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SUPER
VEXTA®

OPERATING MANUAL

AC Servo-motor
KXP Series



- Standard type
- Electromagnetic brake type

Single-phase 100V input
Single-phase 200V input

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Thank you for purchasing an Oriental Motor product. To obtain the best performance from your motor, please read this manual thoroughly before use.

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Suitable Motor-Driver Combinations

KXP Series motors and drivers are shipped as a set. When you receive the product, check to see that you have an appropriate motor-driver combination by referring to the tables below.

■ For 100V Power Supply

Output (W)	Motor Installing Base Size (mm)	Unit Model	Motor Model	Driver Model
30	60	KXP230-ABZ	KXPM230-AB	KXPD30-ABZ
		KXP230-ABZM	KXPM230-ABM	
		KXP230GD-ABZ	KXPM230GD-AB	
		KXP230GD-ABZM	KXPM230GD-ABM	
60	80	KXP460-ABZ	KXPM460-AB	KXPD60-ABZ
		KXP460-ABZM	KXPM460-ABM	
		KXP460GD-ABZ	KXPM460GD-AB	
		KXP460GD-ABZM	KXPM460GD-ABM	
120	90	KXP5120-ABZ	KXPM5120-AB	KXPD120-ABZ
		KXP5120-ABZM	KXPM5120-ABM	
		KXP5120GD-ABZ	KXPM5120GD-AB	
		KXP5120GD-ABZM	KXPM5120GD-ABM	
180	104	KXP6180-ABZ	KXPM6180-AB	KXPD180-ABZ
		KXP6180-ABZM	KXPM6180-ABM	
		KXP6180GD-ABZ	KXPM6180GD-AB	
		KXP6180GD-ABZM	KXPM6180GD-ABM	

■ For 200V Power Supply

Output (W)	Motor Installing Base Size (mm)	Unit Model	Motor Model	Driver Model
30	60	KXP230-CBZ	KXPM230-CB	KXPD30-CBZ
		KXP230-CBZM	KXPM230-CBM	
		KXP230GD-CBZ	KXPM230GD-CB	
		KXP230GD-CBZM	KXPM230GD-CBM	
60	80	KXP460-CBZ	KXPM460-CB	KXPD60-CBZ
		KXP460-CBZM	KXPM460-CBM	
		KXP460GD-CBZ	KXPM460GD-CB	
		KXP460GD-CBZM	KXPM460GD-CBM	
120	90	KXP5120-CBZ	KXPM5120-CB	KXPD120-CBZ
		KXP5120-CBZM	KXPM5120-CBM	
		KXP5120GD-CBZ	KXPM5120GD-CB	
		KXP5120GD-CBZM	KXPM5120GD-CBM	
180	104	KXP6180-CBZ	KXPM6180-CB	KXPD180-CBZ
		KXP6180-CBZM	KXPM6180-CBM	
		KXP6180GD-CBZ	KXPM6180GD-CB	
		KXP6180GD-CBZM	KXPM6180GD-CBM	

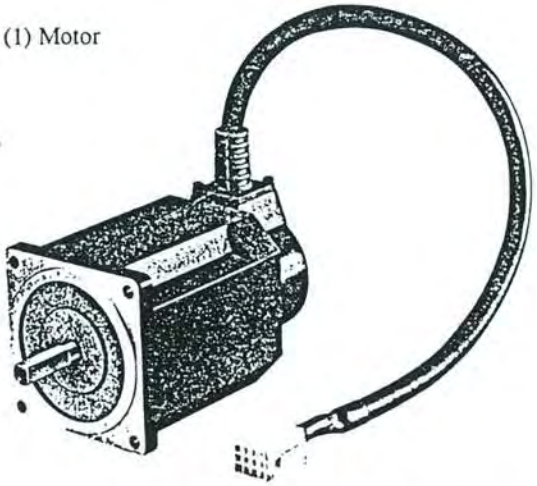
※ Products requiring an extension cable (sold separately) are designated by a 1 or -1 at the end of the unit model (e.g. KXP230-ABZ-1 , KXP230-ABZM1).

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Before Use

Check to see that you have received the complete product set, including accessories. If any parts are missing or damaged, please contact your nearest Oriental Motor.

(1) Motor



(2) Driver



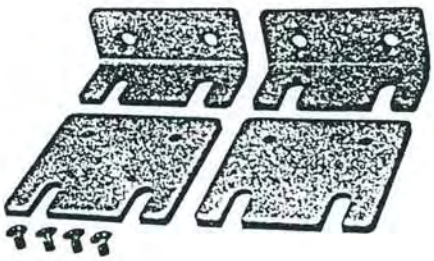
・The photographs shows a standard type (one not equipped with an electromagnetic brake).

(3) Junction cable

・A junction cable is not included with products which require an extension cable.



(4) Driver mounting brackets: One 4-piece set
Flat-headed screws: 4



(5) Connector for control I/O
MR-34LM(Honda Communications Industry)



(6) Operating manual (1 volume)

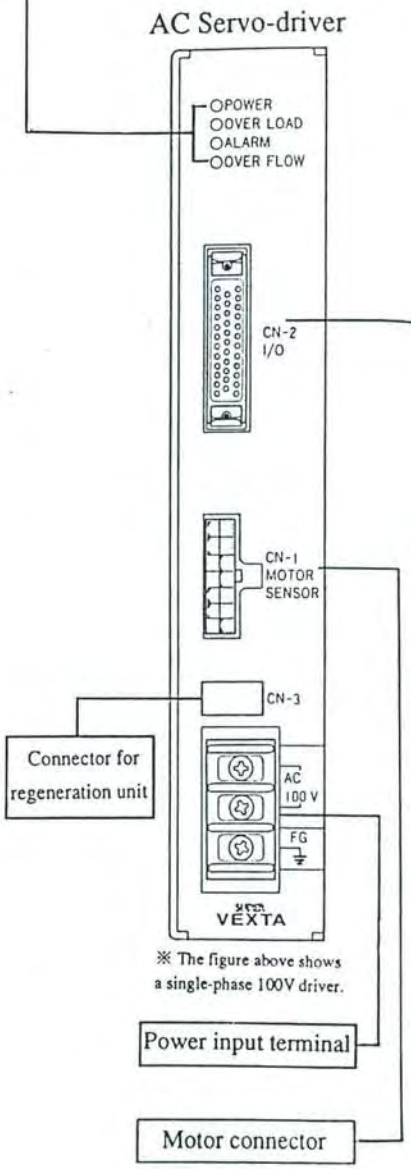
▼ Note :
Connecting the driver to an incorrect power supply voltage will result in damage . Before use, check the driver model name on the front panel. -ABZ models use 100V input , - CBZ models 200V input .

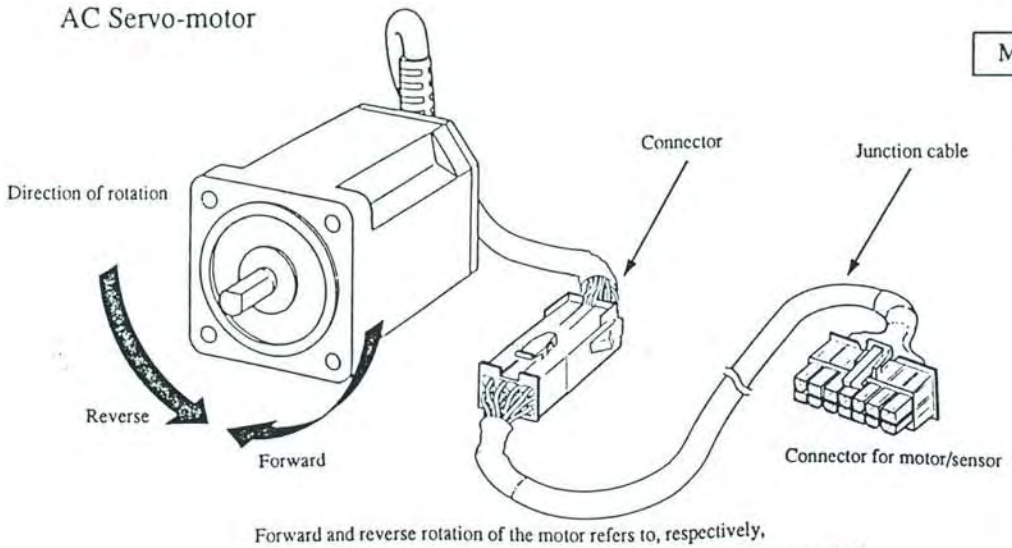
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Names and Functions of Components

LED Indications

Indication	Function	Lighting Conditions
POWER	Power indication	Lights when power is on.
OVER LOAD	Overload protection	① When the motor is operated for a continuous period under a load exceeding the rated torque. ② When the peak torque is output for more than 5 seconds during acceleration / deceleration.
ALARM	Overcurrent protection Overvoltage protection Overheat protection	Lights when the following protection functions are activated : ① Overcurrent detection : Activated when an excessive current has flowed through the power MOSFET of the driver's inverter. ② Overvoltage detection : Activated when the primary voltage of the driver's inverter exceeds the permissible value. ③ Overheat detection : Activated when the temperature of the driver's internal radiator rises to about 85℃. ◇ When a protective function is activated, the alarm signal is output and the motor stops. Operation can be restored by turning power back on, or by inputting the counter - clear signal.
OVER FLOW	Speed error protection	Activated when the motor does not follow-up a pulse speed command normally.

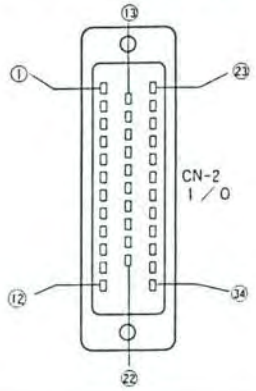




Forward and reverse rotation of the motor refers to, respectively, clockwise and counterclockwise rotation as seen when facing the output shaft.

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· The pin configuration of the CN-2 connector is as shown in the diagram below (view as seen facing soldered parts).



Control Input/Output Signals (CN-2 I/O)

Pin Number	Signal Code	Signal Name	Function / Use
⑪	CW/(PLS)	Forward pulse input	Pulse input for forward rotation command
⑫	$\overline{\text{CW}}$/($\overline{\text{PLS}}$)	(pulse input)※	(pulse input) . ※
⑨	CCW/(DRE)	Reverse pulse input	Pulse input for reverse rotation command
⑩	$\overline{\text{CCW}}$/($\overline{\text{DRE}}$)	(direction of rotation input)※	(rotation direction input) . ※
㉝	HOF	Hold-off input	This signal puts the motor in a non - excitation state. The deviation counter still functions in this state, which means that if the motor shaft is moved manually, it will return to the position immediately preceding movement when the hold-off signal input is canceled. To cancel this return function, input the counter-clear signal at the same time as the hold - off signal .
㉞	$\overline{\text{HOF}}$		
㉑	CCR	Counter-clear input	This signal clears the deviation counter and the alarm. This signal is used primarily for returning to home. This signal can also be used when a protection circuit is activated to clear the alarm signal without switching off the power (see note below) .
㉒	$\overline{\text{CCR}}$		
⑮	ASG	Encoder A-phase pulse output	This signal is used when monitoring encoder output or when setting the origin ASG and BSG signals are output at a rate of 400 pulses for each motor shaft revolution,and ZSG signals at a rate of one pulse per revolution. (During forward rotation , BSG is delayed with respect to ASG by 90° as expressed in electric degrees .)
⑯	$\overline{\text{ASG}}$		
⑬	BSG	Encoder B-phase pulse output	
⑭	$\overline{\text{BSG}}$		
㉓	ZSG	Encoder Z-phase pulse output	
㉔	$\overline{\text{ZSG}}$		
㉙	END	Positioning completion output	This signal is output upon completion of positioning (low voltage level) .
㉚	$\overline{\text{END}}$		
㉕	ALM	Alarm output	This signal is output when a protection circuit is activated (high voltage level). At this time , the ALARM indication lights , and the motor stops .
㉖	$\overline{\text{ALM}}$		
①	VCC	Encoder power supply input	Power input for encoder signal output (+15V or less).
②	GND		

※Signals given in parentheses are selectable by internal switches.

▼ Note : When the alarm is activated, be sure to correct the problem that caused this before inputting the alarm clear signal.

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Connections

Before operating the motor, the proper connections must be made between the motor, driver and external controller.

1. Before Connecting the Equipment

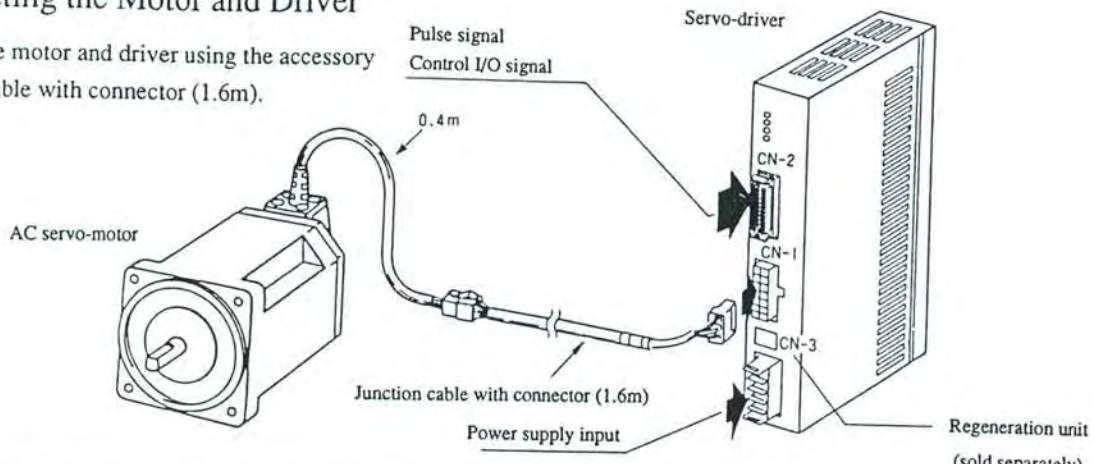
○ Cables for the power supply and the CN-2 control I/O signal port must be furnished by the user.
○ Power must be off in all equipment before making connections.
○ Be sure that all connectors and plugs are fully inserted. Faulty connections can cause operational errors.

Equipment should be connected in the sequence given below.

(1) Motor and driver → (2) Driver and power supply → (3) Driver and controller

2. Connecting the Motor and Driver

●Connect the motor and driver using the accessory junction cable with connector (1.6m).

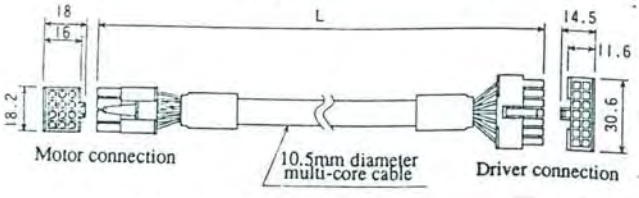


▼Notes:

1. Under no circumstances shoud cabling work be performed when connecting the unit, since this can vesult in damage to the driver or motor, or cause errors in operation.
2. The junction cable and extension cable (see below) are not designed to be bent. For applications in which the motor is mounted on a movable device and the cable repeatedly bent and straightened out, use the optional flexible cable. For further information, contact your nearest Oriental Motor.
3. When using the motor in applications that could put tension on the driver connector, fasten down the junction cable at some point or take other measures to ensure that this does not occur.

● The distance between the motor and driver can be extended to up to 10meters using the extension cable (sold separately).

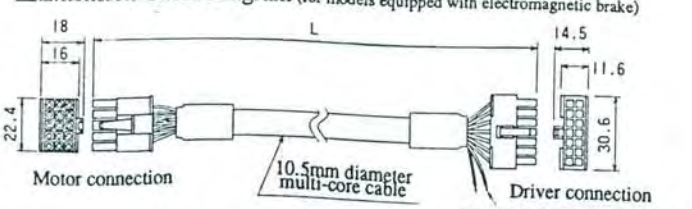
■Extension Cable Diagram (cable for standard type)



■Cable Model

Cable Model	L (m)
CC01SKF	1
CC03SKF	3
CC05SKF	5
CC07SKF	7
CC10SKF	10

■Extension Cable Diagram (for models equipped with electromagnetic brake)



■Cable Model

Cable Model	L (m)
CC01SPFM	1
CC03SPFM	3
CC05SPFM	5
CC07SPFM	7
CC10SPFM	10

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3. Connecting the Driver and Power Supply

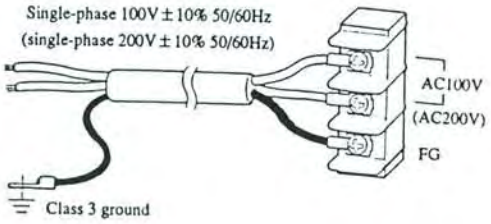
Use a 3 - core cable with a conductor cross - sectional area of at least 1.25mm² for the power supply cable . Power supply voltage is single - phase 100V±10% 50/60Hz or single-phase 200V±10% 50/60Hz. However, power supply input current varies with motor output (see table below). Also, the frame ground (FG) terminal should be connected to a Class 3 (or better) ground (grounding resistance of 100Ω or less) .

▼ Notes:

(1) Connecting the driver to an incorrect power supply voltage will result in damage to the driver. Therefore, before turning on power , check once again that the correct voltage is being used.

(2) Before turning on power , check to see that the motor's cable is properly connected.

Power Supply Connection



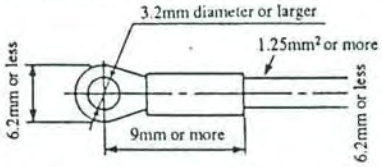
Power supply input current (single - phase 100V)

Unit Models		Maximum Driver Input Current
Round Shaft Type	Pinion Shaft Type	
KXP230-ABZ	KXP230GD-ABZ	2.4A
KXP460-ABZ	KXP460GD-ABZ	4A
KXP5120-ABZ	KXP5120GD-ABZ	7A
KXP6180-ABZ	KXP6180GD-ABZ	9A

Terminal Block Connection

(Suitable crimp terminals)

● Round terminals with insulation



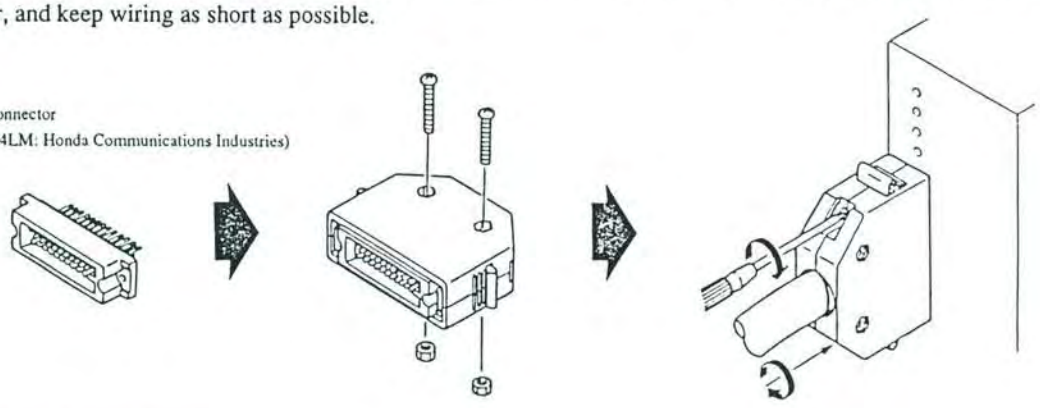
Power Supply Input Current (single - phase 200V)

Unit Models		Maximum Driver Input Current
Round Shaft Type	Pinion Shaft Type	
KXP230-CBZ	KXP230GD-CBZ	1.5A
KXP460-CBZ	KXP460GD-CBZ	2.1A
KXP5120-CBZ	KXP5120GD-CBZ	3.3A
KXP6180-CBZ	KXP6180GD-CBZ	4.5A

4. Connecting the Controller and Control Input/Output Port

Use the accessory connector to connect the controller to the control Input/Output port. To suppress noise, use as the lead a multi-core, twisted-pair, blanket shielding cable that contains at least 20 core wires , each 0.14mm or more in diameter, and keep wiring as short as possible.

I/O connector
(MR-34LM: Honda Communications Industries)



Solder the lead wires to the required pin numbers in accordance with the connection diagram.

Use screws to close the case.

After inserting the connector, tighten the two screws to fasten it to the driver.

Details regarding control Input/Output are given beginning on page 8.

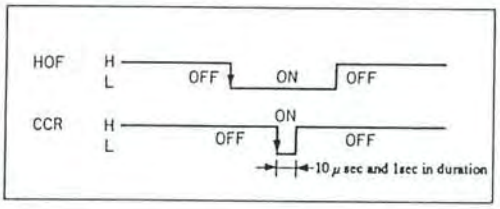
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Use of Control Input/Outp... (I/O)

1. Control Input/Output Signals

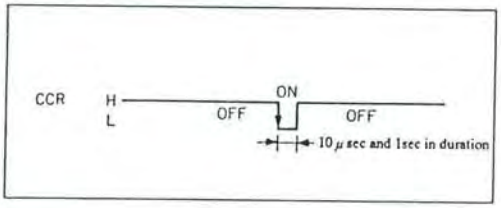
(1) Hold-off input [(33)(34) : HOF]

Inputting the hold-off signal puts the motor in a non-excitation (free) state, which is used when turning the motor shaft externally or when positioning manually. However, since the driver's deviation counter still functions when the hold-off signal is input, the motor returns to the position before input when the hold-off signal is canceled. Therefore, when setting an origin manually, always be sure to input the counter-clear (CCR) signal before canceling the hold-off signal.



(2) Counter-clear input [(21)(22) : CCR]

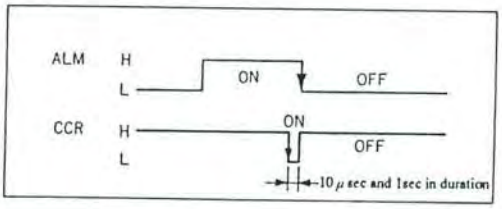
This signal clears the deviation counter and resets the alarm. This signal is used primarily for returning to home. This signal is used when returning to an origin or, when a protection circuit has been activated, for canceling the alarm without turning off power.



▼ Note : Do not reset the alarm until the problem which caused the protection circuit to activate has been corrected.
Always input the counter-clear (CCR) signal as a single impulse of between 10msec and 1sec in duration.

(3) Alarm output (positive logic output) [(25)(26) : ALM]

This signal indicates that one of the driver's protection circuits has been activated. When an abnormality such as an overload or overcurrent is detected, the alarm signal is output, the ALARM indicator lights, and the motor stops. Similarly, if the motor does not follow-up a pulse speed command normally, the alarm signal is input, the OVER FLOW indicator lights, and the motor stops.

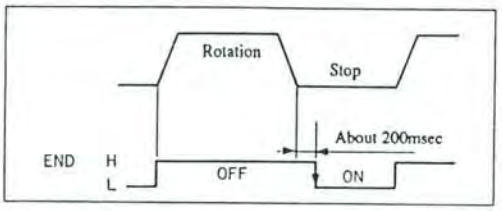


▼Note : Since alarm output uses positive logic, other outputs use negative logic.

(4) Positioning completion output (negative logic output)[(29)(30) : END]

This signal is output at low level when positioning is completed.

※ This signal is output when the deviation counter's accumulated pulsesare 8 or less.

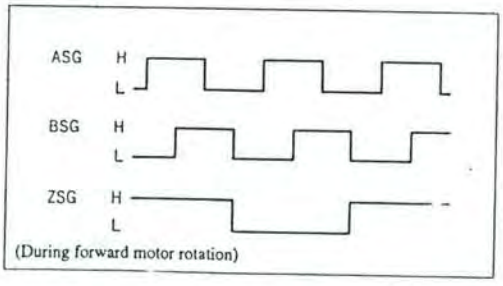


(5) Encoder output [(15)(16) : ASG, (13)(14) : BSG, (23)(24) : ZSG]

These signals are used when monitoring encoder output or returning to an origin.

ASG / BSG ····· 400 pulses are output for each motor revolution. The phase difference between ASG and BSG is 90° as expressed in electric degrees.

ZSG····· 1 pulse is output for each motor revolution.



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2. Pulse Input Systems

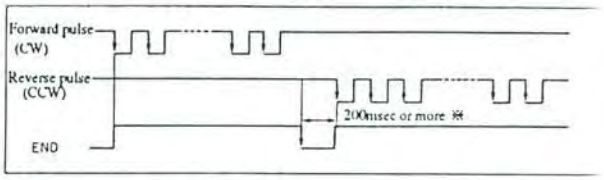
In the KXP series of AC servo-motors, pulse signals are used to control the motor's speed, amount of revolutions and direction of rotation. There are two pulse input modes (described below), which can be selected to match the controller's pulse output system. (At shipment, motors are set to the 2-pulse input mode.)

(1) 2-Pulse and 1-Pulse Input Mode

●2-pulse input mode

This mode is used for input of forward pulses (CW) and reverse pulses (CCW).

When forward pulses are input, the motor rotates clockwise (if viewed facing the motor shaft); when reverse pulses (CCW) are input, the motor rotates counterclockwise.



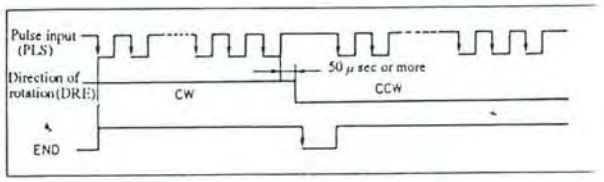
※Upon output of the positioning completion (END) signal, a delay time of 200msec or more must be allowed. This delay time varies depending on the pulse signal input method and the motor's load conditions.

●1-pulse input mode

This mode is used for pulse (PLS) signals and direction of rotation selection (DRE) signals. DRE signals input at high level (i.e. input photocoupler is off) produce forward rotation ; low level input (i.e. input photocoupler is on) produces reverse rotation.

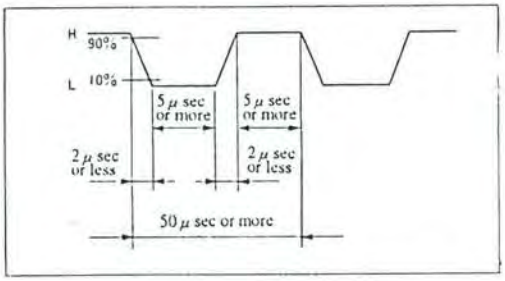
[Direction of rotation input signal]

High : forward Low : reverse



(2) Pulse shape

As shown in the diagram at right, pulse signals should be input to produce a pulse shape that sharply rises and falls between pulselengths of 5 μ sec or more.

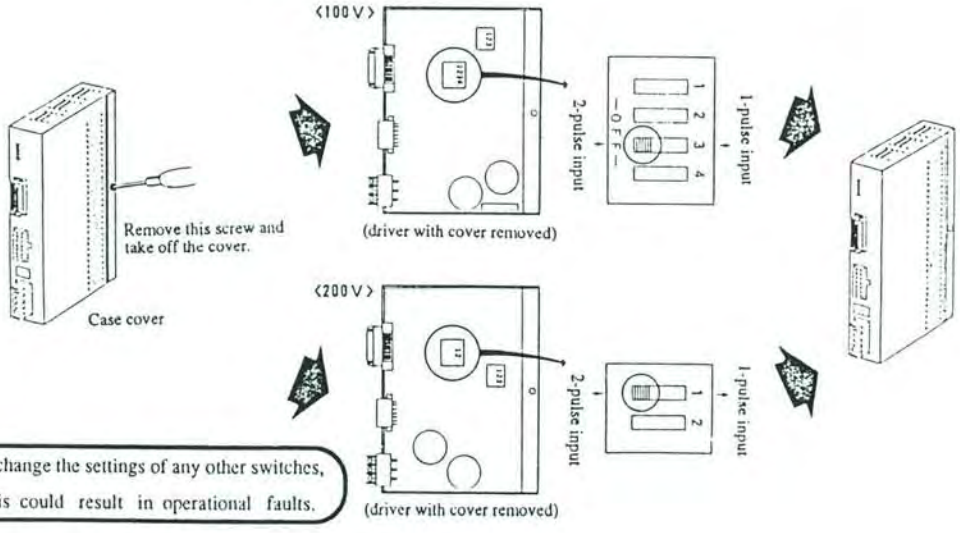


(3) Selecting the pulse input mode

The pulse input mode is selected using the dip switches inside the driver.

〈Instructions for changing dip switch settings〉

(1) Remove the case cover. (2) Change the setting of Switch 3 in the four-switch set (two-switch set for 200V models). (3) Replace the case cover.



▼ Note : Do not change the settings of any other switches, since this could result in operational faults.

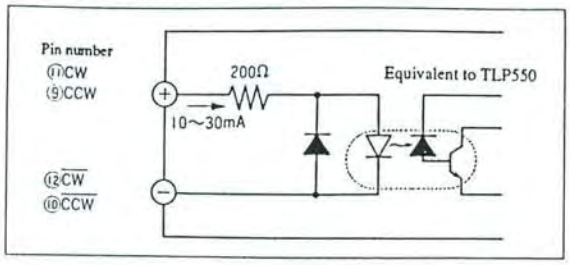
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3. Control Input / Output Circuits (I/O:CN-2)

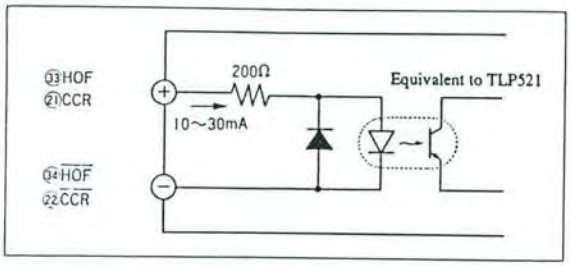
(1) Input Circuits

(Internal circuits)

● Forward pulse input (CW [PLS])
Reverse pulse input (CCW [DRE])



● Hold-off input (HOF)
Counter-clear input (CCR)



▼ Note : Direct connections are possible so long as the signal voltage applied is 5V or less. If used with a signal voltage exceeding 5V, connect an external resistance to keep current within 30mA. Applying a voltage exceeding 5V without using an external resistance can cause damage to circuit elements.

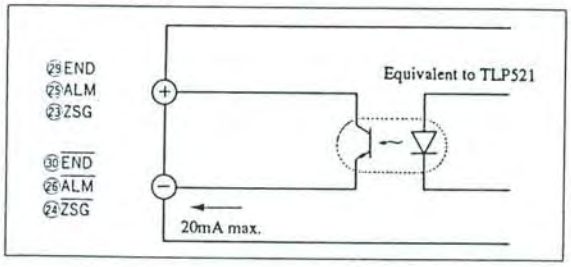
Example : When using with 24V : At least 820Ω · more than 2W

When using with 12V : At least 430Ω · more than 1W

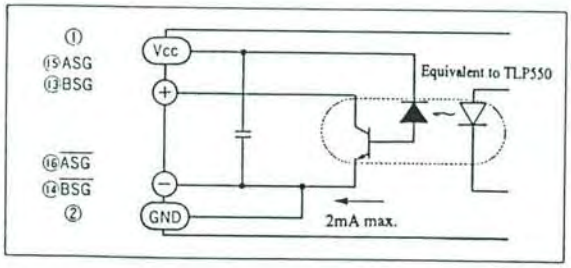
(2) Output Circuits

(Internal circuits)

● Positioning completion output (END)
Alarm output (ALM)
Encoder Z-phase pulse output (ZSG)
Circuits for use with 30V, 20mA maximum:



● Encoder A-phase pulse output (ASG)
Encoder B-phase pulse output (BSG)
Circuits for use with 15V, 2mA maximum:



※ Vcc is the power supply for the encoder output photocoupler and should be connected directly to a power supply of DC15V max.
(This power supply is only required when using A/B phase pulse output.)

▼ Note: Because different types of photocouplers are used for the encoder's A-phase and B-phase pulse outputs, the voltage specifications for the external power supply and the permissible value of the output current will differ for these outputs.

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2. Operation Requirements

The operation requirements given below must be taken into consideration when both selecting and operating motors. These requirements have been established in respect of motor temperature rises, which are related to factors such as large load or large inertial load and high positioning frequency (starting/stopping). To ensure that such temperature rises do not occur, operate the motor strictly in accordance with these requirements.

● Values for rated torque, suitable load inertial moment and peak torque are given in the specifications table on page 22.

(1) Requirements for continuous operation

$T_L \leqq T_M$ ····· The load torque T_L at the motor shaft must be less than or equal to the rated torque T_M.

(2) Requirements for inertial load

$GD_L^2 \leqq 5GD_M^2$ $(J_L \leqq 5J_M)$ ····· The inertial load GD_L^2 (J_L) at the motor shaft must be no more than 5 times the rotor's inertial moment GD_M^2 (J_M).

(3) Requirements for acceleration/deceleration torque

$T_a+T_L \leqq T_{max}$ ····· When adjusting the speed of the inertial load GD_L^2, the sum of the required acceleration/deceleration torque T_a (T_d) and the load torque T_L must be less than or equal to the peak torque T_{max}.

(4) Requirements for effective load torque

$T_{rms} \leqq T_M$ ····· When performing frequency positioning control, the effective load torque T_{rms} for one cycle must be less than or equal to the rated torque T_M.

(5) Calculating the torque

● Acceleration torque T_a

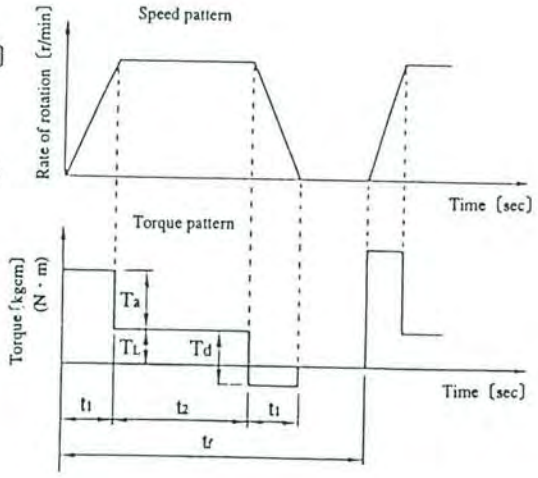
$$T_a = \frac{(GD_L^2 + GD_M^2)}{37500} \times \frac{N_M}{t_1} \text{ [kgcm]} \qquad T_a = \frac{J_L + J_M}{9.55} \times \frac{N_M}{t_1} \text{ [N · m]}$$

● Effective load torque T_{rms}

$$T_{rms} = \sqrt{\frac{(T_a + T_L)^2 \cdot t_1 + T_L^2 \cdot t_2 + (T_d - T_L)^2 \cdot t_1}{t_f}} \text{ [kgcm] (N · m)}$$

$GD_L^2(J_L)$: Load inertial moment [kgcm²] (kgm²) at the motor shaft
$GD_M^2(J_M)$: Rotor inertial moment [kgcm²] (kgm²)
N_M: Motor's maximum speed [r/min]
T_a (T_d): Acceleration torque (deceleration torque) [kgcm] (N · m)
T_L: Load torque [kgcm] (N · m)
t_1: Acceleration/deceleration time [sec]
t_2: Fixed speed time [sec]
t_f: Operating cycle time [sec]

〈Operation pattern〉



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3. Cautions for Operation

(1) Speed control.

The motor's speed N_M [r/min] is proportional to the pulse speed f(Hz).

$$N = \frac{60 \cdot f}{400} = 0.15 \text{ [r/min]}$$

(KXP series models use a 400P/R encoder)

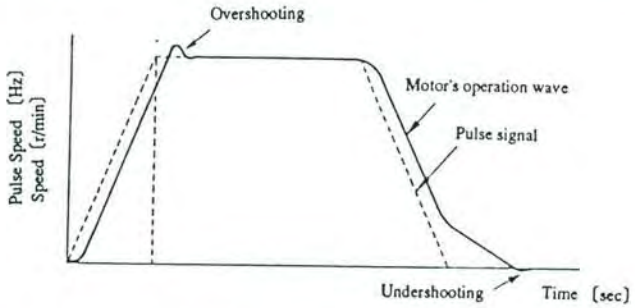
Pulse Speed f [Hz]	Motor Speed N_M [r/min]
1000	150
2000	300
10000	1500
20000	3000

However, speed fluctuates ±3 r/min about setting speed. When the input pulse speed is 20kHz, the motor's speed is 3000r/min.

If the motor is linked directly to a ball screw with a lead pitch of 5mm, a feed speed of 250 mm/sec can be obtained when the pulse speed is 20kHz.

(2) Acceleration/Deceleration

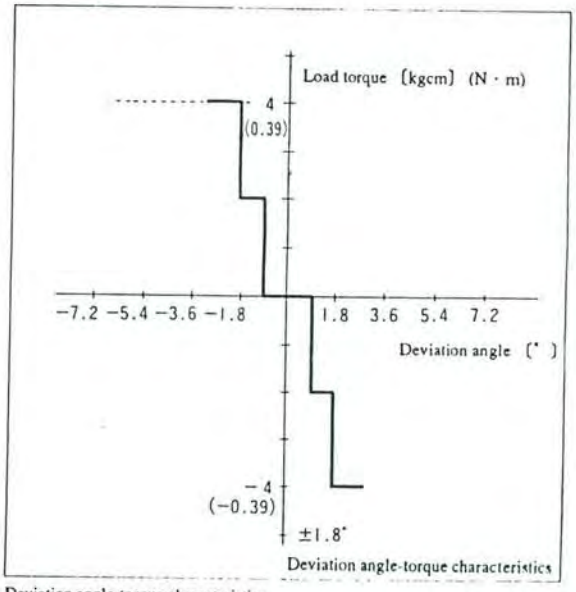
When operating the motor under an inertial load exceeding the rotor's inertia, be sure to perform acceleration/deceleration operation (at least 5msec/kHz) to reduce overshooting and undershooting. Sudden acceleration/deceleration may cause the alarm indicator to light. Setting a suitable acceleration/deceleration duration can minimize overshooting and undershooting.



(3) Positioning Accuracy

The motor's positioning accuracy when not under load is ±0.9° (±1 pulse). However, as shown in the diagram at right, positioning accuracy under load varies with the load torque. Positioning accuracy when load torque equals the rated torque is ±1.8°(±2 pulse).

▼ Note: Stopping accuracy during positioning may vary due to the load torque.



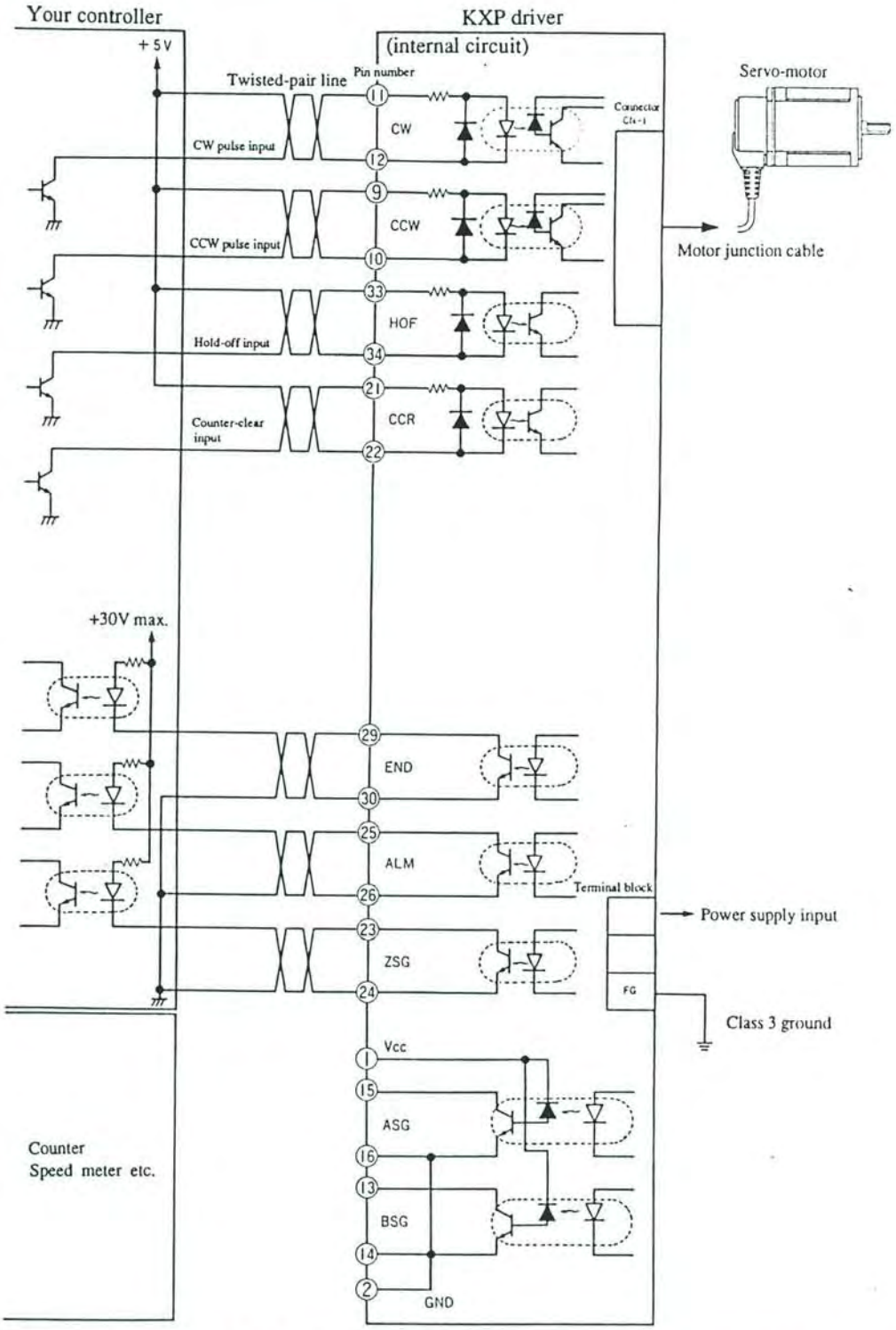
Deviation angle-torque characteristics
(for KXP5120-ABZ)

Time [sec]

Time [sec]

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4. Connection Diagram



▼ Notes :

1. Use for the control Input/Output signal line (CN-2) a multi-core, twisted-pair, blanket shielding wire with a core diameter of at least 0.14mm, and keep it as short as possible (within 2m).
2. For the connection between the motor and servo - driver, use either the junction cable included with the motor or an extension cable (no more than 10m).
3. For the power line, use a 3-core cable with a conductor cross-sectional diameter of at least 1.25mm^2.
4. The control Input / Output signal line and the encoder signal line should be separated from power lines (circuits carrying large current such as AC lines or the motor line) by a distance of at least 30cm. Also , they should not be run through the same duct or pipe with power lines.
5. Cables for the power supply line and the control Input / Output signal line must be furnished by the customer.
6. The FG terminal ground should be a spot ground of at least Class 3 (ground resistance of 100 Ω or less) , and the line should be as thick as possible.

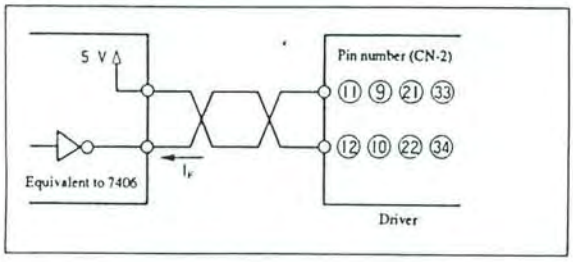
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5. Controller and Control Input / Output Signal Connections

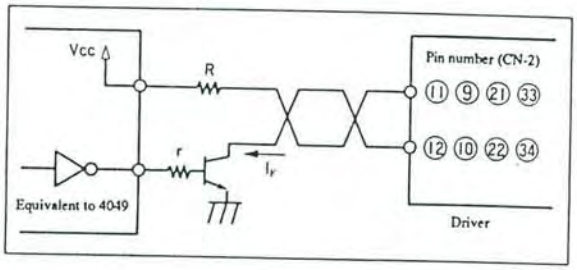
Connections to control Input/Output signals (CN-2) differ according to the controller's input/output system. Use a connection method suitable for your controller referring to the diagrams below.

(1) Controller output system

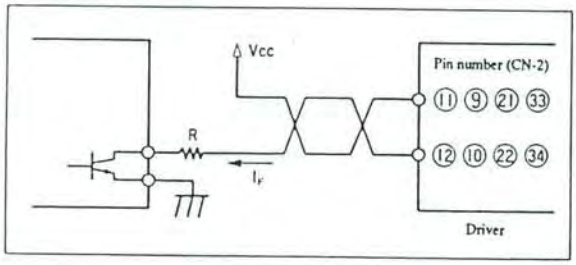
● TTL (equivalent to 7406)



● C-MOS (equivalent to 4049)



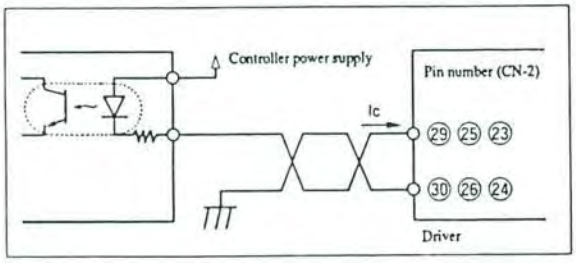
● Open collector



▼ Note : When Vcc is 5V, the current I_F is about 20mA. If a voltage exceeding 5V is used for Vcc,be sure to connect an external resistance to keep current within 30mA.

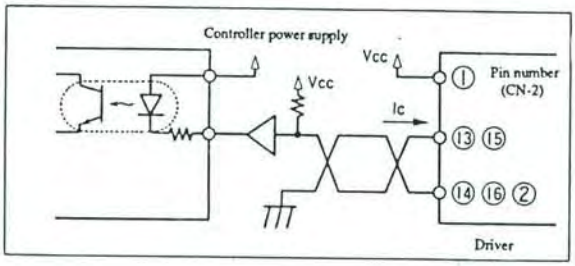
(2) Controller input system (when using photocoupler)

● Positioning completion (END) signal, alarm signal, encoder Z-phase pulse signal



▼ Note : The controller's power supply should be from 5V to 30V. Current Ic should be 20mA maximum.

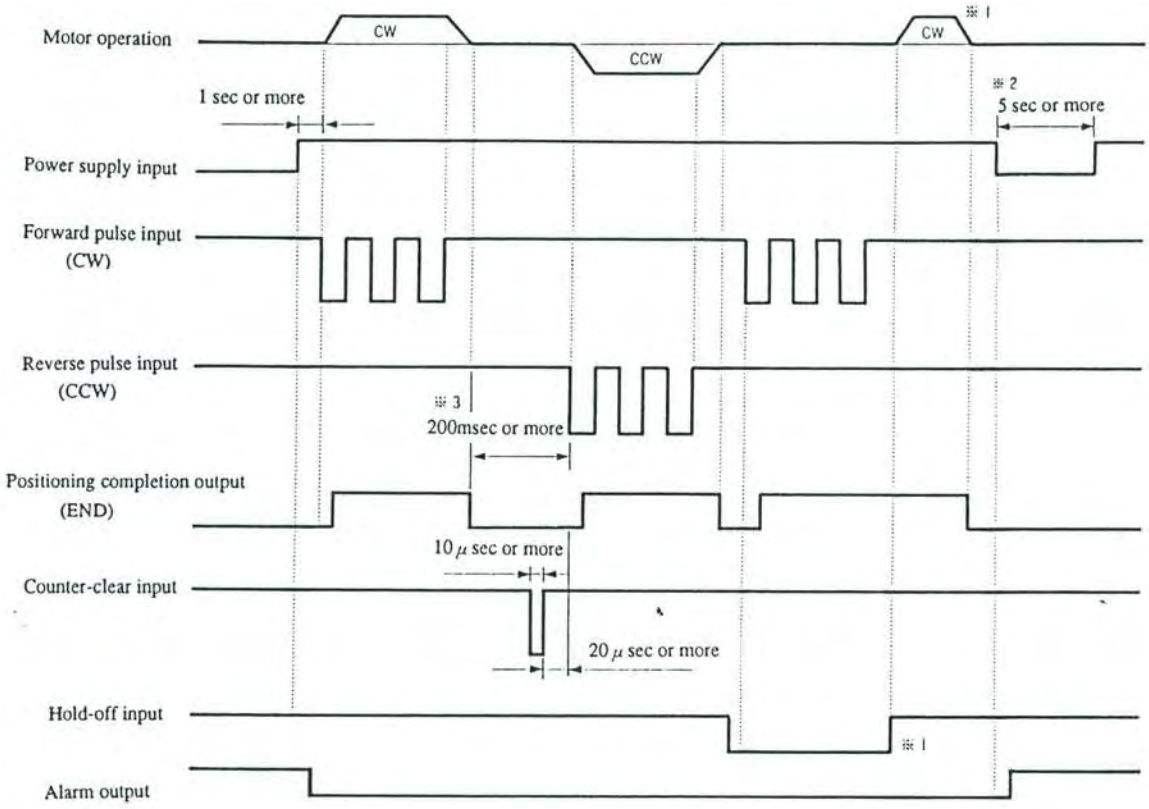
● Encoder A-phase and B-phase pulse signals



▼ Note : The current Ic should be 2mA maximum. If the photocoupler cannot be driven by a direct connection to the controller, amplify th current as shown in the diagram.

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6. Timing Chart



※1 During hold - off signal input, the motor's servo - lock is disengaged (motor in non-excitation state), but the deviation counter still functions. Therefore, when the hold-off signal is canceled, the motor responds to the pulse signals that were input during the period of hold - off signal input.

※2 Once power has been turned off, wait at least 5 seconds before turning it on again.

※3 The cumulative amount of pulses for END signal input is set to ±8 pulses. This means that the positioning completion (END) signal may not be output at precisely the same time that the motor completes positioning. Therefore, some amount of delay time must be allowed after output of the positioning completion (END) signal. This delay time varies depending on the pulse signal acceleration/deceleration rate and the motor's load conditions.

●The timing chart for the electromagnetic brake is given on page 25.

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7. Noise Suppression

Excessive noise entering the servo-system from outside can lead to operational errors. By taking measures such those described below, trouble due to noise can be prevented.

(1) Noise pathways

Noise can enter the system through the following pathways.

① Power line

② Signal line (I/O)

③ Feedback signals between the motor and driver

The following measures can be taken to prevent noise from entering through these pathways.

(2) Measures against noise

① Power supply line

The driver's power supply line should be independent of power lines for equipment that generates noise (welders, electric discharge machines, etc.).

② Signal line

- Keep the signal line as short as possible (2 meters max.).
- Use a twisted-pair blanket shielding line
- Keep the signal line at least 30cm away from cables carrying large current.

③ Motor-driver junction cable

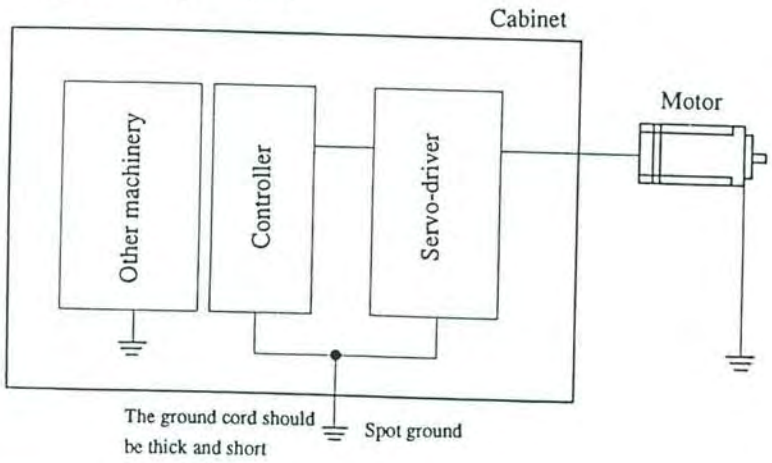
Use the junction cable included with the product. Do not run the cable through the same duct or pipe with cables which carry large current or which could otherwise be a source of noise. It is particularly important to keep the junction cable at least 30cm away from cables that carry large current.

(3) Grounding method

The driver's frame ground (FG) terminal should be grounded using a spot, Class 3 (or better) ground, and the wire should be as thick as possible.

▼ Note : To prevent shocks, ground the motor also.

Grounding method (example)



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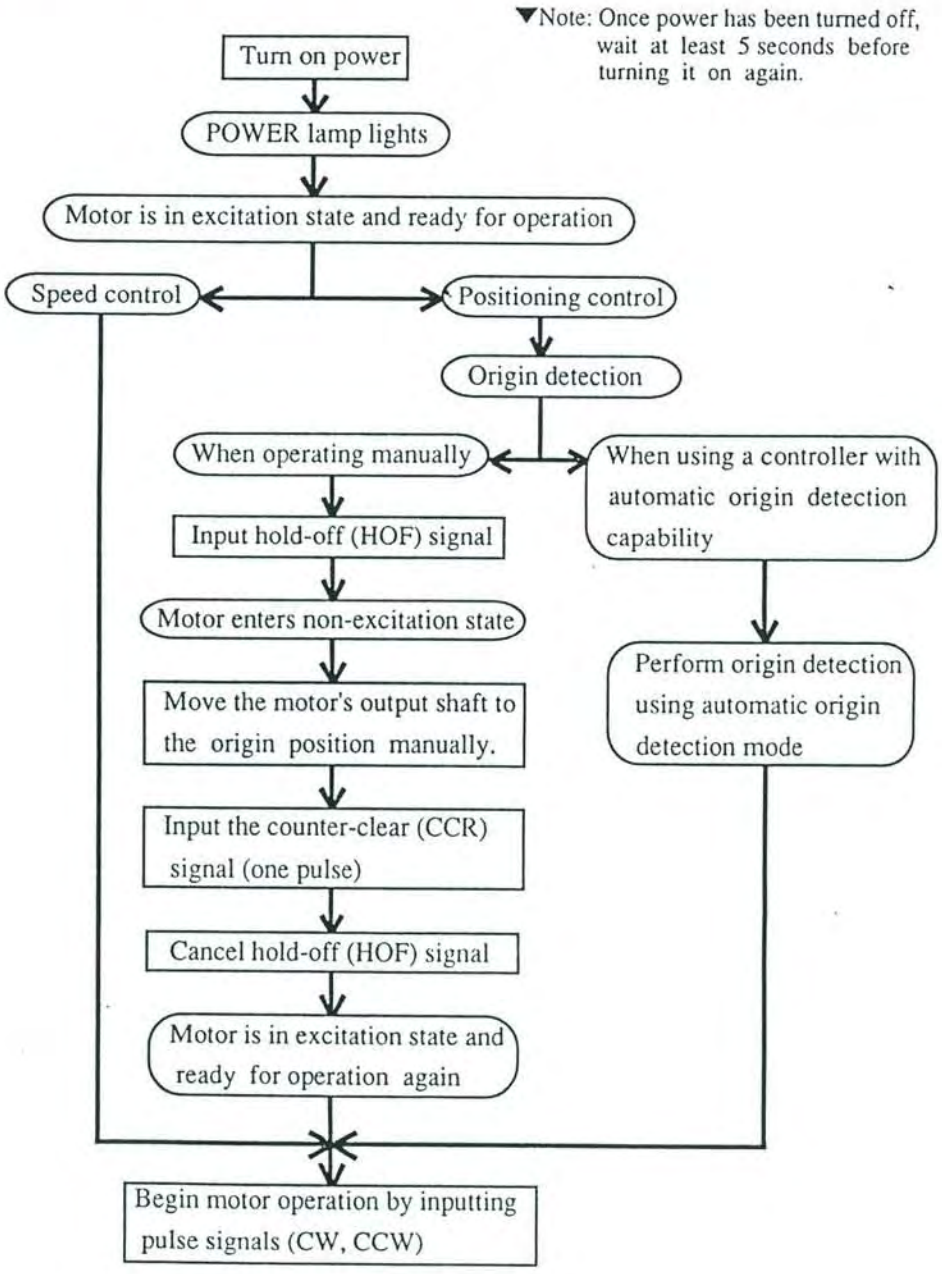
Operation

Before operating the motor, please check the following:

① That the motor and driver are properly connected using the junction cable included with the product.
② That the control Input/Output connector (CN-2) is connected as shown in the connection diagram.
③ That pulse signals are not being input.

1. Operation Sequence

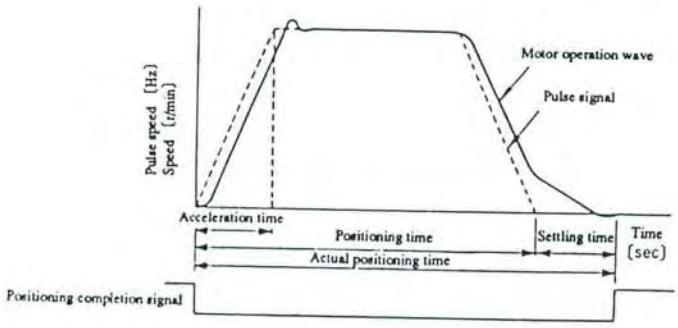
If the above three items have been confirmed, operate the motor according to the following sequence.



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(4) Settling Time

As illustrated in the diagram below, there may be a slight delay between the pre-set positioning time and the time that the motor actually stops and the positioning completion (END) signal is output. This difference is called the settling time and should be taken into account when operating with frequent starts and stops while monitoring the END signal. The settling time varies considerably depending on the speed adjustment time, inertial load and friction load, and can be shortened by performing acceleration/deceleration control.



● Standard Acceleration Time and Settling Time (motor not under load)

Series	Acceleration time (0→3000r/min)	Settling time
KXP Series	100～200msec	200msec

(5) Other Cautions

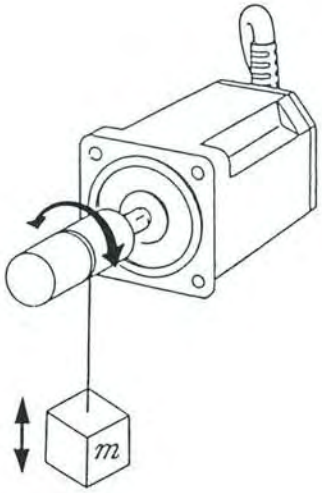
The operations described below involve regeneration (positive feedback), and in view of motor operation requirements, they must be performed using a regeneration unit (sold separately). For further information, contact your nearest Oriental Motor.

①Lowering operations

Operations such as lowering objects on the Z- axis in which the motor is turned in the direction of rotation by an external force.

②Sudden starts or stops at high inertia

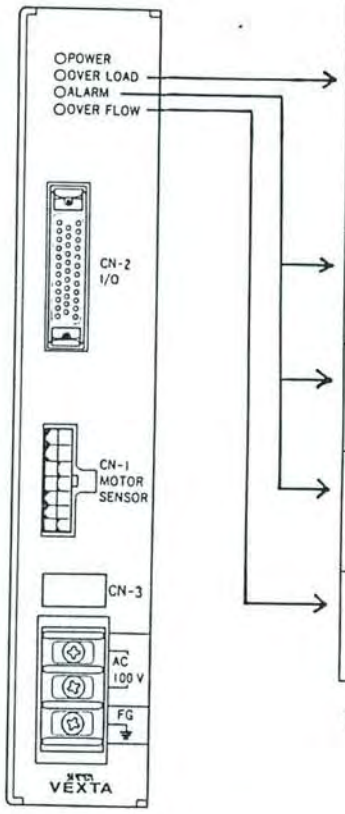
※ The regeneration unit can be used in combination with KXP standard models. However, for applications in which position must be held during power outages or when power is turned off, use in combination with a KXP motor equipped with an electromagnetic brake.



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4. Protection Functions

KXP series AC servo-motors are equipped with various protection functions, which ensure the safety of the servo-system when motors are used under abnormal conditions or when malfunctions occur in the servo - system. When a protection function is activated, the motor is set to an non-excitation (free) state, an alarm signal is output, and the LED on the driver's front panel lights. After an alarm signal is output, the problem that caused the alarm must be determined and corrected before canceling (restoring) the alarm. The alarm can be canceled by inputting a counter-clear (CCR) signal or by turning power on again.



Protection Function	When Activated
Overload	① When the motor is operated continuously under a load exceeding the rated torque. ② When the peak torque is output for 5 seconds or more during acceleration/deceleration.
Overcurrent	When an excessive current has flowed through the power MOSFET of the driver's inverter.
Overheat	When the temperature of the driver's internal radiator rises to about 85℃.
Overvoltage	When the primary voltage of the driver's inverter exceeds the permissible value.
Speed error	When the number of accumulated pulses recorded by the deviation counter exceeds ±8192.

※ The diagram shows a single-phase 100V driver.

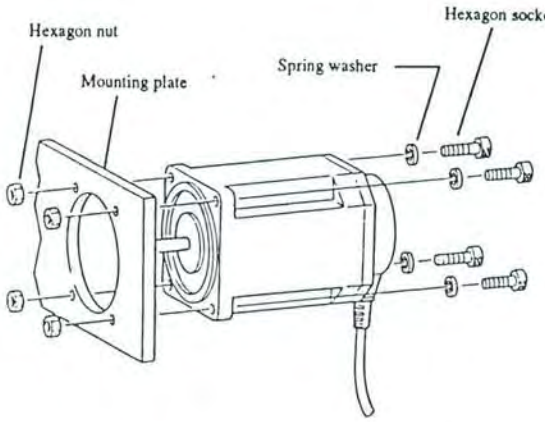
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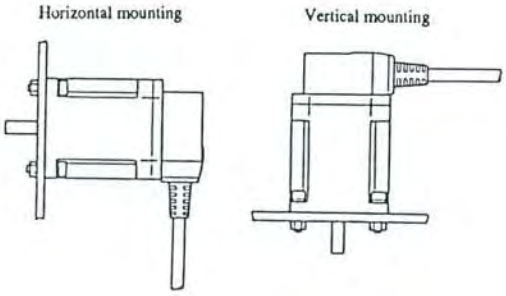
Installing

1. Installing the Motor

(1) Installing the Motor

The motor can be installed either horizontally or vertically. When installing horizontally, it is best to have the cable lead facing downward as a measure against dripping.





▼ Note: Use a sturdy mounting plate and fasten with bolts so that the motor does not vibrate. If the motor is not securely mounted, vibration can cause strain at various points, leading to sudden breakdowns.

(2) Connection to Machinery

When connecting the motor to machinery, the motor shaft must be aligned. Misalignment produces vibration, which can greatly shorten bearing life and cause fatigue damage of the motor shaft. When aligning, set the value at or below the alignment value stated in the specifications for the coupling used. Use a flexible coupling or the like for linking the motor to machinery.

▼Note : When attaching a coupling, timing pulley, gear or other device to the motor shaft, ensure that the shaft is not subjected to any impacts, as this could result in damage to the motor's internal encoder and ball bearings.

Oriental Motor manufactures a coupling designed for AC servo-motors. For further information, inquire at your nearest Oriental Motor.

(3) Installation Locations

These motors should only be installed in locations that meet the following environmental conditions.

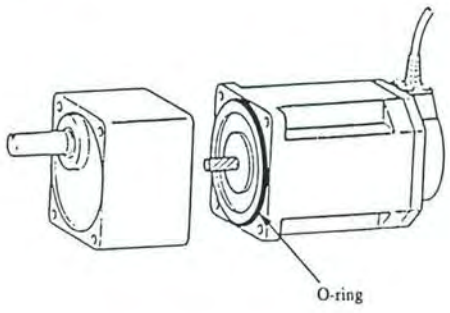
- Indoors, away from direct sunlight.
- Ambient temperature from 0℃ to + 40 ℃(no freezing).
- Ambient humidity of 85% maximum (no condensation).
- No corrosive gases or dust.
- No splashing water or oil (where this is a possibility,protect the motor with a cover).
- Good ventilation and good heat radiation.
- No sources of continuous vibration.

(4) Attaching the Motor and Gearhead

①For pinion shaft models, attach the gearhead after checking that the accessory O-ring is set in the motor socket.

②Make sure there are no particles of waste material or the like adhering to the motor socket , O-ring , or gearhead socket.

③Be sure not to crush the O-ring when attaching the motor and gearhead.



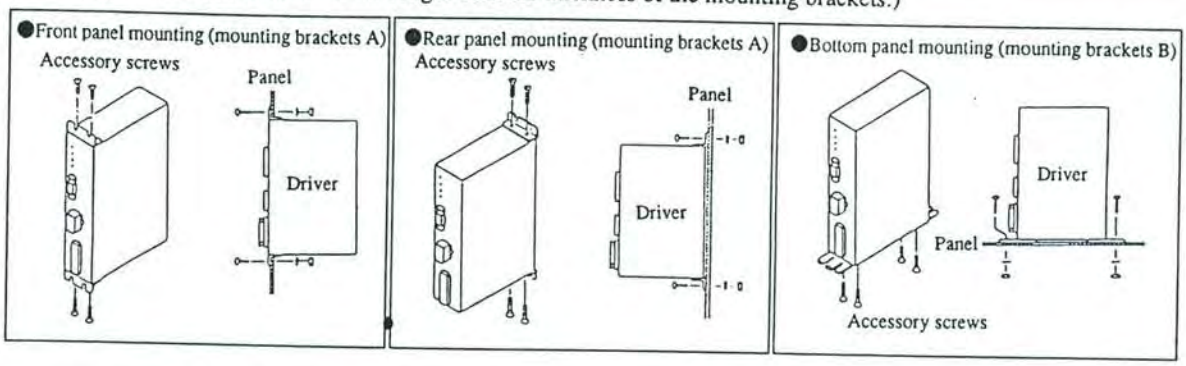
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2. Installing the Driver

(1) Installing the Driver

To install the driver inside machinery, use the accessory mounting brackets and screws. When mounting the driver directly onto machinery without using the mounting brackets be sure to use screws of suitable length. If the screws are too long, they could make contact with the driver's internal circuits, causing damage to the driver.

(Mounting screws should be 2~3mm longer than the thickness of the mounting brackets.)



(2) Installation Locations

These drivers should only be installed in locations that meet the following environmental conditions.

- ●Indoors, away from direct sunlight.
- ●Ambient temperature from 0℃ to +40℃(no freezing).
- ●Ambient humidity of 85% maximum (no condensation).
- ●No corrosive gases, dust, or conductive particles such as iron filings.
- ●No splashing water or oil.
- ●Good ventilation and good heat radiation.
- ●No sources of continuous vibration.

▼ Notes:

① When installing the driver in a tightly sealed location such as a control panel or near a heat source, take precautions against driver temperature rises. When using in locations where the overheat protection function could activate, use a cooling fan or take other measures to keep ambient temperature below 40℃.

② Use a shock absorber when installing the driver in locations where it could be subject to vibration.

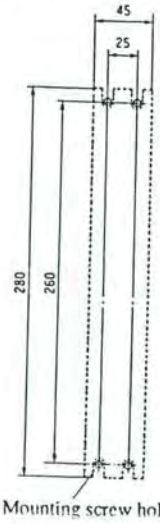
③ When a major source of noise (e.g. high frequency welder or large electromagnetic switch) is near the driver, protect the driver against noise by inserting a noise filter or by rewiring.

④ Do not let small conductive particles such as filings, pins, or waste wire get into the driver.

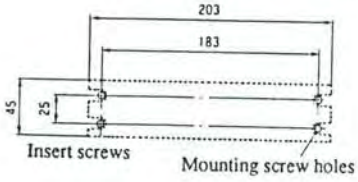
⑤ High voltage is output to the CN-3 regenerator connector, so care is required when working with this equipment.

(3) Mounting Plate Machining Dimensions (units: mm)

● When using mounting brackets A



● When using mounting brackets B



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Specifications

These specifications are applicable when the motor is used in combination with a suitable servo-driver.

■AC Servo-motor/Servo-driver Specifications

(Specifications for motors equipped with an electromagnetic brake are given on page24.)

Unit Model	Round Shaft Type	100V	KXP230-ABZ	KXP460-ABZ	KXP5120-ABZ	KXP6180-ABZ
		200V	KXP230-CBZ	KXP460-CBZ	KXP5120-CBZ	KXP6180-CBZ
	Pinion Shaft Type	100V	KXP230GD-ABZ	KXP460GD-ABZ	KXP5120GD-ABZ	KXP6180GD-ABZ
		200V	KXP230GD-CBZ	KXP460GD-CBZ	KXP5120GD-CBZ	KXP6180GD-CBZ
Motor's Rated Output [W]			30	60	120	180
Rated Rate of Rotation [r/min]			3000	3000	3000	3000
Rated Torque [kgcm] ([N・m])			1.0 (0.1)	2.0 (0.2)	4.0 (0.4)	6.0 (0.6)
Peak Torque*1 [kgcm] ([N・m])			2.0 (0.2)	4.0 (0.4)	8.0 (0.8)	12.0 (1.2)
Speed Control Range*2 [r/min]			20~3000			
Rotor Inertial Moment GD² [kgcm²] *3 (J [kgm²])			0.45 (1.1×10^{-5})	2.3 (0.57×10^{-4})	4.5 (1.1×10^{-4})	7.0 (1.7×10^{-4})
Suitable Load Inertial Moment GD² [kgcm²] *3 (J [kgm²])			2.3 (5.7×10^{-5}) or less	11.5 (2.8×10^{-4}) or less	22.5 (5.6×10^{-4}) or less	35 (8.7×10^{-4}) or less
Power Supplylinput	Voltage And Frequency	100V	Single Phase 100V ±10% 50/60Hz			
		200V	Single Phase 200V ±10% 50/60Hz			
	Maximum Input Current	100V	2.4A	4A	7A	9A
		200V	1.5A	2.1A	3.3A	4.5A
Motor's Insulation Class			Class E (120℃)			
Control System			FET Rectangular wave PWM control			
Speed and Position Detection System			Optical Encoder(400P/R)			
Speed and Position Control Commands			Pulse Train Input			
Maximum Input Pulse Frequency			20kHz (motor shaft's rate of rotation: 3000r/min)			
Positioning Pulse Rate			400 pulses/revolution (motor shaft)			
Encoder Feedback Pulse Rate			400 pulses/revolution (motor shaft)			
Input Signals			Photocoupler input (High : 4~5V, Low : 0~0.5V) ; input current : 10~30mA; forward pulse, reverse pulse, hold-off, counter clear.			
Output Signals			Open collector output by photocoupler insulation; power supply and external equipment requirements : 30V or less, 20mA or less; positioning completion, alarm, encoder Z-phase			
			Open collector output by photocoupler insulation; power supply input and external equipment requirements:DC15V or less, 2mA or less; encoder A phase, B phase			
Protection Function			When the following protection functions are activated, the alarm signal is output and the motor stops : overload, driver overheat, overvoltage, overcurrent, speed error.			
Mass		Motor [kg]	1.0	1.8	2.7	3.8
		Driver [kg]	1.2			

*1. The duration of use of the peak torque is 5 seconds or less at 2000r/min.

*2. The speed control range is the range of r/min whereby if the rated torque is applied, the motor will not stop. Since the motor is controlled by pulses, rotation may be uneven at low speeds.

*3. Always accelerate/decelerate speed when operating the motor under an inertial load exceeding the rotor inertia of the motor. The alarm indicator may light at such times.

■General Specifications

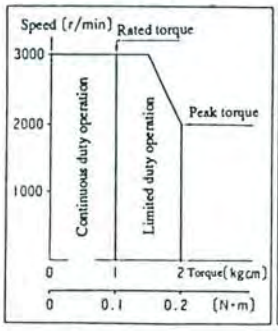
Equipment Component		Servo-Motor, Electromagnetic Brake	Servo-Driver
Insulating Resistance		100MΩ or more when 500VDC is applied between the windings and the frame.	100MΩ or more when 500VDC is applied between the windings and power supply input.
Dielectric Strength		Sufficient to withstand 1.5 kV at 50Hz applied between the windings and the frame. (1kV at 50Hz applied between the electromagnetic brake and the frame.)	Sufficient to withstand 1.5 kV at 50Hz applied between the windings and the frame. (1kV at 50Hz applied between the electromagnetic brake and the frame.)
Operating Environment	Ambient Temperature	0~40℃ (no freezing)	
	Humidity	85% max. (no condensation)	
	Atmosphere	No corrosive gases or dust	

▼ Note: Never attempt to perform an insulating resistance test or dielectric strength test with the motor and driver connected, since this can result in damage. Also, do not perform these tests on the motor's encoder.

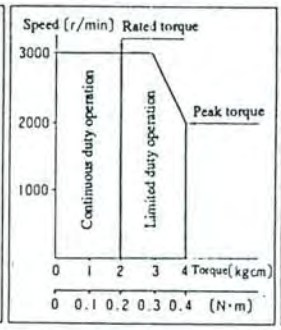
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■Speed-Torque Characteristics (applicable to all models in the KXP series)

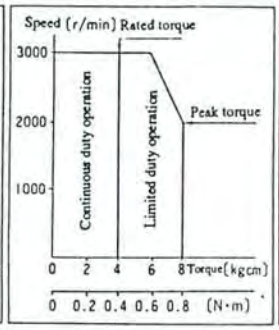
KXP230-ABZ



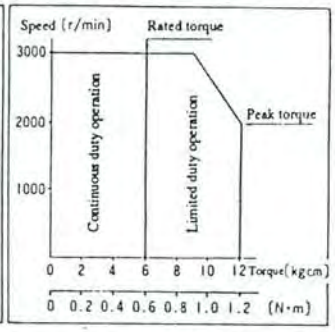
KXP460-ABZ



KXP5120-ABZ



KXP6180-ABZ



Limited duty operation : Primarily speed adjustment operation.
The duration of use of the peak torque is 5 seconds or less at 2000r/min.

●Product characteristics, specifications and dimensions are subject to change without notice in order to incorporate improvements.

■Gearmotor Torque Table〔kgcm〕 (〔N・m〕)

Gear ratio	5	10	15	20	30	50	100	200
Speed range (r/min) / Motor/gearhead model	4～600	2～300	1.3～200	1～150	0.67～100	0.4～60	0.2～30	0.1～15
KXP230GD□□□ / KXP230GD□□□M / 2GD□K	4(0.4)	8.1(0.81)	12(1.2)	16(1.56)	21(2.1)	30(3.0)	40(4.0)	40(4.0)
	81%				73%		66%	
KXP460GD□□□ / KXP460GD□□□M / 4GD□K	8.1(0.81)	16(1.6)	24(2.4)	29(2.9)	43(4.3)	72(7.2)	100(10.0)	40(4.0)
	81%			73%			66%	
KXP5120GD□□□ / KXP5120GD□□□M / 5GD□K	16(1.6)	32(3.2)	48(4.8)	58(5.8)	87(8.7)	145(14.5)	200(20.0)	200(20.0)
	81%			73%			66%	
KXP6180GD□□□ / KXP6180GD□□□M / 6GD□K	24(2.4)	48(4.8)	73(7.3)	87(8.7)	131(13.1)	218(21.8)	300(30.0)	300(30.0)
	81%			73%			66%	

●The box □ represents the motor specifications, which thereby become part of the code for the motor.
●The box □ represents the desired gear ratio, which thereby becomes part of the code for the gearhead. (Gear ratios given in the table are the standard specifications).
●Gray portions of the table give the values that apply when the gearhead and motor rotate in the same direction; the uncolored (white) portions give the values that apply when they rotate in opposite directions.
●The percentages given in the table represent the gearhead's efficiency.
●Gearheads use ball bearings at all stages.

■ Permissible thrust load and permissible overhang load of gearhead output shaft〔kg〕 (〔N〕)

Gearhead model \ Gear ratio		5	10	15	20	30	50	100	200
2GD□K	Permissible thrust load	5(50)							
	Permissible overhang load	10(100)					15(150)		
4GD□K	Permissible thrust load	10(100)							
	Permissible overhang load	25(250)			30(300)				
5GD□K	Permissible thrust load	15(150)							
	Permissible overhang load	30(300)			40(400)				
6GD□K	Permissible thrust load	15(150)							
	Permissible overhang load	30(300)			40(400)				

●Values for permissible overhang load refer to the values at a position 10mm from the end of the shaft.

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Motors Equipped with Electromagnetic Brakes

1. Specifications

Unit model			KXP230-ABZM	KXP460-ABZM	KXP5120-ABZM	KXP6180-ABZM
	Round shaft type	100V	KXP230-ABZM	KXP460-ABZM	KXP5120-ABZM	KXP6180-ABZM
		200V	KXP230-CBZM	KXP460-CBZM	KXP5120-CBZM	KXP6180-CBZM
	Pinion shaft type	100V	KXP230GD-ABZM	KXP460GD-ABZM	KXP5120GD-ABZM	KXP6180GD-ABZM
		200V	KXP230GD-CBZM	KXP460GD-CBZM	KXP5120GD-CBZM	KXP6180GD-CBZM
Motor's rated output		[W]	30	60	120	180
Rated rate of rotation		[r/min]	3000	3000	3000	3000
Rated torque		[kgcm] ([N・m])	1.0 (0.1)	2.0 (0.2)	4.0 (0.4)	6.0 (0.6)
Peak torque*1		[kgcm] ([N・m])	2.0 (0.2)	4.0 (0.4)	8.0 (0.8)	12.0 (1.2)
Speed control range*2		[r/min]	20～3000			
Rotor inertial moment GD²		[kgcm²] *3 (J [kgm²])	0.5 (1.25×10^{-5})	2.3 (0.58×10^{-4})	4.8 (1.2×10^{-4})	7.3 (1.8×10^{-4})
Suitable load inertial moment GD²		[kgcm²] *3 (J [kgm²])	2.3 (5.75×10^{-5}) or less	11.5 (2.87×10^{-4}) or less	22.5 (5.62×10^{-4}) or less	35 (8.7×10^{-4}) or less
Electromagnetic Brake*3	Type		Activate at non-excitation			
	Power Supply Input		DC24V±10 %			
	Power Consumption	[W]	4.3	4.3	6	6
	Excitation Current	[A]	0.18	0.18	0.25	0.25
	Static Friction Torque	[kgm] ([N・m])	1(0.1)	2(0.2)	4(0.4)	6(0.6)
Mass	Motor	[kgcm]	1.4	2.2	3.3	4.5

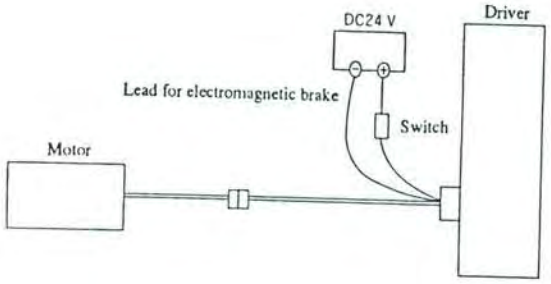
*1. The duration of use of the peak torque is 5 seconds or less at 2000r/min.

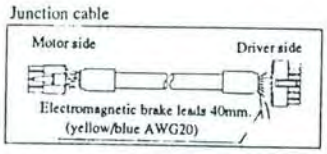
*2. Acceleration/deceleration must be performed when driving an inertial load (the acceleration/deceleration rate should be at least 5～10msec/kHz).

*3. The electromagnetic brake has two functions: to hold the position of the load when power is off and to execute emergency stops. It cannot be used for frequent braking.

2. Connecting the Electromagnetic Brake to Power Supply

Connect the electromagnetic brake to the power supply using a cable with a conductor cross-sectional area of at least 0.2mm².
The power supply input to the electromagnetic brake is DC24V ±10% 0.3A max. and therefore must be independent of the driver's power supply.





* The lead to the electromagnetic brake exits the junction cable at the driver connection.

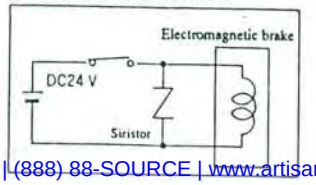
* The electromagnetic brake has no polarity.

▼ Notes:

- Applying a voltage that exceeds the specifications will cause the electromagnetic brake to generate a great deal of heat, resulting in motor temperature rises and possible damage to the motor's internal encoder. Conversely, if voltage is too low, the electromagnetic brake may not operate.
- Connect a siristor to protect switch contacts and to suppress noise.

  * A siristor (C-5A3: Ishizuka Electronics) is included with electromagnetic brake types.

○ Siristor Connection



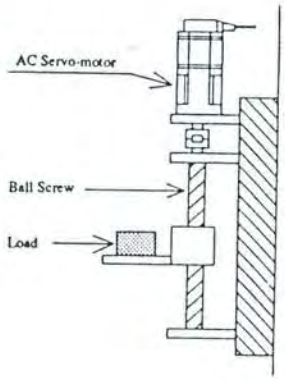
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3. Use of Electromagnetic Brake and Cautions for Use

KXP series motors equipped with magnetic brakes should be used in accordance with the following instructions.

(1) Use of Electromagnetic Brake

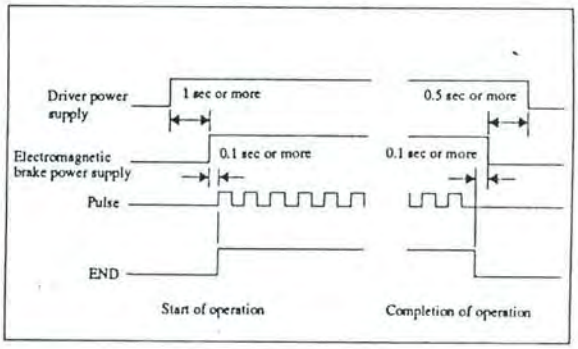
Electromagnetic brakes incorporated in KXP series motors are non-excitation type brakes ; that is, they engage when power is not being input and disengage when it is, at which time the motor shaft is released and the motor becomes operable. This brake is generally used for transporting loads along a vertical axis (Z-axis) as illustrated in the diagram at right. When power is cut off due to an outage, the brake prevents the load from dropping. However, vertical axis operations involve regeneration, and to satisfy motor operation requirements, a regeneration unit (sold separately) must be used. For further information, inquire at your nearest Oriental Motor.



(2) Cautions for Use of Electromagnetic Brake

Since Oriental Motor's electromagnetic brake is designed for holding the position of a load, using it for normal braking operations will shorten its life. The following cautions for use should be observed.

〈Timing Chart〉



① Holding timing

At the start of operation , first turn on power to the driver then power to the electromagnetic brake. No pulses should be input when power to the brake is being turned on. At the completion of operation , do not turn off the electromagnetic brake until after pulses have stopped and the shaft has come to a complete stop (after output of END signal).

② Backlash

Backlash can occur when there are gaps between the electromagnetic brake and the shaft. Therefore, always return to the origin when resuming operation after the electromagnetic brake has engaged to hold the position of a load.

③ Protecting contacts

Connect a siristor, diode or other device to protect switch contacts and to suppress noise.

④ Applied voltage

Applying a voltage that exceeds voltage specifications will cause the electromagnetic brake to generate a great deal of heat, resulting in sharp rises in motor temperature and possible motor breakdowns. In addition, if the voltage applied is less than voltage specifications, the electromagnetic brake may not be released. Therefore, always use the brake within the voltage range provided for in the specifications.

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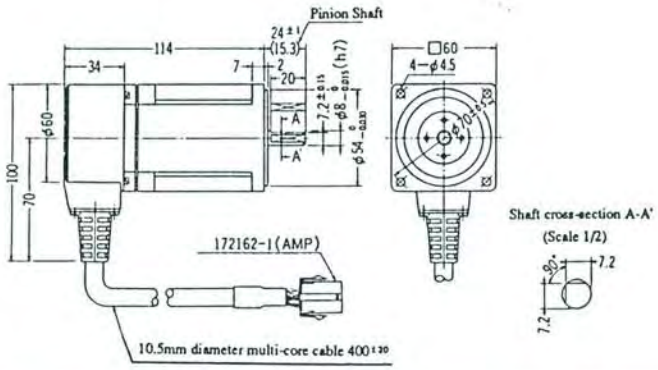
Dimensions

■Motor (Scale 1/4, unit=mm)

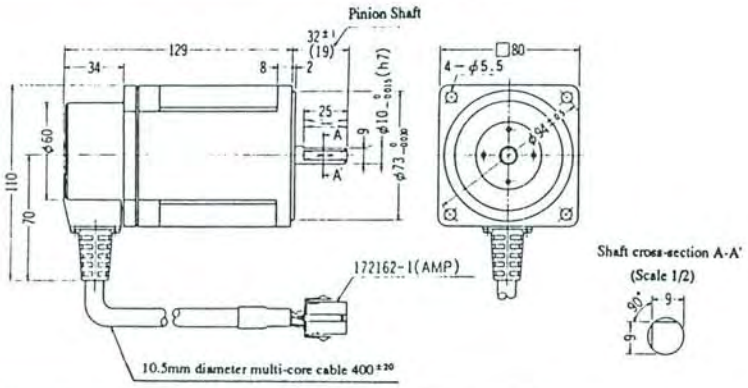
(Standard Type)

■Round Shaft Type

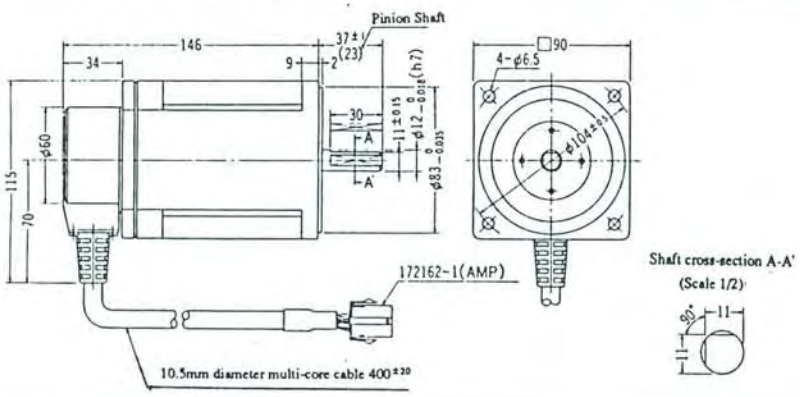
KXPM230-AB
KXPM230-CB



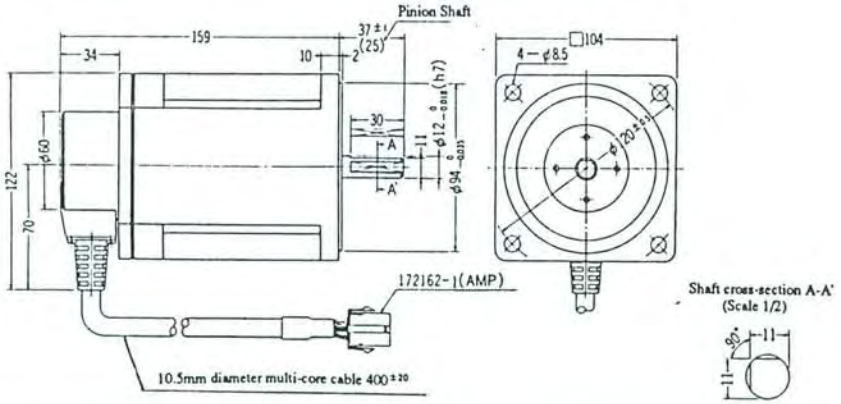
KXPM460-AB
KXPM460-CB



KXPM5120-AB
KXPM5120-CB



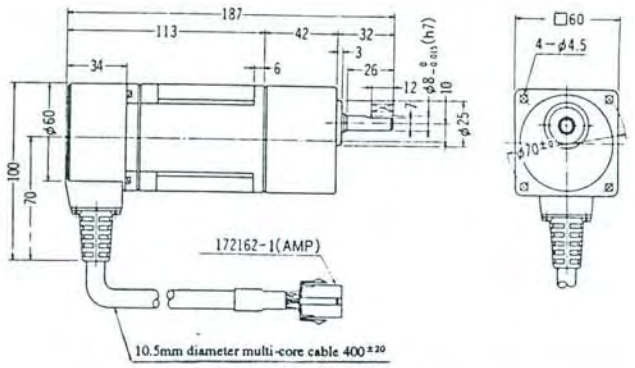
KXPM6180-AB
KXPM6180-CB



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■Pinion Shaft Type (with GD model gearhead)　　※ Gearhead is sold separately.

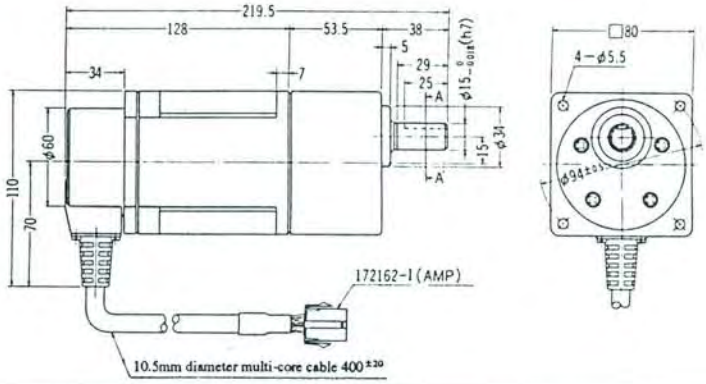
KXPM230GD-AB
KXPM230GD-CB



KXPM460GD-AB
KXPM460GD-CB

Shaft cross-section A-A'
(Scale 1/2)

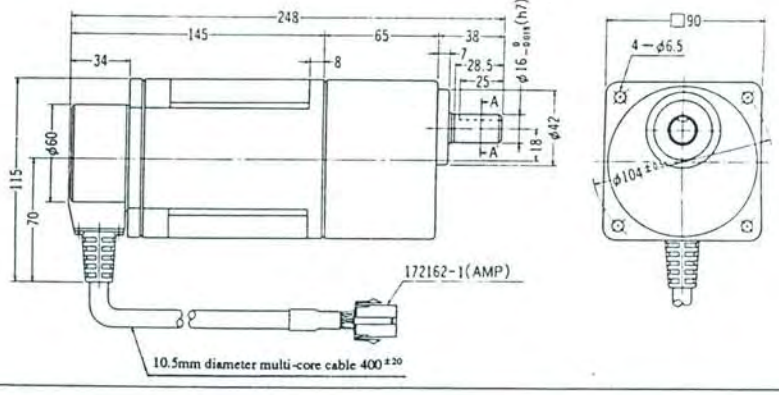
key (accessory)
(Scale 1/2)



KXPM5120GD-AB
KXPM5120GD-CB

Shaft cross-section A-A'
(Scale 1/2)

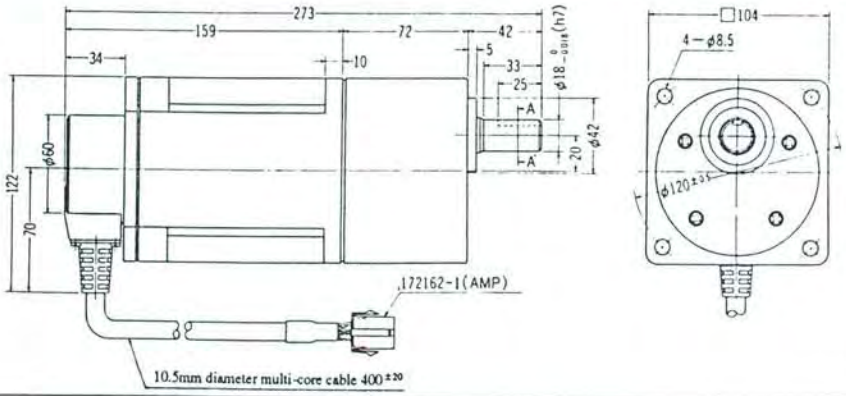
key (accessory)
(Scale 1/2)



KXPM6180GD-AB
KXPM6180GD-CB

Shaft cross-section A-A'
(Scale 1/2)

key (accessory)
(Scale 1/2)

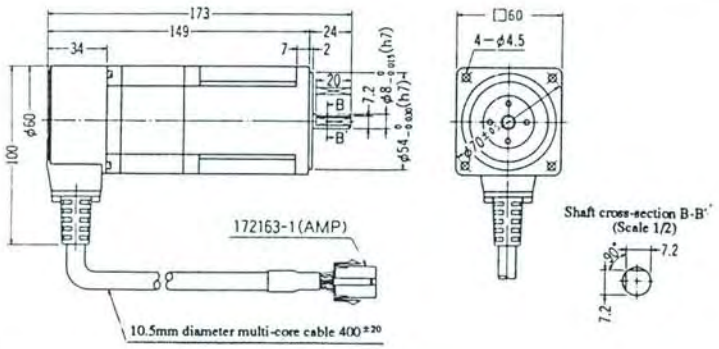


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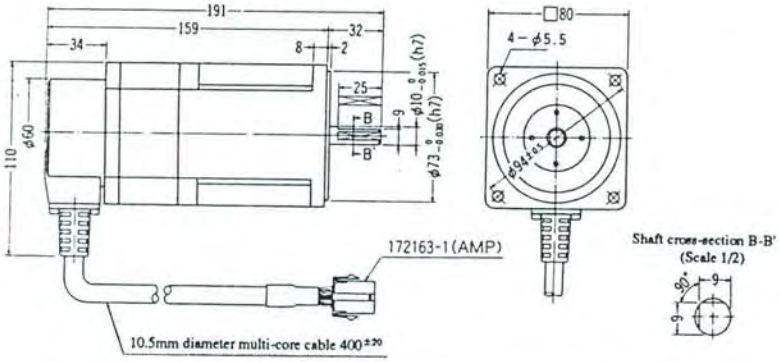
(Electromagnetic Brake Type)

■Round Shaft Type

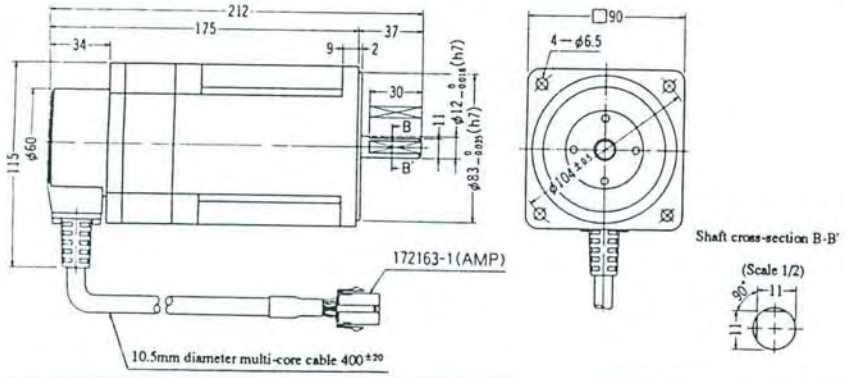
KXPM230-ABM
KXPM230-CBM



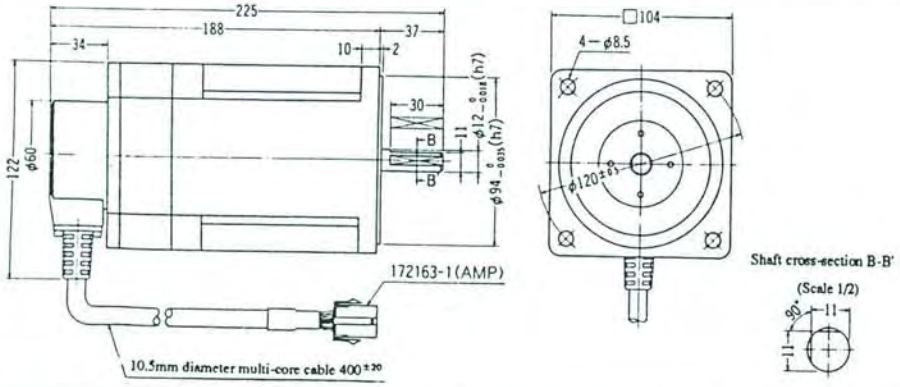
KXPM460-ABM
KXPM460-CBM



KXPM5120-ABM
KXPM5120-CBM



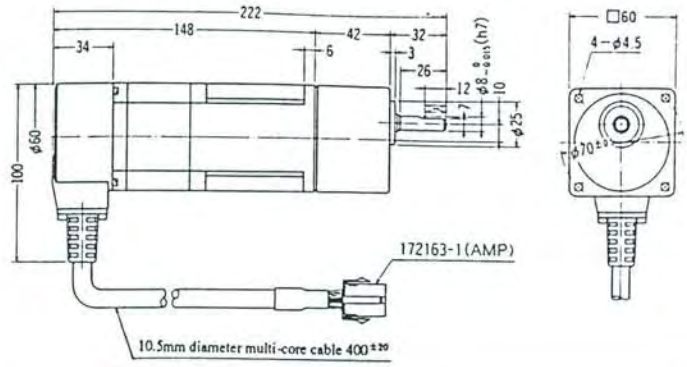
KXPM6180-ABM
KXPM6180-CBM



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■Pinion Shaft Type (GD model gearhead)　　* Gearhead is sold separately.

KXPM230GD-ABM
KXPM230GD-CBM



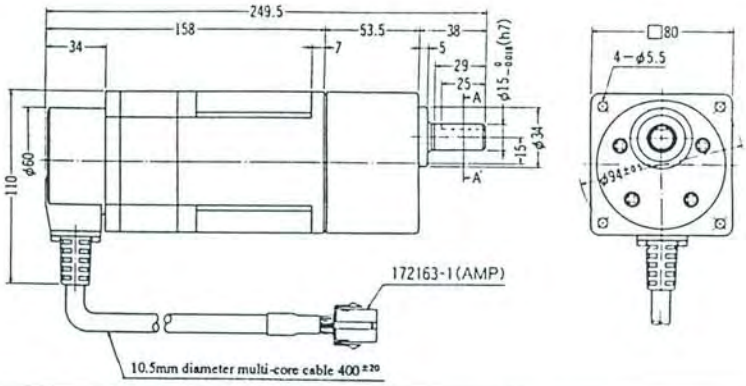
KXPM460GD-ABM
KXPM460GD-CBM

Shaft cross-section A-A'
(Scale 1/2)



key (accessory)
(Scale 1/2)



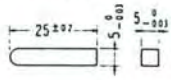


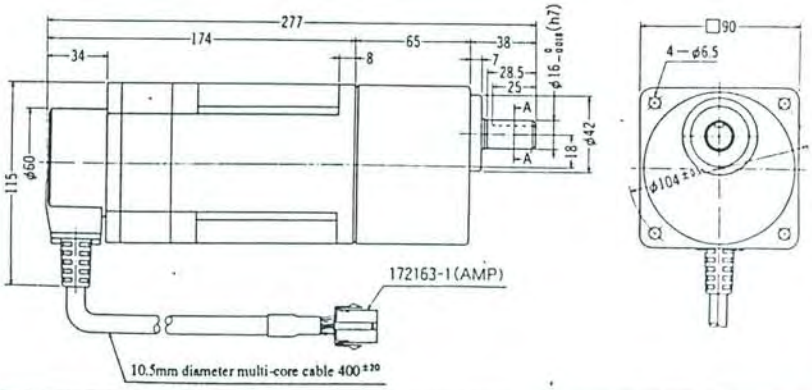
KXPM5120GD-ABM
KXPM5120GD-CBM

Shaft cross-section A-A'
(Scale 1/2)



key (accessory)
(Scale 1/2)



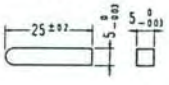


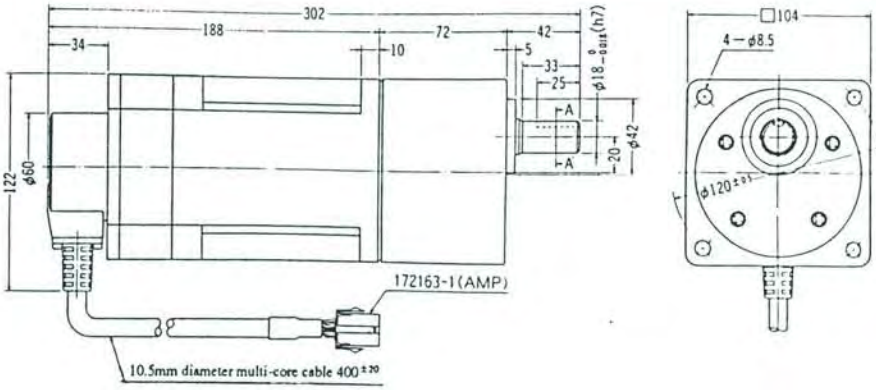
KXPM6180GD-ABM
KXPM6180GD-CBM

Shaft cross-section A-A'
(Scale 1/2)



key (accessory)
(Scale 1/2)

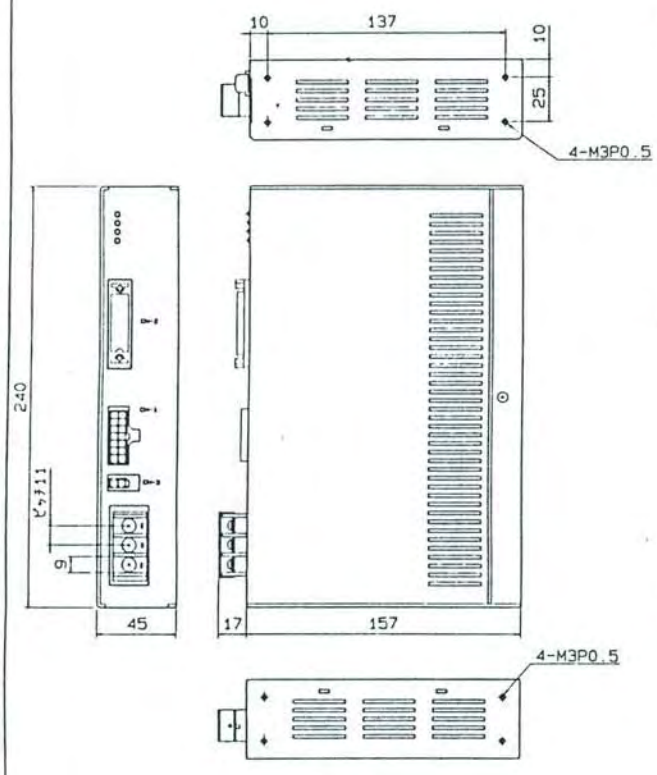




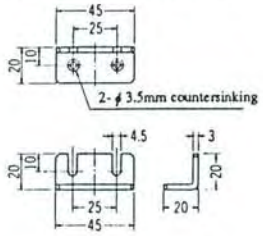
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■Driver (Scale 1/4, units=mm) Mass: 1.2kg

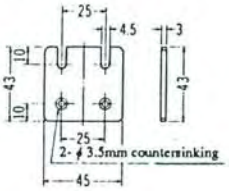
Applicable to all single-phase 100V and 200V drivers.



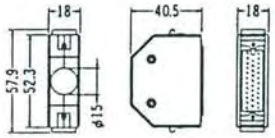
●Mounting brackets A (one 2-piece set)



●Mounting brackets B (one 2-piece set)



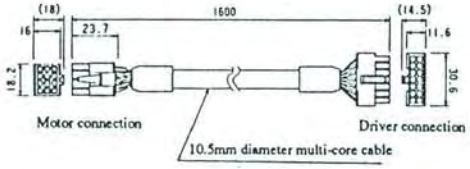
●Control I/O Connector
MR-34LM (Honda Communications Industry)



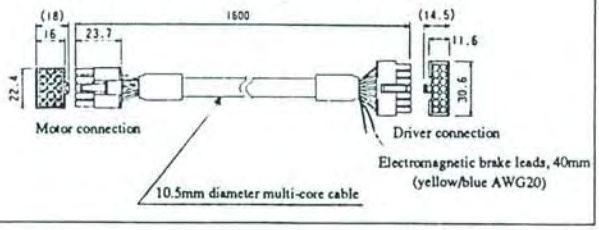
●Junction cable

(included only with models suitable for connection with standard cable)

• Junction cable (for standard type)



• Junction cable (for electromagnetic brake models)



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Troubleshooting

If the motor fails to function properly, first check to see that the problem is not due to errors in operation or set-up as described in the table below. If the trouble persists, contact your nearest Oriental Motor.

Problem	Check Points	Measures
Motor does not rotate.	Is the hold-off signal being input?	Check to see whether the hold off signal is being input. If it is, the motor will not rotate.
	Is the CCR signal being input?	Check to see whether the CCR signal is being input. If it is, the motor will not rotate.
	Are the motor and driver properly connected?	Recheck connection (see p.6).
	Is the alarm signal being output?	Correct the problem that caused to the alarm, and cancel alarm (see p.19). Alarm can be canceled by inputting CCR or by turning power on again.
Motor exhibits hunting during speed adjustment or when stopping.	Is the speed adjustment duration correct?	Check the acceleration/deceleration time(see p.17, (2)).
	Does the inertial load exceed the permissible value for the motor?	Check the inertial moment of the load (see p.16, (2)).
Motor stops during acceleration.	Is the connection between the motor and the load loose?	Tighten the coupling linkage.
	Is the driver's OVER FLOW lamp lit?	Check the acceleration / deceleration time (see p. 17, (2)).
	Is the driver's OVER LOAD lamp lit?	Check the load to see that it is within the rated torque and the permissible inertial load (see p.16).
Motor rotates in opposite direction.	Are the driver and controller properly connected?	Connect pulse input correctly (see p.11). Check the setting for the driver's input pulse method (see p.9).
	Is the gearhead being used?	The direction of rotation could be reversed due to the gearhead's reduction ratio.
	Is the electromagnetic brake engaged?	Check to see if the magnetic brake is released.
Positioning is inaccurate.	Has CCR been input before stopping?	Correct the setting so that CCR is not input before positioning.
	Is the connection between the motor and the load loose?	Tighten the linkage of the coupling.
	Is the operation pulse rate setting correct?	Set the correct operation pulse rate.
	Is there a source of noise nearby?	Take measures against noise (see p.14).
Rotation is not smooth.	Is the motor's rate of rotation set below 20r/min?	Reset the motor's rate of rotation within the range 20 ~ 3000 r / min (133 ~ 20,000Hz).
Alarm is being output even though reset (CCR) has been input.	Is there an overload?	Check the load to see that it is within the rated torque and the permissible inertial load.
	Is the ambient temperature above 40℃?	Cool the motor or lower the ambient temperature (see p.20,(3)).

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Product characteristics, specifications and dimensions are subject to change without notice to incorporate improvements.
Contact your nearest Oriental Motor for further information.

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