SANYO DENKI

# SANMOTION C S500

## Motion controller

Ver.2
English

# SANMOTION C

## MOTION CONTROLLER


EtherCAT®

c UL us LISTED
PROG.CNTLR.
E302733
AT2

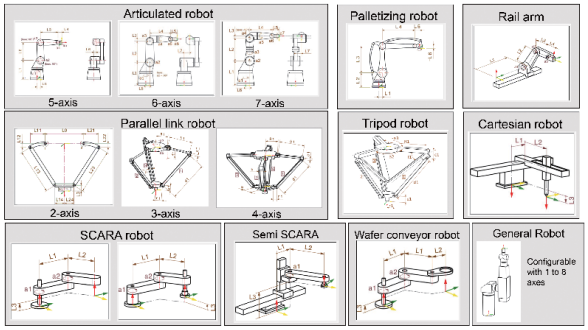
EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

# SANMOTION C
## MOTION CONTROLLER S500

This motion controller can control 7-axis articulated robots.
It can control the motion of a variety of robots, contributing to the in-house robot motion planning for your system.

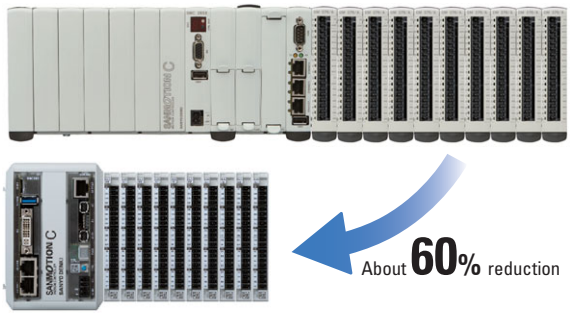
## Abundant Robot Control Functions

This motion controller can control 15 robot configurations, including complex 7-axis articulated robots. Functions such as trajectory control and interpolated operation can be done with ease, contributing to the in-house robot motion planning.




## Space-Saving of Equipment

The product volume has been reduced by approximately 60% compared to our current model. This allows it to be installed in a limited space, helping miniaturizing your system.




Comparison with our existing motion controller SANMOTION C SMC263X with 10 I/O modules installed.

## High-Speed Control of Multiple Axes

This motion controller can control a maximum of 64 motor axes with cycle time of up to 1 ms, improving the accuracy of position control.

## Control of Multiple Robots

This motion controller can control multiple robots simultaneously, allowing different types of robots, e.g. assembly and sorting robots, to be controlled with a single unit.

## Helps Make Systems IoT-ready

This motion controller can connect to a variety of open networks such as EtherCAT, Modbus TCP, and OPC UA. It can contribute to making factories automated and IoT-ready by sharing information between devices in a network in real time.

## Reduces Development Time

This motion controller can integrate robot control and machine control development environments into one. This makes it possible to simulate the motion of the entire system in a single development environment, greatly reducing the maintenance and development time of machines.

## Information on SANMOTION C S100 (separate catalog available)

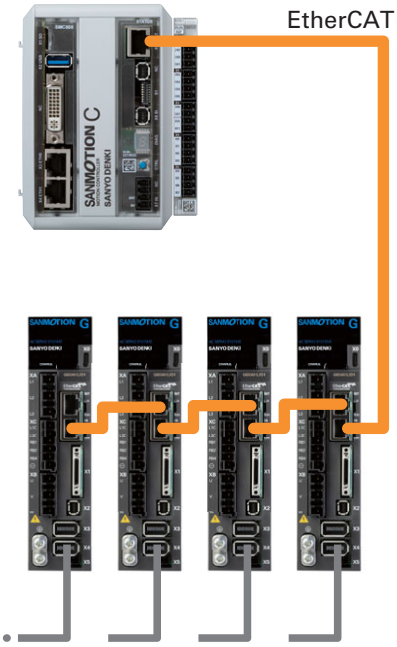
This motion controller specializes in the control of robots with up to 4 axes and point-to-point (PTP) positioning control.
They are ideal for applications such as assembly equipment and conveying machines.

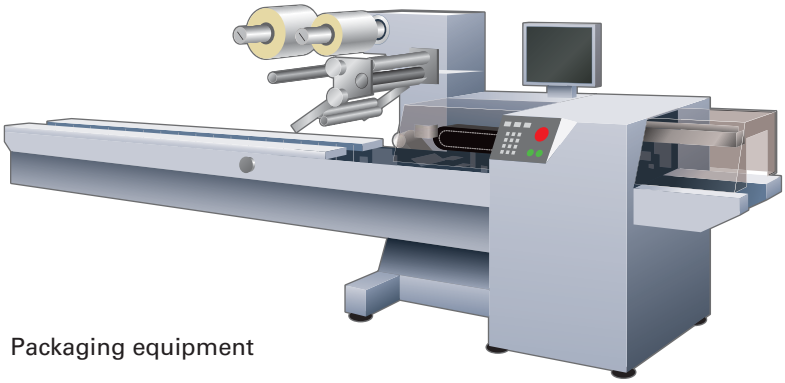
EtherCAT®

# System Configuration Example

## Packaging equipment (electronic cam, electronic gear control)

| Items | Model no. |
|---|---|
| CPU module | SMC505 |
| I/O module | DM570 |
| Runtime firmware | SMC-505-MFB-□□□ |
| Integrated development tool software SANMOTION C Studio | SMC-500-STUDIO-□□□ |

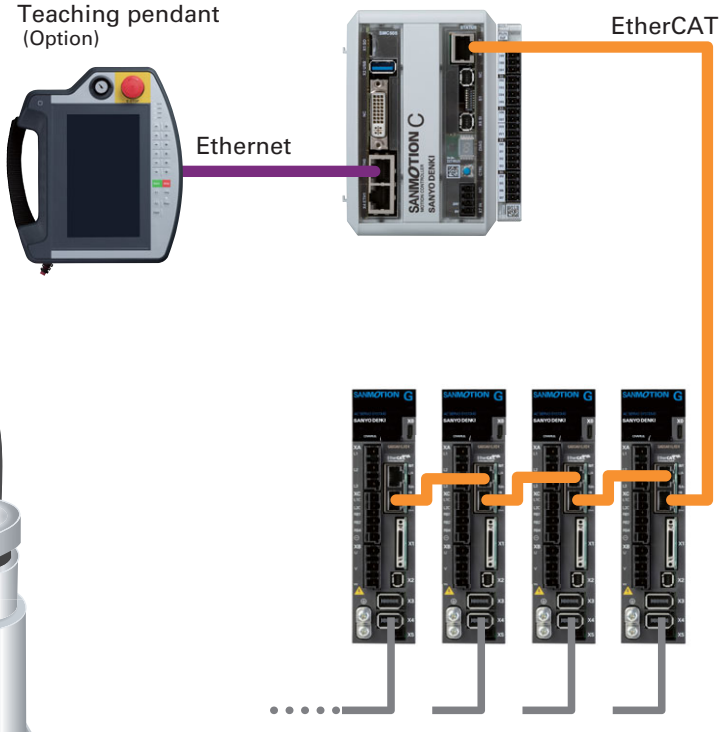


Packaging equipment

## Conveying robot (SCARA robot)

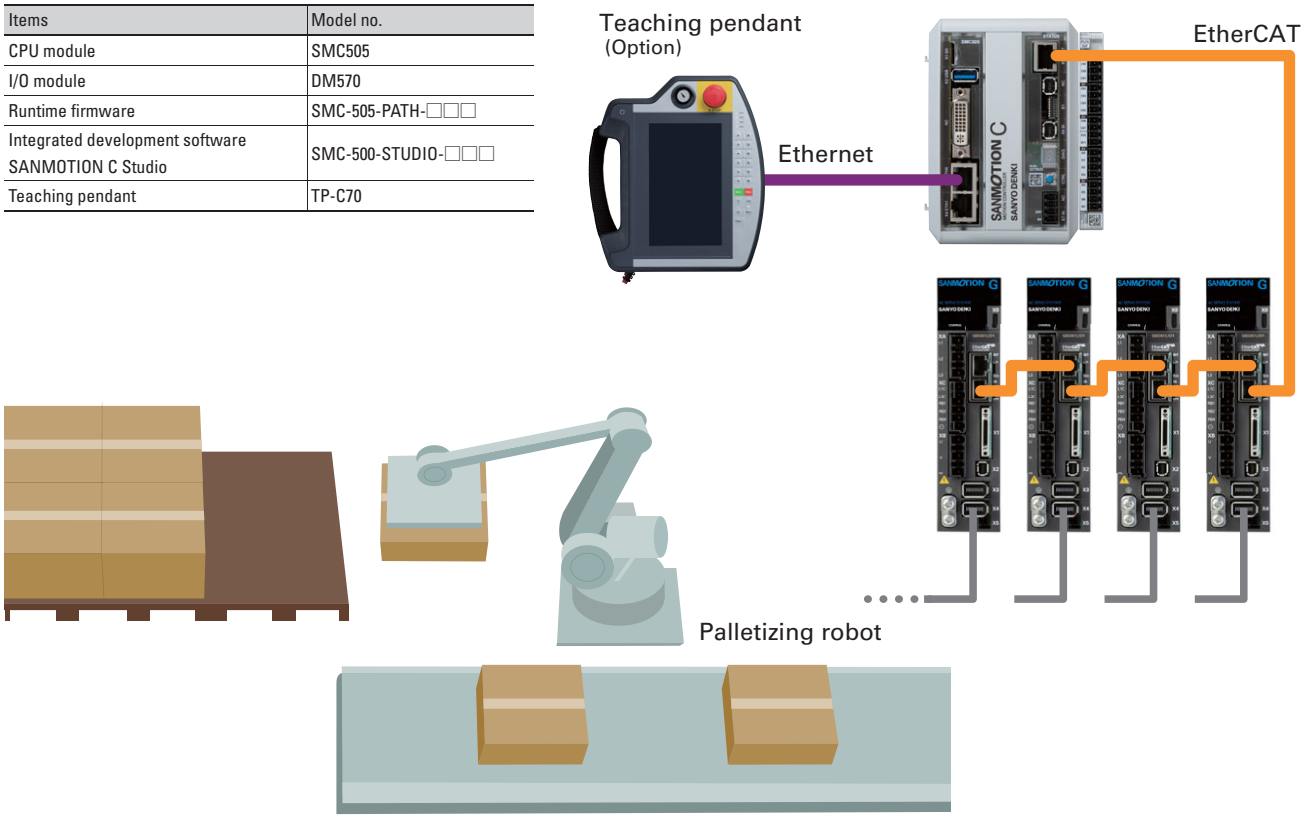
| Items | Model no. |
|---|---|
| CPU module | SMC505 |
| I/O module | DM570 |
| Runtime firmware | SMC-505-PATH-□□□ |
| Integrated development tool software SANMOTION C Studio | SMC-500-STUDIO-□□□ |
| Teaching pendant | TP-C70 |




SCARA robot

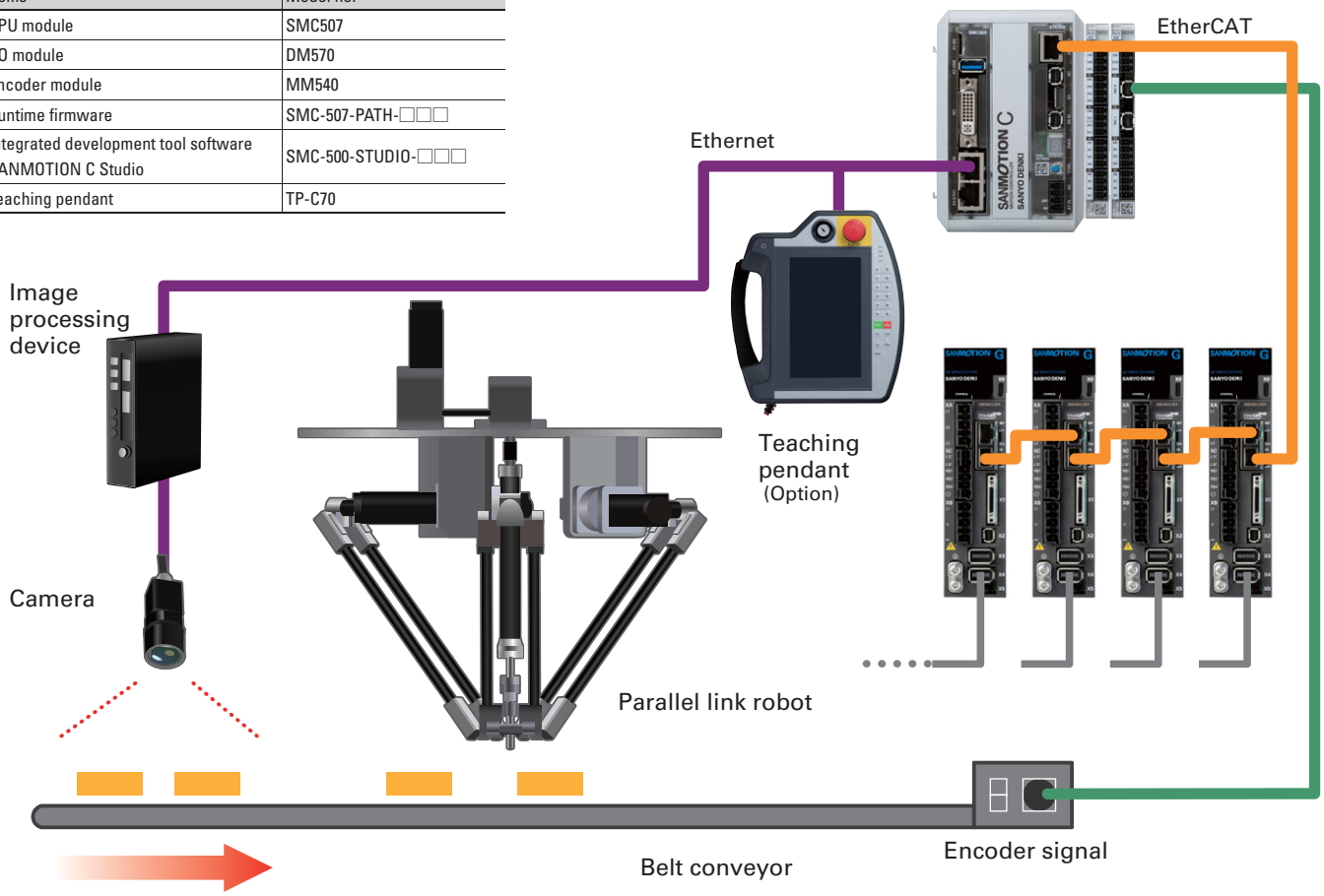
## Palletizing system (palletizing robot)

| Items | Model no. |
|---|---|
| CPU module | SMC505 |
| I/O module | DM570 |
| Runtime firmware | SMC-505-PATH-□□□ |
| Integrated development software SANMOTION C Studio | SMC-500-STUDIO-□□□ |
| Teaching pendant | TP-C70 |




## Conveyor tracking system (with parallel link robot tracking function)

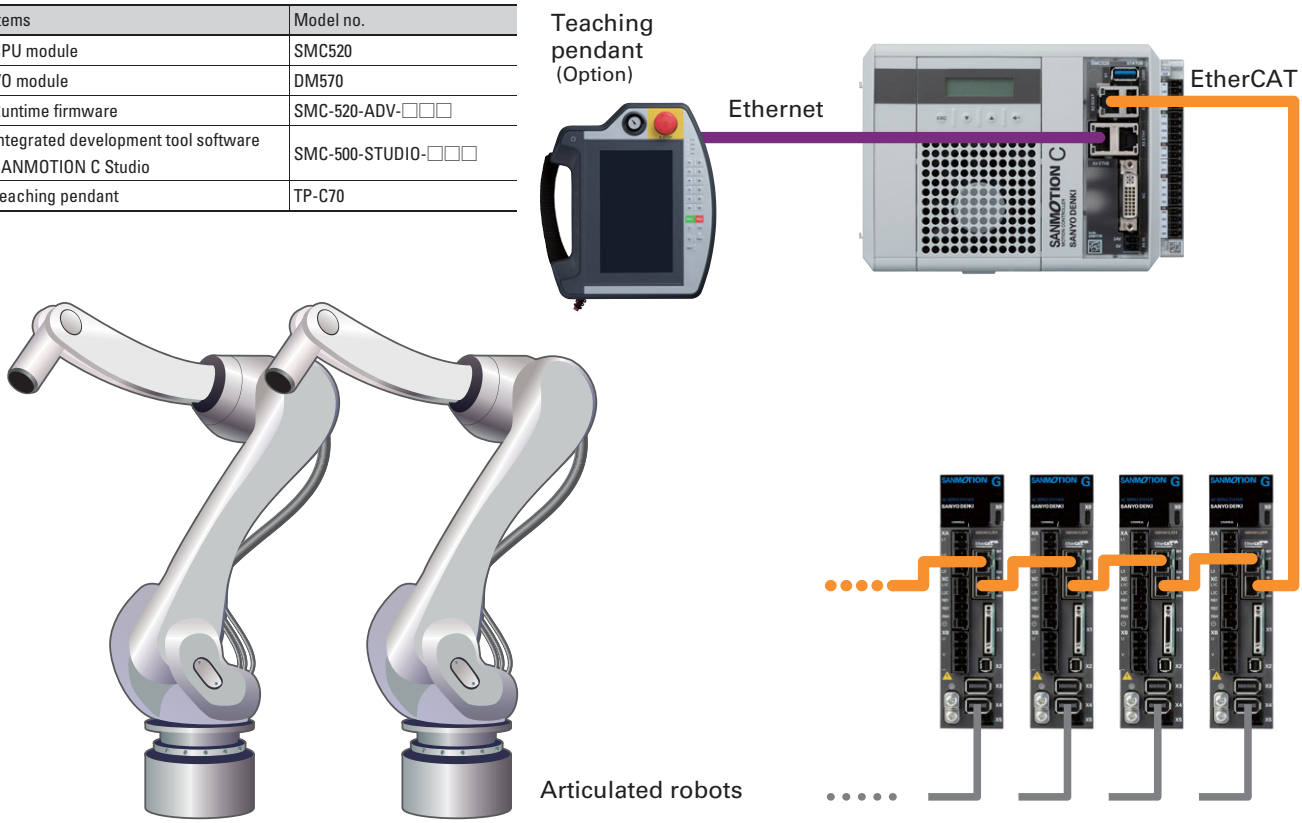
| Items | Model no. |
|---|---|
| CPU module | SMC507 |
| I/O module | DM570 |
| Encoder module | MM540 |
| Runtime firmware | SMC-507-PATH-□□□ |
| Integrated development tool software SANMOTION C Studio | SMC-500-STUDIO-□□□ |
| Teaching pendant | TP-C70 |



# System Configuration Example

## ■ Assembly system with multiple robots (6-/7-axis articulated robot)

| Items | Model no. |
|---|---|
| CPU module | SMC520 |
| I/O module | DM570 |
| Runtime firmware | SMC-520-ADV-□□□ |
| Integrated development tool software SANMOTION C Studio | SMC-500-STUDIO-□□□ |
| Teaching pendant | TP-C70 |




See the following catalogs for AC servo systems and closed loop stepping systems.
Catalogs are available for download from our Catalog Site.

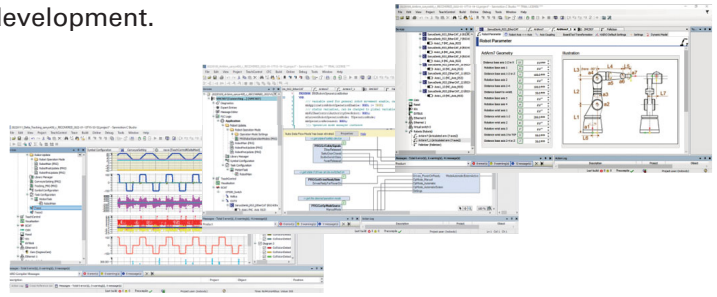
- SANMOTION G Catalog
- SANMOTION R 100/200 V General Catalog
- SANMOTION R 400 V Catalog
- SANMOTION R ADVANCED MODEL 48 VDC Catalog
- SANMOTION Model No.PB Closed Loop Stepping System Catalog

# Software and Peripherals

## Integrated development software
## SANMOTION C Studio

This software features various functions for system development.

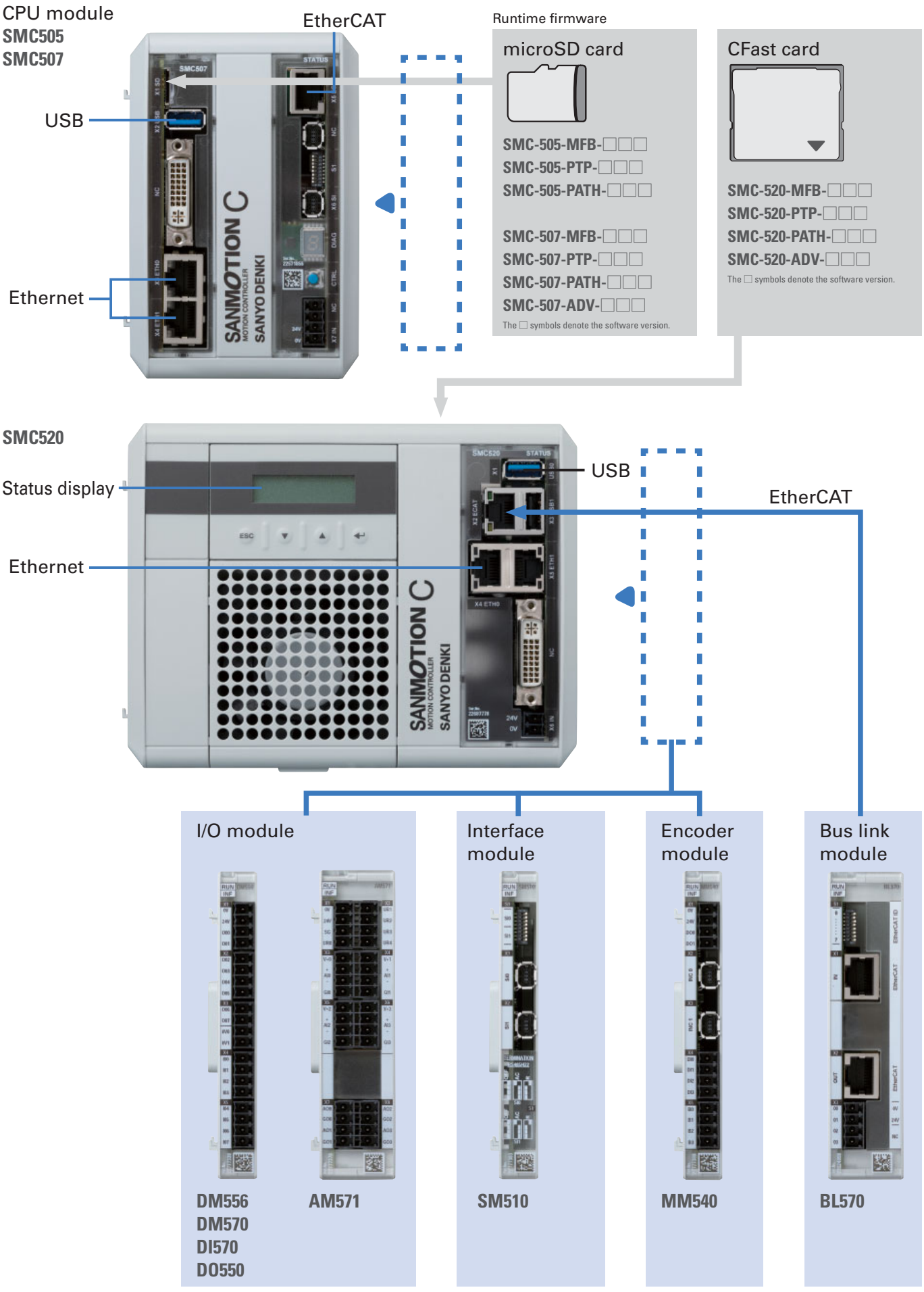
- Programming tool
- Electronic cam editor
- Configuration tool
- Simple HMI (human machine interface) tool
- Analysis and diagnostic tool



## User-friendly
## Teaching pendant

- The 7-inch touch screen is easy to use.
- You can easily create a robot motion program by simply selecting the desired preset commands.
- To ensure operator safety, this teaching pendant features an emergency stop button and a 3-position enabling switch.

# Module Structure



# Specifications

## ■ CPU module

| Model no. | | SMC505 | SMC507 | SMC520 | Remarks | Manufacturer |
|---|---|---|---|---|---|---|
| CPU | | 1.75 GHz | 1.91 GHz | 2 GHz | | |
| Memory | | 2 GB | | 4 GB | | |
| Battery backed SRAM | | 512 kB | | 1 MB | | |
| Storage media | | 2 GB microSD card | | 4 GB CFast card (Type 1) | | |
| Built-in interface specifications | EtherCAT | 100 Mbps, 1 port | | | RJ-45 connector | |
| | Ethernet | 10/100/1000 Mbps, 2 ports | | | RJ-45 connector | |
| | Serial | RS-232C/RS-422/RS-485 selectable in software, 1 port | | – | Industrial Mini I/O connector type II | TE Connectivity |
| | USB | USB 3.0 (SuperSpeed), 1 port | | USB 3.0 (SuperSpeed), 1 port<br>USB 2.0 (Hi-Speed), 1 port | Type A | |
| Max. no. of controllable axes | | 64 | | | | |
| Robot communication cycle | | 4 ms ～ | 2 ms ～ | 1 ms ～ | | |
| Max. controllable robot | | 1 | 2 | 4 | | |
| Max. number of connectable units | | 12 | | | | |
| Input voltage | | 24 VDC (19.2 to 30 VDC) | | | | |
| Power supply connector | | 1969950000, BCF 3.81/04/180 SN BK BX type | | 1969890000, BCF 3.81/02/180 SN BK BX type | | Weidmüller |
| Maximum input power | | 76.2 W | 96.2 W | 140 W | | |
| Inrush current | | 10 A max. | | | | |
| Maximum output power (Ke-bus 5 VDC) | | 10.5 W | 20 W | 30 W | | |
| Maximum output power (Ke-bus 24 VDC) | | 48 W | | | | |
| Cooling method | | Passive air cooling | Forced air cooling | | | |
| Mass | | 500 g | 515 g | 900 g | | |

## ■ Expansion modules

| Module types | Model no. | Specifications | Mass | Remarks | Manufacturer |
|---|---|---|---|---|---|
| I/O module | **DM556** | 8 digital inputs, 24 VDC, positive common input<br>8 digital outputs, 24 VDC, 0.5 A, sink output | 70 g | 1969950000 × 5 pcs, BCF 3.81/04/180 SN BK BX type | Weidmüller |
| | **DM570** | 8 digital inputs, 24 VDC, negative common input<br>8 digital outputs, 24 VDC, 2 A, source output | | | |
| | **DI570** | 19 digital inputs, 24 VDC, negative common input | | | |
| | **DO550** | 16 digital outputs, 24 VDC, 0.5 A, source output | | | |
| | **AM571** | 4 analog inputs, ±10 V (Resolution: 65536, 16 bit) or<br>0 to 10 V (Resolution: 32768, 15 bit)<br>4 analog outputs, ±10 V (Resolution: 4096, 12 bit) | 87 g | 1969950000 × 8 pcs, BCF 3.81/04/180 SN BK BX type | Weidmüller |
| Interface module | **SM510** | RS-232C/RS-422/RS-485 selectable in software, 2 ports<br>Communication speed: baud rate 1200 to 115200 bps | 70 g | Industrial Mini I/O connector type II | TE Connectivity |
| Encoder module | **MM540** | 2 encoder inputs, counter 32 bit, maximum input frequency 700 kHz<br>4 latch inputs, positive/negative common available<br>2 digital outputs, 24 VDC, 0.3 A, source output | 70 g | Industrial Mini I/O connector type II × 2 pcs | TE Connectivity |
| | | | | 1969950000 × 3 pcs, BCF 3.81/04/180 SN BK BX type | Weidmüller |
| Bus link module | **BL570** | Communication speed: 100 Mbps (EtherCAT)<br>Maximum output power: Ke-Bus 5 V: 25 W, Ke-Bus 24 V: 48 W | 91 g | 1969950000 × 1 pc, BCF 3.81/04/180 SN BK BX type<br>RJ-45 connector (Ethernet connector) | Weidmüller |

Connector kit options are available. Prepare connectors and cables as necessary.

## ■ Specifications common to modules

| | |
|---|---|
| Operating ambient temperature | 0 to +55˚C |
| Storage ambient temperature | -40 to +70˚C |
| Operating/storage humidity | 10 to 95% (non-condensing) |
| Vibration resistance | 3.5 mm constant amplitude at $5 \leq f < 8.4$ Hz,<br>9.8 $m/s^2$ constant acceleration at $8.4 \leq f < 150$ Hz in compliance with EN 61131-2 |
| Shock resistance | 147 $m/s^2$ in compliance with EN 61131-2 |
| Operating altitude | 2000 m or less |
| Installation locations | In control panel |
| Over-voltage category | II |
| Degree of pollution | 2 |

# Options

## ■ EtherCAT cables with RJ-45 plug

| Model no. | Cable length | Specifications | Manufacturer |
|---|---|---|---|
| AL-01109322-R50 | 0.5 m | Plug: RJ-45 (TM21P-88P), on both ends | Plug: Hirose Electric Co., Ltd. |
| AL-01109322-01 | 1 m | Boot color: black | Cable: Bando Densen Co., Ltd. |
| AL-01109322-03 | 3 m | Cable: 20276 ESVP AWG#24X4P, CAT5e | |
| AL-01109322-05 | 5 m | | |
| AL-01109322-10 | 10 m | | |

## ■ Ethernet cables with RJ-45 plug

| Model no. | Cable length | Specifications | Manufacturer |
|---|---|---|---|
| AL-01111556-01 | 1 m | Plug: RJ-45 (TM21P-88P), on both ends | Plug: Hirose Electric Co., Ltd. |
| AL-01111556-03 | 3 m | Boot color: yellow | Cable: Bando Densen Co., Ltd. |
| AL-01111556-05 | 5 m | Cable: 20276 ESVP AWG#24X4P, CAT5e | |
| AL-01111556-10 | 10 m | | |

## ■ RS-422/485 encoder cables with Industrial Mini I/O plug (Flying leads on one end)

| Model no. | Cable length | Specifications | Manufacturer |
|---|---|---|---|
| AL-01119298-03 | 3 m | Plug: Industrial Mini I/O connector type II (2040008-2) on one end | Plug: TE Connectivity |
| AL-01119298-05 | 5 m | Cable: 20789 TSVP AWG#26X4P | Cable: Bando Densen Co., Ltd. |
| AL-01119298-10 | 10 m | | |

## ■ RS-232C cables with Industrial Mini I/O plug (Flying leads on one end)

| Model no. | Cable length | Specifications | Manufacturer |
|---|---|---|---|
| AL-01119299-03 | 3 m | Plug: Industrial Mini I/O connector type II (2040008-2) on one end | Plug: TE Connectivity |
| AL-01119299-05 | 5 m | Cable: 20789 TSVP AWG#26X4P | Cable: Bando Densen Co., Ltd. |
| AL-01119299-10 | 10 m | | |

## ■ Connector sets

| Model no. | Specifications | Mfr. part no. | Quantity | Manufacturer |
|---|---|---|---|---|
| AL-01139898-01 | Power supply connector for SMC505/507/BL570 | 1969950000, BCF 3.81/04/180 SN BK BX type | 1 | Weidmüller |
| AL-01139898-02 | Power supply connector for SMC520 | 1969890000, BCF 3.81/02/180 SN BK BX type | 1 | |
| AL-01139898-03 | Serial/encoder connector | 2040008-2 | 1 | TE Connectivity |
| AL-01139898-04 | Encoder module connectors | 1969950000, BCF 3.81/04/180 SN BK BX type | 3 | Weidmüller |
| AL-01139898-05 | Digital I/O module connectors | | 5 | |
| AL-01139898-06 | Analog I/O module connectors | | 8 | |

## ■ Cooling fans

| Model no. | Specifications |
|---|---|
| SMC507FAN | Replacement cooling fan (for SMC507) |
| SMC520FAN | Replacement cooling fan (for SMC520) |

# Runtime firmware

| Model no. | Use | Controllable robots |
|---|---|---|
| SMC-△△△-MFB-□□□ | Sequence/motion control | |
| SMC-△△△-PTP-□□□ | Sequence/motion/robot-1 control | Cartesian, SCARA, palletizing robots |
| SMC-△△△-PATH-□□□ | Sequence/motion/robot-2 control | Parallel link (tracking function) and 6-/7-axis articulated robot control in addition to robot-1 control |
| SMC-○○○-ADV-□□□ | Sequence/motion/robot-3 control | Multiple robot control in addition to robot-2 control |

The □ symbols denote the software version. Please contact us for more information.
The △ symbols = either 505/507/520 and the ○ symbols = either 507/520. 505/507 supports microSD cards and 520 supports CFast cards.

## ■ Motion control function

| | |
|---|---|
| No. of controllable axes | 64 max. |
| Communication cycle | 1 to 8 ms |
| Control system | Position control (PTP), speed control, torque control |
| Acceleration/deceleration profile | Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration |
| Unit for positioning control | Arbitrary (pulse, mm, inch, degree) |
| Max. command value | -2147483648 to 2147483647 (32 bit) |
| Programming language | IL, ST, LD, FBD, SFC, and CFC defined in IEC 61131-3 |
| Function block | Homing, incremental mode, absolute mode, constant speed mode, electronic cam, electronic gear |

## ■ Robot control function

| | |
|---|---|
| No. of controllable axes (per one robot) | 13 max. (7 main axes + 6 external axes) |
| Communication cycle | 1 to 8 ms |
| Control system | PTP, 3D linear, 3D circular |
| Teaching method | Remote teaching, numeric input |
| Unit for positioning control | Arbitrary (pulse, mm, inch, degree) |
| Max. command value | -2147483648 to 2147483647 (32 bit) |
| Programming language | Original robot language |
| Supported robots | Cartesian, SCARA, palletizing, parallel link, 6-/7-axis articulated robots |

# Software

| Model no. | Use |
|---|---|
| SMC-500-STUDIO-□□□ | Integrated development tool (programming, debugging, and scope) |

## ■ Software options

| Model no. | Remarks |
|---|---|
| SMC-500-SIMU-□□□ | Device simulation tool |
| SMC-500-OPCUA-□□□ | OPC UA Server license |

The □ symbols denote the software version. Please contact us for more information.

# Teaching pendant

| Items | Specifications |
|---|---|
| Model no. | TP-C70 |
| Display | 7-inch TFT LCD, LED backlight, 1024 × 600 pixels (WSVGA) |
| Operating panel | Touch screen, emergency stop button, enabling switch (3 positions), membrane switch |
| Connection | To be connected with CPU module via junction box (connection cable length: 5 m) |
| Communication | Ethernet 10/100 Mbps |
| Emergency stop button | Turn-to-Release operator, output: 2 NC contacts |
| Enabling switch | 3-position switch (ON-OFF-ON), output: 2 circuits |
| Vibration resistance | 3.5 mm constant amplitude at $5 \leq f < 8.4$ Hz, 9.8 m/s$^2$ constant acceleration at $8.4 \leq f < 150$ Hz in compliance with EN 61131-2 |
| Shock resistance | 147 m/s$^2$ in compliance with EN 61131-2 |
| Protection rating | IP65 |
| Operating ambient temperature | 0 to +40˚C |
| Storage ambient temperature | -20 to +70˚C |
| Operating ambient humidity | 10 to 95% (non-condensing) |
| Mass | 950 g |

## ■ Junction box

| Items | Specifications |
|---|---|
| Model no. | JBOX-01 |
| Connector | 11-pin terminal block connector (for power supply, emergency stop signal, and enabling signal)<br>RJ-45 connector (for Ethernet)<br>17-pin male circular connector (for pendant cable connection) |
| Protection rating | IP20 |
| Dimensions | 76.1 (H) × 67.2 (W) × 26 (D) mm |
| Mass | 220 g |

This junction box is included in the teaching pendant.

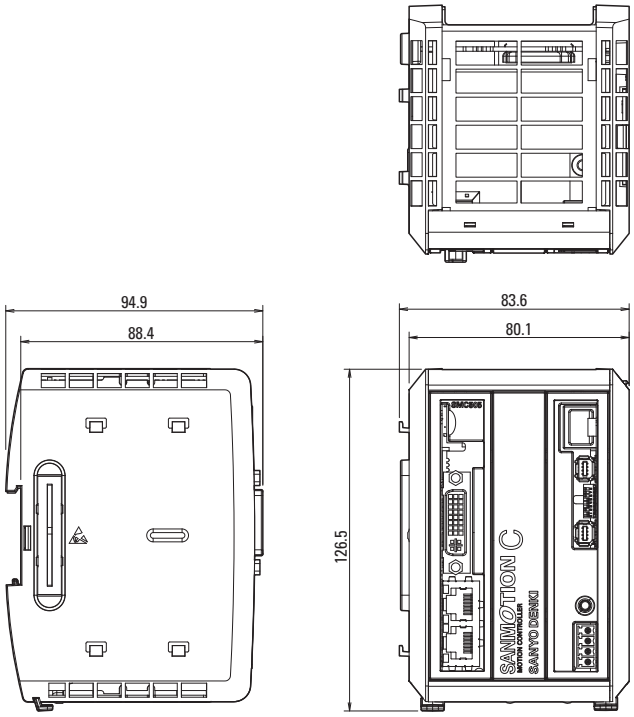
## ■ Bridge connector (For short-circuiting emergency stop signal when a pendant is not connected)

| Model no. | Specifications |
|---|---|
| AL-00920880-01 | 17-pin female circular screw lock connector (for short-circuiting emergency stop signal) |

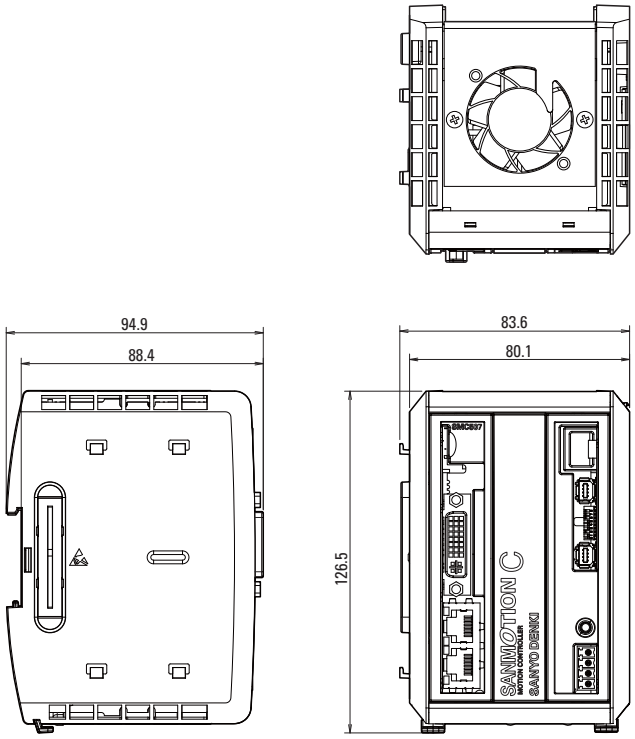
# Dimensions [Unit: mm]

## CPU module

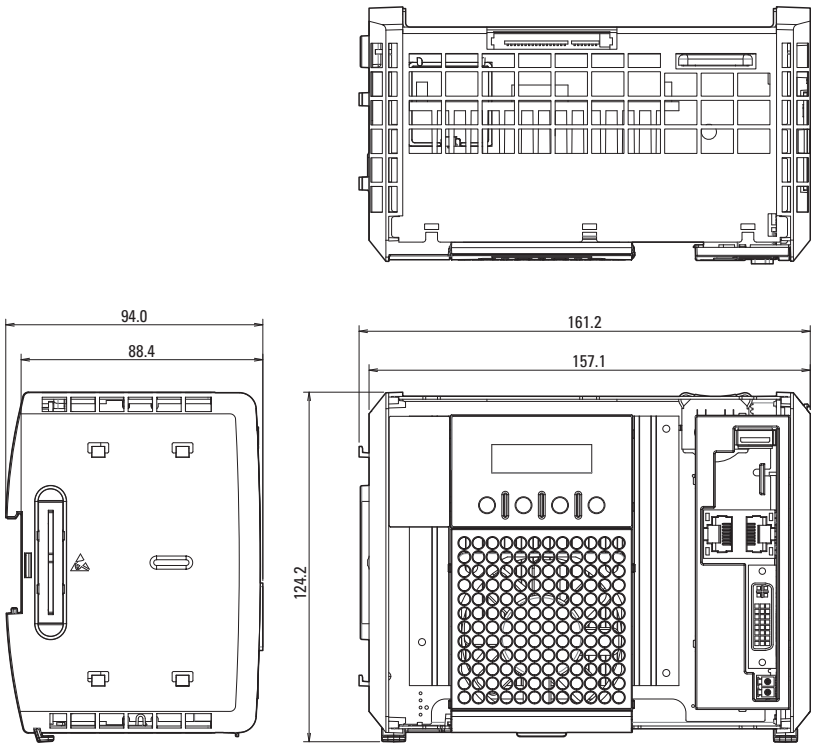
Model: SMC505




Model: SMC507



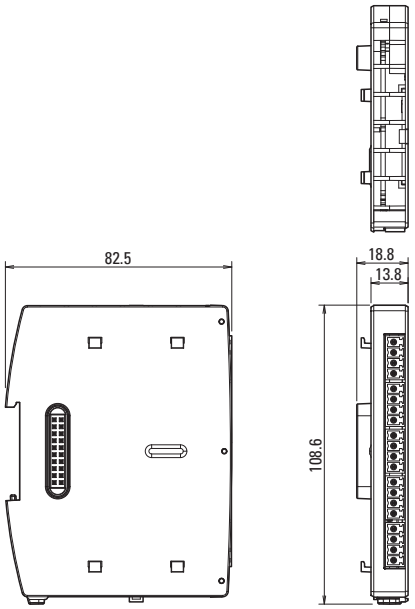

Model: SMC520



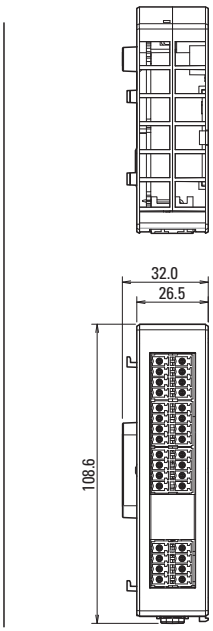
# Dimensions [Unit: mm]

## I/O module

Model: DM556, DM570, DI570, DO550

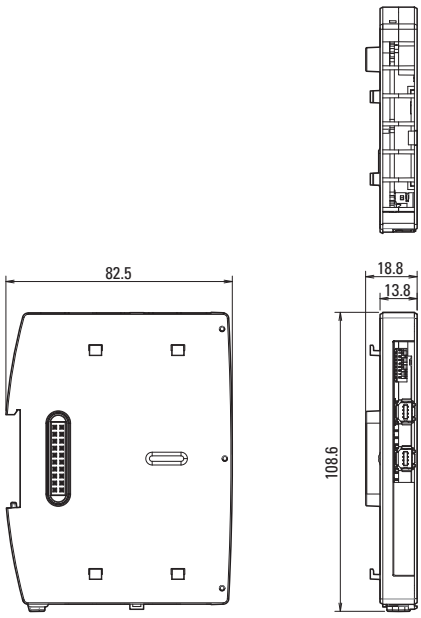



Model: AM571



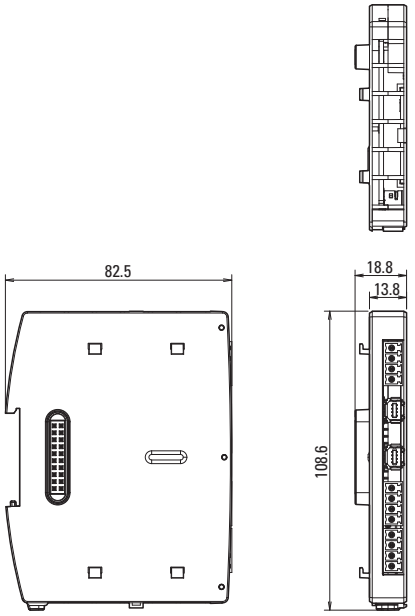

## Interface module

Model: SM510



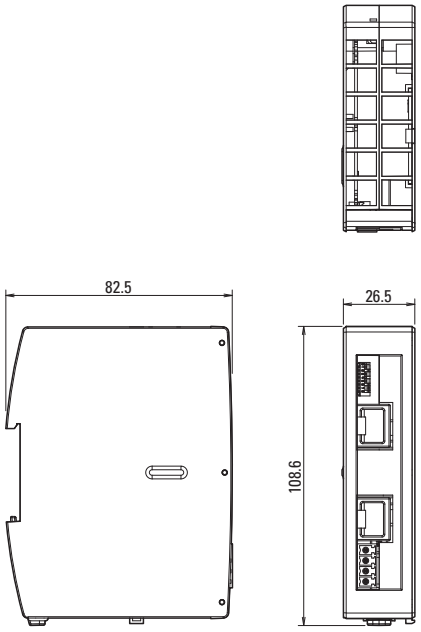

## Encoder module

Model: MM540




## Bus link module

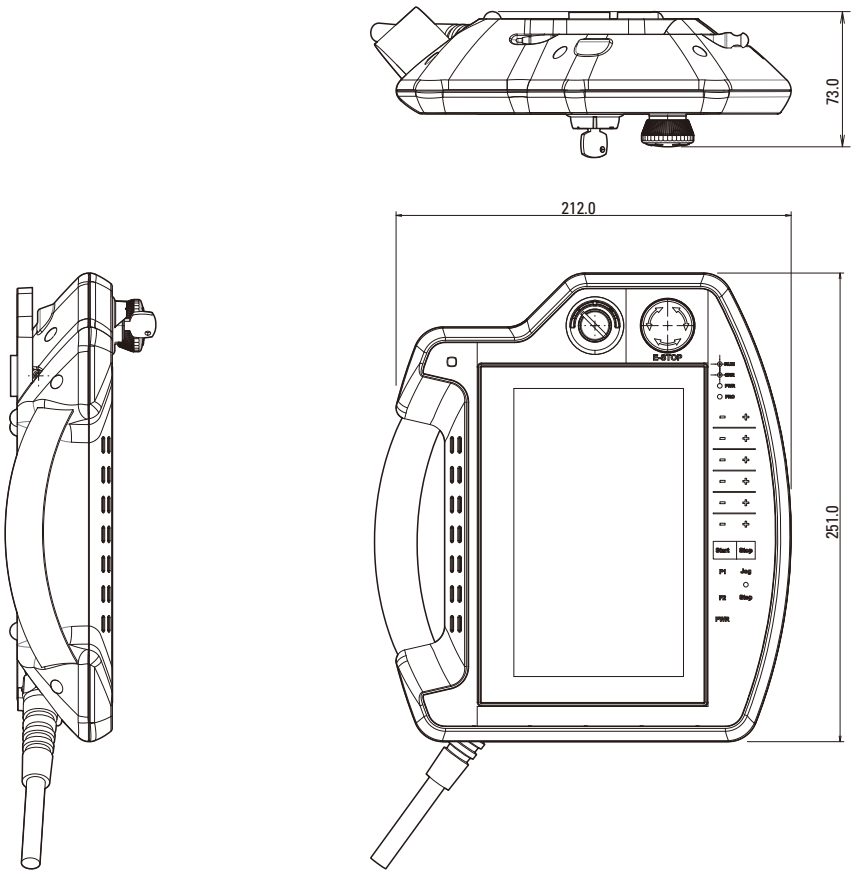
Model: BL570



# Dimensions [Unit: mm]

## Teaching pendant

Model: TP-C70



ECO PRODUCTS

■ ECO PRODUCTS

ECO PRODUCTS are designed to reduce the environmental impacts throughout the product's life cycle. Ranging from design to manufacturing stages, the environmental impact of a product and its packaging materials is assessed against the eco-design requirements. Those products that satisfy the requirements are accredited as ECO PRODUCTS.

## Notes Before Purchase

- Read the accompanying Instruction Manual carefully prior to using the product.
- Do not use this product in an environment where vibration is present, such as in moving vehicles or shipping vessels.
- Do not modify or alter the product in any way.

Please contact us beforehand if you intend to use this product in the following applications.

- Medical equipment that may have an effect on human life
- Systems or equipment that may have a major impact on society or on the public.
- Special applications related to aviation and space, nuclear power, electric power, submarine repeaters, etc.

**SANYO DENKI CO., LTD.** 3-33-1 Minami-Otsuka, Toshima-ku, Tokyo 170-8451, Japan TEL: +81 3 5927 1020 https://www.sanyodenki.com/



CATALOG No.S1059B002 '23.1