

MITSUBISHI

MDS-A-SVJ SERIES

SERVO MAINTENANCE AND ADJUSTMENT MANUAL

M3122-ES

MITSUBISHI

MDS-A-SVJ SERIES

SERVO MAINTENANCE AND ADJUSTMENT MANUAL

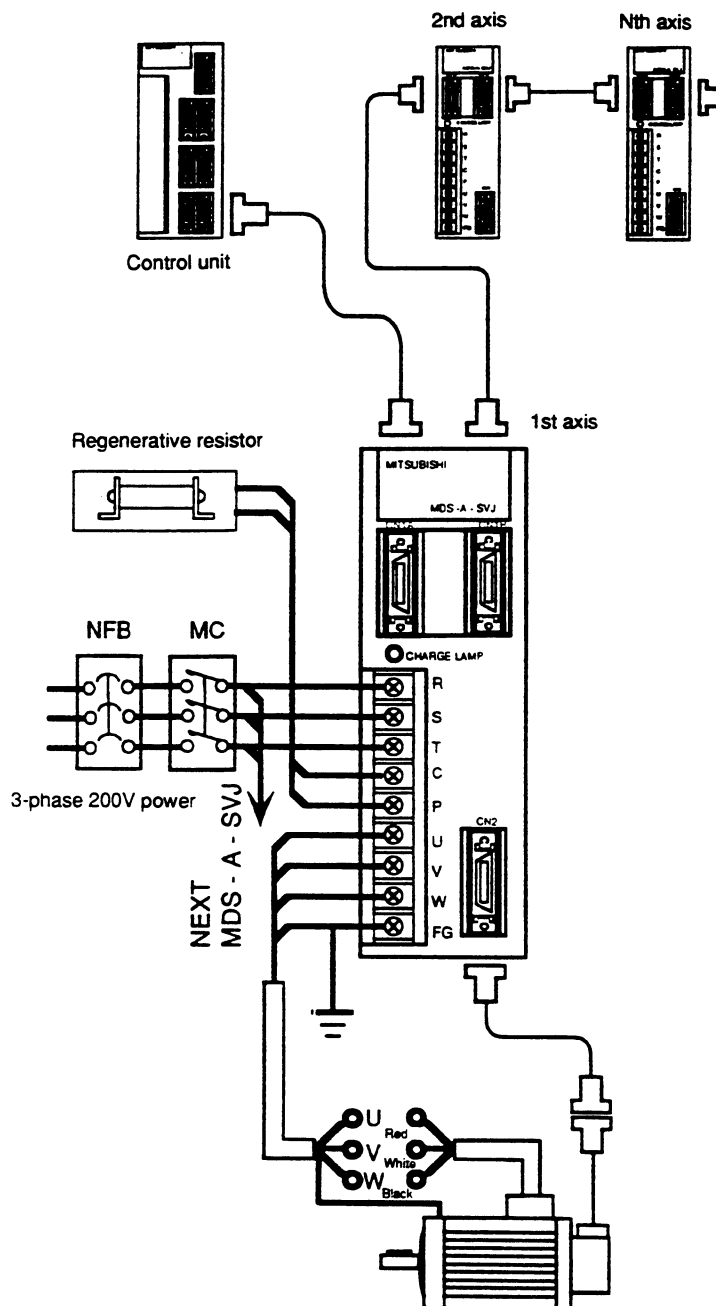
M3122-ES

Contents

1. Outline	1
1.1 Handling guide	1
1.2 Precautions for handling	2
1.3 Inspection at time of purchase	4
1.4 Installation	6
1.5 Periodic inspection	9
2. Setup	10
2.1 Main circuit and cable wiring	10
2.2 Hardware setting	14
2.3 Parameter settings	15
2.4 Status display	27
2.5 Absolute value system	28
3. Adjustment	29
3.1 Measurement of data for adjustment	29
3.2 Characteristic improvement	30
3.3 Parameter settings	36
4. Trouble Diagnosis and Remedies	40
4.1 Points of caution and confirmation	40
4.2 List of protective functions	41
4.3 Troubleshooting	45

1. Outline

1.1 Handling guide



Points for handling

Power specifications

Use power that is within the servo's tolerable power specifications.

Non-fuse breaker/magnetic contactor

A large rush current will flow to the servo when the power is turned on. Take special care to the current capacity.

Reactor installation

A reactor is required when installing power factor improvement units or when installing directly under the max. power capacity (500kVA or more with wiring distance 10m or less).

Installation location

Mistaken wiring will damage the servo. Separate the communication cable and main circuit far apart to prevent noise effects.

Grounding

Ground the motor and driver terminals at the shortest one point ground to prevent electric shocks and noise.

Motor assembly

Do not apply shock to the motor shaft or detector with a hammer, etc.

Reference material

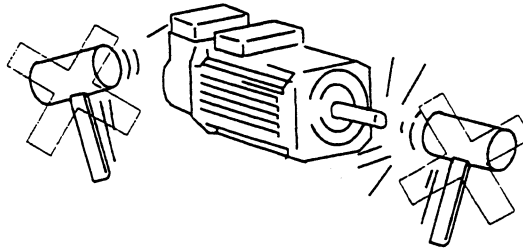
The setting methods and data for each device is noted in the "Servo Selection Manual (BNP-B3783)". Refer to that manual for details and data.

1.2 Precautions for handling

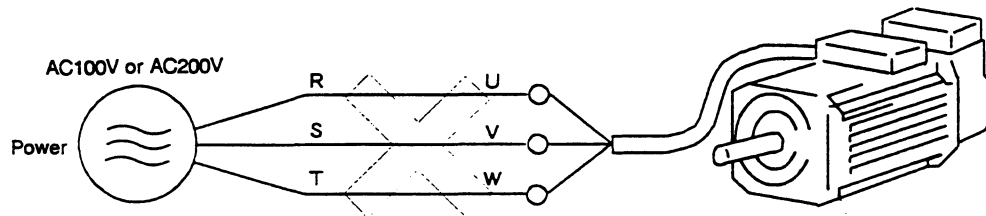
Unforeseen accidents may happen if handling of the servo is mistaken. Importance items are noted below, so refer to these and other related matters, to ensure correct use of the unit.

[Handling]

- (1) Do not apply shock to the motor detector.
The motor may be damaged when the shaft is hammered or dropped.



- (2) Do not directly apply a commercial power (200V) to the motor.
An excessive current will flow and demagnetize the motor magnet.
Always drive the motor with the designated servo drive unit.



[Wire connection]

- (1) Ground the drive unit and motor grounding terminals on the drive unit side at the shortest distance. Use Class 3 grounding (100Ω or less) to prevent electrical shocks or mistaken operation.
- (2) Always match the drive unit and motor U, V and W terminals. Two wires cannot be interchanged to change the rotation direction as with the general purpose motor.
- (3) If a commercial power (200V) is applied to the drive units U, V and W terminals, it may be damaged.
Apply the 200V class power to the R, S and T terminals.
When using a power other than 200V class, install a transformer.
- (4) Connect the exclusive option to the regenerative operation terminal (between C-P), and set the corresponding parameters.
The drive unit may be damaged or the regenerative resistor may overheat and burn if this is mistaken.

Outline
Precautions for handling

[Operation and sequence]

- (1) The motor's solenoid brakes are used only during an emergency or for holding.
The brakes are designed for holding during a power failure, and if used for breaking during deceleration the brakes will wear out quickly.
- (2) Install the breaker and magnetic contactor on the power R, S and T terminals.
- (3) When turning on the drive unit after turning off, confirm that the drive unit's status display LED is out.

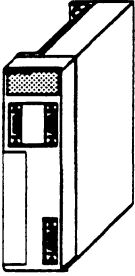
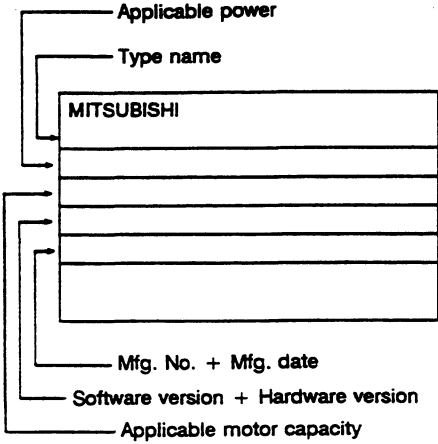
[Maintenance and inspection]

- (1) A "high voltage" will remain inside the drive unit for a short time after the power is turned OFF.
Wait until the CHARGE lamp on the front of the drive unit has gone out.
- (2) The drive unit may be damaged if tested with a megger tester. Do not perform the megger test.
Use the conductivity test when necessary.
- (3) The motor detector cannot be removed. Never remove the covers, etc.

Outline
Inspection at time of purchase

1.3 Inspection at time of purchase

(1) Inspect the rating nameplate and confirm that the product is as ordered.

Appearance	Rating nameplate details	Type details																				
		<p>MDS-A-SVJ-□□</p> <p>Mitsubishi servo drive unit MDS-A-SVJ series</p> <table border="1"> <thead> <tr> <th rowspan="2">Symbol</th><th colspan="2">Capacity (W)</th></tr> <tr> <th>HA-FH HA-FE</th><th>HA series</th></tr> </thead> <tbody> <tr> <td>01</td><td>50 100</td><td>50 100</td></tr> <tr> <td>03</td><td>200 300</td><td>300 450</td></tr> <tr> <td>06</td><td>400 600</td><td>500</td></tr> <tr> <td>10</td><td></td><td>1000</td></tr> <tr> <td>20</td><td></td><td>2000</td></tr> </tbody> </table>	Symbol	Capacity (W)		HA-FH HA-FE	HA series	01	50 100	50 100	03	200 300	300 450	06	400 600	500	10		1000	20		2000
Symbol	Capacity (W)																					
	HA-FH HA-FE	HA series																				
01	50 100	50 100																				
03	200 300	300 450																				
06	400 600	500																				
10		1000																				
20		2000																				

Servo Drive Unit Specifications

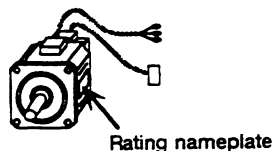
Unit type		MDS-A-SVJ-□□
General specifications	Working temperature	0 ~ 55°C
	Storage temperature	-20 ~ 65°C
	Working humidity	40 ~ 90%RH (with no dew condensation)
	Storage humidity	40 ~ 90%RH (with no dew condensation)
	Vibration resistance	0.6G or less (during operation)
	Shock resistance	3.0G or less (during operation)/ 10G or less (during transportation)
	Working atmosphere	No corrosive gases or dust
Power specifications	Power voltage	3-phase AC200V ~ AC230V -15% +10% 50/60Hz ± 5%
	Power consumption	Differs according to motor being used (Refer to "Servo Selection Manual" for details.)
	Heat generation amount	

Outline
Inspection at time of purchase

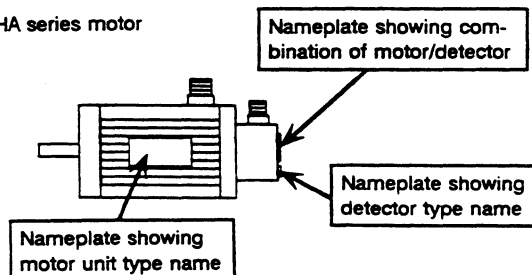
(2) Confirm that the servomotor type is the one ordered.

Rating nameplate details	Type details																								
<div>HA-FE□□ (B)</div> <div>HA-FH□□ (B)-Y</div> <div> <div>Type name →</div> <div>Manufacturing No. →</div> <div>Manufacturing date →</div> <div></div> </div>	<div> <div>HA-F□□3</div> <div>AC servomotor</div> <div>HA-FE series</div> <div>HA-FH series</div> <div>Rated speed 3000 r/min.</div> </div> <table border="1"> <thead> <tr> <th>Symbol</th><th>Capacity</th><th>Symbol</th><th>Capacity</th></tr> </thead> <tbody> <tr> <td>05</td><td>50W</td><td>3</td><td>300W</td></tr> <tr> <td>1</td><td>100W</td><td>4</td><td>400W</td></tr> <tr> <td>2</td><td>200W</td><td>6</td><td>600W</td></tr> </tbody> </table>	Symbol	Capacity	Symbol	Capacity	05	50W	3	300W	1	100W	4	400W	2	200W	6	600W								
Symbol	Capacity	Symbol	Capacity																						
05	50W	3	300W																						
1	100W	4	400W																						
2	200W	6	600W																						
<div>HA□□ (B) S-E□</div> <p>The following items are indicated on the HA Series motor:</p> <ol style="list-style-type: none"> 1) Motor's nameplate 2) Detector's nameplate 3) Motor and detector assembly parts' nameplate <p>The 3) nameplate is the representative type of this servomotor.</p> <div> <div>Type name →</div> <div>Motor capacity/speed →</div> <div>Detector type/resolution →</div> <div>Hardware version →</div> <div>Mfg. No. + Mfg. date →</div> <div> <div>MITSUBISHI</div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> </div>	<div> <div>HA□BS-E30</div> <div>AC servomotor</div> <div>HA series</div> <div>Detector type</div> <div>Shaft shape</div> <div>With brakes</div> </div> <table border="1"> <thead> <tr> <th>Symbol</th><th>Capacity</th><th>Rated speed</th></tr> </thead> <tbody> <tr> <td>053</td><td>50W</td><td rowspan="5">3000 r/min.</td></tr> <tr> <td>13</td><td>100W</td></tr> <tr> <td>23N</td><td>300W</td></tr> <tr> <td>33N</td><td>450W</td></tr> <tr> <td>43N</td><td>500W</td></tr> <tr> <td>83N</td><td>1kW</td><td rowspan="3">2000 r/min.</td></tr> <tr> <td>40N</td><td>500W</td></tr> <tr> <td>80N</td><td>1kW</td></tr> <tr> <td>100N</td><td>2kW</td><td></td></tr> </tbody> </table>	Symbol	Capacity	Rated speed	053	50W	3000 r/min.	13	100W	23N	300W	33N	450W	43N	500W	83N	1kW	2000 r/min.	40N	500W	80N	1kW	100N	2kW	
Symbol	Capacity	Rated speed																							
053	50W	3000 r/min.																							
13	100W																								
23N	300W																								
33N	450W																								
43N	500W																								
83N	1kW	2000 r/min.																							
40N	500W																								
80N	1kW																								
100N	2kW																								

Appearance
HA-FE/FH series
motor



HA series motor



Servomotor specifications

Motor series name		HA-FE/FH series	HA series	
Motor type name		HA-FE/FH 053/13/23/33/43/63	HA053/13/23N/33N/40N/43N/80N/83N	HA100N
Working temperature		0 ~ 40°C (with no freezing)		
Working humidity		80%RH or less (with no dew condensation)		
Vibration resistance	Shaft direction	2.0G or less	1.0G or less	2.0G or less
	Radius direction	2.0G or less	2.5G or less	5.0G or less

Refer to "Installation of the servomotor" for details.

1.4 Installation

< Installation of servo drive >

Each unit is installed into a sealed cabinet structure as a standard.
Observe the following items when installing the units in the cabinet.

(1) Working environment conditions

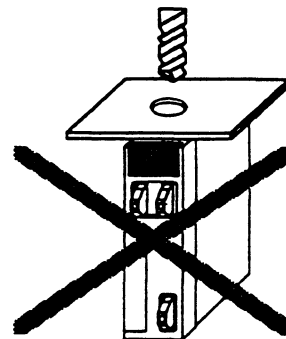
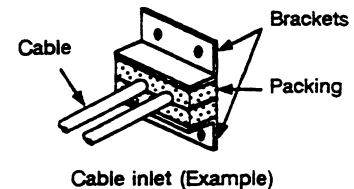
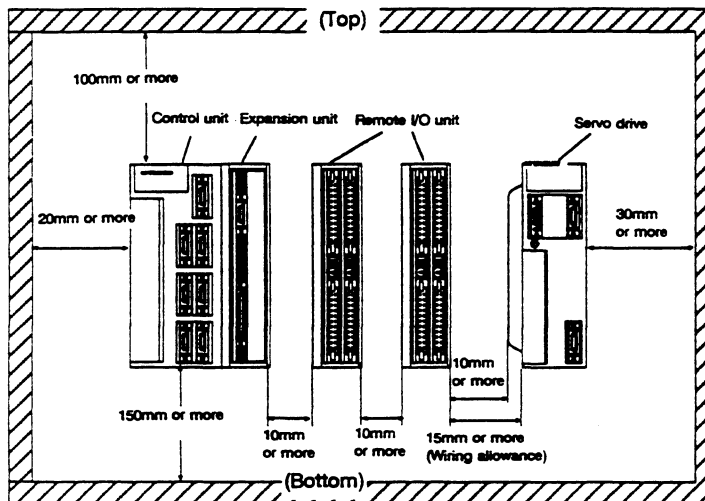
- Ambient temperature: 0 to 55°C (with no freezing)^(Note)
- Ambient humidity : 90%RH or less (with no dew condensation)
- Vibration : 5.9m/s² {0.6G} or less

(Note) Inner panel temperature specifications. The average panel temperature should be 40°C or less to ensure the servo drive life and reliability.

(2) Installation direction and clearance

Install each unit so that the front is visible.

Consider each unit's heat radiation and wiring, and secure enough space for ventilation while referring to the following drawing.



(3) Prevention of entering of foreign matter

Treat the cabinet with the following items.

- Make sure that the cable inlet is dust and oil proof by using packing, etc.
- Make sure that the external air does not enter inside by using heat radiating holes, etc.
- Close all clearances.
- Securely install door packing.
- If there is a rear cover, always apply packing.
- Oil will tend to accumulate on the top. Take special measures such as oil-proofing the top so that oil does not enter the cabinet from the screw holds.

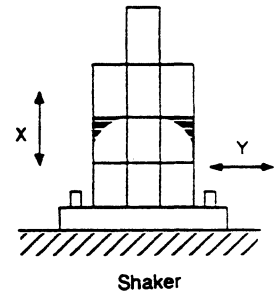
After installing each unit, avoid machining in the periphery. If cutting chips, etc., stick onto the electronic parts, trouble may occur.

< Installation of servomotor >

(1) Working environment conditions

- Ambient temperature: 0 to 40°C (with no freezing)
- Ambient humidity : 80%RH or less (with no dew condensation)
- Vibration : Refer to following table.

Motor	Excitation direction	
	Shaft direction (X)	Shaft and vertical direction (Y)
HA-FE series HA-FH series	2.0G	2.0G
HA053/13 HA23N/33N HA40N/43N HA80N/83N	1.0G	2.5G
HA100	2.0G	5.0G



Conditions

1. Motor at standstill
2. Installation state
3. No trouble with above values after 6 hours of operation at 250Hz
(Confirm that there is no resonance point at 250Hz or less)

Note) In machines (turret punch press, press, chassis, etc.) having severe vibration even within the above values, special care must be taken on the machine side to prevent loosening of the cannon plugs, cables and clamps.

(2) Cautions when mounting load (prevention of shock to shaft)

- When mounting the load, use the shaft tip screw hole (only for HA-FE motor).
- When pulling out the pulley, use a pulley remover.

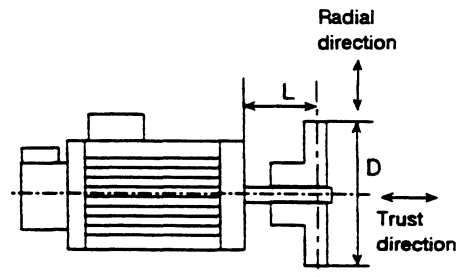
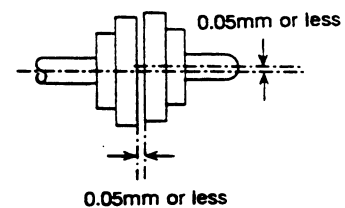
(3) Shaft tolerable load

- Use flexible coupling to keep the shaft run-out within the tolerable values.
- When using a pulley or sprocket, select a diameter that will stay within the tolerable radial load.

Motor shaft end tolerable load

Motor	Tolerable radial load (N)	Tolerable thrust load (N)
HA-FD053	L = 30 108 { 11kgf }	98 { 10kgf }
HA-FD13	L = 30 118 { 12kgf }	98 { 10kgf }
HA-FD23	L = 30 176 { 18kgf }	147 { 15kgf }
HA-FD43/63	L = 40 323 { 33kgf }	284 { 29kgf }
HA053/13	L = 26 78 { 8kgf }	49 { 5kgf }
HA23N/33N	L = 58 196 { 20kgf }	147 { 15kgf }
HA40N/43N HA80N/83N	Tapered shaft L = 58 392 { 40kgf }	490 { 50kgf }
	Straight shaft L = 55 980 { 100kgf }	
HA100N	L = 79 2058 { 210kgf }	980 { 100kgf }

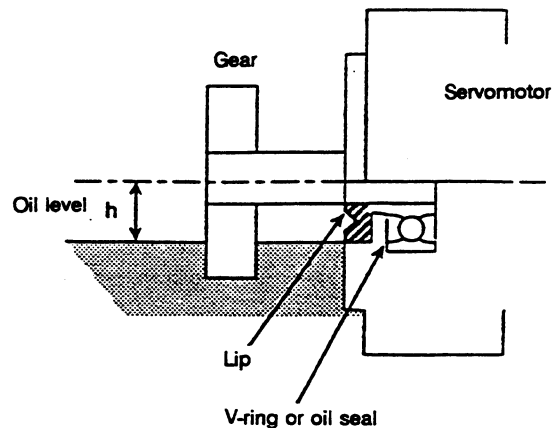
Note) The tolerable thrust load values are for when there is no load radial load.



(4) Measures for oil and water

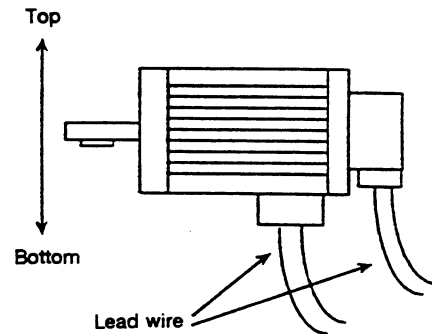
- The servomotor is not a waterproof structure. (IP44).
Make sure that oil or water does not come in contact with the motor.
- When installing the servomotor in the gear box, ensure that the oil level from the motor shaft's V-ring oil seal is as shown in the following table.
Create air holes in the gear box so that the inner pressure does not increase.

Motor	Oil level height h (mm)
HA-FE053/13	8
HA-FE23/33	12
HA-FE43/63	14
HA053/13	8
HA23N/33N	10
HA40N/43N HA80N/83N	20
HA100	25



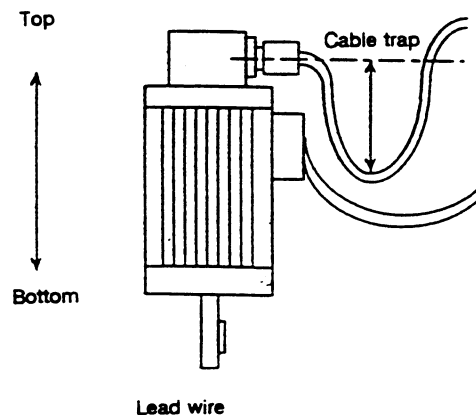
(5) Installation direction

- The servomotor can be installed with the shaft end up, down, or horizontal.
- Make sure that the cables from the motor are installed downward.
- When installing the motor vertically, create a cable trap so that oil or water do not reach the motor.
- Oil or water may pass along the cable and adversely affect the motor and detector. Make sure that the cable does not convey the oil or water and that it does not sit in oil or water pools.
- The standard cannon plug is not waterproof. Use the conduit and connector to waterproof the plug.



(6) Broken cable wires

- Make sure that stress is not applied on the cable, and that it does not become scratched.
- When using the motor in applications where it will move, select the cable according to the bending life required for the cable's bending radius and wire type.



Outline
Periodic inspection

1.5 Periodic inspection

The drive unit is a stationary unit, so daily inspection and maintenance are not required. However, periodic inspections must be enforced.

The servomotor is brush-less and basically does not require maintenance, but periodically confirm that there is not abnormal noise or vibration.

(1) Inspection items

Inspection of drive unit

- Check that there is no dust or dirt accumulated inside, and clean if necessary.
- Check for loose screws on the terminal block, and tighten if necessary. If the screws are dirty with dirt or oil, clean them off.
- Check that the cooling fan operates normally, and clean it. (Built-in only in MDS-A-SVJ-20)
- Use a tester to test the drive unit conductivity, and never use a megger or buzzer.

Inspection of cables and wiring

- Check that the cables are not damaged or scratched, etc., and that the connectors are not loose.

Inspection of motor

- Check that there is no abnormal noise or vibration from the motor.
- Touch the motor bearings and frame by hand, and confirm that they are not hot.
- Inspect the load coupling shaft alignment, and correct if necessary.
- Disconnect the wiring between UVW and the detector. Check the megger between the motor UVW terminals and grounding terminal, and confirm that it is 5MΩ or more. (The drive unit will be damaged if the megger test is executed when connected.)

(2) Measurement instruments

Measurement item	Instrument
Power voltage (R-S-T)	Moving-iron type voltmeter
Power current (R-S-T)	Moving-iron type ammeter
Output voltage (U-V-W)	Rectifying type voltmeter
Output current (U-V-W)	Moving-iron type ammeter
Confirmation of various waveforms	Oscilloscope

(3) Maintenance parts

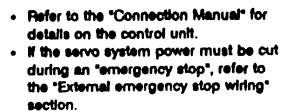
Part	Type name	Replacement period
Battery unit	FCU-A-BT-2 -4 -6 -8	7 years [The life will differ according to the working conditions. If the servo alarm "9F" occurs, replace the battery immediately.]
Magnetic contactor	According to the drive unit capacity.	When broken
Non-fuse breaker		When broken

2.1 Main circuit and cable wiring

- Refer to the "Connection Manual" for details on the control unit.
- If the servo system power must be cut during an "emergency stop", refer to the "External emergency stop wiring" section.

Cannon type	Detector cable		Motor drive cable		Solenoid brake cable	
	Straight type	Angle type	Straight type	Angle type	Straight type	Angle type
HA053/13	R081	R085	R801	R805	R804	R808
HA23/33						
HA40/43/80/83	R080	R084	R802	R806	Built-in motor drive cable	
HA100			R803	R807	R804	R808

< Absolute value system >



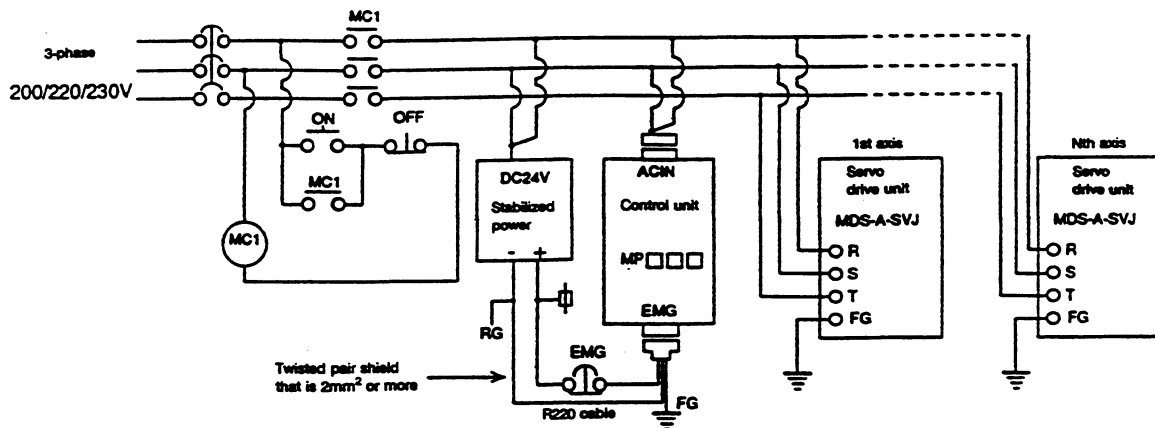
Battery unit name	No. of absolute value specification axes
FCU-A-BT-2	2 axes or less
FCU-A-BT-4	4 axes or less
FCU-A-BT-6	6 axes or less
FCU-A-BT-8	8 axes or less

The HA series motor uses a cannon plug.

Cannon type Motor	Detector cable		Motor drive cable		Solenoid brake cable	
	Straight type	Angle type	Straight type	Angle type	Straight type	Angle type
HA053/13	Absolute value specifications not available.					
HA23/33	R080	R084	R801	R805	R804	R808
HA40/43/80/83			R802	R806	Built-in motor drive cable	
HA100			R803	R807	R804	R808

Power main circuit and external emergency stop wiring

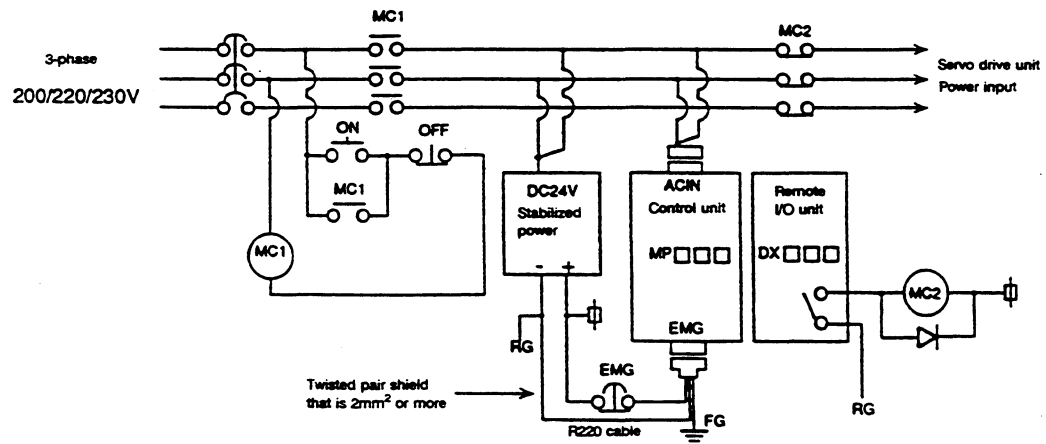
(1) Standard wiring



- The external emergency stop is input to the control unit and then immediately conveyed to all servo drive unit axes through the R000 communication cable. The servo drive unit will then immediately decelerate and stop.
- Deceleration stop will stop with the time constant set in servo parameter SV056. Refer to the section "Adjustment" for details.

(2) Examples of special wiring for emergency stop

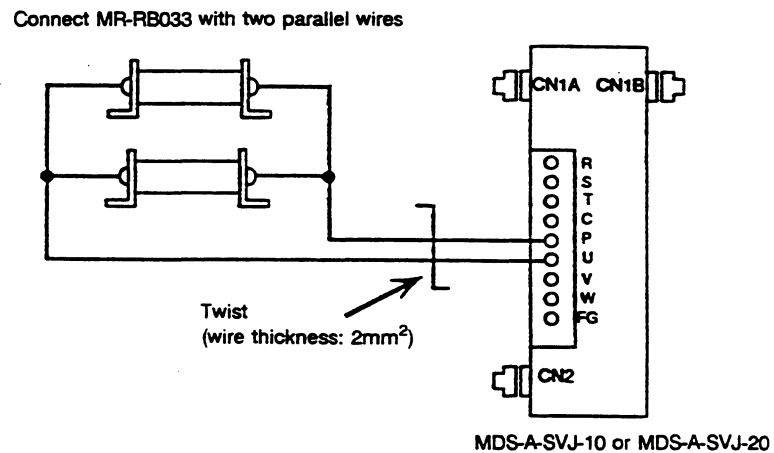
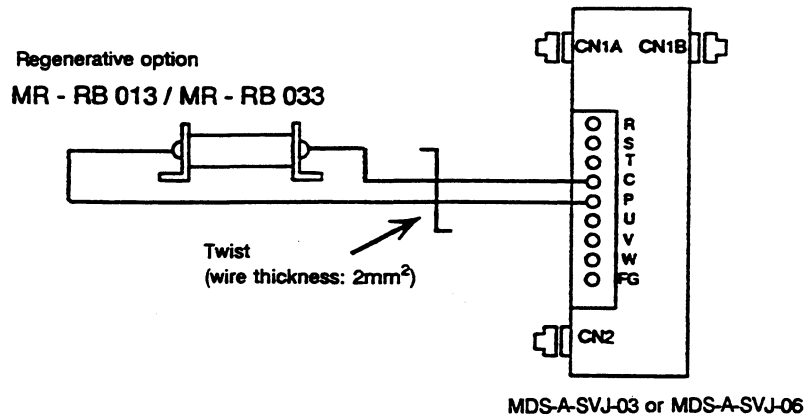
a) When servo drive unit power is to be cut when emergency stop occurs:



- The servo drive unit must be turned ON simultaneously with the control power. (MC2 is b contact)
- The delay time from when the external emergency stop is input in the control unit to when the remote I/O unit output starts depends on PLC.
- To cut the servo drive unit power with the external emergency stop, deceleration stop with a lengthened time constant will not be possible. Select the step stop (set SV056 to 0).
- Once the servo drive unit power is turned off with the external emergency stop, the control unit power must be reset to restart the servo drive unit.

Regenerative option resistor wiring

The regenerative option resistor must be connected as shown below.



1. Always use twisted wires for the regenerative option resistor, and keep the wires as short as possible (within 5m).
2. The regenerative option resistor generates a heat of approximately 100 degrees, so do not install it directly on a wall susceptible to heat.
3. Use non-combustible wires or treat the wires with non-combustible material (silicon tube, etc.) and wire so that the regenerative option resistor unit is not contacted.

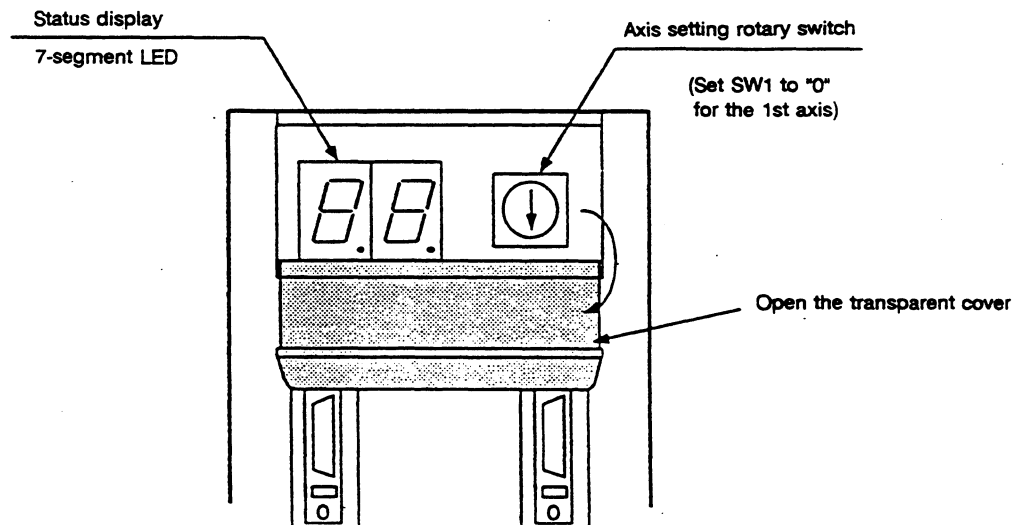
2.2 Hardware setting

Open the transparent cover on the upper front of the MDS-A-SVJ servo drive unit, and turn the rotary switch to set the servo drive unit axis No. Refer to the following table when setting.

SW1 setting	Meaning
0	1st axis
1	2nd axis
2	3rd axis
3	4th axis
4	5th axis
5	6th axis
6	7th axis
7 ~ E	Not used
F	Selection of axis not used

- When the axis not used is selected, that axis will not be controlled even after the power is turned ON. The LED will display "Ab".

< Example of setting to select 1st axis >



2.3 Parameter settings

The servo drive unit parameters (hereafter called servo parameters) must be set when setting up the servo drive system. The servo parameters are classified as shown below.

1) Servo specification parameters	These are parameters determined according to the machine specifications and servo system specifications. Set the servo specification parameters and then set the other parameters according to the standard parameter setting table to drive the servo system.
2) Servo characteristic parameters	These are parameters that improve the servo characteristics. Set these according to the machine inertia, etc.
3) Compensation function parameters	These parameters are used to finely adjust the servo system. <ul style="list-style-type: none"> • Changes the position loop response to a high response. • Characteristic improvement when changing over the quadrant in machine tools, etc. • Suppression of machine resonance
4) Parameters for special specifications	These are parameter used when the machine load is large, when the motor torque is to be limited, or when the motor movement is to be observed, etc.
5) Others	Parameters other than the above should be set with the standard parameter settings.

The servo specification parameter settings will be explained in this chapter. As explained earlier, basic operation of the servo system is possible by setting the basic parameters and setting parameters other than the servo specification parameters to the standard parameters. Refer to the following:

- Servo specification parameter list per motor
- Standard parameter setting list per motor
- Setting of machine specification related parameters (SV001/SV002/SV018/)
- Setting of regeneration method related parameters (SV036)

Servo specification parameter setting (1/2)

The following parameters are servo parameters set according to the machine and servo system specifications.

Motor series name	HA-FE□ series						HA-FH□-Y series						HA-ME□ series								
Rated speed (r/min)	3000						3000						3000								
System specifications	Incremental						Absolute value						Incremental								
Motor capacity symbol	FE053	FE13	FE23	FE33	FE43	FE63	FH053	FH13	FH23	FH33	FH43	FH63	ME053	ME13	ME23	ME43	ME73	NO (Parameter abbreviation)	Parameter name	*1	
Motor capacity kW	0.05	0.1	0.2	0.3	0.4	0.6	0.05	0.1	0.2	0.3	0.4	0.6	0.05	0.1	0.2	0.4	0.75				
Parameter																					
#2201	Set the motor side gear ratio in PC1 and the machine side gear ratio in PC2. Set PC1 and PC2 so that they are the smallest integer ratio.																	SV001 (PC1)	Motor side gear ratio	(1)	
#2202																		SV002 (PC2)	Machine side gear ratio		
#2203	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	SV003 (PGN1)	Position loop gain	(2)	
#2205	Changes according to the machine's load inertia.																	SV005 (VGN1)	Speed loop gain	(4)	
#2217	0000	0000	0000	0000	0000	0000	0080	0080	0080	0080	0080	0080	0000	0000	0000	0000	0000	SV017 (SPEC)	Servo system specification	(2)	
#2218	Set the ball screw pitch in mm units.																	SV018 (PIT)	Ball screw pitch	(1)	
#2219	4	4	4	4	4	4	8	8	8	8	8	8	4	4	4	4	4	SV019 (RNG1)	Position detector resolution	(2)	
#2220	4	4	4	4	4	4	8	8	8	8	8	8	4	4	4	4	4	SV020 (RNG2)	Speed detector resolution		
#2225	337C	337D	337E	337F	3370	3371	227C	227D	227E	227F	2270	2271	339C	339D	339E	3390	3391	SV025 (MTYP)	Motor type	(2)	
#2236	Select the regenerative option resistor. None: 1000 MR-RB013: 1100 MR-RB033: 1200																	SV036 (PTYP)	Selection of regenerative resistor	(3)	

*1 : Setting examples and detailed explanation reference section

Motor series name	HA-FE□ series										HA-ME□ series										
Rated speed (r/min)	3000							2000			3000					2000					
System specifications	Incremental							Incremental			Absolute value					Absolute value					
Motor capacity symbol	HA 053	HA13	HA 23N	HA 33N	HA 43N	HA 83N	HA 93N	HA 40N	HA 80N	HA 100N	HA 23N	HA 33N	HA 43N	HA 83N	HA 93N	HA 40N	HA 80N	HA 100N	NO (Parameter abbreviation)	Parameter name	*1
Motor capacity kW	0.05	0.1	0.3	0.45	0.5	1.0	1.5	0.5	1.0	2.0	0.3	0.45	0.5	1.0	1.5	0.5	1.0	2.0			
Parameter																					
#2201	Set the motor side gear ratio in PC1 and the machine side gear ratio in PC2. Set PC1 and PC2 so that they are the smallest integer ratio.																		SV001 (PC1)	Motor side gear ratio	(1)
#2202																			SV002 (PC2)	Machine side gear ratio	
#2203	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	SV003 (PGN1)	Position loop gain	(2)
#2205	Changes according to the machine's load inertia.																		SV005 (VGN1)	Speed loop gain	(4)
#2217	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0080	0080	0080	0080	0080	0080	0080	0080	SV017 (SPEC)	Servo system specification	(2)
#2218	Set the ball screw pitch in mm units.																		SV018 (PIT)	Ball screw pitch	(1)
#2219	10	10	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	SV019 (RNG1)	Position detector resolution	(2)
#2220	10	10	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	SV020 (RNG2)	Speed detector resolution	
#2225	338C	338D	006E	006F	0080	0081	008A	0000	0001	0002	226E	226F	2280	2281	228A	2200	2201	2202	SV025 (MTYP)	Motor type	(2)
#2236	Select the regenerative option resistor. None: 1000 MR-RB013: 1100 MR-RB033: 1200																		SV036 (PTYP)	Selection of regenerative resistor	(3)

*1 : Setting examples and detailed explanation reference section

Servo specification parameter setting (2/2)

Setup
Parameter settings

Setup
Parameter settings

(1) Parameters that change according to machine specifications

Setting of PC1 (SV001), PC2 (SV002) and PIT (SV018)

• For ball screw

PC1/PC2: Reduce the fraction of the motor side and machine side gear ratio, and set.

PIT : Set the ball screw pitch with an mm unit.

Example) If the reduction ratio is 18/30, reduce the fraction and set 3/5.

When the ball screw pitch is 10mm.

PC1	SV001	3
PC2	SV002	5
PIT	SV018	10

• For rotary shaft

PC1/PC2: Reduce the fraction of the motor side and machine side gear ratio, and set.

PIT : Set the rotary angle for one machine side rotation.

Example) When reduction ratio 1/240 rotary angle is 360°

PC1	SV001	1
PC2	SV002	240
PIT	SV018	360

• Others

By setting PC1 and PC2 to 1, and the machine movement per motor rotation with a mm unit or rotary angle unit in PIT, this can be used for transportation devices, etc.

Note: There is a setting range for PC1, PC2 and PIT. Confirm that the settings are within the following range.

$$PC1 \cdot PIT \cdot (\text{Min. movement amount}/2) \leq 32767$$

$$PC2 \cdot \text{RNG1} \leq 32767$$

(Refer to the command unit setting for the min. movement amount)

(2) Parameters that change according to servo system specifications

• Selection of incremental specifications/absolute value specifications

		Incremental specifications	Absolute value specifications
SPEC	SV017	0000	0080

With machine controller model N, this is set automatically by setting axis specification parameter #2049.

• Setting of detector type and motor type

MTYP	SV025										
F E D C B A 9 8 7 6 5 4 3 2 1											
PEN				ENT				MTYP			
				PEN		ENT		MTYP			
HA-FE/ME series				3		3		Set the motor type. Refer to the motor type list.			
HA-FH□-Y series				2		2					
HA□N-E30				0		0					
HA053/13-E30				3		3					

Setup
Parameter settings

• **Setting of detector resolution**

RNG1	SV019	Setting range: 1 ~ 1000
Set 1/1000 of the position detector resolution (after multiplying by 4). <ul style="list-style-type: none"> • If one rotation is 4000p, the value will be $4000/1000 = 4$, so set 4. 		

RNG2	SV020	Setting range: 1 ~ 1000
Set 1/1000 of the speed detector resolution (after multiplying by 4). <ul style="list-style-type: none"> • If one rotation is 4000p, the value will be $4000/1000 = 4$, so set 4. 		

Note) The MDS-A-SVJ servo driver uses the semi-closed control as a standard, so the position detector and speed detector are the same. Thus, set SV019 and SV020 to the same value.

• **Setting of position loop gain.**

PGN1	SV003	Setting range: 1 ~ 200 (1/sec)
Set the position loop gain. <ul style="list-style-type: none"> • Set 33 as the standard setting. • When setting a value larger than the standard setting, the speed loop gain must be carefully adjusted. If vibration occurs, set the value to lower than the standard setting. 		

(3) Setting of parameters for regenerative option

PTYP	SV036																			
The setting will differ according to the servo driver capacity and standard and optional specifications. <table border="1" data-bbox="521 1436 1096 1732"> <thead> <tr> <th>Driver name</th><th>Standard</th><th>Optional</th></tr> </thead> <tbody> <tr> <td>MDS-A-SVJ-01</td><td>1000</td><td>1000</td></tr> <tr> <td>MDS-A-SVJ-03</td><td>1100</td><td>1200</td></tr> <tr> <td>MDS-A-SVJ-06</td><td>1100</td><td>1200</td></tr> <tr> <td>MDS-A-SVJ-10</td><td>1200</td><td></td></tr> <tr> <td>MDS-A-SVJ-20</td><td>1200</td><td></td></tr> </tbody> </table>			Driver name	Standard	Optional	MDS-A-SVJ-01	1000	1000	MDS-A-SVJ-03	1100	1200	MDS-A-SVJ-06	1100	1200	MDS-A-SVJ-10	1200		MDS-A-SVJ-20	1200	
Driver name	Standard	Optional																		
MDS-A-SVJ-01	1000	1000																		
MDS-A-SVJ-03	1100	1200																		
MDS-A-SVJ-06	1100	1200																		
MDS-A-SVJ-10	1200																			
MDS-A-SVJ-20	1200																			
Note) Set to 1100 when using MR-RB013. Set to 1200 when using MR-RB033.																				
Note) If the actual regenerative resistor and setting differ, the over-regeneration alarm may occur, or the resistor may overheat.																				

Setup
Parameter settings

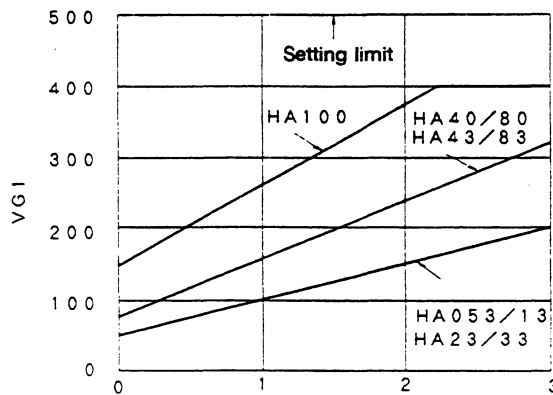
(4) Parameters that change according to the machine load inertia

• Speed loop gain setting

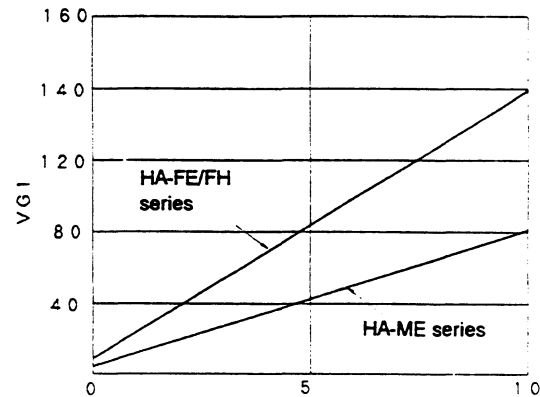
VGN1	SV006	Setting range: 1 ~ 500
Set the speed loop gain. • Increase the setting value according to the machine inertia. If the setting value is increased too far, the response will improve but the vibration and noise will increase.		

Refer to the following charts, and initially set VGN1. Note that these are the values when the motor and load are coupled. Vibration may occur even below the set values if gears, etc., are inserted or according to the coupling method even when coupled, or if the ball screw is twisted, etc.

In this case, lower the setting value 50 at a time from the value where vibration occurs.



Load inertia ratio
(load inertia/motor inertia)



Load inertia ratio
(load inertia/motor inertia)

• Setting of acceleration/deceleration time constant

A "rapid feed acceleration/deceleration time constant" parameter that sets the time (msec units) to when the rapid traverse rate is reached is found in the axis specifications parameters (different screen than servo parameter screen). This will shorten the positioning time. However, the rapid transverse acceleration/deceleration time constant will differ according to the load inertia, machine friction and motor capacity. Calculate the setting value with the following equation.

$$T_s = 1000 (2N\pi/60) \cdot (J_m + J_L) / (0.8 \cdot T_{max} - T_F) \text{ (msec)}$$

T_s : Acceleration/deceleration time constant (msec)

N : Motor speed during rapid traverse (r/min)

J_m : Motor inertia ($\text{kg}\cdot\text{m}^2$)

J_L : Load inertia ($\text{kg}\cdot\text{m}^2$)

T_{max} : Driver max. torque (N·m)

T_F : Motor shaft conversion load torque during rapid traverse

(When readjusting with an actual machine, approximately calculate with $T_F=0$.)

Note) Take note to the J_m , J_L and T_{max} units. The motor constants for when calculating with the SI unit/gravity system units are shown below for reference.

Motor series name			HA-FE□ series					HA-FH□ series		HA□ series								
Rated speed		r/min	3000						3000						2000			
Motor capacity symbol			FE053	FE13	FE23	FE33	FE43	FE63	HA053	HA13	HA23N	HA33N	HA43N	HA83N	HA40N	HA80N	HA100N	
Motor capacity			kW	0.05	0.1	0.2	0.3	0.4	0.5	0.05	0.1	0.3	0.45	0.5	1.0	0.5	1.0	2.0
SI unit system	Motor Inertia	kg·m ²	0.063 × 10 ⁻⁴	0.10 × 10 ⁻⁴	0.35 × 10 ⁻⁴	0.50 × 10 ⁻⁴	0.98 × 10 ⁻⁴	1.2 × 10 ⁻⁴	0.188 × 10 ⁻⁴	0.365 × 10 ⁻⁴	0.98 × 10 ⁻⁴	1.96 × 10 ⁻⁴	9.8 × 10 ⁻⁴	19.6 × 10 ⁻⁴	9.8 × 10 ⁻⁴	19.6 × 10 ⁻⁴	68.5 × 10 ⁻⁴	
	Max. torque	N·m	0.48	0.95	1.9	2.9	3.8	5.7	0.68	1.37	2.75	5.58	10.1	19.2	14.2	25.4	41.9	
Gravity unit system	Motor Inertia	kgf·cm·s ²	0.63 × 10 ⁻⁴	1.0 × 10 ⁻⁴	3.5 × 10 ⁻⁴	5.0 × 10 ⁻⁴	0.001	0.001	1.88 × 10 ⁻⁴	3.65 × 10 ⁻⁴	0.001	0.002	0.01	0.02	0.01	0.02	0.07	
	Max. torque	kgf·cm	4.8	9.5	19	29	38	57	7	14	28	57	104	196	145	260	428	
Non-dimensional	Motor Inertia	J _m = 1	Substitute J _m = 1, J _L = load inertia/motor inertia, and the following values for T _{max} in the acceleration/deceleration time constant conversion equation.															
	Max. torque	T _{max} /J _m	76000	95000	54000	58000	38000	47500	37000	38000	28000	28500	10400	9800	14500	13000	6100	

Setup
Parameter settings

(5) Parameters that change according to machine operation state

- **Setting of excessive error width**

If the error of the machine position from the position command is abnormally large, the protective function will activate and emergency stop will occur as if an error occurred in the machine.

There should be no problems with the standard setting values shown below under normal use, but if the machine load is heavy and a problem occurs with the standard setting, gradually increase the setting and adjust.

OD1	SV023	During servo ON	Setting range: 1 ~ 32767 mm
OD2	SV026	During servo OFF	

Calculation of standard setting value

$$OD1 = OD2 = \frac{\text{Rapid traverse rate (mm/min)}}{60 \cdot \text{PGN1}} \cdot 0.5 \text{ (mm)}$$

Standard parameter settings per motor (1/2)

Motor series name			HA-FED series						HA-FHD-Y series						HA-MED series				
Rated speed			3000 (r/min)						3000 (r/min)						3000 (r/min)				
System specifications			Incremental						Absolute value						Incremental				
Motor capacity symbol / kW			FE053	FE13	FE23	FE33	FE43	FE63	FH053	FH13	FH23	FH33	FH43	FH63	ME053	ME13	ME23	ME43	ME73
Parameter No.	Abbr.		0.05	0.1	0.2	0.3	0.4	0.6	0.05	0.1	0.2	0.3	0.4	0.6	0.5	0.1	0.2	0.4	0.75
#2201	SV001	PC1	Changes according to machine specifications. Refer to the section "Servo specification parameter settings".																
#2202	SV002	PC2	Changes according to machine specifications. Refer to the section "Servo specification parameter settings".																
#2203	SV003	PGN1	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
#2204	SV004	PGN2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
#2205	SV005	VGN1	15	15	15	15	15	15	15	15	15	15	15	15	8	8	8	8	8
#2206	SV006	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
#2207	SV007	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
#2208	SV008	VIA	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364
#2209	SV009	IQA	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048
#2210	SV010	IDA	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048
#2211	SV011	IQG	256	256	512	512	768	768	256	256	512	512	768	768	256	256	768	768	768
#2212	SV012	IDG	256	256	512	512	768	768	256	256	512	512	768	768	256	256	768	768	768
#2213	SV013	ILMT1	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
#2214	SV014	ILMT2	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
#2215	SV015	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Motor capacity symbol / kW			FE053	FE13	FE23	FE33	FE43	FE63	FH053	FH13	FH23	FH33	FH43	FH63	ME053	ME13	ME23	ME43	ME73
#2216	SV026	LMC1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
#2217	SV017	SPEC	0000	0000	0000	0000	0000	0000	Set 0080. For model N, this will depend on the #2049 setting.						0000	0000	0000	0000	0000
#2218	SV018	PIT	Changes according to machine specifications. Refer to the section "Servo specification parameter settings".																
#2219	SV019	PGN1	4	4	4	4	4	4	8	8	8	8	8	8	4	4	4	4	4
#2220	SV020	PGN2	4	4	4	4	4	4	8	8	8	8	8	8	4	4	4	4	4
#2221	SV021	OLT	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
#2222	SV022	OLL	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
#2223	SV023	ODI	Changes according to machine specifications.																
#2224	SV024	INP	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
#2225	SV025	MTYP	337C	337D	337E	337F	3370	3371	227C	227D	227E	227F	2270	2271	339C	339D	339E	3390	3391
#2226	SV026	OD2	Changes according to machine specifications.																
#2227	SV027	SSF1	Set "4000".																
#2228 ~ 35	SV028 ~ 35		Set to "0". These are parameters for compensation functions and special specifications, etc.																
#2236	SV036	PTYP	Select the regenerative option resistor. Refer to the section "Servo specification parameter settings".																
#2237 ~ 48	SV037 ~ 48		Set to "0". These are parameters for compensation functions and special specifications, etc.																
#2249	SV049	PGNISP	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
#2250 ~ 64	SV050 ~ 64		Set to "0". These are parameters for compensation functions and special specifications, etc.																

Standard parameter settings per motor (2/2)

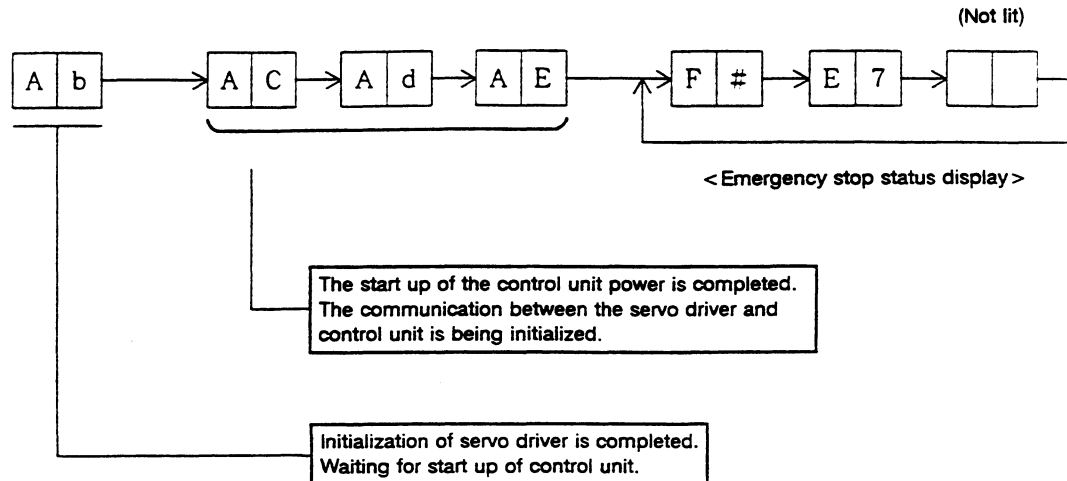
Motor series name			HAC-E30 series										HAC-A33 series								
Rated speed			3000 (r/min)							2000 (r/min)			3000 (r/min)					2000 (r/min)			
System specifications			Incremental							Incremental			Absolute value					Absolute value			
Motor capacity symbol / kW			HA053	HA13	HA 23N	HA 33N	HA 43N	HA 83N	HA 93N	HA 40N	HA 80N	HA 100N	HA 23N	HA 33N	HA 43N	HA 83N	HA 93N	HA 40N	HA 80N	HA 100N	
Parameter No.	Abbr.		0.05	0.1	0.3	0.45	0.5	1.0	1.5	0.5	1.0	2.0	0.3	0.45	0.5	1.0	1.5	0.5	1.0	2.0	
#2201	SV001	PC1	Changes according to machine specifications. Refer to the section "Servo specification parameter settings".																		
#2202	SV002	PC2	Changes according to machine specifications. Refer to the section "Servo specification parameter settings".																		
#2203	SV003	PGN1	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	
#2204	SV004	PGN2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
#2205	SV005	VGN1	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	
#2206	SV006	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
#2207	SV007	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
#2208	SV008	VIA	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	1364	
#2209	SV009	IQA	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	
#2210	SV010	IDA	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	
#2211	SV011	IQG	256	256	256	256	256	256	256	512	512	256	256	256	256	256	256	512	512	256	
#2212	SV012	IDG	256	256	256	256	512	512	512	512	512	512	256	256	512	512	512	512	512	512	
#2213	SV013	ILMT1	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	
#2214	SV014	ILMT2	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	
#2215	SV015	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Motor capacity symbol / kW			HA053	HA13	HA 23N	HA 33N	HA 43N	HA 83N	HA 93N	HA 40N	HA 80N	HA 100N	HA 23N	HA 33N	HA 43N	HA 83N	HA 93N	HA 40N	HA 80N	HA 100N
#2216	SV026	LMC1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
#2217	SV017	SPEC	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	Set 0080. For model N, this will depend on the #2049 setting.							
#2218	SV018	PIT	Changes according to machine specifications. Refer to the section "Servo specification parameter settings".																	
#2219	SV019	PGN1	10	10	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
#2220	SV020	PGN2	10	10	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
#2221	SV021	OLT	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
#2222	SV022	OLL	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
#2223	SV023	ODI	Changes according to machine specifications.																	
#2224	SV024	INP	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
#2225	SV025	MTYP	338C	338D	008E	008F	0080	0081	008A	0000	0001	0002	228E	228F	2280	2281	228A	2200	2201	2202
#2226	SV026	OD2	Changes according to machine specifications.																	
#2227	SV027	SSF1	Set "4000".																	
#2228 ~ 35	SV028 ~ 35		Set to "0". These are parameters for compensation functions and special specifications, etc.																	
#2236	SV036	PTYP	Select the regenerative option resistor. Refer to the section "Servo specification parameter settings".																	
#2237 ~ 48	SV037 ~ 48		Set to "0". These are parameters for compensation functions and special specifications, etc.																	
#2249	SV049	PGNISP	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
#2250 ~ 64	SV050 ~ 64		Set to "0". These are parameters for compensation functions and special specifications, etc.																	

2.4 Status display

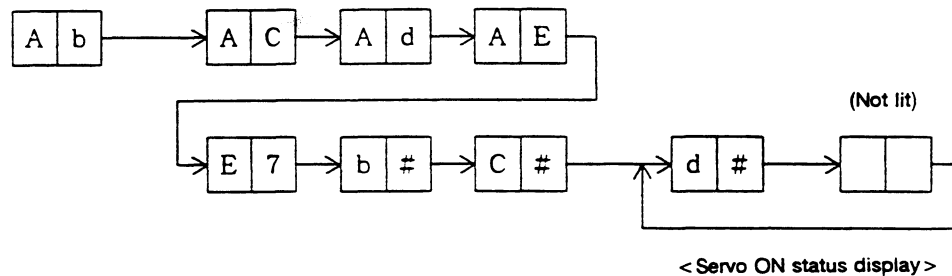
The servo driver's status is displayed on the 7-segment display on the amplifier and the servo monitor screen in the control unit. Confirm the main circuit wiring and cable wiring, and then turn the power on. If there is no error in the system, the servo driver will start up with the following display.

- Power ON with external emergency stop ON



Note) # indicates the axis No. 'F1' is displayed for 1st axis.

- Power ON with external emergency stop OFF



- When the control unit power is cut after starting the system, 'AA' will display. This indicates that start up of the control unit power is being waited for as with the 'Ab' display when the servo driver power is turned ON.
- If a status display other than the above appears, there may be an error in the system or servo drive unit. Refer to the section '4. Troubleshooting'.

2.5 Absolute value system

(1) Applicable motor series

HA - FH * * - Y
HA * * N - A33

(2) Applicable servo drive unit

Depending on the MDS-A-SVJ drive unit version, the absolute value system may not be compatible. Confirm the version on the nameplate located on the side of the unit.

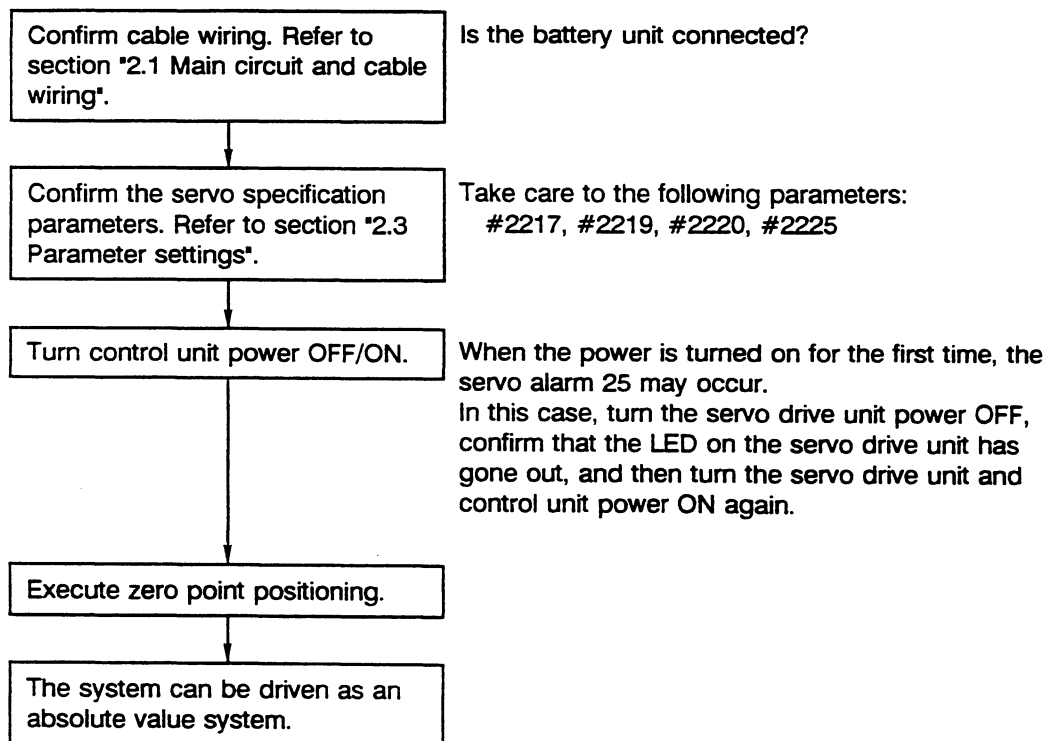
Versions compatible with absolute value system

Hardware version	Version A and following
Software version	Version B0 and following

MITSUBISHI SERVO DRIVE UNIT	
TYPE	MDS-A-SVJ-**
AC INPUT	200-230V 50/60Hz
POWER	600W
S/W	BND-511W000-B0
H/W	VER. A
SERIAL	J9A07G23E0J
DATE	9405

Software/hardware version display

(3) Start-up procedures



Adjustment
Measurement of data for adjustment

3. Adjustment

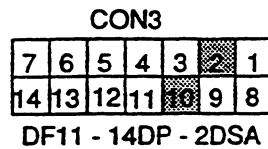
3.1 Measurement of data for adjustment

D/A output function

The MDS-A-SVJ servo driver has a function which D/A converts each control data in the driver. This is used when adjusting the servo system.

< Hardware specifications >

- 1 channel
- 7-bit 0 to 10V
- Output pins
D/A output: CON3-10 pin
GND : CON3-2 pin



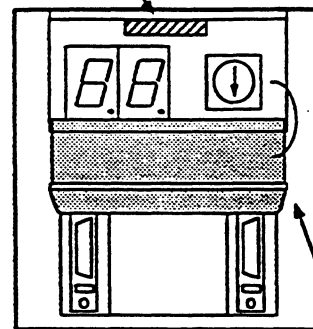
Use the Hirose connector DF11-14DS-2C to lead in the cable.

< Parameter >

Name	Details
SV061	D/A output data No.
SV063	D/A output magnification

< Output data No. >

SV061	Output data	
0	Speed feedback	r/min
1	Current command	Stall current %
2		
3	Current feedback	Stall current %
4		
5	Test output 0V	+5V
6	Position droop (high-order)	Interpolation unit
7	Position droop (low-order)	Interpolation unit



Open the transparent cover

< Setting of output magnification >

Set the output magnification in SV063.

The voltage expressed with the following equation is output to the D/A output.

$$\text{Analog output data} = \text{Setting data} \times \frac{\text{Output magnification}}{512} \quad (\text{Max. 127})$$

$$\text{Analog output data} \leq 63 \quad \text{Output voltage (V)} = 5 + \text{analog output data} \times 0.079$$

$$\text{Analog output data} \geq 64 \quad \text{Output voltage (V)} = -10 + \text{analog output data} \times 0.079$$

< Setting example > Output speed feedback

Speed feedback data at 2000 r/min = 2000

Analog output data = $2000 \times \text{output magnification} / 512 \leq 63 \rightarrow \text{output magnification} = 16$

Output voltage when + 2000 r/min: 9.9V Output voltage when -2000r/min: 0.1V.

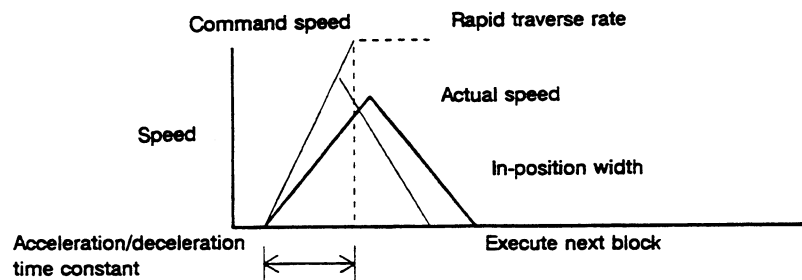
Adjustment
Characteristic improvement

3.2 Characteristic improvement

(1) Optimum adjustment of cycle time

To adjust the cycle time, the following factors must be adjusted.

- Rapid feed rate : Affects the acceleration during positioning.
- Acceleration/deceleration time constant : Time to reach rapid traverse rate
- In-position width : Affects the ending time of each block's movement command.
- Position loop gain : Affects the setting time of each block's movement command.



(a) Optimum adjustment of rapid traverse feed and acceleration/deceleration time constant

To further shorten the acceleration/deceleration time constant calculated with the 2.3 parameter settings, use the following steps to adjust the value.

- Related parameters : Rapid traverse rate/ rapid traverse acceleration/deceleration time constant
(Axis specification parameter)
- Confirmation data : Max. current 1/2 on servo monitor screen
Max. current 1: Max. value from control unit power ON.
Turn off the control unit to clear the value.
Max. current 2: Absolute value of the max. current in 2 sec. intervals.
- Confirmation method : After reciprocating five times with rapid traverse, adjust the related parameters so that the max. current is within the range shown below. Increase the acceleration/deceleration time constant if the values listed below are exceeded.

HA-FE/FH series motor		HA series 2000 r/min.		HA series 3000 r/min.	
Motor	Max. current 1	Motor	Max. current 1	Motor	Max. current 1
HA-F□053	280 ~ 320	HA40N	355 ~ 400	HA053	210 ~ 240
HA-F□13	280 ~ 320	HA80N	325 ~ 365	HA13	210 ~ 240
HA-F□23	280 ~ 320	HA100N	230 ~ 260	HA23N	205 ~ 230
HA-F□33	280 ~ 320			HA33N	205 ~ 230
HA-F□43	280 ~ 320			HA43N	260 ~ 295
HA-F□63	280 ~ 320			HA83N	245 ~ 275

Adjustment
Characteristic improvement

(b) Setting of in-position width

The servomotor drive has a response delay, so a "stop setting time" is required from when the command speed reaches 0 to when the motor actually stops. The movement command for the next block will be issued after it is confirmed that the machine is within the "in-position width" range that is set. Thus, set the precision required for the machine for the in-position width setting. If an excessively high precision is set, the setting time will be delayed and the cycle time will increase.

INP	SV024	
Set the in-position width with a μm unit.		

(c) Adjustment of setting time.

The following parameters are effective for reducing the setting time.
Note that the setting range will differ for positioning machines and cutting machines.

PGN1	SV003	Position loop gain
PGN2	SV004	SHG control parameter
VIA	SV008	Speed loop advance compensation
SHGC	SV057	SHG control parameter

When using PGN1 at a value higher than the standard setting value 33, set it as shown below. When SHG control is used, the conventional control's position loop gain should be doubled for effectiveness. The surface precision will be affected if the gain is raised too far in machines used for cutting.

PGN1	PGN2	SHGC	VIA	Target machine	
33	86	187	1900	Positioning machine	Cutting machine
38	102	225	1900		
47	125	281	1900		
62	160	375	1900		
70	281	0	1900		
80	225	562	1900		

(2) Vibration measures

- Improper examples

- When the machine is touched by hand, the vibration can be felt. A groaning sound is heard.
- Vibration and noise occur during rapid traverse.

- Adjustment example

- Lower VGN1 by 50 at a time.
- Enforce speed feedback compensation.

SSF1	SV027	Servo function 1
------	-------	------------------

Speed feedback compensation (jitter compensation)
: The jitter during light loads is compensated.

F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0

vft2	vft1	
0	0	No jitter compensation
0	1	Jitter compensation 1 pulse
1	0	Jitter compensation 2 pulses
1	1	Jitter compensation 3 pulses

- Set the machine resonance suppression filter

FHZ	SV038	Machine resonance suppression filter frequency
Measure the frequency of the machine vibration, and set the vibration frequency to be suppressed. The effective frequency is 100 to 500Hz, so normally set a value that is smaller than VGN1.		

(3) Improvement of cutting surface precision

- Improper examples

- The precision in the 45° of the taper and circle is poor.
- The load fluctuation is large during cutting, and vibration or cutting precision defects occur.

- Adjustment example

- Raise VGN1 by 20 at a time.
If vibration and noise occur when stopped or during rapid traverse, it is the limit.
- Raise VIA by 200 at a time.

Adjustment
Characteristic improvement

(4) Improvement of protrusions when changing quadrant

The delay in response (caused by non-sensitive band by friction, twists, contraction, backlash, etc.), that occurs when the machine advance direction is reversed, is compensated.

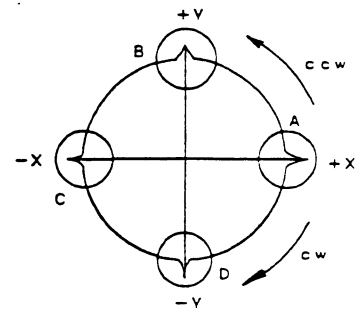
This allows the protrusion phenomenon when changing the quadrant with the DDB measurement method, or the lines that occur when changing the quadrant in circle cutting can be improved.

- Lost motion compensation related parameters

LMC1	SV016	Lost motion compensation gain 1
LMC2	SV041	Lost motion compensation gain 2
SSF1	SV027	Servo function 1

F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0

1mct2	1mct1	
0	0	No lost motion compensation
0	1	Lost motion compensation type 1
1	0	Lost motion compensation type 2
1	1	Setting prohibited



DDB measurement that shows protrusion phenomenon

<Improvement of protrusions at A and C points>

A and C are protrusions that occur due to the delay in the X axis response. This can be improved by adjusting the X axis servo driver lost motion compensation parameter.

- LMC1 and LMC2 compensation validity points

The points where lost motion compensation become valid differ according to the basic specification parameter (CCW) setting and LMC2 setting. Refer to the following table and set the lost motion compensation gain.

When LMC2 = 0			When LMC2 > 0			When LMC2 = -1		
	CCW = 0	CCW = 1		CCW = 0	CCW = 1		CCW = 0	CCW = 1
A	LMC1	LMC1	A	LMC2	LMC1	A	None	LMC1
C	LMC1	LMC1	C	LMC1	LMC2	C	LMC1	None

- LMC1 and LMC2 setting method

For lost motion compensation type 1:

Increase from 0 by 20 at a time while enforcing DDB measurement.

For lost motion compensation type 2:

Confirm the current load (%) during manual feed (500 to 1000mm/min) on the servo monitor screen, and set a value double the current load in LMC1 and LMC2.

However, the final value must be determined with DDB measurement and the precision during actual cutting.

Adjustment
Characteristic improvement

<Improvement of protrusions at B and D points>

- LMC1 and LMC2 compensation validity points

When LMC 2 = 0			When LMC2 > 0			When LMC2 = -1		
	CCW = 0	CCW = 1		CCW = 0	CCW = 1		CCW = 0	CCW = 1
B	LMC1	LMC1	B	LMC2	LMC1	B	None	LMC1
D	LMC1	LMC1	D	LMC1	LMC2	D	LMC1	None

<For unbalanced axes>

If the axes are unbalanced such as for vertical axes, enforcing torque offset compensation in addition to lost motion compensation is effective.

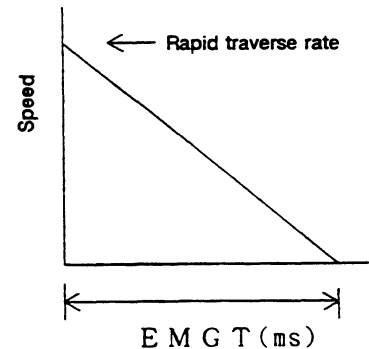
TOF	SV032	Torque offset compensation gain
<ul style="list-style-type: none"> • Perform manual feed in the + and - directions, and confirm the current load (%) on the servo monitor screen. • Set the average value of the + and - direction current load (%). 		

(5) Deceleration control of emergency stop

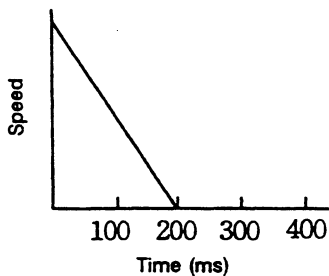
The unit will decelerate and stop with external emergency stop, a servo alarm or when the control unit's power is turned off. The deceleration speed is determined with the "rapid traverse rate" and the servo parameter 'EMGT'.

EMGDT	SV055	Deceleration control max. delay time
<ul style="list-style-type: none"> The max. delay time of the deceleration stop is set. When this time is passed, the deceleration stop will be terminated, and the hardware's dynamic brakes will function. Set a value that is more than 1/2 of the "rapid traverse acceleration/deceleration time constant". When activating deceleration stop, always set a value larger than EMGT. When 0 is set, the speed will be 2000ms. 		
EMGT	SV056	Deceleration control time constant
<ul style="list-style-type: none"> The deceleration stop time constant is set. Set the "rapid traverse acceleration/deceleration time constant" as a standard, and to stop smoothly, set a value that does not exceed 5000ms. When 0 is set, the unit will step and stop. Always set to 0 when using the solenoid brakes. 		

Decelerates at a set deceleration speed.

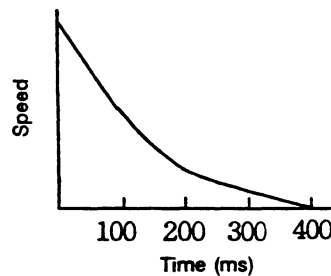


(A) EMGDT = 5000
When EMGT = 200



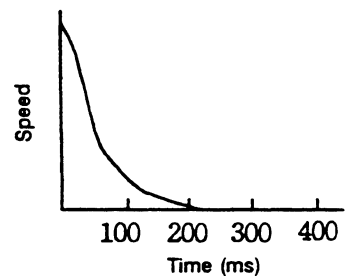
Deceleration control	Hardware dynamic brake
<ul style="list-style-type: none"> After stopping, the hardware dynamic brake will function. 	

(B) EMGDT = 100
When EMGT = 200



Deceleration control	Hardware dynamic brake
<ul style="list-style-type: none"> The hardware dynamic brake will function after 100ms. 	

(C) When EMGT = 0



Deceleration control	Dynamic brake
<p>The unit will step and stop. After stopping, the hardware dynamic brake will function.</p>	

- If the drive unit's power is turned off or if a power failure occurs, the unit will decelerate with the energy accumulated in the unit's capacitor, but the hardware dynamic brake will function during the deceleration.
- When setting EMGT to a large value to enforce "smooth deceleration", avoid wiring that shuts off the servo drive power with an external emergency stop switch.
- When $EMGT < \text{"rapid traverse acceleration/deceleration time constant"}$, the deceleration time may be longer than EMGT.

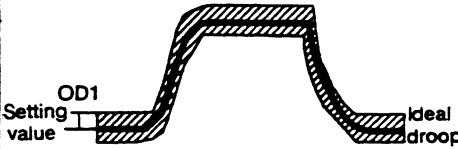
3.3 Parameter settings

Change method	PR	NC power must be turned OFF and ON after setting
	No mark	Power does not need to be turned OFF and ON

Parameter list

#	No. (Parameter abbr.)	Parameter name	Change method	Setting procedure		Standard setting value	Setting range
2201	SV001 (PC1)	Motor side gear ratio	PR	Set the number of gear teeth on the motor side.	PC1 and PC2 should be set to the smallest ratio of integers. • Setting range $PC1 \leq \frac{U \times 32767}{PIT}$ $PC2 \leq \frac{32767}{RNG1}$ U: Interpolation unit (= smallest movement amount/2 (μm)) PIT:SV018 RNG1:SV019 Refer to "Setup" for details.	Machine specifications	1 ~ 32767
2202	SV002 (PC2)	Machine side gear ratio	PR	Set the number of gear teeth on the machine side.		Machine specifications	1 ~ 8192
2203	SV003 (PGN1)	Position loop gain 1		Set the position loop gain in units of 1. Normally set this parameter to 33.0.		33	1 ~ 200 (1/sec)
2204	SV004 (PGN2)	Position loop gain 2		Set with SV057:SHGC when using SHG control. Set to 0 when not using.		0	0 ~ 300 (1/sec)
2205	SV005 (VGN1)	Speed loop gain		Set the speed loop gain. Normally set to 150. When increased, the response will improve but vibration and sound will also increase.		150	1 ~ 500
2208	SV008 (VIA)	Speed loop advance compensation		Set the speed loop integral gain.		1364	1 ~ 9999 (0.0687 rad/sec)
2209	SV009 (IQA)	Current loop q axis advance compensation		Set the current control gain. The set data is fixed for the motor being used. (Refer to the standard parameter list per motor.)	Motor specifications		1 ~ 20480
2210	SV010 (IDA)	Current loop d axis advance compensation					1 ~ 20480
2211	SV011 (IQG)	Current loop q axis gain					1 ~ 2560
2212	SV012 (IDG)	Current loop d axis gain					1 ~ 2560
2213	SV013 (ILMT1)	Current limit value 1		Set the normal current limit value. (Limit value of both ± directions.) Set with a percentage to the rated current. When using to the driver's max. torque, set 500.		500	1 ~ 500 (%)
2214	SV014 (ILMT2)	Current limit value 2		Set the current limit value during the absolute value initial setting (contact). Set with a percentage to the rated current (limit value in both ± directions). Set to 0 when not using.		0	0 ~ 500 (%)

Adjustment
Parameter settings

#	No. (Parameter abbr.)	Parameter name	Change method	Setting procedure	Standard setting value	Setting range
2216	SV016 (LMC1)	Lost motion compensation gain 1		Set when the protrusions (occur due to non-sensitive band caused by friction, twisting and backlash, etc.) at the quadrant changeover time is large.		
				Type 1 (when SV027: SSF1-bit 8 is set to 1)	0	0 ~ 200 (%)
				Protrusion will be eliminated with this type of compensation during low speed interpolation. The compensation gain will be 0 when 0 is set. 100% compensation will be applied when 100 is set.		
				Type 2 (when SV027: SSF1-bit 9 is set to 1)	0	0 ~ 100 (%)
				Use this type if ample compensation is not possible with type 1 during high speed or high precision interpolation. Set with a percentage to the rated current. Compensation will not be applied when 0 is set. Set a value that is double the current % on the servo monitor screen during JOG feed (approx. F1000). The related parameters are SV041:LMC2 and SV027:SSF1. Refer to "Characteristics improvement" for details.		
2217	SV017 (SPEC)	Servo system specifications	PR	The servo system specifications are set with bits. Refer to "Servo specification parameter setting" for details.	0	HEX
2218	SV018 (PIT)	Ball screw pitch	PR	< Ball screw specifications > Set the ball screw pitch with a mm unit. < Rotary axis > Set the rotary angle of the table. Refer to "Setup" for details.	Machine specification	Refer to the setting for 2201 (SV001).
2219	SV019 (RNG1)	Position detector resolution	PR	Set a value that is four times the No. of pulses (k pulse) per rotation of the detector used for position control. Refer to "Servo specification parameter setting" for details.	Detector	1 ~ 1000 kp/rev
2220	SV020 (RNG2)	Speed detector resolution	PR	Set the No. of pulses per rotation of the motor shaft detector. When semi-closed: RNG1 = RNG2.	Detector	1 ~ 1000 kp/rev
2221	SV021 (OLT)	Overload time constant		Set the overload (OL1) detection time constant. (1 sec. units)	60	1 ~ 80 (sec)
2222	SV022 (OLL)	Overload detection level		Set the overload (OL1) current detection level with a percentage to the stall rating.	150	1 ~ 180 (%)
2223	SV023 (OD1)	Excessive error width 1 (during servo ON)		Set the excessive error width during servo ON. (With the M300, the setting unit was interpolation units.) Setting equation: $OD1 = OD2 = \frac{F}{60 \cdot PGN1} \cdot 0.5 \text{ (mm)}$ 	Machine specifications	1 ~ 32767 (mm)

Adjustment
Parameter settings

#	No. (Parameter abbr.)	Parameter name	Change method	Setting procedure	Standard setting value	Setting range
2224	SV024 (INP)	In-position width		Set the in-position width. (μm)	50	0 ~ 32767 (μm)
2225	SV025 (MTYP)	Motor type		Refer to "Servo specification parameter setting" for details.		HEX
2226	SV026 (OD2)	Excessive error width 2 (during servo OFF)		Set the excessive error width during servo OFF. (Normally the same data as OD1 is used.)	Machine specifications	0 ~ 32767 (mm)
2227	SV027 (SSF1)	Servo function 1		Use to select the servo functions. Refer to "Characteristics improvement".	Machine specifications	HEX
2232	SV032 (TOF)	Torque offset compensation gain		Set the unbalance amount for axes requiring an unbalance torque such as vertical axis with a percentage to the rated current. Use this when SSF1 lost motion compensation 1 and 2 are set. Feed the axis in the + and - directions with low JOG feed (approx. F200) while viewing the current load (%) on the I/F diagnosis screen, servo monitor. If the current load is positive, check the maximum value, and when negative the minimum value, and set the average value of the + and - direction values.	0	-100 ~ 100 (%)
2236	SV036 (PTYP)	Regenerative type	PR	Set the type of regenerative option resistor. Refer to "Servo specification parameter setting" for details.	1000	HEX
2238	SV038 (FHZ)	Machine resonance suppression filter frequency		If machine vibration occurs, set the vibration frequency to be suppressed. The frequency must be over 100Hz. Set to 0 when not using.	0	100 ~ 3000 (Hz)
2240	SV040 (LMCT)	Lost motion compensation non-sensitive band		Set the non-sensitive band for lost compensation. When set to 0, the setting will be 2μm.	0	0 ~ 100 (μm)
2241	SV041 (LMC2)	Lost motion compensation gain 2		Set the lost motion compensation gain. Refer to "Characteristics improvement" for details.	Type 1	-1 ~ 200%
					Type 2	-1 ~ 100%
2249	SV049 (PGN1SP)	Spindle synchronous position loop gain 1		Set the position loop gain for synchronizing the servo when moving the spindle with position loop such as for synchronous tap.	15	1 ~ 200 (1/sec)
2250	SV050 (PGN2SP)	Spindle synchronous position loop gain 2		Set when using SHG control during spindle synchronous control. Set to 0 when not using.	0	0 ~ 300 (1/sec)
2253	SV053 (OD3)	Excessive error width 3		Set the excessive error width for special movement such as contact.	0	0 ~ 32767 (ms)
2255	SV055 (EMGDT)	Deceleration control max. delay time		Set the max. time for deceleration control. If this time is passed, the deceleration time will be terminated, and the hardware dynamic brakes will activate. When set to 0, the time will be 2000msec.	0	0 ~ 5000 (ms)

Adjustment
Parameter settings

#	No. (Parameter abbr.)	Parameter name	Change method	Setting procedure	Standard setting value	Setting range
2256	SV056 (EMGT)	Deceleration control time constant		Set the time constant for deceleration stop. Normally, the "rapid traverse acceleration/ deceleration time constant" is set. When set to 0, step stop will function.	0	0 ~ 5000 (ms)
2257	SV057 (SHGC)	High-gain control constant		Set this when using SHG control. Set to 0 when not using.	0	0 ~ 999 (1/sec)
2258	SV058 (SHGCSP)	High-gain constant during spindle synchronization		Set this when using SHG control during spindle synchronous control. Set to 0 when not using.	0	0 ~ 999 (1/sec)
2261	SV061 (DA1NO)	D/A output channel 1 data No.		Set the output data No. for the D/A output function. Refer to "Measurement of data for adjustment" for details.	0	0 ~ 7
2263	SV063 (DA1MPY)	D/A output channel 1 magnification		Set the output data magnification for the D/A output function. Refer to "Measurement of data for adjustment" for details.	0	0 ~ 256

4. Trouble Diagnosis and Remedies

4.1 Points of caution and confirmation

If there is an error in the servo system or if an error has occurred, the servo warning or servo alarm will occur. When a servo warning or alarm occurs, check the state while observing the following points, and inspect or remedy the unit according to the details given in this section.

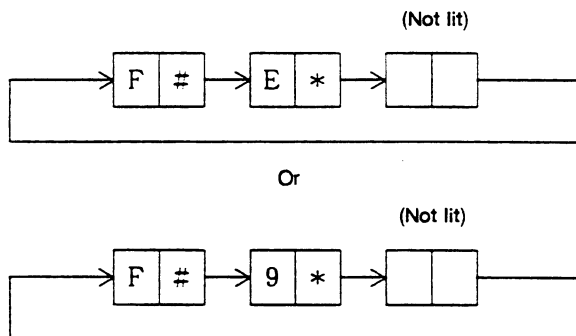
< Caution >

- The MDS-A-SVJ servo driver has a large capacity electrolytic capacitor. The voltage will remain in the unit for several minutes after turning off the power, so take special care to prevent electric shocks and short circuits. There is voltage remaining in the unit when the CHARGE lamp on the front of the driver is lit.
- The structure of the unit prohibits checking the conductivity in the driver, so never attempt to test the unit.
- Megger tests may damage the driver, so never perform them.

Points of confirmation

- (1) What is the alarm code display?
- (2) Can the error or trouble be repeated? (Check alarm history)
- (3) Is the motor and servo driver temperature and ambient temperature normal?
- (4) Are the servo driver, control unit and motor grounded?
- (5) Was the unit accelerating, decelerating or running at a set speed? What was the speed?
- (6) Is there any difference during forward and backward run?
- (7) Was there a momentary power failure?
- (8) Did the trouble occur during a specific operation or command?
- (9) At what frequency does the trouble occur?
- (10) Is a load applied or removed?
- (11) Has the software version been upgraded, parts replaced or emergency measures taken?
- (12) How many years has the unit been operating?
- (13) Is the power voltage normal? Does the state change greatly according to the time band?

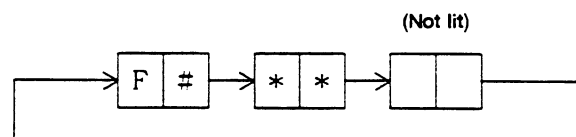
< Status display when a servo warning occurs >



The servo ON state is retained even if a servo warning occurs, but if left along, a servo alarm will occur. Enforce troubleshooting before the alarm occurs.

: Axis No.
E* : Warning No.
9* : Warning No.
** : Alarm No.

< Status display when a servo alarm occurs >



The emergency stop state will be entered when an alarm occurs.

4.2 List of protective functions

< Servo alarms >

Display	Abbr.	Name	Meaning	Re- lease	Alarm/warning check period			
					t1	t2	t3	t4
12	ME1	Memory error	The memory on the control PCB malfunctioned.	AR	○	—	—	—
13	SWE	S/W processing error	The software data process did not end within the normal time.	PR	—	○	○	○
16	RD1	Polarity position detection error	The differential inputs of one of the polarity position detection signals U, V or W phase were both "H" and "L".	PR	—	○	○	○
17	ADE	AD converter error	The AD converter for current detection malfunctioned during initialization.	AR	—	○	—	—
18	RD2	Serial detector initial communication error	An error occurred in the serial communication with the detector after the NC power was turned ON.	PR	—	○	—	—
1F	PIDE	Power PCB type error	A differing type of power PCB is mounted.	AR	○	—	—	—
20	NS1	No signal detection 1	The differential inputs of one of the motor shaft installation detector A, B or Z signals were both "H" and "L".	PR	—	○	○	○
25	ABSE	Absolute position lost	The absolute position data in the absolute value detector was lost.	AR	—	○	—	—
2B	SMEM	Memory in detector error	The CPU in the detector side circuit malfunctioned.	AR	—	○	○	○
2C	SLED	LED in detector error	An error occurred in the detector LED.	PR	—	○	○	○
2D	SDAT	Detector internal data error	An error was found in the analog signal of the detector.	PR	—	○	○	○
2F	STRE	Serial detector communication error	An error occurred in the serial communication with the detector.	PR	—	○	○	○
30	OR	Over-regeneration	An overheating in the regenerative resistor was detected.	PR	—	○	○	—
31	OS	Overspeed	The motor speed exceeded 1.2 times the rated speed.	PR	—	○	○	○
32	PMOC	Power module overcurrent	An overcurrent was detected in the IPM used for the servo drive's main circuit.	PR	—	○	○	○
33	OV	Overvoltage	The bus wire voltage in the driver exceeded 400V.	PR	—	○	○	○
34	DP	CRC error	A CRC error occurred in the communication data from the NC.	PR	—	○	○	○
35	DE	Data error	The movement command data from the NC is abnormally large.	PR	—	○	○	—

Trouble Diagnosis and Remedies

List of protective functions

Display	Abbr.	Name	Meaning	Re- lease	Alarm/warning check period			
					f1	f2	f3	f4
36	TE	Transfer error	The periodic data transmitted from the NC was terminated.	PR	—	○	○	—
37	PE	Parameter error	A servo parameter transferred from the NC during driver initialization was illegal.	PR	—	○	—	○
38	TP1	Protocol error 1	An error was found in the communication protocol with the NC. (Frame error)	PR	—	○	○	○
39	TP2	Protocol error 2	An error was found in the communication protocol with the NC. (Information error)	PR	—	○	○	○
3A	OC	Overcurrent	An excessive current flowed to the motor.	PR	—	○	○	○
3B	PMOH	Power module overheat	Overheating was detected in the IPM used in the servo drive's main circuit.	PR	—	○	○	○
42	FE1	Feedback error 1	A skipped pulse occurred in the detector feedback.	PR	—	○	○	—
46	OHM	Motor overheat	The motor or detector thermal protector functioned.	NR	—	○	○	—
50	OL1	Overload 1	The current flowed for a time exceeding the overload detection level (Parameter OLL) and overload time constant (parameter OLT).	NR	—	○	○	○
51	OL2	Overload 2	A current command that was more than 95% of the max. output current continued for one second or more.	NR	—	—	○	—
52	OD1	Excessive error 1	The actual position in regard to the command exceeded the excessive error width 1 (Parameter OD1) during servo ON.	NR	—	—	○	—
53	OD2	Excessive error 2	The actual position in regard to the command exceeded the excessive error width 2 (Parameter OD2) during servo OFF.	NR	—	○	—	—
88	WD	Watch dog	The servo amplifier's software process was not executed within the specified time.	AR	○	○	○	○

Trouble Diagnosis and Remedies

List of protective functions

< Servo warnings >

Display	Abbr.	Name	Meaning	Re- lease	Alarm/warning check period			
					f1	f2	f3	f4
93	WAM	Absolute position fluctuation	The absolute position data is variable after the NC power was turned ON. The absolute position data may be illegal.	—	—	○	—	—
9E	WAR	Detector internal counter error	The value of the absolute position counter in the detector is illegal. Zero point return is required.	—	—	○	○	○
9F	WAB	Battery voltage drop	The voltage of the battery supplying to the absolute value detector dropped.	—	—	○	○	○
E0	WOR	Over-regeneration warning	An 80% level of the over-regeneration alarm was detected. (The over-regeneration alarm may occur if operation is continued.)	—	—	○	○	○
E1	WOL	Overload warning	An 80% level of the overload 1 alarm was detected. (The overload 1 alarm may occur if operation is continued.)	—	—	○	○	○
E3	WAC	Absolute position counter warning	The absolute position counter value is illegal. Zero point return is required.	—	—	○	○	—
E4	WPE	Parameter error warning	A parameter exceeding the setting range was set. The illegal parameter will be ignored and the value set previously will be retained.	—	—	○	○	—

< Status display other than alarm or warning >

Display	Abbr.	Name	Meaning	Re- lease	Alarm/warning check period			
					f1	f2	f3	f4
E6	AXE	Control axis being removed	The axis removal command was input from the NC.	—	—	○	○	○
E7	NCE	NC emergency stop	The emergency stop command was input from the NC.	—	—	○	○	○

[Release]

AR : Released when servo driver power is turned on again.

PR : Released when the NC power is turned on again.

NR : Released by pressing the NC RESET key.

[Note that overload alarms "50" and "30" cannot be released until the reset level is reached.]

— : Automatically released when warning state is removed.

[Alarm/warning check period]

f1: When servo driver power is turned ON.

f2: When NC power is turned ON after that (emergency stop ON)

f3: During normal operation (servo ON)

f4: During axis removal (ready ON, servo ON)

(Note) Warning "93" may occur after the axis is removed and the axis is remounted.

4.3 Troubleshooting

Class	No.	Alarm name	Alarm details	Alarm occurrence time	Alarm cause	Investigation item	Remedy	
A	12	Memory error	Error in driver memory		Error in driver parts	Check repeatability	Replace driver	
	13	S/W process error	Error in CPU peripheral circuit	After control unit power is turned ON		If the trouble occurs repeatedly, it may be caused by the working environment. Check the grounding state and ambient temperature, etc.	Improve working environment.	
	17	AD converter error	Error in AD conversion circuit					
	1F	Power PCB error	Mistaken PCB in driver	When power is turned ON	Illegal power PCB combination			
B	16	Polarity position detection error	The motor polarity was not detected correctly.	When control unit power is turned ON	Detector connector is disconnected.	Visually check to see if the detector connector is disconnected.	Properly connect.	
	20	No signal detection 1	Error in the detector's A, B, Z signals		Detector cable is defective.	Check the detector cable connection with a tester.	Replace the detector cable	
	42	Feedback error 1	Pulse is skipping in detector's A, B, Z signals		Mistaken servo parameter setting	Confirm SV025 setting.	Correctly set	
	18	Serial detector initial communication error	Error in the initial and normal communication of the serial communication with the detector.		Error in driver parts	Connect with a correct axis, and see if the cause is in the driver or motor built-in detector.	Replace driver	
	2F	Serial detector communication error		Detector error	Replace motor (detector)			
	2B	Detector internal memory error	During operation	The detector cable is broken.	Alarm occurs at a specific position due to detector cable bending. Check the conductivity of the cable at the position where the alarm occurs.	Replace detector cable.		
	2C	Detector internal LED error						
	2D	Detector internal data error						
				Error in detector's internal hardware. <ul style="list-style-type: none">• Memory data• LED• Analog data	After turning control unit power ON	Grounding is incomplete, and susceptible to noise.	Check the grounding state. <ul style="list-style-type: none">• Is the cable shielded?• Is the driver grounded?• Is the motor grounded?	Correctly ground.
B-2	25	Absolute position data lost	Absolute position data in detector was lost.	When control unit power is turned ON	Error in battery unit or cable between driver and battery unit	Confirm connection with battery unit, repeat zero point return, and see if error recurs.	Replace battery unit.	
						Perform the same investigation as for alarm class "B":		

Class	No.	Alarm name	Alarm details	Alarm occurrence time	Alarm cause	Investigation item	Remedy
C	34	CRC error	Error in communication data from control unit	After turning control unit power ON	Communication cable (R000) between control unit and driver, drivers, battery unit and driver is disconnected	Check if the communication cable (R000) is disconnected.	Correctly connect
	35	Data error	Error in movement command from control unit		Communication cable defect	Check communication cable connection with tester.	Replace communication cable
	36	Transfer error	Periodic data transmission from control unit was terminated		Error in driver parts	Change with a normal driver, and check if the error is in the driver or control unit.	Replace driver
					Error in control unit parts		Replace control unit
	38	Protocol error 1	Error in communication protocol between control units		Grounding is incomplete, and susceptible to noise.	Check the grounding state. • Is the cable shielded? • Is the driver grounded? • Is the control unit grounded?	Correctly ground
	39	Protocol error 2	Error in communication protocol between control units				
C-2	37	Parameter error	Error in servo parameter	After turning control unit power on	Servo parameter setting is illegal	Confirm illegal parameter No. displayed on diagnosis screen.	Correct the servo parameters.
					Servo parameter PIT, PC1, PC2 or RNG is illegal or setting range is exceeded.	Check that the setting value meets the machine specifications, and that it is in the setting range. Refer to "Setup".	Correct the servo parameters.
					Problem in communication related parts.	Check the items for alarm class "C".	

Class	No.	Alarm name	Alarm details	Alarm occurrence time	Alarm cause	Investigation item	Remedy	
D	30	Over-regeneration	Overheating in the regenerative resistor was detected.	During operation	<ul style="list-style-type: none">The acceleration/deceleration frequency exceeded the specifications.The regeneration was excessive in the machine specifications for vertical axis, etc.	Confirm the repeated positioning frequency and the regenerative energy. Refer to the "Servo Selection Manual".	<ul style="list-style-type: none">Improve the operation pattern. Rapid traverse rate Repetition frequencyChange the regenerative option.	
					Mistaken servo parameter setting	Check the servo parameter SV032 setting.	Correctly set.	
E	31	Overspeed	The motor's tolerable speed was exceeded	During operation	Mistaken servo parameter setting.	Check the SV025 (MTYP) setting. <ul style="list-style-type: none">A 3000r/min speed specification motor is set for the 2000r/min specifications.	Correctly set.	
					The axis specification parameter setting is illegal. <ul style="list-style-type: none">Rapid traverse rate is too high.	Motor speed = $\frac{\text{Rapid feed rate (mm/min)}}{\text{Ball screw lead (mm)}} \times \frac{\text{PC2}}{\text{PC1}}$	Change to lower than the rated speed.	
							The servo parameter PC1/ PC2/PIT settings do not match the machine specifications.	Correctly set PC1/PC2/PIT.
					Speed overshoot caused by size of acceleration/deceleration time constant (axis specification parameter).	Check that the torque current during acceleration/deceleration is lower than 80% of the max. value. (Refer to the section "Adjustment" for the checking method.)	Adjust the acceleration/ deceleration time constant, and set the torque current during acceleration/deceleration to below 80% of the max. value.	
				After turning control unit power ON	Detector related defects	Detector cable error	Check the same items as alarm class "B".	Replace detector cable
						Driver error		Replace driver
						Motor/detector error		Replace motor/detector

Class	No.	Alarm name	Alarm details	Alarm occurrence time	Alarm cause	Investigation item	Remedy
F	32	Power module overcurrent	The power module overcurrent protection function activated.	Alarm occurs when servo turns ON	Short circuit in motor drive cable U, V and W phases.	Check conductivity between motor drive cable U, V and W phases.	Correct wiring
					Ground fault in motor drive cable U, V and W phases.	Check conductivity between motor drive cable U, V and W phases and grounding.	
	3A	Overcurrent	The motor drive current was excessive.			Disconnect the UVW wiring on the terminal block and motor side, and check with the motor drive cable wires.	
					Motor ground fault	Disconnect the drive wire on the motor side, and check the conductivity between the motor input UVW phases and grounding.	
				Servo driver defect • IPM/ hardware dynamic brake, etc.	Disconnect the output terminals (UVW) and attempt servo ON.	Replace driver	
				During servo ON	Detector related defects	Check the same items as alarm class "B".	Replace detector cable
							Replace driver
			Replace motor/detector				
G	3B	Power module overheat	Power module overheat protection function activated	When turning control unit power ON	Heat discharge environment is inadequate	The ambient temperature is higher than 55°C.	Improve cooling in panel
					< For SVJ-10/20 > The fan built into the driver is not rotating.	Check that wind is flowing over the heat dissipation fins.	Replace driver
					Grounding is incomplete, and susceptible to noise.	Check the grounding state. • Is the driver grounded?	Correctly ground

Class	No.	Alarm name	Alarm details	Alarm occurrence time	Alarm cause	Investigation item	Remedy							
H	33	Overvoltage	The converter's bus wire voltage is 400V or more.	Alarm other than during motor deceleration	Power voltage is 280V or more	Check power voltage with tester.	Review the power							
					Power voltage distortion is large (when not using regenerative option)	Measure power voltage waveform with oscilloscope, and check for power voltage distortion.	<ul style="list-style-type: none">• Insert FR-BAL.• Use a separate power source for the equipment causing the distortion.							
				Alarm during motor deceleration	Regenerative energy is too large (when not using regenerative option)	Reevaluate the regenerative energy. Refer to the "Servo Selection Manual".	Use the regenerative option.							
					Regenerative resistor broken wire	Check regenerative resistor resistivity value with tester. <ul style="list-style-type: none">• Measure between driver CP output terminals, while connected, after the power has been turned off for 5 min. or more. <table border="1"><tr><td>MDS-A-SVJ-03</td><td>52 Ω</td></tr><tr><td>06</td><td>52 Ω</td></tr><tr><td>10</td><td>26 Ω</td></tr><tr><td>20</td><td>26 Ω</td></tr></table> <ul style="list-style-type: none">• Disconnect the regenerative resistor, and measure the resistance value of the resistor unit. <table border="1"><tr><td>MR-RB033</td><td>52 Ω</td></tr><tr><td>MR-RB033</td><td>52 Ω</td></tr></table>	MDS-A-SVJ-03	52 Ω	06	52 Ω	10	26 Ω	20	26 Ω
MDS-A-SVJ-03	52 Ω													
06	52 Ω													
10	26 Ω													
20	26 Ω													
MR-RB033	52 Ω													
MR-RB033	52 Ω													
I	46	Motor overheat	The thermal protector built in the motor (detector) functioned.	Alarm during normal operation	The motor temperature rose, and the thermal protector functioned.	Measure the motor temperature when the alarm occurs.	The motor load is too large. Reevaluate the operation pattern.							
				Alarm one minute or more after start up	Detector cable defect	Check the same items as in alarm class "B".	Replace detector cable							
					Error in driver parts		Replace driver							

Class	No.	Alarm name	Alarm details	Alarm occurrence time	Alarm cause	Investigation item	Remedy
J	50	Overload 1 (Characteristics can be changed with servo parameters)	An excessive load was applied for longer than the set time.	Occurs during operation	An excessive load was applied.	Check the motor temperature when the alarm occurs.	The motor load is excessive. Reevaluate the operation pattern.
					The servo system is unstable and hunting is occurring.	Mistaken servo parameter setting, incorrect adjustment.	Readjust.
	51	Overload 2 (Characteristics fixed for servo driver)		Occurs immediately after operation is started	<For overload 1> Mistaken servo parameter setting.	Check servo parameter SV021 and SV022 settings.	Set to standard setting values if special specifications are not being used.
					Error in driver parts.	Change with a normal axis driver and check to see if the driver is defective.	Replace driver
K	52	Excessive error 1	The deflection of the actual position to the command when the servo is turned ON exceeds the range set in the parameters.	Occurs during acceleration/ deceleration	The acceleration/deceleration time constant setting is too small, and the command cannot be followed.	Readjust the acceleration/deceleration time constant. (Refer to "Adjustment")	Readjust the acceleration/deceleration time constant.
					Mistaken servo parameter SV023 setting.	Check servo parameter SV023 setting.	Set to standard setting values if special specifications are not being used.
				Occurs immediately after operation is started	Detector cable defect	Check items in alarm class "B".	Replace detector cable
					Error in driver parts		Replace driver
L	53	Excessive error 2	The deflection of the actual position to the command when the servo is turned OFF exceeds the range set in the parameters.	During servo OFF	The machine is moving during servo OFF.		Adjust the machine and mechanical brakes.
					Error in detector cable, servo driver, etc.	Check items in alarm class "B".	Replace defective unit
M	88	Watch dog	Servo driver software process did not end in specified time.	After turning power ON	Error in driver parts	Turn power off and on to confirm repeatability.	Replace driver
					Grounding is incomplete, and susceptible to noise.	Check grounding state.	Correctly ground

< Servo warnings >

Class	No.	Alarm name	Alarm details	Alarm occurrence time	Alarm cause	Investigation item	Remedy
D-2	E0	Over-regeneration warning	Overheating in the regenerative resistor was detected.	During operation	80% of the over-regeneration alarm level was detected. (Operation can be continued.)	Check the regenerative load value on the servo monitor screen. If the regenerative load is constant, the alarm will not occur, and there is not problem with using the unit. If the regenerative load is not constant, check the items for alarm class "D".	Same as alarm class "D".
J-2	E1	Overload warning	An excessive load was applied on the motor.	During operation	80% of the overload 1 alarm level was detected. (Operation can be continued.)	Check the items for alarm class "J".	Same as in alarm class "J".
N	E4	Parameter error warning	The parameter setting is illegal.	When settings are changed	An illegal parameter exceeding the setting range was set. (Illegal parameter is ignored, and the previous value is retained.)	Check the parameter setting value.	Set the appropriate parameter.

< Status display other than alarm or warning >

Class	No.	Alarm name	Alarm details	Alarm occurrence time	Alarm cause	Investigation item	Remedy
O	E6	Removing control axis	Axis removal command was input.	"E6" will display while the control unit is executing "control axis removal".			No problem.
	E7	NC emergency switch	Emergency stop command was input from NC.	External emergency stop ON	The external emergency stop signal is ON.	Check the external emergency stop switch.	No problem.
				Alarm in other axis.	If the alarm occurs for another axis, the NC will send the emergency stop command to all axes.	The alarm is for another axis.	Trouble shoot the axis where the alarm occurred.

© 1998 MITSUBISHI ELECTRIC CORPORATION
ALL RIGHTS RESERVED



500 CORPORATE WOODS PARKWAY, VERNON HILLS, IL 60061

These products or technologies are subject to Japanese and/or COCOM
strategic restrictions and diversions contrary thereto is prohibited.

MITSUBISHI

MDS-A-SVJ SERIES

SERVO MAINTENANCE AND ADJUSTMENT MANUAL

M3122-ES