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SBS-N Series

DC Brushless Motor Driver User's Manual

Precautions

Precautions for using

1.Thank you for purchasing TROY products. Please read this user's manual thoroughly before installing and operating the driver, and always keep the manual where it is readily available.

2.The products described in this manual has been designed and manufactured for use in industrial machinery, and must not be used for any other purpose. We are not responsible for any damage caused through failure to observe this warning.

3.Check that the motor, driver and any accessories are all present. If an accessory is missing or damaged, contact the nearest our branches.

4.Never disassemble the motor and driver. Damage or performance impairment may result. Disassembly voids all warranties.

Precautions for maintenance

Check the ambient environments, clean the system equipment to remove dust and tighten the screws periodically. Also pay attention to the followings.

1. Contact us when repairs become necessary.
2. Since the temperature of the frame of the driver can rise high, be careful when conducting maintenance work or inspection work.

Precautions for warranty period

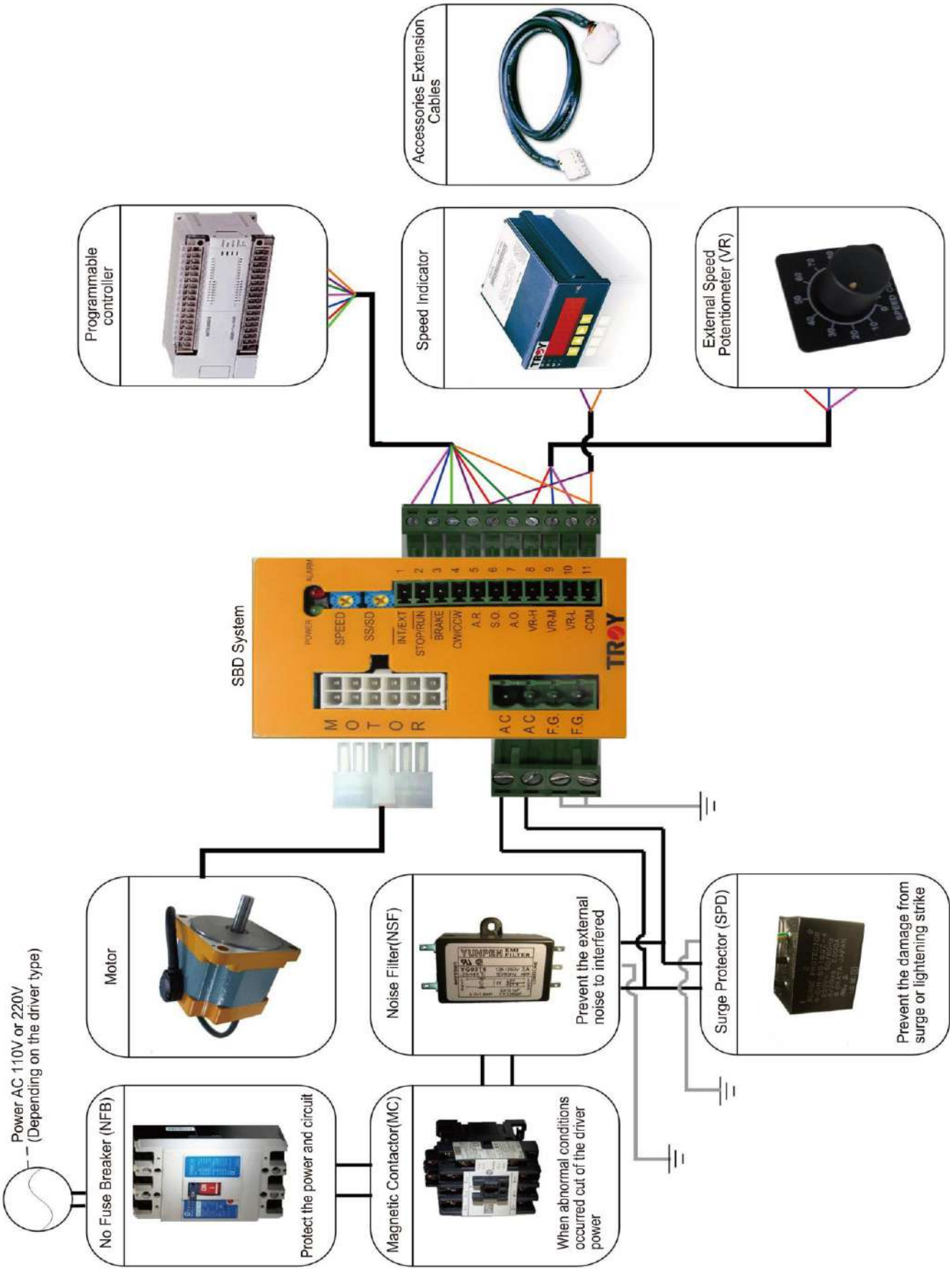
Within the period of one year after delivery of the system equipment, when failures occurring from design error or fabrication error attributable to the manufacture side occur, we will be repairing the failure free of charge within the reparable range or will replace with substitute. (We cannot hold ourselves responsible for breakage and accidents occurring from your use beyond the specified range described in this document.)

Precautions for disposal

When disposing of the driver and the motor, treat them as ordinary industrial waste.

Contents

1.System diagram



2. Specification

2.1 Specs

Motor output			20W	40W	60W	90W
Round shaft			6B020S-□N	6B040S-□N	6B060S-□N	6B090S-□N
Pinion shaft			6B020P-□N	6B040P-□N	6B060PD-□N	6B090PD-□N
Input Power	-Type 1 AC110~115V 50 / 60 Hz	Max Current	2.4A	2.4A	2.5A	2.9A
		Rated Current	0.59A	0.99A	1.48A	1.93A
	-Type 2 AC220~230V 50 / 60 Hz	Max Current	1.7A	1.7A	1.7A	1.7A
		Rated Current	0.33A	0.56A	0.82A	1.05A
Starting torque (Kgcm/Nm) Rated Torque (Kgcm/Nm)			1.5/0.15 1.0/0.10	2.5/0.25 2.0/0.20	4.5/0.45 3.0/0.30	6.5/0.65 5.0/0.50
Permissible load inertia (GD^2)			14.01Kgcm^2	23.23Kgcm^2	39.42Kgcm^2	54.23 Kgcm^2
Speed range			250~2000rpm (Rated toque output)			
Speed variation	To load		-1% (at 2000 rpm with no-load ~rated load)			
	To voltage		±2% (Power voltage variation：-1 type is±15%,-2 type is±10% at 2000rpm under no load)			
	To temp.		±2% (0~40℃, at 2000 rpm with no-load)			
Speed Control			●Controlled by the external speed potentiometer (Variable resistor at 20 kΩ) ●Controlled by the internal speed potentiometer (External/ Internal speed setting switch) ●Controlled by DC voltage (at DC 0~5V / Min 1mA)			
Signal Input			●Photocoupler input interface ●Stop/Run input, Brake input, CW/CCW input, External/ Internal speed setting switch ●ALARM clear input			
Signal Output			●Open Collector output interface ●Speed signal and ALARM signal output			
Functions			●Input/output signal contact which can connect to PLC I/O contact control directly ●Motor flat torque output within 250~2000RPM ●It has instantaneous brake stop, clockwise/ counterclockwise, natural stop, External/ Internal speed setting switch, slow start/slow down ●When brake stop it has electrical holding torque function ●The protection function activated, motor will stop and the 「ALARM」 red light lit up during motor over load /over heat/driver over voltage/ driver low voltage/motor cable broken			

※Please fill the power in the box－□, "1"indicates AC110~115V;"2" indicates AC220V~230V

2.2Motor/Driver specs

Item		Driver	Motor
Insulating resistance		When tested with DC500V high resistance meter, the resistance between power, F.G ground, and I/O contact terminal is over 100MΩ.	When tested with DC500V high resistance meter, the resistance between wires and motor case is over 100MΩ.
Dielectric strength		No abnormal condition when supplying 1.8KV/60Hz voltage between the power and the F.G ground connection terminal and 3KV/60Hz voltage between the power and I/O connection terminal for one minute.	No abnormal condition when supplying 1.8KV/60Hz voltage continued 1 sec.
Environmental conditions	Temperature	0~40℃	0~50℃
	Humidity	Within 85%	
	Atmosphere	No corrosive gases, dust, water, or oil	

3. Verifying the product name and accessories

Upon opening the package, verify that the items listed below are included then install, wring and operating. If there is any problem, please contact our branch.

3.1 Verifying the content of package

●Round type/Pinion type

Item	Quantity
Driver	1
Mounting plate （Attached with flat screwsX4PCS）	2
Variable resistor	1
Signal insulated cable（For variable resistor）	1
Connector (11 pins&4 pins)	2
User's manual	1
Motor	1

※Note：The pinion type has to attached with「GEARHEAD」then it can install

3.2Verifying the product number code

●If you purchased is the 「Round type」please check the combination as below：

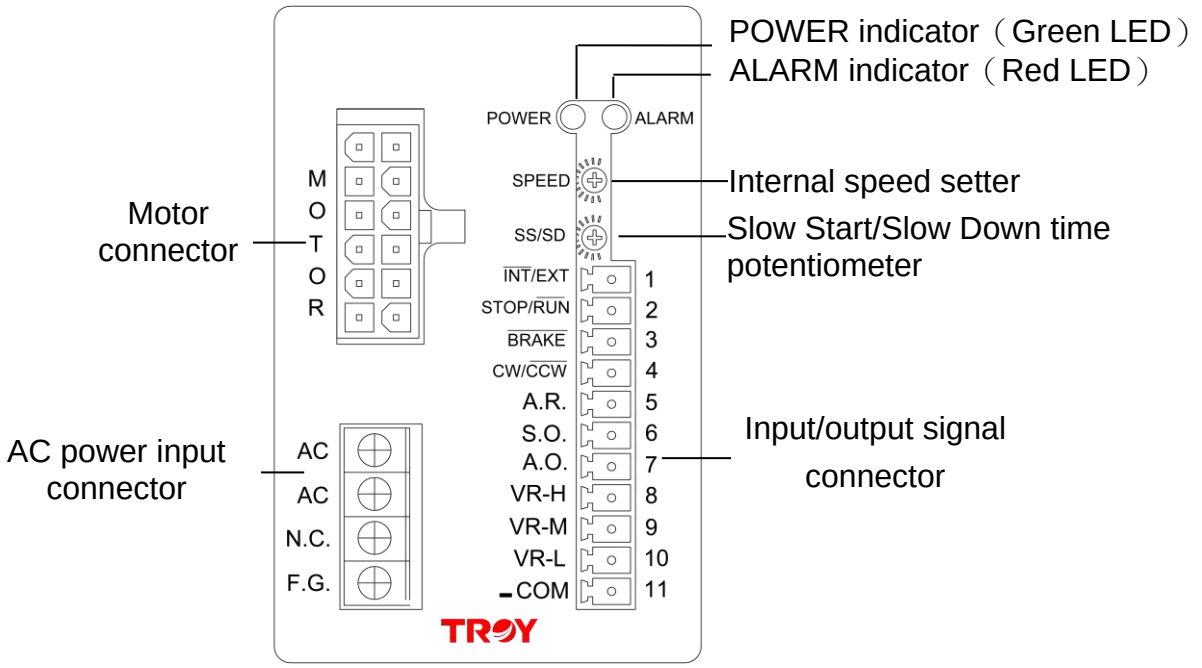
Power	Voltage spec	Name of motor	Name of driver
20W	AC110V~115V	6B020S-1N	SBD020-1N
	AC220V~230V	6B020S-2N	SBD020-2N
40W	AC110V~115V	6BS040S-1N	SBD040-1N
	AC220V~230V	6BS040S-2N	SBD040-2N
60W	AC110~115V	9B060S-1N	SBD060-1N
	AC220~230V	9B060S-2N	SBD060-2N
90W	AC110V~115V	9B090S-1N	SBD090-1N
	AC220V~230V	9B090S-2N	SBD090-2N

●If you purchased is the 「Pinion type」please check the combination as below：

Power	Voltage spec	Name of motor	Name of driver	Name of gearhead
20W	AC110V~115V	6B020P-1N	SBD020-1N	6D□
	AC220V~230V	6B020P-2N	SBD020-2N	
40W	AC110V~115V	6B040P-1N	SBD040-1N	6D□
	AC220V~230V	6B040P-2N	SBD040-2N	
60W	AC110~115V	9B060PD-1N	SBD060-1N	9D□
	AC220~230V	9B060PD-2N	SBD060-2N	
90W	AC110V~115V	9B090PD-1N	SBD090-1N	9D□
	AC220V~230V	9B090PD-2N	SBD090-2N	

※Note：If you purchased is the 「Pinion type」please select the 「GEARHEAD」to attached with

4. Function of driver



Driver panel

Item	Functions			
Motor connector	Please insert the motor cable			
AC power input connector	Please input the AC power voltage according to the specs of driver 「AC」contact：Please connect power line N and L 「FG」contact：Please contact to frame ground of the system 「NC」contact：Not used Note：The mark of driver voltage specs 「-1N」indicates → Single phase AC110~115V 50/60Hz 「-2N」indicates → Single phase AC220~230V 50/60Hz			
Power LED(Green)	When AC power is on, the 「POWER」green light on the front panel will lit up			
ALARM LED (Red)	The protection function activated, motor will stop and the 「ALARM」red light lit up during motor over load/ driver low voltage/driver over voltage			
Slow Start/Slow Down time potentiometer	SS(Slow-start) Acceleration time about 8 sec (0~2000RPM within no load) SD(Slow-down) Deceleration time about 7 sec (2000RPM~0RPM within no load)			
Input/Output signal connector	No.	Name of panel	Name of function	Function
	1.	$\overline{\text{INT}}$/EXT	Internal and external speed switch	Input signal level「L」→Internal speed 「H」→external speed ※2
	2.	STOP/ $\overline{\text{RUN}}$	STOP/RUN	Input signal level「L」→Start 「H」→Stop
	3.	$\overline{\text{BRAKE}}$	Brake stop	Input signal level「L」→Brake stop 「H」→Stop normally
	4.	CW/$\overline{\text{CCW}}$	Clockwise rotation input/Counterclockwise	Input signal level「L」→Counterclockwise

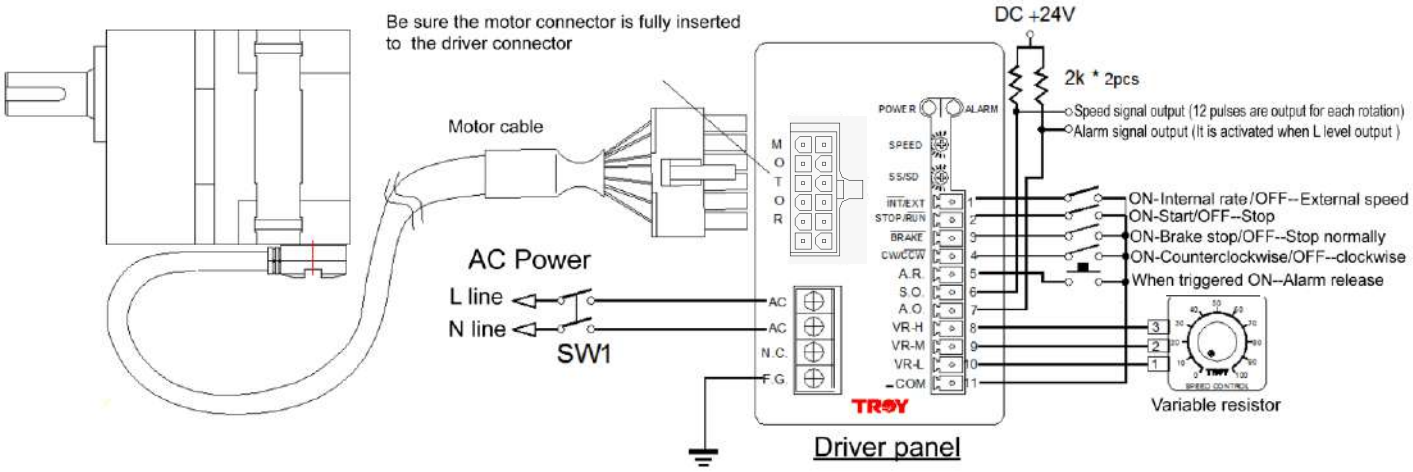
			rotation input	rotation 「H」→Clockwise rotation
	5.	A.R.	A ALARM release	Alarm Reset, input「Negative trigger signal」→ALARM release
	6.	S.O.	Speed output signal	Used when monitoring the rate of rotation, pulse signals output 12Pulse/ rotation
	7.	A.O.	ALARM output signal	The signal is output when motor overload/overheat/driver overvoltage/driver low voltage/motor cable broken. At the same time motor will stop normally
	8-10.	VR-H/M/L	External speed potentiometer	Setting motor rotation speed via connecting speed potentiometer or DC voltage(0~5V)
	11.	-COM	Control signal power GND	Ground terminal for input/output signals and external DC power GND

※ 1.Acceleration/Deceleration time will be different because of load type (ex：Inertia, friction)

※ 2.「L」means contact connected with「-COM」;「H」means no connect (For details please refer to the wiring)

5. Wiring and operation

5.1 Wiring diagram



※Note 1：Do not operate ON/OFF simultaneously for input contacts.

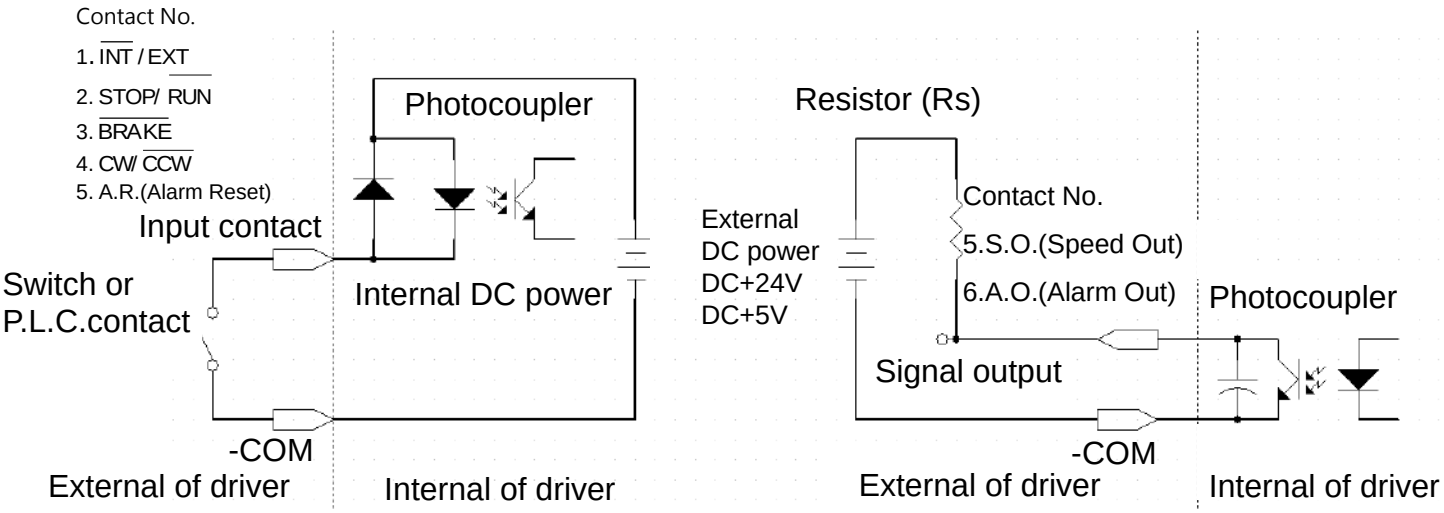
※Note 2：It takes 0.3 seconds after entering a stop command to give a direction change command.

5.2 Noise interference prevention

Noise interference channel	Preventive measures
Input/output signal cable	1. Arrange short-distance wiring and the wire should be less than 2m long. Separate the signal wires from the power cords and the spacing should be over 30cm. 2. When using the external potentiometer (VR) or DC voltage for speed control, use the signal line provided with the unit.
Motor－Driver Connection cable	1. The motor and the driver should be connected with cables. In case of long-distance wiring, please use the optional extension cable to ensure proper wiring. 2. Separate these wires from the power cords and the spacing should be over 30cm.
Power cable	1. Supply the driver with a separate AC power. Do not share the power supply for those devices with radiating noise sources (e.g., High frequency, ultrasonic, welder or thermo coupler etc.) If necessary, please install the "No fuse braker" (NFB) to prevent the surge current. 2. For the F.G. connection on the driver, use the type 3. It is grounding with short-distance and coarser diameter wires. 3. Install a noise filter in front of the AC power input to shield off external noise interference.

5.3 Signal input and output

●Input circuit



Circuit specs of input surface	**Circuit specs of output surface**
1.Photocoupler interface circuit and the power supplied by internal DC power. 2. 「INT/EXT 」「STOP/ RUN 」「BRAKE 」「CW/CCW 」contact and acted mode in 「N.C. Normally closed switch」or「Normally Open switch」. 3.「A.R.」contact acted mode is 「Push button switch」triggered time continue more than 10ms after Alarm released then loose the switch.	1.Open collector circuit output mode which need external DC power voltage and the voltage value less DC 26V, connected resistor（Rs）and keep current value less 20mA. 「S.O.」、「A.O.」signal output via 「Signal output contact」which can measured by voltmeter and the 「external DC voltage」is the level during normal, the 「0V」is the level during action External DC voltage： At DC+24V Rs=1.2kΩ At DC+5V Rs=200Ω

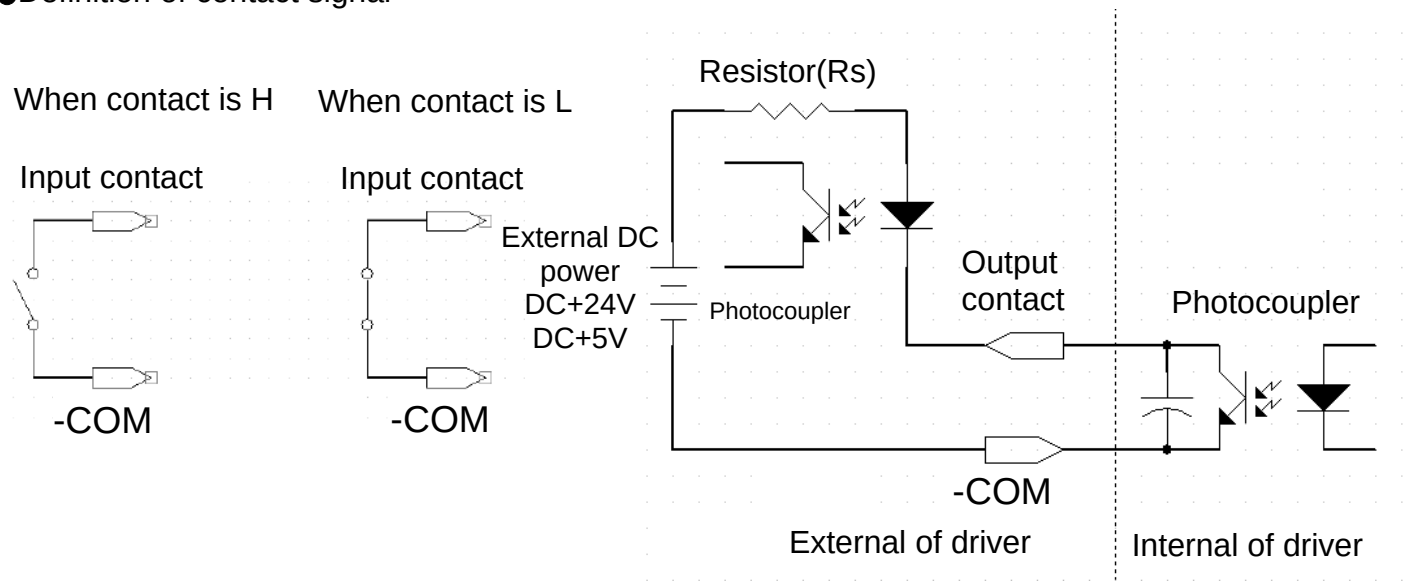
Description of input contact

Contact function	Signal condition	Action
INT/EXT	H	External speed
	L	Internal speed
STOP/RUN	H	Stop operation
	L	Start operation
BRAKE	H	Natural stop
	L	Brake stop
CW/CCW	H	Clockwise
	L	Counterclockwise
A.R. (Alarm reset)	H	Alarm monitor
	L	Alarm release

Description of output contact

Contact function	Signal condition	Action
S.O. (Speed out)	Pulse signal Minus logical Active "L"	Speed signal output and pulse speed is 1 msec Motor output 12 pulses every rotation
A.O. (Alarm output)	Minus logical Active "L"	Driver output the signal and the ALARM LED(Red) lit up

●Definition of contact signal



5.4 Operation

●Operation mode setting

Signal input Operation mode	STOP/$\overline{\text{RUN}}$	$\overline{\text{BRAKE}}$	CW/$\overline{\text{CCW}}$	**A.R. (Alarm Reset)**
Instantaneous clockwise/ counter clockwise	L	H	H→Instantaneous clockwise L→Instantaneous counterclockwise	H
Brake stop	L	L	H or L	H
Brake stop then start or slow start＊	L	L→H	H or L	H
Naturally stop or slow down＊	L→H	H	H or L	H
Naturally stop then start or slow start＊	H→L	H	H or L	H
Alarm release	H	H	H or L	H→L→H 「L」continued 10ms

「＊」indicates Slow Start/Slow Down time potentiometer，default value is「0」

Cautions：

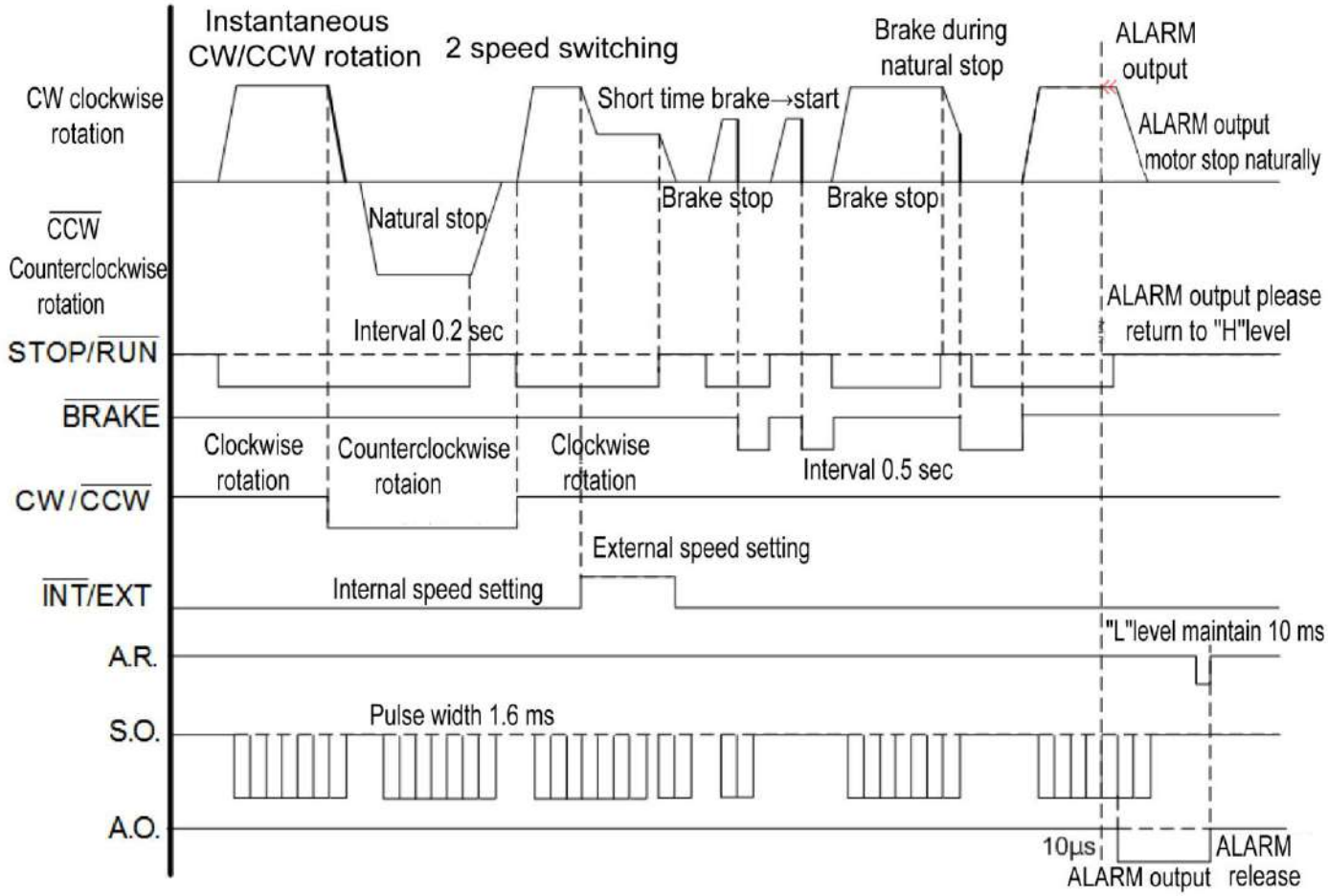
1.A.R. (Alarm Reset) signal：When motor operated, please maintain at「H」to make sure the 「Alarm monitor 」circuit of internal driver operated normal.

If maintain at「L」and driver has Alarm condition, the protection functions cannot work A.O.(Alarm Out) cannot output the signal which will cause the driver damage easily so please pay attention to edit the control procedure.

2.「A.O.」signal output with ALARM led lit up and return the「STOP/$\overline{\text{RUN}}$」to 「H」which can avoid the unexpected start operation during ALARM release

3.Please do not control the motor start/stop operation by 「Power SW」and motor will start operation while power is turn on. But it will occur the surge current and cause the driver damage easily.

●Driver operation timing chart



5.5 Alarm protection function

The protection function activated when Motor over load/over heat/over voltage/low voltage/cable broken and motor stop, the「ALARM」LED(red) lit up at the same time.「A.O.」output contact will output「H」level and change to the「L」level.

Type of protection function	Description
Over load	Activated when a load exceeding the rated torque is applied to the motor for 7 sec
Over heat	The protection function will be triggered when the internal heat sink temperature of the driver exceeds 80℃
Over voltage	1.The protection function will be triggered when the motor operates with loads exceeding the permissible load inertia, or when the motor is used in up and down vertical movements. 2.During motor operation, the AC power voltage AC 110V or AC 220V which input to the driver is over 35%
Low voltage	During motor operation, the AC power voltage AC 110V or AC 220V which input to the driver is lower than 20%
Cable broken	Motor cable was broken

Note：If there is any exceptional conditions during motor running, please turn the driver's

「POWER SW 」OFF, then do the wiring, check the load and power voltage. When the exceptional conditions eliminated and repeat the above-mentioned steps. At this time 「ALARM」light will go out.

After electrify the 「ALARM」light lit up, please contact to our local seller.

「ALARM」release：(1)「A.R.」input contact keep at the「L」condition 10ms then back to the「H」condition.
(2)Please turn the「POWER SW」OFF more than 5sec then input the power.

5.6 Connection

●Connecting the motor

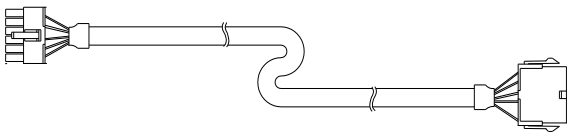
The motor is connected to the driver using the connectors provided. Be sure the motor connector is fully inserted to the driver connector. Please turn the 「POWER SW」OFF while connecting which avoid the improper connection to cause the driver damaged.

The cable can be extended to a maximum of 10m using an extension cable (Sold separately). Please choose the suitable extension cable while ordering.

The total length from motor to driver＝Motor lead length 60 cm+ Extension cable length

Model of extension cable	Length(m)
CB-010	1
CB-020	2
CB-030	3
CB-050	5
CB-070	7
CB-100	10

Extension cable



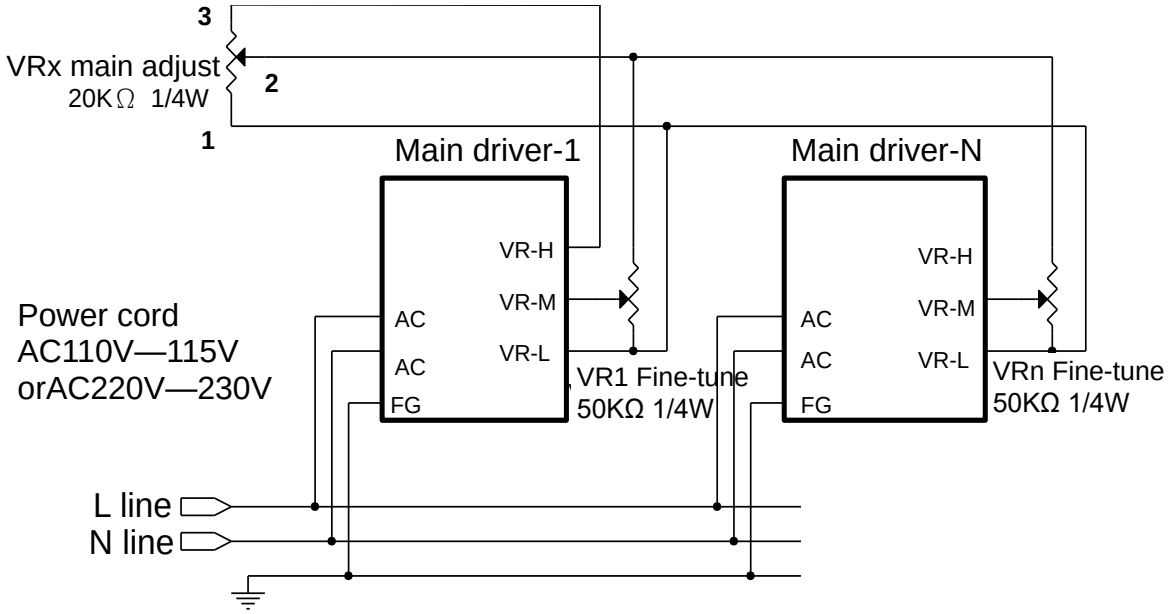
※Actual cable length = Required length + 10cm

●Connecting the AC power

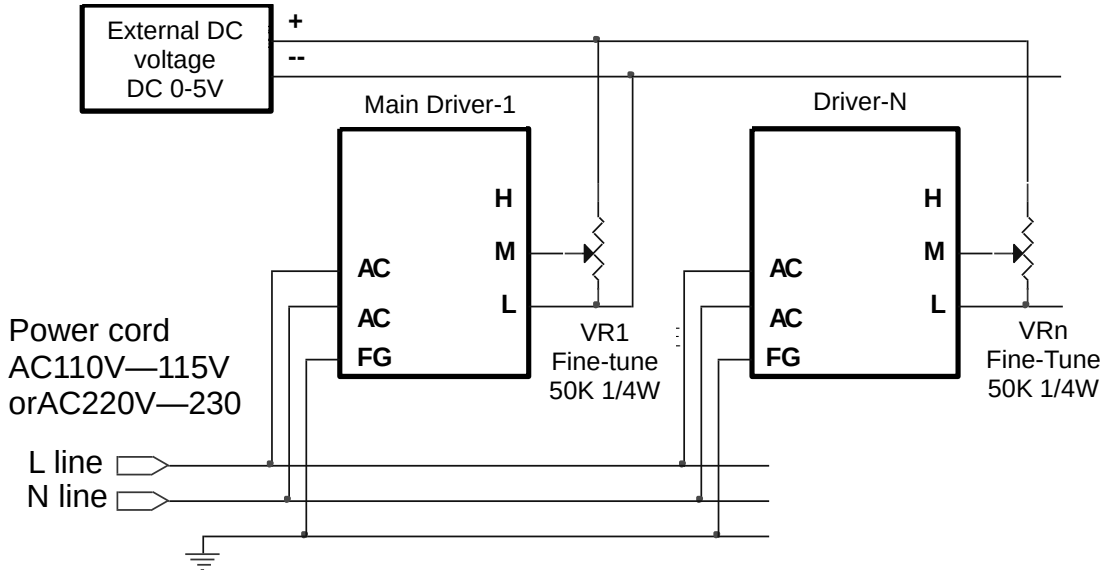
The CE and UL certified terminal board shall be used for the power input. When connecting the driver, fix the power supply wire at the terminal (4-pin accessory) and then insert the terminal into the power terminal jack on the driver. Use AWG18 power source cable (in profile over 0.75mm2). The driver power ground (FG) terminal should be connected with Class 3 grounding. Use as short grounding wires as possible (The ground impedance should be less than 100Ω).

5.7 Parallel operation and multi-speed control

∗External potentiometer



∗DC power



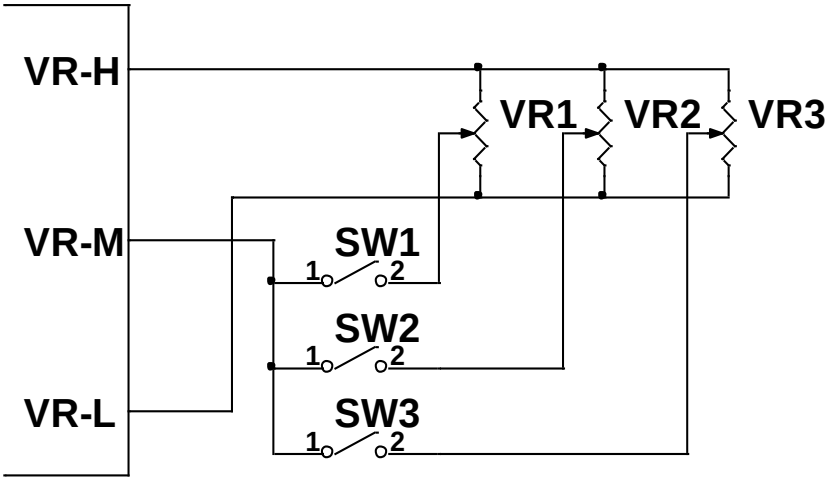
Using the DC power		Using an external speed driver	
DC voltage setting range	DC 0 ~ 5V	Main adjusting resistor VRx	20 (KΩ) 1/4W
DC current capacity	1 mA / units		
Main driver-1 fine-tune resistor VR1 driver-N fine-tune resistor VRn	50 KΩ1/4W 50 KΩ1/4W	Main driver-1 fine-tune resistor VR1 Driver-N fine-tune resistor VRn	50 KΩ 1/4W 50 KΩ 1/4W

1."N" represents the number of driver for the parallel operation, and do not use over 10 drivers for the parallel operation.

2.Be sure to connect the fine-tune resistor VR1~fine-tune resistor VRn, so as to adjust the speed difference between each motor.

3.Except for the collective connection of main adjusting DC voltage/resistor VRx, other output/input control signals should be connected to each driver separately.

●Multi-speed control



3-step speed switching control			
SW3	SW2	SW1	Resistance
OFF	OFF	ON	VR1
OFF	ON	OFF	VR2
ON	OFF	OFF	VR3

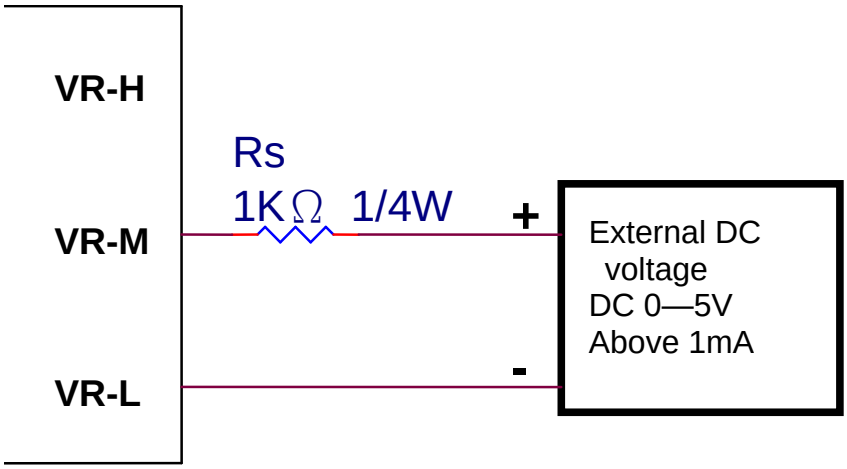
Note：

1.It is recommended to use 20KΩvariable resistor for VR1, VR2 and VR3 (But do not below 10KΩ).

2.The higher the resistance value is, the higher the voltage and the faster the speed.

3.If there required over 3-step speed control, please contact our customer service depart.

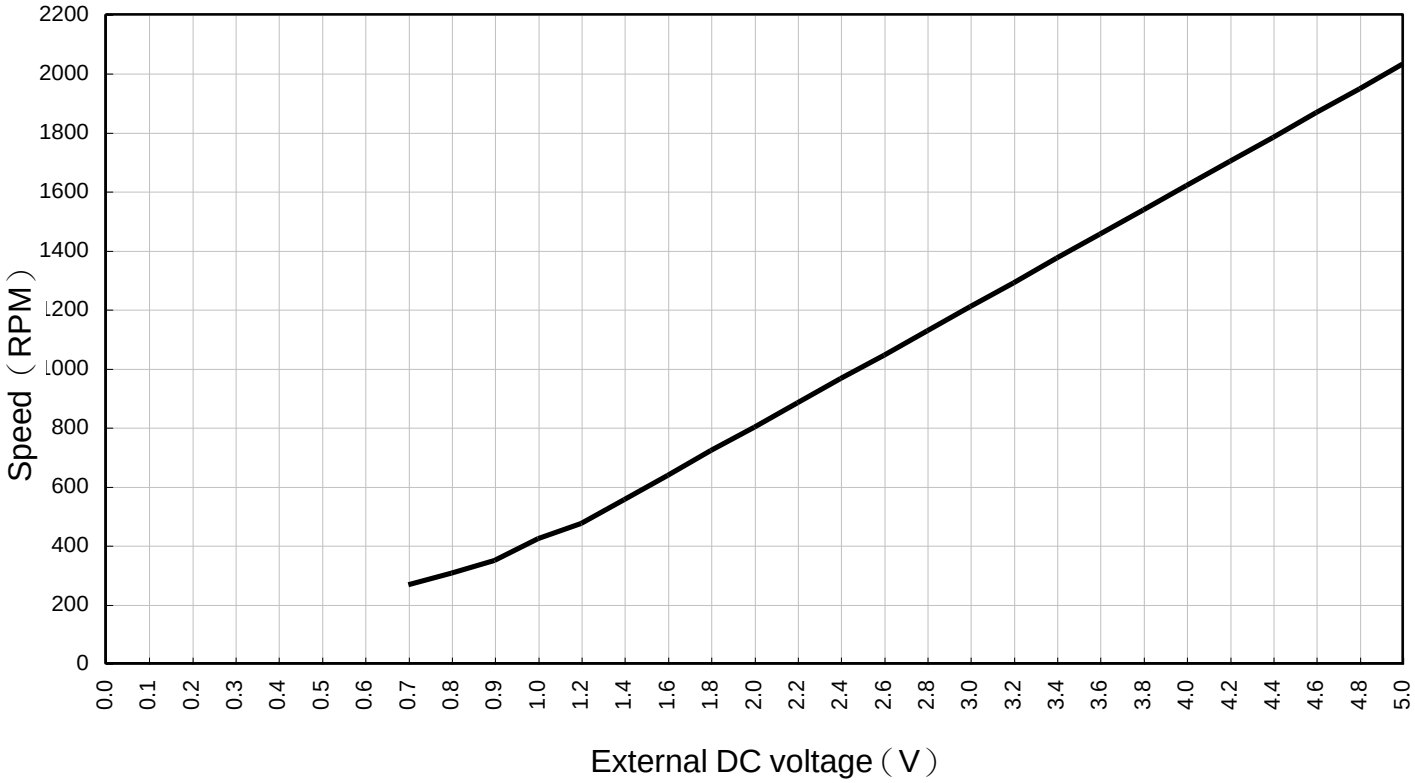
∗Speed controlled by external DC voltage



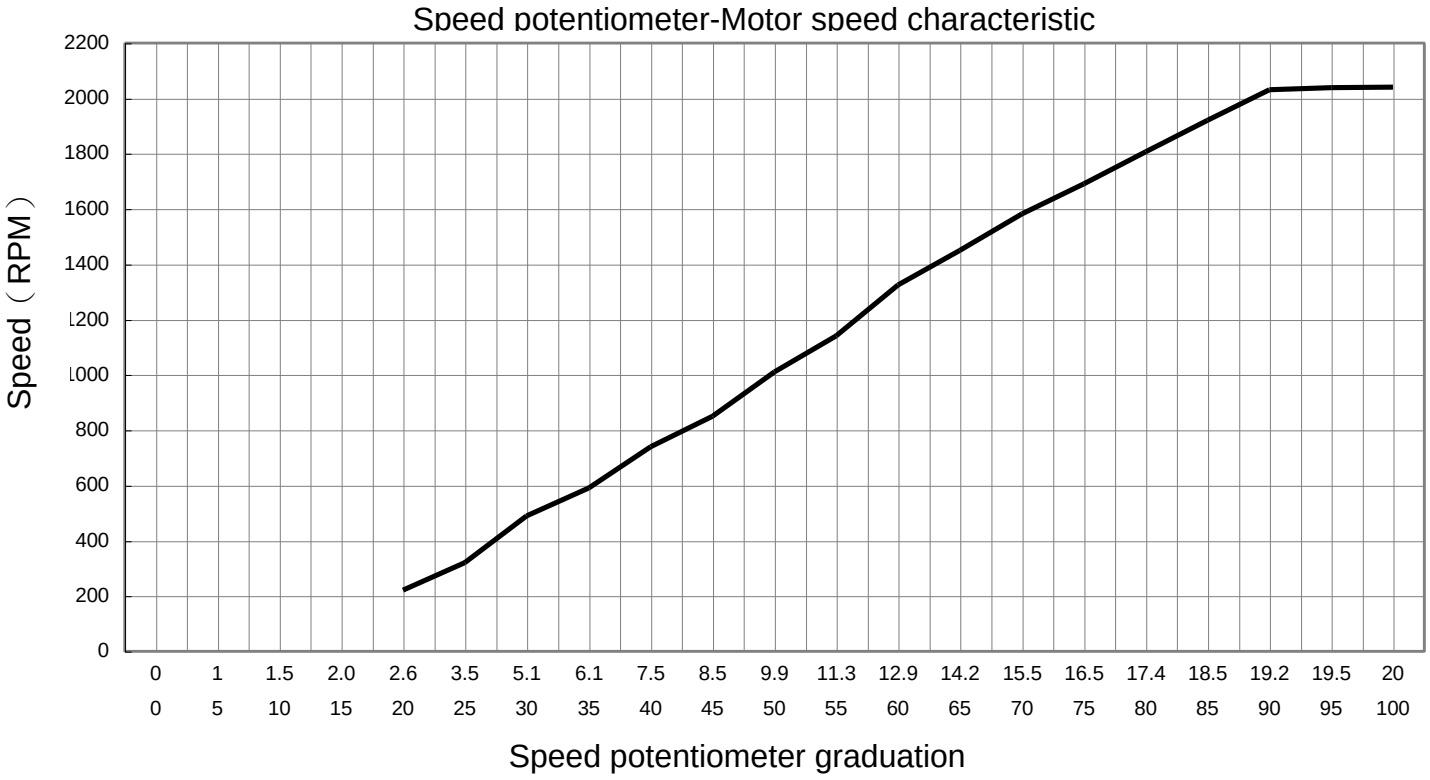
Note：

1. The external DC power output must be connected in parallel with the Rs resistor 1KΩ, 1/4W.
2. Please use the output-insulating DC power supply with ∞ output impedance.

●External DC voltage－Motor speed characteristics

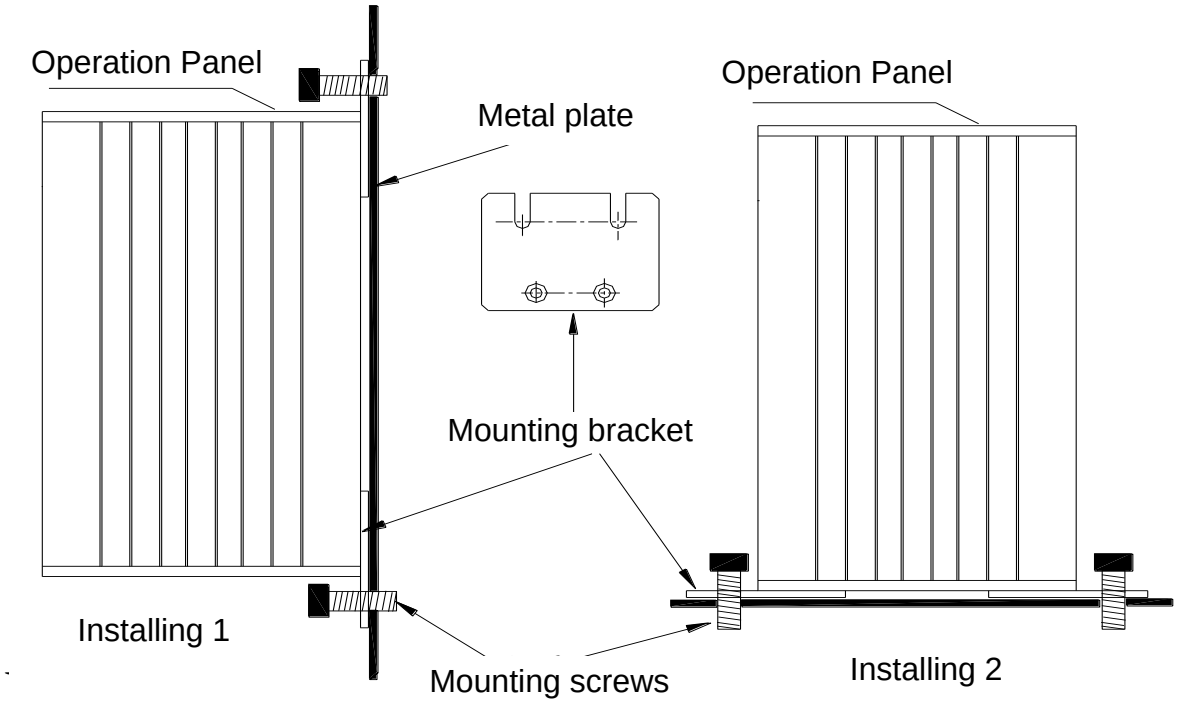


●Speed potentiometer graduation



6.Installation

6.1Installing diagram



※There is also have DIN spec aluminum rail mounting tools(accessories),please contact with our local seller.

6.2Installation condition

●Install and use the driver in the environment described as the following：

※Indoor (without direct sun light exposure) or the place that is well ventilated and easy for heat radiation. Don' t not expose to the sunlight directly.

※Ambient temperature：

Driver0℃～+40℃ (Avoid freezing)

Motor0℃～+50℃ (Avoid freezing)

※Ambient humidity：Below 85% (Avoid condensation).

※The place that will not be affected by water, oil, corrosive and flammable gas or dust.

※The place that will not affected by continuous vibration.

●When the driver is installed in an enclosed place or a place where a heating source exists nearby, please watch out for the temperature rise of the driver. It is recommended to use a fan for forced cooling and maintaining the temperature of the driver at below 400C so as to avoid excessive temperature inside the driver and activation of the overheat protection function.

●Keep conductive objects (cutting powders, bolts and electrical wire chips, etc.)
From getting into the driver.

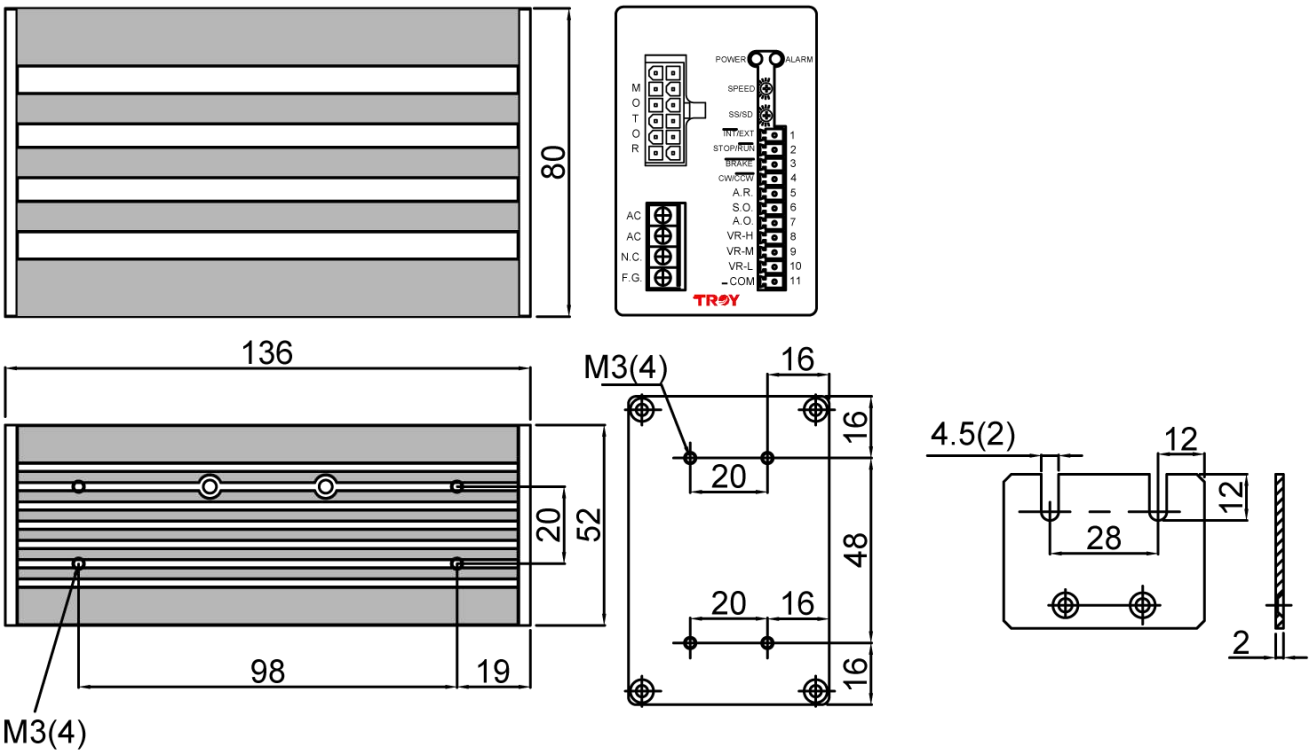
●Installing multiple drivers：

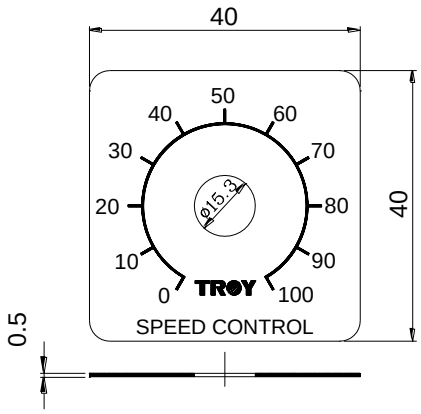
When you install and anchor multiple drives together, be sure to keep a spacing over 25mm between each drive and the drive should have a spacing over 25mm from other peripherals. Please refer to the installing diagram.

7.Dimension

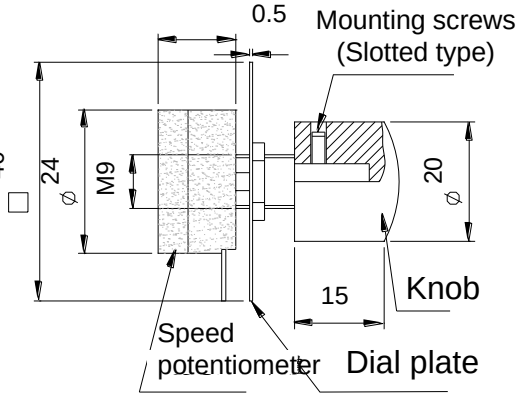
Model：SBD020-□N,SBD040-□N,SBD060-□N,SBD090-□N　Common size

Weight：500g





Knob scale plate dimension



Knob scale plate dimension

＊For environment protection, paper saving and resources preservation, please download the user's manual directly from TROY website：http://www.troy.com.tw

※ Environmental Responsibility

●TROY is always committed to environment protection. All packaging material is recyclable and reusable.

●If disposing of used product, please recycle by type as per waste disposal procedures.

----------Protect the green earth with your care and commitment----------

※ The product is subject to design modification for performance improvement without prior notice. For more details, please contact with your local seller.

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ISO9001:2015 / ISO14001:2015