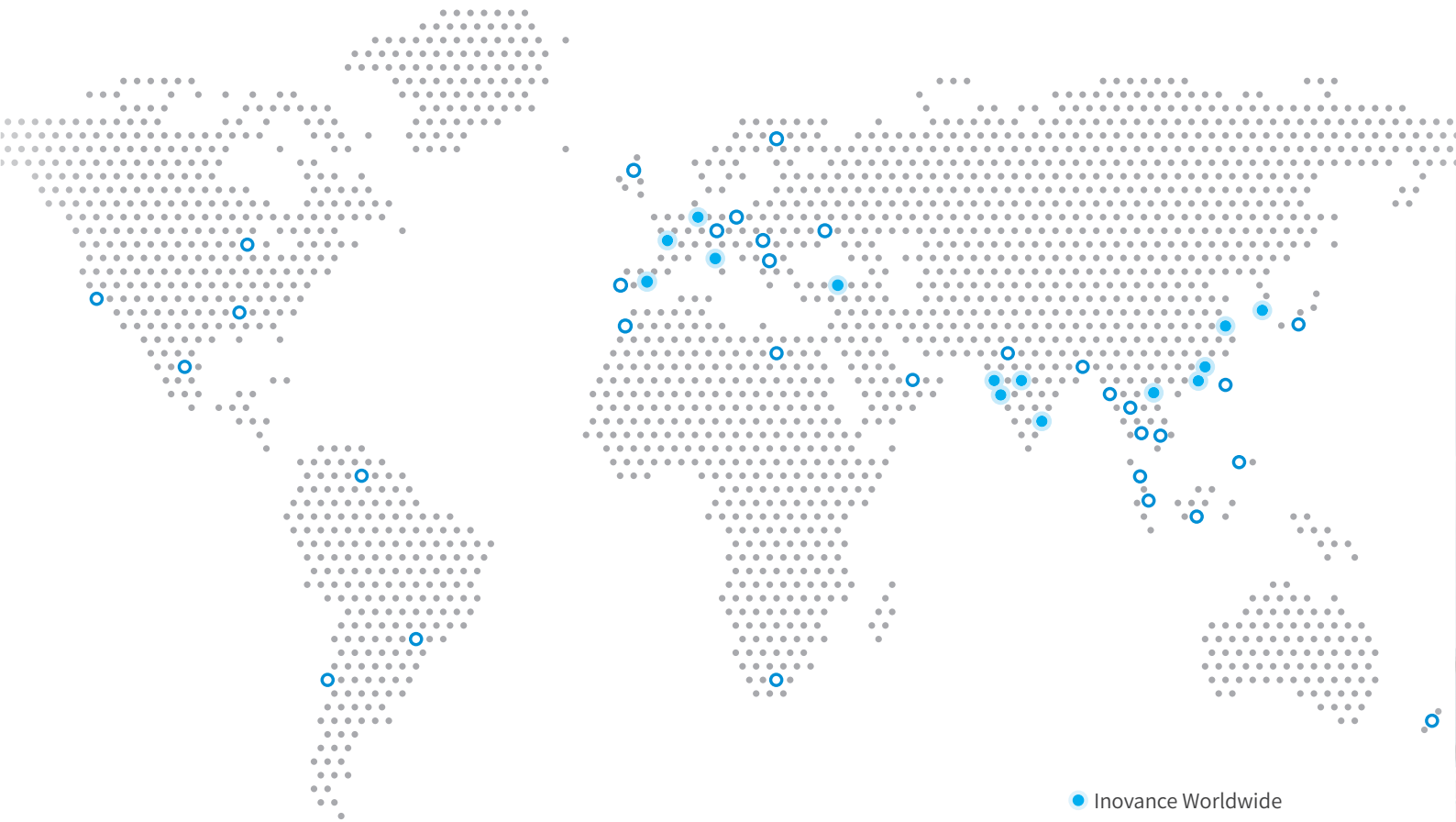




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# INOVANCE

## SV660ND Series

Dual-axis general-purpose servo drive



## Features & functions

- Compact size: More than 30% space saving compared with single-axis servo.
- Easy to use: EOE function, black box, Stune, Etune and other functions supported.
- Saving wiring: Save labor costs for wiring connecting.
- Excellent performance: 23-bit encoder, 625kHz current loop, 3.1kHz speed loop bandwidth.
- Safety and reliability: STO certification, SIL3 level.
- Global certification: CE/KC



EtherCAT



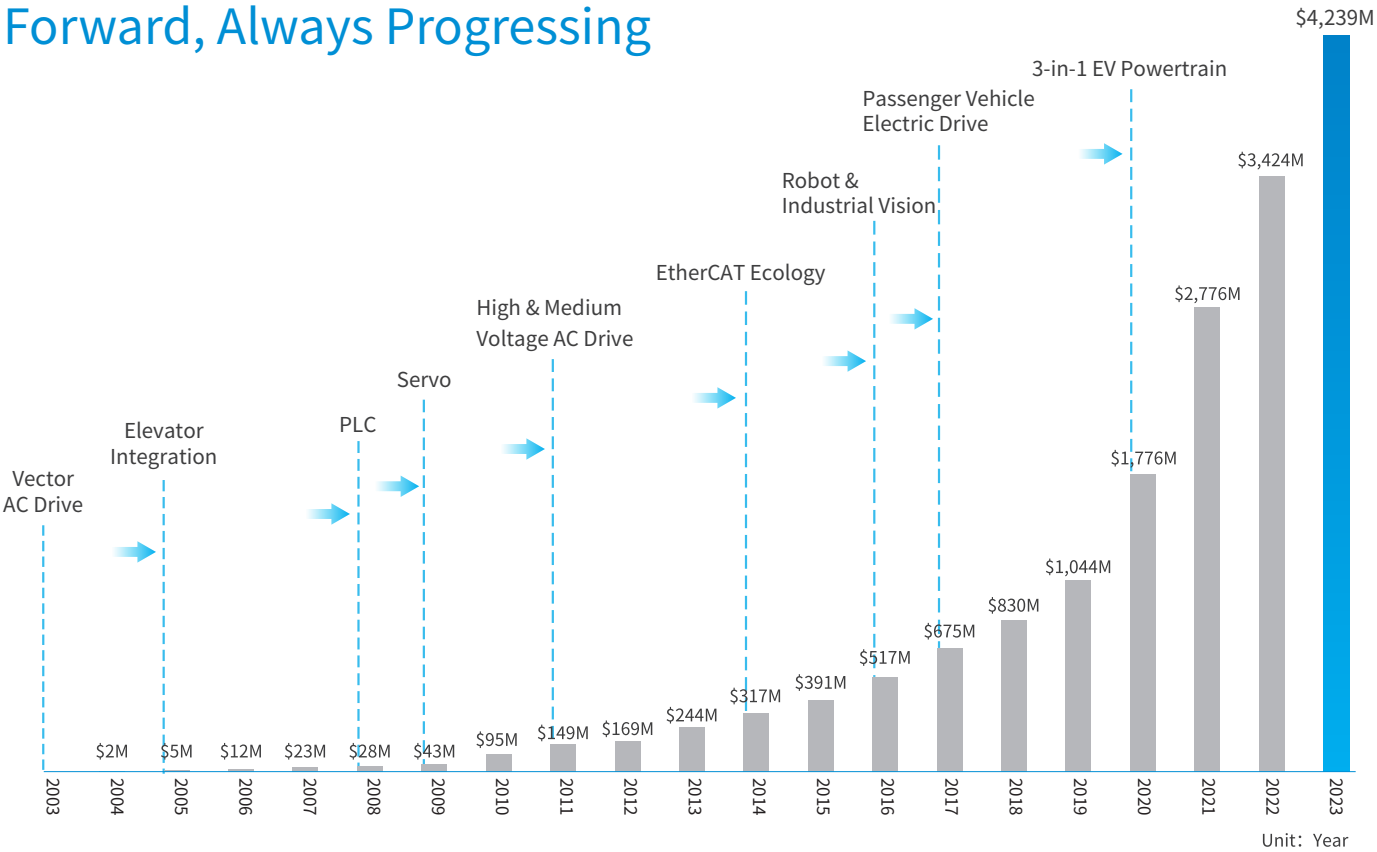


# About Inovance

The Inovance Group, founded in 2003, is a rising star in the global industrial automation business and has revenues of \$4.2 in 2023. Inovance is headquartered in Shenzhen, China, and has built a global operation with offices and facilities in Germany, France, Italy, Spain, Turkey, India, and South Korea. Additionally, the company has a strong network of distribution partners around the world.

The company 's flexible production techniques and expert understanding of all industry sectors - from plastics to printing to packaging to iron & steel production - have allowed it to establish globally leading industry-specific business units. Over the years, Inovance has built an engineering team with specialist expertise in industrial automation. This knowledge allows it to form strong partnerships with OEMs and end users, providing ongoing advice about how to get the most out of their automation solutions today, and how to stay prepared for the market and technology changes that are coming in future.

## Forward, Always Progressing



**2003**  
founded

**IPO:2010**  
Shenzhen, China

**20,000**  
employees

**Global**  
network of offices and distributors

**\$4.2+bn**  
revenues in 2023

**Servo System**  
4,500,000+  
sets delivered in 2023

**AC Drive**  
2,20,000+  
sets delivered in 2023

**Industrial Robot**  
22,000+  
sets delivered in 2023

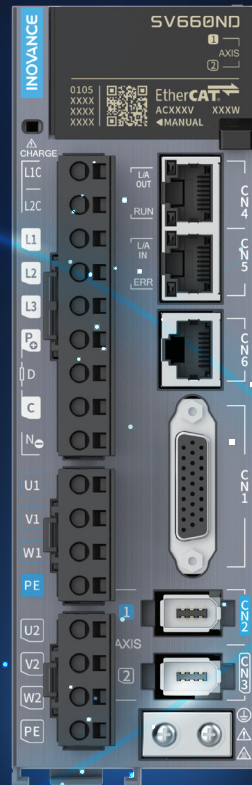
**Controller**  
3,400,000+  
sets delivered in 2023



# 4

SV660ND Series  
dual-axis general-purpose servo drive

## Advantages



One-click Adjustment



Space-saving



EtherCAT support

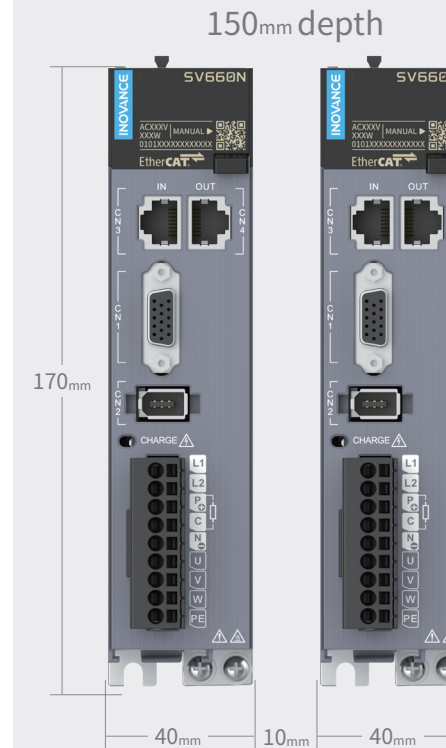


Precise positioning

The SV660ND AC servo drive is a high performance multi-drive product. It comes with a capacity of 0.4 kW an 0.75 kW, as well as support for EtherCAT bus communication. The SV660ND features STO (SIL3), one-button adjustment, and adaptive wave limiter to make the servo drive easy to use. It offers quiet and stable operation and accurate position control by working with an MS1 series high-response servo motor with a 23-bit-turn absolute encoder.

## Space-saving

Dimensions before upgrade



400 W comparison

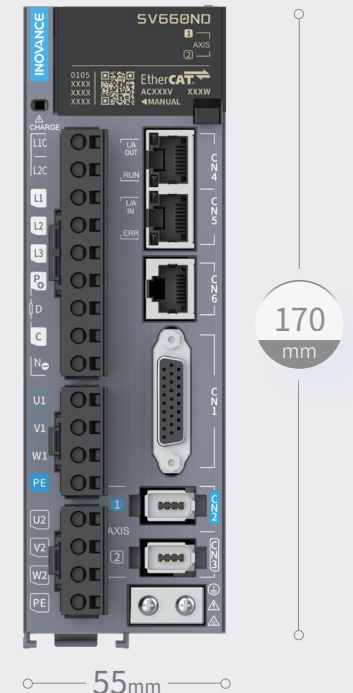
Front dimensions  
(Calculated based on the normal  
heat dissipation distance of 10 mm)

Original dimensions:  
170 mm x 90 mm

Current dimensions:  
170 mm x 55 mm

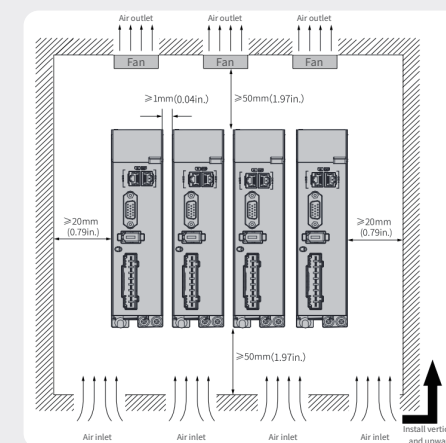
Updated dimensions

183mm depth



## Zero-distance installation, no derating required

Space before upgrade



0.2-0.75 kW supports compact installation and  
needs to be derated to 75%



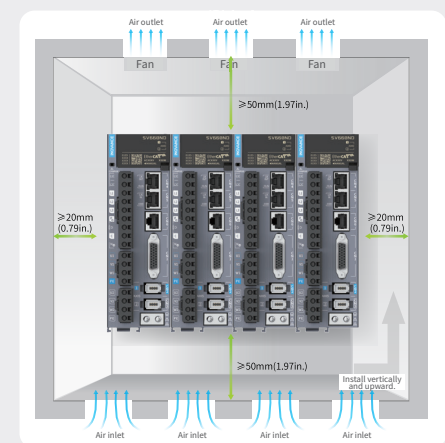
750 W

The cooling space required for eight  
750w single-axis units is as follows:

Original:  
447 mm x 270 mm  
(With heat dissipation, compact instal-  
lation)

Now  
340 mm x 270 mm  
(With heat dissipation, zero-pitch instal-  
lation)

Space after upgrade



0.4-0.75 kW supports compact installation-  
**without derating**



Ordering code

SV660 - N D S 2R8 I - \* -INT

1

2

3

4

5

6

7

8

|                                                            |                                                            |                                                                                 |
|------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------|
| <div>① Product series</div> SV660: SC660series servo drive | <div>④ Voltage level</div> S: 220 V                        | <div>⑥ Installation mode</div> I: Baseplate-mounted                             |
| <div>② Product type</div> N: Network type                  | <div>⑤ Rated output current</div> 2R8: 2.8 A<br>5R5: 5.5 A | <div>⑦ Non-standard function</div> Blank: Standard<br>FS: STO functional safety |
| <div>③ Number of axes:</div> D: Dual-axis (two-in-one)     |                                                            | <div>⑧ Version:</div> INT: International variant                                |

MS1H1-75B30CB - A3 31 R (- \* ) - INT

1

2

3

4

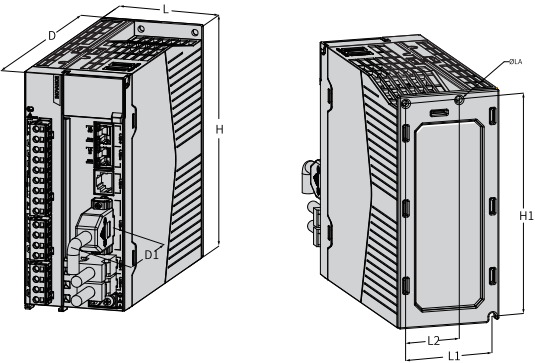
5

|                                                                  |                                                                           |
|------------------------------------------------------------------|---------------------------------------------------------------------------|
| <div>① Encoder type</div> A3: 23-bit multi-turn absolute encoder | <div>③ Motor type</div> R: Interior Permanent Magnet motors (IPM)         |
| <div>② Brake</div> 1: Without brake<br>4: With brake             | <div>④ Non-standard feature</div> Blank: Standard<br>S: Flying leads type |
|                                                                  | <div>⑤ Version:</div> INT: International variant                          |

Selection chart

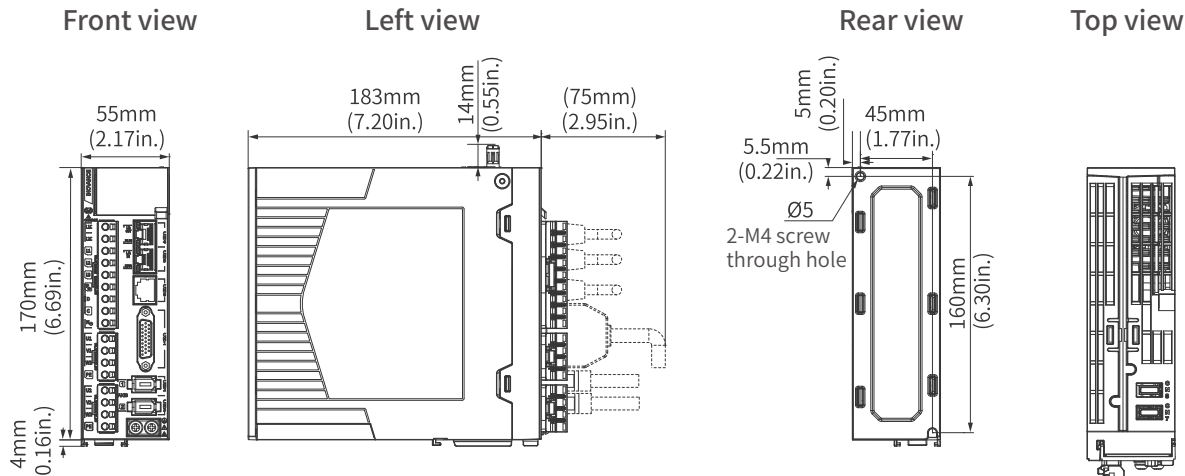
| Servo Drive (SV660ND****I-INT)                                  |                                |      |        | Servo Motor            |                      |             |               |
|-----------------------------------------------------------------|--------------------------------|------|--------|------------------------|----------------------|-------------|---------------|
| Model                                                           | Voltage class (V)              | Size | H01.10 | Brake-less motor model | Brake motor model    | Flange size | Capacity (kW) |
| Ratings of MS1H1 series motors (Vn = 3000 rpm, Vmax = 6000 rpm) |                                |      |        |                        |                      |             |               |
| S2R8                                                            | Single-phase/Three-phase 220 V | A    | 00003  | MS1H1-40B30CB- A331R   | MS1H1-40B30CB- A334R | 60          | 0.4           |
| S5R5                                                            |                                | B    | 00005  | MS1H1-55B30CB- A331R   | -                    | 80          | 0.55          |
| S5R5                                                            |                                |      |        | MS1H1-75B30CB- A331R   | MS1H1-75B30CB- A334R | 80          | 0.75          |
| Ratings of MS1H4 series motors (Vn = 3000 rpm, Vmax = 6000 rpm) |                                |      |        |                        |                      |             |               |
| S2R8                                                            | Single-phase/Three-phase 220 V | A    | 00003  | MS1H4-40B30CB-A331R    | MS1H4-40B30CB-A334R  | 60          | 0.4           |
| S5R5                                                            |                                | B    | 00005  | MS1H4-55B30CB-A331R    | -                    | 80          | 0.55          |
| S5R5                                                            |                                |      |        | MS1H4-75B30CB-A331R    | MS1H4-75B30CB-A334R  | 80          | 0.75          |

Dimensions

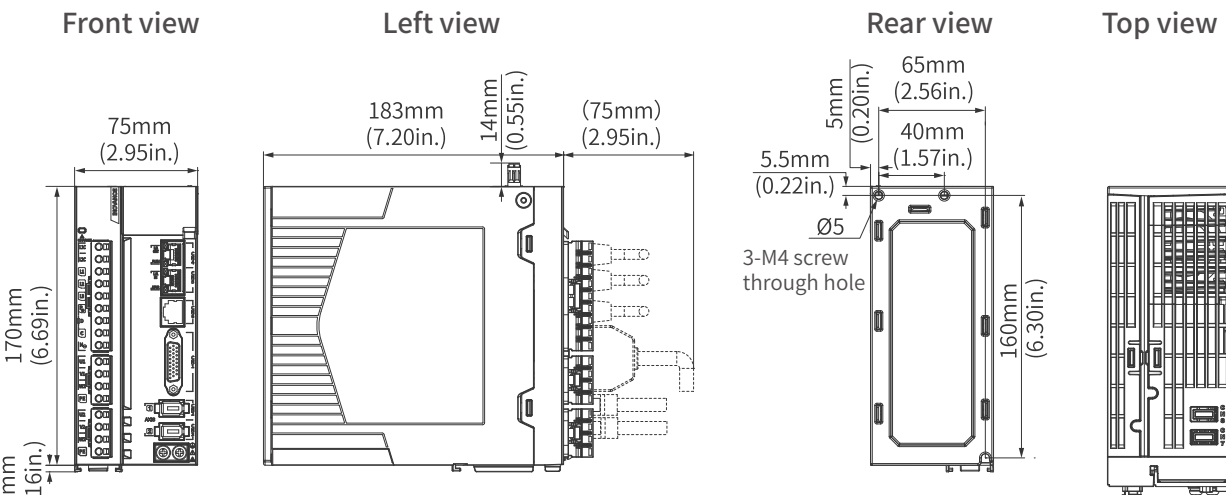


| Frame size | L (mm)       | H (mm)        | D (mm)        | L1 (mm)      | L2 (mm)      | H1 (mm)       | D1 (mm)      | Screw Hole | Tightening torque (N·m) | Weight (kg) |
|------------|--------------|---------------|---------------|--------------|--------------|---------------|--------------|------------|-------------------------|-------------|
| Size A     | 55<br>(2.17) | 170<br>(6.69) | 183<br>(7.20) | 45<br>(1.77) | /            | 160<br>(6.30) | 75<br>(2.95) | 2-M4       | 1, 2                    | 1.4         |
| Size B     | 75<br>(2.95) | 170<br>(6.69) | 183<br>(7.20) | 65<br>(2.56) | 40<br>(1.57) | 160<br>(6.30) | 75<br>(2.95) | 3-M4       | 1, 2                    | 1.8         |

Dimension drawing of SIZE A drive



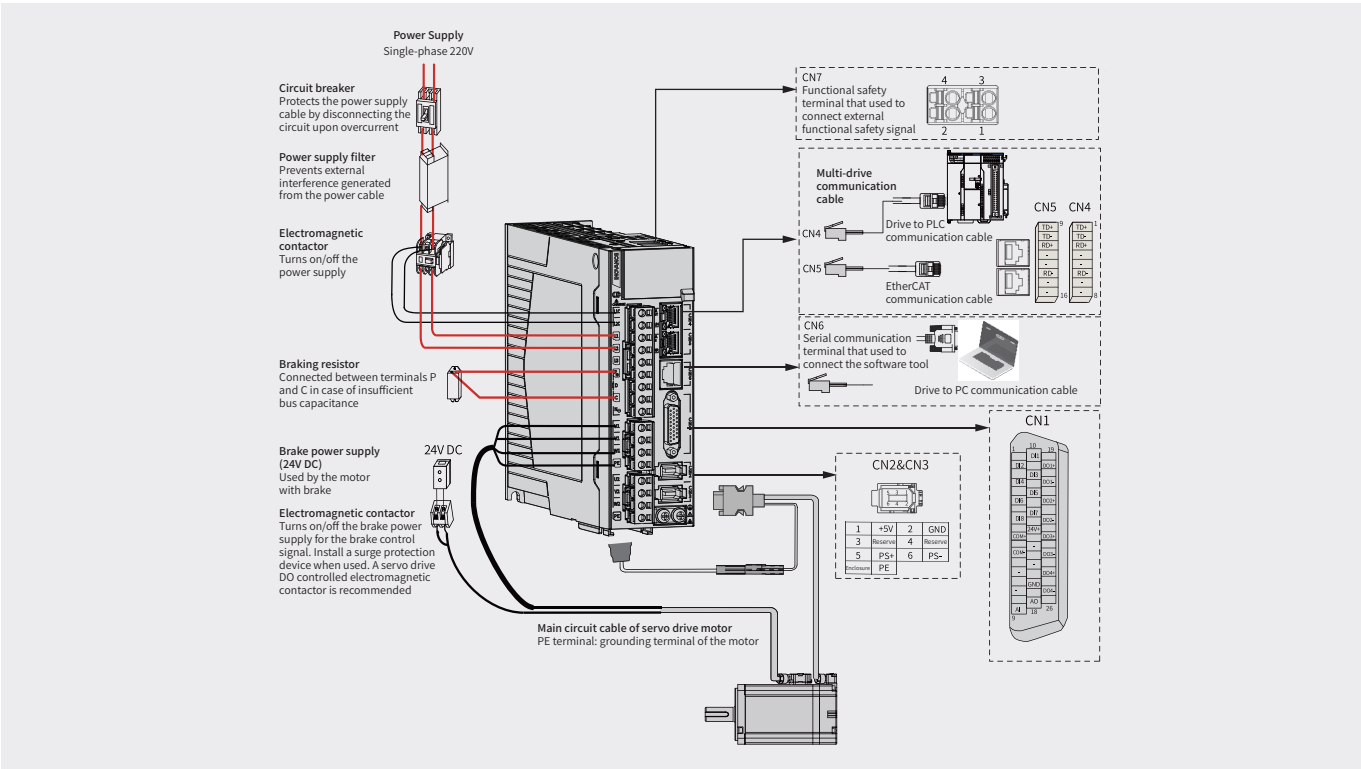
Dimension drawing of SIZE B drive



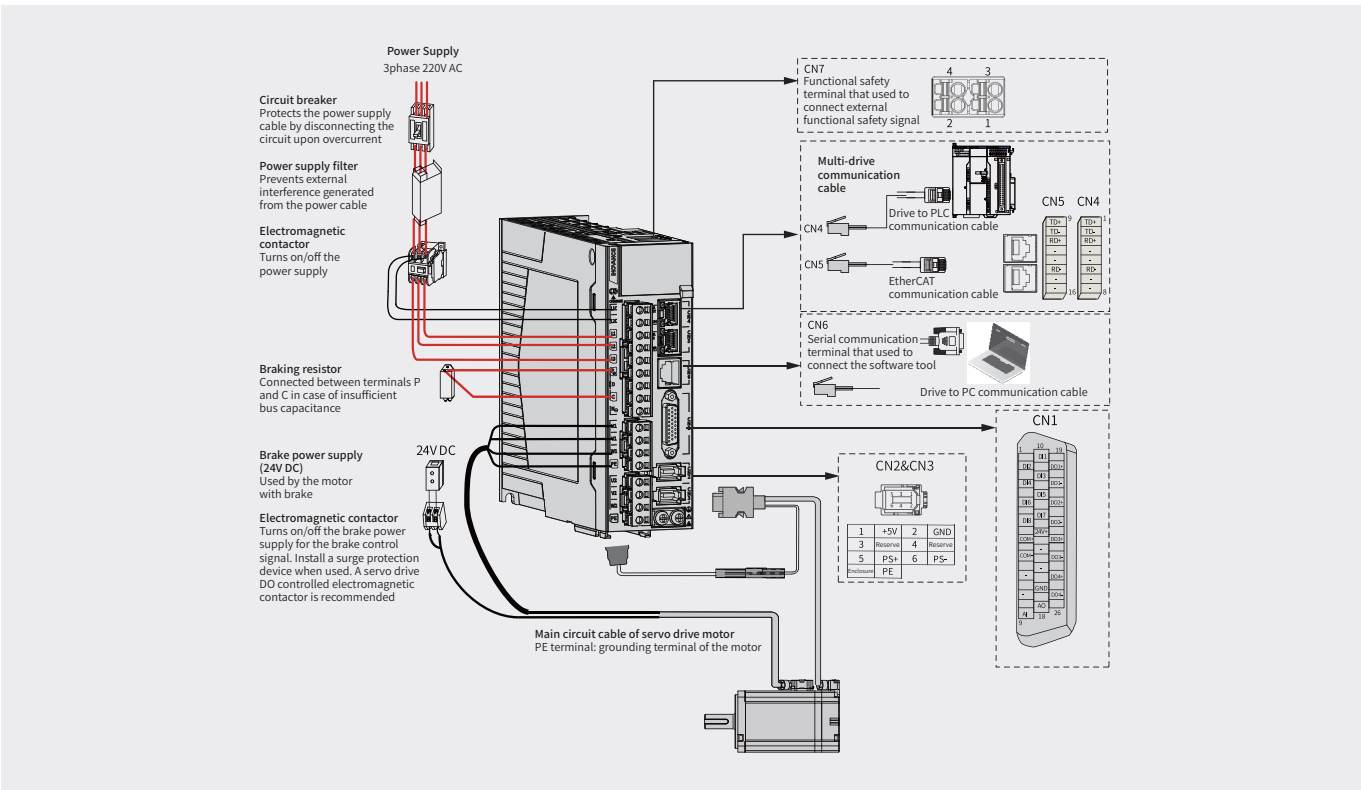


# System connection

## Single-phase connection of dual-axis servo cables



## Three-phase connection



# Definition of the dual-axis servo terminal port

## CN1 terminal pin signal

| Signal name | Default function | Pin No. | Function                                                                                 |
|-------------|------------------|---------|------------------------------------------------------------------------------------------|
| DI1         | P-OT             | 10      | Axis 1 positive switch                                                                   |
| DI2         | P-OT             | 1       | Axis 2 positive switch                                                                   |
| DI3         | N-OT             | 11      | Axis 1 negative switch                                                                   |
| DI4         | N-OT             | 2       | Axis 2 negative switch                                                                   |
| DI5         | HomeSwitch       | 12      | Axis 1 home switch                                                                       |
| DI6         | HomeSwitch       | 3       | Axis 2 home switch                                                                       |
| DI7         | TouchProbe2      | 13      | Axis 1 probe 1                                                                           |
| DI8         | TouchProbe1      | 4       | Axis 2 probe 1                                                                           |
|             | +24 V            | 14      | Internal 24 V power supply; voltage range: 20 V to 28 V; maximum output current: 150 mA. |
|             | COM-             | 6       |                                                                                          |
|             | COM-             | 5       | Common terminal of DI terminals                                                          |
| DO1+        | S-RDY+           | 19      | Axis 1 ready                                                                             |
| DO1-        | S-RDY-           | 20      | Axis 2 ready                                                                             |
| DO2+        | ALM+             | 21      | Axis 2 ready                                                                             |
| DO2-        | ALM-             | 22      |                                                                                          |
| DO3+        | BK+              | 23      | Axis 1 brake output                                                                      |
| DO3-        | BK-              | 24      |                                                                                          |
| DO4+        | BK+              | 25      | Axis 2 brake output                                                                      |
| DO4-        | BK-              | 26      |                                                                                          |
|             | AI               | 9       | Analog input (voltage-type)                                                              |
|             | AO               | 18      | Analog output                                                                            |
|             | GND              | 17      | Common terminal of AI/AO                                                                 |

## CN4&CN5 EtherCAT (communication terminals)

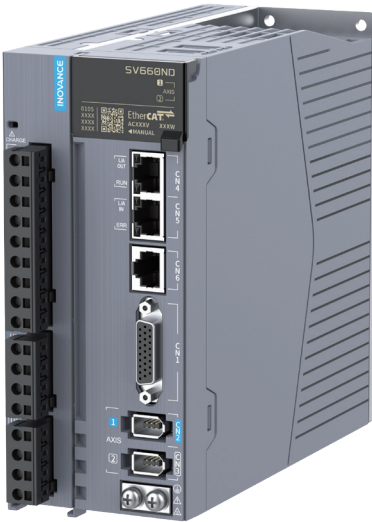
| Pin No.   | Name | Description           |
|-----------|------|-----------------------|
| 1         | TD+  | Transmitting data (+) |
| 2         | TD-  | Transmitting data (-) |
| 3         | RD+  | Receiving data (+)    |
| 4 and 5   | /    | -                     |
| 6         | RD-  | Receiving data (-)    |
| 7 and 8   | /    | -                     |
| 9         | TD+  | Transmitting data (+) |
| 10        | TD-  | Transmitting data (-) |
| 11        | RD+  | Receiving data (+)    |
| 12 and 13 | /    | -                     |
| 14        | RD-  | Receiving data (-)    |
| 15 and 16 | /    | -                     |

## CN2 and CN3 encoder terminals

| Pin No.   | Assignment | Description      |
|-----------|------------|------------------|
| 1         | +5 V       | 5 V power supply |
| 2         | GND        |                  |
| 3         | Reserved   | /                |
| 4         | Reserved   | /                |
| 5         | PS+        | Encoder signal   |
| 6         | PS-        |                  |
| Enclosure | PE         | Shield           |

## Main circuit terminal definition (size A/size B)

| Name                                                       | Terminal Name                                                                                                                 |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| L1C, L2C (control circuit power input terminals)           | Input the control circuit power supply according to the rated voltage class on the name-plate.                                |
| L1, L2, L3 (main circuit power input terminals)            | Input the control circuit power supply according to the rated voltage class on the name-plate.                                |
| P ⊕ , D, and C are connected to external braking resistors | Remove the jumper bar between terminals P ⊕ and D before connecting an external braking resistor between terminals P ⊕ and C. |
| P ⊕ and N ⊖ (servo bus terminals)                          | Used by the common DC bus for multiple servo drives.                                                                          |
| U, V, W (terminals for connecting the servo motor)         | Used for wiring of the brake and motor temperature feedback.                                                                  |
| PE grounding terminal                                      | Connected to the grounding terminal of the motor for grounding purpose.                                                       |



## STO safety terminal CN7

| Pin No. | Assignment | Description           |
|---------|------------|-----------------------|
| 1       | COM-       | STO reference GND     |
| 2       | 24 V       | 24 V power supply     |
| 3       | STO1       | Control input of STO1 |
| 4       | STO2       | Control input of STO2 |



General specifications

| Item                              |                                  |                                            | Description                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------|----------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basic Specifications              | Control mode                     |                                            | IGBT PWM control, sinusoidal wave current drive mode 220 V, 380 V: Single-phase or three-phase full-bridge rectifier                                                                                                                                                                                                                    |
|                                   | Encoder feedback                 |                                            | 23-bit multi-turn absolute encoder, which can be used as an incremental encoder in absence of the battery                                                                                                                                                                                                                               |
|                                   | Conditions for use               | Ambient/Storage temperature <sup>[1]</sup> | 0°C to 55°C (If the ambient temperature exceeds 45°C , derate by 10% for every additional 5°C )/ -20°C to +70°C                                                                                                                                                                                                                         |
|                                   |                                  | Ambient/Storage humidity                   | Below 90% RH (without condensation)                                                                                                                                                                                                                                                                                                     |
|                                   |                                  | Vibration resistance                       | 4.9 m/s <sup>2</sup>                                                                                                                                                                                                                                                                                                                    |
|                                   |                                  | Impact resistance                          | 19.6 m/s <sup>2</sup>                                                                                                                                                                                                                                                                                                                   |
|                                   |                                  | Protection rating                          | IP20 (excluding terminals (IP00))                                                                                                                                                                                                                                                                                                       |
|                                   |                                  | Pollution degree                           | PD2                                                                                                                                                                                                                                                                                                                                     |
|                                   |                                  | Altitude                                   | The maximum altitude is 2000 m.<br>For altitudes not higher than 1000 m, derating is not required.<br>For altitudes above 1000 m, derate 1% for every additional 100 m.<br>For altitudes above 2000 m, contact Inovance.                                                                                                                |
| Velocity Torque Control Authority | Performance                      | Speed control range                        | 1:6000 (Under the rated torque load, the servo drive keeps running as long as the lower limit of the speed control range is not exceeded.)                                                                                                                                                                                              |
|                                   |                                  | Speed loop bandwidth                       | 3 kHz                                                                                                                                                                                                                                                                                                                                   |
|                                   |                                  | Torque control accuracy (repeatability)    | ±2%                                                                                                                                                                                                                                                                                                                                     |
|                                   |                                  | Soft startup time                          | 0s to 65s (Acceleration and deceleration can be set separately.)                                                                                                                                                                                                                                                                        |
|                                   | Input signal                     | Speed reference input                      | The network-type instruction is derived from the local mode and local multi-speed set by EtherCAT communication                                                                                                                                                                                                                         |
| Position Control Authority        | Performance                      | Positioning time                           | 1 ms to 10 ms                                                                                                                                                                                                                                                                                                                           |
|                                   | Input signal                     | Position reference                         | Network-type instructions are derived from the local mode supported by EtherCAT communication                                                                                                                                                                                                                                           |
| Input Output Signal               | DI signal                        | DI signal function assignment              | 8 DIs<br>DI1 to DI8: Fast DI (falling edge (24 V input from high to low) input delay time: 30 us, Rising edge (24 V input from low to high) input delay time: 5 us, voltage range: 12 V to 24 V<br>P-OT (forward overtravel switch) N-OT (reverse overtravel switch)<br>HomeSwitch TouchProbe1 (probe 1)<br>TouchProbe2 (touch probe 2) |
|                                   |                                  |                                            | 4-way DO DO has a load capacity of 50 mA and a voltage range of 5 V to 30 V.                                                                                                                                                                                                                                                            |
|                                   | Digital output signal            | Output signal function selection           | S-RDY: Servo ready Brake output                                                                                                                                                                                                                                                                                                         |
| Built-in function                 | Overtravel (OT) prevention       |                                            | The servo drive stops immediately when P-OT or N-OT signal is active.                                                                                                                                                                                                                                                                   |
|                                   | Protection Functions             |                                            | Protections against overcurrent, overvoltage, undervoltage, overload, main circuit detection error, heatsink overheat, overspeed, encoder error, CPU error, and parameter error                                                                                                                                                         |
|                                   | LED display                      |                                            | Main circuit CHARGE indicator, 5-digit LED display                                                                                                                                                                                                                                                                                      |
|                                   | Vibration suppression            |                                            | 4 notches (including two adaptive notches) available, 50 Hz to 5000 Hz                                                                                                                                                                                                                                                                  |
|                                   | Communication function           | Software tool commissioning                | RS232                                                                                                                                                                                                                                                                                                                                   |
|                                   |                                  | Communication Protocol                     | EtherCAT                                                                                                                                                                                                                                                                                                                                |
|                                   |                                  | Multi-station communication                | Maximum number of slaves: 255                                                                                                                                                                                                                                                                                                           |
|                                   |                                  | Axis address setting                       | No physical knob, set to 0 to 255 through the software                                                                                                                                                                                                                                                                                  |
|                                   |                                  | Description                                | Including status display, user parameter setting, monitored value display, fault tracing display, JOG and auto-tuning, and speed/torque reference signal observation                                                                                                                                                                    |
|                                   | Others                           |                                            | Gain tuning, alarm record, jog                                                                                                                                                                                                                                                                                                          |
| Basic performance of slave        | Communication protocol           |                                            | EtherCAT protocol                                                                                                                                                                                                                                                                                                                       |
|                                   | Service supported                |                                            | CoE (PDO, SDO)                                                                                                                                                                                                                                                                                                                          |
|                                   | Synchronization mode             |                                            | DC - Distributed clock                                                                                                                                                                                                                                                                                                                  |
|                                   | Physical layer                   |                                            | 100BASE-TX                                                                                                                                                                                                                                                                                                                              |
|                                   | Baud rate:                       |                                            | 100 Mbit/s (100Base-TX)                                                                                                                                                                                                                                                                                                                 |
|                                   | Duplex mode                      |                                            | Full duplex                                                                                                                                                                                                                                                                                                                             |
|                                   | Topology                         |                                            | Ring and linear                                                                                                                                                                                                                                                                                                                         |
|                                   | Transmission medium              |                                            | Shielded cables of Cat 5e or higher                                                                                                                                                                                                                                                                                                     |
|                                   | Transmission distance            |                                            | Less than 100 m between two nodes (with proper environment and cables)                                                                                                                                                                                                                                                                  |
|                                   | Number of slaves                 |                                            | Up to 65535 by protocol, not exceeding 100 in actual use                                                                                                                                                                                                                                                                                |
|                                   | EtherCAT frame length            |                                            | 44 bytes to 1498 bytes                                                                                                                                                                                                                                                                                                                  |
|                                   | Process data                     |                                            | Max. 1,486 bytes per Ethernet frame                                                                                                                                                                                                                                                                                                     |
|                                   | Synchronous jitter of two slaves |                                            | < 1 us                                                                                                                                                                                                                                                                                                                                  |
|                                   | Update time                      |                                            | About 30 us for 1,000 digital inputs and outputs<br>About 100 μs for 100 servo axes<br>Define different update time for different interfaces.                                                                                                                                                                                           |
|                                   | Communication code error rate    |                                            | 10 <sup>-10</sup> Ethernet standard                                                                                                                                                                                                                                                                                                     |

General specifications

| Item               |                                                    | Description |
|--------------------|----------------------------------------------------|-------------|
| Configuration unit | Number of FMMU units                               | 8           |
|                    | Number of storage synchronization management units | 8           |
|                    | Process data RAM                                   | 8 kB        |
|                    | Distributed Clock                                  | 64-bit      |
|                    | EEPROM capacity                                    | 32-kbit     |

Power cables

| Motor Model                              |              | Cable Model              | Cable Length (m) |
|------------------------------------------|--------------|--------------------------|------------------|
| MS1H1/MS1H4 terminal type motor          | Front outlet | S6-L-M107-3.0(-T)(-INT)  | 3                |
|                                          |              | S6-L-M107-5.0(-T)(-INT)  | 5                |
|                                          |              | S6-L-M107-10.0(-T)(-INT) | 10               |
|                                          |              | S6-L-B107-3.0(-T)(-INT)  | 3                |
|                                          |              | S6-L-B107-5.0(-T)(-INT)  | 5                |
|                                          | Back outlet  | S6-L-B107-10.0(-T)(-INT) | 10               |
|                                          |              | S6-L-M108-3.0(-T)(-INT)  | 3                |
|                                          |              | S6-L-M108-5.0(-T)-INT    | 5                |
|                                          |              | S6-L-M108-10.0(-T)(-INT) | 10               |
|                                          |              | S6-L-B108-3.0(-T)(-INT)  | 3                |
| MS1H1/MS1H4 flying leads type motor (-S) |              | S6-L-B108-5.0(-T)(-INT)  | 5                |
|                                          |              | S6-L-B108-10.0(-T)(-INT) | 10               |
|                                          |              | S6-L-M100-3.0(-T)(-INT)  | 3                |
|                                          |              | S6-L-M100-5.0(-T)(-INT)  | 5                |
|                                          |              | S6-L-M100-10.0(-T)(-INT) | 10               |

Communication cables

| Description                                                             | Cable Model  | Cable Length (mm) | Tolerance (T) (mm) |
|-------------------------------------------------------------------------|--------------|-------------------|--------------------|
| Drive-PC communication cable                                            | S6-L-T00-3.0 | 3000              | (-30.30)           |
| The servo drive is connected in parallel Communication cable            | S6-L-T01-0.3 | 300               | (-10.10)           |
| The servo drive and host controller are switched on Communication cable | S6-L-T02-2.0 | 2000              | (-20.20)           |

Encoder cables

| Motor Model                              |              | Cable Model              | Cable Length (mm) |
|------------------------------------------|--------------|--------------------------|-------------------|
| MS1H1/MS1H4 terminal-type motor          | Front outlet | S6-L-P124-3.0(-T)(-INT)  | 3                 |
|                                          |              | S6-L-P124-5.0(-T)(-INT)  | 5                 |
|                                          |              | S6-L-P124-10.0(-T)(-INT) | 10                |
|                                          | Rear outlet  | S6-L-P125-3.0(-T)(-INT)  | 3                 |
|                                          |              | S6-L-P125-5.0(-T)(-INT)  | 5                 |
|                                          |              | S6-L-P125-10.0(-T)(-INT) | 10                |
| MS1H1/MS1H4 flying leads type motor (-S) |              | S6-L-P120-3.0(-T)(-INT)  | 3                 |
|                                          |              | S6-L-P120-5.0(-T)(-INT)  | 5                 |
|                                          |              | S6-L-P120-10.0(-T)(-INT) | 10                |

Connector kit

| Description               | Model  |
|---------------------------|--------|
| CN1 terminal (DB26)       | S6-C74 |
| Battery box connector kit | S6-C9  |
| SV660ND's EMC bracket     | S6-C37 |