Doc. no. MH*-OMZ0001

Operation Manual

PRODUCT NAME

Toggle Type Air Gripper

MODEL / Series / Product Number

MHT2-32DZ
MHT2-40DZ
MHT2-50DZ
MHT2-63DZ

SMC Corporation

Contents

Toggle Type Air Gripper Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage.
These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1) , and other safety regulations.

*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.
ISO 4413: Hydraulic fluid power -- General rules relating to systems.
IEC 60204-1: Safety of machinery -- Electrical equipment of machines .(Part 1: General requirements)
ISO 10218: Manipulating industrial robots -Safety.
etc.

Caution	**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
Warning	**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
Danger	**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.

This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1.The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2.When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4.Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

Toggle Type Air Gripper Safety Instructions

⚠ Caution

The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.
Read and accept them before using the product.

Limited warranty and Disclaimer

1.The warranty period of the product is 1 year in service or 1.5 years after the product is delivered,whichever is first.∗2)
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

∗2) Vacuum pads are excluded from this 1 year warranty.
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. **The use of SMC products with production equipment for the manufacture of weapons of mass destruction(WMD) or any other weapon is strictly prohibited.**
2. **The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.**

⚠ Caution

SMC products are not intended for use as instruments for legal metrology.
Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.
Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

1. Specifications

1-1 Specifications

Specifications

Model	MHT2-32DZ	MHT2-40DZ	MHT2-50DZ	MHT2-63DZ
Cylinder inside diameter (mm)	32	40	50	63
Action	Double acting			
Fluid	Air			
Operating pressure (Mpa)	0.1 to 0.6			
Ambient and fluid temperature (°C)	5 to 60			
Lubrication	Lubrication not required.			
Finger opening angle (Total)	-3° to 28°	-3° to 27°	-2° to 23°	-2° to 23°
Weight (g)	790	1070	1890	2720
Gripping moment (Effective value) (N・m) Note)	12.4	36.0	63.0	106

Note) At the pressure of 0.5 MPa.

2. Operating method or operation

2-1. Design precautions

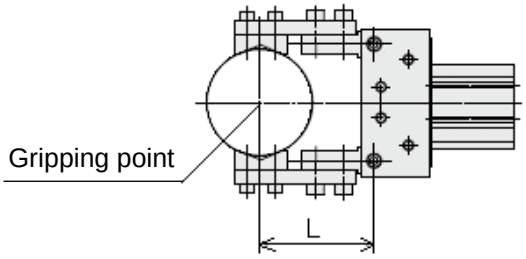
⚠ Warning

1. The product is designed for use only in compressed air systems. Do not operate at pressures or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to the specifications.)
   Please contact SMC if using for fluids other than compressed air. We do not guarantee against any damage if the product is used outside of the specification.
2. Take safety measures (e.g. mounting protective covers) when workpieces pose a danger of fingers being caught in a gripper, etc.
3. There is a danger of workpieces dropping if there is a decrease in gripping force due to a drop in circuit pressure caused by a power failure, etc. It is necessary to take measures such as drop prevention so that injury and damage to machinery or equipment can be prevented.
4. If the product is used for the purpose other than the transportation of a workpiece, such as positioning or clamping, please consult SMC.

2-2. Selection

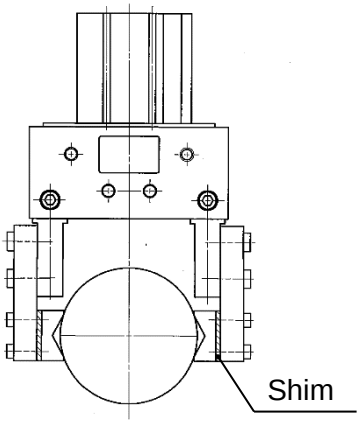
⚠ Warning

1. The gripping point should be set within the limited range. If there is an overhang, please consult with SMC.
   When the gripping point distance becomes large, the gripper attachment applies an excessively large load to the gripper sliding section, and causes adverse affects on the life of the gripper. Refer to the catalog for details.



2. Attachments should be designed to be as light and short as possible.
   (1) A long or heavy attachment increases the inertia force required to open or close the fingers. This may cause unsteady movement of fingers and have an adverse affect on the life of the gripper.
   (2) Design the attachment as short and light as possible even if the gripping point is within the limited range. Refer to the catalog for details.
3. Select a model whose gripping force is compatible with the workpiece mass.
   Incorrect selection may lead to the dropping of a workpiece, etc. Refer to the model selection criteria of each series for the effective gripping force and the workpiece mass.
4. Do not use the product in applications where excessive external force or impact force is applied. It may cause product failure. Please consult with SMC if necessary.
5. Select a model having a sufficient working finger opening/closing width.
   < In case of insufficient width >
   (1) Gripping becomes unsteady due to variations in opening/closing width or workpiece diameter.
   (2) When using an auto switch, the detection may not be reliable. Refer to the Auto Switch Hysteresis section and set the stroke including the hysteresis length for a reliable switch function. When using the water resistant 2-color indicator auto switch, the gripper stroke may be limited by the setting of the indicator color during detection.

6. Attachment Design
   (1) Design the attachment so that both fingers grip the workpiece when they are in parallel with each other.
   (2) Take considerations so that the fine adjustment of the attachment can be made by putting the adjustment sim.
   (3) When the shim is thin, the gripping force becomes insufficient and the workpiece may become unstable. Conversely, when the shim is thick, the toggle mechanism is difficult to activate and a large impulsive sound may sometimes be produced. Carefully check this point.
   (4) The gripping status may become unstable due to continual wear of the bearing or shaft during operation. If this happens, make the adjustment, such as use of thicker shim according to the conditions.



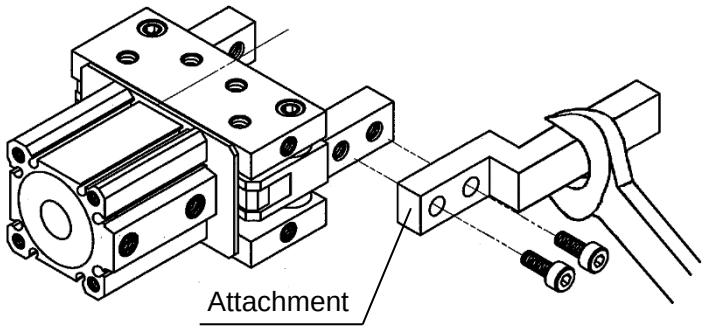
2-3. Mounting

⚠ Warning

1. Install and operate the product only after reading the Operation Manual carefully and understanding its contents. Also, keep the manual where it can be referred to as necessary.
2. Allow sufficient space for maintenance and inspection.
3. Do not drop or hit the product when mounting to avoid scratches and dents.
   Even slight deformation can cause the deterioration of accuracy and operation failure.
4. Tighten the screw within the specified torque range when mounting the attachment.
   Tightening the screws with a higher torque than the maximum may cause malfunction. In addition, tightening the screws with a lower torque can cause the displacement of the mounting position or in extreme conditions, detaching of the work piece.

Mounting attachment to the finger

The attachment should be mounted with the torque specified in the following table by screwing the bolt into the female mounting thread of the finger.

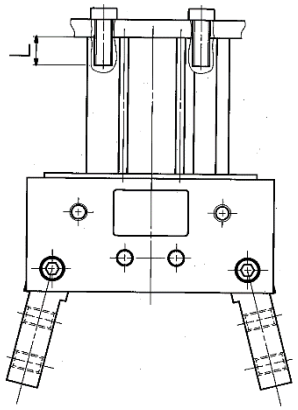


Model	Screw	Max. tightening torque (N·m)
MHT2-32DZ	M6x1	4.8
MHT2-40DZ	M8 x 1.25	12
MHT2-50DZ	M10x1.5	24
MHT2-63DZ	M12x1.75	42.2

5. Tighten the screw within the specified torque range when mounting the air gripper.
   Tightening with a torque above the limit can cause malfunction, while insufficient tightening can cause slippage and dropping.

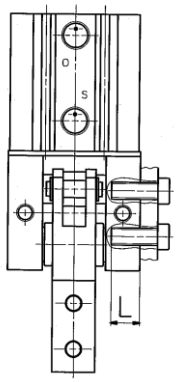
Mounting Gripper

Axial mounting （Cylinder tapped）



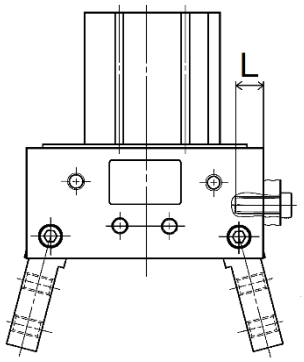
Model	Screw	Max. tightening torque (N・m)	Max. thread depth (L mm)
MHT2-32DZ	M6x1	6.1	10
MHT2-40DZ	M6x1	6.1	10
MHT2-50DZ	M8 x 1.25	15.8	14
MHT2-63DZ	M10x1.5	32.6	18

Side mounting （Side plate tapped）



Model	Screw	Max. tightening torque (N・m)	Max. thread depth (L mm)
MHT2-32DZ	M6x1	6.1	10
MHT2-40DZ	M8 x 1.25	11.3	10
MHT2-50DZ	M10x1.5	21.7	12
MHT2-63DZ	M12x1.75	45.1	17

Vertical mounting （Body tapped）

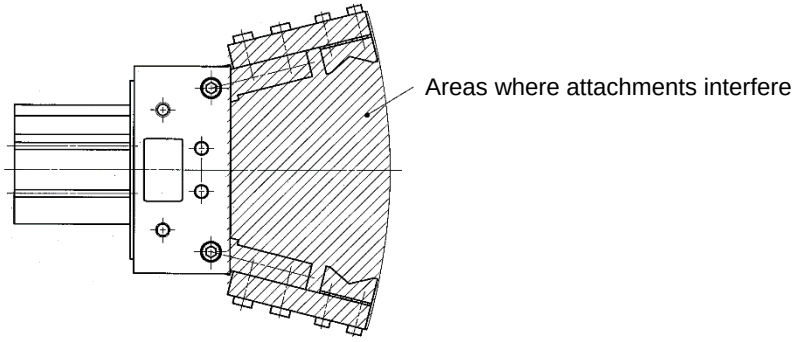


Model	Screw	Max. tightening torque (N・m)	Max. thread depth (L mm)
MHT2-32DZ	M6x1	7.3	15
MHT2-40DZ	M8 x 1.25	13.5	12
MHT2-50DZ	M10x1.5	21.7	12
MHT2-63DZ	M12x1.75	26.6	10

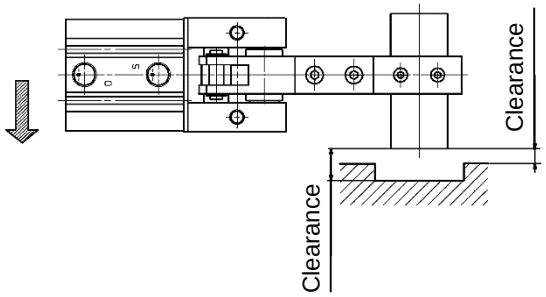
⚠ Caution

1. Avoid twisting the gripper when mounting an attachment.
   Any damage to the gripper may cause malfunction and reduce the accuracy.
2. Avoid external force to fingers.
   Fingers may be damaged by a continual lateral or impact load. Provide clearance to prevent the workpiece or the attachment from striking against any object at the stroke end.

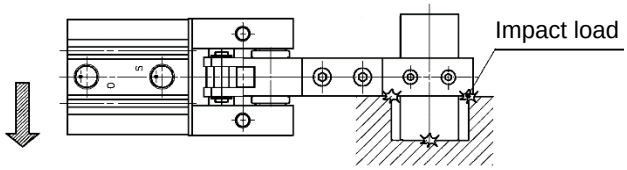
1. Finger opening and closing stroke



2. Stroke end when gripper is moving

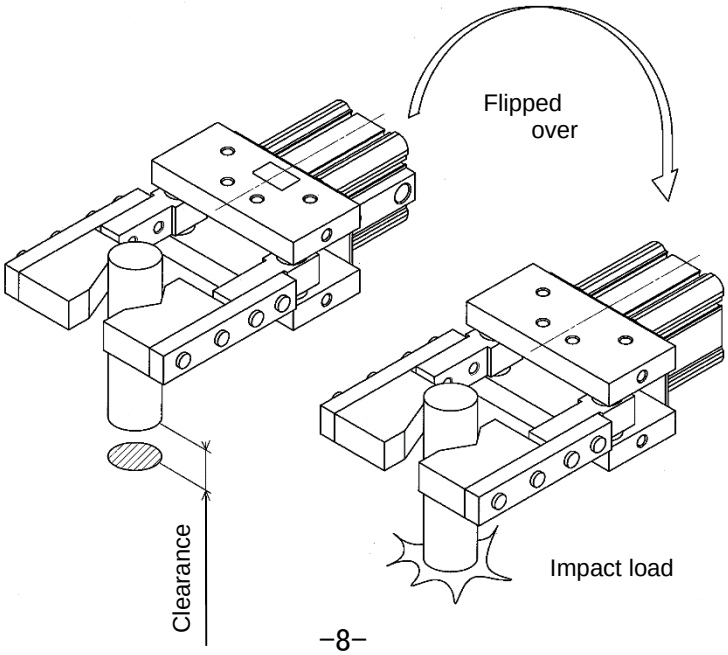


Good: With clearance

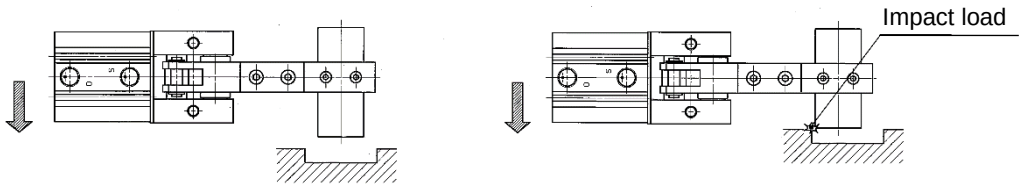


Not good: No clearance

3. When turning over



3. Adjust the gripping point so that an excessive force will not be applied to the fingers when inserting a workpiece.
   Confirm that the gripper can operate without receiving any shock by testing it in manual operation mode or by low speed operation.



Good: Aligned Not good: Not aligned

4. Control the opening/closing speed with the speed controller to avoid excessive high speed operation.
   If the finger opening/closing speed is greater than necessary, impact forces on the fingers and other parts will increase. This can cause a loss of repeatability when gripping a workpiece and have an adverse effect on the life of the gripper unit.

2-4. Air supply

⚠ Warning

1. Please consult with SMC when using the product in applications other than compressed air.
2. Compressed air containing a large amount of condensate can cause malfunction of pneumatic equipment. An air dryer or water droplet separator should be installed upstream from filters.
3. If condensation in the drain bowl is not emptied on a regular basis, the bowl will overflow and allow the condensation to enter the compressed air lines. It causes malfunction of pneumatic equipment. If the drain bowl is difficult to check and remove, installation of a drain bowl with an auto drain option is recommended.
4. Use clean air.
   Do not use compressed air that contains chemicals, synthetic oils including organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

   For detailed information regarding the quality of the compressed air described above, refer to SMC's "Air Cleaning Systems".

⚠ Caution

1. When extremely dry air is used as the fluid, degradation of the lubrication properties inside the equipment may occur, resulting in reduced reliability (or reduced service life) of the equipment. Please consult with SMC.
2. Install an air filter.
   Install an air filter upstream near the valve. Select an air filter with a filtration size of 5 μm or smaller.
3. Take measures to ensure air quality, such as by installing an aftercooler, air dryer, or water separator.
   Compressed air that contains a large amount of drainage can cause malfunction of pneumatic equipment such as air grippers. Therefore, take appropriate measures to ensure air quality, such as by providing an aftercooler, air dryer, or water separator.

4. Use the product within the specified fluid and ambient temperature range.
When operating at temperatures 5°C or lower, water in the circuit may freeze and cause breakage of seals or malfunction. Measures should be taken to prevent freezing.
For detailed information regarding the quality of the compressed air described above, refer to SMC's "Air Cleaning Systems".

2-5. Piping

⚠ Caution

1. Refer to the Fittings and Tubing Precautions (Best Pneumatics) for handling one touch fittings.
2. Before piping
Before piping is connected, flush thoroughly with air or wash to remove chips, cutting oil and other debris from inside the pipe.

2-6. Operating environment

⚠ Warning

1. Do not use in an environment where corrosive gases, chemicals, sea water, water or steam are present.
Refer to the construction drawings regarding the air chuck materials.
2. Do not use in direct sunlight.
3. Do not operate in a location subject to vibration or impact.
4. Do not mount the product in locations where it is exposed to radiant heat.
5. Do not use this product in an area that is dusty, or in an environment in which water or oil splashes on the cylinder.

2-7. Lubrication

⚠ Caution

1. The non-lube type air gripper is lubricated at the factory, and can be used without any further lubrication.
If a lubricant is used in the system, use turbine oil Class 1 (with no additive) ISO VG32.
Furthermore, once lubrication is applied, it must be continued.
If lubrication is later stopped, malfunction can occur due to loss of the original lubricant.
Refer to the Material Safety Data Sheet (MSDS) of the hydraulic fluid when supplying the fluid.

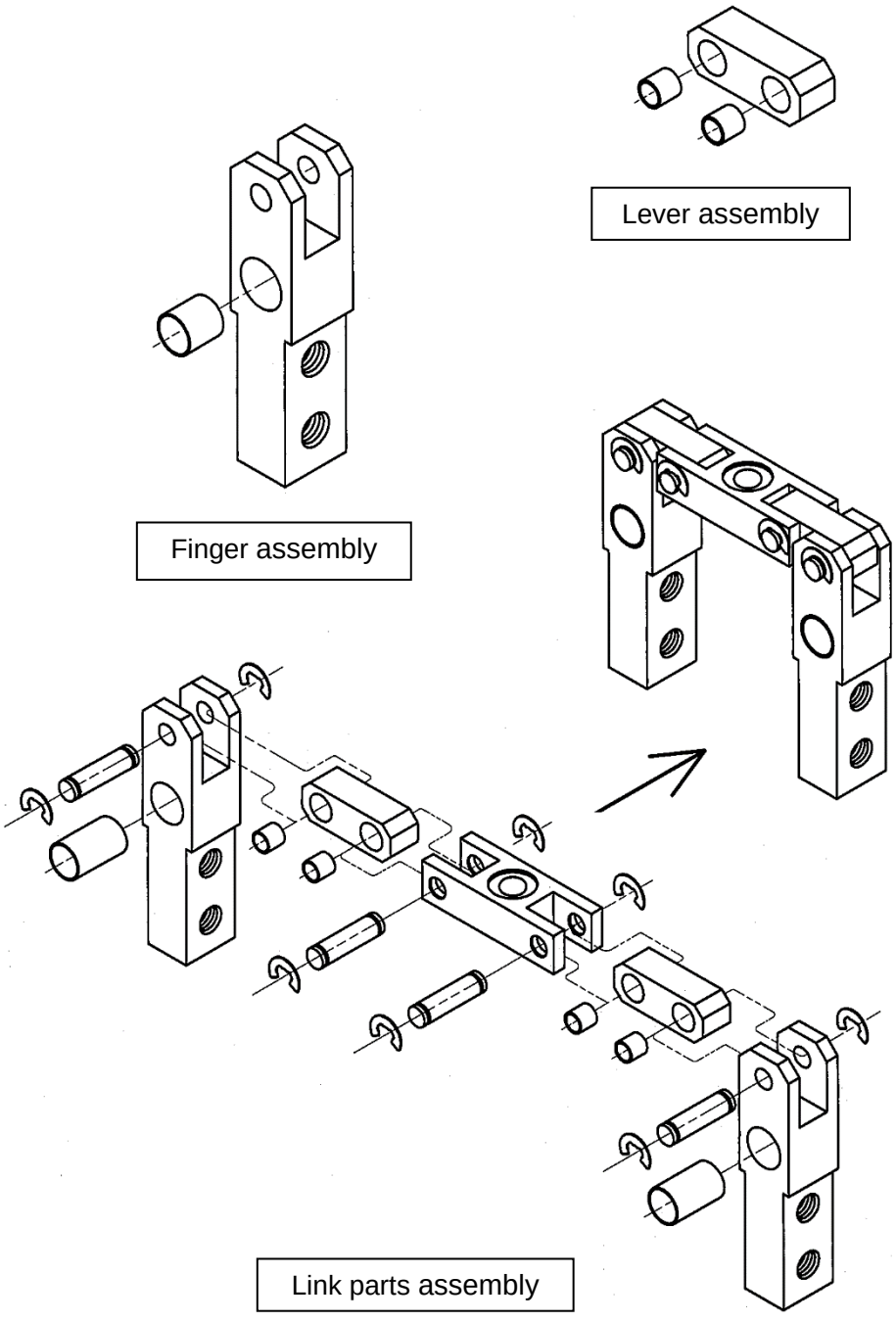
3. Maintenance

3-1. Precautions

⚠ Warning

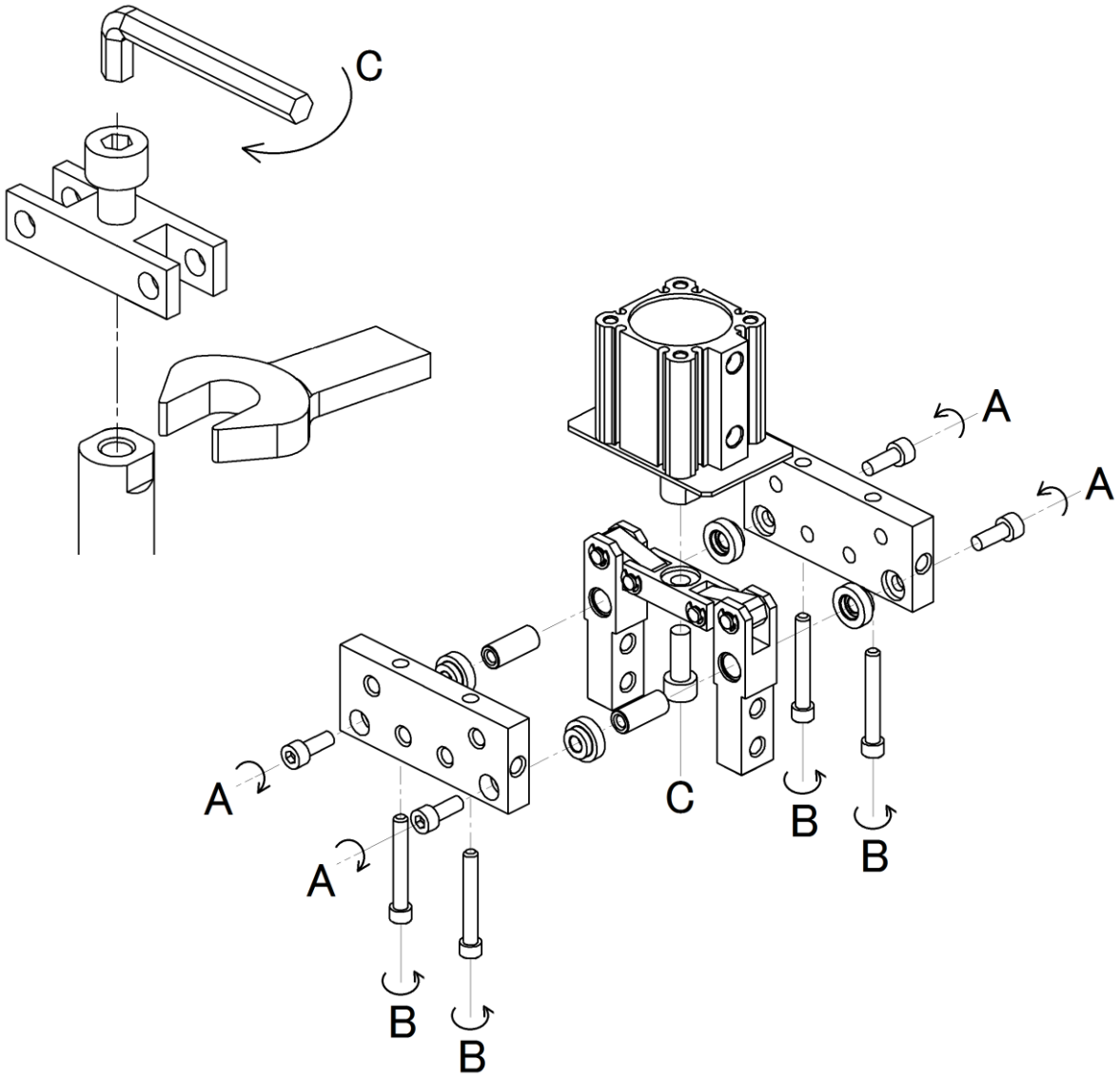
1. Maintenance should be performed according to the procedure indicated in the Operation Manual.
   If handled improperly, malfunction and damage of machinery or equipment may occur.
2. If handled improperly, compressed air can be dangerous. Assembly, handling, repair and element replacement of pneumatic systems should be performed by a knowledgeable and experienced person.
3. Remove drainage from air filters regularly.
4. When components are removed, first confirm that measures are in place to prevent any workpieces from dropping, run-away of equipment, etc.
   Then cut off the supply pressure and electric power, and exhaust all compressed air from the system using the residual pressure release function.
   Turn off the power supply, stop the air supply and exhaust all compressed air from the system.
   When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent cylinders from sudden movement.
5. Do not allow people to enter or place objects in the carrying path of the air gripper.
   This can cause an injury or accident, etc.
6. Do not put hands, etc. in between the air gripper fingers or attachments.
   This can cause an injury or accident, etc.
7. When removing the air gripper, first confirm that no workpieces are being held and then release the compressed air before removing the air gripper.
   If a workpiece is still being held, there is a danger of it being dropped.
8. If a workpiece is to be gripped by using the toggle, make sure to periodically check that the workpiece has not shifted during the acceleration of the movement.
   If the workpiece is not gripped in a stable manner, it could shift or drop and create a dangerous situation.
   If the workpiece is not gripped in a stable manner, use shims on the attachment to adjust the gripped.
   To verify the gripping condition or to make any adjustments, make sure to do so in an area where the air gripper or the workpiece will not fall.

3-2. Disassembly drawing



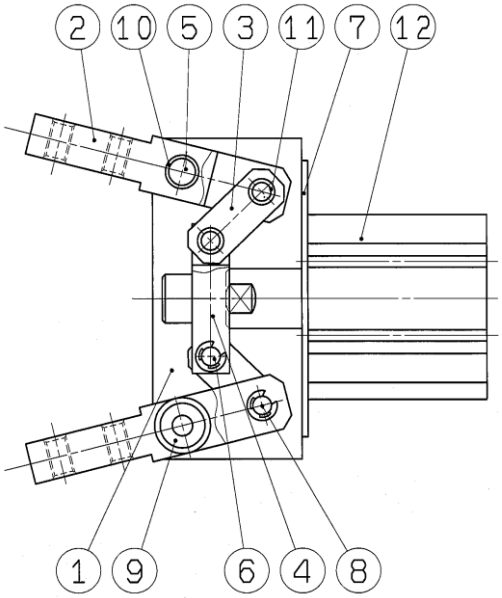
	MHT2-32DZ	MHT2-40DZ	MHT2-50DZ	MHT2-63DZ
Finger assembly	MH-TA3201	MH-TA4001	MH-TA5001	MH-TA6301
Lever assembly	MH-TA3202	MH-TA4002	MH-TA5002	MH-TA6302
Link parts assembly	MH-TA3203	MH-TA4003	MH-TA5003	MH-TA6303

3-3. Tightening torque



Model		Screw	Tightening torque (N·m)
MHT2-32DZ	A	M6	4.8
	B	M5	2.8
	C	M8	12
MHT2-40DZ	A	M6	4.8
	B	M6	4.8
	C	M8	12
MHT2-50DZ	A	M8	12
	B	M8	12
	C	M10	24
MHT2-63DZ	A	M10	24
	B	M10	24
	C	M10	24

3-4. Construction / Parts list



Components

No.	Description	Material	Remarks
1	Side plate	Aluminum alloy	Hard anodized
2	Finger	Carbon steel	Black zinc chromated
3	Lever	Carbon steel	Black zinc chromated
4	Joint	Carbon steel	Black zinc chromated
5	Shaft	Stainless steel	
6	Joint pin	Stainless steel	
7	Cylinder plate	Soft steel	Black zinc chromated
8	Lever pin	Stainless steel	
9	Color	Carbon steel	Black zinc chromated
10	Bearing		Steel lined oil imfilled acetal resin bearing
11	Bearing		Steel lined oil imfilled acetal resin bearing
12	Cylinder		Compact cylinder

Replacement parts

Description	MHT2-32DZ	MHT2-40DZ	MHT2-50DZ	MHT2-63DZ	Main part
Finger assembly	MH-TA3201	MH-TA4001	MH-TA5001	MH-TA6301	2,10
Lever assembly	MH-TA3202	MH-TA4002	MH-TA5002	MH-TA6302	3,11
Link parts assembly	MH-TA3203	MH-TA4003	MH-TA5003	MH-TA6303	< ø 32, ø 50> 2,3,4,6,8,10,11 < ø 40, ø 63> 2,3,4,8,10,11
Compact cylinder	CDQ2A32-15DZ	CDQ2A40-15DZ	CDQ2A50-20DZ	CDQ2A63-20DZ	12

∗ For finger assembly, lever assembly, order 2 pieces per one unit.
Replacement part/Grease pack part no.
For finger part: MH-G01 (30 g)
For cylinder part: GR-S-010 (10 g)

Revision history

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