CKD

New Product

ABSODEX MINI type
AX6000M Series

DESKTOP DIRECT DRIVE ACTUATOR, MINI TYPE, AX6000M SERIES

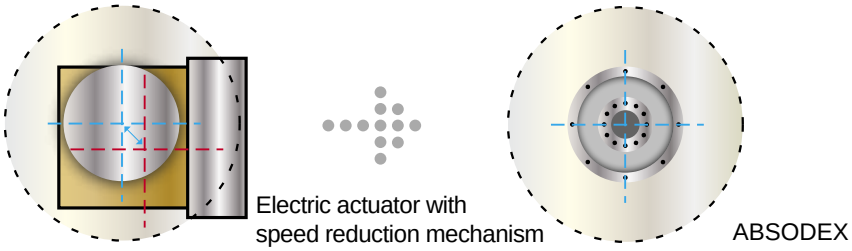
Desktop Direct Drive Actuator, MINI Type

CKD Corporation
CC-1148A 2

Not just small but easy!

Space-saving

Concentric design help to make compact equipment.



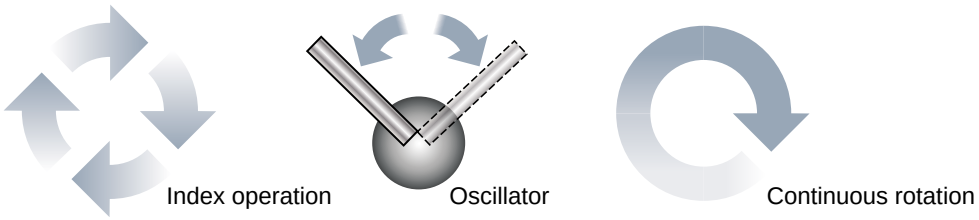
Electric actuator with
speed reduction mechanism

ABSODEX

Flexible

Various ways for programing enable ideal operation. Automatic programing for division equal segment indexing.

Extremely easy even for complicated operation.



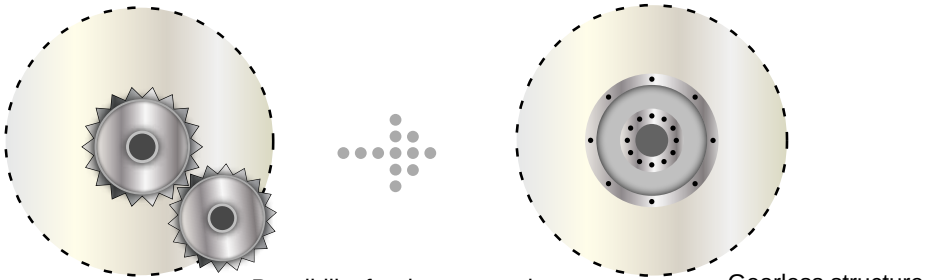
Index operation

Oscillator

Continuous rotation

High reliability & maintenance free

No need to worry about gear damage or accuracy changes caused by worn out thanks to the direct-drive system (gearless).



Possibility for damage and
wear out of the gear

Gearless structure

Industry min.

* Our company's research in August 2013

Please place the work piece and feel the size.

*** Full size**

Extremely convenient for automation.

Designing

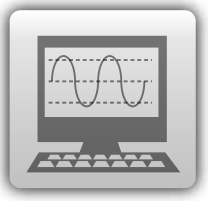
- Easy model selection with specification sheet. (Refer to page 10)
- Simple shape minimizes hours for design.

Purchasing

- Simple order as package. (Motor+Driver+Cable)

Assembly

- Spigot joint and positioning pin hole as standard.
- Save assembling hours.



Operation

- Improved software realizes simple operation.
- Smooth positioning with optimal cam curve.

Maintenance

- Flexibility according to requirement.

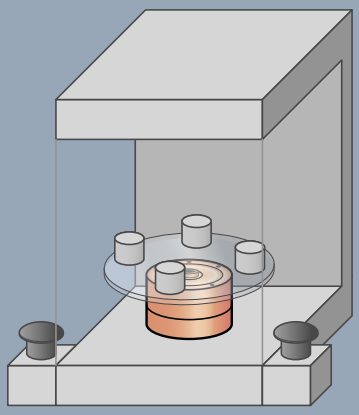
Please try it!!

Application example

Point for application

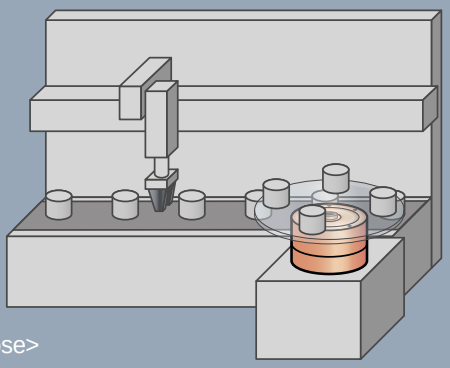
You can design as "Just put it on the table".
Equipped with suitable function for indexing table such as stop position output and I/O signal output during positioning, this helps reducing external sensors.

Semi-automation

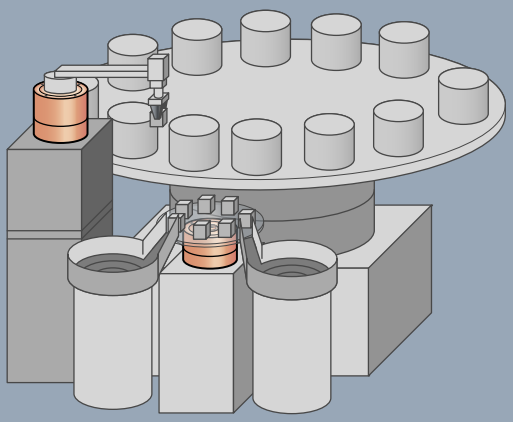


<Purpose>
• Productivity improvement
• For stable quality

θ-axis unit for modularized equipment



<Purpose>
• Saving design hours
• Equipment reuse



Additional process as sub-assembly to existing equipment

<Purpose>
• Tact improvement
• Miniaturization of existing equipment

AX4000T Series

AX2000T Series

AX1000T Series

Program and parameters can be shared with existing ABSODEX.
(*Except for some parameters.)

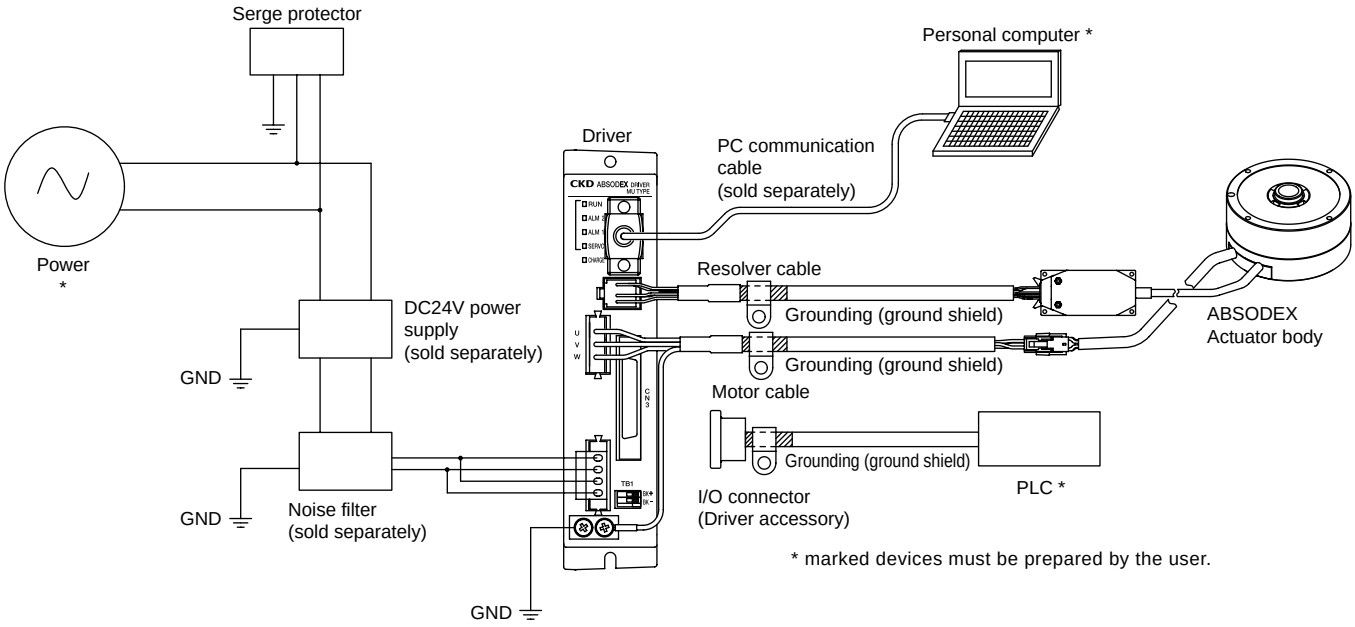
System Configuration

- Basic setting items

1. Input the program from a personal computer.
2. Set required parameters the same way.
3. Set the appropriate gain.

- Basic drive methods

1. A program to be executed is selected at the PLC.
2. Start signal is input at the PLC.
3. After operation, the driver outputs a positioning completion signal.



* marked devices must be prepared by the user.

Configuration (set model no. selection)

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

I/O connector, power supply connector, power supply connector open tool

* The motor cable connector is attached to the motor cable.

* For caution on connection methods, refer to operation manuals and technical data.

To comply with CE marking, parts below are required. Refer to user instructions or technical materials (ABSODEX MU type technical materials) for installation and wiring method.

Parts name	Model No.	Manufacturer
Noise filter	NF2015A-OD Note 1)	SOSHIN ELECTRIC CO.,LTD
Serge protector	R/A/V-781BXZ-4 R/A/V-781BWZ-4 RSPD-250-Q4 RSPD-250-U4	OKAYA ELECTRIC INDUSTRIES CO., LTD.

Note 1) This is AC250 specifications. DC24V power supply is available too.

Programming tool

- Starting adjustment support tool "AX Tools" is available. (Windows version, free)
  ABSODEX programs are created, parameters set, and operation commands, etc., issued from the personal computer.
  Created programs can be saved.
  PC communication cable (model: AX-RS232C-9P) is required.
  Note) The PC communication cable is designed specifically for ABSODEX. You cannot use a cable available on the market. If you do, the driver or PC may be damaged.
  Note) The PC communication cable is assumed to be used only when adjusting the connection. Remove the PC communication cable from CN1 during normal operation.
  Note) When the PC returns from the sleep status, communication errors may occur, due to un-recognizing USB-serial exchange cable.
  Note) Download the latest version of the adjustment support tool "AX Tools" from our website.

ABSODEX MINI type AX6000M Series Variation

	Torque (N•m)		Index accuracy (sec.)	Repeatability (sec.)	Page
	1.2	3			
ACTUATOR			±90	±10	1
Compatible driver			Drivers can be commonly used. The controller function enables the actuator's rotation angle, movement time and timer, etc., to be set as desired with an NC program. M code output, encoder output, etc. can be used to connect to an external PLC, motion controller, etc.		5

Related parts model number table ..... Page 9
Selection..... Page 10
⚠ Safety precautions ..... Page 13

ABSODEX

AX6000M Series

Compatible function with free driver, actuator, and cable combinations
Diameter 80mm minimum size

- Max. torque: 1.2Nm, 3Nm
- Compatible driver: MU Type Driver

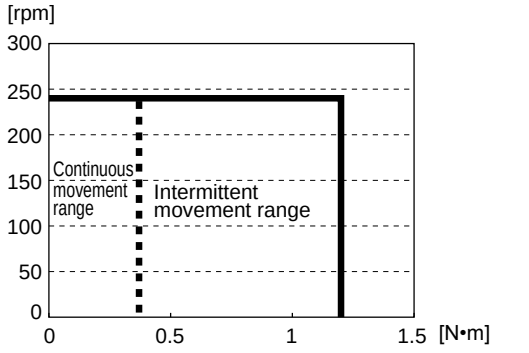
ACTUATOR SPECIFICATIONS

Items		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 (Note 1)	
Allowable axial load	N	600	
Allowable moment load	N·m	5	
Output shaft moment of inertia	kg·m^2	0.00034	0.00059
Allowable load inertia moment	kg·m^2	0.034	0.059
Index accuracy (Note 2)	sec.	±90	
Repeatability (Note 2)	sec.	±10	
Output shaft friction torque	N·m	0.13	0.22
Resolver resolution	P/rev	540672	
Motor insulation class		A	
Motor withstand voltage		AC550V 1 minute	
Motor insulation resistance		10MΩ and over DC500V	
Ambient temperature		0〜40°C	
Ambient humidity		20〜85%RH No freezing	
Storage temperature		-10〜65°C	
Storage ambient humidity		20〜90%RH No freezing	
Atmosphere		Free of corrosive and explosive gases and dust	
Weight	kg	1.2	1.8
Run out of output shaft (Note 2)	mm	0.03	
Surface run out of output shaft (Note 2)	mm	0.05	
Degree of protection		IP20	

Note 1: Use 80 rpm or less during continuous rotary operation.
Note 2: For details on index precision, repeatability, run out of output shaft, and surface run out of output shaft, refer to "Terminology" on page 11.

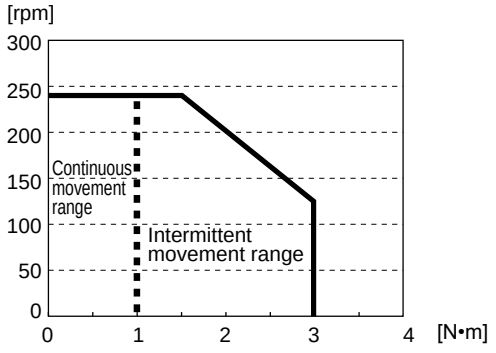
Speed and maximum torque characteristics

- AX6001M



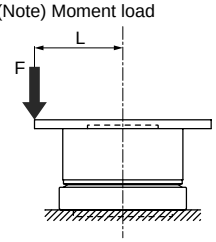
* Graph shows the typical value during 24 VDC (Ambient temperature: 25 °C)

- AX6003M



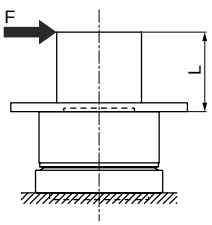
* Graph shows the typical value during 24 VDC (Ambient temperature: 25 °C)

(Note) Moment load



(Fig.a)

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



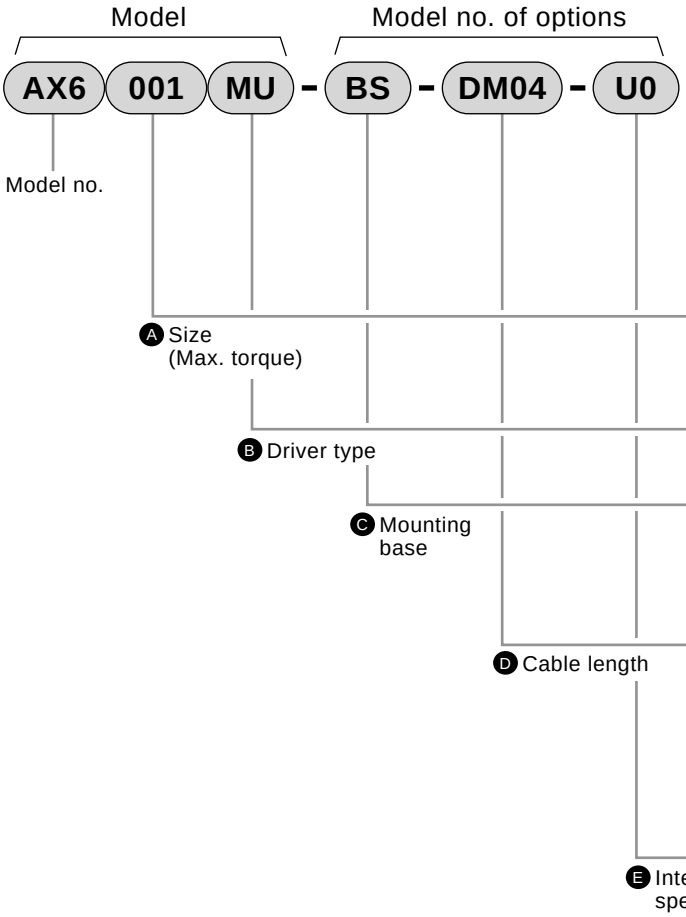
(Fig.b)

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

Read Precautions on page 13 to 17 before use.

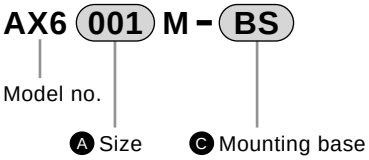
How to order

- Set model no. (actuator, driver, and cable)

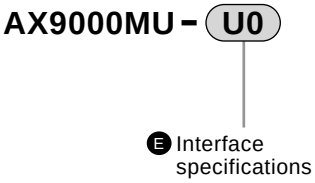


Symbol	Descriptions
A Size (Max. torque)	
001	1.2N•m
003	3.0N•m
B Driver type	
MU	With MU type driver
C Mounting base	
Blank	Standard (without mounting base)
BS	Electroless nickel plating Surface treatment installation
D Cable length	
DM02	2m
DM04	4m
DM06	6m
DM08	8m
DM10	10m
E Interface specifications	
U0	Parallel I/O (NPN specifications)
U1	Parallel I/O (PNP specifications)

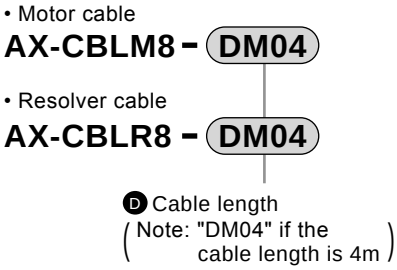
Actuator model no.



Driver model no.



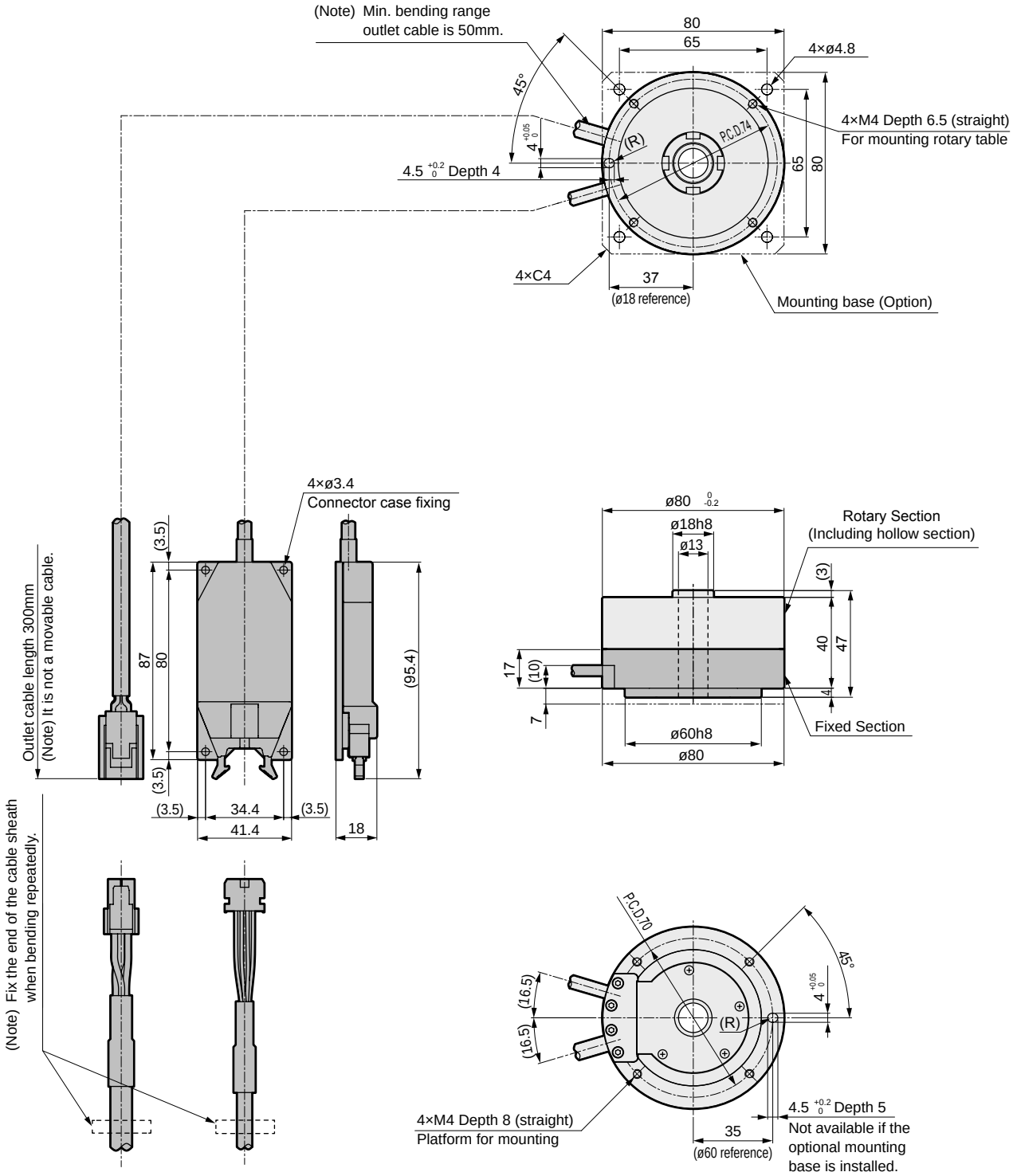
Cable model no.



Custom order models are not compliant with CE nor RoHS. Contact CKD for each order.

Dimensions

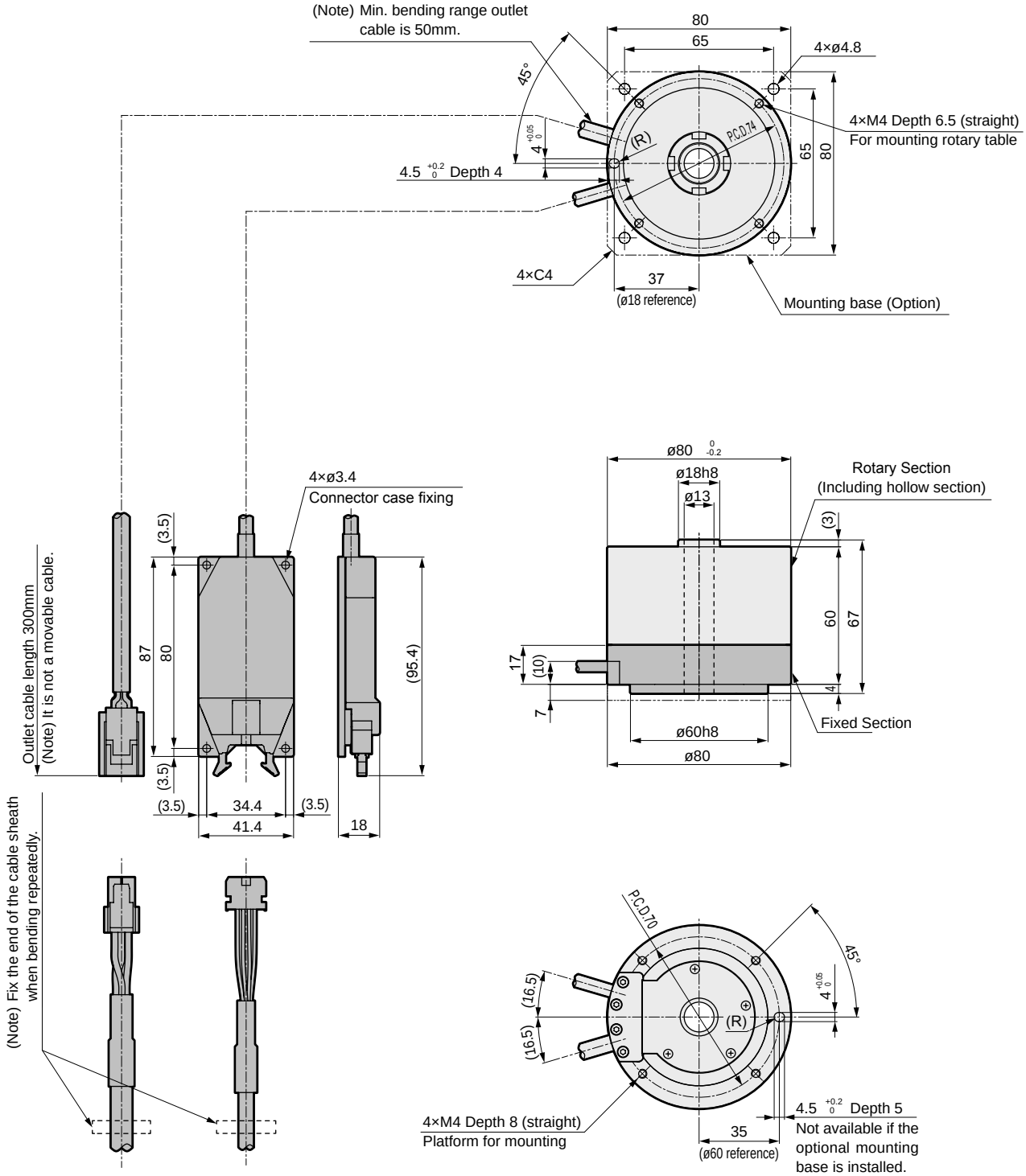
● AX6001M



Note 1: The actuator's origin may differ from that in the dimensional drawing.
The origin offset feature enables you to set the origin to any position you choose.

Dimensions

● AX6003M



Note 1: The actuator's origin may differ from that in the dimensional drawing.
The origin offset feature enables you to set the origin to any position you choose.

ABSODEX

MU Type Driver

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

Main features

- Miniature/light weight (resin body)
- Wiring is easy for the connector connection

How to order

AX9000MU – U0
AX9000MU – U1

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

Common specifications

Items		Descriptions
Product name		MU Type Driver AX9000MU
Power voltage	Main power supply	DC24V±10%
	Control power supply	DC24V±10%
Structure		Integrated driver and controller
Ambient temperature		0~50°C
Ambient humidity		20~90%RH (no freezing)
Operating ambient temperature		−10~65°C
Operating ambient humidity		20~90%RH (no freezing)
Atmosphere		No corrosive gases or powder dust.
Noise resistance		1000 V (P-P), pulse width 1 μs, rising edge 1 ns, impulse noise test, induction noise (capacitive coupling)
Vibration resistance		4.9m/s^2
Weight		Approx. 0.5 kg
Degree of protection		IP2X

Performance Specifications

Items	Descriptions
Control shafts	1 shaft, 540,672 pulses/1 rotation
Angle setting unit	° (degrees), pulses, index numbers
Min. angle setting unit	0.001°, 1 pulse
Speed setting unit	sec. rpm
Speed setting range	0.01~100s/0.11~240rpm
Equal divisions	1~255
Max. command value	7-digit number input ±9,999,999 pulse
Timer	0.01 s to 99.99 s
Program language	NC language
Programming method	Data can be set with an interactive terminal or personal computer, etc., using the RS-232C port.
Operation Mode	Auto, job, single block, servo OFF, pulse train input
Acceleration curve	<5 types> Modified sine (MS), modified constant velocity (MC,MC2), modified trapezoidal (MT), and 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 signals	Refer to the relevant interface specifications page.
Program size	Approx. 6000 characters (256 lines)
Electronic thermal	Actuator overheat protection

Power supply

Actuator Model	Driver Model	Rated input current	Max. input current
AX6001M, AX6003M	AX9000MU	3.3A	10A

⚠ Refer to Safety precautions on page 13 to 17 before use.

Custom order models are not compliant with CE nor RoHS. Contact CKD for each order.

Parallel I/O (NPN specifications)

CN3 Input signal

Pin no.	Signal	Logic	Decision
1~2	External power supply input +24 V ± 10%		
3~4	External power supply input GND		
5	Program number selection input (bit 0)	Positive	Level
6	Program number selection input (bit 1)	Positive	Level
7	Program number selection input (bit 2)	Positive	Level
8	Program number selection input (bit 3)	Positive	Level
9	Program number selection input 2nd digit/ program number selection input (bit 4)	Positive	Edge Level
10	Program number selection input 1st digit/ program number selection input (bit 5)	Positive	Edge Level
11	Reset input	Positive	Edge
12	Home Positioning Instruction 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	Positive	Edge
17	Emergency Stop Input	Negative	Level
18	Brake Release Input	Positive	Level

CN3 output signal

Pin no.	Signal	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	In-position output	Positive
42	Positioning completion output	Positive
43	Start input waiting output	Positive
44	Alarm output 1	Negative
45	Alarm output 2	Negative
46	Intermediate index output 1/origin output	Positive
47	Intermediate index output 2/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
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
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)

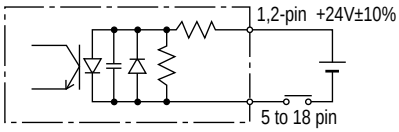
I/O circuit specifications

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

* The maximum number of simultaneous output points for the output circuits is 14 out of 18.

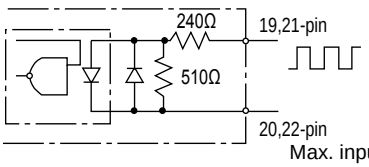
CN3 I/O circuit specifications

● Input circuit



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

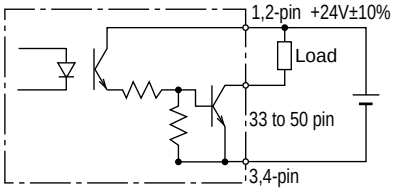
● Pulse train Input circuit



Rated voltage 5V±10%

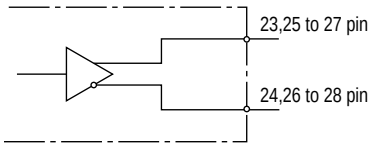
Max. input frequency
Line driver 1Mpps
Open collector 250Kpps

● Output circuit



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

● Encoder Output Circuit



Output type:line driver
Use line driver: DS26C31
Recommended line receiver: DS26C32 or equivalent

MU type driver

Parallel I/O (PNP specifications)

CN3 Input signal

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1~2	External power supply input GND		
3~4	External power supply input +24 V ± 10%		
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11	Reset input	Positive	Edge
12	Home Positioning Instruction 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	Positive	Edge
17	Emergency Stop Input	Negative	Level
18	Brake Release Input	Positive	Level

CN3 output signal

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33	M code output (bit 0)	Positive
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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	In-position output	Positive
42	Positioning completion output	Positive
43	Start input waiting output	Positive
44	Alarm output 1	Negative
45	Alarm output 2	Negative
46	Intermediate index output 1/origin output	Positive
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49	Segment position strobe output	Positive
50	M code strobe output	Positive

CN3 pulse train input signal

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CN3 encoder output signal (incremental)

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23	A phase (line driver output)
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26	-B phase (line driver output)
27	Z phase (line driver output)
28	-Z phase (line driver output)

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Brake output (BK+,BK-)	75	2	150	

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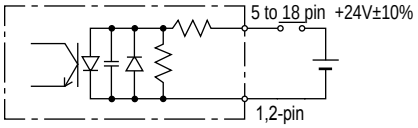
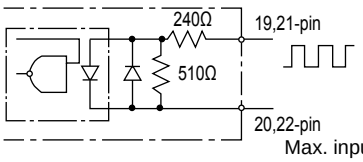
CN3 I/O circuit specifications

● Input circuit



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

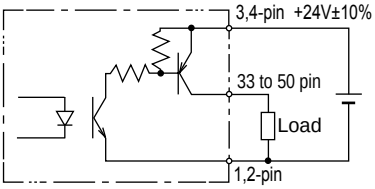
● Pulse train Input circuit



Rated voltage 5V±10%

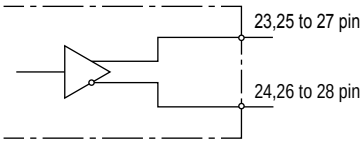
Max. input frequency
Line driver 1Mpps
Open collector 250Kpps

● Output circuit



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

● Encoder Output Circuit



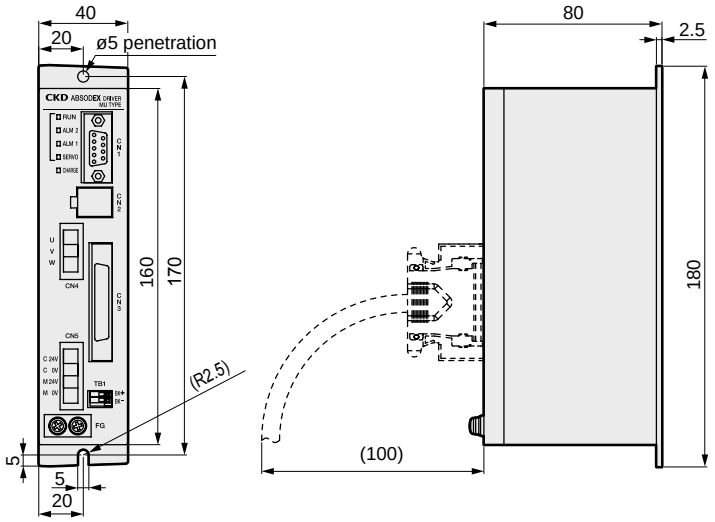
Output type:line driver
Use line driver: DS26C31
Recommended line receiver: DS26C32 or equivalent

Driver accessories

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

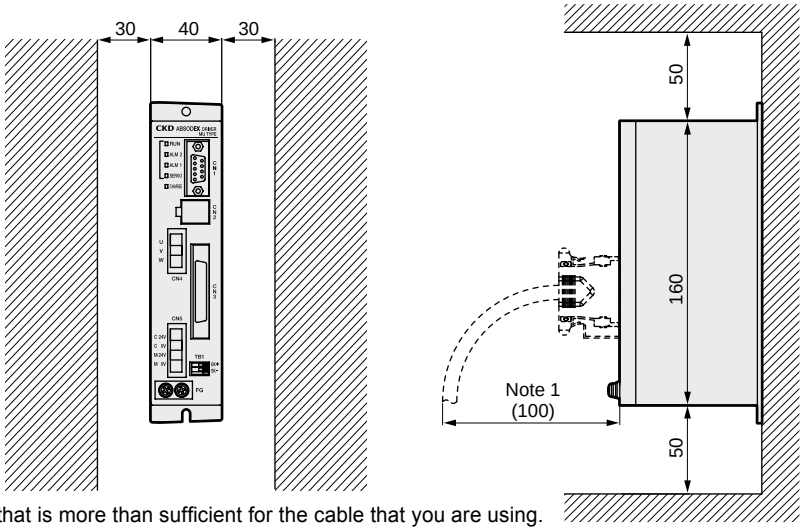
Refer to how to order list for additional part order.

Dimensions



Installation dimensions

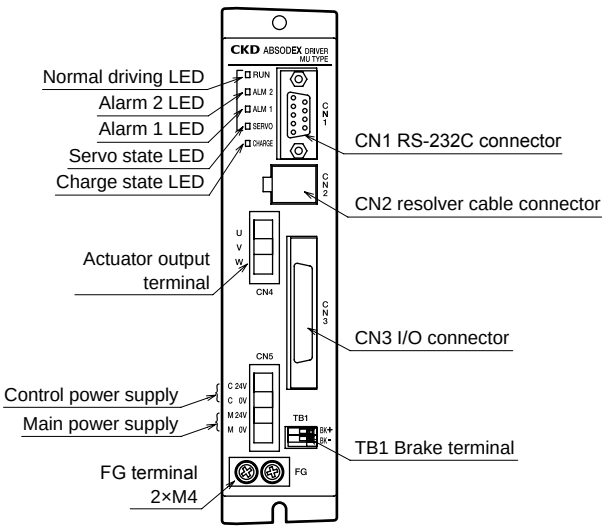
- The ABSODEX driver is not dustproof or waterproof.
  Protect the driver so that dust, water, oil, etc. do not enter the driver.
- If you are installing the ABSODEX driver in the control box, make sure that the temperature inside the box does not exceed 50°C, and install the driver as shown in the following diagram to secure space around it.



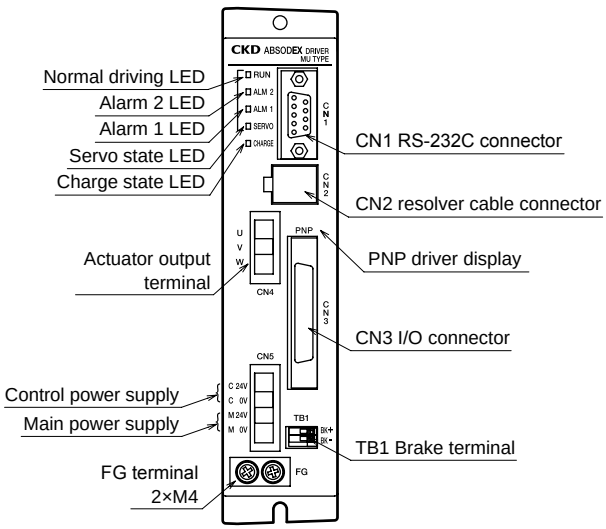
Note1) Determine a dimension that is more than sufficient for the cable that you are using.

Panel description

● Parallel I/O (NPN specifications)

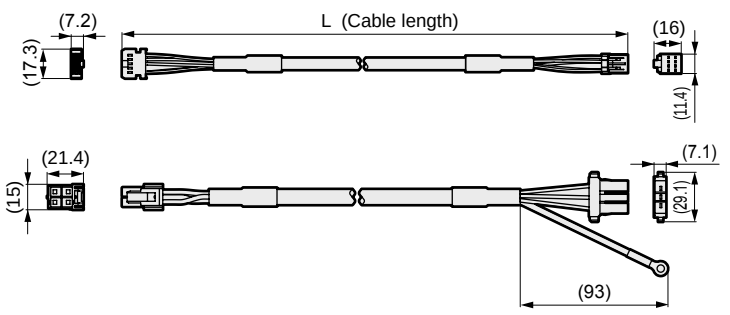


● Parallel I/O (PNP specifications)



Cable specifications

Cable dimensions



Minimum cable bending radius

Resolver cable	60mm
Motor cable	90mm

Safety precautions

- Fix the cable sheath near the actuator connector, where a cable is bent repeatedly.
- The cables are not movable cables. Be sure to fix the cables in place at the connectors so that they do not move. Do not lift up the body by the cable or apply excessive force to the cable as the cable may break.
- When connecting the cable, insert the connector securely to the back. Tighten the connector's set screws and fixing screws.
- Do not modify the cable by cutting or extending it. Failure to observe this could result in faults or malfunctions.
- For cable length L, refer to the cable lengths in "How to order".

How to order ABSODEX related parts

● Related parts

Product	Applicable model	Model no.
PC communication cable (2m)	AX Series	AX-RS232C-9P

● Mounting base

Product	Applicable model	Model no.
Mounting base	AX6001M, AX6003M	AX-AX6000-BASE-BS

● Power

Product	Applicable model	Model no.
24 VDC Power supply	AX9000MU	AX-PWR-SWD100P-24-C Note 1)

(Note 1) If you purchase the above model from our company, the power supply input cable (1m) and power supply output cable (1m) are included.

● Noise filter

Product	Applicable model	Model no.
Noise filter for power supply (Single phase AC250V/15A) Note 1)	AX Series	AX-NSF-NF2015A-OD
Serge protector (For 3 phases) Note 4)	AX Series	AX-NSF-RAV-781BXZ-4

(Note 1) This is AC250V specifications. DC24V power supply is available too.
(Note 2) Parts indicated on this page are the list of parts we provide.
(Note 3) To use them being compatible with EU standards (CE marking), noise filter for electric power and serge protector etc. are required. Refer to user instructions or technical materials (ABSODEX AX series MU type technical materials) for more details.

● Other components

Product	Applicable model	Model no.
I/O connector (CN3: for parallel I/O)	AX Series (-U0,U1)	AX-CONNECTOR-MDR
Power supply connector set (with open tool)	AX9000MU Series	AX-CONNECTOR-04JFAT-KIT

* The parts listed on this page can be purchased from CKD.

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

■ Operating conditions

1. Index 2. Oscillator			
Movement angle	Ψ (°)		or no. of indexes
Movement time	t1 (sec.)		
Cycle time	t0 (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 0.2s.

■ Load conditions

Table

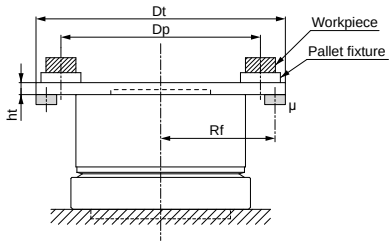
Material	1. Steel 2. Aluminum	
Outline	Dt(mm)	
Plate thickness	ht(mm)	
Weight	m1(kg)	

Workpiece

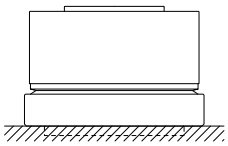
Quantity nw (pc.)	
Max. weight mw (kg/pc.)	
Installation center Dp(mm)	

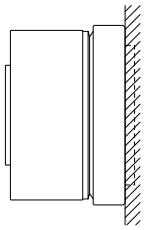
Pallet fixture

Quantity np (pc.)	
Max. weight mp (kg/pc.)	



(Fig. 1) Load conditions


(Fig. 2) Installation orientation: Horizontal


(Fig. 3) Installation orientation: Vertical

■ Others

Installation attitude

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

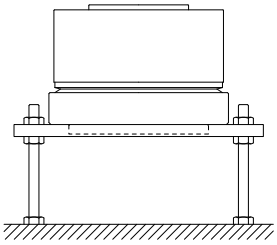
1. None 2. available (Fig. 5)	

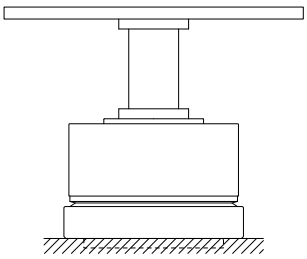
Actuator movement

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)	
DC24V power supply cable length (m)	
DC24V power supply coil diameter (mm^2)	
DC24V power supply voltage accuracy (%)	
DC24V line point of contact quantity (pc.)	
DC24V line point of contact resistance (MΩ / pc.)	

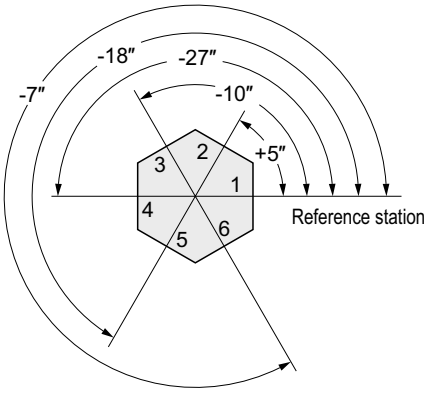
* You can do a more rigorous selection by filling in this field.
* With a power supply cable 1.25mm^2 or more, please use one as short (recommended length 1m or less) as possible.
* If the output voltage is low in a power supply with voltage adjustment, please adjust it to 24V and use it.

Terminology

Index accuracy

The ABSODEX index precision is the difference between the target position set by an NC program and the actual stop position.
The target position is an angle (s) from the reference station (origin return position).
As shown in the diagram on the right, the index precision is calculated from the maximum and minimum values of the differences between the target positions and the actual stop positions. Measurement is expressed in terms of the width using positive and negative seconds, as shown on the right.
A high precision encoder is used for the angular measurement.

Example of index accuracy measurement



Measuring position	Measured value
1	0
2	+5″
3	-10″
4	-27″
5	-18″
6	-7″

Index precision ±16

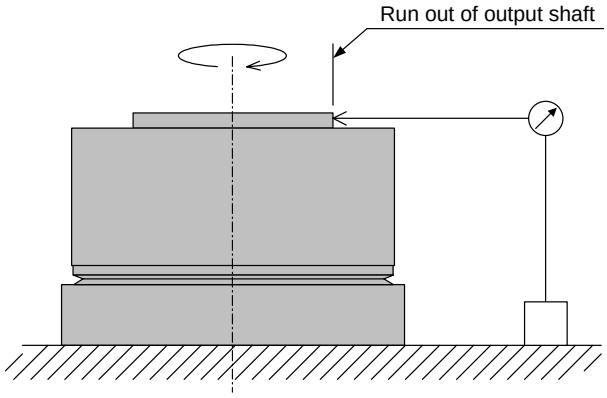
Repeatability

Repeatability expresses the deviation in the angles of the stop positions measured repeatedly under the same conditions for the same target position. It is expressed as an angle in seconds.
Depending on the precision characteristics that the machine requires, repeatability and index precision must be used separately.

* sec. A unit used to express angles (degrees, minutes, and seconds).
1 degree = 60 minutes = 3600 seconds

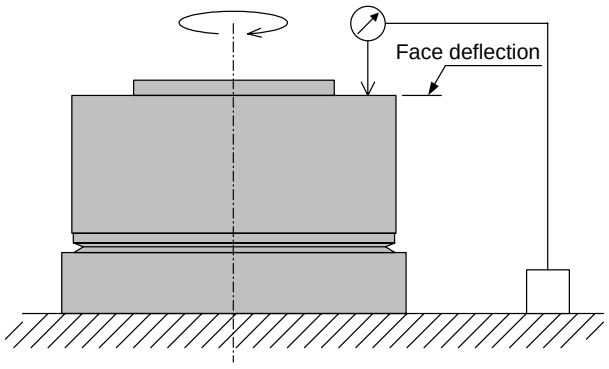
Run out of output shaft

The out-of-roundness of the spigot side of the table installation surface.



Surface run out of output shaft

The out-of-roundness of the table installation surface.



Safety Precautions

Always read this section before use.

When designing and manufacturing devices using direct drive actuator, the manufacturer has an obligation to manufacture a safe device, and to check that the safety of the device's mechanical mechanism and the system operated by the electrical control that controls the device is secured.
Product selection, its usage and handling, as well as adequate maintenance management are important in order to safely use CKD products.
To ensure equipment safety, please follow the warnings and precautions.
Please check that equipment safety is ensured and manufacture safe equipment.

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 in handling.

2 Use within the product's specific specification range.

It cannot be used outside of product-specific specifications. Do not attempt to modify oradditionally machine the product.
This product's applied scope is for use as equipment and parts for general industrial machinery.
Therefore, outdoor use as well as the following conditions and environments shall be considered outside of the applied scope.
(If you consult CKD upon adoption and consent to CKD product specification, it will be applicable; however, safeguards should be adopted that will circumvent dangers in the event of failure.)

❶ Use for special applications including nuclear energy, railway, aircraft, marine vessel, vehicle, medical equipment, equipment, or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.
❷ Usage in applications that especially require safety, such as those that greatly affect humans and property.

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

4 Do not remove devices until safety is confirmed.

❶ Inspect and service the machine and devices after securing the safety of the system, such as by turning off the peripheral devices and other devices connected to this product.
❷ Exercise caution when inspecting, maintaining, and handling the product, as high temperature and charged parts can be present even when operation is stopped.
❸ Before starting device inspection or maintenance, turn off device power and other power to related devices, release compressed air, and check leakage current.

5 Observe warnings and cautions in the instruction manual of each product.

❶ Do not rotate the actuator outputs shaft by 30 rpm or more while power is off.
The driver could fail or electrical shock result from actuator power generation.
❷ If the servomotor is turned off (including emergency stop or alarm) or brakes are turned off while a rotational force, such as gravity, is applied, the output shaft may rotate by rotational force.
Conduct these operations flat where rotational force is not applied, or confirm safety before starting.
❸ Unexpected movement may occur during gain adjustment or test operation, so keep hands, etc., away from the outputs shaft. When conducting operations with the actuator not visible, confirm before starting that it is safe even if the outputs shaft turns.
❹ The brakes of the type with brake do not necessarily hold the outputs shaft completely in all situations. If safety must be ensured, such as in maintenance with an application that rotates the output shaft in unbalanced mode, or when stopping the machine for a long time, it may not be sufficient to stop theshaft with brakes alone. Make sure equipment is maintained balanced or provide a mechanical locking means. Use the system flat or provide a mechanical lock.
❺ It may take several seconds to stop in an emergency, depending on rotation speed and load.

6 To prevent electric shock, observe warnings and cautions.

❶ High voltage is supplied to the terminal block at the driver's front panel and actuator output terminal. For a terminal block, be sure to install the supplied terminal cover before operation. Do not touch the terminal block while power is on. Do not touch the terminal block while power is on. Even after the power is turned off, a high voltage is applied until the charge accumulated in the internal capacitor is discharged. Wait at least five minutes after turning the power off before touching these sections.
❷ In work with side cover off, such as for maintenance and inspection or changing driver switches, turn power off and wait at least five minutes before starting work because a risk of electrical shock from high voltage exists.
❸ Do not connect or disconnect connectors while power is on. Misoperation, faults, or electrical shock may occur.

7 Before restarting a machine or system, check that measures are taken so that parts do not come off.

8 Install an over-current protective device.

In accordance with "JIS B 9960-1:2008 Safety of machinery - Electrical equipment of machines - Part 1: General requirements," install over-current protective devices (circuit breakers, etc.) for the main power and control power (L1, L2, L3, L1C and L2C of the terminal block) and I/O power (connector number CN3-DC24V).

(Translation of an Excerpt from JIS B 9960-1 7.2.1 General Requirements)
Overcurrent protection shall be provided where the current in a machine circuit can exceed either the rating of any component or the current carrying capacity of the conductors,whichever is the lesser value. The ratings or settings to be used are detailed in 7.2.10.

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

■ The safety precaution rankings of the listed precautions are classified as "danger", "warning", "caution".

⚠ DANGER: Situations where improper handling can create dangerous conditions in which death or serious injury is possible, in addition to high levels of urgency during an emergency (degree of emergency).

⚠ WARNING: Situations where improper handling can create dangerous conditions in which death or serious injury is possible.

⚠ CAUTION: Situations where improper handling can create dangerous conditions where minor injuries or physical damage is possible.

Items listed under "caution" can also possibly lead to serious results depending on the situation. Important details are listed for each; please make sure to follow them.

WARRANTY

Terms of warranty

Conditions related to the warranty term and scope are as follows:

1. Warranty period

"Warranty Period" of this product is one (1) year from the first delivery to the customer. (One year after delivery, where one day's operation shall be within eight hours. If durability is reached within one year, the warranty term shall be terminated at that point.)

2. Scope of warranty

If any faults found to be the responsibility of the CKD occur during the above warranty term, the part shall be repaired immediately by CKD free of charge. Note that the following faults are excluded from the warranty:

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 caused by other than the delivered product
④ Failure caused by operation derailing from the purposes for which the product is designed
⑤ Failure caused by modification in the structure, performance, specification or other features made by other than us after delivery, or failure caused by repairs done by other than our designated contractor
⑥ Loss in our product assembled to your machine or equipment, which would be avoided if your machine or equipment were provided with general functions, structures or other features common in the industry
⑦ Failure caused by reason that is unforeseeable with technology put into practical use at the time of delivery
⑧ Failure caused by fire, earthquake, flood, lightning, or other acts of God, earth shock, pollution, salt hazard, gas intoxication, excessive voltage, or other external causes

The warranty here refers to the warranty of the actually delivered product, and does not include any damage resulting from a fault in the delivered product.

3. Warranty for exported products

(1) Products returned to the CKD factory or to a company or factory designated by CKD shall be repaired. All work and expenses related to the return shall be excluded from compensation.
(2) The repaired product shall be returned to a designated place in Japan with domestic packaging specifications.

This warranty specifies basic conditions. If warranty details in individual specification drawings or specifications differ from these warranty conditions, specification drawings or specifications shall take priority.

4. Compatibility confirmation

Customers shall be responsible for confirming our products' compatibility with the customer's own system, machine, and equipment.

1 Actuators and the drivers are not water-proof type. Provide waterproofing when using this where water or oil enters.

2 Current leakage and faults could occur if swarf or dust get onto the actuator or driver. Check that these do not come in contact with devices.

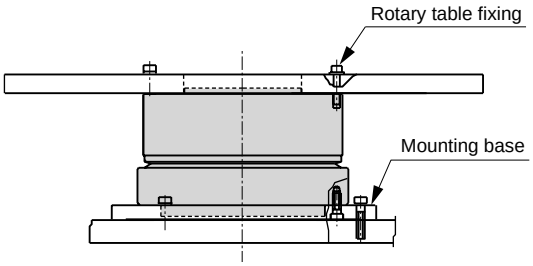
3 Frequent repetition of power-on and -off can cause damage to the elements inside the driver.

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

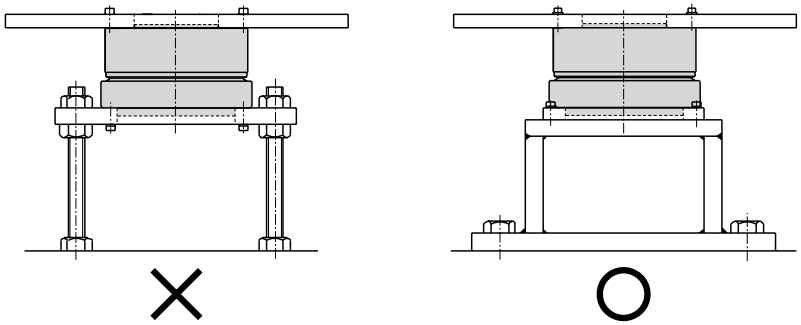
6 Equipment in which direct drive actuators are installed should have sufficient rigidity to realize full direct drive actuator performance. If the load equipment or frame's mechanical unique vibration is relatively low (200 to 300 Hz or less), resonance could occur in the direct drive actuator and load 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 direct drive actuator is not directly installed, it should be installed on a highly rigid frame. [Fig. 2]

[Fig. 2] Actuator attachment



7 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 out shaft's diameter guideline

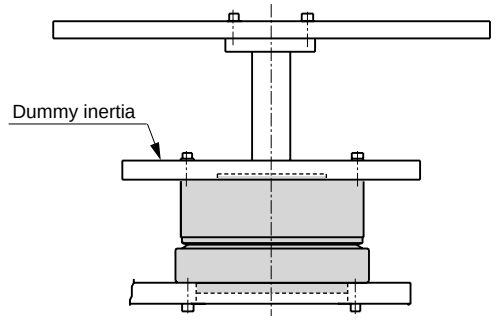
Max. torque [N•m]	Shaft extension (mm)	
	50	100
1.2	ø35	ø40
3	ø35	ø40

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.

8 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] x (0.2 to 1). [Fig. 3]

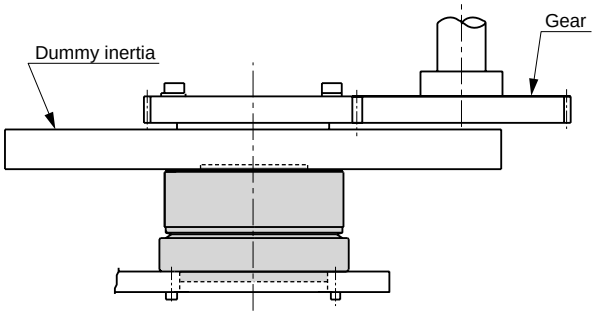
[Fig. 3] Dummy inertia attachment example 1



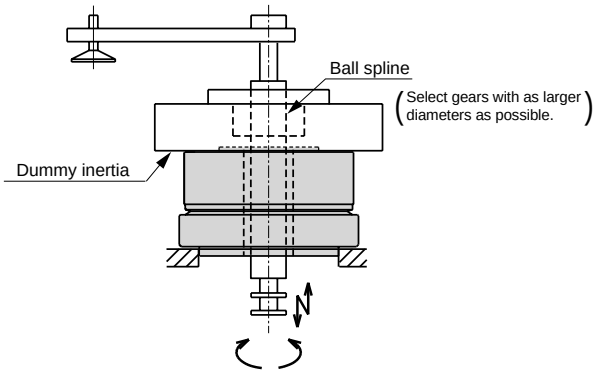
- When coupling with a belt, gears, or spline, or when joining with a key, dummy inertia should be [load inertia] x (0.5 to 2).
- If speed changes with belts or gears, use load inertia as the actuator output shaft conversion value, and install dummy inertia on the actuator. [Fig. 4] [Fig. 5]

(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 attachment example 2



[Fig. 5] Dummy inertia attachment example 3



9 The ABSODEX has a built-in absolute resolver (magnetic position detector).
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.

10 If there is possible of device failure because of induced lightning serge, it is recommended to attach serge protector.

For other cautions, make sure to read cautions provided in materials below.

1. On the web site
   ABSODEX compact type
   AX6000M
   http://www.ckd.co.jp/kiki/caddata/ax_t.htm
   ・USER INSTRUCTION

2. Please request materials in below.
   ABSODEX AX series MU type technical material

Safety precautions

Labor saving mechanisms: Warnings, cautions

Always read this section before use

⚠ Caution Installation and adjustment

1. Be sure to use the enclosed cable between the actuator and driver. Do not modify the enclosed cable (change the length or material) because this could cause functional degradation or failure.
2. Connect the correct power supply. Connecting a nondesignated power supply could cause faults. Wait at least 10 seconds after turning power off (check that the motor output shaft is stopped) before turning it on again.
3. Securely fix the direct drive actuator to the machine, and securely install loads such as the table before adjusting gain. Confirm that no interference occurs and that the state is safe even when flexible sections are rotated.
4. Do not tap the output shaft with a hammer, nor assemble it forcibly. Failure to observe this would prevent the expected accuracy or functions, and could cause faults.
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, etc., 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, etc.so that it cannot be touched.
8. Do not drill holes into the actuator. Contact CKD when machining is required.
9. Compatible models
   - If the actuator and driver are combined mistakenly 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 differ 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 is input (after parameter setting), malfunctions could occur or equipment be damaged.
   - When changing the cable length, order the cable separately.
   - If other than the compatible driver is connected, the actuator may be burned.
10. When using a circuit breaker, select one that has higher harmonic measures for inverter use.
11. 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 to the origin offset.
12. The cables for the AX4009T and AX6000M Series are notmovable cables. Be sure to fix the cables in place at the connectors so that they do not move. Also, lifting the body while holding the cables or applying excessive force on the cables may cause disconnection.
13. Refer to technical materials (ABSODEX AX series MU type technical materials) for other cautions.
14. Pulling an actuator pullout cable or a connector part strongly can result exposing a pullout cable shield braided wire.

⚠ Caution During use and maintenance

1. Do not damage, tug, or apply in excessive force on cables.
2. Do not disassemble the actuator, because this may compromise expected functions and accuracy. Especially, any modification to the resolver could cause malfunction and less accuracy.
3. When testing withstand voltage of the machine or equipment containing the direct drive actuator, disconnect the main power cable to the direct drive actuator driver and check that the voltage is not applied to the driver. It can cause failure.
4. If alarm "4" (actuator overload: electronic thermal) is generated, wait for the actuator temperature to drop 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, 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 other cautions, troubleshooting on alert display, refer to technical materials (ABSODEX AX series MU type technical materials).

For other cautions, make sure to read cautions provided in materials below.

1. On the web site
   ABSODEX compact type
   AX6000M
   http://www.ckd.co.jp/kiki/caddata/ax_t.htm
   ・USER INSTRUCTION

2. Please request materials in below.
   ABSODEX AX series MU type technical material

Related products

Electric driven actuator ERL2/ESD2 Series

Catalog no. CC-1219A

■ Number of alignment points

"63 points alignment" for general purpose is added to conventional "7 points alignment"

■ Easy setting tool

As well as teaching pendant (ETP2), added easy computer setting software (E Tools)

■ Perfect compatibility

"Perfect compatibility" enables free combination between actuator and controller

ABSODEX Quick response type AX1000T, AX2000T, AX4000T Series

Catalog no. CC-995A

■ Ample actuators

12 types of actuators are available from 6 to 1000 N•m.

■ 5 options for interface

5 types (Parallel I/O (NPN, PNP), CC-Link, DeviceNet, PROFIBUS-DP) are available for driver interface.

Electric driven actuator motor-less type

Catalog no. CC-1165A, CC-1216A, CC-1217A

■ Ball screw driven ETS Series

- Motor size: 8 types, lead: 7 types, motor installation directions: 5 types
- Motor you have been familiar with is installable
- Installing specifications for home position sensor and limit sensor are selectable
- Stroke length selection range: 100 - 1500 mm (in 50 mm pitch)
- Wide range of application with Max. load capacity of 150 kg, and max. speed of 2000 mm/s.

■ Ball screw driven low particle generation specifications ETS Series

- Low particle generation is achieved with full cover structure based on ETS Series and suction port.
- Motor size: 7 types, lead: 7 types, motor installation directions: 5 types
- Motor you have been familiar with is installable
- Installing specifications for home position sensor and limit sensor are selectable
- Stroke length selection range: 100 - 1500 mm (in 50 mm pitch)
- Wide range of application with Max. load capacity of 150 kg, and max. speed of 2000 mm/s.

■ Belt driven ETV Series

- Belt driven type based on ETS Series.
- Stroke length selection range is between 100 - 3500 mm (in 50 mm pitch). Also the max speed is 2000 mm/s. Long stroke length and high speed is achieved.
- Motor size: 6 types, motor installation directions: 6 types
- Motor you have been familiar with is installable

Electric driven actuator KBZ Series

Catalog no. CC-1102A

High-tact
Allowable max. speed of 800 mm/s

Equipped with the servo motor
Servo motor allows high speed, high acceleration/deceleration, and greater weight capacity

Absolute specification
Absolute specification without return-to-home

Small controller
Developed to target the smallest size and lowest price

Electric driven actuator ESSD/ELCR Series

Catalog no. CC-1002A

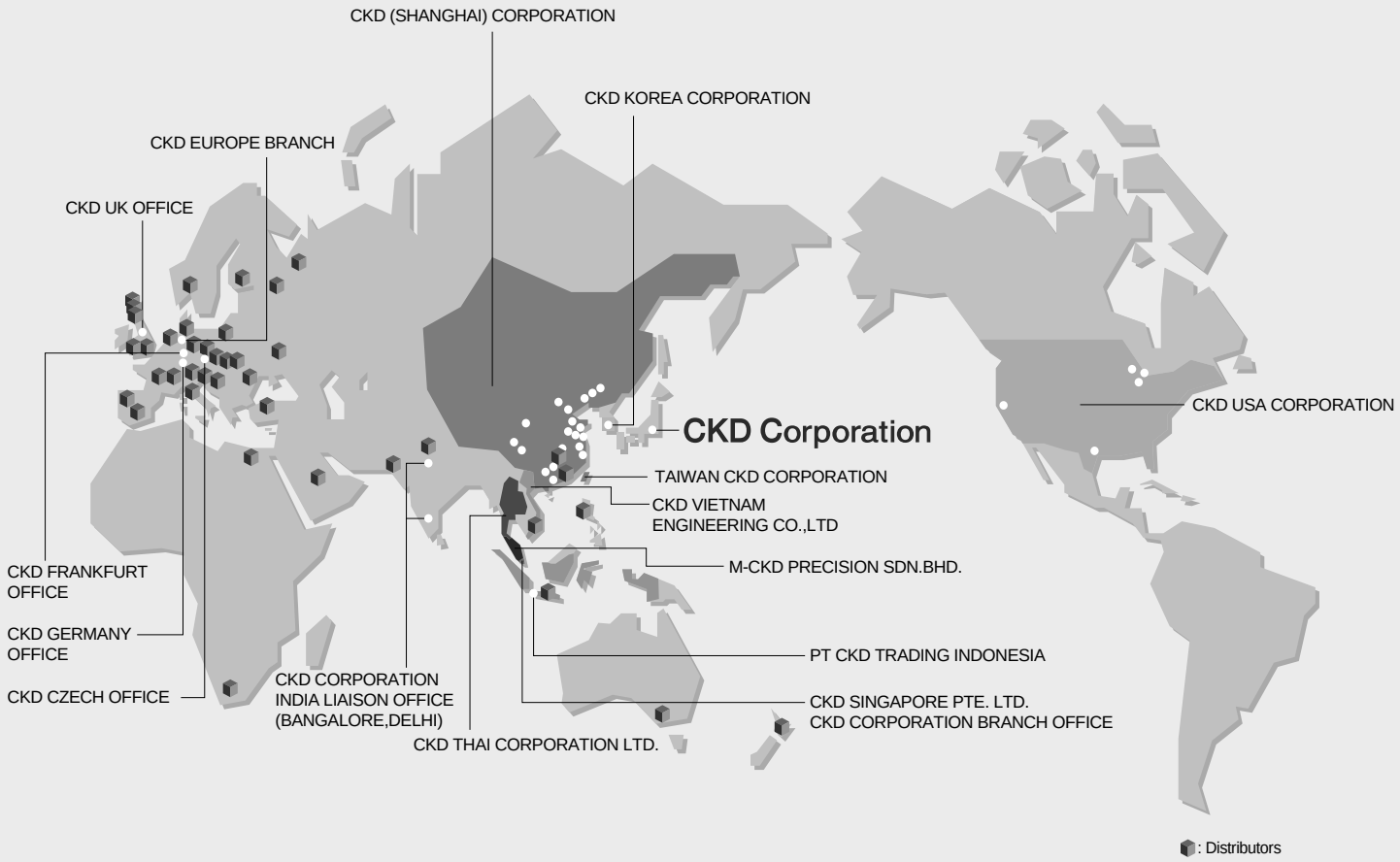
Space saving
Built-in controller eliminates the need for controller installation space and wiring

Installable like a pneumatic cylinder
Design which can imagine a pneumatic cylinder as it is, including appearance configuration, various controls and usage

Motion control at will
Three control modes, speed & acceleration control and positioning completion width (imposition) can be set

Easy teaching
Easy setting with five buttons, enabling direct teaching

WORLD-NETWORK



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