YASKAWA

A World of Automation Solutions™

Σ-II Series

SGDH User's Manual Supplement for Linear Sigma Series

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

⚠ WARNING

YASKAWA manufactures component parts that can be used in a wide variety of industrial applications. The selection and application of YASKAWA products remain the responsibility of the equipment designer or end user. YASKAWA accepts no responsibility for the way its products are incorporated into the final system design.

Under no circumstances should any YASKAWA product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically under all circumstances. All products designed to incorporate a component part manufactured by YASKAWA must be supplied to the end user with appropriate warnings and instructions as to that part's safe use and operation. Any warnings provided by YASKAWA must be promptly provided to the end user.

YASKAWA offers an express warranty only as to the quality of its products in conforming to standards and specifications published in YASKAWA's manual. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED. YASKAWA assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.

This manual deals with the stand-alone installation, wiring, test run, etc., of a unified linear/rotary-type AC servomotor. See the following manual for other items.

- Sigma II Series Servo System Users Manual (YEA-SIA-S800-32.2B)

Table Of Contents

Safety-Related Symbols

The following symbols are used in this manual according to the safety-related content.
Be sure to observe text annotated with these safety symbols as their content is important.

⚠WARNING Mis-operation may result in a hazardous condition with the possibility of death or serious injury.

⚠CAUTION Mis-operation may result in a hazardous condition with the possibility of serious or light injury as well as material damage.

Items marked with **⚠CAUTION** may entail serious ramifications. As either of these symbols contains important content, be sure to observe them.

Icon Display

The following icons have been designed so that the classification of the content of the explanation can be easily discerned. The icons are displayed at needed locations to assist in comprehension.

Important matters to be memorized. In addition, this item serves as a light warning of a level not entailing damage to the machine, such as an alarm display, etc.

Displays programming examples, operation examples, etc.

Shows supplementary items and convenient functions.

Terminology?? Explanation of difficult to understand specialist terminology, as well as for technical terms that were not previously explained.

Outline of Manual

- Thank you for purchasing our unified Linear/Rotary Σ-Ⅱ type AC servo amplifier.
- This manual deals with the stand alone installation, wiring, test run, etc., of a Plug&Play linear/rotary-type Σ-II series AC servo. See the following manuals for other items.

Document Name	Document Number	Content
Σ-Ⅱ Series SGMH□/SGDH User's Manual Servo Selection and Datasheets	SI-S800-32.1	Explains selection of the Σ-II series servo device type and capacity.
Σ-Ⅱ Series SGMH□/SGDH User's Manual Design/Maintenance	SI-S800-32.2	Explains Σ-II series servo installation, wiring, test run, usage of the various functions, as well as maintenance and testing.

Safety Notes

This manual deals with cautionary items that must be observed in using the product, as well as in inspection upon receipt, installation, wiring, running, maintaining, and testing.

■ Inspection Upon Receipt of Product

⚠CAUTION

- Use the linear motor and servo amplifier in a designated combination.
  Failure to due so may result in fire or unit failure.

■ Installation

⚠CAUTION

- Never use this product in an area exposed to water, where the atmosphere is corrosive or flammable, or next to inflammable substances.
  Failure to observe this may result in electrical shock and/or fire.

■ Wiring

⚠WARNING

- Be sure to connect the grounding terminal ⏚ to the grounding pole (D-class grounding).
  Failure to observe this may result in electrical shock and/or fire.

⚠CAUTION

- Do not connect the three-phase power supply to servo amplifier output terminals U, V, and W.
  Doing so may result in injury and/or fire.
- Securely tighten the screws on the power terminals and motor output terminals.
  Failure to due so may result in fire.

■ Running

⚠CAUTION

- To prevent unexpected accidents, operate after mounting limit switches or stoppers to the ends of the slider.
  Failure to do so may result in injury.
- When operating the device after installation on its counterpart machine, set user parameters matching that machine beforehand.
  Operating without setting these parameters may result in machine runaway or failure.

CAUTION

- Before starting operation after installing the unit on its counterpart machine, always have the device in a state capable of emergency stop.
  Failure to do so may result in injury.
- Do not touch the heat sink during operation.
  This may result in burns due to high temperatures.

■ Maintenance/Inspection

WARNING

- Never touch the interior of the servo amplifier.
  Failure to do so may result in electrical shock.
- Be sure the terminal cover is in place when power is fed.
  Failure to do so may result in electrical shock.
- Do not touch the terminals until at least 5 minutes after power shutoff.
  Failure to do so may result in electrical shock due to residual voltage.

CAUTION

- Do not modify the wiring while power is ON.
  Doing so may result in electrical shock or injury.

■ General Cautionary Items

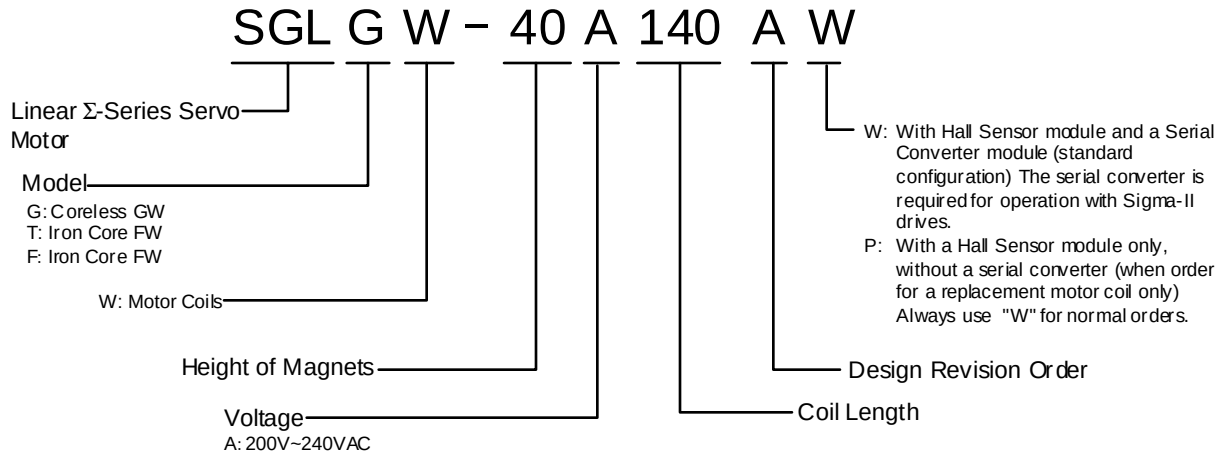
Keep in Mind While Using the Product
• Because the diagrams in this manual describe detailed items, they are sometimes drawn with covers and safety shields removed. When operating this product, be sure that all safety covers and shields are returned to their original positions before operating. • The figures displayed in this manual are representative examples, and may differ from the product received. • This manual may be revised where appropriate due to product improvements, specification changes, or for purposes of improved ease of use for the manual itself. The document number will be updated and issued as a revision with regard to these changes. • To order a new manual due to damage or loss of this one, please contact the nearest Yaskawa sales office listed on the back of this manual with the document number listed on the front. • Yaskawa assumes no responsibility for modifications made to the product by the customer as they fall outside the scope of the warranty.

1. Interpretation of Model Number

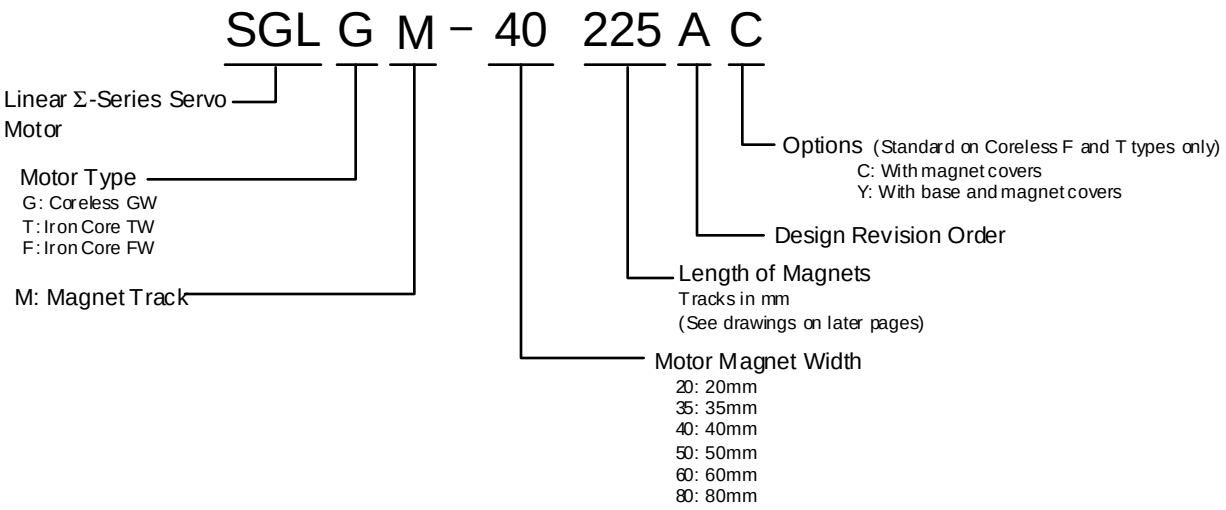
The model numbering conventions are shown below

1.1 Linear Motor Models

1.1.1 Motor Coils

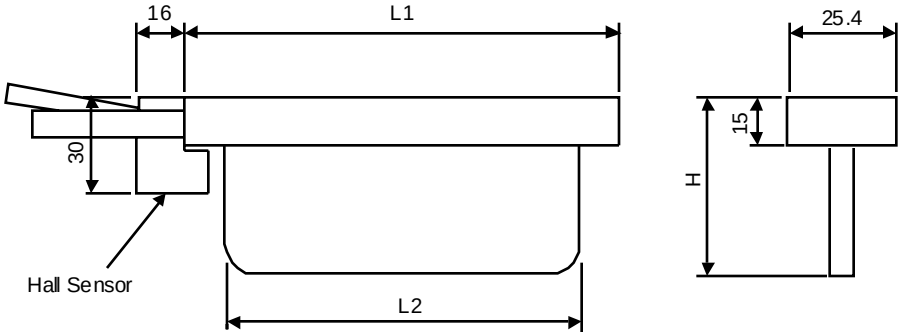


1.1.2 Magnet Tracks



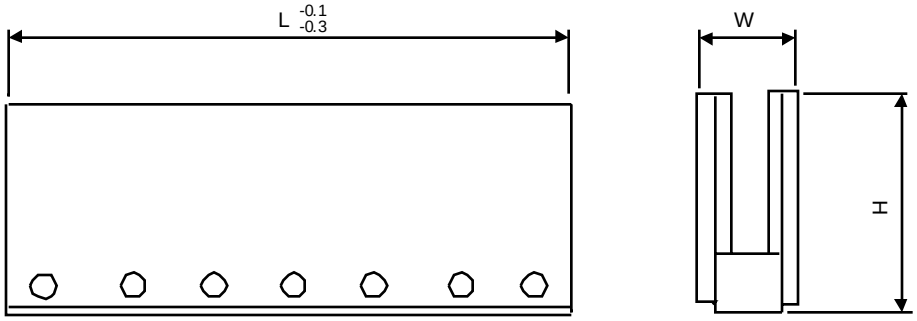
1.2 Core-less Type

1.2.1 Motor Coil



Model SGLGW-	Peak Force (N)	Continuous Force (N)	External Dimensions (mm)			Mass (Kg)
			L1	L2	H	
40A140A(P)	140	47	140	125	63	0.39
40A253A(P)	280	93	252.5	237.5	63	0.65
40A365A(P)	420	140	365	350	63	0.91
60A140A(P)	220	73	140	125	83	0.47
60A253A(P)	440	147	252.5	237.5	83	0.80
60A365A(P)	660	220	365	350	83	1.13

1.2.2 Magnet Track



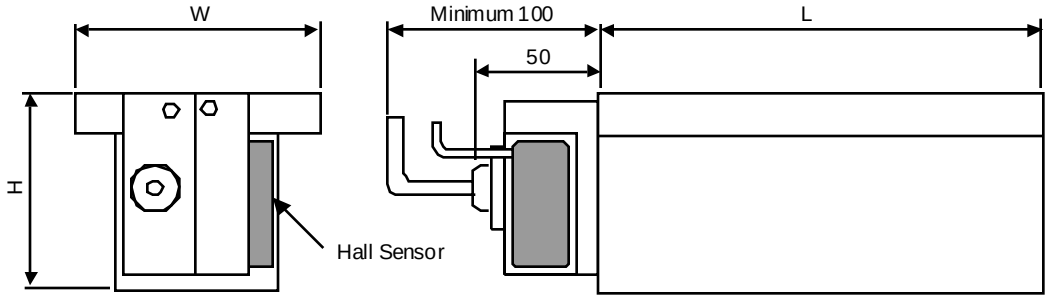
Model SGLGM-	External Dimensions (mm)			Mass (Kg)
	L	W	H	
40090A	90	25.4	62	0.8
40225A	225	25.4	62	2.0
40360A	360	25.4	62	3.1
40405A	405	25.4	62	3.4

Model SGLGM-	External Dimensions (mm)			Mass (Kg)
	L	W	H	
40450A	450	25.4	62	3.9
60090A	90	25.4	82	1.0
60225A	225	25.4	82	2.6
60360A	360	25.4	82	4.1
60405A	405	25.4	82	4.6
60450A	450	25.4	82	5.1

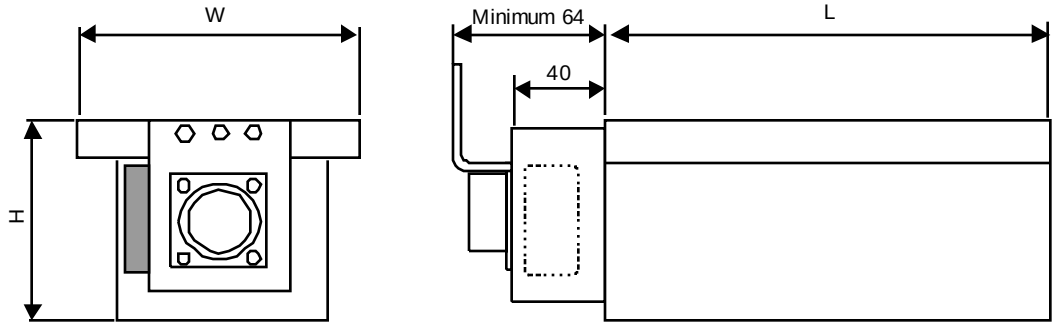
1.3 T-Type Iron Core

1.3.1 Motor Coil

1. 3. 1.1 TYPE: SGLTW-20A□□□A(P), SGLTW -35A□□□A(P)

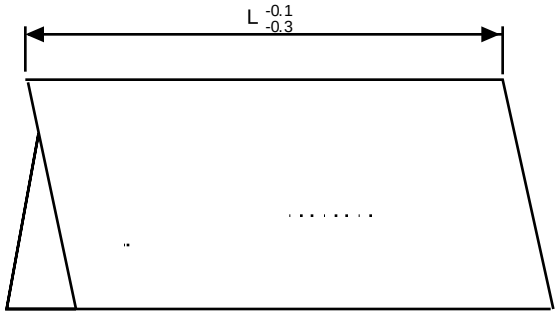


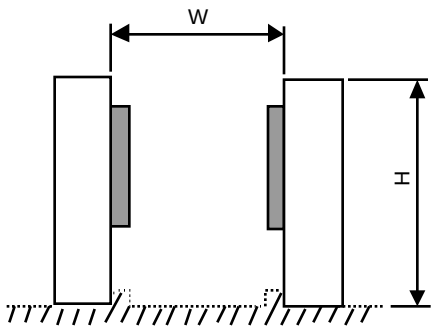
1. 3. 1.2 TYPE: SGLTW-40A□□□A(P), SGLTW -80A□□□A(P)



Model SGLTW-	Peak Force (N)	Continuous Force (N)	External Dimensions (mm			Mass (Kg)
			L	W	H	
20A170A(P)	380	130	170	100	51	2.6
20A320A(P)	760	250	315	100	51	4.8
20A460A(P)	1140	380	460	100	51	7
35A170A(P)	660	220	170	100	66	3.7
35A320A(P)	1320	440	315	100	66	6.8
35A460A(P)	2000	670	460	100	66	10
40A400A(P)	2000	670	395	150	78	20
40A600A(P)	3000	1000	585	150	78	30
80A400A(P)	4000	1300	395	150	115	30

1.3.2 Magnet Track

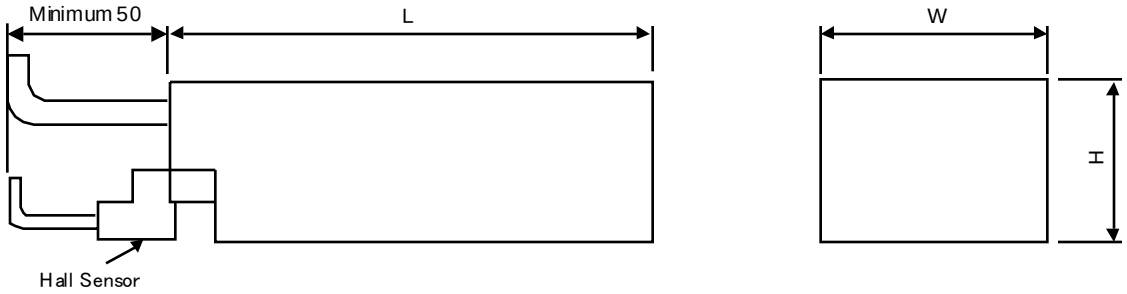




Model SGLTM-	External Dimensions (mm)			Mass (Kg)
	L	W	H	
20324A	324	70	40	3.4
20540A	540	70	40	5.7
20756A	756	70	40	7.9
35324A	324	70	55	4.8
35540A	540	70	55	8
35756A	756	70	55	11
40405A	405	111.8	63	9
40675A	675	111.8	63	15
40945A	945	111.8	63	21
80405A	405	111.8	100	14
80675A	675	111.8	100	24
80945A	945	111.8	100	34

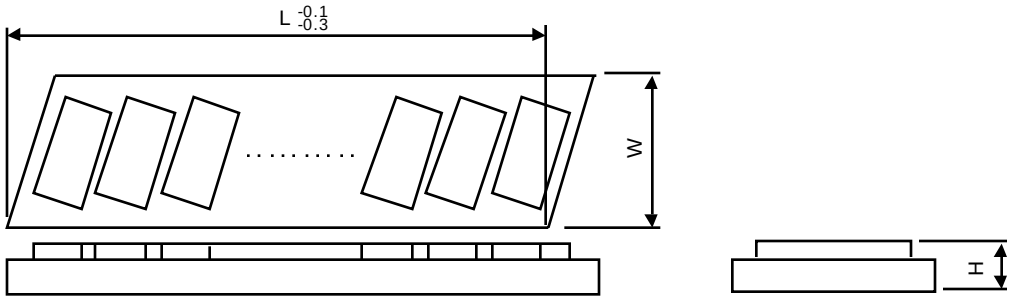
1.4 F-Type Iron Core

1.4.1 Motor Coil



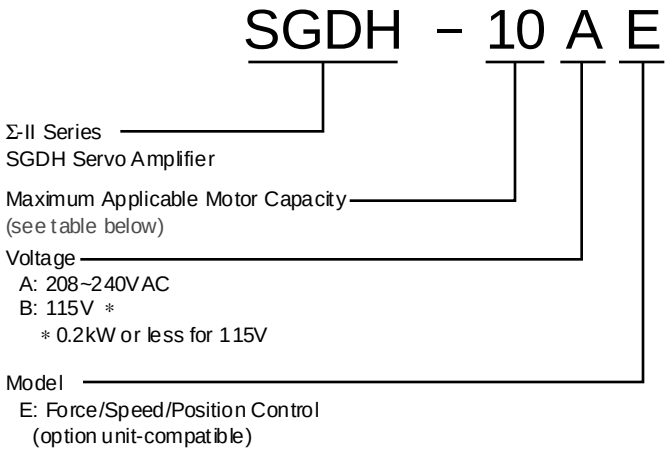
Model SGLFW-	Peak Force (N)	Continuous Force (N)	External Dimensions (mm)			Mass (Kg)
			L	W	H	
20A090A(P)	86	25	91	40	34	0.7
20A120A(P)	125	40	127	40	34	0.9
35A120A(P)	220	80	127	55	34	1.3
35A230A(P)	440	160	235	55	34	2.3
50A200A(P)	600	200	215	71.5	43	3.7
50A380A(P)	1200	400	395	71.5	43	6.9
1ZA200A(P)	1200	400	215	119	43	6.4
1ZA380A(P)	2400	800	395	119	43	12.2

1.4.2 Magnet Track



Model SGLFM-	External Dimensions (mm)			Mass (Kg)
	L	W	H	
20324A	324	44	10	0.9
20540A	540	44	10	1.4
20756A	756	44	10	2
35324A	324	60	10	1.2
35540A	540	60	10	2
35756A	756	60	10	2.9
50405A	405	75	14	2.8
50675A	675	75	14	4.6
50945A	945	75	14	6.5
1Z405A	405	125	14	7.3
1Z675A	675	125	14	12
1Z945A	945	125	14	17

1.5 Servo Amplifiers



Maximum Capacity of Applied Motor

Maximum Capacity Symbol on Applied Motor	Capacity (kW)	Maximum Capacity Symbol on Applied Motor	Capacity (kW)
01	0.10	15	1.5
02	0.20	20	2.0
04	0.40	30	3.0
05	0.45	50	5.0
08	0.75	75	7.5
10	1.0		

Applied Motor Types

Motor Model		Applicable Servo Amplifier
SGLGW-	40A140A	SGDH-01AE
	40A253A	SGDH-02AE
	40A365A	SGDH-04AE
	60A140A	SGDH-02AE
	60A253A	SGDH-04AE
	60A365A	SGDH-08AE
SGLTW-	20A170A	SGDH-05AE
	20A320A	SGDH-10AE
	20A460A	SGDH-15AE
	35A170A	SGDH-08AE
	35A320A	SGDH-15AE
	35A460A	SGDH-20AE
	40A400A	SGDH-20AE
	40A600A	SGDH-30AE
	80A400A	SGDH-50AE
	80A600A	SGDH-75AE
SGLFW-	20A090A	SGDH-02AE
	20A120A	SGDH-02AE
	35A120A	SGDH-02AE
	35A230A	SGDH-05AE
	50A200A	SGDH-08AE
	50A380A	SGDH-15AE
	1ZA200A	SGDH-15AE
	1ZA380A	SGDH-20AE

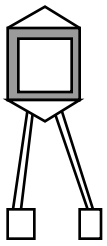
1.6 Serial Converter Unit

JZDP – AOO4 – △△△

Converter Unit Type
(see table below)

Compatible Motor Number
Varies according to the compatible motor (see table below)

Serial Converter Units Classified by Model and Shape

Model	Shape	Scale Used	Servo Sensor (Y/N)
JZDP-A004		Renishaw (Conversion cable for Heiden-hain scales is available)	Y

Serial Converter Units and Applicable Motor Chart

The serial converter contains the motor ID, winding data, as well as the data that enables the system to be Plug and Play. When used with Yaskawa's SGDH Servo Drive, the correct Serial Converter must also be used to operate the system. Mis-matching the motor coil and serial converter will cause system malfunction. To ensure the proper match, a serial converter with the correct P/N and a motor coil are shipped together from the factory.

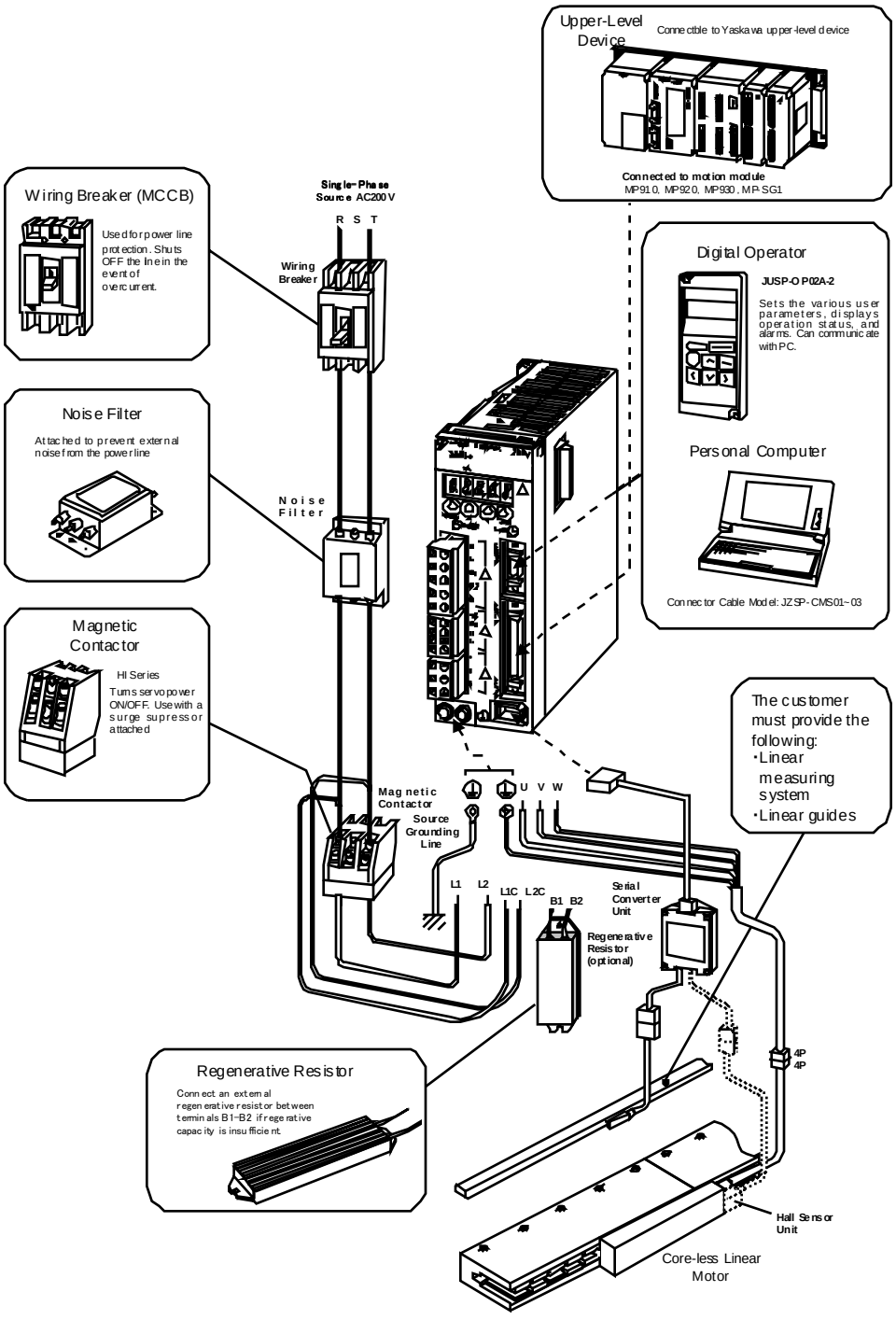
Serial Converter Units and Applied Motors

Serial Converter Unit Model JZDP-A004-□□□	Applied Motor	Serial Converter Unit Model JZDP-A004-□□□	Applied Motor
001	SGLGW-40A140A(P)	013	SGLTW-20A460A(P)
002	SGLGW-40A253A(P)	014	SGLTW-35A170A(P)
003	SGLGW-40A365A(P)	015	SGLTW-35A320A(P)
004	SGLGW-60A140A(P)	016	SGLTW-35A460A(P)
005	SGLGW-60A253A(P)	017	SGLFW-20A090A(P)
006	SGLGW-60A365A(P)	018	SGLFW-20A120A(P)
007	SGLTW-40A400A(P)	019	SGLFW-35A120A(P)
008	SGLTW-40A600A(P)	020	SGLFW-35A230A(P)
009	SGLTW-80A400A(P)	021	SGLFW-50A200A(P)
010	SGLTW-80A600A(P)	022	SGLFW-50A380A(P)
011	SGLTW-20A170A(P)	023	SGLFW-1ZA200A(P)
012	SGLTW-20A320A(P)	024	SGLFW-1ZA380A(P)

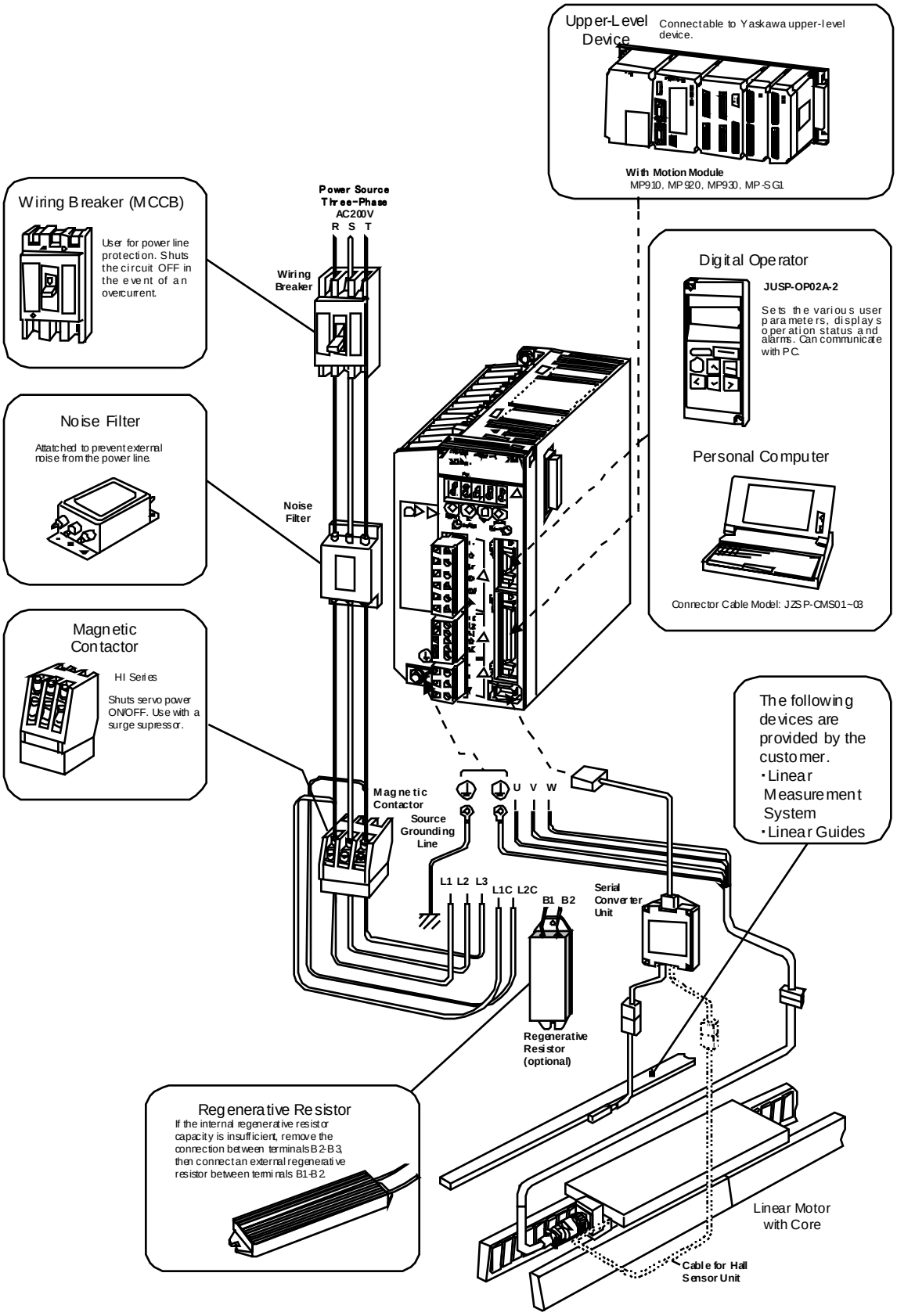
2. Wiring

2.1 Connection With Peripheral Devices

2.1.1 Single-Phase Main Circuit (115V or 208V) Specification



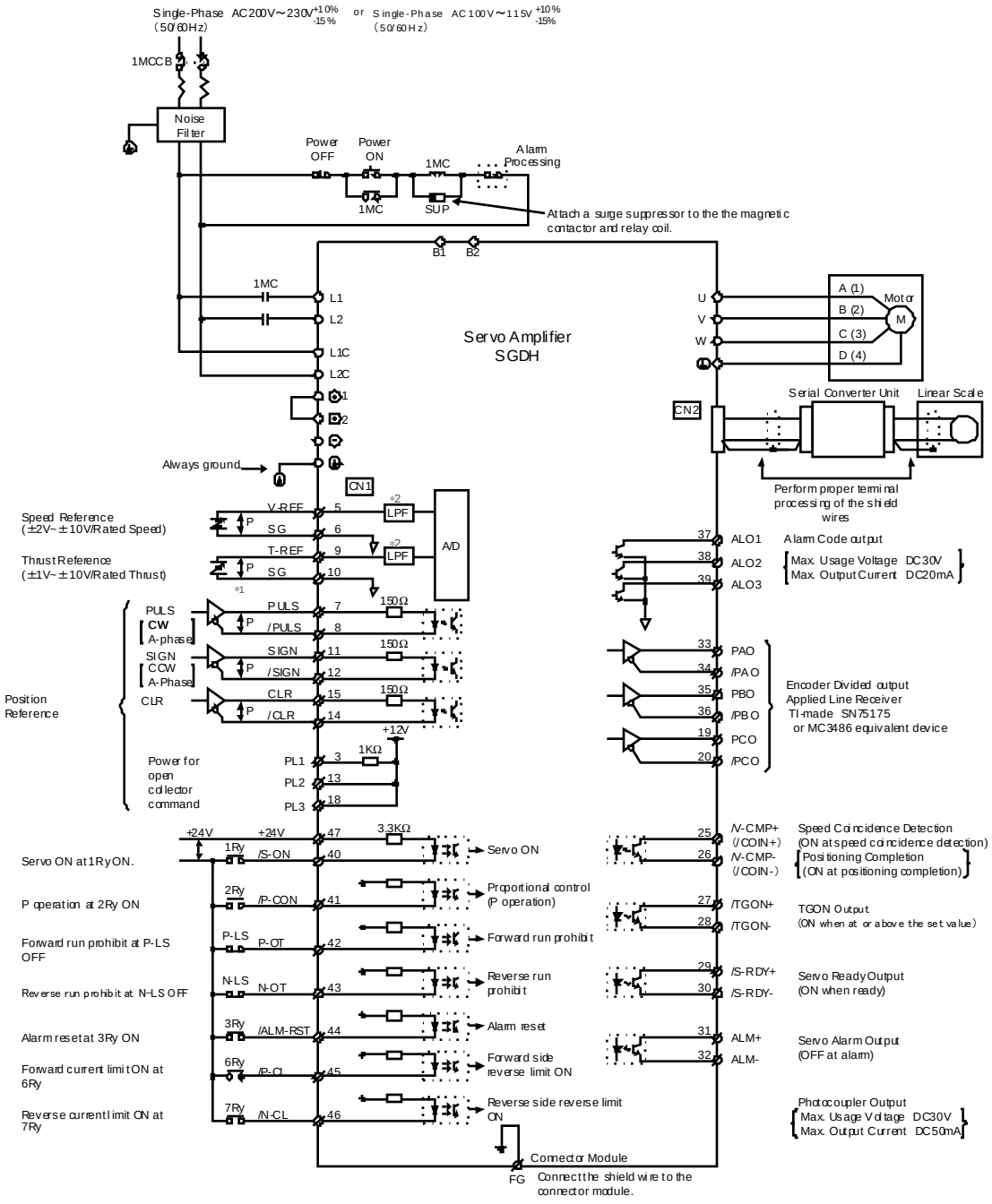
2.1.2 Three-Phase Main Circuit (208V) Specification



2.2 Standard Connection Examples

Standard connection examples for servo amplifiers are shown by specification.

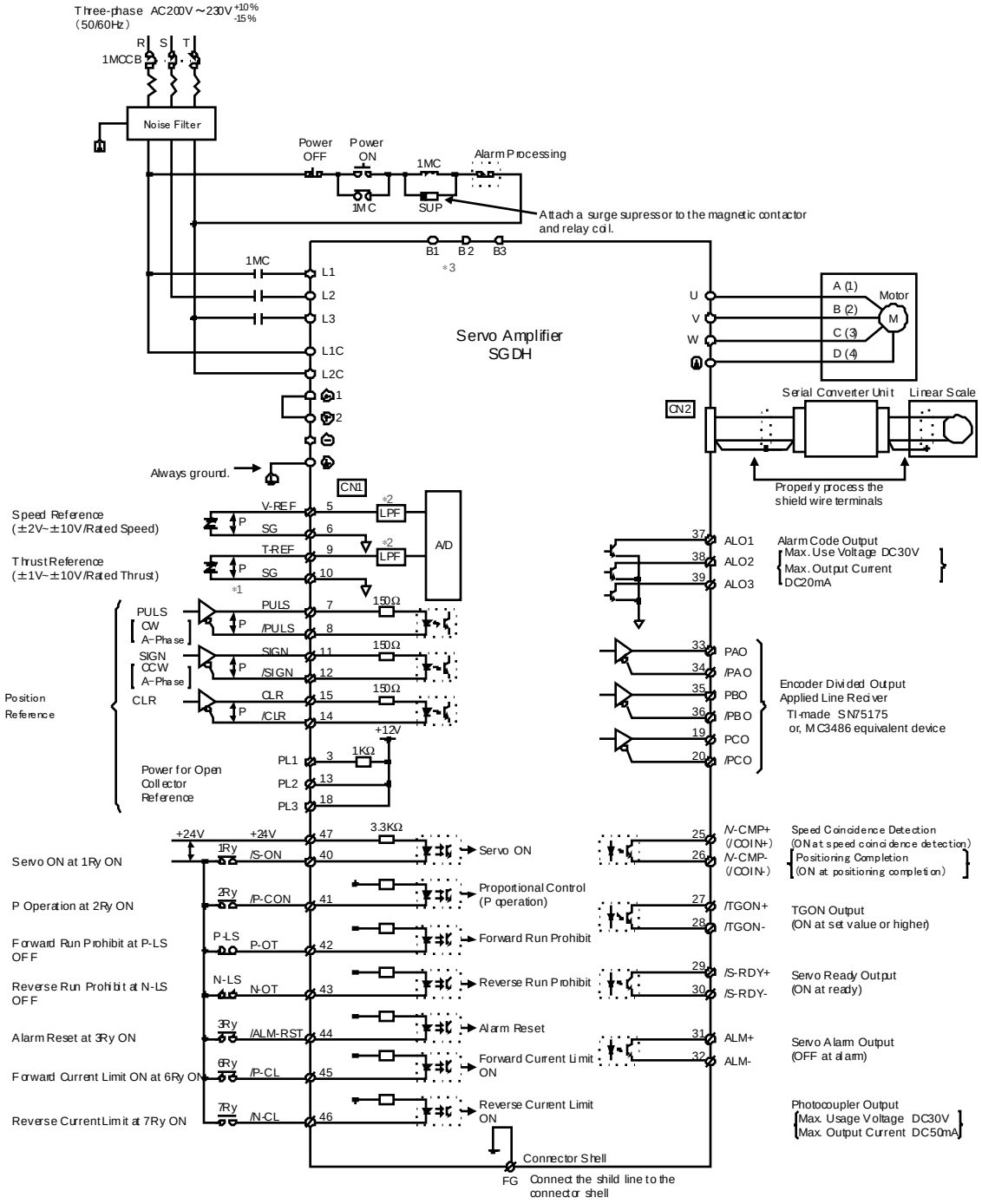
2.2.1 Single-Phase Power Specification



* 1. ⏚ represents a twisted pair wire.

* 2. The 1-time filter time constant is 47μs.

2.2.2 Three-Phase Power Specification

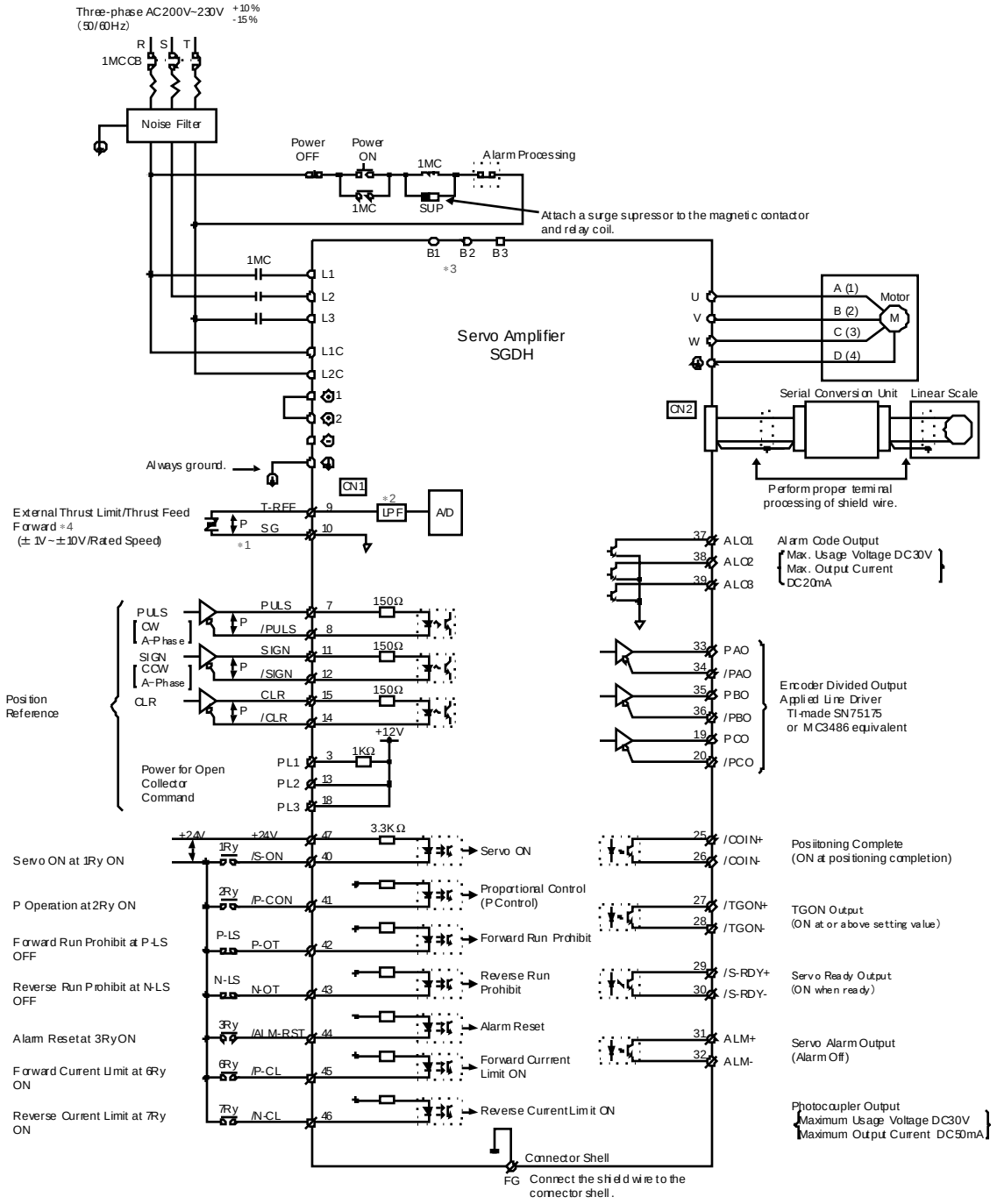


* 1. ⏀ represents a twisted pair wire.

* 2. The 1-time filter time constant is 47 μ s.

* 3. Connect an external regenerative resistor between terminal B1–B2 for servo amplifiers with capacities of 6.0kW or greater. (There is no terminal B3.)

2.2.3 In Position Control Mode



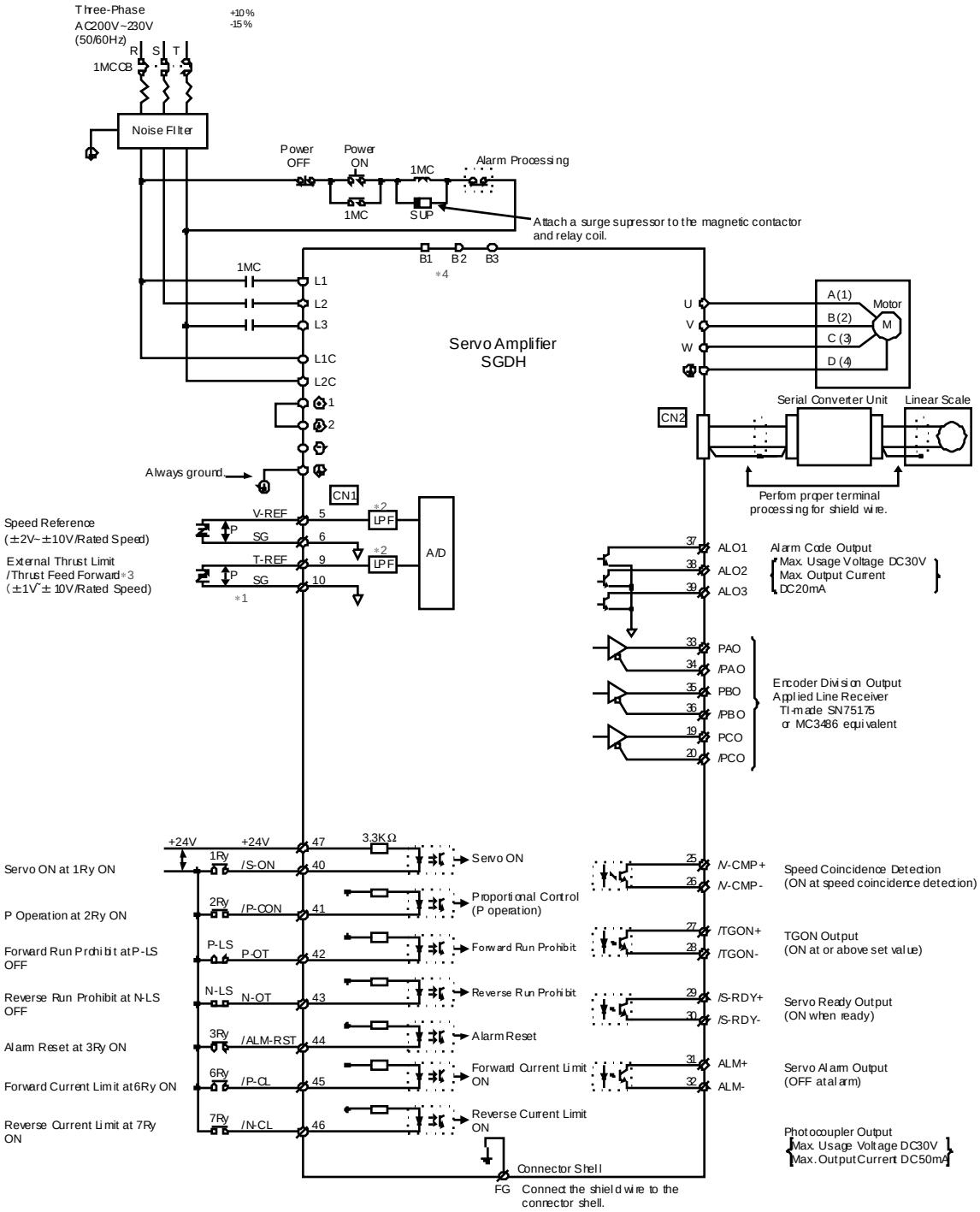
* 1. ⏀ represents a twisted pair wire.

* 2. The 1-time filter time constant is 47 μ s.

* 3. Connect an external regenerative resistor between terminal B1–B2 for servo amplifiers with capacities of 6.0kW or greater. (There is no terminal B3.)

* 4. Enabled by user parameter setting.

2.2.4 In Speed Control Mode



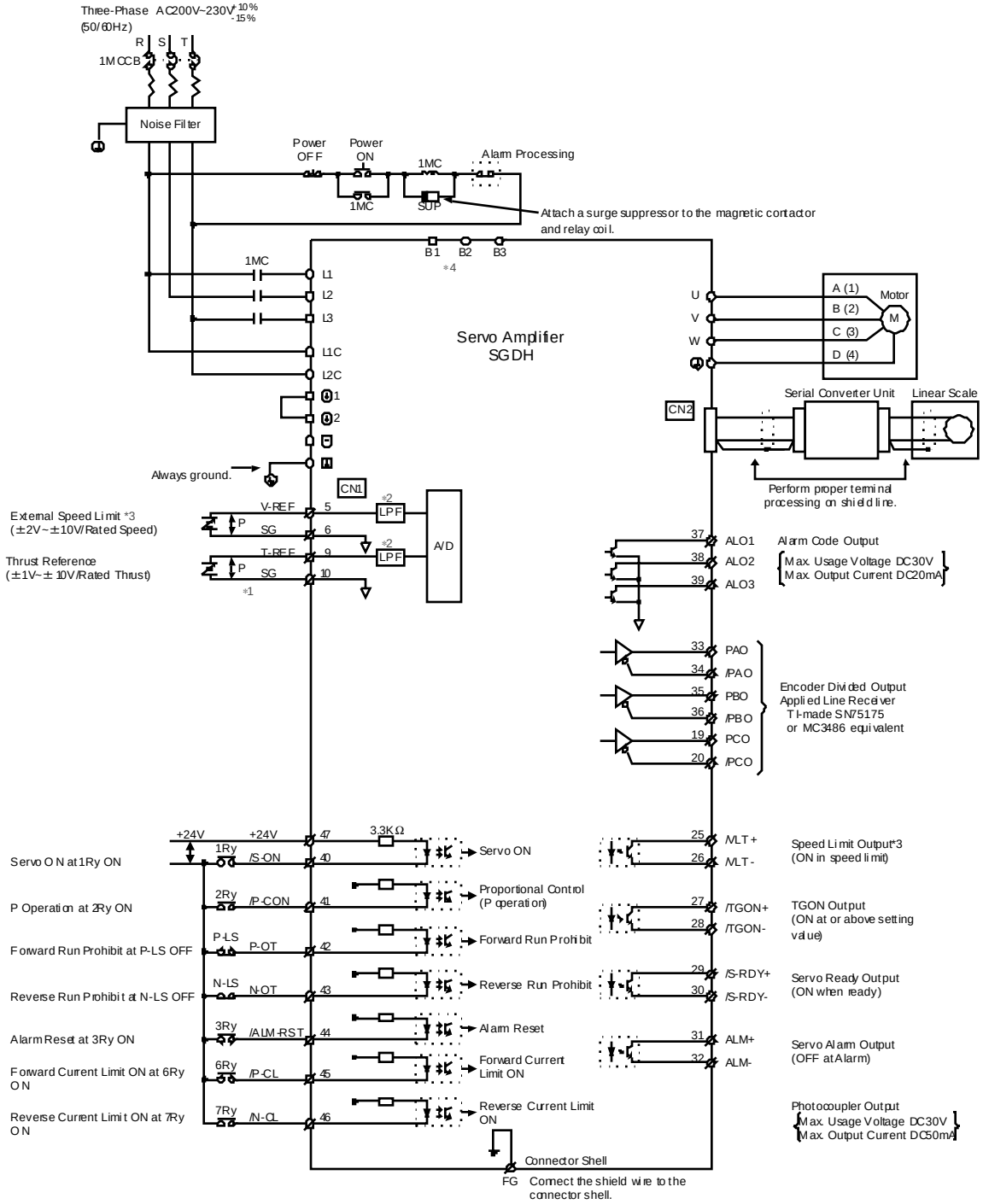
* 1. ⏚ represents a twisted pair wire.

* 2. The 1-time filter time constant is 47 μs.

* 3. Enabled by user parameter setting.

* 4. Connect an external regenerative resistor between terminal B1–B2 for servo amplifiers with capacities of 6.0kW or greater. (There is no terminal B3.)

2.2.5 In Force Control Mode



* 1. ⏚ represents a twisted pair wire.

* 2. The 1-time filter time constant is 47μs.

* 3. Enabled by user parameter setting.

* 4. Connect an external regenerative resistor between terminal B1–B2 for servo amplifiers with capacities of 6.0kW or greater. (There is no terminal B3.)

3. Linear Motor Setup

⚠CAUTION

Be conscientious in setup as linear motors can undergo various status changes due to the installation direction and encoder mounting direction.

- Failure to do so may result in injury.

3.1 Installation and Setting

3.1.1 Motor Mounting and Encoder Mounting

Be sure that the forward direction of the motor and of the encoder match when installing.

(1) See "6.1 Linear Motors" for the forward motor direction.

(2) See "6.2 Serial Converter Unit (JZDP-A004-☐☐☐)" for forward encoder direction.

3.1.2 Setting of Linear Encoder Scale Pitch

After completion of the installation and wiring, feed the control power only, and input the correct linear pitch (pn280) to be used for each application. Alarm A.80 (linear encoder scale pitch setting error will be output when the power is first input because the initial value is "0". This will be resolved upon setting a normal value into Pn280 and cycling the power.

3.1.3 Verification of Feedback Pulse

The feedback pulse verification method is shown below.

1. Connect the encoder wire to CN4.
2. Verify whether the feedback pulse is received correctly by feeding control power and manually move the motor.

Verify the feedback pulse in user parameter Un00D (Feedback Pulse Monitor).
Verify that the feedback pulse variation is the value set in Un00D by moving the motor for a desired distance.
In addition, verify that the value of Un004 (Motor electrical angle monitor) returns to its original value by moving the motor across only two magnets on the motor magnet slide

3.2 Test Run Using Panel Operator

After setting the resolution and verifying the feedback pulse, perform a test run by the following operation.

1. Feed main power
2. Try moving the linear motor by operating the panel operator.
3. Verify that the linear motor is working normally.

(1) When turning on the servo for the first time, stand away from the motor as motor runaway may occur.

(2) To prevent danger during motor setup, the factory settings for the force limit parameters (Pn483, 484) are extremely small (Factory Setting: 10%).

(3) Press the ↑ key on the panel operator, to raise the parameter to the force used when driving the motor forward.

(1) Perform magnetic polarity detection before moving the motor if no Hall sensor is used.
For details, See "4.1 Linear Motor Polarity Detection (only when there is no Hall sensor)"

(2) Input signal verification and verification of operation by external command is the same as in a rotary motor.
For details, see chapter -32.2 "Test Run" of "Σ-ⅡII Series SGMH□/SGDH User's Manual Design/Maintenance (SI-S800-32.2)". See "7.2.2 Test Run with Digital Operator" in the "Σ-ⅡII Series SGMH□/SGDH User's Manual Design/Maintenance (SI-S800-32.2)".

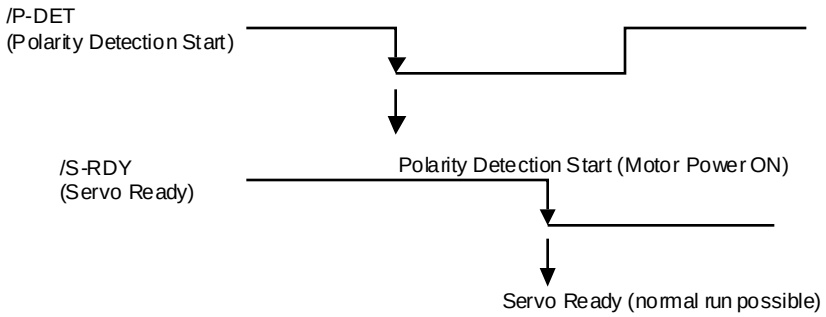
4. Parameter Setting and Description of Functions

Here we will describe the functions dedicated to the linear SGDH servo amplifier. See Chapter 5 “Parameter Setting and Description of Functions” in the “Σ-II Series SGM □ H □ /SGDH User's Manual Design/Maintenance (SI-S800-32.2)” for the other functions.

4.1 Linear Motor Polarity Detection (only when there is no Hall sensor)

If “No Hall Sensor” is set in the user parameters (Pn080.0=1), then polarity detection must be performed after power ON. Polarity detection starts after /P-DET signal input according to the input signal assignment (Pn50D.3).

The following figure shows the signal timing during polarity detection.



Following completion of polarity detection, a SERVO READY state will result, and power can be fed to the motor by /S-ON input.

Important

(1) A polarity Detection Alarm (A.C5) is generated if the polarity detection does not complete normally.

(2) Alarm A.C5 is also generated if the main power is cut off during polarity detection. If an alarm occurs, perform polarity detection again after resetting the alarm. Do not touch the motor during polarity detection.

Supp

(1) Polarity detection is executed by moving the motor. Therefore, the motor will move somewhat during detection.

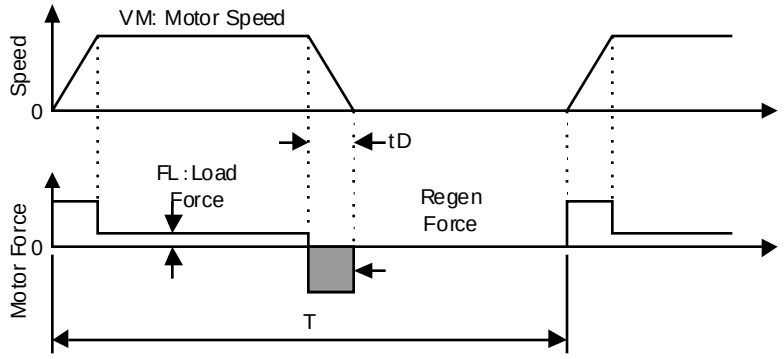
(2) Polarity detection is not performed when the overtravel (OT) signal is OFF (RUN prohibited). Perform polarity detection again after releasing the OT signal.

(3) Be sure to set Pn50A.0 (input signal assignment mode) to “1” if the /P-DET (polarity detection start) signal is used assigned to a desired input terminal. The setting in Pn50D.3 (/P-DET signal mapping) is not enabled if the setting of Pn50A.0 = 0 is “0”.

4.2 Calculation of Needed Regenerative Resistor Capacity

4.2.1 Study by Regenerative Energy Calculation

The procedure is shown for calculating the regenerative resistor capacity when operating accel/decel by the run cycle shown in the figure below.



4. 2. 1.1 Calculation Procedure

The capacity calculation procedure is shown below.

Procedure	Calculation Item	Symbol	Formula
1	Derives the kinetic energy of the servo system.	E_S	$E_S = MV_M^2/2$
2	Derives Consumption Energy due to loss in the load system during the deceleration period.	E_L	$E_L = V_M F_L t_D/2$
3	Calculates loss energy for the linear motor winding resistor	E_M	(Value according to "Linear Motor Winding Resistance Loss" on p.23) $\times t_D$
4	Calculation of energy absorbable by the servo amplifier.	E_C	Calculated according to "Energy Absorbable by Servo Amplifier" on p.26.
5	Derives the energy consumed by the regenerative resistor.	E_K	$E_K = E_S - (E_L + E_M + E_C)$
6	Calculates the needed regenerative resistor capacity.	W_K	$W_K = E_K / (0.2 \times T)$

Note 1 The "0.2" in the W_K calculation is the value when a 20% usage load is assumed for the regenerative resistor.

Note 2 The units for each symbol are shown below:

Symbol	Unit	Content
E_S	J	Servo system kinetic energy
E_L		Consumption Energy due to loss in the load system during the deceleration period
E_M		Consumption Energy due to loss in the linear motor winding resistor
E_C		Energy absorbable by servo amplifier
E_K		Energy consumed by regenerative resistor
W_K	W	Needed regenerative resistor capacity
$M(=M_M+M_L)$	Kg	Load mass including motor
V_M	m/s	Linear motor usage speed
F_L	N	Load force
t_D	sec	Deceleration stop period
T		Linear motor repeat run period

An external regenerative resistor is not needed if the value of W_K in the above calculations does not exceed the processing capability of the integrated regenerative resistor.
If the power exceeds the processing capability of the regenerative resistor integrated in the servo amplifier, install an external regenerative resistor with the capacity (W) obtained in the above calculations.
When the load loss in procedure 2 is unclear, make the calculations assuming $E_L=0$.
Calculate the necessary regenerative resistor capacity (W) by adding the following items to the above calculation procedure when a run period occurs in the continuous regeneration mode for the up or down axis.

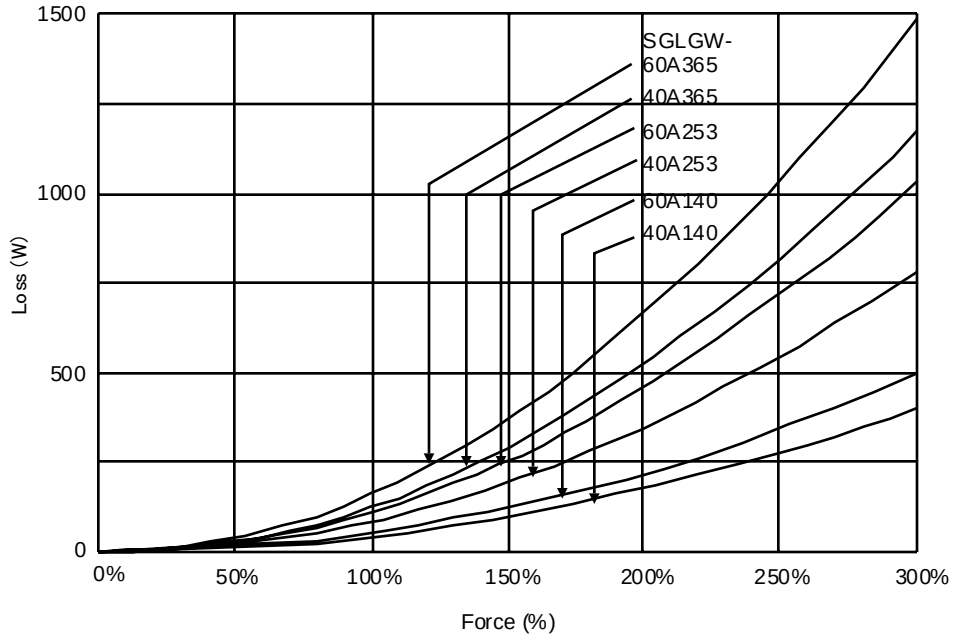
- Run period energy for the continuous run mode: E_G (J)
  Where, $E_G=V_{MG}T_Gt_G$
- V_{MG}: Linear motor speed for above run period (m/s)
- T_G: Linear motor generated force (N) for continuous regeneration mode run period
- t_G: Run time for the above (sec)
- Energy consumed by regenerative resistor: $E_K=E_S\ (E_L+E_M+E_C)+E_G$
- Needed Regenerative Resistor Capacity: $W_K=E_K/\ (0.2\times T)$

4.2.2 Linear Motor Winding Resistance Loss

The relationship between the linear motor generated force and the winding resistance loss is given below.

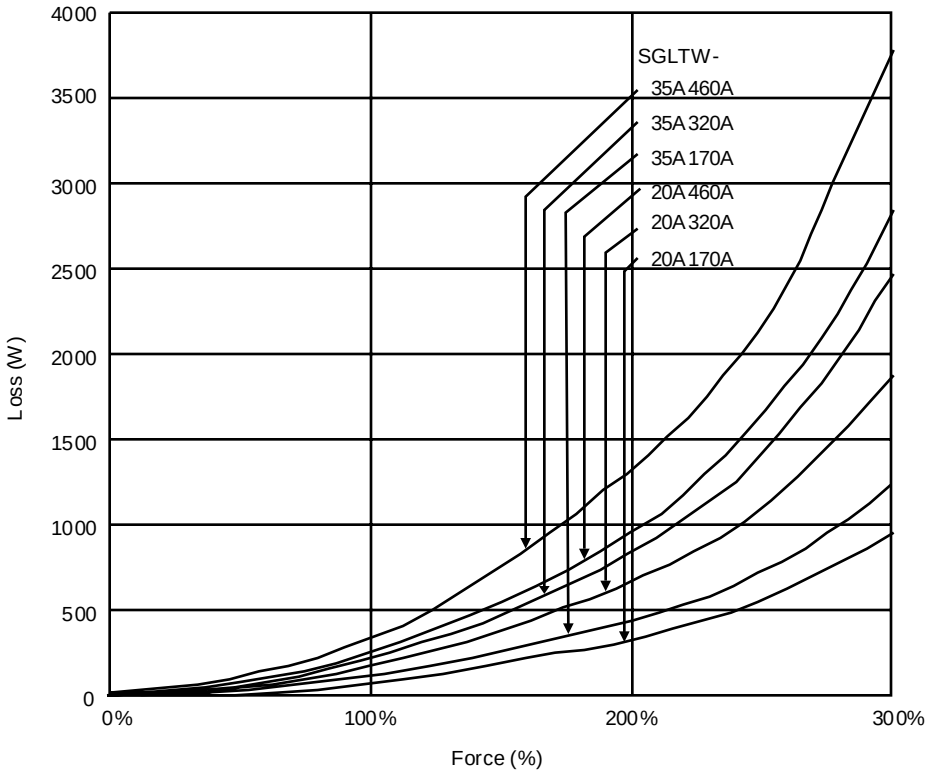
4. 2. 2.1 SGLGW-Type Linear Motors

1. SGLGW-60A365, 40A365, 60A253, 40A253, 50A140, 40A140

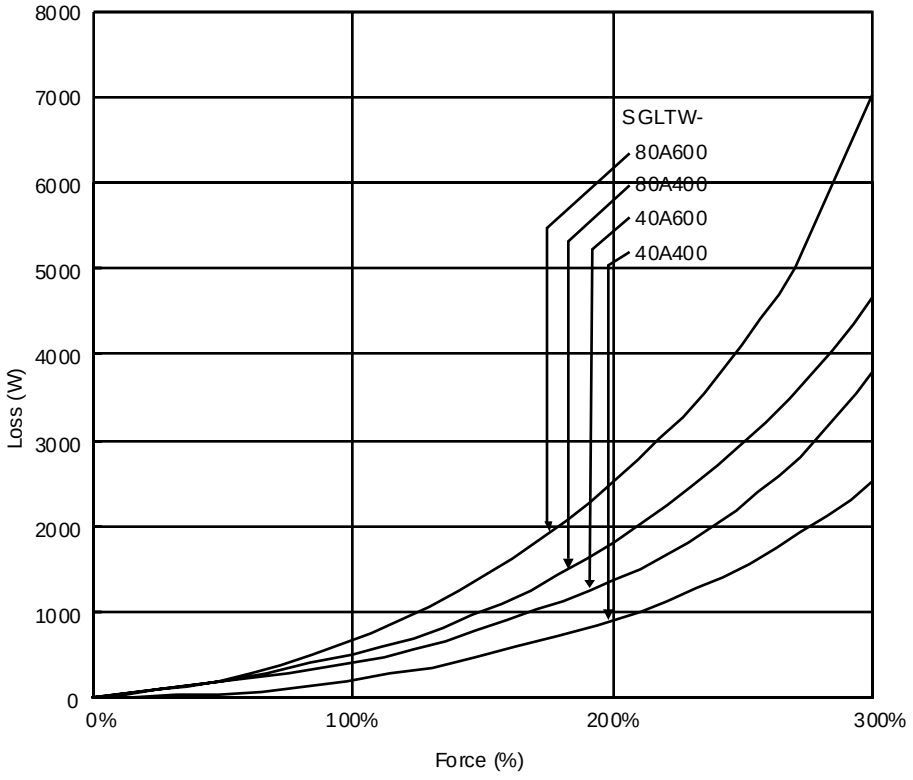


4. 2. 2.2 SGLTW-Type Linear Motors

1. SGLTW-35A460A, 35A320A, 35A170A, 20A460A, 20A320A, 20A170A

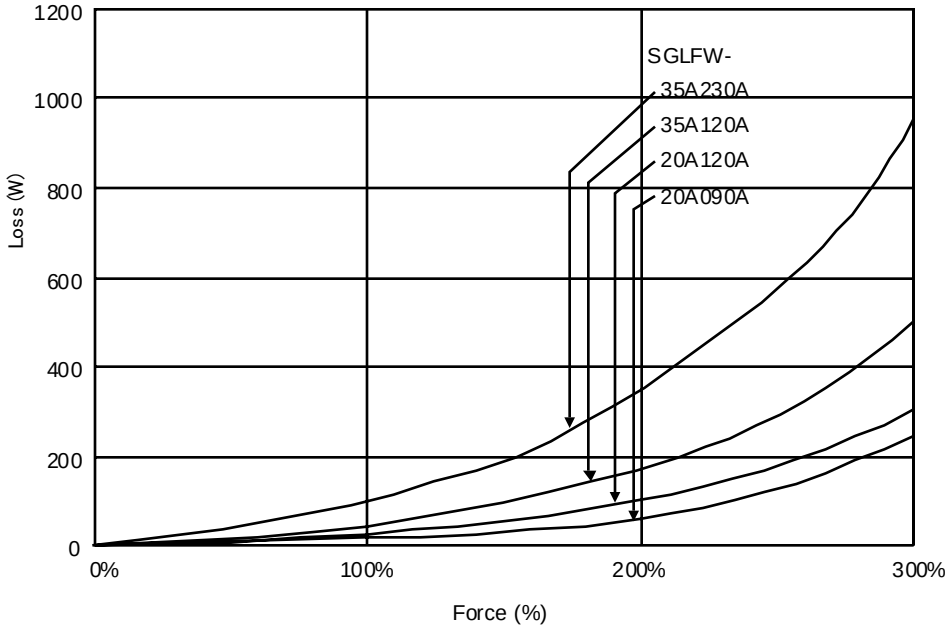


2. SGLTW-80A600, 80A400, 40A600, 40A400

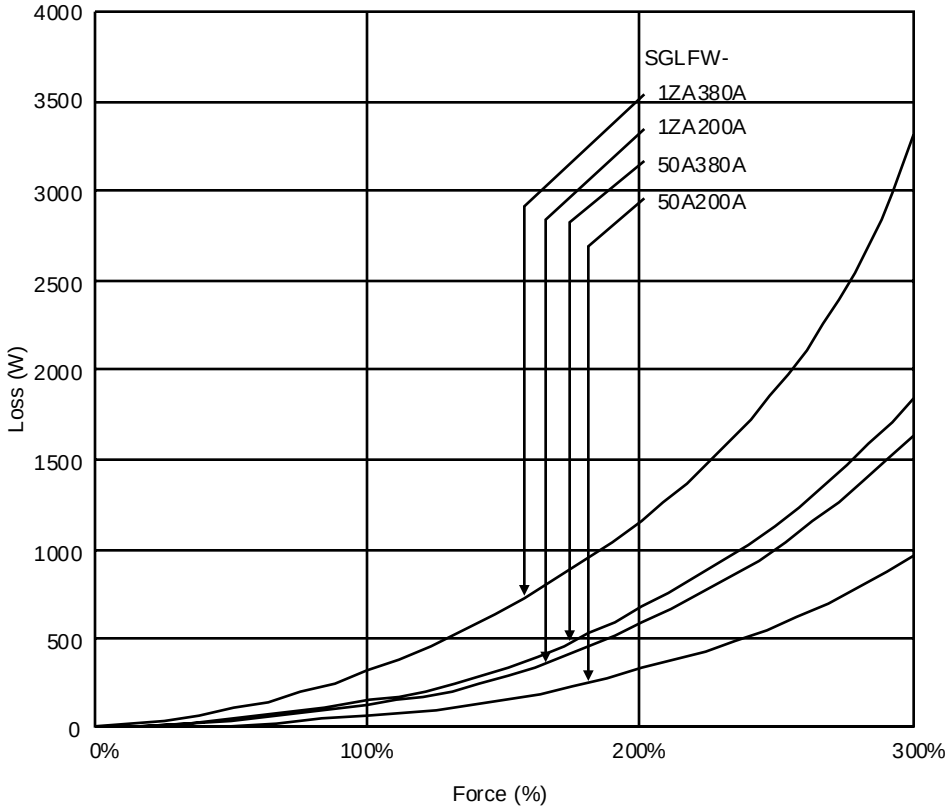


4. 2. 2.3 SGLFW-Type Linear Motors

1. SGLFW-35A230A, 35A120A, 20A120A, 20A090A



2. SGLFW-1ZA380A, 1ZA200A, 50A380A, 50A200A

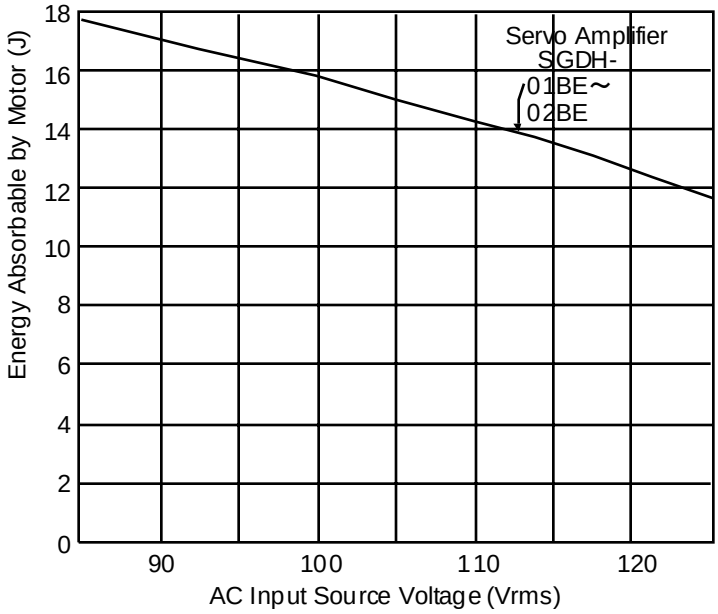


4.2.3 Energy Absorbable by Servo Amplifier

The relationship between servo amplifier input source voltage and absorbable energy is shown below.

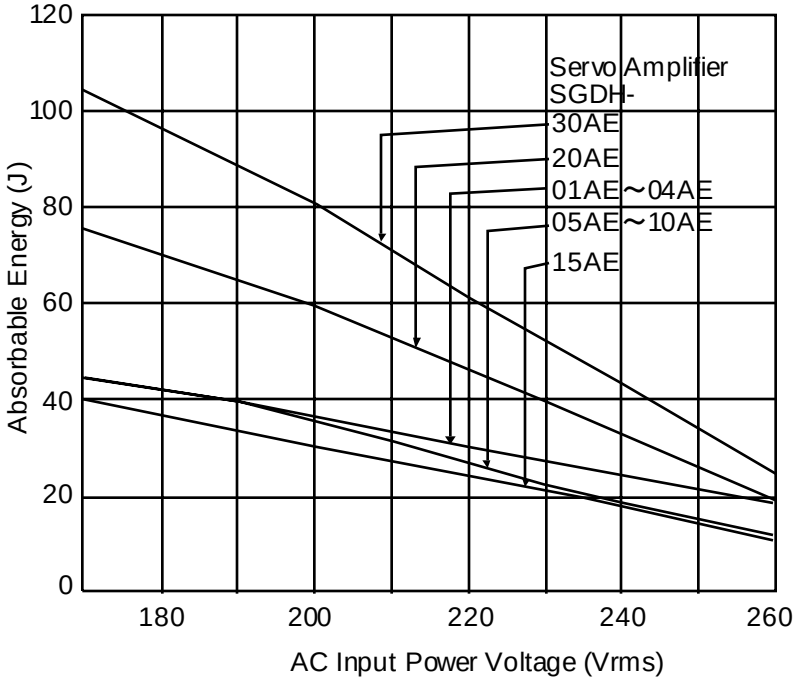
4. 2. 3.1 100V Servo Amplifiers

1. SGDH-01BE~02BE

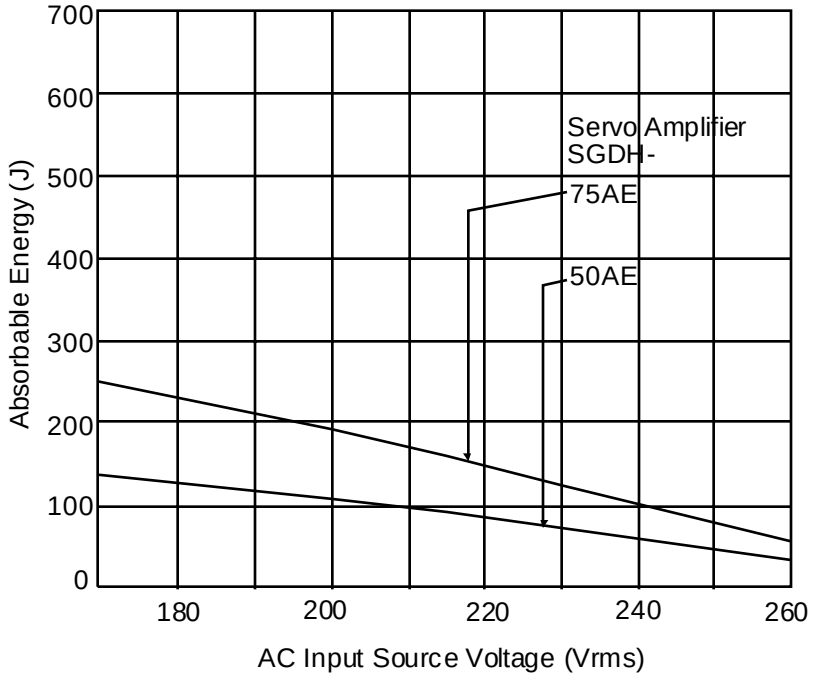


4. 2. 3.2 200V Servo Amplifiers

1. SGDH-05AE~10AE, 01AE~04AE, 15AE, 20AE, 30AE



2. SGDH-50AE, 75AE



5. Differences Between Rotary Motors and Linear Motors

5.1 Terms/Units

Rotary-Type		Linear-Type	
Name	Unit	Name	Unit
Torque	N•m	Force	N
Speed	r/min	Speed	mm/s
Acceleration	r/s^2	Acceleration	mm/s^2
Moment of Inertia	Kg/m^2	Mass	Kg
		Linear Scale Pitch	μm
Encoder Resolution	P/r	Encoder Resolution	Pulse/Scale Pitch

5.2 User Parameters

5.2.1 User Parameter List

The user Parameter List is shown below.

Type	User Parameter No.	Name	Unit	Setting Range	Factory Setting	Difference From Rotary Type
Function Selection Parameters	Pn000	Basic Function Selection Switch Note 1	—	—	0000	—
	Pn001	Function Selection Application Switch1 Note 2	—	—	0000	—
	Pn002	Function Selection Application Switch2 Note 2	—	—	0000	—
	Pn003	Function Selection Application Switch 3	—	—	0002	—
	Pn004	Reserved Parameters (do not use)	—	—	0000	—
	Pn005		—	—	0000	—
	Pn006		—	—	0100	—
	Pn080	Function Selection Application Switch 6 Note 2	—	—	0000	Newly Added

Type	User Parameter No.	Name	Unit	Setting Range	Factory Setting	Difference From Rotary Type
Gain-Related Parameters	Pn100	Speed Loop Gain	Hz	1~2000	40	—
	Pn101	Speed Loop Integral Time Constant	0.01ms	15~51200	2000	—
	Pn102	Position Loop Gain	1/s	1~2000	40	—
	Pn103	Mass Ratio	%	0~10000	0	Name Changed
	Pn104	2nd Speed Loop Gain	Hz	1~2000	40	—
	Pn105	2nd Speed Loop Integral Time Constant	0.01ms	15~51200	2000	—
	Pn106	2nd Position Loop Gain	1/s	1~2000	40	—
	Pn108	Bias Acceleration Width	Command Unit	0~250	7	—
	Pn109	Feed Forward	%	0~100	0	—
	Pn10A	Feed Forward Filter Time Constant	0.01ms	0~6400	0	—
	Pn10B	Gain-Related Application Switch Note 2	—	—	0000	—
	Pn10C	Mode Switch (Force Reference)	%	0~800	200	Name Changed
	Pn10F	Mode Switch (Deviation Pulse)	Command Unit	0~10000	0	—
	Pn110	Online Autotuning-related Switch Note 2	—	—	0010	—
	Pn111	Speed Feedback Compensation Note 1	%	1~500	100	—
	Pn112	Reserved Parameters (do not use)	%	0~1000	100	—
	Pn113		—	0~1000	1000	—
	Pn114		—	0~1000	200	—
	Pn115		—	0~65535	32	—
	Pn116		—	0~65535	16	—
	Pn117		%	20~100	100	—
	Pn118		%	50~100	100	—
	Pn119		1/s	1~2000	50	—
	Pn11A		0.1%	1~2000	1000	—
	Pn11B		Hz	1~150	50	—
	Pn11C		Hz	1~150	70	—
	Pn11D		%	0~150	100	—
	Pn11E		%	0~150	100	—
	Pn11F		ms	0~2000	0	—
	Pn120		0.01ms	0~51200	0	—
	Pn121		Hz	10~250	50	—
	Pn122		Hz	0~250	0	—

Type	User Parameter No.	Name	Unit	Setting Range	Factory Setting	Difference From Rotary Type
Gain-Related Parameters (continued)	Pn123	Reserved Parameter (do not use)	%	0~100	0	—
	Pn180	Bias	mm/s	0~450	0	User Parameter No. Changed, Unit Changed
	Pn181	Mode Switch (Speed Reference)	mm/s	0~5000	0	
	Pn182	Mode Switch (Acceleration)	mm/s^2	0~3000	0	
Position-Related Parameters	Pn200	Position Control Command Status Selection Switch Note 2	—	—	0000	—
	Pn202	Electronic Gearing Ratio (Numerator) Note 2	—	1~65535	4	—
	Pn203	Electronic Gearing Ratio (Denominator) Note 2	—	1~65535	1	—
	Pn204	Position Reference Accel/ Decel Time Constant	0.01ms	0~6400	0	—
	Pn207	Position Control Function Switch Note 2	—	—	0000	—
	Pn208	Average Position Reference Motion Time Note 2	0.01ms	0~6400	0	—
	Pn280	Linear Scale Pitch Note 6	μm	0~65535	0	Newly Added
	Pn281	Encoder Resolution	Pulse/ Scale Pitch (Pn280)	1~256	20	
Speed-Related Parameters	Pn300	Speed Reference Input Gain	0.01V/ Rated Speed	150~3000	600	—
	Pn305	Soft Start Acceleration Time	ms	0~10000	0	—
	Pn306	Soft Start Deceleration Time	ms	0~10000	0	—
	Pn307	Speed Reference Filter Time Constant	0.01ms	0~65535	40	—
	Pn308	Speed F/B Filter Time Constant	0.01ms	0~65535	0	—
	Pn380	Internal Setting Speed 1	mm/s	0~5000	10	User parameter no. changed, Factory setting changed, Unit changed
	Pn381	Internal Setting Speed 2	mm/s	0~5000	20	
	Pn382	Internal Setting Speed 3	mm/s	0~5000	30	
	Pn383	JOG Speed	mm/s	0~5000	50	

Type	User Parameter No.	Name	Unit	Setting Range	Factory Setting	Difference From Rotary Type
Force-Related Parameters	Pn400	Force Reference Input Gain	0.1V/ Continuous Force	10~100	30	Name Changed
	Pn401	Force Reference Filter Time Constant	0.01ms	0~65535	100	Name Changed
	Pn404	Forward External Force Limit	%	0~800	100	Name Changed
	Pn405	Reverse External Force Limit	%	0~800	100	Name Changed
	Pn406	Emergency Stop Force	%	0~800	800	Name Changed
	Pn408	Force-Related Function Switch	—	—	0000	Name Changed
	Pn409	Notch Filter Frequency	Hz	50~2000	2000	—
	Pn480	Speed Limit During force Control	mm/s	0~5000	5000	User parameter no. changed, Factory setting changed, Unit changed
	Pn483	Forward Force Limit Note 7	%	0~800	30	User Parameter No. Changed, Factory Setting Changed
	Pn484	Reverse Force Limit Note 7	%	0~800	30	

Type	User Parameter No.	Name	Unit	Setting Range	Factory Setting	Difference From Rotary Type
Sequence-Related Parameters	Pn500	Positioning Completion Width	Command Unit	0~250	7	—
	Pn504	NEAR Signal Width	Command Unit	1~250	7	—
	Pn505	Overflow Level	256 Command Units	1~32767	1024	—
	Pn506	Brake Command—Servo OFF Lag Time	10ms	0~50	0	—
	Pn508	Servo OFF—Brake Command Wait Time	10ms	10~100	50	—
	Pn509	Momentary Stop Hold Time	ms	20~1000	20	—
	Pn50A	Input Signal Selection 1 Note 2	—	—	2100	—
	Pn50B	Input Signal Selection 2 Note 2	—	—	6543	—
	Pn50C	Input Signal Selection 3 Note 2	—	—	8888	—
	Pn50D	Input Signal Selection 4 Note 2	—	—	8888	—
	Pn50E	Output Signal Selection 1 Note 2	—	—	3211	—
Sequence-Related Parameters (continued)	Pn50F	Output Signal Selection 2 Note 2	—	—	0000	—
	Pn510	Output Signal Selection 3 Note 2	—	—	0000	—
	Pn511	Reserved Parameters (do not use)	—	—	8888	—
	Pn512	Output Signal Inversion Setting Note 2	—	—	0000	—
	Pn580	Zero Clamp Level	mm/s	0~5000	10	User Parameter No. Changed, Unit Changed
	Pn581	Zero Speed Level	mm/s	1~5000	20	
	Pn582	Speed Coincidence Signal Output Band	mm/s	0~100	10	
	Pn583	Brake Command Output Speed Level	mm/s	0~5000	100	
Other Parameters	Pn600	Regenerative Resistor Capacity Note 3	W	0~by device type Note 5	0	—
	Pn601	Reserved Parameters (do not use)	—	0~by device type Note 5	0	—

Note 1 The settings in user parameter Pn111 are enabled when user parameter Pn110.1 is “0”.

Note 2 When this user parameter is changed, it is necessary to turn the main and control power OFF and ON again in order to enable the function. However, Pn110.1 and Pn110.2 are enabled online.

Note 3 This is normally set to “0”. Set to the capacity (W) of the regenerative resistor if an external regenerative resistor is installed.

Note 4 The set value is ignored.

Note 5 The upper limit is the maximum output capacity (W) of the applied servo amplifier.

Note 6 The initial value is set to “0”. Therefore, alarm A.80 will be output when the power is first turned ON. The alarm will not be output if this user parameter is set to the correct value and the power turned ON again.

Note 7 The factory setting is set small to prevent danger in motor setup. Raise the force to the amount used after setup is finished.

5.2.2 Switch List

The switch List is shown below.

User Parameter No.	Digit Position	Name	Setting	Content	Factory Setting
Pn000 Basic Function Selection	0	Motion Direction Selection	0	Forward	0
			1	Reverse	
	1	Control Format Selection	0	Speed Control (analog reference)	0
			1	Position Control (pulse queue reference)	
			2	Force Control (analog reference)	
			3	Internal Setting Speed Control (contact reference)	
			4	Internal Setting Speed Control (contact Reference Speed Control (analog reference)	
			5	Internal Setting Speed Control (contact reference) Position Control (pulse queue reference)	
			6	Internal Setting Speed Control (contact reference)´ Force Control (analog reference)	
			7	Position Control (pulse queue reference) Speed Control (analog reference)	
			8	Position Control (pulse queue reference) Force Control (analog reference)	
			9	Force Control (analog reference) Speed Control (analog reference)	
			40090A	Speed Control (analog reference) Zero Clamp	
			B	Position Control (pulse queue reference) Position Control (inhibit)	
	2	Axis Address	0~F	Sets servo amplifier axis address.	0
	3	Rotary/Linear Actuation Selection (with encoder disconnected)	0	Actuate as rotary.	0
			1	Actuate as linear.	

User Parameter No.	Digit Position	Name	Setting	Content	Factory Setting
Pn001 Application Function Selection	0	Stop Method at Servo OFF or Alarm Occurrence	0	Stop motor by dynamic braking (DB).	0
			1	Stop motor by DB, the release D.	
			2	Do not use DB, let motor coast to stop.	
	1	Stop Method at Overtravel (OT)	0	Stop by DB or coasting (same stop method as in Pn001.0)	0
			1	Assume the force set in Pn406 to be the maximum value, decelerate the motor to stop, the go to a servo lock state.	
			2	Assume the force set in Pn406 to be the maximum value, decelerate the motor to stop, the go to a free-run state.	
	2	AC/DC Power Input Selection	0	Not DC Power Input-Compatible: Input AC power from terminals L1, L2, and (L3).	0
			1	DC Power Input-Compatible: Input DC power from the (+)1– (–) power inputs.	
	3	Warning CodeOutput Selection	0	AL01, AL02, and AL03 output warning codes only.	0
			1	AL01, AL02, and AL03 output both alarm codes and warning codes. However, the ALM signal output stays ON (normal) during warning output.	
Pn002 Application Function Selection	0	Speed/Position Control Option (T-REF assignment)	0	None	0
			1	Use T-REF after inputting external force limit.	
			2	Use T-REF after inputting force feed forward.	
			3	Use the T-REF terminal as the external force limit input when P-CL and N-CL are “enabled”.	
	1	Force Control Option (V-REF assignment)	0	None	0
			1	Use V-REF after inputting external speed limit.	
	2	Reserved Parameters (do not use)	—	—	0
	3		—	—	0

User Parameter No.	Digit Position	Name	Setting	Content	Factory Setting
Pn003 Application Function Selection	0	Analog Monitor 1 Force Reference Monitor	0	Monitor Motion Speed: 1V/1000mm/s	2
			1	Speed Reference: 1V/1000mm/s	
			2	Force Reference:1V/100%	
			3	Position Deviation: 0.05V/1 Command Unit	
			4	Position Deviation: 0.05V/100 Command Unit	
			5	Command Pulse Frequency [mm/s conversion]:1V/1000mm/s	
	1	Analog Monitor 2 Speed Reference Monitor	6	Motor Run Speed×4: 1V/250mm/s	0
			7	Motor Run Speed×8: 1V/125mm/s	
			8	Reserved Parameter(do not use)	
			9		
			40090A		
			B		
			C		
			D		
			E		
			F		
	2	Reserved	—	—	0
	3	Reserved	—	—	0
Pn080 Machine Selection Applications	0	Hall Sensor Selection[Note 3]	0	Yes	0
			1	None	0
	1	Motor Phase Order Selection	0	A-phase progression, U, V, W-phase order	0
			1	B-phase progression, U, V, W-phase order	0
	2	Reserved	—	—	0
	3	Reserved	—	—	0

User Parameter No.	Digit Position	Name	Setting	Content	Factory Setting
Pn10B Gain-Related Applications	0	Mode Switch Selection	0	Takes internal force reference as a condition (Level Setting: Pn10C)	0
			1	Takes speed reference as a condition (Level Setting: Pn10D)	
			2	Takes acceleration as a condition (Level Setting: Pn10E)	
			3	Takes deviation pulse as a condition (Level Setting: Pn10F)	
			4	No mode switch function	
	1	Speed Loop Control Method	0	PI Control	0
			1	IP Control	
	2	Reserved	0	—	0
	3	Reserved Parameter (do not use)	0~2	—	0
Pn110 Autotuning	0	Online Autotuning Method	0	Timing at initial run only.	0
			1	Always tune.	
			2	No autotuning.	
	1	Speed Feedback Compensation Function Selection	0	Yes	1
			1	None	
	2	Viscous Friction Compensation Function Selection	0	Friction Compensation: None	0
			1	Friction Compensation: Small	
			2	Friction Compensation: Large	
	3	Reserved Parameters (do not use)	0~3	—	0
Pn200 Position Control	0	Command Pulse Status	0	Symbol+Pulse, Positive Logic	0
			1	CW+CCW, positive logic	
			2	A-phase + B-phase (1×), positive logic	
			3	A-phase + B-phase (2×), positive logic	
			4	A-phase + B-phase (4×), positive logic	
			5	Symbol+Pulse, Negative Logic	
			6	CW+CCW, negative logic	
			7	A-phase + B-phase (1×), negative logic	
			8	A-phase + B-phase (2×), negative logic	
			9	A-phase + B-phase (4×), negative logic	

User Parameter No.	Digit Position	Name	Setting	Content	Factory Setting
Pn200 Position Control (continued)	1	CLEAR Signal Status	0	Clear deviation counter with signal at “H” level.	0
			1	Clear the deviation counter at upward signal transfer.	
			2	Clear deviation counter with signal at “L” level.	
			3	Clear the deviation counter at downward signal transfer.	
	2	CLEAR Operation	0	Clear deviation counter during base block.	0
			1	Do not clear deviation counter (Clear only with CLR signal)	
			2	Clear deviation counter at alarm occurrence.	
	3	Filter Selection	0	Command input filter using line driver signal	0
			1	Command input filter using open collector signal	
Pn207 Position Control Function Switch	0	Position reference Filter Selection	0	Accel/Decel Filter	0
			1	Average Motion Filter	
	1	Position Control Options	0	None	0
			1	Use V-REF as the speed feed-forward input.	
	2	Reserved		—	0
	3	Reserved Parameters (do not use)	—	—	0
Pn408 Force-Related Function Switch	0	Notch Filter Function Selection	0	None	0
			1	Use the notch filter in the force reference.	
	1	Reserved		—	0
	2	Reserved		—	0
	3	Reserved		—	0

5.2.3 Input Signal Selection List

The input signal selection list is shown below.

User Parameter No.	Digit Position	Name	Setting	Content	Factory Setting
Pn50A	0	Input Signal Assignment Mode	0	Set the input signal assignment used in the sequence the same as the SGDB servo amplifier.Note1, Note2, Note3	0
			1	The above input signal assignments can be freely set.	
	1	/S-ON Signal Mapping (Servo ON at “L”)	0	Input from SI0 (CN1-40) input terminal Note3	0: SI0
			1	Input from SI1 (CN1-41) input terminal	
			2	Input from SI2 (CN1-42) input terminal	
			3	Input from SI3 (CN1-43) input terminal Note1	
			4	Input from SI4 (CN1-44) input terminal	
			5	Input from SI5 (CN1-45) input terminal	
			6	Input from SI6 (CN1-46) input terminal	
			7	Signal fixed at “enabled”	
			8	Signal fixed at “disabled”	
			9	Inverted signal input from SI0 (CN1-40) input terminal	
			A	Inverted signal input from SI1 (CN1-41) input terminal	
			B	Inverted signal input from SI2 (CN1-42) input terminal Note1	
			C	Inverted signal input from SI3 (CN1-43) input terminal	
			D	Inverted signal input from SI4 (CN1-44) input terminal	
			E	Inverted signal input from SI5 (CN1-45) input terminal	
			F	Inverted signal input from SI6 (CN1-46) input terminal	
	2	/P-CON Signal Mapping (P control at “L”)	0~F	As above	1: SI1
	3	P-OT Signal Mapping (overtravel at “H”)	0~F	As above	2: SI2

User Parameter No.	Digit Position	Name	Setting	Content	Factory Setting
Pn50B	0	N-OT Signal Mapping (overtravel at “H”)	0~F	As above	3: SI3
	1	/ALM-RST Signal Mapping (alarm reset at “L”)	0~F	As above	4: SI4
	2	/P-CL Signal Mapping (force limit at “L”)	0~F	As above	5: SI5
	3	/N-CL Signal Mapping (force limit at “L”)	0~F	As above	6: SI6
Pn50C	0	/SPD-D Signal Mapping (internal setting speed selection)	0~F	As above	8: Disabled
	1	/SPD-A Signal Mapping (internal setting speed selection)	0~F	As above	8: Disabled
	2	/SPD-B Signal Mapping (internal setting speed selection)	0~F	As above	8: Disabled
	3	/C-SEL Signal Mapping (control mode switching)	0~F	As above	8: Disabled
Pn50D	0	/ZCLAMP Signal Mapping (zero clamp)	0~F	As above	8: Disabled
	1	/INHIBIT Signal Mapping (command pulse inhibit)	0~F	As above	8: Disabled
	2	/G-SEL Signal Mapping (gain switching)	0~F	As above	8: Disabled
	3	/P-DET Signal Mapping (polarity detection)Note3	0~F	As above	8: Disabled

Note 1 In the SGDB servo amplifier function interchange mode where Pn50A.0=0, only settings Pn50A.1=7, Pn50A.3=8, and Pn50B.0=8 are possible.

Note 2 When Pn50A.1=1, the zero clamp function by /P-CON signal cannot be used.

Note 3 If Pn080.0 is set to 1 (no polarity sensor), set Pn50A.0=1, and set Pn50D.3 to any value desired. The motor cannot be driven unless polarity detection is performed.

5.2.4 Output Signal Selection List

The output signal selection list is shown below.[Note1, Note2]

User Parameter No.	Digit Position	Name	Setting	Content	Factory Setting
Pn50E	0	/COIN Signal Mapping (internal setting speed selection)	0	Not used	1: SO1
			1	SO1 (CN1-25, 26) output from output terminal	
			2	SO2 (CN1-27, 28) output from output terminal	
			3	SO3 (CN1-29, 30) output from output terminal	
	1	/V-CMP Signal Mapping	0~3	As above	1: SO1
	2	/TGON Signal Mapping	0~3	As above	2: SO2
	3	/S-RDY Signal Mapping	0~3	As above	3: SO3
Pn50F	0	/CLT Signal Mapping	0~3	As above	0: Unused
	1	/VLT Signal Mapping	0~3	As above	0: Unused
	2	/BK Signal Mapping	0~3	As above	0: Unused
	3	/WARN Signal Mapping[Note 3]	0~3	As above	0: Unused
Pn510	0	/NEAR Signal Mapping	0~3	As above	0: Unused
	1	Reserved Parameter	0~3	As above	0: Unused
	2	Reserved	0	—	0
	3	Reserved	0	—	0
Pn512	0	SO1 (CN1-25, 26) Terminal Output Signal Inversion	0	No output signal inversion.	0
			1	Output signal inversion.	
	1	SO2 (CN1-27, 28) Terminal Output Signal Inversion	0	No output signal inversion.	0
			1	Output signal inversion.	
	2	SO3 (CN1-29, 30) Terminal Output Signal Inversion	0	No output signal inversion.	0
			1	Output signal inversion.	
	3	Reserved	—	—	0

Note 1 If multiple signals are assigned to the same output circuit, the output is done by OR logic.

Note 2 Undetected signals are assumed to be OFF according to the control mode. For example, the /COIN signal is assumed to be OFF in the speed control mode.

Note 3 /WARN Signal Types: Overload, Regent Overload, Option Warning

5.2.5 Auxiliary Function List

The auxiliary function list is shown below.

User Parameter No.	Function
Fn000	Displays alarm traceback data
Fn001	Sets rigidity in online autotuning
Fn002	JOG Mode Run
Fn003	Origin Search Mode
Fn004	(reserved parameter)
Fn005	User Parameter Setting Initialization
Fn006	Alarm Traceback Data Clear
Fn007	Write Results of Online Autotuning Operation to Mass Ratio Data EEPROM
Fn008	Absolute Encoder Multi-Turn Setting (setup operation) and Encoder Alarm Reset
Fn009	Automatic Adjustment of Analog (speed , force) Reference Offsets
Fn00A	Manual Adjustment of Speed Reference Offset
Fn00B	Manual Adjustment of Force Reference Offset
Fn00C	Manual Zero Adjustment of Analog Monitor Output
Fn00D	Manual Gain Adjustment of Analog Monitor Output
Fn00E	Automatic Adjustment of Motor Current Detection Signal Offset
Fn00F	Manual Adjustment of Motor Current Detection Signal Offset
Fn010	Password Setting (user parameter overwrite prohibition processing)
Fn011	Verification of Motor Type
Fn012	Display Servo Amplifier Software Version
Fn013	Change Multi-Turn Limit Setting at ”Multi-Turn Limit Non-Coincidence (A.CC)” Alarm Occurrence
Fn014	Clear Result of Option Unit Detection

5.2.6 Monitor Mode List

The monitor mode list shown below.

User Parameter No.	Display Content	Unit	Note
Un000	Actual Motor Motion Speed	mm/s	—
Un001	Speed Reference Input	mm/s	—
Un002	Internal Force Reference	%	Percentage of rated force
Un003	Electrical Angle 1	pulse	Number of pulses from origin
Un004	Electrical Angle 2	deg	Degrees from origin (electrical angle)
Un005	Input Signal Monitor	—	—
Un006	Output Signal Monitor	—	—
Un007	Speed of Input Reference Pulse	mm/s	—
Un008	Deviation Counter Value	Command Unit	Position Deviation
Un009	Cumulative Load Rate	%	Value at 100% rated force Displays the effective force for a 10sec. cycle
Un00A	Rated Load Factor	%	Value at 100% processable regen power Displays the regen consumption power for a 10sec period
Un00B	DB Resistor Consumption Power	%	Value at 100% processable power during dynamic brake operation Displays DB consumption current for a 10sec cycle
Un00C	Input Reference Pulse Counter	—	Displayed in hexadecimals
Un00D	Feedback Pulse Counter	—	Displayed in hexadecimals
Un104	Number of S-PG Communication Errors	—	Displayed in decimals (common to rotary and linear)

5.3 Alarm Display List

The ON/OFF relationships for “Alarm Displays” and “Alarm Outputs” are shown in the table below.

Alarm Display and Output List

Alarm Display	Alarm Code Output			Servo Alarm (ALM) Output	Alarm Name	Alarm Content	Alarm Object	
	ALO1	ALO2	ALO3				Rotary	Linear
A.02	×	×	×	×	Parameter Corruption[Note 2]	Error in servo amplifier EEPROM data	●	●
A.03					Main Circuit Sensor Error	Error in individual detection data for the power circuit	●	●
A.04					Parameter Setting Error[Note 2]	A user parameter value exceeding the setting range was set	●	
A.04					User Parameter Setting[Note 2] Error	• A value outside the setting range was previously set or saved in a user parameter. • Pn080.0=1 even though Hall sensor is attached, or pn080.0=0 even though no Hall sensor is attached.		●
A.05					Combination Error	Improper combination of motor and servo amplifier capacity	●	●
A.08					Linear Scale Pitch Setting Error	Value of Pn280 is at factory setting.		●
A.10	○	×	×	×	Overcurrent or heat sink overheat[Note 2]	Heating current is flowed to IGBT. or servo amplifier heat sink has overheated	●	●
A.30	○	○	×	×	Regent Error	• Regenerative Resistor Disconnection • Regenerative transistor failure	●	●
A.32					Regent Overload	Regeneration energy has exceeded the capacity of the regenerative resistor	●	●
A.33					Main Power Connection Error	(DC power fed in AC power input mode) (AC power fed in DC power input mode)	●	●
A.40	×	×	○	×	Overvoltage[Note 4]	Main circuit DC voltage is too high	●	●
A.41					Undervoltage[Note 4]	Main circuit DC voltage has dropped	●	●

Alarm Display	Alarm Code Output			Servo Alarm (ALM) Output	Alarm Name	Alarm Content	Alarm Object	
	ALO1	ALO2	ALO3				Rotary	Linear
A.51	○	×	○	×	Overspeed	Motor speed is too high	●	
A.51					Overspeed	Encoder output frequency has exceeded 15Mpps		●
A.71	○	○	○	×	Overload(momentary maximum load)	Operated for several to sever lens of seconds at torque or force greatly exceeding the rating	●	●
A.72					Overload(continuous maximum load)	Continuous operation at a torque or force exceeding the rating	●	●
A.73					DB Overload	The kinetic energy in DB (dynamic braking) operation exceeds the capacity of the DB resistor	●	●
A.74	○	○	○	×	Surge Resistor Overload	Main power ON/OFF frequently repeated	●	●
A.7A					Heat Sink Overheat Note 1	Servo amplifier heat sink has overheated	●	●
A.81	×	×	×	×	Encoder Backup Alarm Note 2	Encoder power is completely down, and position data is cleared	●	●
A.82					Encoder Sum Check Alarm Note 2	Error in encoder memory sum check results	●	●
A.83					Encoder Battery Alarm	Drop in absolute encoder backup battery	●	●
A.84					Encoder Absolute Alarm Note 2	Error in absolute data received	●	●
A.85					Encoder Overspeed	The encoder operated at excessive speed when power was fed	●	●
A.86					Encoder Overheat	Internal temperature of encoder is too high	●	●
A.b1					Speed Reference A/D Error	Error in speed reference input A/D converter	●	●
A.b2					Torque/Force Reference A/D Error	Error in torque/force reference A/D converter	●	●
A.Bf					System Alarm Note 2		●	●

Alarm Display	Alarm Code Output			Servo Alarm (ALM) Output	Alarm Name	Alarm Content	Alarm Object	
	ALO1	ALO2	ALO3				Rotary	Linear
A.C1	○	×	○	×	Runaway Prevention Detection	Runaway linear motor	●	●
A.C5					Linear Motor Polarity Position Error Detection	Detection of linear motor polarity position failed		●
A.C8					Encoder CLEAR Error Multi-Turn Limit Setting Error[Note 2]	The multi-turn value of the absolute encoder has been cleared, or the settings are incorrect	●	
A.C9					Encoder Communication Error[Note 2]	Communication not possible between encoder and servo amplifier	●	●
A.CA					Encoder Parameter Error[Note 2]	Encoder parameters are corrupted	●	●
A.Cb					Encoder Echo-back Error[Note 2]	Content of the encoder communication is erroneous	●	●
A.CC					Multi-Turn Limit Non-Coincidence[Note 3]	Multi-turn limit data between encoder and servo amplifier do not match	●	
A.d0	○	○	×	×	Excessive Position Deviation	Position deviation pulse exceeds the value set in user parameter (Pn505)	●	●
A.F1	×	○	×	×	Power Line Phase Loss	One phase is missing within the 3-phase main circuit power	●	●
CPF00	Undefined				Digital Operator Communication Error	Communication not possible between the digital operator (JUSP-OP02A-2) and the servo amplifier	●	●
CPF01								
A.- -	×	×	×	○	Not an error display	Shows a normal operation state	●	●

Note 1 ○ : Output transistor ON ×: Output transistor OFF (alarm state)

Note 2 A.08 will always appear at the very first powering-up of the unit. The alarm will go out if the customer inputs the correct values and cycles the power.

Note 3 Displayed in 30W~100W.

Note 4 Cannot be released by the alarm reset (/ALM-RST) signal. Release the alarm by removing the cause of the alarm then turning the power OFF.

Note 5 Installed in version upgrade (SGDM-☐DA) only.

Note 6 Servo amplifiers with capacities of 6kW or greater will display a “Main Circuit Voltage Error Detection” alarm in “A40”. This means that either an overvoltage or undervoltage error has occurred.

For details on these alarms, see 9.2 “Error Diagnosis and Corrective Measures” in the “Σ-II Series SGM☐H/SGDH User's Manual, Design and Maintenance (SI-S800-32.2).

5.4 Warning Display List

The ON/OFF relationships for “Warning Displays” and “Warning Code Outputs” are shown in the table below.

Warning Display and Output List

Warning Display	Warning Code Output			Warning Name	Warning Content	Warning Object	
	ALO1	ALO2	ALO3			Rotary	Linear
A.91	○	×	×	Overload	Warning displayed before reaching an overload (A.71 or A.72) alarm. An alarm may result if operation is continued as is.	●	●
A.92	×	○	×	Regent Overload	Warning displayed before reaching a regen overload (A.32) alarm. an alarm may result if operation is continued as is.	●	●
A.93	×	×	○	Battery Warning	Battery warning message displayed when an absolute encoder is used as an absolute encoder.	●	

Note 1 ○ : Output transistor ON ×: Output transistor OFF (warning state)

6. Ratings and Specifications

6.1 Linear Motors

6.1.1 SGLGW-Type Linear Motor

6. 1. 1.1 Standard Linear Motor Ratings/Specifications

- Time Rating: Continuous
- Insulation Resistance: DC500V, 10MΩ or higher
- Ambient Temperature: 0~40°C
- Excitation Type: Permanent magnet
- Insulation Resist Voltage: AC1500V 1min.
- Protection Methods: Self-cooling, air cooling
- Ambient Humidity: 20~80% (no condensation)

Ratings/Specifications for SGLGW-Type Standard Linear Motor

Linear Motor Model SGLGW-		40A140A	40A253A	40A365A	60A140A	60A253A	60A365A
Continuous Output*	W	94	186	280	146	294	440
Continuous Force*	N	47	93	140	73	147	220
Continuous Current*	Arms	0.8	1.6	2.4	1.2	2.3	3.5
Peak Force*	N	140	280	420	220	440	660
Peak Current*	Arms	2.4	4.9	7.3	3.5	7.0	10.5
Moving Coil Mass	kg	0.39	0.65	0.91	0.47	0.8	1.13
Force Constant	N/Arms	61.5	61.5	61.5	66.6	66.6	66.6
BEMF Constant	V/(m/s)	20.5	20.5	20.5	22.2	22.2	22.2
Electrical Time Constant	ms	0.4	0.3	0.3	0.4	0.4	0.4
Mechanical Time Constant	ms	5.4	4.9	4.7	3.3	3.0	2.9
Allowable Winding Temperature	℃	130 (B type)	130 (B type)	130 (B type)	130 (B type)	130 (B type)	130 (B type)

* These items and force/speed characteristics are the values at a motor winding temperature of 100°C° during operation in combination with a servo amplifier. The others are at 20℃.

Note: "Continuous Force" shows the continuous allowable force when the following aluminum boards (heat sinks) are attached as a cooling means at an ambient temperature of 20°C.

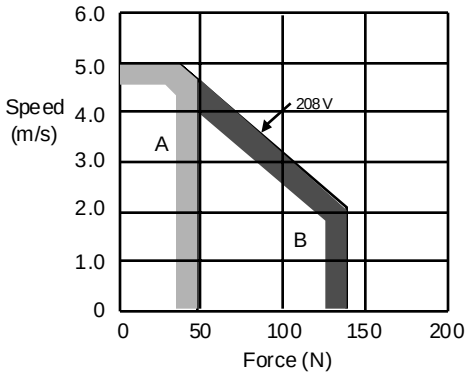
Applied Device Types	Heat Sink Size
40A140A	125×254×13 mm
40A253A	
60A140A	

Applied Device Types	Heat Sink Size
40A365A	305×380×13 mm
60A253A	
60A365A	

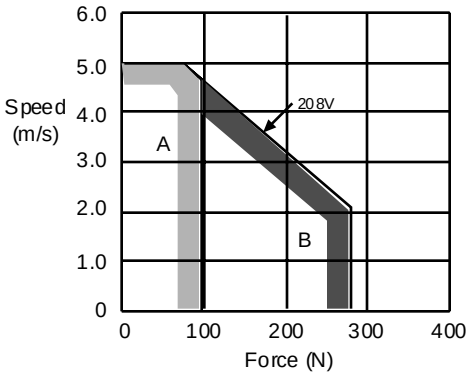
6. 1. 1.2 Force–Speed Characteristics

The force–speed characteristics of the SGLGW linear motors are shown below.

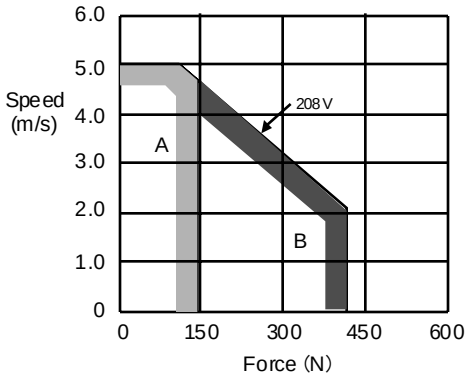
SGLGW-40A140A



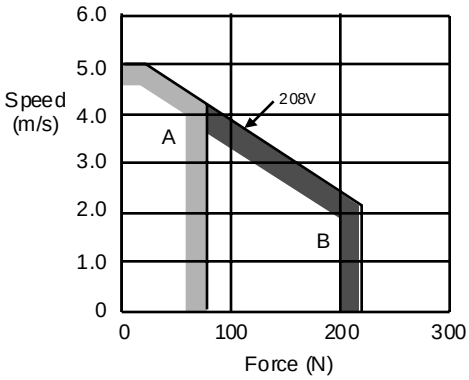
SGLGW-40A253A



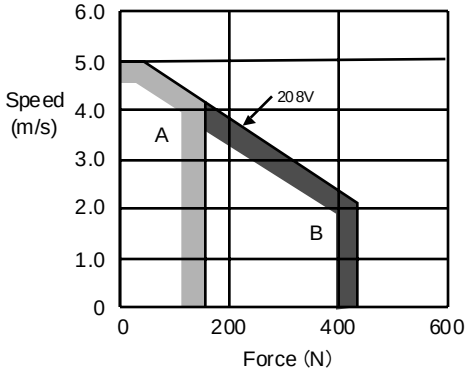
SGLGW-40A365A



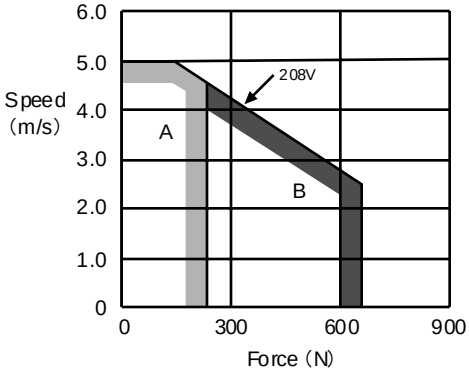
SGLGW-60A140A



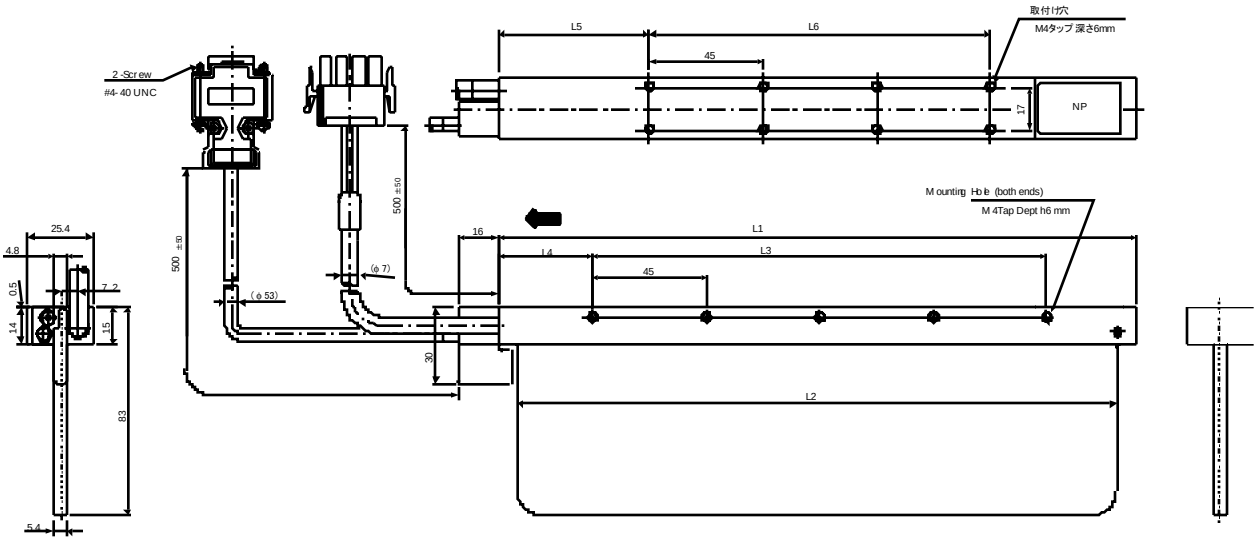
SGLGW-60A253A



SGLGW-60A365A



6. 1. 1.3 Dimensional Drawing of Motor (SGLGW–□□A□□□A□)



Pole Sensor Connector Specifications

Pin Type
Connector: 17JE-23090-02 (D8C)
Dai-ichi Denko, Inc.
Counterpart Model Number

Socket Type
Connector: 17JE-13090-02(D8C)
Studds: 17L-002C or
17L-002C1

Pin No.	Name
1	+5V (Source)
2	U-Phase
3	V-Phase
4	W-Phase
5	0V (Source)
6	Empty
7	Empty
8	Empty
9	Empty

Motor Contactor Specifications

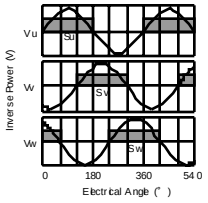
Flag: 350779-1 AMP
Pin: 350561-3 or
350690-3(No.1~3)
350654-1
350669-1(No.4)
Counterpart Model Number

Cap: 3507 80-1
Socket: 350570-3 or
350689-3

Pin No.	Name	Color
1	U-Phase	Red
2	V-Phase	White
3	W-Phase	Blue
4	F G	Grn/Yel

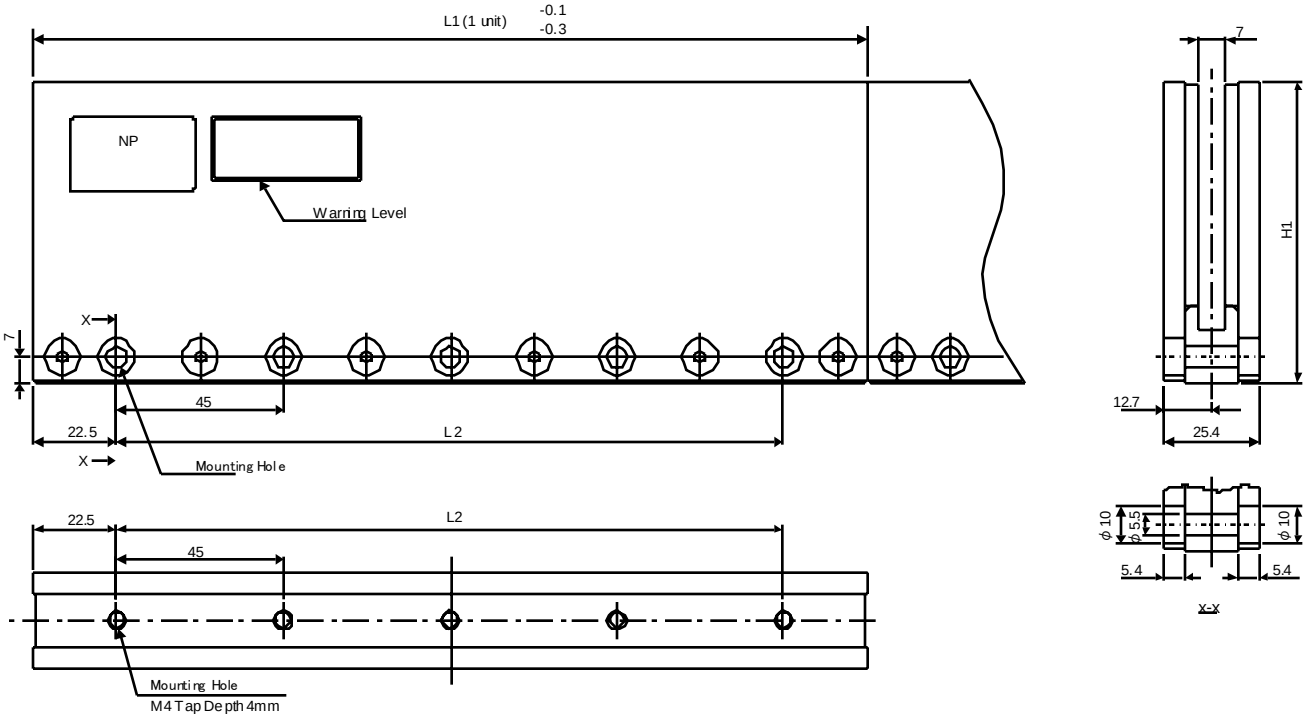
Pole Sensor Output Signal

When the motor moves in the direction indicated by the arrow in the figure, the relationship between the pole sensor output signals Su, Sv, and Sw, and the inverse power of each motor phase becomes as shown in the figure at right.



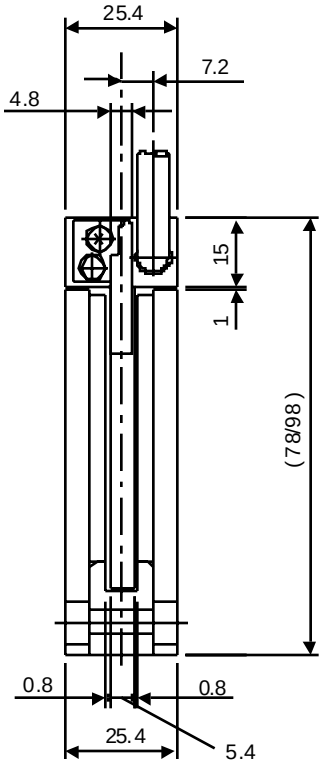
Motor Model SGLGW-	Dim. L1	Dim. L2	Dim. L3	Dim. L4	Dim. L5	Dim. L6	Dim. H1	Units N1	Units N2	Mass (Kg)	Magnet Track Model SGLGM-
40A140A□	140	125	90	30	52.5	45	63	3	4	0.39	40□□□A
40A253A□	252.5	237.5	180	37.5	60	135	63	5	8	0.65	
40A365A□	365	350	315	30	52.5	270	63	8	14	0.91	
60A140A□	140	125	90	30	52.5	45	83	3	4	0.47	60□□□A
60A253A□	252.5	237.5	180	37.5	60	135	83	5	8	0.80	
60A365A□	365	350	315	30	52.5	270	83	8	14	1.13	

6. 1. 1.4 Dimensional Drawing of Magnet Track (SGLGM–□□□□□A)



Magnet Track Model SGLGM-	Dim. L1	Dim. L2	Dim. H1	Units N	Mass (Kg)
40090A	90	45	62	2	0.8
40225A	225	180	62	5	2.0
40360A	360	315	62	8	3.1
40405A	405	360	62	9	3.5
40450A	450	405	62	10	3.9
60090A	90	45	82	2	1.0
60225A	225	180	82	5	2.6
60360A	360	315	82	8	4.1
60405A	405	360	82	9	4.6
60450A	450	405	82	10	5.1

6. 1. 1.5 Structural Diagram of SGLGW



6.1.2 SGLTW-Type Linear Motor

6. 1. 2.1 Standard Linear Motor Ratings/Specifications

- Time Rating: Continuous
- Insulation Resistance: DC500V, 10MΩ or higher
- Ambient Temperature: 0~40°C
- Excitation Type: Permanent magnet
- Insulation Resist Voltage: AC1500V 1min.
- Protection Method: Self-cooling
- Ambient Humidity: 20~80% (no condensation)

Ratings/Specifications for SGLTW-Type Standard Linear Motor

Linear Motor Models SGLTW-		20A			35A		
		170A	320A	460A	170A	320A	460A
Continuous Output*	W	325	625	950	550	1100	1675
Continuous Force*	N	130	250	380	220	440	670
Continuous Current*	Arms	2.3	4.4	6.7	3.3	7.0	10.7
Peak Force *	N	380	760	1140	660	1320	2000
Peak Current*	Arms	7.7	15.4	23.2	12.1	24.2	36.7
Moving Coil Mass	Kg	2.6	4.6	6.7	3.7	6.8	10.0
Force Constant*	N/Arms	61.0	61.0	61.0	67.5	67.5	67.5
BEMF Constant*	V/(m/s)	20.3	20.3	20.3	22.5	22.5	22.5
Electrical Time Constant*	ms	5.9	5.9	5.9	6.9	6.8	7.0
Mechanical Time Constant*	ms	7.5	6.5	6.4	5.2	4.8	4.6
Allowable Winding Temperature	℃	130 (B type)	130 (B type)	130 (B type)	130 (B type)	130 (B type)	130 (B type)

Linear Motor Models SGLTW-		40A		80A	
		400A	600A	400A	600A
Cont. Output*	W	1675	2500	2600	4000
Cont. Force*	N	670	1000	1300	2000

Linear Motor Models SGLTW-		40A		80A	
		400A	600A	400A	600A
Cont. Current*	Arms	10.8	16.1	19.3	29.7
Peak Force*	N	2000	3000	4000	6000
Peak Current*	Arms	37.0	55.5	67.8	101.8
Moving Coil Mass	Kg	20.0	30.0	30.0	43.0
Force Constant*	N/Arms	66.9	66.9	72.6	72.6
BEMF Constant*	V/(m/s)	22.3	22.3	24.2	24.2
Electrical Time Constant*	ms	17.8	16.5	19.3	16.6
Mechanical Time Constant*	ms	4.9	5.1	3.7	3.9
Allowable Winding Temperature	℃	130 (B type)	130 (B type)	130 (B type)	130 (B type)

* These items and force/speed characteristics, are the values at a motor winding temperature of 100°C during operation in combination with a servo amplifier. All other values apply to winding temperatures of 20°C.

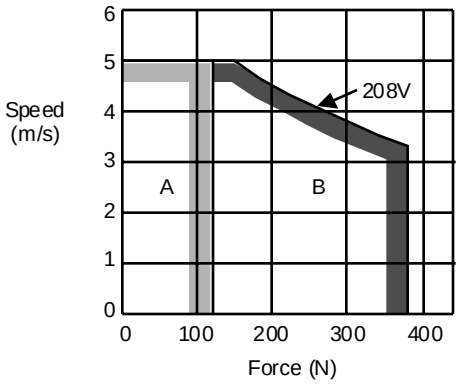
Note: "Continuous Force" shows the continuous allowable value when the following aluminum plates (heat sinks) are attached as a cooling means at an ambient temperature of 20℃.

Applied Device Types	Heat Sink Size
20A170A	254×254×25(mm)
35A170A	
20A320A	400×500×40(mm)
20A460A	
35A320A	
35A460A	
40A400A	609×762×50(mm)
40A600A	
80A400A	
80A600A	

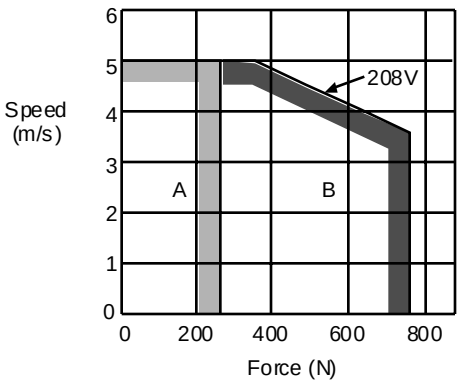
6. 1. 2.2 Force/Speed Characteristics

The force/speed characteristics of the SGLTW linear motors are shown below.

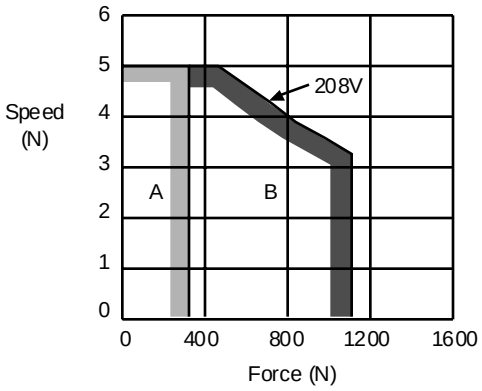
SGLTW-20A170A



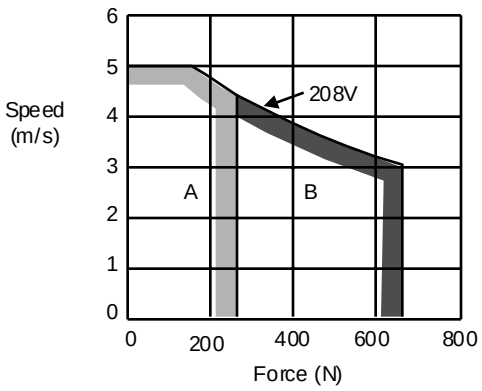
SGLTW-20A320A



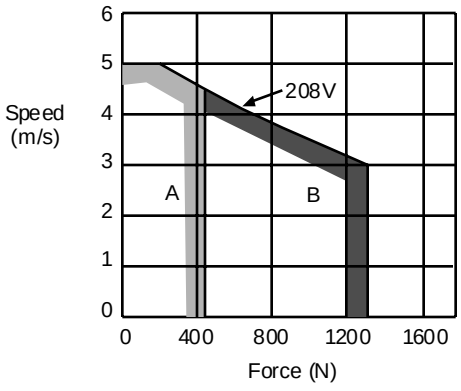
SGLTW-20A460A



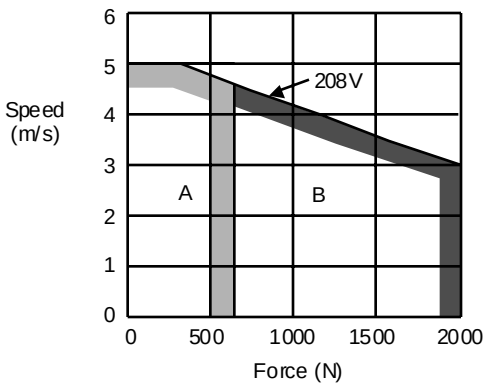
SGLTW-35A170A



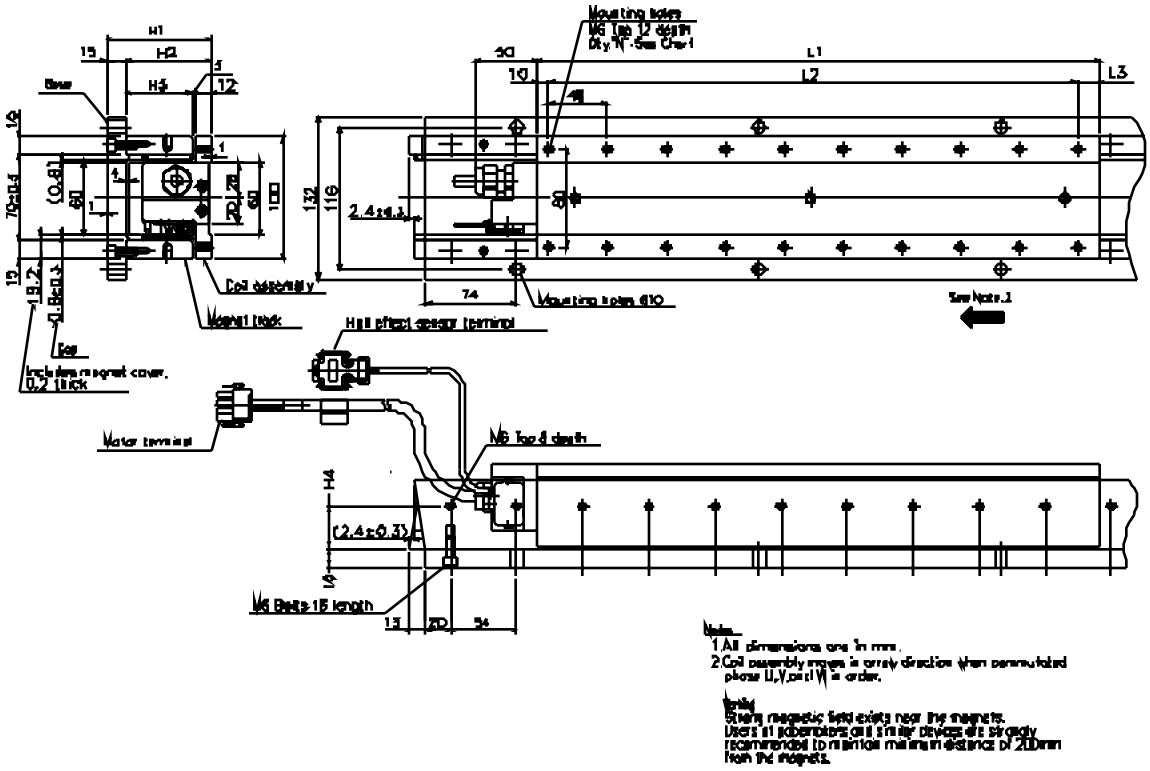
SGLTW-35A320A



SGLTW-35A460A

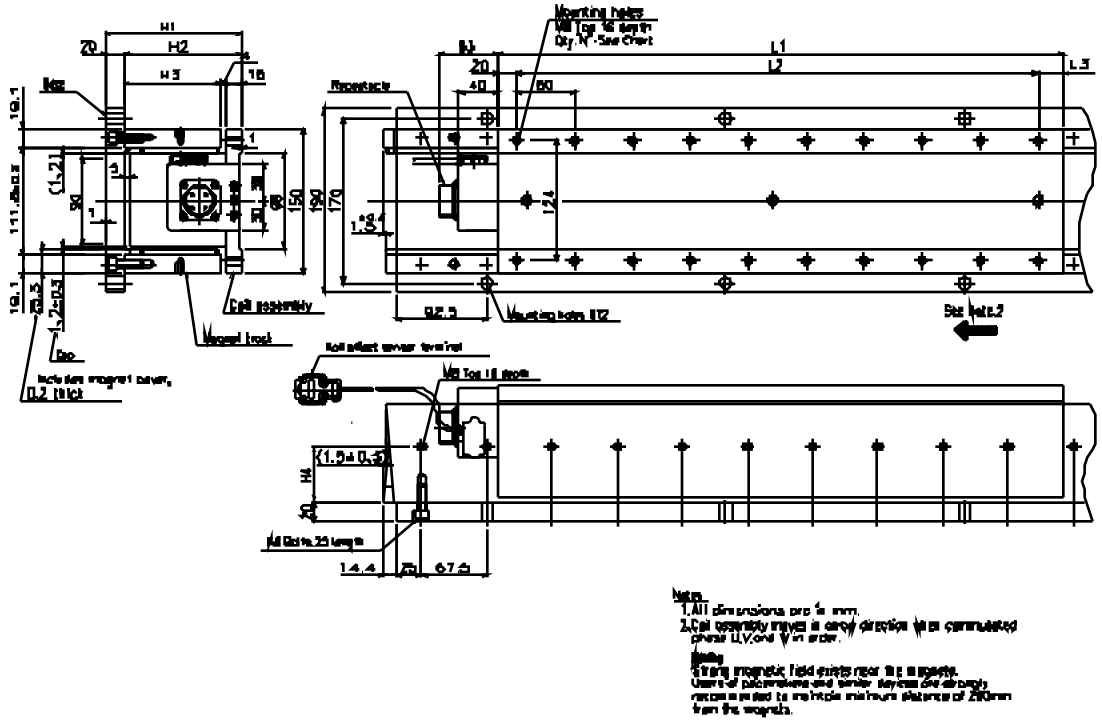


6.1.2.3 Dimensional Drawing of Motor 1 (SGLTW– □□ A □□□□)



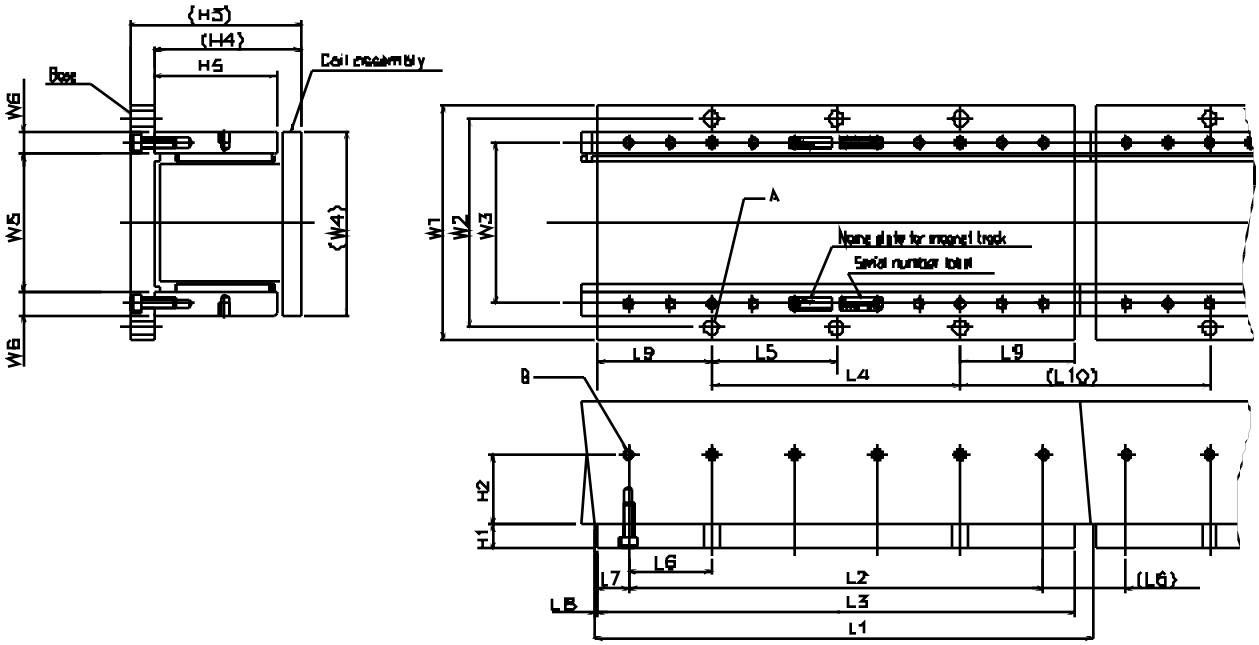
Motor Model SGLTW-	Dim. L1	Dim. L2	Dim. L3	Dim. H1	Dim. H2	Dim. H3	Dim. H4	Units N	Mass (Kg)	Magnet Track Model SGLTM-
20A170A□	170	144	16	70	55	40	27	8	2.6	20□□□A
20A320A□	315	288	17					14	4.6	
20A460A□	460	432	18					20	6.7	
35A170A□	170	144	16	85	70	55	34.5	8	3.7	40□□□A
35A320A□	315	288	17					14	6.8	
35A460A□	460	432	18					20	10	

6. 1. 2.4 Dimensional Drawing of Motor 2 (SGLTW–□□A□□□A□)



Motor Model SGLTW-	Dim. L1	Dim. L2	Dim. L3	Dim. H1	Dim. H2	Dim. H3	Dim. H4	Unit s N	Mass (Kg)	Magnet Track Model SGLTM-
40A400A□	395	360	15	103	83	63	39	14	20	40□□□A
40A600A□	585	540	25					20	30	
80A400A□	395	360	15	140	120	100	57	14	30	80□□□A
80A600A□	585	540	25					20	43	

6. 1. 2.5 Dimensional Drawing of Magnet Track (SGLTM–□□□□□A) (Applicable only to North American Markets)



		Magnet Track Model											
		20324AY	20540AY	20756AY	35324AY	35540AY	35756AY	40405AY	40675AY	40945AY	80405AY	80675AY	80945AY
Mass (Kg)		5.1	8.5	12	6.4	11	15	13	21	30	18	31	43
Dimensions	L1	324	540	756	324	540	756	405	675	945	405	675	945
	L2	270	486	702	270	526	742	337.5	607.5	877.5	337.5	607.5	877.5
	L3	310	526	742	310	526	742	387.5	657.5	927.5	387.5	657.5	927.5
	L4	162	378	594	162	378	594	202.5	472.5	742.5	202.5	472.5	742.5
	L5	162	189	198	162	189	198	202.5	236.5	247.5	202.5	236.5	247.5
	L6	54	54	54	54	54	54	67.5	67.5	67.5	67.5	67.5	67.5
	L7	20	20	20	20	20	20	25	25	25	25	25	25
	L8	2.3	2.3	2.3	1	1	1	5	5	5	3.1	3.1	3.1
	L9	74	74	74	74	74	74	92.5	92.5	92.5	92.5	92.5	92.5
	L10	162	162	162	162	162	162	202.5	202.5	202.5	202.5	202.5	202.5
	W1	132	132	132	132	132	132	190	190	190	190	190	190
	W2	116	116	116	116	116	116	170	170	170	170	170	170
	W3	87	87	87	87	87	87	131	131	131	131	131	131
	W4	100	100	100	100	100	100	150	150	150	150	150	150
	H1	15	15	15	15	15	15	20	20	20	20	20	20
	H2	27	27	27	34.5	34.5	34.5	39	39	39	57	57	57
	H3	70	70	70	85	85	85	103	103	103	140	140	140
	H4	55	55	55	70	70	70	83	83	83	120	120	120
	H5	40	40	40	55	55	55	63	63	63	100	100	100
	A	2 × 2 - 10 Hole	2 × 3 - 10 Hole	2 × 4 - 10 Hole	2 × 2 - 10 Hole	2× 3 - 10 Hole	2× 4 - 10 Hole	2× 2 - 10 Hole	2 × 3 - 10 Hole	2 × 4 - 10 Hole	2 × 2 - 10 Hole	2× 3 - 10 Hole	2 × 4 - 10 Hole
	B	2 × 6 - M6 × 8L	2 ×10 - M6× 8L	2 ×14 - M6 × 8L	2 × 6 - M6 ×8L	2 ×10 - M6 × 8L	2×14 - M6 × 8L	2× 6 - M8 × 10L	2 ×10 - M8 × 10L	2 × 14 - M8 × 10L	2 × 6 - M8 × 10L	2× 10 - M8 × 10L	2 × 14 - M8 × 10L

6.1.3 SGLFW-Type Linear Motor

6. 1. 3.1 Standard Linear Motor Ratings/Specifications

- Time Rating: Continuous
- Insulation Resistance: DC500V, 10MΩ or higher
- Ambient Temperature: 0~40
- Excitation Type: Permanent magnet
- Insulation Resist Voltage: AC1500V 1min.
- Protection Method: Self-cooling
- Ambient Humidity: 20~80% (no condensation)

Ratings/Specifications for SGLFW-Type Standard Linear Motor

Linear Motor Models SGLFW-		20A		35A		50A		1ZA	
		090A	120A	120A	230A	200A	380A	200A	380A
Cont. Output*	W	215	140	200	400	500	1000	1000	2000
Cont. Force*	N	25	40	80	160	200	400	400	800
Cont. Current*	Arms	0.7	0.8	1.4	2.8	3.2	6.3	5.7	11.4
Peak Force*	N	86	125	220	440	600	1200	1200	2400
Peak Current*	Arms	3.0	2.9	4.4	8.8	10.9	21.8	19.7	39.3
Moving Coil Mass	Kg	0.7	0.9	1.3	2.3	3.7	6.9	6.4	12.2
Force Constant*	N/Arms	36.0	54.0	62.4	62.4	67.9	67.9	75.3	75.3
BEMF Constant*	N/(m/s)	12	18.0	20.8	20.8	22.6	22.6	25.1	25.1
Electrical Time Constant*	ms	3.2	3.3	3.6	3.6	9.6	9.4	10.4	9.7
Mechanical Time Constant*	ms	11.1	9.3	6.2	5.5	4.1	4.1	3.2	3.0
Allowable Winding Temperature	℃	130 (B type)	130 (B type)	130 (B type)	130 (B type)	130 (B type)	130 (B type)	130 (B type)	130 (B type)

* These items and force–speed characteristics, are the values at a motor winding temperature of 100°C during operation in combination with a servo amplifier. All other values apply to a winding temperature of 20℃.

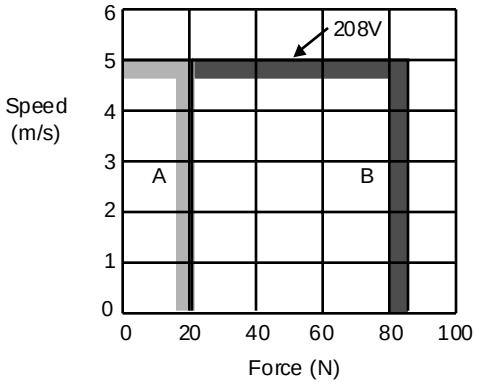
Note: "Continuous Force" shows the continuous allowable force value when the following aluminum plates (heat sinks) are attached as a cooling means at an ambient temperature of 20°C.

Applied Device Types	Heat Sink Size
20A090A	125×125×13(mm)
20A120A	
35A120A	254×254×25(mm)
35A230A	
50A200A	
1ZA200A	
50A380A	400×500×40(mm)
1ZA380A	

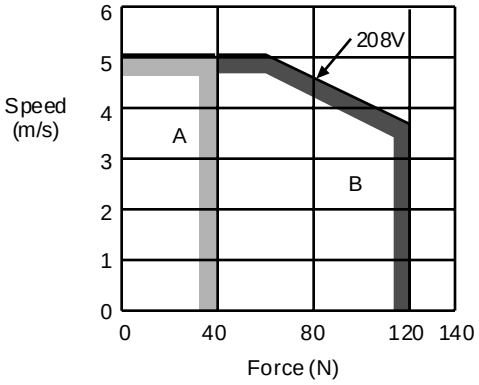
6. 1. 3.2 Force/Speed Characteristics

The force–speed characteristics of the SGLFW linear motors are shown below.

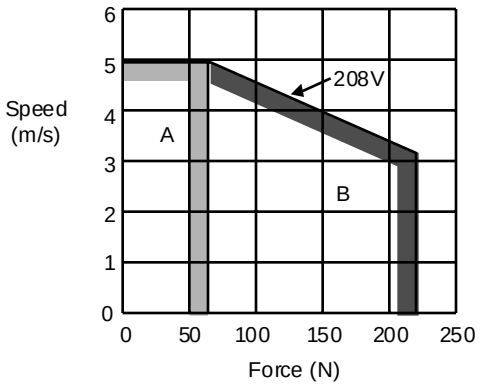
SGLFW-20A090A



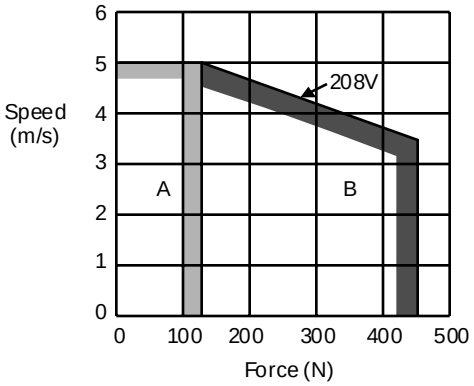
SGLFW-20A120A



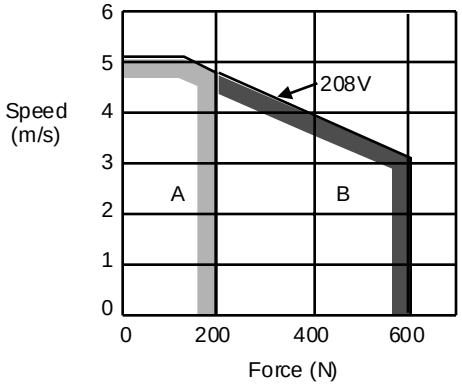
SGLFW-35A120A



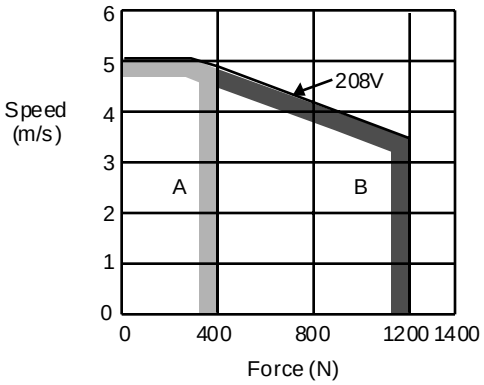
SGLFW-35A230A



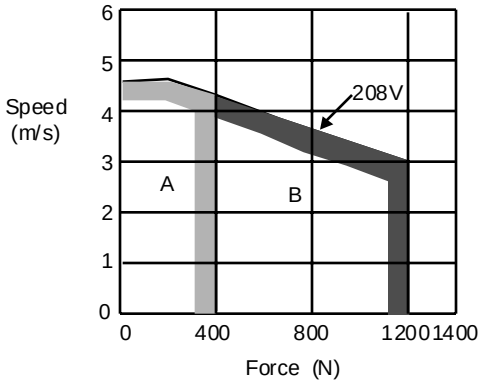
SGLFW-50A200A



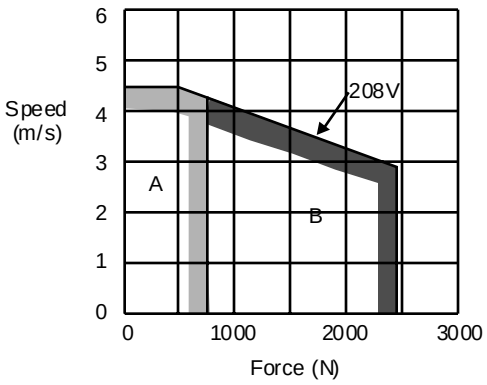
SGLFW-50A380A



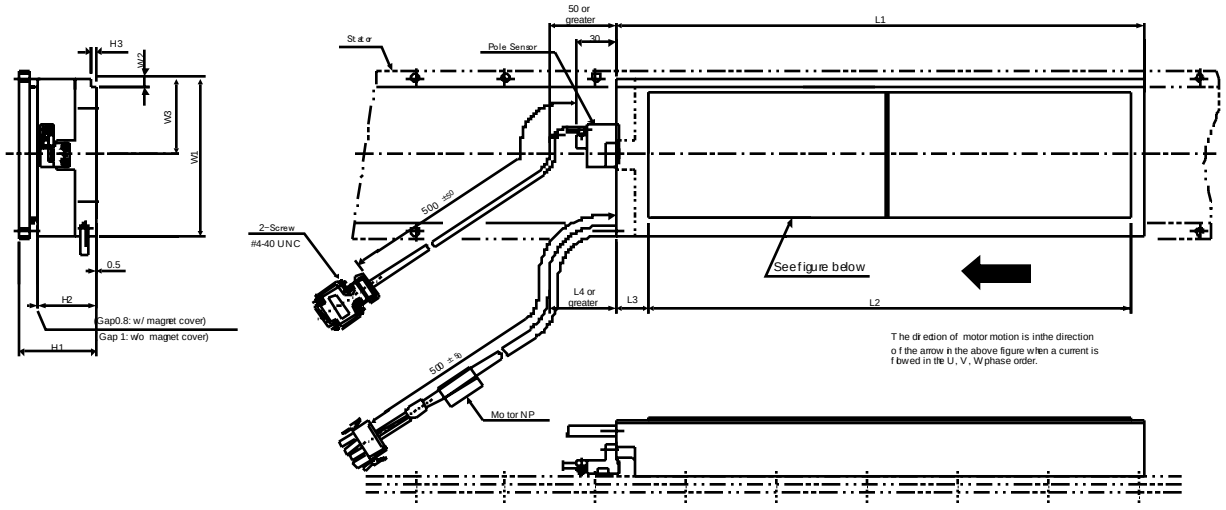
SGLFW-1ZA200A



SGLFW-1ZA380A



6. 1. 3.3 Motor Dimensional Drawing (SGLFW–□□A□□□A□)



Pole Sensor Connector Specifications

Pin Type:
Connector: 17JE-23090-02(D8C)
Dai-Ichi Denko, Inc.

Counterpart Model Numbers

Socket Type:
Connector: 17JE-13090-02(D8C)
Staffs: 17L-002C or
17L-002C1

Pin No.	Name
1	+5VDC
2	U
3	V
4	W
5	0V
6	Empty
7	Empty
8	Empty
9	Empty

Motor Connector Connection Specifications

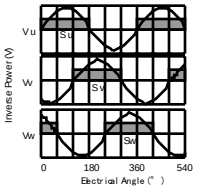
Plug: 350779-1 AMP
Pin: 350218-3 or
350547-3 (No.1~3)
350654-1
350669-1 (No.4)
Counterpart Model Numbers

Cap: 350780-1
Socket 350536-6 or
350550-6

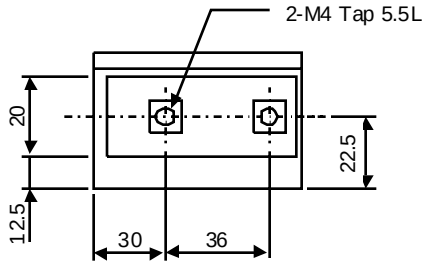
Pin No.	Name	Color
1	U-Phase	Red
2	V-Phase	White
3	W-Phase	Black
4	FG	Green

Pole Sensor Output Signal

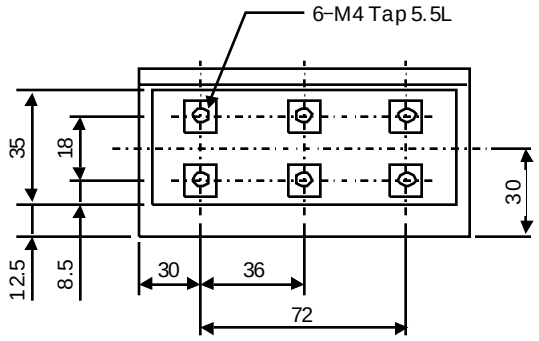
The relationship between pole sensor output signals Su, Sv, and Sw and the inverse power of each of the motor phases Vu Vv, and Vw, when the motor moves in the direction of the arrow in the above diagram is shown in the figure at right.



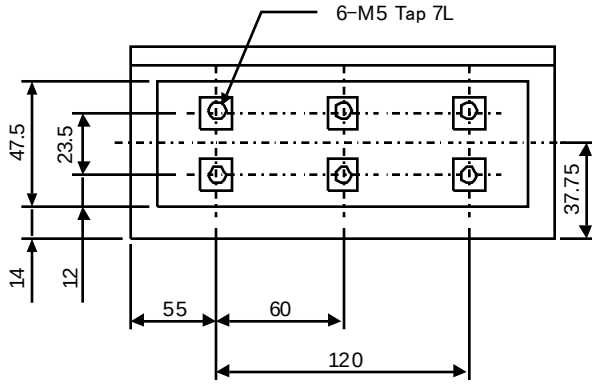
SGLFW－20A090A□



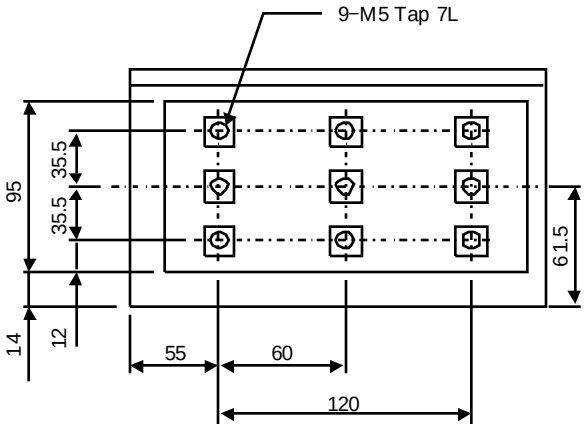
SGLFW－35A120A□



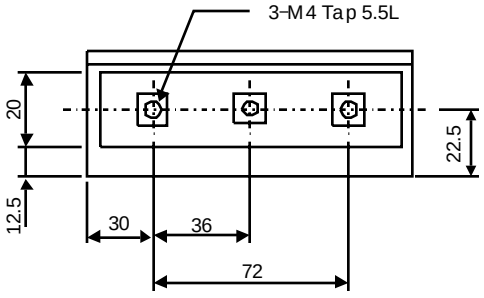
SGLFW－50A200A□



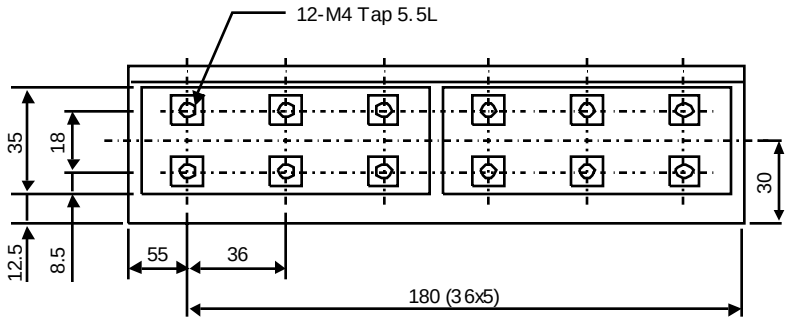
SGLFW－1ZA200A□



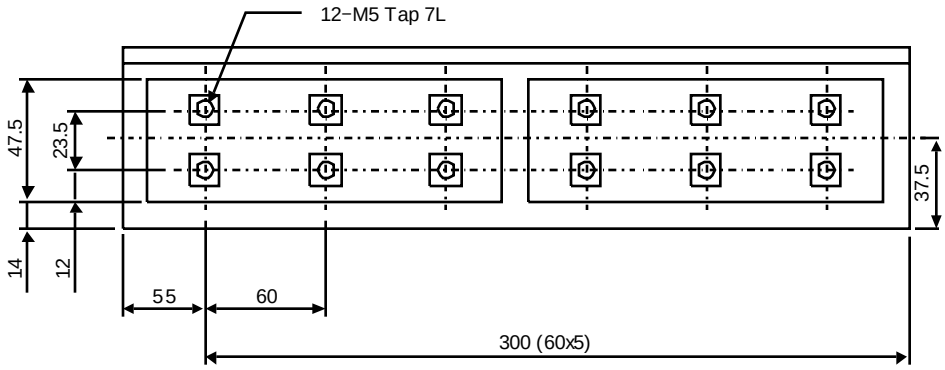
SGLFW－20A120A□



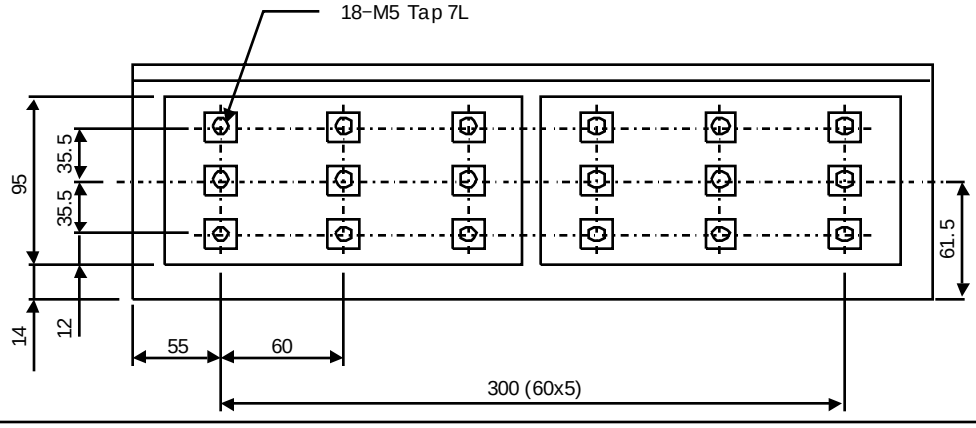
SGLFW－35A230A□



SGLFW－50A380A□



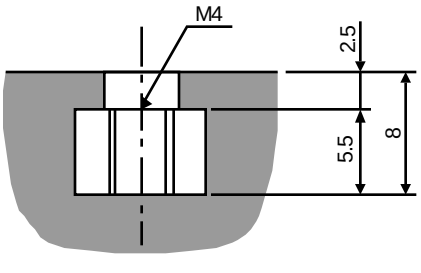
SGLFW－1ZA380A□

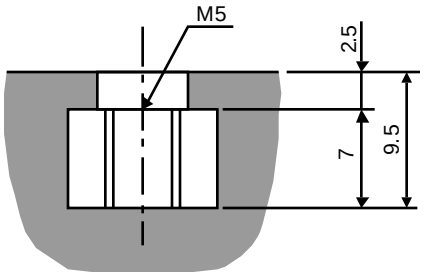


Motor Model SGLFW-	Dim. L1	Dim. L2	Dim. L3	Dim. L4	Dim. H1	Dim. H2	Dim. H3
20A090A□	91	72	12	30	45	34	2
20A120A□	127	108	12				
35A120A□	127	108	12		45	34	2
35A230A□	235	216	12				
50A200A□	215	180	25	50	58	43	3
50A380A□	395	360	25				
1ZA200A□	215	180	25		58	43	3
1ZA380A□	395	360	25				

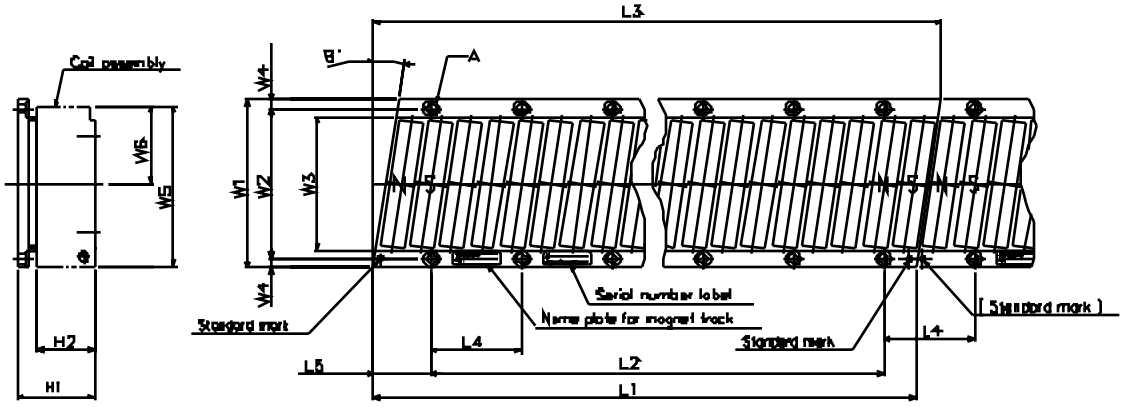
Motor Model SGLFW-	Dim. W1	Dim. W2	Dim. W3	Mass (Kg)	Magnet Track Model SGLFM-
20A090A□	40	5.5	17.5	0.7	20□□□A
20A120A□				0.9	
35A120A□	55	5.5	25	1.3	35□□□A
35A230A□				2.3	
50A200A□	71.5	7	33.75	3.7	50□□□A
50A380A□				6.9	
1ZA200A□	119	7	57.5	6.4	1Z□□□A
1ZA380A□				12.2	

Thread Details for Mounting





6. 1. 3.4 Dimensional Drawing of Magnet Track (SGLFM–□□□□□A)



		Magnet Track Model											
		20324AC	20540AC	20756AC	35324AC	35540AC	35756AC	50405AC	50675AC	50945AC	1Z405AC	1Z675AC	1Z945AC
Mass (Kg)		0.9	1.4	2	1.2	2	2.9	2.8	4.6	6.5	7.3	12	17
Dimensions	L1	324	540	756	324	540	756	405	675	945	405	675	945
	L2	270	486	702	270	486	702	337.5	607.5	877.5	337.5	607.5	877.5
	L3	331.6	547.6	763.6	334.4	550.4	766.4	416.3	686.3	956.3	423.9	693.9	963.9
	L4	54	54	54	54	54	54	67.5	67.5	67.5	67.5	67.5	67.5
	W1	44	44	44	60	60	60	75	75	75	125	125	125
	W2	35	35	35	51	51	51	65	65	65	112	112	112
	W3	25.4	25.4	25.4	40.4	40.4	40.4	52.4	52.4	52.4	99.4	99.4	99.4
	W4	4.5	4.5	4.5	4.5	4.5	4.5	5	5	5	6.5	6.5	6.5
	W5	40	40	40	55	55	55	71.5	71.5	71.5	119	119	119
	W6	17.5	17.5	17.5	25	25	25	33.75	33.75	33.75	57.5	57.5	57.5
	H1	45	45	45	45	45	45	58	58	58	58	58	58
	H2	34	34	34	34	34	34	43	43	43	43	43	43
	A	2 × 6 - 4.8 Hole	2 × 10 - 4.8 Hole	2 × 14 - 4.8 Hole	2 × 6 - 4.8 Hole	2 × 10 - 4.8 Hole	2 × 14 - 4.8 Hole	2 × 6 - 5.8 Hole	2 × 10 - 5.8 Hole	2 × 14 - 5.8 Hole	2 × 6 - 7 Hole with 11.5 Spot Facing 1.5 Depth	2 × 10 - 7 Hole with 11.5 Spot Facing 1.5 Depth	2 × 14 - 7 Hole with 11.5 Spot Facing 1.5 Depth
	B	9.9	9.9	9.9	9.9	9.9	9.9	8.6	8.6	8.6	8.6	8.6	8.6

6.1.4 Mechanical Limitations

The mechanical limitations for Σ-II Series linear motors are shown below.

6.1.4.1 Shock Resistance

The shock resistance is as follows:

- Shock Acceleration: 98m/s^2 (10G)
- No. of Shocks: 2

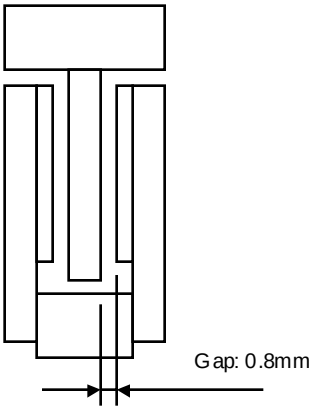
6.1.4.2 Vibration Resistance

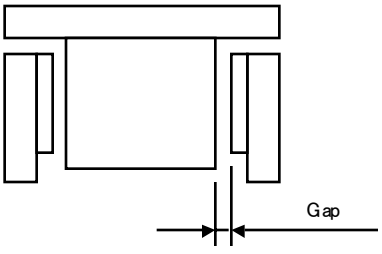
The vibration resistance in up/down, left/right, and back/forth directions is as follows:

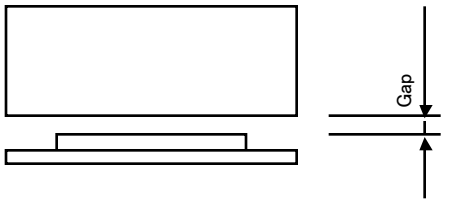
- Vibration Acceleration: 24.5m/s^2 (2.5G)

6.1.4.3 Installation

Maintain the following air gaps when installing the Σ-Series linear motor. Also make sure that the motor and stator do not intervene during the stroke.

Core-less Motors, all Types	
	

SGLTW			
	Model	Air Gap	With Magnet Cover
	SGLTW–20A□□□	1mm	0.8
	SGLTW–35A□□□	1mm	
	SGLTW–40A□□□	1.4mm	1.2
	SGLTW–80A□□□	1.4mm	

SGLFW			
	Model	Air Gap	With Magnet Cover
	SGLFW－20A□□□	1mm	0.8
	SGLFW－35A□□□	1mm	
	SGLFW－50A□□□	1mm	
	SGLFW－1ZA□□□	1mm	

6.2 Serial Converter Unit (JZDP-A004- □□□)

6.2.1 Characteristics/Specifications

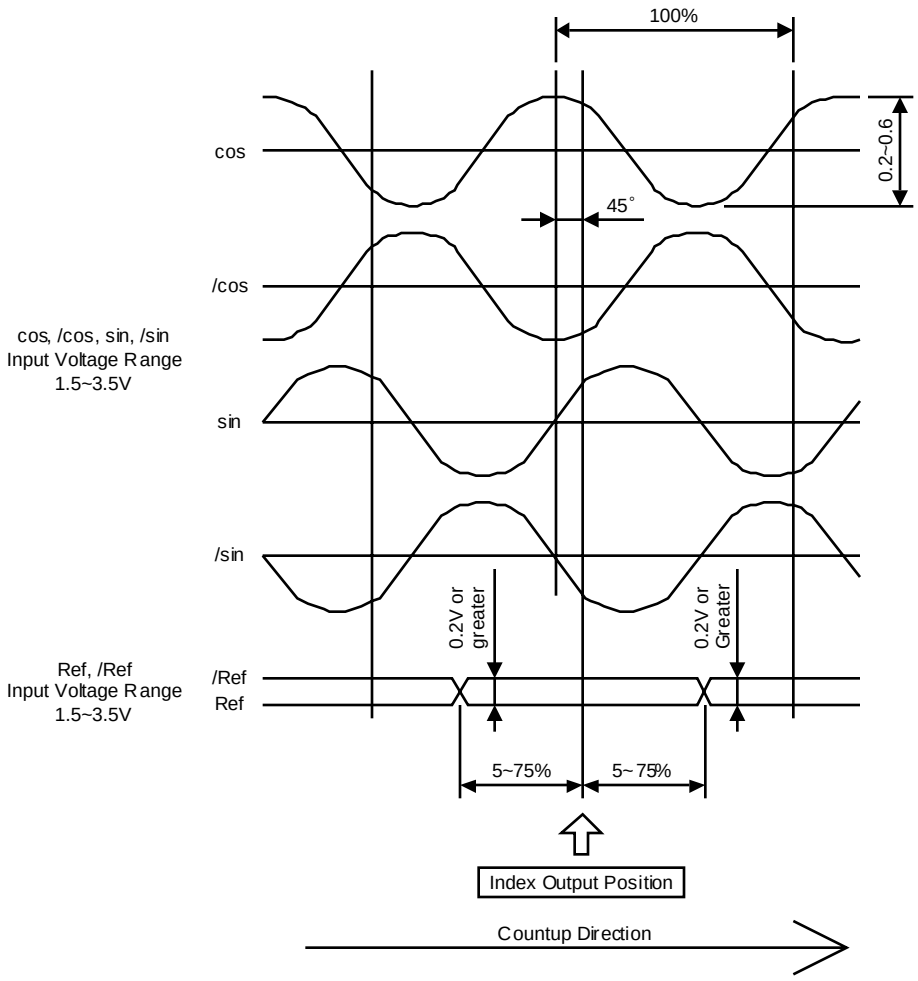
Item		Content
Electrical Characteristics	Power Supply Voltage	+5.0VDC ±5% Ripple inclusion rate of 5% or less
	Current Consumption *1.	120mA Type. 350mA Max. (at power-up)
	Output Resolution	Input analog pitch subdivided by 1/256
	Maximum Frequency Response	250kHz
	Analog Input Signal *2. (Cos, Sin, Ref)	Differential Input: 0.4~1.2V Input Signal Level: 1.5~3.5V
	Hall Sensor Signal Input	CMOS Level
Mechanical Characteristics	Mass	150g
	Dimensions	90×60×23mm
	Vibration Resistance	98m/s^2 Max. (10 –2500Hz) 3 directions
	Shock Resistance	980m/s^2, (11ms) 2 times in 3 directions
Environment	Operational Temperature	0 – +55℃
	Storage Temperature Range	–20 – +80℃
	Humidity Range	20 – 90%RH (no condensing)

* 1. The current consumption of the linear encoder and Hall sensors is not included in this value.

* 2. The system may malfunction if signals outside of this range are applied to these inputs.

6.2.2 Analog Input Timing

Input the analog signals in the timing shown in the figure below.
/cos and /sin are the complementary signals 180° from the cos and sin signals. The voltage specifications for cos, /cos and sin, /sin are the same.
Ref and /Ref are input to the converter. Therefore, be sure to input the signals so that they offset as shown in the figure below.
The output data is counted up when input as shown in the figure below.

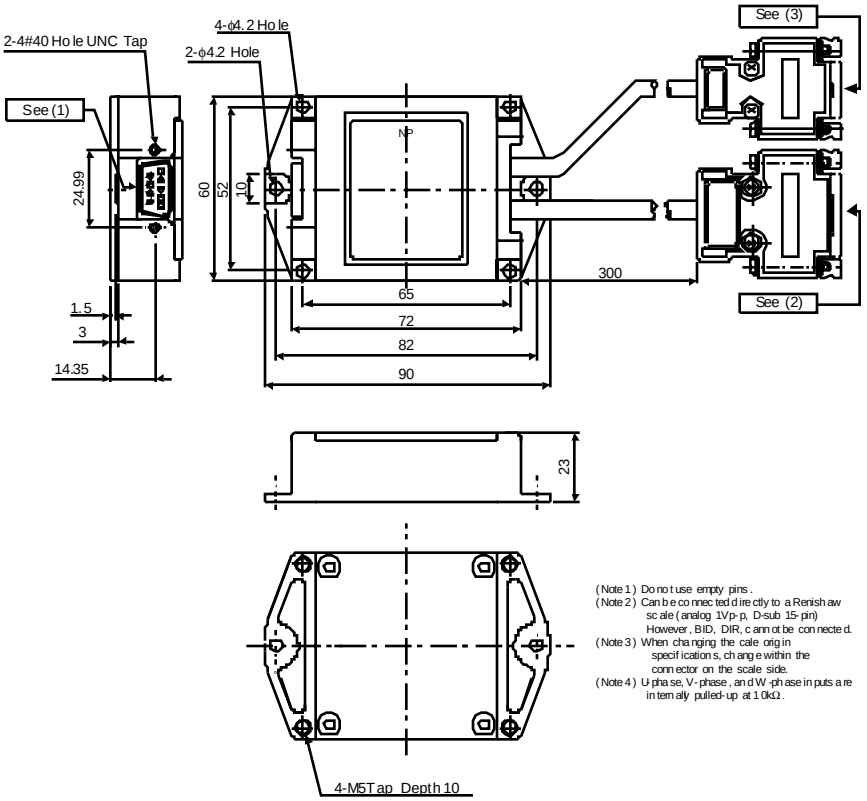


6.2.3 Cautionary Items on Usage

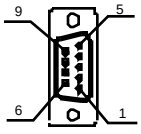
1. Never measure the insulation resistance or insulation resist voltage.
2. Because this signal inputs a minute analog signal, accurate position data cannot be output if there is noise in the analog signal. Therefore, make the analog signal cable wiring as short as possible, and carry out proper shielding processing.
3. Use in places free from H_2S gas, etc.
4. Do not insert live wires as this may lead to device failure.
5. When simultaneously using multiple axes, be sure to use a shielded cable for each axis rather than combining multiple axes into one shielded cable.

6.2.4 Dimensional Drawings

6. 2. 4.1 JZDP-A004 (North American Market Standard)



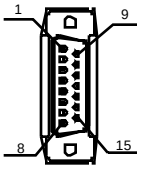
1. Upper-Level Controller Serial Data Output



Dai-Ichi Denko
17 Series Connector
Connector: 17JE-13090-02(D2C)
(socket)

Pin No.	Signal
1	+5V
2	S-Phase Output
3	Empty
4	Empty
5	0V
6	/S-Phase Output
7	Empty
8	Empty
9	Empty
Case	Shield

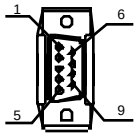
2. Linear Scale Analog Signal Input



Dai-Ichi Denko
17 Series Connector
Connector: 17JE-13150-02(D8C)
(socket)

Pin No.	Signal
1	/Cos Input (V1-)
2	/Sin Input (V2-)
3	Ref Input (V0+)
4	+5V
5	5Vs
6	Empty
7	Empty
8	Limit Switch (Vq)
9	Cos Input (V1+)
10	Sin Input (V2+)
11	/Ref Input (V0-)
12	0V
13	0Vs
14	Empty
15	Inner
Case	Shield

3. Linear Scale Pole Sensor Signal Input



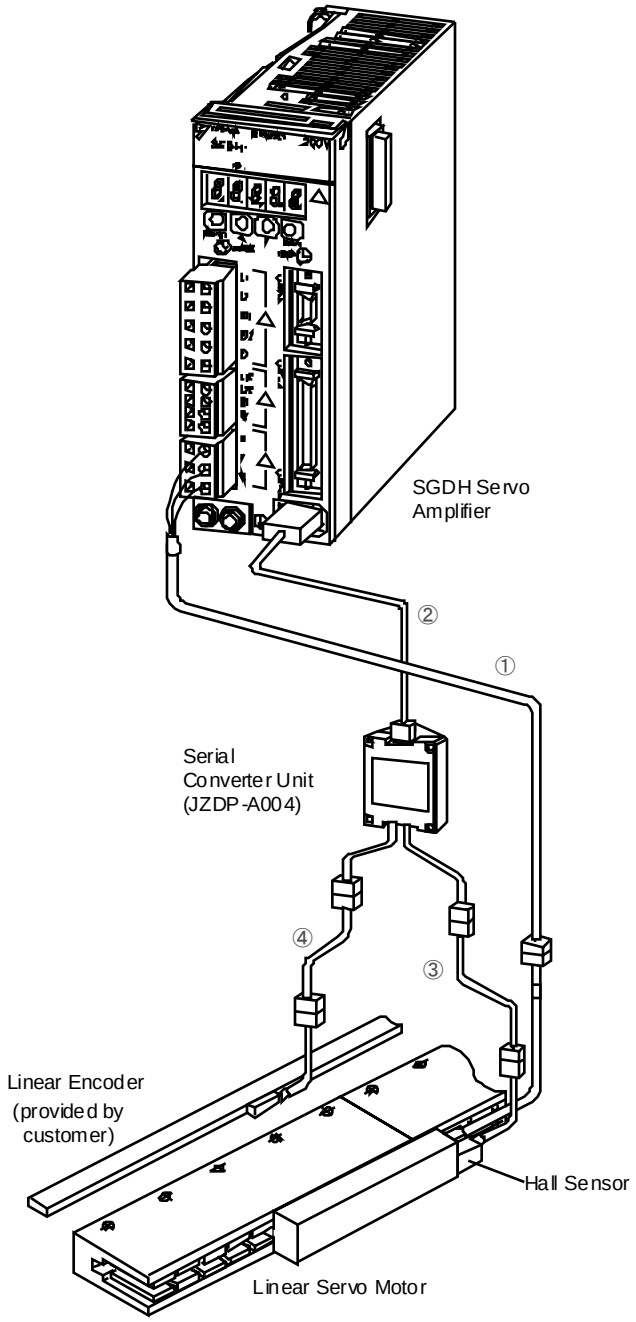
Dai-Ichi Denko
17 Series Connector
Connector: 17JE-13090

Pin No.	Signal
1	+5V
2	U-Phase Output
3	V-Phase Output
4	W-Phase Output
5	0V
6	Empty
7	Empty
8	Empty
9	Empty
Case	Shield

6.3 Suggested Cables

6.3.1 Suggested Cable List

The location of use for the suggested cables, and a list of the cables, is shown below.



Usage Locations for Suggested Cables

Suggested Cable List

Name	Usage Location	Figure	Suggested Cable Model	Length, Application	Note
Power Cable (for main circuit)	Between servo amplifier–motor terminal	①	JZSP-CMM01-03	3m	For SGLGW, all series
			JZSP-CMM01-05	5m	
			JZSP-CMM01-10	10m	
			JZSP-CMM01-15	15m	
			JZSP-CMM01-20	20m	
			Currently under planning	Currently under planning	For F&T types
			JZSP-CLN11-01	1m	For the SGLGW series, SGLFW-20, and SGLFW-35
			JZSP-CLN11-03	3m	
			JZSP-CLN11-05	5m	
			JZSP-CLN11-10	10m	
			JZSP-CLN11-15	15m	
			JZSP-CLN21-01	1m	For the SGLFW-50, SGLFW-1Z, SGLTW-20, and SGLTW-35
			JZSP-CLN21-03	3m	
			JZSP-CLN21-05	5m	
			JZSP-CLN21-10	10m	
			JZSP-CLN21-15	15m	
			JZSP-CLN39-01	1m	For the SGLTW-40 and SGLTW-80
			JZSP-CLN39-03	3m	
			JZSP-CLN39-05	5m	
			JZSP-CLN39-10	10m	
			JZSP-CLN39-15	15m	
Cable with Connectors on Both Ends	Between servo amplifier–serial converter output	②	JZSP-CLP20-03	3m	
			JZSP-CLP20-05	5m	
			JZSP-CLP20-10	10m	
			JZSP-CLP20-15	15m	
			JZSP-CLP20-20	20m	
Hall Sensor-Dedicated Cable	Between serial converter and hall sensor module	③	JZSP-CLL10-03	3m	
			JZSP-CLL10-05	5m	
			JZSP-CLL10-10	10m	
			JZSP-CLL10-15	15m	
			JZSP-CLL10-20	20m	
Encoder-Dedicated Cable	Special Cable for Renishaw Linear Encoders	④	JZSP-CLL00-03	3m D-SUB 15-pin	
			JZSP-CLL00-05	5m D-SUB 15-pin	
			JZSP-CLL00-10	10m D-SUB 15-pin	
			JZSP-CLL00-15	15m D-SUB 15-pin	
			JZSP-CLL00-20	20m D-SUB 15-pin	
	Special Cable for Heidenhain Linear Encoder		JZSP-CLL-2-20-01	1m D-SUB 15-pin	
			JZSP-CLL-2-20-03	3m D-SUB 15-pin	
			JZSP-CLL-2-20-05	5m D-SUB 15-pin	

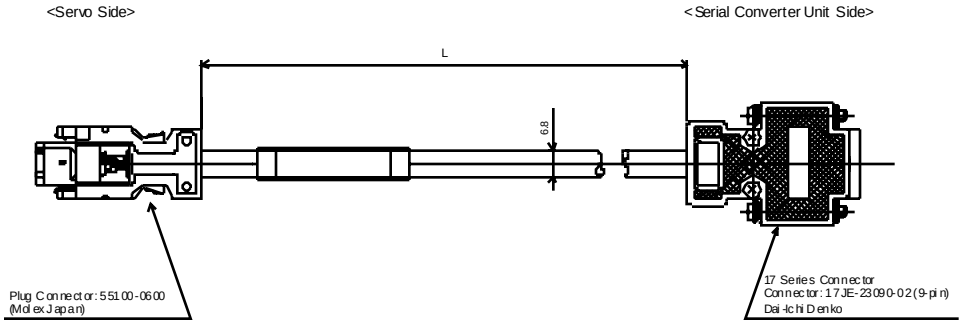
* Connectors marked with an asterisk (*) are not available from Yaskawa Electric America, Inc. in North American markets. Please locally source the appropriately sized Hi-flex cable from reputable local suppliers (wire size shown in AWG classification)

** For Haidenhain linear encoders, use the JZSP-CLL-20-☐☐ conversion cable provided as an option. The "☐☐" can be 01 (1m), 03 (3m), or 05 (5m). Consult Yaskawa Electric America for availability.

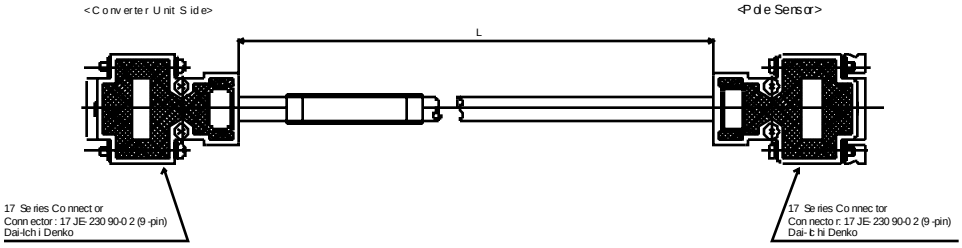
6.3.2 Dimensional Drawings of Suggested Cables

Dimensional drawings cables ② , ③ , and ④ in the above table are shown below.

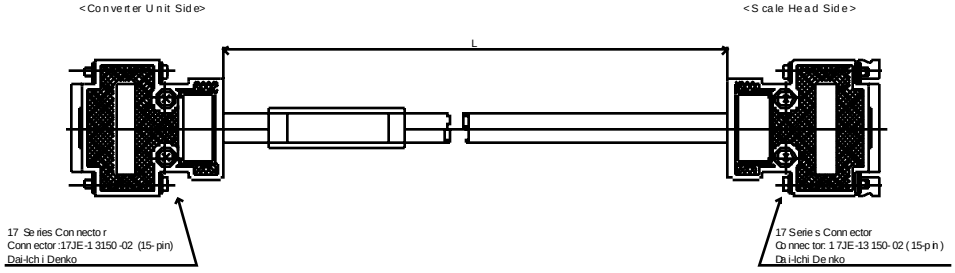
6. 3. 2.1 Cable with Terminal on Both Ends②



6. 3. 2.2 Hall Sensor-Dedicated Cable③



6. 3. 2.3 Encoder-Dedicated Cable④



YASKAWA ELECTRIC AMERICA, INC.
Chicago-Corporate Headquarters 2121 Norman Drive South, Waukegan, IL 60085, U.S.A.
Phone: (847) 887-7000 Fax: (847) 887-7310 Internet: http://www.yaskawa.com

MOTOMAN INC.
805 Liberty Lane, West Carrollton, OH 45449, U.S.A.
Phone: (937) 847-6200 Fax: (937) 847-6277 Internet: http://www.motoman.com

YASKAWA ELECTRIC CORPORATION
New Pier Takeshiba South Tower, 1-16-1, Kaigan, Minatoku, Tokyo, 105-0022, Japan
Phone: 81-3-5402-4511 Fax: 81-3-5402-4580 Internet: http://www.yaskawa.co.jp

YASKAWA ELETRICO DO BRASIL COMERCIO LTDA.
Avenida Fagundes Filho, 620 Bairro Saude Sao Paolo-SP, Brasil CEP: 04304-000
Phone: 55-11-5071-2552 Fax: 55-11-5581-8795 Internet: http://www.yaskawa.com.br

YASKAWA ELECTRIC EUROPE GmbH
Am Kronberger Hang 2, 65824 Schwalbach, Germany
Phone: 49-6196-569-300 Fax: 49-6196-888-301 Internet: http://www.yaskawa.de

MOTOMAN ROBOTICS AB
Box 504 S38525, Torsas, Sweden
Phone: 46-486-48800 Fax: 46-486-41410 Internet: http://www.motoman.se

MOTOMAN ROBOTEC GmbH
Kammerfeldstraβe 1, 85391 Allershausen, Germany
Phone: 49-8166-900 Fax: 49-8166-9039 Internet: http://www.motoman.de

YASKAWA ELECTRIC UK LTD.
1 Hunt Hill Orchardton Woods Cumbernauld, G68 9LF, Scotland, United Kingdom
Phone: 44-12-3673-5000 Fax: 44-12-3645-8182 Internet: http://www.yaskawa.co.uk

YASKAWA ELECTRIC KOREA CORPORATION
Paik Nam Bldg. 901 188-3, 1-Ga Euljiro, Joong-Gu, Seoul, Korea
Phone: 82-2-776-7844 Fax: 82-2-753-2639

YASKAWA ELECTRIC (SINGAPORE) PTE. LTD.
Head Office: 151 Lorong Chuan, #04-01, New Tech Park Singapore 556741, SINGAPORE
Phone: 65-282-3003 Fax: 65-289-3003

TAIPEI OFFICE (AND YATEC ENGINEERING CORPORATION)
10F 146 Sung Chiang Road, Taipei, Taiwan
Phone: 886-2-2563-0010 Fax: 886-2-2567-4677

YASKAWA JASON (HK) COMPANY LIMITED
Rm. 2909-10, Hong Kong Plaza, 186-191 Connaught Road West, Hong Kong
Phone: 852-2803-2385 Fax: 852-2547-5773

BEIJING OFFICE
Room No. 301 Office Building of Beijing International Club,
21 Jianguomanwai Avenue, Beijing 100020, China
Phone: 86-10-6532-1850 Fax: 86-10-6532-1851

SHANGHAI OFFICE
27 Hui He Road Shanghai 200437 China
Phone: 86-21-6553-6600 Fax: 86-21-6531-4242

SHANGHAI YASKAWA-TONJI M & E CO., LTD.
27 Hui He Road Shanghai 200437 China
Phone: 86-21-6533-2828 Fax: 86-21-6553-6677 Internet: http://www.yaskawa-tongji.com

BEIJING YASKAWA BEIKE AUTOMATION ENGINEERING CO., LTD.
30 Xue Yuan Road, Haidian, Beijing 100083 China
Phone: 86-10-6232-9943 Fax: 86-10-6234-5002

SHOUGANG MOTOMAN ROBOT CO., LTD.
7, Yongchang-North Street, Beijing Economic & Technological Development Area,
Beijing 100076 China
Phone: 86-10-6788-0551 Fax: 86-10-6788-2878

YEA, TAICHUNG OFFICE IN TAIWAIN
B1, 6F, No.51, Section 2, Kung-Yi Road, Taichung City, Taiwan, R.O.C.
Phone: 886-4-2320-2227 Fax:886-4-2320-2239

Yaskawa Electric America, Inc., July 2001 Printed In U.S.A. YEA-SIA-S800-39.11