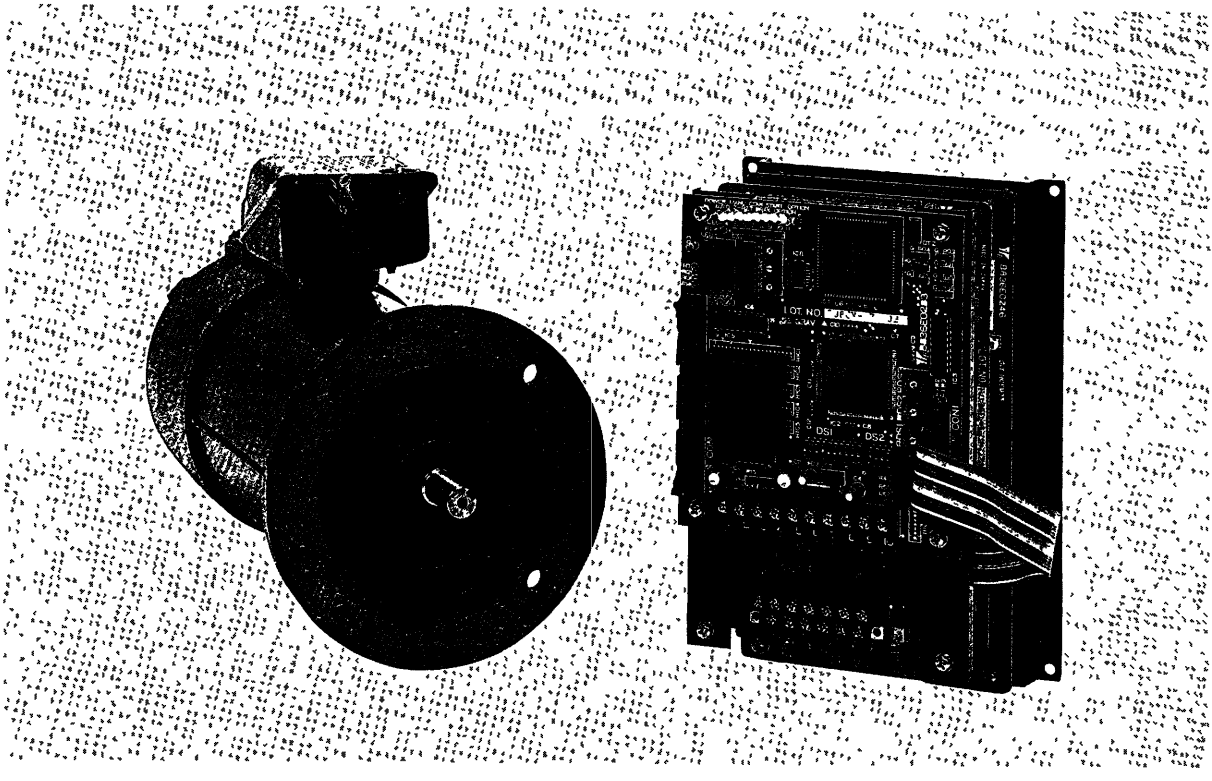
Juspoint

INVERTER POSITIONING SYSTEM WITH OPTIMUM COST/PERFORMANCE RATIO



YASKAWA

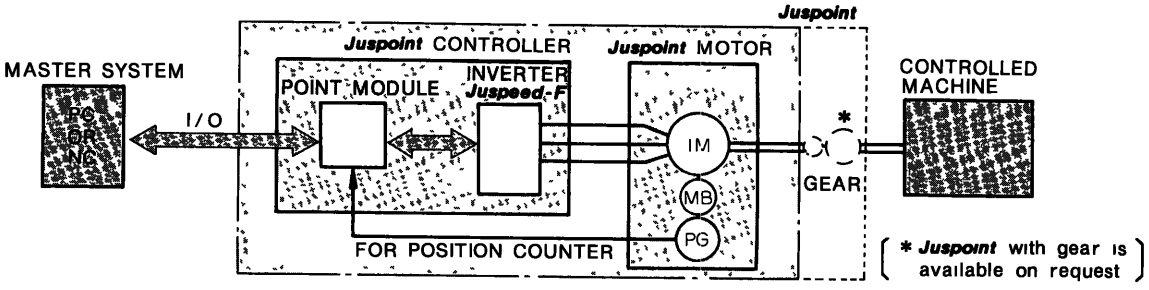
CONTENTS

1. OUTLINE

Juspoint is a positioning system based on general-purpose inverters and general-purpose motors. Juspoint is composed of a Juspoint controller provided with point module (positioning control board) for inverters and a Juspoint motor provided with a pulse encoder (PG) for general-purpose brake motors (IM).

There are two types of Juspoint control specifications : for general industrial machines and exclusive for machine tool auxiliary machines. For general industrial machines, position reference is input in BCD data equivalent to the number of pulses of the encoder. On the other hand, for machine tool auxiliary machine exclusive use, the number of pulses per position has been stored in advance and the number of positions to be moved is input in BCD data.

This technical sheet describes Juspoint for general-purpose industrial machines.



Note YASKAWA Juspeed-F digital command type inverter is used for Juspoint controller For inverter operation, refer to DTOE-S606-3

Fig 1 System Configuration

WARNING

- For inspection, turn off AC main circuit power. Then, remove terminal cover after 10 seconds. (The capacitors are still charged and can be quite dangerous.)
- Do not connect or disconnect wires or connectors while AC power is applied.
- Do not check signals during operation.

IMPORTANT

- Be sure to ground Juspoint using ground terminal Ⓔ (Ⓖ) on the casing of Juspoint.
- Do not install magnetic contactor (MC) or capacitor between Jospoint and motor.
- All the potentiometers of Juspoint have been adjusted and paint-locked at the factory. Do not change their settings unnecessarily.
- Do not perform the following tests in the field :
  - Withstand voltage test on any part of the Juspoint unit. It is an electronic device using semi-conductors and vulnerable to high-voltage.
  - Insulation resistance test with a megger. This test has been made at the factory and need not be conducted at test run. Exception : If megger-testing is required for inspection and maintenance purposes, it should be applied only to main circuit and the ground and never to the control circuit.
  - Conduction test on control circuits.

2. RATINGS AND SPECIFICATIONS

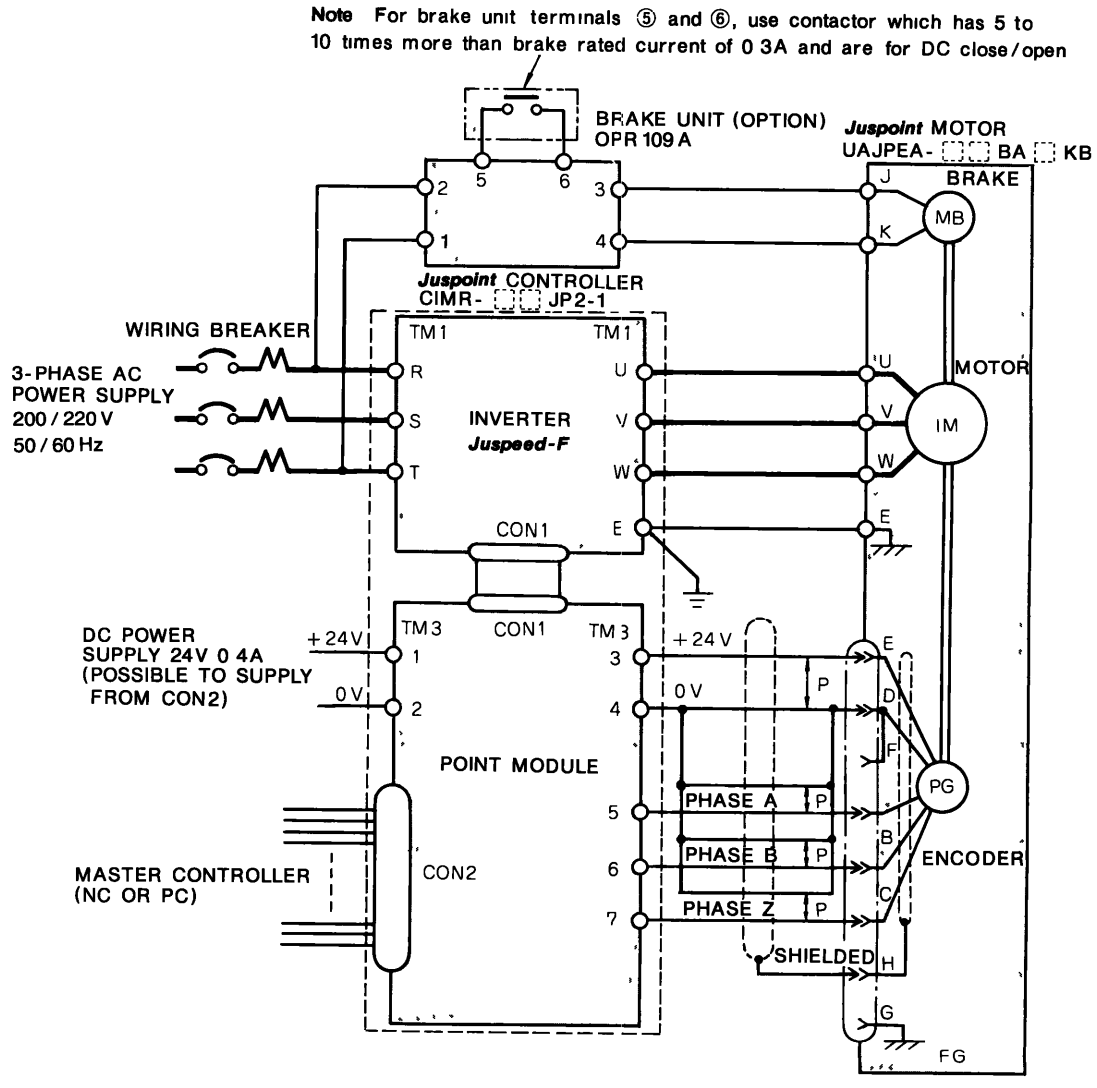
Table 1 Juspoint Ratings and Specifications

MOTOR (4-pole)	Type UAJPEA-[ ]*		04 BA[ ]KB	08 BA[ ]KB	15 BA[ ]KB	22 BA[ ]KB	37 BA[ ]KB
	Output Capacity	kW (HP)	0 4 (3/4)	0 75 (1)	1 5 (2)	2 2 (3)	3 7 (5)
	Rated Torque	kg•m	0 2	0 4	0 8	1 2	2 0
	Moment of Inertia of Rotor (GD^2)	kg•m²	0 006	0 011	0 028	0 036	0 065
	Rated Current	A	1 93	3 3	6 6	8 5	14 0
	Rated Speed	r/min	1710	1720	1740	1710	1700
	Time Rating	%ED	40	40	40	30	30
	Holding Brake: Voltage	VDC	90	90	90		90
	Holding Brake: Rated Current	A	0 14	0 17	0 2		0 24
	Holding Brake: Static Friction Torque	kg•m	0 4	0 8	1 6		3 0
	Rated Voltage	V	3-phase 200/220 V				
	No.of Poles		4 Poles				
	Encoder		24 VDC, 360P/R, Open collector type with A-, B-, Z-phase				
	Others		Vibration V15 Insulation Class E Enclosure Totally-enclosed, Self-cooled Mounting Foot-mounted, Flange-mounted Ambient Temperature −10 to +40℃ (+14 to +104°F) Storage Temperature −20 to +60℃ (−4 to +140°F) Ambient Humidity 20 to 80% (non-condensing)				
CONTROLLER	Type CIMR-[ ]		04JP2-1	08JP2-1	15JP2-1	22JP2-1	37JP2-1
	Inverter Rated Output Capacity	kVA	1 0	1 5	2 5	3 5	6 0
	Inverter Rated Output Current	A	3 0	4 5	7 5	10 5	17 5
	Input Voltage: Inverter		3-phase 200/220 VAC (±10%), 50/60 Hz (±5%)				
	Input Voltage: Point Module		24 VDC, 0 4 A				
	Output Frequency Range		2 to 60 Hz (equivalent to 60 to 1800 r/min)				
	Position Travel Distance Reference		6-digit BCD code (0 to 999999 pulses)				
	Positioning Accuracy		±5 to ±15° at motor shaft (gear not included) (Differs depending on load conditions)				
	Speed Reference		4-digit BCD code (60 to 1800 r/min)				
	Zero-point Return Function		Provided (mode A, mode B)				
	Accel/decel Time		0 2 to 5 0 sec (16 ways)				
	Multi-step Speed Run		V1, V2 (5 to 60 Hz), V3 (2 to 10 Hz) possible to set				
	Current Position Monitor		BCD output (4-bit used, digit designation required)				
	Other Input Signals		RUN/STOP, FWD/REV, OPERATION, SELECT, RESET, etc				
	Other Output Signals		Positioning completion (COIN), alarm, brake				
	Environment		Location Indoors, non-corrosive gases, no dust or dirt Ambient Temperature −10 to +50℃ (+14 to 122°F) Ambient Humidity 30 to 90% (non-condensing) Elevation 1000 m or less (3300 feet) Vibration 0 5G or less (5 to 55 Hz)				

* [ ] in motor type designation is determined by mounting method
  - Foot-mounted 4
  - Flange-mounted 2

3. CONFIGURATION

3.1 INTERCONNECTION



Normally, do not connect to encoder (PG) connector pins F and G

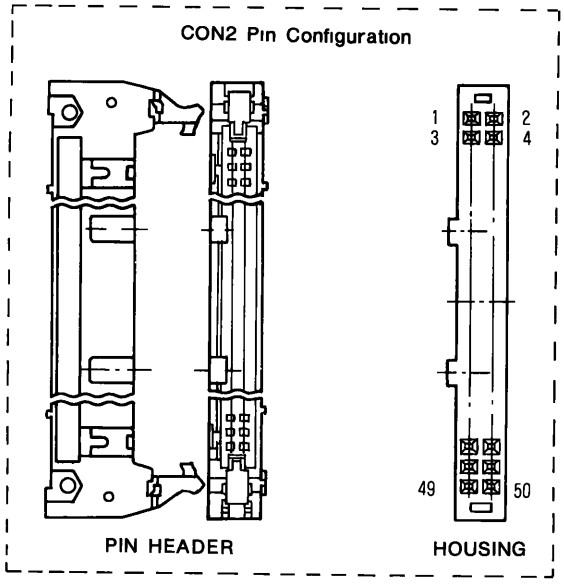


Fig 2 Interconnecting Diagram

3.2 MAIN CIRCUIT TERMINAL TM1

(1) Main Circuit Terminal Names and Description

Table 2 Main Circuit Terminal Names and Description

Terminal Symbol	Name	Description
Ⓡ Ⓢ Ⓣ	Main circuit power supply input terminal	3-phase 200/220VAC (±10%) 50/60Hz (±5%)
Ⓤ Ⓥ Ⓦ	Motor connecting terminal	Connecting Ⓤ and motor terminal Ⓤ, Ⓥ and motor terminal Ⓥ, Ⓦ and motor terminal Ⓦ
Ⓔ	Grounding terminal	—

(2) Main Circuit Terminal Peripheral Devices and Cable Specifications

Table 3 Main Circuit Terminal Peripheral Devices and Cable Specifications

Type CIMR-□	04JP2-1	08JP2-1	15JP2-1	22JP2-1	37JP2-1
Wiring Breaker	NF-30 (5 A)	NF-30 (10 A)	NF-30 (20 A)		NF-30 (30 A)
Magnetic Contactor	HI-7E		HI-10-2E		HI-20E
Main Circuit Terminal Cable Specifications	Cable size 2 mm² Screw dia M4		Cable size 3 5 mm² Screw dia M4		

3.3 ENCODER (PG) CONNECTING TERMINAL TM3

(1) Encoder (PG) Connecting Terminal Names and Description

Table 4 Encoder (PG) Connecting Terminal Names and Description

Terminal No	Name		Description
①	External power supply input terminal*		24 VDC, 0 4 A
②			GND (0 V)
③	PG	Power supply terminal	24 VDC
④			GND (0 V)
⑤		Signal terminal	Phase A input (connected to PG terminal A)
⑥			Phase B input (connected to PG terminal B)
⑦			Phase C input (connected to PG terminal C)
⑧			
⑨			
⑩			

* When 24 VDC is supplied from CON2, power does not have to be supplied from this terminal

(2) Encoder (PG) Connecting Terminal Cable and Receptacle Specifications

Table 5 Encoder (PG) Connecting Terminal Cable and Receptacle Specifications

Name		Type	Remarks
Plug	Straight	MS3106B20-18S	Made by JAE
	Angle	MS3108B20-18S	Made by JAE
Cable Clamp		MS3057-12A	Made by JAE
Connecting Cable		Twisted pair shielded cable (AWG22 × 4P or more)	Phase A, B or Z is twisted with 0 V

Notes
1 JAE made MS3102A20-18P receptacles are used
2 Length 10 m or less

3.4 CON2 CONNECTOR PINS FOR I/O SIGNAL

(1) Connector Pin Arrangement

Table 6 Connector Pin Arrangement

Pin No	Signal	Contents
1*	+ 24 V	+ 24 VDC power supply
3	0 V (GND)	Control circuit 0 V
5	POS · REF 1-1	Speed/Position ref 1-digit
7	POS · REF 1-4	Speed/Position ref 1-digit
9	POS · REF 2-1	Speed/Position ref 2-digit
11	POS · REF 2-4	Speed/Position ref 2-digit
13	POS · REF 3-1	Speed/Position ref 3-digit
15	POS · REF 3-4	Speed/Position ref 3-digit
17	POS · REF 4-1	Speed/Position ref 4-digit
19	POS · REF 4-4	Speed/Position ref 4-digit
21	POS · REF 5-1	Position ref 5-digit
23	POS · REF 5-4	Position ref 5-digit
25	POS · REF 6-1	Position ref 6-digit
27	POS · REF 6-4	Position ref 6-digit
29	SIGN	Rotating direction ref
31	POS · DATA 2	Current position data
33	POS · DATA 8	Current position data
35	POS · DIG 2	Current position digit designation
37	POS · DIG 8	Current position digit designation
39	MANU	Speed ref operation
41	V1	1st speed ref
43	V3	3rd speed ref
45	Z-RET-LS	Zero point limit switch
47	COIN	Positioning completed
49	ALM	Alarm

Pin No	Signal	Contents
2*	0 V (GND)	0 VDC
4	0 V (GND)	Control circuit 0 V
6	POS · REF 1-2	Speed/Position ref 1-digit
8	POS · REF 1-8	Speed/Position ref 1-digit
10	POS · REF 2-2	Speed/Position ref 2-digit
12	POS · REF 2-8	Speed/Position ref 2-digit
14	POS · REF 3-2	Speed/Position ref 3-digit
16	POS · REF 3-8	Speed/Position ref 3-digit
18	POS · REF 4-2	Speed/Position ref 4-digit
20	POS · REF 4-8	Speed/Position ref 4-digit
22	POS · REF 5-2	Position ref 5-digit
24	POS · REF 5-8	Position ref 5-digit
26	POS · REF 6-2	Position ref 6-digit
28	POS · REF 6-8	Position ref 6-digit
30	POS · DATA 1	Current position data
32	POS · DATA 4	Current position data
34	POS · DIG 1	Current position digit designation
36	POS · DIG 4	Current position digit designation
38	AUTO	Positioning operation
40	Z-RET	Zero-point return operation
42	V2	2nd speed ref
44	START	Run reference
46	RESET	Reset, emergency stop
48	BRAK	Brake
50**	OPTION	Open collector output

* When power supply is provided from TM3, it does not have to be supplied from pin Nos 1 and 2

** Pin No 50 is for output option Normally do not connect to this pin

(2) I/O Signal Circuit Method and Logic

All I/O signals are of open collector method.

They are active "Low" (closed) when not specified.

(3) CON2 I/O Signals and How to Use them

Table 7 Input Signals

<table>
<tr><th>Symbol</th><th>Pin No</th><th></th><th>Description</th></tr>
<tr><td>POS•REF1-1
to
POS•REF6 to 8</td><td>5
to
28</td><td>Position reference or speed reference</td><td>Signals to set position or speed
(1) Position setting
Data equivalent to the number of PG pulses are input in 6-digit BCD code Two ways of setting (absolute or incremental) available
(2) Speed setting
Motor speed (at motor shaft) is input in 4-digit BCD
Unit r/min
Effective only when V1, V2 and V3 are "open" in speed reference operation
<table>
<tr><td>Digit</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Pin No</td><td>5*to 8</td><td>9 to 12</td><td>13 to 16</td><td>17 to 20</td><td>21 to 24</td><td>25 to 28*</td></tr>
</table>
* Pin No 5 -LSB, No 28 -MSB</td></tr>
<tr><td>SIGN</td><td>29</td><td>Rotating direction reference</td><td>Signal to specify the direction of position reference or speed reference
"Open" Motor forward running (CCW from load side)
"Closed" Motor reverse running (CW from load side)</td></tr>
<tr><td>POS • DIG</td><td>34
to
37</td><td>Current position digit designation</td><td>Signals to specify the POS • DATA digit
When 1 to 6 are specified, the data of the digit corresponding to the numerical value are output
When 7 is specified, rotating direction is output from POS • DATA (0=FWD, 1=REV)</td></tr>
<tr><td>AUTO</td><td>38</td><td>Positioning operation</td><td>Signal to command positioning operation</td></tr>
<tr><td>MANU</td><td>39</td><td>Speed reference operation</td><td>Signal to command speed reference operation</td></tr>
<tr><td>Z-RET</td><td>40</td><td>Zero-point return operation</td><td>Signal to command zero-point return operation</td></tr>
<tr><td>V1
V2
V3</td><td>41
to
43</td><td>Speed reference</td><td>Signals to command normal speed (V1>V2>V3)
41 V1 speed 5 to 60 Hz (150 to 1800 r/min)
42 V2 speed 5 to 60 Hz (150 to 1800 r/min)
43 V3 speed 2 to 10 Hz (60 to 300 r/min)
In speed reference, when any one of V1, V2, V3 is commanded, values (60 to 1800 r/min) commanded by POS • REF 4-digit BCD become normal speed</td></tr>
<tr><td>START</td><td>44</td><td>Run command</td><td>Signal to start/stop Juspoint operation</td></tr>
<tr><td>Z-RET-LS</td><td>45</td><td>Zero-point limit switch</td><td>Signal to input zero-point LS signal at zero-point return operation
There are two modes (mode A and mode B) for zero-point operation</td></tr>
<tr><td>RESET</td><td>46</td><td>Reset</td><td>Signal to perform alarm reset and emergency stop</td></tr>
</table>

Table 8 Output Signals

Symbol	Pin No	Description	
POS·DATA	30 to 33	Current position data	Signal to output current position to external devices (NC or PC) Data in the specified digit are output by POS·DIG
COIN	47	Positioning complete signal	Signal output when positioning is completed, Juspoint is in stopping status by speed reference operation or zero-point return operation is completed
BRAK	48	Brake	Signal output when motor stops Motor starting method differs depending on switches (DS2 – 4) on the board (Refer to Par 5 2)
ALM	49	Alarm	Signal output when external control cannot be performed temporarily by various alarms Alarm can be released by RESET

(4) CON2 Wiring Specifications

Table 9 Typical CON2 Wiring Application (Made by JAE)

Name		Type	Specifications
Pressure Type	Housing	PS-D4C50	With key, 50-pole
	Socket Contact	030-51304-001	#24 to #28 AWG
	Manual Pressure Tool	CT150-1-PSSF	
Contact Type	Connector	PS-50SM-D4P1-1CA PS-50SM-D4P1-1DA	With key, 50-pole
	Strain Relief	PS-SR50M	
	Contact Connection Device	MT-PSSE0-1B	

Note For CON2 on the point module, JAE made pin header with 50-pole lock (PS-50PE-D4T1-M1A) is used

3.5 BRAKE OPERATION

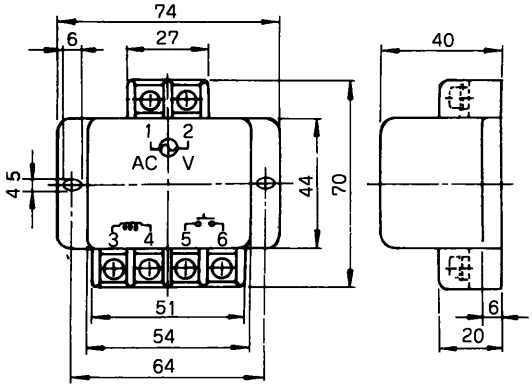
(1) Brake Power Supply (Option)

Use brake power supply of 90 VDC specification.

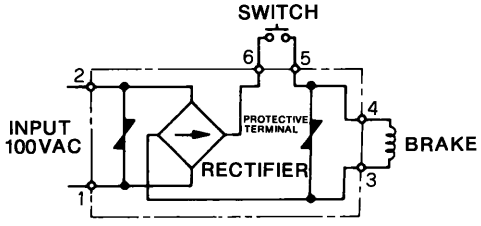
OPR109F type and OPR109A type (made by Ogura Clutch Co., Ltd.).

Brake Power Supply Unit (made by Ogura Clutch Co , Ltd)

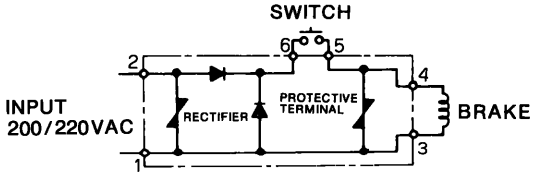
- Input 100 VAC, output 90 VDC (OPR 109F)
- Input 200 VAC, output 90 VDC (OPR 109A)



OPR 109F Circuit Diagram



OPR 109A Circuit Diagram



Notes

1 Do not short output terminal ③ or ④

2 For brake power supply terminals ⑤ and ⑥, use terminals which have 5 to 10 times more than brake rated current of 0 3A and are for DC close/open

3 For power supply unit protection, insert a fuse at input side or output side

Fig 3 Brake Power Supply Unit External Dimensions (in mm) and Circuit Diagrams

(2) How to Use

By using CON2 pin No.48 (brake output signal), the brake can be operated.

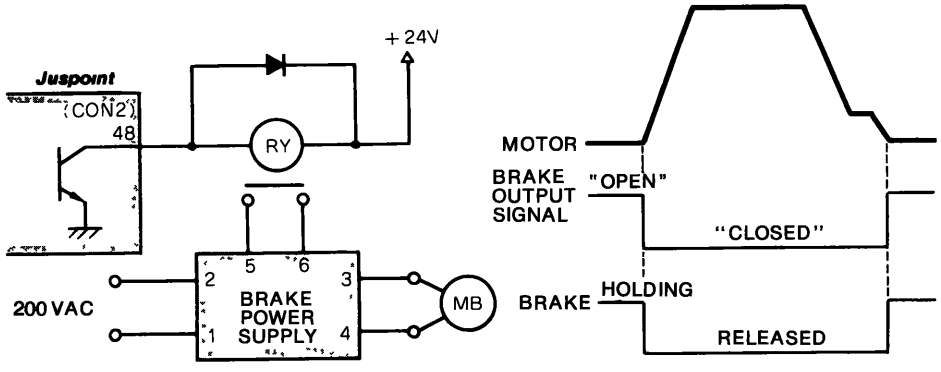


Fig 4 Typical Sequence using Brake Signal

3.6 WIRING PRECAUTIONS

(1) Use twisted pair shielded cables for PG feedback circuit.
Cable length is up to 10 m. For wiring, connect the cables in the shortest distance and cut off the surplus. (Refer to Table 5.)

(2) For grounding cables, use as large size as possible.
Class 3 grounding (100Ω or less) is recommended.

Grounding must be provided at one point. If motor is insulated between machines, use another grounding method to ground the motor

(3) To prevent noise malfunction, take the following actions :
- Locate Juspoint controller or I/O reference setter closely.
- Provide a surge absorbing circuit to relay coils magnetic contactors, solenoids, etc.
- Separate main circuits (high-voltage circuits such as AC lines or motor lines) and signal circuits more than 30 cm. Do not run them in the same duct or bundle them together.
- Provide a noise filter to the power supply or input circuits when the power supply is shared with electrical welders or discharging machines, or when there is a high-frequency noise generating source near the unit.

(4) Radio Frequency Interference Preventive Actions (R.F.I)
No preventive actions for radio frequency interference are provided to Juspoint controller since it is an industrial device. Therefore, if it is used in a residential area or radio frequency interference causes any problems, provide a line filter at the main circuit power supply input side.

(5) Since cable cores used for PG feedback circuit or signal circuits are very thin, do not apply bending force or tension force to the cables.

4. BASIC OPERATION

4.1 POWER SUPPLY ON/OFF

In the power-ON sequence, turn on the control power supply before the main circuit power supply.

In the power-OFF sequence, turn off the main circuit power supply and then the control power supply.

4.2 ZERO-POINT RETURN OPERATION (FIG. 5)

When START signal changes from "open" to "closed", AUTO/MANU/Z-RET is recognized. At this time, when Z-RET is "closed", zero-point return operation starts in the specified speed and direction. When the zero-point return operation is completed, COIN signal is output ("open" to "closed"). Keep START signal "closed" until the zero-point return operation is completed.

IF START signal is changed to "open" before operation completion, the operation stops temporarily. When it is changed to "closed" again, the zero-point operation continues. Once the zero-point return operation is activated, the former encoder pulse information is cleared. Therefore, do not fail to complete the zero-point return operation after activation. Do not change the zero-point return operating direction. There are two zero-point return operation modes (mode A and B).

Mode A

When limit switch signal Z-RET-LS changes from "open" to "closed" during zero-point return operation, the speed is decelerated to V3. Then, the internal counter is cleared by the first phase Z (PG) pulse after detecting that Z-RET-LS has been "closed".

Then a position which is obtained by adding a value (0 to 511) set by switch (DS1) on the board to the counter value is to be a zero point. At this time, the time during which Z-RET-LS is "closed" must be longer than the time in which Juspoint can decelerate down to V3 (creep speed) (or perform dog adjustment).

For example, set to L >1/2VT, assuming dog length is L, speed V and deceleration time T.

Mode B

Z-RET-LS starts deceleration by changing "open" to "closed" and then changes from "closed" to "open" again. Then using the first phase Z (PG) pulse after the next "open" to "closed", the counter is cleared. The rest of the details are the same as those for mode A.

Operation without Zero-Point Return

When positioning or speed reference operation is performed without zero-point return operation after turning on the power supply (24 VDC), the operation is performed with the position at power supply ON as a zero point.

After the power supply is turned on, COIN signal is not output unless the first motion is completed to stop the operation.

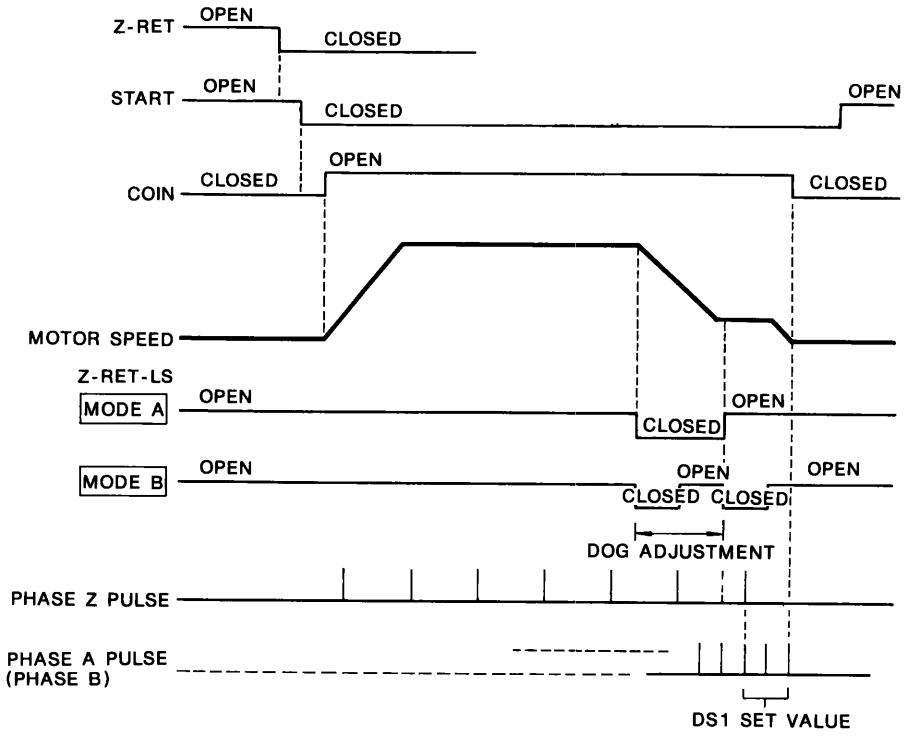


Fig 5 Zero-point Return Operation Time Chart

4.3 POSITIONING OPERATION (FIG. 6)

When START signal changes from "open" to "closed", the operation mode is determined. When "AUTO" is commanded, position reference and normal speed reference at "closed" are taken in and the operation starts toward the specified position.

Position reference (POS · REF), normal speed reference (V1/V2/V3) and direction reference (SIGN) must be held for 10 ms or more after START signal changes from "open" to "closed". Any change must be provided after 10 ms.

When positioning operation is completed, COIN signal is output. (From "open" to "closed".)

If START signal is changed to "open" during positioning, the operation stops temporarily. (COIN signal is not output. Therefore, POS · DATA cannot be output.)

When it is changed to "closed" again, positioning for the remaining amount is performed. At this time, if the remaining positioning must be cancelled, turn RESET signal from "open" to "closed" and to "open" again. A new positioning can be started. In this case, zero-point return operation is not necessary.

There are absolute (ABS) mode and incremental (INC) mode to provide position reference.

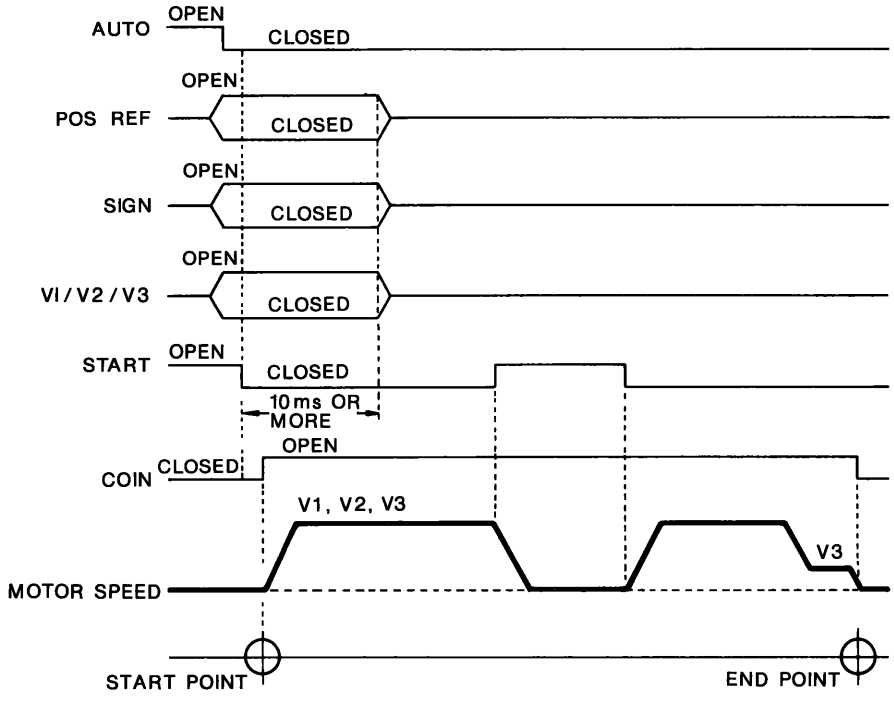
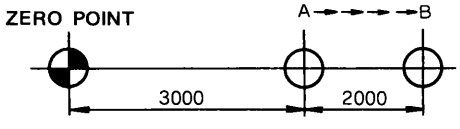


Fig 6 Positioning Operation Time Chart



When proceeding from point A to B

ABS mode : POS · REF = 5000
INC mode : POS · REF = 2000

Fig 7 How to Provide Position Reference (ABS/INC)

Special Operation using Temporary Stop

When ① positioning, ② temporary stop, ③ speed reference and ④ positioning are performed in that order, positioning operation is performed toward the aimed value set by ① positioning. After temporary stop, change RESET from "open" to "closed" and to "open" again to clear the aimed value.

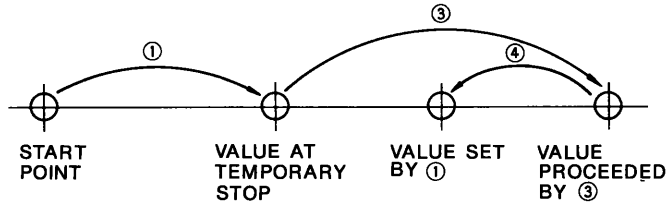


Fig 8 Special Operation using Temporary Stop

4.4 SPEED REFERENCE OPERATION (FIG. 9)

When START signal changes from "open" to "closed", the operation mode is determined. When "MANU" is commanded ("closed"), either of speed reference value 4-digit BCD/V1/V2/V3 is taken in and the operation starts toward the specified direction (SIGN).

The prior order of the speed reference is V1>V2>V3>4-digit BCD (POS · REF 1-1 to 4-8). The operation continues while START signal is "closed" and stops when it is changed to "open" Speed reference value or direction reference can be changed during operation. Since PG (encoder) pulse counting is performed during speed reference operation, positioning operation can be performed successively after stopping. Additionally, using POS · DATA/POS · DIG, current position data after speed reference operation can be informed.

However, if the range of ±999999 pulses (approx. ±2777 rotations) is exceeded during speed reference operation, the internal counter overflows and zero-point return operation is needed. If the counter overflows, 999999 is output by POS · DATA

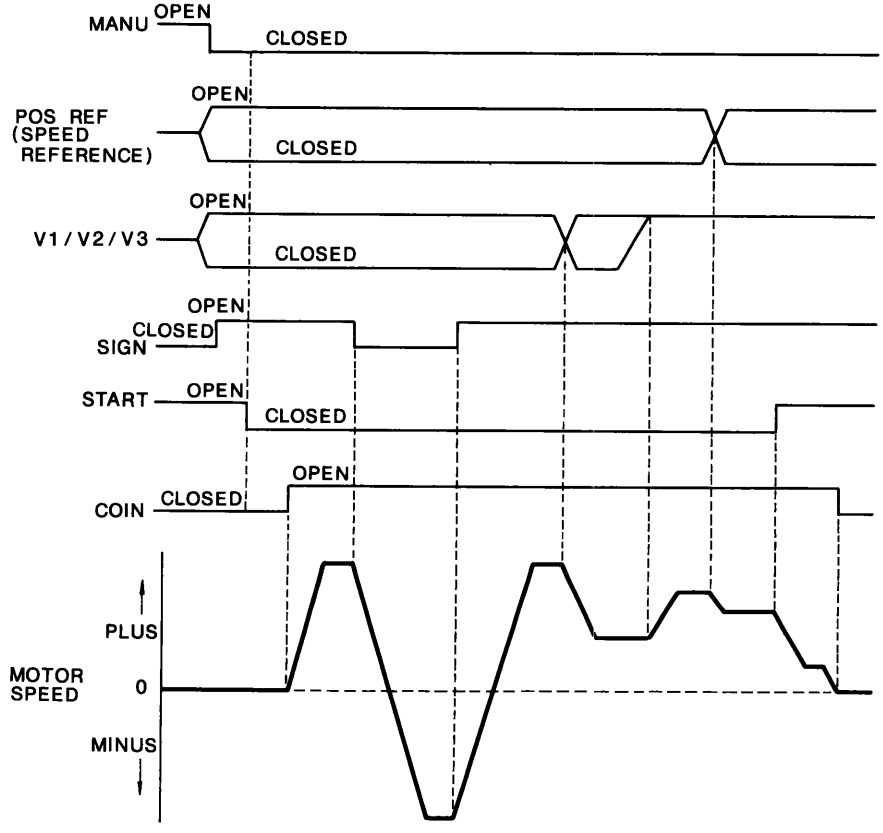


Fig 9 Speed Reference Operation Time Chart

4.5 CURRENT POSITION MONITOR

Using POS · DATA/POS · DIG, current position can be monitored.

- In ABS (absolute) mode, the position from the zero-point is output.
- In INC (incremental) mode, the moving amount from the former "true" position is output.

Input "1 to 7" to POS · DIG in BCD code.

When "1 to 6" is input, data of the digit corresponding to these numbers are output from POS · DATA, and when "7", sign (SIGN) is output from POS · DATA.

"0" indicates plus (open) and "1" minus (closed).

Example : When position moving amount (−123456) is read

[Input to Juspoint (POS•DIG)] → [Output from Juspoint (POS•DATA)]

	BCD Data					BCD Data				
	37	36	35	34		33	32	31	30	DATA
1st digit	0	0	0	1	→	0	1	1	0	6
2nd digit	0	0	1	0	→	0	1	0	1	5
3rd digit	0	0	1	1	→	0	1	0	0	4
4th digit	0	1	0	0	→	0	0	1	1	3
5th digit	0	1	0	1	→	0	0	1	0	2
6th digit	0	1	1	0	→	0	0	0	1	1
SIGN	0	1	1	1	→	0	0	0	1	—

Notes

1 Positioning or speed reference operation cannot be performed with POS · DIG input

2 POS · DATA signal read-in timing is 10 ms after POS · DIG 4-bit is determined and then read POS · DATA

4.6 ALARM CAUSES AND CORRECTIVE ACTIONS

When an alarm occurs, the alarm is displayed by 7-segment LED (refer to Fig.10) on the point module board. If blinks for alarm display.

Table 10 Alarm Causes and Corrective Actions

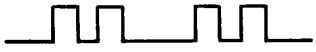
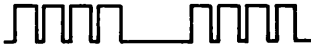
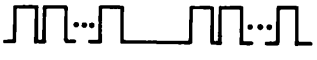
Alarm Display	Cause	Corrective Action (Checking Item)
1	Position reference (6-digit BCD) is not in BCD code	Check that position reference code is not binary A to F
2	Speed reference exceeds 1800 r/min	Check speed reference code (POS · REF)
3	Operation mode is not specified	Input either of AUTO/MANU/Z-RET
4	—	—
5	· ERR/ε set value is too small · Stopping error (accuracy) is larger than ERR/ε value	· Adjust RDS3 · Increase accel/decel time Make V3 speed smaller
6	Stopping error (accuracy) is larger than ±15 pulses	· Increase accel/decel time · Make V3 speed smaller
7	Encoder (PG) alarm	· Check that motor is not locked · Check that encoder cable is connected
8	Emergency stop is performed	After checking the cause, release the alarm by RESET
9*	Inverter (Juspeed-F) overcurrent, overvoltage, undervoltage or fault	Check the following · Load is not excessively large · Accel/decel time is not too long for load GD^2 · Input power supply voltage (200 VAC) is not low · No grounding or shortcircuiting
A	—	—
b	More than one operation mode is selected	Input either of AUTO/MANU/Z-RET

* For details when alarm display (9) blinks, refer to Table 11

[Inverter (Juspeed-F) Alarm Display]

When alarm (9) is displayed, Juspeed-F alarm lamp (milky white) blinks in red. The alarm contents can be known by the number of blinks.

Table 11 Inverter (Juspeed-F) Alarm Display

Alarm Lamp Blinking Status	Possible Reason		Checking Procedures	Corrective Action
n = Number of Blinks	Momentary Overcurrent Protection	Shortcircuiting or grounding at Juspeed-F output side	Remove all terminals at Juspeed-F output side and measure motor resistance	Remove shortcircuiting or grounding
		Accel/decel time is set excessively short	Check accel/decel time	Set accel/decel time longer, and operate the motor
n = 2 Times 		Load is too heavy	• Run the motor with no load • Check the load condition	• Change V/f pattern setting • Reduce the load
		Advance phase capacitor is provided at Juspeed-F output side	—	Remove it
		V/f pattern selection is not correct	Set frequency to 5 Hz and perform operation by V/f pattern selection switch ③ or ⑦ notch	Set proper operation pattern
n = 3 Times 	Regenerative overvoltage protection	Decel time is excessively short	Check decel time	Set decel time longer, and operate the motor
n = 4 Times 	Undervoltage protection	• Power supply voltage is excessively low • Momentary power loss occurs (When more than 15 ms)	Measure power supply voltage and attempt restarting	Remove causes to reduce power supply voltage
n = 5 Times 	• Grounding • Transistor module is damaged		Remove all terminals and perform current conduction check between motor and ground	Remove grounded sections
n = 6 Times 	Microcomputer noise malfunction		Check that there is no noise generating source at inverter I/O sides	Reduce noise generation Provide a noise filter at inverter primary or secondary side

Notes

1 When alarm lamp blinks, change operation switch to STOP After checking the cause, turn off wiring breaker (MCCB) and magnetic contactor (MC)

2 If the cause cannot be obtained, remove the wiring between Juspeed-F and the motor

3 Contact your YASKAWA representative for further information

4.7 RESET AND EMERGENCY STOP

Using RESET input, alarm reset and emergency stop during operation can be performed.

(1) Alarm Reset

When Juspoint detects an alarm, external control cannot be possible for a while.

The alarm contents are displayed by "7-segment LED". (Refer to Par.4.6)

At this time, change RESET signal from "open" to "closed" and then to "open" again to make external control possible. After RESET input signal is "closed" more than 5 ms, change it to "open". The alarm is reset by startup edge which becomes from "closed" to "open". If START signal is "closed" when the alarm is reset, Juspoint will start the operation.

When an alarm occurs and is reset, Juspoint data are all cleared. In this case, perform zero-point return operation.

(2) Emergency Stop

When RESET signal is changed from "open" to "closed" during operation (motor rotation), Juspoint performs emergency stop. This RESET signal must be "closed" more than 5 ms. Stopping time for emergency stop is determined by point module accel/decel time setting. When emergency stop is performed, an alarm status is entered after stopping. For resetting from this status, after changing RESET input signal to "open", perform the same procedures as those described in (1) Alarm Reset. Since data are cleared by emergency stop, zero-point return operation is required. IF START signal is input when RESET signal is changed from "open" to "closed" after emergency stop, Juspoint will start the operation.

(3) Remaining Amount Cancel after Temporary Stop at Positioning Operation

After START signal is switched to "open" during positioning operation and emergency stop is performed, the remaining positioning can be canceled by inputting ("closed") RESET signal. Then a new setting is possible.

4.8 DISPLAY

Juspoint status is displayed by LEDs. The positions of LEDs can be referred by Fig.10.

(1) LED1 (POWER, Red)

Power receiving display lamp. If inverse polarity is supplied, it does not light. In this case, Juspoint controller will be damaged. Attention must be paid to power supply connection.

(2) LED2 (7-segment LED)

Stopping error display and alarm content display.

(a) Stopping error display (continuous lighting)

At positioning completion, stopping position error (stopping accuracy) for position set value is displayed in a value corresponding to PG pulse (±15 pulses).

- Values from 10 to 15 are displayed as A, b, C, d, E and F.
- Sign (+/−) is displayed in LED3.
- When stopping error is displayed, LED2 lights continuously. The display is effective only when COIN signal is output.
- The display changes when the motor shaft rotates by external force during stopping.
- Additionally, an alarm is output when stopping accuracy set width is exceeded.

(b) Alarm display (blinking display)

When an alarm occurs, the contents are displayed. (Refer to Table 11.)
Alarm contents are displayed by blinking.

(3) LED3 (Red)

Stopping error display sign (+/−) is indicated.
Minus "−" is indicated when extinguishing.

(4) LED4 to 9 (Milky white)

I/O status is displayed. Use them for I/O signal monitor.

Table 12 I/O Signal Monitor

LED	Symbol	Description
4	POS	Lights when positioning operation mode (AUTO) is "closed"
5	SPEED	Lights when speed reference operation mode (MANU) is "closed"
6	Z-RET	Lights when zero-point return mode (Z-RET) is "closed"
7	COIN	Lights when positioning complete signal output is "closed "
8	BRAK	Lights when brake signal output is "open"
9	START/STOP	Lights when START signal input is "closed"
10	OPTION	
11	OPTION	

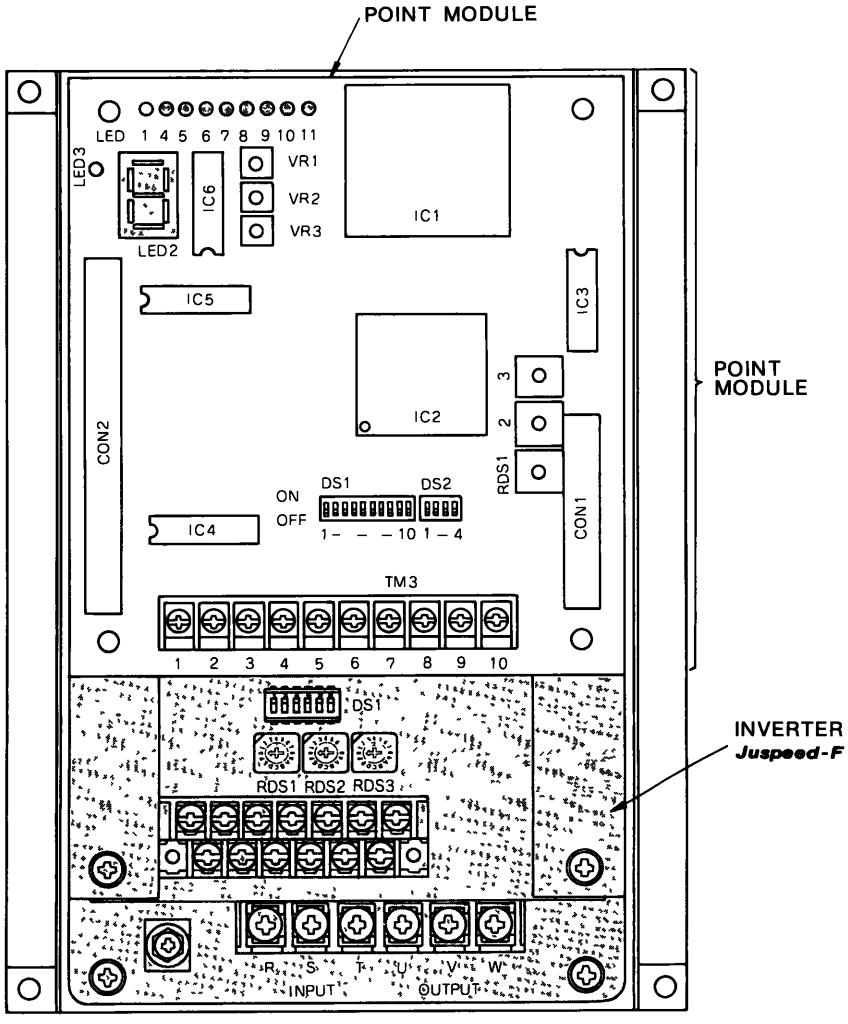
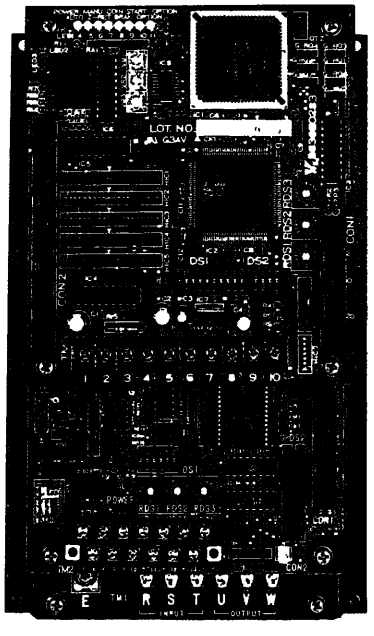


Fig 10 Juspoint Controller Board Configuration



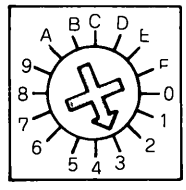
5K0-25

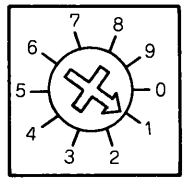
5. ADJUSTMENT

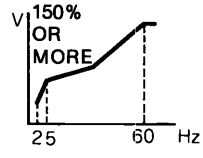
5.1 INVERTER JUSPEED-F SETTING

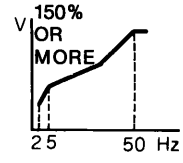
Setting must be performed according to Fig.10 Juspoint Controller Board Configuration.

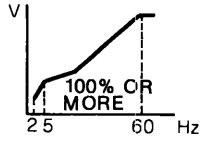
Table 13 Inverter Juspeed-F Setting

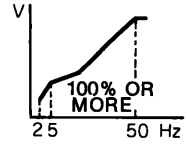
<table>
<tr><th>Symbol</th><th>Name</th><th>Description</th></tr>
<tr><td>RDS1</td><td>Accel Time</td><td>Switch to select a time when motor speed changes from 0 to 1800 r/min (0 to 60 Hz)
16 steps (16 ways) from 0 2 to 5 0 seconds are available for setting
 

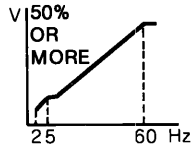
<table>
<tr><th>Notch</th><th>Time (sec)</th></tr>
<tr><td>0</td><td>0 2</td></tr>
<tr><td>1</td><td>0 3</td></tr>
<tr><td>2</td><td>0 4</td></tr>
<tr><td>3</td><td>0 5</td></tr>
<tr><td>4</td><td>0 6</td></tr>
<tr><td>5</td><td>0 7</td></tr>
<tr><td>6</td><td>0 8</td></tr>
<tr><td>7</td><td>0 9</td></tr>
</table>
<table>
<tr><th>Notch</th><th>Time (sec)</th></tr>
<tr><td>8</td><td>1 0</td></tr>
<tr><td>9</td><td>1 2</td></tr>
<tr><td>A</td><td>1 5</td></tr>
<tr><td>B</td><td>1 8</td></tr>
<tr><td>C</td><td>2 0</td></tr>
<tr><td>D</td><td>3 0</td></tr>
<tr><td>E</td><td>4 0</td></tr>
<tr><td>F</td><td>5 0</td></tr>
</table>
Note Set a smaller notch number than point module RDS1 or RDS2 notch number</td></tr>
<tr><td>RDS2</td><td>Decel Time</td><td>Switch to select a time from when motor speed is 1800 r/min until the dynamic brake starts to be applied
16 steps (16 ways) from 0 2 to 5 0 seconds are available for setting Relation between notch and time is the same as that of RDS1
Note Set a smaller notch number than point module RDS1 or RDS2 notch number</td></tr>
<tr><td>RDS3</td><td>V/f Pattern</td><td>Switch to set voltage for output frequency
Normally, use V/f pattern 1
 

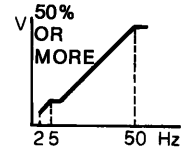
• V/f Pattern 0
 

• V/f Pattern 4
 

• V/f Pattern 1
 

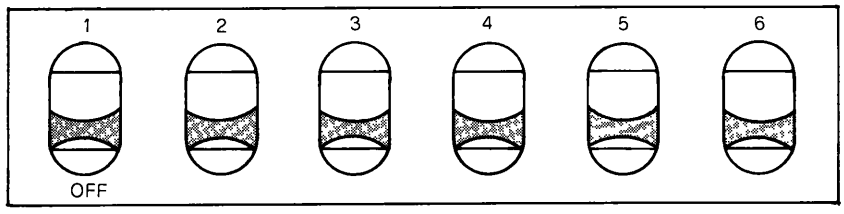
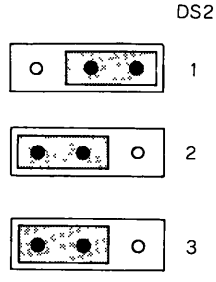
• V/f Pattern 5
 

• V/f Pattern 2
 

• V/f Pattern 6
 

Note V/f patterns 3, 7, 8 and 9 are not used</td></tr>
</table>

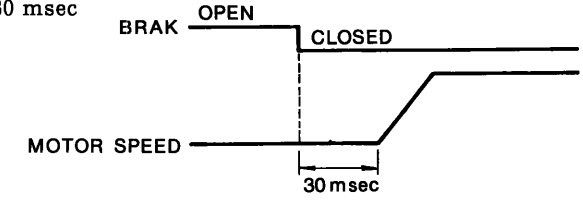
Table 13 Inverter Juspeed-F Setting (Cont'd)

Symbol	Name	Description
DS1	Operation Mode	Check that the switches are set as shown below 
DS2-1	Operation Status Output Selection	Check that the switches are set as shown below 
DS2-2	FWD/RVS Command Selection	
DS2-3	For Future Use	

5.2 POINT MODULE SETTING

Set as follows according to Juspoint controller board configuration in Fig. 10.

Table 14 Point Module Setting

<table>
<tr><th>Symbol</th><th>Name</th><th>Description</th></tr>
<tr><td>RDS1
(For V1)</td><td>1st Accel/Decel Time
(ACC/DEC-1)</td><td rowspan="2">A switch to select linear accel/decel time when operating at normal speed of V1 or V2 16 steps of 0 2 to 5 0 seconds are available for setting This shows the time which varies between 60 and 1800 r/min (2 and 60 Hz) at motor shaft
<table>
<tr><th>Notch</th><th>Time (sec)</th></tr>
<tr><td>0</td><td>0 2</td></tr>
<tr><td>1</td><td>0 3</td></tr>
<tr><td>2</td><td>0 4</td></tr>
<tr><td>3</td><td>0 5</td></tr>
<tr><td>4</td><td>0 6</td></tr>
<tr><td>5</td><td>0 7</td></tr>
<tr><td>6</td><td>0 8</td></tr>
<tr><td>7</td><td>0 9</td></tr>
</table>
<table>
<tr><th>Notch</th><th>Time (sec)</th></tr>
<tr><td>8</td><td>1 0</td></tr>
<tr><td>9</td><td>1 2</td></tr>
<tr><td>A</td><td>1 5</td></tr>
<tr><td>B</td><td>1 8</td></tr>
<tr><td>C</td><td>2 0</td></tr>
<tr><td>D</td><td>3 0</td></tr>
<tr><td>E</td><td>4 0</td></tr>
<tr><td>F</td><td>5 0</td></tr>
</table>
</td></tr>
<tr><td>RDS2
(For V2)</td><td>2nd Accel/Decel Time
(ACC/DEC-2)</td></tr>
<tr><td>RDS3</td><td>Positioning Accuracy Setting Width
(ERR/ε)</td><td>Sets positioning accuracy in values corresponding to the number of PG pulses Values from ±0 to 15 pulses can be set
<table>
<tr><td>Notch</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td>Accuracy</td><td>0</td><td>1</td><td>2</td></tr>
</table>
<table>
<tr><td>C</td><td>D</td><td>E</td><td>F</td></tr>
<tr><td>12</td><td>13</td><td>14</td><td>15</td></tr>
</table>
</td></tr>
<tr><td>DS1</td><td>Zero-point Offset
(Z-OFFSET)</td><td>Difference between phase Z pulse position of encoder (PG) and zero-point position (corresponding to the number of PG pulses) are set
Values from 8 to 511 are set by 9-bit binary switch
Active (1) is set at ON side
Note Turn off the 10th bit</td></tr>
<tr><td>DS2-1</td><td>Zero-point Return Mode</td><td>Either of two zero-point return modes (mode A or B) is selected
ON Mode A
OFF Mode B</td></tr>
<tr><td>DS2-2</td><td>Positioning Set Value Mode</td><td>Selects a type (absolute or incremental value) of positioning set value (6-digit BCD)
ON : ABS (absolute) mode
OFF INC (incremental) mode</td></tr>
<tr><td>DS2-3</td><td>Error Accumulation</td><td>Determines whether PG pulse counter is cleared at every position in INC (incremental value) mode
ON Clears
OFF Not clear
Note No setting can be cleared in ABS mode</td></tr>
<tr><td>DS2-4</td><td>Brake Delay</td><td>Determines whether motor drive (start) is delayed 30 msec from brake signal (BRAK) at operation start
ON Not delayed
OFF Delayed for 30 msec
 
</td></tr>
<tr><td>VR1</td><td>1st Speed V1 (Speed Adjustment)</td><td rowspan="2">Semi-fixed resistor which adjusts the 1st or 2nd speed (V1 or V2) Values of 5 to 60Hz (150 to 1800 r/min) can be set
Turning to the left (CCW) provides a low speed and to the right (CW) a high speed</td></tr>
<tr><td>VR2</td><td>2nd Speed V2 (Speed Adjustment)</td></tr>
<tr><td>VR3</td><td>3rd Speed V3 (Speed Adjustment)</td><td>Semi-fixed resistor which adjusts the 3rd speed (V3) Values of 2 to 10 Hz (60 to 300 r/min) can be set
Since V3 is creep speed, set it as ow as possible when requiring stopping accuracy</td></tr>
</table>

6. I/O CIRCUIT CONFIGURATION

6.1 I/O CIRCUIT CONFIGURATION

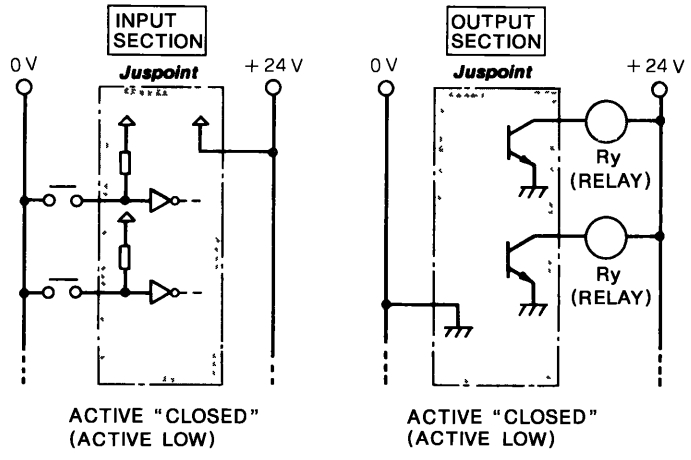


Fig 11 I/O Circuit Diagram

6.2 INPUT CIRCUIT

Input impedance : $R_{in} = 10\ k\Omega$
Threshold level · $V_{in} \leqq 9.6$ V : Low level
$V_{in} \geqq 14$ V : High level
(Power voltage supply Vcc = 24 V)

6.3 OUTPUT CIRCUIT

Open collector method : 35 V, 50 mA max.

When relay coils are used for load, provide a flywheel diode or surge absorber as shown in Fig.12.

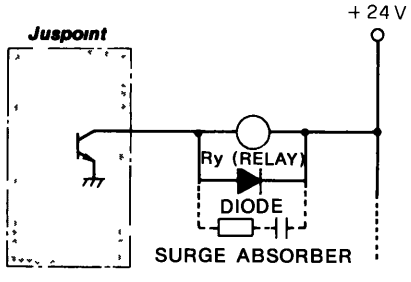


Fig 12 Output Circuit

7. PRECAUTIONS ON APPLICATION

(1) Minus Load

Continuous operation in which the motor is rotated by load and regenerative brake is applied cannot be performed. Juspoint regenerative braking capability is short-term rated specification about motor deceleration time.

(Example) • Motor drives for delivery

• Motor drives for lifting object (without counter weight)

(2) Load Inertia (Load GD^2)

Motor shaft conversion allowable load GD^2 must be within two times as large as applicable Juspoint motor GD^2. In applications in which this value is exceeded, overvoltage alarm may occur at deceleration.

In this case, take the following preventive actions·

- Lower the current limit.
- Increase accel/decel time.
- Lower the maximum speed to be used.

(3) High Voltage

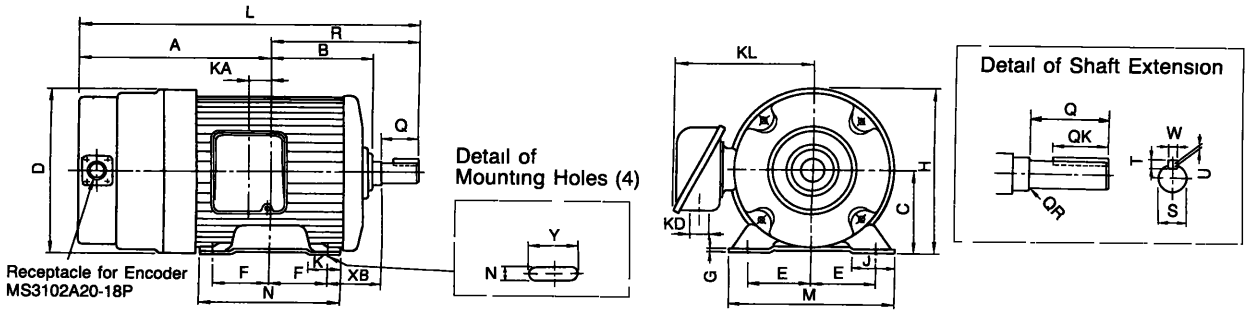
When power supply voltage is 400 V class (400 V, 440 V, etc.), a power supply transformer is required to convert 3-phase 400/440 V to 3-phase 200/220 V.

(4) Machine or Control System Protection

When there is a limitation for machine traveling range, provide a limit switch to the machine system and build sequence to stop Juspoint (emergency stop, etc.) by the limit switch operation, in order to protect the machine or control system.

8. DIMENSIONS in mm (inches)

8.1 FOOT-MOUNTED MOTORS

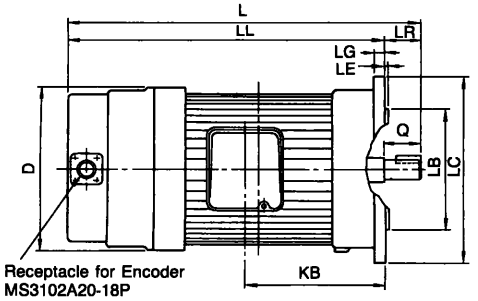


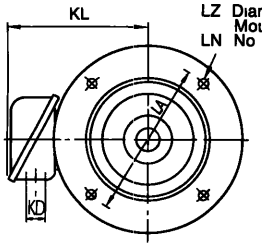
Output	A	B	$C_{-0.5}^{0}$	D	E	F	G	H	J	K	L	M	N	R	KA	KD	KL	XB	Y	Z
0 4 kW (3/4 HP)	176 (6 93)	79 (3 11)	71 (2 80)	134 (5 28)	56 (2 20)	45 (1 77)	3 2 (0 13)	138 (5 43)	40 (1 57)	32 (1 26)	296 (11 65)	150 (5 91)	115 (4 53)	120 (4 72)	36 (1 42)	27 (1 06)	132 (5 20)	45 (1 77)	20 (0 79)	7 (0 26)
0 75 kW (1 HP)	189 5 (7 46)	90 (3 54)	80 (3 15)	151 (5 94)	52 5 (2 07)	50 (1 97)	5 (0 20)	156 (6 14)	48 (1 89)	35 (1 38)	329 5 (12 97)	165 (6 50)	130 (5 12)	140 (5 51)	40 (1 57)	27 (1 06)	138 (5 43)	50 (1 97)	25 (0 98)	10 (0 39)
1 5 kW (2 HP)	209 (8 23)	111 (4 37)	90 (3 54)	176 (6 93)	70 (2 76)	62 5 (2 46)	5 (0 20)	178 (7 01)	45 (1 77)	35 (1 38)	377 5 (14 86)	180 (7 09)	155 (6 10)	168 5 (6 63)	48 (1 89)	27 (1 06)	148 (5 83)	56 (2 20)	25 (0 98)	10 (0 39)
2 2 kW (3 HP)	206 (8 11)	125 (4 92)	100 (3 94)	194 (7 64)	80 (3 15)	70 (2 76)	7 (0 28)	197 (7 76)	40 (1 57)	42 (1 65)	399 (15 71)	215 (8 46)	170 (6 69)	193 (7 60)	58 (2 28)	27 (1 06)	158 (6 22)	63 (2 48)	16 (0 63)	12 (0 47)
3 7 kW (5 HP)	232 (9 13)	132 (5 20)	112 (4 41)	220 (8 66)	95 (3 74)	70 (2 76)	7 (0 28)	258 (10 16)	40 (1 57)	42 (1 65)	432 (17 01)	240 (9 45)	170 (6 69)	200 (7 87)	63 (2 48)	27 (1 06)	170 (6 69)	70 (2 76)	16 (0 63)	12 (0 47)

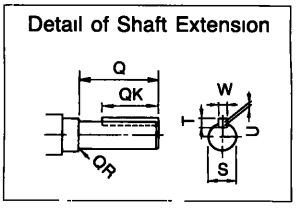
Output	Shaft Extension							Bearing No		Approx Weight kg (lb)
	Q	QK	QR	S	T	U	W	Drive End	Opp Drive End	
0 4 kW (3/4 HP)	30 (1 18)	20 (0 79)	0 5 (0 02)	14^{j6} (0 55)	5 (0 20)	3 (0 12)	5 (0 20)	6202ZZ	6202ZZ	8 (18)
0 75 kW (1 HP)	40 (1 57)	25 (0 98)	0 5 (0 02)	19^{j6} (0 75)	6 (0 24)	3 5 (0 14)	6 (0 24)	6204ZZ	6203ZZ	12 (27)
1 5 kW (2 HP)	50 (1 97)	35 (1 38)	0 5 (0 02)	24^{j6} (0 94)	7 (0 28)	4 (0 16)	8 (0 31)	6205ZZ	6205ZZ	25 (55)
2 2 kW (3 HP)	60 (2 36)	45 (1 77)	1 (0 04)	28^{j6} (1 10)	7 (0 28)	4 (0 16)	8 (0 31)	6206ZZ	6205ZZ	30 (66)
3 7 kW (5 HP)	60 (2 36)	45 (1 77)	1 (0 04)	28^{j6} (1 10)	7 (0 28)	4 (0 16)	8 (0 31)	6306ZZ	6206ZZ	45 (100)

Note Dimensions of the shaft extension key and key-way are based on JIS (Japanese Industrial standard) B 1301 "Sunk keys and Their Corresponding Key-ways (Normal keys) " Shaft extension key is furnished

8.2 FLANGE-MOUNTED MOTORS





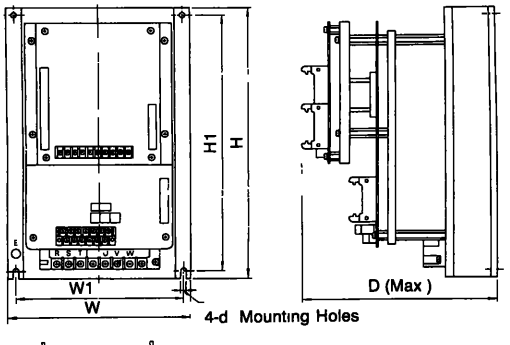


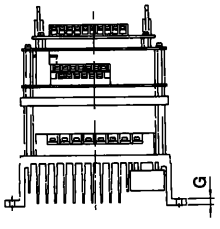
Output	L	LA	LB	LC	LE	LG	LL	LN	LZ	LR	D	KB	KD	KL
0 4 kW (3/4 HP)	323 (12 72)	130 (5 12)	110^{j6} (4 33)	160 (6 30)	3 5 (0 14)	10 (0 39)	293 (11 54)	4 (0 16)	10 (0 39)	30 (1 18)	130 (5 12)	152 5 (6 00)	27 (1 06)	125 (4 92)
0 75 kW (1 HP)	354 5 (13 96)	165 (6 50)	130^{j6} (5 12)	200 (7 87)	3 5 (0 14)	12 (0 47)	314 5 (12 38)	4 (0 16)	12 (0 47)	40 (1 57)	151 (5 94)	165 (6 50)	27 (1 06)	131 (5 16)
1 5 kW (2 HP)	399 (15 71)	165 (6 50)	130^{j6} (5 12)	200 (7 87)	3 5 (0 14)	12 (0 47)	349 (13 74)	4 (0 16)	12 (0 47)	50 (1 97)	176 (6 93)	186 5 (7 34)	27 (1 06)	148 (5 83)
2 2 kW (3 HP)	409 (16 10)	215 (8 46)	180^{j6} (7 09)	250 (9 84)	4 (0 16)	16 (0 63)	349 (13 74)	4 (0 16)	15 (0 59)	60 (2 36)	194 (7 64)	201 (7 91)	27 (1 06)	158 (6 62)
3 7 kW (5 HP)	462 (18 19)	215 (8 46)	180^{j6} (7 09)	250 (9 84)	4 (0 16)	16 (0 63)	402 (15 83)	4 (0 16)	15 (0 59)	60 (2 36)	220 (8 66)	233 (9 17)	27 (1 06)	170 (6 69)

Output	Shaft Extension							Bearing No		Approx Weight kg (lb)
	Q	QK	QR	S	T	U	W	Drive End	Opp Drive End	
0 4 kW (3/4 HP)	30 (1 18)	20 (0 79)	1 2 (0 05)	14^{j6} (0 55)	5 (0 20)	3 (0 12)	5 (0 20)	6203ZZ	6202ZZ	10 (22)
0 75 kW (1 HP)	40 (1 57)	25 (0 98)	0 5 (0 02)	19^{j6} (0 75)	6 (0 24)	3 5 (0 14)	6 (0 24)	6204ZZ	6203ZZ	14 (31)
1 5 kW (2 HP)	50 (1 97)	35 (1 38)	0 5 (0 02)	24^{j6} (0 94)	7 (0 28)	4 (0 16)	8 (0 31)	6205ZZ	6205ZZ	27 (60)
2 2 kW (3 HP)	60 (2 36)	45 (1 77)	1 (0 04)	28^{j6} (1 10)	7 (0 28)	4 (0 16)	8 (0 31)	6206ZZ	6205ZZ	33 (75)
3 7 kW (5 HP)	60 (2 36)	45 (1 77)	1 (0 04)	28^{j6} (1 10)	7 (0 28)	4 (0 16)	8 (0 31)	6306ZZ	6206ZZ	50 (111)

Note Dimensions of the shaft extension key and key-way are based on JIS (Japanese Industrial standard) B 1301 "Sunk keys and Their Corresponding Key-ways (Normal keys) " Shaft extension key is furnished

8.3 CONTROLLERS





(The drawing shows type CIMR-37JP2-1)

Types	External Dimensions			Mounting Dimensions				Approx Weight kg (lb)
	W	H	D	W1	H1	G	d	
CIMR-04JP2-1	210 (8 27)	250 (9 84)	125 (4 92)	200 (7 87)	220 (8 66)	1 6 (0 06)	4 5 (0 18)	2 8 (6 2)
CMIR-08JP2-1	150 (5 91)	220 (8 66)	160 (6 30)	140 (5 51)	210 (8 27)	3 (0 12)	4 5 (0 18)	2 9 (6 4)
CMIR-15JP2-1	150 (5 91)	240 (9 45)	175 (6 89)	140 (5 51)	230 (9 06)	3 (0 12)	4 8 (0 19)	3 1 (6 9)
CMIR-22JP2-1	180 (7 09)	270 (10 63)	195 (7 68)	165 (6 50)	255 (10 04)	6 5 (0 26)	5 5 (0 22)	5 7 (12 6)
CMIR-37JP2-1	180 (7 09)	270 (10 63)	195 (7 68)	165 (6 50)	255 (10 04)	6 5 (0 26)	5 5 (0 22)	6 1 (13 5)

Juspoint

INVERTER POSITIONING SYSTEM WITH OPTIMUM COST/PERFORMANCE RATIO

Distributer

YASKAWA ELECTRIC CORPORATION

YASKAWA

TOKYO OFFICE Ohtemachi Bldg 1 6 1 Ohtemachi Chiyoda ku Tokyo 100 Japan
Phone (03) 3284-9111 Telex YASKAWA J33530 Fax (03) 3284-9034
SEOUL OFFICE Seoul Center Bldg 91 1 So Kong-Dong Chung ku Seoul Korea
Phone (02) 776 7844 Fax (02) 753 2639
TAIPEI OFFICE Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road Taipei Taiwan
Phone (02) 563 0010 7732 Fax (02) 567 4677
YASKAWA ELECTRIC AMERICA INC SUBSIDIARY
Chicago-Corporate Headquarters 2942 MacArthur Blvd Northbrook Illinois 60062-2028 U S A
Phone (708) 291 2340 Fax (708) 498 2430
Chicago-Technical Center 3160 MacArthur Blvd Northbrook Illinois 60062 1917 U S A
Phone (708) 291 0411 Fax (708) 291 1028
Los Angeles Office 5626 Corporate Avenue Cypress California 90630 U S A
Phone (714) 828 9692 Telex (230) 678396 YASKAWAUS TSTN Fax (714) 828-1165
New Jersey Office Riverdale One 44 Route 23 North Suite 5 Riverdale NJ 07457 1619
Phone (201) 835 9512 Fax (201) 835-9511
YASKAWA ELECTRIC EUROPE GmbH SUBSIDIARY
Niederhochstadter Straße 71 73 W 6242 Kronberg Oberhochstadt Germany
Phone (06173) 938 0 Telex 415660 YASE D Fax (06173) 68421
YASKAWA ELÉTRICO DO BRASIL COMÉRCIO LTDA SUBSIDIARY
Rua Conde Do Pinhal 8-5 Andar Sala 51 CEP 01501 Sao Paulo SP Brasil
Phone (011) 35 1911 Fax (011) 37 7375
YASKAWA ELECTRIC (SINGAPORE) PTE LTD
CPF Bldg 79 Robinson Road No 13-05 Singapore 0106
Phone 2217530 Telex (87) 24890 YASKAWA RS Fax (65) 224-5854

Manufacturer & Distributer

Y-E DRIVE CORPORATION
31 YOSHIKITA IIZUKA CITY
FUKUOKA PREF 820 JAPAN
PHONE (0948) 24-7601 FAX (0948) 24-7942

DRIVE

TOKYO SALES DIVISION C/O YASKAWA ELECTRIC CORPORATION Tokyo Office
Ohtemachi Bldg 1 6 1 Ohtemachi Chiyoda ku Tokyo 100 Japan
Phone (03) 3284 9077 Fax (03) 3284 9383

OHSAKA SALES DIVISION C/O YASKAWA ELECTRIC CORPORATION Ohsaka Office
Osaka Daiichi Seimei Bldg 1 8-17 Umeda Kita ku Osaka 530 Japan
Phone (06) 346 4560 Fax (06) 346 4565

NAGOYA SALES DIVISION C/O YASKAWA ELECTRIC CORPORATION Nagoya Office
Horiuchi Bldg 3 25 9 Meieki, Nakamura ku, Nagoya 450 Japan
Phone (052) 581 2346 Fax (052) 581 2359

KYUSHU SALES DIVISION C/O YASKAWA ELECTRIC CORPORATION Kyushu Office
Chiyoda Seimei Fukuoka Bldg 1 9 17 tenjin Fukuoka 810 Japan
Phone (092) 714 5075 Fax (092) 714 5799

DTSE-S606-9B

D92S60-2