Shihlin Electric SDC-E Series AC Servo Drive
Installation Guide

V1.00

SDC-010E2A(U)/ SDC-020E2A(U)/SDC-040E2A(U)/SDC-075E2A(U)/SDC-100E2A(U)

Thank you for choosing Shihlin SDC-E Series AC Drive.
These instructions will explain the use and precautions of the product. Please read the instructions carefully before installation and use the AC servo drive correctly and safely.

1. Safety Instructions

Safety Instructions
✓ Please contact the professionals to install, operate, maintain and inspect the product.
✓ The safety level could be classified as "Warning" and "Caution".
⚠ Warning: the incorrect operation may cause hazardous situation, and accordingly lead to death or serious injury.
⚠ Caution: the incorrect operation may cause hazardous situation, and accordingly lead to general or minor injury or damage of the object.

⚠ Warning
✓ The front cover plate should not be opened when the AC servo drive is powered on. In addition, the AC servo drive should not be operated when the front cover plate is demounted. Otherwise, the electric shock may be caused due to contacting with the high-voltage terminal and the charging part.
✓ If the wiring needs to be changed or inspection is required, the power supply of the AC servo drive should be turned off first. There is still high voltage inside the AC servo drive before the LED display of the AC servo drive is turned off. Therefore, please don't touch the internal circuit and parts.
✓ The AC servo drive must be earthed correctly.
✓ Please don't operate with wet hands, don't touch the heat sink, and don't plug and unplug the cable; or electric shock may be caused.

⚠ Caution
✓ Voltage applied to each terminal must be the one specified in the user manual; otherwise, failure or damage may be caused.
✓ Do not operate a voltage-resistant test for the parts inside the AC servo drive because semiconductors in AC servo drive may be easily damaged due to high-voltage breakdown.
✓ Do not touch the AC servo drive because the temperature of the AC servo drive is very high when it is powered on or right after disconnecting the power supply, only built-in keypad is touchable, otherwise, scalds may occur.
✓ Failure or damage may be caused due to wrong wiring.
✓ Do not reverse the polarities (+, -) by mistake, otherwise failure or damage may be caused.
✓ Please install the AC servo drive on nonflammable walls without holes (to avoid contacting with the cooling fin of the AC servo drive from the back).
✓ Please disconnect the AC servo drive from power supply in case of failure. Overload current passes through the AC servo drive continuously may cause a fire. If the AC servo drive is installed on or close to flammable objects it may cause a fire.
✓ Do not connect a resistor directly to the DC terminals + /P and - /N. Doing so could cause a fire.

2. Product Model
● Drive model designation

S D C – ○ ○ ○ △ ○ □ □ – □
(1)(2) (3) (4)(5)(6)(7) (8)
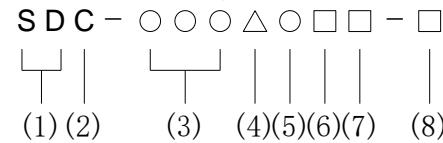
(1) Drive code : SD stands for the servo drive.
(2) Model code : C
(3) Capacity : The output power of the motor. These three digits stand for the output power of the motor after multiplying by 1/10. Example: 020 represents 200W , 100 represents 1000W
(4) Communication type：A：Modbus communication；E：EtherCAT communication
(5) Voltage type : The input power supply specifications.
E2: Single phase or three phase, 200 to 240Vac
(6) Model code : Blank : General type
(7) Safety certification: Blank : Complying with CE only；U: Complying with both CE and UL
(8) Design code : Blank : General；T: STO with Entity Dynamic Brake；Sxx: Customized or dedicated·

● Motor model designation

S M E – □ ○ ○ ○ △ △ ○ □ □ □
(1)(2) (3)   (4)   (5) (6)(7)(8)(9)
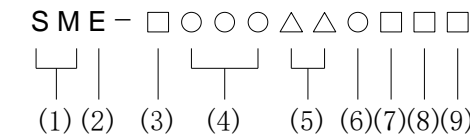
(1) Motor code: SM stands for the servo motor
(2) Model code: E
(3) Inertia classification: In accordance with the motor inertia codes below.

Code	Category
L	Low
M	Medium(SDC does not currently support)
H	High(SDC does not currently support)

(4) Capacity : Rated output power:

Code	010	020	040	075	100
motor power	100	200	400	750	1000

(5) Rated speed: The rated output speed of motor:

Code	15	20	30
Rated speed (rpm)	1500	2000	3000

(6) Encoder type: Shihlin servo motor encoder type

Code	S(Optical)	M(Optical)	T(Magnetic)	N(Magnetic)
Single-turn resolution	24	24	17	17
Multi-turn resolution	-	±15	-	±15

(7) Brake and oil seal: Used to represent whether the motor is equipped with brake and oil seal according to the codes below:

Code	A	B	C	D
Brake	—	●	—	●
Oil seal	—	—	●	●

(8) Keyway and wire type: Motor keyway and line type selection according to the following codes：

Code	A	B	C	D
Keyway	—	●	—	●
Back side cable	—	—	●	●

(9) Safety certification : Motor passed safety certification according to the following code:

Code	CE certification	conform UL/CE certification
Code	–	U

3. Installation Environment

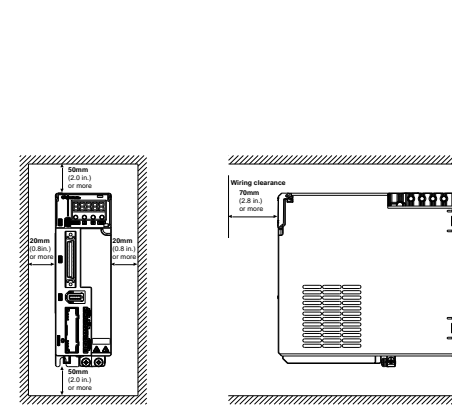| Ambient temperature	0 ~ +55℃ (non-freezing),※If environment temperature is above 45°C, forced cooling will be required
Ambient humidity	Below 90%Rh (non-condensing).
Storage temperature	-20 ~ +65℃。
Surrounding	Indoor, no corrosive gas, no flammable gas, no flammable dust.
Altitude	Altitude below 1000 meters
Vibration	5.9m/ s² (0.6G)below
Protection level	IP20
Pollution degree	2

4. Installation and Wiring

➢ Please install the AC servo drive vertically in order not to reduce the heat dissipation effect:
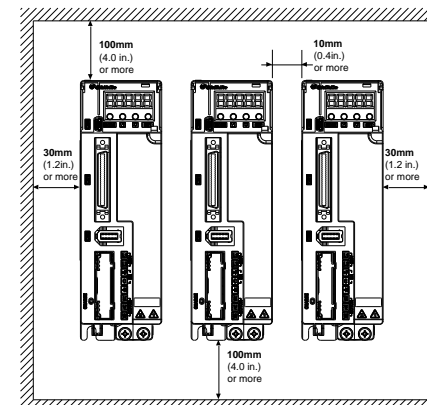

Correct   Wrong
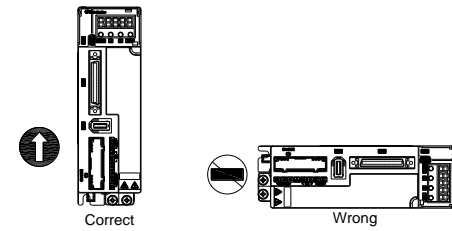
➢ Please follow the installation restrictions shown below to ensure enough ventilation space for AC servo drive cooling and wiring space:

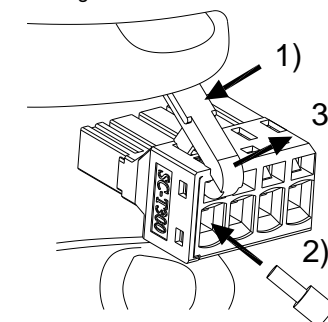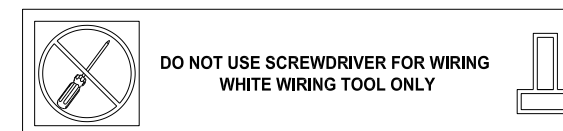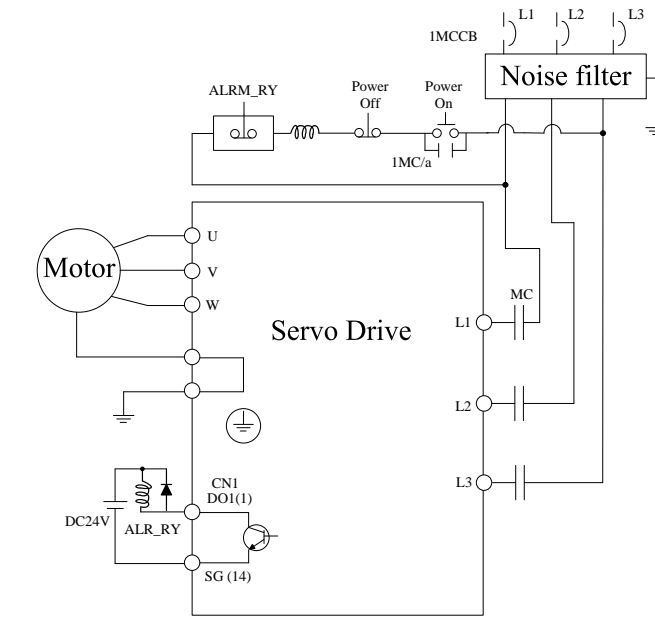・Arrangement of single AC servo drive: ・Arrangement of multiple AC servo drives:

➢Wiring

1) Press down the white tool;
2) Insert the cable;
3) Loose the white tool and secure the cable

DO NOT USE SCREWDRIVER FOR WIRING WHITE WIRING TOOL ONLY

5. Terminal Connection Diagrams

The Shihlin servo drive power wiring is a three-phase power. In the following diagram, Power ON is A contact, Power OFF and Alarm Processing are B contact. 1MC/a is a self-retaining power supply and 1MC is an electromagnetic contactor.

6. Description of drive terminals and sockets

Name	Terminal name	Description		
Power supply input	L1, L2, L3	Connect to single-phase/three-phase AC power		
Motor power input terminal	U、V、W、PE	Connect to servo motor power input.	Terminal code	Wire color
			U	Red
			V	White
			W	Black
			PE	green
Regenerative resistor terminal	P、C	External resistor	Remove the original wiring and connect to a regenerative resistor externally	
		Internal resistor	P and C terminals are connected to the internal regenerative resistor	
Ground terminal	⏚	Connect to the power ground and motor ground. That is, the location of the green screw outside the controller.		
P: + terminal N: - terminal	P、N	If a braking module is used, please connect the "+" terminal of braking module to the "P" terminal of the servo drive and the "-" terminal to the "N" terminal. A braking module is optional to be purchased as it usually doesn't have to be connected. Only if the negative work produced by the servo motor is too strong, the braking module is needed to counteract the regenerative energy.		
I/O connector	CN1	Connect to the upper controller		
Encoder socket	CN2	Connect to the motor encoder		
EtherCAT connector	CN3	Connect to EtherCAT host controller.		
USB port	CN4	Connect to USB port of PC.		
Absolute encoder battery end connection	CN5	Connect to absolute encoder battery set (optional purchase)		
STO connector	CN6	Connect to the dedicated connector or application circuits corresponds to STO.		

Note 1：Keep L1, L2, L3 and U, V, W away from other wires. The distance should be at least 30cm.

Note 2：When the power supply is OFF, do not touch the power cable L1, L2, L3 and U, V, W because the large capacitor inside the drive contains a large amount of electric charges. The drive will be touchable only when the charging indicator is out.

Note 3： If a longer encoder cable is needed, please use a twisted-pair cable which isolates from the ground. The cable should not exceed 20m. If a cable which exceeds 20m is needed, please double the diameter of the cable to ensure the signal strength.

Note 4：If the power supply and the detector (encoder) of the servo motor are not fixed on the motor, it may shake and cause poor contact.

7. Motor U, V, W lead wire connector specifications

➢ U, V, W wiring connector specifications of Shihlin's low inertia motor (Female connector)：

Drive capacity	Motor model	
100W	SME - L01030○□□□	
200W	SME - L02030○□□□	
400W	SME - L04030○□□□	
750W	SME - L07530○□□□	
1KW（80 frame）	SME - L10030○□□□	

With brake   Without brake

The following table shows the UVW lead wire connector's signal of the low inertia motor :

PIN	Signal	Wire color
1	U	Red
2	V	White
3	W	Black
4	PE	Green/yellow (green at the bottom)
5	B1	Black (electromagnetic brake)
6	B2	Black (electromagnetic brake)

Note: The wiring above is the wiring of motor connector.

➤ U, V, W connector specifications of Shihlin low/ medium inertia motor（Male connector）（SDC does not currently support)

Drive capacity	Motor model	
1KW（130 frame）	SME - L10020○□□□	
	SME - M10020○□□□	

➤The table below shows the UVW lead wire connector's signal of 130-frame 1kW motor:

PIN	Signal
A	NC
B	U
C	V
D	W
E	PE
F	NC(electromagnetic brake)
G	NC(electromagnetic brake)
H	NC

Note: The wiring above is the wiring of motor connector.

➤ Cable selection

Drive Model	Power cable [mm2(AWG)]			
	L1、L2、L3	U、V、W	P、C、N	B1、B2
SDC - 010E2□	2(AWG14)	1.5(AWG16)	2(AWG14)	1.5(AWG16)
SDC - 020E2□				
SDC - 040E2□				
SDC - 075E2□				
SDC - 100E2□				

8. CN1 I/O Wiring
CN1 connector (female)
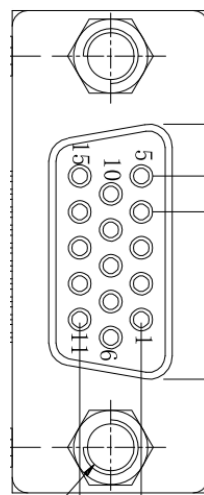
Front view   Pin assignment

Pin	Code	Function	Pin	Code	Function
1	DO1	Digital output 1	2	DOCOM	Digital Output Power Supply
3	DO2	Digital output 2	4	DOCOM	Digital Output Power Supply
5	DO3	digital input 3	6	DOCOM	Digital Output Power Supply
7	DI4	Digital input 4	8	DI3	Digital input 3
9	DI2	Digital input 2	10	DI1	Digital input 1
11	DI5	Digital input 5	12	NC	NA
13	COM+	Digital input Power Supply	14	SG	Digital Power Ground
15	Vdd	Internal power supply +24V output			

Digital input in SINK type:

Using internal power supply	Using external power supply
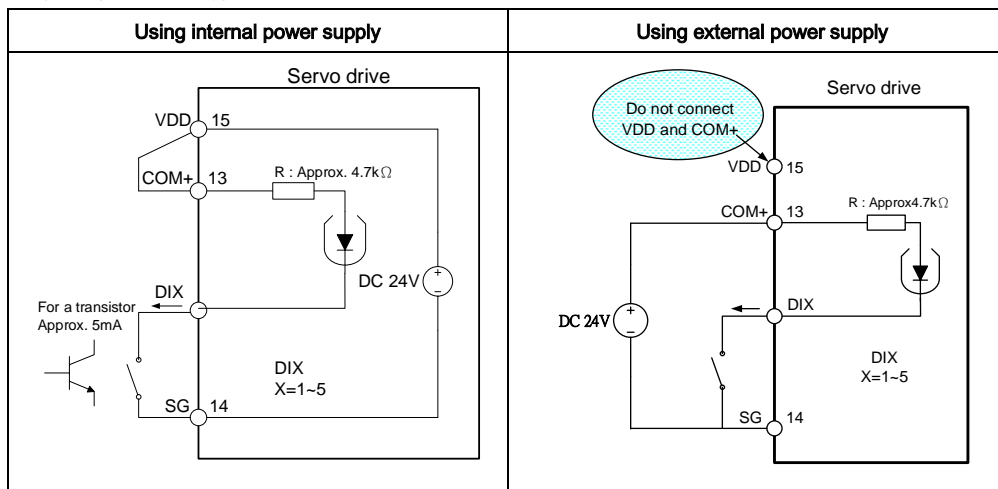
Digital input in Source mode

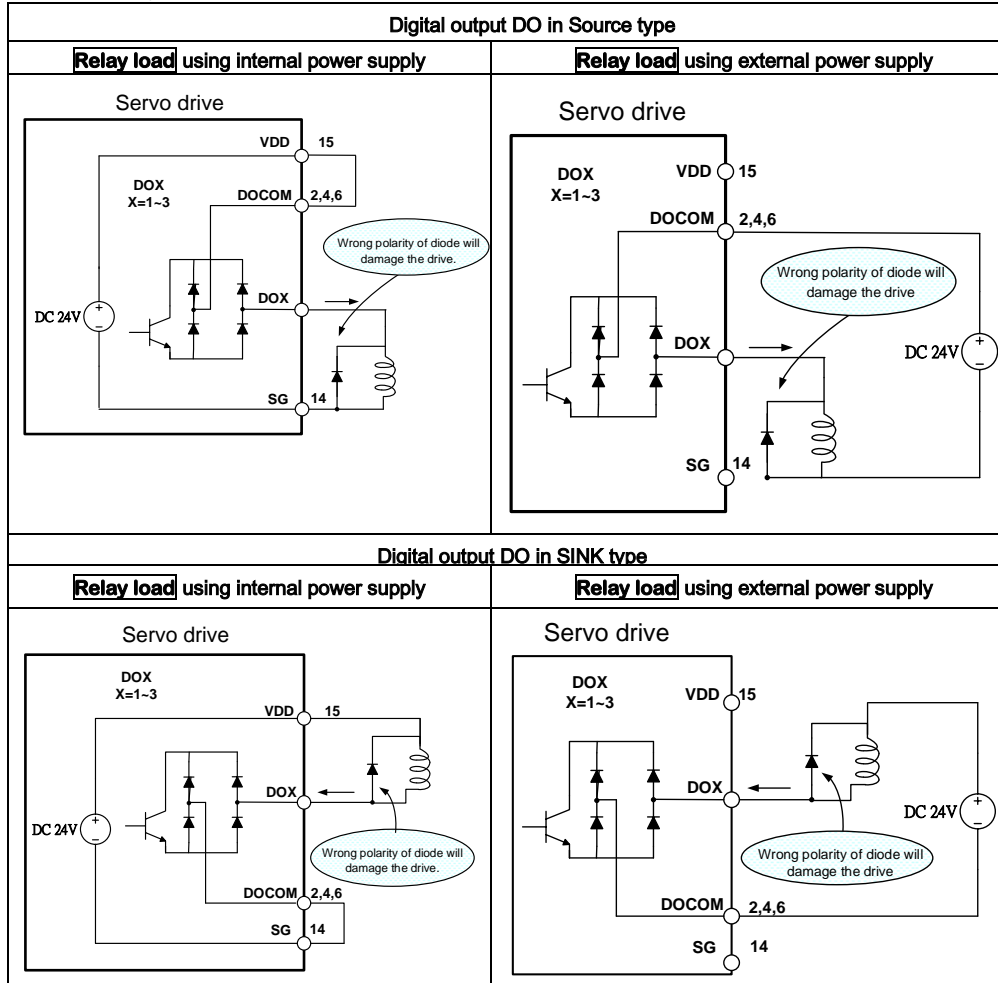| Using internal power supply	Using external power supply
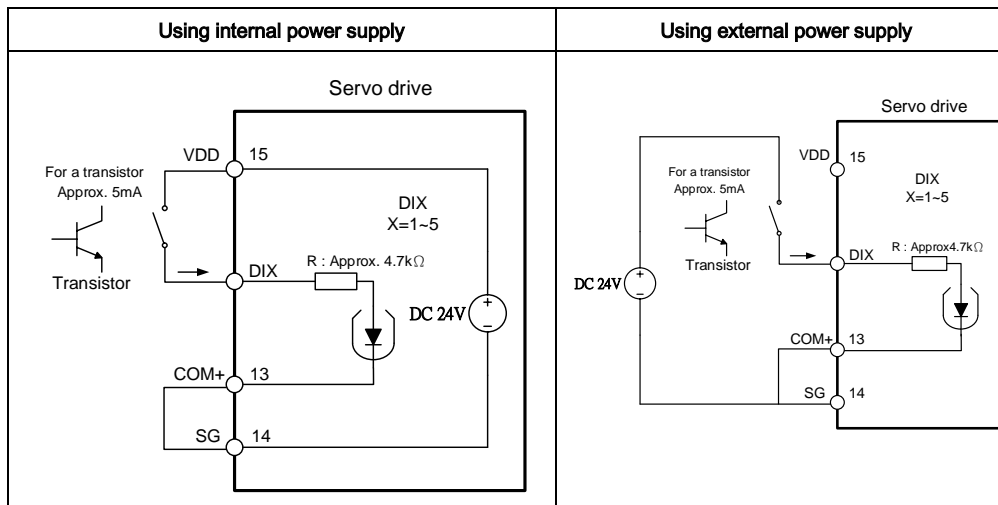
Digital output
It can drive Lamp, Relay and photocoupler. Add a diode when the Relay is loaded, and add a resistor for suppressing surge current when the external Lamp is loaded. (Permissible current: below 40 mA; surge current: below 100 mA)

Digital output DO in Source type

Relay load using internal power supply	Relay load using external power supply

Digital output DO in SINK type

Relay load using internal power supply	Relay load using external power supply

9. Specifications of encoder's lead wire connector
CN2 connector (female)
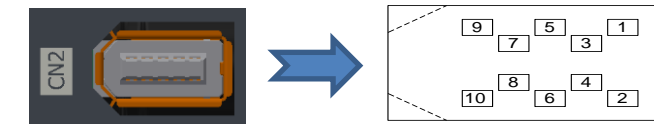
Drive capacity	Motor model	
100W	SME - L01030○□□	
200W	SME - L02030○□□	
400W	SME - L04030○□□	
750W	SME - L07530○□□	
1KW	SME - L10030○□□	
1KW	SME - L10020○□□	
1KW	SME - M10020○□□	

Drive Side			Motor Side Pin No.	
Pin No.	Pin mark	Signal Description	Quick connector (low capacity)	Military Connector (medium capacity)
1、3	Vcc(5V)	5V power supply for encoder	7	B
2、4	GND	Ground of battery	4	A
	GND	Ground of encoder	8	F
5	Vcc(3.6V)	3.6V for battery	3	H
6	ENCP	Encoder communication (+)	6	D
7	ENCN	Encoder communication (-)	5	E
-	Shielding	Shielding	9	I

| Driver model	Encoder wiring(AWG)			
	Standard	Standard Length	Number of Cable Cores	AWG
SDC - 010E2□	UL1332	2M	10	AWG26
SDC - 020E2□	UL1332	2M	10	AWG26
SDC - 040E2□	UL1332	2M	10	AWG26
SDC - 075E2□	UL1332	2M	10	AWG26
SDC - 100E2□	UL1332	2M	10	AWG26

10. CN3/CN3L communication port wiring
Note:Shihlin servo RJ45 pin definition is different from the standard RJ45 definition, please pay attention when wiring.
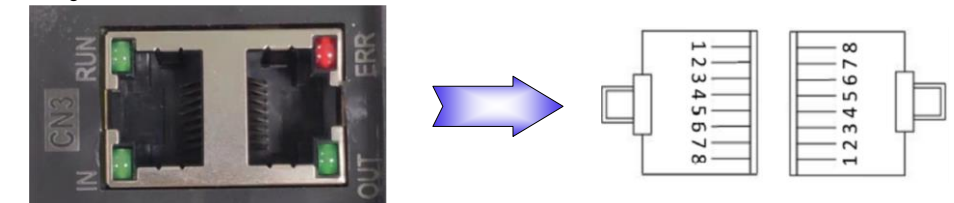
| Pin No.	Pin marking	Function
1	TX +	Transmit +
2	TX -	Transmit -
3	RX +	Receive +
4	-	-
5	-	-
6	RX -	Receive -
7	-	-
8	-	-

11. CN4 USB communication port
CN4 port is for USB communication. With the Shihlin servo communication software, users could connect it to the computer, then set parameters, monitor the status, test the operation, etc.
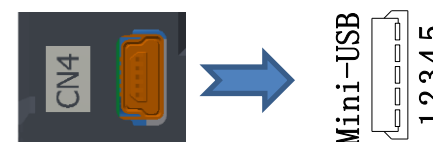
| Pin No.	Pin marking
1	GND
2	NC
3	D+
4	D-
5	+5V

12. CN5 battery power socket

When using a servo motor with an absolute encoder, it should be connected to the battery set of the absolute encoder. Parameter could be set after connecting the battery to CN5.
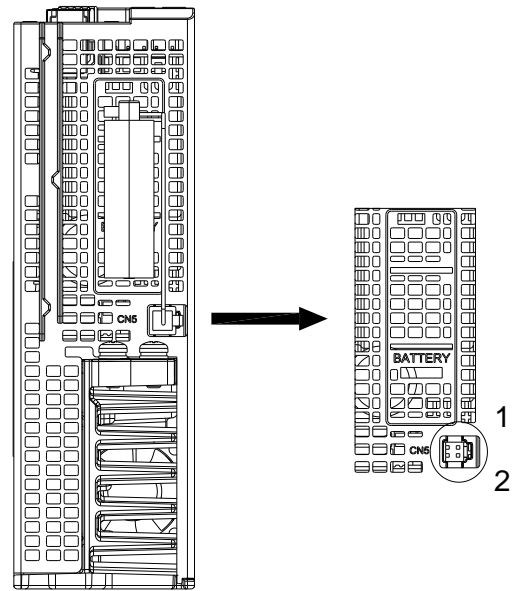
Pin NO	Pin function	Function
1	Vcc(3.6V)	3. 6V for battery
2	GND	Ground of battery

13. CN6 Safe Torque Off (STO) connector description

The pin assignment of the connector (CN6) are as follows:
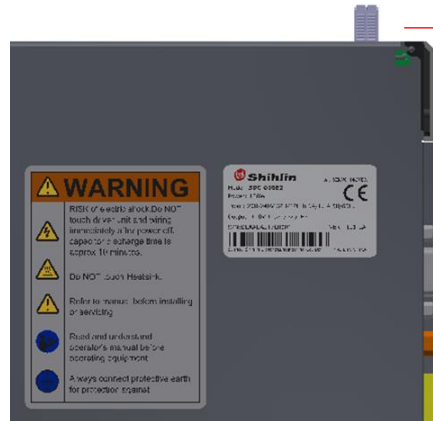
	Pin sign	Signal name	Function
	1	+24V	Drive internal +24V power
STO	2	STO1	STO input 1
(CN6)	3	STO2	STO input 2
	4	0V	STO reference ground

| Terminal name	Function	Description
+24V	Internal +24V power supply	Output Voltage Range: +24V±10%
		Output Current Range: below 200mA
STO1	STO input 1	STO1/STO2
		Rated Input Voltage: +24V±10%
STO2	STO input 2	STO action mode
		Input voltage level: 0~5V
0V	STO reference ground	STO response time: <=8mS
		STO cut-off mode
		Input voltage level: 18~30V

14. Standard wiring instruction

● Wiring diagram for EtherCAT control (CoE mode)
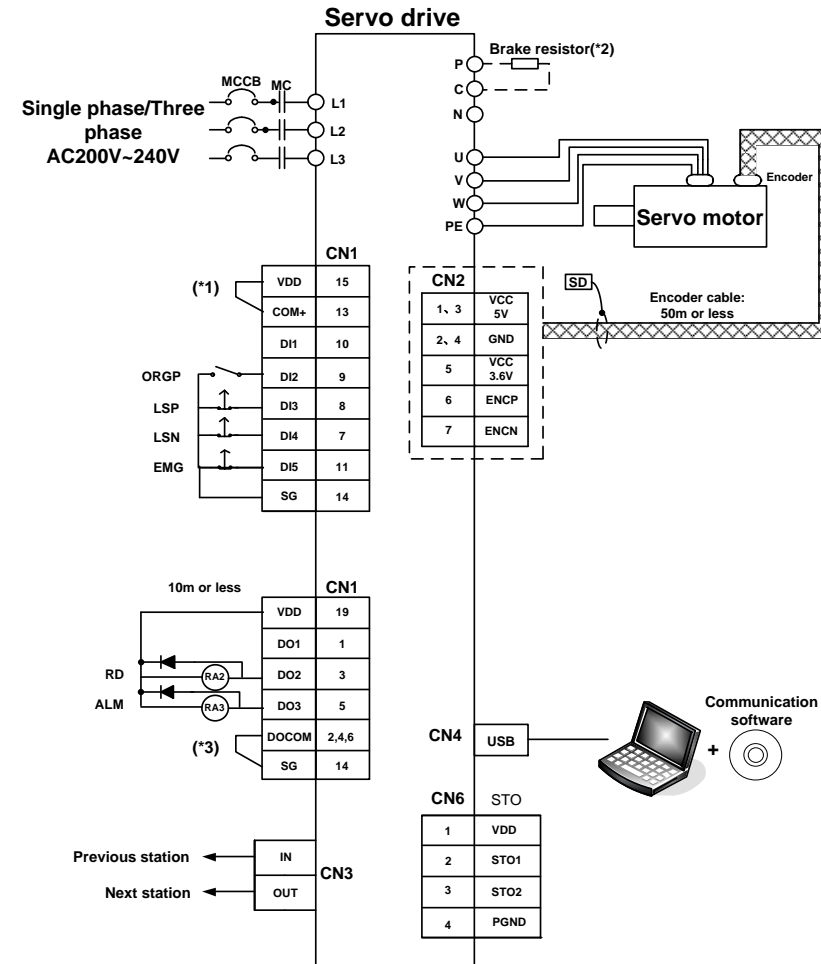
Note : 1.If an external power supply is used, VDD and COM+ cannot be connected.

　　　2.Refer to section 3.1.3 for wiring of regenerative resistor and brake unit.

　　　3.For DO Sink type or Source type, please refer to section 3.2.3 for wiring.

● Wiring diagram for position control (Pr mode)
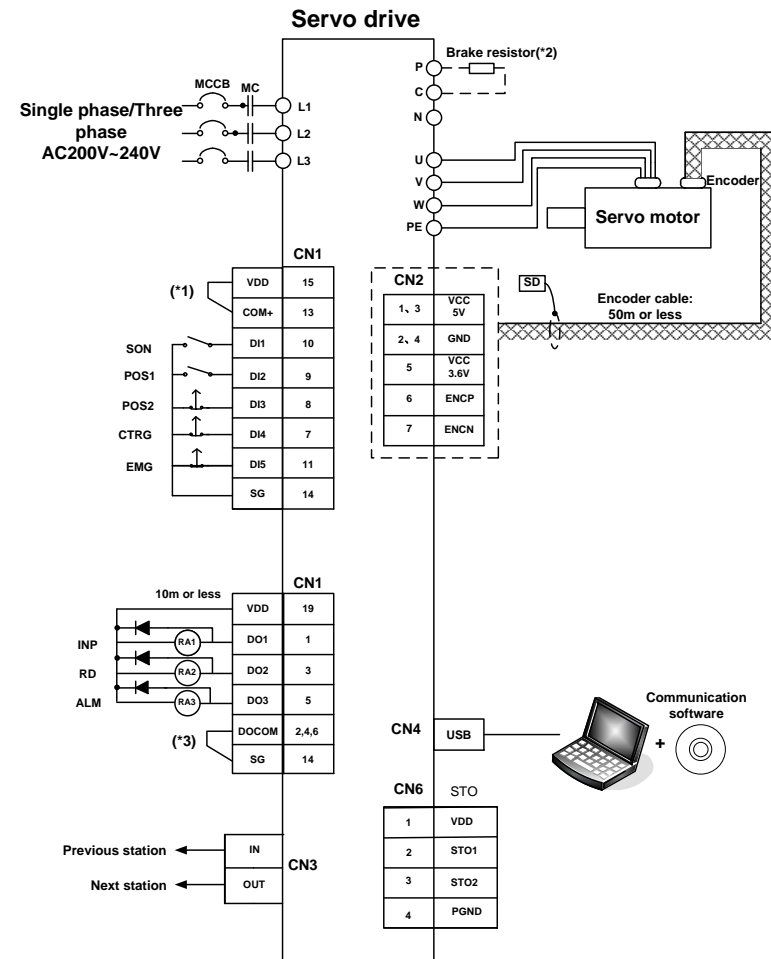
Note: 1. If an external power supply is used, VDD and COM+ cannot be connected.

　　　2. Refer to section 3.1.3 for wiring of regenerative resistor and brake unit.

　　　3. For DO Sink type or Source type, please refer to section 3.2.3 for wiring.

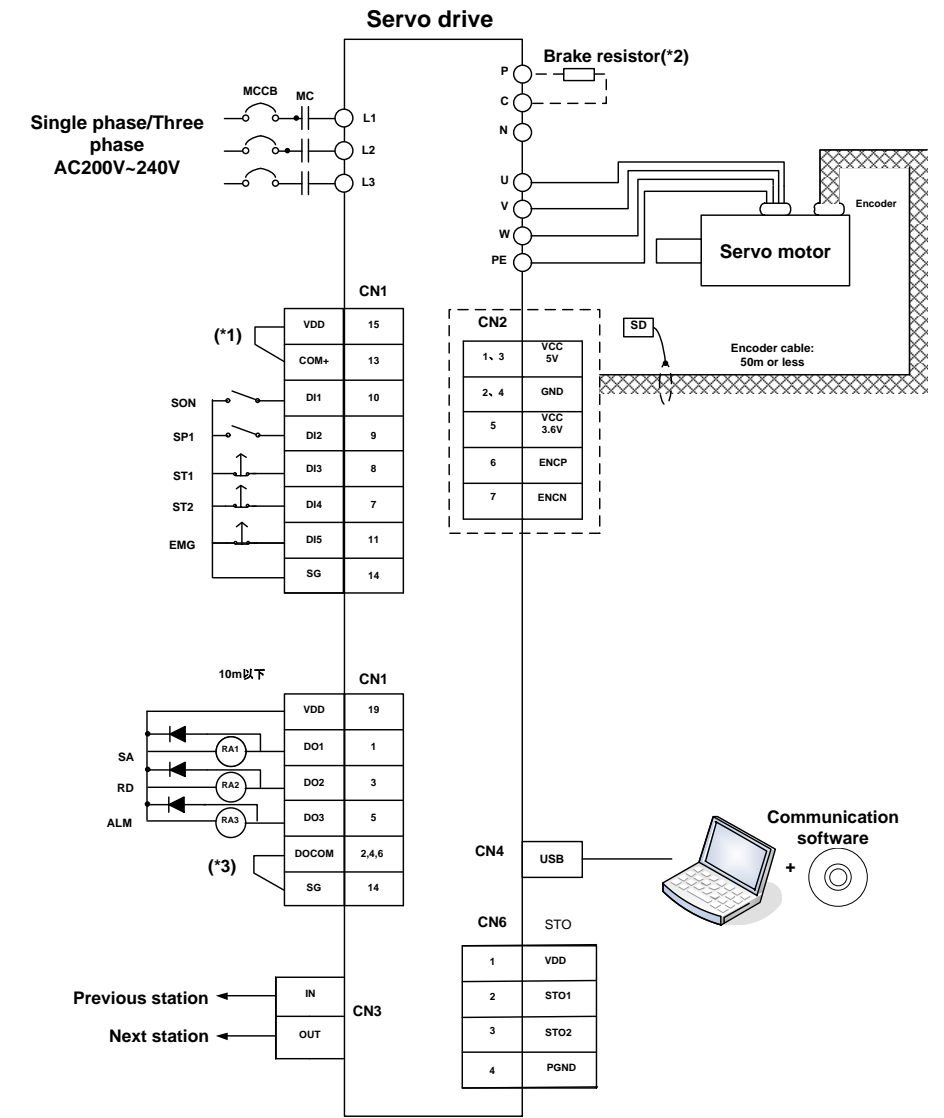● Wiring diagram for speed control (S mode)

Note: 1. If an external power supply is used, VDD and COM+ cannot be connected.

　　　2. Refer to section 3.1.3 for wiring of regenerative resistor and brake unit.

　　　3. For DO Sink type or Source type, please refer to section 3.2.3 for wiring.

After wiring is completed in speed mode, the following parameters need to be set before performing basic speed control.

Parameter	Name	Setting value	Content
PA01(note 1)	Control mode option	□□□2	Speed control mode
PC05	Internal speed command 1	1000	Speed command 1 is 1000 rpm
PC06	Internal speed command 2	1500	Speed command 2 is 1500 rpm
PC07	Internal speed command 3	2000	Speed command 3 is 2000 rpm
PC01	Acceleration time constant	1000	Acceleration time constant is 1000ms
PC02	Deceleration time constant	500	Deceleration time constant is 500ms
PC03	S-curve acceleration/deceleration time constant	0	Disabled
PD15(Note 1)	Digital input filter time option	2	Filter time constant is "4ms"

Note 1: The drive must be shut off and restarted after changing the parameter, or the operation will not be implemented.
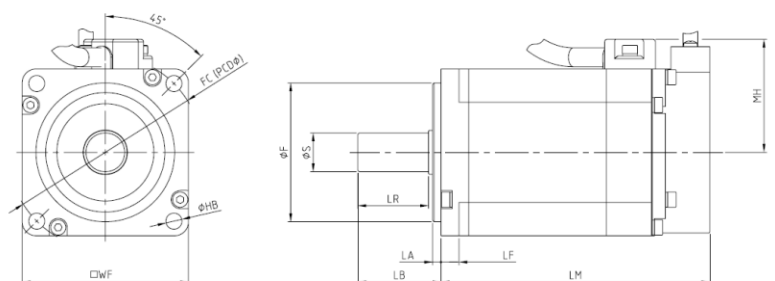
15. Dimensions of the servo drive
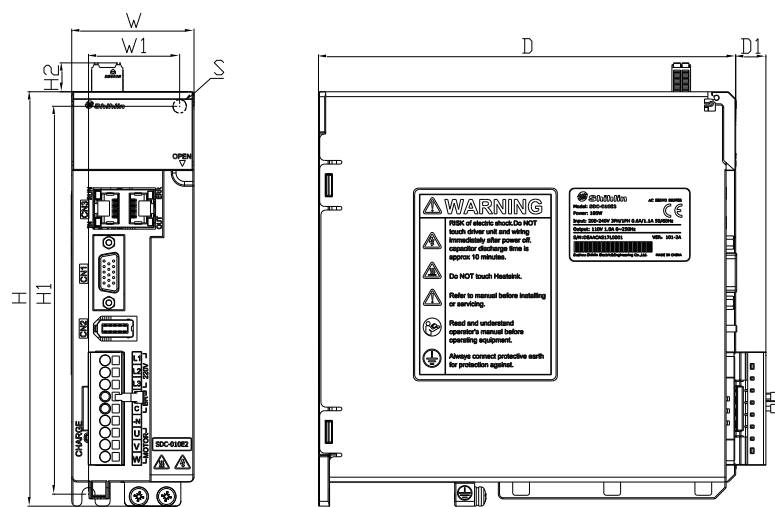
Unit:mm

MODEL	W	W1	H	H1	H2	D	D1	S
SDC - 010E2□								
SDC - 020E2□								
SDC - 040E2□	51	38	172	161	12	174	12.6	5.6
SDC - 075E2□								
SDC - 100E2□								

16. Motor dimensions

Note: ( ) stands for the length of servo with electromagnetic brake

Unit:mm

Type	WF	S	F	LA	LB	LF	LR	MH	LM	FC	HB
SME-L005(B)	40	8	30	2.5	25.5	5.5	20	31	64.5(99.2)	46	2-ψ4.5
SME-L010(B)	40	8	30	2.5	25.0	5.5	20	32	97.8(132.5)	46	2-ψ4.5
SME-L020(B)	60	14	50	3	30	6.5	25.5	42	94.2(129.2)	70	4-ψ5.8
SME-L040(B)	60	14	50	3	30	6.5	25.5	42	114.2(149.2)	70	4-ψ5.8
SME-L075(B)	80	19	70	3	40.0	7.5	35.3	52	119.2(158.2)	90	4-ψ6.6
SME-L100(B)	80	19	70	3	40.0	7.5	35.3	52	159.2(203.5)	90	4-ψ6.6

D-cut shaft   **Key shaft**

Type	QL	QK	W	U	Y	
L020(B) \ L040(B)	3	20	$5^{0}_{-0.03}$	3	Screw: M4	Depth: 15
L075(B)\L100(B) (80 frame)	5	25	$6^{0}_{-0.03}$	3.5	Screw: M5	Depth: 20

17. SDC complies with global standards

- Standard compliance

(1) Compliance with EU directives

SDC servo drives comply with EMC directive (2014/30/EU) and Low-voltage directive (2014/35/EU)

(2) Safety regulations and EMC standards

SDC servo drives comply with safety standards IEC/EN61800-5-1 and EMC standards EN61800-3.

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(3) Compliance with USA/Canada regulations

This servo drive design complies with UL 508C and CSA C22. 2 No. 274-17.

(a) Installation

The minimum size of the distribution box is 200% of the size of the SDC servo drive. For ventilation of the fan and to keep the ambient temperature below 55℃, only copper wires can be used for wiring. The servo drive should be installed in a metal distribution box.

(b) Overload protection feature

The SDC servo drive has overload protection function. (It is specified based on 120% of the rated current of the servo driver (full load current).)

(c) Motor overheat protection

There is no temperature sensor inside the motor, and the SDC series don't have overheat protection.

(d) Capacitor discharge

After the power is turned off, do not touch the servo and its terminals immediately. The capacitor discharge takes 20 minutes.

(e) About wiring protection

When installing equipment in the United States, branch circuit protection is based on the National Electrical Code and local regulations. When installing equipment in Canada, branch circuit protection is based on the Canadian Electrical Code and provincial regulations.

(4) Used in Canada only

A surge absorber should be installed on the power input end of the equipment and shall be rated at 240V (phase to ground) and 240V (phase to phase). It must be suitable for overvoltage category III and provide protection for withstanding a rated impulse voltage peak of 4kV(or equivalent).

- Correct use

Use these devices according to the standard (such as voltage, temperature, etc. Please refer to SDC Manual for more details.)

(1) Power wiring: According to UL/CSA standards, only 75℃ CU wires are allowed.

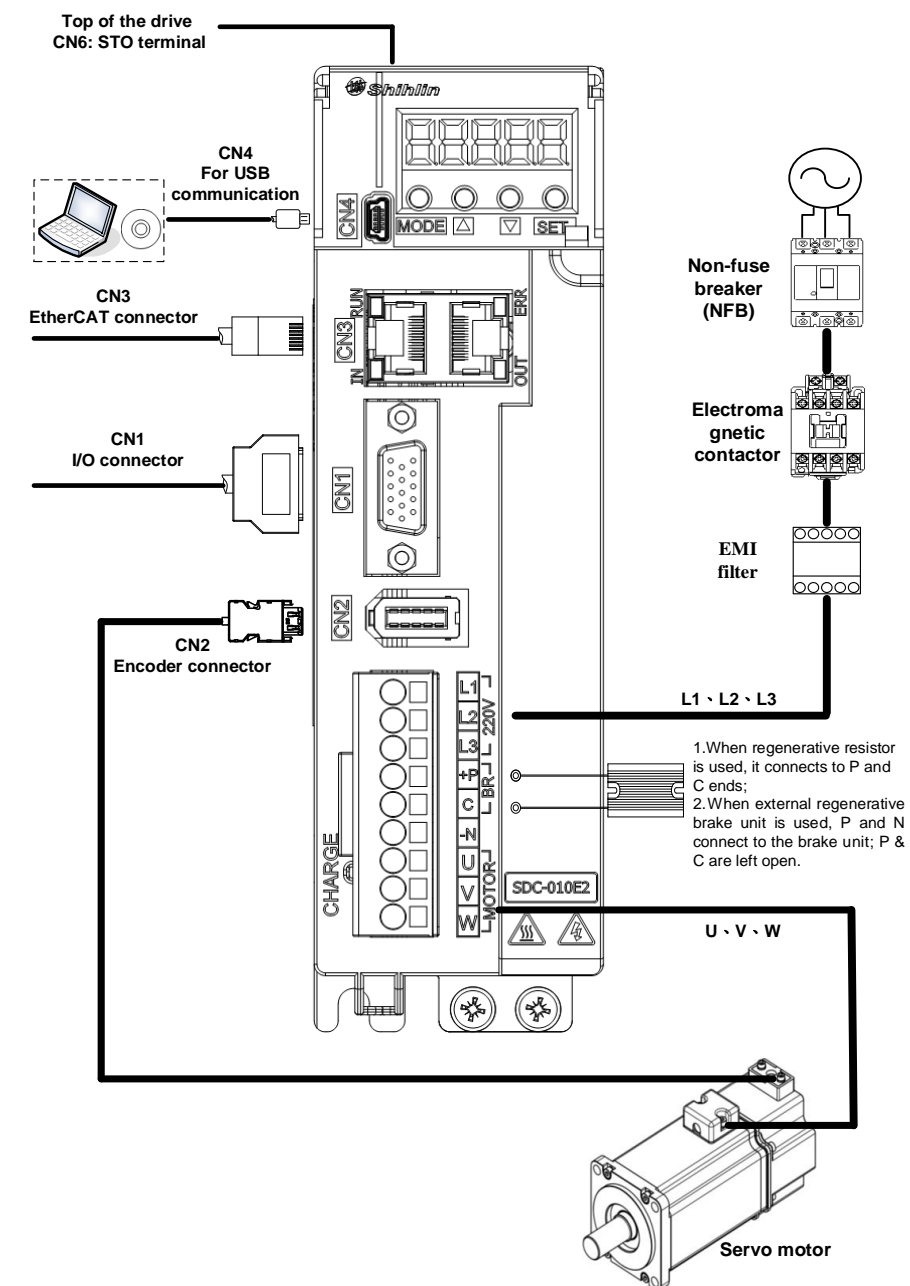| Drive	Wire [AWG (mm2)]			
	L1、L2、L3	U、V、W	P、C、N	⏚
SDC - 010E2□				
SDC - 020E2□				
SDC - 040E2□	AWG14 (2)	AWG16 (1.5)	AWG14 (2)	AWG16 (1.5)
SDC - 075E2□				
SDC - 100E2□				

(2) Torque for fixing terminal block: The crimp terminals must comply with UL standards. The terminals must be sheathed with insulating tube to prevent direct contact:

Drive	Recommended Torque [(N-m)]			
	L1、L2、L3	U、V、W	P、C、N	⏚
SDC - 010E2□				
SDC - 020E2□				
SDC - 040E2□	–	–	–	1.4
SDC - 075E2□				
SDC - 100E2□				

(3) Example for no-fuse breaker selection:

Drive	UL certified current-limiting circuit breaker	Example
SDC-010E2□	240 V, 5 A	NF50-SVFU 5A
SDC-020E2□		
SDC-040E2□	240 V, 10 A	NF50-SVFU 3P 10A
SDC-075E2□	240 V, 15 A	NF50-SVFU 3P 15A
SDC-100E2□		

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(4) Wiring example of peripherals:

1.When regenerative resistor is used, it connects to P and C ends;
2.When external regenerative brake unit is used, P and N connect to the brake unit; P & C are left open.

18. Others

➤ For excelsior products, the parameters and contents may be modified, please contact the agent or refer to Shihlin websites (http://automation.seec.com.tw/) to download the latest version.

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Shihlin Electric&Engineering Co., LTD