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Ver. 1.1

## BLDC STANDARD DRIVER MANUAL

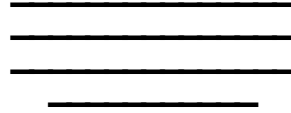
# BLDC MOTOR DRIVER MANUAL

 SERVO INDUSTRIAL SYSTEMS CO., LTD.



# BLDC STANDARD DRIVER MANUAL

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# BLDC STANDARD DRIVER MANUAL

## 1. Caution before installation

### Before using, only moment ...

「 Purchases BLDC MOTOR/DRIVER and from the unit only thank. 」

Reads the next attention fact and time signal safely,use.

- Does not input the mains voltage of above permission in the power input terminal.
- Is in the process of power-up or after lockout electrical disconnect period of short time the high voltage does not touch flows.
- Positively do the noise control and the ground connection control.  
When the noise occurs in the signal wire, the vibrating or operational defectiveness happens.
- BLDC MOTOR/DRIVER the union make a same rated power and use.
- To OP panel work at time of after intercepting work the mains voltage.
- ※ Inquire in the case purchase commercial agent and the head office where the problem point will occur.

### ♣ Caution before installation

- Shock or to the place where the serious vibration occurs does not establish.
- Please do not install it at the place of water, corrosive gas, inflammable gas and materials.
- For an electric shock prevention and surely to put out all the member establish.
- The specialist the person other than the manager does not establish.



NOTICE

### ♣ Caution before using

- In order for the possibility the breakdown or the person being injured to be the person other than the manager not to fabricate.
- Repair or the case which will disjoint put certainly out all the member.
- Does not touch by the hand which gets wet.  
There is a possibility the electric shock happening.



DANGER

※ Please do not alter the products.



## BLDC STANDARD DRIVER MANUAL

### 2. Synopsis and feature

#### 2.1. Synopsis

BLDC DRIVER the low of the drive is affixed BLDC MOTOR in the machinery and tools and the electric and mechanical noise effectiveness of decrease and energy is good very. Also, the calorific power and sound arresting few do not have the necessity which will manage the brush even at old movable time, the life to be long is stable and DRIVER where has a high effectiveness is.

#### 2.2. Feature

- 1) Speed control and electric current restrictive function
- 2) External/internal combination speed control function
- 3) The operation function in compliance with OP100
- 4) Change of direction function
- 5) The parameter configuration feature in compliance with OP500

#### 2.3. Application

- |                                  |  |
|----------------------------------|--|
| 1) Research and industrial robot | 2) Semiconductor production equipment                                |
| 3) Automatic welding machine     | 4) Paver   |
| 5) Insulation machine            | 6) Transfer machine  |
| 7) Measurement machine           | 8) Health organization(Running machine,<br>Tremblingly machine etc.) |



## BLDC STANDARD DRIVER MANUAL

### 3. Specifications of BLDC MOTOR and DRIVER

#### 3.1. Specifications of BLDC MOTOR

Model		TM90 - A0423	TM90 - A0433	TM10 - A0423	TM10 - A0433	TM10 - A0753	TM10 - A0723	TM10 - A0733
Rated power	W	400				750		
Rated torque	N-m	1.91	1.3	1.91	1.27	1.43	3.58	2.39
	kg-cm	1.94	12.9	19.47	12.95	14.58	36.49	24.36
Instant maximum Torque	N-m	3.82	2.6	3.82	2.54	2.86	7.16	4.78
	kg-cm	38.8	25.8	38.94	25.89	29.15	72.99	48.73
Main input voltage	V	AC 220	AC 220	AC 220	AC 220	AC 220	AC 220	AC 220
Rated current	A	1.95	1.85	1.6	1.5	2.8	3.0	2.8
Rated speed	RPM	2000	3000	2000	3000	5000	2000	3000
Insulation grade	-	B	B	B	B	B	B	B
Weight	kg	3		3.7		3.7	5.2	
Operation environment	-	-20 ~ 40°C / 20 ~ 80% RH		0 ~ 40°C / 20 ~ 80% RH		0 ~ 40°C / 20 ~ 80% RH		

Table 1. Specifications of BLDC MOTOR(400W, 750W)



## BLDC STANDARD DRIVER MANUAL

Model		TM10 - A1053	TM13 - A1023	TM13 - A1033	TM13 - A1553	TM13 - A1523	TM13 - A1533	TM13 - A2053
Rated power	W	1000			1500			
	N-m	1.91	4.78	3.19	2.87	7.17	4.78	3.82
Rated torque	kg-cm	19.47	48.73	32.52	29.26	73.09	48.73	38.94
	N-m	3.82	9.56	6.38	5.74	14.43	9.56	7.64
Instant maximum Torque	kg-cm	38.94	97.45	65.04	58.51	146.18	97.46	77.88
	V	AC 220	AC 220	AC 220	AC 220	AC 220	AC 220	AC 220
Rated current	A	3.6	4.4	3.9	5.6	6.2	5.7	7.2
Rated speed	RPM	5000	2000	3000	5000	2000	3000	5000
Insulation grade	-	B	B	B	B	B	B	B
Weight	kg	5.2	6.4			9		
Operation environment	-	0 ~ 40°C / 20 ~ 80% RH				-20 ~ 40°C / 20 ~ 80% RH		

Table 2. Specifications of BLDC MOTOR(1KW, 1.5KW)



## BLDC STANDARD DRIVER MANUAL

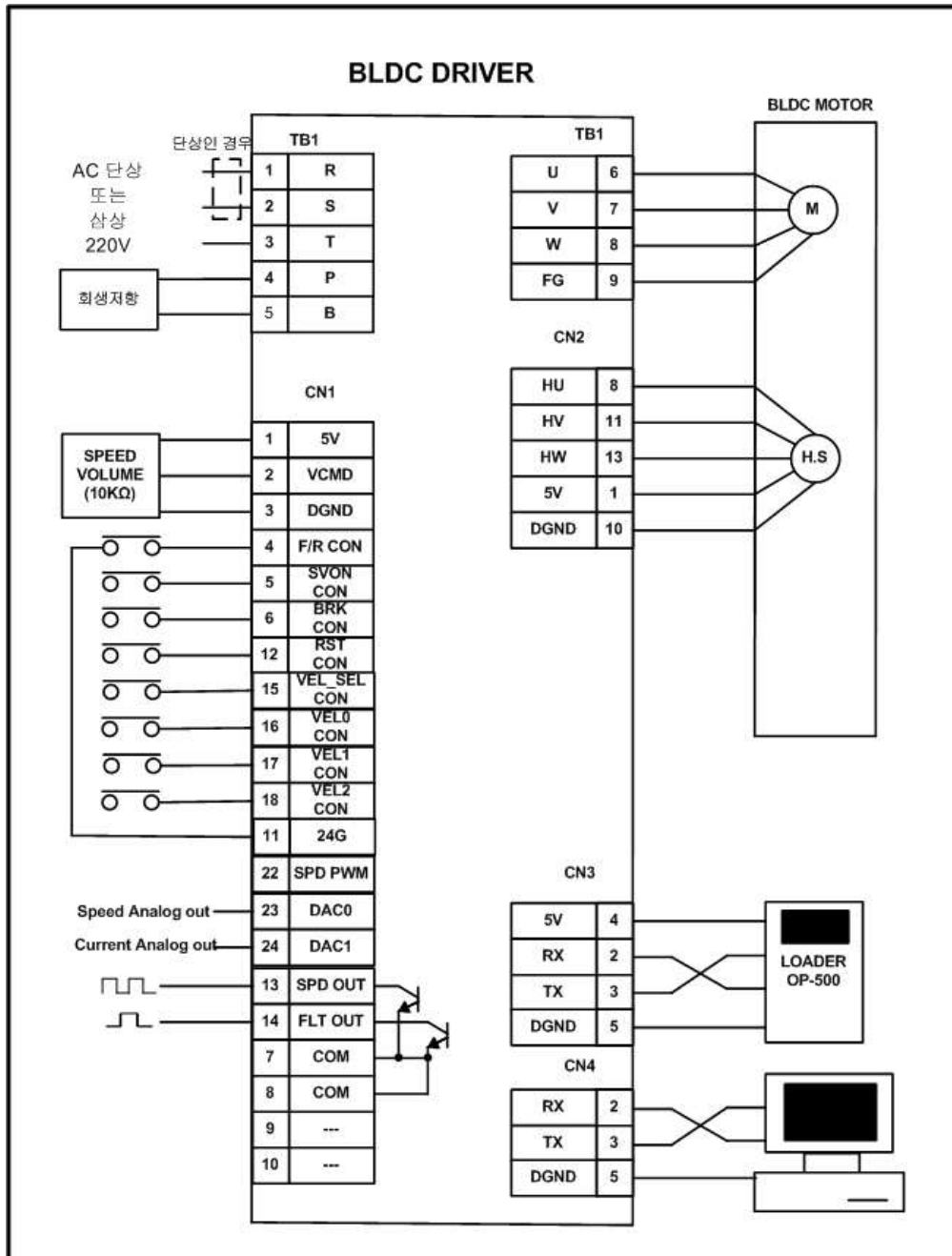
### 3.2. Specifications of BLDC DRIVER

	Model	TMC-A02	TMC-A03	TMC-A04	TMC-A05	TMC-A07	TMC-A10	TMC-A15	TMC-A20
Basic Spec.	Rated current [A]	0.8	1.2	1.6	2	2.8	4.0	6	8
	Max current [A]	2	2.8	4	5	7	10	14	20
	Control function	Speed control, electric current limit							
	Control method	PWM control with Square wave							
	Dimension [mm]	78(W) × 170(H) × 123(D)							
	Speed Control Range	100 RPM ~ 5000 RPM							
Input/Output	Sequence Input	F/R, SVON, BRAKE, ALARM RST, Velocity_Select Internal speed 0 selection, Internal speed 1 selection, Internal speed 2 selection							
	Open collector output	SPEED PULSE OUT, ALARM OUT							
Internal Function	Protection	Over current(250%), Hall sensor alarm, Parameter alarm, Under voltage alarm, Over voltage alarm, Regeneration function							
	Status display	POWER LED(Y), ALARM LED(R), SVON LED(G)							
Option	Communication function, OP-100, OP-500, Speed, Current analog output								

Table 3. Specifications of BLDC DRIVER

# BLDC STANDARD DRIVER MANUAL

## 4. Connection of BLDC MOTOR and DRIVER

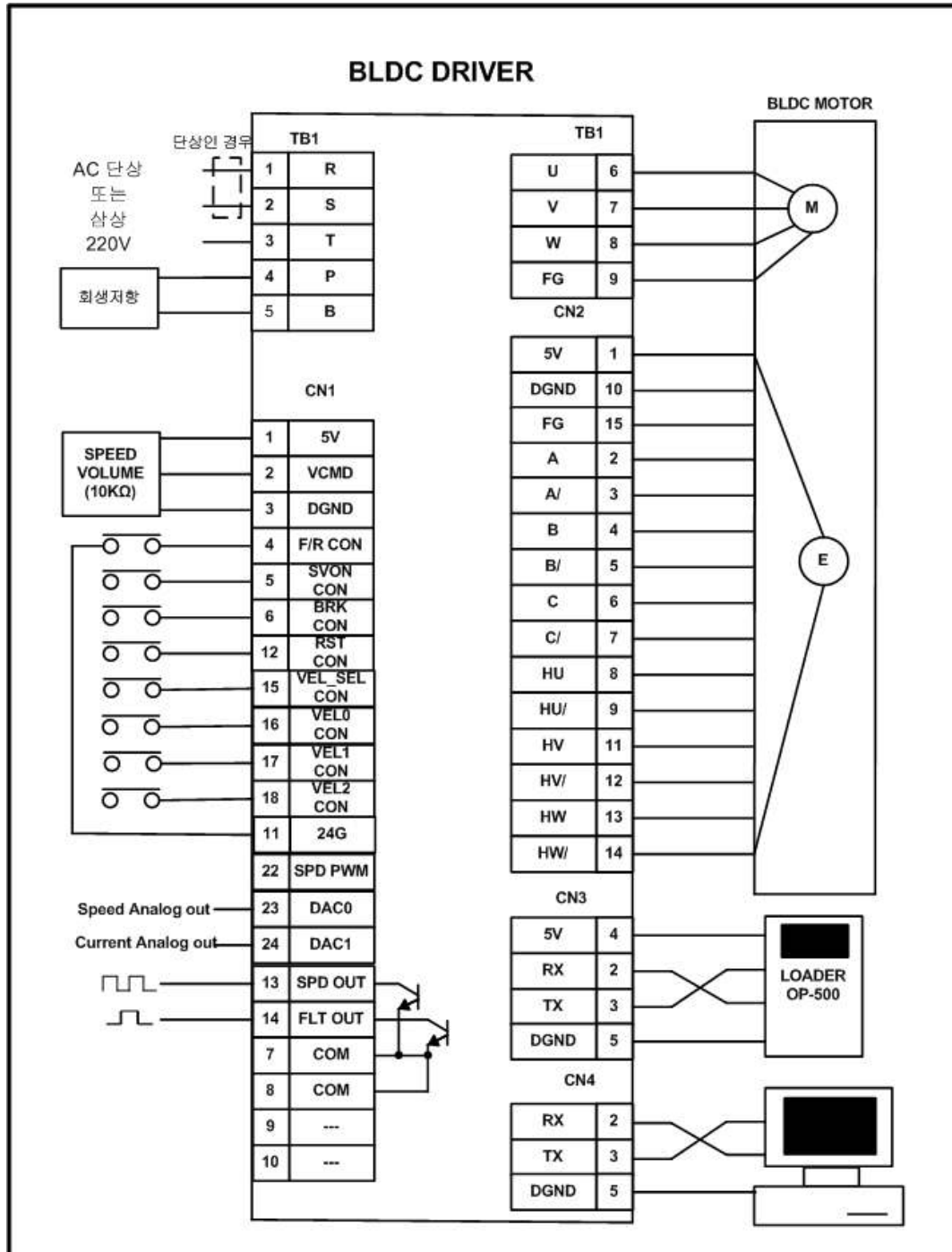


Picture 1. External connection of BLDC DRIVER(Hall sensor use)





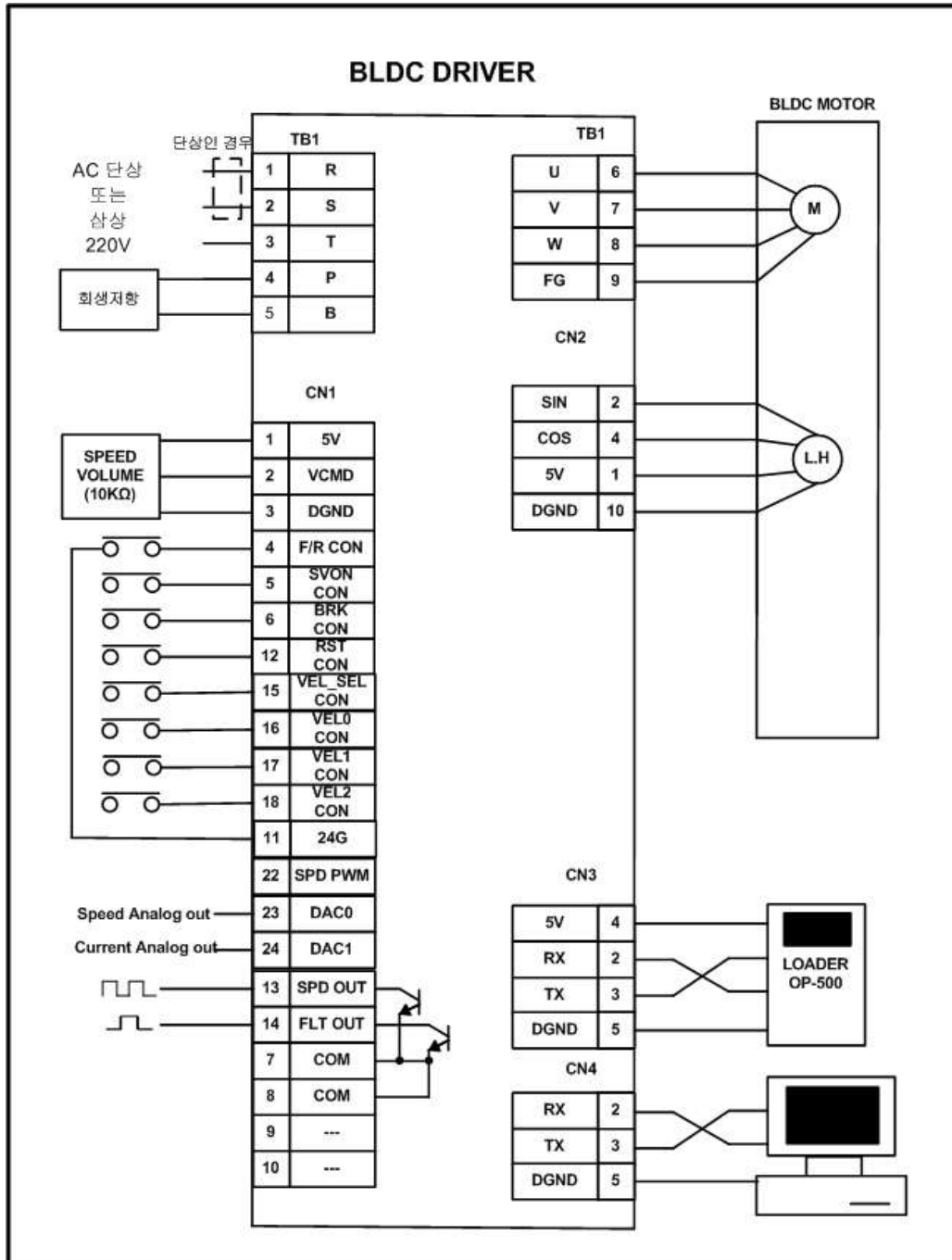
# BLDC STANDARD DRIVER MANUAL



Picture 2. External connection of BLDC DRIVER(Encoder use)



# BLDC STANDARD DRIVER MANUAL



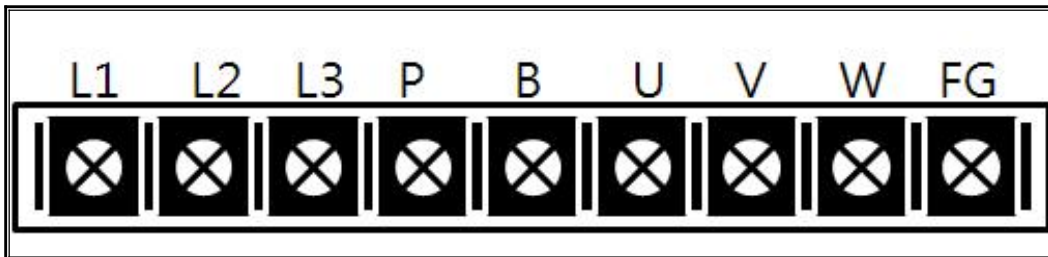
Picture 3. External connection of BLDC DRIVER(Linear hall sensor use)

## BLDC STANDARD DRIVER MANUAL

### 5. Input/Output of BLDC DRIVER

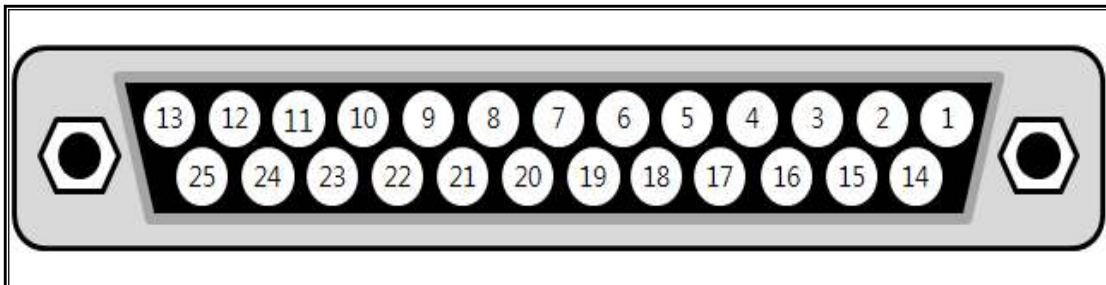
#### 5.1. Flowchart of connector terminal

##### 5.1.1. Flowchart of TB1 terminal(AC input, Motor output, Regen resistor connection)



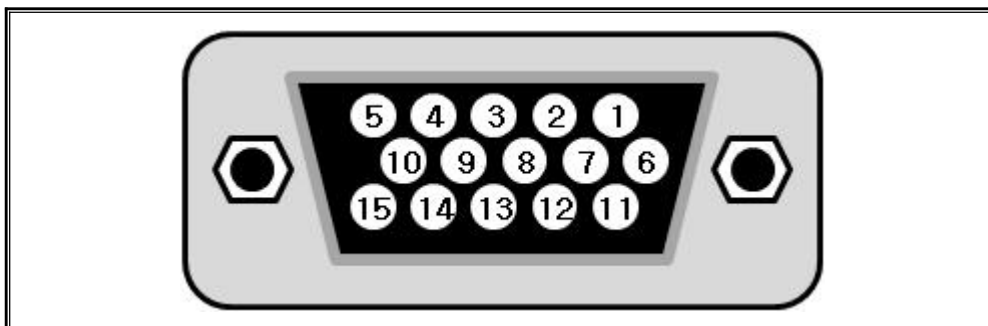
Picture 4. Flowchart of BLDC DRIVER TB1

##### 5.1.2. Flowchart of CN1 connector(Input•Output signal)



Picture 5. Flowchart of BLDC DRIVER CN1

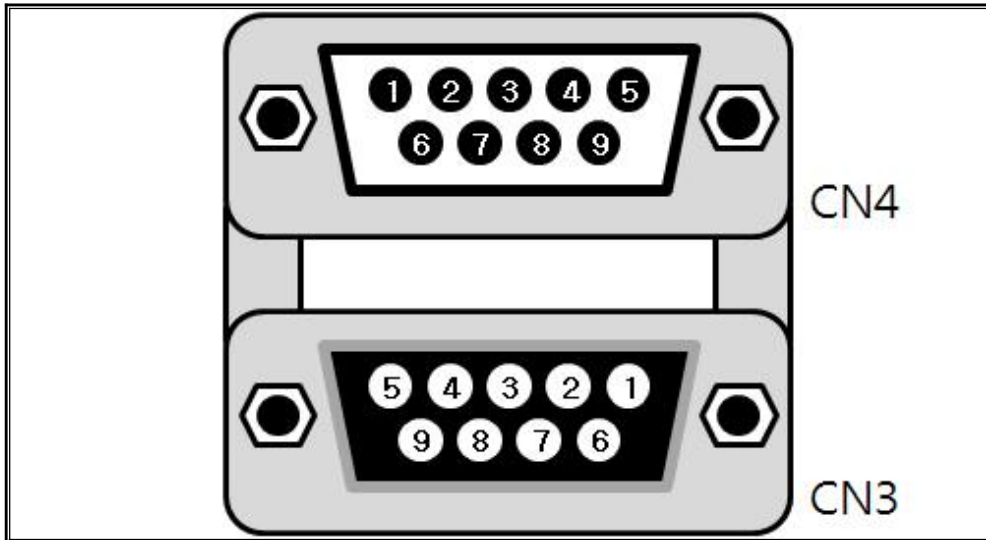
##### 5.1.3. Flowchart of CN2 connector(Feedback sensor)



Picture 6. Flowchart of BLDC DRIVER CN2

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### 5.1.4. Flowchart of CN3 connector and CN4 connector(Loader and communication)



Picture 7. Flowchart of BLDC DRIVER CN3 connector and CN4 connector

### 5.2. Function of TB1 terminal

PIN NO.	Name	Contents
1	R	- R phase input of AC 220V power
2	S	- S phase input of AC 220V power
3	T	- T phase input of AC 220V power
4	P	- connector terminal of regen resistor
5	B	- connector terminal of regen resistor
6	U	- U phase power of MOTOR
7	V	- V phase power of MOTOR
8	W	- W phase power of MOTOR
9	FG	- FRAME GROUND

Table 4. Function of TB1 terminal



## BLDC STANDARD DRIVER MANUAL

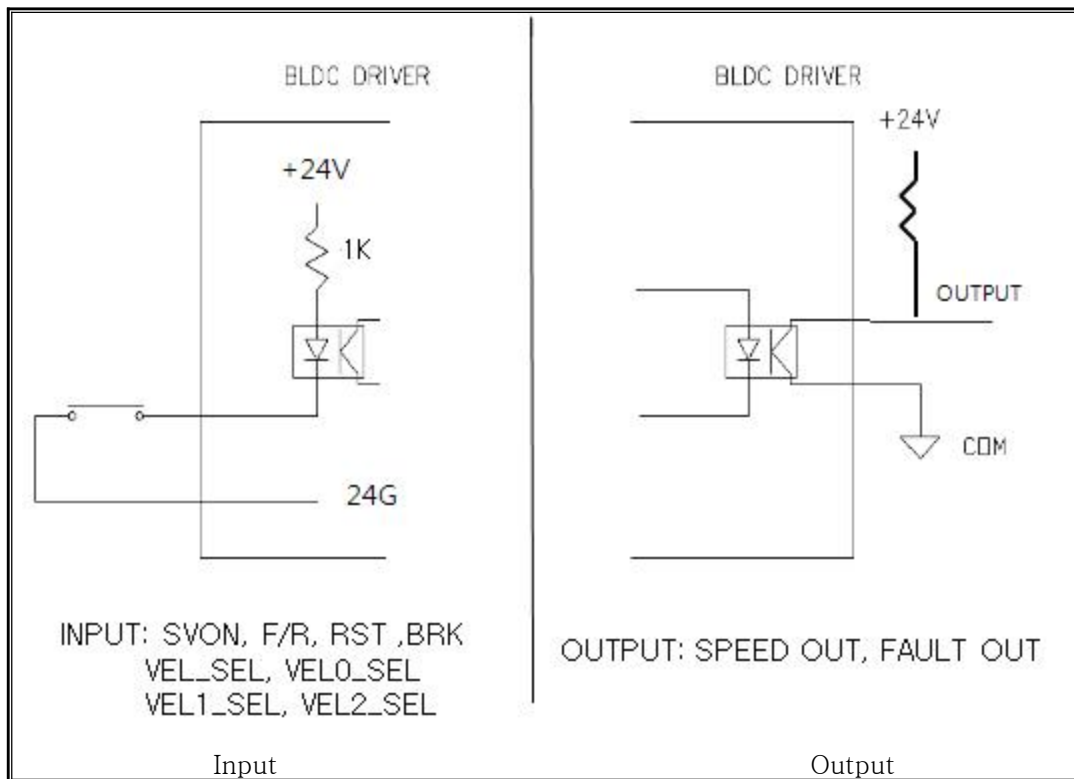
### 5.3. Function of CN1 connector

PIN NO.	Name	Contents
1	5V	- DC 5V
2	VCMD	- Speed command(0~5V)
3,25	DGND	- Ground of speed command
4 11	F/R CON 24G	- When changing the rotary direction of the motor, uses. - Two terminal connection : 'CW' direction(FORWARD) Two terminal opening : 'CCW' direction(REVERSE)
5 11	SVON CON 24G	- This is SERVO ON signals, when connects two terminals SERVO ON and, does not connect, they are SERVO OFF.
6 11	BRK CON 24G	- When is connected two terminals, the motor which is in the process of rotating stops rightly. * With E-STOP does a same duty. When uses but frequently, the possibility the above happening in the product is and avoiding a use wishes.
9,10	NC	- NOT CONNECT
12	RST CON 24G	- When it turns on over 50msec it resets servo alarm in alarm state.
13 7,8	SPD OUT COM	- When a number of revolution drives sprouts, uses. - When motor 1 rotating, 12 pulse outputs(Case of 4 poles)
14	FLT OUT COM	- Turns off when servo error is detected.(normal status: turns on) - Changes a parameter and changes an above detection signal level.
15	VEL SEL CON 24G	- Internal speed selection of parameter - Two terminals are connected, when selects an internal speed, at the speed which comes to decide they rotate.
16	VEL_0 CON 24G	- Internal speed 0 selections - When two terminals are connected, the internal speed is selected with the speed order which is set in internal speed 0 of parameter.
17	VEL_1 CON 24G	- Internal speed 1 selections - When two terminals are connected, the internal speed is selected with the speed order which is set in internal speed 1 of parameter.
18	VEL_2 CON 24G	- Internal speed 2 selections - When two terminals are connected, the internal speed is selected with the speed order which is set in internal speed 2 of parameter.
19,20 21	NC	- NOT CONNECT
22	SPD_PWM DGND	- Currently outputs the speed of the motor with PWM.(5V PWM output)
23	DAC0 DGND	- Currently outputs the speed of the motor with Analog.(0~5V)
24	DAC1 DGND	- Currently outputs the current of the motor with Analog.(0~5V)

Table 5. Function of CN1 connector

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## 5.3.1. Input/Output type of CN1



Picture 8. Input/Output type of CN1



## BLDC STANDARD DRIVER MANUAL

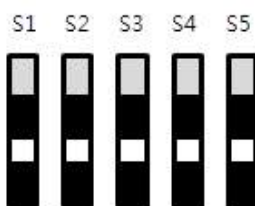
### 5.4. Function of CN2 connector

PIN NO.	Name	Contents
1	5V	- DC5V : Input power of feedback sensor
2	A	- A phase of encoder
	Linear SINE	- SINE curve of linear hall sensor
3	A/	- A/ phase of encoder
	B	- B phase of encoder
4	B	- B phase of encoder
	Linear COS	- COSINE curve of linear hall sensor
5	B/	- B/ phase of encoder
	Z	- Z phase of encoder
6	Z	- Z phase of encoder
	Z/	- Z/ phase of encoder
7	Z/	- Z/ phase of encoder
	HU	- U phase of hall sensor
8	HU/	- U/ phase of hall sensor
	DGND	- GND
9	DGND	- GND
	HV	- V phase of hall sensor
10	HV/	- V/ phase of hall sensor
	HW	- W phase of hall sensor
11	HW/	- W/ phase of hall sensor
	FG	- FRAME GROUND
12	FG	- FRAME GROUND

Table 6. Function of CN2 connector

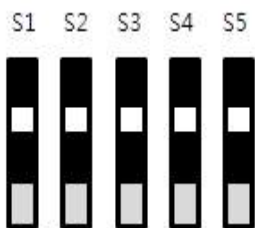
※ According to type of feedback sensor changes MCB S1~S5 switches and connects.

▶ HALL SENSOR or Linear HALL SENSOR use



: Changes all switches with lower part direction.

▶ ENCODER use



: Changes all switches with upper part direction.

※Caution) From the condition which is set does not change with option.



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### 5.5. Function of CN3 connector(OP-500 port)

PIN NO.	Name	Contents
1	-	-
2	RX	RX pin of serial communication
3	TX	TX pin of serial communication
4	DC5V	Power supply of OP-500
5	DGND	GND of OP-500
6	-	-
7	-	-
8	-	-
9	-	-

Table 7. Function of CN3 connector

### 5.6. Function of CN4 connector

PIN NO.	Name	Contents
1	-	-
2	RX	RX pin of serial communication
3	TX	TX pin of serial communication
4	-	-
5	DGND	GND of serial communication
6	-	-
7	-	-
8	-	-
9	-	-

Table 8. Function of CN4 connector

### 5.7. Display function of LED

Name	Contents
PWE.ON	- When connects AC220V power supply in TB1 terminal, PWR LED is light on.
ALARM	- The hall sensor has a problem to connection or when the over current flows in with the motor, ALARM signals occur, ALARM LED is light on. CN1 pin 14 make be opened from COM.
SV.ON	- When CN1 pin5 comes 24GND is connected, the driver become READY conditions and SVON LED come to light.

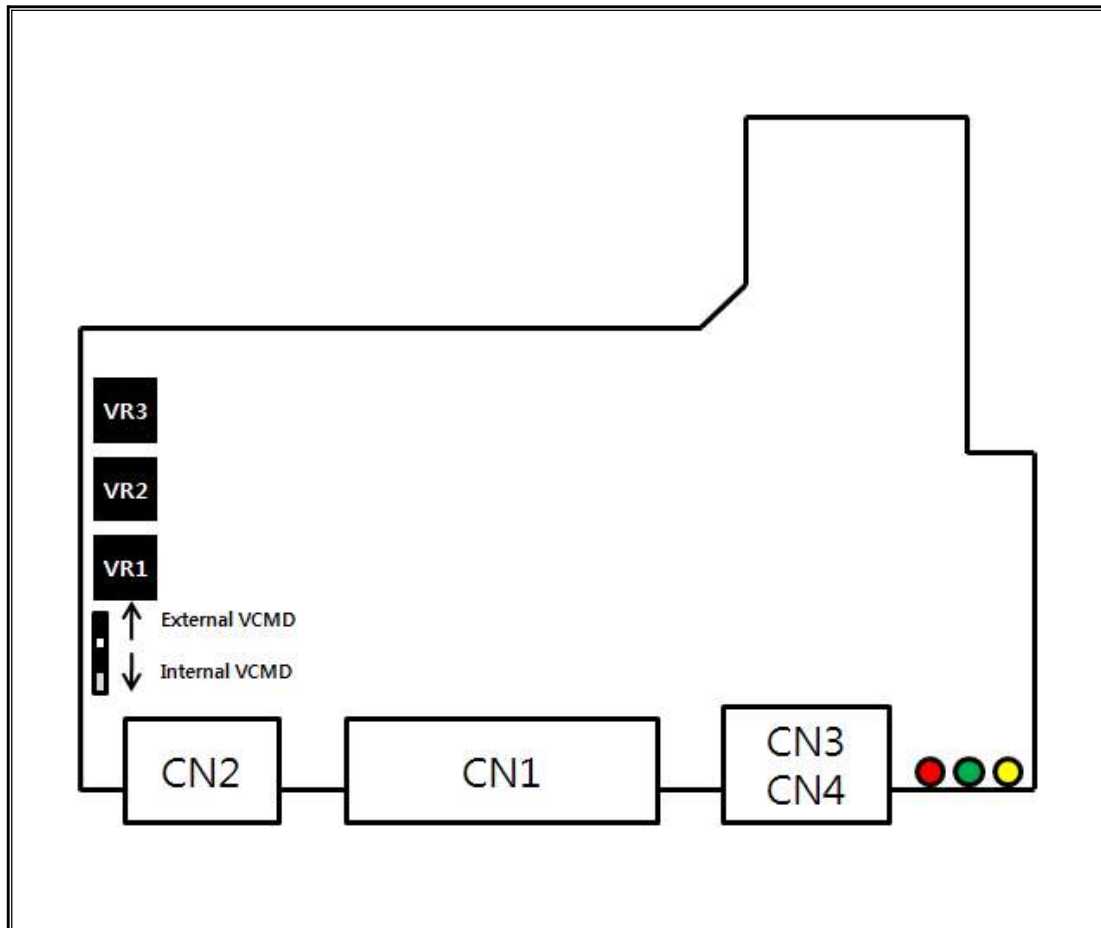
Table 9. Display function of LED



## BLDC STANDARD DRIVER MANUAL

### 6. Function and setting method of variable resistor

#### 6.1 Variable resistor location of BLDC DRIVER



Picture 9. Variable resistor location of BLDC DRIVER MCB



## BLDC STANDARD DRIVER MANUAL

### 6.2 Variable resistor function of BLDC DRIVER

Name	Contents
VR1	<ul style="list-style-type: none"><li>◆ When turns with a clockwise direction with the variable resistor which sets the internal speed of the motor RPM increases and when turns with a counterclockwise direction and RPM decreases. Becomes setting with correct rules RPM of the factory shipping at the time of motor and is shipped.</li></ul>
VR2	<ul style="list-style-type: none"><li>◆ Is an acceleration and deceleration control resistor of the motor. Turns with a counterclockwise direction and accelerates and decelerates, shortly when with a clockwise direction turns and the acceleration and deceleration are long regulated.</li></ul>
VR3	<ul style="list-style-type: none"><li>◆ When going over a rated capacity, (over current occurrence at the time of) is a function which controls ALARM occurrence time. <b>Caution) VR4 manufacture company technical inquiry the user does not fabricate without at random. Under using route promotes in the condition which is shipped.</b></li></ul>
SW1	<ul style="list-style-type: none"><li>◆ Is a switch selects an internal speed command and an external speed command. When selects an up direction, external speed command, when selects a lower part direction, operates with internal speed command.</li></ul>

Table 10. Function of variable resistor and switch

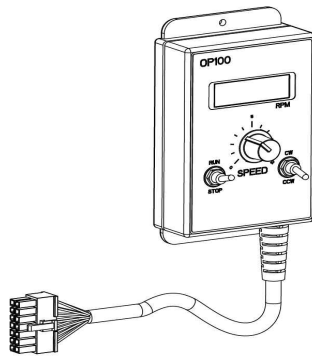
## BLDC STANDARD DRIVER MANUAL

### 7. Display/Setting (OPTION)

#### 7.1.1 Display/Setting of OP-100

- Indicates a motor rotation speed from the indication window which is composed 6 with 7-segment LED of the driver whole surface and the set becomes accomplished at SERVO ON/OFF switch, the motor direction transformation switch and rotation speed control volume.

- ※ Caution) 1. To OP panel work at time of after intercepting work the mains voltage.  
2. OP-100 when connecting, use a conversion connector and attach.

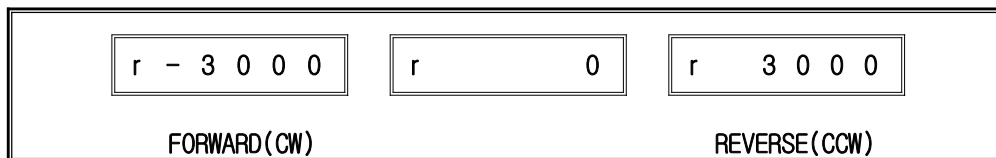


Picture 10. Dimension of OP-100

#### 7.1.2 Display/Setting

Motor rotation speed [ Symbol : r, 0 RPM ~ 3000 RPM ]

; Rotation speed of motor indication



Picture 11. Display of OP-100

- ※ Caution) 1. The highest rotation speed of the motor according to type of motor is a possibility of changing.  
2. Currently the speed of the motor according to pole of the motor is a possibility of changing.

#### 7.2 Display/Setting of OP-500

- OP-500 BLDC DRIVER parameter the real-time monitor and is having the function will can set.

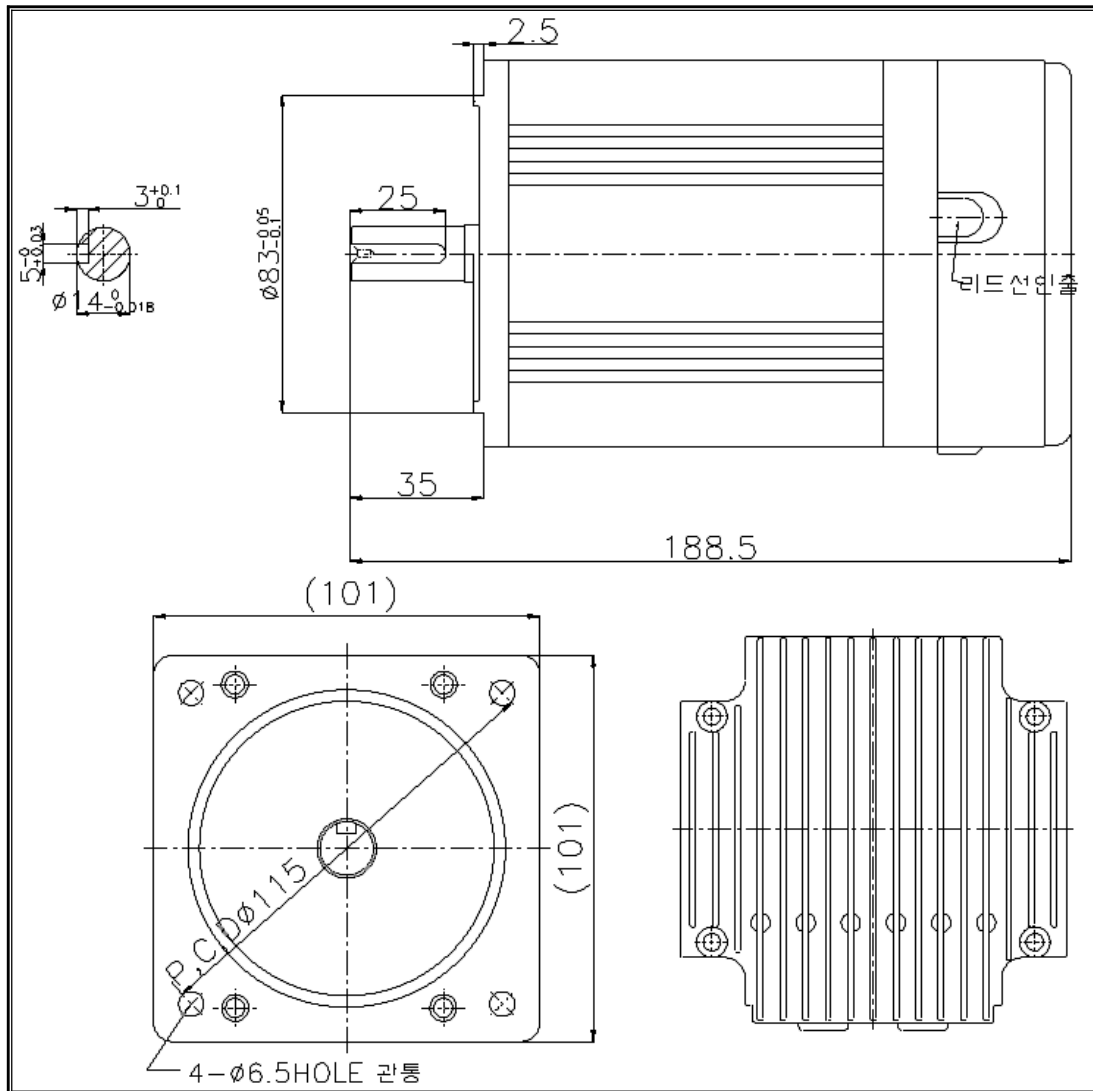
Rotation speed, acceleration time and deceleration time, rotary direction and pole, is speed gain price etc. at parameter.

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## 8. Dimension of BLDC MOTOR

### 8.1. Dimension of BLDC MOTOR

( 400W TM10-A0423, A0433 series, 750W TM10-A0753 series )

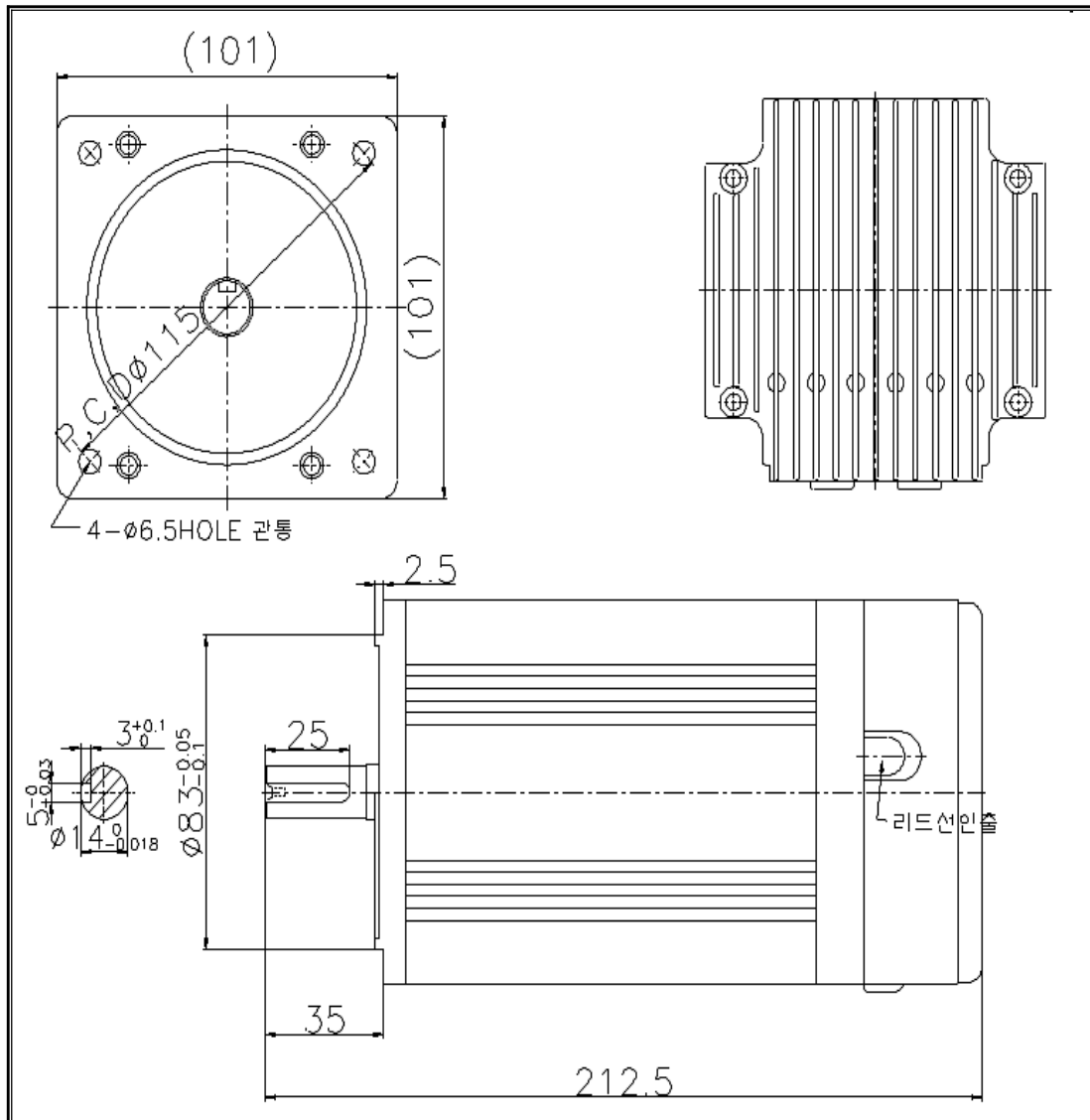


Picture 12. Dimension of BLDC MOTOR  
(400W TM10-A0423, A0433 series, 750W TM-10-A0753 series)

# BLDC STANDARD DRIVER MANUAL

## 8.2. Dimension of BLDC MOTOR

( 750W TM10-A0723, A0733 series, 1KW TM10-A1053 series )



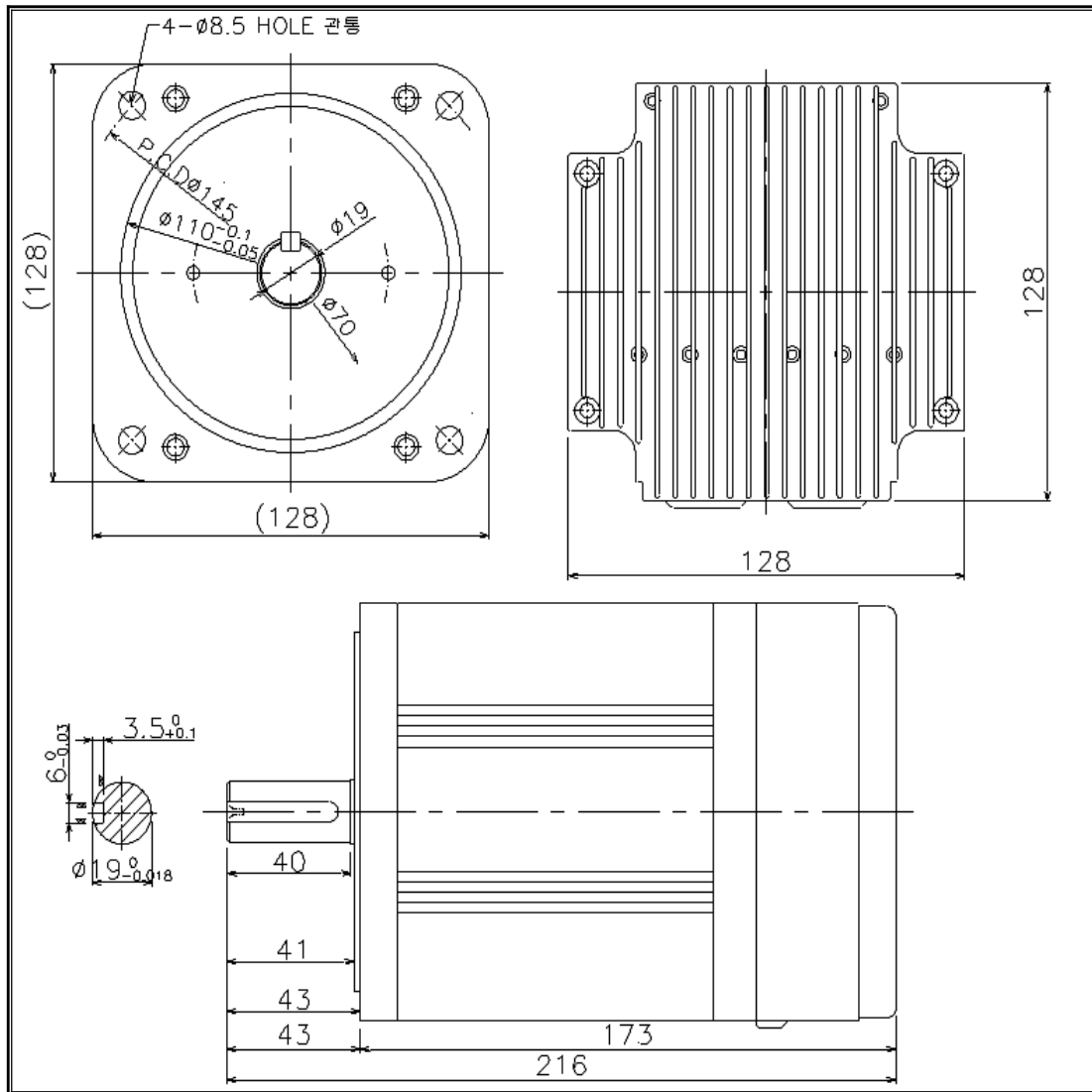
Picture 13. Dimension of BLDC MOTOR  
(750W TM10-A0723, A0733 series, 1KW TM10-A1053 series)



# BLDC STANDARD DRIVER MANUAL

## 8.3. Dimension of BLDC MOTOR

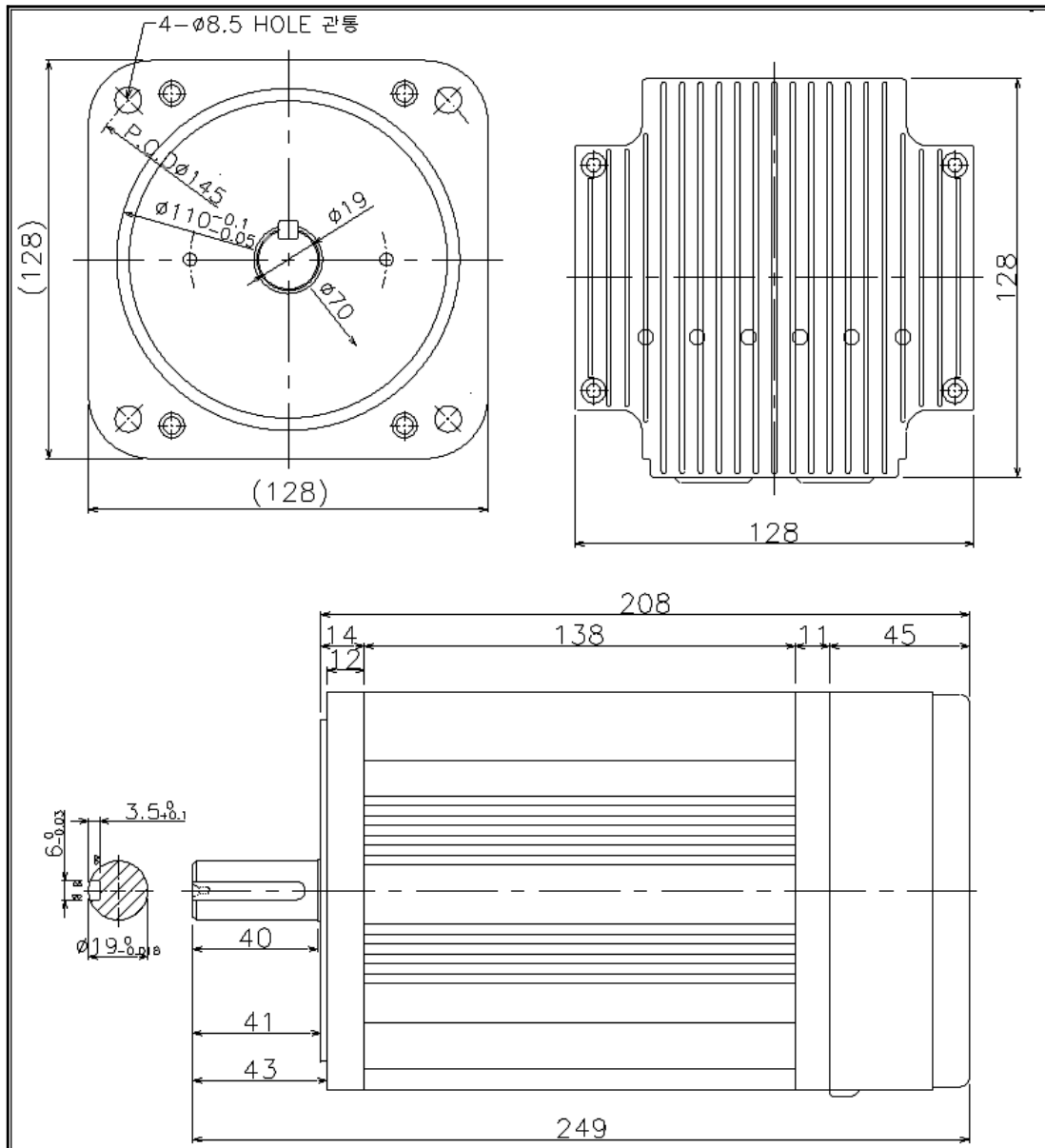
( 1KW TM13-A1023, A1033 series, 1.5KW TM13-A1553 series )



Picture 14. Dimension of BLDC MOTOR  
( 1KW TM13-A1023, A1033 series, 1.5KW TM13-A1553 series )

## BLDC STANDARD DRIVER MANUAL

### 8.4. Dimension of BLDC MOTOR ( 1.5KW TM13-A1523, A1533,A2053 series)

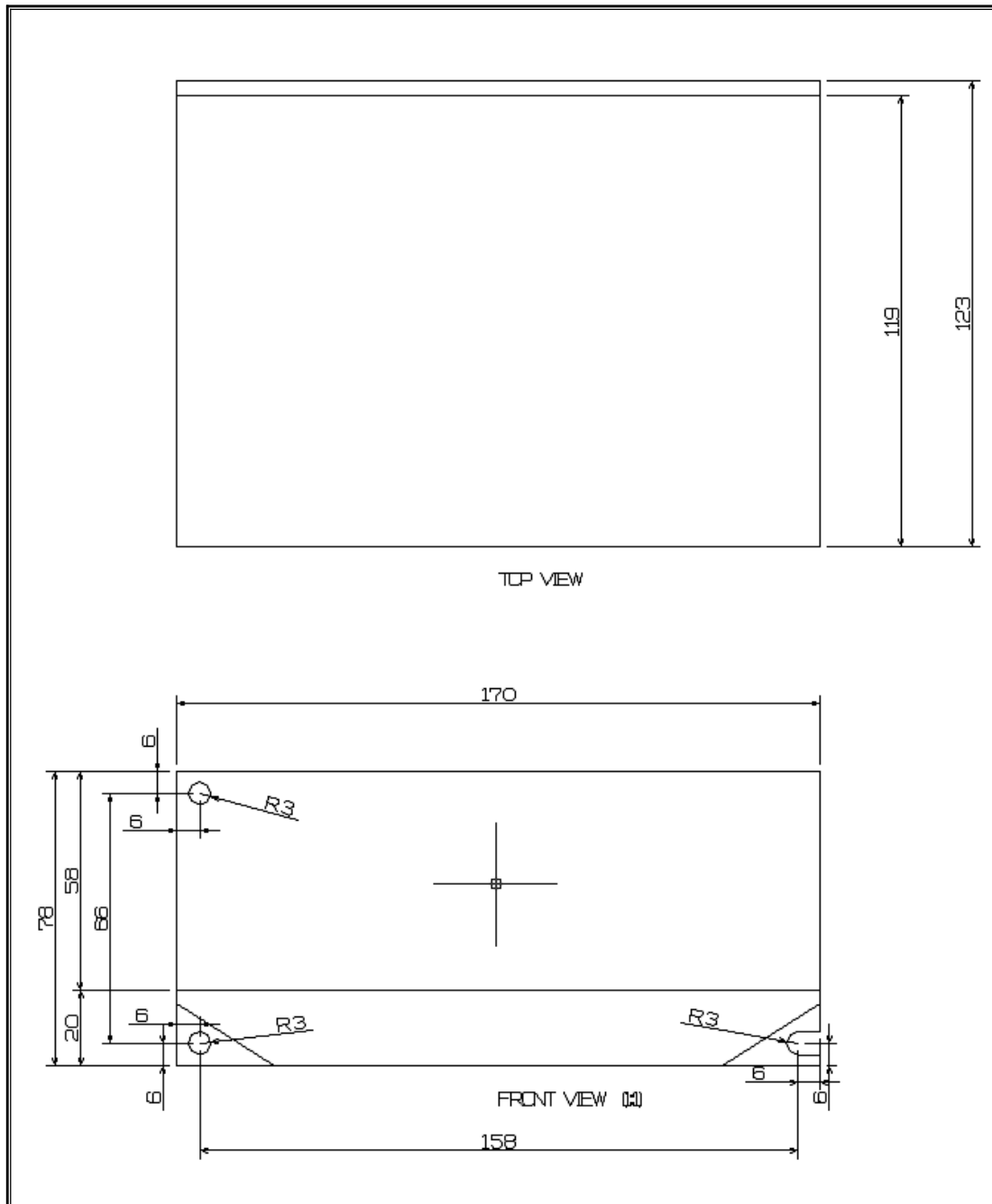


Picture 15. Dimension of BLDC MOTOR  
(1.5KW TM13-A1523, A1533, A2053 series)

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## 9. Dimension of BLDC DRIVER HEATSINK

### 9.1. Dimension of BLDC DRIVER HEATSINK



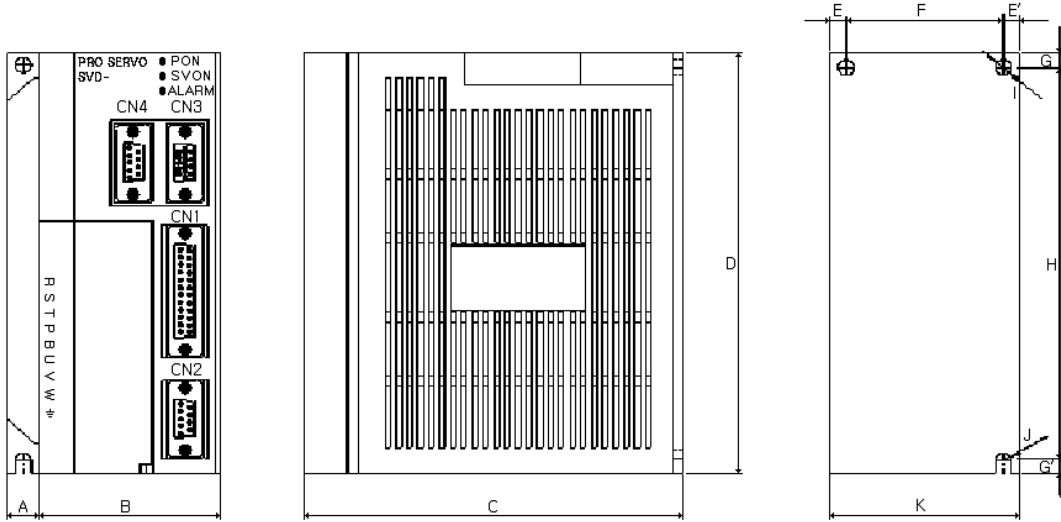
Picture 16. Dimension of BLDC DRIVER HEATSINK





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## 9.2. Dimension of 750/1.0k/1.5k/2.0kW



	A	B	C	D	E	E'	F	G	G'	H	I	J	K
공통	10	61	140	170	6.5	4.5	64	6.5	6	157.5	Φ5	Φ5	75

(단위 : mm)



## BLDC STANDARD DRIVER MANUAL

### 10. Trouble diagnosis and countermeasure

Phenomenon	Display	Reason	Management method
The motor does not rotate	Nothing indication	<ul style="list-style-type: none"> <li>• The confirmation where power should have been supplied in the driver</li> <li>• The confirmation which does not connect power in FG terminals</li> <li>• Connector access state defectiveness</li> <li>• Fuse broken wire confirmations</li> </ul>	<ul style="list-style-type: none"> <li>• Check the power supply</li> <li>• Connection amendment of power terminals</li> <li>• Connector access state confirmation</li> <li>• Change of fuse</li> </ul>
ALARM ON	ALARM LED every 1 seconds blinking	<ul style="list-style-type: none"> <li>• Power alarm</li> <li>Damage of power module</li> <li>When the over current flows</li> </ul>	<ul style="list-style-type: none"> <li>• Driver re-start</li> <li>• Driver repair or change</li> </ul>
	ALARM LED every 3 seconds blinking	<ul style="list-style-type: none"> <li>• Hall sensor alarm</li> <li>Damage of photocoupler</li> <li>Hall sensor defectiveness</li> </ul>	<ul style="list-style-type: none"> <li>• Hall sensor change</li> <li>• Driver repair or change</li> </ul>
	ALARM LED continuously lighting	<ul style="list-style-type: none"> <li>• Over load alarm</li> <li>With the current which is restricted the schedule timely operational at the time of</li> </ul>	<ul style="list-style-type: none"> <li>• Question at the office of primary responsibility</li> </ul>
	ALARM LED 2 continuation blinking	<ul style="list-style-type: none"> <li>• Parameter alarm</li> <li>In memory of driver parameter store failure at the time of</li> </ul>	<ul style="list-style-type: none"> <li>• Driver re-start</li> <li>• Driver repair or change</li> </ul>
	ALARM LED 3 continuation blinking	<ul style="list-style-type: none"> <li>• Under voltage alarm</li> <li>Occurs when input power is under standard value.</li> </ul>	<ul style="list-style-type: none"> <li>• Check the power supply</li> <li>• Connection amendment of power terminals</li> <li>• Driver repair or change</li> </ul>
	ALARM LED 4 continuation blinking	<ul style="list-style-type: none"> <li>• Over voltage alarm</li> <li>Occurs when input power is over standard value.</li> </ul>	<ul style="list-style-type: none"> <li>• Regen resistor establishment</li> <li>• Regen resistor connection inspection</li> <li>• Driver repair or change</li> </ul>

Table 12. Trouble diagnosis and countermeasure