

BS Servo V Series

Engineering

Handbook

Amplifier

Introduction

We greatly thank for your purchasing a B5 Servo V Series product. This manual describes how to operate the product, main features of the product, and considerations for safety.

Careless or erroneous operation of the product may cause failure of the product or serious injury or loss. Please read well this manual "Engineering Handbook - Amplifier" before using the product.

Special Remarks

Please keep this manual at a handy place so that it is easily available to anyone who may operate the product.

Safety Considerations

Make yourself familiar with the product, particularly its operational and safety features before starting the operation. After reading this manual, please keep it at a handy place where anyone who may operate this product may access easily.

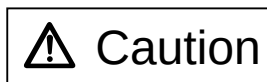
"Danger" and "Caution" Signs

In this document, hazardous situations are classified into two levels: "Danger" and "Caution."



Danger

Not observing the warning may cause a dangerous situation where the operator or other people around the product may suffer serious injury or death.



Caution

Not observing the warning may cause a dangerous situation where the operator may suffer light or moderate injury or material loss may take place.

"Prohibition" and "Enforcement" Signs



● The indicated act is strictly prohibited. For example, the sign  means no one may use fire in the area.



● The instruction must be followed or observed. For example, the sign  means that the part should be grounded without fail.

* When abnormality is sensed:

When you sensed abnormal noises or smells, or anything unusual like smoke during operation, shut down the power and report to your agent or the service department of the import agent or manufacturer for service.

Toei Electric Co., Ltd. Service Department
Service Center in Japan
131 Matsumoto, Mishima City, Shizuoka Prefecture 411-8510
TEL : +81-55-977-0129 FAX : +81-55-977-3744

General precautions

**Danger**

1. Transportation, installation, wiring, operation, and maintenance of the product should be conducted by operators or engineers who are familiar with the product. **Wrong handling of the product may cause accidents such as electric shock, injury, or fire.**
2. Do not touch internal parts of the amplifier with a hand. **You may suffer an electric shock.**
3. The grounding terminals of the amplifier and motor should be grounded without fail. **Otherwise you may suffer an electric shock.**
4. Shut down the power and wait for a minute before staring wiring or service work. **Otherwise, you may suffer an electric shock.**
5. Do not damage, give stress to, place a heavy item on, pinch cabling. **A damaged cable may cause an electric shock.**



6. Do not expose the product to splashed water, corrosive gas, combustible gas, or metal powder, or near any combustible material. **The product may be burned or damaged in such an environment.**



1. During operation, do not touch the rotating parts such as a shaft of the motor. **You may have your hand caught by the belt or injured.**

**Caution**

1. A motor and an amplifier should be used in a specified combination. **Otherwise, the product may be burned or damaged.**
2. The amplifier, motor, and other peripherals are heated hot during operation and should be handled with care. **Overheating may cause a fire.**



1. Do not touch the amplifier, current counter absorption resistor, and motor during operation or a while after shutting down the power because they are hot. **You may burn your hand.**

Precautions during transportation

**Caution**

1. Do not carry the product by holding the cable or motor axis. **You may be injured or damage the product.**



1. Overloading the products may cause load shifting. Observe the loading instructions. **You may be injured or damage the product.**
2. Check the product weight from the outline drawing, dimensions, or catalog, and decide a proper transportation method considering the product weight. **Otherwise, you may be injured or damage the product.**
3. Use the motor eye bold only for the transportation purpose. Do not use for transporting the entire product. **Otherwise, you may be injured or damage the product.**

Precautions for installation

Caution

1. Make sure that you have received the product of your specifications. Installation of a wrong product may cause damage to the product or injury.
2. Do not obstruct the air inlet and outlet ports of the servo motor with a cooling fan.

The product may be burned or damaged.

3. When installing the product, take the possible output and motor weight into consideration.

Remember that improper installation may cause injury or damage to the product.

4. Do not touch keyway at the end of motor axis.

You may be injured.

5. Do not drop or give strong impact to the motor.

Such an accident may cause injury or damage to the product.

6. Precise centering and parallel setting of the belt tension pulley are required when connecting the motor with load. The motor may not be connected with load directly.

That may cause an accident injuring people nearby.

7. Do not overload the motor axis. The axis may be damaged causing injury to the people nearby

8. Do not climb on the product or place a heavy item on it. Such an act may cause injury.

That may cause an accident injuring people nearby.



1. Do not block or let foreign item into the air inlet and outlet ports.

Overheating may cause a fire.

Precautions for wiring

Caution

1. Proper and correct wiring is required. **Otherwise, the motor may run out of control. Such an accident may cause injury.**

2. Do not connect the servo motor to the commercial power outlet directly. **Such a connection may cause damage to the motor.**

3. Prepare an external emergency stop device for stopping operation immediately and shut down the power. **An accident causing injury will be avoided with the device.**



1. Use a wire for grounding the earth terminal (E). **Otherwise, an electric shock may not be avoided.**

Precautions for operation

Caution

1. Extreme adjustment or tuning may cause unstable operation and should be avoided.
Unstable operation may cause injury.
2. Fix the motor firmly separated from the machine system to conduct test runs. After proper operation is confirmed, connect the motor to the machine. **Omitting the procedure may cause injury.**
3. The holding brake is not intended to stop the machine for safety sake. Apply the stop device for stopping the machine for safety sake. **Using the holding brake for an wrong purpose may cause injury.**
4. When an alarm is issued, solve the causing problem, confirm the safety, reset the alarm, and start operation. **Not observing the proper procedure may cause injury.**
5. Don't stand near the machine soon after momentary failure and the following power supply resumption. The machine may start running automatically in such a situation.
Abrupt start of the machine may cause injury.



1. Prepare an external emergency stop circuit for stopping operation immediately and shut down the power. **An accident causing injury will be avoided with the circuit.**
2. When running the motor independently, remove the temporary key on the output axis.
Otherwise, it may fly and injure someone.
3. A motor and an amplifier should be used in a specified combination. Also, set the corresponding servo amplifier parameter to a correct motor code.
Wrong parameter setting may cause burn or damage of the motor.



Precautions for maintenance and services

Caution

1. It is recommended that only professional engineers disassemble the product for services.
Workers unfamiliar with the product may be injured or damage the product in services.



Precautions for disposal

Caution

1. Dispose the motor according to the local regulations for industrial wastes.



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1. Unpacking

On receiving your V series Servo Amplifier, check the following:

■ No damage

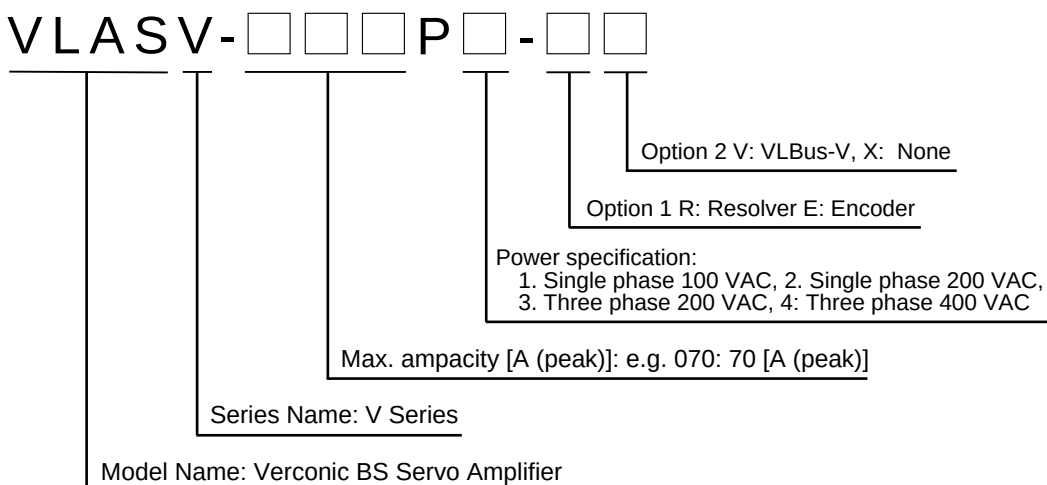
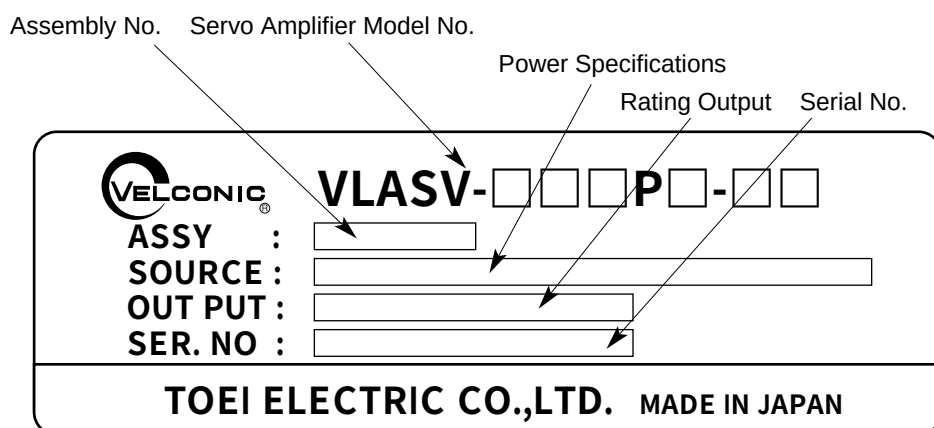
- Check if the product has been damaged during transportation or not.
Check the appearance for damage or indent.

■ Model

- Confirm that you have received a product of your specification.
Check and confirm the right model name on the name plate of the servo amplifier.

A model label is on either side of the servo amplifier. You will find the model, manufacturing year, and serial number of the servo amplifier on the label.

Please refer the data when inquiring about the order or other questions.



■ Accessories

- No accessories come with this product.

Connectors and mounting screws are not provided. You are expected to prepare those items. Various kinds of input/output cables including resolver cables are manufactured and supplied by the manufacturer. Please contact a manufacturer's authorized agent or manufacturer's local office for required cables.

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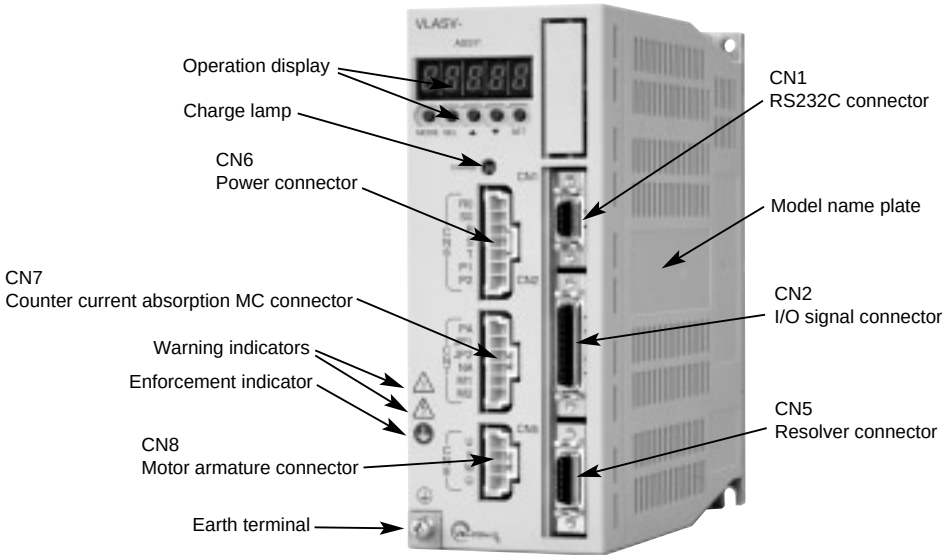
If you have any questions about the product you have received, please contact your agent or one of our following sales offices:

- Tokyo Office
Takanawa Meiko Building 2nd floor, 2-15-9 Takanawa, Minatoku, Tokyo 108-8510
- Overseas Sales Department
131 Matsumoto, Mishima City, Shizuoka Prefecture 411-8510
- Mishima Sales Office
131 Matsumoto, Mishima City, Shizuoka Prefecture 411-8510
- Osaka Office
Marumiya Building 7th Floor, 4-7-18 Nishinakajima, Yodogawaku, Osaka 541-0011
- Nagoya Office
First Ikeshita Building 6th Floor, 1-11-21 Ikeshita, Chigusaku, Nagoya 464-0067
- Service Center in Japan
131 Matsumoto, Mishima City, Shizuoka Prefecture 411-8510

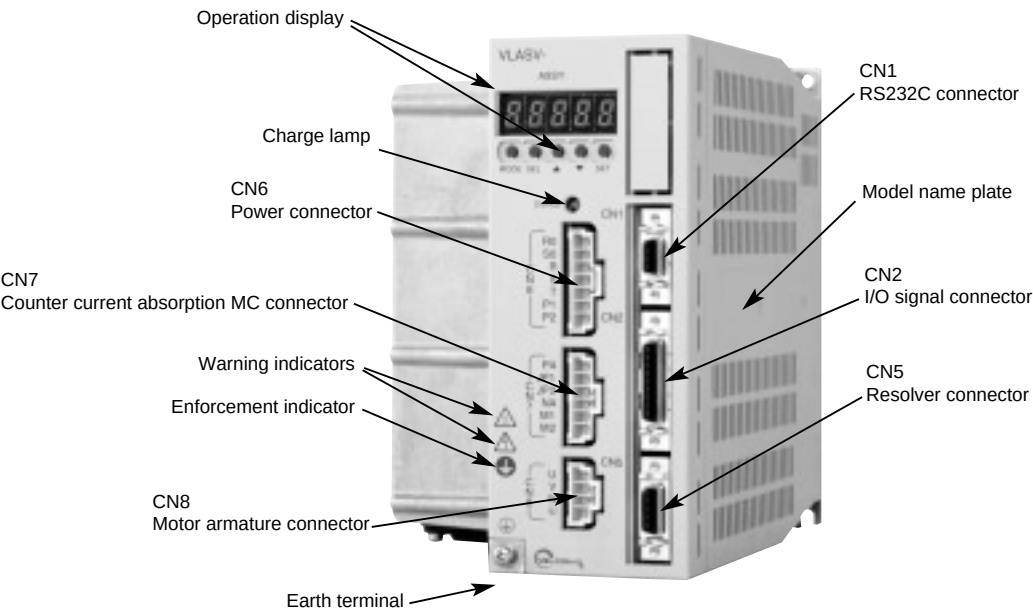
2. Outlooking and Part Names

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VLASV-25V006Px, 012Px



VLASV-025Px, 035Px





Use a wire for grounding the earth terminal (E). Otherwise, an electric shock may not be avoided.



It is recommended that only professional engineers disassemble the product for services. A service by someone unfamiliar with the product may cause damage to the product.

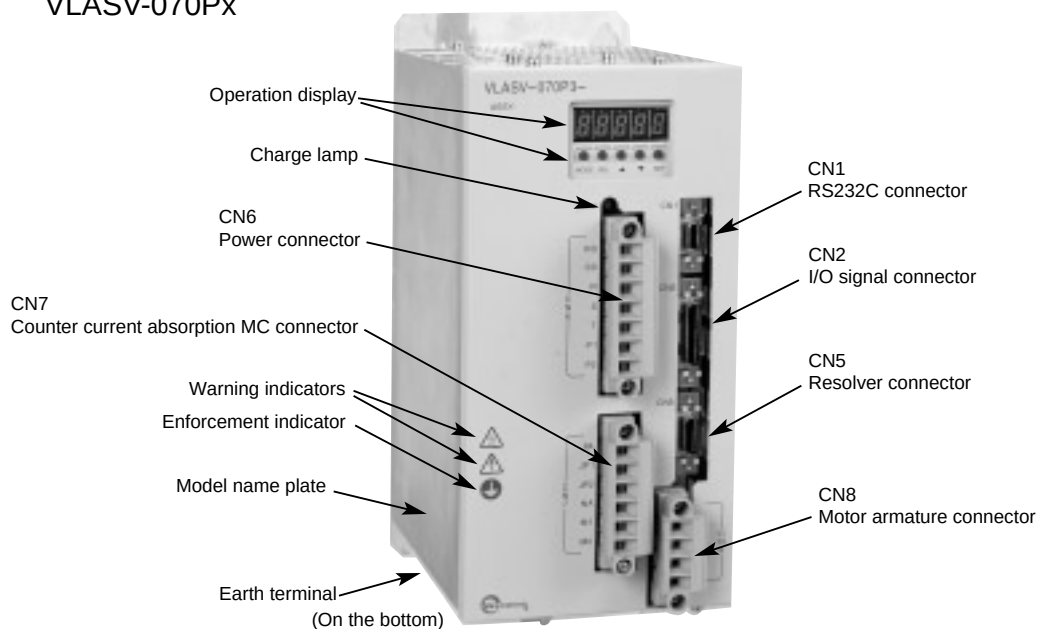


Do not give a strong impact. Such an accident may cause failure of the product.

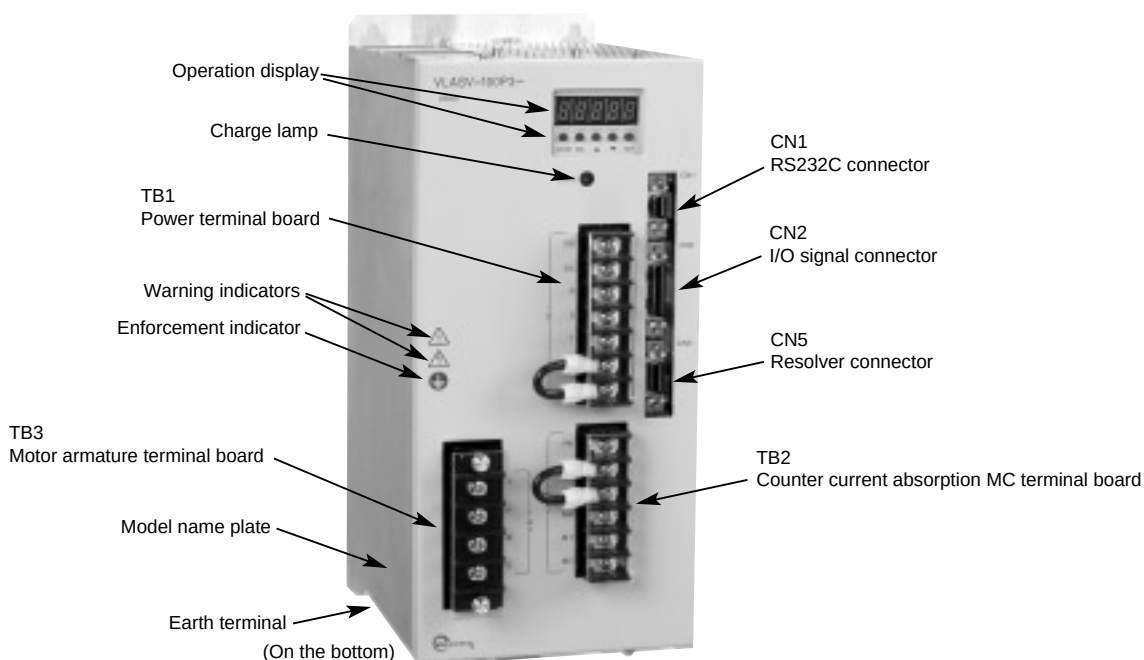


Do not touch the amplifier and current counter absorption resistor during operation or a while after shutting down the power because they are hot. You may burn your hand.

VLASV-070Px



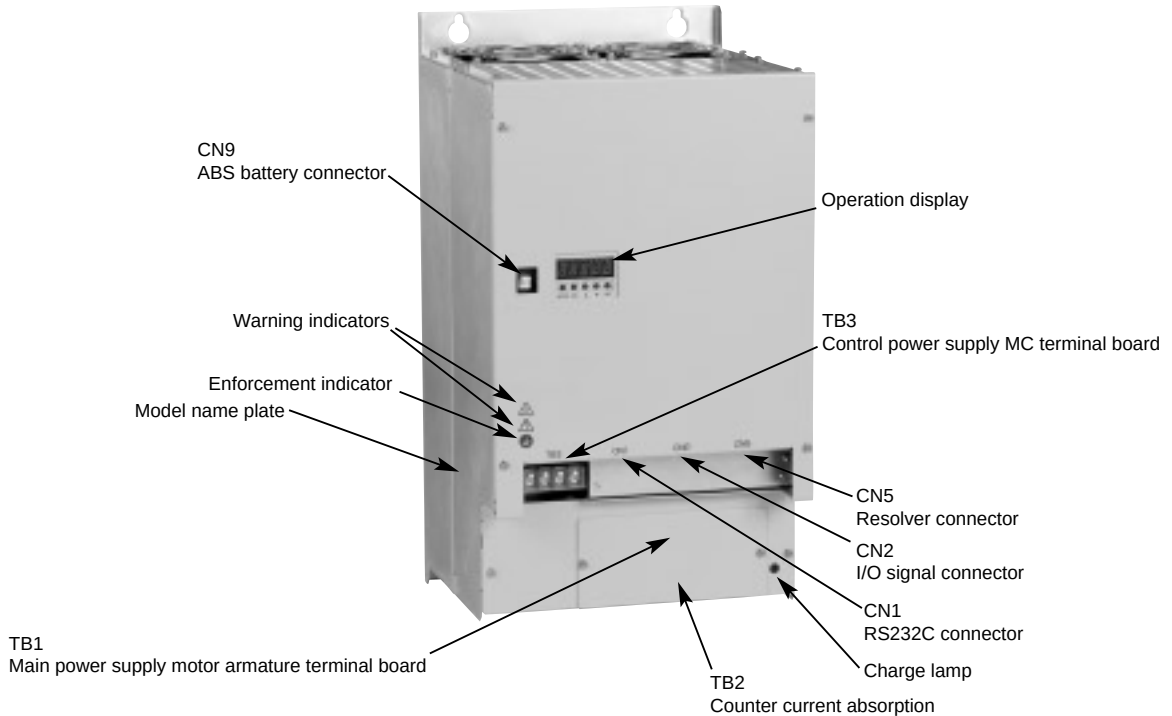
VLASV-100Px



Observe the following to avoid an electric shock or other injuries:

1. Do not touch internal parts of the amplifier with a hand.
2. The grounding terminals of the amplifier should be grounded without fail.
3. Shut down the power and wait for a minute before starting wiring or inspection work. Otherwise, you may suffer an electric shock.
4. Do not damage, give stress to, place a heavy item on, pinch cabling. Otherwise, you may suffer an electric shock.

VLASV-200P3



3. Combination of Motor and Amplifier

Use your V series servo amplifier in combination with a servo motor according to the tables on the following pages.

After turning on the power, the **AL 26** parameter setting error will be displayed.

Set the user parameter **UP-02** to the control mode and **UP-01** to an applied motor code correctly, turn off the machine, make sure that the display went off, and then turn on the machine again.

Setting parameters to wrong values will cause malfunction. Correct settings are required.

Revolution (rpm)	Motor type	Output	Sensor type	Motor no.	Suitable amplifier
Z type 3000r/min	Z00330	30W	20 KHz resolver	01001	006P1•006P2-R
	Z00330-S1		17 bit serial ABS encoder	02001	006P1•006P2-E
	Z00530	50W	20 KHz resolver	01002	006P1•006P2-R
	Z00530-S1		17 bit serial ABS encoder	02002	006P1•006P2-E
	Z01030	100W	20 KHz resolver	01003	006P1•006P2-R
	Z01030-S1		17 bit serial ABS encoder	02003	006P1•006P2-E
	Z02030	200W	20 KHz resolver	01004	012P1•012P2-R
	Z02030-S1		17 bit serial ABS encoder	02004	012P1•012P2-E
	Z04030	400W	20 KHz resolver	01005	012P2-R
	Z04030-S1		17 bit serial ABS encoder	02005	012P2-E
	Z06030	600W	20 KHz resolver	01006	025P2-R
	Z06030-S1		17 bit serial ABS encoder	02006	025P2-E
Standard type 1500r/min	Z08030	800W	20 KHz resolver	01007	025P2-R
	Z08030-S1		17 bit serial ABS encoder	02007	025P2-E
	05015	500W	20 KHz resolver	01021	012P2-R
	05015-A		20 KHz resolver ABS		
	05015-S1		17 bit serial ABS encoder	02021	012P2-E
	10015	1kW	20 KHz resolver	01022	035P3-R
	10015-A		20 KHz resolver ABS		
	10015-S1		17 bit serial ABS encoder	02022	035P3-E
	15015	1.5kW	20 KHz resolver	01023	035P3-R
	15015-A		20 KHz resolver ABS		
	15015-S1		17 bit serial ABS encoder	02023	035P3-E
	20015	2kW	20 KHz resolver	01024	070P3-R
	20015-A		20 KHz resolver ABS		
	20015-S1		17 bit serial ABS encoder	02024	070P3-E
	30015	3kW	20 KHz resolver	01025	070P3-R
	30015-A		20 KHz resolver ABS		
	30015-S1		17 bit serial ABS encoder	02025	070P3-E
	50015	5kW	20 KHz resolver	01026	100P3-R
	50015-A		20 KHz resolver ABS		
	50015-S1		17 bit serial ABS encoder	02026	100P3-E
	75015	7.5kW	20 KHz resolver	01027	200P3-R
	75015-A		20 KHz resolver ABS		
	75015-S1		17 bit serial ABS encoder	02027	200P3-E
Standard type 3000r/min	10030	1kW	20 KHz resolver	01041	035P3-R
	10030-A		20 KHz resolver ABS		
	10030-S1		17 bit serial ABS encoder	02041	035P3-E
	18030	1.8kW	20 KHz resolver	01042	070P3-R
	18030-A		20 KHz resolver ABS		
	18030-S1		17 bit serial ABS encoder	02042	070P3-E
	24030	2.4kW	20 KHz resolver	01043	070P3-R
	24030-A		20 KHz resolver ABS		
	24030-S1		17 bit serial ABS encoder	02043	070P3-E
	30030	3kW	20 KHz resolver	01044	070P3-R
	30030-A		20 KHz resolver ABS		
	30030-S1		17 bit serial ABS encoder	02044	070P3-E
	45030	4.5kW	20 KHz resolver	01045	100P3-R
	45030-A		20 KHz resolver ABS		
	45030-S1		17 bit serial ABS encoder	02045	100P3-E
	70030	7kW	20 KHz resolver	01046	200P3-R
	70030-A		20 KHz resolver ABS		
	70030-S1		17 bit serial ABS encoder	02046	200P3-E
	10K30	10kW	20 KHz resolver	01047	200P3-R
	10K30-A		20 KHz resolver ABS		
	10K30-S1		17 bit serial ABS encoder	02047	200P3-E

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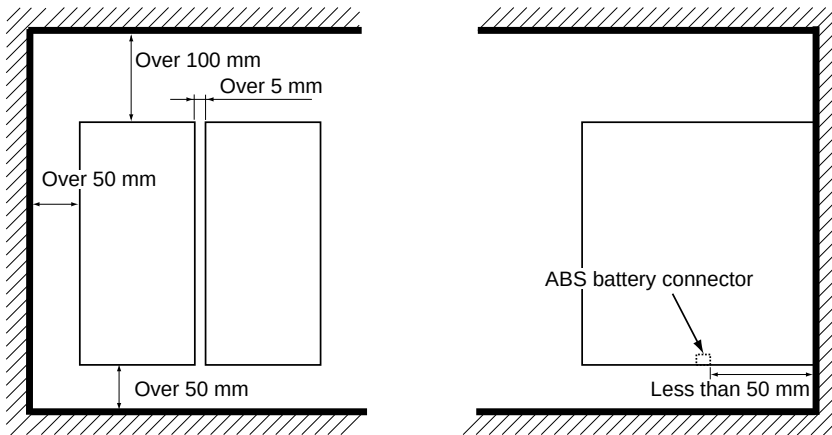
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1-1. Check List for Installation

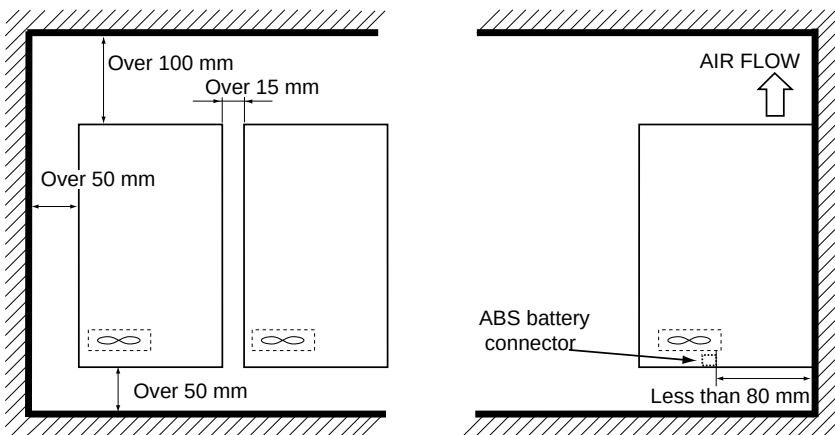
- Install your product by hanging on the wall or embedding in the floor. Arrange so that the operation display face front with the up side up and fasten with mounting screws or bolts.
- Keep the service and ventilation room above, below, and by the sides of the servo amplifier, particularly when setting multiple units side by side referring to the figures below.
- When installing the unit in the control panel, ventilate so that a temperature inside does not exceed 55 degree Celsius. Overheating inside may cause failure of the product.
- Do not install the unit at a hot, humid place or such a place where the unit is exposed to toxic gases, dust, metal powder, oil mist, or water.
- Do not install the counter current absorption resistor and other components that may become hot near the servo amplifier.
- The noise filter should be installed near the servo amplifier.

1-1-1. Installing Amplifier

(1) 006P and 012P

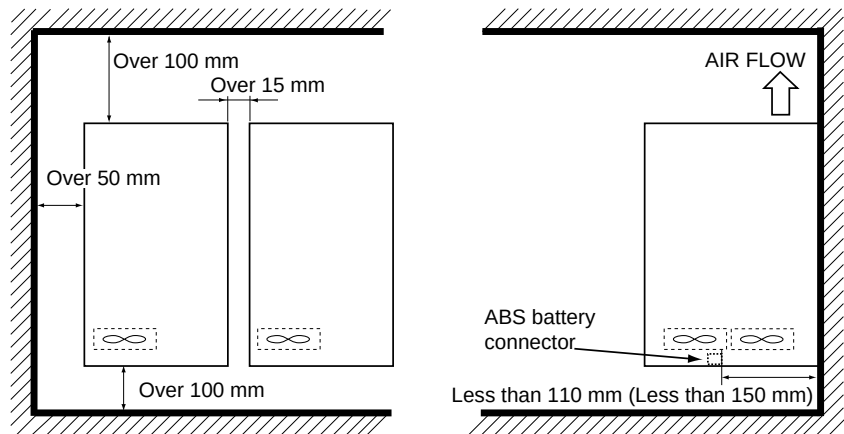


(2) 025P and 035P



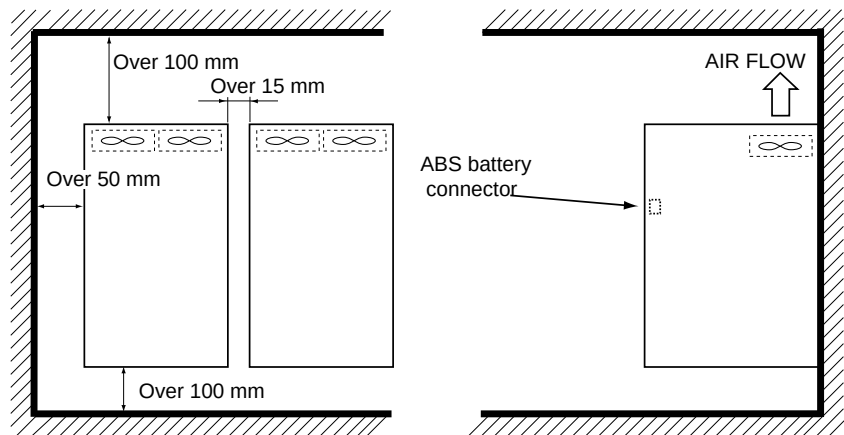
* 35P3 has an internal cooling fan.

(3) 070P and 100P



* The instruction in the brackets is applied to 100P.

(4) 200P



Note : When an ABS battery is used for holding an absolute position, the connector is located on the bottom of the unit and an extra space is needed to prevent interference with wiring ducts.



Caution



Caution: The cooling fins become hot. Choose an installation spot so that the cooling effect is maximized. Do not touch the fins. You may burn your hand.

1-2. Operation Environment

1

Environmental factor	Condition
Ambient temperature	0 to 55 degree Celsius (no freezing allowed)
Ambient humidity	35 to 90% RH (no condensation allowed)
Retention temperature	-10 to +70 degree Celsius (no freezing allowed)
Retention humidity	35 to 90% RH (no condensation allowed)
Installation altitude	Less than 1,000 m
Atmosphere	Dust, metal powder, oil mist, corrosive gas, and explosive gas should not exist in the air.
Vibration	10-50 Hz, below 1 G

 Caution	
	Do not expose the product to spashed water, corrosive gas, inflammable gas, or metal powder, or near any combustible material. Otherwise, the product may be burned or damaged.
	Do not store the product at a place exposed to rain, splashed water, toxic gas or toxic liquid.
	A desirable storage place is shaded from the sun, in the temperature range between -10 and 70 degree Celsius and humidity range between 35 and 90 percent RH.

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2-1. Connecting Power Circuit

The power circuit consists of a power supply circuit, a motor main circuit, a holding brake/dynamic brake circuit, and a counter current absorption circuit.

■ Power supply circuit

A power supply circuit includes a braker, a noise filter for preventing switching noises from influencing external equipment, and an emergency stop circuit, etc.

■ Motor main circuit

Connect an amplifier and a motor directly to the motor main circuit without connecting a braker and a contactor.

■ Holding brake (24 VDC non-excited starting type)

This brake is applied to prevent the vertical shaft from dropping when the power is turned off and also to retain the horizontal shaft. Therefore, this brake should not be used to put a brake on motor revolution.

The brake is working without excitation. An auxiliary contact point should be connected to the amplifier for the purpose of checking ON and OFF of the brake contactor.

■ Dynamic brake

The dynamic brake is used to stop the motor right away on power failure or when an alarm is issued. This brake should be used for mechanical holding.

The brake is applied by shortcircuiting the motor armature with the contactor. An auxiliary contact point should be connected to the amplifier for the purpose of checking ON and OFF of the brake contactor.

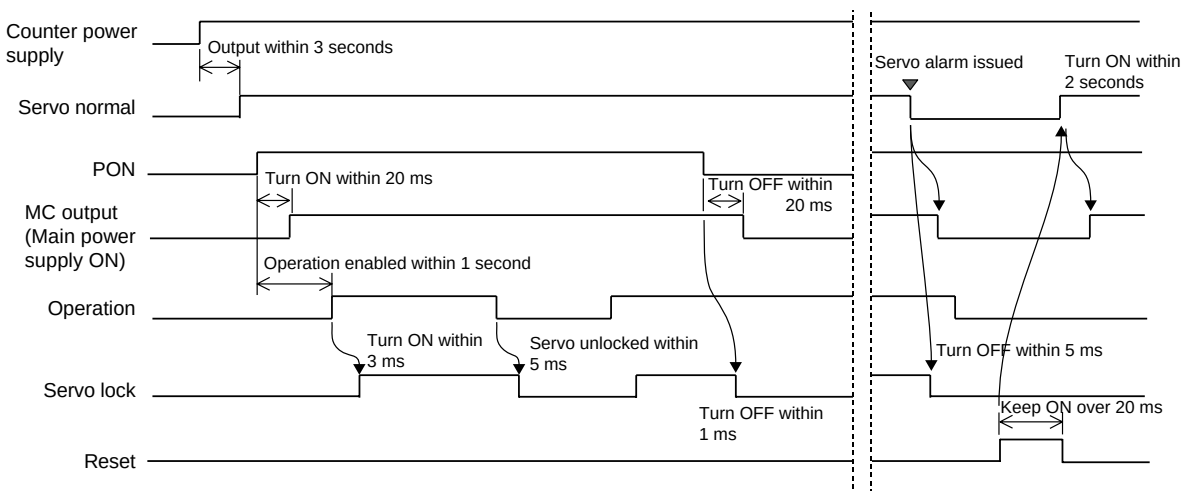
■ Counter current absorption resistor

The counter current absorption resistor suppress the rising DC voltage caused by the energy returned to the amplifier during absorption run for controlling the motor or for using the motor as a load. The standard counter current absorption resistor is incorporated in the amplifier. Yet an additional absorption resistor may be required depending on the amount of counter current energy.

2-1-1. VLA5V-006P1, 012P1, 006P2, 012P2, and 02SP2

(1) When no holding brake nor dynamic brake is applied :

● Operation sequence



Caution



Shift to the sequence to turn OFF the operation signal after the servo normal is turned OFF. The servo lock is applied immediately after resetting causing danger.

[illegible]

Note 4: A DCL terminal may be added to P1 and P2 terminals for the purpose of improving the power factor and suppressing the harmonic component.



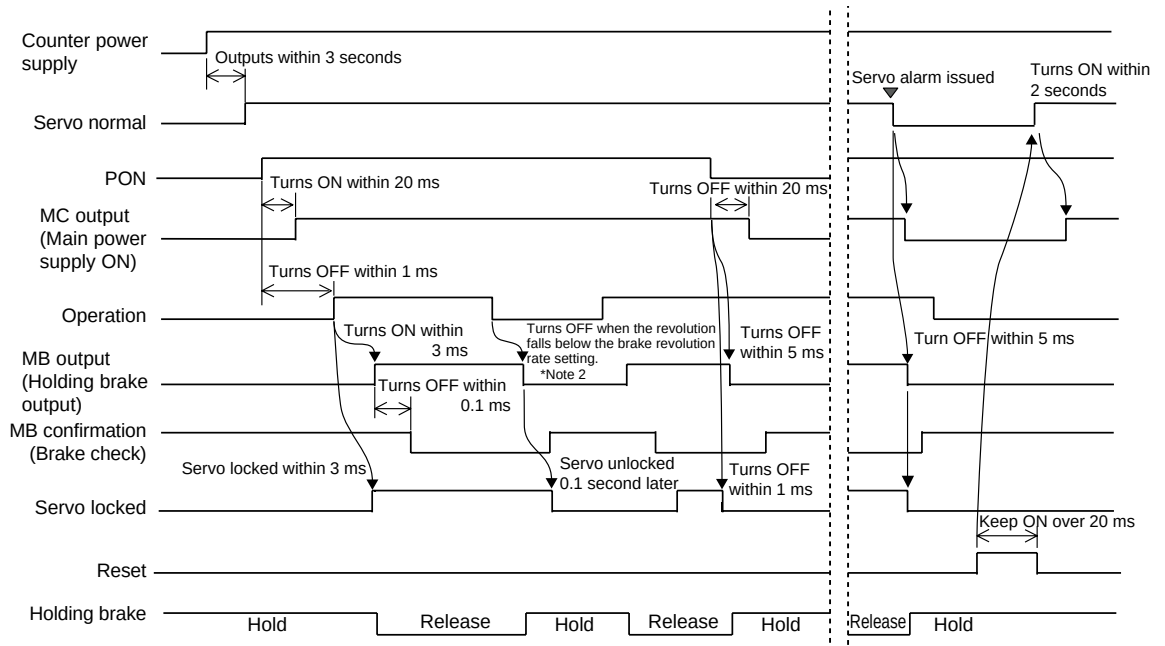
15

(2) When the holding brake (MB) is applied:

- Note 1 : Make sure that the sequence I/O includes "MB confirmation" and "MB output." An alarm (AL-14 brake abnormal) will be issued when MB operation is not confirmed. Particular care is required when the user parameter UP-46 (sequence I/O option) is set to "special sequence."
- Note 2 : When you stop operation the speed starts reducing, and when the revolution rate falls to the brake-ON level, the servo is unlocked and the holding brake is applied. The brake application settings are specified with the user parameter UP-13. When UP-13 is equivalent to zero (0), the deceleration time becomes zero, and the holding brake start working when the actual revolution slows down below the brake ON revolution rate (UP-14). When UP-13 is 1, the deceleration progresses along the set deceleration curve and the holding brake is applied when the speed falls below the brake ON revolution rate.
- Note 3 : A revolution rate at which the holding brake is applied may be set with the user parameter UP-14 (brake ON revolution rate). The parameter is for avoiding applying the holding brake instead of the speed control brake, and prevents the holding brake from application until the revolution rate falls below a set level.
- Note 4 : When PON is turned OFF or an alarm is issued, the servo is unlocked and the brake is applied. Do not turn PON off frequently during operation.

Relevant user parameter	
Holding brake operation UP-13	0 or 1
Brake ON revolution rate UP-14	0.0-100.0%

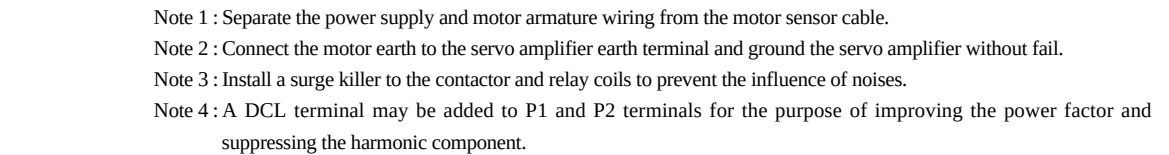
●Operation sequence



**Caution**



Shift to the sequence to turn OFF the operation signal after the servo normal is turned OFF. The servo lock is applied immediately after resetting, causing danger.



Note 4: A DCL terminal may be added to P1 and P2 terminals for the purpose of improving the power factor and suppressing the harmonic component.



(3) When the dynamic brake (DB) is applied:

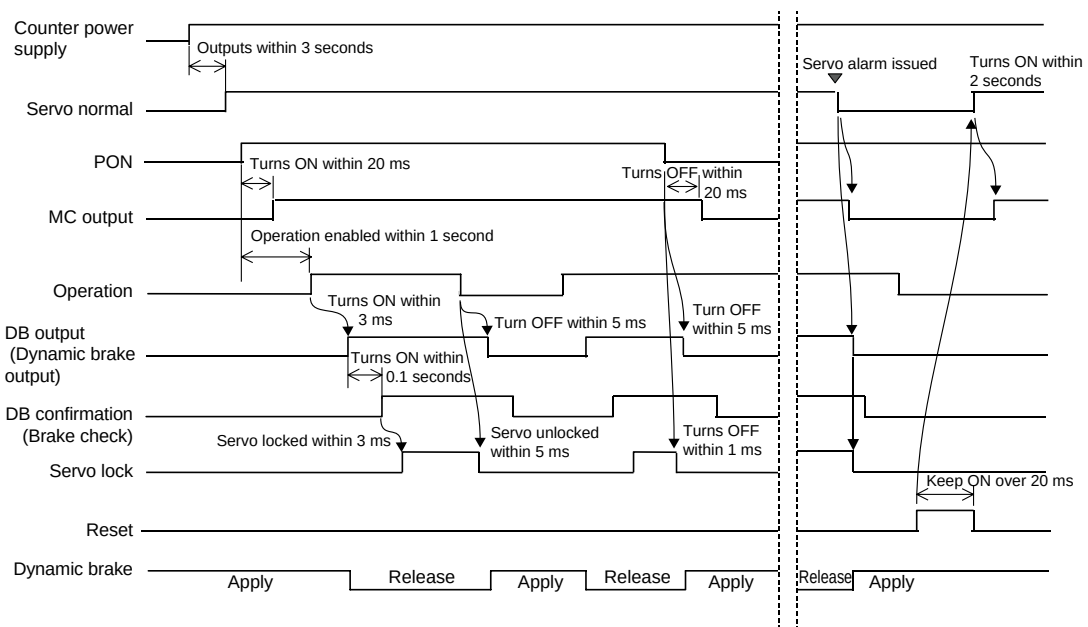
Note 1 : Make sure that the sequence I/O includes "DB confirmation" and "DB output." An alarm (AL-14 brake abnormal) will be issued when DB operation is not confirmed. Particular care is required when the user parameter UP-46 (sequence I/O option) is set to "special sequence."

Note 2 : The servo is unlocked and the dynamic brake is applied right after operation stops.

Note 2 : When PON is turned OFF or an alarm is issued, the servo is also unlocked and the dynamic brake is applied.

2

● Operation sequence

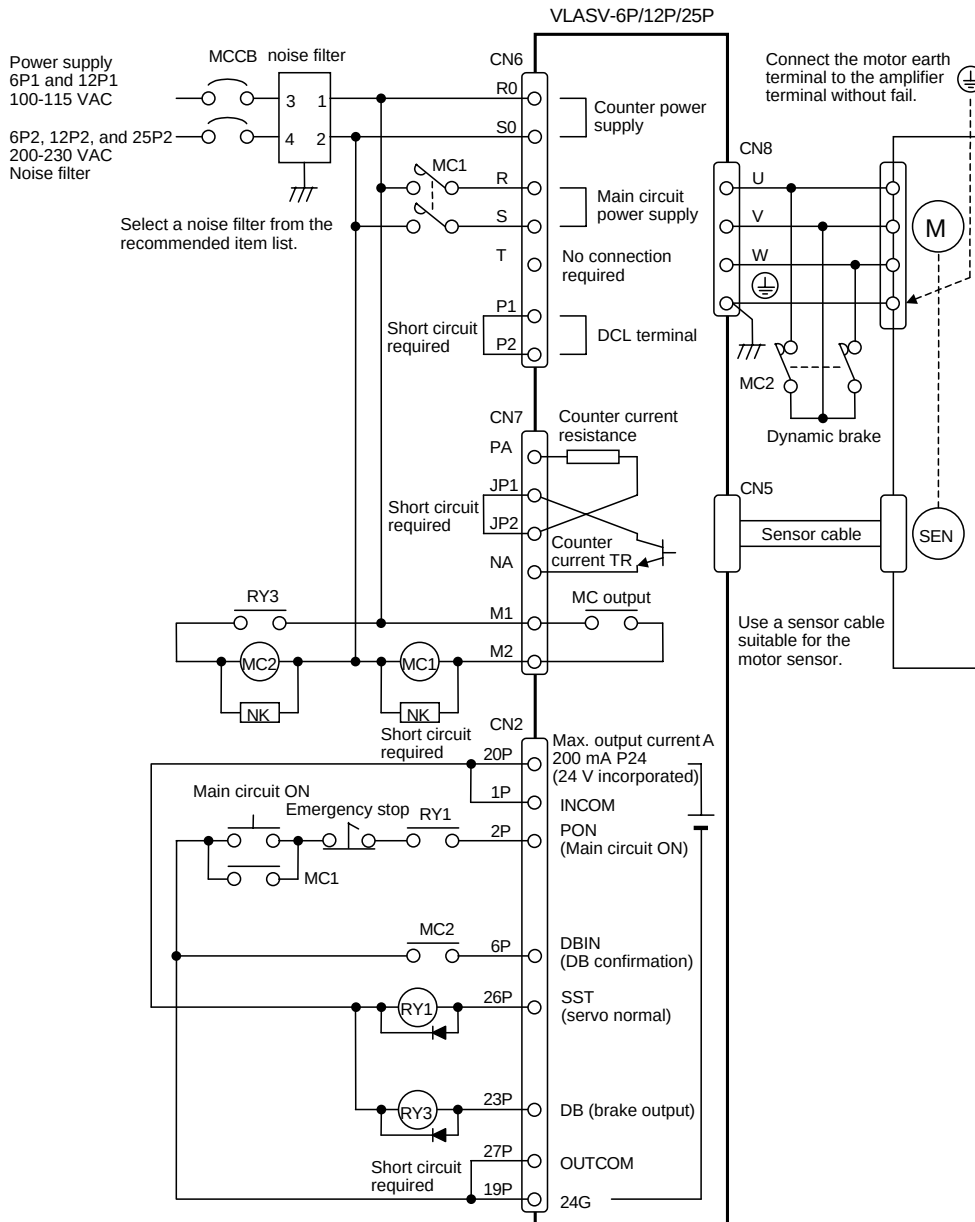


Caution



Shift to the sequence to turn OFF the operation signal after the servo normal is turned OFF. The servo lock is applied immediately after resetting, causing danger.

●Wiring



Note 1 : Separate the power supply and motor armature wiring from the motor sensor cable.

Note 2 : Connect the motor earth to the servo amplifier earth terminal and ground the servo amplifier without fail.

Note 3 : Install a surge killer to the contactor and relay coils to prevent the influence of noises.

Note 4 : A DCL terminal may be added to P1 and P2 terminals for the purpose of improving the power factor and suppressing the harmonic component.

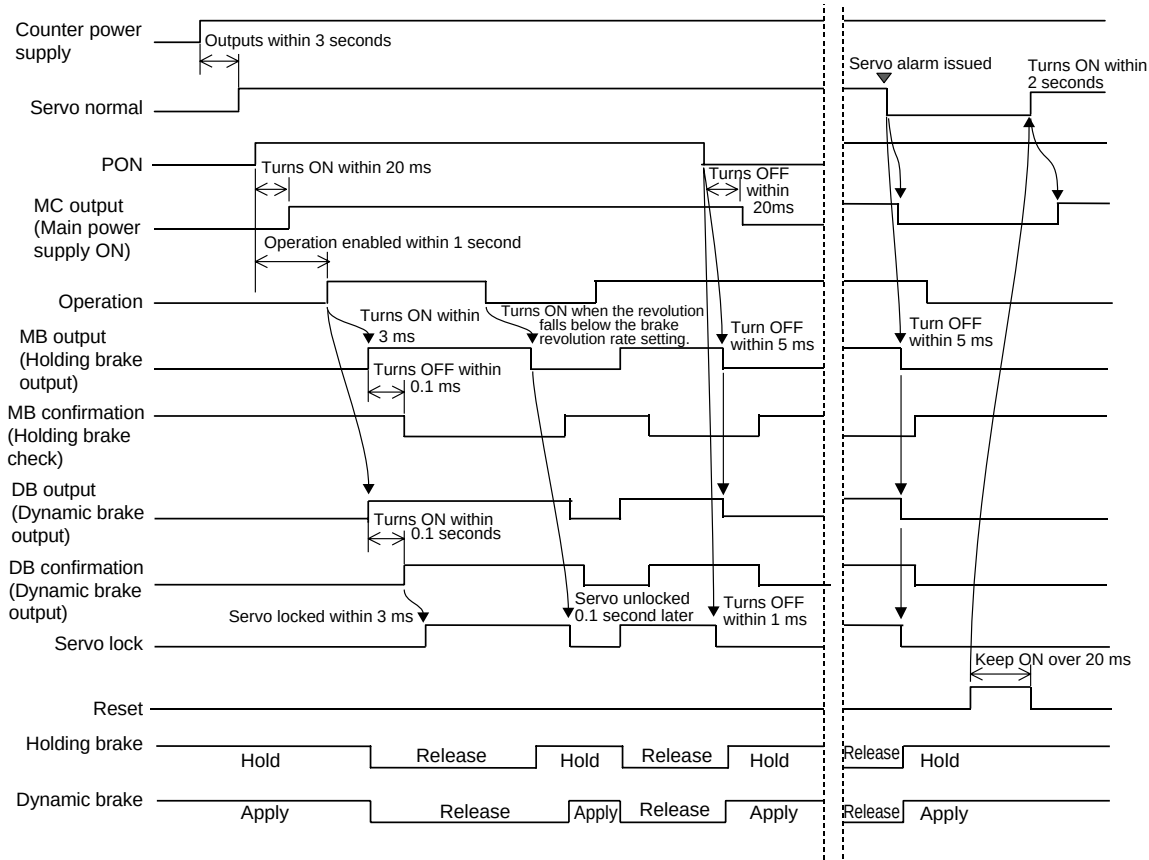
(4) When the holding brake (MB) and dynamic brake (DB) are applied:

- Note 1 : Make sure that the sequence I/O includes "MB confirmation," "DB confirmation," "MB brake output," and "DB brake output." An alarm (AL-14: brake abnormal) will be issued when MB and DB operation is not confirmed. Particular care is required when the user parameter UP-46 (sequence I/O option) is set to "special sequence."
- Note 2 : When you stop operation the speed starts reducing, and when the revolution rate falls to the brake-ON level, the holding brake is applied. Then, the servo is unlocked and the dynamic brake (DB) is applied.
- Note 3 : A revolution rate at which the holding brake is applied may be set with the user parameter UP-14 (brake ON revolution rate). The holding brake will not be applied before the revolution rate falls below the set level.
- Note 4 : When PON is turned OFF or an alarm is issued, the servo is unlocked and both brakes are applied.

2

Relevant user parameter	
Brake ON revolution rate UP-14	0.0-100.0%

●Operation sequence

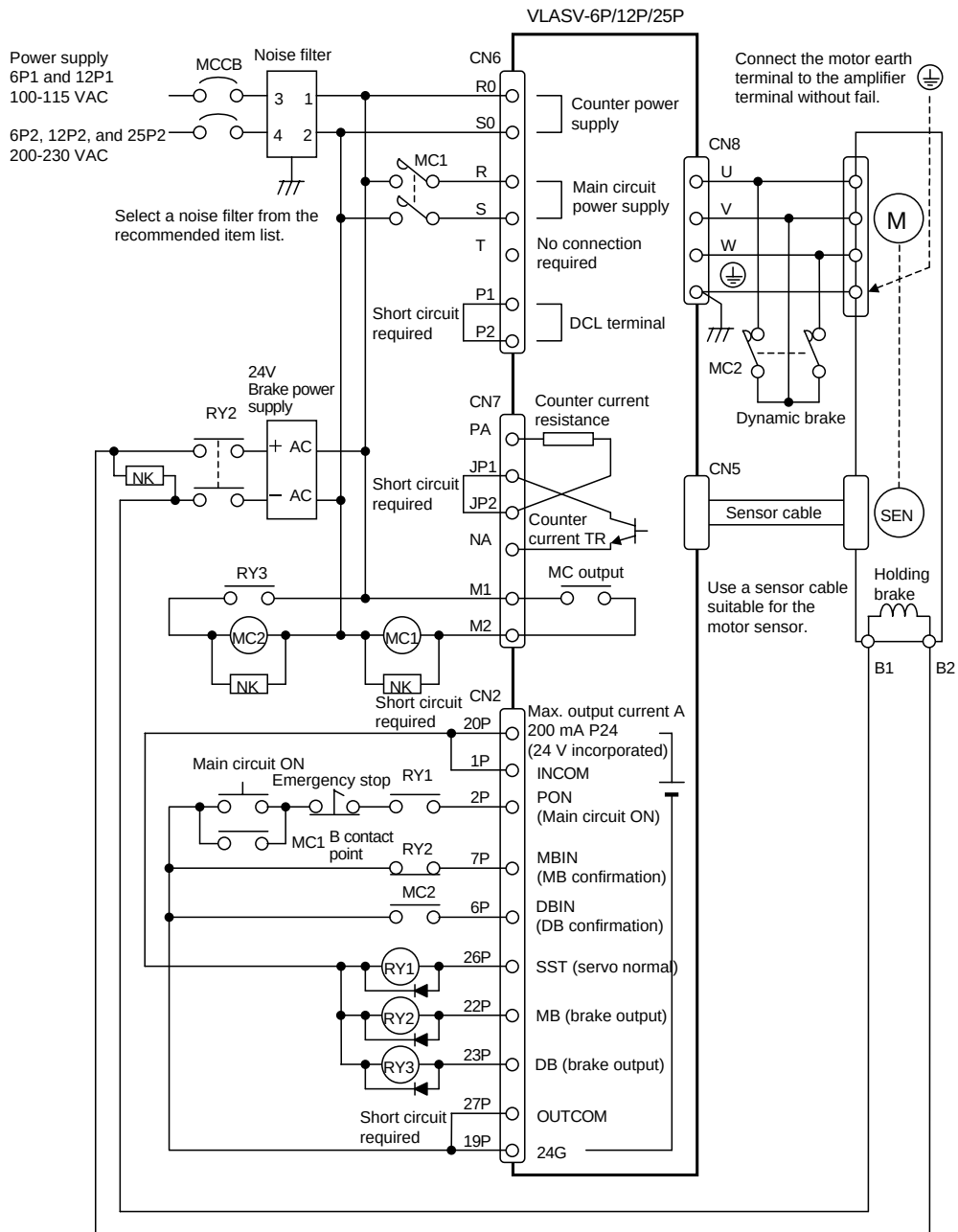


**Caution**



Shift to the sequence to turn OFF the operation signal after the servo normal is turned OFF. The servo lock is applied immediately after resetting, causing danger.

● Wiring



Note 1 : Separate the power supply and motor armature wiring from the motor sensor cable.

Note 2 : Connect the motor earth to the servo amplifier earth terminal and ground the servo amplifier without fail.

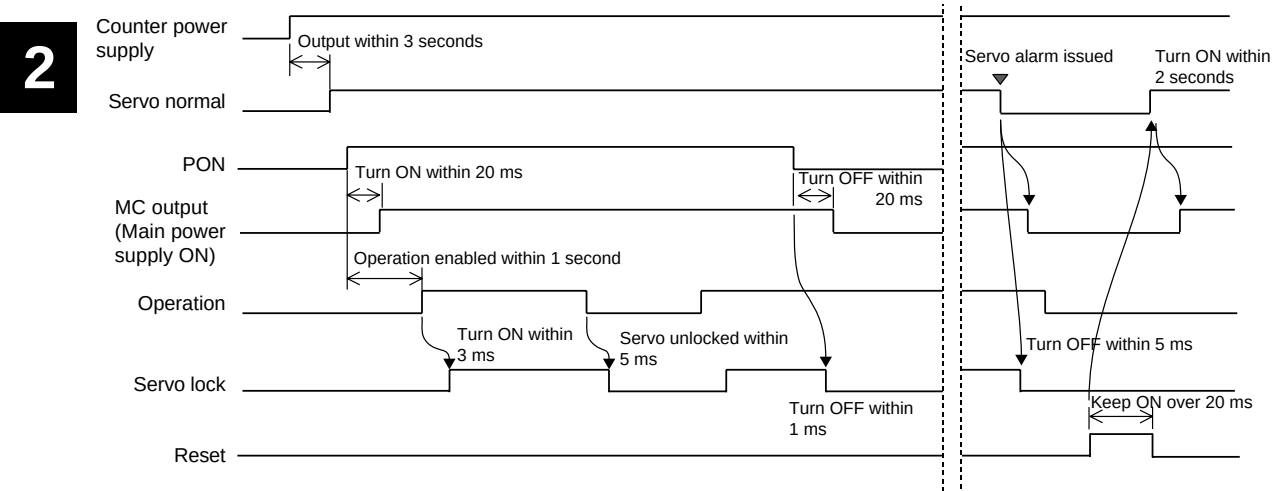
Note 3 : Install a surge killer to the contactor and relay coils to prevent the influence of noises.

Note 4 : A DCL terminal may be added to P1 and P2 terminals for the purpose of improving the power factor and suppressing the harmonic component.

2-1-2. VLASV-035P3, 070P3, and 200P3

(1) When no holding brake nor dynamic brake is applied:

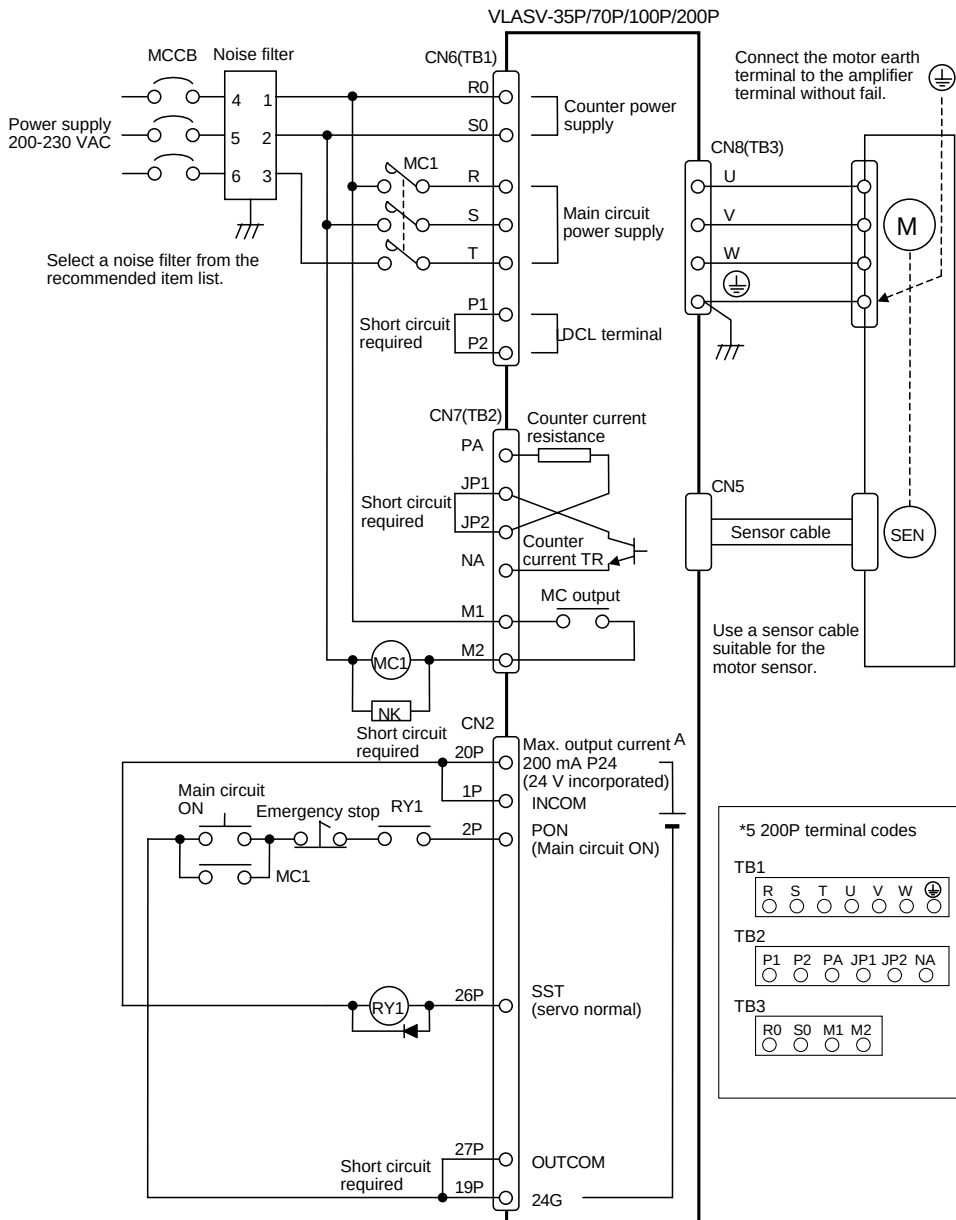
●Operation sequence



 **Caution**

 Shift to the sequence to turn OFF the operation signal after the servo normal is turned OFF. The servo lock is applied immediately after resetting, causing danger.

● Wiring



Note 1 : Separate the power supply and motor armature wiring from the motor sensor cable.

Note 2 : Connect the motor earth to the servo amplifier earth terminal and ground the servo amplifier without fail.

Note 3 : Install a surge killer to the contactor and relay coils to prevent the influence of noises.

Note 4 : A DCL terminal may be added to P1 and P2 terminals for the purpose of improving the power factor and suppressing the harmonic component.

Note 5 : CN6, 7, and 8 are connector numbers for 035P and 070P. Codes for 100P are in brackets (), and those for 200P are indicated in another table.



Caution



Wrong wiring of motor armature wires U, V, and W may drive the motor out of control. Check connections before starting operation.



Caution



The power supply should be connected only to the R, S, or T terminal. Connecting to a different terminal may cause fire.

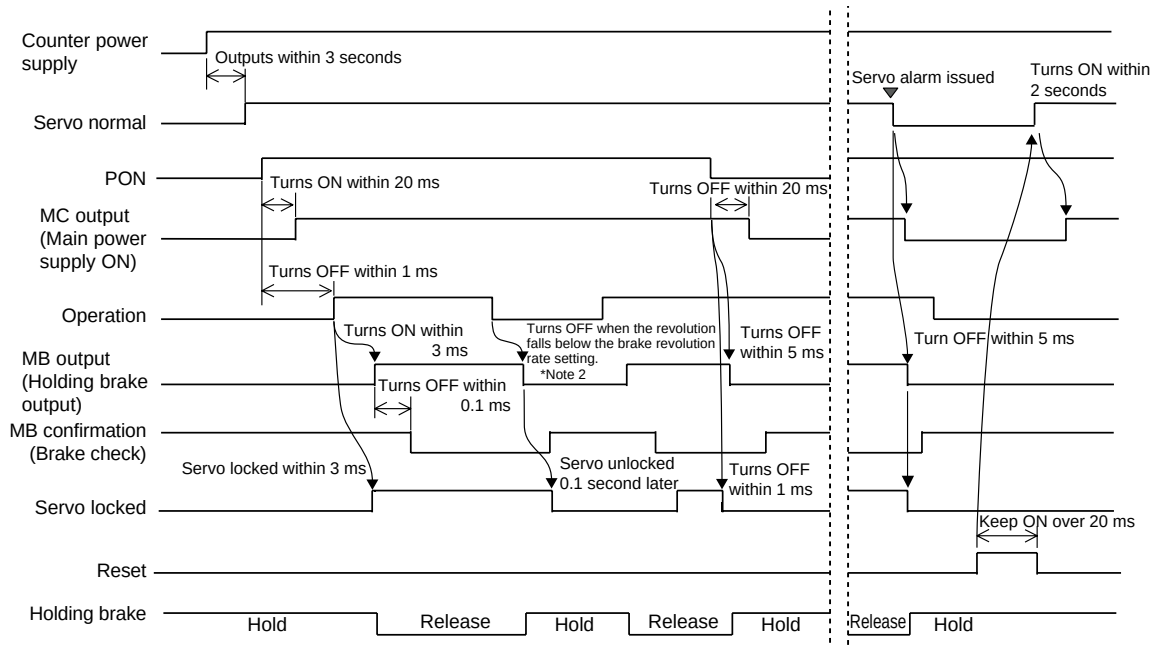
(2) When the holding brake (MB) is applied:

- Note 1 : Make sure that the sequence I/O includes "MB confirmation" and "MB output." An alarm (AL-14: brake abnormal) will be issued when MB and DB operation is not confirmed. Particular care is required when the user parameter UP-46 (sequence I/O option) is set to "special sequence."
- Note 2 : When you stop operation the speed starts reducing, and when the revolution rate falls to the brake-ON level, the holding brake is applied. The brake application settings are specified with the user parameter UP-13. When UP-13 is equivalent to zero (0), the deceleration time becomes zero, and the holding brake start working when the actual revolution slows down below the brake ON revolution rate (UP-14).
- Note 3 : A revolution rate at which the holding brake is applied may be set with the user parameter UP-14 (brake ON revolution rate). The parameter is for avoiding applying the holding brake instead of the speed control brake, and prevents the holding brake from application until the revolution rate falls below a set level.
- Note 4 : When PON is turned OFF or an alarm is issued, the servo is unlocked and the brake is applied. Do not turn PON off frequently during operation.

2

Relevant user parameter	
Holding brake operation UP-13	0 or 1
Brake ON revolution rate UP-14	0.0-100.0%

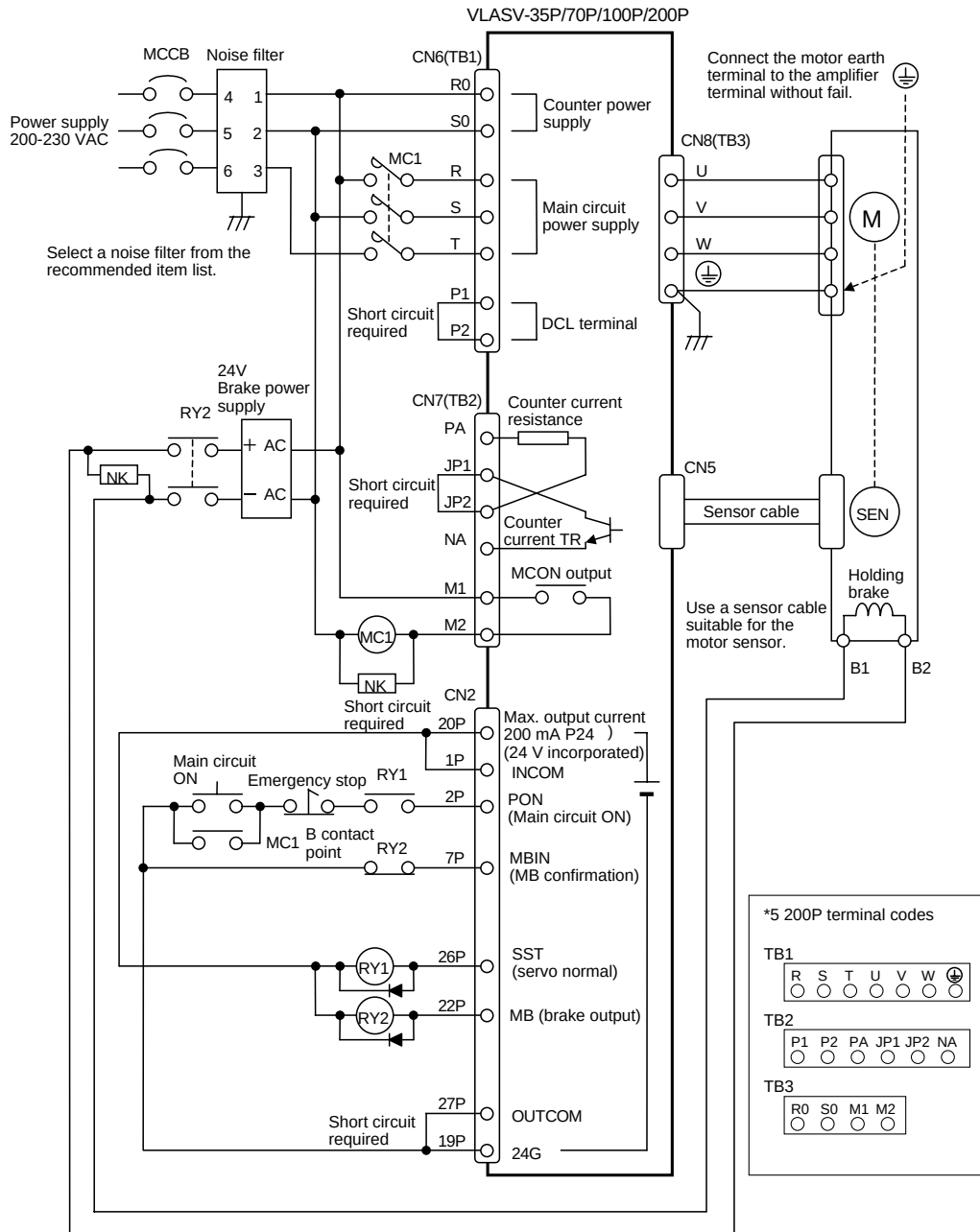
●Operation sequence



**Caution**

Shift to the sequence to turn OFF the operation signal after the servo normal is turned OFF. The servo lock is applied immediately after resetting, causing danger.

● Wiring



Note 1 : Separate the power supply and motor armature wiring from the motor sensor cable.

Note 2 : Connect the motor earth to the servo amplifier earth terminal and ground the servo amplifier without fail.

Note 3 : Install a surge killer to the contactor and relay coils to prevent the influence of noises.

Note 4 : A DCL terminal may be added to P1 and P2 terminals for the purpose of improving the power factor and suppressing the harmonic component.

Note 5 : CN6, 7, and 8 are connector numbers for 035P and 070P. Codes for 100P are in brackets (), and those for 200P are indicated in another table.



Caution



Wrong wiring of motor armature wires U, V, and W may drive the motor out of control. Check connections before starting operation.

(3) When the dynamic brake (DB) is applied:

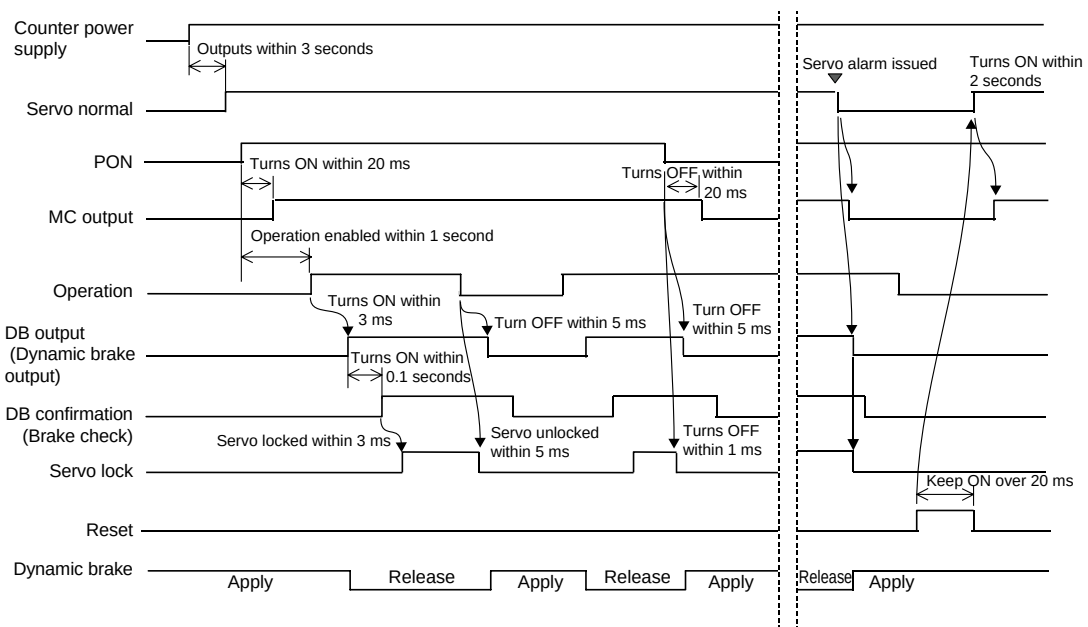
Note 1 : Make sure that the sequence I/O includes "DB confirmation" and "DB output." An alarm (AL-14 brake abnormal) will be issued when DB operation is not confirmed. Particular care is required when the user parameter UP-46 (sequence I/O option) is set to "special sequence."

Note 2 : The servo is unlocked and the dynamic brake is applied right after operation stops.

Note 3 : When PON is turned OFF or an alarm is issued, the servo is also unlocked and the dynamic brake is applied.

2

● Operation sequence

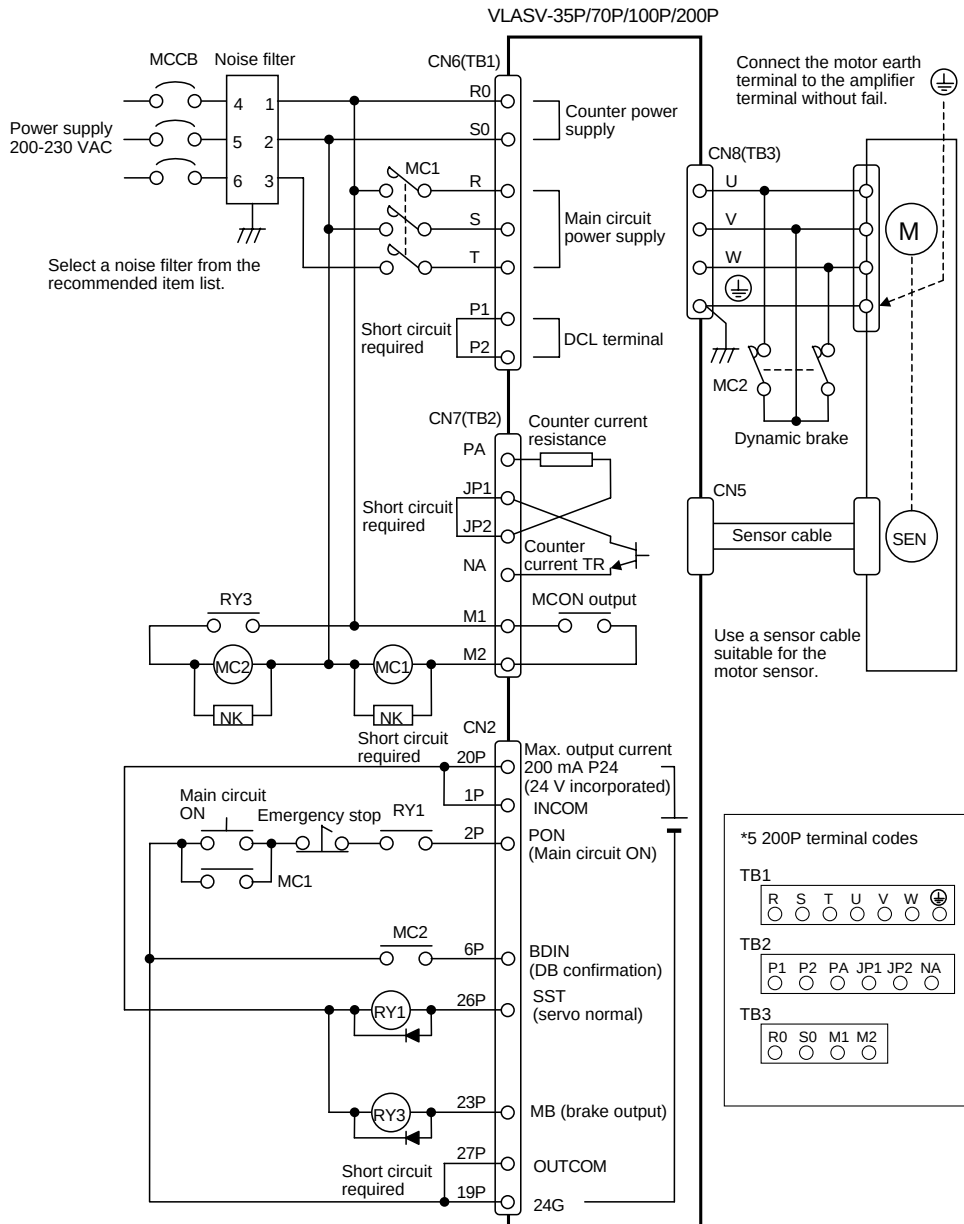


Caution



Shift to the sequence to turn OFF the operation signal after the servo normal is turned OFF. The servo lock is applied immediately after resetting, causing danger.

● Wiring



Note 1 : Separate the power supply and motor armature wiring from the motor sensor cable.

Note 2 : Connect the motor earth to the servo amplifier earth terminal and ground the servo amplifier without fail.

Note 3 : Install a surge killer to the contactor and relay coils to prevent the influence of noises.

Note 4 : A DCL terminal may be added to P1 and P2 terminals for the purpose of improving the power factor and suppressing the harmonic component.

Note 5 : CN6, 7, and 8 are connector numbers for 035P and 070P. Codes for 100P are in brackets (), and those for 200P are indicated in another table.

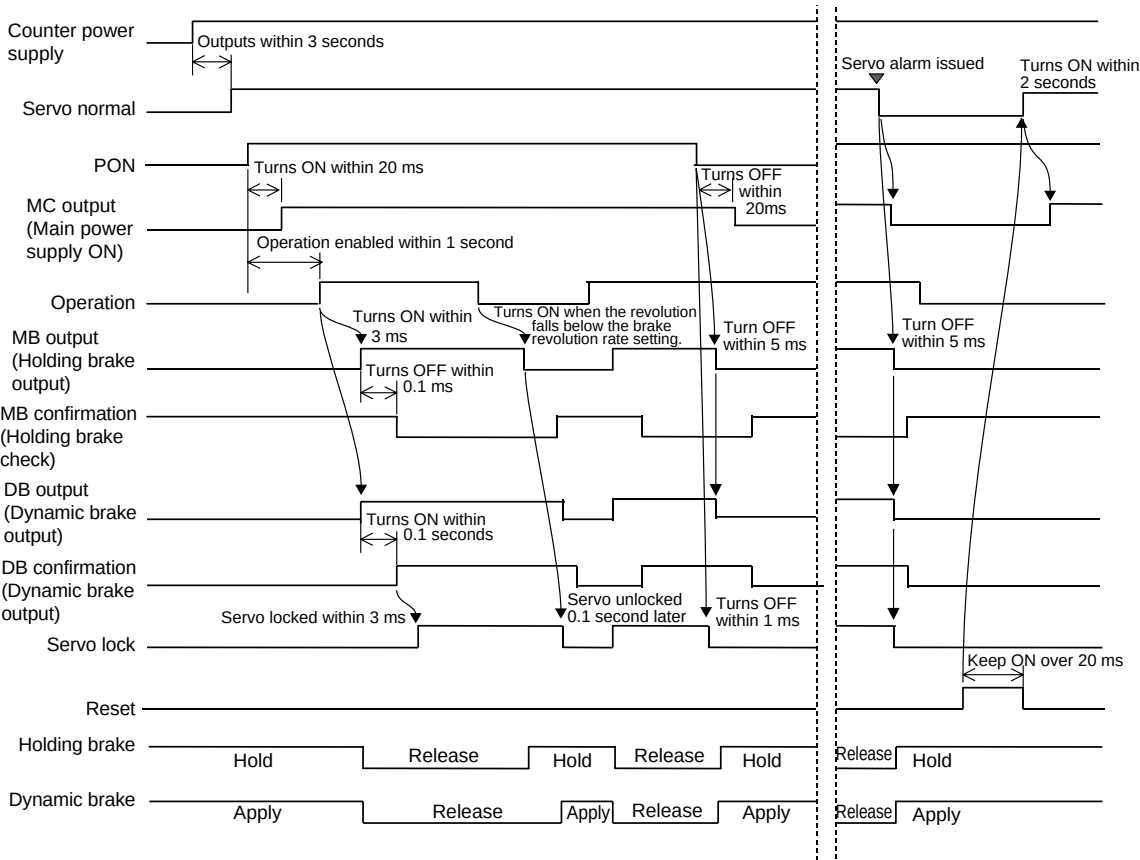
(4) When the holding brake (MB) and dynamic brake (DB) are applied:

- Note 1 : Make sure that the sequence I/O includes "MB confirmation," "DB confirmation," "MB brake output," and "DB brake output." An alarm (AL-14: brake abnormal) will be issued when MB and DB operation is not confirmed. Particular care is required when the user parameter UP-46 (sequence I/O option) is set to "special sequence."
- Note 2 : When you stop operation the speed starts reducing, and when the revolution rate falls to the brake-ON level, the holding brake is applied. Then, the servo is unlocked and the dynamic brake (DB) is applied.
- Note 3 : A revolution rate at which the holding brake is applied may be set with the user parameter UP-14 (brake ON revolution rate). The holding brake will not be applied before the revolution rate falls below the set level.
- Note 4 : When PON is turned OFF or an alarm is issued, the servo is unlocked and both brakes are applied.

2

Relevant user parameter	
Brake ON revolution rate UP-14	0.0-100.0%

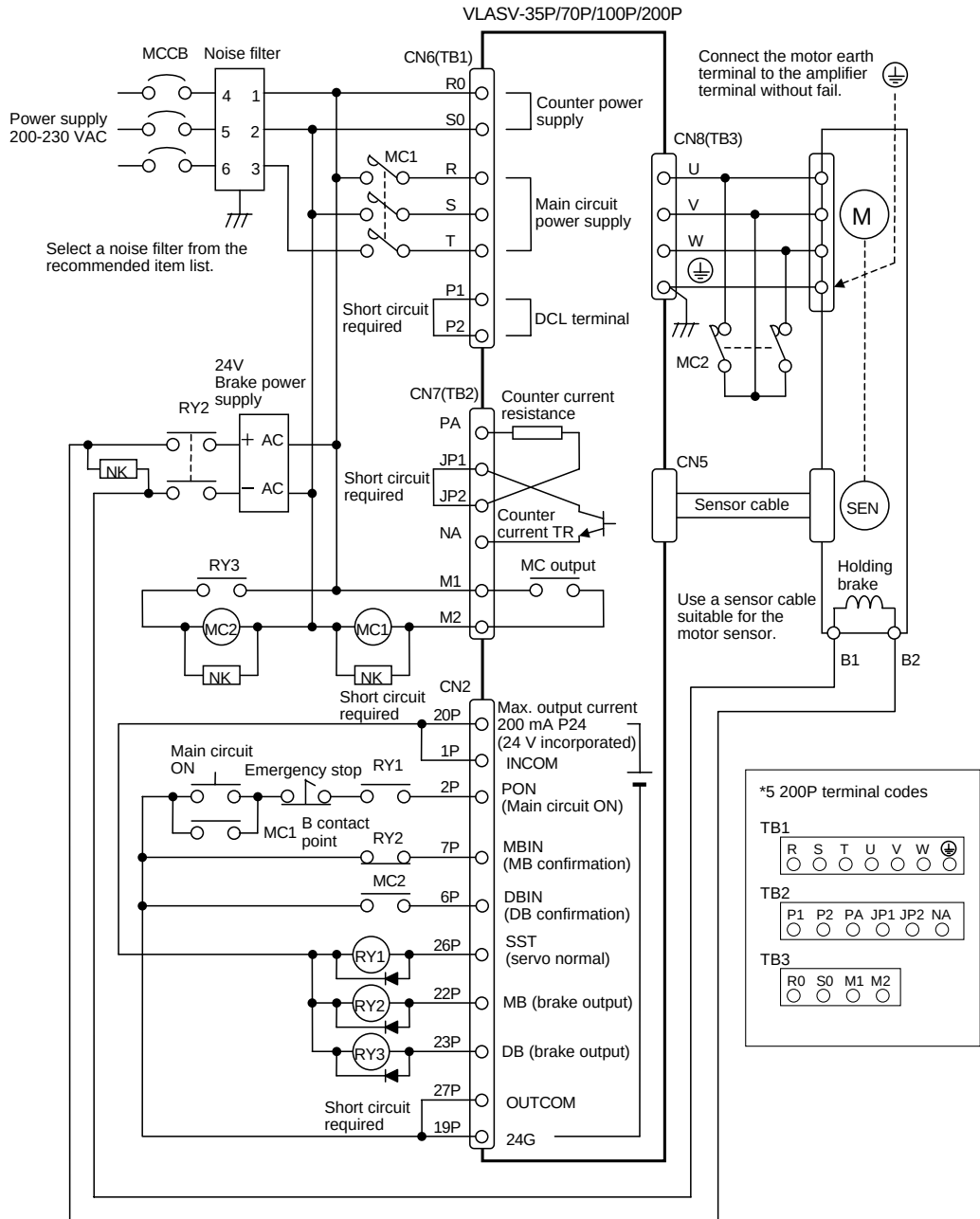
●Operation sequence



**Caution**

Shift to the sequence to turn OFF the operation signal after the servo normal is turned OFF. The servo lock is applied immediately after resetting, causing danger.

- Wiring



Note 1 : Separate the power supply and motor armature wiring from the motor sensor cable.

Note 2 : Connect the motor earth to the servo amplifier earth terminal and ground the servo amplifier without fail.

Note 3 : Install a surge killer to the contactor and relay coils to prevent the influence of noises.

Note 4: A DCL terminal may be added to P1 and P2 terminals for the purpose of improving the power factor and suppressing the harmonic component.

Note 5: CN6, 7, and 8 are connector numbers for 035P and 070P. Codes for 100P are in brackets (), and those for 200P are indicated in another table.

2-2. Selection of Peripheral Equipment

Motor type VLBSV	Suitable amplifier VLASV	Braker Fuji Electric MCCB	Noise filter TDK	Contactors Fuji Electric MC1	Noise killer Nisshin NF	Relay Omron RY1-RY3	Brake power supply Cosel	Contactors Fuji Electric MC2
-Z00330	-006P1	SA32B-3A	ZRAC2206-11	SC-03 1a AC100V	SQ25050NFZ	MY4N-D (with diode)	P15E-24-N	SH-4 2a2b AC100V
	-006P2			SC-03 1a AC200V				SH-4 2a2b AC200V
-Z00530	-006P1			SC-03 1a AC100V				SH-4 2a2b AC100V
	-006P2			SC-03 1a AC200V				SH-4 2a2b AC200V
-Z01030	-006P1			SC-03 1a AC100V				SH-4 2a2b AC100V
	-006P2	SA32B-3A		SC-03 1a AC200V				SH-4 2a2b AC200V
-Z01530	-012P1	SA32B-5A		SC-03 1a AC100V				SH-4 2a2b AC100V
	-012P2	SA32B-3A		SC-03 1a AC200V				SH-4 2a2b AC200V
-Z02030	-012P1	SA32B-5A		SC-03 1a AC100V				SH-4 2a2b AC100V
	-012P2	SA32B-3A		SC-03 1a AC200V				SH-4 2a2b AC200V
-Z04030	-012P2	SA32B-5A					P15E-24-N	
-05015	-012P2	SA32B-10A	ZRAC2206-11				P30E-24-N	
-Z06030	-025P2		ZRAC2210-11				P15E-24-N	
-Z08030	-025P2	SA32B-10A	ZRAC2210-11				P15E-24-N	
-10015	-035P3	SA33B-10A	ZRWT2210-ME				P30E-24-N	
-10030	-035P3							
-15015	-035P3	SA33B-10A	ZRWT2210-ME		SQ25050NFZ			
-18030	-070P3	SA33B-15A	ZRWT2220-ME					
-20015	-070P3							
-24030	-070P3	SA33B-15A						
-30015	-070P3	SA33B-20A						
-30030	-070P3	SA33B-20A	ZRWT2220-ME	SC-03 1a AC200V				SH-4 2a2b AC200V
-45030	-100P3	SA33B-30A	ZRWT2230-ME	SC-4-1 1a AC200V				B-N20 AC200V 3b
-50015	-100P3	SA33B-30A	ZRWT2230-ME	SC-4-1 1a AC200V				
-70030	-200P3	SA53B-40A	ZRCT5050-MF	SC-1N 2a2b AC200V				
-75015	-200P3	SA53B-40A						
-10K30	-200P3	SA53B-50A	ZRCT5050-MF	SC-1N 2a2b AC200V	SQ25050NFZ	MY4N-D (with diode)	P30E-24-N	B-N20 AC200V 3b

■ Multiple axes selection criteria

When you are using one no-fuse breaker for multiple amplifiers, calculate the primary side alternate current using the following formula and determine a required capacity.

● Single phase (VLASV-006P1 • 012P1 / 006P2 • 012P2 • 025P2)

$$I = (2.5 \times P + P_s) \div V \quad [A]$$

● Three phases (VLASV-035P3 • 070P3 • 100P3 • 200P3)

$$I = \left(\frac{1.7 \times P}{\sqrt{3}} + P_s \right) \div V \quad [A]$$

2.5 : Coefficient of efficiency and power factor

P : Aggregate total of motor output [W]

P_s : Aggregate total of control power supply capacity [VA]

V : Power voltage [V]

Amplifier model	Control power supply capacity (VA)
VLASV-006P1	50
VLASV-006P2	50
VLASV-012P1	50
VLASV-012P2	50
VLASV-025P2	50
VLASV-035P3	65
VLASV-070P3	80
VLASV-100P3	80
VLASV-200P3	100

2-3. Wire Diameter

Motor type VLBSV	Suitable amplifier VLASV	Main circuit (RST)	Motor output (UVW)	Operating circuit (R0-S0)	MCON (M1-M2)	Counter current resistance (P-JP1)	Dynamic brake circuit	Holding brake (B1-B2)	(note 2)	(note 3)
									DC input (PA-NA)	DCL (P1-P2)
-Z00330	-006P1	AWG20	AWG20	AWG20	AWG20	AWG20	AWG20	AWG20	AWG20	AWG20
	-006P2									
-Z00530	-006P1									
	-006P2									
-Z01030	-006P1									
	-006P2									
-Z01530	-012P1									
	-012P2									
-Z02030	-012P1									
	-012P2									
-Z04030	-012P2									
-05015	-012P2	AWG20	AWG20			AWG20	AWG20		AWG20	AWG20
-Z06030	-025P2	AWG16	AWG16			AWG16	AWG16		AWG16	AWG16
-Z08030	-025P2									
-10015	-035P3									
-10030	-035P3									
-15015	-035P3		AWG16							
-18030	-070P3		AWG14							
-20015	-070P3									
-24030	-070P3	AWG16				AWG16			AWG16	AWG16
-30015	-070P3	AWG14				AWG14			AWG14	AWG14
-30030	-070P3	AWG14	AWG14			AWG14	AWG16		AWG14	AWG14
-45030	-100P3	AWG12	AWG12			AWG12	AWG14		AWG12	AWG12
-50015	-100P3	AWG12	AWG12			AWG12	AWG14		AWG12	AWG12
-70030	-200P3	AWG10	AWG8			AWG10	AWG10		AWG10	AWG10
-75015	-200P3	AWG10							AWG10	AWG10
-10K30	-200P3	AWG8	AWG8	AWG20	AWG20	AWG10	AWG10	AWG20	AWG8	AWG8

Note 1 : Wire size determination criterion - when UL1430 and UL1015 wires are used at a ambient temperature 40 degrees Celsius.

Note 2 : Wires in this column are required only when 280 VDC is input to the PA-NA terminal, and should not be connected for AC input to the RST terminal. Connecting to both terminals will damage the unit.

Note 3 : The V series product has terminals P1 and P2 for connecting a DCL terminal for the purpose of improving the power factor and suppressing the harmonic component.

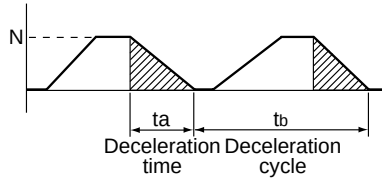
2-4. Counter Current Absorption Resistance

During motor revolution deceleration or absorption operation (while loaded with a pulley), the reverse current energy will raise the DC voltage in the amplifier. The counter current absorption circuit is provided to prevent the voltage rise. The counter current absorption circuit is designed to consume the reverse current energy with a resistor mounted in the amplifier. When the reverse current energy grows greater, heat generated by the internal resistance exceeds a set threshold and the overvoltage (AL02), counter current absorption resistance (AL09), and reverse current absorption (AL10) protective circuits function. Yet, the counter current absorption capacity can be expanded by adding an external resistor.

2-4-1. Selection of External Resistance

The value of reverse current energy is defined by a load amount and an operation pattern. An excessive energy amount to be absorbed by an external resistor is obtained by subtracting machine loss, motor internal loss, amplifier power consumption, amplifier power source charging capacity, and energy to be absorbed by the internal internal counter current resistance from the reverse current energy. Convert an energy amount obtained in this way to a value per unit time period to obtain the wattage (W) for the external counter current resistor.

● Horizontal axis



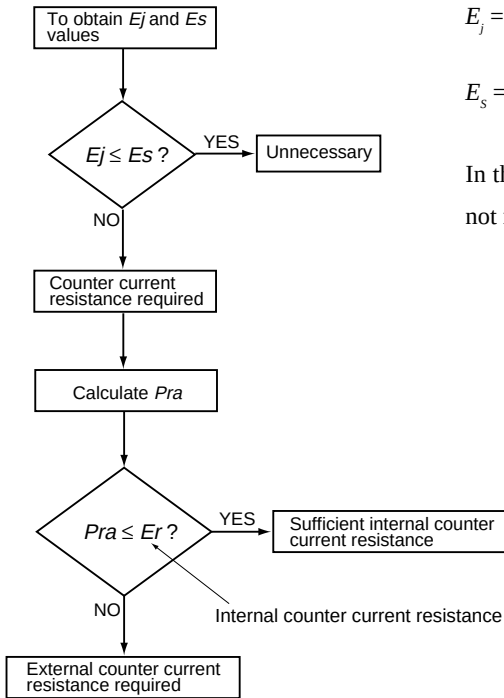
Reverse current energy	$E_j = \frac{1}{2} \times (J_m + J_L) \times \left(\frac{2\pi N}{60}\right)^2 \quad (\text{J})$
Total of various losses and charging capacity	$E_s = \left(\frac{\pi N}{60} \times T_L + P_m + P_a\right) \times t_a + E_c \quad (\text{J})$
Counter current power	$P_{ra} = \frac{E_j - E_s}{t_b} \quad (\text{W})$

J_m : Motor inertia	(kg·m ²)	 See the manufacturer's specifications
J_L : Load inertia	(kg·m ²)	
π : pi (?I) 3.14		
N : rpm at the time of deceleration	(r/min)	
T_L : Load torque	(N·m)	
P_m : Motor loss	(W)	 10% of motor capacity
P_a : Amplifier power consumption	(W)	 See the table below.
E_c : Amplifier power source charging capacity	(J)	 See the table below.
t_a : Deceleration time	(s)	
t_b : Deceleration cycle	(s)	

Amplifier counter current absorption capacity

Amplifier model	Power consumption Pa (W)	Internal counter current resistance Er (W)	Charging capacity Ec (J)
VLASV-006P1	7	10	3.3
VLASV-006P2	7	20	5.4
VLASV-012P1	10	10	3.3
VLASV-012P2	16	20	5.4
VLASV-025P2	27	30	8.0
VLASV-035P3	40	60	8.0
VLASV-070P3	70	80	16
VLASV-100P3	140	100	26
VLASV-200P3	200	180	76

Example 1: Using motor VLBSV-Z04030 and amplifier VLASV-012P2 in a set



$$E_j = \frac{1}{2} \times (0.39 + 1.2) \times 10^4 \times \left(\frac{2\pi \times 3000}{60} \right)^2 = 7.8 \quad (\text{J})$$

$$E_s = \left(\frac{\pi \times 3000}{60} \times 0.13 + 40 + 16 \right) \times 0.035 + 5.4 = 8.1 \quad (\text{J})$$

In this example, E_j (7.8J) is less than E_s (8.1J) and external resistance is not required.

J_m : Motor inertia	0.39×10^{-4}	(kg·m ²)
J_L : Load inertia	1.2×10^{-4}	(kg·m ²)
π : pi (?I) 3.14		
N : rpm at the time of deceleration	3000	(r/min)
T_L : Load torque	0.13	(N·m)
P_m : Motor loss	40	(W)
P_a : Amplifier power consumption	16	(W)
E_c : Amplifier power source charging capacity	5.4	(J)
t_a : Deceleration time	0.035	(s)
t_b : Deceleration cycle	0.1	(s)

User parameter setting

UP-21	0
UP-22	0

Example 2: Using motor VLBSV-18030 and amplifier VLASV-070P3 in a set

$$E_j = \frac{1}{2} \times (12.9 + 13.0) \times 10^4 \times \left(\frac{2\pi \times 3000}{60} \right)^2 = 128 \quad (\text{J})$$

$$E_s = \left(\frac{\pi \times 3000}{60} \times 0.6 + 180 + 70 \right) \times 0.05 + 16 = 33 \quad (\text{J})$$

E_j (128J) is greater than E_s (33J) and additional counter current resistance is required.

Then, obtain a value for P_{ra} .

$$P_{ra} = \frac{128-33}{0.3} = 128 \quad (\text{W})$$

Because the amplifier 070P3 has its internal resistance of 80 W, an external resistance over 316 W is required. When using an optional counter current absorption resistor, select one with the absorption capacity 400 W.

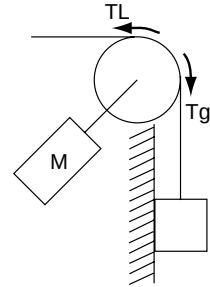
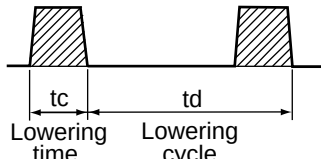
If you select a resistor of 15 ohm and 400 W, set the user parameters UP-21 and UP-22 as following:

User parameter setting	UP-21	15.0 (Ω)
	UP-22	0.40 (kW)

J_m : Motor inertia	12.9×10^{-4}	(kg·m ²)
J_L : Load inertia	13.0×10^{-4}	(kg·m ²)
π : pi (?I) 3.14		
N : rpm at the time of deceleration	3000	(r/min)
T_L : Load torque	0.6	(N·m)
P_m : Motor loss	180	(W)
P_a : Amplifier power consumption	70	(W)
E_c : Amplifier power source charging capacity	16	(J)
t_a : Deceleration time	0.05	(s)
t_b : Deceleration cycle	0.3	(s)

● Vertical axis

This is an example in the case that a work piece is lowered by a pulley or a motor is used as a brake for tension control. In the formulas below, TL is load torque generated by friction and Tg is torque defined by work mass and a pulley's diameter.



Reverse current energy

$$E_j = \frac{2 \pi N}{60} \times T_g \times t_c \quad (\text{J})$$

Total of various losses and charging capacity

$$E_s = \left(\frac{2 \pi N}{60} \times T_L + P_m + P_a \right) \times t_c + E_c \quad (\text{J})$$

Counter current power

$$P_{ra} = \frac{E_j - E_s}{t_b} \quad (\text{W})$$

N : rpm during lowering

(r/min)

Tg : Tare torque

(N·m)

TL : Load torque

(N·m)

Pm : Motor loss

(W) 10% of motor capacity

Pa : Amplifier power consumption

(W) See the table below.

Ec : Amplifier power source charging capacity

(J) Assumed as zero (0)

tc : Lowering time

(s)

td : Lowering cycle

(s)

π : pi (π) 3.14

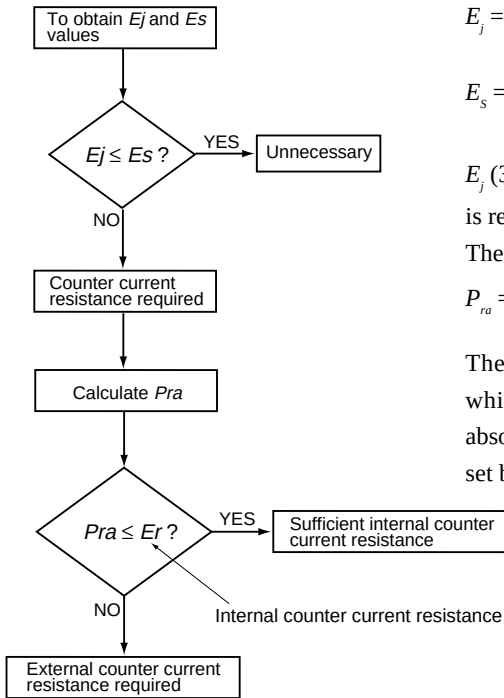
*Note 1

Note 1 : It is assumed that in continuous absorption operation, the charging capacity of amplifier power source is not utilized and thus Ec is assumed zero (0).

Amplifier counter current absorption capacity

Amplifier model	Power consumption Pa (W)	Internal counter current resistance Er (W)	Charging capacity Ec (J)
VLASV-006P1	7	10	3.3
VLASV-006P2	7	20	5.4
VLASV-012P1	10	10	3.3
VLASV-012P2	16	20	5.4
VLASV-025P2	27	30	8.0
VLASV-035P3	40	60	8.0
VLASV-070P3	70	80	16
VLASV-100P3	140	100	26
VLASV-200P3	200	180	76

Example 3: Using motor VLBSV-Z04030 and amplifier VLASV-012P2 in a set



User parameter setting	UP-21	0
	UP-22	0

$$E_j = \frac{2\pi \times 3000}{60} \times 0.5 \times 0.2 = 31 \quad (\text{J})$$

$$E_s = \left(\frac{2\pi \times 3000}{60} \times 0.13 + 40 + 16 \right) \times 0.2 + 0 = 9 \quad (\text{J})$$

E_j (31J) is greater than E_s (9J) and additional counter current resistance is required.

Then, obtain a value for P_{ra} .

$$P_{ra} = \frac{31-9}{1} = 12 \quad (\text{J})$$

The amplifier 012P2's internal counter current resistance is 20 W, which can be absorbed without adding an external counter current absorption resistor. The user parameters UP-21 and UP-22 are zero as set before shipped out from the factory.

N : rpm during lowering	3000	(r/min)
T_g : Tare torque	0.5	(N·m)
T_L : Load torque	0.13	(N·m)
P_m : Motor lossn	40	(W)
P_a : Amplifier power consumption	16	(W)
E_c : Amplifier power source charging capacity	5.4	(J)
t_c : Lowering time	0.2	(s)
t_d : Lowering cycle	1	(s)
π : pi (?)	3.14	

Example 4: Using motor VLBSV-18030 and amplifier VLASV-070P3 in a set

$$E_j = \frac{2\pi \times 3000}{60} \times 40 \times 0.2 = 251 \quad (\text{J})$$

$$E_s = \left(\frac{2\pi \times 3000}{60} \times 0.6 + 180 + 70 \right) \times 0.2 + 0 = 88 \quad (\text{J})$$

E_j (251J) is greater than E_s (88J) and additional counter current resistance is required.

Then, obtain a value for P_{ra} .

$$P_{ra} = \frac{251-88}{1} = 163 \quad (\text{W})$$

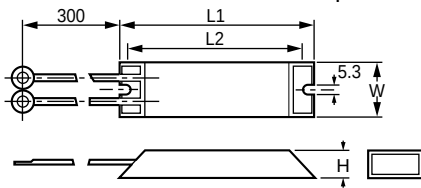
Because the amplifier 070P3 has its internal resistance (E_r) of 80 W, an external resistance over 163 W is required. When using an optional counter current absorption resistor, select one with the absorption capacity 200 W. If you select a resistor of 15 ohm and 200 W, set the user parameters UP-21 and UP-22 as following:

User parameter setting	UP-21	15.0 (Ω)
	UP-22	0.20 (kW)

N : rpm during lowering	3000	(r/min)
T_g : Tare torque	4.0	(N·m)
T_L : Load torque	0.6	(N·m)
P_m : Motor lossn	180	(W)
P_a : Amplifier power consumption	70	(W)
E_c : Amplifier power source charging capacity	16	(J)
t_c : Lowering time	0.2	(s)
t_d : Lowering cycle	1	(s)
π : pi (?)	3.14	

2-4-2. Counter Current Absorption Resistor

● Dimensions and Absorption Capacity



	Model	Absorption capacity	L1	L2	W	H
A	RGH60 100Ω	30 W	115	100	40	20
B	RGH200 30Ω	100 W	215	200	50	25
C	RGH400 30Ω	200 W	265	250	60	30

● Combination of Counter Current Absorption Resistor and Amplifier and User Parameter Setting

Absorption capacity Amplifier model Recommended resistance value	30W	100W	200W	400W	600W	800W
VLASV-006P 30~100Ω	 UP-21 100.0 UP-22 0.03	 UP-21 30.0 UP-22 0.10				
VLASV-012P 30Ω	 UP-21 100.0 UP-22 0.03	 UP-21 30.0 UP-22 0.10	 UP-21 30.0 UP-22 0.20	 UP-21 30.0 UP-22 0.40		 UP-21 30.0 UP-22 0.80
VLASV-025P 30Ω		 UP-21 30.0 UP-22 0.10	 UP-21 30.0 UP-22 0.20	 UP-21 30.0 UP-22 0.40		 UP-21 30.0 UP-22 0.80
VLASV-035P 30Ω		 UP-21 30.0 UP-22 0.10	 UP-21 30.0 UP-22 0.20	 UP-21 30.0 UP-22 0.40		 UP-21 30.0 UP-22 0.80
VLASV-070P 15Ω			 UP-21 15.0 UP-22 0.20	 UP-21 15.0 UP-22 0.40		 UP-21 15.0 UP-22 0.80
VLASV-100P 10Ω			 UP-21 10.0 UP-22 0.30		 UP-21 10.0 UP-22 0.60	 UP-21 10.0 UP-22 1.20
VLASV-200P 6Ω						 UP-21 6.0 UP-22 1.00

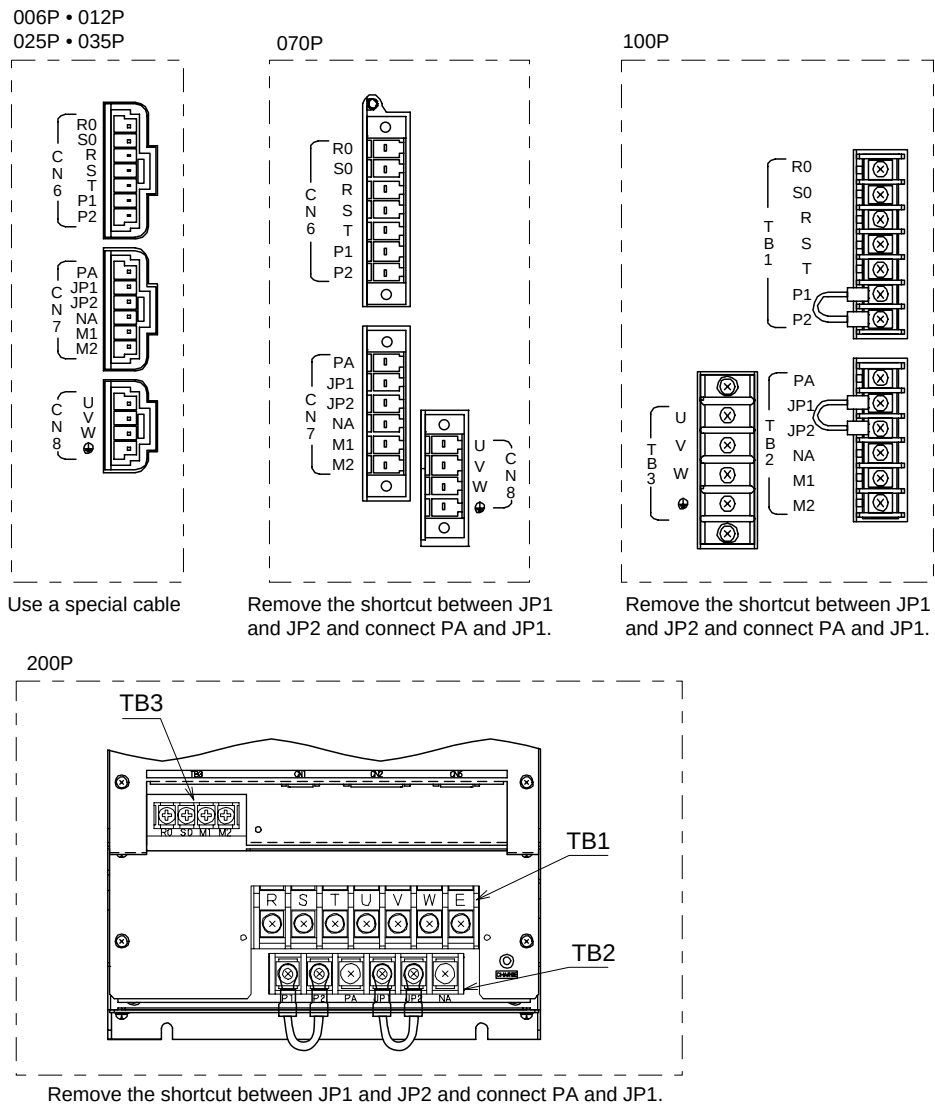
● External resistor with great absorption capacity

Select a resistor according to the table on the right when required absorption capacity is not met with any resistor in the above table.

Amplifier model	Recommended resistance value	Maximum absorption capacity
VLASV-006P	30~100 Ω	100 W
VLASV-012P	30 Ω	500 W
VLASV-025P	30 Ω	1.0 kW
VLASV-035P	30 Ω	1.5 kW
VLASV-070P	15 Ω	3.0 kW
VLASV-100P	10 Ω	5.5 kW
VLASV-200P	6 Ω	11 kW

2-4-3. Installing Counter Current Absorption Resistance

The internal counter current resistance of a servo amplifier may not be used together with an external absorption resistor. Therefore, the shortcut wire between JP1 and JP2 must be removed and the external resistor should be connected between PA and JP1. A special tool is required to remove wiring from 006P, 012P, 025P, and 035P. If you have not such a tool, use a cable (CV07B) specialized for counter current absorption resistor. The wiring for amplifier 070P may be removed from the connector using a flathead screwdriver. Amplifiers 100P and 200P have a terminal block and wiring may be changed using a Phillips screwdriver.



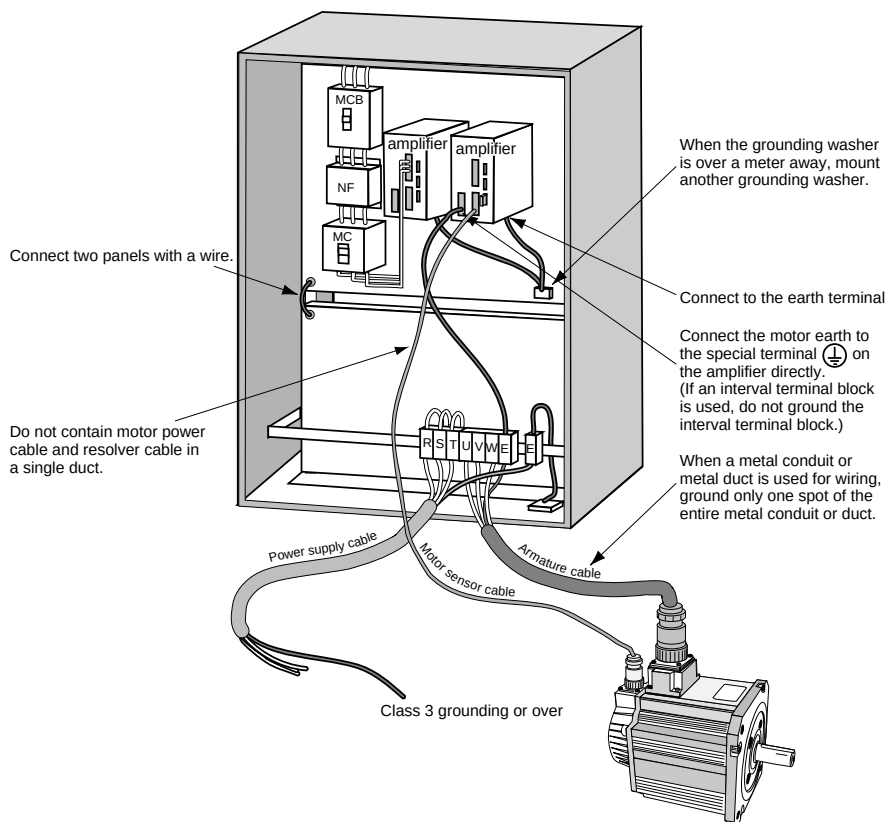
 Caution	 A counter current absorption resistor will be heated to about 100 degree Celsius. Therefore, installation environment and radiation method are important. Use heat resistant plastic coated wire and arrange so that the wire does not touch the resistor.
 Caution	 A servo amplifier and a counter current absorption resistor should be used only in a specified set. A different combination may cause a fire.
 Caution	 A resistor will be heated to a high temperature. If you touch, you may burn your hand.

2-5. Grounding

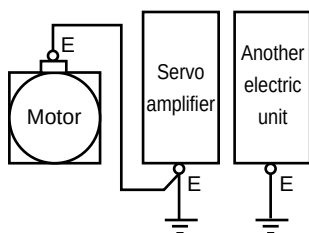
Apply class 3 grounding to a servo amplifier and a servo motor for safety and as a countermeasure for noises. The switching noises of a transistor may give adverse influence to the signal and power transmission systems.

Proper wiring and grounding are required.

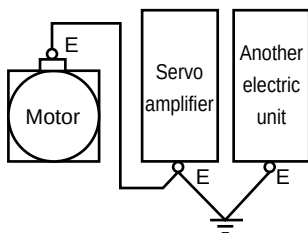
- A noise filter should be installed near the servo amplifier.
- When the control panel grounding washer is located over a meter away from the servo amplifier, ground by mounting a grounding washer to the servo amplifier mounting panel.
- The servo amplifier earth should be connected to the connector marked with ().



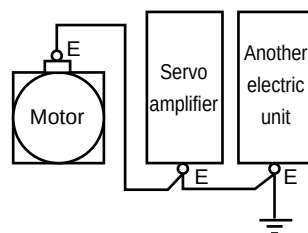
- Do not share grounding with high power equipment or a motor.
- Do not ground to the steel frame of building to which a variety of equipment is grounded.



Separate grounding : Fine



Shared grounding : Fine



Shared grounding : Undesirable



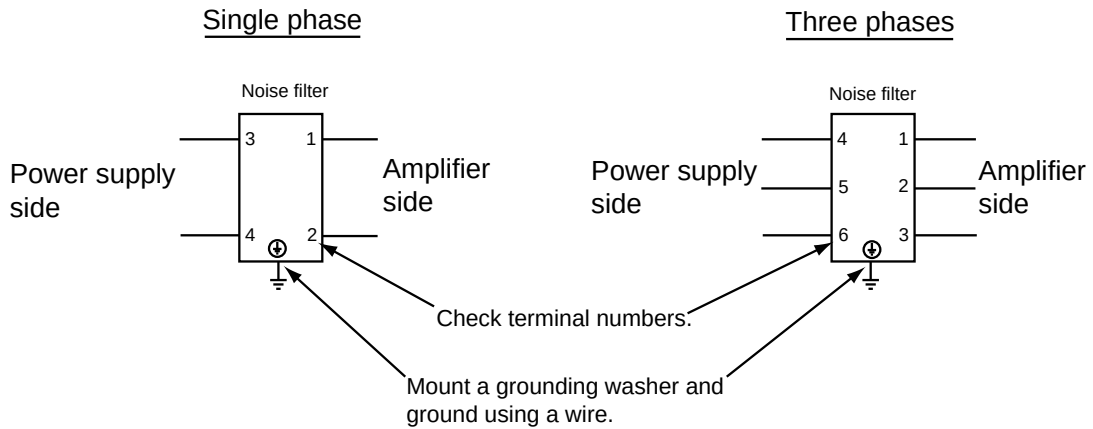
Caution



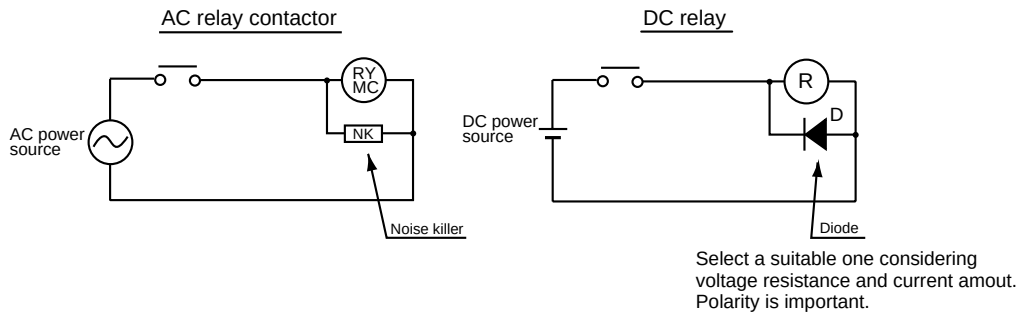
Use a wire for grounding the earth terminal (E). Otherwise, you may suffer an electric shock.

2-6. Countermeasures for Noise

- Use a noise filter on the primary side of the AC power source. A noise filter has an input and an output connector which should not be confused.



- Take following measures when using an electric noise source such as a relay, an electromagnetic solenoid, and an electromagnetic brake near the servo amplifier:
 1. Install those noise sources as far as possible from the servo amplifier.
 2. Install a noise killer or a diode to those noise sources.



- When an inverter is housed in the same panel, take necessary measures for safety such as insulating its power supply system and separating power distribution wiring.

2

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3-1. Input Output Signal Table

There are four types of signals: 24-V input output, analog input, pulse input, and differential output. The same type of signal may have different functions in different modes. For example, IN4 signal means "forward running possible" in the speed control mode but "deviation clear" in the direct feed mode. This should be remembered when conducting wiring.

- The following table shows the standard I/O for each control mode.
- Setting the user parameter UP-46 (Sequence I/O option) enables to select a sequence I/O other than the standard I/O. Particularly, when a dynamic brake or/and a holding brake is used, I/O allocation may have to be changed.

<Standard I/O> (* Except the NCBOY mode)

Mode Symbol	Mode 01 Speed control	Mode 02 Current control	Mode 03 Position control	Mode 04 Speed/current/ position control	Mode 05 Direct feed	Mode 06 Draw control
REF	Speed command	Speed limit		Speed command or speed limit	Primary feed speed	
CLI	Current limit	Current command	Current limit	Current limit or current command	Secondary feed speed	
VMON and AMON	Speed and current monitor (Selecting an output by setting a parameter)					
FMA and FMB			Pulse command	Pulse command		Pulse command
AP, BP, and ZP	Encoder output, display device output, current value output, command pulse output, and draw pulse output					
IN7	Operation	Operation	Operation	Operation	Operation	Operation
IN6	Reset	Reset	Reset	Reset	Reset	Reset
IN5	MB confirmation	MB confirmation	MB confirmation	MB confirmation	MB confirmation	MB confirmation
IN4	Forward running possible		Forward running possible	Deviation value	Speed selection 2	DRAW 3
IN3	Reverse running possible	Monitor switch-over	Reverse running possible	Current control switch-over	Speed selection 1	DRAW 2
IN2	Current value clear	Current value clear	Deviation value	Position control switch-over	Forward running command	DRAW1
IN1	Zero point stop	Limit switch-over	Zero point stop	Zero point stop	Reverse running command	DRAW0
IN0	PON input	PON input	PON input	PON input	PON input	PON input
OUT4	Servo normal	Servo normal	Servo normal	Servo normal	Servo normal	Servo normal
OUT3	Servo ready	Servo ready	Servo ready	Servo ready	Servo ready	Servo ready
OUT2	Zero point stopped	Stop detection	In-position/zero point stopped	In-position/zero point stopped	Stop detection	Stop detection
OUT1	Warning	Warning	Warning	Warning	Warning	Warning
OUT0	MB output	MB output	MB output	MB output	MB output	MB output

<Special Sequence I/O> (* See "5-.8 Special Sequence" below.)

Type Symbol	Special sequence 1 for Mode 01	Special sequence 2 for Mode 01	Special sequence 3 for Mode 02	Special sequence 4 for Mode 03	Special sequence 5 for Mode 03	Special sequence 6 for Mode 04	Special sequence 7 for Mode 05	Special sequence 8 for Mode 06
IN5	Current limit switch-over	MB confirmation	MB confirmation	Current limit switch-over	MB confirmation	MB confirmation	Speed selection 2	MB confirmation
IN4	DB confirmation	DB confirmation	DB confirmation	DB confirmation	DB confirmation	DB confirmation	DB confirmation	DB confirmation
IN3	Zero command	Monitor switch-over	Monitor switch-over	Current value clear	Current value clear	Current control switch-over	Speed selection 1	Pulse prohibited
IN2	Current value clear	Current value clear	Current value clear	Current value clear	Current value clear	Position control switch-over	Forward running command	Forward running command
IN1	Zero point stop	Zero point stop	Speed limit switch-over	Zero point stop	Zero point stop	Limit switch-over	Reverse running command	Reverse running command
OUT2	Zero point stopped	Zero point stopped	Stop detection	In-position/zero point stopped	In-position/zero point stopped	In-position/zero point stopped	Stop detection	Stop detection
OUT1	DB output	DB output	DB output	DB output	DB output	DB output	DB output	DB output
OUT0	Warning	MB output	MB output	Warning	MB output	MB output	Warning	MB output



Caution



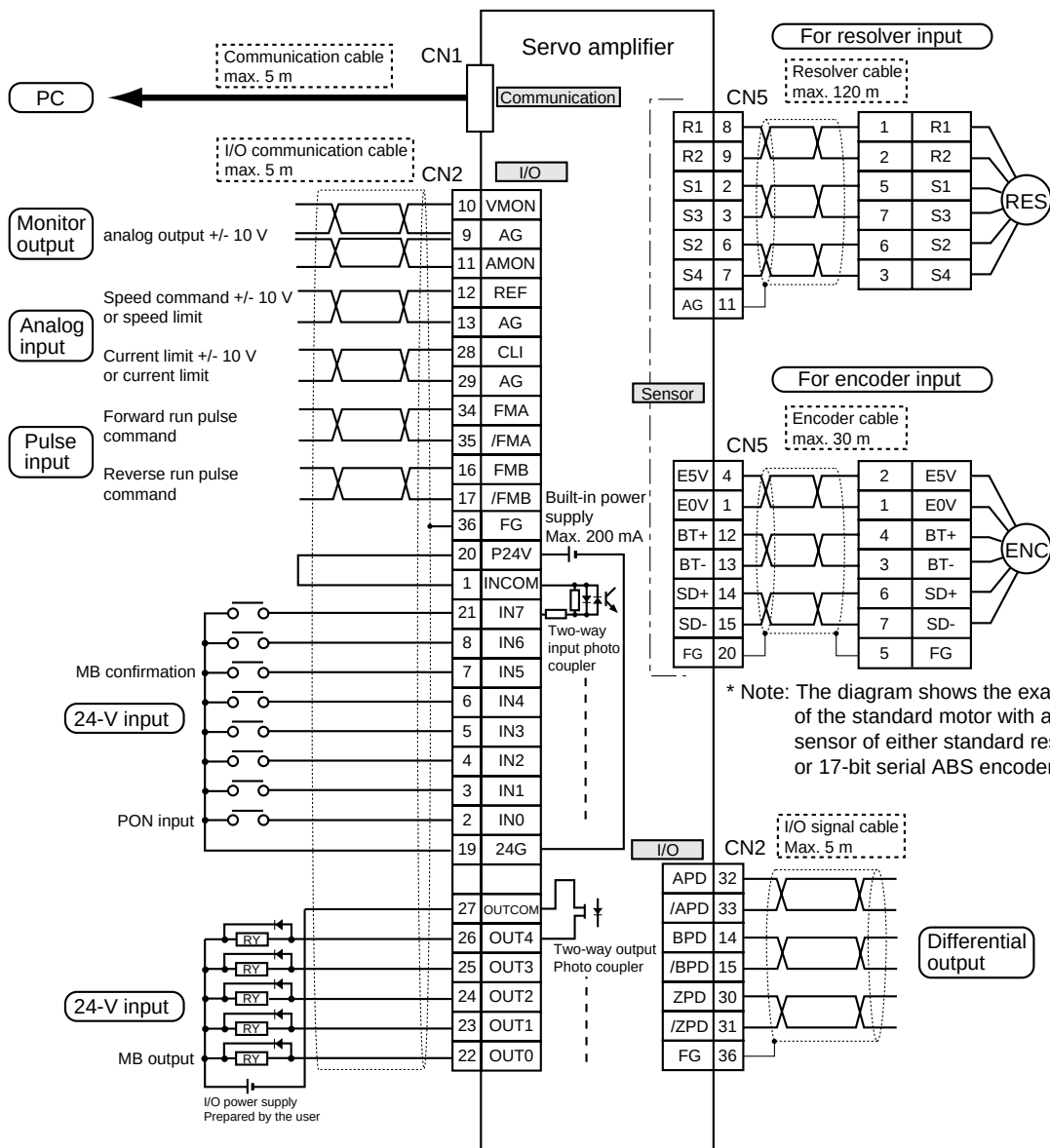
Wrong CN2 control connector wiring will cause an unexpected result. Make sure that wiring is correctly arranged and conduct test run first.



Caution



Shut down the power first before plugging in or out the control connectors for CN1, CN2, and CN5. Such an act will cause malfunction or fault.



Connector symbol	Cable name	Cable model	Remarks
CN1	RS232C communication cable	CV01A-□□□ □	Select either one.
CN1	RS485 communication cable	CV01B-□□□ □	
CN2	I/O signal cable	CV02A-□□□ □	Select one of these.
CN5	V standard resolver cable	CV05A-□□□ □	
CN5	VZ motor resolver cable	CV05B-□□□ □	
CN5	V standard resolver ABS cable	CV05C-□□□ □	
CN5	V standard serial ABS cable	CV05D-□□□ □	
CN5	VZ motor serial ABS cable	CV05E-□□□ □	



Caution



I/O power supply voltage should be in the range of 24 VDC $\pm 10\%$. Otherwise, the unit may be damaged.



Caution



Wrong CN5 connection may drive the motor out of order. Make sure that wiring is correctly arranged and conduct test run first.

3-2. Connecting Signal Circuit

3-2-1. Analog Input

●Input specification

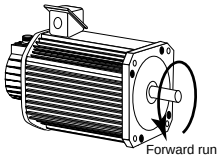
Maximum input voltage DC $\pm 12\text{ V}$
Input impedance 49 kohm

●Wiring

Conduct wiring with two pairs of twisted pair shielded wire in the I/O signal cable. Connect the amplifier side shield with CN2-29AGND and cut the shield on the other end.

●Rotating direction

The motor runs forward with speed command input positive voltage in the speed control mode. (Setting on shipment.)
The motor runs forward with current command input positive voltage in the current control mode. (Setting on shipment.)
The setting may be changed using the user parameter UP-15.

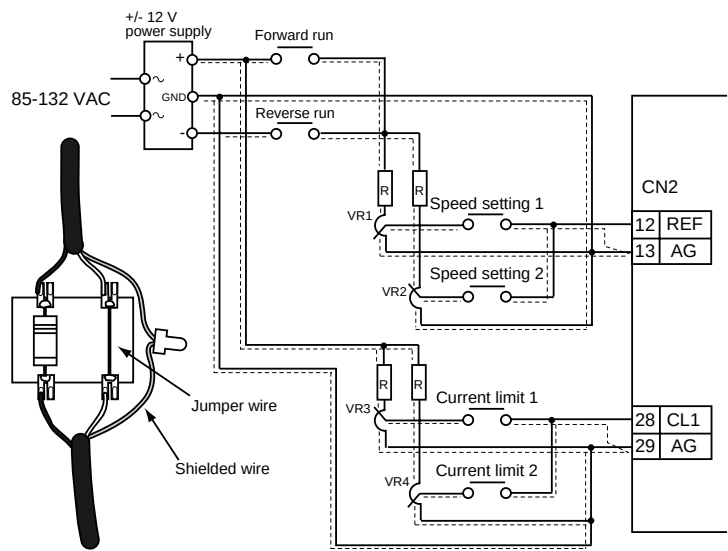


●Functional overview

The speed command controls speed in the speed control mode and limits speed in the current control mode. The current command controls current (torque) in the current control mode and limits current (torque) in the speed control mode. Using the limiting function is subject to UP-34 setting and existence of a limit switch-over signal. To the speed command, linear acceleration/deceleration or S-shaped acceleration/deceleration may be specified. In the direct feed mode, parameters UP-24 and UP-25 may be used for the primary feed speed and secondary feed speed by setting the values to "0."

●An example of connection

The diagram below shows the example of setting a speed command and current limit by using a relay. In such a case, select a relay contact that is suitable for minuscule current. Note that the most desirable wire is twisted pair shielded wire. Use a lug terminal to resistance and volume so that those signals are sent through twist pair shield wire. Connect the shield to AGND on the amplifier side. Trim the other side.



Item	Symbol	Model	Manuf
DC source	PS	RMC15-1-N (85-132VAC + 12V 0.3A - 12V 0.2A)	Corseil
Volume	VR	RV30YN205B I KOHM, 2 W	Cosmos
Resistance	R	R25XT-29J201 (1/4 W, 200 OHM)	Rohm
Relay	RY	MY4-NZ	Omron

3-2-2. Pulse Input

● Input specification

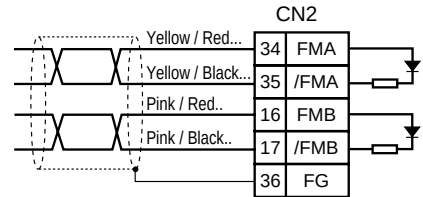
Max. input frequency 500 kpps, 5 VDC, 16 mA

When the pulse command type is forward/reverse pulse: 500 kpps

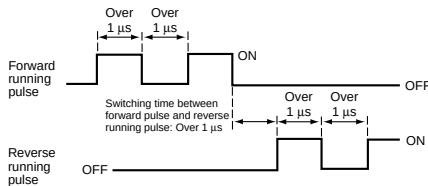
When the pulse command type is AB phase pulse: 125 kpps

When the pulse command types are both pulse and forward/reverse signal:

500 kpps

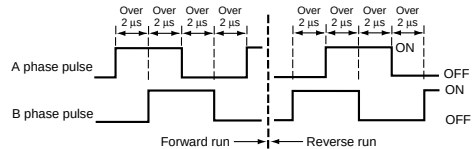


Forward/reverse pulse (max. 500 kpps)



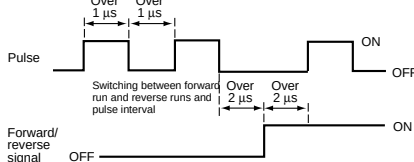
AB-phase pulse (max. 125 kpps)

The parameter UP-16 allows setting either to A or B-phase input. Input pulse encoder resolution is multiplied four times internally.

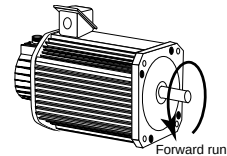


Pulse and forward/reverse signal

Pulse and forward/reverse signal may be switched with the parameter UP-16. (Max. 500 kpps)



Motor rotating direction



● Wiring

Conduct wiring with two pairs of twisted pair shielded wire in the I/O signal cable. Connect the amplifier side shield with FG and cut the shield on the other end.

● Rotating direction

Factory setting:

When the pulse command type is forward/reverse pulse: Input pulses to FMA for forward run.

When the pulse command type is AB phase pulse: Input pulses to FMA after rotating 90 degrees for forward run.

When the pulse command types are 'Pulse' and 'forward/reverse signal,' input pulses to FMA and set FMB to 'H' for forward run.

The setting may be changed using a user parameter.

● Functional overview

The electronic gear is a function about which the traveling distance (weight) of a machine per pulse is set with a user parameter, and positional determination and high-precision speed control without drift is enabled with any number of pulses (frequency). Set parameters UP-4 (numerator) and UP-5 (denominator) to scopes of machine travel based on motor detection split count 24,000 pulses per one rotation.

When you wish to move a machine 0.01 mm per one input pulse in the forward/reverse pulse mode:

Ball screw pitch 10 mm Deceleration ratio 1:2

Set UP-04 to 48 and UP05 to 1.

$$\frac{\text{Traveling distance per pulse} \times \text{detection split count}}{\text{Ball screw pitch} \times \text{deceleration ratio}} = \frac{0.01 \times 24000}{10 \times 1/2} = 48$$

Then, specify the pulse command type.

When the pulse command type is forward/reverse pulse, set UP-16 to 00:

In case of AB phase pulse (UP-16=01), this electronic gear setting will move 0.04 mm per pulse.

3-2-3. 24-V Input

● Input specification

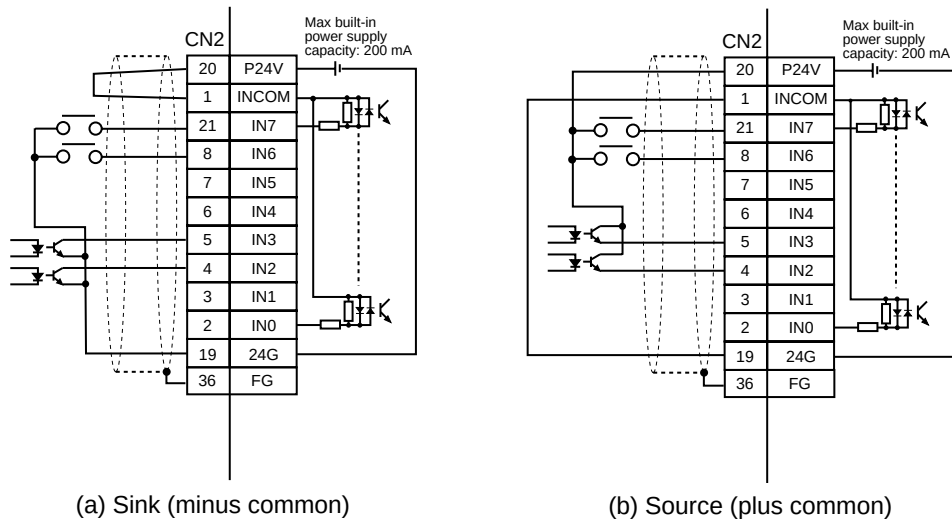
Input voltage: 24 VDC, input current: 6 mA
Max. built-in power supply capacity: 200 mA
Because a two-way photo coupler is used as the interface, both sink (minus common wiring) and source (plus common wiring) connections are possible.

● Wiring

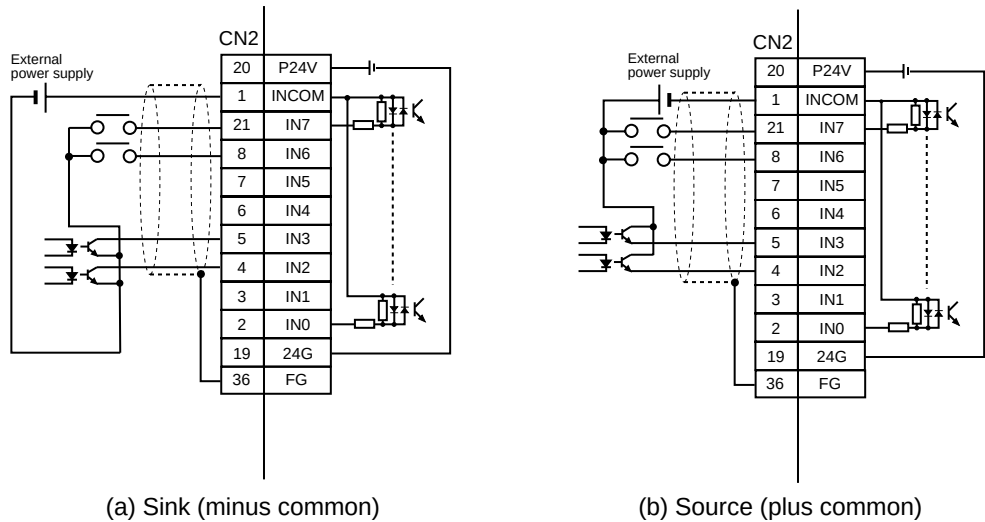
Use collective shielded wire. Connect the shield to the servo amplifier's earth. Trim the other end of the shield.

● An example of connection

With internal power supply:



With external power supply:





Caution



When using the external power supply for both 24-V input signal and 24-V output signal, remove the jumper between P24V and INCOM. Otherwise, product may be damaged.

3-2-4. 24-V Output

●Output specifications

Output voltage 24 VDC, max. current 50 mA
This output drives the LED, photo coupler, and miniature relay.

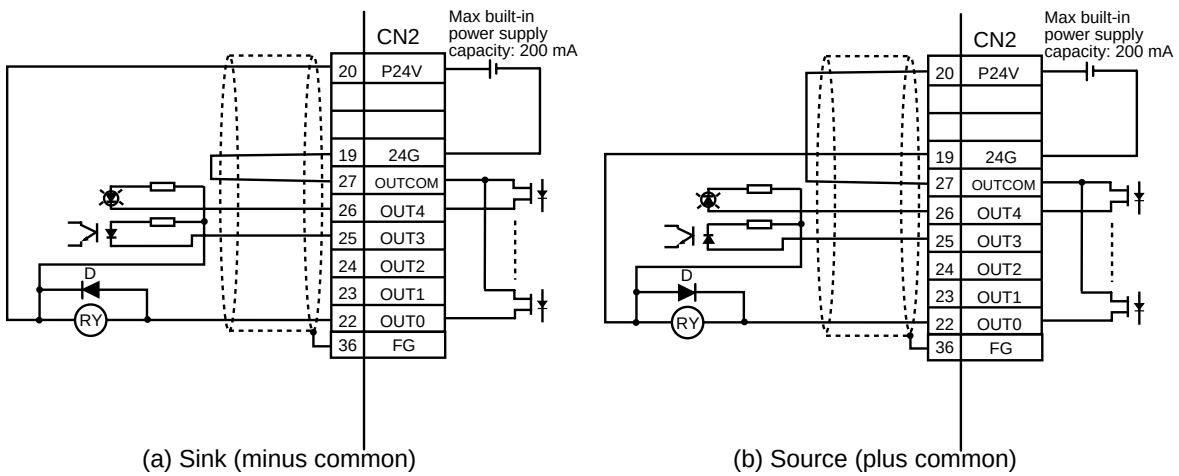
●Wiring

Use collective shielded wire. Connect the shield to the servo amplifier's earth. Trim the other end of the shield. Do not confuse the polarity of relay noise prevention diode. Wrong connection will damage the output transistor.

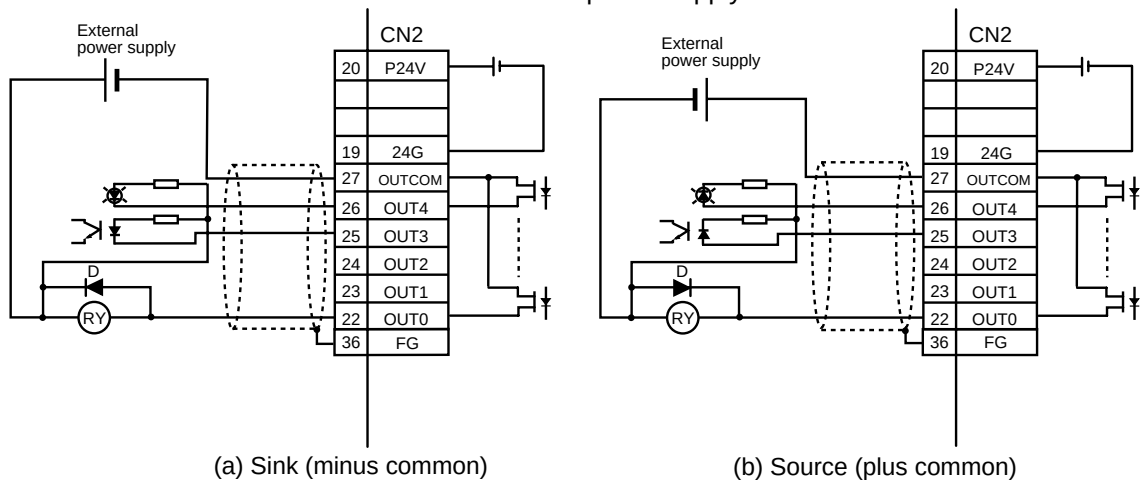
●An example of connection

The capacity of a built-in power supply should not exceed 200 mA.

With internal power supply:



With external power supply:



Item	Symbol	Model	Manuf
Relay	RY	MY2N DC24V	Omron
Diode	D	1S1830	Toshiba
DC source	PS	P15E-24-N AC85~264V 0.7A	Corsel

Caution

Do not connect an external power supply to P24V. Otherwise, product may be damaged.

3-2-5. Differential Output

●Output specifications

Max. output frequency

When the pulse output type is AB phase pulse: 125 kpps

When the pulse output type is forward/reverse pulse: 500 kpps

Max. output current 20 mA (3.4 V) line driver output (equivalent to AM26LS31)

A fraction rate up to 65535/65535 may be set for the split count 24,000 pulses per one rotation. The range should be from 0.05 to 500.

(The split count is 131,072 per rotation for 17 bit serial ABS encoder.)

●Wiring

Conduct wiring using two or three twisted pairs in the I/O signal cable. Connect the amplifier side shield with FG and cut the shield on the other end.

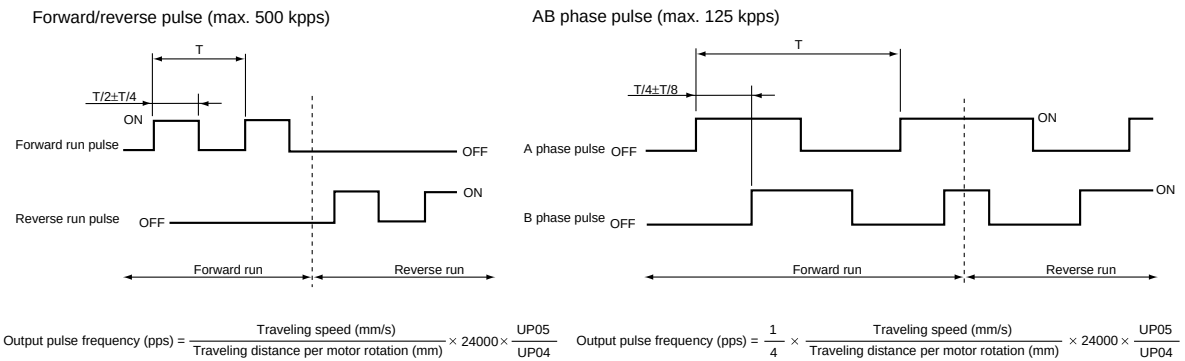
●Output for a rotating direction

When the product is shipped out, the pulse output type is set to AB phase pulse, and in forward run the pulse output to APD is 90 degrees advanced from the pulse output to BPD.

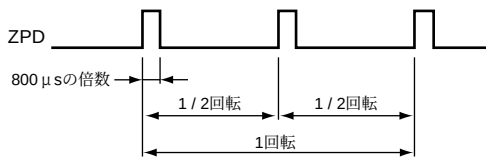
Change the user parameter UP-17 to switch the pulse output type to forward/reverse pulse so that:

pulse output is directed to APD in forward run, and

pulse output is directed to BPD in reverse run.



Z phase pulse (with a resolver)



When a resolver is used as the motor sensor, two zero point pulses appears 180 degrees apart during one motor rotation. When an encoder is used, only one pulse appears. Change the UP-06 parameter to shift the output position. For example, set the value to 36 to shift 36 degrees on the motor axis. Use this parameter for tuning the machine zero point.

●Functional overview

The differential output has the following three functions. Select a function using the parameter UP-18.

1. Pulse output

For motor position output either in forward/reverse pulse or AB phase pulse depending on the line driver method.

2. Monitor output

For outputting motor count, current value, motor current, electro-thermal value, motor phase amount, and machine traveling speed to an optional display device (DPA-80).

3. Current value serial data output

For serial outputting of a current value in binary 32 bits, 23 bits plus parity, 24 bits plus parity, or 31 bits plus parity. A current value is an absolute value with an absolute position (ABS) detector.

You can not use more than one function at the same time.

Function 1 Pulse output

In the output pulse mode, the motor position pulse is output in the line driver method.

■ Example of how to calculate an output pulse count for a traveling distance

When you want to output one pulse for traveling distance 0.01 mm (forward/reverse pulse), set as following:

Ball screw pitch 10 mm, Deceleration ratio 1:2

UP-04=48, UP-05=1, and UP-17=00.

$$\frac{\text{Traveling distance per pulse} \times \text{detection split count}}{\text{Ball screw pitch} \times \text{deceleration ratio}} = \frac{0.01 \times 24000}{10 \times 1/2} = 48$$

When the pulse command type is AB phase pulse (UP-19=01), one pulse is output for each 0.04 mm.

The split count for output pulse is 500 (pulses/rev).

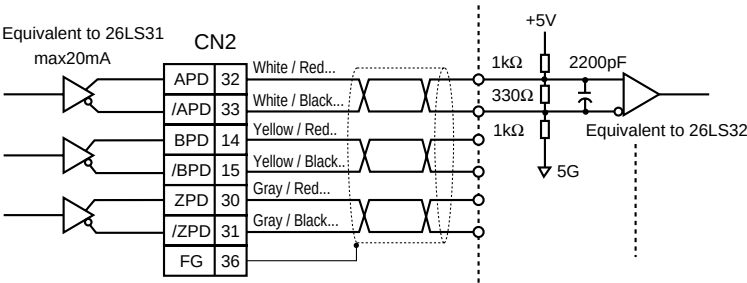
$$\frac{\text{Ball screw pitch}}{\text{Traveling distance per pulse} \times \text{deceleration ratio}} = \frac{10}{0.01 \times 1/2} = 2000 \text{ (pulses/rev)}$$

■ Example of obtaining a specific split count:

When you want to output 2000 (pulses/rev) with the AB phase pulse command type:

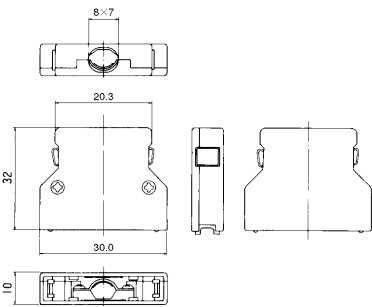
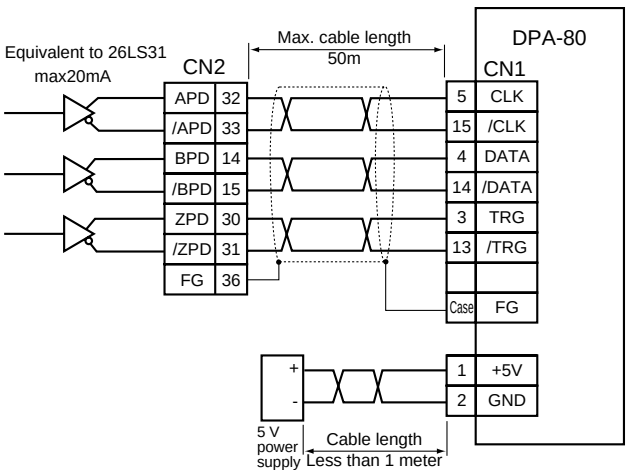
Set parameters as following: UP-04=3, UP-05=1, and UP-17=01.

$$\frac{4 \times \text{desired split count}}{\text{Detection split count}} = \frac{4 \times 200}{2400} = \frac{1}{3} = \frac{\text{UP-05}}{\text{UP-04}}$$



Function 2 Monitor output

Connect an optional display device DPA-80 (8 digits). Specify what to display using the parameter UP-18.



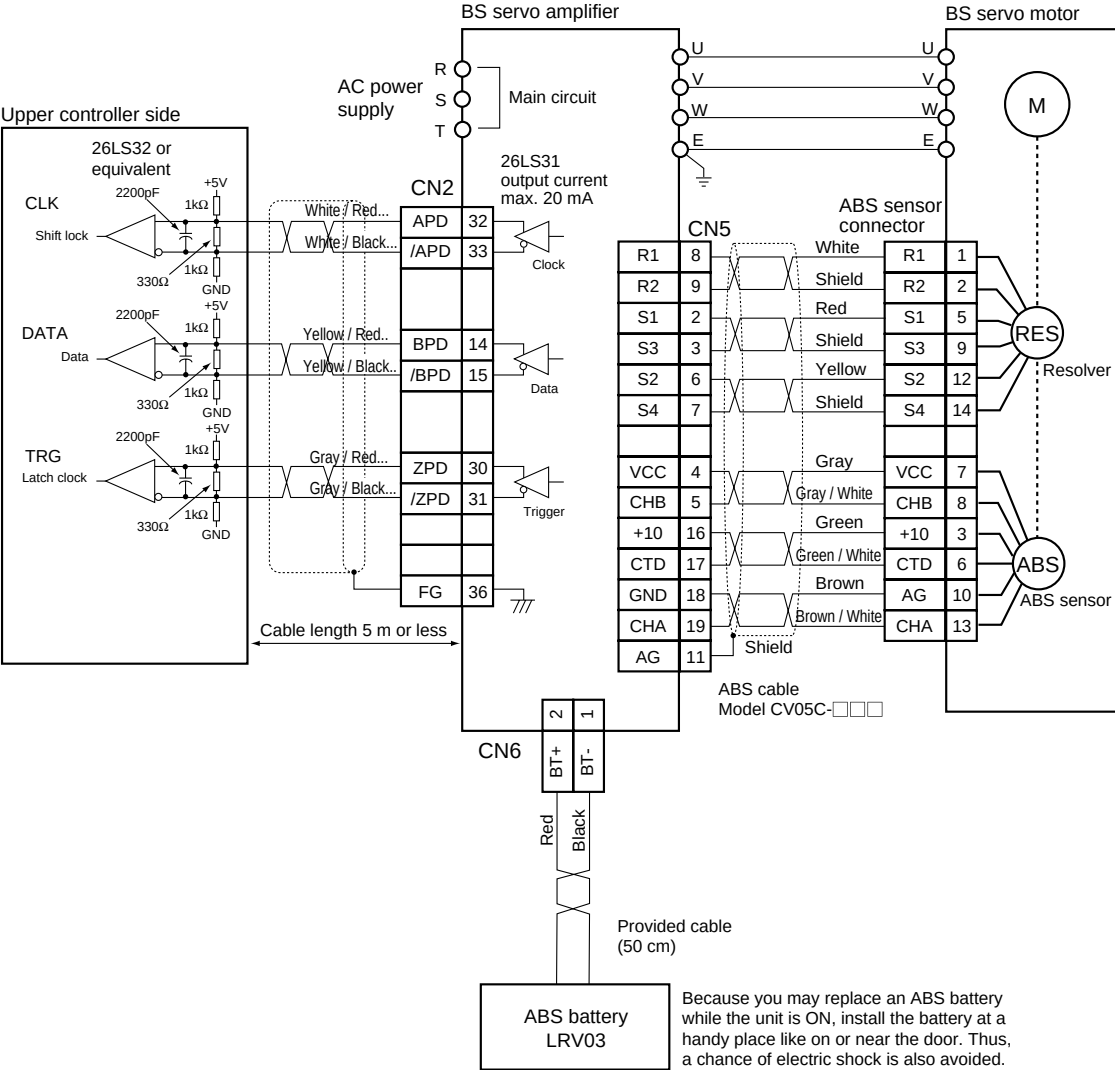
Pins	20
Plug	PCR-E20FS
Case	PCS-E20LB

Function 3 Current value serial data output

The position where you clear the input signal current value is set to the current value "0." Using the position as the starting point, current values are output as serial data. The maximum rotation count is +/- (215-1). With an absolute detector (ABS sensor), current values are absolute positions.

●An example of connection

Data are serially output from CN2. The display device (DPA80) is not available in this case. When the ABS sensor is not used, ABS cable and battery cable are not required. The length of cable connecting the differential output signal and a higher order controller should be less than 5 meters.



●Parameter setting

Set the last two digits of UP-20 so that current values are output as binary serial data.

UP-18 11 ☐ ☐

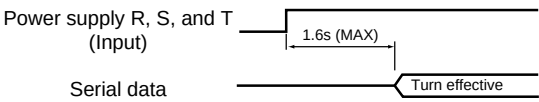
Set the output selection to 2--A current value is output to the differential output.

Value	Current value output type	Output order								
		FIRST	2	...	7	8	9	10	...	LAST
0	32 bits	MSB D31	D30	...	D25	D24	D23	D22	...	LSB D0
1	23 bits plus parity	x	x	...	x	x	parity	MSB D22	...	LSB D0
2	24 bits plus parity	x	x	...	x	parity	MSB D23	D22	...	LSB D0
3	31 bits plus parity	parity	MSB D30	...	D25	D24	D23	D22	...	LSB D0

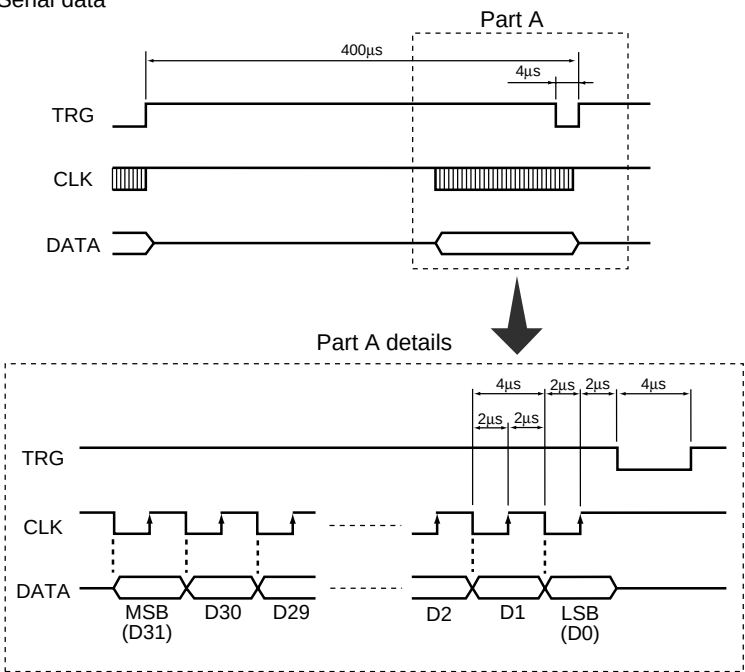
Serial data are output from MSB as described in the above table. Irrespective of current value output type setting, output data are 32 bits and the part marked X in the above table is truncated in a shift register.

●Output timing

• Turning serial data effective

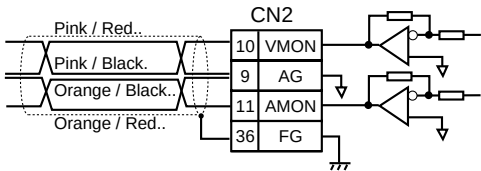


• Serial data



3-2-6. Analog Monitor Output

Analog monitor output is 12-bit DAC and may be used for monitoring as well as control purposes. Outputs are available from VMON and AMON, and both monitors process the same types of output data. Output analog data may be specified by selecting either UP-49 (for VMON) or UP-51 (for AMON). Output scales may be specified with UP-50 (for VMON) or UP-52 (for AMON). Default setting for VMON is speed (with a filter) and that for AMON (with a filter) is current.



●Output data selection and output type

UP-49 ☐ ☐ ☐ or UP-51 ☐ ☐ ☐

Output selection (data display)
0: speed (with a filter), 1: current (with a filter), 2: current value (after electronic gear processing),
3: current value (sensor direct), 4: deviation amount (after electronic gear processing),
5: deviation amount (sensor direct), 6: speed command, 7: current command,
8: position command (per sampling time unit), 9: motor phase, 10: speed (without a filter),
11: current (without a filter), 12: BL value, 13: OL value, 14: RL value, 15: fin temperature,
16: speed deviation, and 17: current deviation.

Output type (display method)
0: non-inverse output, 1: inverse output, 2: absolute value output, and 3: without non-inverse ramp.

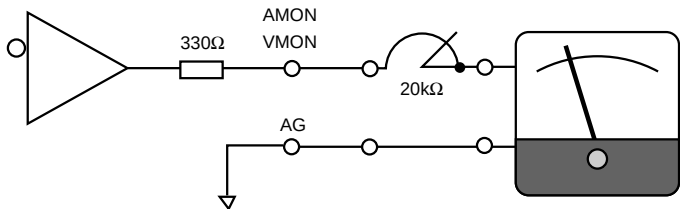
●Output scale

UP-50 or UP-52

Use these parameters for setting an amount per 1 output voltage. For example, set 2.0 for 2 A per 1 V.

Speed: 0.1 to 3276.7 r/min.
Current: 0.1 to 3276.7 A/V
Pulse: 0.1 to 3276.7 P/V
Voltage: 0.1 to 3276.7 V/V
Angle: 0.1 to 3276.7 deg/V
Percentage: 0.1 to 3276.7%/V
Temperature: 0.1 to 3276.7 deg. (Celsius)/V

●Connecting a moving coil direct current meter



Permanent magnet moving coil direct current meter
Model P XK-60 (Daiichi Keiki)

Electric input amount:
Positive side - DC 0 to 1 mA
Positive and negative sides - DC 0 to +/-1 mA

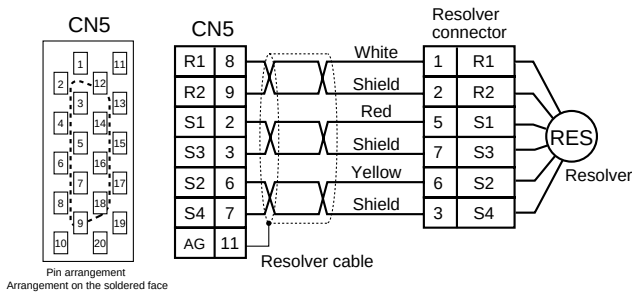
3-2-7. Motor Sensor CN5

Resolver, resolver ABS, and 17-bit serial ABS encoder are available as a motor sensor for V Series.

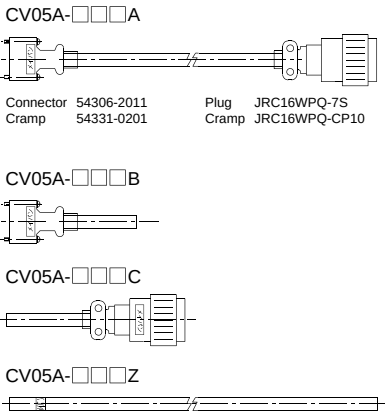
A resolver requires excitation signals to be supplied by the servo amplifier. Use the provided special cable (resolver cable) for connection. When resolver ABS is selected, use an ABS cable that is good for connecting both resolver and absolute detector. In case of a Z motor, a special resolver cable is provided. Select a 17-bit serial ABS encoder as a sensor when using a Z motor on an absolute coordinate.

Cable is available in four types: cable with connectors on both amplifier side and motor side, cable with a connector on the motor side, cable with a connector on the amplifier side, and cable without any accessories.

● Standard resolver cable (CV05A)

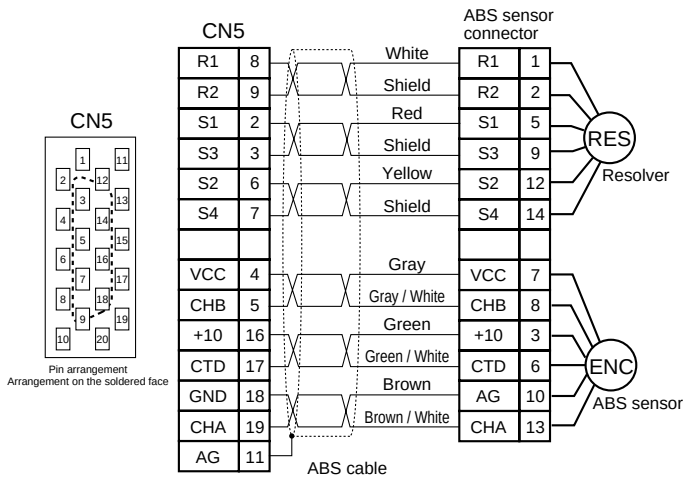


Model	Accessories
CV05A-□□□A	With connectors on both sides
CV05A-□□□B	With a connector on the amplifier side
CV05A-□□□C	With a connector on the motor side
CV05A-□□□Z	With both sides unprocessed

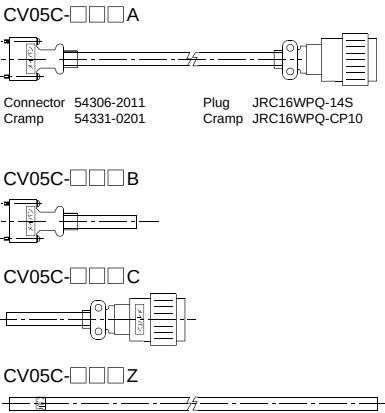


Standard length: 3 m, 5 m, and 10 m
Max. 120 m

● Standard motor resolver cable (CV05C)



Model	Accessories
CV05C-□□□A	With connectors on both sides
CV05C-□□□B	With a connector on the amplifier side
CV05C-□□□C	With a connector on the motor side
CV05C-□□□Z	With both sides unprocessed

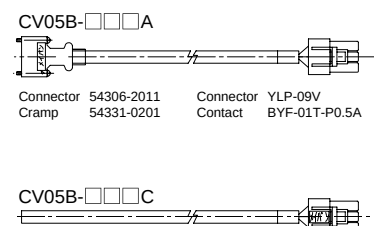


Standard length: 3 m, 5 m, and 10 m
Max. 120 m

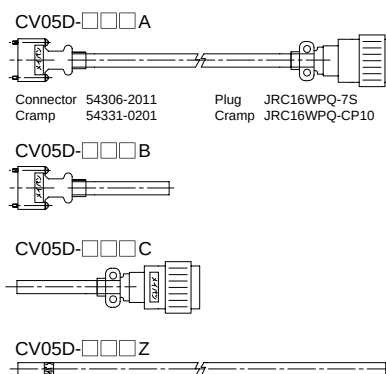
**Caution**

 Shut down the power first before plugging in or out the control connectors for CN5. Such an act will cause malfunction or fault.

- Standard serial ABS cable (CV05D)

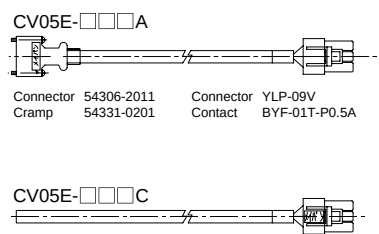
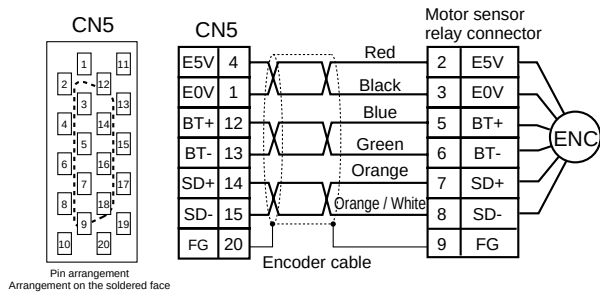


Model	Accessories	
CV05B-□□□A	With connectors on both sides	
* Note 1	With a connector on the amplifier side	* Note 1: Same as CV05A-□□□B
CV05B-□□□C	With a connector on the motor side	
* Note 2	With both sides unprocessed	* Note 2: Same as CV05A-□□□D



 **Caution**  Caution: Shut down the power first before plugging in or out the control connectors for CN5. Such an act will cause malfunction or fault.

● Z motor serial cable (CV05E)



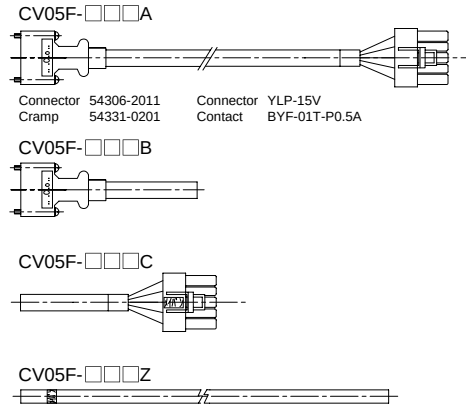
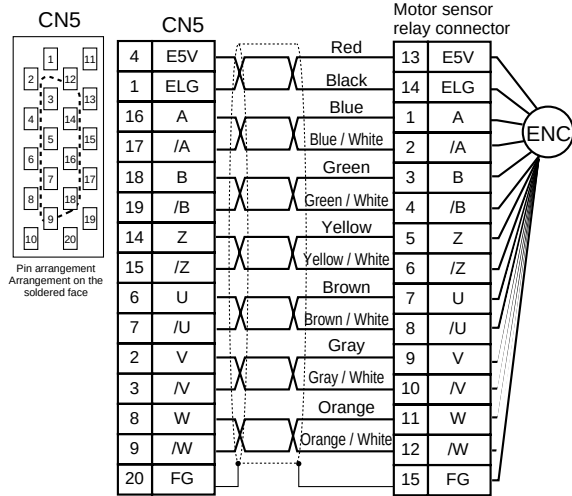
Standard length: 3 m, 5 m, and 10 m
Max. 30 m

Model	Accessories
CV05E-□□□A	With connectors on both sides
* Note 3	With a connector on the amplifier side
CV05E-□□□C	With a connector on the motor side
* Note 4	With both sides unprocessed

* Note 3: Same as CV05D-□□□B

* Note 4: Same as CV05D-□□□D

● Z motor INC cable (CV05F) (Compatible with a T series Z motor)



Standard length: 3 m, 5 m, and 10 m
Max. 20 m

Model	Accessories
CV05F-□□□A	With connectors on both sides
CV05F-□□□B	With a connector on the amplifier side
CV05F-□□□C	With a connector on the motor side
CV05F-□□□Z	With both sides unprocessed

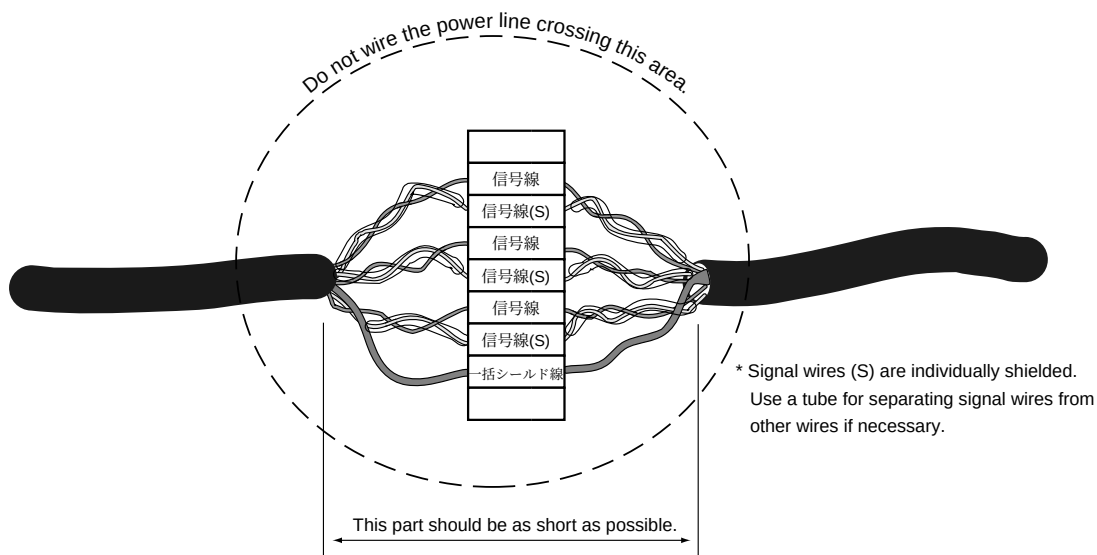
**Caution**

 Shut down the power first before plugging in or out the control connectors for CN5. Such an act will cause malfunction or fault.

●Relaying resolver cable and resolver ABS cable

Do not relay resolver cable and resolver ABS cable as a rule. When you need relay them, the following cares are needed:

- (1) Make the relay wire (unshielded part) as short as possible,
- (2) Do not wire the power line close to the relay, and
- (3) Relay the shielded wire too.



●Relaying serial ABS cable

Similarly to the resolver cable, twist signal wires, and connect collective shielded wire securely. Do not wire the power line near the resolver cable.

●Parameter setting

Specify the resolver cable and ABS cable lengths to the user parameter UP-03 (resolver cable length). Specifying an incorrect value may reduce motor torque. Round off the part below one meter. There is no parameter for specifying the serial ABS cable length.

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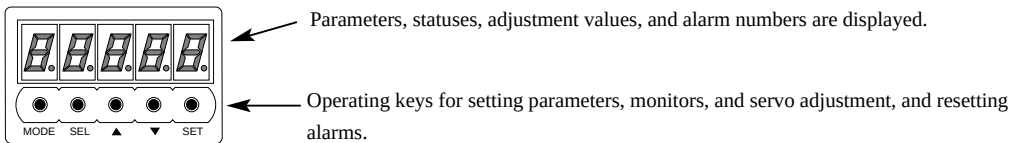
Operation Display and Display Details

Chapter 4

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4-1. Operation Display

The operation display is used to display user parameters and tuning parameters, change servo adjustment values using operation keys, and to display operating conditions and alarms on the five-digit display device.



4-2. Operating Keys

Each operating key has a function described in the table below when pressed individually, but serves a different function when pressed with another key at the same time or double clicked.

- Each operating key has a function described in the table below when pressed individually:

Key	Function
MODE	Press this key to change display areas. Double-clicking the key will return you to the previous home function. (See individual operation descriptions below for home functions.)
SEL	Each time pressing the key, the position for data entry shifts to the left by a digit. Address adding or subtracting results are changed.
▲	Press this key to move up a menu path in the area or to increase a value when specifying a value.
▼	Press this key to move down a menu path in the area or to decrease a value when specifying a value.
SET	Press this key to determine a specified value or to reset an alarm.

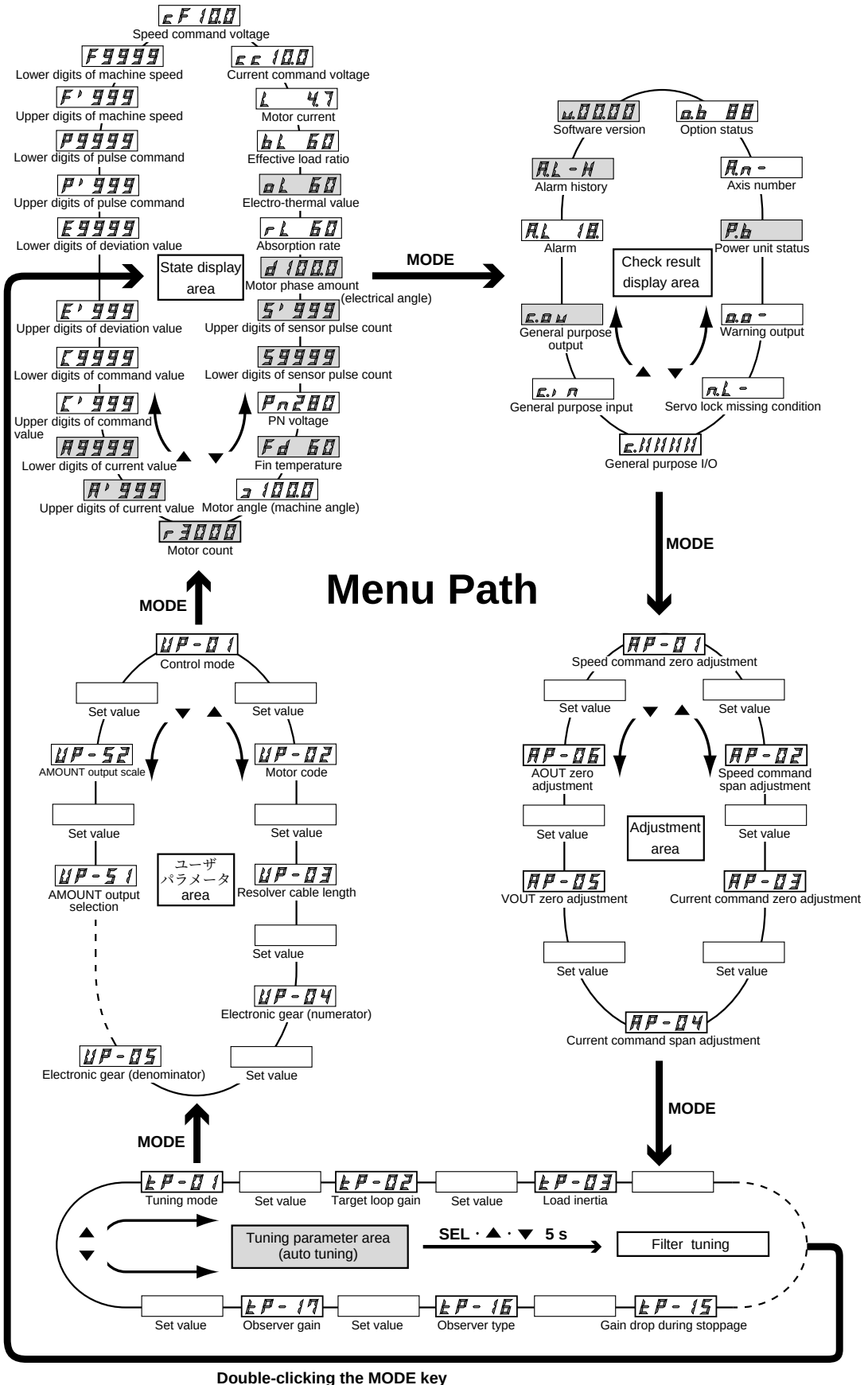
- Pressing more than one key together will provide the following functions:

Key	Function
SEL + SET	Press these keys together to move to the writing mode when specifying a data value. Press these keys also to display the details of the alarm history, a warning message, or servo lock missing conditions.
▲ + MODE	Press these keys together to run the motor in the positive direction at a rotation rate specified with a parameter during motor test operation.
▼ + MODE	Press these keys together to run the motor in the negative direction at a rotation rate specified with a parameter during motor test operation.
SEL + ▼	Press these keys to switch from auto-adjustment mode to manual adjustment mode during zero adjustment or span adjustment operation.
Press SEL +▲+▼ keys for 5 sec.	In each area press these keys together to go down a level.

4-3. Menu Path

Pressing the MODE key each time changes the areas in the following order: Status display, Check result display, Analog I/O adjustment parameters, Tuning parameters, and User parameters. In each area, press Up key (▲) or Down key (▼) to select a menu.

In the menu paths on the next page, a shaded item has a sub-menu. Press Up key (▲) or Down key (▼) over five seconds while pressing down the SEL key to move to the sub-menu. You can go to the auto-tuning manual mode from every parameter in the tuning parameter area. In the tuning parameter area, double click the MODE key after setting parameters to display the motor count in the state display area.



Double-clicking the MODE key

4-4. State Display Area Operation and Items

This area shows condition with values such as speed, current value, and effective load ratio. Move to the top item (Motor count) of status display using the MODE key. Select a menu in the status display using the UP or DOWN key.

Status display menu	Symbol	Range and Unit	Description
Motor rotation rate		+/-99999 r/min	The menu shows the motor rotation rate. The symbol flashes during reverse run. No symbol is displayed when the rate is over 10,000 rpm and all digits flashes during reverse run.
Upper digits of current value		+/-9999999 pulses	This menu counts the pulses obtained with [Feedback pulse x UP05/UP04]. The symbol flashes when the value is negative. When the obtained count is outside of the display range, +/-9999999 does not change.
Lower digits of current value			
Upper digits of command value		+/-9999999 pulses	The menu counts the command pulses to the deviation counter and displays the value. The symbol flashes when the value is negative. When the obtained count is outside of the display range, +/-9999999 does not change.
Lower digits of command value			
Upper digits of deviation value		+/-9999999 pulses	This menu displays a difference (deviation) between a command value and a current value. The symbol flashes when the value is negative. When the obtained count is outside of the display range, +/-9999999 does not change.
Lower digits of deviation value			
Upper digits of pulse command		+32767 to -32768	This menu counts the position control pulse commands and displays the value. The count is displayed even when the motor is not running. When the obtained count is outside of the display range, a ring counter value is displayed.
Lower digits of pulse command			
Upper digits of machine speed		+/-9999999	This menu displays the speed obtained by [motor count x UP41/UP42]. The symbol flashes when the value is negative. When the obtained speed is outside of the display range, +/-9999999 does not change.
Lower digits of machine speed			
Speed command voltage		+/-10.0 V	This menu displays the input voltage for REF (speed command/speed limit).
Current command voltage		+/-10.0 V	This menu displays the input voltage for CLI (current command/current limit).
Motor current		+/-0.0 to 141.1 A	This menu displays output current to the motor.
Effective load ratio		0 - 255%	This menu displays the load ratio (output current/rated current) to the motor rated current.
Motor electronic thermal		0 - 110%	This menu displays the motor temperature rise rate (%) expected from the output current. When the rate reaches 110%, the electronic thermal (AL-17) is triggered.
Counter current resistance thermal		0 - 100%	This menu displays the rate (%) obtained by dividing the reverse current absorption capacity by the counter current resistance capacity.
Motor phase amount (electrical angle)		0 to 359.9 degrees	This menu displays the angle (electrical angle) of the motor detection phase. (With eight poles, a quarter motor revolution advances 360 degrees. With four poles, a half motor revolution advances 360 degrees.)
Upper digits of sensor pulse count		+/-9999999 pulses	This menu displays the number of pulses for each sensor during one motor revolution. The symbol flashes when the value is negative. When the number of pulses for a sensor exceeds the display range, +/-9999999 does not change.
Lower digits of sensor pulse count			
PN voltage		+/-999 V	This menu displays the PN voltage.
Fin temperature		0 to 200 degrees	This menu displays the fin temperature calculated based on the analog input value.
Motor angle (machine angle)		0 to 359.9 degrees	This menu displays the angle (machine angle) measured from the motor's home position. One motor revolution advances 360 degrees. (When a resolver is used, the motor has a home position each 180 degrees.)

The symbol flashes if a displayed value is negative. If the value is more than four digits, If the number of digits is more than four, then the excessive part is displayed in the upper digits. If the lower digits is less than four digits and upper digits are displayed, then assume that the blank lower digit(s) are padded with zero(s).

When the current value is 1234567 pulses,

When the current value is 1230067 pulses,

Upper three digits 123 Upper three digits 123
Lower three digits 4567 Lower three digits 00067

The symbol flashes if a value is negative.

Zeros are not displayed.

4-4-1. Motor Test Run

Before starting test run, make sure that the braking system is correctly wired and PON input is turned ON, and set the servo free by turning OFF the operation command.

[Step 1] When  (motor count) is displayed, press the UP and DOWN keys five seconds while holding down the SEL key to change the display to .

[Step 2] Press the SET key to turn ON the servo and display .

[Step 3] Conduct motor test run in the following key operation:

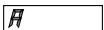
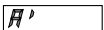
- Motor forward run: The motor runs forward while the UP key is pressed.
- Motor reverse run: The motor runs backward while the DOWN key is pressed.
- Continuous forward run: Press the MODE key during the forward run while pressing the UP key for continuous forward run. Press the UP key again to cancel the continuous forward run.
- Continuous backward run: Press the MODE key during the forward run while pressing the UP key for continuous forward run. Press the UP key again to cancel the continuous reverse run.

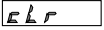
[Step 4] Press the SET key to set the servo free and return to .

[Step 5] Double click the MODE key to return to  (motor count) display.

4-4-2. Clearing Current Value

The current value may be cleared from the operation display.

[Step 1] When  or  (current value) is displayed, press the UP and DOWN keys five seconds while holding down the SEL key to change the display to .

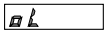
[Step 2] Press the SEL and SET keys together to move to the current value clearing mode and the entire  display flashes.

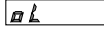
[Step 3] Press the SET key to clear the current value and once the current value is cleared  display stops flashing. Press the MODE key to cancel the current value clearing mode and  display stops flashing.

[Step 4] Double click the MODE key to return to  or  (current value) display.

4-4-3. Motor Electronic Thermal High Speed

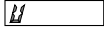
You can monitor the motor electronic thermal high-speed data from the operation display unit.

[Step 1] When  is displayed (motor electronic thermal display), press the UP and DOWN keys for five minutes while pressing down the SEL key to change the display to  display (motor electronic thermal high-speed display).

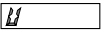
[Step 2] Double click the MODE key to return to  (motor electronic thermal display).

4-4-4. Resolver ABS Special Display

You can monitor the resolver ABS special data (previous resolver phase data, resolver ABS phase counter, and resolver ABS multi-revolution data) from the operation display unit.

[Step 1] When  is displayed (motor phase amount display), press the UP and DOWN keys for five minutes while pressing down the SEL key to change the display to  display (previous resolver phase data display).

[Step 2] Press the UP or DOWN key to switch to the following displays.

 (previous resolver phase data)

The value of resolver detection phase (electrical angle) is displayed converted to the number of pulses in the range of 0 through 9999.

 (resolver ABS phase counter)

The numeric display changes from 0 to 1, 2, and 3 depending on the resolver position.***** (resolver aBS multi-revolution data)

The multi-revolution data of the resolver ABS is displayed. (All five digits are used to display a number and no symbol is displayed.)

[Step 3] Double click the MODE key to return to  display (motor phase amount display).

4-4-5. ABS Sensor Multi-Revolution Display

You can monitor the ABS sensor multi-revolution amount from the operation display unit.

[Step 1] When **5** or **5'** is displayed (sensor pulse count display), press the UP and DOWN keys for five minutes while pressing down the SEL key to change the display to **n'** display (ABS sensor multi-revolution count upper three digits display).

[Step 2] Press the UP or DOWN key to switch to the three upper digits and four lower digits display.

n' (ABS multi-revolution data upper three digits)

n (ABS multi-revolution data lower four digits)

[Step 3] Double click the MODE key to return to **5** or **5'** display (sensor pulse count display).

4-4-6. Fan Test

A fan test may be conducted from the operation display.

[Step 1] When **Fd** (fin temperature display) is displayed, press the UP and DOWN keys five seconds while holding down the SEL key to change the display to **FAnk**].

[Step 2] Press the SET key to start a fan test and the entire **FAnk** display flashes. Make sure that the fan is running.

[Step 3] Press the SET key once more to finish the fan test and the entire **FAnk** display flashes.

[Step 4] Double click the MODE key to return to **Fd** display (fin temperature display).

4-5. Check Area Operation and Items

This section describes how to display the I/O signal ON/OFF state, alarms, and alarm history. Press the MODE key to move to the standard I/O at the top of the check procedure. Use the UP or DOWN key to select a menu in the check display area.

Check menu	Symbol	Description
Standard I/O	C.	ON-OFF states of I/O signals are displayed in hexadecimal notation. The two upper digits shows output and the lower two digits shows input. For example, when IN7 and IN5 turn ON, the digit of IN7IN4 in the figure on the right displays "A." IN7-IN4IN3-IN0 C.0000 OUT4OUT3-OUT0
Option input	C. IN	Not used.
Option output	C. OU	Used to force sequence output.
Real alarm	AL	An alarm code is displayed. Press the SET key to reset the alarm. When the alarm is canceled, the display automatically returns to the motor count display in the state display area. When AL26 has taken place, keep pressing the SEL key to display one of the following alarm causing problems: tbLEr (No motor table), SEnEr (Invalid sensor number), Q InEr (Control mode set to zero), Q loEr (Out of control mode), SPnEr (Sensor split count set to zero), oLkEr (No link circuit board).
Alarm history	AL-H	Press the SEL and SET keys together to display the alarm history. Press the UP or DOWN keys to move back or forward the alarm history. Up to sixteen events may be displayed. Press the MODE key to return to the home position.
Software version	u00000	The CPU software version is displayed.
Option status	ab	An option board status is displayed using two digits. The second lowest digit The lowest digit 0: VLBUS-V board 0: No option board 7: No option board 1: Resolver HIC attached 2: Encoder HIC attached
Axis number	An-	An amplifier's link axis number is displayed. Press the SEL and SET keys together to change to the Write mode. Use the UP or DOWN key to change modes and press the SET key to set the selected mode. Press the MODE key to return to the home position. In the VLBUS-V (NCBOY) mode, you cannot select and set a mode using keys. This mode is for displaying a dip switch setting on the communications board. Changing axis numbers while powered flashes the display indicating an invalid setting. Shut down and turn on again to enable setting.

Power unit (GA) status		This menu displays the power unit status information. Bit 0:1 indicates overvoltage. Bit 1:1 indicates excessive current. Bit 2:1 indicates DSP failure. Bit 3:1 indicates CPU failure. Bit 4:1 indicates main power supply contactor ON. Bit 5:1 indicates main power supply ON. Bit 6:1 indicates control power supply ON. Bit 7:1 indicates absorption Tr ON. (Example)  → Control power supply ON
Warning output		This menu displays the number of warning occurrences. Press the SEL and SET keys together to display an ongoing warning event. Press the UP or DOWN key to change display items. Press the MODE key to return to the home position. - Warning event  (Low battery voltage)  (Zero point not saved)  (Electronic thermal warning)  (Reverse current absorption overheating warning)  (Fin overheating warning)  (Electronic gear invalid setting)  (Duplicated axis number warning)  (No data on the axis number received.) - Warning causing problems - Low battery charge When an ABS sensor is used, if the battery voltage level drops below the battery alarm threshold 3.4 V, a warning is issued (resolver only). - Origin unsaved. When the origin (zero point) is not set effectively, a warning is issued. - Electronic thermal warning When the thermal value reaches 100%, a warning is issued. - Reverse current absorption overheat warning When the absorption rate value reaches 110%, a warning is issued. - Fin overheat warning When the fin temperature reaches the range between 85 and 95 degrees Celsius, a warning is issued. - Electronic gear invalid setting warning When the electronic gear setting (UP-04/UP-05) is smaller than 0.05 or greater than 1000, this warning is issued. - Axis number duplication warning There are more than one amplifiers with the same axis number in the optical link. The amplifier that is backward in the connection sequence detects the duplication. - No data on the axis name received This warning is issued when data on the axis name is not found in the communication data.
Servo lock missing condition		The number of conditions missing for servo locking is displayed. Press the SEL and SET keys together to flash missing conditions. Press the UP or DOWN key to change display items. Press the MODE key to return to the original display. - Servo lock missing conditions  (PON not entered)  (Operation command not entered)  (Servo preparation not completed)  (Main circuit uncharged)  (Dynamic brake confirmation not entered)  (Holding brake confirmation not entered)

4-5-1. Sequence Output Test

You may force sequence output from the operation display. Conduct this test after turning off the motor. (Input data will not be updated while sequence process is not running.)

- [Step 1] When **Seq** (option sequence output display) is displayed, press the UP and DOWN keys five seconds while holding down the SEL key to change the display to **Seq**.
- [Step 2] Press the SEL key while holding down the SET key to change the display to **500-0**.
- [Step 3] Press the SET key to change the display to **500-1** and to force OUT0 output. To specify the first part of the output address **500**, select from OUT0 through 4 using the UP or DOWN key. Each time pressing the SET key will toggle the output status between **1** (ON) and **0** (OFF).
- [Step 4] Press the MODE key to return to the **Seq** display.
- [Step 5] Double click the MODE key to return to the **Seq** display (option sequence output display).

4-5-2. Clearing Alarm History

You may clear the alarm history from the operation display.

- [Step 1] When **AL-H** is displayed, press both SEL and SET keys together to display **AL- ****.
- [Step 2] Press the UP and DOWN keys five seconds while holding down the SEL key to change the display to **ALCLR**.
- [Step 3] Press both SEL and SET keys together to flash **ALCLR** and press the SET key to clear completely.
- [Step 4] Double click the MODE key to display **AL- **** and press the same key again to return to **AL-H**.

4-5-3. Displaying Parameter Version

You may view a parameter version from the operation display.

- [Step 1] When **u0000** (software version) is displayed, press the UP and DOWN keys five seconds while holding down the SEL key to change the display to **P0000** (parameter version display).
- [Step 2] Press the UP or DOWN key to browse the following version displays.
 - P0000** (parameter version display)
 - 50000** (sequence table version display)
 - a0000** (power unit parameter version display)
 - r0000** (sensor parameter version display)
 - k0000** (motor parameter version display)
- [Step 3] Double click the MODE key to return to **u0000** display (software version display).

4-5-4. Displaying Gate Array, CPU Board, and DSP Versions

Gate array, CPU board, and DSP versions may be displayed from the operation display.

- [Step 1] When **Pb***** (power unit status display) is displayed, press the UP and DOWN keys five seconds while holding down the SEL key to change the display to **u*****.
- [Step 2] Versions of Gate array (0 to F: 1 digit), CPU board (0 to F: 1 digit), and DSP (00 to FF: 2 digits) are displayed from right to left.
- [Step 3] Double click the MODE key to return to **Pb***** display (power unit status display).

4-5-5. Displaying Amplifier Model

The amplifier model may be displayed from the operation display.

- [Step 1] When **Pb***** (power unit status display) is displayed, amplifier models are displayed as following while the SET key is depressed:

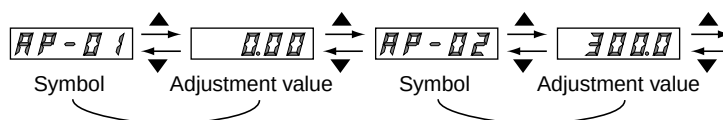
006P1 012P1 006P2 012P2 025P2 035P3 070P3
100P3 200P3

The upper three digits shows the maximum current capacity [A(PEAK)] for each servo amplifier model number. The lowest digit shows the power specifications. (1: Single phase 100 VAC, 2: Single phase 200 VAC, 3: Three phase 200 VAC)

- [Step 2] Release the SET key to return to **Pb***** display (power unit status display).

4-6. Analog I/O Adjustment Parameter

This area is for adjusting the offset, span, and servo gain of input voltage. Press the MODE key to move to the top menu (standard I/O) of the adjustment area. Use the UP or DOWN key to select a menu in the area.



Adjustment menu	Symbol	Effective control mode	Setting range	Factory setting	Unit	Writing from communication port
Speed command zero adjustment	AP-01	01, 02, 03, 04, 05, 06, and 31	+/-10.00	Done	0.01 V	Not allowed
Speed command span adjustment	AP-02	01, 02, 03, 04, 05, 06, and 31	0.1 - 3276.7	150.0	0.1 (rpm) / V	Allowed
Current command zero adjustment	AP-03	01, 02, 03, 04, 05, 06, and 31	+/-10.00	Done	0.01 V	Not allowed
Current command span adjustment	AP-04	01, 02, 03, 04, 05, 06, and 31	0.10 - 327.67	1.00	0.01 A / V	Allowed
VMOUT output zero adjustment	AP-05	01, 02, 03, 04, 05, 06, and 31	+/-10.00	Done	0.01 V	Not allowed
AMOUT output zero adjustment	AP-06	01, 02, 03, 04, 05, 06, and 31	+/-10.00	Done	0.01 V	Not allowed

4-6-1. Automatic Zero Adjustment

- [Step 1] Display adjustment values for AP01 and AP03 and press the SEL and SET keys together. All digits for the adjustment value flash and you are in the automatic adjustment mode.
- [Step 2] Press the SET key. Zero adjustment is completed when flashing stops. Press the MODE key again to cancel the ongoing automatic adjustment and flashing stops. (Data are not changed.)

4-6-2. Manual Zero Adjustment

- [Step 1] Display adjustment values for AP01 and AP03 and press the SEL and SET keys together. All digits for the adjustment value flash and you are in the automatic adjustment mode.
- [Step 2] Press the SEL and DOWN keys together. The lowest digit for the adjustment value flashes and you are in the manual adjustment mode. (This step becomes effective without conducting [Step 1] above.)
- [Step 3] Each time you press the SEL key, the flashing digit moves to the left. Change the adjustment value using the UP or DOWN key.
- [Step 4] Repeat Step 3 until desirable data are set and then press the SET key. Adjustment mode ends and flashing stops. Press the MODE key again to cancel the ongoing manual adjustment and flashing stops. (Data are not changed.)

4-6-3. Span Adjustment and Analog Output Zero Adjustment

- [Step 1] Display adjustment values for AP02, AP04, AP05, and AP06 and press the SEL and SET keys together. The lowest digit for the adjustment value flashes and you are in the change mode.
- [Step 2] Each time you press the SEL key, the flashing digit moves to the left. Change the adjustment value using the UP or DOWN key.
- [Step 3] Press the SET key. Span adjustment is completed when flashing stops. Press the MODE key again to cancel the ongoing span adjustment and flashing stops. (Data are changed.)

4-7. Tuning Parameters

Use parameters in this area to conduct servo response adjustment. Press the MODE key to move to the top menu (TP-01) of the Tuning parameter area. Use the UP or DOWN key to select a parameter menu (symbol) in the area. Press the UP key to display a setting value.

● How to change parameter values

[Step 1] Display a setting value and press the SEL and SET keys together.

[Step 2] The lowest digit of the setting value flashes and you are in the change mode. Each time you press the SEL key, the flashing digit moves to the left.

[Step 3] Press the UP or DOWN key to change the setting value.

[Step 4] Press the SET key to make setting value change effective and finish the change mode.

Tuning menu	Symbol	Effective control mode	Setting range	Factory setting	Unit	Remarks
Tuning mode	TP-01	01, 02, 03, 04, 05, 06, and 31	0 - 4	0	None	0: 01: Standard Mode 1: Semi-auto Mode 2: Real Time Mode 3: Manual Mode 
Target loop gain	TP-02	01, 02, 03, 04, 05, 06, and 31	1 - 1000	60	1 rad/s	
Load inertia	TP-03	01, 02, 03, 04, 05, 06, and 31	0.0 - 200.0	1.0	0.1 times	All modes allow display. Set TP-01 to 0 or 3 to make setting possible.
Semi-auto tuning	TP-04	01, 02, 03, 04, 05, 06, and 31	0.1 - 10.0	2.0	0.1 r	Set TP-1 to 1 to make display and setting possible.
Speed loop gain	TP-05	01, 02, 03, 04, 05, 06, and 31	1 - 6000	360	1 rad/s	Set TP-01 to 0 or 3 to make display possible. Set TP-01 to 3 to make setting possible.
Speed loop integral gain	TP-06	01, 02, 03, 04, 05, 06, and 31	1 - 2000	60	1 rad/s	Set TP-1 to 3 to make display and setting possible.
A position loop gain	TP-07	01, 02, 03, 04, 05, 06, and 31	1 - 1000	60	1 rad/s	Set TP-1 to 3 to make display and setting possible.
A speed loop gain	TP-08	01, 02, 03, 04, 05, 06, and 31	1 - 6000	360	1 rad/s	Set TP-01 to 3 to make display and setting possible.
A speed loop integral gain	TP-09	01, 02, 03, 04, 05, 06, and 31	1 - 2000	60	1 rad/s	Set TP-01 to 3 to make display and setting possible.
Position loop FF gain	TP-11	01, 02, 03, 04, 05, 06, and 31	0.001 - 1.000	0.000	0.001	
Speed loop FF gain	TP-12	01, 02, 03, 04, 05, 06, and 31	0.001 - 1.000	0.000	0.001	
Current loop gain	TP-13	01, 02, 03, 04, 05, 06, and 31	1 - 20000	3000	1 rad/s	Set TP-1 to 3 to make display and setting possible.
Current loop integral gain	TP-14	01, 02, 03, 04, 05, 06, and 31	1 - 20000	600	1 rad/s	Set TP-1 to 3 to make display and setting possible.
Gain drop during stoppage	TP-15	01, 02, 03, 04, 05, 06, and 31	0.00 - 100.00	0.00	0.01%	
Observer type	TP-16	01, 02, 03, 04, 05, and 06	0 - 2	0	None	
Observer gain	TP-17	01, 02, 03, 04, 05, and 06	1 - 10000	1	1 rad/s	

* With a parameter menu marked with , shut down the unit after setting the parameter, make sure the display has been turned off, and then turn ON the unit. Thus, the setting becomes effective.

4-7-1. Auto-tuning Operation

● Standard Mode

[Step 1] Set **LP-01** (Tuning mode) to 0 (zero) and shut down and turn on the unit.

[Step 2] Set the target loop gain of the machine to be controlled **LP-02**.

[Step 3] Set **LP-03** to a multiplication rate of the load inertia of the machine to be controlled against the motor inertia.

● Semi-auto Mode

[Step 1] Set **LP-01** (Tuning mode) to 1 and shut down and turn on the unit.

[Step 2] Set the target loop gain of the machine to be controlled **LP-02**.

[Step 3] Set **LP-04** to the moving range of the machine to be controlled during auto-tuning operation.

[Step 4] When a symbol or a data area of **LP-04** is displayed, press the UP and DOWN keys five seconds while holding down the SEL key to change the display to **tune**.

[Step 5] Turn On both the main circuit (PON) and operation (RUN).

[Step 6] When **tune** is displayed, press the SEL and SET keys together to flash the symbol and start tuning operation.

[Step 7] Normal stop ends symbol flashing. Press the MODE key to return to **LP-04**. Press the MODE key during tuning operation to stop the operation and return to **LP-04**.

● Real Time Mode

[Step 1] Set **LP-01** (Tuning mode) to 2 and shut down and turn on the unit.

[Step 2] Set the target loop gain of the machine to be controlled **LP-02**. The load inertia of the machine to be controlled **LP-03** is set automatically.

● Manual Mode

[Step 1] Set **LP-01** (Tuning mode) to 3 and shut down and turn on the unit.

[Step 2] Set all tuning and manual parameters.

4-7-2. Filter Tuning Parameters

Use these parameters in the manual turning mode. From the tuning parameter menu, press the UP and DOWN keys together for five seconds while holding down the SEL key to move to the filter tuning area.

Filter tuning menu	Symbol	Effective control mode	Setting range	Factory setting	Unit	Remarks
Current command filter 1 type	LS-21	01, 02, 03, 04, 05, 06, and 31	0 - 5	0	None	Set TP-1 to 3 to make display and setting possible.
Current command filter 1 attenuation rate	LS-22	01, 02, 03, 04, 05, 06, and 31	0.001 - 2.000	1.000	0.001	Set TP-1 to 3 to make display and setting possible.
Current command filter 1 *1	LS-23	01, 02, 03, 04, 05, 06, and 31	1 - 20000	20000	1 rad/s	Set TP-1 to 3 to make display and setting possible.
Current command filter 1 *1	LS-24	01, 02, 03, 04, 05, 06, and 31	1 - 20000	20000	1 rad/s	Set TP-1 to 3 to make display and setting possible.
Current command filter 2 type	LS-25	01, 02, 03, 04, 05, 06, and 31	0 - 1	0	None	
Current command filter 2 *1	LS-26	01, 02, 03, 04, 05, 06, and 31	1 - 20000	20000	1 rad/s	
Speed FB filter type	LS-29	01, 02, 03, 04, 05, 06, and 31	0 - 5	0	None	Set TP-1 to 3 to make display and setting possible.
Speed FB filter attenuation rate	LS-30	01, 02, 03, 04, 05, 06, and 31	0.001 - 2.000	1.000	0.001	Set TP-1 to 3 to make display and setting possible.
Speed FB filter *1	LS-31	01, 02, 03, 04, 05, 06, and 31	1 - 20000	20000	1 rad/s	Set TP-1 to 3 to make display and setting possible.
Speed FB filter *2	LS-32	01, 02, 03, 04, 05, 06, and 31	1 - 20000	20000	1 rad/s	Set TP-1 to 3 to make display and setting possible.
Speed command filter type	LS-33	01, 02, 03, 04, 05, 06, and 31	0 - 5	0	None	
Speed command filter *1	LS-34	01, 02, 03, 04, 05, 06, and 31	1 - 20000	20000	1 rad/s	
Observer filter type	LS-37	01, 02, 03, 04, 05, and 06	0 - 5	0	None	
Observer filter attenuation rate	LS-38	01, 02, 03, 04, 05, and 06	0.001 - 2.000	1.000	0.001	
Observer filter *1	LS-39	01, 02, 03, 04, 05, and 06	1 - 20000	20000	1 rad/s	
Observer filter *2	LS-40	01, 02, 03, 04, 05, and 06	1 - 20000	20000	1 rad/s	
Tuning special setting	LS-41	01, 02, 03, 04, 05, 06, and 31	00 - 11	00	None	

4-8. User Parameters

Press the MODE key to move to the top (UP-01) of the user parameter area. Use the UP or DOWN key to select a parameter menu (symbol) in the area. Press the UP key to display a setting value.

●Parameter entry

[Step 1] Display a setting value and press the SEL and SET keys together.

[Step 2] The lowest digit of the setting value flashes and you are in the change mode. Each time you press the SEL key, the flashing digit moves to the left.

[Step 3] Press the UP or DOWN key to change the setting value.

[Step 4] Press the SET key to make setting value change effective and finish the change mode.

[Step 5] Press the UP or DOWN key to browse the parameter menu items and press the MODE key to move to the State display area.

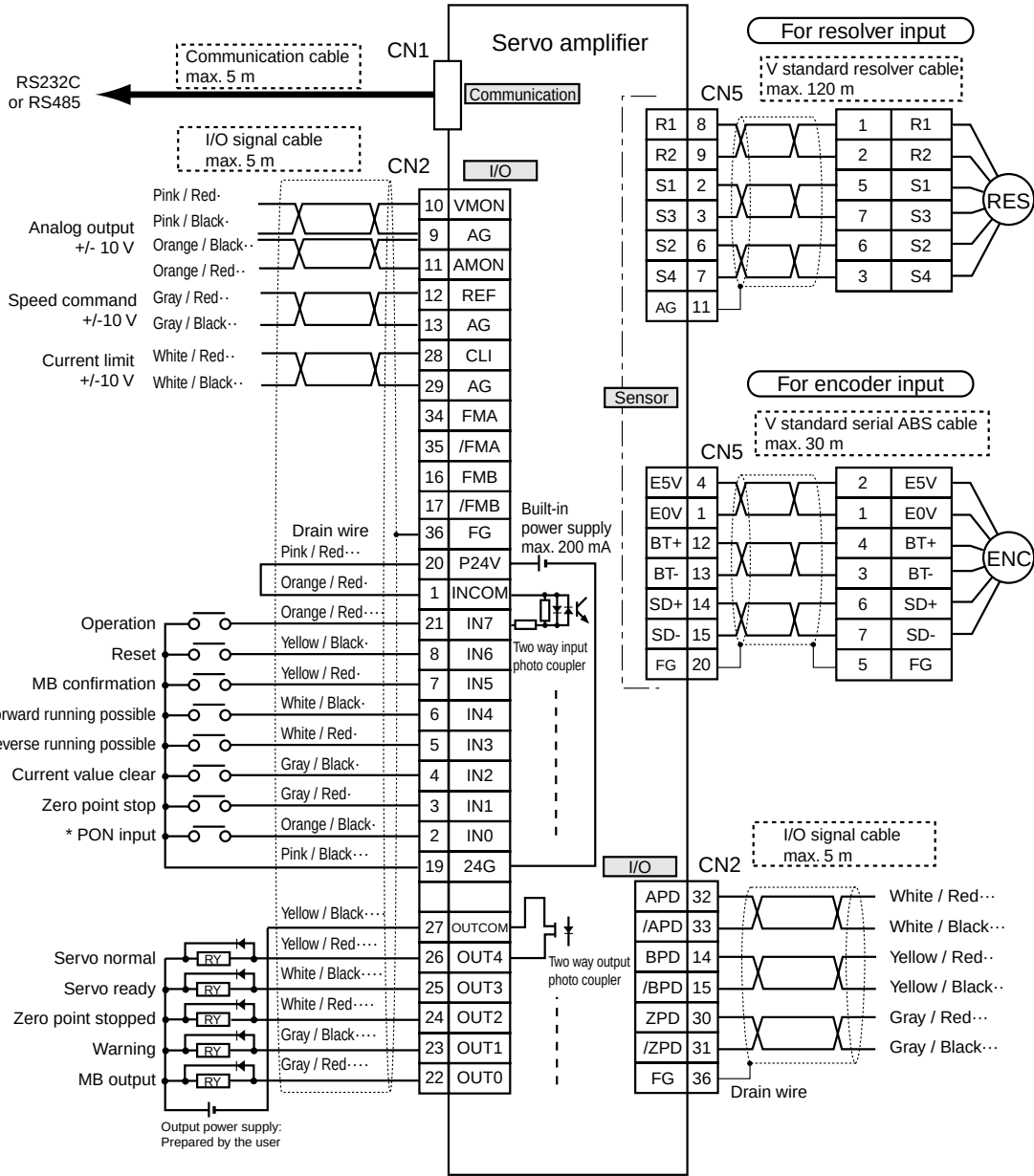
User parameter menu	Symbol	Effective control mode	Setting range	Factory setting	Unit	Remarks
Control mode	UP-01	01, 02, 03, 04, 05, 06, and 31	0 - 31	0	None	
Motor code	UP-02	01, 02, 03, 04, 05, 06, and 31	0 - 64999	00000	None	
Resolver cable length	UP-03	01, 02, 03, 04, 05, 06, and 31	1 - 120	5	1 m	
Electronic gear numerator	UP-04	01, 02, 03, 04, 05, 06, and 31	1 - 65535	1	1 pulse	
Electronic gear denominator	UP-05	01, 02, 03, 01, 05, 06, and 31	1 - 65535	1	1 pulse	
Zero point shift amount	UP-06	01, 02, 03, 04, 05, 06, and 31	0.00 - 360.00	0.00	0.01 degrees	
In-position width	UP-07	03, 04, and 31	1 - 65535	50	1 pulse	
Current limit value	UP-08	01, 02, 03, 04, 05, and 06	0.0 - 100.0	100.0	0.1 %	
Software start acceleration time	UP-09	01, 04, 05	0.000 - 65.535	0.000	0.001 s	
Software start deceleration time	UP-10	01, 04, 05	0.000 - 65.535	0.000	0.001 s	
S-shaped acceleration/ deceleration time	UP-11	01, 03, 04, 05, and 06	0.000 - 65.535	0.000	0.001 s	
ABS mode	UP-12	01, 02, 03, 04, 05, 06, and 31	00 - 12	00	None	
Holding brake operation	UP-13	01, 02, 03, 04, 05, 06, and 31	0 - 1	0	None	
Brake ON revolution rate	UP-14	01, 02, 03, 01, 06, 06, and 31	0.0 - 100.0	10.0	0.1 %	
Analog command polarity	UP-15	01, 02, 03, 04, 05, and 31	00 - 11	00	None	
Pulse command type	UP-16	03, 04, 06, and 31	00 - 12	00	None	
Pulse output type	UP-17	01, 02, 03, 04, 05, 06, and 31	00 - 11	01	None	
Differential output type	UP-18	01, 02, 03, 04, 05, 06, and 31	0000 - 5535	0000	None	
Position control polarity	UP-19	03, 04, 06, and 31	0 - 1	0	None	
Draw multiplication rate	UP-20	06	0 - 2	0	None	
External reverse current absorption resistance value	UP-21	01, 02, 03, 04, 05, 06, and 31	0.0 to 1000	0.0	0.1 Ohm	
External counter current absorption resistance capacity	UP-22	01, 02, 03, 04, 05, 06, and 31	0.00 to 327.67	0.00	0.01 kW	
Common power supply mode	UP-23	01, 02, 03, 04, 05, 06, and 31	0000 - 1112	0000	None	
Primary feed speed	UP-24	05, and 06	0.00 - 327.67	100.00	0.01 %	
Secondary feed speed	UP-25	05	0.00 - 327.67	50.00	0.01 %	
Third feed speed	UP-26	05	0.00 - 327.67	25.00	0.01 %	
Fourth feed speed	UP-27	05	0.00 - 327.67	12.50	0.01 %	

User parameter menu	Symbol	Effective control mode	Setting range	Factory setting	Unit	Remarks
Stop detection rpm	UP-28	01, 02, 03, 04, 05, 06, and 31	1 - 32767	50	1 rpm	
Speed reach rpm	UP-29	01, 04, 05, 06, and 31	0 - 32767	3000	1 rpm	
Speed reach range	UP-30	01, 04, 05, 06, and 31	1 - 10000	50	1 rpm	
Motor test rpm	UP-31	01, 02, 03, 04, 05, 06, and 31	1 - 10000	50	1 rpm	
Load factor time constant	UP-33	01, 02, 03, 04, 05, 06, and 31	1 - 60	30	1 s	
Limit switching-over method	UP-34	01, 02, 03, 04, 05, 06, and 31	000 - 121	011	None	
Speed limit value	UP-35	02, 04	1 - 4000	4000	1 rpm	
Forward drive current limit value	UP-36	01, 03, 04, 05, and 06	0.0 - 100.0	100.0	0.1 %	
Forward run absorption current limit value	UP-37	01, 03, 04, 05, and 06	0.0 - 100.0	100.0	0.1 %	
Reverse run drive current limit value	UP-38	01, 03, 04, 05, and 06	0.0 - 100.0	100.0	0.1 %	
Reverse run absorption current limit value	UP-39	01, 03, 04, 05, and 06	0.0 - 100.0	100.0	0.1 %	
Drive absorption detection width	UP-40	02	0.0 - 100.0	5.0	0.1 %	
Display magnification rate numerator	UP-41	01, 02, 03, 04, 05, 06, and 31	1 - 65535	1	None	
Display magnification rate denominator	UP-42	01, 02, 03, 04, 05, 06, and 31	1 - 65535	1	None	
Decimal point display position	UP-43	01, 02, 03, 04, 05, 06, and 31	0 - 7	0	None	
Sequence input reversing	UP-44	01, 02, 03, 04, 05, and 06	00 - FF	00	None	
Sequence output reversing	UP-45	01, 02, 03, 04, 05, and 06	00 - 1F	00	None	
Sequence I/O selection	UP-46	01, 02, 03, 04, 05, and 06	0 - 32	0	None	
In-position timer	UP-47	03, 04, and 31	0 - 2000	20	1 ms	
Electronic gear multiplication rate	UP-48	01, 02, 03, 04, 05, 06, and 31	1 - 100	1	1	
VMOUNT output selection	UP-49	01, 02, 03, 04, 05, 06, and 31	000 - 399	000	None	
VMOUT scale	UP-50	01, 02, 03, 04, 05, 06, and 31	0.1 - 3276.7	300.0	0.1	
AMOUT output selection	UP-51	01, 02, 03, 04, 05, 06, and 31	000 - 399	001	None	
AMOUT output scale	UP-52	01, 02, 03, 04, 05, 06, and 31	0.1 - 3276.7	5.0	0.1	
VLBUS-V operation confirmation setting	UP-55	31	0 - 3	0	None	
Rotating coordinate setting (upper)	UP-56	31	9999	0	1 pulse	
Rotating coordinate setting (lower)	UP-57	31	9999	0	1 pulse	
LS function selection	UP-58	31	00 - 32	0	None	
LS function reversing selection	UP-59	31	0 - FF	0	None	
Zero point stop system	UP-60	31	0 - 3	0	None	
Draw value	UP-64	06	0 - 32767	0	1 %	

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5-1. Speed Control Mode OperationF

5-1-1. Connection examples



5-1-2. I/O Signal

Type	Name	Terminal No.	Function	Power specifications
Communi- cation	RS232C	CN 1	Connect to this terminal for using an RS232C and RS422 interfaces and PC tool SHAN5. These two interfaces are to be switched automatically by cables. ??	
Analog output	Monitor 1 (VMON)	10P (VMON) 9P (AG)	Output data defaults to 'Speed.' Use the parameter UP-49 to select data. Specify a scale using the parameter UP-50.	+/-10 V/3000 rpm Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??
	Monitor 2 (AMON)	11P (AMON) 9P (AG)	Output data defaults to 'Current.' Use the parameter UP-51 to select data. Specify a scale using the parameter UP-52.	+/-10 V/50 A Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??
Analog input	Speed command (REF)	12P (REF) 13P (AG)	For entering a speed command. Use AP-01 for zero adjustment and AP-02 for span adjustment. The motor will run forward with the positive voltage polarity. Change the rotating direction with the parameter UP-15. Monitor the voltage value with the status display [cF---]. Use the parameters UP-09 through 11 for setting acceleration and deceleration curves and times.	Vin +/-11.5 V (Max.) Input resistance 49 Kohm AD resolution +/-2048 (+/-11.5 V per hour) ??
	Current limit (CLI)	28P (CLI) 29P (AG)	Set the limit switching-over method parameter UP-34 to nOn and turn ON current limit switch-over CCD (special sequence) to set the entered input voltage value as a current limit value. Use the parameter AP-03 for zero adjustment and AP-04 for span adjustment. The voltage polarity has nothing to do with the setting. Monitor the input voltage with the status display [cc---].	
24-V input	Operation (RUN)	21P (IN7)	Turn on this signal to enable operation (servo locking) and turn OFF for setting the servo free. This signal also serves to turn ON/OFF brake output.	ON voltage 19.2 to 26.4 V OFF voltage 3 V (Max.) ON current 6 mA (TYP) Min. ON/OFF width 1 ms on 24 V
	Reset (RST)	8P (IN6)	For resetting an alarm code. (Keep ON over 60 ms.) Alarms caused by overheating such as AL-01, AL-05, AL-08, AL-09, and AL-17 may not be reset until temperature falls to a certain level.	
	MB confirmation (MBIN)	7P (IN5)	Enter the holding brake operation checking signal (the brake contactor auxiliary contact point). See the description on power circuit for the connecting method.	
	Forward running possible (FEN)	6P (IN4)	This signal is for specifying the speed command for motor forward run. Only the forward run command is accepted even if you set UP-15 to reverse run. Connect with the contact point 'b' of the machine side forward run limit switch.	
	Reverse running possible (REN)	5P (IN3)	This signal is for specifying the speed command for motor reverse run. Only the reverse run command is accepted even if you set UP-15 to forward run. Connect with the contact point 'b' of the machine side reverse run limit switch.	
	Current value clear (PCLR)	4P (IN2)	When 'Resolver ABS' is specified as the motor sensor, set UP-12 to 10 to clear the current value. Set to 11 to clear only rotation count. When another ABS sensor is specified as the motor sensor, set UP-12 to 10 or 11 to clear the current value. Clearing the current value will bring you back to the zero point memorization state. With the standard specifications (incremental) the current value is cleared irrespective of UP-12's value.	
	Zero point stop (ZSTP)	3P (IN1)	Turn ON during the speed command operation to stop at the next motor zero point and to output HOME at the zero point.	
	Main circuit ON (PON)	2P (IN0)	This signal is for turning ON the MC output and the circuit contactor. When the PN power source is fully charged, the servo ready (RDY) turns ON. Turning OFF this signal turns OFF the main circuit contactor physically; this terminal should be integrated into an emergency stop circuit.	
24-V output	Servo normal (SST)	26P (OUT4)	This signal turns ON about 3 seconds after the AC power supply is turned on. Use this signal as the main circuit ON (PON) interlock. An alarm will turn OFF this signal and reset (RST) will turn ON the signal again.	ON voltage 1.5 V (max.) at 50 mA (peak current) OFF leak current 1uA (max.)
	Servo ready (RDY)	25P (OUT3)	This signal is turned ON when the servo normal (SST) comes ON, the main circuit ON (PON) is turned ON, and PN power supply is turned ON.	
	Home position (HOME)	24P (OUT2)	This signal comes ON when the motor stops at the zero point during zero point stop operation (ZSTP). The servo must be locked at this time.	
	Warning (WARN)	23P (OUT1)	This signal turns ON when battery voltage falls, the zero point is not saved, an electro-thermal warning is issued, a counter current absorption overheating warning is issued, or a fin overheating warning is issued. It turns OFF when the problems causing a warning are solved. You may continue operation even while a warning is issued.	
	MB output (MBO)	22P (OUT0)	This signal is to output holding brake control. See "Chapter 2 Power Circuit" for operation sequence.	
Pulse output / differen- tial output	(APD) (/APD) (BPD) (/BPD) (ZPD) (/ZPD)	20P (APD) 21P (/APD) 22P (BPD) 23P (/BPD) 24P (ZPD) 25P (/ZPD)	This signal outputs motor positions in terms of AB phase pulses with 90-degree phase differences. The Z phase is placed at the motor's zero point, and a half rotation generates a pulse when a resolver is used as the motor sensor and one rotation generates a pulse with the encoder sensor. When a resolver is used as the motor sensor, the number of pulses per rotation can be obtained in the following formula: APD (BPD) = [24000] x [1/4] x [UP-05/UP-04]. When a 17 bit encoder is used, use the formula: APD (BPD) = [131072] x [1/4] x [UP05/UP04]. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output.	Differential output equivalent to AM26LS31 ?? Vout: 3 V (TYP) 2 V (MIN) On 20 mA output

5-1-3. User Parameter

Symbol	Name	Unit	Setting range	Factory setting	Function
UP01 	Control mode	None	0 to 6	0	This parameter is for setting a servo amplifier control mode: Set to 1 for speed control mode. Set to 2 for current control mode. Set to 3 for position control mode. Set to 4 for speed/current/position control mode. Set to 5 for direct feed mode. Set to 6 for draw control mode.
UP02 	Motor code	None	0 to 64999	00000	This parameter is for setting a motor type for operation with a motor code. A motor code consists of a motor number and a sensor number. See the combination table for details.
UP03 	Resolver cable length	1 m	1 to 120	5	This parameter sets a cable length when a resolver is used as the motor sensor. When another type of motor sensor is specified, this setting is ignored.
UP04  	Electronic gear numerator	1 pulse	1 to 65535	1	This parameter is for setting a pulse command and an electronic gear for pulse output. For a pulse command: Set UP-04 and UP-05 to a traveling distance per pulse and UP-16 to a pulse command type (AB phase, forward/reverse pulse, and pulse and forward/reverse signal) and polarity. Specify a rotating direction using the parameter UP-19 for position control polarity. For pulse output: When a resolver is used as a motor sensor, the number of pulses per rotation can be obtained in the following formula: $APD (BPD) = [24000] \times [1/4] \times [UP-05/UP-04]$. When a 17 bit encoder is used, use the formula: $APD (BPD) = [131072] \times [1/4] \times [UP05/UP04]$. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output. * The positions of the numerator and the denominator exchange when the formula is used for pulse command and for pulse output.
UP05  	Electronic gear denominator	1 pulse	1 to 65535	1	
UP06	Zero point shift amount	0.01 degrees	0.00 to 360.00	0.00	This parameter is for setting a phase shift amount of the motor axis zero point pulse with an angle. When a resolver is used as the motor sensor, one motor rotation generates two zero point pulses. Set this parameter assuming one motor rotation makes 360 degrees.
UP08 	Current limit value	0.001	0.0 to 100.0	100.0	Set a value using percentage of a current limit value against a motor maximum current while current limit switch-over signal is ON. Set to 0 (zero) to switch to the 4-quadrant current limit mode. This parameter is invalid in the analog current limit command mode.
UP09 	Soft start acceleration time	0.001 s	0.000 to 65.535	0.000	Use this parameter to set an acceleration rate when adding a linear acceleration/deceleration rate to the speed command in the speed control mode. The rate is specified as time in the range from zero to that required to reach the maximum rpm. This parameter is effective only when UP-11 is set to zero.
UP10 	Soft start deceleration time	0.001 s	0.000 to 65.535	0.000	Use this parameter to set an deceleration rate when adding a linear acceleration/deceleration rate to the speed command in the speed control mode. The acceleration rate is specified as time required to decelerate from the maximum rotation rate to full stop. This parameter is effective only when UP-11 is set to zero.
UP11 	S-shaped acceleration/deceleration time	0.001 s	0.000 to 65.535	0.000	Use this parameter to set a time constant when adding an S-shaped acceleration/deceleration rate to the speed command in the speed control mode. Define a time constant as duration to accelerate by in the range between 5 and 95 percent. When UP-11 is set to zero, soft start acceleration/deceleration set with UP-09 and UP-10 becomes effective. In the position control mode, an S-shaped acceleration/deceleration rate may be added to the position command pulse. In the position control mode, soft start acceleration/deceleration parameters are ignored.
UP12 	ABS mode	None	00 to 12	00	Use this parameter to specify the coordinate clear mode to the ABS sensor and if the ABS sensor is used or not. Specify these items using two digits each individually. Even when the ABS sensor is used, selecting not to use the ABS sensor disables the battery alarm, zero point memorization management, and multi-revolution management functions and it serves as the incremental sensor. Digit position of one: Set the coordinate clear mode to 0 for clearing all. Set to 1 for clearing the rotation count only. Set to 2 to prohibit clearance. Digit position of ten: Set the ABS mode to 0 for disabling the ABS sensor. Set to 1 to use the ABS sensor.

UP13 	Holding brake operation	None	0 to 1	0	Use this parameter to specify the holding brake operation. Set to 0 for starting deceleration immediately and applying brake when the brake is turned ON and the rotation count is below the speed set with UP-14. Set to 1 to decelerate according to the currently set deceleration curve and turn ON the brake. Apply brake at a speed lower than the rotation count specified with UP-14. The holding brake will be applied exceptionally when an alarm is issued or PON is turned OFF.
UP14	Brake applying rotation rate 	0.001	0.0 to 100.0	10.0	Use this parameter to specify a motor rotation rate where the holding brake is turned ON. This parameter is for avoiding to use the holding brake instead of the speed control brake and the holding brake applies only when the motor rotation rate is below the rate specified with this parameter. Assume the maximum rpm as 100%.
UP15	Analog command polarity	None	00 to 11	00	This parameter is for setting the polarity for analog current command input. Specify these items using two digits each individually. Digit position of one: Set the speed command to 0 for running the motor forward with the positive voltage. Set the speed command to 1 for running the motor backward with the positive voltage. Digit position of ten: Set the current command to 0 for obtaining the motor forward run torque with the positive voltage. Set the current command to 1 for obtaining the motor reverse run torque with the positive voltage.
UP16	Pulse command type	None	00 to 12	00	This parameter is for setting the type and polarity of the position command pulse. Specify these items using two digits each individually. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Set the type to 2 for setting forward/reverse signal. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP17	Pulse output type	None	00 to 11	01	This parameter is for setting a pulse type when UP-18 is set to 'pulse.' Use two digits for setting. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP18	Differential output type	None	0000 to 6635	0000	Use this parameter for setting a differential output type in four digits. Digit position of one: Set output selection to 0 for pulse output (current value). Set output selection to 1 for DPA-80 output. Set output selection to 2 for current value output. Set output selection to 3 for high-speed pulse output. Set output selection to 4 for command pulse output. Set output selection to 5 for draw pulse output. Digit position of ten: Set current value output type to 0 for setting to 32 bits. Set current value output type to 1 for 23 bits plus parity. Set current value output type to 2 for 24 bits plus parity. Set current value output type to 3 for 31 bits plus parity. Digit position of one hundred: Display data while monitor switch-over is ON. Digit position of one thousand: Display data while monitor switch-over is OFF. Set to 0 for motor count. Set to 1 for current value. Set to 2 for motor current. Set to 3 for electro-thermal value. Set to 4 for motor phase amount (machine angle). Set to 5 for machine speed.
UP21	External reverse current absorption resistance value	0.1 Ohm	0 to 100.0	0.0	Use this parameter when using external counter current absorption resistance. Set to 0 for internal counter current absorption resistance.
UP22	External counter current absorption resistance capacity	0.01 kW	0.00 to 327.67	0	Set a external counter current absorption resistance capacity. Set to 0 for internal counter current absorption resistance.

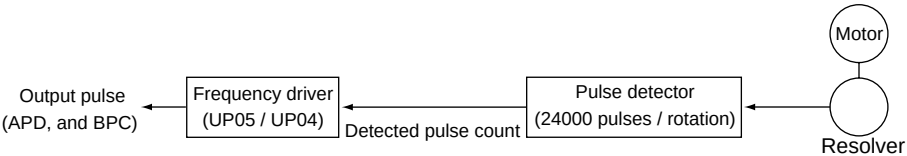
5	UP23 	Common power supply mode	None	0000 to 1112	0000	Use this parameter for setting usage condition for sharing the PN power source with four digits. Please contact the manufacturer or its agent before starting sharing the power source. Digit position of one: Set reverse current absorption monitor to 0 for detecting AL-9 and AL-10. Set reverse current absorption monitor to 1 for setting AL-9 and AL-10 unavailable. ?? Set reverse current absorption monitor to 2 for setting AL-10 unavailable. ?? Digit position of ten: Set the counter current absorption capacity to 0 for setting the function available. Set the counter current absorption capacity to 1 for setting the function unavailable. Digit position of ten: Set the main power supply monitor to 0 for setting the function available. Set the main power supply monitor to 1 for setting the function unavailable. Digit position of thousand: Set the self-discharge function to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable.
	UP28	Stop detection rpm	1 rpm	1 to 32767	50	The stop detection signal turns ON when a motor count falls below the level specified with this parameter. At a rotation rate below the set level, running forward and running reverse signals turn OFF. When the stop detection signal turns ON, the gain drop during stoppage function also works.
	UP29 	Specified speed	1 rpm	0 to 32767	3000	Once the motor count enters the range specified with UP29 +/- UP30, the specified speed signal turns ON. If you set the parameter to 0, the specified speed signal turns ON when the speed reaches the command rotation rate at that time with the positive and negative tolerance specified with UP30. (In the position control mode, the command speed calculated from the position command pulses is assumed as the command rotation rate.)
	UP30	Specified speed range	1 rpm	1 to 10000	50	This parameter is setting the detection range allowance of the specified speed detection signal. Once the actual motor count enters the range specified with UP29 +/- UP30, the specified speed signal turns ON.
	UP31	Motor test rpm	1 rpm	1 to 10000	50	This parameter is for specifying a rotation rate for motor test run.
	UP33	Load factor time constant	1 s	1 to 60	30	This parameter is for setting a time constant for effective load factor calculation.
	UP34	Limit switching-over method	None	000 to 121	011	This parameter is for setting a current limit in the speed limit mode and a speed limit method and a 4-phase current limit method in the current limit mode. Digit position of one: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP35 when the LCHG signal turns ON. Digit position of ten: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP08 (UP36 through UP39) when the CCD signal turns ON. Set the speed limit to 2 for always limiting with UP08 (UP36 through UP39). Digit position of hundred: Set the 4-phase current limit to 0 for switching over with the speed command sign. Set the 4-phase current limit to 1 for switching over with the speed detection sign.
	UP36 	Forward drive current limit	0.001	0.0 to 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates forward drive torque.
	UP37 	Forward run absorption current limit	0.001	0.0 to 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates forward run absorption torque.
	UP38 	Reverse drive current limit	0.001	0.0 to 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates reverse drive torque.

UP39	Reverse run absorption current limit functional description	0.001	0.0 to 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates reverse run absorption torque.																														
UP41	Display magnification rate numerator	None	1 to 65535	1	This parameter is for setting a display magnification rate numerator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																														
UP42	Display magnification rate denominator	None	1 to 65535	1	This parameter is for setting a display magnification rate denominator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																														
UP43	Display decimal point position	None	0 to 7	0	This parameter is for setting a decimal point position for an external display. Set to 0 when using no decimal point, 1 for the lowest digit, 2 for the second digit, 3 for the third digit, and so forth. The value is used for machine speed, current value, command pulse, etc. The decimal point is fixed to the second digit for motor current and motor phase. The decimal point is not displayed on the display.																														
UP44	Sequence input inverting ??	None	00 to FF	00	This parameter is for setting sequence input logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. INO (PON entry) may not be inverted. <table><tr><td>Entry address</td><td>IN7</td><td>IN6</td><td>IN5</td><td>IN4</td><td>IN3</td><td>IN2</td><td>IN1</td><td>INO</td><td></td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>0</td><td>[0: non-inversion]</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to F</td><td colspan="4">0 to E</td><td>[1: Inversion]</td></tr></table>	Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO		Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	[0: non-inversion]	Hexadecimal	0 to F				0 to E				[1: Inversion]
Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO																											
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	[0: non-inversion]																										
Hexadecimal	0 to F				0 to E				[1: Inversion]																										
UP45	Sequence output reversing	None	00 - 1F	00	This parameter is for setting sequence output logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. <table><tr><td>Entry address</td><td>-</td><td>-</td><td>-</td><td>OUT4</td><td>OUT3</td><td>OUT2</td><td>OUT1</td><td>OUT0</td><td></td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>[0: non-inversion]</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to 1</td><td colspan="4">0 to F</td><td>[1: Inversion]</td></tr></table>	Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0		Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	[0: non-inversion]	Hexadecimal	0 to 1				0 to F				[1: Inversion]
Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0																											
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	[0: non-inversion]																										
Hexadecimal	0 to 1				0 to F				[1: Inversion]																										
UP46 Power OFF	Sequence I/O selection	None	0 to 32	0	This parameter is for selecting a combination of 32 types of sequence entry. At present eight combinations are available. Set this parameter to 0 for standard sequence I/O.																														
UP48 Power OFF	Electronic gear multiplication rate	1 time	1 to 100	1	Use the parameter when the magnification rate is too low with the electronic gear setting. This magnification rate change setting is prepared for the case where the sensor split count becomes too great compared with the external command pulse frequency. ??																														
UP49	VMOOUT output selection	None	000 to 399	000	This parameter is for setting output data and output type of analog output VMOOUT. The lowest two digits: VMOOUT output data Set the parameter to 0 for detected speed (filter output). Set the parameter to 1 for detected current (filter output). Set the parameter to 2 for current value (after processing with the electronic gear). Set the parameter to 3 for current value (sensor pulse). Set the parameter to 4 for a differential (after processing with the electronic gear). Set the parameter to 5 for a differential (sensor pulse). Set the parameter to 6 for speed command. Set the parameter to 7 for current command. Set the parameter to 8 for position command (speed command conversion value). Set the parameter to 9 for motor phase. Set the parameter to 10 for detected speed (without filter). Set the parameter to 11 for detected current (without filter). Set the parameter to 12 for the BL value. Set the parameter to 13 for the OL value. Set the parameter to 14 for the RL value. Set the parameter to 15 for fin temperature. Set the parameter to 16 for a speed differential. Set the parameter to 17 for a current differential. The highest digit: output type Set the parameter to 0 for non-inversion output. Set the parameter to 1 for inversion output. Set the parameter to 2 for absolute value output. Set the parameter to 3 for no inversion without a cramp.																														

UP50	VMOUT output scale	0.1	0.1 to 3276.7	300.0	This parameter is for setting an output scale for analog output VMOUT. Example: Set to 2.0 when specifying 2 A per monitor output voltage 1 V. Scales may be set in the following ranges for each data type based on 1.0 A / 1 V. Speed: 0.1 to 3276.7 rpm/V Current: 0.1 to 3276.7 A/V Pulse: 0.1 to 3276.7 P/V Voltage: 0.1 to 3276.7 V/V Angle: 0.1 to 3276.7 deg./V Percentage: 0.1 to 3276.7 %/V Temperature: 0.1 to 3276.7 deg. (Celsius)/V
UP51	AMOUT output selection	None	000 to 399	001	This parameter is for setting the output data and output type for analog output AMOUT.
UP52	AMOUT output scale	0.1	0,1 to 3276,7	5.0	This parameter is for setting an output scale for analog output AMOUT. ?? Refer to UP50 for the detailed setting.

● Electronic gear

Based on UP-04 and UP-05 settings, the pulse count with any weight per one motor rotation can be obtained and output.



Setting example: When you want to output 200 pulses per rotation with the AB phase pulse, multiply the resolution four times to obtain the forward/backward run pulse count and then obtain the 2000 x 4 = 8000 pulses per rotation. When a resolver is used as the motor sensor, set the electronic gear as following because the pulse count per rotation is 24000.

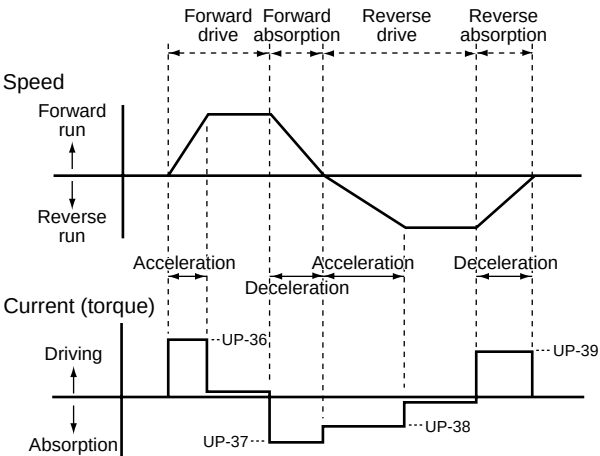
$$UP-05/UP-04=8000/24000=1/3$$

Thus, set UP-04 to 3, UP-17 to 01, and UP-18 to 0000.

* Note that in the case of 17-bit serial ABS encoder, the pulse count per rotation is 131072.

● On forward run - backward run - driving - absorption run cycle

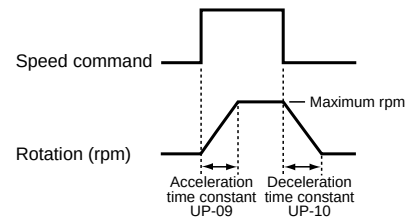
As to motor operation, the condition where the motor is driving a load is called 'driving state.' To the contrary, the condition where the motor works as a generator driven by a load is called 'absorption state.' Each state is possible with forward run and reverse run and therefore four states are available. User parameters UP-36 through UP-39 are provided to limit current supplied to a motor in individual states. Motor torque is proportionate to current, and thus you may use these parameters to limit torque for the purpose of acceleration or deceleration of a motor.



● Speed acceleration and deceleration

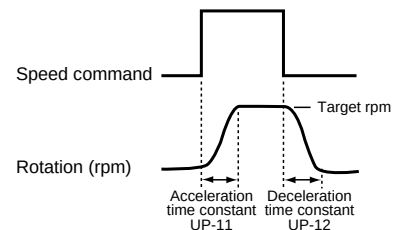
Soft start (linear acceleration/deceleration)

A speed command for quick speed change causes sudden acceleration or deceleration of a motor that can be leveled by setting soft start duration. Set UP-09 and UP-10 to a duration period in the range between zero and the maximum rotation rate. If you set S-shaped acceleration/deceleration (UP-11) to a value except zero, this parameter setting is ignored and S-shaped acceleration/deceleration takes place.



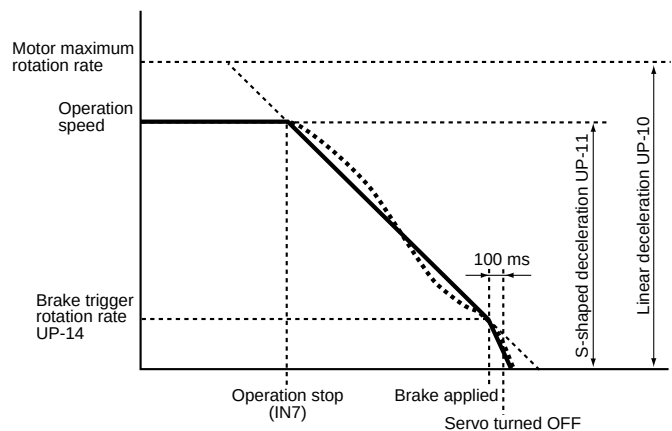
S-shaped acceleration/deceleration

Smoother acceleration / deceleration than soft start is obtained. Set the same time constant for both acceleration and deceleration. Time required to reach the target rotation rate will be 1.1 times the set value. Use UP-11 for the purpose.



● Brake trigger rotation rate

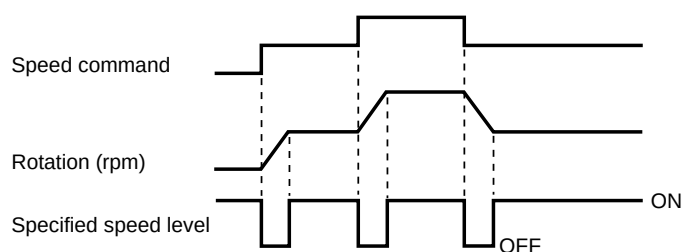
When using the holding brake, stop operation (IN2) first and the holding brake will be applied when the rotation rate falls linearly or along an S-shaped line to the rotation level set with the brake trigger rotation rate parameter (UP-14). One hundred ms later the servo will be turned OFF.



5

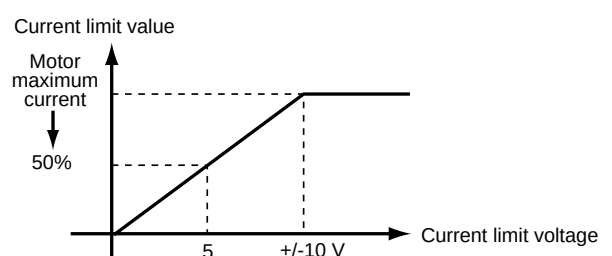
● Specified speed level

??? when the motor rotation rate reaches the target rotation level specified with speed command (REF). Use UP-29 and UP-30 for setting.



● Current limit

Turn ON the current limit switch-over CCD (special sequence) by setting UP-34 to apply a current limit level proportionate with the current limit (CLI) voltage. ??? It's also possible to set current limit of a fixed value using a parameter.

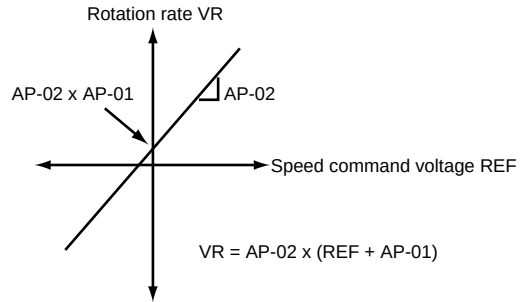


● Zero adjustment (AP-01) and span adjustment (P-02) of a speed command

The formula $VR = AP-02 \times (REF + AP-01)$ is possible where VR is motor rotation rate and REF is speed command voltage.

At the time of shipment from the factory the motor is set to zero adjustment with AP-01 but it may turn a little if a speed command has an offset. If that is the case, make automatic zero adjustment taking the command offset into consideration.

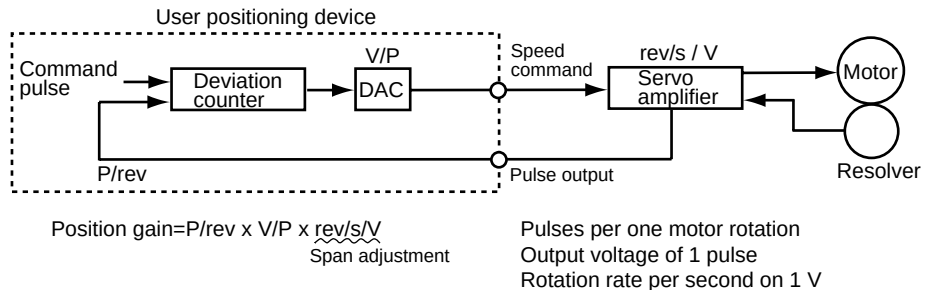
The span adjustment (AP-02) is set to 1500 (rpm)/10 V. Set AP-02 to 300.0 if the speed command is based on 3000 rpm per 10 V.



● Setting user controller position gain

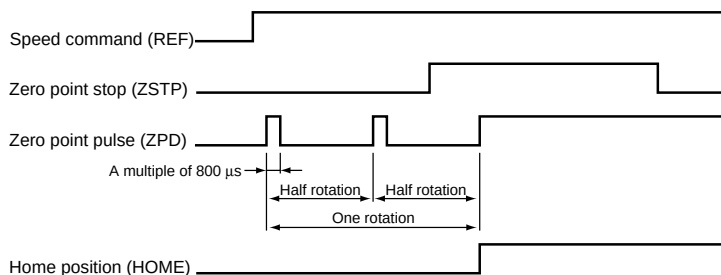
If you issued a speed command on the positioning system as illustrated below, adjust position gain setting on the positioning system. The speed loop frequency characteristics are adjusted to an optimum value by setting the target loop gain TP-02 to the same value as the position gain with the user controller in the auto-tuning standard mode (TP-01 = 0) and setting TP-03 to load inertia. Readjustment of the speed loop frequency characteristics is required when position gain is changed by an event such as hunting during adjustment.

If your positioning system has no function for adjustment of position gain, try the span adjustment (AP-02) with the servo amplifier.



● Zero point stop and home position (how to set user controller's zero point)

The zero point can be determined exactly using zero point stop (ZSTP) and zero point pulse (ZPD). Positioning control based on the zero point pulse enables exact zero point setting despite mechanical inertia or flow rate change during zero point setting. Turn OFF zero point stop to return to ordinary speed control and start rotation with a speed command.



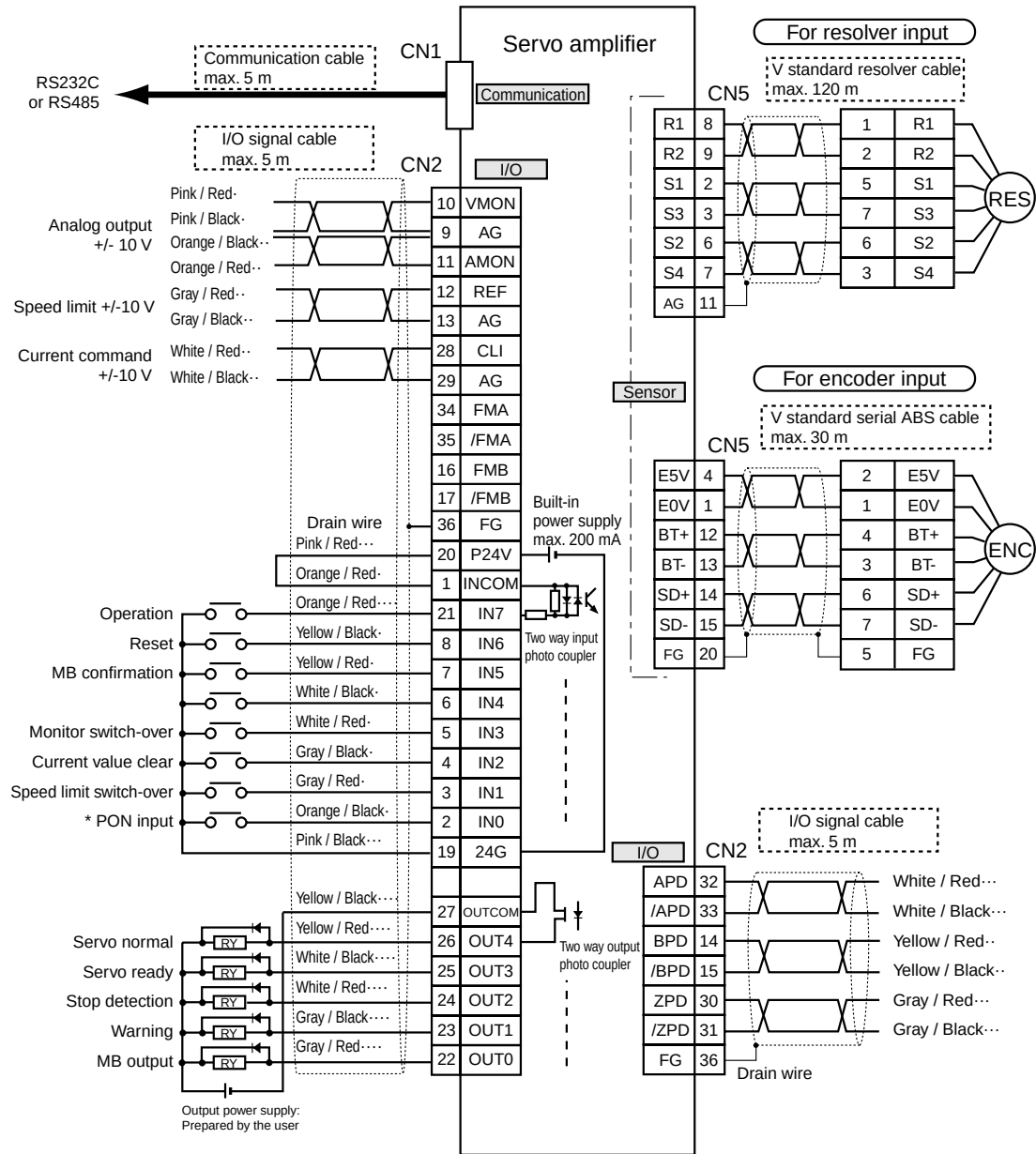
Right after the zero point stop command is issued, the motor stops ??? Clear the deviation counter of the upper position positioning device at the ON edge ??? at the home position.

5-1-4. Operation

Operation steps	Description
Power ON User parameter setting Enter 01 for UP-01. Enter the motor code for UP-02. Shut down the power and turn ON again after making sure that the entire display has gone off. Specify all required data to user parameters. Turn ON the operation signal. Speed command zero adjustment Test run with the speed command voltage Lower the speed command voltage to zero. Turn OFF the operation signal.	Alarm AL26 was issued. Press the MODE key to display UP-01 (0 is displayed) → Press SEL and SET together. (0 flashes.) Press SET → UP-02 (UP-02 is displayed.) (Flashing stops.) (Set to 01.) Press SEL and SET together. → 0000 (0000 is displayed.) (Rightmost 0 flashes.) (Set a motor code.) (Flashing stops.) → SET Data are set to UP01 and UP02. Example: resolver cable length for UP-03, electronic gear for UP-04 and UP-05, current limit to UP-08 and UP-34, etc. The motor is ready for operation and servo locked. If a brake is used, make sure the brake is not applied. Conduct offset adjustment for command voltage 0 V with the adjustment parameter AP-01. The motor starts running. Check the following points with a low voltage at first. * Rotating direction * Hunting during operation * Vibration when the motor comes to stop * Impact during acceleration and deceleration * Rotation rate for a command voltage Conduct auto-tuning if necessary. TP-01 is set to 0 (standard mode) on shipment from the factory and therefore set TP-02 to a target loop gain and TP-03 to load inertia multiplication rate. Also specify values to UP-9 through UP-11 and UP-15. The motor stops rotation. Turn ON the zero command signal (with special sequence) to make a complete stop. The motor is set in the servo-free condition. If a brake is used, make sure the brake can be applied.

5-2. Current Control Mode Operation

5-2-1. Connection examples



Connector symbol	Cable name	Cable model	Remarks
CN1	RS232C communication cable	CV01A-□□□ □	Select either one.
CN1	RS485 communication cable	CV01B-□□□ □	
CN2	I/O signal cable	CV02A-□□□ □	
CN5	V standard resolver cable	CV05A-□□□ □	Select one of these.
CN5	VZ motor resolver cable	CV05B-□□□ □	
CN5	V standard resolver ABS cable	CV05C-□□□ □	
CN5	V standard serial ABS cable	CV05D-□□□ □	
CN5	VZ motor serial ABS cable	CV05E-□□□ □	

5-2-2. I/O Signal

Type	Name	Terminal No.	Function	Power specifications
Communi- cation	RS232C	CN 1	Connect to this terminal for using an RS232C and RS422 interfaces and PC tool SHAN5. These two interfaces are to be switched automatically by cables. ??	
Analog output	Monitor 1 (VMON)	10P (VMON) 9P (AG)	Output data defaults to 'Speed.' Use the parameter UP-49 to select data. Specify a scale using the parameter UP-50.	+/-10 V/3000 rpm Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??
	Monitor 2 (AMON)	11P (AMON) 9P (AG)	Output data defaults to 'Current.' Use the parameter UP-51 to select data. Specify a scale using the parameter UP-52.	+/-10 V/50 A Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??
Analog input	Speed limit (REF)	12P (REF) 13P (AG)	Set the limit switching-over method parameter UP-34 to xx0 and turn ON the limit switching-over key LCHG to specify this input voltage as a speed limit value. Use AP-01 for zero adjustment and AP-02 for span adjustment. The voltage polarity has nothing to do with the setting. Monitor the input voltage with the status display [cF---]. Vin +/-11.5 V (Max.)	Vin +/-11.5 V (Max.) Input resistance 49 Kohm AD resolution +/- 2048 (+/-11.5 V per hour) ??
	Current command (CLI)	28P (CLI) 29P (AG)	For entering a current command voltage. Use the parameter AP-03 for zero adjustment and AP-04 for span adjustment. Forward drive torque is obtained with the positive voltage polarity. Change the torque generating direction with the parameter UP-15. Monitor the voltage value with the status display [cc---].	
24-V input	Operation (RUN)	21P (IN7)	This signal sets the motor ready to run. In the current limit control operation mode, the command value torque is obtained directly without servo lock. Turn OFF the signal to set the servo free. This signal also serves to turn ON/OFF brake output.	ON voltage 19.2 to 26.4 V OFF voltage 3 V (Max.) ON current 6 mA (TYP) Min. ON/OFF width 1 ms on 24 V
	Reset (RST)	8P (IN6)	For resetting an alarm code.(Keep ON over 60 ms.) Alarms caused by overheating such as AL-01, AL-05, AL-08, AL-09, and AL-17 may not be reset until temperature falls to a certain level.	
	MB confirmation (MBIN)	7P (IN5)	Enter the holding brake operation checking signal (the brake contactor auxiliary contact point). See the description on power circuit for the connecting method.	
		6P (IN4)	Not used.	
	Monitor switch- over (EXD)	5P (IN3)	This signal switches the monitor display between settings at the digit position of one hundred and one thousand conducted with the differential output type parameter UP-18. Turn ON the signal to make the digit position of one hundred effective.	
	Current value clear (PCLR)	4P (IN2)	When 'Resolver ABS' is specified as the motor sensor, set UP-12 to 10 to clear the current value. Set to 11 to clear only rotation count. When another ABS sensor is specified as the motor sensor, set UP-12 to 10 or 11 to clear the current value. Clearing the current value will bring you back to the zero point memorization state. With the standard specifications (incremental) the current value is cleared irrespective of UP-12's value.	
	Limit switch-over (LCHG)	3P (IN1)	Turn ON the signal to apply the speed limit. Set limit methods using UP-34 and UP-35.	
	Main circuit ON (PON)	2P (IN0)	This signal is for turning ON the MC output and the circuit contactor. When the PN power source is fully charged, the servo ready (RDY) turns ON. Turning OFF this signal turns OFF the main circuit contactor physically; this terminal should be integrated into an emergency stop circuit.	
24-V output	Servo normal (SST)	26P (OUT4)	This signal turns ON about 3 seconds after the AC power supply is turned on. Use this signal as the main circuit ON (PON) interlock. An alarm will turn OFF this signal and reset (RST) will turn ON the signal again.	ON voltage 1.5 V (Max.) 50 mA/h (Max. current) OFF leak current 1uA (Max.)
	Servo ready (RDY)	25P (OUT3)	This signal is turned ON when the servo normal (SST) comes ON, the main circuit ON (PON) is turned ON, and PN power supply is turned ON.	
	Stop detection (STA)	24P (OUT2)	This signal turns ON when the motor rotation speed comes down below the stop detection rpm set with UP-28.	
	Warning (WARN)	23P (OUT1)	This signal turns ON when battery voltage falls, the zero point is not saved, an electro-thermal warning is issued, a counter current absorption overheating warning is issued, or a fin overheating warning is issued. It turns OFF when the problems causing a warning are solved. You may continue operation even while a warning is issued.	
	MB output (MBO)	22P (OUT0)	This signal is to output holding brake control. See "Chapter 2 Power Circuit" for operation sequence.	
Pulse output / differen- tial output	(APD) (/APD) (BPD) (/BPD) (ZPD) (/ZPD)	20P (APD) 21P (/APD) 22P (BPD) 23P (/BPD) 24P (ZPD) 25P (/ZPD)	This signal outputs motor positions in terms of AB phase pulses with 90-degree phase differences. The Z phase is placed at the motor's zero point, and a half rotation generates a pulse when a resolver is used as the motor sensor and one rotation generates a pulse with the encoder sensor. When a resolver is used as the motor sensor, the number of pulses per rotation can be obtained in the following formula: APD (BPD) = [24000] x [1/4] x [UP-05/UP-04]. When a 17 bit encoder is used, use the formula: APD (BPD) = [131072] x [1/4] x [UP05/UP04]. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output.	Differential output equivalent to AM26LS31 ?? Vout: 3 V (TYP) 2 V (MIN) On 20 mA output

5-2-3. User Parameter

Symbol	Name	Unit	Setting range	Factory setting	Function
UP01 	Control mode	None	0 to 6	0	This parameter is for setting a servo amplifier control mode: Set to 1 for speed control mode. Set to 2 for current control mode. Set to 3 for position control mode. Set to 4 for speed/current/position control mode. Set to 5 for direct feed mode. Set to 6 for draw control mode.
UP02 	Motor code	None	0 to 64999	00000	This parameter is for setting a motor type for operation with a motor code. A motor code consists of a motor number and a sensor number. See the combination table for details.
UP03 	Resolver cable length	1 m	1 to 120	5	This parameter sets a cable length when a resolver is used as the motor sensor. When another type of motor sensor is specified, this setting is ignored.
UP04  	Electronic gear numerator	1 pulse	1 to 65535	1	This parameter is for setting a pulse command and an electronic gear for pulse output. For a pulse command: Set UP-04 and UP-05 to a traveling distance per pulse and UP-16 to a pulse command type (AB phase, forward/reverse pulse, and pulse and forward/reverse signal) and polarity. Specify a rotating direction using the parameter UP-19 for position control polarity. For pulse output: When a resolver is used as a motor sensor, the number of pulses per rotation can be obtained in the following formula: $APD (BPD) = [24000] \times [1/4] \times [UP-05/UP-04]$. When a 17 bit encoder is used, use the formula: $APD (BPD) = [131072] \times [1/4] \times [UP05/UP04]$. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output. * The positions of the numerator and the denominator exchange when the formula is used for pulse command and for pulse output.
UP05  	Electronic gear denominator	1 pulse	1 to 65535	1	
UP06	Zero point shift amount	0.01 degrees	0.00 to 360.00	0.00	This parameter is for setting a phase shift amount of the motor axis zero point pulse with an angle. When a resolver is used as the motor sensor, one motor rotation generates two zero point pulses. Set this parameter assuming one motor rotation makes 360 degrees.
UP08 	Current limit value	0.001	0.0 to 100.0	100.0	Set a value using percentage of a current limit value against a motor maximum current while current limit switch-over signal is ON. Set to 0 (zero) to switch to the 4-quadrant current limit mode. This parameter is invalid in the analog current limit command mode.
UP12 	ABS mode	None	00 to 12	00	Use this parameter to specify the coordinate clear mode to the ABS sensor and if the ABS sensor is used or not. Specify these items using two digits each individually. Even when the ABS sensor is used, selecting not to use the ABS sensor disables the battery alarm, zero point memorization management, and multi-revolution management functions and it serves as the incremental sensor. Digit position of one: Set the coordinate clear mode to 0 for clearing all. Set to 1 for clearing the rotation count only. Set to 2 to prohibit clearance. Digit position of ten: Set the ABS mode to 0 for disabling the ABS sensor. Set to 1 to use the ABS sensor.
UP13 	Holding brake operation	None	0 to 1	0	Use this parameter to specify the holding brake operation. Set to 0 for starting deceleration immediately and applying brake when the brake is turned ON and the rotation count is below the speed set with UP-14. Set to 1 to decelerate according to the currently set deceleration curve and turn ON the brake. Apply brake at a speed lower than the rotation count specified with UP-14. The holding brake will be applied exceptionally when an alarm is issued or PON is turned OFF.
UP14 	Brake applying rotation rate	0.001	0.0 to 100.0	10.0	Use this parameter to specify a motor rotation rate where the holding brake is turned ON. This parameter is for avoiding to use the holding brake instead of the speed control brake and the holding brake applies only when the motor rotation rate is below the rate specified with this parameter. Assume the maximum rpm as 100%.

UP15	Analog command polarity	None	00 to 11	00	This parameter is for setting the polarity for analog current command input. Specify these items using two digits each individually. Digit position of one: Set the speed command to 0 for running the motor forward with the positive voltage. Set the speed command to 1 for running the motor backward with the positive voltage. Digit position of ten: Set the current command to 0 for obtaining the motor forward run torque with the positive voltage. Set the current command to 1 for obtaining the motor reverse run torque with the positive voltage.
UP17	Pulse output type	None	00 to 11	01	This parameter is for setting a pulse output type when UP-18 is set to 'Pulse output.' Use two digits for setting. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP18	Differential output type	None	0000 to 6635	0000	Use this parameter for setting a differential output type in four digits. Digit position of one: Set output selection to 1 for pulse output (current value). Set output selection to 1 for DPA-80 output. Set output selection to 2 for current value output. Set output selection to 3 for high-speed pulse output. Set output selection to 4 for command pulse output. Set output selection to 5 for draw pulse output. Digit position of ten: Set current value output type to 0 for setting to 32 bits. Set current value output type to 1 for 23 bits plus parity. Set current value output type to 2 for 24 bits plus parity. Set current value output type to 3 for 31 bits plus parity. Digit position of one hundred: Display data while monitor switch-over is ON. Digit position of one thousand: Display data while monitor switch-over is OFF. Set to 0 for motor count. Set to 1 for current value. Set to 2 for motor current. Set to 3 for electro-thermal value. Set to 4 for motor phase amount (machine angle). Set to 5 for machine speed.
UP21	External reverse current absorption resistance value	0.1 Ohm	0 to 100.0	0.0	Use this parameter when using external counter current absorption resistance. Set to 0 for internal counter current absorption resistance.
UP22	External counter current absorption resistance capacity	0.01 kW	0.00 to 327.67	0.00	Set a external counter current absorption resistance capacity. Set to 0 for internal counter current absorption resistance.
UP23 	Common power supply mode	None	0000 to 1112	0000	Use this parameter for setting usage condition for sharing the PN power source with four digits. Please contact the manufacturer or its agent before starting sharing the power source. Digit position of one: Set reverse current absorption monitor to 0 for detecting AL-9 and AL-10. Set reverse current absorption monitor to 1 for setting AL-9 and AL-10 unavailable. ?? Set reverse current absorption monitor to 2 for setting AL-10 unavailable. ?? Digit position of ten: Set the counter current absorption capacity to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of ten: Set the main power supply monitor to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of thousand: Set the self-discharge function to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable.

UP28	Stop detection rpm	1 rpm	1 to 32767	50	The stop detection signal turns ON when a motor count falls below the level specified with this parameter. At a rotation rate below the set level, running forward and running reverse signals turn OFF. When the stop detection signal turns ON, the gain drop during stoppage function also works.																											
UP31	Motor test rpm	1 rpm	1 to 10000	50	This parameter is for specifying a rotation rate for motor test run.																											
UP33	Load factor time constant	1 s	1 to 60	30	This parameter is for setting a time constant for effective load factor calculation.																											
UP34	Limit switching-over method	None	000 to 121	011	This parameter is for setting a current limit in the speed limit mode and a speed limit method and a 4-phase current limit method in the current limit mode. Digit position of one: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP35 when the LCHG signal turns ON. Digit position of ten: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP08 (UP36 through UP39) when the CCD signal turns ON. Set the speed limit to 2 for always limiting with UP08 (UP36 through UP39). Digit position of hundred: Set the 4-phase current limit to 0 for switching over with the speed command sign. Set the 4-phase current limit to 1 for switching over with the speed detection sign.																											
UP35	Speed limit value functional description	1 rpm	1 to 4000	4000	This parameter is for setting a speed limit level that is turned effective by the limit switch-over LCHG signal in the current control mode. The speed limit level becomes effective only when the digit position of one of the limit switching-over method parameter UP-34 is set to 1.																											
UP40	Drive absorption detection width	0.001	0.0 to 100.0	5.0	This parameter is for setting the turning-ON current for the driving signal and absorption signal. Both signals turn ON when a current level over the setting is detected.																											
UP41	Display magnification rate numerator	None	1 to 65535	1	This parameter is for setting a display magnification rate numerator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																											
UP42	Display magnification rate denominator	None	1 to 65535	1	This parameter is for setting a display magnification rate denominator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																											
UP43	Display decimal point position	None	0 to 7	0	This parameter is for setting a decimal point position for an external display. Set to 0 when using no decimal point, 1 for the lowest digit, 2 for the second digit, 3 for the third digit, and so forth. The value is used for machine speed, current value, command pulse, etc. The decimal point is fixed to the second digit for motor current and motor phase. The decimal point is not displayed on the display.																											
UP44	Sequence input inverting ??	None	00 to FF	00	This parameter is for setting sequence input logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. INO (PON entry) may not be inverted. <table><tr><td>Entry address</td><td>IN7</td><td>IN6</td><td>IN5</td><td>IN4</td><td>IN3</td><td>IN2</td><td>IN1</td><td>INO</td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>0</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to F</td><td colspan="4">0 to E</td></tr></table> [0: non-inversion] [1: Inversion]	Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO	Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	Hexadecimal	0 to F				0 to E			
Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO																								
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0																								
Hexadecimal	0 to F				0 to E																											
UP45	Sequence output reversing	None	00 - 1F	00	This parameter is for setting sequence output logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. <table><tr><td>Entry address</td><td>-</td><td>-</td><td>-</td><td>OUT4</td><td>OUT3</td><td>OUT2</td><td>OUT1</td><td>OUT0</td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to 1</td><td colspan="4">0 to F</td></tr></table> [0: non-inversion] [1: Inversion]	Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0	Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	Hexadecimal	0 to 1				0 to F			
Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0																								
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0																								
Hexadecimal	0 to 1				0 to F																											
UP46	Sequence I/O selection Power OFF	None	0 to 32	0	This parameter is for selecting a combination of 32 types of sequence entry. At present eight combinations are available. Set this parameter to 0 for standard sequence I/O.																											

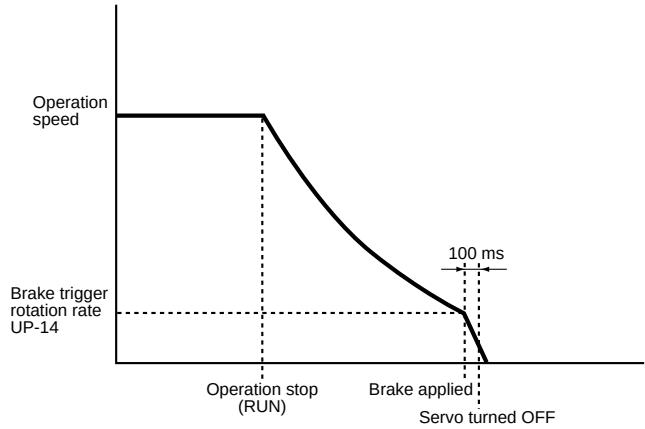
UP48 	Electronic gear multiplication rate	1 time	1 to 100	1	Use the parameter when the magnification rate is too low with the electronic gear setting. This magnification rate change setting is prepared for the case where the sensor split count becomes too great compared with the external command pulse frequency. ??
UP49	VMOUT output selection	None	000 to 399	000	This parameter is for setting output data and output type of analog output VMOUT. The lowest two digits: VMOUT output data Set the parameter to 0 for detected speed (filter output). Set the parameter to 1 for detected current (filter output). Set the parameter to 2 for current value (after processing with the electronic gear). Set the parameter to 3 for current value (sensor pulse). Set the parameter to 4 for a differential (after processing with the electronic gear). Set the parameter to 5 for a differential (sensor pulse). Set the parameter to 6 for speed command. Set the parameter to 7 for current command. Set the parameter to 8 for position command (speed command conversion value). Set the parameter to 9 for motor phase. Set the parameter to 10 for detected speed (without filter). Set the parameter to 11 for detected current (without filter). Set the parameter to 12 for the BL value. Set the parameter to 13 for the OL value. Set the parameter to 14 for the RL value. Set the parameter to 15 for fin temperature. Set the parameter to 16 for a speed differential. Set the parameter to 17 for a current differential. The highest digit: output type Set the parameter to 0 for non-inversion output. Set the parameter to 1 for inversion output. Set the parameter to 2 for absolute value output. Set the parameter to 3 for no inversion without a cramp.
UP50	VMOUT output scale	0.1	0.1 to 3276.7	300.0	This parameter is for setting an output scale for analog output VMOUT. Example: Set to 2.0 when specifying 2 A per monitor output voltage 1 V. Scales may be set in the following ranges for each data type based on 1.0 A / 1 V. Speed: 0.1 to 3276.7 rpm/V Current: 0.1 to 3276.7 A/V Pulse: 0.1 to 3276.7 P/V Voltage: 0.1 to 3276.7 V/V Angle: 0.1 to 3276.7 deg./V Percentage: 0.1 to 3276.7 %/V Temperature: 0.1 to 3276.7 deg. (Celsius)/V
UP51	AMOUT output selection	None	000 to 399	001	This parameter is for setting the output data and output type for analog output AMOUT.
UP52	AMOUT output scale	0.1	0.1 to 3276.7	5.0	This parameter is for setting an output scale for analog output AMOUT. ?? Refer to UP50 for the detailed setting.

● Brake application rotation rate in the current control mode

When you are using a holding brake sequence that is configured internally in the amplifier, the soft deceleration function does not work even if you set UP-13 (holding brake operation) to 1 in the current limit mode.

Turning OFF operation (RUN) reduces the speed to the level set with UP-14 (Brake application rotation rate) where the holding brake is applied and 100 ms later the servo is turned OFF.

In the current control mode the motor speed is influenced by load and it becomes necessary to manage the speed control unit in the control system. It is also desirable to control the holding brake externally. It is recommended to turn ON or OFF the current command (CLI) and the holding brake in the entire system operation stop sequence.



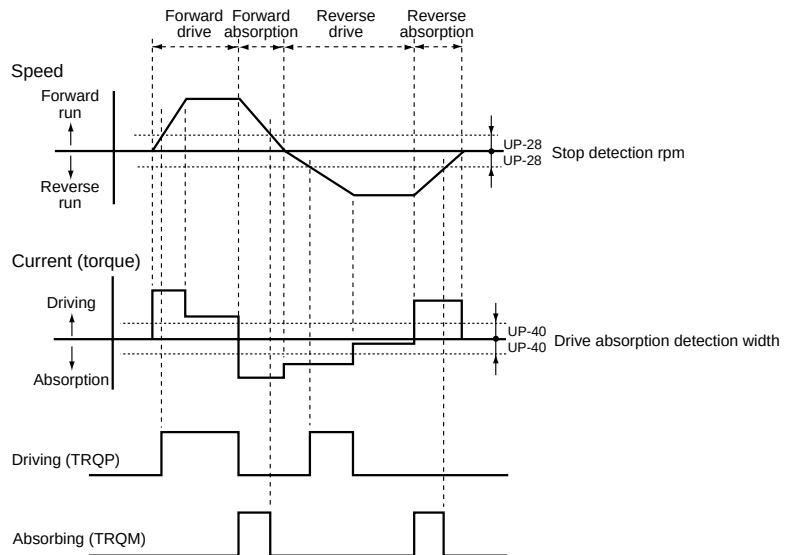
● Drive absorption detection width

As to motor operation, the condition where the motor is driving a load is called 'driving state.' To the contrary, the condition where the motor works as a generator driven by a load is called 'absorption state.' Each state is possible with forward run and reverse run and therefore four states are available.

The motor's operation state can be known from output signals: FOR (forward run), REV (reverse run), TRQP (driving), and TRQM (absorbing).

About output signals during driving and absorption, specify a detection range and instruct chattering protection using UP-28 (stop detection rpm) and UP-40 (drive absorption detection width).

This signal is not output when the motor rotation rate falls below the stop detection rpm and current flowing in the motor is within the drive absorption detection width.

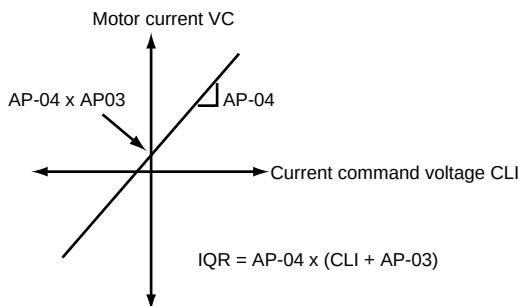


● Zero adjustment (AP-03) and span adjustment (AP-04) of a current command

$IQR = AP-04 \times (CLI + AP-03)$ is true where IQR is motor current and CLI is current speed command voltage.

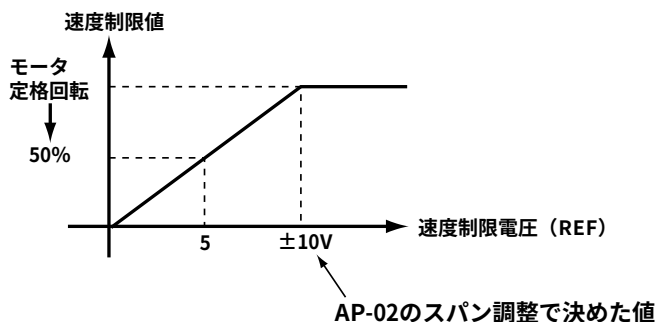
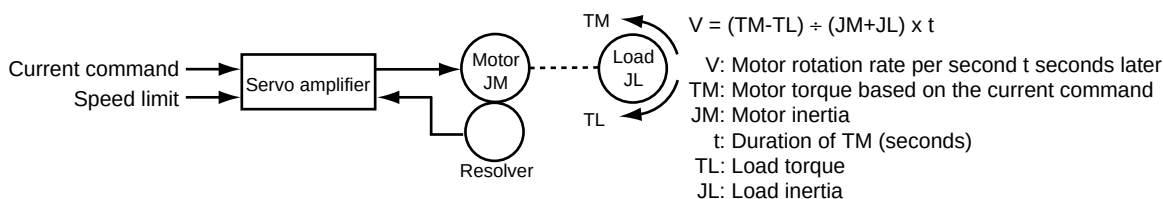
At the time of shipment from the factory the motor is set to zero adjustment with AP-03 but a little torque may be generated if a speed command has an offset. If that is the case, make automatic zero adjustment taking the command offset into consideration.

AP-04 (span adjustment) is set to 1 A/V.



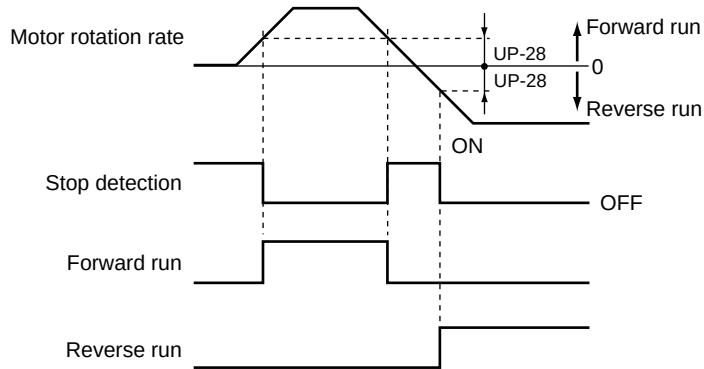
● Speed limit for protecting machine

In the current control mode, the motor rotation rate fluctuates depending on the load torque. When the load torque grows smaller compared with the current command value, the motor rotation rate rises to the maximum level. Therefore the motor should be used in the system under speed control. The speed limit function is provided for safety sake. If you turn ON LCHG (sequence input limit switch-over), the rotation rate can be limited by limiting REF (external input) using UP-34 or by setting UP-35.

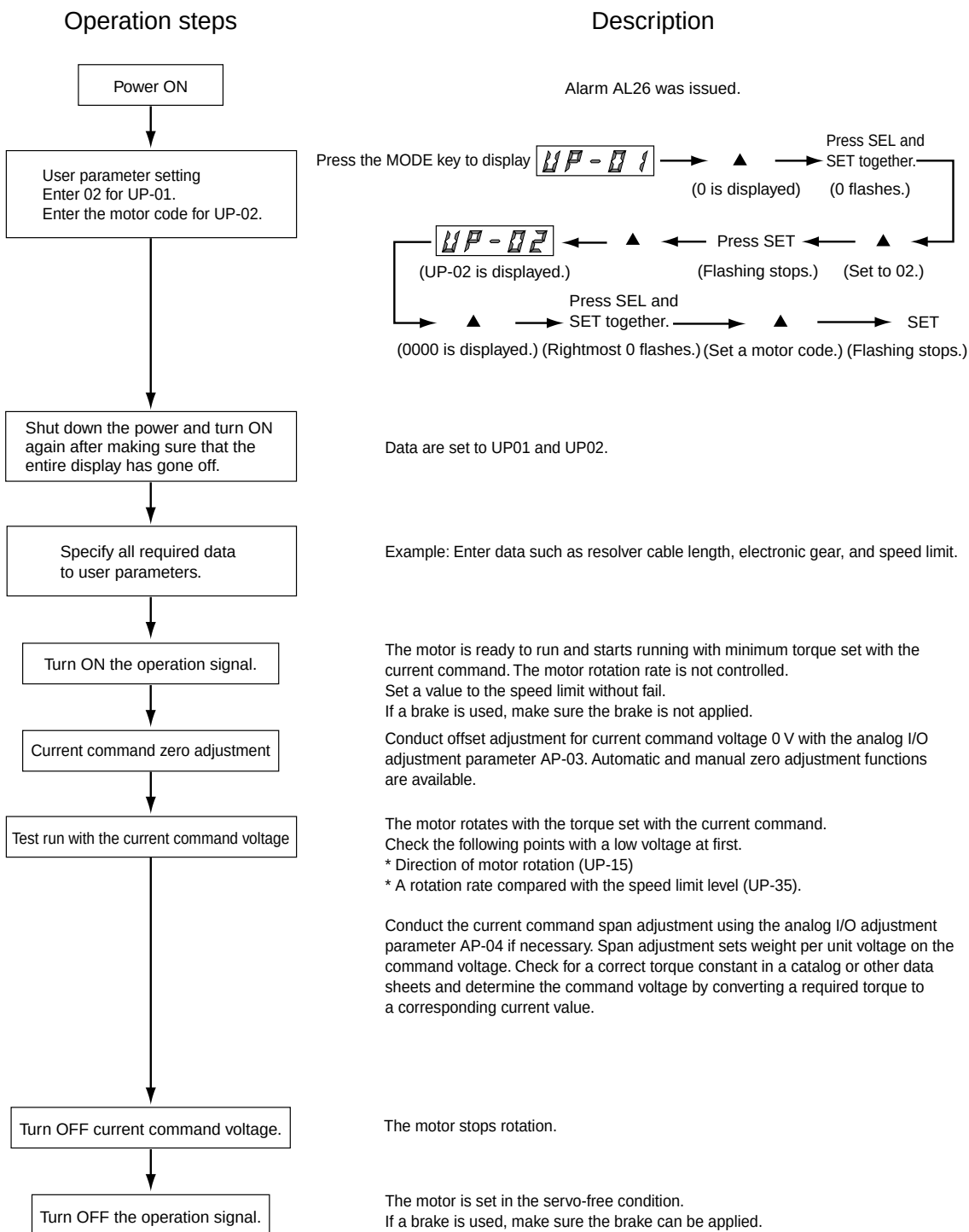


● Forward run, reverse run, and stop detection output

Stop detection is launched when the motor rotation rate falls in the range specified with UP-28 (stop detection rpm). Outside the range, either forward run (FOR) or reverse run (REV) is detected and displayed. Output signal during forward run and reverse run is not supported by the standard sequence. It is processed with the special sequence.



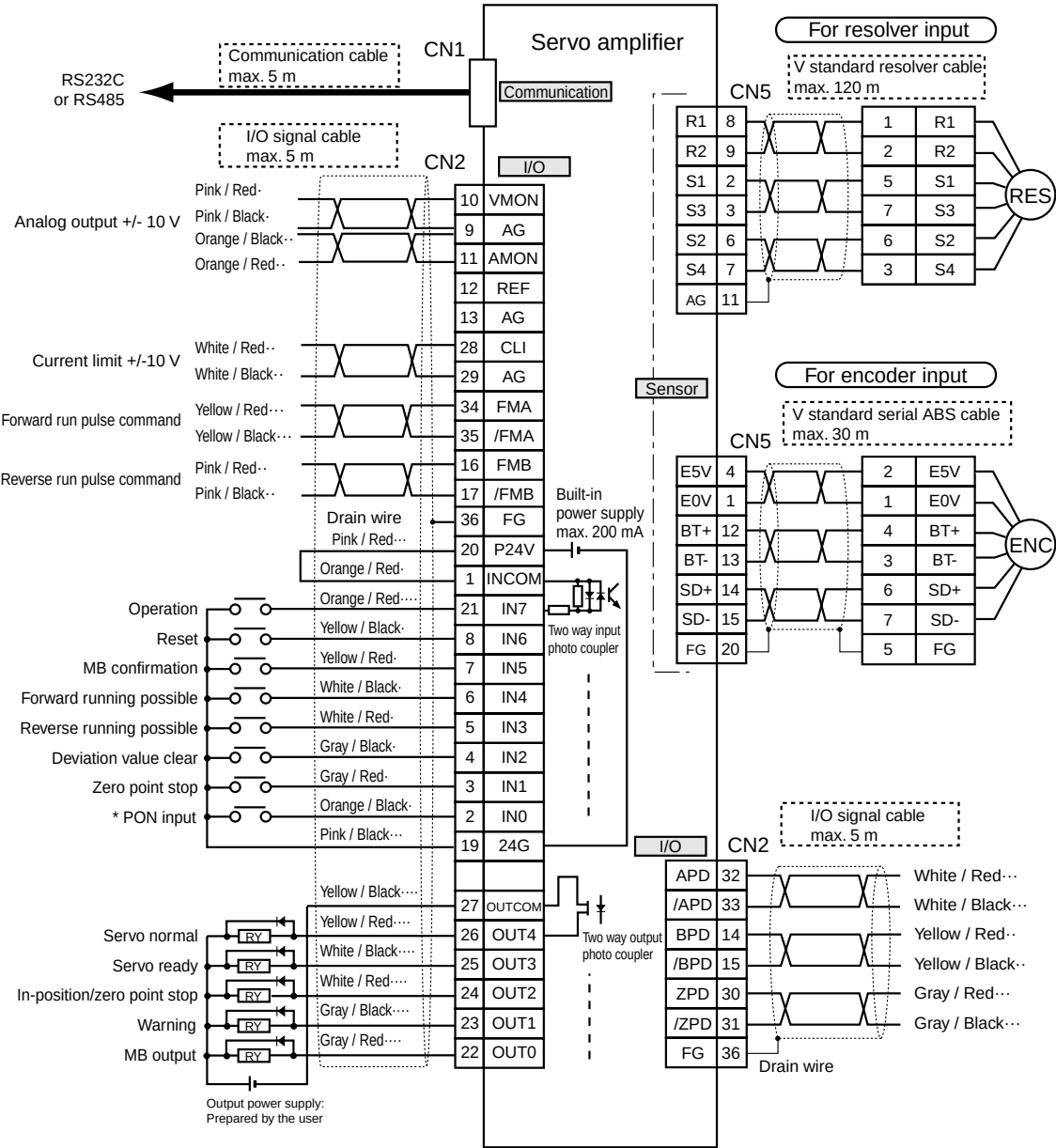
5-2-4. Operation



5-3. Position Control Mode Operation

5-3-1. Connection examples

5



Connector symbol	Cable name	Cable model	Remarks
CN1	RS232C communication cable	CV01A-□□□ □	Select either one.
CN1	RS485 communication cable	CV01B-□□□ □	
CN2	I/O signal cable	CV02A-□□□ □	Select one of these.
CN5	V standard resolver cable	CV05A-□□□ □	
CN5	VZ motor resolver cable	CV05B-□□□ □	
CN5	V standard resolver ABS cable	CV05C-□□□ □	
CN5	V standard serial ABS cable	CV05D-□□□ □	
CN5	VZ motor serial ABS cable	CV05E-□□□ □	

5-3-2. I/O Signal

Type	Name	Terminal No.	Function	Power specifications
Communi- cation	RS232C	CN 1	Connect to this terminal for using an RS232C and RS422 interfaces and PC tool SHAN5. These two interfaces are to be switched automatically by cables. ??	
Analog output	Monitor 1 (VMON)	10P (VMON) 9P (AG)	Output data defaults to 'Speed.' Use the parameter UP-49 to select data. Specify a scale using the parameter UP-50.	+/-10 V/3000 rpm Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??
	Monitor 2 (AMON)	11P (AMON) 9P (AG)	Output data defaults to 'Current.' Use the parameter UP-51 to select data. Specify a scale using the parameter UP-52.	+/-10 V/50 A Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??
Analog input	Current limit (CLI)	28P (CLI) 29P (AG)	Set the limit switching-over method parameter UP-34 to n0n and turn ON current limit switch-over CCD (special sequence) to set the entered input voltage value as a current limit value. Use the parameter AP-03 for zero adjustment and AP-04 for span adjustment. The voltage polarity has nothing to do with the setting. Monitor the input voltage with the status display [cc---].	Vin +/-11.5 V (Max.) Input resistance 49 Kohm AD resolution +/-2048 (+/-11.5 V per hour) ??
Pulse input	Position command (FMA) (/FMA) (FMB) (/FMB)	34P (FMA) 35P (/FMA) 16P (FMB) 17P (/FMB)	Forward running pulse: (FMA)/(FMA) Reverse running pulse: (FMB)/(FMB) Enter the pulse command. Set UP-04 and UP-05 to a traveling distance per pulse and UP-16 to a pulse command type (AB phase, forward/reverse pulse, and pulse and forward/reverse signal) and polarity. Specify a rotating direction using the parameter UP-19 for position control polarity.	ON voltage 3.5 to 5.5 V OFF voltage 2 V (Max.) ON current 16 mA (TYP) on 5 V/h
24-V input	Operation (RUN)	21P (IN7)	Turn on this signal to enable operation (servo locking) and Turn OFF the signal to set the servo free. This signal also serves to turn ON/OFF brake output.	ON voltage 19.2 to 26.4 V OFF voltage 3 V (Max.) ON current 6 mA (TYP) Min. ON/OFF width 1 ms on 24 V
	Reset (RST)	8P (IN6)	For resetting an alarm code.(Keep ON over 60 ms.) Alarms caused by overheating such as AL-01, AL-05, AL-08, AL-09, and AL-17 may not be reset until temperature falls to a certain level.	
	MB confirmation (MBIN)	7P (IN5)	Enter the holding brake operation checking signal (the brake contactor auxiliary contact point). See the description on power circuit for the connecting method.	
	Forward running possible (FEN)	6P (IN4)	This signal is for specifying the speed command for motor forward run. Only the forward run command is accepted even if you set UP-15 to reverse run. Connect with the contact point 'b' of the machine side forward run limit switch.	
	Reverse running possible (REN)	5P (IN3)	This signal is for specifying the speed command for motor reverse run. Only the reverse run command is accepted even if you set UP-15 to forward run. Connect with the contact point 'b' of the machine side reverse run limit switch.	
	Clearing deviation value (ECLR)	4P (IN2)	The positional deviation counter is cleared to zero on the ON edge.	
	Zero point stop (ZSTP)	3P (IN1)	Turn ON during the speed command operation to stop at the next motor zero point and to output HOME at the zero point.	
	Main circuit ON (PON)	2P (IN0)	This signal is for turning ON the MC output and the circuit contactor. When the PN power source is fully charged, the servo ready (RDY) turns ON. Turning OFF this signal turns OFF the main circuit contactor physically; this terminal should be integrated into an emergency stop circuit.	
24-V output	Servo normal (SST)	26P (OUT4)	This signal turns ON about 3 seconds after the AC power supply is turned on. Use this signal as the main circuit ON (PON) interlock. An alarm will turn OFF this signal and reset (RST) will turn ON the signal again.	ON voltage 1.5 V (Max.) 50 mA/h (Max. current) OFF leak current 1uA (Max.)
	Servo ready (RDY)	25P (OUT3)	This signal is turned ON when the servo normal (SST) comes ON, the main circuit ON (PON) is turned ON, and PN power supply is turned ON.	
	In-position / Zero point stop (INP/HOME)	24P (OUT2)	In-position turns ON when the positional deviation comes down below a level set with UP-07 (In-position width). Use the in-position timer parameter UP-47 to set the minimum signal-ON duration. This signal comes ON when the motor stops at the zero point during zero point stop operation (ZSTP). The servo must be locked at this time.	
	Warning (WARN)	23P (OUT1)	This signal turns ON when battery voltage falls, the zero point is not saved, an electro-thermal warning is issued, a counter current absorption overheating warning is issued, or a fan overheating warning is issued. It turns OFF when the problems causing a warning are solved. You may continue operation even while a warning is issued.	
	MB output (MBO)	22P (OUT0)	This signal is to output holding brake control. See "Chapter 2 Power Circuit" for operation sequence.	
Pulse output / differen- tial output	(APD) (/APD) (BPD) (/BPD) (ZPD) (/ZPD)	20P (APD) 21P (/APD) 22P (BPD) 23P (/BPD) 24P (ZPD) 25P (/ZPD)	This signal outputs motor positions in terms of AB phase pulses with 90-degree phase differences. The Z phase is placed at the motor's zero point, and a half rotation generates a pulse when a resolver is used as the motor sensor and one rotation generates a pulse with the encoder sensor. When a resolver is used as the motor sensor, the number of pulses per rotation can be obtained in the following formula: APD (BPD) = [24000] x [1/4] x [UP-05/UP-04]. When a 17 bit encoder is used, use the formula: APD (BPD) = [131072] x [1/4] x [UP05/UP04]. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output.	Differential output equivalent to AM26LS31 ?? Vout: 3 V (TYP) 2 V (MIN) On 20 mA output

5-3-3. User Parameter

Symbol	Name	Unit	Setting range	Factory setting	Function
UP01 	Control mode	None	0 to 6	0	This parameter is for setting a servo amplifier control mode: #Set to 1 for speed control mode. Set to 2 for current control mode. Set to 3 for position control mode. Set to 4 for speed/current/position control mode. Set to 5 for direct feed mode. Set to 6 for draw control mode.
UP02 	Motor code	None	0 to 64999	00000	This parameter is for setting a motor type for operation with a motor code. A motor code consists of a motor number and a sensor number. See the combination table for details.
UP03 	Resolver cable length	1 m	1 to 120	5	This parameter sets a cable length when a resolver is used as the motor sensor. When another type of motor sensor is specified, this setting is ignored.
UP04  	Electronic gear numerator	1 pulse	1 to 65535	1	This parameter is for setting a pulse command and an electronic gear for pulse output. For a pulse command: Set UP-04 and UP-05 to a traveling distance per pulse and UP-16 to a pulse command type (AB phase, forward/reverse pulse, and pulse and forward/reverse signal) and polarity. Specify a rotating direction using the parameter UP-19 for position control polarity. For pulse output: When a resolver is used as a motor sensor, the number of pulses per rotation can be obtained in the following formula: $APD (BPD) = [24000] \times [1/4] \times [UP-05/UP-04]$. When a 17 bit encoder is used, use the formula: $APD (BPD) = [131072] \times [1/4] \times [UP05/UP04]$. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output. * The positions of the numerator and the denominator exchange when the formula is used for pulse command and for pulse output.
UP05  	Electronic gear denominator	1 pulse	1 to 65535	1	
UP06	Zero point shift amount	0.01 degrees	0.00 to 360.00	0.00	This parameter is for setting a phase shift amount of the motor axis zero point pulse with an angle. When a resolver is used as the motor sensor, one motor rotation generates two zero point pulses. Set this parameter assuming one motor rotation makes 360 degrees.
UP07 	In-position width	1 pulse	1 to 65535	50	xxx turns ON when the deviation during positional control comes down below this value. ?? Specify a value in terms of motor sensor pulses.
UP08 	Current limit value	0.1%	0.0 to 100.0	100.0	Set a value using percentage of a current limit value against a motor maximum current while current limit switch-over signal is ON. Set to 0 (zero) to switch to the 4-quadrant current limit mode. This parameter is invalid in the analog current limit command mode.
UP11 	S-shaped acceleration/deceleration time	0.001 s	0.000 to 65.535	0	Use this parameter to set a time constant when adding an S-shaped acceleration/deceleration rate to the speed command in the speed control mode. Define a time constant as duration to accelerate by in the range between 5 and 95 percent. When UP-11 is set to zero, soft start acceleration/deceleration set with UP-09 and UP-10 becomes effective. In the position control mode, an S-shaped acceleration/deceleration rate may be added to the position command pulse. In the position control mode, soft start acceleration/deceleration parameters are ignored.
UP12 	ABS mode	None	00 to 12	000	Use this parameter to specify the coordinate clear mode to the ABS sensor and if the ABS sensor is used or not. Specify these items using two digits each individually. Even when the ABS sensor is used, selecting not to use the ABS sensor disables the battery alarm, zero point memorization management, and multi-revolution management functions and it serves as the incremental sensor. Digit position of one: Set the coordinate clear mode to 0 for clearing all. Set to 1 for clearing the rotation count only. Set to 2 to prohibit clearance. Digit position of ten: Set the ABS mode to 0 for disabling the ABS sensor. Set to 1 to use the ABS sensor.

UP13 	Holding brake operation	None	0 to 1	0	Use this parameter to specify the holding brake operation. Set to 0 for starting deceleration immediately and applying brake when the brake is turned ON and the rotation count is below the speed set with UP-14. Set to 1 to decelerate according to the currently set deceleration curve and turn ON the brake. Apply brake at a speed lower than the rotation count specified with UP-14. The holding brake will be applied exceptionally when an alarm is issued or PON is turned OFF.
UP14 	Brake applying rotation rate	0.1%	0.0 to 100.0	10.0	Use this parameter to specify a motor rotation rate where the holding brake is turned ON. This parameter is for avoiding to use the holding brake instead of the speed control brake and the holding brake applies only when the motor rotation rate is below the rate specified with this parameter. Assume the maximum rpm as 100%.
UP15	Analog command polarity	None	00 to 11	00	This parameter is for setting the polarity for analog current command input. Specify these items using two digits each individually. Digit position of one: Set the speed command to 0 for running the motor forward with the positive voltage. Set the speed command to 1 for running the motor backward with the positive voltage. Digit position of ten: Set the current command to 0 for obtaining the motor forward run torque with the positive voltage. Set the current command to 1 for obtaining the motor reverse run torque with the positive voltage.
UP16	Pulse command type	None	00 to 12	00	This parameter is for setting the type and polarity of the position command pulse. Specify these items using two digits each individually. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Set the type to 2 for setting forward/reverse signal. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP17	Pulse output type	None	00 to 11	01	This parameter is for setting a pulse type when UP-18 is set to 'pulse.' Use two digits for setting. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP18	Differential output type	None	0000 to 6635	0000	Use this parameter for setting a differential output type in four digits. Digit position of one: Set output selection to 1 for pulse output (current value). Set output selection to 1 for DPA-80 output. Set output selection to 2 for current value output. Set output selection to 3 for high-speed pulse output. Set output selection to 4 for command pulse output. Set output selection to 5 for draw pulse output. Digit position of ten: Set current value output type to 0 for setting to 32 bits. Set current value output type to 1 for 23 bits plus parity. Set current value output type to 2 for 24 bits plus parity. Set current value output type to 3 for 31 bits plus parity. Digit position of one hundred: Display data while monitor switch-over is ON. Digit position of one thousand: Display data while monitor switch-over is OFF. Set to 0 for motor count. Set to 1 for current value. Set to 2 for motor current. Set to 3 for electro-thermal value. Set to 4 for motor phase amount (machine angle). Set to 5 for machine speed.
UP19	Position control polarity	None	0 to 1	0	This parameter is for setting the motor rotation direction when the forward pulse is directed by the pulse command. The motor rotation direction and the current value incrementing rotation direction are also switched. Set the parameter to 0 for the forward rotation with the forward rotation pulse and incrementing the current value with the forward rotation. Set the parameter to 1 for the reverse rotation with the forward rotation pulse and incrementing the current value with the reverse rotation.

UP21	External reverse current absorption resistance value	0.1 Ohm	0 to 100.0	0.0	Use this parameter when using external counter current absorption resistance. Set to 0 for internal counter current absorption resistance.
UP22	External counter current absorption resistance capacity	0.01 kW	0.00 to 327.67	0.00	Set a external counter current absorption resistance capacity. Set to 0 for internal counter current absorption resistance.
UP23 	Common power supply mode	None	0000 to 1112	0000	Use this parameter for setting usage condition for sharing the PN power source with four digits. Please contact the manufacturer or its agent before starting sharing the power source. Digit position of one: Set reverse current absorption monitor to 0 for detecting AL-9 and AL-10. Set reverse current absorption monitor to 1 for setting AL-9 and AL-10 unavailable. ?? Set reverse current absorption monitor to 2 for setting AL-10 unavailable. ?? Digit position of ten: Set the counter current absorption capacity to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of ten: Set the main power supply monitor to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of thousand: Set the self-discharge function to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable.
UP28	Stop detection rpm	1 rpm	1 to 32767	50	The stop detection signal turns ON when a motor count falls below the level specified with this parameter. At a rotation rate below the set level, running forward and running reverse signals turn OFF. When the stop detection signal turns ON, the gain drop during stoppage function also works.
UP31	Motor test rpm	1 rpm	1 to 10000	50	This parameter is for specifying a rotation rate for motor test run.
UP33	Load factor time constant	1 s	1 to 60	30	This parameter is for setting a time constant for effective load factor calculation.
UP34	Limit switching-over method	None	000 to 121	011	This parameter is for setting a current limit in the speed limit mode and a speed limit method and a 4-phase current limit method in the current limit mode. Digit position of one: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP35 when the LCHG signal turns ON. Digit position of ten: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP08 (UP36 through UP39) when the CCD signal turns ON. Set the speed limit to 2 for always limiting with UP08 (UP36 through UP39). Digit position of hundred: Set the 4-phase current limit to 0 for switching over with the speed command sign. Set the 4-phase current limit to 1 for switching over with the speed detection sign.
UP36	Forward drive current limit 	0.1%	0.0 to 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates forward drive torque.
UP37	Forward run absorption current limit 	0.1%	0.0 to 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates forward run absorption torque.
UP38	Reverse drive current limit 	0.1%	0.0 to 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates reverse drive torque.
UP39	Reverse run absorption current limit 	0.1%	0.0 to 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates reverse run absorption torque.

UP41	Display magnification rate numerator	None	1 to 65535	1	This parameter is for setting a display magnification rate numerator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																														
UP42	Display magnification rate denominator	None	1 to 65535	1	This parameter is for setting a display magnification rate denominator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																														
UP43	Display decimal point position	None	0 to 7	0	This parameter is for setting a decimal point position for an external display. Set to 0 when using no decimal point, 1 for the lowest digit, 2 for the second digit, 3 for the third digit, and so forth. The value is used for machine speed, current value, command pulse, etc. The decimal point is fixed to the second digit for motor current and motor phase.																														
UP44	Sequence input inverting ??	None	00 to FF	00	This parameter is for setting sequence input logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. INO (PON entry) may not be inverted. <table><tr><td>Entry address</td><td>IN7</td><td>IN6</td><td>IN5</td><td>IN4</td><td>IN3</td><td>IN2</td><td>IN1</td><td>INO</td><td></td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>0</td><td>[0: non-inversion]</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to F</td><td colspan="4">0 to E</td><td>[1: Inversion]</td></tr></table>	Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO		Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	[0: non-inversion]	Hexadecimal	0 to F				0 to E				[1: Inversion]
Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO																											
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	[0: non-inversion]																										
Hexadecimal	0 to F				0 to E				[1: Inversion]																										
UP45	Sequence output reversing	None	00 - 1F	00	This parameter is for setting sequence output logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. <table><tr><td>Entry address</td><td>-</td><td>-</td><td>-</td><td>OUT4</td><td>OUT3</td><td>OUT2</td><td>OUT1</td><td>OUT0</td><td></td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>[0: non-inversion]</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to 1</td><td colspan="4">0 to F</td><td>[1: Inversion]</td></tr></table>	Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0		Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	[0: non-inversion]	Hexadecimal	0 to 1				0 to F				[1: Inversion]
Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0																											
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	[0: non-inversion]																										
Hexadecimal	0 to 1				0 to F				[1: Inversion]																										
Power OFF UP46	Sequence I/O selection	None	0 to 32	0	This parameter is for selecting a combination of 32 types of sequence entry. At present eight combinations are available. Set this parameter to 0 for standard sequence I/O.																														
UP47	In-position timer	1 ms	0 to 2000	20	This parameter is for setting the minimum ON duration for in-position. This value indicates the in-position OFF delay duration.																														
Power OFF UP48	Electronic gear multiplication rate	1 time	1 to 100	1	Use the parameter when the magnification rate is too low with the electronic gear setting. This magnification rate change setting is prepared for the case where the sensor split count becomes too great compared with the external command pulse frequency. ??																														
UP49	VMOOUT output selection	None	000 to 399	000	This parameter is for setting output data and output type of analog output VMOOUT. The lowest two digits: VMOOUT output data Set the parameter to 0 for detected speed (filter output). Set the parameter to 1 for detected current (filter output). Set the parameter to 2 for current value (after processing with the electronic gear). Set the parameter to 3 for current value (sensor pulse). Set the parameter to 4 for a differential (after processing with the electronic gear). Set the parameter to 5 for a differential (sensor pulse). Set the parameter to 6 for speed command. Set the parameter to 7 for current command. Set the parameter to 8 for position command (speed command conversion value). Set the parameter to 9 for motor phase. Set the parameter to 10 for detected speed (without filter). Set the parameter to 11 for detected current (without filter). Set the parameter to 12 for the BL value. Set the parameter to 13 for the OL value. Set the parameter to 14 for the RL value. Set the parameter to 15 for fin temperature. Set the parameter to 16 for a speed differential. Set the parameter to 17 for a current differential. The highest digit: output type Set the parameter to 0 for non-inversion output. Set the parameter to 1 for inversion output. Set the parameter to 2 for absolute value output. Set the parameter to 3 for no inversion without a cramp.																														

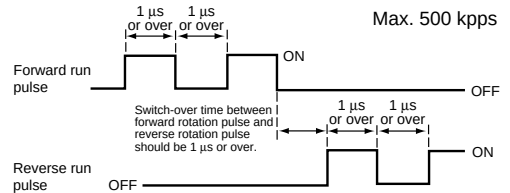
UP50	VMOOUT output scale	0.1	0.1 to 3276.7	300.0	This parameter is for setting an output scale for analog output VMOOUT. Example: Set to 2.0 when specifying 2 A per monitor output voltage 1 V. Scales may be set in the following ranges for each data type based on 1.0 A / 1 V. Speed: 0.1 to 3276.7 rpm/V Current: 0.1 to 3276.7 A/V Pulse: 0.1 to 3276.7 P/V Voltage: 0.1 to 3276.7 V/V Angle: 0.1 to 3276.7 deg./V Percentage: 0.1 to 3276.7 %/V Temperature: 0.1 to 3276.7 deg. (Celsius)/V
UP51	AMOUT output selection	None	000 to 399	001	This parameter is for setting the output data and output type for analog output AMOUT.
UP52	AMOUT output scale	0.1	0.1 to 3276.7	5.0	This parameter is for setting an output scale for analog output AMOUT. ?? Refer to UP50 for the detailed setting.

● Pulse command types

Photo coupler input 5 V 16 mA

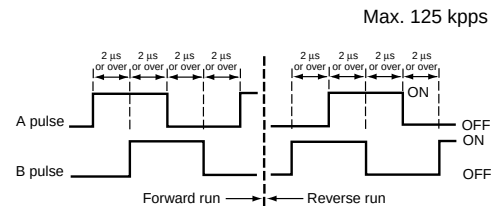
Forward rotation pulse / reverse rotation pulse command input

UP-16 defaults to forward run/reverse run pulse by factory setting. Change both pulse width and interval to 1 us or over. (Max. 500 kpps)



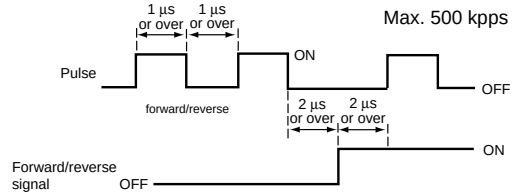
AB phase pulse command input

Switch the UP-16 parameter (pulse command type) to AB phase input to multiply the input pulse resolution rate four times. Set the delay/advance phase to 2 us or over. (max. 125 kpps)



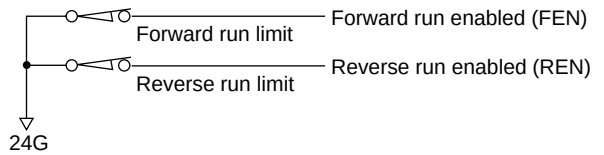
Pulse command and forward/reverse signal input

Switch the UP-16 parameter (pulse command type) to switch-over mode between input pulse command input and forward/reverse signal. Change both pulse width and interval to 1 us or over. (max. 500 kpps)



● Enabling forward and reverse runs

This forward run/reverse run enabling signal is used at the utmost forward or reverse limit. Although you may reverse logics with UP-44, usually use the normal close input.



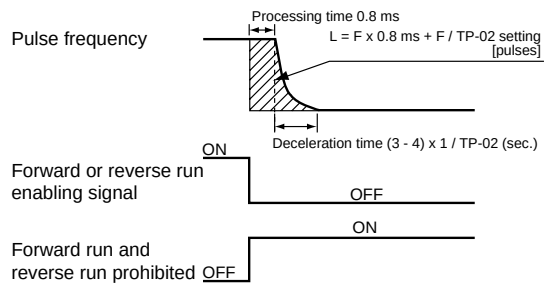
An enabling signal shuts down the command pulse immediately and decelerates the motor rotation to full stop. The deceleration distance in the right figure can be obtained with the following formula:

$$L = F \times 0.8 \text{ ms} + F / \text{TP-02 setting [pulses]}$$

Where L is distance until full stop [in pulses],

F is pulse frequency [pps], and

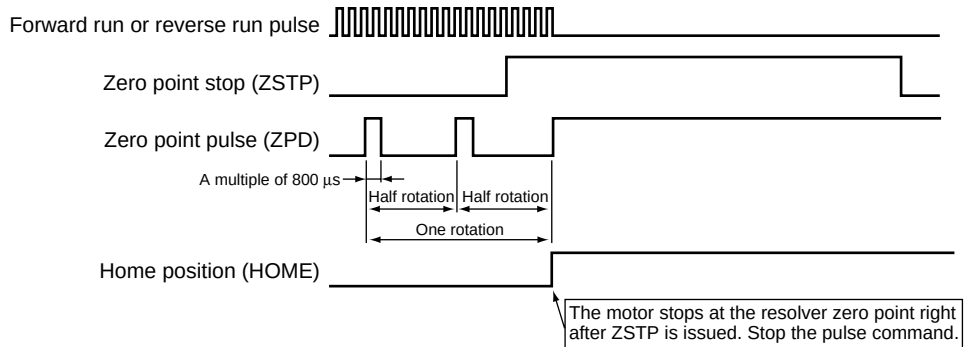
TP-02 is position gain [rad/s].



● Zero point setting

The zero point can be determined exactly using zero point stop and zero point pulse (ZPD). Positioning control based on the zero point pulse enables exact zero point setting despite mechanical inertia or flow rate change during zero point setting.

Exit the zero point stop entry to return to the ordinary position control mode. Otherwise, feeding pulses do not run the motor.

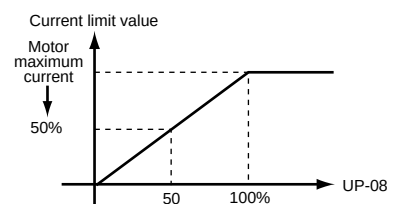
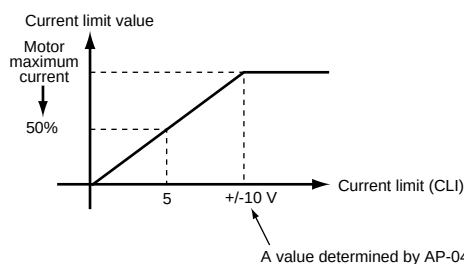


● Current limit

The following three current limiting methods become available for selection by setting the limit switching-over method parameter UP-34.

1. Analog input voltage CLI
2. Parameter UP-08 setting for constant limit (UP-36 through UP-39)
3. Turning ON current limit switch-over CCD to make the parameter UP-08 setting effective.

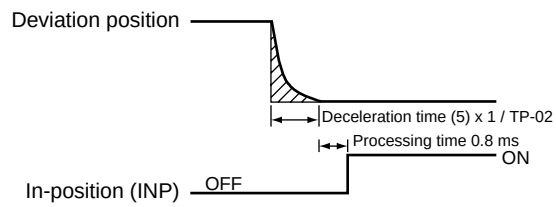
* UP-36 through UP-39 are for setting 4-phase current limit.



- In-position duration

Duration from pulse input stop until the in-position signal comes ON is about 5 times the inverse number of position gain.

In-position duration = Deceleration time + processing time

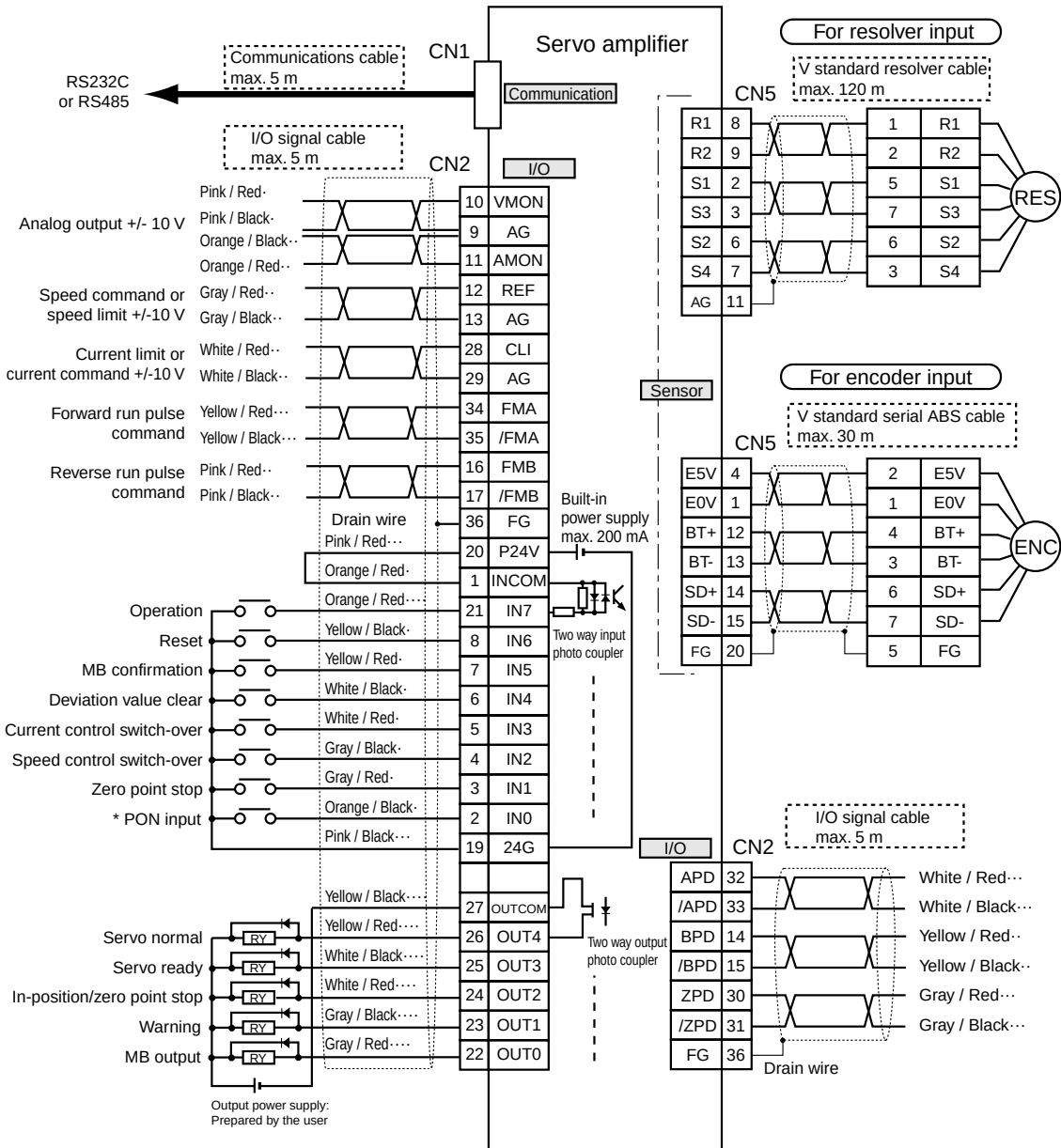


5-3-4. Operation

Operation steps	Description
Power ON User parameter setting Enter '3' for UP-01. Enter the motor code for UP-02. Shut down the power and turn ON again after making sure that the entire display has gone off. Specify all required data to user parameters. Turn ON the operation signal. Enter the command pulse string. Turn ON FEN and REN signals. Stop the command pulse string. Turn OFF the operation signal.	Alarm AL26 was issued. Press the MODE key to display UP-01 (0 is displayed) → Press the SEL and SET key together (0 flashes.) → UP-02 (UP-02 is displayed.) → SET (Flashing stops.) (Set to 03.) → Press the SEL and SET keys together (0000 is displayed.) (0 flashes at the rightmost digit.) → SET (Set a motor code.) (Flashing stops.) Data are set to UP01 and UP02. Example: Data such as resolver cable length, electronic gear, current limit, pulse command UP-16, output type UP-17, and differential output type UP-18. The motor is ready for operation and servo locked. If a brake is used, make sure the brake is not applied. The motor starts running. At first, check the operation condition with a low speed pulse string. Conduct auto-tuning if necessary. TP-01 is set to 0 (standard mode) on shipment from the factory and therefore set TP-02 to a target loop gain and TP-03 to load inertia multiplication rate. The motor stops rotation. The motor is set in the servo-free condition. If a brake is used, make sure the brake can be applied.

5-4. Speed / Current / Position Control Operation

5-4-1. Connection examples



5-4-2. I/O Signal

Type	Name	Terminal No.	Function	Power specifications															
Communication	RS232C	CN 1	Connect to this terminal for using an RS232C and RS422 interfaces and PC tool SHAN5. These two interfaces are to be switched automatically by cables. ??																
Analog output	Monitor 1 (VMON)	10P (VMON) 9P (AG)	Output data defaults to 'Speed.' Use the parameter UP-49 to select data. Specify a scale using the parameter UP-50.	+/-10 V/3000 rpm Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??															
	Monitor 2 (AMON)	11P (AMON) 9P (AG)	Output data defaults to 'Current.' Use the parameter UP-51 to select data. Specify a scale using the parameter UP-52.	+/-10 V/50 A Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??															
Analog input	Speed command or speed limit (REF)	12P (REF) 13P (AG)	The signal serves as a speed command in the speed control mode and speed limit in the current control mode. Refer to the descriptions on the speed control mode and current control mode for details.	Vin +/-11.5 V (Max.) Input resistance 49 Kohm															
	Current command or current limit (CLI)	28P (CLI) 29P (AG)	The signal serves as a current limit in the speed control mode and current command in the current control mode. Refer to the descriptions on the speed control mode and current control mode for details.	AD resolution +/-2048 (+/-11.5 V per hour) ??															
Pulse input	Position command (FMA) (/FMA) (FMA) (/FMA) (FMB) (/FMB)	34P (FMA) 35P (/FMA) 16P (FMB) 17P (/FMB)	Forward running pulse: (FMA) (/FMA) Reverse running pulse: (FMB) (/FMB) Enter the pulse command.Set UP-04 and UP-05 to a traveling distance per pulse and UP-16 to a pulse command type (AB phase, forward/reverse pulse, and pulse and forward/reverse signal) and polarity. Specify a rotating direction using the parameter UP-19 for position control polarity.	ON voltage 3.5 to 5.5 V OFF voltage 2 V (Max.) ON current 16 mA (TYP) on 5V															
24-V input	Operation (RUN)	21P (IN7)	Turn on this signal to enable operation (servo locking) and Turn OFF the signal to set the servo free. This signal also serves to turn ON/OFF brake output.	ON voltage 19.2 to 26.4 V OFF voltage 3 V (Max.) ON current 6 mA (TYP)															
	Reset (RST)	8P (IN6)	For resetting an alarm code. (Keep ON over 60 ms.) Alarms caused by overheating such as AL-01, AI-05, AL-08, AL-09, and AL-17 may not be reset until temperature falls to a certain level.	Min. ON/OFF width 1 ms on 24 V															
	MB confirmation (MBIN)	7P (IN5)	Enter the holding brake operation checking signal (the brake contactor auxiliary contact point). See the description on power circuit for the connecting method.																
	Clearing deviation value (ECLR)	6P (IN4)	The positional deviation counter is cleared to zero on the ON edge.																
	Current control switch-over (CCNT)	5P (IN3)	The control methods may be switched by signal combination. If you switch to position control during speed control operation, the switch																
	Position control switch-over (PCNT)	4P (IN2)	<table><tr><td></td><td>Speed control</td><td>Current control</td><td>Position control</td><td>Current control</td></tr><tr><td>CCNT</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr><tr><td>PCNT</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr></table>		Speed control	Current control	Position control	Current control	CCNT	OFF	ON	OFF	ON	PCNT	OFF	OFF	ON	ON	
		Speed control	Current control	Position control	Current control														
	CCNT	OFF	ON	OFF	ON														
	PCNT	OFF	OFF	ON	ON														
		becomes effective after stop detection following deceleration.																	
Zero point stop (ZSTP)	3P (IN1)	Turn ON during the speed command operation to stop at the next motor zero point and to output HOME at the zero point.																	
Main circuit ON (PON)	2P (IN0)	This signal is for turning ON the MC output and the circuit contactor. When the PN power source is fully charged, the servo ready (RDY) turns ON. Turning OFF this signal turns OFF the main circuit contactor physically; this terminal should be integrated into an emergency stop circuit.																	
24-V output	Servo normal (SST)	26P (OUT4)	This signal turns ON about 3 seconds after the AC power supply is turned on. Use this signal as the main circuit ON (PON) interlock. An alarm will turn OFF this signal and reset (RST) will turn ON the signal again.	ON voltage 1.5 V (Max.) 50 mA/h (Max. current) OFF leak current 1uA (Max.)															
	Servo ready (RDY)	25P (OUT3)	This signal is turned ON when the servo normal (SST) comes ON, the main circuit ON (PON) is turned ON, and PN power supply is turned ON.																
	In-position / Zero point stop (INP/HOME)	24P (OUT2)	In-position turns ON when the positional deviation comes down below a level set with UP-07 (In-position width). Use the in-position timer parameter UP-47 to set the minimum signal-ON duration. This signal comes ON when the motor stops at the zero point during zero point stop operation (ZSTP). The servo must be locked at this time.																
	Warning (WARN)	23P (OUT1)	This signal turns ON when battery voltage falls, the zero point is not saved, an electro-thermal warning is issued, a counter current absorption overheating warning is issued, or a fan overheating warning is issued. It turns OFF when the problems causing a warning are solved. You may continue operation even while a warning is issued.																
	MB output (MBO)	22P (OUT0)	This signal is to output holding brake control. See "Chapter 2 Power Circuit" for operation sequence.																
Pulse output / differential output	(APD) (/APD) (BPD) (/BPD) (ZPD) (/ZPD)	20P (APD) 21P (/APD) 22P (BPD) 23P (/BPD) 24P (ZPD) 25P (/ZPD)	This signal outputs motor positions in terms of AB phase pulses with 90-degree phase differences. The Z phase is placed at the motor's zero point, and a half rotation generates a pulse when a resolver is used as the motor sensor and one rotation generates a pulse with the encoder sensor. When a resolver is used as the motor sensor, the number of pulses per rotation can be obtained in the following formula: APD (BPD) = [24000] x [1/4] x [UP-05/UP-04]. When a 17 bit encoder is used, use the formula: APD (BPD) = [131072] x [1/4] x [UP05/UP04]. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output.	Differential output equivalent to AM26LS31 ?? Vout: 3 V (TYP) 2 V (MIN) On 20 mA output															

5-4-3. User Parameter

Symbol	Name	Unit	Setting range	Factory setting	Function
UP01 	Control mode	None	0 - 6	0	This parameter is for setting a servo amplifier control mode: Set to 1 for speed control mode. Set to 2 for current control mode. Set to 3 for position control mode. Set to 4 for speed/current/position control mode. Set to 5 for direct feed mode. Set to 6 for draw control mode.
UP02 	Motor code	None	0 - 64999	00000	This parameter is for setting a motor type for operation with a motor code. A motor code consists of a motor number and a sensor number. See the combination table for details.
UP03 	Resolver cable length	1 m	1 - 120	5	This parameter sets a cable length when a resolver is used as the motor sensor. When another type of motor sensor is specified, this setting is ignored.
UP04  	Electronic gear numerator	1 pulse	1 - 65535	1	This parameter is for setting a pulse command and an electronic gear for pulse output. For a pulse command: Set UP-04 and UP-05 to a traveling distance per pulse and UP-16 to a pulse command type (AB phase, forward/reverse pulse, and pulse and forward/reverse signal) and polarity. Specify a rotating direction using the parameter UP-19 for position control polarity. For pulse output: When a resolver is used as a motor sensor, the number of pulses per rotation can be obtained in the following formula: $APD (BPD) = [24000] \times [1/4] \times [UP-05/UP-04]$. When a 17 bit encoder is used, use the formula: $APD (BPD) = [131072] \times [1/4] \times [UP05/UP04]$. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output. * The positions of the numerator and the denominator exchange when the formula is used for pulse command and for pulse output.
UP05  	Electronic gear denominator	1 pulse	1 - 65535	1	
UP06	Zero point shift amount	0.01 degrees	0.00 - 360.00	0.00	This parameter is for setting a phase shift amount of the motor axis zero point pulse with an angle. When a resolver is used as the motor sensor, one motor rotation generates two zero point pulses. Set this parameter assuming one motor rotation makes 360 degrees.
UP08 	Current limit value	0.1%	0.0 - 100.0	100.0	Set a value using percentage of a current limit value against a motor maximum current while current limit switch-over signal is ON. Set to 0 (zero) to switch to the 4-quadrant current limit mode. This parameter is invalid in the analog current limit command mode.
UP09 	Soft start acceleration time	0.001 s	0.000 - 65.535	0.000	Use this parameter to set an deceleration rate when adding a linear acceleration/deceleration rate to the speed command in the speed control mode. The rate is specified as time in the range from zero to that required to reach the maximum rpm. This parameter is effective only when UP-11 is set to zero.
UP10 	Soft start deceleration time	0.001 s	0.000 - 65.535	0.000	Use this parameter to set an deceleration rate when adding a linear acceleration/deceleration rate to the speed command in the speed control mode. The acceleration rate is specified as time required to decelerate from the maximum rotation rate to full stop. This parameter is effective only when UP-11 is set to zero.
UP11 	S-shaped acceleration/deceleration time	0.001 s	0.000 - 65.535	0.000	Use this parameter to set a time constant when adding an S-shaped acceleration/deceleration rate to the speed command in the speed control mode. Define a time constant as duration to accelerate by in the range between 5 and 95 percent. When UP-11 is set to zero, soft start acceleration/deceleration set with UP-09 and UP-10 becomes effective. In the position control mode, an S-shaped acceleration/deceleration rate may be added to the position command pulse. In the position control mode, soft start acceleration/deceleration parameters are ignored.
UP12 	ABS mode	None	00 - 12	00	Use this parameter to specify the coordinate clear mode to the ABS sensor and if the ABS sensor is used or not. Specify these items using two digits each individually. Even when the ABS sensor is used, selecting not to use the ABS sensor disables the battery alarm, zero point memorization management, and multi-revolution management functions and it serves as the incremental sensor. Digit position of one: Set the coordinate clear mode to 0 for clearing all. Set to 1 for clearing the rotation count only. Set to 2 to prohibit clearance. Digit position of ten: Set the ABS mode to 0 for disabling the ABS sensor. Set to 1 to use the ABS sensor.

UP13 	Holding brake operation	None	0 - 1	0	Use this parameter to specify the holding brake operation. Set to 0 for starting deceleration immediately and applying brake when the brake is turned ON and the rotation count is below the speed set with UP-14. Set to 1 to decelerate according to the currently set deceleration curve and turn ON the brake. Apply brake at a speed lower than the rotation count specified with UP-14. The holding brake will be applied exceptionally when an alarm is issued or PON is turned OFF.
UP14	Brake applying rotation rate 	0.1%	0.0 - 100.0	10.0	Use this parameter to specify a motor rotation rate where the holding brake is turned ON. This parameter is for avoiding to use the holding brake instead of the speed control brake and the holding brake applies only when the motor rotation rate is below the rate specified with this parameter. Assume the maximum rpm as 100%.
UP15	Analog command polarity	None	00 - 11	00	This parameter is for setting the polarity for analog current command input. Specify these items using two digits each individually. Digit position of one: Set the speed command to 0 for running the motor forward with the positive voltage. Set the speed command to 1 for running the motor backward with the positive voltage. Digit position of ten: Set the current command to 0 for obtaining the motor forward run torque with the positive voltage. Set the current command to 1 for obtaining the motor reverse run torque with the positive voltage.
UP16	Pulse command type	None	00 - 12	00	This parameter is for setting the type and polarity of the position command pulse. Specify these items using two digits each individually. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Set the type to 2 for setting forward/reverse signal. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP17	Pulse output type	None	00 - 11	01	This parameter is for setting a pulse type when UP-18 is set to 'pulse.' Use two digits for setting. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP18	Differential output type	None	0000 - 6635	0000	Use this parameter for setting a differential output type in four digits. Digit position of one: Set output selection to 1 for pulse output (current value). Set output selection to 1 for DPA-80 output. Set output selection to 2 for current value output. Set output selection to 3 for high-speed pulse output. Set output selection to 4 for command pulse output. Set output selection to 5 for draw pulse output. Digit position of ten: Set current value output type to 0 for setting to 32 bits. Set current value output type to 1 for 23 bits plus parity. Set current value output type to 2 for 24 bits plus parity. Set current value output type to 3 for 31 bits plus parity. Digit position of one hundred: Display data while monitor switch-over is ON. Digit position of one thousand: Display data while monitor switch-over is OFF. Set to 0 for motor count. Set to 1 for current value. Set to 2 for motor current. Set to 3 for electro-thermal value. Set to 4 for motor phase amount (machine angle). Set to 5 for machine speed.
UP21	External reverse current absorption resistance value	0.1 Ohm	0 - 100.0	0.0	Use this parameter when using external counter current absorption resistance. Set to 0 for internal counter current absorption resistance.
UP22	External counter current absorption resistance capacity	0.01 kW	0.00 - 327.67	0.00	Set a external counter current absorption resistance capacity. Set to 0 for internal counter current absorption resistance.

UP23 	Common power supply mode	0000 - 1112		0000	Use this parameter for setting usage condition for sharing the PN power source with four digits. Please contact the manufacturer or its agent before starting sharing the power source. Digit position of one: Set reverse current absorption monitor to 0 for detecting AL-9 and AL-10. Set reverse current absorption monitor to 1 for setting AL-9 and AL-10 unavailable. ?? Set reverse current absorption monitor to 2 for setting AL-10 unavailable. ?? Digit position of ten: Set the counter current absorption capacity to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of ten: Set the main power supply monitor to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of thousand: Set the self-discharge function to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable.
UP24	Primary feed speed	0.01%	0.00 - 327.67	100.00	This parameter is for setting the first feeding speed. Specify a value in terms of the percentage against the motor's maximum rotation rate. Specify 0 to turn analog input voltage REF effective.
UP25	Secondary feed speed	0.01%	0.00 - 327.67	50.00	This parameter is for setting the second feeding speed. Specify a value in terms of the percentage against the motor's maximum rotation rate. Specify 0 to turn analog input voltage CLI effective.
UP26	Third feed speed	0.01%	0.00 - 327.67	25.00	This parameter is for setting the third feed speed. Specify a value in terms of the percentage against the motor's maximum rotation rate.
UP27	Fourth feed speed	0.01%	0.00 - 327.67	12.50	This parameter is for setting the fourth feed speed. Specify a value in terms of the percentage against the motor's maximum rotation rate.
UP28	Stop detection rpm	1 rpm	1 - 32767	50	The stop detection signal turns ON when a motor count falls below the level specified with this parameter. At a rotation rate below the set level, running forward and running reverse signals turn OFF. When the stop detection signal turns ON, the gain drop during stoppage function also works.
UP29	Specified speed 	1 rpm	0 - 32767	3000	Once the motor count enters the range specified with UP29 +/- UP30, the specified speed signal turns ON. If you set the parameter to 0, the specified speed signal turns ON when the speed reaches the command rotation rate at that time with the positive and negative tolerance specified with UP30. (In the position control mode, the command speed calculated from the position command pulses is assumed as the command rotation rate.)
UP30	Specified speed range	1 rpm	1 - 10000	50	This parameter is setting the detection range allowance of the specified speed detection signal. Once the actual motor count enters the range specified with UP29 +/- UP30, the specified speed signal turns ON.
UP31	Motor test rpm	1 rpm	1 - 10000	50	This parameter is for specifying a rotation rate for motor test run.
UP33	Load factor time constant	1 s	1 - 60	30	This parameter is for setting a time constant for effective load factor calculation.
UP34	Limit switching-over method	None	000 - 121	011	This parameter is for setting a current limit in the speed limit mode and a speed limit method and a 4-phase current limit method in the current limit mode. Digit position of one: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP35 when the LCHG signal turns ON. Digit position of ten: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP08 (UP36 through UP39) when the CCD signal turns ON. Set the speed limit to 2 for always limiting with UP08 (UP36 through UP39). Digit position of hundred: Set the 4-phase current limit to 0 for switching over with the speed command sign. Set the 4-phase current limit to 1 for switching over with the speed detection sign.
UP36	Forward drive current limit 	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates forward drive torque.
UP37	Forward run absorption current limit 	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates forward run absorption torque.

UP38	Reverse drive current limit functional description	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates reverse drive torque.																														
UP39	Reverse run absorption current limit functional description	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when settzing UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates reverse run absorption torque.																														
UP41	Display magnification rate numerator	None	1 - 65535	1	This parameter is for setting a display magnification rate numerator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																														
UP42	Display magnification rate denominator	None	1 - 65535	1	This parameter is for setting a display magnification rate denominator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																														
UP43	Display decimal point position	None	0 - 7	0	This parameter is for setting a decimal point position for an external display. Set to 0 when using no decimal point, 1 for the lowest digit, 2 for the second digit, 3 for the third digit, and so forth. The value is used for machine speed, current value, command pulse, etc. The decimal point is fixed to the second digit for motor current and motor phase. The decimal point is not displayed on the display.																														
UP44	Sequence input inverting ??	None	00 to FF	00	This parameter is for setting sequence input logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. INO (PON entry) may not be inverted. <table><tr><td>Entry address</td><td>IN7</td><td>IN6</td><td>IN5</td><td>IN4</td><td>IN3</td><td>IN2</td><td>IN1</td><td>INO</td><td></td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>0</td><td>[0: non-inversion]</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to F</td><td colspan="4">0 to E</td><td>[1: Inversion]</td></tr></table>	Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO		Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	[0: non-inversion]	Hexadecimal	0 to F				0 to E				[1: Inversion]
Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO																											
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	[0: non-inversion]																										
Hexadecimal	0 to F				0 to E				[1: Inversion]																										
UP45	Sequence output reversing	None	00 - 1F	00	This parameter is for setting sequence output logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. <table><tr><td>Entry address</td><td>-</td><td>-</td><td>-</td><td>OUT4</td><td>OUT3</td><td>OUT2</td><td>OUT1</td><td>OUT0</td><td></td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>[0: non-inversion]</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to 1</td><td colspan="4">0 to F</td><td>[1: Inversion]</td></tr></table>	Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0		Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	[0: non-inversion]	Hexadecimal	0 to 1				0 to F				[1: Inversion]
Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0																											
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	[0: non-inversion]																										
Hexadecimal	0 to 1				0 to F				[1: Inversion]																										
Power OFF UP46	Sequence I/O selection	None	0 - 32	0	This parameter is for selecting a combination of 32 types of sequence entry. At present eight combinations are available. Set this parameter to 0 for standard sequence I/O.																														
Power OFF UP48	Electronic gear multiplication rate	1 time	1 - 100	1	Use the parameter when the magnification rate is too low with the electronic gear setting. This magnification rate change setting is prepared for the case where the sensor split count becomes too great compared with the external command pulse frequency. ??																														
UP49	VMOUT output selection	None	000 - 399	000	This parameter is for setting output data and output type of analog output VMOUT. The lowest two digits: VMOUT output data Set the parameter to 0 for detected speed (filter output). Set the parameter to 1 for detected current (filter output). Set the parameter to 2 for current value (after processing with the electronic gear). Set the parameter to 3 for current value (sensor pulse). Set the parameter to 4 for a differential (after processing with the electronic gear). Set the parameter to 5 for a differential (sensor pulse). Set the parameter to 6 for speed command. Set the parameter to 7 for current command. Set the parameter to 8 for position command (speed command conversion value). Set the parameter to 9 for motor phase. Set the parameter to 10 for detected speed (without filter). Set the parameter to 11 for detected current (without filter). Set the parameter to 12 for the BL value. Set the parameter to 13 for the OL value. Set the parameter to 14 for the RL value. Set the parameter to 15 for fin temperature. Set the parameter to 16 for a speed differential. Set the parameter to 17 for a current differential. The highest digit: output type Set the parameter to 0 for non-inversion output. Set the parameter to 1 for inversion output. Set the parameter to 2 for absolute value output. Set the parameter to 3 for no inversion without a cramp.																														

UP50	VMOUT output scale	0.1 - 3276.7		300.0	This parameter is for setting an output scale for analog output VMOUT. Example: Set to 2.0 when specifying 2 A per monitor output voltage 1 V. Scales may be set in the following ranges for each data type based on 2.0 A / 1 V. Speed: 0.1 to 3276.7 rpm/V Current: 0.1 to 3276.7 A/V Pulse: 0.1 to 3276.7 P/V Voltage: 0.1 to 3276.7 V/V Angle: 0.1 to 3276.7 deg./V Percentage: 0.1 to 3276.7 %/V Temperature: 0.1 to 3276.7 deg. (Celsius)/V
UP51	AMOUT output selection	None	000 - 399	001	This parameter is for setting the output data and output type for analog output AMOUT.
UP52	AMOUT output scale	0.1	0.1 - 3276.7	5.0	This parameter is for setting an output scale for analog output AMOUT. ?? Refer to UP50 for the detailed setting.

● Main features of Speed, Current, and Position control mode (Mode 04)

In this control mode, you may use three functions in each of the speed control mode (01), current control mode (02), and position control mode (03) by selecting one of the modes by switching between 24-V input signals PCNT and CCNT. In this case, the usage of input and output signals is different from that in modes 01, 02, or 03. Please refer to the input/output signal table for details.

The table on the right shows the relationship between control types and input signals. The current control has two statuses and you may switch the phases by turning ON or OFF either PCNT or CCNT. Use this function when you want to bypass the remaining mode.

Input signal	Position control switch-over (PCNT)	Current control switch-over (CCNT)
Speed control		
Control type	OFF	OFF
Current control	OFF	ON
Position control	ON	OFF
Current control	ON	ON

● Considerations on using input and output signals

Some input and output signals have different functions depending on the control types. A certain setting effective with the speed control may not be effective with another control type. For example, the speed command (REF) with the speed control corresponds to the speed limit with the current control. In such a case, externally switch the input/output signal settings sequentially. (Particularly take care of the speed command, current command, limit switch-over, and limit applied.)

In the position control mode (03), shutting down the forward run or reverse run signal stops the motor despite the pulse command input. This function is not available with the position control in the speed/current/position control mode. When prohibiting forward or reverse run using the limit switch, use a method that does not need to issue command pulses in this control mode.

● Reference to other modes

Refer to the descriptions of each control mode (01, 02, and 03) for adjustment of this speed/current/position control mode.



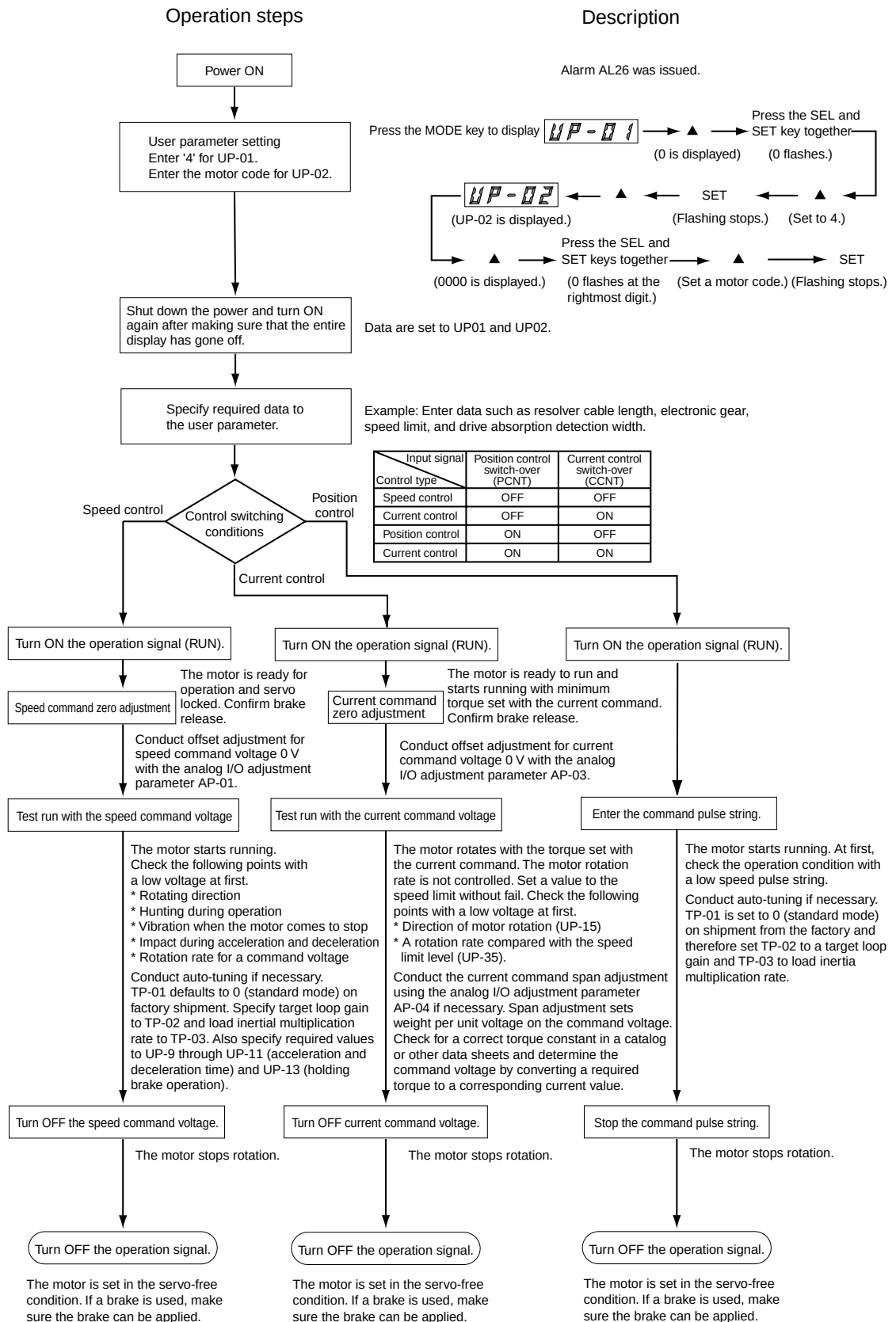
Caution



If you switch from the speed control mode to the current control mode, the current limit setting turns into the current command input value. Therefore, shut down the command voltage or set it to the minimum value to avoid excessive current command input.

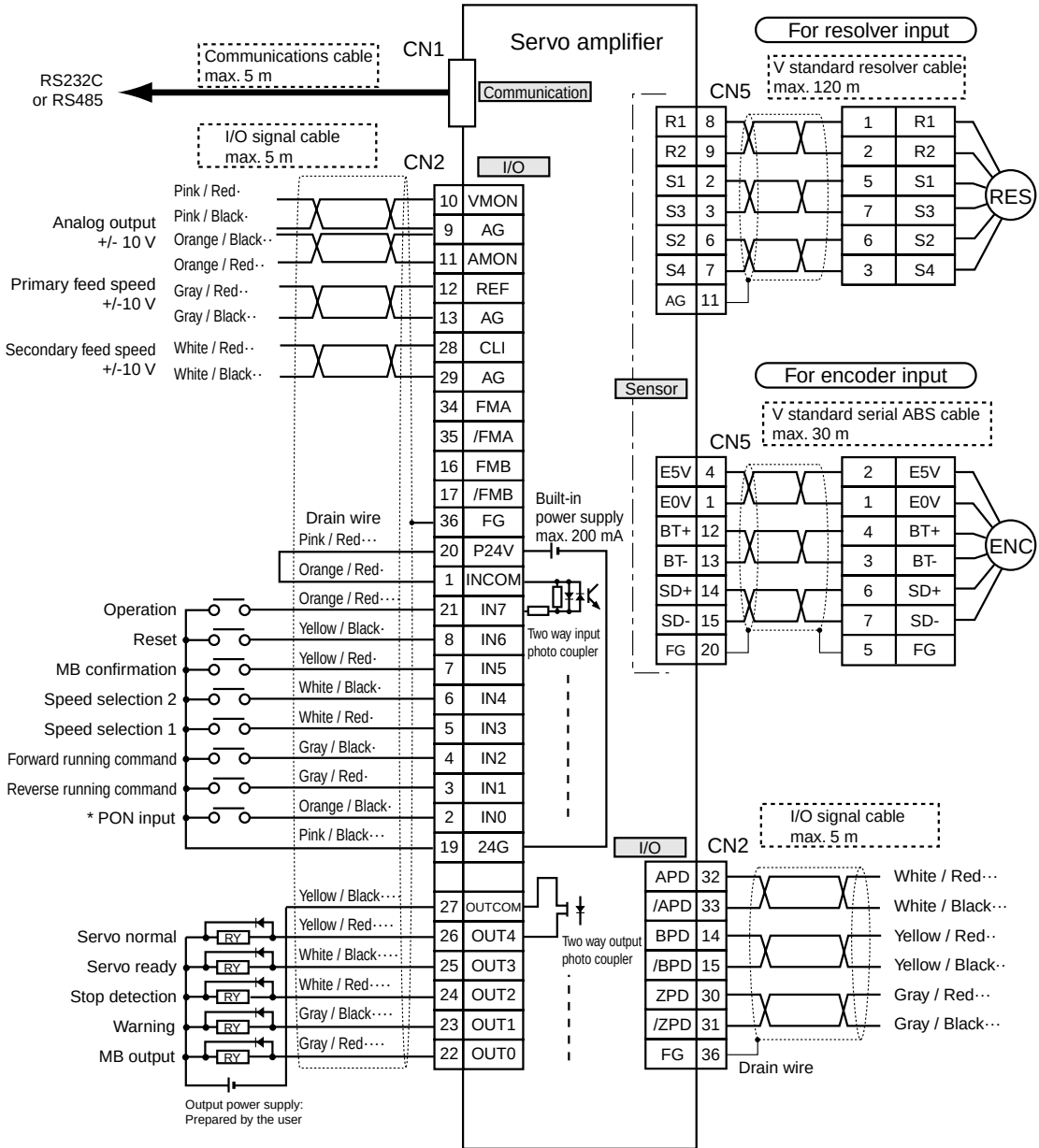
If you switch from the current control mode to the speed control mode, the speed limit setting turns into the speed command input value. Therefore, shut down the command voltage or set it to the minimum value to avoid excessive speed command input.

5-4-4. Operation



5-5. Direct Feed Mode Operation

5-5-1. Connection examples



Connector symbol	Cable name	Cable model	Remarks
CN1	RS232C communication cable	CV01A-□□□ □	Select either one.
CN1	RS485 communication cable	CV01B-□□□ □	
CN2	I/O signal cable	CV02A-□□□ □	
CN5	V standard resolver cable	CV05A-□□□ □	Select one of these.
CN5	VZ motor resolver cable	CV05B-□□□ □	
CN5	V standard resolver ABS cable	CV05C-□□□ □	
CN5	V standard serial ABS cable	CV05D-□□□ □	
CN5	VZ motor serial ABS cable	CV05E-□□□ □	

5-5-2. I/O Signal

Type	Name	Terminal No.	Function	Power specifications															
0.50.5C ommunication	RS232C	CN 1	Connect to this terminal for using an RS232C and RS422 interfaces and PC tool SHAN5. These two interfaces are to be switched automatically by cables. ??																
Analog output	Monitor 1 (VMON)	10P (VMON) 9P (AG)	Output data defaults to 'Speed.' Use the parameter UP-49 to select data. Specify a scale using the parameter UP-50.	+/-10 V/3000 rpm Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??															
	Monitor 2 (AMON)	11P (AMON) 9P (AG)	Output data defaults to 'Current.' Use the parameter UP-51 to select data. Specify a scale using the parameter UP-52.	+/-10 V/50 A Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??															
Analog input	Primary feed speed (REF)	12P (REF) 13P (AG)	The first feeding speed control voltage input signal by combination sets of speed selection 1 and 2. Set the first feeding speed parameter UP-24 to 0. Specify the rotation direction using the parameter UP-15. Specify the acceleration/deceleration time to UP-09 through UP-11. Monitor the input voltage with the status display [cF---].	Vin +/-11.5 V (Max.) Input resistance 49 Kohm AD resolution +/-2048 (+/-11.5 V per hour) ??															
	Secondary feed speed (CLI)	28P (CLI) 29P (AG)	The first feeding speed control voltage input signal by combination sets of speed selection 1 and 2. Set the second feeding speed parameter UP-25 to 0. Specify the rotation direction using the parameter UP-15. Specify the acceleration/deceleration time to UP-09 through UP-11. Monitor the input voltage with the status display [cc---].																
24-V input	Operation (RUN)	21P (IN7)	Turn on this signal to enable operation (servo locking) and Turn OFF the signal to set the servo free. This signal also serves to turn ON/OFF brake output.	ON voltage 19.2 to 26.4 V OFF voltage 3 V (Max.) ON current 6 mA (TYP) Min. ON/OFF width 1 ms on 24 V															
	Reset (RST)	8P (IN6)	For resetting an alarm code. (Keep ON over 60 ms.) Alarms caused by overheating such as AL-01, AI-05, AL-08, AL-09, and AL-17 may not be reset until temperature falls to a certain level.																
	MB confirmation (MBIN)	7P (IN5)	Enter the holding brake operation checking signal (the brake contactor auxiliary contact point). See the description on power circuit for the connecting method.																
	Speed selection 2 (SEL2)	6P (IN4)	Select the first to fourth feed speed using the following combinations:																
	Speed selection 1 (SEL1)	5P (IN3)	<table><tr><td></td><td>First feed</td><td>Second feed</td><td>Third feed</td><td>Fourth feed</td></tr><tr><td>Speed selection 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr><tr><td>Speed selection 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr></table>		First feed	Second feed	Third feed	Fourth feed	Speed selection 1	OFF	ON	OFF	ON	Speed selection 2	OFF	OFF	ON	ON	
		First feed	Second feed	Third feed	Fourth feed														
	Speed selection 1	OFF	ON	OFF	ON														
Speed selection 2	OFF	OFF	ON	ON															
Forward running command (FCMD)	4P (IN2)	When RUN is ON, turn ON this signal for forward run. If you turn OFF the signal, the motor is servo locked when the rotation rate falls below the stop detection level.																	
Reverse running command (RCMD)	3P (IN1)	When RUN is ON, turn ON this signal for reverse run. If you turn OFF the signal, the motor is servo locked when the rotation rate falls below the stop detection level.																	
24-V output	Main circuit ON (PON)	2P (IN0)	This signal is for turning ON the MC output and the circuit contactor. When the PN power source is fully charged, the servo ready (RDY) turns ON. Turning OFF this signal turns OFF the main circuit contactor physically; this terminal should be integrated into an emergency stop circuit.																
	Servo normal (SST)	26P (OUT4)	This signal turns ON about 3 seconds after the AC power supply is turned on. Use this signal as the main circuit ON (PON) interlock. An alarm will turn OFF this signal and reset (RST) will turn ON the signal again.	ON voltage 1.5 V (Max.) 50 mA/h (Max. current) OFF leak current 1uA (Max.)															
	Servo ready (RDY)	25P (OUT3)	This signal is turned ON when the servo normal (SST) comes ON, the main circuit ON (PON) is turned ON, and PN power supply is turned ON.																
	Stop detection (STA)	24P (OUT2)	This signal turns ON when the motor rotation speed comes down below the stop detection rpm set with UP-28.																
	Warning (WARN)	23P (OUT1)	This signal turns ON when battery voltage falls, the zero point is not saved, an electro-thermal warning is issued, a counter current absorption overheating warning is issued, or a fin overheating warning is issued. It turns OFF when the problems causing a warning are solved. You may continue operation even while a warning is issued.																
Pulse output / differential output	MB output (MBO)	22P (OUT0)	This signal is to output holding brake control. See "Chapter 2 Power Circuit" for operation sequence.																
	(APD) (/APD) (BPD) (/BPD) (ZPD) (/ZPD)	20P (APD) 21P (/APD) 22P (BPD) 23P (/BPD) 24P (ZPD) 25P (/ZPD)	This signal outputs motor positions in terms of AB phase pulses with 90-degree phase differences. The Z phase is placed at the motor's zero point, and a half rotation generates a pulse when a resolver is used as the motor sensor and one rotation generates a pulse with the encoder sensor. When a resolver is used as the motor sensor, the number of pulses per rotation can be obtained in the following formula: APD (BPD) = [24000] x [1/4] x [UP-05/UP-04]. When a 17 bit encoder is used, use the formula: APD (BPD) = [131072] x [1/4] x [UP05/UP04]. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output.	Differential output equivalent to AM26LS31 ?? Vout: 3 V (TYP) 2 V (MIN) On 20 mA output															

5-5-3. User Parameter

Symbol	Name	Unit	Setting range	Factory setting	Function
UP01 	Control mode	None	0 - 6	0	This parameter is for setting a servo amplifier control mode: #Set to 1 for speed control mode. Set to 2 for current control mode. Set to 3 for position control mode. Set to 4 for speed/current/position control mode. Set to 5 for direct feed mode. Set to 6 for draw control mode.
UP02 	Motor code	None	0 - 64999	00000	This parameter is for setting a motor type for operation with a motor code. A motor code consists of a motor number and a sensor number. See the combination table for details.
UP03 	Resolver cable length	1 m	1 - 120	5	This parameter sets a cable length when a resolver is used as the motor sensor. When another type of motor sensor is specified, this setting is ignored.
UP04  	Electronic gear numerator	1 pulse	1 - 65535	1	This parameter is for setting a pulse command and an electronic gear for pulse output. For a pulse command: Set UP-04 and UP-05 to a traveling distance per pulse and UP-16 to a pulse command type (AB phase, forward/reverse pulse, and pulse and forward/reverse signal) and polarity. Specify a rotating direction using the parameter UP-19 for position control polarity. For pulse output: When a resolver is used as a motor sensor, the number of pulses per rotation can be obtained in the following formula: $APD (BPD) = [24000] \times [1/4] \times [UP-05/UP-04]$. When a 17 bit encoder is used, use the formula: $APD (BPD) = [131072] \times [1/4] \times [UP05/UP04]$. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output. * The positions of the numerator and the denominator exchange when the formula is used for pulse command and for pulse output.
UP05  	Electronic gear denominator	1 pulse	1 - 65535	1	
UP06	Zero point shift amount	0.01 degrees	0.00 - 360.00	0.00	This parameter is for setting a phase shift amount of the motor axis zero point pulse with an angle. When a resolver is used as the motor sensor, one motor rotation generates two zero point pulses. Set this parameter assuming one motor rotation makes 360 degrees.
UP08 	Current limit value	0.1%	0.0 - 100.0	100.0	Set a value using percentage of a current limit value against a motor maximum current while current limit switch-over signal is ON. Set to 0 (zero) to switch to the 4-quadrant current limit mode. This parameter is invalid in the analog current limit command mode.
UP09 	Soft start acceleration time	0.001 s	0.000 - 65.535	0.000	Use this parameter to set an deceleration rate when adding a linear acceleration/deceleration rate to the speed command in the speed control mode. The rate is specified as time in the range from zero to that required to reach the maximum rpm. This parameter is effective only when UP-11 is set to zero.
UP10 	Soft start deceleration time	0.001 s	0.000 - 65.535	0.000	Use this parameter to set an deceleration rate when adding a linear acceleration/deceleration rate to the speed command in the speed control mode. The acceleration rate is specified as time required to decelerate from the maximum rotation rate to full stop. This parameter is effective only when UP-11 is set to zero.
UP11 	S-shaped acceleration/deceleration time	0.001 s	0.000 - 65.535	0.000	Use this parameter to set a time constant when adding an S-shaped acceleration/deceleration rate to the speed command in the speed control mode. Define a time constant as duration to accelerate by in the range between 5 and 95 percent. When UP-11 is set to zero, soft start acceleration/deceleration set with UP-09 and UP-10 becomes effective. In the position control mode, an S-shaped acceleration/deceleration rate may be added to the position command pulse. In the position control mode, soft start acceleration/deceleration parameters are ignored.
UP12 	ABS mode	None	00 - 12	00	Use this parameter to specify the coordinate clear mode to the ABS sensor and if the ABS sensor is used or not. Specify these items using two digits each individually. Even when the ABS sensor is used, selecting not to use the ABS sensor disables the battery alarm, zero point memorization management, and multi-revolution management functions and it serves as the incremental sensor. Digit position of one: Set the coordinate clear mode to 0 for clearing all. Set to 1 for clearing the rotation count only. Set to 2 to prohibit clearance. Digit position of ten: Set the ABS mode to 0 for disabling the ABS sensor. Set to 1 to use the ABS sensor.

UP13 	Holding brake operation	None	0 - 1	0	Use this parameter to specify the holding brake operation. Set to 0 for starting deceleration immediately and applying brake when the brake is turned ON and the rotation count is below the speed set with UP-14. Set to 1 to decelerate according to the currently set deceleration curve and turn ON the brake. Apply brake at a speed lower than the rotation count specified with UP-14. The holding brake will be applied exceptionally when an alarm is issued or PON is turned OFF.
UP14	Brake applying rotation rate 	0.1%	0.0 - 100.0	10.0	Use this parameter to specify a motor rotation rate where the holding brake is turned ON. This parameter is for avoiding to use the holding brake instead of the speed control brake and the holding brake applies only when the motor rotation rate is below the rate specified with this parameter. Assume the maximum rpm as 100%.
UP15	Analog command polarity	None	00 - 11	00	This parameter is for setting the polarity for analog current command input. Specify these items using two digits each individually. Digit position of one: Set the speed command to 0 for running the motor forward with the positive voltage. Set the speed command to 1 for running the motor backward with the positive voltage. Digit position of ten: Set the current command to 0 for obtaining the motor forward run torque with the positive voltage. Set the current command to 1 for obtaining the motor reverse run torque with the positive voltage.
UP16	Pulse command type	None	00 - 12	00	This parameter is for setting the type and polarity of the position command pulse. Specify these items using two digits each individually. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Set the type to 2 for setting forward/reverse signal. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP17	Pulse output type	None	00 - 11	01	This parameter is for setting a pulse type when UP-18 is set to 'pulse.' Use two digits for setting. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP18	Differential output type	None	0000 - 6635	0000	Use this parameter for setting a differential output type in four digits. Digit position of one: Set output selection to 1 for pulse output (current value). Set output selection to 1 for DPA-80 output. Set output selection to 2 for current value output. Set output selection to 3 for high-speed pulse output. Set output selection to 4 for command pulse output. Set output selection to 5 for draw pulse output. Digit position of ten: Set current value output type to 0 for setting to 32 bits. Set current value output type to 1 for 23 bits plus parity. Set current value output type to 2 for 24 bits plus parity. Set current value output type to 3 for 31 bits plus parity. Digit position of one hundred: Display data while monitor switch-over is ON. Digit position of one thousand: Display data while monitor switch-over is OFF. Set to 0 for motor count. Set to 1 for current value. Set to 2 for motor current. Set to 3 for electro-thermal value. Set to 4 for motor phase amount (machine angle). Set to 5 for machine speed.
UP21	External reverse current absorption resistance value	0.1 Ohm	0 - 100.0	0.0	Use this parameter when using external counter current absorption resistance. Set to 0 for internal counter current absorption resistance.
UP22	External counter current absorption resistance capacity	0.01 kW	0.00 - 327.67	0.00	Set a external counter current absorption resistance capacity. Set to 0 for internal counter current absorption resistance.

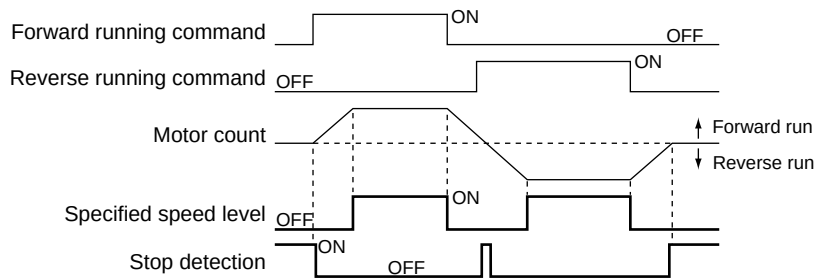
5	UP23	Common power supply mode 	0000 - 1112		0000	Use this parameter for setting usage condition for sharing the PN power source with four digits. Please contact the manufacturer or its agent before starting sharing the power source. Digit position of one: Set reverse current absorption monitor to 0 for detecting AL-9 and AL-10. Set reverse current absorption monitor to 1 for setting AL-9 and AL-10 unavailable. ?? Set reverse current absorption monitor to 2 for setting AL-10 unavailable. ?? Digit position of ten: Set the counter current absorption capacity to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of ten: Set the main power supply monitor to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of thousand: Set the self-discharge function to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable.
	UP24	Primary feed speed	0.01%	0.00 - 327.67	100.00	This parameter is for setting the first feeding speed. Specify a value in terms of the percentage against the motor's maximum rotation rate. Specify 0 to turn analog input voltage REF effective.
	UP25	Secondary feed speed	0.01%	0.00 - 327.67	50.00	This parameter is for setting the second feeding speed. Specify a value in terms of the percentage against the motor's maximum rotation rate. Specify 0 to turn analog input voltage CLI effective.
	UP26	Third feed speed	0.01%	0.00 - 327.67	25.00	This parameter is for setting the third feed speed. Specify a value in terms of the percentage against the motor's maximum rotation rate.
	UP27	Fourth feed speed	0.01%	0.00 - 327.67	12.50	This parameter is for setting the fourth feed speed. Specify a value in terms of the percentage against the motor's maximum rotation rate.
	UP28	Stop detection rpm	1 rpm	1 - 32767	50	The stop detection signal turns ON when a motor count falls below the level specified with this parameter. At a rotation rate below the set level, running forward and running reverse signals turn OFF. When the stop detection signal turns ON, the gain drop during stoppage function also works.
	UP29	Specified speed 	1 rpm	0 - 32767	3000	Once the motor count enters the range specified with UP29 +/- UP30, the specified speed signal turns ON. If you set the parameter to 0, the specified speed signal turns ON when the speed reaches the command rotation rate at that time with the positive and negative tolerance specified with UP30. (In the position control mode, the command speed calculated from the position command pulses is assumed as the command rotation rate.)
	UP30	Specified speed range	1 rpm	1 - 10000	50	This parameter is setting the detection range allowance of the specified speed detection signal. Once the actual motor count enters the range specified with UP29 +/- UP30, the specified speed signal turns ON.
	UP31	Motor test rpm	1 rpm	1 - 10000	50	This parameter is for specifying a rotation rate for motor test run.
	UP33	Load factor time constant	1 s	1 - 60	30	This parameter is for setting a time constant for effective load factor calculation.
	UP34	Limit switching-over method	None	000 - 121	011	This parameter is for setting a current limit in the speed limit mode and a speed limit method and a 4-phase current limit method in the current limit mode. Digit position of one: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP35 when the LCHG signal turns ON. Digit position of ten: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP08 (UP36 through UP39) when the CCD signal turns ON. Set the speed limit to 2 for always limiting with UP08 (UP36 through UP39). Digit position of hundred: Set the 4-phase current limit to 0 for switching over with the speed command sign. Set the 4-phase current limit to 1 for switching over with the speed detection sign.
	UP36	Forward drive current limit 	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates forward drive torque.
	UP37	Forward run absorption current limit 	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates forward run absorption torque.

UP38	Reverse drive current limit functional description	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates reverse drive torque.																														
UP39	Reverse run absorption current limit functional description	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when settzing UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates reverse run absorption torque.																														
UP41	Display magnification rate numerator	None	1 - 65535	1	This parameter is for setting a display magnification rate numerator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																														
UP42	Display magnification rate denominator	None	1 - 65535	1	This parameter is for setting a display magnification rate denominator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																														
UP43	Display decimal point position	None	0 - 7	0	This parameter is for setting a decimal point position for an external display. Set to 0 when using no decimal point, 1 for the lowest digit, 2 for the second digit, 3 for the third digit, and so forth. The value is used for machine speed, current value, command pulse, etc. The decimal point is fixed to the second digit for motor current and motor phase. The decimal point is not displayed on the display.																														
UP44	Sequence input inverting ??	None	00 to FF	00	This parameter is for setting sequence input logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. INO (PON entry) may not be inversed. <table><tr><td>Entry address</td><td>IN7</td><td>IN6</td><td>IN5</td><td>IN4</td><td>IN3</td><td>IN2</td><td>IN1</td><td>INO</td><td></td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>0</td><td>[0: non-inversion]</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to F</td><td colspan="4">0 to E</td><td>[1: Inversion]</td></tr></table>	Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO		Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	[0: non-inversion]	Hexadecimal	0 to F				0 to E				[1: Inversion]
Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO																											
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	[0: non-inversion]																										
Hexadecimal	0 to F				0 to E				[1: Inversion]																										
UP45	Sequence output reversing	None	00 - 1F	00	This parameter is for setting sequence output logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. <table><tr><td>Entry address</td><td>-</td><td>-</td><td>-</td><td>OUT4</td><td>OUT3</td><td>OUT2</td><td>OUT1</td><td>OUT0</td><td></td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>[0: non-inversion]</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to 1</td><td colspan="4">0 to F</td><td>[1: Inversion]</td></tr></table>	Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0		Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	[0: non-inversion]	Hexadecimal	0 to 1				0 to F				[1: Inversion]
Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0																											
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	[0: non-inversion]																										
Hexadecimal	0 to 1				0 to F				[1: Inversion]																										
UP46 Power OFF	Sequence I/O selection	None	0 - 32	0	This parameter is for selecting a combination of 32 types of sequence entry. At present eight combinations are available. Set this parameter to 0 for standard sequence I/O.																														
UP48 Power OFF	Electronic gear multiplication rate	1 time	1 - 100	1	Use the parameter when the magnification rate is too low with the electronic gear setting. This magnification rate change setting is prepared for the case where the sensor split count becomes too great compared with the external command pulse frequency. ??																														
UP49	VMOUT output selection	None	000 - 399	000	This parameter is for setting output data and output type of analog output VMOUT. The lowest two digits: VMOUT output data Set the parameter to 0 for detected speed (filter output). Set the parameter to 1 for detected current (filter output). Set the parameter to 2 for current value (after processing with the electronic gear). Set the parameter to 3 for current value (sensor pulse). Set the parameter to 4 for a differential (after processing with the electronic gear). Set the parameter to 5 for a differential (sensor pulse). Set the parameter to 6 for speed command. Set the parameter to 7 for current command. Set the parameter to 8 for position command (speed command conversion value). Set the parameter to 9 for motor phase. Set the parameter to 10 for detected speed (without filter). Set the parameter to 11 for detected current (without filter). Set the parameter to 12 for the BL value. Set the parameter to 13 for the OL value. Set the parameter to 14 for the RL value. Set the parameter to 15 for fin temperature. Set the parameter to 16 for a speed differential. Set the parameter to 17 for a current differential. The highest digit: output type Set the parameter to 0 for non-inversion output. Set the parameter to 1 for inversion output. Set the parameter to 2 for absolute value output. Set the parameter to 3 for no inversion without a cramp.																														

UP50	VMOUT output scale	0.1 - 3276.7		300.0	This parameter is for setting an output scale for analog output VMOUT. Example: Set to 2.0 when specifying 2 A per monitor output voltage 1 V. Scales may be set in the following ranges for each data type based on 2.0 A / 1 V. Speed: 0.1 to 3276.7 rpm/V Current: 0.1 to 3276.7 A/V Pulse: 0.1 to 3276.7 P/V Voltage: 0.1 to 3276.7 V/V Angle: 0.1 to 3276.7 deg./V Percentage: 0.1 to 3276.7 %/V Temperature: 0.1 to 3276.7 deg. (Celsius)/V
UP51	AMOUT output selection	None	000 - 399	001	This parameter is for setting the output data and output type for analog output AMOUT.
UP52	AMOUT output scale	0.1	0.1 - 3276.7	5.0	This parameter is for setting an output scale for analog output AMOUT. ?? Refer to UP50 for the detailed setting.

● Specified speed and stop detection

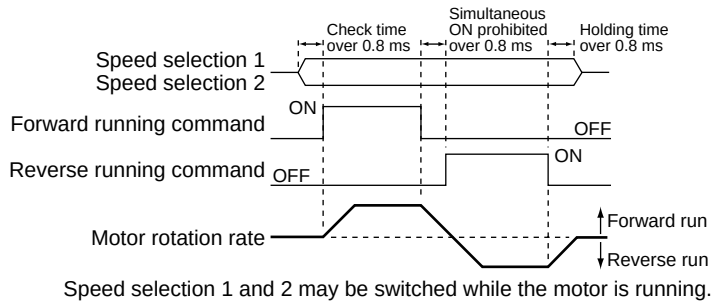
When the motor rotation reaches the level of the first to fourth feed speed, the stop detection function turns ON.



● Switching among the first through fourth feed speeds in the direct feed mode

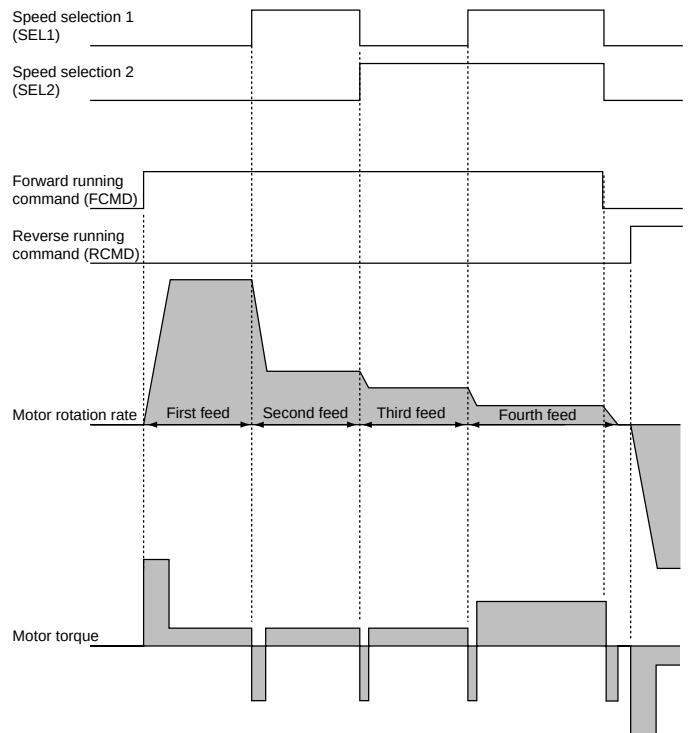
The four types of feed speed may be switched using the signal combinations in the table below:

Input signal	Speed selection 1 (SEL1)	Speed selection 2 (SEL2)
Speed selection		
First feed	OFF	OFF
Second feed	ON	OFF
Third feed	OFF	ON
Fourth feed	ON	ON



● Direct feed operation

The direct feed operation is the operation method for changing speed by means of external signals. This method is often adopted by transfer machines. Boring fast feed, grinding feed, or limiting maximum driving force by means of current limit is possible. The feed speed is available in four stages and the first and second feeds may be set using analog input (REF and CLI) or parameters UP-24 and UP-25. Use parameters UP-26 and UP-27 for setting the third and fourth feeds. Use UP-34 for selecting a limit switching method of current limit and set values using parameters UP-08 and UP-36 through UP-39. Speed setting by parameters has an advantage over the speed setting by analog input that speed setting is stable because the value is insusceptible of ambient temperature. The figure on the right shows the boring process of a transfer machine where quick feeding by the first feed is followed by deceleration in the second and third feed steps and grinding in the fourth feed. Then, speed selection is set to the first feed and then a reverse command is turned ON for quick return.



5

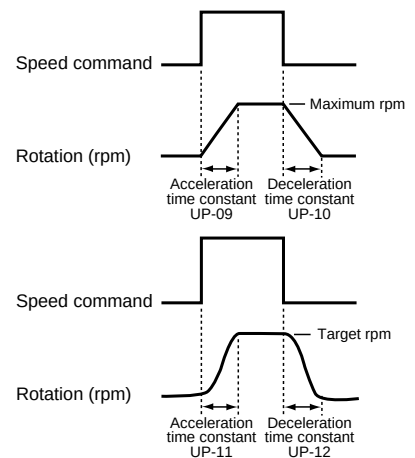
● Acceleration and deceleration functions

Soft start

A speed command for quick speed change causes sudden acceleration or deceleration of a motor that can be leveled by setting soft start duration. Use UP-09 and UP-10 for setting. If you set S-shaped acceleration/deceleration (UP-11) to a value except zero, this parameter setting is ignored.

S-shaped acceleration/deceleration

Smoother acceleration / deceleration than soft start is obtained. Set the same time constant for both acceleration and deceleration. Time required to reach the target rotation rate will be 1.1 times the set value. Use UP-11 for setting.



● External command for the first and second feeding speed

When you have specified 0 (zero) to UP-24 and UP-25 and set the feeding speed to external command, the following adjustment is required.

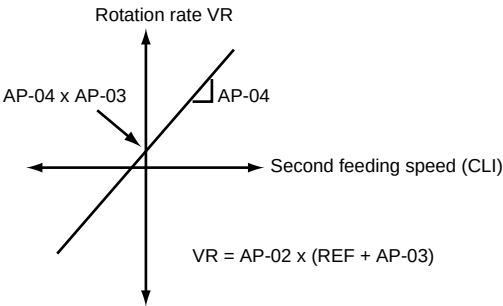
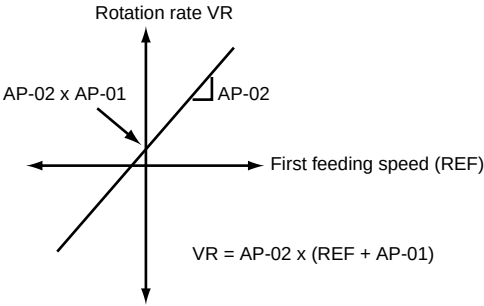
Zero adjustment (AP-01) and span adjustment (P-02) of the first feeding speed

The formula $VR = AP-02 \times (REF + AP-01)$ is possible where VR is motor rotation rate and REF is speed command voltage.

At the time of shipment from the factory the motor is set to zero adjustment with AP-01 but it may turn a little if a speed command has an offset. If that is the case, make automatic zero adjustment taking the command offset into consideration.

The span adjustment (AP-02) is set to 1500 (rpm)/10 V. Set AP-02 to 300.0 if the speed command is based on 3000 rpm per 10 V.

Zero adjustment (AP-03) and span adjustment (AP-04) of the second feeding speedMake adjustment with AP-03 and AP-04 as with the first feeding speed.

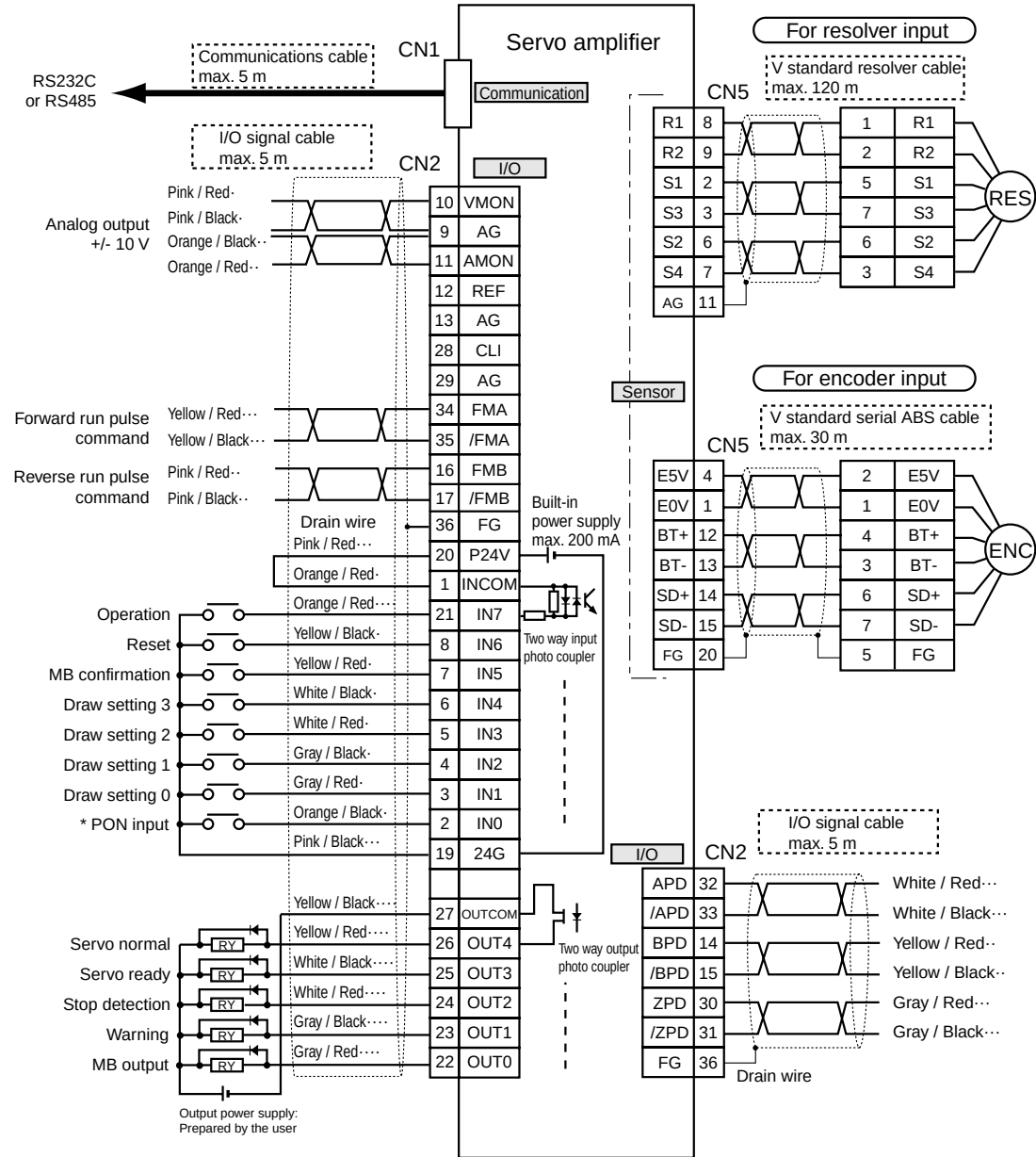


5-5-4. Operation

Operation steps	Description
Power ON User parameter setting Enter '5' for UP-01. Enter the motor code for UP-02. Shut down the power and turn ON again after making sure that the entire display has gone off. Specify all required data to user parameters. Turn ON the operation signal. Zero adjustment of the first and second feeding speed command voltage Turn ON speed selection 1 and 2. Turn ON the forward running command or the reverse running command. Turn OFF the forward running command or the reverse running command. Turn OFF the operation signal.	Alarm AL26 was issued. Press the MODE key to display UP-01 (0 is displayed) → Press the SEL and SET key together (0 flashes.) UP-02 (UP-02 is displayed.) ← SET (Flashing stops.) (Set to 5.) Press the SEL and SET keys together (0000 is displayed.) (0 flashes at the rightmost digit.) → SET (Set a motor code.) (Flashing stops.) Data are set to UP01 and UP02. Example: Set data such as resolver cable length, electronic gear, and the first through fourth feeding speeds. The motor is ready for operation and servo locked. If a brake is used, make sure the brake is not applied. Use adjustment parameters AP-01 and AP-03 for specifying the first and second feeding speeds respectively and offset adjustment for each speed at command voltage 0 V. The motor starts running. Check the operation state at a low speed at first. * Rotating direction * Hunting during operation * Vibration when the motor comes to stop * Impact during acceleration and deceleration * Rotation rate for a command voltage Conduct auto-tuning if necessary. TP-01 is set to 0 (standard mode) on shipment from the factory and therefore set TP-02 to a target loop gain and TP-03 to load inertia multiplication rate. Also specify values to UP-9 through UP-11 and UP-15. The motor stops rotation. Note: The motor also stops when both forward and reverse running commands are issued at the same time. The motor is set in the servo-free condition. If a brake is used, make sure the brake can be applied.

5-6. Current Control Mode Operation

5-6-1. Connection examples



Connector symbol	Cable name	Cable model	Remarks
CN1	RS232C communication cable	CV01A-□□□ □	Select either one.
CN1	RS485 communication cable	CV01B-□□□ □	
CN2	I/O signal cable	CV02A-□□□ □	
CN5	V standard resolver cable	CV05A-□□□ □	Select one of these.
CN5	VZ motor resolver cable	CV05B-□□□ □	
CN5	V standard resolver ABS cable	CV05C-□□□ □	
CN5	V standard serial ABS cable	CV05D-□□□ □	
CN5	VZ motor serial ABS cable	CV05E-□□□ □	

5-6-2. I/O Signal

Type	Name	Terminal No.	Function					Power specifications
Communi- cation	RS232C	CN 1	Connect to this terminal for using an RS232C and RS422 interfaces and PC tool SHAN5. These two interfaces are to be switched automatically by cables. ??					
Analog output	Monitor 1 (VMON)	10P (VMON) 9P (AG)	Output data defaults to 'Speed.' Use the parameter UP-49 to select data. Specify a scale using the parameter UP-50.					+/-10 V/3000 rpm Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??
	Monitor 2 (AMON)	11P (AMON) 9P (AG)	Output data defaults to 'Current.' Use the parameter UP-51 to select data. Specify a scale using the parameter UP-52.					+/-10 V/50 A Output resistance 330 Ohm DA resolution +/-2048 (+/-10 V per hour) ??
Analog input			Not used.					
Pulse input	Position command (FMA) (/FMA) (FMB) (/FMB)	34P (FMA) 35P (/FMA) 16P (FMB) 17P (/FMB)	Forward running pulse: (FMA)/(FMA) Reverse running pulse: (FMB)/(FMB) Enter the pulse command. Set UP-04 and UP-05 to a traveling distance per pulse and UP-16 to a pulse command type (AB phase, forward/reverse pulse, and pulse and forward/reverse signal) and polarity. Specify a rotating direction using the parameter UP-19 for position control polarity.					ON voltage 3.5 to 5.5 V OFF voltage 2 V (Max.) ON current 16 mA (TYP) On 5 V
24-V input	Operation (RUN)	21P (IN7)	In the operation enabling state current limit control operation mode, the command value torque is obtained directly without servo lock. Turn OFF the signal to set the servo free. This signal also serves to turn ON/OFF brake output.					ON voltage 19.2 to 26.4 V OFF voltage 3 V (Max.)
	Reset (RST)	8P (IN6)	For resetting an alarm code.(Keep ON over 60 ms.) Alarms caused by overheating such as AL-01, AI-05, AL-08, AL-09, and AL-17 may not be reset until temperature falls to a certain level.					ON current 6 mA (TYP) Min. ON/OFF width 1 ms on 24 V
	MB confirmation (MBIN)	7P (IN5)	Enter the holding brake operation checking signal (the brake contactor auxiliary contact point). See the description on power circuit for the connecting method.					
	Draw setting 3 (DRAW3)	6P (IN4)	This signal indicates increase or decrease ratio against the command pulse. Use the draw multiplication rate parameter UP-20 to set at 10 times and 100 times. You may use the parameter UP-64 to set a draw value as a fixed value. * 1 indicates ON and 0 OFF in the table.	DRAW 3	DRAW 2	DRAW 1	DRAW 0	Draw value
	Draw setting 2 (DRAW2)	5P (IN3)		0	1	1	1	7
				0	1	1	0	6
				0	1	0	1	5
				0	1	0	0	4
				0	0	1	1	3
				0	0	1	0	2
	Draw setting 1 (DRAW1)	4P (IN2)		0	0	0	1	1
				0	0	0	0	0
1				1	1	1	-1	
1				1	1	0	-2	
Draw setting 0 (DRAW0)	3P (IN1)	1		1	0	1	-3	
		1		1	0	0	-4	
		1		0	1	1	-5	
		1		0	1	0	-6	
Main circuit ON (PON)	2P (IN0)	1		0	0	1	-7	
		1	0	0	0	-8		
This signal is for turning ON the MC output and the circuit contactor. When the PN power source is fully charged, the servo ready (RDY) turns ON. Turning OFF this signal turns OFF the main circuit contactor physically; this terminal should be integrated into an emergency stop circuit.								
24-V output	Servo normal (SST)	26P (OUT4)	This signal turns ON about 3 seconds after the AC power supply is turned on. Use this signal as the main circuit ON (PON) interlock. An alarm will turn OFF this signal and reset (RST) will turn ON the signal again.					ON voltage 1.5 V (Max.) 50 mA/h (Max. current)
	Servo ready (RDY)	25P (OUT3)	This signal is turned ON when the servo normal (SST) comes ON, the main circuit ON (PON) is turned ON, and PN power supply is turned ON.					OFF leak current 1uA (Max.)
	Stop detection (STA)	24P (OUT2)	This signal turns ON when the motor rotation speed comes down below the stop detection rpm set with UP-28.					
	Warning (WARN)	23P (OUT1)	This signal turns ON when battery voltage falls, the zero point is not saved, an electro-thermal warning is issued, a counter current absorption overheating warning is issued, or a fin overheating warning is issued. It turns OFF when the problems causing a warning are solved. You may continue operation even while a warning is issued.					
	MB output (MBO)	22P (OUT0)	This signal is to output holding brake control. See "Chapter 2 Power Circuit" for operation sequence.					
Pulse output / differen- tial output	(APD) (/APD) (BPD) (/BPD) (ZPD) (/ZPD)	20P (APD) 21P (/APD) 22P (BPD) 23P (/BPD) 24P (ZPD) 25P (/ZPD)	This signal outputs motor positions in terms of AB phase pulses with 90-degree phase differences. The Z phase is placed at the motor's zero point, and a half rotation generates a pulse when a resolver is used as the motor sensor and one rotation generates a pulse with the encoder sensor. When a resolver is used as the motor sensor, the number of pulses per rotation can be obtained in the following formula: APD (BPD) = [24000] x [1/4] x [UP-05/UP-04]. When a 17 bit encoder is used, use the formula: APD (BPD) = [131072] x [1/4] x [UP05/UP04]. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output.					Differential output equivalent to AM26LS31 ?? Vout: 3 V (TYP) 2 V (MIN) On 20 mA output

5-6-3. User Parameter

Symbol	Name	Unit	Setting range	Factory setting	Function
UP01 	Control mode	None	0 - 6	0	This parameter is for setting a servo amplifier control mode: Set to 1 for speed control mode. Set to 2 for current control mode. Set to 3 for position control mode. Set to 4 for speed/current/position control mode. Set to 5 for direct feed mode. Set to 6 for draw control mode.
UP02 	Motor code	None	0 - 64999	00000	This parameter is for setting a motor type for operation with a motor code. A motor code consists of a motor number and a sensor number. See the combination table for details.
UP03 	Resolver cable length	1 m	1 - 120	5	This parameter sets a cable length when a resolver is used as the motor sensor. When another type of motor sensor is specified, this setting is ignored.
UP04  	Electronic gear numerator	1 pulse	1 - 65535	1	This parameter is for setting a pulse command and an electronic gear for pulse output. For a pulse command: Set UP-04 and UP-05 to a traveling distance per pulse and UP-16 to a pulse command type (AB phase, forward/reverse pulse, and pulse and forward/reverse signal) and polarity. Specify a rotating direction using the parameter UP-19 for position control polarity. For pulse output: When a resolver is used as a motor sensor, the number of pulses per rotation can be obtained in the following formula: $APD (BPD) = [24000] \times [1/4] \times [UP-05/UP-04]$. When a 17 bit encoder is used, use the formula: $APD (BPD) = [131072] \times [1/4] \times [UP05/UP04]$. Use the parameter UP-17 for forward/reverse pulse. Use UP-18 to switch to external display differential output or ABS output. * The positions of the numerator and the denominator exchange when the formula is used for pulse command and for pulse output.
UP05  	Electronic gear denominator	1 pulse	1 - 65535	1	
UP06	Zero point shift amount	0.01 degrees	0.00 - 360.00	0.00	This parameter is for setting a phase shift amount of the motor axis zero point pulse with an angle. When a resolver is used as the motor sensor, one motor rotation generates two zero point pulses. Set this parameter assuming one motor rotation makes 360 degrees.
UP07 	In-position width	1 pulse	1 - 65535	50	xxx turns ON when the deviation during positional control comes down below this value. ?? Specify a value in terms of motor sensor pulses.
UP08 	Current limit value	0.1%	0.0 - 100.0	100.0	Set a value using percentage of a current limit value against a motor maximum current while current limit switch-over signal is ON. Set to 0 (zero) to switch to the 4-quadrant current limit mode. This parameter is invalid in the analog current limit command mode.
UP11 	S-shaped acceleration/deceleration time	0.001 s	0.000 - 65.535	0.000	Use this parameter to set a time constant when adding an S-shaped acceleration/deceleration rate to the speed command in the speed control mode. Define a time constant as duration to accelerate by in the range between 5 and 95 percent. When UP-11 is set to zero, soft start acceleration/deceleration set with UP-09 and UP-10 becomes effective. In the position control mode, an S-shaped acceleration/deceleration rate may be added to the position command pulse. In the position control mode, soft start acceleration/deceleration parameters are ignored.
UP12 	ABS mode	None	00 - 12	00	Use this parameter to specify the coordinate clear mode to the ABS sensor and if the ABS sensor is used or not. Specify these items using two digits each individually. Even when the ABS sensor is used, selecting not to use the ABS sensor disables the battery alarm, zero point memorization management, and multi-revolution management functions and it serves as the incremental sensor. Digit position of one: Set the coordinate clear mode to 0 for clearing all. Set to 1 for clearing the rotation count only. Set to 2 to prohibit clearance. Digit position of ten: Set the ABS mode to 0 for disabling the ABS sensor. Set to 1 to use the ABS sensor.
UP13 	Holding brake operation	None	0 - 1	0	Use this parameter to specify the holding brake operation. Set to 0 for starting deceleration immediately and applying brake when the brake is turned ON and the rotation count is below the speed set with UP-14. Set to 1 to decelerate according to the currently set deceleration curve and turn ON the brake. Apply brake at a speed lower than the rotation count specified with UP-14. The holding brake will be applied exceptionally when an alarm is issued or PON is turned OFF.

UP14	Brake applying rotation rate functional description	0.1%	0.0 - 100.0	10.0	Use this parameter to specify a motor rotation rate where the holding brake is turned ON. This parameter is for avoiding to use the holding brake instead of the speed control brake and the holding brake applies only when the motor rotation rate is below the rate specified with this parameter. Assume the maximum rpm as 100%.
UP15	Analog command polarity	None	00 - 11	00	This parameter is for setting the polarity for analog current command input. Specify these items using two digits each individually. Digit position of one: Set the speed command to 0 for running the motor forward with the positive voltage. Set the speed command to 1 for running the motor backward with the positive voltage. Digit position of ten: Set the current command to 0 for obtaining the motor forward run torque with the positive voltage. Set the current command to 1 for obtaining the motor reverse run torque with the positive voltage.
UP16	Pulse command type	None	00 - 12	00	This parameter is for setting the type and polarity of the position command pulse. Specify these items using two digits each individually. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Set the type to 2 for setting forward/reverse signal. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP17	Pulse output type	None	00 - 11	01	This parameter is for setting a pulse type when UP-18 is set to 'pulse.' Use two digits for setting. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP18	Differential output type	None	0000 - 6635	0000	Use this parameter for setting a differential output type in four digits. Digit position of one: Set output selection to 1 for pulse output (current value). Set output selection to 1 for DPA-80 output. Set output selection to 2 for current value output. Set output selection to 3 for high-speed pulse output. Set output selection to 4 for command pulse output. Set output selection to 5 for draw pulse output. Digit position of ten: Set current value output type to 0 for setting to 32 bits. Set current value output type to 1 for 23 bits plus parity. Set current value output type to 2 for 24 bits plus parity. Set current value output type to 3 for 31 bits plus parity. Digit position of one hundred: Display data while monitor switch-over is ON. Digit position of one thousand: Display data while monitor switch-over is OFF. Set to 0 for motor count. Set to 1 for current value. Set to 2 for motor current. Set to 3 for electro-thermal value. Set to 4 for motor phase amount (machine angle). Set to 5 for machine speed.
UP19	Position control polarity	None	0 - 1	0	This parameter is for setting the motor rotation direction when the forward pulse is directed by the pulse command. The motor rotation direction and the current value incrementing rotation direction are also switched. Set the parameter to 0 for the forward rotation with the forward rotation pulse and incrementing the current value with the forward rotation. Set the parameter to 1 for the reverse rotation with the forward rotation pulse and incrementing the current value with the reverse rotation.
UP20	Draw multiplication rate	None	0 - 2	0	This parameter is for setting weight per bit on the draw setting. Set the parameter to 0 for 0.01% per bit. Set the parameter to 1 for 0.1% per bit. Set the parameter to 2 for 1% per bit.

UP21	External reverse current absorption resistance value	0.1 Ohm	0 - 100.0	0.0	Use this parameter when using external counter current absorption resistance. Set to 0 for internal counter current absorption resistance.
UP22	External counter current absorption resistance capacity	0.01 kW	0.00 - 327.67	0.00	Set a external counter current absorption resistance capacity. Set to 0 for internal counter current absorption resistance.
UP23 	Common power supply mode	0000 - 1112		0000	Use this parameter for setting usage condition for sharing the PN power source with four digits. Please contact the manufacturer or its agent before starting sharing the power source. Digit position of one: Set reverse current absorption monitor to 0 for detecting AL-9 and AL-10. Set reverse current absorption monitor to 1 for setting AL-9 and AL-10 unavailable. ?? Set reverse current absorption monitor to 2 for setting AL-10 unavailable. ?? Digit position of ten: Set the counter current absorption capacity to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of ten: Set the main power supply monitor to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of thousand: Set the self-discharge function to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable.
UP24	Primary feed speed	0.01%	0.00 - 327.67	100.00	This parameter is used for independent operation during draw operation. Specify a value in terms of the percentage against the motor's maximum rotation rate. When the forward running command FCMD or reverse running command RCMD is turned ON, the motor runs at a rate specified with this parameter.
UP28	Stop detection rpm	1 rpm	1 - 32767	50	The stop detection signal turns ON when a motor count falls below the level specified with this parameter. At a rotation rate below the set level, running forward and running reverse signals turn OFF. When the stop detection signal turns ON, the gain drop during stoppage function also works.
UP29	Specified speed (Functional) 	1 rpm	0 - 32767	3000	Once the motor count enters the range specified with UP29 +/- UP30, the specified speed signal turns ON. If you set the parameter to 0, the specified speed signal turns ON when the speed reaches the command rotation rate at that time with the positive and negative tolerance specified with UP30. (In the position control mode, the command speed calculated from the position command pulses is assumed as the command rotation rate.)
UP30	Specified speed range	1 rpm	1 - 10000	50	This parameter is setting the detection range allowance of the specified speed detection signal. Once the actual motor count enters the range specified with UP29 +/- UP30, the specified speed signal turns ON.
UP31	Motor test rpm	1 rpm	1 - 10000	50	This parameter is for specifying a rotation rate for motor test run.
UP33	Load factor time constant	1 s	1 - 60	30	This parameter is for setting a time constant for effective load factor calculation.
UP34	Limit switching-over method	None	000 - 121	011	This parameter is for setting a current limit in the speed limit mode and a speed limit method and a 4-phase current limit method in the current limit mode. Digit position of one: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP35 when the LCHG signal turns ON. Digit position of ten: Set the speed limit to 0 for limiting with REF entry when the LHCG signal turns ON. Set the speed limit to 1 for limiting with UP08 (UP36 through UP39) when the CCD signal turns ON. Set the speed limit to 2 for always limiting with UP08 (UP36 through UP39). Digit position of hundred: Set the 4-phase current limit to 0 for switching over with the speed command sign. Set the 4-phase current limit to 1 for switching over with the speed detection sign.

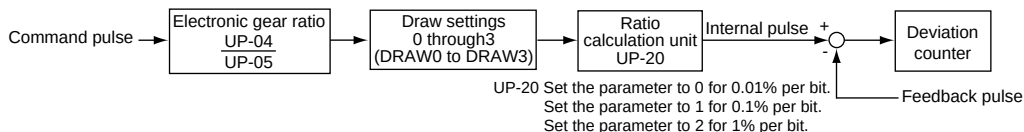
UP36	Forward drive current limit functional description	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates forward drive torque.																														
UP37	Forward run absorption current limit functional description	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates forward run absorption torque.																														
UP38	Reverse drive current limit functional description	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when setting UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates reverse drive torque.																														
UP39	Reverse run absorption current limit functional description	0.1%	0.0 - 100.0	100.0	The limit setting becomes effective when settzing UP08 to 0 and selecting the 4-phase current mode. This setting limits the current that generates reverse run absorption torque.																														
UP41	Display magnification rate numerator	None	1 - 65535	1	This parameter is for setting a display magnification rate numerator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																														
UP42	Display magnification rate denominator	None	1 - 65535	1	This parameter is for setting a display magnification rate denominator for data to be sent to an external display. The value is used for machine speed, current value, command pulse, etc. It's also used for machine speed (F) display on the display operation unit.																														
UP43	Display decimal point position	None	0 - 7	0	This parameter is for setting a decimal point position for an external display. Set to 0 when using no decimal point, 1 for the lowest digit, 2 for the second digit, 3 for the third digit, and so forth. The value is used for machine speed, current value, command pulse, etc. The decimal point is fixed to the second digit for motor current and motor phase. The decimal point is not displayed on the display.																														
UP44	Sequence input inverting ??	None	00 to FF	00	This parameter is for setting sequence input logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. INO (PON entry) may not be inversed. <table><tr><td>Entry address</td><td>IN7</td><td>IN6</td><td>IN5</td><td>IN4</td><td>IN3</td><td>IN2</td><td>IN1</td><td>INO</td><td></td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>0</td><td>[0: non-inversion]</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to F</td><td colspan="4">0 to E</td><td>[1: Inversion]</td></tr></table>	Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO		Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	[0: non-inversion]	Hexadecimal	0 to F				0 to E				[1: Inversion]
Entry address	IN7	IN6	IN5	IN4	IN3	IN2	IN1	INO																											
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	0	[0: non-inversion]																										
Hexadecimal	0 to F				0 to E				[1: Inversion]																										
UP45	Sequence output reversing	None	00 - 1F	00	This parameter is for setting sequence output logical inversion in the hexadecimal notation. Set each bit to 0 for prohibiting inverse run and 1 for enabling inverse run. <table><tr><td>Entry address</td><td>-</td><td>-</td><td>-</td><td>OUT4</td><td>OUT3</td><td>OUT2</td><td>OUT1</td><td>OUT0</td><td></td></tr><tr><td>Logical inversion</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>1/0</td><td>[0: non-inversion]</td></tr><tr><td>Hexadecimal</td><td colspan="4">0 to 1</td><td colspan="4">0 to F</td><td>[1: Inversion]</td></tr></table>	Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0		Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	[0: non-inversion]	Hexadecimal	0 to 1				0 to F				[1: Inversion]
Entry address	-	-	-	OUT4	OUT3	OUT2	OUT1	OUT0																											
Logical inversion	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	[0: non-inversion]																										
Hexadecimal	0 to 1				0 to F				[1: Inversion]																										
UP46	Sequence I/O selection Power OFF	None	0 - 32	0	This parameter is for selecting a combination of 32 types of sequence entry. At present eight combinations are available. Set this parameter to 0 for standard sequence I/O.																														
UP48	Electronic gear multiplication rate Power OFF	1 time	1 - 100	1	Use the parameter when the magnification rate is too low with the electronic gear setting. This magnification rate change setting is prepared for the case where the sensor split count becomes too great compared with the external command pulse frequency. ??																														

UP49	VMOU output selection	None	000 - 399	000	This parameter is for setting output data and output type of analog output VMOU. The lowest two digits: VMOU output data Set the parameter to 0 for detected speed (filter output). Set the parameter to 1 for detected current (filter output). Set the parameter to 2 for current value (after processing with the electronic gear). Set the parameter to 3 for current value (sensor pulse). Set the parameter to 4 for a differential (after processing with the electronic gear). Set the parameter to 5 for a differential (sensor pulse). Set the parameter to 6 for speed command. Set the parameter to 7 for current command. Set the parameter to 8 for position command (speed command conversion value). Set the parameter to 9 for motor phase. Set the parameter to 10 for detected speed (without filter). Set the parameter to 11 for detected current (without filter). Set the parameter to 12 for the BL value. Set the parameter to 13 for the OL value. Set the parameter to 14 for the RL value. Set the parameter to 15 for fin temperature. Set the parameter to 16 for a speed differential. Set the parameter to 17 for a current differential. The highest digit: output type Set the parameter to 0 for non-inversion output. Set the parameter to 1 for inversion output. Set the parameter to 2 for absolute value output. Set the parameter to 3 for no inversion without a cramp.
UP50	VMOU output scale	0.1	0.1 - 3276.7	300.0	This parameter is for setting an output scale for analog output VMOU. Example: Set to 2.0 when specifying 2 A per monitor output voltage 1 V. Scales may be set in the following ranges for each data type based on 2.0 A / 1 V. Speed: 0.1 to 3276.7 rpm/V Current: 0.1 to 3276.7 A/V Pulse: 0.1 to 3276.7 P/V Voltage: 0.1 to 3276.7 V/V Angle: 0.1 to 3276.7 deg./V Percentage: 0.1 to 3276.7 %/V Temperature: 0.1 to 3276.7 deg. (Celsius)/V
UP51	AMOU output selection	None	000 - 399	001	This parameter is for setting the output data and output type for analog output AMOU.
UP52	AMOU output scale	0.1	0.1 - 3276.7	5.0	This parameter is for setting an output scale for analog output AMOU. ?? Refer to UP50 for the detailed setting.
UP64	Draw value	0.01	0 - 32767	0	A draw value may be specified with this parameter without using sequence input. Set the parameter to 0 to make a sequence command effective. If you specify a value other than 0, a value obtained by multiplying the specified value by a draw multiplier set with UP-20 is used as a draw value.

● Draw ratio

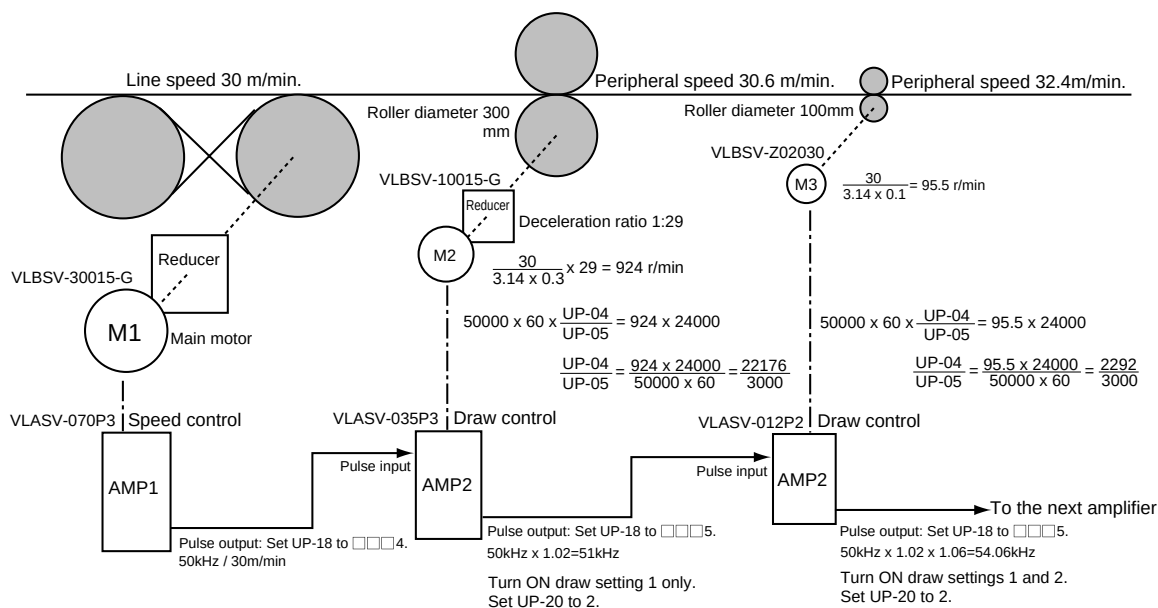
The draw ratio is obtained by using the input signal draw setting and user parameter draw multiplication rate (UP-20) as following:

$$\text{Internal pulse} = [\text{command pulse}] \times \left[\frac{\text{UP-04}}{\text{UP-05}} \right] \times [1 \pm \text{draw setting} \times \text{draw multiplier}]$$



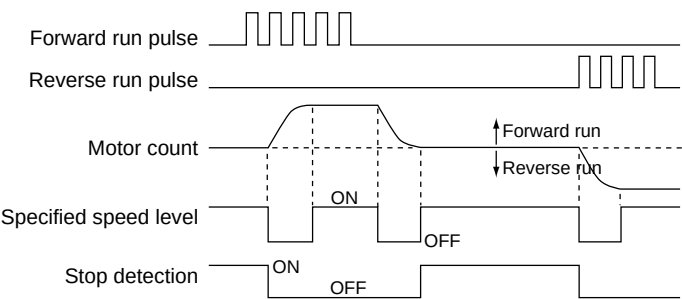
* Draw setting is possible not only with sequence input but also using the parameter UP-64.

M1 is the main motor used for speed control and tension cut and is run in the speed control mode. **M2** and **M3** are draw control systems for the preceding steps. Set the electronic gears (UP-04 and UP-05) so that the roller peripheral speed becomes equivalent to the line speed. Specify a draw ratio using the input signal draw settings 0 to 3 and UP-20. In this example, **M2** has a rotation rate 2% greater than that of **M1** and **M3** 6% greater than that of **M2**.



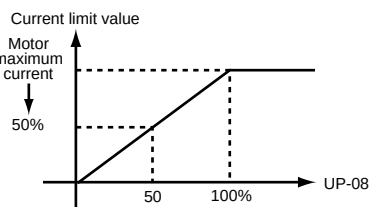
● Specified speed and stop detection

When the motor rotation reaches the target rpm specified with the pulse command, the specified speed signal comes ON.
If the motor stops because the pulse command was interrupted, the stop detection signal comes ON.



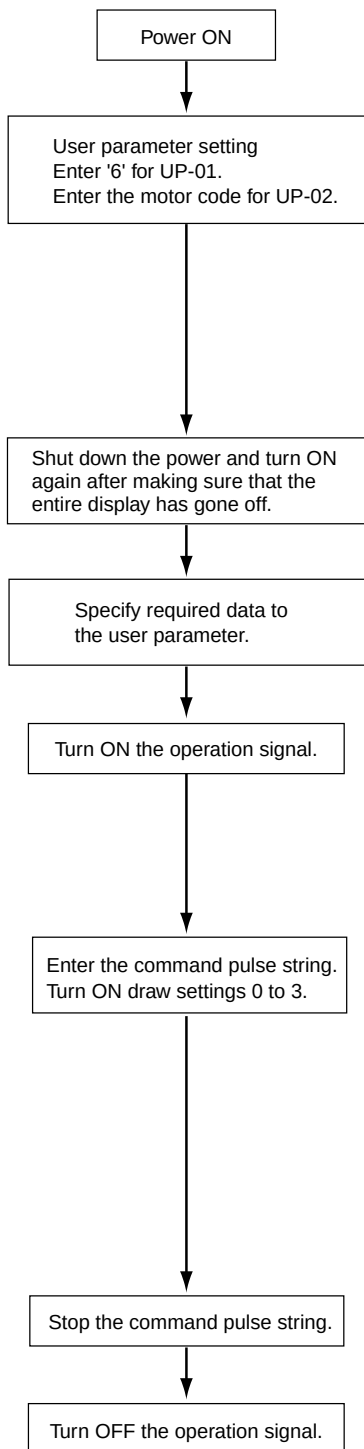
● Current limit

Set UP-34 (current limit switch-over method) to n2n to apply the current limit at the current limit level specified with UP-08 (current limit value).
UP-08 is set to 100% on factory shipment.



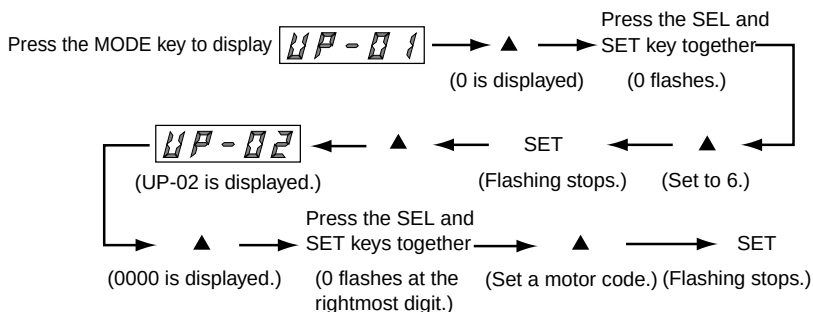
5-6-4. Operation

Operation steps



Description

Alarm AL26 was issued.



Data are set to UP01 and UP02.

Example: Data such as resolver cable length, electronic gear, current limit, pulse command UP-16, output type UP-17, and differential output type UP-18.

The motor is ready for operation and servo locked.
If a brake is used, make sure the brake is not applied.

The motor starts running.
At first, check the operation condition with a low speed pulse string.
* Rotating direction
* Hunting during operation
* Vibration when the motor comes to stop

Conduct auto-tuning if necessary. TP-01 is set to 0 (standard mode) on shipment from the factory and therefore set TP-02 to a target loop gain and TP-03 to load inertia multiplication rate.

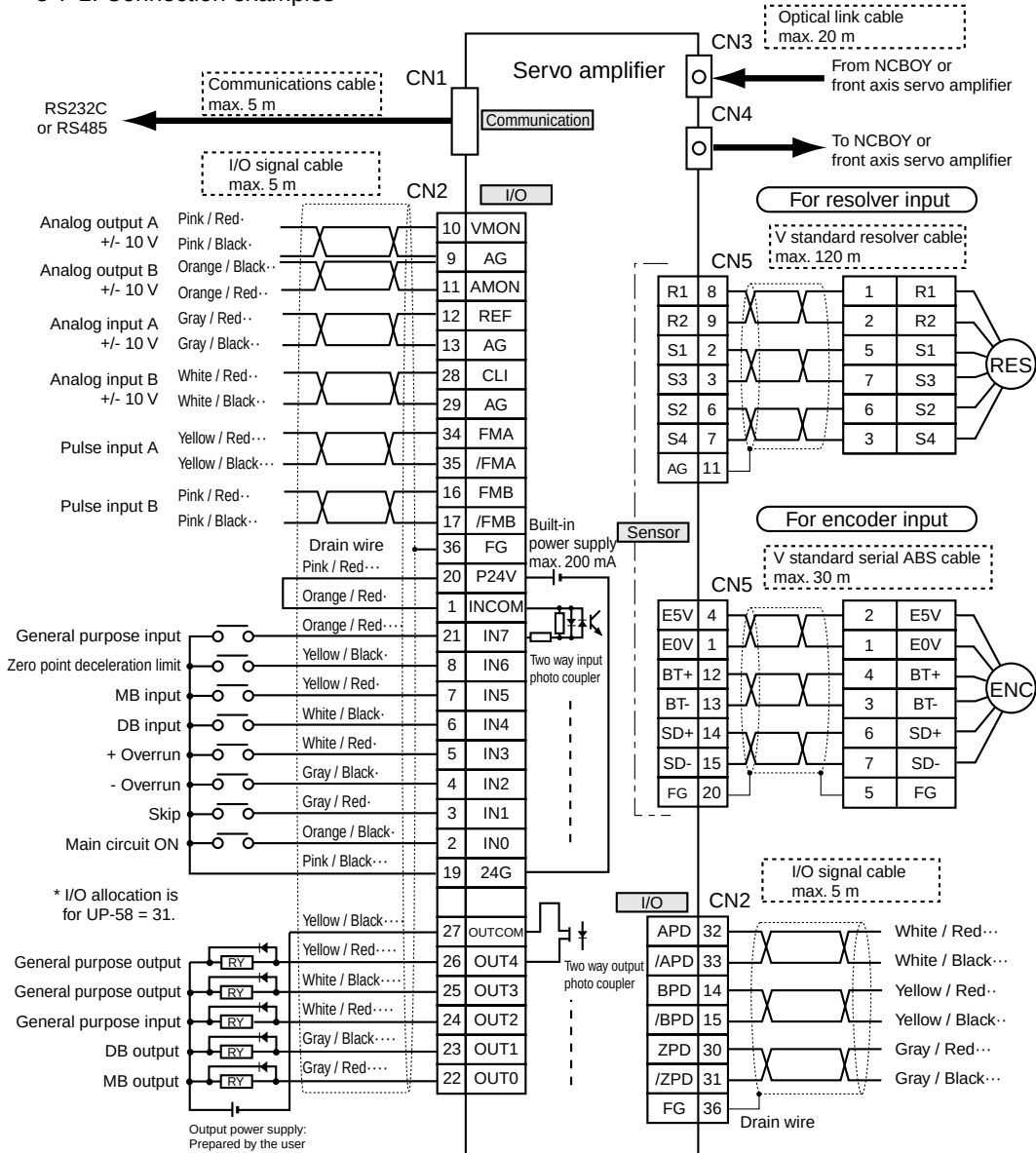
The motor stops rotation.

The motor is set in the servo-free condition. If a brake is used, make sure the brake can be applied.

5-7. NCBOY Mode Operation

The NCBOY mode is the operation mode where the servo amplifier type is VLASY-nnnPn-nV (VLBus-V communication specifications). Software specific to NCBOY mode is used. Make sure that the user parameter UP01 is set to 31.

5-7-1. Connection examples



Connector symbol	Cable name	Cable model	Remarks
CN1	RS232C communication cable	CV01A-□□□ □	Select either one.
CN1	RS485 communication cable	CV01B-□□□ □	
CN2	I/O signal cable	CV02A-□□□ □	
CN3 and CN4	Optical link cable	CV23A-□□□ A	
CN5	V standard resolver cable	CV05A-□□□ □	Select one of these.
CN5	VZ motor resolver cable	CV05B-□□□ □	
CN5	V standard resolver ABS cable	CV05C-□□□ □	
CN5	V standard serial ABS cable	CV05D-□□□ □	
CN5	VZ motor serial ABS cable	CV05E-□□□ □	

5-7-2. I/O Signal

Type	Name	Terminal No.	Function	Power specifications
Communi- cation	RS232C	CN 1	Connect to this terminal for using an RS232C and RS422 interfaces and PC tool SHAN5. These two interfaces are to be switched automatically by cables. ??	
Analog output	Output A	10P (VMON) 9P (AG)	Output data defaults to 'Speed.' Use the parameter UP-49 to select data. Specify a scale using the parameter UP-50. When UP-49 is set to 1□□□, the value for NCIF register Q*□□SBA is output in analog voltage.	Output resistance 330 Ohm +/-10 V
	Output B	11P (AMON) 9P (AG)	Output data defaults to 'Current.' Use the parameter UP-49 to select data. Specify a scale using the parameter UP-50. When UP-49 is set to 1nnn, the value for NCIF register Q*□□SBA is output in analog voltage.	Output resistance 330 Ohm +/-10 V
Analog input	Input A	12P (REF) 13P (AG)	The analog voltage is retrieved to NCIF register Q*□□SBA.	Input resistance 49 Kohm
	Input B	28P (CLI) 29P (AG)	The analog voltage is retrieved to NCIF register Q*□□SBA.	Vin +/- 11.5 V max.
Pulse input	Pulse input A	34P (FMA) 35P (/FMA)	Use UP-16 for specifying the pulse command type (AB phase, forward/reverse pulse, and pulse and forward/reverse signal) and polarity. ????	ON voltage 3.5 to 5.5 V OFF voltage 2 V (Max.) ON current 16 mA (TYP) on 5 V
	Pulse input B	16P (FMB) 17P (/FMB)		
24-V input	General purpose input	21P (IN7)	This signal may be used as general purpose input. (* See the allocation table.)	ON voltage 19.2 to 26.4 V OFF voltage 3 V (Max.) ON current 6 mA (TYP) Min. ON/OFF width 1 ms on 24 V * Note: Input description is on the assumption that UP58 is set to ?1. ??
	Zero point deceleration reset (Q*□□HLLS)	8P (IN6)	This is for connecting the zero point deceleration limit signal for zero point setting operation. Use the amplifier parameter UP59 for switching forward and reverse runs. When you have set this signal to general purpose input using UP58, NCIF register Q*nnHLLS has the same function.	
	MB input (MBI)	7P (IN5)	Enter the holding brake operation checking signal (the brake contactor auxiliary contact point). See the description on power circuit for the connecting method. The NCIF register do not have this function.	
	DB input (DBI)	6P (IN4)	Input the dynamic brake operation checking signal (the brake contactor auxiliary contact point). See the description on power circuit for the connecting method. The NCIF register do not have this function.	
	+ Overrun (LOTP)	5P (IN3)	Connect with the overrun detection signal on the positive (+) side. Use the amplifier parameter UP59 for switching forward and reverse logics. The NCIF register do not have this function.	
	- Overrun (LOTM)	4P (IN2)	Connect with the overrun detection signal on the negative (-) side. Use the amplifier parameter UP59 for switching forward and reverse logics. The NCIF register do not have this function.	
	Skip (Q*□□SKIP1)	3P (IN1)	This is for skip input for G31, CAME, and CAMF commands. Use the NC parameter NP110 for specifying the skip signal detection condition. When you need skip input more than once, change the UP58 setting. When you have set this signal to general purpose input using UP58, NCIF register Q*nnSKIPn has the same function.	
	Main circuit ON (PON)	2P (IN0)	This signal is for turning ON the MC output and the circuit contactor. When the PN power source is fully charged, the servo ready (RDY) turns ON. Turning OFF this signal turns OFF the main circuit contactor physically; this terminal should be integrated into an emergency stop circuit.	
24-V output	General purpose output	26P (OUT4)	This signal may be used as general purpose output. (* See the allocation table.)	ON voltage 1.5 V (max.) at 50 mA (peak current) OFF leak current 1uA (max.) * Note: Input description is on the assumption that UP58 is set to ?□. ??
	General purpose output	25P (OUT3)	This signal may be used as general purpose output. (* See the allocation table.)	
	General purpose output	24P (OUT2)	This signal may be used as general purpose output. (* See the allocation table.)	
	DB output (DBO)	23P (OUT1)	This is the output for dynamic brake control. See "Chapter 2 Power Circuit" for operation sequence. The NCIF register do not have this function.	
	MB output (MBO)	22P (OUT0)	This signal is to output holding brake control. See "Chapter 2 Power Circuit" for operation sequence. The NCIF register do not have this function.	
Pulse output / differen- tial output	(APD) (/APD) (BPD) (/BPD) (ZPD) (/ZPD)	20P (APD) 21P (/APD) 22P (BPD) 23P (/BPD) 24P (ZPD) 25P (/ZPD)	Output data defaults to current value AB phase pulse output. Use UP-17 and UP-18 for selecting an output type. When UP-18 is set to □□□6, the value for NCIF register Q*□□POUTR is output in pulse output.	Differential output equivalent to AM26LS31 ?? Vout: 3 V (TYP) 2 V (MIN) On 20 mA output

5-7-3. User Parameter

Symbol	Name	Unit	Setting range	1Factory setting	1Function
UP01 	Control mode	None	0 - 31	31	This parameter defaults to 31 in the NCBOY mode on factory shipment.
UP02 	Motor code	None	0 - 64999	00000	This parameter is for setting a motor type for operation with a motor code. A motor code consists of a motor number and a sensor number. See the combination table for details.
UP03 	Resolver cable length	1 m	1 - 120	5	This parameter sets a cable length when a resolver is used as the motor sensor. When another type of motor sensor is specified, this setting is ignored.
UP04 	Electronic gear numerator	1 pulse	1 - 65535	1	This parameter is for setting an amount of motor rotation per command traveling distance. Calculate the number of pulses corresponding to NC parameter NP005 (minimum setting unit) for NCBOY. Express the obtained number in the form of fraction and place UP05 and UP04 as the denominator and numerator respectively. Pulses per minimum setting unit = $\frac{\text{Minimum setting unit} \times \text{split}}{\text{countTraveling distance per motor rotation}}$ (Example: ball screw pitch x deceleration ratio) Split count: 24000 for resolver, 131072 for 17-bit serial encoder
UP05 	Electronic gear denominator		1 - 65535	1	
UP06	Zero point shift amount	0.01 degrees	0.00 - 360.00	0.00	This parameter is for setting a phase shift amount of the motor axis zero point pulse with an angle. When a resolver is used as the motor sensor, one motor rotation generates two zero point pulses. Set this parameter assuming one motor rotation makes 360 degrees.
UP07	In-position width	1 pulse	1 - 65535	50	The in-position signal (Q*□□NP) turns ON when the deviation amount during position control falls below the level set with this parameter. Specify a value in terms of motor sensor pulses.
UP08	Current limit value	0.1%	0.0 - 100.0	100.0	Not used. (Set on NCBOY.)
UP09	Software start acceleration time	0.001 s	0.000 - 65.535	0.000	Not used. (Set on NCBOY.)
UP10	Software start deceleration time	0.001 s	0.000 - 65.535	0.000	Not used. (Set on NCBOY.)
UP11	S-shaped acceleration/deceleration time	0.001 s	0.000 - 65.535	0.000	Not used. (Set on NCBOY.)
UP12 	ABS mode	None	00 - 12	00	Use this parameter to specify the coordinate clear mode to the ABS sensor and if the ABS sensor is used or not. Specify these items using two digits each individually. Even when the ABS sensor is used, selecting not to use the ABS sensor disables the battery alarm, zero point memorization management, and multi-revolution management functions and it serves as the incremental sensor. Digit position of one: Set the coordinate clear mode to 0 for clearing all. Set to 1 for clearing the rotation count only. Set to 2 to prohibit clearance. Digit position of ten: Set the ABS mode to 0 for disabling the ABS sensor. Set to 1 to use the ABS sensor.
UP03 	Holding brake operation	None	0 - 1	1	Use this parameter to specify the holding brake operation. Set to 0 for starting deceleration immediately and applying brake when the brake is turned ON and the rotation count is below the speed set with UP-14. Set to 1 to decelerate according to the currently set deceleration curve and turn ON the brake. Apply brake at a speed lower than the rotation count specified with UP-14. The holding brake will be applied exceptionally when an alarm is issued or PON is turned OFF.
UP14	Brake ON revolution rate	0.1%	0.0 - 100.0	10.0	Use this parameter to specify a motor rotation rate where the holding brake is turned ON. This parameter is for avoiding to use the holding brake instead of the speed control brake and the holding brake applies only when the motor rotation rate is below the rate specified with this parameter. Assume the maximum rpm as 100%.

UP15	Analog command polarity	None	00 - 11	00	This parameter is for setting the analog input polarity. Specify these items using two digits each individually. Digit position of one: Set the analog input A to 0 for non-inverse. Set the polarity to 1 for inverse rotation. Digit position of ten: Set the analog input B to 0 for non-inverse. Set the polarity to 1 for inverse rotation.
UP16	Pulse command type	None	00 - 12	00	This parameter is for setting the type and polarity of the input pulse. Specify these items using two digits each individually. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Set the type to 2 for setting forward/reverse signal. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP17	Pulse output type	None	00 - 11	01	This parameter is for setting the pulse output type in the case the digit position of one for UP18 is set to 0, 4, or 6. Use two digits for setting. Digit position of one: Set the type to 0 for setting forward/reverse pulse. Set the type to 1 for setting AB phase pulse. Digit position of ten: Set the polarity to 0 for non-inverse rotation. Set the polarity to 1 for inverse rotation.
UP18	Differential output type	None	0000 - 6635	0000	Use this parameter for setting a differential output type in four digits. Digit position of one: Set output selection to 1 for pulse output (current value). Set output selection to 1 for DPA-80 output. Set output selection to 2 for current value output. Value 3 is not defined. Set output selection to 4 for pulse output (command value). Value 5 is not defined. Set output selection to 6 for userpulse output.* Digit position of ten: current value serial data output type Set the digit to 0 for 32 bits. Set the digit to 1 for 23 bits plus parity. Set the digit to 2 for 24 bits plus parity. Set the digit to 3 for 31 bits plus parity. Digit position of one hundred: Display data while monitor switch-over is ON. Digit position of one thousand: Display data while monitor switch-over is OFF. Set to 0 for motor count. Set to 1 for current value. Set to 2 for motor current. Set to 3 for electro-thermal value. Set to 4 for motor phase amount (machine angle). Set to 5 for machine speed.
UP19	Position control polarity 	None	0 - 1	0	This parameter is for setting the relationship between the motor rotation direction and the coordinate increasing direction. Set the parameter to 0 for coordinate increase with motor forward run. Set the parameter to 1 for coordinate increase with motor reverse run.
UP20	Draw multiplication rate	None	0 - 2	0	Not used.
UP21	External reverse current absorption resistance value	0.1 Ohm	0 - 100.0	0.0	Use this parameter when using external counter current absorption resistance. Set to 0 for internal counter current absorption resistance.
UP22	External counter current absorption resistance capacity	0.01 kW	0.00 - 327.67	0.00	Set a external counter current absorption resistance capacity. Set to 0 for internal counter current absorption resistance.

UP23	Common power supply mode	0000 - 1112		0000	Use this parameter for setting usage condition for sharing the PN power source with four digits. Please contact the manufacturer or its agent before starting sharing the power source. Digit position of one: Set reverse current absorption monitor to 0 for detecting AL-9 and AL-10. Set reverse current absorption monitor to 1 for setting AL-9 and AL-10 unavailable. ?? Set reverse current absorption monitor to 2 for setting AL-10 unavailable. ?? Digit position of ten: Set the counter current absorption capacity to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of ten: Set the main power supply monitor to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable. Digit position of thousand: Set the self-discharge function to 0 for setting the function available. Set the self-discharge function to 1 for setting the function unavailable.
UP24	Primary feed speed	0.01%	0.00 - 327.67	100.0	Not used.
UP25	Secondary feed speed	0.01%	0.00 - 327.67	50.00	Not used.
UP26	Third feed speed	0.01%	0.00 - 327.67	25.00	Not used.
UP27	Fourth feed speed	0.01%	0.00 - 327.67	12.50	Not used.
UP28	Stop detection rpm	1 rpm	1 - 32767	50	The stop detection signal (Q*□□STA) turns ON when a motor count falls below the level specified with this parameter. When the stop detection signal turns ON, the gain drop during stoppage function also works.
UP29	Speed reach rpm	1 rpm	0 - 32767	3000	In the speed control mode (VELM) or current control mode (CURM), the specified speed acquired signal (Q*□□SAR) turns ON when the motor rotation rate reaches the range specified with UP29 +/- UP30. If you set the parameter to 0, the specified speed acquired signal turns ON when the speed reaches the command rotation rate at that time with the positive and negative tolerance specified with UP30. (In the position control mode, the command speed calculated from the position command pulses is assumed as the command rotation rate.)
UP30	Specified speed range	1 rpm	1 - 10000	50	This parameter is for setting the detection range allowance of the specified speed detection signal (Q*□□SAR). Once the actual motor count enters the range specified with UP29 +/- UP30, the specified speed signal turns ON.
UP31	Motor test rpm	1 rpm	1 - 10000	50	This parameter is for specifying a rotation rate for motor test run.
UP32	Undefined				
UP33	Undefined	1 s	1 - 60	30	This parameter is for setting a time constant for effective load factor calculation.
UP34	Limit switching-over method	None	000 - 121	011	Not used.
UP35	Speed limit value	1 rpm	1 - 4000	4000	Not used.
UP36	Forward drive current limit value	0.1%	0.0 - 100.0	100.0	Not used.
UP37	Forward run absorption current limit value	0.1%	0.0 - 100.0	100.0	Not used.
UP38	Reverse run drive current limit value	0.1%	0.0 - 100.0	100.0	Not used.
UP39	Reverse run absorption current limit value	0.1%	0.0 - 100.0	100.0	Not used.
UP40	Drive absorption detection width	0.1%	0.0 - 100.0	5.0	Not used.

UP41	Display magnification rate numerator	None	1 - 65535	1	This parameter is for setting multiplication rate of data to be displayed on the external display (DPA80). This parameter is used for machine speed, machine coordinate current value, machine coordinate command value, etc. It's also used for machine speed (F) display on the display operation unit.
UP42	Display magnification rate denominator	None	1 - 65535	1	$\left[\begin{array}{l} \text{Machine coordinate current value} \\ \text{Machine speed} \\ \text{machine coordinate command value} \end{array} \right] = \left[\begin{array}{l} \text{Current value} \\ \text{Motor rotation rate} \\ \text{Command value} \end{array} \right] \times \frac{\text{UP41}}{\text{UP42}}$
UP43	Display decimal point position	None	0 - 7	0	This parameter is for setting a decimal point position for the external display (DPA80). Set to 0 when no decimal point is used. Set to 1 for the lowest digit. Set to 2 for the second lowest digit. Set to 7 for the seventh digit from the right. The value is used for machine speed, current value, command pulse, etc. The decimal point is fixed to the second digit for motor current and motor phase. The decimal point is not displayed on the display.
UP44	Sequence input inverting ??	None	00 to FF	00	Not used.
UP45	Sequence output reversing	None	00 - 1F	00	Not used.
UP46	Sequence I/O selection	None	Not used.	0	Not used.
UP47	In-position timer	1 ms	0 - 2000	20	This parameter is for setting the minimum ON duration (OFF delay time) for in-position.
UP48	Electronic gear multiplication rate	1 time	1 - 100	1	Use the parameter when the magnification rate is too low with the electronic gear setting. This magnification rate change setting is prepared for the case where the sensor split count becomes too great compared with the external command pulse frequency. ??
UP49	VMOUT output selection	None	000 - 399	0000	This parameter is for setting output data and output type of analog output A. The digit positions of ten and one show VMOUT output data. Set the parameter to 0 for detected speed (filter output). Set the parameter to 1 for detected current (filter output). Set the parameter to 2 for current value (after processing with the electronic gear). Set the parameter to 3 for current value (sensor pulse). Set the parameter to 4 for a differential (after processing with the electronic gear). Set the parameter to 5 for a differential (sensor pulse). Set the parameter to 6 for speed command. Set the parameter to 7 for current command. Set the parameter to 8 for position command (speed command conversion value). Set the parameter to 9 for motor phase. Set the parameter to 10 for detected speed (without filter). Set the parameter to 11 for detected current (without filter). Set the parameter to 12 for the BL value. Set the parameter to 13 for the OL value. Set the parameter to 14 for the RL value. Set the parameter to 15 for fin temperature. Set the parameter to 16 for a speed differential. Set the parameter to 17 for a current differential. The digit position of one hundred shows output types. Set the parameter to 0 for non-inversion output. Set the parameter to 1 for inversion output. Set the parameter to 2 for absolute value output. Set the parameter to 3 for no inversion without a cramp. The digit position of one thousand shows functional selection. Set the parameter to 0 for amplifier standard function. Set the parameter to 1 for user data (Setting to Q*□□SBA allows user specified analog amount output.)

UP50	VMOUS output scale	0.1	0.1 - 3276.7	300.0	This parameter is for setting an output scale for analog output A. Example: Set to 2.0 when specifying 2 A per monitor output voltage 1 V. Scales may be set in the following ranges for each data type based on 2.0 A / 1 V. Speed: 0.1 to 3276.7 rpm/V Current: 0.1 to 3276.7 A/V Pulse: 0.1 to 3276.7 P/V Voltage: 0.1 to 3276.7 V/V Angle: 0.1 to 3276.7 deg./V Percentage: 0.1 to 3276.7 %/V Temperature: 0.1 to 3276.7 deg. (Celsius)/V User data: 0.1 to 3276.7/V																																													
UP51	AMOUT output selection	None	000 - 399	0001	This parameter is for setting output data and output type of analog output B. Refer to UP49 for the detailed setting. (Q*□□SBB for user data)																																													
UP52	AMOUT output scale	0.1	0.1 - 3276.7	5.0	This parameter is for setting an output scale for analog output AMOUT. ?? Refer to UP50 for the detailed setting.																																													
UP55	VLBUS-V operation confirmation setting	None	0 - 3	0	This parameter is used for examining the VLBus-V operation state. Set to 0 normally. The operating state is checked using AL28 (Link error occurrence check). Set the parameter to 0 for standard setting. Set the parameter to 1 for operation check high level (for maintenance). Set the parameter to 2 for operation check medium level (for maintenance). Set the parameter to 3 for operation check low level (for maintenance).																																													
 UP56	Rotating coordinate setting (upper)	Pulse	9999	0	This parameter is for setting one rotation distance on the coordinate system. Set this parameter to 0 when using on the linear coordinate system. When the machine system keep rotating in the same direction forever, set the rotating coordinate system to avoid "command counter over." When the absolute positioning is applied to the rotating coordinate system, determine the positioning direction based on the value of the Q*□□REVC register. Set REVC to 0 for shorter access. Set REVC to 1 for the constant positive positioning direction. Set REVC to 2 for the constant negative positioning direction.																																													
 UP57	Rotating coordinate setting (lower)	Pulse	9999	0																																														
 UP58	LS function selection	None	00 - 32	0	This parameter is for selecting limit input (HLS and SKIP1 through 4) and the brake to be used. The digit position of one: Limit input selection <table><tr><td></td><td>IN 1</td><td>IN 2</td><td>IN 3</td><td>IN 4</td></tr><tr><td>☐0</td><td>General purpose</td><td>General purpose</td><td>General purpose</td><td>General purpose</td></tr><tr><td>☐2</td><td>SKIP 1</td><td>LOTM</td><td>LOTP</td><td>HLLS</td></tr><tr><td>☐3</td><td>SKIP 1</td><td>SKIP 2</td><td>SKIP 3</td><td>SKIP 4</td></tr></table> The digit position of ten: Brake selection <table><tr><td></td><td>IN 4</td><td>IN 5</td><td>IN 6</td><td>IN 7</td></tr><tr><td>0☐</td><td>General purpose</td><td>General purpose</td><td>General purpose</td><td>General purpose</td></tr><tr><td>1☐</td><td>DB 1</td><td>General purpose</td><td>General purpose</td><td>DB 0</td></tr><tr><td>2☐</td><td>General purpose</td><td>MB 1</td><td>MB 0</td><td>General purpose</td></tr><tr><td>3☐</td><td>DB 1</td><td>MB 1</td><td>MB 0</td><td>DB 0</td></tr></table>		IN 1	IN 2	IN 3	IN 4	☐ 0	General purpose	General purpose	General purpose	General purpose	☐ 2	SKIP 1	LOTM	LOTP	HLLS	☐ 3	SKIP 1	SKIP 2	SKIP 3	SKIP 4		IN 4	IN 5	IN 6	IN 7	0 ☐	General purpose	General purpose	General purpose	General purpose	1 ☐	DB 1	General purpose	General purpose	DB 0	2 ☐	General purpose	MB 1	MB 0	General purpose	3 ☐	DB 1	MB 1	MB 0	DB 0
	IN 1	IN 2	IN 3	IN 4																																														
☐ 0	General purpose	General purpose	General purpose	General purpose																																														
☐ 2	SKIP 1	LOTM	LOTP	HLLS																																														
☐ 3	SKIP 1	SKIP 2	SKIP 3	SKIP 4																																														
	IN 4	IN 5	IN 6	IN 7																																														
0 ☐	General purpose	General purpose	General purpose	General purpose																																														
1 ☐	DB 1	General purpose	General purpose	DB 0																																														
2 ☐	General purpose	MB 1	MB 0	General purpose																																														
3 ☐	DB 1	MB 1	MB 0	DB 0																																														
UP59	LS function reversing selection ??	None	0 - FF		This parameter is for setting the limit input logical inversion in the case the digit position of one for UP58 is set to 1 or 2. Bit 1: SKIP1 inversion selection (0: positive logic, 1: negative logic) Bit 2: SKIP2 or LOTM inversion selection (0: positive logic, 1: negative logic) Bit 3: SKIP3 or LOTP inversion selection (0: positive logic, 1: negative logic) Bit 6: SKIP3 or HLLS inversion selection (0: positive logic, 1: negative logic)																																													
UP60	Zero point stop system	None	0 - 3	0	This parameter is for setting the zero point setting method. 0: Stop at the first motor zero point after HLLS (1 to 0). 1: Stop at the first motor zero point after HLLS (0 to 1). 2: Stop at the HLLS (0 to 1) edge. 3: Stop at the HLLS (1 to 0) edge.																																													
UP61	Undefined																																																	

UP62	Undefined				
UP63	Undefined				
UP64	Draw value	UP20	0 - 32767	0	Not used.

5-7-4. Amplifier I/O allocation table

The I/O addresses of the 32-axis servo amplifier used for general purpose I/O are allocated as shown in the table below.

IN0 is fixed to PON (main circuit power supply ON). This can be used as a monitor from NCBOY.

	Axis 0	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7
IN0	I900	I908	I910	I918	I920	I928	I930	I938
IN1	I901	I909	I911	I919	I921	I929	I931	I939
IN2	I902	I90A	I912	I91A	I922	I92A	I932	I93A
IN3	I903	I90B	I913	I91B	I923	I92B	I933	I93B
IN4	I904	I90C	I914	I91C	I924	I92C	I934	I93C
IN5	I905	I90D	I915	I91D	I925	I92D	I935	I93D
IN6	I906	I90E	I916	I91E	I926	I92E	I936	I93E
IN7	I907	I90F	I917	I91F	I927	I92F	I937	I93F
OUT0	O900	O908	O910	O918	O920	O928	O930	O938
OUT1	O901	O909	O911	O919	O921	O929	O931	O939
OUT2	O902	O90A	O912	O91A	O922	O92A	O932	O93A
OUT3	O903	O90B	O913	O91B	O923	O92B	O933	O93B
OUT4	O904	O90C	O914	O91C	O924	O92C	O934	O93C

	Axis 8	Axis 9	Axis 10	Axis 11	Axis 12	Axis 13	Axis 14	Axis 15
IN0	I940	I948	I950	I958	I960	I968	I970	I978
IN1	I941	I949	I951	I959	I961	I969	I971	I979
IN2	I942	I94A	I952	I95A	I962	I96A	I972	I97A
IN3	I943	I94B	I953	I95B	I963	I96B	I973	I97B
IN4	I944	I94C	I954	I95C	I964	I96C	I974	I97C
IN5	I945	I94D	I955	I95D	I965	I96D	I975	I97D
IN6	I946	I94E	I956	I95E	I966	I96E	I976	I97E
IN7	I947	I94F	I957	I95F	I967	I96F	I977	I97F
OUT0	O940	O948	O950	O958	O960	O968	O970	O978
OUT1	O941	O949	O951	O959	O961	O969	O971	O979
OUT2	O942	O94A	O952	O95A	O962	O96A	O972	O97A
OUT3	O943	O94B	O953	O95B	O963	O96B	O973	O97B
OUT4	O944	O94C	O954	O95C	O964	O96C	O974	O97C

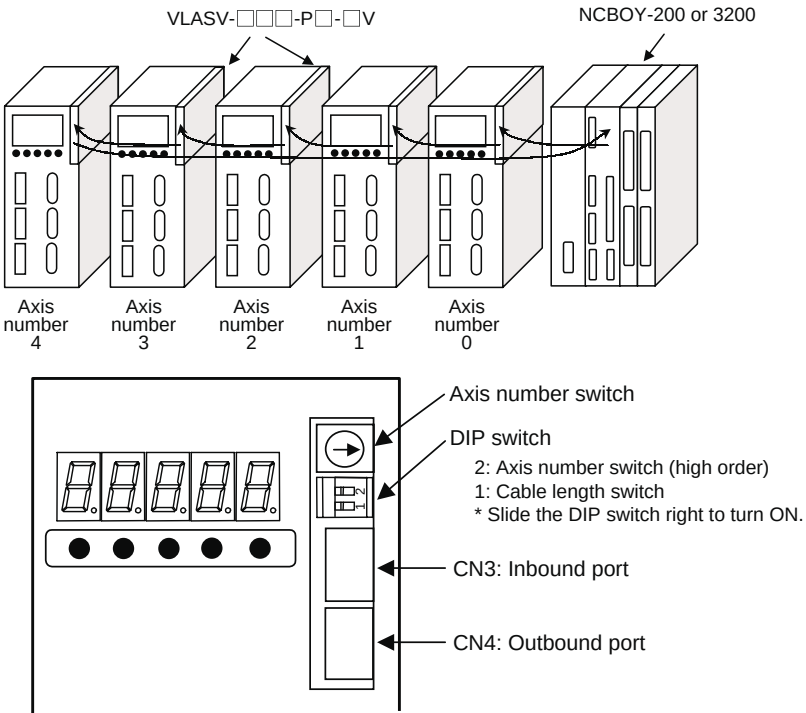
	Axis 16	Axis 17	Axis 18	Axis 19	Axis 20	Axis 21	Axis 22	Axis 23
IN0	I980	I988	I990	I998	I9A0	I9A8	I9B0	I9B8
IN1	I981	I989	I991	I999	I9A1	I9A9	I9B1	I9B9
IN2	I982	I98A	I992	I99A	I9A2	I9AA	I9B2	I9BA
IN3	I983	I98B	I993	I99B	I9A3	I9AB	I9B3	I9BB
IN4	I984	I98C	I994	I99C	I9A4	I9AC	I9B4	I9BC
IN5	I985	I98D	I995	I99D	I9A5	I9AD	I9B5	I9BD
IN6	I986	I98E	I996	I99E	I9A6	I9AE	I9B6	I9BE
IN7	I987	I98F	I997	I99F	I9A7	I9AF	I9B7	I9BF
OUT0	O980	O988	O990	O998	O9A0	O9A8	O9B0	O9B8
OUT1	O981	O989	O991	O999	O9A1	O9A9	O9B1	O9B9
OUT2	O982	O98A	O992	O99A	O9A2	O9AA	O9B2	O9BA
OUT3	O983	O98B	O993	O99B	O9A3	O9AB	O9B3	O9BB
OUT4	O984	O98C	O994	O99C	O9A4	O9AC	O9B4	O9BC

	Axis 24	Axis 25	Axis 26	Axis 27	Axis 28	Axis 29	Axis 30	Axis 31
IN0	I9C0	I9C8	I9D0	I9D8	I9E0	I9E8	I9F0	I9F8
IN1	I9C1	I9C9	I9D1	I9D9	I9E1	I9E9	I9F1	I9F9
IN2	I9C2	I9CA	I9D2	I9DA	I9E2	I9EA	I9F2	I9FA
IN3	I9C3	I9CB	I9D3	I9DB	I9E3	I9EB	I9F3	I9FB
IN4	I9C4	I9CC	I9D4	I9DC	I9E4	I9EC	I9F4	I9FC
IN5	I9C5	I9CD	I9D5	I9DD	I9E5	I9ED	I9F5	I9FD
IN6	I9C6	I9CE	I9D6	I9DE	I9E6	I9EE	I9F6	I9FE
IN7	I9C7	I9CF	I9D7	I9DF	I9E7	I9EF	I9F7	I9FF
OUT0	O9C0	O9C8	O9D0	O9D8	O9E0	O9E8	O9F0	O9F8
OUT1	O9C1	O9C9	O9D1	O9D9	O9E1	O9E9	O9F1	O9F9
OUT2	O9C2	O9CA	O9D2	O9DA	O9E2	O9EA	O9F2	O9FA
OUT3	O9C3	O9CB	O9D3	O9DB	O9E3	O9EB	O9F3	O9FB
OUT4	O9C4	O9CC	O9D4	O9DC	O9E4	O9EC	O9F4	O9FC

5-7-5. Setting axis numbers

With NCBOY-200 and 3200, the servo amplifier needs a number allocated to each axis. Optical cable is used for connection with the servo amplifier and the switch must be adjusted to the cable length used. See the illustration below for switching. (The maximum optical cable length is 20 m.)

Axis numbers should be in the range between 0 and the number obtained by subtracting 1 from the total axis number.) The numbers should be sequential. If a number is skipped as 0,1,3 or the same number is used twice, an error will be issued. Axis numbers do not need to correspond with the cable connecting order.



Switch setting for axis numbers

Axis number	Axis number switch	DIP switch 2	Axis number	Axis number switch	DIP switch 2
0	0	OFF	16	0	ON
1	1	OFF	17	1	ON
2	2	OFF	18	2	ON
3	3	OFF	19	3	ON
4	4	OFF	20	4	ON
5	5	OFF	21	5	ON
6	6	OFF	22	6	ON
7	7	OFF	23	7	ON
8	8	OFF	24	8	ON
9	9	OFF	25	9	ON
10	A	OFF	26	A	ON
11	B	OFF	27	B	ON
12	C	OFF	28	C	ON
13	D	OFF	29	D	ON
14	E	OFF	30	E	ON
15	F	OFF	31	F	ON

Note: Turn OFF and ON the power to make axis number settings effective.

Switch setting for cable lengths

Cable length	DIP switch 1
Up to 10 m	OFF
From 10 to 20 m	ON

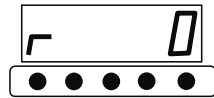
The cable length means the length of a cable for connecting with CN4 (Outbound port).
 * ON the NCBOY side, use the NC parameter NP011 (transfer fiber cable length) for setting.

5-7-6. Confirming axis numbers

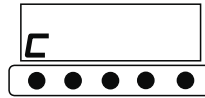
When you have specified axis numbers, check those on the operation display unit.

The figures following An indicate axis numbers. If a figure is flashing, the number is not yet effective and thus turn of the power again.

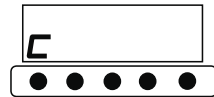
Switch the display to "c."



Press the MODE key.



Display [An - nn].



Press the key four times.



The above display shows that the axis number is set to "3."

5-7-7. Considerations on using optical cable

General specifications

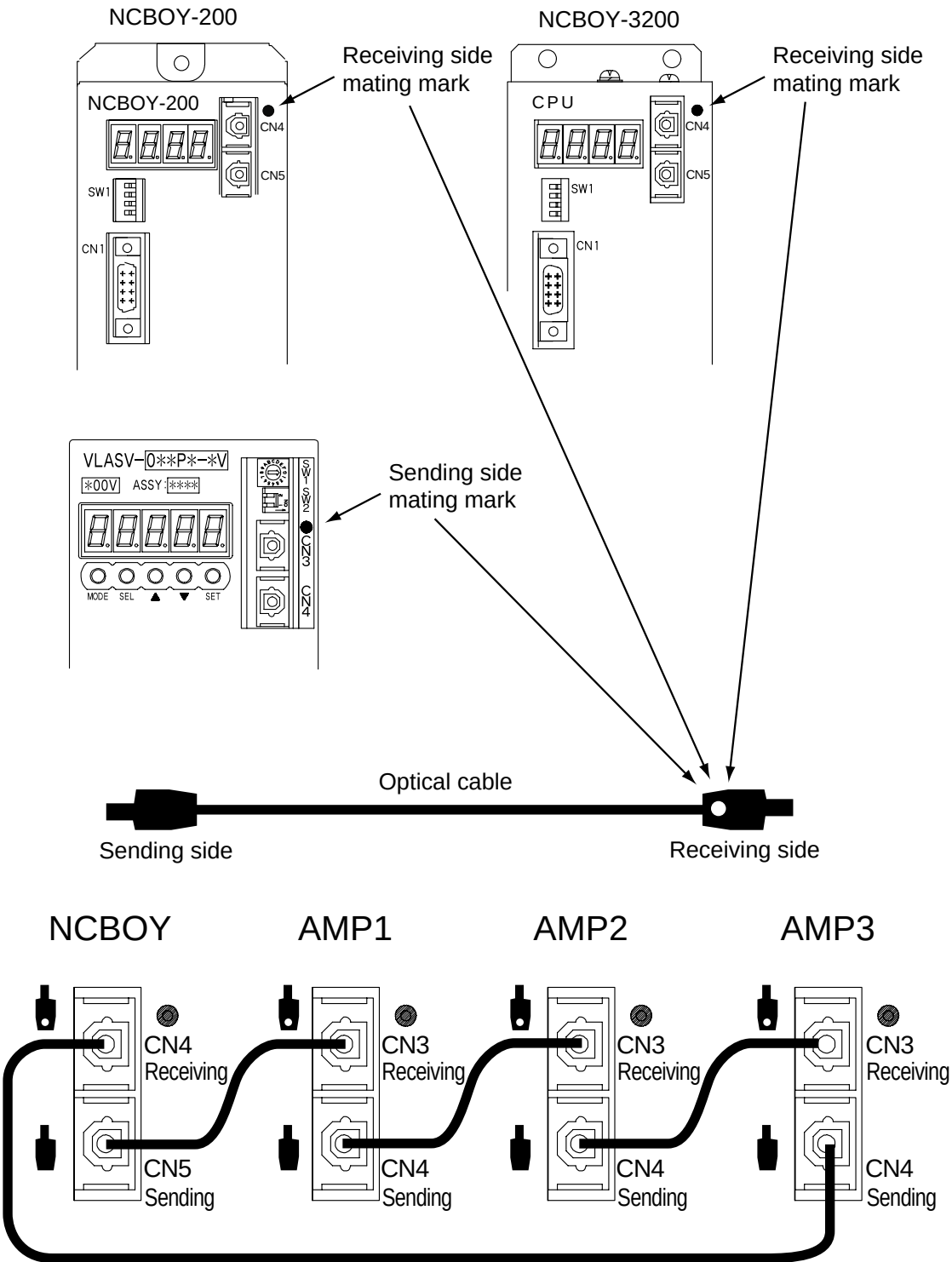
Ambient temperature	0 - 60°C
Yield strength	7 kg
Plug withdraw strength	3 kg
Ambient humidity	35 - 90%RH
Minimum bending radius	50 mm

1. Do not apply force greater than the maximum tensile strength. Application of excessive force will damage or deteriorate the cable.
2. Do not install cable with a radius smaller than the minimum bending radius. Application of excessive force will damage or deteriorate the cable.
3. Do not twist optical fiber cable. Application of stress will damage or deteriorate the cable.
4. If you install optical fiber cable in duct piping or together with other kinds of wiring, contact with plasticizer contained in such piping or wiring may deteriorate the fiber cable's property. Do not keep optical fiber cable in contact with plasticized PVC products.
5. Hold the connector and not the cable when you plug in or out an optical connector. If you unplug a connector by pulling the cable, the cable will be damaged or deteriorated by the strain.
6. If you give optical fiber cable stress or impact by falling something on it, the cable will be damaged or deteriorated.
7. Optical fiber cable will be deteriorated in property in a high temperature/high humidity environment.
8. Side stress on optical fiber cable will damage or deteriorate the property of the cable. Do not tread on fiber cable or fix on the wall or floor too firmly.
9. Do not install optical fiber cable in an environment where it is exposed to sun shine, UV, or X ray because the property may be deteriorated in such an environment.
10. Do not let foods contact with installed optical fiber cable.
11. Optical fiber cable is combustible. Please observe the instructions on temperature and humidity for use or storage.
12. Do not leave dust and dirt attached to an optical fiber cable end or connector that causes property deterioration or damage to the fiber cable.
13. When washing optical fiber cable, use water or diluted detergent.
14. Do not leave thinner attached to optical fibers as the property may be deteriorated or fibers may be damaged.
15. Disposal of optical fiber cable should be handled by a disposal company that has an incinerator for hydrofluoric and chlorine gases.

5-7-8. Connecting optical communication cable

A cable is directional. The receiving end has a mating mark.

The cable length is about the length of cable connected on the sending side.



5-8. Special Sequence

5-8-1. Special Sequence Setting

Each control mode has standard I/O signal allocations. Special sequences are created by customizing these standard allocations. Please note that IN0, OUT3, and OUT4 are allocated to "main circuit ON," "servo ready," and "servo normal" respectively and these allocations may not be changed.

Type Symbol	Special sequence 1 for Mode 01	Special sequence 2 for Mode 01	Special sequence 3 for Mode 02	Special sequence 4 for Mode 03	Special sequence 5 for Mode 03	Special sequence 6 for Mode 04
IN5	Current limit switch-over	MB confirmation	MB confirmation	Current limit switch-over	MB confirmation	MB confirmation
IN4	DB confirmation	DB confirmation	DB confirmation	DB confirmation	DB confirmation	DB confirmation
IN3	Zero command	Monitor switch-over	Monitor switch-over	Current value clear	Current value clear	Current control switch-over
IN2	Current value clear	Current value clear	Current value clear	Deviation value clear	Deviation value clear	Position control switch-over
IN1	Zero point stop	Zero point stop	Speed limit switch-over	Zero point stop	Zero point stop	Limit switch-over
OUT2	Zero point stopped	Zero point stopped	Stop detection	In-position/zero point stopped	In-position/zero point stopped	In-position/zero point stopped
OUT1	DB output	DB output	DB output	DB output	DB output	DB output
OUT0	Warning	MB output	MB output	Warning	MB output	MB output

Type Symbol	Special sequence 7 for Mode 05for Mode 06	Special sequence 8 for Mode 05	Special sequence 9 for Mode 01	Special sequence 10 for Mode 01	Special sequence 11	
IN5	Speed selection 2	MB confirmation	Current limit switch-over	MB confirmation	Zero command	
IN4	DB confirmation	DB confirmation	Speed selection 2	Forward running possible	Forward running possible	
IN3	Speed selection 1	Pulse prohibited	Speed selection 1	Reverse running possible	Reverse running possible	
IN2	Forward running command	Forward running command	Forward running command	Current value clear	Current limit switch-over	
IN1	Reverse running command	Reverse running command	Reverse running command	Zero point stop	Zero point stop	
OUT2	Stop detection	Stop detection	Stop detection	Zero point stopped	Stop detection	
OUT2	DB output	DB output	Warning	Specified speed level	Warning	
OUT0	Warning	MB output	MB output	MB output	Specified speed level	

5-8-2. How to Use Special Sequence

Set the sequence I/O selection parameter UP-46 to special numbers in the above table. Then, specify a value to the control mode parameter Up-01. For example, set UP-46 to 2 and Up-01 to 1 for special sequence 2 for Mode 01.

When you need special sequences other than the combinations in the above table, please consult the manufacturer.

5-8-3. Special Sequence I/O Signal

The following are descriptions on I/O signals that are not allocated to the standard sequences.

Name	Symbol	I/O	Function
Zero command	STP	Input	During the speed command operation, the motor decelerates and stops in the position control mode. The motor receives a pulse command here. In the position control mode, the motor stop ignoring the pulse command. As to the deceleration curve, the S-shaped deceleration parameter UP-11 is effective. This signal is not available for the servo-free state or during operation in the current control mode.
Current limit switch-over	CCD	Input	This signal switches current limit values other than the current limit mode. When this signal is OFF, the motor maximum current serves as the current limit value. When this signal is ON, the switch-over depends on the limit switching-over method parameter UP-34.
DB confirmation	DBIN	Input	This signal inputs the relay contact point output (contact point 'a') for the dynamic brake contactor. It inputs ON when the dynamic brake is released and OFF when the dynamic brake is applied. The servo amplifier is locked by turning ON DB confirmation after turning ON DB output. AL14 will be issued if dynamic brake confirmation turns OFF during servo locking.
Pulse prohibited	PLDI	Input	This signal is used in the draw control mode. Turn ON pulse prohibition to forcefully stop the command pulse to the position loop. Pulse input, draw calculation, and pulse output will keep going without stopping.
Current limited	CLA	Output	This signal turns ON when the current command is limited in the speed and position control modes. An applicable current limit value is determined by the current limit switch-over (CCD) input state and the limit switching-over method parameter UP-34 setting. If the "current limited" signal turns ON, extending acceleration or deceleration time will prevent current limit.
Speed limited	SLA	Output	This signal turns ON when the motor rotation rate is limited in the current limit mode. An applicable speed limit value is determined by the limit switch-over (LCHG) input state and the limit switching-over method parameter UP-34 setting.
Running forward	FOR	Output	This signal turns ON when the servo motor is running forward at a speed exceeding the stop detection rpm.
Running backward	REV	Output	This signal turns ON when the servo motor is running backward at a speed exceeding the stop detection rpm.
Forward running prohibited	FXA	Output	This signal turns ON when the forward running enabling FEN is OFF. A forward running pulse command or speed command is detected in this condition. Therefore the motor may run forward by a current command issued or disturbance occurring during normal operation.
Reverse run prohibited	RXA	Output	This signal turns ON when the reverse running enabling REN is OFF. A backward running pulse command or speed command is detected in this condition. Therefore the motor may run backward by a current command issued or disturbance occurring during normal operation.
Driving	TRQP	Output	This signal turns ON when driving torque is generated with the motor rotation rate over the level specified with the stop detection rpm parameter UP-28 and the motor current over the level specified with the drive absorption detection width parameter UP-40.
Absorbing	TRQM	Output	This signal turns ON when absorbing torque is generated with the motor rotation rate over the level specified with the stop detection rpm parameter UP-28 and the motor current over the level specified with the drive absorption detection width parameter UP-40.
Limit applied	LMT	Output	This signal turns ON while current or speed is limited.
DB output	DBO	Output	This is the output for dynamic brake control. See "Chapter 2 Power Circuit" for operation sequence.
Specified speed level	SAR	Output	This signal turns ON when the motor rotation rate is in the range of the specified speed rpm parameter UP-30 +/- the specified speed allowance parameter UP-30.

5

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6-1. Overview of Auto-tuning

Auto-tuning automatically calculates optimum values for speed loop and the following items in the control system by specifying a target loop gain and a load inertial multiplication rate. A target loop gain is defined by performance requests in the machine system. A load inertia multiplication rate can be calculated at the stage of machine designing. Yet, the servo amplifier can guess a value of load inertia.

Auto-tuning may be conducted in the following four modes:

Standard Mode

Semi-auto Mode

Real Time Mode

Manual Mode

- When adjusting the standard mode, use a rigidly built machine with the least vibration, the load inertia of which is known,
- The semi-auto mode is used when the load inertia is unknown and the inertia needs to be estimated.
- In the real time mode, the load inertia may be estimated during operation.
- In the manual mode, parameters for details such as loop gain and filter should be set manually.

6-1-1. Tuning Parameter

Symbol	Name	Unit	Setting range	Factory setting	Function
TP01 	Tuning mode	None	0 to 6	0	This parameter is for setting the Auto-tuning mode. Set the parameter to 0 for standard mode (for setting target loop gain and load inertia). Set the parameter to 1 for semi-auto mode. Set the parameter to 2 for real time mode. Set the parameter to 3 for manual mode. Set the parameter to 4 for parameter copy mode. The gain for each loop obtained from target loop gains set in the tuning modes 1, 2, and 3 and filter settings are used as initial values for the manual mode. The initial values for the following parameters are to be changed: TP05 through TP14 TS21 through TS24 TP29 through TP32 Turn off and on the machine for switching to the manual mode.
TP02	Target loop gain	1 rad/s	0 to 1000	60	This parameter is for setting a target value of the position loop gain. Even when you are operating in the speed control mode, specify a value to this parameter as a target value for the tuning parameter. This parameter will be a gain for the virtual part.
TP03	Load inertia	0.1 times	0.0 to 200.0	1.0	Specify a value representing an amount of load inertia in terms of a multiplication rate of the motor inertia. This parameter needs to be set when you tune in the standard or manual mode. A value estimated by the servo amplifier is used for this parameter in the semi-auto or real time mode.
TP04	Semi-auto tuning	0.1 r	0.1 to 10.0	2.0	This parameter is for setting allowances for the rotation level for the semi-auto tuning. The value of this parameter is displayed only in the semi-auto tuning mode.
TP05	Speed loop gain	1 rad/s	1 to 6000	360	This parameter is for setting the speed loop gain for the virtual unit and is available only in the manual mode. In other modes auto-tuning is effective and the gain specified in the manual mode is ignored. Auto-tuning operation is set ready with this symbol displayed.
TP06	Speed loop integral gain	1 rad/s	1 to 2000	60	This parameter is for setting the speed loop integral bending point frequency for the virtual unit and is available only in the manual mode. In other modes auto-tuning is effective and the gain specified in the manual mode is ignored.
TP07	A position loop gain	1 rad/s	1 to 1000	60	This parameter is for setting the position loop gain for the actual unit and is available only in the manual mode. In other modes auto-tuning is effective and the gain specified in the manual mode is ignored.
TP08	A speed loop gain	1 rad/s	1 to 6000	360	This parameter is for setting the speed loop gain for the actual unit and is available only in the manual mode. In other modes auto-tuning is effective and the gain specified in the manual mode is ignored.
TP09	A speed loop integral gain	1 rad/s	1 to 2000	60	This parameter is for setting the speed loop integral bending point frequency for the actual unit and is available only in the manual mode. In other modes auto-tuning is effective and the gain specified in the manual mode is ignored.

TP11	Position loop feed forward gain	0.001	0.000 to 1.000	0.000	This parameter is for setting a feed forward gain of the position loop. Feed forward compensation is added to the actual unit with TFC and to the virtual unit without TFC.
TP12	Speed loop feed forward gain	0.001	0.000 to 1.000	0.000	This parameter is for setting a feed forward gain of the speed loop. Feed forward compensation is added to the actual unit with TFC and to the virtual unit without TFC.
TP13	Current loop gain	1 rad/s	1 to 20000	3000	This parameter is for setting the current loop gain only in the manual mode. In other modes auto-tuning is effective and the gain specified in the manual mode is ignored.
TP14	Current loop integral gain	1 rad/s	1 to 20000	600	This parameter is for setting the current loop integral bending point frequency only in the manual mode. In other modes auto-tuning is effective and the gain specified in the manual mode is ignored.
TP15	Gain drop during stoppage	0.0001	0.00 to 100.00	0.00	This parameter is for setting gain drop during stoppage. This parameter is available in all tuning modes. Specify allowances of the stop position deviation assuming the positional deviation amount equivalent to ± 90 degrees on the motor axis as 100.00%. The amplifier suppresses current until the value reaches the specified positional deviation amount.
TP16	Observer type	None	0 to 2	0	This parameter is for setting observer types. This parameter is available in all modes. Set the parameter to 0 when using no observer. Set the parameter to 1 for using the standard torque observer. Set the parameter to 2 for using the inertia system observer.
TP17	Observer gain	1 rad/s	1 to 10000	1	This parameter is for setting a compensation gain for a selected observer. This parameter is available in all modes.

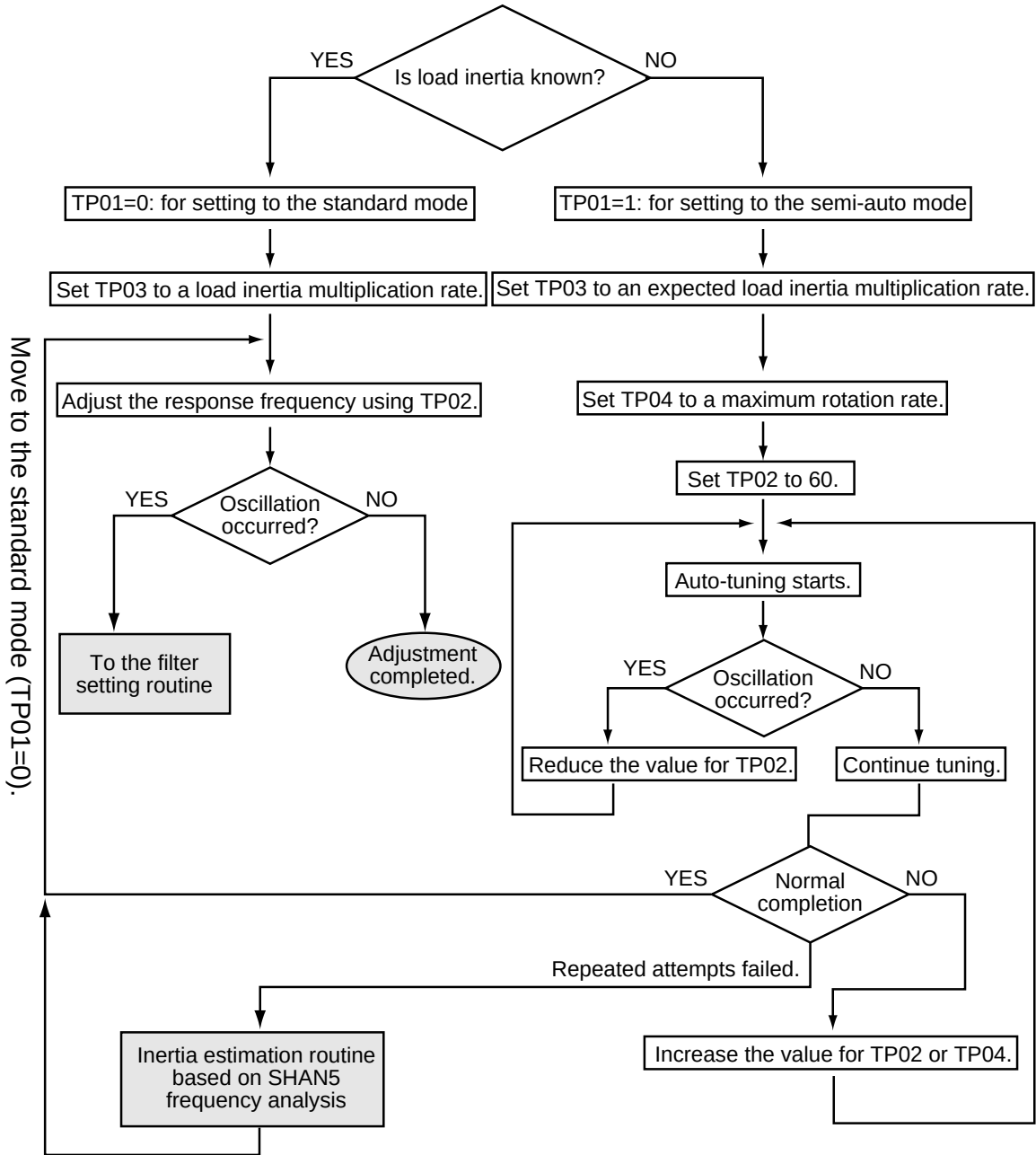
6-1-2. Filter Parameter

These filter parameters are typically used for suppressing resonance of the machine system.

Symbol	Name	Unit	Setting range	Factory setting	Function
TS21	Current command filter 1	None	0 to 5	0	This parameter is for specifying filter types. The following five types are available for selection only in the manual mode. In other modes a primary filter is set by auto-tuning and the gain specified in the manual mode is ignored. Set to 0 when using no filter. Set to 1 when using a primary filter. Set to 2 when using a secondary filter. Set to 3 when using a phase compensation filter. Set to 4 when using a notch filter. Set to 5 when using ??? filter.
TS22	Current command filter 1 attenuation rate	0.001 to 2.000		1.000	Specify an attenuation rate to this parameter when you have selected the secondary, notch, or ??? filter. This setting is ignored with the other filters.
TS23	Current command filter 1 *1	1 rad/s	1 to 20000	20000	Specify filter frequency when you have selected the primary, secondary, notch, or ??? filter. Specify phase delay frequency when you have selected a phase compensation filter.
TS24	Current command filter ???.	1 rad/s	1 to 20000	20000	Specify phase advancing frequency when you have selected a phase compensation filter. This setting is ignored with the other filters.
TS25	Current command filter 2 type	None	0 to 1	0	This parameter is for specifying filter types. This parameter is available in all modes. Set to 0 when using no filter. Set to 1 when using a primary filter.
TS26	Current command filter 2 *1	1 rad/s	1 to 20000	20000	This parameter is for setting the cut-off frequency for the primary filter.
TS29	Speed feedback filter type	None	0 to 5	0	This parameter is for specifying filter types. This parameter is available only in the manual mode. In other modes a primary filter is set by auto-tuning and the filter specified in the manual mode is ignored. Set to 0 when using no filter. Set to 1 when using a primary filter. Set to 2 when using a secondary filter. Set to 3 when using a phase compensation filter. Set to 4 when using a notch filter. Set to 5 when using ??? filter.
TS30	Speed feedback filter attenuation rate	0.001	0.001 to 2.000	1.000	Specify an attenuation rate to this parameter when you have selected the secondary, notch, or ??? filter. This setting is ignored with the other filters.
TS31	Speed feedback filter *1	1 rad/s	1 to 20000	20000	Specify filter frequency when you have selected the primary, secondary, notch, or ??? filter. Specify phase delay frequency when you have selected a phase compensation filter.
TS32	Speed feedback filter *2	1 rad/s	1 to 20000	20000	Specify phase advancing frequency when you have selected a phase compensation filter. This setting is ignored with the other filters.
TS33	Speed command filter type	None	0 to 1	0	This parameter is for specifying filter types. This parameter is available in all modes. Set to 0 when using no filter. Set to 1 when using a primary filter.
TS34	Speed command filter *1	1 rad/s	1 to 20000	20000	This parameter is for setting the cut-off frequency for the primary filter.
TS37	Observer filter type	None	0 to 5	0	This parameter is for specifying filter types. This parameter is available in all modes. Set to 0 when using no filter. Set to 1 when using a primary filter. Set to 2 when using a secondary filter. Set to 3 when using a phase compensation filter. Set to 4 when using a notch filter. Set to 5 when using ??? filter.
TS38	Observer filter attenuation rate	0.001	0.001 to 2.000	1.000	Specify an attenuation rate to this parameter when you have selected the secondary, notch, or ??? filter. This setting is ignored with the other filters.

TS39	Observer filter *1	1 rad/s	1 to 20000	20000	Specify filter frequency wheyn you have selected the primary, secondary, notch, or ??? filter. Specify phase delay frequency when you have selected a phase compensation filter.
TS40	Observer filter *2	1 rad/s	1 to 20000	20000	Specify phase advancing frequency when you have selected a phase compensation filter. This setting is ignored with the other filters.
TS41 	Tuning special setting	None	00 to 11	00	This parameter is for selecting TFC functions and a gain multiplication rates for the actual and virtual units. This parameter is available in all modes. The digit position of one:TFC function selection Set to 0 when not using TFC. Set to 1 when using TFC. The digit position of ten:Gain multiplication rate selection for the actual and virtual units Set to 0 for 0.707 times. Set to 1 for 1,000 times

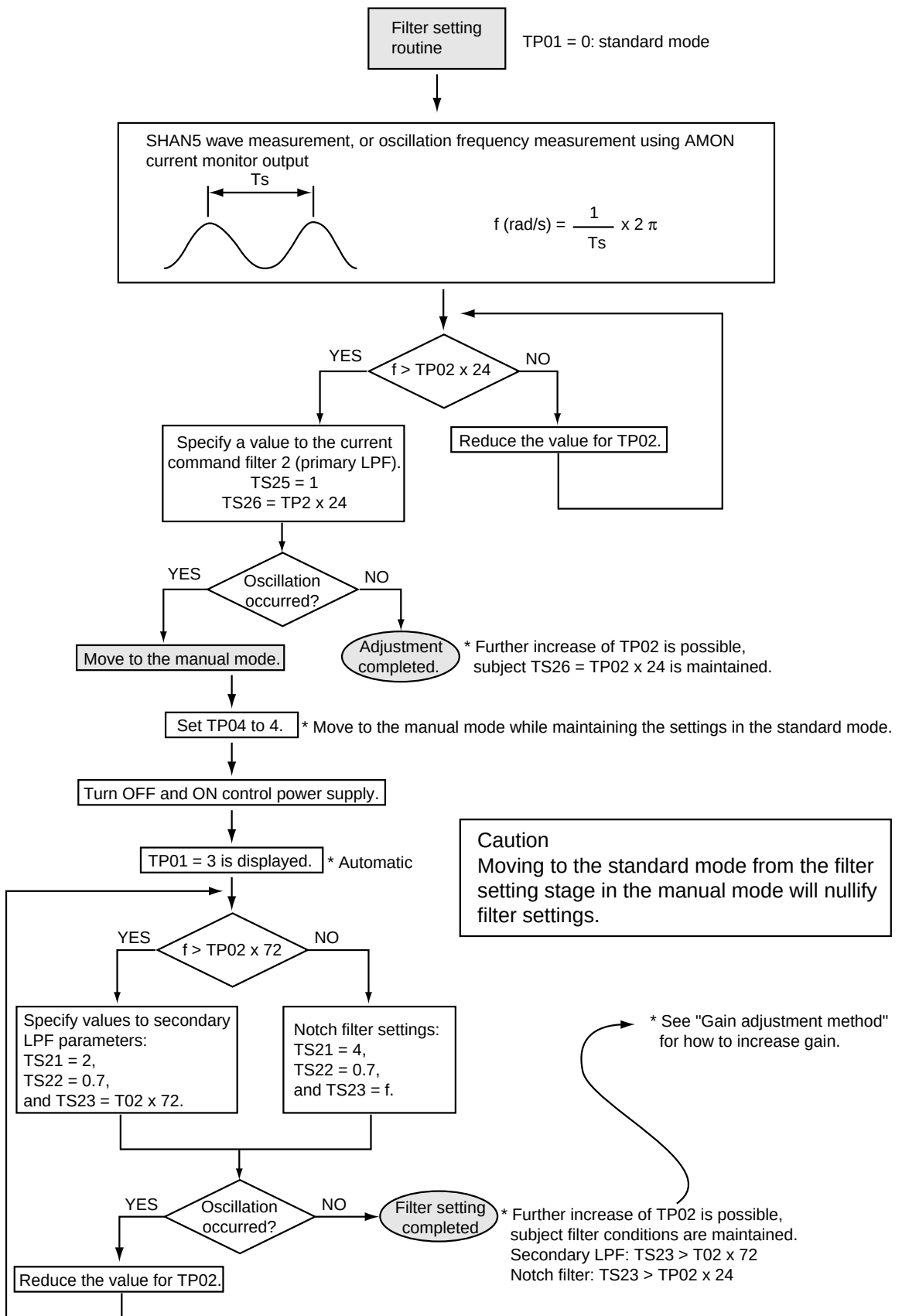
6-1-3. Tuning Flow Chart



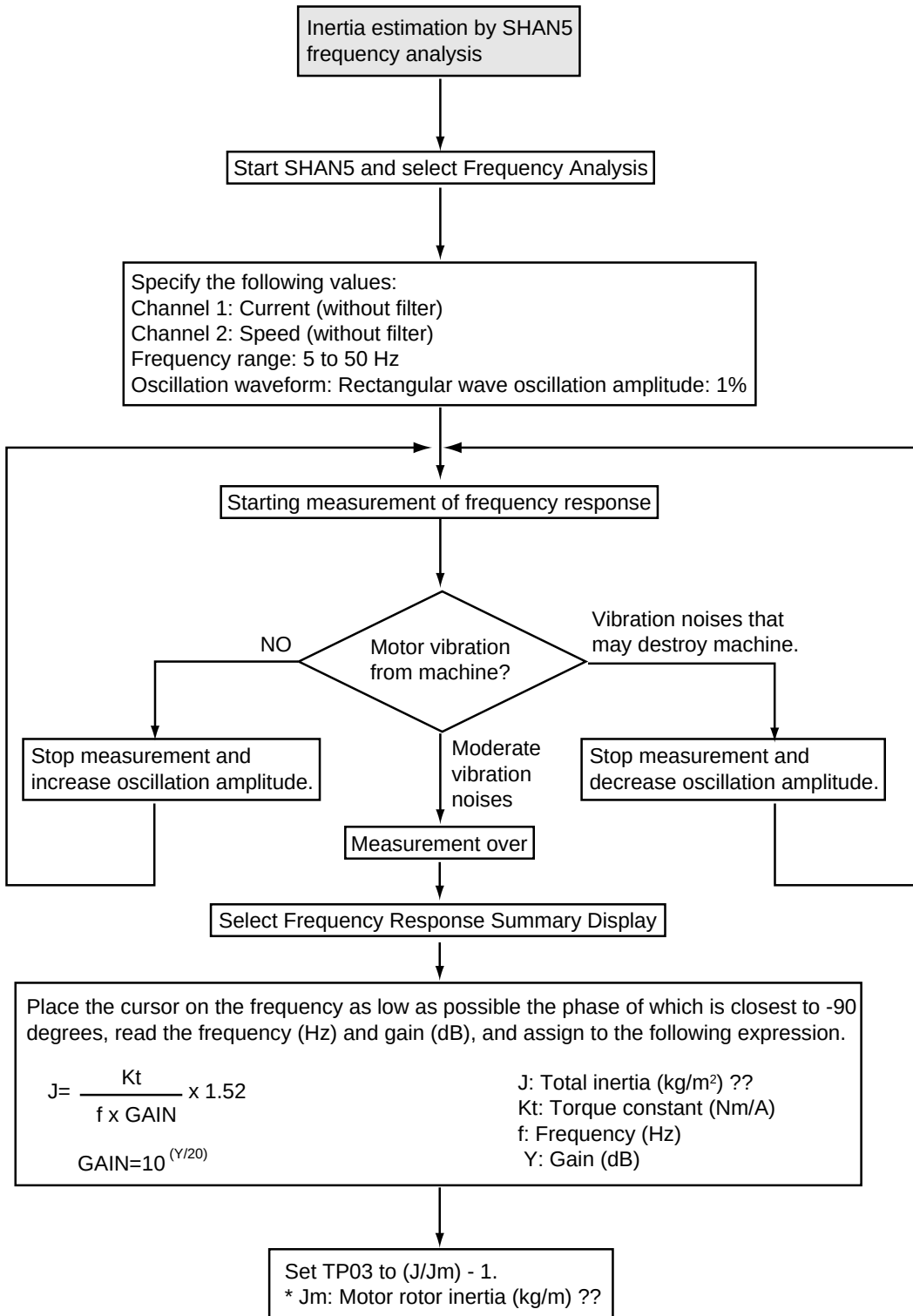
● Gain adjustment methods

In the standard mode, other parameters are automatically calculated based on the TP02 setting. In the manual mode increase or decrease gains maintaining these relationships.

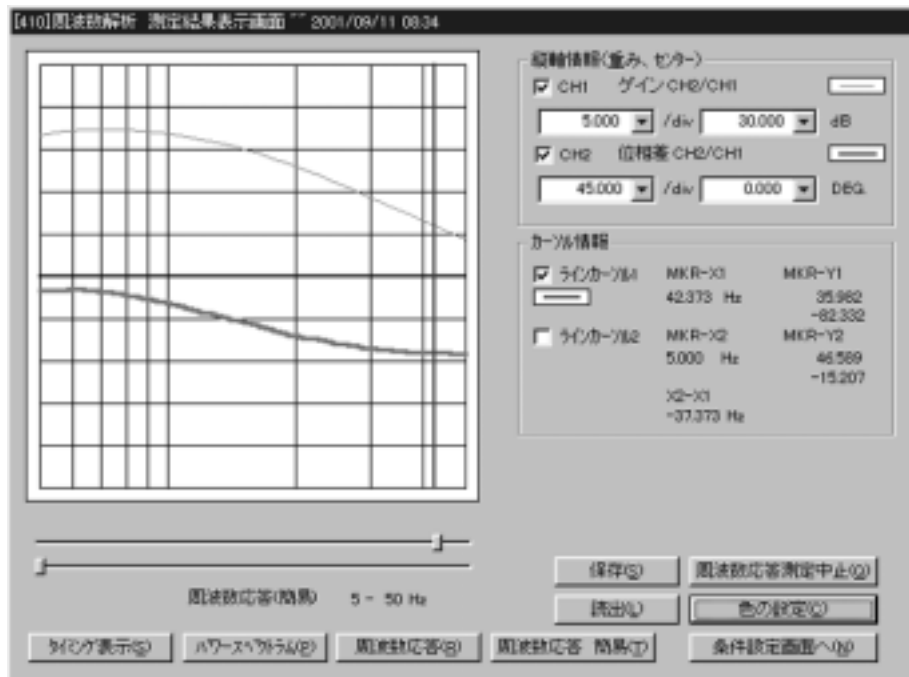
No.	Name	Calculation method
TP02	Target loop gain	Set manually.
TP03	Load inertia multiplication rate	Set in various ways.
TP07	Position loop gain	$TP07 = TP02$
TP08	Speed loop gain	$TP08 = TP02 \times 6$
TP09	Speed loop integral gain	$TP09 = TP02$
TP29	Speed FB filter selection	Set to 1 in the standard mode (primary LPF).
TP31	Speed FB filter frequency	$TP31 = TP02 \times 6 \times 12$



- Inertia estimation method by SHAN5 frequency analysis



SHAN5 Frequency Analysis Window



The figure shows that as the frequency rises, the phase value is getting closer to -90 degrees. Place the cursor at 42 Hz where the phase is fairly close to -90 degrees and read the gain 36.0 dB. Assign the value to the expression and obtain the load inertia multiplication rate (TP03).

$$\text{GAIN} = 10^{(36.0/20)} = 63.1$$

$$J = \frac{0.55}{42 \times 63.1} \times 1.52 = 3.15 \times 10^{-4} \text{ (kg} \cdot \text{m)}$$

$$\text{TP03} = (3.15 \times 10^{-4} / 0.47 \times 10^{-4}) - 1 = 5.7 \text{ (times)}$$

If you select a frequency the phase of which is remote from -90 degrees, an exact value may not be obtained.

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7-2. Specifications

Resolver ABS specifications

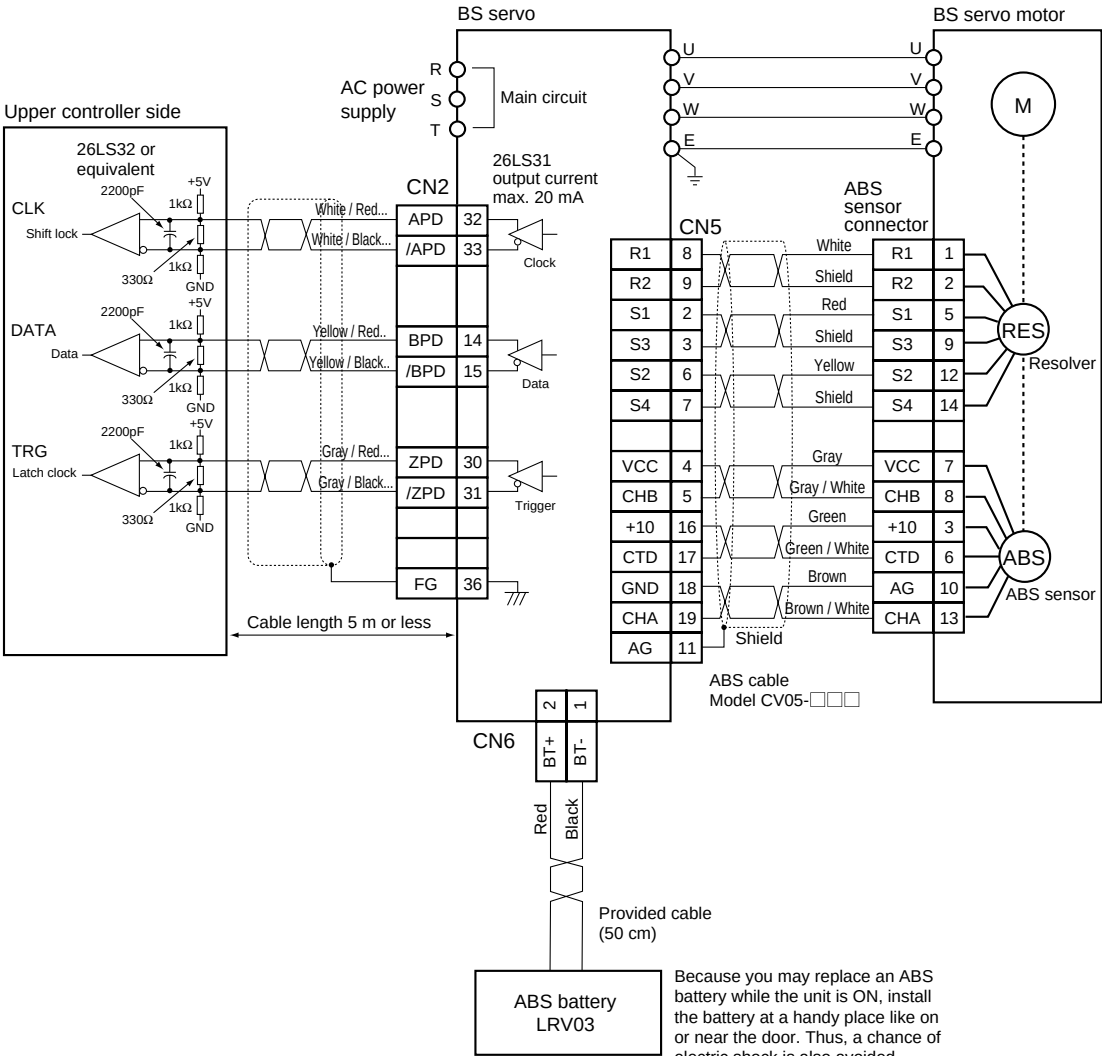
No.	Item	Specifications
1	Type	Magnetic encoder for rotation count with battery backup and resolver
2	Max. rotation count	Counter 16 bits +/- (215-1)
3	Applicable motor	BS servo motor with ABS sensor VLBSV-□□□□□-A
4	Protective function (alarms)	AL06: Resolver broken line, AL13: Resolver ABS battery low voltage, AL19: Abnormal resolver phase, AL22: Abnormal resolver ABS phase, AL23: Resolver ABS broken line, AL24: Battery alarm, AL27: Resolver ABS error, AL32: Zero point unsaved error, AL33: Invalid zero point, AL36: Battery cable broken line, and AL49: Abnormal sensor phase
5	Data output	Selection of 4 serial output types by parameter UP-18
6	Zero point setting	Entry by current value clearance (PCLR) or manual setting from key typing
7	ABS battery	Type LRV03 Alkali AAA battery, 4.5 V, 3-year life

17-bit Serial ABS Specifications

No.	Item	Specifications
1	Type	17-bit serial ABS encoder with battery backup
2	Max. rotation count	Counter 13 bits +/- (212-1)
3	Applicable motor	17-bit serial ABS encoder type BS servo motor VLBSV-□□□□□-S1
4	Protective function (alarms)	AL40: Encoder broken line, AL41: Encoder communication error, AL42: Encoder backup error, AL44: Encoder battery alarm, AL45: Encoder ABS phase error, and AL46: Encoder excessive speed
5	Data output	Selection of 4 serial output types by parameter UP-18
6	Zero point setting	Entry by current value clearance (PCLR) or manual setting from key typing
7	ABS battery	Type LRV03 Alkali AAA battery, 4.5 V, 3-year life

7-3. Wiring

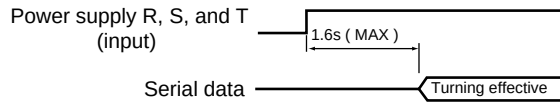
The following diagram shows the system with a resolver used as the motor sensor: 17-bit serial ABS encoder type has the same specifications as the standard type (incremental), except that it needs an LRV03 battery. Absolute data are serially output from CN2. The display unit (DPA-80) may not be used.



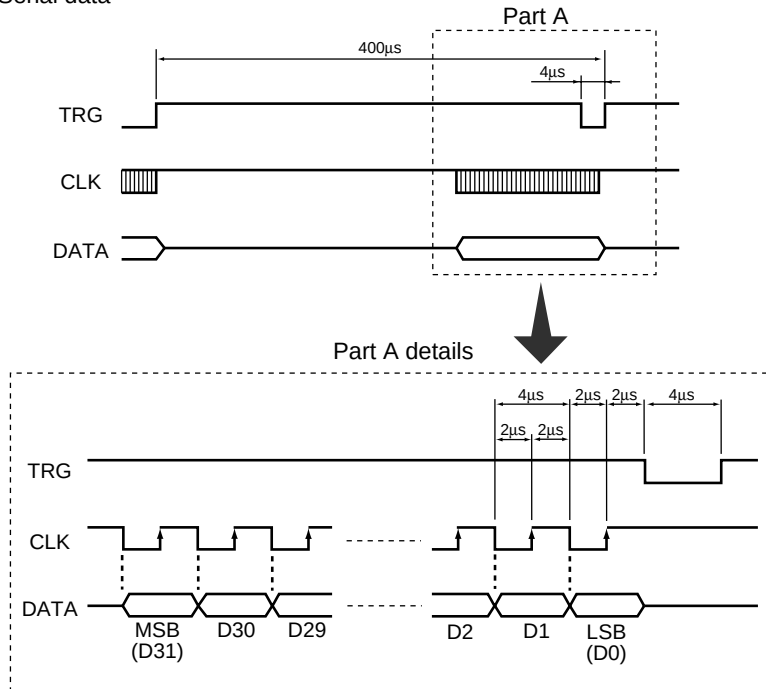
Setting value	Function	Description
0	All clear	This setting clears the rotation count and motor home position on starting.
1	Rotation count clear	This sets an absolute position during one motor rotation and used when moving to a new location.
2	Inhibiting clearance	This nullifies the zero point set and prevents erroneous operation.

7-4. Output Timing

- Turning serial data effective



- Serial data



7-5. Parameter Setting

The following parameters are used for absolute position detection:

- UP-03 □□□: Resolver cable length

This parameter is for setting resolver ABS cable length between the motor and the amplifier with the resolver ABS type. With the encoder type, this parameter is not used.

- UP-04 □□□□□: Electronic gear (numerator)

- UP-05 □□□□□: Electronic gear (denominator)

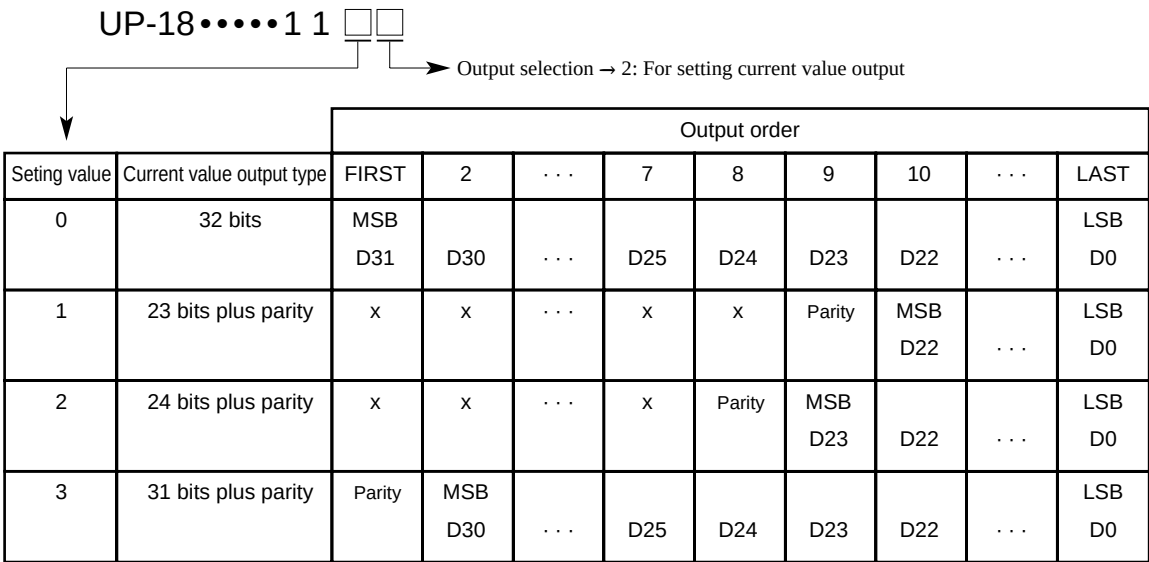
Specify electronic gears to UP-04 (numerator) and UP-05 (denominator) based on the number of pulses per one motor rotation.

- UP-12□□: ABS clearance mode

This parameter has the following two types of clearance functions on the zero point setting and preventing erroneous operation.

Setting value	Function	Description
0	All clear	This setting clears the rotation count and motor home position on starting.
1	Rotation count clear	This sets an absolute position during one motor rotation and used when moving to a new location.
2	Inhibiting clearance	This nullifies the zero point set and prevents erroneous operation.

- Differential output type UP-18□□□□
Set the lowest two digits of UP-18 so that current values are output as binary serial data.

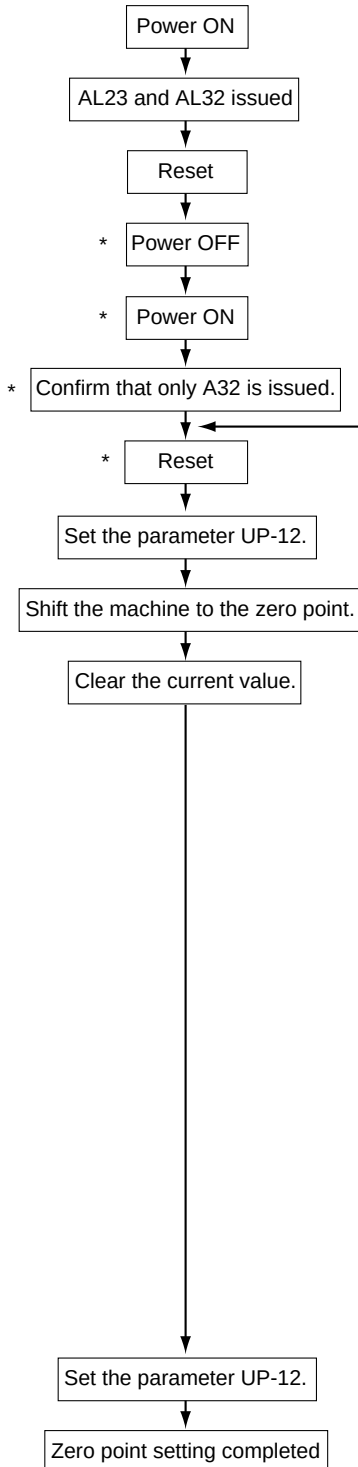


Serial data are output from MSB as described in the above table. Irrespective of current value output type setting, output data are 32 bits and the part marked X in the above table is truncated in a shift register.

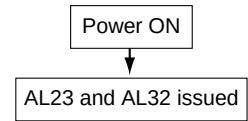
7-6. ABS Value (Current Value) Clearance

When the electronic gear settings are changed or zero point setting is cleared from the memory on starting the machine, perform ABS clearance without fail.

Resolver ABS type



Serial ABS encoder type



AL23: ABS cable broken
AL32: Zero point unsaved error

Press the SET key or use sequence input RST

Make sure that the display is turned off and turn on the power again.

Press the SET key or use sequence input RST

Set the ABS clearance mode to 10 (All clear).

Keep the current value clearance signal PCLR ON for over 30 ms or clear the current value by key operation.

Current value clearance by key operation:

The current value may be cleared from the operation display.

[Step 1] When $\boxed{H}$ or $\boxed{H'}$ (current value) is displayed, press the UP and DOWN keys five seconds while holding down the SEL key to change the display to $\boxed{CLR}$.

[Step 2] Press the SEL and SET keys together to move to the current value clearing mode and the entire $\boxed{CLR}$ display flashes.

[Step 3] Press the SET key to clear the current value and once the current value is cleared $\boxed{CLR}$ display stops flashing. Press the MODE key to cancel the current value clearing mode and $\boxed{CLR}$ display stops flashing.

[Step 4] Double click the MODE key to return to $\boxed{H}$ or $\boxed{H'}$ (current value) display.

Set the ABS clearance mode parameter UP-12 to 12 (Clearance inhibited). Set this parameter without fail for preventing erroneous operation.

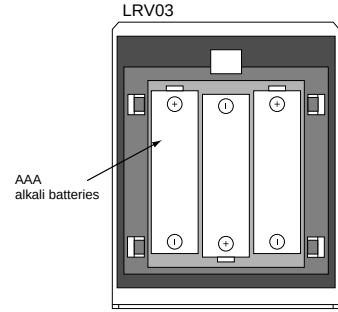
* Skipping a step marked with * will cause AL33 (invalid ABS zero point) error. (Resolver ABS type only)

7-7. Replacement of ABS Battery for Maintaining Absolute Position

- 1) Prepare three AAA batteries (1.5 V).
- 2) Remove the lid of ABS battery LRV03 without turning off the power.
- 3) Remove all batteries.
- 4) Place three new AAA alkali batteries in the case.
- 5) Replace the lid to LRV03.
- 6) Dispose the old batteries according to the local regulations.

Caution

The power is kept ON during replacement of batteries. Carefully avoid an electric shock accident. If you turn off the power before battery replacement, the ABS zero point is cleared from the memory and the alarm AL32 will be issued. Then, set the zero point again according to the absolute zero point setting method.

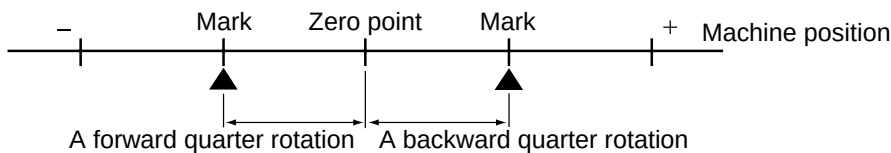


The batteries may be replaced after turning off the power in case of the 17-bit serial absolute encoder type. Complete the replacement within ten minutes in this case.

7-8. Resolver ABS Usage Examples

● Moving the machine

Mark the points of +/- quarter rotation from the zero point before moving the machine.



Restore the zero point in the following steps after moving the machine:

- 1) Set UP-15 to 1 (rotation count clearance).
- 2) Move the machine to the marked area.
- 3) Conduct ABS clearance.

● Wiring and checking functions

In the state display mode confirm the AB phase wiring or if the ABS counter is normally functioning or not in the following steps:

- 1) Press the MODE key to display r 0.
- 2) Press the UP or DOWN key to shift to the motor phase amount d 0.
- 3) When d 0 is displayed (motor phase amount display), press the UP and DOWN keys for five seconds while pressing down the SEL key to change the display to u 0 display (previous resolver phase data display).
- 4) Press the UP key once to display r H 0 (resolver ABS phase counter). The AB phase is correctly wired if this display shows the $\curvearrowright 3 \rightarrow 1 \rightarrow 0 \rightarrow 2 \curvearrowright$ cycle on forward rotation.
- 5) Press the UP key again to display the resolver ABS multi-rotation data in hexadecimal digits. The counter is working correctly if it counts 1 by one motor rotation and -1 by one forward rotation. The count range is from 0 to FFFFF.



Caution



The power is kept ON during battery replacement. Please take care to avoid an electric shock accident.

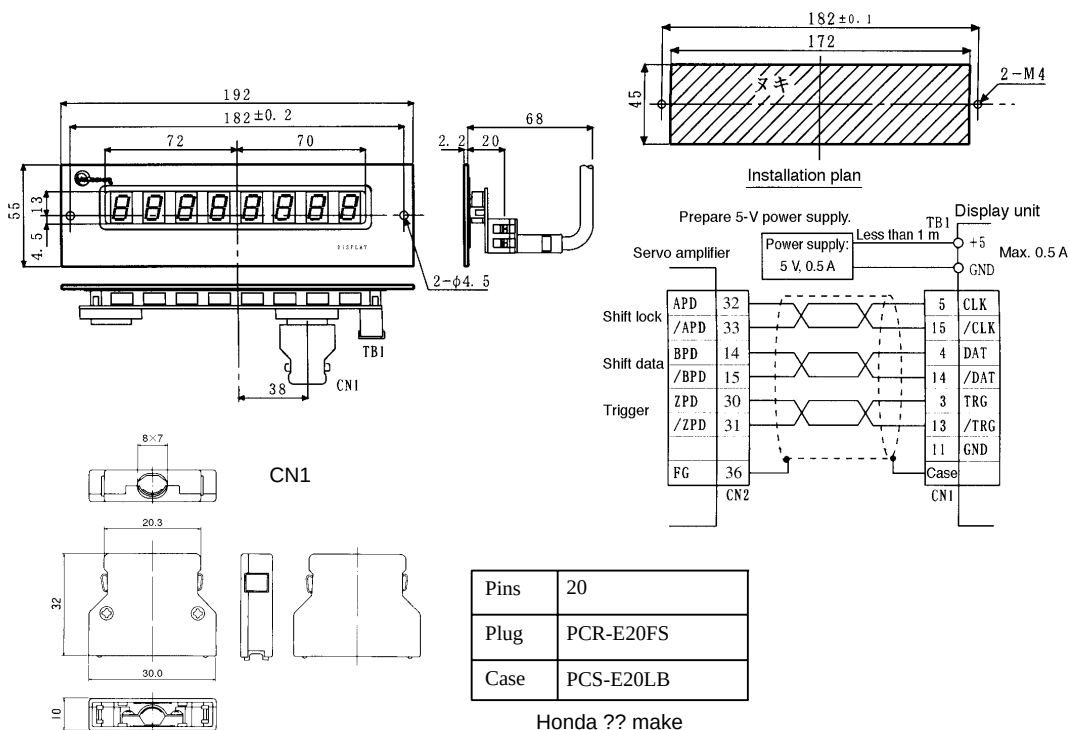
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8-3. ABS Battery for Maintaining Absolute Position (LRV03) -----	165
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Peripheral Equipment

Chapter 8

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8-1. External Display Unit (DPA-30)

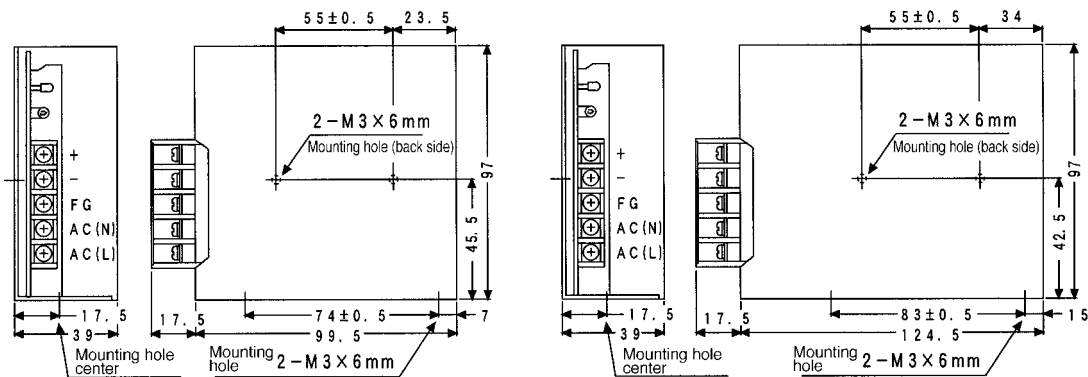


8-2. Brake Power Supply (Corsel make)

8

P15E-24-N

P30E-24-N

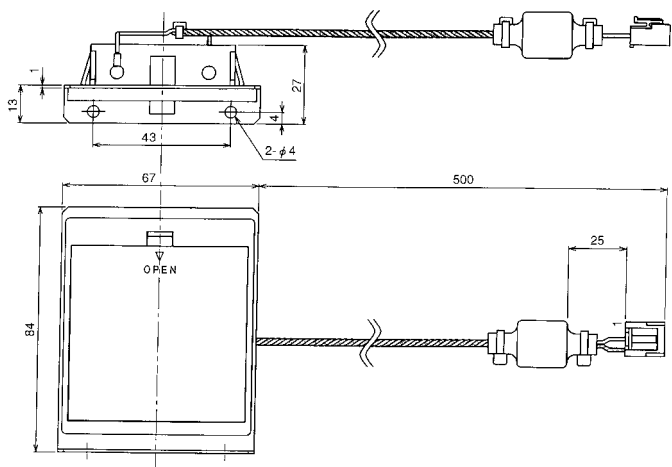


* See 2-2. Selection of Peripheral Equipment for applicable motors.

仕様

	P15E-24-N	P30E-24-N
入力電圧	単相 AC85 ～ 264V	
出力電圧	DC24V	DC24V
出力電流	0.7A	1.3A

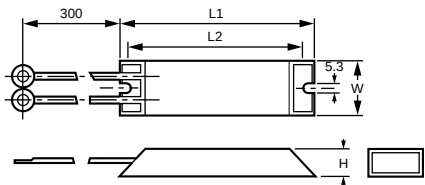
8-3. ABS Battery for Maintaining Absolute Position (LRV03)



Install separately from the amplifier and connect using the provided cable.

Model	LRV03
Battery type	AAA alkali battery
Life	3 years

8-4. External Reverse Current Absorption Resistor (RGH)



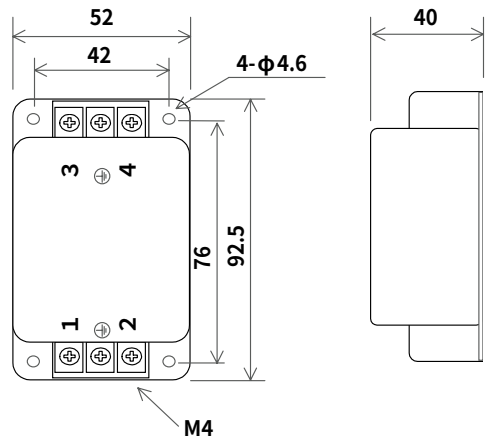
	Model	Absorption capacity	L ₁	L ₂	W	H
A	RGH60 100Ω	30 W	115	100	40	20
B	RGH200 30Ω	100 W	215	200	50	25
C	RGH400 30Ω	200 W	265	250	60	30

8-5. Noise filter (TDK make)

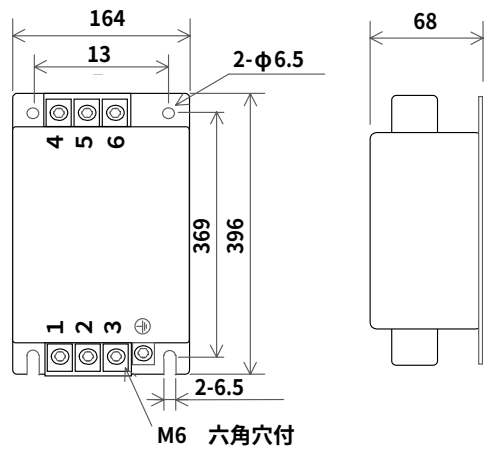
See 2-2. Peripheral Equipment Selection for combination with motors.

Rated output	Model	Connecting terminal
0.03 - 0.5 KW	ZRAC2206-11	Connect terminals no. 3 and no.4 with the power supply and no.1 and no.2 with the servo amplifier main circuit power supplies R and S respectively.
0.6 - 0.8 KW	ZRAC2210-11	
1.0 - 1.5 KW	ZRWT2210-ME	Connect terminals nos. 4, 5, and 6 with the poser supply and nos. 1, 2, and 3 with the primary side of the main circuit MC contactor.
1.8 - 3.0 KW	ZRWT2220-ME	
4.5 - 5.0 KW	ZRWT2230-ME	
7.0 - 10 KW	ZRCT5050-MF	

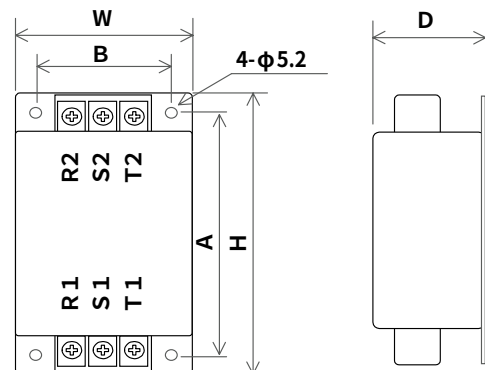
ZRAC2206-11,ZRAC2210-11



ZRCT5050-MF



ZRWT2210-ME,ZRWT2220-ME,ZRWT2230-ME

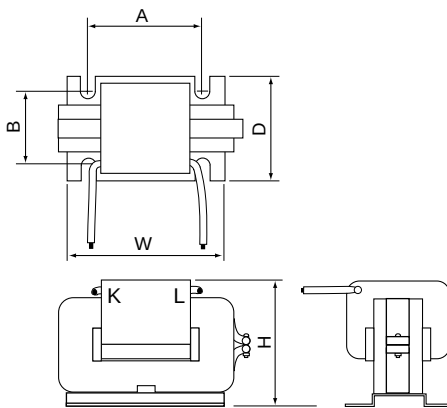


	H	W	D	A	B	結線 ビス
ZRWT2210 ME	194	90	40	170	68	M4 +
ZRWT2220 ME	214	100	50	190	78	M4 +
ZRWT2230 ME	236	125	60	190	101	M6 六角穴付

ケースアース（この機種はアース線は取付ビスに共締してください）

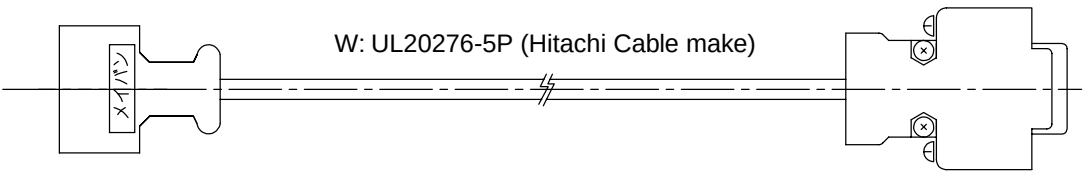
8-6. DCL

Motor capacity	Amplifier model	Amplifier specifications	Reactor specifications								
			Reactor model	Inductance (mH)	Rated current (A)	W (mm)	H (mm)	D (mm)	A (mm)	B (mm)	4-øU (mm)
Up to 100 W	VLASV-006P1	100 VAC single phase	#P0211001	6	4	90	65	60	55	35	4
200 W	VLASV-012P1	100 VAC single phase									
Up to 100 W	VLASV-006P2	200 VAC single phase	#P0210901	22	1	50	45	40	33	32	4
200 W	VLASV-012P2	200 VAC single phase	#P0210902	12	2	70	55	55	40	32	4
400 W	VLASV-012P2	200 VAC single phase	#P0210903	6	4.5	90	65	60	55	35	4
500 W	VLASV-012P2	200 VAC single phase									
600 W	VLASV-025P2	200 VAC single phase	#P0210904	5	9	115	85	90	70	55	4.5
800 W	VLASV-025P2	200 VAC single phase									
1 kW	VLASV-035P3	200 VAC 3 phases	#P0210905	2	11	115	80	75	70	35	5
1.5 kW	VLASV-035P3	200 VAC 3 phases									
1.8 kW	VLASV-070P3	200 VAC 3 phases	#P0210906								
2 kW	VLASV-070P3	200 VAC 3 phases									
2.4 kW	VLASV-070P3	200 VAC 3 phases		1.5	20	135	100	90	80	47	5
3 kW	VLASV-070P3	200 VAC 3 phases									



These are DC reactors for suppressing harmonic waves ACL is used for servo amplifiers of 100-VAC specifications.

8-7. RS232C Cable (CV01A)



CN: 54306-1411 (Molex make)

CN: 17JE-13090-02 (D8A) (DDK make)

Clamp: 54331-0140 (Molex make)

Cable model and specifications

CV01A-****

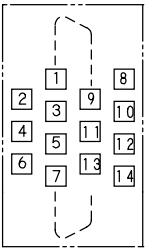
Cable end
A: Connectors on both ends

Cable length
(Example)

Model	L (m)
500	0.5
501	5.0

Type

Amplifier side CN1



CN1 pin arrangement view from the soldering surface side

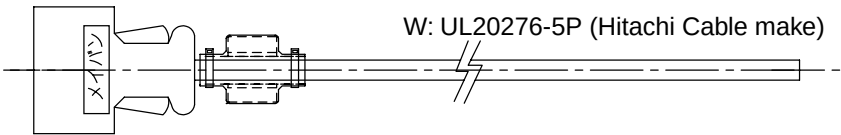
Amplifier side CN1

Pin	Signal	Wire color	Dot mark	
			Color	Mark
1	TXD	Blue	Red	•
2	DTR	Blue	Black	•
4	RTS	Pink	Red	•
9	RXD	Pink	Black	•
10	CTS	Green	Red	•
14	GND	Green	Black	•

Cable clamp fixture

Cable clamp fixture

8-8. RS485 Cable (CV01B)



CN: 54306-1411 (Molex make)
Clamp: 54331-0140 (Molex make)
NF: ESD-R-16C (Tokin make)

Cable model and specifications

CV01B-***B

Cable end
B: A connector on the amplifier side end

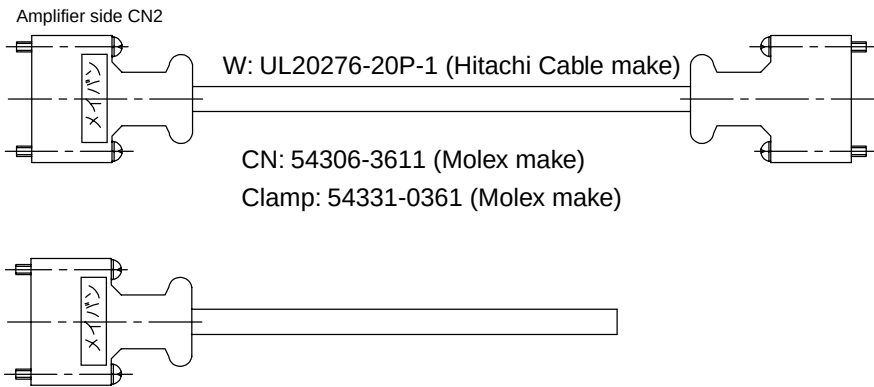
Cable length
(Example)

Model	L (m)
500	0.5
501	5.0

Type

Pin	Signal	Wire color	Dot mark	
			Color	Mark
1				
2				
3				
4				
5	TX+	Blue	Red	•
6	TX-	Blue	Black	•
7	RX+	Pink	Red	•
8	RX-	Pink	Black	•
9	RXD	Green	White	
10				
11				
12	FG	Shield	Shield	
13				
14	GND	Green	Green	

8-9. I/O Signal Cable (CV02A)



Amplifier side CN2							
Pin No.	Signal	Wire color	Dot color	Dot		Pin No.	Signal
1	INCOM	Orange	Red	•		1	INCOM
2	IN0	Orange	Black	•		2	IN0
3	IN1	Gray	Red	•		3	IN1
4	IN2	Gray	Black	•		4	IN2
5	IN3	White	Red	•		5	IN3
6	IN4	White	Black	•		6	IN4
7	IN5	Yellow	Red	•		7	IN5
8	IN6	Yellow	Black	•		8	IN6
19	24G	Pink	Black	•••		19	24G
20	P24V	Pink	Red	•••		20	P24V
21	IN7	Orange	Red	••••		21	IN7
22	OUT0	Gray	Red	••••		22	OUT0
23	OUT1	Gray	Black	••••		23	OUT1
24	OUT2	White	Red	••••		24	OUT2
25	OUT3	White	Black	••••		25	OUT3
26	OUT4	Yellow	Red	••••		26	OUT4
27	OUTCOM	Yellow	Black	••••		27	OUTCOM
9	AG	Pink	Black	•		9	AG
10	VMON	Pink	Red	•		10	VMON
		Orange	Black	••			
11	AMON	Orange	Red	••		11	AMON
12	REF	Gray	Red	••		12	REF
13	AG	Gray	Black	••		13	AG
28	CLI	White	Red	••		28	CLI
29	AG	White	Black	••		29	AG
14	BPD	Yellow	Red	••		14	BPD
15	/BPD	Yellow	Black	••		15	/BPD
16	FMB	Pink	Red	••		16	FMB
17	/FMB	Pink	Black	••		17	/FMB
18	GND	Orange	Black	•••		18	GND
30	ZPD	Gray	Red	•••		30	ZPD
31	/ZPD	Gray	Black	•••		31	/ZPD
32	APD	White	Red	•••		32	APD
33	/APD	White	Black	•••		33	/APD
34	FMA	Yellow	Red	•••		34	FMA
35	/FMA	Yellow	Black	•••		35	/FMA
36	FG	Drain wire				36	FG

Cable model and specifications

CV02A-****

Cable end

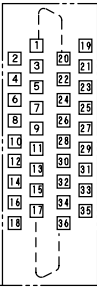
A: Connectors on both ends
B: A connector on the amplifier side end
C: A connector on another side end
Z: Without connector

Cable length

(Example)

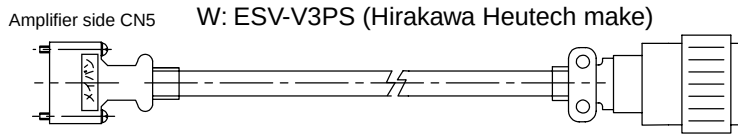
Model	L (m)
500	0.5
501	5.0
502	50.0

Type



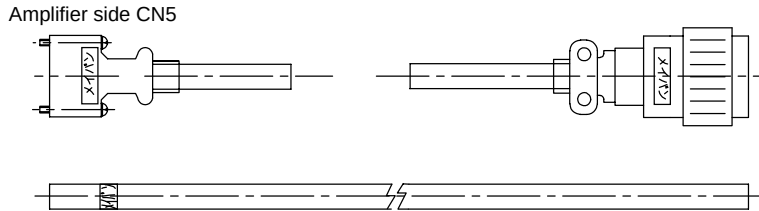
CN2 pin arrangement view
from the soldering surface side

8-10. Standard Resolver Cable (CV05A)



CN: 54306-2011 (Molex make)
Clamp: 54331-0201 (Molex make)

Plug: JRC16WPQ-7S (Hirose Electric make)
Clamp: JRC16WPQ-CP10 (Hirose Electric make)



Cable model and specifications

CV05A-****

Cable end
A: Connectors on both ends
B: A connector on the amplifier side end
C: A connector on the motor side end
Z: Without connector

Cable length
(Example)

Model	L (m)
500	0.5
501	5.0
502	50.0

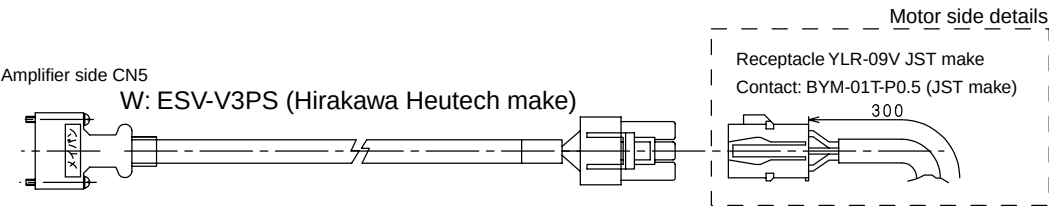
Type



CN5 pin arrangement view from the soldering surface side

Amplifier side CN5				Motor side plug	
Pin	Signal	Wire color			Pin
		1	2		
8	R 1	Light green	White		1
9	R 2		Shield		2
2	S 1	Black	Red		5
3	S 3		Shield		7
6	S 2	Blue	Yellow		6
7	S 4		Shield		3
11	A G	Shield			

8-11. Z Motor Resolver Cable (CV05B)

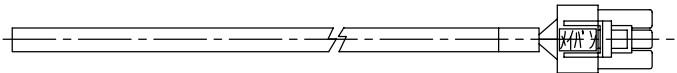


CN: 54306-2011 (Molex make)

Clamp: 54331-0201 (Molex make)

CN: HLO-09V (JST make)

Contact: BYF-01T-P0.5A (JST make)



Cable model and specifications

CV05B-***

Cable end
A: Connectors on both ends
B: A connector on the amplifier side end
C: A connector on the motor side end
Z: Without connector

Cable length
(Example)

Model	L (m)
500	0.5
501	5.0
502	50.0

Type

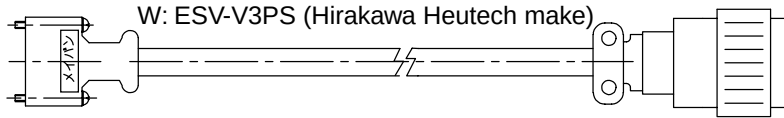


CN5 pin arrangement view from the soldering surface side

Amplifier side CN5						Motor side plug	
Pin	Signal	Wire color				Pin	
		1	2				
8	R 1	Light green	White			1	
9	R 2		Shield			2	
2	S 1	Black	Red			4	
3	S 3		Shield			5	
6	S 2	Blue	Yellow			7	
7	S 4		Shield			8	
11	A G	Shield				9	

8-12. Standard Resolver ABS Cable (CV05C)

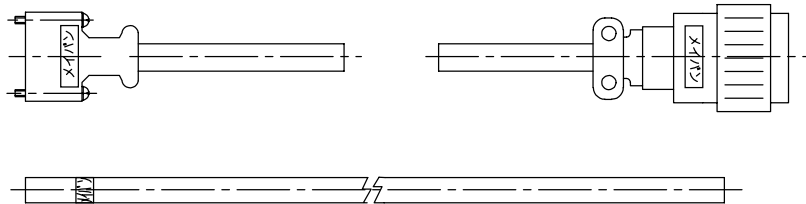
Amplifier side CN5



CN: 54306-2011 (Molex make)
Clamp: 54331-0201 (Molex make)

CN: JRC16WPQ-14S (Hirose Electric make)
Clamp: JRC19WPQ-CP10 (Hirose Electric make)

Amplifier side CN5



Cable model and specifications

CV05C-***

Cable end

A: Connectors on both ends
B: A connector on the amplifier side end
C: A connector on the motor side end
Z: Without connector

Cable length

(Example)

Model	L (m)
500	0.5
501	5.0
502	50.0

Type

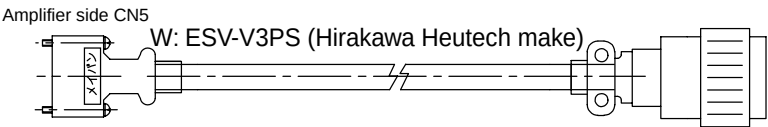


CN5 pin arrangement view
from the soldering surface side

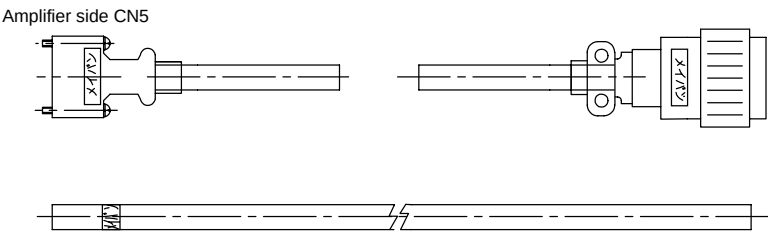
Amplifier side CN5

Pin	Signal	Wire color			Motor side plug
		1	2		
8	R 1	Light green	White		1
9	R 2		Shield		2
2	S 1	Black	Red		5
3	S 3		Shield		9
6	S 2	Blue	Yellow		1 2
7	S 4		Shield		1 4
1 1					
1 0					
4	VCC	Gray			7
5	CHB	Gray / White			8
1 2					
1 3					
1 4					
1 5					
1 6	+10	Green			3
1 7	CTD	Green / White			6
1 8	GND	Brown			1 0
1 9	CHA	Brown / White			1 3
1 1	AG	Shield			

8-13. Standard Resolver ABS Cable (CV05D)



CN: 54306-2011 (Molex make) CN: JRC16WPQ-14S (Hirose Electric make)
Clamp: 54331-0201 (Molex make) Clamp: JRC19WPQ-CP10 (Hirose Electric make)



Cable model and specifications

CV05D-xxxx

Cable end

A: Connectors on both ends
B: A connector on the amplifier side end
C: A connector on the motor side end
Z: Without connector

Cable length

(Example)

Model	L (m)
500	0.5
501	5.0
502	50.0

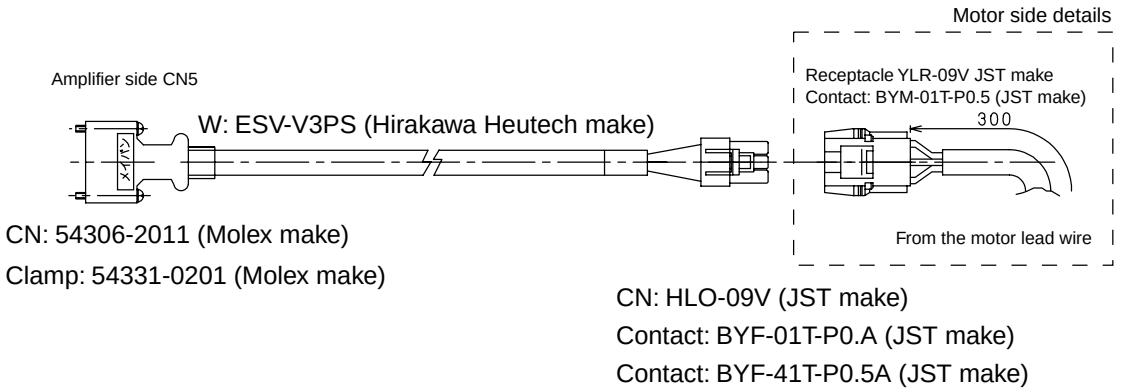
Type



CN5 pin arrangement view
from the soldering surface side

Amplifier side CN5			Motor side plug	
Pin	Signal	Wire color		Pin
4	E 5 V	Red		2
1	E 0 V	Black		1
12	B T +	Blue		4
13	B T -	Green		3
14	S D +	Orange		6
15	S D -	Orange/White		7
20	F G	Shield		5

8-14. Z Motor Serial ABS Cable (CV05E)



Cable model and specifications

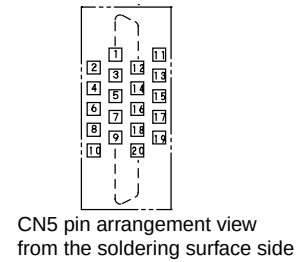
CV05E-****

Cable end
A: Connectors on both ends
B: A connector on the amplifier side end
C: A connector on the motor side end
Z: Without connector

Cable length
(Example)

Model	L (m)
500	0.5
501	5.0
502	50.0

Type

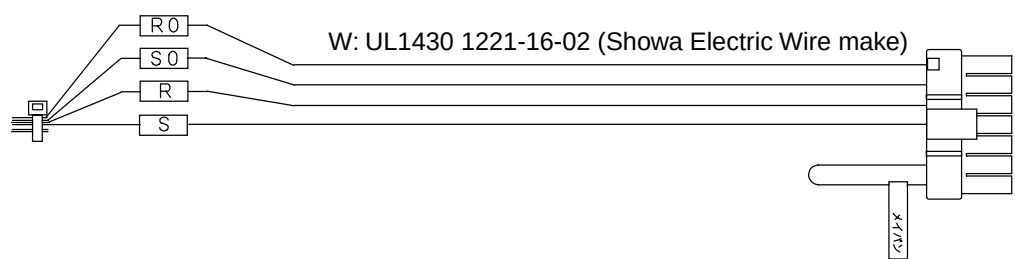


Amplifier side CN5

Motor side plug

Pin	Signal	Wire color	Pin
4	E 5 V	Red	2
1	E 0 V	Black	3
12	B T +	Blue	5
13	B T -	Green	6
14	S D +	Orange	7
15	S D -	Orange/White	8
20	F G	Shield	9

8-15. Single Phase Power Supply Cable (CV06A)



CN: DF7-7S-3.96C (Hirose Electric make)
Contactor: DF7-1618SC (Hirose Electric make)
Clamp: DF7-7RS/P-3.96 (Hirose Electric make)

Cable model and specifications

CV06A-***B

Cable end
B: A connector on the amplifier side end

Cable length
(Example)

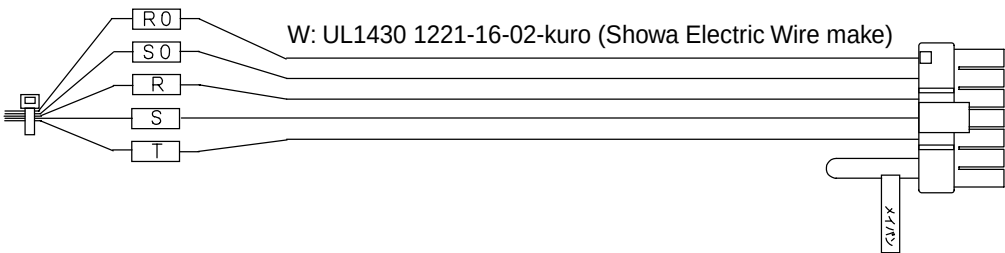
Model	L (m)
500	0.5
501	5.0
502	50.0

Type

8

Pin No.	Wire color	Signal
1	Black	R 0
2	Black	S 0
3	Black	R
4	Black	S
5		
6	Black	P 1
7	Black	P 2

8-16. 3 Phase Power Supply Cable (CV06B)



CN: DF7-7S-3.96C (Hirose Electric make)
Contactor: DF7-1618SC (Hirose Electric make)
Clamp: DF7-7RS/P-3.96 (Hirose Electric make)

Cable model and specifications

C V O 6 B - * * * B

Cable end
B: A connector on the amplifier side end

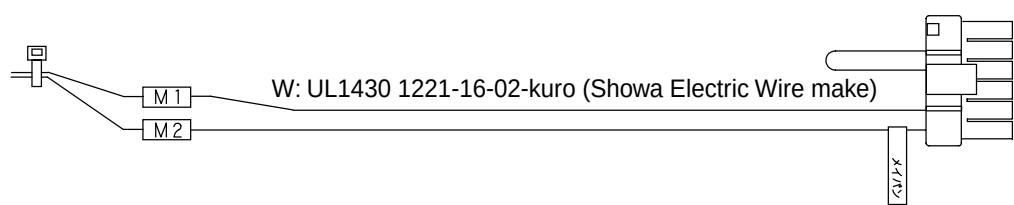
Cable length
(Example)

Model	L (m)
5 0 0	0 . 5
5 0 1	5 . 0
5 0 2	5 0 . 0

Type

Pin No.	Wire color	Signal
1	Black	R 0
2	Black	S 0
3	Black	R
4	Black	S
5	Black	T
6	Black	P 1
7	Black	P 2

8-17. Internal Reverse Current Absorption MC Cable (CV07A)



CN: DF7-7S-3.96C (Hirose Electric make)
Contactor: DF7-1618SC (Hirose Electric make)
Clamp: DF7-7RS/P-3.96 (Hirose Electric make)

Cable model and specifications

CV07A-***B

Cable end
B: A connector on the amplifier side end

Cable length
(Example)

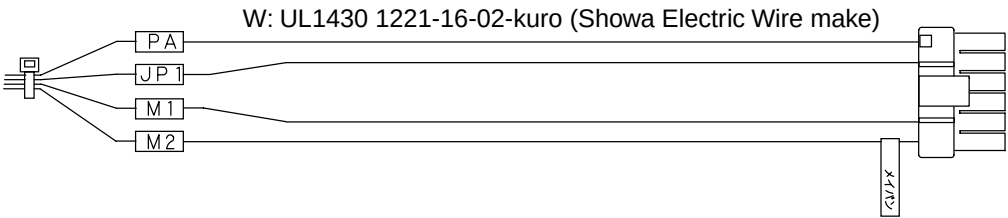
Model	L (m)
500	0.5
501	5.0
502	50.0

Type

8

Pin No.	Wire color	Signal
1	Black	P A
2	Black	J P 1
3	Black	J P 2
4		
5	Black	M 1
6	Black	M 2

8-18. External Reverse Current Absorption MC Cable (CV07B)



CN: DF7-7S-3.96C (Hirose Electric make)
Contactor: DF7-1618SC (Hirose Electric make)
Clamp: DF7-7RS/P-3.96 (Hirose Electric make)

Cable model and specifications

CV07B-***B

Cable end
B: A connector on the amplifier side end

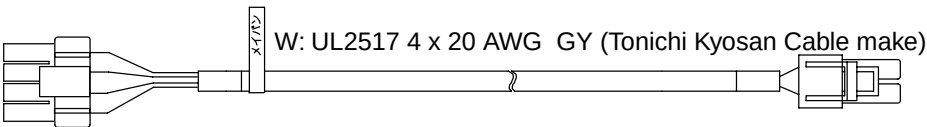
Cable length
(Example)

Model	L (m)
500	0.5
501	5.0
502	50.0

Type

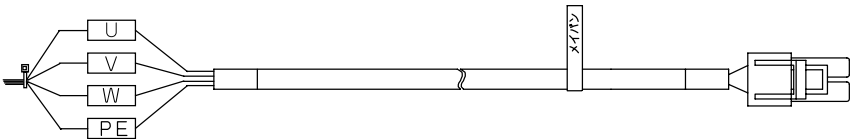
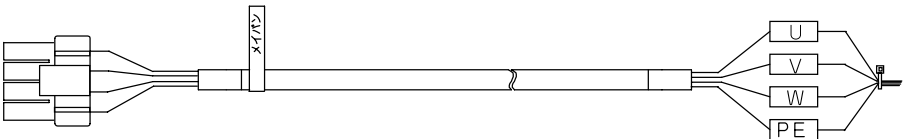
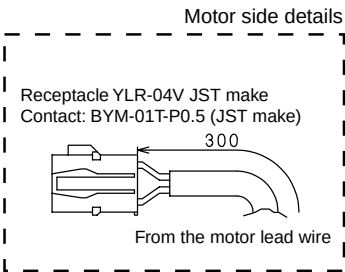
Pin No.	Wire color	Signal
1	Black	P A
2	Black	J P 1
3	Black	J P 2
4		
5	Black	M 1
6	Black	M 2

8-19. Z Motor Armature Cable (CV08A)



CN: DF7-4S-3.96C (Hirose Electric make)
Contact: DF7-2022SC (Hirose Electric make)
Clamp: DF7-4RS/P-3.96 (Hirose Electric make)

CN: YLP-04V (JST make)
Contact: BYF-41T-P0.5A (JST make)



Cable model and specifications

CV08A-****

Cable end
A: Connectors on both ends
B: A connector on the amplifier side end
C: A connector on the motor side end
Z: Without connector

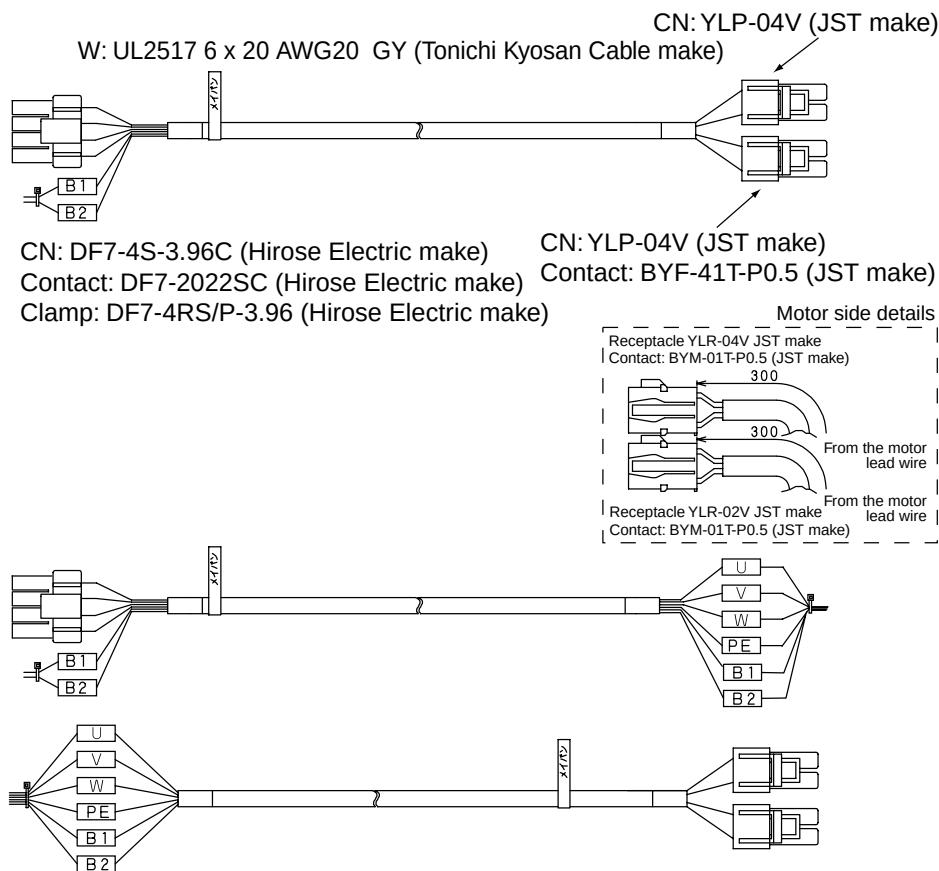
Cable length
(Example)

Model	L (m)
500	0.5
501	5.0
502	50.0

Type

Pin No.	Wire color	Signal	Pin No.
1	Red	U	1
2	White	V	2
3	Black	W	3
4	Yellow green	PE	4

8-20. Z Motor with Brake Armature Cable (CV08B)



Cable model and specifications

CV08B-***

Cable end
A: Connectors on both ends
B: A connector on the amplifier side end
C: A connector on the motor side end
Z: Without connector

Cable length
(Example)

Model	L (m)
500	0.5
501	5.0
502	50.0

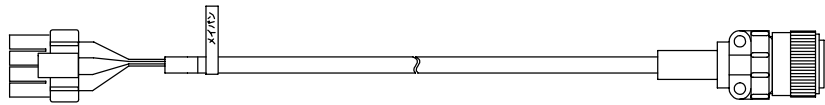
Type

Pin No.	Wire color	Signal	Pin No.
1	Red	U	1
2	White	V	2
3	Black	W	3
4	Yellow green	PE	4

	Yellow	B1	1
	Brown	B2	2

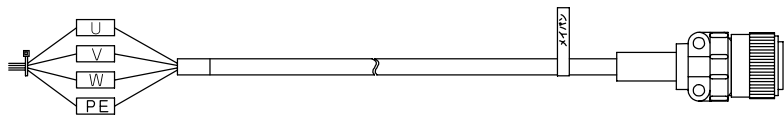
8-21. Standard Armature Cable - 130 mm square (CV08C)

W: UL2517 4 x 16 AWG GY (Tonichi Kyosan Cable make)



CN: DF7-4S-3.96C (Hirose Electric make)
Contactor: DF7-1618SC (Hirose Electric make)
Clamp: DF7-4RS/P-3.96 (Hirose Electric make)

CN: DL3106A 20-15S (Amphenol make)
Clamp: DL3057-12A (Amphenol make)



Cable model and specifications

CV08C-****

Cable end

A: Connectors on both ends

B: A connector on the amplifier side end

C: A connector on the motor side end

Z: Without connector

Cable length

(Example)

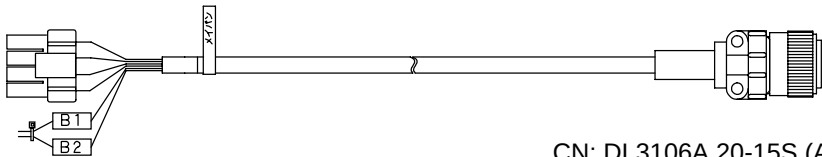
Model	L (m)
500	0.5
501	5.0
502	50.0

Type

Pin No.	Wire color	Signal	Pin No.
1	Red	U	A
2	White	V	B
3	Black	W	C
4	Yellow green	PE	D

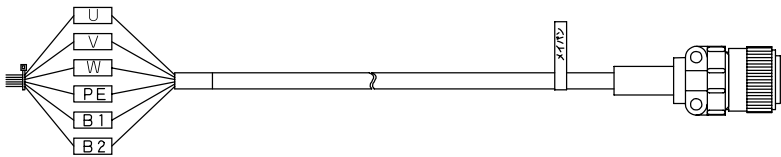
8-22. Standard Armature Cable with Brake - 130 mm square (CV08D)

W: UL2517 6 x 16 AWG GY (Tonichi Kyosan Cable make)



CN: DF7-4S-3.96C (Hirose Electric make)
Contactor: DF7-1618SC (Hirose Electric make)
Clamp: DF7-4RS/P-3.96 (Hirose Electric make)

CN: DL3106A 20-15S (Amphenol make)
Clamp: DL3057-12A (Amphenol make)



Cable model and specifications

CV08D-*****

Cable end
A: Connectors on both ends
B: A connector on the amplifier side end
C: A connector on the motor side end
Z: Without connector

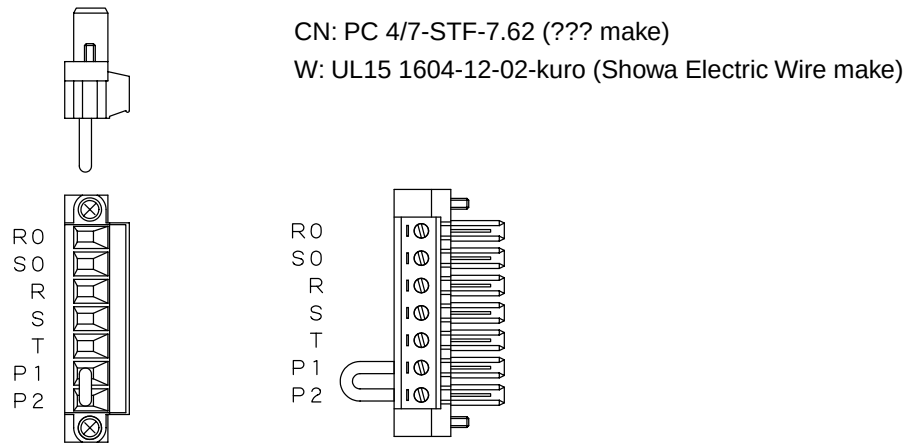
Cable length
(Example)

Model	L (m)
500	0.5
501	5.0
502	50.0

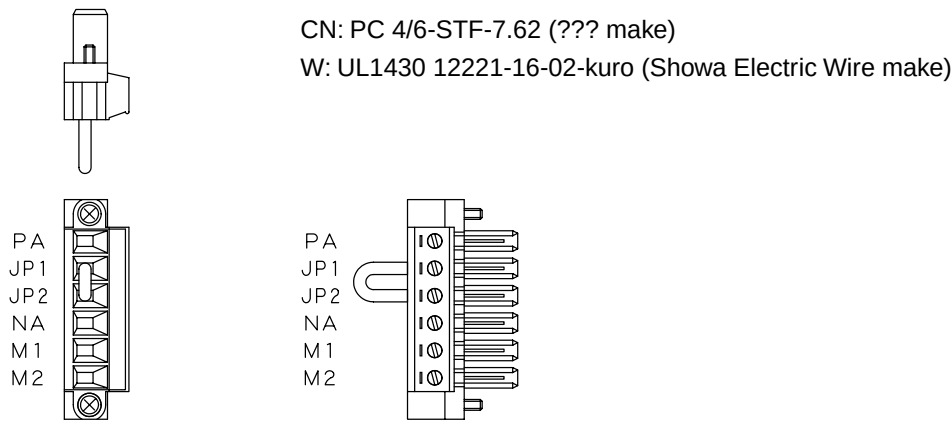
Type

Pin No.	Wire color	Signal	Pin No.
1	Red	U	A
2	White	V	B
3	Black	W	C
4	Yellow green	PE	D
	Yellow	B1	E
	Brown	B2	F

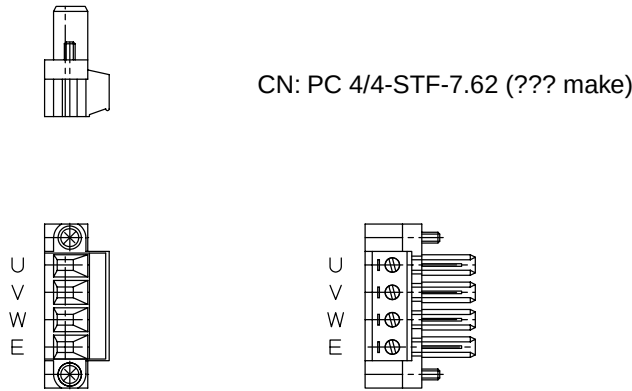
8-23. CN6 for 070P (CV06C)



8-24. CN7 for 070P (CV07C)



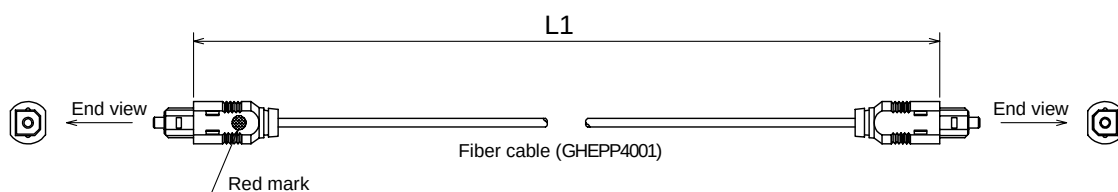
8-25. CN8 for 070P (PC4/4-STF-7.62)



8-26. Optical Communications Cable for VLBUS-V Panel Inside Use (CV23A)

Connector: RFA4011P (Mitsubishi Rayon make) x 2

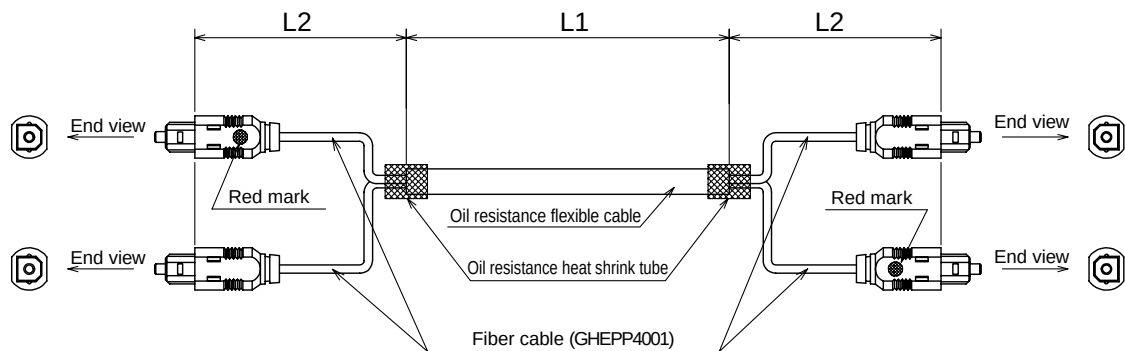
Fiber cable: GHEPP4001P (Mitsubishi Rayon make) x 1



Product code	L1
CV23A-300A	300 ⁺⁶⁰ ₋₀ mm
CV23A-500A	500 ⁺⁶⁰ ₋₀ mm
CV23A-101A	1000 ⁺¹⁰⁰ ₋₀ mm
CV23A-201A	2000 ⁺¹⁰⁰ ₋₀ mm
CV23A-301A	3000 ⁺¹⁰⁰ ₋₀ mm
CV23A-401A	4000 ⁺¹⁰⁰ ₋₀ mm
CV23A-501A	5000 ⁺¹⁰⁰ ₋₀ mm
CV23A-102A	10000 ⁺²⁰⁰ ₋₀ mm

8-27. Optical Communications Cable for VLBUS-V Panel Outside Use (CV24A)

Connector: RFA4011P (Mitsubishi Rayon make) x 4
Fiber cable: GHEPP4001P (Mitsubishi Rayon make) x 2
Flexible cable: Oil resistance flexible cable x 1



Product code	L1	L2
CV24A-102A	8000 ⁺¹²⁰ _{- 0} mm	1000 ⁺¹⁰⁰ _{- 0} mm
CV24A-132A	10000 ⁺¹²⁰ _{- 0} mm	1500 ⁺¹⁰⁰ _{- 0} mm
CV24A-202A	17000 ⁺¹²⁰ _{- 0} mm	1500 ⁺¹⁰⁰ _{- 0} mm

9-1. Short Time Overload ----- 188

9-2. Electro-thermal ----- 189

9-1. Short Time Overload

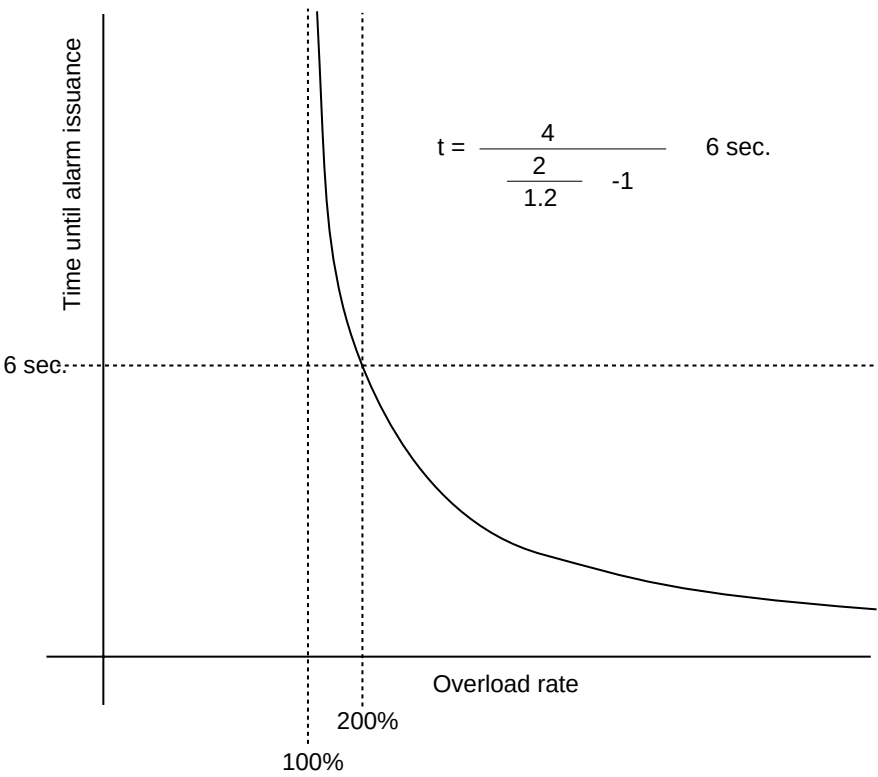
Alarm AL18 (Instant thermal) is issued when current exceeding the rated current by 20% flows continuously. Calculation will be started from the beginning when current drops below 120% even for an instant.)

The alarm will be issued sooner as overload is greater. The time until the alarm is issued is obtained from the following formula:

$$t = \frac{k}{\frac{I_a}{I_r \times 1.2} - 1} \quad (\text{Sec.})$$

k: Constant
I_r: Rated current
I_a: Current current

For example, when current as much as 200% of the rated current flows continuously with VLBSV-Z04030, the alarm will be issued in six seconds.



* Constant "k" will vary depending on motors as shown in the following table.

Motor type	"k"
VLBSV-Z00330	1.5
VLBSV-Z00530	2.0
VLBSV-Z01030	2.5
VLBSV-Z02030	3.0
VLBSV-Z04030	4.0
Other motors	6.0

9-2. Electro-thermal

Electro-thermal estimates a heat amount generated by the motor. ??? When the electro-thermal value reaches 110%, the alarm AL17 (Motor overload) is issued. The alarm will be issued also when actual current over 105% of the rated current flows constantly.

The time until the alarm is issued is obtained with the following formula.

$$t = -Te \times \ln \left(1 - \frac{1.05^2}{\left(\frac{I_{rms}}{I_r} \right)^2} \right) \quad (\text{min.})$$

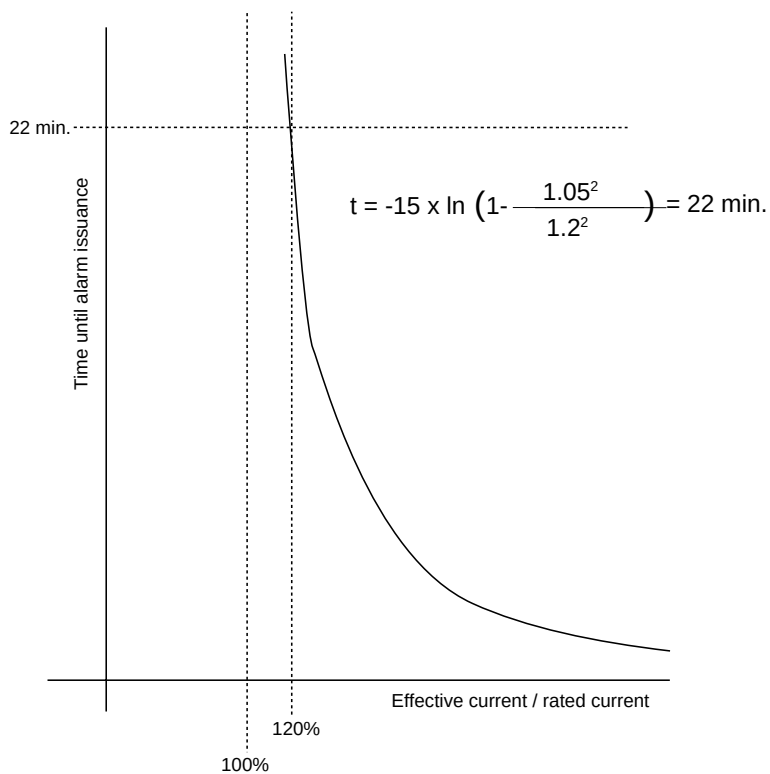
I_r : Rated current

I_{rms} : Current effective current

Te : Motor heat time constant

$$\frac{I_{rms}}{I_r} \times 100 = bL: \text{Effective load rate}$$

For example, when effective current 120% of the rated current flows 22 minutes, the alarm is issued. (VLBSV-Z04030 motor heat time constant 15 min.)

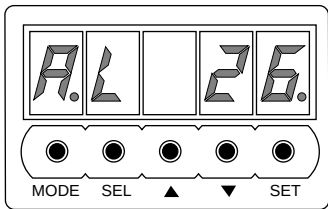


10-1. Alarm Display ----- 192

10-2. Alarm Code Table and Recovery Measures ----- 193

10-1. Alarm Display

An alarm code is displayed in the display unit when abnormality takes place.



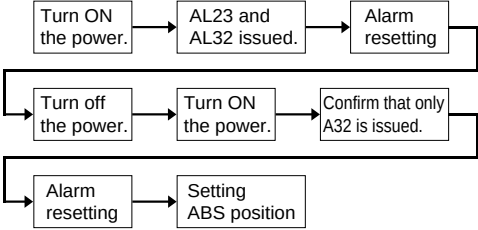
AL indicates occurrence of a trouble and the lowest two digits shows an alarm code. When an alarm is issued, the dot mark at the lowest digit column flashes.

The initial power input causes AL26 (Parameter setting error). Set the user parameters UP-01 (Control mode) and UP-02 (Motor code), turn off the machine, make sure that the display went off, and then turn on the machine again.

10-2. Alarm Code Table and Recovery Measures

Check a problem causing an issued alarm, look into the counter measures, and try to recover the normal condition.

Alarm	Alarm name	Detecting method	Cause and counter measures
AL01	Over-current (OC)	IPM of the power supply detected following troubles. (Model 035P or lower versions can detect 1 only.) 1. Over-current 2. Overheating 3. Gate power supply low	1. Short circuit or grounding of armature wire (U, V, or W) 2. Ambient temperature is higher than 55 degrees Celsius. Above problems are likely. If other causes are likely, contact the manufacturer.
AL02	Over voltage (OV)	Main circuit DC power supply (PN voltage) is over 400 VDC.	1. The motor is running with a speed greater than the max. rotation rate. 2. Acceleration causes overshoot exceeding the max. rotation rate. 3. JP1 or JP2 is disconnected. Or the external counter current resistance is not connected or the connection line is broken.
AL03	Low PN voltage (PNLV)	Main circuit DC power supply (PN voltage) dropped below 170 VDC.	1. Low input power voltage 2. T phase is missing from input power supply. (In case of 070 to 200P) 3. If this alarm is issued during motor acceleration, power supply capacity shortage is likely.
AL04	Main power supply input trouble (ACINF)	Low main power supply (AC) input voltage	1. Electrolytic capacitor is not properly charged during main power supply input. 2. Main power supply was disconnected during operation.
AL05	Function undefined		
AL06	Resolver disconnected (RELV)	Resolver signal voltage between R1 and R2 dropped below 0.35 VAC.	Check that the resolver cable is not broken or disconnected. Test the voltage level between R1 and R2. (It should be over 0.35 V in the AC range.)
AL07	Power status error (POWFAIL)	CPU cannot judge the amplifier type.	1. CPU's software version is not consistent with the unit configuration. 2. The amplifier is out of order. Above problems are likely. Please contact the manufacturer.
AL08	Servo amplifier overheating (SOH)	The radiation fin is heated exceeding the range of 90 to 100 degrees Celsius.	1. Temperature rise inside the control panel 2. The cooling fan inside the amplifier is out of order.
AL09	Counter current resistance overheating (RGOH)	Overheating of the amplifier integrated counter current absorption resistor is detected by software operation.	The frequency of acceleration or deceleration may be too high or continuous absorption (negative load) is likely. Calculate the counter current energy and install an external counter current resistor.
AL10	Reverse current absorption error (RGST)	The reverse current absorption transistor is ON over 50 ms.	1. When an external resistor is not used, check if JP1 and JP2 are short-circuited or not. 2. When an external resistor is used, turn OFF the machine and test the resistance between the terminal block PA and JP2. The normal range is between 6 and 30 ohms. If the value is over that range, a line break inside the resistor is likely. Replace the resistor.
AL11	Function undefined		
AL12	DSP error (DSPERR)	DSP stopped working.	The amplifier is out of order. Please contact the manufacturer.
AL13	Resolver ABS battery low voltage (BLV)	The battery voltage is below 3.4 V.	Replace the battery. If AL24 has not been issued, the zero point setting is still saved.
AL14	Brake error (BERR)	1. When the dynamic brake is used, brake output turning ON did not generate the brake confirmation signal input. 3 2. When the holding brake is used, brake output turning ON kept the brake confirmation signal ON.	Read the descriptions on the dynamic and holding brake connections and check the wiring and used accessories.
AL15	Over-current detection (OCS)	The motor current exceeded 120% of the current limit setting.	1. The motor in rotation was locked mechanically. 2. Short-circuit or grounding of the A, B, and C phases of the motor. 3. Erroneous setting of the parameter UP-02 (Motor application)
AL16	Speed amplifier saturation (VAS)	The speed amplifier was saturated and current exceeding the maximum level flew more than 3 seconds.	1. The motor is locked mechanically. 2. The load inertia is too great to accelerate or decelerate. 3. Erroneous setting of the parameter UP-02 (Motor application)

AL17	Motor overload (MOL)	Motor temperature calculated from the actual load level rose exceeding 110% of the maximum temperature setting.	1. Load is too much for the motor output capacity. 2. Operation cycles are too short for the motor capacity.
AL18	Instant thermal (POL)	This alarm is issued when output current is more than 120% of the motor rated current.	1. The motor is locked mechanically. 2. Load is too much for the motor output capacity. 3. Erroneous setting of the parameter UP-02 (Motor application)
AL19	Resolver error (RESERR)	The resolver feedback counter made erroneous counting.	1. Bad contact of the resolver cabling. 2. The resolver cable is installed near the power line and affected by noises. Check the resolver cable. 3. The ground line between the motor and the amplifier is broken or disconnected.
AL20	Overspeed (OSPD)	The rotation rate exceeded 120% of the maximum rotation setting.	1. The servo adjustment value is overshooting. Conduct auto tuning. 2. A command value was too much. 3. Bad contact of the resolver cabling. 4. The resolver cable is installed near the power line and affected by noises. 5. The ground line between the motor and the amplifier is broken or disconnected.
AL21	Deviation counter over (FULL)	Accumulated pulses in the deviation counter exceeded the following detection level.	1. Load is too much for the motor output capacity. 2. The load inertia is too great to accelerate or decelerate. 3. The value for TP2 (Target loop gain) is set too high. 4. Current limit is set too low.
Detection level $\frac{\text{Motor maximum rotation rate}}{60} \times \frac{\text{Sensor split count}}{\text{TP2}} \times 10$ Example: Max. rpm 2000 rpm, Motor sensor: resolver Target loop gain TP2=60 Detection level $\frac{2000}{60} \times \frac{24000}{\text{TP2}} \times 10 = 133000$ pulses			
AL22	Resolver ABS phase error (ABSE)	The ABS sensor had phase shift.	Adjust ABS sensor phases or replace the sensor. Please contact the manufacturer.
AL23	Resolver ABS broken line (ACN)	The ABS cable was disconnected or the +10 CTD signal line was disconnected.	Even when the power is turned OFF, disconnecting the ABS cable will trigger the alarm. Absolute position must be set again after the ABS cable was disconnected and reconnected for moving the machine or another purpose.
AL24	Resolver ABS battery alarm (BAL)	The ABS battery voltage dropped below 3.2 V.	Replace the ABS battery immediately. The zero point setting is no longer saved. Reset the absolute position.
AL25	Option alarm (CPALM)	Option board alarm.	Please contact the manufacturer.
AL26	Parameter setting error (CERR)	Parameters UP-01 (Control mode) and UP-02 (Applicable motor) are not set, or set with invalid values.	This alarm is issued on the first power input. Set the user parameters UP-01 and UP-02, turn off the machine, make sure that the display went off, and then turn on the machine again.
AL27	Resolver ABS error (AEERR)	CHA and CHB signals are kept ON while the power is ON but were turned OFF perhaps by disconnection or line break.	1. ABS cable was disconnected. 2. Bad contact of the connector Check that CTD, CHA, and CHB signals are ON.
AL28	Link error (VERR)	Connection error with individual axes	Check communications state.
AL32	Zero point saving error (MZE)	When the resolver ABS is used, ABS setting is not completed with the ABS motor. Or this alarm is issued together with AL06, AL19, AL22, AL23, and AL27. When the encoder is used, the alarm is issued together with AL42, AL43, and AL45.	In case of the ABS motor, AL32 is always issued with the factory setting. Set the ABS position in the following steps: 
AL33	Resolver ABS invalid zero point (CLD)	The ABS position was not set following the steps on the right when AL06, AL19, AL22, AL23, or AL27 was issued.	
AL36	Resolver ABS battery cable broken or disconnected (ABT)	The ABS battery went out of place when the power was turned OFF.	Check the battery cable connector is not coming loose or the cable is not broken.
AL38	Overrun (OVTR)	The work passed the stroke end limit in the moving direction. ??	Reset an alarm and remove the work from the limit using the jog dial. ??

AL40	Encoder line broken (EREE)	The differential signal from the encoder was disconnected.	1. Encoder cable broken 2. Bad contact of the connector
AL41	Encoder communication error (ETER)	Communication with the encoder interrupted.	1. Encoder cable broken 2. Bad contact of the connector
AL42	Encoder backup error (EBACK)	Low encoder battery caused BS coordinate loss.	1. Encoder battery voltage below 2.5 V 2. Battery cable unplugged 3. Encoder cable connector bad contact
AL43	Encoder checksum error (ECKER)	Checksum error	This error does not take place with the 17-bit serial ABS encoder.
AL44	Encoder battery alarm (EBAL)	Encoder battery low voltage	The battery voltage is below 3.1 V. Replace the battery.
AL45	Encoder ABS phase error (EABSE)	Encoder position data error detected	Frequent occurrence indicates encoder failure.
AL46	Encoder overspeed (EOSPD)	The encoder detected a rotation rate 6000 rpm. This error can be detected even during power disconnection.	1. An excessive command was input. 2. Check the mechanical system.
AL47	Encoder communication error (EWER) ??	Communication with the encoder interrupted. ??	This error does not take place with the 17-bit serial ABS encoder.
AL48	Encoder initialization error (EINIT)	The encoder detected initialization error.	This error does not take place with the 17-bit serial ABS encoder.
AL49	Encoder sensor phase error (PHSERR)	Phase error of the sensor within one rotation was detected. This error does not take place with the 17-bit serial ABS encoder.	This error does not take place with the 17-bit serial ABS encoder.

How to reset alarm codes

Press the SET key of the display unit while an alarm code is displayed. Or turn ON the reset input signal to clear the alarm code and the flashing dot mark.

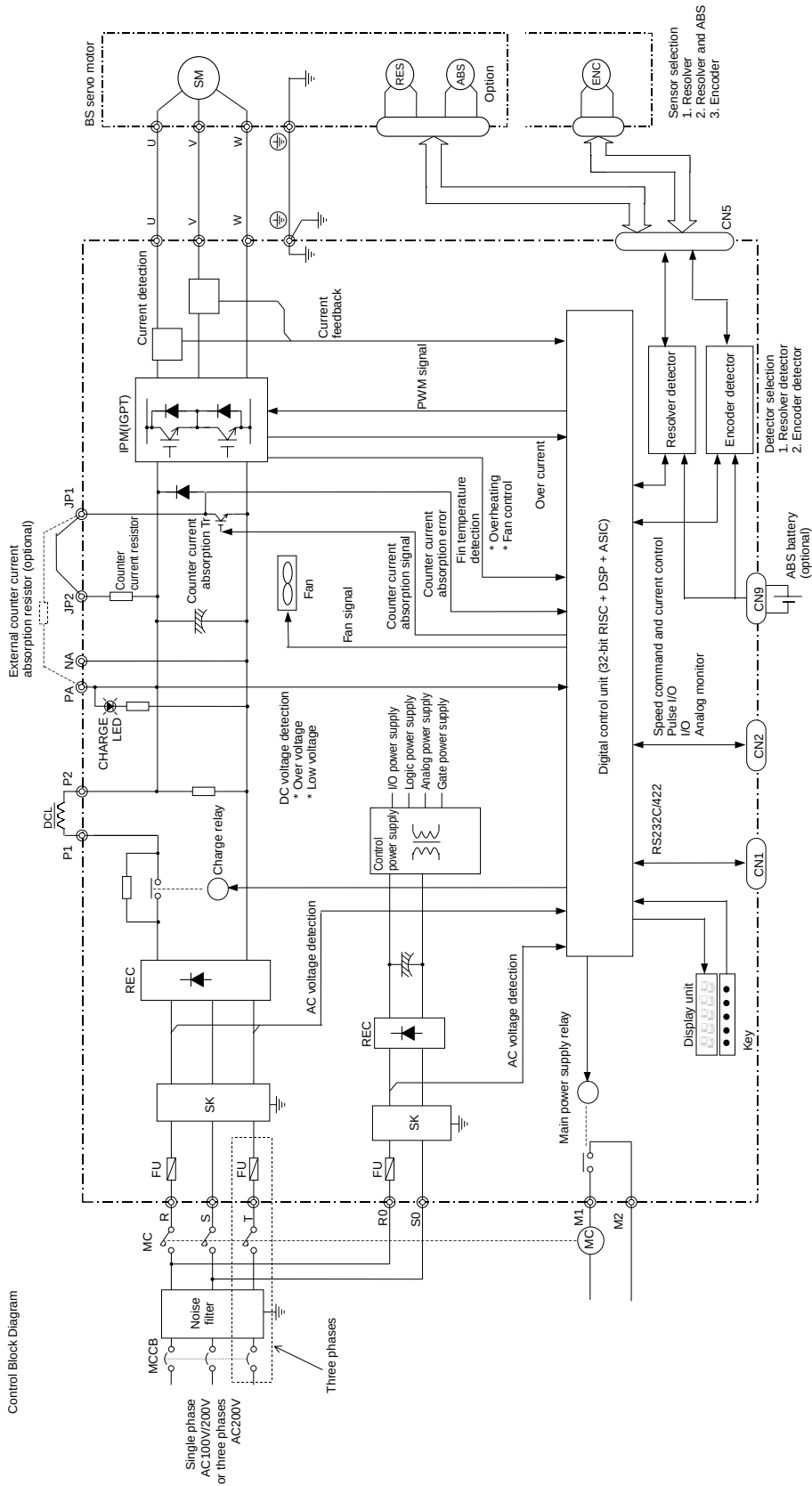
If multiple alarms were issued, one alarm is cleared each time the SET key is pressed. All alarms are reset by the reset input signal.

11-1. Control Block Diagram ----- 198

11-2. Specifications ----- 199

11-3. External Views ----- 200

11-1. Control Block Diagram

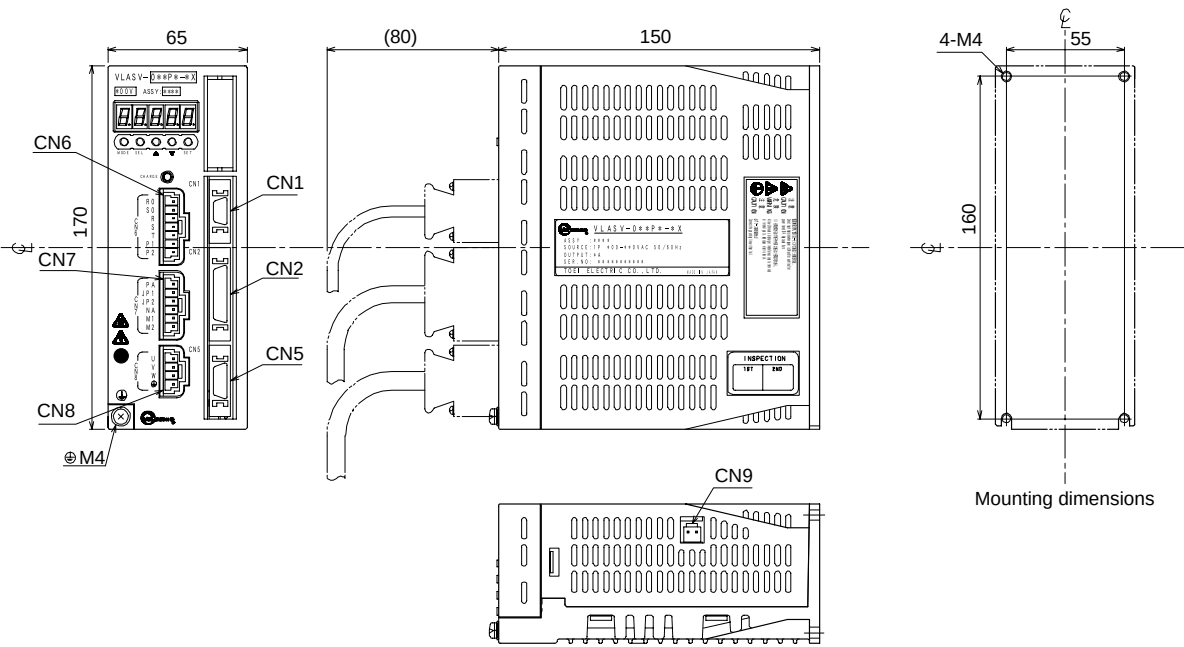


11-2. Specifications

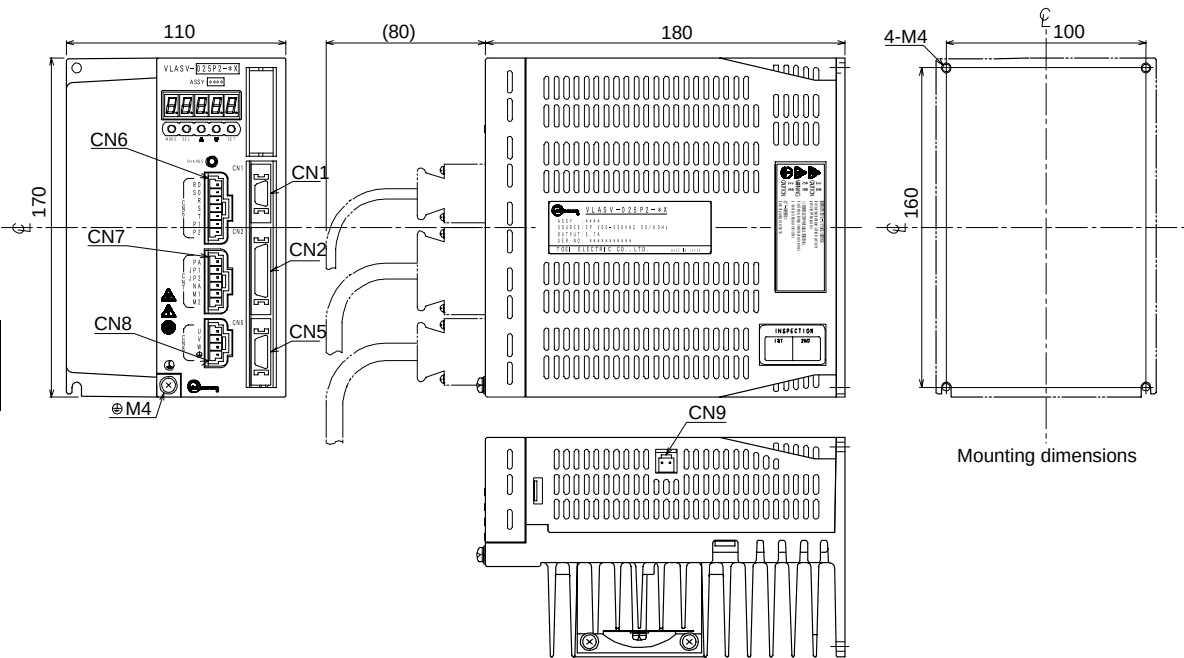
Amplifier model		006P1	012P1	006P2	012P2	025P2	035P3	070P3	100P3	200P3
Control method		WM 3-phase sine wave								
Main circuit	Power voltage	Single phase 100 to 115 VAC -15 to +10% 50/60 Hz		Single phase 200 to 230 VAC -15 to +10% 50/60 Hz			Three phases 200 to 230 VAC -15 to +10% 50/60 Hz			
	Power supply capacity	250 VA	500 VA	250 VA	1.2 kVA	1.7 kVA	2.6 kVA	5.4 kVA	8.0 kVA	18 kVA
Control circuit	Power voltage	Single phase 100 to 115 VAC -15 to +10% 50/60 Hz		Single phase 200 to 230 VAC -15 to +10% 50/60 Hz			Single phase 200 to 230 VAC -15 to +10% 50/60 Hz			
	Power supply capacity	50 VA	50 VA	50 VA	50 VA	50 VA	65 VA	80 VA	80 VA	100 VA
Max. applicable motor		100 W	200 W	100 W	500 W	1 kW	1.5 kW	3.4 kW	5.0 kW	11 kW
Continuous output current		1.4 A (rms)	2.1 A (rms)	1.4 A (rms)	3.4 A (rms)	5.7 A (rms)	8.3 A (rms)	18.4 A (rms)	28.3 A (rms)	56.6 A (rms)
Momentary maximum current		4.2 A (rms)	5.7 A (rms)	4.2 A (rms)	8.5 A (rms)	17.7 A (rms)	25.0 A (rms)	49.5 A (rms)	71.0 A (rms)	141 A (rms)
Speed/position detector		Resolver or 17-bit serial encoder (both resolver and encoder are available with ABS.)								
Speed control range		1:5000 (ratio between the minimum rotation rate that outputs motor rated current and the rated rotation rate)								
Ratio of speed fluctuations		Below +/-0.02% with load 0 to 100% or power supply range -15 to 10% and below +/-0.2% with temperature range 0 to 55 degrees Celsius (specifications are defined for rated rotation rate.)								
Heat loss	Main circuit	8 W	12 W	8 W	22 W	39 W	58 W	98 W	178 W	310 W
	Control circuit	20 W	20 W	20 W	20 W	20 W	26 W	32 W	32 W	40 W
Counter current absorption capacity		10 W	10 W	20 W	20 W	30 W	60 W	80 W	100 W	180 W
Mass (standard)		1.3 kg	1.3 kg	1.3 kg	1.3 kg	2.3 kg	2.4 kg	4.5 kg	7.0 kg	12 kg
Outer dimensions (W x H x D)		65 x 70 x 150	65 x 170 x 150	65 x 170 x 150	65 x 170 x 150	110 x 170 x 180	110 x 170 x 180	110 x 250 x 180	130 x 307 x 197	220 x 410 x 230
General purpose input		24 VDC 6 mA 8 points (speed control: Run, Reset, MB confirm, Forward run enable, Reverse run enable, Current value clear, Zero point stop, PON input), both sink (negative common) and source (positive common) connections are possible.								
General purpose output		24 VDC 50 mA 5 points (speed control: Servo normal, Servo ready, Stop detection, Warning, MB output), both sink (negative common) and source (positive common) connections are possible.								
General purpose I/O power supply		24 VDC 200 mA may be used for general purpose I/O power supply.								
Speed/ current control	Speed command	Motor maximum rotation rate with 0 to +/-10 VDC and +/-10 V (ratio setting possible), input resistance 49 ohms, AD resolution 12 bits (speed limit in the current control mode).								
	Current limit	Motor maximum torque with 0 to +/-10 VDC and +/-10 V (ratio setting possible), input resistance 49 ohms, AD resolution 12 bits (speed limit in the current control mode).								
Position control	Split count	Resolver: 24,000 P/rev., Encoder: 131,072 R/rev. (traveling amount during 1 pulse may be set with 65535/65535.)								
	Command type	Forward run/reverse run pulse (A phase/B phase pulse, forward/reverse signal / transfer pulse), 3.5 V to 5.5 VDC 16 mA photo coupler input, frequency 500 KHz (max.)								
Pulse output	Split count	Resolver: 24,000 P/rev., Encoder: 131,072 R/rev. (traveling amount during 1 pulse may be set with 65535/65535.)								
	Output mode	A phase/B phase pulse (forward run/reverse run pulse), Vout: 3 V (typ), 20 mA (max.), output equivalent to AM26LS31, frequency 500 KHz (max.)								
Acceleration and deceleration	Soft start	Acceleration and deceleration time may be specified independently from a speed command, linear acceleration or deceleration in the range of 0.000 to 65.535 seconds with 0.001 second steps								
	S-shaped acceleration/deceleration	S-shaped acceleration/deceleration Acceleration or deceleration time may be specified against a speed command or pulse command, S-shaped acceleration or deceleration in the range of 0.000 to 65.535 seconds with 0.001 second steps								
Monitor function	Monitor output	Speed or current monitoring in the range of 0 to +/-10 V, output resistance 330 ohms, DA resolution 12 bits								
	Display unit	5 digit LED (allowing checking, adjusting, and parameter setting for various kinds of monitors)								
	External display	Model DPA-80 (optional) may be connected for monitoring speed, current, current value, and electronic-thermal.								
Auto-tuning		Automatic gain setting by repeated tuning operation								
Protective function (alarms)		Over current, over voltage, low voltage, motor over load (electro-thermal and instant thermal), fin overheating, counter current resistance over load, resolver broken line, encoder broken line, etc.								
General specifications	Operational environment condition	Temperature: 0 to 55 degrees Celsius (no freezing allowed), Humidity: 35% to 90% (no condensation allowed), Atmosphere: without dirt and dust, metal powder, or corrosive gas. Installation altitude: Below 1000 M								
	Vibration resistance	10-50 Hz, below 1 G								
	Storage environment condition	Temperature: -10 to 70 degrees Celsius (no freezing allowed), Humidity: 35% to 90% (no condensation allowed), Atmosphere: without dirt and dust, metal powder, or corrosive gas.								
	Protection structure	IP10								
	Over voltage class	Category II								
	Protective insurance	Entire interface (including CN1, CN2, CN5, and CN9) are protected by insulation from the primary power supply.								

11-3. External Views

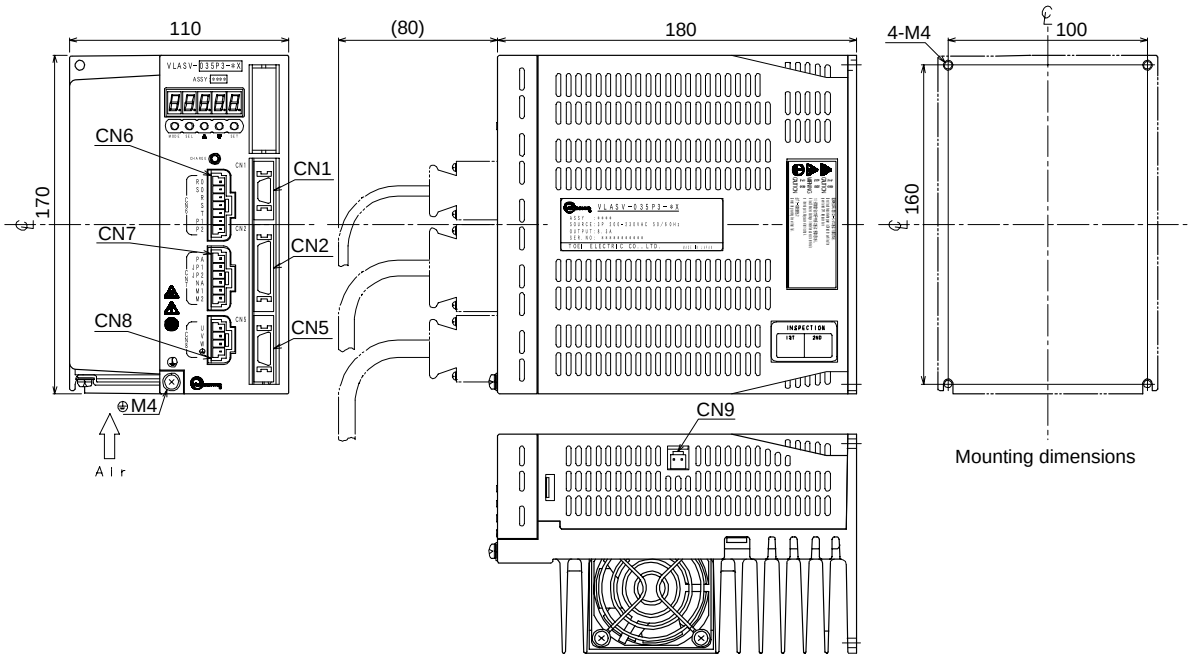
VLASV-006P1 • 006P2 • 012P1 • 012P2



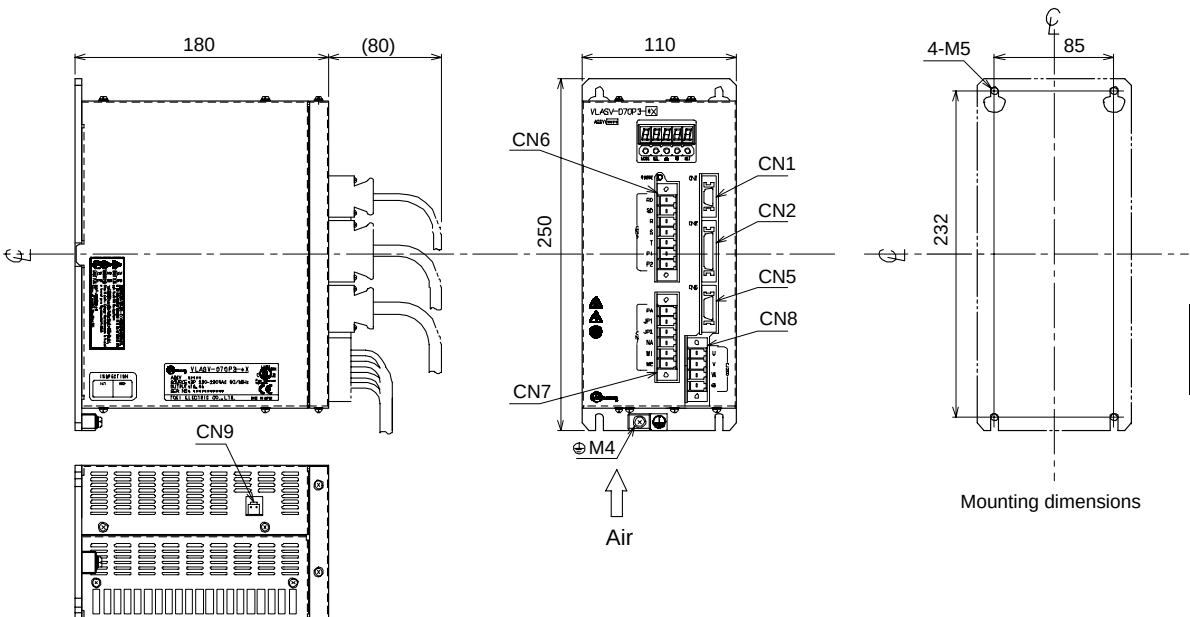
VLASV-025P2



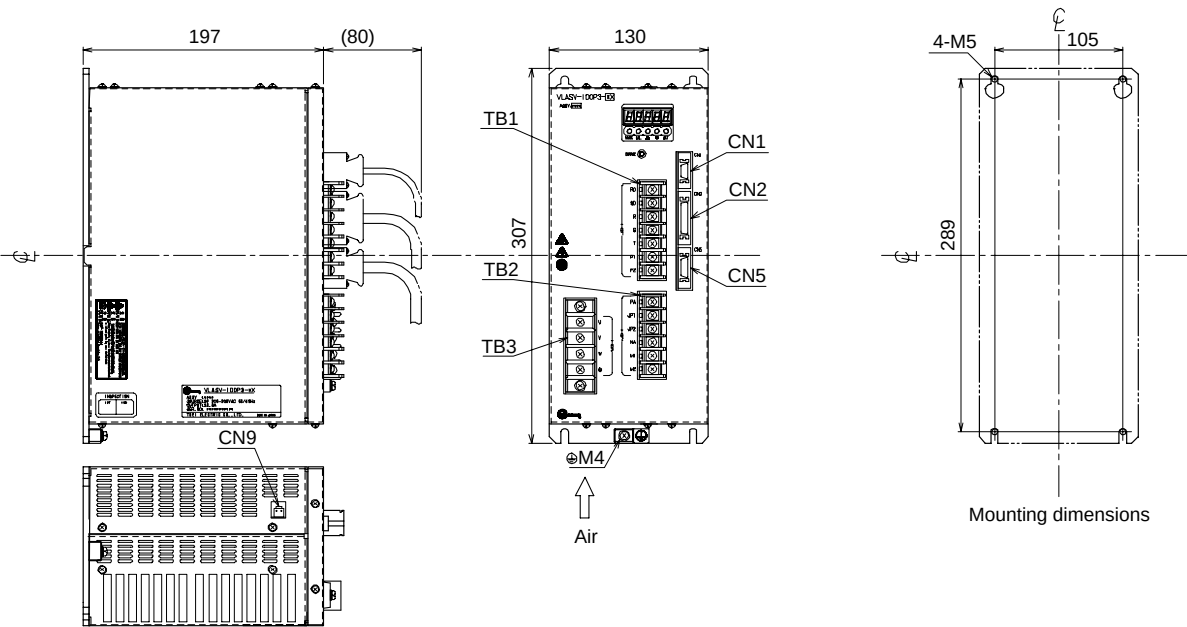
VLASV-035P3



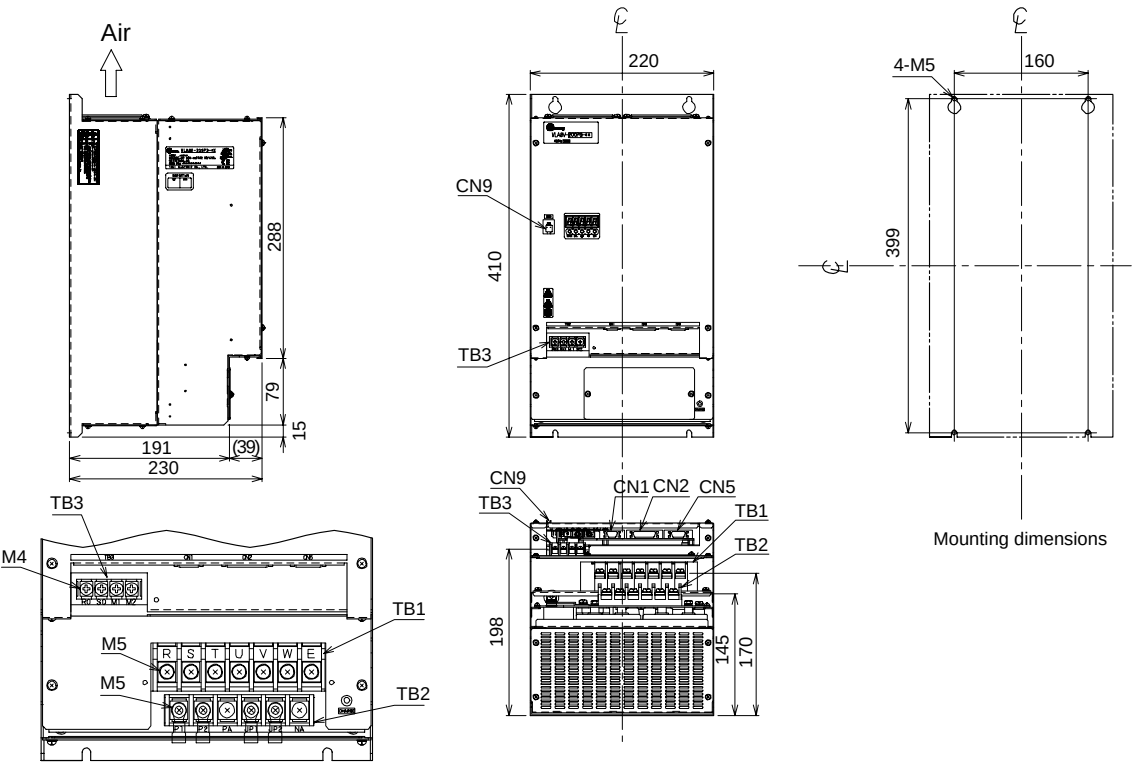
VLASV-070P3



VLASV-100P3



VLASV-200P3



Appendix

Composition of this Engineering Handbook

This handbook describes operation of V series servo amplifiers VLASV-006P through 200P. The circuit structure shown in the block diagram in Chapter 11 is common to all models. In this handbook, the main circuit and the signal circuit are described separately. As for the motor sensor, both resolver type and 17-bit serial encoder type are described. Do not be confused.

Safety is assured by right operation. Read this handbook carefully.

Safety consideration

Meaning of terms and labeling, general matters, transportation, installation, wiring, operation and handling, maintenance and service, and disposal.

Examine package contents first. Set the motor code and control mode next.

Preface P2

Unpacking, part names, and combination of the motor and amplifier

Before designing a control panel and wiring.

Chapter 1 Installation P10

Installation and environmental condition

Chapter 2 Power Circuit P14

Main circuit wiring, brake circuit, and counter current absorption resistance

Chapter 3 Signal Circuit P42

Analog I/O, pulse I/O, monitor I/O, and motor sensor input

Get familiar with key operation.

Chapter 4 Operation Display and Display Details P58

Key operation and operation and details of each area

Chapter 6 Auto-tuning P146

See Chapter 4 for auto-tuning parameters and adjustment flow operation.

Each mode has different I/O signals and parameters.

Chapter 5 Operation GuidelineP72

Speed control mode
Current control mode
Position control mode
Speed/current/position control mode
Direct feed mode
Draw control mode
NCBOY mode

How to operate ABS and peripheral equipment

Chapter 7 Absolute Position Detection (ABS)P156

Configuration, specifications, wiring, and output timing

Chapter 8 Peripheral EquipmentP164

Display unit, brake power supply, ABS battery, external counter current absorption resistor, noise filter, DCL, cable, connector, plug, etc.

Understand well amplifier and motor properties.

Chapter 9 PropertiesP188

Short time overload, electronic-thermal, and dynamic brake properties

Chapter 11 SpecificationsP198

Control block diagram, specifications, and external views

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Chapter 10 Alarm CodeP192

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Trouble Reporting Card

■ Please contact one of the following offices:

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- Mishima Sales Office
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- Nagoya Sales Office
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- Service Center in Japan
131 Matsumoto, Mishima City, Shizuoka Prefecture 411-8510 Tel: +81-55-977-0129 Fax: +81-55-977-3744

Contact of your company	Company name	
	Div./Dept.	
	Contact name	
	Tel	Fax
Motor type	VLBSV- -	
Motor serial number		
Type of servo amplifier to be combined	VL - P -	
Amplifier serial number		
Amplifier ASSY number		
Working condition	Installing/operating Years (operation hours per day: hours)	
Phenomena of trouble/failure	Not starting/unstable rotation/wild run/overheating/ strange noises or smell Others _____	
Alarm issued		
Detailed description of troubles	What happened in what operation stage?	