4-4-4 Forward and Reverse Drive Prohibit (All Operating Modes)*

Note 1. If not using the soft start function, set this parameter to 0 (default setting).

Note 2. The actual acceleration and deceleration time is as follows:

$$\text{Actual acceleration (deceleration time)} = \frac{\text{speed command (r/min.)}}{\text{maximum No. rotations (r/min.)}} \times \text{soft start acceleration (deceleration) time}$$



Note The maximum rotation speeds are as follows:

- 3,000-r/min. Servomotor: 5,000 r/min.
- 3,000-r/min. Flat-style Servomotor: 5,000 r/min.
- 1,000-r/min. Servomotor: 2,000 r/min.
- 1,500-r/min. Servomotor (450 W to 1.8 kW): 3,000 r/min.

4-4-9 Electronic Gear Function (Position)

■ Functions

- This function rotates the Servomotor for the number of pulses obtained by multiplying the command pulses by the electronic gear ratio.
- This function is enabled under the following conditions.

  When fine-tuning the position and speed of two lines that are to be synchronous.

  When using a position controller with a low command pulse frequency.

  When you want to set the travel distance for machinery per pulse to 0.01 mm, for example.

■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn20E	Electronic gear ratio G1 (numerator)	Set the pulse rate for the command pulse and Servomotor travel distance. When G1/G2 = 1, if the pulse (encoder resolution × 4) is input, the Servomotor will rotate once (i.e., the internal driver will rotate × 4). (See note 1.)	*4-3-3 Parameter Details*
Pn210	Electronic gear ratio G2 (denominator)		

Note 1. Set within the range 0.001 ≤ G1/G2 ≤ 1000.

Note 2. These parameters become effective when the power is turned ON again after having been turned OFF. (Check to see that the LED display has gone OFF.)

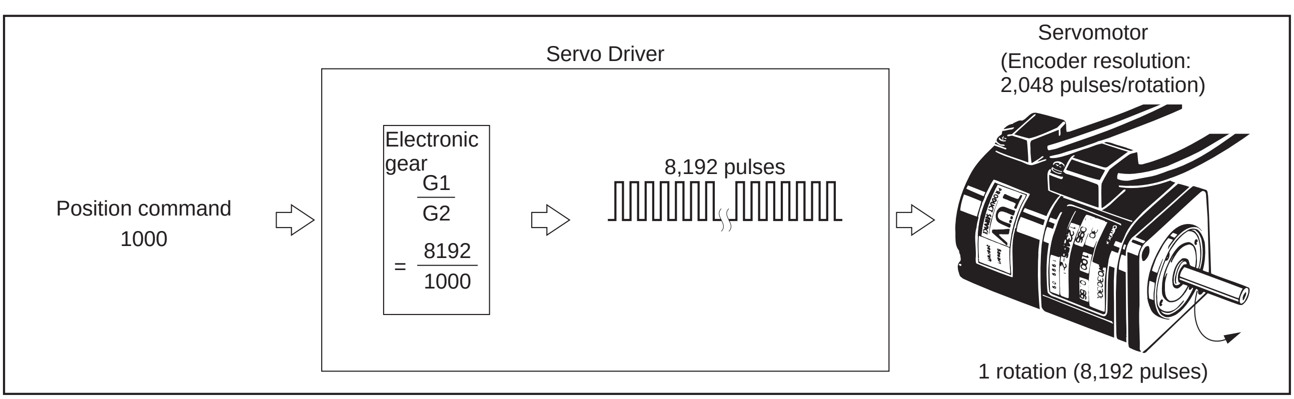
Note 3. With the default setting (G1/G2 = 4), the Servomotor will rotate once when the encoder resolution pulses are input.

Note 4. One position deviation (deviation counter) display and positioning completed range pulse make one input pulse. (This is called a command unit.)

■ Operation

● Servomotor with 2,048 (Pulses/Rotation) Encoder

- When set to G1/G2 = 8192/1000, the operation is the same as for a 1,000-pulses/rotation Servomotor.



4-4-10 Speed Limit Function (Torque)

■ Functions

- This function limits Servomotor rotation speed when torque control is used.
- Set a limit so that the Servomotor rotation speed does not exceed the maximum speed of the mechanical system.
- Outside of the speed limit range, a torque in proportion to the difference from the speed limit value is generated to slow down the Servomotor rotation speed. In such cases the number of Servomotor rotations does not necessarily match the speed limit value. (The number of Servomotor rotations varies depending on the load.)
- The two ways to limit the speed are given in the following table. The Controllers that support each method are also shown.

Function	CJ1W-NCF71	CS1W-MCH71 CJ1W-MCH71
Limiting using a constant fixed speed limit (parameter setting) for torque control	Use Pn407 (speed limit).	
Limiting the speed by means of an option command value	Use option command value 1 as the speed control value.	---

Note For details on commands and instructions, refer to the manual for the specific Unit.

- When the speed limit is in operation, VLIMT (speed limit detection) is output (when the signal has been allocated in Pn50F.1).
- When there are multiple speed limit functions in effect, Servomotor rotation speed is limited by the smallest value.

■ Parameters Requiring Settings

● Limiting Using a Constant Fixed Speed Limit (Parameter Setting) for Torque Control

Parameter No.	Parameter name	Explanation	Reference
Pn407	Speed limit	Set the speed limit for torque control. Setting range: 0 to 10,000 (r/min).	*4-3-3 Parameter Details*

● Limiting Speeds with Option Command Values (CJ1W-NCF71 Only)

- When 1 is set for Pn002.1 (Speed command input change), speed limit values can be specified with option command value 1.
  Unit: 0.001%; command range: 0 to 100.000% (% of maximum number of Servomotor rotations)
- Speed limits based on option command values are the same for forward and reverse rotation.

Parameter No.	Parameter name	Explanation	Reference
Pn002.1	Speed command input change	Set Pn002.1 to 1 (option command value used as speed limit command).	*4-3-3 Parameter Details*

4-4-11 Acceleration/Deceleration Function (Position)

■ Functions

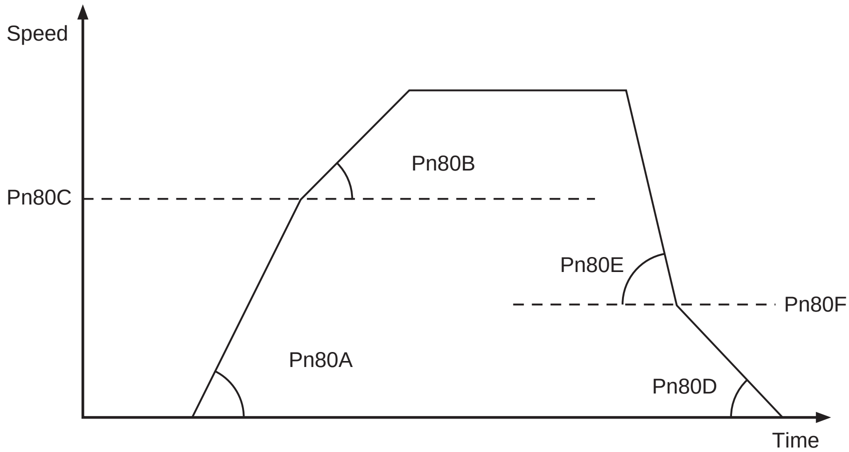
- This function sets the speed during acceleration and deceleration to two levels.
- The setting is made by a host device from MECHATROLINK-II.

■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn80A	First-step linear acceleration parameter	Sets the step 1 acceleration for when two-step acceleration is used.	*4-3-3 Parameter Details*
Pn80B	Second-step linear acceleration parameter	Sets the step 2 acceleration for when two-step acceleration is executed. When using one-step acceleration, set this parameter as a one-step acceleration parameter.	*4-3-3 Parameter Details*
Pn80C	Acceleration parameter switching speed	Sets the switching speed for the step 1 and step 2 acceleration when two-step acceleration is executed. When using one-step acceleration, set 0 for this parameter.	*4-3-3 Parameter Details*
Pn80D	First-step linear deceleration parameter	Sets the step 1 deceleration for when two-step deceleration is used.	*4-3-3 Parameter Details*
Pn80E	Second-step linear deceleration parameter	Sets the step 2 deceleration for when two-step deceleration is executed. When using one-step deceleration, set this parameter as a one-step deceleration parameter.	*4-3-3 Parameter Details*
Pn80F	Deceleration parameter switching speed	Sets the switching speed for the step 1 and step 2 deceleration when two-step deceleration is executed. When using one-step deceleration, set 0 for this parameter.	*4-3-3 Parameter Details*
Pn810	Exponential acceleration/deceleration bias	Sets the bias for when an exponential filter is used for the position command filter.	*4-3-3 Parameter Details*
Pn811	Exponential acceleration/deceleration time constant	Sets the time constant for when an exponential filter is used for the position command filter.	*4-3-3 Parameter Details*
Pn812	Moving average time	Sets the moving average time for when and an average movement filter is used for the position command filter. Set when using S-curve acceleration/deceleration.	*4-3-3 Parameter Details*

Note When trapezoidal acceleration/deceleration (not using two-step acceleration/deceleration) is executed, set Pn80C and Pn80F to 0, set the acceleration speed in Pn80B, and set the deceleration speed in Pn80E.

■ Operation



4-4-12 Sequence Input Signals (All Operating Modes)

■ Functions

- These are sequence input signals for controlling Servo Driver operation. They must be connected as required.
- Used for purposes such as latching the feedback position.

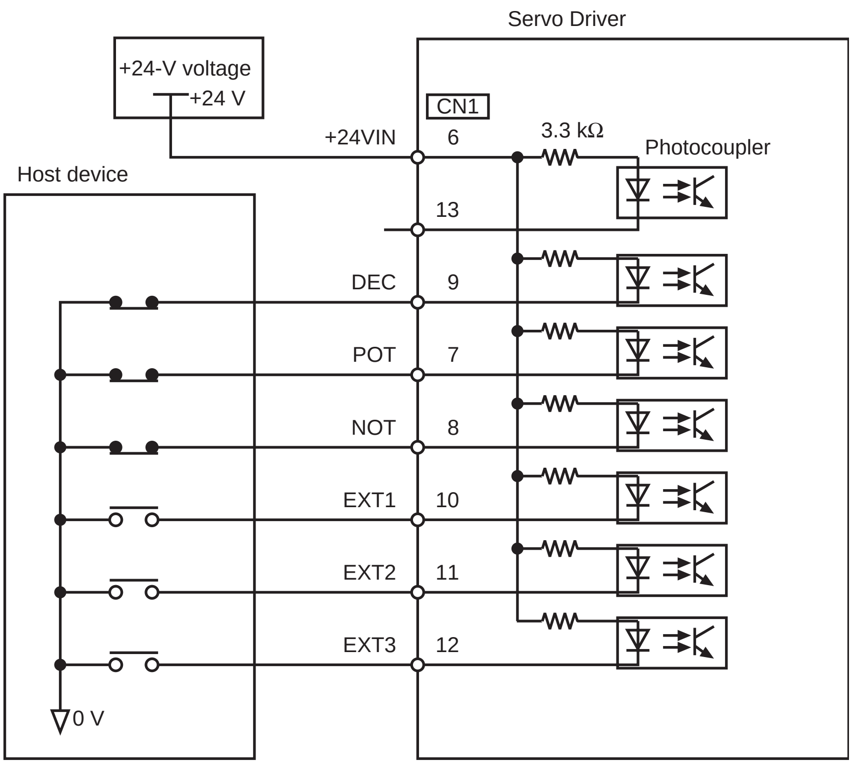
■ Parameters Requiring Settings

- Input Signals

Parameter No.	Parameter name	Explanation	Reference
Pn511.1	Input signal selections 5 -- EXT1 signal allocation	External latch signals 1, 2, and 3 **Note:** As the default setting, the signals are allocated to CN1 pins 10, 11, and 12.	*4-3-2 Important Parameters*
Pn511.2	Input signal selections 5 -- EXT2 signal allocation		
Pn511.3	Input signal selections 5 -- EXT3 signal allocation		

■ Connection

- Connect sequence input signals as shown in the following diagram.



4-4-13 Program JOG Operation

This is an auxiliary function that enables continuous automatic operation, determined by preset operating patterns, movement distances, movement speeds, acceleration/deceleration times, and numbers of repeat operations, to be executed using a Digital Operator. Just like the JOG operation mode, this function can operate a Servomotor for trial operation without being connected to a host device. Also, continually repeated operations according to position control are enabled, making it possible to check command units and the electronic gear, and to execute simple positioning operations.

■ Parameters Requiring Settings

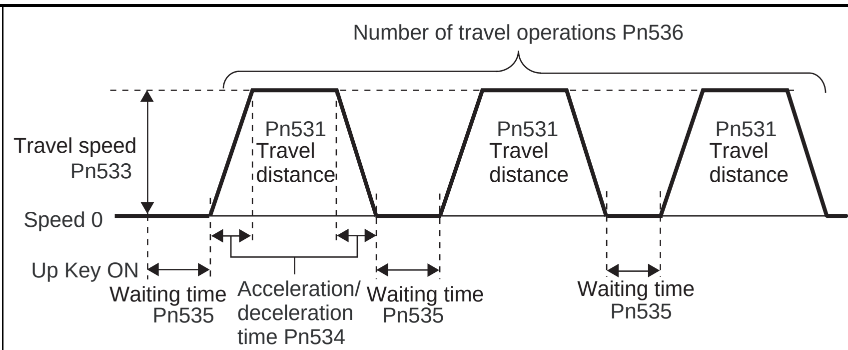
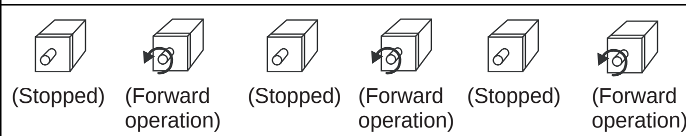
Parameter No.	Parameter name	Explanation	Reference
Pn530.0	Program JOG operation related switches -- Program JOG operating pattern	Set the program JOG operating pattern.	*4-3-3 Parameter Details*
Pn531	Program JOG movement distance	Set the program JOG movement distance. Setting range: 1 to 1,073,741,824 (command units)	*4-3-3 Parameter Details*
Pn533	Program JOG movement speed	Sets the program JOG movement speed. Setting range: 1 to 10,000 (r/min)	*4-3-3 Parameter Details*
Pn534	Program JOG acceleration/deceleration time	Set the acceleration/deceleration time for program JOG operation. Setting range: 2 to 10,000 (ms)	*4-3-3 Parameter Details*
Pn535	Program JOG waiting time	Set the program JOG waiting time (the time that the Servomotor is to be stopped). Setting range: 0 to 10,000 (ms)	*4-3-3 Parameter Details*
Pn536	Number of program JOG movements	Sets the number of repetitions of the operating pattern set in Pnn530.0, under the conditions set in Pn531 to Pn535. Setting range: 1 to 1,000 (times)	*4-3-3 Parameter Details*

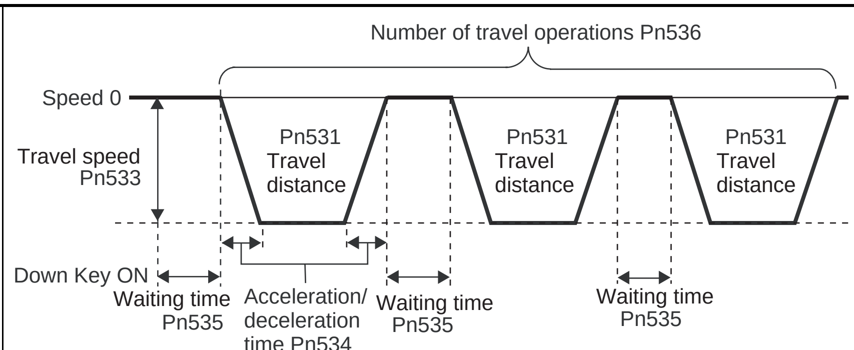
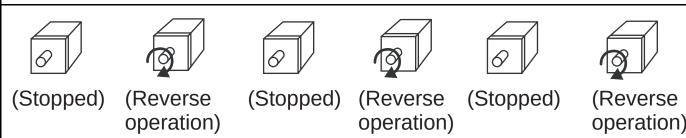
■ Precautions

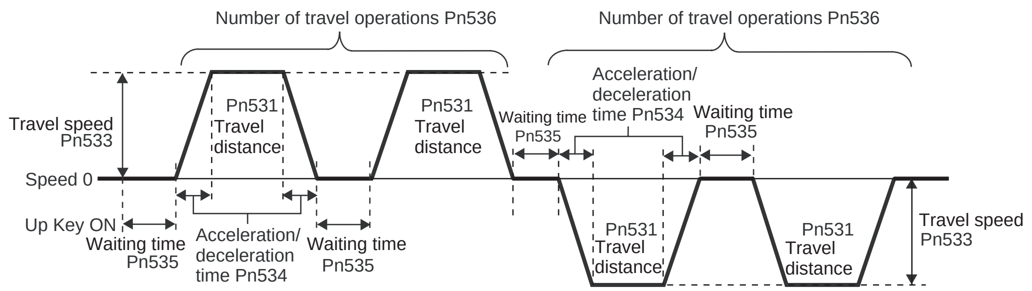
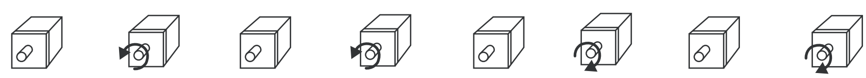
The following restrictions apply during operation.

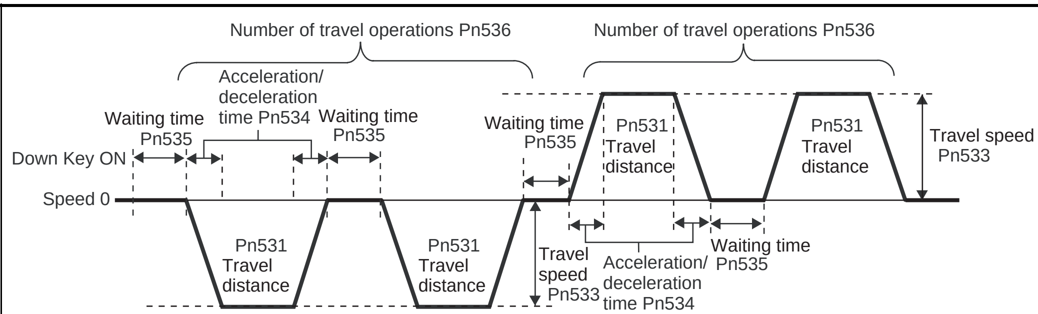
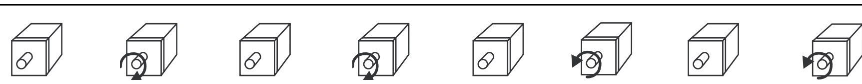
- When setting this function, set the operating range for the machinery and the safe operating speed in user constants such as the program JOG movement distance and the program JOG movement speed.
- This function is executed with the Servo Driver in Servo ready status. It cannot be executed while the Servo is ON.
- If the Servo ON command is ON, turn it OFF.
- If user parameter Pn50A.1 is set to 7 and Servo-ON is selected to be always enabled, clear the always enabled setting for the Servo-ON signal.
- The mode during program JOG operation is the position control mode, but pulse command inputs to the Servo Driver are prohibited and not received.
- The overtravel function is disabled in JOG mode, but it is enabled for program JOG operation.
- The SEN signal is always enabled when an absolute encoder is used.
- Functions such as position command filters, that can be used for position control, can be used.
- This function cannot be executed when Pn200.2 is set to 1 (Deviation counter not reset when Servo is OFF).

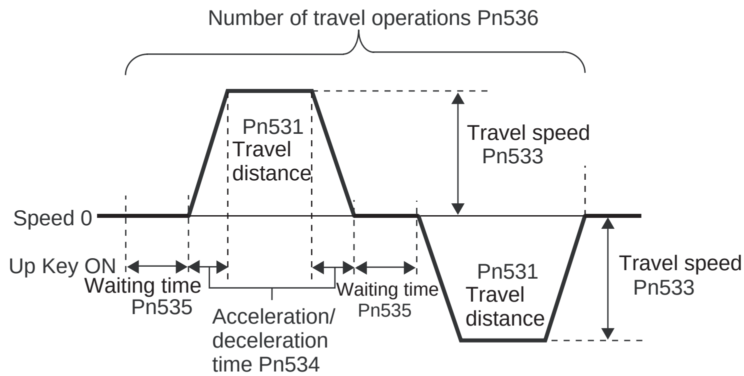
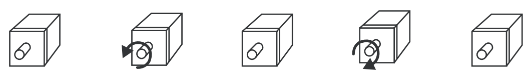
■ Program Operating Patterns

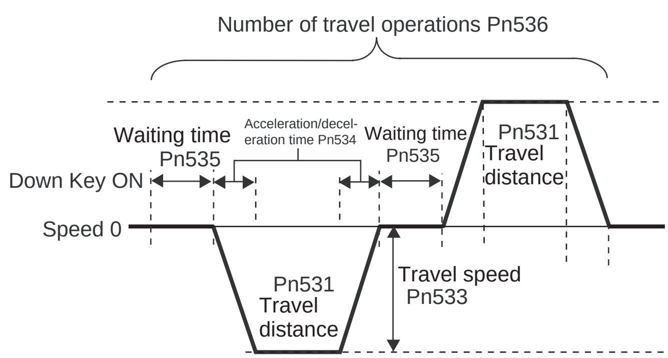
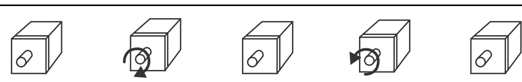
<table>
<tr><th colspan="2">Pn530.0: 0 (Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536</th></tr>
<tr><td>Speed line diagram</td><td>
</td></tr>
<tr><td>Servomotor operating status</td><td>
</td></tr>
</table>

<table>
<tr><th colspan="2">Pn530.0: 1 (Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536</th></tr>
<tr><td>Speed line diagram</td><td>
</td></tr>
<tr><td>Servomotor operating status</td><td>
</td></tr>
</table>

Pn530.0: 2	**(Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536** **(Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536**
Speed line diagram	
Servomotor operating status	 (Stopped) (Forward operation) (Stopped) (Forward operation) (Stopped) (Reverse operation) (Stopped) (Reverse operation)

Pn530.0: 3	**(Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536** **(Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536**
Speed line diagram	
Servomotor operating status	 (Stopped) (Reverse operation) (Stopped) (Reverse operation) (Stopped) (Forward operation) (Stopped) (Forward operation)

Pn530.0: 4 (Waiting time Pn535 → Forward movement Pn531 → Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536	
Speed line diagram	
Servomotor operating status	 (Stopped) (Forward operation) (Stopped) (Reverse operation) (Stopped)

Pn530.0:5 (Waiting time Pn535 → Reverse movement Pn531 → Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536	
Speed line diagram	
Servomotor operating status	 (Stopped) (Reverse operation) (Stopped) (Forward operation) (Stopped)

4-5 Trial Operation Procedure

When you have finished installation, wiring, verifying Servomotor and Servo Driver operations (i.e., jog operation), and setting the user parameters, perform a trial operation. The main purpose of a trial operation is to confirm that the Servo System is operating correctly electrically. Make sure that the host controller and all the programming devices are connected, then turn ON the power. First perform a trial operation at low speed to confirm that the system is operating correctly. Next, perform a normal run pattern to confirm that the system is operating correctly.

Note 1. If an error occurs during the trial operation, refer to Troubleshooting to eliminate the cause. Then check for safety and reset the alarm, and then retry the trial operation.

Note 2. If the system vibrates due to insufficient gain adjustment, making it difficult to check the operation, refer to *4-6 Making Adjustments*, and adjust the gain.

■ Preparation for Trial Operation

● Turn OFF the Power

Some parameters are enabled by turning OFF the Unit, then turning it ON again. Consequently, first turn OFF the power to the control circuits and main circuits.

● Mechanical System Connection

Firmly connect the Servomotor shaft and the load (i.e., the mechanical system). Tighten screws to make sure they are not loose.

● Absolute Encoder Setup ABS

If using Servomotor with an absolute encoder, refer to *4-2-2 Absolute Encoder Setup and Battery Changes* for the setup procedure. After performing a jog operation, the amount of multi-turn rotation may be too large, so when connecting the absolute encoder to the mechanical system, be sure to set the rotation speed to zero.

● Turning OFF the Servomotor

Set up the system so that the power and the RUN command can be turned OFF to enable turning OFF Servomotor immediately if an error occurs in the machinery.

■ Trial Operation

1. Turn ON the Power Supply.
   - Turn ON the power supply to the control circuits and main circuits, and then turn ON the RUN command.
   - Check that the Servomotor is ON.

2. Low-speed Operation

- Send a low speed command from the host controller to rotate the Servomotor. (The definition of low speed varies depending on the mechanical system, but a rough estimate is 1/10 to 1/5 normal operating speed.)
- Check the following items.

Is the emergency stop operating correctly?
Are the limit switches operating correctly?
Is the operating direction of the machinery correct?
Are the operating sequences correct?
Are there any abnormal sounds or vibration?
Is any error (or alarm) generated?

Note 1. If anything abnormal occurs, refer to *Chapter 5 Troubleshooting* and apply the appropriate countermeasures.

Note 2. If the system vibrates due to insufficient gain adjustment, making it difficult to check the operation, refer to *4-6 Making Adjustments*, and adjust the gain.

3. Operation Under Actual Load Conditions

- Operate the Servomotor in a regular pattern and check the following items.

Is the operating speed correct? (Use the speed feedback monitor.)
Is the load torque roughly equivalent to the measured value? (Use the torque command monitor and the accumulated load monitor.)
Are the positioning points correct?
When an operation is repeated, is there any discrepancy in positioning?
Are there any abnormal sounds or vibration?
Is either the Servomotor or the Servo Driver abnormally overheating?
Is any error (or alarm) generated?

Note 1. Refer to *4-9 Using Monitor Output* for how to display the speed feedback monitor, torque command monitor, and the cumulative load rate monitor.

Note 2. If anything abnormal occurs, refer to *Chapter 5 Troubleshooting* and apply the appropriate countermeasures.

Note 3. If the system vibrates due to insufficient gain adjustment impeding, making it difficult to check the operation, refer to *4-6 Making Adjustments*, and adjust the gain.

4. Completing the Trial Operation

- Performing the above completes the trial operation. Next, adjust the gain to improve command efficiency. (Refer to *4-6 Making Adjustments* for details.)

4-6 Making Adjustments

The OMNUC R88D-WN□□□-ML2 Series is equipped with a responsive auto-tuning function. When auto-tuning cannot be used, make adjustments manually.

4-6-1 Adjustment Methods

The Servo gain can be adjusted either using auto-tuning for simple adjustment or using manual adjustment. auto-tuning is performed using the Computer Monitor Software. The features of the various means of adjustment are listed in the following table. Select the method that is most suitable for the purpose.

Note Refer to *6-3 Restrictions*.

Adjustment method	Description	Guidelines for selection
Advanced auto-tuning with inertia	An automatic operation pattern is used to automatically calculated the inertia ratio and set the Servo gain and notch filter.	Use this method to automatically calculate the Servo gain. A stroke must be provided for the automatic operation pattern. Gain adjustment is possible only using the automatic operation pattern.
Advanced auto-tuning without inertia	An automatic operation pattern is used to automatically set the Servo gain and notch filter. The inertia ratio is not calculated.	Use this method when manually setting the Servo gain in Pn103. A stroke must be provided for the automatic operation pattern. Gain adjustment is possible only using the automatic operation pattern.
One-parameter auto-tuning	One parameter is set to adjust and balance the following four parameters. These are adjusted during operation from the host. • Position loop gain • Speed loop gain • Speed loop integration constant • Torque command filter time constant	Use this method when manually setting the Servo gain in Pn103. Machine response can be monitored while changing just one parameter to reduce the trouble of manual tuning. The results are judged by the user.
Manual tuning	The Servo gain parameters are adjusted at the discretion of the user.	Use this method when suitable adjustments cannot be achieved using autotuning.

4-6-2 Advanced Auto-tuning

■ What is Advanced Auto-tuning?

- Advanced auto-tuning is a control function that estimates the operating inertia, increases the Servo gain, and automatically seeks a no-vibration range that matches the characteristics of the machinery.
- Advanced auto-tuning is executed from the Computer Monitor Software.

Note Advanced auto-tuning cannot be used in the following cases.

- When the load inertia fluctuates at 200 ms or less.
- When the load rigidity is low and mechanisms (such as belt drive inputs) tends to vibrate, or viscosity friction is high.
- When the range of movement is narrow, e.g., only several rotations.
- When movement is possible only in a fixed direction.
- When P (proportional) control is used.

Use the following method to make adjustments if any of the above conditions apply, or if operation is not satisfactory when normal auto-tuning is executed.

- Set Pn103 (Inertia ratio), and then execute one-parameter tuning or manual adjustment.

■ User Parameters Related to Advanced Auto-tuning

- The following user parameters are set automatically by advanced auto-tuning.

Pn100 Speed loop gain
Pn101 Speed loop integration constant
Pn102 Position loop gain
Pn103 Inertia ratio
Pn401 1st step 1st torque command filter time constant

- The following parameters are also set automatically as required.

Pn408.0 Torque command setting -- Notch filter selection 1
Pn409 Notch filter 1 frequency
Pn408.2 Torque command setting -- Notch filter selection 2
Pn40C Notch filter 2 frequency

- If the electronic gear ratio is not set within the following range, an A042 error (parameter combination error) will occur. Always set the electronic gear ratio within the following range.

Electronic gear ratio (Pn20E/Pn210) ≤ 218

4-6-3 One-parameter Tuning

■ What is One-parameter Tuning?

- One-parameter tuning is a function that smoothly changes the status of four gain parameters (Pn100, Pn101, Pn102, Pn401) during operation by changing just one tuning level.
- One-parameter tuning is used to adjust the Servo gain at the user's discretion, while checking Servo and machinery responses.

■ Parameters Related to One-parameter Tuning

- The following user parameters are set automatically by one-parameter tuning.

Pn100 Speed loop gain
Pn101 Speed loop integration constant
Pn102 Position loop gain
Pn401 1st step 1st torque command filter time constant

4-6-4 Manual Tuning

■ Rigidity Settings During Tuning

- If the gain is adjusted as an initial setting using manual tuning, tuning can be performed comparatively quickly. Therefore it is recommended that the rigidity be set first.
- Select the rigidity setting to suit the mechanical system from the following 10 levels.
- The speed loop handles both PI and I-P control.
  Switching between PI and I-P control is performed by means of the Pn10B.1 setting. Setting Pn10B.1 to 0 switches to PI control, and setting it to 1 switches to I-P control. The new setting is enabled by turning the power OFF and back ON after the setting has been made.

1.Speed Loop PI Control

Response	Rigidity setting	Position loop gain (s^{-1}) Pn102	Speed loop gain (Hz) Pn100	Speed loop integration constant (ms) Pn101	1st step 1st torque command filter time constant (ms) Pn401	Representative applications (mechanical system)
Low	01	15.0	15.0	60.00	2.50	Articulated robots, harmonic drives, chain drives, belt drives, rack and pinion drives, etc.
	02	20.0	20.0	45.00	2.00	
	03	30.0	30.0	30.00	1.30	
Medium	04	40.0	40.0	20.00	1.00	XY tables, Cartesian-coordinate robots, general-purpose machinery, etc.
High	05	60.0	60.0	15.00	0.70	Ball screws (direct coupling), feeders, etc.
	06	80.0	80.0	10.00	0.50	
	07	100.0	100.0	8.00	0.40	
	08	120.0	120.0	7.00	0.35	
	09	140.0	140.0	6.00	0.30	
	10	160.0	160.0	5.00	0.25	

Note Make sure that the location of the decimal point is correct when setting the parameters.

2.Speed Loop I-P Control

Response	Rigidity setting	Position loop gain (s^{-1}) Pn102	Speed loop gain (Hz) Pn100	Speed loop integration constant (ms) Pn101	1st step 1st torque command filter time constant (ms) Pn401	Representative applications (mechanical system)
Low	01	15.0	15.0	18.00	2.50	Articulated robots, harmonic drives, chain drives, belt drives, rack and pinion drives, etc.
	02	20.0	20.0	14.00	2.00	
	03	30.0	30.0	9.00	1.30	
Medium	04	40.0	40.0	7.00	1.00	XY tables, Cartesian-coordinate robots, general-purpose machinery, etc.

Response	Rigidity setting	Position loop gain (s^{-1}) Pn102	Speed loop gain (Hz) Pn100	Speed loop integration constant (ms) Pn101	1st step 1st torque command filter time constant (ms) Pn401	Representative applications (mechanical system)
High	05	60.0	60.0	4.50	0.70	Ball screws (direct coupling), feeders, etc.
	06	80.0	80.0	3.50	0.50	
	07	100.0	100.0	3.00	0.40	
	08	120.0	120.0	2.50	0.35	
	09	140.0	140.0	2.00	0.30	
	10	160.0	160.0	2.00	0.25	

Note 1. Make sure that the location of the decimal point is correct when setting the parameters.

Note 2. The Servo System loop gain will rise in response to a higher rigidity setting, shortening the positioning time. If the setting is too large, however, the machinery may vibrate. In that case, make the setting smaller.

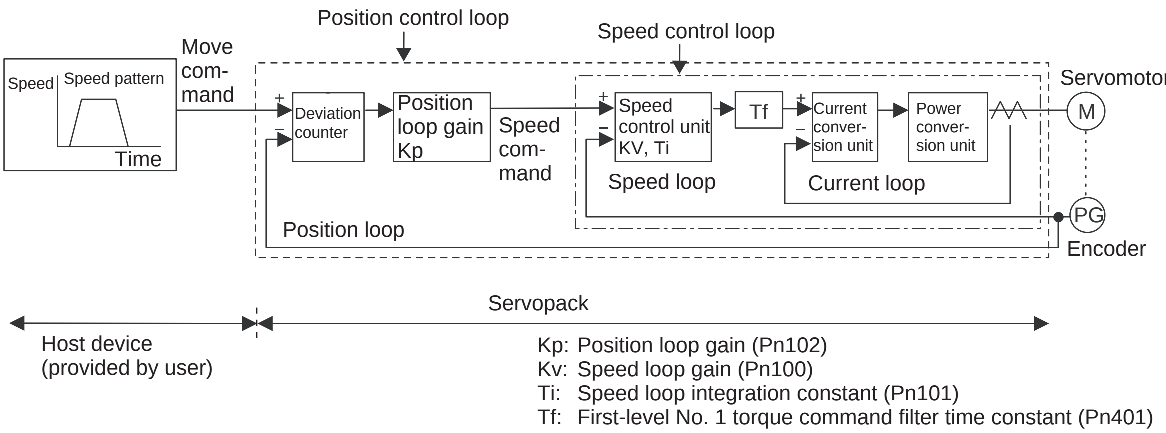
■ Manual Tuning-related User Parameters

- The following user parameters are set by manual tuning.

  Pn100 Speed loop gain
  Pn101 Speed loop integration constant
  Pn102 Position loop gain
  Pn103 Inertia ratio
  Pn401 1st step 1st torque command filter time constant

■ Manually Adjusting Servo Gain

1. Increase the speed loop gain (Pn100) as much as possible without having the machinery vibrate, and simultaneously reduce the speed loop integration constant (Pn101).
2. Adjust the 1st step 1st torque command filter time constant (Pn401) and set it so there is no vibration.
3. Repeat steps 1 and 2, and return 10% to 20% from the changed values.
4. For position control, increase the position loop gain (Pn102) to the point where the machinery does not vibrate.



■ Procedure for Adjusting Gain

- A Servo System control block is configured of a position loop, a speed loop, and a current loop.
- The current loop is the most interior, followed by the speed loop and then the position loop.
- An output from an exterior loop is an input for an interior loop. As a condition for the exterior loop to operate properly, the interior loop must be able to give a sufficient response to that input. In other words, high response is required from the interior loop. Also, when adjusting gain, the adjustment proceeds from the interior loop gain.
- In order for the current loop to have a sufficient response, it is adjusted at the time of shipping. Therefore first adjust the speed loop, and then the position loop.
- The speed loop adjustment increases tracking for speed commands. Perform this adjustment in servolock status, while checking the Servo rigidity (the force holding the position against external force).
- The position loop adjustment increases tracking for position commands. Input the position command in the actual operating pattern while checking the positioning time.

4-7 Advanced Adjustment Functions

4-7-1 Bias Function (Position)

■ Functions

- The bias function shortens positioning time by adding bias revolutions to speed commands (i.e., commands to the speed control loop).
- If the residual pulses in the deviation counter exceed the setting in Pn108 (bias addition band), the speed set in Pn107 (bias rotational speed) is added to the speed command, and when the residual pulses in the deviation counter are within the setting in Pn108, adding to the number of bias rotations stops.
- By setting the following user constants and providing a bias to the speed command unit in the Servo Driver, the settling time can be shortened during positioning control.

■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn107	Bias rotational speed	Set the rotation speed to be added to the bias (setting range: 0 to 450 (r/min.)).	*4-3-3 Parameter Details*
Pn108	Bias addition band	Set the residual pulses to be added to the number of bias rotations using command units (setting range: 0 to 250 (command units)).	*4-3-3 Parameter Details*

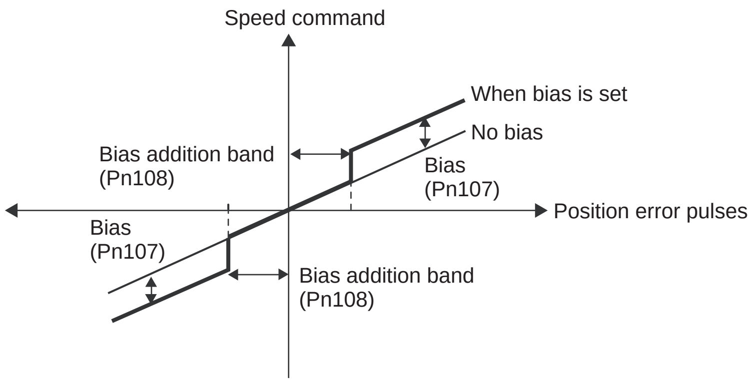
Note 1. When not using the bias function, set Pn107 to 0.

Note 2. If the bias rotational speed is set too high, it will cause Servomotor operation to be unstable. The optimum setting depends on the load, the gain, and the bias addition band, so adjust the setting while observing the Servomotor response. (Begin with a bias setting of Pn107 = 0, and gradually increase it.)

■ Setting Procedure

- Complete the gain adjustment before adjusting the bias.
- Increase the Pn107 (bias rotational speed) setting until positioning time is minimal. At this point, if there are no problems with using overshoot, adjustments are complete.
- If the overshoot is too large, increase Pn108 (bias addition band) to reduce it.
- To shorten positioning time, make the settings according to the mechanical conditions. The bias addition band (Pn108) is the value that indicates by position deviation pulses the timing for adding the bias (Pn107). Bias is added when the position deviation pulses exceed the set value for the bias addition band.

■ Operation



4-7-2 Feed-forward Function (Position)

■ Functions

- This function shortens positioning time by automatically, in the Servo Driver, adding the position command value differential to the speed loop.
- Perform feed-forward compensation to increase Servo gain efficiency, thus improving response. There is very little effect, however, on systems with sufficiently high position loop gain.

■ Parameters Requiring Settings

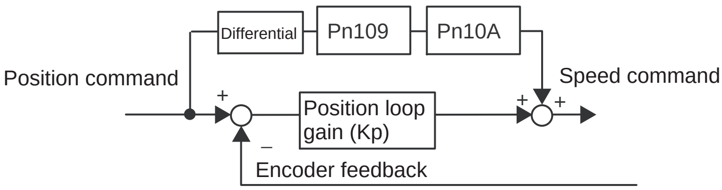
Parameter No.	Parameter name	Explanation	Reference
Pn109	Feed forward amount	Set the feed-forward gain (setting rage: 0 to 100 (%)).	*4-3-3 Parameter Details*
Pn10A	Feed forward command filter	Set the feed-forward command filter (primary lag). (Setting range: 0 to 6400 ($\times$ 0.01 ms).)	*4-3-3 Parameter Details*

Note When not using the feed-forward function, set Pn10A to 0.

■ Setting Procedure

- Finish adjusting the gain before adjusting the feed-forward.
- Increase the Pn109 (feed-forward amount) setting until positioning time is minimal. At this point, if there are no problems with using overshoot, adjustments are complete. A high setting may cause the machinery to vibrate. With ordinary machinery, set the gain to 80% maximum. (Adjust the gain while checking the machine response.)
- If the overshoot is too large, increase Pn10A (feed-forward command filter) to reduce the it.
- In the Servo Driver, feed forward compensation is applied to position control. This function is used to shorten positioning time. If the value is set too high, the machinery may vibrate. Set it to 80% or less.

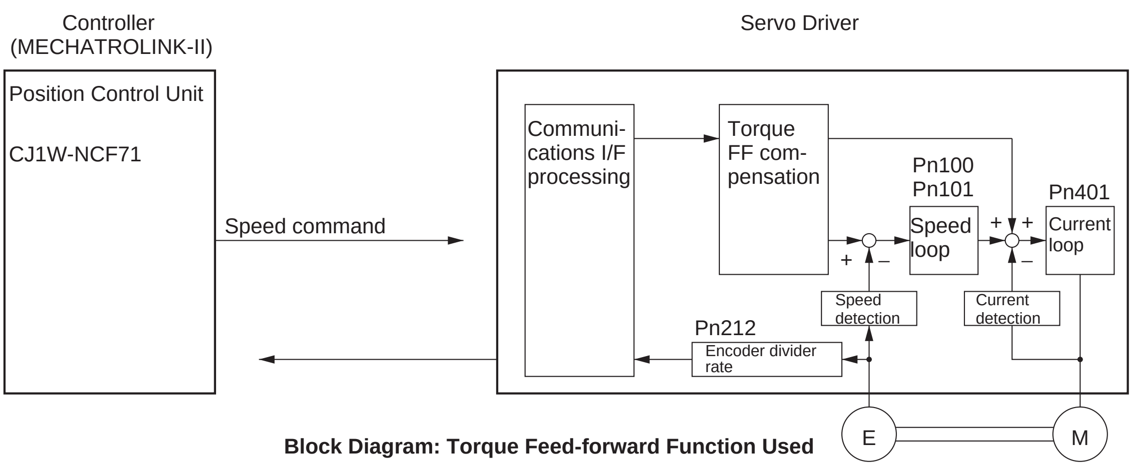
■ Operation



4-7-3 Torque Feed-forward Function (Speed)

■ Functions

- The torque feed-forward function reduces the acceleration time by adding the torque feed-forward command value to the current loop.
- Normally a differential value is generated in the controller and this value is input as the torque feed-forward command value.

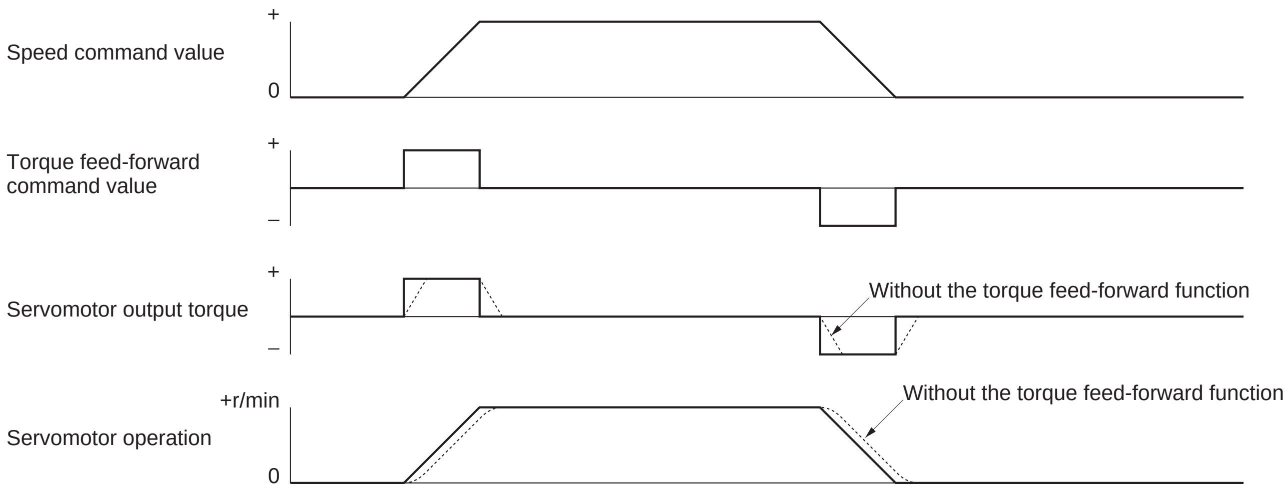


Block Diagram: Torque Feed-forward Function Used

■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn002.0	Torque command input switching	Set Pn002.0 to 2 (Option command value used as torque feed-forward command value)	*4-3-3 Parameter Details*

■ Operation



Note If torque feed-forward is input when the Servomotor's rotation speed is fixed, the rotation speed won't match the speed command. Design the Controller's circuit so that torque feed-forward is applied only when the Servomotor is accelerating or decelerating.

■ Applicable Controller Commands

Controller	Commands and instructions
CJ1W-NCF71	According to option command values during speed control.
CS1W-MCH71 CJ1W-MCH71	Not available.

Note For details on commands and instructions, refer to the manual for the specific Unit.

4-7-4 Automatic Gain Switching (Position)

■ Functions

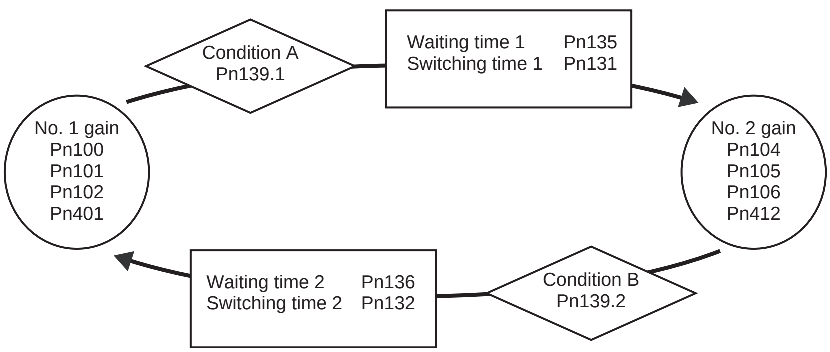
- This function switches the speed loop and position loop gain.
- When Pn139.0 (Gain switching selection switch) is set to 1, and the conditions set in Pn139.1 (Gain switching condition A) and Pn139.2 (Gain switching condition B) are satisfied, the No. 1 gain and the No. 2 gain are switched alternately. Switching from the No. 1 gain to the No. 2 gain occurs when gain switching condition A is satisfied, and switching from the No. 2 gain to the No. 1 gain occurs when gain switching condition B is satisfied.

● Gain Switching Combinations

Switched gain	Speed loop gain		Speed loop integral time constant		Position loop gain		Torque command filter	
No. 1 gain	Pn100	Speed loop gain	Pn101	Speed loop integration constant	Pn102	Position loop gain	Pn401	1st step 1st torque command filter time constant
No. 2 gain	Pn104	Speed loop gain 2	Pn105	Speed loop integration constant 2	Pn106	Position loop gain 2	Pn412	1st step 2nd torque command filter time constant

● Automatic Gain Switching Pattern

• Automatic Switching Pattern 1 (Pn139.0: 1)



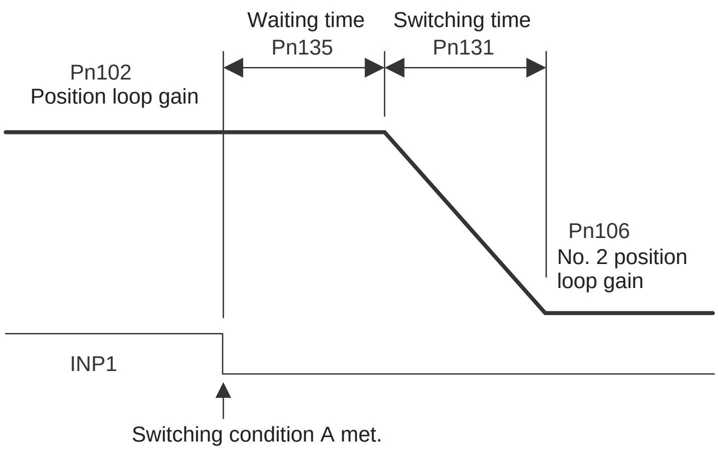
• Even when the switching conditions are met, switching is not executed during the gain switching waiting time. This is effective for when switching conditions are not stable, or when detailed timing is set. The switching time is set to reduce shock during gain switching, and the gain is directly switched during this time. The gain switching waiting time and switching time can be set for No. 1 to No. 2 and No. 2 to No. 1 gain as shown in the following table.

● Automatic Gain Switching

Parameter setting	Switching condition	Switching gain	Gain switching waiting time	Gain switching time
Pn139.0: 1 (Automatic switching pattern 1)	Condition A met. Pn139.1	No. 1 to No. 2 gain	Waiting time 1 Pn135	Switching time 1 Pn131
	Condition B met. Pn139.2	No. 2 to No. 1 gain	Waiting time 2 Pn136	Switching time 2 Pn132

● Gain Switching Waiting Time and Gain Switching Time

• The following diagram shows the relationship between the gain switching waiting time and the gain switching time constant. In this example, automatic gain switching pattern 1 takes the turning ON of positioning completed signal 1 (INP1) as the condition, and operation is switched from the position loop gain (Pn102) to the No. 2 position loop gain (Pn106). The switching condition is satisfied when the INP1 signal turns ON, and then, from that point, operation pauses for the delay time set in Pn135. Then the gain is directly changed from Pn102 to Pn106 during the switching time set in Pn131.



- Automatic gain switching is also possible with less-deviation control, in addition to the standard PI and I-P control. The following table shows the gain combinations for less-deviation control. The method for setting the switching conditions, and the settings for the gain switching waiting time and gain switching time are the same as for PI and I-P control. For details on adjusting less-deviation control, refer to *4-7-9 Less-deviation Control (Position)*.

● Automatic Gain Switching Combinations for Less-deviation Control

Switching gain	Servo rigidity	Speed feedback filter time constant	Integral compensation processing Pn1A7.0			
			0	1	2	3
No. 1 gain	Servo rigidity Pn1A0	Speed feedback filter time constant Pn1A2	Disabled	Enabled	Enabled	Disabled
No. 2 gain	Servo rigidity 2 Pn1A1	Speed feedback filter time constant 2 Pn1A3	Disabled	Enabled	Disabled	Enabled

- Observe the following points when using the gain switching function.
  The control method corresponds to less-deviation control as well as to IP and I-P control.
  If automatic switching is interrupted in progress by an event such as Servo OFF or an alarm, the No. 1 gain is set.

■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn139.0	Automatic gain changeover related switches 1 -- Gain switching selection switch	Set Pn139.0 to 1 (Automatic switching pattern 1) in order to use the automatic gain switching function.	*4-3-3 Parameter Details*
Pn139.1	Automatic gain changeover related switches 1 -- Gain switching condition A	Set the condition for switching from No. 1 gain to No. 2.	*4-3-3 Parameter Details*
Pn131	Gain switching time 1	Set the switching time for switching from No. 1 gain to No. 2. Setting range: 0 to 65,535 (ms)	*4-3-3 Parameter Details*
Pn135	Gain switching waiting time 1	Set the time for starting to switch from No. 1 gain to No. 2 after gain switching condition A has been satisfied. Setting range: 0 to 65,535 (ms)	*4-3-3 Parameter Details*
Pn139.2	Automatic gain changeover related switches 1 -- Gain switching condition B	Set the switching time for switching from No. 2 gain to No. 1.	*4-3-3 Parameter Details*
Pn132	Gain switching time 2	Set the switching time for switching from No. 2 gain to No. 1. Setting range: 0 to 65,535 (ms)	*4-3-3 Parameter Details*
Pn136	Gain switching waiting time 2	Set the time for starting to switch from No. 2 gain to No. 1 after gain switching condition B has been satisfied. Setting range: 0 to 65,535 (ms)	*4-3-3 Parameter Details*
Pn104	No. 2 speed loop gain	Set the speed loop gain for the No. 2 gain. Setting range: 10 to 20,000 ($\times$ 0.1 Hz)	*4-3-3 Parameter Details*
Pn105	No.2 speed loop integration constant	Set the speed loop integral time constant for the No. 2 gain. Setting range: 15 to 51,200 ($\times$ 0.01 ms)	*4-3-3 Parameter Details*
Pn106	No. 2 position loop gain.	Set the position loop gain for the No. 2 gain. Setting range: 10 to 20,000 ($\times$ 0.01/s)	*4-3-3 Parameter Details*

4-7-5 Speed Feedback Compensation (Position, Speed)

■ Functions

- This function shortens positioning time.
- This function works to lower the speed loop feedback gain, and raise the speed loop gain and position loop gain. Consequently, response to commands is improved, and positioning time can be shortened. Noise sensitivity is lowered, however, so positioning time cannot be shortened where there is external force applied, such as with the vertical axis.
- Using speed feedback compensation is effective in suppressing vibration and raising the speed loop gain. If the speed loop gain can be raised, the position loop gain can be raised as well, so this can effectively reduce the settling time for positioning.

■ Parameters Requiring Settings

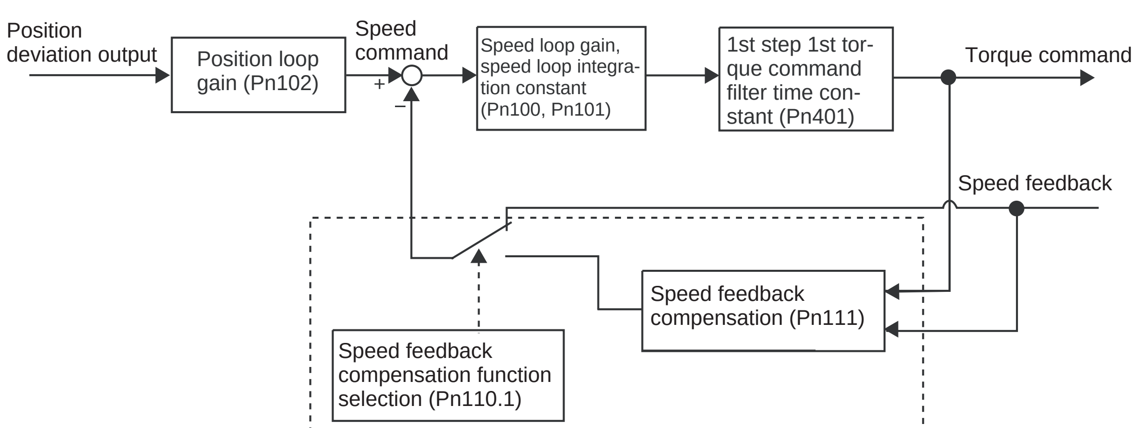
Parameter No.	Parameter name	Explanation	Reference
Pn110.1	Normal autotuning switches -- Speed feedback compensation function selection	To use the speed feedback compensation function, set Pn110.1 to 0 (speed feedback compensation function ON).	*4-3-3 Parameter Details*
Pn111	Speed feedback compensating gain	Adjusts the speed loop feedback gain. Setting range: 1 to 500 (%)	*4-3-3 Parameter Details*

- Reduce the setting value for Pn111 (speed feedback compensating gain) to increase the speed loop gain and position loop gain. If the value is too small, the response may vibrate.
- For this function to be used, it is a prerequisite that the inertia ratio (Pn103) value be correctly set. Make sure that the inertia ratio is set correctly.

■ Setting Procedure

- To perform adjustment, monitor position deviation and torque commands. Either monitor the analog monitor output or use Computer Monitor Software.
- Follow *4-6-4 Manual Tuning* to adjust Pn100 (speed loop gain), Pn101 (speed loop integration constant), Pn102 (position loop gain), and Pn401 (1st step 1st torque command filter time constant) to quickly set the position deviation to zero without the torque command vibrating.
- After completing tuning, lower Pn111 to 10, and adjust Pn100, Pn101, Pn102, and Pn401 in the same way.
- Repeat this adjustment procedure and perform optional adjustment.

■ Adjustment Example



Speed feedback compensation function

This section describes the adjustment method for when speed loop gain cannot be raised due to vibration in the mechanical system. If speed loop feedback compensation is added, be sure to monitor position deviation and torque commands with the analog monitor while adjusting the Servo gain. (Refer to *4-9 Using Monitor Output*.)

1. Set user constant Pn110 to 0002.
    - Speed feedback compensation will be used.

2. Gradually raise the speed loop gain (Pn100) with PI control, while lowering the speed loop integration constant (Pn101). At this time, equalize the set values for the speed loop gain (Pn100) and the position loop gain (Pn102). The relationship between the speed loop gain and the integral time constant is shown in the equation below. Take the value derived from this equation as the criterion for the integration constant (Pn101) set value.

   Speed loop integration constant (Pn101) = 4000/2π $\times$ Pn100 set value

   Speed loop gain setting unit: [$\times$ 0.1 Hz]
   When setting the speed loop integration constant (Pn101), confirm the unit. The setting unit for Pn101 is [$\times$ 0.01ms]. This differs from the setting units for speed loop gain [$\times$ 0.1 Hz] and position loop gain [$\times$ 0.1/s], but the numbers set are the same.
3. Repeat step 2 and raise the gain while monitoring the settling time conditions with an analog monitor position deviation and the vibration conditions with a torque command. If oscillation can be heard or if vibration increases too much, gradually increase the 1st step 1st torque command filter time constant (Pn401).
4. Raise only the position loop gain little by little. When the gain has been raised to approximately the limit, go to the next step. Lower the speed feedback compensation gain (Pn111) from 100% to 90%. Then repeat steps 2 and 3 above.
5. Further lower the speed feedback compensation gain from 90%, and repeat steps 2 to 4 to shorten the settling time. If the speed feedback compensation value is lowered too much, however, the response waveform will oscillate.
6. Seek the lowest settling time, in a range where torque command waveforms and position deviation monitored by the analog monitor do not become unstable through oscillation.
7. The Servo gain adjustment is complete at the point where the positioning time cannot be shortened any further.

Note When the speed feedback compensation function is used, the speed loop gain and position loop gain can normally be raised. However, if the compensation value is greatly changed with the speed loop gain and position loop gain raised, or if the speed feedback compensation function is disabled (i.e., Pn110.1 set to 1), the machinery may strongly vibrate and cause damage to the machinery.

4-7-6 Speed Feedback Filter (Position, Speed)

■ Functions

- This function sets the primary filter for the speed feedback gain.
- Use the filter function when you cannot raise the speed loop feedback due to mechanical system vibration, etc.

■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn308	Speed feedback filter time constant	Set the filter time constant for the speed feedback. (Setting range: 0 to 65535 ($\times$ 0.01 ms).)	*4-3-3 Parameter Details*

• Set the primary delay filter for the speed loop speed feedback. The feedback speed will be evened out and vibration will be reduced. If a large value is entered, it will contribute to delay and response will be reduced.

■ Setting Procedure

• Measure the machinery vibration cycle, and set Pn508 (speed feedback filter time constant) to that value.

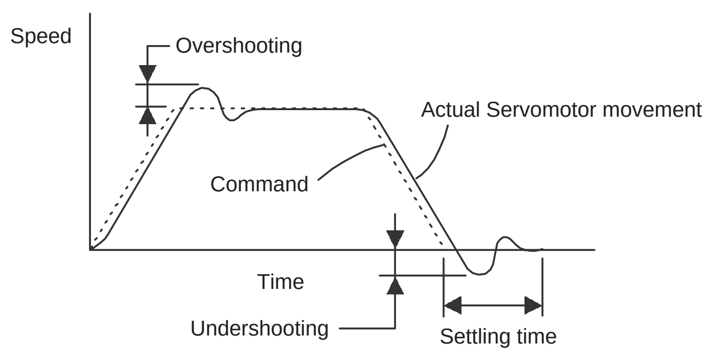
4-7-7 P Control Switching (Position, Speed)

■ Functions

• For speed control, to suppress overshooting during acceleration and deceleration.

• For position control, to suppress undershooting during positioning operations and shorten the settling time.

■ Operation Examples



• The P control switching function automatically switches the control mode from PI control to P control, with the status amount in the Servo Driver above or below the detection point set by the user constant.

Note 1. The P control switching function is used when it is necessary to push Servo Driver performance to it's limits in order to obtain especially high-speed positioning. To perform adjustments, it is necessary to monitor the speed response waveform.

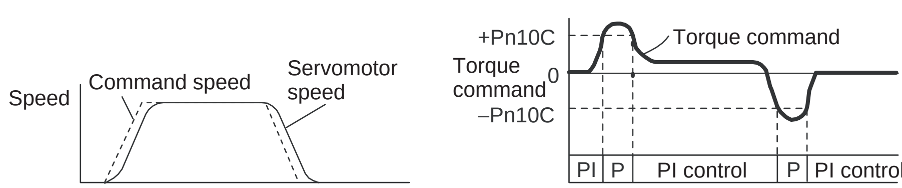
Note 2. In normal operation, sufficient control can be executed by means of the speed loop gain and position loop gain set by auto-tuning operations. Also, even when overshooting or undershooting occurs, it can be suppressed by setting the acceleration/deceleration time constant for the host device and the soft start time (Pn305, Pn306) and the position command acceleration/deceleration time constant (Pn216) for the Servo Driver.

■ Parameters Requiring Settings

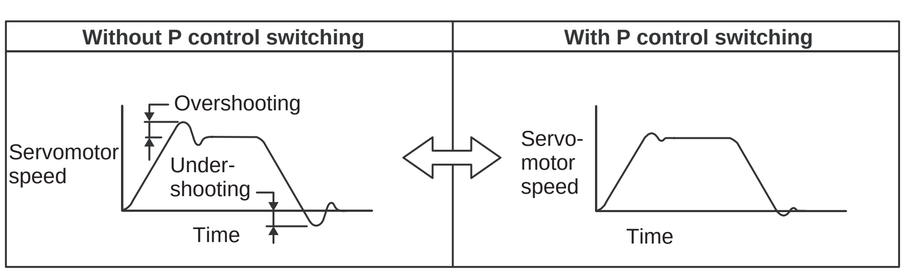
Parameter No.	Parameter name	Explanation	Reference
Pn10B.0	Speed control setting -- P control switching condition	Sets the condition for switching the speed loop from PI control to P control. Use Pn10C to Pn10F to make the switching level settings.	*4-3-3 Parameter Details*
Pn10C	P control switching (torque command)	Set when Pn10B.0 = 0 (switch using internal torque command value). Set the conditions for switching to P control using the ratio (%) of the Servomotor rated torque. (Setting range: 0 to 800%)	*4-3-3 Parameter Details*
Pn10D	P control switching (speed command)	Set when Pn10B.0 = 1 (switch using speed command value). Set the speed (r/min.) to switch to P control. (Setting range: 0 to 10,000 r/min)	*4-3-3 Parameter Details*
Pn10E	P control switching (acceleration command)	Set when Pn10B.0 = 2 (switch using acceleration command value). Set the acceleration (r/min./s) to switch to P control. (Setting range: 0 to 30,000 r/min/s)	*4-3-3 Parameter Details*
Pn10F	P control switching (deviation pulse)	Set when Pn10B.0 = 3 (switch using deviation pulse value). Set the deviation pulse value (command unit) to switch to P control. (Setting range: 0 to 10,000 command units)	*4-3-3 Parameter Details*

● P Control Switching Condition Taken as Internal Torque Command (Pn10B.0 = 0)

- When the torque command is equal to or greater than the torque set in the user constant (Pn10C), the speed loop is switched to P control. For the Servo Driver this mode is set at the factory as the standard setting. The torque command level is set to 200%.

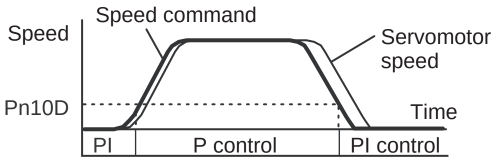


- Operation Example
  When P control switching is not used, and PI control is always used, the torque during acceleration and deceleration may be saturated and the Servomotor speed may overshoot or undershoot. Using P control switching suppresses torque saturation and eliminates Servomotor speed overshooting and undershooting.

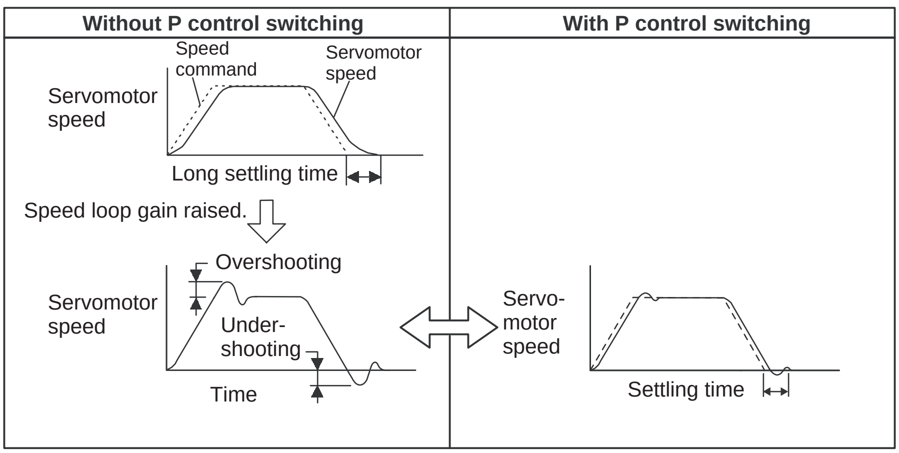


● P Control Switching Condition Taken as Speed Command (Pn10B.0 = 1)

• When the speed command is equal to or greater than the speed set in the user constant (Pn10D), the speed loop is switched to P control.

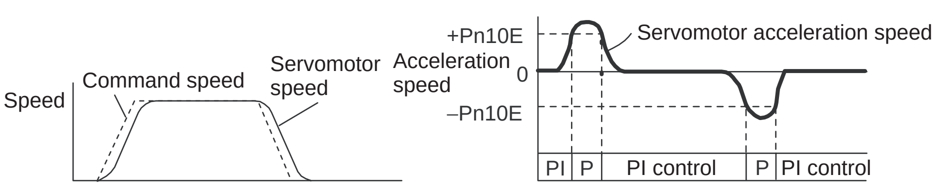


• Operation Example
Used to shorten the settling time. In general, the speed loop gain must be raised in order to shorten the settling time, but in this case overshooting and undershooting are suppressed.

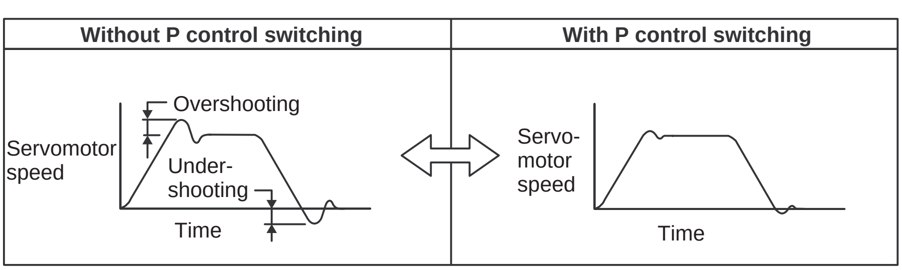


● P Control Switching Condition Taken as Acceleration Speed (Pn10B.0 = 2)

• When the Servomotor acceleration speed is equal to or greater than the acceleration speed set in the user constant (Pn10E), the speed loop is switched to P control.

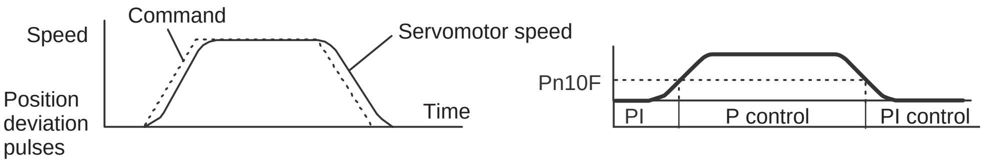


• Operation Example
When P control switching is not used, and PI control is always used, the torque during acceleration and deceleration may be saturated and the Servomotor speed may overshoot or undershoot. Using P control switching suppresses torque saturation and eliminates Servomotor speed overshooting and undershooting.

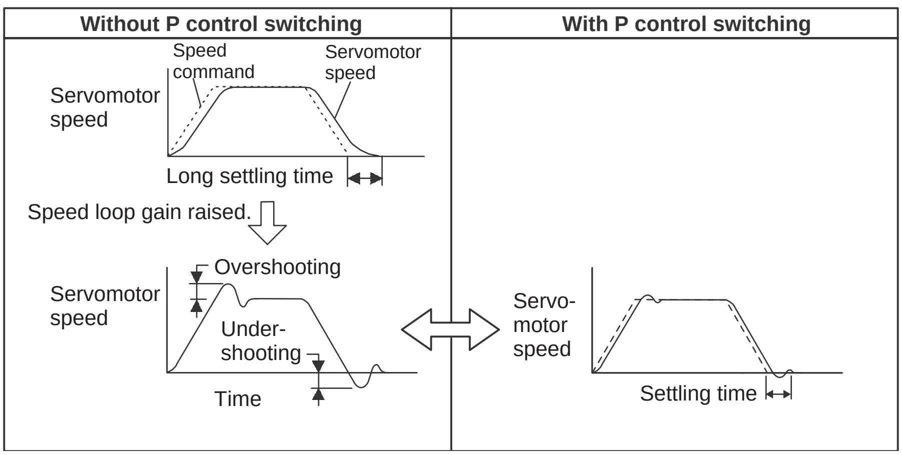


● P Control Switching Condition Taken as Position Deviation Pulses (Pn10B.0 = 3)

• When the Servomotor position deviation pulses are equal to or greater than the number of pulses set in the user constant (Pn10F), the speed loop is switched to P control.



• Operation Example
Used to shorten the settling time. In general, the speed loop gain must be raised in order to shorten the settling time, but in this case overshooting and undershooting are suppressed.



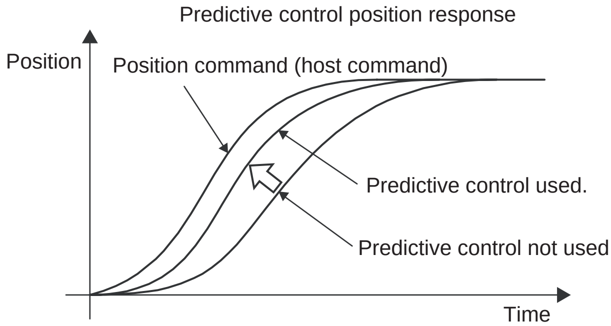
4-7-8 Predictive Control (Position)

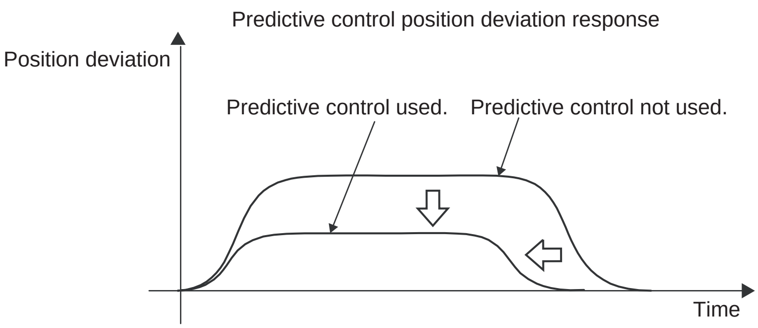
Predictive control is a method for minimizing future deviation by using machine characteristics and target values in position control mode to predict deviation.

The R88D-WN☐☐☐-ML2 Servo Driver provides two types of predictive control: predictive control for positioning, which aims at shortening the settling time, and predictive control for tracking, which aims at reducing tracking deviation.

With predictive control for positioning, future position commands are predicted in order to execute high-speed positioning. With predictive control for tracking, on the other hand, the tracking of position commands that are input is retained.

The adjustment method is to simply enable predictive control, and then the recommended value is calculated and set according to the position loop gain (Kp) set at that time. If required, the adjustment can be further refined by means of user constants for minute adjustment.





■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn150.0	Predictive control selection switches -- Predictive control selection	In order to use the predictive control function, set 1 (Predictive control used) for Pn150.0.	*4-3-3 Parameter Details*
Pn150.1	Predictive control switches -- Predictive control type	Set the predictive control type.	*4-3-3 Parameter Details*
Pn151	Predictive control acceleration/deceleration gain	Set the acceleration/deceleration gain for predictive control. Setting range: 0 to 300 (%)	*4-3-3 Parameter Details*
Pn152	Predictive control weighting ratio	Set the position deviation ratio for predictive control. Setting range: 0 to 300 (%)	*4-3-3 Parameter Details*

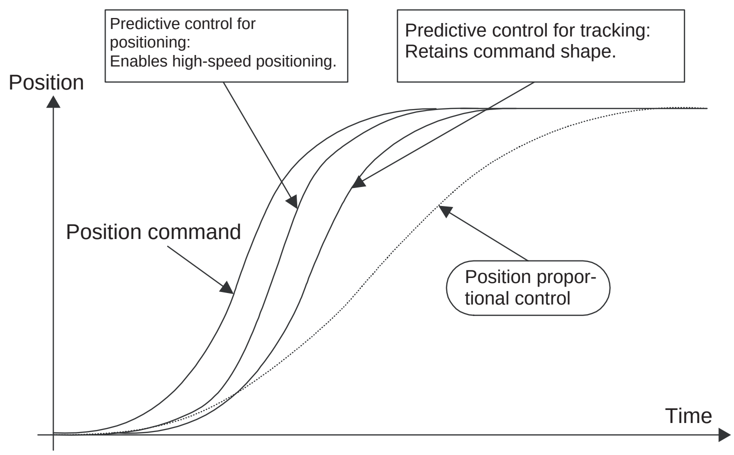
■ Predictive Control Type (Pn150.1)

• Predictive control for tracking (Pn150.1 = 0)

This function operates by retaining the tracking for position commands that are input. Use it when there is a need to retain the shape of position command tracking. The beginning of operation is delayed by several ms, however, from when the command is executed, so the positioning settling time is longer than the positioning predictive control.

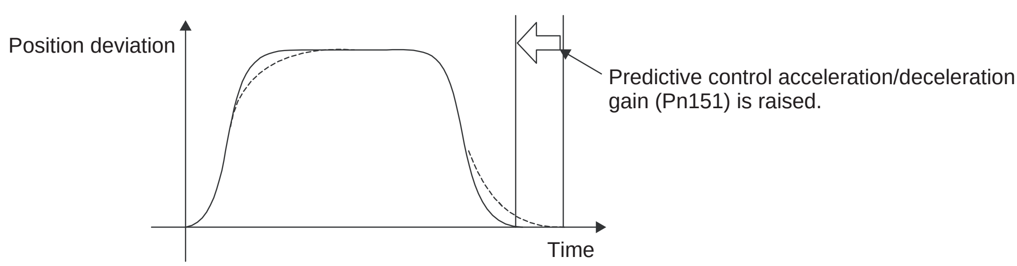
• Predictive control for positioning (Pn150.1 = 1)

This function operates by anticipating future position commands. It starts operation simultaneously with a command and is effective in shortening positioning time.
The tracking is different from the command tracking shape. With machinery that is prone to vibration, the vibration may increase when stopping. In that case, even with a positioning application, use predictive control for tracking.



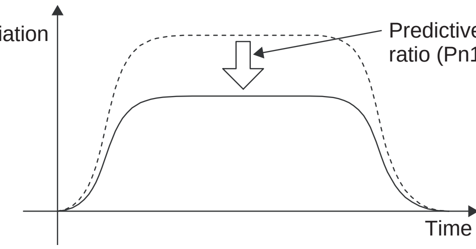
■ Predictive Control Acceleration/Deceleration Gain (Pn151)

As this value is increased, the settling time is shortened without significantly changing the maximum position deviation. If the value is set too high, overshooting will occur. The following diagram shows an example of position deviation during operation by a trapezoidal speed command. Raising the predictive control acceleration/deceleration gain changes the position deviation from the dotted line to the solid line and shortens the settling time.



■ Predictive Control Weighting Ratio (Pn152)

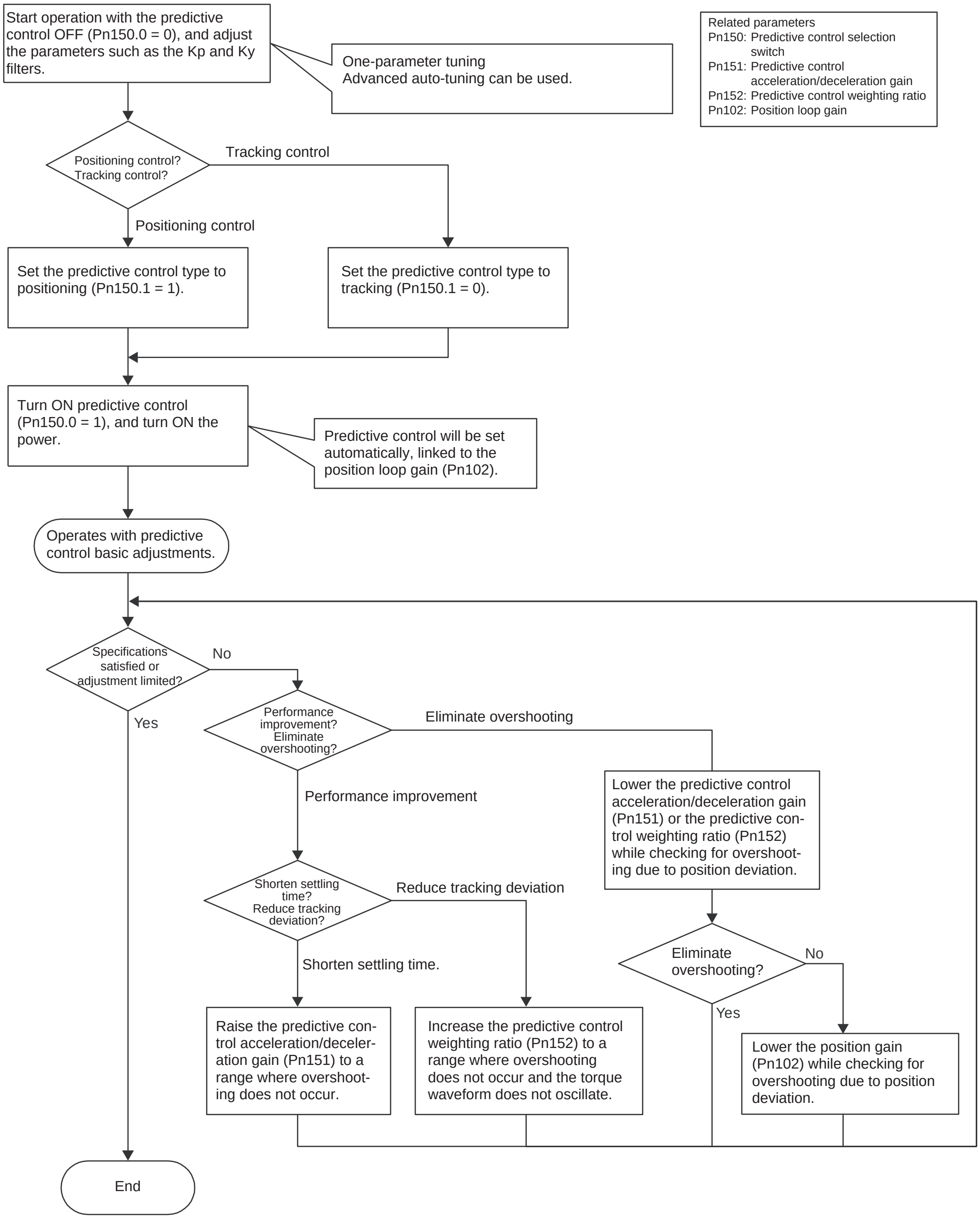
As this value is increased, the tracking deviation is reduced. If the positioning completed range is large, this is also effective in shortening the settling time. If the value is set too high, torque vibration and overshooting may occur. The following diagram shows an example of position deviation during operation by a trapezoidal speed command. Raising the predictive control weighting ratio changes the position deviation from the dotted line to the solid line and lowers the tracking deviation.



■ Procedure for Adjusting Predictive Control

• Use the following procedure for adjusting predictive control.

1. Adjust by normal control.
   Functions such as one-parameter tuning or auto-tuning can be used.
2. Change the predictive control selection switches.
   Change the predictive control selection switches to use predictive control. After changing the switch, the power must be turned OFF and back ON.
3. Adjust the predictive control parameters.
   Adjust the predictive control parameters as required, while checking the response.

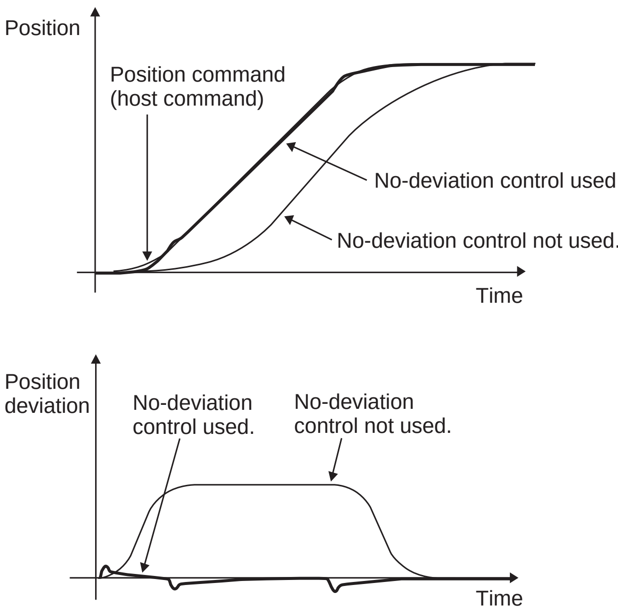


■ Applicable Restriction

- Advanced auto-tuning cannot be used while the predictive control function is in use (Pn150.0 = 1).

4-7-9 Less-deviation Control (Position)

Less-deviation control is a method for shortening the settling time and lowering tracking deviation by reducing as much as possible the deviation during movement in position control mode. Using less-deviation one-parameter tuning makes it easy to perform adjustments. Also, when even higher performance is required, user adjustment constants for less-deviation control can be used to make minute adjustments.



No-deviation control response waveform examples

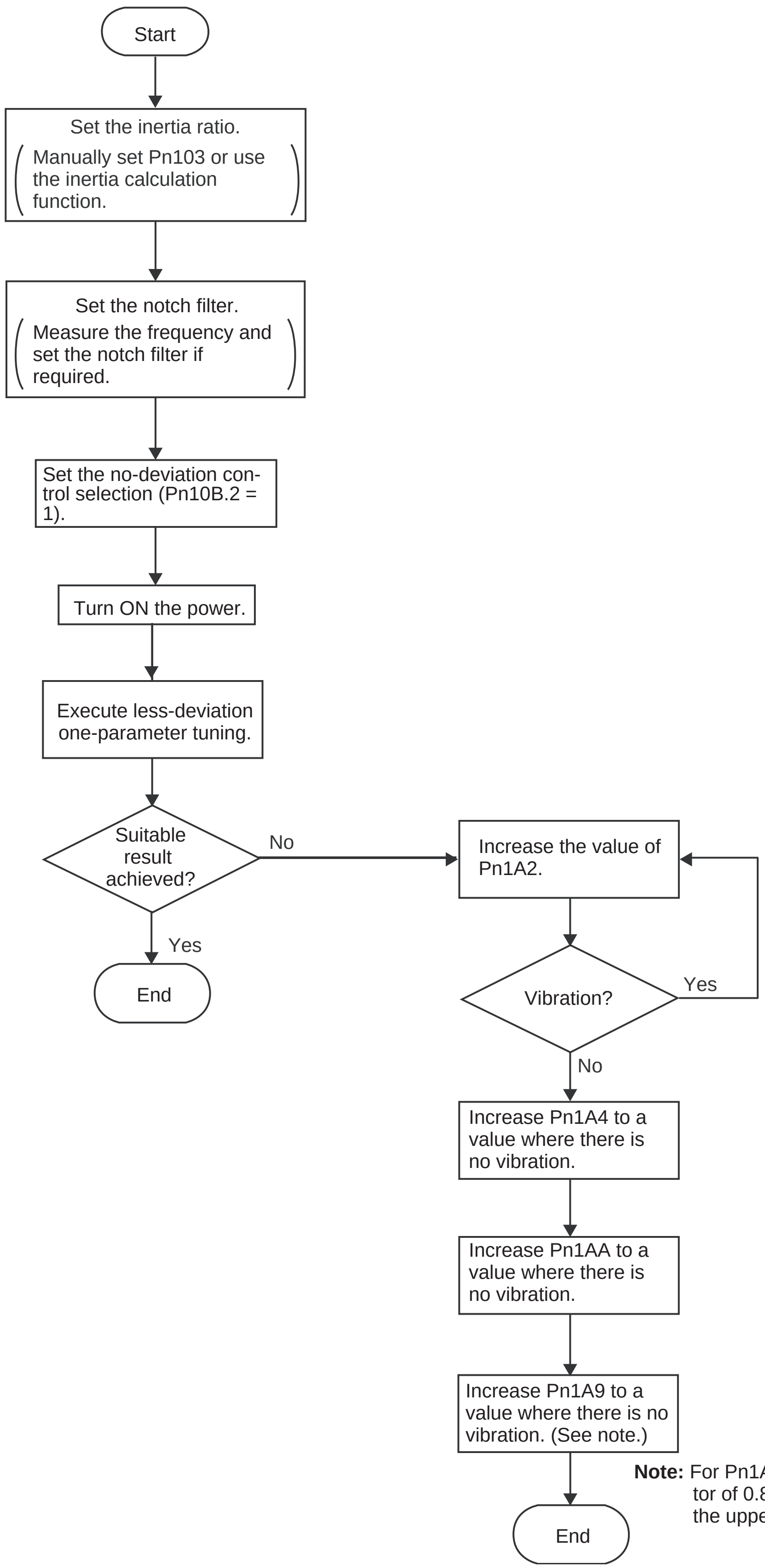
■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn10B.2	Speed control setting -- Position loop control method	To execute less-deviation control, set Pn10B.2 to 1.	*4-3-3 Parameter Details*
Pn1A0	Servo rigidity	Set the Servo rigidity for the No. 1 gain. Setting range: 1 to 500 (%)	*4-3-3 Parameter Details*
Pn1A1	Servo rigidity 2	Set the Servo rigidity for the No. 2 gain. Setting range: 1 to 500 (%)	*4-3-3 Parameter Details*
Pn1A2	Speed feedback filter time constant	Set the speed feedback filter time constant for the No. 1 gain. Setting range: 30 to 3,200 (× 0.01 ms)	*4-3-3 Parameter Details*
Pn1A3	Speed feedback filter time constant 2	Set the speed feedback filter time constant for the No. 2 gain. Setting range: 30 to 3,200 (× 0.01 ms)	*4-3-3 Parameter Details*
Pn1A4	Torque command filter time constant 2	Adjust for less-deviation control (set Pn10B.2 to 1). Setting range: 0 to 2,500 (× 0.01 ms)	*4-3-3 Parameter Details*
Pn1A7.0	Utility control switches -- Integral compensation processing	Set the integral compensation processing for the No. 1 gain and the No. 2 gain during less-deviation gain switching.	*4-3-3 Parameter Details*

Parameter No.	Parameter name	Explanation	Reference
Pn1A9	Utility integral gain	Adjust the auxiliary integral gain. Setting range: 0 to 500 (Hz)	*4-3-3 Parameter Details*
Pn1AA	Position proportional gain	Adjust the position proportional gain. Setting range: 0 to 500 (Hz)	*4-3-3 Parameter Details*
Pn1AB	Speed integral gain	Adjust the speed integral gain. Setting range: 0 to 500 (Hz)	*4-3-3 Parameter Details*
Pn1AC	Speed proportional gain	Adjust the speed proportional gain Setting range: 0 to 2,000 (Hz)	*4-3-3 Parameter Details*

■ Procedure for Adjusting Less-deviation Control

- Execute and adjust less-deviation control according to the following flowchart. The inertia ratio must be set first, and then the notch filter if required. Then select less-deviation control and turn the power OFF and back ON.



Note: For Pn1A9, take a factor of 0.8 of Pn1AA as the upper limit.

■ Less-deviation Gain Switching

- For details on gain switching when using less-deviation control, refer to the information on *Automatic Gain Switching Combinations for Less-deviation Control* in *4-7-4 Automatic Gain Switching (Position)*.

■ Function Limitations when Less-deviation Control is Used

- Auxiliary Functions

  The following auxiliary functions will not operate effectively even if they are selected.

  Advanced auto-tuning

  One-parameter tuning

- Control Methods used for Normal Position Control

  The following control methods will not operate.

  Feed forward

  P control switching function

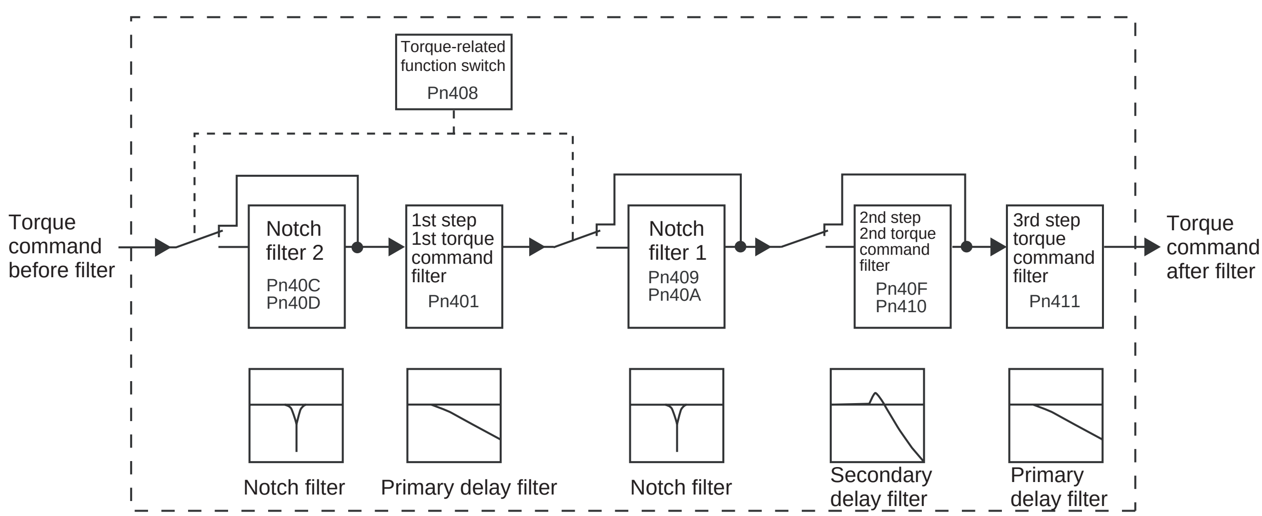
  Speed feedback compensation

  Predictive control

  Average movement filter

4-7-10 Torque Command Filter (All Operating Modes)

As shown in the following diagram, three torque command filters and two notch filters are wired in series in the torque command filter, and they are used independently. The notch filters can be enabled or disables by parameter settings.



■ Torque Command Filter

● Functions

If vibration thought to be caused by the Servo Driver occurs in the machinery, adjusting the torque command filter time constant may cause the vibration to subside. The lower the value is set, the better the response of the control that can be achieved. There are limits, however, depending on the conditions of the machinery.

● Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn401	1st step 1st torque command filter time constant	Set the step 1 torque time constant for the torque command. Setting range: 0 to 65,535 (× 0.01 ms)	*4-3-3 Parameter Details*
Pn40F	2nd step 2nd torque command filter frequency	When using the 2nd step 2nd torque command filter frequency, set a number other than 2,000 Hz. Setting range: 100 to 2,000 (Hz)	*4-3-3 Parameter Details*
Pn410	2nd step 2nd torque command filter Q value	Set the 2nd step 2nd torque command filter Q value. Setting range: 50 to 1,000 (× 0.01)	*4-3-3 Parameter Details*
Pn411	3rd step torque command filter time constant	Set the 3rd step torque command filter time constant. Setting range: 0 to 65,535 (μs)	*4-3-3 Parameter Details*

Note The unit for the 3rd step torque command filter time constant is different from the units for the step 1 and step 2. The 2nd step 2nd torque command filter will be disabled if Pn40F (2nd step 2nd torque command filter frequency) is set to 2,000 Hz.

■ Notch Filter

● Functions

- A notch filter can be set for internal torque commands (commands to the current loop). A notch filter is a function for lowering the response of the frequency that is set. The degree to which the response is to be lowered is set by the Q value.
- If mechanical resonance is occurring, a notch filter can be used to prevent it. This makes it possible to shorten positioning time by raising the speed loop gain.
- With W-series AC Servo Drivers, two notch filters (notch filters 1 and 2) can be set.

Note This is a filter setting for the purpose of preventing machine resonance that cannot be eliminated by simply adjusting the gain. If it not set carefully, it may have the unintended effect of making machine operation unstable. Adjust the setting while monitoring machine operation by means such as the torque command monitor. Also, provide an emergency stop switch that can be pressed to immediately stop the machinery.

● Parameters Requiring Settings

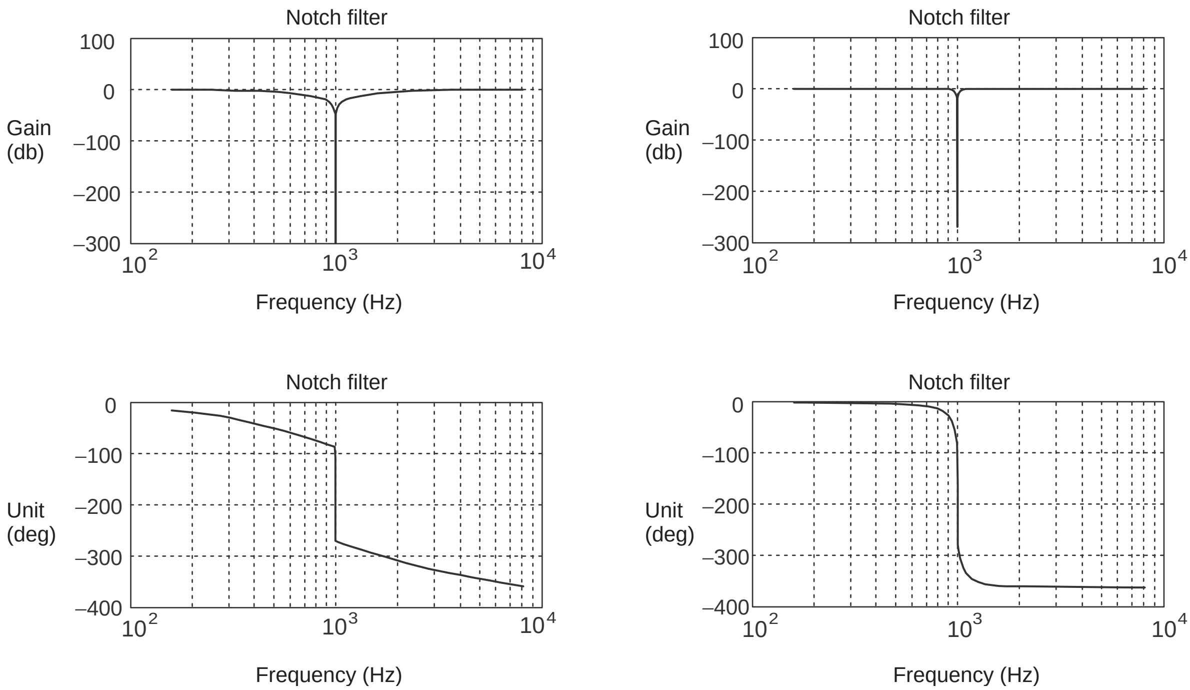
Parameter No.	Parameter name	Explanation	Reference
Pn408.0	Torque command setting -- Selects notch filter 1 function	When using notch filter 1, set Pn408.0 to 1 (Notch filter 1 used).	*4-3-3 Parameter Details*
Pn409	Notch filter 1 frequency	Set the machine resonance frequency. Setting range: 50 to 2,000 (Hz)	*4-3-3 Parameter Details*
Pn40A	Notch filter 1 Q value	Set the Q value for notch filter 1. Setting range: 50 to 1,000 (× 0.01)	*4-3-3 Parameter Details*
Pn408.2	Torque command setting -- Selects notch filter 2 function	When using notch filter 2, set Pn408.2 to 1 (Notch filter 2 used).	*4-3-3 Parameter Details*
Pn40C	Notch filter 2 frequency	Set the machine resonance frequency. Setting range: 50 to 2,000 (Hz)	*4-3-3 Parameter Details*
Pn40D	Notch filter 2 Q value	Set the Q value for notch filter 2. Setting range: 50 to 1,000 (× 0.01)	*4-3-3 Parameter Details*

Note 1. The Q value determines the notch filter characteristics. The smaller the Q value is set, the larger the frequencies that lower response, so current loop response for frequencies other than for resonance frequencies is lowered. If the Q value is increased, the frequencies that lowers response can be reduced to the resonance frequencies. If the resonance frequencies vary due to influences such as the load or temperature, the effectiveness of the notch filter is decreased. Therefore determine the optimum setting while making adjustments.

Note 2. Be very careful when setting the notch frequency (Pn409 or Pn40C). Do not set the notch frequency near the speed loop response frequency. Set the frequency at least four times greater than speed loop response frequency, or it may cause damage to the machinery.

Note 3. Make sure that the Servomotor is stopped while the notch filter frequency (Pn409, Pn40C) is being changed. The Servomotor will vibrate if the frequency is changed during operation.

Q value = 0.7 Q value = 1.0



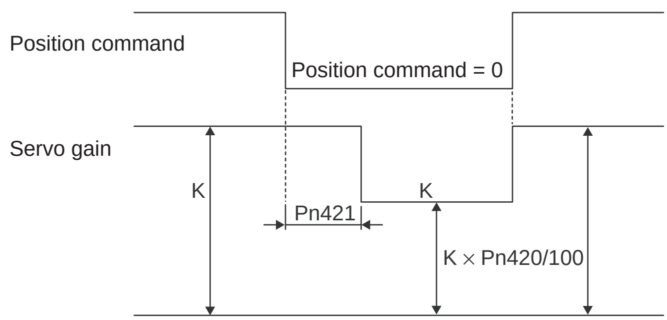
● Setting Procedure

- Raise the value of Pn100 (speed loop gain) and measure the torque vibration frequency with the machinery barely vibrating. Either monitor the analog monitor output (torque command monitor) or use Computer Monitor Software.
- Set the measured frequency in Pn409 (or Pn40C).
- Minutely adjust Pn409 (or Pn40C) in order to minimize output vibration.
- Gradually increase the Q value (Pn40A or Pn40C) in a range where vibration does become too great.
- Again adjust Pn100 (Speed loop gain), Pn101 (Speed loop integration constant), Pn102 (Position loop gain), and Pn401 (1st step 1st torque command filter time constant according to the procedure described in *4-6-4 Manual Tuning*.

4-7-11 Vibration Suppression when Stopping (Position)

■ Functions

When the Servo gain is increased, there may be vibration (such as the limit cycle) while stopped, even though there is no vibration while moving. It was previously necessary to lower the response to a gain where vibration while stopped subsided, sacrificing response during movement. To suppress the vibration while movement is stopped, this function lowers the internal Servo gain only while movement is stopped. Use this function by adjusting the parameters given below. After the vibration suppression starting time (Pn421) has elapsed from the point where the position command is 0, the internal Servo gain will change to the percentage set for the damping for vibration suppression on stopping (Pn420).



■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn420	Damping for vibration suppression on stopping	Sets the gain reduction rate for when the Servomotor is stopped. Setting range: 10 to 100%	*4-3-3 Parameter Details*
Pn421	Vibration suppression starting time	Set the time for Pn420 to be enabled after the motor stops. Setting range: 0 to 65,535 (ms)	*4-3-3 Parameter Details*

Note Use when the damping for vibration suppression on stopping (Pn420) is 50% or higher, and the vibration suppression starting time (Pn421) is 10 ms or longer. If a low value is set, the response characteristics may be lowered and vibration may occur.

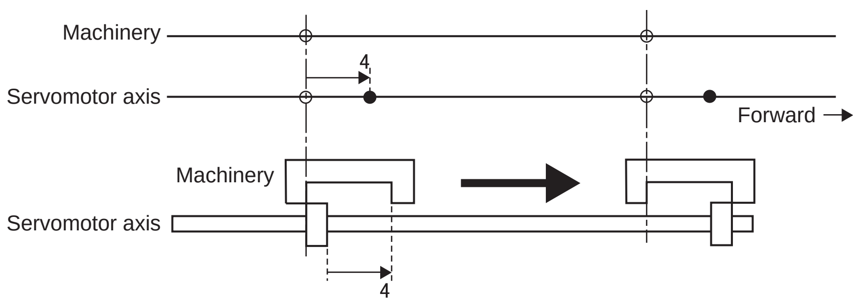
4-7-12 Backlash Compensation (Position)

■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn207.2	Position control settings 2 -- Backlash compensation selection	To execute backlash compensation in the forward command direction, set Pn207.2 to 1 (Forward compensation). To execute backlash compensation in the reverse command direction, set Pn207.2 to 2 (Reverse compensation).	*4-3-3 Parameter Details*
Pn214	Backlash compensation amount	Set the compensation amount in command units. Setting range: –32,767 to 32,767 (command units)	*4-3-3 Parameter Details*
Pn215	Backlash compensation time constant	Set the time constant for backlash compensation. Setting range: 0 to 65,535 (× 0.01 ms)	*4-3-3 Parameter Details*

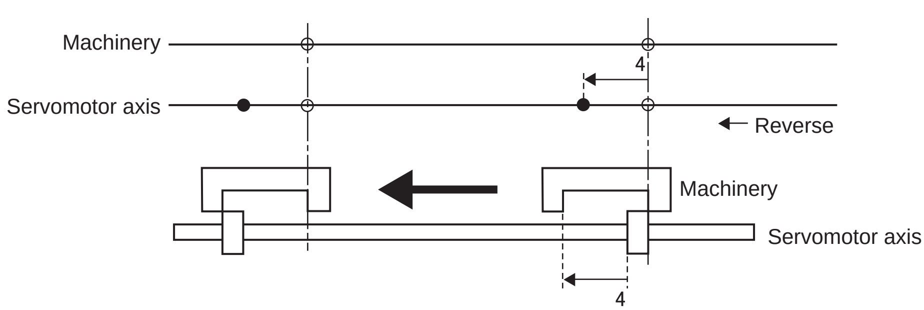
■ When Pn207.2 = 1

• Executes in the forward direction the amount of backlash compensation set in Pn214.



■ When Pn207.2=2

• Executes in the reverse direction the amount of backlash compensation set in Pn214.



4-7-13 Position Integration (Position)

■ Parameters Requiring Settings

Parameter No.	Parameter name	Explanation	Reference
Pn11F	Position integral time constant	Set the integral time constant for the position loop. Setting range: 0 to 50,000 (× 0.1 ms)	*4-3-3 Parameter Details*

Note Effective for synchronous operations such as electronic cam and electronic shift.

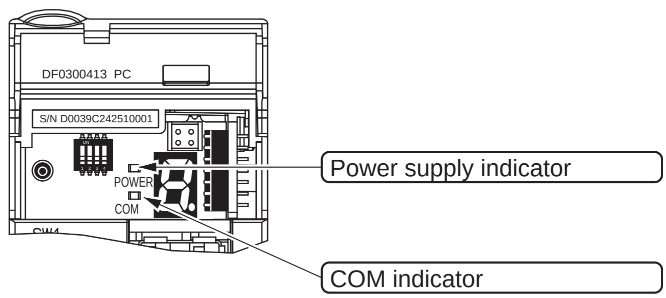
4-8 Using Displays

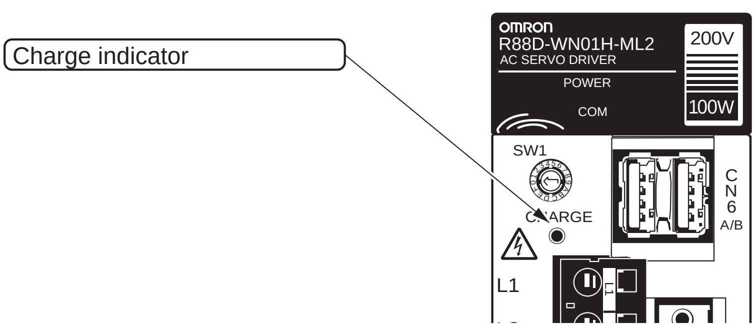
OMNUC C-series AC Servomotors have unique Servo software that enables quantitative monitoring in real time, on digital displays, of changes in a variety of characteristics. Use these displays for checking the various characteristics during operation.

4-8-1 Power, Charge, and COM Indicators

• There are three indicators on the Servo Driver itself: Power, charge, and COM.

With front cover open





■ Indicators

Symbol	Name	Color	Function
POWER	Power supply indicator	Green	Lit when control power supply is normal.
CHARGE	Charge indicator	Red	Lit when main-circuit power supply is charging. With Servo Drivers of 1 kW or less, lights dimly when the control power supply is ON.
COM	COM indicator	Green	Lights while MECHATROLINK-II communications are in progress.

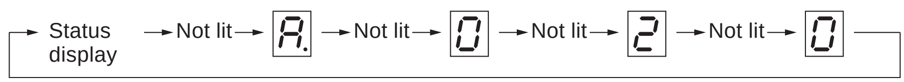
Note The indicator stays lit while the main circuit capacitor remains charged even after the power is turned OFF. Do not touch the Servo Driver terminal.

4-8-2 Status Display Mode

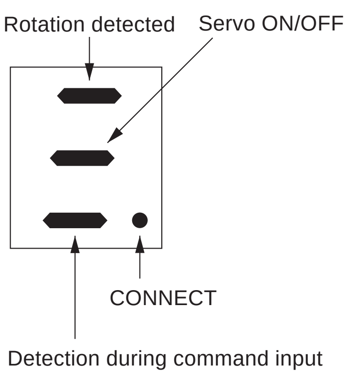
- The Status Display Mode indicates the internal status of the driver using bit display (LED ON/OFF), and symbol display (7-segment LEDs).
- Status Display Mode is the mode in which the Servo Driver starts when the power supply is first turned ON.

Status Display Mode Normal: Bit display

Error: Symbol display (Example: A.020)



■ Bit Data Display Contents



Bit data	Contents
Servomotor rotation detection	Lit during Servomotor rotation.
Servo ON/OFF	Lit when Servo is OFF. Not lit while Servo is ON.
Command input detection	Lit during command input.
CONNECT	Lit when MECHATROLINK-II communications begin.

■ Symbol Display Contents

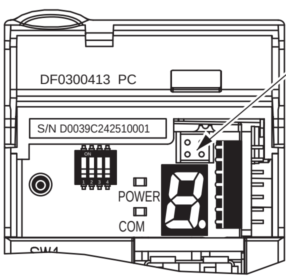
Bit data	Contents
A.□□□	Alarm display (Refer to alarm table.)

4-9 Using Monitor Output

OMNUC W-series AC Servo Drivers output in analog form the Servomotor rotation speed, torque command, position difference, and other proportional voltage amounts from the Analog Monitor Output Connector (CN5). This function can be used in situations such as making fine gain adjustments or when a meter is attached to the control panel. Select the monitor items using parameters Pn006.0 to Pn006.1 and Pn007.0 to Pn007.1. Also, use parameters Pn006.2 and Pn007.2 to change scaling and Pn550 and Pn551 to adjust the offset.

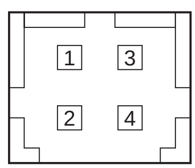
■ Analog Monitor Output Connector (CN5)

• The Analog Monitor Output Connector (CN5) is located inside the top cover of the Servo Driver.



View with upper cover open

CN5 pin distribution (front panel view)



Driver pin header: DF11-4DP-2DS
Cable connector socket: DF11-4DS-2C
Cable connector contact: DF11-2428SCF
(Manufactured by Hirose.)

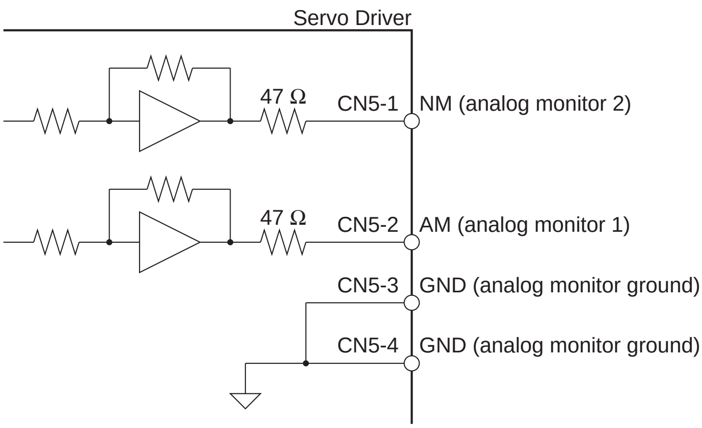
Pin No.	Symbol	Name	Function and interface
1	NM	Analog monitor 2	Default setting: Speed monitor 1 V/1000 r/min. (change using Pn007.0-1)
2	AM	Analog monitor 1	Default setting: Current monitor 1 V/rated torque (change using Pn006.0-1)
3	GND	Analog monitor ground	Ground for analog monitors 1 and 2
4	GND	Analog monitor ground	

Note 1. Displays status with no change to scaling.

Note 2. Maximum output voltage is ±8 V. Exceeding this value may result in an abnormal output. (Clamped at ±8 V.)

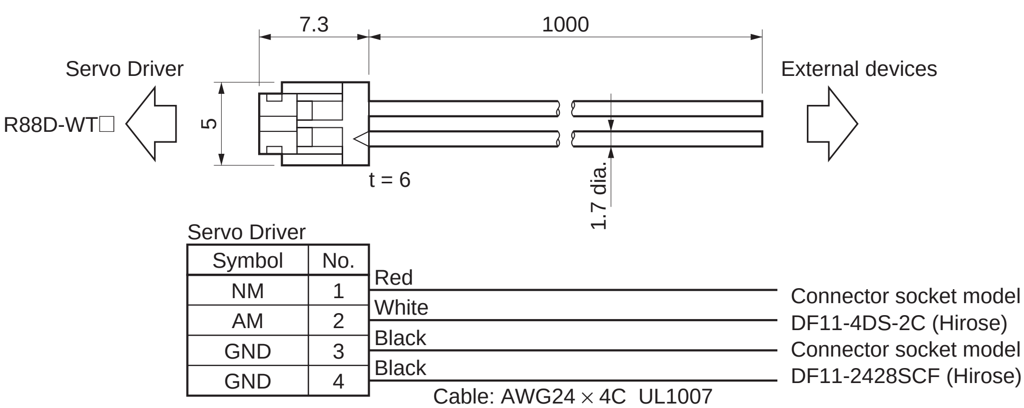
Note 3. Output accuracy is approximately ±15%.

■ Analog Monitor Output Circuit



■ Analog Monitor Cable (R88A-CMW001S)

Use this cable to connect the Servo Driver's Analog Monitor Connector (CN5)



■ Monitored Item Selection

Pn006.0-1	Function selection application switches 6 -- Analog monitor 1 signal selection (All operation modes)						
Setting range	00 to 1F	Unit	---	Default setting	2	Restart power?	No

Pn007.0-1	Function selection application switches 7 -- Analog monitor 2 signal selection (All operation modes)						
Setting range	00 to 1F	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
00	Servomotor rotation speed: 1 V/1000 r/min
01	Speed command: 1 V/1000 r/min
02	Torque command -- Gravity compensation torque (Pn422): 1 V/100% or rated torque
03	Position deviation (See note.): 0.05 V/1 command
04	Position amp deviation (See note.): 0.05 V/ encoder pulse unit
05	Position command speed (Rotation speed calculation): 1 V/1,000 r/min
06	Not used.
07	Not used.
08	Positioning completed: Positioning completed, 5 V; positioning not completed, 0 V
09	Speed feed forward: 1 V/1,000 r/min
0A	Torque feed forward: 1 V/100% of rated torque
0B to 1F	Not used.

• Set values are the same as for Pn006.0-1 and Pn007.0-1.

Note 1. Displays status without offset adjustment and scaling changes.

Note 2. For speed control, the position deviation monitor signal becomes 0.

Pn006.2	Function selection application switches 6 -- Analog monitor 1 signal multiplier selection (All operation modes)						
Setting range	0 to 4	Unit	---	Default setting	0	Restart power?	No

Pn007.2	Function selection application switches 7 -- Analog monitor 2 signal multiplier selection (All operation modes)						
Setting range	0 to 4	Unit	---	Default setting	0	Restart power?	No

Setting Explanation

Setting	Explanation
0	1x
1	10x
2	100x
3	1/10x
4	1/100x

• Set values are the same as for Pn006.2 and Pn007.2.

Pn550	Analog monitor 1 offset voltage (All operation modes)						
Setting range	–10000 to 10000	Unit	× 0.1 V	Default setting	0	Restart power?	No

Pn551	Analog monitor 2 offset voltage (All operation modes)						
Setting range	–10000 to 10000	Unit	× 0.1 V	Default setting	0	Restart power?	No

• When Pn006 = 0102, Pn422 = 100 [%], and Pn550 =3.0 [V]

Analog monitor 1 = Torque command

= {(–1) × (Torque command [%] – 10%) × 10} + 3 [V]

If the torque here is 52%

= {(–1) × (52 [%] – 10%) × 1 [V]/100 [%] × 10} + 3 [V]
= –7.2 [V] (Analog monitor 1 output voltage)

Note The analog monitor output voltage is ±8 V max. If ±8 V is exceeded, the output is fixed at ±8 V.

Chapter 5

Troubleshooting

5-1 Measures when Trouble Occurs

5-1-1 Preventive Checks Before Trouble Occurs

This section explains the preventive checks and analysis tools required to determine the cause of trouble when it occurs.

■ Check the Power Supply Voltage

• Check the voltage to the power supply input terminals.

Main-circuit Power Supply Input Terminals (L1, L2, (L3))

R88D-WN☐H-ML2
(50 to 400 W, 750W): Single-phase 200/230 V AC (170 to 253 V) 50/60 Hz
(500 W to 3 kW): 3-phase 200/230 V AC (170 to 253 V) 50/60 Hz

R88D-WN☐L-ML2 (50 to 400 W): Single-phase 100/115 V AC (85 to 127 V) 50/60 Hz

Control-circuit Power Supply Input Terminals (L1C, L2C)

R88D-WN☐H-ML2: Single-phase 200/230 V AC (170 to 253 V) 50/60 Hz

R88D-WN☐L-ML2: Single-phase 100/115 V AC (85 to 127 V) 50/60 Hz

If the voltage falls outside of this range, there is a risk of malfunction, so make sure that the power supply is correct.

• Make sure that the voltage of the sequence input power supply (+24 VIN Terminal (CN1-6 pin)) is within the range 23 to 25 VDC. If the voltage falls outside of this range, there is a risk of malfunction, so make sure that the power supply is correct.

■ Selecting Analysis Tools

● Check Whether an Alarm Has Occurred

• If an alarm has occurred, check the alarm code (A.☐☐☐), and perform analysis depending on the alarm code.

• If an alarm has not occurred, perform analysis depending on the error.

Note Refer to *5-3 Troubleshooting* in either case.

● Types of Analysis Tools

• The types of analysis tools are as follows:

Servo Driver Indicators and Parameter Unit

• Perform analysis using the display (7-segment LEDs) and the operation keys on the front panel of the Servo Driver. This manual explains analysis using these methods.

Computer Monitor Software

- Install and use the Computer Monitor Software. The following three items are required: A Windows 95/98-compatible computer, Computer Monitor Software, and R88A-CCW002P□ Connecting Cable.
- Refer to the Computer Monitor Software for operation details.

5-1-2 Precautions

When checking and verifying I/O after trouble has occurred, the Servo Driver may suddenly start to operate or suddenly stop, so take precautions. Also, do not attempt operations not specified in this manual.

■ Precautions

- Disconnect any cables before checking if they have burned out. Even if you have checked the conduction of the wiring, there is a risk of conduction due to the return circuit.
- If the encoder signal is lost, the Servomotor may run away, or an error may be generated. Make sure the Servomotor is disconnected from the mechanical system before checking the encoder signal.
- When measuring the encoder output, measure using the ground (CN1-16 pin) as standard. If measuring using an oscilloscope, measure using the differential between CH1 and CH2 to reduce interference from noise.
- When performing tests, first check that there are no personnel inside the machine facilities, and that the facilities will not be damaged even if the Servomotor runs away. Also, check that even if the Servomotor runs away, you can immediately stop the machine using an emergency stop before performing the tests.

■ Checking Alarm Codes at the Controller

- The alarm codes that occur at the Servo Driver with regard to CS1W-MCH71 and CJ1W-MCH71 Motion Control Units and CJ1W-NCF71 Position Control Units are stored in the Controller as shown below.

● Controller Alarm Codes

- Alarm codes such as the following are stored at the Controller for alarms that occur at the Servo Driver.

Controller alarm (error) code: 40□□ (Hex)

The leftmost two digits from the Servo Driver's 3-digit alarm code are entered at the two boxes (□□).

Example: Deviation counter overflow alarm at Servo-ON (A.d01).
The alarm code stored at the Controller is 40D0 (hex).

● **Controller Storage Area**

Controller	Storage variable/bit name	Storage data
Motion Control Unit CS1W-MCH71 CJ1W-MCH71	System variable Error log	Stored as detailed codes for the error log.
Position Control Unit CJ1W-NCF71	Input Area for individual axis operation Axis alarm codes	Stored as error codes for errors occurring for individual axes.

Note For details on the above variable/bit areas, refer to the users manual for the specific Controller.

5-1-3 Replacing the Servomotor and Servo Driver

Perform the following procedure to replace the Servomotor or Servo Driver.

■ Replacing the Servomotor

1. Replace the Servomotor.
2. Perform origin teaching (if using position control).
   - When replacing the Servomotor, the Servomotor's specific origin position (Z-phase) may slip, so be sure to perform origin teaching.
   - Refer to the manual for the position controller you use for how to perform origin teaching.
3. Set up the absolute encoder (ABS).
   - If using a Servomotor with an absolute encoder, when replacing the Servomotor, the absolute data in the absolute encoder will be cleared, so you need to set up the data again. Also, the rotation limit data will be different from before you replaced the Servomotor, so initialize the Motion Control Unit settings.

Note Refer to *4-2-2 Absolute Encoder Setup and Battery Changes* for details.

- Also, if you have changed the setting in Pn205 (absolute encoder multi-turn limit setting), an A.CC (rotation speed mismatch) alarm will occur, so change the rotation limit setting (Fn013) using system check mode.

■ Replacing the Servo Driver

1. Make a note of the parameters.
   - If using Computer Monitor Software, start the program, and transfer and save all the parameters in the Servo Driver to the personal computer.
   - If not using Computer Monitor Software, transfer all of the parameters saved in the host to the Servo Driver.
2. Replace the Servo Driver.
3. Set the parameters.
   - If using Computer Monitor Software, transfer all the parameters stored in the personal computer to the Servo Driver.

- If using Computer Monitor Software, transfer all of the parameters saved in the host to the Servo Driver. Refer to the manuals for the host for operating procedures.

4. Set up the absolute encoder (ABS).
   - If using a Servomotor with an absolute encoder, when replacing the Servomotor, the absolute data in the absolute encoder will be cleared, so you need to reset the data. Also, the multi-turn data will be different from before the Servo Driver was replaced. If the host device is a CS1W-MCH71 or CJ1W-MCH71, make the initial settings for the host device.

Note Refer to *4-2-2 Absolute Encoder Setup and Battery Changes* for details.

5-2 Alarms

If the Servo Driver detects an error, $\overline{\text{ALM}}$ (alarm output) and ALO1 to ALO3 (alarm codes) are output, the power drive circuit in the Servo Driver turns OFF, and the alarm is displayed. If the Servo Driver detects a warning (e.g., overload warning or regenerative overload warning), WARN (warning output) and ALO1 to ALO3 (warning codes) are output, and the warning is displayed. (Operation continues.)

Note 1. Warning outputs and warning codes are output only if the parameters have been set (Pn50F.3, Pn001.1).

Note 2. Refer to *5-3-1 Error Diagnosis Using Alarm Display* for appropriate alarm countermeasures.

Note 3. Cancel the alarm using one of the following methods. (Remove the cause of the alarm first.)

- Turn OFF the power supply, then turn it ON again.
- Input a RESET signal from the host device.

The following alarms can only be cancelled by turning OFF the power supply, then turning it ON again: A.02□, A.04□, A.100, A.810, A.820, A.840, A.850, A.860, A.b□□, A.C8□, A.C9□, A.CA0, A.Cb0, A.CC0, A.E02, A.E07, A.E08, A.E09, A.EA0, and A.EA1.

Note 4. When an alarm occurs, the Servo Driver stops the Servomotor by the following methods.

- DB stop: The Servomotor is stopped according to the method set in Pn001.0.
- Zero-speed stop: The speed command at the Servo Driver is set to zero, and then the Servomotor is stopped according to the method set in Pn001.0.

■ Alarm Table

Display	Error detection function	Cause of error	Stopping method at alarm	Alarm reset possible?
A.020	Parameter checksum error 1	The Servo Driver's internal parameter data is abnormal.	DB stop	No
A.021	Parameter format error 1	The Servo Driver's internal parameter data is abnormal.	DB stop	No
A.022	System parameter checksum error 1	The Servo Driver's internal parameter data is abnormal.	DB stop	No
A.023	Parameter password error 1	The Servo Driver's internal parameter data is abnormal.	DB stop	No
A.02A	Parameter checksum error 2	The Servo Driver's internal parameter data is abnormal.	DB stop	No
A.02b	System parameter checksum error 2	The Servo Driver's internal parameter data is abnormal.	DB stop	No
A.030	Main circuit detection error	There is an error in the detection data for the power supply circuit.	DB stop	Yes
A.040	Parameter setting error 1	A parameter value exceeds the setting range.	DB stop	No
A.04A	Parameter setting error 2	A parameter value exceeds the setting range.	DB stop	No

Display	Error detection function	Cause of error	Stopping method at alarm	Alarm reset possible?
A.041	Dividing pulse output setting error	The encoder divider rate setting is out of range or the set conditions are not satisfied.	DB stop	No
A.042	Parameter combination error	A combination of multiple parameters is set out of range.	DB stop	No
A.050	Combination error	The combined capacity of the Servomotor and the Servo Driver is unsuitable.	DB stop	Yes
A.060	Servo ON command invalid alarm	After a function for executing Servo ON by means of Computer Monitor Software was used, an attempt was made to execute Servo ON using a host command.	DB stop	Yes
A.100	Overcurrent or overheating of radiation shield	An overcurrent has occurred, or the Servo Driver's radiation shield has overheated.	DB stop	No
A.300	Regeneration error	The regeneration resistance is disconnected or the regeneration transistor is faulty.	DB stop	Yes
A.320	Regeneration overload	The regenerative energy exceeds the regeneration resistance.	Zero-speed stop	Yes
A.330	Main circuit power supply setting error	The method for providing power to the main circuit does not match the Pn001 setting.	DB stop	Yes
A.400	Overvoltage	The main-circuit DC voltage is abnormally high.	DB stop	Yes
A.410	Low voltage	The main-circuit DC voltage is low.	Zero-speed stop	Yes
A.510	Overspeed	The Servomotor's rotation speed is abnormally high.	DB stop	Yes
A.511	Dividing pulse output overspeed	The Servomotor rotation speed upper limit set for the encoder divider rate setting (Pn212) was exceeded.	DB stop	Yes
A.520	Vibration alarm	Abnormal vibration was detected in the Servomotor rotation speed.	DB stop	Yes
A.521	Auto-tuning alarm	The inertia ratio was in error during auto-tuning.	DB stop	Yes
A.710	Overload (momentary maximum load)	Operated for several seconds to several tens of seconds at a torque greatly exceeding the rating.	Zero-speed stop	Yes
A.720	Overload (continual maximum load)	Operated continually at a torque exceeding the rating.	DB stop	Yes
A.730	DB overload	During DB (dynamic braking) operation, rotation energy exceeds the DB capacity.	DB stop	Yes
A.740	Inrush resistance overload	The main-circuit power supply has frequently and repeatedly been turned ON and OFF.	DB stop	Yes
A.7A0	Overheat	The Servo Driver's radiation shield overheated.	Zero-speed stop	Yes

Display	Error detection function	Cause of error	Stopping method at alarm	Alarm reset possible?
A.810	Encoder backup error	The encoder power supply was completely down, and position data was cleared.	DB stop	No
A.820	Encoder checksum error	The encoder memory checksum results are in error.	DB stop	No
A.830	Encoder battery error	The absolute encoder backup battery voltage has dropped.	DB stop	Yes
A.840	Encoder data error	The encoder's internal data is in error.	DB stop	No
A.850	Encoder overspeed	The encoder rotated at high speed when the power was ON.	DB stop	No
A.860	Encoder overheat	The encoder's internal temperature is too high.	DB stop	No
A.b31	Current detection error 1	The phase-U current detector is in error.	DB stop	No
A.b32	Current detection error 2	The phase-V current detector is in error.	DB stop	No
A.b33	Current detection error 3	The current detector is in error.	DB stop	No
A.b6A	MECHATROLINK communications ASIC error 1	The MECHATROLINK communications ASIC is in error.	DB stop	No
A.b6b	MECHATROLINK communications ASIC error 2	A fatal error occurred in the MECHATROLINK communications ASIC.	DB stop	No
A.bF0	System alarm 0	Servo Driver internal program error 0 occurred.	DB stop	No
A.bF1	System alarm 1	Servo Driver internal program error 1 occurred.	DB stop	No
A.bF2	System alarm 2	Servo Driver internal program error 2 occurred.	DB stop	No
A.bF3	System alarm 3	Servo Driver internal program error 3 occurred.	DB stop	No
A.bF4	System alarm 4	Servo Driver internal program error 4 occurred.	DB stop	No
A.C10	Runaway detected	Servomotor runaway occurred.	DB stop	Yes
A.C80	Multi-turn data error	Absolute encoder multi-turn data was cleared or could not be set correctly.	DB stop	No
A.C90	Encoder communications error	No communication possible between the encoder and Servo Driver.	DB stop	No
A.C91	Encoder communications position data error	An error occurred in the encoder's position data calculations.	DB stop	No
A.C92	Encoder communications timer error	An error occurred in the timer for communications between the encoder and Servo Driver.	DB stop	No
A.CA0	Encoder parameter error	Encoder parameters are corrupted.	DB stop	No
A.Cb0	Encoder echo-back error	The contents of communications with the encoder are wrong.	DB stop	No

Display	Error detection function	Cause of error	Stopping method at alarm	Alarm reset possible?
A.CC0	Multi-turn limit discrepancy	The multi-turn limits for the encoder and the Servo Driver do not match.	DB stop	No
A.d00	Deviation counter overflow	Position deviation pulses exceeded the level set for Pn520.	DB stop	Yes
A.d01	Deviation counter overflow alarm at Servo-ON	When Servo ON was executed, the accumulated number of position deviation pulses reached or exceeded the number set for Pn526.	DB stop	Yes
A.d02	Deviation counter overflow alarm by speed limit at Servo-ON	If Servo ON is executed with position deviation pulses accumulated, the speed is limited by the setting in Pn529. A command pulse was input during this period, without the limit being cleared, and the setting in Pn520 was exceeded.	Zero stop	Yes
A.E00	COM alarm 0	Servo Driver COM error 0 occurred.	Zero-speed stop	Yes
A.E01	COM alarm 1	Servo Driver COM error 1 occurred.	Zero-speed stop	Yes
A.E02	COM alarm 2	Servo Driver COM error 2 occurred.	DB stop	No
A.E07	COM alarm 7	Servo Driver COM error 7 occurred.	DB stop	No
A.E08	COM alarm 8	Servo Driver COM error 8 occurred.	Zero-speed stop	No
A.E09	COM alarm 9	Servo Driver COM error 9 occurred.	Zero-speed stop	No
A.E40	MECHATROLINK-II transmission cycle setting error	There is an error in the setting for the MECHATROLINK-II communications transmission cycle.	Zero-speed stop	Yes
A.E50	MECHATROLINK-II synchronization error	A synchronization error occurred during MECHATROLINK-II communications.	Zero-speed stop	Yes
A.E51	MECHATROLINK-II synchronization failure	A synchronization failure occurred during MECHATROLINK-II communications.	Zero-speed stop	Yes
A.E60	MECHATROLINK-II communications error	Communications errors occurred continuously during MECHATROLINK-II communications.	Zero-speed stop	Yes
A.E61	MECHATROLINK-II transmission cycle error	An error occurred in the transmission cycle during MECHATROLINK-II communications.	Zero-speed stop	Yes
A.EA0	DRV alarm 0	Servo Driver DRV error 0 occurred.	DB stop	No
A.EA1	DRV alarm 1	Servo Driver DRV error 1 occurred.	DB stop	No
A.EA2	DRV alarm 2	Servo Driver DRV error 2 occurred.	Zero-speed stop	Yes

Display	Error detection function	Cause of error	Stopping method at alarm	Alarm reset possible?
A.Ed0	Internal command error	A command error occurred in the Servo Driver.	Zero-speed stop	Yes
A.F10	Missing phase detected	One phase from the three-phase main circuit power supply is not connecting.	Zero-speed stop	Yes

■ Warning Table

Display	Warning detection function	Meaning
A.900	Deviation counter overflow	The accumulated position deviation pulses equaled or exceeded the parameter (Pn520 × Pn51E/100) setting.
A.901	Deviation counter overflow at Servo-ON	The accumulated position deviation pulses when the Servo turned ON equaled or exceeded the parameter (Pn526 × Pn528/100) setting.
A.910	Overload	This is a warning before the overload alarm (A.710 or A.720) is reached. If operation continues at this point, an alarm may be generated.
A.911	Vibration	Faulty oscillation was detected in the Servomotor rotation speed. The detection level is the same as for A520, but the difference is in whether an alarm or warning is to be set by the Pn310 vibration detection switches.
A.920	Regeneration overload	This is the warning display before the regenerative overload alarm (A.320) is reached. If operation continues at this point, an alarm may be generated.
A.930	Absolute encoder battery warning	This is the warning display indicating that the absolute encoder battery voltage is low.
A.941	Parameter change requiring restarting	A parameter requiring the power to be turned ON again was changed.
A.94A	Data setting warning 1 (parameter No.)	There is an error in a command parameter number.
A.94b	Data setting warning 2 (out of range)	The setting outside of the command data range. If the Servo Driver is connected to the CJ1W-MCH71 or CS1W-MCH71, the option monitor parameters may not be set correctly. Check the setting of Pn813 and change it to 0032 hex if any other value is set.
A.94C	Data setting warning 3 (calculation error)	A calculation error was detected.
A.94d	Data setting warning 4 (parameter size)	A non-conforming data size was detected.
A.95A	Command warning 1 (command conditions not met)	A command was specified even though the command conditions were not completely met.
A.95b	Command warning 2 (unsupported command)	An unsupported command was specified.
A.95C	Command warning 3	Command conditions set by parameters were not met.
A.95d	Command warning 4	Command interference (mainly latch command interference)
A.95E	Command warning 5	Sub-command and main command interference
A.960	MECHATROLINK-II communications warning	A communications error occurred during MECHATROLINK-II communications.

Note 1. When Pn008.2 is set to 1 (Warnings not detected), the following warnings are not detected. A.900, A.901, A.910, A.911, A.920, A.930

Note 2. Depending on the setting for Pn800.1 (Warning check mask), A.94□, A.95□, and A.96□ warnings may not be detected. With the default setting, A.94□, A.95□, and A.96□ warnings are detected.

5-3 Troubleshooting

If an error occurs in the machinery, check the type of error using the alarm indicators and operation status, verify the cause, and take appropriate countermeasures.

5-3-1 Error Diagnosis Using Alarm Display

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.020	Parameter checksum error 1	Occurs when the control circuit power supply is turned ON.	• The control voltage drops to a range of 30 to 60 V AC.	• Correct the power supply and initialize the parameters.
			• The control circuit power supply was interrupted during parameter setting.	• A constant was input again after parameter initialization processing.
			• The upper limit for the number of parameter writes was exceeded (e.g., parameters were changed by the host device with every scan).	• Replace the Servo Driver. (Correct the parameter writing method.)
			• The Servo Driver EEPROM and peripheral circuits are defective.	• Replace the Servo Driver.
A.021	Parameter format error 1	Occurs when attempting to power up again after a parameter is written using the parameter copy function.	• The Servo Driver software is too old for the current parameters.	• Replace the Servo Driver.
				• Write only parameters that are supported by the software version of the Servo Driver.
A.022	System parameter checksum error 1	Occurs when the control circuit power supply is turned ON.	• The control voltage drops to a range of 30 to 60 V AC.	• Correct the power supply and initialize the parameters.
				• Replace the Servo Driver.
A.023	Parameter password error 1	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.02A	Parameter checksum error 2	Occurs when the control circuit power supply is turned ON.	• The control voltage drops to a range of 30 to 60 V AC.	• Correct the power supply and initialize the parameters.
			• The control circuit power supply was interrupted during parameter setting.	• A constant was input again after parameter initialization processing.
			• The upper limit for the number of parameter writes was exceeded (e.g., parameters were changed by the host device with every scan).	• Replace the Servo Driver. (Correct the parameter writing method.)
A.02b	System parameter checksum error 2	Occurs when the control circuit power supply is turned ON.	• The control voltage drops to a range of 30 to 60 V AC.	• Correct the power supply and initialize the parameters.
			• The Servo Driver EEPROM and peripheral circuits are defective.	• Replace the Servo Driver.
A.030	Main circuit detection error	Occurs when the control circuit power supply is turned ON or during operation.	• Servo Driver is defective.	• Replace the Servo Driver.
A.040	Parameter setting error 1	Occurs when the control circuit power supply is turned ON.	• A value outside of the setting range was set in the parameters.	• Reset the parameters within the setting range.
A.04A	Parameter setting error 2		• The Servo Driver EEPROM and peripheral circuits are defective.	• Replace the Servo Driver.
A.041	Dividing pulse output setting error	Occurs when the control circuit power supply is turned ON.	• The encoder dividing pulses set in Pn212 are out of range or do not meet the setting conditions.	• Set an appropriate value for Pn212.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.042	Parameter combination error	Occurs when powering up again after changing the electronic gear ratio (Pn20E, Pn210), or after changing to a Servomotor with a different number of encoder pulses.	• Due to the change in the electronic gear ratio (Pn20E, Pn210) or the Servomotor, the speed for the program JOG operation command was out of the setting range.	• Lower the value for the electronic gear ratio (Pn20E, Pn210).
		Occurs when the setting for the program JOG speed (Pn533) is changed.	• Due to the change in the program JOG speed (Pn533), the speed for the program JOG operation command was out of the setting range.	• Increase the program JOG speed (Pn533).
		Occurs when powering up again and attempting to execute advanced auto-tuning after changing the electronic gear ratio (Pn20E, Pn210), or after changing to a Servomotor with a different number of encoder pulses.	• Due to the change in the electronic gear ratio (Pn20E, Pn210) or the Servomotor, the travel speed for advanced auto-tuning was out of the setting range.	• Set the electronic gear ratio within the following range. Electronic gear ratio (Pn20E/Pn210) ≤ 218
A.050	Combination error	Occurs when the control circuit power supply is turned ON.	• The Servo Driver capacity and the Servomotor capacity do not match. Servomotor capacity / Servo Driver capacity ≤ 1/4, or Servomotor capacity / Servo Driver capacity ≥ 4	• Match the Servo Driver capacity to the capacity of the Servomotor.
			• There is an error in a parameter written for the encoder.	• Replace the Servomotor (encoder)
			• The Servo Driver board is defective.	• Replace the Servo Driver.
A.060	Servo ON command invalid alarm	Occurs when the Servo is turned ON after one of the following functions is used: JOG, origin search, program JOG, EasyFFT.	• A Servo ON command was input when a Servo ON command invalid alarm was in effect.	• Turn the control circuit power supply OFF and back ON.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.100	Overcurrent or overheating of radiation shield	Occurs when the control circuit power supply is turned ON.	• An overload alarm has been reset several times by turning OFF the power.	• Change the alarm reset method.
			• There is a faulty connection between the Servo Driver board and the thermoswitch.	• Replace the Servo Driver.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when main circuit power supply is turned ON, or when an overcurrent occurs during Servomotor operation.	• There is a faulty connection between U, V, W, and the ground.	• Correct the wiring.
			• The ground wire is making contact with another terminal.	• Correct the wiring.
			• There is a short between the ground and the U-, V-, or W- phase wire in the Servomotor's main-circuit cable.	• Correct or replace the Servomotor's main-circuit cable.
			• There is a short between the U-, V-, and W- phase wires in the Servomotor's main-circuit cable.	• Correct or replace the Servomotor's main-circuit cable.
			• The wiring for the regeneration resistance is incorrect.	• Correct the wiring.
			• There is a short between the Servo Driver U-, V-, and W- phase wires and the ground.	• Replace the Servo Driver.
			• Servo Driver is defective. (The current feedback circuit, power transistor, or board is defective.)	• Replace the Servo Driver.
			• There is a short between the Servomotor U-, V-, and W- phase wires and the ground.	• Replace the Servomotor.
			• There is a short between the Servomotor U-, V-, and W- phase wires.	• Replace the Servomotor.
			• The DB circuit is defective.	• Replace the Servo Driver. (Lighten the load or lower the rotation speed used.)

Display	Error	Status when error occurs	Cause of error	Countermeasures
A. 100	Overcurrent or overheating of radiation shield	Occurs when main circuit power supply is turned ON, or when an overcurrent occurs during Servomotor operation.	• The DB has frequent use. (A DB overload alarm occurred.)	• Replace the Servo Driver. (Reduce the frequency of DB use.)
			• An overload alarm has been reset several times by turning OFF the power.	• Change the alarm reset method.
			• Was the load excessive, or was the regeneration processing capacity exceeded?	• Recheck the load and operating conditions.
			• The Servo Driver was mounted in an unsuitable way (direction, spacing). (Is there heat radiation in the or is there a heating effect from the surroundings?)	• Reduce the Servo Driver's ambient temperature to 55°C or below.
			• The Servo Driver's fan is stopped.	• Replace the Servo Driver.
			• Servo Driver is defective.	• Replace the Servo Driver.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.300	Regeneration error	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when the main circuit power supply is turned ON.	• For models of 400 W and below, a value other than zero is set for Pn600, and there is no external regeneration resistance installed.	• Connect regeneration resistance, or set Pn600 to zero if regeneration resistance is not required.
			• Check whether the regeneration resistance wiring is defective, loose, or disconnected.	• Correct the wiring for the external regeneration resistance.
			• Servo Driver is defective. (The regeneration transistor or the voltage detection component is defective.)	• Correct the wiring for the external regeneration resistance.
		Occurs during normal operation.	• Check whether the regeneration resistance wiring is defective, loose.	• Correct the wiring for the external regeneration resistance.
			• For models of 500 W or greater, the jumper between B2 and B3 is disconnected.	• Correct the wiring.
			• The regeneration resistance is disconnected. (Is the regenerative energy increasing?)	• Replace the regeneration resistance or replace the Servo Driver. (Recheck the load and operating conditions.)
			• Servo Driver is defective. (The regeneration transistor or the voltage detection component is defective.)	• Replace the Servo Driver.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.320	Regeneration overload	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when the main circuit power supply is turned ON.	• The power supply voltage is 270 V or higher.	• Correct the voltage.
		Occurs during normal operation. (Large increase in regeneration resistor temperature)	• Regenerative energy is excessive.	• Reselect the regeneration resistance amount, or recheck the load conditions and operating conditions.
			• Regeneration is continuous.	
		Occurs during normal operation. (Small increase in regeneration resistor temperature)	• The capacity set in Pn600 is smaller than the external regeneration resistance capacity.	• Correct the setting for Pn600.
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs during Servomotor deceleration.	• Regenerative energy is excessive.	• Reselect the regeneration resistance amount, or recheck the load conditions and operating conditions.
A.330	Main circuit power supply setting error	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when the main circuit power supply is turned ON.	• While in DC power supply input mode, AC power was supplied via L1 and L2 (or L1, L2, and L3).	• For AC power supply input, set Pn001.2 to 0. For DC power supply input, set Pn001.2 to 1.
			• While in AC power supply input mode, DC power was supplied via B1/⊕ and ⊖ terminals.	
			• Pn600 is not set to 0 even though no regeneration resistance is connected.	

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.400	Overvoltage	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when the main circuit power supply is turned ON.	• The AC power supply voltage is 290 V or higher.	• Set the AC power supply voltage in the correct range.
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs during normal operation.	• Check the AC power supply voltage. (Was there an excessive change in voltage?)	• Set the AC power supply voltage in the correct range.
			• The operating rotation frequency is high, and the load inertia is excessive. (The regeneration capacity is insufficient.)	• Recheck the load and operating conditions. (Check the load inertia and minus load specifications.)
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs during Servomotor deceleration.	• The operating rotation frequency is high, and the load inertia is excessive.	• Check the load and operating conditions.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.410	Low voltage	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when the main circuit power supply is turned ON.	• The AC power supply voltage is 120 V or lower.	• Set the AC power supply voltage in the correct range.
			• The Servo Driver fuse is burned out.	• Replace the Servo Driver.
			• Inrush current limit resistance disconnection (Check whether there is an error in the power supply voltage or an inrush current limit resistance overload.)	• Replace the Servo Driver. (Check the power supply voltage and reduce the frequency at which the main circuit is switched ON and OFF.)
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs during normal operation.	• The AC power supply voltage is low. (Check whether there was a large voltage drop.)	• Set the AC power supply voltage in the correct range.
			• A momentary power interruption occurred.	• Reset the alarm to restore operation.
			• The Servomotor main-circuit cable is short-circuited.	• Correct or replace the Servomotor main-circuit cable.
			• The Servomotor is short-circuited.	• Replace the Servomotor.
			• Servo Driver is defective.	• Replace the Servo Driver.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.510	Overspeed	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when the Servo is turned ON.	• The U, V, and W phases are wired out of order in the Servomotor.	• Correct the Servomotor wiring.
			• The encoder wiring is incorrect.	• Correct the encoder wiring.
			• Noise in the encoder wiring is causing malfunctioning.	• Implement measures against noise in the encoder wiring.
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs at start of Servomotor operation or at high-speed rotation.	• The U, V, and W phases are wired out of order in the Servomotor.	• Correct the Servomotor wiring.
			• The encoder wiring is incorrect.	• Correct the encoder wiring.
			• Noise in the encoder wiring is causing malfunctioning.	• Implement measures against noise in the encoder wiring.
			• Position, speed command inputs are excessive.	• Lower the command value.
			• The command input gain setting is incorrect.	• Correct the command input gain.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
A.511	Dividing pulse output overspeed	Occurs during Servomotor operation.	• The dividing pulse frequency equaled or exceeded 1.6 MHz.	• Lower the setting for the encoder divider rate (Pn212)
				• Lower the Servomotor rotation speed.
A.520	Vibration alarm	Occurs during Servomotor operation.	• An abnormal oscillation was detected in the Servomotor's rotation speed.	• Lower the Servomotor rotation speed.
				• Lower the speed loop gain (Pn100).
			• The inertia ratio (Pn103) value is greater than the actual value, or it is greatly fluctuating.	• Set a suitable value for the inertia ratio (Pn103).
A.521	Auto-tuning alarm	Occurs during advanced auto-tuning.	• The motor speed oscillated during operation.	• Without using advanced auto-tuning, set Pn103 by calculating the inertia ratio from various machine elements.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.710	Overload (momentary maximum load)	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when the Servo is turned ON.	• Servomotor wiring is incorrect (faulty wiring or connections).	• Correct the Servomotor wiring.
A.720	Overload (continual maximum load)		• Encoder wiring is incorrect (faulty wiring or connections).	• Correct the encoder wiring.
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs without the Servomotor rotating by command input.	• Servomotor wiring is incorrect (faulty wiring or connections).	• Correct the Servomotor wiring.
			• Encoder wiring is incorrect (faulty wiring or connections).	• Correct the encoder wiring.
			• The starting torque exceeds the maximum torque.	• Recheck the load conditions, the operating conditions, and the Servomotor capacity.
			• Servo Driver is defective.	• Replace the Servo Driver.
A.730	DB overload	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs during Servomotor operation, except with Servo OFF.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs with Servo OFF during Servomotor operation.	• The rotation energy during DB stops exceeds the DB resistance capacity.	• Check the following items. (1) Lower the Servomotor's operating rotation frequency. (2) Reduce the load inertia. (3) Reduce the frequency of DB stops.
			• Servo Driver is defective.	• Replace the Servo Driver.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.740	Inrush resistance overload	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs at times other than when the main-circuit power supply is turned ON and OFF.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when the main-circuit power supply is turned ON and OFF.	• The allowable main-circuit power supply ON/OFF frequency was exceeded for the inrush current limit resistance.	• Reduce the main circuit power supply ON/OFF frequency (to 5 times/min).
			• Servo Driver is defective.	• Replace the Servo Driver.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.7A0	Overheat	Occurs when the control circuit power supply is turned ON.	• Servo Driver is defective.	• Replace the Servo Driver.
			• An overload alarm has been reset several times by turning OFF the power.	• Change the alarm reset method.
		Overheating of radiation shield occurs when the main circuit power supply is turned ON, or during Servomotor operation.	• The load exceeds the rated load.	• Recheck the load conditions, the operating conditions, and the Servomotor capacity.
			• The Servo Driver's ambient temperature exceeds 55°C.	• Reduce the Servo Driver's ambient temperature to 55°C or below.
			• Servo Driver is defective.	• Replace the Servo Driver.
			• An overload alarm has been reset several times by turning OFF the power.	• Change the alarm reset method.
			• There is a faulty connection between the Servo Driver board and the Servomotor switch.	• Replace the Servo Driver.
			• Was the load excessive, or was the regeneration processing capacity exceeded?	• Recheck the load and operating conditions.
			• The Servo Driver was mounted in an unsuitable way (direction, spacing). (Is there heat radiation in the panel or is there a heating effect from the surroundings?)	• Reduce the Servo Driver's ambient temperature to 55°C or below.
			• The Servo Driver's fan is stopped.	• Replace the Servo Driver.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.810	Encoder backup error	Occurs when the control circuit power supply is turned ON. (Setting: Pn002.2 = 1)	• The Servo Driver board is defective. (When absolute values are used incrementally.)	• Replace the Servo Driver.
		Occurs when the control circuit power supply is turned ON. Used with absolute value (setting: Pn002.2 = 0).	• The power was turned ON for the first time to the absolute encoder.	• Execute the encoder's setup operation.
			• The encoder cable was disconnected.	• Check the connections and execute the encoder's setup operation.
			• The encoder power supply (+5 V) from the Servo Driver and the battery power supply are both down.	• Restore power to the encoder (e.g., replacing the battery), and then execute the encoder's setup operation.
			• Absolute encoder is defective.	• If the alarm is still not cleared even after executing the setup operation again, then replace the encoder.
			• Servo Driver is defective.	• Replace the Servo Driver.
A.820	Encoder checksum error	Occurs when the control circuit power supply is turned ON or during operation.	• Encoder is defective. (Encoder self-diagnosis)	• If the problem continues to occur frequently even after the encoder has been set up, replace the Servomotor.
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs when the SENSOR ON (SENS_ON) command is executed.	• Encoder is defective. (Encoder self-diagnosis)	• If the problem continues to occur frequently even after the encoder has been set up, replace the Servomotor.
A.830	Encoder battery error	Occurs when the control circuit power supply is turned ON. (Setting: Pn002 = 1)	• The Servo Driver board is defective. (When absolute values are used incrementally.)	• Replace the Servo Driver.
		Occurs when the control circuit power supply is turned ON. Used with absolute value (setting: Pn002.2 = 0).	• The battery has a faulty connection or is disconnected.	• Correct the battery connections.
			• The battery voltage is lower than the prescribed value (2.7 V).	• Replace the battery and turn ON the encoder power again.
			• The Servo Driver board is defective.	• Replace the Servo Driver.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.840	Encoder data error	Occurs when the control circuit power supply is turned ON.	• The encoder is malfunctioning.	• If the problem continues to occur frequently after the encoder power is turned ON again, replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs during operation.	• The encoder is malfunctioning.	• Correct the encoder's peripheral wiring (separating the encoder and power lines, grounding, etc.).
			• Encoder is defective.	• If the problem occurs frequently, replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
A.850	Encoder overspeed	Occurs when the control circuit power supply is turned ON.	• The Servomotor is rotating at 200 r/min or more when the encoder power is turned ON (or when the SEN signal turns ON for an absolute encoder).	• Set the Servomotor to rotate at less than 200 r/min when the encoder power is turned ON.
			• Encoder is defective.	• Replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs during operation.	• Encoder is defective.	• Replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
A.860	Encoder overheat	Occurs when the control circuit power supply is turned ON.	• Encoder is defective.	• Replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs during operation.	• The Servomotor's ambient temperature is too high.	• Lower the Servomotor's ambient temperature to 40°C or less.
			• The Servomotor load is greater than the rated load.	• Operate the Servomotor with a load that is no more than the rated load.
			• Encoder is defective.	• Replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
A.b31	Current detection error 1	Occurs when the control circuit power supply is turned ON or during operation.	• The phase-U current detection circuit is defective.	• Replace the Servo Driver.
A.b32	Current detection error 2		• The phase-V current detection circuit is defective.	

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.b33	Current detection error 3	Occurs when the Servo is turned ON.	• The current detection circuit is defective.	• Replace the Servo Driver.
			• The Servomotor's main circuit cable is broken.	• Correct the Servomotor wiring.
A.b6A	MECHATROLINK communications ASIC error 1	Occurs when the control circuit power supply is turned ON or during operation.	• The MECHATROLINK communications ASIC is defective.	• Replace the Servo Driver.
A.b6b	MECHATROLINK communications ASIC error 2			
A.bF0	System alarm 0	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
A.bF1	System alarm 1			
A.bF2	System alarm 2			
A.bF3	System alarm 3			
A.bF4	System alarm 4			
A.C10	Runaway detected	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when the Servo is turned ON or when a command is input.	• The U, V, and W phases are wired out of order in the Servomotor.	• Correct the Servomotor wiring.
			• Encoder is defective.	• Replace the Servomotor.
			• Servo Driver is defective.	• Replace the Servo Driver.
A.C80	Multi-turn data error	Occurs when the control circuit power supply is turned ON.	• Encoder is defective.	• Replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when an encoder alarm is reset.	• Encoder is defective.	• Replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
A.C90	Encoder communications error	Occurs when the control circuit power supply is turned ON or during operation.	• The encoder wiring is incorrect or the contact is faulty.	• Correct the encoder wiring.
			• The encoder cable is carrying noise that does not accord with the specifications.	• For the cable specifications, us twisted-pair wire or twisted-pair bound shielded wire, core wire of 0.12 mm^2 min., made of tin-coated soft copper.
			• The encoder cable is carrying noise because the distance is too long.	• Use a maximum wiring distance of 20 m.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.C91	Encoder communications position data error	Occurs when the control circuit power supply is turned ON or during operation.	• The encoder cable is crimped, and deterioration of the insulation is allowing noise to affect the signal line.	• Correct the cable installation.
			• The encoder cable is bundled with, or close to, lines carrying a large current.	• Arrange the cable so that the encoder cable is not affected by surges.
			• The electric potential of the FG is fluctuating due to influence from machinery (such as welders) in the vicinity of the Servomotor.	• Ground the machinery to prevent branching to the encoder's FG.
A.C92	Encoder communications timer error	Occurs when the control circuit power supply is turned ON or during operation.	• Noise is being carried to the line for signals coming from the encoder.	• Implement measures against noise in the encoder wiring.
			• The encoder is subjected to excessive vibration and shock.	• Reduce machine vibration or securely mount the Servomotor.
			• Encoder is defective.	• Replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
A.CA0	Encoder parameter error	Occurs when the control circuit power supply is turned ON.	• Encoder is defective.	• Replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.Cb0	Encoder echo-back error	Occurs when the control circuit power supply is turned ON or during operation.	• The encoder wiring is incorrect or the contact is faulty.	• Correct the encoder wiring.
			• The encoder cable is carrying noise that does not accord with the specifications.	• For the cable specifications, us twisted-pair wire or twisted-pair bound shielded wire, core wire of 0.12 mm^2 min., made of tin-coated soft copper.
			• The encoder cable is carrying noise because the distance is too long.	• Use a maximum wiring distance of 20 m.
			• The encoder cable is crimped, and deterioration of the insulation is allowing noise to affect the signal line.	• Correct the cable installation.
			• The encoder cable is bundled with, or close to, lines carrying a large current.	• Arrange the cable so that the encoder cable is not affected by surges.
			• The electric potential of the FG is fluctuating due to influence from machinery (such as welders) in the vicinity of the Servomotor.	• Ground the machinery ground to prevent branching to the encoder's FG.
			• Noise is being carried to the line for signals coming from the encoder.	• Implement measures against noise in the encoder wiring.
			• The encoder is subjected to excessive vibration and shock.	• Reduce machine vibration or securely mount the Servomotor.
			• Encoder is defective.	• Replace the Servomotor.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
A.CC0	Multi-turn limit discrepancy	Occurs when the control circuit power supply is turned ON.	• A Servo Driver parameter is set incorrectly.	• Correct the setting for Pn205 (0 to 65,535).
			• The encoder's multi-turn limit setting was omitted or changed.	• Change settings when an alarm occurs.
		Occurs during operation.	• The Servo Driver board is defective.	• Replace the Servo Driver.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.d00	Deviation counter overflow	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs during high-speed rotation.	• The Servomotor's U, V, and W wiring is incorrect (faulty connections).	• Correct the Servomotor wiring.
				• Correct the encoder wiring.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs without Servomotor rotation when there is a position command.	• The Servomotor's U, V, and W wiring is faulty.	• Correct the Servomotor wiring.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when operation is normal but a long command is sent.	• Servo Motor gain is poorly adjusted.	• Increase the speed loop gain (Pn100) and the position loop gain (Pn102).
			• The position command pulse frequency is too high.	• Increase/decrease the position command pulse frequency slowly.
				• Use the smoothing function.
				• Check the electronic gear ratio.
			• The deviation counter overflow level (Pn520) is not suitable.	• Correct the setting for Pn520.
			• The load conditions (torque, inertia) do not conform to the Servomotor specifications.	• Check the load and the Servomotor capacity.
A.d01	Deviation counter overflow alarm at Servo-ON	Occurs when the control circuit power supply is turned ON.	• Position deviation pulses have accumulated excessively with the Servo OFF. • The Servomotor was operated form outside when the Servo was OFF.	• Set so that the Servomotor does not operate with the Servo OFF.
				• Correct the detection level.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.d02	Deviation counter overflow alarm by speed limit at Servo-ON	Occurs during Servomotor drive.	• The Servo turned ON with position deviation pulses accumulated, and command pulses were input during operation at the limit speed. Position deviation pulses accumulated exceeding the deviation counter overflow level (Pn520).	• Set so that the Servomotor does not operate with the Servo OFF.
				• Correct the detection level.
				• Set a suitable value for the limit speed level at Servo-ON (Pn529).
A.E00	COM alarm 0	Occurs when the control circuit power supply is turned ON.	• Servo Driver is defective. • The conditions in *6-3 Restrictions* were not met when using the Computer Monitor Software.	• Replace the Servo Driver. • Make sure the conditions in *6-3 Restrictions* are met.
A.E01	COM alarm 1			
A.E02	COM alarm 2			
A.E07	COM alarm 7			
A.E08	COM alarm 8			
A.E09	COM alarm 9			
A.E40	MECHATROLINK-II transmission cycle setting error	Occurs when MECHATROLINK-II communications are started.	• The MECHATROLINK-II transmission cycle setting is out of the range in the specifications.	• Set a suitable value for the MECHATROLINK-II transmission cycle.
A.E50	MECHATROLINK-II synchronization error	Occurs during MECHATROLINK-II communications.	• The WDT data refreshing for the host device is not correct.	• Correct the WDT data refreshing for the host device.
			• Servo Driver is defective.	• Replace the Servo Driver.
A.E51	MECHATROLINK-II synchronization failure	Occurs when MECHATROLINK-II synchronous communications are started.	• The WDT data refreshing for the host device was not correct when synchronous communications started, so they could not be started.	• Correct the WDT data refreshing for the host device.
			• Servo Driver is defective.	• Replace the Servo Driver.
A.E60	MECHATROLINK-II communications error	Occurs during MECHATROLINK-II communications.	• Correct the MECHATROLINK-II wiring.	• Wire the MECHATROLINK-II communications cable correctly. Connect the terminator correctly.
			• Servo Driver is defective.	• Replace the Servo Driver.
			• A MECHATROLINK-II data reception error occurred due to noise.	• Implement measures against noise (such as using MECHATROLINK-II communications cable, checking the FG wiring, and installing a ferrite core in the MECHATROLINK-II communications cable).

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.E61	MECHATROLINK-II transmission cycle error	Occurs during MECHATROLINK-II communications.	• The MECHATROLINK-II transmission cycle fluctuated.	• Eliminate the cause of fluctuation in the host device transmission cycle.
			• Servo Driver is defective.	• Replace the Servo Driver.
A.EA0	DRV alarm 0	Occurs when the control circuit power supply is turned ON or during operation.	• Servo Driver is defective.	• Replace the Servo Driver.
A.EA1	DRV alarm 1			
A.EA2	DRV alarm 2			
A.Ed0	Internal command error	Occurs when MECHATROLINK-II communications are started, or during operation.	• Parameters were edited at a personal computer during MECHATROLINK-II communications.	• Do not edit parameters during MECHATROLINK-II communications.
			• Servo Driver is defective.	• Replace the Servo Driver.
A.F10	Missing phase detected	Occurs when the control circuit power supply is turned ON.	• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs when the main circuit power supply is turned ON.	• The three-phase power supply is faulty.	• Correct the power supply wiring.
			• The three-phase power supply is unbalanced.	• Correct the power supply unbalance. (Switch the phase.)
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs during Servomotor drive.	• There are faulty contacts in the three-phase power supply wiring.	• Correct the power supply wiring.
			• The three-phase power supply is unbalanced.	• Correct the power supply imbalance.
			• Servo Driver is defective.	• Replace the Servo Driver.

5-3-2 Error Diagnosis Using Warning Indicators

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.900	Deviation counter overflow	Occurs during normal operation.	• The Servo Driver board is defective.	• Replace the Servo Driver.
			• The Servomotor's U, V, and W wiring is incorrect (faulty connections).	• Correct the Servomotor wiring.
				• Correct the encoder wiring.
			• Servo Motor gain is poorly adjusted.	• Increase the speed loop gain (Pn100) and the position loop gain (Pn102).
			• The position command pulse frequency is too high.	• Increase/decrease the position command pulse frequency slowly.
				• Use the smoothing function.
				• Check the electronic gear ratio.
			• A parameter setting (Pn520: Deviation counter overflow level) is incorrect.	• Set a value other than zero for Pn520.
			• The load conditions (torque, inertia) do not conform to the Servomotor specifications.	• Check the load and the Servomotor capacity.
A.901	Deviation counter overflow at Servo-ON	Occurs when the Servo is turned ON.	• Position deviation pulses have accumulated excessively with the Servo OFF. • Position deviation pulses were not set to be cleared with the Servo OFF, and the Servomotor was operated from outside.	• Set so that the Servomotor does not operate with the Servo OFF.
				• Set so that position deviation pulses are cleared when the Servo is OFF.
				• Correct the detection level.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.910	Overload	Occurs when the Servo is turned ON.	• Servomotor wiring is incorrect (faulty wiring or connections).	• Correct the Servomotor wiring.
			• Encoder wiring is incorrect (faulty wiring or connections).	• Correct the encoder wiring.
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs without Servomotor rotation by command input.	• Servomotor wiring is incorrect (faulty wiring or connections).	• Correct the Servomotor wiring.
			• Encoder wiring is incorrect (faulty wiring or connections).	• Correct the encoder wiring.
			• The starting torque exceeds the maximum torque.	• Recheck the load conditions, the operating conditions, and the Servomotor capacity.
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs during normal operation.	• The effective torque exceeds the rated torque.	• Recheck the load conditions, the operating conditions, and the Servomotor capacity.
			• The temperature is high in the Servo Driver's panel	• Lower the temperature in the panel to 55°C or less.
			• Servo Driver is defective.	• Replace the Servo Driver.
A.911	Vibration	Occurs during normal operation.	• The Servo Driver gain is incorrect.	• In order to set the correct gain, lower the speed loop gain (Pn100) and the position loop gain (Pn101), and increase filter time constants such as the1st step 1st torque command filter time constant (Pn401).
			• The inertia ratio (Pn103) value is greater than the actual value, or it is greatly fluctuating.	• Set a suitable value for the inertia ratio (Pn103).

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.920	Regeneration overload	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs during normal operation. (Large increase in regeneration resistance temperature)	• Regenerative energy is excessive.	• Reselect the regeneration resistance amount, or recheck the load conditions and operating conditions.
			• Regeneration is continuous.	
		Occurs during normal operation. (Small increase in regeneration resistance temperature)	• The capacity set in Pn600 is smaller than the external regeneration resistance capacity.	• Correct the setting for Pn600.
			• Servo Driver is defective.	• Replace the Servo Driver.
		Occurs during Servomotor deceleration.	• Regenerative energy is excessive.	• Reselect the regeneration resistance amount, or recheck the load conditions and operating conditions.
A.930	Absolute encoder battery warning	Occurs when the control circuit power supply is turned ON.	• The Servo Driver board is defective.	• Replace the Servo Driver.
		Occurs when the control circuit power supply is turned ON. (Setting: Pn002 = 1)	• The Servo Driver board is defective. (When absolute values are used incrementally.)	• Replace the Servo Driver.
		Occurs when four seconds or more have elapsed after the control power supply is turned ON. Used with absolute value (setting: Pn002.2 = 0).	• The battery has a faulty connection or is disconnected.	• Correct the battery connections.
			• The battery voltage is lower than the prescribed value (2.7 V).	• Replace the battery and turn the encoder power supply ON again.
			• The Servo Driver board is defective.	• Replace the Servo Driver.
A.941	Parameter change requiring restart	Occurs when parameters are changed.	• A parameter was changed that required the power to be turned OFF and back ON.	• Turn the power OFF and back ON.
A.94A	Data setting warning 1 (parameter No.)	Occurs when a PRM_RD, PRM_W, or PPRM_WR command is sent.	• An unusable parameter number was used.	• Use a correct parameter number.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.94b	Data setting warning 2 (out of range)	Occurs when a MECHATROLINK-II command is sent.	• An attempt was made to set a value outside of the setting range for the command data. • If the Servo Driver is connected to the CJ1W-MCH71 or CS1W-MCH71, the option monitor parameters may not be set correctly.	• Set a value in the setting range. • Check the setting of Pn813 and change it to 0032 hex if any other value is set.
A.94C	Data setting warning 3 (calculation error)	Occurs when a PRM_WR or PPRM_WR command is sent.	• An error occurred in the calculation results for the set value.	• Set a value in the setting range for the parameter.
A.94d	Data setting warning 4 (parameter size)	Occurred during MECHATROLINK-II communications.	• The parameter size set by the command is not correct.	• Use the correct parameter size.
A.95A	Command warning 1 (command conditions not met)	Occurred during MECHATROLINK-II communications.	• The command transmission conditions have not been met.	• Satisfy all the command transmission conditions before sending the command.
A.95b	Command warning 2 (unsupported command)	Occurred during MECHATROLINK-II communications.	• An unsupported command was received.	• Do not send unsupported commands.
A.95C	Command warning 3	Occurred during MECHATROLINK-II communications.	• A MECHATROLINK-II command cannot be executed according to the setting conditions.	• Set the parameters required for command execution.
A.95d	Command warning 4	Occurred during MECHATROLINK-II communications.	• The transmission conditions for a latch-related command have not been satisfied.	• Satisfy all the latch-related command transmission conditions before sending the command.
A.95E	Command warning 5	Occurred during MECHATROLINK-II communications.	• The sub-command transmission conditions have not been satisfied.	• Satisfy all the sub-command transmission conditions before sending the command.
A.960	MECHATROLINK-II communications warning	Occurred during MECHATROLINK-II communications.	• Connection is faulty or line is disconnected.	• Review the connector wiring. • Check for disconnections in the communications wiring.
			• Communications error due to noise or other factors.	• Implement noise countermeasures. • Check system operation and, if there are no problems (or if the problems are acceptable), set to ignore the A.96□ warning using the warning check mask.

5-3-3 Troubleshooting by Means of Operating Status

Symptom	Probable cause	Items to check	Countermeasures
The Servomotor does not start.	The control power supply is not ON.	• Check the voltage between the control power supply terminals.	• Correct the control power supply ON circuit.
	The main circuit power supply is not ON.	• Check the voltage between the main circuit power supply terminals.	• Correct the main circuit power supply ON circuit.
	The I/O (CN1) wiring is faulty or disconnected.	• Check the condition and wiring of the CN1 connector.	• Correct the CN1 wiring.
	The Servomotor or encoder wiring is detached.	• Checking the wiring.	• Connect the wiring.
	There is an overload.	• Operate without an overload.	• Either lighten the load or change to a Servomotor with greater capacity.
	Speed and position commands are not being input.	• Check the input pins.	• Correct the speed and position inputs.
	The input signal selections (Pn50A to Pn50D) are set incorrectly.	• Check the settings for the input signal selections (Pn50A to Pn50D).	• Correct Check the settings for the input signal selections (Pn50A to Pn50D).
	The type of encoder being used is different from the parameter setting.	• Is it an incremental or an absolute encoder?	• Match the setting in Pn002.2 to the type of encoder that is being used.
	The Servo-ON (SV-ON) command is not being sent.	• Check the host device commands.	• Specify the Servo-ON (SV-ON) command.
	The sensor ON (SENS_ON) command is not being sent.	• Check the host device commands.	• Send commands to the Servo Driver in the correct sequence.
	The forward drive prohibit (POT) and reverse drive prohibit (NOT) input signals are remaining OFF.	• Check the POT and NOT input signals.	• Turn ON the POT and NOT input signals.
	Servo Driver is defective.	• The Servo Driver board is defective.	• Replace the Servo Driver.
The Servomotor operates momentarily but then stops.	Servomotor wiring is faulty.	• Check the Servomotor wiring.	• Correct the Servomotor wiring.
	Encoder wiring is faulty.	• Check the encoder wiring.	• Correct the encoder wiring.
Servomotor rotation is unstable.	Wiring connections to the Servomotor are faulty.	• Connections are unstable at power line (phase U, V, W) or encoder connectors.	• Tighten any looseness at the processing terminals and connectors.
Servomotor rotates without any commands.	Servo Driver is defective.	• Servo Driver board is defective.	• Replace the Servo Driver.

Symptom	Probable cause	Items to check	Countermeasures
DB (dynamic brake) does not operate.	The parameter setting is incorrect.	• Check the setting for Pn001.0.	• Correct the parameter setting.
	DB resistance is disconnected.	• Is there excessive inertia, rotation speed, or frequency of DB use?	• Replace the Servo Driver and check the load system.
	DB drive circuit is defective.	• A DB circuit component is defective.	• Replace the Servo Driver.
The Servomotor is making strange noises.	The mechanical installation is faulty.	• Are Servomotor mounting screws loose?	• Tighten the mounting screws.
		• Are couplings off center?	• Center the couplings.
		• Are couplings unbalanced?	• Balance the couplings.
	There is a problem with the bearings.	• Check for sounds and vibration around the bearings.	• If there are any abnormalities, please contact an OMRON representative.
	The source of vibration is in another machine.	• Have any foreign objects gotten into the movable parts of the machine, or is there any damage or deformation?	• Consult with the maker of the machine.
	Noise is carried because the input signal line specifications are incorrect.	• Is twisted-pair wire or twisted-pair bound shielded core wire of 0.12 mm^2 min., made of tin-coated soft copper, being used?	• Make sure that input signal lines conform to the specifications.
	Noise is carried because the encoder cable specifications are incorrect.	• Is twisted-pair wire or twisted-pair bound shielded core wire of 0.12 mm^2 min., made of tin-coated soft copper, being used?	• Make sure that the encoder cable conforms to the specifications.
	The encoder cable is carrying noise because the distance exceeds the operating range.	• Use a maximum wiring distance of 50 m.	• Make sure that the encoder cable distance conforms to the specifications.
	Noise interference is occurring because of damage to the encoder cable.	• The encoder cable is crimped, or deterioration of the insulation is allowing noise to affect the signal line.	• Correct the cable installation.
	There is excessive noise interference to the encoder cable.	• Is the encoder cable bundled with, or close to, lines carrying a large current?	• Arrange the cable so that the encoder cable is not affected by surges.
	The electric potential of the FG is fluctuating due to influence from machinery (such as welders) in the vicinity of the Servomotor.	• What is the grounding status of equipment such as welding machines near the Servomotor (e.g., imperfectly grounded, not grounded at all)?	• Ground the machinery to prevent branching to the encoder's FG.
	The Servo Driver pulse count is incorrect due to noise.	• Is noise being carried to the line for signals coming from the encoder?	• Implement measures against noise in the encoder wiring.

Symptom	Probable cause	Items to check	Countermeasures
The Servomotor is making strange noises.	There is interference due to the encoder being subjected to excessive vibration and shock.	• Check for machine vibration or faulty Servomotor mounting (mounting surface precision, secure fastening, centering, etc.).	• Lower machine vibration or correct Servomotor mounting.
	Encoder is defective.	• Encoder is defective.	• Replace the Servomotor.
Servomotor oscillates at approx. 200 to 400 Hz.	The speed loop gain (Pn100) is set too high.	• Default: Kv = 80.0/Hz Refer to the instructions on adjusting gain in the user's manual.	• Correct the setting for the speed loop gain (Pn100).
	The position loop gain (Pn102) is set too high.	• Default: Kv = 40.0/Hz Refer to the instructions on adjusting gain in the user's manual.	• Correct the setting for the position loop gain (Pn102).
	The speed loop integral time constant (Pn101) setting is inappropriate.	• Default: Ti = 20.00 ms Refer to the instructions on adjusting gain in the user's manual.	• Correct the setting for the speed loop integral time constant (Pn101).
	The machine rigidity setting is inappropriate.	• Check the machine rigidity setting.	• Correct the machine rigidity setting.
	The inertia ratio (Pn103) data is inappropriate.	• Check the inertia ratio (Pn103) data.	• Correct the inertia ratio (Pn103) data.
Frequency overshooting when starting and stopping is too high.	The speed loop gain (Pn100) is set too high.	• Default: Kv = 80.0 Hz Refer to the instructions on adjusting gain in the user's manual.	• Correct the setting for the speed loop gain (Pn100).
	The position loop gain (Pn102) is set too high.	• Default: Kp = 40.0/s Refer to the instructions on adjusting gain in the user's manual.	• Correct the setting for the position loop gain (Pn102).
	The speed loop integral time constant (Pn101) setting is inappropriate.	• Default: Ti = 20.00 ms Refer to the instructions on adjusting gain in the user's manual.	• Correct the setting for the speed loop integral time constant (Pn101).
	The machine rigidity setting is inappropriate.	• Check the machine rigidity setting.	• Correct the machine rigidity setting.
	The inertia ratio (Pn103) data is inappropriate.	• Check the inertia ratio (Pn103) data.	• Correct the inertia ratio (Pn103) data. • Use the Servomotor switch function.

Symptom	Probable cause	Items to check	Countermeasures
Absolute encoder position displacement error (The position in the host device's memory when the power is turned OFF is different from the position when the power is next turned ON.)	Noise is carried because the encoder cable specifications are incorrect.	• Check whether the cable is twisted-pair wire or twisted-pair bound shielded core wire of 0.12 mm^2 min., made of tin-coated soft copper.	• Make sure that the encoder cable conforms to the specifications.
	The encoder cable is carrying noise because the distance exceeds the operating range.	• Use a maximum wiring distance of 50 m.	• Make sure that the encoder cable distance conforms to the specifications.
	Noise interference is occurring because of damage to the encoder cable.	• The encoder cable is crimped, or deterioration of the insulation is allowing noise to affect the signal line.	• Correct the cable installation.
	There is excessive noise interference to the encoder cable.	• Is the encoder cable bundled with, or close to, lines carrying a large current?	• Arrange the cable so that the encoder cable is not affected by surges.
	The electric potential of the FG is fluctuated due to noise from machinery (such as welders) in the vicinity of the Servomotor.	• What is the grounding status of equipment such as welding machines near the Servomotor (e.g., imperfectly grounded, not grounded at all)?	• Ground the machinery to prevent branching to the encoder's FG.
	The Servo Driver pulse count is incorrect due to noise.	• Is noise being carried to the line for signals coming from the encoder?	• Implement measures against noise in the encoder wiring.
	There is interference due to the encoder being subjected to excessive vibration and shock.	• Check for machine vibration or faulty Servomotor mounting (mounting surface precision, secure fastening, centering, etc.).	• Reduce machine vibration or correct the Servomotor mounting.
	Encoder is defective.	• Encoder is defective. (Pulses are not changing.)	• Replace the Servomotor.
	Servo Driver is defective.	• Multi-turn data is not output from the Servo Driver.	• Replace the Servo Driver.

Symptom	Probable cause	Items to check	Countermeasures
Overtravel (OT) (Travelling outside of the zone specified by the host device)	The forward/reverse drive prohibit input signal does not change. (POT (CN1-7 or NOT (CN1-8) is at H level.)	• Is the voltage correct for the external power supply (+24 V) for input signals?	• Use a +24-V external power supply.
		• Is the operating status correct for the overtravel limit switch?	• Correct the status of the overtravel limit switch.
		• Is the wiring to the overtravel limit switch correct?	• Correct the wiring to the overtravel limit switch.
	The forward/reverse drive prohibit input signal is malfunctioning. (Does the POT or NOT signal sometimes change?)	• Does the external power supply (+24 V) voltage fluctuate?	• Eliminate the fluctuation in the external power supply (+24 V) voltage.
		• Is overtravel limit switch operation unstable?	• Stabilize overtravel limit switch operation.
		• Is the overtravel limit switch wiring correct (cable undamaged, screws tightened, etc.)	• Correct the wiring to the overtravel limit switch.
	The forward/reverse drive prohibit input signal (POT/NOT) selection is incorrect.	• Check the POT signal selection (Pn50A.3).	• Correct the POT signal selection (Pn50A.3)
		• Check the NOT signal selection (Pn50B.0)	• Correct the NOT signal selection (Pn50B.0)
	The Servomotor stopping method selection is incorrect.	• Is the free-run stopping method selected for the Servomotor?	• Check the settings for Pn001.0 and Pn001.1.
		• Is free-run set for torque control?	• Check the settings for Pn001.0 and Pn001.1.
	The overtravel limit switch position is inappropriate.	• The overtravel limit switch position is less than the coasting amount.	• Set the overtravel limit switch position correctly.
	Noise is carried because the encoder cable specifications are incorrect.	• Is twisted-pair wire or twisted-pair bound shielded core wire of 0.12 mm^2 min., made of tin-coated soft copper, being used?	• Make sure that the encoder cable conforms to the specifications.
	The encoder cable is carrying noise because the distance exceeds the operating range.	• Use a maximum wiring distance of 50 m.	• Make sure that the encoder cable distance conforms to the specifications.
	Noise interference is occurring because of damage to the encoder cable.	• The encoder cable is crimped, or deterioration of the insulation is allowing noise to affect the signal line.	• Correct the cable installation.
	There is excessive noise interference to the encoder cable.	• Is the encoder cable bundled with, or close to, lines carrying a large current?	• Arrange the cable so that the encoder cable is not affected by surges.

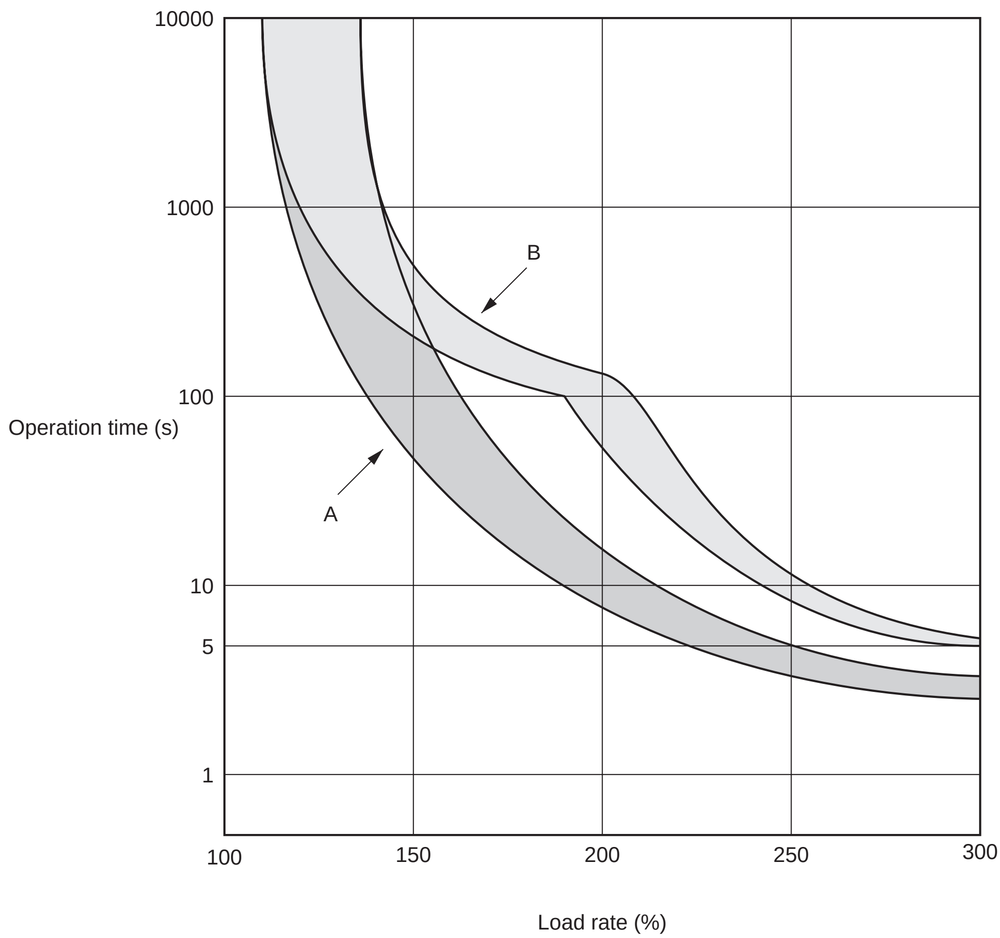
Symptom	Probable cause	Items to check	Countermeasures
Overtravel (OT) (Travelling outside of the zone specified by the host device)	The FG is fluctuating due to influence from machinery (such as welders) in the vicinity of the Servomotor.	• What is the grounding status of equipment such as welding machines near the Servomotor (e.g., imperfectly grounded, not grounded at all)?	• Ground the machinery to prevent branching to the encoder's FG.
	The Servo Driver pulse count is incorrect due to noise.	• Is noise being carried to the line for signals coming from the encoder?	• Implement measures against noise in the encoder wiring.
	There is interference due to the encoder being subjected to excessive vibration and shock.	• Check for machine vibration or faulty Servomotor mounting (mounting surface precision, secure fastening, centering, etc.).	• Reduce machine vibration or correct the Servomotor mounting.
	Encoder is defective.	• Encoder is defective.	• Replace the Servomotor.
	Servo Driver is defective.	• Servo Driver is defective.	• Replace the Servo Driver.
The position is displaced (without an alarm being output).	The coupling between the machine and the Servomotor is faulty.	• Is the coupling between the machine and the Servomotor displaced?	• Correct the coupling between the machine and the Servomotor.
	Noise is carried because the input signal line specifications are incorrect.	• Is twisted-pair wire or twisted-pair bound shielded core wire of 0.12 mm^2 min., made of tin-coated soft copper, being used?	• Make sure that input signal lines conform to the specifications.
	Encoder is defective. (Pulses are not changing.)	• Encoder is defective. (Pulses are not changing.)	• Replace the Servomotor.
Servomotor is overheating.	The ambient temperature is too high.	• Measure the Servomotor's ambient temperature.	• Lower the ambient temperature to 40°C or less.
	The Servomotor's surface is dirty.	• Visually check the surface.	• Clean off dirt and oil from the Servomotor's surface.
	There is an overload.	• Operate without an overload.	• Recheck the load conditions, the operating conditions, and the Servomotor capacity.

5-4 Overload Characteristics (Electronic Thermal Characteristics)

An overload protection (electronic thermal) function is built into the Servo Driver to protect against Servo Driver or Servomotor overload. If an overload (A.710 to A.720) does occur, first clear the cause of the error and then wait at least one minute for the Servomotor temperature to drop before turning on the power again. If the power is turned on again too soon, the Servomotor coil may be damaged.

■ Overload Characteristics Graph

Overload characteristics are shown in the following table. If, for example, a current of three times the Servomotor's rated current flows continuously, it will be detected after approximately three seconds.



A : 3,000-r/min Servomotors, 30 to 400 W
3,000-r/min Flat-style Servomotors, 100 to 400 W

B : 3,000-r/min Servomotors, 750 W to 3 kW
3,000-r/min Flat-style Servomotors, 750 W to 1.5 kW
1,000-r/min Servomotors, 300 W to 2 kW
1,500-r/min Servomotors, 450 W to 1.8 kW

Interpreting the Graph

If a current that is equivalent to the maximum torque is applied continuously to a Servomotor equivalent to B in the above graph, an overload will be detected in approximately 5 s.

5-5 Periodic Maintenance

Maintenance and Inspection Precautions

⚠ **WARNING** Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock.

⚠ **Caution** Resume operation only after transferring to the new Unit the contents of the data required for operation. Not doing so may result in an unexpected operation.

Servomotors and Servo Drivers contain many components and will operate properly only when each of the individual components is operating properly. Some of the electrical and mechanical components require maintenance depending on application conditions. In order to ensure proper long-term operation of Servomotors and Drivers, periodic inspection and part replacement is required according to the life of the components.

The periodic maintenance cycle depends on the installation environment and application conditions of the Servomotor or Driver. Recommended maintenance times are listed below for Servomotors and Drivers. Use these for reference in determining actual maintenance schedules.

■ Servomotors

- Recommended Periodic Maintenance
  Bearings: 20,000 hours
  Reduction gear: 20,000 hours
  Oil seal: 5,000 hours

  Application Conditions: Ambient Servomotor operating temperature of 40°C, within allowable shaft load, rated operation (rated torque and r/m), installed as described in operation manual.

- The radial loads during operation (rotation) on timing pulleys and other components contacting belts is twice the still load. Consult with the belt and pulley manufacturers and adjust designs and system settings so that the allowable shaft load is not exceeded even during operation. If a Servomotor is used under a shaft load exceeding the allowable limit, the Servomotor shaft can break, the bearings can burn out, and other problems can occur.

■ Servo Drivers

- Recommended Periodic Maintenance

  Aluminum analytical capacitors: 50,000 hours, at an ambient Servo Driver operating temperature of 40°C, rated operation (rated torque), installed as described in operation manual.

  Axle fan: 30,000 hours, at an ambient Servo Driver operating temperature of 40°C and an ambient humidity of 65%.

Absolute encoder backup battery: 50,000 hours, at an ambient Servo Driver operating temperature of 20°C.

- When using the Servo Driver under the continuous operation mode, cool the Servo Driver with fans and air conditioners to maintain an ambient operating temperature below 40°C.
- The life of aluminum analytical capacitors is greatly affected by the ambient operating temperature. Generally speaking, an increase of 10°C in the ambient operating temperature will reduce capacitor life by 50%. We recommend that ambient operating temperature be lowered and the power supply time be reduced as much as possible to lengthen the maintenance times for Servo Drivers.
- If the Servomotor or Servo Driver is not to be used for a long time, or if they are to be used under conditions worse than those described above, a periodic inspection schedule of five years is recommended. Please consult with OMRON to determine whether or not components need to be replaced.

5-6 Replacing the Absolute Encoder Battery (ABS)

Replace the absolute encoder backup battery if it has been used for at least five years, or if an A.930 (battery warning) warning or an A.830 (battery error) alarm occurs.

■ Battery Model and Specifications

Item	Specification
Name	Absolute Encoder Backup Battery Unit
Model numbers	R88A-BAT01W
Battery model	ER3V (Toshiba)
Battery voltage	3.6 V
Current capacity	1,000 mA·h

Note Refer to *2-8 Absolute Encoder Backup Battery Specifications* for dimensions and wiring details.

■ Battery Replacement Procedure

- Replace the battery using the following replacement procedure. After replacing the battery, if a A.810 (backup error) alarm does not occur, the replacement is completed. If an A.810 alarm occurs, you need to set up the absolute encoder.

1. Turn ON the power supply to the Servo Driver's control circuit.
   - Turn ON the power supply to the Servo Driver's control circuit only. This will supply power to the absolute encoder.

   Note If an A.930 warning occurs when the power supply is ON, turn OFF only the main circuit power supply after completing operation and then perform the following replacement procedure. If the control circuit power supply is turned OFF, the absolute data in the absolute encoder may be inadvertently cleared.

2. Replace the battery.
   - Remove the old battery from the absolute encoder battery cable's battery holder, and disconnect the connector to the battery from the battery connector.
   - Place the new battery in the battery holder, and insert the connector correctly into battery connector.
3. Turn the power supply OFF, then ON again.
   - After correctly connecting the new battery, turn OFF the power supply to the Servo Driver, then turn it ON again.
   - If a Servo Driver alarm is not displayed, battery replacement is completed.

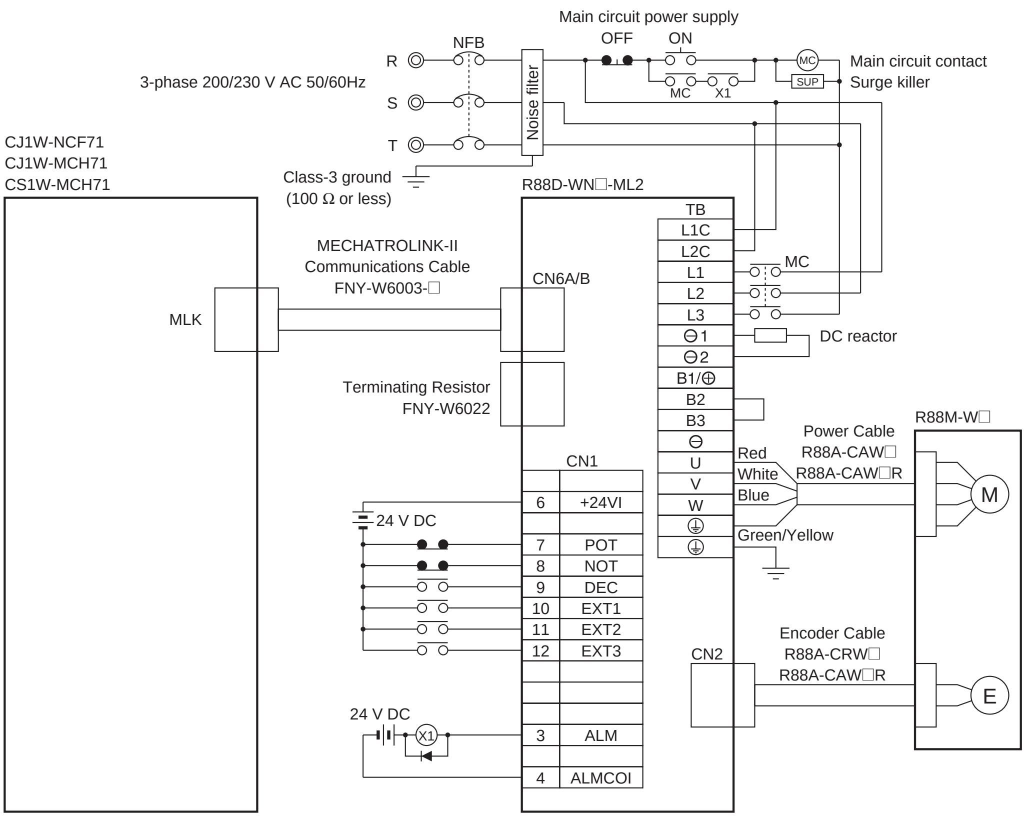
   Note If A.810 (backup error) is displayed, you need to set up the absolute encoder. Refer to *4-2-2 Absolute Encoder Setup and Battery Changes*, and perform the setup and make the initial settings for the Motion Control Unit.

Chapter 6

Appendix

6-1 Connection Examples

■ Connection Example: Connecting to SYSMAC CS1W-MCH71, CJ1W-MCH71, CJ1W-NCF71 Position Control Units



Note 1. The example shows a three-phase, 200-V AC input to the Servo Driver for the main circuit power supply. Be sure to provide a power supply and wiring conforming to the power supply specifications for the Servo Driver in use.

Note 2. Incorrect signal wiring can cause damage to Units and the Servo Driver.

Note 3. Leave unused signal lines open and do not wire them.

Note 4. The diode recommended for surge absorption is the ERB44-02 (Fuji Electric).

6-2 Parameter Setting Tables

■ Function Selection Parameters (from Pn000)

Param-eter No.	Param-eter name	Digit No.	Name	Setting	Explanation	Default setting	Unit	Setting range	Restart power?	Set value
Pn000	Function selection basic switches	0	Reverse rotation	0	CCW direction is taken for positive command	0000	---	---	Yes	0□0□
				1	CW direction is taken for positive command					
				2 to 3	Not used.					
		1	Not used.	0	(Do not change setting.)					
		2	Unit No. setting	0 to F	Servo Driver communications unit number setting (necessary for multiple Servo Driver connections when using personal computer monitoring software)					
		3	Not used.	0	(Do not change setting.)					
Pn001	Function selection application switches 1	0	Stop selection if an alarm occurs when Servomotor is OFF	0	Servomotor stopped by dynamic brake.	0002	---	---	Yes	0□□□
				1	Dynamic brake OFF after Servomotor stopped					
				2	Servomotor stopped with free run					
		1	Stop selection when drive prohibited is input	0	Stop according to Pn001.0 setting (release Servomotor after stopping)					
				1	Stop Servomotor using torque set in Pn406, and lock Servomotor after stopping					
				2	Stop Servomotor using torque set in Pn406, and release Servomotor after stopping					
		2	AC/DC power input selection	0	AC power supply: DC power supplied from L1, L2, (L3) terminals					
				1	DC power supply: DC power from +1, – terminals					
		3	Not used.	0	(Do not change setting.)					
Pn002	Function selection application switches 2	0	Torque command input change (during speed control)	0	Do not use option command value.	0000	---	---	Yes	0□□□
				1	Use option command value 1 as the torque limit value.					
				2	Use option command value 1 as the torque feed forward command value.					
				3	Use option command value 1 or 2 as the torque limit value, according to the forward and reverse torque limits that are specified.					
		1	Speed command input change (during torque control)	0	Do not use option command value.					
				1	Use option command value 1 as the speed limit value.					
		2	Operation switch when using absolute encoder	0	Use as absolute encoder					
				1	Use as incremental encoder					
		3	Not used.	0	(Do not change setting.)					

Param- eter No.	Param- eter name	Digit No.	Name	Setting	Explanation	Default setting	Unit	Setting range	Restart power?	Set value
Pn004	Function selection application switches 4	0	Not used.	0	(Do not change setting.)	0110	---	---	Yes	011□
		1	Not used.	1	(Do not change setting.)					
		2	Not used.	1	(Do not change setting.)					
		3	Not used.	0	(Do not change setting.)					
Pn006	Function selection application switches 6	0 to 1	Analog monitor 1 (AM) signal selection	00	Servomotor rotation speed: 1V/ 1000 r/min	0002	---	---	---	0□□□
				01	Speed command: 1 V/1000 r/min					
				02	Torque command: gravity compensation torque (Pn422) (1 V per 100%)					
				03	Position deviation: 0.05 V/1 command unit					
				04	Position amp error (after electronic gear) (0.05 V per encoder pulse unit)					
				05	Position command speed (1 V/1,000 r/min)					
				06	Not used.					
				07	Not used.					
				08	Positioning completed command (Positioning completed: 5 V; positioning not completed: 0 V)					
				09	Speed feed forward (1 V/1,000 r/min)					
				0A	Torque feed forward (1 V per 100%)					
				0B to 1F	Not used.					
		2	Analog monitor 1 signal multiplier selection	0	1x					
				1	10x					
				2	100x					
				3	1/10x					
				4	1/100x					
		3	Not used.	0	(Do not change setting.)					

Parameter No.	Parameter name	Digit No.	Name	Setting	Explanation	Default setting	Unit	Setting range	Restart power?	Set value
Pn007	Function selection application switches 7	0 to 1	Analog monitor 2 (NM) signal selection	00	Servomotor rotation speed: 1V/1000 r/min	0000	---	---	---	0□□□
				01	Speed command: 1 V/1000 r/min					
				02	Torque command: gravity compensation torque (Pn422) (1 V per 100%)					
				03	Position deviation: 0.05 V/1 command unit					
				04	Position amp error (after electronic gear) (0.05 V per encoder pulse unit)					
				05	Position command speed (1 V/1,000 r/min)					
				06	Not used.					
				07	Not used.					
				08	Positioning completed command (Positioning completed: 5 V; positioning not completed: 0 V)					
				09	Speed feed forward (1 V/1,000 r/min)					
				0A	Torque feed forward (1 V per 100%)					
				0B to 1F	Not used.					
		2	Analog monitor 2 signal multiplier selection	0	1x					
				1	10x					
				2	100x					
				3	1/10x					
				4	1/100x					
		3	Not used.	0	(Do not change setting.)					
Pn008	Function selection application switches 8	0	Lowered battery voltage alarm/warning selection	0	Regard battery voltage drop as alarm (A.830).	4000	---	---	Yes	4□0□
				1	Regard battery voltage drop as warning (A.930).					
		1	Not used.	0	(Do not change setting.)					
		2	Warning detection selection	0	Warnings detected.					
				1	Warnings not detected.					
		3	Not used.	4	(Do not change setting.)					

■ Servo Gain Parameters (from Pn100)

Parameter No.	Parameter name	Explanation (See note 1.)				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation (See note 2.)					
Pn100	Speed loop gain	Adjusts speed loop response.				800	× 0.1 Hz	10 to 20000	---	
Pn101	Speed loop integration constant	Speed loop integral time constant				2000	× 0.01 ms	15 to 51200	---	
Pn102	Position loop gain	Adjusts position loop response.				400	× 0.1/s	10 to 20000	---	
Pn103	Inertia ratio	Set using the ratio between the machine system inertia and the Servomotor rotor inertia.				300	%	0 to 20000	---	
Pn104	Speed loop gain 2	Adjusts speed loop response (enabled by gain switching input).				800	× 0.1 Hz	10 to 20000	---	
Pn105	Speed loop integration constant 2	Speed loop integral time constant (enabled by gain switching input).				2000	× 0.01 ms	15 to 51200	---	
Pn106	Position loop gain 2	Adjusts position loop response (enabled by gain switching input).				400	× 0.1/s	10 to 20000	---	

Parameter No.	Parameter name	Explanation (See note 1.) Digit No.	Name	Setting	Explanation (See note 2.)	Default setting	Unit	Setting range	Restart power?	Set value
Pn107	Bias rotational speed	Sets position control bias.				0	r/min	0 to 450	---	
Pn108	Bias addition band	Sets the position control bias operation start using deviation counter pulse width.				7	Command unit	0 to 250	---	
Pn109	Feed-forward amount	Position control feed-forward compensation value				0	%	0 to 100	---	
Pn10A	Feed-forward command filter	Sets position control feed-forward command filter.				0	× 0.01 ms	0 to 6400	---	
Pn10B	Speed control settings	0	P control switching conditions	0	Sets internal torque command value conditions (Pn10C).	0004	---	---	---	0□□□
				1	Sets speed command value conditions (Pn10d).					
				2	Sets acceleration command value conditions (Pn10E)					
				3	Sets deviation pulse value conditions (Pn10F)					
				4	No P control switching function					
		1	Speed control loop switching	0	PI control				Yes	
				1	IP control					
				2 to 3	Not used.					
		2	Position loop control method	0	Standard position control					
				1	Less deviation control					
				2 to 3	Not used.					
		3	Not used.	0	(Do not change setting.)					
Pn10C	P control switching (torque command)	Sets level of torque command to switch from PI control to P control.				200	%	0 to 800	---	
Pn10D	P control switching (speed command)	Sets level of speed command to switch from PI control to P control.				0	r/min	0 to 10000	---	
Pn10E	P control switching (acceleration command)	Sets level of acceleration command to switch from PI control to P control.				0	r/min/s	0 to 30000	---	
Pn10F	P control switching (deviation pulse)	Sets level of deviation pulses to switch from PI control to P control.				10	Command unit	0 to 10000	---	
Pn110	Normal autotuning switches	0	Normal autotuning method	2	(Do not change setting.)	0012	---	---	Yes	00□□
		1	Speed feedback compensation function selection	0	ON					
				1	OFF					
				2 to 3	Not used.					
		2	Not used.	0	(Do not change setting.)					
		3	Not used.	0	(Do not change setting.)					
Pn111	Speed feedback compensating gain	Adjusts speed loop feedback gain.				100	%	1 to 500	---	
Pn119	Not used.	(Do not change setting.)				500	---	---	---	500
Pn11A	Not used.	(Do not change setting.)				1000	---	---	---	1000
Pn11E	Not used.	(Do not change setting.)				1000	---	---	---	1000

Parameter No.	Parameter name	Explanation (See note 1.)				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation (See note 2.)					
Pn11F	Position integral time constant	Position loop integral time constant				0	× 0.1 ms	0 to 50000	---	
Pn12B	Not used.	(Do not change setting.)				400	---	---	---	400
Pn12C	Not used.	(Do not change setting.)				2000	---	---	---	2000
Pn12D	Not used.	(Do not change setting.)				400	---	---	---	400
Pn12E	Not used.	(Do not change setting.)				400	---	---	---	400
Pn12F	Not used.	(Do not change setting.)				2000	---	---	---	2000
Pn130	Not used.	(Do not change setting.)				400	---	---	---	400
Pn131	Gain switching time 1	Switching time from No. 1 gain to No. 2 gain				0	ms	0 to 65535	---	
Pn132	Gain switching time 2	Switching time from No. 2 gain to No. 1 gain				0	ms	0 to 65535	---	
Pn135	Gain switching waiting time 1	The time from when gain switching condition A is satisfied until switching from the No. 1 gain to the No. 2 gain begins.				0	ms	0 to 65535	---	
Pn136	Gain switching waiting time 2	The time from when gain switching condition B is satisfied until switching from the No. 2 gain to the No. 1 gain begins.				0	ms	0 to 65535	---	
Pn139	Automatic gain changeover related switches 1	0	Gain switching selection switch	0	Manual gain switching	0000	---	---	Yes	0□□□
				1	Automatic switching pattern 1 Automatic switching from No. 1 gain to No. 2 gain when gain switching condition A is satisfied. Automatic switching from No. 2 gain to No. 1 gain when gain switching condition B is satisfied.					
				2 to 4	Not used.					
		1	Gain switching condition A	0	Positioning completed output 1 (INP1) ON					
				1	Positioning completed output 1 (INP1) OFF					
				2	Positioning completed output 2 (INP2) ON					
				3	Positioning completed output 2 (INP2) OFF					
				4	The position command filter output is 0, and also the position command input is 0.					
				5	The position command input is not 0.					
		2	Gain switching condition B	0 to 5	Same as above.					
		3	Not used.	0	(Do not change setting.)					
Pn144	Not used.	(Do not change setting.)				1000	---	---	---	1000
Pn150	Predictive control selection switches	0	Predictive control selection	0	Predictive control not used.	0210	---	---	Yes	02□□
				1	Predictive control used.					
				2	Not used. (Do not change setting.)					
		1	Predictive control type	0	Predictive control for tracking					
				1	Predictive control for positioning					
		2	Not used.	2	(Do not change setting.)					
		3	Not used.	0	(Do not change setting.)					

Param-eter No.	Parameter name	Explanation (See note 1.)				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation (See note 2.)					
Pn151	Predictive control accelera-tion/deceler-ation gain	Adjusts acceleration and deceleration response for predic-tive control.				100	%	0 to 300	---	
Pn152	Predictive control weighting ratio	Adjusts position deviation for predictive control.				100	%	0 to 300	---	
Pn1A0	Servo rigid-ity	Adjusts the Servo rigidity for the No. 1 gain.				60	%	1 to 500	---	
Pn1A1	Servo rigid-ity 2	Adjusts the Servo rigidity for the No. 2 gain.				60	%	1 to 500	---	
Pn1A2	Speed feed-back filter time con-stant	Sets the filter time constant for No. 1 gain speed feedback.				72	× 0.01 ms	30 to 3200	---	
Pn1A3	Speed feed-back filter time con-stant 2	Sets the filter time constant for No. 2 gain speed feedback.				72	× 0.01 ms	30 to 3200	---	
Pn1A4	Torque com-mand filter time con-stant 2	Sets the filter time constant for the torque command.				36	× 0.01 ms	0 to 2500	---	
Pn1A7	Utility con-trol switches	0	Integral com-pensation processing	0	Integral compensation pro-cessing not executed.	1121	---	---	---	112□
				1	Integral compensation pro-cessing executed.					
				2	Integral compensation is executed for No. 1 gain and not for No. 2 gain for less-deviation gain switch-ing.					
				3	Integral compensation is executed for No. 2 gain and not for No. 1 gain for less-deviation gain switch-ing.					
		1	Not used.	2	(Do not change setting.)					
		2	Not used.	1	(Do not change setting.)					
		3	Not used.	1	(Do not change setting.)					
Pn1A9	Utility inte-gral gain	Adjusts the auxiliary integral response.				37	Hz	0 to 500	---	
Pn1AA	Position pro-portional gain	Adjusts the position proportional response.				60	Hz	0 to 500	---	
Pn1AB	Speed inte-gral gain	Adjusts the speed integral response.				0	Hz	0 to 500	---	
Pn1AC	Speed pro-portional gain	Adjusts the speed proportional response.				120	Hz	0 to 2000	---	
Pn1B5	Not used.	(Do not change setting.)				150	---	---	---	150

■ Position Control Parameters (from Pn200)

Parameter No.	Parameter name	Explanation: Digit No.	Explanation: Name	Explanation: Setting	Explanation: Explanation	Default setting	Unit	Setting range	Restart power?	Set value
Pn200	Not used.	0	Not used.	0	(Do not change setting.)	0100	---	---	Yes	0100
		1	Not used.	0	(Do not change setting.)					
		2	Not used.	1	(Do not change setting.)					
		3	Not used.	0	(Do not change setting.)					
Pn205	Absolute encoder multi-turn limit setting	Sets the multi-turn limit for when a Servomotor with an absolute encoder is used.				65535	Rotation	0 to 65535	Yes	
Pn207	Position control settings 2	0	Not used.	0	(Do not change setting.)	0010	---	---	Yes	□□10
		1	Not used.	1	(Do not change setting.)					
		2	Backlash compensation selection	0	Disabled					
				1	Compensates to forward rotation side.					
				2	Compensates to reverse rotation side.					
		3	INP 1 output timing	0	When the position deviation is below the INP1 range.					
				1	When the position deviation is below the INP1 range and also the command after the position command filter is 0.					
				2	When the absolute value for the position deviation is below the INP1 range (Pn522) and also the position command input is 0.					
Pn209	Not used.	(Do not change setting.)				0	---	---	---	0
Pn20A	Not used.	(Do not change setting.)				32768	---	---	Yes	32768
Pn20E	Electronic gear ratio G1 (numerator)	Sets the pulse rate for the command pulses and Servo Servomotor travel distance. 0.001 ≤ Pn20E/Pn210 ≤ 1000				4	---	1 to 1073741824	Yes	
Pn210	Electronic gear ratio G2 (denominator)					1	---	1 to 1073741824	Yes	
Pn212	Encoder divider rate	Sets the number of output pulses per Servomotor rotation.				1000	Pulses/ rotation	16 to 1073741824	Yes	
Pn214	Backlash compensation amount	Mechanical system backlash amount (the mechanical gap between the drive shaft and the shaft being driven)				0	Command unit	–32767 to 32767	---	
Pn215	Backlash compensation time constant	Sets the backlash compensation time constant.				0	× 0.01 ms	0 to 65535	---	
Pn216	Not used.	(Do not change setting.)				0	---	---	---	0
Pn217	Not used.	(Do not change setting.)				0	---	---	---	0
Pn281	Not used.	(Do not change setting.)				20	---	---	Yes	20

■ Speed Control Parameters (from Pn300)

Param-eter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation					
Pn300	Not used.	(Do not change setting.)				600	---	---	---	600
Pn301	Not used.	(Do not change setting.)				100	---	---	---	100
Pn302	Not used.	(Do not change setting.)				200	---	---	---	200
Pn303	Not used.	(Do not change setting.)				300	---	---	---	300
Pn304	Jog speed	Sets rotation speed during jog operation.				500	r/min	0 to 10000	---	
Pn305	Soft start acceleration time	Sets acceleration time during speed control soft start.				0	ms	0 to 10000	---	
Pn306	Soft start deceleration time	Sets deceleration time during speed control soft start.				0	ms	0 to 10000	---	
Pn307	Not used.	(Do not change setting.)				40	---	---	---	40
Pn308	Speed feedback filter time constant	Sets constant during filter of speed feedback.				0	× 0.01 ms	0 to 65535	---	
Pn310	Vibration detection switches	0	Vibration detection selection	0	Vibration detection not used.	0000	---	---	---	000☐
				1	Gives warning (A.911) when vibration is detected.					
				2	Gives warning (A.520) when vibration is detected.					
		1	Not used.	0	(Do not change setting.)					
		2	Not used.	0	(Do not change setting.)					
		3	Not used.	0	(Do not change setting.)					
Pn311	Vibration detection sensitivity	Sets the vibration detection sensitivity.				100	%	50 to 500	---	
Pn312	Vibration detection level	Sets the vibration detection level				50	r/min	0 to 5000	---	

■ Torque Control Parameters (from Pn400)

Param-eter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation					
Pn400	Not used.	(Do not change setting.)				30	---	---	---	30
Pn401	1st step 1st torque command filter time constant	Sets the filter time constant for internal torque commands.				40	× 0.01 ms	0 to 65535	---	
Pn402	Forward torque limit	Forward rotation output torque limit (rated torque ratio).				350	%	0 to 800	---	
Pn403	Reverse torque limit	Reverse rotation output torque limit (rated torque ratio).				350	%	0 to 800	---	
Pn404	Forward rotation external current limit	Output torque limit during input of forward rotation current limit (rated torque ratio)				100	%	0 to 800	---	
Pn405	Reverse rotation external current limit	Output torque limit during input of reverse rotation current limit (rated torque ratio)				100	%	0 to 800	---	
Pn406	Emergency stop torque	Deceleration torque when an error occurs (rated torque ratio)				350	%	0 to 800	---	

Param-eter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation					
Pn407	Speed limit	Sets the speed limit in torque control mode.				3000	r/min	0 to 10000	---	
Pn408	Torque command setting	0	Selects notch filter 1 function.	0	Notch filter 1 not used.	0000	---	---	---	0□0□
				1	Notch filter 1 used for torque commands.					
		1	Not used.	0	(Do not change setting.)					
		2	Selects notch filter 2 function.	0	Notch filter 2 not used.					
				1	Notch filter 2 used for torque commands.					
		3	Not used.	0	(Do not change setting.)					
Pn409	Notch filter 1 frequency	Sets notch filter 1 frequency for torque command.				2000	Hz	50 to 2000	---	
Pn40A	Notch filter 1 Q value	Sets Q value of notch filter 1.				70	× 0.01	50 to 1000	---	
Pn40C	Notch filter 2 frequency	Sets the notch filter 2 frequency for torque commands.				2000	Hz	50 to 2000	---	
Pn40D	Notch filter 2 Q value	Sets Q value of notch filter 2.				70	× 0.01	50 to 1000	---	
Pn40F	2nd step 2nd torque command filter frequency	Sets the filter frequency for internal torque commands.				2000	Hz	100 to 2000	---	
Pn410	2nd step 2nd torque command filter Q value	Sets the torque command filter Q value.				70	× 0.01	50 to 1000	---	
Pn411	3rd step torque command filter time constant	Sets the filter time constant for internal torque commands.				0	µs	0 to 65535	---	
Pn412	1st step 2nd torque command filter time constant	Sets the filter time constant for No. 2 gain internal torque commands.				100	× 0.01 ms	0 to 65535	---	
Pn413	Not used.	(Do not change setting.)				100	---	---	---	100
Pn414	Not used.	(Do not change setting.)				100	---	---	---	100
Pn420	Damping for vibration suppression on stopping	Sets the vibration suppression value while stopped.				100	%	10 to 100	---	
Pn421	Vibration suppression starting time	Sets the time from when the position command becomes 0 until the stopped vibration suppression begins.				1000	ms	0 to 65535	---	
Pn422	Gravity compensation torque	Sets the gravity compensation torque.				0	× 0.01%	–20000 to 20000	---	
Pn456	Sweep torque command amplitude	Sets the sweep torque command amplitude.				15	%	1 to 800	---	

■ Sequence Parameters (from Pn500)

Param- eter No.	Parame- ter name	Explanation				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation					
Pn501	Not used.	(Do not change setting.)				10	---	---	---	10
Pn502	Rotation speed for motor rotation detection	Sets the number of rotations for the Servomotor rotation detection output (TGON).				20	r/min	1 to 10000	---	
Pn503	Speed confor- mity sig- nal output width	Sets the allowable fluctuation (number of rotations) for the speed conformity output (VCMP).				10	r/min	0 to 100	---	
Pn506	Brake tim- ing 1	Sets the delay from the brake command to the Servomo- tor turning OFF.				0	× 10 ms	0 to 50	---	
Pn507	Brake command speed	Sets the number of rotations for outputting the brake com- mand.				100	r/min	0 to 10000	---	
Pn508	Brake tim- ing 2	Sets the delay time from the Servomotor turning OFF to the brake command output.				50	× 10 ms	10 to 100	---	
Pn509	Momen- tary hold time	Sets the time during which alarm detection is disabled when a power failure occurs.				20	ms	20 to 1000	---	
Pn50A	Input sig- nal selec- tions 1	0	Not used.	1	(Do not change setting.)	1881	---	---	Yes	☐881
		1	Not used.	8	(Do not change setting.)					
		2	Not used.	8	(Do not change setting.)					
		3	POT (for- ward drive prohibited input) sig- nal Input terminal allocation	0	Allocated to CN1, pin 13: Valid for low input					
				1	Allocated to CN1, pin 7: Valid for low input					
				2	Allocated to CN1, pin 8: Valid for low input					
				3	Allocated to CN1, pin 9: Valid for low input					
				4	Allocated to CN1, pin 10: Valid for low input					
				5	Allocated to CN1, pin 11: Valid for low input					
				6	Allocated to CN1, pin 12: Valid for low input					
				7	Always enabled.					
				8	Always disabled.					
				9	Allocated to CN1, pin 13: Valid for high input					
				A	Allocated to CN1, pin 7: Valid for high input					
				B	Allocated to CN1, pin 8: Valid for high input					
				C	Allocated to CN1, pin 9: Valid for high input					
				D	Allocated to CN1, pin 10: Valid for high input					
				E	Allocated to CN1, pin 11: Valid for high input					
				F	Allocated to CN1, pin 12: Valid for high input					

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation					
Pn50B	Input signal selections 2	0	NOT (reverse drive prohibited input) signal Input terminal allocation	0 to F	Same as Pn50A.3. NOT (reverse drive prohibited) signal allocation	8882	---	---	Yes	888□
		1	Not used.	8	(Do not change setting.)					
		2	Not used.	8	(Do not change setting.)					
		3	Not used.	8	(Do not change setting.)					
Pn50C	Input signal selections 3	0	Not used.	8	(Do not change setting.)	8888	---	---	Yes	8888
		1	Not used.	8	(Do not change setting.)					
		2	Not used.	8	(Do not change setting.)					
		3	Not used.	8	(Do not change setting.)					
Pn50D	Input signal selections 4	0	Not used.	8	(Do not change setting.)	8888	---	---	Yes	8888
		1	Not used.	8	(Do not change setting.)					
		2	Not used.	8	(Do not change setting.)					
		3	Not used.	8	(Do not change setting.)					
Pn50E	Output signal selections 1	0	INP1 (positioning completed 1) signal output terminal allocation	0	Not used.	0000	---	---	Yes	□□□□
				1	Allocated to CN1 pins 1, 2					
				2	Allocated to CN1 pins 23, 24					
				3	Allocated to CN1 pins 25, 26					
		1	VCMP (speed conformity) signal output terminal allocation	0 to 3	Same as Pn50E.0. VCMP (speed coincidence) signal allocation					
		2	TGON (servomotor rotation detection) signal output terminal allocation	0 to 3	Same as Pn50E.0. TGON (Servomotor rotation detection) signal allocation					
		3	READY (servo ready) signal output terminal allocation	0 to 3	Same as Pn50E.0. READY (servo ready) signal allocation					
Pn50F	Output signal selections 2	0	CLIMT (current limit detection) signal output terminal allocation	0 to 3	Same as Pn50E.0. CLIMT (current limit detection) signal allocation	0100	---	---	Yes	□□□□
		1	VLIMT (speed limit detection) signal output terminal allocation	0 to 3	Same as Pn50E.0. VLIMT (speed limit detection) signal allocation					
		2	BKIR (brake interlock) signal output terminal allocation	0 to 3	Same as Pn50E.0. BKIR (brake interlock) signal allocation.					
		3	WARN (warning) signal output terminal allocation	0 to 3	Same as Pn50E.0. WARN (warning) signal allocation					

Param-eter No.	Parame-ter name	Explanation				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation					
Pn510	Output signal selec-tions 3	0	INP2 (posi-tioning com-pleted 2) signal out-put terminal allocation	0 to 3	Same as Pn50E.0. INP2 (positioning com-pleted 2) signal alloca-tion	0000	---	---	Yes	000☐
		1	Not used.	0	(Do not change setting.)					
		2	Not used.	0	(Do not change setting.)					
		3	Not used.	0	(Do not change setting.)					

Param-eter No.	Parame-ter name	Explanation				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation					
Pn511	Input sig-nal selec-tions 5	0	DEC signal input termi-nal alloca-tion	0	Allocated to CN1, pin 13: Valid for low input	6543	---	---	Yes	□□□□
				1	Allocated to CN1, pin 7: Valid for low input					
				2	Allocated to CN1, pin 8: Valid for low input					
				3	Allocated to CN1, pin 9: Valid for low input					
				4	Allocated to CN1, pin 10: Valid for low input					
				5	Allocated to CN1, pin 11: Valid for low input					
				6	Allocated to CN1, pin 12: Valid for low input					
				7	Always enabled.					
				8	Always disabled.					
				9	Allocated to CN1, pin 13: Valid for high input					
				A	Allocated to CN1, pin 7: Valid for high input					
				B	Allocated to CN1, pin 8: Valid for high input					
				C	Allocated to CN1, pin 9: Valid for high input					
				D	Allocated to CN1, pin 10: Valid for high input					
				E	Allocated to CN1, pin 11: Valid for high input					
				F	Allocated to CN1, pin 12: Valid for high input					
		1	EXT1 sig-nal input ter-minal allocation	0 to 3	Always disabled.					
				4	Allocated to CN1, pin 10: Valid for low input					
				5	Allocated to CN1, pin 11: Valid for low input					
				6	Allocated to CN1, pin 12: Valid for low input					
				7	Always enabled.					
				8	Always disabled.					
				9 to C	Always disabled.					
				D	Allocated to CN1, pin 10: Valid for high input					
				E	Allocated to CN1, pin 11: Valid for high input					
				F	Allocated to CN1, pin 12: Valid for high input					
		2	EXT2 sig-nal input ter-minal allocation	0 to F	Same as for Pn511.1. EXT2 signal allocation					
		3	EXT3 sig-nal input ter-minal allocation	0 to F	Same as for Pn511.1. EXT3 signal allocation					

Parameter No.	Parameter name	Explanation: Digit No.	Explanation: Name	Explanation: Setting	Explanation: Explanation	Default setting	Unit	Setting range	Restart power?	Set value
Pn512	Output signal reverse	0	Output signal reverse for CN1 pins 1, 2	0	Not reversed.	0000	---	---	Yes	0□□□
				1	Reversed.					
		1	Output signal reverse for CN1 pins 23, 24	0	Not reversed.					
				1	Reversed.					
		2	Output signal reverse for CN1 pins 25, 26	0	Not reversed.					
				1	Reversed.					
		3	Not used.	0	(Do not change setting.)					
Pn513	Not used.	(Do not change setting.)				0321	---	---	Yes	0321
Pn515	Not used.	(Do not change setting.)				8888	---	---	Yes	8888
Pn51B	Not used.	(Do not change setting.)				1000	---	---	---	1000
Pn51E	Deviation counter overflow warning level	Sets the detection level for the deviation counter overflow warning. (A warning is output for Pn520 × Pn51E/100 or higher.)				100	%	10 to 100	---	
Pn520	Deviation counter overflow level	Sets the deviation counter overflow alarm detection level. Pn520 ≥ (Max. feed speed [command unit/s]/Pn102) × 2.0				262144	Command unit	1 to 1073741823	---	
Pn522	Positioning completed range 1	Setting range for positioning completed range 1 (INP1)				3	Command unit	0 to 1073741824	---	
Pn524	Positioning completed range 2	Setting range for positioning completed range 2 (INP2)				3	Command unit	1 to 1073741824	---	
Pn526	Deviation counter overflow level at Servo-ON	Sets the deviation counter overflow alarm detection level for Servo ON.				262144	Command unit	1 to 1073741823	---	
Pn528	Deviation counter overflow warning level at Servo-ON	Sets the deviation counter overflow warning detection level for Servo ON.				100	%	10 to 100	---	
Pn529	Speed limit level at Servo-ON	Sets the speed limit for when the Servo turns ON with position deviation accumulated.				10000	r/min	0 to 10000	---	
Pn52A	Not used.	(Do not change setting.)				20	---	---	---	20
Pn52F	Not used.	(Do not change setting.)				FFF	---	---	---	FFF

Parameter No.	Parameter name	Explanation: Digit No.	Explanation: Name	Explanation: Setting	Explanation: Explanation	Default setting	Unit	Setting range	Restart power?	Set value
Pn530	Program JOG operation related switches	0	Program JOG operating pattern	0	(Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536	0000	---	---	---	000□
				1	(Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536					
				2	(Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536 (Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536					
				3	(Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536 (Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536					
				4	(Waiting time Pn535 → Forward movement Pn531 → Waiting time Pn535 → Reverse movement Pn531) × Number of movement operations Pn536					
				5	(Waiting time Pn535 → Reverse movement Pn531 → Waiting time Pn535 → Forward movement Pn531) × Number of movement operations Pn536					
		1	Not used.	0	(Do not change setting.)					
		2	Not used.	0	(Do not change setting.)					
		3	Not used.	0	(Do not change setting.)					
Pn531	Program JOG movement distance	Sets the program JOG movement distance.				32768	Command unit	1 to 1073741823	---	
Pn533	Program JOG movement speed	Sets the program JOG operation movement speed.				500	r/min	1 to 10000	---	
Pn534	Program JOG acceleration/deceleration time	Sets the acceleration/deceleration time for program JOG operation.				100	ms	2 to 10000	---	

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation					
Pn535	Program JOG waiting time	Sets the delay time from the program JOG operation start input until operation starts.				100	ms	0 to 10000	---	
Pn536	Number of program JOG movement	Sets the number of repetitions of the program JOG operations.				1	Times	1 to 1000	---	
Pn540	Gain limit	Sets the gain limit.				2000	× 0.1 Hz	10 to 2000	---	
Pn550	Analog monitor 1 offset voltage	Sets the analog monitor 1 offset voltage.				0	× 0.1 V	–10000 to 10000	---	
Pn551	Analog monitor 2 offset voltage	Sets the analog monitor 2 offset voltage.				0	× 0.1 V	–10000 to 10000	---	

■ Other Parameters (from 600)

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation					
Pn600	Regeneration resistor capacity (See note 1.)	Setting for regeneration resistance load ratio monitoring calculations				0	× 10 W	0 to (varies by model) (See note 2.)	---	
Pn800	Communications control	0	MECHATROLINK-II communications check mask	0	Normal	0040	---	---	---	0□□□
				1	Ignore communications errors (A.E6□).					
				2	Ignore WDT errors (A.E5□).					
				3	Ignore communications errors (A.E6□) and WDT errors (A.E5□).					
		1	Warning check mask	0	Normal					
				1	Ignore data setting warning (A. 94□).					
				2	Ignore command warning (A. 95□).					
				3	Ignore A.94□ and A.95□.					
				4	Ignore communications warning (A. 96□).					
				5	Ignore A.94□ and A.96□.					
				6	Ignore A.95□ and A.96□.					
				7	Ignore A.94□, A.95□ and A.96□.					
		2	Communications error count at single transmission	0 to F	Detects communications errors (A.E60) if errors occur consecutively for the set value plus two times.					
		3	Not used.	0	(Do not change setting.)					

<table>
<tr><th rowspan="2">Param-eter No.</th><th rowspan="2">Parame-ter name</th><th colspan="4">Explanation</th><th rowspan="2">Default setting</th><th rowspan="2">Unit</th><th rowspan="2">Setting range</th><th rowspan="2">Restart power?</th><th rowspan="2">Set value</th></tr>
<tr><th>Digit No.</th><th>Name</th><th>Setting</th><th>Explanation</th></tr>
<tr><td rowspan="9">Pn801</td><td rowspan="9">Function selection applica-tion 6 (software LS)</td><td rowspan="4">0</td><td rowspan="4">Software limit function</td><td>0</td><td>Software limit enabled.</td><td rowspan="9">0003</td><td rowspan="9">---</td><td rowspan="9">---</td><td rowspan="9">---</td><td rowspan="9">0□0□</td></tr>
<tr><td>1</td><td>Forward software limit disabled.</td></tr>
<tr><td>2</td><td>Reverse software limit disabled.</td></tr>
<tr><td>3</td><td>Forward/reverse soft-ware limits disabled.</td></tr>
<tr><td>1</td><td>Not used.</td><td>0</td><td>(Do not change setting.)</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Software limit check using refer-ence</td><td>0</td><td>No software limit check using reference</td></tr>
<tr><td>1</td><td>Software limit check using reference</td></tr>
<tr><td>3</td><td>Not used.</td><td>0</td><td>(Do not change setting.)</td></tr>
<tr><td>Pn802</td><td>Not used.</td><td colspan="4">(Do not change setting.)</td><td>0000</td><td>---</td><td>---</td><td>---</td><td></td></tr>
<tr><td>Pn803</td><td>Zero point width</td><td colspan="4">Sets the origin position detection range.</td><td>10</td><td>Command unit</td><td>0 to 250</td><td>---</td><td></td></tr>
<tr><td>Pn804</td><td>Forward software limit</td><td colspan="4">Sets the software limit for the positive direction.
Note: Pn806 must be set lower than Pn804.</td><td>8191 91808</td><td>Command unit</td><td>–1073741823 to 1073741823</td><td>---</td><td></td></tr>
<tr><td>Pn806</td><td>Reverse software limit</td><td colspan="4">Sets the software limit for the negative direction.
Note: Pn806 must be set lower than Pn804.</td><td>–8191 91808</td><td>Command unit</td><td>–1073741823 to 1073741823</td><td>---</td><td></td></tr>
<tr><td>Pn808</td><td>Absolute encoder zero point position offset</td><td colspan="4">Sets the encoder position and machine coordinate sys-tem offsets for when an absolute encoder is used.</td><td>0</td><td>Command unit</td><td>–1073741823 to 1073741823</td><td>---</td><td></td></tr>
<tr><td>Pn80A</td><td>First step linear accelera-tion parameter</td><td colspan="4">Sets the step 1 acceleration for when two-step accelera-tion is used.</td><td>100</td><td>× 10000 Command unit/s²</td><td>1 to 65535</td><td>---</td><td></td></tr>
<tr><td>Pn80B</td><td>Second step lin-ear accel-eration parameter</td><td colspan="4">Sets the step 2 acceleration for when two-step accelera-tion is executed, or the one-step acceleration parameter for when one-step acceleration is executed.</td><td>100</td><td>× 10000 Command unit/s²</td><td>1 to 65535</td><td>---</td><td></td></tr>
<tr><td>Pn80C</td><td>Accelera-tion parame-ter switch-ing speed</td><td colspan="4">Sets the switching speed for the step 1 and step 2 accel-eration when two-step acceleration is executed.
Note: When used as one-step acceleration, 0 must be set.</td><td>0</td><td>× 100 Command unit/s</td><td>0 to 65535</td><td>---</td><td></td></tr>
<tr><td>Pn80D</td><td>First step linear decelera-tion parameter</td><td colspan="4">Sets the step 1 deceleration for when two-step decelera-tion is used.</td><td>100</td><td>× 10000 Command unit/s²</td><td>1 to 65535</td><td>---</td><td></td></tr>
<tr><td>Pn80E</td><td>Second step lin-ear decel-eration parameter</td><td colspan="4">Sets the step 2 deceleration for when two-step decelera-tion is executed, or the one-step deceleration parameter for when one-step deceleration is executed.</td><td>100</td><td>× 10000 Command unit/s²</td><td>1 to 65535</td><td>---</td><td></td></tr>
<tr><td>Pn80F</td><td>Decelera-tion parame-ter switch-ing speed</td><td colspan="4">Sets the switching speed for the step 1 and step 2 decel-eration when two-step deceleration is executed.
Note: When used as one-step acceleration, 0 must be set.</td><td>0</td><td>× 100 Command unit/s</td><td>0 to 65535</td><td>---</td><td></td></tr>
<tr><td>Pn810</td><td>Exponen-tial accel-eration/ decelera-tion bias</td><td colspan="4">Sets the bias for when an exponential filter is used for the position command filter.</td><td>0</td><td>Command unit/s</td><td>0 to 32767</td><td>---</td><td></td></tr>
</table>

Parameter No.	Parameter name	Explanation				Default setting	Unit	Setting range	Restart power?	Set value
		Digit No.	Name	Setting	Explanation					
Pn811	Exponential acceleration/deceleration time constant	Sets the time constant for when an exponential filter is used for the position command filter.				0	× 0.1 ms	0 to 5100	---	
Pn812	Moving average time	Sets the moving average time for when S-curve acceleration/deceleration is used, and an average movement filter is used for the position command filter.				0	× 0.1 ms	0 to 5100	---	
Pn813	Not used.	(Do not change setting.)				0	---	---	---	0
Pn814	Final travel distance for external positioning	Sets the distance from the external signal input position when external positioning is executed. **Note:** For a negative direction or if the distance is short, operation is reversed after decelerating to a stop.				100	Command unit	–1073741823 to 1073741823	---	
Pn816	Zero point return mode settings	0	Zero point return direction	0	Forward direction	0000	---	---	---	000□
				1	Reverse direction					
		1	Not used.	0	(Do not change setting.)					
		2	Not used.	0	(Do not change setting.)					
		3	Not used.	0	(Do not change setting.)					
Pn817	Zero point return approach speed 1	Sets the origin search speed after the deceleration limit switch signal turns ON.				50	× 100 Command unit/s	0 to 65535	---	
Pn818	Zero point return approach speed 2	Sets the origin search speed after the deceleration limit switch signal turns ON.				5	× 100 Command unit/s	0 to 65535	---	
Pn819	Final travel distance to return to zero point	Sets the distance from the latch signal input position to the origin, for when origin search is executed. **Note:** If the final travel distance is in the opposite direction from the origin return direction or if the distance is short, operation is reversed after decelerating to a stop.				100	Command unit	–1073741823 to 1073741823	---	
Pn81B	Not used.	(Do not change setting.)				0	---	---	---	0
Pn81C	Not used.	(Do not change setting.)				0	---	---	---	0
Pn81D	Not used.	(Do not change setting.)				0	---	---	---	0
Pn81E	Not used.	(Do not change setting.)				0000	---	---	---	0000
Pn81F	Not used.	(Do not change setting.)				0	---	---	---	0
Pn820	Not used.	(Do not change setting.)				0	---	---	---	0
Pn822	Not used.	(Do not change setting.)				0	---	---	---	0
Pn824	Not used.	(Do not change setting.)				0000	---	---	---	0000
Pn825	Not used.	(Do not change setting.)				0000	---	---	---	0000
Pn900 to Pn910	Not used.	(Do not change setting.)					---	---	---	
Pn920 to Pn95F	Not used.	(Do not change setting.)					---	---	---	

Note 1. The normal setting is 0. If an external regeneration resistor is used, refer to *3-3-3 Regenerative Energy Absorption by External Regeneration Resistance* for the recommended setting.

Note 2. The upper limit is the maximum output capacity (W) of the Servo Driver.

6-3 Restrictions

This section describes the restrictions for the following functions of the Computer Monitor Software. If these restrictions are violated, a COM2 alarm (A.E02) may occur.

1. Advanced auto-tuning
2. Online vibration monitor
3. Easy FFT
4. Tracing

Functions that cannot be used together with the above functions are listed in the following table. Use the default settings for any functions that cannot be used together with the above functions.

Function	Pn number	Advanced auto-tuning		Online vibration monitor	Easy FFT	Tracing
		Mode 0: With inertia	Mode 1: Without inertia			
Commands via MECHATROLINK-II		---	---	OK	---	OK
Jogging		---	---	---	---	---
Speed feed forward compensation	Pn110.1	No	OK	No	No	No
Less-deviation control	Pn10B.2	---	---	No	No	No
Predictive control	Pn150.0	---	---	OK	OK	OK
Automatic gain switching	Pn139.0	No	OK	No	No	OK
Backlash compensation	Pn207.2	No	OK	No	No	OK
Vibration detection	Pn310.0	No	OK	No	No	OK
Notch filter 1	Pn408.0	OK	OK	OK	OK	OK
Notch filter 2	Pn408.2	No	OK	No	No	OK
Damping for vibration suppression on stopping	Pn420 Pn421	No	OK	No	No	OK

OK: Can be used together, No: Cannot be used together, ---: Not used together.

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R

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T

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.

Cat. No. I544-E1-06

Revision code

The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
01	November 2004	Original production
02	November 2006	**Page 2-34:** Graphics replaced, diagram numbers added, and dimensions D1, D4, D5, D6, E2, and F changed/added. **Pages 2-38 and 2-39:** Graphics replaced/added, diagram numbers added, and dimensions LM, D1, D4, D6, E2, and F changed/added. **Page 2-44:** Dimensions LM changed from 110 to 97.5 for 750 W model. **Pages 2-45, 2-62, 3-11, and 3-12:** Graphics corrected. **Pages 2-84 and 2-85:** Specifications changed from 50 W through 750 W models. **Page 2-86:** Specifications changed in top table. **Pages 2-88 and 2-89:** Weights and reduction gear inertia changed for 750 W models. **Page 4-10:** Settings changed for Pn110. **Page 4-38:** Last paragraph deleted from Pn103. **Pages 4-38 and 4-38:** Description of Pn106 changed. **Pages 4-41, 4-43, 4-44, 4-55, 4-56, 4-109, and 4-111:** Notes deleted. **Pages 4-42 and 4-43:** Material deleted. **Page 4-46:** Paragraph below graphic changed. **Pages 4-81 and 4-82:** “Power supply” changed to “main circuit power supply” in timing charts. **Page 4-90:** Last paragraph removed. **Page 4-97:** Section 4-6-1 changed. **Page 4-98:** Second paragraph removed. **Page 4-110:** Item 1 at top of page changed. **Page 4-118:** Parameter numbers removed at top of flowchart. **Page 4-121:** Flowchart changed. **Page 4-122:** Lists changed. **Page 5-22:** Part of description of A.S21 deleted. **Page 5-30:** Part of description of A.d01 deleted. **Page 5-31:** Countermeasure for A.d02 deleted, material added for A.E00, and countermeasure for A.Ed0 deleted. **Page 5-39:** “When auto-tuning is used” and “when auto-tuning is not used” deleted in two places each. **Page 6-6:** Description of Pn110 changed.

Revision code	Date	Revised content
03	March 2007	**Back of front cover:** Added general precautionary information above NOTICE. **Under *Warning Labels* at front of manual:** Added precautionary information about battery disposal. **Page 2-3:** Changed table titles and modified power cable capacity. **Page 2-4:** Added specifications for robot cables. **Pages 2-26 and 2-27:** Changed Servomotor capacities and added new models to the headings. **Pages 2-60 and 2-66:** Modified signal name WARN and changed OFF to ON in the description. **Page 2-66:** Changed cable plug model number. **Pages 2-71, 2-72, 2-76, 2-78, and 2-81:** Changed specifications for applicable load inertia. **Pages 2-73 and 2-76:** Changed note 6. **Pages 2-79 and 2-82:** Added note 6. **Pages 2-92:** Added information on Servo Driver cables, Connector-Terminal Block Conversion Units, and motor cable specifications. **Pages 2-93, 2-94, and 2-95:** Modified the header levels and changed connector plug model number and connector socket model number. **Page 2-102:** Added robot cable specifications. **Page 2-104:** Changed connector plug model number. **Page 3-8:** Modified the servo system configuration. **Page 3-9:** Changed Servomotor capacity in the bottom table. **Page 3-10:** Changed Servomotor capacity in the top table and added information on robot cables. **Pages 3-11, 3-12, 3-13, and 3-18:** Changed grounding indication in the figure. **Page 3-14:** Changed description for frame ground at the bottom of the table. **Page 3-20:** Added a table for selecting non-fuse breakers to the top of the page. **Pages 3-22 and 3-32:** Modified the table under surge suppressors. **Page 4-5:** Added “Status Display (Bit Data)” at the bottom of the page. **Page 4-6:** Changed the paragraph and figure at the top of the page. **Pages 4-7 and 6-3:** Changed the explanation for reverse rotation setting 1. **Page 4-29:** Deleted a paragraph about WARN. **Page 4-62:** Added a paragraph under Pn520. **Page 5-6:** Modified signal name WARN. **Page 5-36:** Added a row for A.960 to the bottom of the table. **Pages 5-43 and 5-44:** Modified description and notes below the chart. **Pages 6-2:** Added a power cable model and an encoder model in the figure.
04	February 2008	***Warning Labels* page in front matter:** Replaced figure at bottom of page. **Page 2-72:** Removed “protective structure” from table, removed note 2, and added material on protective structure. **Page 2-95:** Changed bottom figure. **Page 2-99:** Reversed “X1” and XB” in figure. **Page 2-111:** Corrected model number on left of second figure. **Page 2-123:** Added information on manufacturing code. **Page 2-124:** Corrected bottom figure. **Pages 3-21 to 3-26:** Removed material. **Pages 3-33 and 3-35:** Replaced section on leakage breakers. **Page 4-24:** Added notes. **Page 4-57:** Rewrote note. **Pages 4-63, 4-68, 4-73, 5-10, and 5-35:** Added information on using CJ1W-NCF71 and CS1W-NCF71. **Page 5-43:** Changed text below graph.
05	March 2009	Added a new section 2-10 on MECHATROLINK-II Repeater specifications. Corrected mistakes and added information.

Revision code	Date	Revised content
06	December 2010	**Page 2-62:** Description added to the contents for TGONCOM. **Page 2-67:** Description added below the note for Motor Rotation Detection Output. **Page 3-37:** Information on Pn600 settings added below the note. **Page 4-24:** Note 1 modified. **Pages 5-38 and 5-41:** Wiring distance changed from 20 m to 50 m in the items to check column. **Page 6-20:** Notes added below the table.

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