CKD

DIRECT DRIVE ACTUATOR PRODUCTS CATALOG

ABSODEX General Catalog

There is a reason why people choose us.

CKD Corporation

CB-054A 1

LINEUP

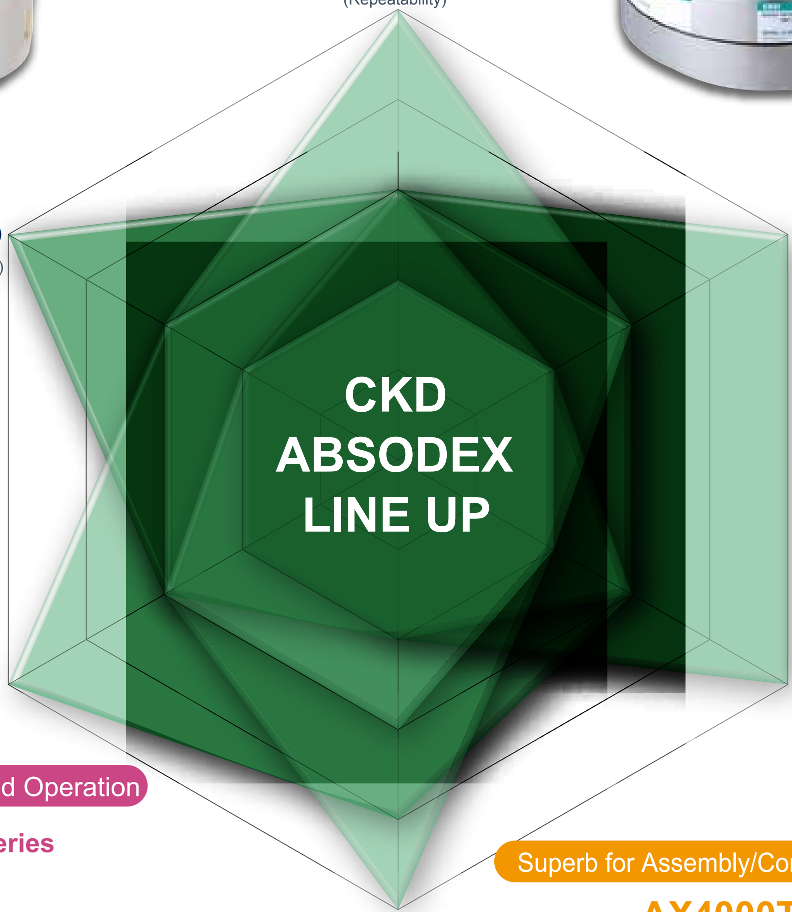
CKD's ABSODEX Lineup
can be used for any application

Excellent for Assembly/Inspection

AX1000T Series

Most suited for Precision Alignment/Positioning

AX7000X Series



Magnificent High Speed Operation

AX2000T Series

Superb for Assembly/Conveyance/Index tables

AX4000T Series

Great for miniaturizing equipment

AX6000M Series

All actuators are absolute types

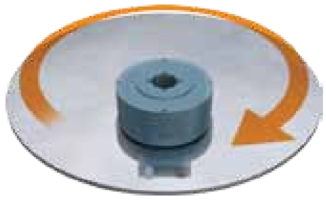
3 user friendly features of ABSODEX

Flexible Operation

With an abundant programming function - realize the operation that you want.

Indexing

Oscillations

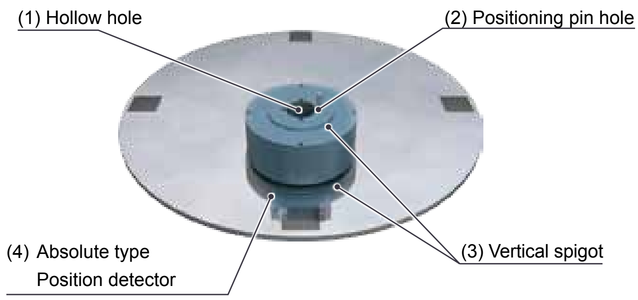


Oscillations

Reduce Workload and Save Space

A simple design with 4 standard useful features.

Motor+Timing belt

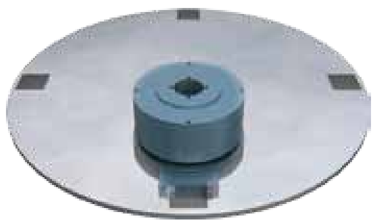


ABSODEX

High Reliability and Maintenance Free

No more damaged or worn gears from a gearless design.

Eventual gear damage and wear



No worries Gearless structure

Compatibility

Freely combine drivers and actuators

TS/TH Drivers
(AX1000T, 2000T, 4000T)

Mounting holes added

Separate main power and control power

Use of connectors

Terminal for the Safety function

With the STO Function (Safe Torque Off), one can easily incorporate it with the drive circuit to cut off power.

MU Driver
(AX6000M)

XS Driver
(AX7000X)

Uses 24 VDC

Realized smaller dimensions.

Uses connectors

Main power and control power are separate

Mounting holes

Separate main power and control power

Uses connectors

Great Usability!

- No backup batteries needed
- Freely combine drivers and actuators

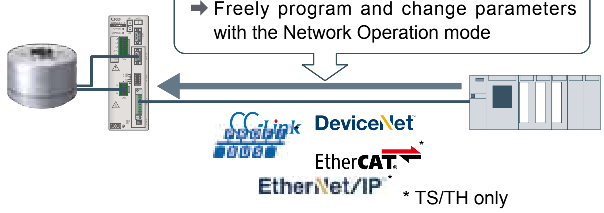
Convenient functions

- Various functions for your usage!
- Segmented position output function

Use IoT on your equipment!

- Monitor function (TS/TH/XS wiresaving serial communication)
- Network Operation mode (XS wiresaving serial communication)

➡ Flexible positioning of any arbitrary position
➡ Freely program and change parameters with the Network Operation mode



* TS/TH only

SOFTWARE

Operation made easier

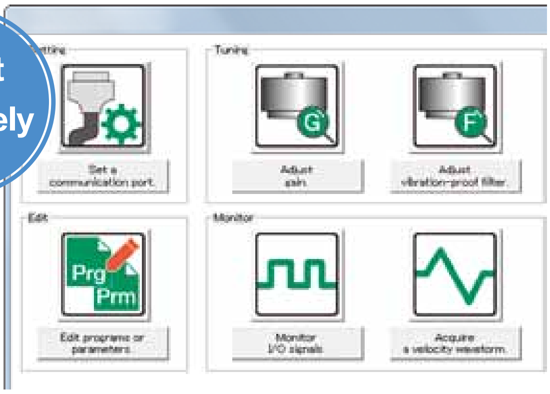
The AxTools is here to help you from operation settings to adjustments.

From experts to novices, the **AX Tools** is **user friendly**

Intuitive operation with a simple and easy to use interface.

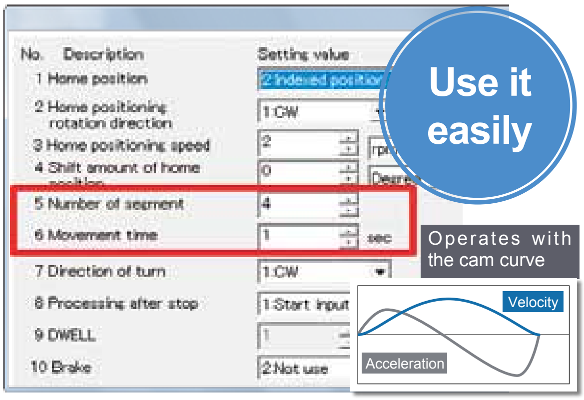
Freeware

Use it intuitively



Desired conditions can be instantly implemented.

Use it easily



Operates with the cam curve

In equal segmental programming, only the number of partitions and travel times need to be input.

Industry's 1st! Equipped with an AI that **supports adjustments**

Conventionally...

- Tuning relied on experts
- Overseas startups were unstable
- Results of adjustments were difficult to judge

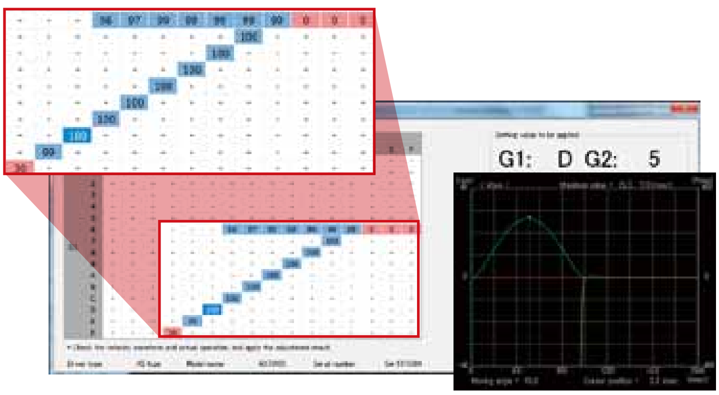
Anyone can use it

Adjustments made by the AI

Input the conditions

Click

Data is acquired automatically and the most suited tuning is advised with a score

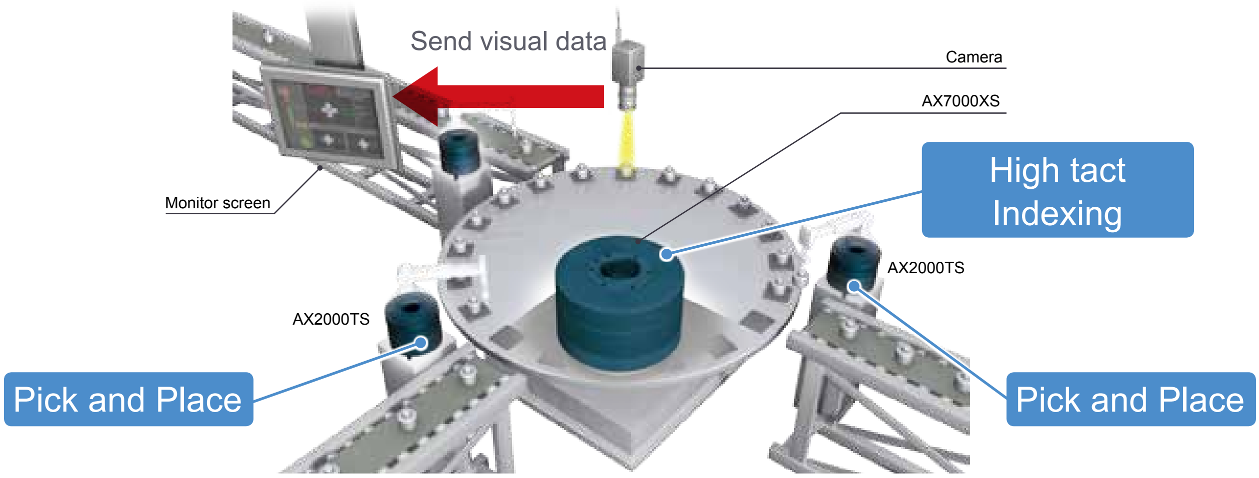


Also, simultaneous confirmation of the operation wavelength is possble

Operation examples

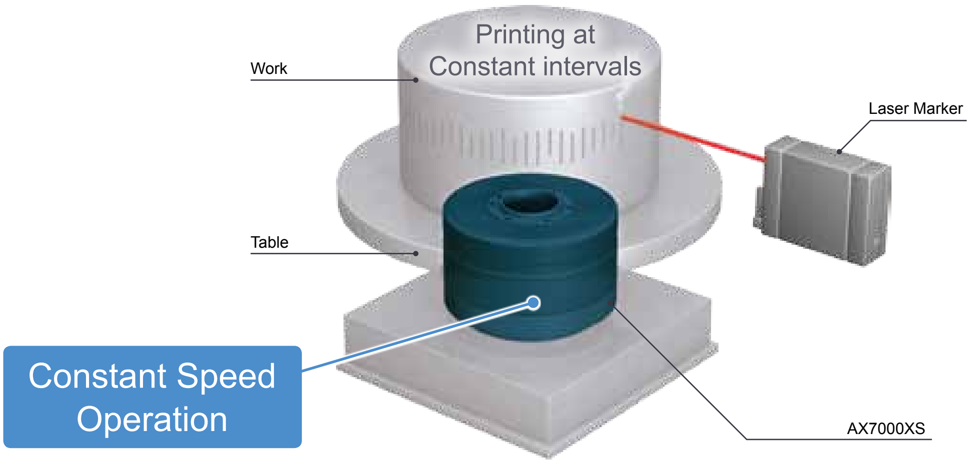
Electronic Parts Inspection

Operate the AX with multiple machines and achieve high tact



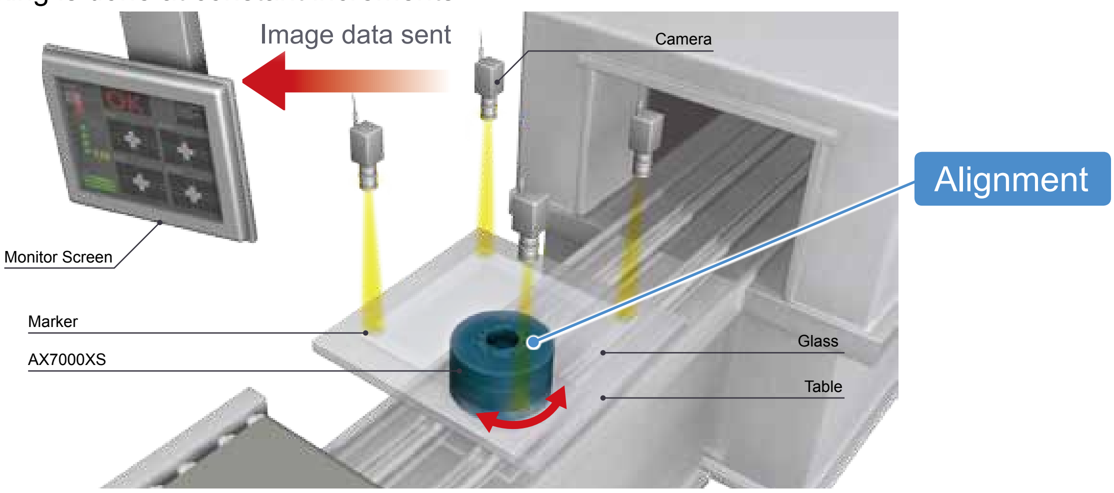
Laser Labeling of Workpieces

Laser marking is done at constant increments.



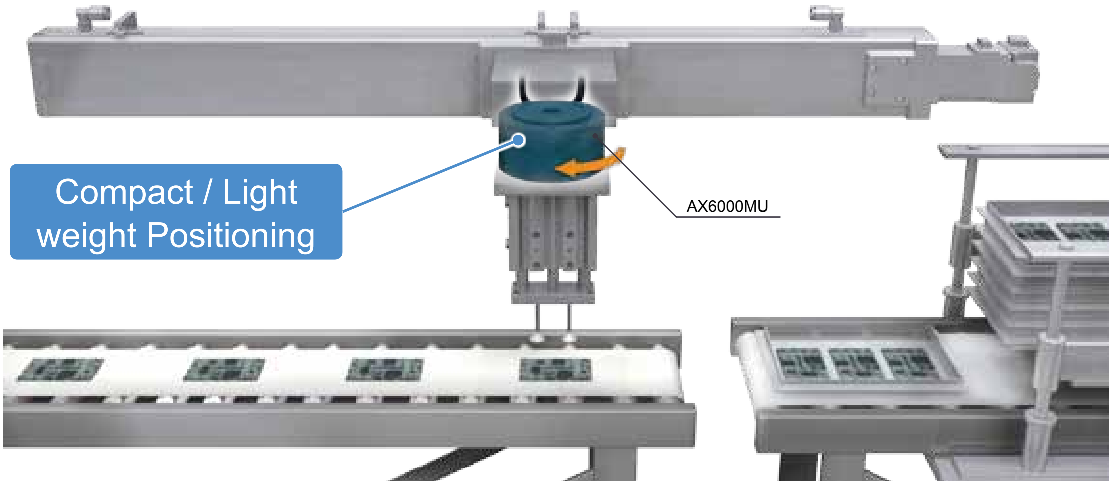
Laser Labeling of Workpieces

Laser marking is done at constant increments.



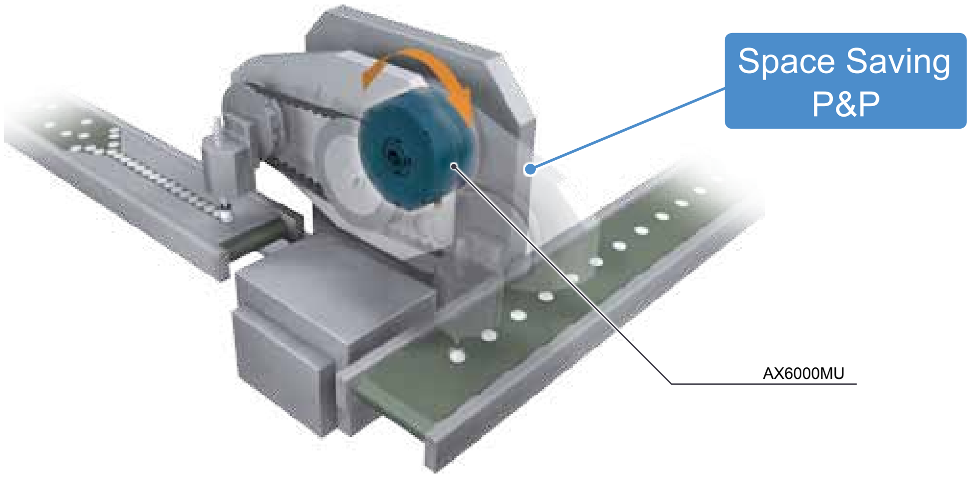
Conveyor of Electronic Substrate

Rotate electronic substrates by 90°



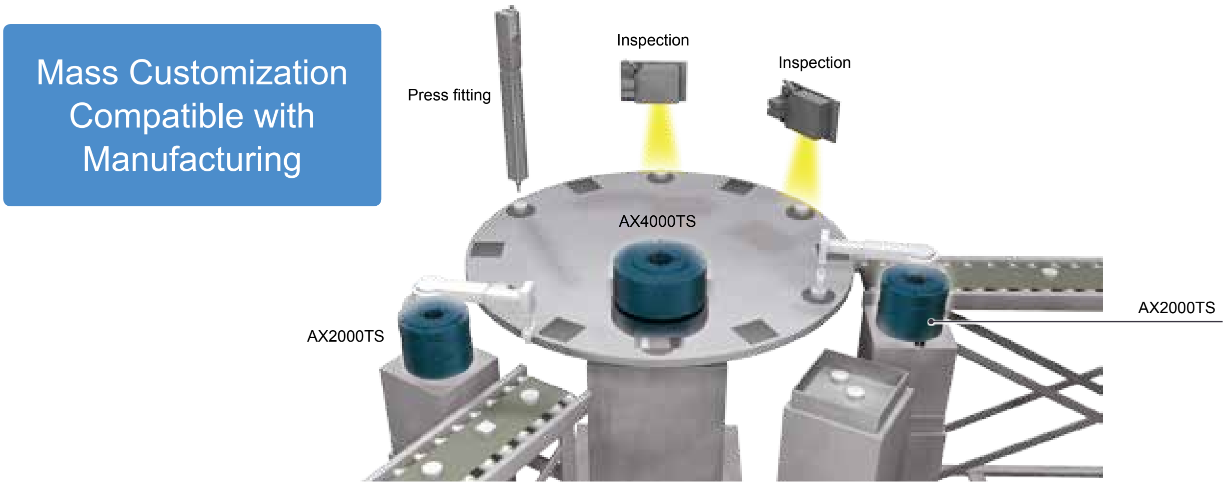
Pick and Place

Work is conveyed using an equipped parallel displacement mechanism.



Assembly, Inspection Machines

Conduct setup changes without time loss



ABSODEX

Compact and easy to use

AX6000M Series

Industry's smallest and lightest!

* Market survey Oct. 2017

Mass 1.2 kg

Suitable anywhere

- Tiny work conveyance
- Radial angle compensation of the moving parts

Move one grade higher - with Positioning

AX7000X Series

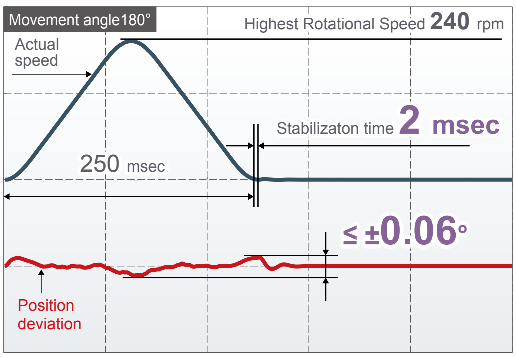
Equipped with the **industry's highest level** high resolution encoder

Resolution	4,194,304 Pulse/rev	Repetitive positioning accuracy	±2 arcsecs

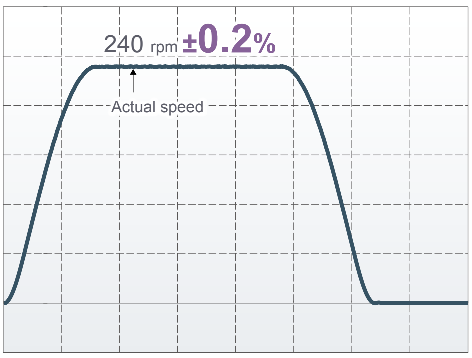
Realized **[High Accuracy × High Response]** Positioning

In addition to precision positioning, greatly improved stability in response time and constant speeds

■ Positioning velocity waveform



■ Uniform rotation velocity waveform



* The above is not a guranteed value, but a reference value. Depending on the load conditions, etc., the value may vary.

Most suited for

- Alignment requiring minute operations
- Positioning of miniature work
- Operation requiring constant speeds

ABSODEX

Compatible with a Wide range of Needs

AX1000T/AX2000T/AX4000T Series

AX1000T Series

- 5 sizes lined up from 22 to 210 N·m
- Improved indexing accuracy and deflection of shaft/surface, allowing for precise positioning

Most suited for

- Precision measurements
- Inspection machines
- Assembly machines

AX2000T Series

- 3 sizes lined up from 6 to 18 N·m
- High speed operation, compact design

Most suited for

- Pick&Place
- Turn tables
- Assembly machines

AX4000T Series

- 8 sizes lined up from 9 to 1000 N·m
- Wide selection, supporting large inertial loads

Most suited for

- Pick and Place
- Turn tables
- Inspection machines
- Assembly machines

ABSODEX

AX9000TS/TH Series

Safety Standards

Contributes to safety standards certification (Safe Torque Off function).

International Standards

Compatible with UL/cUL (N.A. standards), CE(European standards)

c US   c UL US LISTED   CE   TÜVRheinland

Support for domestic and international networks

CC-Link DeviceNet PROFIBUS EtherCAT EtherNet/IP

Ideal for IoT connection of devices!

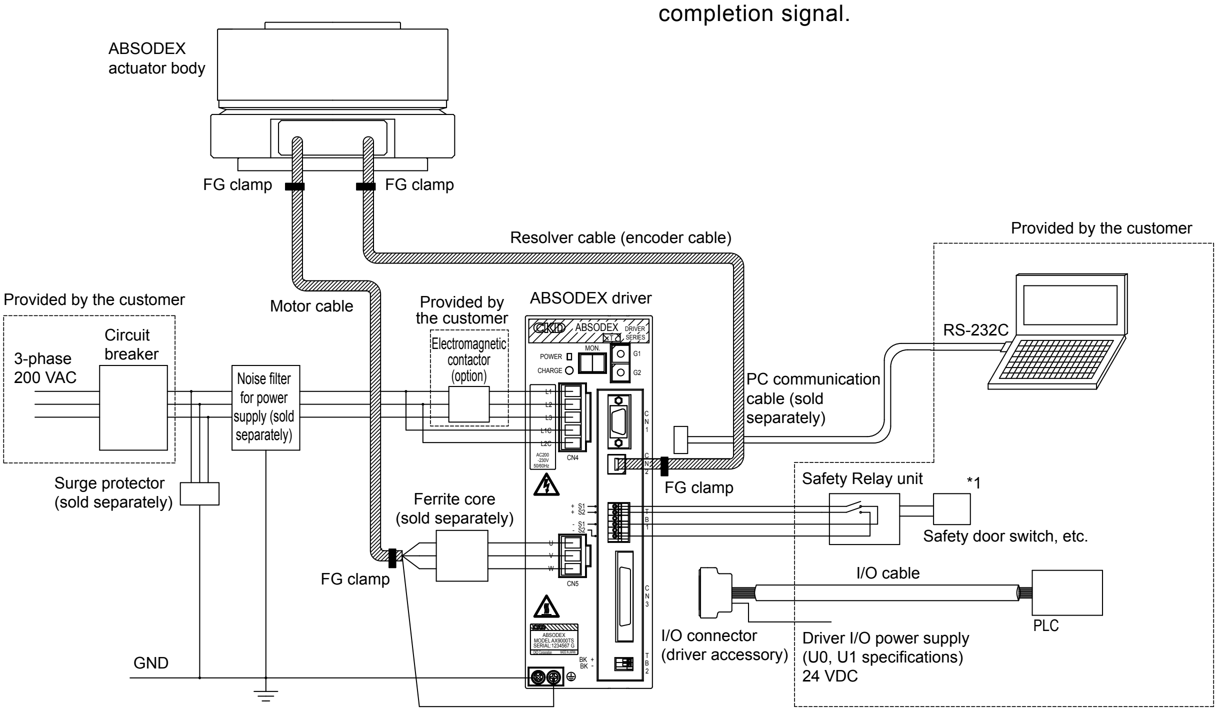
- **Highly efficient monitor function!**
  The current status of ABSODEX can be monitored using the highly efficient monitor function, which provides the current position, velocity, electronic thermal value, and alarms.
- **Monitor function also available for preventive maintenance!**
  ・Torque load factor   Enables monitoring of the current torque load factor.
  ・Acceleration   Enables monitoring of the current acceleration.
- **Network operation mode (Direct value mode) added!**
  The network operation mode enables flexible positioning as desired from the host controller.

CC-Link	CC-Link is a registered trademark of Mitsubishi Electric Corporation.
PROFIBUS	PROFIBUS is a trademark of PROFIBUS User Organization.
DeviceNet™	DeviceNet™ is a registered trademark of ODVA.
EtherCAT®	EtherCAT® is a patented technology, licensed by Beckhoff Automation GmbH in Germany.
EtherNet/IP™	EtherNet/IP™ is a registered trademark of 0DVA.

System configuration AX1000T/2000T/4000T/7000X

● Basic setting items
1. Input a program from a PC or the dialog terminal.
2. Set necessary parameters in the same way.
3. Set the gain appropriately.

● Basic driving method
1. Select a program to execute from PLC.
2. Supply a start signal from PLC.
3. After indexing is started, the driver outputs a positioning completion signal.



*1 Safety features (TB1) of AX7000X are not compliant with the certification for safety standards.

To comply with the CE marking, the parts shown below or overcurrent/short circuit protection devices are required. In addition, the driver must be installed within the switchboard. For details on the selection, installation and wiring methods of these devices, refer to the instruction manual or technical data (ABSODEX AX Series TS/TH type or XS type technical data).

Part name	Compatible product(s)	Model No.	Manufacturer
*3 Noise filter	Three-phase/single-phase 200 to 230 VAC	3SUP-EF10-ER-6	Okaya Electric Industries Co., Ltd.
	Single phase 100 to 115 VAC	NF2015A-OD	Soshin Electric Co., Ltd.
Ferrite core	Common	RC5060ZZ	Soshin Electric Co., Ltd.
Surge protector	Common	R/A/V-781BXZ-4	Okaya Electric Industries Co., Ltd.
FG Clamp *2	Common	FGC-5,FGC-8	Kitagawa Industries Co.,Ltd.

*2) The FG clamp is used for grounding the shield of the motor cable or resolver cable (encoder cable).
*3) Commercially available from CKD. Refer to the ABSODEX related parts model No. table (page 63).

Configuration (when selecting the set model No.)

	Name	Quantity
Standard configuration	Actuator body	1
	Driver (with controller)	1
	Motor cable, resolver cable (encoder cable)	1 each

Accessories: I/O connector, connector for power supply, connector for motor cable

Note) For the notes on the connection method, make sure to read the instruction manual (technical data).
Note) For details, refer to the accessories supplied with the driver on page 57 (for AX9000TS/AX9000TH) or page 19 (for AX9000XS).

Programming tool

- Dialog terminal “AX0180” is available.
- Start support tool “AX Tools” is available.
  ABSODEX programs are created, parameters set, and operation commands, etc., issued from the PC. The created programs can be saved.
  The PC communication cable (model No.: AX-RS232C-9P) is required.

Note 1) The PC communication cable is designed specifically for ABSODEX. You cannot use a commercially available cable as it is. If you do, the driver or PC may be damaged.
Note 2) Connect the dialog terminal and PC when adjusting only. For normal operation, remove the PC communication cable from CN1.
Note 3) When the PC recovers from the sleep mode, the USB-serial conversion cable may not be recognized, leading to communication errors.
Note 4) Download the latest version of the starting adjustment support tool "AX Tools" from our website.

System configuration

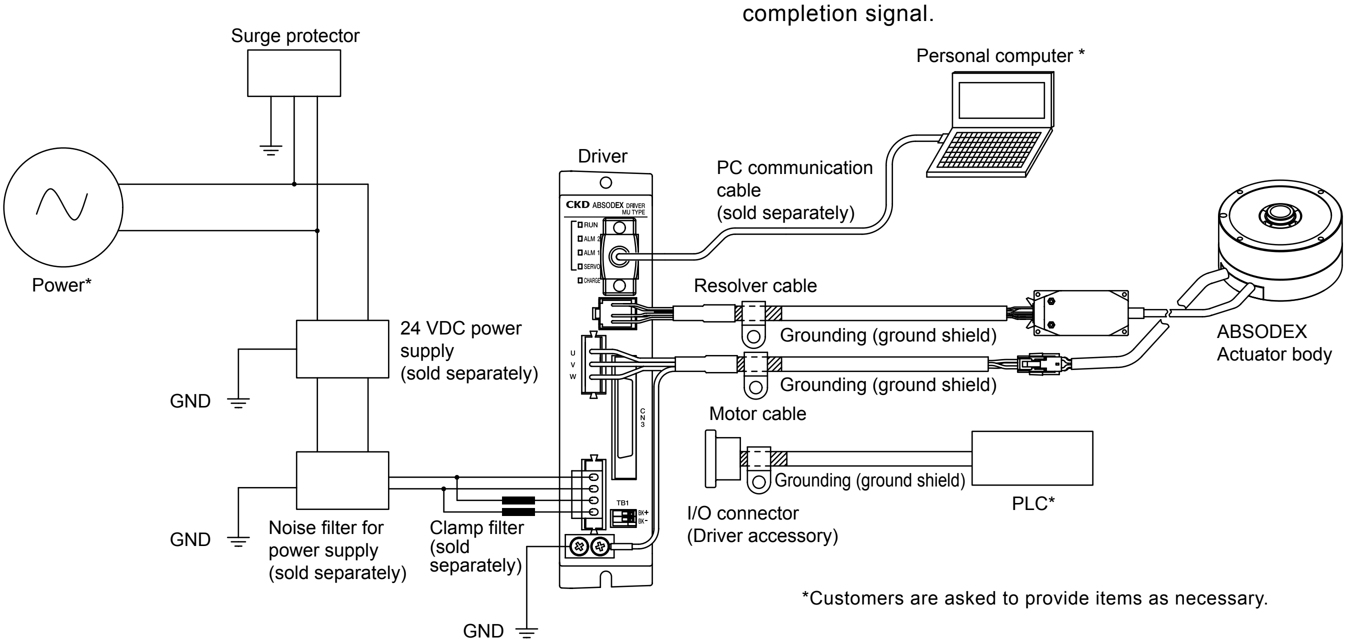
AX6000M

● Basic setting items

1. Input a program from a PC.
2. Set necessary parameters.
3. Set the gain appropriately.

● Basic driving method

1. Select a program to execute from PLC.
2. Supply a start signal from PLC.
3. After driving is started, the driver outputs a positioning completion signal.



*Customers are asked to provide items as necessary.

Configuration (when selecting the set model No.)

Name	Quantity
Actuator body	1
Driver (with controller)	1
Motor cable, resolver cable	1 each

Accessories: I/O connector, connector for power supply, open tool for power supply connector

Note) For details, refer to the accessories supplied with the driver in page 7.

Note) The connectors for motor cable come with the motor cable.

Note) For the notes on the connection method, make sure to read the instruction manual (technical data)

To comply with the CE marking, the parts shown in the following table are required.
For details on the installation and wiring method, refer to the instruction manual or technical data (ABSODEX MU type technical data).

Parts	Model No.	Manufacturer
Noise filter	NF2015A-OD Note 1)	Soshin Electric Co., Ltd.
Surge protector	R/A/V-781BXZ-4 R/A/V-781BWZ-4 RSPD-250-Q4 RSPD-250-U4	Okaya Electric Industries Co., Ltd.
FG Clamp	FGC-5, FGC-8	Kitagawa Industries Co.,Ltd.
Clamp filter	ZCAT2035-0903A	TDK

Note 1) With 250 VAC. Also available with 24 VDC power supply.

Programming tool

• Start support tool “AX Tools” is available. (Windows version, free)
ABSODEX programs are created, parameters set, and operation commands, etc., issued from the PC.
The created program can be saved.
The PC communication cable (model No.: AX-RS232C-9P) is required.

Note 1) The PC communication cable is designed specifically for ABSODEX. You cannot use a commercially available cable as it is. If you do, the driver or PC may be damaged.

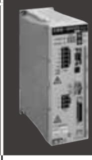
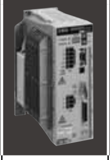
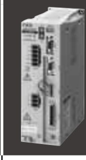
Note 2) Connect the PC communication cable when adjusting only.
For normal operation, remove the PC communication cable from CN1.

Note 3) When the PC recovers from the sleep mode, the USB-serial conversion cable may not be recognized, leading to communication errors.

Note 4) Download the latest version of the starting adjustment support tool “AX Tools” from our website.

ABSODEX system table

Type	Actuator Series	Torque (N·m)													
		1.2	3	6	9	12	18	22	45	75	150	210	300	500	1000
(compact)	AX6000M Series	 AX6001 MU	 AX6003 MU												
High precision	AX7000X Series							 AX7022XS	 AX7045XS						
High response	AX1000T Series (compact/ middle)							 AX1022T	 AX1045T	 AX1075T					
	AX1000T Series (large)										 AX1150T	 AX1210T			
	AX2000T Series			 AX2006T		 AX2012T	 AX2018T								
	AX4000T Series (compact/ middle)				 AX4009T			 AX4022T	 AX4045T	 AX4075T					
	AX4000T Series (large)										 AX4150T		 AX4300T	 AX4500T	 AX410WT

Indexing accuracy	Repeat accuracy	Surface runout	Shaft runout	Driver series name				Features	Applications	Page
				TS	TH	MU	XS			
(sec)	(sec)	(mm)	(mm)							
±90	±10	0.03	0.05			●		●Small diameter (φ80)	●P&P ●Sub table	1
±30	±2	0.03	0.03				●	●High precision (high resolution, high repeatability)	●Inspection machine ●Turntable	11
±15	±5	0.01	0.01	●				●High accuracy (Indexing accuracy and output shaft runout accuracy)	●Precision measurement ●Turntable ●Inspection machine ●Assembling machine	23
±15	±5	0.01	0.01		●					
±30	±5	0.03	0.03	●				●High-speed rotation (300 rpm) ●Compact with small diameter ●Large hollow diameter (φ30)	●P&P ●Turntable ●Assembling machine	29
±30	±5	0.03	0.05	●				●Supports large moments of inertia load ●Large hollow diameter and a variety of size options	●Turntable ●Inspection machine ●Assembling machine ●P&P	33
±30	±5	0.03	0.05 (0.08) *1		●					41

*1 AX410WT

Characteristics of the driver
Drivers can be commonly used for supported actuators.
The controller function allows you to use an NC program to desirably set the actuator’s rotation angle, movement time and timer, etc.
M code output, encoder output, etc. are also available to connect to an external PLC, motion controller, etc.

ABSODEX

AX6000M Series

Minimum size of 80 mm diameter
Compatible function allows free combination of driver, actuator, and cable

- Max. torque: 1.2, 3 N·m
- Supported driver: MU driver

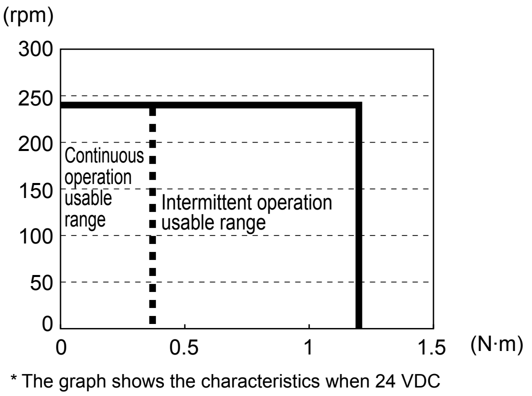
Actuator specifications

Descriptions		AX6001M	AX6003M
Max. output torque	N·m	1.2	3.0
Continuous output torque	N·m	0.4	1.0
Max. rotation speed	rpm	240 (*1)	
Allowable axial load	N	600	
Allowable moment load	N·m	5	
Output shaft moment of inertia	$kg \cdot m^2$	0.00034	0.00059
Allowable moment of load inertia	$kg \cdot m^2$	0.034	0.059
Index accuracy (*3)	sec	±90	
Repeatability (*3)	sec	±10	
Output shaft friction torque	N·m	0.13	0.22
Resolution	P/rev	540672	
Motor insulation class		Class A	
Motor withstand voltage		550 VAC 1 minute	
Motor insulation resistance		10 MΩ or more 500 VDC	
Operating ambient temperature		0 to 40°C	
Operating ambient humidity		20 to 85% RH, no condensation	
Storage ambient temperature		-10 to 65°C	
Storage ambient humidity		20 to 90% RH, no condensation	
Atmosphere		No corrosive gas, explosive gas, or dust	
Weight	kg	1.2 (1.4) *2	1.8 (2.0) *2
Output shaft runout (*3)	mm	0.03	
Output shaft surface runout (*3)	mm	0.05	
Degree of protection		IP20	

*1: Use at a speed of 80 rpm or less during continuous rotation operation.
*2: The values in ( ) are the actuator weight with the mounting base option.
*3: Refer to the "Glossary" on page 64 for index accuracy, repeatability, output shaft runout and output shaft surface runout.

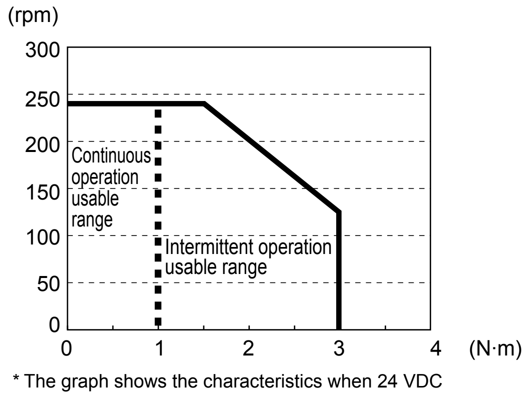
Speed/maximum torque characteristics

- AX6001M



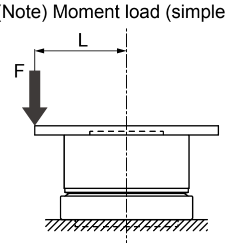
* The graph shows the characteristics when 24 VDC (ambient temperature: 25°C) is connected.

- AX6003M



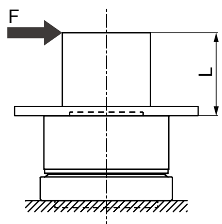
* The graph shows the characteristics when 24 VDC (ambient temperature: 25°C) is connected.

(Note) Moment load (simple formula)



(Fig. a)

M (N·m) = F (N) × L (m)
M: Moment load
F: Load
L: Distance from the output shaft center



(Fig. b)

M (N·m) = F (N) × (L+0.02) (m)
M: Moment load
F: Load
L: Distance from the output shaft flange surface

Always read the safety precautions on pages 73 to 78 before use.

How to order

● Set model No. (actuator, driver, cable)

Body model No. / Option model No.

AX6 (001)(MU) - (BS) - (DM04) - (U0)

Model No.

Ⓐ Size (max. torque)

Ⓑ Driver type

Ⓒ Mounting base

Ⓓ Cable length *1

Ⓔ Interface specifications

Code	Content
Ⓐ Size (max. torque)	
001	1.2 N·m
003	3.0 N·m
Ⓑ Driver type	
MU	MU driver
Ⓒ Mounting base	
Blank	Standard (without mounting base)
BS	With mounting base
Ⓓ Cable length	
DM00	Without cable
DM02	2 m
DM04	4 m
DM06	6 m
DM08	8 m
DM10	10 m
Ⓔ Interface specifications	
U0	Parallel I/O (NPN)
U1	Parallel I/O (PNP)

⚠ Precautions for model No. selection

*1: Cable is a movable cable.
Refer to page 9 for dimensions of the cable. The lead-out cable is not movable.

*2: Ⓒ When the "BS" option with the mounting base is selected, the positioning pin hole on the bottom is not available. The surface is treated with electroless nickel plating.

*3: Positioning pin holes may not be surface treated.

*4: The surface part is treated with electroless nickel plating. The fixed section is made of stainless steel.

Actuator body discrete model No.

AX6 (001) M - (BS)

Ⓐ Size Ⓒ Mounting base

Driver discrete model No.

AX9000MU - (U0)

Ⓔ Interface specifications

Cable discrete model No.

• Motor cable

AX-CBLM8 - (DM04)

• Resolver cable

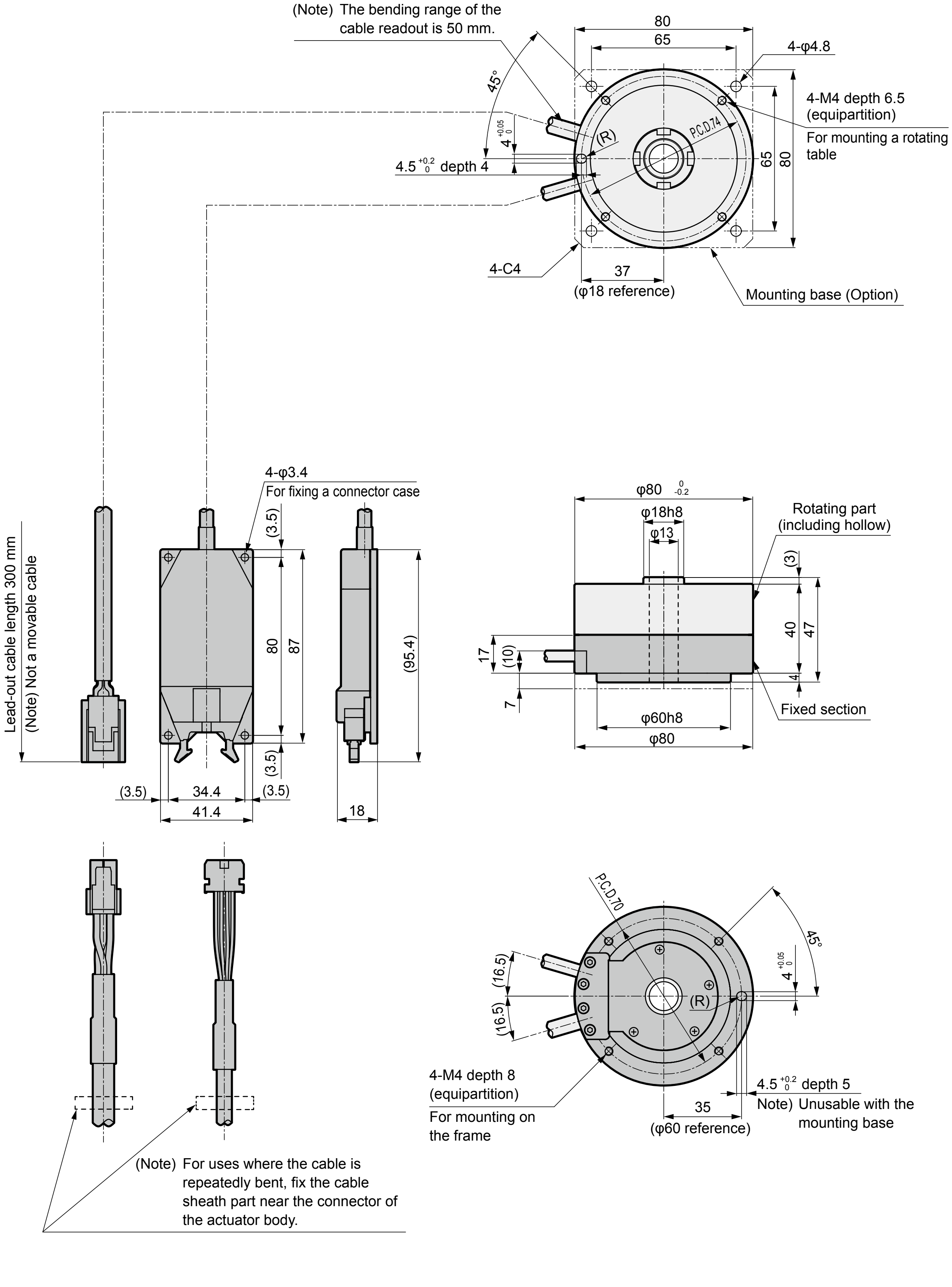
AX-CBLR8 - (DM04)

Ⓓ Cable length
(Note: "DM04" when cable length is 4 m)

Custom order products are CE and RoHS non-compliant. Contact CKD as needed.

Dimensions

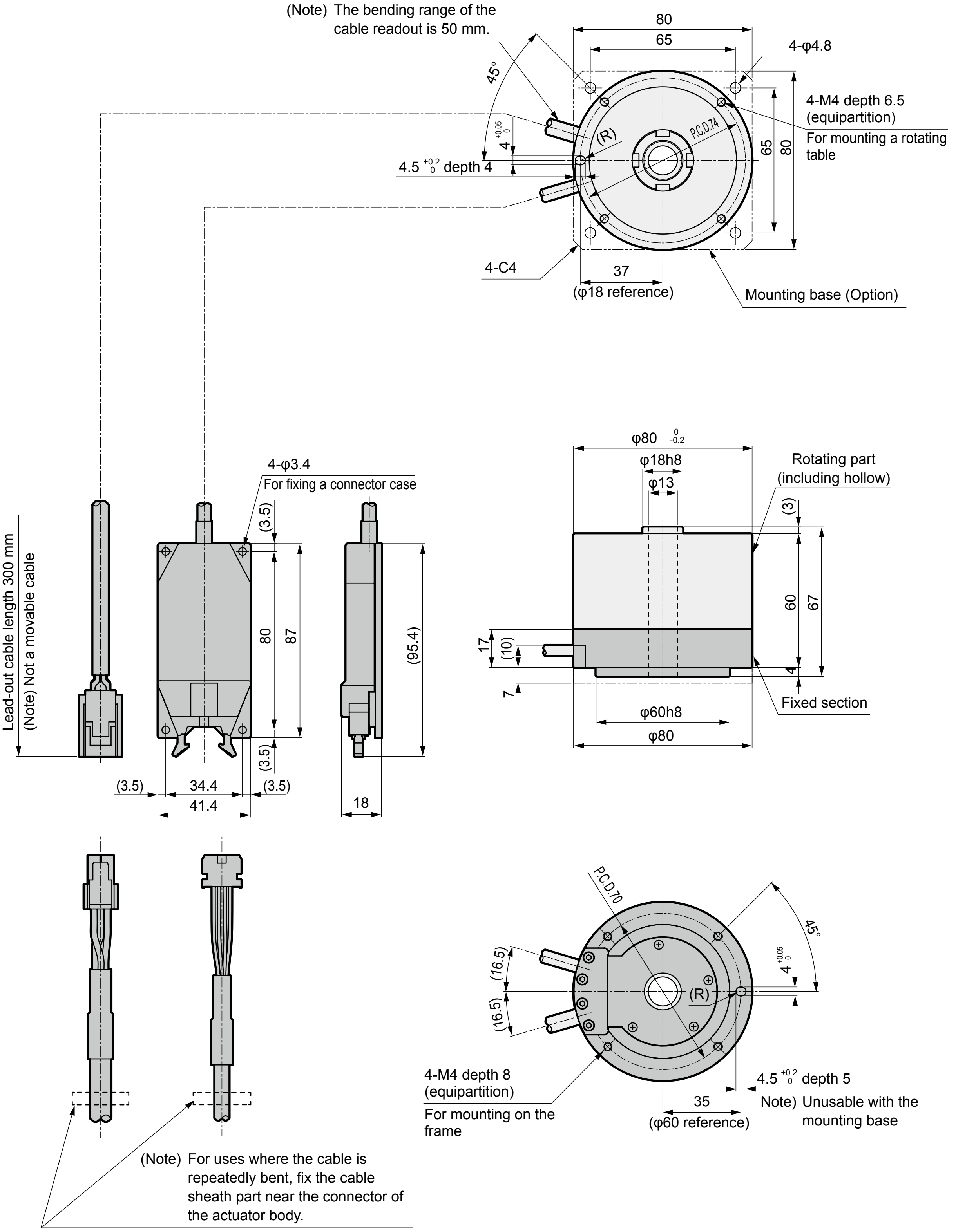
● AX6001M



*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

Dimensions

● AX6003M



*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

ABSODEX (AX6000M Series)

MU driver

Interface specifications: parallel I/O (NPN)
Parallel I/O (PNP)

Features

- Ultra-compact/lighter weight (resin body adopted)
- Easy wiring with connector

How to order

AX9000MU - U0
AX9000MU - U1

Interface specifications
U0: Parallel I/O (NPN)
U1: Parallel I/O (PNP)

General specifications

Descriptions		Model: MU driver AX9000MU
Power supply voltage	Main power supply	24 VDC ±10%
	Control power	24 VDC ±10%
Structure		Driver and controller integrated
Operating ambient temperature		0 to 50°C
Operating ambient humidity		20 to 90% RH (no condensation)
Storage ambient temperature		−10 to 65°C
Storage ambient temperature		20 to 90% RH (no condensation)
Atmosphere		No corrosive gas or dust
Anti-noise		1000 V (P-P), pulse width 1 μsec, rising, falling time 1 nsec impulse noise test, induction noise (capacitive coupling)
Vibration resistance		4.9 m/s^2
Weight		Approx. 0.5 kg
Degree of protection		IP2X

Performance specifications

Descriptions	Content
No. of control axes	1 axis, 540,672 pulses/1 rotation
Angle setting unit	° (degree), pulse, indexing No.
Angle min. setting unit	0.001°, 1 pulse
Speed setting unit	sec, rpm
Speed setting range	0.01 to 100 sec/0.11 to 240 rpm
Equal divisions	1 to 255
Max. command value	7-digit numeric input ±9,999,999 pulse
Timer	0.01 sec to 99.99 sec
Programming language	NC
Programming method	Set data through RS-232C port with a PC.
Operation mode	Auto, MDI, jog, single block, servo OFF, pulse train input mode
Coordinates	Absolute, incremental
Acceleration curve	[5 types] Modified Sine (MS), Modified Constant Velocity (MC/MC2), Modified Trapezoid (MT), Trapecloid (TR)
Status display	RUN: Normal operating state
	ALM2: Alarm 2 state
	ALM1: Alarm 1 state
	SERVO: Servo state
	CHARGE: Charge state
Communication interface	RS-232C compliant
I/O signal	Refer to interface specification pages.
Program capacity	Approx. 6,000 characters (256)
Electronic thermal	Overheating protection for actuator

Power capacity

Actuator model No.	Driver model No.	Rated input current	Max. input current
AX6001M, AX6003M	AX9000MU	3.3 A	10 A

Always read the safety precautions on pages 73 to 78 before use.
Custom order products are CE and RoHS non-compliant. Contact CKD as needed.

Parallel I/O (NPN)

CN3 Input signal

Pin No.	Signal name	Logic	Determination
1 to 2	External power supply input +24 V ±10%		
3 to 4	External power supply input GND		
5	Program No. selection input (Bit 0)	Positive	Level
6	Program No. selection input (Bit 1)	Positive	Level
7	Program No. selection input (Bit 2)	Positive	Level
8	Program No. selection input (Bit 3)	Positive	Level
9	Program No. setting 2nd digit input/ Program No. selection input (Bit 4)	Positive	Edge Level
10	Program No. setting 1st digit input/ Program No. selection input (Bit 5)	Positive	Edge Level
11	Reset input	Positive	Edge
12	Origin return directive input	Positive	Edge
13	Start input	Positive	Edge
14	Servo on input/Program stop input	Positive	Level Edge
15	Continuous rotation stop input	Positive	Edge
16	Answer input/Position deviation counter reset input	Positive	Edge
17	Emergency stop input	Negative	Level
18	Brake release input	Positive	Level

CN3 Output signal

Pin No.	Signal name	Logic
33	M code output (Bit 0)	Positive
34	M code output (Bit 1)	Positive
35	M code output (Bit 2)	Positive
36	M code output (Bit 3)	Positive
37	M code output (Bit 4)	Positive
38	M code output (Bit 5)	Positive
39	M code output (Bit 6)	Positive
40	M code output (Bit 7)	Positive
41	Imposition output	Positive
42	Positioning completion output	Positive
43	Start input wait output	Positive
44	Alarm output 1	Load
45	Alarm output 2	Load
46	Output 1 during indexing/Origin position output	Positive
47	Output 2 during indexing/Servo state output	Positive
48	Ready output	Positive
49	Segment position strobe output	Positive
50	M code strobe output	Positive

CN3 pulse train input signal

Pin No.	Signal name
19	PULSE/UP/A phase
20	-PULSE/-UP/-A phase
21	DIR/ DOWN/ B phase
22	-DIR/-DOWN/-B phase

CN3 encoder output signal (Incremental)

Pin No.	Signal name
23	A phase (Line driver output)
24	-A phase (Line driver output)
25	B phase (Line driver output)
26	-B phase (Line driver output)
27	Z phase (Line driver output)
28	-Z phase (Line driver output)

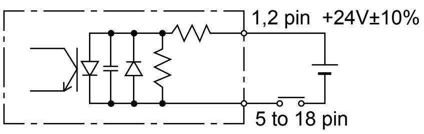
Input/output circuit specifications

Content	1 circuit current (mA)	Max. points (Circuit)	Max. current (mA)	Max. power consumption (mA)
Input circuit	4	14	56	746
Output circuit	30	18	540	
Brake output (BK+, BK−)	75	2	150	

* The maximum simultaneous output points of the output circuit are 14 points out of 18 points.

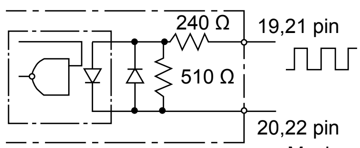
CN3 input/output circuit specifications

● Input circuit



Rated voltage 24 V ±10%
Rated current 4 mA (24 VDC)

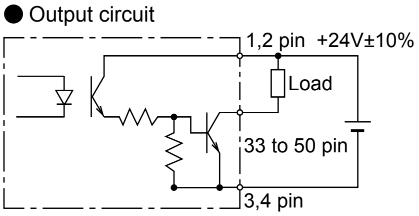
● Pulse train input circuit



Rated voltage 5 V ±10%

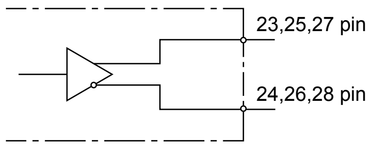
Maximum input frequency
Line driver 1 Mpps
Open collector 250 Kpps

● Output circuit



Rated voltage 24 V ±10%
Rated current 30 mA (MAX)

● Encoder output circuit



Output format: Line driver
Line driver: DS26C31

* Custom order products are CE and RoHS non-compliant.

MU driver

Parallel I/O (PNP)

CN3 Input signal

Pin No.	Signal name	Logic	Determination
1 to 2	External power supply input GND		
3 to 4	External power supply input +24 V ±10%		
5	Program No. selection input (Bit 0)	Positive	Level
6	Program No. selection input (Bit 1)	Positive	Level
7	Program No. selection input (Bit 2)	Positive	Level
8	Program No. selection input (Bit 3)	Positive	Level
9	Program No. setting 2nd digit input/ Program No. selection input (Bit 4)	Positive	Edge Level
10	Program No. setting 1st digit input/ Program No. selection input (Bit 5)	Positive	Edge Level
11	Reset input	Positive	Edge
12	Origin return directive input	Positive	Edge
13	Start input	Positive	Edge
14	Servo on input/Program stop input	Positive	Level Edge
15	Continuous rotation stop input	Positive	Edge
16	Answer input/Position deviation counter reset input	Positive	Edge
17	Emergency stop input	Load	Level
18	Brake release input	Positive	Level

CN3 Output signal

Pin No.	Signal name	Logic
33	M code output (Bit 0)	Positive
34	M code output (Bit 1)	Positive
35	M code output (Bit 2)	Positive
36	M code output (Bit 3)	Positive
37	M code output (Bit 4)	Positive
38	M code output (Bit 5)	Positive
39	M code output (Bit 6)	Positive
40	M code output (Bit 7)	Positive
41	Imposition output	Positive
42	Positioning completion output	Positive
43	Start input wait output	Positive
44	Alarm output 1	Load
45	Alarm output 2	Load
46	Output 1 during indexing/Origin position output	Positive
47	Output 2 during indexing/Servo state output	Positive
48	Ready output	Positive
49	Segment position strobe output	Positive
50	M code strobe output	Positive

CN3 pulse train input signal

Pin No.	Signal name
19	PULSE/UP/A phase
20	-PULSE/-UP/-A phase
21	DIR/ DOWN/ B phase
22	-DIR/-DOWN/-B phase

CN3 encoder output signal (Incremental)

Pin No.	Signal name
23	A phase (Line driver output)
24	-A phase (Line driver output)
25	B phase (Line driver output)
26	-B phase (Line driver output)
27	Z phase (Line driver output)
28	-Z phase (Line driver output)

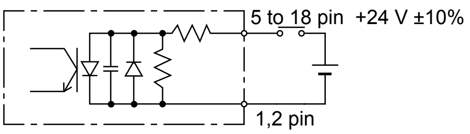
Input/output circuit specifications

Content	1 circuit current (mA)	Max. points (Circuit)	Max. current (mA)	Max. power consumption (mA)
Input circuit	4	14	56	746
Output circuit	30	18	540	
Brake output (BK+, BK−)	75	2	150	

* The maximum simultaneous output points of the output circuit are 14 points out of 18 points.

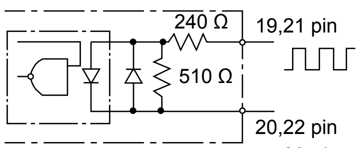
CN3 input/output circuit specifications

● Input circuit



Rated voltage 24 V ±10%
Rated current 4 mA (24 VDC)

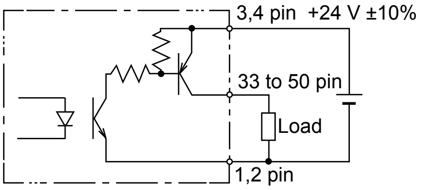
● Pulse train input circuit



Rated voltage 5 V ±10%

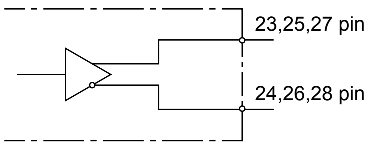
Maximum input frequency
Line driver 1 Mpps
Open collector 250 Kpps

● Output circuit



Rated voltage 24 V ±10%
Rated current 50 mA (MAX)

● Encoder output circuit



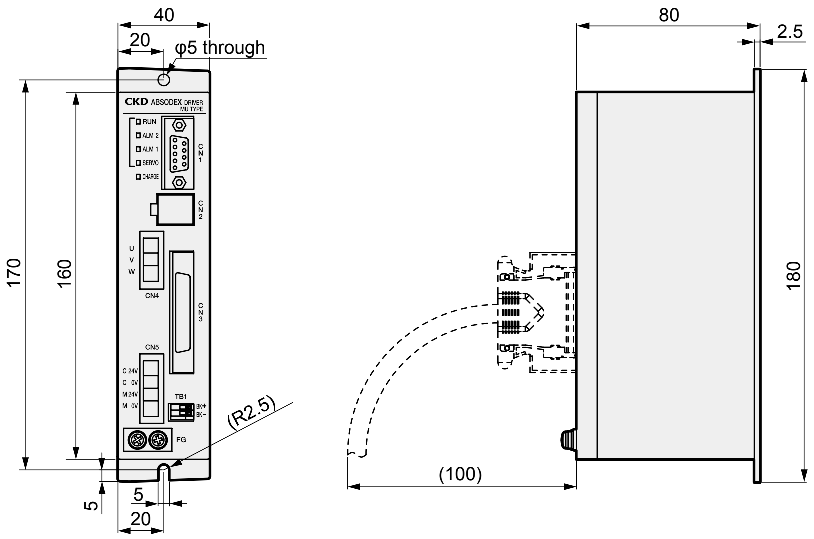
Output format: Line driver
Line driver: DS26C31

Accessories supplied with the driver

Model No.	Specifications	CN3 Connector	CN4 Connector
AX9000MU-U0	Parallel I/O (NPN)	10150-3000PE (Plug) 10350-52A0-008 (Shell) Sumitomo 3M Ltd.	Power supply connector 04JFAT-SBXGF-I Open tool J-FAT-OT J.S.T. Mfg Co., Ltd.
AX9000MU-U1	Parallel I/O (PNP)		

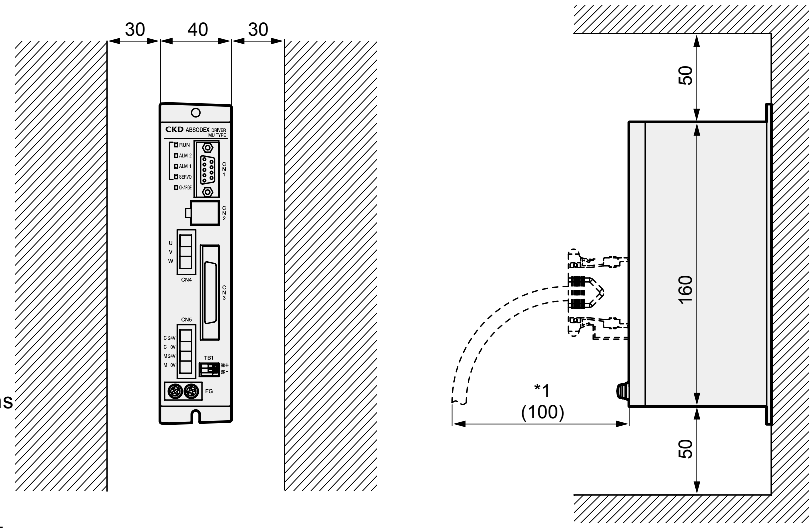
For additional orders of parts, refer to the parts model No. table.

Dimensions



Installation Dimensions

*1) Determine the dimensions with extra allowance according to the cable you want to use.

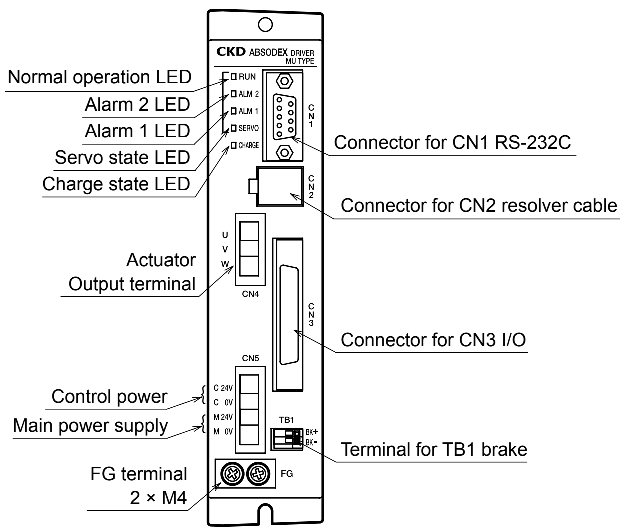


Safety precautions

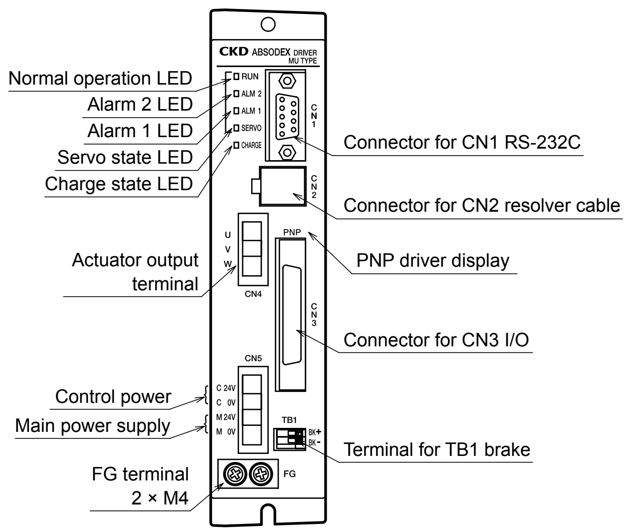
- The ABSODEX driver does not have a dust-proof/waterproof structure. To prevent dust, water, oil or other substances from entering the driver, provide protection according to the working environment.
- Install the ABSODEX driver away from other devices, walls or other structures by 50 mm or more from both top and bottom and 30 mm or more from sides. When heat is generated from other drivers or devices, check that the ambient temperature does not exceed 50°C.

Panel Details

- Parallel I/O (NPN)



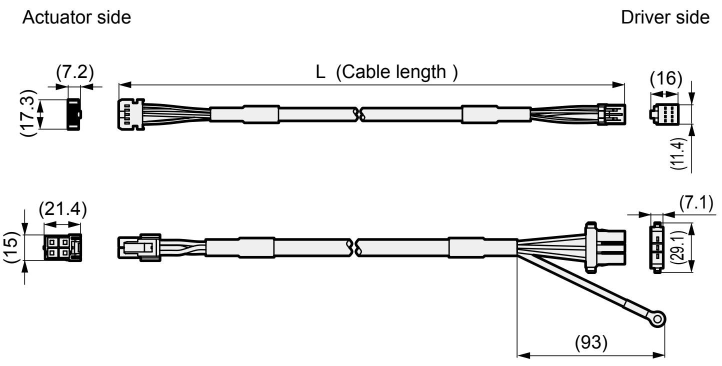
- Parallel I/O (PNP)



Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

Cable Specifications

Cable dimensions



Product name/model No.	Cable's min. bending radius
Resolver cable AX-CBLR8-DM□□ (*1)	60 mm
Motor cable AX-CBLM8-DM□□ (*1)	90 mm

*1) □□ indicates the cable length.

Safety precautions

- For uses in which the cable is repeatedly bent, fix the cable sheath part near the connector of the actuator body.
- The lead-out cable of the actuator section is not movable. Make sure to fix the cable in the connector section to prevent the cable from moving. Do not pull the lead-out cable to lift the unit or apply excessive force to the cable. Otherwise, malfunction, an alarm, damage of the connector part, or disconnection may result.
- When connecting the cable, fully insert the connector. Also, tighten the connector mounting screws and fix screws securely.
- Do not modify the cable, including disconnection or extension. Such modification may cause failure or malfunction.
- For the cable length L, refer to the cable length shown in the How to order.

MEMO

ABSODEX

AX7000X Series

High-end model equipped with high-resolution encoder
Compatible function allows free combination of driver, actuator, and cable

- Max. torque: 22/45 N·m
- Supported driver: XS driver

RoHS

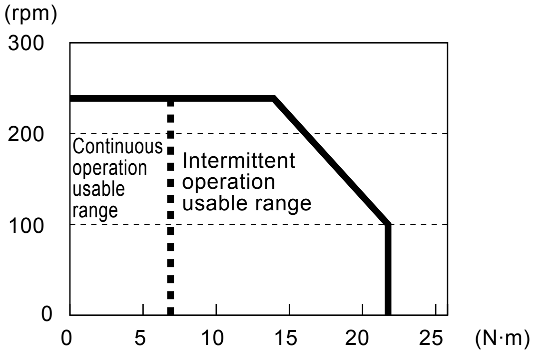
Actuator specifications

Descriptions		AX7022X	AX7045X
Max. output torque	N·m	22	45
Continuous output torque	N·m	7	15
Max. rotation speed	rpm	240 (*1)	
Allowable axial load	N	400	
Allowable moment load	N·m	20	
Output shaft moment of inertia	kg·m^2	0.0182	0.0254
Allowable moment of load inertia	kg·m^2	0.60	0.90
Index accuracy (*3)	sec	±30	
Repeatability (*3)	sec	±2	
Output shaft friction torque	N·m	2.5	
Resolution	P/rev	4,194,304	
Motor insulation class		Class F	
Motor withstand voltage		1,500 VAC 1 min	
Motor insulation resistance		10 MΩ or more 500 VDC	
Operating ambient temperature		0 to 40°C	
Operating ambient humidity		20 to 85% RH, no condensation	
Storage ambient temperature		−20 to 80°C	
Storage ambient humidity		20 to 90% RH, no condensation	
Atmosphere		No corrosive gas, explosive gas, or dust	
Weight	kg	10.0 (12.9) *2	13.2 (16.1) *2
Output shaft runout (*3)	mm	0.03	
Output shaft surface runout (*3)	mm	0.03	
Degree of protection		IP20	

*1: Use at a speed of 80 rpm or less during continuous rotation operation.
*2: The values in ( ) are the actuator weight with the mounting base option.
*3: Refer to the "Glossary" on page 64 for index accuracy, repeatability, output shaft runout and output shaft surface runout.

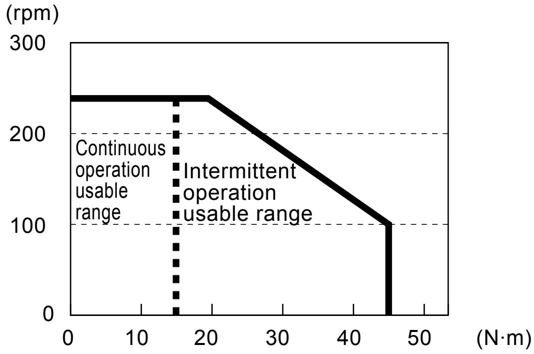
Speed/maximum torque characteristics

● AX7022X



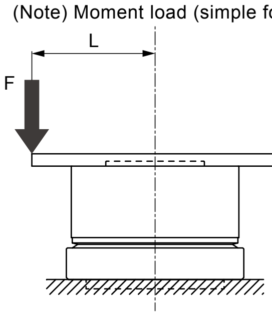
* The graph shows the characteristics of three-phase 200 VAC.

● AX7045X



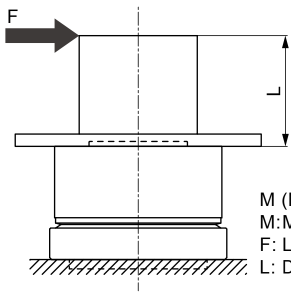
* The graph shows the characteristics of three-phase 200 VAC.

(Note) Moment load (simple formula)



M (N·m) = F (N) × L (m)
M:Moment load
F: Load
L: Distance from the output shaft center

(Fig. a)



M (N·m) = F (N) × (L+0.02) (m)
M:Moment load
F: Load
L: Distance from the output shaft flange surface

(Fig. b)

Always read the safety precautions on pages 73 to 78 before use.

How to order

● Set model No. (actuator, driver, cable)

Body model No. / Option model no

AX7 (022)(XS) - (BS) - (DM04) - (J1) - (U0)

Model No.

Ⓐ Size (max. torque)

Ⓑ Driver type

Ⓒ Mounting base

Ⓓ Cable length *2

Ⓔ Driver power voltage

Ⓕ Interface specifications

Code	Content
Ⓐ Size (max. torque)	
022	22 N·m
045	45 N·m
Ⓑ Driver type	
XS	XS driver
Ⓒ Mounting base	
Blank	Standard (without mounting base)
BS	With mounting base
Ⓓ Cable length	
DM00	Without cable
DM02	2 m
DM04	4 m
DM06	6 m
DM08	8 m
DM10	10 m
DM15	15 m
DM20	20 m
Ⓔ Driver power voltage	
Blank	Single-phase/three-phase 200 to 230 VAC
J1	Single-phase 100 to 115 VAC
Ⓕ Interface specifications	
U0	Parallel I/O (NPN)
U2	CC-Link
U4	DeviceNet

⚠ Precautions for model No. selection

*1: Select the driver according to the compatibility table below.

Driver power voltage compatibility table

Model \ Drivers Type	XS driver	
	Three-phase/ single-phase 200 to 230 VAC	Single-phase 100 to 115 VAC
AX7022X	Blank	J1
AX7045X	Blank	J1

*2: Cable is a movable cable.
Refer to page 21 for dimensions of the cable.
Body lead-out cable is not a movable cable.

*3: Ⓒ When the "BS" option with the mounting base is selected, the positioning pin hole on the bottom is not available.
The surface is treated with electroless nickel plating.

*4: Positioning pin holes may not be surface treated.

*5: The body surface of AX7022X and AX7045X is treated with electroless nickel plating.

● Actuator body discrete model No.

AX7 (022) X - (BS)

Ⓐ Size

Ⓒ Mounting base

● Driver discrete model No.

• 200 to 230 VAC

AX9000XS - (U0)

• 100 to 115 VAC

AX9000XS - J1 - (U0)

Ⓕ Interface specifications

● Cable discrete model No.

• Motor cable

AX-CBLM6-(DM04)

• Encoder cable

AX-CBLR10-(DM04)

Ⓓ Cable length
(Note: "DM04" when cable length is 4 m)

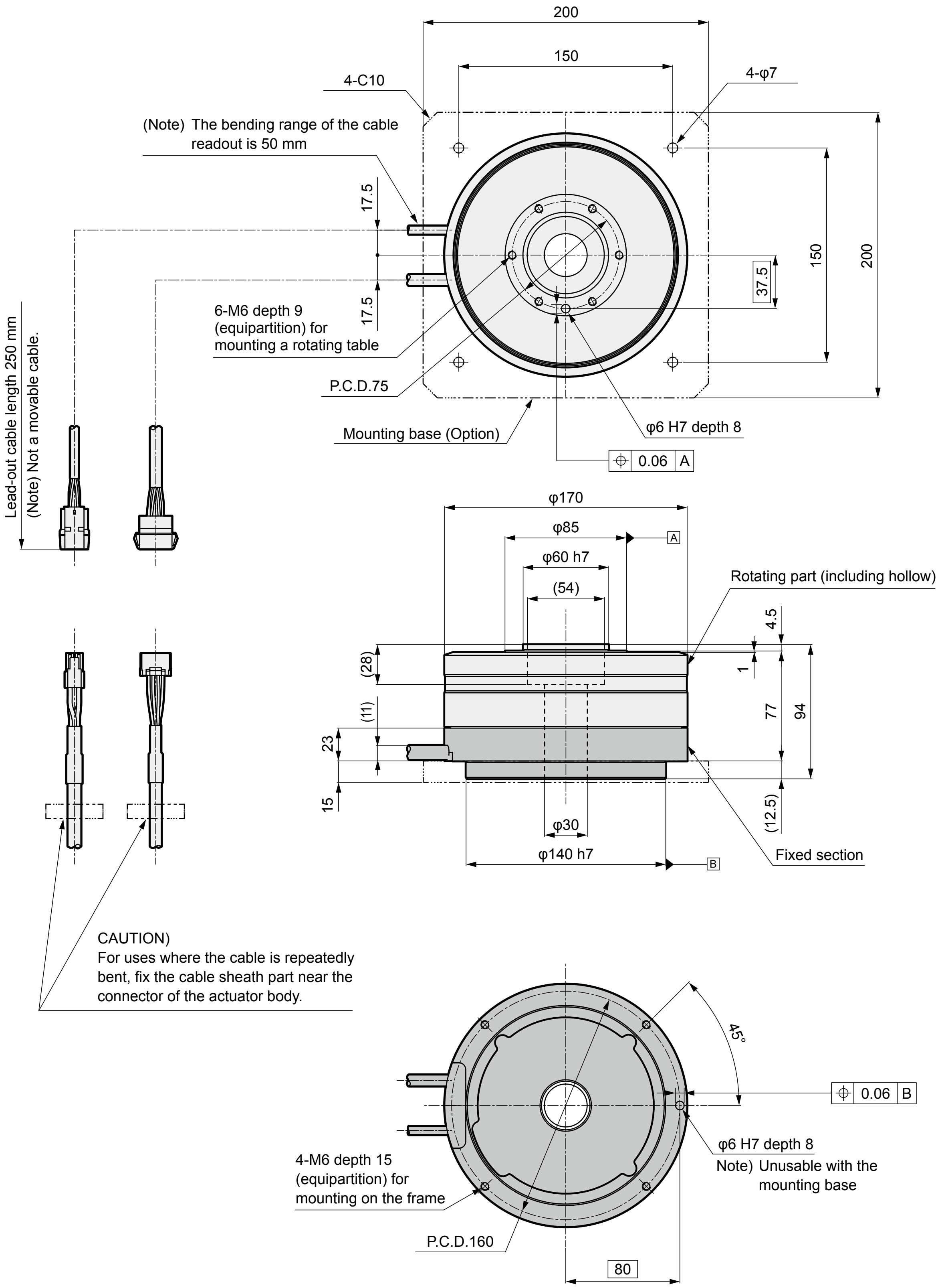
* Custom order products are RoHS non-compliant. Contact CKD as needed.

Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

Dimensions

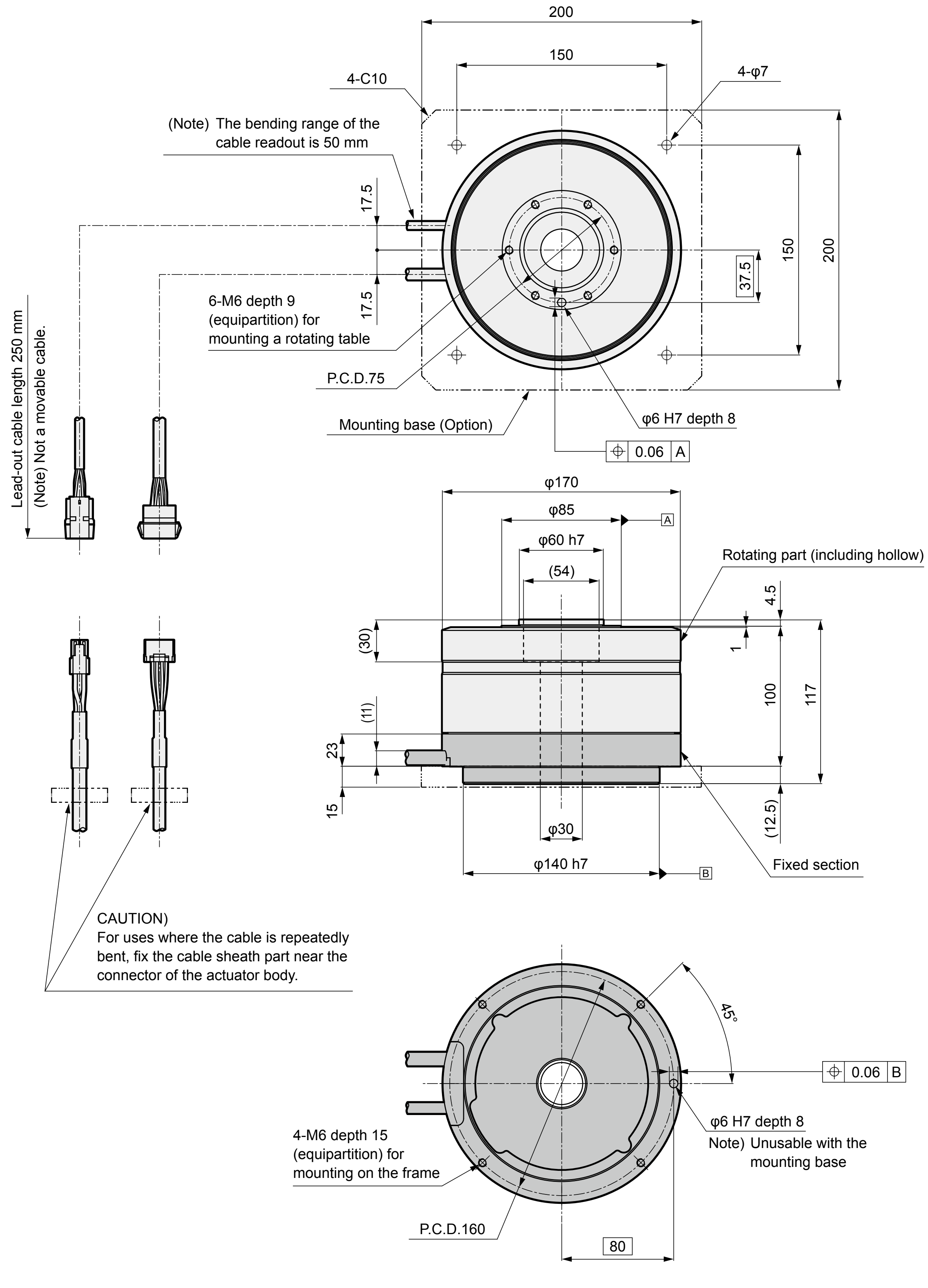
● AX7022X



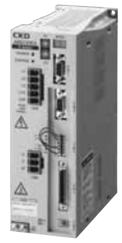
*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

Dimensions

● AX7045X



*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.



ABSODEX (AX7000X Series)

XS driver

Interface specifications: parallel I/O (NPN)
CC-Link
DeviceNet

RoHS

Features

- Power supply is divided into main power supply and control power supply
- Smaller/lighter weight (resin body adopted)
- 7-segment LED 2-digit display
- Compatible with encoder output (parallel I/O only)
- Serial communication options available
- Driving conditions enabled to be set or directed by the host controller (CC-Link and DeviceNet only)

How to order

• 200 to 230 VAC

AX9000XS - U0

• 100 to 115 VAC

AX9000XS-J1- U0

Interface specifications
U0: Parallel I/O(NPN)
U2: CC-Link
U4: DeviceNet

General specifications

Descriptions		Model: XS driver AX9000XS
Power supply voltage	Main power supply	Three phase, single phase 200 VAC ±10% to 230 VAC ±10% 100 VAC ±10% to 115 VAC ±10% (J1 Option) (*1)
	Control power	200 VAC ±10% to 230 VAC ±10% 100 VAC ±10% to 115 VAC ±10% (J1 Option) (*1)
Power frequency		50/60 Hz
Rated input current		200 VAC: 1.8 A 100 VAC: 2.4 A
Rated output current		1.9 A
Structure		Driver and controller integrated (open type)
Operating ambient temperature		0 to 50°C
Operating ambient humidity		20 to 90% RH (no condensation)
Storage ambient temperature		−20 to 65°C
Storage ambient humidity		20 to 90% RH (no condensation)
Atmosphere		No corrosive gas or dust
Anti-noise		1,000 V (P-P), pulse width 1 μsec, rising 1 nsec impulse noise test, induction noise (capacitive coupling)
Vibration resistance		4.9 m/s²
Weight		Approx. 1.6 kg
Degree of protection		IP2X (excluding CN4 and CN5)

*1) If a 200 to 230 VAC power supply is connected by mistake when using power voltage 100 to 115 VAC specifications (-J1 option), the driver internal circuit will be damaged.
*2) If the main power is cut off while the actuator is rotating, the rotation may continue due to inertia.
*3) After the main power supply is cut OFF, the motor may rotate by the residual voltage of the driver.

Performance specifications

Descriptions	Content
No. of control axes	1 axis, 4,194,304 pulses/1 rotation
Angle setting unit	° (degree), pulse, indexing No.
Angle min. setting unit	0.001°, 1 pulse
Speed setting unit	sec, rpm
Speed setting range	0.01 to 100 sec/0.11 to 240 rpm
Equal divisions	1 to 255
Max. command value	8-digit numeric input ±99,999,999
Timer	0.01 to 99.99 sec
Programming language	NC
Programming method	Set data through RS232C port with a PC or other terminal.
Operation mode	Auto, MDI, jog, single block, servo OFF, pulse train input mode Network operation mode
Coordinates	Absolute, incremental
Acceleration curve	[5 types] Modified Sine (MS), Modified Constant Velocity (MC/MC2), Modified Trapezoid (MT), Trapecloid (TR)
Status display	LED display CHARGE = Main power supply POWER = Control power
Operation display	Display with 7-segment LED (2 digits)
Communication interface	RS-232C compliant
I/O signal	Refer to interface specification pages.
Program capacity	Approx. 6,000 characters (256)
Electronic thermal	Overheating protection for actuator

Breaker capacity

Actuator model No.	Driver model No.	Rush current (A): Single phase 100 V	Rush current (A): Single-phase/ three-phase 200 V	Breaker capacity: Rated current (A)
AX7022X, AX7045X	AX9000XS	16 (*1)	56 (*1)	10

*1) The value of the rush current is a representative value at 115 VAC and 230 VAC.

Always read the safety precautions on pages 73 to 78 before use.

* Custom order products are RoHS non-compliant.

Parallel I/O (NPN)

CN3 Input signal

Pin No.	Signal name	Logic	Determination
1 to 2	External power supply input +24 V ±10%		
3 to 4	External power supply input GND		
5	Program No. selection input (Bit 0)	Positive	Level
6	Program No. selection input (Bit 1)	Positive	Level
7	Program No. selection input (Bit 2)	Positive	Level
8	Program No. selection input (Bit 3)	Positive	Level
9	Program No. setting 2nd digit input/ Program No. selection input (Bit 4)	Positive	Edge Level
10	Program No. setting 1st digit input/ Program No. selection input (Bit 5)	Positive	Edge Level
11	Reset input	Positive	Edge
12	Origin return directive input	Positive	Edge
13	Start input	Positive	Edge
14	Servo on input/ Program stop input	Positive	Level Edge
15	Ready return/Continuous rotation stop input	Positive	Edge
16	Answer input/Position deviation counter reset input	Positive	Edge
17	Emergency stop input	Load	Level
18	Brake release input	Positive	Level

CN3 Output signal

Pin No.	Signal name	Logic
33	M code output (Bit 0)	Positive
34	M code output (Bit 1)	Positive
35	M code output (Bit 2)	Positive
36	M code output (Bit 3)	Positive
37	M code output (Bit 4)	Positive
38	M code output (Bit 5)	Positive
39	M code output (Bit 6)	Positive
40	M code output (Bit 7)	Positive
41	Imposition output	Positive
42	Positioning completion output	Positive
43	Start input wait output	Positive
44	Alarm output 1	Load
45	Alarm output 2	Load
46	Output 1 during indexing/Origin position output	Positive
47	Output 2 during indexing/Servo state output	Positive
48	Ready output	Positive
49	Segment position strobe output	Positive
50	M code strobe output	Positive

CN3 pulse train input signal

Pin No.	Signal name
19	PULSE/UP/A phase
20	-PULSE/-UP/-A phase
21	DIR/ DOWN/ B phase
22	-DIR/-DOWN/-B phase

CN3 encoder output signal (Incremental)

Pin No.	Signal name
23	A phase (Line driver output)
24	-A phase (Line driver output)
25	B phase (Line driver output)
26	-B phase (Line driver output)
27	Z phase (Line driver output)
28	-Z phase (Line driver output)

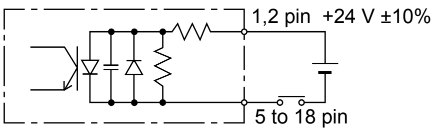
Input/output circuit specifications

Content	1 circuit current (mA)	Max. points (Circuit)	Max. current (mA)	Max. power consumption (mA)
Input circuit	4	14	56	1106
Output circuit	50	18	900	
Brake output (BK+, BK−)	75	2	150	

* The maximum simultaneous output points of the output circuit are 14 points out of 18 points.

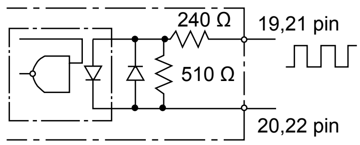
CN3 input/output circuit specifications

● Input circuit



Rated voltage 24 V ±10%
Rated current 4 mA (24 VDC)

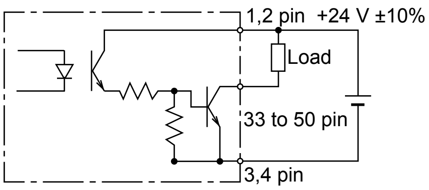
● Pulse train input circuit



Rated voltage 5 V ±10%

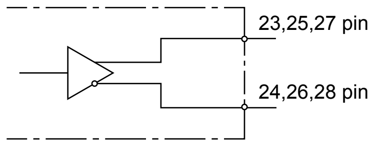
Maximum input frequency
Line driver 1 Mpps
Open collector 250 Kpps

● Output circuit



Rated voltage 24 V ±10%
Rated current 50 mA (MAX)

● Encoder output circuit



Output format: Line driver
Line driver: DS26C31

⚠ Always read the safety precautions on pages 73 to 78 before use.

* Custom order products are RoHS non-compliant.

XS driver

CC-Link

Communication specifications

Descriptions	Specifications
Power supply	5 VDC is supplied from the servo amplifier.
CC-Link version	Ver.1.10
Number of occupied stations (type)	2 stations (Remote device station)
Remote input points	48 point
Remote output points	48 point
Remote register input/output	Input 8 words/Output 8 words
Communication speed	10 M/5 M/2.5 M/625 k/156 kbps (Selected by parameter setting)
Connection cable	CC-Link Ver.1.10 compliant cable (3 core cable with shield)
Transmission format	HDLC compliant
Remote station No.	1 to 63 (Set by a parameter)
Number of connected units	For remote device station only Max. 32 units/2 stations occupied
Monitor function	Present position within 1 rotation (degree, pulse), position deviation, amount, program No., electronic thermal, rotation speed, alarm, parameter, operation mode

I/O signal

PLC → AX (Input)

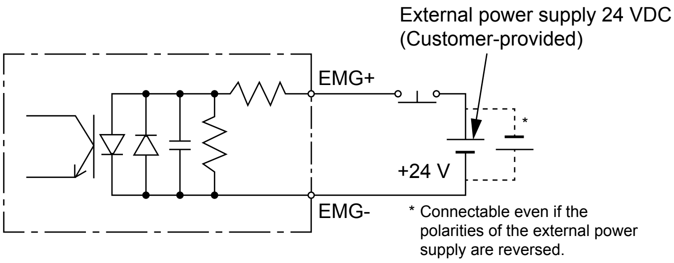
Device No.	Signal name	Logic	Determination
RYn0	Program No. selection input (Bit 0)	Positive	Level
RYn1	Program No. selection input (Bit 1)	Positive	Level
RYn2	Program No. selection input (Bit 2)	Positive	Level
RYn3	Program No. selection input (Bit 3)	Positive	Level
RYn4	Program No. setting 2nd digit input /Program No. selection input (Bit 4)	Positive	Edge level
RYn5	Program No. setting 1st digit input /Program No. selection input (Bit 5)	Positive	Edge level
RYn6	Reset input	Positive	Edge
RYn7	Origin return directive input	Positive	Edge
RYn8	Start input	Positive	Edge
RYn9	Servo on input /Program stop input	Positive	Level edge
RYnA	Ready return input /Continuous rotation stop input	Positive	Edge
RYnB	Answer input /Position deviation counter reset input	Positive	Edge
RYnC	Emergency stop input	Load	Level
RYnD	Brake release input	Positive	Level
RYnE	Job operation input (CW direction)	Positive	Edge
RYnF	Job operation input (CCW direction)	Positive	Edge
RY(n+1)0	Unusable /Travel unit selection input (Bit 0)	Positive	Level
RY(n+1)1	Unusable /Travel unit selection input (Bit 1)	Positive	Level
RY(n+1)2	Unusable /Travel speed unit selection input	Positive	Level
RY(n+1)3	Operation by table, Operation by data input Switching input	Positive	Level
RY(n+1)4 to RY(n+1)F	Unusable		
RY(n+2)0	Monitor output execution request	Positive	Level
RY(n+2)1	Command code execution request	Positive	Edge
RY(n+2)2 to RY(n+2)F	Unusable		
RY(n+3)0 to RY(n+3)F	Unusable		

AX (Output) → PLC

Device No.	Signal name	Logic
RXn0	M code output (Bit 0)	Positive
RXn1	M code output (Bit 1)	Positive
RXn2	M code output (Bit 2)	Positive
RXn3	M code output (Bit 3)	Positive
RXn4	M code output (Bit 4)	Positive
RXn5	M code output (Bit 5)	Positive
RXn6	M code output (Bit 6)	Positive
RXn7	M code output (Bit 7)	Positive
RXn8	Imposition output	Positive
RXn9	Positioning completion output	Positive
RXnA	Start input wait output	Positive
RXnB	Alarm output 1	Load
RXnC	Alarm output 2	Load
RXnD	Output 1 during indexing /Origin position output	Positive
RXnE	Output 2 during indexing /Servo state output	Positive
RXnF	Ready output	Positive
RX(n+1)0	Segment position strobe output	Positive
RX(n+1)1	M code strobe output	Positive
RX(n+1)2 to RX(n+1)F	Unusable	
RX(n+2)0	Monitoring	Positive
RX(n+2)1	Command code execution completed	Positive
RX(n+2)2 to RX(n+2)F	Unusable	
RX(n+3)0 to RX(n+3)A	Unusable	
RX(n+4)B	Remote READY	Positive
RX(n+3)C to RX(n+3)F	Unusable	

* n is determined by the setting of the station No.

TB3 Input circuit specifications (Machine stops)



Rated voltage 24 V ±10%, Rated current 5 mA or less

Safety precautions

- Reserve a sufficient distance between the communication cable and power cable (motor cable, power supply cable, etc.).
- Placing the communication cable and power cable close to each other or bundling these cables makes communication unstable due to noise, possibly resulting in a communication error or retry.
- For details on the installation of a communication cable, refer to the CC-Link installation manuals.

DeviceNet

Communication specifications

Descriptions	Specifications
Power supply for communication	11 to 25 VDC
Current consumption of power supply for communication	50 mA or less
Communication protocol	DeviceNet compliant: Remote I/O
Number of occupied nodes	Input 8 bytes/Output 8 bytes
Communication speed	500 k/250 k/125 kbps (Selected by parameter setting)
Connection cable	DeviceNet compliant cable (5-wire cable with shield, 2 signal lines, 2 power cables, 1 shield)
Node address	0 to 63 (Set by a parameter)
Number of connected units	Max. 64 units (including the master)
Monitor function	Present position within 1 rotation (degree, pulse), position deviation amount, program No., electronic thermal, rotation speed, alarm, parameter, operation mode

I/O signal

PLC → AX (Input)

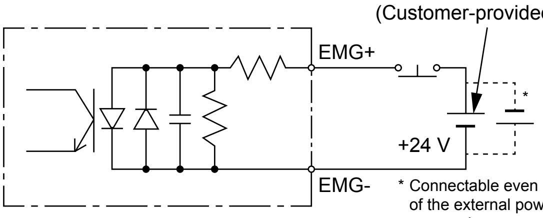
Byte No.	Signal name	Logic	Determination
0.0	Program No. selection input (Bit 0)	Positive	Level
0.1	Program No. selection input (Bit 1)	Positive	Level
0.2	Program No. selection input (Bit 2)	Positive	Level
0.3	Program No. selection input (Bit 3)	Positive	Level
0.4	Program No. setting 2nd digit input /Program No. selection input (Bit 4)	Positive	Edge level
0.5	Program No. setting 1st digit input /Program No. selection input (Bit 5)	Positive	Edge level
0.6	Reset input	Positive	Edge
0.7	Origin return directive input	Positive	Edge
1.0	Start input	Positive	Edge
1.1	Servo on input /Program stop input	Positive	Level edge
1.2	Ready return input /Continuous rotation stop input	Positive	Edge
1.3	Answer input /Position deviation counter reset input	Positive	Edge
1.4	Emergency stop input	Load	Level
1.5	Brake release input	Positive	Level
1.6	Job operation input (CW direction)	Positive	Edge
1.7	Job operation input (CCW direction)	Positive	Edge
2.0	Parameter No. (Bit 8) /Travel unit selection input (Bit 0)	Positive	Level
2.1	Parameter No. (Bit 9) /Travel unit selection input (Bit 1)	Positive	Level
2.2	Parameter No. (Bit 10) /Travel speed unit selection input	Positive	Level
2.3	Operation by table, Operation by data input Switching input	Positive	Level
2.4 2.5	Unusable		
2.6	Monitor output execution request	Positive	Level
2.7	Command code execution request	Positive	Edge
3.0	Parameter No. (Bit 0) /Unusable	Positive	Level
3.1	Parameter No. (Bit 1) /Unusable	Positive	Level
3.2	Parameter No. (Bit 2) /Unusable	Positive	Level
3.3	Parameter No. (Bit 3) /Unusable	Positive	Level
3.4	Parameter No. (Bit 4) /Unusable	Positive	Level
3.5	Parameter No. (Bit 5) /Unusable	Positive	Level
3.6	Parameter No. (Bit 6) /Unusable	Positive	Level
3.7	Parameter No. (Bit 7) /Unusable	Positive	Level

AX (Output) → PLC

Byte No.	Signal name	Logic
0.0	M code output (Bit 0)	Positive
0.1	M code output (Bit 1)	Positive
0.2	M code output (Bit 2)	Positive
0.3	M code output (Bit 3)	Positive
0.4	M code output (Bit 4)	Positive
0.5	M code output (Bit 5)	Positive
0.6	M code output (Bit 6)	Positive
0.7	M code output (Bit 7)	Positive
1.0	Imposition output	Positive
1.1	Positioning completion output	Positive
1.2	Start input wait output	Positive
1.3	Alarm output 1	Load
1.4	Alarm output 2	Load
1.5	Output 1 during indexing /Origin position output	Positive
1.6	Output 2 during indexing /Servo state output	Positive
1.7	Ready output	Positive
2.0	Segment position strobe output	Positive
2.1	M code strobe output	Positive
2.2 to 2.5	Unusable	
2.6	Monitoring	Positive
2.7	Command code execution completed	Positive
3.0 to 3.7	Unusable	

TB3 Input circuit specifications (Machine stops)

External power supply 24 VDC
(Customer-provided)



* Connectable even if the polarities of the external power supply are reversed.

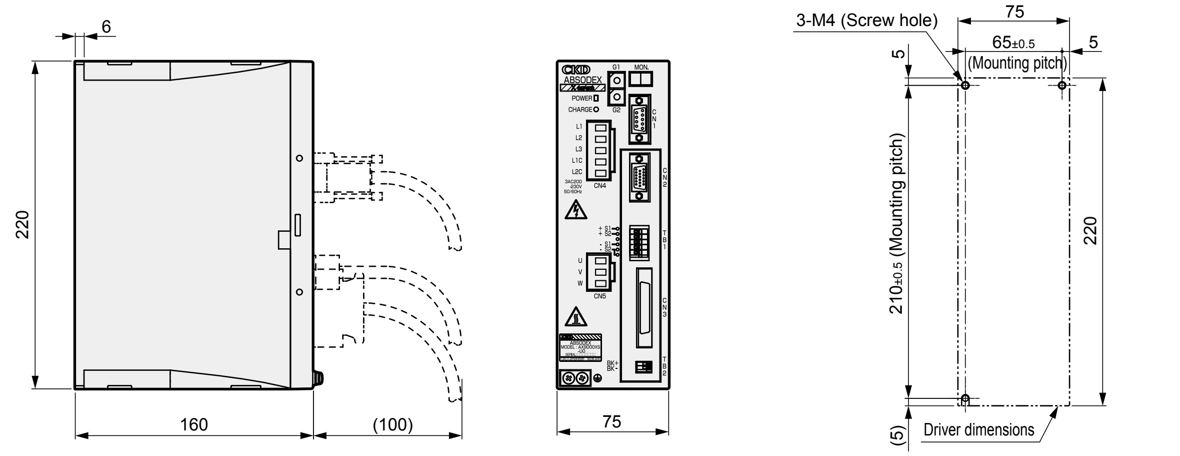
Rated voltage 24 V ±10%, Rated current 5 mA or less

Safety precautions

- Reserve a sufficient distance between the communication cable and power cable (motor cable, power supply cable, etc.).
- Placing the communication cable and power cable close to each other or bundling these cables makes communication unstable due to noise, possibly resulting in a communication error or retry.
- For details on the installation of communication cables, refer to the DeviceNet installation manuals.

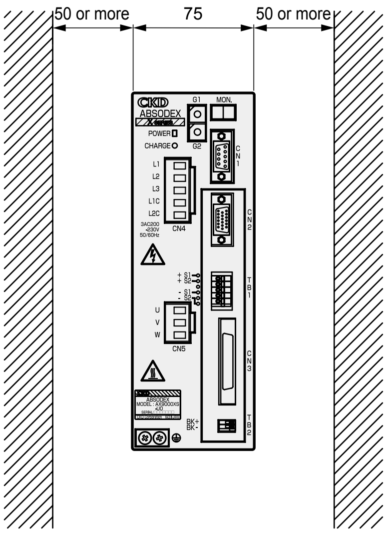
XS driver

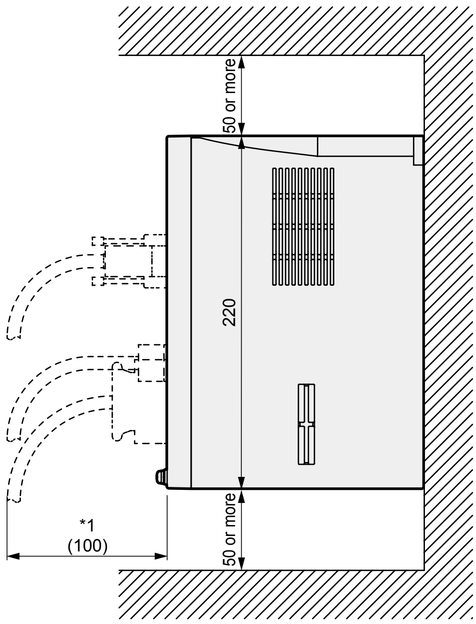
Dimensions



Mounting hole machining diagram

Installation Dimension





*1) Determine the dimension with extra allowance according to a cable you want to use.

Safety precautions

- The ABSODEX driver does not have a dust-proof/waterproof structure.
  To prevent dust, water, oil or other substances from entering the driver, provide protection according to the working environment.
- Install the ABSODEX driver away from other devices, walls or other structures by 50 mm or more from the top, bottom and sides. When heat is generated from other drivers or devices, check that the ambient temperature does not exceed 50°C.

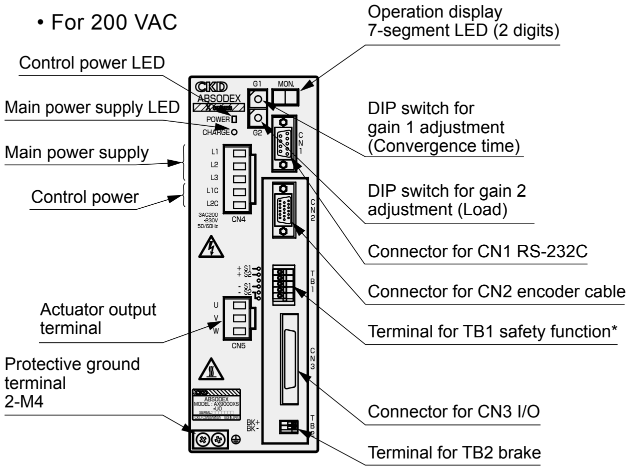
Accessories supplied with the driver

Model No.	Specifications	CN3 Connector	Power supply connector (CN4)	Motor cable connector (CN5)
AX9000XS-U0	Parallel I/O(NPN)	10150-3000PE (Plug) 10350-52A0-008 (Shell) Sumitomo 3M Ltd.	PC4/5-ST-7.62 Phoenix Contact	PC4/3-ST-7.62 Phoenix Contact
AX9000XS-U2	CC-Link	BLZP5.08HC/05/180F AU OR BX Weidmüller		
AX9000XS-U4	DeviceNet	MSTB2.5/5-STF-5.08AUM Phoenix Contact		

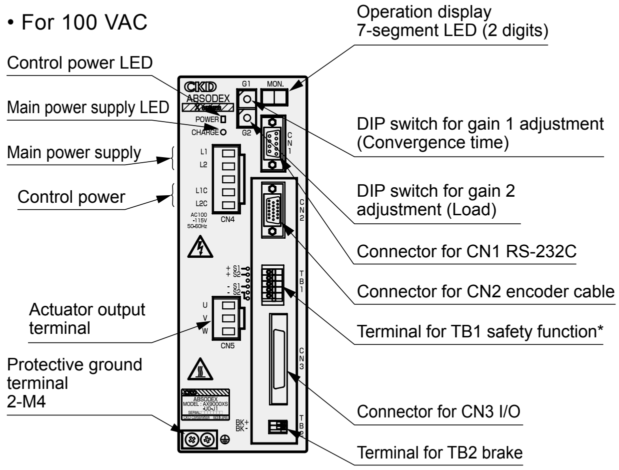
Panel Details

● Parallel I/O (NPN)

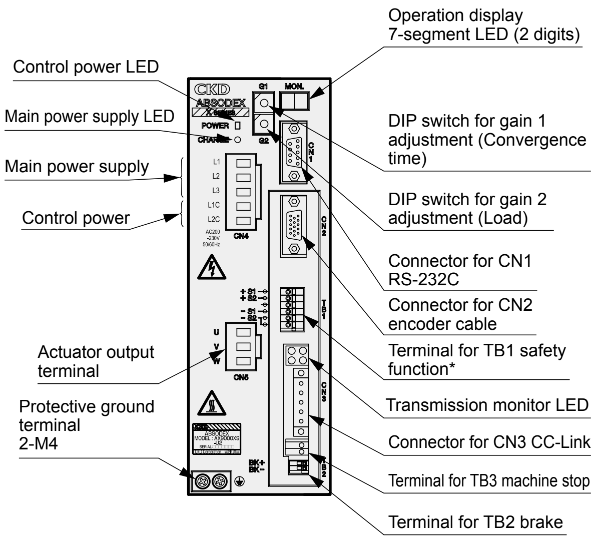
• For 200 VAC



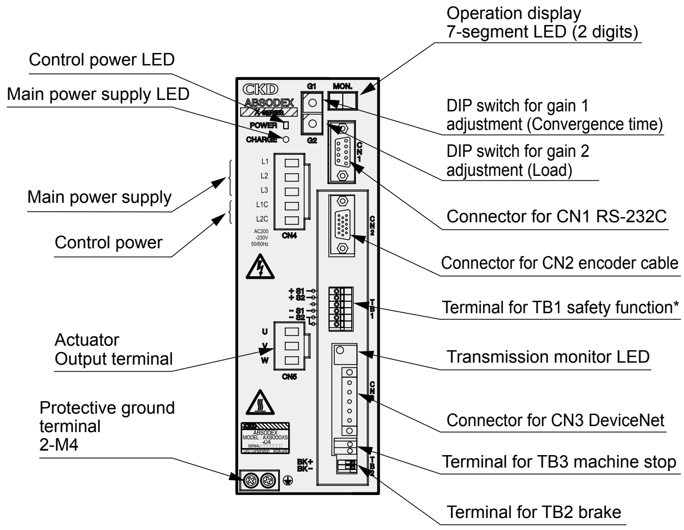
• For 100 VAC



● CC-Link



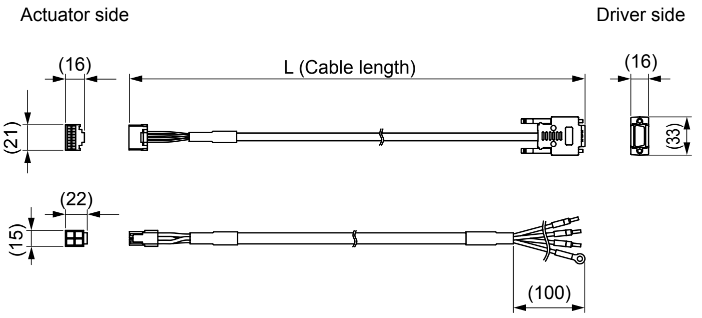
● DeviceNet



* Safety features (TB1) of this product are not compliant with the certification for safety standards compliance.

Cable Specifications

Cable dimensions



Product name/model No.	Cable's min. bending radius
Encoder cable AX-CBLR10-DM□□ (*1)	60 mm
Motor cable AX-CBLM5-DM□□ (*1)	110 mm

*1) □□ indicates the cable length.

⚠ Safety precautions

- Connect the motor cable and driver correctly by checking the mark tube of the cable and the display of the driver.
- For uses in which the cable is repeatedly bent, fix the cable sheath part near the connector of the actuator body.
- The lead-out cable of the actuator section is not movable. Make sure to fix the cable in the connector section to prevent the cable from moving. Do not pull the lead-out cable to lift the unit or apply excessive force to the cable. If you do, malfunction, an alarm, damage of the connector part, or disconnection may result.
- When connecting the cable, fully insert the connector. Also, tighten the connector mounting screws and fixing screws securely.
- Do not disconnect, extend, or make other modifications to the cable. Such modifications may cause failure or malfunction.
- For the cable length L, refer to the cable length shown in the How to order.

ABSODEX

AX1000T Series

High accuracy specifications (index accuracy, output shaft runout, etc.)
Compatible function allows free combination of driver, actuator, and cable

- Max. torque: 22/45/75/150/210 N·m
- Supported driver: TS/TH driver

Actuator specifications

Descriptions		AX1022T	AX1045T	AX1075T	AX1150T	AX1210T
Max. output torque	N·m	22	45	75	150	210
Continuous output torque	N·m	7	15	25	50	70
Max. rotation speed	rpm	240 (*1)		140 (*1)	120 (*1)	
Allowable axial load	N	600		2200		
Allowable moment load	N·m	19	38	70	140	170
Output shaft moment of inertia	$kg \cdot m^2$	0.00505	0.00790	0.03660	0.05820	0.09280
Allowable moment of load inertia	$kg \cdot m^2$	0.6	0.9	4.0	6.0	10.0
Index accuracy (*3)	sec	±15				
Repeatability (*3)	sec	±5				
Output shaft friction torque	N·m	2.0		8.0		
Resolution	P/rev	540672				
Motor insulation class		Class F				
Motor withstand voltage		1500 VAC 1 min				
Motor insulation resistance		10 MΩ or more 500 VDC				
Operating ambient temperature		0 to 45°C (0 to 40°C: *4)				
Operating ambient humidity		20 to 85% RH, no condensation				
Storage ambient temperature		−20 to 80°C				
Storage ambient humidity		20 to 90% RH, no condensation				
Atmosphere		No corrosive gas, explosive gas, or dust				
Weight	kg	8.9 (10.8) *2	12.0 (13.9) *2	23.0 (27.1) *2	32.0 (36.1) *2	44.0 (48.1) *2
Output shaft runout (*3)	mm	0.01				
Output shaft surface runout (*3)	mm	0.01				
Degree of protection		IP20				

*1: Use at a speed of 80 rpm or less during continuous rotation operation.
*2: The values in ( ) are the actuator weight with the mounting base option.
*3: Refer to the "Glossary" on page 64 for index accuracy, repeatability, output shaft runout and output shaft surface runout.
*4: When using as a UL certified product, the maximum temperature is 40°C.

Always read the safety precautions on pages 73 to 78 before use.

How to order

● Set model No. (actuator, driver, cable)

Body model No. / Option model No.

AX1 (022)(TS) - (BS) - (C) - (DM04) - (J1) - P3 - (U0)

Model No.
Ⓐ Size (max. torque)
Ⓑ Driver type *1
Ⓒ Mounting base
Ⓓ Connector mounting direction
Ⓔ Cable length *3
Ⓕ Driver power voltage *1
Ⓖ Interface specifications

Code	Content
Ⓐ Size (max. torque)	
022	22 N·m
045	45 N·m
075	75 N·m
150	150 N·m
210	210 N·m
Ⓑ Driver type	
TS	TS type with driver
TH	TH driver
Ⓒ Mounting base	
Blank	Standard (without mounting base)
BS	With mounting base
Ⓓ Connector mounting direction	
Blank	Standard (connector horizontal mounting)
C	Connector downward mounting
Ⓔ Cable length	
DM00	Without cable
DM02	2 m
DM04	4 m (standard length)
DM06	6 m
DM08	8 m
DM10	10 m
DM15	15 m
DM20	20 m
Ⓕ Driver power voltage	
Refer to the driver power voltage compatibility table at left.	
Ⓖ Interface specifications	
U0	Parallel I/O (NPN specifications)
U1	Parallel I/O (PNP specifications)
U2	CC-Link
U3	PROFIBUS-DP
U4	DeviceNet
U5	EtherCAT
U6	EtherNet/IP

⚠ Precautions for model No. selection

*1: Select the driver according to the compatibility table below.

Driver power voltage compatibility table

Model \ Drivers type	TS driver: Three-phase/ single-phase 200 to 230 VAC	TS driver: Single phase 100 to 115 VAC	TH driver: Three-phase/ single-phase 200 to 230 VAC
AX1022T	Blank	J1	
AX1045T	Blank	J1	
AX1075T	Blank *2		
AX1150T			Blank *2
AX1210T			Blank *2

*2: For models with maximum torque 75 N·m or more, the calculation of torque limit region is different from the usual when used at single-phase 200 VAC. Contact CKD to determine usability.

*3: Cable is a movable cable.
Refer to page 60 for dimensions of the cable.

*4: Ⓒ When the "BS" option with the mounting base is selected, the positioning pin hole on the bottom is not available. The surface is treated with electroless nickel plating.

*5: Positioning pin holes may not be surface treated.

● Actuator body discrete model No.

AX1 ( ) T - (BS) - (C) - P3

Ⓐ Size
Ⓒ Mounting base
Ⓓ Connector mounting direction

● Driver discrete model No.

- 200 to 230 VAC

AX9000TS - (U0)

AX9000TH - (U0)

- 100 to 115 VAC

AX9000TS-J1-(U0)

Ⓖ Interface specifications

● Cable discrete model No.

- Motor cable

AX-CBLM5-(DM04)

- Resolver cable

AX-CBLR5-(DM04)

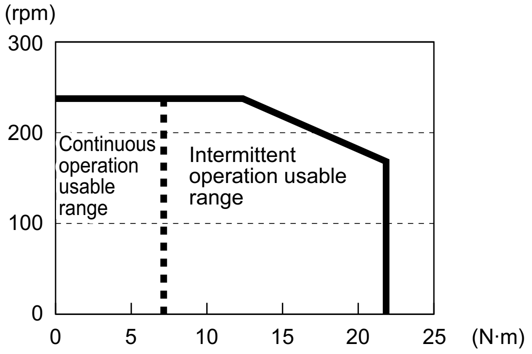
Ⓔ Cable length
(Note: "DM04" when cable length is 4 m)

* Custom order products are CE, UL/cUL, and RoHS non-compliant. Contact CKD as needed.

Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

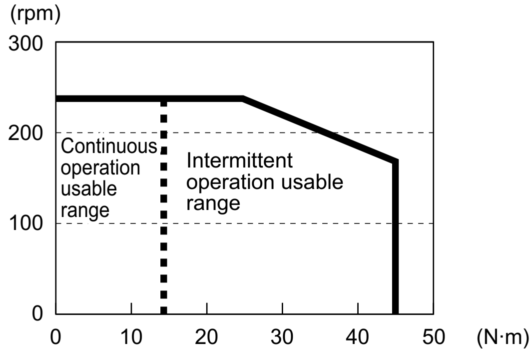
Speed/maximum torque characteristics

● AX1022T



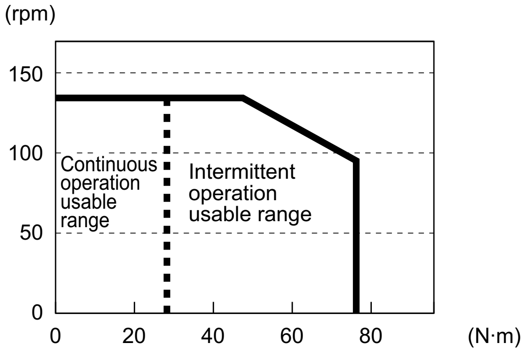
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX1045T



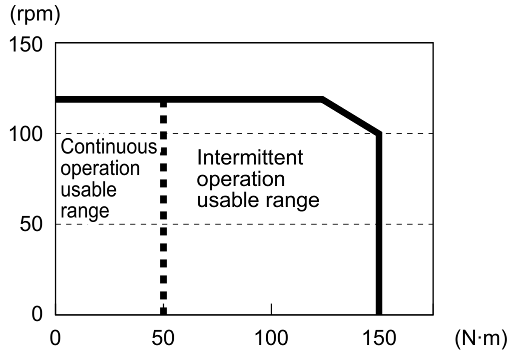
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX1075T



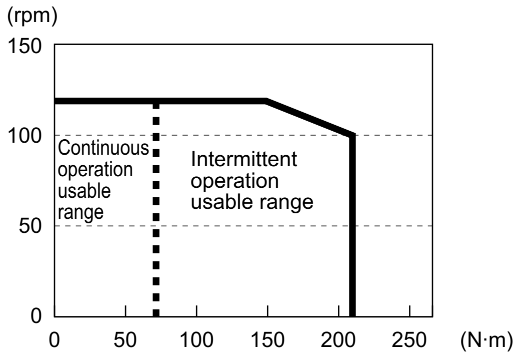
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX1150T



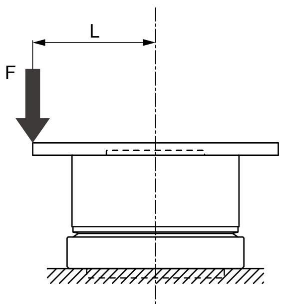
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX1210T



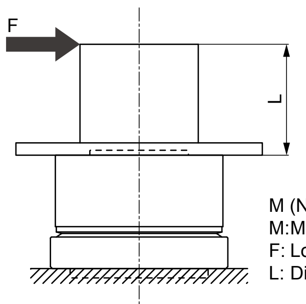
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

(Note) Moment load (simple formula)



M (N·m) = F (N) × L (m)
M:Moment load
F: Load
L: Distance from output shaft center

(Fig. a)

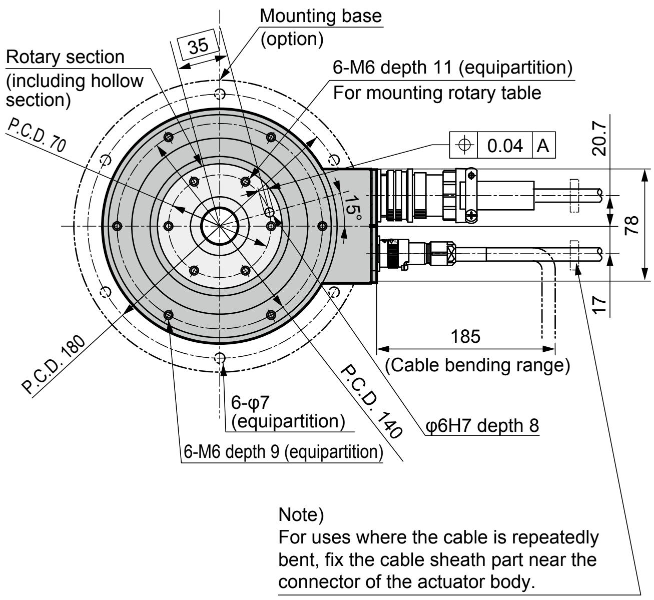


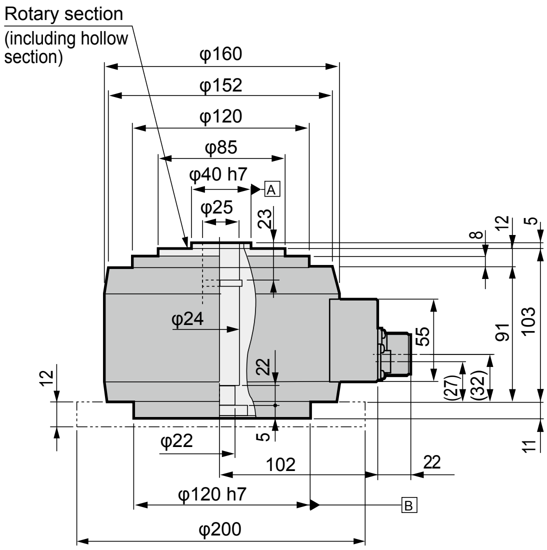
M (N·m) = F (N) × (L + 0.02) (m)
M:Moment load
F: Load
L: Distance from output shaft flange

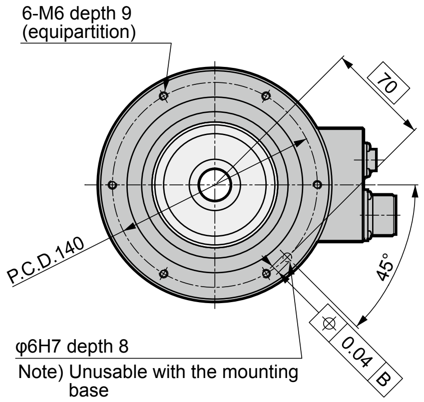
(Fig. b)

Dimensions

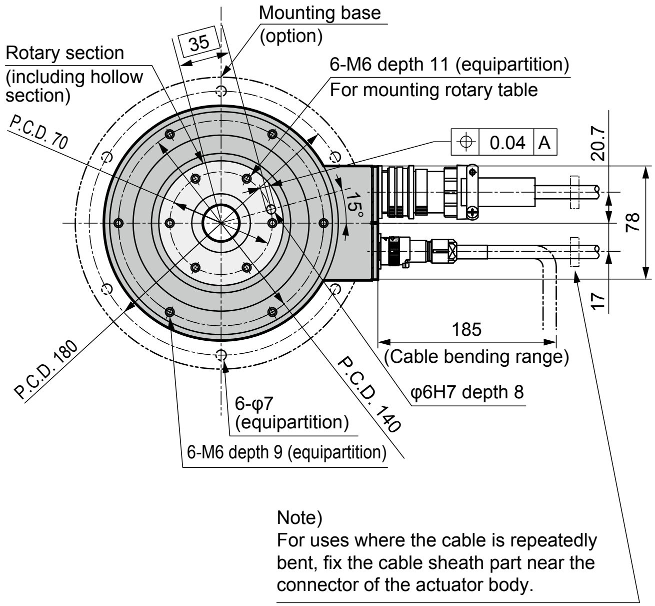
● AX1022T

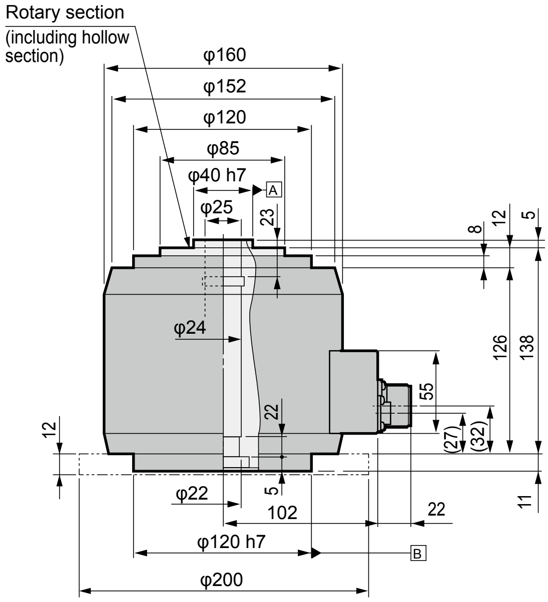


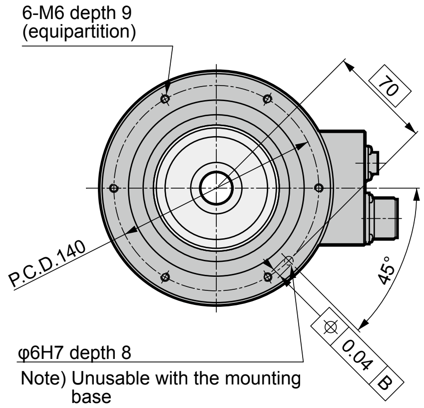




● AX1045T





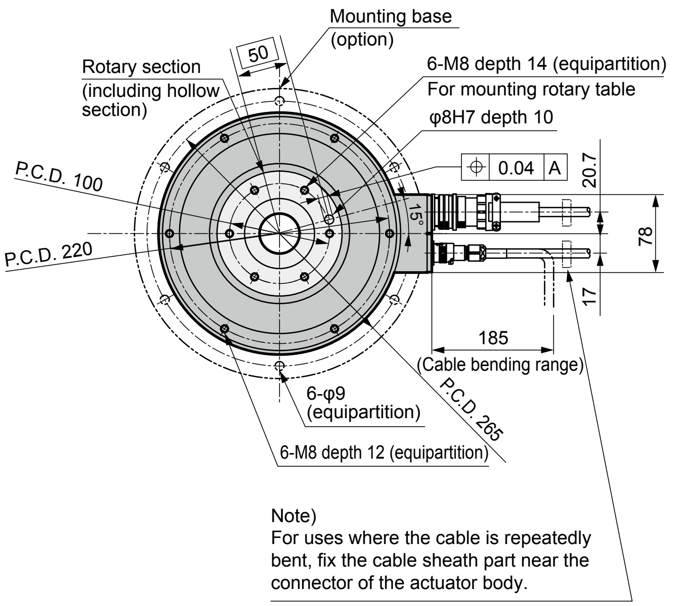


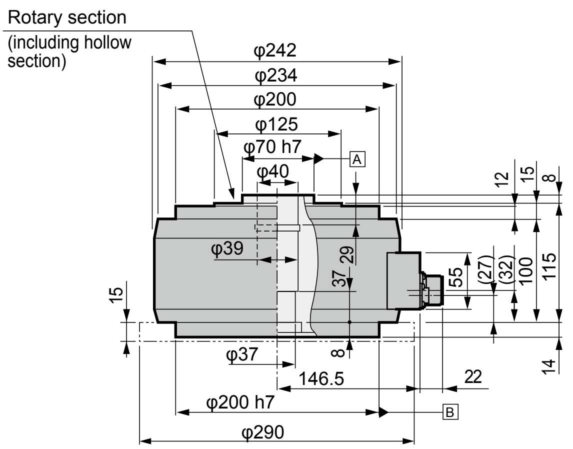
*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

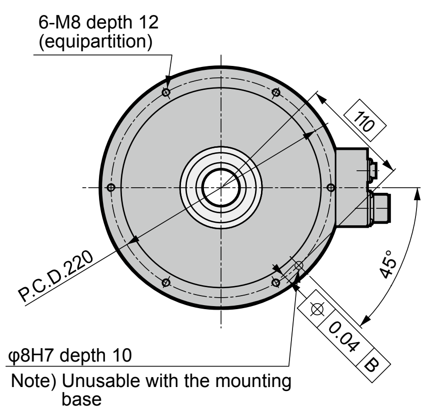
Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

Dimensions

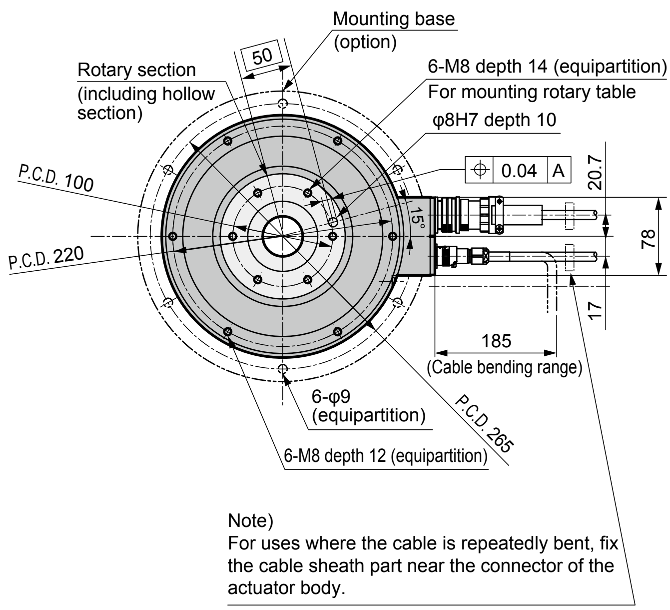
● AX1075T

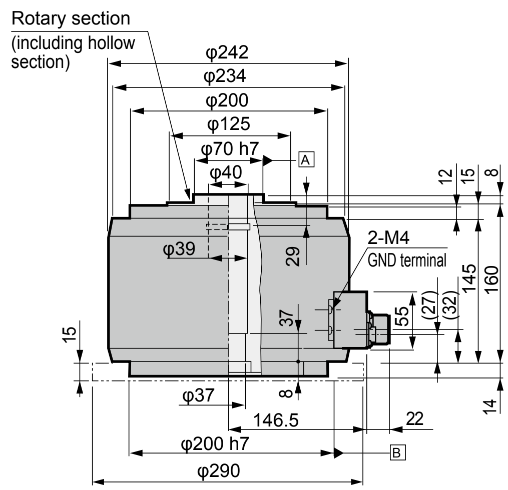


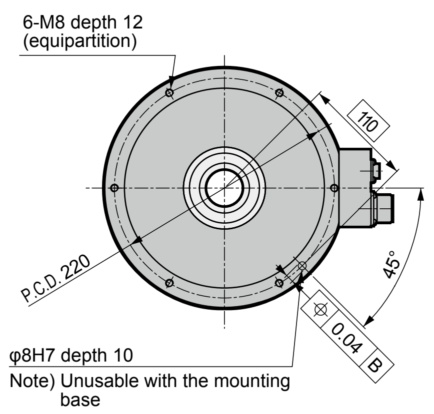




● AX1150T



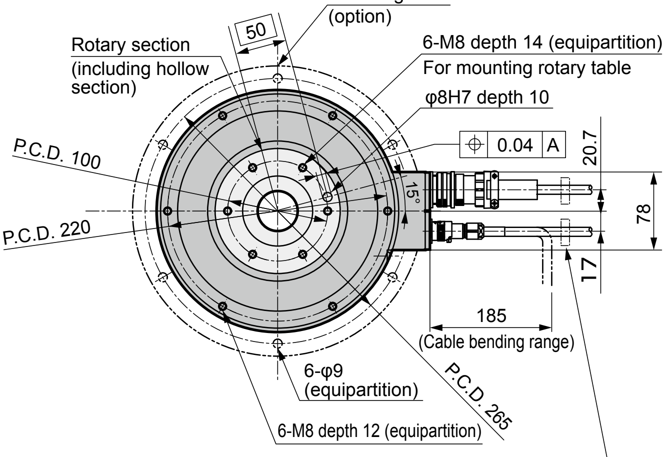




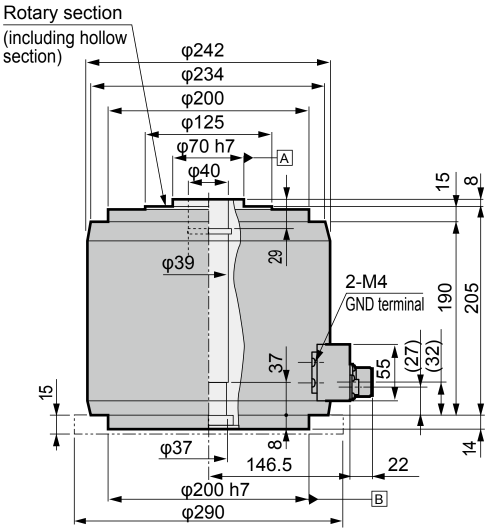
*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

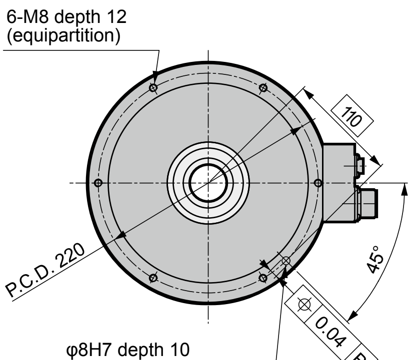
Dimensions

● AX1210T



Note)
For uses where the cable is repeatedly bent, fix the cable sheath part near the connector of the actuator body.

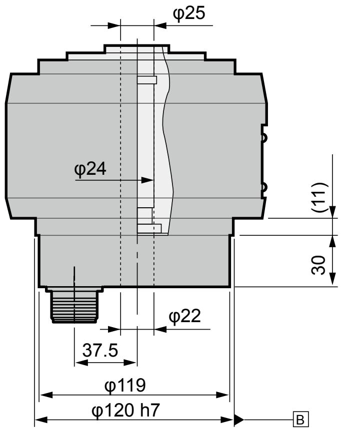


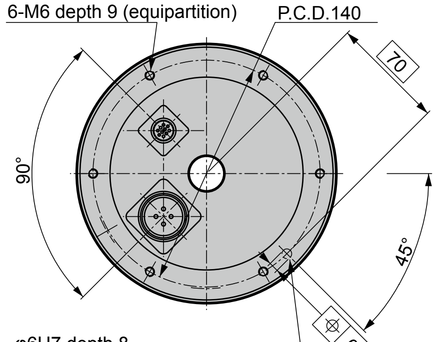


Note) Unusable with the mounting base

Dimensions (-C: Connector downward mounting)

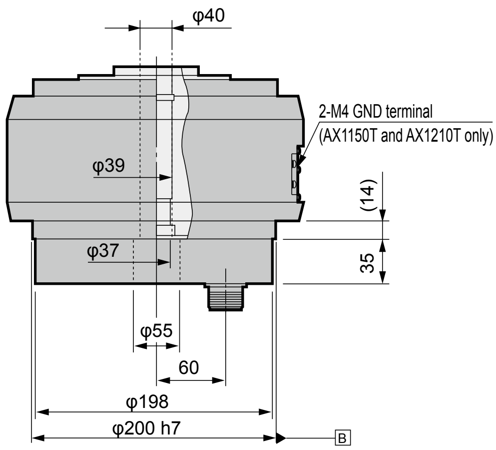
● AX1022T/AX1045T-C

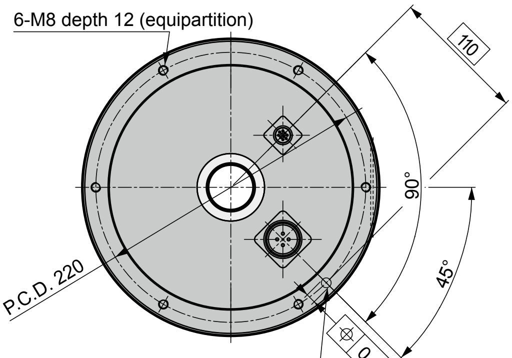




Note) Cannot be used with the mounting base.

● AX1075T/AX1150T/AX1210T-C





Note) Unusable with the mounting base

*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

ABSODEX

AX2000T Series

High-speed rotation (max. rotation speed 300 rpm), compact with small diameter, large hollow diameter (φ30)
Compatible function allows free combination of driver, actuator, and cable

- Max. torque: 6/12/18 N·m
- Supported driver: TS driver

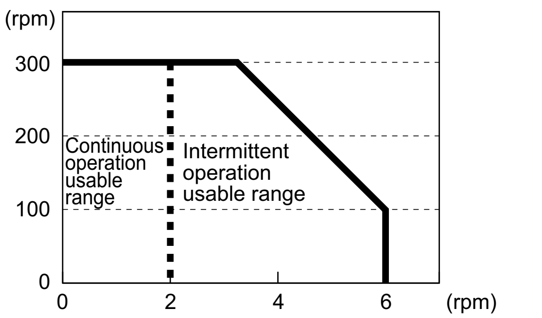
Actuator specifications

Descriptions		AX2006T	AX2012T	AX2018T
Max. output torque	N·m	6	12	18
Continuous output torque	N·m	2	4	6
Max. rotation speed	rpm	300 (*1)		
Allowable axial load	N	1000		
Allowable moment load	N·m	40		
Output shaft moment of inertia	kg·m²	0.00575	0.00695	0.00910
Allowable moment of load inertia	kg·m²	0.3	0.4	0.5
Index accuracy (*3)	sec	±30		
Repeatability (*3)	sec	±5		
Output shaft friction torque	N·m	0.6		0.7
Resolution	P/rev	540672		
Motor insulation class		Class F		
Motor withstand voltage		1,500 VAC 1 min		
Motor insulation resistance		10 MΩ or more 500 VDC		
Operating ambient temperature		0 to 45°C (0 to 40°C: *4)		
Operating ambient humidity		20 to 85% RH, no condensation		
Storage ambient temperature		−20 to 80°C		
Storage ambient humidity		20 to 90% RH, no condensation		
Atmosphere		No corrosive gas, explosive gas, or dust		
Weight	kg	4.7 (6.0) *2	5.8 (7.1) *2	7.5 (8.8) *2
Output shaft runout (*3)	mm	0.03		
Output shaft surface runout (*3)	mm	0.03		
Degree of protection		IP20		

*1: Use at a speed of 80 rpm or less during continuous rotation operation.
*2: The values in ( ) are the actuator weight with the mounting base option.
*3: Refer to the "Glossary" on page 64 for index accuracy, repeatability, output shaft runout and output shaft surface runout.
*4: When using as a UL certified product, the maximum temperature is 40°C.

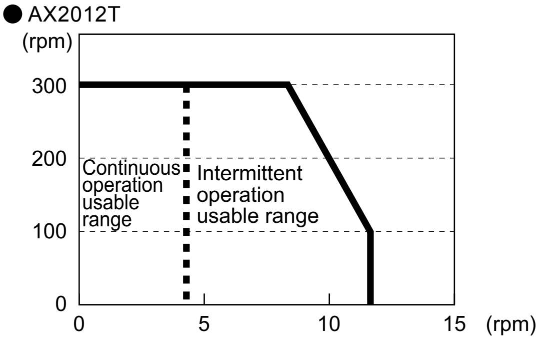
Speed/maximum torque characteristics

● AX2006T



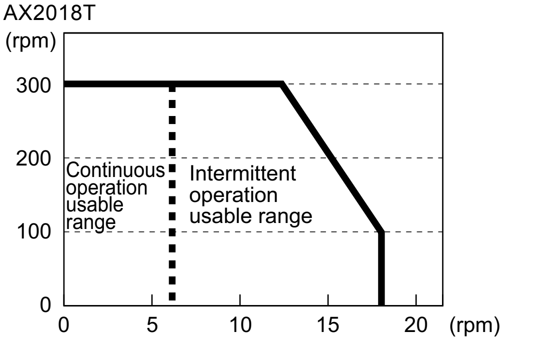
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX2012T



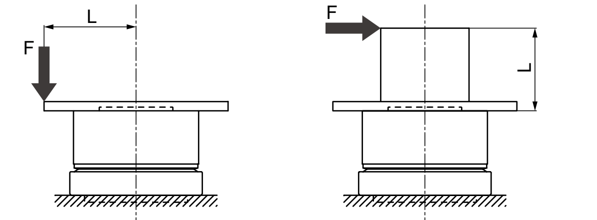
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX2018T



* Fig. This graph shows the characteristics for 3-phase 200 VAC.

(Note) Moment load (simple formula)



(Fig. a)
M (N·m) = F (N) × L (m)
M:Moment load
F: Load
L: Distance from output shaft center

(Fig. b)
M (N·m) = F (N) × (L + 0.02) (m)
M:Moment load
F: Load
L: Distance from output shaft flange

Always read the safety precautions on pages 73 to 78 before use.

How to order

● Set model No. (actuator, driver, cable)

Body model No. / Option model No.

AX2 (018) (TS) - (BS) - (DM04) - (J1) - P3 - S - (U0)

Model No.
Ⓐ Size (max. torque)
Ⓑ Driver type
Ⓒ Mounting base *3
Ⓓ Cable length *2
Ⓔ Driver power voltage *1
Ⓕ Interface specifications

Code	Content
Ⓐ Size (max. torque)	
006	6 N·m
012	12 N·m
018	18 N·m
Ⓑ Driver type	
TS	TS driver
Ⓒ Mounting base	
Blank	Standard (without mounting base)
BS	With mounting base
Ⓓ Cable length	
DM00	Without cable
DM02	2 m
DM04	4 m (standard length)
DM06	6 m
DM08	8 m
DM10	10 m
DM15	15 m
DM20	20 m
Ⓔ Driver power voltage	
Refer to the driver power voltage compatibility table at left.	
Ⓕ Interface specifications	
U0	Parallel I/O (NPN specifications)
U1	Parallel I/O (PNP specifications)
U2	CC-Link
U3	PROFIBUS-DP
U4	DeviceNet
U5	EtherCAT
U6	EtherNet/IP

⚠ Precautions for model No. selection

*1: Select the driver according to the compatibility table below.

Driver power voltage compatibility table

Model \ Drivers type	TS driver: Three-phase/ single-phase 200 to 230 VAC	TS driver: Single phase 100 to 115 VAC
AX2006T	Blank	J1
AX2012T	Blank	J1
AX2018T	Blank	J1

*2: Cable is a movable cable.
Refer to page 60 for dimensions of the cable. Body lead-out cable is not a movable cable.
*3: Ⓒ When the "BS" option with the mounting base is selected, the positioning pin hole on the bottom is not available. The surface is treated with electroless nickel plating.
*4: Positioning pin holes may not be surface treated.
*5: The surface is treated with electroless nickel plating.

● Actuator body discrete model No.

AX2 ( ) T - (BS) - P3 - S

Ⓐ Size
Ⓒ Mounting base

● Driver discrete model No.

- 200 to 230 VAC

AX9000TS - (U0)

- 100 to 115 VAC

AX9000TS-J1- (U0)

Ⓕ Interface specifications

● Cable discrete model No.

- Motor cable

AX-CBLM6- (DM04)

- Resolver cable

AX-CBLR6- (DM04)

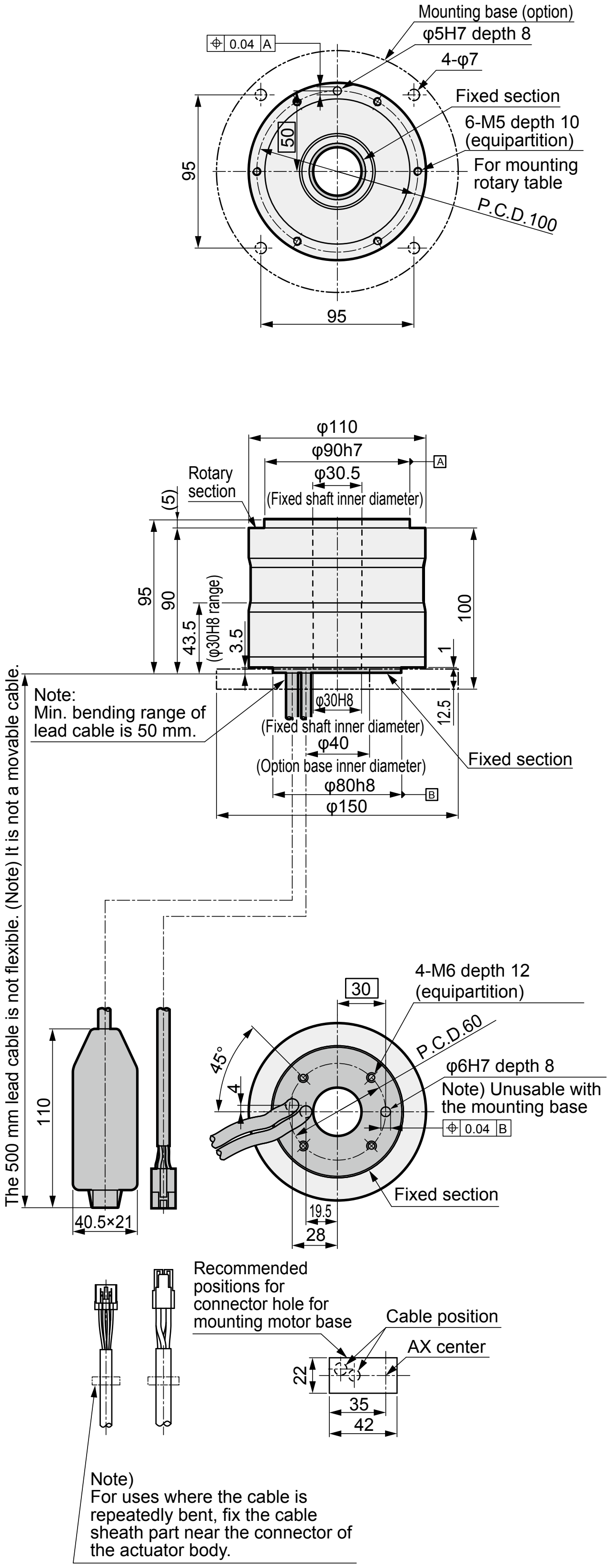
Ⓓ Cable length
(Note: "DM04" when cable length is 4 m)

* Custom order products are CE, UL/cUL, and RoHS non-compliant. Contact CKD as needed.

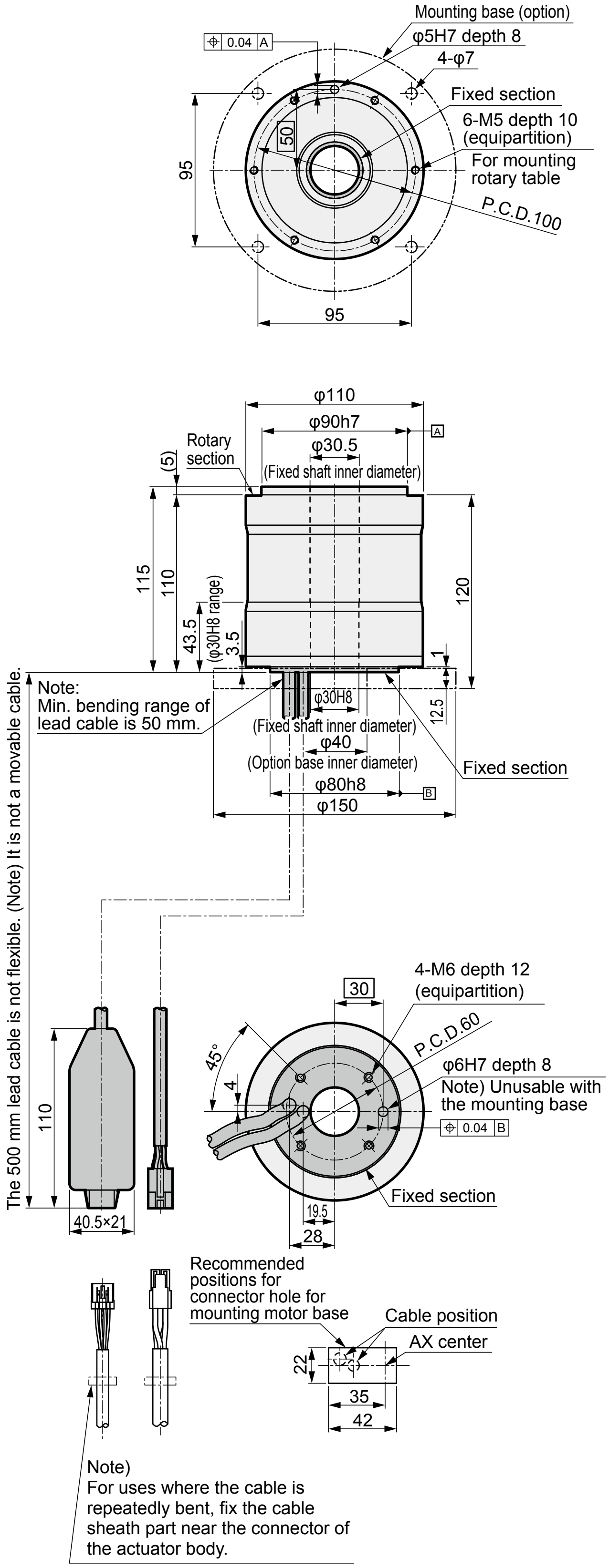
Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

Dimensions

● AX2006T



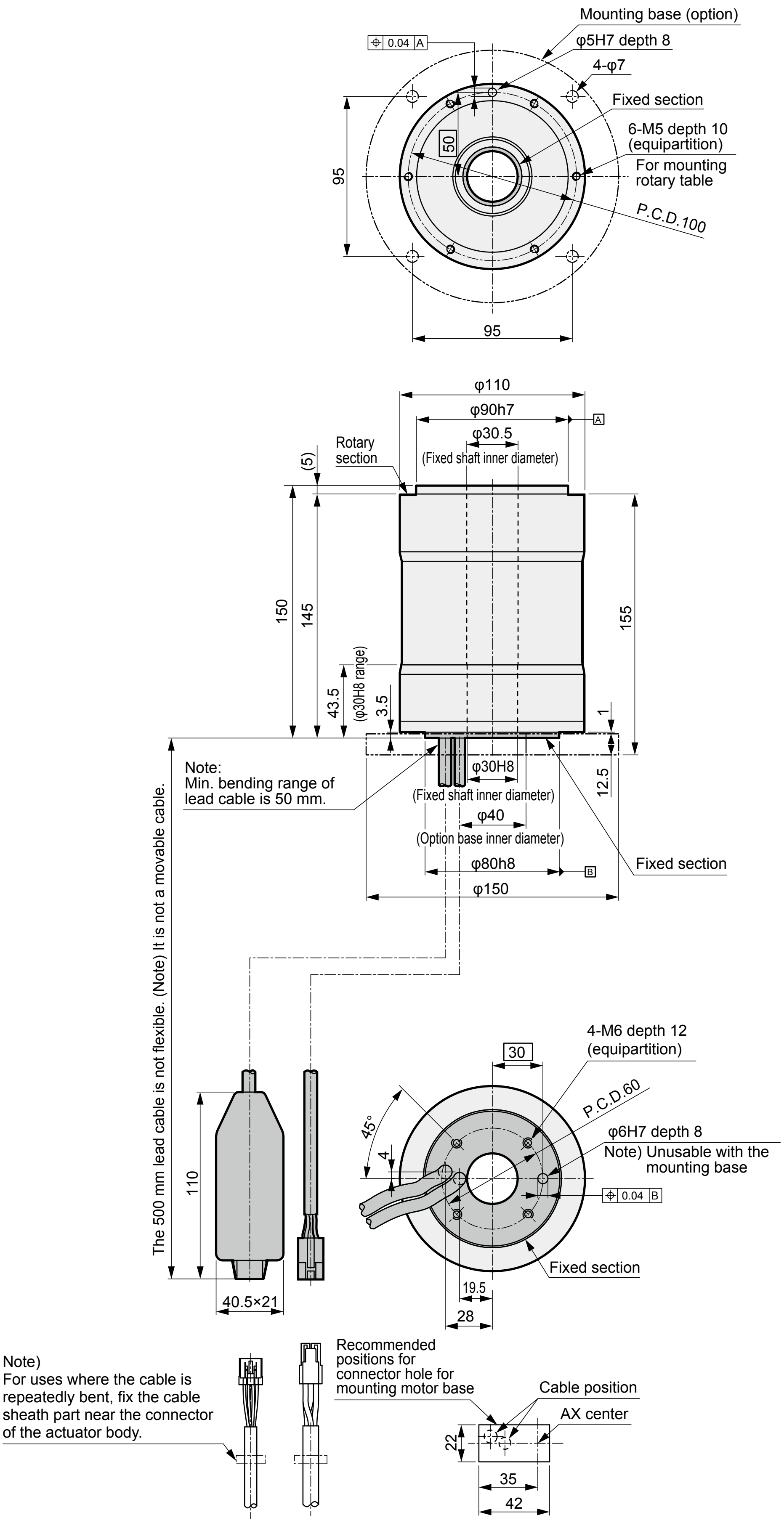
● AX2012T



*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

Dimensions

● AX2018T



*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

ABSODEX

AX4000T Series

Supports large moments of inertia load
Compatible function allows free combination of driver, actuator, and cable
Large hollow diameter is convenient for cable wiring and piping, abundant options available

- Max. torque: 9/22/45/75 N·m
- Supported driver: TS driver

Actuator specifications

Descriptions		AX4009T	AX4022T	AX4045T	AX4075T
Max. output torque	N·m	9	22	45	75
Continuous output torque	N·m	3	7	15	25
Max. rotation speed	rpm	240 (*1)			140 (*1)
Allowable axial load	N	800	3700		20000
Allowable moment load	N·m	40	60	80	200
Output shaft moment of inertia	kg·m²	0.009	0.0206	0.0268	0.1490
Allowable moment of load inertia	kg·m²	0.35 (1.75) (*2)	0.60 (3.00) (*2)	0.90 (5.00) (*2)	5.00 (25.00) (*2)
Index accuracy (*5)	sec	±30			
Repeatability (*5)	sec	±5			
Output shaft friction torque	N·m	0.8	3.5		10.0
Resolution	P/rev	540672			
Motor insulation class		Class F			
Motor withstand voltage		1,500 VAC 1 min			
Motor insulation resistance		10 MΩ or more 500 VDC			
Operating ambient temperature		0 to 45°C (0 to 40°C: *5)			
Operating ambient humidity		20 to 85% RH, no condensation			
Storage ambient temperature		−20 to 80°C			
Storage ambient humidity		20 to 90% RH, no condensation			
Atmosphere		No corrosive gas, explosive gas, or dust			
Weight	kg	5.5	12.3 (14.6) *3	15.0 (17.3) *3	36.0 (41.0) *3
Total weight when brake is set	kg	−	16.4 (18.7) *3	19.3 (21.6) *3	54.0 (59.0) *3
Output shaft runout (*5)	mm	0.03			
Output shaft surface runout (*5)	mm	0.05			
Degree of protection		IP20			

*1: Use at a speed of 80 rpm or less during continuous rotation operation.
*2: When using in load conditions up to those given in ( ), set parameter 72 (integral gain magnification) = 0.3 (reference value).
*3: The values in ( ) are the actuator weight with the mounting base option.
*4: Contact CKD whenever using continuous rotation operation in combination with parameter 72 (integral gain magnification).
*5: Refer to the "Glossary" on page 64 for index accuracy, repeatability, output shaft runout and output shaft surface runout.
*6: When using as a UL certified product, the maximum temperature is 40°C.

Electromagnetic brake specifications (option)

Descriptions \ Compatibility		AX4022T/AX4045T	AX4075T
Type		Non-backlash dry type non-excitation type	
Rated voltage	V	24 VDC	
Power capacity	W	30	55
Rated current	A	1.25	2.30
Static friction torque	N·m	35	200
Armature release time (brake on)	msec	50 (reference value)	50 (reference value)
Armature suction time (brake off)	msec	150 (reference value)	250 (reference value)
Retention accuracy	Minutes	45 (reference value)	
Max. operating frequency	times/min	60	40

*1: During output shaft rotation, the electromagnetic brake disc and fixed part may cause a scraping sound.
*2: For travel after brake off, you must change the parameter delay time by the above-mentioned armature suction time.
*3: Though it is a non-backlash type, holding a constant position is difficult if load is applied in the rotation direction.
*4: The armature makes contact with the electromagnetic brake fixed part while the electromagnetic brake is operating, causing the sound.
*5: Manual release of the electromagnetic brake is possible by evenly tightening the bolts in the manual release tap (3 locations). Lightly tighten the bolt, and then turn it about 90° from the stopped position. Once the manual release work is over, be sure to promptly remove the 3 bolts and confirm that the brakes are working to securely hold the output shaft.

Always read the safety precautions on pages 73 to 78 before use.

How to order

● Set model No. (actuator, driver, cable)

Body model No. / Option model No.

AX4 (022)(TS) - (BS) - (DM04) - (EB) - (J1) - P3 - S - (U0)

- AX4: Model No.
- 022: Ⓐ Size (max. torque)
- TS: Ⓑ Driver type
- BS: Ⓒ Mounting base *4, *6
- DM04: Ⓓ Cable length *3
- EB: Ⓔ Brake *7
- J1: Ⓕ Driver power voltage *1
- U0: Ⓖ Interface specifications

Code	Content
Ⓐ Size (max. torque)	
009	9 N·m
022	22 N·m
045	45 N·m
075	75 N·m
Ⓑ Driver type	
TS	TS driver
Ⓒ Mounting base	
Blank	Standard (without mounting base)
BS	With mounting base
Ⓓ Cable length	
DM00	Without cable
DM02	2 m
DM04	4 m (standard length)
DM06	6 m
DM08	8 m
DM10	10 m
DM15	15 m
DM20	20 m
Ⓔ Brake	
Blank	Standard (without electromagnetic brake)
EB	Negative-actuated electromagnetic brake
Ⓕ Driver power voltage	
Refer to the driver power voltage compatibility table at left.	
Ⓖ Interface specifications	
U0	Parallel I/O (NPN specifications)
U1	Parallel I/O (PNP specifications)
U2	CC-Link
U3	PROFIBUS-DP
U4	DeviceNet
U5	EtherCAT
U6	EtherNet/IP

⚠ Precautions for model No. selection

*1: Select the driver according to the compatibility table below.

Driver power voltage compatibility table

Model \ Drivers type	TS driver: Three-phase/single-phase 200 to 230 VAC	TS driver: Single phase 100 to 115 VAC
AX4009T	Blank	J1
AX4022T	Blank	J1
AX4045T	Blank	J1
AX4075T	Blank *2	

*2: For models with maximum torque 75 N·m, the calculation of torque limit region is different from the usual when used at single-phase 200 VAC. Contact CKD to determine usability.

*3: Cable is a movable cable.
Refer to page 60 for dimensions of the cable. Body lead-out cable is not a movable cable.

*4: Ⓒ When the "BS" option with the mounting base is selected, the positioning pin hole on the bottom is not available. The surface is treated with electroless nickel plating.

*5: Positioning pin holes may not be surface treated.

*6: For options, select according to the "Option compatibility table" below.
Option compatibility table

	AX4009T	AX4022T	AX4045T	AX4075T
Mounting base (-BS)	×	○	○	○
Brake (-EB)	×	○	○	○

*7: The surface of the body is treated with electroless nickel plating.

● Actuator body discrete model No.

AX4 ( ) T - (BS) - ( ) - P3 - S

- Ⓐ Size
- Ⓒ Mounting base
- Ⓔ Brake

● Driver discrete model No.

- 200 to 230 VAC
  AX9000TS - (U0)
- 100 to 115 VAC
  AX9000TS-J1- (U0)

Ⓖ Interface specifications

● Cable discrete model No.

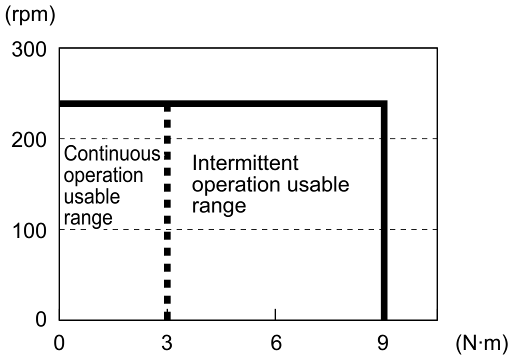
- Motor cable
  AX-CBLM6- (DM04)
- Resolver cable
  AX-CBLR6- (DM04)

Ⓓ Cable length
(Note: "DM04" when cable length is 4 m)

* Custom order products are CE, UL/cUL, and RoHS non-compliant. Contact CKD as needed.

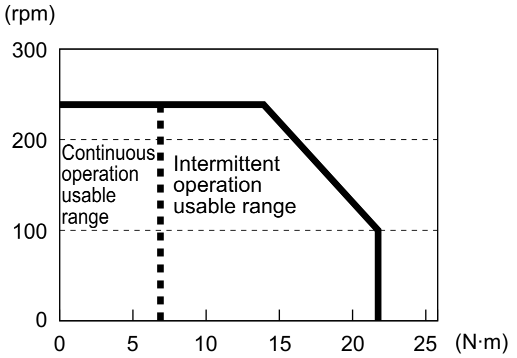
Speed/maximum torque characteristics

● AX4009T



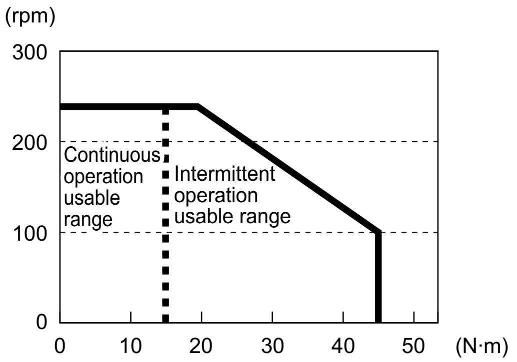
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX4022T



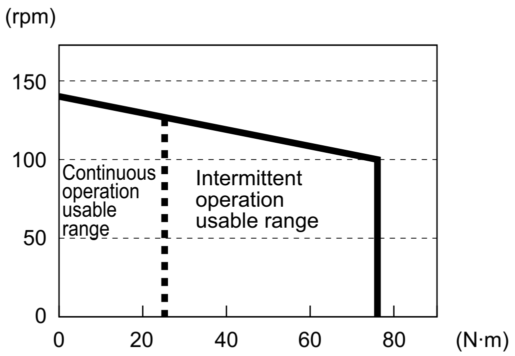
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX4045T



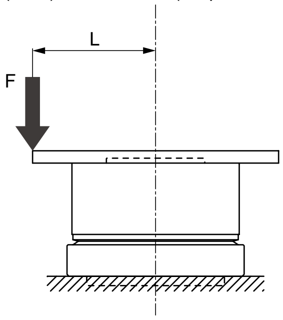
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX4075T



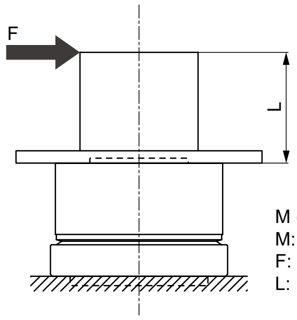
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

(Note) Moment load (simple formula)



M (N·m) = F (N) × L (m)
M:Moment load
F: Load
L: Distance from output shaft center

(Fig. a)



M (N·m) = F (N) × (L + 0.02) (m)
M:Moment load
F: Load
L: Distance from output shaft flange

(Fig. b)

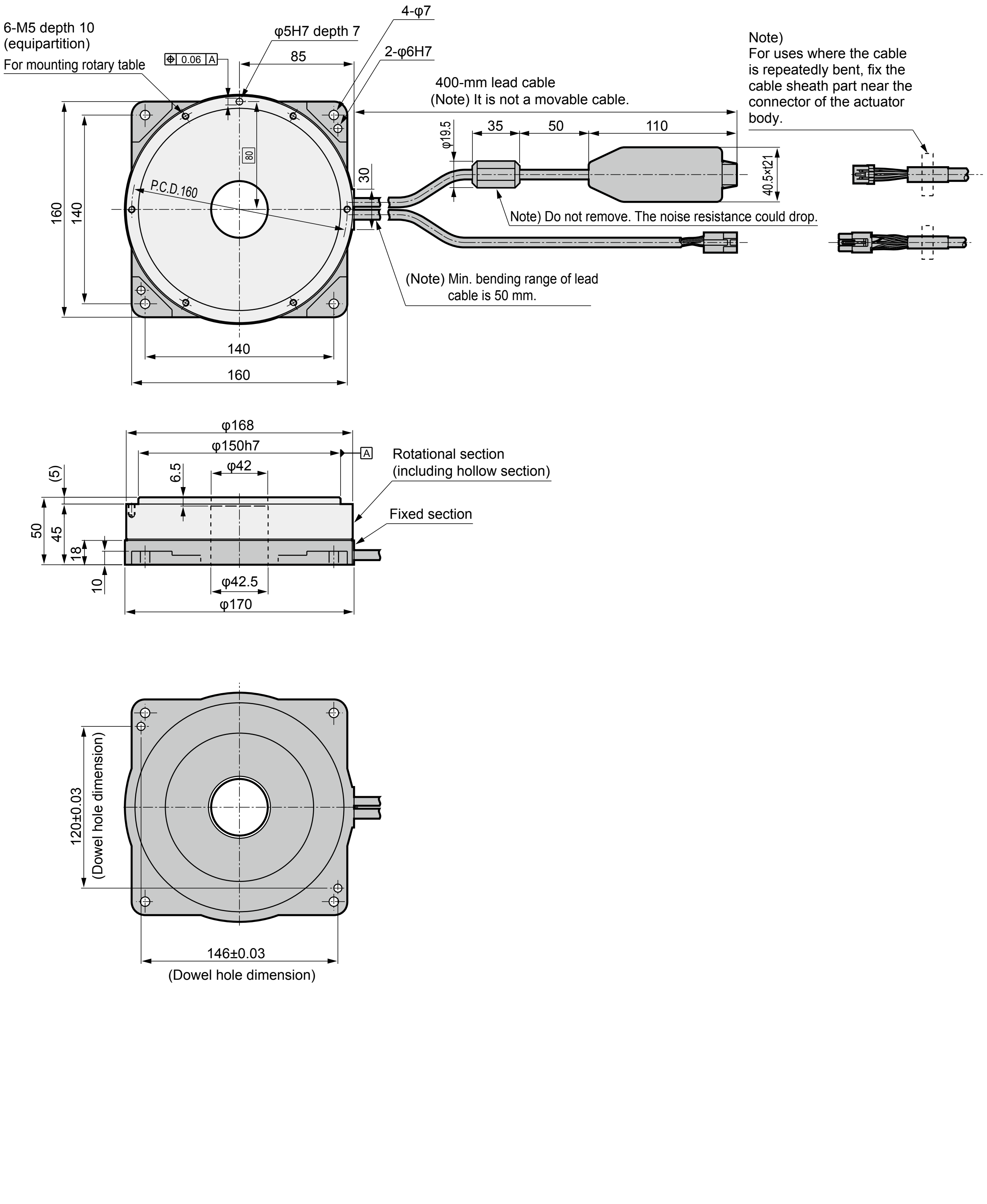
⚠ Always read the safety precautions on pages 73 to 78 before use.

MEMO

Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

Dimensions

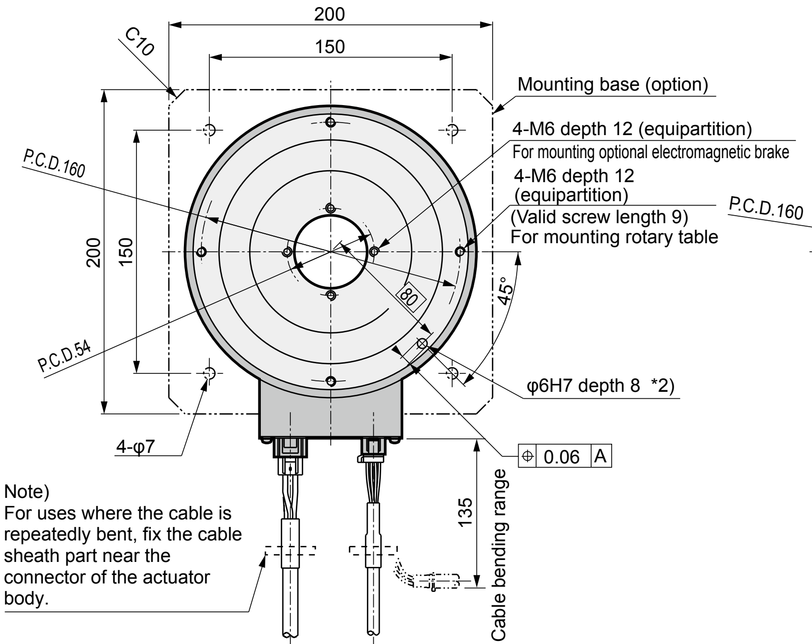
● AX4009T

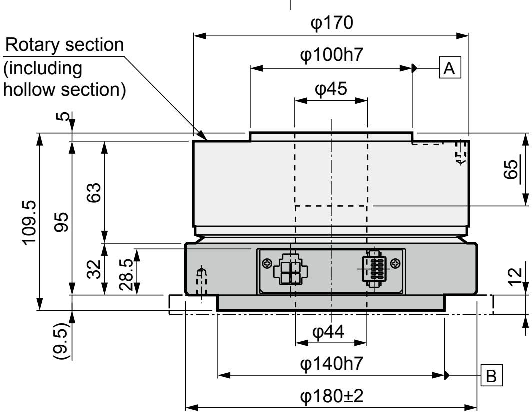


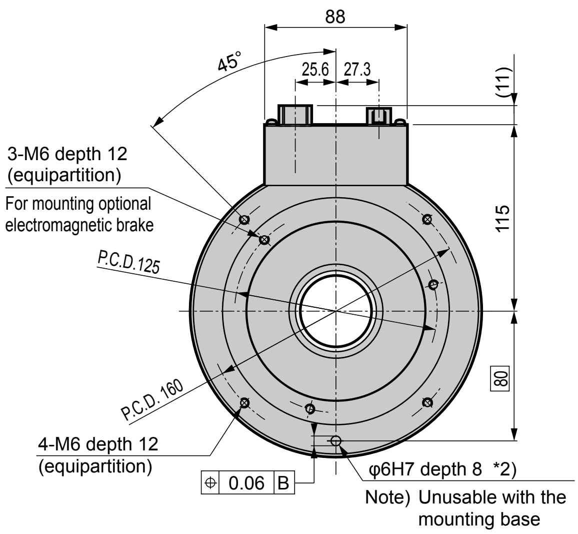
*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

Dimensions

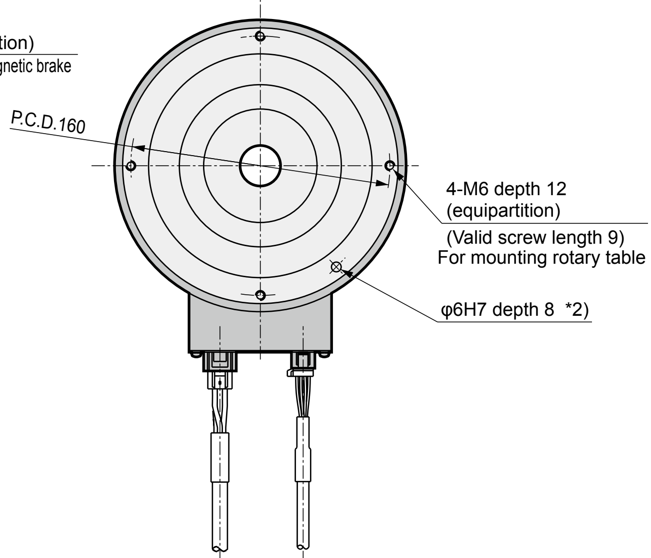
● AX4022T

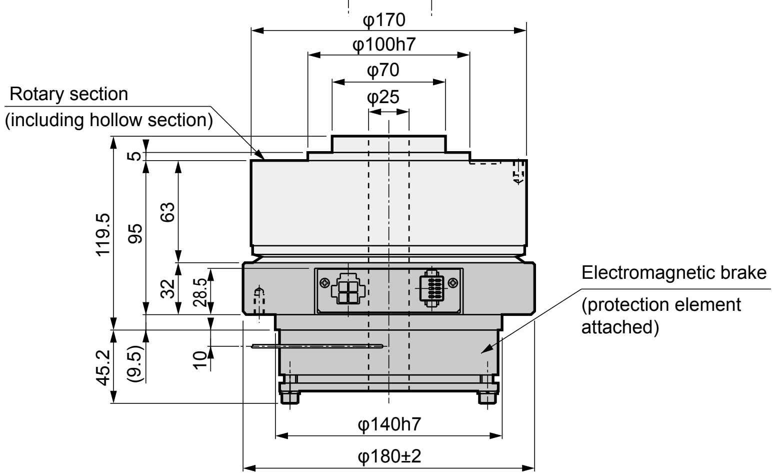


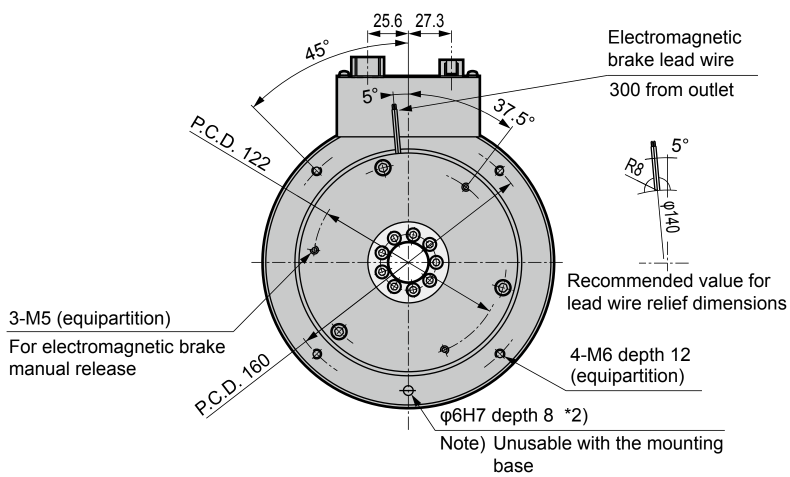




● AX4022T-EB
Electromagnetic brake
For other options, refer to the left figure on the left.





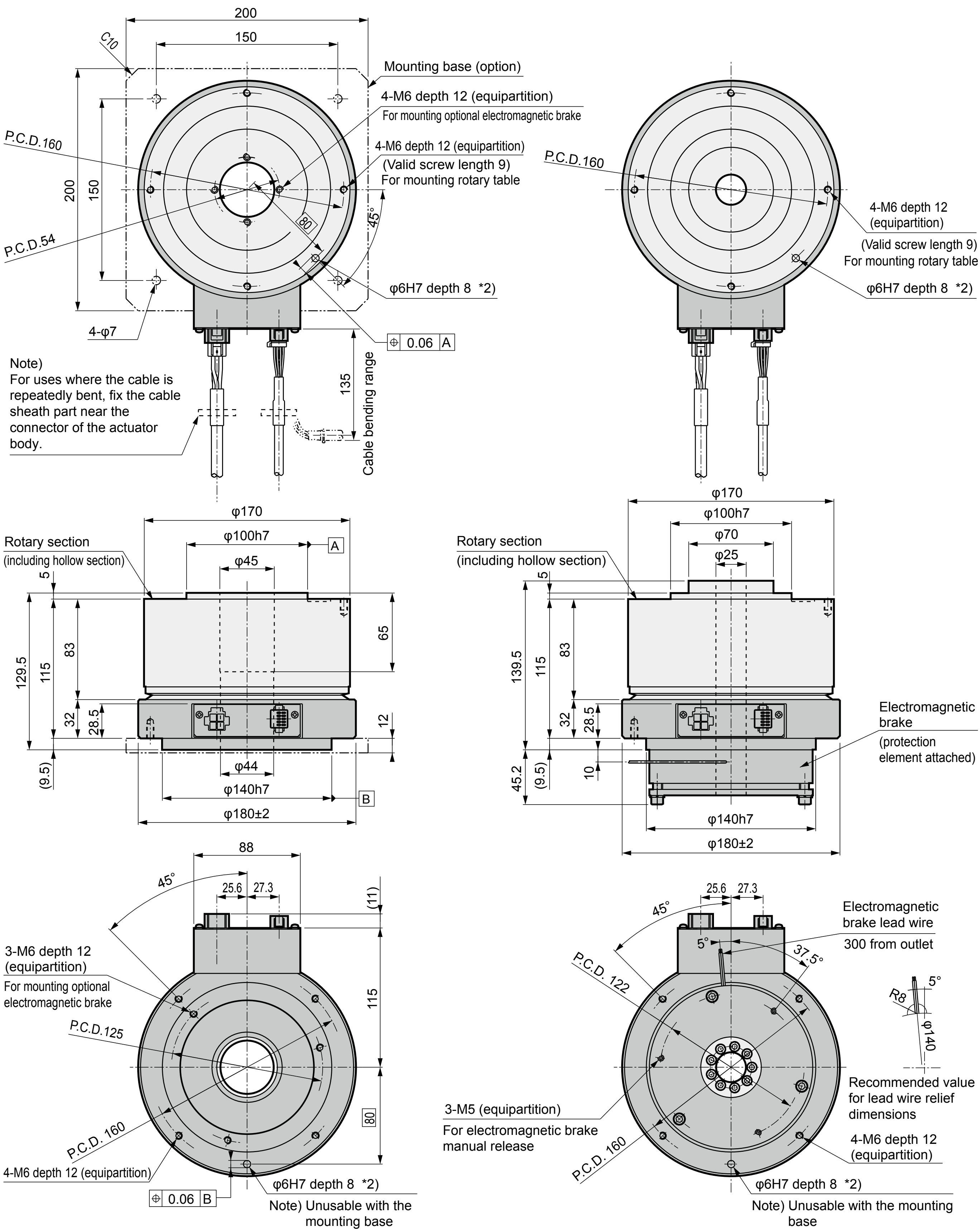


*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.
*2) The position of the positioning pin hole is the same as that of AX4022T.

Dimensions

● AX4045T

● AX4045T-EB
Electromagnetic brake
For other options, refer to the left figure on the left.

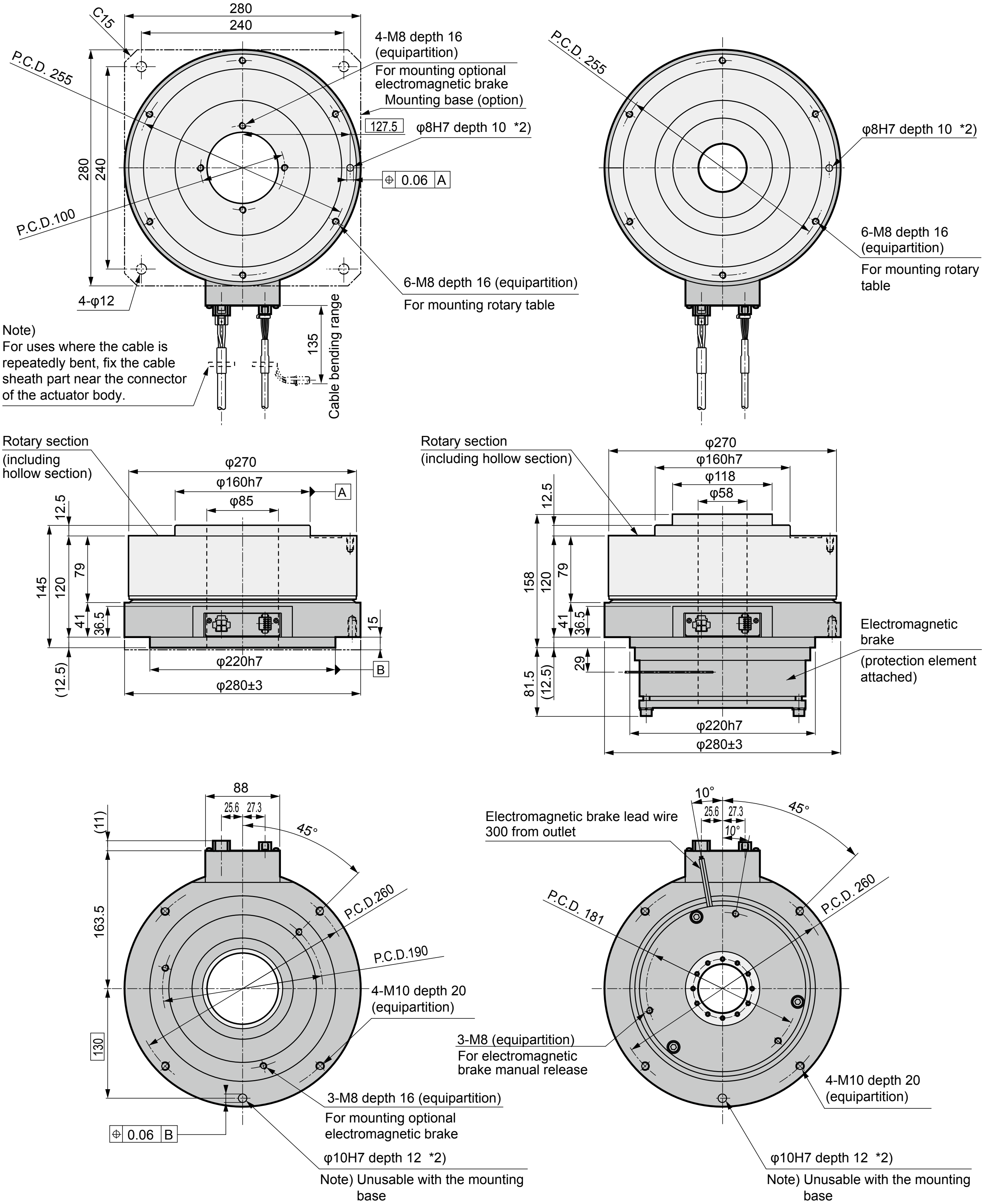


*1) The origin position of the actuator may differ from that shown in the dimensions. The origin offset function allows you to set a desired origin position.
*2) The position of the positioning pin hole is the same as that of AX4045T.

Dimensions

● AX4075T

● AX4075T-EB
Electromagnetic brake
For other options, refer to the left figure on the left.



*1) The origin position of the actuator may differ from that shown in the dimensions. The origin offset function allows you to set a desired origin position.
*2) The position of the positioning pin hole is the same as that of AX4075T.

ABSODEX

AX4000T Series

Supports large moments of inertia load
Compatible function allows free combination of driver, actuator, and cable
Large hollow diameter is convenient for cable wiring and piping, abundant options available

- Max. torque: 150/300/500/1000 N·m
- Supported driver: TH driver

Actuator specifications

Descriptions		AX4150T	AX4300T	AX4500T	AX410WT
Max. output torque	N·m	150	300	500	1000
Continuous output torque	N·m	50	100	160	330
Max. rotation speed	rpm	100 (*1)		70	30
Allowable axial load	N	20000			
Allowable moment load	N·m	300	400	500	400
Output shaft moment of inertia	kg·m²	0.2120	0.3260	0.7210	2.7200
Allowable moment of load inertia	kg·m²	75.00 (*2)	180.00 (*2)	300.00 (*2)	600.00 (*2)
Index accuracy (*4)	sec	±30			
Repeatability (*4)	sec	±5			
Output shaft friction torque	N·m	10.0		15.0	20.0
Resolution	P/rev	540672			
Motor insulation class		Class F			
Motor withstand voltage		1,500 VAC 1 min			
Motor insulation resistance		10 MΩ or more 500 VDC			
Operating ambient temperature		0 to 45°C (0 to 40°C: *4)			
Operating ambient humidity		20 to 85% RH, no condensation			
Storage ambient temperature		−20 to 80°C			
Storage ambient humidity		20 to 90% RH, no condensation			
Atmosphere		No corrosive gas, explosive gas, or dust			
Weight	kg	44.0 (49.0) *3	66.0 (74.0) *3	115.0 (123.0) *3	198.0 (217.0) *3
Total weight when brake is set	kg	63.0 (68.0) *3	86.0 (94.0) *3	-	-
Output shaft runout (*4)	mm	0.03			
Output shaft surface runout (*4)	mm	0.05			0.08
Degree of protection		IP20			

*1: Use at a speed of 80 rpm or less during continuous rotation operation.
*2: Settings when shipped support large moment of inertia.
*3: The values in ( ) are the actuator weight with the mounting base option.
*4: Refer to the "Glossary" on page 64 for index accuracy, repeatability, output shaft runout and output shaft surface runout.
*5: When using as a UL certified product, the maximum temperature is 40°C.

Electromagnetic brake specifications (option)

Descriptions \ Compatibility		AX4150T/AX4300T
Type		Non-backlash dry type non-excitation type
Rated voltage	V	24 VDC
Power capacity	W	55
Rated current	A	2.30
Static friction torque	N·m	200
Armature release time (brake on)	msec	50 (reference value)
Armature suction time (brake off)	msec	250 (reference value)
Retention accuracy	Minutes	45 (reference value)
Max. operating frequency	times/min	40

*1: During output shaft rotation, the electromagnetic brake disc and fixed part may cause a scraping sound.
*2: For travel after brake off, you must change the parameter delay time by the above-mentioned armature suction time.
*3: Though it is a non-backlash type, holding a constant position is difficult if load is applied in the rotation direction.
*4: The armature makes contact with the electromagnetic brake fixed part while the electromagnetic brake is operating, causing the sound.
*5: Manual release of the electromagnetic brake is possible by evenly tightening the bolts in the manual release tap (3 locations). Lightly tighten the bolt, and then turn it about 90° from the stopped position. Once the manual release work is over, be sure to promptly remove the 3 bolts and confirm that the brakes are working to securely hold the output shaft.

⚠ Always read the safety precautions on pages 73 to 78 before use.

How to order

● Set model No. (actuator, driver, cable)

Body model No. / Option model No.

AX4 (300)(TH) - (BS) - (DM04) - (EB) - P3 - S - (U0)

Model No.

Ⓐ Size (max. torque)

Ⓑ Driver type

Ⓒ Mounting base *4

Ⓓ Cable length *3

Ⓔ Brake *5

Ⓕ Interface specifications

Code	Content
Ⓐ Size (max. torque)	
150	150 N·m
300	300 N·m
500	500 N·m
10W	1000 N·m
Ⓑ Driver type	
TH	TH driver
Ⓒ Mounting base	
Blank	Standard (without mounting base)
BS	With mounting base
Ⓓ Cable length	
DM00	Without cable
DM02	2 m
DM04	4 m (standard length)
DM06	6 m
DM08	8 m
DM10	10 m
DM15	15 m
DM20	20 m
Ⓔ Brake	
Blank	Standard (without electromagnetic brake)
EB	Negative-actuated electromagnetic brake
Ⓕ Interface specifications	
U0	Parallel I/O (NPN specifications)
U1	Parallel I/O (PNP specifications)
U2	CC-Link
U3	PROFIBUS-DP
U4	DeviceNet
U5	EtherCAT
U6	EtherNet/IP

⚠ Precautions for model No. selection

*1: Select the driver according to the compatibility table below.

Driver power voltage compatibility table

Model \ Drivers type	TH driver Three-phase/single-phase 200 to 230 VAC
AX4150T	Blank *2
AX4300T	Blank *2
AX4500T	Blank *2
AX410WT	Blank *2

*2: The calculation of torque limit region is different from the usual when used at single-phase 200 VAC. Contact CKD to determine usability.

*3: Cable is a movable cable.
Refer to page 60 for dimensions of the cable.

*4: Ⓒ When the "BS" option with the mounting base is selected, the positioning pin hole on the bottom is not available. The surface is treated with electroless nickel plating.

*5: For options, select according to the "Option compatibility table" below.

Option compatibility table

	AX4150T	AX4300T	AX4500T	AX410WT
Electromagnetic brake (-EB)	○	○	×	×

*6: Positioning pin holes may not be surface treated.

*7: The surface is treated with electroless nickel plating.

● Actuator body discrete model No.

AX4( )T-(BS)-( )-P3-S

Ⓐ Size, Ⓔ Brake, Ⓒ Mounting base

● Driver discrete model No.

• 200 to 230 VAC

AX9000TH-(U0)

Ⓕ Interface specifications

● Cable discrete model No.

• Motor cable

AX-CBLM6-(DM04)

• Resolver cable

AX-CBLR6-(DM04)

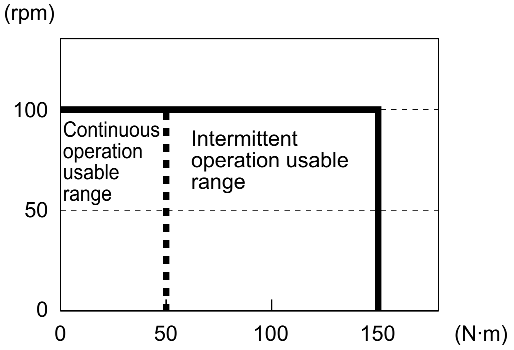
Ⓓ Cable length
(Note: "DM04" when cable length is 4 m)

* Custom order products are CE, UL/cUL, and RoHS non-compliant. Contact CKD as needed.

Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

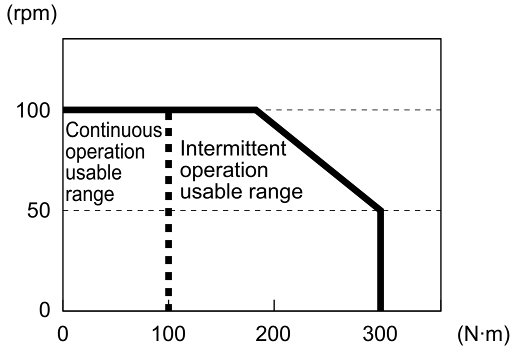
Speed/maximum torque characteristics

● AX4150T



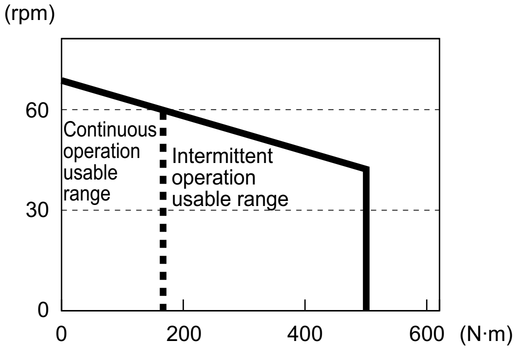
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX4300T



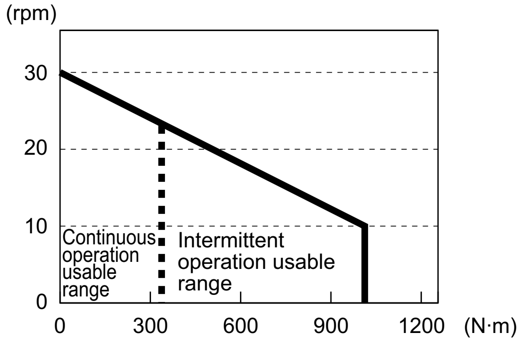
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX4500T



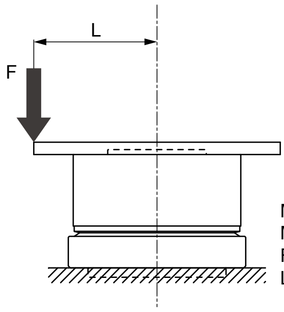
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

● AX410WT



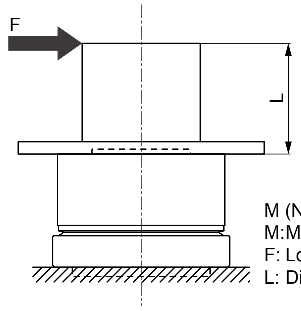
* Fig. This graph shows the characteristics for 3-phase 200 VAC.

(Note) Moment load (simple formula)



M (N·m) = F (N) × L (m)
M:Moment load
F: Load
L: Distance from output shaft center

(Fig. a)



M (N·m) = F (N) × (L + 0.02) (m)
M:Moment load
F: Load
L: Distance from output shaft flange

(Fig. b)

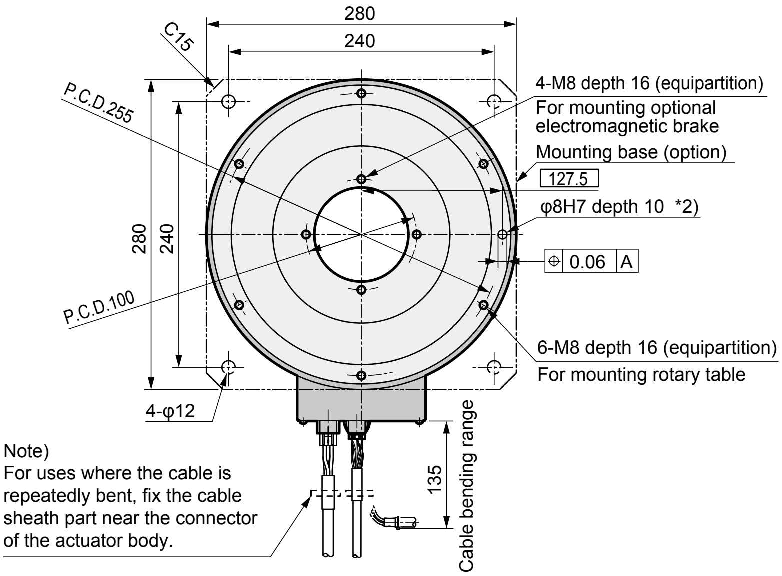
Always read the safety precautions on pages 73 to 78 before use.

MEMO

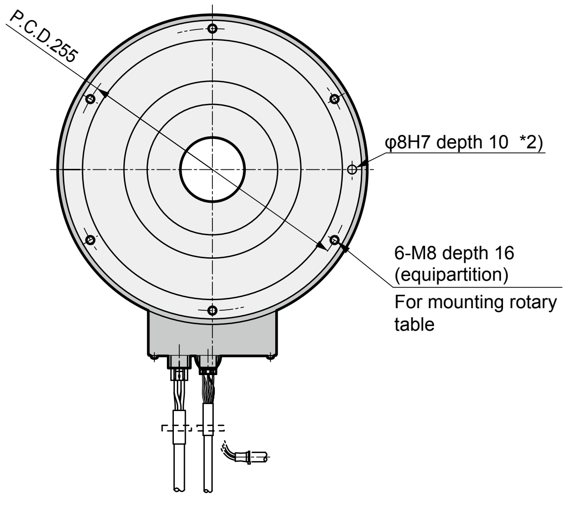
Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

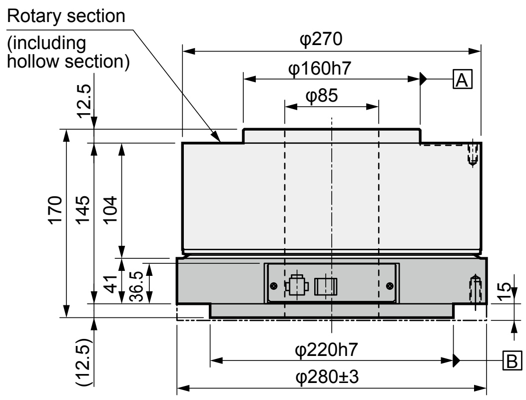
Dimensions

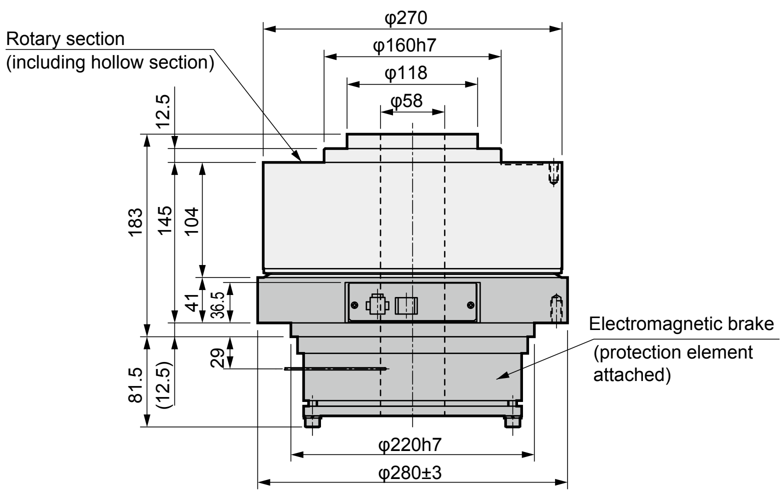
● AX4150T

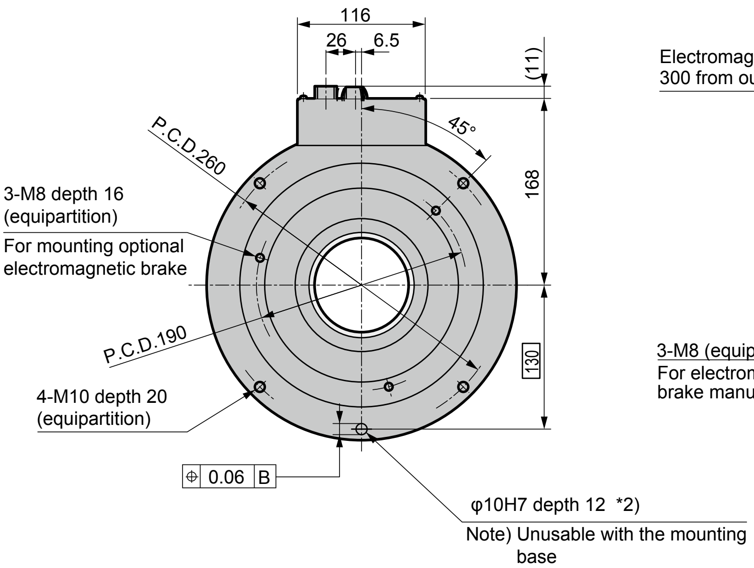


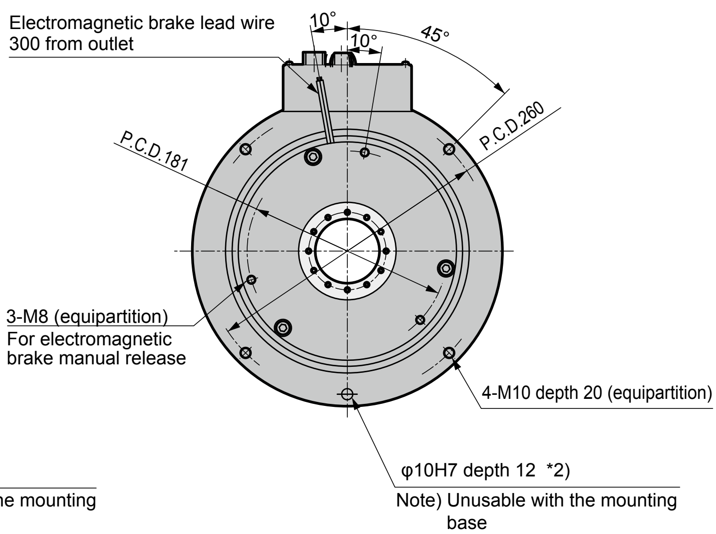
● AX4150T-EB
Electromagnetic brake
For other options, refer to the left figure on the left.







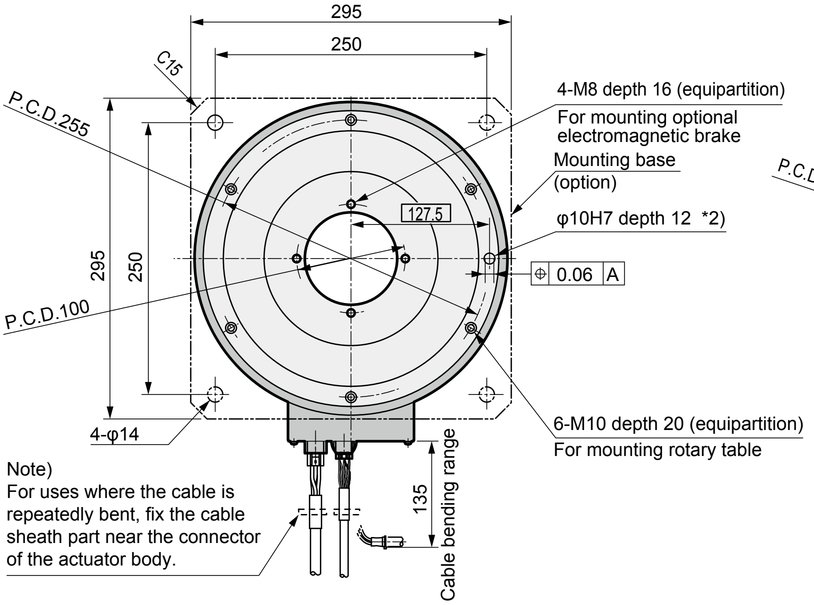




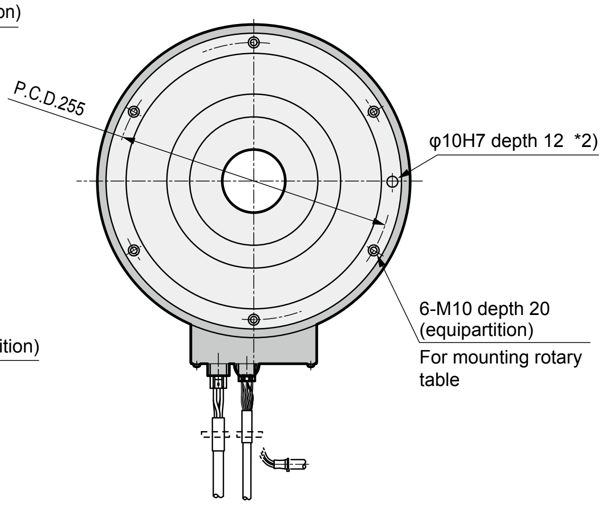
*1) The origin position of the actuator may differ from that shown in the dimensions. The origin offset function allows you to set a desired origin position.
*2) The position of the positioning pin hole is the same as that of AX4150T.

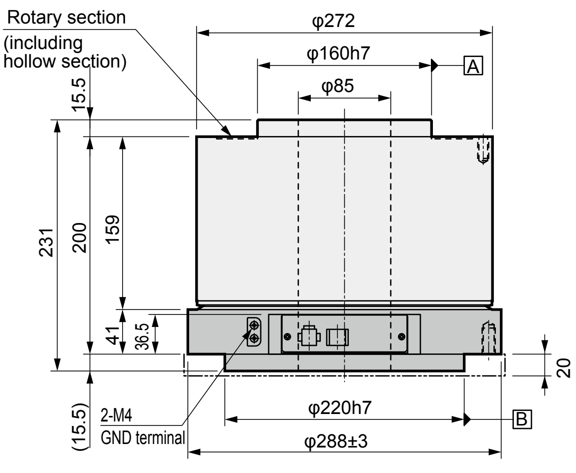
Dimensions

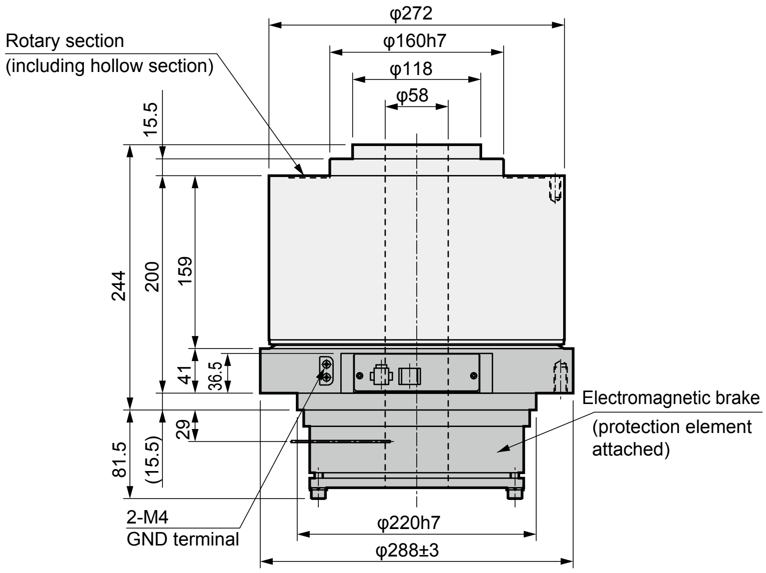
● AX4300T

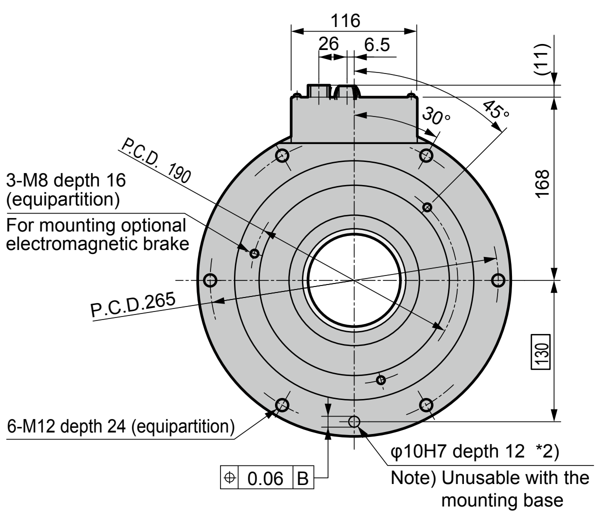


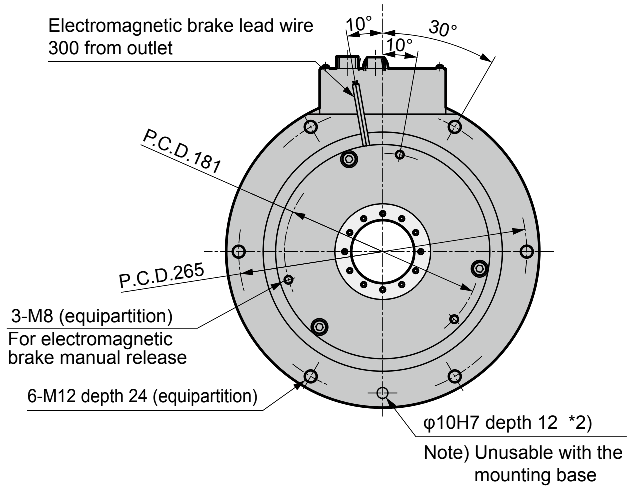
● AX4300T-EB
Electromagnetic brake
For other options, refer to the left figure on the left.







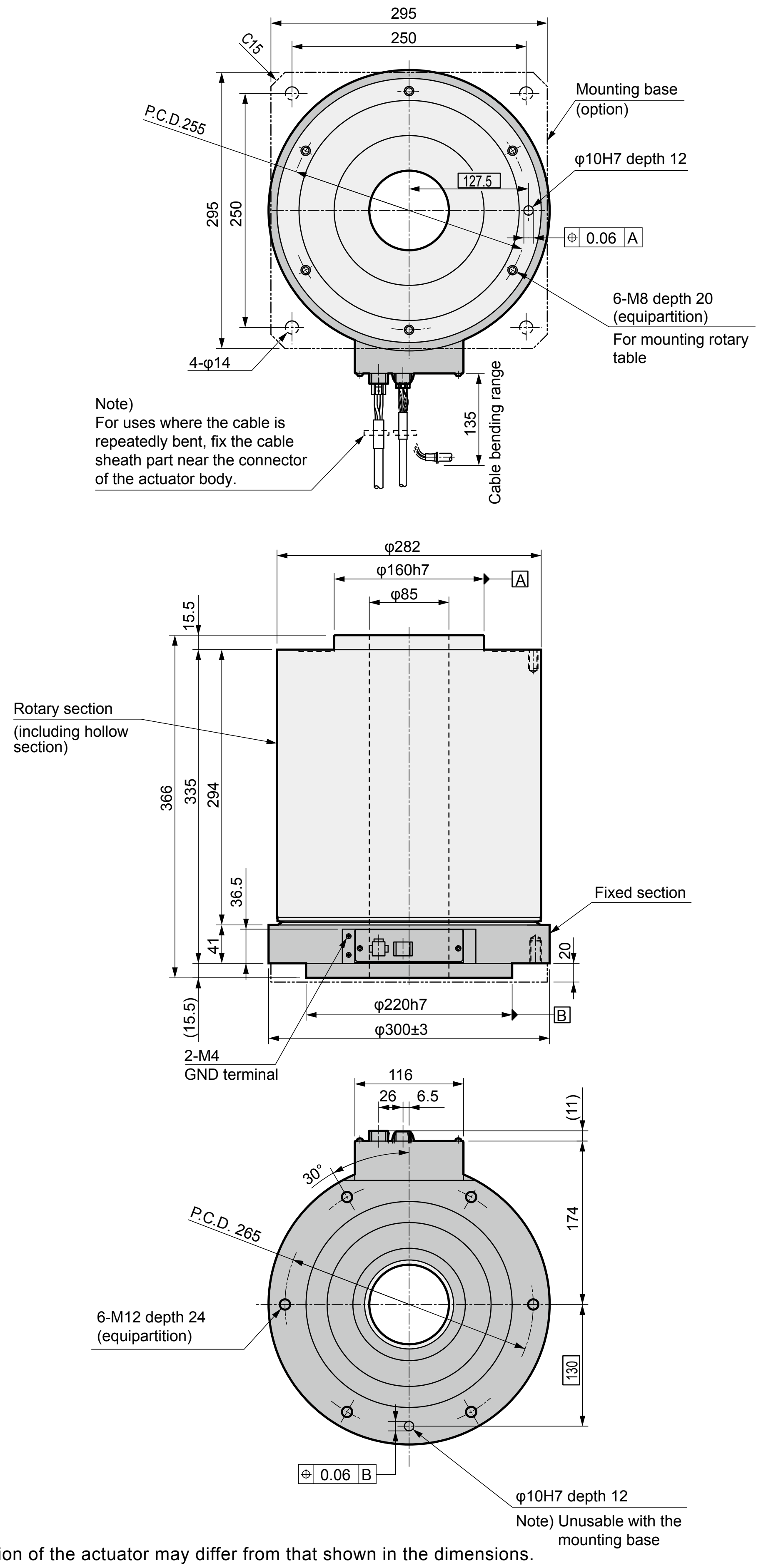




*1) The origin position of the actuator may differ from that shown in the dimensions. The origin offset function allows you to set a desired origin position.
*2) The position of the positioning pin hole is the same as that of AX4300T.

Dimensions

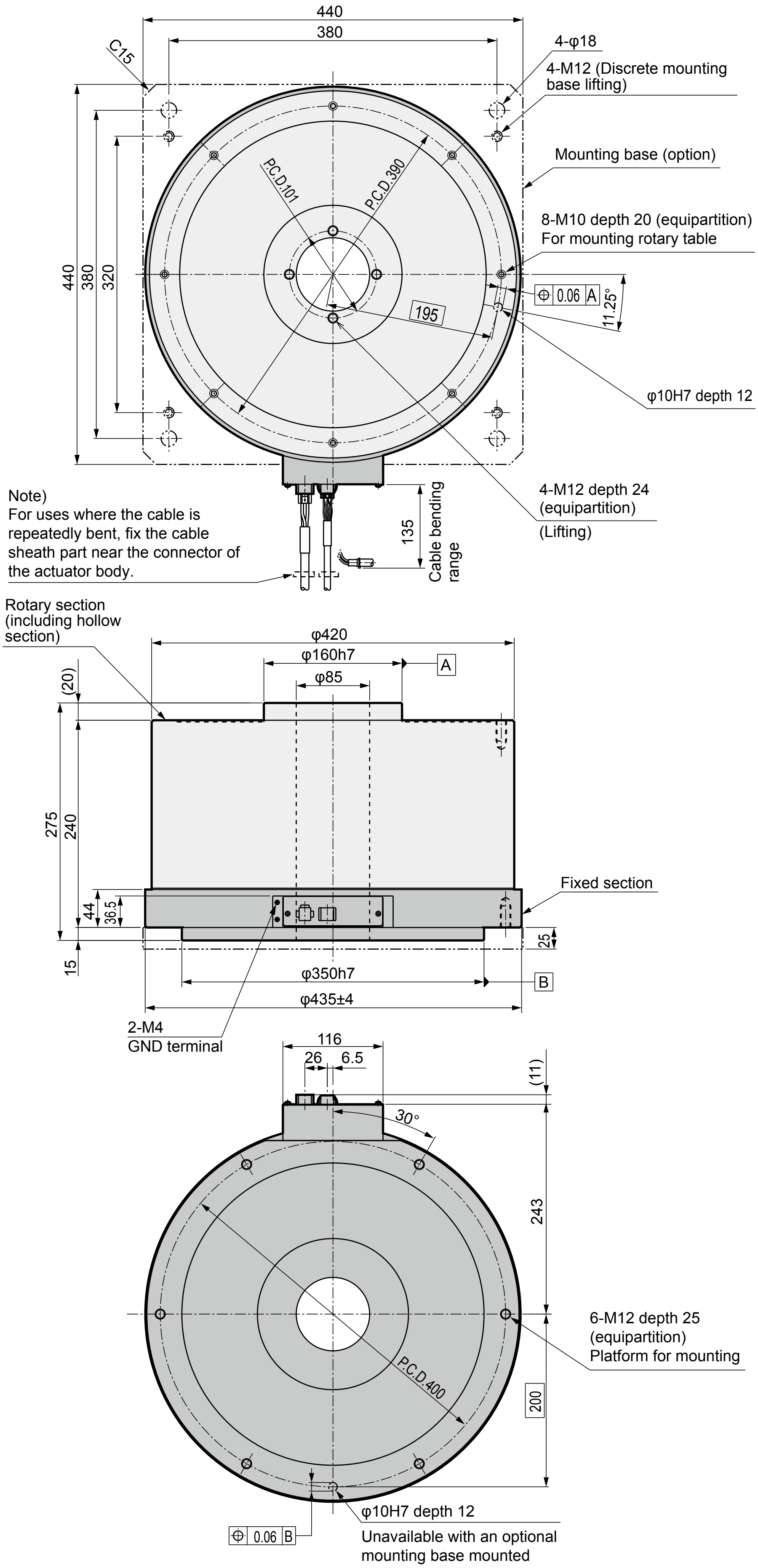
● AX4500T



*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

Dimensions

● AX410WT



*1) The origin position of the actuator may differ from that shown in the dimensions.
The origin offset function allows you to set a desired origin position.

ABSODEX (AX1000T/AX2000T/AX4000T Series)

TS/TH driver

Interface specification: Parallel I/O (NPN), Parallel I/O (PNP)
CC-Link, PROFIBUS-DP, DeviceNet
EtherCAT, EtherNet/IP

c UL us LISTED CE RoHS

Features

- Power supply is divided into main power supply and control power supply
- Wiring method is changed from terminal block to connector
- Smaller/lighter weight (resin body adopted)
- 7-segment LED 2-digit display
- Compatible with encoder output (parallel I/O only)
- Serial communication options available
- Monitoring functions such as position information, alarm status, etc. (U2, U3, U4, U5, and U6 options only)

How to order

• 200 to 230 VAC

AX9000TS - U0

AX9000TH - U0

• 100 to 115 VAC

AX9000TS-J1- U0

Interface specifications
U0: Parallel I/O (NPN)
U1: Parallel I/O (PNP)
U2: CC-Link
U3: PROFIBUS-DP
U4: DeviceNet
U5: EtherCAT
U6: EtherNet/IP

General specifications

Descriptions		Model: TS driver AX9000TS	Model: TH driver AX9000TH
Power supply voltage	Main power supply	Three phase, Single phase 200 VAC ±10% to 230 VAC ±10% (*1) 100 VAC ±10% to 115 VAC ±10% (J1 Option) (*2) (*3)	
	Control power	200 VAC ±10% to 230 VAC ±10% 100 VAC ±10% to 115 VAC ±10% (J1 Option) (*2) (*3)	
Power frequency		50/60 Hz	
Rated input current		200 VAC: 1.8 A 100 VAC: 2.4 A	200 VAC: 5.0 A
Rated output current		1.9 A	5.0 A
Structure		Driver and controller integrated (open type)	
Operating ambient temperature		0 to 50°C	
Operating ambient humidity		20 to 90% RH (no condensation)	
Storage ambient temperature		−20 to 65°C	
Storage ambient humidity		20 to 90% RH (no condensation)	
Atmosphere		No corrosive gas or dust	
Anti-noise		1,000 V (P-P), pulse width 1 μsec, rising 1 nsec impulse noise test, induction noise (capacitive coupling)	
Vibration resistance		4.9 m/s^2	
Weight		Approx. 1.6 kg	Approx. 2.1 kg
Degree of protection		IP2X (excluding CN4 and CN5)	

*1) For models with maximum torque 75 N·m or more, the calculation of torque limit region is different from the usual when used at single-phase 200 VAC. Contact CKD to determine usability.
*2) If 200 to 230 VAC is connected by mistake, when using power voltage 100 to 115 VAC specifications (-J1 option), the driver internal circuit will be damaged.
*3) For models with maximum torque 75 N·m or more, "-J1" cannot be selected.
*4) If the main power is cut off while the actuator is rotating, the rotation may continue due to inertia.
*5) After the main power supply is cut OFF, the motor may rotate by the residual voltage of the driver.

Performance specifications

Descriptions	Content
No. of control axes	1 axis, 540,672 pulses/1 rotation
Angle setting unit	° (degree), pulse, indexing No.
Angle min. setting unit	0.001°, 1 pulse
Speed setting unit	sec, rpm
Speed setting range	0.01 to 100 sec/0.11 to 300 rpm (*1)
Equal divisions	1 to 255
Max. command value	7-digit numeric input ±9,999,999
Timer	0.01 sec to 99.99 sec
Programming language	NC
Programming method	Set the data through RS-232C port with an interactive terminal, PC, etc.
Operation mode	Auto, MDI, jog, single block, servo OFF, pulse train input mode
Coordinates	Absolute, incremental
Acceleration curve	[5 types] Modified sine (MS), modified constant velocity (MC/MC2), modified trapezoid (MT), trapecloid (TR)
Status display	LED display CHARGE: Main power supply POWER: Control power
Operation display	Display with 7-segment LED (2 digits)
Communication interface	RS-232C compliant
I/O signal	Refer to interface specification pages.
Program capacity	Approx. 6,000 characters (256)
Electronic thermal	Overheating protection for actuator

*1) Maximum rotation speed differs depending on the actuator connected.

Breaker capacity

TS driver

Actuator model No.	Driver model No.	Rush current (A): Single phase 100 V	Rush current (A): Single-phase/three-phase 200 V	Breaker capacity: Rated current (A)
AX2006T	AX9000TS	16 (*1)	56 (*1)	10
AX1022T, AX2012T, AX2018T				
AX4009T, AX4022T				
AX1045T, AX4045T				
AX1075T, AX4075T		—		

*1) The value of the rush current is a representative value at 115 VAC and 230 VAC.

TH driver

Actuator model No.	Driver model No.	Rush current (A): Three-phase 200 V	Breaker capacity: Rated current (A)
AX1150T, AX4150T	AX9000TH	56 (*1)	20
AX1210T, AX4300T			
AX4500T			
AX410WT			

*1) The value of the rush current is a representative value at 230 VAC.

Parallel I/O (NPN)

CN3 Input signal

Pin No.	Signal name	Logic	Determination
1 to 2	External power supply input +24 V ±10%		
3 to 4	External power supply input GND		
5	Program No. selection input (Bit 0)	Positive	Level
6	Program No. selection input (Bit 1)	Positive	Level
7	Program No. selection input (Bit 2)	Positive	Level
8	Program No. selection input (Bit 3)	Positive	Level
9	Program No. setting 2nd digit input/ Program No. selection input (Bit 4)	Positive	Edge Level
10	Program No. setting 1st digit input/ Program No. selection input (Bit 5)	Positive	Edge Level
11	Reset input	Positive	Edge
12	Origin return directive input	Positive	Edge
13	Start input	Positive	Edge
14	Servo on input/ Program stop input	Positive	Level Edge
15	Ready return/Continuous rotation stop input	Positive	Edge
16	Answer input/Position deviation counter reset input	Positive	Edge
17	Emergency stop input	Load	Level
18	Brake release input	Positive	Level

CN3 Output signal

Pin No.	Signal name	Logic
33	M code output (Bit 0)	Positive
34	M code output (Bit 1)	Positive
35	M code output (Bit 2)	Positive
36	M code output (Bit 3)	Positive
37	M code output (Bit 4)	Positive
38	M code output (Bit 5)	Positive
39	M code output (Bit 6)	Positive
40	M code output (Bit 7)	Positive
41	Imposition output	Positive
42	Positioning completion output	Positive
43	Start input wait output	Positive
44	Alarm output 1	Load
45	Alarm output 2	Load
46	Output 1 during indexing/Origin position output	Positive
47	Output 2 during indexing/Servo state output	Positive
48	Ready output	Positive
49	Segment position strobe output	Positive
50	M code strobe output	Positive

CN3 pulse train input signal

Pin No.	Signal name
19	PULSE/UP/A phase
20	-PULSE/-UP/-A phase
21	DIR/DOWN/B phase
22	-DIR/-DOWN/-B phase

CN3 encoder output signal (Incremental)

Pin No.	Signal name
23	A phase (Line driver output)
24	-A phase (Line driver output)
25	B phase (Line driver output)
26	-B phase (Line driver output)
27	Z phase (Line driver output)
28	-Z phase (Line driver output)

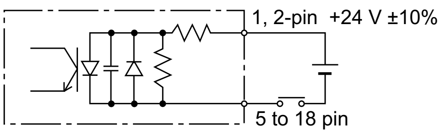
Input/output circuit specifications

Content	1 circuit current (mA)	Max. points (Circuit)	Max. current (mA)	Max. power consumption (mA)
Input circuit	4	14	56	1106
Output circuit	50	18	900	
Brake output (BK+, BK−)	75	2	150	

* The maximum simultaneous output points of the output circuit are 14 points out of 18 points.

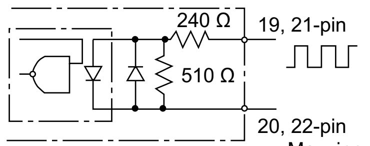
CN3 input/output circuit specifications

● Input circuit



Rated voltage 24 V ±10%
Rated current 4 mA (at 24 VDC)

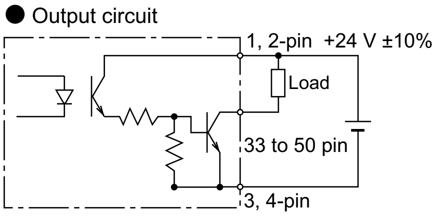
● Pulse string Input circuit



Rated voltage 5 V ±10%

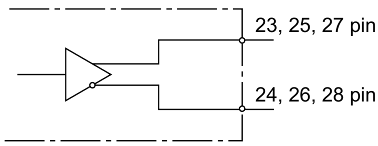
Max. input frequency
Line driver 1 Mpps
Open collector 250 Kpps

● Output circuit



Rated voltage 24 V ±10%
Rated current 50 mA (MAX)

● Encoder Output circuit



Output: line driver
Use line driver: DS26C31

⚠ Always read the safety precautions on pages 73 to 78 before use.

*Custom order products are CE, UL/cUL, and RoHS non-compliant.

TS/TH driver

Parallel I/O (PNP)

CN3 Input signal

Pin No.	Signal name	Logic	Determination
1 to 2	External power supply input GND (*1)		
3 to 4	External power supply input +24 V ±10% (*1)		
5	Program No. selection input (Bit 0)	Positive	Level
6	Program No. selection input (Bit 1)	Positive	Level
7	Program No. selection input (Bit 2)	Positive	Level
8	Program No. selection input (Bit 3)	Positive	Level
9	Program No. setting 2nd digit input/ Program No. selection input (Bit 4)	Positive	Edge Level
10	Program No. setting 1st digit input/ Program No. selection input (Bit 5)	Positive	Edge Level
11	Reset input	Positive	Edge
12	Origin return directive input	Positive	Edge
13	Start input	Positive	Edge
14	Servo on input/ Program stop input	Positive	Level Edge
15	Ready return/Continuous rotation stop input	Positive	Edge
16	Answer input/Position deviation counter reset input	Positive	Edge
17	Emergency stop input	Load	Level
18	Brake release input	Positive	Level

*1) The wiring differs from that under the PNP specification of AX9000GS/AX9000GH.

CN3 Output signal

Pin No.	Signal name	Logic
33	M code output (Bit 0)	Positive
34	M code output (Bit 1)	Positive
35	M code output (Bit 2)	Positive
36	M code output (Bit 3)	Positive
37	M code output (Bit 4)	Positive
38	M code output (Bit 5)	Positive
39	M code output (Bit 6)	Positive
40	M code output (Bit 7)	Positive
41	Imposition output	Positive
42	Positioning completion output	Positive
43	Start input wait output	Positive
44	Alarm output 1	Load
45	Alarm output 2	Load
46	Output 1 during indexing/Origin position output	Positive
47	Output 2 during indexing/Servo state output	Positive
48	Ready output	Positive
49	Segment position strobe output	Positive
50	M code strobe output	Positive

CN3 pulse train input signal

Pin No.	Signal name
19	PULSE/UP/A phase
20	-PULSE/-UP/-A phase
21	DIR/DOWN/B phase
22	-DIR/-DOWN/-B phase

CN3 encoder output signal (Incremental)

Pin No.	Signal name
23	A phase (Line driver output)
24	-A phase (Line driver output)
25	B phase (Line driver output)
26	-B phase (Line driver output)
27	Z phase (Line driver output)
28	-Z phase (Line driver output)

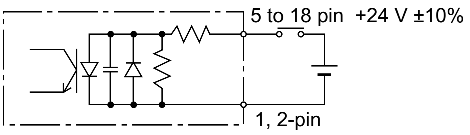
Input/output circuit specifications

Content	1 circuit current (mA)	Max. points (Circuit)	Max. current (mA)	Max. power consumption (mA)
Input circuit	4	14	56	1106
Output circuit	50	18	900	
Brake output (BK+, BK−)	75	2	150	

* The maximum simultaneous output points of the output circuit are 14 points out of 18 points.

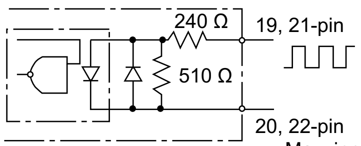
CN3 input/output circuit specifications

● Input circuit



Rated voltage 24 V ±10%
Rated current 4 mA (at 24 VDC)

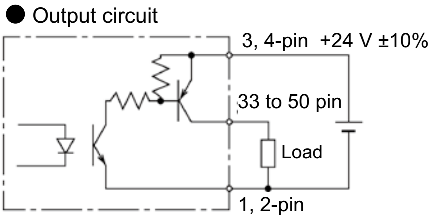
● Pulse string Input circuit



Rated voltage 5 V ±10%

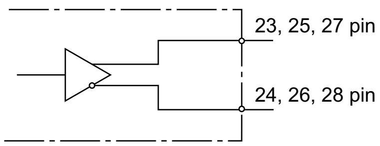
Max. input frequency
Line driver 1 Mpps
Open collector 250 Kpps

● Output circuit



Rated voltage 24 V ±10%
Rated current 50 mA (MAX)

● Encoder Output circuit



Output: line driver
Use line driver: DS26C31

*Custom order products are CE, UL/cUL, and RoHS non-compliant.

CC-Link

Communication specifications

Descriptions	Specifications
Power supply	5 VDC is supplied from the servo amplifier.
CC-Link version	Ver 1.10
Number of occupied stations (Station type)	2 stations (Remote device station)
Remote input points	48 points
Remote output points	48 points
Remote register input/output	Input 8 words/Output 8 words
Communication speed	10M/5M/2.5M/625k/156kbps (Selected by parameter setting)
Connection cable	CC-Link Ver. 1.10 compliant cable (3 core cable with shield)
Transmission format	HDLC compliant
Remote station No.	1 to 63 (Set by a parameter)
Number of connected units	For remote device station only, Max. 32 units/2 stations occupied
Monitor function	Present position within 1 rotation (degree, pulse), position deviation amount, program No., electronic thermal, rotation speed, point table No., torque load factor, acceleration, alarm, parameter, operation mode

I/O signal

PLC → AX (Input)

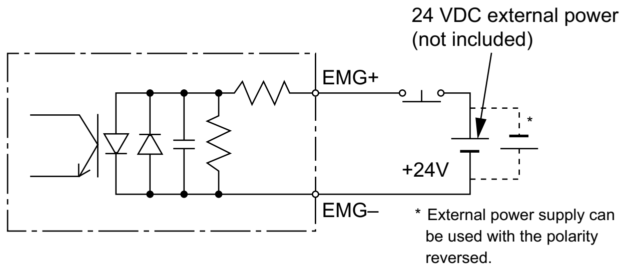
Device No.	Signal name	Logic	Determination
RYn0	Program No. selection input (Bit 0)	Positive	Level
RYn1	Program No. selection input (Bit 1)	Positive	Level
RYn2	Program No. selection input (Bit 2)	Positive	Level
RYn3	Program No. selection input (Bit 3)	Positive	Level
RYn4	Program No. setting 2nd digit input/ Program No. selection input (Bit 4)	Positive	Edge Level
RYn5	Program No. setting 1st digit input/ Program No. selection input (Bit 5)	Positive	Edge Level
RYn6	Reset input	Positive	Edge
RYn7	Origin return directive input	Positive	Edge
RYn8	Start input	Positive	Edge
RYn9	Servo on input/ Program stop input	Positive	Level Edge
RYnA	Ready return input/Continuous rotation stop input	Positive	Edge
RYnB	Answer input/Position deviation counter reset input	Positive	Edge
RYnC	Emergency stop input	Load	Level
RYnD	Brake release input	Positive	Level
RYnE	Job operation input (CW direction)	Positive	Edge
RYnF	Job operation input (CCW direction)	Positive	Edge
RY(n+1)0	Unusable/Travel unit selection input (Bit 0)	Positive	Level
RY(n+1)1	Unusable/Travel unit selection input (Bit 1)	Positive	Level
RY(n+1)2	Unusable/Travel speed unit selection input	Positive	Level
RY(n+1)3	Operation by table, Operation by data input switching input	Positive	Level
RY(n+1)4 to RY(n+1)F	Unusable		
RY(n+2)0	Monitor output execution request	Positive	Level
RY(n+2)1	Command code execution request	Positive	Edge
RY(n+2)2 to RY(n+2)F	Unusable		
RY(n+3)0 to RY(n+3)F	Unusable		

AX (Output) → PLC

Device No.	Signal name	Logic
RXn0	M code output (Bit 0)	Positive
RXn1	M code output (Bit 1)	Positive
RXn2	M code output (Bit 2)	Positive
RXn3	M code output (Bit 3)	Positive
RXn4	M code output (Bit 4)	Positive
RXn5	M code output (Bit 5)	Positive
RXn6	M code output (Bit 6)	Positive
RXn7	M code output (Bit 7)	Positive
RXn8	Imposition output	Positive
RXn9	Positioning completion output	Positive
RXnA	Start input wait output	Positive
RXnB	Alarm output 1	Load
RXnC	Alarm output 2	Load
RXnD	Output 1 during indexing/ Origin position output	Positive
RXnE	Output 2 during indexing/ Servo state output	Positive
RXnF	Ready output	Positive
RX(n+1)0	Segment position strobe output	Positive
RX(n+1)1	M code strobe output	Positive
RX(n+1)2 to RX(n+1)F	Unusable	
RX(n+2)0	Monitoring	Positive
RX(n+2)1	Command code execution completed	Positive
RX(n+2)2 to RX(n+2)F	Unusable	
RX(n+3)0 to RX(n+3)A	Unusable	
RX(n+3)B	Remote READY	Positive
RX(n+3)C to RX(n+3)F	Unusable	

* n is determined by the setting of the station No.

TB3 Input circuit specifications (Machine stops)



Rated voltage 24 V ±10%, rated current 5 mA or less

Safety precautions

- Reserve a sufficient distance between the communication cable and power cable (motor cable, power supply cable, etc.).
- Placing the communication cable and power cable close to each other or bundling these cables makes communication unstable due to noise, possibly resulting in a communication error or retry.
- For details on the installation of the communication cable, refer to the CC-Link installation manuals.

TS/TH driver

PROFIBUS-DP

Communication specifications

Descriptions	Specifications
Communication protocol	PROFIBUS DP-V0 compliant
I/O data	Input 8 bytes/Output 8 bytes
Communication speed	12M/6M/3M/1.5M/500k /187.5k/93.75k/45.45k /19.2k/9.6kbps (Autobaud rate function)
Connection cable	PROFIBUS compliant cable (2-wire twisted pair cable with shield)
Node address	2 to 125 (Set by a parameter)
Number of connected units	Without repeater: Up to 32 stations for each segment With repeater: Up to 126 stations for each segment
Monitor function	Present position within 1 rotation (degree, pulse), position deviation amount, program No., electronic thermal, rotation speed, point table No., torque load factor, acceleration, alarm, parameter, operation mode

I/O signal

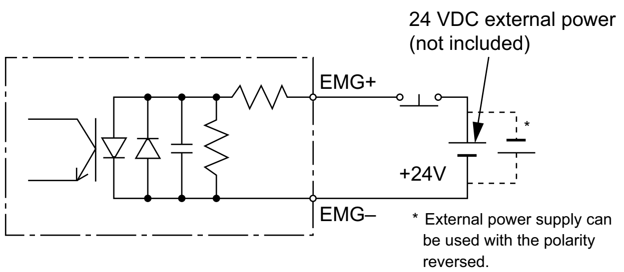
PLC → AX (Input)

Byte No.	Signal name	Logic	Determination
0.0	Program No. selection input (Bit 0)	Positive	Level
0.1	Program No. selection input (Bit 1)	Positive	Level
0.2	Program No. selection input (Bit 2)	Positive	Level
0.3	Program No. selection input (Bit 3)	Positive	Level
0.4	Program No. setting 2nd digit input/ Program No. selection input (Bit 4)	Positive	Edge Level
0.5	Program No. setting 1st digit input/ Program No. selection input (Bit 5)	Positive	Edge Level
0.6	Reset input	Positive	Edge
0.7	Origin return directive input	Positive	Edge
1.0	Start input	Positive	Edge
1.1	Servo on input/ Program stop input	Positive	Level Edge
1.2	Ready return input/Continuous rotation stop input	Positive	Edge
1.3	Answer input/Position deviation counter reset input	Positive	Edge
1.4	Emergency stop input	Load	Level
1.5	Brake release input	Positive	Level
1.6	Job operation input (CW direction)	Positive	Edge
1.7	Job operation input (CCW direction)	Positive	Edge
2.0	Parameter No. (Bit 8)/Travel unit selection input (Bit 0)	Positive	Level
2.1	Parameter No. (Bit 9)/Travel unit selection input (Bit 1)	Positive	Level
2.2	Parameter No. (Bit 10)/Travel speed unit selection input	Positive	Level
2.3	Operation by table, Operation by data input switching input	Positive	Level
2.4 2.5	Unusable		
2.6	Monitor output execution request	Positive	Level
2.7	Command code execution request	Positive	Edge
3.0	Parameter No. (Bit 0)/Unusable	Positive	Level
3.1	Parameter No. (Bit 1)/Unusable	Positive	Level
3.2	Parameter No. (Bit 2)/Unusable	Positive	Level
3.3	Parameter No. (Bit 3)/Unusable	Positive	Level
3.4	Parameter No. (Bit 4)/Unusable	Positive	Level
3.5	Parameter No. (Bit 5)/Unusable	Positive	Level
3.6	Parameter No. (Bit 6)/Unusable	Positive	Level
3.7	Parameter No. (Bit 7)/Unusable	Positive	Level

AX (Output) → PLC

Byte No.	Signal name	Logic
0.0	M code output (Bit 0)	Positive
0.1	M code output (Bit 1)	Positive
0.2	M code output (Bit 2)	Positive
0.3	M code output (Bit 3)	Positive
0.4	M code output (Bit 4)	Positive
0.5	M code output (Bit 5)	Positive
0.6	M code output (Bit 6)	Positive
0.7	M code output (Bit 7)	Positive
1.0	Imposition output	Positive
1.1	Positioning completion output	Positive
1.2	Start input wait output	Positive
1.3	Alarm output 1	Load
1.4	Alarm output 2	Load
1.5	Output 1 during indexing/ Origin position output	Positive
1.6	Output 2 during indexing/ Servo state output	Positive
1.7	Ready output	Positive
2.0	Segment position strobe output	Positive
2.1	M code strobe output	Positive
2.2 to 2.5	Unusable	
2.6	Monitoring	Positive
2.7	Command code execution completed	Positive
3.0 to 3.7	Unusable	

TB3 Input circuit specifications (Machine stops)



Rated voltage 24 V ±10%, rated current 5 mA or less

Safety precautions

■ For details on the installation of a communication cable, refer to "Installation Guideline for PROFIBUS DP/FMS" issued by the PROFIBUS Organization or the PROFIBUS wiring guide.

DeviceNet

Communication specifications

Descriptions	Specifications
Power supply for communication	11 to 25 VDC
Current consumption of power supply for communication	50 mA or less
Communication protocol	DeviceNet compliant: Remote I/O
Number of occupied nodes	Input 8 bytes/Output 8 bytes
Communication speed	500 k/250 k/125 kbps (Selected by parameter setting)
Connection cable	DeviceNet compliant cable (5-wire cable with shield, 2 signal lines, 2 power cables, 1 shield)
Node address	0 to 63 (Set by a parameter)
Number of connected units	Max. 64 units (including the master)
Monitor function	Present position within 1 rotation (degree, pulse), position deviation amount, program No., electronic thermal, rotation speed, point table No., torque load factor, acceleration, alarm, parameter, operation mode

I/O signal

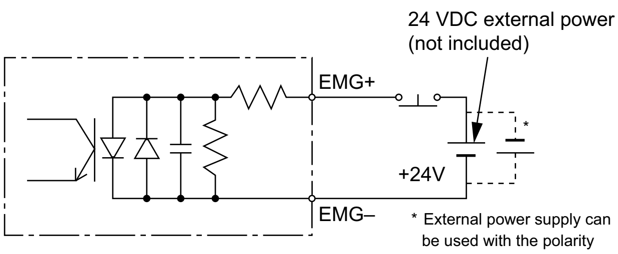
PLC → AX (Input)

Byte No.	Signal name	Logic	Determination
0.0	Program No. selection input (Bit 0)	Positive	Level
0.1	Program No. selection input (Bit 1)	Positive	Level
0.2	Program No. selection input (Bit 2)	Positive	Level
0.3	Program No. selection input (Bit 3)	Positive	Level
0.4	Program No. setting 2nd digit input/ Program No. selection input (Bit 4)	Positive	Edge Level
0.5	Program No. setting 1st digit input/ Program No. selection input (Bit 5)	Positive	Edge Level
0.6	Reset input	Positive	Edge
0.7	Origin return directive input	Positive	Edge
1.0	Start input	Positive	Edge
1.1	Servo on input/ Program stop input	Positive	Level Edge
1.2	Ready return input/Continuous rotation stop input	Positive	Edge
1.3	Answer input/Position deviation counter reset input	Positive	Edge
1.4	Emergency stop input	Load	Level
1.5	Brake release input	Positive	Level
1.6	Job operation input (CW direction)	Positive	Edge
1.7	Job operation input (CCW direction)	Positive	Edge
2.0	Parameter No. (Bit 8)/Travel unit selection input (Bit 0)	Positive	Level
2.1	Parameter No. (Bit 9)/Travel unit selection input (Bit 1)	Positive	Level
2.2	Parameter No. (Bit 10)/Travel speed unit selection input	Positive	Level
2.3	Operation by table, Operation by data input switching input	Positive	Level
2.4 2.5	Unusable		
2.6	Monitor output execution request	Positive	Level
2.7	Command code execution request	Positive	Edge
3.0	Parameter No. (Bit 0)/Unusable	Positive	Level
3.1	Parameter No. (Bit 1)/Unusable	Positive	Level
3.2	Parameter No. (Bit 2)/Unusable	Positive	Level
3.3	Parameter No. (Bit 3)/Unusable	Positive	Level
3.4	Parameter No. (Bit 4)/Unusable	Positive	Level
3.5	Parameter No. (Bit 5)/Unusable	Positive	Level
3.6	Parameter No. (Bit 6)/Unusable	Positive	Level
3.7	Parameter No. (Bit 7)/Unusable	Positive	Level

AX (Output) → PLC

Byte No.	Signal name	Logic
0.0	M code output (Bit 0)	Positive
0.1	M code output (Bit 1)	Positive
0.2	M code output (Bit 2)	Positive
0.3	M code output (Bit 3)	Positive
0.4	M code output (Bit 4)	Positive
0.5	M code output (Bit 5)	Positive
0.6	M code output (Bit 6)	Positive
0.7	M code output (Bit 7)	Positive
1.0	Imposition output	Positive
1.1	Positioning completion output	Positive
1.2	Start input wait output	Positive
1.3	Alarm output 1	Load
1.4	Alarm output 2	Load
1.5	Output 1 during indexing/ Origin position output	Positive
1.6	Output 2 during indexing/ Servo state output	Positive
1.7	Ready output	Positive
2.0	Segment position strobe output	Positive
2.1	M code strobe output	Positive
2.2 to 2.5	Unusable	
2.6	Monitoring	Positive
2.7	Command code execution completed	Positive
3.0 to 3.7	Unusable	

TB3 Input circuit specifications (Machine stops)



* External power supply can be used with the polarity reversed.

Rated voltage 24 V ±10%, rated current 5 mA or less

Safety precautions

- Reserve a sufficient distance between the communication cable and power cable (motor cable, power supply cable, etc.).
- Placing the communication cable and power cable close to each other or bundling these cables makes communication unstable due to noise, possibly resulting in a communication error or retry.
- For details on the installation of the communication cable, refer to the DeviceNet installation manuals.

TS/TH driver

EtherCAT

Communication specifications

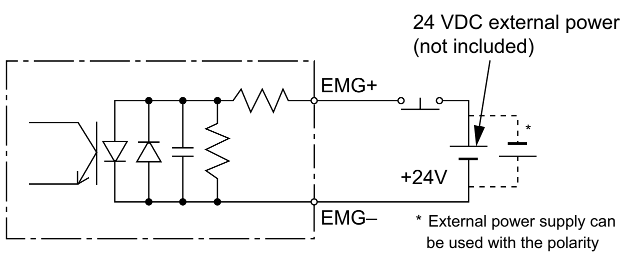
Descriptions	Specifications
Communication protocol	EtherCAT
Communication speed	100 Mbps (fast Ethernet, full duplex)
Process data	Fixed PDO mapping
Max. PDO data length	RxPDO: 40 bytes/TxPDO: 40 bytes
Station arias	0 to 65535 (Set by a parameter)
Connection cable	EtherCAT compliant cable (CAT5e or higher twisted pair cable (double shield with aluminum tape and braid) is recommended.)
Node address	Automatic indexing the master
Monitor function (Output Data)	Present position within 1 rotation (degree, pulse), position deviation amount, program No., electronic thermal, rotation speed, point table No., torque load factor, acceleration, alarm, parameter, operation mode

I/O signal

PLC → AX (Input)

Index	Sub Index	Display name	bit	Signal name	Logic	Determination
0x2001	0x01	Input signal 1	0	Program No. selection input (Bit 0)	Positive	Level
			1	Program No. selection input (Bit 1)	Positive	Level
			2	Program No. selection input (Bit 2)	Positive	Level
			3	Program No. selection input (Bit 3)	Positive	Level
			4	Program No. setting 2nd digit input/ Program No. selection input (Bit 4)	Positive	Edge Level
			5	Program No. setting 1st digit input/ Program No. selection input (Bit 5)	Positive	Edge Level
			6	Reset input	Positive	Edge
			7	Origin return directive input	Positive	Edge
			8	Start input	Positive	Edge
			9	Servo on input/ Program stop input	Positive	Level Edge
			10	Ready return input/Continuous rotation stop input	Positive	Edge
			11	Answer input/Position deviation counter reset input	Positive	Edge
			12	Emergency stop input	Load	Level
			13	Brake release input	Positive	Level
			14	Job operation input (CW direction)	Positive	Edge
			15	Job operation input (CCW direction)	Positive	Edge
			16	Unusable/Travel unit selection input (Bit 0)	Positive	Level
			17	Unusable/Travel unit selection input (Bit 1)	Positive	Level
			18	Unusable/Travel speed unit selection input	Positive	Level
			19	Operation by table, Operation by data input switching input	Positive	Level
			20 to 31	Unusable		
	0x02	Input signal 2	0	Monitor output execution request	Positive	Level
			1	Command code execution request	Positive	Edge
			2 to 31	Unusable		

TB3 Input circuit specifications (Machine stops)



* External power supply can be used with the polarity reversed.

Rated voltage 24 V ±10%, rated current 5 mA or less

PDO mapping

RxPDO

Index	Sub Index	Display name	Content
0x1600	0x00	Number of PDO objects	10
	0x01	Input signal 1	0x2001-0x01
	0x02	Input signal 2	0x2001-0x02
	0x03	Input data 1	0x2003-0x01
	0x04	Input data 2	0x2003-0x02
	0x05	Input data 3	0x2003-0x03
	0x06	Input data 4	0x2003-0x04
	0x07	Input data 5	0x2003-0x05
	0x08	Input command 1	0x2003-0x06
	0x09	Input command 2	0x2003-0x07
	0x0A	Input command 3	0x2003-0x08

TxPDO

Index	Sub Index	Display name	Content
0x1A00	0x00	Number of PDO objects	10
	0x01	Output signal 1	0x2005-0x01
	0x02	Output signal 2	0x2005-0x02
	0x03	Output data 1	0x2007-0x01
	0x04	Output data 2	0x2007-0x02
	0x05	Output data 3	0x2007-0x03
	0x06	Output data 4	0x2007-0x04
	0x07	Output data 5	0x2007-0x05
	0x08	Output command 1	0x2007-0x06
	0x09	Output command 2	0x2007-0x07
	0x0A	Output command 3	0x2007-0x08

I/O signal

AX (Output) → PLC

Index	Sub Index	Display name	bit	Signal name	Logic
0x2005	0x01	Output signal 1	0	M code output (Bit 0)	Positive
			1	M code output (Bit 1)	Positive
			2	M code output (Bit 2)	Positive
			3	M code output (Bit 3)	Positive
			4	M code output (Bit 4)	Positive
			5	M code output (Bit 5)	Positive
			6	M code output (Bit 6)	Positive
			7	M code output (Bit 7)	Positive
			8	Imposition output	Positive
			9	Positioning completion output	Positive
			10	Start input wait output	Positive
			11	Alarm output 1	Load
			12	Alarm output 2	Load
			13	Output 1 during indexing/Origin position output	Positive
			14	Output 2 during indexing/Servo state output	Positive
			15	Ready output	Positive
			16	Segment position strobe output	Positive
			17	M code strobe output	Positive
			18 to 31	Unusable	
	0x02	Output signal 2	0	Monitoring	Positive
			1	Command code execution completed	Positive
			2 to 31	Unusable	

Safety precautions

- ■ Reserve a sufficient distance between the communication cable and power cable (motor cable, power supply cable, etc.).
- ■ Placing the communication cable and power cable close to each other or bundling these cables makes communication unstable due to noise, possibly resulting in a communication error or retry.
- ■ For details on the installation of the communication cable, refer to ETG.1600 EtherCAT installation guidelines.

EtherNet/IP

Communication specifications

Descriptions	Specifications
Communication protocol	EtherNet/IP
Communication speed	Automatic setting (100 Mbps/10 Mbps, full duplex/half duplex)
Occupied bytes	Input: 32 bytes/Output: 32 bytes
IP address	0.0.0.0 to 255.255.255.255 (Set by a parameter)
Subnet mask	0.0.0.0 to 255.255.255.255 (Set by a parameter)
Default gateway	0.0.0.0 to 255.255.255.255 (Set by a parameter)
RPI (Packet interval)	10 msec to 1,000 msec
Connection cable	EtherNet/IP compliant cable (CAT5 or higher twisted pair cable (double shield with aluminum tape and braid) is recommended.)
Monitor function	Present position within 1 rotation (degree, pulse), position deviation amount, program No., electronic thermal, rotation speed, point table No., torque load factor, acceleration, alarm, parameter, operation mode

I/O signal

PLC → AX (Input)

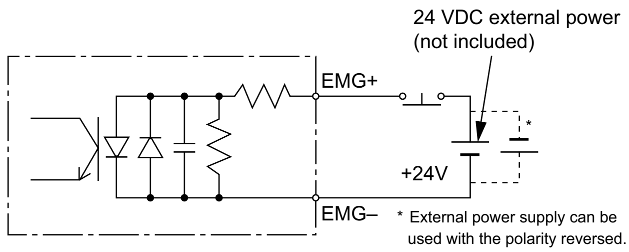
Byte	bit	Signal name	Logic	Determination
0	0	Program No. selection input (Bit 0)	Positive	Level
	1	Program No. selection input (Bit 1)	Positive	Level
	2	Program No. selection input (Bit 2)	Positive	Level
	3	Program No. selection input (Bit 3)	Positive	Level
	4	Program No. setting 2nd digit input/ Program No. selection input (Bit 4)	Positive	Edge Level
	5	Program No. setting 1st digit input/ Program No. selection input (Bit 5)	Positive	Edge Level
	6	Reset input	Positive	Edge
	7	Origin return directive input	Positive	Edge
1	0	Start input	Positive	Edge
	1	Servo on input/ Program stop input	Positive	Level Edge
	2	Ready return input/Continuous rotation stop input	Positive	Edge
	3	Answer input/Position deviation counter reset input	Positive	Edge
	4	Emergency stop input	Load	Level
	5	Brake release input	Positive	Level
	6	Job operation input (CW direction)	Positive	Edge
	7	Job operation input (CCW direction)	Positive	Edge
2	0	Unusable/Travel unit selection input (Bit 0)	Positive	Level
	1	Unusable/Travel unit selection input (Bit 1)	Positive	Level
	2	Unusable/Travel speed unit selection input	Positive	Level
	3	Operation by table, Operation by data input switching input	Positive	Level
	4 to 7	Unusable		
3	-	Unusable		
4	0	Monitor output execution request	Positive	Level
	1	Command code execution request	Positive	Edge
	2 to 7	Unusable		
5	-	Unusable		
6	-	Unusable		
7	-	Unusable		
8	-	Monitor code 1		
9	-			
10	-			
11	-			
12	-	Monitor code 2		
13	-			
14	-			
15	-			
16	-	Monitor code 3		
17	-			
18	-			
19	-			
20	-	Command code		
21	-			
22	-			
23	-			
24	-	Write data/A code or P code		
25	-			
26	-			
27	-			
28	-	Data setting/F code		
29	-			
30	-			
31	-			

I/O signal

AX (Output) → PLC

Byte	bit	Signal name	Logic
0	0	M code output (Bit 0)	Positive
	1	M code output (Bit 1)	Positive
	2	M code output (Bit 2)	Positive
	3	M code output (Bit 3)	Positive
	4	M code output (Bit 4)	Positive
	5	M code output (Bit 5)	Positive
	6	M code output (Bit 6)	Positive
	7	M code output (Bit 7)	Positive
1	0	Imposition output	Positive
	1	Positioning completion output	Positive
	2	Start input wait output	Positive
	3	Alarm output 1	Load
	4	Alarm output 2	Load
	5	Output 1 during indexing/Origin position output	Positive
	6	Output 2 during indexing/Servo state output	Positive
	7	Ready output	Positive
2	0	Segment position strobe output	Positive
	1	M code strobe output	Positive
	2 to 7	Unusable	
3	-	Unusable	
4	0	Monitoring	Positive
	1	Command code execution completed	Positive
	2 to 7	Unusable	
5	-	Unusable	
6	-	Unusable	
7	-	Unusable	
8	-	Monitor data 1	
9	-		
10	-		
11	-		
12	-	Monitor data 2	
13	-		
14	-		
15	-		
16	-	Monitor data 3	
17	-		
18	-		
19	-		
20	-	Response code	
21	-		
22	-		
23	-		
24	-	Read data	
25	-		
26	-		
27	-		
28	-	Unusable	
29	-		
30	-		
31	-		

TB3 Input circuit specifications (Machine stops)



* External power supply can be used with the polarity reversed.

Rated voltage 24 V ±10%, rated current 5 mA or less

Safety precautions

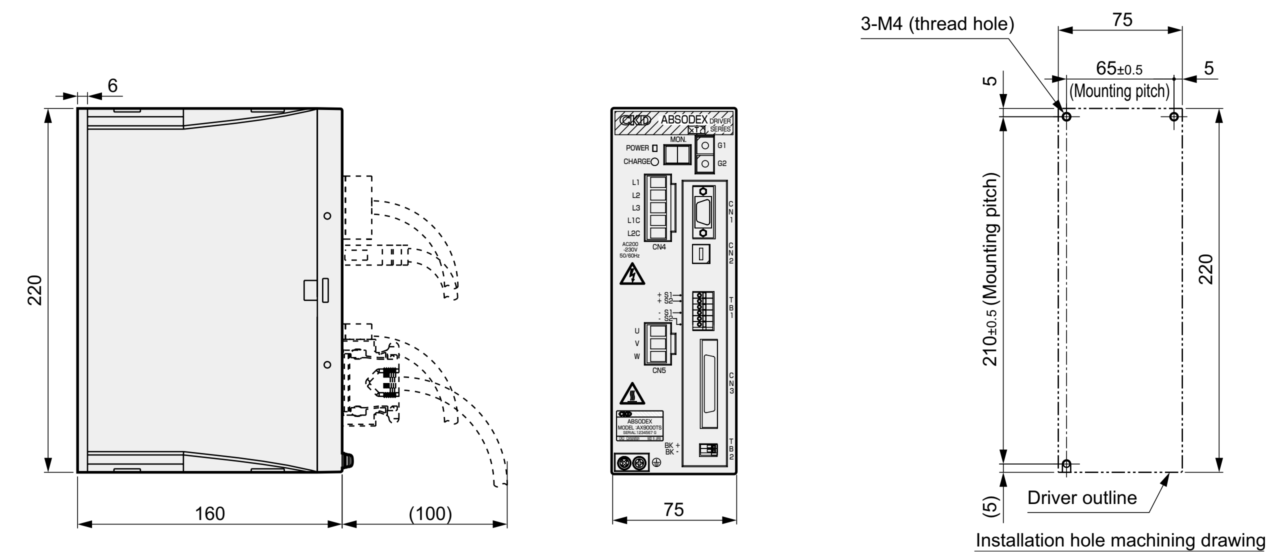
- Reserve a sufficient distance between the communication cable and power cable (motor cable, power supply cable, etc.).
- Placing the communication cable and power cable close to each other or bundling these cables makes communication unstable due to noise, possibly resulting in a communication error or retry.
- For details on the installation of the communication cable, refer to the EtherNet/IP installation manuals.

Actuator AX6000M
Drivers AX9000MU
Actuator AX7000X
Drivers AX9000XS
Actuator AX1000T
Actuator AX2000T
Actuator AX4000T
Drivers AX9000TS/TH
Dialog terminal AX0180
Related parts model No. table

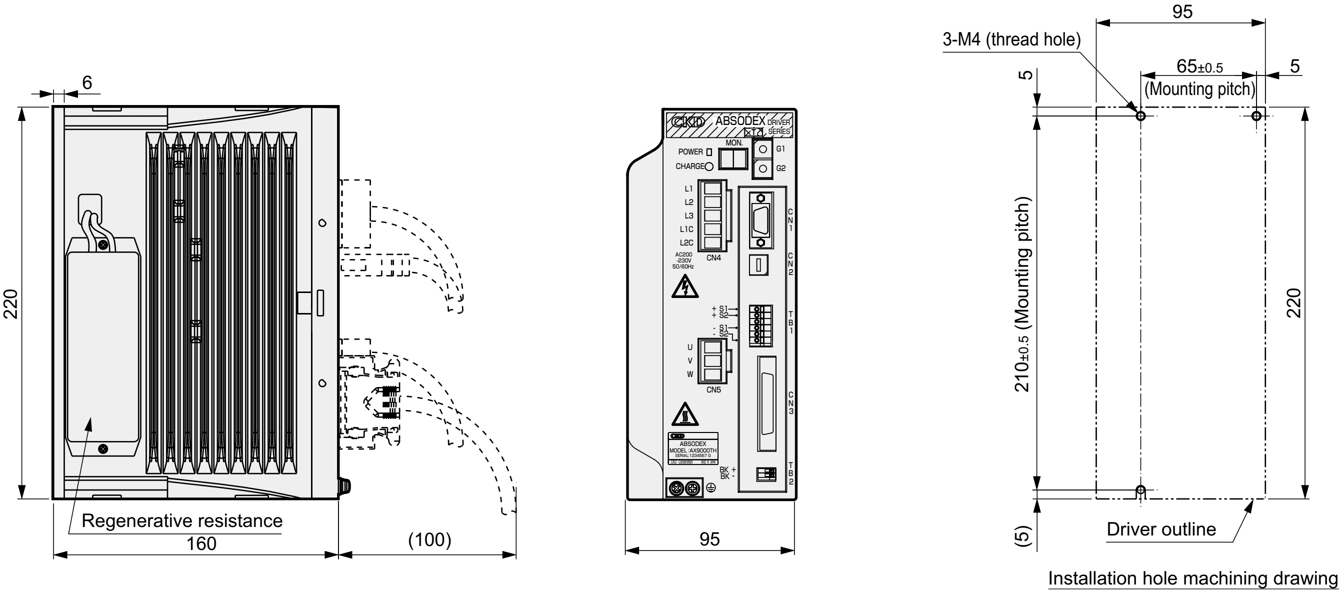
TS/TH driver

Dimensions

● TS driver



● TH driver



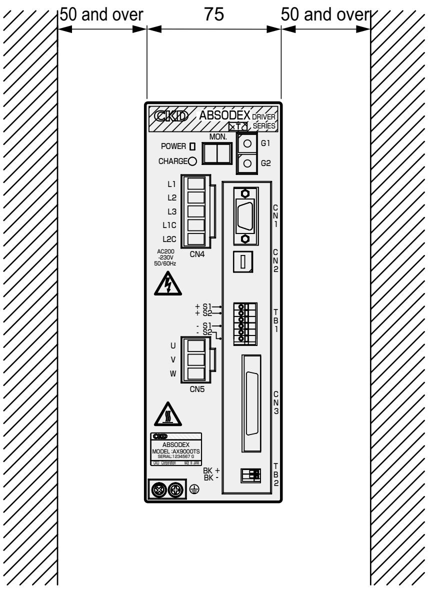
Accessories supplied with the driver

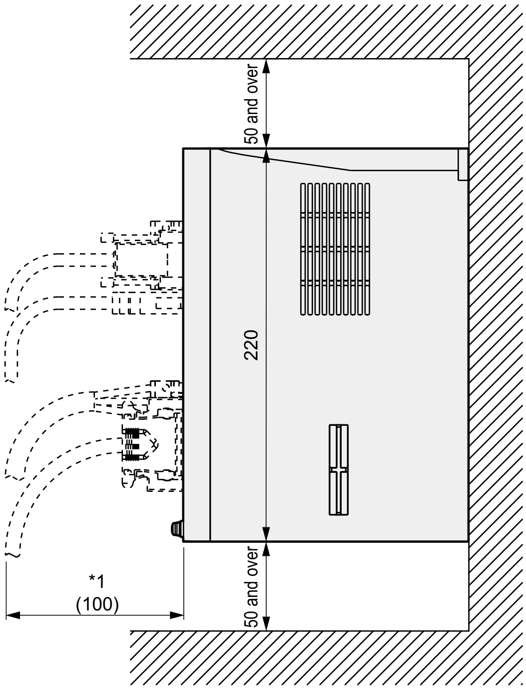
Model No.	Specifications	CN3 Connector	Power supply connector (CN4)	Motor cable connector (CN5)
AX9000TS-U0 AX9000TH-U0	Parallel I/O (NPN)	10150-3000PE (Plug) 10350-52A0-008 (Shell) Sumitomo 3M Ltd.	PC4/5-ST-7.62 Phoenix Contact	PC4/3-ST-7.62 Phoenix Contact
AX9000TS-U1 AX9000TH-U1	Parallel I/O (PNP)			
AX9000TS-U2 AX9000TH-U2	CC-Link	BLZP5.08HC/05/180F AU OR BX Weidmüller		
AX9000TS-U3 AX9000TH-U3	PROFIBUS-DP	Not attached		
AX9000TS-U4 AX9000TH-U4	DeviceNet	MSTB2.5/5-STF-5.08AUM Phoenix Contact		
AX9000TS-U5 AX9000TH-U5	EtherCAT	Not attached		
AX9000TS-U6 AX9000TH-U6	EtherNet/IP	Not attached		

For additional orders of parts, refer to the parts model No. table.

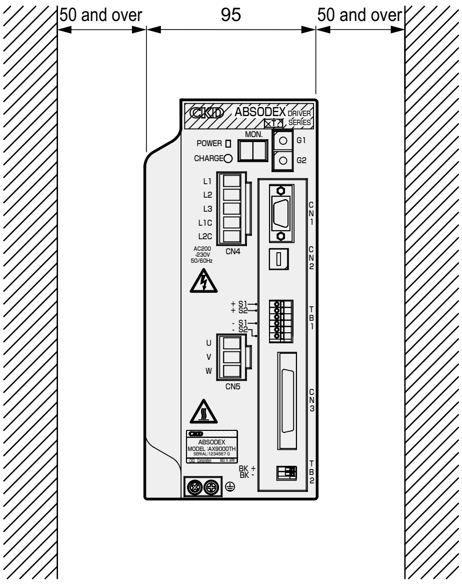
Installation Dimension

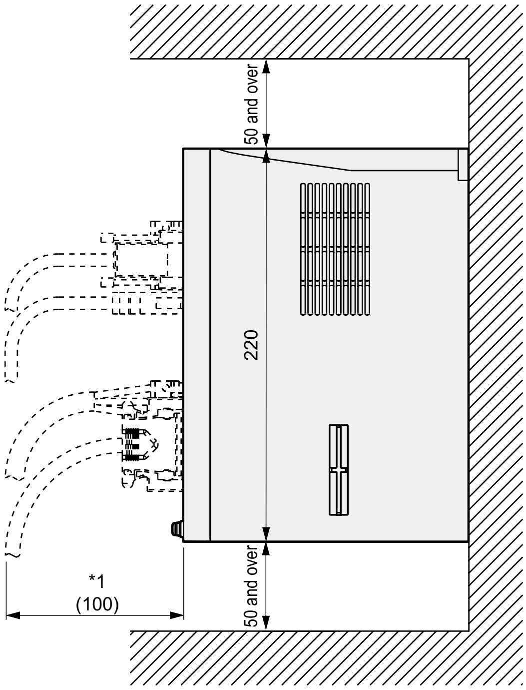
● TS driver





● TH driver





*1) Determine the dimension with extra allowance according to a cable you want to use.

Safety precautions

● The ABSODEX driver does not have a dust-proof/waterproof structure.
To prevent dust, water, oil or other substances from entering the driver, provide protection according to the working environment.

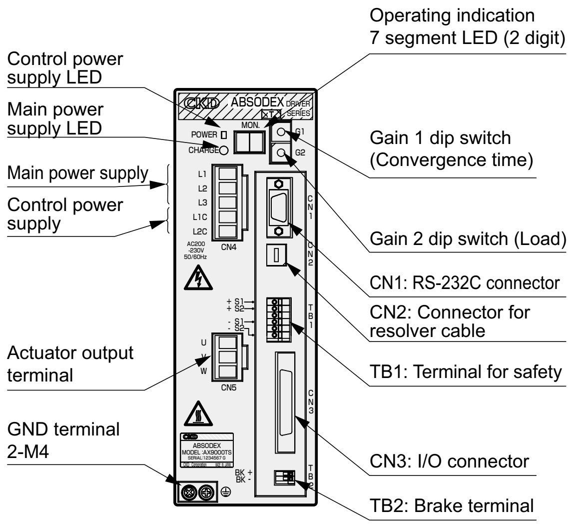
● Install the ABSODEX driver away from other devices, walls or other structures by 50 mm or more from the top, bottom and sides. When heat is generated from other drivers or devices, check that the ambient temperature does not exceed 50°C.

TS/TH driver

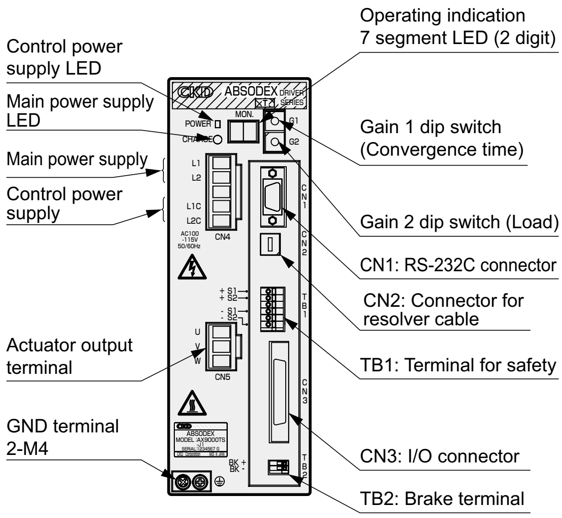
Panel Details

● Parallel I/O (NPN, PNP)

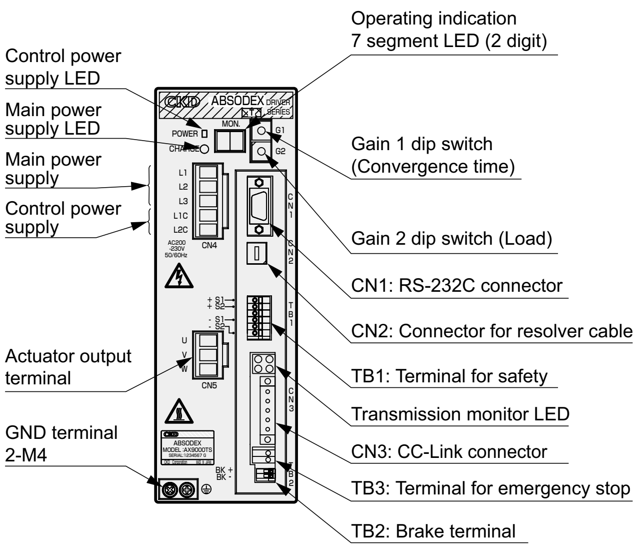
• For 200 VAC



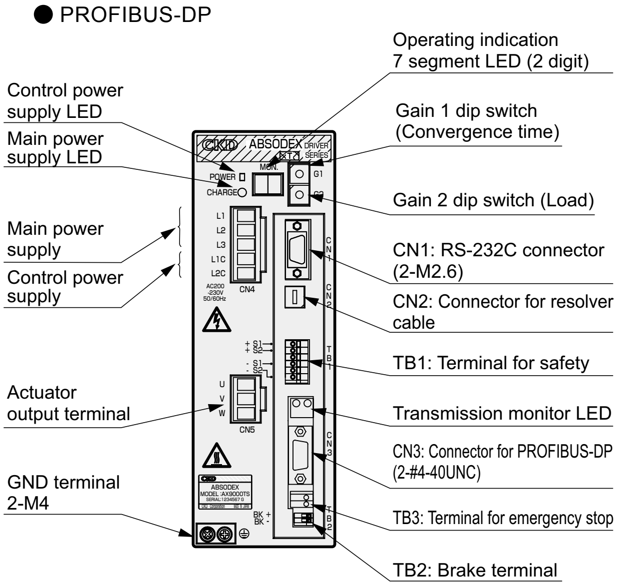
• For 100 VAC



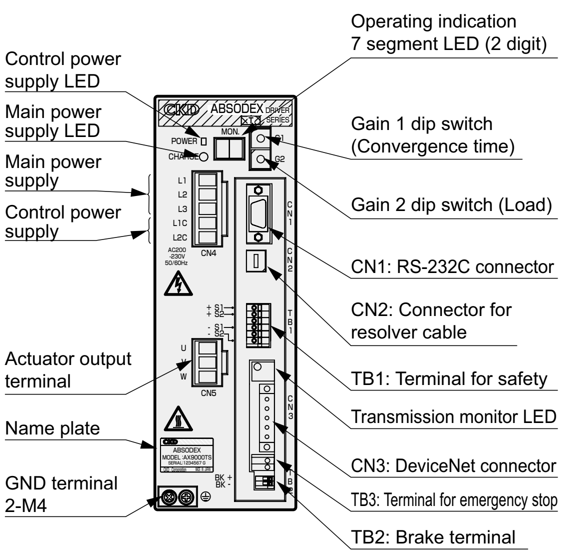
● CC-Link



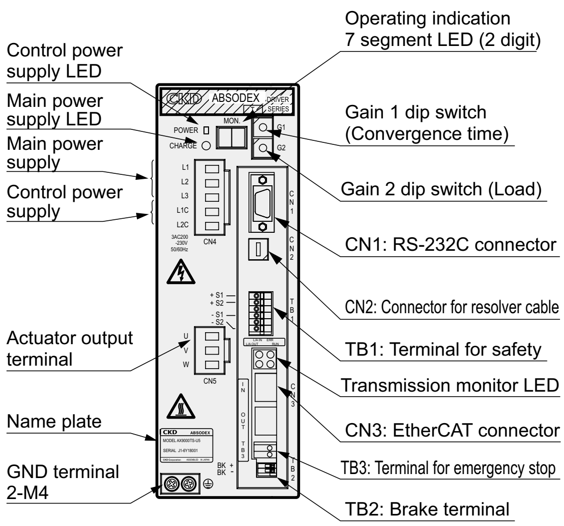
● PROFIBUS-DP



● DeviceNet

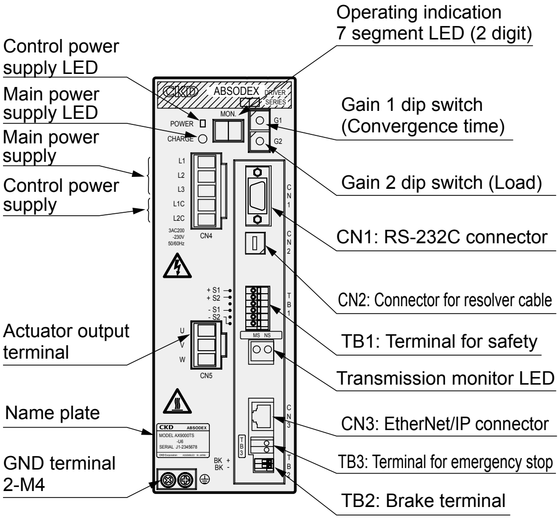


● EtherCAT

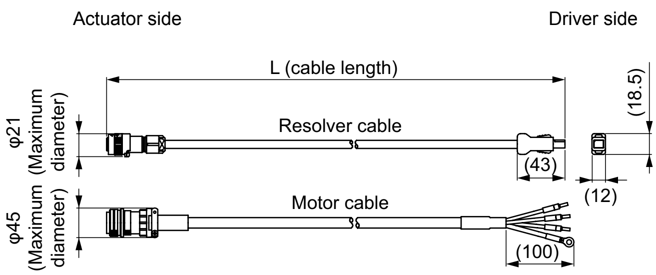
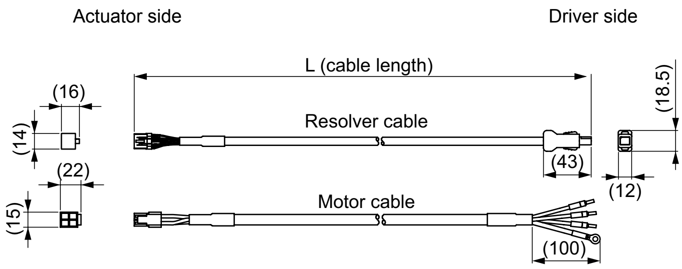


Panel Details

● EtherNet/IP



Cable Specifications

Cable dimensions	Product name/model No.	Cable's min. bending radius
● AX1000T 	Resolver cable AX-CBLR5-DM□□ (*1)	60 mm
	Motor cable AX-CBLM5-DM□□ (*1)	110 mm
● AX2000T, AX4000T 	Resolver cable AX-CBLR6-DM□□ (*1)	60 mm
	Motor cable AX-CBLM6-DM□□ (*1)	110 mm

*1) □□ represents the cable length.

Safety precautions

- Connect the correct motor cable and driver by checking the mark tube of the cable and the display of the driver.
- For uses where the cable is repeatedly bent, fix the cable sheath part near the connector of the actuator body.
- For the AX4009T and AX2000T Series, the lead-out cable of the actuator section is not movable. Make sure to fix the cable in the connector section to prevent the cable from moving. Do not pull the lead-out cable to lift the unit or do not apply an excessive force to the cable. Otherwise, malfunction, an alarm, damage of the connector part, or disconnection may result.
- When connecting the cable, fully insert the connector. Also, tighten the connector mounting screws and fix screws securely.
- Do not disconnect, extend, or make other modifications to the cable. Such modifications may cause failure or malfunction.
- For the cable length L, refer to the cable length shown in the How to order.

ABSODEX Handy Terminal

AX0180

● TS/TH driver

RoHS

Features

(1) Programming is easy.
For an equal segment program, you can easily write a program by answering the questions interactively from the handy terminal.

(2) No dedicated power supply is required.
The power is supplied from ABSODEX.

(3) Backup is available.
The programs and parameters can be stored, and programs can be copied.

(4) Available also for conventional models.
With the S/GS/H/GH/WGH type drivers, this product operates in the same way as the conventional handy terminal (AX0170H).

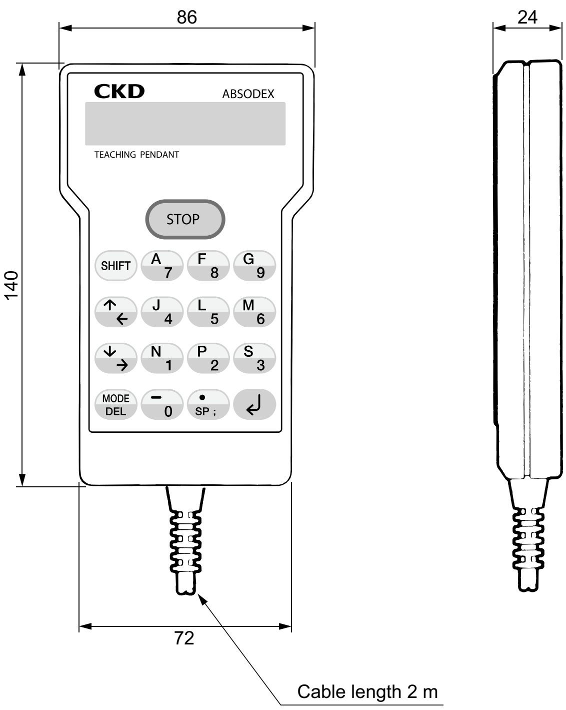
Specifications

Descriptions	AX0180
Operation mode	Edit, Display, Parameter, Operation, and Copy modes
Program capacity	Equal segment or NC program 2,000 characters (One)
Program No.	Equal segment program: Program No. 0 to 999
Display	16 characters × 2 digits (LCD display)
Input keys	17 keys (Stop key: 1, Control key: 5 characters, Number key: 11)
Backup	Super capacitor (about 3 hours)
Power supply	Supplied by the ABSODEX driver
Cable length	2 m
Operating ambient temperature	0 to 50°C
Operating ambient humidity	20 to 90% (no condensation)
Storage ambient temperature	−20 to 80°C
Storage ambient humidity	20 to 90% (no condensation)
Atmosphere	No corrosive gas or dust
Weight	Body only About 140 g

* For the English version, messages are displayed in English. The characters on the operation panel are the same as those of the English version.

Dimensions

● Handy terminal



How to order

Body model No. — Option model No.

AX0180 – **E**

Model No.

Code	Content
Blank	Standard (Japanese version)
E	English version

Handy terminal

Operation mode

Mode	Description
Edit mode	■ Program editing Equal division programs created interactively and operation programs created with NC codes are editted. Only one edited program can be saved. (Memory backup: 3 hours) After the equal division program is edited, parameters required for operation are edited. Up to 2000 letters are input for the NC program. Twelve sample programs are used for editting.
Display mode	■ I/O state and current position display The ABSODEX driver's input/output signal CN3's input/output status, the current motor position, and the alarm status, etc., are displayed.
Parameter mode	■ Parameter setting You can refer and set the parameters of the ABSODEX. * With the AX9000TS/AX9000TH serial communication option, you can set the station number, baud rate, etc.
Operation mode	■ Push-in operation commands Start and stop programs, execute one block, reset, set numbers, input and execute MDI data, communicate in terminal mode, brake ON and OFF, servo ON and OFF, return to origin, execute a JOG operation, set offset, etc.
Copy mode	■ Batch copying the programs All programs stored in the ABSODEX driver are stored in another driver.
Tuning mode	■ ABSODEX adjustment (AX9000TS only) Adjust the gain using the ABSODEX auto tuning function.

Interactive programming

You can easily write a program by inputting values for items as follows:

[Example of input values for a program]

New	Program No. [0 to 999]
Origin return position	1. Origin 2. Indexing
Return direction	1. CW 2. CCW 3. Shortcut
Return speed	[1.0 to 20.0] rpm
Number of segments	[1 to 255]
Travel time	[0.01 to 100] seconds
Rotation direction	1. CW 2. CCW
Stop processing	1. Wait for start 2. Dwell
Brake	1. Using the product 2. Vacant
Delay timer	[0.01 to 99.99] seconds
M Cord	1. M Cord 2. Segmentation position

When you want to...

Make a trial run of ABSODEX!	⇒	Edit mode 12 sample programs are provided. You can try them when making adjustment.
Write an ABSODEX program and store it into ABSODEX!	⇒	Edit mode You can input programming values and store the program by a simple procedure.
Run a program stored in ABSODEX!	⇒	Operation mode You can easily start a program by specifying the program No.
Make use of the characteristics of the cam curve!	⇒	Parameter mode 5 types of cam curves are provided. Driving operation taking advantages of the properties is one touch away.
Check the ON/OFF of I/O!	⇒	Display mode You can display the I/O status.

ABSODEX related parts model No. table

● Related parts

Part name	Compatible model No.	Model No.
PC communication cable	AX Series	AX-RS232C-9P

*1) The PC communication cable is 2 meters long.
*2) Start support tool "AX Tools" (free of charge) is available. The latest version can be downloaded from the following URL.
http://www.ckd.co.jp/

● Mounting base

Compatible model No.	Model No.
AX1022T	AX-AX1022-BASE-BS
AX1045T	AX-AX1045-BASE-BS
AX1075T	AX-AX1075-BASE-BS
AX1150T	AX-AX1150-BASE-BS
AX1210T	AX-AX1210-BASE-BS
AX2006T	AX-AX2006-BASE-BS
AX2012T	AX-AX2012-BASE-BS
AX2018T	AX-AX2018-BASE-BS

Compatible model No.	Model No.
AX4022T	AX-AX4022-BASE-BS
AX4045T	AX-AX4045-BASE-BS
AX4075T	AX-AX4075-BASE-BS
AX4150T	AX-AX4150-BASE-BS
AX4300T	AX-AX4300-BASE-BS
AX4500T	AX-AX4500-BASE-BS
AX6001M, AX6003M	AX-AX6000-BASE-BS
AX7022X, AX7045X	AX-AX7000-BASE-BS

● Power supply

Part name	Compatible model No.	Model No.
24 VDC power supply	AX9000MU	AX-PWR-SWD100P-24-C (*1)

*3) When purchased from CKD, this model comes with a power supply input cable (1 m) and power supply output cable (1 m).

● Noise filter

Part name	Compatible model No.	Model No.
Noise filter for power supply (Three phase/Single phase 200 to 230 VAC)	AX Series	AX-NSF-3SUP-EF10-ER-6
Noise filter for power supply (Single phase 250 VAC/15 A *2)	AX Series	AX-NSF-NF2015A-OD
Surge protector	AX Series	AX-NSF-RAV-781BXZ-4
Ferrite core for motor cable	AX Series	AX-NSF-RC5060ZZ
Clamp filter (set of 2)	AX6000M Series	AX-NSF-ZCAT2035-0930A

*4) With 250 VAC. Also available with 24 VDC power supply
*5) To make these products compliant with EU standards and CE marking or UL standards, the user is required to provide accessories such as a circuit breaker and FG clamp. For details, refer to the instruction manual or (technical data).

● Other parts

Part name	Compatible model No.	Model No.
Power supply connector (CN4)	XS, TS/TH Series	AX-CONNECTOR-PC45
Motor cable connector (CN5)	XS, TS/TH Series	AX-CONNECTOR-PC43
Power supply connector protective cover (CN4)	XS, TS/TH Series	AX-COVER-KGG-PC45
Motor cable connector protective cover (CN5)	XS, TS/TH Series	AX-COVER-KGG-PC43
I/O connector (CN3: For Parallel I/O)	AX Series (-U0, U1)	AX-CONNECTOR-MDR
I/O connector (CN3: For CC-Link)	AX Series (-U2)	AX-CONNECTOR-BLZ5
I/O connector (CN3: For DeviceNet)	AX Series (-U4)	AX-CONNECTOR-MSTB
Protection element for electromagnetic brake	AX Series (-EB)	AX-PARTS-TNR20V121K
Power supply connector set (with open tool)	AX9000MU Series	AX-CONNECTOR-04JFAT-KIT

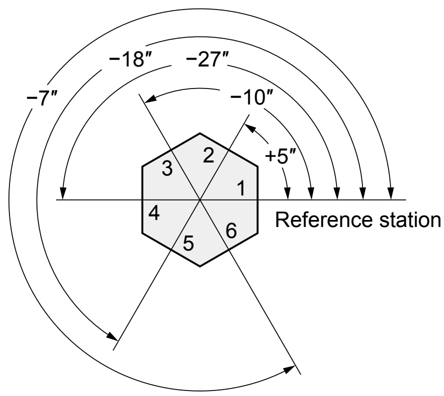
* The parts listed in this page are commercially available from CKD.

Glossary

Index accuracy

The index accuracy of ABSODEX is the difference between the target position set by an NC program and the actual stop position.
This target position is the angle (seconds) from the reference station (origin return position).
As shown in the right figure, the index accuracy is calculated using the maximum value and minimum value of the differences between the target positions and actual stop positions. These positions are expressed with ±x seconds and the width as shown in the figure.
For angle measurement, a high-precision encoder is used.

Index accuracy measurement example



Measurement positions	Measurements
1	0
2	+5″
3	−10″
4	−27″
5	−18″
6	−7″

Index accuracy ±16

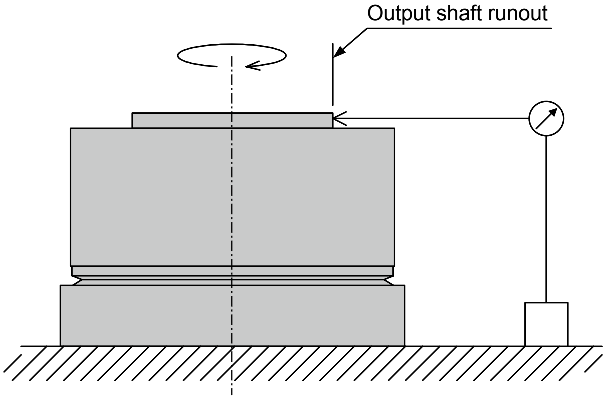
Repeatability

The repeatability expressed by angle (seconds) is the maximum value of angle irregularities of the repeat stop positions when reciprocating operation is performed for a certain target position under the same conditions.
The repeatability and the index accuracy must be used differently according to the accuracy characteristics required for the machine.

*Second: A unit (degree/minute/second) for expressing an angle.
1 degree = 60 minutes = 3600 seconds

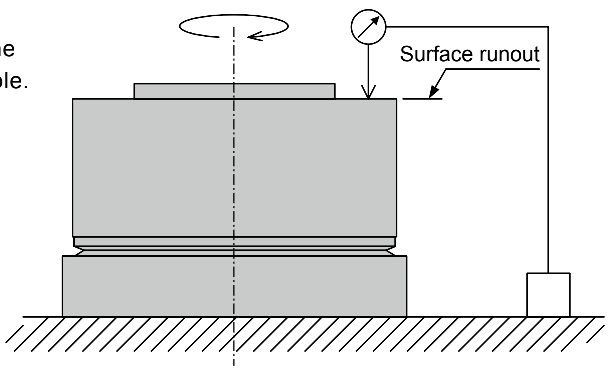
Output shaft runout

This the runout accuracy of the inlay side on the table mounting side.



Output shaft surface runout

This the runout accuracy of the table mounting side.
* Measured at the periphery of the screw hole for mounting the table.



Selection guide

Units and symbols of operation conditions	
Load moment of inertia (kg·m²)	J
Travel angle (°)	ψ
Travel time (s)	t_1
Cycle time (s)	t_0
Load friction torque (N·m)	T_F
Work torque (N·m)	T_W
Cam curve	Select from (MS, MC, MT, TR)

1. Moment of inertia of load

Calculate the moment of inertia of load and temporarily select an actuator that can allow the moment of inertia.

2. Rotation speed

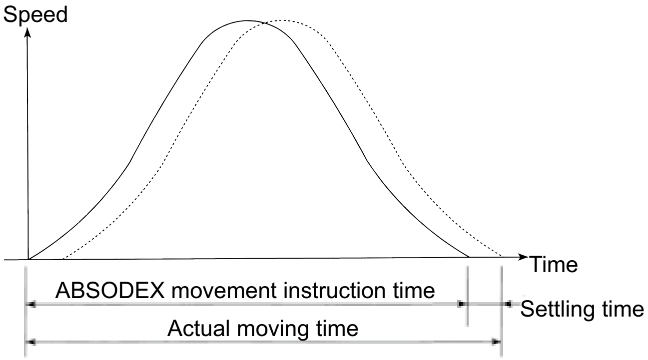
The max. rotation speed Nmax is obtained by the formula:

$$N_{max} = V_m \cdot \frac{\psi}{6 \cdot t_1} \quad \text{(rpm)}$$

Where ψ and t_1 represent travel angle (°) and travel time (s), respectively. V_m is a constant determined by the cam curve.

Check that the value of Nmax dose not exceed the max. rotation speed defined in the actuator specifications.

[Precautions]
The actual travel time is the directive travel time of the ABSODEX plus the stabilization time.



Though the stabilization time depends on working conditions, it is approximately between 0.025 and 0.2 seconds.
For the travel time t_1 in model selection, use the directive travel time of ABSODEX. Also, for setting the travel time with an NC program, use the directive travel time of ABSODEX.

(Note) The friction torque works on the output shaft by the bearing, sliding surface, and other friction. The friction torque can be obtained by the following relational expression:
$Tf = \mu \cdot Ff \cdot Rf$ (N·m)
$Ff = m \cdot g$
where μ: Coefficient of friction

Rolling friction	Sliding friction
μ = 0.03 to 0.05	μ = 0.1 to 0.3

Ff : Force working on the sliding surface, bearing, etc. (N)
Rf : Average friction radius (m)
m : Weight (kg)
g : Gravity acceleration (m/s²)

3. Load torque

a) The maximum load torque is obtained with the following formula.

$$T_m = [A_m \cdot (J+J_M) \cdot \frac{\psi \cdot \pi}{180 \cdot t_1^2} + T_F + T_W] \cdot fc + T_{MF}$$

b) The effective value of the load torque is obtained with the following formula.

$$T_{rms} = \sqrt{\frac{t_1}{t_0} \cdot [r \cdot A_m \cdot (J+J_M) \cdot \frac{\psi \cdot \pi}{180 \cdot t_1^2} \cdot fc]^2 + (T_F \cdot fc + T_W \cdot fc + T_{MF})^2}$$

The values in the following table are applied to Vm, Am and r.

Cam curve	V_m	A_m	r
MS	1.76	5.53	0.707
MC	1.28	8.01	0.500
MT	2.00	4.89	0.866
TR	2.18	6.17	0.773

J_M, T_{MF}, fc are as follows:
J_M : Output shaft moment of inertia (kg·m²)
T_{MF} : Output shaft friction torque (N·m)
fc : Used factor (For normal use: fc = 1.5)

For the temporarily selected actuator,
Max. load torque < Max. output torque
Effective value of load torque < Continuous output torque
If either of the above conditions is not met, re-calculate the load torque with a larger actuator.

Note) There is a torque limit region where the max. torque decreases at the time of high-speed rotation.
For use in the torque limit region, use the mode selection software to determine the availability of the device.

(Note) The work torque indicates an exterior load, expressed as torque, working as the load on the ABSODEX output shaft.

The work torque Tw is calculated by the following formula:
$T_W = F_W \times R_W$ (N·m)
F_W (N) : Necessary force for work
R_W (m) : Working radius
(Example)
For the body on its side (the output shaft in the horizontal direction), the table, workpiece, jigs and so forth are work torques.

4. Regenerative power

For AX9000TS/AX9000TH and AX9000XS drivers, calculate the regenerative power using the following simple formula and determine the availability.

● For AX9000TS/AX9000XS drivers

AX9000TS type drivers and AX9000XS type drivers do not come with a built-in regenerative resister.
Therefore, check that the value of the regenerative energy calculated by the simple formula below does not exceed energy chargeable with a capacitor (table below).

$$E = \left(\frac{V_m \cdot \psi \cdot \pi}{t_1 \cdot 180} \right)^2 \cdot \frac{(J+J_M)}{2} \ (J)$$

Power specifications	Processable regenerative energy (J)	Remarks
200 VAC	17.2	Value when the input voltage of the main power is 200 VAC
100 VAC (-J1)	17.2	Value when the input voltage of the main power is 100 VAC

If this condition is not met, contact CKD.

● For AX9000TH drivers

AX9000TH drivers have limitation on the consumption capability of the regenerative power in the driver.
The value is obtained by the following simple formula:

$$W = \left(\frac{V_m \cdot \psi \cdot \pi}{t_1 \cdot 180} \right)^2 \cdot \frac{(J+J_M)}{2 \cdot t_0} \ (W)$$

$W \leq 40$

If this condition is met, re-consider the operation conditions and load conditions.

[Working conditions]		[Operating conditions]	
Table radius	: R = 0.4 (m)	Travel angle	: ψ = 90 (°)
Table weight	: Wt = 79 (kg)	Travel time	: t_1 = 0.8 (s)
Radius of jig rotation	: Re = 0.325 (m)	Cycle time	: t_0 = 4 (s)
Jig weight	: Wj = 10 (kg/piece) (Including the workpiece weight)	Load friction torque	: T_F = 0 (N·m)
		Work torque	: T_W = 0 (N·m)
Number of jigs	: N = 4	Output shaft friction torque	: T_{MF} (N·m) According to the actuator specifications
		Cam curve	: MS (modified sine)

STEP 1
Calculating moment of inertia

a) Table $J_1 = \dfrac{W_t \times R^2}{2} = \dfrac{79 \times 0.4^2}{2} = 6.32$ (kg·m²)

b) Jig, workpiece $J_2 = N \times W_j \times R_e^2 = 4 \times 10 \times 0.325^2 = 4.225$ (kg·m²)

c) Sum of moment of inertia $J = J_1 + J_2 = 6.32 + 4.225 = 10.545$ (kg·m²)

STEP 2
Max. rotation speed

$$N_{max} = V_m \cdot \frac{\psi}{6 \cdot t_1} = 1.76 \times \frac{90}{6 \times 0.8} = 33 \text{ (rpm)}$$

Check that N_{max} does not exceed the maximum rotation speed of ABSODEX.

STEP 3
Load torque

At first, perform calculation for the smallest model that allows the moment of inertia of load.
The allowed moment of inertia of AX4300T is 180 (kg·m²), which means that this load is allowed.
Max. load torque

$$T_m = [A_m \cdot (J + J_M) \cdot \frac{\psi \cdot \pi}{180 \cdot t_1^2} + T_F + T_W] \cdot fc + T_{MF}$$

$$= [5.53 \times (10.545 + 0.326) \times \frac{90 \times \pi}{180 \cdot 0.8^2} + 0 + 0] \times 1.5 + 10$$

$$= 231.3 \text{ (N·m)}$$

Effective value of load torque

$$T_{rms} = \sqrt{\frac{t_1}{t_0} \cdot [r \cdot A_m \cdot (J + J_M) \cdot \frac{\psi \cdot \pi}{180 \cdot t_1^2} \cdot fc]^2 + (T_F \cdot fc + T_W \cdot fc + T_{MF})^2}$$

$$T_{rms} = \sqrt{\frac{0.8}{4} \times [0.707 \times 5.53 \times 10.871 \times \frac{90 \times \pi}{180 \cdot 0.8^2} \times 1.5]^2 + (0 \times 1.5 + 0 \times 1.5 + 10)^2}$$

$$= 70.7 \text{ (N·m)}$$

STEP 4
Regenerative power

$$W = \left(\frac{V_m \cdot \psi \cdot \pi}{t_1 \cdot 180}\right)^2 \cdot \frac{(J + J_M)}{2 \cdot t_0}$$

$$= \left(\frac{1.76 \times 90 \times \pi}{0.8 \times 180}\right)^2 \times \frac{10.871}{2 \times 4} = 16.23 \text{ (W)}$$

$W \leq 40$ (W)

STEP 5
Selection guide

Consider whether the temporarily selected AX4300T is available.

Sum of the moment of inertia of load	10.545 ≤ 180 (kg·m²)
Max. rotation speed	33 ≤ 100 (rpm)
Max. load torque	231.3 ≤ 300 (N·m)
Effective value of load torque	70.7 ≤ 100 (N·m)
Regenerative power	16.23 ≤ 40 (J)

Under these conditions, AX4300T is available.

[Working conditions]		[Operating conditions]	
Table radius	: R = 0.25 (m)	Travel angle	: ψ = 90 (°)
Table weight	: Wt = 10.6 (kg)	Travel time	: t_1 = 0.5 (s)
Radius of jig rotation	: Re = 0.2 (m)	Cycle time	: t_0 = 4 (s)
Jig weight	: Wj = 2 (kg/piece) (Including the workpiece weight)	Load friction torque	: T_F = 0 (N·m)
Number of jigs	: N = 4	Work torque	: T_W = 0 (N·m)
		Output shaft friction torque	: T_{MF} (N·m) According to the actuator specifications
		Cam curve	: MS (modified sine)

STEP 1
Calculating moment of inertia

a) Table $J_1 = \frac{W_t \times R^2}{2} = \frac{10.6 \times 0.25^2}{2} = 0.331$ (kg·m²)

b) Jig, workpiece $J_2 = N \times W_j \times R_e^2 = 4 \times 2 \times 0.2^2 = 0.32$ (kg·m²)

c) Sum of moment of inertia $J = J_1 + J_2 = 0.331 + 0.32 = 0.651$ (kg·m²)

STEP 2
Max. rotation speed

$$N_{max} = V_m \cdot \frac{\psi}{6 \cdot t_1} = 1.76 \times \frac{90}{6 \times 0.5} = 52.8 \quad \text{(rpm)}$$

Check that N_{max} does not exceed the maximum rotation speed of ABSODEX.

STEP 3
Load torque

At first, perform calculation for the smallest model that allows the moment of inertia of load.

The allowed moment of inertia of AX7045X is 0.90 (kg·m²), which means that this load is allowed.

Max. load torque

$$T_m = [A_m \cdot (J+J_M) \cdot \frac{\psi \cdot \pi}{180 \cdot t_1^2} + T_F + T_W] \cdot fc + T_{MF}$$

$$= [5.53 \times (0.651 + 0.0254) \times \frac{90 \times \pi}{180 \cdot 0.5^2} + 0 + 0] \times 1.5 + 2.5$$

$$= 37.8 \text{ (N·m)}$$

Effective value of load torque

$$T_{rms} = \sqrt{\frac{t_1}{t_0} \cdot [r \cdot A_m \cdot (J + J_M) \cdot \frac{\psi \cdot \pi}{180 \cdot t_1^2} \cdot fc]^2 + (T_F \cdot fc + T_W \cdot fc + T_{MF})^2}$$

$$T_{rms} = \sqrt{\frac{0.5}{4} \times [0.707 \times 5.53 \times 0.6764 \times \frac{90 \times \pi}{180 \cdot 0.5^2} \times 1.5]^2 + (0 \times 1.5 + 0 \times 1.5 + 2.5)^2}$$

$$= 9.2 \text{ (N·m)}$$

STEP 4
Regenerative power

$$E = \left(\frac{V_m \cdot \psi \cdot \pi}{t_1 \cdot 180}\right)^2 \cdot \frac{(J+J_M)}{2} \text{ (J)}$$

$$= \left(\frac{1.76 \times 90 \times \pi}{0.5 \times 180}\right)^2 \times \frac{0.6764}{2} = 10.3 \text{ (J)}$$

$E \leq 17.2$ (J)

STEP 5
Selection guide

Consider whether the temporarily selected AX7045X is available.

Sum of the moment of inertia of load	0.651 ≤ 0.90 (kg·m²)
Max. rotation speed	52.8 ≤ 240 (rpm)
Max. load torque	37.8 ≤ 45 (N·m)
Effective value of load torque	9.2 ≤ 15 (N·m)
Regenerative power	10.3 ≤ 17.2 (J)

With these conditions, AX7045X is available.

Selection guide (2)

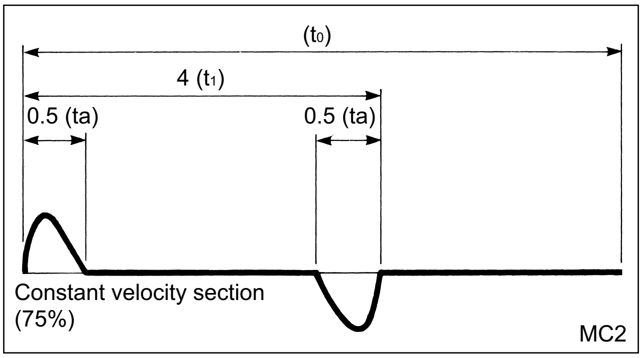
For model selection for "MC2 curve"

What is MC2 curve?

The MC2 curve is a cam curve for which the constant velocity interval can be freely set by setting the acceleration/deceleration time while there is a constant velocity interval during travel, as is the case with an MC (modified constant) curve.
For an MC (generic term: MCV50) curve, the percentage of the constant velocity interval is 50%.

Note: The setting of the acceleration/deceleration time is 1/2 or less of the travel time. When the setting of the acceleration/deceleration time exceeds 1/2 of the travel time, the cam curve is automatically changed to the MS (modified sine) curve.

The example diagram shows the velocity pattern when the percentage of the constant velocity interval is 75% by setting the acceleration/deceleration time (ta) to 0.5 seconds for the 4 seconds of the travel time (t_1).



Selection method

For the MC2 curve, the formula below is used to select a model.

Travel angle	:	ψ (°)
Cycle time	:	t_0 (s)
Travel time	:	t_1 (s)
Acceleration/deceleration time	:	ta (s)
Load moment of inertia	:	J (kg·m²)
Output shaft moment of inertia	:	J_M (kg·m²)
Friction torque	:	Tf (N·m)
Work torque	:	T_w (N·m)
Output shaft friction torque	:	T_{MF} (N·m)

Max. rotation speed: Nmax (rpm)

$$\text{Nmax} = \frac{\psi}{6\,(t_1 - 0.863ta)}$$

Load torque (max. value): T_m (N·m)

$$Tm = \left[5.53\,(J+J_M) \cdot \frac{\psi \cdot \left(1 - \dfrac{t_1 - 2ta}{t_1 - 0.863ta}\right) \cdot \pi}{720 \cdot ta^2} + Tf + T_w \right] \cdot fc + T_{MF}$$

Load torque (effective value): Trms (N·m)

$$Trms = \sqrt{\frac{2ta}{t_0} \cdot \left[3.91\,(J+J_M) \cdot \frac{\psi \cdot \left(1 - \dfrac{t_1 - 2ta}{t_1 - 0.863ta}\right) \cdot \pi}{720 \cdot ta^2} \cdot fc \right]^2 + \left[(Tf+T_w) \cdot fc + T_{MF}\right]^2}$$

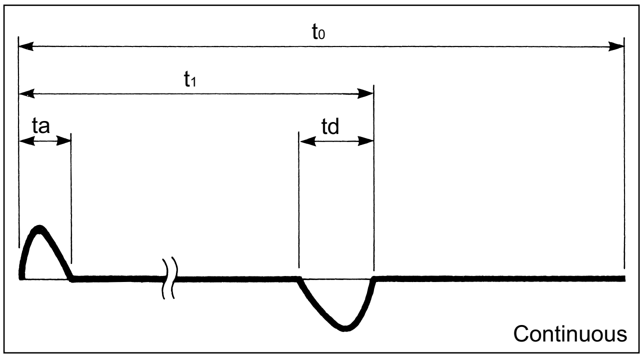
For model selection for "Continuous rotation"

What is continuous rotation?

The continuous rotation has the following functions.

1. Continuous rotation : Rotation continues at a constant rotation speed until the continuous rotation stop input is input.
2. Stop at equal segment position : With the equal segment specified, the device stops at the equal segment position by a continuous rotation stop input.

The example diagram shows the velocity pattern where the motor is accelerated at the acceleration time: ta up to the set rotation speed: N, and then stopped, by a continuous rotation stop input, at the deceleration time: td.



Selection method

For the continuous rotation, the formula below is used to select a model.

Rotation speed	:	N (rpm)
Cycle time	:	t_0 (s)
Acceleration time	:	ta (s)
Deceleration time	:	td (s)
Load moment of inertia	:	J (kg·m²)
Output shaft moment of inertia	:	J_M (kg·m²)
Friction torque	:	Tf (N·m)
Work torque	:	T_w (N·m)
Output shaft friction torque	:	T_{MF} (N·m)

Max. rotation speed: Nmax (rpm) (*1)
Nmax = N

Load torque (max. value): Tm (N·m)

$$Tm = \left[5.53\,(J+J_M) \cdot \frac{6.82N \cdot ta \cdot \pi}{720 \cdot ta^2} + Tf + T_w \right] \cdot fc + T_{MF}$$

Load torque (effective value): Trms (N·m)

$$Trms = \sqrt{\frac{2ta}{t_0} \cdot \left[3.91\,(J+J_M) \cdot \frac{6.82N \cdot ta \cdot \pi}{720 \cdot ta^2} \cdot fc \right]^2 + \left[(Tf+T_w) \cdot fc + T_{MF}\right]^2}$$

The formula above is applicable when ta ≤ td. When ta > td, replace ta with td for perform selection.

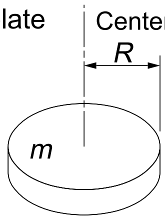
*1) At the time of continuous rotation, the maximum rotation speed is limited. Use the device according to the actuator specifications.

Formulas of moment of inertia

(m : Weight of object (kg))

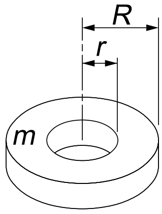
● A When rotation center is own shaft

1. Circular plate (cylinder)



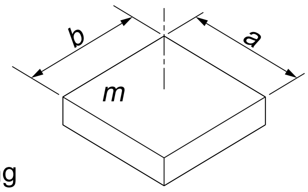
$$J = \frac{mR^2}{2}$$

2. Hollow circular plate (hollow cylinder)



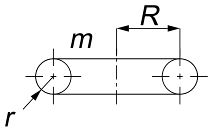
$$J = \frac{m\,(R^2 + r^2)}{2}$$

3. Cuboid



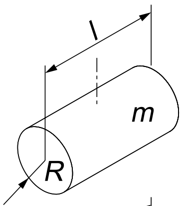
$$J = \frac{m\,(a^2 + b^2)}{12}$$

4. Ring



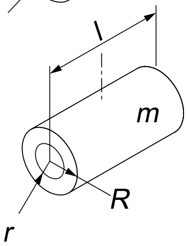
$$J = \frac{m\,(4R^2 + 3r^2)}{4}$$

5. Cylinder



$$J = \frac{m\,(3R^2 + l^2)}{12}$$

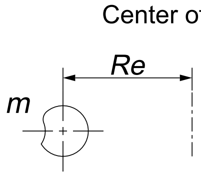
6. Hollow cylinder



$$J = \frac{m\,(R^2 + r^2 + l^2/3)}{4}$$

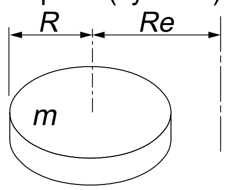
● B When rotation center differs from own shaft

1. Any shape (if sufficiently small)



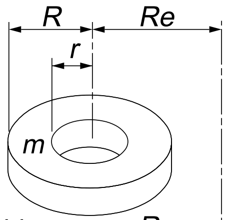
$$J = mRe^2$$

2. Circular plate (cylinder)



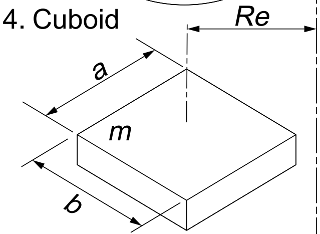
$$J = m\left(\frac{R^2}{2} + Re^2\right)$$

3. Hollow circular plate (hollow cylinder)



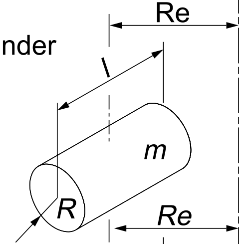
$$J = m\left(\frac{R^2 + r^2}{2} + Re^2\right)$$

4. Cuboid



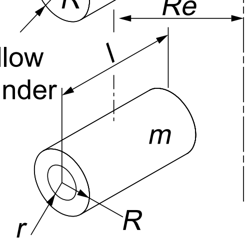
$$J = m\left(\frac{a^2 + b^2}{12} + Re^2\right)$$

5. Cylinder



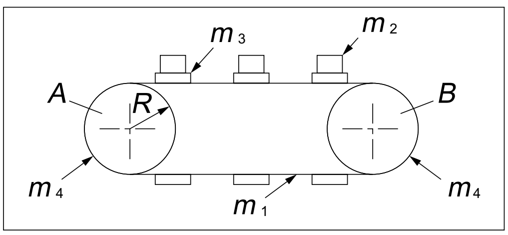
$$J = m\left(\frac{3R^2 + l^2}{12} + Re^2\right)$$

6. Hollow cylinder



$$J = m\left(\frac{R^2 + r^2 + l^2/3}{4} + Re^2\right)$$

● For conveyor



m_1 : Chain weight

m_2 : Workpiece total weight

m_3 : Jig (pallet) total weight

m_4 : Sprocket A (drive) + B total weight

R : Drive side sprocket radius

$$J = \left(m_1 + m_2 + m_3 + \frac{m_4}{2}\right) \cdot R^2$$

ABSODEX selection guide specifications check sheet Table direct drive		(Note) Contact CKD for chain drives and gear drives.	
Company name		Your name	
Division			
TEL		FAX	

■ Operating conditions

1. Index 2. Oscillator
Movement angle Ψ (°) — or No. of indexes
Movement time t_1 (sec.)
Cycle time t_0 (sec.) — cycle time=moving time+dwelling time

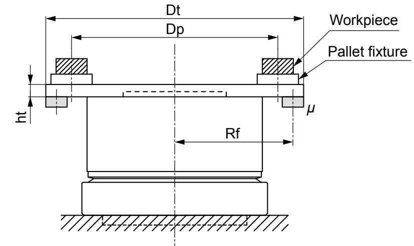
(Note) Index time is movement time + settling time.
The settling time differs according to the working condition, but generally is between 0.025 and 0.20 s.

■ Load conditions

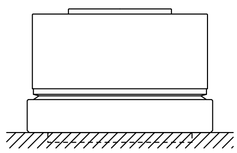
Table
- Material — 1. Steel 2. Aluminum
- Outline — Dt (mm)
- Plate thickness — ht (mm)
- Weight — m1 (kg)

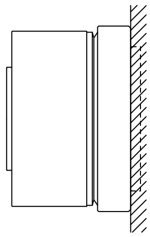
Workpiece
- Quantity nw (pc.)
- Max. weight mw (kg/pc.)
- Installation center Dp (mm)

Pallet fixture
- Quantity np (pc.)
- Max. weight mp (kg/pc.)



(Fig. 1) Load conditions


(Fig. 2) Installation position: Horizontal


(Fig. 3) Installation position: Vertical

■ Other load conditions

Installation position
- 1. Horizontal (Fig.2) 2. Vertical (Fig. 3)

Extemal job
- 1. None 2. Available
- (Note) Eccentric load caused by gravity from vertical installation, extemal load caused by caulking work

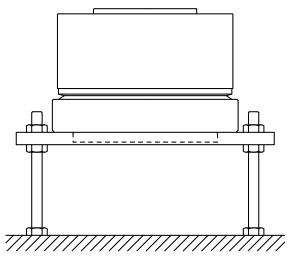
Dial plate support form bottom
- 1. None 2. Available
- Coefficient of friction μ
- Work radius Rf (mm)

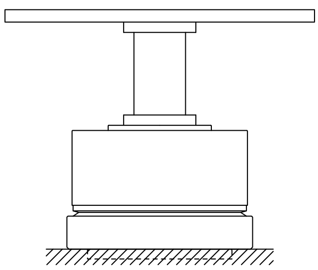
Device rigidity
- 1. High 2. Low (Note)
- (Note) When using a spline, when unit cannot be fixed directly onto the device (Fig. 4), when there is a mechanism such as a chuck on the table.

Extension with table shaft
- 1. None 2. Available (Fig. 5)

Actuator movement
- 1. None 2. Available
- (Note) When actuator is mounted on X-Y table or vertical mechanism, etc., and mounted actuator moves

(Note) If 2 is selected for any item, contact CKD.


(Fig. 4) Installation rigidity: Low


(Fig. 5) Extension with shaft

(Note) Attach system outline and reference drawings so that the optimal model can be selected.

■ Use conditions, environmental conditions (Optional)

Actuator ambient temperature (°C)
Motor cable length (m)

Driver ambient temperature (°C)
24 VDC power supply cable length (m)
24 VDC power supply coil diameter (mm^2)
24 VDC power supply voltage accuracy (%)
24 VDC line point of contact quantity (pc.)
24 VDC line point of contact resistance (mΩ / pc.)

* You can do a more rigorous selection by filling in this field.
* With a power supply cable 1.25 mm² or more, please use one as short (recommended length 1 m or less) as possible.
* If the output voltage is low in a power supply with voltage adjustment, please adjust it to 24 V and use it.

MEMO

Safety Precautions

Always read this section before use.

When designing equipment using ABSODEX, the manufacturer is obligated to ensure that the safety of the mechanism and the system that runs by the electrical controls are secured.
It is important to select, use, handle and maintain the product appropriately to ensure that the CKD product is used safely. Observe warnings and precautions to ensure device safety.
Check that device safety is ensured, and manufacture a safe device.

WARNING

1 This product is designed and manufactured as a general industrial machine part.
It must be handled by an operator having sufficient knowledge and experience.

2 Use the product within specifications range.

This product must be used within its stated specifications. In addition, never modify or additionally machine this product.
This product is intended for use as a device or part for general-purpose industrial machinery. It is not intended for use outdoors or for use under the following conditions or environment.
(Note that this product can be used when CKD is consulted prior to use and the customer consents to CKD product specifications. The customer must provide safety measures to avoid risks in the event of problems.)

❶ Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency operation (cutoff, release, etc.) circuits, press machines, brake circuits, or safety devices or applications.
❷ Use for applications where life or assets could be adversely affected, and special safety measures are required.

3 Observe organization standards and regulations, etc., related to the safety of the device design.

4 Do not remove devices before confirming safety.

❶ Inspect and service the machine and devices after confirming the safety of the system by for instance turning off the nearby devices and connected devices.
❷ Note that there may be hot or charged sections even after operation is stopped. Be careful when handling devices at the time of inspection and servicing.
❸ When inspecting or servicing the device, turn off the device and the power to the facility. Discharge any compressed air from the system, and pay close attention to possible water leakage and leakage of electricity during inspection and servicing.

5 Observe the instructions and cautions of each product to prevent accidents.

❶ When the device is off, do not turn the output shaft of the actuator to a speed exceeding 30 rpm.
The power generation of the actuator may damage the driver or may cause electrical shock.
❷ Servo off (including emergency stop and alarm) or brake off with rotational force being applied, e.g. by gravity, may cause the output shaft to rotate due to turning force.
Operate the actuator in the balanced condition so that no rotational force is applied for these operations or after safety is confirmed.
❸ Keep hands away from the output shaft, as sudden motion may take place during gain adjustments or trial run. When operating the actuator from a position in which motion cannot be confirmed, make sure that safety is assured when the output shift is rotated beforehand.
❹ The brake built-in actuators do not completely clamp the output shaft in all cases.
The built-in brake alone is not enough to secure safety when performing maintenance in applications in which the output axis may rotate due to an unbalanced load, or when the machine is stopped for an extended period of time. Be sure that the equipment is in a balanced state or provide a mechanical locking mechanism.
❺ It may take several seconds to stop in an emergency depending on rotation speed and load.

6 Observe the following precautions to prevent electric shock.

❶ The power terminals on the front side of the driver and the motor cable connection terminals are high voltage parts. For the terminal blocks, make sure to install the attached terminal cover. Do not touch the actuator and the driver while the power supply is on.
Immediately after the power is turned off, high voltage is applied, so also do not touch them for 5 minutes or more, until the electrical charge accumulated in the capacitor inside the driver is released.
❷ For operations with the side cover removed, such as maintenance and inspection or change of the switch inside the driver, make sure to turn off the actuator and release the electrical charge for 5 minutes or more before work; otherwise, an electric shock may occur from the high-voltage device.
❸ Do not attach or remove any connectors with the power supply on. Doing so may cause malfunction, failure, or electric shock.

7 Before restarting the machine and devices, confirm that measures are taken to prevent the loaded objects from being removed.

8 Install an overcurrent protective device.

The wiring to the driver should be in accordance with JIS B 9960-1:2008 Safety of Machinery - Electrical Equipment of Machines - Part 1: General Requirements. Install an overcurrent protector (a circuit protector or a shutoff mechanism for wiring) for the main power supply, control power supply, and power supply for I/O.
(Excerpt from JIS B 9960-1 7.2.1 General matters)
If the circuit current inside the machine (electric apparatus) may exceed the rated value of the components or the allowable current of the conductor, whichever is the smaller, overcurrent protection must be implemented. 7.2.10 defines the rated value or set value that should be selected.

9 Observe the precautions on the following pages to prevent accidents.

■ The precautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.

⚠ DANGER: When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, and when there is a high degree of emergency to a warning.

⚠ WARNING: If handled incorrectly, a dangerous situation may occur, resulting in death or serious injury.

⚠ CAUTION: When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. Every item provides important information and must be observed.

Warranty

Terms of warranty

The warranty period and the scope of warranty are described below.

1. Warranty period

The warranty of this product is valid for one (1) year after delivery to the customer's designated site. (However, the period assumes eight hours of operation per day. As well, if the durability limit is reached within one year, the period to the durability limit is the warranty period.)

2. Scope of warranty

If failure is caused in the above warranty period due to poor workmanship of our product, we will repair the product free of charge without delay.
This Limited Warranty will not apply to:
① Operation under the conditions or in the environment derailing from those specified in the product specifications.
② Failure caused by lack of attention or erroneous control.
③ Failure resulting from factors other than the delivered product.
④ Failure caused by improper use of the product.
⑤ Failure caused by modification in the structure, performance, specification, or failure caused by repairs done by other than our designated contractor.
⑥ Losses which would have been avoided if your machine or equipment to which the ABSODEX product is assembled were provided with general functions, structures or other features common in the industry.
⑦ Failure caused by matters that could not be predicted with the technologies in practice when the product was delivered.
⑧ Failure caused by fire, earthquake, flood, lightning, or other natural disasters, earth shock, pollution, salt hazard, gas intoxication, excessive voltage, or other external causes.

The warranty covers the actual delivered product, as a single unit, and does not cover any losses induced by failure of the delivered product.

3. Warranty of product exported outside Japan

(1) We will repair products sent back to our factory or a company or factory designated by us. Work and cost necessary for transportation shall not be compensated for.
(2) The repaired product will be packed according to the domestic packing specifications and delivered to a designated site inside Japan.

These are the basic terms of warranty. Priority will be given to specification drawings and specification sheets if the warranty description given on such specification drawings or specification sheets is different from the warranty terms given herein.

4. Compatibility confirmation

The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines and equipment.

⚠CAUTION Design/selection

1 The actuators and drivers are not waterproof. Provide waterproofing when using them where they may come in contact with water or oil.

2 Dust and cuttings gathered on the actuator or driver may cause earth leakage or failure. Check that these do not come in contact with the product.

3 Repeatedly turning power on and off may cause damage to the elements inside the driver.

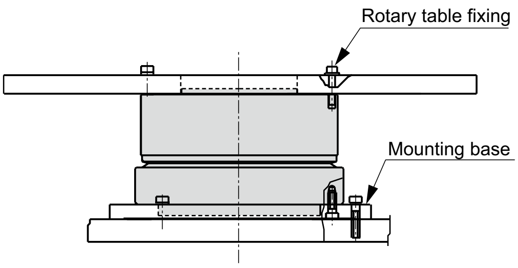
4 If power is turned off and servomotor turnoff is executed while the servomotor is on (holding), the output shaft may move from the held position even without external force.

5 The optional electromagnetic brake is provided to increase the holding rigidity when stopping the output shaft.
Do not use it to brake or stop the rotating output shaft.

6 Actuators and drivers do not guarantee rustproofing. Give careful consideration to storage, installation, and environment.

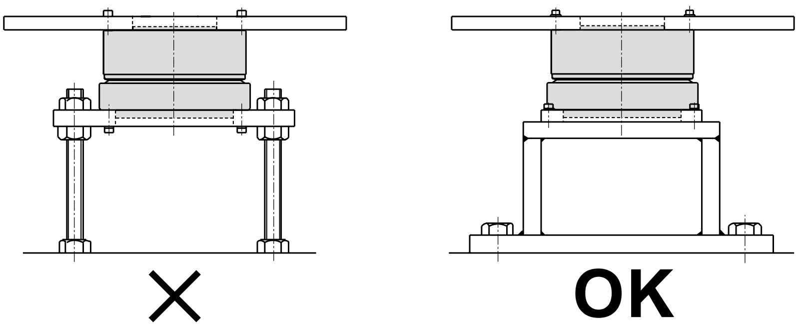
7 Equipment with ABSODEX products installed should have sufficient rigidity to realize full ABSODEX performance. If the load equipment or frame's mechanical unique vibration is relatively low (approx. 200 to 300 Hz or less depending on the equipment), resonance could occur in the ABSODEX product and load equipment or frame. Secure the rotary table and main unit installation bolts, and ensure sufficient rigidity without loosening, etc. [Fig. 1]

[Fig. 1] Actuator installation



Gain must be adjusted based on load table size, etc.
Even when the ABSODEX product is not directly installed, it should be installed on a highly rigid frame. [Fig. 2]

[Fig. 2] Actuator attachment



8 When extending the output shaft, refer to the references given in Table 1 for the extended shaft's diameter and length. In addition, add dummy inertia by using Fig. 3 as a reference.

[Table 1] Extended output shaft's diameter guideline

Max. torque [N·m]	Shaft extension (mm) TS/TH/XS				
	50	100	200	300	500
6	φ35	φ40	φ46	φ50	φ60
9, 12	φ40	φ46	φ55	φ60	φ70
18, 22	φ45	φ55	φ65	φ70	φ80
45	φ55	φ65	φ75	φ85	φ95
75	φ62	φ75	φ90	φ95	φ110
150	φ75	φ90	φ110	φ115	φ130
210	φ80	φ95	φ115	φ125	φ140
300	φ90	φ105	φ125	φ140	φ155
500	φ100	φ120	φ145	φ160	φ180
1000	φ120	φ140	φ170	φ185	φ210

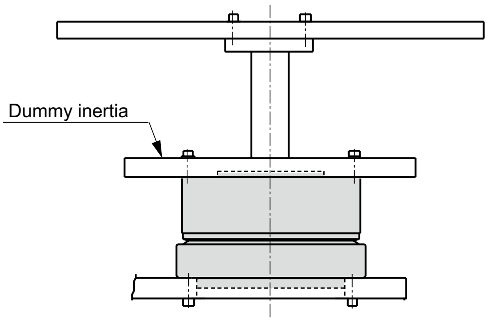
Max. torque [N·m]	Shaft extension (mm) MU	
	50	100
1.2	φ35	φ40
3	φ35	φ40

Note) The figures in the above table are extended output shaft's diameter references for steel materials (solid shafts).
Contact CKD for references for other materials and hollow shafts.

9 If sufficient rigidity cannot be attained, machine resonance is suppressed to some degree by installing dummy inertia as close to the actuator as possible.
Examples of adding dummy inertia are shown below.

- As a reference, dummy inertia is [load inertia] × (0.2 to 1). [Fig. 3]

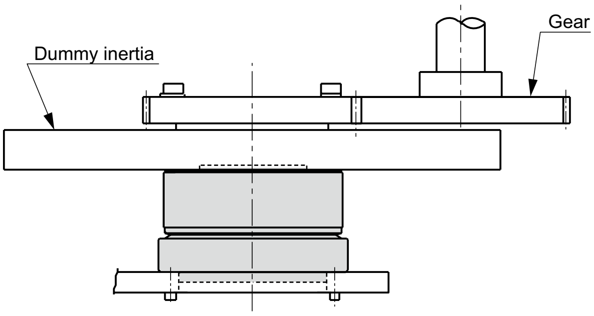
[Fig. 3] Dummy inertia installation example 1



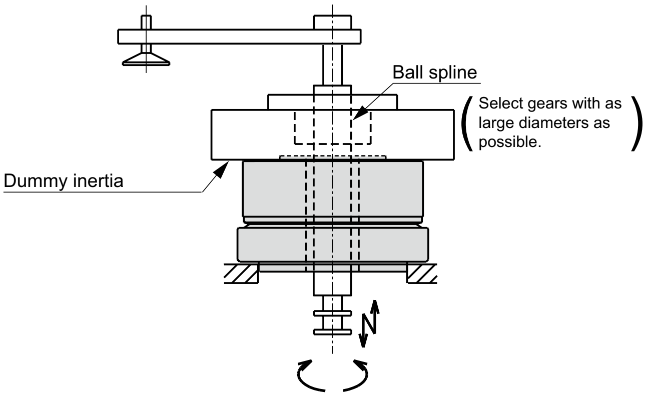
- When coupling with a belt, gears, or spline, or when joining with a key, dummy inertia should be [load inertia] × (0.5 to 2).
- If speed changes with belts or gears, use load inertia as the actuator output shaft conversion value, and install dummy inertia on the actuator. [Fig. 4] [Fig. 5]

(CAUTION) Install dummy inertia as large as possible within the actuator’s capacity. (Use steel that has a large specific gravity.)

[Fig. 4] Dummy inertia installation example 2



[Fig. 5] Dummy inertia installation example 3



10 A resolver (magnetic position detector) is built into the ABSODEX product.
Do not place strong magnetic fields such as rare earth magnets near the actuator. Do not pass high-current wiring through the hollow hole. If you do, the full performance may not be achieved, and malfunction or fault may result.

11 We recommend that you install a surge protector if there is a possibility that the device may fail due to lightning-induced surges.

For other precautions, check the materials below.

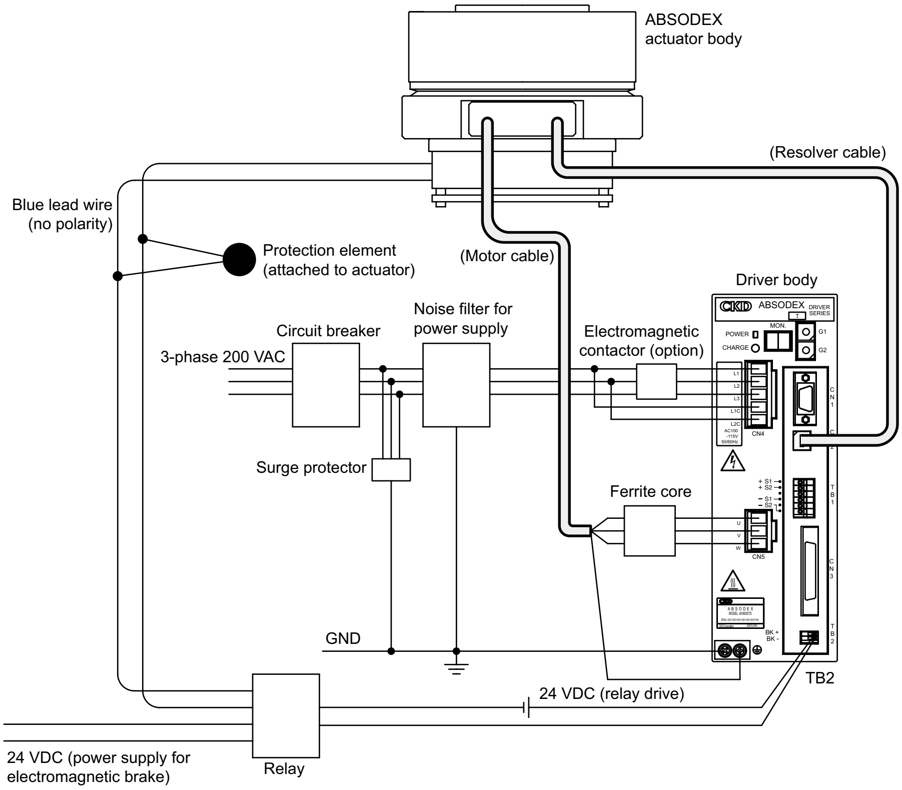
1. On the Internet
   AX_T Data Download
   http://catalog-search.ckd.co.jp/
   • Instruction manuals, supplementary explanations

2. Please request the following materials:
   ABSODEX AX Series TS/TH/XS Type Technical Data
   ABSODEX AX Series MU Type Technical Data

⚠CAUTION Design/selection

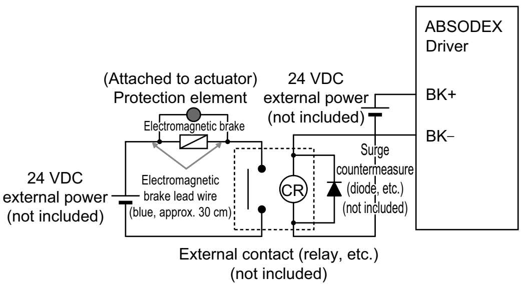
12 Electromagnetic brake connection

AX4000T-EB



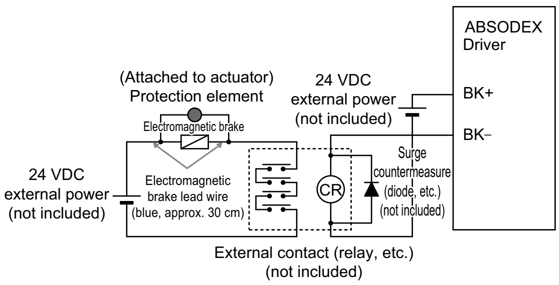
1) Do not use the electromagnetic brake to brake or stop the rotating output shaft.
2) Connecting the BK+ or BK- of the driver directly with the electromagnetic brake damages the driver.
3) To connect induction loads such as the relay shown below to the external contact, use ones with a rated coil voltage of 24 VDC and a rated current within 100 mA, and take a surge suppression measure.

Recommended circuit for electromagnetic brake



- Operating method
1. Control by the NC program (M68/M69)
   When the "M68" code is executed, the current is stopped (brake activated) across BK+ and BK-, and when the "M69" code is executed, the current flows (brake released).
2. Control by brake release input (I/O connector, 18 pin)
   With the brake activated, when brake release is input, the current flows (brake released) across BK+ and BK−.
- When the electromagnetic brake is operated frequently (number times turned on/off), use a solid state relays (SSR) for the external contact.
  Recommended model G3NA-D210B DC5-24 (OMRON)
  Read the instruction manual of SSR before use.

• For serial connection to relay contacts



- Use a relay with the contact capacity of 10 times or more the rated current. For relays with less capacity than the above, use a multi-polar relay for two or more relay contacts to be serially connected. Connection in this way can extend the lifetime of the contact of the relay having contacts.

13 To pass a shaft through the hollow of the model equipped with an electromagnetic brake, use a non-magnetic material (such as SUS303). If a magnetic material (such as S45C) is used, the shaft will be magnetized, causing stuck iron powder on the equipment or giving magnetic effects on peripheral devices.

14 Note that the magnetic force of the electromagnetic brake may cause stuck iron powder or effects on measuring instruments, sensors or other devices.

15 For other precautions, refer to the instruction manual (technical data).

Safety precautions for

Labor saving mechanisms

Always read this section before use.

⚠CAUTION Mounting, installation and adjustment

1 Use the dedicated cable for connecting the driver to the actuator. Changing the length or the material of the dedicated cable may deteriorate or damage the function.

2 Connect the correct power supply. Connecting a non-designated power supply could cause failure. When reconnecting the power, wait more than 10 seconds after the power is turned off (first confirm that the motor output shaft has stopped).

3 Securely fix the ABSODEX product to the machine and securely install loads such as the table before adjusting gain. Confirm that no interference occurs and the movable parts are in a safe state when are rotated.

4 Do not tap the output shaft with a hammer, or assemble it forcibly. Doing this would prevent the expected accuracy or functions, and could cause failure.

5 Do not place strong magnetic fields such as rare earth magnets near the actuator. It may not be able to maintain expected accuracy.

6 The actuator may become hot depending on operating conditions. Provide a cover so that it will not be touched by accident.

7 The driver surface may become hot depending on operating conditions. Put it inside the switchboard so that it cannot be touched.

8 Do not drill holes into the actuator. Contact CKD when machining is required.

9 Please do not perform maintenance work on the actuator, the rotary table attached to the actuator or other moving parts.

10 About combining the actuator and driver
- If the actuator and driver are not combined correctly after program input (parameter setting), alarm 3 will be generated. Check the actuator and driver combination.
  (Note) Alarm 3 occurs to prevent malfunction if the actuator and driver combination differs from when the program was input. Alarm 3 is reset when the program and parameters are input again.
- If operation is started with an incorrect actuator and driver combination after the program input (after parameter setting), malfunction could occur or equipment be damaged.
- When changing the cable length, order the cable separately.
- If a driver other than the compatible driver is connected, the actuator may burnout.

11 When using a circuit breaker, select one that has higher frequency measures for inverter use.

12 The position of the output shaft in the actuator dimension drawing does not indicate the actuator's origin. When using it at the output shaft shown in dimension drawings, the origin must be adjusted by the origin offset function.

13 The cables for the AX4009T, AX2000T, AX6000M Series, and AX7000X Series are not movable cables. Make sure to fix the cable in the connector section to prevent the cable from moving. Do not pull the lead-out cable to lift the unit or do not apply an excessive force to the cable. Otherwise, malfunction, an alarm, damage of the connector part, or disconnection may result.

14 For additional notes and conditions of compatibility with international standards, please refer to the technical data (ABSODEX AX Series TS/TH/XS Type Technical Data, ABSODEX AX Series MU Type Technical Data).

15 When the lead-put cable or connector of the actuator is pulled forcibly, the drawer cable shield braided wire may be exposed.

⚠CAUTION During Use & maintenance

1 Do not pull the cable forcibly, apply excessive force to it, or damage it.

2 Do not overhaul the actuator unit, as original functions may not be restored. In particular, taking apart the rotational position detection unit may cause malfunction or accuracy degradation.

3 When testing the withstand voltage of the machine or equipment incorporating an ABSODEX product, disconnect the main power cable from the ABSODEX driver and check that the voltage is not applied to the driver. Otherwise, failure may occur.

4 If alarm "4" (actuator overload: electronic thermal) is generated, wait for the actuator to sufficiently cool down before restarting.
Alarm "4" could occur in the cases below. Remove the cause before resuming use.
- Resonance or vibration: Ensure sufficient installation rigidity.
- Tact or speed: Increase movement time or stopping time.
- Structure that locks the output shaft: Add M68 and M69 commands.

5 Actuator coordinates are recognized after power is turned on, so check that the output shaft does not move for several seconds after power is turned on.

6 For additional notes and troubleshooting for the alarm display, please refer to the technical data (ABSODEX AX Series TS/TH Type Technical Data, ABSODEX AX Series MU Type Technical Data).

For other precautions, check the materials below.

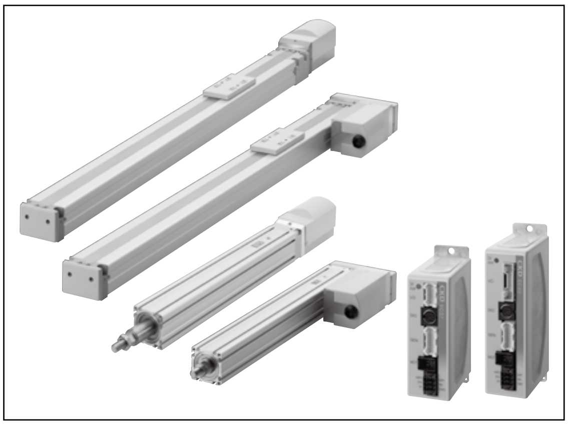
1. On the Internet
   http://catalog-search.ckd.co.jp/
   • Instruction manuals, supplementary explanations

2. Please request the following materials:
   ABSODEX AX Series TS/TH/XS Type Technical Data
   ABSODEX AX Series MU Type Technical Data

Related products

Electric actuator ERL2/ESD2 Series

Catalog No. CC-1219A



■ Selectable motor mounting direction
Left, right, and downward mounting directions added to the conventional straight type

■ More controller models
The "Pulse train input" controller was added to the conventional "7 point positioning" and "63 point positioning"

■ Easy setting tool
Easy PC setting software (E Tools) added to teaching pendant (ETP2)

■ Fully interchangeable
"Full Interchangeability" enables free combination of actuators and controllers

Electric actuator Motorless

Catalog No. CC-1165A, CC-1216A, CC-1217A, CC-1257A

■ Ball screw drive ETS Series
- Motor size: 8 types, lead: 7 types, motor mounting direction: 5 types
- Mount a motor you're familiar with
- Mounting specifications for origin sensor and limit sensor can also be selected
- Stroke length can be selected from 100 to 1500 mm (50 mm pitch)
- Max. load capacity is 150 kg, max. speed is 2000 mm/s for support of a wide range of applications

■ Belt drive ETV Series
- Belt drive based on the ETS Series.
- Stroke lengths of 100 to 3500 mm (50 mm pitch) can be selected; max. speed 2000 mm/s and long stroke/high speed are achieved.
- Motor size: 6 types, motor mounting direction: 6 types
- Mount a motor you're familiar with

■ Ball screw drive low dust specifications ECS Series
- Based on the ETS Series, low dust generation is achieved by a full cover structure and vacuum port.
- Motor size: 7 types, lead: 7 types, motor mounting direction: 5 types
- Mount a motor you're familiar with
- Mounting specifications for origin sensor and limit sensor can also be selected
- Stroke length can be selected from 100 to 1500 mm (50 mm pitch)
- Max. load capacity is 150 kg, max. speed is 2000 mm/s for support of a wide range of applications

■ Belt drive Low dust specifications ECV Series
- Based on the ETV Series, low dust generation is achieved by a full cover structure and vacuum port.
- Motor size: 6 types, motor mounting direction: 6 types
- Mount a motor you're familiar with

Electric actuator KBX Series

Catalog No. CC-1287A

■ High tact
Max. 2000 mm/s (timing belt drive)

■ High precision
Repeatability: ±0.01 mm (ball screw drive)

■ All models are absolute types
Long service life lithium batteries (50,000 hour life) are used and all models do not require to return to home position

■ High level processing with a high speed CPU
High level processing is achieved due to a high speed CPU

■ Wide variation
8 types of ball screws, 7 types of timing belts
4 directions selectable for each axis for motor mounting position

Electric shuttle mover ESM Series

Catalog No. CC-1259A

■ Single axis two dimension transfer/space saving with only one motor

Two dimension movement is achieved without using multi-axis or a gantry robot. Space can be utilized as desired. Space saving is also possible as desired.

■ Long stroke, max. 20 m

Features a long stroke that changes conventional ideas of electric actuators. ESM will solve your problems before you even consider using a linear motor.

■ Multi-point positioning/soft start and stop

Electric actuators are good at multi-point positioning, acceleration and deceleration setting or changing operation speed. This includes the ESM.

■ Compatible with other manufacturers' motors

Mount a motor you're familiar with. Similar to the other motorless series, brackets compatible with other manufacturers' motors are available.

Electric actuator ESSD/ELCR Series

Catalog No. CC-1002A

■ Space saving

Built-in controller eliminates the need for controller installation space and wiring.

■ Installation similar to a pneumatic cylinder

Design resembles a pneumatic cylinder in every way, from appearance to configuration and control.

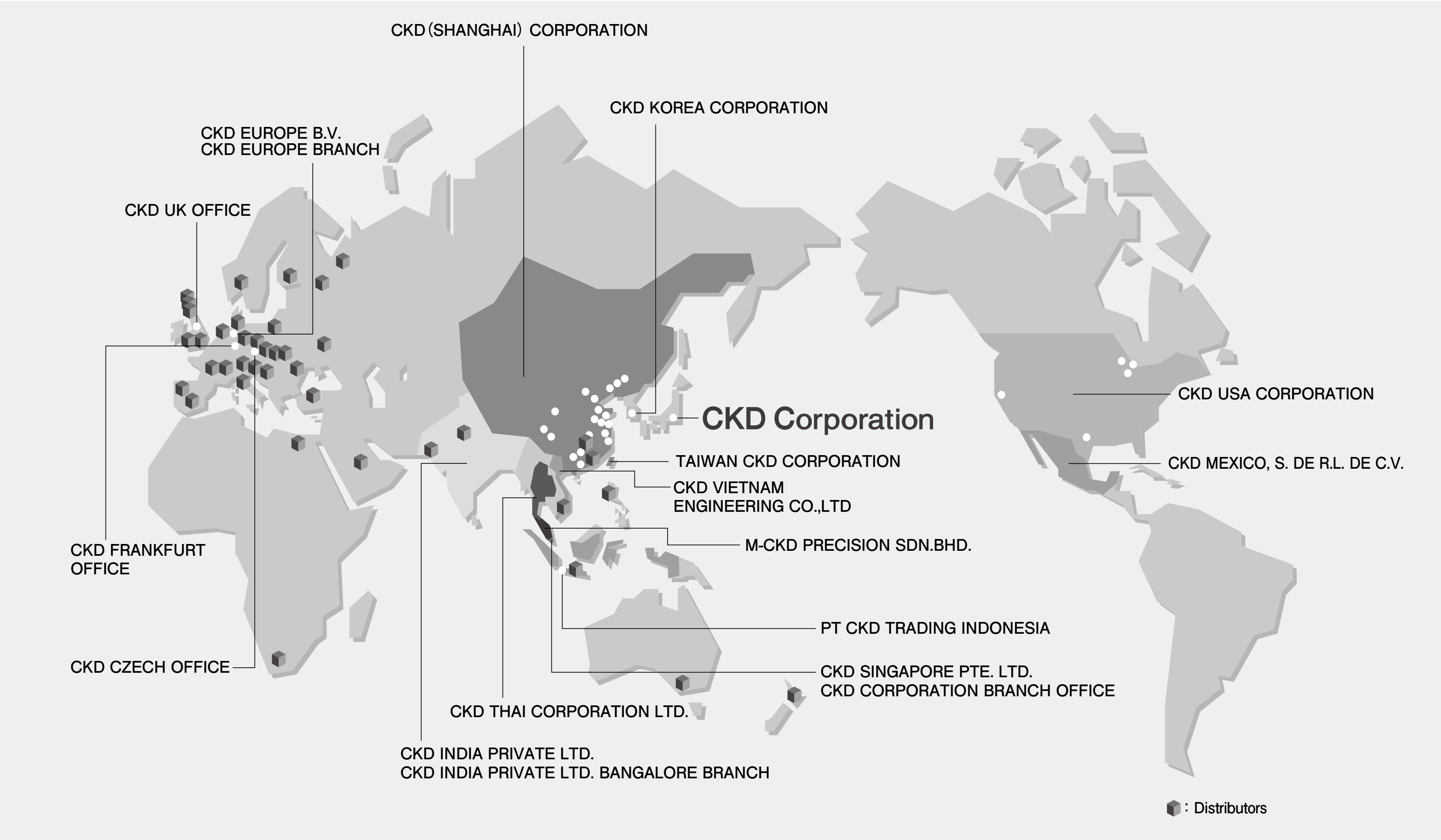
■ Free motion control

Set speed and acceleration control, positioning completion width (in-position), and choose between three control modes.

■ Easy teaching

Easy setting with five buttons, enabling direct teaching

WORLD－NETWORK



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●Specifications are subject to change without notice.

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