SMC

DOCUMENT No.:MH＊-OMF0021

OPERATION MANUAL

PRODUCT NAME : MHF2 SERIES

MODEL : MHF2－8D□

MHF2－12D□

MHF2－16D□

MHF2－20D□

- Read this operation manual carefully to understand before installation and operation.
- Pay extra attention on the clause concerning the safety.
- Keep this operation manual available whenever necessary.

SMC CORPORATION

Contents

Notes to users

Safety Instructions

These safety instructions are intended to prevent a hazardous situation and／or equipment damage. These instructions indicate the level of potential hazard by label of "**Caution**", "**Warning**", or "**Danger**". To ensure safety, be sure to observe ISO 4414 [Note 1)], JIS B 8370 [Note 2)] and other safety practices.

⚠ **Caution** : Operator error could result in injury or equipment damage.

⚠ **Warning** : Operator error could result in serious injury or loss of life.

⚠ **Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

(Note－1) ISO 4414 : Pneumatic fluid power－Recommendations for the application of equipment to transmission and control systems.

(Note－2) JIS B 8370 : Pneumatic systems axiom.

⚠ WARNING

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

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analyses and／or tests to meet your specific requirements.

② Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

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

1. Inspection and maintenance of machinery／equipment should only be performed after confirmation of safe locked－out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.

3. Before machinery／equipment is re－started, take measures to prevent shooting out of cylinder piston rod etc. (Bleed air into the system gradually to create back－pressure.)

④ Contact SMC if the product is to be used in any of the following conditions :

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

1. Specifications

Specifications

Model		MHF2-8D□	MHF2-12D□	MHF2-16D□	MHF2-20D□
Bore size mm		8	12	16	20
Fluid		Air			
Operating pressure MPa		0.15to0.7	0.1to0.7		
Ambient and fluid temperature		−10to60℃(No freeze)			
Repeatability		±0.05 mm			
Max . operating frequency	Short stroke	120 c.p.m.			
	Middle stroke	120 c.p.m			
	Long stroke	60 c.p.m			
Lubrication		Not required			
Action		Double acting			
Note1)Holding force Per 1 finger Persecution Value N		19	48	90	141
Opening stroke (Both side) mm	Short stroke	8	12	16	20
	Middle stroke	16	24	32	40
	Long stroke	32	48	64	80
Note2)Weight g	Short stroke	65	155	350	645
	Middle stroke	85	190	445	850
	Long stroke	120	275	650	1,225

Note 1) Pressure: 0.5MPa, Gripping force L: 20mm.

Note 2) Not including auto switch.

2. Operation Guide for Air Gripper.

2−1 Precautions on design

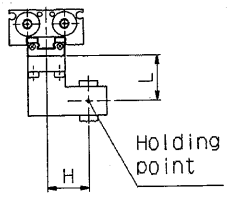
⚠ Warning

1. A protective cover is recommended to minimize the risk of personal injury due to accidental contact with moving parts of the gripper.
2. Measures should be taken to protect against unexpected drop of work due to loss of air pressure.
3. Contact SMC for other applications than work transfer. (i,e. Positioning, crimping)

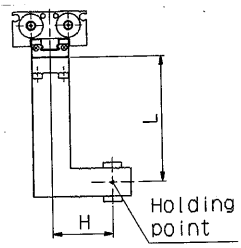
2−2 Selection

⚠ Warning

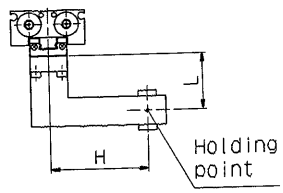
1. Keep the holding point within the specified range of the holding distance.
   When the holding point distance becomes large, the finger attachment applies an excessively large load to the cross roller section, causing excessive play of the fingers and possibly leading to premature failure. Refer to catalog for details.



○ L and H are correct.

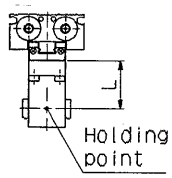


× L is too long.

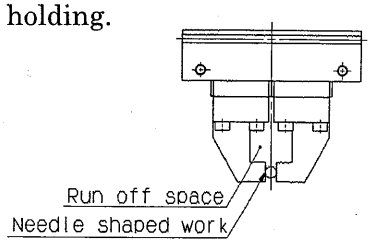


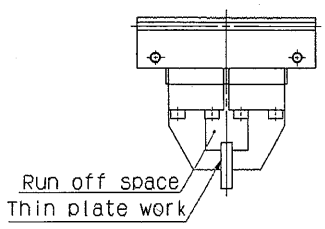
× H is too long.

2. Attachment should be designed as light and short as possible.
   1) Long and heavy attachment increases the inertia force to open or close the finger. It may cause unsteady movement of fingers and have an adverse effect on life.
   2) Even if holding point remains within the limited range, make the attachment as light and short as possible.



   3) Please use some pieces or larger size if long work or large work.
3. Please set roll on attachment if work is extra thin or extra fine.
   Product without roll off may cause incorrect positioning or incorrect holding, due to unstable holding.





4. Select the model whose holding force is sufficient against work weight.
   Incorrect selection may lead to release of work etc. Refer to "Effective holding force" and information to select the model by weight of work.
5. Do not use in applications where excessive external force or impact force may be applied to gripper. It may cause malfunction. Consult SMC with regard to any other application.
6. Select a model to have allowance in opening／closing width to work.
   <If no allowance is provided>
   1) Holding may be insecure due variations in air gripper opening／closing width or in work diameter.
   2) If auto-switch is used, detection failure may occur. Refer to hysteresis of auto-switch in each series to secure extra stroke for hysteresis. Especially when dual color advance waterproof auto-switch is used, stroke may be restricted depending on the setting of the lamp color at detection.

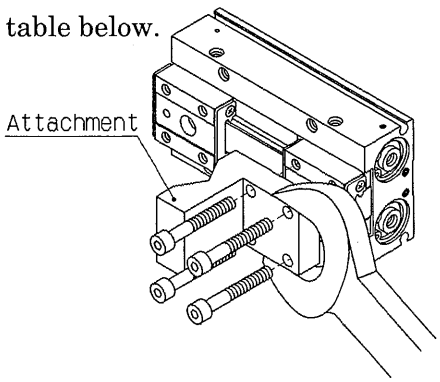
2－3 Mounting

⚠ Warning

1. Do not drop nor dent the gripper when mounting. Slight deformation can cause unaccuracy or malfunction.
2. Tighten the screw within the specified torque range to mount the attachment.
   The tightening with larger torque than specified range may cause malfunction, while the tightening with smaller torque may allow movement of holding position and dropping of work.

How to mount the attachment on fingers

To mount attachment, screw bolts in finger mounting female threads with the tightening torque in the table below.

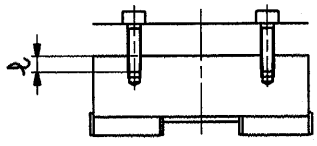


Model	mounting bolt	Max.tightening torque N・m
MHF2- 8 D□	M2.5×0.45	0.36
MHF2-12D□	M3×0.5	0.63
MHF2-16D□	M4×0.7	1.5
MHF2-20D□	M4×0.7	1.5

3. Adjust the holding point so that excessive force will not be applied on fingers when inserting the work.
   Confirm that the gripper can operate without receiving any shock by testing with manual operation or low-speed operation.

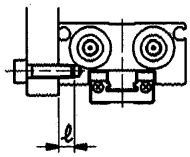
Mounting of gripper

Top mounting (Body tapped)



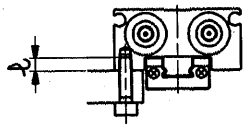
Model	mounting bolt	Max.tightening torque N・m	Max.screw-in depth mm
MHF2- 8 D□	M3×0.5	0.95	7
MHF2-12D□	M4×0.7	2.2	10
MHF2-16D□	M5×0.8	4.5	12
MHF2-20D□	M6×1	7.8	15

Side mounting (Body tapped)



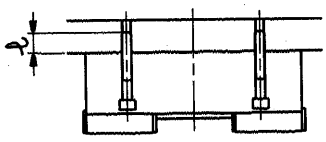
Model	mounting bolt	Max.tightening torque N・m	Max.screw-in depth mm
MHF2- 8 D□	M3×0.5	0.63	4
MHF2-12D□	M4×0.7	1.5	5
MHF2-16D□	M5×0.8	3	5.5
MHF2-20D□	M6×1	5.2	6

Bottom mounting (Body tapped)



Model	mounting bolt	Max.tightening torque N・m	Max.screw-in depth mm
MHF2- 8 D□	M3×0.5	0.63	4
MHF2-12D□	M4×0.7	1.5	5
MHF2-16D□	M5×0.8	3	5.5
MHF2-20D□	M6×1	5.2	6

Through-hole mounting



Model	mounting bolt	Max.tightening torque N・m	Max.screw-in depth mm
MHF2- 8 D□	M2.5×0.45	0.36	4
MHF2-12D□	M3×0.5	0.63	5.2
MHF2-16D□	M4×0.7	1.5	-
MHF2-20D□	M5×0.8	3	-

Note) For mounting MHF2-8D□or MHF2-12D□ via the through hole on the body, use attached specific mounting bolts.

Attached parts : Mounting bolts for through hole on body

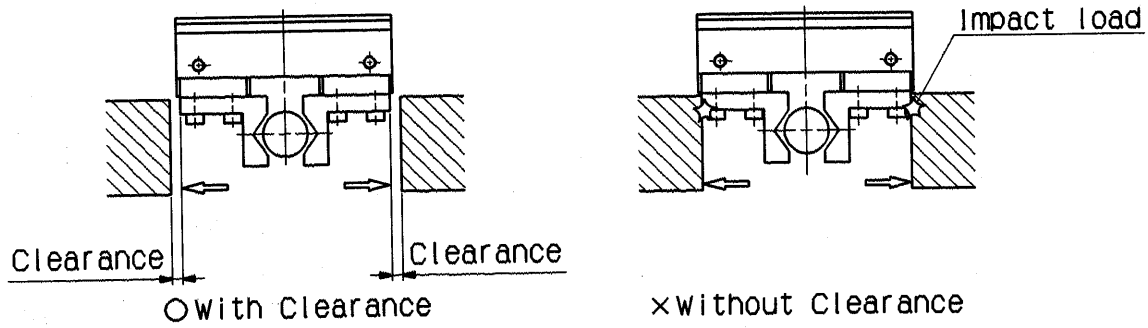
Parts No.			
MHF2-8D・D1	MHF2-8D2	MHF2-12D・D1	MHF2-12D2
MHF-B08(2 peaces)	MHF-B08(4 peaces)	MHF-B12(2 peaces)	MHF-B12(4 peaces)

※ For mounting MHF2-8D□ or MHF2-12D□ via the through hole on the body, use Hexagon socket head cap screw(ISO 4762-1977)

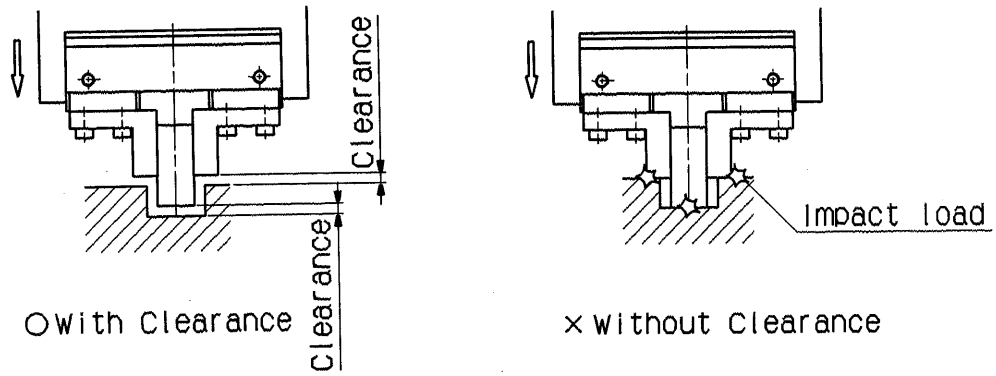
⚠ Caution

1. Avoid the excessive force on fingers when mounting the attachment.
   Any change of fingers may cause the malfunction and deteriorate the accuracy.
2. Avoid external force to fingers. Fingers may be damaged by continual lateral or the impact load.
   Provide clearance to prevent the work or the attachment from striking against any object at the stroke end.

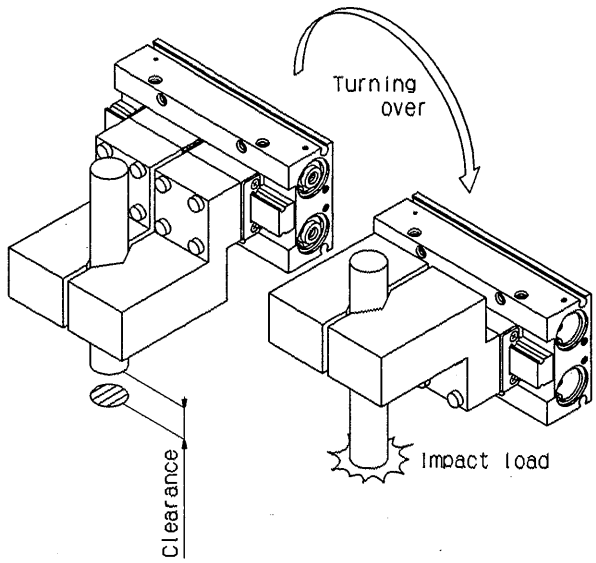
1. Stroke end in finger opening condition



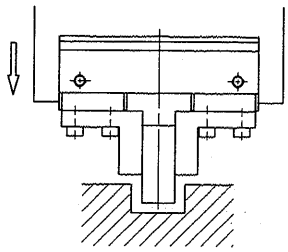
2. Air gripper traveling stroke end



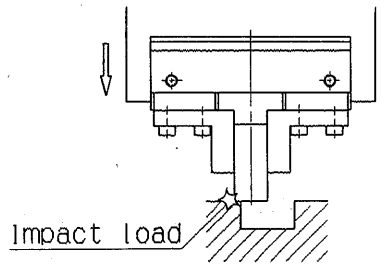
3. At opposite movement



3. Adjust the holding point so that excessive force will not be applied on fingers when inserting the work.
   Confirm that the gripper can operate without receiving any shock by testing with manual operation or low-speed operation.



○ Aligned



× Not aligned

4. Excessive finger opening／closing speed may cause play or damage of air gripper due to inertia of fingers or attachment. Mount speed controller to avoid impact.
   Applicable speed controller
   1) Air gripper mounted type ····· AS1201F-M3
      AS1201F-M5
   2) In-Line type ····· AS1000series
      AS1001F

2－4 Air source

⚠Warning

1. Use clean air.
   Do not use compressed air contains chemicals, salinity, corrosive gas or synthetic oil with organic solvent. Using it may cause malfunction or damage of air gripper.

⚠ Caution

1. Mount air filter.
   Mount air filter near valve and before air gripper. Select filtration rating of 5 μm or less.
2. Install after-cooler, air dryer and drain catch.
   Compressed air contains a large amount of drain may cause malfunction of valve and other pneumatic equipment.
3. Use air gripper within the specified fluid and ambient temperature range.
   If air gripper is used below 5℃, moisture inside the circuit is frozen and may cause damage of packings or malfunction. Take preventative measures for freezing.
   Refer to SMC "Compressed Air Cleaning System" for the details of compressed air quality described above.

2−5 Piping

⚠ Caution

1. Preparation before piping.

   Thoroughly flush the fittings to prevent dust or chips from entering the gripper.

2−6 Environment

⚠ Warning

1. Do not use in environment of corrosive grass, salt water, water, nor vapor.
2. Do not use in direct sun light.
3. Do not subject to excessive vibration.
4. Do not use close to flame.
5. Use a cover when gripper must be used in an environment where dust or cutting oil will come in contact with gripper.
6. Consult SMC for the use in any other special environment.

2−7 Lubrication

⚠ Caution

1. Non-lube type is lubricated already. Therefore, it is not necessary to lubricate before using. When lubricating the gripper, use the turbine oil class 1 (ISO VG32) and refuel continually. When lubrication has been started, it must be continued throughout the life of the gripper or malfunction may result.

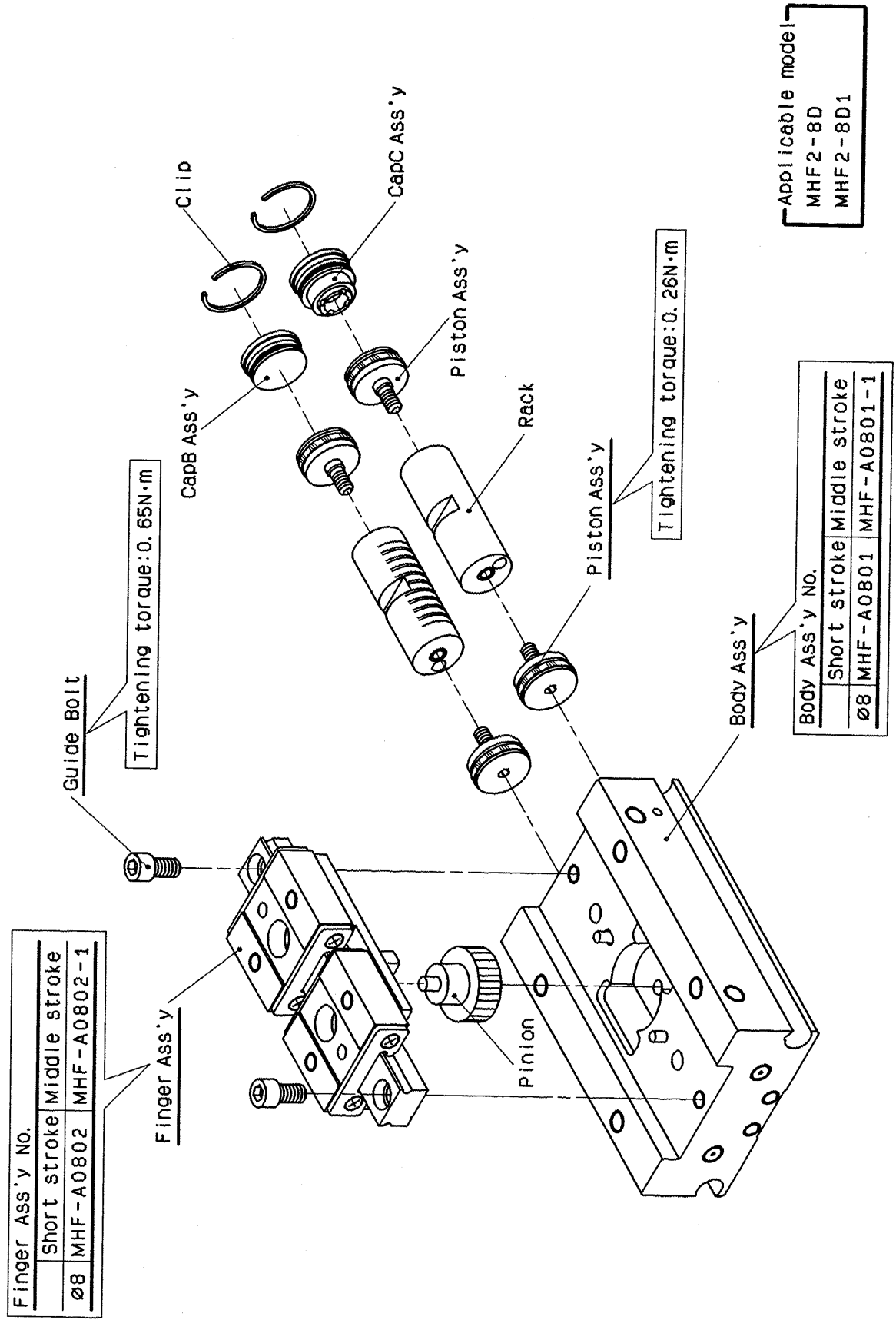
3. Maintenance

3−1 Notes

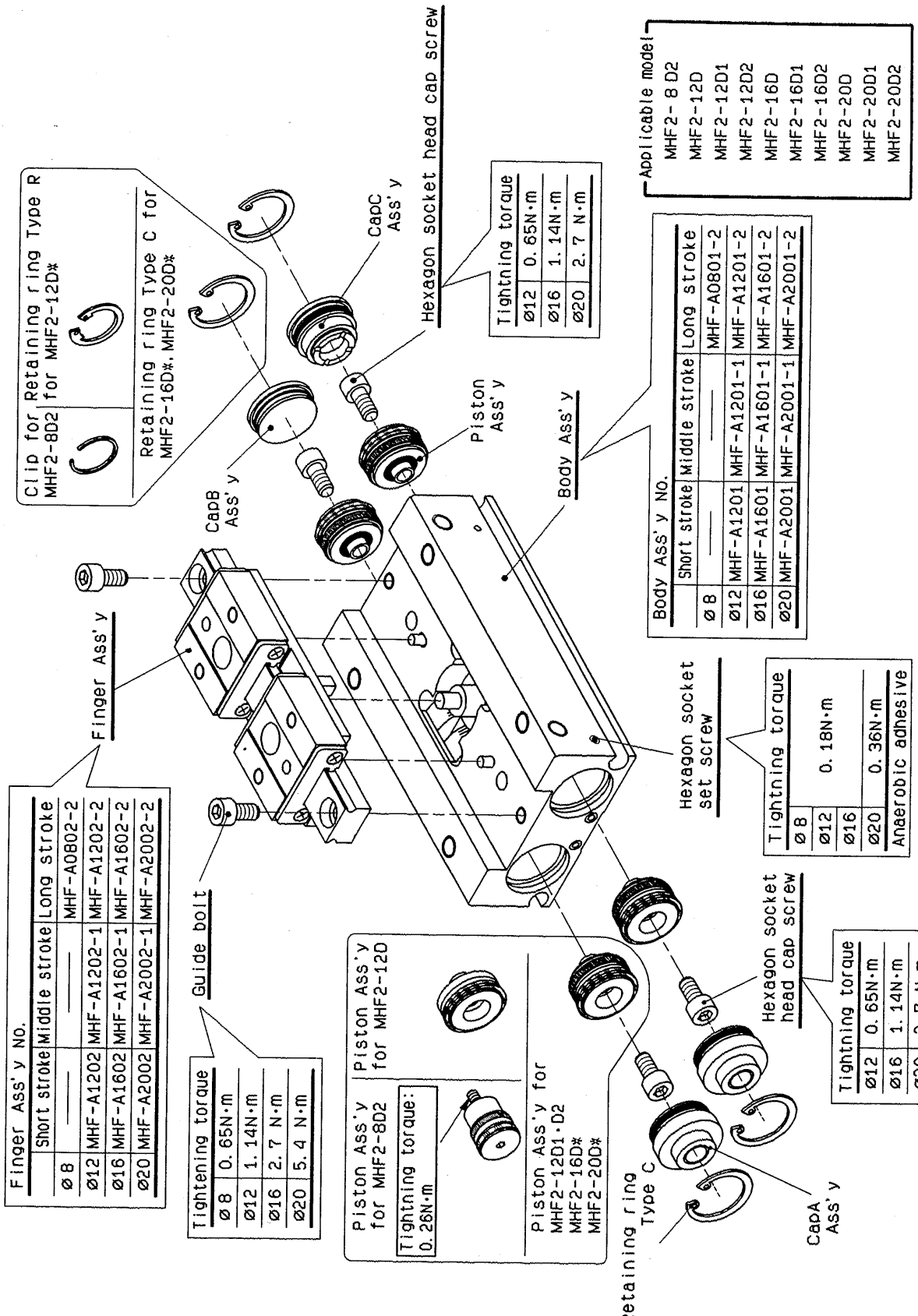
⚠ Warning

1. Do not enter the transfer line nor put the object. It may cause unexpected accidents.
2. Do not enter your hands between finger and attachment. It may cause unexpected accidents.
3. Confirm that no work is held by fingers before releasing the compressed air to remove the gripper from the line. Dropping of work can be dangerous.

3−2 Exploded view ①



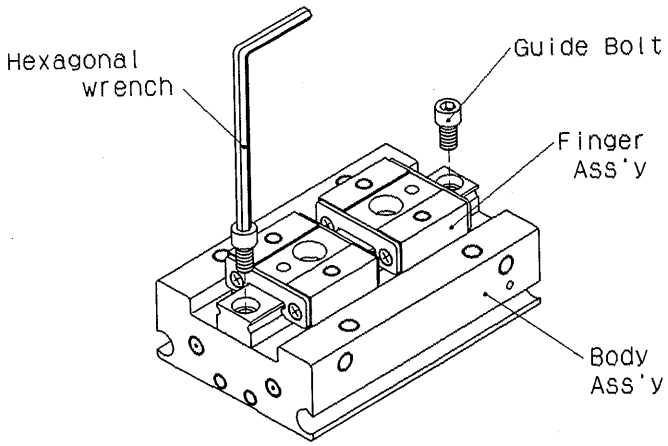
Exploded view ②



3−3 Replacing Procedure of Packing ①

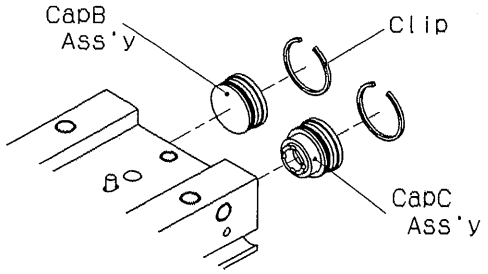
Applicable model: MHF2-8D,MHF2-8D1

1.Loosen guide bolt and disconnect finger Ass'y.

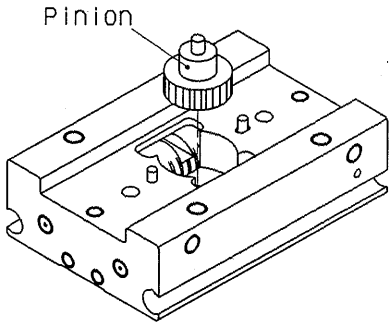


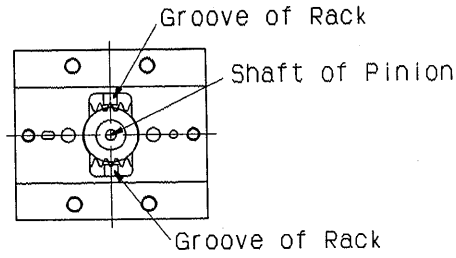
Hexagonal wrench size	
ϕ8	2

2.Disconnect clip, cap B and C.

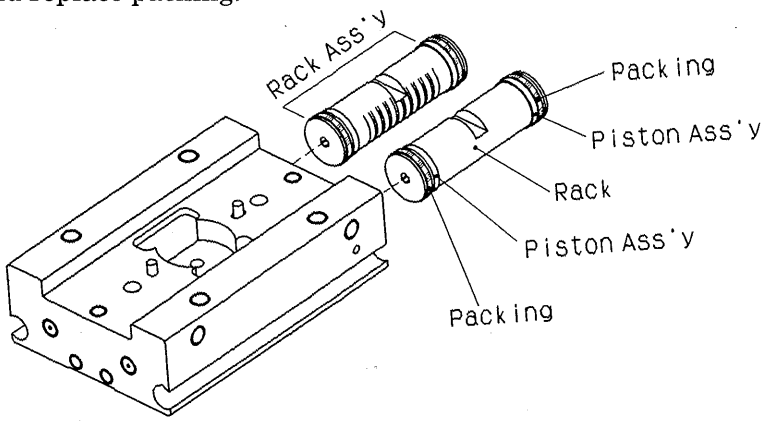


3.Disconnect pinion. (For reassembly, meet the groove of rack with the shaft of pinion.)





4.Pull out rack Ass'y and replace packing.

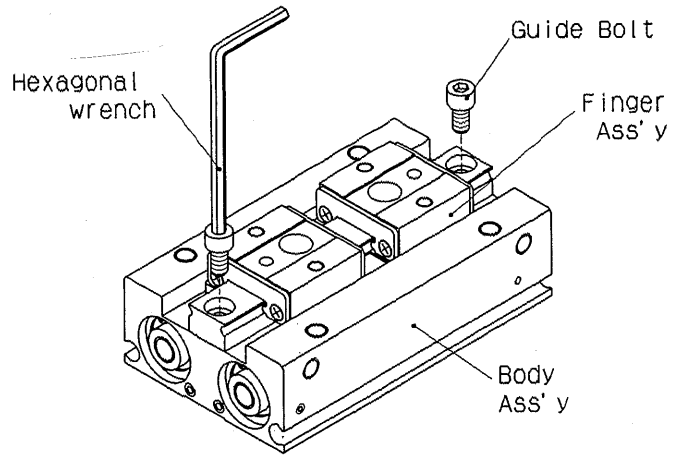


- Follow this procedure backward for assembly.
- Refer to the disassembly drawing for piston bolt tightening torque.
- Contact SMC for grease. Special grease is available.

Replacing Procedure of Packing ②

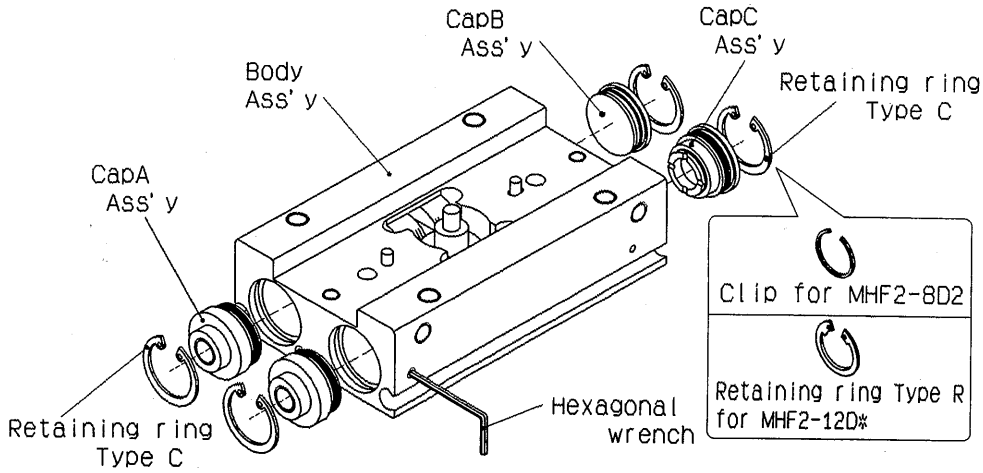
Applicable model: MHF2-8D2,MHF2-12D※~20D※

1.Loosen guide bolt and disconnect finger Ass'y.



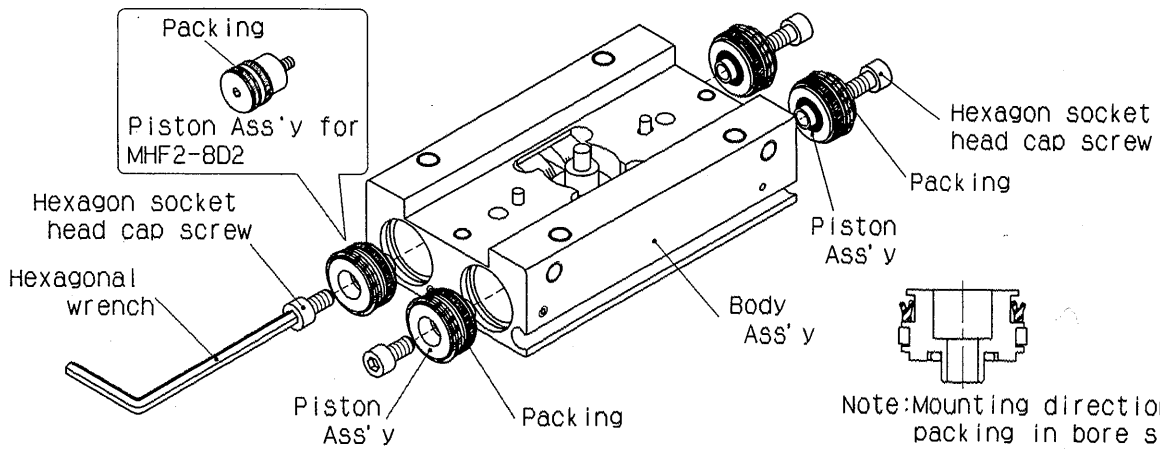
Hexagonal wrench size	
ϕ 8	2
ϕ 12	2.5
ϕ 16	3
ϕ 20	4

2.Loosen hexagon socket head cap screw and disconnect clip(ϕ 8),
Retaining ring type R(ϕ 12) or Retaining ring type C(ϕ 16, 20), and cap A, B and C (all)



Hexagonal wrench size	
ϕ 8	0.9
ϕ 12	
ϕ 16	
ϕ 20	1.3

3.Loosen hexagon socket head bolt (inserted on piston Ass'y in case of ϕ 8) to pull out piston Ass'y and replace packing.
(For bore size ϕ 12 or more, mounting direction of packing is specified.)



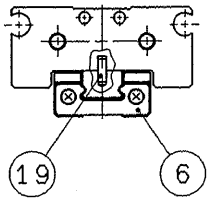
Hexagonal wrench size	
ϕ 8	1.5
ϕ 12	2
ϕ 16	2.5
ϕ 20	3

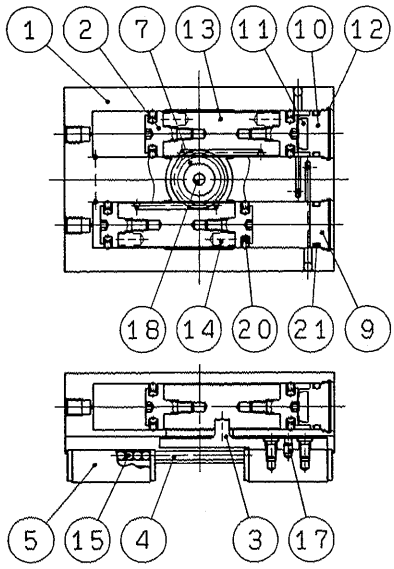
Note:Mounting direction of packing in bore size ø12.

- Follow this procedure backward for assembly.
- Refer to the disassembly drawing for piston bolt tightening torque.
- Contact SMC for grease. Special grease is available.

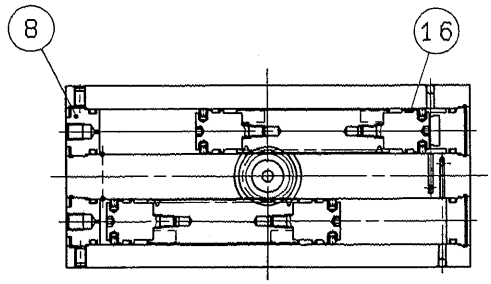
3－4 Structural drawing ／ Parts List・Seal Kits ①

MHF2-8D、MHF2-8D1





MHF2-8D2



Parts List

No.	Description	Material	Note
1	Body	Aluminum alloy	Hard anodized
2	Piston	Stainless steel	
3	Joint	Stainless steel	Haet treatment
4	Guide rail	Stainless steel	Haet treatment
5	Finger	Stainless steel	Haet treatment
6	Roller stopper	Stainless steel	
7	Pinion	Carbon steel	Nitrided
8	Cap A	Aluminum alloy	Clear anodized
9	Cap B	Aluminum alloy	Clear anodized
10	Cap C	Aluminum alloy	Clear anodized
11	Head dumper	Urethane rubber	
12	Clip	Stainless steel wire	
13	Rack	Stainless steel	Nitrided
14	Magnet	Rare earth	Nickel plated

No.	Description	Material	Note
15	Steel ball	Steel	
16	Ware ring	Resin	
17	Cylindrical roller	Steel	
18	Needle roller	Steel	
19	Parallel pin	Stainless steel	
20	Piston packing	NBR	
21	Gasket	NBR	

Replaceable Parts List:Seal Kits

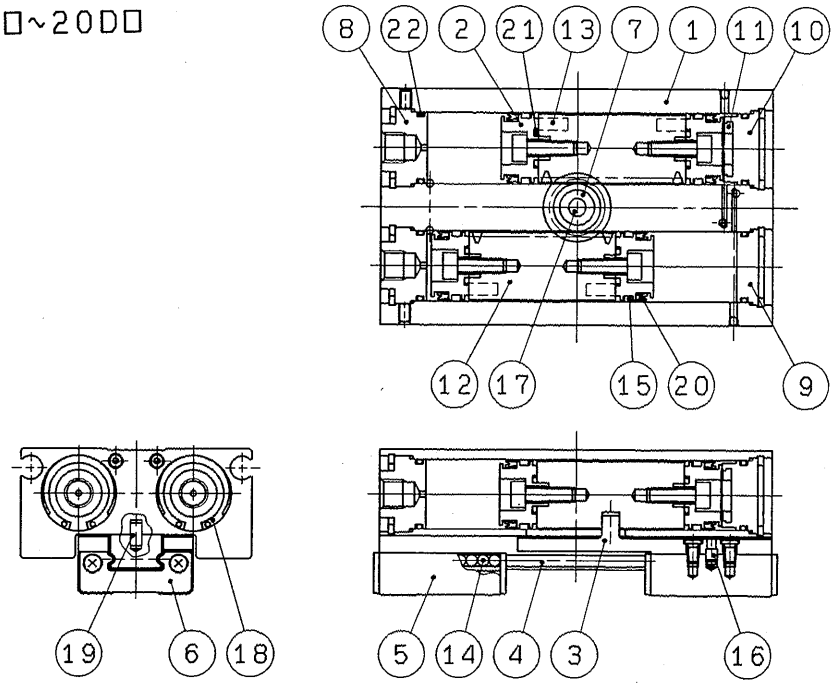
Part No.	Order No.			Description
	MHF2-8D	MHF2-8D1	MHF2-8D2	
Seal kits	MHF8-PS	MHF8-PS	MHF8-PS-2	12, 20, 21

※Seal kits consist of times 12,20 and 21 in one kit,and can be ordered using the Seal kits number for each cylinder bore size.

※ Refer to disassembly drawing on P11 for Part No. and replacing procedure of Finger Ass'y and Body Ass'y.

Structural drawing / Parts List ②

MHF2-12D□~20D□



Parts List

No.	Description	Material	Note
1	Body	Aluminum alloy	Hard anodized
2	Piston	Aluminum alloy	Clear anodized
3	Joint	Stainless steel	Heat treatment
4	Guide rail	Stainless steel	Heat treatment
5	Finger	Stainless steel	Heat treatment
6	Roller stopper	Stainless steel	
7	Pinion	Carbon steel	Nitrided
8	Cap A	Aluminum alloy	Clear anodized
9	Cap B	Aluminum alloy	Clear anodized
10	Cap C	Aluminum alloy	Clear anodized
11	Head dumper	Urethane rubber	
12	Rack	Stainless steel	Nitrided
13	Magneto	Rare earth	Nickel plated
14	Steel ball	steel	

No.	Description	Material	Note
15	Ware ring	Resin	
16	φ12 : Cylindrical roller φ16~20: Parallel pin	Steel Stainless steel	
17	Needle roller	Steel	
18	φ12 : Retaining ring Type R φ16~20: Retaining ring Type C	steel	Nickel plated
19	Parallel pin	Stainless steel	
20	Piston packing	NBR	
21	Gasket	NBR	
22	Gasket	NBR	

Replaceable Parts List : Seal Kits

Part No.	Order No.			Description
	MHF2-12D	MHF2-12D1	MHF2-12D2	
Seal kits	MHF12-PS	MHF12-PS	MHF12-PS	20、21、22

Part No.	Order No.			Description
	MHF2-16D	MHF2-16D1	MHF2-16D2	
Seal kits	MHF16-PS	MHF16-PS	MHF16-PS	20、21、22

Part No.	Order No.			Description
	MHF2-20D	MHF2-20D1	MHF2-20D2	
Seal kits	MHF20-PS	MHF20-PS	MHF20-PS	20、21、22

※Seal kits consist of times 20,21 and 22 in one kit, and can be ordered using the Seal kits number for each cylinder bore size.

※Refer to disassembly drawing on P12 for Part No. and replacing procedure of Finger Ass'y and Body Ass'y.