

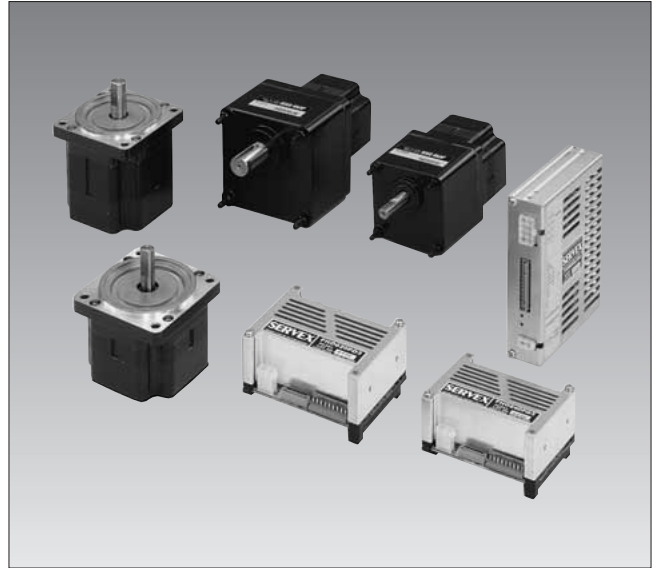
BRUSHLESS DC MOTOR & SPEED CONTROL DRIVERS

FHD Series

DC24V (20, 40W) DC48V (60W)

■Distinguishing Features

1. Motors are designed small and high performance
 - A special magnetic circuit design was employed newly. By this design, these motors are in small, and high performance than conventional FED, FYD series motors.
 - Flange size of this series is 61mm sq. (2.4 in sq.). However flange size of 40W & 60W types are 80mm sq. (3.1 in sq.)
2. Compact design Driver
 - "Palm Mini PLUS" Type is the smallest. (20W, 40W only)
 - "J - Book" Type is (60W only)
3. Wide Ranged Speed Control (60W only)
 - Wide range (65r/min ~ 2500r/min thinner type), stepless speed control.
 - Very steady characteristics (Feed back control employed).
4. Speed pulse output
 - Speed pulse output can be used for speed monitoring, simplified position control...
 - "Palm Mini PLUS" Type : 42ppr
 - "J - Book" Type : 42ppr
5. Direction of rotation signal output
 - Direction of rotation can be monitored by this signal.
6. Alarming
 - At an over-load condition, the motor stops and an alarm signal is output.



■Model Code

Model on set FHD 6 P 20 S - D3

①
②
③
④
⑤
⑥

- ① Series name
- ② Motor flange dimensions
6 : 61×61mm (2.4×2.4 in.)
- ③ Driver type
P : Palm mini PLUS type
J : J - Book type
- ④ Motor output
20 : 20W
40 : 40W
60 : 60W

- ⑤ Motor output shaft type
S : plain shaft
PF : Pinion shaft
PE : Pinion shaft
- ⑥ Power supply voltage
D3 : DC24V
D5 : DC48V

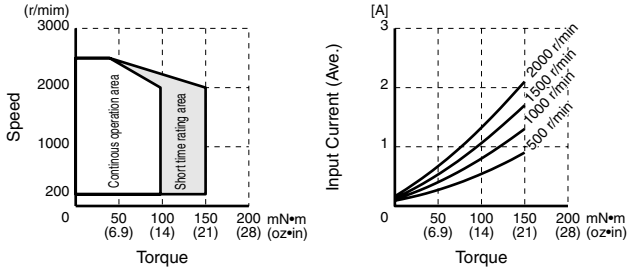
■Specification

Model on set	plain shaft type	FHD6P20S-D3	FHD6P40S-D3	FHD6J60S-D5				
	Pinion shaft type	FHD6P20PF-D3	FHD6P40PE-D3	FHD6J60PE-D5				
Rated voltage	V(DC)	24	24	48				
Rated output	W	20	40	60				
Speed control range	r/min	200~2500	200~2500	65~2500				
Rated torque	mN • m	98	200	290				
	oz • in	14	28	42				
MAX. instantaneous torque (in 5sec.)	mN • m	150(2000r/min MAX.)	290(500r/min MAX.)	440(1500r/min MAX.)				
	oz • in	21(2000r/min MAX.)	42(500r/min MAX.)	62(1500r/min MAX.)				
Rated speed	r/min	2000	2000	2000				
Speed setting method		①Speed setting by external speed setter(Sold separately : model code Q-R10KB) ②Speed setting by external voltage supply 0~10V						
Speed setting	(r/min)/V	300±5%						
Speed variation	Against load	±1%	0~rated torque at rated voltage and speed					
	Against voltage	±1%	Rated voltage ±10% at rated speed, no load					
	Against temperature	±3%	20±20°C at rated voltage and speed, no load					
Input and output signal	Input	RUN, BRAKE, F/R IN, ALARM RST(Only 60W) H : Open collector L : GND(0~0.8V)						
	Output	ALARM, SPEED OUT(PULSE OUTPUT), F/R OUT H : Open collector DC30V MAX. L : 0~0.8V 10mA MAX.						
Speed pulse	Pulse/Rotation	42	42	42				
Current	Rated (Ave.)	A	1.8 MAX.	3.1 MAX.	2.3 MAX.			
	MAX. (Peak)		9 MAX.	10 MAX.	10 MAX.			
Protection		Over load protection When an exceeding torque than rated is applied to motor for more than about 5 sec.,Steps moter and outputs "L" from "ALARM" (20W, 40W) or "ALARM OUT" (60W). To release alarm : Palm Mini PLUSE type : Disconnect power supply for more than 1min J-Book type : Input "L" to "ALARM RST" for more than 1sec. Do not measure/ judge by this operation whether the motor is overloaded or not.						
Others		Operation temperature: 0~40°C(no condensation) continuous duty. The motor flange surface temp. must be 80°C MAX. (Ambient temperature 40°C without heat sink) Motor dielectric strength: Withstand for 1min. under AC500V 50Hz (Between case and coil) Motor insulation resistance: 10MΩMIN. (20W, 40W) 100MΩMIN. (60W) (Between case and coil by DC500V tester)						
Gear ratio	Speed(r/min)		Applicable MAX. Torque for gearheads					
	at 200r/min	at 2500r/min	6H□EBN		8F□EBN			
			mN • m	oz • in	mN • m	oz • in	mN • m	oz • in
5	40	500	390	56	780	110	1200	170
10	20	250	780	110	1600	220	2400	330
25(25.44)	8	100	1800	250	3600	510	5500	780
50(49.6)	4	50	3500	500	7100	1000	10600	1500

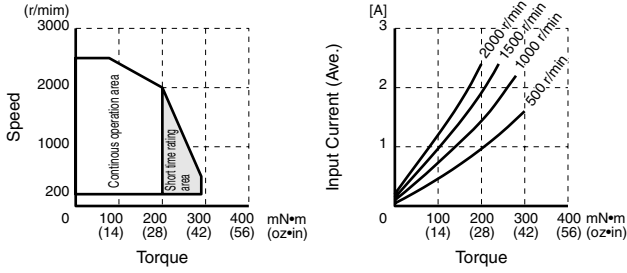
- □: rotation of gear head output shaft becomes reverse direction of motor's.
- In case of 8F□EBN value in () should be used as gear ratio.

Torque Speed/Current (TYP.) Characteristics

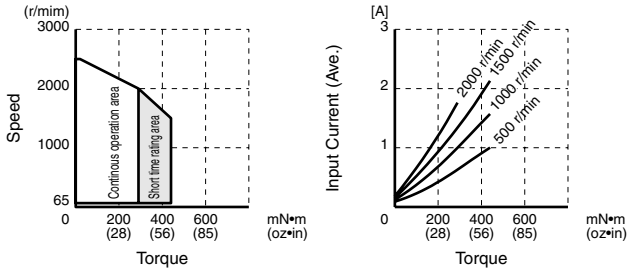
FHD6P20S(PF)-D3



FHD6P40S(PE)-D3

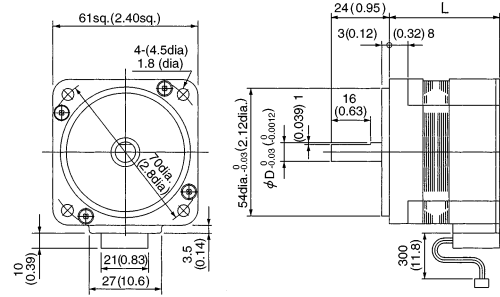


FHD6J60S(PE)-D5



Motor outlines (plain shaft type)

Unit : mm (inch)



	Model	L	D:dia	Weight	
				Kg	(lb)
①	FHD6P20S-D3	(46)18.1	(8)0.3150	0.5	1.1
②	FHD6P40S-D3	(60)2.36	(8)0.3150	0.7	1.5
③	FHD6J60S-D5	(60)2.36	(10)0.3937	0.7	1.5

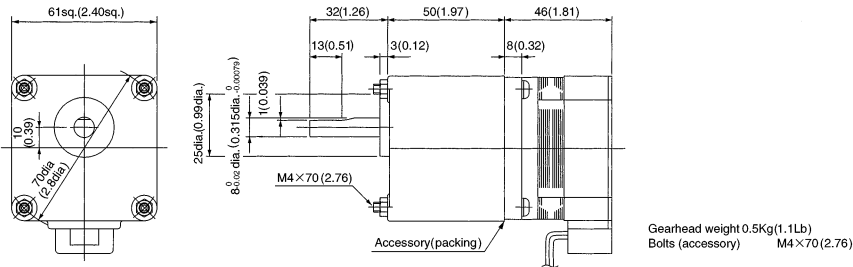
Connection guide

	Symbol	20 / 40W		60W		Remark
		① PIN #	② Lead wire color	③ PIN #	④ Lead wire color	
Motor connector	Coil U	1	Brown	3	Brown	
	Coil V	2	Red	4	Red	
	Coil W	3	Orange	8	Orange	
	-	4	-	-	-	
	HW	5	Green	7	Green	Open collector
	HV	6	Blue	6	Blue	Open collector
	HU	7	Purple	5	Purple	Open collector
	GND	8	Gray	1	Gray	
	12V	9	White	2	White	

Motor (Pinion shaft type) + Gear head outlines

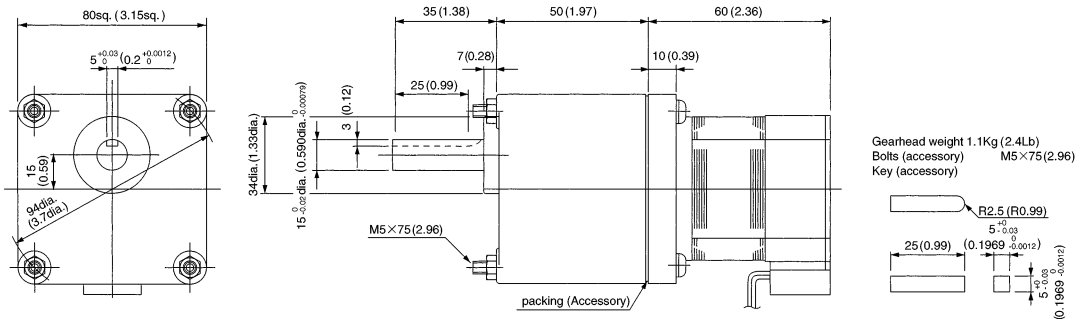
FHD6P20PF+D3+6H EBN

Unit : mm (inch)



FHD6P40PE+D3+8F EBN

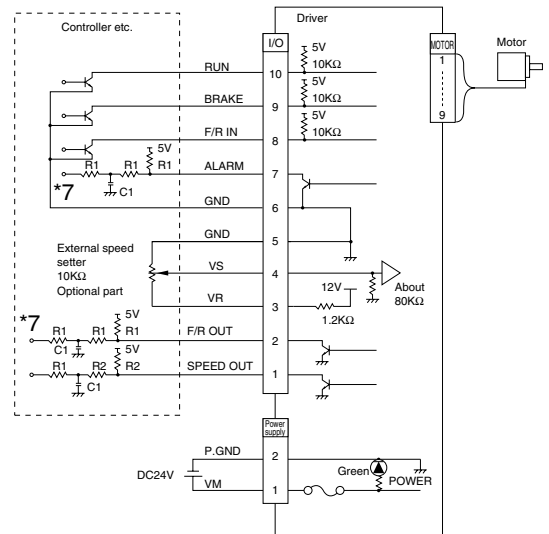
FHD6J60PE+D5+8F EBN



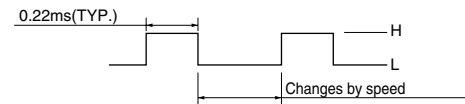
Input & output terminals and wiring diagram

FHD6P20S(PF)-D3 FHD6P40S(PE)-D3

Item	Pin No.	Symbol	Input or Output	Function	Standard • Condition
Power supply	1	VM	Input	Power supply positive for driver	DV24V±10%
	2	P.GND	—	Power supply GND for driver	
I/O	1	SPEED OUT	Output	42 Pulse/Revolution *3	*1 H : Open collector DC30V MAX. L : 0~0.8V 10mA MAX.
	2	F/R OUT	Output	H : CCW L : CW (Viewed from motor output shaft side)	
	3	VR	Output	Power supply positive for external speed setter	0~10V
	4	VS	Input	Speed setting signal positive	
	5	GND	—	Speed setting signal GND	
	6	GND	—	GND for I/O Signal	Same as *1
	7	ALARM	Output	H : Normal operation L : Protective function operates	
	8	F/R IN	Input	H : CCW L : CW (Viewed from motor output shaft side)	*2 H : Open L : 0~0.8V
	9	BRAKE	Input	H : Brake releases L : Brake operates	H : Open collector L : 0~0.8V During the operation of "BRAKE", "RUN" signal should be "L".
	10	RUN	Input	H : Motor stops L : Motor rotates	Same as *2

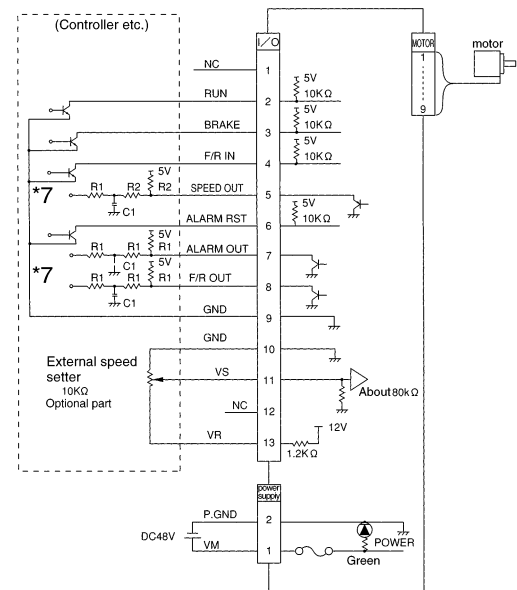


*3 "SPEED OUT" signal is shown below.



FHD6J60S(PE)-D5

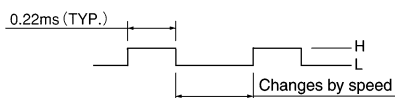
Item	Pin No.	Symbol	Input or Output	Function	Standard • Condition
Power supply	1	VM	Input	Power supply positive for driver	DC48V±10%
	2	P.GND	—	Power supply GND for driver	
I/O	1	NC	—		*4 H : Open L : 0~0.8V
	2	RUN	Input	H : Motor stops L : Motor rotates	
	3	BRAKE	Input	H : Brake releases L : Brake operates	
	4	F/R IN	Input	H : CCW L : CW (Viewed from motor output shaft side)	Same as *5
	5	SPEED OUT	Output	42 [Pulse/Revolution] *6	
	6	ALARM RST	Input	H : In operation L : Alarm to be reset by 1 sec1. MIN. input.	Same as *4
	7	ALARM OUT	Output	H : Normal Operation L : Protective Function Operates	
	8	F/R OUT	Output	H : CCW L : CW (Viewed from motor output shaft side)	*5 H : Open collector DC30V MAX. L : 0~0.8V, 10mA MAX.
	9	GND	—	GND for I/O Signal	
	10	GND	—	Speed Setting Signal GND	0~10V
	11	VS	Input	Speed Setting Signal Positive	
	12	NC	—		
	13	VR	Output	Power Supply Positive for External Speed Setter	



*8

Part name	Recommended value
R1	4.7KΩ
R2	1KΩ
C1	0.01μF

*6 "SPEED OUT" signal is shown below.



note

- When input signal is H, input signals (RUN, BRAKE, F/R IN, and ALARM RST (60W Only)) should be input by open collector.
If 5V is input, it will become the cause of wrong operation.
- Noise of output signals (ALARM (20W, 40W) ALARM OUT (60W)), F/R OUT, SPEED OUT) should be removed by a filter as shown in figure above. (*7)
Setting of filter constant should be done by confirming the noise level referring to the recommended constant. (*8)
Be note that signal delays if the values of resistance and/or capacitor are big though it becomes better to kill noise.
Especially for speed out, setting should be done with attention to filter constant because pulse width is narrow.

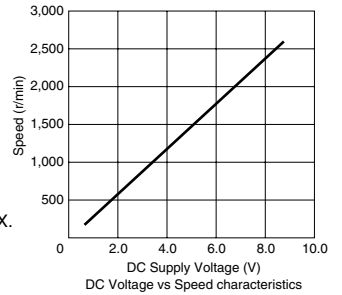
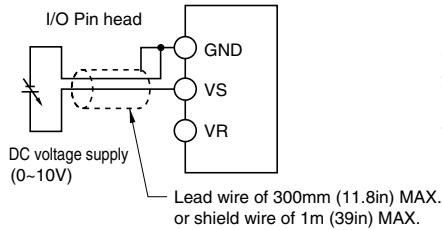
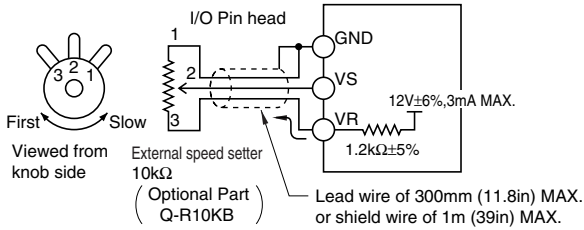
Input and Output Functions

Item	Symbol	Input or Output	Function	Pin. No.	
				20/40W	60W
Motor	GND	—	Power Supply GND for Hall Sensor	8	1
	VH(12V)	Output	Power Supply Positive for Hall Sensor	9	2
	MU	Output	Coil U-Phase Output	1	3
	MV	Output	Coil V-Phase Output	2	4
	HU	Input	Hall Signal	7	5
	HV	Input		6	6
	HW	Input		5	7
	MW	Output	Coil W-Phase Output	3	8

Speed setting

Fig.1 Speed setting by external speed setter

Fig.2 Speed setting by external voltage supply



Should be used within specified speed control range, although the speed could be set at out of the speed range.

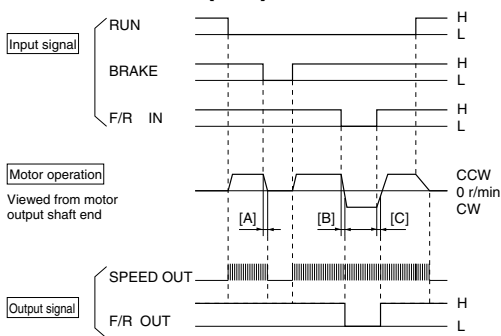
I/O Pin head Pin No.

	FHD6P20S(PF)-D3 FHD6P40S(PE)-D3	FHD6J60S(PE)-D5
GND	5	10
VS	4	11
VR	3	13

Item	Setting Method
Speed setting by external speed setter (Optional Part)	Connect as shown in Fig.1 and set by external speed setter. Use variable resistor 10[KΩ] as an external speed setter.
Speed setting by external voltage supply	Connect as shown in Fig.2 and set speed by external voltage supply.

Control sequence

FHD6P20S(PF)-D3 FHD6P40S(PE)-D3



[Notes for BRAKE Operation & Rotation change]

- (1) During the brake is operating (period [A] left), to change direction of rotation, switch signal of "F/R IN", only after the brake signal was changed to non-operational condition ("L"→"H").
- (2) During the direction of rotation changing (period [B] & [C] left), you need the brake to operate, let it operate only when the both direction of rotation setting signal ("F/R IN") and direction monitor signal ("F/R OUT") is the same,
- (3) When actual motor speed is higher than the setting (by signal input value of (VS)), any of signal switching on "F/R IN" and BRAKE ("H"→"L") must not be made.
- (4) During the brake is operating, set the "RUN" signal at "L" all the time.

WARNING:

Notes above must be following without fail, and reminded all the time. But if not follow to (1), (2) & (4), it may cause abnormal/damaging motor operation, and not follow to (3), it may cause FIRE or system damage.

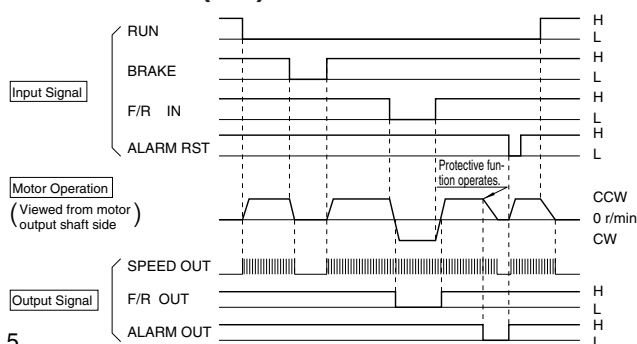
Electrical shock : By the load condition, the terminal voltage (VM) is raised up to 30 VDC, during switching BRAKE and/or Rotation direction.

(Braking Operation : At higher speed : reverse rotation brake first, then short circuit brake. But at slower speed : short circuit brake only.)

[Notes on "F/R OUT"] (20,40W only)

During the motor is in stop, the "F/R OUT" is held at the same signal as previously outputting. This means ; if the motor stopped once, but the rotation reversed by Cogging torque or by the Load, then the "F/R OUT" is held at reversed signal. Also note that "F/R OUT" signal will delay by 0-5pulses of "SPEED OUT" from the motor rotation switched.

FHD6J60S(PE)-D5



[Notes for "F/R OUT"] (60W only)

In case that motor is not running, "F/R OUT" holds the signal which has been output until motor stops. But according to the condition of use, there may be a case that motor runs reversely by cogging torque, load etc. After it stops. Be careful that in such case "F/R OUT" reverses and holds that condition.

[Notes for "ALARM RST"] (60W only)

Operation should be done by "H". If operated by "L", overload protective function will not work.

