FANUC SERVO AMPLIFIER βi series DESCRIPTIONS

1. Type of applied documents

Name	FANUC SERVO AMPLIFIER βi series DESCRIPTIONS
Spec. No./Ver.	B-65322EN/02-02

2. Summary of Change

Group	Name / Outline	New, Add Correct, Del	Applicable Date
Basic Function			
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another	Addition of β(HV)i series SVM	New	2005. 1

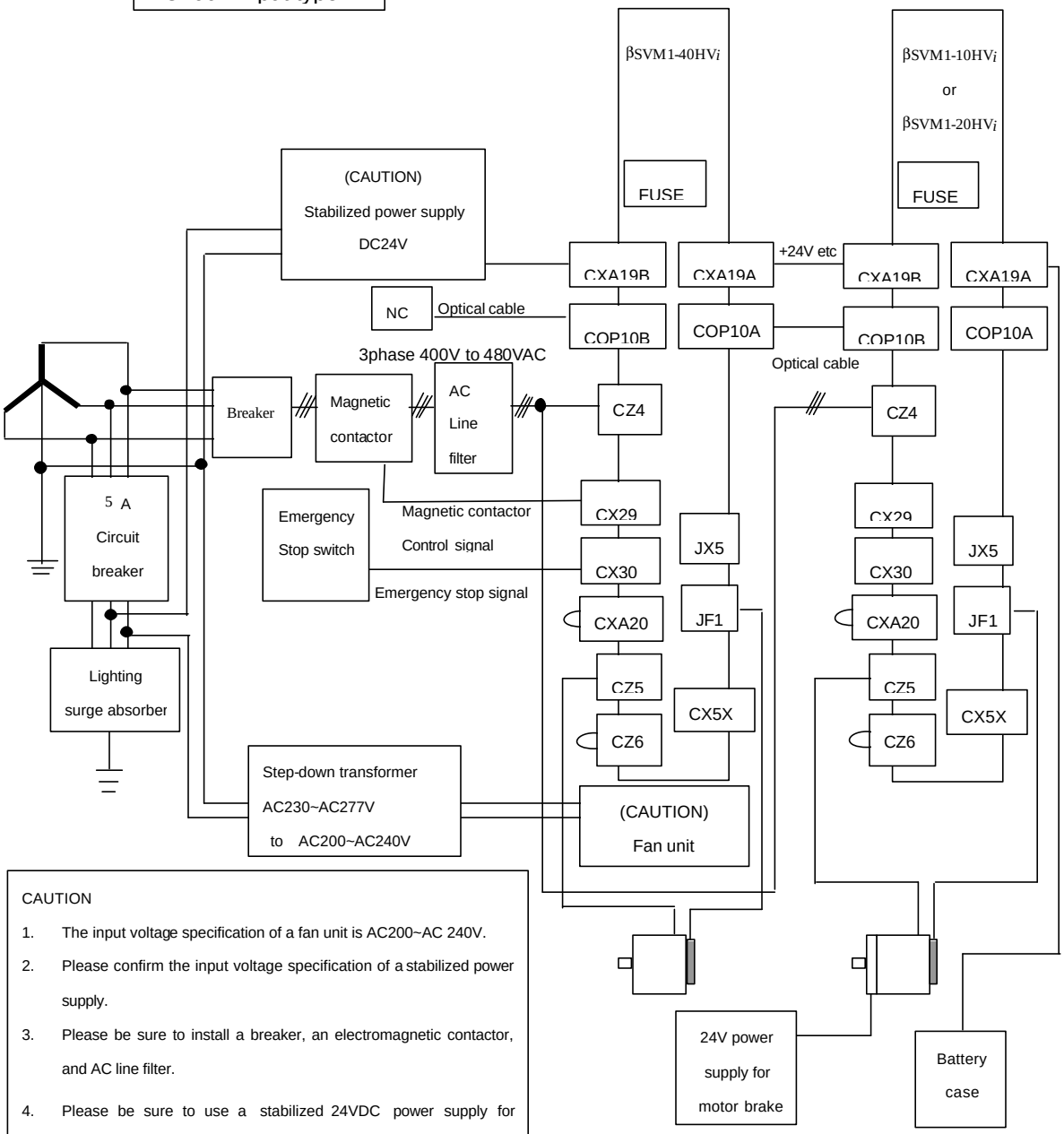
β(HV)*i* series SVM DESCRIPTIONS

This documents is described about the specification of β(HV)i series SVM.
Please refer to FANUC SERVO AMPLIFIER βi series DESCRIPTIONS (B-65322EN/02) about contents without in this.

All specifications and designs are subject to change without notice.

1. Configuration

AC400V input type



CAUTION

1. The input voltage specification of a fan unit is AC200~AC 240V.
2. Please confirm the input voltage specification of a stabilized power supply.
3. Please be sure to install a breaker, an electromagnetic contactor, and AC line filter.
4. Please be sure to use a stabilized 24VDC power supply for amplifier. Common use with 24V power supply for motor brakes cannot be performed.
5. The cabling of CX29 and CX30 of the second and subsequent amplifiers may be omitted. Refer to “Total connection diagram” for details.

2. Specification

Item		SVM1-10HV*i*	SVM1-20HV*i*	SVM1-40HV*i*
Interface		FSSB		
Unit Designation		A06B-6131-H001	A06B-6131-H002	A06B-6131-H003
Power P.C.B.		A16B-3200-0515	A16B-3200-0516	A16B-3200-0517
Control P.C.B.		A20B-2101-0051		
Main Power For Three Phase Supply	Input Voltage	AC 400-480 V (+10%,-15%) 50 / 60 Hz		
	Current at 50Hz	2.3 Arms	3.6 Arms	9.0Arms
	Rated Capacity	1.6 kVA	2.5 kVA	6.2kVA
Control Power supply	Input Voltage	DC 24 V (+10%,-10%)		
	Input Current	0.9 Arms		
Rated Output Current		3.1Arms	5.6Arms	9.2Arms
Current Limit Value		10Ap	20 Ap	40 Ap
Servo HRV control		HRV2,HRV3		
Main Circuit Control Method		Sine Wave PWM Control with Transistor Bridges		
Dynamic brake circuit		Built-in		
Servo output frequency range		0-334Hz		
Warning and protectivefunctions		- High Current - IPM Abnormal - High Voltage of DC Link - Low Voltage of DC Link - Overheat of Discharge Resistor - Low Voltage of Control Power Supply - FSSB Communication Error - Locked Fan Motor		
Ambient Temperature Range		0 to +55 degrees Celsius		
Weight		3.9kg		
Option		Built-in regererative resistor (64ohm, 50W no-wind condition) (64ohm,130W wind velocity 2m/s condition) Separated AC line filter Separated battery		

3. Applicable motors

		2	4		8			22			
MOTOR	αi			α4 /4000HV*i* (20A)		α8 /3000HV*i* (20A)			α12 /3000HV*i* (40A)		α22 /3000HV*i* (40A)
	αi s	α2 /5000HV*i* s (10A)	α4 /5000HV*i* s (10A)				α8 /4000HV*i* s (40A)		α12 /4000HV*i* s (40A)		
	βi s	β2 /4000HV*i* s (10A)	β4 /4000HV*i*s (10A)		β8 /3000HV*i* s (10A)			β12 /3000HV*i* s (20A)		β22 /2000HV*i* s (20A)	
SVM1-	10HV*i*	?	?		?						
	20HV*i*			?		?		?		?	
	40HV*i*						?		?		?

4. Selection of breaker, electromagnetic contactor, and AC line filter

4.1. Breaker

Name	Specification	Note
The breaker for main power supplies (30A)	A06B-6077-K101	Fuji Electric EA53B/30+ cover BZ-TB20B-3
The breaker for control sources (5A)	A06B-6077-K106	Fuji Electric EA33/5+ cover BZ-TB10B-503

4.2. Electromagnetic contactor

Name	Specification	Note
Electromagnetic contactor (32A)	A06B-6077-K121	Fuji Electric SC-5-1+ cover SZ-JC4

4.3. AC line filter

Name	Specification	Note
AC line filter	A81L-0001-0168	
AC line filter	A81L-0001-0169	

Please refer to the following table and select it. For details, please refer to B-65322/02JA.

Servo motor	Continuous rating current [Arms] (Reference value)	Power supply capacity [kVA] (Reference value)
β2/4000HV*i*s	1.2	0.8
β 4/4000HV*i*s	1.7	1.2
β 8/3000HV*i*s	2.7	1.9
β12/3000HV*i*s	4.0	2.8
β 22/2000HV*i*s	5.6	3.9
α2/5000HV*i*s	1.7	1.2
α4/5000HV*i*s	2.3	1.6
α4/4000HV*i*	3.2	2.2
α8/3000HV*i*	3.6	2.5
α8/4000HV*i*s	5.2	3.6
α12/4000HV*i*s	5.6	3.9
α12/3000HV*i*	6.7	4.7
α22/3000HV*i*	9.0	6.2

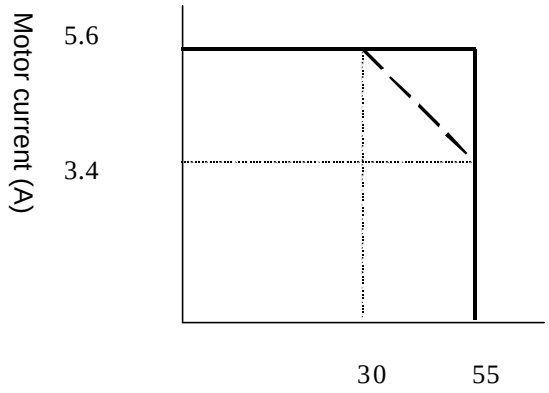
5. Cooling fan motor
The fan motor for amplifier cooling is needed for the following model.

Ordering number	Amplifier	Applied motor
A06B-6134-K002	SVM1-40HV*i*	All motors

6. Derating
Consider derating as shown below, according to ambient temperature.
The solid line is a derating line for use when HRV2, while the dotted line is a derating line for use when HRV3 is applied.

SVM1-20HV*i*

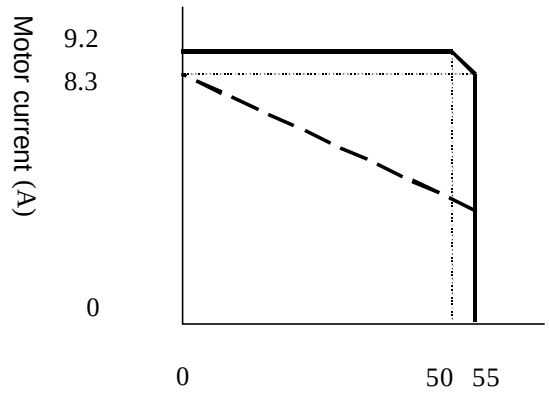
Motor current derating



Ambient temperature (Degree)

SVM1-40HV*i*

Motor current derating



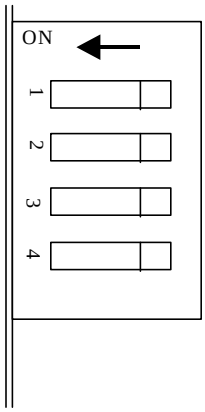
Ambient temperature (Degree)

7. Capacity of regeneration discharge resistor
The regeneration discharge resistor of the following capacity is built in the servo amplifier module.

Amplifier	Specification	Capacity of regeneration discharge resistance
SVM1-10HV*i*	A06B-6131-H001	50W No –wind condition
SVM1-20HV*i*	A06B-6131-H002	
SVM1-40HV*i*	A06B-6131-H003	130W Wind velocity 2m/s condition

8. Setup switch (For DC alarm level)
Since the switch of four channels is in the front of a servo amplifier module for regeneration resistance protection, please make it the following setup.

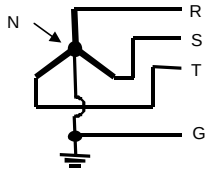
Switch	Setup
Switch1	OFF
Switch2	OFF
Switch3	ON
Switch4	ON



9. Power supply specification

9.1. Three-phase input power supply for motor power

- Nominal rating voltage: 400V to 480VAC
  Star connection, neutral grounding
  PE is provided on the power line



- Allowable voltage fluctuation: -15% - +10%
- Frequency: 50/60Hz
- Allowable frequency fluctuation: ±2Hz
- Power supply impedance : Voltage fluctuation by load (at maximum output) not be exceed 7%.
- Power supply Unbalance: ±5% or less of rated voltage

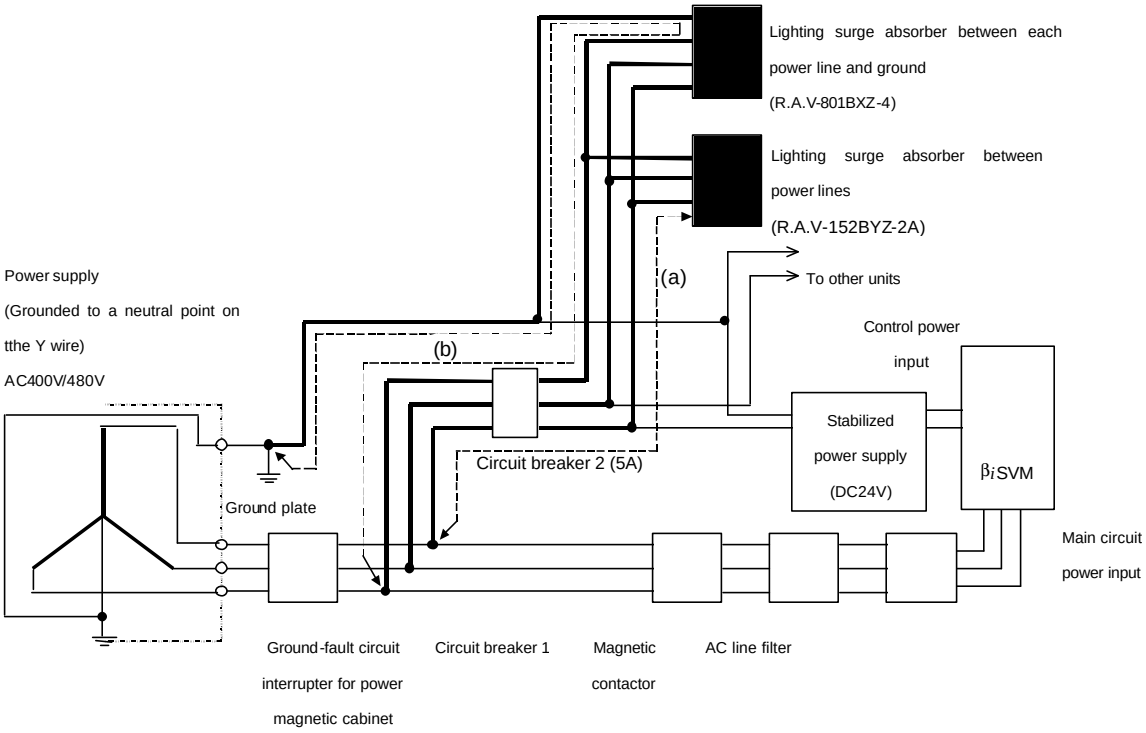
9.2. Single-phase input for control power

Please be sure to use a regulated power supply for 24V power supply for amplifier.
Common use with 24V power supply for motor brakes cannot be performed.

- Nominal rating voltage: 24V DC
- Allowable voltage fluctuation: ±10% (Including momentary variations)
- Power supply capacity

	Power supply capacity per amplifier
FSSB interface	0.9A

10. Installing of lighting surge absorber



CAUTIONS

(1) To increase the efficiency of lightning surge absorption, the wires indicated by bold lines should be as short as possible.
Wire cross-sectional area : 2 mm^2 or more
Wire length :
The total length of the cables used for line-to-line lightning surge protector (a) and that used for line-to-ground lightning surge protector (b) must not exceed 2 m.

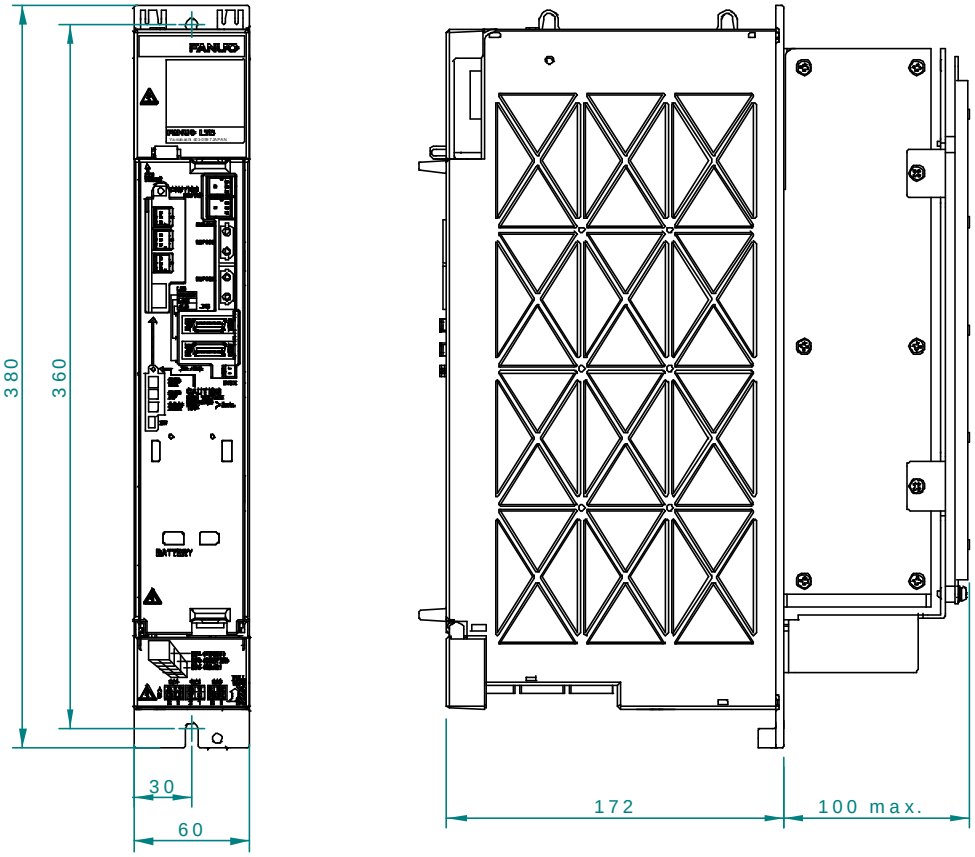
(2) When performing a dielectric strength test by applying an overvoltage to the power line, line-to-ground lightning surge protector must be removed to enable the applied voltage to be maintained.

(3) The circuit breaker 2 (5A) works for line protection when the lightning surge absorber is short-circuited because of a surge higher than its rating being applied.

(4) Because current does not flow through lightning surge protector in a normal state, the circuit breaker 2 (5A) can be used together with the surge absorbers as well as with other equipment.

11. External dimention/ Panel cut-out drawing/ maintenance area

11.1. SVM1-10HV*i*, SVM1-20HV*i*, SVM1-40HV*i*

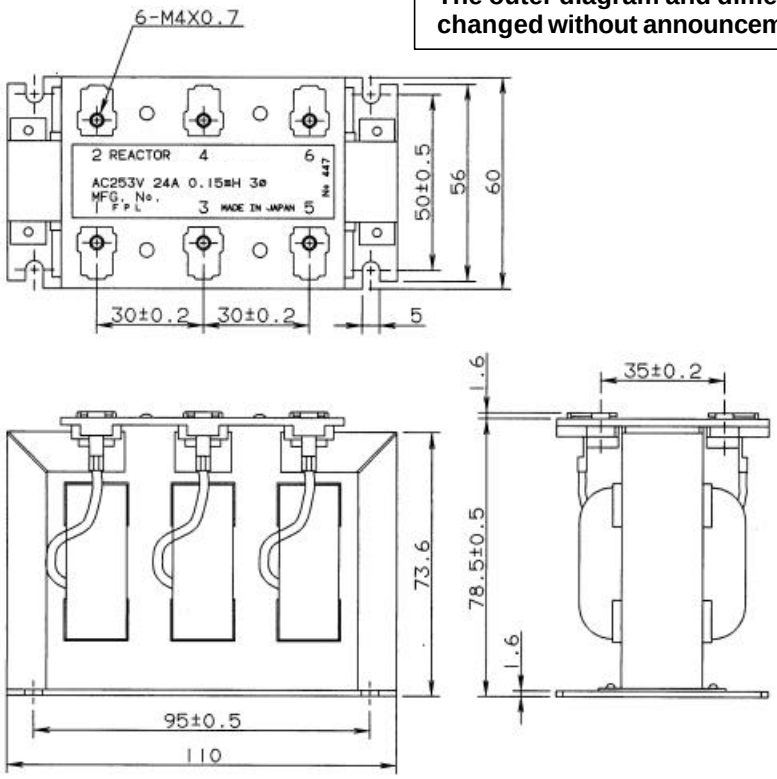


External dimensions/ panel cut-out/ maintenance area is the same as SVM1-40*i* and SVM1-80*i*. Please refer to B-65322/02EN for details.

11.2. AC line filter

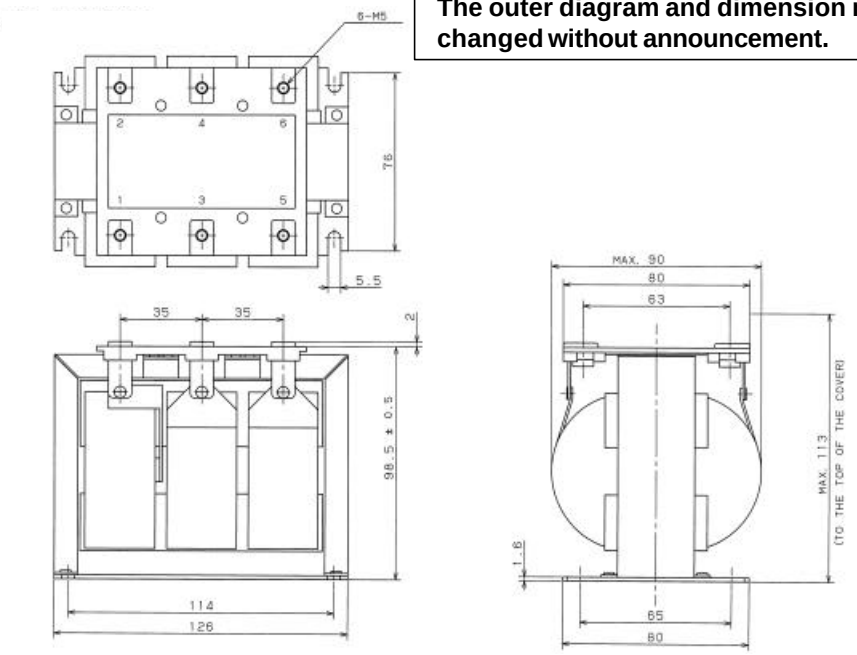
11.2.1 A81L-0001-0168

NOTE
The outer diagram and dimension may be changed without announcement.

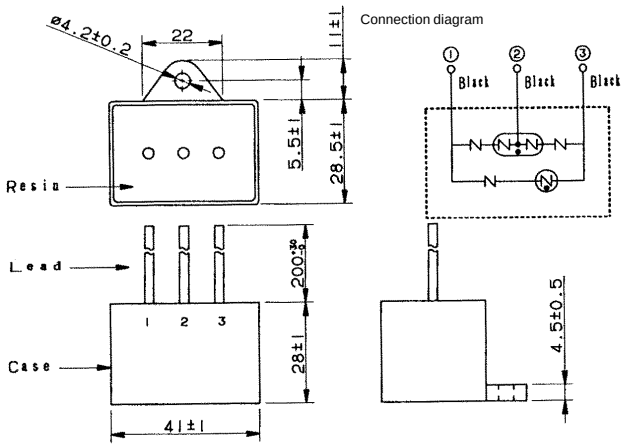


11.2.2 A81L-0001-0169

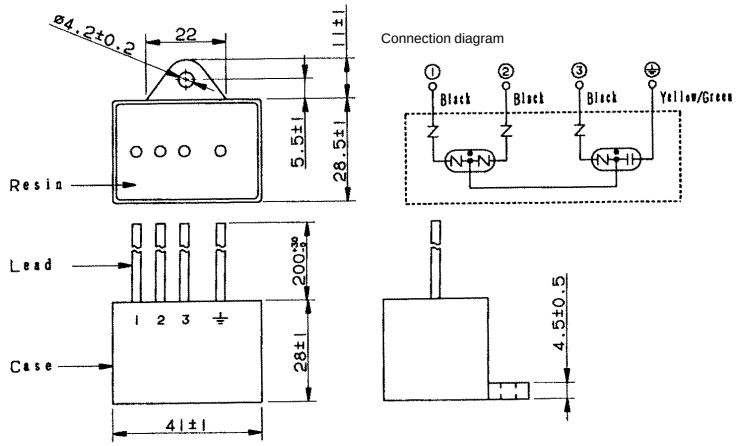
NOTE
The outer diagram and dimension may be changed without announcement.



11.3. Lighting surge absorber A06B-6077-K143



(1) For line-to-line installation: RAV-152BYZ-2A

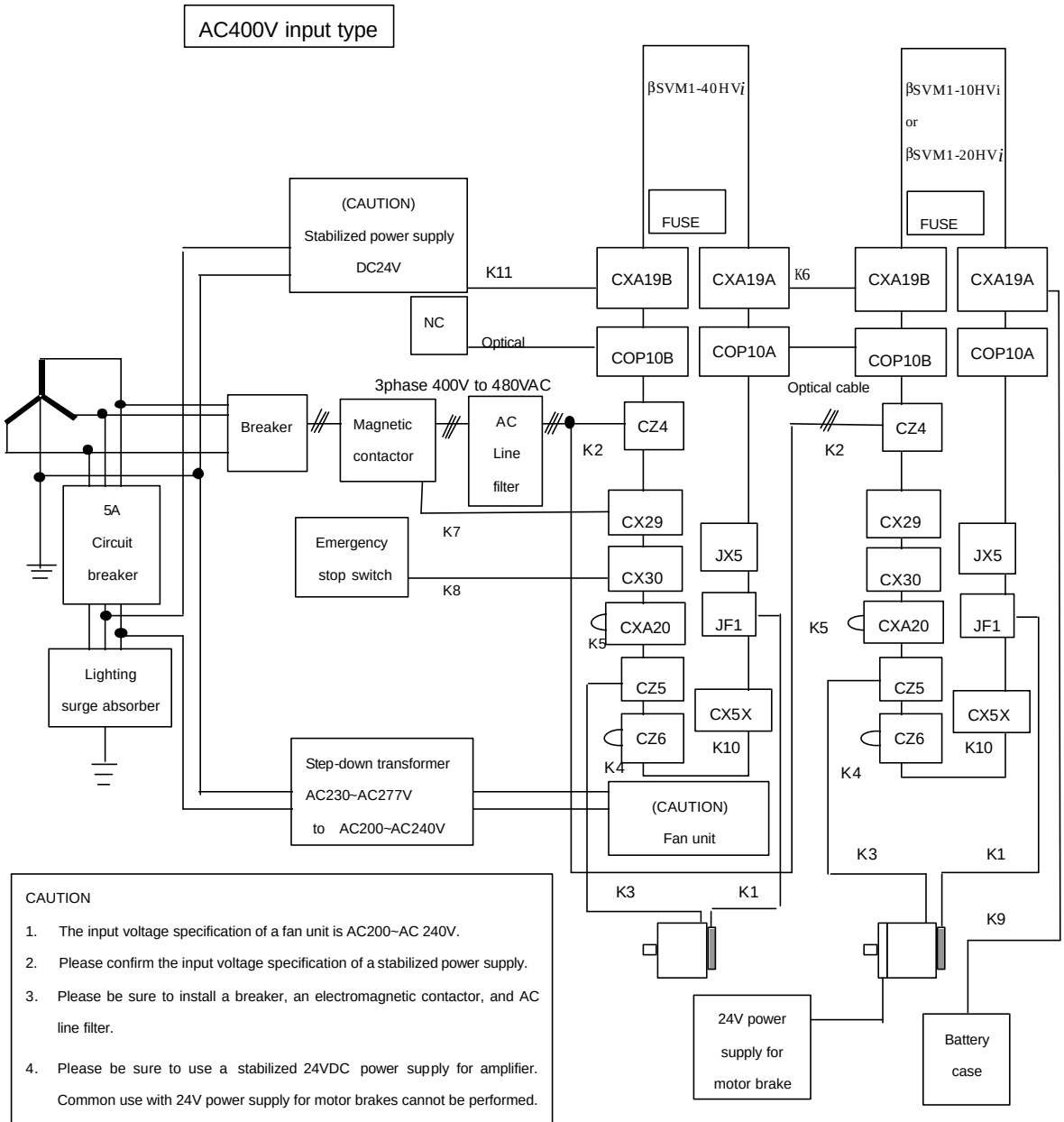


(2) For line-to-ground installation: RAV-801BXZ-4

Specification	Rated voltage	Clamp voltage	Surge withstand current	Surge withstand voltage
R·A·V-152BYZ-2A	460VAC	1470V ±10%(V1.0)	2500A(8/20μS)	20kV(1.2/50μS)

Specification	Rated voltage	AC discharge start voltage	Surge withstand current	Maximum surge discharge start voltage
R·A·V-801BXZ-4	line-to-line: 500VAC, line-to-ground: 290VAC	800VAC ±20%(Ua)	2500A(8/20μS)	2.32kV(1.2/50μS)

12. Total connection diagram



CAUTION

1. The input voltage specification of a fan unit is AC200~AC 240V.
2. Please confirm the input voltage specification of a stabilized power supply.
3. Please be sure to install a breaker, an electromagnetic contactor, and AC line filter.
4. Please be sure to use a stabilized 24VDC power supply for amplifier. Common use with 24V power supply for motor brakes cannot be performed.
5. The cabling of CX29 and CX30 of the second and subsequent amplifiers may be omitted. Refer to "Total connection diagram" for details.

12.1. Connection details

Refer to Section [I. .SVM] of B -65322EN/02 for details.

12.1.1. Details of cable K2 (Refer to B-65322/02EN)

Please select specification of cables in consideration of following table. Refer to Section [I .SVM] of B -65322EN/02 for details.

Servo motor	Continuous rating current [Arms] (Reference value)
β2/4000HV*i*s	1.2
β4/4000HV*i*s	1.7
β8/3000HV*i*s	2.7
β12/3000HV*i*s	4.0
β22/2000HV*i*s	5.6
α2/5000HV*i*s	1.7
α4/5000HV*i*s	2.3
α4/4000HV*i*	3.2
α8/3000HV*i*	3.6
α8/4000HV*i*s	5.2
α12/4000HV*i*s	5.6
α 12/3000HV*i*	6.7
α22/3000HV*i*	9.0

12.1.2. Details of cable K3 (Refer to B-65322/02EN)

Please select specification of cables in consideration of following table. Refer to Section [I. .SVM] of B-65322EN/02 for details.

Servo motor	Continuous rating current [Arms] (Reference value)
β2/4000HV*i*s	1.7
β4/4000HV*i*s	2.4
β8/3000HV*i*s	3.1
β12/3000HV*i*s	5.1
β22/2000HV*i*s	5.7
α2/5000HV*i*s	1.7
α4/5000HV*i*s	3.1
α4/4000HV*i*	4.1
α8/3000HV*i*	4.2
α8/4000HV*i*s	5.6
α12/4000HV*i*s	6.7
α12/3000HV*i*	9.1
a 22/3000HV*i*	9.2

13. Heat disspaton

The amount of heat dissipation depends on the SVM model and the current that flows through the servo motor. For the current that flows through a servo motor, reference the continuous rated current of each servo motor. (For the continuous rated current of each servo motor, refer to the servo motor descriptions.) As the current that flows through a servo motor, the root-mean-square value of the current that flows through an actual servo motor on a machine can be used. The amount of heat dissipation indicated below assumes the use of HRV2.

(1) Total amount of heat dissipation

The total amount of heat dissipation is calculated according to the following expression:

Total amount of heat dissipation= a + Ka1 × b1

a: Amount of heat dissipation determined by the SVM model [W]

Ka1: Coefficient determined by the SVM [W/Arms]

b1: Current flowing through the servo motor [Arms]

Total amount of heat dissipation

Name	Specification	a [W]	K [W/Arms]
SVM1-10HV*i*	H001	20	Ka1: 10.8
SVM1-20HV*i*	H002	20	Ka1: 11.1
SVM1-40HV*i*	H003	20	Ka1: 11.1

(2) Residual amount of heat in the cabinet

By placing the heat sink section outside the cabinet, the residual amount of heat in the cabinet can be calculated according to the expression below.

Residual amount of heat in the cabinet= a + Kb1 × b1

a: Amount of heat dissipation determined by the SVM model [W]

Kb1: Coefficient determined by the SVM [W/Arms]

b1: Current flowing through the servo motor [Arms]

Residual amount of heat in the cabinet

Name	Specification	a [W]	K [W/Arms]
SVM1-10HV*i*	H001	20	Ka1: 2.2
SVM1-20HV*i*	H002	20	Ka1: 2.2
SVM1-40HV*i*	H003	20	Ka1: 1.1

FANUC SERVO AMPLIFIER βiSV 20/20 DESCRIPTIONS

1. Type of applied documents

Name	FANUC SERVO AMPLIFIER βiSV 20/20 DESCRIPTIONS
Spec. No./Ver.	B-65322EN/02-03

2. Summary of Change

Group	Name / Outline	New, Add Correct, Del	Applicable Date
Basic Function			
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another	Addition of βiSV 20/20	New	2005. 7

βiSV 20/20 DESCRIPTIONS

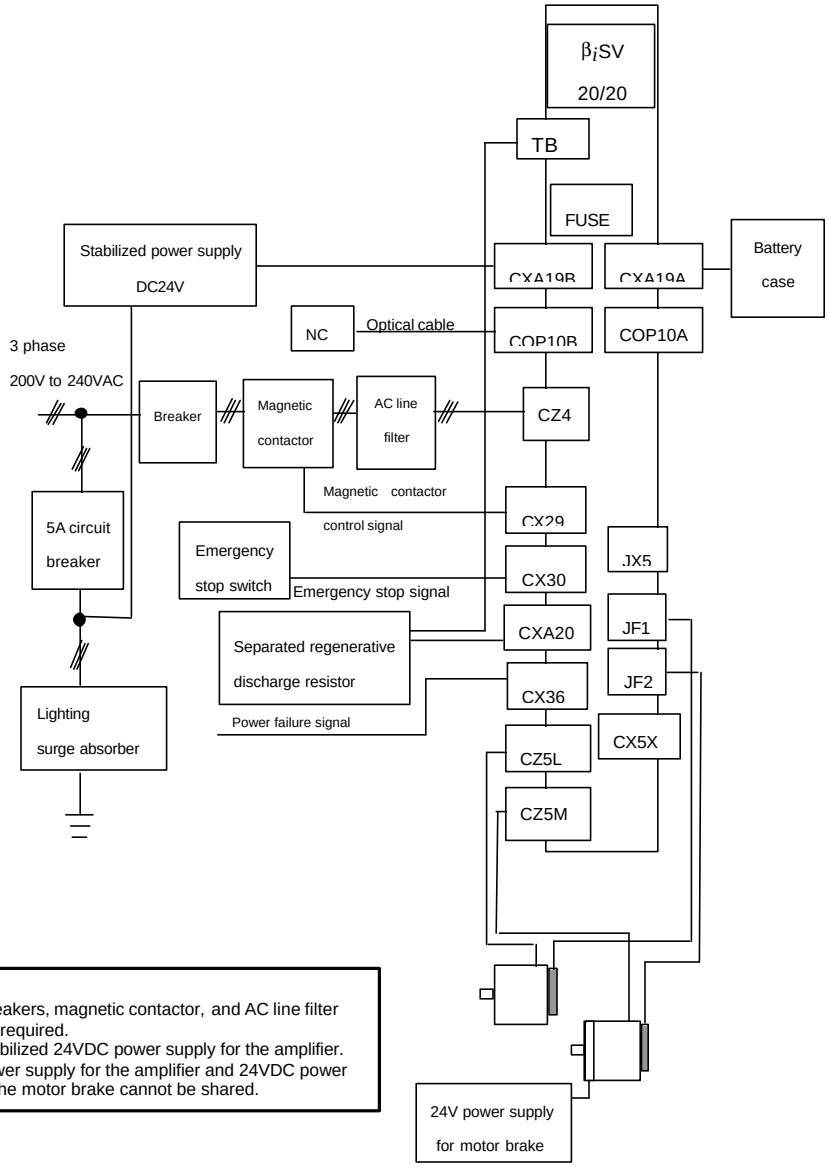
This documents describes about the specification of βiSV 20/20.
Please refer to FANUC SERVO AMPLIFIER βi series DESCRIPTIONS (B-65322EN/02) about contents without in this.

(Note)

This Servo amplifier βiSV 20/20 is available to use combining Series 0i-MODEL C/ 0i Mate-MODEL C.

All specifications and designs are subject to change without notice.

1. Configuration



CAUTION
1 A circuit breakers, magnetic contactor, and AC line filter are always required.
2 Use the stabilized 24VDC power supply for the amplifier. 24VDC power supply for the amplifier and 24VDC power supply for the motor brake cannot be shared.

2. Specification

Item		βiSV 20/20
Interface		FSSB
Unit Designation		A06B-6136-H201
Power P.C.B.		A16B-3200-0642
Control P.C.B.		A20B-2101-0290
Main Power For Three Phase Supply	Input Voltage	AC 200-240 V (+10%,-15%) 50 / 60 Hz
	Current at 50Hz	7.6Arms
	Rated Capacity	2.7kVA
Control Power supply	Input Voltage	DC 24 V (+10%, -10%)
	Input Current	0.8 Arms
Rated Output Current	L-Axis	6.5Arms
	M-Axis	6.5Arms
Current Limit Value	L-Axis	20 Ap
	M-Axis	20 Ap
Servo control		HRV2, HRV3
Main Circuit Control Method		Sine Wave PWM Control with Transistor Bridges
Servo output frequency range		0-667Hz
Warning and protectivefunctions		- High Current - IPM Abnormal - High Voltage of DC Link - Low Voltage of DC Link - Overheat of Discharge Resistor - Low Voltage of Control Power Supply - FSSB Communication Error - Locked Fan Motor
Ambient Temperature Range		0 to +55 degrees Celsius
Weight		3.9kg
Option		Regererative resistor (16ohm, 100W no-wind condition) (16ohm, 200W no-wind condition) (16ohm, 400W wind velocity 2m/s condition) Separated AC line filter Separated battery

3. Applicable motors

		0.4	0.5	1	2	4	8	12
MOTOR	αi F			αi F1 /5000 (20A)	αi F2 /5000 (20A)			
	αi S				αi S2 /5000 /6000 (20A)	αi S4 /5000 (20A)		
	βi s	βi S0.4 /5000 (20A)	βi S0.5 /6000 (20A)	βi S1 /6000 (20A)	βi S2 /4000 (20A)	βi S4 /4000 (20A)	βi S8 /3000 (20A)	βi S12 /2000 (20A)
SV 20/20	L axis	O	O	O	O	O	O	O
	axis	O	O	O	O	O	O	O

4. Selection of breaker, electromagnetic contactor, and AC line filter

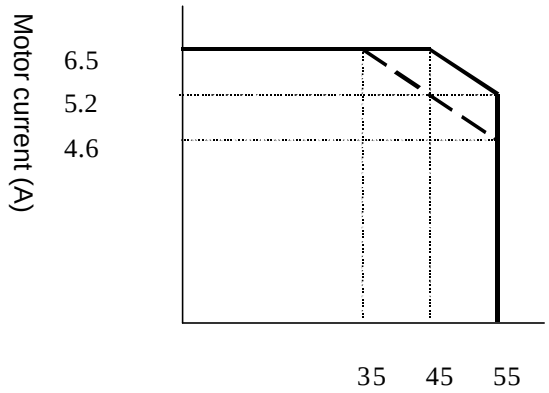
Please refer to the following table and select it. For details, please refer to B-65322/02EN.

Servo motor	Continuous rating current [Arms] (Reference value)	Power supply capacity [kVA] (Reference value)
β*i*S 0.4/5000	0.6	0.2
β*i*S 0.5/6000	1.4	0.47
β*i*S 1/6000	2.3	0.77
β*i*S 2/4000	2.2	0.77
β*i*S 4/4000	3.3	1.2
β*i*S 8/3000	5.4	1.9
β*i*S 12/2000	6.3	2.2
α*i*F 1/5000	2.2	0.77
α*i*F 2/5000	3.3	1.2
α*i*S 2/5000	3.3	1.2
α*i*S 2/6000	4.5	1.6
α*i*S 4/5000	4.5	1.5

5. Derating

Consider derating as shown below, according to ambient temperature.
The solid line is a derating line for use when HRV2, while the dotted line is a derating line for use when HRV3 is applied.

Motor current derating



6. Regeneration discharge resistor

6.1. When separated regenerative discharge resistor is not needed.

When the regeneration energy per regenerative cycle is below the following amounts of energy [J], regeneration discharge resistor is unnecessary.

Table6.1 Permissible regenerative energy amount (Reference value)

Amplifier model	Permissible regenerative energy amount
β*i*SV 20/20	25[J]

Refer to Section [I. SVM] of B-65322EN/02 for details about calculation method of the regeneration energy per regenerative cycle.

6.2. When separated regenerative discharge resistor is needed.

When the regeneration energy per regenerative cycle exceeds the amount of permission regenerative energy of servo amplifier, DC link overvoltage alarm or abnormal of regeneration discharge may occur. In this case, regenerative discharge resistor is needed.

Table6.2 Capacity of regenerative discharge resistor

Specification	Capacity of regenerative discharge resistor	
A06B-6130-H404 (Note1) (Note2)	100W No –wind condition	-
A06B-6089-H500 (Note1)	200W No –wind condition	400W Wind velocity 2m/s condition

⚠ Cautions

- Please install into the cabinet, which fulfills the following conditions so that cutting fluid, oil mist, cutting waste, etc. may not adhere to regeneration discharge resistor.
  So, please install in the environment of the pollution degree 2 level specified to "IEC 60664-1."

  In order to satisfy a pollution degree 2 under the severe environment of a machine tool, it is necessary to install in a cabinet with which it is generally satisfied of IP54.

  If the cabinet does not have a structure for preventing materials that adversely affect regenerative discharge resistor from gettinng into the cabinet, normal operation and safety may fail. So, special care should be taken.

- Incorrect connection may cause to damage the amplifier.

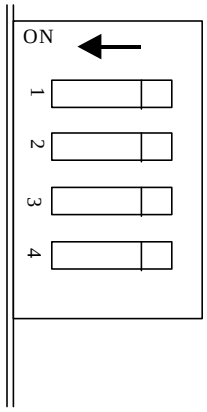
7. Setup switch (For DC alarm level)
Since the switch of four channels is in the front of a servo amplifier for regeneration resistance protection, please make it the following setup.

Setup of SW1, SW2

Switch	Setup
Switch1	OFF
Switch2	OFF

Setup of SW3, SW4

SW3	SW4	Separated regenerative discharge resistor
ON	ON	A06B-6130-H404 (Note1)
OFF	ON	A06B-6089-H500



8. Power supply specification

8.1. Three-phase input power supply for motor power

- Nominal rating voltage: 200V to 240VAC
- Allowable voltage fluctuation: -15% - +10%
- Frequency: 50/60Hz
- Allowable frequency fluctuation: ±2Hz
- Power supply impedance : Voltage fluctuation by load (at maximum output) not be exceed 7%.
- Power supply Unbalance: ±5% or less of rated voltage

NOTE
The allowable voltage fluctuation is a change observed for several minutes. It is not a continuous change.

8.2. Single-phase input for control power

Please be sure to use a regulated power supply for 24V power supply for amplifier.
Common use with 24V power supply for motor brakes cannot be performed.

- Nominal rating voltage: 24V DC
- Allowable voltage fluctuation: ±10% (Including momentary variations)
- Power supply capacity

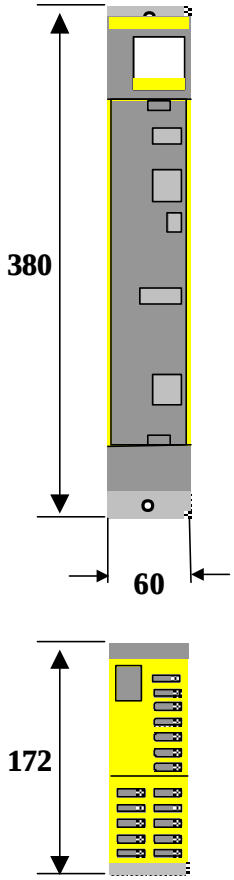
	Power supply capacity per amplifier
FSSB interface	0.8A

9. External dimention/ Panel cut-out drawing/ maintenance area

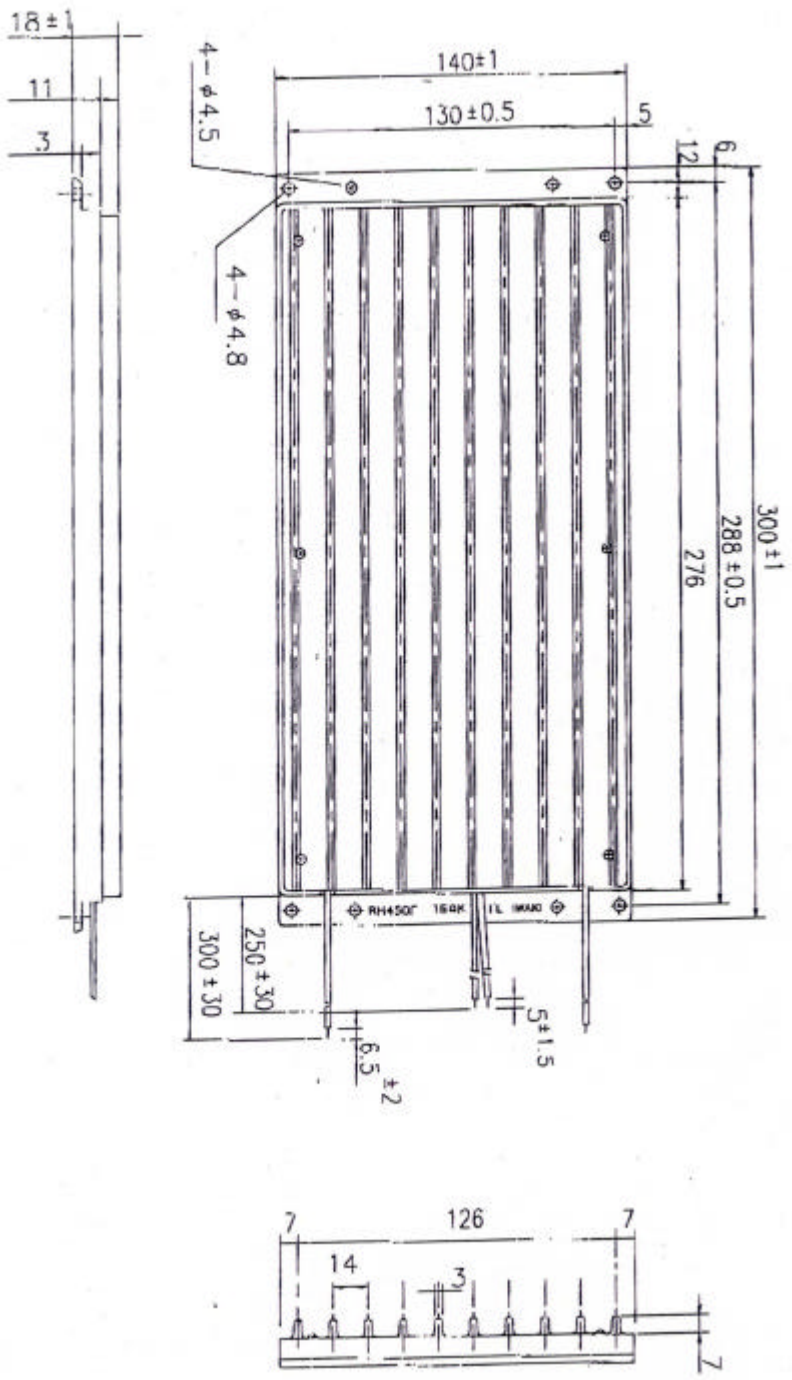
9.1. External dimension

βiSV 20/20

Without outer fin



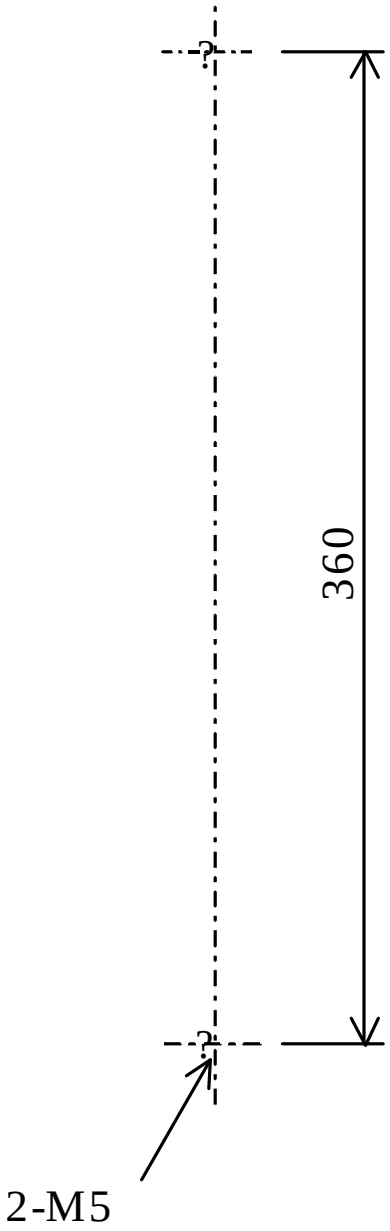
External dimension Regenerative discharge resistor (A06B-6130-H404)



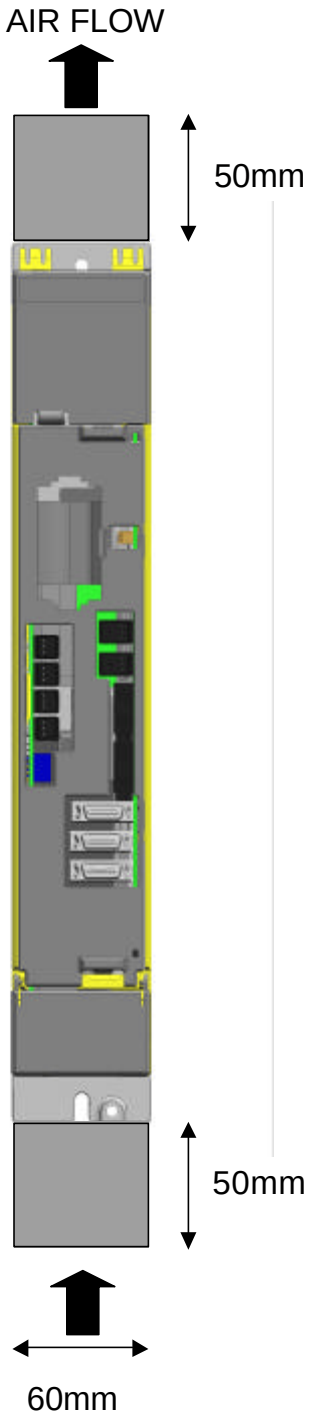
				TITLE	FANUC SERVO AMPLIFIER βiSV 20/20 DESCRIPTIONS
				DRAW. No.	B-65322EN/02-03
EDIT	DATE	DESIGN	DESCRIPTION	FANUC LTD	Page 11 / 22

9.2. Panel cut-out drawing

βiSV 20/20



9.3. Maintenance area



10. Power failure detecting function

The power failure detect function aiming at the gravity axis fall prevention at the time of a power failure was occurred.
Please refer to the section [11.5] for connection details.

In case of using this function, please add an uninterruptible power supply (UPS) etc. to be able to maintain the control source (DC 24V) of CNC and amplifier after a power failure occurs until mechanical brake operates.

Specification

2-axes amplifier β*i*SV output a power failure detect signal from a connector CX36, when power failure is occurred.

The drop of three-phase circuit AC voltage inputted into the connector "CZ4" of 2-axes amplifier β*i*SV is detected.

CZ4 input voltage range: 0 V-AC240V+10% 3φ 50Hz/60Hz±2Hz

CZ4 power failure detect voltage: AC165V±10V

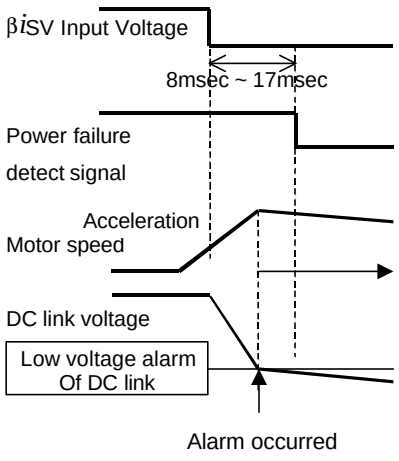
Detection delay time is established so that it may not react sensitively to instantaneous power failure.

Detection delay time: 8msec~17msec

(Note)

The detect condition is simultaneous three-phase circuit AC voltage drop.
Therefore, it may be unable to detect a power failure correctly on following conditions.

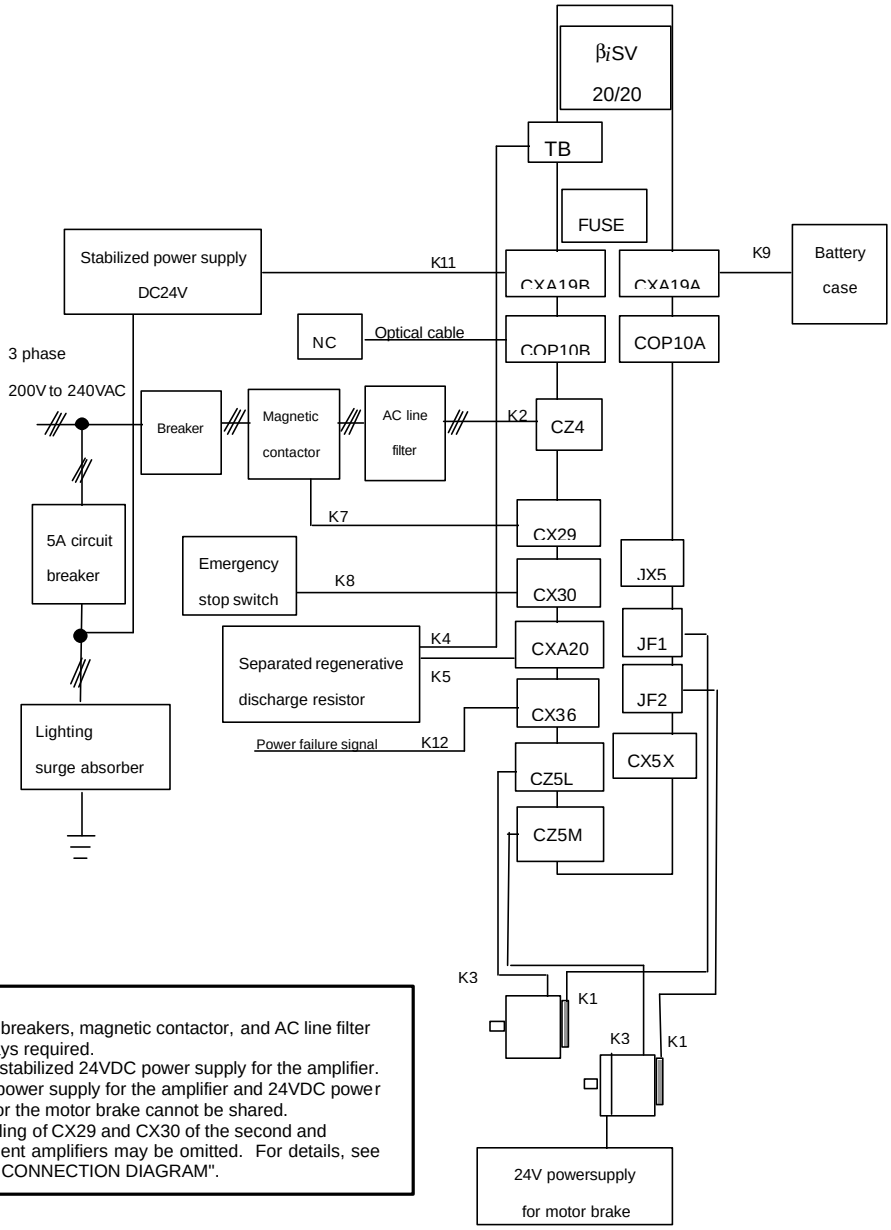
1. Power failure (phase interruption) as only one phase drop.
2. Power failure occurred at the time of motor acceleration. (Please see below.)



A power failure detecting signal is outputted from β*i*SV behind time 8msec~17msec after power failure occur. When the output power of motor is large by acceleration, DC link voltage falls rapidly. So, even if power failure is detected, DC link low voltage alarm may be occurred.

3. The amplifier is necessary to operate normally at instantaneous power failure for 3msec or less and for this terms the power failure detect signal is not detected.

11. Total connection diagram



CAUTION
1 A circuit breakers, magnetic contactor, and AC line filter are always required.
2 Use the stabilized 24VDC power supply for the amplifier. 24VDC power supply for the amplifier and 24VDC power supply for the motor brake cannot be shared.
3 The cabling of CX29 and CX30 of the second and subsequent amplifiers may be omitted. For details, see "TOTAL CONNECTION DIAGRAM".

11.1. Connection details

Refer to Section [I. .SVM] of B-65322EN/02 for details.

11.2. Details of cable K2 (Refer to B-65322/02EN)

Please select specification of cables in consideration of following table. Refer to Section [I .SVM] of B-65322EN/02 for details.

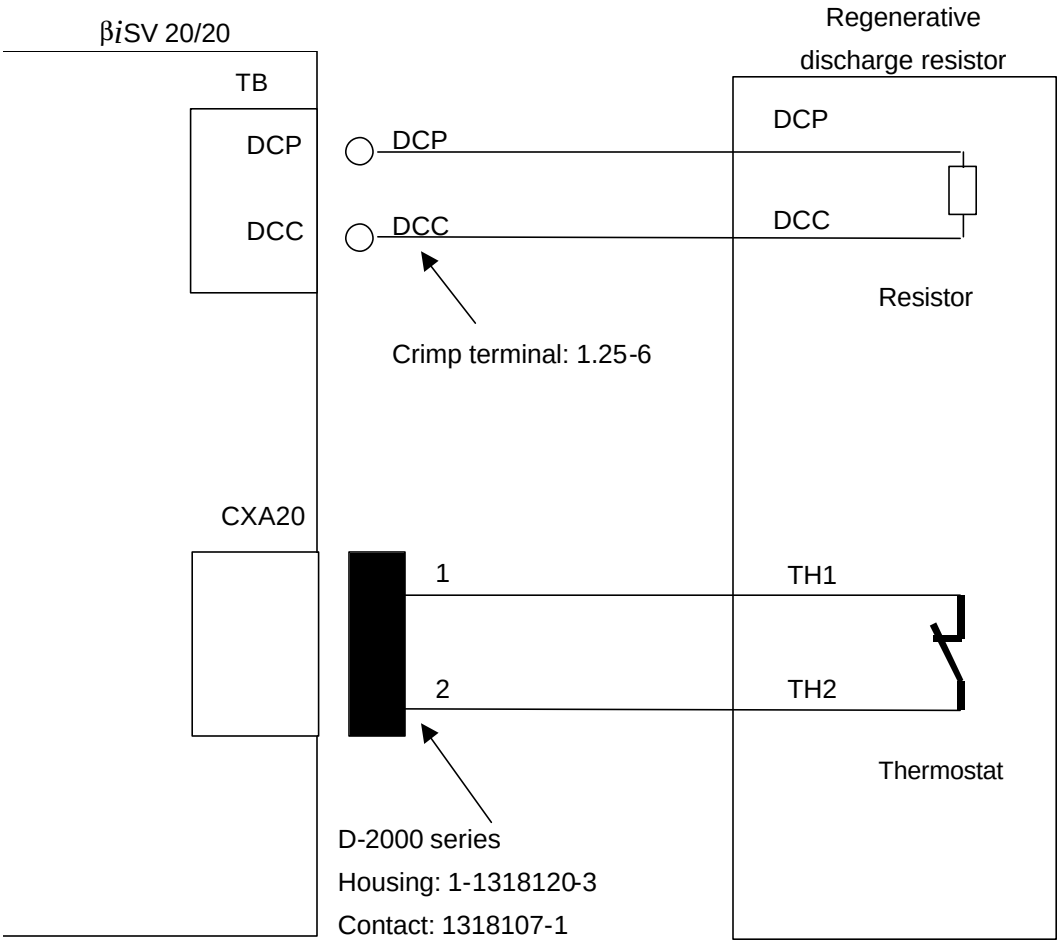
Servo motor	Continuous rating current [Arms] (Reference value)
β*i*S 0.4/5000	0.6
β*i*S 0.5/6000	1.4
β*i*S 1/6000	2.3
β*i*S 2/4000	2.2
β*i*S 4/4000	3.3
β*i*S 8/3000	5.4
β*i*S 12/2000	6.3
α*i*F 1/5000	2.2
α*i*F 2/5000	3.3
α*i*S 2/5000	3.3
α*i*S 2/6000	4.5
α*i*S 4/5000	4.5

11.3. Details of cable K3 (Refer to B-65322/02EN)

Please select specification of cables in consideration of following table. Refer to Section [I.SVM] of B-65322EN/02 for details.

Servo motor	Continuous rating current [Arms] (Reference value)
β*i*S 0.4/5000	3.6
β*i*S 0.5/6000	3.0
β*i*S 1/6000	2.7
β*i*S 2/4000	3.2
β*i*S 4/4000	4.7
β*i*S 8/3000	6.0
β*i*S 12/2000	6.5
α*i*F 1/5000	2.7
α*i*F 2/5000	3.5
α*i*S 2/5000	3.3
α*i*S 2/6000	4.1
α*i*S 4/5000	4.6

11.4. Details of cable K4 (Refer to B-65322/02EN)
In case of using regenerative discharge resistor
(a) A06B-6130-H404



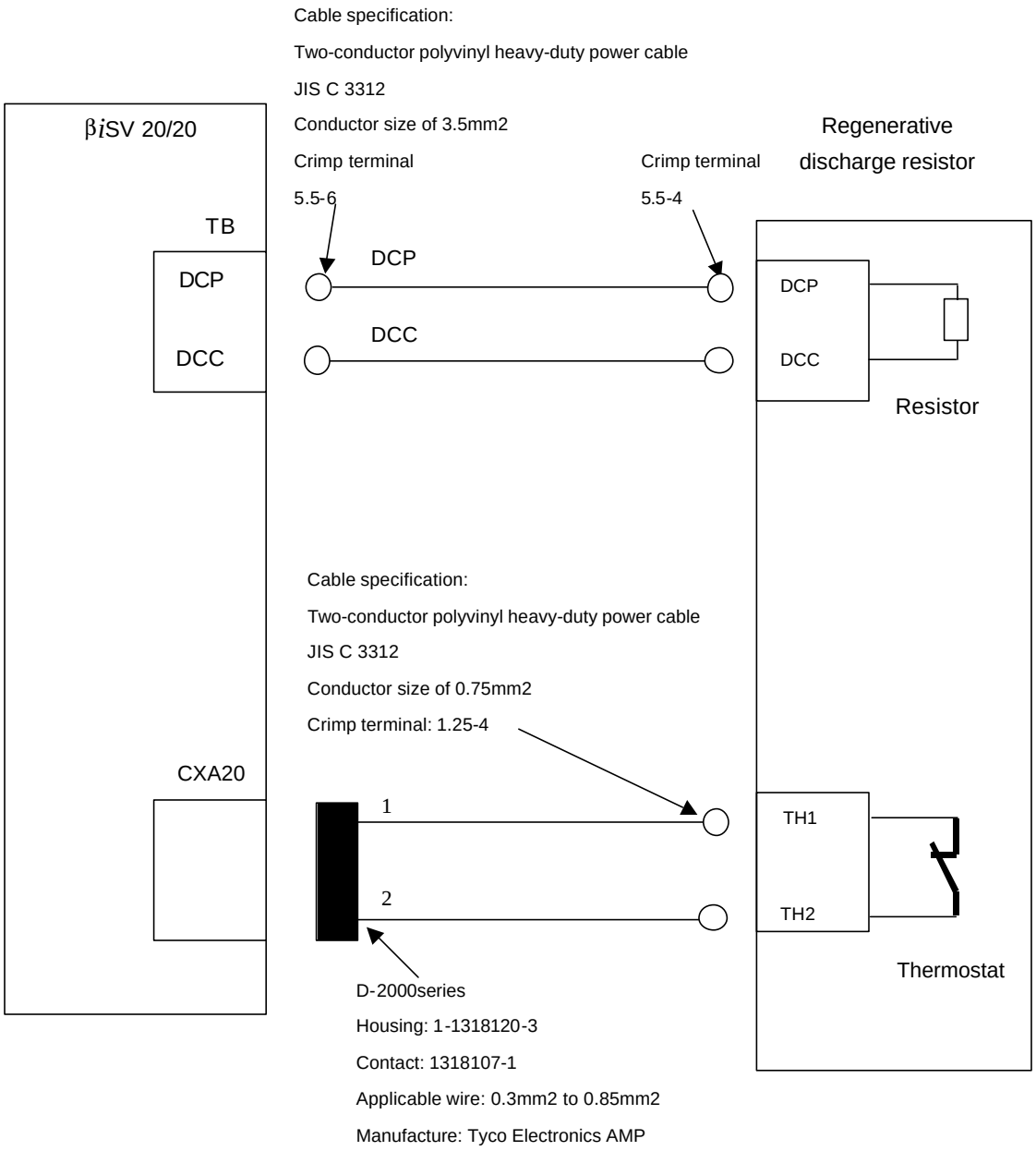
For connection tools, see subsection 9.2.3. of [I.SVM] for B-65322EN/02

⚠ WARNING

- **Do not short between terminal "DCP" and terminal "DCC".**
- **Do not connect this terminal "TB" to terminal "TB1(DCP/DCN)" of servo amplifier a*i* series.**

Servo amplifier may be broken in case of above incorrect connection.

(b) A06B-6089-H500



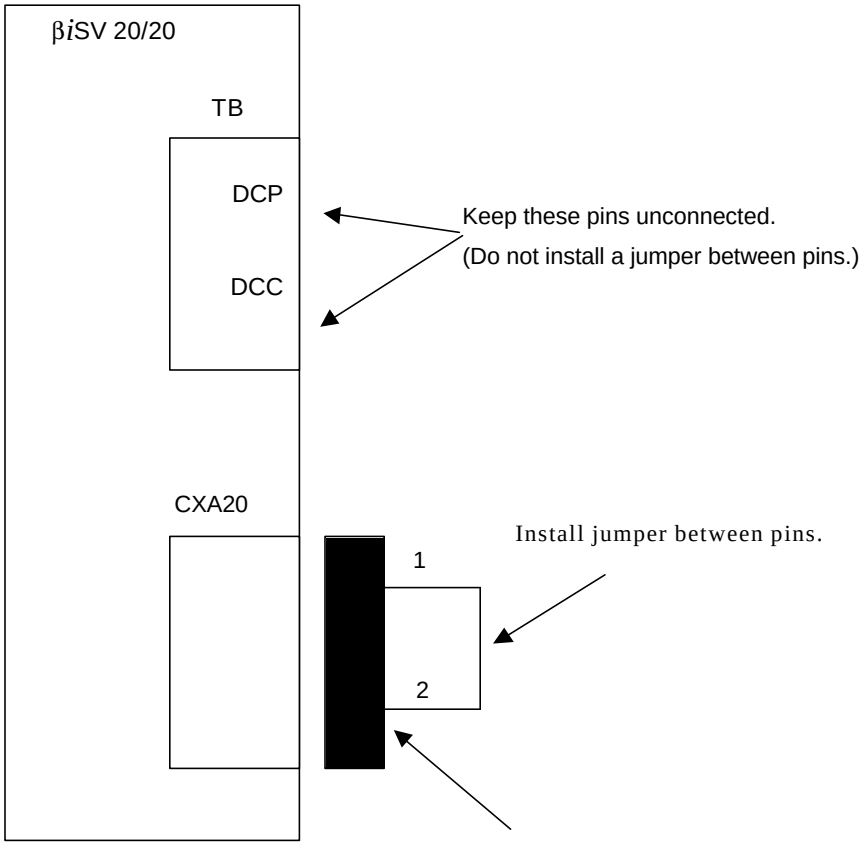
For connection tools, see subsection 9.2.3. of [I.SVM] for B-65322EN/02

⚠ WARNING

- **Do not short between terminal "DCP" and terminal "DCC".**
- **Do not connect this terminal "TB" to terminal "TB1(DCP/DCN)" of servo amplifier a*i* series.**

Servo amplifier may be broken in case of above incorrect connection.

(c) In case of not using regenerative discharge resistor



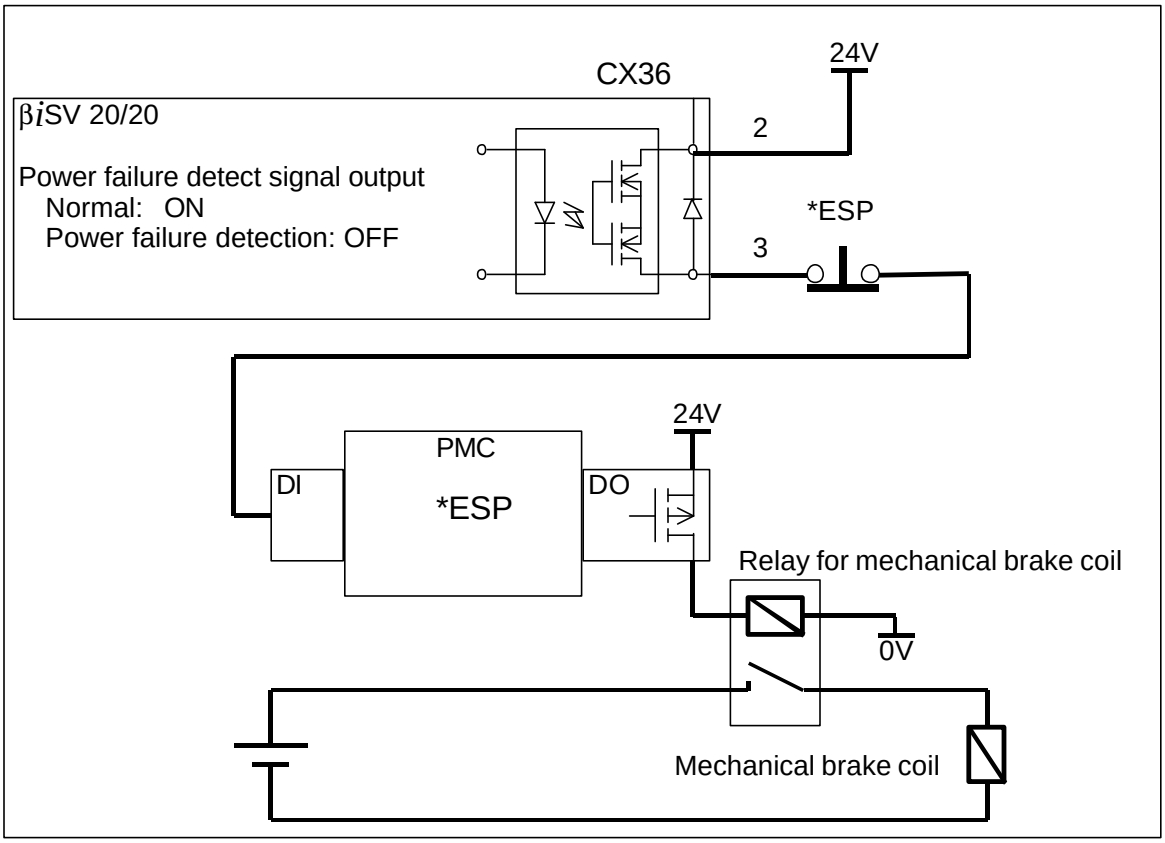
For connection tools, see subsection 9.2.3. of [I.SVM] for B-65322EN/02

⚠ WARNING

- **Do not short between terminal "DCP" and terminal "DCC".**
- **Do not connect this terminal "TB" to terminal "TB1(DCP/DCN)" of servo amplifier a*i* series.**

Servo amplifier may be broken in case of above incorrect connection.

11.5. Details of cable K12



CX36 specification (Rated output)

Output voltage:	30V Max.
Output current :	200mA Max.

12. Heat disspaton

The amount of heat dissipation depends on the current that flows through the servo amplifier and servo motor. For the current that flows through a servo motor, reference the continuous rated current of each servo motor. (For the continuous rated current of each servo motor, refer to the servo motor descriptions.) As the current that flows through a servo motor, the root-mean-square value of the current that flows through an actual servo motor on a machine can be used. The amount of heat dissipation indicated below assumes the use of HRV2.

(1) Total amount of heat dissipation

The total amount of heat dissipation is calculated according to the following expression:

Total amount of heat dissipation= a + Ka1 $\times$ b1

a: Amount of heat dissipation determined by the βiSV [W]

Ka1: Coefficient determined by the βiSV [W/Arms]

b1: Current flowing through the servo motor [Arms]

Total amount of heat dissipation

Name	Specification	A [W]	K [W/Arms]
βiSV 20/20	H201	20	Ka1: 12.6

(2) Residual amount of heat in the cabinet

By placing the heat sink section outside the cabinet, the residual amount of heat in the cabinet can be calculated according to the expression below.

Residual amount of heat in the cabinet= a + Kb1 $\times$ b1

a: Amount of heat dissipation determined by the βiSV [W]

Kb1: Coefficient determined by the βiSV [W/Arms]

b1: Current flowing through the servo motor [Arms]

Residual amount of heat in the cabinet

Name	Specification	a [W]	K [W/Arms]
βiSV 20/20	H201	20	Ka1: 12.6

FANUC SERVO AMPLIFIER βi series DESCRIPTIONS

1. Type of applied documents

Name	FANUC SERVO AMPLIFIER βi series DESCRIPTIONS
Spec. No./Ver.	B-65322EN/02-02

2. Summary of Change

Group	Name / Outline	New, Add Correct, Del	Applicable Date
Basic Function			
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another	Addition of 400V input model βiSV	New	2005. 1

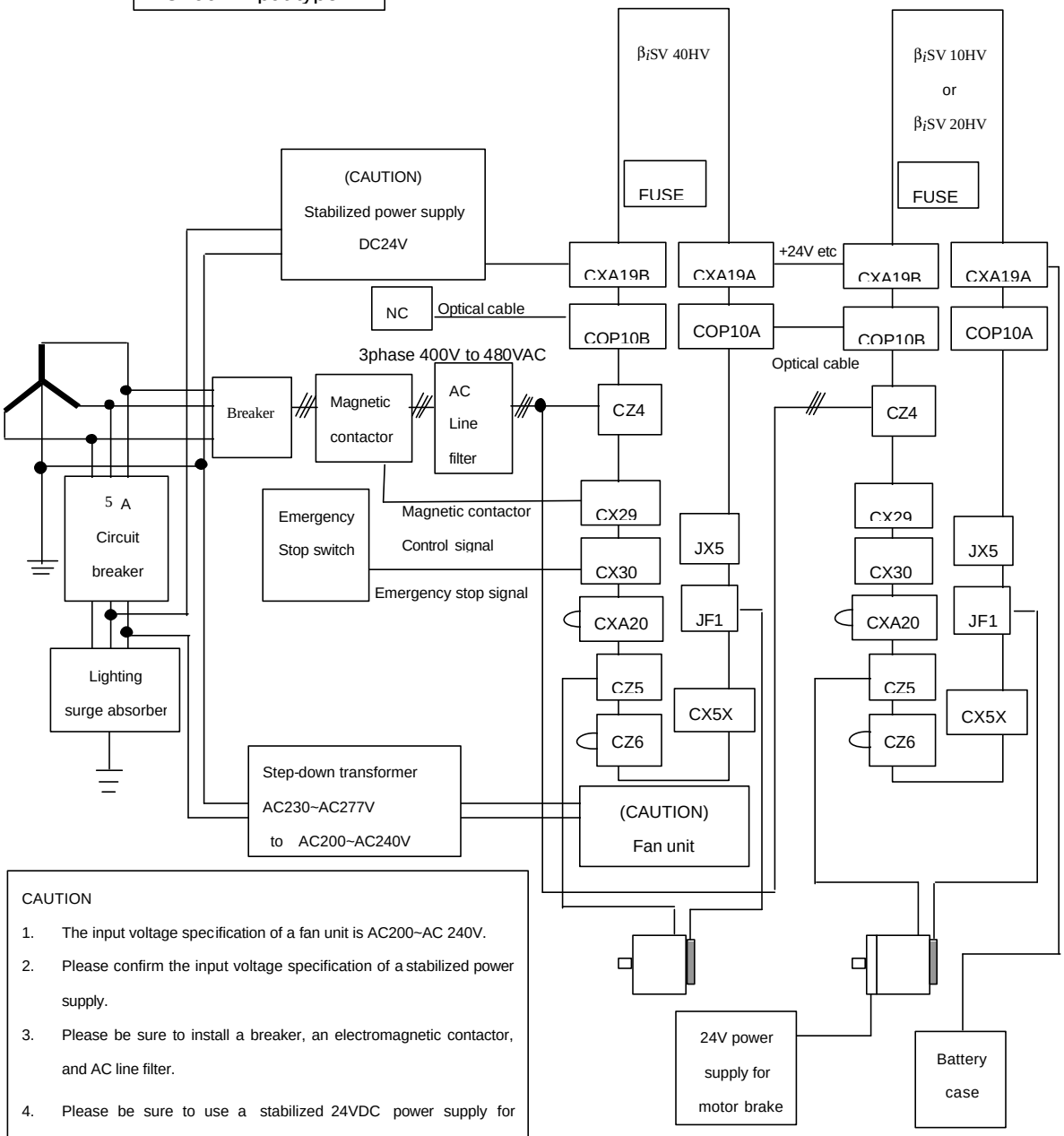
400V input model of βiSV DESCRIPTIONS

This documents is described about the specification of 400V input model βiSV.
Please refer to FANUC SERVO AMPLIFIER βi series DESCRIPTIONS (B-65322EN/02) about contents without in this.

All specifications and designs are subject to change without notice.

1. Configuration

AC400V input type



CAUTION

1. The input voltage specification of a fan unit is AC200~AC 240V.
2. Please confirm the input voltage specification of a stabilized power supply.
3. Please be sure to install a breaker, an electromagnetic contactor, and AC line filter.
4. Please be sure to use a stabilized 24VDC power supply for amplifier. Common use with 24V power supply for motor brakes cannot be performed.
5. The cabling of CX29 and CX30 of the second and subsequent amplifiers may be omitted. Refer to “Total connection diagram” for details.

2. Specification

Item		bi SV 10HV	bi SV 20HV	bi SV 40HV
Interface		FSSB		
Unit Designation		A06B-6131-H001	A06B-6131-H002	A06B-6131-H003
Power P.C.B.		A16B-3200-0515	A16B-3200-0516	A16B-3200-0517
Control P.C.B.		A20B-2101-0051		
Main Power For Three Phase Supply	Input Voltage	AC 400-480 V (+10%,-15%) 50 / 60 Hz		
	Current at 50Hz	2.3 Arms	3.6 Arms	9.0Arms
	Rated Capacity	1.6 kVA	2.5 kVA	6.2kVA
Control Power supply	Input Voltage	DC 24 V (+10%, -10%)		
	Input Current	0.9 Arms		
Rated Output Current		3.1Arms	5.6Arms	9.2Arms
Current Limit Value		10Ap	20 Ap	40 Ap
Servo HRV control		HRV2,HRV3		
Main Circuit Control Method		Sine Wave PWM Control with Transistor Bridges		
Dynamic brake circuit		Built-in		
Servo output frequency range		0-334Hz		
Warning and protectivefunctions		- High Current - IPM Abnormal - High Voltage of DC Link - Low Voltage of DC Link - Overheat of Discharge Resistor - Low Voltage of Control Power Supply - FSSB Communication Error - Locked Fan Motor		
Ambient Temperature Range		0 to +55 degrees Celsius		
Weight		3.9kg		
Option		Built-in regererative resistor (64ohm, 50W no-wind condition) (64ohm , 130W wind velocity 2m/s condition) Separated AC line filter Separated battery		

3. Applicable motors

		2	4		8					22	
MOTOR	αi			αi F4 /4000HV (20A)		αi F8 /3000HV (20A)			αi F12 /3000HV (40A)		αi F22 /3000HV (40A)
	αi S	αi S2 /5000HV (10A)	αi S4 /5000HV (10A)				αi S8 /4000HV (40A)		αi S12 /4000HV (40A)		
	βi S	βi S2 /4000HV (10A)	βi S4 /4000HV (10A)		βi S8 /3000HV (10A)			βi S12 /3000HV (20A)		βi S22 /2000HV (20A)	
βi SV	10HV	?	?		?						
	20HV			?		?		?		?	
	40HV						?		?		?

4. Selection of breaker, electromagnetic contactor, and AC line filter

Please select based on the amplifier input current of following table [Tab.: The amplifier input current at the time of continuous motor ouput power]. When two or more sets of amplifier are connected, please select based on total of amplifier input current. For details, please refer to B-65322/02JA.

4.1. Breaker

Name	Specification	Note
The breaker for main power supplies (30A)	A06B-6077-K101	Fuji Electric EA53B/30+ cover BZ-TB20B-3
The breaker for control sources (5A)	A06B-6077-K106	Fuji Electric EA33/5+ cover BZ-TB10B-503

4.2. Electromagnetic contactor

Name	Specification	Note
Electromagnetic contactor (32A)	A06B-6077-K121	Fuji Electric SC-5-1+ cover SZ-JC4

4.3. AC line filter

Name	Specification	Note
AC line filter (12A)	A81L-0001-0168	
AC line filter (22A)	A81L-0001-0169	

02

[Tab.: The amplifier input current at the time of continuous motor ouput power]

Servo motor	Continuous rating current [Arms] (Reference value)	Power supply capacity [kVA] (Reference value)
β*i*S2/4000HV	1.2	0.8
β*i*S4/4000HV	1.7	1.2
β*i*S8/3000HV	2.7	1.9
β*i*S12/3000HV	4.0	2.8
β*i*S22/2000HV	5.6	3.9
α*i*S2/5000HV	1.7	1.2
α*i*S4/5000HV	2.3	1.6
α*i*F4/4000HV	3.2	2.2
α *i*F8/3000HV	3.6	2.5
α *i*S8/4000HV	5.2	3.6
α *i*S12/4000HV	5.6	3.9
α *i*F12/3000HV	6.7	4.7
α *i*F22/3000HV	9.0	6.2

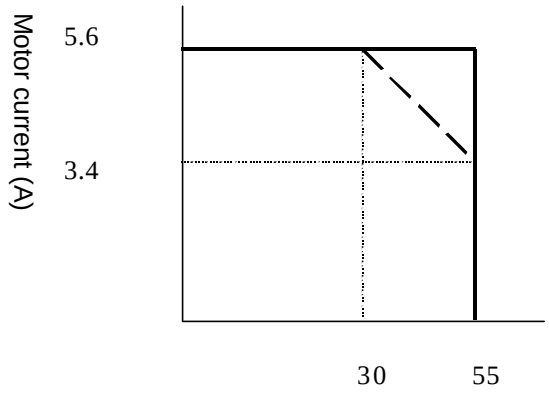
5. Cooling fan motor
The fan motor for amplifier cooling is needed for the following model.

Ordering number	Amplifier	Applied motor
A06B-6134-K002	β*i*SV 40HV	All motors

6. Derating
Consider derating as shown below, according to ambient temperature.
The solid line is a derating line for use when HRV2, while the dotted line is a derating line for use when HRV3 is applied.

β*i*SV 20HV

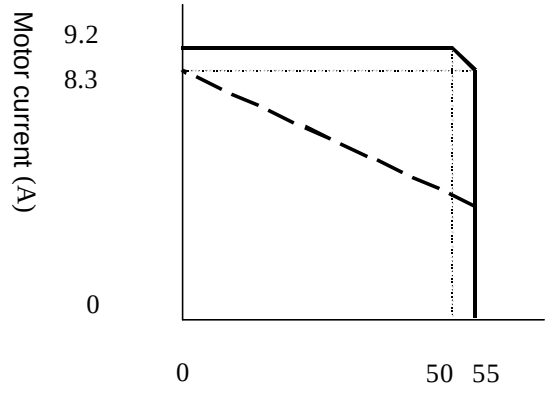
Motor current derating



Ambient temperature (Degree)

β*i*SV 40HV

Motor current derating



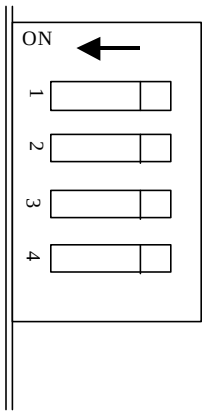
Ambient temperature (Degree)

7. Capacity of regeneration discharge resistor
The regeneration discharge resistor of the following capacity is built in the servo amplifier module.

Amplifier	Specification	Capacity of regeneration discharge resistance
β*i*SV 10HV	A06B-6131-H001	50W No –wind condition
β*i*SV 20HV	A06B-6131-H002	
β*i*SV 40HV	A06B-6131-H003	130W Wind velocity 2m/s condition

8. Setup switch (For DC alarm level)
Since the switch of four channels is in the front of a servo amplifier module for regeneration resistance protection, please make it the following setup.

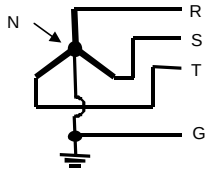
Switch	Setup
Switch1	OFF
Switch2	OFF
Switch3	ON
Switch4	ON



9. Power supply specification

9.1. Three-phase input power supply for motor power

- Nominal rating voltage: 400V to 480VAC
  Star connection, neutral grounding
  PE is provided on the power line



- Allowable voltage fluctuation: -15% - +10%
- Frequency: 50/60Hz
- Allowable frequency fluctuation: ±2Hz
- Power supply impedance : Voltage fluctuation by load (at maximum output) not be exceed 7%.
- Power supply Unbalance: ±5% or less of rated voltage

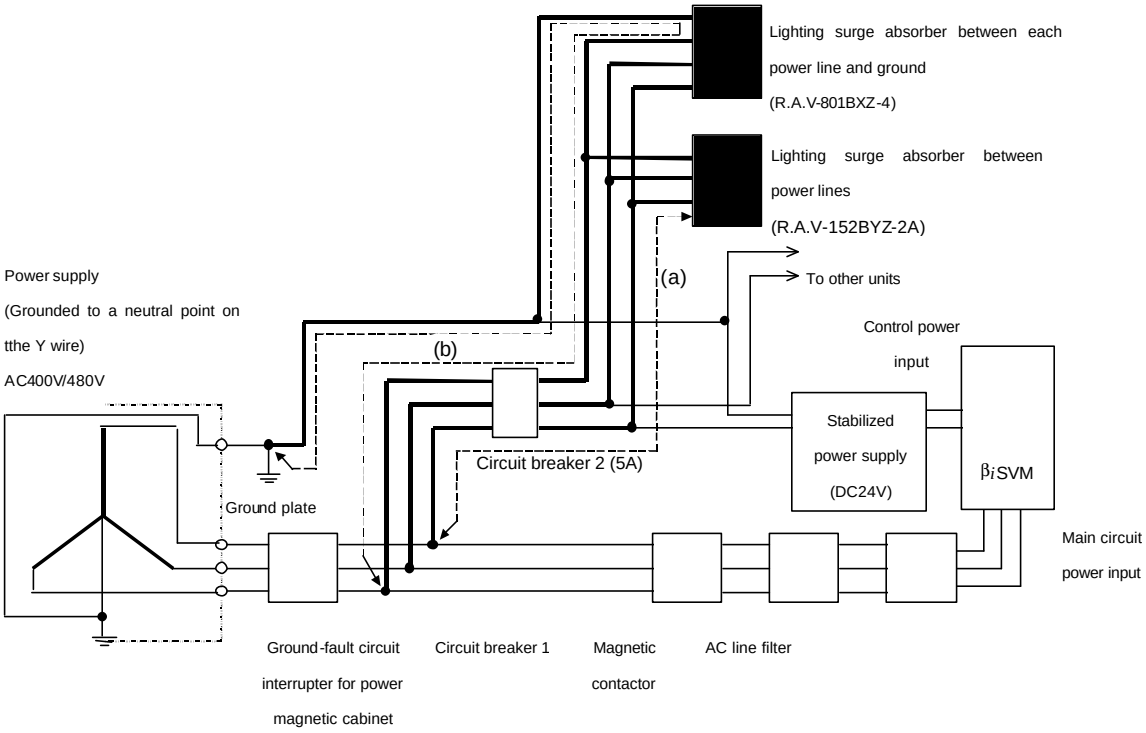
9.2. Single-phase input for control power

Please be sure to use a regulated power supply for 24V power supply for amplifier.
Common use with 24V power supply for motor brakes cannot be performed.

- Nominal rating voltage: 24V DC
- Allowable voltage fluctuation: ±10% (Including momentary variations)
- Power supply capacity

	Power supply capacity per amplifier
FSSB interface	0.9A

10. Installing of lighting surge absorber



CAUTIONS

(1) To increase the efficiency of lightning surge absorption, the wires indicated by bold lines should be as short as possible.
Wire cross-sectional area: 2 mm^2 or more
Wire length:
The total length of the cables used for line-to-line lightning surge protector (a) and that used for line-to-ground lightning surge protector (b) must not exceed 2 m.

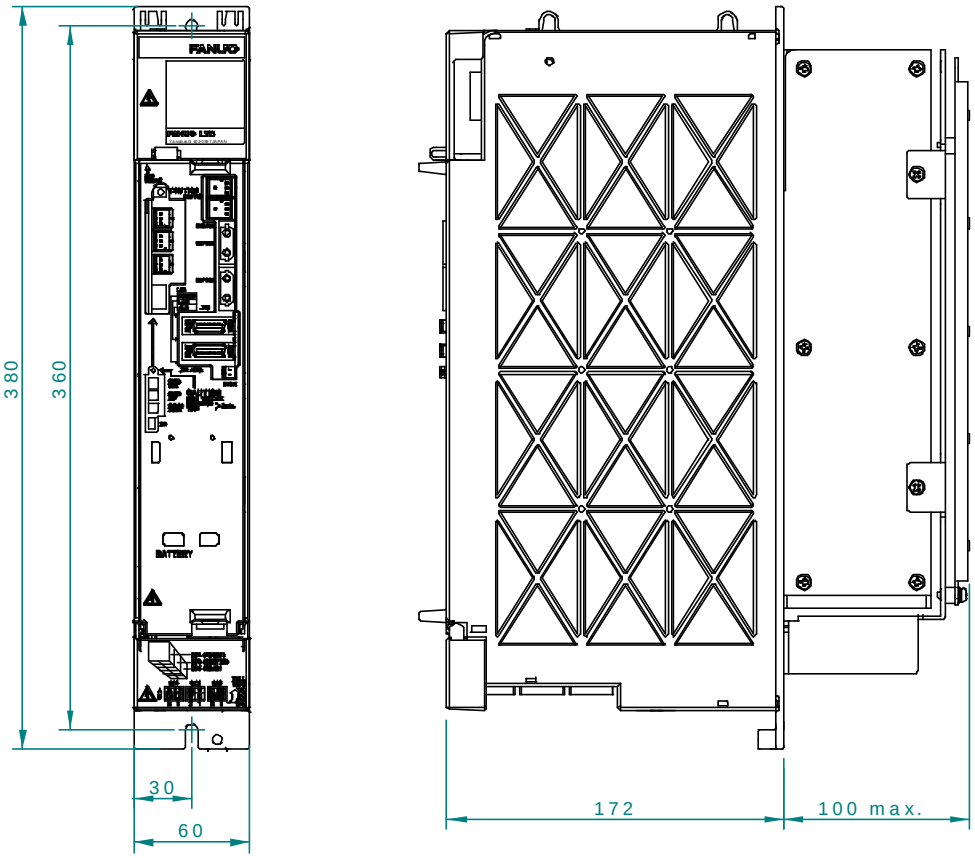
(2) When performing a dielectric strength test by applying an overvoltage to the power line, line-to-ground lightning surge protector must be removed to enable the applied voltage to be maintained.

(3) The circuit breaker 2 (5A) works for line protection when the lightning surge absorber is short-circuited because of a surge higher than its rating being applied.

(4) Because current does not flow through lightning surge protector in a normal state, the circuit breaker 2 (5A) can be used together with the surge absorbers as well as with other equipment.

11. External dimention/ Panel cut-out drawing/ maintenance area

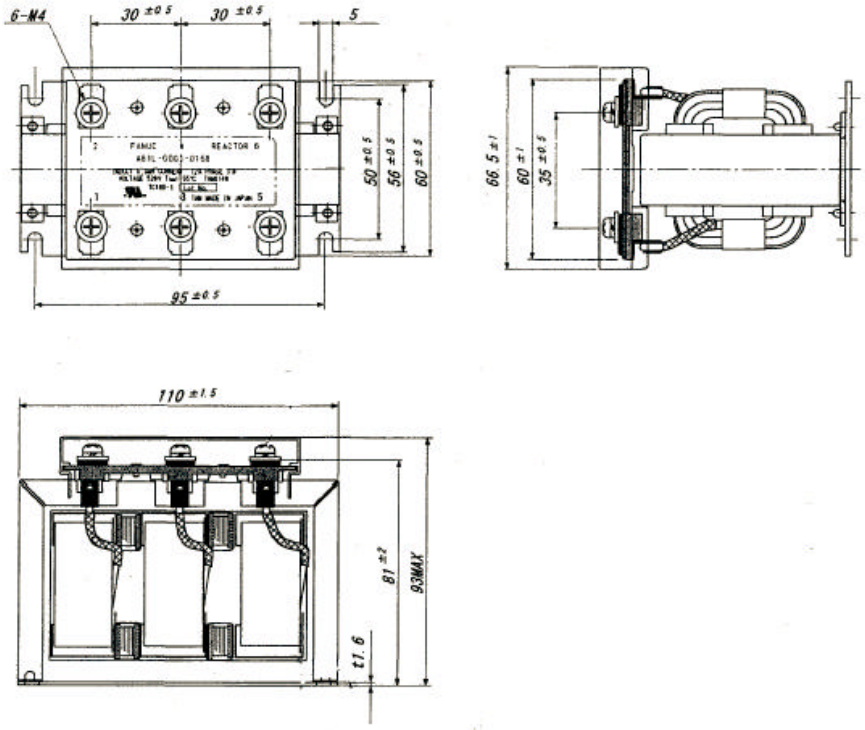
11.1. β*i*SV 10HV, β*i*SV 20HV, β*i*SV 40HV



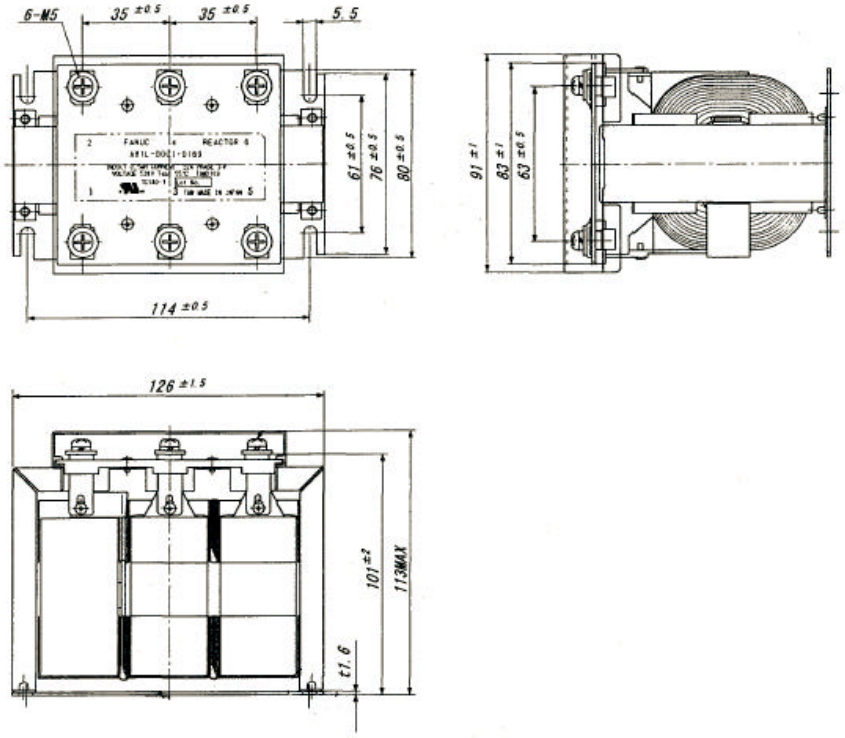
External dimensions/ panel cut-out/ maintenance area is the same as β*i*SV 40 and β*i*SV 80. Please refer to B-65322/02EN for details.

11.2. AC line filter

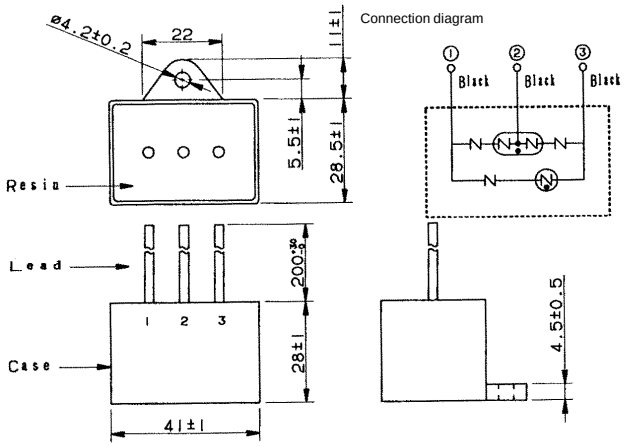
11.2.1 A81L-0001-0168



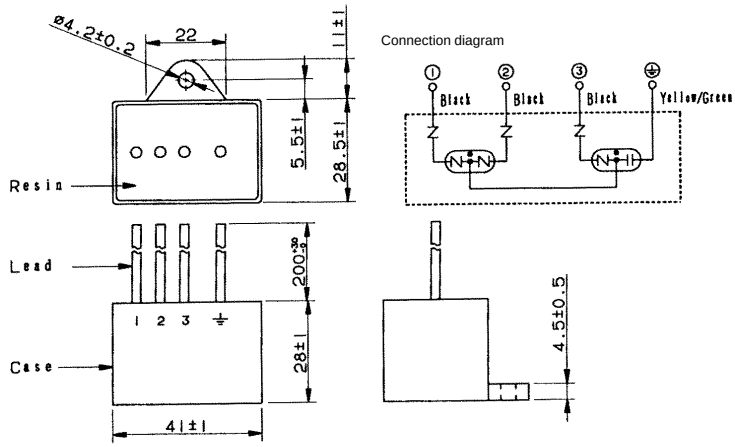
11.2.2 A81L-0001-0169



11.3. Lighting surge absorber A06B-6077-K143



(1) For line-to-line installation: RAV-152BYZ-2A

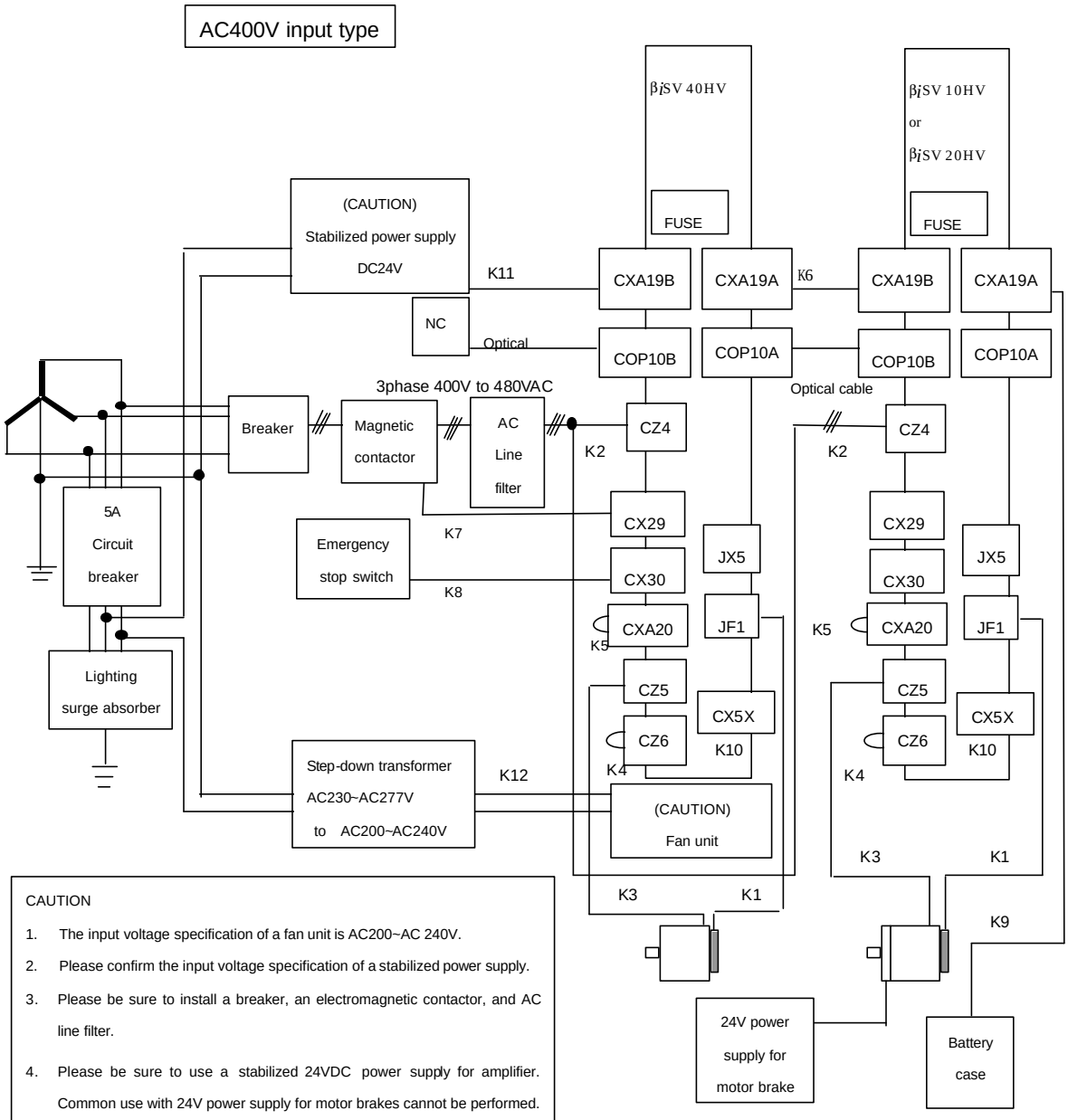


(2) For line-to-ground installation: RAV-801BXZ-4

Specification	Rated voltage	Clamp voltage	Surge withstand current	Surge withstand voltage
R·A·V-152BYZ-2A	460VAC	1470V ±10%(V1.0)	2500A(8/20μS)	20kV(1.2/50μS)

Specification	Rated voltage	AC discharge start voltage	Surge withstand current	Maximum surge discharge start voltage
R·A·V-801BXZ-4	line-to-line: 500VAC, line-to-ground: 290VAC	800VAC ±20%(Ua)	2500A(8/20μS)	2.32kV(1.2/50μS)

12. Total connection diagram



CAUTION

1. The input voltage specification of a fan unit is AC200~AC 240V.
2. Please confirm the input voltage specification of a stabilized power supply.
3. Please be sure to install a breaker, an electromagnetic contactor, and AC line filter.
4. Please be sure to use a stabilized 24VDC power supply for amplifier. Common use with 24V power supply for motor brakes cannot be performed.
5. The cabling of CX29 and CX30 of the second and subsequent amplifiers may be omitted. Refer to "Total connection diagram" for details.

12.1. Connection details

Refer to Section [I. .SVM] of B-65322EN/02 for details.

12.1.1. Details of cable K2 (Refer to B-65322/02EN)

Please select specification of cables in consideration of following table. Refer to Section [I .SVM] of B-65322EN/02 for details.

Servo motor	Continuous rating current [Arms] (Reference value)
β*i*S2/4000HV	1.2
β*i*S4/4000HV	1.7
β*i*S8/3000HV	2.7
β*i*S12/3000HV	4.0
β*i*S22/2000HV	5.6
α*i*S2/5000HV	1.7
α*i*S4/5000HV	2.3
α*i*F4/4000HV	3.2
α*i*F8/3000HV	3.6
α*i*S8/4000HV	5.2
α*i*S12/4000HV	5.6
α*i*F12/3000HV	6.7
α*i*F22/3000HV	9.0

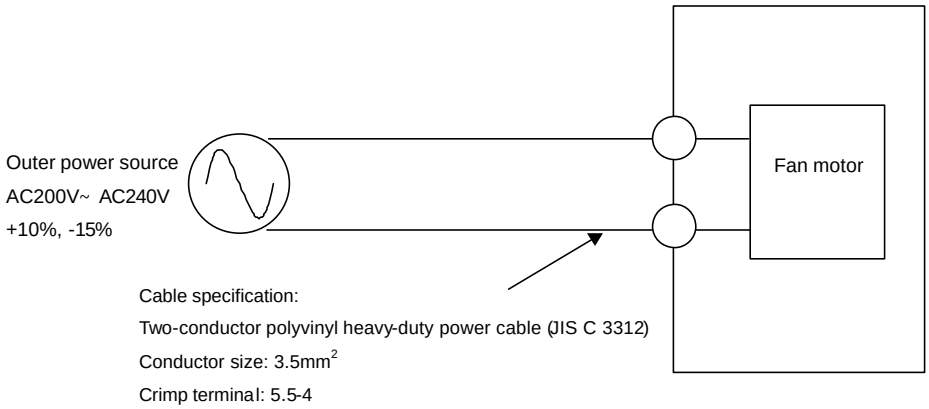
12.1.2. Details of cable K3 (Refer to B-65322/02EN)

Please select specification of cables in consideration of following table. Refer to Section [I. .SVM] of B-65322EN/02 for details.

Servo motor	Continuous rating current [Arms] (Reference value)
β*i*S2/4000HV	1.7
β*i*S4/4000HV	2.4
β*i*S8/3000HV	3.1
β*i*S2/3000HV	5.1
β*i*S22/2000HV	5.7
α*i*S2/5000HV	1.7
α*i*S4/5000HV	3.1
α*i*F4/4000HV	4.1
α*i*F8/3000HV	4.2
α*i*S8/4000HV	5.6
α*i*S12/4000HV	6.7
α*i*F12/3000HV	9.1
a *i*F22/3000HV	9.2

02

12.1.3. Details of cable K12



13. Heat disspaton

The amount of heat dissipation depends on the SV model and the current that flows through the servo motor. For the current that flows through a servo motor, reference the continuous rated current of each servo motor. (For the continuous rated current of each servo motor, refer to the servo motor descriptions.) As the current that flows through a servo motor, the root-mean-square value of the current that flows through an actual servo motor on a machine can be used. The amount of heat dissipation indicated below assumes the use of HRV2.

(1) Total amount of heat dissipation

The total amount of heat dissipation is calculated according to the following expression:

Total amount of heat dissipation= a + Ka1 × b1

a: Amount of heat dissipation determined by the SV model [W]

Ka1: Coefficient determined by the SV [W/Arms]

b1: Current flowing through the servo motor [Arms]

Total amount of heat dissipation

Name	Specification	a [W]	K [W/Arms]
β*i*SV 10HV	H001	20	Ka1: 10.8
β*i*SV 20HV	H002	20	Ka1: 11.1
β*i*SV 40HV	H003	20	Ka1: 11.1

(2) Residual amount of heat in the cabinet

By placing the heat sink section outside the cabinet, the residual amount of heat in the cabinet can be calculated according to the expression below.

Residual amount of heat in the cabinet= a + Kb1 × b1

a: Amount of heat dissipation determined by the SV model [W]

Kb1: Coefficient determined by the SV [W/Arms]

b1: Current flowing through the servo motor [Arms]

Residual amount of heat in the cabinet

Name	Specification	a [W]	K [W/Arms]
β*i*SV 10HV	H001	20	Ka1: 2.2
β*i*SV 20HV	H002	20	Ka1: 2.2
β*i*SV 40HV	H003	20	Ka1: 1.1

FANUC SERVO AMPLIFIER βi series I/O Link option Addition of 400V type

1. Type of applied technical documents

Name	FANUC SERVO AMPLIFIER βi series DESCRIPTIONS
Spec.No./Version	B-65322EN/02

2. Summary of change

Group	Name / Outline	New, Add, Correct, Delete	Applicable Date
Basic Function			
Optional Function			
Unit	FANUC SERVO AMPLIFIER βi series I/O Link option 400V type	New	2006.9
Maintenance parts			
Notice			
Correction			
Another			

				TITL FANUC SERVO AMPLIFIER βi series I/O Link option Addition of 400V type	
01	06.08.10	Arimoto	Registerd	DRAW. NO B-65322EN/02-04	CU
ED	DATE	DESIG	DESCRIPTION	FANUC LTD	SH 1/5

Specification of 400V type of FANUC SERVO AMPLIFIER β*i* series I/O Link option is noted in this document because that is newly released.
See FANUC SERVO AMPLIFIER β*i* series DESCRIPTIONS (B-65322EN/02) about items that are not noted in this document.
Following abbreviation is used in this document.

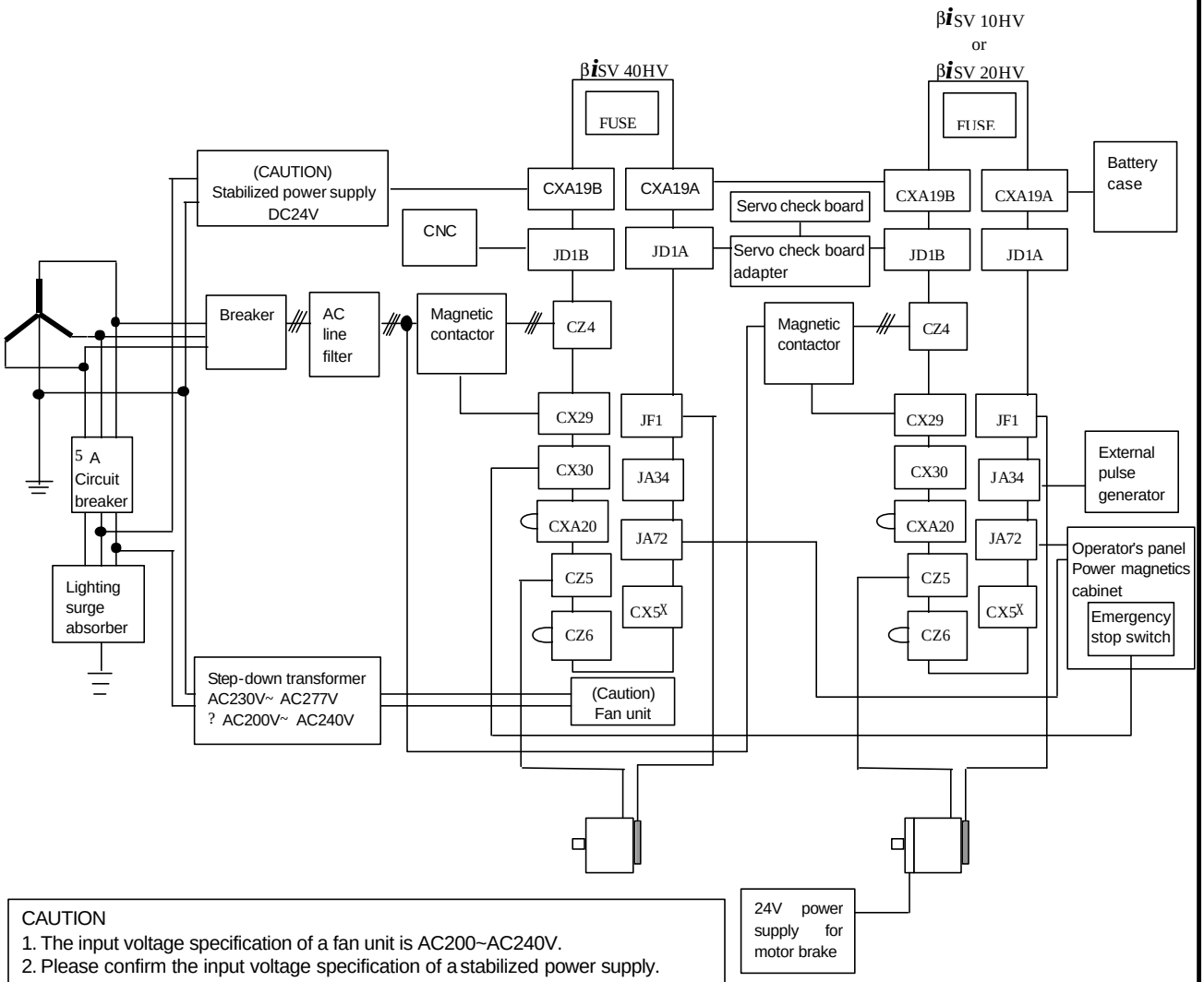
Model name	Abbreviation
FANUC SERVO AMPLIFIER β*i* series I/O Link option 400V type	β*i*SV HV

All specifications and designs are subject to change without notice.

1.CONFIGURATION

This chapter shows an example of a 2-axis system configuration using the βiSV 40HV for the first axis (the unit nearer the CNC) and the βiSV 10HV or βiSV 20HV for the second axis.

In this example, the servo check board adapter and servo check board in the configuration are provided for the first axis.



CAUTION
1. The input voltage specification of a fan unit is AC200~AC240V.
2. Please confirm the input voltage specification of a stabilized power supply.
3. Please be sure to install a breaker, a magnetic contactor and AC line filter.
4. Please be sure to use a stabilized 24VDC power supply for βiSV HV. Common use with 24V power supply for motor brakes cannot be performed.
5. The cabling of CX30 of the second and subsequent βiSV HV may be omitted. See part I. of B-65322EN/02 for details.
6. A magnetic contactor may be shared. See "Total connection diagram" for details.

2.SPECIFICATIONS

Model		bi SV 10HV	bi SV 20HV	bi SV 40HV
No. of controlled axes		1 axis		
Interface with CNC		FANUC I/O Link		
Unit drawing No.		A06B-6133-H001	A06B-6133-H002	A06B-6133-H003
Power PCB drawing No.		A16B-3200-0515	A16B-3200-0516	A16B-3200-0517
Control PCB drawing No.		A20B-8101-0200		
Main power for three-phase supply	Input voltage	AC 400-480 V (+10%, -15%) 50/60Hz		
	Input current (50Hz)	2.3 Arms	3.6 Arms	9.0 Arms
	Power supply rating	1.6 kVA	2.5 kVA	6.2 kVA
Control power supply	Input voltage	DC 24 V (+10%, -10%)		
	Input current	0.9 A		
Rated output current		3.1 Arms	5.6 Arms	9.2 Arms
Maximum output current		10 Ap	20 Ap	40 Ap
Servo HRV control		HRV2		
Control method		Sine wave PWM control with transistor bridges		
Dynamic brake circuit		Built-in		
Output frequency range		0-334 Hz		
External pulse input		Differential phase A/B, 1 ch		
Internal DI		5 points (ESP, interlock, + overtravel, - overtravel, skip)		
Setting display		Performed by master CNC via I/O Link		
LEDs for status display		8 LEDs		
Protection function		-High Current -IPM Abnormal -High/Low Voltage of DC link -Overheat of Discharge Resistor -Low Voltage of Control Power Supply -I/O Link Communication Error -Locked Fan Motor -Disconnection of External Pulse Input -Program or Setting Error -Servo Motor Overheat -Exceeding Stroke Limit		
Ambient temperature range		0 ~ 55 ?		
Weight		3.9 kg		
Remarks		Built-in regenerative resistor (64ohm, 50W no-wind condition) (64ohm, 130W wind velocity 2m/s condition) Separated AC line filter Separated battery		

3.APPLICABLE MOTORS

See B-65322EN/02-02.

4.SELECTION OF BREAKER, MAGNETIC CONTACTOR AND AC LINE FILTER

See B-65322EN/02-02. It is recommended that one magnetic contactor is connected per β*i*SV HV.

5.COOLING FAN MOTOR

See B-65322EN/02-02.

6.DERATING

See derating in case of applying HRV2 in B-65322EN/02-02.

7.CAPACITY OF REGENERATIVE DISCHARGE RESISTOR

The regenerative discharge resistor of the following capacity is built in the β*i*SV HV.

Model	Capacity of regenerative discharge resistor
β*i*SV 10HV	50W No –wind condition
β*i*SV 20HV	
β*i*SV 40HV	130W Wind velocity 2m/s condition

8.SETUP SWITCH (FOR DC ALARM LEVEL)

See B-65322EN/02-02.

9.POWER SUPPLY SPECIFICATION

9.1.THREE-PHASE INPUT POWER SUPPLY FOR MOTOR POWER

See B-65322EN/02-02.

9.2.CONTROL POWER SUPPLY

See Part III. of B-65322EN/02.

- **External 24-VDC power supply specifications**
  See Part I. of B-65322EN/02.
- **Circuit configuration**
  See Part I. of B-65322EN/02.

9.2.1.Sequence for turning on control power supply

See Part III. of B-65322EN/02.

10.INSTALLING OF LIGHTING SURGE ABSORBER

See B-65322EN/02-02. In the figure of B-65322EN/02-02, change the positions of the magnetic contactor and AC line filter in case that one magnetic contactor is connected per β*i*SV HV.

11. EXTERNAL DIMENSIONS/ PANEL CUT-OUT DRAWINGS/ MAINTENANCE AREA

11.1. EXTERNAL DIMENSIONS OF β*i*SV 10HV, β*i*SV 20HV and β*i*SV 40HV

External dimensions of these models are same.
See subsection 8.1.2 SVM1-40*i*, SVM1-80*i* in Part III. of B-65322EN/02.

11.2. EXTERNAL DIMENSIONS OF AC LINE FILTER

See B-65322EN/02-02.

11.3. EXTERNAL DIMENSION OF LIGHTING SURGE ABSORBER

See B-65322EN/02-02.

11.4. PANEL CUT-OUT DRAWINGS

See subsection 8.2.2 SVM1-40*i*, SVM1-80*i* in Part I. of B-65322EN/02.

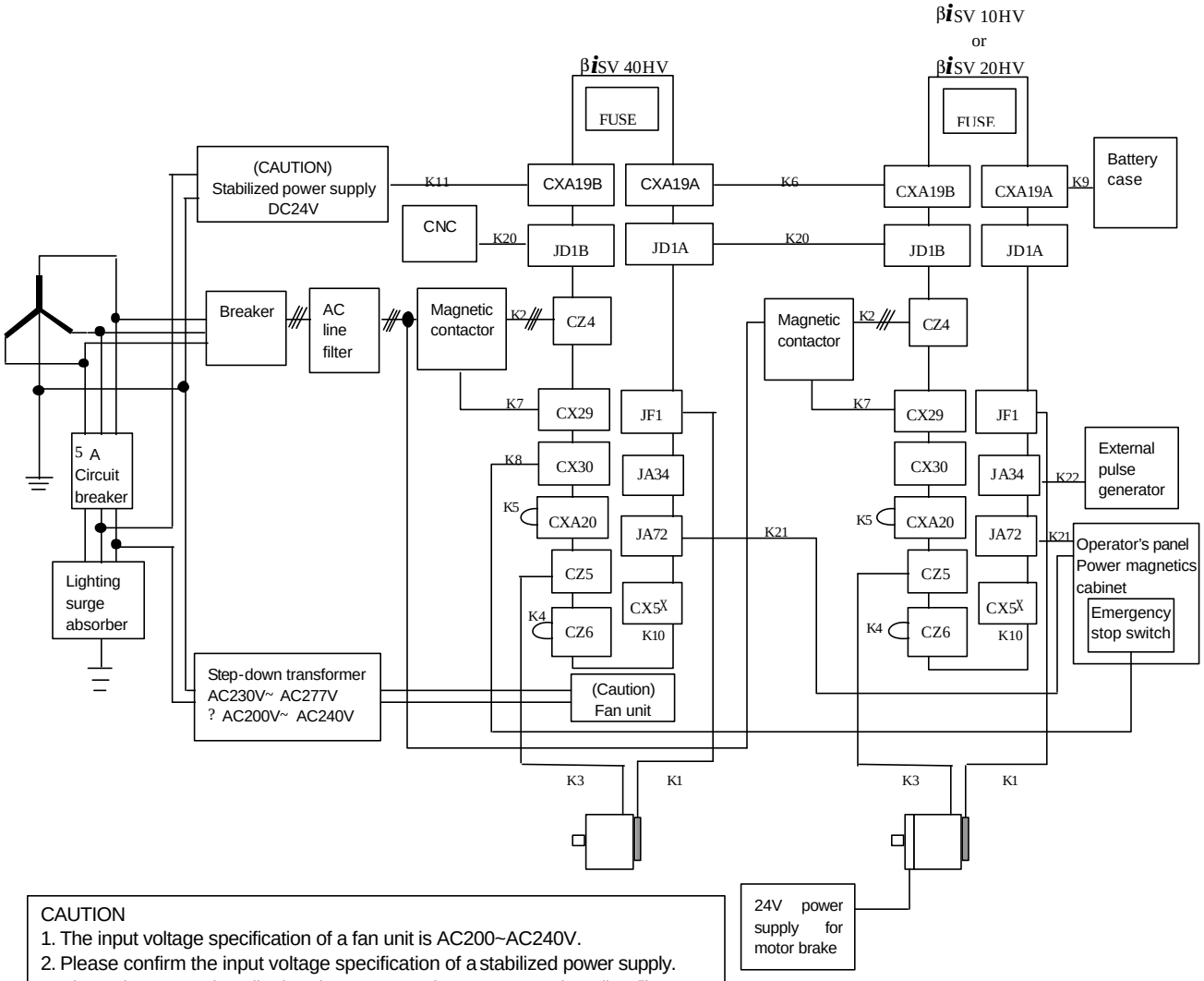
11.5. MAINTENANCE AREA

See "When no cooling fan AC motor (A06B-6134-K002) is used to cool the heat sink" in subsection 8.3.2 Maintenance Area for the SVM1-40*i* and SVM1-80*i* in part I. of B-65322EN/02 about maintenance area of β*i*SV 10HV and β*i*SV 20HV.
See "When the cooling fan AC motor (A06B-6134-K002) is used to cool the heat sink" in the same subsection as noted above about maintenance area of β*i*SV 40HV.

12.TOTAL CONNECTION DIAGRAM

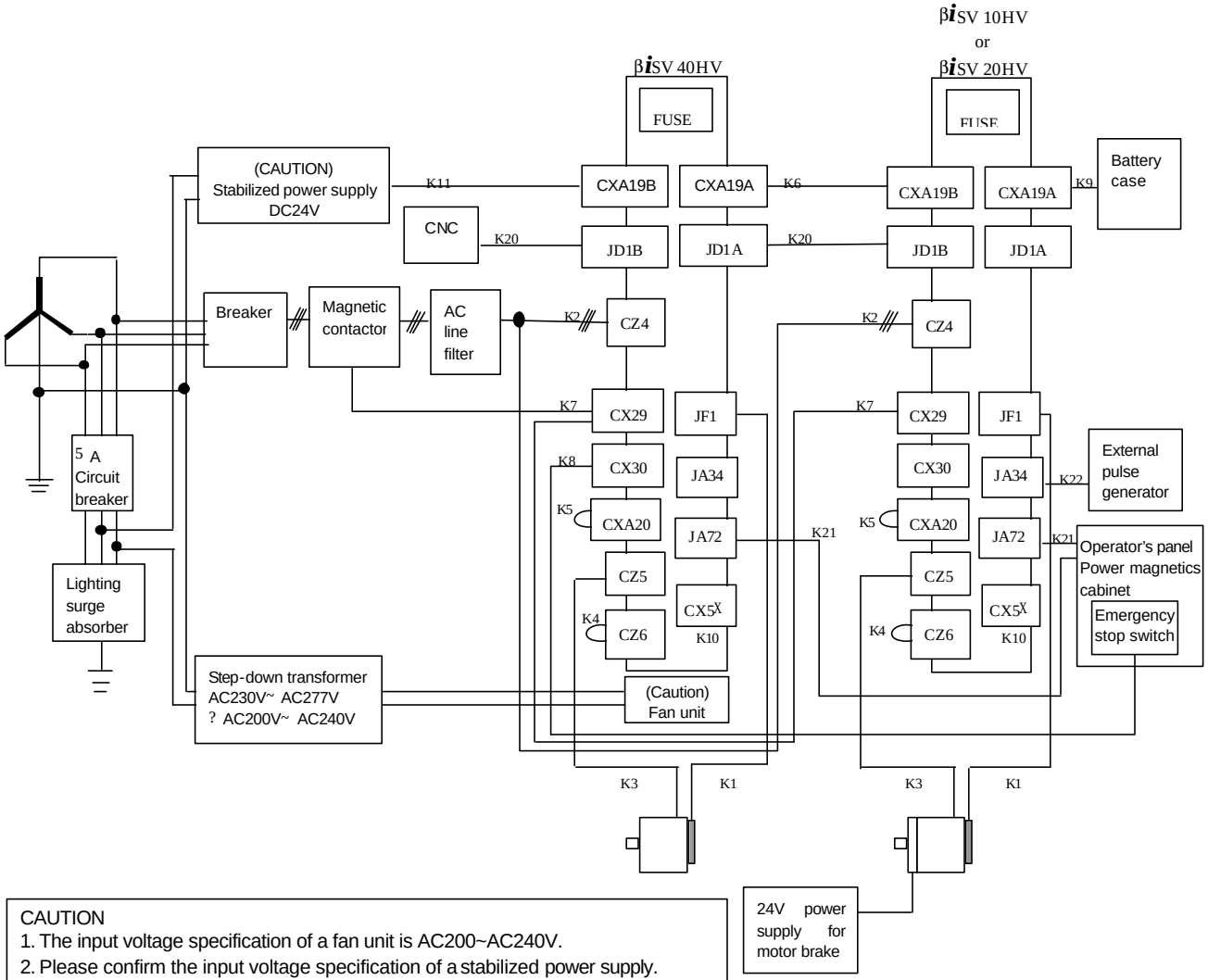
This chapter shows a connection example of a 2-axis system using the βiSV 40HV for the first axis (the unit nearer the CNC) and the βiSV 10HV or βiSV 20HV for the second axis.
There are two methods about connection of magnetic contactor. First one magnetic contactor is connected per βiSV HV. Secondly a magnetic contactor is shared by some βiSV HVs. First case is recommended. In the case of sharing a magnetic contactor, if an alarm that turns off the magnetic contactor is issued in the βiSV HV, an alarm indicating DC link voltage shortage is issued in the other βiSV HVs. When emergency stop is cancelled by different timing, an alarm indicating DC link voltage shortage may be issued in the βiSV HV.

- Example for connecting one magnetic contactor per βiSV HV (Recommended)



CAUTION
1. The input voltage specification of a fan unit is AC200~AC240V.
2. Please confirm the input voltage specification of a stabilized power supply.
3. Please be sure to install a breaker, a magnetic contactor and AC line filter.
4. Please be sure to use a stabilized 24VDC power supply for βiSV HV. Common use with 24V power supply for motor brakes cannot be performed.
5. The cabling of CX30 of the second and subsequent βiSV HV may be omitted. Refer to part I. of B-65322EN/02 for details.

- Example for sharing a magnetic contactor (Reference)



CAUTION
1. The input voltage specification of a fan unit is AC200~AC240V.
2. Please confirm the input voltage specification of a stabilized power supply.
3. Please be sure to install a breaker, a magnetic contactor and AC line filter.
4. Please be sure to use a stabilized 24VDC power supply for βiSV HV. Common use with 24V power supply for motor brakes cannot be performed.
5. The cabling of CX30 of the second and subsequent βiSV HV may be omitted. Refer to part I. of B-65322EN/02 for details.
6. If an alarm that turns off the magnetic contactor is issued in the βiSV HV, an alarm indicating DC link voltage shortage is issued in the other βiSV HVs. When emergency stop is also cancelled by different timing, an alarm indicating DC link voltage shortage may be issued in the βiSV HV.

See part III. of B-65322EN/02 about details of cable.
See B-65322EN/02-02 about continuous rating current of servo motor to select cable of K2 and K3.

13.HEAT DISSIPATION

See B-65322EN/02-02.

SERVO AMPLIFIER βiSVSP LEVEL-UP version DESCRIPTIONS

1. Type of applied documents

Name	FANUC SERVO AMPLIFIER βi series DESCRIPTIONS
Spec. No./Ver.	B-65322EN/02-06

2. Summary of Change

Group	Name / Outline	New, Add Correct, Del	Applicable Date
Basic Function	SERVO AMPLIFIER βiSVSP series LEVEL-UP version descriptions	New	2007.8
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another	Addition of model "βiSVSP 40/40/80-15"	Add	2007.10

INDEX

EDT.	DATE	DESIG.	DESCRIPTION		
03	07.09.28	INABA	Addition of model "βiSVSP 40/40/80-15" INABA	TITLE	SERVO AMPLIFIER βiSVSP series LEVEL-UP version Descriptions
02	07.08.02	MATSU	Change NO.(B-65322EN/02-05? B-65322EN/02-06 INABA		
01	07.07.31	INABA	New added INABA	NO.	B-65322EN/02-06
				FANUC LTD	PAGE 3 / 3

A. Outline of difference between level-up version and current model

βiSVSP series level-up version

- The level-up version servo amplifier is added in the βiSVSP
- Power up of spindle axis from 5.5KW to 7.5KW in level-up version (No sale of 5.5KW model)
- There is no sensor-less model
- 2nd FSSB connector is added
- Built-in of power failure detecting funtion
- Application of plastic case and terminal cover
- Addition of new model "40/40/80-15"

This model is the amplifier series for 0*i*/ 0*i* Mate like the current model.

This document describes only changed or added specifications from current model.
Therefore please refer the specifications which are not described in this document to FANUC SERVO AMPLIFIER βiseries DESCRIPTIONS B-65322EN.

EDT.	DATE	DESIG.	DESCRIPTION			
03	07.09.28	INABA	Addition of model "βiSVSP 40/40/80-15" INABA	TITLE	SERVO AMPLIFIER βiSVSP series LEVEL-UP version Descriptions	
02	07.08.02	MATSU	Change NO.(B-65322EN/02-05? B-65322EN/02-06 INABA			
01	07.07.31	INABA	New added INABA	NO.	B-65322EN/02-06	
				FANUC LTD	PAGE	4 / 4

B. βiSVSP series level-up version

1. Overview

[Level-up points]

- The level-up version servo amplifier, which is 2-axis or 3-axis servo and 1-axis spindle, is added in the βiSVSP
- There is no sensor-less model
- 2nd FSSB connector is added
- Built-in of power failure detecting funtion
- Application of plastic case and terminal cover
- Addition of new model "40/40/80-15"

This model is the amplifier series for 0i/ 0i Mate like the current model.

[Compatibility]

- No applicable to spindle sensor-less type
- Plastic case and terminal cover are applied, however external dimensions and maintenance area are same as current model.

2. Ordering number

Ordering number is changed as follows.

Level-up βiSVSP series, which is 2-axis servo and 1-axis spindle

Current: A06B-**6134**-H2**#A ? Level-up: A06B-**6134**-H2**#D

Name	Ordering number
βiSVSP 20/20-7.5	A06B-6134-H201#D
βiSVSP 20/20-11	A06B-6134-H202#D
βiSVSP 40/40-15	A06B-6134-H203#D
βiSVSP 20/20/40-7.5	A06B-6134-H301#D
βiSVSP 20/20/40-11	A06B-6134-H302#D
βiSVSP 40/40/40-15	A06B-6134-H303#D
βiSVSP 40/40/80-15	A06B-6134-H313#D

3. Specification

3.1 Specification list

Two-axis-type

Item		ßiSVSP 20/20-7.5 (TypeD)	ßiSVSP 20/20-11 (TypeD)	ßiSVSP 40/40-15 (TypeD)
Unit designation		A06B-6134-H201#D	A06B-6134-H202#D	A06B-6134-H203#D
Power PCB		A20B-2101-0440	A20B-2101-0441	A20B-2101-0022
Control PCB		A20B-2101-0450	A20B-2101-0450	A20B-2101-0450
Main power supply	Input voltage	AC200-240V (+10%,-15%) 50/60Hz		
	Rated current	36Arms	52Arms	68Arms
	Rated capacity	13KVA	18KVA	24KVA
Control power supply	Inputvoltage/current	DC24V ±10% / 1.5Amax.		
HRV Control		HRV2, HRV3		
Main control methods		Sine wave PWM control with Transistor Bridge		
Spindle rated output current		31Arms	56Arms	63Arms
Spindle base output frequency		60Hz		
Spindle output frequency range		1Hz-1KHz		
Servo	L-axis	6.5Arms	6.5Arms	13Arms
Rated output current	M-axis	6.5Arms	6.5Arms	13Arms
Servo Current limit val	L-axis	20A	20A	40A
Rated output current	M-axis	20A	20A	40A
Servo output frequency range		0Hz-334Hz		
Warning and Protective function		High Current IPM Abnormal High Voltage of DC Link Low Voltage of DC Link Low Voltage of Control Power Supply Short Time Overload FSSB Communication Error		
Ambient Temperature Range		0-+55 Degree Centigrade		
Weight		10.2kg	14.8kg	
Demension in 'mm'	Including fin block	260x380x272		
	Fin block (only)	260x380x100		
Associated products	AC Reactor	A81L-0001-0155		A81L-0001-0156

(Note)

This specification is described on the condition of intermitting motor operation and not continuous motor operation.

Three-axis-type

Item		ßiSVSP 20/20/40-7.5 (TypeD)	ßiSVSP 20/20/40-11 (TypeD)	ßiSVSP 40/40/40-15 (TypeD)	ßiSVSP 40/40/80-15 (TypeD)
Unit designation		A06B-6134-H301#D	A06B-6134-H302#D	A06B-6134-H303#D	A06B-6134-H313#D
Power PCB		A20B-2101-0026	A20B-2101-0024	A20B-2101-0025	A20B-2101-0029
Control PCB		A20B-2101-0452	A20B-2101-0452	A20B-2101-0452	A20B-2101-0452
Main power supply	Input voltage	AC200-240V (+10%,-15%) 50/60Hz			
	Rated current	38Arms	54Arms	70Arms	71Arms
	Rated capacity	13KVA	19KVA	24KVA	25KVA
Control power supply	Input voltage/current	DC24V ± 10% / 1.5Ar			
HRV Control		HRV2, HRV3			
Main control methods		Sine wave PWM control with Transistor Bridge			
Spindle rated output current		31Arms	56Arms	63Arms	63Arms
Spindle base output frequency		60Hz			
Spindle output frequency range		1Hz-1KHz			
Servo Rated output current	L-axis	6.5Arms	6.5Arms	13Arms	13Arms
	M-axis	6.5Arms	6.5Arms	13Arms	13Arms
	N-axis	13Arms	13Arms	13Arms	19Arms
Servo Current limit val Rated output current	L-axis	20Ap	20Ap	40Ap	40Ap
	M-axis	20Ap	20Ap	40Ap	40Ap
	N-axis	40Ap	40Ap	40Ap	80Ap
Servo output frequency range		0Hz-334Hz			
Warning and Protective function		High Current IPM Abnormal High Voltage of DC Link Low Voltage of DC Link Low Voltage of Control Power Supply Short Time Overload FSSB Communication Error			
Ambient Temperature Range		0-+55 Degree Centigrade			
Weight		14.8kg			
Demension in 'mm'	Including fin block	260x380x272			
	Fin block (only)	260x380x100			
Associated products	AC Reactor	A81L-0001-0155		A81L-0001-0156	

(Note)

This specification is described on the condition of intermitting motor operation and not continuous motor operation.

EDT.	DATE	DESIG.	DESCRIPTION		
03	07.09.28	INABA	Addition of model "βiSVSP 40/40/80-15" INABA	TITLE	SERVO AMPLIFIER βiSVSP series LEVEL-UP version Descriptions
02	07.08.02	MATSU	Change NO.(B-65322EN/02-05? B-65322EN/02-06 INABA		
01	07.07.31	INABA	New added INABA	NO.	B-65322EN/02-06
				FANUC LTD	PAGE 9 / 9

3.2 Weight

Model	Weight
βiSVSP 20/20-7.5	10.2Kg
βiSVSP 20/20-11 βiSVSP 40/40-15	14.8Kg
βiSVSP 20/20/40-7.5	
βiSVSP 20/20/40-11	
βiSVSP 40/40/40-15 βiSVSP 40/40/80-15	

3.3 Fan unit

Please install the following fan unit for cooling.

If no, please cool by wind velocity “2m/s or more”.

Model	Option-FAN	Wind velocity
βiSVSP 20/20-7.5 (A06B-6134-H201)	Not necessary	2 m/s
βiSVSP 20/20-11 A06B-6134-H202)	A06B-6134-K001 1 piece	
βiSVSP 40/40-15 (A06B-6134-H203) βiSVSP 20/20/40-7.5 (A06B-6134-H301#D)	A06B-6134-K001 2 pieces A06B-6134-K001 1 piece	
βiSVSP 20/20/40-11 (A06B-6134-H302#D)	A06B-6134-K001 1 piece	
βiSVSP 40/40/40-15 (A06B-6134-H303#D)	A06B-6134-K001 2 piece	
βiSVSP 40/40/80-15 (A06B-6134-H313#D)		

3.4 Applied motor

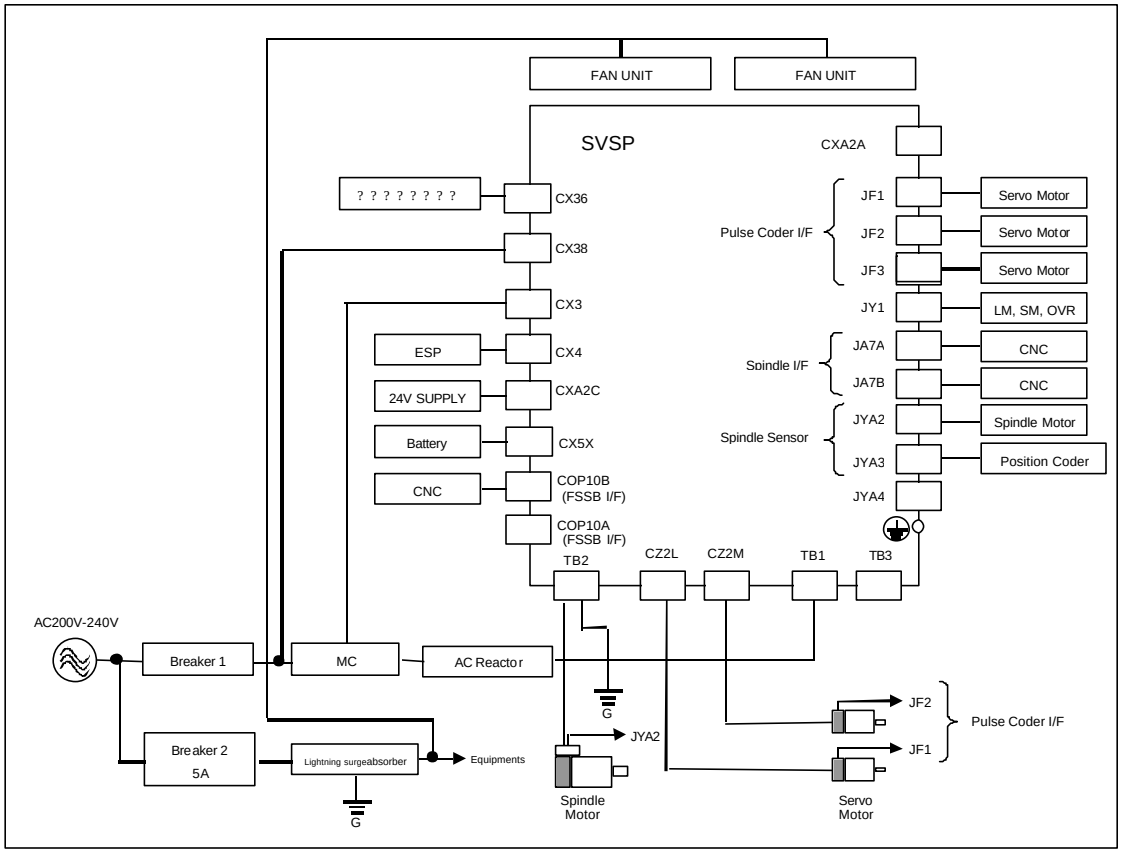
		Spindle Motor								Servo Motor							
		βiI 3 /10000	βiI 6 /10000	βiI 8 /10000	βiI 12 /8000	βiIP 8 /6000	βiIP 12 /6000	βiIP 15 /6000	βiIP 18 /6000	βiS 2 /4000	βiS 4 /4000	βiS 8 /3000	βiS 12 /2000	βiS 22 /1500	βiS 12 /3000	βiS 22 /2000	βiS 22 /3000
ß iSVSP 20/20-7.5 A06B-6134-H201#D	Spindle	O				O	O										
	Servo L axis									O	O	O	O	O			
	Servo M axis									O	O	O	O	O			
ß ¡SVSP 20/20-11 A06B-6134-H202#D	Spindle	O	O	O		**	**	O	O								
	Servo L axis									O	O	O	O	O			
	Servo M axis									O	O	O	O	O			
ß ¡SVSP 40/40-15 A06B-6134-H203#D	Spindle	O	O	O	O	**	**	O	O								
	Servo L axis									**	**	**	**	**	O	O	
	Servo M axis									**	**	**	**	**	O	O	
ß ¡SVSP 20/20/40-7.5 A06B-6134-H301#D	Spindle	O				O	O										
	Servo L axis									O	O	O	O	O			
	Servo M axis									O	O	O	O	O			
	Servo N axis									**	**	**	**	**	O	O	
ß ¡SVSP 20/20/40-11 A06B-6134-H302#D	Spindle	O	O	O		**	**	O	O								
	Servo L axis									O	O	O	O	O			
	Servo M axis									O	O	O	O	O			
	Servo N axis									**	**	**	**	**	O	O	
ß ¡SVSP 40/40/40-15 A06B-6134-H303#D	Spindle	O	O	O	O	**	**	O	O								
	Servo L axis									**	**	**	**	**	O	O	
	Servo M axis									**	**	**	**	**	O	O	
	Servo N axis									**	**	**	**	**	O	O	
ß ¡SVSP 40/40/80-15 A06B-6134-H313#D	Spindle	O	O	O	O	**	**	O	O								
	Servo L axis									**	**	**	**	**	O	O	
	Servo M axis									**	**	**	**	**	O	O	
	Servo N axis																O

⚠CAUTION

** Combining with this motor requires changing the motor control parameter. An incorrect parameter setting may damage the motor.

** Special motor number exists. So, please select it in combining with this motor.

3.5 Breaker, Magnetic contactor, AC Reactor



03	07.09.28	INABA	Addition of model "βiSVSP 40/40/80-15" INABA	TITLE	SERVO AMPLIFIER βiSVSP series LEVEL-UP version Descriptions
02	07.08.02	MATSU	Change NO.(B-65322EN/02-05? B-65322EN/02-06 INABA		
01	07.07.31	INABA	New added INABA	NO.	B-65322EN/02-06
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Please select breaker, magnetic contactor, and AC reactor by the model of βiSVSP. The ordering number and specification are as follows.

Order number of breaker 1

Model	Ordering number	Breaker specification	Breaker cover specification
For βiSVSP 20/20-7.5	A06B-6077-K103	Fuji Electric Co.,Ltd. EA103B/60	Fuji Electric Co.,Ltd. BZ-TB20B-3
For βiSVSP 20/20-11	A06B-6077-K103	Fuji Electric Co.,Ltd. EA103B/60	Fuji Electric Co.,Ltd. BZ-TB20B-3
For βiSVSP 40/40-15	A06B-6077-K104	Fuji Electric Co.,Ltd. EA103B/75	Fuji Electric Co.,Ltd. BZ-TB20B-3
For βiSVSP 20/20/40-7.5	A06B-6077-K103	Fuji Electric Co.,Ltd. EA103B/60	Fuji Electric Co.,Ltd. BZ-TB20B-3
For βiSVSP 20/20/40-11	A06B-6077-K103	Fuji Electric Co.,Ltd. EA103B/60	Fuji Electric Co.,Ltd. BZ-TB20B-3
For βiSVSP 40/40/40-15	A06B-6077-K104	Fuji Electric Co.,Ltd. EA103B/75	Fuji Electric Co.,Ltd. BZ-TB20B-3
For βiSVSP 40/40/80-15	A06B-6077-K104	Fuji Electric Co.,Ltd. EA103B/75	Fuji Electric Co.,Ltd. BZ-TB20B-3

Order number of breaker 2

Model	Ordering number	Breaker specification	Breaker cover specification
For cotrol power supply (Common to all models)	A06B-6077-K106	Fuji Electric Co.,Ltd. EA33/5	Fuji Electric Co.,Ltd. BZ-TB10B-503

Ordering number of magnetic contactor

Model	Ordering number	Magnetic contactor specification	Magnetic contactor cover specification
For βiSVSP 20/20-7.5	A06B-6077-K123	Fuji Electric Co.,Ltd. SC-2N	Fuji Electric Co.,Ltd. SZ-1N/T
For βiSVSP 20/20-11	A06B-6077-K123	Fuji Electric Co.,Ltd. SC-2N	Fuji Electric Co.,Ltd. SZ-1N/T
For βiSVSP 40/40-15	A06B-6077-K124	Fuji Electric Co.,Ltd. SC-2SN	Fuji Electric Co.,Ltd. SZ-2SN/T
For βiSVSP 20/20/40-7.5	A06B-6077-K123	Fuji Electric Co.,Ltd. SC-2N	Fuji Electric Co.,Ltd. SZ-1N/T
For βiSVSP 20/20/40-11	A06B-6077-K123	Fuji Electric Co.,Ltd. SC-2N	Fuji Electric Co.,Ltd. SZ-1N/T
For βiSVSP 40/40/40-15	A06B-6077-K124	Fuji Electric Co.,Ltd. SC-2SN	Fuji Electric Co.,Ltd. SZ-2SN/T
For βiSVSP 40/40/80-15	A06B-6077-K124	Fuji Electric Co.,Ltd. SC-2SN	Fuji Electric Co.,Ltd. SZ-2SN/T

Cautions

The coil voltage of magnetic contactor is AC200V specification.

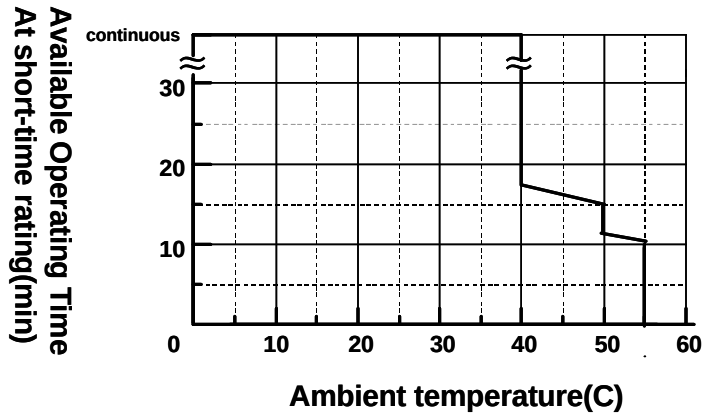
AC Reactor

Classification	The suiting model	Ordering number
Basic	For βiSVSP 20/20-7.5	A81L-0001-0155
	For βiSVSP 20/20-11	
	For βiSVSP 40/40-15	A81L-0001-0156
	For βiSVSP 20/20/40-7.5	A81L-0001-0155
	For βiSVSP 20/20/40-11	
	For βiSVSP 40/40/40-15	A81L-0001-0156
	For βiSVSP 40/40/80-15	

3.6 Derating

It is necessary to limit the output power by the ambient temperature.

Target model: Common to all βiSVSP



EDT.	DATE	DESIG.	DESCRIPTION		
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01	07.07.31	INABA	New added INABA	NO.	B-65322EN/02-06
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4. Power failure detect function

The power failure detect function aiming at the gravity axis fall prevention at the time of a power failure was occurred.

Please refer to the section “6” for connection details.

In case of using this function, please add an uninterruptible power supply (UPS) etc. to be able to maintain the control source (DC 24V) of CNC and amplifier after a power failure occurs until mechanical brake operates.

[Specification]

Connector “CX36” output power failure detect signal in case of power failure.

Detect the drop of three-phase AC input voltage of connector “CX38”.

CX38 input voltage range: 0 V-AC240V+10% 3F 50Hz/60Hz±2Hz

Detect delay time is set so that it may not react sensitively to instantaneous power failure.

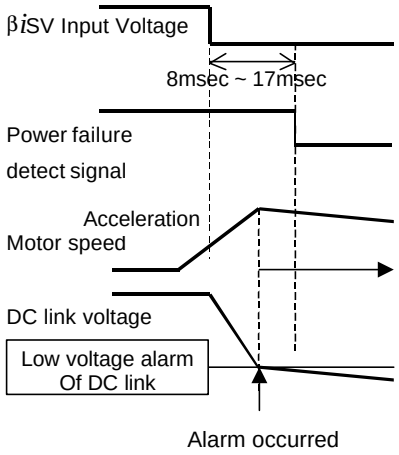
Detection delay time: 8msec~17msec

(Note)

The condition of power failure is simultaneous three-phase AC voltage drop.

Therefore, it may be unable to detect a power failure correctly on following conditions.

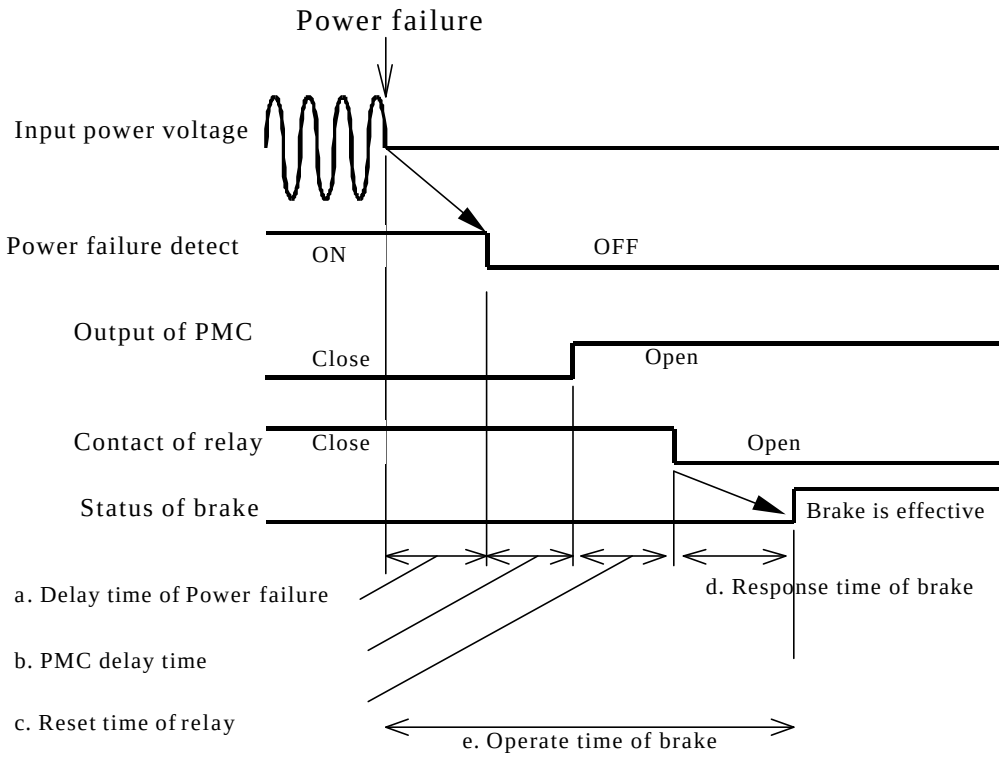
1. Power failure (phase interruption) as only one phase drop.
2. Power failure occurred at the time of motor acceleration. (Please see below.)



Power failure detect signal is outputted from βiSV 8msec~17msec later after at the time of power failure. At the time of motor acceleration, DC link voltage falls rapidly. So, even if power failure is detected, DC link low voltage alarm may be occurred.

The time from power failure till the brake becomes effective.

"Operate time of brake" after power failure is the total of "Power failure detection delay time", "Reset time of relay" and "Response time of brake".



a. Power failure detection delay time: The time from detecting the power failure till power failure detection signal is output from βiSVSP (8msec ~ 17msec)
b. PMC delay time: The time from DI operating till DO operating of PMC (15msec)
c. Reset time of relay: The time from cutting off the rated voltage supplied to the coil of the relay till the contact of the relay is turned off ("a contact" is opened)
d. Response time of brake: The time from cutting off the rated voltage supplied to the coil of the brake till the brake becomes effective
e. Operate time of brake: The time from occurring the power failure till the brake becomes effective

Reset time of relay

Select the relay whose reset time is as short as possible.

Example: G2R type made by OMRON

- Diode installed type
- Rated voltage of coil: DC24V
- Reset time: 20msec max.

Response time of brake

The specification of the built-in brake is shown in the following table.

Motor model	βiS 2, βiS 4	βiS 8, βiS 12 , βiS 22
Maximum response time of brake	10msec	30msec

Operate time of brake

The example of the calculation of the time from power failure till the brake becomes effective is shown as follows.

Condition

(1) Power failure detection delay time --- 10msec
(2) PMC delay time---15msec
(3) Relay: G2R type made by OMRON --- Reset time of relay is 20msec
(4) Brake: Built-in brake for ? *i*S8 motor --- Response time of brake is 30msec

Result

10msec + 15msec + 20msec + 30msec = 75msec

Operate time of brake

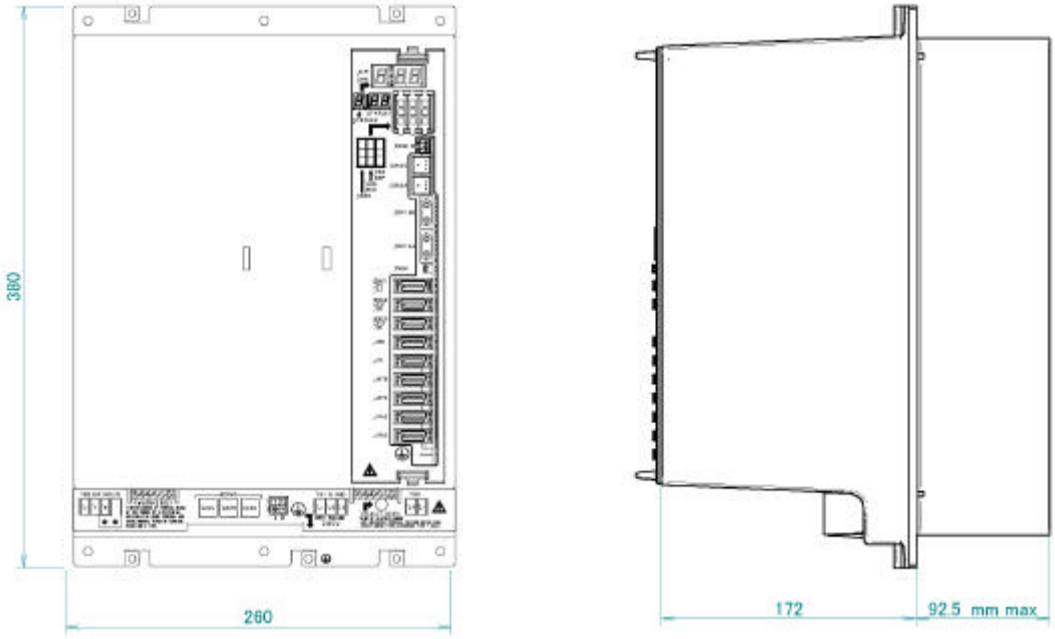
The example of the calculation of the time from power failure till the brake becomes effective is shown as follows.

Confirm at the real machine

Please check power failure function operates normally by real machine.

5. External dimension and maintenance area

5.1 External dimension



5.2 panel cut

Panel cuts when FANUC fan unit (A06B-6134-K001) is used and when not used are shown below. A fan unit can be placed either on top of or below the servo amplifier.

NOTE

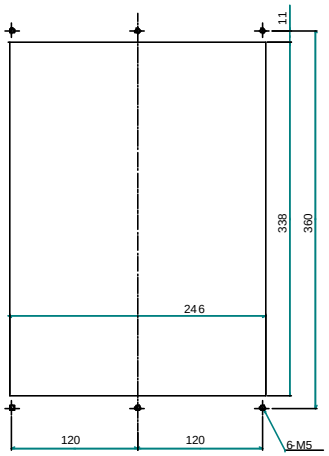
1 Attach the accompanying gasket around the panel cut-out to prevent oil and dust from getting into it.

2 Reinforce the right and left sides of the panel cut-out in the power magnetics cabinet by using fittings such as angles to maintain satisfactory contact between the power magnetics cabinet and the amplifier.

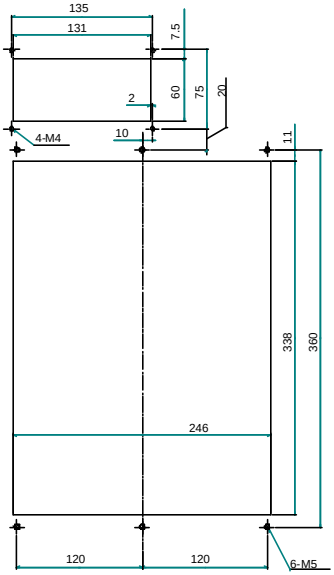
3 Placing a FANUC fan unit on top of the servo amplifier requires installing a duct.
Refer to the "Example Duct Structure for Using a FANUC Fan Unit (A06B-6134-K001)" for descriptions about the structure of the duct.

4 Placing a FANUC fan unit below the servo amplifier does not require installing a duct.
If no FANUC fan unit is used, the user is requested to install a fan motor that can generate an air flow of at least 2 m/s at the heat sink.

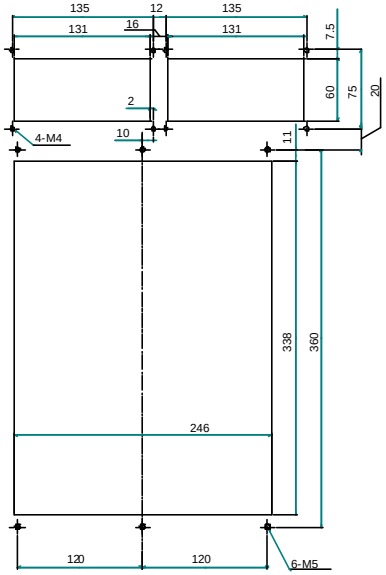
(1) When no FANUC fan unit is used



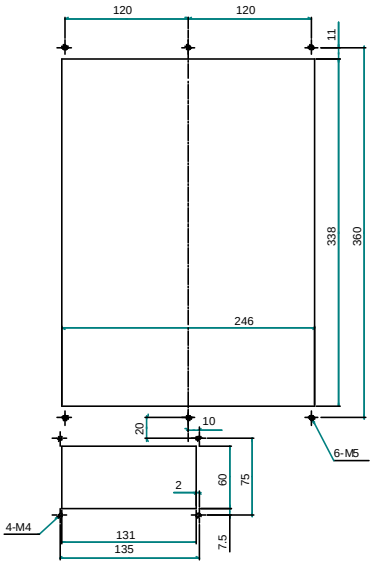
(2) When one FANUC fan unit is used (placed on top of the servo amplifier)



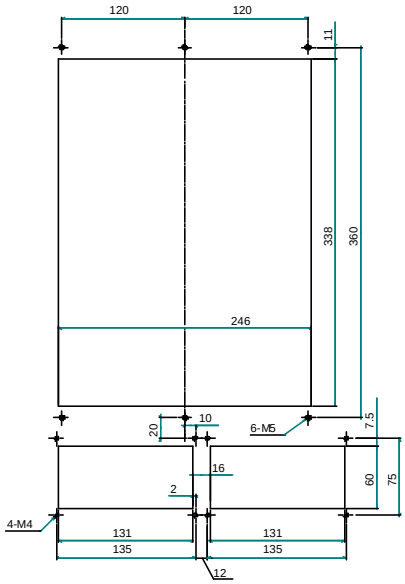
(3) When two FANUC fan units are used (placed on top of the servo amplifier)



(4) When one FANUC fan unit is used (placed below the servo amplifier)



(5) When two FANUC fan units are used (placed below the servo amplifier)



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02	07.08.02	MATSU	Change NO.(B-65322EN/02-05? B-65322EN/02-06 INABA		
01	07.07.31	INABA	New added INABA	NO.	B-65322EN/02-06
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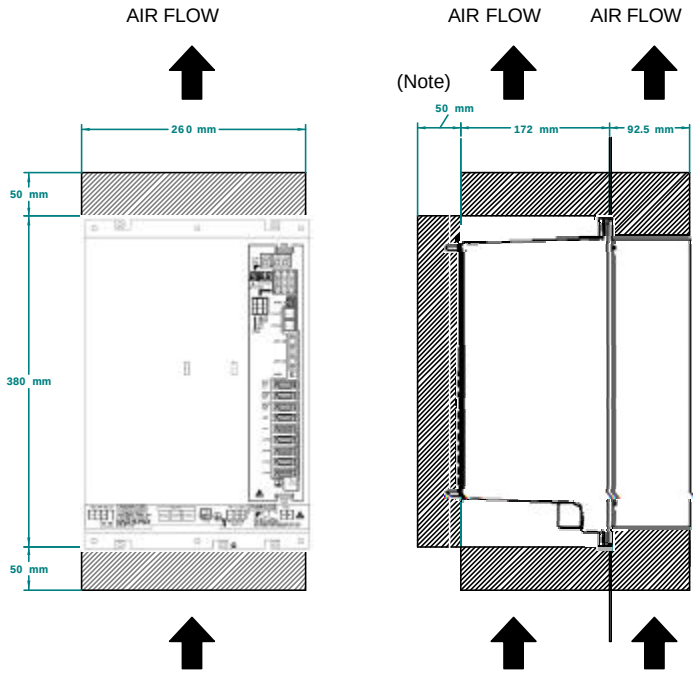
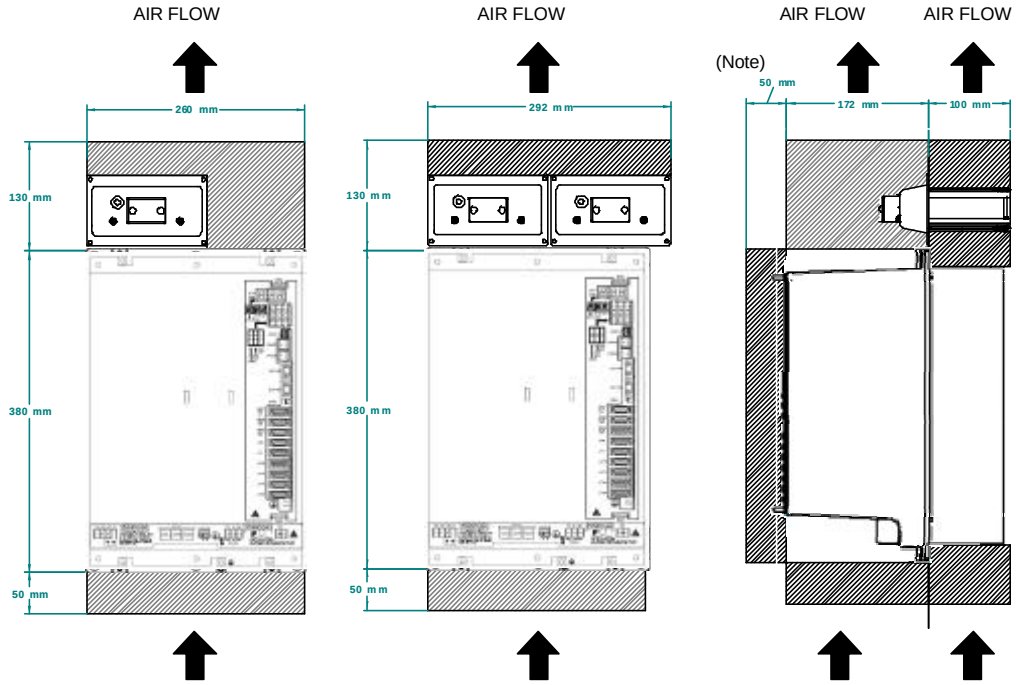
5.3 MAINTENANCE AREA

(1) When no fan unit is used



(NOTE) When a right-angle type cable connector is used (+30 mm when a straight type cable connector is used)

(2) When a fan unit used (placed on top of the servo amplifier)



(NOTE) When a right-angle type cable connector is used (+30 mm when a straight type cable connector is used)

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01	07.07.31	INABA	New added INABA	NO.	B-65322EN/02-06
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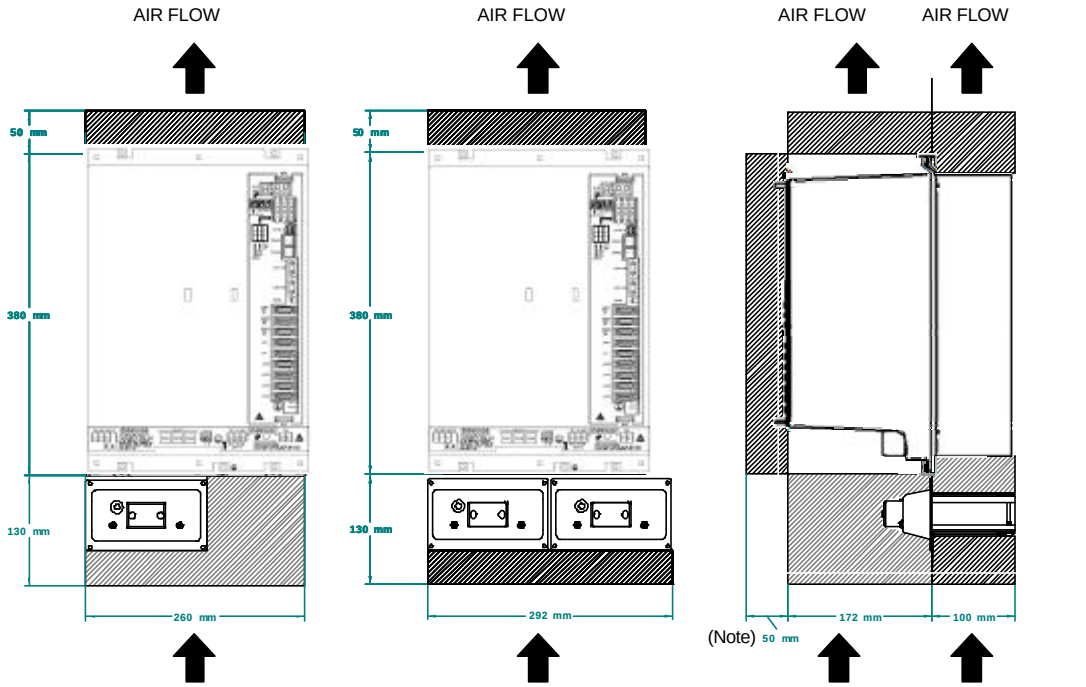
(3) When a fan unit used (placed below the servo amplifier)



(NOTE) When a right-angle type cable connector is used (+30 mm when a straight type cable connector is used)

EDT.	DATE	DESIG.	DESCRIPTION		
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01	07.07.31	INABA	New added INABA	NO.	B-65322EN/02-06
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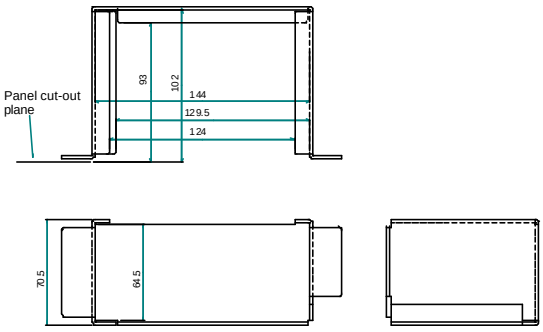
5.4 DUCT

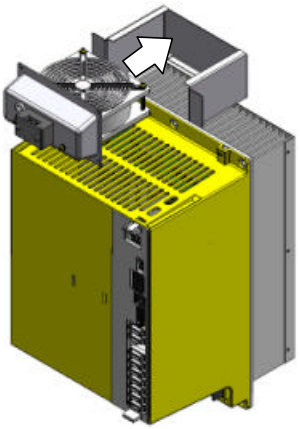
Shown below is an example duct structure where a FANUC fan unit (A06B-6134-K001) is used.

NOTE

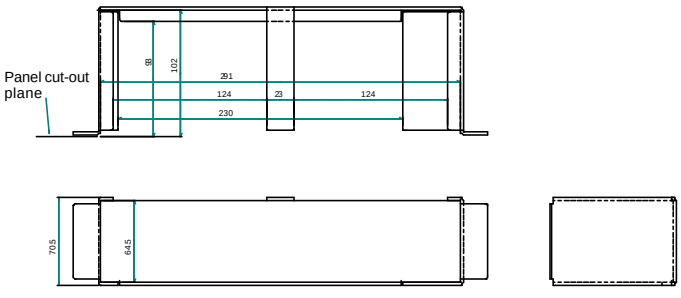
1 Install a duct having the shape shown below between the fan unit and heat sink to provide a ventilation flue.
2 Weld the duct to the cabinet.
3 If the fan unit is placed below the servo amplifier, no duct is needed.

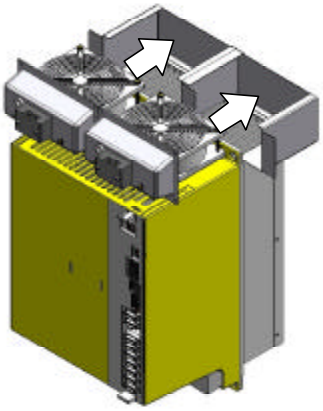
(1) When one fan unit is used





(2) When two fan units are used





EDT.	DATE	DESIG.	DESCRIPTION			
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01	07.07.31	INABA	New added INABA	NO.	B-65322EN/02-06	
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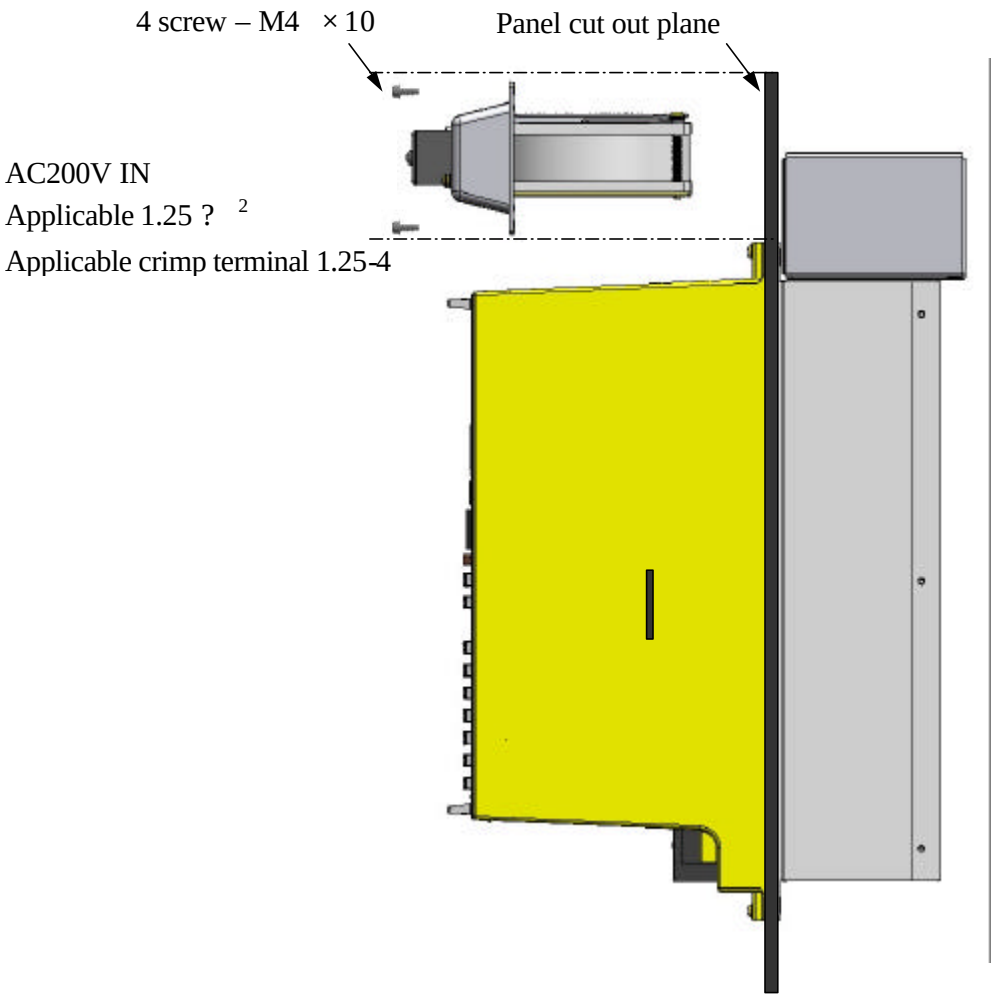

EDT.	DATE	DESIG.	DESCRIPTION			
03	07.09.28	INABA	Addition of model "βiSVSP 40/40/80-15" INABA	TITLE	SERVO AMPLIFIER βiSVSP series LEVEL-UP version Descriptions	
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01	07.07.31	INABA	New added INABA	NO.	B-65322EN/02-06	
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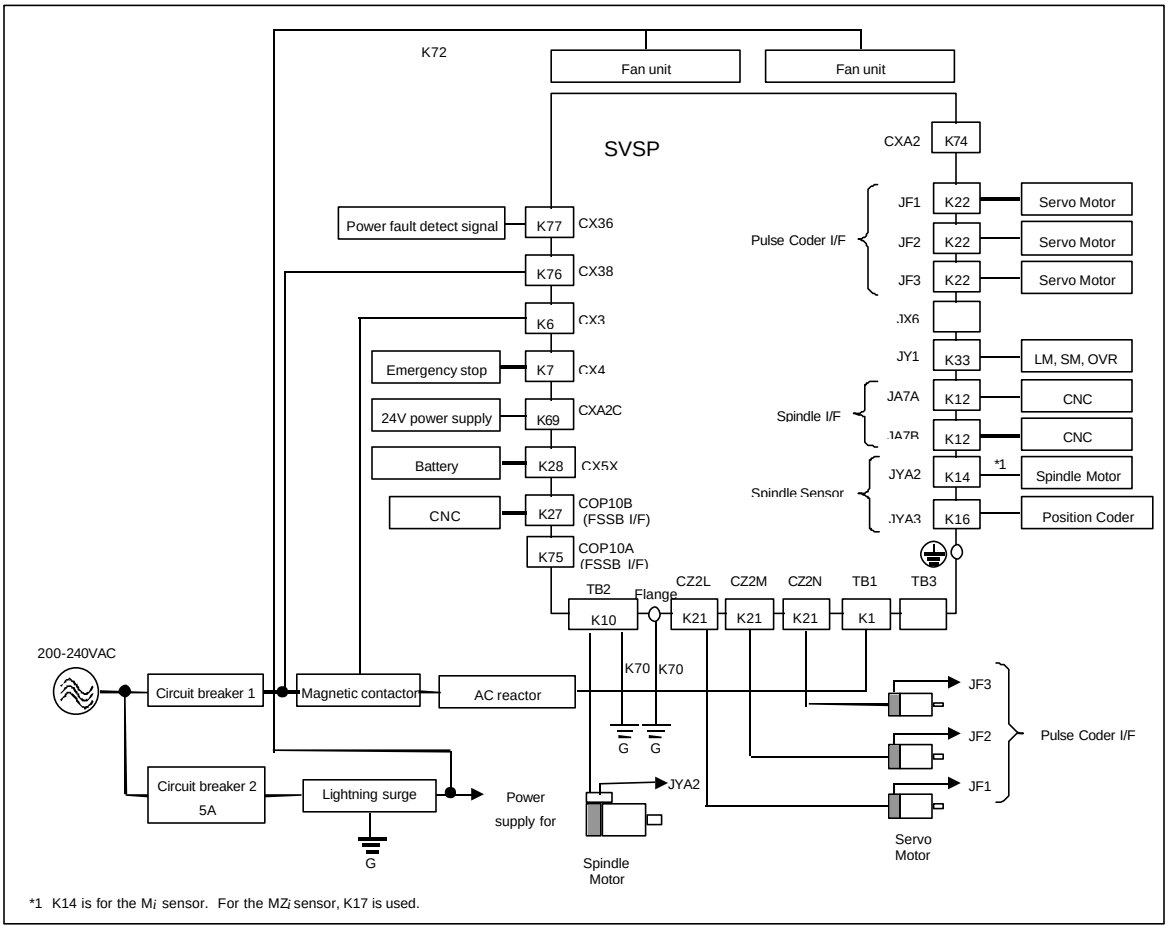
6. Total connection diagram



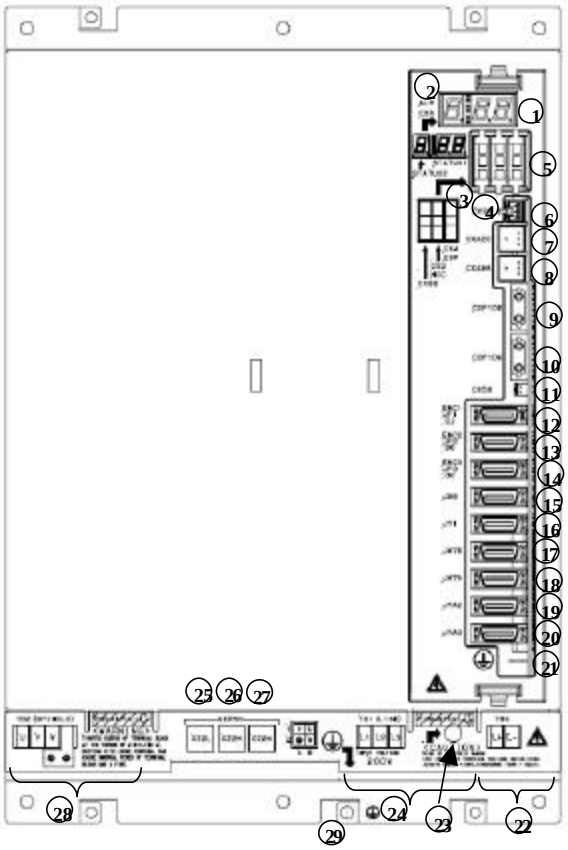
NOTE

1 Always install the circuit breakers, magnetic contactor, and AC reactor.

2 To protect the equipment from lightning surge voltages, install a lightning surge absorber across each pair of power lines and across each power line and the grounding line at the power inlet of the power magnetics cabinet.

3 Be sure to connect the grounding terminal (G) on TB2 to a substantial ground.

6.1 Connector location diagram



No.	Name	Remarks
1	STATUS1	Status LED : spindle
2	STATUS2	Status LED : servo
3	CX38	AC input voltage (For Power failure detect)
4	CX3	Main power MCC control signal
5	CX4	Emergency stop signal (ESP)
6	CX36	Outout signal (For Power failure detect)
7	CXA2C	24VDC power input
8	CXA2A	24VDC power output
9	COP10B	Servo FSSB I/F
10	COP10A	Servo FSSB I/F
11	CX5X	Absolute Pulsecoder battery
12	JF1	Pulsecoder : L axis
13	JF2	Pulsecoder : M axis
14	JF3	Pulsecoder : N axis
15	JX6	Power outage backup module
16	JY1	Load meter, speedometer, analog override
17	JA7B	Spindle interface input
18	JA7A	Spindle interface output
19	JYA2	Spindle sensor M*i*, MZ*i*
20	JYA3	α position coder External one-rotation signal
21	⏚	Earth terminal (Fro signal)
22	TB3	DC link terminal block
23		DC link charge LED (Warning)
24	TB1	Main power supply cnnection terminal board
25	CZ2L	Servo motor power line : L axis
26	CZ2M	Servo motor power line : M axis
27	CZ2N	Servo motor power line : N axis
28	TB2	Spindle motor power line
29	⏚	Tapped hole for grounding the flange

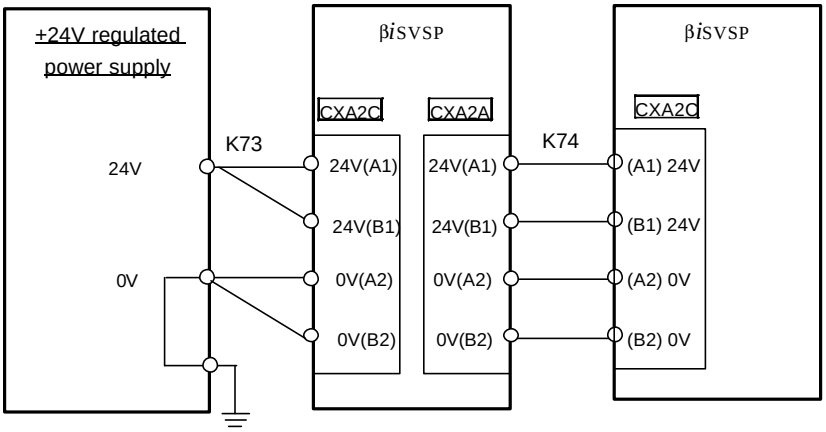
⚠ WARNING

Do not touch any component in the module or any connected cable when item24 ”DC LINK charge LED” is on, because it is dangerous.

6.2 Details of connection

6.2.1 Details of K73, K74

Refer to K69 in case of 1unit of βiSVSP.
In case of 2 units of βiSVSP, please connect as follows.



K73	Connector	Manufactured by Tyco Electronics AMP D-2100 series Hausing(X key): 1-1318119-4 (1 pcs.) Contact(Msize): 1318107-1 (4 pcs.)
	Cable	Wire size: 0.5mm^2, AWG20 Instruction outer diameter : 1.11-1.87 mm
	Applied tool	91558-1
K74	Connector	Manufactured by Tyco Electronics AMP D-2100 series Hausing(X key): 1-1318119-4 (2 pcs.) Contact(Msize): 1318107-1 (8 pcs.)
	Cable	Wire size: 0.5mm^2, AWG20 Instruction outer diameter: 1.11-1.87 mm
	Applied tool	91595-1

NOTE
The maximum current of contact for “K73, K74” is 4.0A.

[The ordering number of connector and applied tool]

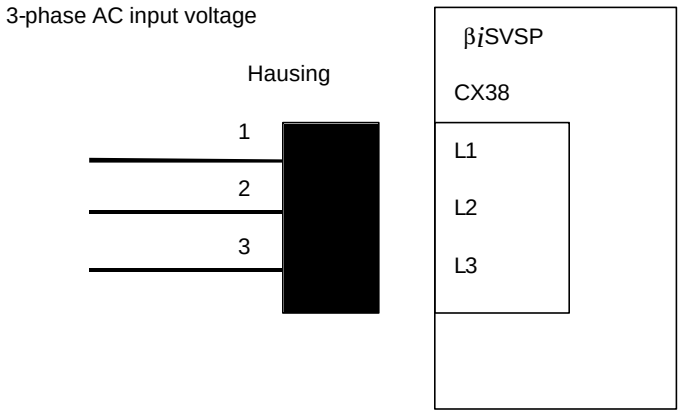
It is possible to order connector (hausing and contact) and applied tool from FANUC and Tyco Electronics AMP. In case of FANUC, the ordering numbers are as follows.

Orderinf number	Contact
A06B-6134-K202 (For K6, K7, K73) (NOTE)	Manufactured by Tyco Electronics AMP D-3200 series Hausing(Y key): 2-178128-3 (1 pcs.) Contact(L size): 1-175218-2 (2pcs.) Applied tool: 91558-1 (not included) Manufactured by Tyco Electronics AMP D-3200 series Hasusing(X key): 1-178128-3 (1 pcs.) Contact(L size): 1-175218-2 (2pcs.) Applied tool : 91558-1 (not included) Manufactured by Tyco Electronics AMP D-2100 series Hausing (X key): 1-1318119-4 (1 pcs.) Contact(M size): 1318107-1 (4 pcs.) Applied tool: 91595-1(not included)
A06B-6134-K203 (2 pieces necessary for K74)	Manufactured by Tyco Electronics AMP D-2100 series Hausing (X key): 1-1318119-4 (1 pcs.) Contact(M size): 1318107-1 (8 pcs.) Applied tool: 91595-1(not included)

(NOTE) In case of 2 units βiSVSP

In case of 1 unit βiSVSP, Please select ordering number" A06B-6134-K201"

6.2.2 Details of K76



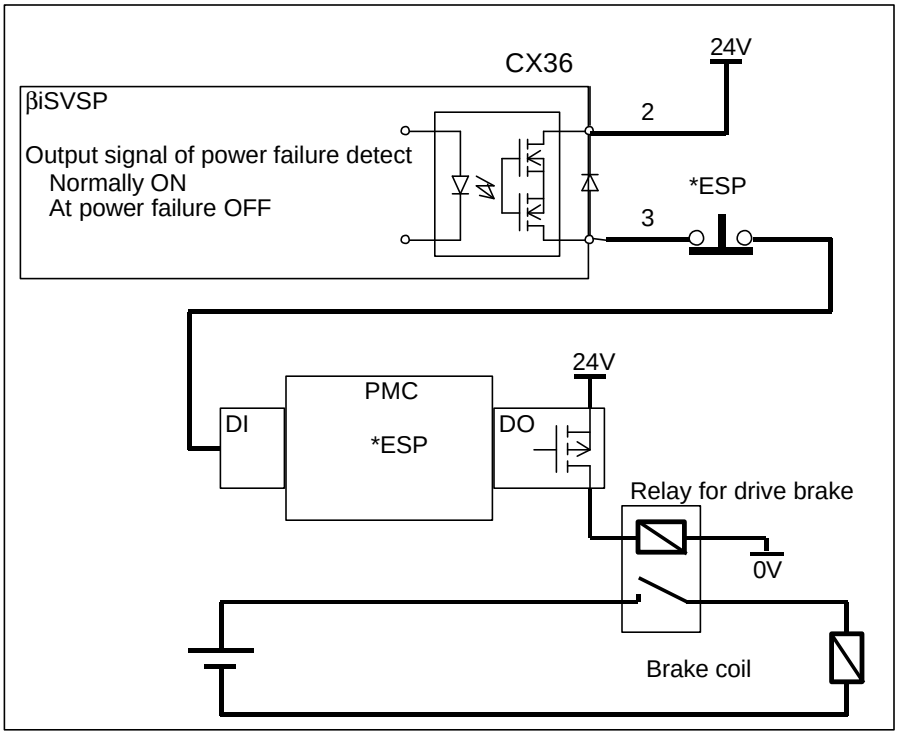
Connector	Manufactured by Tyco Electronics AMP D-3200 series Hausing(Z key): 3-178128-3 (1 pcs.) Contact (L size): 1-175218-2 (3 pcs.)
Cable	Wire size: 1.25mm^2,(50/0.18) PVC9.6f
Applied tool	91558-1

[The ordering number of connector and applied tool]

It is possible to order connector (hausing and contact) and applied tool from FANUC and Tyco Electronics AMP. In case of FANUC, the ordering numbers are as follows.

Ordering number	Contact
A06B-6134-K204 (For K76, K77)	Manufactured by Tyco Electronics AMP D-3200 series Hassing (Z key): 3-178128-3 (1 pcs.) Contact (L size) 1-175218-2 (3pcs.) Applied tool: 91558-1(not included) Manufactured by Tyco Electronics AMP D-2100 series Hasusing (Y key): 2-1318120-3 (1pcs.) Contact(M size): 1318107-1 (2pcs.) Applied tool: 91595-1 (Not included)

6.2.3 Details of K77



The specification of CX36 (Rated output)

Maximum rated voltage 30V / Maximum rated current 200mA

Connector	Manufactured by Tyco Electronics AMP D-2100 series Hasusing (Y key): 2-1318120-3 (1 pcs.) Contact (M size): 1318107-1 (2 pcs.)
Cable	Wire size: 0.5mm^2, AWG20 Instruction outer diameter: 1.11-1.87 mm
Applied tool	: 91595-1

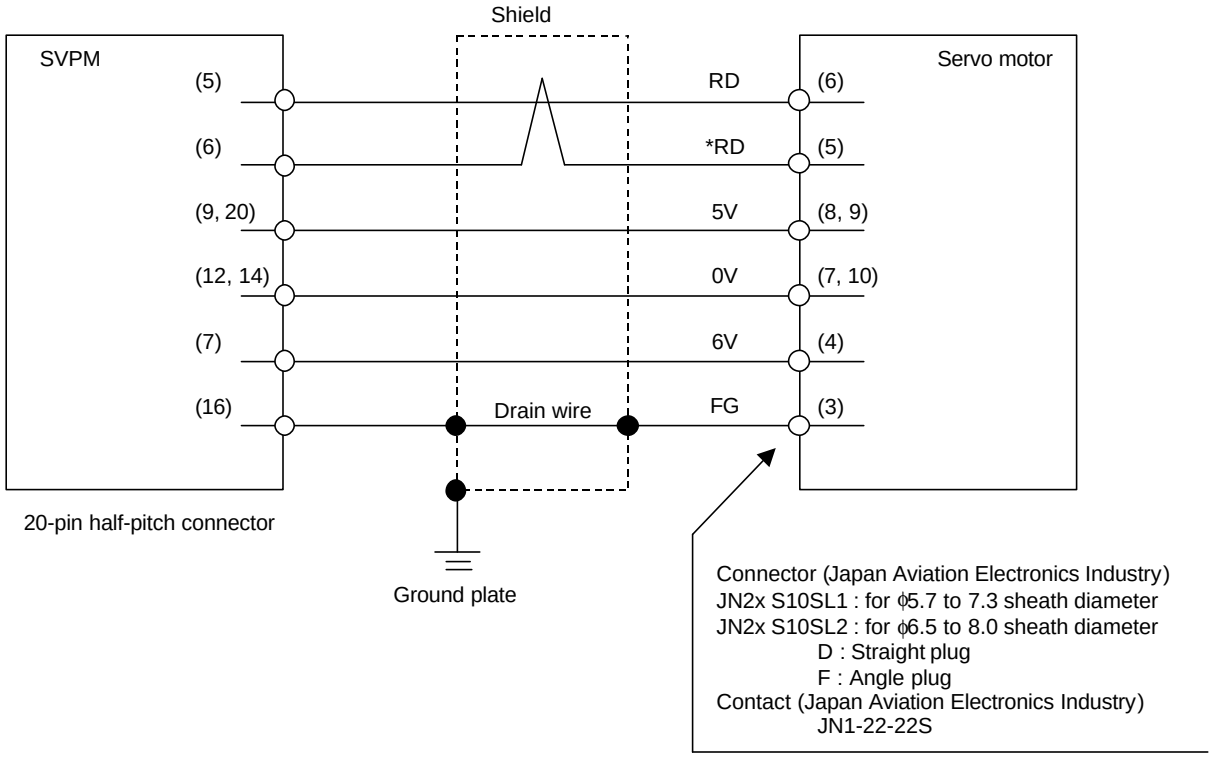
[The ordering number of connector and applied tool]

It is possible to order connector (hausing and contact) and applied tool from FANUC and Tyco Electronics AMP. In case of FANUC, the ordering numbers are as follows. Please refer to K76

6.2.4 Details of K22

The cable K22 is used to connect the SVPM and Pulsecoder of βiS servo motor.

For servo motor βis series (β2/4000is to β22/3000is)



Using cable conductor

Signal name	Cable length : 28m or less	Cable length : 50m or less
5V, 0V, 6V	$0.3mm^2 \times 5$ (Note 4) Wire construction 12/0.18 or 60/0.08 Insulation outer diameter ϕ0.8 to ϕ1.5	$0.5mm^2 \times 5$ (Note 4) Wire construction 20/0.18 or 104/0.08 Insulation outer diameter ϕ0.8 to ϕ1.5
RD, *RD	$0.18mm^2$ or more Twisted-pair wire Insulation outer diameter ϕ0.8 to ϕ1.5	$0.18mm^2$ or more Twisted-pair wire Insulation outer diameter ϕ0.8 to ϕ1.5
Drain wire	$0.15mm^2$ or more	$0.15mm^2$ or more

See Subsection 5.4.1 for explanations about the SVPM-side connector that matches the recommended cable.

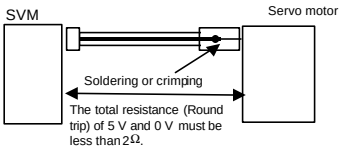
NOTE

1 The ground plate to which the shield is connected must be placed as close as possible to the servo amplifier so that distance between the ground plate and the servo amplifier becomes shortest.

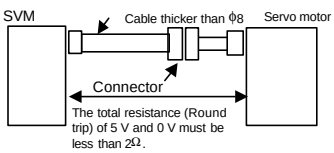
2 In case that the cable is prepared by MTB, total resistance of 5V and 0V must be less than 2Ω.

3 Pulsecoder side connector can accept maximum 0.5mm^2 (wire construction 20/0.18 or 104/0.08, diameter φ1.5 or less) wire and sheath diameter is φ5.7 to φ8.0. In case of using thicker wire or cable, take measures described below.

[Case 1] Cable conductor exceeds 0.5mm^2.



[Case 2] Sheath diameter of exceeds φ8.



4 In case of incremental Pulsecoder, 6V is not necessary to be connected.

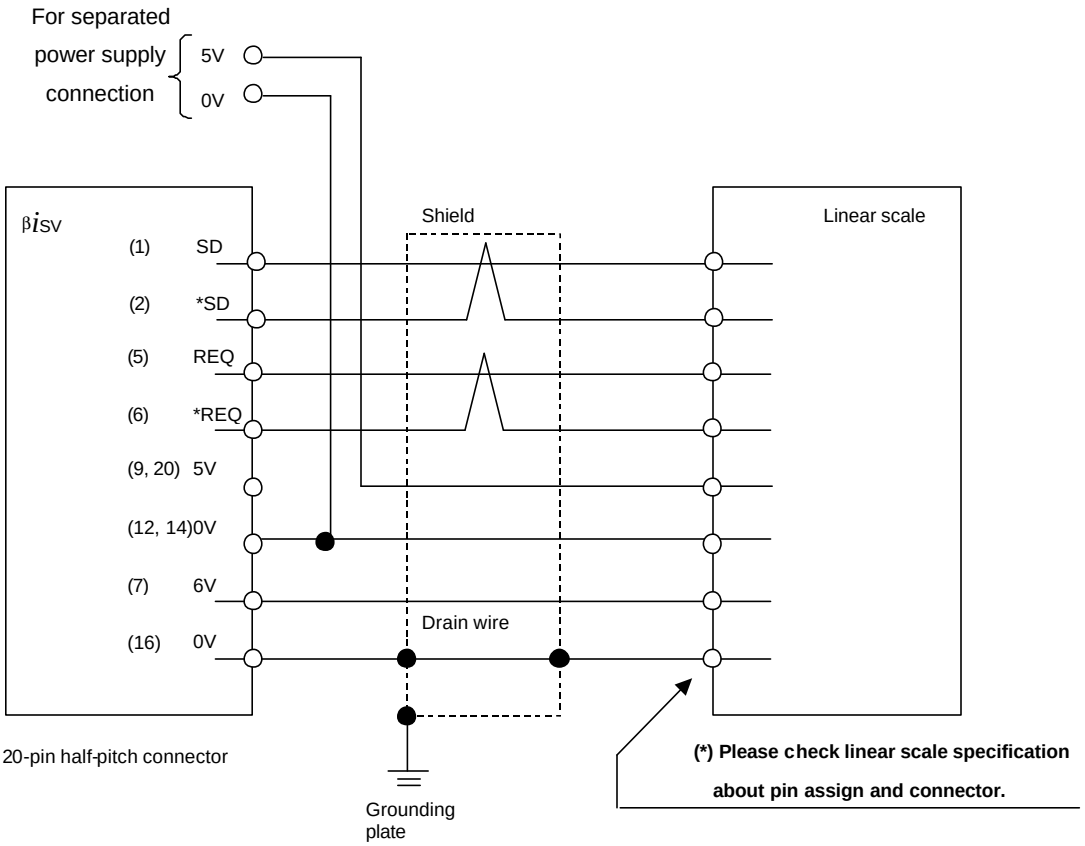
- Crimp tool specification
  A06B-6114-K201/JN1S : For 0.3 mm^2
  A06B-6114-K201/JN1L : For 0.18 mm^2 or 0.5 mm^2

- Connector kit specification
  A06B-6114-K204/S : Straight plug (including a contact)
  A06B-6114-K204/E : Elbow plug (including a contact)

- Recommended cable
  A66L-0001-0460 : Flexible cable 28m or less long
  A66L-0001-0462 : Flexible cable 50m or less long
  A66L-0001-0481 : Fixed cable 28m or less long
  A66L-0001-0491 : Fixed cable 50m or less long

[In case of connection with third party detection]

The appliable output current of βiSVSP is 0.2A. So, please prepare other regulated powwr supply, if the supply current of third party detection is 0.2A or more. And in this case, please note follows.



[Power-on/ Power-off sequence]

(1) Power-on sequence

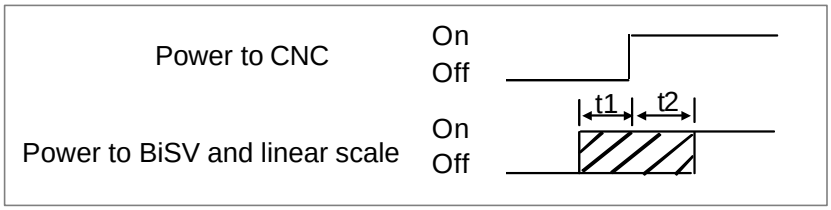
Turn on the power to CNC, βiSVSP and linear scale at the same time, or in the following sequence:

1.Power to βiSVSP and linear scale

2.Power to CNC

(Note)

When the following power-on timing condition is satisfied, the power to βiSVSP and linear scale is assumed to be turned on simultaneously when the power to CNC is turned on.



t1: 200ms

Means that the power to βiSVSP and linear scale is turned on within 200 ms before the power to CNC is turned on.

t2: 500ms

Means that the power to βiSVSP and linear scale is turned on within 500 ms after the power to CNC is turned on.

(2) Power-off sequence

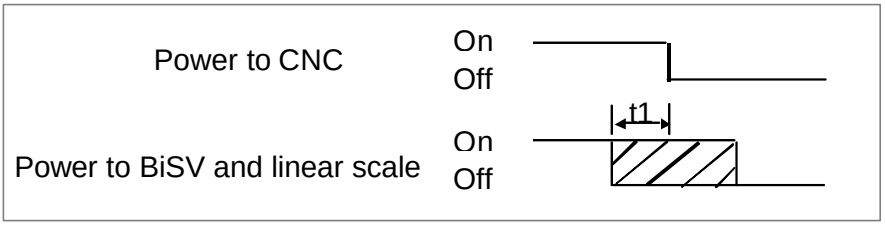
Turn off the power to CNC, βiSVSP and linear scale at the same time, or in the following sequence:

1.Power to CNC

2.Power to BiSV and the linear scale

(Note)

When the following power-off timing condition is satisfied, the power to BiSV and linear scale is assumed to be turned off simultaneously when the power to CNC is turned off.



t1: 500ms

Means that the power to BiSV and linear scale is turned off within 500 ms before the power to CNC is turned off.

7. HEAT DISSIPATION

The amount of heat generated in an SVSP series depending on its model, the current flowing through the motor, and the motor output. (Refer to the respective motor description manuals for the current and output of each motor.)

7.1 Total amount of heat dissipation

The total amount of heat dissipation by the SVSP is calculated according to the following expression:

Total amount of heat dissipation
= a Ka1xb1 + Ka2xb2 + Ka3xb3+ Ka4xb4++ Ka5xb5

a: Amount of heat dissipation determined by the SVSP model [W]
Ka1 to Ka5: Coefficient determined by the SVSP
b1: Total output of motors connected to the SVSP [kW]
b2: Current flowing through the spindle motor [Arms]
b3: Current flowing through the servo motor of L-axis [Arms]
b4: Current flowing through the servo motor of M-axis [Arms]
b5: Current flowing through the servo motor of N-axis [Arms]

SVSP (total amount of heat dissipation)

Name	Specification	a [W]	Coefficient	
For βiSVSP 20/20-7.5	H201#D	22	Ka1	14.3
			Ka2	5.8
			Ka3	5.0
			Ka4	5.0
For βiSVSP 20/20-11	H202#D	22	Ka1	14.3
			Ka2	5.4
			Ka3	5.0
			Ka4	5.0
For βiSVSP 40/40-15	H203#D	22	Ka1	13.1
			Ka2	5.5
			Ka3	4.6
			Ka4	4.6

SVSP (total amount of heat dissipation)

Name	Specification	a [W]	Coefficient	
For βiSVSP 20/20/40-7.5	H301#D	24	Ka1	14.3
			Ka2	5.8
			Ka3	5.0
			Ka4	5.0
			Ka5	4.6
For βiSVSP 20/20/40-11	H302#D	24	Ka1	14.3
			Ka2	5.4
			Ka3	5.0
			Ka4	5.0
			Ka5	4.6
For βiSVSP 40/40/40-15	H303#D	24	Ka1	13.1
			Ka2	5.5
			Ka3	4.6
			Ka4	4.6
			Ka5	4.6
For βiSVSP 40/40/80-15	H313#D	24	Ka1	13.1
			Ka2	5.5
			Ka3	4.6
			Ka4	4.6
			Ka5	4.3

AC reactor

Name	Ordering number	Rated output	Total amount of heat dissipation
For βiSVSP 20/20-7.5 For βiSVSP 20/20/40-7.5	A81L-0001-0155	7.5kW	24W
For βiSVSP 20/20-11 For βiSVSP 20/20/40-11		11kW	38W
For βiSVSP 40/40-15 For βiSVSP 40/40/40-15 For βiSVSP 40/40/80-15	A81L-0001-0156	15kW	50W

7.2 Residual amount of heat in the cabinet

By placing the heat sink section of the SVSP outside the cabinet, the residual amount of heat in the cabinet can be calculated according to the expression below.

Residual amount of heat in the cabinet
= a + Ka1×b1 + Ka2×b2 + Ka3×b3 + Ka4×b4

a: Amount of heat dissipation determined by the SVSP model [W]
Ka1 to Ka4: Coefficient determined by the SVSP
b1: Total output of motors connected to the SVSP [kW]
b2: Current flowing through the spindle motor [Arms]
b3: Current flowing through the servo motor of L-axis [Arms]
b4: Current flowing through the servo motor of M-axis [Arms]
b5: Current flowing through the servo motor of N-axis [Arms]

SVPM (residual amount of heat in the cabinet)

Name	Specification	a [W]	Coefficient	
βiSVSP 20/20-7.5	H201#D	22	Ka1	2.1
			Ka2	0.9
			Ka3	0.8
			Ka4	0.8
βiSVSP 20/20-11	H202#D	22	Ka1	2.1
			Ka2	0.8
			Ka3	0.8
			Ka4	0.8
βiSVSP 40/40-15	H203#D	22	Ka1	1.3
			Ka2	0.6
			Ka3	0.5
			Ka4	0.5

SVPM (residual amount of heat in the cabinet)

Name	Specification	a [W]	Coefficient	
βiSVSP 20/20/40-7.5	H301#D	24	Ka1	2.1
			Ka2	0.9
			Ka3	0.8
			Ka4	0.8
			Ka5	0.7
βiSVSP 20/20/40-11	H302#D	24	Ka1	2.1
			Ka2	0.8
			Ka3	0.8
			Ka4	0.8
			Ka5	0.7
βiSVSP 40/40/40-15	H303#D	24	Ka1	1.3
			Ka2	0.6
			Ka3	0.5
			Ka4	0.5
			Ka5	0.5
βiSVSP 40/40/80-15	H313#D	24	Ka1	1.3
			Ka2	0.6
			Ka3	0.5
			Ka4	0.5
			Ka5	0.5

Addition of βiSVSP series for Series 0i/0i Mate-MODEL D

1. Type of applied documents

Name	FANUC SERVO AMPLIFIER βi series DESCRIPTIONS
Spec. No./Ver.	B-65322EN/02-07

2. Summary of Change

Group	Name / Outline	New, Add Correct, Del New	Applicable Date 2008.6
Basic Function	Addition of βiSVSP series for Series 0i/0i Mate-MODEL D		
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction Another			

INDEX

A. This amplifier is βiSVSP for Series 0i/0i Mate-MODEL D. And the ordering number is different from current βiSVSP (A06B-6134-H***#A or #C). The difference between βiSVSP for Series 0i/0i Mate-MODEL D and current βiSVSP is as follows.

Difference between βiSVSP for Series 0i/0i Mate-MODEL D and current βiSVSP (A06B-6134-H***#A or #C).

The feature of βiSVSP for Series 0i/ 0i Mate-MODEL D

- Power up of spindle axis from 5.5KW to 7.5KW
  (No sale of 5.5KW model)
- 2nd FSSB connector is added
- Built-in of power failure detecting funtion
- Application of plastic case and terminal cover
- Addition of new model "40/40/80-15"
- In case of Spindle motor βiI series (αiM, αiMZ sensor model), αiBZ sensor is available for separated spindle sensor

Difference between βiSVSP for Series 0i/0i Mate-MODEL D and current βiSVSP (A06B-6134-H***#D).

The feature of βiSVSP for Series 0i/ 0i Mate-MODEL D

- In case of Spindle motor βiI series (αiM, αiMZ sensor model), αiBZ sensor is available for separated spindle sensor

This document describes only changed or added specifications from current model.
Therefore please refer the specifications which are not described in this document to FANUC SERVO AMPLIFIER bi series DESCRIPTIONS B-65322EN.

1. Ordering number

Ordering number is changed as follows.

Sensor for spindle	Model	Ordering number
Spindle motor βiI series (αiM, αiMZsensor model)	βiSVSP20/20-7.5	A06B-6164-H201#H580
	βiSVSP20/20-11	A06B-6164-H202#H580
	βiSVSP40/40-15	A06B-6164-H223#H580
	βiSVSP20/20/40-7.5	A06B-6164-H311#H580
	βiSVSP20/20/40-11	A06B-6164-H312#H580
	βiSVSP40/40/40-15	A06B-6164-H333#H580
	βiSVSP40/40/80-15	A06B-6164-H343#H580
Spindle motor βiI series (Sensor-less model)	βiSVSP20/20-7.5	A06B-6165-H201#H560
	βiSVSP20/20-11	A06B-6165-H202#H560
	βiSVSP40/40-15	A06B-6165-H223#H560
	βiSVSP20/20/40-7.5	A06B-6165-H311#H560
	βiSVSP20/20/40-11	A06B-6165-H312#H560
	βiSVSP40/40/40-15	A06B-6165-H333#H560
	βiSVSP40/40/80-15	A06B-6165-H343#H560

2. Specification

2.1 Specification list

Servo 2-axis and spindle motor (αiM, αiMZ sensor) type

Item		ßiSVSP 20/20-7.5	ßiSVSP 20/20-11	ßiSVSP 40/40-15
Unit designation		A06B-6164-H201#H580	A06B-6164-H202#H580	A06B-6164-H223#H580
Power PCB		A20B-2101-0440	A20B-2101-0441	A20B-2101-0022
Control PCB		A20B-2101-0710	A20B-2101-0710	A20B-2101-0710
Control PCB(MODULE)		A20B-2902-0671	A20B-2902-0671	A20B-2902-0671
Main power supply	Input voltage	AC200-240V (+10%,-15%) 50/60Hz		
	Rated current	31Arms	39Arms	60Arms
	Rated capacity	11KVA	14KVA	21KVA
Control power supply	Inputvoltage/current	DC24V ±10% / 2.0Amax.		
Servo HRV Control		HRV2, HRV3		
Spindle HRV Control		HRV1		
Main control methods		Sine wave PWM control with Transistor Bridge		
Spindle rated output current		31Arms	56Arms	64Arms
Spindle base output frequency		60Hz		
Spindle output frequency range		0Hz-1KHz		
Servo	L-axis	6.5Arms	6.5Arms	13Arms
Rated output current	M-axis	6.5Arms	6.5Arms	13Arms
Servo Current limit value	L-axis	20A	20A	40A
Rated output current	M-axis	20A	20A	40A
Servo output frequency range		0Hz-400Hz		
Warning and Protective function		High Current IPM Abnormal High Voltage of DC Link Low Voltage of DC Link Low Voltage of Control Power Supply Short Time Overload FSSB Communication Error		
Ambient Temperature Range		0-+55 Degree Centigrade		
Weight		10.2kg	14.8kg	
Demension in 'mm'	Including fin block	260x380x272		
	Fin block (only)	260x380x100		
Associated products	AC Reactor	A81L-0001-0155		A81L-0001-0156

(Note)

This specification is described on the condition of intermitting motor operation and not continuous motor operation.

Servo 2-axis and spindle motor (sensor-less) type

Item		ßiSVSP 20/20-7.5	ßiSVSP 20/20-11	ßiSVSP 40/40-15
Unit designation		A06B-6165-H201#H560	A06B-6165-H202#H560	A06B-6165-H223#H560
Power PCB		A20B-2101-0440	A20B-2101-0441	A20B-2101-0022
Control PCB		A20B-2101-0710	A20B-2101-0710	A20B-2101-0710
Control PCB(MODULE)		A20B-2902-0672	A20B-2902-0672	A20B-2902-0672
Main power supply	Input voltage	AC200-240V (+10%,-15%) 50/60Hz		
	Rated current	31Arms	39Arms	60Arms
	Rated capacity	11KVA	14KVA	21KVA
Control power supply	Inputvoltage/current	DC24V ±10% / 2.0Amax.		
Servo HRV Control		HRV2, HRV3		
Spindle HRV Control		HRV1		
Main control methods		Sine wave PWM control with Transistor Bridge		
Spindle rated output current		31Arms	56Arms	64Arms
Spindle base output frequency		60Hz		
Spindle output frequency range		1Hz-1KHz		
Servo	L-axis	6.5Arms	6.5Arms	13Arms
Rated output current	M-axis	6.5Arms	6.5Arms	13Arms
Servo Current limit value	L-axis	20A	20A	40A
Rated output current	M-axis	20A	20A	40A
Servo output frequency range		0Hz-400Hz		
Warning and Protective function		High Current IPM Abnormal High Voltage of DC Link Low Voltage of DC Link Low Voltage of Control Power Supply Short Time Overload FSSB Communication Error		
Ambient Temperature Range		0-+55 Degree Centigrade		
Weight		10.2kg	14.8kg	
Demension in 'mm'	Including fin block	260x380x272		
	Fin block (only)	260x380x100		
Associated products	AC Reactor	A81L-0001-0155		A81L-0001-0156

(Note)

This specification is described on the condition of intermitting motor operation and not continuous motor operation.

Servo 3-axis and spindle motor (αiM, αiMZ sensor) type

Item		ßiSVSP 20/20/40-7.5	ßiSVSP 20/20/40-11	ßiSVSP 40/40/40-15	ßiSVSP 40/40/80-15
Unit designation		A06B-6164-H311#H580	A06B-6164-H312#H580	A06B-6164-H333#H580	A06B-6164-H343#H580
Power PCB		A20B-2101-0581	A20B-2101-0582	A20B-2101-0025	A20B-2101-0029
Control PCB		A20B-2101-0711	A20B-2101-0711	A20B-2101-0711	A20B-2101-0711
Control PCB(MODULE)		A20B-2902-0671	A20B-2902-0671	A20B-2902-0671	A20B-2902-0671
Main power supply	Input voltage	AC200-240V (+10%,-15%) 50/60Hz			
	Rated current	36Arms	45Arms	65Arms	69Arms
	Rated capacity	13KVA	16KVA	23KVA	24KVA
Control power supply	Input voltage/current	DC24V ±10% / 2.0Amax.			
Servo HRV Control		HRV2, HRV3			
Spindle HRV Control		HRV1			
Main control methods		Sine wave PWM control with Transistor Bridge			
Spindle rated output current		31Arms	56Arms	64Arms	64Arms
Spindle base output frequency		60Hz			
Spindle output frequency range		0Hz-1KHz			
Servo Rated output current	L-axis	6.5Arms	6.5Arms	13Arms	13Arms
	M-axis	6.5Arms	6.5Arms	13Arms	13Arms
	N-axis	13Arms	13Arms	13Arms	19Arms
Servo Current limit value Rated output current	L-axis	20Ap	20Ap	40Ap	40Ap
	M-axis	20Ap	20Ap	40Ap	40Ap
	N-axis	40Ap	40Ap	40Ap	80Ap
Servo output frequency range		0Hz-400Hz			
Warning and Protective function		High Current IPM Abnormal High Voltage of DC Link Low Voltage of DC Link Low Voltage of Control Power Supply Short Time Overload FSSB Communication Error			
Ambient Temperature Range		0-+55 Degree Centigrade			
Weight		14.8kg			
Demension in 'mm'	Including fin block	260x380x272			
	Fin block (only)	260x380x100			
Associated products	AC Reactor	A81L-0001-0155		A81L-0001-0156	

(Note)

This specification is described on the condition of intermitting motor operation and not continuous motor operation.

Item		ßiSVSP 20/20/40-7.5	ßiSVSP 20/20/40-11	ßiSVSP 40/40/40-15	ßiSVSP 40/40/80-15
Unit designation		A06B-6165-H311#H560	A06B-6165-H312#H560	A06B-6165-H333#H560	A06B-6165-H343#H560
Power PCB		A20B-2101-0581	A20B-2101-0582	A20B-2101-0025	A20B-2101-0029
Control PCB		A20B-2101-0711	A20B-2101-0711	A20B-2101-0711	A20B-2101-0711
Control PCB(MODULE)		A20B-2902-0672	A20B-2902-0672	A20B-2902-0672	A20B-2902-0672
Main power supply	Input voltage	AC200-240V (+10%,-15%) 50/60Hz			
	Rated current	36Arms	45Arms	65Arms	69Arms
	Rated capacity	13KVA	16KVA	23KVA	24KVA
Control power supply	Input voltage/current	DC24V ± 10% / 2.0Amax.			
Servo HRV Control		HRV2, HRV3			
Spindle HRV Control		HRV1			
Main control methods		Sine wave PWM control with Transistor Bridge			
Spindle rated output current		31Arms	56Arms	64Arms	64Arms
Spindle base output frequency		60Hz			
Spindle output frequency range		1Hz-1KHz			
Servo Rated output current	L-axis	6.5Arms	6.5Arms	13Arms	13Arms
	M-axis	6.5Arms	6.5Arms	13Arms	13Arms
	N-axis	13Arms	13Arms	13Arms	19Arms
Servo Current limit value Rated output current	L-axis	20Ap	20Ap	40Ap	40Ap
	M-axis	20Ap	20Ap	40Ap	40Ap
	N-axis	40Ap	40Ap	40Ap	80Ap
Servo output frequency range		0Hz-400Hz			
Warning and Protective function		High Current IPM Abnormal High Voltage of DC Link Low Voltage of DC Link Low Voltage of Control Power Supply Short Time Overload FSSB Communication Error			
Ambient Temperature Range		0-+55 Degree Centigrade			
Weight		14.8kg			
Demension in 'mm'	Including fin block	260x380x272			
	Fin block (only)	260x380x100			
Associated products	AC Reactor	A81L-0001-0155		A81L-0001-0156	

Servo 3-axis and spindle motor (sensor-less) type

(Note)

This specification is described on the condition of intermitting motor operation and not continuous motor operation.

2.2 Weight

Sensor for spindle	Model	Weight
Spindle motor βiI series (αiM, αiMZ sensor model)	βiSVSP20/20-7.5	10.2Kg
	βiSVSP20/20-11	14.8Kg
	βiSVSP40/40-15	
	βiSVSP20/20/40-7.5	
	βiSVSP20/20/40-11	
	βiSVSP40/40/40-15	
	βiSVSP40/40/80-15	
Spindle motor βiI series (Sensor-less model)	βiSVSP20/20-7.5	10.2Kg
	βiSVSP20/20-11	14.8Kg
	βiSVSP40/40-15	
	βiSVSP20/20/40-7.5	
	βiSVSP20/20/40-11	
	βiSVSP40/40/40-15	
	βiSVSP40/40/80-15	

2.3 Fan unit

Please install the following fan unit for cooling.

If no, please cool by wind velocity “2m/s or more”.

Sensor for spindle	Model	Option fan	Wind velocity
Spindle motor βiI series (αiM, αiMZ sensor model)	βiSVSP 20/20-7.5 (A06B-6164-H201#H580)	Not necessary	2 m/s
	βiSVSP 20/20-11 (A06B-6164-H202#H580)	A06B-6134-K001 1 piece	
	βiSVSP 40/40-15 (A06B-6164-H223#H580)	A06B-6134-K001 2 pieces	
	βiSVSP 20/20/40-7.5 (A06B-6164-H311#H580)	A06B-6134-K001 1 piece	
	βiSVSP 20/20/40-11 (A06B-6164-H312#H580)		
	βiSVSP 40/40/40-15 (A06B-6164-H333#H580)	A06B-6134-K001 2 pieces	
	βiSVSP 40/40/80-15 (A06B-6164-H343#H580)		
Spindle motor βiI series (Sensor-less model)	βiSVSP 20/20-7.5 (A06B-6165-H201#H560)	Not necessary	
	βiSVSP 20/20-11 (A06B-6165-H202#H560)	A06B-6134-K001 1 piece	
	βiSVSP 40/40-15 (A06B-6165-H223#H560)	A06B-6134-K001 2 pieces	
	βiSVSP 20/20/40-7.5 (A06B-6165-H311#H560)	A06B-6134-K001 1 piece	
	βiSVSP 20/20/40-11 (A06B-6165-H312#H560)		
	βiSVSP 40/40/40-15 (A06B-6165-H333#H560)	A06B-6134-K001 2 pieces	
	βiSVSP 40/40/80-15 (A06B-6165-H343#H560)		

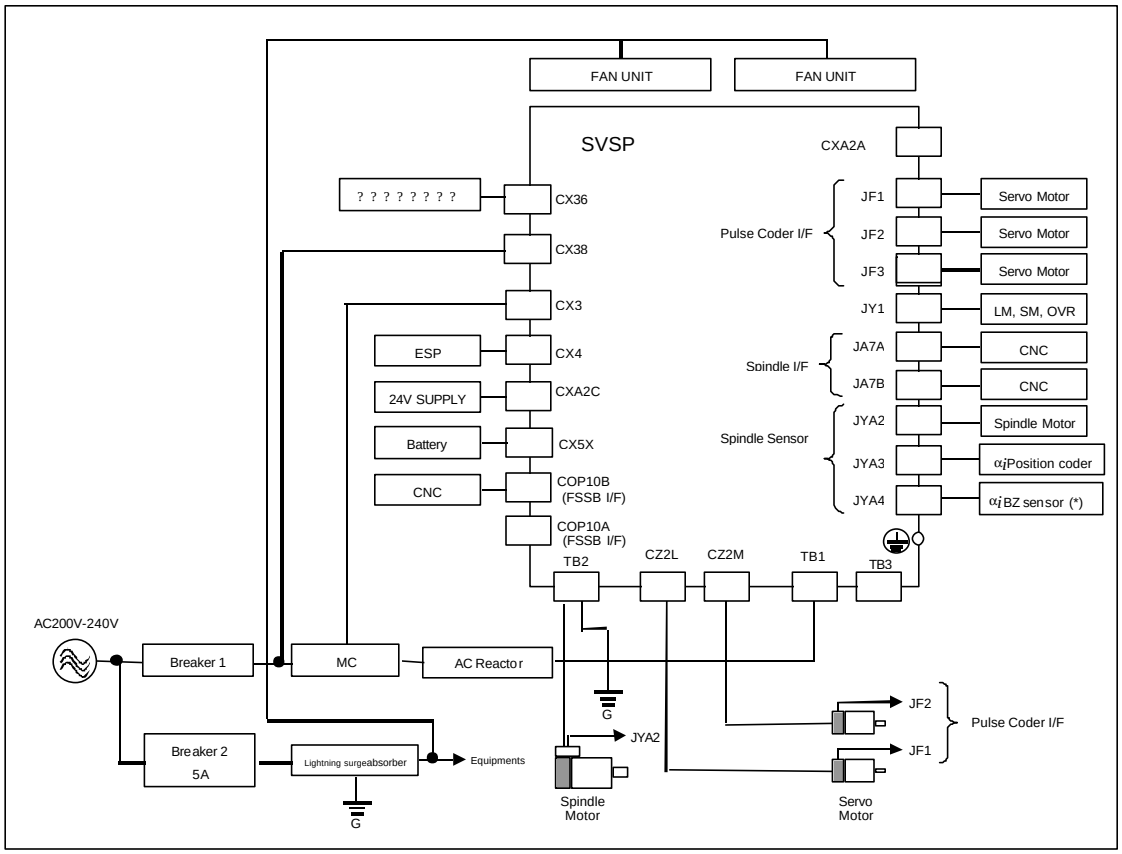
2.4 Applied motor

		Spindle Motor								Servo Motor							
		βiI 3 /10000	βiI 6 /10000	βiI 8 /10000	βiI 12 /8000	βiIP 8 /6000	βiIP 12 /6000	βiIP 15 /6000	βiIP 18 /6000	βiS 2 /4000	βiS 4 /4000	βiS 8 /3000	βiS 12 /2000	βiS 22 /1500	βiS 12 /3000	βiS 22 /2000	βiS 22 /3000
ßiSVSP 20/20-7.5 A06B-6164-H201#H580 A06B-6165-H201#H560	Spindle	O				O	O										
	Servo L axis									O	O	O	O	O			
	Servo M axis									O	O	O	O	O			
ßiSVSP 20/20-11 A06B-6164-H202#H580 A06B-6165-H202#H560	Spindle	O	O	O		**	**	O	O								
	Servo L axis									O	O	O	O	O			
	Servo M axis									O	O	O	O	O			
ßiSVSP 40/40-15 A06B-6164-H223#H580 A06B-6165-H223#H560	Spindle	O	O	O	O	**	**	O	O								
	Servo L axis									**	**	**	**	**	O	O	
	Servo M axis									**	**	**	**	**	O	O	
ßiSVSP 20/20/40-7.5 A06B-6164-H311#H580 A06B-6165-H311#H560	Spindle	O				O	O										
	Servo L axis									O	O	O	O	O			
	Servo M axis									O	O	O	O	O			
	Servo N axis									**	**	**	**	**	O	O	
ßiSVSP 20/20/40-11 A06B-6164-H312#H580 A06B-6165-H312#H560	Spindle	O	O	O		**	**	O	O								
	Servo L axis									O	O	O	O	O			
	Servo M axis									O	O	O	O	O			
	Servo N axis									**	**	**	**	**	O	O	
ßiSVSP 40/40/40-15 A06B-6164-H333#H580 A06B-6165-H333#H560	Spindle	O	O	O	O	**	**	O	O								
	Servo L axis									**	**	**	**	**	O	O	
	Servo M axis									**	**	**	**	**	O	O	
	Servo N axis									**	**	**	**	**	O	O	
ßiSVSP 40/40/80-15 A06B-6164-H343#H580 A06B-6165-H343#H560	Spindle	O	O	O	O	**	**	O	O								
	Servo L axis									**	**	**	**	**	O	O	
	Servo M axis									**	**	**	**	**	O	O	
	Servo N axis																O

⚠CAUTION

** Combining with this motor requires changing the motor control parameter. Special motor number exists. So, please select it in combining with this motor.
Incorrect parameter setting may damage the motor.

2.5 Breaker, Magnetic contactor, AC Reactor



(*) This is available in case of Spindle motor βiI series (αiM, αiMZ sensor model).

Please select breaker, magnetic contactor, and AC reactor by the model of βiSVSP. The ordering number and specification are as follows.

Order number of breaker 1

Model	Ordering number	Breaker specification	Breaker cover specification
For βiSVSP 20/20-7.5	A06B-6077-K103	Fuji Electric Co.,Ltd. EA103C/60	Fuji Electric Co.,Ltd. BZ6TBH10C3
For βiSVSP 20/20-11	A06B-6077-K103	Fuji Electric Co.,Ltd. EA103C/60	Fuji Electric Co.,Ltd. BZ6TBH10C3
For βiSVSP 40/40-15	A06B-6077-K104	Fuji Electric Co.,Ltd. EA103C/75	Fuji Electric Co.,Ltd. BZ6TBH10C3
For βiSVSP 20/20/40-7.5	A06B-6077-K103	Fuji Electric Co.,Ltd. EA103C/60	Fuji Electric Co.,Ltd. BZ6TBH10C3
For βiSVSP 20/20/40-11	A06B-6077-K103	Fuji Electric Co.,Ltd. EA103C/60	Fuji Electric Co.,Ltd. BZ6TBH10C3
For βiSVSP 40/40/40-15	A06B-6077-K104	Fuji Electric Co.,Ltd. EA103C/75	Fuji Electric Co.,Ltd. BZ6TBH10C3
For βiSVSP 40/40/80-15	A06B-6077-K104	Fuji Electric Co.,Ltd. EA103C/75	Fuji Electric Co.,Ltd. BZ6TBH10C3

Order number of breaker 2

Model	Ordering number	Breaker specification	Breaker cover specification
For cotrol power supply (Common to all models)	A06B-6077-K106	Fuji Electric Co.,Ltd. EA33AC/5	Fuji Electric Co.,Ltd. BZ6TBH10C3

Ordering number of magnetic contactor

Model	Ordering number	Magnetic contactor specification	Magnetic contactor cover specification
For βiSVSP 20/20-7.5	A06B-6077-K123	Fuji Electric Co.,Ltd. SC-N2	Fuji Electric Co.,Ltd. SZ-N1J
For βiSVSP 20/20-11	A06B-6077-K123	Fuji Electric Co.,Ltd. SC-N2	Fuji Electric Co.,Ltd. SZ-N1J
For βiSVSP 40/40-15	A06B-6077-K124	Fuji Electric Co.,Ltd. SC-N2S	Fuji Electric Co.,Ltd. SZ-N2SJ
For βiSVSP 20/20/40-7.5	A06B-6077-K123	Fuji Electric Co.,Ltd. SC-N2	Fuji Electric Co.,Ltd. SZ-N1J
For βiSVSP 20/20/40-11	A06B-6077-K123	Fuji Electric Co.,Ltd. SC-N2	Fuji Electric Co.,Ltd. SZ-N1J
For βiSVSP 40/40/40-15	A06B-6077-K124	Fuji Electric Co.,Ltd. SC-N2S	Fuji Electric Co.,Ltd. SZ-N2SJ
For βiSVSP 40/40/80-15	A06B-6077-K124	Fuji Electric Co.,Ltd. SC-N2S	Fuji Electric Co.,Ltd. SZ-N2SJ

Cautions

The coil voltage of magnetic contactor is AC200V specification.

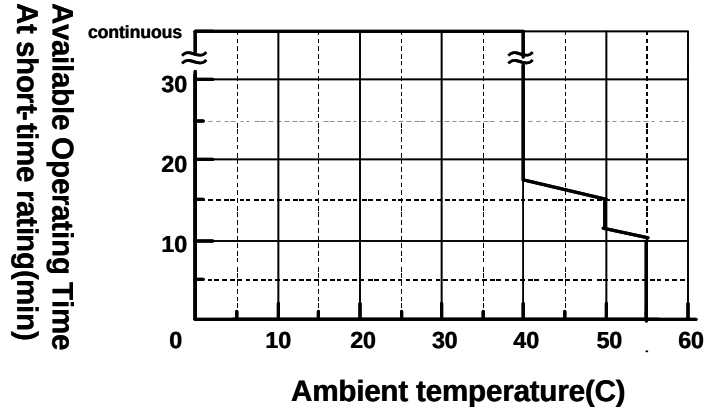
AC Reactor

Classification	The suiting model	Ordering number
Basic	For βiSVSP 20/20-7.5	A81L-0001-0155
	For βiSVSP 20/20-11	
	For βiSVSP 40/40-15	A81L-0001-0156
	For βiSVSP 20/20/40-7.5	A81L-0001-0155
	For βiSVSP 20/20/40-11	
	For βiSVSP 40/40/40-15	A81L-0001-0156
	For βiSVSP 40/40/80-15	

2.6 Derating

It is necessary to limit the output power by the ambient temperature.

Target model: Common to all βiSVSP



2.7 Sensor for spindle

The following lists combinations of βiSVSP type, applicable sensors, and functions.

		Configuration	Type 1	2	3	4	5	6	7	Remarks
Spindle system configuration	βiSVSP	A06B-6164-H***#H580	O	O	O	O	O			
		A06B-6165-H***#H560						O	O	
	Sensor on the motor	αiM sensor	O		O	O	O			
		αiMZ sensor		O						
		Sensor–less						O	O	
	Sensor on the spindle	αi position coder			O				O	*3
		External one-rotation (Proximity switch)				O				*3
		αiBZ sensor					O			*3
Function	Rigid tapping		O *1	O *10	O	O *2 *9	O		O	
	Orientation by a position coder			O *6	O		O		O	
	Orientation by the external one-rotation signal					O *2				*5
	Spindle synchronization	Velocity synchronization	O *2	O *2	O	O *2	O		O	*4
		Phase synchronization		O *6	O	O *2 *7	O		O	*4
	Threading			O *6	O		O		O	
	Cs contour control			O *6	O *8		O			

*1 Connect spindle and motor directly or with timing belt or gear. Reference position return is not be available to adjust the tapping start position.

*2 Connect spindle and motor directly or with timing belt or gear.

*3 Connect spindle and sensor with 1:1.

*4 Two pairs of motors and amplifiers are required.

*5 Note that the stop position may move by a backlash between spindle and motor.

*6 Connect spindle and motor with 1:1 by direct connection or timing belt or gear.

*7 Command orientation and detect one-rotation signal (PC1DT=1) before applying spindle synchronization command

*8 The resolution of position detection is 4096 p/rev.

*9 In case of performing reference position return to adjust the tapping start position, command orientation and detect one-rotation signal (PC1DT=1) before applying rigid tapping.

*10 Connect spindle and motor directly or with timing belt or gear. In case of performing reference position return to adjust the tapping start position, Connect spindle and sensor with 1:1.

Other functions

	#H580	#H560	Remarks
Analog output of load meter and speed meter	O		Connector JY1
Analog output of either load meter or speed meter		O	Connector JY1
Analog override input	O	O	Connector JY1

3. Power failure detect function

The power failure detect function aiming at the gravity axis fall prevention at the time of a power failure was occurred.

Please refer to the section “6” for connection details.

In case of using this function, please add an uninterruptible power supply (UPS) etc. to be able to maintain the control source (DC 24V) of CNC and amplifier after a power failure occurs until mechanical brake operates.

[Specification]

Connector “CX36” output power failure detect signal in case of power failure.

Detect the drop of three-phase AC input voltage of connector “CX38”.

CX38 input voltage range: 0 V-AC240V+10% 3F 50Hz/60Hz±2Hz

Detect delay time is set so that it may not react sensitively to instantaneous power failure.

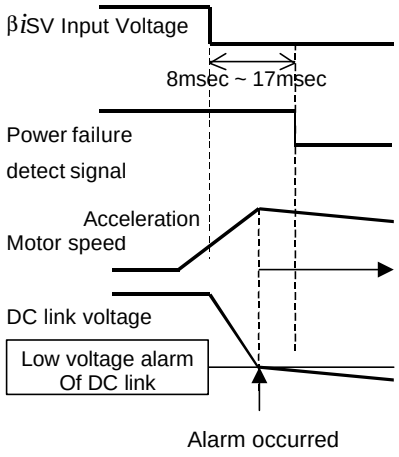
Detection delay time: 8msec~17msec

(Note)

The condition of power failure is simultaneous three-phase AC voltage drop.

Therefore, it may be unable to detect a power failure correctly on following conditions.

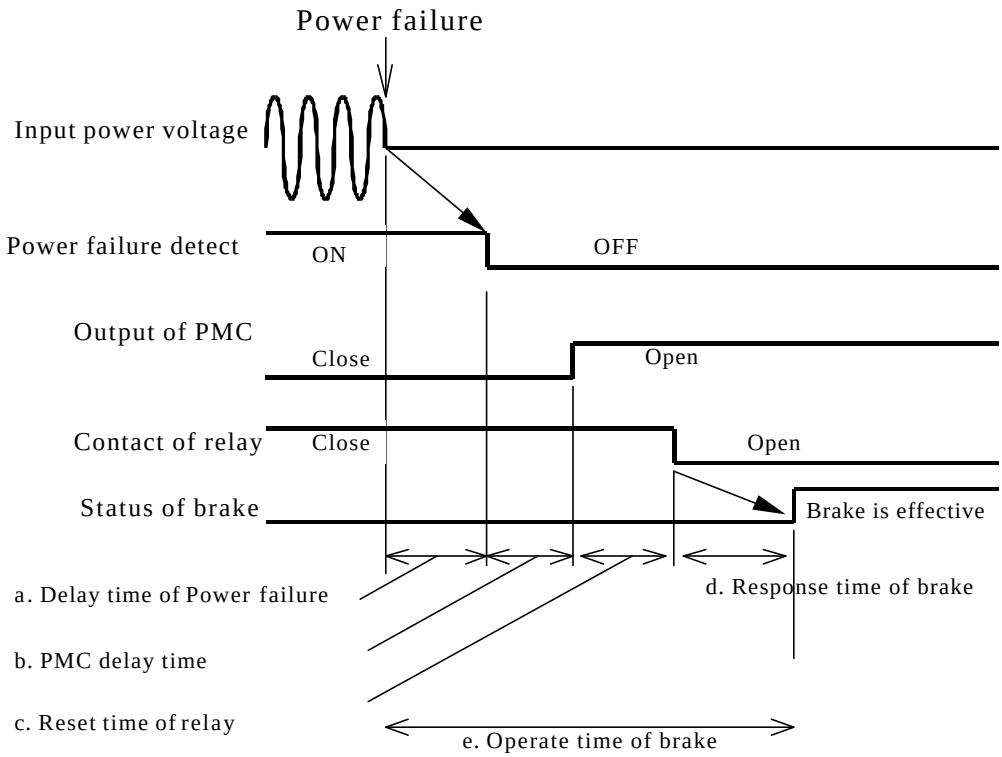
1. Power failure (phase interruption) as only one phase drop.
2. Power failure occurred at the time of motor acceleration. (Please see below.)



Power failure detect signal is outputted from βiSV 8msec~17msec later after at the time of power failure. At the time of motor acceleration, DC link voltage falls rapidly. So, even if power failure is detected, DC link low voltage alarm may be occurred.

The time from power failure till the brake becomes effective.

"Operate time of brake" after power failure is the total of "Power failure detection delay time", "Reset time of relay" and "Response time of brake".



a. Power failure detection delay time: The time from detecting the power failure till power failure detection signal is output from β_iSVSP (8msec ~ 17msec)

b. PMC delay time: The time from DI operating till DO operating of PMC (15msec)

c. Reset time of relay: The time from cutting off the rated voltage supplied to the coil of the relay till the contact of the relay is turned off ("a contact" is opened)

d. Response time of brake: The time from cutting off the rated voltage supplied to the coil of the brake till the brake becomes effective

e. Operate time of brake: The time from occurring the power failure till the brake becomes effective

Reset time of relay

Select the relay whose reset time is as short as possible.

Example: G2R type made by OMRON

- Diode installed type
- Rated voltage of coil: DC24V
- Reset time: 20msec max.

Response time of brake

The specification of the built-in brake is shown in the following table.

Motor model	βiS 2, βiS 4	βiS 8, βiS 12 , βiS 22
Maximum response time of brake	10msec	30msec

Operate time of brake

The example of the calculation of the time from power failure till the brake becomes effective is shown as follows.

Condition

(1) Power failure detection delay time --- 10msec
(2) PMC delay time---15msec
(3) Relay: G2R type made by OMRON --- Reset time of relay is 20msec
(4) Brake: Built-in brake for ? *i*S8 motor --- Response time of brake is 30msec

Result

10msec + 15msec + 20msec + 30msec = 75msec

Operate time of brake

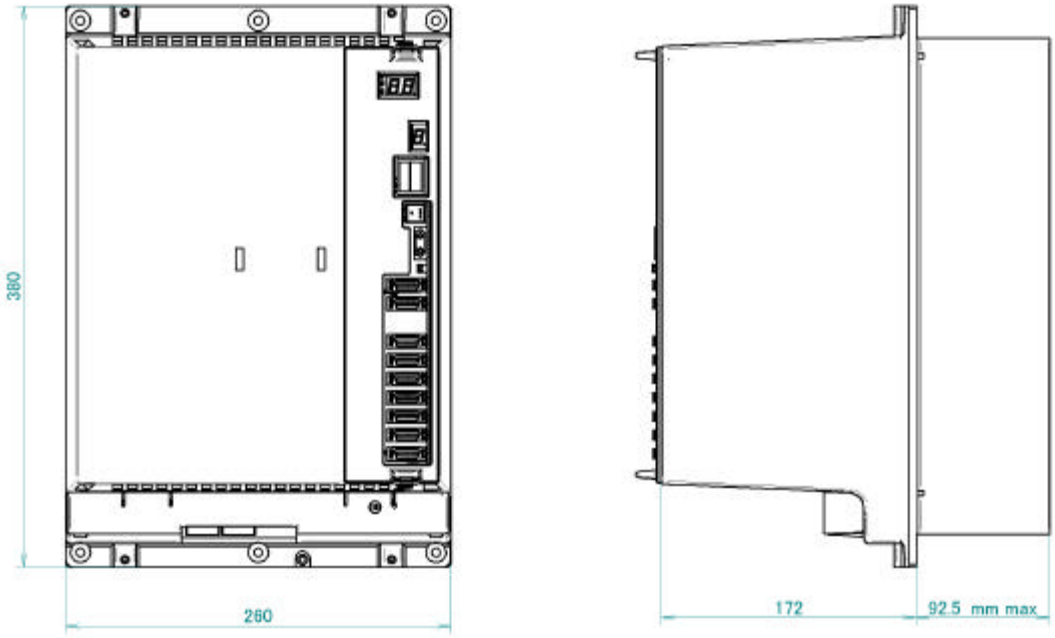
The example of the calculation of the time from power failure till the brake becomes effective is shown as follows.

Confirm at the real machine

Please check power failure function operates normally by real machine.

4. External dimension and maintenance area

4.1 External dimension



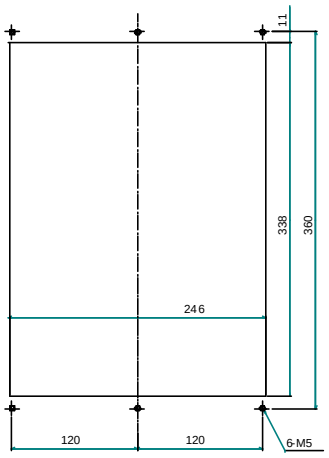
4.2 panel cut

Panel cuts when FANUC fan unit (A06B-6134-K001) is used and when not used are shown below. A fan unit can be placed either on top of or below the servo amplifier.

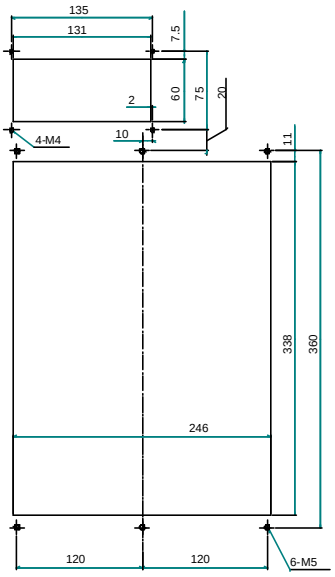
NOTE

1. Attach the accompanying gasket around the panel cutout to prevent oil and dust from getting into it.
2. Reinforce the right and left sides of the panel cutout in the power magnetic cabinet by using fittings such as angles to maintain satisfactory contact between the power magnetic cabinet and the amplifier.
3. Placing a FANUC fan unit on top of the servo amplifier requires installing a duct. Refer to the "Example Duct Structure for Using a FANUC Fan Unit (A06B-6134-K001)" for descriptions about the structure of the duct.
4. Placing a FANUC fan unit below the servo amplifier does not require installing a duct. If no FANUC fan unit is used, the user is requested to install a fan motor that can generate airflow of at least 2 m/s at the heat sink.

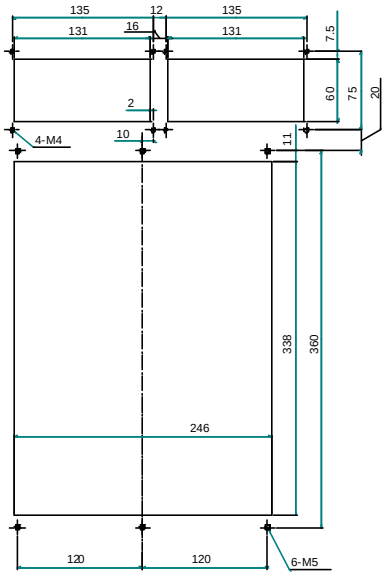
(1) When no FANUC fan unit is used



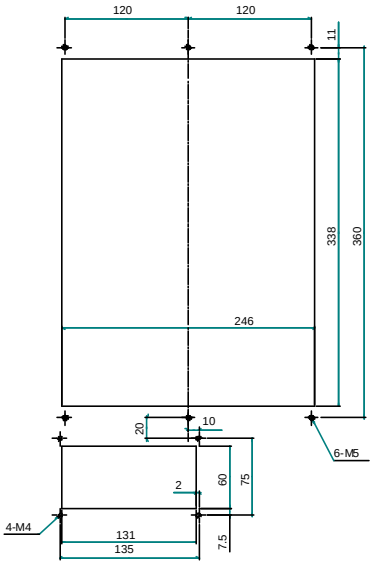
(2) When one FANUC fan unit is used (placed on top of the servo amplifier)



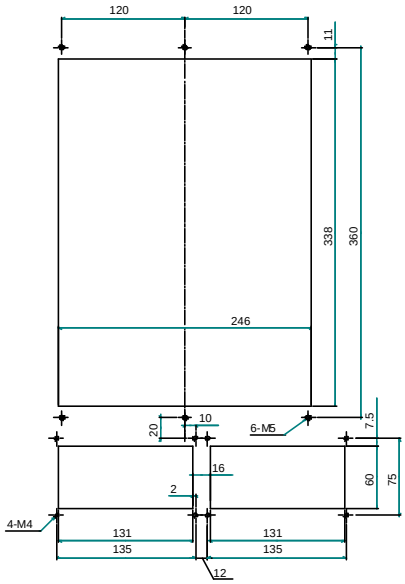
(3) When two FANUC fan units are used (placed on top of the servo amplifier)



(4) When one FANUC fan unit is used (placed below the servo amplifier)

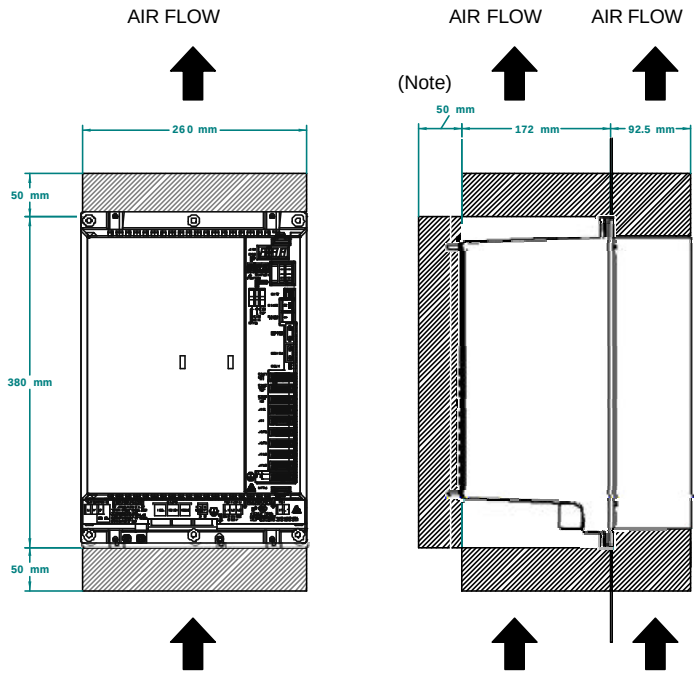


(5) When two FANUC fan units are used (placed below the servo amplifier)



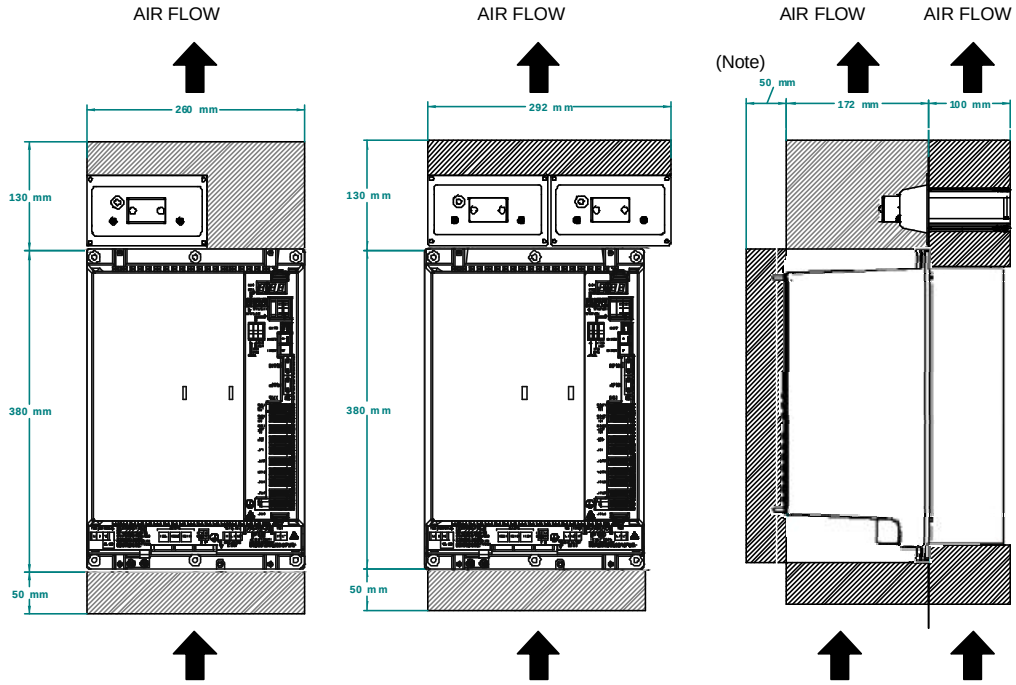
4.3 MAINTENANCE AREA

(1) When no fan unit is used



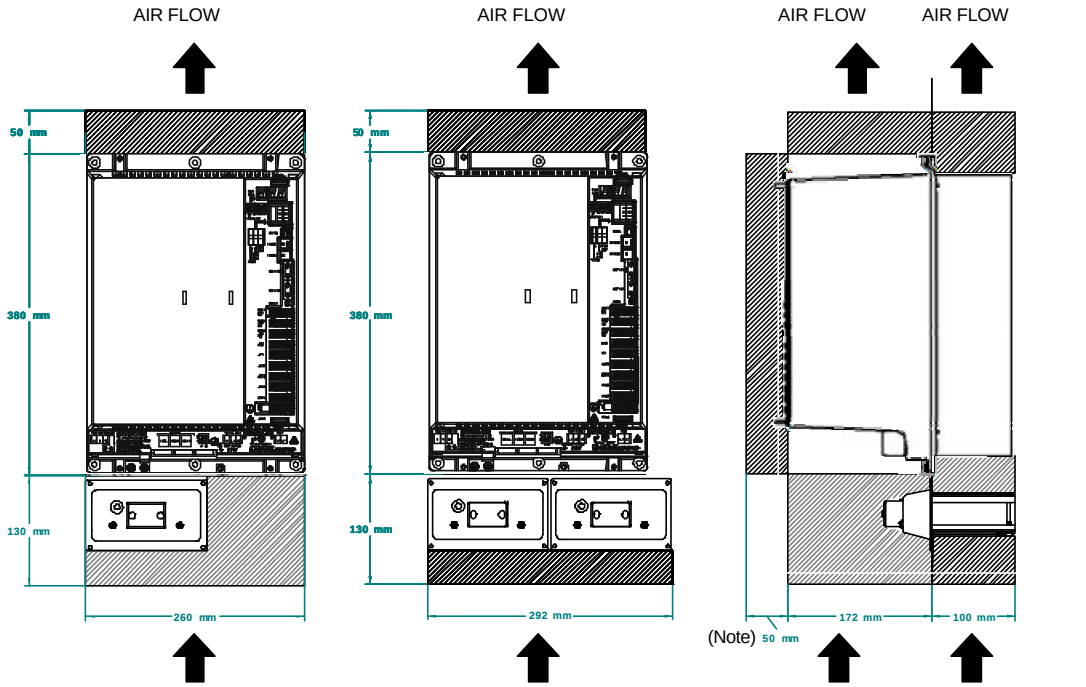
(NOTE) When a right-angle type cable connector is used (+30 mm when a straight type cable connector is used)

(2) When a fan unit used (placed on top of the servo amplifier)



(NOTE) When a right-angle type cable connector is used (+30 mm when a straight type cable connector is used)

(3) When a fan unit used (placed below the servo amplifier)



(NOTE) When a right-angle type cable connector is used (+30 mm when a straight type cable connector is used)

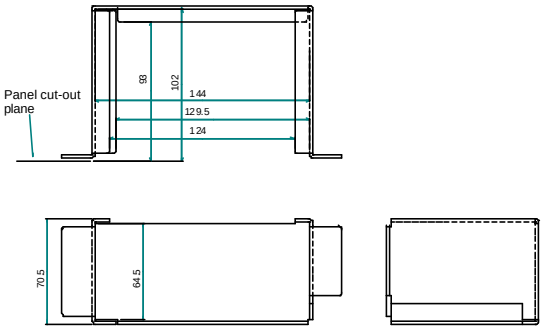
4.4 DUCT

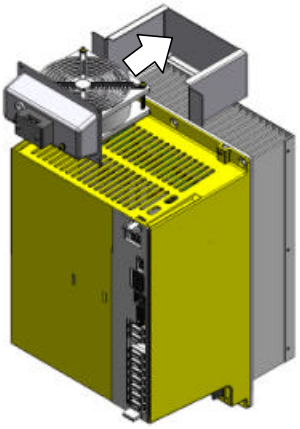
Shown below is an example duct structure where a FANUC fan unit (A06B-6134-K001) is used.

NOTE

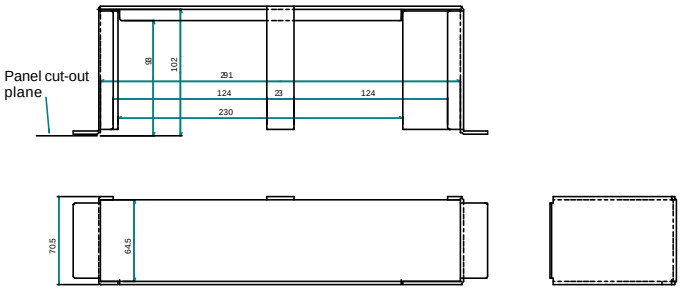
1 Install a duct having the shape shown below between the fan unit and heat sink to provide a ventilation flue.
2 Weld the duct to the cabinet.
3 If the fan unit is placed below the servo amplifier, no duct is needed.

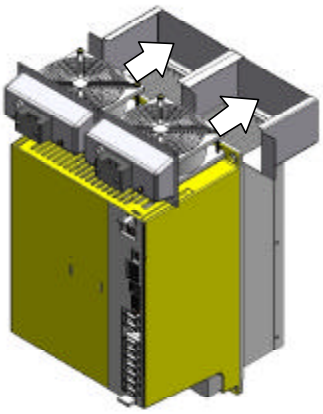
(1) When one fan unit is used

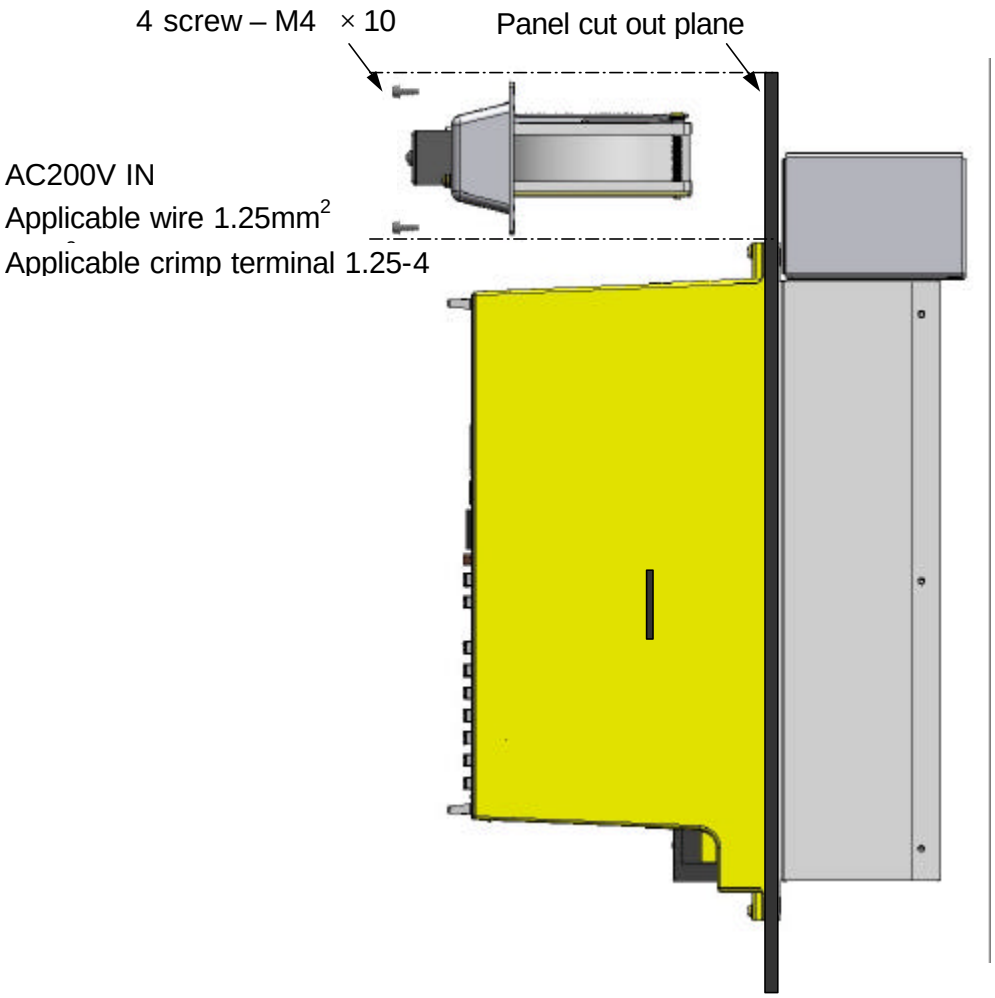




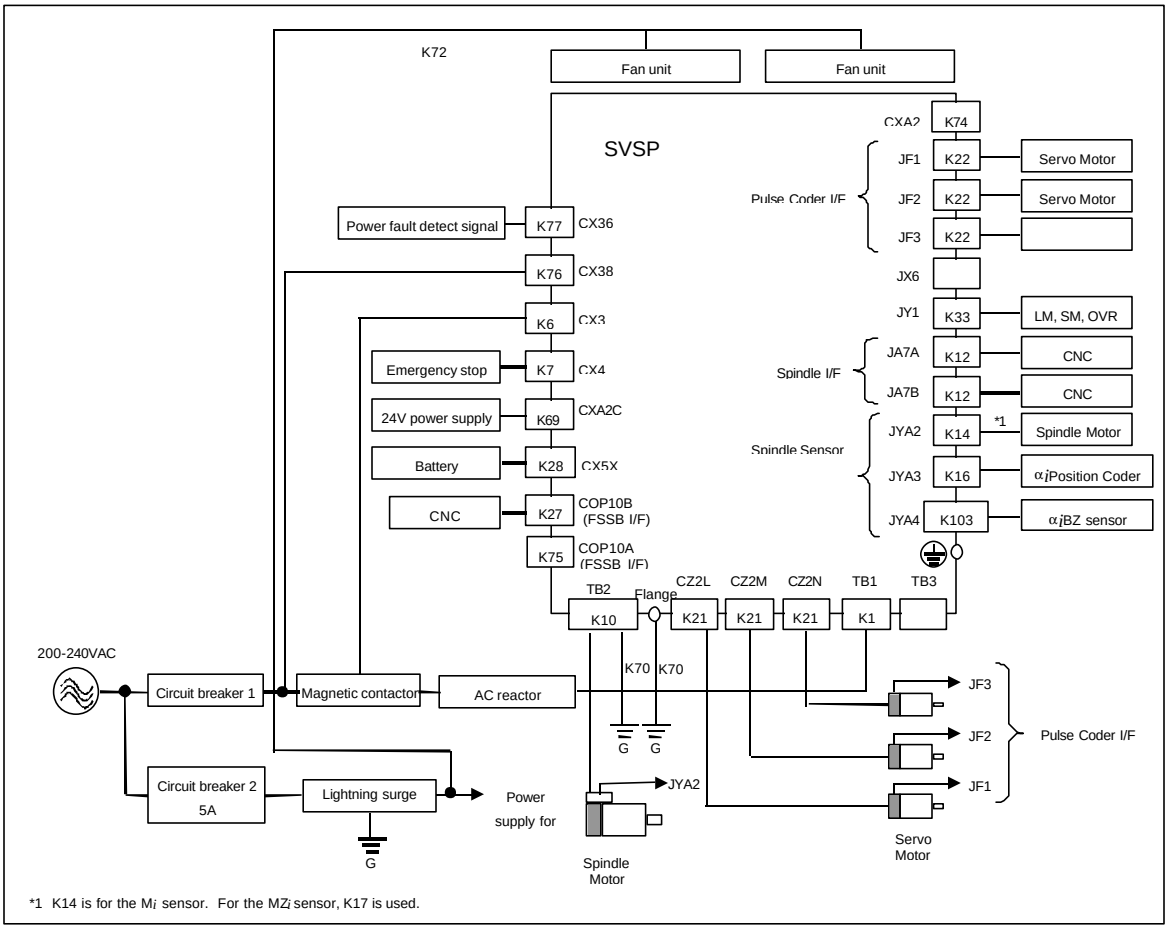
(2) When two fan units are used






4 screw – M4 × 10
Panel cut out plane
AC200V IN
Applicable wire 1.25mm2
Applicable crimp terminal 1.25-4

5. Total connection diagram



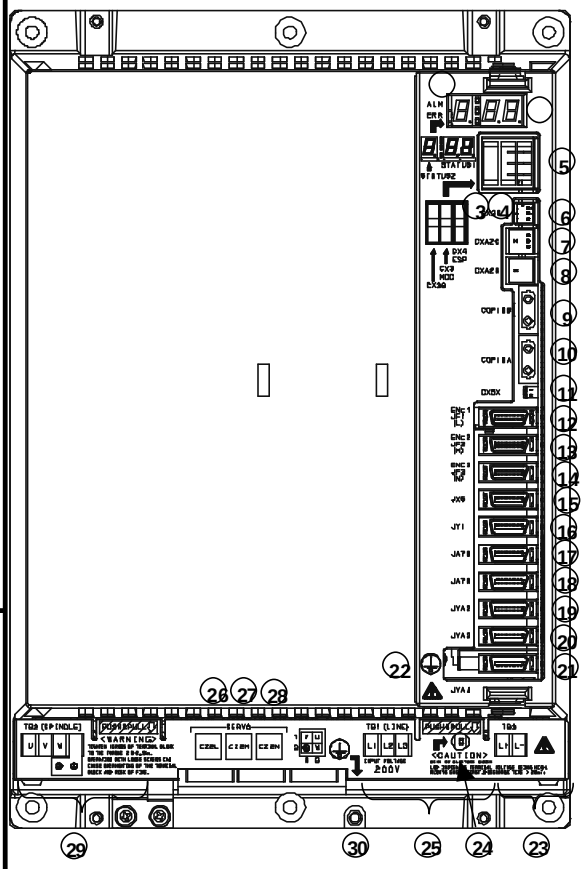
NOTE

1 Always install the circuit breakers, magnetic contactor, and AC reactor.

2 To protect the equipment from lightning surge voltages, install a lightning surge absorber across each pair of power lines and across each power line and the grounding line at the power inlet of the power magnetic cabinet.

3 Be sure to connect the grounding terminal (G) on TB2 to a substantial ground.

5.1 Connector location diagram



No.	Name	Remarks
1	STATUS1	Status LED: spindle
2	STATUS2	Status LED: servo
3	CX38	AC input voltage (For Power failure detect)
4	CX3	Main power MCC control signal
5	CX4	Emergency stop signal (ESP)
6	CX36	Outout signal (For Power failure detect)
7	CXA2C	24VDC power input
8	CXA2A	24VDC power output
9	COP10B	Servo FSSB I/F
10	COP10A	Servo FSSB I/F
11	CX5X	Absolute Pulse coder battery
12	JF1	Pulse coder: L axis
13	JF2	Pulse coder: M axis
14	JF3	Pulse coder: N axis
15	JX6	Power outage backup module
16	JY1	Load meter, speedometer, analog override
17	JA7B	Spindle interface input
18	JA7A	Spindle interface output
19	JYA2	Spindle sensor αiM, αiMZ
20	JYA3	α Position coder External one-rotation signal
21	JYA4	Connector for separate spindle sensor
22	⏚	Earth terminal (Fro signal)
23	TB3	DC link terminal block
24	V4	DC link charge LED (Warning)
25	TB1	Main power supply connection terminal board
26	CZ2L	Servo motor power line: L axis
27	CZ2M	Servo motor power line: M axis
28	CZ2N	Servo motor power line: N axis
29	TB2	Spindle motor power line
30	⏚	Tapped hole for grounding the flange

⚠ WARNING

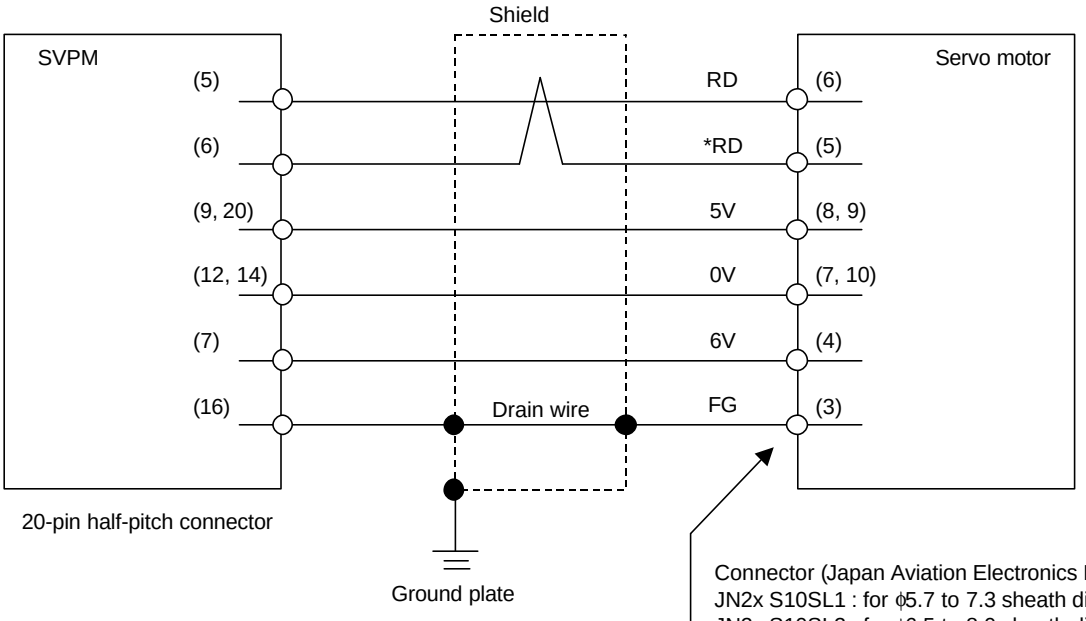
Do not touch any component in the module or any connected cable when item24 "DC LINK charge LED" is on, because it is dangerous.

5.2 Details of connection

5.2.1 Details of K22

The cable K22 is used to connect the SVPM and Pulse coder of βiS servo motor.

For servo motor βiS series (βiS2/4000 to βiS22/3000)



Connector (Japan Aviation Electronics Industry)
JN2x S10SL1 : for φ5.7 to 7.3 sheath diameter
JN2x S10SL2 : for φ6.5 to 8.0 sheath diameter
D : Straight plug
F : Angle plug
Contact (Japan Aviation Electronics Industry)
JN1-22-22S

Using cable conductor

Signal name	Cable length: 28m or less	Cable length: 50m or less
5V, 0V, 6V	$0.3mm^2 \times 5$ (Note 4) Wire construction 12/0.18 or 60/0.08 Insulation outer diameter φ0.8 to φ1.5	$0.5mm^2 \times 5$ (Note 4) Wire construction 20/0.18 or 104/0.08 Insulation outer diameter φ0.8 to φ1.5
RD, *RD	$0.18mm^2$ or more Twisted-pair wire Insulation outer diameter φ0.8 to φ1.5	$0.18mm^2$ or more Twisted-pair wire Insulation outer diameter φ0.8 to φ1.5
Drain wire	$0.15mm^2$ or more	$0.15mm^2$ or more

See Subsection 5.4.1 for explanations about the SVPM-side connector that matches the recommended cable.

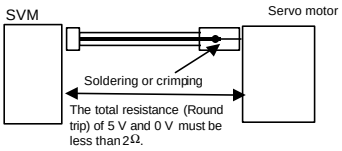
NOTE

1 The ground plate to which the shield is connected must be placed as close as possible to the servo amplifier so that distance between the ground plate and the servo amplifier becomes shortest.

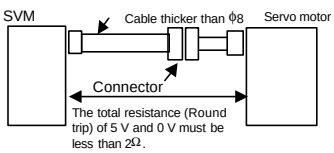
2 In case that the cable is prepared by MTB, total resistance of 5V and 0V must be less than 2Ω.

3 Pulse coder side connector can accept maximum 0.5mm^2 (wire construction 20/0.18 or 104/0.08, diameter ϕ1.5 or less) wire and sheath diameter is ϕ5.7 to ϕ8.0. In case of using thicker wire or cable, take measures described below.

[Case 1] Cable conductor exceeds 0.5mm^2.



[Case 2] Sheath diameter of exceeds ϕ8.



4 In case of incremental Pulse coder, 6V is not necessary to be connected.

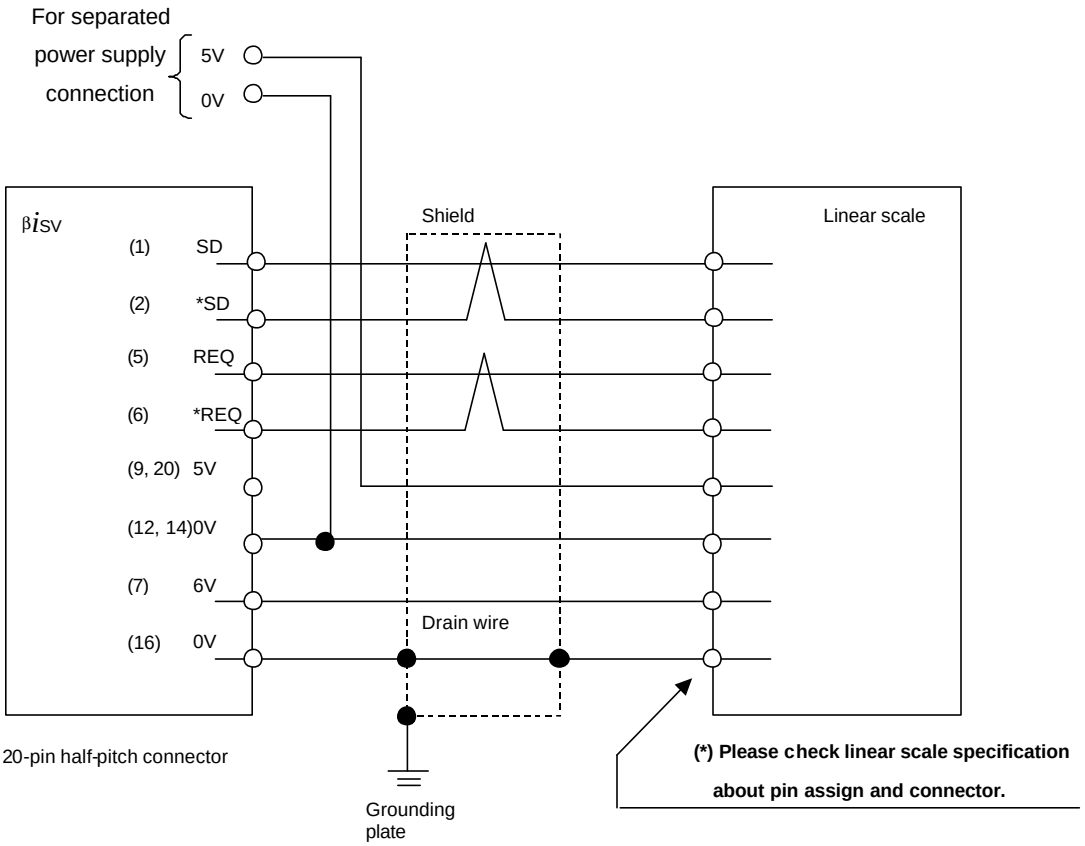
- Crimp tool specification
  A06B-6114-K201/JN1S: For 0.3 mm^2
  A06B-6114-K201/JN1L: For 0.18 mm^2 or 0.5 mm^2

- Connector kit specification
  A06B-6114-K204/S: Straight plug (including a contact)
  A06B-6114-K204/E: Elbow plug (including a contact)

- Recommended cable
  A66L-0001-0460: Flexible cable 28m or less long
  A66L-0001-0462: Flexible cable 50m or less long
  A66L-0001-0481: Fixed cable 28m or less long
  A66L-0001-0491: Fixed cable 50m or less long

[In case of connection with third party detection]

The appliable output current of βiSVSP is 0.35A. So, please prepare other regulated powwr supply, if the supply current of third party detection is more than 0.35A. And in this case, please note follows.



[Power-on/ Power-off sequence]

(1) Power-on sequence

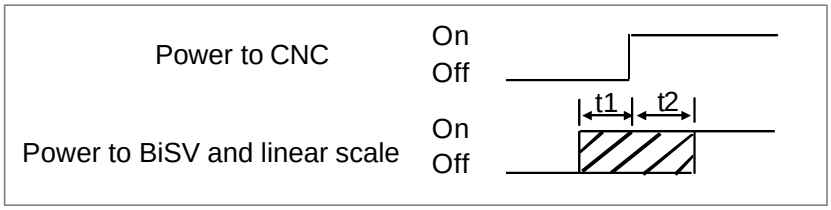
Turn on the power to CNC, βiSVSP and linear scale at the same time, or in the following sequence:

1.Power to βiSVSP and linear scale

2.Power to CNC

(Note)

When the following power-on timing condition is satisfied, the power to βiSVSP and linear scale assume to be turned on simultaneously when the power to CNC is turned on.



t1: 200ms

Means that the power to βiSVSP and linear scale is turned on within 200 ms before the power to CNC is turned on.

t2: 500ms

Means that the power to βiSVSP and linear scale is turned on within 500 ms after the power to CNC is turned on.

(2) Power-off sequence

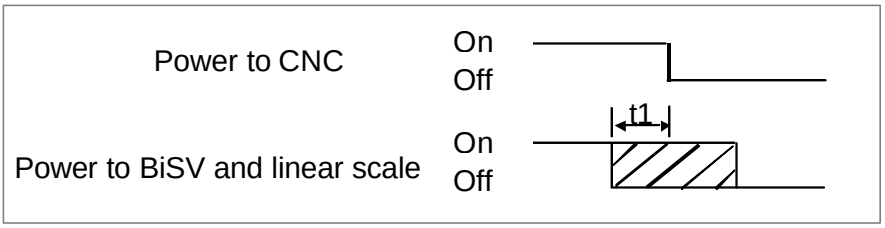
Turn off the power to CNC, βiSVSP and linear scale at the same time, or in the following sequence:

1.Power to CNC

2.Power to BiSV and the linear scale

(Note)

When the following power-off timing condition is satisfied, the power to BiSV and linear scale is assumed to be turned off simultaneously when the power to CNC is turned off.



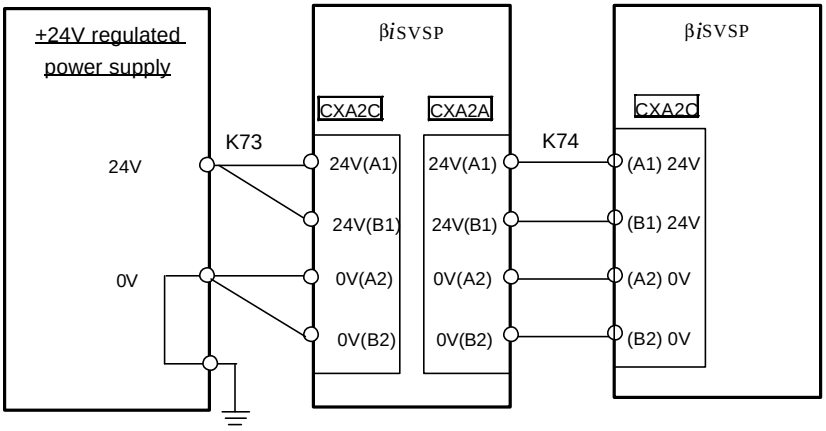
t1: 500ms

Means that the power to BiSV and linear scale is turned off within 500 ms before the power to CNC is turned off.

5.2.2 Details of K73, K74

Refer to K69 in case of 1unit of βiSVSP.

In case of 2 units of βiSVSP, please connect as follows.



K73	Connector	Manufactured by Tyco Electronics AMP D-2100 series Hausing(X key): 1-1318119-4 (1 pcs.) Contact(Msize): 1318107-1 (4 pcs.)
	Cable	Wire size: 0.5mm^2, AWG20 Instruction outer diameter : 1.11-1.87 mm
	Applied tool	91558-1
K74	Connector	Manufactured by Tyco Electronics AMP D-2100 series Hausing(X key): 1-1318119-4 (2 pcs.) Contact(Msize): 1318107-1 (8 pcs.)
	Cable	Wire size: 0.5mm^2, AWG20 Instruction outer diameter: 1.11-1.87 mm
	Applied tool	91595-1

NOTE

The maximum current of contact for “K73, K74” is 4.0A.

[The ordering number of connector and applied tool]

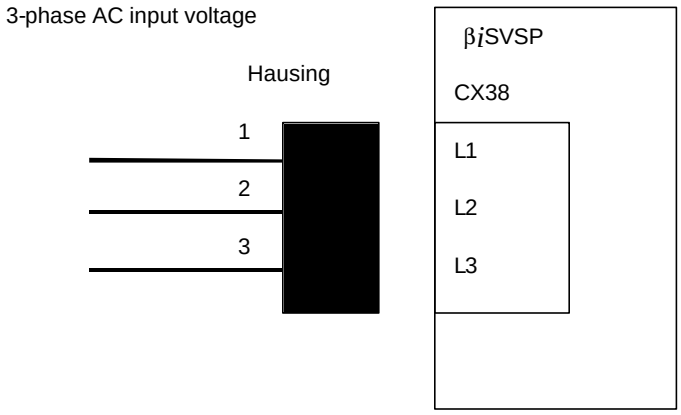
It is possible to order connector (hausing and contact) and applied tool from FANUC and Tyco Electronics AMP. In case of FANUC, the ordering numbers are as follows.

Orderinf number	Contact
A06B-6134-K202 (For K6, K7, K73) (NOTE)	Manufactured by Tyco Electronics AMP D-3200 series Hausing(Y key): 2-178128-3 (1 pcs.) Contact(L size): 1-175218-2 (2pcs.) Applied tool: 91558-1 (not included) Manufactured by Tyco Electronics AMP D-3200 series Hasusing(X key): 1-178128-3 (1 pcs.) Contact(L size): 1-175218-2 (2pcs.) Applied tool : 91558-1 (not included) Manufactured by Tyco Electronics AMP D-2100 series Hausing (X key): 1-1318119-4 (1 pcs.) Contact(M size): 1318107-1 (4 pcs.) Applied tool: 91595-1(not included)
A06B-6134-K203 (2 pieces necessary for K74)	Manufactured by Tyco Electronics AMP D-2100 series Hausing (X key): 1-1318119-4 (1 pcs.) Contact(M size): 1318107-1 (8 pcs.) Applied tool: 91595-1(not included)

(NOTE) In case of 2 units βiSVSP

In case of 1 unit βiSVSP, Please select ordering number" A06B-6134-K201"

5.2.3 Details of K76



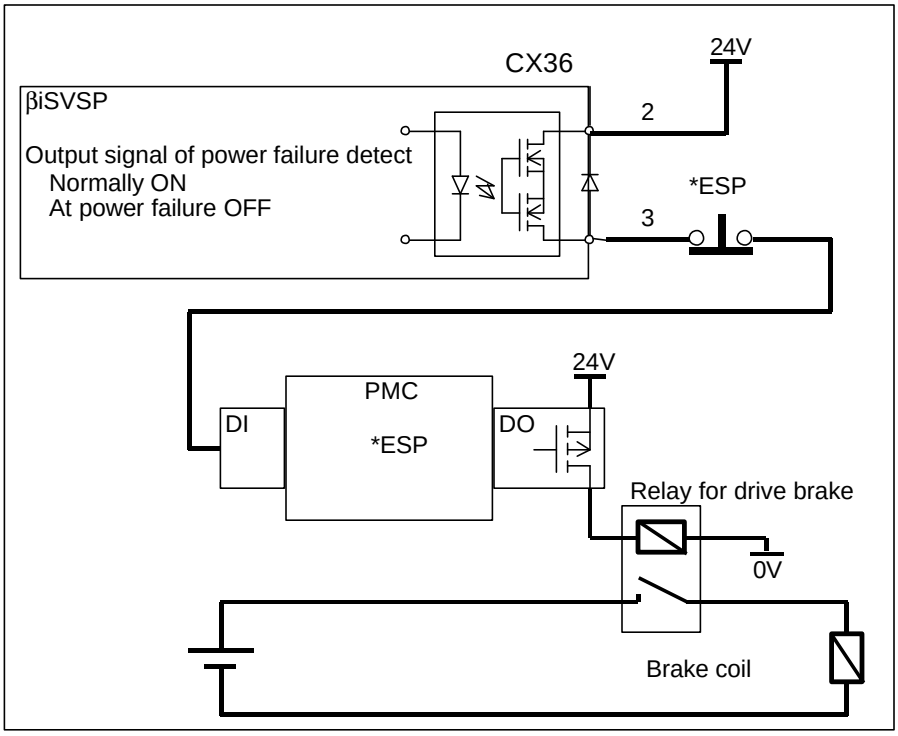
Connector	Manufactured by Tyco Electronics AMP D-3200 series Hausing(Z key): 3-178128-3 (1 pcs.) Contact (L size): 1-175218-2 (3 pcs.)
Cable	Wire size: 1.25mm^2,(50/0.18) PVC9.6f
Applied tool	91558-1

[The ordering number of connector and applied tool]

It is possible to order connector (hausing and contact) and applied tool from FANUC and Tyco Electronics AMP. In case of FANUC, the ordering numbers are as follows.

Ordering number	Contact
A06B-6134-K204 (For K76, K77)	Manufactured by Tyco Electronics AMP D-3200 series Hassing (Z key): 3-178128-3 (1 pcs.) Contact (L size) 1-175218-2 (3pcs.) Applied tool: 91558-1(not included) Manufactured by Tyco Electronics AMP D-2100 series Hasusing (Y key): 2-1318120-3 (1pcs.) Contact(M size): 1318107-1 (2pcs.) Applied tool: 91595-1 (Not included)

5.2.4 Details of K77



The specification of CX36 (Rated output)

Maximum rated voltage 30V / Maximum rated current 200mA

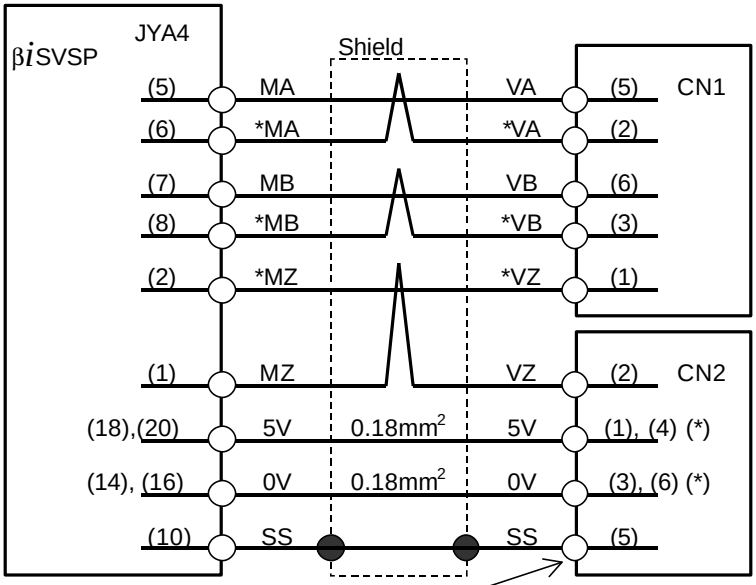
Connector	Manufactured by Tyco Electronics AMP D-2100 series Hasusing (Y key): 2-1318120-3 (1 pcs.) Contact (M size): 1318107-1 (2 pcs.)
Cable	Wire size: 0.5mm^2, AWG20 Instruction outer diameter: 1.11-1.87 mm
Applied tool	: 91595-1

[The ordering number of connector and applied tool]

It is possible to order connector (hausing and contact) and applied tool from FANUC and Tyco Electronics AMP. In case of FANUC, the ordering numbers are as follows. Please refer to K76

5.2.5 Details of K103

(1) In case of αiBZ sensor (Current type A860-2120-T***) and αiBZ sensor (small type A860-2155-T***)



20-pin half-pitch connector

Crimp terminal M4

(*) In case of aiBZ sensor (A860-2155-T***) pin numbers (1) and (3) are non-connection.

CN1, CN2: manufactured by HONDA
Connector: Z-374
Contact: HKP-F413

Cable specification:

Shielded cable with 4 pieces of 0.18mm^2 twisted pairs and 4 pieces of 0.18mm^2 wire

Recommended cable conductor: A66L-0001-0367

NOTE

If only one 5 V line and only one 0 V line are used, use pins 20 and 16 for them, so that, if the connector is attached the wrong way, the sensor can be prevented from being damaged.

Connector pin assignment

Pin assignment of the connector CN1 (manufactured by Honda Tsushin Kogyo Co., Ltd.) on the motor side

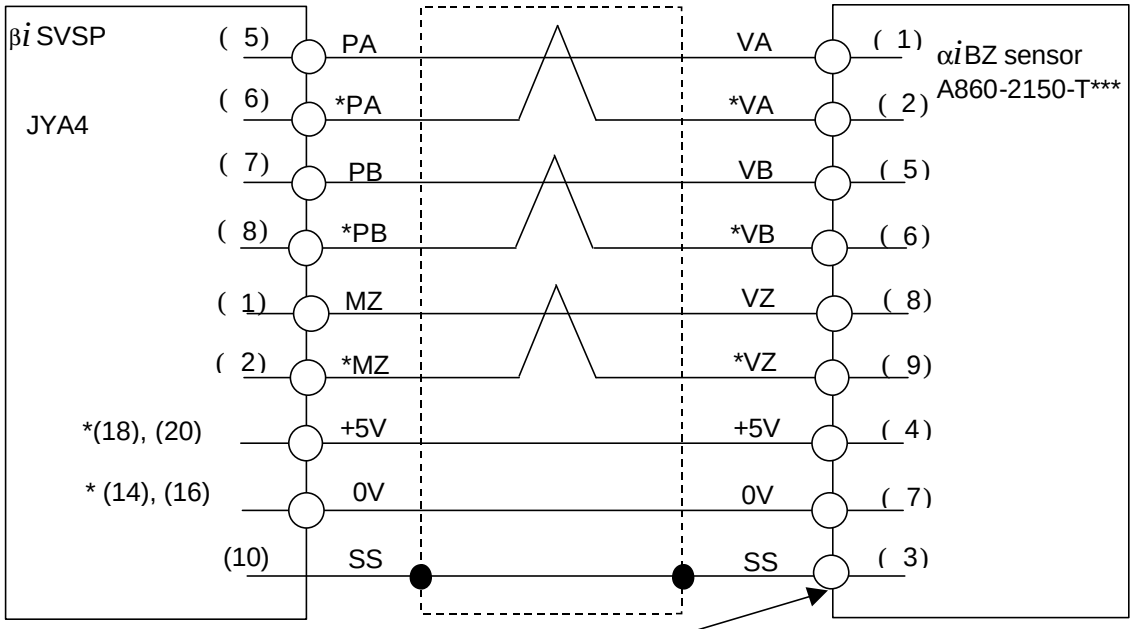
1	*VZ	4	
2	*VA	5	VA
3	*VB	6	VB

Pin assignment of the connector CN2 (manufactured by Honda Tsushin Kogyo Co., Ltd.) on the motor side

1	5V	4	5V
2	VZ	5	SS
3	0V	6	0V

(*) In case of aiBZ sensor (A860-2155-T***) pin numbers (1) and (3) are non-connection.

(2) αiBZ sensor (small type A860-2150-T***)



20-pin half-pitch connector

Connector (Japan Aviation Electronics)
JN2DS10SL1: applicable sheath diameter f 5.7-f 7.3
JN2DS10SL2: applicable sheath diameter f 6.5-f 8.0
Contact (Japan Aviation Electronics)
JN1-22-22S(signal line)
JN1-22-20S(power line)

Recommended cable: A66L-0001-0482

Cable length	28m or shorter
5V, 0V	0.3mm^2 (Connected to one of the line with *)
VA, *VA, VB, *VB, VZ, *VZ	3 pieces of 0.2mm^2 twisted pairs

- Specifications of crimping tools

  A06B-6114-K201/JN1S (for 0.3mm^2 wire)

  A06B-6114-K201/JN1L (for 018mm^2 and 0.5mm^2 wire)

- Specification of connector kit

  A06B-6114-K204/S (straight plug including contacts)

Connector pin assignment

Pin assignment of the connector (manufactured Japan Aviation Electronics) on sensor head side

1	VA
2	*VA
3	SS
4	5V
5	VB
6	*VB
7	0V
8	VZ
9	*VZ
10	

6. HEAT DISSIPATION

The amount of heat generated in an SVSP series depending on its model, the current flowing through the motor, and the motor output. (Refer to the respective motor description manuals for the current and output of each motor.)

6.1 Total amount of heat dissipation

The total amount of heat dissipation by the SVSP is calculated according to the following expression:

Total amount of heat dissipation
= a Ka1xb1 + Ka2xb2 + Ka3xb3+ Ka4xb4++ Ka5xb5

a: Amount of heat dissipation determined by the SVSP model [W]
Ka1 to Ka5: Coefficient determined by the SVSP
b1: Total output of motors connected to the SVSP [kW]
b2: Current flowing through the spindle motor [Arms]
b3: Current flowing through the servo motor of L-axis [Arms]
b4: Current flowing through the servo motor of M-axis [Arms]
b5: Current flowing through the servo motor of N-axis [Arms]

SVSP (total amount of heat dissipation)

Name	Specification	a [W]	Coefficient	
For βiSVSP20/20-7.5	A06B-6164-H201#H580 A06B-6165-H201#H560	48	Ka1	14.3
			Ka2	5.8
			Ka3	5.0
			Ka4	5.0
For βiSVSP20/20-11	A06B-6164-H202#H580 A06B-6165-H202#H560	48	Ka1	14.3
			Ka2	5.4
			Ka3	5.0
			Ka4	5.0
For βiSVSP40/40-15	A06B-6164-H223#H580 A06B-6165-H223#H560	48	Ka1	13.1
			Ka2	5.5
			Ka3	4.6
			Ka4	4.6

SVSP (total amount of heat dissipation)

Name	Specification	a [W]	Coefficient	
For βiSVSP20/20/40-7.5	A06B-6164-H311#H580 A06B-6165-H311#H560	48	Ka1	14.3
			Ka2	5.8
			Ka3	5.0
			Ka4	5.0
			Ka5	4.6
For βiSVSP20/20/40-11	A06B-6164-H312#H580 A06B-6165-H312#H560	48	Ka1	14.3
			Ka2	5.4
			Ka3	5.0
			Ka4	5.0
			Ka5	4.6
For βiSVSP40/40/40-15	A06B-6164-H333#H580 A06B-6165-H333#H560	48	Ka1	13.1
			Ka2	5.5
			Ka3	4.6
			Ka4	4.6
			Ka5	4.6
For βiSVSP40/40/80-15	A06B-6164-H343#H580 A06B-6165-H343#H560	48	Ka1	13.1
			Ka2	5.5
			Ka3	4.6
			Ka4	4.6
			Ka5	4.3

AC reactor

Name	Ordering number	Rated output	Total amount of heat dissipation
For βiSVSP20/20-7.5 For βiSVSP20/20/40-7.5	A81L-0001-0155	7.5kW	24W
For βiSVSP20/20-11 For βiSVSP20/20/40-11		11kW	38W
For βiSVSP40/40-15 For βiSVSP40/40/40-15 For βiSVSP40/40/80-15	A81L-0001-0156	15kW	50W

6.2 Residual amount of heat in the cabinet

By placing the heat sink section of the SVSP outside the cabinet, the residual amount of heat in the cabinet can be calculated according to the expression below.

Residual amount of heat in the cabinet
= a + Ka1×b1 + Ka2×b2 + Ka3×b3 + Ka4×b4

a: Amount of heat dissipation determined by the SVSP model [W]
Ka1 to Ka4: Coefficient determined by the SVSP
b1: Total output of motors connected to the SVSP [kW]
b2: Current flowing through the spindle motor [Arms]
b3: Current flowing through the servo motor of L-axis [Arms]
b4: Current flowing through the servo motor of M-axis [Arms]
b5: Current flowing through the servo motor of N-axis [Arms]

SVPM (residual amount of heat in the cabinet)

Name	Specification	a [W]	Coefficient	
βiSVSP20/20-7.5	A06B-6164-H201#H580 A06B-6165-H201#H560	48	Ka1	2.1
			Ka2	0.9
			Ka3	0.8
			Ka4	0.8
βiSVSP20/20-11	A06B-6164-H202#H580 A06B-6165-H202#H560	48	Ka1	2.1
			Ka2	0.8
			Ka3	0.8
			Ka4	0.8
βi40/40-15	A06B-6164-H223#H580 A06B-6165-H223#H560	48	Ka1	1.3
			Ka2	0.6
			Ka3	0.5
			Ka4	0.5

SVPM (residual amount of heat in the cabinet)

Name	Specification	a [W]	Coefficient	
βiSVSP 20/20/40-7.5	A06B-6164-H311#H580 A06B-6165-H311#H560	48	Ka1	2.1
			Ka2	0.9
			Ka3	0.8
			Ka4	0.8
			Ka5	0.7
βiSVSP 20/20/40-11	A06B-6164-H312#H580 A06B-6165-H312#H560	48	Ka1	2.1
			Ka2	0.8
			Ka3	0.8
			Ka4	0.8
			Ka5	0.7
βiSVSP 40/40/40-15	A06B-6164-H333#H580 A06B-6165-H333#H560	48	Ka1	1.3
			Ka2	0.6
			Ka3	0.5
			Ka4	0.5
			Ka5	0.5
βiSVSP 40/40/80-15	A06B-6164-H343#H580 A06B-6165-H343#H560	48	Ka1	1.3
			Ka2	0.6
			Ka3	0.5
			Ka4	0.5
			Ka5	0.5

7. Detectors

Please refer to section “Detectors” of FANUC SERVO AMPLIFIER αi series DESCRIPRIONS (B-65282EN)

Compatibility with current βiSVSP series and βiSVSP for Series 0i/0i Mate-MODEL D

1. Type of applied documents

Name	FANUC SERVO AMPLIFIER βi series DESCRIPTIONS
Spec. No./Ver.	B-65322EN/02

2. Summary of Change

Group	Name / Outline	New, Add Correct, Del	Applicable Date
Basic Function			
Optional Function			
Unit			
Maintenance Parts			
Notice	Compatibility with current βiSVSP and βiSVSP for Series 0i/0i Mate-MODEL D	New	2009.4
Correction			
Another			

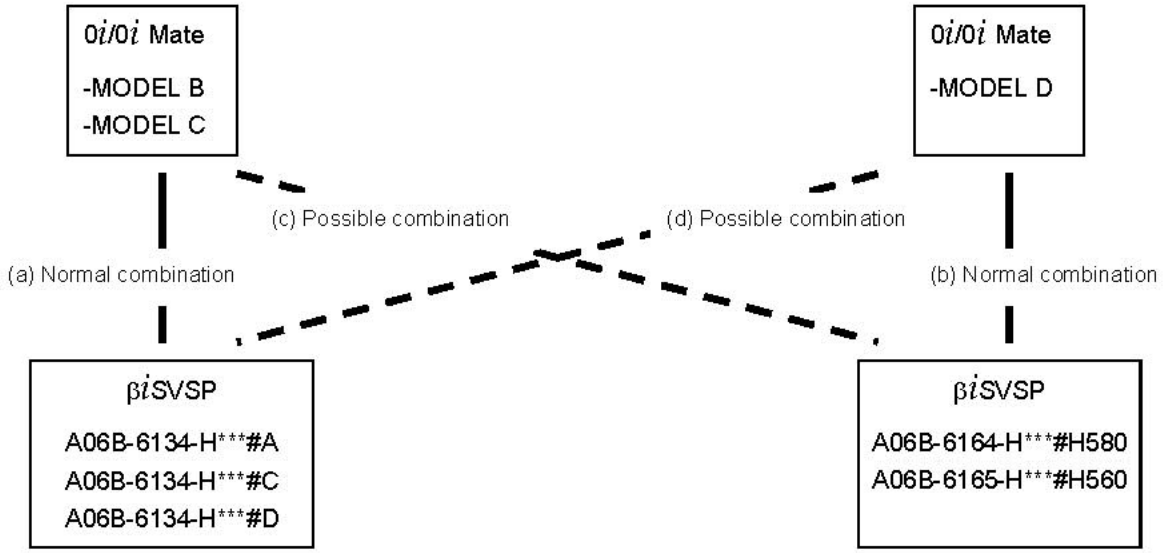
βiSVSP for Series 0i/0i Mate-MODEL D was released in July 2008. And the Conversion table is as follows.

Regarding with difference between βiSVSP for Series 0i/0i Mate-MODEL D and current βiSVSP (A06B-6134-H***#A or #C), please refer to technical report (TMS08/016).

Conversion table

Current βiSVSP	→	βiSVSP for Series 0i/0i Mate-MODEL D
A06B-6134-H201#A A06B-6134-H201#D	→	A06B-6164-H201#H580
A06B-6134-H202#A A06B-6134-H202#D	→	A06B-6164-H202#H580
A06B-6134-H203#A A06B-6134-H203#D	→	A06B-6164-H223#H580
A06B-6134-H301#A A06B-6134-H301#D	→	A06B-6164-H311#H580
A06B-6134-H302#A A06B-6134-H302#D	→	A06B-6164-H312#H580
A06B-6134-H303#A A06B-6134-H303#D	→	A06B-6164-H333#H580
A06B-6134-H313#D	→	A06B-6164-H343#H580
A06B-6134-H201#C	→	A06B-6165-H201#H560
A06B-6134-H202#C	→	A06B-6165-H202#H560
A06B-6134-H203#C	→	A06B-6165-H223#H560
A06B-6134-H301#C	→	A06B-6165-H311#H560
A06B-6134-H302#C	→	A06B-6165-H312#H560
A06B-6134-H303#C	→	A06B-6165-H333#H560
		A06B-6165-H343#H560

Compatibility with CNC (0*i*/0*i* Mate) and servo amplifier β*i*SVSP.



(a) (b) This is normal combination.
(c) This is possible combination.
(d) This is possible combination by adding special parameter setting. And the specification is restricted in this combination. Please refer to following section (1) in details.

(1) Details of (d)

Setting and note of servo axis in β*i*SVSP

Setting to Series 0*i*/ 0*i* Mate-MODEL C mode is necessary. Please input following parameter.

Series 0*i*/ 0*i* Mate-MODEL C mode shall be set as follows.

14476#0=1 Series 0*i*/ 0*i* Mate-MODEL C mode

Power off/ on

(Note)

The maximum connectable number per 1 FSSB line is as follows.

- Up to 4 axes is connectable in case of servo control (HRV3).
- Up to 8 axes is connectable in case of servo control (HRV2).

Note of spindle axis in β*i*SVSP

Following series and editions of spindle software is applicable to support interface such as position control (rigid tapping etc.) between Series 0*i*/0*i* Mate-MODEL D and β*i*SVSP.

- Series and editions of spindle software

9D50/ Edition V(=Edition 22) ~ Edition Y(=Edition 25)

9D5A/ Edition A(=Edition 01)

And Dual Check Safety is not applied.

(Note) Spindle output power of βiSVSP is upped from 5.5KW to 7.5KW as following table.

Drawing number of βiSVSP	Output power of spindle axis
A06B-6134-H201#A A06B-6134-H201#C	5.5KW
A06B-6134-H201#D	7.5KW
A06B-6164-H201#H580 A06B-6164-H311#H580 A06B-6165-H201#H560 A06B-6165-H311#H560	7.5KW

Therefore, spindle model code is changed by driving with 7.5KW model of βiSVSP.

	Model code of spindle motor		
Drawing number of βiSVSP	βiI3/10000	βiIP 8/6000	βiIP 12/6000
A06B-6134-H201#D	336	(*1)	(*1)
A06B-6164-H201#H580 A06B-6164-H311#H580	336	(*1)	(*1)

(*1) Please refer to next page.

	Model code of spindle motor
Drawing number of βiSVSP	βiI3/6000
A06B-6165-H201#H560 A06B-6165-H311#H560	252

(*1) Parameter table of βi_{IP} 8/6000 and βi_{IP} 12/6000

Motor model		βi IP 8/6000	βi IP 12/6000
Applicable amplifier		βi SVSPx-7.5	βi SVSPx-7.5
Model code		—	—
4007		00000000	00000000
4008		00010000	00010000
4009		00000000	00000000
4010		00010000	00010000
4011		00001010	00001010
4012		10000000	10000000
4013		00001100	00001100
4019		00000100	00000100
4020		6000	6000
4039		0	0
4080		16474	18000
4083		30	30
4100		800	800
4101		65	78
4102		1345	1059
4103		0	0
4104		4500	5000
4105		0	0
4106		7500	11000
4107		0	0
4108		0	0
4109		25	25
4110		1106	1302
4111		503	403
4112		200	200
4113		730	780
4114		23552	20480
4115		100	100
4116		6255	6000
4117		90	90
4118		100	100
4119		13	12
4120		0	0
4124		0	0
4127		164	150
4128		110	0
4129		0	0
4130		25700	25700
4134		110	110
4169		0	0

[Parameter setting procedure]

(1) Load parameters automatically with the model code 300.

Note) If you don't want to initialize adjusted parameters, you should not load parameters automatically.

(2) Change parameters manually according to the table.

(3) Set sensor parameters according to the sensor system.

(4) Set parameter No.4090 to 95(βi spindle motor standard).

(5) Power off/on to activate the SPINDLE HRV Control parameters surely.

FANUC SERVO AMPLIFIER βiSV 40/40 DESCRIPTIONS

1. Type of applied documents

Name	FANUC SERVO AMPLIFIER βi series DESCRIPTIONS
Spec. No./Ver.	B-65322EN/02

2. Summary of Change

Group	Name / Outline	New, Add Correct, Del	Applicable Date
Basic Function	Addition of βiSV 40/40	New	2009. 7
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another			

This is 2-axis βiSV for Series 0i/0i Mate.

This document describes only changed or added specifications from current model.
Therefore please refer the specifications which are not described in this document to FANUC SERVO AMPLIFIER βi series DESCRIPTIONS B-65322EN.

A. Parameter setting

Setting for Series 0i/ 0i Mate-MODEL C mode is necessary. In case of combination with Series 0i/ 0i Mate-MODEL D, please set following parameter.

14476#0=1 Series 0i / 0 i Mate-MODEL C mode

Power off/ on

(Note)
The maximum connectable number per 1 FSSB line is as follows.
- Up to 4 axes is connectable in case of servo control (HRV3).
- Up to 8 axes is connectable in case of servo control (HRV2).

B. DYNAMIC BRAKE

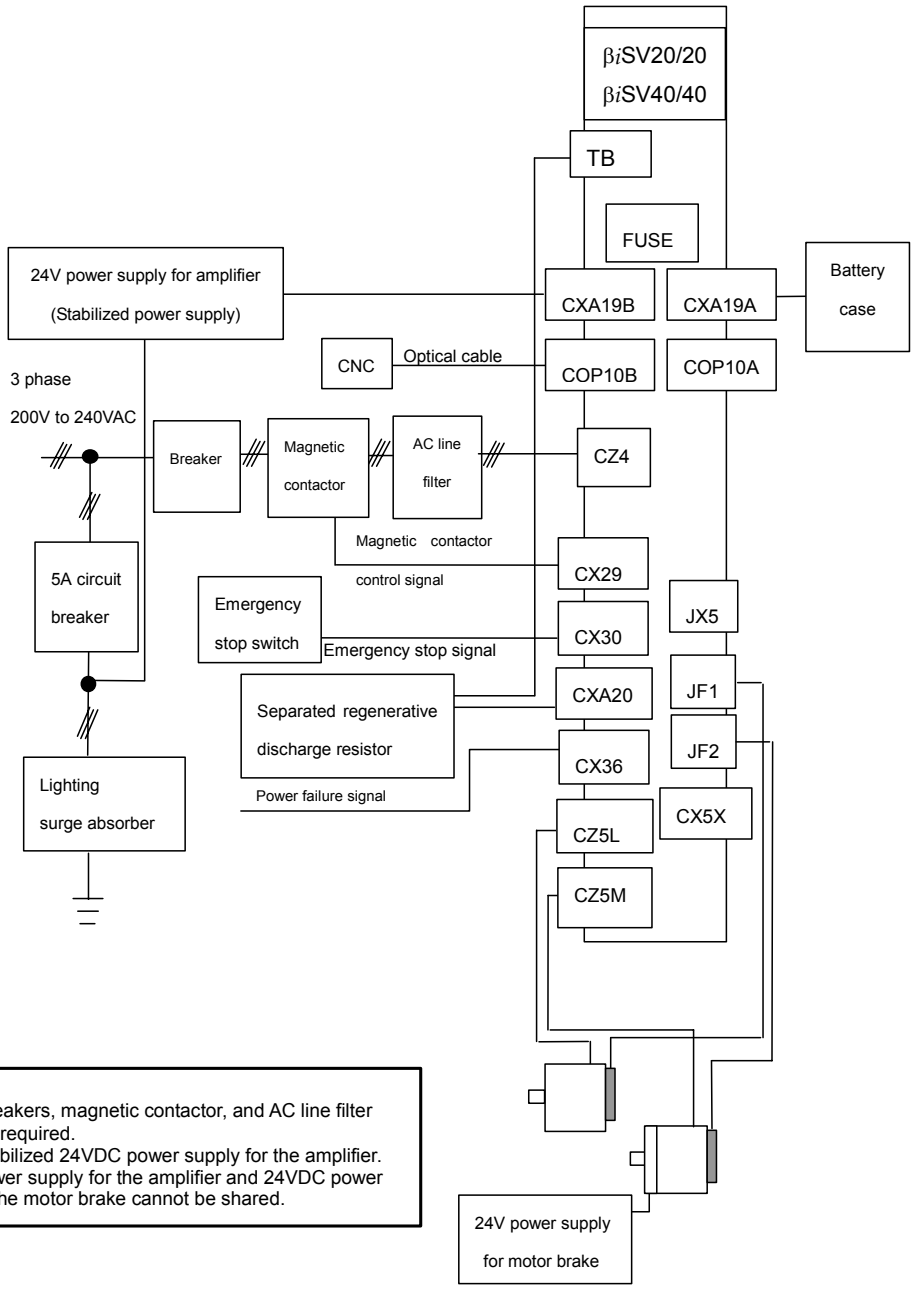
In case of using L axis and M axis of βiSV40/40, the distance of dynamic brake becomes long as compared with other model (βiSV40). Please use the following coefficients for calculation of the distance of dynamic brake in the case of using L axis and M axis of βiSV40/40. Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262JA/05 about the details of calculation.

Motor Model	SI unit		CGS unit	
	A	B	A	B
αiF4/4000	8.3E-02	1.6E-07	8.1E-03	1.5E-08
αiF8/4000	3.3E-02	9.7E-08	3.3E-03	9.5E-09
βiS12/3000	1.9E-02	2.5E-08	1.9E-03	2.4E-09
βiS22/2000	0.0078	3.5E-08	0.00076	3.5E-09

1. Ordering number

Model	Orderin number
βiSV 40/40	A06B-6136-H203

2. Configuration



CAUTION
1 A circuit breakers, magnetic contactor, and AC line filter are always required.
2 Use the stabilized 24VDC power supply for the amplifier. 24VDC power supply for the amplifier and 24VDC power supply for the motor brake cannot be shared.

3. Specification

Item		βi SV 40/40
Interface		FSSB
Unit Designation		A06B-6136-H203
Power P.C.B.		A16B-3200-0643
Control P.C.B.		A20B-2101-0290
Main Power For Three Phase Supply	Input Voltage	AC 200-240 V (+10%,-15%) 50 / 60 Hz
	Current at 50Hz	13Arms
	Rated Capacity	4.8kVA
Control Power supply	Input Voltage	DC 24 V (+10%, -10%)
	Input Current	0.8 A
Rated Output Current	L-Axis	13Arms
	M-Axis	13Arms
Current Limit Value	L-Axis	40 Ap
	M-Axis	40 Ap
Servo control		HRV2, HRV3
Main Circuit Control Method		Sine Wave PWM Control with Transistor Bridges
Servo output frequency range		400Hz
Warning and protectivefunctions		- High Current - IPM Abnormal - High Voltage of DC Link - Low Voltage of DC Link - Overheat of Discharge Resistor - Low Voltage of Control Power Supply - FSSB Communication Error - Locked Fan Motor
		- FSSB Communication Error
		- Locked Fan Motor
Ambient Temperature Range		0 to +55 degrees Celsius
Weight		3.0kg
Option		Regererative resistor (16ohm, 100W no-wind condition) (16ohm, 200W no-wind condition) (16ohm, 400W wind velocity 2m/s condition) Separated AC line filter Separated battery

4. Applicable motors

Torque(Nm)		4	8	12	22
Motor	αiF	αiF4 /4000 (40A)	αiF8 /3000 (40A)	–	–
	βiS	–	–	βiS12 /3000 (40A)	βiS22 /2000 (40A)

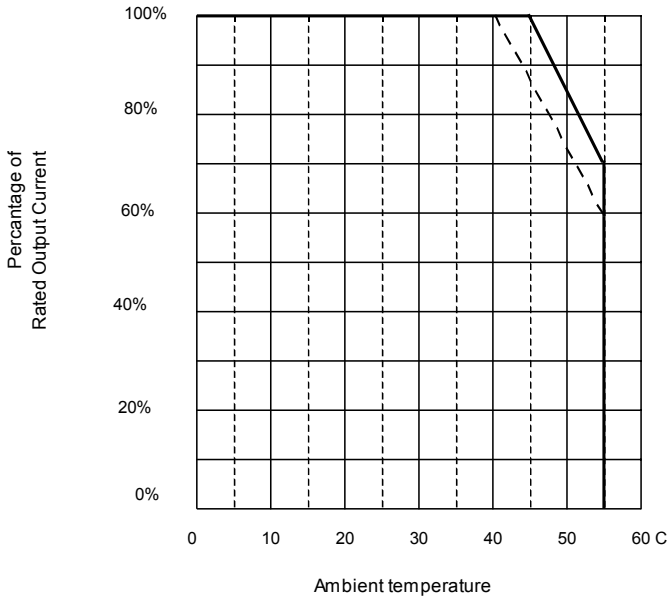
5. Selection of breaker, electromagnetic contactor, and AC line filter

Please refer to the following table and select it. For details, please refer to B-65322/02EN.

Servo motor	Continuous rating current [Arms] (Reference value)	Power supply capacity [kVA] (Reference value)
αiF4/4000	6.2	2.2
αiF8/3000	7.1	2.5
βis12/3000	8.0	2.8
βis22/2000	11.1	3.9

6. Derating

Consider derating as shown below, according to ambient temperature.
The solid line is derating line for HRV2 and the dotted line is derating line for HRV3.



7. Regeneration discharge resistor

7.1. The condition of unnecessary of regenerative discharge resistor
When the regeneration energy per regenerative cycle is below the following amounts of energy [J], regeneration discharge resistor is unnecessary.

Table6.1 Permissible regenerative energy amount

Amplifier model	Permissible regenerative energy amount
βiSV 40/40	35[J]

Refer to Section [I. SVM] of B-65322EN/02 for details about calculation method of the regeneration energy per regenerative cycle.

7.2. The condition of necessary of regenerative discharge resistor
When the regeneration energy per regenerative cycle exceeds the amount of permission regenerative energy of servo amplifier, DC link overvoltage alarm or abnormal of regeneration discharge may occur. In this case, regenerative discharge resistor is needed.

Table6.2 Capacity of regenerative discharge resistor

Specification	Capacity of regenerative discharge resistor	
A06B-6130-H404 (Note)	100W No –wind condition	-
A06B-6089-H500 (Note)	200W No –wind condition	400W Wind velocity 2m/s condition

⚠Cautions

In case of “A06B-6130-H404”, please install into the cabinet, which fulfills IP54.

And in case of “A06B-6089-H500”, please install into duct area, which fulfills IP22 or IP23.

If the cabinet does not have a structure for preventing materials that adversely affect regenerative discharge resistor from gettinng into the cabinet, normal operation and safety may fail. So, special care should be taken.

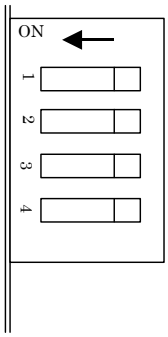
Incorrect connection may cause to damage the amplifier.

8. Setup switch (For DC alarm level)
Since the switch of four channels is in the front of a servo amplifier for regeneration resistance protection, please make it the following setup.
Setup of SW1, SW2

Switch	Setup
Switch1	OFF
Switch2	OFF

Setup of SW3, SW4

SW3	SW4	Separated regenerative discharge resistor
ON	ON	A06B-6130-H404
OFF	ON	A06B-6089-H500



9. Power supply specification

9.1. Three-phase input power supply for motor power

- Nominal rating voltage: AC 200-240V
- Allowable voltage fluctuation: +10%, -15%
- Frequency: 50/60Hz
- Allowable frequency fluctuation: ±2Hz
- Power supply impedance : Voltage fluctuation by load (at maximum output) not be exceed 7%.
- Power supply Unbalance: ±5% or less of rated voltage

NOTE
The allowable voltage fluctuation is not continuous change but change for several minutes.

9.2. Control power supply

Please be sure to use a regulated power supply for 24V power supply for amplifier.
Common use with 24V power supply for motor brakes cannot be performed.

- Nominal rating voltage: DC 24V
- Allowable voltage fluctuation: +10%, -10%
- Power supply capacity

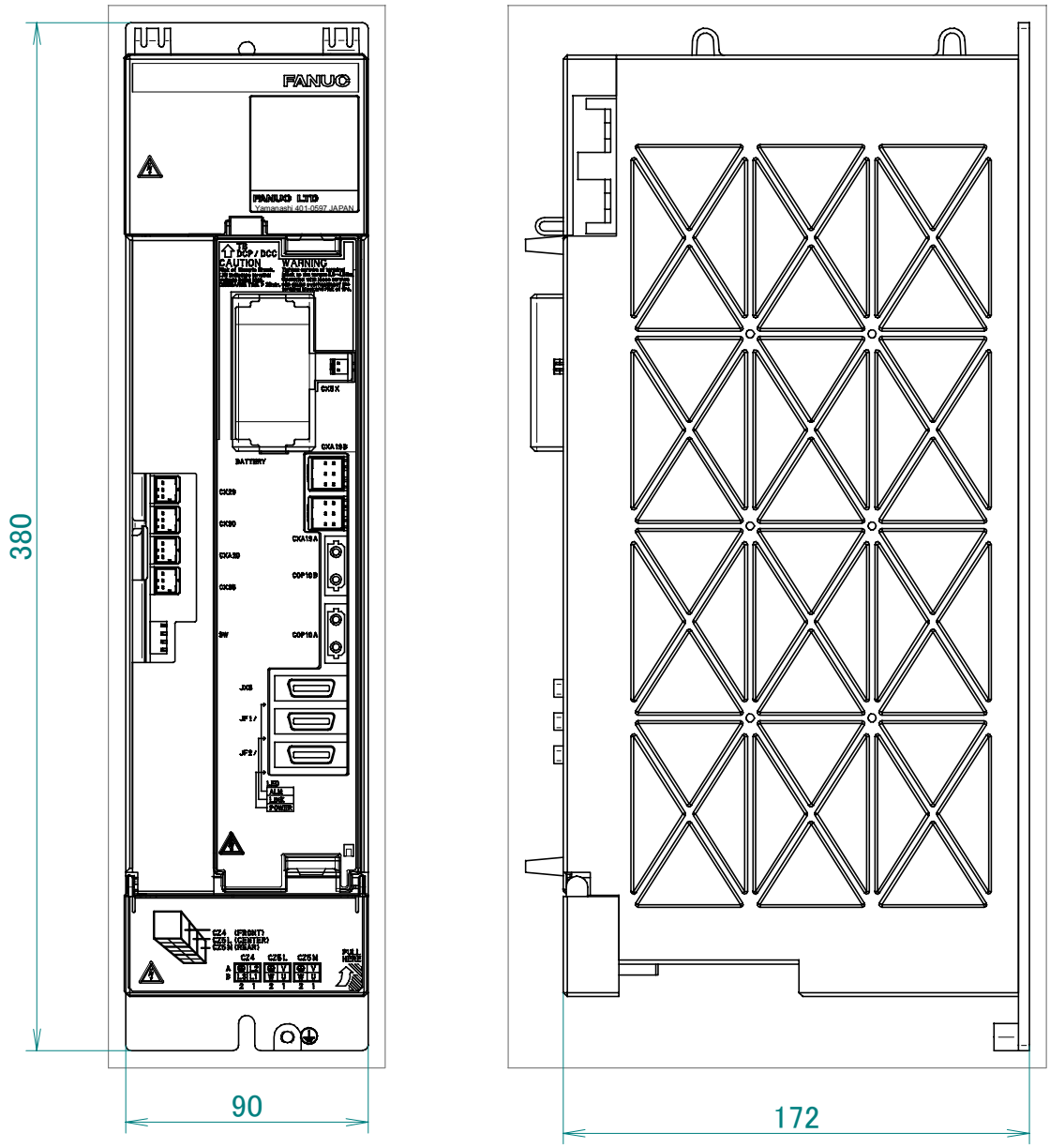
Power supply capacity per amplifier
0.8A

10. External dimention/ Panel cut-out drawing/ maintenance area

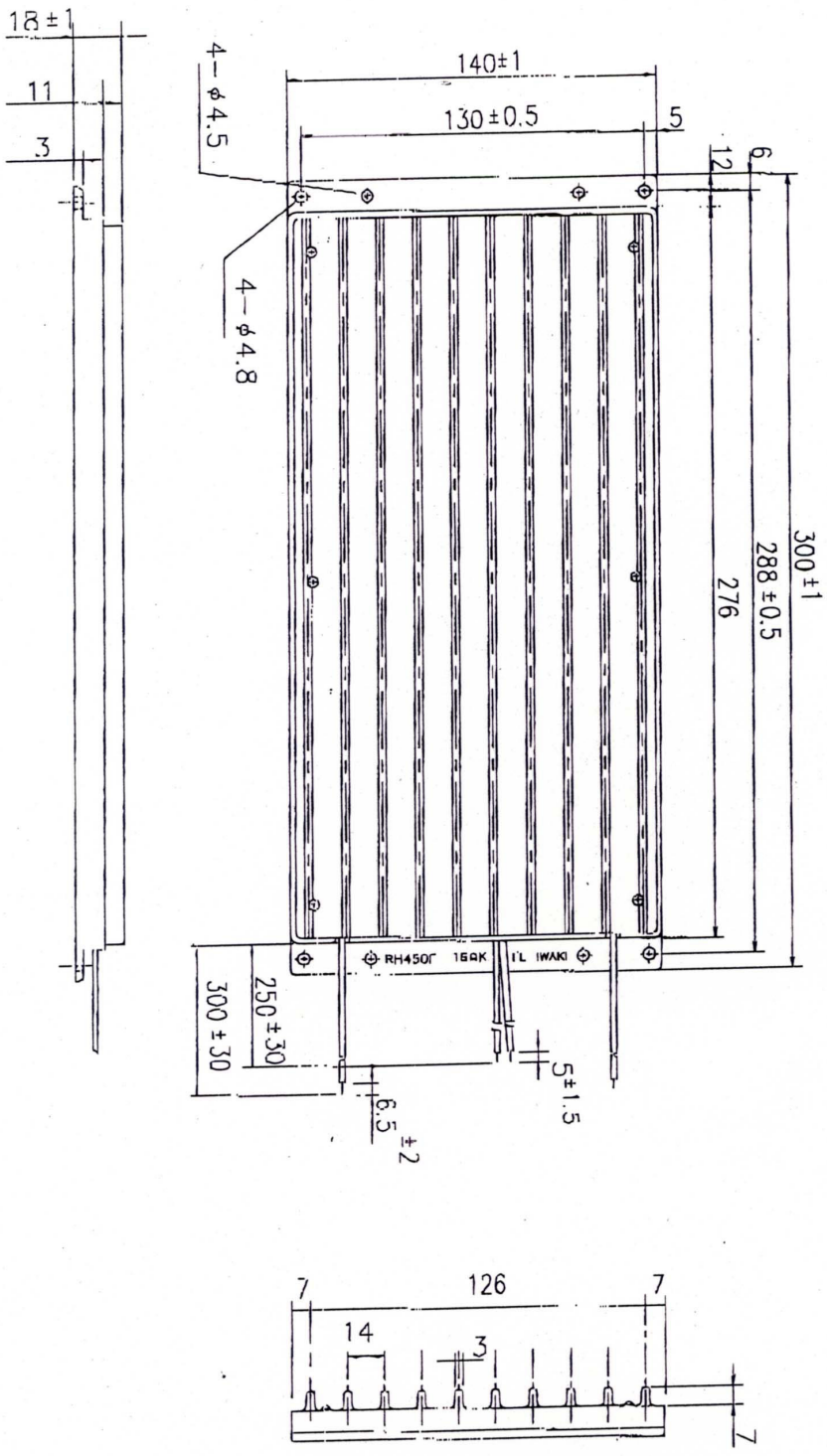
10.1. External dimension

βiSV 40/40

Without outerfin



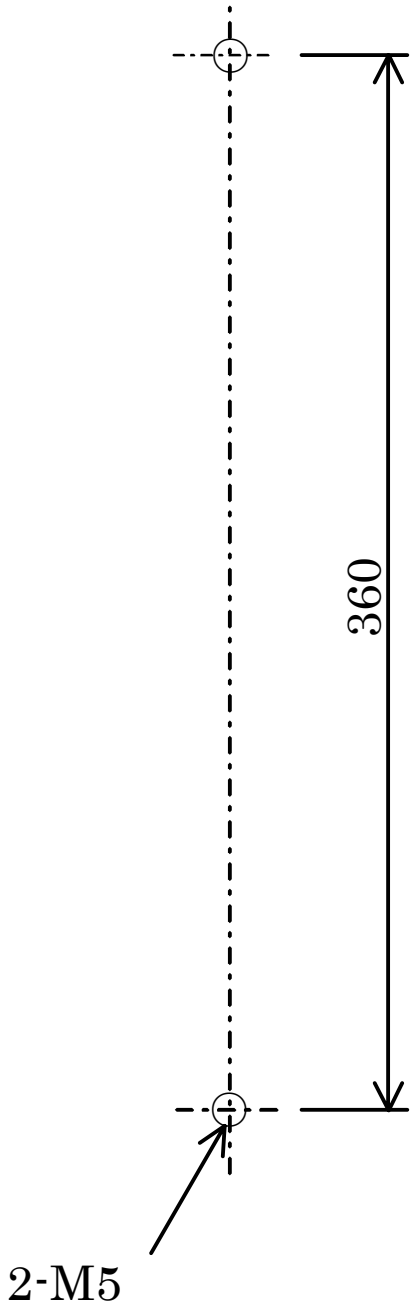
External dimension regenerative discharge resistor (A06B-6130-H404)



				TITLE	FANUC SERVO AMPLIFIER βi series ESCRIPTIONS	
				DRAW. No.	B-65322EN/02-10	
EDIT	DATE	DESIGN	DESCRIPTION	FANUC LTD	Page	9 / 17

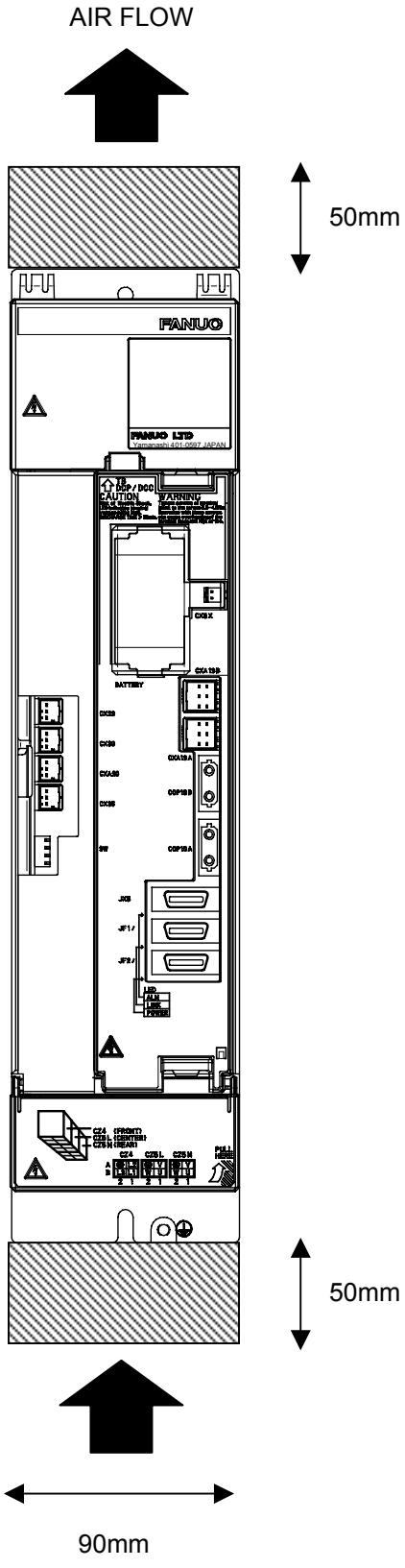
10.2. Panel cut-out drawing

βiSV40/40,

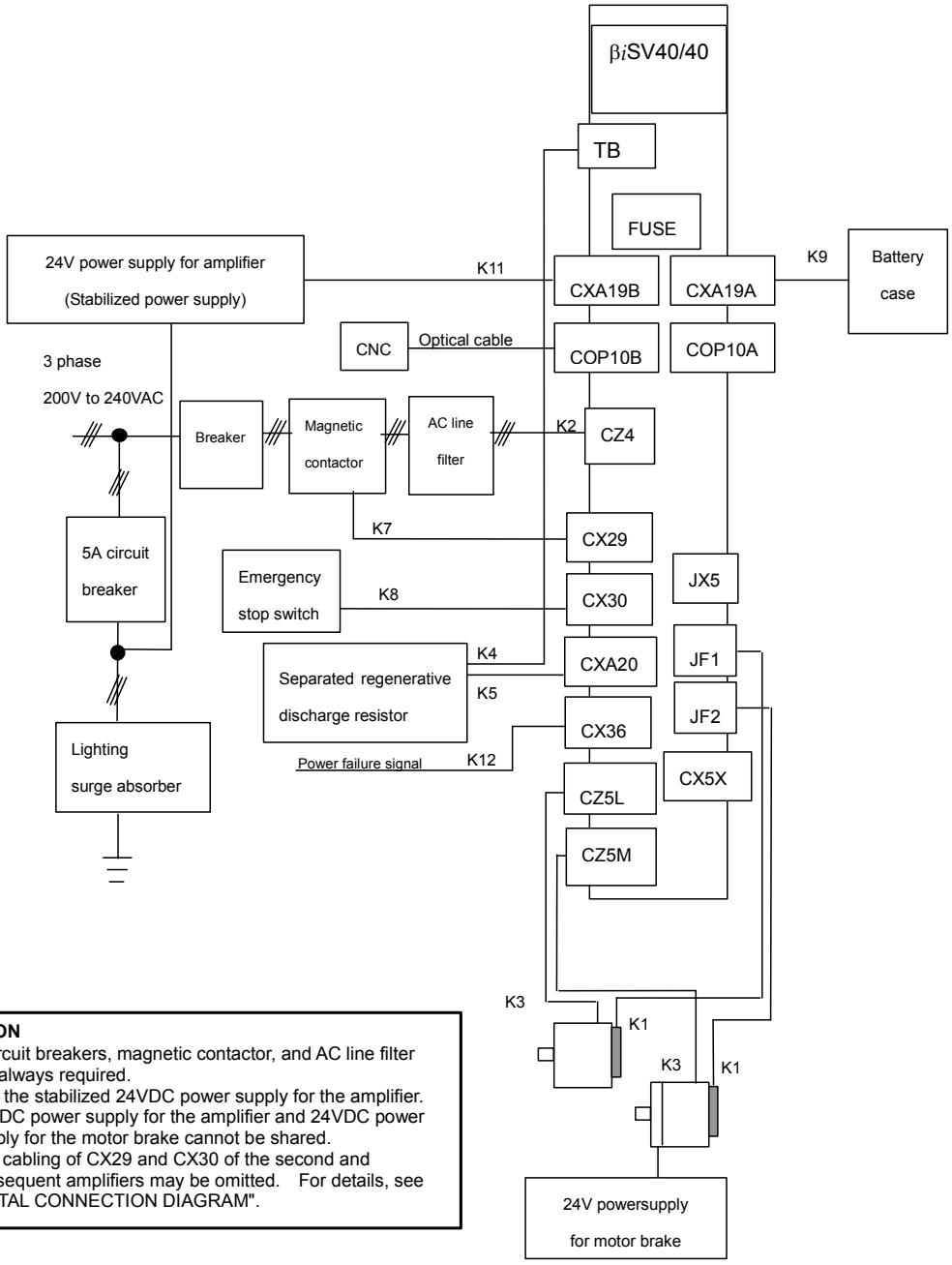


10.3. Maintenance area

βiSV 40/40



11. Total connection diagram



CAUTION
1 A circuit breakers, magnetic contactor, and AC line filter are always required.
2 Use the stabilized 24VDC power supply for the amplifier. 24VDC power supply for the amplifier and 24VDC power supply for the motor brake cannot be shared.
3 The cabling of CX29 and CX30 of the second and subsequent amplifiers may be omitted. For details, see "TOTAL CONNECTION DIAGRAM".

11.1. Connection details

Refer to Section [I. .SVM] of B-65322EN/02 for details.

11.2. Details of cable K2 (Refer to B-65322/02EN)

Please select specification of cables in consideration of following table. Refer to Section [I .SVM] of B-65322EN/02 for details.

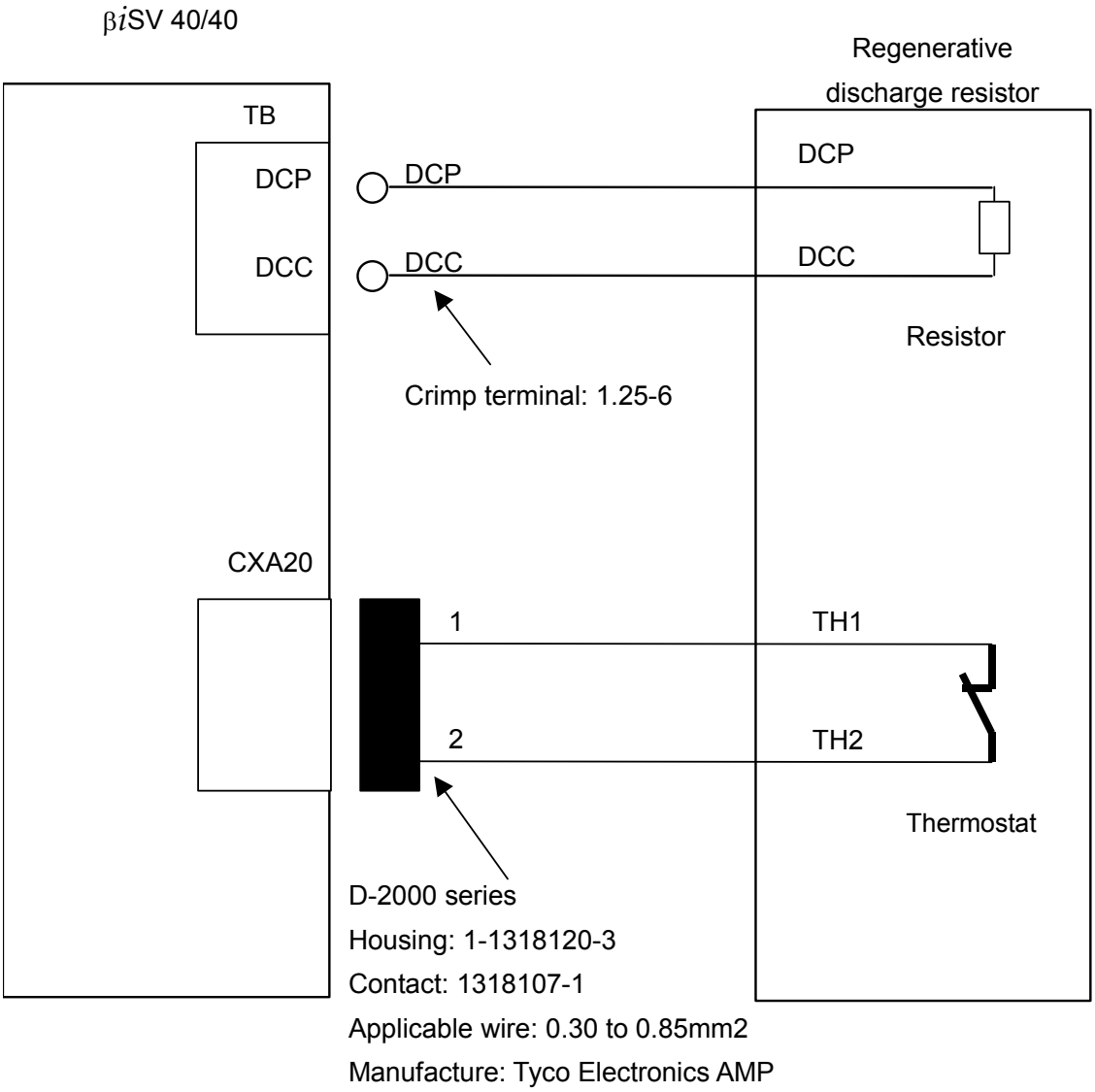
Servo motor	Continuous rating current [Arms] (Reference value)
β*i*s12/3000	8.0
β*i*s22/2000	11.1
α*i*F4/4000	6.2
α*i*F8/3000	7.1

11.3. Details of cable K3 (Refer to B-65322/02EN)

Please select specification of cables in consideration of following table. Refer to Section [I.SVM] of B-65322EN/02 for details.

Servo motor	Continuous rating current [Arms] (Reference value)
β*i*s12/3000	10.2
β*i*s22/2000	11.3
α*i*F4/4000	7.7
α*i*F8/3000	8.4

11.4. Details of cable K4 (Refer to B-65322/02EN)
In case of using regenerative discharge resistor
(a) A06B-6130-H404



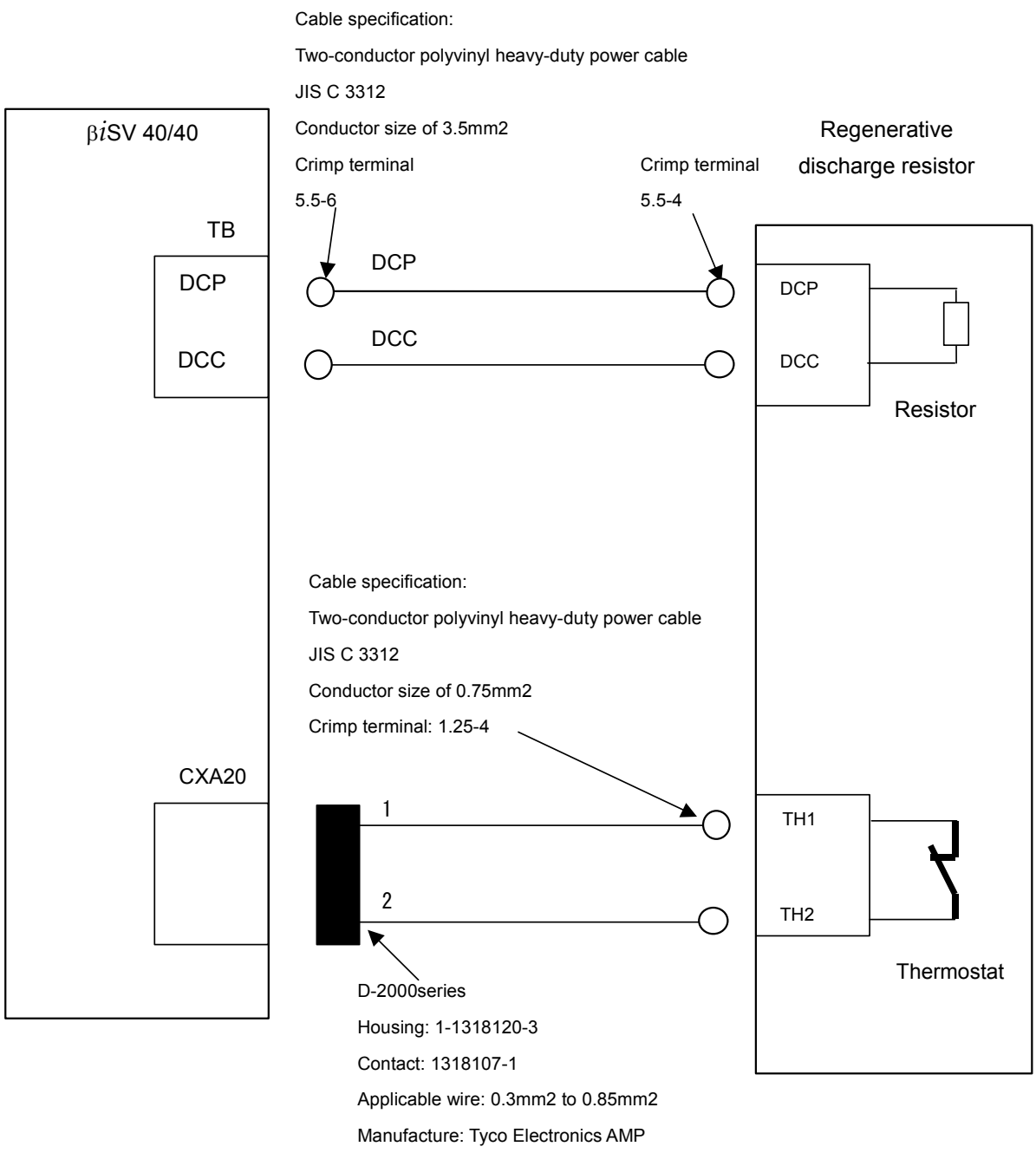
For connection tools, see subsection 9.2.3. of [I.SVM] for B-65322EN/02

⚠ WARNING

Do not short between terminal "DCP" and terminal "DCC".

Do not connect this terminal "TB" to terminal "TB1(DCP/DCN)" of servo amplifier αi series. Servo amplifier may be broken in case of above incorrect connection.

(b) A06B-6089-H500

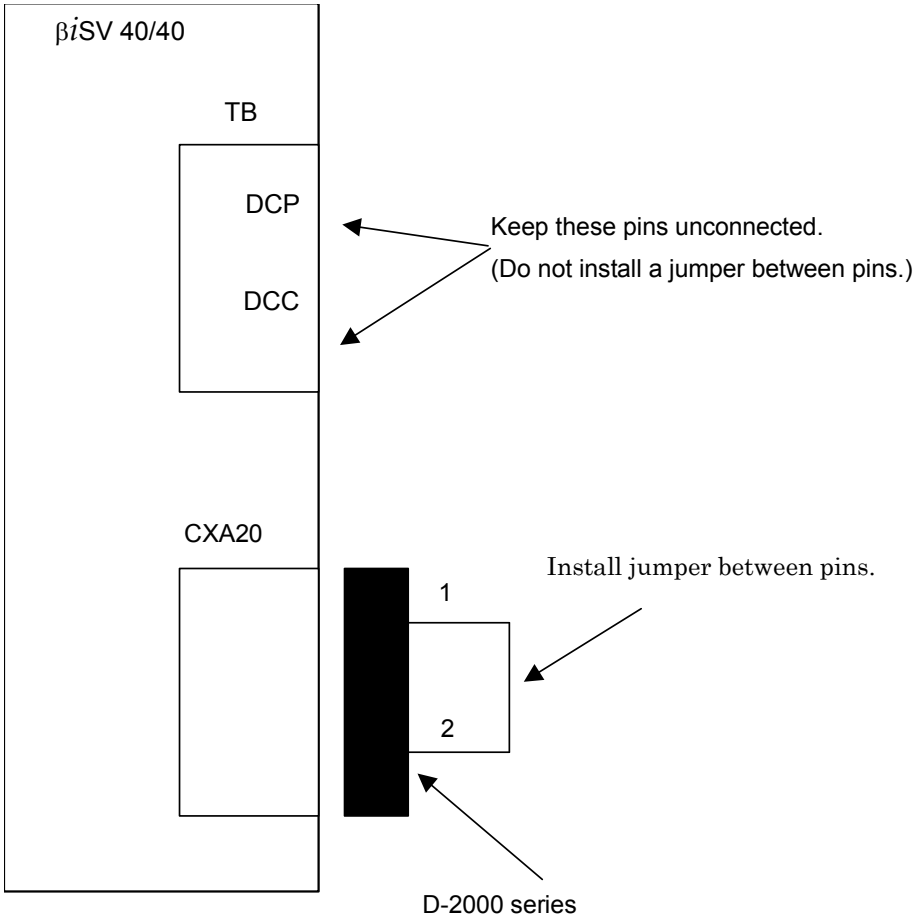


For connection tools, see subsection 9.2.3. of [I.SVM] for B−65322EN/02

⚠ WARNING

Do not short between terminal "DCP" and terminal "DCC".
Do not connect this terminal "TB" to terminal "TB1(DCP/DCN)" of servo amplifier αi series. Servo amplifier may be broken in case of above incorrect connection.

(c) In case of not using regenerative discharge resistor



For connection tools, see subsection 9.2.3. of [I.SVM] for B-65322EN/02

⚠ WARNING

Do not short between terminal "DCP" and terminal "DCC".
Do not connect this terminal "TB" to terminal "TB1(DCP/DCN)" of servo amplifier αi series. Servo amplifier may be broken in case of above incorrect connection.

12. Heat disspaton

The amount of heat dissipation depends on the current that flows through servo motor. For the current that flows through a servo motor, reference the continuous rated current of each servo motor. (For the continuous rated current of each servo motor, refer to the servo motor descriptions.) As the current that flows through a servo motor, the root-mean-square value of the current that flows through an actual servo motor on a machine can be used. The amount of heat dissipation indicated below assumes the use of HRV2.

(1) Total amount of heat dissipation

The total amount of heat dissipation is calculated according to the following expression.

Total amount of heat dissipation= a + Ka1 × b1 + Ka2 × b2

a: Amount of heat dissipation determined by the βiSV40/40 [W]

Ka1, Ka2: Coefficient determined by the βiSV40/40 [W/Arms]
b1, b2: Current flowing through the servo motor [Arms]

Total amount of heat dissipation

Name	Specification	a[W]	axis	K[W/Arms]
βiSV40/40	H203	20	L	Ka1: 5.8
			M	Ka2: 5.8

(2) Residual amount of heat in the cabinet

By placing the heat sink section outside the cabinet, the residual amount of heat in the cabinet can be calculated according to the expression below.

Residual amount of heat in the cabinet= a + Kb1 × b1 + Kb2 × b2

a: Amount of heat dissipation determined by the βiSV40/40 [W]

Kb1, Kb2: Coefficient determined by the βiSV40/40 [W/Arms]
b1, b2: Current flowing through the servo motor [Arms]

Residual amount of heat in the cabinet

Name	Specification	a[W]	axis	K[W/Arms]
βiSV40/40	H203	20	L	Kb1: 5.8
			M	Kb2: 5.8