



User Guide

IS650N Series Servo Drive



19011123 A00

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Overview

Thank you for purchasing the IS650N series servo drives developed by Inovance. The IS650N series servo drive is a high-performance AC servo drive covering a power range of 11 kW to 55 kW. It adopts Ethernet communication interfaces and supports EtherCAT communication protocol to achieve a networked operation of multiple servo drives through working with the host controller. The IS650N series servo drive supports stiffness level setting, inertia auto-tuning and vibration suppression to simplify the operating procedures. It allows a quiet and stable operation through working with the ISMG series high-response servo motor configured with a 20-bit incremental encoder or a 23-bit multi-turn absolute encoder.

The IS650N series servo drive aims to implement quick and accurate position control, speed control, and torque control in large-scale machine tools, injection molding machines, large-scale textile machines, printing and packaging machines, food-processing machines, and medium- and high-end numerical control equipment such as hoop bending machines, decoiler machines, all-electric injection molding machines, multi-wire cutting machines, punch presses, and die-casting machines.

This user guide contains product safety information and instructions for mechanical and electrical installations. First-time users must read through this user guide. Visit <http://en.inovance.cn/> to check the latest version of the user guide.

If you have any question concerning the product function or performance, contact Inovance for technical support.

The equipment integrator must deliver the user guide to end users along with the equipment.

Safety Instructions

Safety instructions are divided into two levels: WARNING and CAUTION. Make sure to operate properly with adequate safety assurance.

	Indicates improper operations which may cause death or serious injury.
	Indicates improper operations which may cause moderate or minor injury, as well as equipment damage.

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In some cases, failure to follow the "CAUTION" may also lead to serious consequences. Abide by the safety instructions at both levels (WARNING and CAUTION). Failure to comply may cause death or serious injury and damage the product and related machines and systems.

Keep this user guide in a proper place for future reference.

Forward this user guide to the end user.

Precautions for Use

- ◆ This servo drive is a general industrial product, which is not designed for use in machines or systems on which lives depend.
- ◆ Install a proper safety device when the servo drive is to be used on the equipment which may cause a serious accident or loss due to servo drive faults.
- ◆ Contact Inovance when the servo drive is to be used on special applications such as atomic energy control, aerospace equipment, transport equipment, medical apparatus, safety devices and other equipment that requires high cleanliness.
- ◆ Although this servo drive has passed all QC tests, it may react unexpectedly due to faults arising from ambient noise, static interferences, input power supply, wiring, optional parts, and so on. Take mechanical safety measures into full consideration to ensure safety against possible actions of the servo drive in the application site.
- ◆ The wiring, operation, maintenance and inspection of the servo drive can only be conducted by professionals only.
- ◆ When selecting the tightening torque of the mounting screws for the servo drive, take the screw strength and the material of the installation part into consideration. Select proper mounting screws which can ensure a secure installation and keep the installation part undamaged.
- ◆ When the motor shaft runs without being grounded, the motor bearing may, depending on the actual mechanical and installation conditions, suffer electric corrosion or large noise. Check the actual conditions by yourself.
- ◆ Device faults may give rise to a certain amount of smoke equal to that of a smoking cigarette. Pay special attention to the smoke generated when the servo drive is to be used in a purification workshop or similar environment.
- ◆ Note that the chip resistor may be disconnected or in poor contact due to a sulfuration reaction if the servo drive is to be used in an environment with high-density sulphur or sulfuretted gas.
- ◆ Pay attention to the voltage input to the servo drive. Inputting a voltage far larger than the rated voltage may cause damage to the internal components, resulting in smoke or a fire.
- ◆ The end user decides whether the servo drive matches the structure, dimension, service life, features, and specifications of the equipment (to which the servo drive is to be installed) and its parts, and whether it complies with local laws and regulations.
- ◆ Note that use beyond the product's range of specifications is not covered by the warranty.
- ◆ Components of this servo drive are subject to change without prior notice due to continuous product improvement.

1. Product Information

Nameplate and Model Number

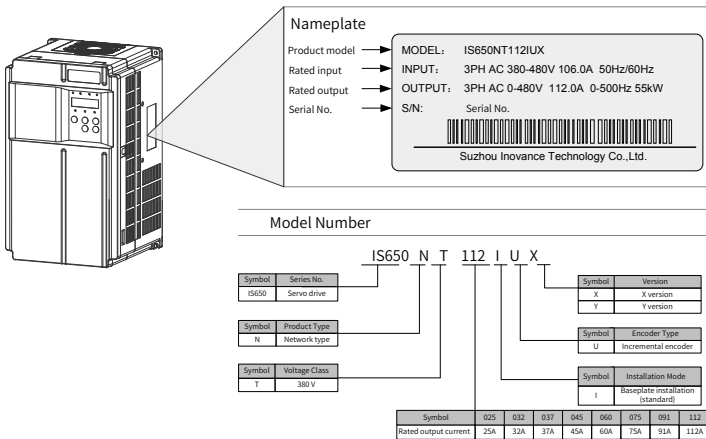


Figure 1 Nameplate and model number

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Structure of the Servo Drive

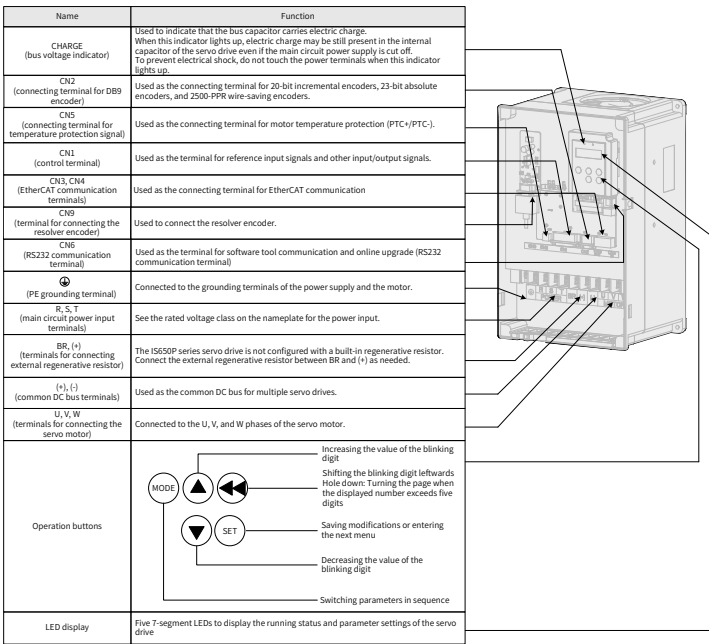
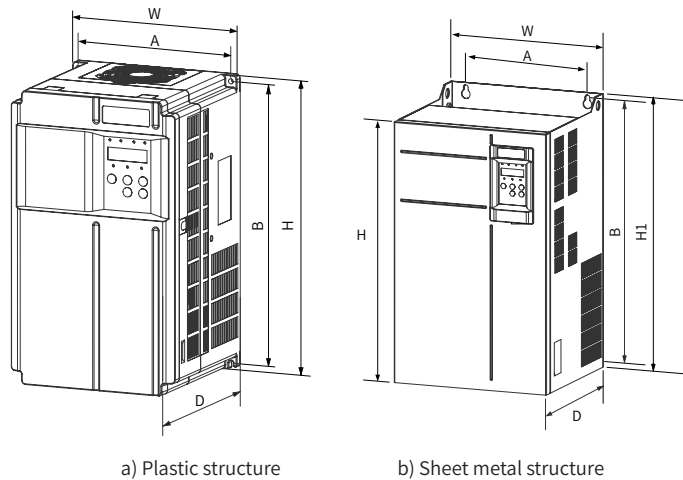


Figure 2 Structure of the servo drive

2. Installation Instructions

Product Dimensions



Outline dimensions and mounting hole dimensions of the servo drive

Servo Drive Model	Mounting Hole (mm)		Outline Dimensions (mm)				Mounting Hole Diameter (mm)	Weight (kg)	Structure
	A	B	H	H1	W	D			
IS650NT025IU-X-B	195	335	350	/	210	192	Φ6	9.1	Plastic structure
IS650NT032IU-X-B									
IS650NT037IU-X									
IS650NT045IU-X	230	380	400	/	250	220	Φ7	17	Plastic structure
IS650NT060IU-X									
IS650NT075IU-X									
IS650NT091IU-X	245	523	523	540	300	275	Φ10	35	Sheet metal structure
IS650NT112IU-X									

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Installation Space

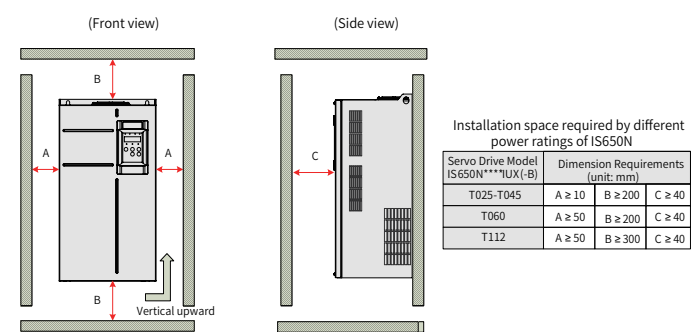


Figure 3 Single-unit installation

The IS650N series servo drive dissipates heat from bottom to top. If multiple servo drives are connected together, install them side by side. See the preceding figure for the clearance required by side-to-side installation.

For dual-row installation, install an air guide plate to prevent servo drives in the lower row from heating up those in the upper row and causing thermal/overload faults.

3. Electrical Wiring

Layout and Introduction to Main Circuit Terminals

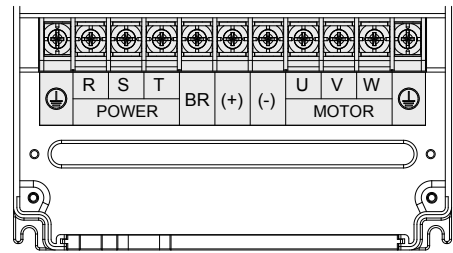


Figure 4 Terminal block layout of the servo drive

Names and functions of main circuit terminals of the servo drive

Terminal Symbol	Name	Function
R, S, T	Three-phase power input terminals	Used for three-phase 380 V power input of the main circuit.
BR, (+)	Terminals for connecting the external regenerative resistor	Connected to the external regenerative resistor.
(+), (-)	Common DC bus terminal	Used for common DC bus connection when multiple servo drives are connected in parallel.
U, V, W	Servo motor connecting terminals	Connected to U, V, and W phases of the servo motor.
	Grounding	The two grounding terminals are respectively connected to the power supply grounding terminal and the servo motor grounding terminal. The entire system must be grounded.

Layout and Introduction to Control Terminals

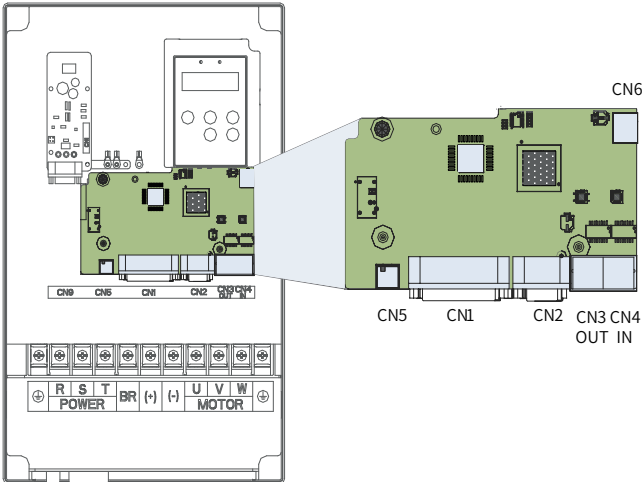


Figure 5 Control board terminal layout of the servo drive

Description of the control board terminals of the servo drive

Terminal Symbol	Function
CN1	Connecting terminal for digital input/output signals
CN2	Connecting terminal for serial incremental encoder signals
CN3	EtherCAT communication terminal (output)
CN4	EtherCAT communication terminal (input)
CN5	Connecting terminal for PTC and /PTC (no polarity differentiation) of motor temperature detection
CN6	Wiring terminals for software tool communication and online upgrade signals

■ Connection of the Control Signal Terminal CN1 (DI/DO Signal)

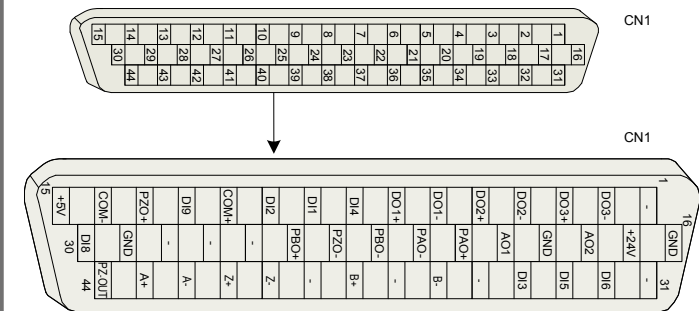


Figure 6 Pin layout of the connector for servo drive control circuit terminals

CN1 terminal: Plastic housing of the plug on cable side: DB25P (SZTDK), black housing; Core: HDB44P male (SZTDK)

It is recommended to use 24AWG to 26AWG cables.

Description of DI/DO signals

Signal Name	Default Function	Pin No.	Function
DI1	P-OT	9	Positive limit switch
DI2	N-OT	10	Negative limit switch
DI3	INHIBIT	34	Pulse input inhibition
DI4	ALM-RST	8	Alarm reset (edge valid)
DI5	ZCLAMP	33	Zero speed clamp
DI6	GAIN-SEL	32	Gain switchover
DI8	TouchProbe	30	Touch probe
DI9	HomeSwitch	12	Home switch
General	+24V	17	Internal 24 V power supply, voltage range: 20 V to 28 V, maximum output current: 200 mA
	COM-	14	
	COM+	11	Power input end (12 V to 24 V)
	DO1+	S-RDY+	7
	DO1-	S-RDY-	6
	DO2+	COIN	5
	DO2-	COIN	4
	DO3+	ALM+	3
	DO3-	ALM-	2



DI8 and DI9 are high-speed DI terminals.

■ Connection of the Serial Incremental Encoder (CN2)

Terminal pin definition of the 20-bit encoder cable connector on servo drive side

Outline Drawing of the Connector	Terminal Pin Layout	
	Pin No.	Signal Name
	1	PS+
	2	PS-
	7	+5V
	8	GND
	Enclosure	PE

Recommendations:
Plastic housing of the plug on cables side: DB9P (SZTDK), black housing
Core: DB9P male (SZTDK), blue glue

■ Wiring of Communication Signals CN3/CN4

The communication signal connectors (CN3, CN4) are EtherCAT port connectors, where CN4 (IN) is connected to the master station, and CN3 (OUT) is connected to the next slave device.

Pin definitions of the communication signal connector are shown in the following table.

Pin No.	Definition	Description	Terminal Pin Layout
1	TX+	Data transmitting (+)	
2	TX-	Data transmitting (-)	
3	RX+	Data receiving (+)	
4	-	-	
5	-	-	
6	RX-	Data receiving (-)	
7	-	-	
8	-	-	
Housing	PE	Shield	

The definition complies with the terminal definition of a standard Fast Ethernet (FE).

Cable selection: Direct-attach or crossover Ethernet cables. It is recommended to use double-shielded Cat 5e or better Ethernet cables.

Recommendation:
COPARTNER, UL2835#26*4P+ Mylar aluminum foil + Grounding cable (weaving OD: 6.0)

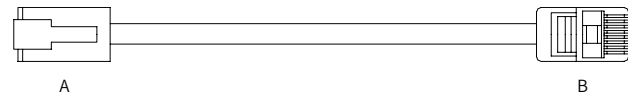


Figure 7 Outline drawing of the cable for parallel communication of multiple servo drives (S6-L-T04)

Pin connection relation of the cable for parallel communication of multiple servo drives

A		B	
Signal Name	Pin No.	Signal Name	Pin No.
TX+	1	TX+	1
TX-	2	TX-	2
RX+	3	RX+	3
RX-	6	RX-	6
PE (shield)	Enclosure	PE (shield)	Enclosure

■ Wiring of CN5 (Wiring of PTC Signals for Temperature Protection)

The PTC is used for motor temperature protection. Do not confuse the PTC signal with the fan power supply. Connecting the PTC signal to the power supply will cause permanent damage to the motor or even cause a fire.

Pin No.	Signal Name
1	PTC
2	/PTC

The PTC and /PTC on the motor side are connected to the PTC and /PTC of the servo drive (without polarity differentiation). See the following figure for the connection of PTC signal cables.

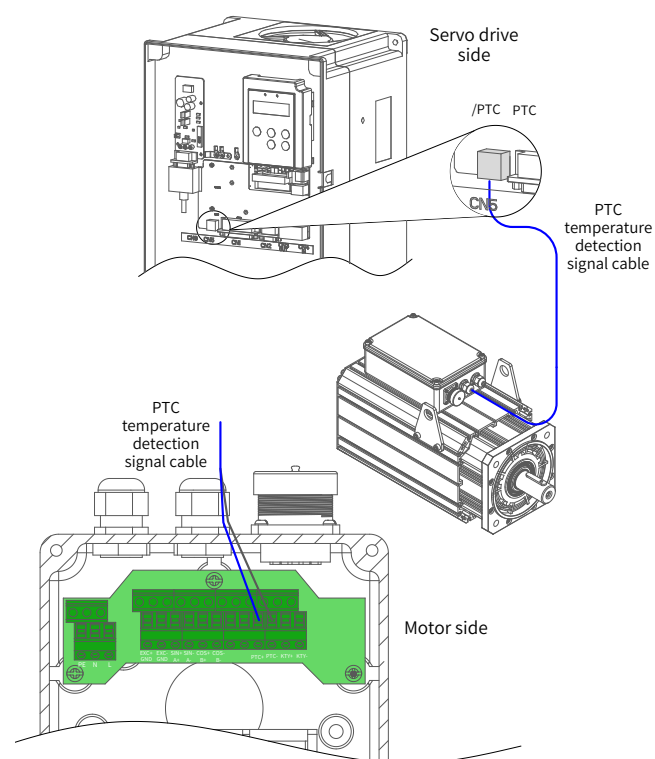


Figure 8 Wiring of the PTC

■ Wiring of Software Tool Communication and Online Upgrade Signal (CN6)

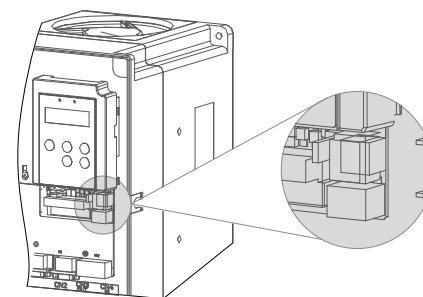


Figure 9 Terminal position of RS232 (CN6)

Definition of RS232 connector terminals

Terminal	Pin	Definition	Description
	1-5	GND	Reference ground
	6	RS232-TXD	RS232 signal transmitting end
	7	RS232-RXD	RS232 signal receiving end
	8	GND	Reference ground

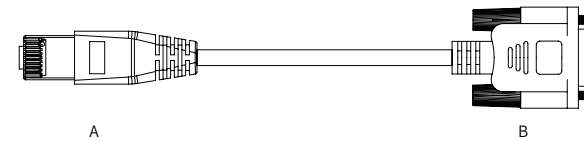


Figure 10 RS232 Connection Cables

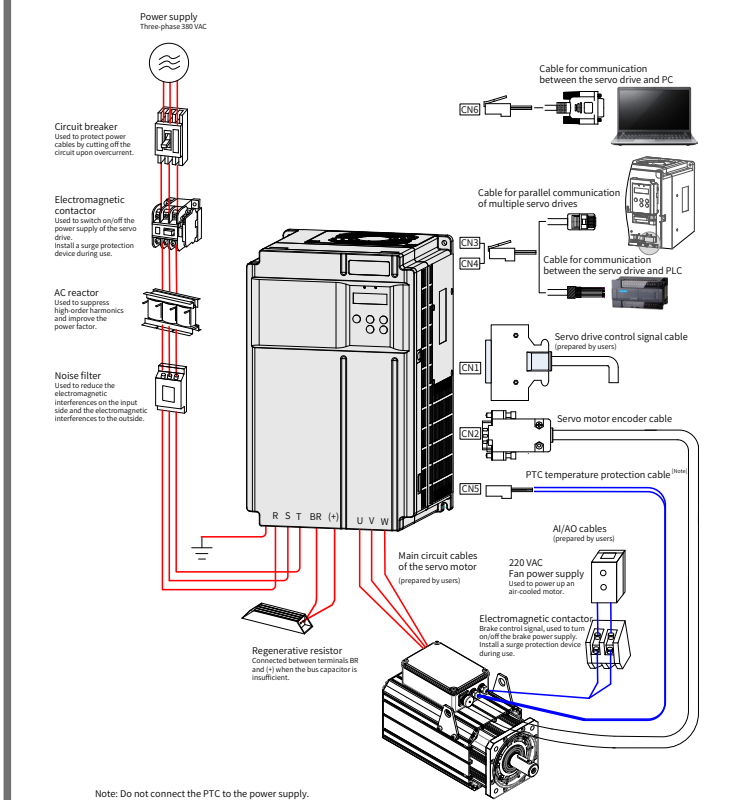
Pin connection relation of the PC communication cable

4 pins on the Servo Drive Side (A)		DB9 on the PC Side (B)	
Signal Name	Pin No.	Signal Name	Pin No.
GND	1, 3	GND	5
RS232-TXD	4	PC-RXD	2
RS232-RXD	2	PC-TXD	3
PE (shield)	None	PE (shield)	Enclosure

If the host controller provides only the USB interface, use the serial-to-USB cable for conversion.

Recommendation:
Z-TEK, model: ZE551A, 0.8 m USB extension cable, chip model: FT232

■ Wiring Diagram



Note: Do not connect the PTC to the power supply.

Figure 11 Wiring of the servo system

The servo drive is directly connected to an industrial power supply, with no isolation such as a transformer. To prevent cross electric shock, install a fuse or a circuit breaker for wiring on the input power supply. The servo drive is not configured with built-in protective grounding circuits. To build a safer system, use a residual current device (RCD) against both overload and short-circuit events or an RCD dedicated for protection of the grounding cable.

Do not use the electromagnetic contactor to start or stop the servo motor. As a high-inductance device, the motor generates instantaneous high voltage, which may damage the contactor.

Abide by the following precautions during wiring:

- CN3 and CN4 are identical communication interfaces with the same pin definition, and either can be used.
- Do not start or stop the servo drive frequently (twice (or more) per 10 minutes) by switching the contactor on and off, or start the servo drive directly through the contactor.

INOVANCE Warranty Agreement

- Inovance provides an 18-month free warranty to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.
- Within the warranty period, maintenance will be charged for the damage caused by the following reasons:
 - Improper use or repair/modification without prior permission
 - Fire, flood, abnormal voltage, natural disasters and secondary disasters
 - Hardware damage caused by dropping or transportation after procurement
 - Operations not following the user instructions
 - Damage out of the equipment (for example, external device factors)
- The maintenance fee is charged according to the latest Maintenance Price List of Inovance.
- If there is any problem during the service, contact Inovance's agent or Inovance directly.
- Inovance reserves the rights for explanation of this agreement.

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