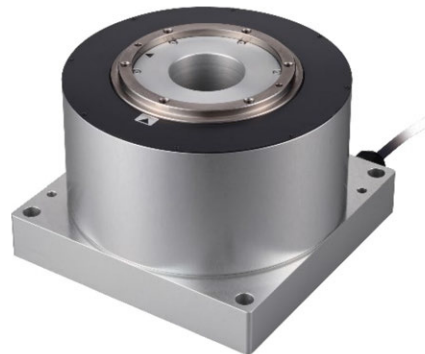
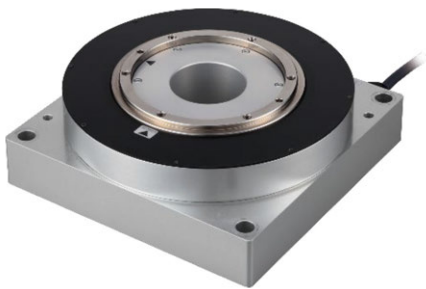


Direct Drive Motor

DDA, DDACR

Instruction Manual Sixth edition ME3756-6B



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Connection to the Controller	Ch.3
Operation	Ch.4
Maintenance and Inspection	Ch.5
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Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

Please download the user's manual from our website.

You can download it free of charge. User registration is required for the first time downloading.

URL : www.iai-robot.co.jp/data_dl/CAD_MANUAL/

When using the product, print out of the necessary portions of the relevant manual, or please display it on your computer, tablet terminal, etc. so that you can check it immediately.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
- Use or reproduction of this instruction manual in full or in part without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the text are registered trademarks.

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Safety Guide

“Safety Guide” has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it before the operation of this product.

Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	<ul style="list-style-type: none"> ● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. <ol style="list-style-type: none"> 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) ● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. <ol style="list-style-type: none"> 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	<ul style="list-style-type: none"> ● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment’s capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	<ul style="list-style-type: none"> ● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	<p>(1) Installation of Robot Main Body and Controller, etc.</p> <ul style="list-style-type: none"> ● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. <ol style="list-style-type: none"> 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	<p>(2) Cable Wiring</p> <ul style="list-style-type: none"> ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire. <p>(3) Grounding</p> <ul style="list-style-type: none"> ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal (PE) on the AC power cable of the controller and the grounding plate in the control panel, make sure for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment standards and criteria). For detail, follow the description in [an instruction manual of each controller or controller built-in actuator]. ● Conduct functional grounding on the FG terminal for a controller supplying 24V DC or a controller built-in type actuator. In order to minimize influence to mechanical operation given by electromagnetic interference (noise) to an electrical device or insulation failure, conduct grounding on a terminal or a conductor that is electrically stable. The reference impedance should be Type D (Former Class 3, ground resistance 100Ω or less).





No.	Operation Description	Description
4	Installation and Start	<p>(4) Safety Measures</p> <ul style="list-style-type: none"> ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot’s movable range. When the robot under operation is touched, it may result in death or serious injury. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. ● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. ● When the installation or adjustment operation is to be performed, give clear warnings such as “Under Operation; Do not turn ON the power!” etc. Sudden power input may cause an electric shock or injury. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	<ul style="list-style-type: none"> ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>

No.	Operation Description	Description
6	Trial Operation	<ul style="list-style-type: none"> ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. ● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation. ● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc. ● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	<ul style="list-style-type: none"> ● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	<ul style="list-style-type: none"> ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the instruction manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. ● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. ● Pay attention not to lose the removed cover or screws, and make sure to put the product back to the original condition after maintenance and inspection works. <p>Use in incomplete condition may cause damage to the product or an injury.</p> <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>
9	Modification and Dismantle	<ul style="list-style-type: none"> ● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	<ul style="list-style-type: none"> ● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	<ul style="list-style-type: none"> ● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety. ● Using the devise in a way not indicated by IAI may lose the protection performance equipped to the device.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the instruction manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	 Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	 Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	 Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	 Notice

Caution in Handling

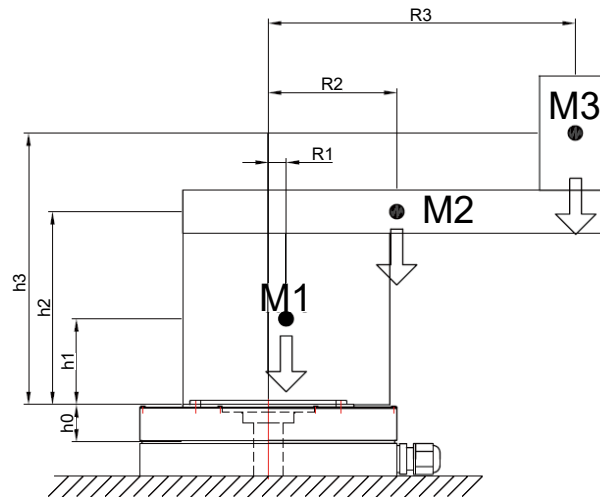
1. Make sure to follow the usage condition, environment and specification range of the product.
In case it is not secured, it may cause a drop in performance or malfunction of the product.
2. Do not attempt to handle or operate in a way not described in this instruction manual.
3. Make sure to attach the actuator properly by following this instruction manual.
Using the product with the actuator not being certainly retained or affixed may cause abnormal noise, vibration, malfunction or shorten the product life.
4. It is recommended to apply our products for the wiring between the actuator and the controller.
5. To have an optimized operation, make sure to input the gain parameters that suit to the mounted load inertia.
In case of optimized selection of gain parameters not being made, it may cause an unexpected operation error such as vibration or overshoot. Refer to [4.2 Gain Parameter Settings]
6. Use this product in a condition that it is installed on a surface that possesses a characteristic of heat radiation equivalent to an aluminum plate sized $450 \times 450 \times t12$.
Contact us in case the heat radiation condition for installation is worse than described above.
7. Be aware of high temperature on the surface of the product during operation.
8. The product possesses magnetic field of approximately 30 [mT] in the hollow area due to the impact of the magnet inside.

9. Use the product below the allowable load.

Pay special attention to the load moment, load inertia and thrust load applied to the rotary table.

[Refer to Section 1.3]

If moment load is applied, the rotary table will generate a wobble caused by the moment stiffness of the product.



International Standards Compliances

The actuator complies with the following overseas standards.

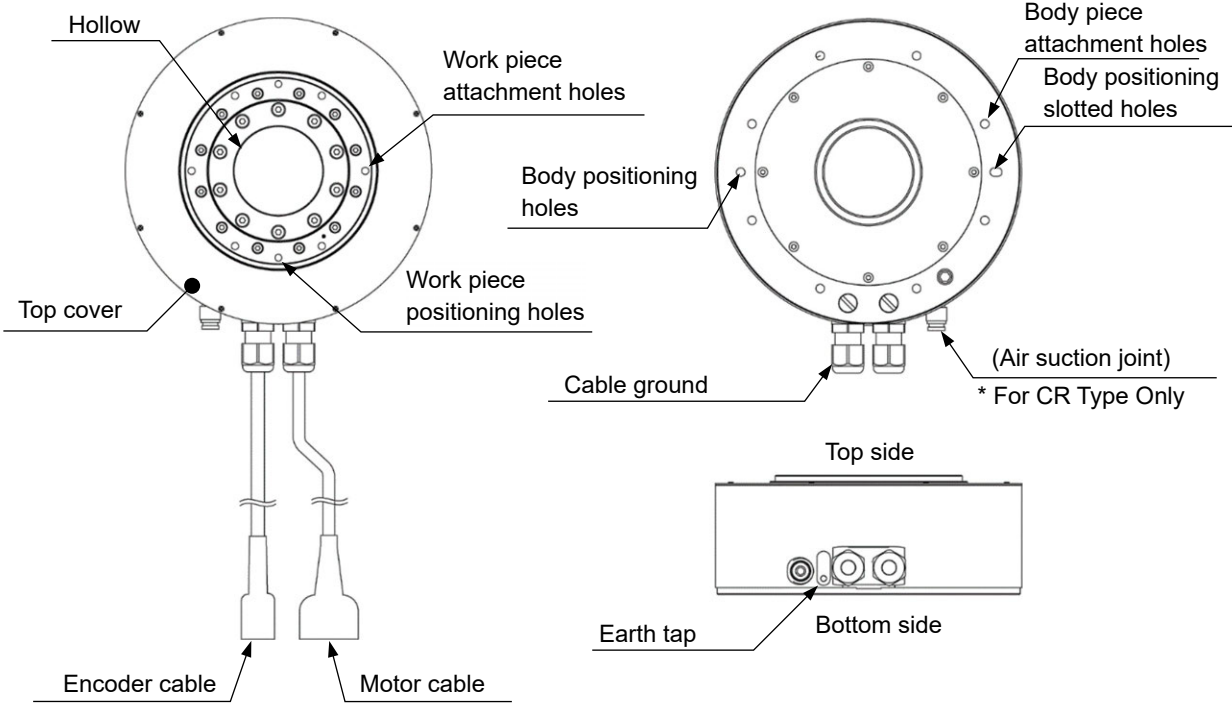
Refer to the Overseas Standard Compliance Manual (ME0287) for more detailed information.

RoHS3 Directive	CE Marking	UL
○	○	×

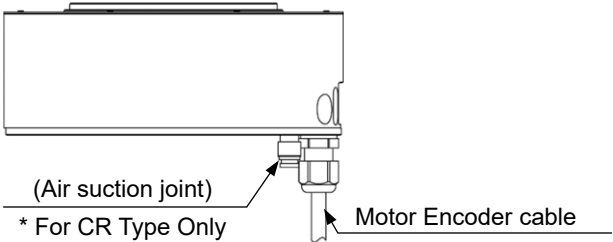
Names of the Parts

◆DDA(CR)-LT18C/LH18C-A1

(Option: Cable Ejection on Side A1)

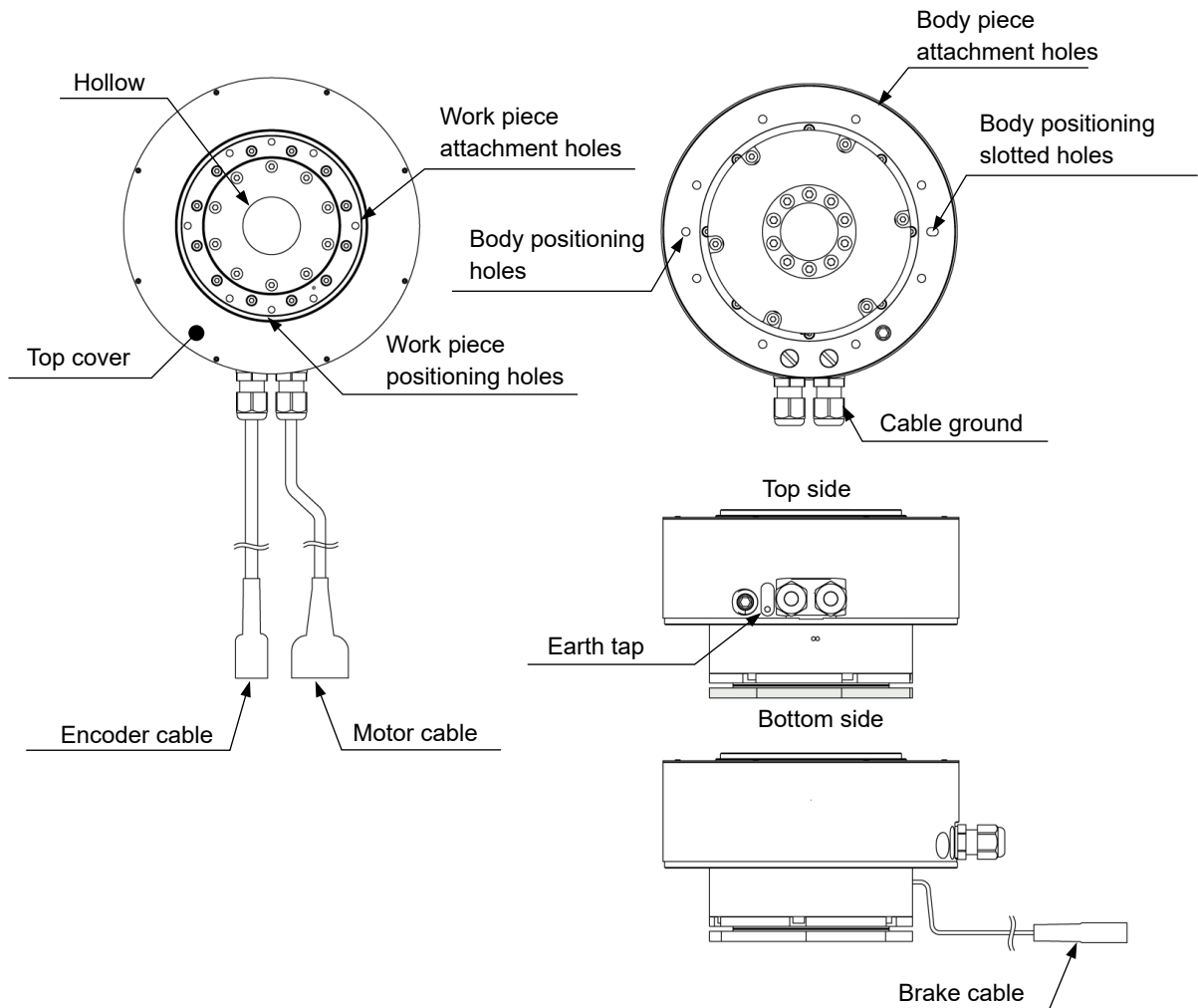


(Option: Cable Ejection on Bottom A0)

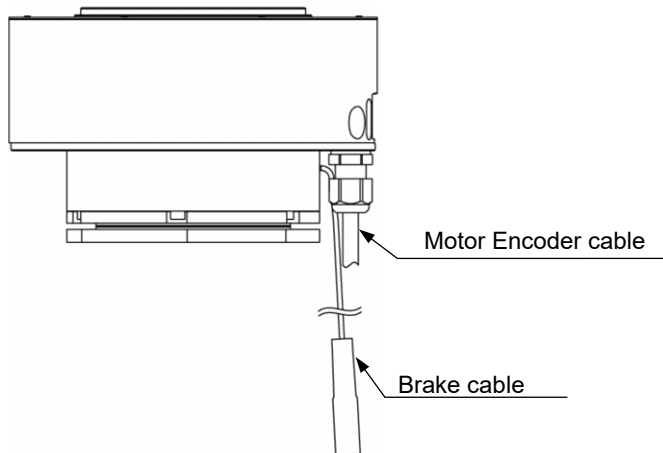


◆DDA(CR)-LT18C/LH18C-A0-BK

(Option: Cable Ejection on Side A1, Equipped with Brake BK)



(Option: Cable Ejection on Bottom A0, Equipped with Brake BK)



ELECYLINDER

Chapter 1

Specifications

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1.1 Specifications Check

The standard configuration of this product is comprised of the following parts.

See the component list for the details of the enclosed components. If you find any fault or missing parts, contact your local IAI distributor.

1.1.1 Parts

No.	Name	Model number	Quantity	Remarks
1	Actuator	Refer to "How to Read the Model Nameplate" and "How to Read the Model Number."	1	
Accessories				
2	Motor Robot Cables <small>(Note 1)</small>	CB-X-MA□□□ (Slim type) CB-XMC-MA□□□ (High torque type)	1	
3	Encoder Robot Cables	CB-X3-PA□□□	1	
4	Safety Guide	M0194	1	

Note 1 Package might be separately provided in some cases depending on the cable length of your order.

1.1.2 Instruction Manuals Related to This Product

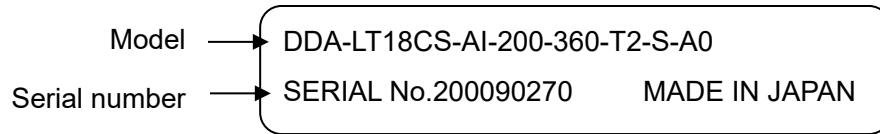
(1) X-SEL P/Q R/S Controllers

No.	Name	Control No.
1	XSEL-P/Q Controller Instruction Manual	ME0148
2	XSEL-R/S Controller Instruction Manual	ME0313
3	XSEL-P/Q/PX/QX Controller Gateway Function Instruction Manual	ME0188
4	X-SEL Controller P/Q Vision System I/F Function Instruction Manual	ME0269
5	XSEL-P/Q R/S Function of Electronic Cam Instruction Manual	ME0246
6	PC Software IA-101-X-MW/IA-101-X-USBMW Instruction Manual	ME0154
7	Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Program Controller Instruction Manual	ME0325
8	Touch Panel Teaching Pendant TB-02, TB-02D Applicable for Program Controller Instruction Manual	ME0356
9	Touch Panel Teaching Pendant TB-03 Applicable for Program Controller Instruction Manual	ME0377
10	Teaching Pendant SEL-T/TD/TG Instruction Manual	ME0183
11	Teaching Pendant IA-T-X/XD Instruction Manual	ME0160
12	DeviceNet Instruction Manual	ME0124
13	CC-Link Instruction Manual	ME0123
14	PROFIBUS-DP Instruction Manual	ME0153
15	XSEL Ethernet Instruction Manual	ME0140

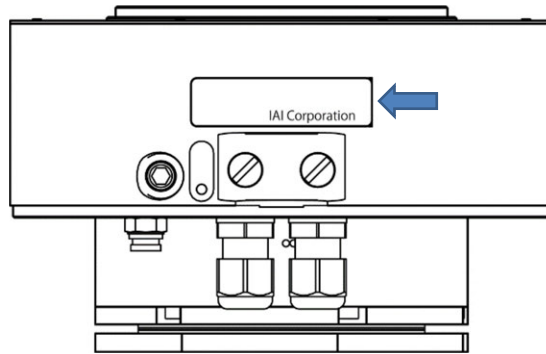
(2) SCON-CA/CB Controller

No.	Name	Control No.
1	SCON-CA Controller Instruction Manual	ME0243
2	SCON-CB Controller Instruction Manual	ME0340
3	PC Software RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
4	Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Position Controller Instruction Manual	ME0324
5	Touch Panel Teaching Pendant TB-02, TB-02D Applicable for Position Controller Instruction Manual	ME0355
6	Touch Panel Teaching Pendant TB-03 Applicable for Program Controller Instruction Manual	ME0377
7	Teaching Pendant CON-T/TG Instruction Manual	ME0178
8	Touch Panel Teaching CON-PT/PD/PG Instruction Manual	ME0227
9	DeviceNet Instruction Manual	ME0124
10	CC-Link Instruction Manual	ME0123
11	PROFIBUS-DP Instruction Manual	ME0153

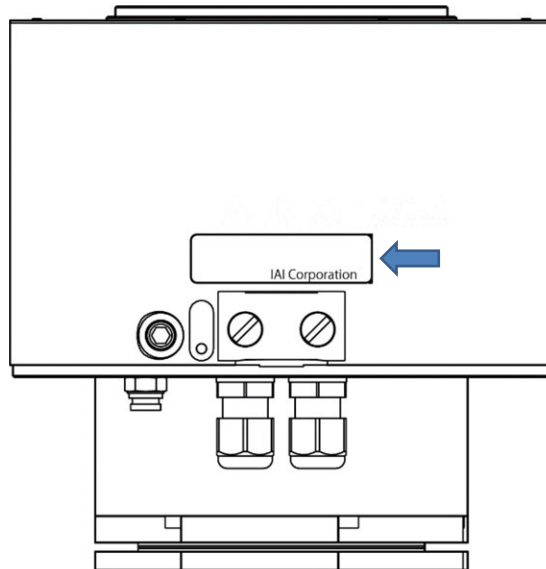
1.1.3 How to Read the Model Nameplate



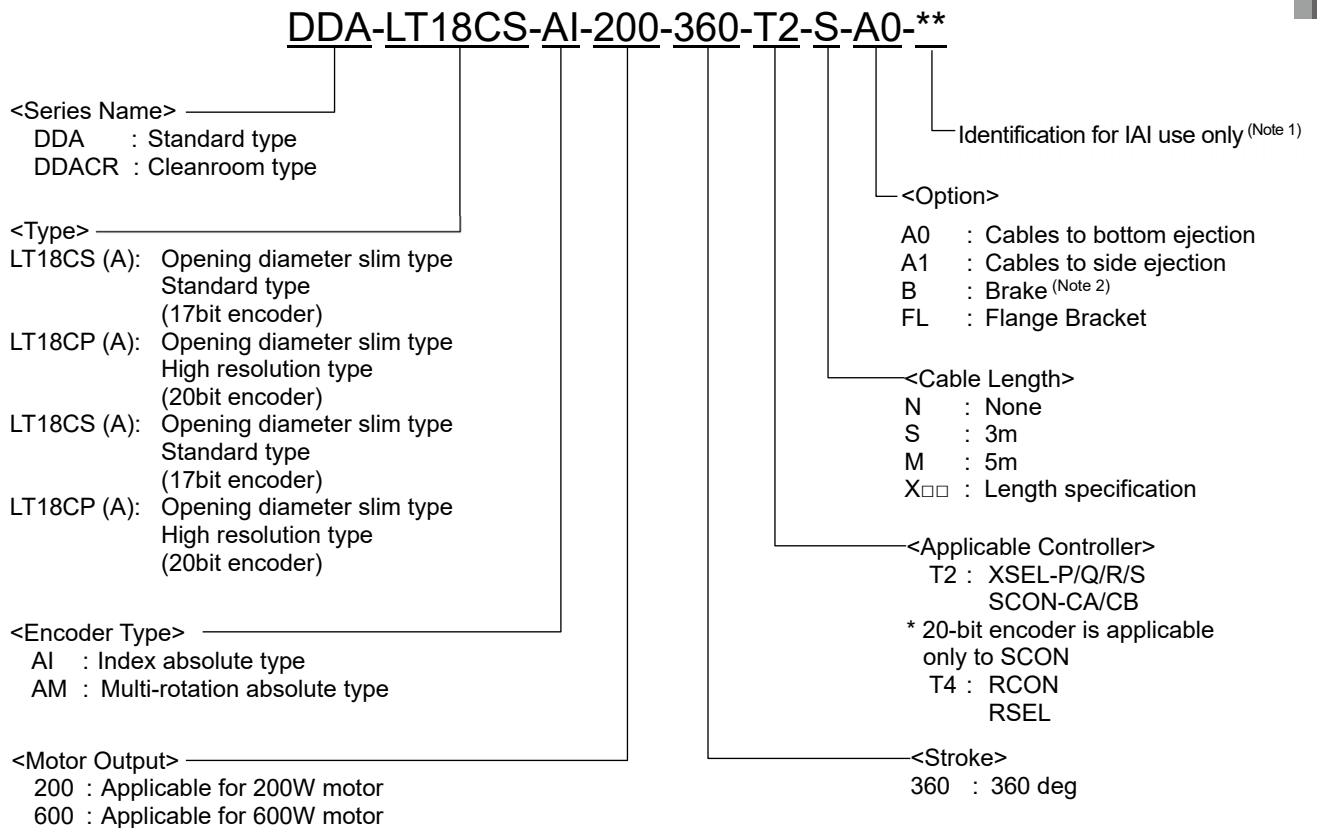
[Label Position]
LT18C



LH18C



1.1.4 How to Read the Model Number



Note 1 Identification for IAI use only: This may be marked for the purpose of IAI. It is not an ID to describe the model type.

Note 2 The brake option (B) is available to select only for DDA Standard Type.



Caution

- The mounted encoder may differ depending on the end digit of the type if there is A or not. When an encoder is required to be replaced to another type, it may require to update the version of a controller. Consult with IAI.

1.2 Specifications

Item	Specification		
	Slim Type (LT18C)	High Torque Type(LH18C)	
Rotating Angle	359.999 deg		
Rated Torque	8.4N·m	25N·m	
Instantaneous Max. Torque	25.2N·m	75N·m	
Rated Angular Velocity	1,080 deg/sec	800 deg/sec	
Maximum Angular Velocity	1,800 deg/sec	1,440 deg/sec	
Maximum Acceleration/ Deceleration Speed (Reference)	Refer to Section 4.2.2 Load Inertia - Gain Parameter List		
Allowable Thrust Load (Note 1)	3,100N (316.3kgf) Positive Direction (Note 3) / 250N(25.5kgf) Negative Direction (Note 3)		
Allowable Moment Load	80N·m (Note 1)		
Rotor Inertia	0.0043kg·m ²	0.0092kg·m ²	
Allowable Load Inertia	0.6kg·m ² (=maximum torque/0.24G)	1.8kg·m ² (=maximum torque/0.24G)	
Positioning Repeatability	±0.0055 deg (resolution: 17bit) ±0.00103 deg (resolution: 20bit)		
Angular Error	±45sec (resolution: 17bit) ±30sec (resolution: 20bit)		
Lost Motion	0.011 deg Max. (resolution: 17bit) 0.00206 deg Max. (resolution: 20bit)		
Loss Torque	4.0N·m Max (Note 2)		
Encoder Resolution	131,072pulse/rev (17bit), 1,048,576pulse/rev (20bit)		
Usage Ambient Temp.	0 to 40°C		
Usage Ambient Humidity	20 to 85%		
Storage Ambient Temp.	-20 to 85°C		
Storage Ambient Humidity	20 to 85%		
Protection Class	IP40 (Cleanroom Types not applicable for IP)		
Mass	Standard	5.8kg	13.0kg
	With brake	8.7 kg	17.4kg
Thrust (Axial) Rotary Wobble	30μm		
Radial Rotary Wobble	30μm		
Operation Range	0 to 359.999 deg (maximum ±9,999 deg (resolution: 17bit)) 0 to 359.999 deg (maximum ±2,520 deg (resolution: 20bit))		
Max. Surface Magnetic Flux Density	Standard	10mT Max.	
	With brake	100mT Max.	
Cleanliness (Cleanroom Specifications Only)	Class 10		

Note 1 Load to make the product life L10 for 5 years under the condition of the rated rotation speed 8h/day and the load factor 1.2

Note 2 The motor is driven with a support of another device in the rated rotation speed and measure the maximum output torque with a torque motor

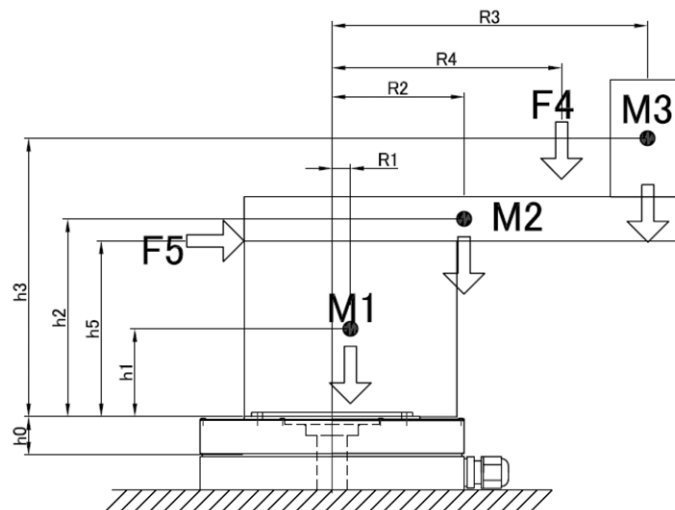
Note 3 Forward : Direction to press the rotor along the rotary axis towards the body side
Backward : Direction to pull the rotor along the rotary axis against the body side

1.3 Conditions for Selection

It is necessary to calculate the five conditions below of the mounted load when determining if this product can be used or not or when studying the operation patterns.

Thrust load and load moment can give an impact to the product life while load inertia can give an impact to the operational characteristics. All of them need to be calculated correctly and check the specifications before use.

1. Thrust load
2. Load moment
3. Load inertia
4. Unbalanced Load
5. Operational Conditions



- M1, M2, M3 : Mounted Mass (kg)
 F4 : Axial External Force (N)
 F5 : Radial External Force (N)

In the following, explains about the each Item.

1.3.1 Thrust Load

It is the sum of the gravity applied to the mounted load and the thrust external force applied to the mounted load.

$$\text{Thrust Load} = M1 \times G + M2 \times G + M3 \times G + F4$$

Gravitational Acceleration $G = 9.806$

[DDA Allowable thrust load]

Positive Direction	Direction to push towards the main body along the rotary axis of the rotor	3,100N (316.3kgf)
Negative Direction	Direction to pull against the main body along the rotary axis of the rotor	250N (25.5kgf)

* The allowable thrust load to the negative direction is for the case that thrust load is applied in the pulling direction such as in ceiling installation.

1.3.2 Load Moment

It is the sum of the moment load applied to the bearings in this product. It is the total value of the figures calculated for the following items.

- Moment caused by the gravity applied to the mounted load
- Moment caused by the centrifugal force of the rotary movement during the operation
- Moment caused by the thrust external force
- Moment caused by the radial external force

Load moment (N•m) = Make sure the moment generated by gravity
 + Moment caused by centrifugal force
 + Moment caused by the axial external force
 + Moment caused by the radial external force

Make sure the moment generated by gravity = $M1 \times R1 \times G + M2 \times R2 \times G + M3 \times R3 \times G$

Moment caused by centrifugal force = $M1 \times R1 \times \omega^2 \times (h0+h1) + M2 \times R2 \times \omega^2 \times (h0 + h2) + M3 \times R3 \times \omega^2 \times (h0 + h3)$

Moment caused by the axial external force = $F4 \times R4$

Moment caused by the radial external force = $F5 \times h5$

Gravitational acceleration	: G (m/s ²)
Angular velocity	: ω (rad/s)
Mass of loaded piece	: M1, M2, M3 (kg)
Rotation radius of the center of gravity of mounted load	: R1, R2, R3 (m)
Height of the center of gravity of mounted load from work piece attachment surface	: h1, h2, h3 (m)
Height from the center of bearing to work piece attachment surface	: h0 (m)
Axial external force	: F4 (N)
Radial external force	: F5 (N)
Distance of axial external force center	: R4 (m)
Height of radial external force	: h5 (m)

DDA Allowable moment load: 80N•m

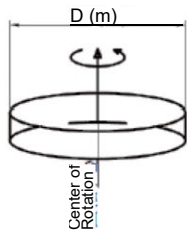
1.3.3 Load Inertia

It is the inertia of the mounted load for the center of the rotary table. The settings for the angular acceleration, angular velocity and the gain parameters of the rotary table are established based on this value. In this instruction manual, the inertia is expressed in the unit of $\text{kg}\cdot\text{m}^2$.

[Calculation of Load Inertia]

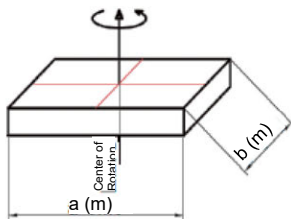
To set up the driver parameter appropriately, it is necessary to figure out the load inertia. Calculate the load inertia for the center of rotation by referring to a textbook that describes general formulas.

Shown below is a typical formula to calculate the load inertia.



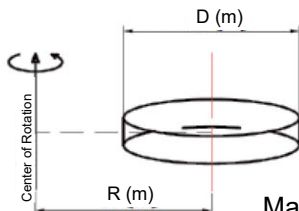
Mass : M (kg)

$$J = 1/8 \times M \times D^2 \text{ (kg}\cdot\text{m}^2\text{)}$$



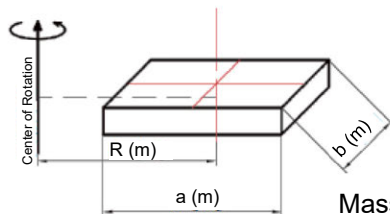
Mass : M (kg)

$$J = 1/12 \times M \times (a^2 + b^2) \text{ (kg}\cdot\text{m}^2\text{)}$$



Mass : M (kg)

$$J = M \times R^2 + 1/8 \times M \times D^2 \text{ (kg}\cdot\text{m}^2\text{)}$$



Mass : M (kg)

$$J = M \times R^2 + 1/12 \times M \times (a^2 + b^2) \text{ (kg}\cdot\text{m}^2\text{)}$$

[DDA Allowable load inertia]

Thin Type	DDA-LT18C	$0.6\text{kg}\cdot\text{m}^2$ (= Maximum torque /0.24G)
High Torque Type	DDA-LH18C	$1.8\text{kg}\cdot\text{m}^2$ (= Maximum torque /0.24G)

1.3.4 Unbalanced Load

$T_{gmax} \geq$ Rated Torque ... Not available for use

Max value of load torque by gravity	$T_{gmax} =$ Max value of T_g
Load torque by gravity in Angle θ	$T_g = M \times G \times \sin\psi \times \sin\theta \times R$
Distance from center of rotation to center of gravity in workpiece	R
Total weight of workpiece	M
Gravitational acceleration	$G = 9.806$
Tilted angle of rotary axi	ψ [0deg in horizontal installation, 90deg in vertical installation]
Rotary angle of rotor	θ [90deg is horizontal to gravity*]

* Position where workload is in horizontal and load torque by gravity gets maximum as shown in figure below

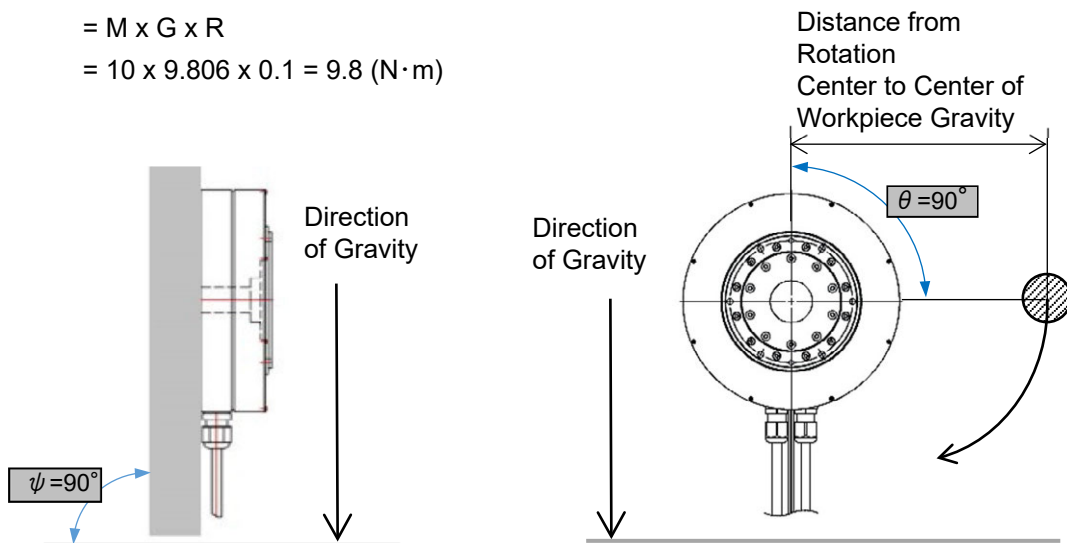
[Example] Calculate Max. Value of Load Torque by Gravity

When installed in horizontal oriented wall mount at total workpiece mass $M = 10$ (kg) and distance from rotation center to center of workpiece gravity $R = 0.1$ (m) $\sin \Psi = \sin \theta = 1$ when $\Psi = 90$ deg in installation in horizontally oriented wall mount and position that load torque due to gravity gets the highest $\theta = 90$ deg

$$T_{gmax} = M \times G \times \sin\psi \times \sin\theta \times R$$

$$= M \times G \times R$$

$$= 10 \times 9.806 \times 0.1 = 9.8 \text{ (N}\cdot\text{m)}$$



[DDA Rated Torque]

Thin Type	DDA-LT18C	8.4 N·m
High Torque Type	DDA-LH18C	25 N·m

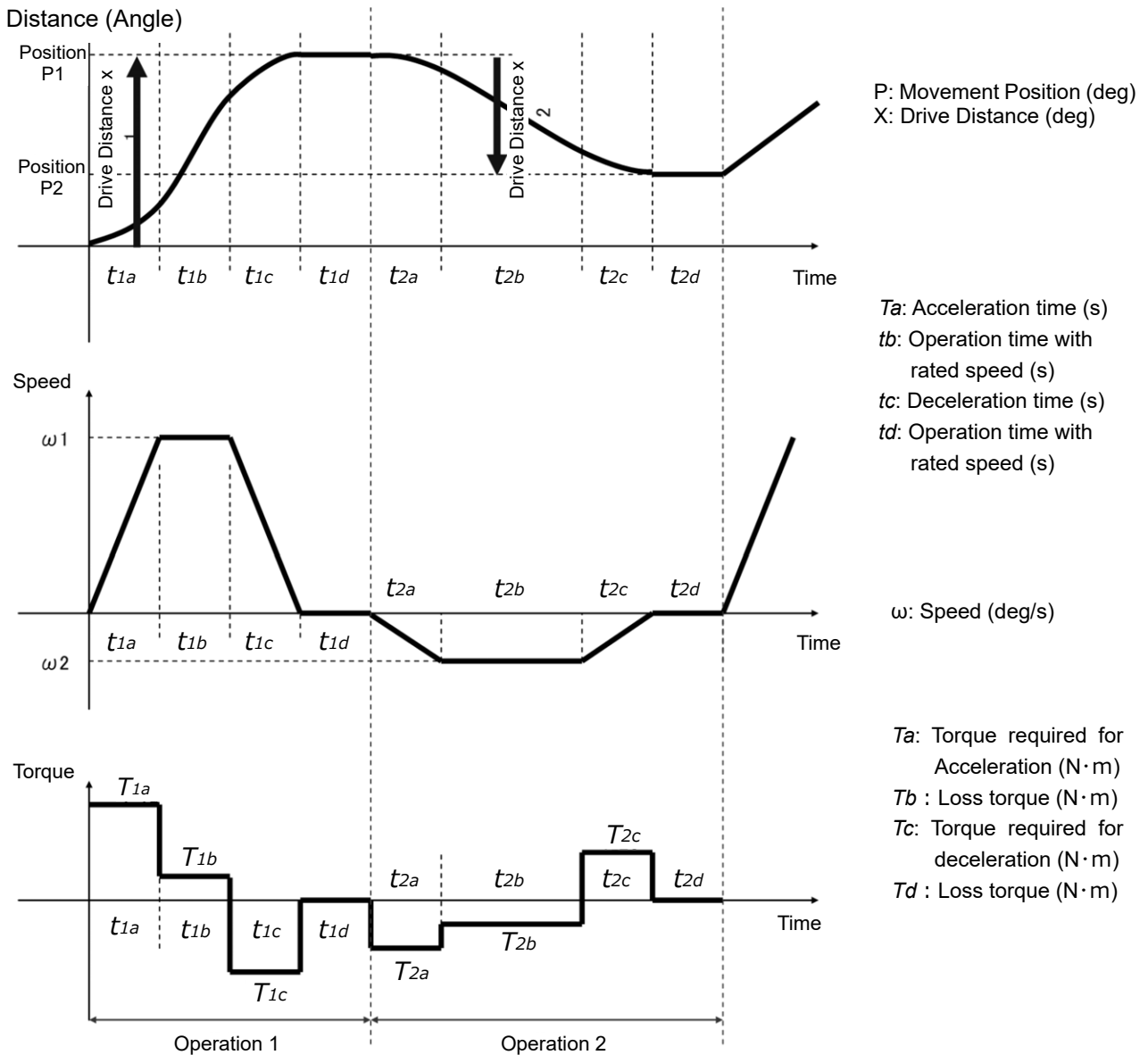
- The product may get damaged with unexpected heat generation in case of use in an environment that the condition of heat radiation is not good. The reference for the temperature on the top surface of the base while in a continuous operation is 65degC.
- If the product is used only in a specific small range, have an additional one turn operation of approximately 180deg in a day for the purpose of preventing oil shortage on the bearings. Not having this operation may shorten the product life or lower the operation accuracy.

1.3.5 Operational Conditions

(1) Operational Pattern Check

Set the operations into the operation patterns below, check the values for the velocity (ω) and torque (T) time in each section (t).

Operational Patterns



(2) Check on Acceleration/Deceleration

Acceleration/deceleration should be calculated by values of the velocity (ω) and time in each section (t) checked in (1).

$$\text{Acceleration } 1a = \omega 1/t_{1a}$$

$$\text{Acceleration } 2a = \omega 2/t_{2a}$$

$$\text{Deceleration } 1c = \omega 1/t_{1c}$$

$$\text{Deceleration } 2c = \omega 2/t_{2c}$$

Make sure that the acceleration / deceleration figured out do not undergo the possibly acceleration / deceleration figured out from the motor characteristics.

◆ Possibly Acceleration Deceleration \geq Acceleration / Deceleration

$$\text{Possibly Acceleration Deceleration} = (T_{\max} - T_f) / (J_i + J_d) \times \kappa$$

J_i : Load inertia ($\text{kg} \cdot \text{m}^2$)

J_d : Rotor inertia ($\text{kg} \cdot \text{m}^2$)

T_{\max} : Max. motor torque ($\text{N} \cdot \text{m}$)

T_f : Loss torque $T_f = 0.048 \times (V / 360 \times 2\pi) + 0.5$ ($\text{N} \cdot \text{m}$)

κ : Margin factor (ordinary set to 0.6)

(3) Check on Availability of Continuous Operation

Figure out the continuous operation torque (T_{rms}) from the torque (T) and time in each section (t) checked in (1).

Continuous operation torque (T_{rms})

$$T_{rms} = \sqrt{\frac{(T_{1a}^2 \times t_{1a} + T_{1b}^2 \times t_{1b} + T_{1c}^2 \times t_{1c}) + (T_{2a}^2 \times t_{2a} + T_{2b}^2 \times t_{2b} + T_{2c}^2 \times t_{2c})}{(t_{1a} + t_{1b} + t_{1c} + t_{1d}) + (t_{2a} + t_{2b} + t_{2c} + t_{2d})}}$$

Figure out the continuous operation velocity (ω_{rms}) from the velocity (ω) and time in each section (t) checked in (1).

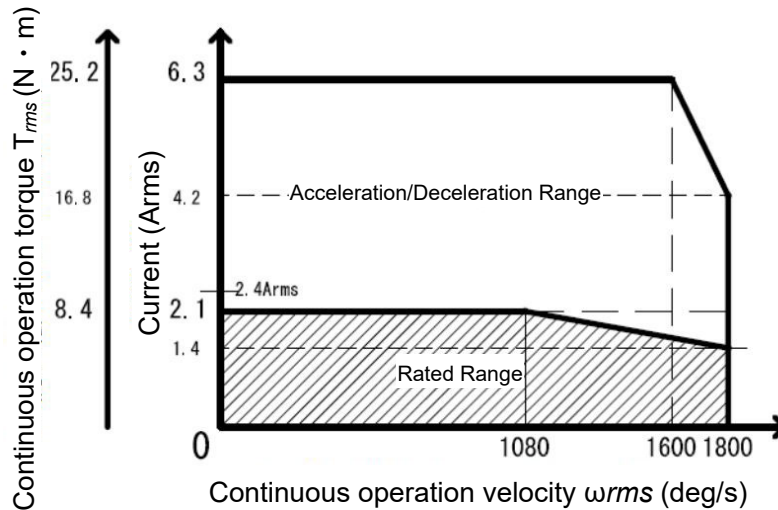
Continuous operation velocity (ω_{rms})

$$\omega_{rms} = \sqrt{\frac{\left(\frac{1}{3}t_{1a} + t_{1b} + \frac{1}{3}t_{1c}\right) \times \omega_1^2 + \left(\frac{1}{3}t_{2a} + t_{2b} + \frac{1}{3}t_{2c}\right) \times \omega_2^2}{(t_{1a} + t_{1b} + t_{1c} + t_{1d}) + (t_{2a} + t_{2b} + t_{2c} + t_{2d})}}$$

1.3 Conditions for Selection

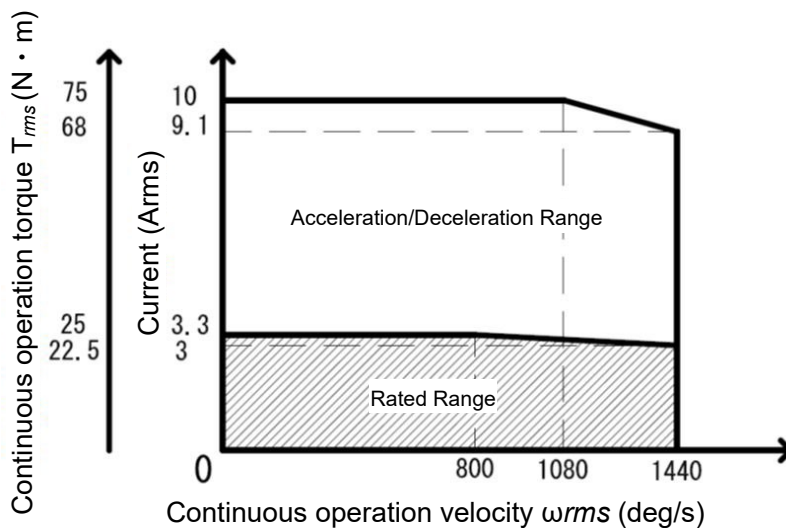
Continuous operation should be available when the figured out continuous operation torque (T_{rms}) and the continuous operation velocity (ω_{rms}) are within the continuous operation range (rated range).

Continuous Operation Range for Thin Type (DDA-LT18C)



- As it is necessary to set the parameters up considering heat generation during high speed operation, consult with IAI when operation is to be made in the continuous operation velocity at 1080deg/s or higher.

Continuous Operation Range for High Torque Type (DDA-LT18C)



- As it is necessary to set the parameters up considering heat generation during high speed operation, consult with IAI when operation is to be made in the continuous operation velocity at 800deg/s or higher.

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Chapter 2

Installation

2.1	Transportation	2-1
2.1.1	Handling the package	2-1
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2.2.1	Installation Environment	2-2
2.2.2	Storage • Preservation Environment	2-2
2.3	How to Installation	2-3
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2.3.2	Installation of the Main Unit	2-4
2.3.3	Attachment of Work Piece	2-5

2.1 Transportation

2.1.1 Handling the package

Unless otherwise specified, the actuators are wrapped individually when the product is shipped out.

- Do not damage or drop. The package is not applied with any special treatment that enables it to resist an impact caused by a drop or crash.
- An operator should never attempt to carry a heavy package on their own. Use an appropriate way for transportation.
- If the shipping box is to be left standing, it should be in a horizontal position. Follow the instruction if there is any for the packaging condition.
- Do not step or sit on the package.
- Do not put any load that may cause a deformation or breakage of the package.

2.1.2 Handling after unpacking

- Do not carry the actuator by holding the cable, or do not move it by pulling the cable.
- Hold the body base when transporting the actuator.
- Do not hit or drop the product while carrying.
- Do not give any excessive force to any of the sections in the actuator.
- Do not hold the hollowed area.

2.2 Installation and Storage • Preservation Environment

2.2.1 Installation Environment

Avoid use in the following environments and also make sure to keep enough work space necessary for maintenance.

- Location exposed to radiant heat from a huge heat source such as the heat treatment
- Location where the surrounding air temperature exceeds the range of 0 to 40°C
- Location where condensation occurs due to abrupt temperature changes
- Location where relative humidity smaller than 20% or larger than 85%RH
- Location exposed to direct sunlight
- Location exposed to corrosive gases or combustible gases
- Location exposed to significant amount of dust, salt or iron powder (Outside of an ordinary assembly plant)
- Location where water, oil (includes oil mist and cutting fluid) or a chemical is splashed
- Location where the product main body receives vibration or hit impact
- Where the altitude is more than 2000m

When using the product in any of the locations specified below, provide a sufficient shield.

- Place subject to electrostatic noise
- Location where exposed to the influence of strong electric or magnetic field
- Location where exposed to the influence of ultraviolet or radiant rays

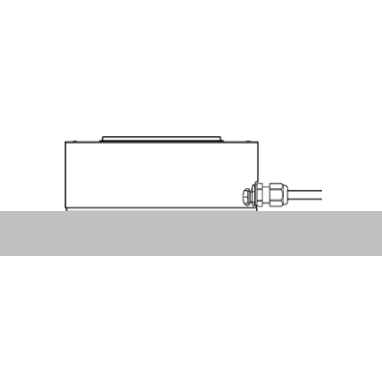
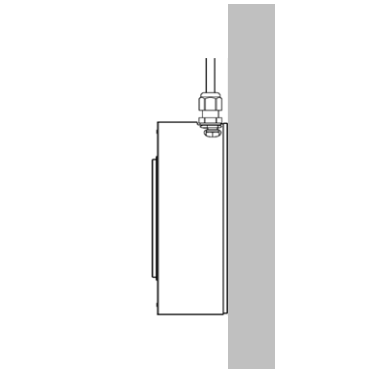
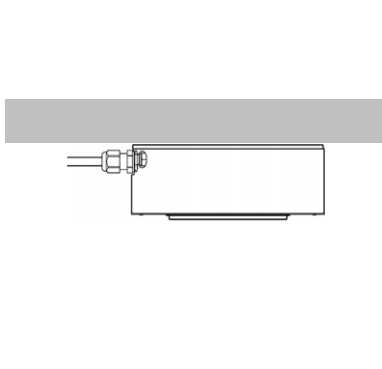
2.2.2 Storage • Preservation Environment

- The storage and preservation environment should comply with the same standards as those for the installation environment. In particular, when the machine is to be stored for a long time, pay close attention to environmental conditions so that no dew condensation forms.
- Unless specially specified, moisture absorbency protection is not included in the package when the machine is delivered. In the case that the machine is to be stored and preserved in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.
- For storage and preservation temperature, the machine withstands temperatures up to 60°C for a short time, but in the case of the storage and preservation period of 1 month or more, control the temperature to 50°C or less.
- Storage and preservation should be performed in the horizontal condition. In the case it is stored in the packaged condition, follow the orientation instruction if any displayed on the package.

2.3 How to Installation

2.3.1 Installation Posture

Installation in arbitrary orientations as well as horizontal mount is available. (Vertical/horizontally oriented wall mount and ceiling mount)

Horizontal Mount	Vertical/Horizontally Oriented Wall Mount	Ceiling Mount
 A technical drawing showing a rectangular device mounted horizontally on a wall. The device is attached to the wall by a bracket on its right side, which is secured with a bolt and nut. The wall is represented by a grey horizontal bar.	 A technical drawing showing a rectangular device mounted vertically on a wall. The device is attached to the wall by a bracket on its top side, which is secured with a bolt and nut. The wall is represented by a grey vertical bar.	 A technical drawing showing a rectangular device mounted horizontally on a ceiling. The device is attached to the ceiling by a bracket on its top side, which is secured with a bolt and nut. The ceiling is represented by a grey horizontal bar.

2.3.2 Installation of the Main Unit

- The surface to mount the main unit should be machined or a plane that possesses an equivalent accuracy and the flatness should be within 0.05mm/m.
- For the platform, ensure the structure that possesses enough stiffness to avoid vibration being generated.
- To have heat radiation performed well, make the bottom surface of the base fully touched to the attachment surface.
- For the cable ejection at bottom option and brake option and brake option, set appropriate holes and recesses on the installation surface.
- The body can be fixed from the top side.

There are spigot joint structure and reamed holes for positioning pins equipped on the bottom of the unit.

About Tightening Screws

- Use a hex socket head cap screw for the attachment to the base.
- It is recommended to use high-tensile bolts with ISO-10.9 or more.
- The effective thread length of a screw should be as shown in the table below.

Screwing in longer than stated in the table below will cause interference to internal components which could cause malfunction.

Type	Screw nominal diameter	Tightening Torque	Threaded Hole Effective Depth	Volume
LT18C	M6	2.6N·m	12mm	8
LH18C	M8	6.2N·m	16mm	8
LT18C-FL	M10	12.5N·m	20mm	4
LH18C-FL	M10	12.5N·m	20mm	4

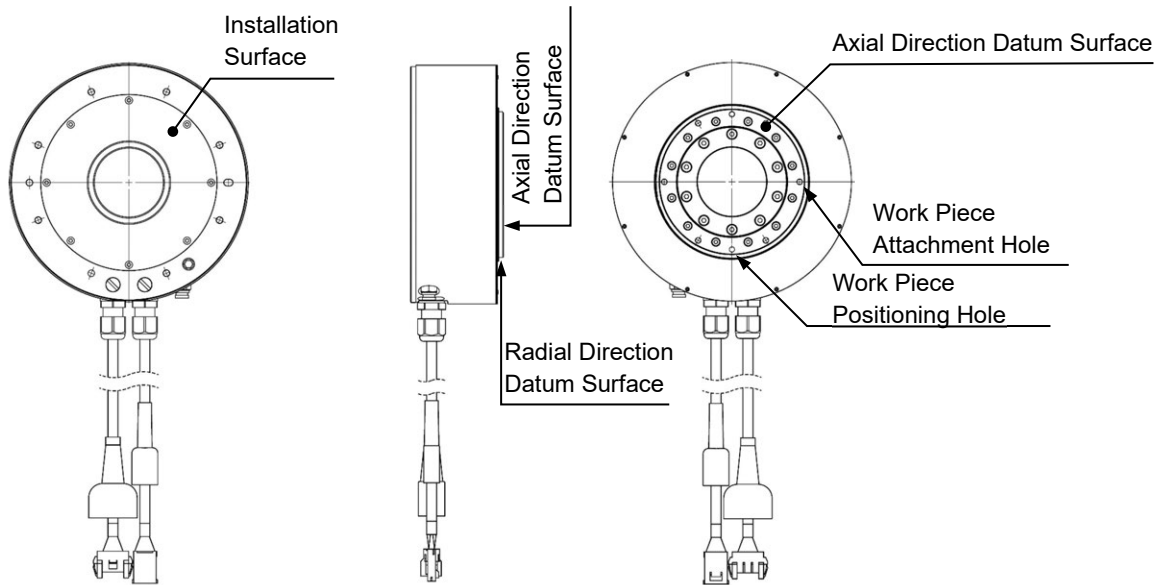


Caution

- Use this product in a condition that it is installed on a surface that possesses a characteristic of heat radiation equivalent to an aluminum plate sized 450 × 450 × t12. Contact us in case the heat radiation condition for installation is worse than described above.

2.3.3 Attachment of Work Piece

- There are screw holes on the rotary table. Fix the work piece on those holes.
- The datum surfaces for radial direction and axis direction are as shown in the figure below.
- The way to affix follows the installation of the main unit.
- There are two holes on the rotary table for positioning. Utilize them when repeatability of attachment and detachment is necessary.



Work piece attachment holes

Type	Screw nominal diameter	Tightening Torque	Threaded Hole Effective Depth	Volume
LT18C	M5	3N·m	5mm	6
LH18C	M6	5.2N·m	9mm	6

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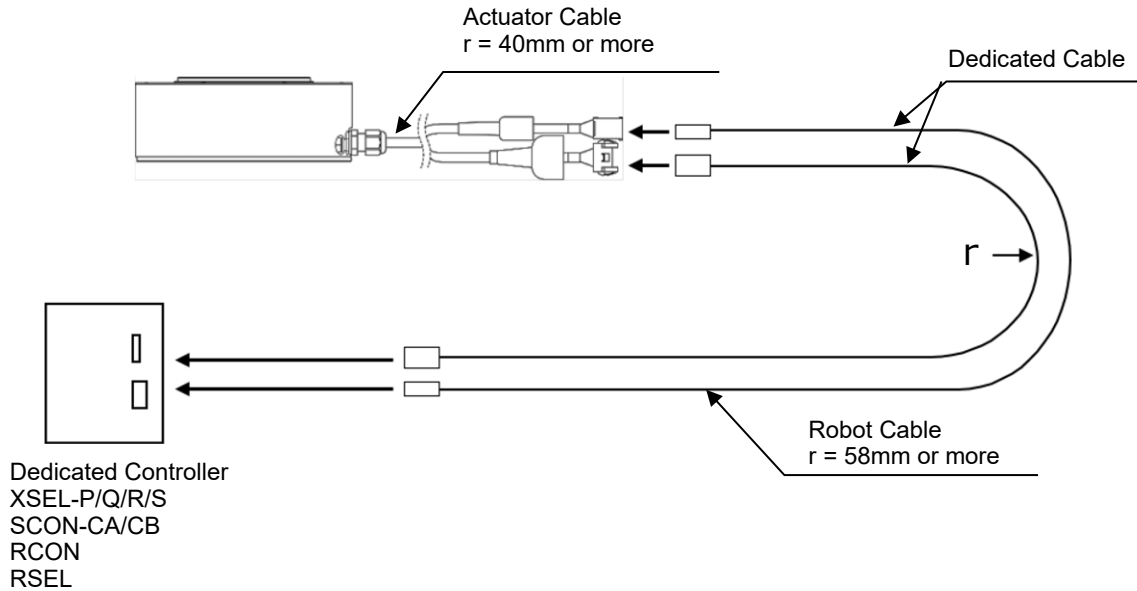
Chapter 3

Connection to the Controller

3.1	Connection to the Controller	3-1
3.2	Motor Cables • Encoder Cables	3-2
3.2.1	Motor Robot cables	3-2
3.2.2	Encoder Robot cables	3-6
3.3	Wiring for Brake-Equipped Type	3-7
3.4	Caution for Wiring	3-11

3.1 Connection to the Controller

Use the dedicated connection cables provided by us for the connection between a controller and an actuator.



Dedicated Cable

XSEL-P/Q/R/S, SCON-CA/CB

- Motor Cable CB-X-MA□□□ (Thin Type: T18/LT18)
- Motor Cable CB-XMC-MA□□□(High Torque Type : H18/LH18)
- Encoder Cable CB-X3-PA□□□

□□□ indicates the cable length Example: 080=8m

RCON, RSEL

- Motor Cable CB-X2-MA□□□ (Thin Type: T18/LT18)
- Motor Cable CB-XMC1-MA□□□(High Torque Type: H18/LH18)
- Encoder Cable CB-X3-PA□□□

□□□ indicates the cable length Example: 080=8m

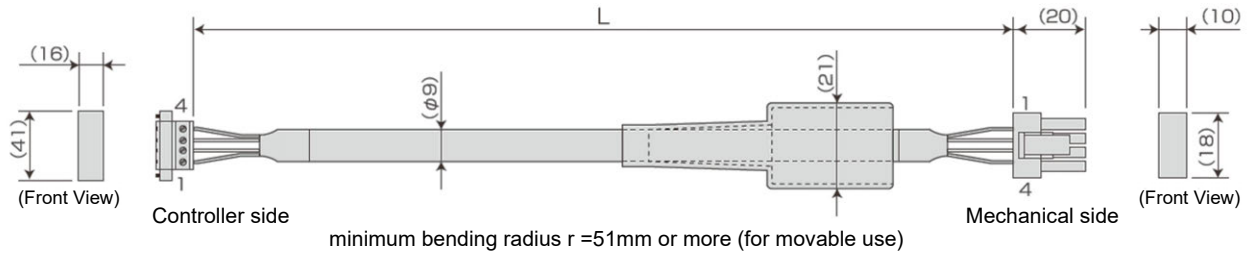
3.2 Motor Cables • Encoder Cables

3.2.1 Motor Robot cables

◆For XSEL, SCON

[Thin Type: T18/LT18]

Model **CB-X-MA**□□□

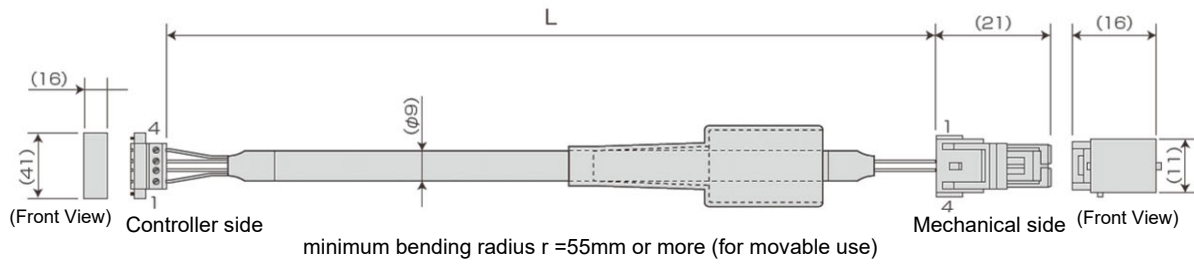


Wire Size	Color	Signal	No.	No.	Signal	Color	Wire Size
AWG18	Green	PE	1	1	U	Red	AWG18
	Red	U	2	2	V	White	
	White	V	3	3	W	Black	
	Black	W	4	4	PE	Green	

- The cable length should be 1m at minimum and 30m at maximum.
Order can be make in unit of 1m long.
- Model for example Cable length 1m → CB-X-MA010
10m → CB-X-MA100

[High Torque Type: H18/LH18]

Model **CB-XMC-MA**□□□



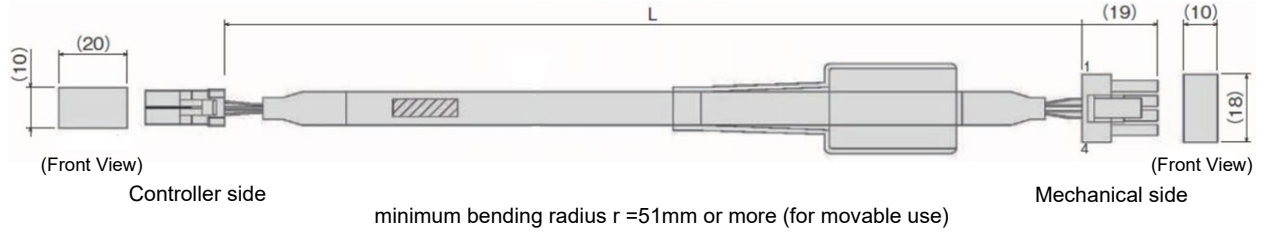
Wire Size	Color	Signal	No.	No.	Signal	Color	Wire Size
AWG16	Green	PE	1	1	U	Red	AWG16
	Red	U	2	2	V	White	
	White	V	3	3	W	Black	
	Black	W	4	4	PE	Green	

- The cable length should be 1m at minimum and 30m at maximum.
Order can be made in unit of 1m long.
- Model for example Cable length 1m → CB-XMC-MA010
10m → CB-XMC-MA100

◆For RCON, RSEL

[Thin Type: T18/LT18]

Model **CB-X2-MA**□□□

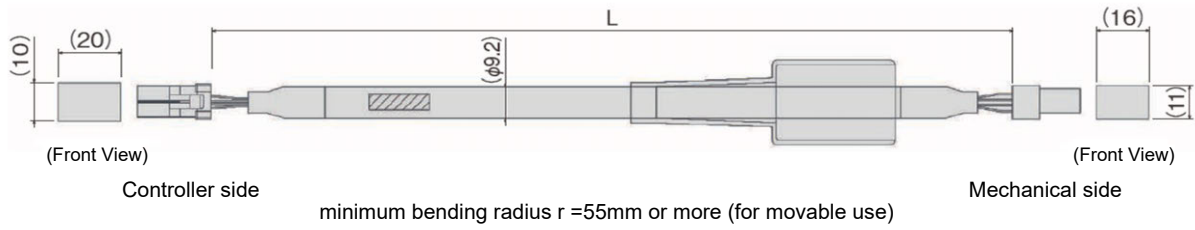


Wire Size	Color	Signal	No.	No.	Signal	Color	Wire Size
AWG18	Red	U	1	1	U	Red	AWG18
	White	V	2	2	V	White	
	Black	W	3	3	W	Black	
	Green	PE	4	4	PE	Green	

- The cable length should be 1m at minimum and 30m at maximum.
Order can be make in unit of 1m long.
- Model for example Cable length 1m → CB-X-MA010
10m → CB-X-MA100

[High Torque Type: H18/LH18]

Model **CB-XMC1-MA**□□□



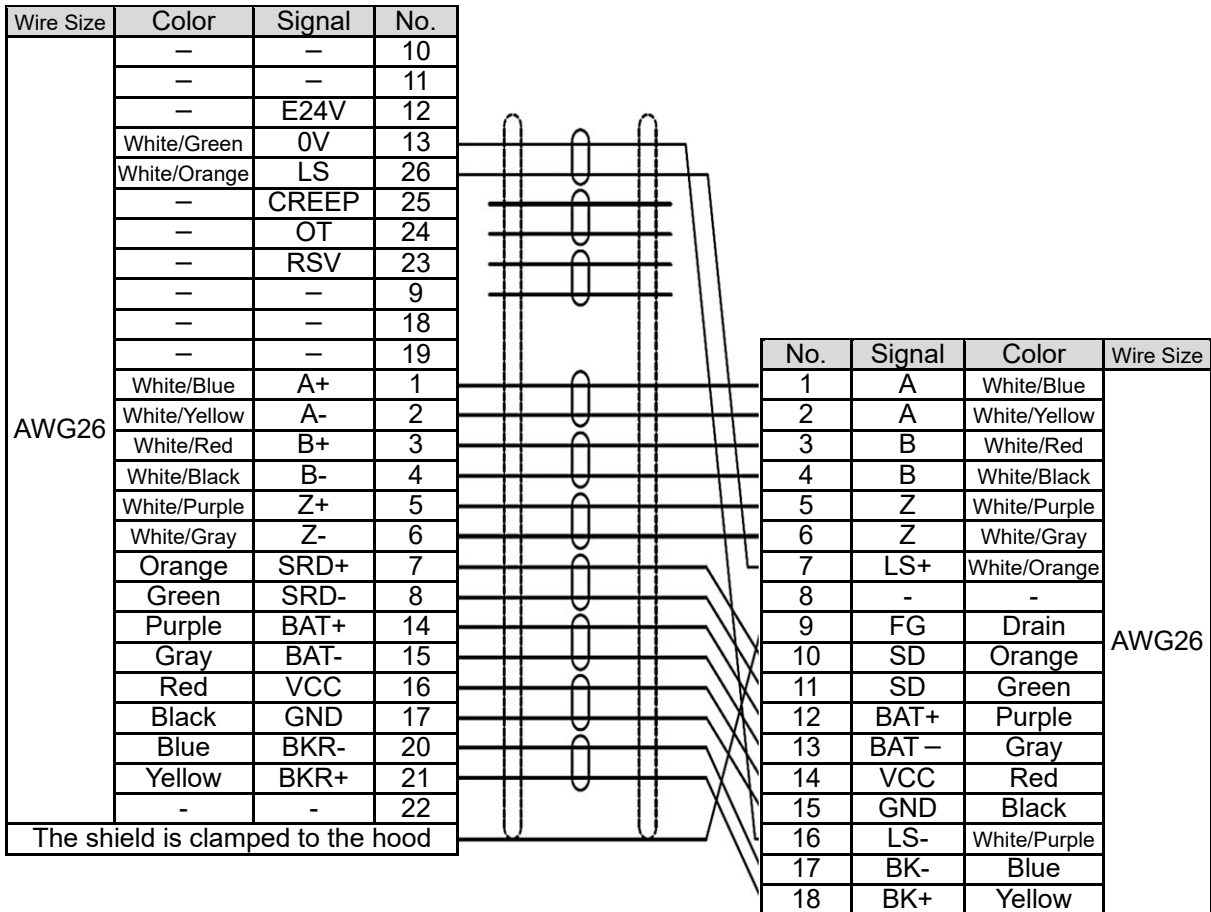
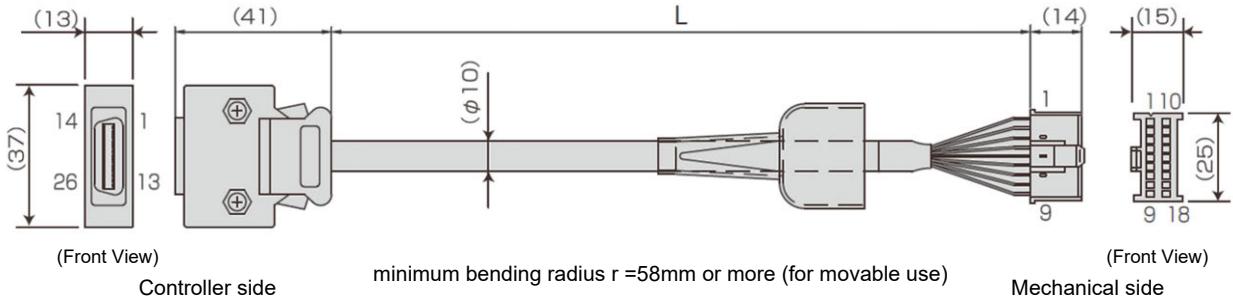
Wire Size	Color	Signal	No.	No.	Signal	Color	Wire Size
AWG16	Red	U	B1	1	U	Red	AWG16
	White	V	B2	2	V	White	
	Black	W	A1	3	W	Black	
	Green	PE	A2	4	PE	Green	

- The cable length should be 1m at minimum and 30m at maximum.
Order can be made in unit of 1m long.
- Model for example Cable length 1m → CB-XMC-MA010
10m → CB-XMC-MA100

3.2.2 Encoder Robot cables

◆Type, Controller common

Model **CB-X3-PA**□□□



- The cable length should be 1m at minimum and 30m at maximum.
Order can be make in unit of 1m long.
- Model for example Cable length 1m → CB-X-MA010
10m → CB-X-MA100

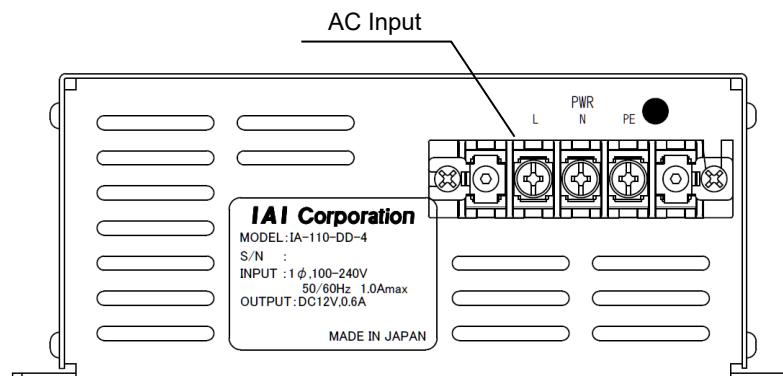
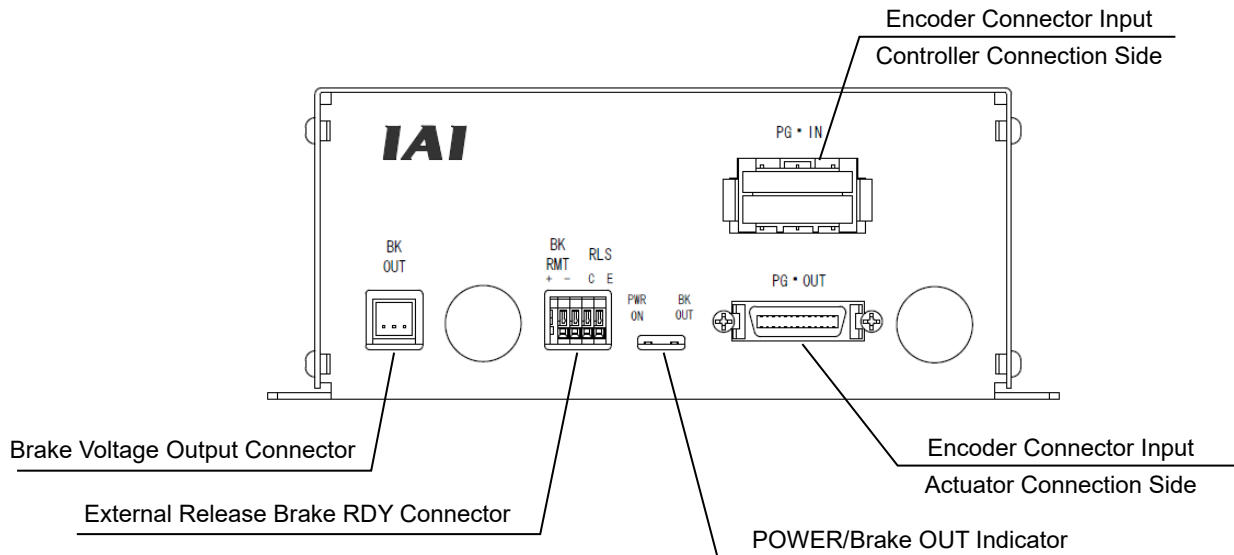
3.3 Wiring for Brake-Equipped Type

It is necessary to connect a brake box for the brake-equipped type.

This brake requires special control. Do not fail to use a brake box indicated by IAI.

Connect a power source of 100 to 200V AC to the brake box.

Connect cables following the example for connection shown below.



◆AC Power Supply Input

It is the terminal block to supply power to the brake box.

Terminal Block Name : ML-50-S2FXS-3P (Sato Parts Co., Ltd.)		
Pin No.	Signal Name	Description
1	L	AC Power Supply L-phase
2	N	AC Power Supply N-phase
3	PE	Protective Earth

◆POWER/Brake OUT Indicator

It is the LED lamps to show the brake box status.

LED Name	Status	Description
PWR ON (Green)	illuminating	Brake Box Power Supply Input ON
	OFF	Brake Box Power Supply Input OFF
BK OUT (Yellow)	illuminating	Brakes Voltage Output ON
	OFF	Brakes Voltage Output OFF

* Both LED lamps will turn off if the protection feature activates inside the brake box.

◆External Release Brake RDY Connector

1-2 pins are a connector to release the brake externally.

The brake will be released compulsorily when 1-2 pins get short-circuited.

When a switch is to be connected to the external release connector, it is necessary to have 30V DC and 1.5mA or more for the switch rating.

3-4 pins are a connector to output the release signal.

As it is the open collector using a photocoupler, inside 3-4 pins, 3-4 pins will be conducted when the brake voltage is output.

(Inside the brake box and 3-4 pins are isolated by the photocoupler.)

Connector Name: ML-700-NH-4P (Sato Parts Co., Ltd.)		
Pin No.	Signal Name	Description
1	BKRMT+	Brake Release Input + side
2	BKRMT-	Brake Release Input - side
3	RLS-C	Open collector Output Collector side
4	RLS-E	Open collector Output Emitter side

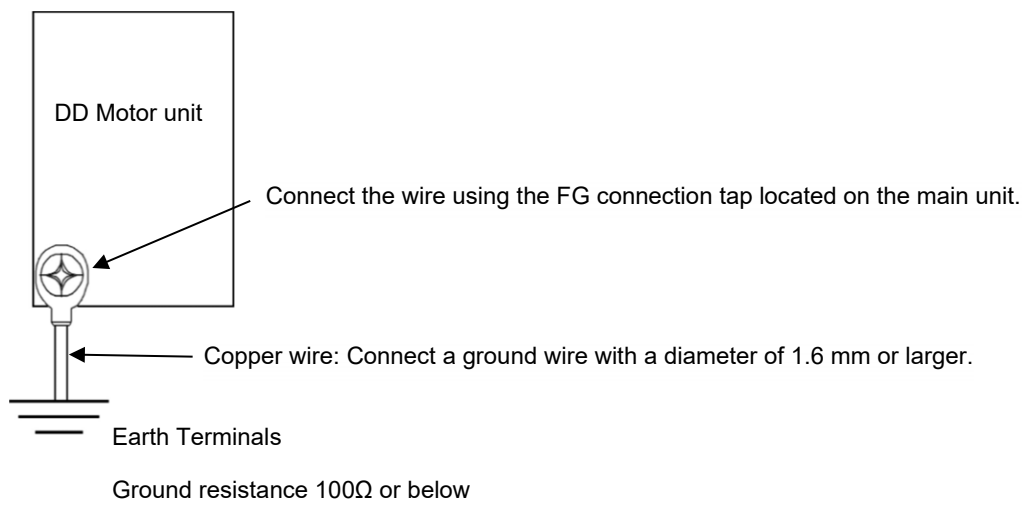
Item	Description
Power line Size	AWG22 to AWG28
Standard Pealed Wire Length	9 to 10mm

◆ Brake Voltage Output Connector

It is a connector to output the brake voltage.

Connector Name: S03B-J11SK-TXR (J. S. T. Mfg. Co., Ltd.)		
Pin No.	Signal Name	Description
1	FG	Frame ground
2	BK-	Brakes Voltage Output - side
3	BK+	Brakes Voltage Output + side

◆ Noise Elimination Grounding (Frame Ground)



3.4 Caution for Wiring

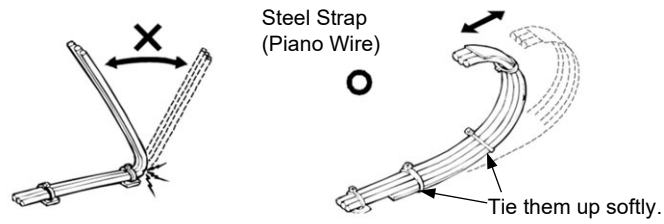


Caution

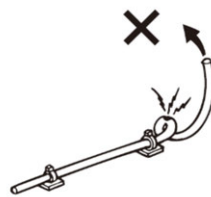
For wiring, please follow the warnings stated below. When constructing a system as the machinery equipment, pay attention to the wiring and connection of each cable so they are conducted properly. Not following them may cause not only a malfunction such as cable breakage or connection failure, or an operation error, but also electric shock or electric leakage, or may even cause a fire.

- Use dedicated cables of IAI indicated in this instruction manual. Contact us if you wish to have a change to the specifications of the dedicated cables.
- Make sure to turn the power off in the process of power line or cable connection or disconnection.
- Do not attempt to cut a dedicated cable with connectors on both ends to extend, shorten or re-joint it.
- Hold the dedicated cable to avoid mechanical force being applied to the terminals and connectors.
- Use a cable pipe or duct to have an appropriate protection when there is a possibility of mechanical damage on a dedicated cable.
- In case a dedicated cable is to be used at a moving part, make sure to lay out the cable without applying any force to pull the connector or extreme bend on the cable. Do not attempt to use the cable with a bending radius below the allowable value.
- Make certain that the connectors are plugged properly. Insufficient connection may cause an operation error, thus it is extremely risky.
- Do not lay out the cables to where the machine runs over them.
- Pay attention to the cable layout so it would not hit peripherals during an operation. In case it does, have an appropriate protection such as a cable track.
- When a cable is used hanging on the ceiling, prevent an environment that the cable swings with acceleration or wind velocity.
- Make sure there is not too much friction inside the cable storage equipment.
- Do not apply radiated heat to power line or cables.

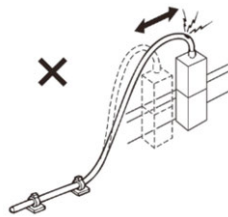
- Have a sufficient radius for bending, and avoid a bend concentrating on one point.



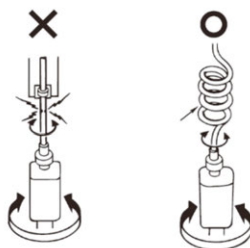
- Do not let the cable bend, kink or twist.



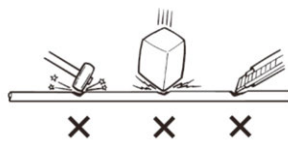
- Do not pull the cable with a strong force.



- Pay attention not to concentrate the twisting force to one point on a cable.

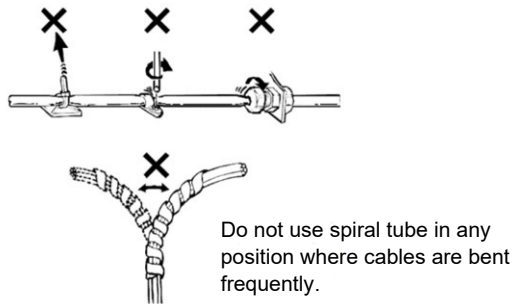


- Do not pinch, drop a heavy object onto or cut the cable.

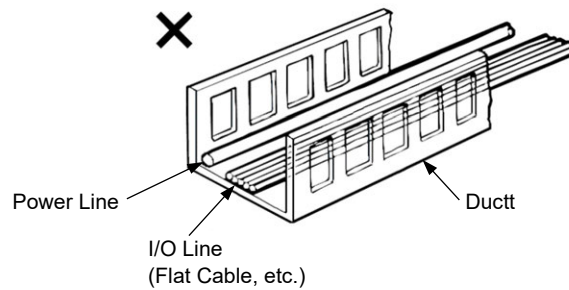


3.4 Caution for Wiring

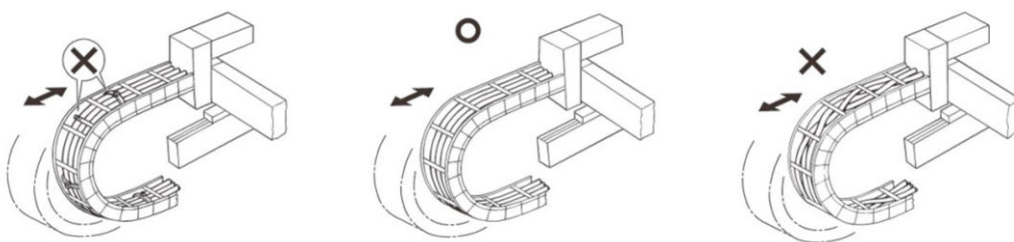
- When a cable is fastened to affix, make sure to have an appropriate force and do not tighten too much.



- PIO line, communication line, power and driving lines are to be put separately from each other and do not tie them together. Arrange so that such lines are independently routed in the duct.



- Follow the instructions below when using a cable track.
 - If there is an indication to the cable for the space factor in a cable track, refer to the wiring instruction given by the supplier when storing the cable in the cable track.
 - Avoid the cables to get twined or twisted in the cable track, and also to have the cables move freely and do not tie them up. (Avoid tension being applied when the cables are bent.)
Do not pile up cables. It may cause faster abrasion of the sheaths or cable breakage.



ELECYLINDER

Chapter 4

Operation

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4.1 Operation Type

Operation type is set to the index absolute type or multiple rotation absolute type that was selected at the order. Check the characteristics and points of caution for each type before start using.

4.1.1 Index Absolute Type

XSEL can operate in 180deg at maximum in one operation and SCON in 360deg in maximum, and they are capable to operate in one direction with no limitation.

This mode is available when there is no cable or wiring on the rotary table and no interference with peripherals when the rotary table turns 360°.

4.1.2 Multi-Rotation Absolute Type

This mode is available when there are cables or wirings on the rotary table or there is interference with peripherals when the rotary table turns 360°.

Operation can be performed for ±9999deg (approx. 27 turns) from the coordinates the absolute reset was conducted, and no further operation can be performed.

Contact us if a change in the operation mode after delivery is required.

Operation Type	Index Absolute Type	Multi-Rotation Absolute Type
Motion Range	0 to 359.999deg (XSEL) 0 to 359.99deg (SCON)	-9999.99 to 9999.99deg
Maximum movable amount in one operation command	180deg ^(Note1) (XSEL) 360deg (SCON)	Operation range described above
Infinite rotation	Available ^(Note2)	Unavailable
Home-return operation	Not required	Not required ^(Note3)
Usage condition	<ul style="list-style-type: none"> • Should be no external wiring or piping • Should be no interference in operation range 	Absolute battery needs to be connected <ul style="list-style-type: none"> • Should be no external wiring or piping • Should be no interference in operation range

Note 1 In Index Absolute Type of XSEL, the rotation is made in the direction of smaller movement amount to reach to the target position when it is more than 180deg for the movement from the current position. Therefore, be careful of the rotary direction change due to the current position. Use the SCON-CB in case you desire the movement always in one direction.

Note 2 Index Absolute Type can rotate in one direction with no limitation, and the movement amount in one operation is 180deg at maximum for XSEL and 360deg at maximum for SCON.

It cannot perform rotation continuously without a pause in one direction like a motor does.

Note 3 For Multi-rotation absolute type, it is necessary to home-return after the setting is established for the first time and every time the absolute battery is replaced.

4.2 Gain Parameter Settings

Gain parameter is determined due to the load inertia that you would mount. Set an appropriate gain parameter that suits to the load inertial from Load inertia – Gain Parameter List.



Caution

- The product may perform an unexpected movement if the gain parameter is inappropriate. Have the parameter setting work under the condition that safety is secured enough in the way that there is no interference to the peripherals in the range of operation or no one can step into the range.

4.2.1 Calculation of Load Inertia

Calculate the load inertia applied to the rotary center of the load mounted on the rotary table. Refer to [1.3.3 Load Inertia]

4.2.2 Gain Parameter Settings

Select the gain parameter that suits to your load inertia by referring to the tables in the following pages.

◆ Load Inertia - Gain Parameter List (Thin Type)

When connecting DDA-LT18CS(A) to XSEL-P/Q and R/S

Bottom Limit of Load Inertia (kg•m ²)	0	0.005	0.01	0.02	0.03	0.04	0.05	0.06
Top Limit of Load Inertia (kg•m ²)	0.005	0.01	0.02	0.03	0.04	0.05	0.06	0.07
Position Gain Each Axis Parameter No.60	125	125	125	125	125	125	106	92
Velocity Loop Gain Driver parameter No.43	20133	30958	52609	74260	95910	117561	118068	118068
Velocity Loop Integrated Time Constant Driver parameter No.44	8	8	8	8	8	8	9	11
Torque Filter Time Constant Driver parameter No.45	3	3	3	3	3	3	3	4
Current Control Band Number Driver parameter No.46	4	4	4	4	4	4	4	4

Bottom Limit of Load Inertia (kg•m ²)	0.07	0.08	0.09	0.1	0.2	0.3	0.4	0.5
Top Limit of Load Inertia (kg•m ²)	0.08	0.09	0.1	0.2	0.3	0.4	0.5	0.6
Position Gain Each Axis Parameter No.60	81	72	65	33	22	17	14	11
Velocity Loop Gain Driver parameter No.43	118068	118068	118068	118068	118068	118068	118068	118068
Velocity Loop Integrated Time Constant Driver parameter No.44	12	14	15	30	45	59	74	89
Torque Filter Time Constant Driver parameter No.45	4	5	5	10	15	20	25	30
Current Control Band Number Driver parameter No.46	4	4	4	4	4	4	4	4

(Note) Refer to the instruction manual of the controller and a teaching tool such as PC software for how to change the parameter.

When connecting DDA-LT18CS(A) to SCON-CA/CB and RCON-SC

Bottom Limit of Load Inertia (kg•m ²)	0	0.005	0.01	0.02	0.03	0.04	0.05	0.06
Top Limit of Load Inertia (kg•m ²)	0.005	0.01	0.02	0.03	0.04	0.05	0.06	0.07
Servo Gain Number Parameter No.7	24	24	24	24	24	24	20	17
Velocity Loop Proportional Gain Parameter No.31	20133	30958	52609	74260	95910	117561	118068	118068
Velocity Loop Integrated Gain Parameter No.32	251664	386981	657614	928247	1198880	1469513	1251691	1083224
Torque filter time constant Parameter No.33	3	3	3	3	3	3	3	4
Current Control Band Number Parameter No.54	4	4	4	4	4	4	4	4

Bottom Limit of Load Inertia (kg•m ²)	0.07	0.08	0.09	0.1	0.2	0.3	0.4	0.5
Top Limit of Load Inertia (kg•m ²)	0.08	0.09	0.1	0.2	0.3	0.4	0.5	0.6
Servo Gain Number Parameter No.7	15	13	12	6	3	2	2	1
Velocity Loop Proportional Gain Parameter No.31	118068	118068	118068	118068	118068	118068	118068	118068
Velocity Loop Integrated Gain Parameter No.32	954727	853482	771652	393945	264485	199067	159593	133183
Torque filter time constant Parameter No.33	4	5	5	10	15	20	25	30
Current Control Band Number Parameter No.54	4	4	4	4	4	4	4	4

4.2 Gain Parameter Settings

When connecting DDA-LT18CP(A) to SCON-CA/CB and RCON-SC

Bottom Limit of Load Inertia (kg•m ²)	0	0.005	0.01	0.02	0.03	0.04	0.05	0.06
Top Limit of Load Inertia (kg•m ²)	0.005	0.01	0.02	0.03	0.04	0.05	0.06	0.07
Servo Gain Number Parameter No.7	24	24	24	24	24	24	20	17
Velocity Loop Proportional Gain Parameter No.31	20133	30958	52609	74260	95910	117561	118068	118068
Velocity Loop Integrated Gain Parameter No.32	251664	386981	657614	928247	1198880	1469513	1251691	1083224
Torque filter time constant Parameter No.33	3	3	3	3	3	3	3	4
Current Control Band Number Parameter No.54	4	4	4	4	4	4	4	4

Bottom Limit of Load Inertia (kg•m ²)	0.07	0.08	0.09	0.1	0.2	0.3	0.4	0.5
Top Limit of Load Inertia (kg•m ²)	0.08	0.09	0.1	0.2	0.3	0.4	0.5	0.6
Servo Gain Number Parameter No.7	15	13	12	6	3	2	2	1
Velocity Loop Proportional Gain Parameter No.31	118068	118068	118068	118068	118068	118068	118068	118068
Velocity Loop Integrated Gain Parameter No.32	954727	853482	771652	393945	419159	556905	694650	832396
Torque filter time constant Parameter No.33	4	5	5	10	15	20	25	30
Current Control Band Number Parameter No.54	4	4	4	4	4	4	4	4

(Note) Refer to the instruction manual of the controller and a teaching tool such as PC software for how to change the parameter.

Load Inertia Acceleration Correspondence Table for DDAL-T18C Series

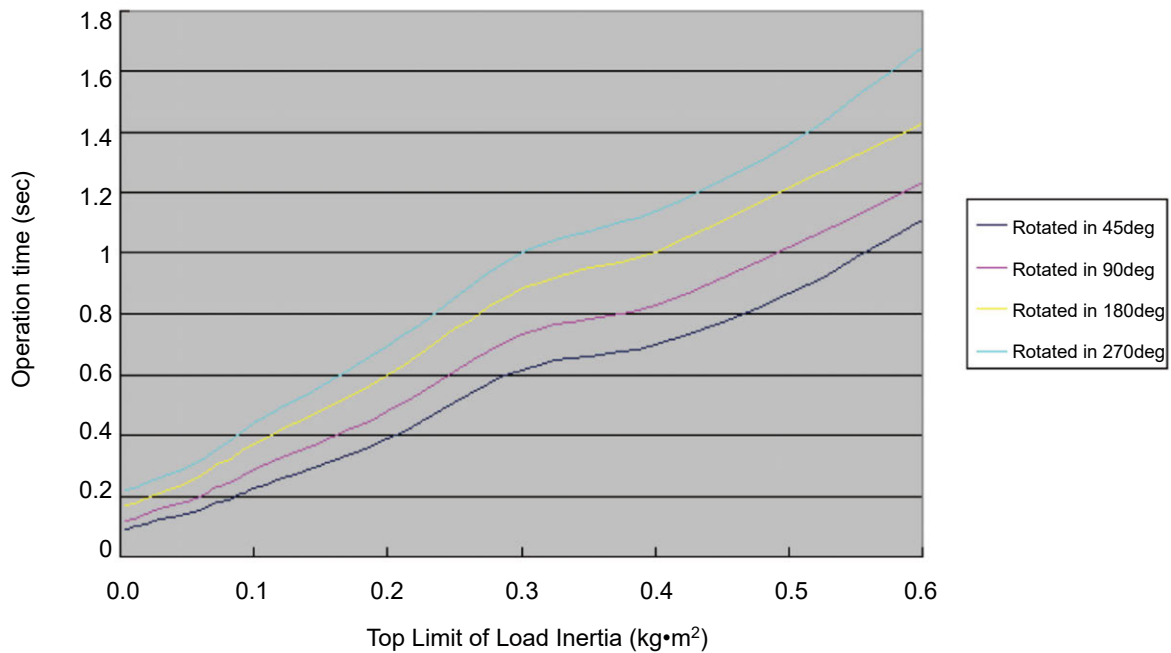
Rotor Inertia = 0.001987 (kg•m²)

Bottom Limit of Load Inertia (kg•m ²)	0	0.005	0.01	0.02	0.03	0.04	0.05	0.06
Top Limit of Load Inertia (kg•m ²)	0.005	0.01	0.02	0.03	0.04	0.05	0.06	0.07
Rated Acceleration (G) *	5.28	3.43	2.02	1.43	1.11	0.90	0.76	0.66
Recommended Max. Acceleration (Rating×1.8) (G) *	9.50	6.18	3.64	2.58	1.99	1.63	1.37	1.19

Bottom Limit of Load Inertia (kg•m ²)	0.07	0.08	0.09	0.1	0.2	0.3	0.4	0.5
Top Limit of Load Inertia (kg•m ²)	0.08	0.09	0.1	0.2	0.3	0.4	0.5	0.6
Rated Acceleration (G) *	0.58	0.52	0.47	0.24	0.16	0.12	0.10	0.08
Recommended Max. Acceleration (Rating×1.8) (G) *	1.05	0.94	0.85	0.43	0.29	0.22	0.18	0.15

* 1G = 9806.65deg/s²

[DD-T18 Series Takt Time (Reference)]



(Note) Acceleration and takt time are reference. Adjust them as necessary considering the characteristics of the load.

◆ Load Inertia - Gain Parameter List (High Torque Type)

When connecting DDA-LH18CS(A) to XSEL-P/Q and R/S

Bottom Limit of Load Inertia (kg•m ²)	0	0.005	0.01	0.015	0.02	0.03	0.04	0.06	0.08	0.10
Top Limit of Load Inertia (kg•m ²)	0.005	0.01	0.015	0.02	0.03	0.04	0.06	0.08	0.1	0.15
Position Gain Each Axis Parameter No.60	125	125	125	125	125	125	125	125	125	125
Velocity Loop Gain Driver parameter No.43	16404	22177	27951	33724	45271	56818	79912	103006	126100	183835
Velocity Loop Integrated Time Constant Driver parameter No.44	8	8	8	8	8	8	8	8	8	8
Torque Filter Time Constant Driver parameter No.45	3	3	3	3	3	3	3	3	3	3
Current Control Band Number Driver parameter No.46	4	4	4	4	4	4	4	4	4	4

Bottom Limit of Load Inertia (kg•m ²)	0.15	0.2	0.3	0.4	0.6	0.8	1.0	1.2	1.4
Top Limit of Load Inertia (kg•m ²)	0.2	0.3	0.4	0.6	0.8	1	1.2	1.4	1.8
Position Gain Each Axis Parameter No.60	118	80	60	40	30	24	20	17	14
Velocity Loop Gain Driver parameter No.43	227248	227248	227248	227248	227248	227248	227248	227248	227248
Velocity Loop Integrated Time Constant Driver parameter No.44	9	13	17	25	33	41	49	57	74
Torque Filter Time Constant Driver parameter No.45	3	5	7	10	13	17	20	23	30
Current Control Band Number Driver parameter No.46	4	4	4	4	4	4	4	4	4

(Note) Refer to the instruction manual of the controller and a teaching tool such as PC software for how to change the parameter.

When connecting DDA-LH18CS(A) to SCON-CA/CB and RCON-SC

Bottom Limit of Load Inertia (kg·m ²)	0	0.005	0.01	0.015	0.02	0.03	0.04
Top Limit of Load Inertia (kg·m ²)	0.005	0.01	0.015	0.02	0.03	0.04	0.06
Servo Gain Number Parameter No.7	24	24	24	24	24	24	24
Velocity Loop Proportional Gain Parameter No.31	16404	22177	27951	33724	45271	56818	79912
Velocity Loop Integrated Gain Parameter No.32	205047	277216	349385	421554	565891	710229	998904
Torque filter time constant Parameter No.33	3	3	3	3	3	3	3
Current Control Band Number Parameter No.54	4	4	4	4	4	4	4

Bottom Limit of Load Inertia (kg·m ²)	0.06	0.08	0.10	0.15	0.2	0.3	0.4
Top Limit of Load Inertia (kg·m ²)	0.08	0.1	0.15	0.2	0.3	0.4	0.6
Servo Gain Number Parameter No.7	24	24	24	23	15	11	7
Velocity Loop Proportional Gain Parameter No.31	103006	126100	183835	227248	227248	227248	227248
Velocity Loop Integrated Gain Parameter No.32	1287579	1576254	2297942	2672183	1807975	1366150	917648
Torque filter time constant Parameter No.33	3	3	3	3	5	7	10
Current Control Band Number Parameter No.54	4	4	4	4	4	4	4

Bottom Limit of Load Inertia (kg·m ²)	0.6	0.8	1.0	1.2	1.4
Top Limit of Load Inertia (kg·m ²)	0.8	1	1.2	1.4	1.8
Servo Gain Number Parameter No.7	5	4	3	2	2
Velocity Loop Proportional Gain Parameter No.31	227248	227248	227248	227248	227248
Velocity Loop Integrated Gain Parameter No.32	690846	553937	462317	396703	308996
Torque filter time constant Parameter No.33	13	17	20	23	30
Current Control Band Number Parameter No.54	4	4	4	4	4

4.2 Gain Parameter Settings

When connecting DDA-LH18CP(A) or to SCON-CA/CB and RCON-SC

Bottom Limit of Load Inertia (kg·m ²)	0	0.005	0.01	0.015	0.02	0.03	0.04
Top Limit of Load Inertia (kg·m ²)	0.005	0.01	0.015	0.02	0.03	0.04	0.06
Servo Gain Number Parameter No.7	24	24	24	24	24	24	24
Velocity Loop Proportional Gain Parameter No.31	16404	22177	27951	33724	45271	56818	79912
Velocity Loop Integrated Gain Parameter No.32	205047	277216	349385	421554	565891	710229	998904
Torque filter time constant Parameter No.33	3	3	3	3	3	3	3
Current Control Band Number Parameter No.54	4	4	4	4	4	4	4

Bottom Limit of Load Inertia (kg·m ²)	0.06	0.08	0.10	0.15	0.2	0.3	0.4
Top Limit of Load Inertia (kg·m ²)	0.08	0.1	0.15	0.2	0.3	0.4	0.6
Servo Gain Number Parameter No.7	24	24	24	23	15	11	7
Velocity Loop Proportional Gain Parameter No.31	103006	126100	183835	227248	227248	227248	227248
Velocity Loop Integrated Gain Parameter No.32	1287579	1576254	2297942	2672183	1807975	1366150	917648
Torque filter time constant Parameter No.33	3	3	3	3	5	7	10
Current Control Band Number Parameter No.54	4	4	4	4	4	4	4

Bottom Limit of Load Inertia (kg·m ²)	0.6	0.8	1.0	1.2	1.4
Top Limit of Load Inertia (kg·m ²)	0.8	1	1.2	1.4	1.8
Servo Gain Number Parameter No.7	5	4	3	2	2
Velocity Loop Proportional Gain Parameter No.31	227248	227248	227248	227248	227248
Velocity Loop Integrated Gain Parameter No.32	690846	553937	462317	396703	308996
Torque filter time constant Parameter No.33	13	17	20	23	30
Current Control Band Number Parameter No.54	4	4	4	4	4

(Note) Refer to the instruction manual of the controller and a teaching tool such as PC software for how to change the parameter.

Load Inertia Acceleration Correspondence Table for DDA-LH18C Series

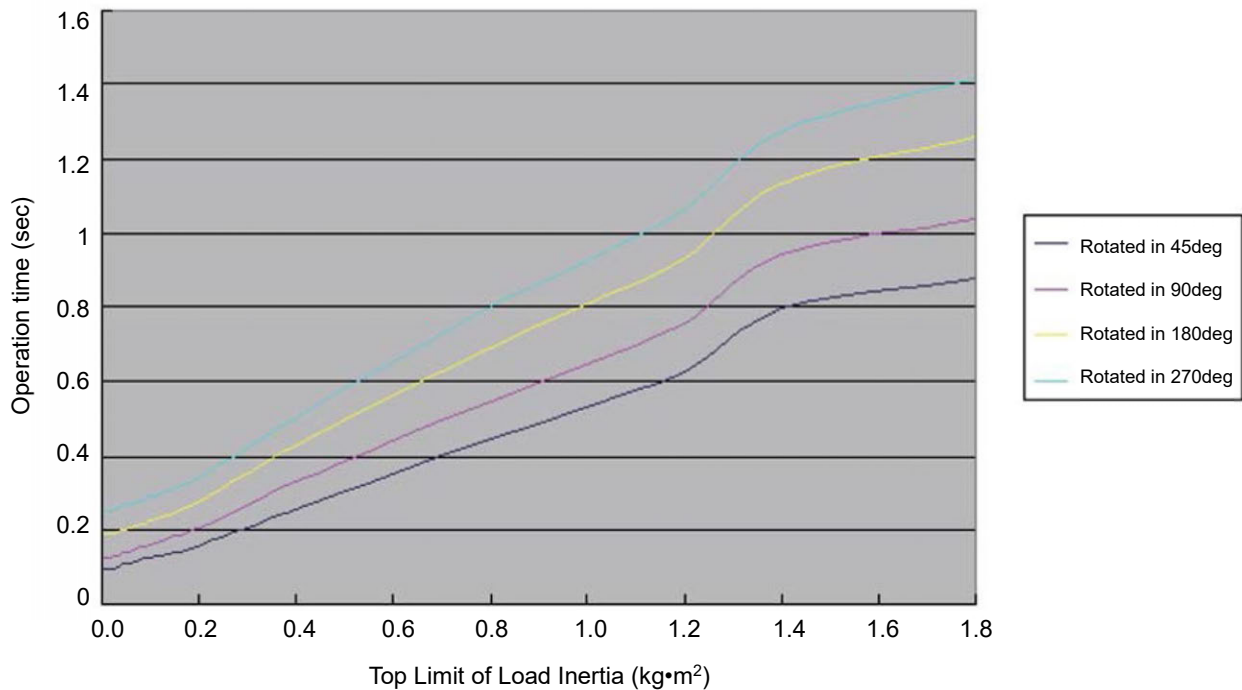
Rotor Inertia = 0.001987 (kg•m²)

Bottom Limit of Load Inertia (kg•m ²)	0	0.005	0.01	0.015	0.02	0.03	0.04	0.06	0.08	0.10
Top Limit of Load Inertia (kg•m ²)	0.005	0.01	0.015	0.02	0.03	0.04	0.06	0.08	0.1	0.15
Rated Acceleration (G) *	9.99	7.61	6.03	5.00	3.73	2.97	2.11	1.64	1.34	0.92
Recommended Max. Acceleration (Rating×1.8) (G) *	9.99	9.99	9.99	9.00	6.71	5.34	3.80	2.95	2.41	1.65

Bottom Limit of Load Inertia (kg•m ²)	0.15	0.2	0.3	0.4	0.6	0.8	1.0	1.2	1.4
Top Limit of Load Inertia (kg•m ²)	0.2	0.3	0.4	0.6	0.8	1	1.2	1.4	1.8
Rated Acceleration (G) *	0.70	0.47	0.36	0.24	0.18	0.14	0.12	0.10	0.08
Recommended Max. Acceleration (Rating×1.8) (G) *	1.26	0.85	0.64	0.43	0.32	0.26	0.22	0.19	0.15

* 1G = 9806.65deg/s²

[DD-T18 Series Takt Time (Reference)]



(Note) Acceleration and takt time are reference. Adjust them as necessary considering the characteristics of the load.

4.3 Home Return

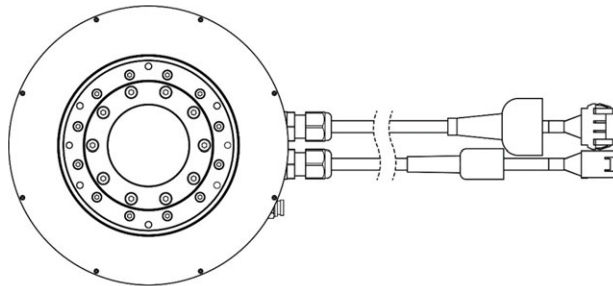
4.3.1 Home Return Operation

- 1) Rotary table turns in the indicated direction, and the position that the encoder detected the home signal is defined as the datum point.

Home-Return Direction (Clockwise in initial setting)

XSEL: Axis-Specific Parameter No. 11

SCON, RCON-SC: User Parameter No.5



Rotation direction for home-return operation

- 2) Turn for the offset amount set from the datum point, and that point should be the home position.
XSEL: Axis-Specific Parameter No.12
SCON, RCON-SC: User Parameter No.22

4.3.2 Fine-Tuning of Home Position

The rotary table turns 360deg at maximum after the home signal search operation has started by the home return command before the encoder detecting ^(Note 1) home signal, and rotates for the amount of offset that you have set up in addition.

As long as the home return direction is the same, fine-tuning of the rotary table home position can be conducted by changing the amount of offset. Conduct fine-tuning by following the steps below.

- 1) Have a home-return operation to confirm the home position.
- 2) Rotate the table to the desired home position, check the difference and adjust the offset.
The setting of offset can be changed to the positive of the moving direction. (Changing to negative cannot be done.)

Note 1 Home signal detected position cannot be changed.

4.4 Caution for Operation

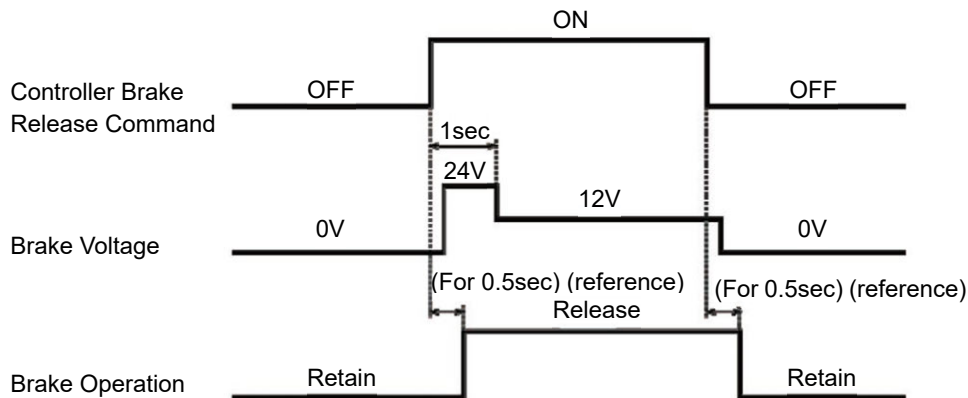
- It is necessary to lower the rated load level when operation is conducted continuously with the angular velocity 1,080deg/s or more. Please contact us.
- The product may get damaged with unexpected heat generation in case of use in an environment that the condition of heat radiation is not good. The reference for the temperature on the top surface of the base while in a continuous operation is 65°C. Please contact us if the temperature exceeds it.
- If the product is used only in a specific small range, have an additional one turn operation of approximately 180° in a day for the purpose of preventing oil shortage on the bearings. Not having this operation may shorten the product life or lower the operation accuracy.

4.5 About Cleanroom Specifications

- It is necessary to vacuum the air inside the main unit when using as Cleanliness Class 10.
- Conduct vacuuming at 35NL/min (L/min) of vacuum volume from the vacuum joint on the base area for air vacuuming.
- Use a tube that possesses the endurance temperature at 80degC or more for the suction tube.

4.6 About Brake Control

The dedicated brake box [IA-110DD-4] releases the brake with outputting 24V for 1sec when it receives a signal for brake release. Then, it drops the voltage to 12V and retains released.



Electricity Conduction	Condition of Brake	Rotation of DD Motor
Not Conducted	Brake Working	Controlled
24V Conducted (for 1sec)	Brake Release Operation	Free
12V Conducted	Brake Retain Released	Free



Caution

- Consider 10 (times/min.) as a reference for the number of brake operation times (times of switching on and off).
Exceeding this could cause abnormal heat radiation, which may cause malfunction.
- When supplying power to the brake, make sure to use a dedicated brake box.
- Pay attention that the brake unit generates magnetic force while it is released.
- Do not perform control operation with using this brake. (Do not attempt to stop the motor rotation using this brake.)
Dust could be generated from the brake, which may damage the brake.
- Do not attempt to use any power source other than a dedicated brake box for the power supply to the brake box. Abnormal heat generation or burnout of the brake may occur.
- When having to conduct a control operation due to electricity shutdown or emergency stop, check deformation on the disk and any abnormality in the contact of disk and stator.
- It is necessary to replace the brake when an abnormality is found. Stop using the product and contact IAI.



4. Operation

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Chapter 5

Maintenance and Inspection

5.1 Appearance Inspection	5-1
5.2 Cleaning	5-2

5.1 Appearance Inspection

Even though this product is designed maintenance-free, it is recommended to have appearance visual inspection regularly for the items listed below to ensure safety.

Inspection items	Maintenance work
Is abnormal noise or vibration generated?	Take an action by referring to [Troubleshooting in Controller Instruction Manual].
Is there any deformation on attachment screws?	Tighten them further.
Is the cable scratched?	Replace if the damage is severe.
Is the connector loose?	Re-insert correctly.
Is there any abnormality in the surrounding temperature or product temperature during operation?	<ul style="list-style-type: none"> • Set the surrounding temperature at the allowable surrounding temperature or less. • Perform operation in the duty ratio at the allowable value or less. • Check if the sliding resistance is high.



Caution

- If the product is used only in a specific small range, have an additional one turn operation of approximately 180° in a day for the purpose of preventing oil shortage on the bearings. Not having this operation may shorten the product life or lower the operation accuracy.

5.2 Cleaning

- When cleaning, wipe with a soft cloth to remove dust and dirt.
- Do not attempt to blow compressed air to avoid dust from getting into small gaps.
- Do not apply oil type solvent, neutral detergent or alcohol.
- When it is extremely dirty, have neutral detergent applied on a soft cloth, and wipe off the dirt firmly.



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Chapter 6

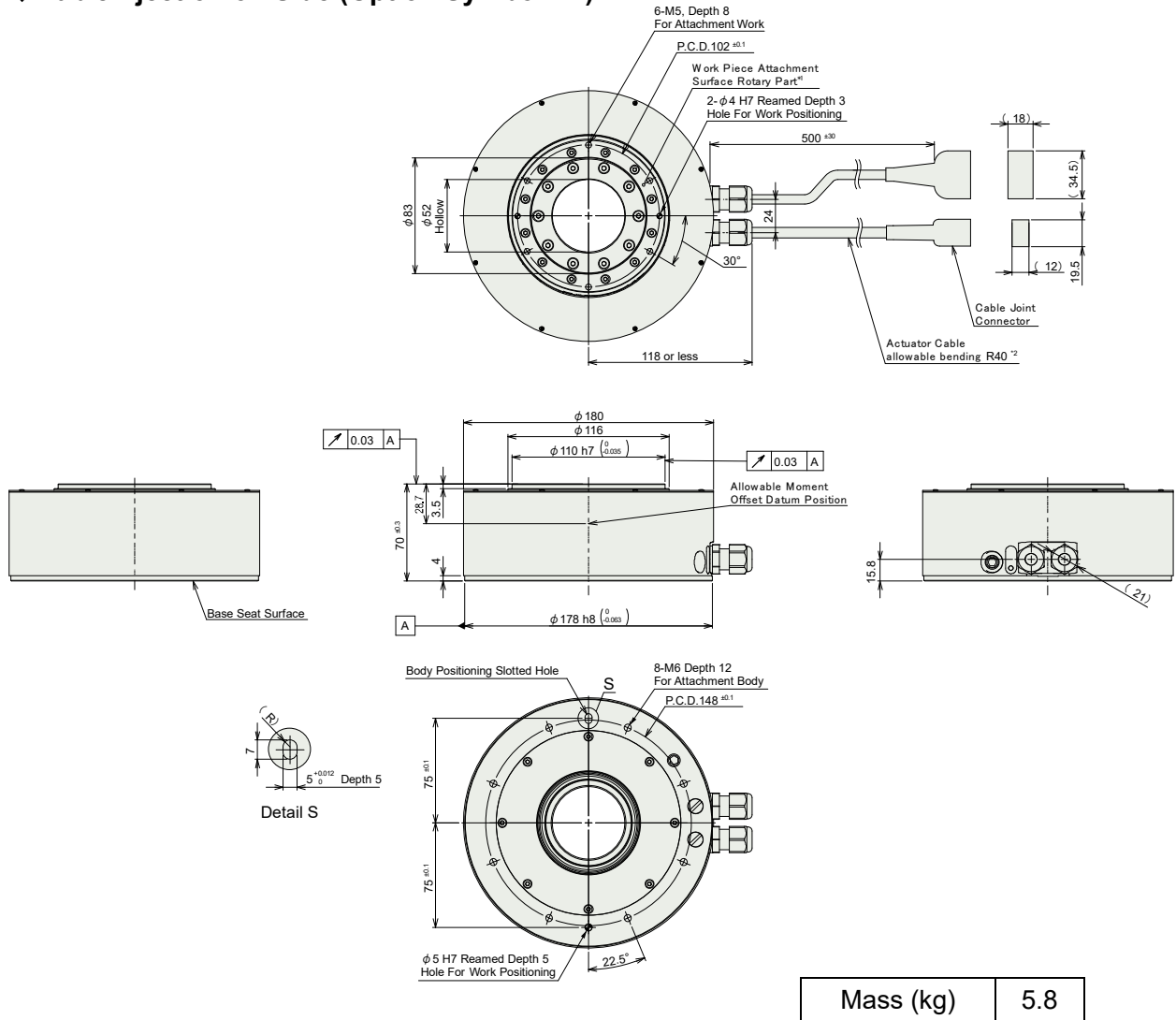
External Dimensions

6.1	External Dimensions	6-1
6.1.1	DDA-LT18C	6-1
6.1.2	DDA-LT18C-B with Brake	6-4
6.1.3	DDA-LH18C	6-6
6.1.4	DDA-LH18C-B with Brake	6-9
6.1.5	DDACR-LT18C	6-11
6.1.6	DDACR-LH18C	6-13

6.1 External Dimensions

6.1.1 DDA-LT18C

◆ Cable Ejection on Side (Option Symbol A1)



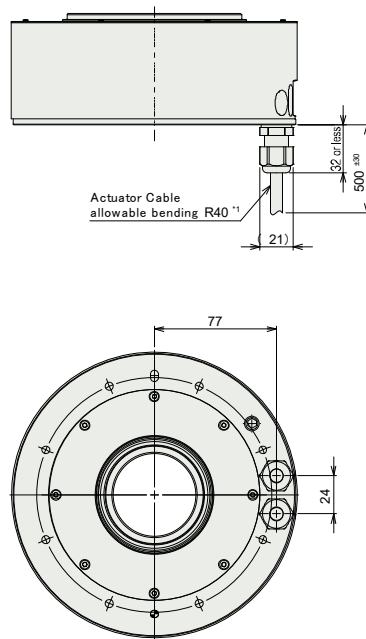
*1 The position in the top view of the workpiece attachment surface rotation area should be the home position. There are "Home Position Marking Labels" at the home position as an alignment mark.

*2 The actuator cable is a robot cable.



Home Position Marking Labels

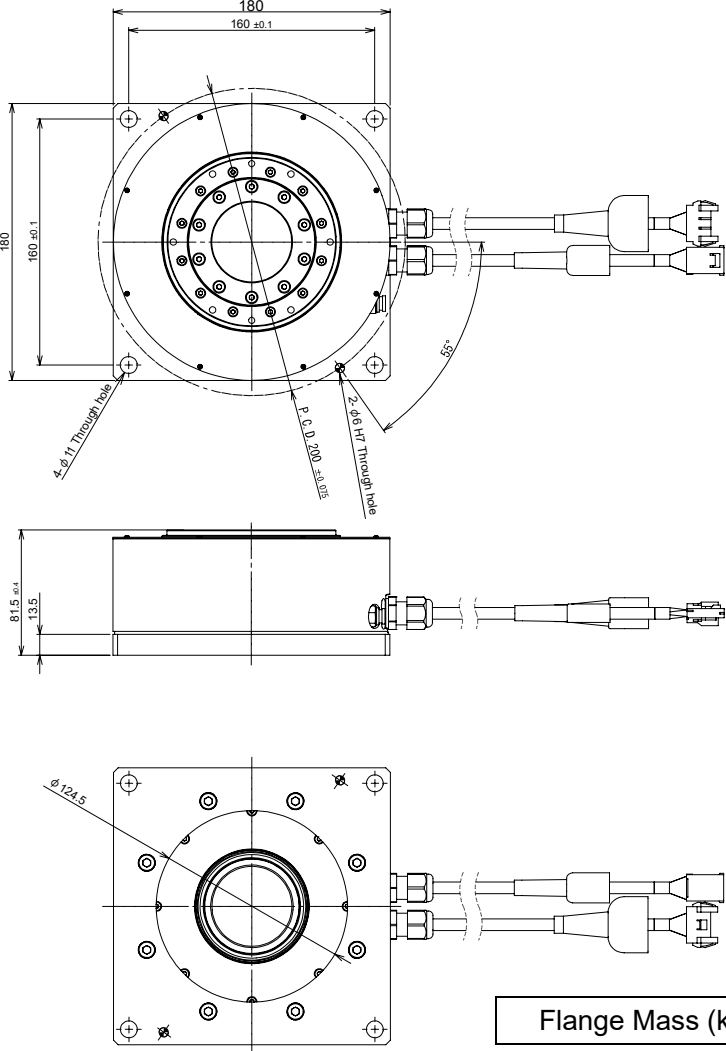
◆ Cable Ejection on Bottom (Option Symbol A0)



*1 The actuator cable is a robot cable.

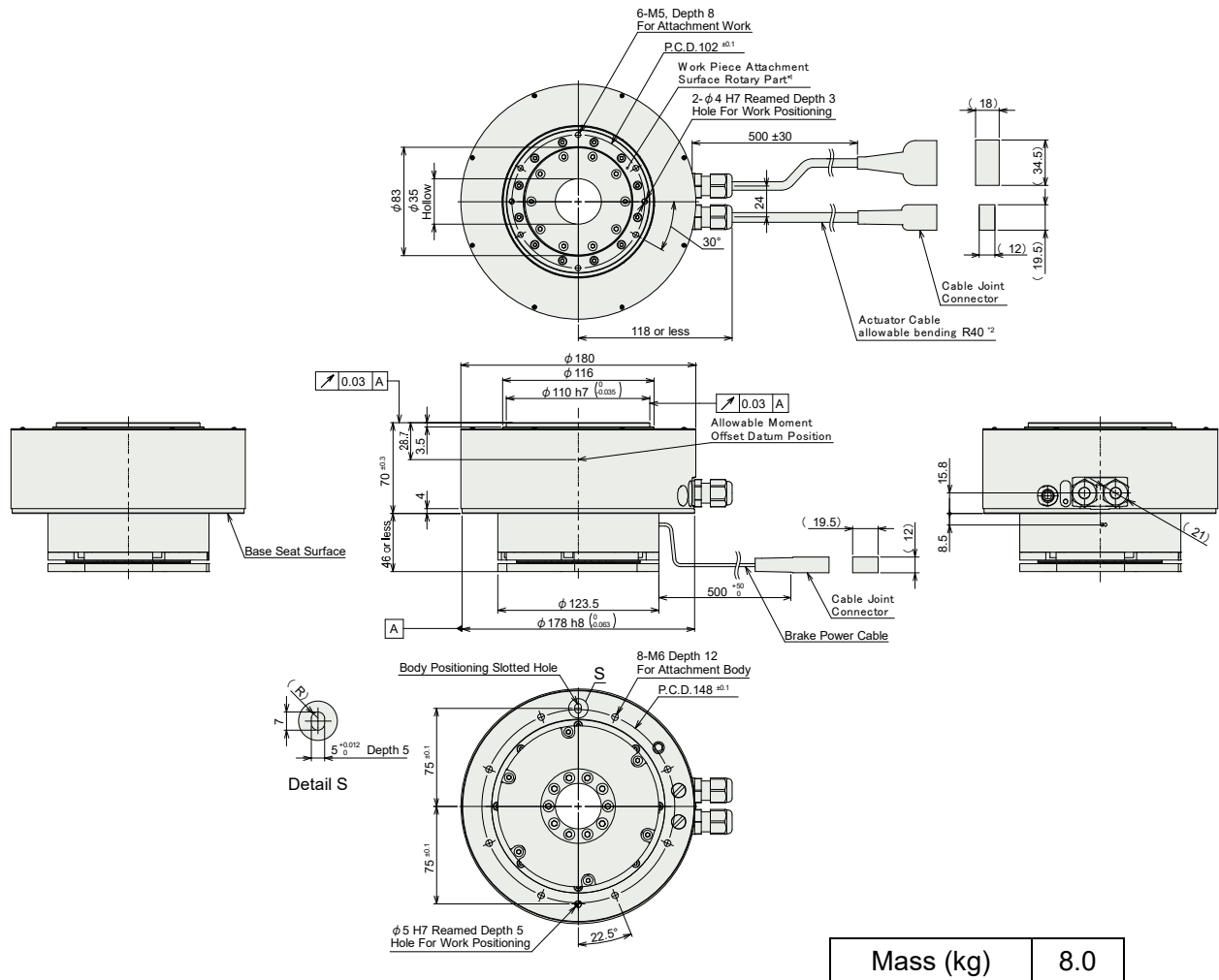
◆ **Flange (Option Symbol FL)**

It is a bracket to fix the unit with screws from the top of it.



6.1.2 DDA-LT18C-B with Brake

◆ Cable Ejection on Side (Option Symbol A1)



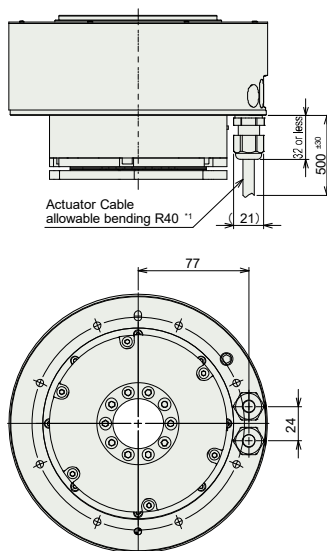
*1 The position in the top view of the workpiece attachment surface rotation area should be the home position. There are “Home Position Marking Labels” at the home position as an alignment mark.

*2 The actuator cable is a robot cable.



Home Position Marking Labels

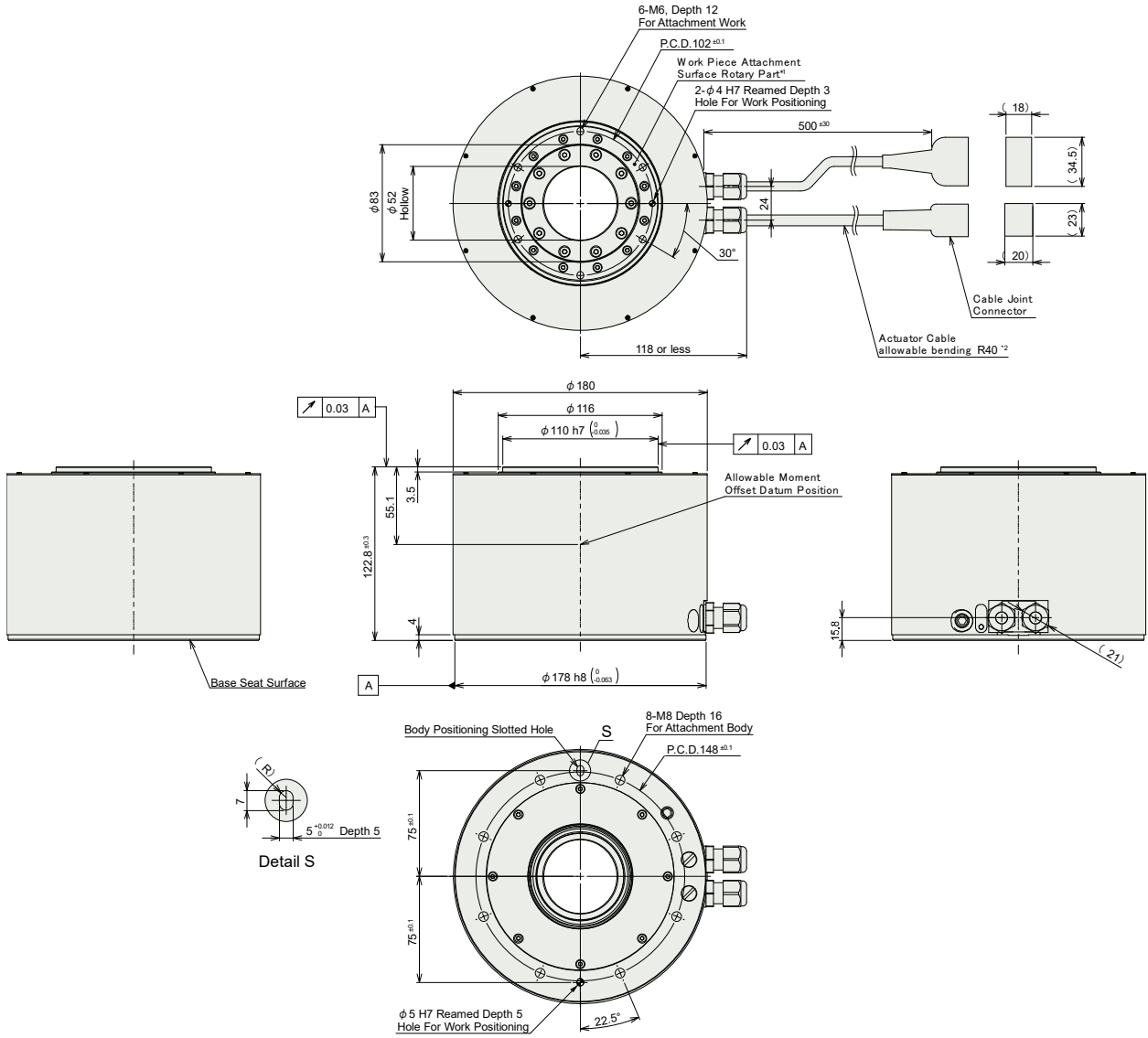
◆ Cable Ejection on Bottom (Option Symbol A0)



*1 The actuator cable is a robot cable.

6.1.3 DDA-LH18C

◆ Cable Ejection on Side (Option Symbol A1)



Mass (kg)	13.0
-----------	------

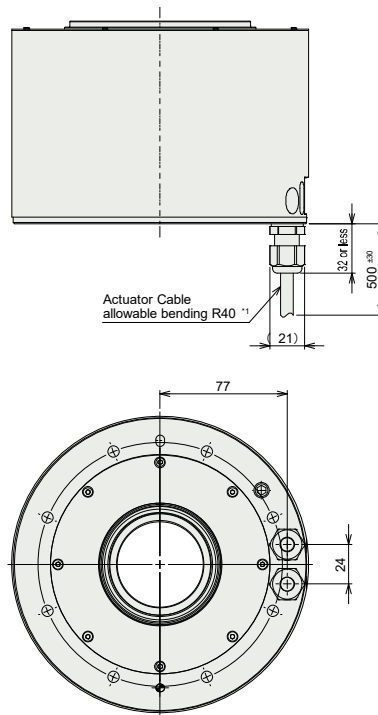
*1 The position in the top view of the workpiece attachment surface rotation area should be the home position. There are “Home Position Marking Labels” at the home position as an alignment mark.

*2 The actuator cable is a robot cable.



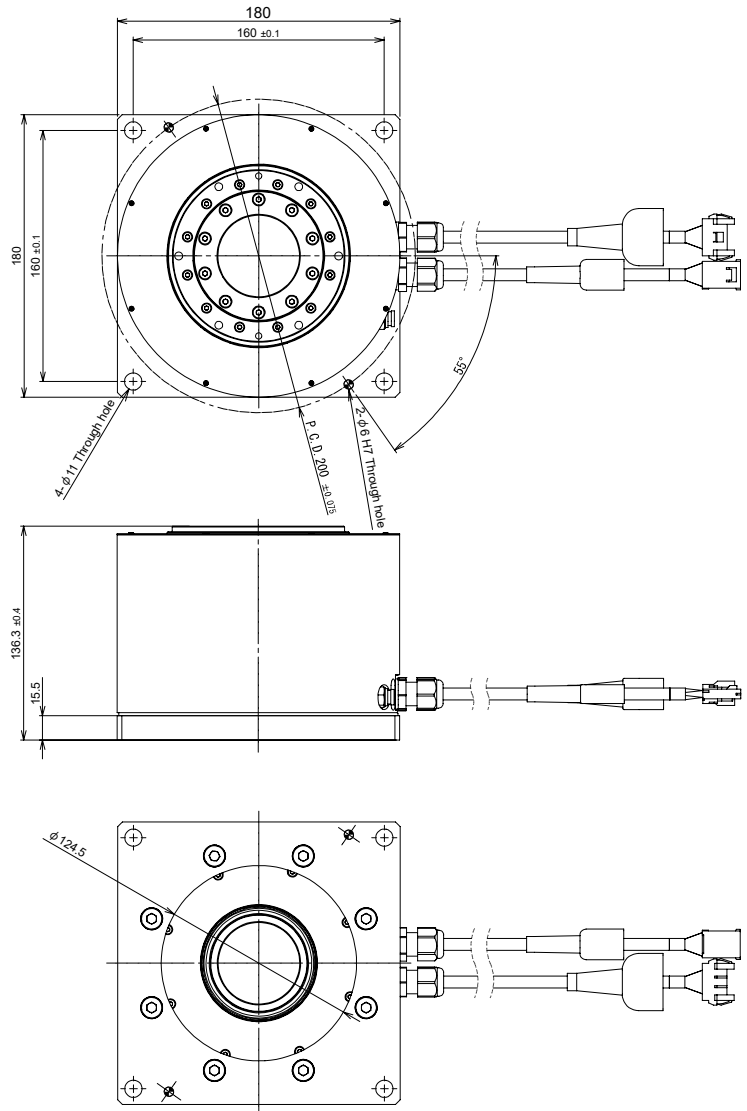
Home Position Marking Labels

◆ Cable Ejection on Bottom (Option Symbol A0)



*1 The actuator cable is a robot cable.

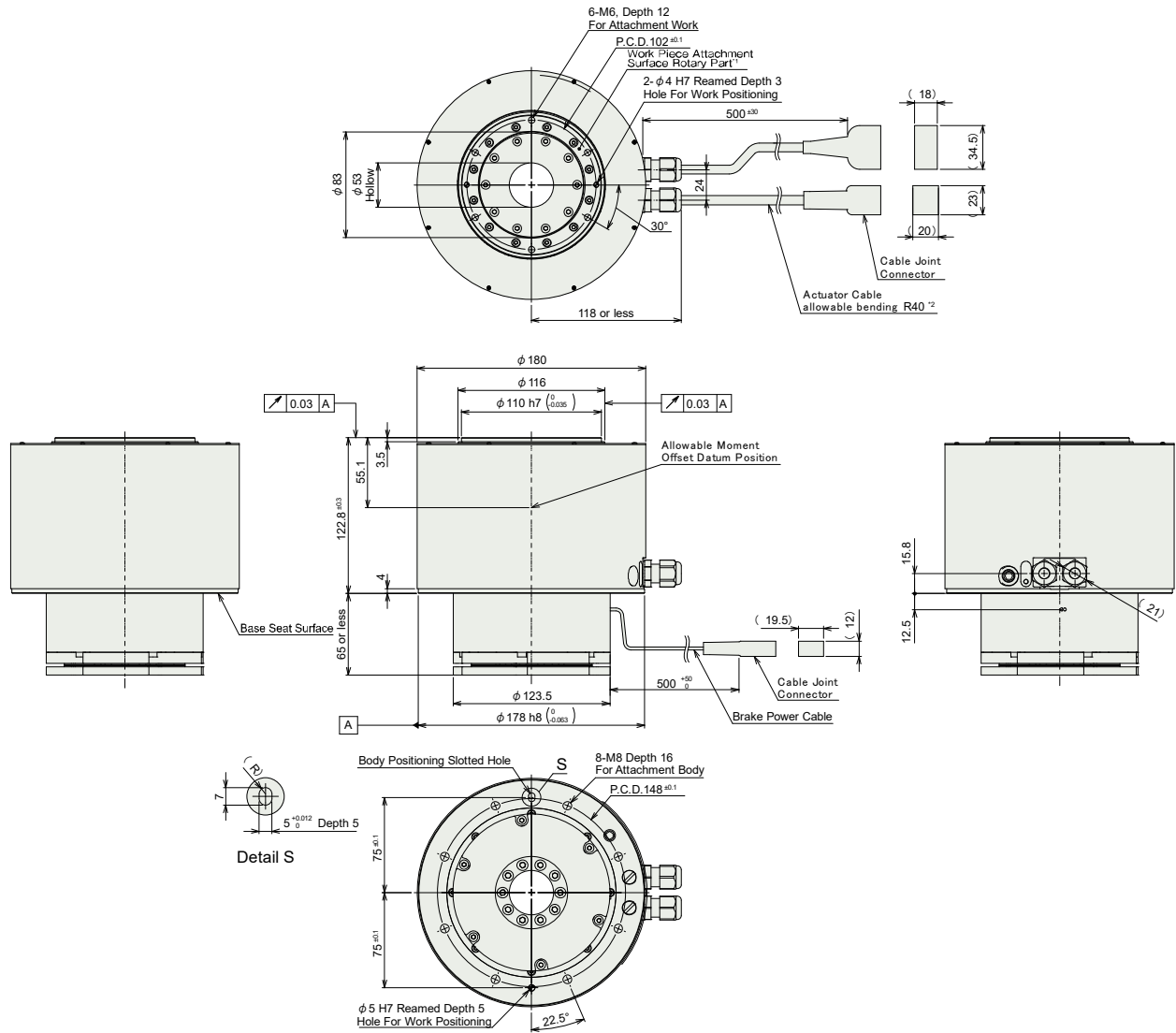
◆ Flange (Option Symbol FL)



Flange Mass (kg)	0.4
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6.1.4 DDA-LH18C-B with Brake

◆ Cable Ejection on Side (Option Symbol A1)



Mass (kg)	17.4
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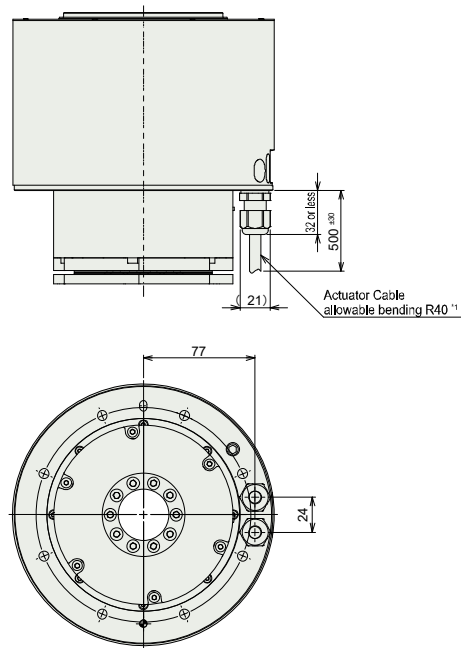
*1 The position in the top view of the workpiece attachment surface rotation area should be the home position. There are “Home Position Marking Labels” at the home position as an alignment mark.

*2 The actuator cable is a robot cable.



Home Position Marking Labels

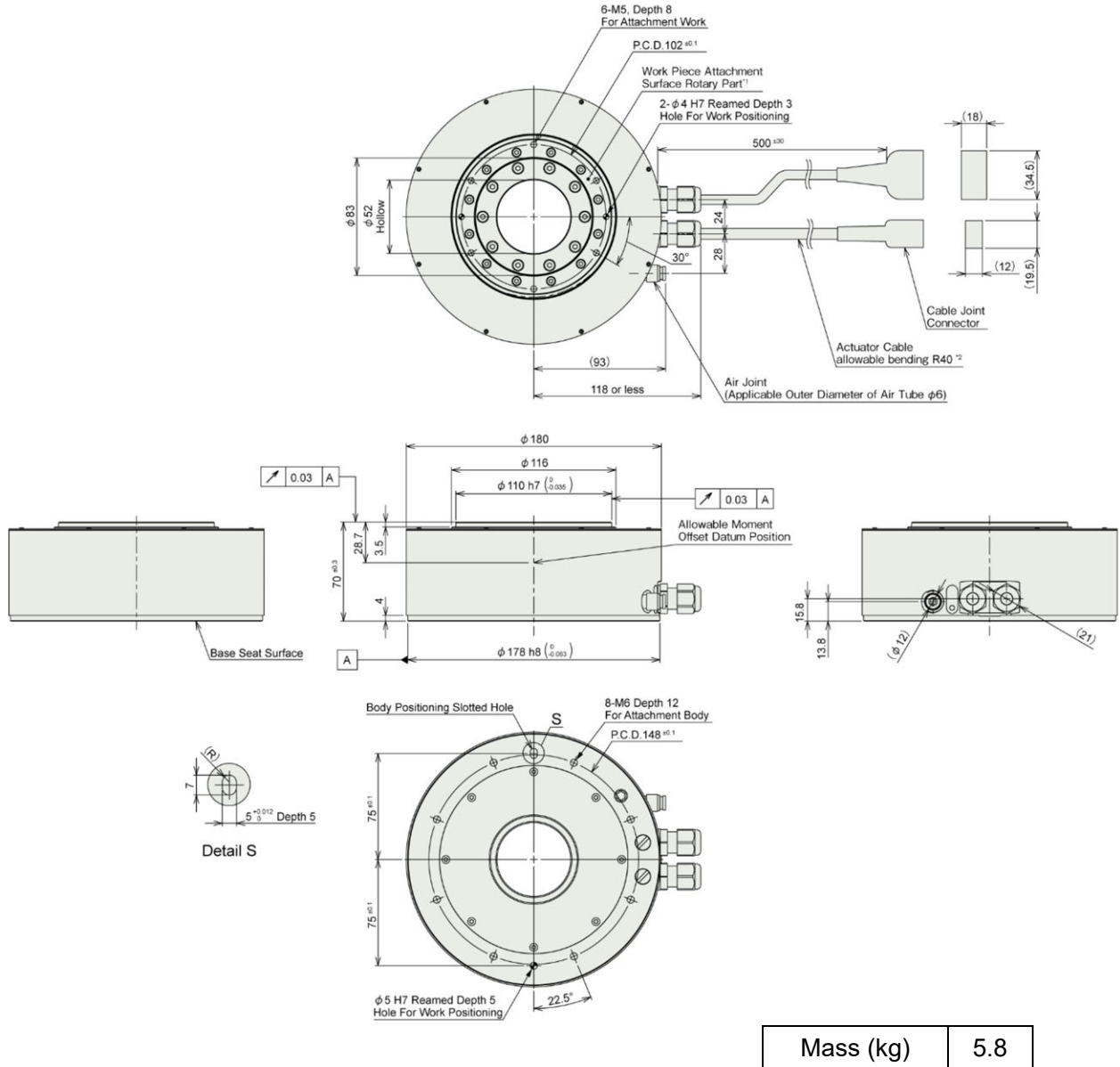
◆ Cable Ejection on Bottom (Option Symbol A0)



*1 The actuator cable is a robot cable.

6.1.5 DDACR-LT18C

◆ Cable Ejection on Side (Option Symbol A1)



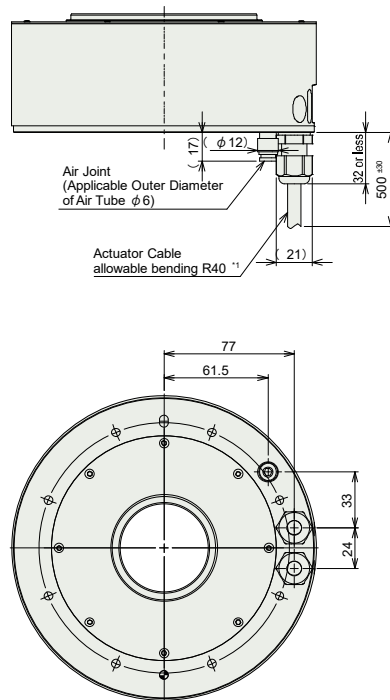
*1 The position in the top view of the workpiece attachment surface rotation area should be the home position. There are “Home Position Marking Labels” at the home position as an alignment mark.

*2 The actuator cable is a robot cable.



Home Position Marking Labels

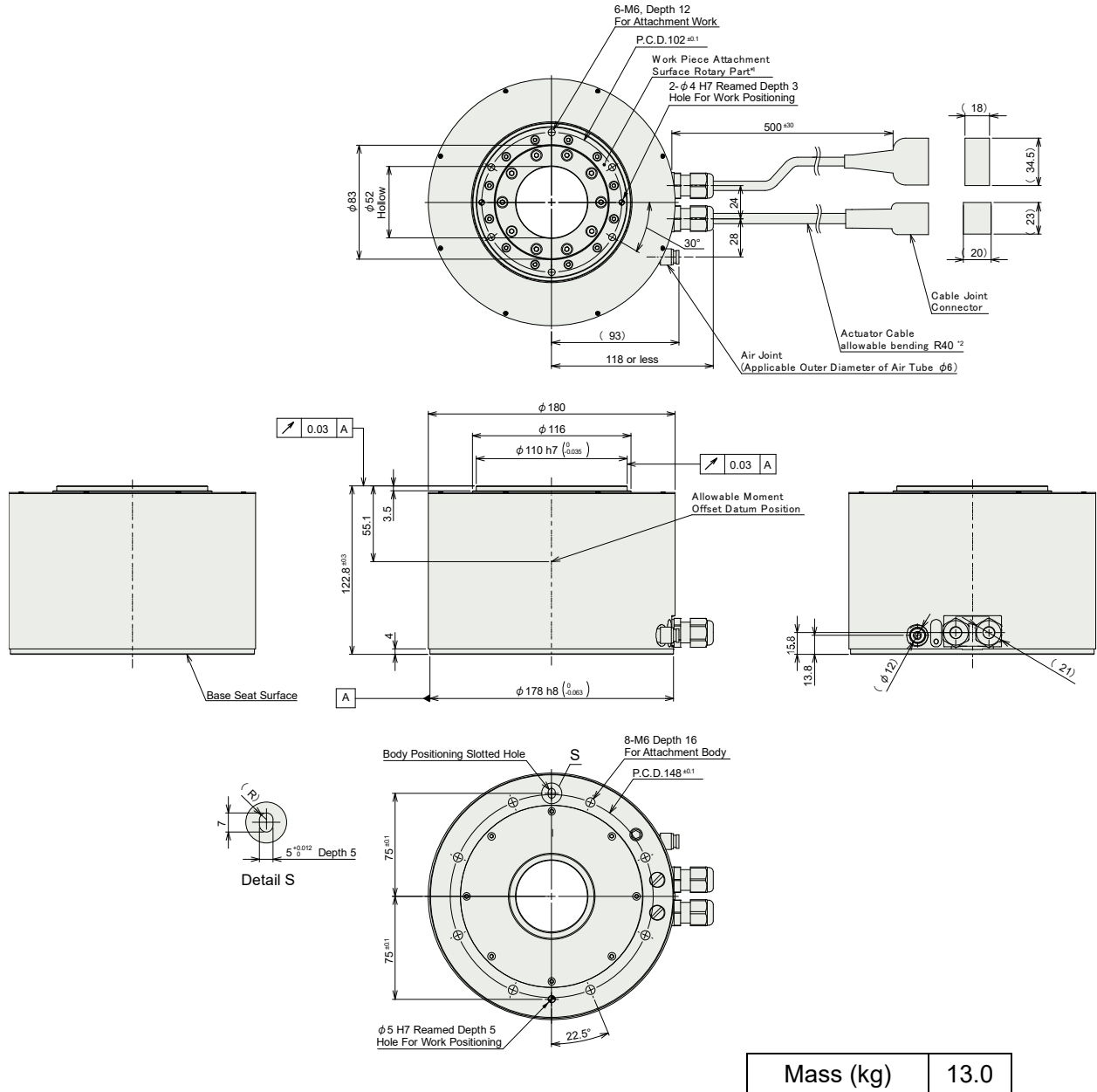
◆ Cable Ejection on Bottom (Option Symbol A0)



*1 The actuator cable is a robot cable.

6.1.6 DDACR-LH18C

◆ Cable Ejection on Side (Option Symbol A1)



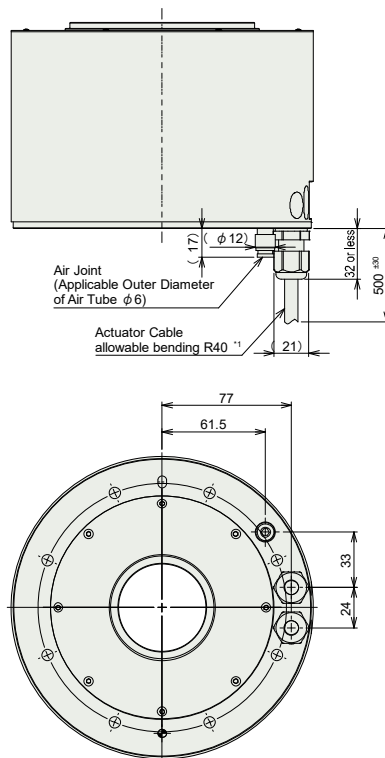
*1 The position in the top view of the workpiece attachment surface rotation area should be the home position. There are “Home Position Marking Labels” at the home position as an alignment mark.

*2 The actuator cable is a robot cable.



Home Position Marking Labels

◆ Cable Ejection on Bottom (Option Symbol A0)



*1 The actuator cable is a robot cable.



External Dimensions

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Chapter 7

Life

7.1 How to Grasp Life of Direct Drive Motor..... 7-1

7.1 How to Grasp Life of Direct Drive Motor

For the product life, it is assumed 5 years (reference) under the condition that it is operated 8hrs/day with maximum allowable load moment.

The life may significantly change depending on the condition of use, environment and state of maintenance.

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Chapter 8

Warranty

8.1	Warranty	8-1
8.2	Scope of the warranty	8-1
8.3	Honoring the warranty	8-1
8.4	Limited liability	8-2
8.5	Conformance with applicable standards/regulations, etc., and application conditions	8-2
8.6	Other items excluded from warranty	8-2

8. Warranty

8.1 Warranty

Whichever of the following periods is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to a specified location
- 2,500 operational hours

8.2 Scope of the warranty

Our products are covered by warranty when all of the following conditions are met.

Faulty products covered by warranty will be replaced or repaired free of charge:

- (1) The breakdown or malfunction in question pertains to our product as delivered by IAI or our authorized dealer.
- (2) The breakdown or malfunction in question occurred during the warranty period.
- (3) The breakdown or malfunction in question occurred while the product was in use for an appropriate purpose under the operating conditions and operating environment specified in the instruction manual and catalog.
- (4) The breakdown or malfunction in question was caused by a specification defect, malfunction, or poor product quality.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:

- Anything other than our product
- Modification or repair performed by a party other than IAI (unless approved by IAI)
- Anything that could not be easily predicted with the level of science and technology available at the time of shipment from IAI
- Natural disaster, unnatural disaster, incident or accident for which we are not liable
- Natural fading of paint or other symptoms of aging
- Wear, depletion or other expected results of use
- Operation noise, vibration or other subjective sensations not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

8.3 Honoring the warranty

As a rule, the product must be consigned to IAI for repair under warranty.

8.4 Limited liability

- (1) We assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
- (2) We assume no liability for any program or control method created by the customer to operate our product or for the results of any such program or control method.

8.5 Conformance with applicable standards/regulations, etc., and application conditions

- (1) If our product is combined with another product or any system, equipment, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc.
In such a case we assume no liability for the conformance of our product with the applicable standards, etc.
- (2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications.
Contact IAI if you must use our product for any of these applications:
 - Medical equipment used to maintain, control or otherwise affect human life or physical health
 - Mechanisms and machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)
 - Machinery components essential for safety (safety devices etc.)
 - Equipment used to handle cultural assets, art or other irreplaceable items
- (3) Contact IAI in advance if our product is to be used in any condition or environment that differs from that specified in the catalog or instruction manual.

8.6 Other items excluded from warranty

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

- Guidance for mounting/adjustment and witnessing of test operation
- Maintenance and inspection
- Technical guidance and education on operating/wiring methods, etc.
- Technical guidance and education on programming and other items related to programs



Change History

Revision Date	Description of Revision
2016.06	First edition
2016.08	Second edition • P25, P33 Max. length changed for connection cable between brake box and actuator P32 Change made to brake box connection diagram P47 Contents changed for suction tube
2017.01	Third edition • P21 Correction made in [3-1] Formula for Continuous Operation Torque Calculation P50 to P59 (CR) added after [6. Appearance] Model DDA Drawing changed
2017.06	Fourth edition • P33 Explanation added for brake box terminals
2017.07	Fifth edition • P16 Note added for protection class and CR specifications in [1.2 Specifications] • P50 Note deleted for sealing performance in [5.1 Appearance Inspection]
2018.10	5B edition • P34 Note added stating to supply 24V DC brake power to controller
2018.11	5C edition • P47 Correction made to rotation direction for home-return operation
2019.01	5D edition • P31 Bending radius added for actuator cable • P22, P34 Correction made
2019.01	5E edition • P34 Appearance for brake box added
2019.05	5F edition • P22 Contents corrected for explanation of unbalanced load
2020.02	5G edition • P61 Correction made 24hrs/day → 8hrs/day
2020.04	5H edition • P39 Note added stating Note 1 is a caution for XSEL
2020.06	5I edition • P15, 31, 34 Contents related to RCON, RSEL added

Change History

Revision Date	Description of Revision
2020.07	5J edition • P15 Note added stating brake option is available to select only for DDA Standard Type • P55 to P58 (CR) deleted
2020.09	5K edition • P51 to P60 Description added stating home position is where home position marking labels are aligned
2021.05	5L edition • P41, P42, P44, P45, P47 RCON-SC added
2023.05	Sixth edition • International standards compliances, complied with RoHS3 • Parts DVD deleted • 1.1.4 How to Read Model Code model codes and caution added • 1.3 Condition of Selection contents revised • 1.4 Motor Encoder Cable deleted • 4.2 Gain Parameter settings Load Inertia - Gain Parameter List correction made to values • 6. Appearance change made to expression • Terms integrated, correction made, layout changed
2026.01	6B edition • Changes due to discontinuation of including the First Step Guide

Change History



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