

# AC SERVO DRIVES LARGE-CAPACITY $\Sigma$ -II SERIES

400V CLASS 22 TO 55kW

SERVOMOTOR: TYPE SGMBH-□□

SERVOPACK : TYPE SGDH-□□



YASKAWA

Certified by  
ISO 9001



JQA-0386.0422

LITERATURE NO. KAE-S800-32.3



See Its  
**Dynamic  
Performance!**

YASKAWA's well-known  $\Sigma$ -II series of AC servo drives respond quickly and precisely because of the perfect combinations of servomotors and SERVOPACKs.

When your application needs great power as well as speed and accuracy, the large-capacity  $\Sigma$ -II answers your every need.

Its fine, dynamic performance makes your machine much more productive.



**Highest Performance**

The high-performance magnet circuit and the high-density winding assure reliable quality. The upgraded control algorithm and the high-speed CPU operation reduce the response time to 1/3 of that of the previous model.

**Easy Setup and Maintenance**

Online autotuning automatically adjusts the servo drives in accordance with the characteristics of your machine.

The main and the control circuit have different power supplies.

**Wide Usage**

Five models are available for 400V series in the full lineup of compact, light-weight  $\Sigma$ -II series.

Each model can flexibly combine with different types of encoders and brakes.

Conformance to international standards assures worldwide usage.

# PERIPHERAL DEVICES

**① Molded-Case Circuit Breaker (MCCB)**

Protects power supply line.

**② Noise Filter**

Mounted to prevent external electrical noise from the power line.

**③ Magnetic Contactor (HI series)**

ON/OFF servo power supply.  
Note: When applied, make sure to provide a coil surge suppresser.

**④ Brake Power Supply**

Mount when fail safe/holding brake is provided with SGMB servomotor.

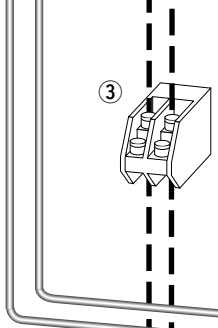
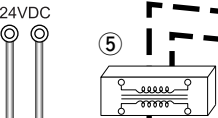
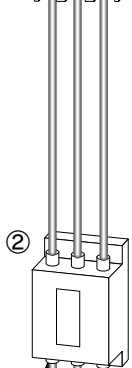
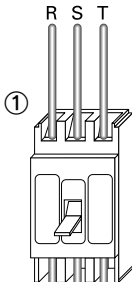
LPDE-1H01 (100VAC input)  
LPSE-2H01 (200VAC input)

**⑤ Transformer**

Switches 400V power supply to 200V.

**⑥ DB Resistor Unit**

Power Supply  
Three-phase 200VAC



**CN1**

**Host Controller**

SGDH SERVOPACK to a YASKAWA host controller or one made by other vendors.



MP920 (Analog input, pulse train input available)

**SGDH SERVOPACK**

**CN3**

**Digital Operator**

User constant setting, run command and status/alarm display are performed.

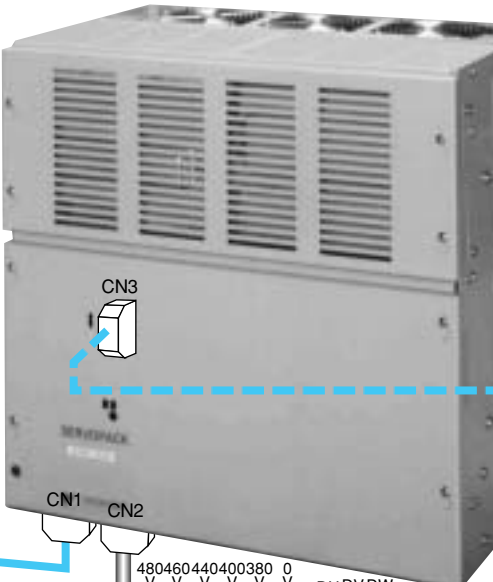


Hand-held Type (JUSP-OP02A-2)

1m-cable is provided.

**Personal Computer**

Prepare the connector (D-SUB 9 pins) by yourself. Applicable receptacle is 17JE-23090-02 (D8B) (made by DDK).



Power Supply for Fan

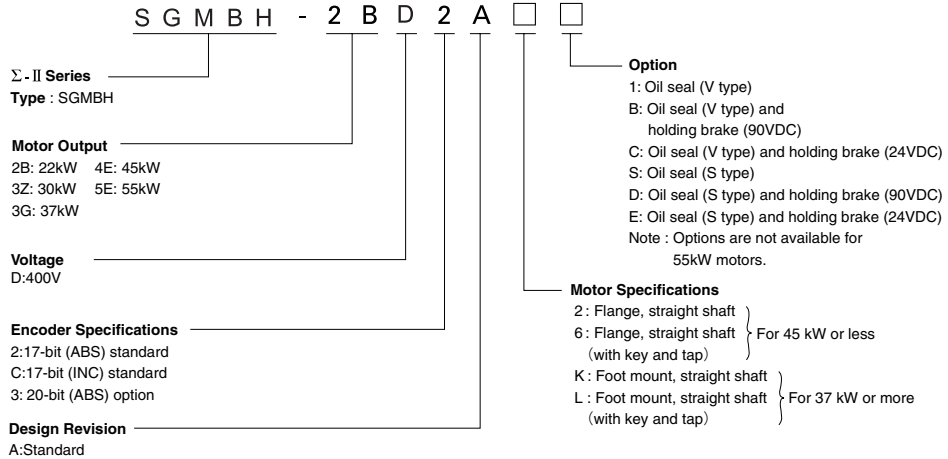
**SGMBH Servomotor**



# SPECIFICATIONS

## Servomotor

### Type Designation

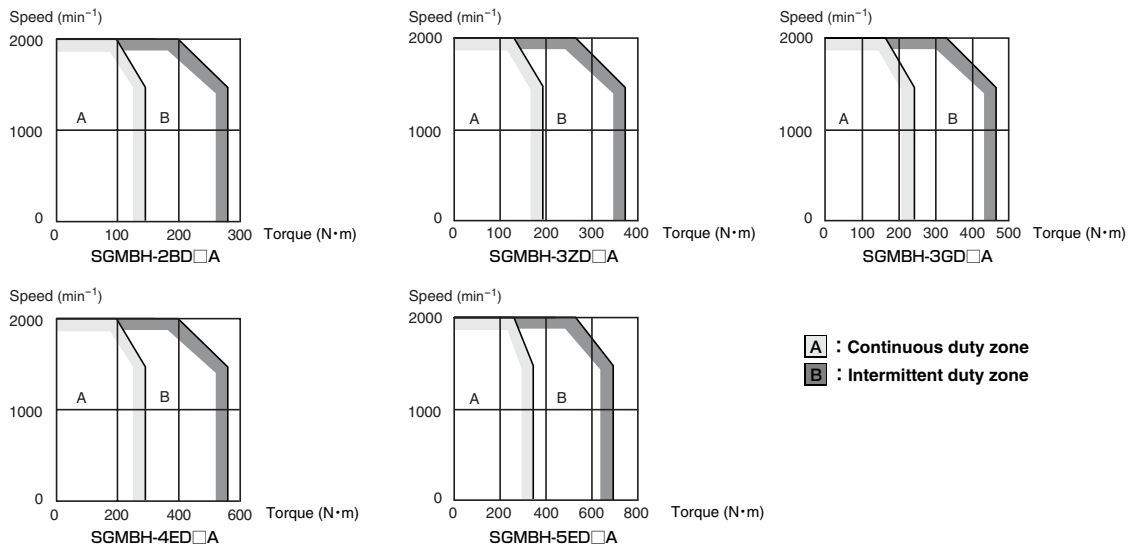


Type	SGMBH-□□□□	2BD□A	3ZD□A	3GD□A	4ED□A	5ED□A	
Performance	Rated Output	kW	22	30	37	45	55
	Rated Torque	N·m	140	191	236	286	350
	Stalling Torque	N·m	140	191	236	286	350
	Instantaneous Peak Torque	N·m	280	382	471	572	700
	Rated/Max. Speed	min <sup>-1</sup>	1500/2000				
	Rotor Inertia	kg·m <sup>2</sup>	0.0592	0.0773	0.139	0.151	0.197
Structure	Protective Enclosure	IP44					
	Mounting Method	Flange		Flange Foot mount*1		Foot mount	
Encoder	Standard	Incremental,absolute:17 bits 16384P/R or equivalent*2					
	Option	Absolute		:20 bits 16384P/R or equivalent*2			
Usage Temperature	0 to 40°C						
Usage Humidity	20 to 80% (non-condensing)						

\* 1 37kW and 45kW motors with brakes are foot mount type.

\* 2 The number of output pulses of SERVOPACK is 16384P/R for both 17-bit and 20-bit encoders (no dividing).

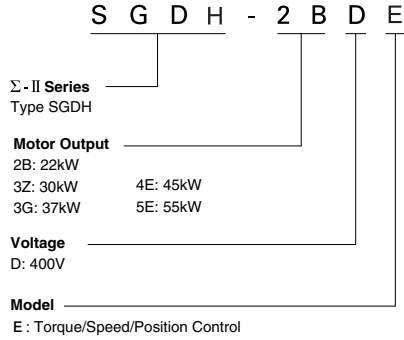
## Torque/Speed Characteristics



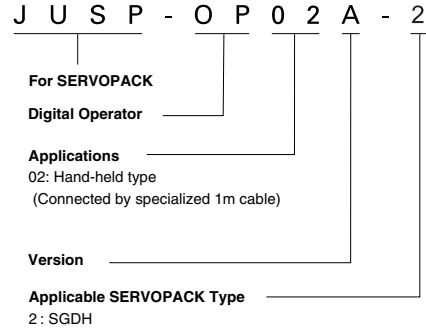
# SERVOPACK

## Type Designation

### • SERVOPACK



### • Digital Operator

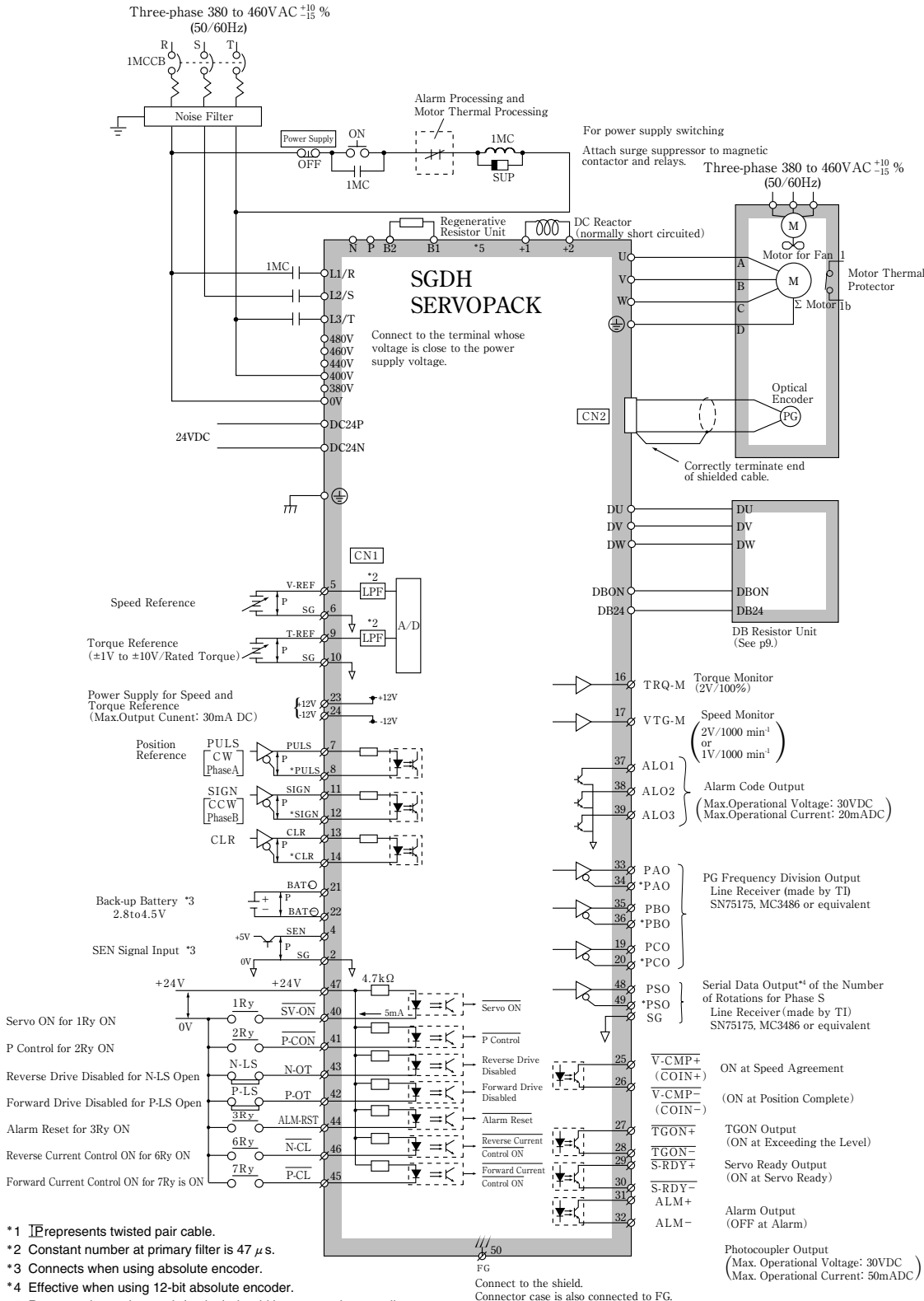


Type	SGDH- [ ]	2BDE	3ZDE	3GDE	4EDE	5EDE	
Applicable Servomotor Type	SGMBH- [ ]	2BD [ ]A	3ZD [ ]A	3GD [ ]A	4ED [ ]A	5ED [ ]A	
Continuous Output	kW	22	30	37	45	55	
Allowable Load Inertia	kg · m <sup>2</sup> × 10	0.296	0.3865	0.695	0.840	0.985	
Basic Specifications	Power Supply	Main Circuit	Three-phase 380 to 480VAC/+10 to -15%, 50/60Hz				
		Main Circuit Power Capacity kVA	36.7	50.1	61.8	75.2	91.9
	Control Circuit	Control Circuit	24VDC ± 10%				
		Control Circuit Power Capacity	46W				
	Control Method	Three-phase, full-wave rectification IGBT-PWM					
	Feedback	17-bit serial encoder (incremental/absolute)					
	Usage/Storage Temperature	SERVOPACK : 0 to 55°C / -20 to 85°C Digital operator : 0 to 55°C / -20 to 70°C					
	Usage/Storage Humidity	90%RH or less (non-condensing)					
	Control Method	Speed Control	±2 to ±10VDC at 1500r/min				
		Torquer Control	±1 to ±10VDC at rated output				
		Position Control	Input form : Sign +pulse train, CW+CCW pulse train, 90° phase difference 2-phase pulse Input frequency : 500/200kpps (line driver/open collector output)				
	I/O Signals	Position Control	Output Form	Phase A, phase B, phase C : (line driver output)			
			Frequency Dividing Ratio	(16 to N) N : encoder pulse number			
		Sequence Input Signal	Servo ON, forward rotation prohibited (P-OT), reverse rotation prohibited (N-OT), forward rotation current limit, reverse rotation current limit, alarm reset, P control				
Sequence Output Signal		Servo alarm, 3-bit alarm code Select three signals from servo ready, current limit detection, TGON, positioning complete (speed agreement), brake release, overload, warning, overload detected					
Functions/Performance	Frequency Response	100Hz (motor inertia = load inertia)					
	DB	Built-in (External resistor is required.)   External DB contactor and DB resistor are required.					
	Regeneration	Built-in (External resistor is required.)					
	Protection	Overcurrent, overload, regenerative error, main circuit voltage error, heatsink overheat, power open phase, overspeed, encoder error, encoder disconnected, overrun, CPU error, overflow, parameter error					
	Display	POWER, ALARM, CHARGE display LED 5-figure, 7-segment LED on digital operator					
	Others	Zero-clamp, soft start/stop. Reverse rotation connection, brake interlock signal output, JOG run					
	Digital Operator Type	JUSP-OP02A-2					
Mounting Method	Base mounted						

\* DB means an automatic dynamic brake, which operates at main power OFF, servo alarm, servo OFF, and overtravel.

# CONNECTION EXAMPLE

## Standard Connections



\*1  $\overline{\text{P}}$  represents twisted pair cable.

\*2 Constant number at primary filter is 47  $\mu$ s.

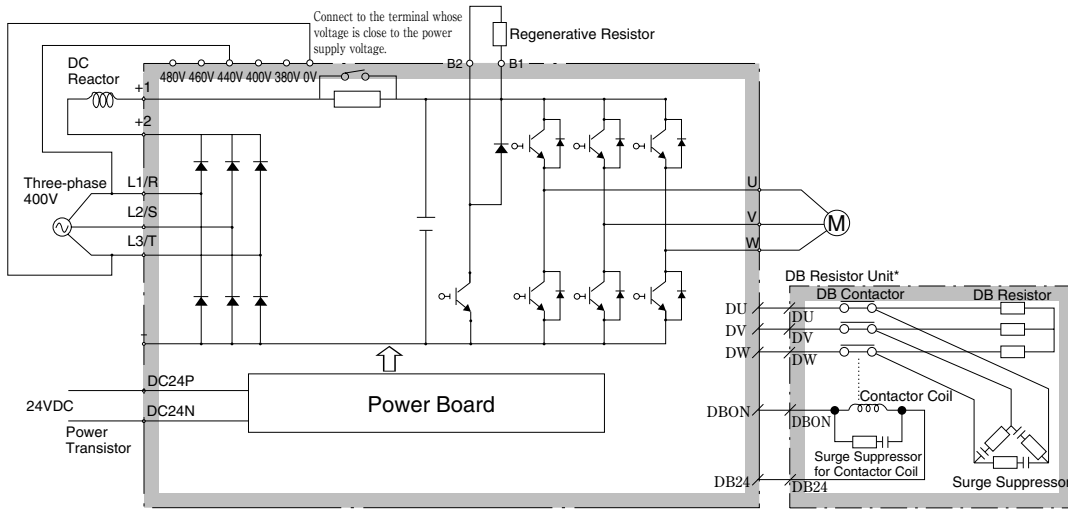
\*3 Connects when using absolute encoder.

\*4 Effective when using 12-bit absolute encoder.

\*5 Regenerative resistor unit (option) should be mounted externally.

\*6 TI stands for Texas Instruments Inc.

## Main Circuit Connection



\* This diagram is an example of a DB resistor unit with a built-in DB contactor and a surge suppressor for 37 to 55kW. A unit for 22/30kW consists of the resistor only.

## Main Circuit Terminal Description

Terminal Symbol	Name	Description	Terminal Symbol	Name	Description
L1/R, L2/S, L3/T	Main Circuit Power Supply Input Terminal	Three-phase 380 to 460VAC, +10 to -15%, 50/60Hz	B1, B2	Regenerative Resistor	Connects regenerative resistor.
DC24P	Control Power Supply Input Terminal	24VDC	—	Main Circuit Negative Side Terminal	(Normally external connection is not necessary.)
DC24N			DU, DV, DW	DB Resistor Unit, DB Contactor Connection Terminal	Connects DB resistor unit or DB contactor.
U, V, W	Motor Connection Terminal	Connect with motor.	DBON, DB24	DB Resistor Unit Connection Terminal	For 37 to 55kW, connects to DBON and DB24 terminals of DB resistor unit.
⏏ (X2)	Earth Terminal	Grounded (for power supply earth and motor earth).	480V, 460V, 440V, 400V, 380V, 0V	Control Power Supply Input Terminal	Connect to the terminal whose voltage is close to the power supply voltage.
+1, +2	DC Reactor Connection Terminal	Connect DC reactor for suppressing high-harmonic wave. If not necessary, shorten the terminals.			

## Control Circuit Terminal Description

Refer to pp12 to 13 for connector 2CN connections and 1CN output processing.

### CN1 (Connector I/O) Terminal Layout

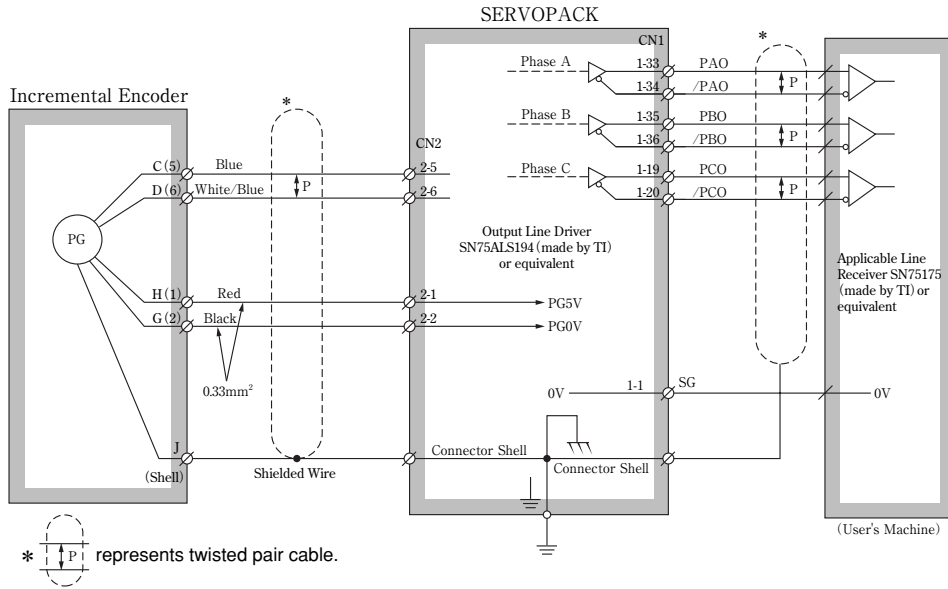
1	SG	GND	26	/V-CMP (/COIN-)	Speed agreement signal output
2	SG	GND	27	/TGON+	TGON output signal
3	PL1	Power supply for open collector ref.	28	/TGON-	TGON output signal
4	SEN	SEN signal input	29	/S-RDY+	Servo ready output
5	V-REF	Speed ref. input	30	/S-RDY-	Servo ready output
6	SG	GND	31	ALM+	Servo alarm output
7	PULS	Ref. pulse input	32	ALM-	Servo alarm output
8	/PULS	Ref. pulse input	33	PAO	PG dividing output phase A
9	T-REF	Torque ref. input	34	/PAO	PG dividing output phase A
10	SG	GND	35	PBO	PG dividing output phase B
11	SIGN	Ref. code input	36	/PBO	PG dividing output phase B
12	/SIGN	Ref. code input	37	ALO1	Alarm code output
13	PL2	Power supply for open collector ref.	38	ALO2	Alarm code output
14	/CLR	Clear input	39	ALO3	(Open collector)
15	CLR	Clear input	40	/S-ON	Servo ON input
16	—	—	41	/P-CON	P control input
17	—	—	42	P-OT	Fwd. overtravel input
18	PL3	Power supply for open collector ref.	43	N-OT	Rev. side overtravel input
19	PCO	PG dividing output phase C	44	/ALM-RST	Alarm reset input
20	/PCO	PG dividing output phase C	45	/P-CL	Fwd. current limit ON input
21	BAT (+)	Battery (+)	46	/N-CL	Rev. current limit ON input
22	BAT (-)	Battery (-)	47	+24V IN	External input power supply
23	—	—	48	PSO	Phase S signal output
24	—	—	49	/PSO	Phase S signal output
25	/V-CMP (/COIN+)	Speed agreement signal output	50	—	—

### CN2 (Encoder Connection) Terminal Layout

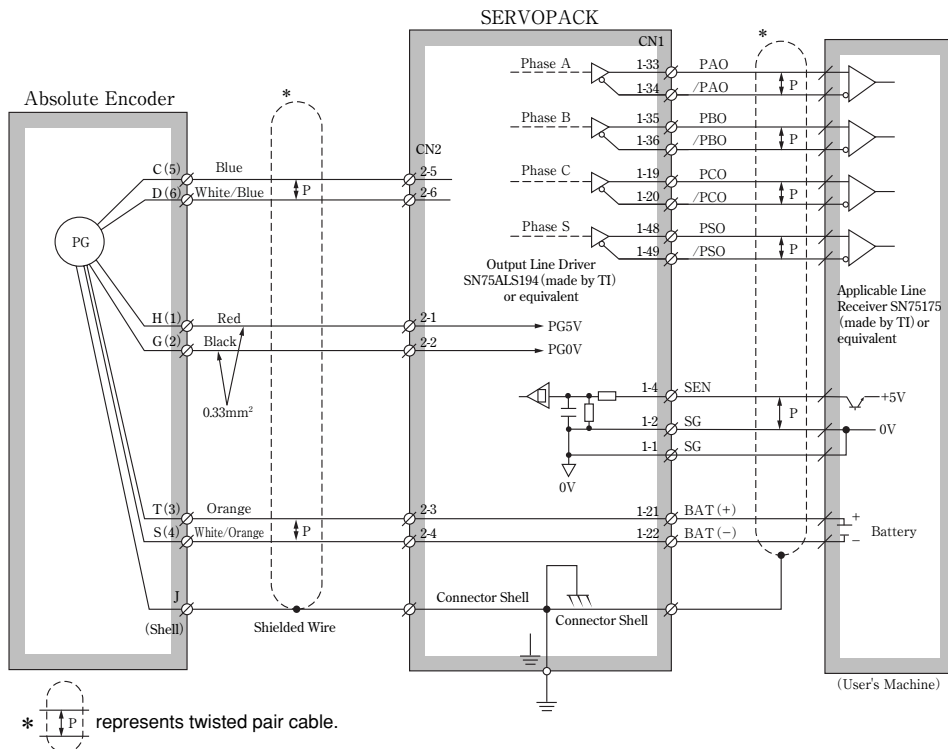
1	PG5V	PG power supply +5V	2	PG 0V	PG power supply 0V
3	BAT(+)	Battery (+) (absolute encoder only)	4	BAT(-)	Battery (-) (absolute encoder only)
5	PS	PG serial signal input	6	/PS	PG serial signal input

# Encoder Connections

## Incremental Encoder



## Absolute Encoder



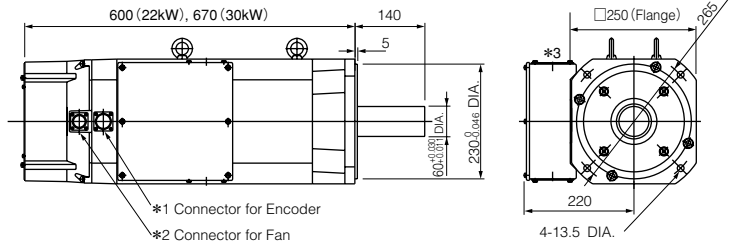


# DIMENSIONS

in mm

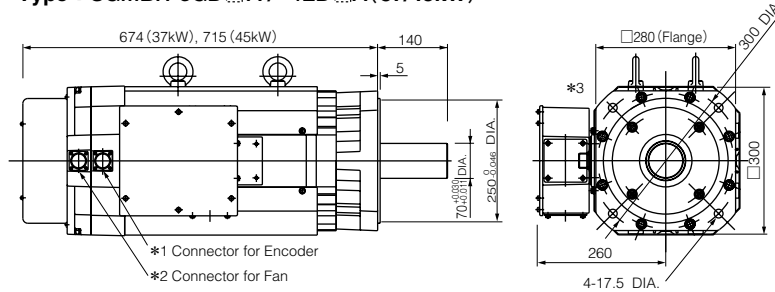
## Servomotor

### Type : SGMBH-2BD A / -3ZD A (22/30kW)



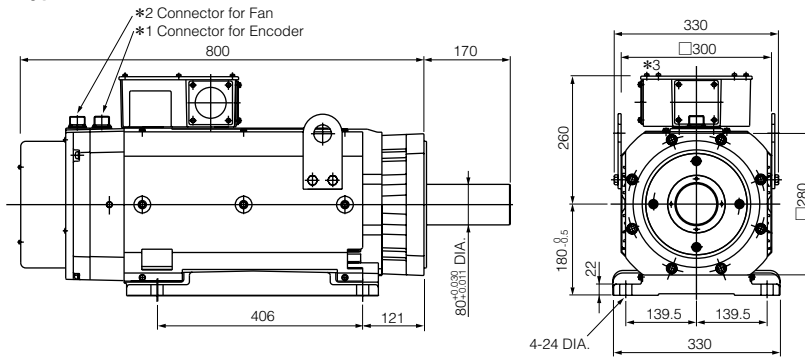
Approx. Mass: 120kg (22kW)  
140kg (30kW)

### Type : SGMBH-3GD A / -4ED A (37/45kW)



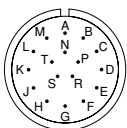
Approx. Mass: 230kg (37kW)  
250kg (45kW)

### Type : SGMBH-5ED A (55kW)



Approx. Mass: 350kg

#### \* 1 Connector for Encoder

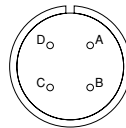


Receptacle: 97F-3102E20-29P

Plug L-shape: JA08A-20-29S-J1-EB (CE conformance) or MS3108B20-29S  
Straight: JL06A-20-29S-J1-EB (CE conformance) or MS3106B20-29S  
Cable Clamp: JL04-2022CKE(\*\*) (CE conformance) or MS3057-12A

Notes 1 \*\* will be replaced by cable diameter.  
2 Items surrounded by rectangle should be prepared by customer.  
3 A connector conformed to CE marking requires a CE conformed plug and a cable clamp.

#### \* 2 Connector for Fan



Receptacle: CE05-2A18-10PD-B

Plug L-shape: CE05-8A18-10SD-B-BAS (CE conformance) or MS3108B18-10S  
Straight: CE05-6A18-10SD-B-BSS (CE conformance) or MS3106B18-10S  
Cable Clamp: CE3057-10A- \* (D265) (CE conformance) or MS3057-10A

Notes 1 \*\* will be replaced by cable diameter.  
2 Items surrounded by rectangle should be prepared by customer.  
3 A connector conformed to CE marking requires a CE conformed plug and a cable clamp.

#### ● Absolute Encoder

A	—	K	—
B	—	L	—
C	DATA+	M	—
D	DATA-	N	—
E	—	P	—
F	—	R	—
G	0V	S	BATT -
H	+5VDC	T	BATT +
J	FG(Frame Ground)		

#### ● Incremental Encoder

A	—	K	—
B	—	L	—
C	DATA+	M	—
D	DATA-	N	—
E	—	P	—
F	—	R	—
G	0V	S	—
H	+5VDC	T	—
J	FG(Frame Ground)		

A	Fan Terminal (U)
B	Fan Terminal (V)
C	Fan Terminal (W)
D	

#### \* 3 Terminal Box

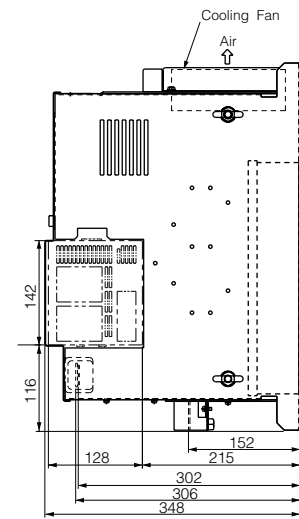
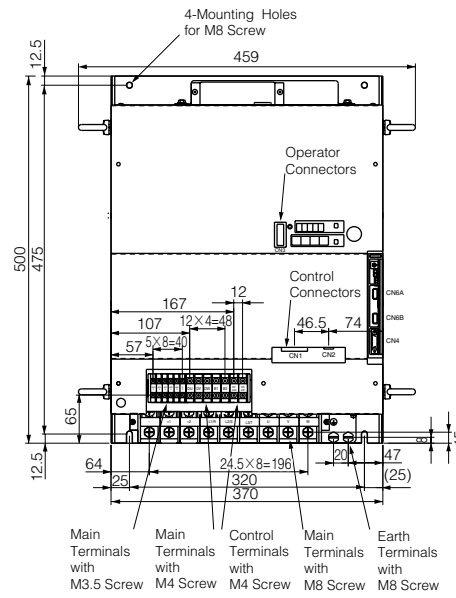
U, V, W,	Motor terminal	M10
⊕	Earth terminal	M10
1, 1b	Thermostat	M4

Common for all types of SERVOPACK

Symbol	Connector for SERVOPACK	Made by
1CN	10250—52AJL	SUMITOMO 3M LTD.
2CN	10220—52AJL	
3CN	17JE—13090—37 (D2B)	Daiichi Electronic Industries Co., Ltd

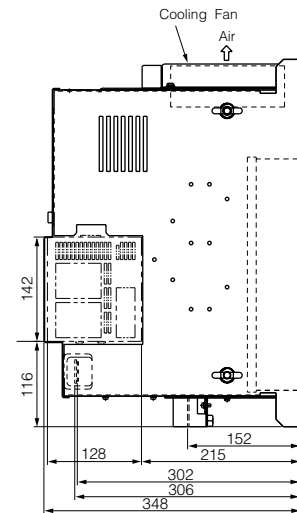
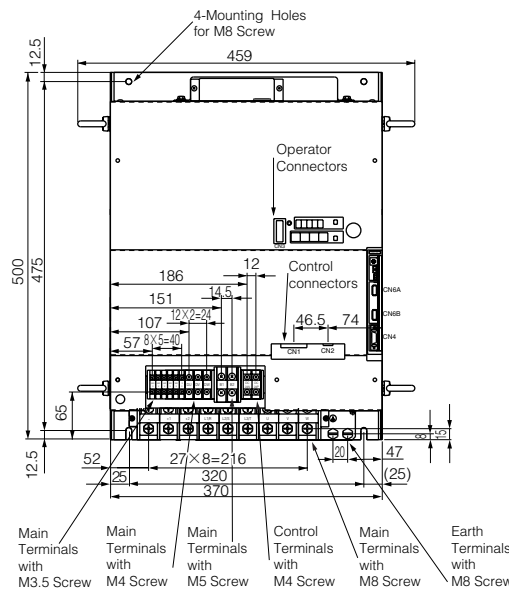
Painting color of front cover and case : 5Y 7/1 Munsell notation

**Type : SGDH-2BDE (22kW)**



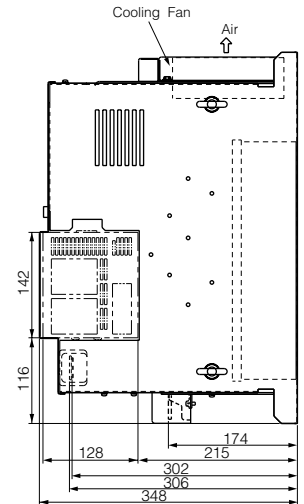
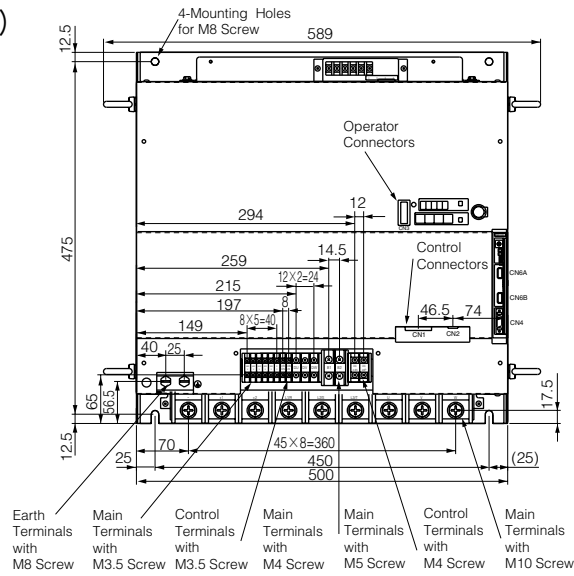
Approx. Mass: 40kg

**Type : SGDH-3ZDE (30kW)**



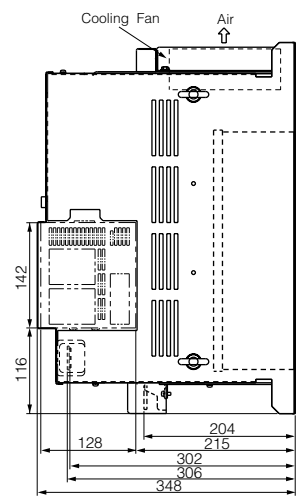
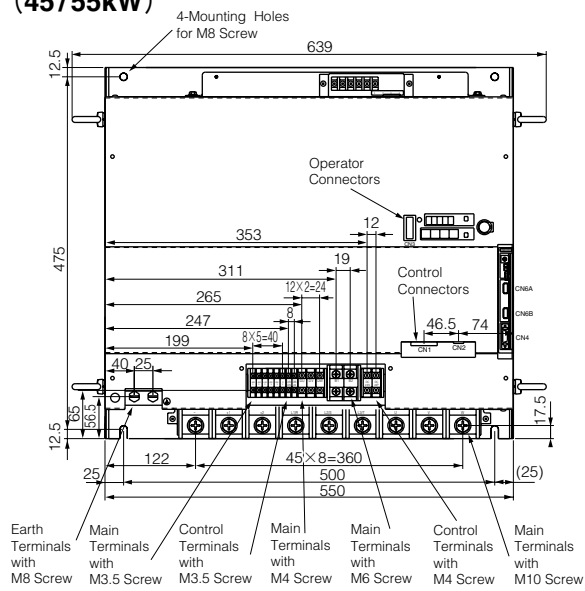
Approx. Mass: 40kg

**Type : SGDH-3GDE (37kW)**



Approx. Mass: 60kg

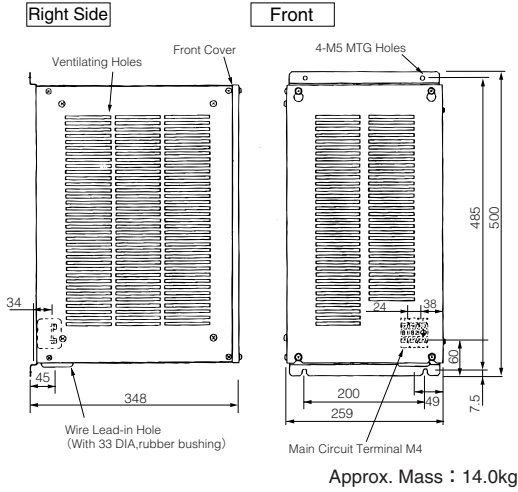
**Type : SGDH-4EDE/-5EDE (45/55kW)**



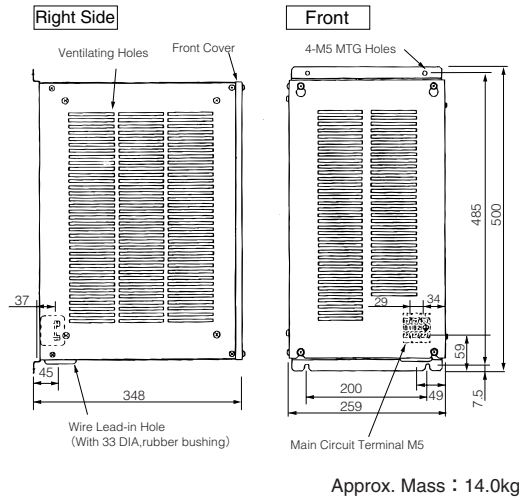
Approx. Mass: 65kg

## Regenerative Resistor Unit

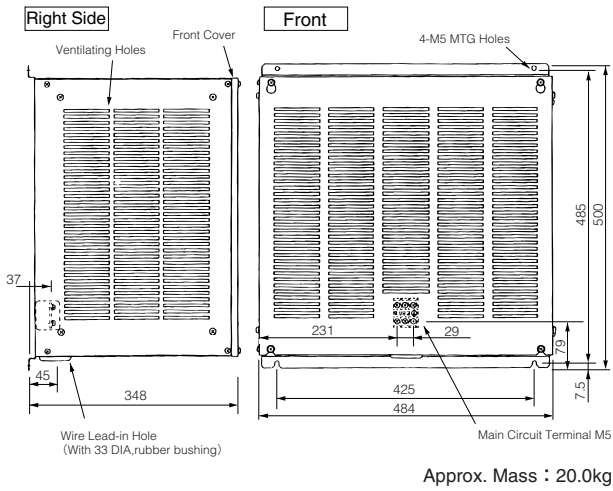
### Type : JUSP-RA12 (for 22kW)



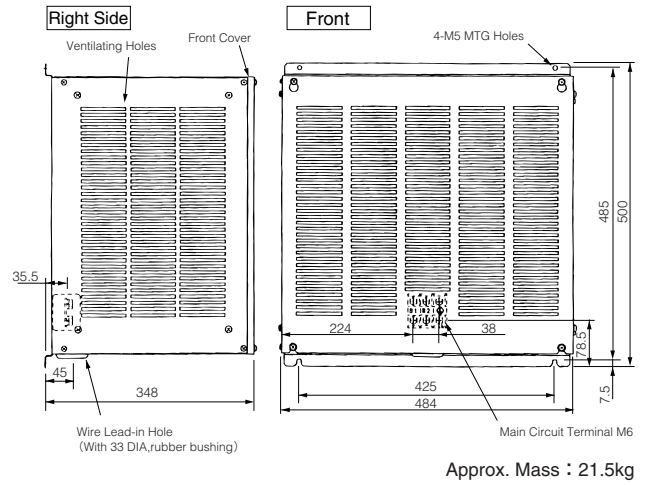
### Type : JUSP-RA13 (for 30kW)



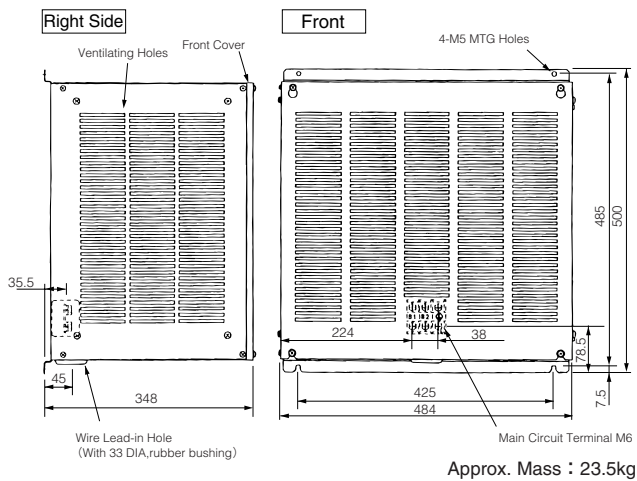
### Type : JUSP-RA14 (for 37kW)



### Type : JUSP-RA15 (for 45kW)

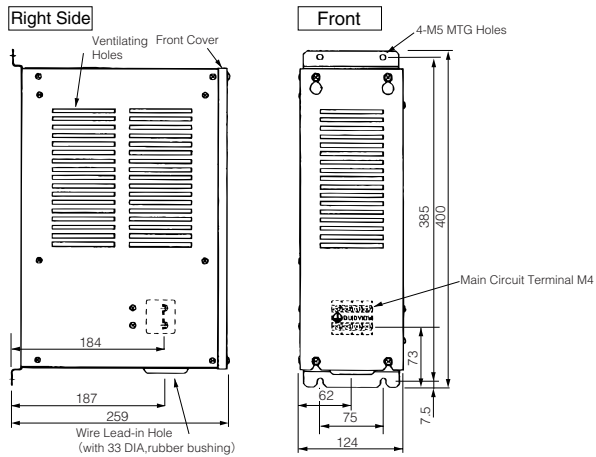


### Type : JUSP-RA16 (for 55kW)



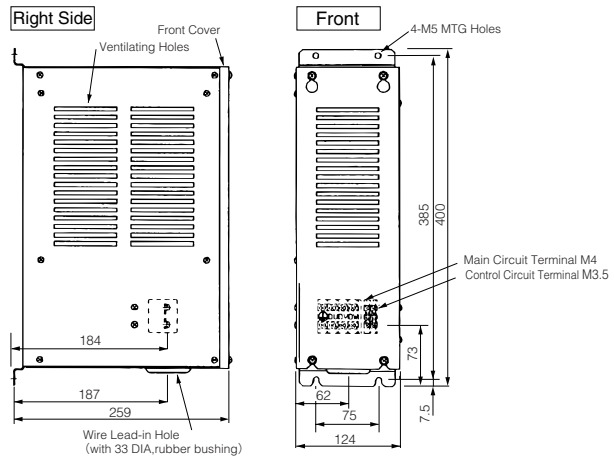
## DB Resistor Unit

### Type : JUSP-DB03 (for 22/30kW)



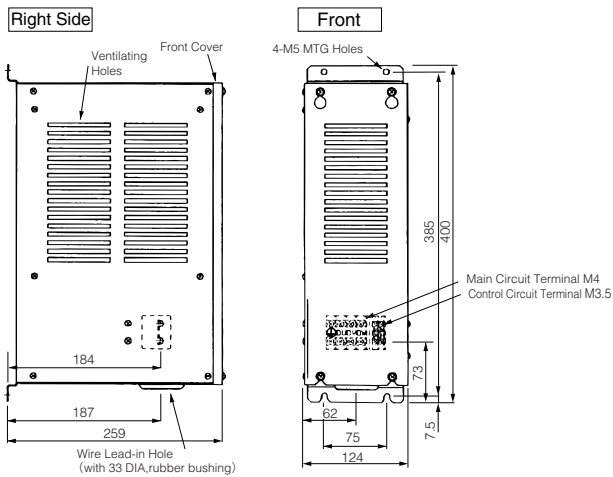
Approx. Mass : 5.0kg

### Type : JUSP-DB04 (for 37kW)



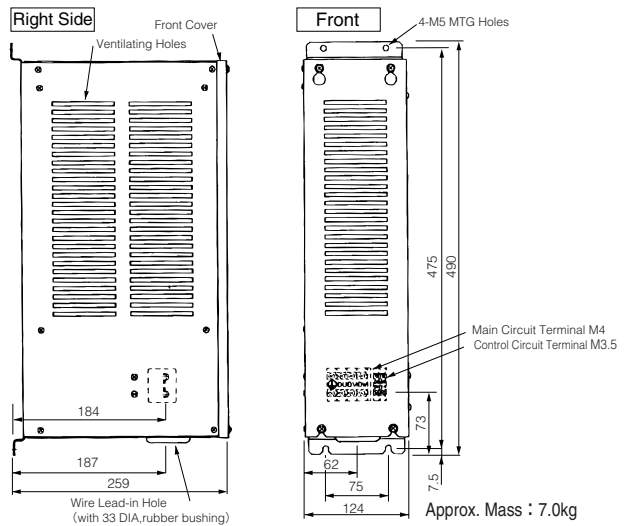
Approx. Mass : 6.0kg

### Type : JUSP-DB05 (for 45kW)



Approx. Mass : 6.0kg

### Type : JUSP-DB06 (for 55kW)



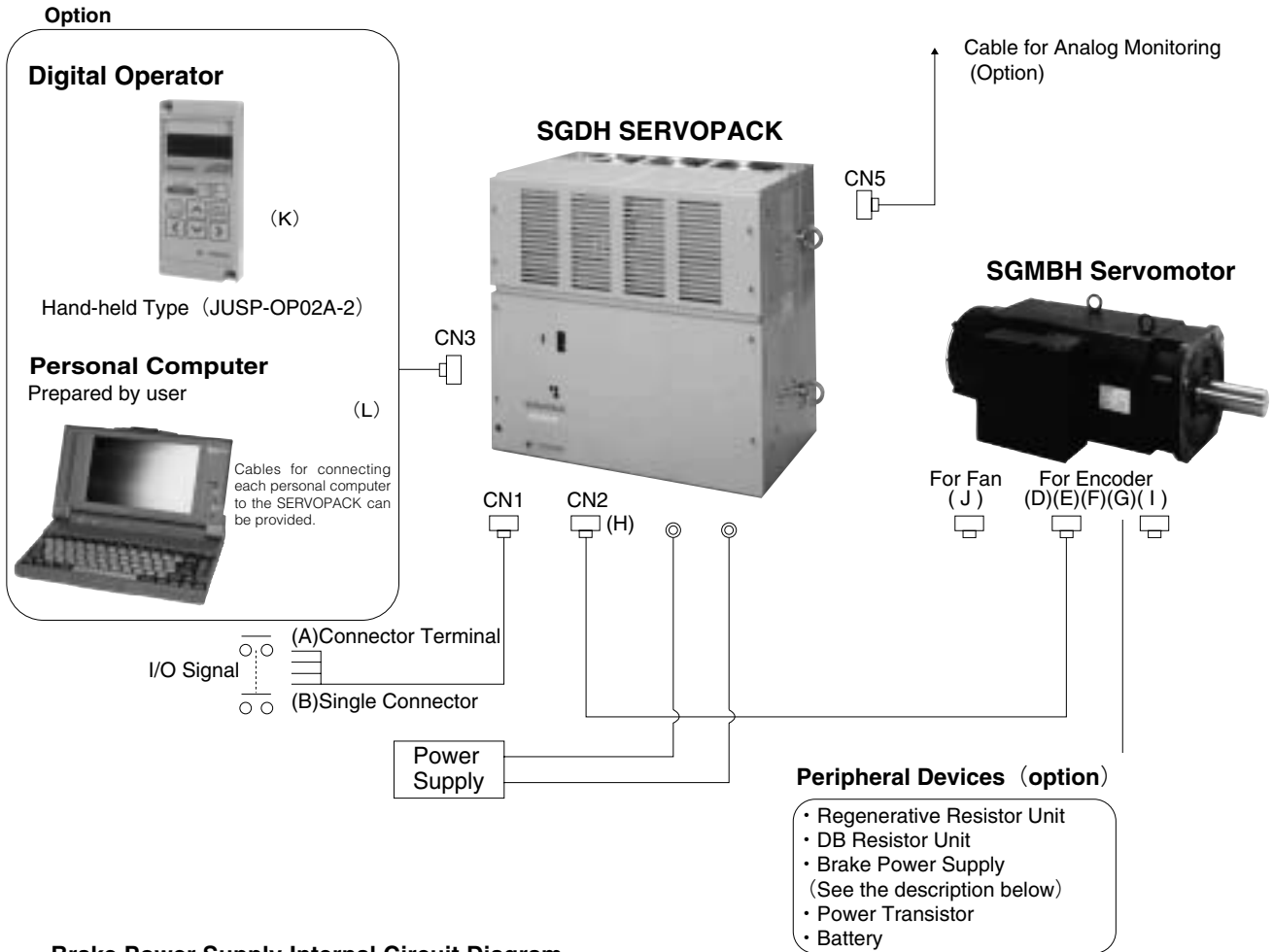
Approx. Mass : 7.0kg



# ORDERING REFERENCE

## System Configuration Example

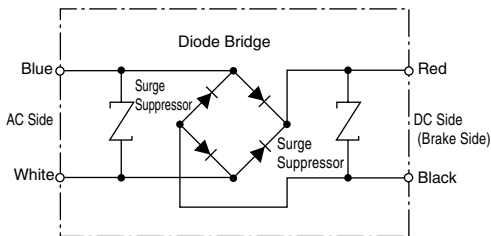
Large-capacity AC servo drive configurations are illustrated below.  
Connectors and operators are not provided with servomotors and SERVOPACKS.  
Order what you need separately.



### Brake Power Supply Internal Circuit Diagram

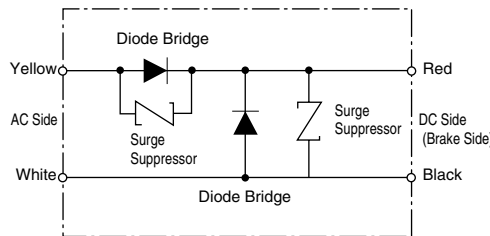
#### ■ Type LPDE-1H01

[ 100VAC input, 90VDC output ]  
1.0ADC Max.



#### ■ Type LPSE-2H01

[ 200VAC input, 90VDC output ]  
1.0ADC Max.



• Lead Length: 500mm each  
• Lead Color

AC Input Side		Brake Side
100V	200V	
Blue, White	Yellow, White	Red, Black

• Max. Ambient Temperature: 60°C

Note: Opening and closing braking power supply circuit is safer on the AC side.  
When opening and closing on the DC side, use surge suppressor near the brake coil in case surge suppressor damages brake coil.

## Order List

●: Required ○: Select one from the list ◇: Option

Product Name				Type	Q'ty
SGMBH Servomotor				● SGMBH- <input type="checkbox"/> D <input type="checkbox"/> A <input type="checkbox"/>	
SGDH SERVOPACK				● SGDH- <input type="checkbox"/> <input type="checkbox"/> E	
<b>For I/O Signals (CN1)</b>					
CN1	A	Connector Terminal Unit (with CN1 connector and 0.5m cable)		○	JUSP-TA50P
	B	Cable with Single Connector		1m	○ JZSP-CKI01-1
				2m	○ JZSP-CKI01-2
3m	○ JZSP-CKI01-3				
<b>For Encoder Signals (CN2)</b>					
Encoder ⇕	D	Cable with Single Connector (SERVOPACK Side: Connector)		3m	○ JZSP-CMP03-03
				5m	○ JZSP-CMP03-05
				10m	○ JZSP-CMP03-10
				15m	○ JZSP-CMP03-15
				20m	○ JZSP-CMP03-20
	E	Cable with Connector on Both Ends (SERVOPACK Side: Connector Encoder Side: Straight plug)		3m	○ JZSP-CMP01-03
				5m	○ JZSP-CMP01-05
				10m	○ JZSP-CMP01-10
				15m	○ JZSP-CMP01-15
				20m	○ JZSP-CMP01-20
	F	Cable with Connectors on Both Ends (SERVOPACK Side: Connector Encoder Side: L-shape plug)		3m	○ JZSP-CMP02-03
				5m	○ JZSP-CMP02-05
				10m	○ JZSP-CMP02-10
				15m	○ JZSP-CMP02-15
				20m	○ JZSP-CMP02-20
	G	Encoder Cable without Connector		5m	○ JZSP-CMP09-05
				10m	○ JZSP-CMP09-10
				15m	○ JZSP-CMP09-15
				20m	○ JZSP-CMP09-20
				30m	○ JZSP-CMP09-30
40m				○ JZSP-CMP09-40	
50m	○ JZSP-CMP09-50				
H	Connector Kit (for CN2)*1		○	JZSP-CMP9-1	
Connector*2	I	Plug for Encoder		○	L-Shape MS3108B20-29S
		Cable Clamp for Encoder			Straight MS3106B20-29S
	J	Plug for Fan on Motor Side		○	L-Shape MS3108B18-10S
		Cable Clamp for Fan on Motor Side			Straight MS3106B18-10S
					MS3057-12A
					MS3057-10A
<b>For Setting Devices (CN3,CN5)</b>					
CN3 ⇕ Setting Device	K	Digital Operator (Hand-held Type, with Cable)		1m	◇ JUSP-OP02A-2
		Cable for			
	L	Connecting		2m	◇ JZSP-CMS01
		PC			
		PC98 Half Pitch 14 pins		2m	◇ JZSP-CMS02
				2m	◇ JZSP-CMS03
CN5		Cable for Analog Monitor (With Single Connector)		1m	◇ DE9404559
<b>Peripheral Devices</b>					
Regenerative Resistor Unit				○	JUSP-RA12/RA13/RA14/RA15/RA16
DB Resistor				◇	JUSP-DB03/DB04/DB05/DB06
Brake Power Supply				◇	For 100VAC LPDE-1H01
(Required for servomotor with brake)					For 200VAC LPSE-2H01
Battery (Required for absolute encoder)				◇	ER6VC3 (3.6V)

\* 1 Made by Molex Japan Co.,Ltd.

\* 2 Made by Japan Aviation Electronics Industry,Ltd. Water-resistance types are also available.

Note : Prepare DC power supply by customer (24V±10% 5A load possible).

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