

Brushless Motor **BH Series(DC Input)** **30W/50W/100W**

OPERATING MANUAL

Thank you for your purchasing LUYANG products.

This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.



INDEX



1 PRECAUTIONS 02~06

- 1.1 Overall
 - 1.2 Usage Environment
 - 1.3 Installation Notes
 - 1.4 Assembling and Disassembling of the Gearbox
 - 1.5 Noise Countermeasures
 - 1.6 Operation
 - 1.7 Transportation and Storage
 - 1.8 Package Content
-

2 MODEL DESCRIPTION 07

3 SPECIFICATIONS 08~10

- 3.1 Motor
 - 3.2 Gearbox
-

4 EXTERNAL VIEW 11~13

- 4.1 Motor
 - 4.2 Motor gear set
 - 4.3 Driver
 - 4.4 Driver power cable
 - 4.5 Driver input signal cable
 - 4.6 Power Cable
-

5 OPERATION INSTRUCTIONS 14~15

- 5.1 Driver Functions
 - 5.2 Driver Wiring
-

6 OPERATION 15~21

7 WARNING CODES 22

8 TROUBLESHOOTING 23~24

1 Precautions

1.1 Overall

Note before use

- This instruction manual provides operations and safety precautions for the product.
- This product must be used by qualified users with professional knowledge in motors and machinery.
- Make sure to read the instruction manual thoroughly and follow the warnings, notes and important items in the article.
- Please note that our company will not be responsible for any damages caused by failure to follow the warnings.

Warning

- Please have personnel with appropriate qualifications perform the installation, wiring, operation and fault diagnosis operations.
- Do not use this product near explosive environments, environments with flammable gases, corrosive environments, or locations easily exposed to water and flammable objects, otherwise it may cause fires or personal injuries.
- Do not carry out moving, installation, or wiring operations while the power is on. Please cut off the power supply before proceeding. Otherwise, it may cause a fire or cause personal injury.
- Do not use it in lifting devices. When the driver's protection function is activated, the motor will stop completely, causing the workpiece to fall, which may cause personal injury or equipment damage.
- When the driver protection function is activated, please eliminate the abnormal cause first and then release the protection function. Removing the protection function before eliminating the cause of the abnormality may cause the motor to malfunction and may result in personal injury or equipment damage.
- Do not repair, modify, or disassemble the product by yourself, as doing so may result in personal injuries or equipment damage.

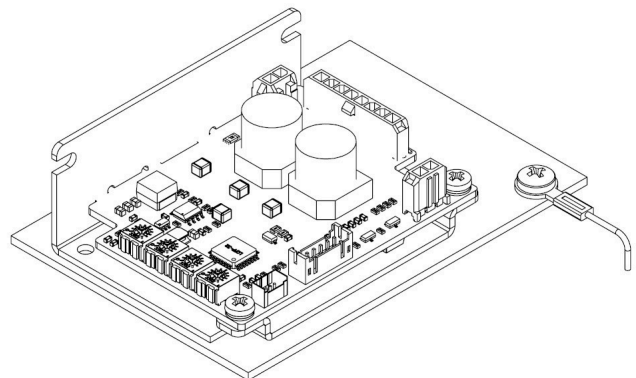
1.2 Usage Environment

To ensure that the functions of this product are normal, please use this product in locations with an ambient temperature of 0~+40°C (no freezing), ambient humidity of less than 85% (no condensing), altitude under 1000m, little electromagnetic noise, no explosive gases, no hazardous gases and liquids, no direct sunlight exposure and will not be stained by liquids.

1.3 Installation

- Install horizontally through the mounting holes. Please install the product on a smooth metal plate with good heat dissipation effects; if you are installing two or more drivers, the drivers must be kept 20cm or more apart horizontally and 50cm or more apart vertically.
- The motor and reducer should be installed at a location that is not easily accessible by personnel or protected with outer covers to avoid personal injuries from touching the rotating axis by accident.
- Please secure the driver, motor and reducer to the mounting plate, otherwise personal injury may occur if they fall.
- Please use a DC power supply with reinforced insulation on the primary and secondary sides for the power supply of the driver, otherwise it may cause electric shock.
- Make sure to ground the grounding terminals of the driver and motor with the shortest distance, otherwise it may cause electric shocks.
- Please do not share the grounding terminal with the welding machine or high noise grounding terminal.
- Do not bend, tug or clamp the power cable with force, otherwise it may damage the cable and cause fire.
- Please be sure to install the load on the output shaft, otherwise personal injury may occur.
- Make sure to control the driver power input voltage within the rated range, otherwise it may cause equipment damage or fire.
- When replacing the driver and motor, you need to cut off the power supply and wait until the power light is completely extinguished before you can replace it. Otherwise, electric shock may occur.

Grounding

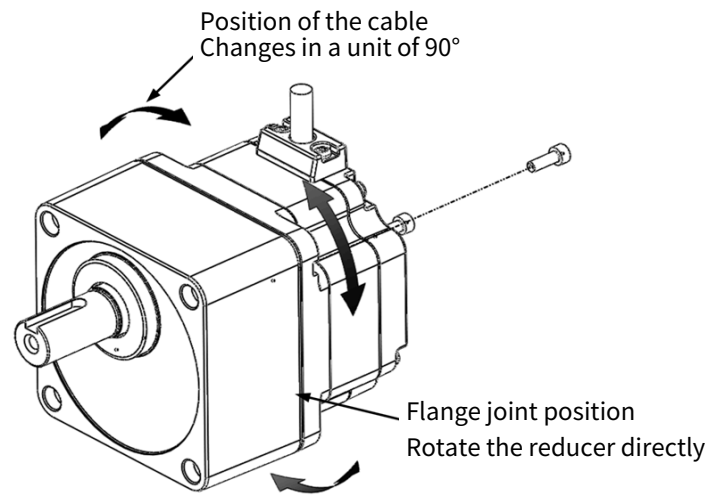
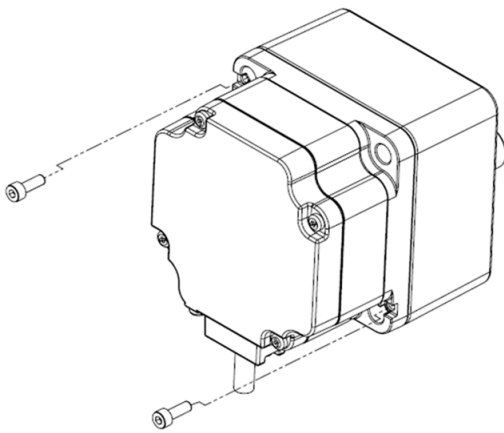


1.4 Assembling and Disassembling of the Gearbox

1. Remove the screws installed on the motor and the gearbox (two places)

※ Do not separate the motor and the gearbox completely to avoid damaging the gears from improper assembly.

2. Make the motor and gearbox parallel, then slowly rotate the gearbox to the left and right and adjust it to the needed position, then assemble the screws (two places).



1.5 Noise Countermeasures

There are two types of noises, including the ones that enter the driver externally and cause the driver to malfunction, and the ones that are emitted externally from the driver that causes peripheral devices to malfunction.

• Suppressing noises

- Use noise filters when relays and electromagnetic switches are used.
- Cover the driver with a metal plate such as aluminum. It can shield the noise emitted by the driver.

• Preventing the spreading of noises

- Make sure that the power systems, such as the motor cable and power supply, are at least 10cm away from the signal cable, and do not tie them together.
- Please use 26AWG or above cables as the signal cable of the driver, and control the length within 3m.
- The motor cable must not be rolled or tied up, and should be wired within the shortest possible distance.
- Wind cables with noises around a ferrite core to prevent noises from entering the driver or be emitted from the driver.
- **EMC directive:** If effective measures are not taken for the noise emitted by the motor and driver to the surrounding control systems, it may cause severe interference to other devices.
- To suppress the impact of noise spreading, please use ferrite cores and install them around the driver and motor.
- In order to prevent noise from spreading to the outside through the power line, users are asked to prepare an AC filter and connect it to the AC input line.
- The suitability of EMC must be set according to the descriptions above, and users must confirm EMC compliance.

1.6 Operation

Note

- Please install an emergency stop device or emergency stop circuit outside the device to ensure that the entire device is in a safe state when device failure or abnormal operation occurs. Otherwise, personal injury may occur.
- Before turning on the driver power, please stop inputting all signals to the driver.
- Do not directly use the power supply “ON/OFF” to run or stop the motor.
- When using the motor, reducer, or driver, do not exceed their rated specifications. Otherwise, it may cause equipment damage.
- Do not touch the output shaft during operation. Otherwise, personal injury may occur.
- The surface temperature may exceed 70°C while the motor is operating normally. Please attach warning signs where people may approach.
- When abnormalities occur, please stop motor operation immediately and disconnect the driver's power; otherwise, it may cause fire or personal injuries.
- Do not touch the motor or driver during operation or within one minute after stopping, otherwise burns or electric shock may occur.

1.7 Transportation and Storage

Note

- Do not transport the product by holding the output shaft and power cable of the motor (reducer) to prevent it from falling or getting damaged.
- Place this product in the package box provided when storing it.
- Please store this product at a location with an ambient temperature of -20~+70°C (no freezing), ambient humidity of under 85% (no condensing), altitude of under 3000m, no direct sunlight exposure, a little salt and well ventilated.

1.8 Package Content

Note

- Driver.....1 unit
- Motor or Gearbox with Motor.....1 unit
- Operating Manual.....1 booklet
- Installation Screw Set.....1 set
- Driver Input Signal Cable.....1 cable
- Driver Power Cable.....1 cable

※ Actual package contents are subject to the order specifications.

2 Model Description



INDICATION OF MOTOR

6 BH 030 GB - K 25 □

DIMENSION	TYPE	OUTPUT	MOTOR SHAFT	VOLTAGE	RATED SPEED	PROTECTION
6: 60mm 8: 80mm 9: 90mm	BH: BH Brushless motor	030: 30W 050: 50W 100: 100W	A: Round shaft GB: Helical gear shaft	K: DC24V	25: 2500RPM	□: IP40 standard (not shown)

INDICATION OF DRIVER

BHD 030 - K □

TYPE	OUTPUT	POWER INPUT VOLTAGE	FUNCTION
BHD: BH driver	030: 30W 050: 50W 100: 100W	K: DC24V	□: Standard(not shown) G: Regenerative Control

INDICATION OF GEAR BOX

6 GB 5

DIMENSION	TYPE	RATIO
6: 60mm 8: 80mm 9: 90mm	GB: Helical gearbox	5: 1/5

INDICATION OF DRIVER POWER CABLE/DRIVER INPUT SIGNAL CABLE

LBH 003 Y1

CONNECTION CABLE	LENGTH	CODE
LBH: BH series	003: 0.3m (standard type)	Y1: Driver power cable Y2: Driver input signal cable

INDICATION OF CABLE

CL 010 □ BH □

CONNECTION CABLE	LENGTH	CONNECTOR TYPE	SERIES	FUNCTION
CL: Cable	010: 1m 020: 2m	□: Standard type (not shown)	BH: BH series	□: Standard type (not shown)

※ Maximum extension distance of cable: 2m (including motor cable 0.5m)

3 Specifications

3.1 Motor

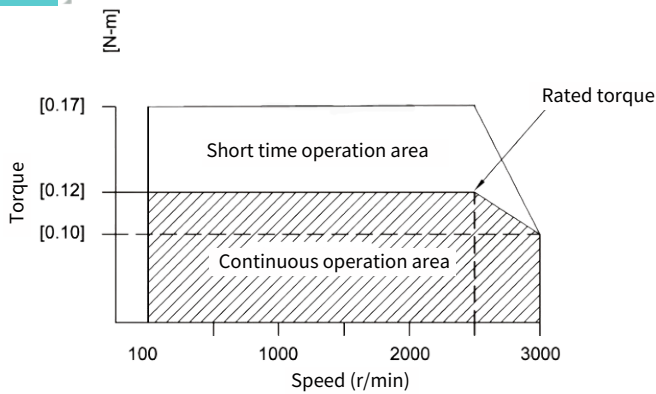
30W	Model of motor		6BH030A-K25	6BH030GB-K25
	Model of driver		BHD030-K	
	Power input voltage	Rated voltage (V)	DC24	
		Voltage tolerance	±15%	
		Rated input current (A)	1.9	
		Max. input current (A)	4.1	
	Rated output (W)		30	
	Motor rated speed (r/min)		2500	
	Speed control range (r/min)		100~3000	
	Speed change rate		±0.5%	
	Motor rated torque (N-m)		0.12	
	Motor peak torque (N-m)		0.17	
	Rotor inertia(J= X 10 kg · m ²)		0.087	
	Allowable load moment of inertia(J= X 10 kg · m ²)		1.8	
	Insulation Class		B	
Ingress Protection Rating		Motor IP40, Driver IP00		

50W	Model of motor		8BH050A-K25	8BH050GB-K25
	Model of driver		BHD050-K	
	Power input voltage	Rated voltage (V)	DC24	
		Voltage tolerance	±15%	
		Rated input current (A)	2.9	
		Max. input current (A)	5.4	
	Rated output (W)		50	
	Motor rated speed (r/min)		2500	
	Speed control range (r/min)		100~3000	
	Speed change rate		±0.5%	
	Motor rated torque (N-m)		0.19	
	Motor peak torque (N-m)		0.29	
	Rotor inertia(J= X 10 kg · m ²)		0.23	
	Allowable load moment of inertia(J= X 10 kg · m ²)		3.3	
	Insulation Class		B	
Ingress Protection Rating		Motor IP40, Driver IP00		

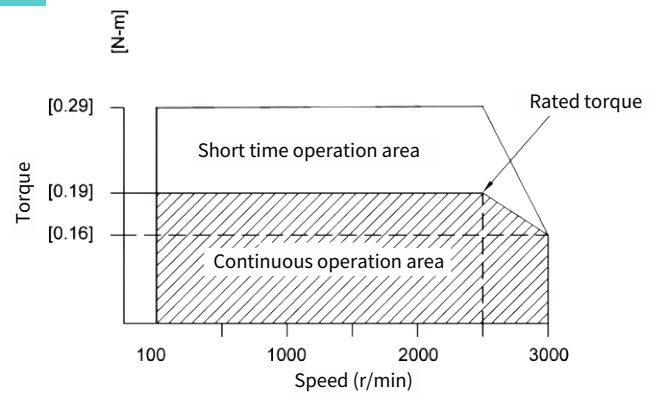
100W	Model of motor		9BH100A-K25	9BH100GB-K25	
	Model of driver		BHD100-K		
	Power input voltage	Rated voltage (V)	DC24		
		Voltage tolerance	±15%		
		Rated input current (A)	6		
		Max. input current (A)	9.8		
	Rated output (W)		100		
	Motor rated speed (r/min)		2500		
	Speed control range (r/min)		100~3000		
	Speed change rate		±0.5%		
	Motor rated torque (N·m)		0.38		
	Motor peak torque (N·m)		0.58		
	Rotor inertia(J= X 10 kg · m ²)		0.61		
	Allowable load moment of inertia(J= X 10 kg · m ²)		5.6		
	Insulation Class		B		
Ingress Protection Rating		Motor IP40, Driver IP00			

MOTOR TORQUE CHARACTERISTICS

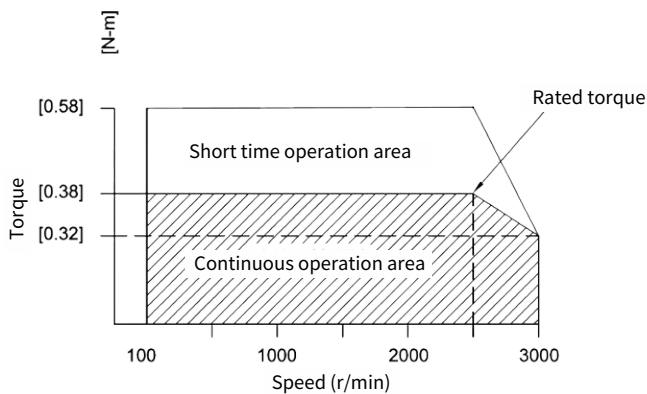
30W



50W



100W



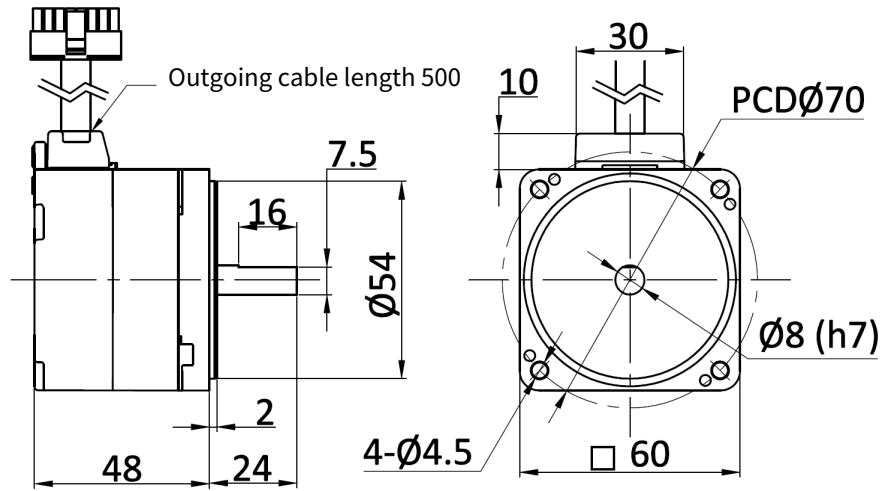
3.2 Reducer

Gearbox			5	10	15	20	30	50	100
Output speed (r/min)		2500r/min	500	250	167	125	83	50	25
Allowable torque (N.m)	30W	100~2500r/min	0.50	0.97	1.55	2.04	2.91	4.75	6.00
		3000r/min	0.42	0.83	1.26	1.65	2.43	3.98	5.82
	50W	100~2500r/min	0.83	1.65	2.52	3.30	4.75	7.95	16.00
		3000r/min	0.70	1.36	2.04	2.81	3.98	6.60	13.29
	100W	100~2500r/min	1.75	3.49	5.24	6.98	9.99	16.68	30.00
		3000r/min	0.87	1.75	2.62	3.49	5.04	8.34	16.68
Allowable hanging load (N)	30W	10mm from the front end of the output shaft	100	150		200			
	50W		200	300		450			
	100W		300	400		500			
	30W	20mm from the front end of the output shaft	150	200		300			
	50W		250	350		550			
	100W		400	500		650			
Allowable thrust load (N)	30W		40						
	50W		100						
	100W		150						
Running direction			Same direction as motor				Opposite direction to the motor		

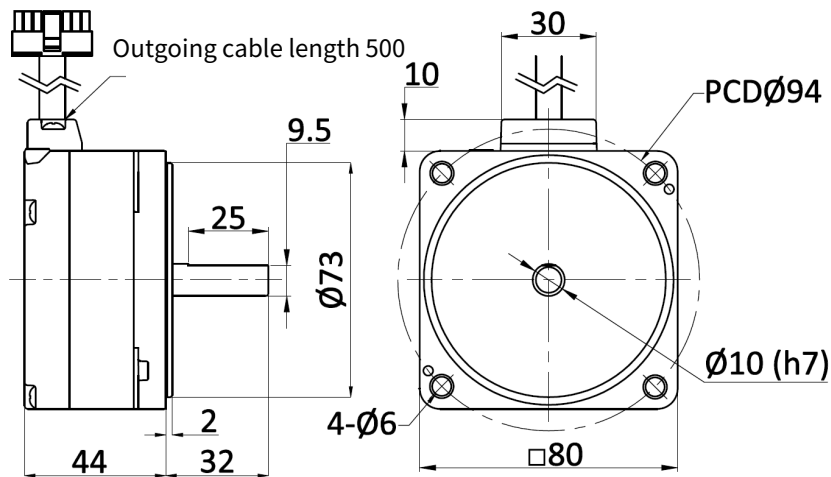
4 External View

4.1 Motor

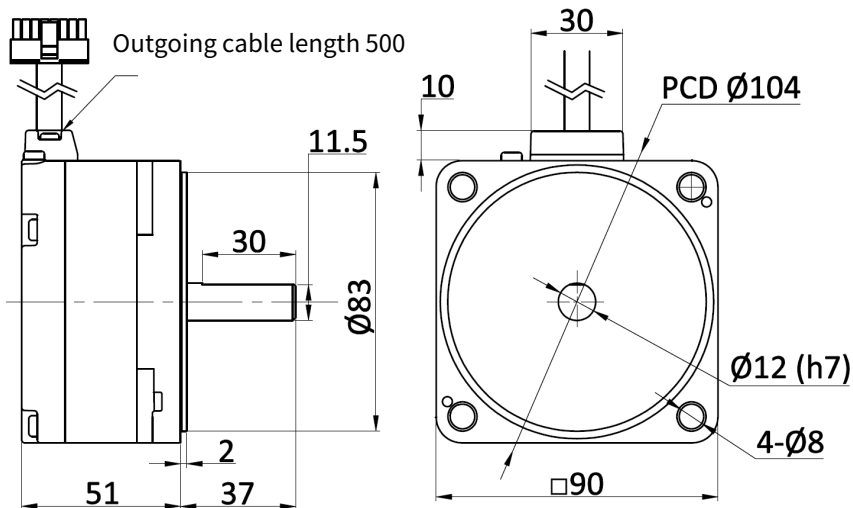
30W



50W



100W

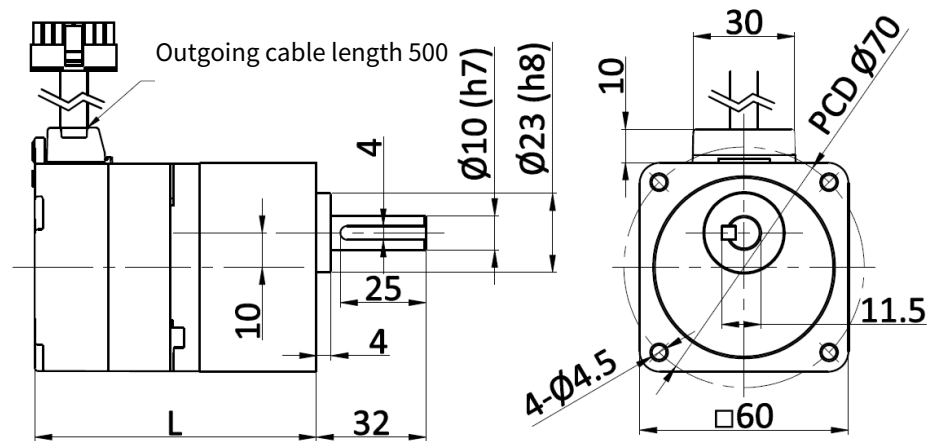


Unit:mm

4.2 Motor gear set

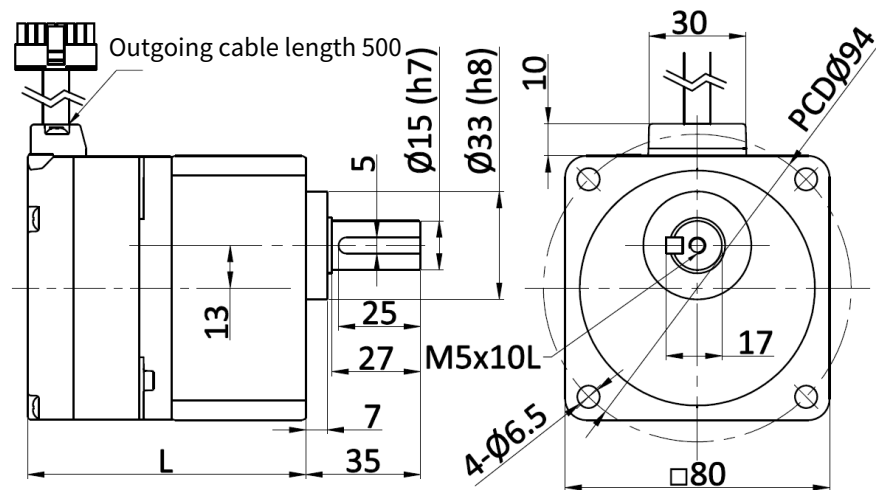
30W

Ratio	L
5~20	82
30~100	86



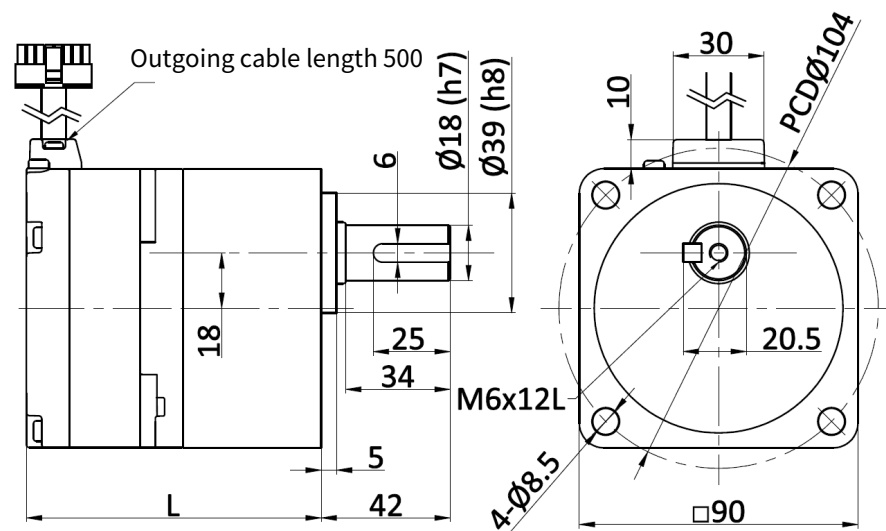
50W

Ratio	L
5~20	85
30~100	90



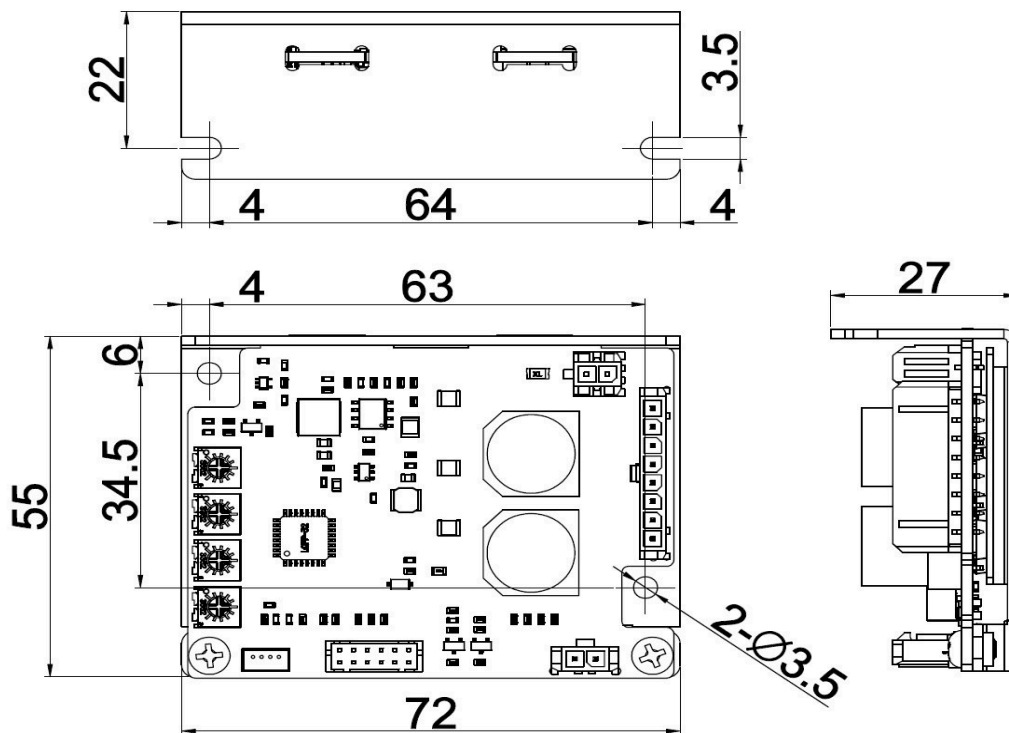
100W

Ratio	L
5~20	96
30~100	109

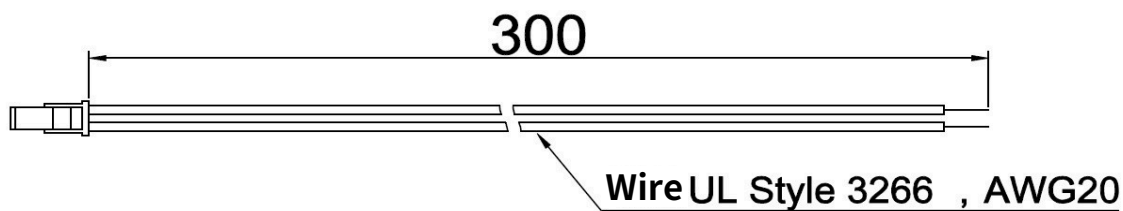


Unit:mm

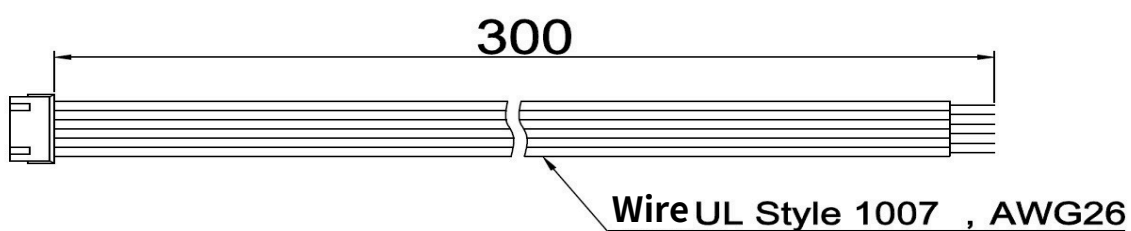
4.3 Driver



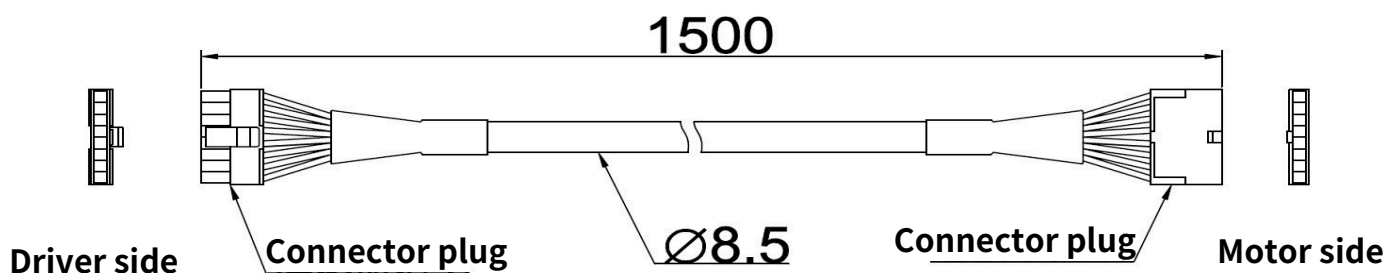
4.4 Driver power cable



4.5 Driver input signal cable



4.6 Power cable

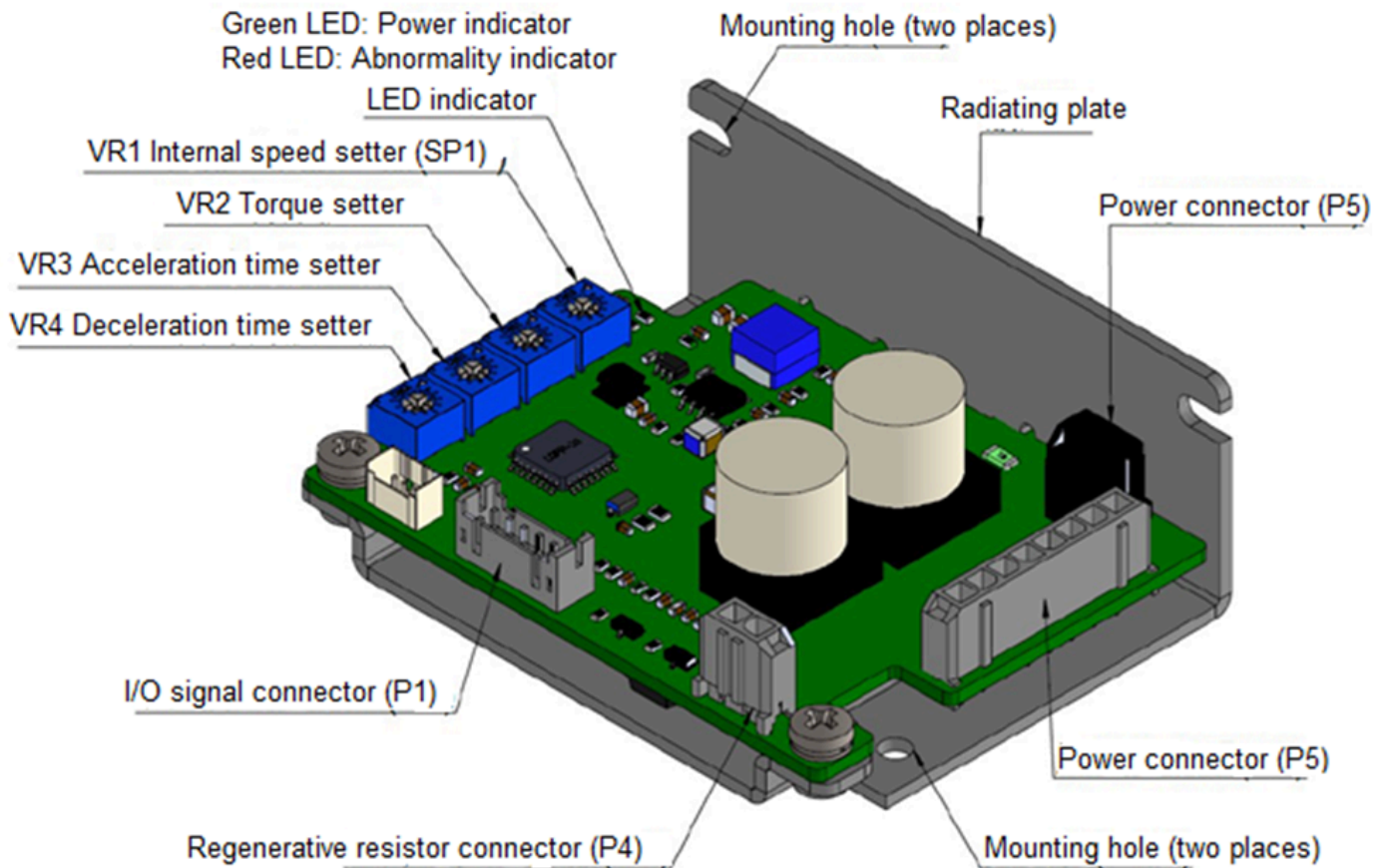


Unit:mm

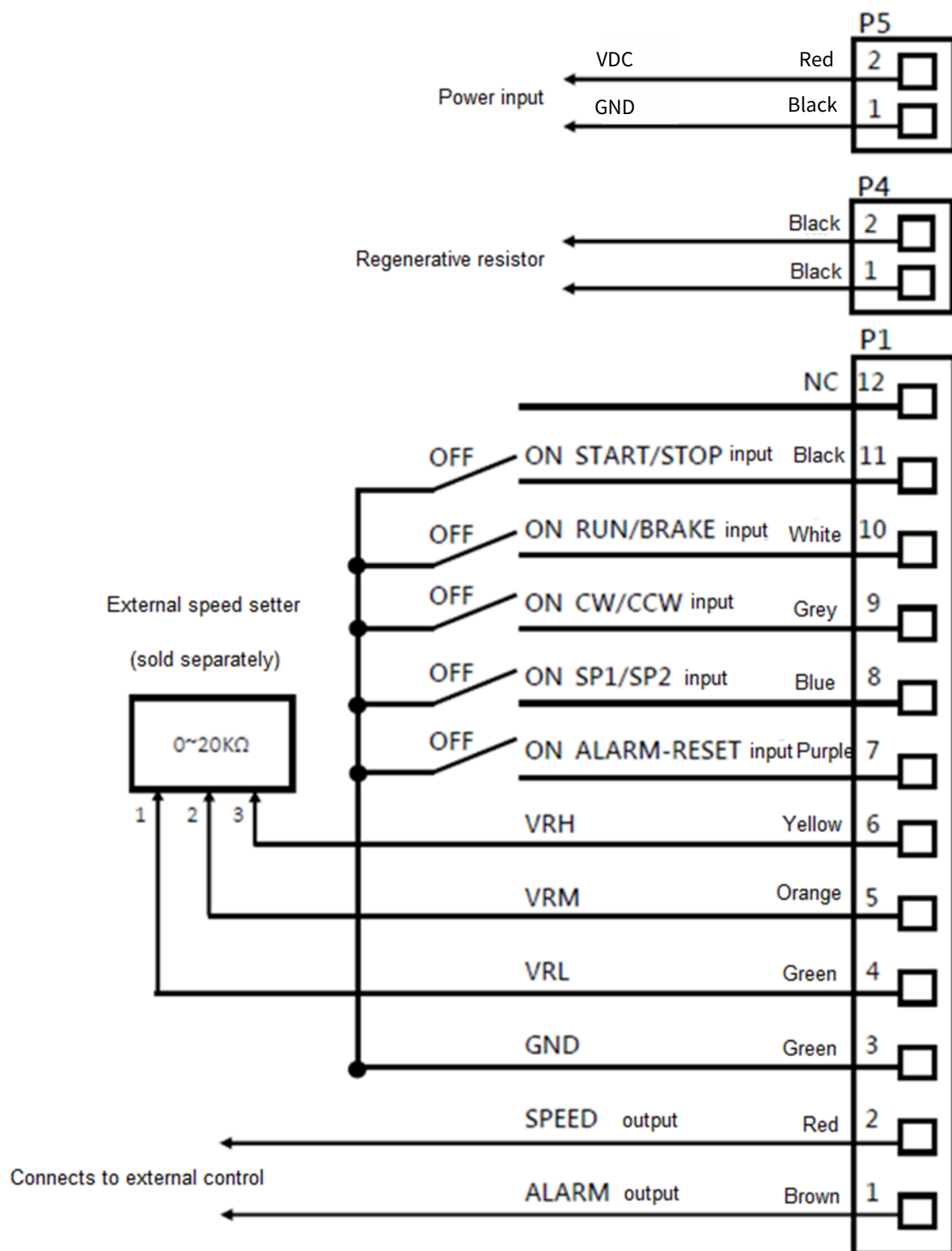
5 Operation Instructions

5.1 Driver Functions

The following are the descriptions of the names and main functions of each part of the driver.



5.2 Driver Wiring



※When the motor is used for inertia operation, using it with a regenerative resistor is recommended, with a regenerative resistance of 40Ω and regenerative power of 30W.

6 Operation

Warning

- Do not use ON/OFF on the power to start and stop the operation of the motor. Make sure to use the START/STOP input and RUN/ BRAKE input to do so, otherwise it may cause fire or personal injuries.

Note

- Please enter input signals at least 10ms apart, otherwise the motor may malfunction.
- The greater the friction load or inertia load, or the more frequent the starting-sudden stopping-reverse operation is, the faster the temperature of the motor rises. Please keep the surface temperature of the motor under 90°C, and the temperature of the driver's radiating plate must also be kept under 90°C.

▼ START/STOP input and RUN/BRAKE input

Use the START/STOP input or RUN/BRAKE input when switching between the operation and sudden stopping (or stopping) of the motor.

	START/STOP input	RUN/BRAKE input	Motor movement status
Signal level	ON	ON	Operating*1
	ON	OFF	Sudden stop
	OFF	ON	Stop*2

*1 For the motor operation, the speed is set according to the SP1/SP2 speed setter.

*2 When the motor is stopping, it is stopped according to the deceleration time.

Note

- Make sure to set the START/STOP input and RUN/BRAKE input to OFF before inputting power to the driver.
- When the START/STOP input and RUN/BRAKE input are both OFF, BRAKE has the highest priority.
- The actual acceleration and deceleration times are affected by the customer's usage conditions, load inertia and load torque, etc.

▼ CW/CCW input

CW is selected when ON. CCW is selected when OFF.

The running direction is the running direction of the motor output shaft as viewed from the output shaft facing the motor.

▼ SP1/SP2 input

SP2 is selected when ON; the value set by the external speed setter (sold separately) is valid at this time.

SP1 is selected when OFF; the value set by VR1 (internal speed setter) is valid at this time.

▼ Setting by internal speed setter (SP1)

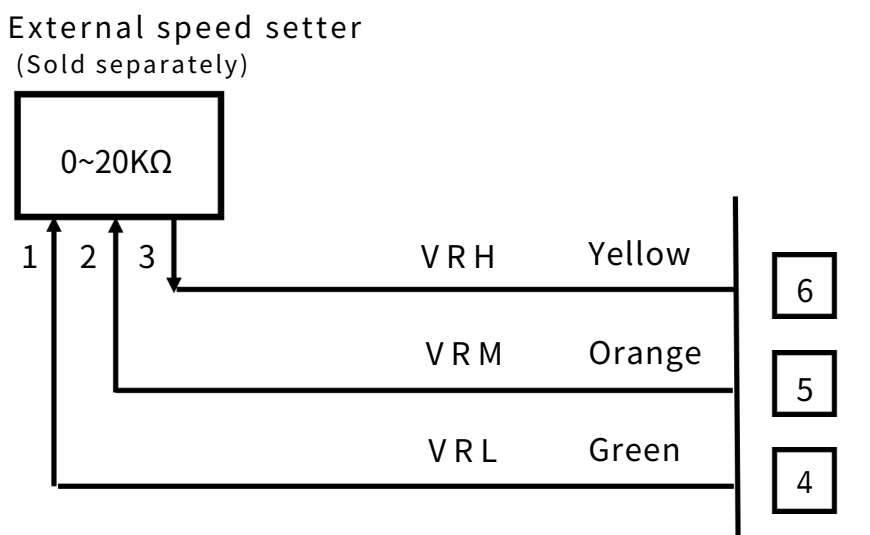
- Adjust and increase in a clockwise direction through the settings of VR1 (internal speed setter).
- Factory speed: 0 rpm
- An insulated screwdriver is required to adjust the setter.

▼ Torque range setting

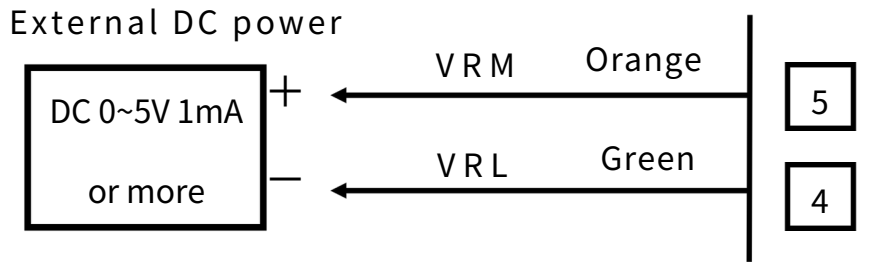
- Set through VR2 (torque setter).
- Factory torque: Max.
- Please adjust the setter with an insulated screwdriver.

▼ Using the setting of the external setter (SP2)

Connect PIN NO.4~NO.6 of P1.

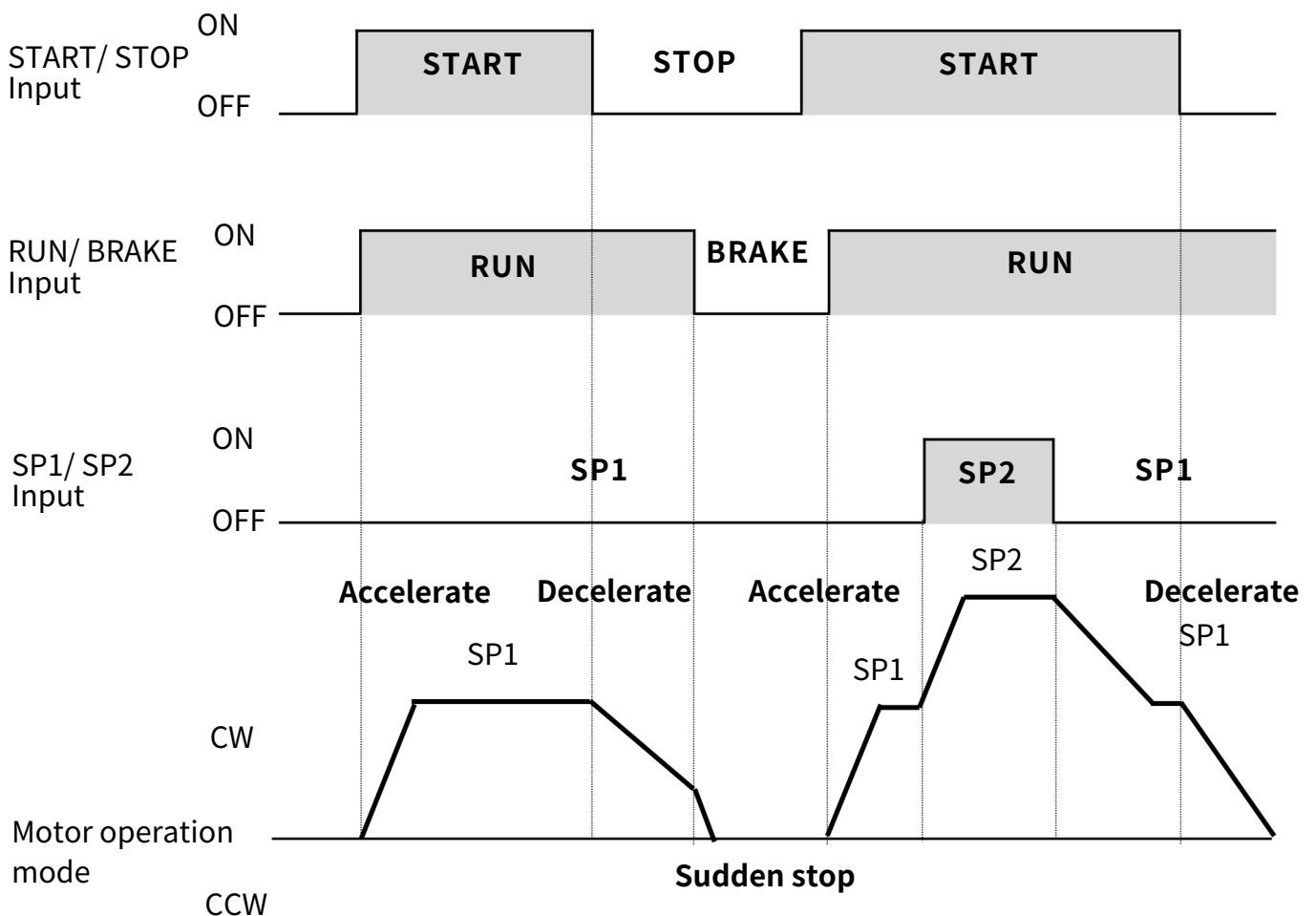


▼ Using the setting of the external DC voltage(SP2)



▼ Setting the acceleration time and deceleration time

Set through VR3 (acceleration time setter) and VR4 (deceleration time setter). Please adjust the setter with an insulated screwdriver. Adjust in the clockwise direction to increase time. Can be set within the range of 0.1~12 seconds. The acceleration time is the time from stopping to reaching the rated speed. The deceleration time is the time from the rated speed to stopping. The actual acceleration and deceleration times are affected by the usage conditions, inertia load, and motor load torque.

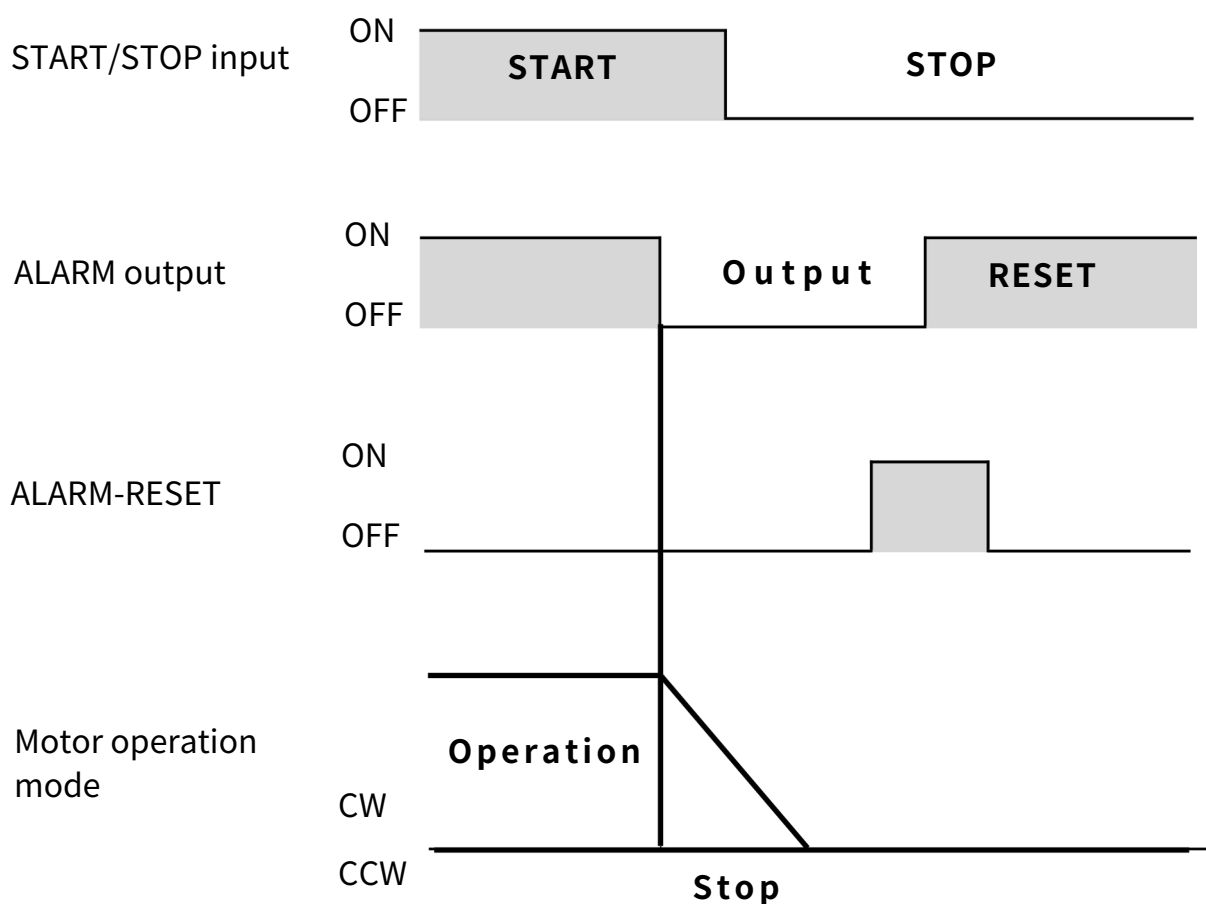


▼ ALARM-RESET input

When the protection function of the driver is active, please find the cause of the ALARM and eliminate it before restarting the motor; please refer to the fault descriptions for the ALARM output statuses.

When the motor is in the stop status, set the input signal of this ALARM-RESET to ON and the ALARM signal will be reset.

The START/STOP input must be set as OFF before inputting ALARM-RESET.



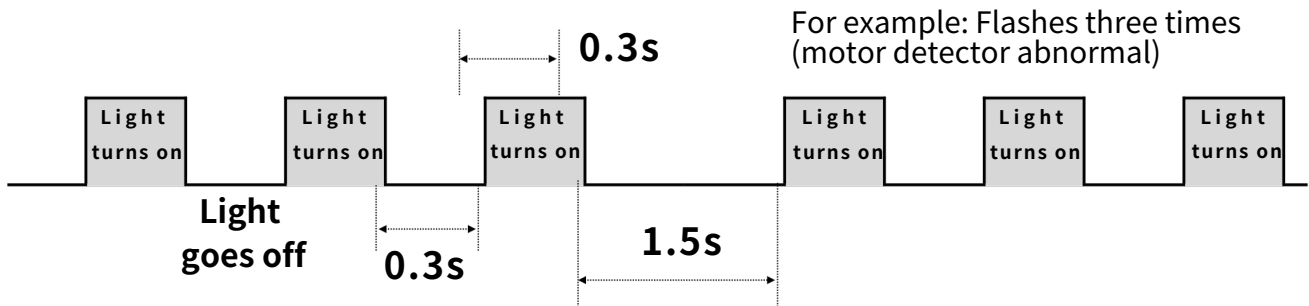
Note

- The START/STOP signal cannot be inputted until the ALARM reset operation is completed.
- Please perform ALARM-RESET input after the motor (reducer) output shaft has completely stopped.

▼ ALARM display

The protection function of the driver will be activated, and the ALARM output will be automatically switched OFF to stop the motor in the scenarios described below. At this time, the reason why the protection function is activated can be confirmed by the number of times the LED light flashes.

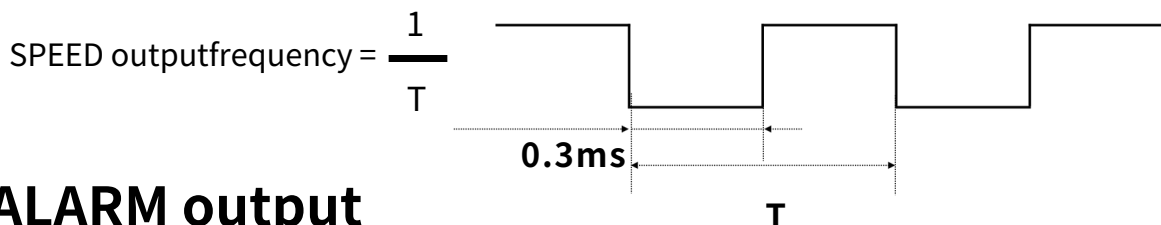
After the LED light flashes the number of specified times in the order of 0.3 seconds on and 0.3 seconds off, the light flashes repeatedly in the interval of 1.5 seconds.



▼ SPEED output

Synchronized with the motor operation; 30 pulse signals will be outputted for every revolution of the motor output shaft (pulse amplitude 0.3ms). The operation speed of the motor can be calculated by measuring the frequency of the SPEED output.

$$\text{Motor operation speed [r/min]} = \frac{\text{SPEED output frequency [Hz]}}{30} \times 60$$



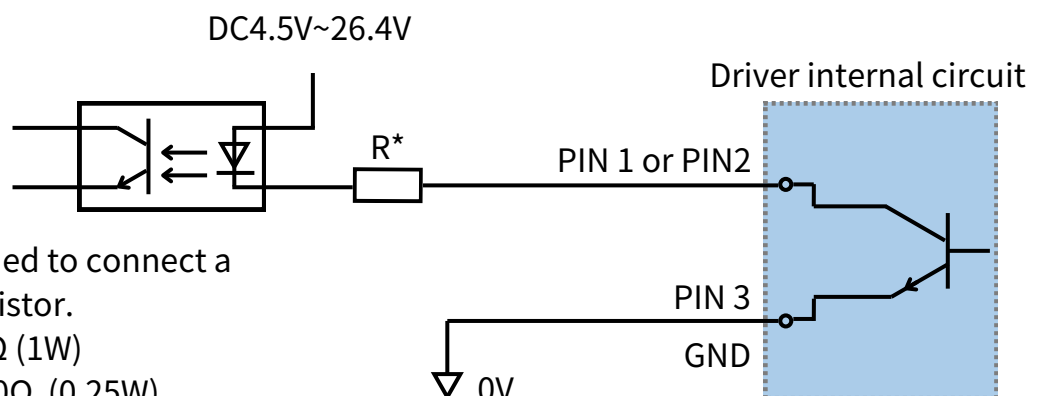
▼ ALARM output

The ALARM output is ON when normal and OFF when there is an alarm.

▼ Output circuit

The signal output of the driver is a transistor open-collector output.

The signal status does not represent the voltage level of the signal, but rather the state of the internal transistor: ON [powered] and OFF [not powered].

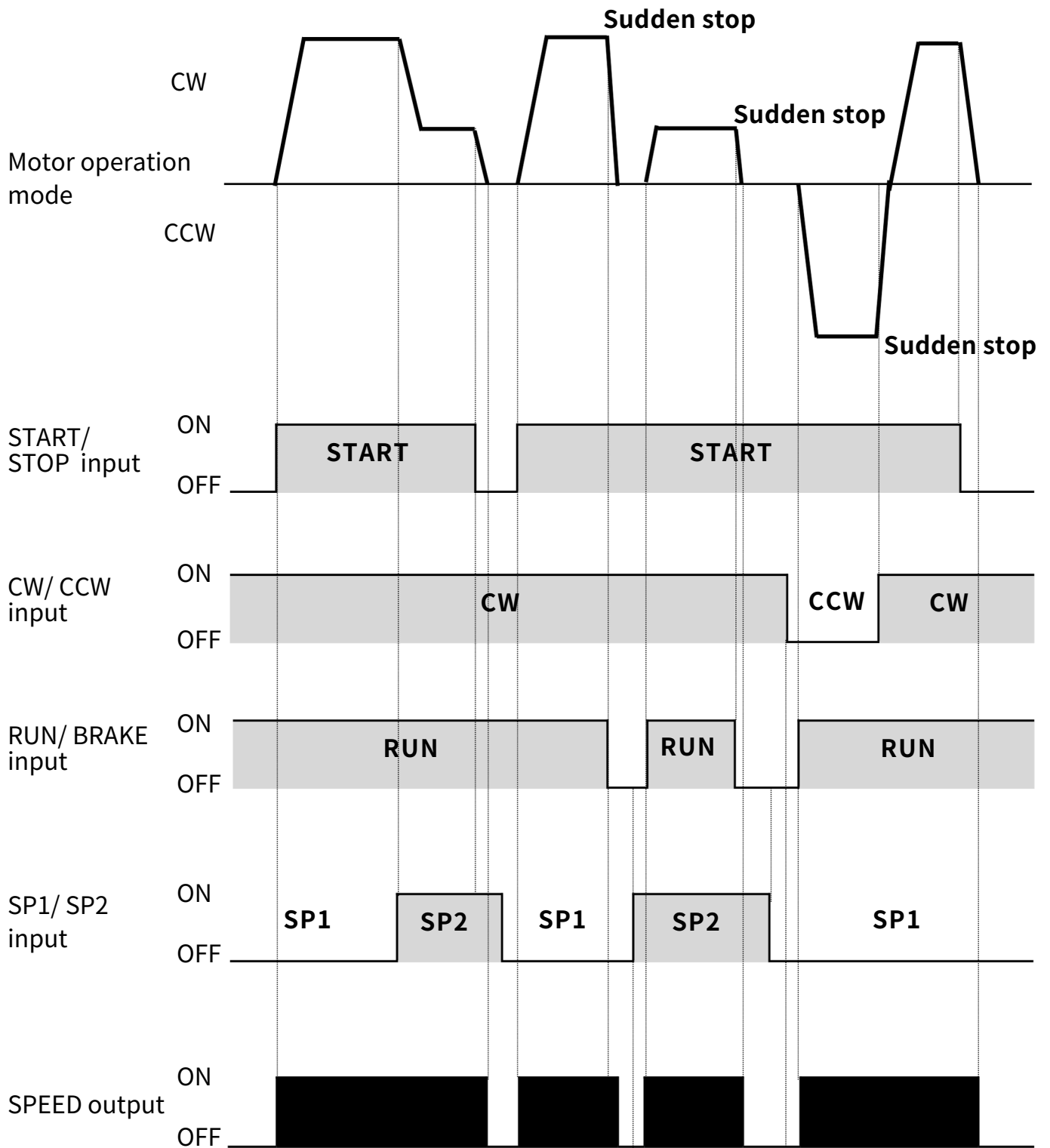


R^* : It is recommended to connect a current-limiting resistor.

DC24V: 2.7k Ω ~4.7k Ω (1W)

For DC 5V: 560 Ω ~820 Ω (0.25W)

▼ Sequence diagram



7 Warning Codes

Warning name	Number of times the light flashes for the warning	Cause of failure	Troubleshooting
Over-current	2	<ul style="list-style-type: none"> More than three times the load of the rated torque of the motor is applied to the motor. 	If it is still abnormal after resetting, increase the capacity of the motor or reduce the load.
Overload	3	<ul style="list-style-type: none"> When a load that exceeds the rated torque of the motor is applied to the motor for more than 5 seconds. Motor operated frequently within a short period of time-Stopped suddenly or when the operation direction was changed. 	If it is still abnormal after resetting, increase the capacity of the motor or reduce the load. °
Over-voltage	4	<ul style="list-style-type: none"> When performing roll-down load operation or when driving a load that exceeds the allowable load inertia. The voltage applied to the driver exceeds DC24V by approximately 15% or more. 	If abnormalities still occur when the input voltage is within the rated allowable range, send the product back to the dealer or original manufacturer for repairs.
Insufficient voltage	5	<ul style="list-style-type: none"> When the voltage applied to the driver drops below approximately 15% or more of DC24V. 	If abnormalities still occur when the input voltage is within the rated allowable range, send the product back to the dealer or original manufacturer for repairs.
Regenerative over-voltage	6	<ul style="list-style-type: none"> The regenerative voltage exceeds 25% 	Reduce load inertia.
Motor stalled	7	<ul style="list-style-type: none"> When the motor stalled for more than 2 seconds. 	Confirm whether the load end is stuck.
Over-speed	8	<ul style="list-style-type: none"> When the operation speed of the motor exceeds 3500r/min. 	If abnormalities still occur after the load is removed from the motor, send the product back to the dealer or original manufacturer for repairs.
Initial startup abnormal	11	<ul style="list-style-type: none"> When power is connected, both the START/STOP and RUN/BRAKE are ON 	Reconfirm the wiring.
Motor detector abnormal	12	<ul style="list-style-type: none"> The detector wires in the motor cable have fallen off or broken. 	If it is still abnormal after resetting, send the product back to the dealer or original manufacturer for repairs.

Warning

- When the protection function of the driver is activated, please eliminate the cause first and then release the protection function. Continuing to operate without eliminating the cause will cause the motor to malfunction or even cause injuries or equipment damage.

8 Troubleshooting

While the motor is operating, sometimes the motor and driver will malfunction due to reasons such as speed settings or wiring errors. When the motor cannot be operated normally, please refer to the table below and perform appropriate handling; if it still cannot operate normally, please contact Luyang Technology Co., Ltd.

Phenomenon	Possible cause	Handling method
Motor does not operate	START/STOP input is not ON	Confirm whether the START/STOP input is ON.
	The internal/external speed regulator was not adjusted	Please rotate the internal regulator in the clockwise direction. Set as 0 r/min by default.
Motor output abnormal	Torque regulator not adjusted	Rotate the torque regulator in the clockwise direction. Set as maximum torque by default.
Motor does not operate and stops midway	Protection function activated	Please confirm the number of times the LED flashes. Please refer to the fault description, check the reason why the protection function occurred and handle it.
The motor rotates in the opposite direction of the specified direction	CW/CCW input incorrect or poor contact	When the CW/CCW input is ON, the motor operates in the direction of CW. When the CW/CCW input is OFF, the motor operates in the direction of CCW.
	The reduction ratio of the installed gearbox is 1/30, 1/50, 1/100 product.	The operation direction is opposite to the direction of the motor when these reduction ratios are adopted; please reverse the CW/CCW input operations.

Phenomenon	Possible cause	Handling method
The motor movement is unstable and the motor vibrates greatly	There is an axial deviation between the motor (reducer) output shaft and the load shaft.	Please confirm the coupling status of the motor (reducer) output shaft and load shaft.
	There is noise interference	Please isolate the source where the noise occurs, rewire, change the shielding cable of the signal cable and install ferrite magnetic rings, etc.
Motor cannot stop immediately	It is possible that the load inertia is too large	Confirm by increasing the motor friction load to reduce the motor load inertia.
	Deceleration time set too long	Please confirm the settings of the deceleration time setter.

- If there is the need to improve the performance, specifications and appearance of the product, they may be changed without prior notice; please understand.
- If there are errors or anything missing in the contents of this instruction manual, please contact Luyang Technology Co., Ltd.

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