A Nidec Group Company

Sankyo

All for dreams

AC SERVO MOTOR SERIES

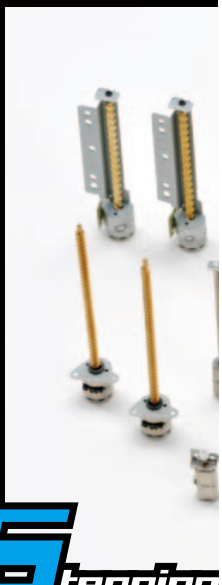
S-FLAG

NIDEC SANKYO CORPORATION

Liquid Crystal Glass Robot

Liquid Crystal Robot

Sankyo's robots operate world-wide in the field of liquid crystal semi-conductors



Stepping

The crystallization of Sankyo's know-how in robot control
The birth of the S-Flag AC servo motor series!

Sankyo's robots operate world-wide in the field of liquid crystal semi-conductors. Our robotics business, which boasts a track record of 30 years, is built on the foundations of sophisticated servo control technology. The S-FLAG series is the crystallization of Sankyo's know-how in robot control. In addition, the cost-forming capability of Sankyo's stepping motors, which are used world-wide in PC's and other consumer product areas, has been inherited by the S-FLAG series as well.

Ac Servo Motor Series S-FLAG

Stepping Motors

Motor

Stepping motors used world-wide in PC's and other consumer products

AC SERVO MOTOR SERIES

S-FLAG

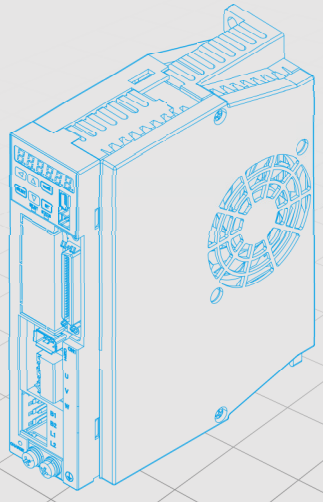
S-FLAG AC Servo Motor Series

A Nidec Group Company

Sankyo

All for dreams

Contents



Function

Advanced Functionality

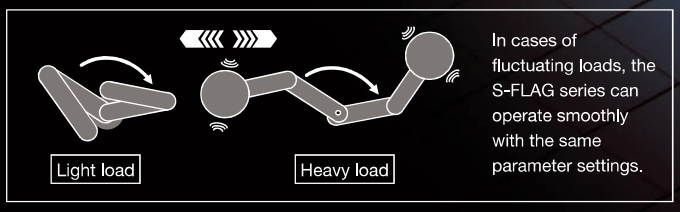
S-FLAG offers the best solution in all scenes of next-generation product development requiring automation, high speed, high precision and convenience.

We have realized the industry's smallest panel-equipped servo amplifier

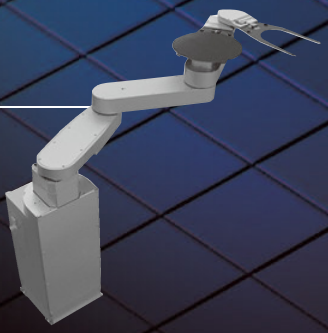
We have realized the smallest size in the industry for a servo amplifier equipped with a setting panel.
We have unified the height (160 mm) and depth (130 mm) across all models to enable space saving installation in a smart way.

The S-FLAG series is equipped with servo control utilizing our know-how in liquid crystal semi-conductor robotics

It uses two-degrees-of-freedom control making command responsiveness and disturbance compensation independent by using observer-based model matching and feed-forward control.

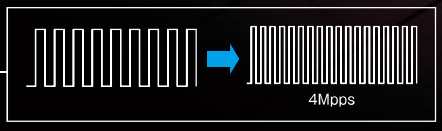


In cases of fluctuating loads, the S-FLAG series can operate smoothly with the same parameter settings.



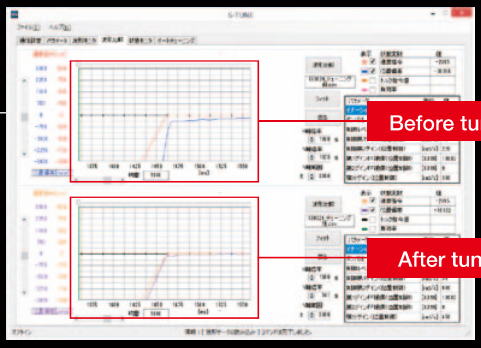
High performance positioning command resolution

The S-FLAG series can handle a maximum positioning command resolution of 4 Mpps in input/output pulses.



Easy tuning

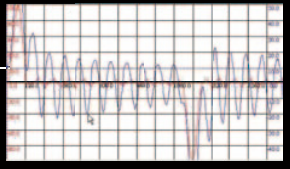
The S-FLAG series can be tuned easily using Sankyo's unique auto-tuning and two-stage feed-forward control. Waveforms can be compared on a single screen using "S-TUNE," dedicated tuning software.



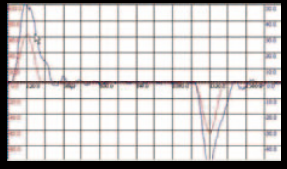
Tuning can be carried out by operating the servo amplifier panel.

Vibration suppression function

The S-FLAG series is provided with a vibration suppression filter. Vibration and noise levels can be reduced by setting the parameters.



Vibration suppression disabled



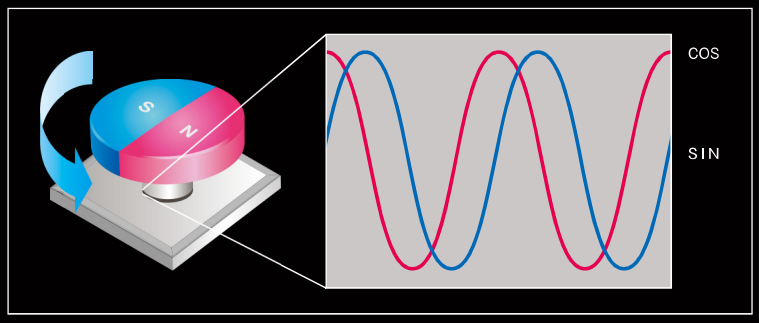
Vibration suppression enabled

Blue: position deviation waveform Red: torque waveform

The S-FLAG series is equipped with a magnetic encoder originally developed by the company

Resolution is the highest of the magnetic types: 17 bits [131,072 pulses/r]

- Excellent environmental resistance (dust, oil mist, and vibrations)
- Simple, highly productive structure
- Advantages in cost formation at times of high volume production



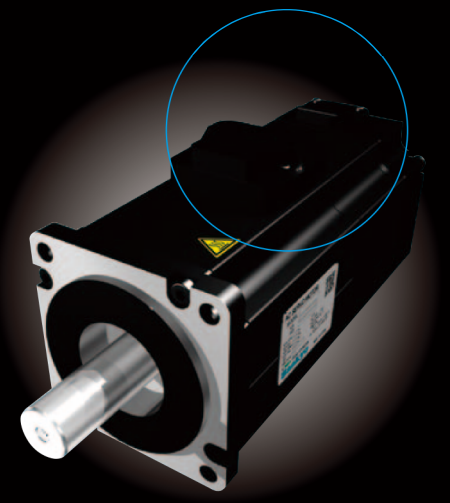
IP65 compatible motor

The S-FLAG series is IP65 compatible in terms of dust- and water-proofing.

IP– 6 5

- 5: The S-FLAG series is protected against water-jets (12.5 l/min) from all directions.
- 7: The S-FLAG series is protected against immersion in water at the specified pressure for the specified period of time
- 6: The S-FLAG series is protected to prevent the entry of dust particles (75 µm in diameter) used for dust-proofing tests

* Compatibility with IP67 environmental resistance is planned.



Compliance with safety standards

*** Acquisition of certification is planned.**

The S-FLAG series is designed to comply with the CE, UL and RoHS directives. Acquisition of certification is planned.

Custom

Customizable products

If you are going to use these products for multi-axis equipment, we can propose a customized multi-axis configuration.

The cost and required space of a multi-axis configuration can be reduced by sharing the main circuit power on a single main amplifier and combining it with sub-amplifiers consisting only of the control section,

* Please contact our sales agent with your instructions.

With a configuration of 10 axes and 200 W amplifiers, space can be reduced by up to 90 mm.

We can offer simplified NC controllers depending on your request.

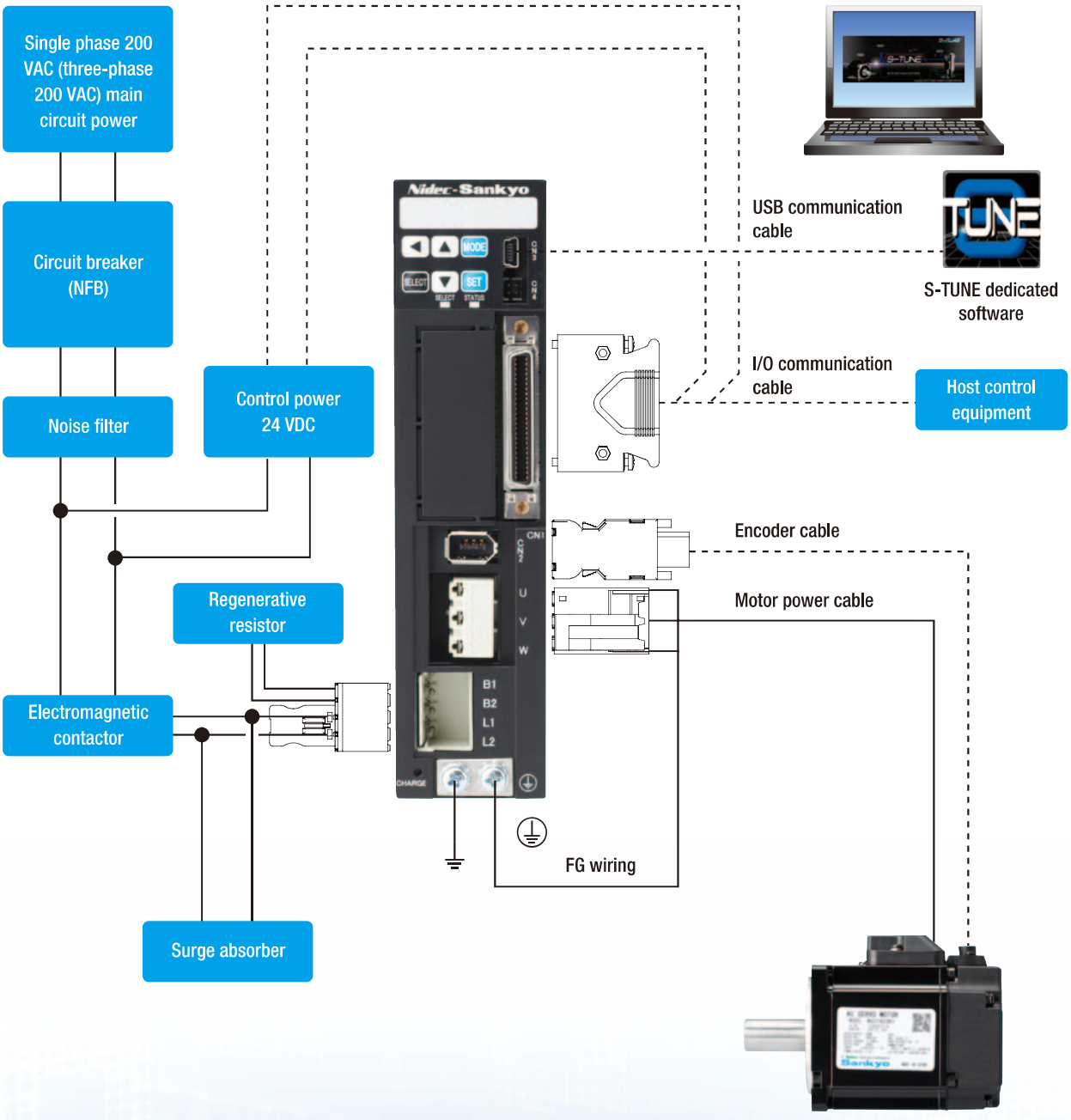
S-DECK (S-FLAG Digital Easy Control Kit)

- Draws 100% of the high resolution performance of the encoder, which has not been possible with pulse train command.
- With excellent synchronization performance, the S-DECK realizes locus control with coordinated multiple axis motion.
- S-DECK is equipped with sophisticated real-time (motion) control functionality developed through Sankyo's robotic control.
- Motion control compatible with articulated robots and other diversified mechanisms.
- Improvement in through-put due to independent control of communication and mechanical motion based on multi-task control
- S-DECK is compatible with a variety of interfaces and easily realizes remote control systems.
- S-DECK is the same size as the servo amplifier in height and depth for smart installation.

Depending on your request, we can offer encoder-less and other customized isolated motors.

We are planning future additions to our product line-up including compact motors, large-capacity motors of 3 kW or more, and low-voltage motors.

Total Wiring Diagram



* In cases where the I/O host communication cable between the host control equipment and the amplifier connector CN1 is 50 cm or more in length, please use a shield cable.
* Please consider the routing of the encoder cable so cable length does not exceed 20 m.
* Please see the operating instructions for the wiring of the multi-axis servo amplifier.
* The broken lines on the wiring diagram represent non-hazardous voltage lines.

Servo motors


MM500
[Under development]


MM101
[Under development]


MA201


MH201


MA401

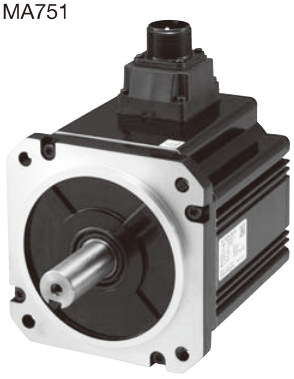

MH401


MA751


MH751


MM102


MM152


MM202

How to read the part numbers

MA201 N 2 S N **

Rated motor output/rotor inertia

Type	Output/rotor inertia
MM500	50 W/middle inertia [under development]
MM101	100 W/middle inertia [under development]
MA201	200 W/low inertia
MH201	200 W/high inertia
MA401	400 W/low inertia
MH401	400 W/high inertia
MA751	750 W/low inertia
MH751	750 W/high inertia
MM102	1 kW/middle inertia
MM152	1.5 kW/middle inertia
MM202	2 kW/middle inertia

Holding brake

Type	Brake
N	W/O brake
A	24 V brake

Voltage specifications

Type	Voltage
2	AC200-240 V
3	DC24 V [under development]
4	DC48 V [under development]

Shaft end specifications/oil seal

Type	Shaft end specifications/oil seal
S	Straight/w/o oil seal
K	Key/w/o oil seal
T	Straight/with oil seal
L	Key/with oil seal

Encoder

Type	Specifications
N	Incremental 17 bits
A	Absolute 17 bits

Control number

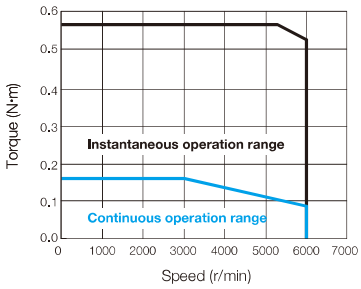
MM500 50W Middle Inertia

Specifications

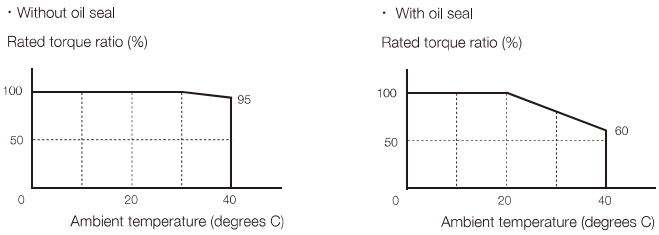
Item		Unit	
Motor model name M□□□□□2□□**			50W middle inertia MM500□2
Fitting flange size		mm	□40
Approximate mass	Without brake	kg	0.4
	With brake		0.6
Rated voltage		V	200
Rated output		W	50
Rated torque		N·m	0.16
Instantaneous maximum torque		N·m	0.56
Rated current		Arms	0.6
Instantaneous maximum current		Arms	2.1
Rated speed		r/min	3000
Maximum speed		r/min	6000
Torque constant		N·m/A	0.25
Induced voltage constant per phase		mV/(r/min)	8.8
Rated power rate	Without brake	kW/s	5.6
	With brake		4.7
Mechanical time constant	Without brake	ms	2.60
	With brake		3.06
Electrical time constant		ms	0.64
Moment of inertia	Without brake	$\times 10^{-4}$kg·m^2	0.045
	With brake		0.053
Brake specifications: Usage		–	Holding
Brake specifications: Rated voltage		V	DC24V±10%
Brake specifications: Rated current		A	0.25
Brake specifications: Static friction torque		N·m	0.16 or over
Brake specifications: Suction time		ms	35 at 100% voltage
Brake specifications: Release time		ms	20 at 100% voltage
Brake specifications: Release voltage		V	DC1V or over

NT characteristics

■NT characteristics

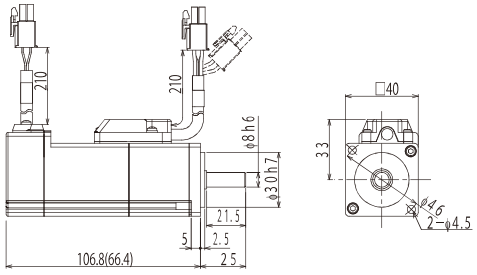


■Continuous torque - ambient temperature

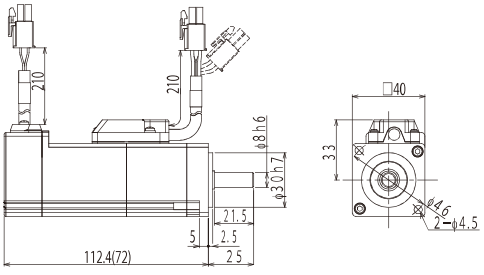


External dimensions

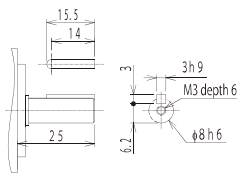
■MM500 without oil seal



■MM500 with oil seal



■Shaft end dimensions



* Dimensions in parentheses ( ) show dimensions with no brake.

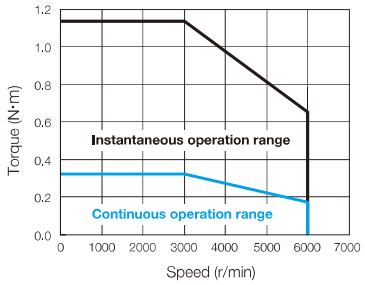
MM101 100W Middle Inertia

Specifications

Item		Unit	
Motor model name M□□□□□2□□**			100W middle inertia MM101□2
Fitting flange size		mm	□40
Approximate mass	Without brake	kg	0.5
	With brake		0.8
Rated voltage		V	200
Rated output		W	100
Rated torque		N·m	0.32
Instantaneous maximum torque		N·m	1.12
Rated current		Arms	0.9
Instantaneous maximum current		Arms	3.2
Rated speed		r/min	3000
Maximum speed		r/min	6000
Torque constant		N·m/A	0.36
Induced voltage constant per phase		mV/(r/min)	12.5
Rated power rate	Without brake	kW/s	13.6
	With brake		12.3
Mechanical time constant	Without brake	ms	1.69
	With brake		1.87
Electrical time constant		ms	0.76
Moment of inertia	Without brake	$\times 10^{-4}$kg·m^2	0.074
	With brake		0.082
Brake specifications	Usage	–	Holding
	Rated voltage	V	DC24V±10%
	Rated current	A	0.25
	Static friction torque	N·m	0.32 or over
	Suction time	ms	35 at 100% voltage
	Release time	ms	20 at 100% voltage
	Release voltage	V	DC1V or over

NT characteristics

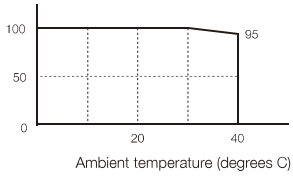
■NT characteristics



■Continuous torque - ambient temperature

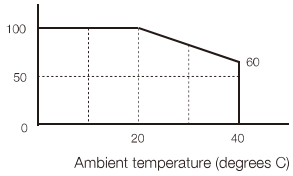
・Without oil seal

Rated torque ratio (%)



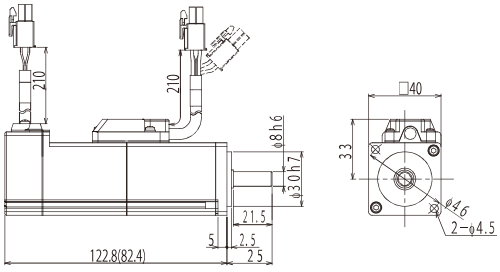
・With oil seal

Rated torque ratio (%)

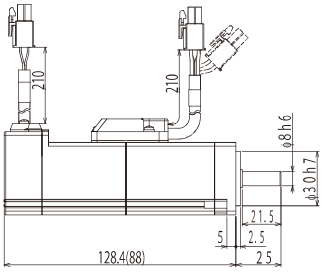


External dimensions

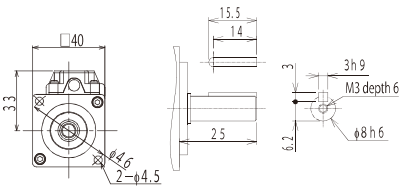
■MM101 without oil seal



■MM101 with oil seal



■Shaft end dimensions



* Dimensions in parentheses ( ) show dimensions with no brake.

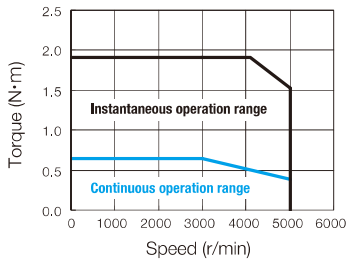
MA201 200W Low Inertia
MH201 200W High Inertia

Specifications

Item		Unit		
Motor model name M□□□□□2□□**			200W low inertia MA201□2	200W high inertia MH201□2
Fitting flange size		mm	□60	
Approximate mass	Without brake	kg	0.9	1.0
	With brake		1.4	1.5
Rated voltage		V	AC200	
Rated output		W	200	
Rated torque		N·m	0.64	
Instantaneous maximum torque		N·m	1.91	
Rated current		Arms	1.7	
Instantaneous maximum current		Arms	4.9	
Rated speed		r/min	3000	
Maximum speed		r/min	5000	
Torque constant		N·m/A	0.417	
Induced voltage constant per phase		mV/(r/min)	14.5	
Rated power rate	Without brake	kW/s	23.9	9.3
	With brake		19.5	8.6
Mechanical time constant	Without brake	ms	1.12	2.87
	With brake		1.37	3.12
Electrical time constant		ms	1.99	
Moment of inertia	Without brake	$\times 10^{-4}$kg·m^2	0.17	0.43
	With brake		0.21	0.47
Brake specifications: Usage		–	Holding	
Brake specifications: Rated voltage		V	DC24V±10%	
Brake specifications: Rated current		A	0.3	
Brake specifications: Static friction torque		N·m	1.27 or over	
Brake specifications: Suction time		ms	50 at 100% voltage	
Brake specifications: Release time		ms	15 at 100% voltage	
Brake specifications: Release voltage		V	DC1V or over	

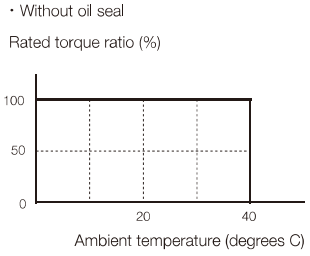
NT characteristics

■NT characteristics

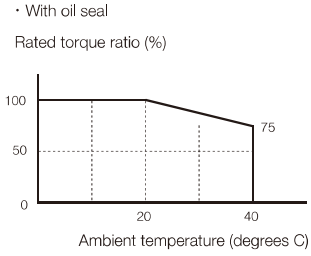


■Continuous torque - ambient temperature

・Without oil seal

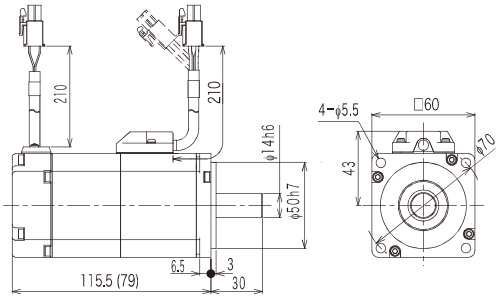


・With oil seal

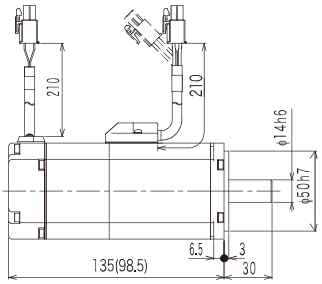


External dimensions

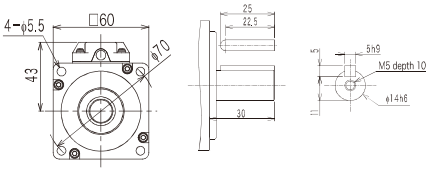
■MA201



■MH201



■Shaft end dimensions



* Dimensions in parentheses ( ) show dimensions with no brake.

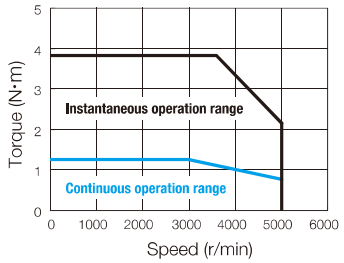
MA401 400W Low Inertia
MH401 400W High Inertia

Specifications

Item		Unit		
Motor model name M□□□□□2□□**			400W low inertia MA401□2	400W high inertia MH401□2
Fitting flange size		mm	□60	
Approximate mass	Without brake	kg	1.3	1.5
	With brake		1.8	2.0
Rated voltage		V	AC200	
Rated output		W	400	
Rated torque		N·m	1.27	
Instantaneous maximum torque		N·m	3.82	
Rated current		Arms	2.7	
Instantaneous maximum current		Arms	7.8	
Rated speed		r/min	3000	
Maximum speed		r/min	5000	
Torque constant		N·m/A	0.498	
Induced voltage constant per phase		mV/(r/min)	17.4	
Rated power rate	Without brake	kW/s	58.7	23.5
	With brake		51.9	22.4
Mechanical time constant	Without brake	ms	0.67	1.66
	With brake		0.75	1.75
Electrical time constant		ms	2.47	
Moment of inertia	Without brake	$\times 10^{-4}$kg·m^2	0.28	0.69
	With brake		0.31	0.72
Brake specifications: Usage		–	Holding	
Brake specifications: Rated voltage		V	DC24V±10%	
Brake specifications: Rated current		A	0.3	
Brake specifications: Static friction torque		N·m	1.27 or over	
Brake specifications: Suction time		ms	50 at 100% voltage	
Brake specifications: Release time		ms	15 at 100% voltage	
Brake specifications: Release voltage		V	DC1V or over	

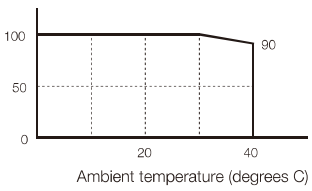
NT characteristics

■NT characteristics

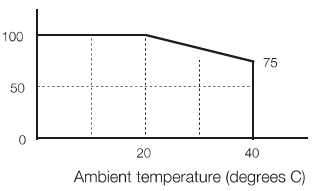


■Continuous torque - ambient temperature

・Without oil seal

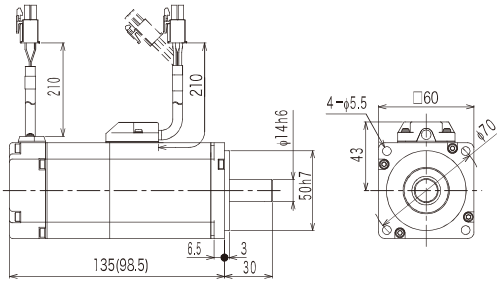


・With oil seal

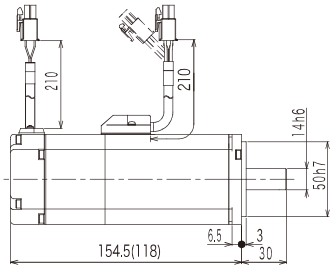


External dimensions

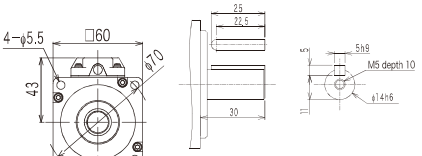
■MA401



■MH401



■Shaft end dimensions



* Dimensions in parentheses ( ) show dimensions with no brake.

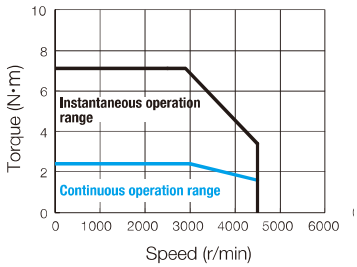
MA751 750W Low Inertia
MH751 750W High Inertia

Specifications

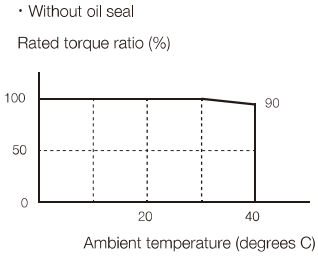
Item		Unit		
Motor model name M□□□□□2□□**			750W low inertia MA751□2	750W high inertia MH751□2
Fitting flange size		mm	□80	
Approximate mass	Without brake	kg	2.5	2.7
	With brake		3.3	3.5
Rated voltage		V	AC200	
Rated output		W	750	
Rated torque		N·m	2.39	
Instantaneous maximum torque		N·m	7.1	
Rated current		Arms	4.3	
Instantaneous maximum current		Arms	12.8	
Rated speed		r/min	3000	
Maximum speed		r/min	4500	
Torque constant		N·m/A	0.61	
Induced voltage constant per phase		mV/(r/min)	21.3	
Rated power rate	Without brake	kW/s	64.1	35.9
	With brake		52.8	32.1
Mechanical time constant	Without brake	ms	0.53	0.94
	With brake		0.64	1.06
Electrical time constant		ms	4.3	
Moment of inertia	Without brake	$\times10^{-4}$kg·m^2	0.89	1.59
	With brake		1.08	1.78
Brake specifications: Usage		–	Holding	
Brake specifications: Rated voltage		V	DC24V±10%	
Brake specifications: Rated current		Arms	0.4	
Brake specifications: Static friction torque		N·m	2.39 or over	
Brake specifications: Suction time		ms	70 at 100% voltage	
Brake specifications: Release time		ms	20 at 100% voltage	
Brake specifications: Release voltage		V	DC1V or over	

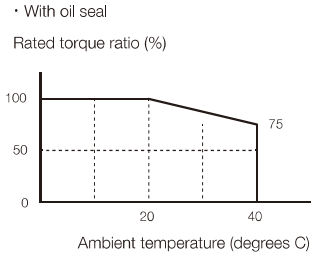
NT characteristics

■NT characteristics



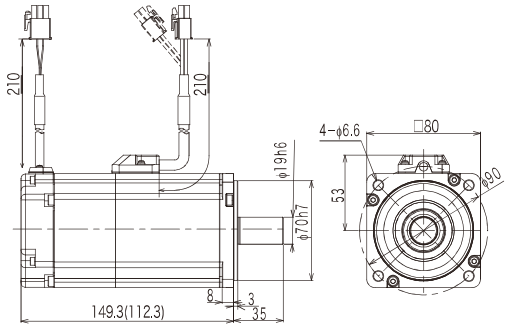
■Continuous torque - ambient temperature



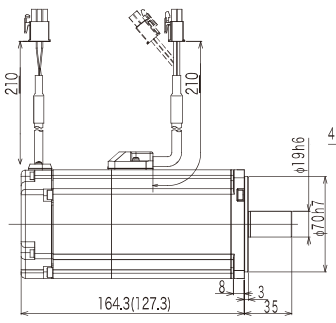


External dimensions

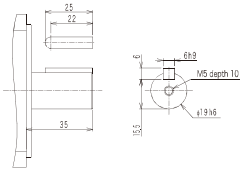
■MA751



■MH751



■Shaft end dimensions



* Dimensions in parentheses ( ) show dimensions with no brake.

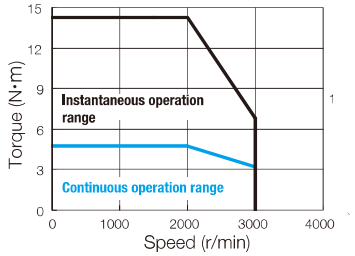
MM102 1 kW Middle Inertia

Specifications

Item		Unit	
Motor model name M□□□□□2□□**			1 kW middle inertia MM102□2
Fitting flange size		mm	□130
Approximate mass	Without brake	kg	5.6
	With brake		7.0
Rated voltage		V	AC200
Rated output		W	1000
Rated torque		N·m	4.77
Instantaneous maximum torque		N·m	14.3
Rated current		Arms	5.6
Instantaneous maximum current		Arms	15.6
Rated speed		r/min	2000
Maximum speed		r/min	3000
Torque constant		N·m/A	0.88
Induced voltage constant per phase		mV/(r/min)	30.9
Rated power rate	Without brake	kW/s	50.0
	With brake		36.5
Mechanical time constant	Without brake	ms	0.76
	With brake		1.05
Electrical time constant		ms	10.1
Moment of inertia	Without brake	$\times10^{-4}$kg·m^2	4.56
	With brake		6.24
Brake specifications: Usage		–	Holding
Brake specifications: Rated voltage		V	DC24V±10%
Brake specifications: Rated current		Arms	1
Brake specifications: Static friction torque		N·m	9.55 or over
Brake specifications: Suction time		ms	120 at 100% voltage
Brake specifications: Release time		ms	30 at 100% voltage
Brake specifications: Release voltage		V	DC1V or over

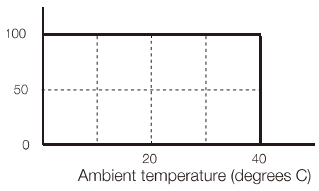
NT characteristics

■NT characteristics

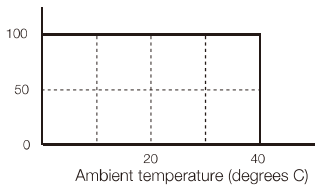


■Continuous torque - ambient temperature

・Without oil seal
Rated torque ratio (%)

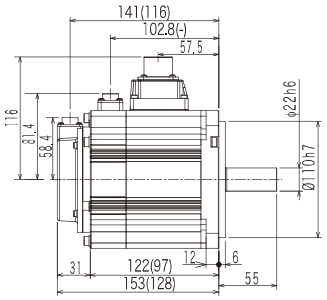


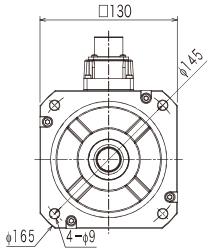
・With oil seal
Rated torque ratio (%)



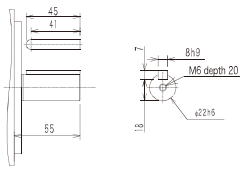
External dimensions

■MM102





■Shaft end dimensions



* Dimensions in parentheses ( ) show dimensions with no brake.

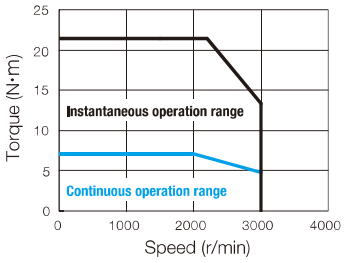
MM152 1.5 kW Middle Inertia

Specifications

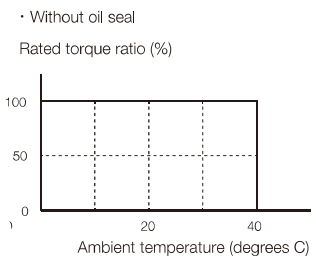
Item		Unit	
Motor model name M□□□□□2□□**			1.5 kW middle inertia MM152□2
Fitting flange size		mm	□130
Approximate mass	Without brake	kg	7.0
	With brake		8.4
Rated voltage		V	AC200
Rated output		W	1500
Rated torque		N·m	7.16
Instantaneous maximum torque		N·m	21.5
Rated current		Arms	9.9
Instantaneous maximum current		Arms	27.9
Rated speed		r/min	2000
Maximum speed		r/min	3000
Torque constant		N·m/A	0.81
Induced voltage constant per phase		mV/(r/min)	28.4
Rated power rate	Without brake	kW/s	76.9
	With brake		61.4
Mechanical time constant	Without brake	ms	0.60
	With brake		0.75
Electrical time constant		ms	12.2
Moment of inertia	Without brake	$\times 10^{-4}$kg·m^2	6.67
	With brake		8.35
Brake specifications	Usage	–	Holding
	Rated voltage	V	DC24V±10%
	Rated current	Arms	1
	Static friction torque	N·m	9.55 or over
	Suction time	ms	120 at 100% voltage
	Release time	ms	30 at 100% voltage
	Release voltage	V	DC1V or over

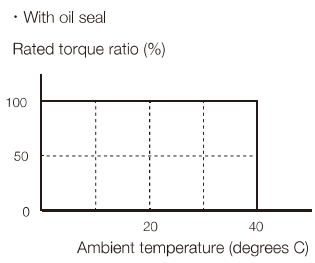
NT characteristics

■NT characteristics



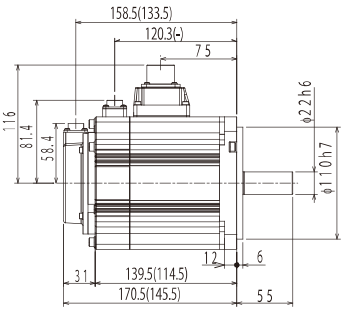
■Continuous torque - ambient temperature

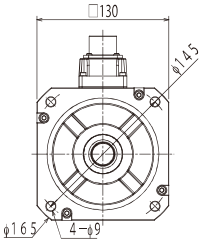




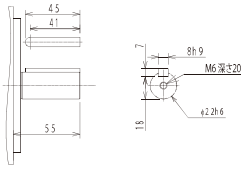
External dimensions

■MM152





■Shaft end dimensions



* Dimensions in parentheses ( ) show dimensions with no brake.

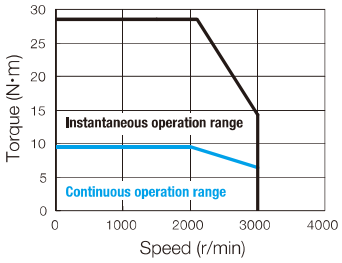
MM202 2 kW Middle Inertia

Specifications

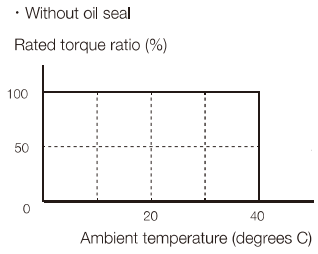
Item		Unit	
Motor model name M□□□□□2□□**			2 kW middle inertia MM202□2
Fitting flange size		mm	□130
Approximate mass	Without brake	kg	8.4
	With brake		9.8
Rated voltage		V	AC200
Rated output		W	2000
Rated torque		N·m	9.55
Instantaneous maximum torque		N·m	28.6
Rated current		Arms	12.2
Instantaneous maximum current		Arms	34.6
Rated speed		r/min	2000
Maximum speed		r/min	3000
Torque constant		N·m/A	0.85
Induced voltage constant per phase		mV/(r/min)	29.6
Rated power rate	Without brake	kW/s	104.9
	With brake		87.9
Mechanical time constant	Without brake	ms	0.58
	With brake		0.69
Electrical time constant		ms	12.2
Moment of inertia	Without brake	$\times10^{-4}$kg·m^2	8.70
	With brake		10.38
Brake specifications: Usage		–	Holding
Brake specifications: Rated voltage		V	DC24V±10%
Brake specifications: Rated current		Arms	1
Brake specifications: Static friction torque		N·m	9.55 or over
Brake specifications: Suction time		ms	120 at 100% voltage
Brake specifications: Release time		ms	30 at 100% voltage
Brake specifications: Release voltage		V	DC1V or over
Heat radiating condition		–	t=20×□470 aluminum heat sink

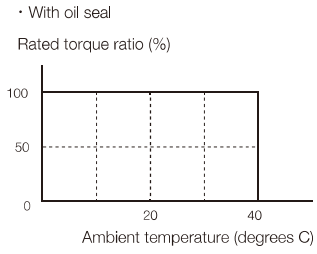
NT characteristics

■NT characteristics



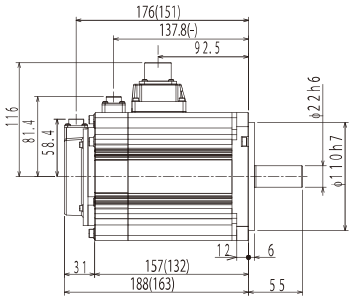
■Continuous torque - ambient temperature

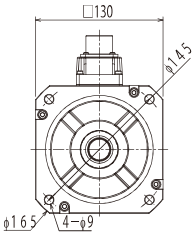




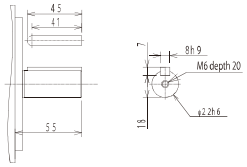
External dimensions

■MM202





■Shaft end dimensions



* Dimensions in parentheses ( ) show dimensions with no brake.

Supplement to Motor Specifications

Ambient conditions for use

Item	Unit	Specifications	
Ambient temperature for use	°C	0 - 40 (without condensation) Note 1)	
Ambient humidity for use	%RH	20 - 85 (without condensation)	
Ambient temperature for storage	°C	-20 - 65 (highest temperature guaranteed: 80 degrees C, 72 hours) Note 2)	
Ambient humidity for storage	%RH	20 - 85 (without condensation)	
Atmosphere for use/storage	–	Indoors (not subject to rainwater or direct sunlight); free from corrosive gas, flammable gas, flammables, grinding fluid, oil mist, or dust	
Insulation class	–	Class B	
Insulation resistance	–	1000 VDC megger 5 Mohms or more	
Dielectric strength	–	At 1500 VAC 50/60 Hz for 1 minute 10 mA or less	
Vibration class	–	V 15	
Vibration resistance	m/s^2	49 (5G)	
Impact resistance	m/s^2	98 (10G)	
Protective construction	–	IP65 (excluding shaft penetrating section and connectors)	
Time rating	–	Continuous	CCW 
Operating position	–	All orientations	
Direction of rotation	–	Normal: CCW, Reverse: CW	
Standard test conditions	–	20degrees C, 65% RH. However, if no doubt is to occur, measurement may be conducted in the range 5 - 40 degrees C, 45 - 95% RH.	
Common/normal conditions of use	–	20 hours or less per day at an annual average temperature of 30 degrees C and a load factor of 80% or less	

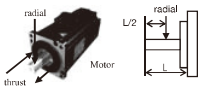
Note 1) The temperature for use is the temperature measured at a point 5 cm apart from the motor.
Note 2) This is a temperature that can be tolerated only for a short period such as during transportation.

Encoder specifications

Item		Unit			Remarks
Motor model name		–	M□□□□□□□N**	M□□□□□□□A**	
Encoder specifications		–	17bit (incremental)	17bit (absolute)	
Encoder room temperature		°C	0 - 85		
Resistance to external magnetic field		mT	± 2 (20 G) or less		
Rated voltage		V	DC 4.5V - 5.5 V		
External battery voltage		V	–	DC 2.4 V - 5.5 V	
Current consumption		mA	160 typ		
State of low power consumption		µA	–	Typ 10µA	
Single revolution resolution		–	131,072 (17bit)		
Multi-revolution count		count/turn	–	65,536 Count	Count-up direction CCW 
Maximum speed		r/min	6,000		
Input/output form			EIA-422B (half-duplex)		
Count-up direction		–	CCW		
Communication specifications	Transmission method	–	Half-duplex asynchronous serial communication		
	Communication speed	Mbps	2.5		

Output shaft permissible load

Item	Unit	Specifications							
Motor model name M□□□□□2□□**		50 W MM500□2	100 W MM101□2	200 W MA201□2 MH201□2	400 W MA401□2 MH401□2	750 W MA751□2 MH751□2	1 kW MM102□2	1.5 kW MM152□2	2 kW MM202□2
Permissible radial load	N	68	68	245	245	392	490	490	490
Permissible thrust load	N	58	58	98	98	147	196	196	196



* At the midpoint of the shaft protrusion

Amplifiers

DA2YZ**

DA2Z1**

DA212**

DA224**

DA238**

DA24A**

DA26B**

DA28C**

How to read the part numbers

DA 2 12 * *

Suffix

Voltage specifications

Type	Voltage
2	AC200 - 240 V

Applicable motor

Type	Motor model	Output
YZ	M□500□2□□＊＊	50 W
Z1	M□101□2□□＊＊	100 W
12	M□201□2□□＊＊	200 W
24	M□401□2□□＊＊	400 W
38	M□751□2□□＊＊	750 W
4A	M□102□2□□＊＊	1 kW
6B	M□152□2□□＊＊	1.5 kW
8C	M□202□2□□＊＊	2 kW

Compatible amplifier model

Type	
0	For incremental type only
1	For both incremental and absolute types

Specifications

Item			Specifications							
Model name			DA2YZ**	DA2Z1**	DA212**	DA224**	DA238**	DA24A**	DA26B**	DA28C**
Common specifications	Applicable motor		M□500	M□101	M□201	M□401	M□751	M□102	M□152	M□202
	External dimensions W (mm)		40				48	84		
	H (mm)		160				160	160		
	D (mm)		130				130	130		
	Weight (Kg-Typ)		0.7				0.8	1.6		
	Input power	Main circuit power	Single-phase 200 - 240 V ± 10%, 50/60 Hz Note 1: In case of three-phase power, connect only two phases.					Three-phase 200 - 240V ± 10% 50/60 Hz		
		Control power	24 VDC ± 10% Use SELV power. Note 2)							
			140mA Typ				220mA TypA	240mA Typ		
	Control type		Three-phase PWM inverter sine-wave driven							
	Encoder feed-back		17-bit serial incremental/absolute encoder							
	Control signal	Input	Switched by 8-point (24 VDC system, photo-coupler input insulation) control mode							
		Output	Switched by 8-point (24 VDC system, open collector output insulation) control mode							
	Pulse signal	Input	EIA-422 differential Open collector							
		Output	A/B/Z-phase EIA-422 differential Open collector output enabled for Z-phase alone.							
	Communication function		USB: connection with PC, EIA-485: host remote control communication (multi-drop compatible)							
	Amplifier state indication function		Normal/fault indication by LED (STATUS) Power ON normal: lit green; power OFF: unlit; power ON fault: flashing red							
	Regeneration function		Regenerative resistor mountable externally							
	Dynamic brake		Software-based short braking							
	Control mode		Position control, speed control							

Note 1) When connecting two phases from three-phase power, the power supply contract may need checking depending on the country of use.
Note 2) The precondition if any CE action is required is a capacity of 150 W or less.

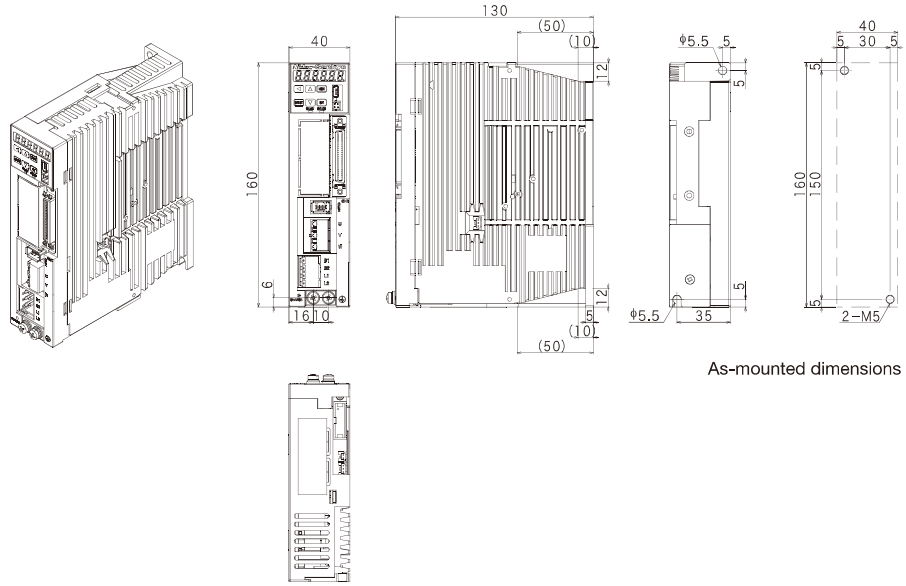
Environmental specifications	Temperature	Ambient temperature for use	0 - 55 (without condensation)
		Ambient temperature for storage	-20 - 65 (without condensation)
	Humidity	Ambient humidity for use	20 - 85% RH or less (without condensation)
		Ambient humidity for storage	20 - 85% RH or less (without condensation)
	Atmosphere for use & storage		Indoors (not subject to direct sunlight); free from corrosive gas, flammable gas, oil mist, or dust
	Altitude		1000 m or less above sea level
	Vibration		5.8 m/s^2 (0.6 G) or less, 10 - 60 Hz (no continuous operation allowed at frequency of resonance)
Dielectric strength			1 minute at 1500 VAC across the primary and FG
Points to note			Class I products for which grounding is mandatory
			"Over-voltage category II" products
			"Pollution Degree 2" products

Specifications

Specifications for functional control section	Position control	Control input		Servo ON, alarm reset, command input prohibition, deviation counter clear, torque limiter selection, CCW/CW drive prohibition
		Control output		Alarm state, servo ready, positioning complete, brake release, servo ON
		Pulse input	Maximum command pulse frequency	EIA-422 differential: 4 Mpps Open collector: 200 kpps
			Input pulse signal form	Pulse + direction, A-/B-phase orthogonal phase difference pulse, CW + CCW pulse
			Command pulse division/ multiplication	Provided
			Smoothing	Provided
		Pulse output	Output pulse signal format	Encoder position pulse released in the following manner: A-/B-phase orthogonal phase difference pulse and Z-phase index pulse released in EIA-422 differential format, Z-phase index pulse released through open collector
		Vibration suppression control function		Provided
	Speed control	Control input		Servo ON, alarm reset, command input prohibition (zero speed clamp), torque limiter selection, CCW/CW drive prohibition
		Control output		Alarm state, servo ready, brake release, servo ON
		Analog input	Speed command input	Input voltage -10 V to +10 V (Maximum speed occurs at ± 10 V.)
			Smoothing	Provided
		Pulse output	Output pulse signal format	Encoder position pulse released in the following manner: A-/B-phase orthogonal phase difference pulse and Z-phase index pulse released in EIA-422 differential format Z-phase index pulse released through open collector
	Internal speed control	Control input		Servo ON, alarm reset, internal speed command - start/stop, 8-stage internal speed command selection, torque limiter selection
		Control output		Servo alarm, servo ready, brake release, servo ON
		Pulse output	Output pulse signal format	Encoder position pulse released in the following manner: A-/B-phase orthogonal phase difference pulse and Z-phase index pulse released in EIA-422 differential format Z-phase index pulse released through open collector
	Common	Speed observer function		Provided
		Feed-forward compensation		Provided
		Mechanical resonance reduction function		Provided
		Auto-tuning function		Provided
		Encoder output division/multiplication		Provided
		Tuning/function setting		Adjusted using “S-TUNE” dedicated software
		Protective function		Hardware error/software error

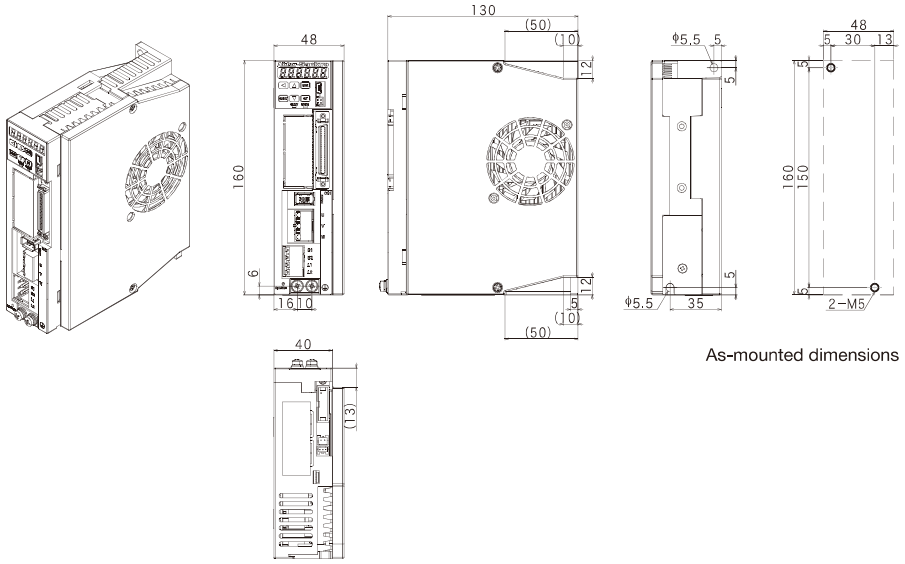
External Dimensions of Amplifiers

■DA2YZ**, DA2Z1**, DA212**, DA224**



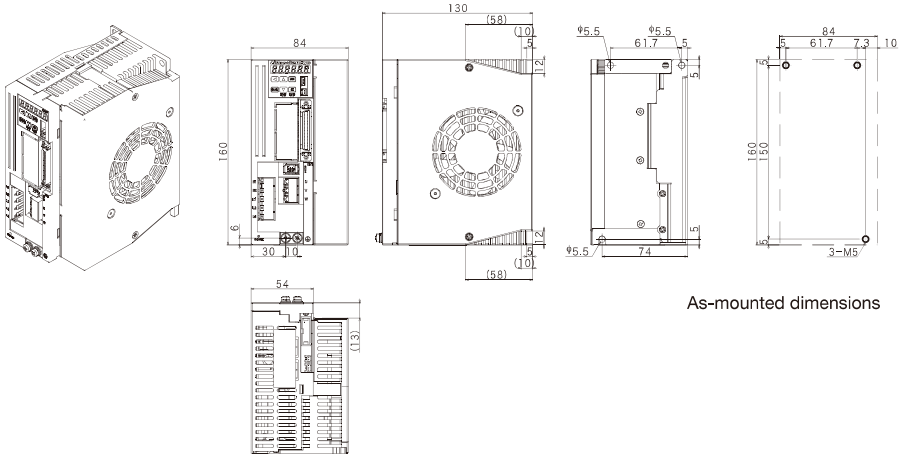
As-mounted dimensions

■DA238**



As-mounted dimensions

■DA24A**, DA26B**, DA28C**

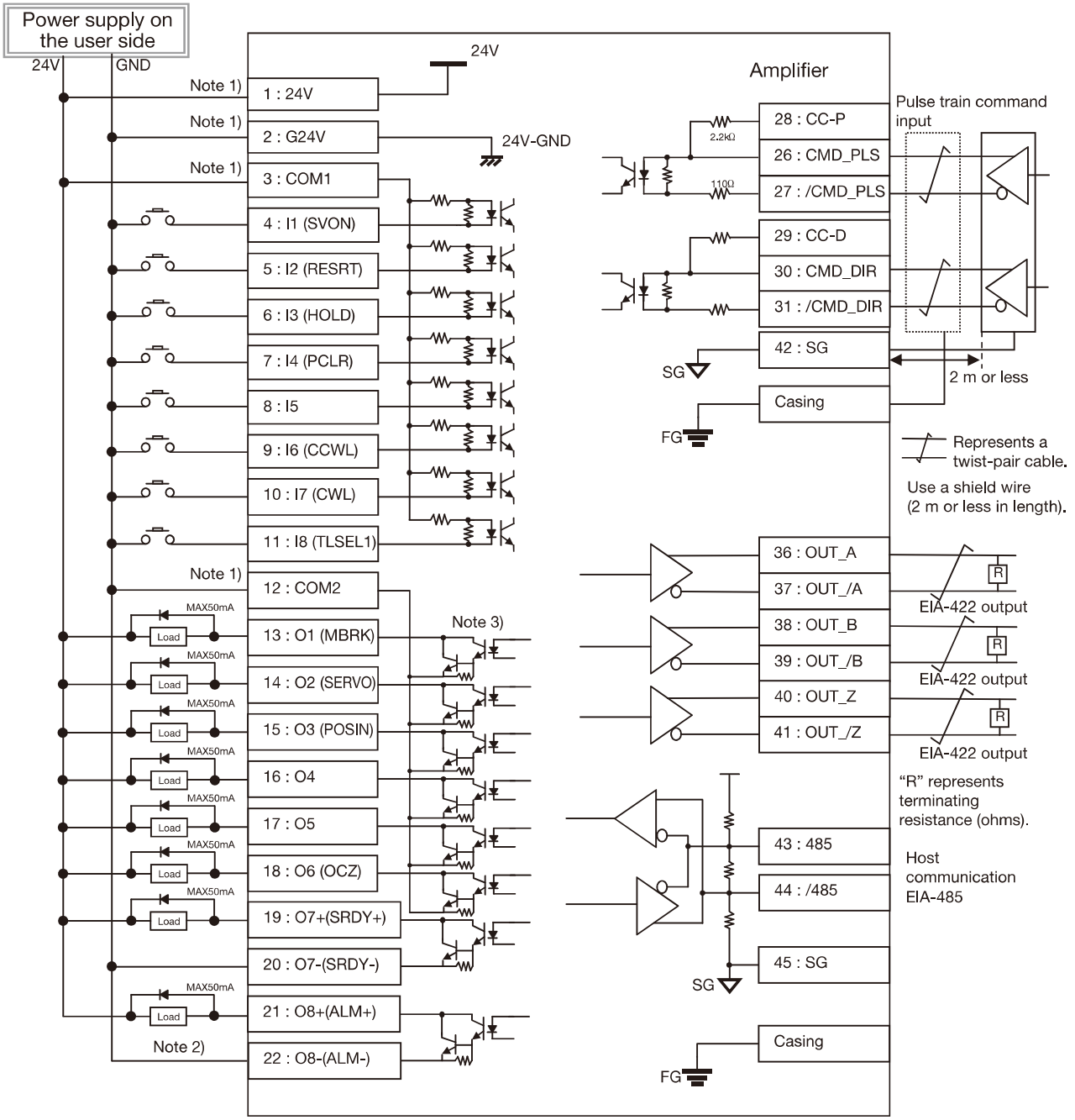


As-mounted dimensions

I/O Connector (CN1) Pin Arrangement

Pin No.	Signal name	Class	Control code	Description
1	24V	Power supply	All	Amplifier control power supply 24 V input
2	G24V	Power supply	All	Amplifier control power supply GND
3	COM1	Power supply	All	I/O power supply 24 V input
4	I1	Input	All	Servo ON
5	I2	Input	All	Alarm reset
6	I3	Input	Position	Command input prohibition
			Analog speed	Command input prohibition (zero speed clamp)
			Internal speed	Internal speed command - start 1
7	I4	Input	Position	Deviation counter clear
			Analog speed	Reserved
			Internal speed	Internal speed command - start 2
8	I5	Input	Position	Reserved
			Analog speed	Reserved
			Internal speed	Internal speed command - speed command selection 1
9	I6	Input	Position	CCW drive prohibition
			Analog speed	CCW drive prohibition
			Internal speed	Internal speed command - speed command selection 2
10	I7	Input	Position	CW drive prohibition
			Analog speed	CW drive prohibition
			Internal speed	Internal speed command - speed command selection 3
11	I8	Input	All	Torque limit
12	COM2	Power supply	All	I/O power supply GND
13	O1	Output	All	Brake release
14	O2	Output	All	Servo status output
15	O3	Output	Position	Positioning complete output
			Analog speed	Reserved
			Internal speed	Reserved
16	O4	Output	All	Reserved
17	O5	Output	All	Reserved
18	O6	Output	All	Encoder Z-phase output
19	O7+	Output	All	Servo ready +
20	O7-	Output	All	Servo ready -
21	O8+	Output	All	Alarm status +
22	O8-	Output	All	Alarm status -
23	NC1	-	-	Reserved (Do not connect)
24	SP1	-	-	Reserved
25	SP2	-	-	Reserved
26	CMD_PLS	Input	Position	[Differential input] (1) Pulse + direction Pulse (2) Orthogonal phase difference A-phase (3) CCW + CW pulse CCW [5 V open collector] (4) 5 V power supply input of /CMD_PLS
27	/CMD_PLS	Input	Position	[Differential input] (1) Pulse + direction /Pulse (2) Orthogonal phase difference/ A-phase (3) CCW + CW pulse /CCW [5 V/24 V open collector] (4) Pulse + direction Pulse (5) Orthogonal phase difference A-phase (6) CCW + CW pulse CCW
28	CC-P	Input	Position	[24 V open collector input] (1) 24 V of /CMD_PLS
29	CC-D	Input	Position	[24 V open collector input] (1) 24 V of /CMD_DIR
30	CMD_DIR	Input	Position	[Differential input] (1) Pulse + direction Direction (2) Orthogonal phase difference B-phase (3) CCW + CW pulse CW [5 V open collector] (4) 5 V power supply input of /CMD_DIR
31	/CMD_DIR	Input	Position	[Differential input] (1) Pulse + direction /Direction (2) Orthogonal phase difference / B-phase (3) CCW + CW pulse /CW [5 V/24 V open collector] (4) Pulse + direction Direction (5) Orthogonal phase difference B-phase (6) CCW + CW pulse CW
32	A_SPEED	Input	Analog speed	Analog speed command input
33	A_GND	Input	Analog speed	Analog ground
34	A_TRQ	Input	-	Reserved
35	A_GND	Input	-	Reserved
36	OUT_A	Output	All	Encoder A-phase
37	/OUT_A	Output	All	Encoder /A-phase
38	OUT_B	Output	All	Encoder B-phase
39	/OUT_B	Output	All	Encoder /B-phase
40	OUT_Z	Output	All	Encoder Z-phase
41	/OUT_Z	Output	All	Encoder /Z-phase
42	SG	Power supply	All	Signal ground
43	485	Input	All	485 of EIA-485 communication
44	/485	Input	All	/485 of EIA-485 communication
45	SG	Power supply	All	Signal ground
46	NC2	-	-	Reserved (Do not connect)
47	SP3	-	-	Reserved
48	SP4	-	-	Reserved
49	EDM+	-	-	Reserved
50	EDM-	-	-	Reserved

Position Command Differential Input

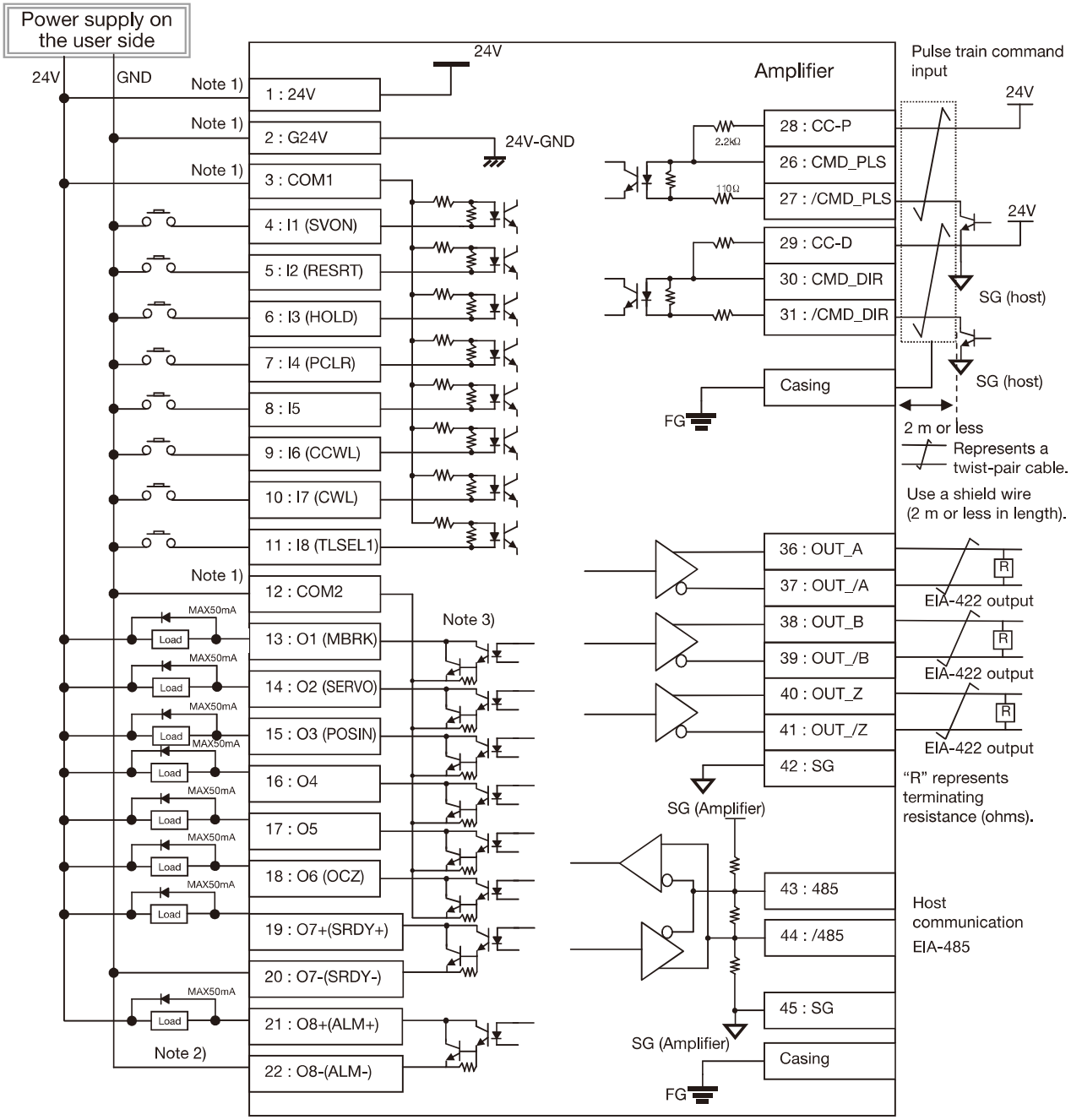


Note 1) Use a shared power supply for the control power (24 V, G24 V) and I/O power (COM1, 2).

Note 2) When driving inductance loads (e.g.: relays), provide a protective circuit (diode).

Note 3) The output circuit is configured as open collector Darlington transistor output. It is connected to a relay or photo coupler. Please note that, since the collector - emitter voltage VCE (SAT) is approximately 1 V while the transistor is ON, no ordinary TTL IC can satisfy the requirement of VIL.

Position Command 24 V Open Collector Input

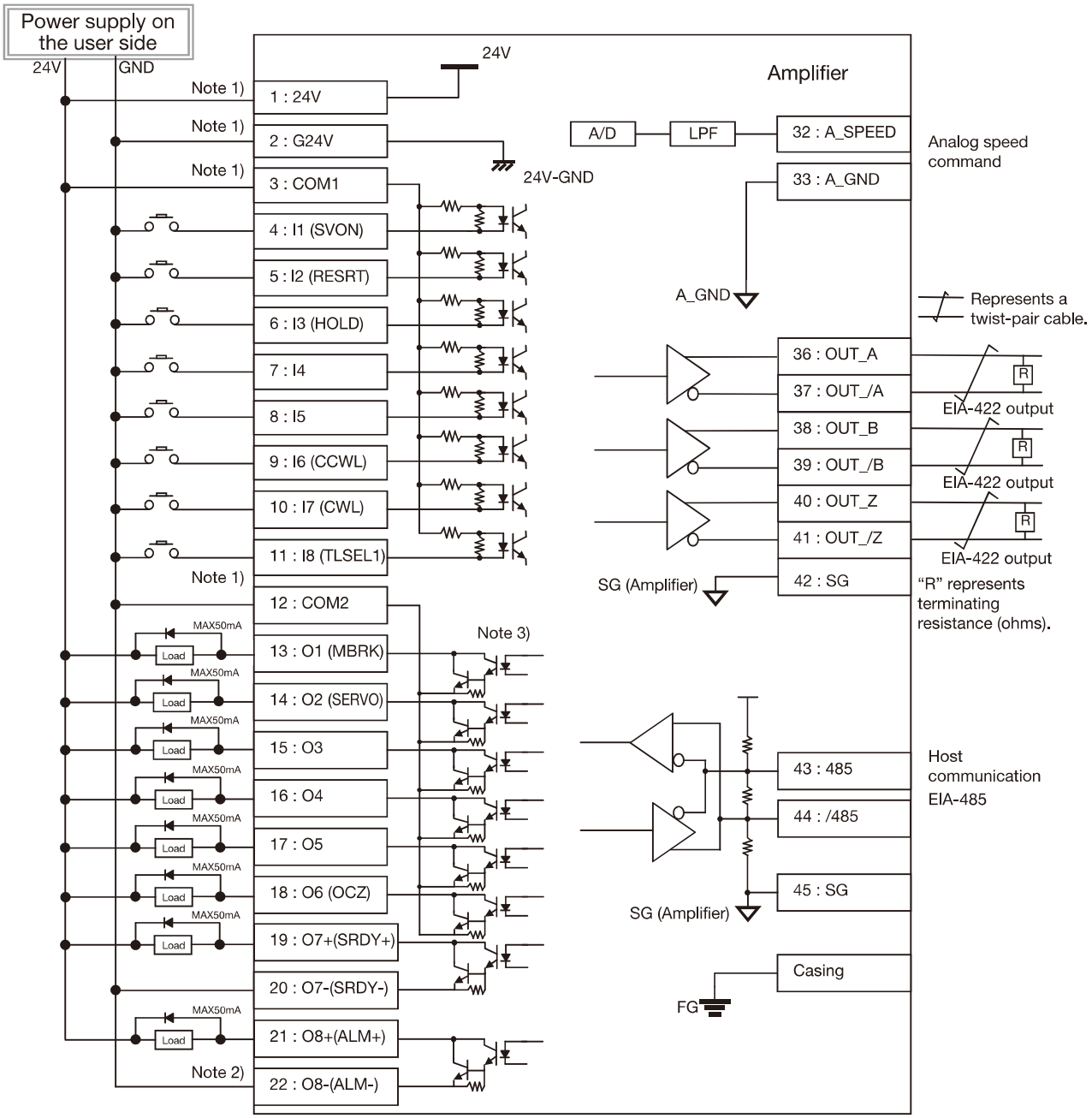


Note 1) Use a shared power supply for the control power (24 V, G24 V) and I/O power (COM1, 2).

Note 2) When driving inductance loads (e.g.: relays), provide a protective circuit (diode).

Note 3) The output circuit is configured as open collector Darlington transistor output. It is connected to a relay or photo coupler. Please note that, since the collector - emitter voltage VCE (SAT) is approximately 1 V while the transistor is ON, no ordinary TTL IC can satisfy the requirement of VIL.

Analog Speed Command



Note 1) Use a shared power supply for the control power (24 V, G24 V) and I/O power (COM1, 2).

Note 2) When driving inductance loads (e.g.: relays), provide a protective circuit (diode).

Note 3) The output circuit is configured as open collector Darlington transistor output. It is connected to a relay or photo coupler. Please note that, since the collector - emitter voltage VCE (SAT) is approximately 1 V while the transistor is ON, no ordinary TTL IC can satisfy the requirement of VIL.

Explanation of Wiring Connections with Peripheral Equipment

Item	Description
Peripheral equipment configuration	To comply with the EC Directive, select appropriate equipment in compliance with applicable standards and install in accordance with the “operating instructions.”
Installation environment	Install the amplifier in an environmental of Pollution Degree 2 or 1 as specified by IEC60664-1.
Power supply1: 200 - 240 VAC (main circuit)	Please use our products in the power supply environment of over-voltage category II as specified by IEC60664-1.
Power supply 2: 24 VDC ・Amplifier control power ・I/O power ・Motor brake release power	For the 24 VDC external power supply, select specifications that satisfy the following requirements: Use SELV power (*) with a capacity of 150 W or less. This is a precondition for taking any CE action. * SELV: Safety Extra Low Voltage (Non-hazardous voltage, or reinforced insulation from any hazardous voltage)
Wiring/cabling	For the motor motive power cable, encoder cable, 200 VAC input cable, FG cable, and the main circuit power distribution cable in the case of multi-axis configuration, use wire materials with a dielectric strength of AWG18/600 V or equivalent for 750 W or less and AWG14/600 V or equivalent for 1 kW or over.
Circuit breaker	The circuit breaker shuts the circuit down upon any occurrence of over-current to protect the power supply line. In accordance with the “operating instructions,” always use an IEC standard or UL-certified circuit breaker between the power supply and the noise filter. To ensure compliance with EMC, use our recommended circuit breaker, which can detect electrical leakage.
Noise filter	Prevents any ingress of external noise from the power supply line. To ensure compliance with EMC, use our recommended noise filter.
Electromagnetic contactor	Turns the main power supply ON and OFF. Provide a surge absorber for use.
Surge absorber	To ensure compliance with EMC, use our recommended surge absorber.
Signal line noise filter/ferrite core	To ensure compliance with EMC, use our recommended noise filter.
Regenerative resistor	The current product is not equipped with a regenerative resistor. In cases where the smoothing capacitor inside the servo amplifier is not capable of fully absorbing regenerative power, an externally mounted regenerative resistor is required. As a guide, use a regenerative resistor if the regenerative voltage warning is ON when you check the state of regeneration on the settings panel. For the reference specifications of the regenerative resistor, see the “operating instructions.” Use a built-in thermostat type resistor to form an overheating prevention circuit.
Grounding	Since our products are Class I equipment, protective grounding is mandatory. Securely ground the company’s products using protective grounding terminals through EMC-compatible casings and control panels. The protective grounding terminal connection is indicated on the FG label as shown below. 

Amplifier Connectors

Name		Symbol	Pin No.	Signal name	Description	Amplifier connector type code	Connection connector type code	Manufactured by
750 W or less	Regenerative resistor connection	B1/ B2/ L1/ L2	1	VP	Regenerative resistor connection P-side	2092-1424	2092-1104/002-000	WAGO Japan
			2	Regen-out	Regenerative resistor connection N-side			
	Single-phase 200 VAC input		3	Primary-Power 1	L1			
			4	Primary-Power 2	L2			
1 kW or over	Regenerative resistor connection	B1/ B2/ L1/ L2/ L3	1	VP	Regenerative resistor connection P-side	2092-3425	2092-3105/002-000	WAGO Japan
			2	Regen-out	Regenerative resistor connection N-side			
	Three-phase 200 VAC input		3	Primary-Power 1	L1 (L1 when using with single-phase power)			
			4	Primary-Power 2	L2 (not connected when using with single-phase power)			
			5	Primary-Power 3	L3 (L2 when using with single-phase power)			
Motor motive power output		U/V/W	1	U	Motor motive power U-phase output	2092-3323	2092-3523/002-000	WAGO Japan
			2	V	Motor motive power V-phase output			
			3	W	Motor motive power W-phase output			
Encoder		CN2	1	VCC	Encoder power supply 5 V output	3E106-2230KV	Connector 3E206-0100KV Cover 3E306-3200-008	3M
			2	GND	Signal ground			
			3	NC	-			
			4	NC	-			
			5	+D	Encoder signal data input & output			
			6	-D	Encoder signal/data input & output			
			-	SHIELD	SHIELD wired to the connector casing			
PC communication		CN3	1	VBUS	USB power supply	UX60SC-MB-5ST	USB mini B (any manufacturer)	Hirose Electric
			2	D-	USB data -			
			3	D+	USB data +			
			4	NC	-			
			5	GND	USB signal ground			
User I/O		CN1	See the separate table.			XAP-02V-1	Plug 10150-30000-PE Cover 10350	3M

◆ None of the above-shown connectors is attached to the product, excluding the single-phase 200 VAC input/regenerative resistor connecting connector, the three-phase 200 VAC input/regenerative resistor connecting connector and the motor motive power output connector. Customers are asked to procure these on their own.

Motor Connectors

■① In case of 750 W or less

Name	Pin No.	Signal name	Description	Motor connector type code	Connection connector type code	Manufactured by
Motor motive power input	1	U	Motor motive power U-phase	Housing 172167-1 Contact 170364-1	Housing 172159-1 Contact 170366-1	Tyco Electronics Japan
	2	V	Motor motive power V-phase			
	3	W	Motor motive power W-phase			
	4	FG	Motor frame ground			
Brake Note 1)	1	BRK +	Brake power supply 24 VDC	Housing 172165-1 Contact 170363-1	Housing 172157-1 Contact 170366-1	Tyco Electronics Japan
	2	BRK–	Brake power supply GND			
Encoder (incremental)	1	-	NC	Housing 172168-1 Contact 170363-1	Housing 172160-1 Contact 170365-1	Tyco Electronics Japan
	2	+D	Serial communication data +data			
	3	-D	Serial communication data - data			
	4	VCC	Encoder power supply 5 V			
	5	GND	Signal ground			
	6	SHIELD	Shield			
Encoder (absolute)	1	BAT	External battery Note 2)	Housing 172169-1 Contact 170363-1	Housing 172161-1 Contact 170365-1	Tyco Electronics Japan
	2	CAP	External capacitor Note 2)			
	3	SHIELD	Shield			
	4	+D	Serial communication data +data			
	5	-D	Serial communication data - data			
	6	IC	Internal connect Note 3)			
	7	VCC	Encoder power supply 5 V			
	8	GND	Signal ground			
	9	IC	Internal connect Note 3)			

■② In case of 1 kW or over

Name	Pin No.	Signal name	Description	Motor connector type code	Connection connector type code	Manufactured by
Motor motive power input	A	U	Motor motive power U-phase	JI04V-2A18-10PE-B-R	JI04V-6A18-10SE-EB-R or JI04V-8A18-10SE-EB-R	Japan Aviation Electronics
	B	V	Motor motive power V-phase			
	C	W	Motor motive power W-phase			
	D	FG	Motor frame ground			
Brake Note 1)	1	BRK+	Brake power supply 24 VDC	CM10-R2P-D (D7)	CM10-SP2S- □ -D CM10-AP2S- □ -D Select from 6 part numbers where □ represents “S,” “M” or “L.”	DDK
	2	BRK-	Brake power supply GND			
Encoder (incremental)	1	VCC	Encoder power supply 5 V	CM10-R10P-D(D7)	CM10-SP10S- □ -D CM10-AP10S- □ -D Select from 6 part numbers where □ represents “S,” “M” or “L.”	DDK
	2	GND	Signal ground			
	3	-	NC			
	4	-	NC			
	5	+D	Serial communication data +data			
	6	-D	Serial communication data - data			
	7	-	NC			
	8	-	NC			
	9	-	NC			
	10	SHIELD	Shield			
Encoder (absolute)	1	VCC	Encoder power supply 5 V			
	2	GND	Signal ground			
	3	CAP	External capacitor Note 2)			
	4	BAT	External battery Note 2)			
	5	+D	Serial communication data +data			
	6	-D	Serial communication data - data			
	7	IC	Internal connect Note 3)			
	8	IC	Internal connect Note 3)			
	9	GND	Signal ground			
	10	SHIELD	Shield			

Note 1) In the case of a motor equipped with a brake
Note 2) For the external capacitor and battery, use GND as the reference point of potential.
Note 3) Since the internal connect (IC) is internally connected to the circuit board, do not connect anything to that.

Sample Recommended Cable Specifications

S-FLAG series servo motor products do not come with the cables required for connection. Customers are asked to procure the cables appropriate for their actual conditions of use referencing the following sample recommendations.

Cable name	AWG	UL	Dielectric strength	Resistance to heat	Remarks
Motor motive power (750 W or less)	18	1015	600V	105 °C	Red/white/black/green
Motor motive power (1 kW or over)	14 Note 1)	1015	600V	105 °C	Red/white/black/green
200 VAC input (750 W or less) FG cable Note 2)	18	1015	600V	105 °C	White/black/ green/yellow spiral Note 2)
200 VAC input (1 kW or over) FG cable Note 2)	14 Note 1)	1015	600V	105 °C	White/black/ green/yellow spiral Note 2)
Encoder	26	20276	30V	80 °C	5P (10-conductor) shielded 20 m or less (when using shielded twisted pair cable)
I/O host communication Shielded twisted pair cable	26	1007	300V	80 °C	For cable length, 50 cm or less is recommended.
Regenerative resistor connection	18	1015	600V	105 °C	
Brake	18	2517	300V	105 °C	1P (2-conductor)

Note 1) For the 1 kW motor, AWG16 cables may be used.
Note 2) Select the cable lengths depending on the actual conditions of use.

■ The following classifies and explains the degree of personal injury and/or property damage that may occur as a result of ignoring the instructions presented and using a system improperly.	■ The types of precautions to be observed are classified and explained under the following signs.
⚠ DANGER The precautions under this sign contain instructions that will, if not observed, cause a situation of imminent hazard potentially resulting in death or serious injury.	⊘ This sign indicates "prohibited" actions that must not be carried out.
⚠ CAUTION The types of precautions to be observed are classified and explained under the following signs.	❗ This sign indicates "mandatory" actions that must be carried out.

⚠ DANGER

Installation & Wiring		
⊘	Never connect the motor directly to commercial power.	May cause fire or fault.
⊘	Do not place any flammable items in the vicinity of a motor or amplifier.	May cause fire.
❗	Always protect an amplifier with a protective casing and allow the stipulated clearance between the amplifier and the casing or any other equipment as indicated in the operating instructions.	May cause electric shock, fire or fault.
❗	Install in a place with little dust and that is not splashed with water or oil.	May cause electric shock, fire, fault or damage.
❗	Mount the motor and amplifier on metallic or other non-flammable members.	May cause fire.
❗	Always have any wiring work carried out by an electrical work expert.	May cause electric shock.
❗	The FG terminal of the motor or amplifier must always be grounded.	May cause electric shock.
❗	When conducting any wiring work, always turn OFF the circuit breaker on the upstream side first and then do the work properly and methodically.	May cause electric shock, injury, fault or damage.
❗	Connect all cables correctly and isolate all energized sections with certainty using insulating material.	May cause electric shock, fire or fault.
Control & Operation		
⊘	Never touch the interior of the amplifier.	May cause burn or electric shock.
⊘	Do not damage a cable, do not apply any excessive force to a cable, do not place any heavy object on a cable and do not pinch a cable.	May cause electric shock, fault or damage.
⊘	Never touch the revolving part of the motor while it is operating.	May cause injury.
⊘	Do not use equipment anywhere subject to water splashing, in a corrosive atmosphere, in an atmosphere of flammable gas, or in the presence of flammable items.	May cause fire.
⊘	Do not use equipment anywhere subject to severe vibration or impact.	May cause electric shock, injury or fire.
⊘	Do not use equipment with a cable immersed in oil or water.	May cause electric shock, fault or damage.
⊘	Do not carry out any wiring work or touch the controls with a wet hand.	May cause electric shock, injury or fire.
⊘	In the case of a shaft end key-grooved motor, do not touch the key groove with an unprotected hand.	May cause injury.
⊘	Do not touch the heat sink of a motor or amplifier because it will be hot.	May cause burn or component damage.
⊘	Do not drive the motor with any external motive power.	May cause fire.
Other Precautions for Use		
❗	Always confirm safety after the occurrence of an earthquake.	May cause electric shock, injury or fire.
❗	To prevent any fire or personal injury during an earthquake, carry out installation work securely and properly.	May cause injury, electric shock, fire, fault or damage.
❗	Provide an external emergency stop circuit so operation may be stopped and power supply shut down immediately upon occurrence of an emergency.	May cause injury, electric shock, fire, fault or damage.
Maintenance & Inspections		
❗	Allow 5 minutes after shutting down the power before starting any wiring or inspection work.	May cause electric shock.

⚠ CAUTION

Installation & Wiring		
❗	Observe the specified combinations of motors and amplifiers.	May cause fire or fault.
❗	Do not touch the terminals of a connector directly by hand.	May cause electric shock or fault.
❗	Be careful not to block a ventilation port or allow the ingress of foreign matter.	May cause electric shock or fire.
❗	When conducting a trial run, confirm operation with the motor fixed in place and isolated from the mechanical system and then mount it on the mechanical system.	May cause injury.
❗	Observe the specified mounting method and orientation.	May cause injury or fault.
❗	Carry out appropriate mounting commensurate with the weight of the main body and rated output of the product.	May cause injury or fault.
Control & Operation		
⊘	Do not step on the product or place any heavy object on the product.	May cause electric shock, injury, fault or damage.
⊘	Never carry out any extreme change of adjustments because operation will become unstable.	May cause injury.
⊘	Do not come close to a machine after the restoration of power after an outage of power because the machine may restart unexpectedly at any time. Enter machine settings that assure personal safety upon restart.	May cause injury.
⊘	Do not use the machine anywhere subject to direct sunlight.	May cause fault.
⊘	Do not subject the motor or amplifier to any hard impact.	May cause fault.
⊘	Do not use the built-in brake of the motor for ordinary braking purposes because it is intended for holding.	May cause injury or fault.
❗	Do not use a faulty or damaged motor or amplifier.	May cause injury, electric shock or fire.
❗	Confirm that the power supply specifications are normal.	May cause fault.
❗	The holding brake is not a stopping device to secure the safety of the machine. The machine requires a separate stopping device to secure safety.	May cause injury.
❗	Upon occurrence of an alarm, remove the cause and secure safety before resetting the alarm and restarting the machine.	May cause injury.
❗	Connect a relay in series with the brake control relay to shut down power upon occurrence of an emergency stop.	May cause injury or fault.
Transportation & Storage		
⊘	Do not store the equipment anywhere subject to water or moisture or where toxic gas or liquid is present.	May cause fault.
⊘	Do not hold a cable or the motor shaft when transporting.	May cause injury or fault.
⊘	Do not let any component drop or fall over during transportation or installation work.	May cause injury or fault.
❗	Store in a place that meets the storage conditions specified in the operating instructions.	May cause fault.
Other Precautions for Use		
❗	When disposing of batteries, insulate them with tape or other material and throw them out in compliance with the regulations of the local authorities.	
❗	When disposing of products, treat them as industrial waste.	
Maintenance & Inspections		
⊘	Do not have overhauls carried out by anyone other than Sankyo.	May cause fault.
⊘	Do not turn the main circuit power supply ON and OFF frequently.	May cause fault.
❗	Do not touch the heat sink of a motor, amplifier or regenerative resistor, etc., by hand while they are energized or for some time after power shutdown because they may be hot.	May cause burn or electric shock.
❗	If an amplifier is faulty, shut down both the control power and the main circuit power.	May cause fire.
❗	When not using equipment for an extended period of time, be sure to turn the power OFF.	May cause injury as a result of malfunction.

Warranty Period

The warranty period of the product shall be 18 months after the date of manufacture at Sankyo. However, in the case of motors equipped with a brake, the number of shaft accelerations and decelerations shall not exceed the service life.

Details of Warranty

Any fault that occurs within the warranty period under normal operating conditions in accordance with these operating instructions shall be repaired without cost to the customer. However, even within the warranty period, repairs for the following cases of fault shall be provided on a charged-for basis.

1. Fault attributable to misuse, improper repair or modification
2. Fault attributable to dropping of the product after purchase or to damage during transportation
3. Fault attributable to use out of the specification range of the product
4. Fault attributable to fire, earthquake, lightning, wind, flood, salt damage, extraordinary voltage or any other natural disaster or accident
5. Fault attributable to the ingress of water, oil metallic fragments or any other foreign matter

The scope of the warranty shall be limited to the main unit of the product delivered and any damage caused due to the fault of the delivered product shall be outside of the scope of compensation.