# ∑ Series SGM/SGMP/SGD USER'S MANUAL

**AC Servodrives** 

SGM/SGMP Servomotors SGD- $\square$ H Servopack



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### **Preface**

Based on Yaskawa servo manufacturing technology and servo application technology accumulated over the last half a century, Yaskawa has launched the AC Servo Series that, together with its rich line of products, meets the needs of the modern needs of FA and FMS in their application to machining tools and robots.

AC Servos not only provide stable, highly accurate, and high-speed response control even under adverse environments, but also provide such features as easy application, flexibility, and easy maintain. The new Yasakawa AC Servos can be used in various servo fields, including machining tools and robots.

### **Features**

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- The highest available power rates and response in this class of servo.
- Compared with conventional products, these servomotors are approximately 1/3 both in volume and weight and Servopacks are approximately 1/4 in volume.
- The book-shape Servopacks can be used with either incremental encoders or absolute encoders.
- Positioning by the serial communications
- Electronic gear function provided.
- For incremental encoders, there are now only 9 lines to wire between the motor and encoder (previously: 15 lines).
- Improved environmental resistance by using varnish coating.

### **General Precautions**

- The diagrams in this manual may be indicated without covers or safety shields to show details. Be sure to restore covers or shields before operating the Units and run the Units according to the instructions described in this manual.
- Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.
- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual. A new version of the manual will be released under a revised manual number when any changes are made.
- When ordering a new copy of the manual due to damage or loss, contact your Yaskawa dealer or the nearest Yaskawa sales office and provide the manual number shown on the front cover.

• Yaskawa assumes no responsibilities for products that are modified by users.

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# **Safety Notices**

The following conventions are used to indicate precautions in this manual. Failure to heed precautions provided in this manual can result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

WARNING Indicates precautions that, if not heeded, are likely to result in loss of life or serious injury.

Caution Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

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## **Safety Precautions**

### ■ Checking Products upon Delivery



### / Caution

• Always use the Servomotor and Servopack in one of the specified combinations. Not doing so may cause fire or malfunction.

### Installation



### / Caution

• Never use the products in an environment subject to water, corrosive gases, inflammable gases, or combustibles.

Doing so may result in electric shock or fire.

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### Wiring



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• Connect the ground terminal to a class-3 ground (100  $\Omega$  or less). Improper grounding may result in electric shock or fire.

### Caution

- Do not connect a three-phase power supply to the U, V, or W output terminals. Doing so may result in injury or fire.
- Securely fasten the power supply terminal screws and motor output terminal screws. Not doing so may result in fire.

### Operation



### / WARNING

• Never touch any rotating motor parts while the motor is running. Doing so may result in injury.

## ( Caution

 Conduct trial operation on the Servomotor alone with the motor shaft disconnected from machine to avoid any unexpected accidents.

Not doing so may result in injury.

Before starting operation with a machine connected, change the settings to match the user's
constants of the machine.

Starting operation without matching the proper settings may cause the machine to run out of control or malfunction.

 Before starting operation with a machine connected, make sure that an emergency stop can be applied at any time.

Not doing so may result in injury.

• Do not touch the heat sinks during operation.

Doing so may result in burns due to high temperatures.

### ■ Maintenance and Inspection



- Never touch the inside of the Servopacks repairtw.com
   Doing so may result in electric shock.
- Do not remove the panel cover while the power is ON

  Doing so may result in electric shock. COM
- Do not touch terminals for five minutes after the power is turned OFF.
   Residual voltage may cause electric shock.

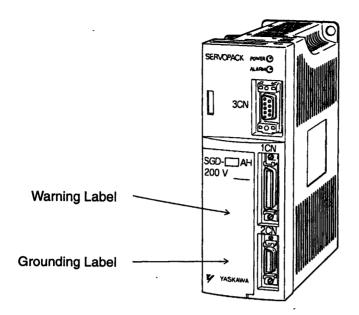
## ⚠ Caution

• Do not disassemble the Servomotor.

Doing so may result in electric shock or injury.

• Do not attempt to change wiring while the power is ON.

Doing so may result in electric shock or injury.



### Warning Label



### **Grounding Label**



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Warning Label and Grounding Label Sticker Attachment Positions (Servopack)

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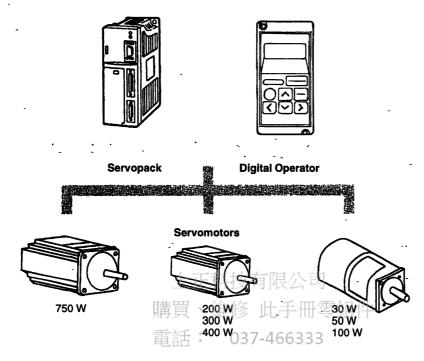
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# 1

# **Configuration and Model Numbers**

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# 1.1 Configuration

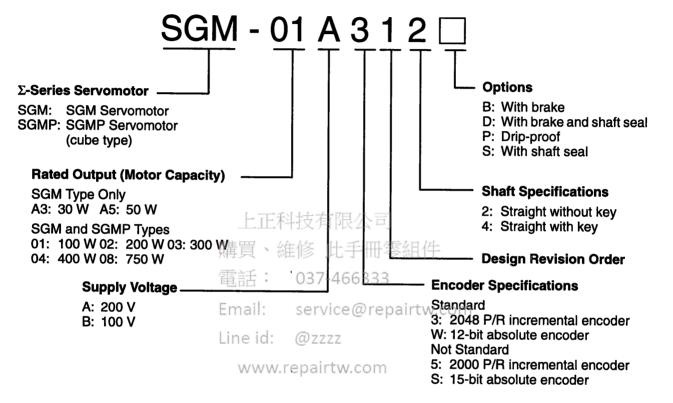


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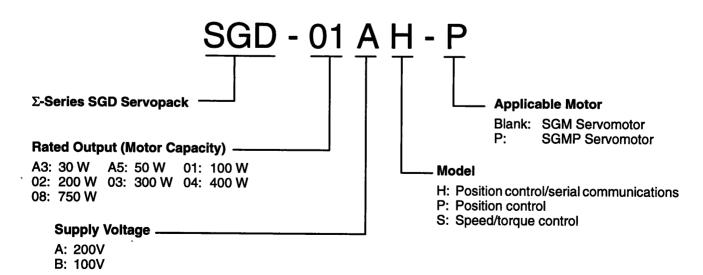
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### 1.2 Model Numbers

### 1.2.1 Servomotor Model Numbers



## 1.2.2 Servopack Model Numbers



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# 2

# **Ratings and Specifications**

This chapter provides Servomotor ratings, specifications, and torque-speed characteristics, as well as Servopack ratings and specifications.

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## 2

2 1 1 Ratings and Specifications

# 2.1 Ratings/Specifications for 200-VAC SGM Servomotors

# 2.1.1 Ratings and Specifications

Time Rating:

Continuous

Enclosure:

Totally enclosed, self cooled

**Excitation:** 

Permanent magnet

Insulation Class:
Ambient Temperature

Class B 0 to 40°C

Ambient Temperature Drive Method:

Direct drive

Vibration Class:

15 μm or below

Ambient Humidity:

20% to 80% (with no condensation)

Mounting:

Flange method

Withstand Voltage:

1500 VAC

Insulation Resistance:

500 VDC, 10 MΩ min.

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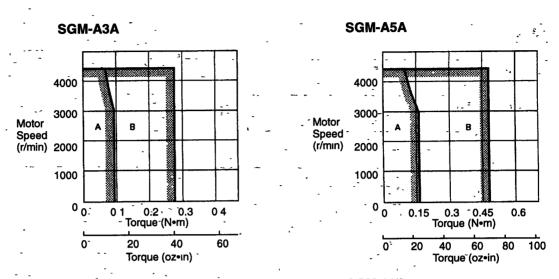
Table 2.1 200-VAC SGM Servomotor Ratings and Specifications

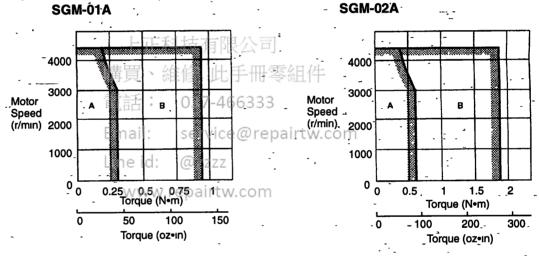
SGM Servomotor Type: SGM-		A3A	A5A	01A	02A	04A	08A	
Rated Output	भ	W	30	50	100	200	400	750
Rated Torque*1*2		N·m	0.095	0.159	0.318	0.637	1.27	2.39
		oẓ⋅in	13.5	22.6	45.1	90.1	181	338
Instantaneous Peak		N-m	0.29	0.48	0.96	1.91	3.82	7.1
Torque*1	-	oz.in	40.5	67.7	135	270	542	1010
Rated Current	<u> *1</u>	A (rms)	0.42	0.6	0.87	2.0	2.6	4.4
Instantaneous	Max Current*1	A (rms)	1.3	1.9	2.8	6.0	8.0	13.9
Rated Speed*	1	r/min	3000					
Instantaneous	Max Speed*1	r/min	4500					
Torque Const	ant*1	N·m/A (rms)	0.255	0.286	0.408	0.355	0.533	0.590
•		kgf-cm/A (rms)	2.60	2.92	4.16	3.62	5.44	6.01
Moment of Inertia [J <sub>M</sub> ]	Incremental encorder, no brake	(=GD <sup>2</sup> <sub>M</sub> /4)kg ·m <sup>2</sup>	0.021 ×10 <sup>-4</sup>	0.026 ×10 <sup>-4</sup>	0.040 ×10 <sup>-4</sup>	0.123 ×10 <sup>-4</sup>	0.191 ×10 <sup>-4</sup>	0.671 ×10 <sup>-4</sup>
		oz.in.s <sup>2</sup> ×10 <sup>-3</sup>	0.288	0.368	0.576	1.74	2.70	9.52
	Incremental encorder, with brake	(=GD <sup>2</sup> <sub>M</sub> /4)kg ⋅m <sup>2</sup>	0.030 ×10 <sup>-4</sup>	0.035 ×10 <sup>-4</sup>	0.049 ×10 <sup>-4</sup>	0.181 ×10 <sup>-4</sup>	0.249 ×10 <sup>-4</sup>	0.811 ×10 <sup>-4</sup>
		oz.in.s <sup>2</sup> ×10 <sup>-3</sup>	0.408	0.488	0.696	2.56	3.52	11.5
	Absolute encorder, no brake  Absolute encorder,	(=GD <sup>2</sup> <sub>M</sub> /4)kg ·m <sup>2</sup>	0.046 ×10 <sup>-4</sup> 03	0.051 ×10 <sup>-4</sup> 222	0.065 ×10 <sup>-4</sup>	0.148 ×10 <sup>-4</sup>	0.216 ×10 <sup>-4</sup>	0.696 ×10 <sup>-4</sup>
		oz·in·s <sup>2</sup> ×10 <sup>-3</sup>	0.640	0.720	0.928	2.09	3.05	9.87
		(=GD <sup>2</sup> <sub>M</sub> /4)kg ·m <sup>2</sup>	0.055 ser ×10 <sup>-4</sup>	/0.060© rep ×10−4	9.074/V.CO ×10 <sup>-4</sup>	0.206 ×10 <sup>-4</sup>	0.274 ×10 <sup>-4</sup>	0.836 ×10 <sup>-4</sup>
-	with brake	oz·in·s <sup>2</sup> ×10 <sup>-3</sup>	0.760 @Z	0.840	1.048	2.91	3.87	11.9
Rated Power	Rate*1	kW/s	4.36	9.63	25.4	32.8	84.6	85.1
Rated Angular rad/s		rad/s <sup>2</sup>	45200	61200	79500	51800	66600	35600
Inertia Time C	Constant	ms	1.5	0.9	0.5	0.4	0.3	0.3
Inductive Tim	e Constant	ms ,	1.5	1.8	1.9	5.4	6.4	13

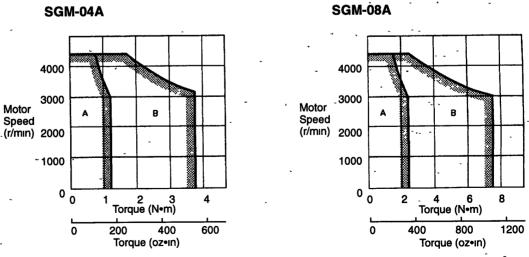
- Note 1. These items and torque-motor speed characteristics quoted in combination with a Servopack are at an armature winding temperature of 100°C Other values quoted at 20°C. All values are typical
  - 2. Rated torques are continuous allowable torque values at 40°C with a 250 x 250 x 6 (mm) (9.84 x 9.84 x 0.24 (in.)) heat sink attached.
  - 3. When a motor is fitted with a shaft seal, use the following reduction ratings because of the higher friction torque.

SGM-	АЗА	A5A	01A	02A	04A	08A
Reduction Rating (%)	70	80	90	90	95	95

## 200-VAC SGM Servomotor Torque-Motor Speed Characteristics







# 2.2 Ratings/Specifications for 100-VAC SGM Servomotors

# 2.2.1 Ratings and Specifications

Time Rating: Continuous

Enclosure: Totally enclosed, self cooled

Excitation: Permanent magnet

Insulation Class:

Ambient Temperature

O to 40°C

Drive Method:

Direct drive

Vibration Class:

15 µm or below

Ambient Humidity: 20% to 80% (with no condensation)

Mounting: Flange method

Withstand Voltage: 1500 VAC

Insulation Resistance:  $+\pm500$  VDC, 10 M $\Omega$  min.

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### 2 2 1 Ratings and Specifications

Table 2.2 100-VAC SGM Servomotor Ratings and Specifications

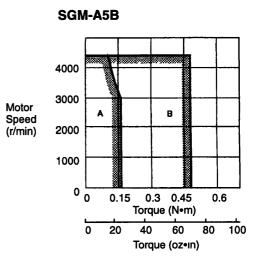
SGM Servomotor Type: SGM-			A3B	A5B	01B	02B	03B
Rated Output *1 W		30	50	100	200	300	
Rated Torque *1 *2		N·m -	0.095	0.159	0.318	0.637	0.95
		oz·ın	13.5	22.6	45.1	90.1	135
Instantaneous Peak Torque *1		N·m	0.29	0.48	0.96	1.91	3.72
		oz∙in	40.5 -	67.7	135 -	270	528
Rated Current	<b>*1</b>	A (rms)	0.63	0.9	2.2	2.7	3.7
Instantaneous	Peak Current *1	A (rms)	2.0	2.9	7.1	8.4	14.8
Rated Rotation	Speed *1	r/mın	3000 .				
Max. Rotation	Speed *1	r/min	4500				
Torque Consta	nt *1	N·m/A (rms)	0.168	0.194	0.156	0.255	0.279
		kgf-cm/A (rms)	1.72	1.98	1.59	2.60	2.85
Moment of Inertia [J <sub>M</sub> ]		(=GD <sup>2</sup> <sub>M</sub> /4) kg·m <sup>2</sup>	0.021 ×10 <sup>-4</sup>	0.026 ×10 <sup>-4</sup>	0.040 ×10 <sup>-4</sup>	0.123 ×10 <sup>-4</sup>	0.191 ×10 <sup>-4</sup>
		oz.in.s <sup>2</sup> ×10 <sup>-3</sup>	0.288	0.368	0.576	1.74	2.71
		(=GD <sup>2</sup> <sub>M</sub> /4) kg·m <sup>2</sup>	0.030 ×10 <sup>-4</sup>	0.035 ×10 <sup>-4</sup>	0.049 · ×10 <sup>-4</sup>	0.181 -×10 <sup>-4</sup>	0.249 ×10 <sup>-4</sup>
		oz·in·s <sup>2</sup> ×10 <sup>-3</sup>	0.408	0.488	0.696	2.56	3.53
		(=GD <sup>2</sup> M/4) kg m <sup>2</sup>	0.046 ×10-4	0.051 ×10-4	0.065 ×10 <sup>-4</sup>	0.148 ×10 <sup>-4</sup>	0.216 ×10 <sup>-4</sup>
	brake	oz.in.s <sup>2</sup> ×10 <sup>-3</sup>	0.640.466	0.720	0.928	2.09	3.07
	Absolute encorder, with	(=GD <sup>2</sup> <sub>M</sub> /4) kg m <sup>2</sup>	0.055 ×10/4ce@	0.060 r×10=1rtw.	0.074 ×10 <sup>-4</sup>	0.206 ×10 <sup>-4</sup>	0.274 ×10 <sup>-4</sup>
	brake	oz.in.s <sup>2</sup> ×10 <sup>-3</sup>	0.760	0.840	1.048	2.91	3.89
Rated Power Rating *1 kW/S Line id:		4.36 <sup>-ZZ</sup>	9.63	25.4	32.8	47.3	
Rated Angular Acceleration *1 rad/s <sup>2</sup>		rad/s <sup>2</sup>	45200	61200	79500	51800	49700
Inertia Time Co	onstant	ms	1.6	0.9	0.6	0.4	0.3
Inductive Time	Constant	ms	1.3	1.6	1.6	5.7	5.3

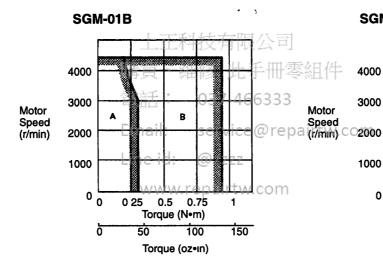
- Note 1 These items and torque-motor speed characteristics quoted in combination with a Servopack are at an armature winding temperature of 100°C. Other values quoted at 20°C. All values are typical.
  - 2. Rated torques are continuous allowable torque values at 40°C with a 250 x 250 x 6 (mm) (9.84 x 9.84 x 0.24 (in.)) heat sink attached.
  - 3. When a motor is fitted with a shaft seal, use the following reduction ratings because of the higher friction torque.

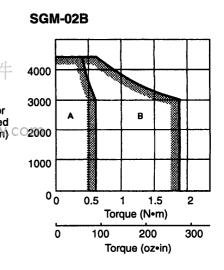
SGM-	A3B	A5B	01B	02B	03B
Reduction Rating (%)	70	80	90	90	90

## ■ 100-VAC SGM Servomotor Torque-Motor Speed Characteristics

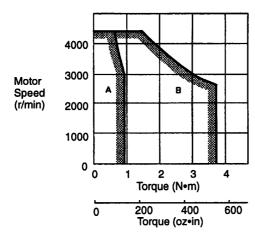
### SGM-A3B 4000 3000 Motor В Speed (r/min) 2000 1000 0 0 02 0.3 0.4 Torque (N•m) ō 20 60 Torque (oz•in)







### SGM-03B



A: Continuous Duty Zone B: Intermittent Duty Zone

### 2 3 1 Ratings and Specifications

# 2.3 Ratings/Specifications for 200-VAC SGMP Servomotors

### 2.3.1 Ratings and Specifications

Time Rating: Continuous

Enclosure: Totally enclosed, self cooled

Excitation: Permanent magnet

Insulation Class: Class B
Ambient Temperature 0 to 40°C

Drive Method: Direct drive

Vibration Class: 15 µm or below

Ambient Humidity: 20% to 80% (with no condensation)

Mounting: Flange method Withstand Voltage: 1500 VAC

Insulation Resistance: +500 VDC, 10 M $\Omega$  min.

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Table 2.3 200-VAC SGMP Servomotor Ratings and Specifications

SGMP Serv	omotor Type: SG	MP-	. 01A	02A	04A	08A
Rated Outp	Rated Output *1 W		100	200	400	750
Rated Torque *1 *2		N⋅m	0.318	0.637	1.27	2.39
		oz₊in	45.1	90.1	181	338
Instantaneous Peak Torque		N⋅m	0.96	1.91	3.82	7.1
		oz₊in	135	270	542	1010
Rated Curre	ent *1	A (rms)	0.89	2.0	2.6	4.1
Instantaneo *1	us Peak Current	A (rms)	2.8	6.0	8.0	13.9
Rated Rota	tion Speed *1	r/min	3000	<u> </u>		
Max. Rotati	on Speed *1	r/min	4500	· · · · · · · · · · · · · · · · · · ·		
Torque Con	stant *1	N·m/A (rms)	0.392	0.349	0.535	0.641
		kgf.cm/A (rms)	4.00	3.56	5.46	6.55
Moment of Inertia	encoder, no brake  Incremental encoder, with brake  Absolute encoder, no	(=GD <sup>2</sup> <sub>M</sub> /4) kg⋅m <sup>2</sup>	0.065 ×10 <sup>-4</sup>	0.209 ×10 <sup>-4</sup>	0.347 ×10 <sup>-4</sup>	2.11 ×10 <sup>-4</sup>
		oz·in·s <sup>2</sup> ×10 <sup>-3</sup>	0.917	2.96	4.92	29.9
		(=GD <sup>2</sup> <sub>M</sub> /4) kg·m <sup>2</sup>	0.103 ×10 有限公司	0.307 ×10 <sup>-4</sup>	0.445 ×10 <sup>-4</sup>	2.52 ×10 <sup>-4</sup>
		oz·in·s <sup>2</sup> ×10 <sup>-3</sup>	1.46	4.35	6.31	35.7
		(=GD <sup>2</sup> <sub>M</sub> /4) kg·m <sup>2</sup>	0.090 ×10-4	0.234 ×10 <sup>-4</sup>	0.372 ×10 <sup>-4</sup>	2.14 ×10 <sup>-4</sup>
	brake	oz·in·s <sup>2</sup> ×10 <sup>-3</sup>	1.27	3.31	5.27	30.3
	Absolute encoder, with	(=GD <sup>2</sup> <sub>M</sub> /4) kg·m <sup>2</sup>	0.128 vice@re	0,332 ×10 <sup>-4</sup>	0.470 ×10 <sup>-4</sup>	2.55 ×10 <sup>-4</sup>
	brake	oz.in.s2x10-3	1.81 ZZZZ	4.70	6.66	36.1
Rated Power Rate *1 kW/s			1,5.7	19.4	46.8	26.9
•1	lar Acceleration	rad/s WWW.	49200 TTW.COT	30500	36700	11300
nertia Time		ms	0.7	0.6	0.4	0.7
Inductive Tir	ne Constant	ms	3.7 ·	7.4	8.5	18

Note 1. These items and torque-motor speed characteristics quoted in combination with a Servopack are at an armature winding temperature of 100°C. Other values quoted at 20°C. All values are typical.

2. Rated torques are continuous allowable torque values at 40°C with the specified heat sink attached.

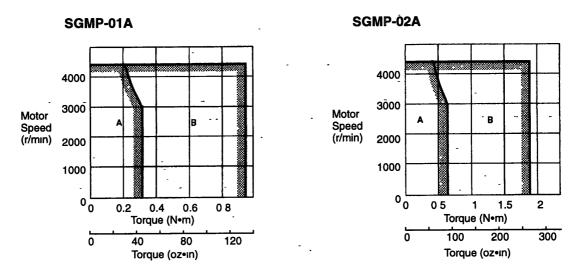
Heat sink dimensions 01A, 02A, 04A: 250 x 250 x 6 (mm) (9.84 x 9.84 x 0.24 (in)) 08A. ...... 300 x 300 x 12 (mm) (11.81 x 11.81 x 0.47 (in))

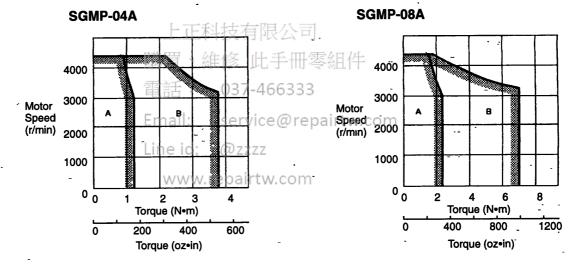
3. When a motor is fitted with a shaft seal, use the following reduction ratings because of the higher friction torque.

SGMP-	01A	02A	04A	A80
Reduction Rating (%)	90	90	95	95

### 2 3 1 Ratings and Specifications

# ■ 200-VAC SGMP Servomotor Torque-Motor Speed Characteristics





A: Continuous Duty Zone B: Intermittent Duty Zone

# 2.4 Ratings/Specifications for 100-VAC SGMP Servomotors

### 2.4.1 Ratings and Specifications

Time Rating:

Continuous

Enclosure:

Totally enclosed, self cooled

Excitation:

Permanent magnet

Insulation Class:

Class B

Ambient Temperature

0 to 40°C

Drive Method: Vibration Class:

Direct drive 15 μm or below

Ambient Humidity:

20% to 80% (with no condensation)

Mounting:

Flange method

Withstand Voltage:

1500 VAC

Insulation Resistance:

500 VDC, 10 MΩ min.

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### 2 4 1 Ratings and Specifications

Table 2.4 100-VAC SGMP Servomotor Ratings and Specifications

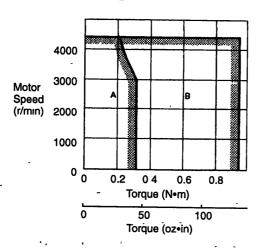
SGMP Servomotor Typ	e: SGMP-		01B	02B	03B
Rated Output*1		W	100	200	300
Rated Torque*1*2		N-m	0.318	0.637	0.955
·	-	oz∙in	45.1	90.1	135
Instantaneous Peak Tor	que*1	N⋅ṁ	0.96	1.91	2.86
	-	oz in	135	270 <sup>-</sup>	406
Rated Current*1	- ,	A (rms)	2.2	2.7	4.3
Instantaneous Peak Cur	rent*1	A (rms)	7.1	8.4	13.9
Rated Rotation Speed*1	-	r/min	3000	-	
Max. Rotation Speed*1		r/min 🛴	4500		
Torque Constant*1		N m/A (rms)	0.160	0.258	0.246
		kgf cm/A (rms)	1.64	2.63	2.51
Moment of Inertia	incremental encoder, no brake	(=GD <sup>2</sup> <sub>M</sub> /4) kg·m <sup>2</sup>	0.065 ×10 <sup>-4</sup>	0.209 ×·10 <sup>-4</sup>	0.347 ×10 <sup>-4</sup>
	: •	oz·in·s²×10 <sup>-3</sup>	0.917 .	2.96	4.92
	Incremental encoder, with brake	(=GD <sup>2</sup> <sub>M</sub> /4) kg m <sup>2</sup>	0.103 ×10 <sup>-4</sup>	0.307 ×10 <sup>-4</sup>	0.445 ×10 <sup>-4</sup>
	上止	oz·in·s <sup>2</sup> ×10 <sup>-3</sup>	1.46	4.35	6.31
	Absolute encoder, no brake	(=GD <sup>2</sup> <sub>M</sub> /4) kg·m <sup>2</sup>	0.090 ×10-4件	0.234 ×10 <sup>-4</sup>	0.372 ×10 <sup>-4</sup>
	雷註:	$oz \cdot in \cdot s^2 \times 10^{-3}$	1.27	3.31	5.27
	Absolute encoder, with brake Email:	(=GD <sup>2</sup> <sub>M</sub> /4) kg·m <sup>2</sup> vice @ re	0.128 ×10 <sup>-4</sup> w.com	0.332 ×10 <sup>-4</sup>	0.470 ×10 <sup>-4</sup>
		oz ın·s <sup>2</sup> ×10 <sup>-3</sup>	1.81	4.70	6.66
Rated Power Rate*1	Line id:	kW/sZZZZ	15.7	19.4	26.3
Rated Angular Accelera	tion*1	rad/s	49200	30500	27500 ·
Inertia Time Constant	6-6-6-6-6-6-6-6	ms	0.8	0.7	0.4
Inductive Time Constant	1	ms	3.6	6.3	8.5

- Note 1. These items and torque-motor speed characteristics quoted in combination with a Servopack are at an armature winding temperature of 100°C. Other values quoted at 20°C. All values are typical.
  - 2. Rated torques are continuous allowable torque values at 40°C with a 250 x 250 x 6 (mm) (9.84 x 9 84 x 0.24 (in )) heat sink attached.
  - 3. When a motor is fitted with a shaft seal, use the following reduction ratings because of the higher friction \_ -torque.

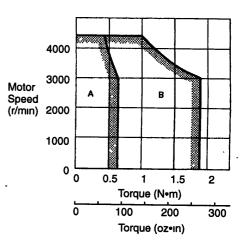
SGMP-	01B	02B	_ 03B
Reduction Rating (%)	90	90	95

# ■ 100-VAC SGMP Servomotor Torque-Motor Speed Characteristics

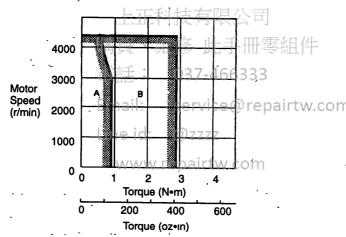
### SGMP-01B



### SGMP-02B



### SGMP-03B



A: Continuous Duty Zone

**B:** Intermittent Duty Zone

# 2.5 Servopack Ratings and Specifications

The ratings and specifications for the SGD Servopack are shown below. Refer to them as required when selecting a Servopack. Refer to the specifications listed in the table for combination with the appropriate type of Servomotor.

Table 2.5 Servopack and Applicable Servomotors

-	Voltage		200 VAC							- 100 VAC				
SGD Servopack	ζ	-	АЗАН	A5AH	01AH	02AH	04AH	HA80	A3BH	A5BH	01BH	02BH	03BH	
Max. Applicable (HP)		acity W	30 (0.04)	50 (0 07)	100 (0.13)	200 (0 27)	400 (0 53)	750 (1.01)	30 (0:04)	50 (0.07)	100 (0.13)	200 (0.27)	300 (0.40)	
Combined Specifications	Motor	Type: SGM-	АЗА□	A5A□	01A□	02A□	04A□	08A□	АЗВ□	A5B□	01B□	02B□	03B□ .	
	-	Motor Ca- pacity W (HP)	30 (0.04)	50 (0.07)	100 (0 13)	200 (0.27)	400 (0 53)	750 (1.01)	30 (0.04)	50 (0.07)	100 (0.13)	200 (0 27)	300 (0.40)	
		Rated/ Max. Motor Speed	3000/45	3000/4500 r/min 上正科技有限公司 3000/4500 r/min										
Applica encode			Increme	ntal enco	oder 204	8 P/R or	2000 P/R	, absolute	e encode	r 1024 P/	'R -			
	Allowable Load iner- tia*1	0 63 (8.80)	0.78 (11.0)	1 20 7 (17.0)	3.69 (52.2)	3.82 (54 1)	13.4 (189)	0.63 (8 80)	0.78 (11.0)	1.20 (17.0)	3.69 (52.2)	3.82 (54.1)		
$\begin{array}{c c} J_L \times 10^{-4} \\ \text{kg m}^2 \\ \text{(oz · in s}^2 \times \\ 10^{-3}) \end{array}$		kg m² (oz∙ın s²×	Em Lin	aii: e id:	serv @zz	ice@ zz	repail	rtw.co	m					
	Continuou	is Output	0.42	0.6 WW.	e pair	<b>2.0</b> .cc	2.6	4.4	0.63	0 90	2.2	2.7	3.7	
	Max. Output Current		1.3	19	2.8	6.0	80	13.9	2.0	2.9	7.1	8.4	14.8	
Basic Specifi- cations	Power Su	pply	Single-  50/60 H	Single-phase 200 to 230 VAC, +10% to −15%, 50/60 Hz*2						Single-phase 100 to 115 VAC* <sup>2</sup> , +10% to –15%, 50/60 Hz				
	Control M	ethod	Single-phase, full-wave rectification IGBT-PWM (sine-wave driven)											
	Feedback		Incremental encoder 2048 P/R or 2000 P/R, absolute encoder 1024 P/R											
	Location	Ambient Temp.	0 to 55°C*3											
		Storage Temp.	-20 to +85°C											
	Ambient/ Storage Humidity				90% or less (with no condensation)									
	Vibration/ Shock Re- sistance	4.9/19.6 m/s <sup>2</sup> (0 5/2G)												
-	Structure	<u></u>	Book (Base-mounted)											
-	Approx. Mass kg (lb)		0.9 (1.9	98)		-	1.2 (2 65)	1.5 (3.31)	0 9 (1.	98)		1.2 (2.65)	1.5 (3.31)	
Performance	Bias Setti	ng	0 to 45	0 r/mın. (	Setting re	esolution:	1 r/min.)							
	Feed For	ward Com-	0 to 10	0% (Setti	ng resolu	ution: 1%								
	Position C	Complete	0 to 10	0 to 100 reference units										
	Width Setting		Reference unit: Minimum unit of position data which moves the load											

	Voltage	200 VAC	100 VAC				
I/O Signals	Serial Communications	Function: Position reference input, user constant setting monitors Type of Communications: RS-422, asynchronous, 9600 for a maximum of 16 axes enabled					
	Sequence Input	Servo ON, P drive (or external speed setting selection), stop (N-OT), origin return deceleration LS (alarm reset current limit + selection (or JOG forward instruction), cuinstruction)	when using an absolute encoder).				
	Sequence Output	During current limit detection, positioning complete, bra codes	ke interlock, servo alarm, 3-bit alarm				
Dynamic Brak	(e	Operated automatically with main power OFF or a serve	alarm				
External Rege	enerative Resistor Unit	Required when exceeding the allowable load mertia 1					
Overtravel		Dynamic brake stop at P-OT, N-OT or deceleration stop					
Protective Ful	nctions	Overcurrent, overload, overvoltage, overspeed, overrun encoder error, overflow					
Indicators		Alarm and power indicators (LEDs)					
		Digital Operator standard with options					
Others		Brake interlock signal output, JOG run, electronic gear					

- Note 1. Allowable load inertia ranges require no optional External Regenerative Resistor Unit. Values are 30 times the moment of inertia for 30-W to 200-W Servomotors, and 20 times for 300-W, 400-W and 750-W Servomotors.
  - 2. Supply voltage should not exceed 230 V + 10% (253 V) or 115 V + 10% (127 V). A step-down transformer is required if the voltage should exceed these values.
  - 3. Use within the specified ambient temperature range. When enclosed in a box, the internal temperature must not exceed the ambient temperature range.

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# 2.6 Standard Servodrives

The rated current for the external terminal of the SGD Servopack, applicable power supply size, and peripheral equipment are listed in the following table.

Table 2.6. SGM Servomotor, SGD Servopack, and Peripheral Device Combinations

Туре		pack Model SGD-	Applicable Servomotor Model	Power Sup- ply Capacity per Servo-	MCCB or Fuse Power	Applica- ble Noise Filter		nended Noise Filter <sup>*3</sup>	Power ON/OFF Contactor
٠,		·		pack <sup>*1</sup> (kVA)	Supply Capac- ity <sup>*2</sup> (A)	(Refer- ence Dia- gram)	Model	Spec.	-
200	30 W	SGD-A3AH	SGM-A3A□	0 25	5	(Applica-	LF- 205A	Single-phase	Yaskawa
VAC	50 W	SGD-A5AH .	SGM-A5A□	03		ble)		200 VAC-class, 5 A	HI-15E5 (30 A), or the equivalent
	100 W	SGD-01AH.	SGM-01A□	.05			- ,		or the equivalent
,	200 W	SGD-02AH	SGM-02A□	075 .	-				
	400 W	SGD-04AH	SGM-04A□	1.2	9 つ	·	LF- 210 °	Single-phase 200 VAC-class, 10 A	
	750 W	SGD-08AH	SGM-08A□ 購	<del>工作符段</del> 買、維修	16 此手	(Not applicable)	LF- 220	Single-phase 200 VAC-class, 20 A	
100	30 W	SGD-A3BH	SGM-A3B	025 03	7-4663	3 <b>)</b> X	LF- 205A	Single-phase	
VAC	50 W	SGD-A5BH	SGM-A5B□	03	7-4000	- <b>XX</b>	<u> </u>	200 VAC-class, 5 A	
	100 W	SGD-01BH	SGM-01B⊞ n	95: se	rvice@	repairty	v.com	3 A	
	200 W	SGD-02BH	SGM-02B□ Lir	075 e id: @:	<b>8</b> 2ZZZ		LF- 210	Single-phase 200 VAC-class, 10 A	-
	300 W	SGD-03BH	SGM-03B□	www.repa	ii <sub>l</sub> stw.co	m	LF- 220	Single-phase 200 VAC-class, 20 A	

Note 1. Values for the rated load

- 2. Shut off characteristics (at 25°C): 200%: 2 s min., 700%: 0.01 s min.
- 3. A Tokin Corp. noise filter available from Yaskawa Control Co., Ltd. is recommended.

3

# **Servodrive Characteristics**

This chapter provides characteristics of Servopacks and Servomotors.

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## 3.1 Overload Characteristics

The Servopack has a built-in overload protective function to protect the Servopack and Servomotor from overload. Allowable power for the Servopack is therefore limited by the overload protective function as shown below.

The overload detection level quoted under hot start conditions at a motor ambient temperature of 40°C cannot be modified.

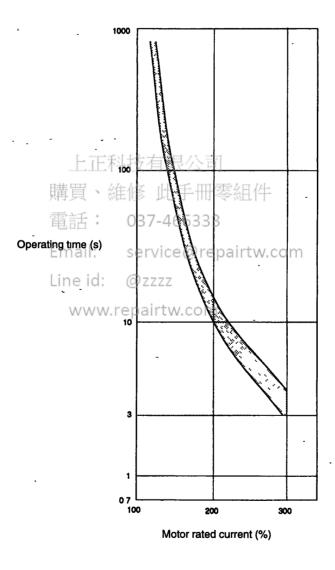


Figure 3.1 Overload Characteristics

# 3.2 Starting and Stopping Time

The motor starting (tr) and stopping time (tf) with a constant load are calculated using the following equations. Motor viscous torque and friction torque have been ignored.

Starting time: 
$$tr = 104.7 \times \frac{N_R(J_M + J_L)}{Kt \cdot I_R(\alpha - \beta)}[ms]$$

Stopping time: 
$$tf = 104.7 \times \frac{N_R(J_M + J_L)}{Kt \cdot I_R(\alpha + \beta)}[ms]$$

N<sub>R</sub>: Rated motor speed (r/min)

J<sub>M</sub>: Motor moment of inertia (kg•m<sup>2</sup>...(GD<sup>2</sup><sub>M</sub>/4)

J<sub>L</sub>: Load converted to shaft moment of inertia (kg•m²)...(GD²<sub>L</sub>/4)

 $K_t$ : Motor torque constant (N•m/A)

I<sub>R</sub>: Rated motor current (A)

 $\alpha = I_P/I_R$ : Acceleration/deceleration current coefficient

[Where Ip is accel/decel current (accel/decel current is  $\alpha$  times the rated motor current) (A)]

[Where  $I_L$  is the load torque equivalent current (load current is  $\beta$  times the rated motor current) (A)]

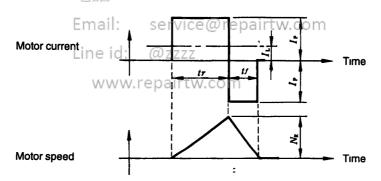


Figure 3.2 Motor Current – Motor Speed Timing Chart

3 3 1 Allowable Repeatability as Limited by the Servomotor

# 3.3 Allowable Repeatability

Running and stopping repeatability are limited by the Servomotor.

# 3.3.1 Allowable Repeatability as Limited by the Servomotor

Running and stopping repeatability vary with motor conditions, such as the load conditions and running time. A typical example is given below (See 3.2 Starting and Stopping Time details on symbols.).

#### **■** With Motor Idling or Stopped

The most common example is the operating cycle shown in Fig. 3.3 where rms frequency for motor armature current is lower than the rated motor current. If we assume that T is the operating cycle, then the range for T will satisfy the following equation.

$$T \ge \frac{I^2 P(tr + tf) + I^2 L ts}{I^2 R} [s]$$

Find I<sub>P</sub>, tr, and tf that satisfy the equation above when cycle time (T) is already known.

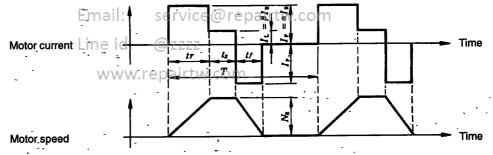


Figure 3.3 Motor Current – Motor Speed Timing Chart

# ■ With Motor Stopped without Idling Except during Acceleration or Deceleration

The timing chart for motor armature current and motor speed is shown in Fig. 3.4. If we assume that allowable repeatability is N (times per minute), then N can be found using the equation given below.

$$N = 286.5 \times \frac{Kt \cdot I_R}{N_R(J_M + J_L)} (1/\alpha - \beta^2/\alpha^3) \text{ [times per minute]}$$

Motor speed Time

Figure 3.4 Motor Current - Motor Speed Timing Chart

# With Motor Constantly Cycling through Acceleration, Idling, and Deceleration without Stopping rtw.com

The timing chart for motor armature current and motor speed is shown in Fig. 3.5. If we assume that allowable repeatability is N (times per minute), then N can be found using the equation given below.

$$N = 286.5 \times \frac{Kt \cdot I_R}{N_R(J_M + J_L)} (1/\alpha - \beta^2/\alpha)$$
 [times per minute]

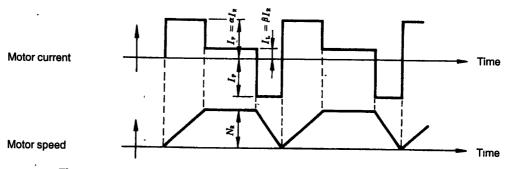


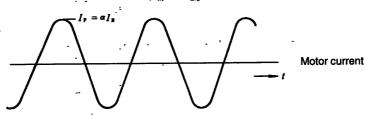
Figure 3.5 Motor Current – Motor Speed Timing Chart

### J.T Lai

3.4 Large-amplitude Frequency Characteristics

When looking at frequency characteristics with a Servopack and Motor combination, the motor speed amplitude is limited by the peak current through the Servopack. The relationship between motor speed (N) and frequency (f) is expressed using the equation given below.

$$N = 1.52 \times \frac{\alpha \cdot K_t \cdot I_R}{(J_M + J_L)f} [r/min]$$



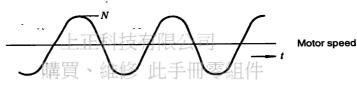


Figure 3.6 Motor Current - Motor Speed Timing Chart

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# 3.5 Mechanical Characteristics

# 3.5.1 Mechanical Strength

A Servomotor can withstand instantaneous peak torque on the output shaft of up to 300% of the motor rating.

# 3.5.2 Allowable Radial Loads and Allowable Thrust Loads

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The output shaft allowable loads for SGM and SGMP Servomotors are shown below.

Use mechanical designs where thrust and radial loads do not exceed the values below during motor operation.

Table 3.1 Allowable Radial Loads and Allowable Thrust Loads for SGM and SGMP Servomotors

Servomotor		dial Load Fr	Allowable Th		Reference Diagram		
Туре	With Incremental Encoder	With Subsolute re Encoder	With Incremental Encoder	With Absolute Encoder			
SGM-A3	68 (7)	49 (5)	54 (5.5)	19 (2)			
SGM-A5	68 (7)	nai 68 (7) cor	54 (5.5)	19 (2)			
SGM-01	78 (8)	68 (7)	54 (5.5)	19 (2)			
SGM-02	245 (25)	196 (20)	74 (7.5)	49 (5)			
SGM-03	245 (25)	196 (20)	74 (7.5)	68 (7)	Fr 5/200		
SGM-04	245 (25)	196 (20)	74 (7.5)	68 (7)	1 5 (0 20)		
SGM-08	392 (40)	343 (35)	147 (15)	98 (10)	<b>→</b>		
SGMP-01	78 (8)	78 (8)	49 (5)	49 (5)			
SGMP-02	245 (25)	245 (25)	68 (7)	49 (5)	ľ		
SGMP-03	245 (25)	245 (25)	68 (7)	49 (5)			
SGMP-04	245 (25)	245 (25)	68 (7)	49 (5)			
SGMP-08	392 (40)	392 (40)	147 (15)	49 (5)			

Note Radial and thrust load limit values are the sum of the loads generated by the motor torque and external loads applied to the shaft.

3 5 4 Direction of Motor Rotation

# 3.5.3 Mechanical Tolerances

Tolerances for Servomotor output shaft and installation are shown in Table 3.2.

Table 3.2 Mechanical Tolerances

Tolerance (T.I.R.) (see no	Reference Diagram	
Perpendicularity between the flange face and output shaft	0.04 mm (0.0016 in)	
Mating concentricity of flange O.D.	0.04 mm (0.001,6 in)	
Run-out at the end of the shaft	0.02 mm (0.00079 in)	

Note T.I.R. = Total Indicator Reading

#### 3.5.4 Direction of Motor Rotation

Servomotor rotation when a forward run command is input is counterclockwise as viewed from the load end of the shaft 037-466333

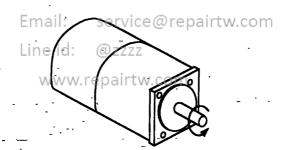


Figure 3.7 Direction of Rotation for Forward Run Command Input

#### **Connector Wiring Specifications**

#### Motor Side (Standard)

#### U phase Red V phase White W phase Blue

FG (frame ground)

#### Motor Side (with Brake)



(Absolute Encoder)

**Encoder Side** 

1	U phase	Red
2	V phase	White
3	W phase	Blue
4	FG (frame ground)	Green
5	Brake terminal	Black
6	Brake terminal	Black

#### **Encoder Side** (Incremental Èncoder)



1	Channel A output	Blue	ے ا
2	Channel A output	Blue/Black	
3	Channel B output	Yellow	
4	Channel B output	Yellow/Black	
5	Channel C output	Green	11 12 18
6	Channel C output	Green/Black	1
7	0V (power supply)	Gray	1
8	+5V (power supply)	Red	
9	FG (frame ground)	Orange	I I - 171 - 17 - 17
		上止村	支有限公司



12345 678910 11218415
678910
11 12 18 14 15

	1	Channel A output	Blue
	2	Channel A output	White/Blue
	3	Channel B output	Yellow
	4	Channel B output	White/Yellow
	5	Channel Z output	Green
	6	Channel Z output	White/Green
	7	0V (power supply)	Black -
	8	+5V (power supply)	Red
	9	FG (frame ground)	Green/Yellow
٠	10	Channel S output	Purple
	11	- Channel S output	White/Purple
•	(12)	(Capacitor reset)	(Gray)
	_ 13	Reset	White/Gray
	14	0 V (battery)	White/Orange
	15	3 6 V (battery)	Orange .

Green

037-466333

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#### 3.5.5 Impact Resistance.

The Servomotor will withstand two vertical impacts at an impact acceleration of 98 m/s<sup>2</sup> (10 G) (See Fig. 3.8.) when the axis of the Servomotor is mounted horizontally.

Since a precision detector is attached to the shaft at the end opposite the load end, do not subject the shaft to direct impact as this may damage the detector.

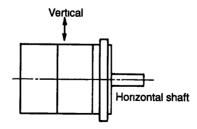


Figure 3.8 Impact Measurement

#### 3.5.6 Vibration Resistance

The Servomotor will withstand a vibration acceleration of 24.5 m/s<sup>2</sup> (2.5 G) in the vertical, transverse, and longitudinal directions (See Fig. 3.9) when the axis of the Servomotor is mounted horizontally.

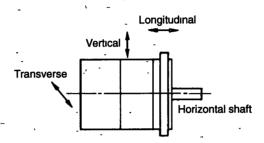


Figure 3.9 Vibration Resistance Measurement

#### 3.5.7 Vibration Class

The vibration class of the Servomotor is 15  $\mu m$  or below at the rated speed (See Fig. 3.10).

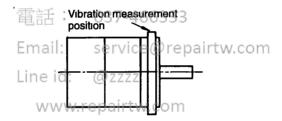


Figure 3.10 Vibration Measurement

# **Configuration and Connections**

This chapter describes Servodrive configmations and connections.

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# 4.1 Internal Connection Diagram

The internal connection diagram of the SGD- $\square$ H Servopack is given below.

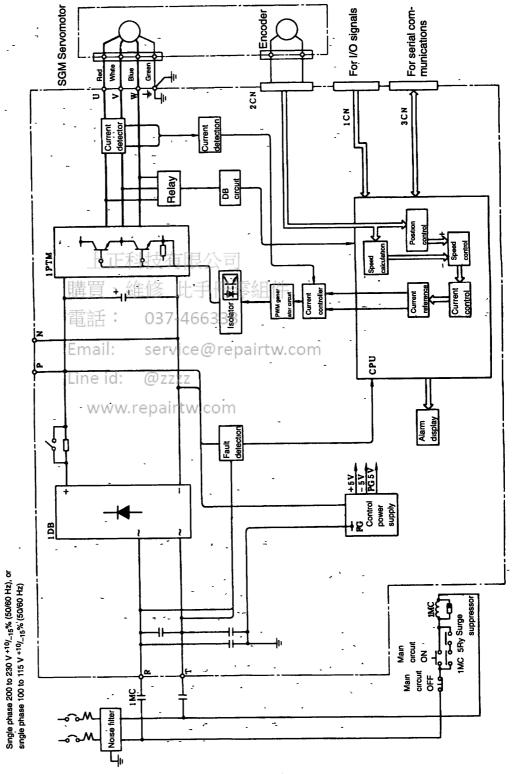


Figure 4.1 Internal Connection Diagram for the Servopack

# 4.2 Main Circuit Terminals

Table 4.1 Main Circuit Terminals

Terminal Signal	Name	Description
R, T	Power supply input terminal	Single-phase 200 to 230 VAC +10/_15%, 50/60 Hz*
U, V, W	Motor terminal	Connect U to the red motor terminal, V to the white motor terminal, and W to the blue motor terminal.
<b>(</b>	Ground terminal	Connect to the motor ground terminal (green) for grounding.
P, N	Regenerative Resistor Unit terminal	Connect to a Regenerative Resistor Unit (External connection is usually not needed.)

Note For 100 V power supply: Single phase 100 to 115 VAC  $^{+10}/_{-15}\%$ , 50/60 Hz

# 4.3 Applicable Receptacles

#### 4.3.1 1CN Connector for I/O Signals

Table 4.2 Specifications for Applicable Servopack I/O Signal Receptacles

Specifications for Servopack	電話:	037-46	Applicable Receptacle M	lodel
Connectors	Solde	er	Case	Manufacturer
10236-52A2JL (Manufactured by SUMITOMO 3M), 36-P right	10136-3000VE	service	10336-52A0-008	SUMITOMO 3M
angle	Line id:	@zzzz		·

# **4.3.2 2CN Connector for Encoder**

Table 4.3 Applicable Receptacle and Cable Specifications

Specifications for		Cable Specifications			
Servopack Connectors	Solder	Case	Manufacturer	(see note)	
10220-52A2JL (Manufactured by SUMITOMO 3M), 20-P right angle	10120-3000VE	10320-52A0-008	SUMITOMO 3M	See 10.4.2 Cable Specifications.	

Note This cable is available from Yaskawa. Refer to 10.4.2 Cable Specifications for more details on cables.

# 4.3.3 3CN Connector for Serial Communications

Table 4.4 Applicable Receptacle

Specifications for Servopack	Applicable Receptacle Model						
Connectors	Solder	Case	Manufacturer				
17LE-13090-27 (Manufactured by Dairchi Denshi Kogyo Co., Ltd.), 9-pin right angle	17JE-23090-02 (D8B)	Provided with receptacle	Dauchi Denshi Kogyo Co., Ltd.				

# 4.4 Connecting an Incremental Encoder

# 4.4.1 Typical Example

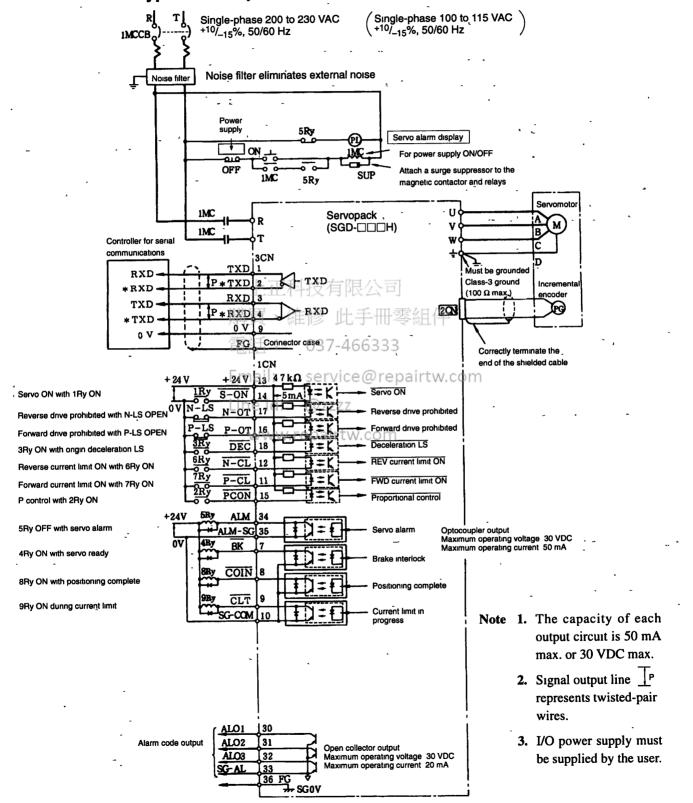


Figure 4.2 SGD-□□□H Servopack Connection

4

# 4.4.2 1CN I/O Connector Terminals

#### **■** Terminal Layout

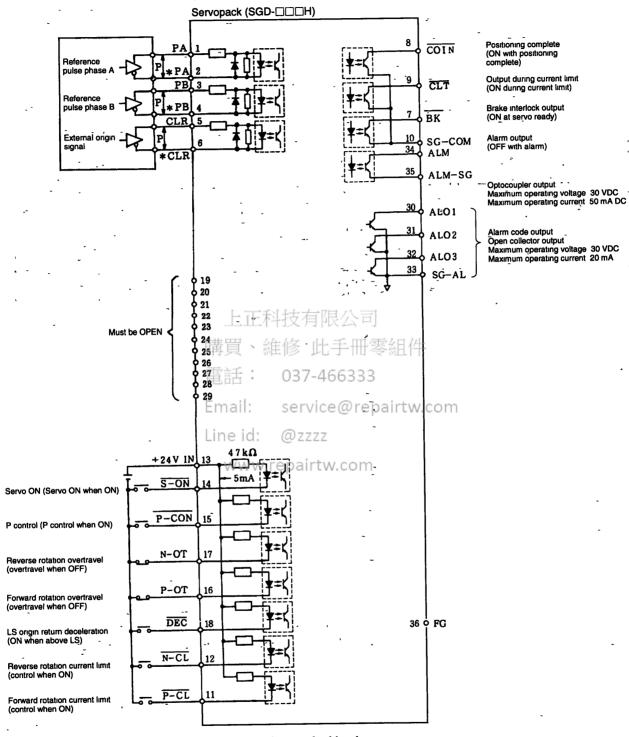
Table 4.5 1CN Terminal Layout

			_			-,	-	•			-	
2	*PA	Reference	1	PA	Reference pulse input				19	Not	used	
		pulse input	- 3	PB	Reference	20	Not used		21			
4	*PB	Reference pulse input		pulse input		- 22	Not used			Not used		
		puise iriput	5	CLR	External origin signal		Not used			Not used		
6	*CLR	External origin signal	L	CLR	input	24	4 Not used		23			
-		input	. 7	 BK	Brake inter- lock signal				25			
8	COIN	Positioning complete signal output			output	26	No.	t used	25	Not used		
			9	CLT	Current limit detection sig-	1	T - <del></del>	 m <del></del>		Not used		
10	SG-COM	BK/COIN/ CLT common		□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	nal output	166	333 No	t used		NOL	used	
		0 V	11	P-CLail:	Forward current limit	28		1 4364	29	Not used		
12	N-CL	Reverse current			ON input	30	repair	<del>rw.com</del>	29			
		limit ON in- put	13	Line id	External ZZZZ power supply	30	ALO1	Alarm code output (open	31	ALO2	Alarm code output (open	
14	S-ON	Servo ON input		WW	wwwepairt	W.C 32	collector out	collector out-		COI	collector out- put)	
		Forward	· .	15	P-CON	P control		ALO3		33	SG-AL	Alarm code output com-
16	P-OT					Servo alarm	-		mon 0 V			
$\vdash$		<u> </u>	17	17 N-OT	Reverse drive prohib-	-	LIGI	output	35	ALM-SG	Servo alarm output	
18	DEC	Deceleration LS input			ited input	36	FG ,	Frame ground				
		,			Į.							

Note Do not use vacant pins for relay or other purposes. Set PRM36 bit 3 to 1 when using a reference pulse input (see page 7 - 7), and set PRM39 bit 7 to 1 when using an external origin signal input (see page 7 - 9).

#### 4 4 2 1CN I/O Connector Terminals

# ■ I/O Signal Connections and External Signal Processing



Note 1. I/O power supply must be supplied by the user.

- 2. Signal output line  $\prod_{P}$  represents twisted-pair cable.
- 3. See Pulse String Input: PRM36 bit 2 for more details on reference pulses (page 7 7), and Origin Pulse Selection: PRM39 bit 7 for more details on external origin signals (page 7 12).

Figure 4.3 1CN I/O Signal Connection and External Signal Processing

4 - 6

# Input Signals and Their Application

Table 4.6 Input Signals

Signal Name	1CN Pin No.	Description				
S-ON	14	Servo ON	<ul> <li>When input, this signal triggers a standby status for the reference input.</li> <li>Cancels the base block and dynamic brake.</li> <li>The Servo ON signal can be canceled with user constant PRM37</li> </ul>			
P-CON	15 (Two functions can be set via user	Proportional control reference	bit 0 if not needed  When input, this signal switches the speed loop control mode from PI (proportional-integral) to P (proportional) control.			
-	constant PRM37 bit 2.)	External set speed selection	When N-CL and P-CL are used as the JOG run reference, this signal is used as the reference speed selection signal.			
N-OT P-OT	17 16	Reverse drive prohibited Forward drive prohibited	<ul> <li>Connect to the appropriate forward or reverse limit switch signal for linear or other types of drive. The signals are CLOSED during normal operation and are OPEN when the limit switch is operated.</li> <li>These functions can be canceled with user constant PRM37 bit 1. Always N-OT or Always P-OT can also be set.</li> </ul>			
+24V IN	13	24 購買、維修 』 電話: 037-	This signal is the external power supply input for pins 11, 12, 14, 15, 16, 17 and 18 of 1CN. The user must provide the I/O (50 mA min.) power supply.			
N-CL P-CL	12 11	Reverse current limit reference (Reverse JOGV run reference) Forward current limit ZZZ reference (Forward JOG run reference)	This signal is the current limit reference or JOG run reference input depending on the setting of user constant PRM37 bit 2.  The current limit and set speed values are set with user constant settings.			
DEC	18	Origin deceleration LS	<ul> <li>This signal is the deceleration LS input when the motor returns to the origin. The signal is CLOSED on the LS.</li> <li>Polarity can be reversed (OPEN on LS) with user constant PRM37 bit 4.</li> </ul>			

#### **■** Input Circuits

The input signals are Servo ON, P control reference, forward/reverse overtravel prohibited, forward/reverse current limit reference, and origin deceleration LS. They comprise the input circuits that use I/O power supply (See Fig. 4.4.). See Fig. 4.2 for an example of connections.

The user must provide I/O power supply: 24 VDC ±1 V, 50 mA min. (about 5 mA per circuit).

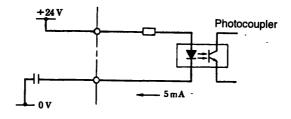


Figure 4.4 Input Circuit Configuration

#### P-CON

The P-CON signal is used as one of the following two signals depending on the setting of user constant PRM37 bit 2.

- P Control (PRM37 bit 2 = 0)
   This signal switches the speed loop control mode between PI (proportional-integral) and P (proportional) control.
- External Set Speed Selection (PRM37 bit 2 = 1)
   This signal is used to input the speed set selection in user constants PRM26 and 27.

# P-OT and N-OT: Forward and Reverse Drive Prohibited

These inputs are used to stop the forward operation of the motor (counterclockwise when viewed from the drive end of the motor) and reverse operation. When the overtravel prevention input is not used, connect 1CN 16 and 17 to the 0 V of the external 24-V power supply, or disable this function by setting bit 1 of user constant PRM37.

When an overtravel occurs, regardless of the speed reference, the internal circuit will forcibly change the speed reference to zero and immediately stop the motor. The motor will be zero-clamped after it stops.

# S-ON: Servo ON 037-466333

Turning ON this signal activates the power drive circuit in the Servopack main circuits. The motor cannot rotate without inputting this signal (Servo OFF status).

If the Servo is turned OFF while the motor is rotating, the motor will be stopped with the dynamic brake. This signal can be automatically input by setting bit 0 of user constant PRM37.

#### P-CL, N-CL

These signals are used as one of the following two signals depending on the setting of user constant PRM37 bit 2.

- Forward and Reverse Current Limit References (PRM37 Bit 2 = 0)
  This circuit limits the peak current of the motor armature during forward (counterclockwise viewed from the load coupling side) or reverse rotation. Limits can be set individually for forward and reverse rotation with user constants PRM8 and 9. The continuous output current is set at 100%, and can be set up to the peak output current.
- JOG Run Reference (PRM37 Bit 2 = 1) This is the JOG run reference input.

Table 4.7  $\overline{P\text{-}CL}$  and  $\overline{N\text{-}CL}$ 

N-CL	Reverse JOG run reference					
P-CL	Forward JOG run reference					

Table 4.8 P-CON

P-CON	Speed reference
OFF	Speed 1
ON	Speed 2

# LS DEC: Origin Deceleration

When the motor returns to the origin, it decelerates from the origin return speed (PRM18) to creep speed (PRM19) when this signal changes from H to L. After the signal changes from L to H, the motor moves from the first C-pulse position until it reaches the position set for PRM20 (final travel distance) where it stops.

# Output Signals and Their Application

Table 4.9 Output Signals

Signal Name	1CN pin No.	Description					
ALM	34 (35)	Servo Alarm 購買、維修」	Turns OFF when an error is detected.  See 5.4.2 Error Detection Function for further details.				
CLT	9 (10)	Current Limit Detection _	4 When N-CL or P-CL is ON, this signal turns ON when the torque reaches the lower level value either limited by Cn-18 and Cn-19 or set in Cn-08 and Cn-09				
			Turns ON when the torque set for PRM28 and 29 is applied while N-CL and P-CL are OFF.				
BK	7 (10)	Brake Interlock Output	Outputs the timing signal for the external brake signal.				
COIN	8 (10)	Positioning Complete	Output when the pulses remaining in the error counter fall within the positioning complete range set for PRM6				
ALO1 ALO2 ALO3	30 (33) 31 (33) 32 (33)	Alarm Code Output	Open collector output  Maximum operating voltage. 30 VDC  Maximum operating current. 20 mA				

# 4.5 Connecting an Absolute Encoder

# 4.5.1 Typical Example

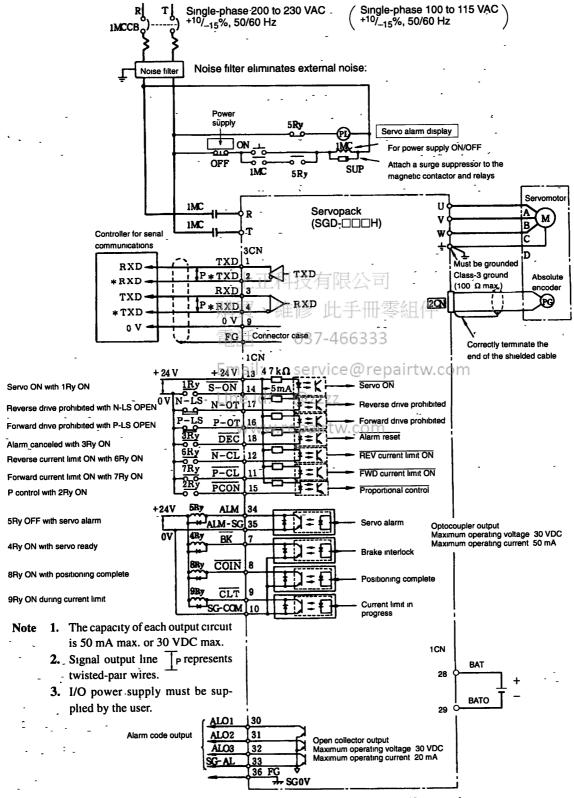


Figure 4.5 SGD-□□□H Servopack Connection

# 4.5.2 1CN I/O Connector Terminals

#### **■** Terminal Layout

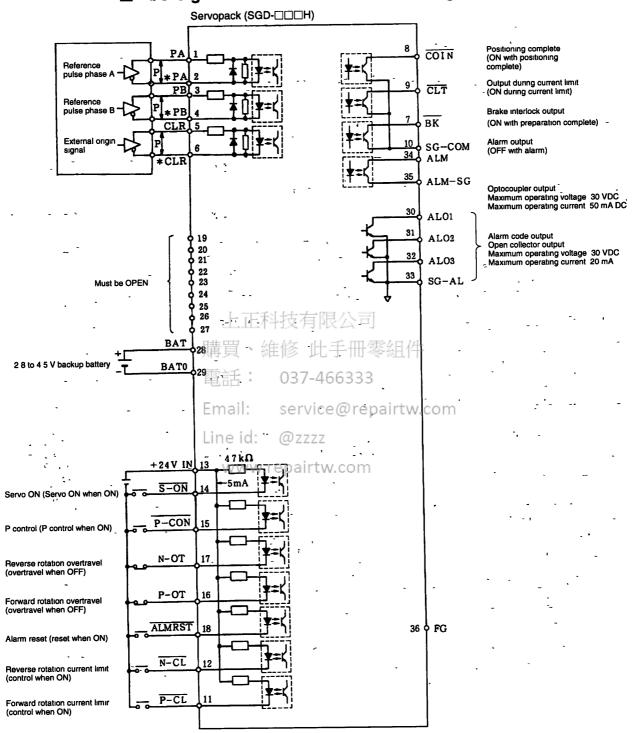
Table 4.10 1CN Terminal Layout

					1	-ı ·	-				
2	*PA	Reference	1	PA	Reference pulse input	-			19	Not used	
		pulse input	3	PB	Reference pulse input	20	N	ot used	21	21 Not used	
4	*PB	Reference pulse input			puise input	22	N	ot used		1401	
			5	CLR	External origin signal			-			
6	*CLR	External origin signal	5	OLN	input	24	No.	ot used	23	Not used	
		input	7	BK	Brake inter- lock signal						
8	COIN	Positioning complete signal output			output 「和技力」	26	冒 No	ot used	25	Not used	
ļ		signal output		CLT	Current limit detection sig-		· · · · · · · · · · · · · · · · · · ·	-	-27	Not used	
10	SG-COM	BK/COIN/	BK/COIN/ CLT common		WHA.	nal output		)33	J. I.		
		0 V	11	DOI .	Forward	28	BAT	Battery (+)	, , ,		
12	NO	Reverse current		Prilail:	ON input	le@	<del>repair</del>	Alarm code	29	BAT0	Battery (-)
12	N-CL	lımit ON in- put	13	Line id	External ZZZZZ power supply	30	ALO1				Alarm code output (open
14	S-ON	Servo ON		+24 VIN	/MPUEpairt			output (open collector output)	31		collector out-
		input	15	P-CON	P control	32	ALO3		33	SG-AL	Alarm code output com-
16	P-OT	Forward drive pro-		1-0011	input	_		Servo alarm			mon 0 V
		hibited input	17		Reverse	34	ALM -	output	35	ALM-SG	Servo alarm
18	8 ALMRST	Alarm reset		17 N-OT drive prohib ited input		36	FG Frame				output
		input	,				ground			-	

Note Do not use vacant pins for relay or other purposes. Set PRM36 bit 3 to 1 when using a reference pulse input (see page 7 - 7), and set PRM39 bit 7 to 1 when using an external origin signal input (see page 7 - 9).

#### 4 5 2 1CN I/O Connector Terminals

# ■ I/O Signal Connections and External Signal Processing



Note 1. I/O power supply must be supplied by the user.

- 2. Signal output line  $\frac{1}{1}$ P represents twisted-pair wires.
- 3. See Pulse String Input: PRM36 Bit 2 for more details on reference pulses (page 7 7), and Origin Pulse Selection: PRM39 Bit 7 for more details on external origin signals (page 7 12).

Figure 4.6 1CN I/O Signal Connection and External Signal Processing

# Input Signals and Their Application

Table 4.11 Input Signals

Signal Name	1CN Pin No.	Description					
S-ON	14	Servo ON	<ul> <li>When input, this signal triggers standby status for a reference input.</li> <li>Cancels the base block and dynamic brake.</li> <li>The Servo ON signal can be canceled with user constant PRM37 bit 0 if not needed</li> </ul>				
P-CON	(Two functions can be set via user	Proportional control reference	When input, this signal switches the speed loop control mode from PI (proportional-integral) to P (proportional) control				
	constant PRM37 bit 2.)	External set speed selection	When N-CL and P-CL are used as the JOG run reference, this signal is used as the reference speed selection signal.				
N-OT P-OT	17 16	Reverse drive prohibited Forward drive prohibited	Connect to the appropriate forward or reverse limit switch signal for linear or other types of drive. The signals are CLOSED during normal operation and are OPEN when the limit switch is operated.      This function can be canceled with user constant PRM37 bit 1. Al-				
+24V IN	13	上上科技有 24購買、維修 L 電話: 037-4	ways N-OT or Always P-OT can also be set.  This signal is the external power supply input for pins 11, 12, 14, 15, 16, 17 and 18 of 1CN. The user must provide the I/O (50 mA min.) power supply.				
N-CL P-CL	12	Reverse current limit reference (Reverse JOG/run reference) Forward current limit ZZZ reference (Forward JOG run reference)	This signal is the current limit reference or JOG run reference input depending on the setting of user constant PRM37 bit 2.  The current limit and set speed values are set with user constants.  W.COM				
ALMRST	18	Alarm reset	This signal resets the servo alarm status.				
BAT BAT0	28 29	+ Backup battery input - Backup battery input	This terminal connects to the backup battery used when power to the absolute encoder is OFF.  The voltage is 2 8 to 4.5 V (The user must supply the battery.)				

# ■ Input Circuits

The input signals are the same as those for the incremental encoder (See page 4 - 7 Input Circuits under 5.4.2 ICN I/O Connector Terminals) except that the DEC signal is the alarm reset (ALMRST) signal.

#### 4 5 2 1CN I/O Connector Terminals

# ■ Output Signals and Their Application

Table 4.12 Output Signals

Signal Name	1CN Pin No.	-	Description				
ALM+	34 (35)	Servo Alarm	Turns OFF when an error is detected.				
(ALM–)			See 5.4.2 Error Detection Function for further details.				
CLT	9 (10)	Current Limit Detection	When N-CL or P-CL is ON, this signal turns ON when the torque reaches the lower level value either limited by Cn-18 and Cn-19 or set in Cn-08 and Cn-09.  Turns ON when torque set for PRM28 and 29 is applied while N-CL and P-CL are OFF.				
BK	7 (10) 7-	Brake Interlock Output	Outputs the timing signal for the external brake signal				
COIN	8 (10)	Positioning Complete	Output when the pulses remaining in the error counter falls within the positioning complete range set for PRM6.				
ALO1 ALO2 ALO3	30 (33) 31 (33) 32 (33)	Alarm Code Output (BCD code)	Open collector output  Maximum operating voltage: 30 VDC  Maximum operating current: 20 mA				

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# 4.6 Output Circuits

The output signals are the current limit detection, brake interlock, servo alarm, and positioning complete signals that comprise the non-contact transistor circuits, as well as the three open collector output alarm codes. The voltage and current specifications for all signals are as follows:

Applied Voltage  $(V \text{ max.}) \le 30 \text{ V}$ Conduction Current  $(Ip) \le 50 \text{ mA}$  (20 mA for ALO1 to 3)

Output circuits require a power supply (open collector output ≤ 20 mA) that must be provided by the user. We recommend the same I/O power supply as that used for the input circuits (See Fig. 4.7.).

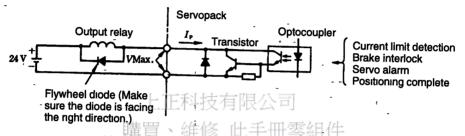


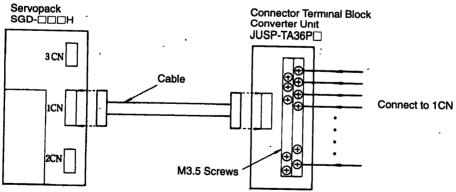
Figure 4.7 Output Circuit

# 4.7 Connector Terminal Block Converter Unit for 1CN

Line id: @zzzz

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# 4.7.1 Application



Note There is no connector Terminal Block Converter Unit for the 2CN. Separate encoder cables are provided for the 2CN connector. Obtain a cable of suitable length (See 10.4.2 Cable Specifications.)

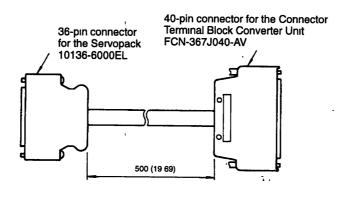
# 4.7.2 Connection Specifications

SGD Servopa	ack			nai Block Converte	er Unit
O. mai Nama	ICN .	the second	Con- nector		Terminal
Signal Name	Pın No.		No.	-	Block No
PA	1 -	, , , , , , , , , , , , , , , , , , ,	A1	, ,	1
*PA	2 -	P	B1		2
PB	3 -		A2		3
*PB	4 -	P	B2		4
CLR	5 -	·	A3	-	- 5
*CLR	6		В3		6_
BK	7 -	1 + - 1 1 - 1	A4		7 _
COIN	8 -	1 - 1	B4	<del></del>	- 8
CLT	9 -		A5		9_
	10 -		B5		10
SG-COM	11 -		A6		11
P-CL	12		B6		12
N-CL	13		A7		- 13
+24V IN	14 -		B7.		14
S-ON .			A8		15
P-CON	15	正科技有限公司	B8	· · ·	16
P-OT	<del></del>	ETIXARX	A9		17
N-OT		、維修 止手冊雲	B9		18
DEC (ALMRST)	相	400 NO 1 10 4	A10		19
	19 注	: 037-466333	B10		20
	20	,	A11		21
	<u> Pmai</u>	: service@repa	airt w <mark>a</mark> cor	n	22
	22	P	A12		23
	<u> 23</u> 1e_	d: @zzzz	B12		24
	24	P	<del></del>		25
	25 14/14	/w.repairtw.com	A13	-	26
	26	P	B13 \		27
	27	1	A14		
(BAT)	28	;	B14		28
(BAT0)	29		A15	-	29
ALO1	30	1 1	B15		30
ALO2	31		A16_	-	31
ALO3	32	(1)	B16_		32
SG-AL	33	- 1 1	A17		33
ALM	34	P	B17		34
ALM-SG	35		A18_	*-	35
FG .	36		B18		36_
Connector C		<u> </u>	A19		37
		, Drawided with the terminal blo	ck B19	<u> </u>	38
	<del></del>	Provided with the terminal blo	A20		
	‡ P :	Twisted-pair wires	. B20		40

Note Do not use vacant pins.

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# 4.7.3 Cable Specifications (Accessory for Connector Terminal Block Converter Unit)



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# **4.8 2CN Encoder Connector Terminals**

#### 4.8.1 2CN Terminal Layout

Table 4.13 2CN Terminal Layout

			,		f -			-	11		
		PG power	1	PG0V	PG power			Battery (+) (for abso-	11		
2	PG0V	supply 0 V	3	PG0V	supply 0 V	12	BAT+	lute encod- er only)	13	BAT-	Battery (-) (for abso- lute encod-
		PG power	,		-			PG input			er only)
4	PG5V	supply +5 V	5	PG5V	PG power supply +5 V	14	PC	phase C	15	` *PC	PG input
6-	DOEM			-		16	- PA	PG input			
"	PG5V		7	L. 7		-78		phase A	17	*54	PG input
		PG input	1	لــــــ	<u> </u> 上个十寸又	PR	四四		17	*PA	phase A
8	PS	phase S (for absolute en- coder only)	9 -	購買	PG input phase S (for absolute en-	18	FIP 琴組	PG input phase B	19	*PB	PG input phase B
10	_			電話 Email	coder only)	46 <b>20</b> ice	6333 <b>FG</b> @repair	Frame ground		-	hirase D

Line id: @zzzz

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# 4.8.2 Applicable Cables

Yaskawa provides cables with the following specifications. Cables are not provided with the Servopack or motor. Order cables in the standard specifications (lengths) as required.

**Table 4.14 Applicable Cables** 

<u> </u>	Incremental Encoder (Yaskawa Dwg. #B9400064)	Absolute Encoder (Yaskawa Dwg. #DP8409123)				
Basic	Compound KQVV-SW	Compound KQVV-SW				
Specifications	AWG22 x 3C, AWG26 x 4P	AWG22 x 3C, AWG26 x 6P				
Finished Dimension	ф7.5 mm (ф0.30 ın)	φ8.0 mm (φ0.31 in)				
Internal Structure and Lead Colors (DP8409123 standard)	A <sub>1</sub> Red A <sub>2</sub> Black A <sub>3</sub> Green yellow F <sub>1</sub> Blue/White blue F <sub>2</sub> Yellow/White yellow Twisted pair F <sub>3</sub> Green/White green Twisted pair F <sub>4</sub> Orange/White orange Twisted pair Twisted pair Twisted pair Twisted pair Twisted pair	A <sub>1</sub> Red A <sub>2</sub> Black A <sub>3</sub> Green yellow B <sub>1</sub> Blue/White blue Twisted pair B <sub>2</sub> Yellow/White yellow B <sub>3</sub> Green/White green Twisted pair B <sub>4</sub> Orange/White orange B <sub>5</sub> Purple/White purple Twisted pair B <sub>6</sub> Gray/White gray Twisted pair Twisted pair Twisted pair Twisted pair Twisted pair Twisted pair				
Yaskawa Standard Specifications	Standard lengths: 3 m (9.9 ft), 5 m (16.4 ft), 10 m (32.8 ft), 15 m (49.2 ft), 20 m (65.6 ft) (see note 2)  Line id:					

Note 1. The maximum allowable wiring distance for applicable cables between the Servopack and the Servomotor (PG) is 20 m (65.6 ft).

2. See 10.4.2 Cable Specifications for details on cables.

Note

# 4.8.3 2CN Connection Method

#### Incremental Encoder

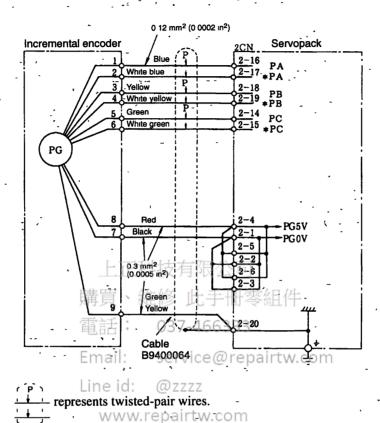


Figure 4.8 Using a B9400064 Cable for an Incremental Encoder

#### **■** Absolute Encoder

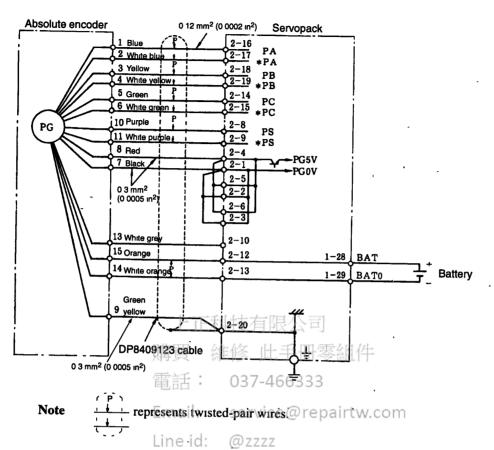


Figure 4.9 Using a DP8409123 Cable for an Absolute Encoder www.repairtw.com

#### 492 3CN Connection Method and External Signal Processing

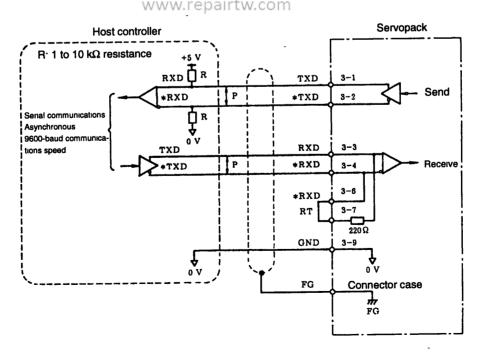
# 4.9 3CN Serial Communications Connectors

#### 4.9.1 3CN Terminal Layout

Table 4.15 3CN Terminal Layout

	- TVD	Serial communications: Normal line driver output		•		
	TXD				Serial communications: Inverted line receiver	
2	*TXD	Serial communications. Inverted line driver output	6	*RXD	input	
		-		DT	Terminating resistance	
3	RXD	Serial communications: Normal line receiver input		RT -	Terrimaung resistance	
4	*RXD	Senal communications Inverted line receiver input	7 <b>8</b>	5VPP	- Digital Operator power supply (+5 v)	
	HAD	購買、維修」		一零組 GND	Signal ground 0 V	
5	OPH	Digital Operator signal	466	333 Drepairt		

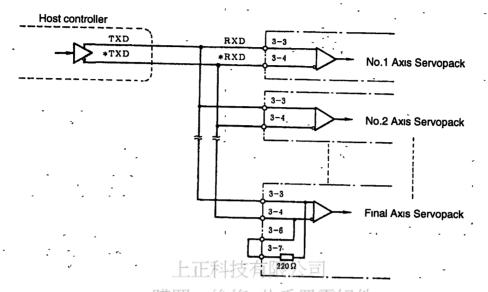
# 4.9.2 3CN Connection Method and External Signal Processing



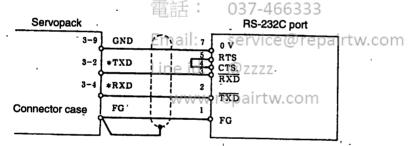
represents twisted-pair wires. Note

# **■** Multiple Axis Connections

Short 3CN pins 6 and 7 to insert a terminating resistor only at the Servopack for the last axis on the line.



# ■ Using an RS-232C Port, such as One on a Personal Computer



Note 1. This type of connection is only for short distances (2 m (6.56 ft) max.). Use RS-422 specifications for longer distances.

2. These 2-m (6.56-ft) cables are available from Yaskawa. Refer to 10.4.2 Cables for details on cables and connections.

For PC98 (25-pin D-sub): DE9405258 For PC98 (half-pitch connector): DE9408564 For IBM PC (9-pin D-sub): DE9408565

# 4.9.3 3CN I/O Signals and Their Application

Table 4.16 3CN Output Signals

Signal Name	Pin No.	N	lame	Circuit Structure	Description
TXD-	1	Data send signal	Normal output	(Line driver) TXD	This is the data send signal from the Servopack in RS-422 serial communications. The signal line goes to high im-
*TXD	2		Inverted out- put	*TXD	pedance when data is not being sent.
RXD	3	Data re- ceive sig-	Normal input -	(Line receiver)	This is the data receive signal from the host controller (personal computer, etc.) in RS-422 serial communications
*RXD	4	nal	Inverted input.	*RXD	
ОРН	5				This signal is only for the Digital Operator. Do not connect anything else to this pin.
*RXD	6	Terminating	resistor	+RXD	Short pins 6 and 7 to insert a terminating resistor in the serial input circuit of the Servopack. When using multiple axes
RT	7		購買、約	修 此手冊零組件	connections, short only the last axis on the line.
5VPP	8	+5-V output	電話:	037-166333 svpp	This +5-V power supply output is only for the Digital Operator. Do not connect anything else to these pins
GND	9	Signal grou	nd 0 V	service@repairtw.co	Signal ground 0 V for TXD (*TXD) and RXD (*RXD)

- Note 1. Connect the shield on the serial communications cable to the connector case.
  - 2. Serial data send signal: The signal line goes to high impedance when data is not being sent, so attach pull-up and pull-down resistors to the data receive section of the host controller.
  - 3. The allowable wiring distance is a maximum of 20 m (65.6 ft) with RS-422 cables



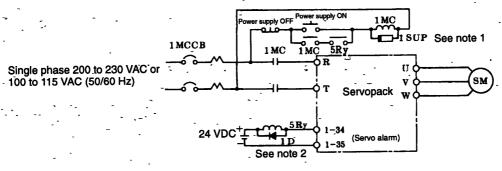
# **Application**

This chapter describes how to use Servodrives.

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# 5.1 Turning Power ON/OFF

The figure below shows a typical example of the power ON/OFF sequence.



Note 1. CR50500BA surge suppressor (OKAYA Electric Industries Co, Ltd) or the equivalent 2. Flywheel diode (to prevent spikes in 5Ry)

Figure 5.1 Example of Power ON/OFF Sequence

#### **IMPORTANT**

- 1. Construct a power ON sequence so the power is turned OFF if a servo alarm signal is output. See 5.4.4 Handling Protection Circuit Operation for more details on handling the alarm signal output.
- 2. During the power ON/OFF sequence shown in Fig. 5.1, it takes up to two seconds until the normal signal is valid once power is turned ON. The Servopack outputs a servo alarm signal for up to two seconds when power is turned ON in order to give time to initialize the Servopack.
- 3. The Servopack has a capacitor in the power supply. A high charging current will thus flow for 0.2 seconds when the power is turned ON. Frequently turning the power ON and OFF will cause the main power devices (such as capacitors and fuses) to deteriorate and can result in unexpected problems. Start and stop the Servomotor with Start and Stop commands rather than turning the power supply ON and OFF.
- 4. A power loss alarm may occur if the Servopack is turned ON immediately after being turned OFF. To prevent this, always wait for the time shown in the table below before turning the power ON again.

Servopack Type SGD-	A3AH A5AH	01AH 02AH 04AH	08AH	200-VAC input
_	АЗВН	A5BH 01BH 02BH	03BH	100-VAC input
Power Holding Time	6 s	10 s	15 s	Maximum values

5. After turning the power OFF, do not touch the power terminals for at least five minutes because high voltage may remain in the Servopack

# **5.2 Position Control**

# 5.2.1 Electronic Gear Function

The electronic gear function enables the motor travel distance per input reference pulse to be set to any value. More specifically, the value is set based on the number of encoder pulses, reference unit (minimum unit of position data for moving the load), and machine gear ratio. An input of one pulse moves the load by one reference unit.

# ■ Setting the Electronic Gear Ratio (B/A)

# **Determining the Reference Unit**

The reference unit is the minimum unit of position data for moving the load, e.g., 0.01 mm, 0.1°, or 0.01 inches.

A 1-pulse input moves the load by 1 reference unit.

Example: Reference Unit =  $0.1 \, \mu m$ If a reference of 50000 pulses is input, the load will move 5 mm (50000 x  $0.1 = 5000 \, \mu m = 5 \, mm$ ). repairty.

Determine the reference unit based on factors like equipment specifications and positioning precision.

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# Determining the Load Travel Distance per Load Shaft Revolution in Reference Units

Load travel distance per load shaft revolution

Load travel distance per load shaft revolution

Reference unit

Table 5.1 shows an example of the load travel distance per load shaft revolution.

Table 5.1 Example of the Load Travel Distance per Load Shaft Revolution

#### 5 2.1 Electronic Gear Function

Load Travel Distance per Load Shaft Revolution	Example of the Load Structure			Example of the Load Structure	
P	Ball screw	1 revolution P: Pitch			
360°	Disc table	1 revolution			
πD	Belt and pulley	1 revolution $D$ $+$			

Example: Load Travel Distance per Load Shaft Revolution= 12 mm (0.47 in), Reference Unit = 0.01 mm (0.0004 in)

Load travel distance per load shaft revolution = 12/0.01 = 1200 (reference units)

#### **Determining the Electronic Gear Ratio (B/A)**

 $B = [(PRM34) \times 4] \times (motor shaft revolution speed)$ 

A = [Load travel distance per load shaft revolution (reference units)] x (load shaft speed)

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Reduce the electronic gear ratio (B/A) to the lowest terms so that both A and B are less than 30000, and then set A and B in PRM33 and PRM32.

#### Motor Shaft and Load Shaft Revolution Speed

The motor shaft and load shaft speeds form the gear ratio for the mechanical system. If the mechanical system is structured so that load shaft makes "l" revolutions when the motor shaft makes "m" revolutions, the gear ratio for the motor shaft and the load shaft is m/l, as shown below.

Motor shaft speed m (revolutions) Load shaft speed l (revolutions)

Email:

Fig. 5.2 shows a block diagram of the electronic gear function.

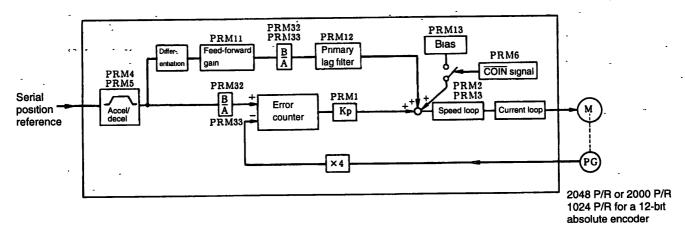


Figure 5.2 Block Diagram of the Electronic Gear Function

## 5.2.2 Feed-forward Function

The feed-forward control function performs reference pulse differentiation and add it to speed reference in order to shorten positioning time. Set the amount of feed-forward control (0% to 100%) in PRM11, but do not set the level too high, because this may cause overshooting with light loads.

A primary lag filter can be added for the feed-forward reference. If it is added, set the time constant for the primary lag filter in user constant PRM12.

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## 5.3 Setting Up a 12-bit Absolute Encoder

#### 5.3.1 Battery

An absolute encoder requires a battery in order to save position data in the event of a power interruptions.

- We recommend the following battery.
   One lithium battery: ER6VC 3.6 V battery made by Toshiba Battery Co., Ltd.
- Make sure the battery is installed securely so that environmental changes or changes over time will not cause a loss of contact.
- The battery voltage is not monitored inside the Servopack. Provide a battery voltage monitor circuit if necessary. The minimum voltage is 2.8 V.

#### 5.3.2 Setup Procedure

The encoder needs to be set up to clear the cumulative rotation number to zero to set up the motor, or when the absolute encoder has been left disconnected from a battery for more than two days.

Internal circuit elements may not function properly if the capacitor in the encoder is not fully charged. Use the setup procedure described below in the following cases.

- To set the data for the amount of motor rotation to zero when test running the motor.
- When the Servopack is left for more than two days without connecting the absolute encoder to a battery.

**Note** Failure to follow the procedure exactly as written may result in problems.

- 1. Turning ON Servopack Power
  - Wire the Servopack, motor, and encoder together correctly.
  - Connect the battery and turn ON the Servopack. Leave the Servopack turned ON for at least three minutes to sufficiently charge the backup capacitor. The encoder will be in alarm status at this time.
- 2. Resetting Data
  - Turn OFF the Servopack, and disconnect the encoder connector.
  - Short encoder terminals 13 and 14 together for 1 to 2 seconds.



3. Wiring

Restore the wiring to the normal status.

4. Turning ON Power

The setup is complete if there are no errors when the Servopack is turned ON. If serial data ALM00.ABS is sent from the Servopack, then repeat the procedure starting from the beginning.

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## **5.4 Protection Functions**

The Servopack is equipped with various functions to protect the drive and motor from damage.

#### 5.4.1 Dynamic Brake Function

The Servopack is equipped with a dynamic brake for emergency stops. The brake is operated for any of the following conditions.

- When an alarm occurs (error detection).
- When the servo ON signal is turned OFF (When the servo receives the SVOFF command.)
- When power is turned OFF

### **5.4.2 Error Detection Function**

Table 5.2 shows the error detection function for the Servopack. Alarm details can be checked in two output forms other than serial communications.

Table 5.2 Error Detection Function

Serial			t Signals	3	Error Detection 7777 Function	Description
Communications Send Data	Alarm	Output	Code	SVALM	ZZZZ Function	
Send Data	ALO1	ALO2	ALO3	Output	oirtu. ooro	
ALM00, ABS ALM02, PRM ALM04, PRM	OFF	OFF	OFF	OFF	Parameter error	An absolute or parameter (user constant) error.
ALM10, OC	ON	OFF	OFF	OFF	Overcurrent detection	Overcurrent flowed through the main circuit     The Servopack heat sink overheated.
ALM31, OF	ON	ON .	OFF -	OFF	Overflow detection .	The number of pulses remaining in the error counter exceeded the range of setting by user constant.
ALM40, OV	OFF	OFF -	ON	OFF	Overvoltage detection	The main circuit DC voltage exceeded 420 V.
ALM51, OS	ON	OFF	ON	OFF	Overspeed detection	Motor speed exceeded the maximum speed
ALM71, OL ALM72, OL	ON	ON ·	ON	OFF.	Overload detection	The rated torque for the motor and Servo- pack was exceeded.
ALMC2, PG ALMC3, PG ALMC4, PG	ON	OFF	ON	OFF	Phase error detection, overrun detection, bro- ken PG signal line	<ul> <li>An overrun was caused by the motor or the PG wiring incorrect.</li> <li>Noise in encoder wiring.</li> </ul>
ALM8□, POS	OFF	OFF	OFF	OFF	Encoder alarm	Absolute encoder alarm.
ALMF3, SRC	OFF	ON	OFF	OFF	Momentary power loss detection	Power was turned back ON within the allotted power retention time after it was turned OFF

ON: Output transistor is ON. OFF: Output transistor is OFF.

## 5.4.3 ALM, ALM-SG: Servo Alarm Output

The power drive circuit in the Servopack will turn OFF and the alarm status will be displayed if any error detection function operates. Details of the alarm will be sent via serial communications, the red indicator on the Servopack will light, and the alarm output (ALM, ALM-SG) will go OFF. At the same time, the alarm code will be output externally through the open collector output circuits of ALO1 to ALO3. See *Table 5.2* for details on alarm codes.

## 5.4.4 Handling Protection Circuit Operation

An alarm signal output indicates some kind of error. Determine the cause, take appropriate action, and then resume operation.

#### **■** Error Troubleshooting

Check the error data for past occurrences through serial communications or using the error trace-back mode of the Digital Operator (JUSP-OP02A-1), and implement the remedy listed in *Table 13.6*, page 13 - 5.

#### 5.4.5 Servo Alarm Reset 037-466333

Use one of the methods given below to reset a servo alarm.

Line id: @ZZZZ

■ Enter ARES via serial communications.

• Enter the alarm reset signal (if using an absolute encoder).

• Turn the power OFF and then back ON again.

#### 5.4.6 Indications

The following indications are made on the front panel of the Servopack.

• Power ON: Green LED indicator lights

Alarm occurred: Red LED indicator lights

#### 5.5 Precautions

#### 5.5.1 Overhanging Loads

Do not allow the motor to be continuously rotated by the load while the regenerative brake is being applied.

**Example:** Tension Control Drive

Do not use the motor for lowering objects without a counterweight.

Rated specifications for the regenerative braking capacity of the Servopack is only for brief periods while the motor is stopped. Contact your Yaskawa representative about applications with overhanging loads.

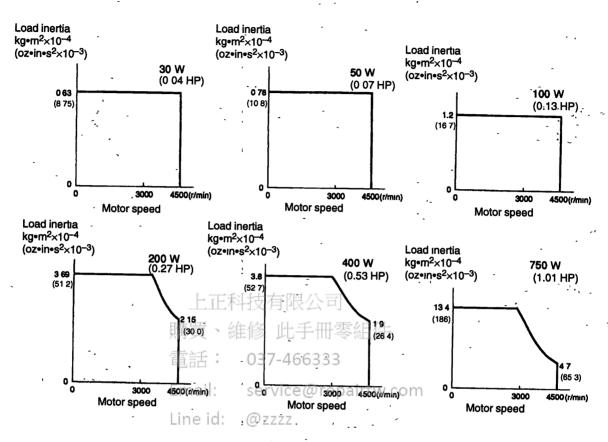
#### 5.5.2 Load Inertia J<sub>L</sub>

Make sure the allowable load mertia  $J_L$  calculated for the motor shaft falls within the range given in Fig. 5.3. An overvoltage alarm will occur during deceleration if the load inertia exceeds the values in the figure. If this occurs, take one of the following actions.

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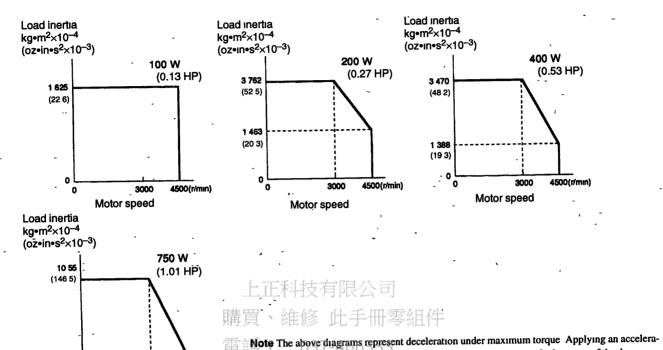
- Reduce the torque limit.
- Reduce the deceleration rate.
- Reduce the maximum rotation speed.
- Add a Regenerative Resistor Unit.

# ■ SGM Servomotors 200-VAC Servomotors with Incremental Encoders



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# ■ SGMP Servomotors 200-VAC Servomotors with Incremental Encoders



tion/deceleration curve to the reference allows operation outside the range of the diagrams
(That is, characteristics changes according to the pattern of operation and load conditions)

Figure 5.3 Allowable Load Inertias

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## 5.5.3 Regenerative Unit

3000 Motor speed

A Regenerative Unit is used as an SGD Servopack Peripheral Device.

## Specifications and Ratings

Specifications for the Regenerative Unit are given below.

Typė	JUSP-RG08C	Comments
Applicable Servopack		<del></del>
Regenerative Working Voltage	380 VDC	
Regenerative Process Current	8 A, DC	Regenerative resistance: 50 Ω, 60 W
Error Detection Functions	Regenerative resistance failure, regenerative transistor failure, overvoltage	
Alarm Output	Normally closed contact (OPEN when protective function operates)	200-V operation OK
Dimensions in mm (inches)	55 × 160 × 130 mm (2.17 × 6.30 × 5 31 in) W×H×D	

#### ■ Connecting a Regenerative Unit

The connections of the Regenerative Unit are shown below.

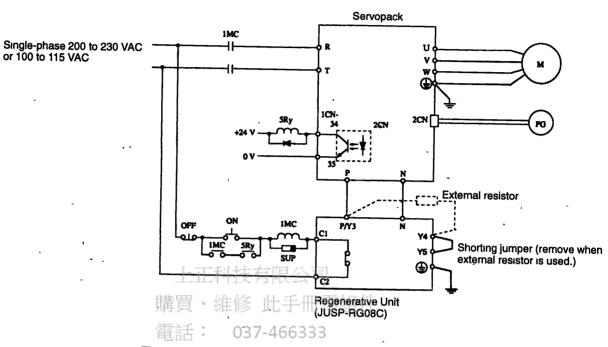


Figure 5.4 Regenerative Unit Connection Diagram

- A Regenerative Unit is equipped with the following fault detection functions:
  - Detecting disconnection in the regenerative resistor.
  - Detecting faults in the regenerative transistor.
  - Detecting overvoltage.
- When one of these fault detection functions operates, the internal alarm relay is actuated, and the circuit between output terminals C1 and C2 is opened.
- Form a sequence so that Servopack power turns OFF when the alarm relay is actuated.
- Once the alarm relay is actuated, it takes two or three seconds until the system returns to a
  normal state. This time is required for the main capacitor inside the Servopack to discharge.
- When using an external resistor, remove the shorting jumper between Y4 and Y5 and then connect the resistor between P/Y3 and Y4.
- The resistance value of the external resistor must be 50  $\Omega$  min.

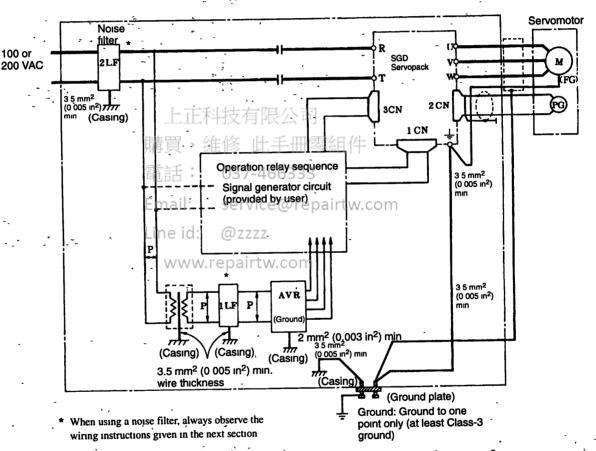
#### 5.5.4 Noise Control

### ■ Example of Wiring for Noise Control

The Servopack uses high-speed switching elements in the main circuit. "Switching noise" may be generated by these high-speed switching elements if wiring or grounding around the Servopack is not appropriate. To prevent this, always wire and ground the Servopack correctly.

The Servopack also has a built-in microprocessor (CPU). Therefore, install a noise filter to protect the microprocessor from external noise.

The diagram below shows an example of wiring for noise control.



Note 1. Use a wire (preferably a plain stitch copper wire) at least 3.5 mm<sup>2</sup> (0.005 in<sup>2</sup>) thick to ground the casing.

2. Use twisted-pair wires whenever possible for wires indicated by  $\overline{P}$ .

Figure 5.5 Grounding

#### **■** Correct Grounding

#### **Motor Frame Grounding**

If the Servomotor is grounded via the machine, switching noise current (Cf dv/dt) will flow from the Servopack power unit (PWM) through motor stray capacitance. Always connect the Servomotor ground terminal 4 (green) to the Servopack ground terminal to prevent adverse effects from switching noise. Be sure to ground the ground terminal.

#### Servopack SG 0 V

If the reference input line receives noise, ground the SG 0 V line. If the main circuit wiring for the motor is accommodated in a metal conduit, ground the conduit as well as the junction box. Always ground using ground to one point only.

#### Using a Noise Filter

Use an inhibit-type noise filter to block noise from the power supply line. *Table 5.3* lists recommended noise filters for each Servopack. Also install a noise filter on the power supply line for peripheral equipment if needed.

Note Always observe the installation and wiring instructions shown in Figs. 5.6 to 5.9. Incorrect use of a noise filter reduces its benefits.

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Noise Filter Types

Power	Servor	ack Type	Noise Filter	Recommended Noise Filter*	
Voltage		w.repairty	Connection	Model	Specifications
	30 W (0.04 HP)	SGD-A3AH		LF-205A	Single-phase 200 VAC, 5 A
	50 W . (0.07 HP)	SGD-A5AH			
200 V	100 W (0 13 HP)	SGD-01AH			
(0)	200 W (0.27 HP)	SGD-02AH	(Correct)		
	400 W (0.53 HP)	SGD-04AH		LF-210	Single-phase 200 VAC, 10 A
	750 W (1.01 HP)	SGD-08AH		LF-220	Single-phase 200 VAC, 20 A
	30 W (0.04 HP)	SGD-A3BH	(Incorrect)	LF-205A	Single-phase 200 VAC, 5 A
	50 W (0.07 HP)	SGD-A5BH	₩.		
100 V	100 W (0.13 HP)	SGD-01BH			
	200 W (0.27 HP)	SGD-02BH		LF-210	Single-phase 200 VAC, 10 A
	300 W (0.39 HP)	SGD-03BH		LF-220	Single-phase 200 VAC, 20 A

Note These noise filters made by Tokin Corp. are available from Yaskawa. Contact your nearest Yaskawa sales representative for noise filters.

Separate input lines from output lines.
 Do not run input and output lines in the same duct or bundle them together.

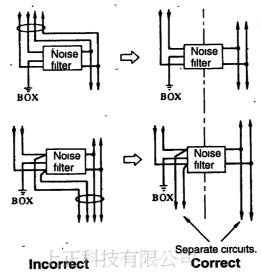


Figure 5頁、維修 此手冊零組件

• Separate ground wires from noise filter output lines.

Do not run ground wires, noise filter output lines, and other signal lines in the same duct or bundle them together.

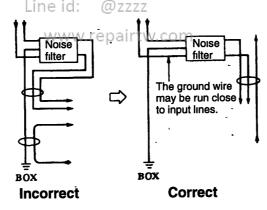


Figure 5.7

5

• Connect the ground wire directly to the junction box or the ground plate.

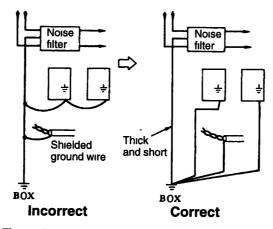


Figure 5.8

• When grounding a noise filter inside a unit, connect the noise filter ground wire and the ground wires for other devices inside the unit to the ground plate of the unit first, and then ground these wires.

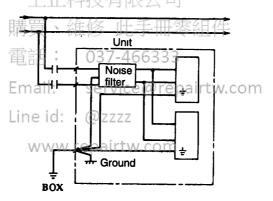


Figure 5.9

#### 5.5.5 High Voltage Lines

A transformer that will step down three-phase 400/440 V to single-phase 200 V or single-phase 100 V is required when using a 400 V-class (400 V, 440 V) power supply. Select an appropriate power transformer according to *Table 5.5 Power Supply Capacity per Servopack*.

When using a 400 V-class supply voltage, power must be turned ON and OFF on the primary side of the power transformer.

#### 5.5.6 Power Supply Line Protection

The Servopack is connected directly to a commercial power supply (200 or 100 V). Therefore, always use an appropriate molded-case circuit breaker (MCCB) or fuse for each Servopack. A fast-operating fuse cannot be used because the Servopack power supply is a capacitor input type, and a fast-operating fuses may blow out when power is turned ON.

Table 5.4 MCCB or Fuse for the Power Capacity

Supply Voltage	Servopack Type	Power Capacity per Servopack (kVA) (See Note 1)	Power Capacity per MCCB or Fuse (A) (See Note 2)
200 V	SGD-A3AH	0.25	5
	SGD-A5AH	0.3	
	SGD-01AH	0.5	
	SGD-02AH	0.75	
	SGD-04AH	1.2	9
•	SGD-08AH	2.2	16
100 V	SGD-A3BH	0.2	5
	SGD-A5BH	文月限公司03	]
	SGD-01BH	修 IH 千皿 录 <b>5</b> 日/H	
	SGD-02BH	0.75	8
	SGD-03BH 電話 (	037-466333 14	15

Note 1. Power capacity at the rated load mail:

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2. Operating characteristics (25°C): 2 s or more at 200%, 0.01 s or more at 700%

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## 5.6 Appropriate Applications

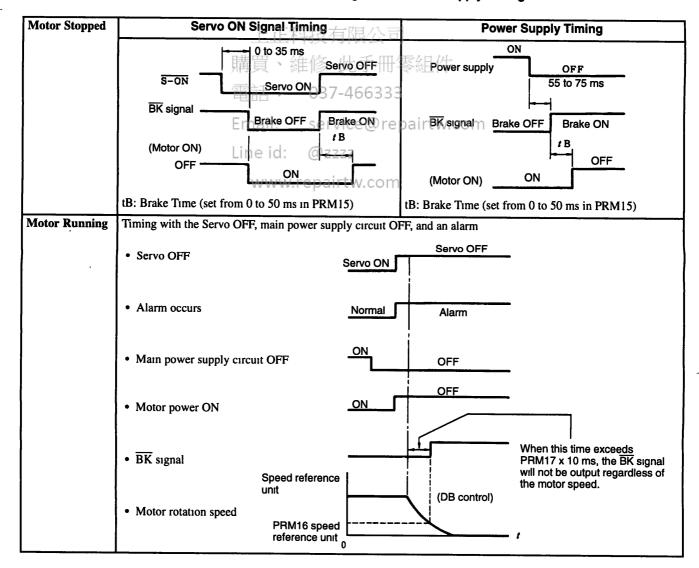
#### 5.6.1 Holding Brake Interlock Signal

This output signal can be output for interlocking motor circuit power status, motor rotation speed, and the interlock.

#### **■** Setup Procedure

The brake signal is output from 1CN-7(10). Delay time tB ( $\times$  10 ms) from the brake turns ON until the Servomotor turns OFF can be adjusted in user constant PRM15. The following shows the Servo ON signal and power supply timing.

Table 5.5 Servo ON Signal and Power Supply Timing



## 5.7 Adjustments

#### 5.7.1 Servo System Adjustments

The following user constants (parameters) are provided for the user to adjust the servo system.

- PRM2: Speed Loop Gain
- PRM3: Speed Loop Integration Time Constant
- PRM10:Torque Reference Filter Time Constant
- PRM1: Position Loop Gain

A simple block diagram of the servo system is shown below.

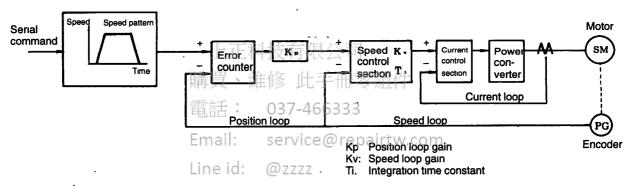


Figure 5.10 Servo System Block Diagram

#### ■ Basic Rules for Gain Adjustment: Three Feedback Systems

The servo system is equipped with the following feedback systems.

- Position loop
- Speed loop
- Current loop

The interior loops require better response. Failure to follow this principle will result in poor response and vibration.

#### Position and Speed Loop

- Can be adjusted by the customer.
- Make sure the response is balanced.



#### **Current Loop**

- Can not be adjusted by the customer.
- Maintain an adequate response.

Increasing position gain alone to improve response will result in a speed reference vibration in the Servopack that will cause vibration or slow positioning time. If the position loop gain is increased, the speed loop gain must be similary increased.

The mechanical system will start to vibrate at the upper limits for the position and speed loop gain. Can not exceed these limits. Generally position loop gain cannot be increased beyond the natural frequency of the mechanical system.

Example: Articulated Robots

Using harmonic gears produces a mechanism with extremely low rigidity.

Natural frequency: 10 to 20 Hz Position loop gain: 10 to 20 (1/s)

Example: Chip Mounter, IC Bonder, Precision Machine Tools

Natural frequency: 70 Hz min. Position loop gain: 70 (1/s) min.

The response of the servo system (Controller, Servodriver, Servomotor, detector, etc.) is crucial to the response requirements, but a highly rigid system is also needed as well.

#### 5.7.2 User Constants

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Line id: @zzzz

#### ■ PRM2: Speed Loop Gain com

The Speed Loop Gain sets the speed loop response. The response is improved by setting this user constant to the maximum value in a range that does not cause vibrations in the mechanical system. The equation below shows the relationship between the speed loop gain and the load inertia.

Speed loop gain Kv (Hz) = 
$$\frac{2}{\frac{GD^2L}{GD^2M} + 1}$$
 x (PRM2 value)

GD<sup>2</sup><sub>L</sub>: Motor axis converted load inertia GD<sup>2</sup><sub>M</sub>:Motor moment of inertia

#### ■ PRM3: Speed Loop Integration Time Constant

The speed loop has an integration element that enables response to micro-inputs. Because this integration element can produce a delay in the servo system, positioning settling time increases and response slows as the time constants increase. The integration time constant must be increased, however, to prevent machine vibration if the load inertia is large or the mechanical system includes an element prone to vibration. The following equation can be used to calculate a guideline value.

572 User Constants

5

 $T_{i} \geq 2.3 \times \frac{1}{2\pi \times K_{v}}$ 

Ti: Integration time constant (s)

Kv: Speed loop gain (Hz) (calculated above)

#### **■ PRM10: Torque Reference Filter Time Constant**

When a ball screw is used, torsional resonance may occur that increases the pitch of the vibrating noise. This vibration can sometimes be overcome by increasing the torque reference filter time constant. The filter, however, will produce a delay in the servo system, just like the integration time constant, and its value should not be increased any more than necessary.

#### **■** PRM1: Position Loop Gain

The position loop gain determines the response of the servo system. The higher it is set, the higher the response and the less time it takes for positioning. As such, the equipment must have higher rigidity and a higher characteristic frequency.

The entire servo system is more susceptible to vibration if position loop gain alone is increased to improve response, and the speed reference output from the position loop will cause vibration. Always increase speed loop gain while checking the response.

Position loop gain Kp is calculated as shown below.

 $K_P = \frac{\mathbf{v}_s^{-1}}{\epsilon}$  service@repairtw.com

K (1/s): Position loop gain

V (PPS): Steady speed reference

ε (Pulse): Steady error (The number of pulses in the error counter at constant speed)

#### Adjustment Procedure

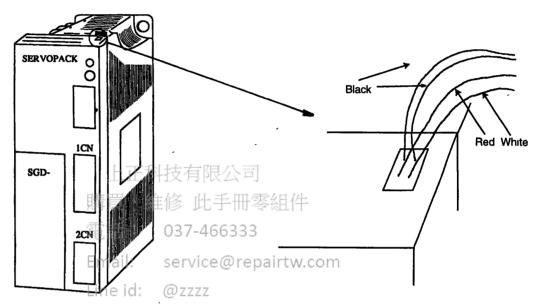
- 1. Set the loop gain to a low value and increase speed loop gain within a range that does not cause noise or vibration to occur.
- 2. Slightly reduce the speed loop gain from the value in step 1, and increase position loop gain within a range that does not cause overshooting or vibration to occur.
- 3. Determine the speed loop integration time constant by observing the positioning settling time and vibration in the mechanical system. Positioning time may be increased if the speed loop integration time constant is too large.
- 4. It is not necessary to change the torque reference filter time constant unless torsional resonance occurs in the equipment shafts. Torsion resonance may be present if there high-frequency vibration noise. In this case, adjust the torque reference filter time constant to reduce the noise.
- 5. Finally, the position and speed loop gain as well as the integration time constant must be finely adjusted to determine the optimum point for step response.

#### Analog Monitoring

Motor speed and torque can be monitored via an analog signal while adjusting the gain. The cable connections and output signals needed for this are outlined below.

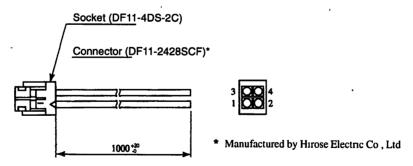
**Note** The cable is only loosely attached to the SGD connector, and an external force applied to it may cause it to disconnect. Do not connect meters or other devices to the cable in applications.

#### **Connecting Monitoring Cables to an SGD Servopack**



Insert the cables that will be used for monitoring through the location marked with a circle in the figure above. Make sure the red and white cables reach the front panel of the Servopack.

#### Dimension Diagram of the Monitoring Cable (Dwg. #DE9404559)



#### **Cable Colors and Monitor Signals**

Cable Color	Signal Name	Description
Red	VTG-M	Speed monitor (0.5 V, 1000 r/min.)
White	TRQ-M	Torque monitor (0.5 V, 100% torque)
Black (2 wires)	GND	GND

#### 5.7.3 Functions that Improve Response

The following functions are provided to improve response.

- Mode switching
- Feed-forward function
- Bias function

These functions will not necessarily improve characteristics, and they can even have the opposite effect. Be sure to observe the precautions given below, and monitor the actual response of the characteristics while making adjustments.

#### Mode Switching

Mode switching is used to improve transient characteristics if the torque reference saturates during acceleration and deceleration. In other words, mode switching is a function that automatically switches the speed control mode inside the Servopack from PI (proportional/integral) to P (proportional) control above a certain setting.

#### ■ Feed-forward Function 手冊零組件

Feed-forward function generally shortens positioning time, but has no effect on systems where the position loop gain is at its maximum. Adjust the feed-forward amount (PRM11) as outlined below.

- Adjust the speed and position loop.
- Gradually increase the amount of feed-forward amount (PRM11) until the positioning complete signal (COIN) is output as quickly possible.

A primary delay filter can be applied to the feed-forward to improve characteristics when the positioning complete signal is intermittent or when speed overshooting occurs due to excessive feed-forward.

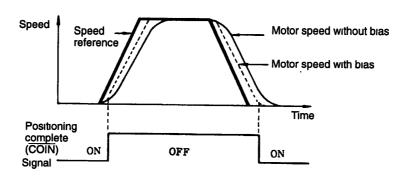
Note Make sure that the position complete signal ( $\overline{\text{COIN}}$ ) breaks up (repeatedly turning ON/OFF) and that the speed is not overshoot. Setting the amount of feed-forward too high will cause a intermittent positioning complete signal as well as speed overshooting.

#### Bias Function

When the number of lag pulses in the error counter exceeds the width of the positioning complete signal (PRM6), bias amount (PRM13) is added to the error counter output (speed reference) until the speed reference falls within the width of the positioning complete signal. This shortens the positioning time by reducing the number of lag pulses in the error counter.

Motor rotation will become unstable if the bias amount is set too large. Adjust the bias while monitoring the response because the optimum value will vary with the gain and the positioning complete width.

Set PRM13 to 0 if bias is not used.



## 5.7.4 Guidelines for Gain Settings According to the Load Inertia Ratio

Adjustment guidelines are given below based on the rigidity and load inertia of the mechanical system. These values are given as guidelines only, and vibration or poor response may occur within the given ranges. Monitor the response (waveform) to optimize the adjustment. Higher gain is possible with highly rigid machines.

#### ■ Machines with High Rigidity

Machines with high rigidity include ball screws and direct-drive machines.

Examples: Chip mounters, IC bonders, precision machine tools

Load Inertia Ratio	Position Loop Gain (PRM1) [1/s]	Speed Loop Gain (PRM2) [Hz]	Speed Loop Integration Time Constant (PRM3) [ms]
×1	50 to 70	50 to 70	5 to 20
×3	w.repairtw.com	100 to 140	1
×5		150 to 200	1
×10		270 to 380	1
×15		400 to 560	1
×20		500 to 730	1
×30		700 to 1100	

Note 1. For an inertia ratio of ×10 or higher, slightly reduce the position loop gain and speed loop gain below the values shown, and set the integration time constant to a higher value before starting the adjustment.

- 2. Slightly increase the speed loop integration time constant for an inertia ratio of ×20 or higher.
- 3. As the inertia ratio increases, set the position loop gain and speed loop gain to the lower limit of the range of values specified and increase the speed loop integration time constant.

5 7 4 Guidelines for Gain Settings According to the Load Inertia Ratio

#### Machines with Medium Rigidity

Machines with medium rigidity include machines driven by ball screws through reduction gears. or machines driven directly by long ball screws.

Examples: General machine tools, orthogonal robots, conveyors

Load Inertia Ratio ( <i>GD</i> <sup>2</sup> <sub>L</sub> / <i>GD</i> <sup>2</sup> <sub>M</sub> )	Position Loop Gain (PRM1) [1/s]	Speed Loop Gain (PRM2) [Hz]	Speed Loop Integration Time Constant (PRM3) [ms]
×1	30 to 50	30 to 50	10 to 40
×3		60 to 100	
×5		90 to 150	
×10		160 to 270	1
×15		240 to 400	
×20·		310 to 520	1
×30 ·	1	450 to 770	

- Note 1. For an inertia ratio of ×10 or higher, slightly reduce the position loop gain and speed loop gain below the values shown, and set the integration time constant to a higher value before starting the adjustment.
  - 2. Slightly increase the speed loop integration time constant for an inertia ratio of ×20 or higher
  - 3. As the inertia ratio increases, set the position loop gain and speed loop gain to the lower limit of the range of values specified, and increase the speed loop integration time constant

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#### ■ Machines with Low Rigidity

Machines with low rigidity include machines driven by timing belts, chains, or wave reduction gears (Product name: Harmonic drive).

**Example:** Conveyors, articulated robots

Load Inertia Ratio (GD <sup>2</sup> L/GD <sup>2</sup> M)	Position Loop Gain (PRM1) [1/s]	Speed Loop Gain (PRM2) [Hz]	Speed Loop Integration Time Constant (PRM3) [ms]
×I	10 to 20	10 to 20	50 to 120
×3	1	20 to 40	
×5	•	30 to 60	
×10	1	50 to 110	
×15	1	80 to 160	
×20	1	100 to 210	
×30	1	150 to 310	

- Note 1. For an inertia ratio of ×10 or higher, slightly reduce the position loop gain and speed loop gain below the values shown, and set the integration time constant to a higher value before starting the adjustment.
  - 2. Slightly increase the speed loop integration time constant for an inertia ratio of  $\times 20$  or higher.
  - 3. As the inertia ratio increases, set the position loop gain and speed loop gain to the lower limit of the range of values specified, and increase the speed loop integration time constant.



## **Serial Communications**

This chapter describes serial communications specifications and commands.利拉有限公司

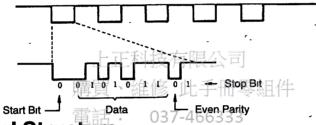
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<b>6.1 Specifications</b> 037-466-333	6 - 2
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## **6.1 Specifications**

The specifications and one-character structure are given below.

Item	Specifications	
Standard	RS-422	
Communications Method	Asynchronous (ASYNCH)	
Baud Rate	9600 baud	
Start Bits	1 bit -	
Data	7-bit JIS, 7 bits (JIS X0201, formerly C6220)	
Parity	1-bit even	
Stop Bits	1 bit .	

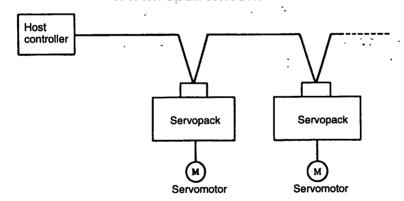


## **6.2 Control Structure**

:mail: service@repairtw.com

Line id: @zzzz

A host controller and Servopack can control up to 16 axes.



## 6.3 Sending Commands from Controller to Servopack

Commands are sent from the Controller to the Servopack as outlined below.

Item	Single Axis	Multiple Axes	
Commands	command_string C <sub>R</sub>	Axis-specific commands	
		axis_No.(00 to 98) command_string C <sub>R</sub>	
		All-axis commands	
		command_string C <sub>R</sub>	
		When PRM36 bit 8 (ignore with no axis number) is set to 1, set the axis number to 99 to send commands for all axes simultaneously.	
Examples	• SPD12345 C <sub>R</sub>	• 11SPD123 C <sub>R</sub>	
	• NOV1234 C <sub>R</sub>	• 12SPD456 C <sub>R</sub>	
	• ST C <sub>R</sub>	• 11MOV123 C <sub>R</sub>	
		• 12MOV456 C <sub>R</sub>	
	上工利士右阻	• ST C <sub>R</sub>	

Note C<sub>R</sub> = Carriage Return

## 6.3.1 Confirmation Return Signal 333

An OK  $C_R$  is returned each time a command is received if PRM36 bit 10 is set to 1. Line id: 0zzzz

## PRM36 Bit 9 Set to 1

If an unacceptable command is received, the Servopack for the designated axis will return ERR\_SN C<sub>R</sub>. No signal will be returned from axes that were not specified or if the command was received normally

#### PRM36 Bit 9 and 10 Set to 1

The specified axis will return either an OK or ERR\_SN each time it receives a command.

## 6.3.2 Typical Send Examples

The following shows typical send examples.

641 List of Serial Commands

## Sending a Run Command to the Servopack

O SVON CR

O: From Controller to Servopack

. lacktriangle OK  $C_R$ 

●: From Servopack to Controller

- O SVONN CR
- ERR\_SN CR

There is a maximum 5-ms delay between receiving and executing a command.

## ■ Requesting Data from the Servopack

 $\bigcirc$  ALM  $C_R$ 

O. From Controller to Servopack

● ALM\_ \_RUN C<sub>R</sub>

: From Servopack to Controller

- $\bigcirc$  MON1  $C_R$
- PUN  $\stackrel{\checkmark}{=}$  -12345678  $C_R$

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6.4 Serial Commands 維修 此手冊零約

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6.4.1 List of Serial Commands

The following table lists serial commands.

Operation	Command	Description	
Run	SV ON	Supplies power to the motor.	
	SV OFF	Stops power to the motor.	
[  -	ARES	Resets an alarm.	
-	ZEROSET (±) nnnnnnn	Overwrites the origin so the current position becomes (±) nnnnnnn.	-
	RES	Operates the same as turning power ON and OFF.	

Operation	Command	Description
Move Reference	POS (±) nnnnnn	Positions the motor at (±) nnnnnnn (absolute value) using linear acceleration and deceleration.
	POSI (±) nnnnnn	Positions the motor at (±) nnnnnnn (incremental value) using linear acceleration and deceleration
	MOV (±) nnnnnn	Sets an absolute position reference.
	MOVI (±) nnnnnn	Sets an incremental position reference.
	SPD nnnnn	Sets a speed reference
	RP	Repeats an incremental move following a POSI or MOVI command.
	ST	Starts automatic operation.
	ZRN	Starts a return to origin.
	PCON	Switches the speed loop to P control.
	PCOFF	Cancels P control for the speed loop.
	HOLD	Places the feed on hold (retains the remaining distance).
	SKIP	Decelerates to a stop
User Constant	PRMpp	Sends the user constant at pp (user constant number).
	$PRMpp = (\pm) nnnnn$	Overwrites the user constant at pp (user constant number) with (±) nnnnnn.
Monitoring	MONp	Sends monitor data.
	IN	Sends the input signal status.
_	OUT	Sends the output signal status.
·	ALM (p)	Sends an alarm code 100333
-	-,-	Nothing for p: Current alarm  p=1 to 9: Serv Alarm p times earlier.
Output Setting	OUT = bbbb	Turns ON and OFF masked output.

## 6.4.2 Command Functions

## User Constant Commands

User constant commands are used to access or overwrite the contents of user constants. User constants will not be lost if the power goes out because they are stored on EEPROM. See *roman 7 User Constants* for more details on these constants.

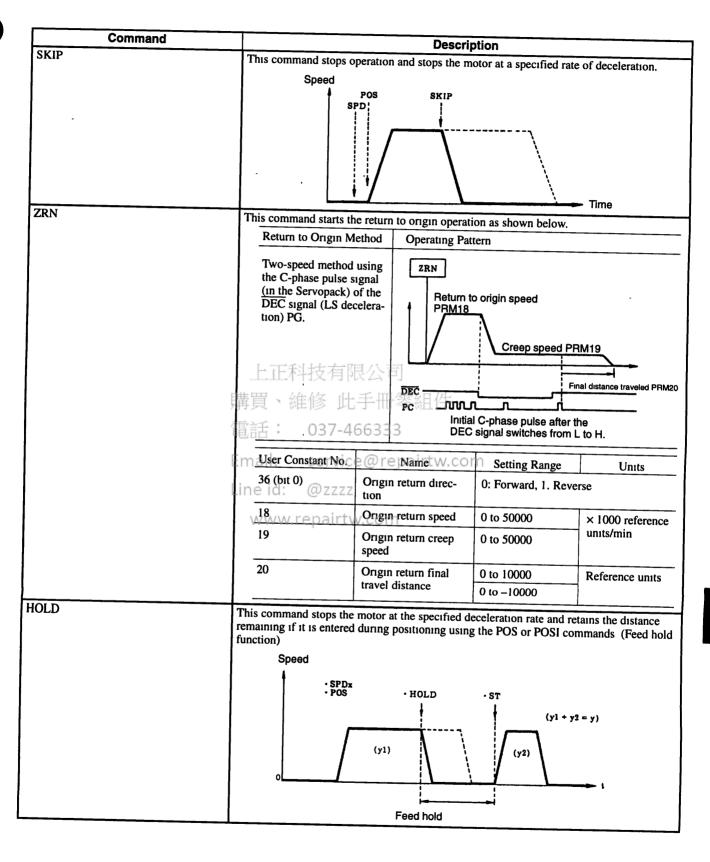
#### 642 Command Functions

Command	Description					
PRMpp (pp = user constant No.)	This command sends the contents of user constant pp from the Servopack in order to check the contents.  Note User constants are output in hexadecimal for pp 36 to 39.  Example Command: PRM30 → RPM30 = XXX (Sent from the Servopack)					
PRMpp = (±) nn using up to 5 dig (pp = user constant No., n = 0 to 9)	(+) and $(+)$ and $(+)$ and $(+)$ and $(+)$ can be					
	Example Commands: PRM32 = 2048 PRM33 = 1000 Turn the power OFF and then back ON.					

## ■ Basic Operating Commands

The following table describes basic operating commands.

Command	上上科技有限公司 Description					
RES	This command operates the same as turning power ON and OFF, i.e., it resets the digital control section of the Servopack. It is used when user constants starting from PRM32 are overwritten.					
ARES	This command operates the same as the alarm reset signal/ALMRST to reset alarms that occur in the Servopack.					
ZEROSET (±) nn Maximum ±3000000 (The plus sign (+) can be omitted.)	This command sets (±) nn as the standard origin position. (Units: Reference units)  ZEROSET ± nn zzz  The current position will be set at (±) nn, and is displayed as monitor data PUN = (±) nnmnnn v. repairtw.com					
SVON SVOFF	The SVON command operates the power drive circuits of the main Servopack circuits to turn the motor ON The SVOFF command turns the motor OFF. (Both signals operate the same as the Servo ON signal S-ON.)  Note The S-ON signal, must be masked (PRM37 bit 0 = 1) if the SVON/SVOFF commands are used without the S-ON signal.					
	SVON SVOFF  W (OFF) ON (OFF)					
SPD nn Maximum 50000	This command sets the speed reference. The units for (nnn) is [x 1,000 reference units min].  When power is turned ON or the RES command is executed, the speed reference value becomes all zeroes. An ERR_SN signal will be returned if a POS or POSI command is executed prior to executing an SPD command when power is turned ON or the RES command is executed.					
ST .	This command starts automatic operation after a MOV or MOVI command is executed, restarts following a HOLD, and moves the remaining distance when ST is sent. The ST command is ignored during positioning.					



#### 642 Command Functions

Command	Description					
POS (±) nn	These commands position the motor using linear acceleration.					
Maximum 4000000 POSI (±) nn	POS: Moves to the absolute position (±) nn POSI. Moves incrementally (±) nn					
Maximum 4000000	(Speed is set using the SPD command.)					
(The plus sign (+) can be omitted.)	Speed					
	Absolute value  Absolute value  (Units: Reference units)  Incremental value (300)  Position					
PCON PCOFF	These commands switch the speed loop mode of the Servopack from PI (proportional/integral) control to P (proportional) control. PCON sets P control while PCOFF returns to PI control.					

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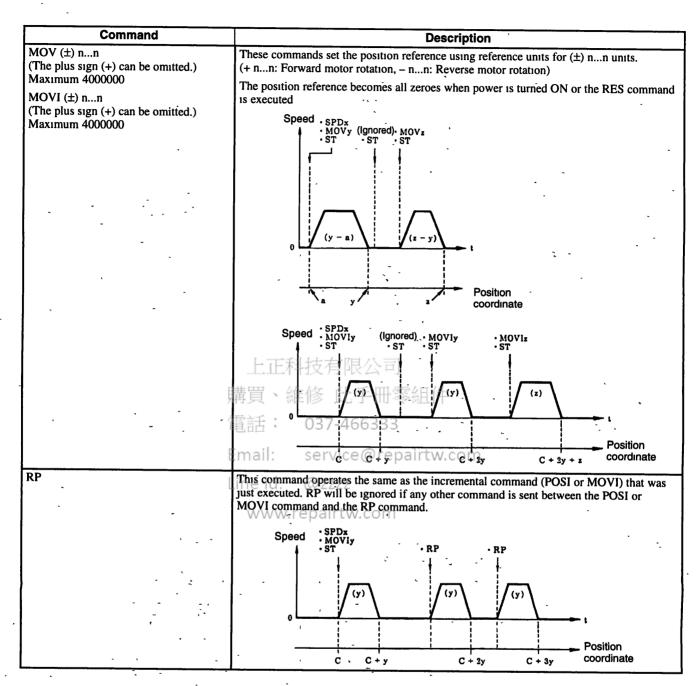
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#### Monitoring Commands

Monitoring commands return monitor data from the Servopack when they are executed.

"CR" (carriage return) is added to the text string rather than "LF" (line feed).

#### **Monitor Commands**

Command	Dat	a sent from Servopack	Unit, Misc.				
	Name	Display					
MONI	Current position	$PUN = \pm \underline{n \dots n} \text{ (see note)}$	Reference units				
MON2	Position error	$PER = \pm \underline{nn} \text{ (see note)} $ 7 digits max.	Converted pulse 4 times the absolute encoder pulse				
MON3	Current speed (motor rotation speed)	VFB = $\pm \underline{\text{nn}}$ (see note) 4 digits max.	r/min				
MON4	Reference speed	$VRF = \pm \underline{nn} \text{ (see note)}$ 5 digits max.	× 1000 reference units/min				
MON5	Torque reference	$TRQ = \pm \underline{nnn} \text{ (see note)}$ $3 \text{ digits max.}$	,%				
MON6	Servopack status	STS = n n n n n 1 2 3 4 5 n is 0 or 1. n is "1" for the following conditions 1: RDY, Ready 2: COIN, Positioning completed 3: RUN, Moving 4: TLIM, Current limit in progress 5: ALM, Alarm					

Note A plus sign (+) is not output if data sent from MON1 to MON5 Servopacks is positive or 0, but a negative sign

(-) is output if the data is negative

#### Input Signal Status: IN Command

Data sent from a Servopack: IN = n6 n5 n4 n3 n2 n1 n0

The monitor data indicates the input signal status as follows (with contacts):

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Open: 0, Closed: 1

Each data digit corresponds to a connector pin number and signal name as shown below.

Command	Data sent from a Servopack											
	n <sup>6</sup>	n <sup>5</sup>	n <sup>4</sup>	n <sup>3</sup>	n <sup>2</sup>	n <sup>1</sup>	n <sup>0</sup>					
IN -	- 12 -	-11	. 17	16	18	15	14					
- -	N-CL	P-CL	N-OT	P-OT	(ALMRST)	P-CON	S-ON					

#### **Output Signal Status: OUT Command**

Data sent from the Servopack: OUT =  $n^6 n^5 n^4 n^3 n^2 n^1 n^0$ 

Monitor data represents output signal status. The output relay is turned OFF when set to 0 and is ON when set to 1.

Each data digit corresponds to a connector pin number and signal name as shown below.

Command		· · · · · · · · · · · · · · · · · · ·					
	n <sup>6</sup>	n <sup>5</sup>	n <sup>4</sup>	n <sup>3</sup>	n <sup>2</sup>	n <sup>1</sup>	n <sup>0</sup>
OUT	OUT - 32 31 30		11	8	7	34	
	ALO3	ALO2	ALO1	CLT	COIN	BK	ALM

#### **Setting Output Signals**

Command	Description						
OUT = bbbb	This command can output CLT (1CN-9), $\overline{\text{COIN}}$ (1CN-8), $\overline{\text{BK}}$ (1CN-7) and ALM (1CN-34) when these signals are masked.						
	OUT = b,b b b · ALM signal  BK signal  COIN signal  CLT signal						
· 上ī 購買	All signals are turned OFF when b = 0 and are turned ON when b = 1.  Example: OUT 0101  Here the CLT signal is turned OFF, the COIN signal is turned ON, the BK signal is turned OFF and the ALM signal is turned ON if the signal is turned ON.						
電話	nals are masked. See User Constant PRM37 bits 11 to 8 for more de-						

## ALM (ALMp) Command Prepairtw.com

The Servopack sends status data just once with the ALM (ALMp) command. See Servopack Status and Data Sent from the Servopack on the next page for details on alarm codes and alarm abbreviations.

#### 6 4 2 Command Functions

Command	. ,	~ -		· Da	ta Se	e Ser	Servopack						
1	Servopack Status								Data Display				
ALM	Operating	Motor OFF (base block status)							ALMBB				
	condition Motor ON							ALMRDY					
-	· .	Motor	runnı	ng	_	:	-E	ALN	1R	UN _	-		
-	-	Positio	nıng-	comp	lete -		-	ALN	1C	OIN .	•	-	
-	Alarm occu (Including o		red vertraveling, software lmit switch)						ALM_nn.nnnn Alarm abbreviation Alarm code				
ALMp	Previous alarm p times earlier							ALMp = nn.nnnn					
(p = 1  to  9)								Alarm abbreviation					
	The Servop to see detail the third ala	s of the	se pre	vious	alarm	s alar s. AL	ms, an M3, fo	d ALl r exar	M1 to	ALM9 c is the cor	ommand nmand u	s can be used sed to view	
	(Previous	) X≔	X	X	X	X	X.	·X	X	X	-	(Future)	
	-	<b>↓</b>	1	<b>↓</b>	<b>↓</b>	1	<b>↓</b>	<b>↓</b>	<b>↓</b>	ļ	. •	Time	
1	上正	<b>拜</b> 其	78	<b>限</b> 夕	6	. 5	4	3	2	1]-[	Present time	-	
	購買、	購買、維修 此手冊Recorded alarm								_(X: Ala	arm ssequ	uence)	

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#### Servopack Status and Data Sent from the Servopack

	Servop	Data Sent			
	Des				
Status Display	Normal	Motor OFF (base block status)	ALMBB		
		Motor ON	ALMRDY		
		Motor running	ALMRUN		
		Positioning completed	ALMCOIN		
	Positive o	vertravel	ALM_P P-OT		
	Beyond p	ositive software limit switch	ALM_P. P-LS		
-	Negative	overtravel	ALM_N. N-OT		
		egative software limit switch	ALM_N. N-LS		
Alarm Display	Absolute	data error	ALM 00. ABS		
-	Parameter	corrupted	ALM 02. PRM		
	Parameter	setting error	ALM 04. PRM		
		ent detection eated heat sink detection)	ALM 10. OC		
		有限公司	ALM 31. OF		
1	Overvolta	ge detection	ALM 40. OV		
XH5-	Accelerati	on calculation	ALM 51. OS		
"礼記	Overload	detection (instantaneous peak load)	ALM 71. OL		
Ema	Overload	detection (continuous peak load)	ALM 72. OL		
	Encoder e	rror -	ALM 80. POS		
. Line	Lincode	ackup error	ALM 81. POS		
W	Encoder c	hecksum error	ALM 82. POS		
	Encoder b	attery error	ALM 83. POS		
	Encoder a	bsolute data error _	ALM 84. POS		
	Encoder of	verspeed .	ALM 85. POS		
-	Overrun d	etection	ALM C1. RWY		
	Phase erro	or detection	ALM C2. PG		
		A, PB phase wire	ALM C3. PG		
	Broken Po	C phase wire	ALM C4, PG		
	Power los	s alarm	ALM F3. SRC		
	CPU error		See note		

Note Serial data that is sent will be erratic when a CPU error has occurred.

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# **User Constants**

This chapter describes the contents and settings of user constants, including details on memory switches.

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7.1.1	Gain-related Constants
7.1.2	Positioning Unit Related Constants pairtw.com
7.1.3	Torque Related Constants
7.1.4	Sequence Related Constants
7.1.5	Other Constants repairtw.com
7.1.6	Memory Switches

# 7

# 7.1 Setting User Constants

The Servopack has the following user constants that can be set or modified to fit the system. It is important to understand what the constants mean before using them.

User constants are set and modified through serial communications or through a Digital Operator when serial communications are not available. See *Chapter 6 Serial Communications* or *Chapter 8 Digital Operator (JUSP-OP02A-1)* for more details.

#### 7.1.1 Gain-related Constants

## ■ PRM1: Position Loop Gain

- Set the proportional gain for the position controller.
- Allowable adjustment range: 1 to 500 [1/s]

## ■ PRM2: Speed Loop Gain

- Set the proportional gain for the speed controller.
- Allowable adjustment range: 1 to 2000 [Hz] (With equivalent inertia)
- Set PRM 2 at 40 Hz maximum when the motor is running under no-load conditions.

# ■ PRM3: Speed Loop Integration Time Constant

- Set the time constant for the speed controller.
- 'Allowable adjustment range: 2 to 10000 [ms]

#### ■ PRM7: Mode Switch

 Set the mode switching level. PRM7 switches between PI and P control in order to improve transient characteristics when the speed controller output saturates during acceleration and deceleration. The mode switch can be used to select any one of the following detection points and to set their levels.

Torque reference (speed controller output):

%

Speed reference:

Speed reference value Reference units/100 ms

Motor acceleration and deceleration detection:

Reference units

Error pulse:

• The detection point is selected using PRM36 bits 12 and 13.

# PRM10: Torque Reference Filter Time Constant

 Set the primary lag filter to add to the reference torque line for speed error and speed loop gain.

- PRM10 is used to prevent vibration due to mechanical resonance.
- Allowable setting range: 0 to 250 [x 100 μs]

#### ■ PRM11: Feed Forward Compensation

- Set the feed forward compensation for the position controller.
- Allowable adjustment range: 0 to 100 [%]

#### PRM12: Feed Forward Reference Filter

- Set the primary lag filter to add to the feed-forward compensation line.
- PRM12 can be used to reduce the impact of feed forward control.

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• Allowable setting range: 0 to 500 [x 100 μs]

#### **■** PRM13: Bias

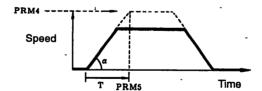
- Set the position control bias. PRM13 is used depending on load conditions to shorten positioning time.
- Allowable adjustment range: 0 to 450 [r/min]

# 7.1.2 Positioning Unit Related Constants

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## ■ PRM4: Maximum Speed

- Set the maximum speed using speed reference units (position reference units x 1000/min)
- Allowable adjustment range: 0 to 50000 [reference units], but the speed cannot be set higher than the maximum rotation speed of the motor.



#### ■ PRM5: Acceleration/Deceleration Time

- Set the acceleration based on the time required for the motor to go from a stop to the maximum speed (PRM4).
- Acceleration remains constant even if the feed speed varies.

#### PRM32 (B) and PRM33 (A): Electronic Gear Ratio

The electronic gear ratio B/A (PRM32/PRM33) represents the number of encoder pulses per reference unit.

For example, consider a system where the reference unit is micrometers in equipment that drives a ball screw with a 5-mm (0.20-in) pitch using a Servomotor with an incremental en-

#### 7 1 3 Torque Related Constants

coder (2048 pulses). Since 2048 encoder pulses are generated 4 times (unconditionally 4 times) in one motor revolution, the number of pulses generated is  $2048 \times 4$  or 8192 pulses. Here, the Servomotor moves 5 mm (0.20 in) above the 5-mm (0.20-in) pitch ball screw, and this distance expressed as micrometers is 5000  $\mu$ m. Therefore, set PRM32 to 8192 and PRM33 to 5000.

- Make sure that the electronic gear ratio falls within the range  $1 \le B/A \le 10$ .
- Always execute RES or turn power OFF and back-ON when the electronic gear ratio is changed.
- Be sure to recalculate and correct user constants set in reference and speed reference units.

#### **■ PRM34: Number of Encoder Pulses**

- Set the number of pulses per encoder rotation.
- For a 12-bit absolute encoder: Set 1024 [P/R].
- For an incremental encoder:
   Set 2048 [P/R] (SGM-□□□312) or 2000 [P/R] (SGM-□□□512).

#### 7.1.3 Torque Related Constants

#### ■ PRM8: Forward External Current Limit

- Set the forward current limit. PRM8 is valid when contact input P-CL (1CN-11) is ON.
- Allowable setting range: 0 to maximum torque [%]

#### **■ PRM9: Reverse External Current Limit**

- Sets the reverse current limit. PRM9 is valid when contact input N-CL (1CN-12) is ON.
- Allowable setting range: 0 to maximum torque [%]

#### **■ PRM28: Forward Torque Limit**

- Set the forward torque limit.
- Allowable setting range: 0 to maximum torque [%]

#### **■ PRM29: Reverse Torque Limit**

- Set the reverse torque limit.
- Allowable setting range: 0 to maximum torque [%]

# 7

## 7.1.4 Sequence Related Constants

### ■ PRM6: Positioning Completed Width

- Set the range for the positioning complete signal output (COIN).
- Allowable setting range: 0 to 100 [reference units]

# ■ PRM15: Delay Time from Brake Reference Output to Servo OFF Operation

- Sets the time delay from the brake reference output to Servo OFF when using a Servomotor with a brake.
- Allowable setting range: 0 to 50 [x 10 ms]

# PRM16: Mechanical Brake ON Enabled Speed with Servo OFF

- Set the motor rotation speed that turns the mechanical brake ON (signal open) with the Servo OFF. 上正科技有限公司
- PRM 16 holds the mechanical brake open when motor rotation speed exceeds this setting.
- Allowable setting range; 0 to maximum speed [speed reference units]

# PRM17: Delay Time from Servo OFF to Forced Brake ON During Motor Rotation

PRM17 prevents the mechanical brake from being applied immediately when motor rotation exceeds the mechanical brake ON enabled speed with the Servo OFF. PRM17 designates brake ON (signal OPEN) regardless of motor rotation speed after this specified time elapses.

• Allowable setting range: 0 to 1000 [x 10 ms]

# ■ PRM25: Command Distribution Completed Signal Width

- PRM25 is valid only when the CLT signal (1CN-9) is converted to command distribution completed signal (PRM39 bit 10 = 1).
- PRM25 sets the number of pulses left until command distribution completed signal is output.
- Allowable adjustment range: 0 to 30000 (reference units)
- The unit for PRM25 is (× 100 reference units) when PRM39 bit 11 is set to 1.

#### 7.1.5 Other Constants

#### PRM14: Overflow

• Set the overflow detection level.

• Allowable setting range: 1 to 65535 [× 100 reference units]

#### **■ PRM18: Origin Return Speed**

- Set the initial speed for origin return.
- PRM18 is set in speed reference units. The direction is determined by PRM36 bit 0.

#### ■ PRM19: Origin Return Creep Speed

- Set the speed for locating the origin after the deceleration limit switch signal turns ON during a origin return.
- PRM19 is set in speed reference units.

#### ■ PRM20: Origin Return Final Travel Distance

- Set the distance from the origin return (encoder C-phase pulse) to the origin.
- PRM20 is set in position reference units and requires a sign.
- If the direction of the setting is opposite of the origin return direction, the Servomotor will
  decelerate to a stop after detecting the origin, and reverse directions.

## ■ PRM21: Origin Return Strike Time and Strike Torque

- Set the strike time and strike torque when the method used to origin return (PRM39 bits 4 to 6) is set to 5 or 6. Service@repairtw.com
- Last two digits (00 to 99): Strike torque (% units) <5 decimal digits>
- First three digits (0 to 300): Strike time (10-ms units)

  Example: PRM21 = 5070 ....... Strike continuously for 500 ms at 70% torque.

# ■ PRM26 and PRM27: JOG Speed

- Set the JOG-mode speed for running forward or reverse depending on P-CL or N-CL contact input.
- The Servomotor runs at the first JOG speed set in PRM26 when the P-CON signal is OFF, and runs at the second JOG speed set in PRM27 when the P-CON signal is ON.
- Allowable setting range: 0 to maximum speed (PRM4)
- Speed reference units: Position reference units × 1000/min

# ■ PRM30: Forward Software Limit/PRM31: Reverse Software Limit

- Set the limits to the range of motion. A Servomotor with an absolute encoder or an incremental encoder that returns to origin cannot move beyond these limits.
- They are used to check the range when a run start command is received via serial communications. The Servomotor does not start moving if the reference position is outside the range.
- The Servomotor moves up to the software limit and then stops when an external JOG signal is received.

• Set PRM30 and PRM31 to 0 in systems that do not use software limits.

#### PRM35: Axis Number

- Be sure to give each Servopack a unique number when multiple Servopacks are connected
  in parallel on a single transmission line. Add an axis designation number in front of all communications commands to send commands only to the required axes. Axis numbers range
  from 01 to 98.
- Setting this parameter enables communications for the relevant Servopack only.
- PRM36 to PRM39 are bit parameters. Convert bits 15 (MSB) to 0 (LSB) to hexadecimal in PRM command settings.

#### 7.1.6 Memory Switches

#### ■ PRM 36 Bit 0: Origin Return Direction

- When using an absolute encoder, PRM36 is valid only if PRM36 bit 1 is set to 1.
- Set the origin return direction to 0 for a positive direction (+) and to 1 for a negative direction (-). 購買、維修 出手冊零組件

#### PRM36 Bit 1: Change the Origin Return Method

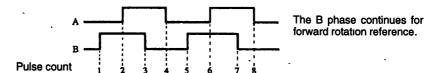
- When PRM36 bit 1 is set to 0 with an incremental encoder, the ZRN command will return
  the Servomotor to the origin the same way as setting PRM39 bits 6 to 4 to 0. With an absolute
  encoder, the ZRN command positions the Servomotor at the position set in PRM20.
- When PRM36 bit I is set to 1, the Servomotor will return to the origin the same way as setting PRM39 bits 6 to 4 to 1 for both absolute and incremental encoders.

#### PRM36 Bit 2: Encoder Selection

Set PRM36 bit 2 to 0 for an incremental encoder and to 1 for an absolute encoder.

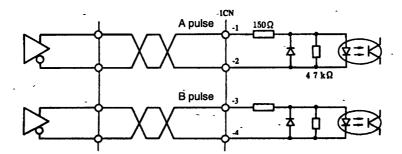
#### ■ PRM36 Bit 3: Pulse Train Input

- The Servomotor moves by pulse train reference when PRM36 bit 3 is set to 1.
- The reference pulse is a two-phase pulse 90° phase difference, and is counted using a multiplier of 4. A reference of one reference unit is given one count.
- The pulse form and multiplier cannot be changed.



#### 7 1 6 Memory Switches

- Note 1. Pulse-inputs are ignored during serial commands as well as during JOG operations and cannot be cleared from the error counter.
  - 2. Be sure to input pulses equivalent to 5-V line driver signals.



#### ■ PRM36 Bits 7 to 4: Pulse Count Check for Absolute Encoder Cycle

- This settings is valid only when using an absolute encoder.
- PRM36 bits 7 to 4 are used to check whether the number of PG pulses (A and B phase) between origin pulses (C phase) match the number of pulses per encoder rotation when an absolute encoder is used. Set the allowable errors.
   Units: Encoder pulse units
- An encoder alarm (ALM80.POS) occurs when the error exceeds this setting, but the check is not performed if the bits are set to 0.

#### ■ PRM36 Bit 8: Ignore with No Axis Number

- When this bit is set to 0, serial commands with no axis number are valid for all axes. Set this bit to 0 if there is only one axis.
- When this bit is set to 1, serial commands with no axis number are ignored. Add axis number 99 to make commands valid for all axes.

#### ■ PRM36 Bit 9: Error Signal Return

- An ERR SN will be returned when a serial command receive error occurs when PRM36 bit 9 is set to 1. Only the designated axis will return a signal.
- The receive errors given below both return ERR SN.
  - Illegal text and numbers
  - . The received command cannot be executed.
  - (An ST command when the Servo is OFF or the reference is outside the software limits.)

#### PRM36 Bit 10: OK Signal Return

When this bit is set to 1, OK is returned when a serial command is received normally. An OK
may be returned even if the serial command is not valid as when SVOFF is received while
the Servo is OFF or when ARES is received when there is no alarm.

**Note** OK is not returned when a RES command is received because status is initialized the same as turning power OFF and ON.

#### PRM36 Bit 11: Received Text Return

• When this bit is set to 1, received text is returned after an OK (receive normal) or ER (receive error), but only from the designated axis. The text is returned without the axis number, and is returned one space after OK or ER.

**Example:** 02SPD5000 — Command (Host controller to Servopack)
OK SPD5000 — Returned (Servopack to host controller)

#### PRM36 Bits 12 and 13: Mode Switch Selection

• Set the mode switch switching conditions. See 5.7.3 Functions that Improve Response for more details on mode switching.

Bits 13 and 12 = 0, 0: Torque
Bits 13 and 12 = 0, 1: Speed
Bits 13 and 12 = 1, 0: Acceleration
Bits 13 and 12 = 1, 1: Error pulse

Set the mode switching level in PRM7.

Note When changing switching conditions, be sure to change PRM7 to suit the new conditions.

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# ■ PRM36 Bit 14: Starting Point Change

- When this bit is set to 0, the reference position (target position for the previous reference) is set as the starting point for an incremental reference (MOVI, POSI) during current limit.
- When this bit is set to a the current position (position where the Servomotor stopped) is set as the starting point for an incremental reference (MOVI, POSI) during current limit.

#### ■ PRM37 Bit 0: S-ON Signal Mask

• When this bit is set to 1, the S-ON signal (1CN-14) is disabled.

#### ■ PRM37 Bit 1 OT Signal Mask

• When this bit is set to 1, the P-OT signal (1CN-16) and the N-OT signal (1CN-17) are disabled so the Servomotor cannot run even when these signals are OPEN.

#### PRM37 Bit 2: External JOG Signal

 When this bit is set to 1, the P-CL signal (1CN-11), N-CL signal (1CN-12), and P-CON signal (1CN-15) are set as external JOG run reference signals.

P-CL → JOG+ (JOG forward reference, forward when ON and stopped when OFF)
N-CL → JOG- (JOG reverse reference, reverse when ON and stopped when OFF)
P-CON → SP2ND (2nd JOG speed selection, PRM26 speed when ON and PRM27 speed when OFF)

### PRM37 Bit 3: ALMRST Signal Mask

• When this bit is set to 1, the ALMRST signal (1CN-18) is disabled.

#### ■ PRM37 Bit 4: Inverted DEC Signal

 When this bit is set to 1, the logic of the deceleration signal (DEC, 1CN-18) when the Servomotor origin return is reversed. The Servomotor starts decelerating when the DEC turns OFF, and searches for an origin pulse when the signal turns back ON.

#### ■ PRM37 Bits 7 and 6: Special Input Signal

- Enable input signals to execute serial commands and other functions. Set bits 7 and 6 to 0 and 1, respectively, to enable the special input signals. Be sure to mask the input signals at PRM37 bit 3 and bits 1 to 0, or both functions will be executed.
- When using this function, specify the function allotted to signals at PRM38 and PRM39 bits 3 to 0.

#### PRM37 Bit 8: ALM Signal Mask

When this bit is set to 1, the ALM signal (1CN-34) is removed from the servo status output.
 Here, the ALM signal changes with the serial command OUT = b3 b2 b1 b0, where b0 = 0 turns the mask OFF and b0 = 1 turns the mask ON.

#### ■ PRM37Bita9: BK Signal-Maskpairtw.com

When this bit is set to 1, the BK signal (1CN-7) is removed from the servo status output. Here, the BK signal changes with serial command OUT = b3 b2 b1 b0, where b1 = 0 turns the mask OFF and b1 = 1 turns the mask ON.

## ■ PRM37 Bit 10: COIN Signal Mask

When this bit is set to 1, the COIN signal (1CN-8) is removed from the servo status output.
 Here, the COIN signal changes with serial command OUT = b3 b2 b1 b0, where b2 = 0 turns the mask OFF and b2 = 1 turns the mask ON.

### ■ PRM37 Bit 11: CLT Signal Mask

• When this bit is set to 1, the CLT signal (1CN-9) is removed from the servo status output. Here, the CLT signal changes with serial command OUT = b3 b2 b1 b0, where b3 = 0 turns the mask OFF and b3 = 1 turns the mask ON.

## PRM37 Bit 12: Inverted ALM Signal Output

 When this bit is set to 1, the logic of the ALM signal (1CN-34) is reversed. Here, the ALM signal is OFF during normal operation and is ON when an alarm occurs.

#### PRM37 Bit 13: Inverted BK Signal Output

When this bit is set to 1, the logic of the  $\overline{BK}$  signal (1CN-7) is reversed. Here, the  $\overline{BK}$  signal is OFF when the motor is ON and is ON during base block.

#### PRM37 Bit 14: Inverted COIN Signal Output

When this bit is set to 1, the logic of the COIN signal (1CN-8) is reversed. Here, the COIN signal is OFF when positioning is completed and is ON for all other cases.

#### PRM37 Bit 15: Inverted CLT Signal Output

When this bit is set to 1, the logic of the CLT signal (1CN-9) is reversed. Here, the CLT signal is OFF during current limit and is ON when current limit is OFF.

#### PRM38 and PRM39 Bit 3 to 0: Input Signal Allocation

• Set the input signal allocation when PRM37 bits 7 and 6 are 0 and 1.

Allocated to the N-CL signal (1CN-12) PRM38 bits 15 to 12: Allocated to the P-CL signal (1CN-11) PRM38 bits 11 to 8: Allocated to the P-CON signal (1CN-15) PRM38 bits 7 to 4: Allocated to the S-ON signal (1CN-14) PRM38 bits 3 to 0:

Allocated to the ALMRST signal (1CN-18) PRM39 bits 3 to 0;

- The settings are as follows:
  - No special operation. Always set unmasked signals at 0.
  - SVON command 1;
  - **PCON** command 2:
  - 3: ws7rcommandirtw.com
  - HOLD command (HOLD when OFF, run enabled when ON) 4:
  - 5: RP command
  - SKIP command 6:
  - **ZRN** command 7:
  - ARES command

#### PRM39 Bits 6 to 4: Selection of Origin Return Method

- Select the method used to origin return when PRM36 bit 1 is set to 1.
- The parameters used in origin return are listed below.

Origin return speed PRM18:

PRM19: Origin return creep speed

PRM20: Origin return final travel distance

Origin return strike time and torque (PRM39 bits 6 to 4 must be 5 or 6) PRM21:

PRM36 bit 0: Origin return direction

Change the origin return method PRM36 bit 1:

PRM37 bit 4: Inverted DEC signal

PRM39 bits 6 to 4: Selection of origin return method

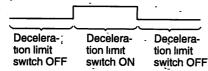
PRM39 bit 7: Origin pulse selection

The settings values are described in the following table.

Setting	Move Status	Description
	Δ <u>Θ</u>	Moves the equipment the distance to the origin based on the initial C-phase pulse position after exceeding deceleration limit switch in order to set the origin just as with returning to the origin using standard settings.
1		Moves the equipment the distance to the origin based on the initial C-phase pulse when deceleration limit switch turns ON in order to set the origin.
. 2	• Δ	Moves the equipment in reverse when deceleration limit switch turns ON and moves it the distance to the origin based on the initial C-phase pulse when deceleration limit switch turns OFF in order to set the origin.
3	(When deceleration limit switch turns ON)	Functions the same as 1, above, when returning the equipment to the origin from the deceleration-limit switch OFF position. When returning to the origin from the deceleration limit switch ON position, the equipment moves in reverse and then reverses direction when the deceleration limit switch signal turns OFF. After that, it again functions the same as 1; above.
5	<u>************************************</u>	After the equipment strikes the movement limit, it moves the distance to the origin in the reverse direction in order to set the origin
6	上上科技· mananananananananananananananananananan	After the equipment strikes the movement limit, it moves in the reverse direction and moves the distance to the origin based on the initial C-phase pulse when deceleration limit switch turns ON in order to set the origin

Note 1. Symbols in the figure indicate the following:

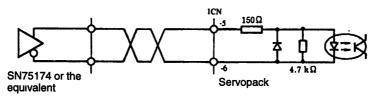
- \Rightarrow Ongın return speed (PRM18) er∨ice@repairtw.com
- → Origin return creep speed (PRM19)
- --> Move the return to origin distance (PRM20)
- △ Origin pulse (C-phase pulse) position
- Return to origin complete position
- 2. \_\_\_\_ indicates deceleration limit switch status.

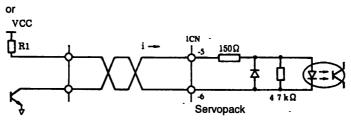


3. Codes can be used to set the direction of movement for distance to origin (PRM20). Care must be taken with this setting, however, because the direction of movement is limited using return to origin by striking when PRM39 bits 4 to 6 are set to 5.

#### ■ PRM39 Bit 7: Origin Pulse Selection

- When this bit is set to 0, the encoder origin pulse (C phase) is set as the reference position for returning to the origin.
- When this bit is set to 1, the leading edge of the CLR signal (1CN-5 and 6) is set as the reference position for returning to the origin. Be careful here because the voltage level of the CLR signal varies with other I/O signals.

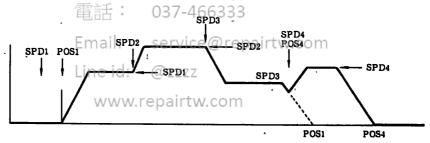


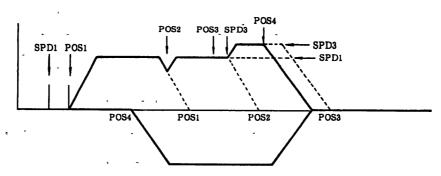


i = 6.6 to 15.3 mA R1 examples 1 kΩ when the VCC is 12 V 180 Ω when the VCC is 5 V

#### **■ PRM39 Bit 8: Overwrite Method**

- When this bit is set to 0, the position and speed reference commands are ignored while the
  equipment is moving.
- When this bit is set to 1, position and speed reference commands entered while the equipment is moving are enabled immediately.



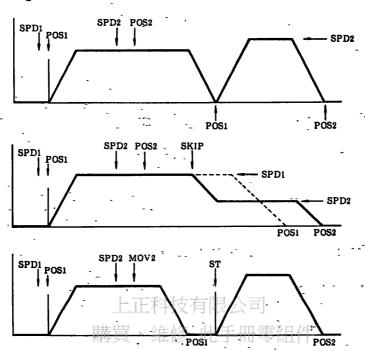


#### ■ PRM39 Bit 9: Reference Buffer Method

- When this bit is set to 0, the position and speed reference commands are ignored while the equipment is moving.
- When this bit is set to 1, the position and speed reference commands entered while the equipment is moving are held as a single group and enabled when operation ends or when operation is aborted by a SKIP command.

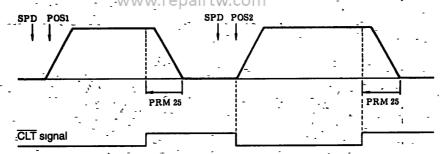
Note

The Servomotor will not stop even if a SKIP command is sent when the reference commands given below are received.



#### ■ PRM39 Bit 10: Pulse Distribution Completed Signal

When this bit is set to 1, the CLT signal output (1CN-9) is switched to the pulse distribution
completed signal after current limit is detected. The number of pulses remaining before outputting the pulse distribution completed signal is set to PRM25 in reference units.



# ■ PRM39 Bit 11: Multiplier for Distribution Completed Signal Width

- PRM39 bit 11 is valid only-when PRM39 bit 10 is set to 1.
- When this bit is set to 1, the unit for PRM25, which is used to set the range for the output completed signal above, is changed from reference units to (x 100 reference units). This parameter is useful for creating signals when passing points during operation.

## ■ PRM39 Bit 12: Ignore Parity

- When this bit is set to 0, the error characters are ignored during the parity check on the serial communications input.
- When this bit is set to 1, a parity check is not performed on the serial communications input.

# 7.2 User Constants

This following is a list of user constants.

Table 7.1 List of User Constants

No.	Digits (Bits)	Name (Description)	Units	Upper and Lower Limits	Factory Setting
1		Position loop gain	1/s	1 to 250	40
2		Speed loop gain	Hz	1 to 2000	80 -
3		Speed loop integration time constant	ms -	2-to 10000	20
4	= -	Maximum speed	Speed reference units	0 to 50000	37000
, 5		Accelération/deceleration time	ms	0 to 1000	100 .
6		Positioning completed width	Reference units	1 to 250	1
7		Mode switch level Torque Speed 上正科技有限公司 Acceleration/deceleration Error pulse	% Speed reference units Speed/100 ms Reference units	0 to max. 0 to max. 0 to max. 0 to 10000	200
8		Forward external current limit/-466333	%	0 to max.	100
9		Reverse external current limit	%	0 to max.	100
10		Torque reference filter time constant	× 100 μs	0 to 250	4
1-1		Feed forward compensation ZZZZ	% .	0 to 100	0
12		Feed forward reference filter	100 μs	0 o 500 .	. 0
13	-	Bias	Speed reference units	0 to 450	0
14		Overflow	× 100 reference units	1-to 50000	500
15		Time delay from brake ON to Servo OFF	× 10 ms	0 to 50	0
16	-	Mechanical brake ON enabled speed with the Servo OFF	Speed reference units	0 to max.	100
17		Time from Servo OFF to forced brake ON during motor rotation	× 10 ms	0 to 1000	0
18		Origin return speed	Speed reference units	1 to max.	1000
19		Origin return creep speed	Speed reference units	1 to max.	200
20		Origin return final travel distance	Reference units	±30000	0
21	Last two digits	Origin return strike torque	%	0 to 99	0
	First three digits	Origin return strike time	× 10 ms	0 to 300	0
22 23 24		Not used.			0 0 0
25		Pulse distribution completed signal range	Reference units	0 to 30000	0

No.	Digits (Bits)	Name (Description)	Units	Upper and Lower Limits	Factory Setting
26		1st JOG speed	Speed reference units	0 to max.	1000
27		2nd JOG speed	Speed reference units	0 to max	200
28		Forward torque limit	%	0 to max.	Max.
29		Reverse torque limit	%	0 to max.	. Max.
30		Forward software limit	× 100 reference units	±30000 ,	0
-31		Reverse software limit	× 100 reference units	±30000	0
32		Electronic gear ratio B (no. of pulses)		30000	1
33		Electronic gear ratio A (no. of units set)	,	30000	ì
34	17.7	Number of encoder pulses	P/R	513 to 32768	2048
35		Axis number		0 to 99	99
36	b15	Not used.	- 2	0	0
	b14	Starting point change (for an incremental reference during current limit)  0: Previous reference position  1: Current position	7	0, 1	0
	b13 to b12	Mode switch selection 00: Torque, 01: Speed, 10. Acceleration/de- celeration, 11: Error pulse	零組件	00 to 11	00
	b11	1: Received text return 037-45033	δ	0, 1	0
	ь10	1: OK signal return service@re	pairtw.com	0, 1	. 0.
	b9	1: Error signal return		0, 1	0
	b8	1: Ignore with no axis number	. `	0, 1.	0
-	b7 to b4	Pulse count check for absolute encoder cycle	PG pulses	000 to 101	000
	b3	1: Pulse train input	_	0, 1	0
	b2	1: Absolute encoder		-0, 1	0
_	bl	1: Change the origin return method	-	0, 1	0
-	b0	Origin return direction: 0: + direction, 1: - direction		0, 1	

No.	Digits (Bits)	Name (Description) Units	Upper and Lower Limits	Factory Setting
37	b15	1: Inverted CLT signal output.	0, 1	0
	bl4	1: Inverted COIN signal output.	0, 1	0
	b13	1: Inverted BK signal output.	0, 1	0
	b12	1: Inverted ALM signal output.	0, 1	0
	b11	1: CLT signal mask	0, 1	0
	b10	1: COIN signal mask	0, 1	0
	b9	1: BK signal mask	0, 1	0
	b8	1: ALM signal mask	0, 1	0
-	b7 to b6	Special input signals: 00: General, 01: Allocated	00, 01	00
	b5	Not used.	0	0
	b4	1: Inverted DEC signal	0, 1	0
	b3	1: ALMRST signal mask	0, 1	0
	b2	1: External JOG signal .	0, 1	0
	bl	1: OT signal mask	0, 1	0
	ь0	1: S-ON signal mask 科技有限公司	0, 1	0
38	b15 to b12	N-CL signal allocation (I) F III F SI III	0000 to 1000	0000
	b11 to b8	P-CL signal allocation	0000 to 1000	0000
	b7 to b4	P-CON signal allocation U37-466333	0000 to 1000	0000
	b3 to b0	S-ON signal allocation Service (Premainty Com	0000 to 1000	0000
39	b15	Not used.	0	0
	b14	Not used. Line id: @ZZZZ .	0	0
	b13	Not used. www.repairtw.com	0	0
	b12	· 1: Ignore parity	0, 1	0
	b11	1: Multiplier for pulse distribution completed signal width	0, 1	0
	b10	1: Pulse distribution completed signal	0, 1	0
	ь9	1: Reference buffer method	0, 1	0
	b8	1: Overwrite method	0, 1	0
	b7	Origin pulse selection 0: C phase of PG, 1. CLR signal	0, 1	0
	b6 to b4	Selection of origin return method	000 to 110	000
	b3 to b0	ALMRST signal allocation	0000 to 1000	0000

Note 1. Speed reference units are expressed as reference units  $\times\,1000/\text{mm}$  .

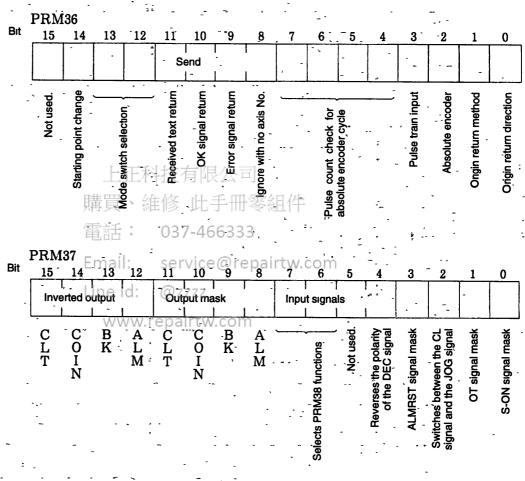
- 2. The factory setting for PRM2 (speed loop gain) must meet the following conditions:

  Load inertia ≥ motor moment of inertia × 3

  Since vibrations will occur with these load settings with a small motor (no load inertia) or small load inertia, always set PRM2 at 40 or less prior to operation.
- 3. Be sure to set the electronic gear ratio (PRM32 and 33) so that  $1 \le B$  (PRM32)/A (PRM33)  $\le 10$ .
- 4. To avoid possible danger, never change parameters starting at PRM28 (encoder selection, number of encoder pulses, etc.) while the Servomotor is ON (Servo ON).

- 5. Changing parameters like the electronic gear ratio and number of encoder pulses may cause the Servomotor to run at a maximum speed outside the specified Servomotor speed range and may generate an A.04 alarm when power is turned ON. If this happens, check the reference units one more time
- 6. Since the JOG reference is internally processed as POS±2097152, the Servomotor will stop after a set number of rotations.
- 7. Be sure to convert b15 (MSB) to b0 (LSB) to hexadecimal in 4-bit groups ((b15 to b12, b11 to b8, b7 to b4, b3 to b0) for parameters 36 to 39. Servopacks read and send bits in hexadecimal. The upper and lower limits as well as factory settings for parameters 36 to 39 in the table above are given in binary.

Parameter numbers PRM36, PRM37, PRM38 and PRM39 are illustrated below.



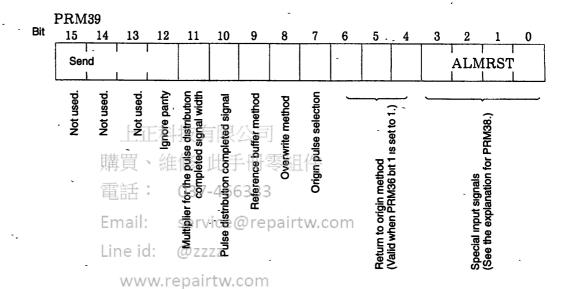
PRM38 Special input signals (Valid when PRM37 bit 6 is set to 1)

Sit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

N - C L P - C L P C O N - S - O N-

The following commands can be allocated to each signal.

- 0: None
- 1: SVON
- 2: PCON
- 3: ST
- 4: HOLD
- 5: RP
- 6: SKIP
- 7: **ZRN**
- 8: ARES



上正科技有限公司

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電話: 037-466333

Email: service@repairtw.com

Line id: @zzzz

www.repairtw.com

# **Using the Digital Operator**

This chapter describes the basic operation of the Digital Operator.

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8.2 Basic Function and Mode Selction	
Email: service@repairtw.com  8.3 Status Display Mode  Line id: @zzzz	8 - 5
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8.4.1 User Constants	8-6
8.4.2 Operation Using the Digital Operator	8 - 11
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# 8.1 Switch Operation

Figure 8.1 shows the Digital Operator. The Digital Operator provides various functions, which are grouped under different Operating Modes. See 8.2 Basic Functions and Switching Modes.

Note

Use serial communications to send references, monitoring functions, and all other commands to an SGD-\\_\\_\\_H-series Servopack. When serial communications are not available (e.g., at system startup), functions such as monitoring and setting parameters for test operation and maintenance are possible with the SGD Digital Operator. The Digital Operator is used for maintenance work only, and not for normal operation.

When executing serial communications again after using the Digital Operator, be sure to turn OFF power before changing the connections.

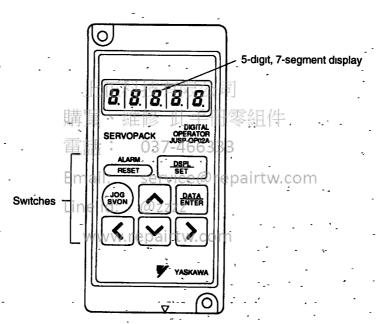


Figure 8.1 Digital Operator

8

# 8.2 Basic Function and Mode Selction

Table 8.1 shows the Digital Operator functions. The Status Display Mode is set when the control power supply is turned ON. Press the DSPL/SET Key as shown in Figure 8.2 to switch modes.

**Table 8.1 Digital Operator Functions** 

	Mode	Function
Status Disj	play	Displays status
		Baseblock
	-	• Run
		• Alarm
Setting		Sets and displays user constants
1 .	,	Operating mode from Digital Operator (JOG).
	·	Clears alarm traceback data.
		Checks Servomotor parameters.
	上正科技	• Checks the software version.
Monitor	購買、維修	Monitoring functions  Speeds
	電話: 03	7-4 Torque references
	Email: se	No. of pulses from motor U-phase edge     Comparity Com     Electrical angle
	Line id: @:	ZZ Internal status bits
-	MANALTON:	Position error
Alarm Trac	ceback	Displays previous alarms.

Email: service@repairtw.com

Line id: @zzzz

www.repairtw.com

8

# 8.3 Status Display Mode

The Status Display Mode displays Servopack status using bits and codes as shown in *Figure 8.3*. *Table 8.2* shows bit data and *Table 8.3* show the codes and status. ALARM/RESET is the reset switch for alarms, and DSPL/SET switches from Status Display Mode to Setting Mode.

The panel display is shown below.

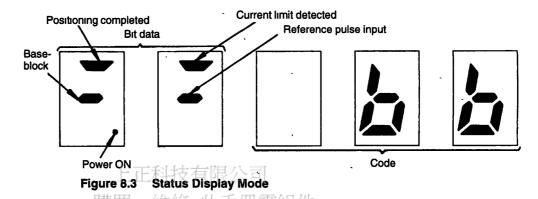


Table 8.2 Bit Data Description

Bit Dataa   :	service@rep <b>Description</b> m
Power ON	Lit when Servopack power is ON.
Baseblock	Lit for base block, and not lit with Servo ON.
Positioning Completed/W. re	Lit when positioning has been completed.
Current Limit Detection	Lit if the torque reference is at the torque limit.

Table 8.3 Codes and Status

Code	Status
ьь	Baseblock
רטח	Operating
Pot	Forward rotation prohibited
not	Reverse rotation prohibited .
R00	Alarm status See Table 8.7 Table of Alarms on page 8 - 19.
RO2	
:	

# 0

# 8.4 Setting Mode

The Setting Mode is used to perform the following operations.

- Set and display user constants.
- Operate the system from the Digital Operator.
- Clear alarm traceback data.
- Check Servomotor parameters
- Check the software version.

#### 8.4.1 User Constants

#### ■ Setting Constants (Cn-01 to Cn-23)

The panel display is shown below.



Figure 8.4 Setting User Constants

- 1. Set the user constant number using the Cursor Keys.
  - Select the digit that will be set using the LEFT and RIGHT Keys. The selected digit will flash.
  - Use the UP and DOWN Keys to increase or decrease the selected digit to the desired user constant number.
- 2. Press the DATA/ENTER Key to display the setting of the user constant.
- Change the setting using the Cursor Keys. (The procedure here is the same described in step 1, above.)
- Press the DSPL/SET Key to store the setting.
- 5. Repeat steps 1 to 4 above as many times as required. -
- 6. Press the DATA/ENTER Key to return to the user constant number display.
- 7. Press the DSPL/SET Key to switch from Setting Mode to Monitor Mode.

  See *Table 8.4* (p 8 7) for a list of user constants.

# 8

# ■ Setting Memory Switches (Cn-24 to Cn-27)

User constants Cn-24 to Cn-27 are used to set bits used as memory switches. The procedure used to set user constant numbers and display settings are the same as those given in steps 1. and 2. in the above procedure.

The panel display is shown below.

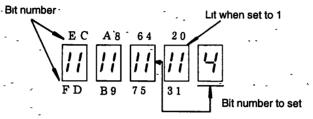


Figure 8.5 Bit Data Display

- 1. Use the LEFT and RIGHT Keys to set the bit number of the memory switch that will be set on the right side of the panel.
- 2. Use either the UP or DOWN Key to turn ON and OFF the memory switch.
- 3. Repeat steps 1 and 2, above, as many times as required.
- 4. Press the DSPL/SET Key to store the setting.
- 5. Press the DATA/ENTER Key to return to the user constant number display.
- 6. Press the DSPL/SET Key to switch from Setting Mode to Monitor Mode.

# ■ User Constants pairtw.com

The following is a list of user constants.

**Table 8.4 List of User Constants** 

Cn No.	Param- eter No.	Bits	Name (Description)	Unit	Upper and Lower Limits	Factory Setting
0,1	1		Position loop gain	l/s	1 to 250	40
02	.2		Speed loop gain	Hz	1 to 2000	80
03	3		Speed loop integration time constant	ms	2 to 10000	20
04	4	-	Maximum speed	Speed reference units	0 to 50000	37000
05	5		Acceleration/deceleration time	ms	0 to 1000	100
06	6		Positioning completed width	Reference units	1 to 250	1 -
07	7		Mode switching level Torque Speed Acceleration/deceleration Error pulse	% Speed reference units Speed/100 ms Reference units	0 to max. 0 to max. 0 to max. 0 to 10000	200
08	8		Forward external current limit	%	0 to max.	100
09	9		Reverse external current limit	%	0 to max.	100

#### 8 4 1 User Constants

Cn No.	Param- eter No.	Bits	Name (Description)	Unit -	Upper and Lower Limits	Factory Setting
0A .	10		Torque reference filter time constant	× 100 μs	0 to 250	4
0B	11		Feed-forward compensation	%	0 to 100	0
0C	12		Feed-forward reference filter	100 μs	0 to 500	0 ;
0D	13		Bias	Speed reference units	0 to 450	0
0E -	14		Overflow	× 100 reference units	.1 to 50000	500
0F	15	-	Time from brake ON to Servo OFF	× 10 ms	0 to 50	0
10	16		Mechanical brake ON enabled speed with the Servo OFF	Speed reference units	0 to max.	100
11	17	-	Time from Servo OFF to forced brake ON during motor rotation	× 10 ms	0 to 1000	0
12	18		Origin return speed	Speed reference units	1 to max	1000
13	19		Origin return creep speed	Speed reference units	1 to max	200
14	20		Origin return final travel distance	Reference units	±30000 (see note)	0
1-5	21 .	Last two digits	Origin return strike torque	<b>%</b>	0 to 99	0 -
		First three digits	Origin return strike time 購買、維修 此手冊	×10°ms′ 零組件	0 to 300	0
16	22		Not used. 1111 1037-40033			0
17 18	23 24 :		Email: service@re	pairtw.com	-	0
19	25		Pulse distribution completed signal range	Reference units	0 to 30000	0_
1A	26		1st JOG speed	Speed reference units	0 to max.	1000
1B ·	27		2nd JOG speed WWW.repairtw.com	Speed reference units	0 to max.	200
1C	28		Forward torque limit	%	0 to max	max.
1D	29		Reverse torque limit	%	0 to max.	max.
IE .	30		Forward software limit	× 100 reference units	±30000 (see note 3)	0
1F	31	-	Reverse software limit	× 100 reference units	±30000 (see note 3)	0
20 -	32	-	Electronic gear ratio B (no. of pulses)		-30000	1 -
21	33 -		Electronic gear ratio A (no. of units set)	-	30000	1
22 ·	34		Number of encoder pulses	P/R	513 to 32768	2048
23	35	1	Axis number -	~	0-to 99	99

Cn No.	Param- eter No.	Bits	Name (Description)	Unit	Upper and Lower Limits	Factory Setting
24	36	b15	Not used.		0	0 .
		b14	Starting point change (for an incremental reference during current limit) 0: Previous reference position 1: Current position		0, 1	0
	:	b13 to b12	Mode switch selection 00: Torque, 01: Speed, 10: Acceleration/deceleration, 11: Error pulse		00 to 11	00
		b11	1: Received text return		0, 1	0
		b10	1: OK return		0, 1	0
		b9	1: Error signal return		0, 1	0
		b8	1: Ignore with no axis number		0, 1	0
		b7 to b4	Pulse count check for absolute encoder cycle	PG pulses	000 to 101	000
	1	b3	1: Pulse train input		0, 1	0
		b2	1: Absolute encoder		0, 1	0
		b1	1: Change the origin return method		0, 1	.0
		ь0	Origin return direction.  0: + direction.  1 direction.	京公日 (4生)	0, 1	0
25	37	b15	1: Inverted CLT signal output	S. A.T. 1	0, 1	0
		b14	1: Invered COIN signal output -466333		0, 1	0
		b13	1: Inverted BK signal output	airtw.com	0, 1	0 ,
		b12	1: Inverted ALM signal output		0, 1	0 .
		b11	1: CLT signal mask		0, 1	0
		ь10	1: COIN signal masky, repairtw.com		0, 1	0
		b9	1: BK signal mask		0, 1	0
		b8	1: ALM signal mask	,	0, 1	0
		b7 to b6	Special input signals: 00. General, 01: Allocated		00, 01	00
		b5	Not used.		0	0
		b4	1: Inverted DEC signal		0, 1	0
		b3	1: ALMRST signal mask		0, 1	0
		b2	1: External JOG signal		0, 1	0
		b1	1: OT signal mask		0, 1	0
		b0	1: S-ON signal mask		0, 1	0
26	38	b15 to b12	N-CL signal allocation		0000 to 1000	0000
		bil to	P-CL signal allocation		0000 to 1000	0000
		b7 to b4	P-CON signal allocation		0000 to 1000	0000
		b3 to b0	S-ON signal allocation		0000 to 1000	0000

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v	٧,
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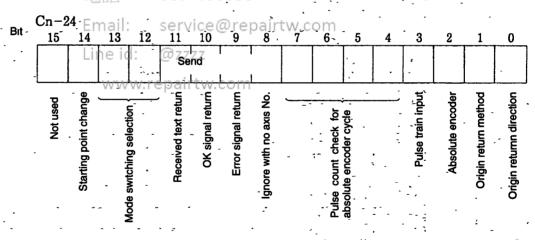
Cn No.	Param- eter No.	Bits	Name (Description)	Unit	Upper and Lower Limits	Factory Setting
27	39	b15	Not used.		0 -	0 .
	-	b14 -	Not used.	-	0	0_
	- <u>:</u>	b13	Not used.	<del></del> .	0	0
		b12	1: Ignore parity		0, 1	0
-		bll -	1: Multiplier for pulse distribution completed signal width	7-7-	0, 1	0
		b10.	1: Pulse distribution completed signal		0, 1	0
		b9.	1: Reference buffer method -		0, 1	0
. •		b8	1: Overwrite method		0, 1	0
•		b7 _	Origin pulse selection 0: C phase of PG, 1: CLR signal		0, 1	0 -
	,	b6 to b4	Selection of origin return method		000 to 110	000
		b3 to b0	ALMRST signal allocation		0000 to 1000	0000

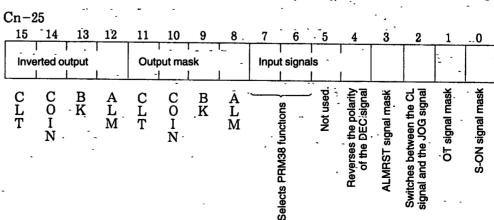
- Note 1. Specify parameter numbers for Cn numbers in hexadecimal.
  - 2. Use a bit pattern to set Cn-24 to Cn-27

Bit

3. A 16-bit two's complement is used to set and display settings for Cn-14, Cn-1E, and Cn-1F. (Example: For -1000, the setting is 65536 - 1000 or 55536.)

User settings for Cn-24, Cn-25, Cn-26 and Cn-27 are illustrated below.





The following commands can be allocated to each signal.

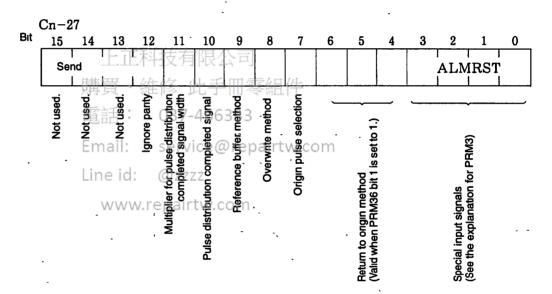
Special input signals (Valid when Cn-25 bit 6 is set to 1.)

0: None

Cn-26

Bit

- 1: SVON
- 2: PCON
- 3: ST
- 4: HOLD
- 5: RP
- 6: SKIP
- **7**: **ZRN**
- 8: ARES



# 8.4.2 Operation Using the Digital Operator

## ■ Setting Operation Mode

Set user constant Cn-00 to 00 to switch from the monitor panel to Operation Mode.

#### 8 4 3 Clearing Alarm Traceback Data

The panel display is shown below.

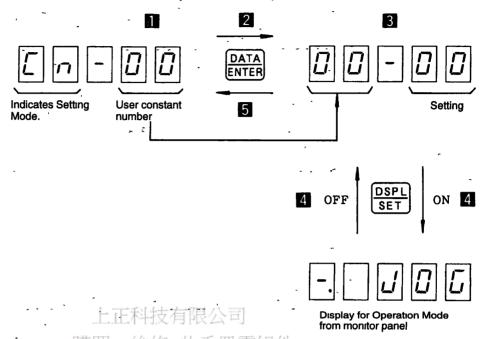


Figure 8.6 Operation Mode from the Digital Operator

037-466333

- 1. Use the Cursor Keys to select user constant number 00.
- 2. Press the DATA/ENTER Key to display the setting of the user constant.
- 3. Use the Cursor Keys to set 00.
- -4. Press the DSPL/SET Key on the monitor panel to turn the Operation Mode ON and OFF.
- -5. Press the DATA/ENTER Key to return to the user constant number display.
- -6. Press the DSPL/SET Key to switch from Setting Mode to Monitor Mode.

### ■ Operation Using the Digital Operator

Be sure to set the size of the speed reference at user constant PRM27 (2nd JOG speed). See 7.2 User Constants for more details on this setting.

- 1. Press the JOG/SVON Key to switch between SVON and SVOFF.
- 2. Press and hold the UP Key for reverse rotation.
  - 3. Press and hold the DOWN Key for forward rotation.

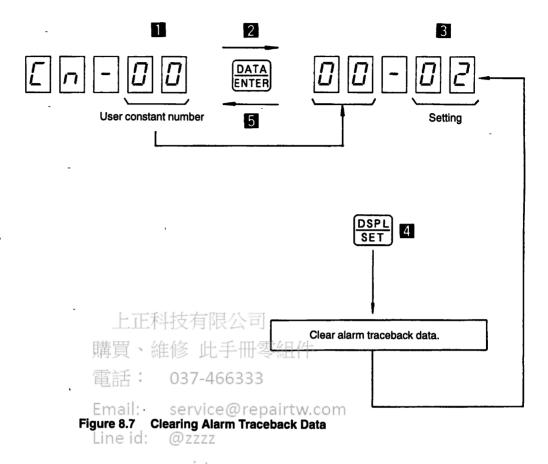
Note The S-ON signal must be masked (Cn-25 bit 0 set to 1) if the S-ON signal is not used. Also be sure to mask the OT signal (Cn-25 bit 1 set to 1) if the N-OT and P-OT signals are not used.

# 8.4.3 Clearing Alarm Traceback Data

Set user constant Cn-00 to 02 to clear alarm traceback data.

8

The panel display is shown below.



- 1. Use the Cursor Keys to select user constant number 00.
- 2. Press the DATA/ENTER Key to display the setting of the user constant.
- 3. Use the Cursor Keys to set 02.
- **4.** Press the DSPL/SET Key to clear alarm trace data and return to the display for user constant Cn-00.
- 5. Press the DATA/ENTER Key to return to the user constant number display.
- 6. Press the DSPL/SET Key to switch from Setting Mode to Monitor Mode.

# 8.4.4 Checking Servomotor Parameters

# ■ Checking Servomotor Parameters

Set user constant Cn-00 to 04 to switch to Servomotor parameter checking mode.

The panel display is shown below.

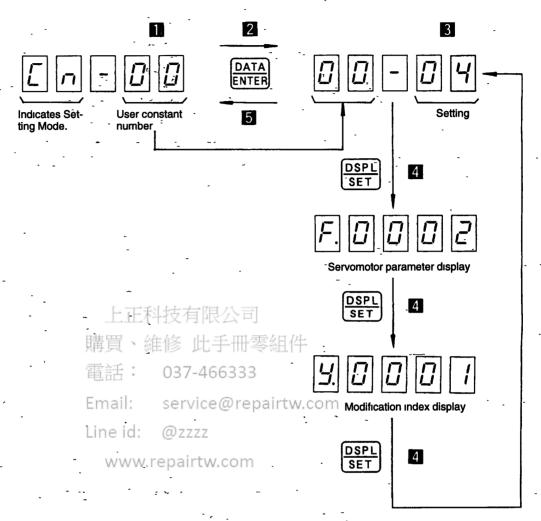


Figure 8.8 Display Changes when Checking Servomotor Parameters

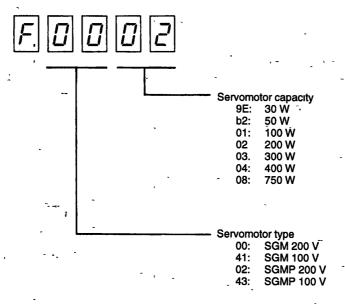
- 1. Use the Cursor Keys to select user constant number 00.
- 2. Press the DATA/ENTER Key to display the setting of the user constant.
- 3. Use the Cursor Keys to set 04.
- 4. Press the DSPL/SET Key to check the Servomotor parameters.
- 5. Press the DATA/ENTER Key to return to the user constant number display.
- 6. Press the DSPL/SET Key to switch from Setting Mode to Monitor Mode.

#### ■ Parameter Display

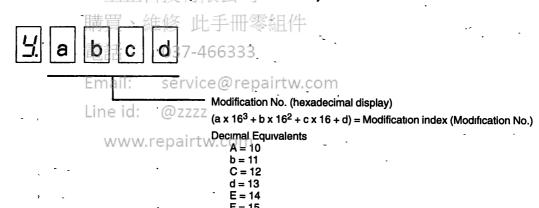
The Servomotor type and modification index (modification No.) are displayed as shown below.

8

#### **Servomotor Parameters**



### Modification Index (Modification No.)



# 8.4.5 Checking the Software Version

# ■ Setting the Software Version Checking Mode

Set user constant Cn-00 to 06 to switch to Software Version Checking Mode.

#### 8 4 5 Checking the Software Version

The panel display is shown below.

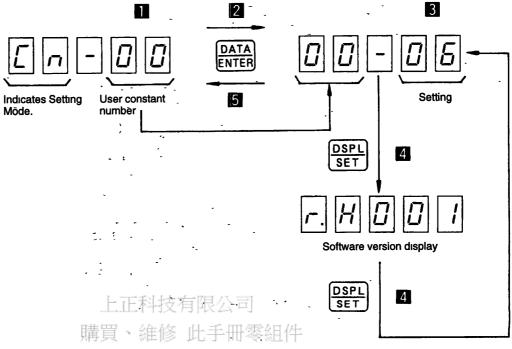
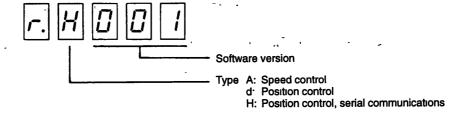


Figure 8.9 Display Changes when Checking the Software Version

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- 1. Use the Cursor Keys to select user constant number 00.
- 2. Press the DATA/ENTER Key to display the setting of the user constant.
- 3. Use the Cursor Keys to set 06.
- 4. Press the DSPL/SET-Key to switch to the adjustment mode.
- 5. Press the DATA/ENTER Key to return to the user constant number display.
- 6. Press the DSPL/SET Key to switch from Setting Mode to Monitor Mode.

#### Software Version Display



3

## 8.5 Monitor Mode

The Digital Operator can monitor the speed, torque and other references in Monitor Mode.

## 8.5.1 Monitor Display

The following table shows the types of monitoring available.

**Table 8.5 Monitor Display** 

Monitor Display
Feedback speed (r/min)
Torque reference (%)
No. of pulses from motor U-phase edge (pulse)
Electrical angle (deg)
Internal status bit display (See Table 8.6.)
Position error (reference units)

The panel display is shown below.



Figure 8.10 Display Changes in Monitor Mode

- 1. Use the UP and DOWN Keys to select monitor number to be used.
- 2. Press the DATA/ENTER Key to start the monitor display.
- 3. Press the DATA/ENTER Key to return to monitor number selection.
- 4. Press the DSPL/SET Key to switch from Monitor Mode to Alarm Traceback Mode.

8 5 2 Internal Status Bit Display in Monitor Mode

## 8.5.2 Internal Status Bit Display in Monitor Mode

The following tables describes the bit displays for Un-05 internal status in Monitor Mode.

Table 8.6 Internal Status Bit Display in Monitor Mode (Un-05)

			· · ·
-		13 14 15 9	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
	Bit No.	Code	Description
Un-05	- 1	SVALM	Lit for a servo alarm:
	2	DBON	Lit when the dynamic brake is ON.
	3 .		Not used.
١.	4	CLT	Lit during current limit.
-	5 .	COIN	Lit when positioning has been completed
	6	MSON	Lit when the mode switch is ON.
1	7	P-CL PI	Lit when forward current limit is ON.
	8	N-CL .	Lit when reverse current limit is ON.
	9 .	B-ON	Lit when the Servomotor is ON.
	10	PA	Not lit when the A-phase encoder input signal is high.
	11 -	PB Li	Not lit when the B-phase encoder input signal is high.
	12 .	PC ·	Not lit when the C-phase encoder input signal is high.
-	13	PU	Not lit when the U-phase encoder input signal is high (only for an incremental encoder).
-	14 .	PV	Not lit when the V-phase encoder input signal is high (only for an incremental encoder).
	15.	PW _	Not lit when the W-phase encoder input signal is high (only for an incremental encoder).
	16	SVON	Lit when the servo is ON.
	17 -	P-CON	Lit for the P control input.
	18	P-OT	Lit for the forward rotation prohibited input.
	19	N-OT	Lit for the reverse rotation prohibited input.
	20 =	-	Not used.

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## 8

## 8.6 Alarm Traceback Mode

The Alarm Traceback Mode is used to display data on previous alarms.

- The storage capacity for alarm data is up to 10 previous alarms.
- Traceback data A.99 for ten alarms is saved when the control power supply is turned ON or an alarm is reset (included in the 10 alarms).
- See Table 8.7 for more details on traceback data and steps to be taken for alarms.

The panel display is shown below.

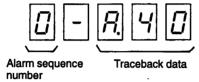


Figure 8.11 Alarm Traceback Mode

- 1. Press the UP and DOWN Keys to scroll through the alarm sequence numbers and display information on previous alarms. The higher the left-hand digit (alarm sequence number), the older the alarm data.)
- 2. Press the DSPL/SET Key to switch from Alarm Traceback Mode to Status Display Mode.

The following table lists alarm displays and traceback data provided by the Digital Operator.

Table 8.7 Alarm Displays and Traceback data Provided by the Digital Operator

Displayed Alam Code	Description			
<i>R00</i>	Absolute data error (only with an absolute encoder)			
R.O.2	Parameter breakdown			
R.DY	Parameter setting error			
R. 10	Overcurrent (or overheated heat sink)			
R.3 I	Overflow			
R40	Overvoltage			
R5 !	Overspeed (110% of maximum speed)			
R71	Overload (instantaneous peak load)			
R72	Overload (continuous peak load)			

Displayed Alam Code	Description :
R80	Absolute encoder error (only with an absolute encoder)
R8 I	Absolute encoder backup error (only with a 12-bit absolute encoder)
· 882	Absolute encoder checksum error (only with a 12-bit absolute encoder)
R83	Absolute encoder battery error (only with a 12-bit absolute encoder)
<i>R</i> 84	Absolute encoder absolute data error (only with a 12-bit absolute encoder)
<i>R</i> 85	Absolute encoder overspeed (only with a 12-bit absolute encoder)
RE I	Servo overrun detected (improper Servomotor or encoder wiring)
RC2	Phase error (only with an incremental encoder)
RE3	PA or PB phase disconnection .
R[4	PC phase disconnection
RF3 <sup>購貝</sup>	Power loss error (detected if power was reconnected within the power holding time)
R.99	Not an alarm. Reset by resetting the alarm or turning Servopack power ON (only for traceback data).
The following are opera	ttor-related alarms that are not recorded in alarm traceback.
[PFOO ine	Digital Operator transmission error 1
[PFO 1	Digital Operator transmission error 2

# **Installation and Wiring**

This chapter describes delivery item checking, installation, and wiring specifications for Servomotors and Servopacks.

## 購買、維修 此手冊零組件

9.1 Ch	ecking on Delivery, -466333	9 - 2
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9.2.3	Power Loss vw.repairtw.com	9 - 5
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	Cable Specifications	
	Cable Types	0 - 6

## 9.1 Checking on Delivery

When  $\Sigma$ -Series products are delivered, check the following items:

Check Items	Remarks
Check if the delivered products are the ones you ordered.	Check the model numbers marked on the nameplates of Servomotor and Servopack.
Check for damage.	Check the overall appearance, and check for damage or scratches resulting from transportation.
Check if the motor shaft rotates smoothly.	If the motor shaft can be smoothly turned by hand, it is normal. If the motor has a brake, however, it cannot be turned manually.
Check loose screws.	Check for looseness by using a screwdriver as necessary.

If any of the above items are faulty or incorrect, contact the dealer from which you purchased the products or your nearest sales representative. Be sure to confirm that there are no loose screws, breakage in lead wires, or damage in insulation.

## 9.2 Installation

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## 9.2.1 Installing the Servomotore@repairtw.com

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The Servomotor can be installed either horizontally or vertically. If the Servomotor is installed incorrectly or in an inappropriate location, the service life will be shortened or unexpected problems will occur. To prevent this, always observe the installation instructions provided below.

#### **■** Before Installation

Anticorrosive paint is coated on the edge of the motor shaft to prevent corrosion during storage. Before installation, clean off the anticorrosive paint thoroughly using a cloth moistened with thinner.



**IMPORTANT** 

Avoid getting thinner on other parts of the Servomotor when cleaning the shaft.

## Storage

Store the Servomotor in the following temperature range.

−20°C to 60°C

#### Installation Site

The Servomotors are designed for indoor use. Install Servomotor in an environment which meets the following conditions:

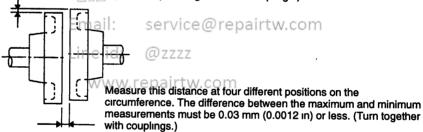
- Free from corrosive or explosive gases
- Well-ventilated and free from dust and moisture
- Ambient temperature of 0 to 40°C
- Relative humidity of 20% to 80% (with no condensation)
- Sufficient access for each inspection and cleaning

If the Servomotor is used in a location subject to water or oil mist, install a shield or cover over the Servomotor.

## Alignment

Align the shaft of the Servomotor with that of the equipment to be controlled. When connecting couplings, be careful not to apply any impact to the shaft or excessive force on bearings. Install the Servomotor so that alignment accuracy falls within the range shown below.

Measure this distance at four different positions on the circumference. The difference between the maximum and minimum measurements must be 0.03 mm (0.0012 in) or less. (Turn together with couplings.)



**IMPORTANT** 

If the shafts are not aligned properly, vibration will occur, resulting in damage to the bearings.

## Allowable Bearing Load

Do not apply any excessive thrust load or radial load to the AC Servomotor. When installing gears, couplings, pulleys, etc., be careful not to apply any impact to the shaft or excessive force on bearings. Mechanical shock to the shaft end must be less than 50 G (490m/s<sup>2</sup>).

Design the mechanical system so that thrust load and radial load applied to the servomotor shaft end during operation falls within the range shown in *Table 3.1*.

## 9.2.2 Installing the Servopack

The SGD-□□H Servopack is a book-shaped compact servo controller.

#### ■ Installation Site

Situation	Precautions
When installed in a control panel	Depending on the size of the panel, the temperature inside the control panel may become higher than the ambient temperature due to heat generated by internal devices. Design the control panel size, unit layout, and cooling method so that the temperature around the Servopack does not exceed 55°C.
When installed near a heating unit	Suppress radiation heat from the heating unit and temperature rise caused by convection so that the temperature around the Servopack does not exceed 55°C.
When installed near a source of vibration	Install a vibration isolator underneath the Servopack to prevent it from receiving vibration.
When installed in a place subject to corrosive gases 上正科技有限	Corrosive gases do not immediately affect the Servopack but will eventually cause magnetic contactors or relays in the reference circuits or main circuits to malfunction. Take appropriate action to prevent corrosive gases.
Others 購買、維修 此	Avoid installation in hot or humid places, or where excessive dust or iron powder is present in the air.

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■ Orientationil: service@repairtw.com

Install the Servopack perpendicular to the wall as shown in the figure. www.repairtw.com

The Servopack must be orientated as shown in the figure because it is designed to be cooled by natural convection.

• Firmly secure the Servopack through the mounting holes provided.

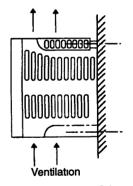
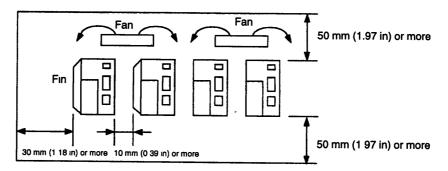


Figure 9.3 Installation Orientation

#### **Installation Method**



- Install the Servopack perpendicular to the wall so that the front panel faces outward.
- Provide sufficient space around each Servopack to allow cooling by natural convection.
- When installing Servopacks side by side, install cooling fans above the Servopacks to prevent the temperature around each Servopack from increasing excessively and also to maintain an even temperature inside the control panel.
- When installing multiple Servopacks side by side in a control panel, provide at least 10 mm (0.39 in) space between them and at least 50 mm (1.97 in) space above and below them as shown in the figure above and observe the following installation conditions:
  - Ambient temperature for Servopacks: 0 to 55°C
  - Humidity: 90% RH or less
  - Vibration: 0.5G (4.9 m/s<sup>2</sup>)
  - Condensation and freezing: None
  - Ambient temperature to ensure long-term reliability: 45°C or less

#### 9.2.3 Power Loss

The power loss of the Servopacks is as shown in the following table.

Table 9.1 Power Loss during Rated Output

Servopack Model SGD-	Supply Voltage	Capacity W	Output Current A (rms)	Power Loss W
АЗАН	200 VAC	30	0.42	15
A5AH		50	0.60	18
01AH		100	0.87	20
02AH		200	2.0	35
04AH	]	400	2.6	45
08AH	<u>l</u>	750	4.4	60
A3BH	100 VAC	30	0.63	17
A5BH	_	50	0.90	20
01BH		100	2.2	30
02BH	]	200	2.7	47
03BH		300	3.7	70

## 9.3 Wiring

## 9.3.1 Wiring Instructions

To ensure safe and stable operation, always refer to the following wiring instructions.

**IMPORTANT** 

Always use the following cables for wiring the signal lines and PG feedback lines.

Lines	Cable Type	Yaskawa Drawing No.	Maximum Allowable Length
For reference input	Twisted-pair wires	DE9404859	3 m (9.8 ft.)
For PG feedback lines and serial communication lines	Multiconductor shielded twisted-pair wires	B9400064 (for incremental encoder) DE8400093 (for absolute encoder)	20 m (65.6 ft.)

• Cut off the excess portion of the cable to minimize the cable length.

**IMPORTANT** 

For a ground wire, use as thick a cable as possible.

- At least class-3 ground (ground to  $100 \Omega$  or less) is recommended.
- Always use one-line grounding a repairtw.com
- If the motor is insulated from the machine, ground the motor directly.

**IMPORTANT** 

Do not bend or apply tension to cables.

• Since the conductor of a signal cable is very thin (0.1 to 0.3 mm<sup>2</sup> (0.0002 to 0.0005 in<sup>2</sup>), handle it with adequate care.

**IMPORTANT** 

To prevent malfunction due to noise, take the following actions:

- Position the input reference device and noise filter as close to the Servopack as possible.
- Always install a surge absorber circuit in the relay, solenoid and magnetic contactor coils.
- The distance between a power line (such as a power supply line or motor cable) and a signal line must be at least 30 cm (12 in). Do not put the power and signal lines in the same duct or bundle them together.
- Do not share the power supply with an electric welder or electrical discharge machine. When the Servopack is placed near a high-frequency oscillator, install a noise filter on the input side of the power supply line.

Note

The Servopack uses high-speed switching elements, which may cause noise on signal lines. To prevent this, always take the above actions.

**IMPORTANT** 

Use a noise filter to prevent the radio frequency interference.

Since the Servopacks are designed to be used for industrial use, no measures are provided
against radio frequency interference. Use a noise filter in the power input line when using
the Servopacks near residential areas or where they are prone to radio frequency interference.

## 9.3.2 Cable Specifications

The rated current of the Servopack external terminals and cable size are listed in *Tables 9.3* and 9.4. The cable specifications and sizes must be selected according to the operating environment and current capacity. The cable specifications in these tables were selected under conditions of three cables per bundle at 40° C ambient temperature, with the rated current flowing. *Table 9.4* lists the cable types.

Table 9.2 Cable Specifications (1)

Туре	Servopack Model SGD-		Main Circuit Power Input Terminal (R) (T)		Motor Connection Terminals (U) (V) (W) ⊥	
			Rated Current A (rms)	Cable Spec.	Rated Current A (rms)	Cable Specifications
For 200 V	30 W (0 04HP)	АЗАН	1 3,	HIV 1 25 min	0 42	Use Yaskawa cable See 10 4 2 Cable Specifications for details
	50 W (0 07HP)	А5АН	1 5		06	When using non-Yaskawa cables, check the cable current rating and
	100 W (0 13HP)	OLAHE科技	<b>背</b> 限公		0 87	consider the operating environ- ment
	200 W (0 27HP)	<b>gaH</b> 維修	批手用	计零組件	20	Use cable sizes AWG22 to AWG18 (0 3 to 0 89 mm <sup>2</sup> (0 0005 to
	400 W (0 53HP)	<b>04AH</b> 03	<b>764</b> 663	HIV 20 min	26	0 001 in <sup>2</sup> )
	750 W (1 01HP) Er	08AH nail: ser	vice@r	epairtw.co	5.5	_
For 100 V	30 W (0.04HP)	A3BH ne id: @z	2.0 ZZZ	HIV 1 25 min	0 63	
	50 W (0 07HP)	Mww.repa	26 W.CO	m	07	
	100 W (0 13HP)	01BH	45		22	
	200 W (0 27HP)	02BH	80	HIV 2 0 min	2 7	
	300 W (0 40HP)	03ВН	14 0		3.7	

The appropriate cables for Servopack connectors 1CN, 2CN and 3CN are shown in the following table.

Table 9.3 Cable Specifications (2)

Control I/O Signal 1CN Connector		Cable	Use twisted-pair cable or shielded twisted-pair wire.
		Applicable Cable	AWG24, 26, 28, 30
		Finished Cable Dimensions	Ø16.0 mm (Ø 0.63 in ) max.
		Rated Current A (rms)	100 mA DC max
PG Signal Connector	PG Signal Connector 2CN		Use Yaskawa cable. See 10.4.2 Cable Specifications for details. Use shielded twisted-pair wire if a Yaskawa cable is not used.
		Applicable Cable	Applicable cable sizes: AWG24, 26, 28, 30. Use AWG22 for encoder power supply and FG lines. Use AWG26 for other signals. These connections permit wiring distances up to 20 m (65.6 ft.)
上正科	技有	Finished Cable Dimensions	Ø11.6 (Ø0.46 in.) mm max.
購買、維	修」	Rated Current A (rms)	100 mA DC max (500 mA DC max for power supply line)
Serial Communication	3 <b>SN</b>	Cable 400333	Use twisted-pair wires or shielded twisted-pair wires.
Connector Email:	corv	Applicable Cable	AWG24, 26, 28, 30
Line id:	s <u>erv</u>	Finished Cable Dimensions	Ø7.0 mm (Ø0.28 in) max.
www.re	enair	Rated Current A (rms)	100 mA DC max

**Note** Cable selection conditions: three cables per bundle at 40 °C ambient temperature with the rated current flowing.

## 9.3.3 Cable Types

The types of cable are shown in the following table. Use this table in combination with the table above.

Table 9.4 Cable Types

	Cable Type	Conductor Allowable Temperature
Symbol	Name	°C
PVC	Normal vinyl cable	-
IV	600-V vinyl cable	60
HIV	Temperature-resistant vinyl cable	75

Note 1. Use cable with 600 V min. withstand voltage for main circuits.

- 2. Consider allowable current reduction ratio if cables are bundled in PVC or metal ducts.
- **3.** Use temperature-resistant cable under high ambient or panel temperatures where normal vinyl cables rapidly deteriorate.

# 10

## $\Sigma$ -Series Dimensional Drawings

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This chapter presents dimensional drawings of the  $\Sigma$ -series Servomotors, Servopacks, Digital Operator and Peripheral Devices.

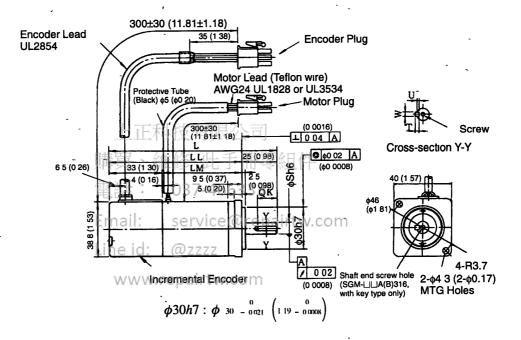
10.1 Servomotor Dimensional Drawings ..... 10.1.1 SGM Servomotors ..... 10.1.2 SGMPServomotors rvice@repairtw.com 10 - 18 10.2 Servopack Dimensional Drawings ...... 10 - 35 10.2.1 SGD-A3AH to 02AH SGD-A3BH to 01BH ...... 10 - 35 10.3 Digital Operator Dimensional Drawings .................. 10 - 38 10.4 Specifications and Dimensional Drawings of Peripheral Devices ...... 10 - 39 10.4.6 Brake Power Supply ...... 10 - 50 

## 10.1 Servomotor Dimensional Drawings

#### 10.1.1 SGM Servomotors

## SGM Servomotors with Incremental Encoders, No Brakes

30 W (0.04 HP), 50 W (0.07 HP), 100 W (0.13 HP)



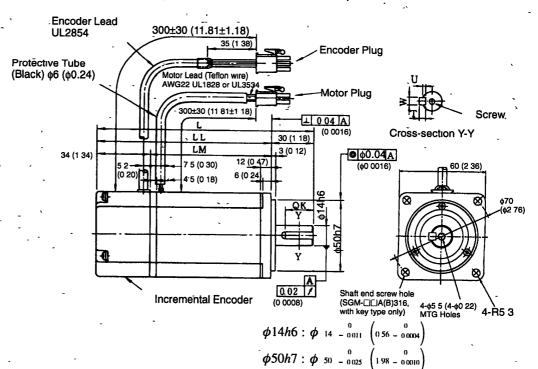
Model SGM-	L	LL	LM	s	ΟŘ	U	W	T	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
A3A□12 A3B□12	94 5 (3 72)	69 5 (2 74)	36 5 (1 44)	6 (0 24)	No key					30 (0 04)	0 3 (0 66)	68 (15)	54 (12)
A3B□12 A3A□14	<b>∤</b> ` ′		( )	(0 - 1)	1.4	r			1	(0 04)			٠,
A3A□14 A3B□14-	1		·.	į	14 (0 55)	1 2 (0 05)	(0 08)	2 (0 08)				٠	
A3A□16	i	- /			` /	( ,		(0 00)	142.5	-		-	
A3B□16	_					_		٠	M2 5, depth 5 (0 20)				,
A5A□12 .	102 0	77 0	44 0	6	No key	L	<u> </u>			50	04(088)	68.(15)	54 (12)
A5B□12	(4 02)	(3 03)	(1 73)	(0 24)	ľ		-	-		(0 07)	: ,		
A5A□14					14	12	2	2					٠
A5B□14					(0 55)	(0 05)	(0 08)	(0 08)					
A5A□16				,	-	ı			M2 5,			,	
A5B□16							-	,	depth 5 (0 20)	,			7
01A□12	119 5	94 5	61.5	8	No key		·			100	05(110)	78 (17)	54 (12)
01B□12	(4 70)	(3 72)	(2 42)	(0 31)						(0 13)			-
01A□14	] ~			-	14	18	3	3				•	-
01B□14		1			(0 55)	(0 07)	(0 12)	(0 12)					
01A□16						TTIX	月形。	스미	M3,	•			
01B□16		<b>!</b> -	,	購	買、	維修	此手	L冊零	depth 6 (0 24)	f			

Note 1. The encoder is an incremental encoder.

- 2. "A" in the model number indicates 200-V specifications, and "B" indicates 100-V specifications.
- 3. The symbol "\(\subseteq\)" in the model number indicates the number of encoder pulses (3. 2048P/R, 5: 2000P/R).

## 200 W (0.27 HP), 300 W (0.04 HP), 400 W (0.53 HP)

037-466333



#### 10 1 1 SGM Servomotors

Model SGM-	L	LL	LM ·	QK	· U	W	Τ,	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
02A□12	126 5	96 5 .	62 5	No key					200	1 1 (2 43)	245 (55)	74 (16)
02B□12	(4 98)	(3 80) -	(2 46)			-		<u> </u>	(0 27)			
02A□14				20 (0 79)	3 (0 12)	5 (0 20)	5 (0 20)	-		-		-
02B□14-					`` .						•	
02A□16	-	·		<u> </u>	;			M5, depth 8	٠.		·· _	
02B□16	] -				, ,			(0 31)				
03B□12	154.5	124 5,	90 5	No key	1	-			300	17 (3 75)	245 (55)	74 (16)
03B□14	(6 08)	(4 90)	(3 56)	20 (0 79)	3 (0 12)	5 (0 20)	5 (0 20)		(0 40)	ļ <sup>*</sup>	, i	
03B□16	-	,		-		,	,	M5, depth 8 (0 31)			-	
04A□12	154 5	124 5	90 5	No key	-				400	17 (375)	245 (55)	74 (16)
04A□14	(6 08)	(4 90)	(3 56)	20 (0 79)	3 (0 12)	5 (0 20)	5 (0 20)		(0 53) .			
04A□16						-   , .	,	M5, depth 8 (0 31)				

Note 1 The encoder is an incremental encoder.

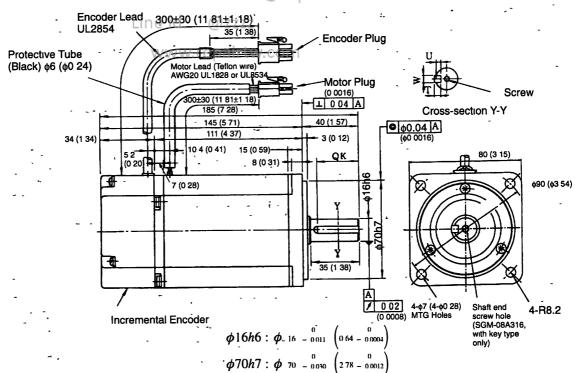
2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications

3. The symbol "\(\sum \)" in the model number indicates the number of encoder pulses (3: 2048P/R, 5: 2000P/R)

037-466333

## 750 W (1.01 HP)

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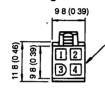
10

Model SGM-	QK	U	W	Т	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
08A□12	No key		-			750 (1 01)	3 4 (7 50)	392 (88)	147 (33)
08A□14	30	3	5	5	1	l		ì	
08A□16	(1 18)	(0 12)	(0 20)	(0 20)	M5, depth 8 (0 31)				

- Note 1. The encoder is an incremental encoder.
  - 2. "A" in the model number indicates 200 V-specifications
  - **3.** The symbol "□" in the model number indicates the number of encoder pulses (3: 2048P/R, 5. 2000P/R)

## Motor and Encoder Plugs (For 30 W (0.04 HP) to 750 W (1.01 HP))





Plug 172167-1 (AMP) Pin: 170360-1 or 170364-1

Connected to Cap: 172159-1斗技有限公司

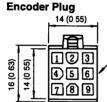
Socket: 170362-1 or 170366-1

買、維修 此手冊零組件

#### **Motor Wiring Specifications**

1	U phase	Red
2	V phase	White
3	W phase	Blue
4	FG	Green

電話: 037-466333



Plug: 172169-1 (AMP)
Pin: 170359-1 or 170363-1
Connected to 2ZZZZ
Cap: 172161-1

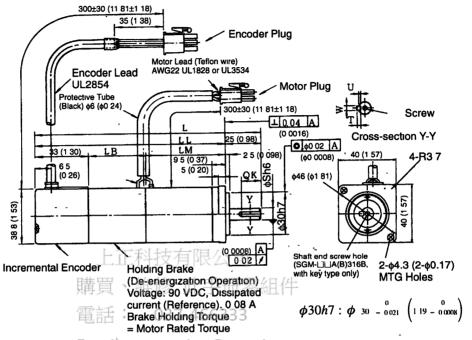
Socket 170361-1 or 170365-1 m

#### Incremental Encoder Wiring Specifications

A channel output	Blue
A channel output	Blue/Black
B channel output	Yellow
B channel output	Yellow/Black
C channel output	Green
C channel output	Green/Black
0 V (power supply)	Gray
+5 V (power supply)	Red
FG (Frame Ground)	Orange
	A channel output B channel output B channel output C channel output C channel output V (power supply)

## ■ SGM Servomotors with Incremental Encoders and Brakes

## 30 W (0.04 HP), 50 W (0.07 HP), 100 W (0.13 HP)



					Emai	1:	servi	ce@	repai	irtw.co	)m			
Model SGM-	L	LL .	LM	LB	<b>s</b> Line W	<b>QK</b> id: ww.re	u @zz: epair		<del>t</del> m	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allow- able Ra- dial Load N (lb)	Allow- able Thrust Load N (lb)
A3A□12B	126 0	101 0	36.5 -	31.5	6	No key					30	06	68 (15)	54 (12)
A3B□12B	(4 96)	(3 98)	(1 44)	(1 24)	(0 24)						(0 04)	(1 32)		
A3A□14B _						14	12	2	2					
A3B□14B				ľ		(0 55)	(0 05)	(0 08)	(0 08)					
A3A□16B			-							M2 5, depth 5			-	
A3B□16B										(0 20)			1	
A5A□12B	133 5	108 5	44 0	31 5	6	No key					50	07	68 (15)	54 (12)
A5B□12B	(5 26)	(4 27)	(1 73)	(1 24)	(0 24)						(0 07)	(1 54)		
A5A□14B						14	12	2	2 (0 08)					
A5B□14B	1	İ				(0 55)	(0 05)	(0 08)	(0 00)					
A5A□16B			1	ļ						M2 5, depth 5				
A5B□16B			}						·	(0 20)				
01A□12B	1600	135 0	61.5	40 5	8	No key					100	0.8	78 (17)	54 (12)
01B□12B	(6 30)	(5 31)	(2 42)	(1 59)	(0 31)			_			(0 13)	(1 76)		
01A□14B	]					14	18	3	3					
01B□14B						(0 55)	(0 07)	(0 12)	(0 12)					}
01A□16B	]									M3				İ
01B□16B	1									depth 6 (0 24)				

Note 1 The encoder is an incremental encoder.

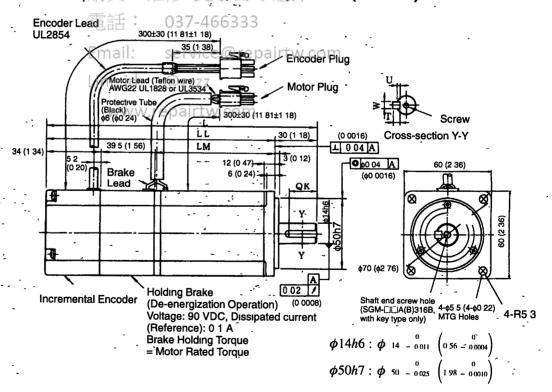
- 2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications.
- 3. The symbol "\(\sigma\)" in the model number indicates the number of encoder pulses (3. 2048P/R, 5: 2000P/R).

#### **Dimensional Tolerances**

Model SGM-	Shaft-end Dimensions [mm (in)]
	S
A3A□12B	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
A3B□12B	$0 = 0.008  \left(0.24 = 0.0003\right)$
A3A□14B	]
A3B□14B	]
A5A□12B	$6 = \frac{0}{0.008} \left( 0.24 = \frac{0}{0.0003} \right)^{-1}$
A5B□12B	$\int_{0}^{6} = 0.008  \left(0.24 = 0.0003\right)$
A5A□14B	Ť .
A5B[]14B	1
01A□12B	8 0 (0.20 0 )
01B□12B	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
01A□14B	1 , `
01B□14B	1

## 200 W (0.53 HP), 300 W (0.40 HP), 400 W (0.27 HP)

上正科技有限公司

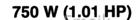


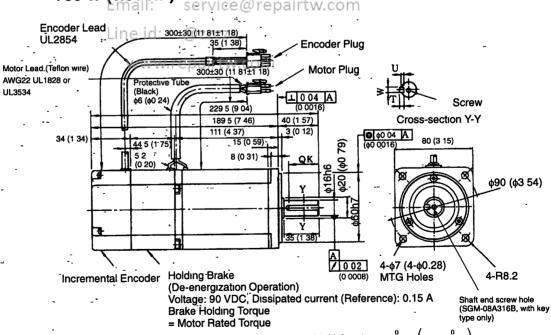
#### 10 1 1 SGM Servomotors

Model SGM-	L.	LL	LM 	QK	U	W	Τ'	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
02A□12B	166 0	136 0	62 5	No key	_				200	16-	245 (55) -	74 (16)
02B□12B	(6 54)	(5 35)	(2 46)					_	(0 27)	(3 53)		
02A□14B			ļ	20	3	5	5 (0 20)	1.	٠ .		į.	
02A□14B				(0 79) -	(0 12)	·(0 20) ·	(0 20)					
02A□16B								M5, depth 8	_	•	1	
02A□16B					1		_	(0 31)		] <del>.</del> .		
03B□12B	194 0	164 0	90 5	No key			_		300	22	245 (55)	74 (16)
03B□14B	(7 64)	(6 46)	(3 56)	20	3	5-	5		(0 40)	(4 85)		
03B□16B		-	į	(0 79)_	(0 12)	(0 20)	(0 20)	M5, depth 8 (0 31)				
04A□12B	j .		-	No key					400	22	245 (55)	74 (16)
04A□14B	1			20	3	5 .	5		(0 53)	.(4 85)		
04A□16B	_			(0 79)	(0 12) <sub>-</sub>	(0 20),	(0 20)	M5, depth 8 (0 31)	- · · ·			

Note 1 The encoder is an incremental encoder. 正科技有限公司

- 2. "A" in the model number indicates 200-V-specifications, and "B" indicates 100 V-specifications
- 3. The symbol "\(\subseteq\)" in the model number indicates the number of encoder pulses (3. 2048P/R, 5. 2000P/R).





$$\phi 16h6: \phi_{16} = \frac{0}{0011} \left( 0.64 - \frac{0}{00004} \right)$$

$$\phi 60h7: \phi_{70} = \frac{0}{0000} \left( 2.78 - \frac{0}{00012} \right)$$

Model SGM-	QK	U	W	Т	Screw Di- mensions	Output W (HP)	Approx. Mass kg (lb)	Allowable Ra- dial Load N (lb)	Allowable Thrust Load N (lb)
08A□12B	No key					750 (1 01)	4 3 (9 48)	392 (88)	147 (33)
08A□14B	30 (1 18)	3 (0 12)	5 (0 20)	5 (0 20)	1				
08A□16B		-		<u> </u> 	M5 depth 8 (0 31)	1			

- Note 1. The encoder is an incremental encoder.
  - 2. "A" in the model number indicates 200 V-specifications.
  - 3. The symbol "□" in the model number indicates the number of encoder pulses (3. 2048P/R, 5 2000P/R).

## Motor and Encoder Plugs (For 30 W (0.04 HP) to 750 W (1.01 HP))



	Motor Wiring Specifications									
1	U phase	Red								
2	V phase	White								
3	W phase	Blue								
4	FG	Green								
5	Brake terminal	Red								
6	Brake terminal	Black								

#### 

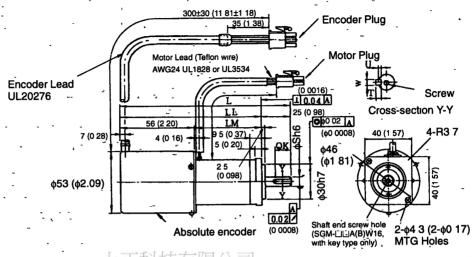
#### A channel output Blue A channel output Blue/Black B channel output Yellow 4 B channel output Yellow/Black C channel output Green C channel output Green/Black 0 V (power supply) Gray +5 V (power supply) Red FG (Frame Ground) Orange

**Incremental Encoder Wiring Specifications** 

#### 10 1 1 SGM Servomotors

## SGM Servomotors with Absolute Encoders, No Brakes

## 30 W (0.04 HP), 50 W (0.07 HP), 100 W (0.13 HP)



 $\phi 30h7: \phi 30 = {0 \atop 0.021} \left(119 = {0 \atop 0.0008}\right)$ 

				-		- 1 1 45			*	$\varphi_{SUn}$ :	<b>φ</b> 30 – οσ	021   119 - 0000	8 ]
				肆	買、	維修		手册等	零組件				<i>'</i>
Model SGM-	L	LL	LM	S	武計:	0	<b>w</b> 37-46	6333	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
A3AW12	117.5	92 5	36 5	6	No key			<del></del>	<del></del>	30 (0 04)	0 45	68 (15)	54 (12)
A3BW12	(4 63)	(3 64)	(1 44)	(0 24)	ne id	: @	ZZZZ	,	, .		(0 99)		
A3AW14		-			14	1 2	2	2				ļ	
A3BW14	1		i .		(0,55)/\	(0,05)p	<b>(0 08)</b> <sup>V</sup>	(899)			,		
A3AW16	]				-			' '	M2.5,	-			
A3BW16	-		•	·					depth 5 (0 20)	_			
A5AW12	125 0	100 0	44 0	6	No key					50 (0 07)	0.55	68 (15)	54 (12)
A5BW12 -	(4 92) ·	(3 94)	(1 73)	(0 24)							(1 21)		<u> </u>
A5AW14	1		ł		14	1.2	2	2	i		ĺ		
A5BW14	1			-	(0 55)	(0 05)	(0 08)	(0 08)		[	-		
A5AW16 -	Ī							1	M2 5,		ŀ		
A5BW16	1				-	-			depth 5 (0 20)				
01AW12	142 5	1175	61 5	8	No key					100	0 65	78 (17)	54 (12)
01BW12	(5.61)	(4 63)	(2 42)	(0 31)					ļ	(0 13)	(1.43)		
01AW14	] -				14	18	3	3			1		
01BW14	]		1		(0 55)	(0.07)	(0 12)	(0.12)					
01AW16	] -								M3,				
01BW16	1								depth 6 (0 24)		<u></u>		

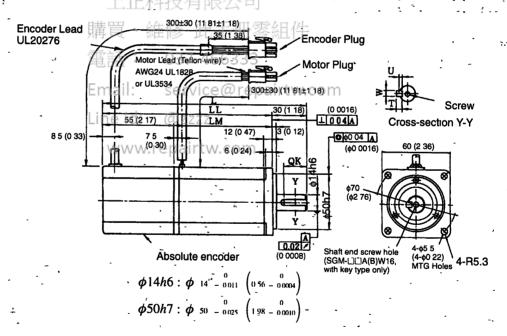
-Note 1. The encoder is a 12-bit absolute encoder 1024 P/R.

<sup>2. &</sup>quot;A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications.

### **Dimensional Tolerances**

Model SGM-	Shaft-end Dimensions [mm (in)]
	S
A3AW12 -	$6 = \frac{0}{0.008} \left( 0.24 = \frac{0}{0.0003} \right)$
A3BW12	0 = 0.008 (0.24 = 0.0003)
A3AW14	_
A3BW14	·
A5AW12	$6 = \frac{0}{0.008} \left( 0.24 = \frac{0}{0.0003} \right)$
A5BW12 .	0 = 0.008 (0.24 = 0.0003)
A5AW14	
A5BW14	•
01AW12	$8 = {0 \atop 0.009} \left( 0.32 = {0 \atop 0.0004} \right)$
01BW12	0 - 0.009, $0.32 - 0.0004$
01AW14	1
01BW14	

## 200 W (0.27 HP), 300 W (0.40 HP) (100 V Only), 400 W (0.53 HP) (200 V Only)



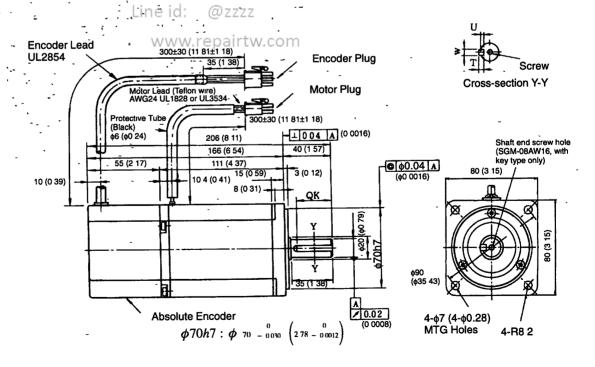
#### 10 1 1 SGM Servomotors

Model SGM-	L	LL	LM	QK	U	W	Т 1	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N <sup>-</sup> (lb)
02AW12	147.5	117.5	62 5 (2 46)	No key-				,	200 (0 27)	1 2 (2 65)	245 (55 1)	74 (17)
02BW12 -	(5 81)	(4 63)	(2 40)						(02/)	-	ŀ	
02AW14				20	3	5	5 (0.20)					
02BW14				(0 79)	(0 12)	(0 20)	(0 20)		_ '		1	
02AW16	]					****	_	M5, depth 8				
02BW16						٠,	_	(0 31)				
03AW12	175 5	145 5	90 5	No key	-				300 (0 40)	18 (3 97)	245 (55 1)	74 (17)
03BW12	(6 91)	(5 73)	(3 56)						(040)			
03AW14-				20 (0 79)	3 (0 12)	5 (0 20)	5 (0 20)		,			_
03BW14	-		ļ-			-	-	M5,		• , `		
03AW16		-						depth 8	-		1	
03BW16	1			,				(0 31)	-			
04AW12	175 5	145 5	90 5-	No key					-400	18 (3 97)	245 (55 1)	74 (17)
04AW14	(6 91)	(5 73)	(3 56)	20	3	5	5		(0 53)		-	
04AW16	-	-		(0 79)	(0 12)	(0 20) N技有	(0 20) 限公司	M5, depth 8 (0 31)	· .			

Note 1 The encoder is a 12-bit absolute encoder 1024 P/R.

2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications

## 750 W (1001 HP) service@repairtw.com



Model SGM-	QK	U	W	T	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
08AW12	No key					750	3.5	392 (88)	147 (33)
08AW14 08AW16	30 (1 18)	3 (0 12)	5 (0 20)	5 (0 20)	M5, depth 8 (0 31)	(1 01)	(7 72)		

Note 1. The encoder 1s' a 12-bit absolute encoder 1024 P/R

2. "A" in the model number indicates 200 V-specifications.

## Motor and Encoder Plugs (For 30 W (0.04 HP) to 750 W (1.01 HP))

#### **Motor Plug Motor Wiring Specifications** U phase Red Plug 172167-1 (AMP) V phase White Pin. 170360-1 or 170364-1 3 W phase Blue Connected to 3 4 FG Green Cap 172159-1 Socket: 170362 -1 or 170366-1 **Encoder Plug Absolute Encoder Wiring Specifications** Plug: 172171-1 (AMP) Pin: 170359-1 or 170363-1 A channel output Blue A channel output White/Blue 12345 Connected to 3 B channel output Yellow Cap: 172163-1 678910 Socket 170361-1 or 170365-1 B channel output White/Yellow 11 12 18 14 15 5 Z channel output Green Line id: @ZZZZ Z channel output White/Green 0 V (power supply) Black www.repairtw.com +5 V (power supply) Red 9 FG (Frame Ground) Green/Yellow Purple S channel output 10 S channel output White/Purple (Capacitor reset) (12) (Gray) 13 Reset White/Gray 0 V (battery) White/Orange

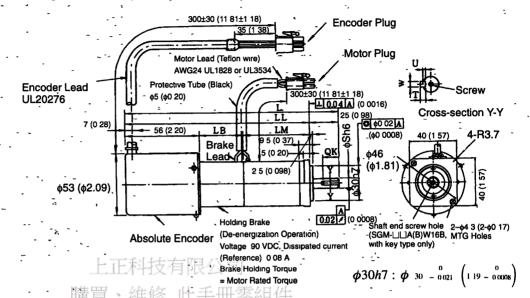
3 6 V (battery)

Orange

<sup>\*</sup> Terminal to discharge capacitor before shipment Do not use

## ■ SGM Servomotors with Absolute Encoders and Brakes

## 30 W (0.04 HP), 50 W (0.07 HP), 100 W (0.13 HP)



Model SGM-	L ,	LL -	LM	LB E	s 註: mail:	QK 03 se	7-466 rvice(	<b>w</b> 3333 Ørepa	irtw.	Screw Di- men- sions	Out- put W (HP)	Mass kg (lb)	Allow- able Radial Load N (lb)	Allow- able Thrust Load N (lb)
A3AW12B	149 0 (5 87)	124 () -(4 88)	36 5 (1 44)	31 5 (1 24)	6 (024)	No key	ZZZZ				30 (0 04)	0 75 (1 65)	68 (15)	54 (12)
A3AW14B A3BW14B		- : .		,	WWV	(0 55)	1-2 (0 05)	2 (0 08)	2 (0 08)		-		-	-
A3AW16B A3BW16B	<i>'</i>				·	,		-		M2 5, depth 5 (0 20)			-	•
A5AW12B A5BW12B	156 5 (6 16)	131 5 (5 18)	44 0 (1 73) .	31 5 (1,24)	6 . (0 24)	No key .			<u></u>		50 (0 07)	0 85 (1 87)	68 (15)	54 (12)
A5AW14B A5BW14B				- '	-	14 (0 55)	1 2 (0 05)	2 (0 08)	2 (0 08)					
A5AW16B A5BW16B	"	-		-		-	-		į	M2 5, depth 5 (0 20)			-	
01AW12B 01BW12B	183 0 (7 20)	158 0 (6 22)	61 5 (2 42)	40 5 (1 59)	8 (0 31)	No key	<b>I</b>		<u> </u>		100 (0 13)	0 95 (2 09)	78 (17)	54 (12)
01AW14B 01BW14B						14 (0 55)	1 8 (0 07)	3 (0 12)	3 (0 12)	-	-	:		
01AW16B 01BW16B -	-			-						M3, depth 6 (0 24)				

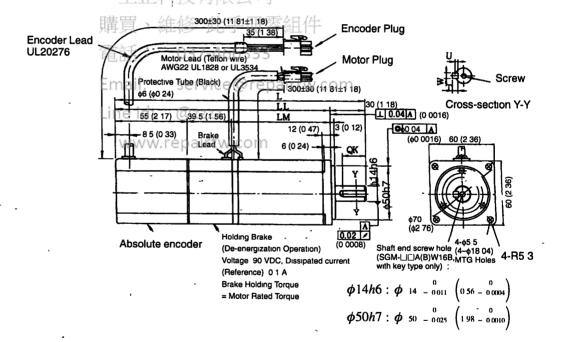
Note 1 The encoder is a 12-bit absolute encoder 1024 P/R.

<sup>2. &</sup>quot;A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications.

#### **Dimensional Tolerances**

Model SGM-	Shaft-end Dimensions [mm (in)]
	S
A3AW12B	$6 = \frac{0}{0.008} \left( 0.24 = \frac{0}{0.0003} \right)$
A3BW12B	
A3AW14B	]
A3BW14B	
A5AW12B	$6 - \frac{0}{0.008} \left( 0.24 - \frac{0}{0.0003} \right)$
A5BW12B	$0 = 0.008  \left(0.24 = 0.0003\right)$
A5AW14B	
A5BW14B	1
01AW12B	8 _ 0 009 (0.32 _ 0 0004)
01BW12B	0 - 0009 (0.32 - 00004)
01AW14B	1
01BW14B	1

## 200 W (0.27 HP), 300 W (0.40 HP) (100 V Only), 400 W (0.53 HP) (200 V Only)

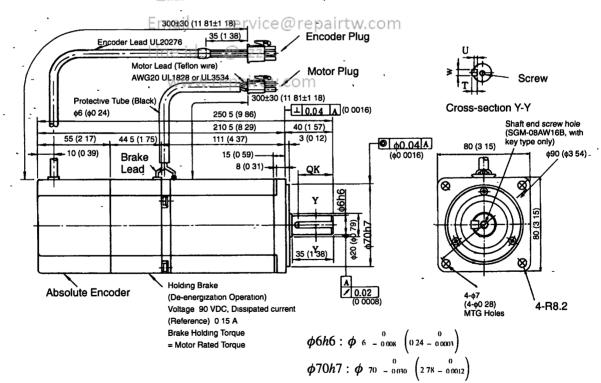


Model SGM-	L	LL	LM	QK	U	W	т	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allow- able Radial Load N (lb)	Allow- able Thrust Load N (lb)
02AW12B	187 0	157 0	62 5	No key	-	-			200、	17 (375)	245	74 (17)
02BW12B	(7 36)	(6 18)	(2 46)				•		(0 27)		(55 1)	
02AW14B	1			20	3	5	5		-			
02BW14B	1		1	(0 79)	(0 12)	(0 20)	(0 20)					
02AW16B					·  -	٠		M5, depth 8	-	1-2		
02BW16B	1 '	·	1				,	(0 31)	-			•
03BW12B	215 0	185 0	90 5	No key			_		300	2 3 (5 07)	245	74 (17)
03BW14B	(8 46)	(7 28)	(3 56)	20	3	5	5	1	(0 40)	-	(55 1)	
03BW16B			_	(0 79)	(0 12)	. (0 20) -	(0 20)	M5, depth 8- (0 31)				-
04AW12B	1			No key					400	2 3 (5 07)	245	74 (17)
04AW14B				20 (0 79)	3 (0 12)	5 (0 20)	5 (0 20)	M5, depth 8	(0 53)	,	(55 1)	-
04AW16B				[2,7]	(0.2)	(320)	(3 20)	(0 31)				

Note 1 The encoder is a 12-bit absolute encoder 1024 P/R.7 1

2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications

## **750 W (1.01 HP)** 037-466333

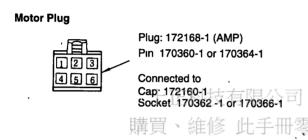


Model SGM-	QK	U	W	Т	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allow- able Radial Load N (lb)	Allow- able Thrust Load N (lb)
08AW12B	No key	-		-		750	4.5	392 (88)	147 (33)
08AW14B	30 (1 18)	3 (0 12)	5 (0 20)	5 (0 20)	1	(1 01)	(9 92)		
08AW16B					M5, depth 8 (0 31)				

Note 1. The encoder is a 12-bit absolute encoder 1024 P/R.

2. "A" in the model number indicates 200 V-specifications

## Motor and Encoder Plugs (For 30 W (0.04 HP) to 750 W (1.01 HP))



	Motor Wiring Specifications									
1	U phase	Red								
2	V phase	White								
3	W phase	Blue								
4	FG	Green								
5	Brake terminal	Red								
6	Proke terminal	Diook								



12345

678910

11 12 18 14 15

Plug 172171-1 (AMP) ryjce@repai

Connected to Cap 172163-1

Socket: 170361-1 or 170365-1

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#### **Incremental Encoder Wiring Specifications**

1 A channel output Blue 2 A channel output White/Blue 3 B channel output Yellow 4 B channel output White/Yellow 5 Z channel output Green 6 Z channel output White/Green 7 0 V (power supply) Black 8 +5 V (power supply) Red 9 FG (Frame Ground) Green/Yellow 10 S channel output Purple 11 S channel output White/Purple			
3 B channel output Yellow 4 B channel output White/Yellow 5 Z channel output Green 6 Z channel output White/Green 7 0 V (power supply) Black 8 +5 V (power supply) Red 9 FG (Frame Ground) Green/Yellow 10 S channel output Purple	ales a r		Blue
4 B channel output White/Yellow 5 Z channel output Green 6 Z channel output White/Green 7 0 V (power supply) Black 8 +5 V (power supply) Red 9 FG (Frame Ground) Green/Yellow 10 S channel output Purple	2/0	A channel output	White/Blue
5         Z channel output         Green           6         Z channel output         White/Green           7         0 V (power supply)         Black           8         +5 V (power supply)         Red           9         FG (Frame Ground)         Green/Yellow           10         S channel output         Purple	3	B channel output	Yellow
6 Z channel output White/Green 7 0 V (power supply) Black 8 +5 V (power supply) Red 9 FG (Frame Ground) Green/Yellow 10 S channel output Purple	4	B channel output	White/Yellow
7 0 V (power supply) Black 8 +5 V (power supply) Red 9 FG (Frame Ground) Green/Yellow 10 S channel output Purple	5	Z channel output	Green
8 +5 V (power supply) Red 9 FG (Frame Ground) Green/Yellow 10 S channel output Purple	6	Z channel output	White/Green
9 FG (Frame Ground) Green/Yellow 10 S channel output Purple	7	0 V (power supply)	Black
10 S channel output Purple	8	+5 V (power supply)	Red
	9	FG (Frame Ground)	Green/Yellow
11 S channel output White/Purple	10	S channel output	Purple
	11	S channel output	White/Purple
(12) (Capacitor reset) (Gray)	(12)	(Capacitor reset)	(Gray)
13 Reset White/Gray	13	Reset	White/Gray
14 0 V (battery) White/Orange	14	0 V (battery)	White/Orange
15 3 6 V (battery) Orange	15	3 6 V (battery)	Orange

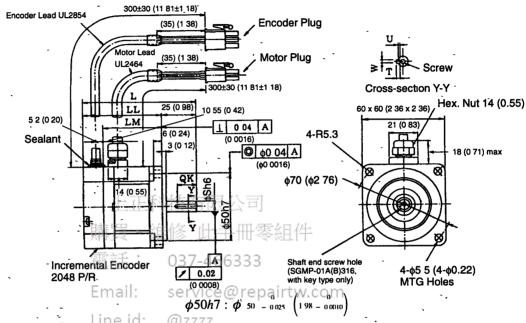
<sup>\*</sup> Terminal to discharge capacitor before shipment. Do not use.

10 1 2 SGMP Servomotors

### 10.1.2 SGMP Servomotors

## ■ SGMP Servomotors with Incremental Encoders, No Brakes

100 W (0.13 HP)



		-		L-11	ie iu.	00 222			<u> </u>					
Model SGMP-	L	LL	LM	S	QK WWW.	repair	w tw.co	n	Screw dimen- sions	Out- put W (HP)	Approx. Mass kg (lb)	Allow- able Radial Load N (lb)	Allow- able Thrust Load N (lb)	
01A312	82	57	42 5	8 (0 31)	No key					100	07 (1 54)	78 (17)	49 (11)	
01B312	(3 23)	(2 24)	(1 67)							(0 13)	-			
01A314					14	18	3 (0 12)	3 (0 12)		1				
01B314				_	(0 55)	(0 07)								
01A316				,					M3, depth 6					
01B316 -		_							(0 24)	<u> </u>			-	

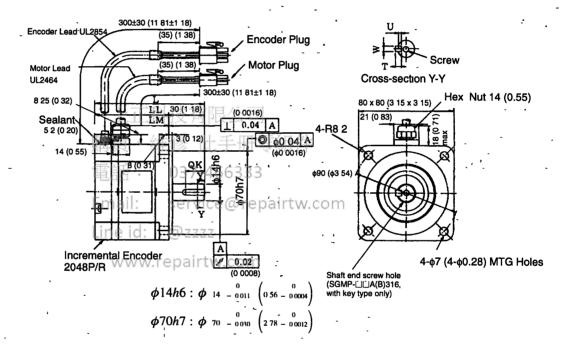
Note 1. The encoder is an incremental encoder 2048 P/R

- 2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications
- 3. The quoted allowable radial load is the value at a position 20 mm (0 79 in.) from the motor mounting surface.
- 4. Conforms to "IP55" protective structure (except connector and output shaft faces).

#### **Dimensional Tolerances**

Model SGMP-	Shaft-end Dimensions [mm (in)]						
	S						
01A312	$8 = \frac{0}{0.009} \left( 0.32 = \frac{0}{0.0004} \right)$						
01B312	$\frac{1}{1}$ = 0 009 $\left(0.32 - 0.0004\right)$						
01A314							
01B314	] · · · · ·						
01A316 ·	]						
01B316	1						

## 200 W (0.27 HP), 300 W (0.40 HP) (100 V Only), 400 W (0.53 HP) (200 V Only)



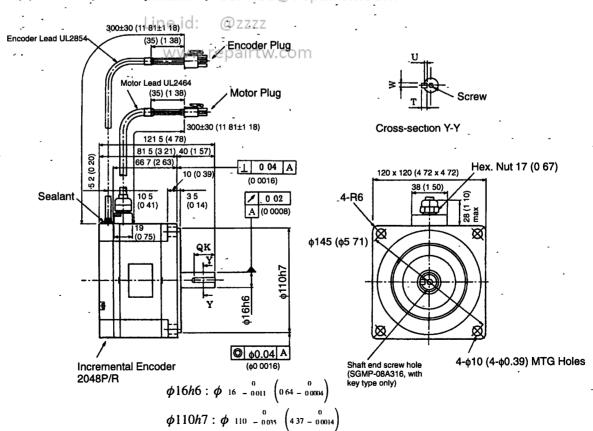
#### 10<sup>-</sup>1-2 SGMP Servomotors

Model SGMP-	L -	LL	LM	QK		W	T .	Screw dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radiál Load N (lb)	Allowable Thrust Load N (lb)
02A312	92	62	48.1	No key			-		200-	14	245 (55)	68 (15)
02B312	(3.62)	(2.44)	(1.89)	,					(0 27) -	-(3.09)		
02A314	1			16	3	5	5					
02B314	1			(0 63)	(0.12)	(0.20)	(0 20)					
02A316	1	-		-				M5, depth	,	-		
02B316	1				١.		-5.	8 (0.31)				-
03B312	112	82	68.1	No key	-				300	2.1		
03B314	(4.41)	(3 23)	(2.68)	16	3	5	5	-	(0.40)	(4 63)		
03B316		Ē		(0.63)	(0.12)	(0 20)	(0.20)	M5,-depth 8 (0.31)				
04A312	1			No key	_				400			
04A314				16	3,	5	5		(0 53)		-	
04A316				(0.63)	(0.12)	(0 20)	(0,20)	M5, depth 8 (0.31)	. ·			

Note 1. The encoder is an incremental encoder 2048 P/R

- 2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications
- 3. The quoted allowable radial load is the value at a position 25 mm (0.98in.) from the motor mounting surface.
- 4. Conforms to "IP55" protective structure (except connector and output shaft faces)

## 750 W (1:01 HP) service@repairtw.com



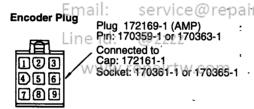
Model SGMP-	QK	U	W	Т	Screw dimensions	Output W (HP)	Approx. Mass kg(lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
08A312	No key					750	4.6	392 (80)	147 (33)
08A314	22	3	5	5	]	(1.01)	(10.14)		
08A316	(0.87)	(0.12)	(0.20)	(0.20)	M5, depth 8 (0.31)	-			

- Note 1. The encoder is an incremental encoder for 2048 P/R
  - 2. "A" in the model number indicates 200 V-specifications.
  - 3. The quoted allowable radial load is the value at a position 35 mm (1.38 in.) from the motor mounting surface.
  - Conforms to IP55 protective structure (except connector and output shaft faces).

## Motor and Encoder Plugs (For 100 W (0.13HP) to 750 W (1.01HP))



# Motor Wiring Specifications 1 U phase Red 2 V phase White 3 W phase Blue 4 FG Green/Yellow

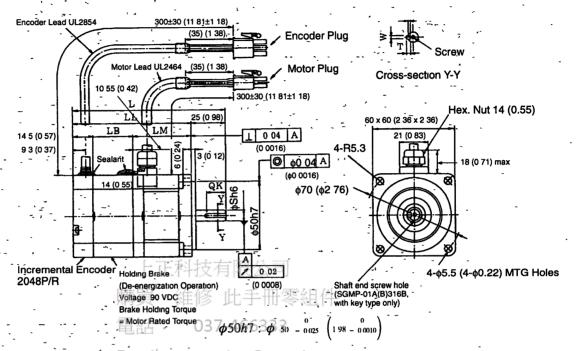


#### A channel output Blue A channel output Blue/Black 3 B channel output Yellow 4 B channel output Yellow/Black 5 C channel output Green 6 C channel output Green/Black Gray 7 0 V (power supply) +5 V (power supply) Red FG (Frame Ground) Orange

om Incremental Encoder Wiring Specifications 10.1 2 SGMP Servomotors

## ■ SGMP Servomotors with Incremental Encoders and Brakes

## 100 W (0.13HP)

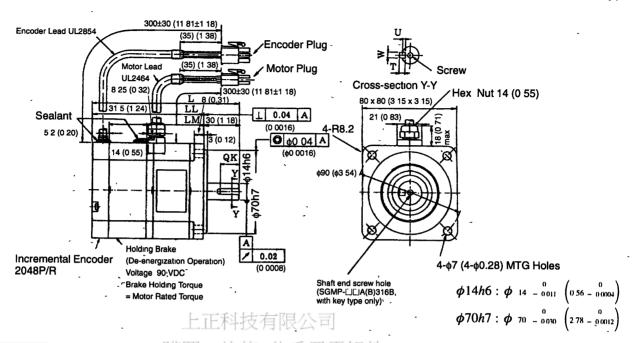


Model SGMP-	- <b>L</b>	LL.	LM	Lin	r <del>ais:</del> le id: www		zzz irtw.c	rom	a 11 <b>4</b> VV	Screw Di- men- sions	Out- put W (HP)	Approx. Mass kg (lb)	Allow- able Radial Load - N (lb)	Allow- able Thrust Load N (lb)
01A312B	111	86	42 5	29	8	No key	-	•			100 -	09	-78 (17)	49 (11)
01A314B -	(4 3.7)	(3 39)	(1 67)	(1 14)	(0 31)	14	18	3	3	,	(0.13)	(1 98)	_	· -
01A316B	, -	,	*	-		(0.55)	(0.07)	(0.12)	(0 12)	M3,				
	٠,٠	- :	1 1	2.71		-				depth		· -		1_
				٠.	-	_				(0 24)		-		_

Note 1 The encoder is an incremental encoder 2048 P/R

- 2. "A" in the model number indicates 200 V-specifications
- 3. The quoted allowable radial load is the value at a position 20 mm (0.79in.) from the motor mounting surface.
- 4. Conforms to IP55 protective structure (except connector and output shaft faces).

## 200 W (0.27 HP), 300 W (0.40 HP) (100 V Only), 400 W (0.53 HP) (200 V Only)

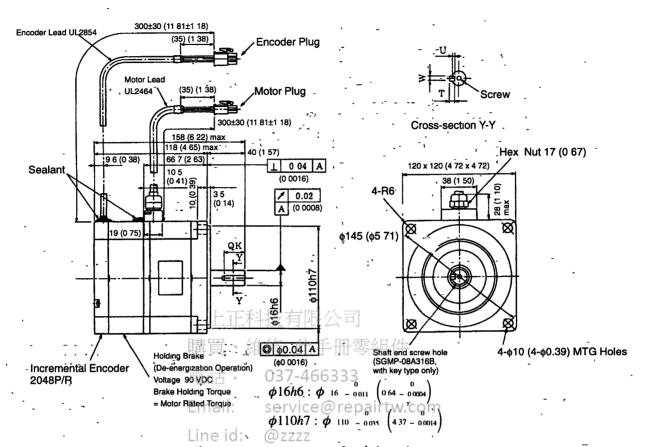


Model SGMP-	L	LL	LM <sub>-</sub>	照 電話	: <b>u</b> <u>t</u> 1	<b>8 W</b> L- 37-46	上冊零 6333	Screw Di- men- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
02A312B	123 5	93 5	48 1	No key	: s	ervice	@repa	airtw.c	200 (0 27)	1 9 (4 19)	245 (55)	68 (15)
02B312B	(4 86)	(3.68)	(1 89)						(0 27)			
02A314B					c <b>3</b> : @	) <b>5</b> ZZZZ	5-		-			
02B314B	-			(0 63)	(0 12)	(0 20)	(0 20)	-			_	
02A316B			] , ,	WV	vw.rep	airtw	com	M5,		-	-	
02B316B .								depth 8 (0 31)			`.	
03B312B	143 5	113 5	68 1	No key				400	26 (0 10)			
03B314B	(5 65)	(4 47)	(2 68)	16	3	5	5		(0 53)		•	
03B316B		_		(0 63)	(0 12) <sup>-</sup>	(0 20)	(0 20)	M5,				
		=						depth 8 (0 31)				
04A312B			١.	No key								
04A314B				16	3	5	5					
04A316B			•	(0.63)	(0.12)'	(0 20)	(0 20)	M5,				
					,	<u> </u>		depth 8 (0 31)				

Note 1 The encoder is an incremental encoder 2048 P/R.

- 2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications.
- 3. The quoted allowable radial load is the value at a position 25 mm (0 98in.) from the motor mounting surface.
- 4. Conforms to IP55 protective structure (except connector and output shaft faces).

## 750 W (1.01HP)

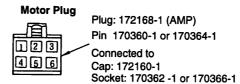


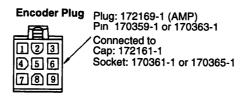
Model SGMP-	QK	VVVVV	v.repai	rtw.co	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
08A312B	No key	•			'	750	5 7	392 (88)	147 (33)
08A314B	22 (0 87)	3 (0 12)	5 (0 20)	5 (0 20)		(1,01)	(12 566)	_	- •
08A316B				_	M5, depth 8 (0 31)	-	-	- ·	•

Note 1. The encoder is an incremental encoder 2048 P/R.

- 2. "A" in the model number indicates 200 V-specifications.
- 3. The quoted allowable radial load is the value at a position 35 mm (1.38 in ) from the motor mounting surface.
- 4. Conforms to IP55 protective structure (except connector and output shaft faces).

## Motor and Encoder Plugs (For 100 W (0.13 HP) to 750 W (1.01 HP))





## **Motor Wiring Specifications**

1	U phase	Red
2	V phase	White
3	W phase	Blue
4	FG	Green/Yellow
5	Brake	Black
6	Brake .	Black

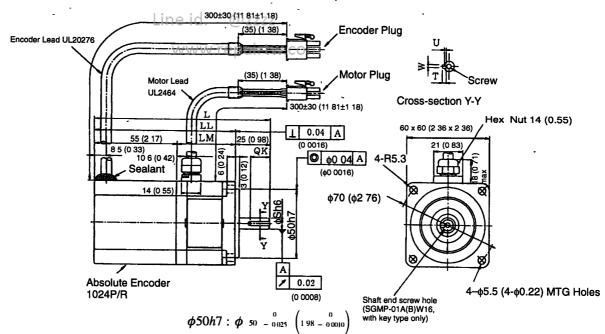
## **Incremental Encoder Wiring Specifications**

1	A channel output	Blue
$\overline{}$		1
2	A channel output	Blue/Black
3	B channel output	Yellow
4	B channel output	Yellow/Black
5	C channel output	Green
6	C channel output	Green/Black
7	0 V (power supply)	Gray
8	+5 V (power supply)	Red
9	FG (Frame Ground)	Orange

## SGMP Servomotors with Absolute Encoders, No Brakes

100 W (0.13HP) 037-466333

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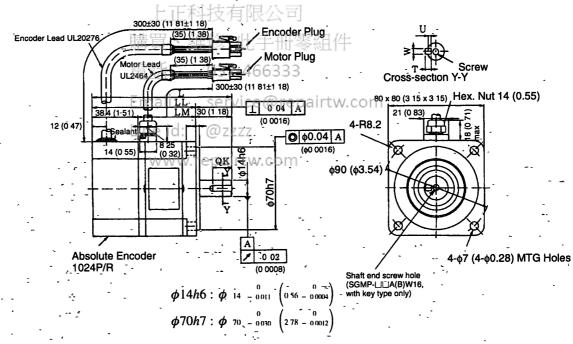
## 10 1 2 SGMP Servomotors

Model SGMP-	. <b>L</b>	LL	LM	<b>S</b>	QK '	U	<b>W</b>	·T	Screw dimen- sions	Output W (HP)	Approx. Mass kg(lb)	Allow- able Radial Load N (lb)	Allow- able Thrust Load N (lb)
01AW12 01BWJ2_	122.5 =	97.5	42 5 (1.67)	8 -(0 31)	No key		,			100 (0.13)	0.95- (2.094)	78 (17)	49.(11)
01AW14 01BW14				-	14 (0.55)	1.8 (0 07)	3 (0.12)	(0.12)					
01AW16 01BW16				,	-	-	,	_	M3,_ depth 6 (0 24)	<u>.</u>			-

## Note 1 The encoder is a 12-bit absolute encoder 1024 P/R

- 2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications.
- 3. The quoted allowable radial load is the value at a position  $20\,\mathrm{mm}\,(0.79\,\mathrm{in}\,)$  from the motor mounting surface
- 4. Conforms to IP55 protective structure (except connector and output shaft faces).

## 200 W (0.27 HP), 300 W (0.40 HP) (100 V only), 400 W (0.53HP) (200 V only)



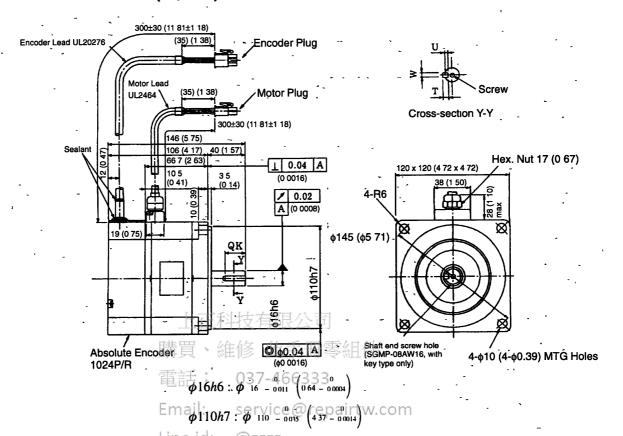
Model SGMP-	L	LL	LM	QK	U	W	Т	Screw dimen- sions	Out- put W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
02AW12	116.5	86 5	48.1	No key					200	16	245 (55)	68 (15)
02BW12	(4.59)	(3.41)	(1.89)					-	(0.27)	(3.53)		
02AW14			ŀ	16	3	5	5		-			
02BW14				(0.63)	(0.12)	(0.20)	(0 20)					
02AW16	-	-			ł			M5,			-	
02BW16				l			-	depth 8 (0.31)		,		
03BW12	136.5	106.5	68.1	No key			•		300	2.3		
03BW14	(5.37)	(4.19)	(2.68)	16	3	5	5		(0.40)	(5.07)		
03BW16		,		(0.63)	(0.12)	(0.20)	(0.20)	M5, depth 8 - (0.31)		-	-	
04AW12				No key					400		•	
04AW14				16	3	5.	5 -	1 .	(0.53)			-
04AW16	-	-		(0.63)	(0.12)	(0.20)	(0.20)	M5, depth 8 (0.31)	,	-		

Note 1. The encoder is a 12-bit absolute encoder 1024 P/R. 止手冊零組件

- 2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications.
- 3. The quoted allowable radial load is the value at a position 25 mm (0.98 in.) from the motor mounting surface.
- 4. Conforms to IP55 protective structure (except connector and output shaft faces).

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## 750 W (1.01HP)



Model SGMP-	QK W	U WW.re	<b>w</b> pairt	w.con	Screw Dimen- sions	Output W (HP)	Approx . Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
08AW12	No key					750	4 8	392 (88)	147 (33)
08AW14	22	3	5	5		(1 01)	(10 58)		
08AW16	(0 87)	(0 12)	(0 20)	(0 20)	M5 depth 8 (0 31)				

Note 1. The encoder is a 12-bit absolute encoder 1024 P/R.

- 2. "A" in the model number indicates 200 V-specifications.
- 3. The quoted allowable radial load is the value at a position 35 mm (1.38 in ) from the motor mounting surface.
- **4.** Conforms to IP55 protective structure (except connector and output shaft faces)

## 10

## Motor and Encoder Plugs (For 100 W (0.13 HP) to 750 W (1.01 HP))

## **Motor Plug**



Plug: 172167-1 (AMP) Pin: 170360-1 or 170364-1

Connected to Cap. 172159-1

Socket. 170362 -1 or 170366-1

## **Motor Wiring Specifications**

1	U phase	Red
2	V phase	White
3	W phase	Blue
4	FG	Green/Yellow

## **Encoder Plug**



Plug: 172171-1 (AMP) Pin: 170359-1 or 170363-1

Connected to Cap: 172163-1

Socket: 170361-1 or 170365-1

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## **Absolute Encoder Wiring Specifications**

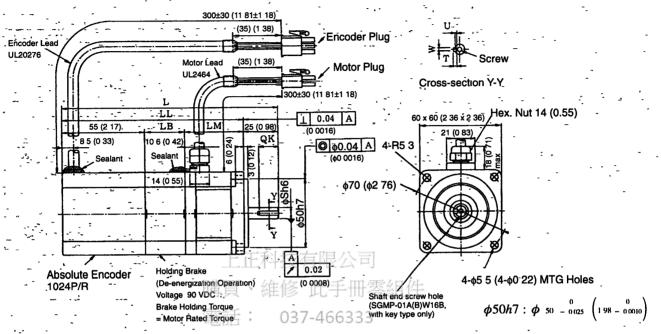
1	A channel output	Blue
2	A channel output	White/Blue
3	B channel output	Yellow
4	B channel output	White/Yellow
5	Z channel output-	Green
6	Z channel output	White/Green
7	0 V (power supply)	Black
8	+5 V(power supply)	Red
9	FG (Frame Ground)	Green/Yellow
10	S channel output	Purple
11	S channel output	White/Purple
(12)	(Capacitor reset)	(Gray)
13	Reset	White/Gray
14	0 V(battery)	White/Orange
15	3 6V(battery)	- Orange

Terminal to discharge capacitor before shipment. Do not use

## 10

## ■ SGMP Servomotors with Absolute Encoders and Brakes

## 100 W (0.13 HP)



Model SGMP-	7. <b>L</b>	LL	LM	LB	En <b>s</b> ail Line i	: <b>QK</b> s d: @	er <b>v</b> ice Dzzzz	e@wre	pa <b>i</b> rtv	/ Screw dimen- sions	Out- put W (HP)	Approx . Mass kg (lb)	Allow- able radial load N (lb)	Allo- wable thrust load N (lb)
01AW12B	151 5	126 5	42 5	29	8 000	No key	Janty	v.com			100	12.	78 (17)	49 (11)
01BW12B			(1 67)	(1 14)	(0 31)						(0 13)	(2 65)		
01AW14B						14	18	3	3	_			-	-
01B-W14B						(0.55)	(0 07)	(0 12)	(0 12)		-			·· ·
01AW16B	- "									M3, depth 6			5	
01BW16B		1				1			-	(0 24)		-		

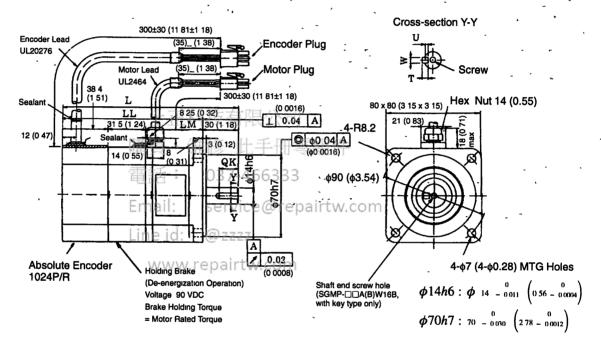
Note 1. The encoder is a 12-bit absolute encoder 1024 P/R.

- 2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications.
- 3. The quoted allowable radial load is the value at a position 20 mm (0.79 in.) from the motor mounting surface.
- 4. Conforms to IP55 protective structure (except connector and output shaft faces).

## **Dimensional Tolerances**

Model SGMP-	Shaft-end Dimensions [mm (in)] S						
01AW12B	$8 = 0.009 \left(0.32 = 0.0004\right)$						
01BW12B	-8 = 0.009  (0.32 = 0.0004)						
01AW14B	1						
01BW14B	1						
01AW16B	1						
01BW16B	1						

## 200 W (0.27 HP), 300 W (0.40 HP) (100 V Only), 400 W (0.53 HP) (200 V Only)



## 10 1 2 SGMP Servomotors

Model SGMP-	<b>L</b>	LL	LM	QK	U	W	Т	Screw dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allow- able Ra- dial Load N (lb)	Allow- able Thrust Load N (lb)
02AW12B	148	118	48 1	No key					200	2.1	245 (55)	68 (15)
02BW12B	(5 83)	(4 65)	(1.89)		_				(0.27)	(4.63)		
02AW14B				16	3	5	5		-	-		
02BW14B			-	(0.63)	(0.12)	(0.20)	(0.20)		_ · •			
02AW16B								M5,		·		-
02BW16B		:	<u> </u>  -		-			depth 8 (0.31)				<del>-</del> :
03BW12B	168	138	68.1	No key					300	2.8		
03BW14B	(6 61)	(5.43)	(2.68)	16	3	5	5 ~		(0.40)	(6.17)		
03BW16B				(0.63)	(0.12)	(0 20)	(0.20)	M5,		,	-	
			,	-	٠.			depth 8 (0.31)				
04AW12B				No key		-	3.5		400	•	,	
04AW14B		' '		16	3	ر ا	5	-	(0 53)			
04AW16B				(0.63)	(0.12)	(0.20)	.(0.20)	M5,	<b>.</b>	-	-	
			_		上正程	斗技有	可限公	depth 8 (0 31)	. "			

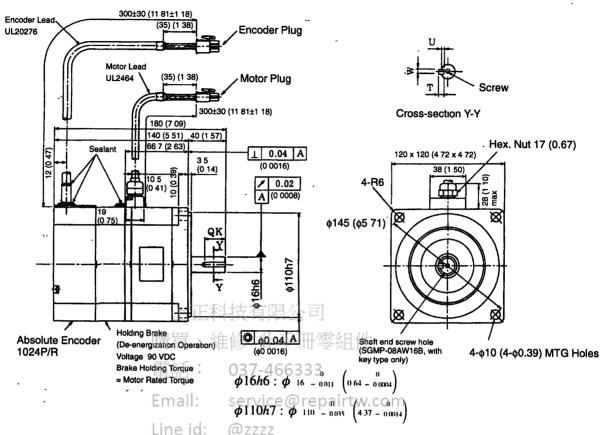
Note 1. The encoder is a 12-bit absolute encoder 1024 P/R.

- 2. "A" in the model number indicates 200 V-specifications, and "B" indicates 100 V-specifications.
- 3. The quoted allowable radial load is the value at a position 25 mm (0.98 in.) from the motor mounting surface.
- 4. Conforms to IP55 protective structure (except connector and output shaft faces).

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## 750 W (1.01 HP)



Model SGMP-	QK W	U WW.re	<b>w</b> pairtw	t.com	Screw Dimen- sions	Output W (HP)	Approx. Mass kg (lb)	Allowable Radial Load N (lb)	Allowable Thrust Load N (lb)
08AW12B	No key					750	62	392 (88)	147 (33)
08AW14B	22	3	5	5 (0 20)	1	(1 01)	(13 67)		
08AW16B	(0 87)	(0 12)	(0 20)		M5, depth 8 (0 31)	!			

Note 1. The encoder is a 12-bit absolute encoder 1024 P/R.

- 2. "A" in the model number indicates 200 V-specifications.
- 3. The quoted allowable radial load is the value at a position 35 mm (1.38 in) from the motor mounting surface
- **4.** Conforms to IP55 protective structure (except connector and output shaft faces)

## 10 1 2 SGMP Servomotors

## Motor and Encoder Plugs (For 100 W (0.13 HP) to 750 W (1.01 HP))

## **Motor Plug**



Plug 172168-1 (AMP)

Pin: 170360-1 or 170364-1 (1 to 4 pins) 170359-1 or 170363-1 (5, 6 pins) (170360-1 or 170364-1 750 W only)

Connected to Cap: 172160-1

Socket. 170362 -1 or 170366-1

## Motor Wiring Specifications

1	-U phase ¯	Red
	V phase	White
3	W phase	Blue
4	FG <sub>→</sub>	- Green/Yellow
5	Brake terminal	Black
6	Brake terminal	Black

## **Encoder Plug**



Plug: 172171-1 (AMP) Pin: 170359-1 or 170363-1 Connected to Cap: 172163-1

Socket 170361-1 or 170365-1

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## **Absolute Encoder Wiring Specifications**

1	A channel output	_ Blue
2 -	A channel output	~White/Blue
3	B channel output	Yellow
4	B channel output	White/Yellow
5	Z channel output	Green
6	Z channel output	White/Green
7	0 V (power supply)	Black
8	+5 V (power supply)	Red
9	FG (Frame Ground)	Green/Yellow
10	S channel output	Purple
H11	S channel output	, White/Purple
(12)	(Capacitor reset)	(Gray)
13	Reset	White/Gray
14	0 V (battery)	White/Orange
LNA/.	36V (battery)	Orange

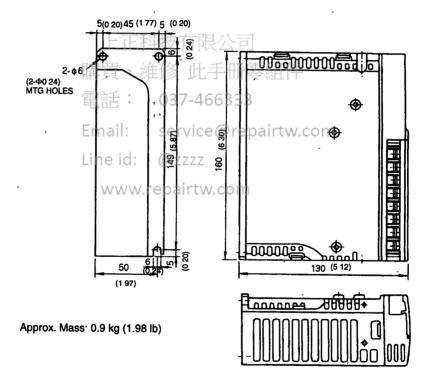
Terminal to discharge capacitor before shipment. Do not use

## 10.2 Servopack Dimensional Drawings

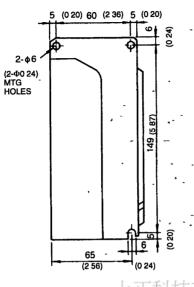
The dimension drawings of the SGD Servopack are broadly grouped according to capacity into the following three categories.

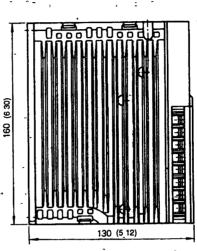
- 200 V, 30 W (0.04 HP) to 200 W (0.27 HP) (Model: SGD-A3AH to 02AH) 100 V, 30 W (0.04 HP) to 100 W (0.13 HP) (Model: SGD-A3BH to 01BH)
- 200 V, 400 W (0.53 HP) (Model: SGD-04AH)
   100 V, 200 W (0.27 HP) (Model: SGD-02BH)
- 200 V, 750 W (1.01 HP) (Model: SGD-08AH)
   100 V, 300 W (0.40 HP) (Model: SGD-03BH)

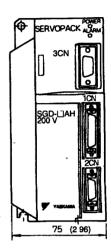
## 10.2.1 SGD-A3AH to 02AH, SGD-A3BH to 01BH



## 10.2.2 SGD-04AH, SGD-02BH







Approx. Mass: 1.2 kg (2.65 lb)

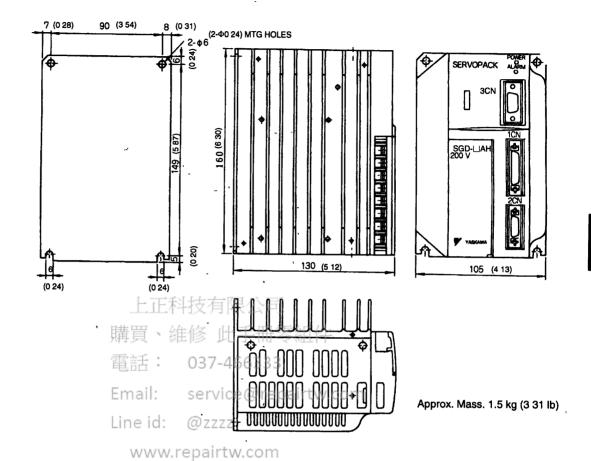
037-4

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Line id: @zzzz

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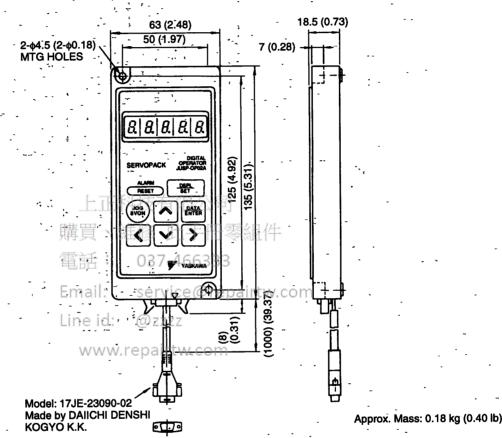
## 10.2.3 SGD-08AH, SGD-03BH



## 10.3 Digital Operator Dimensional Drawings

The dimensional drawings of the Digital Operator are as shown below.

## Type JUSP-OP02A-1

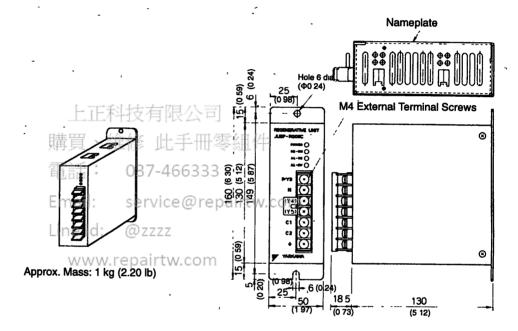


## 10.4 Specifications and Dimensional Drawings of Peripheral Devices

## 10.4.1 Regenerative Unit

The dimensional drawings of the Regenerative Unit are as shown below.

## **■** Type JUSP-RG08C



## 10.4.2 Cable Specifications

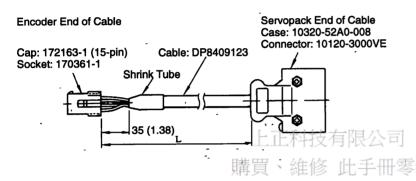
## Cables from Yaskawa

## **Encoder Cables**

• For Incremental Encoders (Connectors at Both Ends)

Model L in mm (feet)	
DP9320089-1	3000 <sup>+100</sup> <sub>0</sub> (10 <sup>+0</sup> <sub>0</sub> <sup>33</sup> )
DP9320089-2	5000 <sup>+100</sup> (16.7 <sup>+0</sup> <sup>33</sup> )
DP9320089-3	10000 +500 (33.3 +1 67 )
DP9320089-4	15000 +500 (50 +1 67)
DP9320089-5	20000 +500 (66.7 +1 67 )

• For Absolute Encoders (Connectors at Both Ends)



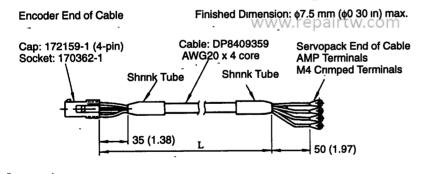
Model	L in mm (feet)	
DP9320088-1	3000 +100 - (10+0 33 )	
DP9320088-2	5000 +100 (16.7 +0 33 )	
DP9320088-3	10000 +500 (33.3 +1 67 )	
DP9320088-4	15000 +500 (50 +1 67 )	
DP9320088-5	20000 +500 (66.7 +1 67 )	

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## **Motor Cables**

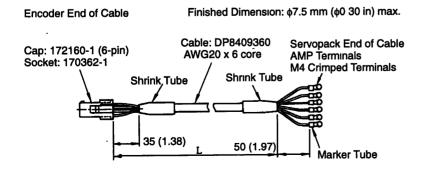
Email: service@repairtw.com

• For Motors Without Brakes (with Connector and AMP Terminals)



Model	L in mm (feet)
DP9320081-1	3000 <sup>+100</sup> <sub>0</sub> (10 <sup>+0</sup> <sub>0</sub> <sup>33</sup> )
DP9320081-2	5000 <sup>+100</sup> <sub>0</sub> (16.7 <sup>+0</sup> <sub>0</sub> <sup>33</sup> )
DP9320081-3	10000 +500 (33.3 +1 67 )
DP9320081-4	15000 +500 (50 +1 67)
DP9320081-5	20000 +500 (66.7 +1 67)

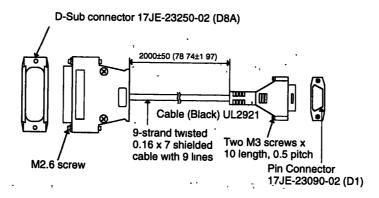
• For Motors with Brakes (with Connector and AMP Terminals)

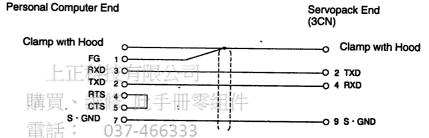


Model	L in mm (feet)	
DP9320083-1	3000 +100	(10 <sup>+0</sup> 33 )
DP9320083-2	5000 +100	$(16.7_{0}^{+0.33})$
DP9320083-3	10000 +500	(33.3 <sup>+1 67</sup> )
DP9320083-4	15000 +500	(50 <sup>+1 67</sup> )
DP9320083-5	20000 +500	(66.7 <sup>+1 67</sup> <sub>0</sub> )

## **PC Connection Cables**

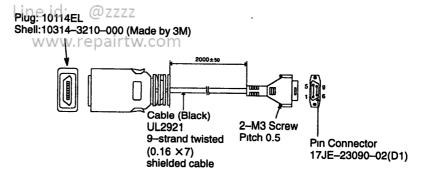
For NEC PC-98 Computers with D-sub Connectors 25 pin
 Use Yaskawa DE9405258 cable.



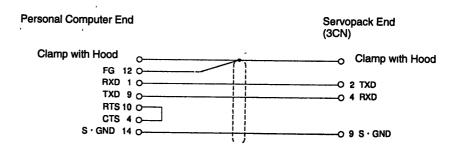


For NEC PC-98 Half-pitch Connector

Use Yaskawa DE9408564 cable.

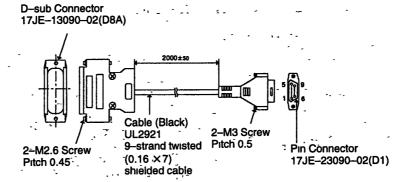


Note: Fold back the cable shielding at each end of the cable and secure it with clamp.

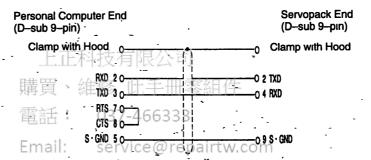


• For IBM PC (IBM-compatible PC)

Use Yaskawa DE9408565 cable.



Note: Fold back the cable shielding at each end of the cable and secure it with clamp.

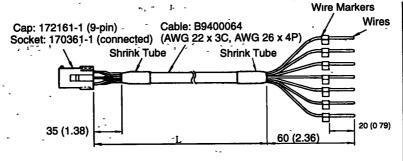


## ■ Cables without Servopack Connectors (PG Cables Only)

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## Cables for Incremental Encoders (Servopacks End without Connectors)

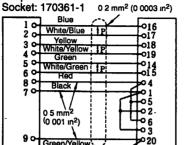
## **Lead Specifications**



Wire Marker	Lead Color
1	Black
4	Red
14	Green
15	White (green)
16	Blue
17	White (blue)
18	Yellow
19	White (yellow)
20	Green (yellow)

## Connections

Cap: 172161-1



To be provided by user

Case: 10320-52A0-008 (Manufactured by 3M.) Connector: 10120-3000VE (Manufactured by 3M.)

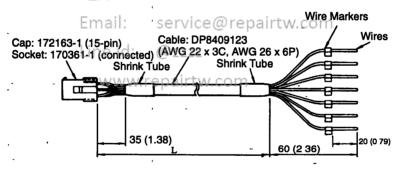
P: Twisted-pair shielded wires

Model	L in mm (feet)
DP9320086-1	3000 <sup>+100</sup> <sub>0</sub> (10 0 )
DP9320086-2	5000 <sup>+100</sup> 0 (16.7 0 )
DP9320086-3	10000 <sup>+500</sup> (33.3 <sup>+1 67</sup> 0 )
DP9320086-4	15000 <sup>+500</sup> 0 (50 0)
DP9320086-5	20000 <sup>+500</sup> <sub>0</sub> (66.7 0 )

## Cables for Absolute Encoders (Servopack End without Connector)

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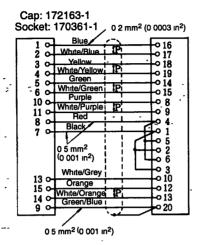


## **Lead Specifications**

Wire Marker	Lead Color
1	Black
4	Red
8	Purple
9	White (purple)
10	White (gray)
12	Orange
13	White (orange)
14	Green
15	White (green)
16	Blue
17	White (blue)
18	Yellow
19	White (yellow)
20	Green (yellow)

## 10 4 2 Cable Specifications

## Connections



To be provided by user

Case: 10320-52A0-008 (Manufactured by 3M ) Connector: 10120-3000VE (Manufactured by 3M.)

. Model	L in mm (feet)
DP9320085-1	3000 +100 +0 33 (10 0 )
DP9320085-2	5000 <sup>+100</sup> 0 (16.7 0 )
DP9320085-3	10000 <sup>+500</sup> (33.3 <sup>0</sup> )
DP9320085-4	15000 <sup>+500</sup> 0 +1 67 (50 0)
DP9320085-5	20000 <sup>+500</sup> (66.7 <sup>+1</sup> 67 0 )

## **T** P: Twisted-pair shielded wires

## ■ Cables Only正科技有限公

## Cables for Incremental Encoders

## To be provided by useail: service@repairtw.com

Cap: 172161-1

Socket: 170361-1 (Connected) 7777 or 170365-1 (separated) 0 12 mm² (0 0002 m²)

To be provided by user

Case: 10320-52A0-008 (Manufactured by 3M.) Connector: 10120-3000VE (Manufactured by 3M.)

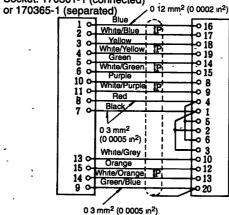
P: Twisted-pair shielded wires.

3000 +100 (10 0 0 ) 5000 +100 0 0
5000 <sup>+100</sup>
(16.7 0 33
10000 +500 0 - (33.3 0 )
15000 <sup>+500</sup> <sub>0</sub> (50 0 )
20000 <sup>+500</sup> (66.7 <sup>0</sup> )

## **Cables for Absolute Encoders**

To be provided by user

Cap: 172163-1 Socket: 170361-1 (connected)



To be provided by user Case: 10320-52A0-008 (Manufactured by 3M.) Connector: 10120-3000VE (Manufactured by 3M.)

Model	L in mm (feet)
DP8409123-1	3000 <sup>+100</sup> (10 0 )
DP8409123-2	5000 <sup>+100</sup> <sub>0</sub> (16.7 <sup>0</sup> )
DP8409123-3	10000 <sup>+500</sup> <sub>0</sub> (33.3 <sup>+1</sup> <sub>0</sub> 67)
DP8409123-4	15000 <sup>+500</sup> <sub>0</sub> (50 0 )
DP8409123-5	20000 <sup>+500</sup> <sub>0</sub> (66.7 <sup>0</sup> )

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## Cables for Motors without Brakes

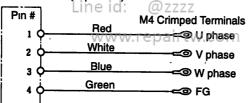
To be provided by user

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Cap: 172159-1

Socket: 170362-1 (connected) ervice@repairtw.com

or 170366-1 (separated)



To be provided by user R1.25-4TOR Round terminal (Manufactured by Nihon Crimp Terminal.)

Model	L in mm (feet)
DP8409359-1	3000 <sup>+100</sup> (10 0 )
DP8409359-2	5000 <sup>+100</sup> (16.7 <sup>0</sup> )
DP8409359-3	$10000_{0}^{+500}$ $(33.3_{0}^{+1.67})$
DP8409359-4	15000 <sup>+500</sup> <sub>0</sub> (50 <sup>+1</sup> <sub>0</sub> 67)
DP8409359-5	20000 <sup>+500</sup> (66.7 <sup>+1 67</sup> 0 )

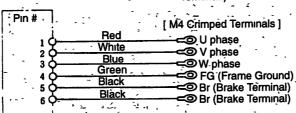
## **Cables for Motors with Brakes**

To be provided by user

Cap: 172160-1

Socket: 170362-1 (connected)
or 170366-1 (separated)

To be provided by user R1 25-4TOR Round terminal (Manufactured by Nihon Crimp Terminal.)



Model	L in mm (feet)
DP8409360-1	3000 <sup>+100</sup> +0.33 (10 0 )
DP8409360-2	5000 <sup>+100</sup> <sub>0</sub> . (16.7 0 )
DP8409360-3	10000 <sup>+500</sup> - (33.3 0 )
DP8409360-4	15000 <sup>+500</sup> 0 +1.67 (50 0)
DP8409360-5	20000 <sup>+500</sup> <sub>0</sub> (66.7 0 )

Note

Each connector is available as a connector kit. However, it is not an accessory of the Servopacks or motors. Refer to 10.4.3 for details on Connector Kits.

037-466333

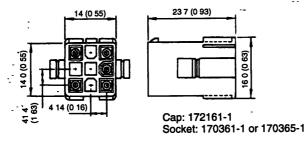
## 10.4.3 Connector Kits

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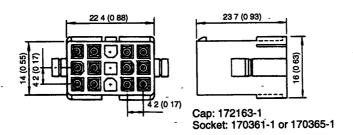
## ■ Encoder Cable Connectors

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## For Incremental Encoders

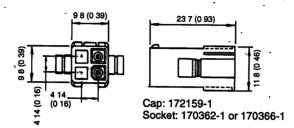


## For Absolute Encoders

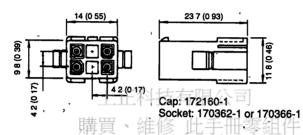


## ■ Motor Cable Connectors

## **Motors Without Brakes**

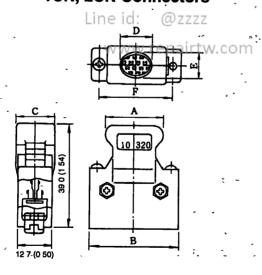


## **Motors with Brakes**

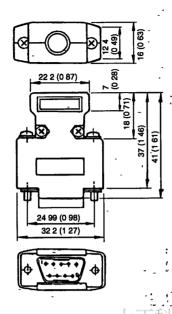


## Servopack Connectors

## 1CN, 2CN Connectors @repairtw.com



## **3CN Connectors**



Units: mm (inches)

Servopack	Connector	Case	Α	В	, C	D	E	F
For ICN	10136-3000VE	10336-52A0-008	32 2 (1 27)	43 5 (1 71)	18 0 (0 71)	17 0 (0 67)	14 0 (0.55)	37 6 (1 48)
For 2CN	10120-3000VE 37	10320-52A0-008	22 0 (0 87)	33 3 (1 31)	14 0 (0.55)	12 0 (0 47)	10 0 (0 39)	27.4 (1 08)

The models of connector kit are shown below.

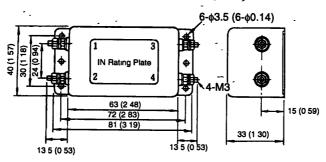
Connector Application				www.repairtw.c.Connector Kit Part List										
Kit Model	Encoger/Motor			For Encoder Cable					Fo	For Motor Cable				
Number			Е	ncod	er End		Se	ervop	ack End					
	Encoder	Motor	Сар	-	Socke	et	Connec	ctor -	Case	•	Сар		Socke	t
	Туре	Brake	Model	Qty	Model	Qty	Model	Qty	Model	Qty	Model	Qty	Model	Qty
DP9420006-1	Incremental	Without	*1	1	*1	*3	*2	1 -	. *2	1-	*1	1	*1	*3
			172161-1		170365-1	10	10120-		10320-	`	172159-1	-	170366-1	5
DP9420006-2	Incremental	With		l	1	i	3000VE		52A0- 008	-	*1	1		*3
											172160-1			7_
DP9420006-3	Absolute	Without	*1	1 -	1	*3	1 .				*1	1		*3
	-		172163-1		1	16		-		-	172159-1			5
DP9420006-4	Absolute	With					-	1			*1	1		*3
		1	1				ŀ				172160-1	ļ		7

Connector	Application	Connector Part List					
Model		Connector		Case			
		Model	Qty	Model	Qty		
DP9420007	I/O connector for 1CN	10136-3000VE*2	1	10336-52A0-008*2	1		
DE9409459	Serial commu-	Connector with case	;				
	nications connec-	Model 17JE-23090-02 (D8B)			Qty		
	tor for 3CN				1		

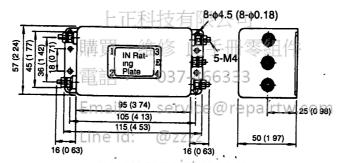
- \* 1. Manufactured by AMP.
- \* 2. Manufactured by Sumitomo 3M.
- \* 3. Including one spare.

## 10.4.4 Noise Filters

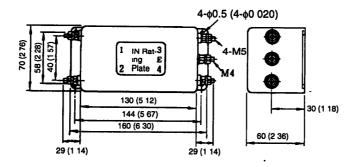
• LF-205A (Single-phase 200-VAC Class, 5 A)



• LF-210 (Single-phase 200-VAC Class, 10 A)



• LF-220 (Single-phase 200-VAC Class, 20 A)

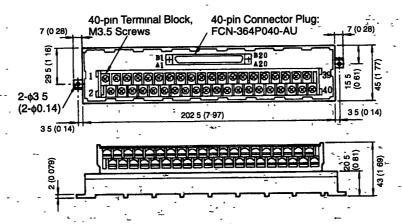


Manufactured by TOKIN

1046 Brake Power Supply

## 10.4.5 Connector Terminal Block Converter Unit

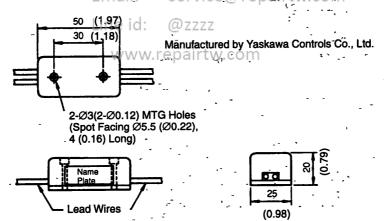
• JUSP-TA36P



## 10.4.6 Brake Power Supply

Brake power supplies are available for 100-V and 200-V inputs. Select an appropriate model depending on the power supply voltage.

- 200-VAC Input: 90 VDC (LPSE-2H01)
- 100-VAC Input: 90 VDC (LPDE 1H01)



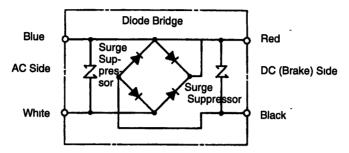
- Lead Wire Length: 500 mm each (19.69 in.)
- Max. Ambient Temperature: 60°C
- Lead Wires: Color coded

- 4	AC Input		
100 V	200 V		
Blue/White	Yellow/White	Red/Black	

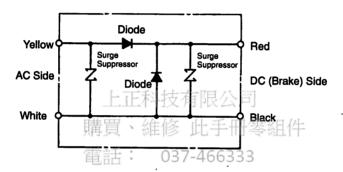
While it is possible to switch either the AC or DC side of the brake power supply, it is normally safer to switch the AC side. If the DC side is to be switched, install a surge suppressor near

the brake coil to prevent the surge voltages due to switching the DC side from damaging the brake coil.

Internal Circuit for 200-VAC Input (LPDE-2H01)

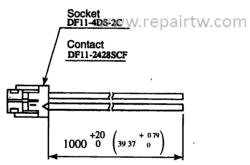


• Internal Circuit for 100-VAC Input (LPDE-1H01)



## 10.4.7 Analog Monitor Cablesce@repairtw.com

Line id: @zzzz



Model	L in mm (feet)	
DE9404559	1000 +20 (39 37 + 079)	

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# 11

## **Trial Operation**

This chapter describes how to conduct a full trial operation.

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11.1 Check Items before Trial Operation	11
11.1.1 Servemeter:03.7-466333	
Email: service@repairtw.com  11.2 Trial Operation Procedure	
11.2.1 Preparation for Trial Operation	1
11.2.2 Operation	
11.2.2 Operation  11.2.3 Inspection during Trial Operation	1

11 1 2 Servopack

## 11.1 Check Items before Trial Operation

Inspect the following items before conducting trial operation. Also conduct the inspections according to *Chapter 14 Maintenance and Inspection* if conducting trial operation on Servomotors that have been stored for a long period of time.

## 11.1.1 Servomotor

- Connection to machines or devices, wiring and grounding are correct.
- Bolts and nuts are tightened.
- For motors with shaft seals, the seals are not damaged and motor is properly lubricated.

## 11.1.2 Servopack

- User constants are properly set for the applicable Servomotor and specifications.
- Terminal connections and wiring leads are tightened securely. Connectors are inserted securely.
- The power supply is turned OFF if a servo alarm occurs.
- Voltage supplied to SGD Servopack is 200 to 230 V +10/\_15% (100 to 115 V +10/\_15%).
   (When using a power supply that is not 200 V (100 V), a transformer that steps down to 200 V (100 V) must be installed separately.)

Take appropriate action immediately if an alarm occurs or one of the items above is incorrect.

## 11.2 Trial Operation Procedure

## 11.2.1 Preparation for Trial Operation

To prevent accidents, initially conduct trial operation with no load connected to the Servomotor. If the trial operation must be conducted while connected to equipment, confirm that the driven system is ready for an emergency stop at any time.

## Power ON

If the power supply ON sequence is correct as shown in 5.1, press the ON switch to turn ON power. Press and hold the switch for about two seconds in Figure 5.1 of 5.1.

If the power is supplied normally, the power ON indicator LED (green) on the Digital Operator will light and the alarm LED (red) will go OFF. Send the ALM command to check Servopack status, and the Servopack will return ALM\_BB.

The power circuit in the Servopack runs and Servomotor drive is enabled when the Servo ON signal is ON (SVON is sent by serial command or S-ON contact is turned ON). When the ALM command is sent to the Servopack, the Servopack returns ALM\_\_RDY.

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## 11.2.2 Operation @zz

The Servomotor will only operate while the Servo ON signal is ON, and it will run at low speed.

Example Commands: SVON

SPD 50 POSI 1000

Make sure the Servomotor is running in the proper direction according to the reference.

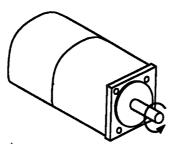


Figure 11.1 Motor Forward Operation

## 11.2.3 Inspection during Trial Operation

Inspect for the following items during the trial operation.

- Unusual vibration
- Abnormal noise
- Excessive temperature rise

-Take actions according to *Chapter 14 Alarm Troubleshooting* if any fault is found. During trial operation, the load and machine may not fit well at first and result in an overload.

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## 12

## **Settings**

This chapter describes characteristics at the factory before shipping and Servo performance adjustment.

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## 12.1 Characteristics at the Factory

The speed reference characteristics at the factory are shown below.

## **Speed Reference – Motor Speed Characteristics**

Conditions:-No load

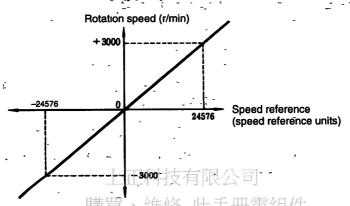


Figure 12.1 Speed Reference - Motor Speed Characteristics

12.2 Reset

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If settings must be reset because of application or usage conditions, reset them in according to Chapter 6 Serial Communications.

## 12.3 Adjusting Servo Performance

## 12.3.1 Setting User Constants

## ■ Position Loop Gain (PRM1)

Position loop gain is ideally determined by the specifications of the equipment, but initially set a level lower than the desired value. (The factory setting is 40 (l/s).)

## ■ Speed Loop Gain (PRM2)

The setting (Hz) of PRM 2 expresses the speed loop gain characteristics, and is the cutoff frequency "fc" for the response characteristics of a system with balanced inertia. The value fc may vary even with the same speed loop gain setting due to fluctuations in load inertia.



 $(J_M: Motor moment of inertia, J_L: Servomotor axis converted load inertia, <math>J_L/J_M = x)$ WWW.repairtw.com

Cutoff frequency fc = PRM2 setting  $\times \frac{2}{x+1}$  [Hz]

- The speed loop gain (PRM2) setting is therefore 50 (x + 1). (fc = 100 Hz with balanced inertia.)
- Since the values above may not hold for mechanical systems with low rigidity, initially set the value at 50x + 35. (The factory setting is 80 (Hz).)

**Note** Set PRM2 to 40 (Hz) or less if the Servomotor is running under no-load conditions.

## Speed Loop Integration Time constant (PRM3)

Set PRM3 to 20 (ms). (Factory setting)

## 12.3.2 Setting Optimum Position and Speed Loop Gain

## Speed Overshooting and Vibration

• Incrementally decrease the position loop gain (PRM1).

## 12 3 2 Setting Optimum Position and Speed Loop Gain

• Incrementally increase the speed loop gain. If the situation worsens when the speed loop gain is increased, incrementally decrease the gain.

Note

A certain amount of position loop gain is necessary, so set the acceleration/deceleration time (PRM5) high if the application cannot handle overshoot.

## When Response Tracking Worsens

- Incrementally increase the f position loop gain (PRM1).
- If the position loop gain cannot be increased any higher because of vibration, incrementally increase the speed loop gain (PRM2). If increasing the speed loop gain causes vibration, then tracking performance including that for the mechanical system is at its limit.

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# 13

## **Maintenance and Inspection**

This chapter describes Servodrive maintenance, inspection, and trouble-shooting.

 13.1 Servodrive Maintenance and Inspection
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 13.1.1 Servomotor
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 13.1.2 Servopack
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 13.1.3 Replacing Battery for Absolute Encoder
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 13.2 Troubleshooting
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 13.2.1 Servomotor
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 13.2.2 Servopack
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13 1 1 Servomotor -

## 13.1 Servodrive Maintenance and Inspection

## 13.1.1 Servomotor

Simple daily inspections are all that are needed to maintain the Servomotor because it is brushless. The inspection and maintenance frequencies given in the following table are only guidelines, and may be increased or decreased to suit operating conditions and environment. Do not disassemble the Servomotor during inspection and maintenance, but rather contact your Yaskawa representative if the Servomotor must be disassembled.

Table 13.1 Inspection Items

Item	Frequency	Procedure	Comments
Vibration and noise	Daily	Touch and listen.	The degree of vibration and noise must not be any higher than normal.
Appearance and clean- ing	According to the degree of dirt	Clean with a cloth or compressed air. 维修 叶手冊雯组件	
Insulation resistance measurement	Yearly 電話	Disconnect the Servopack and test insulation resistance at 500 V. Must exceed 10 $M\Omega$	Contact your Yaskawa representative if insulation resistance is below $10\ M\Omega$
Overhaul	Every 20000 hours or 5 years	Remove the Servomotor, replace consum- able parts and perform any necessary repairs.	Contact your Yaskawa representa- tive for the overhaul
Oil seal replacement (for motors equipped with oil seals)	ł	Remove the Servomotor and replace the oil seal. W.repairtw.com	

## ■ Parts Replacement Schedule

The following parts are subject to mechanical wear or deterioration over time. To avoid failure, replace these parts periodically as indicated below.

**Table 13.2 Parts Replacement** 

Part	Standard Replacement Period	Replacement Method
Bearings	20000 operating hours	Disassemble the Servomotor and replace the bearings if necessary.
Oil seal	About 5000 hours	Replace with a new oil seal.

## 13.1.2 Servopack

The Servopack contains highly reliable parts and does not require daily inspection. Always inspection the Servopack at least once a year. Be sure to check user settings prior to operation because we reset user constants to standard settings when we ship overhauled Servopacks.

Table 13.3 Inspection Items

Item	Frequency	Procedure	Remedy
Clean unit interior and circuit boards	Yearly	Check for dust, dirt, and oil on surfaces.	Clean with a cloth or compressed air.
Loose screws	Yearly	Check for loose terminal block and connector screws.	Tighten any loose screws.
Defective parts in unit or on circuit boards	Yearly	Check for discoloration, damage, or broken wires due to heat.	Contact your Yaskawa representative.

## Parts Replacement Schedule

The following parts are subject to mechanical wear or deterioration over time. To avoid failure, replace these parts at the frequency indicated in the following table.

Table 13.4 Parts Replacement

	Part 037	Standard Replacement Period	Replacement Method
Smoothing	Capacitor SETV	7 to 8 years	Test and replace with a new capacitor if necessary.
Relays	<u> </u>	-	Test and replace if necessary.
Fuse	www.repair	10 years	Replace with a new fuse.
Aluminum the Circuit	Electrolytic Capacitor on Board	5 years	Test and replaced with a new circuit board if necessary

Note Operating conditions:

Ambient temperature. Annual average of 30°C

Load factor: 80% max.

Operation rate: 20 hours/day max.

## 13.1.3 Replacing Battery for Absolute Encoder

Replace the absolute encoder battery (purchased by the customer) as outlined below. With an ER 6-V C-type lithium battery manufactured by Toshiba Battery Co., the estimated life is about 10 years.

- 1. Turn ON the Servopack and wait at least 3 minutes until the encoder capacitor is charged.
- 2. Replace the battery. The Servopack power supply may be ON or OFF when the battery is replaced.

Encoder rotation data will not be lost if the battery is replaced following the instructions given above.

**Note** After completing step 1, above, the absolute encoder will function normally for up to 2 days without a battery.

13.2 1 Servomotor

## 13.2 Troubleshooting

## 13.2.1 Servomotor

Refer to the Table 13.5 for the appropriate action when a problem occurs during operation, and be sure to turn OFF the servo system power supply before commencing the procedures that are shaded. Contact your Yaskawa representative immediately if the problem cannot be resolved by using the described procedures.

Table 13.5 Causes, Inspection Areas, and Remedies

Symptom	Cause	Inspection	Remedy
Servomotor does not start	Overloaded	Try operating with no load	Reduce the load or replace with a larger-capacity Servomotor.
	Loose connection	Check connector terminals (1CN, 2CN)	Tighten any loose parts,
	External connector wiring in- correct	Check external connector (ICN) wiring	Refer to the connection diagram and correct the wiring.
Unstable Servomotor rotation	Faulty connection	Check the U-; V- and W-phase lead terminals as well as feedback pulse connection.	Reconnect the wiring:
Servomotor overheated	Ambient temperature too high Line id: @z	Check to see if the ambient temperature is below 40°C.	Reduce the ambient temperature to below 40°C.
- •	Servomotor surface dirty WWW.repa	Check visually.	Clean dust and oil from the motor surface.
	Overloaded	Try operating with no load	Reduce the load or replace with a larger capacity Servomotor.
Abnormal noise	-Mechanical mounting incor-	Loose Servomotor mounting	Tighten mounting screws.
	rect	screws?	Center or balance the cou
		Coupling not centered?	- pling.
-		Coupling unbalanced?	·
	Bearing defective	Check for noise and vibration near the bearing.	Contact your Yaskawa representative if defective.
	Vibration caused by the equipment	Foreign objects, damage, or de- formation of sliding parts.	Contact the equipment manufacturer.

## 13.2.2 Servopack

## Troubleshooting with Serial Communications Data

Table 13.6 shows examples of troubleshooting problems with serial communications data.

**Table 13.6 Troubleshooting with Serial Communications Data** 

Serial Communications Data (Traceback Monitor)	Status When Lit	Cause	Remedy
ALM10.OC	Lit at power ON	Circuit board (1PWB) defective	Replace Servopack.
Overcurrent	Lit at power ON and servo ON	Current feedback circuit or power transistor defective     Replace Servopack.	Replace Servopack.
,	Lit during operation Lit even though power is turned OFF and ON Operation resumes after waiting and resetting.	Servopack ambient temperature exceeds 55°C.	Bring Servopack ambient temperature down to 55°C. (Heat sink overheated)
ALM40.OV Overvoltage	Lit with normal operation or deceleration	GD <sup>2</sup> load too large (+	Check Servomotor shaft converted inertia on the equipment.
	-6111	Circuit board (1PWB) defective	Replace Servopack.
ALM51.OS Overspeed	Lit with high-speed Servomory tor rotation after reference in- put Line id: @zz	Servomotor wiring incorrect     Encoder wiring incorrect	Check and correct wiring.  Check to see if the A-, B- and C-phase pulses are correct at 2CN, and repair if necessary.
ALM31.OF	No feedback pulse after refer-	Servomotor wiring incorrect	Check and correct wiring.
Overflow	ence pulse input	Encoder wiring incorrect	Check to see if the A-, B- and C-phase pulses are correct at 2CN, and repair (disconnection, short, power supply, defective circuit board.) if necessary.
-		Control board (1PWB) defective	Replace Servopack.
	Overflow during high-speed operation	Servomotor wiring incorrect     Encoder wiring incorrect	Check and correct wiring.  Check to see if the A-, B- and C-phase pulses are correct at 2CN, and repair (disconnection, short, power supply, defective circuit board.) if necessary.
		Control board (1PWB) defective	Replace Servopack.
	Normal operation by overflow with large reference input	Servopack adjustment incorrect	Increase speed loop gain (Cn-04).
-		Load capacity too large	Review the load. (overload, load inertia)
		Speed reference too large	Decrease the speed reference.

## 13 2 2 Servopack

Serial Communications Data (Traceback Monitor)			Remedy	
ALM71.OL Instantaneous overload	Lit during operation Operation resumes after turning power OFF and ON.	Load greatly exceeds the rated torque	Review the load. (overload)	
ALM72.OL Continuous overload	Lit during operation Operation resumes after turning power OFF and ON.	Load greatly exceeds the rated torque	Review the load (overload)	
ALM80.POS Absolute encoder error	Lit during operation	Faulty absolute encoder wiring or connection	Check to see if the A-, B- and C-phase pulse wiring is correct at 2CN, and repair if necessary.	
·		Servopack miscounted pulses	<ul> <li>Turn power OFF, reset and turn power ON.</li> <li>Separate encoder wiring from main wiring circuits.</li> </ul>	
ALM81.POS Backup error	Lit several seconds after power ON	Absolute encoder backup voltage dropped	Follow the absolute encoder setup procedures.	
ALM82.POS Checksum error	Lit several seconds after power ON	Absolute encoder memory data check failed	Follow the absolute encoder setup procedures.	
ALM83.POS Battery error	Lit several seconds after power ON 購買 維修	Absolute encoder battery voltage dropped 日本组件	Replace the battery and turn power ON twice.	
ALM84.POS Absolute encoder data error	At power ON 宣話: 03	Absolute encoder malfunctioned	Replace the Servomotor if the error occurs frequently.	
ALM85.POS Overspeed	Lit several seconds after power ON	Servemotor related at power ON.	Turn power ON with the Servomotor stopped.	
ALMC1.RWY Servo overrun	Lit soon after Servomotor started to run	Servomotor wiring incorrect or dis- connected	Check wiring and connectors at the Servomotor.	
	, ,	Encoder wiring incorrect or disconnected	Check wiring and connectors at the encoder.	
ALMC2.PG Phase error detected	Lit 1 to 3 seconds after power ON	Faulty encoder wiring or connection	Check wiring and connectors at the encoder.  Separate encoder wiring from	
		Noise in encoder wiring  Encoder defective	main wiring circuits.  Replace Servomotor.	
	Lit during operation	Faulty encoder wiring or connection	Check wiring and connectors at the encoder.	
		Noise in encoder wiring	Separate encoder wiring from main wiring circuits.	
· ·		Encoder defective	Replace Servomotor.	
ALMC3.PG Broken encoder PA-, PB- phases	Lit soon after Servomotor started to run	Faulty encoder wiring (PA, PB) or connection	Check wiring and connectors at the encoder.	
ALMC4.PG Broken encoder PC-phase	Lit soon after Servomotor started to run	Faulty encoder wiring (PC) or connection	Check wiring and connectors at the encoder.	
ALMF3.SRC Power loss error	Lit at power ON	Time between turning power OFF and back ON was shorter than the power holding time	After turning power OFF, wait longer than the power holding time (6 to 15 s) before turning power back ON.	

Serial Communications Data (Traceback Monitor)	Status When Lit	Cause	Remedy
ALM00.ABS	Lit several seconds after power	Absolute encoder malfunctioned	Turn power back ON.
Absolute data error	ON		Follow the absolute encoder setup procedures.
		Absolute encoder wiring incorrect	Check and correct absolute encoder wiring.
ALM02.PRM	Lit at power ON	Circuit board (1PWB) defective	Replace Servopack.
Parameter breakdown	,		-
ALM04.PRM	Lit at power ON	An out-of-range parameter was pre-	Reset all parameters within
Parameter setting error		viously set or loaded.	range.

Note A.00 is reset by turning power OFF.

## ■ Problems due to Detective Wiring or Parts

Table 13.7 Problems Caused by Detective Wiring or Parts

Symptom	Check Areas and Items	Remedy
Motor will not rotate with reference input	<ul> <li>Check voltage between R and T.</li> <li>Make sure the alarm indicator is not lit.</li> <li>Check the P-CON, N-OT, P-OT, and S-ON signals.</li> <li>Use the serial command ALM to check Servopack status. ALMRUN should be returned.</li> </ul>	<ul> <li>Check the AC power supply circuit.</li> <li>Look for a cause if an indicator is lit.</li> </ul>

## ■ Problems due to Setting Errors

Table 13.8 Problems due to Setting Errors

Symptom	Cause	Remedy	
Poor servo tracking performance	Position loop gain too low	Increase the position loop gain (PRM1). Decrease the speed loop gain when increasing position loop gain causes hunting.	
	,	Note Do not increase the position loop gain any high- er once hunting occurs. This is the tracking per- formance limit.	

## ■ Troubleshooting: No Alarm Displayed but the Motor Does Not Run

Table 13.9 Troubleshooting with no Alarm Displays

Symptom	Cause	Conditions	Remedy
Servomotor does not start	Servo ON is turned OFF	First digit of PRM37 set to 0	Turn ON the Servo ON input.
	Encoder to Servomotor wiring disconnected	_	Reconnect the wiring.
	Encoder types differs from the user constant setting	_	Select the correct encoder using the first digit of PRM36.
	P-OT and N-OT inputs are turned OFF	First digit of PRM37 set to 0	Turn ON the P-OT and N-OT inputs.

## 13 2.2 Servopack

Symptom	Cause	Conditions	Remedy
Servomotor moves instantaneously, then stops	Number of encoder pulses differs from the user constant setting (PRM34).	-	Set the user constant (Cn-11) to match the number of encoder pulses if neces- sary.
	Servomotor or encoder wiring incorrect		Correct the wiring.
Servomotor suddenly stops during operation and will not restart (With an absolute encoder only)	The alarm reset signal (ALMRST) is turned ON because an alarm occurred.		Remove the cause of the alarm and switch the alarm reset signal (ALMRST) from ON to OFF.

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