
Maintenance



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8-1 REGULAR MAINTENANCE

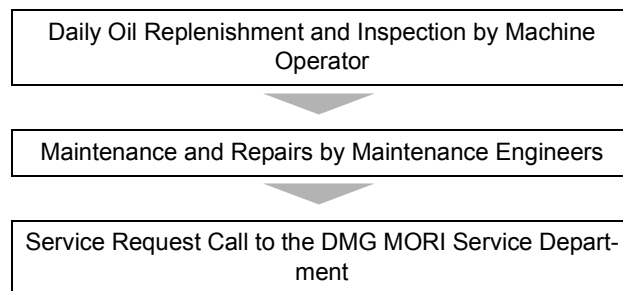
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1 IMPORTANCE OF INSPECTIONS

Daily lubrication and inspection by operators and regular inspection by maintenance engineers are the keys to long-lasting machine accuracy. Prior to inspection, confirm the following points:

1. Any abnormality discovered during daily inspections must be reported to maintenance engineers. If necessary, repair or replacement is to be performed immediately.
2. Maintenance engineers must take immediate and proper action in compliance with the instructions of operators who are in charge of daily inspection.
3. For queries or concerns related to the contents of the instruction manuals, circuit diagrams, and ladder diagrams, contact the DMG MORI Service Department for assistance.
4. If the cause of a problem cannot be determined, or if it cannot be remedied, contact the DMG MORI Service Department for assistance.

<Maintenance/Inspection Sequence>



2 PRIOR TO MAINTENANCE WORK

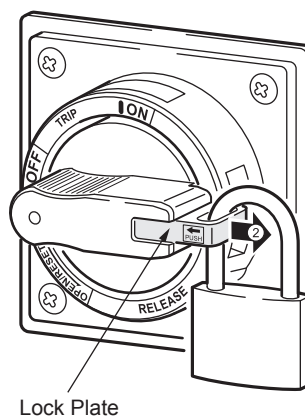
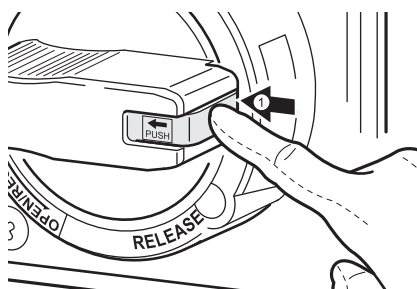
Turn OFF the main power and lock the main power switch with a padlock using the following procedure when performing maintenance procedures considered dangerous if the power is ON.

NOTE

A padlock should be prepared by the user.

<Procedure>

- 1) Place the main power switch in the [OFF] position.
[The machine is turned OFF.]
- 2) Press ① in the figure below and pull out the lock plate ②.
- 3) Attach a padlock.



WARNING

When the main power switch is locked, it means that maintenance procedures are being performed. Do not place the main power switch in the [ON] position.

3 REGULAR INSPECTION LIST

Items that require regular inspection and maintenance are indicated below. Perform maintenance and inspections by following the inspection interval below.



CAUTION

Failure to perform the maintenance and inspections indicated below will lead to machine malfunction.

Inspection Interval	Inspection Item	
As required	Replenish-ment	"Replenishing Coolant" (page 8-47)
		Replenishing hydraulic oil (20000 min ⁻¹ specification) (page 8-58)
		"Replenishing Lubricating Oil" (page 8-61)
		Water-glycol chiller (20000 min ⁻¹ specification) "Replenishing Cooling Fluid" (page 8-68)
		"Replenishing Oil" (page 8-79) for tool unclamp cylinder lubricator
		"Replenishing Grease" (page 8-90) for magazine
		Replenishing hydraulic oil (option) (page 8-105)
	Replacement	"REPLACING MACHINE LIGHT" (page 8-34)
		Replacing machine cooling fan (page 8-36)
		"Replacing O-ring of Positioning Block for Angle Head and Oil Hole Drill (Option)" (page 8-43)
		"Replacing Plungers on Spindle End Face (Through Spindle Coolant Specification)" (page 8-44)
		Replacing scraper of chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL

Inspection Interval	Inspection Item	
As required	Cleaning	“CLEANING MACHINE SURFACE” (page 8-38)
		“CLEANING OPERATION PANEL” (page 8-39)
		“Cleaning Filter Element (Option)” (page 8-50) of coolant unit
		“Cleaning Coolant Gun” (page 8-56) (option)
		“Manual Draining from Air Filter” (page 8-73) of pneumatic devices
		Cleaning main separator of mist collector (AFS series) (option) (page 8-97)
		“Cleaning Radiator” (page 8-107) of hydraulic unit (option)
		“Cleaning Pallet Clamping Part” (page 8-118) (option)
		Cleaning drum filter of chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL
		Cleaning scraper of chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL
		Cleaning coolant nozzle of chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL
	Inspection/ Confirmation	“PREPARATION FOR MACHINE OPERATION AFTER PROLONGED IDLE PERIOD” (page 8-26)
		Reaffirming machine level  Installation
	Adjustment	“Adjusting Coolant Discharge Rate” (page 8-47)
		“Adjusting Flow Rate of Coolant Gun” (page 8-57) (option)
		“Adjusting Oil-water Separation Tank Drain” (page 8-117) (option)
		Adjusting drum filter back washing coolant discharge rate of chip conveyor (left disposal type) (option)  CHIP CONVEYOR INSTRUCTION MANUAL

Inspection Interval	Inspection Item	
Daily	Cleaning	"Cleaning Machining Chamber Observation Window" (page 8-29)
		Checking machining chamber observation window for damages (page 8-29)
		"CLEANING MACHINING CHAMBER" (page 8-32)
		"Cleaning Spindle Tapered Section and End Face" (page 8-41)
		"Cleaning Chip Conveyor" (page 8-92) (rear disposal type) (option)
		"Cleaning Inside Magazine" (page 8-89)
		Cleaning waste oil container of oil-water separation tank for oil skimmer (option) (page 8-117)
		Cleaning chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL
	Inspection/ Confirmation	"Spindle Warm-up" (page 8-40)
		"Checking Coolant Level" (page 8-46)
		Checking hydraulic oil level (20000 min ⁻¹ specification) (page 8-58)
		Hydraulic unit (20000 min ⁻¹ specification) "Checking Pressure Gage" (page 8-59)
		"Checking Lubricating Oil Level" (page 8-61)
		"Checking Oil-air Lubrication (15000 min ⁻¹ /20000 min ⁻¹ Specification)" (page 8-64)
		Water-glycol chiller (20000 min ⁻¹ specification) "Checking Cooling Fluid Level" (page 8-67)
		"Inspecting and Adjusting Air Pressure" (page 8-72)
		Checking hydraulic oil level (option) (page 8-105)
		"Checking Pressure Gage" (page 8-107) of hydraulic unit (option)
		Checking line filter indicator of hydraulic unit (page 8-109) (Option)
		Inspecting scraper of chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL
50 hours	Cleaning	Water-glycol chiller (20000 min ⁻¹ specification) "Cleaning Air Filter and Condenser" (page 8-69)
		"Cleaning Air Filter and Condenser" (page 8-94) of coolant chiller (option)
	Inspection/ Confirmation	"Visually Inspecting Coolant Chiller" (page 8-94) (option)
		Inspecting oil-water separation tank for oil skimmer (option) (page 8-117)
250 hours	Inspection/ Confirmation	"Visually Inspecting Water-glycol Chiller" (page 8-67) (20000 min ⁻¹ specification)
		"Checking Oil Level" (page 8-79) of tool unclamp cylinder lubricator
	Cleaning	Cleaning pre-separator of mist collector (AFS series) (option) (page 8-97)
		Cleaning follow-up separator of mist collector (AFS series) (option) (page 8-98)
	Replacement	Replacing pre-filter fleece of mist collector (AFS series) (option) (page 8-97)
500 hours	Cleaning	"Cleaning Coolant Tank and Filter" (page 8-48)
		"Cleaning Lubricating Unit Tank, Suction Filter and Fill Port Filter" (page 8-62)
		"Cleaning Lubricating Unit Line Filter" (page 8-62)

Inspection Interval	Inspection Item	
1000 hours	Cleaning	"Cleaning Fan Filter for Electrical Cabinet Heat Exchanger" (page 8-84)
		"Cleaning Electrical Cabinet Back Fin Filter" (page 8-84)
		"Cleaning Suction Strainer and Tank" (page 8-108) of hydraulic unit (option)
	Inspection/ Confirmation	"INSPECTING AND REPLACING PROTECTOR WIPERS" (page 8-33)
		Inspecting filter element of coolant unit (page 8-50) (option)
		"Inspecting Filter Element of Air Filter/Mist Separator" (page 8-72) of pneumatic devices ^{*1}
	Replacement	"Replacing Oil" (page 8-58) of hydraulic unit (20000 min ⁻¹ specification)
		Replacing second element and oil mist element of multi dry filter (option) (page 8-76)
		"Replacing Oil" (page 8-106) of hydraulic unit (option)
2000 hours	Inspection/ Confirmation	"Determine Retention Capability of Machining Chamber Observation Window" (page 8-30)
	Replacement	Water-glycol chiller (20000 min ⁻¹ specification) "Replacing Cooling Fluid" (page 8-70)
		"Replacing Filter Element of Air Filter/Mist Separator" (page 8-73) of pneumatic devices ^{*1}
	Cleaning	Electrical cabinet chiller (SK series) (option) "Cleaning Condenser" (page 8-111)
		Electrical cabinet chiller (ENC- series) (option) "Cleaning Filter" (page 8-115)
1 week	Inspection/ Confirmation	Checking pre-separator of mist collector (AFS series) (option) (page 8-97)
		Checking follow-up separator of mist collector (AFS series) (option) (page 8-98)
2 weeks	Replenish- ment	"Greasing Tool Clamp Unit" (page 8-42) ^{*3}
1 month	Inspection/ Confirmation	Checking main separator of mist collector (AFS series) (option) (page 8-97)
	Cleaning	Cleaning oil-water separation tank for oil skimmer (option) (page 8-117)
2 to 3 months after start of use	Adjustment	"Adjusting Chip Conveyor Belt" (page 8-93) (first slack) (rear disposal type) (option)
		Adjusting chip conveyor chain (first slack) (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL
3 months	Inspection/ Confirmation	Checking and cleaning machine cooling fan (page 8-36)
		Inspecting drum filter of chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL
		Inspecting coolant nozzle of chip conveyor (left disposal type) (option)
4 months ^{*4}	Cleaning	Mist collector (HVS- series) (option) "Cleaning Louver Unit/Baffler Unit" (page 8-99)
		Mist collector (HVS- series) (option) "Cleaning Drum Filter/Demister" (page 8-101)
	Replacement	Mist collector (HVS- series) (option) "Replacing Final Filter" (page 8-103)
6 months	Inspection/ Confirmation	Inspecting drum sprocket of chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL
		Inspecting V-ring of chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL
		Inspecting sprocket of chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL
		Inspecting motor of chip conveyor (left disposal type) (option)
		 CHIP CONVEYOR INSTRUCTION MANUAL

Inspection Interval	Inspection Item	
1 year	Replacement	“Replacing Battery” (page 8-85) of electrical cabinet
		“Replacing Line Filter Element” (page 8-109) of hydraulic unit (option)*5
	Adjustment	“Adjusting Chip Conveyor Belt” (page 8-93) (rear disposal type) (option)
		Adjusting chip conveyor chain (left disposal type) (option)  CHIP CONVEYOR INSTRUCTION MANUAL
2 years	Replacement	Cleaning or replacing first element of multi dry filter (option) (page 8-76)
 NOTE *1 The mist separator is installed for 15000 min⁻¹/20000 min⁻¹ specification. *2 Depending on the environment in which the machine is used, cleaning interval may be reduced. *3 Once or twice a month or when the message demanding grease replenishment is displayed. *4 1 - 3 times a year, depending on the usage conditions, amount of mist generated, and mist fineness. *5 Replace the filter element although one year has not yet passed in the following cases: • When replacing the hydraulic oil • When the visual indicator turns red		

4 MAINTENANCE ROUTE MAP

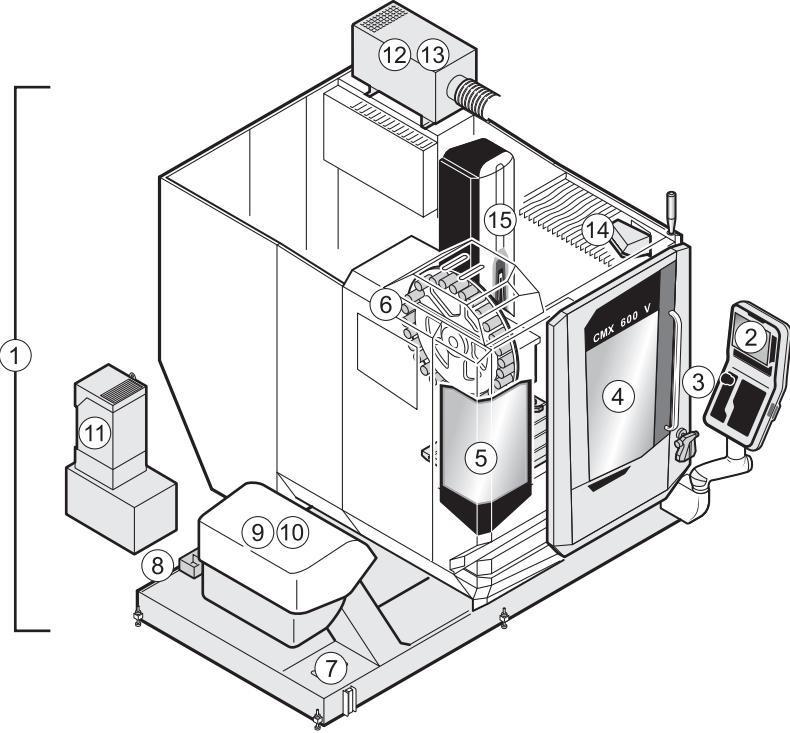
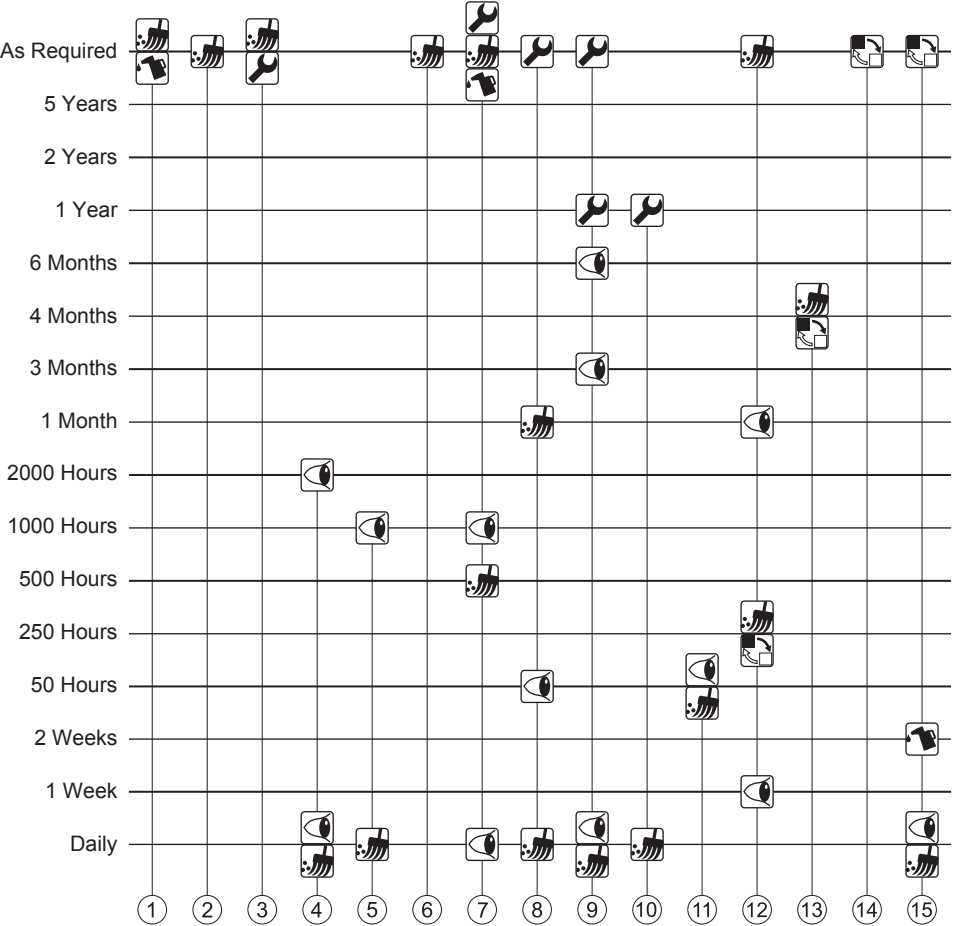
Cleaning

Replacement

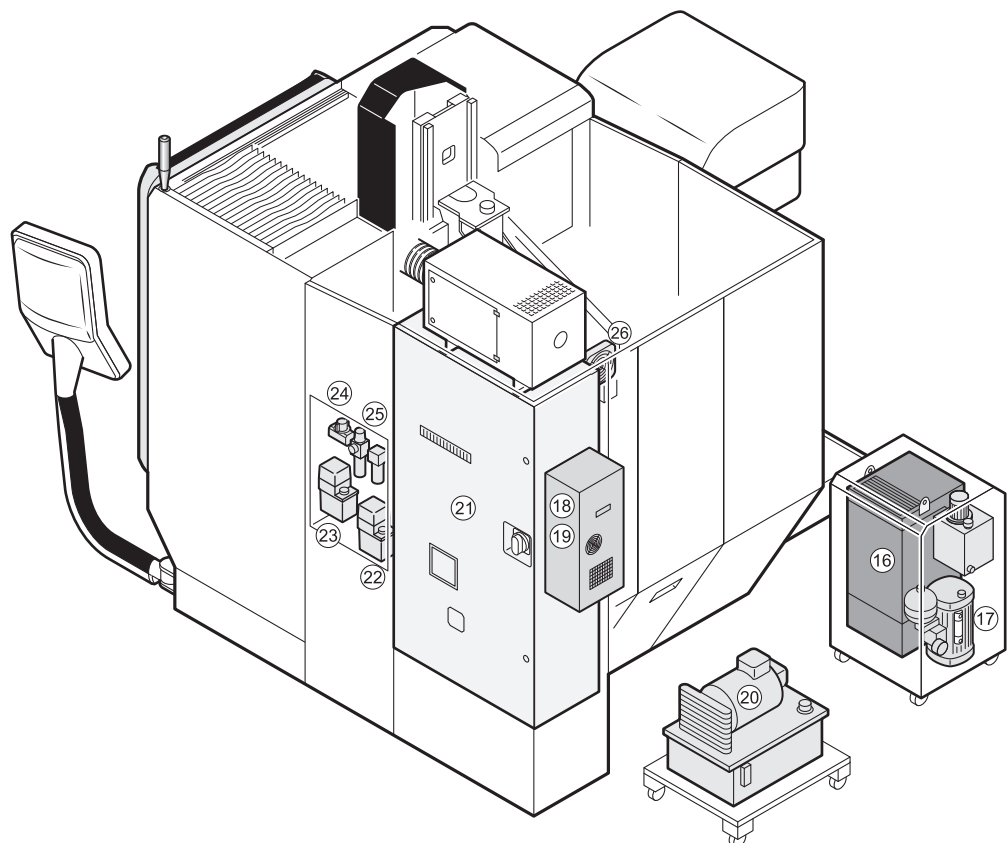
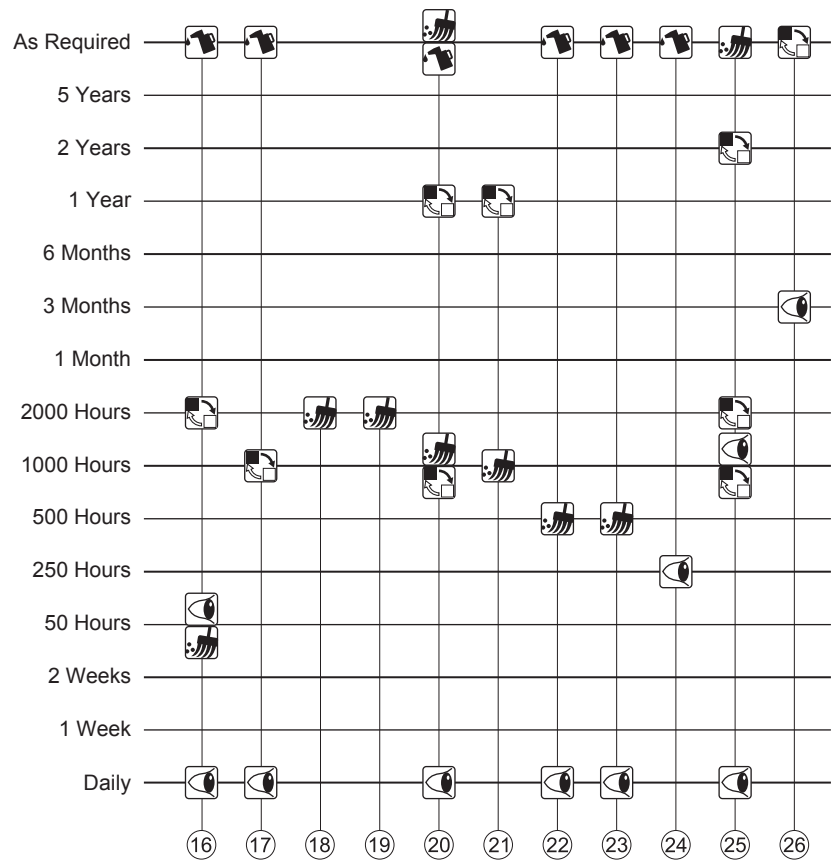
Adjustment

Replenishment

Inspection/Confirmation



 Cleaning
  Replacement
  Adjustment
  Replenishment
  Inspection/Confirmation



No.	Name	Inspection Item (Refer to)
①	Entire machine	“PREPARATION FOR MACHINE OPERATION AFTER PROLONGED IDLE PERIOD” (page 8-26)
		“CLEANING MACHINE SURFACE” (page 8-38)
		Reaffirming machine level (Installation)
②	Operation panel	“CLEANING OPERATION PANEL” (page 8-39)
③	Coolant gun (option)	“Cleaning Coolant Gun” (page 8-56)
		“Adjusting Flow Rate of Coolant Gun” (page 8-57)
④	Machining chamber observation window	“Cleaning Machining Chamber Observation Window” (page 8-29)
		“Check Machining Chamber Observation Window for Damages” (page 8-29)
		“Determine Retention Capability of Machining Chamber Observation Window” (page 8-30)
⑤	Machining chamber	“CLEANING MACHINING CHAMBER” (page 8-32)
		“INSPECTING AND REPLACING PROTECTOR WIPERS” (page 8-33)
⑥	Magazine	“Cleaning Inside Magazine” (page 8-89)
		“Replenishing Grease” (page 8-90)
⑦	Coolant unit	“Checking Coolant Level” (page 8-46)
		“Replenishing Coolant” (page 8-47)
		“Adjusting Coolant Discharge Rate” (page 8-47)
		“Cleaning Coolant Tank and Filter” (page 8-48)
		“Cleaning Filter Element (Option)” (page 8-50)
⑧	Oil skimmer (option)	“Adjusting Oil-water Separation Tank Drain” (page 8-117)
		“Inspecting and Cleaning Oil-water Separation Tank” (page 8-117)
⑨	Chip conveyor (left disposal type) (option)	Cleaning Chip Conveyor (CHIP CONVEYOR INSTRUCTION MANUAL)
		Adjusting Chip Conveyor Chain (CHIP CONVEYOR INSTRUCTION MANUAL)
		Adjusting Drum Filter Back Washing Coolant Discharge Rate (Option) (CHIP CONVEYOR INSTRUCTION MANUAL)
		Inspecting Scraper (CHIP CONVEYOR INSTRUCTION MANUAL)
		Inspecting Drum Filter (Option) (CHIP CONVEYOR INSTRUCTION MANUAL)
		Inspecting Coolant Nozzle (Option) (CHIP CONVEYOR INSTRUCTION MANUAL)
		Inspecting Drum Sprocket (Option) (CHIP CONVEYOR INSTRUCTION MANUAL)
		Inspecting V-ring (CHIP CONVEYOR INSTRUCTION MANUAL)
		Inspecting Sprocket (CHIP CONVEYOR INSTRUCTION MANUAL)
		Inspecting Motor (CHIP CONVEYOR INSTRUCTION MANUAL)
		Cleaning Drum Filter (Option) (CHIP CONVEYOR INSTRUCTION MANUAL)
		Cleaning Scraper (CHIP CONVEYOR INSTRUCTION MANUAL)
		Cleaning Coolant Nozzle (Option) (CHIP CONVEYOR INSTRUCTION MANUAL)
		Replacing Scraper (CHIP CONVEYOR INSTRUCTION MANUAL)
⑩	Chip conveyor (rear disposal type) (option)	“Cleaning Chip Conveyor” (page 8-92)
		“Adjusting Chip Conveyor Belt” (page 8-93)

No.	Name	Inspection Item (Refer to)
⑪	Coolant chiller (option)	"Visually Inspecting Coolant Chiller" (page 8-94)
		"Cleaning Air Filter and Condenser" (page 8-94)
⑫	Mist collector (AFS series) (option)	"Checking and Cleaning Pre-separator/Main Separator" (page 8-97)
		"Checking and Cleaning Follow-up Separator" (page 8-98)
		Replacing pre-filter fleece (page 8-97)
⑬	Mist collector (HVS- series) (option)	"Cleaning Louver Unit/Baffle Unit" (page 8-99)
		"Cleaning Drum Filter/Demister" (page 8-101)
		"Replacing Final Filter" (page 8-103)
⑭	Machine light	"REPLACING MACHINE LIGHT" (page 8-34)
⑮	Spindle	"Spindle Warm-up" (page 8-40)
		"Cleaning Spindle Tapered Section and End Face" (page 8-41)
		"Greasing Tool Clamp Unit" (page 8-42)
		"Replacing O-ring of Positioning Block for Angle Head and Oil Hole Drill (Option)" (page 8-43)
		"Replacing Plungers on Spindle End Face (Through Spindle Coolant Specification)" (page 8-44)
⑯	Water-glycol chiller (20000 min ⁻¹ specification)	"Visually Inspecting Water-glycol Chiller" (page 8-67)
		"Checking Cooling Fluid Level" (page 8-67)
		"Replenishing Cooling Fluid" (page 8-68)
		"Cleaning Air Filter and Condenser" (page 8-69)
		"Replacing Cooling Fluid" (page 8-70)
⑰	Hydraulic unit (20000 min ⁻¹ specification)	"Checking Oil Level/Replenishing Oil" (page 8-105)
		"Replacing Oil" (page 8-106)
		"Checking Pressure Gage" (page 8-107)
⑱	Electrical cabinet chiller (SK series) (option)	"Cleaning Condenser" (page 8-111)
⑲	Electrical cabinet chiller (ENC-series) (option)	"Cleaning Filter" (page 8-115)
⑳	Hydraulic unit (option)	"Checking Oil Level/Replenishing Oil" (page 8-105)
		"Replacing Oil" (page 8-106)
		"Checking Pressure Gage" (page 8-107)
		"Cleaning Radiator" (page 8-107)
		"Cleaning Suction Strainer and Tank" (page 8-108)
		"Replacing Line Filter Element" (page 8-109)
㉑	Electrical cabinet	"Cleaning Fan Filter for Electrical Cabinet Heat Exchanger" (page 8-84)
		"Cleaning Electrical Cabinet Back Fin Filter" (page 8-84)
		"Replacing Battery" (page 8-85)
㉒	Lubricating unit for feeding	"Checking Lubricating Oil Level" (page 8-61)
		"Replenishing Lubricating Oil" (page 8-61)
		"Cleaning Lubricating Unit Line Filter" (page 8-62)
		"Cleaning Lubricating Unit Tank, Suction Filter and Fill Port Filter" (page 8-62)

No.	Name	Inspection Item (Refer to)
②③	Oil-air lubricating unit	"Checking Lubricating Oil Level" (page 8-61)
		"Replenishing Lubricating Oil" (page 8-61)
		"Cleaning Lubricating Unit Line Filter" (page 8-62)
		"Cleaning Lubricating Unit Tank, Suction Filter and Fill Port Filter" (page 8-62)
		"Checking Oil-air Lubrication (15000 min-1/20000 min-1 Specification)" (page 8-64)
②④	Tool unclamp cylinder lubricator	"Checking Oil Level" (page 8-79)
		"Replenishing Oil" (page 8-79)
②⑤	Pneumatic device	"Manual Draining from Air Filter" (page 8-73)
		"Inspecting and Adjusting Air Pressure" (page 8-72)
		"Inspecting Filter Element of Air Filter/Mist Separator" (page 8-72)
		"Replacing Filter Element of Air Filter/Mist Separator" (page 8-73)
		"Replacing Filter Element of Multi Dry Filter (Option)" (page 8-76)
②⑥	Machine Cooling Fan	Checking Machine Cooling Fan (page 8-36)
		"Cleaning/Replacing Machine Cooling Fan" (page 8-36)
—	Pallet changer (option)	"Cleaning Pallet Clamping Part" (page 8-118)

5 OILS/COOLING FLUID

5.1 Precautions when Supplying Oil

CAUTION

1. Always use the same oil can for specific oil brands. Do not use oil cans used with different brands of oil.
2. Do not reuse the used oil.
3. Do not remove the filter from the fill port on each tank when supplying oil.
4. If oils other than those specified by DMG MORI are used mistakenly or different brands of oil are mixed, clean the tank and flush the piping immediately.
5. Obtain the MSDS (MATERIAL SAFETY DATA SHEET) from the oil manufacturer directly by yourself as the customer. Work environment management and the storage and disposal of oils are the sole responsibility of the customer. Please be sure to pay careful attention to the effects on the human body described in the MSDS.

NOTE

1. Do not mix different brands of oil even when identified as being of "equivalent" quality and viscosity.
2. Dispose of the waste oil before the waste oil container becomes full.

5.2 Recommended Oils

Use the following recommended oils. Using other oils may degrade the machine performance.

Supplied to		Name	Quantity (L)	Replacement Interval	Replenishment Interval
Oil-air lubricating unit (15000 min ⁻¹ /20000 min ⁻¹ specification)		Idemitsu Daphne Mechanic Oil 32	2.0	—	As required
Lubricating unit for feeding		Shell Shell Tonna S3 M 68	2.0	—	As required
Hydraulic unit (20000 min ⁻¹ specification)		Idemitsu Daphne Hydraulic Fluid 32	3.9	1000 hours	As required
Hydraulic unit (option)		Idemitsu Daphne Hydraulic Fluid 32	20	1000 hours	As required
Tool clamp unit	BT/BT two-face contact specifications	Shell Shell Stamina Grease RL2	Adequate quantity	—	*
Magazine		Shell Shell Gadus S2 V220 0	 "Replenishing Grease" (page 8-90)		
Tool unclamp cylinder lubricator		Idemitsu Daphne Mechanic Oil 32	0.1	—	As required

NOTE

* Once or twice a month or when the message demanding grease replenishment is displayed.

5.3 Recommended Cooling Fluid

Use the following recommended cooling fluid. Using other cooling fluid may degrade the machine performance.

Supplied to	Name	Quantity (L)	Replacement Interval	Replenishment Interval
Water-glycol chiller (20000 min ⁻¹ specification)	JXTG Nippon Oil & Energy PRECISE FLUID LT	21.0	2000 hours	As required

5.4 Oil Equivalents

The following table shows equivalent product names for your information. The oils other than recommended oils are not guaranteed on the dynamic characteristics.

◆ Recommended Oils

Supplied to	Name					
	Idemitsu	Mobil	Shell	Kyodo Yushi	Castrol	
Oil-air lubricating unit (15000 min ⁻¹ /20000 min ⁻¹ specification)	◆Daphne Mechanic Oil 32	Mobil DTE Oil Light	Shell Tellus S2 MX 32	—		
Lubricating unit for feeding	Daphne Super Multi Oil 68	Mobil Vactra Oil No. 2	◆Shell Tonna S3 M 68	—	Magna BD 68	
	Daphne Multi-way 68MT					
Hydraulic unit	◆Daphne Hydraulic Fluid 32	Mobil DTE Oil Light	Shell Tellus S2 MX 32	—	Hyspin AWS 32	
Magazine	Daphne Eponex Grease SR No. 0	Mobilux EP0	◆Shell Gadus S2 V220 0	—	Spheerol EPL 0	
Tool unclamp cylinder lubricator	◆Daphne Mechanic Oil 32	Mobil DTE Oil Light	Shell Tellus S2 MX 32	—	Hyspin AWS 32	

6 CONSUMABLE PARTS LIST

Unit Name	Part Name	Part No.	Reference
Protector Wipers		*	8-33
Tool Clamp Unit (BT/BT Two-Face Specification)	Shell Stamina Grease RL2	W20043	8-42
Positioning Block for Oil Hole Drill (Option)	O-ring	W06012	8-43
Plunger for Side Through Spindle (Through Spindle Coolant Specification)	O-ring	W06005	8-44
	Spring	Y73591	
Line Filter for Coolant (1.5 MPa Specification) (Option)	Filter Element	W12063	8-50
	O-ring	*	
Suction Filter for Coolant (7.0 MPa Specification) (Option)	Filter Element	FDYPTSF1012400W	8-53
Water-glycol Chiller (20000 min ⁻¹ Specification)	PRECISE FLUID LT	W20086	8-67
	Packing	X08861	8-70
Multi Dry Filter (Option)	First element	U29235	8-76
	Second element + oil mist element set	U29236	
Electrical Cabinet	Heat Exchanger Fan Filter	E18099	8-84
	Back Fin Filter	E18103	8-84
	Battery (1 Alkaline D Battery)	E30061	8-85
	Battery (4 Alkaline D Batteries)	E30144	
Mist Collector (AFS Series) (Option)	Pre-filter Fleece	SBF6013158	8-97
 NOTE * For the part numbers, refer to the "Reference" page.			

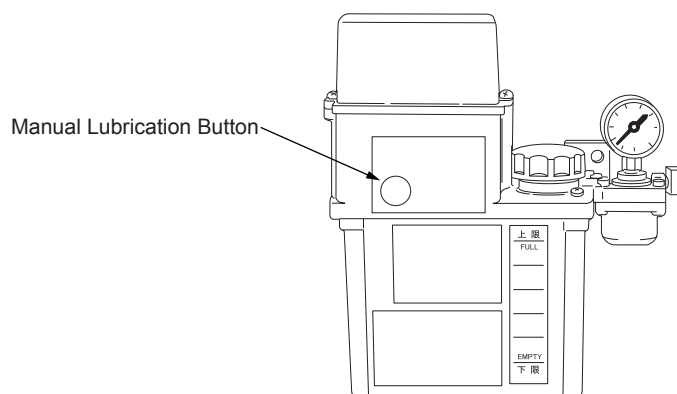
7 PREPARATION FOR MACHINE OPERATION AFTER PROLONGED IDLE PERIOD

Perform the following operations after machine has been idle for two days or more.

Operations	Machine Idle Period	Refer to
Forced Lubrication	Two Days or More	 "Forced Lubrication" (page 8-26)
Full Stroke Travel of Axes	Two Days or More	 "Full Stroke Travel of All Axes" (page 8-26)
Spindle Warm-up	Two Weeks or More	 "Spindle Warm-up" (page 8-40)

7.1 Forced Lubrication

Operate the lubricating pump for about 10 seconds to supply lubricating oil.



CAUTION

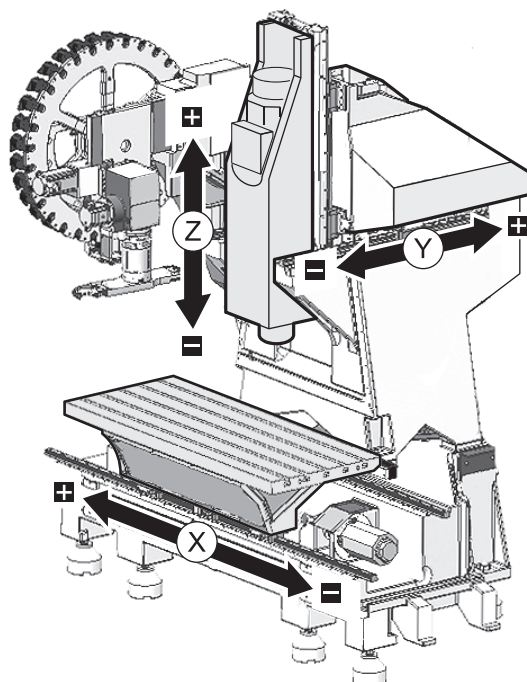
Supplying too much lubricant to the spindle bearings may cause spindle seizure or fire.

7.2 Full Stroke Travel of All Axes

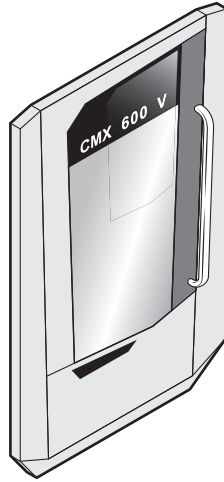
Using the manual pulse generator, perform full stroke travel of each axis to check for abnormal sounds or operation.

<Travel Distance of Each Feed Axis>

Model	Axis	Travel (mm)
CMX600V CMX600Vc	X	600
	Y	560
	Z	510
CMX800V CMX800Vc	X	800
	Y	560
	Z	510
CMX1100V CMX1100Vc	X	1100
	Y	560
	Z	510



8 MACHINING CHAMBER OBSERVATION WINDOW



8.1 Maintenance Work Overview

- Clean the machining chamber observation window.
- Check the machining chamber observation window for damages.
- Determine the retention capability of the machining chamber observation window.

DANGER

1. Turn OFF the main power and disconnect the plant side power supply (breaker).
2. When working inside the machine, ensure that the door will not be closed completely. When closed completely, the door is automatically locked. Check the procedure to escape out of the machine in case of being trapped inside the machine/the procedure to rescue an operator in case that he or she is trapped inside the machine.
[Serious injury]

WARNING

When working inside the machine provided with a locked-in prevention key, turn the key to prevent the door from being locked, remove the key and carry it with you in the machine.

[Locked in machine/Serious injury]

 Machine operation

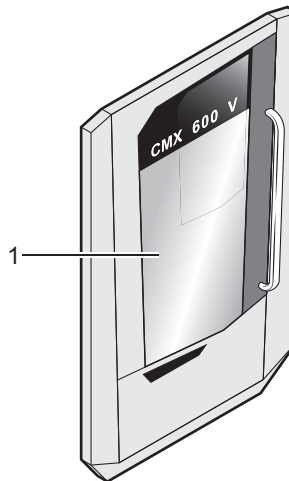
CAUTION

Automatic machine operation.

Danger of automatic operation during the maintenance works with unforeseen effects.

- Switch off the main switch for all maintenance work and secure it against being turned ON again with a padlock.

8.2 Cleaning Machining Chamber Observation Window



1	Machining chamber observation window
---	--------------------------------------

NOTE

Exemplary representation for all inspection windows of the machine.

CAUTION

The machining chamber observation window is made of polycarbonate.

Danger of deformation and decomposition.

- Only clean the machining chamber observation window with an appropriate fluid.

Prerequisites

- The main switch has been turned OFF and has been secured with a padlock.

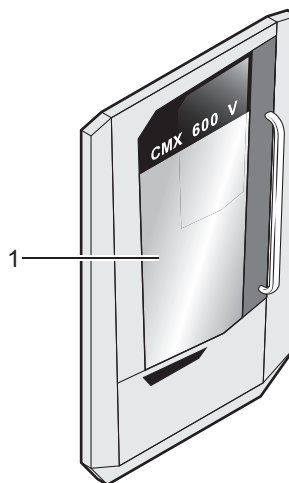
Required tools/materials

- A soft, clean cloth.
- Commercially available neutral agent or glass cleaning agent which does not include abrasives or strongly alkaline additives.

Sequence of operations

- 1) Clean all inspection windows of the machine (including those that are not shown) from the inside and from the outside.

8.3 Check Machining Chamber Observation Window for Damages



1	Machining chamber observation window
---	--------------------------------------

NOTE

The window is considered to be damaged:

- if the internal and outside pane or its edge sealing is torn, damaged or if the surface is heavily scratched.
- if an impact load caused a plastic deformation.



WARNING

The machining chamber observation window of the machining compartment door is made of polycarbonate.

If the machining chamber observation window has been damaged, there is risk of rupture with high energy by breaking off tool tips, insufficiently secured workpieces.

- In case of damages or in case of a plastic deformation of the machining chamber observation window, the machine has to be stopped immediately and the machining chamber observation window has to be exchanged by the DMG MORI service personnel immediately.
- It is prohibited to operate the machine with a damaged machining chamber observation window.
- The replacement of the machining chamber observation window must be documented including the date.

Prerequisites

- The main switch has been turned OFF and has been secured with a padlock.

Required tools/materials

- Spare part: Machining chamber observation window

Sequence of operations

- 1) Check the machining chamber observation window (1) for damages and plastic deformation on the inside and on the outside by visual check.
 - a) Machining chamber observation window is not damaged: End of maintenance work.
 - b) Machining chamber observation window is damaged: Shutdown machine immediately and have the machining chamber observation window exchanged by the DMG MORI service personnel.

8.4 Determine Retention Capability of Machining Chamber Observation Window

Even if the machining chamber observation window does not show any external damages, they are subject to wear by:

- coolant lubricants
- cleaning agents
- greases
- oils
- other aggressive media

As these cause an aging process including brittleness, machining chamber observation window is to be rated as wearing parts. Depending on the following conditions, machining chamber observation window must be replaced by the DMG MORI service personnel.

- the used tool diameters
- the used speeds
- the age of the window

Determine the retention capability according to the diagram:

The diagram indicates the maximum admissible tool diameter and the maximum admissible speed depending on the age of an undamaged machining chamber observation window.

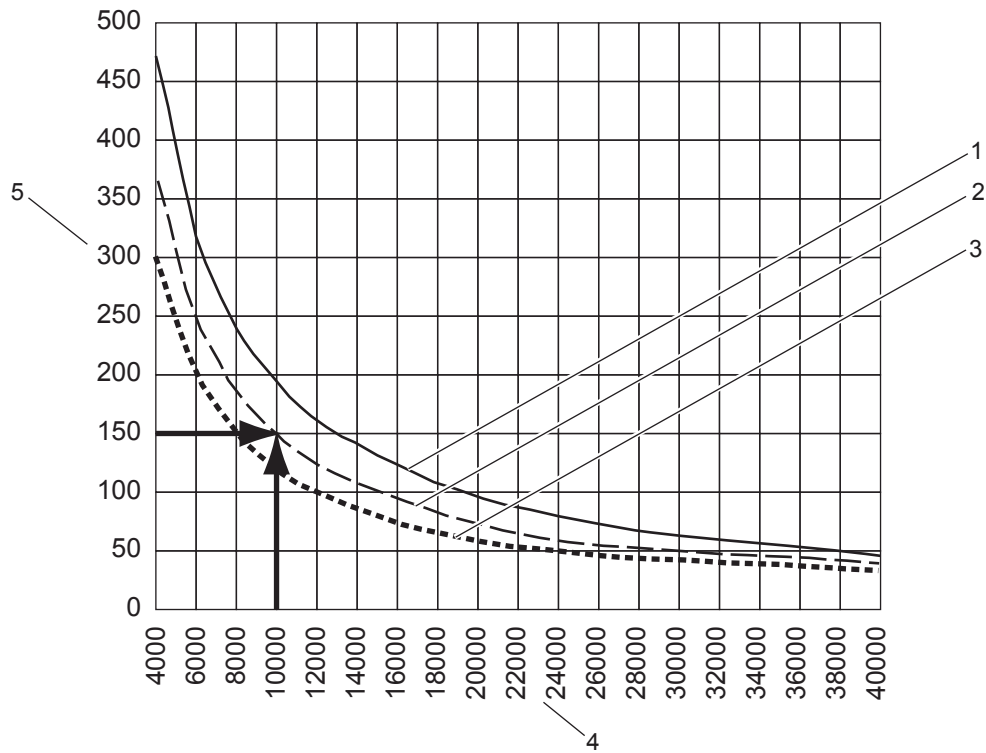
The potential hazard is defined in accordance with DIN EN 12417 for parts flying out with a mass of 100 g.



NOTE

1. The diagram applies to the action of coolant lubricant or other aggressive media. Without the effects of coolant lubricants or other aggressive media, the indicated years may be increased by 2 years, each.
2. For the permissible tool speed, the tool manufacturer's figures are relevant, not the theoretical limits in the diagram.

<Admissible tools and speeds for 12 mm polycarbonate pane>

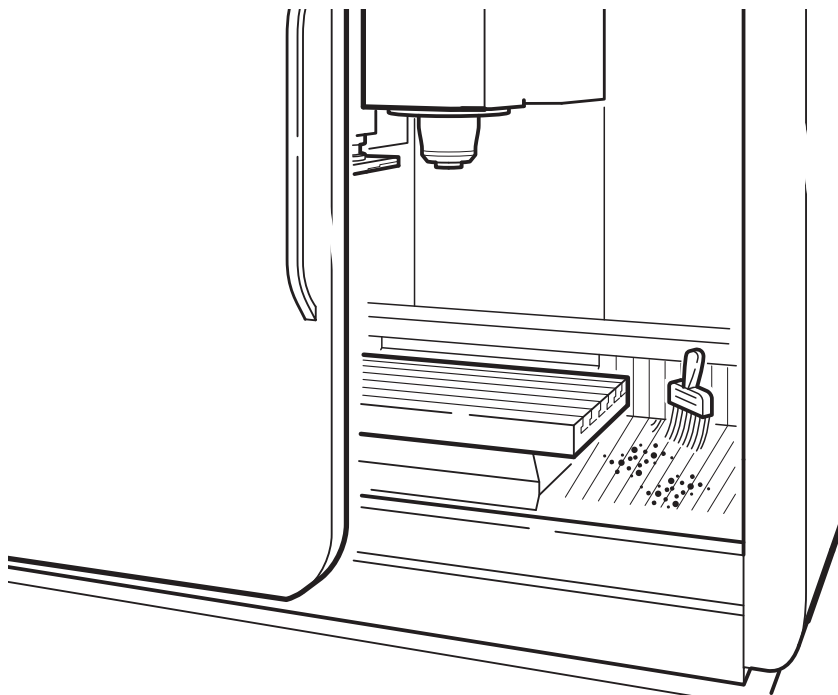


1	Age 4 years
2	Age 6 years
3	Age 8 years
4	Maximum spindle speed [min^{-1}]
5	Maximum tool diameter [mm]

Example: The speed allowed theoretically for a tool with a diameter of 150 mm with a 6 year-old machining chamber observation window is 10000 min^{-1} .

9 CLEANING MACHINING CHAMBER

Sweep chips accumulating on the slideway telescopic covers into the chip bucket using a broom.



DANGER

Turn OFF the main power and disconnect the plant side power supply (breaker).

CAUTION

1. Do not use compressed air.
[Machine failure due to chips and coolant entry]
2. To maintain machining accuracy, clean the machining chamber after completion of machining operations.
3. Do not get on top of the telescopic covers when cleaning the machining chamber.
[Machine damage, Injury]

10 INSPECTING AND REPLACING PROTECTOR WIPERS

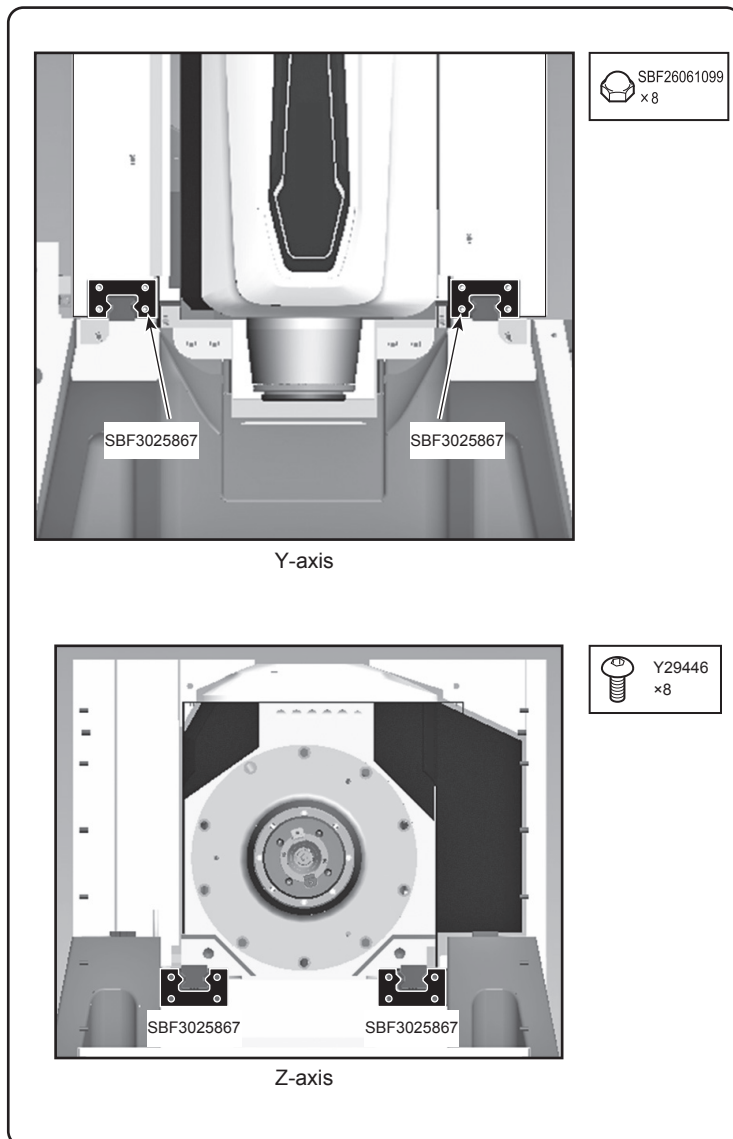
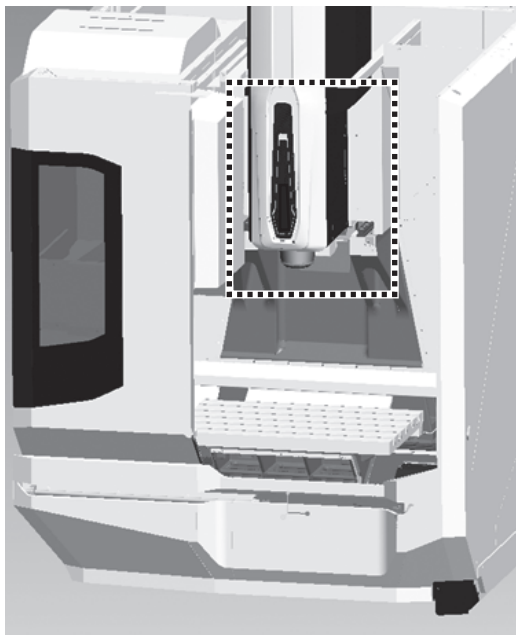
If the protector wipers are damaged, coolant and chips may enter and adhere to the linear guides and ball screws. As the protector wipers are consumables, inspect and replace them at regular intervals. Please note that the protector wipers are not covered by the warranty.

DANGER

Turn OFF the main power.

<Procedure>

1) Turn OFF the main power.



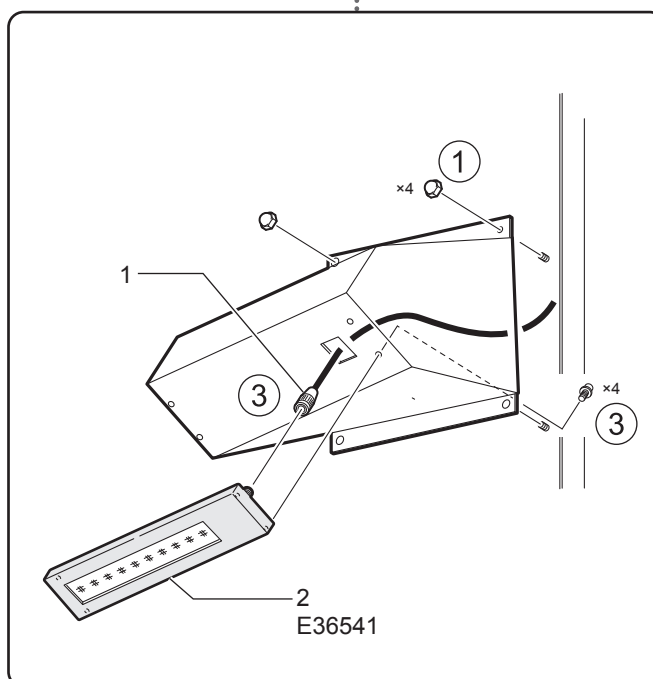
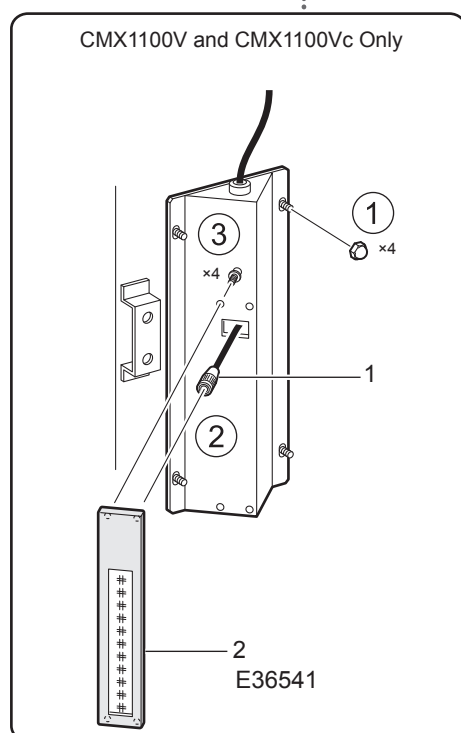
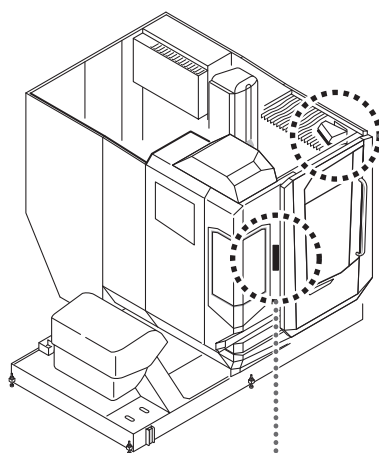
- 2) Loosen the screws of the protector wipers.
- 3) Replace with the new protector wipers.
- 4) Tighten the screws of the protector wipers again.

11 REPLACING MACHINE LIGHT

DANGER

Turn OFF the main power.

<Procedures>



1	Connector
2	LED Unit (Part No.: E36541)

- 1) Open the operation panel side door.
- 2) Turn OFF the main power.
- 3) Wipe the coolant and chips off the external surfaces of the LED unit.
- 4) Remove the four screws securing the LED mounting plate to the machine, and remove the LED unit together with the mounting plate (①).
- 5) Remove the LED unit connector (②).
- 6) Remove the four bolts securing the LED unit on the mounting plate and remove the LED unit (③).
- 7) Attach a replacement LED unit to the mounting plate.
- 8) Reconnect the connector to the LED unit.

- 9) Mount the LED mounting plate to the machine.
- 10) Turn ON the main power.
- 11) Press the  **[MACHINE LIGHT]** button to turn ON the LED lamp.
- 12) Make sure that the LED lamp lights.

 NOTE

If the light is not illuminated or turns ON slowly, turn OFF the main power and confirm the lamp is inserted correctly.

12 MACHINE COOLING FAN

The machine is equipped with internal cooling fan to ensure proper machining accuracy.

To maintain the machining accuracy for longer period, inspect the cooling fan to ensure that it operates normally and clean it periodically.

The cooling fan is a consumable. The cooling fan must be replaced if it stops rotating or starts producing abnormal noise.

NOTE

Machine Cooling Fan Parts No.: E55048

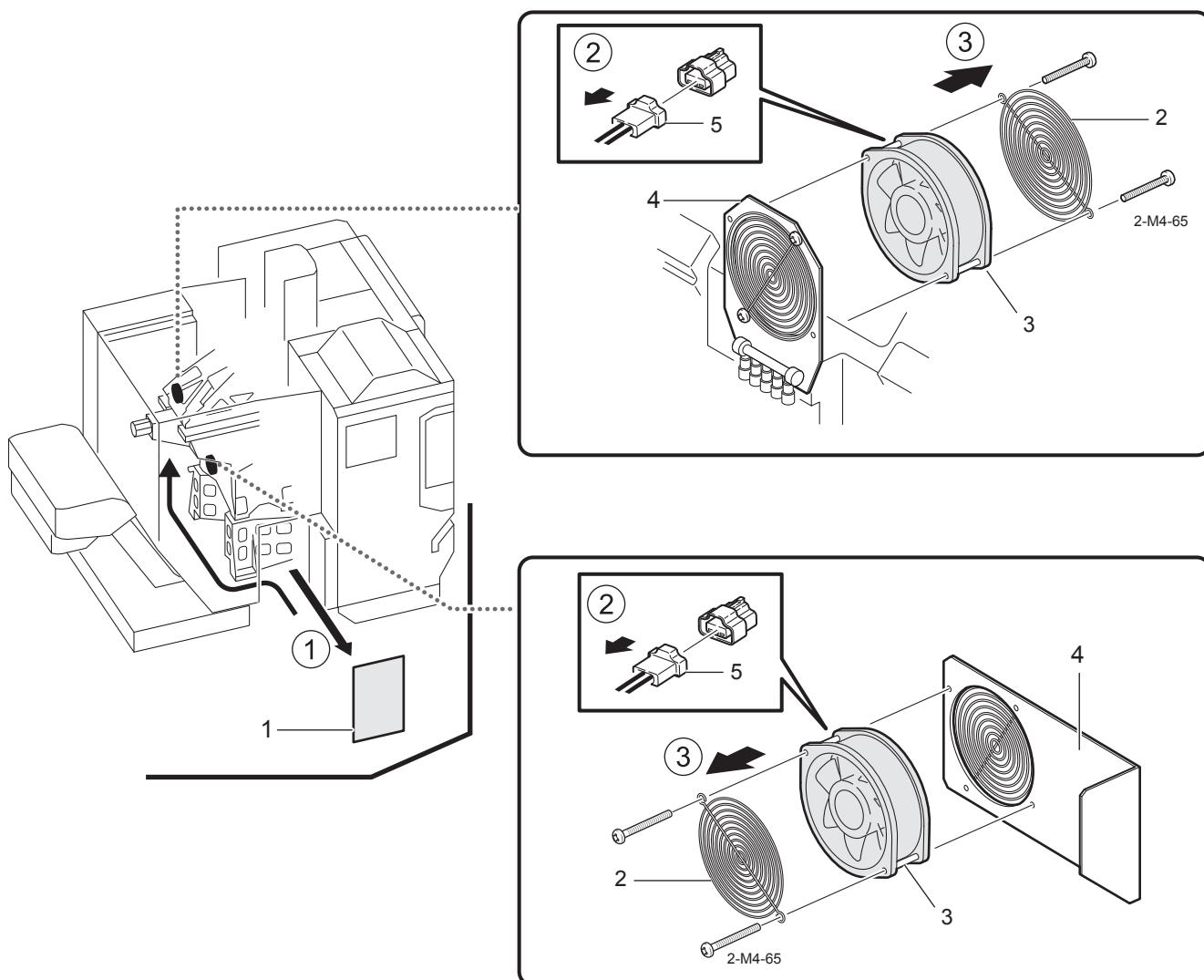
12.1 Cleaning/Replacing Machine Cooling Fan

WARNING

Always make sure to turn OFF the main power of the machine before replacing or cleaning the cooling fan.

CAUTION

1. Clean the cooling fan periodically because dust or oil that adheres to the fan may cause a fire.
2. Do not touch the cooling fan in operation.
[Injury]
3. Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]



2	Fan guard
3	Cooling fan
4	Bed
5	Connector

<Procedure>

- 1) Turn OFF the main power.
- 2) Disconnect the plant side power supply (breaker).
- 3) Open the maintenance door on the left side of the machine (①).
- 4) Remove the connector (②).
- 5) Remove the fan guard and the cooling fan (③).
- 6) Clean or replace the cooling fan using the following procedure:

<Cleaning Procedure>

- a) Clean the space between the blades and the frame using a cloth.
- b) Lightly clean the dust that adheres to the blade body using a cloth or a brush or by blowing compressed air.

**CAUTION**

Do not exert excessive forces on the blade body.

- c) Turn the blades by hand to check that the blades rotate smoothly.
 - d) Remount the cooling fan and the fan guard.
- <Replacing Procedure>**
- a) Mount the new cooling fan and the fan guard.
- 7) Close the maintenance door.
 - 8) Operate the cooling fan to confirm that the fan works without abnormal noise.

13 CLEANING MACHINE SURFACE

Remove smudges from the machine surface using a detergent-soaked cloth.

DANGER

Turn OFF the main power and disconnect the plant side power supply (breaker).

CAUTION

1. Do not use compressed air.
[Machine damage due to chips and coolant entry]
2. Use a neutral detergent that satisfies the following conditions;
 - The detergent must be free of abrasive agents, alkaline material, or organic solvents.
 - The detergent must be free of constituents with adverse effects on human beings such as offensive smells or those that cause skin irritation.
 - The detergent must not cause hardening, dissolution or swelling of the polycarbonate.

NOTE

Before using the detergent, test it on an inconspicuous part of the machine to confirm that it does not cause deformation or discoloration.

14 CLEANING OPERATION PANEL

Remove any smudges from the operation panel with a detergent-soaked cloth.



WARNING

Turn OFF the main power and disconnect the plant side power supply (breaker).



CAUTION

Use limonene-based liquid detergent that satisfies the following conditions;

- The detergent must be free of constituents with adverse affects on human beings such as offensive smells or those that cause skin irritation.
- The detergent must not cause hardening, dissolving, or swelling of the operation panel's synthetic resin, etc.

15 SPINDLE

15.1 Spindle Warm-up

Perform the spindle warm-up periodically to ensure optimum bearing service life.



CAUTION

1. Do not rotate the spindle without a tool clamped in the spindle.
[Machine damage]
2. Perform the spindle warm-up below the maximum permissible rotation speed of the tool and fixture.
[Tool ejection/Serious injury/Machine damage]
3. Ensure that the tool and fixture mounted securely before performing the spindle warm-up.
[Machine damage/Serious injury]

15.1.1 Daily Spindle Warm-up

After turning on the power, perform the spindle warm-up referring to the table below before operating the machine:

NOTE

Adjust the rotation speed for warm-up based on the maximum rotation speed for the machining programs used for the day. The percentage in the table below indicates the ratio to the maximum rotation speed of the machining programs of that day.

Step	Warm-up Speed	Time
1	5 %	10 minutes
2	25 %	10 minutes
3	50 %	5 minutes
4	75 %	5 minutes
5	100 %	5 minutes

<Program example>

The warm-up program shown below is for cases where the maximum rotation speed for the machining programs of the day is 8000 min^{-1} .

```
O0001;
T1*1
S400 M03;
G04 X600.0;
S2000;
G04 X600.0;
S4000;
G04 X300.0;
S6000;
G04 X300.0;
S8000;
G04 X300.0;
S0 M05;
M30;
```

NOTE

*1 T1 is a small diameter tool that can be rotated at more than the maximum spindle speed for each machine specifications.

15.1.2 Spindle Warm-up after Extended Idle Period

Perform the spindle warm-up before restarting the machine after an idle period of two weeks or more, referring to the table below:

NOTE

Adjust the rotation speed for warm-up based on the regularly used maximum rotation speed. The percentage in the table below indicates the ratio to the regularly used maximum rotation speed.

Step	Warm-up Speed	Time
1	5 %	60 minutes

Step	Warm-up Speed	Time
2	25 %	15 minutes
3	50 %	10 minutes
4	75 %	10 minutes
5	100 %	60 minutes

<Program example>

The warm-up program shown below is for cases where the regularly used maximum rotation speed is 10000 min⁻¹.

```

O0001;
T1*1
S500 M03;
G04 X3600.0;
S2500;
G04 X900.0;
S5000;
G04 X600.0;
S7500;
G04 X600.0;
S10000;
G04 X3600.0;
S0 M05;
M30;

```

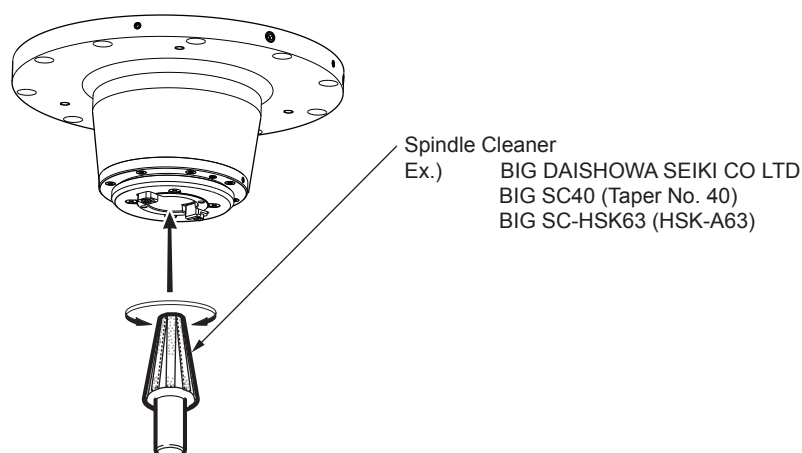
NOTE

*1 T1 is a small diameter tool that can be rotated at more than the maximum spindle speed for each machine specifications.

15.2 Cleaning Spindle Tapered Section and End Face

CAUTION

1. Do not insert fingers deep into the hole of the spindle tapered section as there is a collet deep in the hole.
[Injury]
2. Never use compressed air such as an air gun. Using compressed air will cause chips and coolant to enter into the spindle, which may result in spindle seizure.
[Machine malfunction]
3. To maintain spindle accuracy, clean the spindle tapered section and end face daily to remove dust and chips.

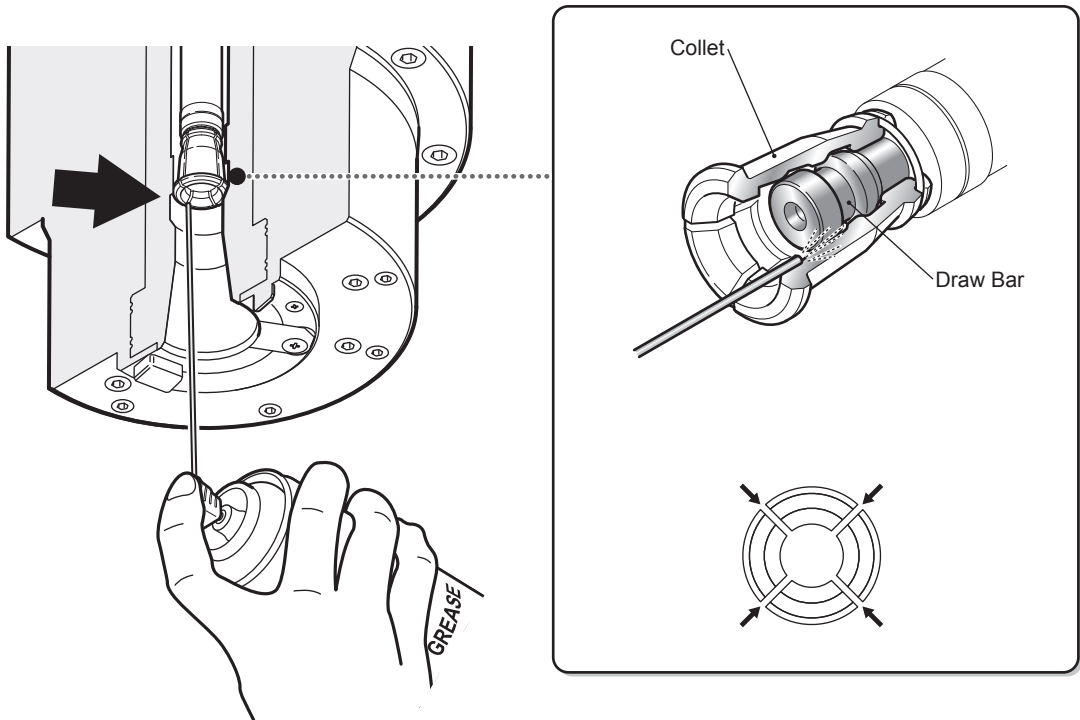


<Procedure>

- 1) Confirm spindle rotation has stopped completely.
- 2) Remove the tool from the spindle.
- 3) Press the **[Emergency Stop]** button.
- 4) Remove dust and chips from the spindle end face using a clean cloth.
- 5) Clean the spindle tapered section using a spindle cleaner.

15.3 Greasing Tool Clamp Unit

15.3.1 BT/BT Two-Face Contact Specification



 CAUTION

- 1. Grease the tool clamp unit once or twice a month to maintain the unit performance. However, replenish grease when the message demanding grease replenishment is displayed in either of the following cases:
 - Every 90 hours of operation
 - 100000 rotations of the ATC
- 2. Be sure to use a spray grease with nozzle when greasing tool clamp unit.
- 3. Do not insert fingers deep into the hole of the spindle tapered section as there is a collet deep in the hole.
[Injury]
- 4. Wear eye protectors.
[Eye damage due to grease splash]

<Procedure>

- 1) Confirm spindle rotation has stopped completely.
- 2) Unclamp the spindle and remove the tool from the spindle.
 Machine operation
- 3) Leaving the spindle unclamped, press the [Emergency Stop] button.
- 4) Spray grease towards the four gaps between collet segments near the end face of the draw bar. Apply one shot (for 0.5 to 1.0 sec) at each location.

 NOTE

The nozzle does not need to be inserted to the rear of the collet.

◆ Recommended Grease

Grease	Part No.
Shell ◆Shell Stamina Grease RL2	W20043

◆ Recommended Grease

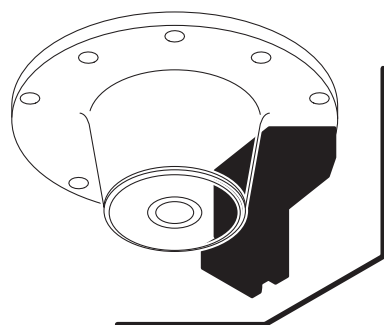
Grease	Part No.
METAFLUX METAFLUX 70-81	W20042

5) Release the Emergency Stop status.

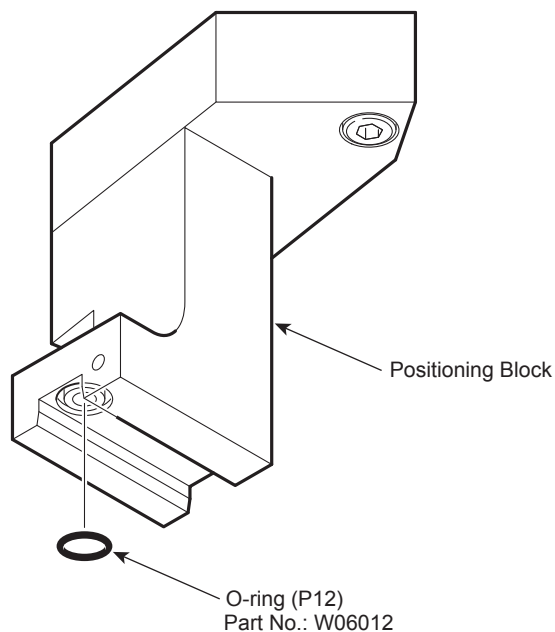
6) Repeat clamp/unclamp operations several times with no tool in the spindle to apply grease evenly.

15.4 Replacing O-ring of Positioning Block for Angle Head and Oil Hole Drill (Option)

Damage or wearing of the O-ring may cause coolant leakage.
Replace the O-ring if it is damaged or worn.



Spindle End Face



NOTE

The shape and the direction of installation of the positioning block differ for each machine specification.

<Procedure>

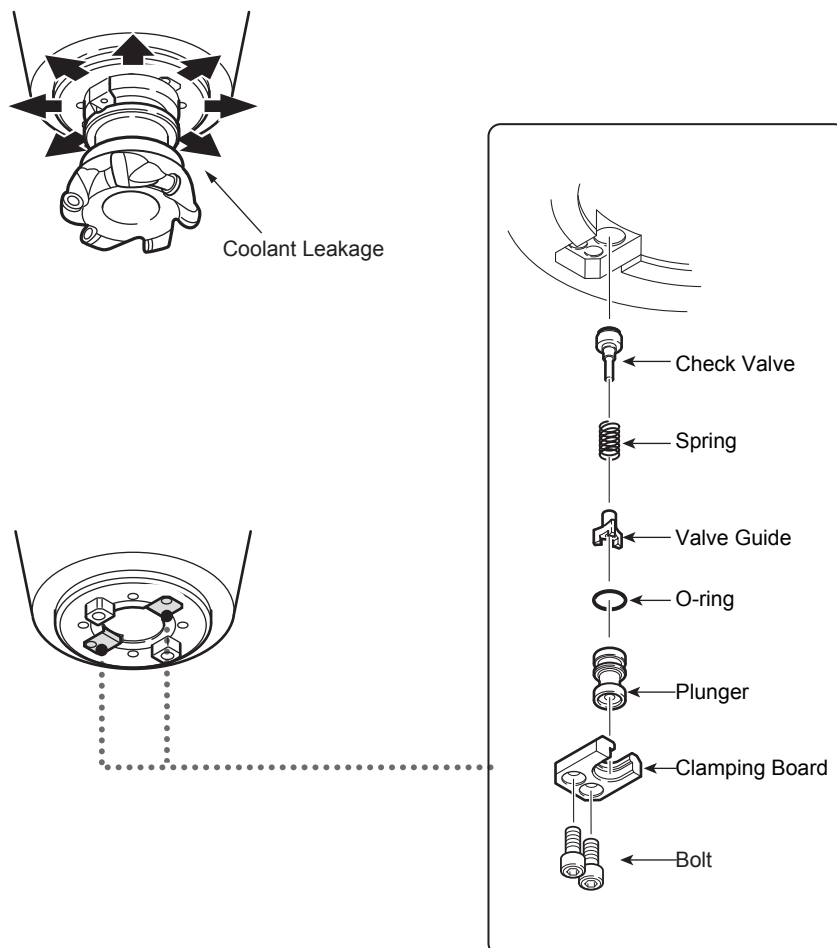
- 1) Remove the O-ring from the groove of the positioning block using a tool with a sharp, pointed end (e.g., a small flat head screwdriver).
- 2) Insert a new O-ring into the groove.

NOTE

Take care not to damage the new O-ring.

15.5 Replacing Plungers on Spindle End Face (Through Spindle Coolant Specification)

When chips become trapped between the side through coolant plungers on the spindle end face (2 points), coolant leaks from the gap between the spindle and the tool holder. When the tool holder is removed from the spindle to perform a tool exchange, replace the plungers using the following procedure:



Name	Part No.
Check valve	R30428
Spring	Y73591
Valve guide	P46221
O-ring	W06005
Plunger	R31373
Clamping board	B5100733
Screw	SBF26050157



DANGER

Turn OFF the main power.

<Procedure>

- 1) Turn OFF the main power.
- 2) Remove the screw to remove the clamping board and plungers from the spindle end face.



NOTE

Take care to ensure that the other parts do not fall during this procedure.

- 3) Install replacement plungers by performing the above procedure in reverse.

 NOTE

To prevent chip-damage to the plungers, check the coolant unit filter regularly to ensure clogging is not occurring. Clean or replace the filter as necessary.

16 COOLANT UNIT

16.1 Precautions when Selecting Coolant



WARNING

Disregarding the following warnings will result in serious injuries and machine damage by fire. DMG MORI is not responsible for accidents and fires arising from disregard for the warnings.

1. Do not use a flammable coolant such as an oil-based coolant that may catch fire. If there is no choice but to use a flammable coolant, it is the user's responsibility to deal with fires and accidents caused by the coolant.
2. If using a flammable coolant, do not carry out unmanned operation.
3. If using a flammable coolant, install appropriate automatic fire extinguishing equipment.
4. If using a flammable coolant, the coolant chiller must be installed. Contact DMG MORI.
5. If a flammable oil-based coolant is used, its viscosity will increase in cold temperatures, which may result in tripping of the coolant pump motor breaker. Although this problem will be cleared by using a coolant with a lower viscosity, such coolant may have a low flash point, raising the risk of fire.
6. Obtain the MSDS (MATERIAL SAFETY DATA SHEET) from the coolant manufacturer directly by yourself as the customer and use coolant without any chemical effects on the machine. Please be sure to pay careful attention to the effects on the human body and the storage method described in the MSDS.



CAUTION

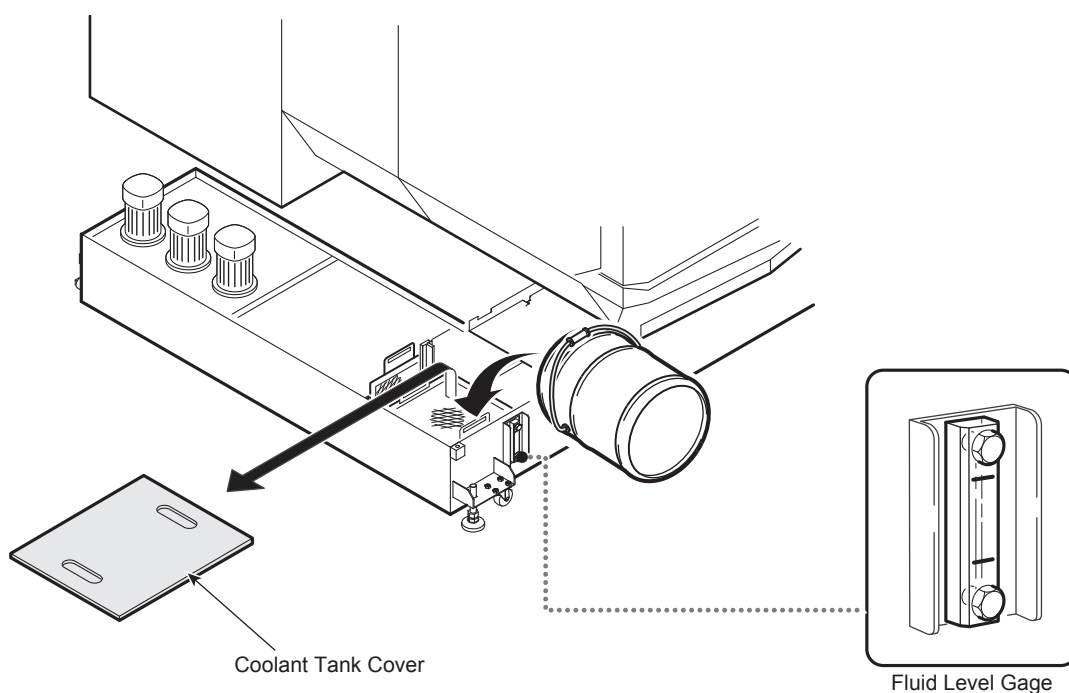
1. Use coolant that satisfies the following conditions:
 - Coolant must be free of constituents with adverse effects on human beings such as offensive smells or those that cause skin irritation.
 - Coolant must not deteriorate during storage.
 - Coolant must not include constituents that adversely affect machining accuracy.
 - Coolant must be free of constituents forming a dry film which deteriorates electric conductivity.
 - Coolant must not corrode the machine.
 - Coolant must not peel off machine coating.
 - Coolant must not cause hardening or swelling of chemical parts (rubber parts, synthetic resin parts, etc.).
 - Coolant must not have electric conductivity equivalent to metal.
 - Coolant must not be of high viscosity.
2. When using water-soluble coolant, observe the following points:
 - Add diluted coolant mixture to coolant tank after mixing in a separate container.
 - Use coolant at the concentration specified by the coolant manufacturer. If coolant of improper concentration is used, workability is degraded and rusting of the machine and workpiece occurs, causing damage to the machine and adversely affecting machining accuracy.
 - Contact the coolant manufacturer for the recommended hardness levels of water used to dilute the coolant. Diluting the coolant using water that is too hard makes the coolant separate, and diluting it using water whose hardness is too low makes the coolant froth easily.
 - Do not mix water and concentrated coolant in the coolant tank.

16.2 Checking Coolant Level

<Procedure>

- 1) Turn OFF the main power.
- 2) Wait until the coolant level is stabilized after the coolant inside machine is returned to the coolant tank.
- 3) Check the coolant level at the fluid level gage.
- 4) If the coolant level is low, add coolant.

16.3 Replenishing Coolant



Machine Model	Tank Capacity (L)			
	Without Chip Conveyor Specification	Left Disposal Type Chip Conveyor Specification	Rear Disposal Type Chip Conveyor Specification	Rear Disposal Manual-scraping Type
CMX600V CMX600Vc	185	275	360	270
CMX800V CMX800Vc	235	300	360	270
CMX1100V CMX1100Vc	275	330	360	270

<Procedure>

- 1) Turn OFF the main power.
- 2) Remove the coolant tank cover.
- 3) Wait until the coolant level is stabilized after the coolant inside machine is returned to the coolant tank.
- 4) Supply coolant up to the upper limit on the fluid level gage.
- 5) Remount the coolant tank cover.



CAUTION

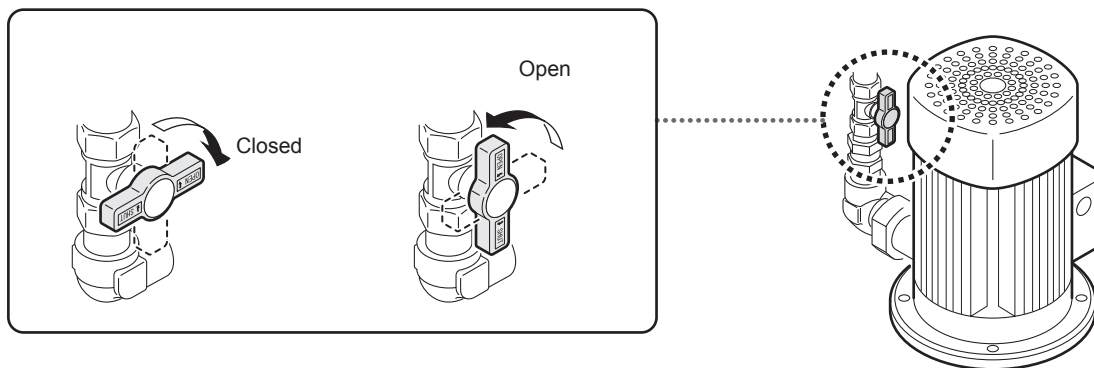
1. When supplying coolant, ensure the coolant filters are installed.
2. Do not supply coolant during machine operation.
3. Do not fill above the upper limit on the fluid level gage.
4. Some types of coolant may froth and leak from the coolant tank under certain conditions. In this case, adjust the discharge rate of the coolant. When the discharge rate cannot be adjusted, use the antifoamer.

16.4 Adjusting Coolant Discharge Rate

Turn the discharge rate adjusting valve by hand to adjust the coolant discharge rate.

NOTE

When the valve is in the horizontal position (fully closed), coolant is not discharged. The coolant discharged rate is increased as the valve is turned toward the vertical position (fully open).



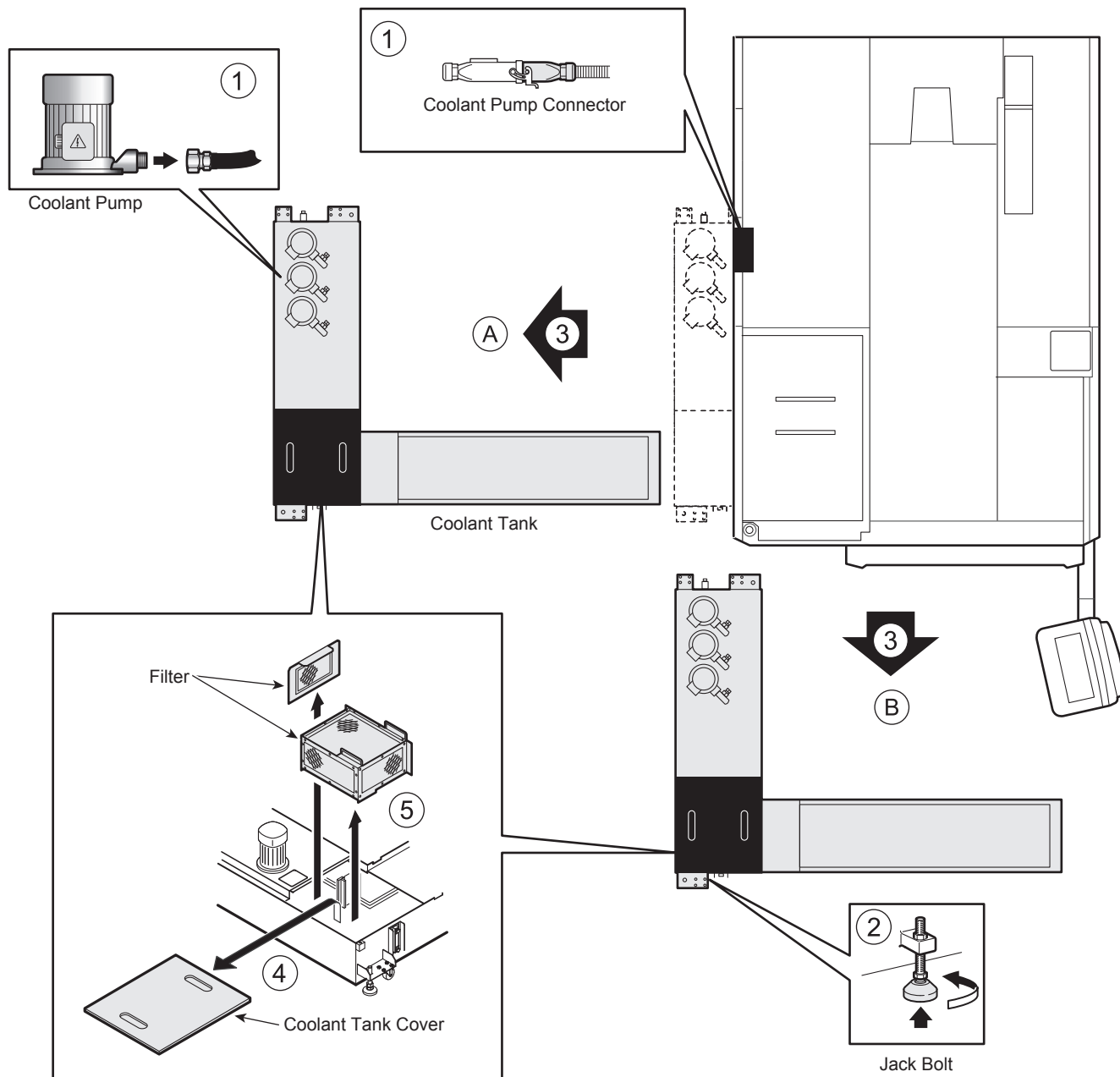
16.5 Cleaning Coolant Tank and Filter

! DANGER

Turn OFF the main power.

- 1) Turn OFF the main power.

- 2) Wait until the coolant level is stabilized after the coolant inside machine is returned to the coolant tank.



- 3) Remove the hose and cables (①).
- 4) Loosen the jack bolt (②).
- 5) Pull out the coolant tank in direction A or B (③).
- 6) Remove the coolant tank cover (④).
- 7) Remove the coolant filter (⑤).
- 8) Remove the coolant pumps.
- 9) Drain the coolant using a special suction device.
- 10) Clean the coolant tank with a spade or shovel.
- 11) Clean the coolant filter by blowing compressed air.

⚠ CAUTION

1. Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]
2. Take care to prevent excessive spray of coolant and chips.

- 12) Reinstall the coolant filter and the pump.
- 13) Reinstall the coolant tank.



Installation

14) Refill coolant.**15)** Reinstall the coolant tank cover.**16)** Push the coolant button  **[ON] (On)** on the operation panel to confirm coolant is supplied.

16.6 Cleaning Filter Element (Option)

The line filter/the suction filter is a unit for removing chips in coolant to be supplied to the spindle unit. In order to prevent the spindle unit being damaged, clean the filter element when either of the following occurs.

- When the visual indicator of the pressure switch turns red to the top (Only for the line filter)
- When a PLC alarm “EX0509: ‘THRU SP. COOLANT FILTER CLOGGED’” is displayed on the screen on the NC operation panel

CAUTION

1. Clean the filter element within an hour when “EX0509: ‘THRU SP. COOLANT FILTER CLOGGED’” is displayed, otherwise “EX0566: ‘THRU SP.CLNT.UNIT ALARM’” is triggered and machine operation is completely stopped.
2. Although you can change the coolant flow to use the line filter/suction filter on the other side during the cleaning operation, ensure that the coolant flow changing handle are placed correctly and that the coolant flow has definitely changed, otherwise the following injuries and machine damage could result.
 - Spewing coolant on removing the cover leads to injuries such as eye damage.
 - Coolant not being discharged from the spindle or pressure failure damages workpieces.
 - Continuous pump operation without the normal coolant discharge rate damages the pump.
3. Stop the coolant unit mounted on the coolant tank before cleaning the filter element.
4. Never put the filter element close to fire during the cleaning procedure.
5. Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]

16.6.1 Line Filter Element for 1.5 MPa Specification



NOTE

The 1.5 MPa coolant unit mounted on the coolant tank is equipped with the line filters.



Installation

CAUTION

If the coolant flow is changed during operation of the coolant unit mounted on the coolant tank, the pressure remains in the filter. Stop the coolant unit before changing the coolant flow.

<Procedure for Changing Coolant Flow Direction>

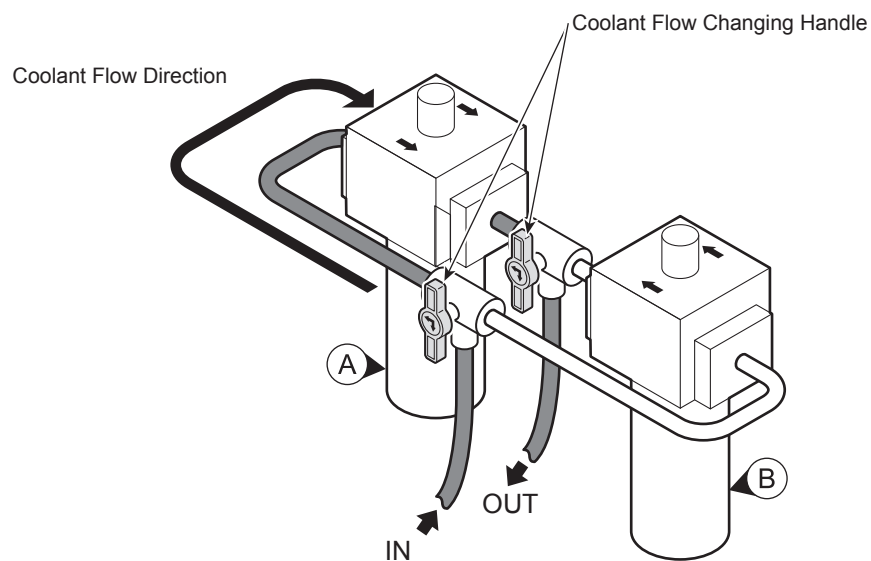
- 1) Stop the coolant unit mounted on the coolant tank by pressing the through spindle coolant button on the operation panel.
- 2) Turn the coolant flow changing handles of the line filters manually by referring to the figure below.



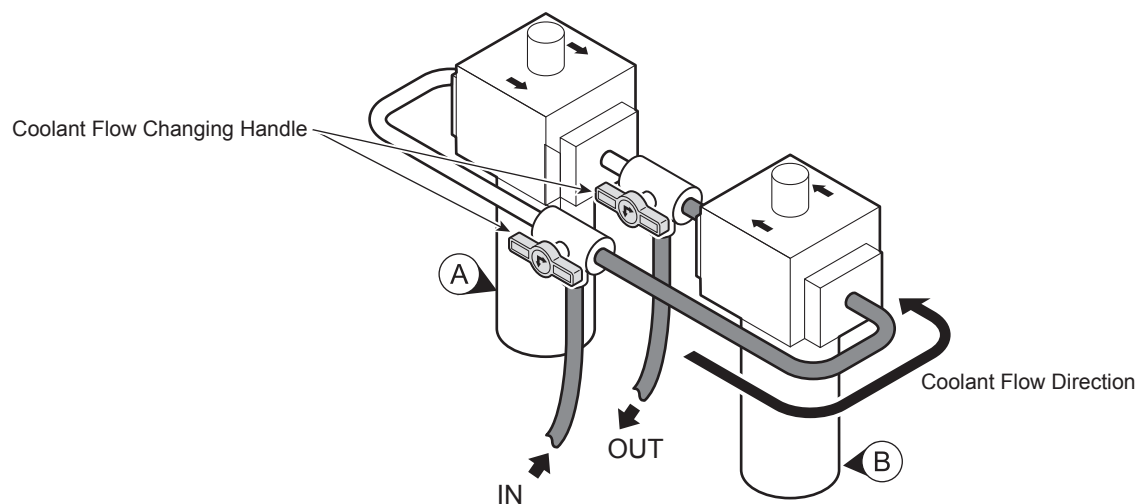
NOTE

Adjust the direction of the arrow  on the handles to the direction of the coolant flow.

<Changing the coolant flow direction to the line filter A>

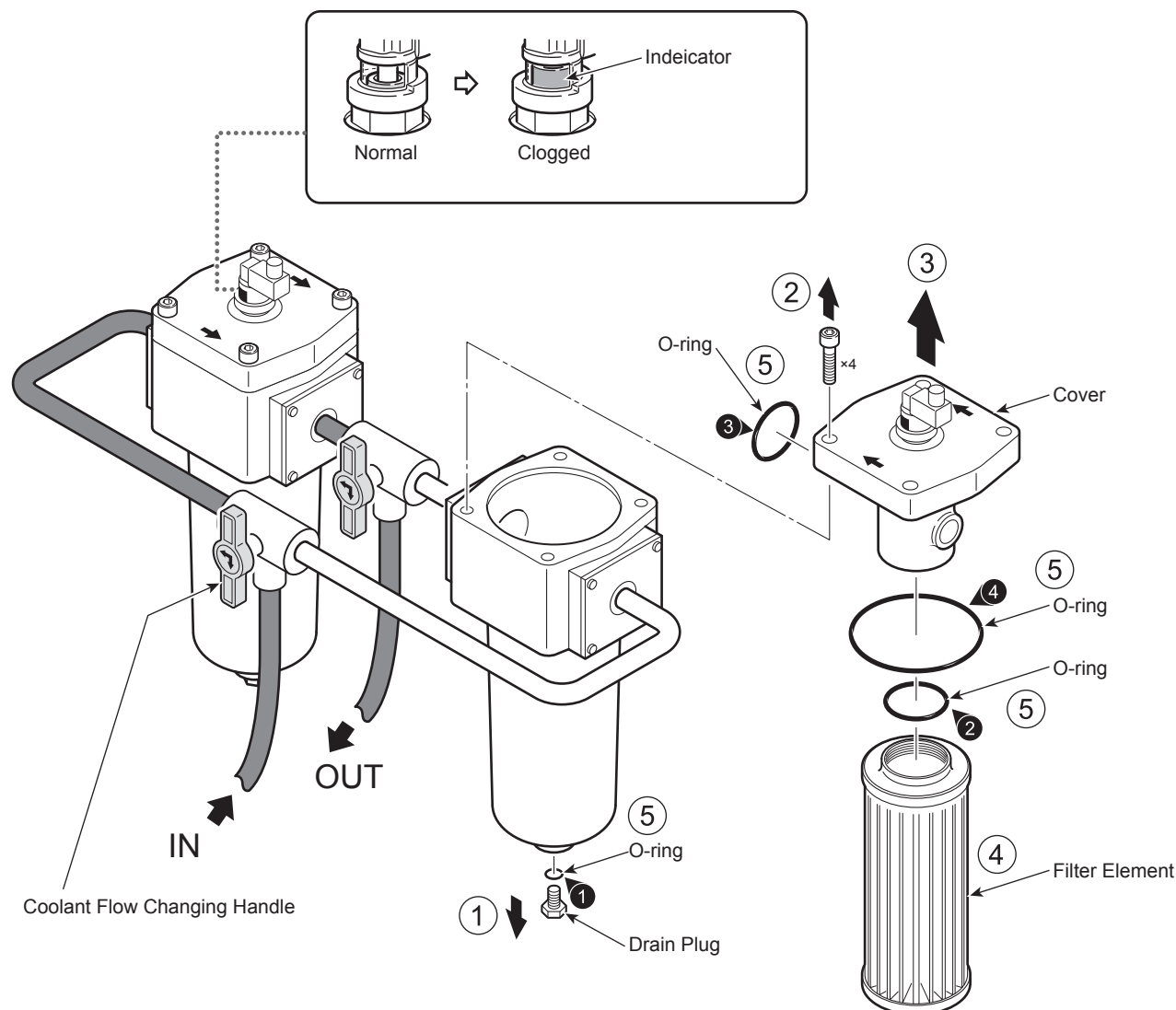


<Changing the coolant flow direction to the line filter B>



<Procedure for Cleaning Filter Element>

 "<Procedure for Changing Coolant Flow Direction>" (page 8-50)



- 1) Stop the coolant unit mounted on the coolant tank by pressing the through spindle coolant button on the operation panel.
- 2) Change the coolant flow direction.
[Residual pressure is released.]
- 3) Change the coolant flow direction to the line filter which is not cleaned.
- 4) Remove the drain plug from the line filter that needs cleaning, and drain coolant completely from the unit. (①)
- 5) Remove the hexagon socket head cap screws securing the cover. (②)
- 6) While rotating the cover to left and right, pull out the cover and the filter element together. (③)
- 7) Pull the filter element, and remove it from the cover part. (④)
- 8) Clean the filter element using the following procedure:
 - a) Shake the filter element in four directions in a light oil such as kerosene or light diesel oil.

CAUTION

Use caution when using a light oil, and make sure there is no open flame in the vicinity.

- b) Brush the filter element to remove sludge.
- c) Remove residual accumulations by blowing compressed air.

NOTE

Blow the compressed air from the inside of the filter element to the outside.

- d) Rinse the filter element well in clean light oil.
 - e) Dry the filter element by blowing compressed air.
- 9) Replace the four O-rings with new ones. (⑤)

NOTE

1. Replace the filter element with a new one in case of a strong contamination.
2. Install the new O-rings carefully in the mating groove since they can slip off relatively easily.
3. Contact the DMG MORI Service Department and quote the part No. indicated in the tables when ordering the filter element and the O-rings.

Name	Part No.
Filter Element	W12063

O-ring	Size	Part No.
①	P-14	W06014
②	G-45	W07045
③	G-55	W07055
④	G-100	W07100

10) Remount the drain plug.

11) Remount the filter element and the cover.

NOTE

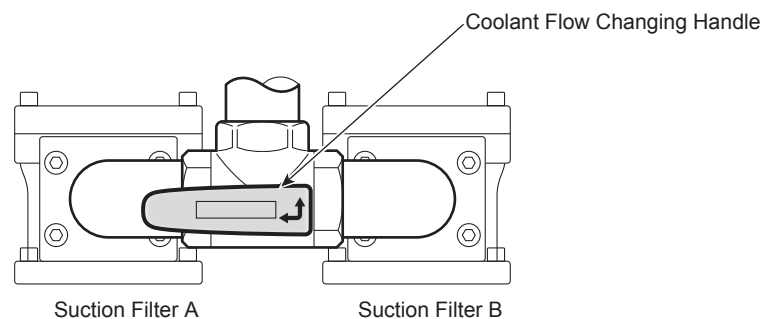
After remounting the cover, ensure that it is mounted in the correct direction by checking the arrows of the cover.

16.6.2 Suction Filter Element for 7.0 MPa Specification

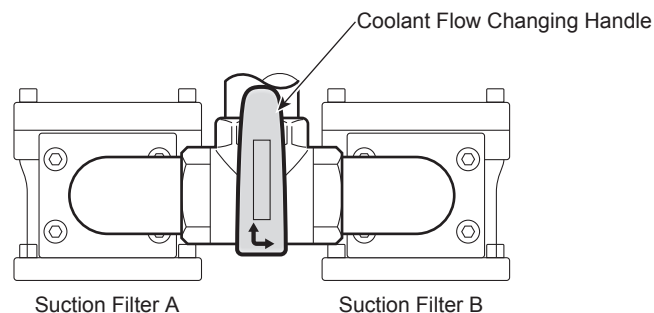
<Procedure for Changing Coolant Flow Direction>

- 1) Stop the coolant unit mounted on the coolant tank by pressing the through spindle coolant button on the operation panel.
- 2) Turn the coolant flow changing handle manually by referring to the figure below so that the direction of the arrow “↶” on the handle matches the direction of the coolant flow.

<Changing the coolant flow direction to the suction filter A>



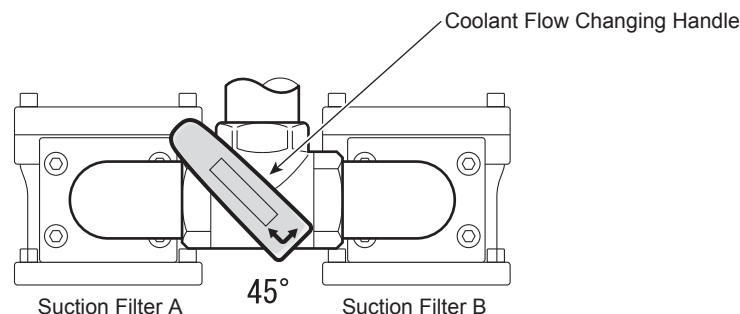
<Changing the coolant flow direction to the suction filter B>



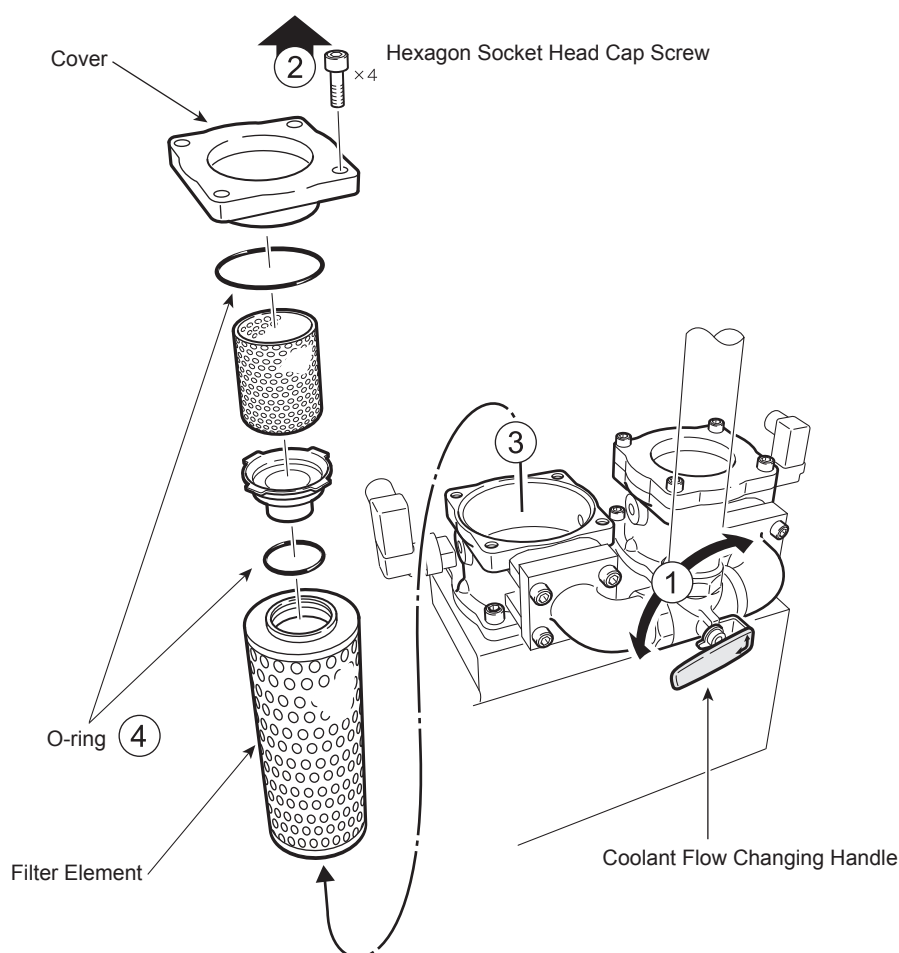
<Procedure for Cleaning Filter Element>

NOTE

1. If the alarm EX0509 is displayed, change the coolant flow direction and press the  **[RESET]** button to release the alarm. If the alarm is not released, set the coolant flow changing handle at the angle of 45° by referring to the figure below after stopping the coolant unit mounted on the coolant tank, and wait until the negative pressure in the suction filter is eliminated. Then press the  **[RESET]** button to release the alarm.



2. If the alarm is not released even after the above procedure is performed, both filter elements are clogged. Clean both filter elements immediately by following the procedure below. After cleaning the filter elements, press the  **[RESET]** button to release the alarm.



- 1) Stop the coolant unit mounted on the coolant tank by pressing the through spindle coolant button on the operation panel.
- 2) Change the coolant flow direction from the suction filter to be cleaned to the other suction filter. (①)
 "<Procedure for Changing Coolant Flow Direction>" (page 8-53)
- 3) Remove the hexagon socket head cap screws securing the cover, and remove the cover. (②)
- 4) Pull out the filter element. (③)
- 5) Clean the filter element using the following procedure:

NOTE

Replace the filter element with a new one in case of strong contamination.

Part No.: FDYPTSF1012400W

- a) Shake the filter element in four directions in a light oil such as kerosene or light diesel oil.

⚠ CAUTION

Use caution when using a light oil such as kerosene or light diesel oil, and make sure there is no open flame in the vicinity.

- b) Brush the filter element to remove sludge.
- c) Remove residual accumulations by blowing compressed air.

🔊 NOTE

Blow the compressed air to the inside of the filter element from the outside.

- d) Rinse the filter element well in clean light oil.
 - e) Dry the filter element by blowing compressed air.
- 6) Replace the O-rings with new ones. (④)

🔊 NOTE

Install the new O-rings carefully in the mating groove since they can slip off relatively easily.

- 7) Remount the filter element and cover.

🔊 NOTE

After remounting the cover, ensure that it is mounted in the correct direction.

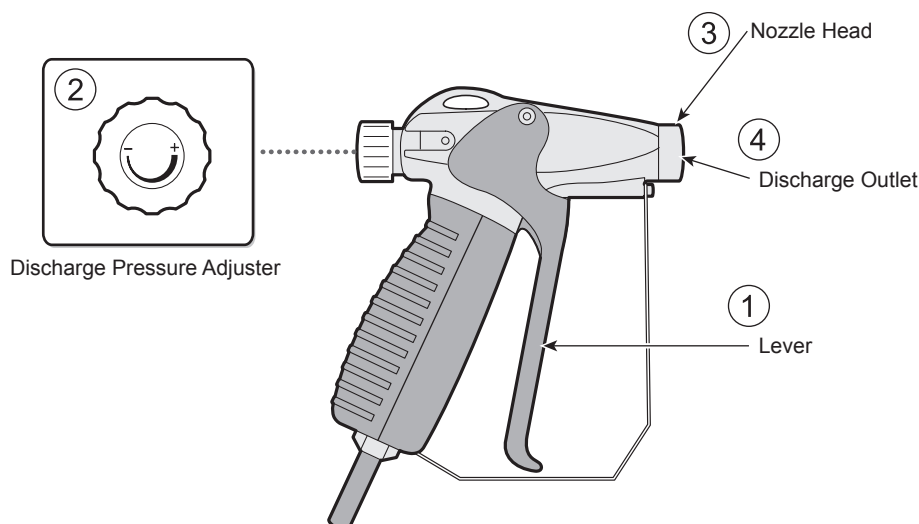
16.7 Coolant Gun (Option)

⚠ CAUTION

When using the coolant gun, wear protective glasses to prevent eye damage from dust or foreign matter (those who wear glasses are included).

🔊 NOTE

The coolant gun is attached by the magnet to the machine cover. Take care not to reattach the coolant gun with chips adhering to the magnet part as the chips may damage the machine cover.



16.7.1 How to Use Coolant Gun

<Procedure>

- 1) Open the door.
- 2) Press **[COOLANT GUN]** to start the coolant gun pump.
- 3) Remove the coolant gun from the machine cover.
- 4) Pull the coolant gun lever ① to discharge the coolant and remove chips accumulated inside the machine.



1. The coolant discharge pressure is increased as the lever is pulled more deeply.
2. By turning the discharge pressure adjuster ②, for changing the movement range of the lever, the maximum discharge pressure can be adjusted.
 - + direction: The movement range of the lever increases and the maximum discharge pressure is increased accordingly.
 - direction: The movement range of the lever decreases and the maximum discharge pressure is decreased accordingly.

- 5) Return the coolant gun to its original position.
- 6) Press **[COOLANT GUN]** to stop the coolant gun pump.

 NOTE

When the door is closed, the coolant gun pump is stopped.

16.7.2 Cleaning Coolant Gun

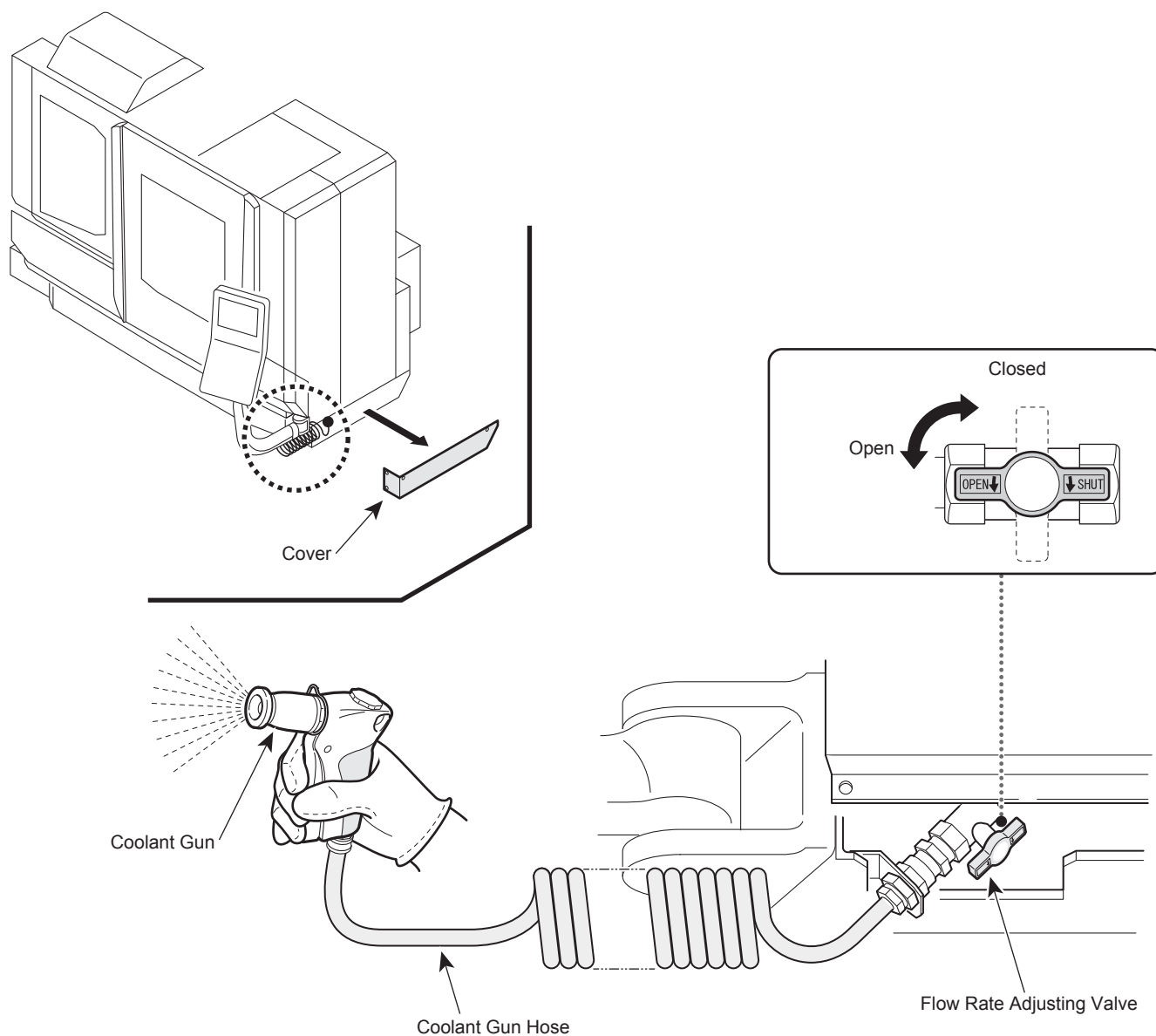


CAUTION

1. **When the coolant gun pump is started with the nozzle head removed, coolant will be discharged even if the lever is not pulled. Start the pump after confirming the coolant discharge outlet is directed to the inside of the machine.**
2. **Do not touch chips with bare hands. If handling chips, wear gloves that have resistance to cutting.**
[Injury]
3. **Wear safety goggles without air vent at all times while blowing compressed air.**
[Eye damage due to ejected foreign matter]
 - 1) Stop the coolant gun pump.
 - 2) Remove the nozzle head ③ by turning counterclockwise.
 - 3) Clean the nozzle head ③ and coolant discharge outlet ④ by blowing compressed air.
 - 4) Discharge coolant by starting the coolant gun pump and remove chips and dust adhering to the inside of the coolant gun.
 - 5) Stop the coolant gun pump to stop coolant supply.
 - 6) Remount the nozzle head ③.

16.7.3 Adjusting Flow Rate of Coolant Gun

Remove the right side cover and turn the flow rate adjusting valve by hand to adjust the coolant flow rate.



17 HYDRAULIC UNIT (20000 min⁻¹ SPECIFICATION)

DANGER

Turn OFF the main power.

CAUTION

1. If the oil level decreases rapidly, the pump unit or the machine may be malfunctioning. Contact the DMG MORI Service Department for assistance.
2. Maintain oil at the correct level to prevent air being suctioned through the pump unit.
3. Keep oil free from contamination.
4. If foreign matter accumulates in the tank, oil cannot be kept free from contamination, causing pump damage.
5. If the oil pressure setting is incorrect, hydraulic unit malfunction and damage may result.

17.1 Checking Oil Level/Replenishing Oil

Turn OFF the main power and supply oil when the oil level is lower than the lower limit on the oil level gage.

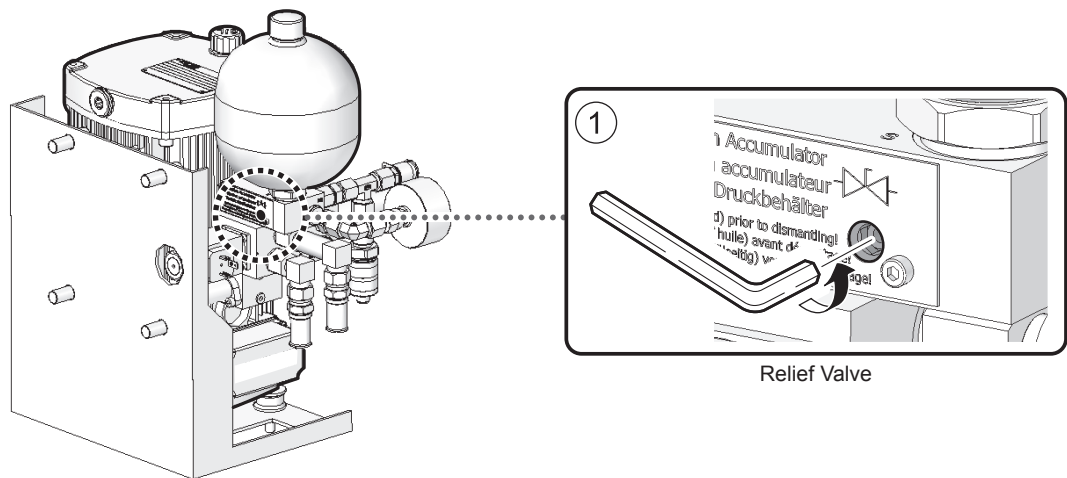
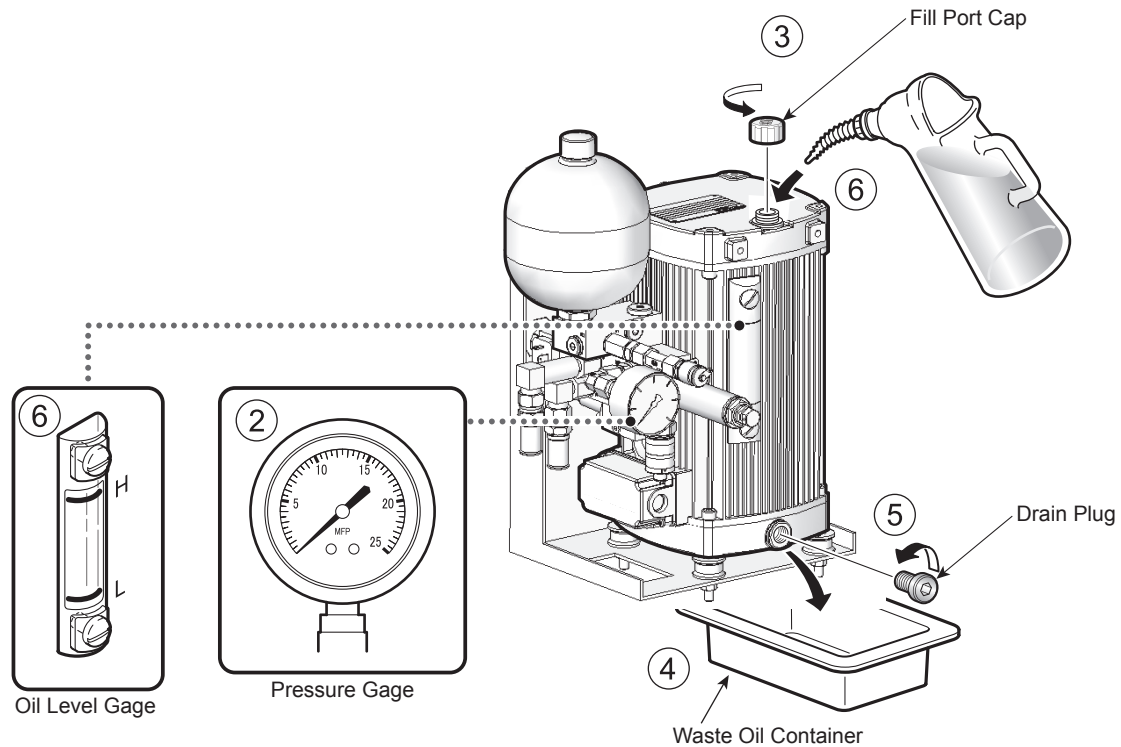
 "OILS/COOLING FLUID" (page 8-23)

17.2 Replacing Oil

<Procedure>

- 1) Turn OFF the main power.
- 2) Remove the maintenance cover.
- 3) Turn the relief valve counterclockwise to remove pressure in the hydraulic piping.
- 4) Confirm the pressure gage is set at 0 MPa.
- 5) Remove the fill port cap.
- 6) Place a waste oil container beneath the drain plug.
- 7) Remove the drain plug and drain oil in the tank.
- 8) Remount the drain plug.

9) Supply oil while checking the oil level gage.



10) Remount the fill port cap.

11) Turn ON the main power.

12) Confirm pump pressure and suction noise are normal.

NOTE

If the suction sound is louder than prior to oil replacement, check the oil level again.

13) Remount the maintenance cover.

17.3 Checking Pressure Gage

NOTE

Check the pressure gage in the tool clamp or empty clamp state.

<Procedure>

1) Turn ON the main power and control power supplies.

NOTE

Confirm all machine operations have come to a complete stop.

-
- 2) Confirm the pressure gage indicates the predetermined value.

18 LUBRICATING UNIT

18.1 Checking Lubricating Oil Level

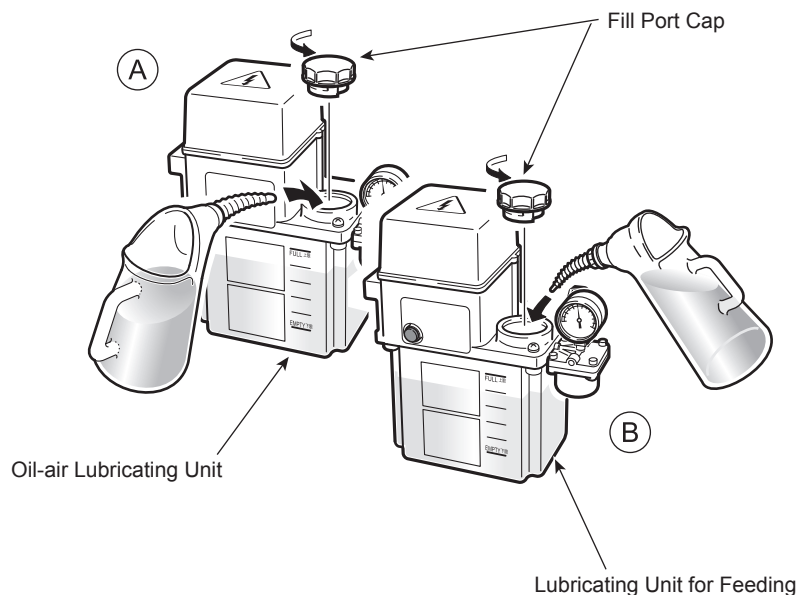
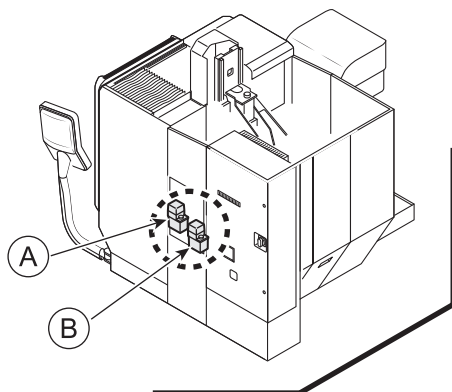
<Procedure>

- 1) Check the filling level at the oil level gage.
- 2) If the oil level is low, add oil.
 "Replenishing Lubricating Oil" (page 8-61)

18.2 Replenishing Lubricating Oil

CAUTION

1. Use clean lubricant. Do not reuse the used oil.
2. When refilling, do not remove the fill port filter.



NOTE

The oil-air lubricating unit (A) is installed for 15000 min⁻¹/20000 min⁻¹ specification.
Remove the fill port cap and pour oil while checking the oil level using a dedicated oil can.

NOTE

Note that the oil used for each unit varies in 15000 min⁻¹/20000 min⁻¹ specification.

 "OILS/COOLING FLUID" (page 8-23)

18.3 Cleaning Lubricating Unit Line Filter



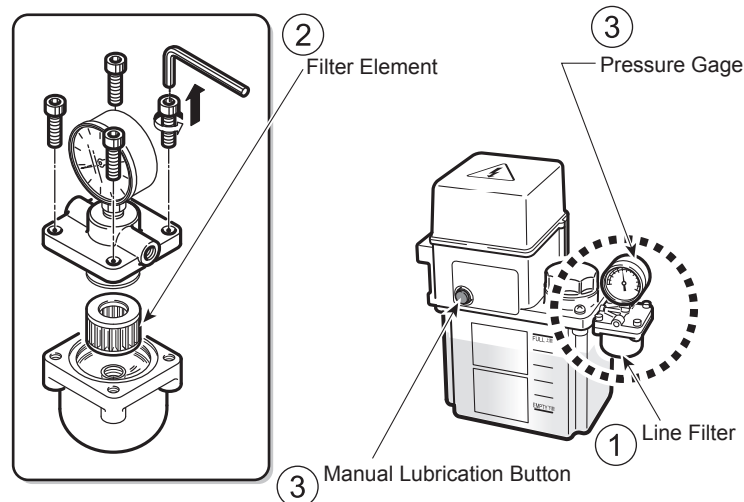
WARNING

Turn OFF the main power.



CAUTION

1. Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]
2. Use caution when using kerosene, and make sure there is no open flame in the vicinity.



<Procedure>

- 1) Turn OFF the main power.
- 2) Remove the line filter.
- 3) Clean the filter element with kerosene.
- 4) Dry the filter element by blowing compressed air.
- 5) When the filter element is badly fouled or damaged, replacement is necessary.



NOTE

When replacing the filter element, contact the DMG MORI Service Department.

- 6) Remount the line filter.
- 7) Press the manual lubrication button for 10 seconds to bleed air from the piping. Stop pressing the button when the pointer reaches the green mark on the meter.

18.4 Cleaning Lubricating Unit Tank, Suction Filter and Fill Port Filter

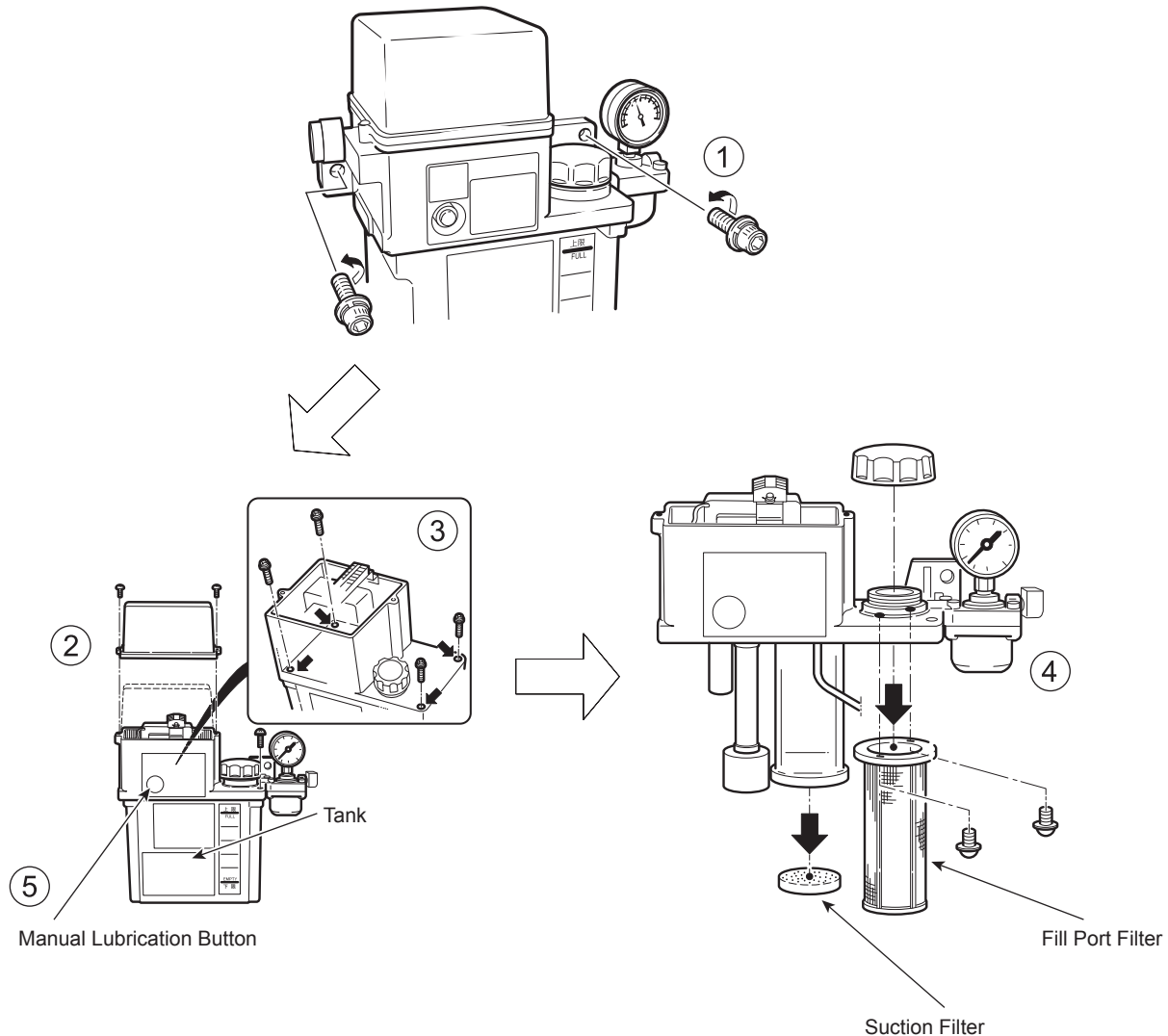


WARNING

Turn OFF the main power.

⚠ CAUTION

1. Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]
2. Use caution when using kerosene, and make sure there is no open flame in the vicinity.



<Procedure>

- 1) Turn OFF the main power.
- 2) Remove the lubricating unit from the machine.
- 3) Remove two bolts to remove the lubricating unit cover.
- 4) Remove four bolts to remove the lubricating unit from the tank.

NOTE

Take care not to spill lubricant when removing the tank.

- 5) Remove the suction filter and the fill port filter.
- 6) Clean the inside of the tank using a neutral detergent.
- 7) Clean the suction filter and the fill port filter with kerosene.
- 8) Dry the suction filter and the fill port filter by blowing compressed air.
- 9) When the suction filter is badly fouled or damaged, replacement is necessary.

Instruction manual supplied by lubricating unit manufacturer

- 10) Perform the steps from 2) to 4) in reverse order to reinstall the lubricating unit in its original position.
- 11) Supply lubricant.
 "Replenishing Lubricating Oil" (page 8-61)
- 12) Turn ON the main power.

13) Press the manual lubrication button for about 10 seconds to supply lubricant to the slideways.

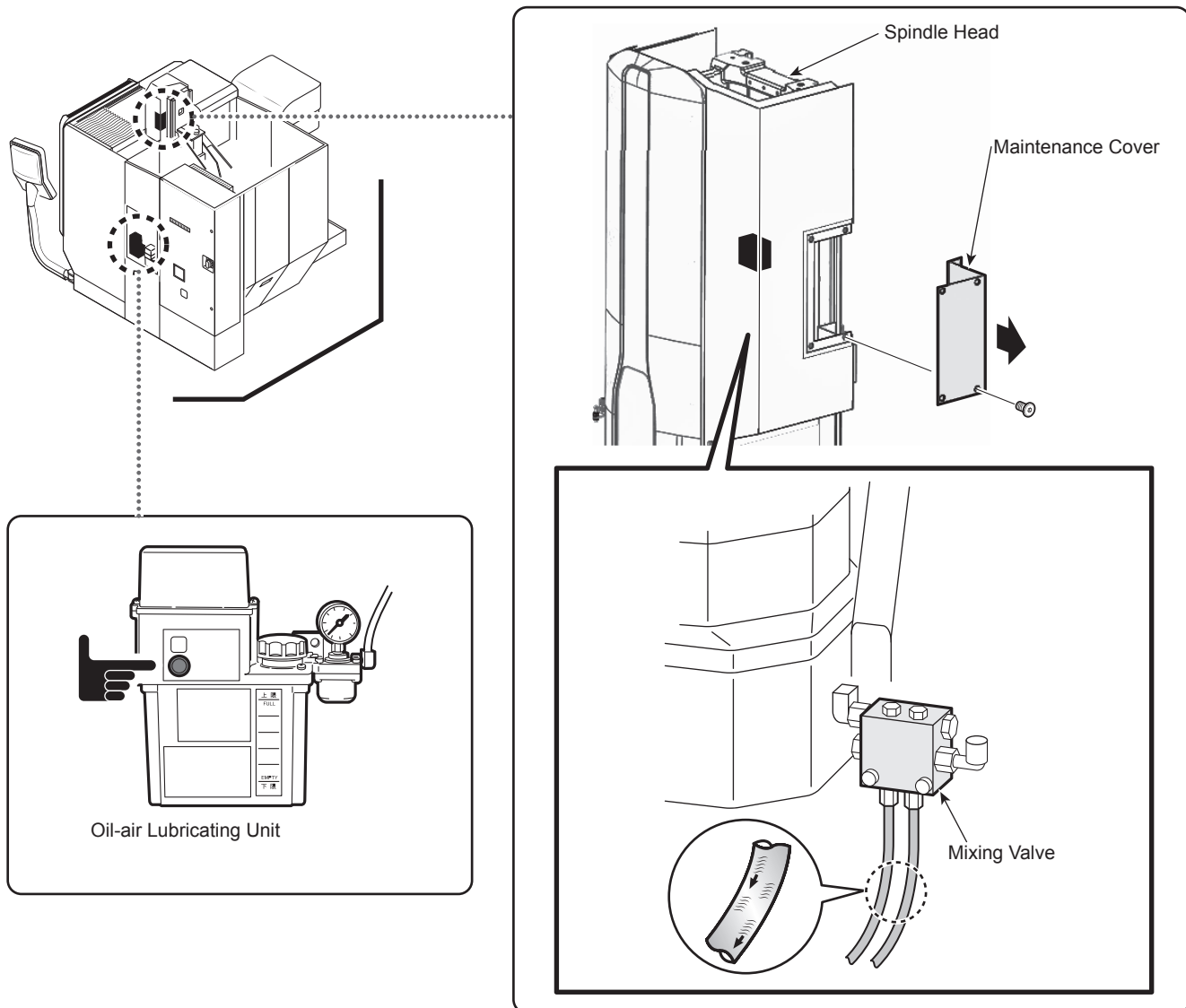
18.5 Checking Oil-air Lubrication ($15000 \text{ min}^{-1}/20000 \text{ min}^{-1}$ Specification)

Oil-air is a mixture of lubricant supplied from the lubricating tank and air supplied from the pneumatic device to lubricate the spindle bearings. To ensure optimum spindle bearing service life, check the oil-air lubricant flow daily.

DANGER

1. Do not check oil-air lubrication when machine is in operation.
2. Select the handle mode and take steps to ensure other personnel do not operate the machine during this procedure.

18.5.1 15000 min^{-1} Specification



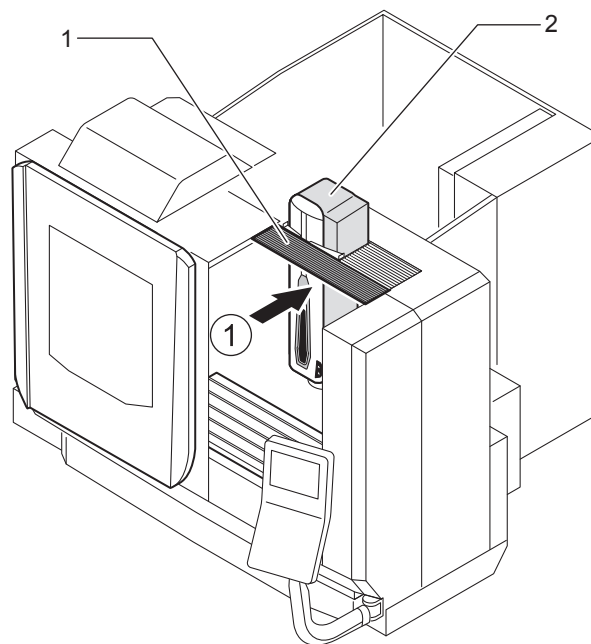
<Procedure>

- 1) Remove the maintenance cover on the spindle head.
- 2) Press the manual lubrication button.
- 3) Check that oil-air lubricant is flowing through the hose while pressing the manual lubrication button.
- 4) Remount the maintenance cover.

18.5.2 20000 min⁻¹ Specification

<Procedure>

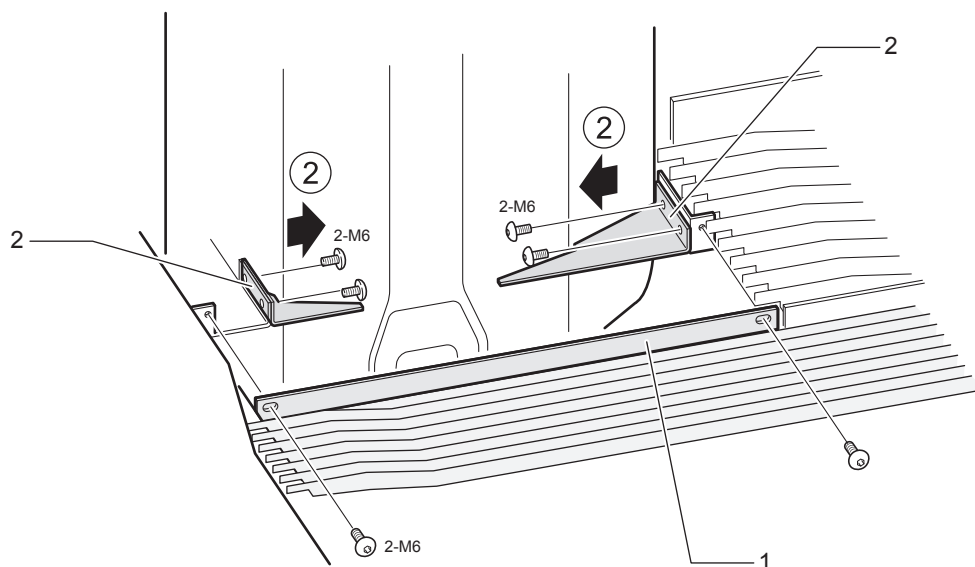
- 1) Move the ceiling shutter manually in the Y-axis positive direction (①).



1	Ceiling shutter
2	Spindle head

- 2) Remove the truss head machine screws.

- 3) Remove the sheet metals located in front of the spindle head cover (②).



1	Ceiling shutter
2	Sheet metal

- 4) Remove the spindle head cover (③).

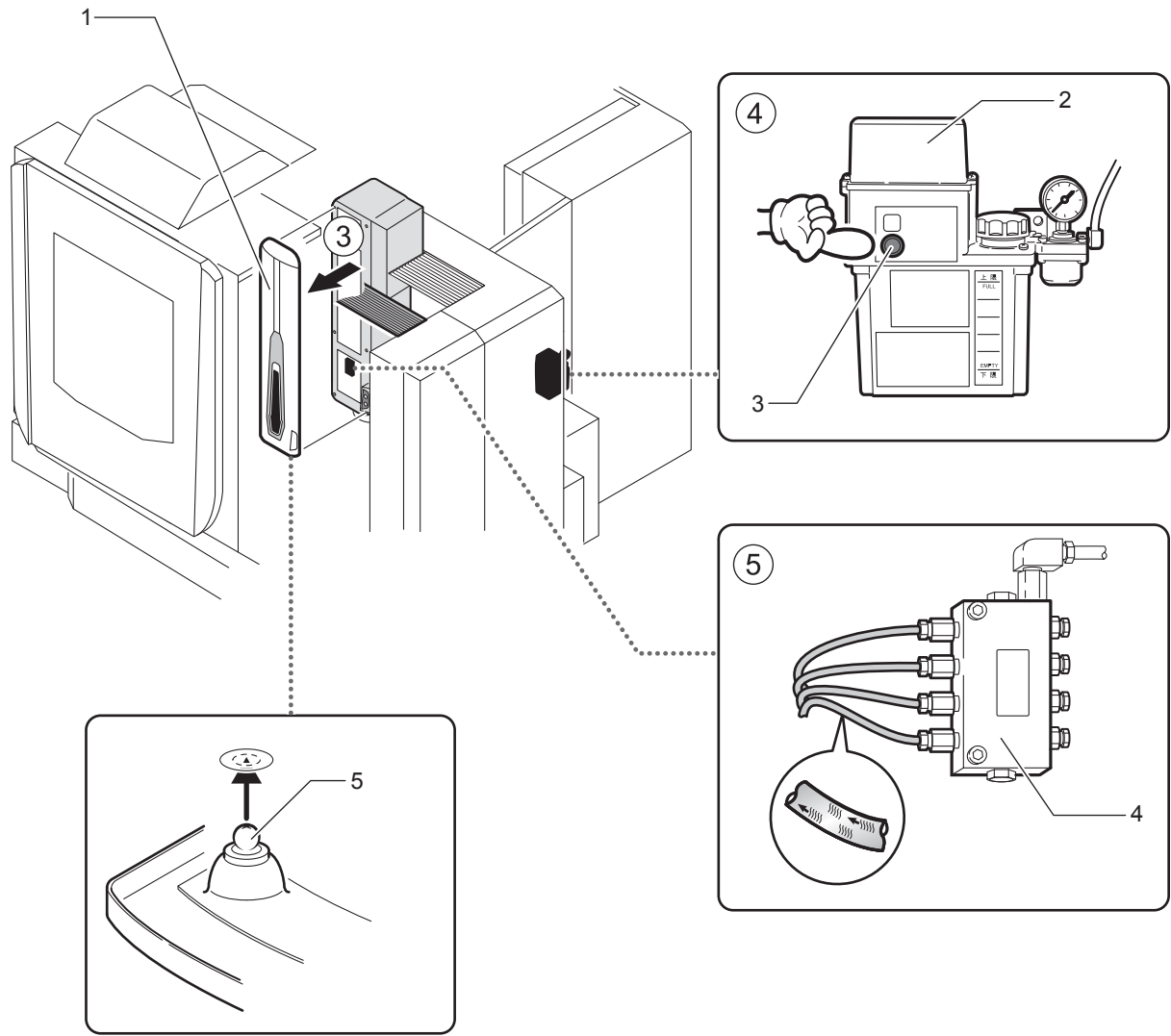
- 5) Press the manual lubrication button (④).

- 6) Check that oil-air lubricant is flowing through the hose while pressing the manual lubrication button (⑤).

- 7) Remount the spindle head cover.

NOTE

There are 10 ball catches on the back side of the spindle head cover.



1	Spindle head cover
2	Oil-air lubricating unit
3	Manual lubrication button
4	Mixing valve
5	Ball catch

- 8) Remount the sheet metal removed at step 3).
- 9) Move the ceiling shutter to the original position.

19 WATER-GLYCOL CHILLER (20000 min⁻¹ SPECIFICATION)



WARNING

Turn OFF the main power.



CAUTION

If the fluid level continues to decrease following replenishment, contact the DMG MORI Service Department for assistance.

19.1 Visually Inspecting Water-glycol Chiller

Visually inspect the following items periodically. If any abnormality is found, contact the DMG MORI Service Department.

- Abnormal noise
- Damage to the external appearance
- Corrosion
- Rusting
- Oil leakage
- Frost on the condenser

19.2 Checking Cooling Fluid Level

Check the fluid level gage periodically.

<Procedure>

- 1) Turn OFF the main power.
- 2) Wait until the cooling fluid level is stabilized after the cooling fluid inside machine is returned to the reservoir tank.
- 3) Check the filling level at the fluid level gage.
- 4) If the fluid level is low, add cooling fluid.



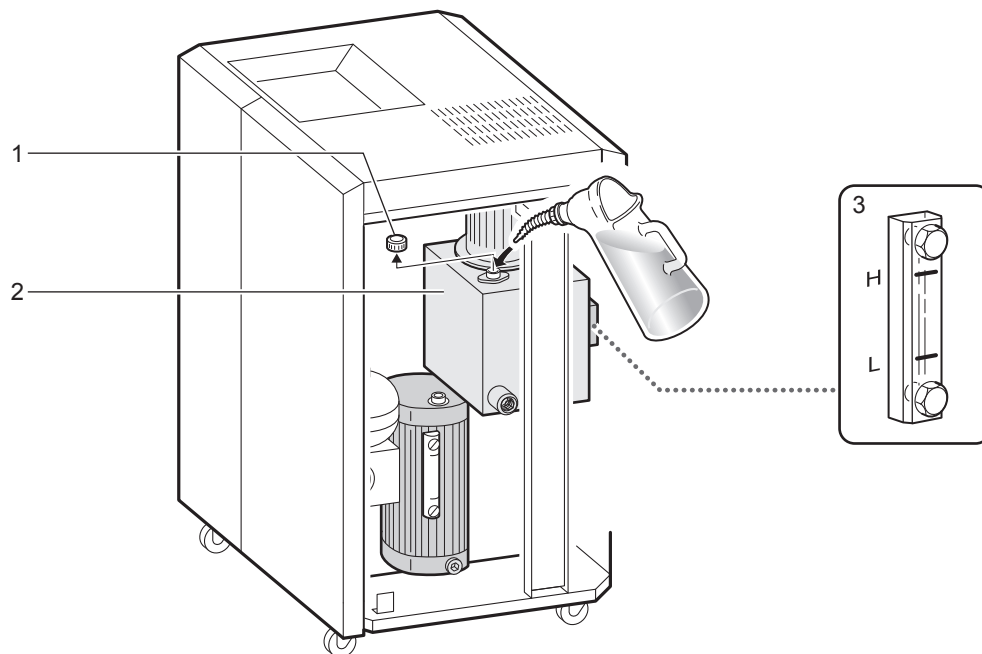
"Replenishing Cooling Fluid" (page 8-68)

19.3 Replenishing Cooling Fluid

CAUTION

Do not supply any cooling fluid other than water-glycol fluid.

[Machine damage]



1	Fill port cap
2	Reservoir tank
3	Fluid level gage

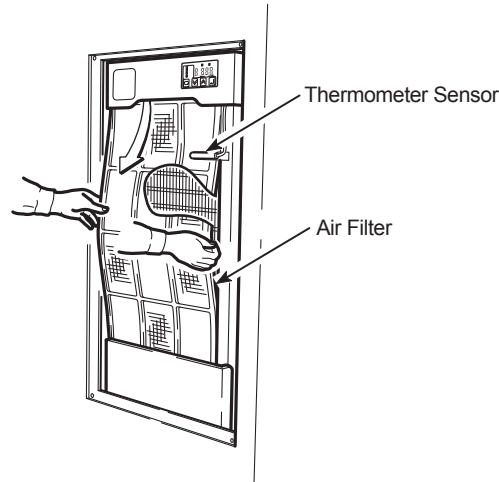
<Procedure>

- 1) Turn OFF the main power.
- 2) Wait until the cooling fluid level is stabilized after the cooling fluid inside machine is returned to the reservoir tank.
- 3) Remove the fill port cap.
- 4) Pour cooling fluid while checking the fluid level gage.
 "OILS/COOLING FLUID" (page 8-23)
- 5) Remount the fill port cap.

19.4 Cleaning Air Filter and Condenser

CAUTION

Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]



<Procedure>

- 1) Turn OFF the main power.
- 2) Remove the air filter.

CAUTION

Pay sufficient care not to catch the thermometer sensor with the air filter.

NOTE

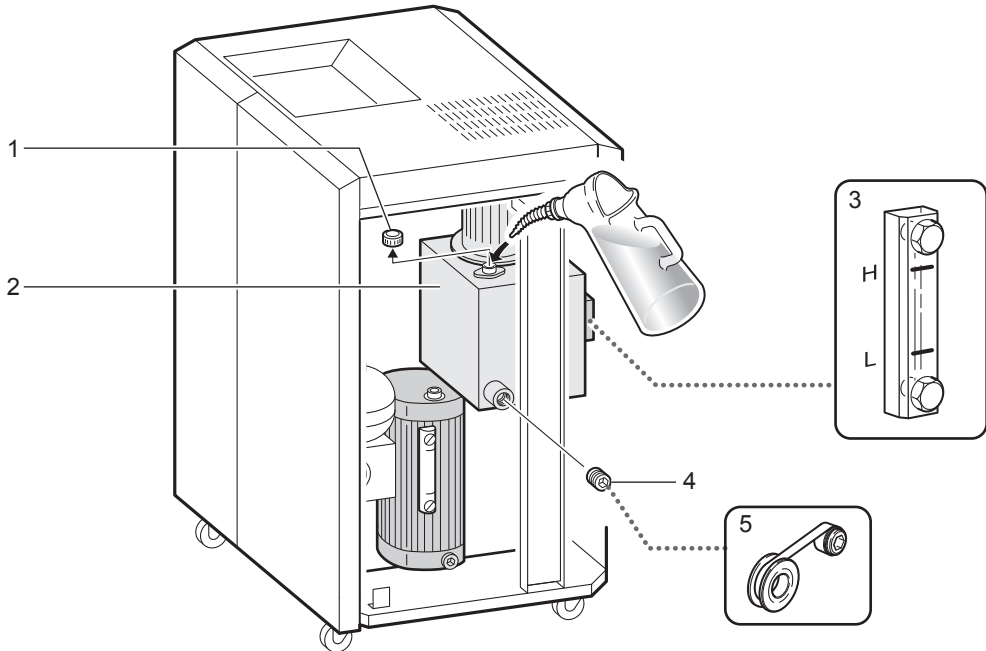
The condenser is exposed when the filter is removed.

- 3) Wash the air filter with a neutral detergent and tepid water (not warmer than 40 degrees).
- 4) Remove the neutral detergent using freshwater.
- 5) Dry the air filter by blowing compressed air.
- 6) Clean the condenser using one of the following methods:
 - Using a brush
 - Blowing compressed air
- 7) Remount the air filter.

19.5 Replacing Cooling Fluid

 WARNING

Turn OFF the main power.



1	Fill port cap
2	Reservoir tank
3	Fluid level gage
4	Drain plug
5	Sealing tape

<Procedure>

- 1) Turn OFF the main power.
- 2) Place a waste fluid container beneath the drain plug.
- 3) Remove the drain plug and drain all cooling fluid from the reservoir tank.
- 4) Wrap sealing tape around the threaded part of the plug.
- 5) Remount the drain plug.
- 6) Remove the fill port cap.
- 7) Pour cooling fluid while checking the fluid level gage.

 "OILS/COOLING FLUID" (page 8-23)
- 8) Remount the fill port cap.
- 9) Turn ON the main power and confirm the pump generates a suction sound.
- 10) Turn OFF the main power and check the fluid level.
- 11) If the fluid level is still low, add cooling fluid again.

20 PNEUMATIC DEVICES

20.1 Precautions when Performing Maintenance Work on Pneumatic Devices



WARNING

1. Turn OFF the main power.
2. Inspect the pressure gage periodically. If not set at the correct value, adjustment is necessary.
[Serious injury/Machine failure]
3. When using a ladder or a service platform, make sure it is stable.
[Serious injury]
4. Release residual pressure in the pneumatic devices.

20.2 Releasing Residual Pressure

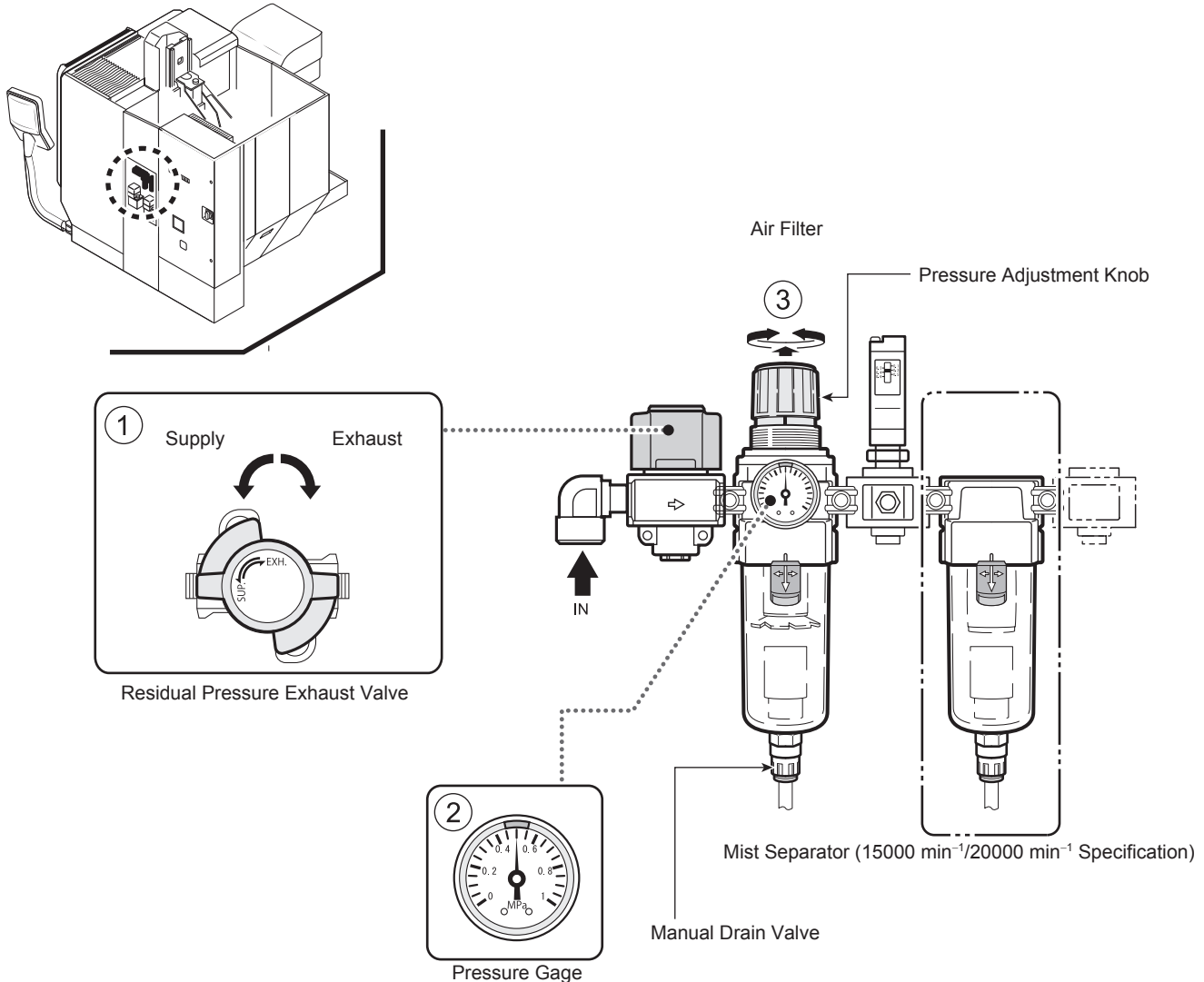
<Procedure>

- 1) Turn OFF the main power.
- 2) Turn the residual pressure exhaust valve 90-degree clockwise to release the residual pressure.

20.3 Inspecting and Adjusting Air Pressure

WARNING

Inspect the pressure gage periodically. If not set at the correct value, adjustment is necessary.
[Machine damage/Serious injury]



<Procedure>

- 1) Supply the compressed air by rotating the handle of the residual pressure exhaust valve to SUP. position.
- 2) Check that the pressure gage is set at 0.5 MPa (green mark).
- 3) If necessary, pull upward and rotate the pressure adjustment knob to adjust the pressure.
Increasing pressure: Rotate the knob clockwise.
Reducing pressure: Rotate the knob counterclockwise.

NOTE

If the pressure cannot be adjusted, check the plant side air source.

- 4) Push the pressure adjustment knob downward.

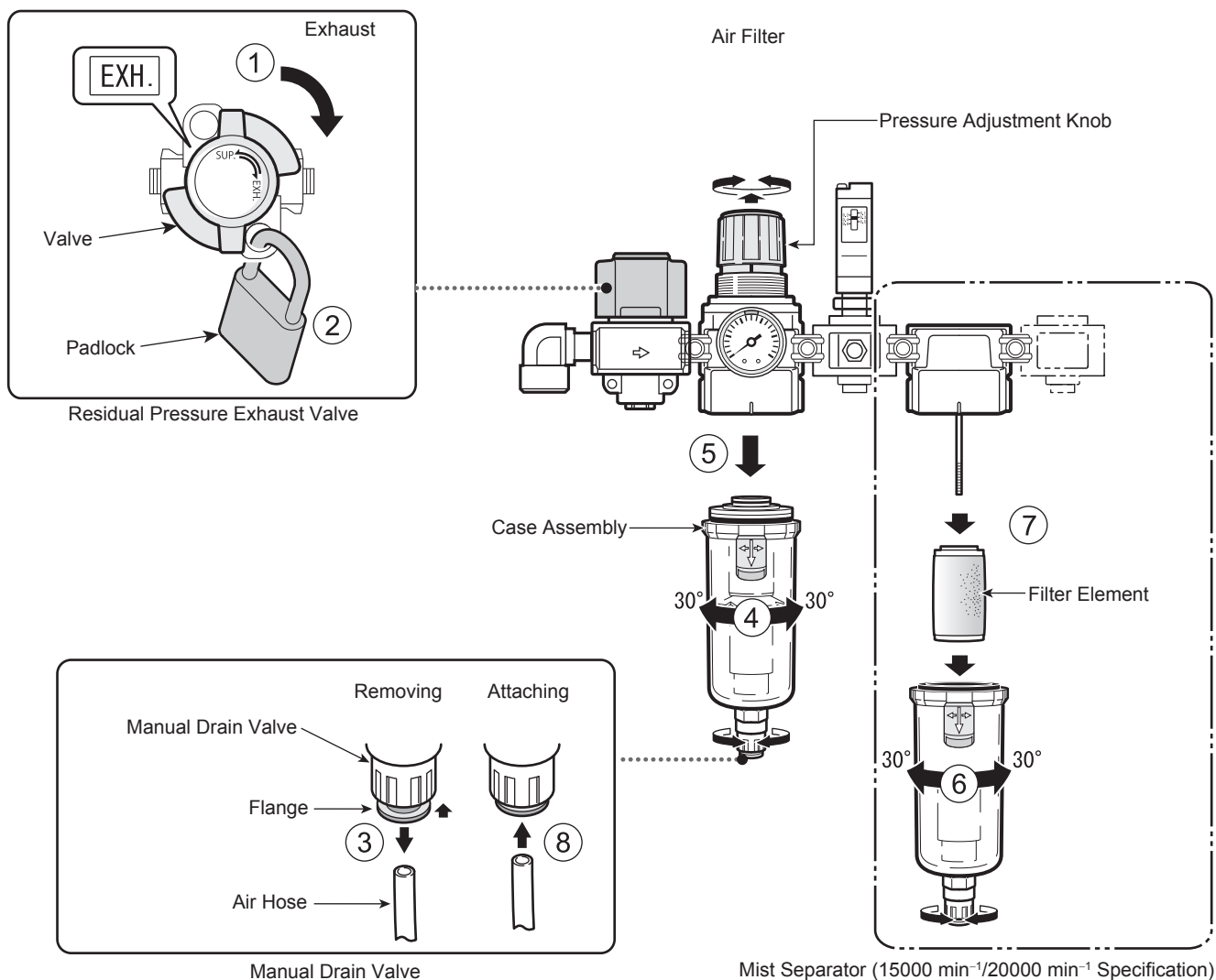
20.4 Inspecting Filter Element of Air Filter/Mist Separator

If the filter element of the air filter/mist separator is clogged, the pressure is reduced. Inspect the filter element at regular intervals and replace it if it is clogged.

20.5 Manual Draining from Air Filter

The air filter is equipped with a float-type automatic drain unit. Draining is normally performed automatically by the drain unit. However, if draining is not performed automatically or if foreign matter has accumulated in the bottom of the bowl, turn the manual drain valve counterclockwise to drain manually.

20.6 Replacing Filter Element of Air Filter/Mist Separator



WARNING

1. Turn OFF the main power.
2. When performing maintenance work, check the pressure gauge indicates 0 MPa after releasing residual pressure from the pneumatic device.

<Procedure>

- 1) Turn OFF the main power.
- 2) Turn the residual pressure exhaust valve 90-degree clockwise to remove residual pressure. (Fig. 1 ①)
- 3) Confirm the pressure gauge indicates 0 MPa.
- 4) Padlock the residual pressure exhaust valve. (Fig.1 ②)
- 5) Remove the air hoses from the manual drain valves while pushing up the flanges. (Fig. 1 ③)
- 6) Replace the air filter element by following the procedure below:
 - a) Slide the lock button downward, raise the case assembly and then pull down the case assembly to remove it while rotating it 30 degrees clockwise or counterclockwise. (Fig.1 ④, ⑤)

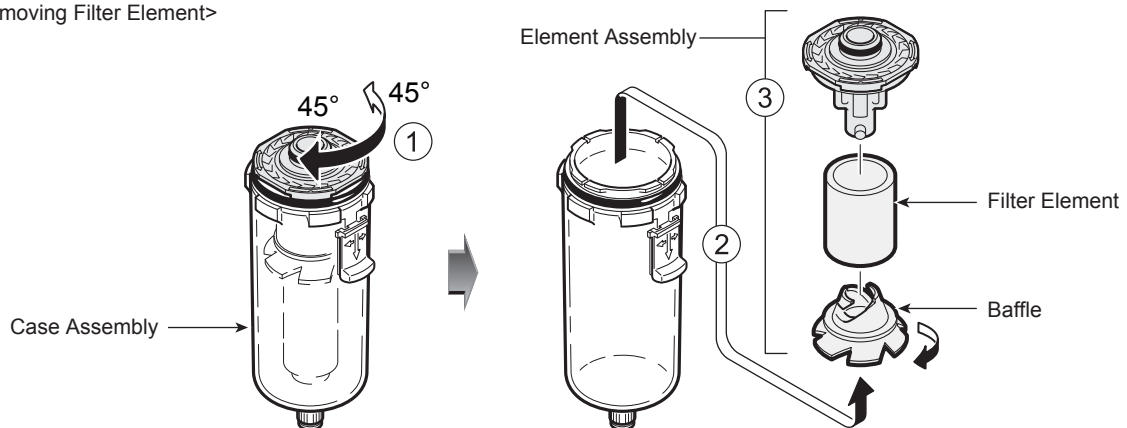
 NOTE

1. Take care not to damage the O-ring mounted in the upper part of the case assembly.
2. Filter element comes off with the case assembly.
- b)** Remove the element assembly from the case assembly while rotating the element assembly 45 degrees clockwise or counterclockwise. (Fig.2 ①, ②)
- c)** Remove the old filter element by rotating the baffle in the direction of the arrow. (Fig.2 ③)
- d)** Mount a new filter element and secure it with the baffle.
- e)** Install the element assembly in the case assembly so that position ① of the element assembly lines up with position ② of the case assembly. (Fig. 2 ④)
- f)** After installing the element assembly, rotate it 45 degrees clockwise or counterclockwise so that the ③ of the element assembly is fitted in the ④ of the assembly case. (Fig. 2 ⑤)
- g)** Mount the case assembly to its original position. (Fig. 2 ⑥, ⑦)

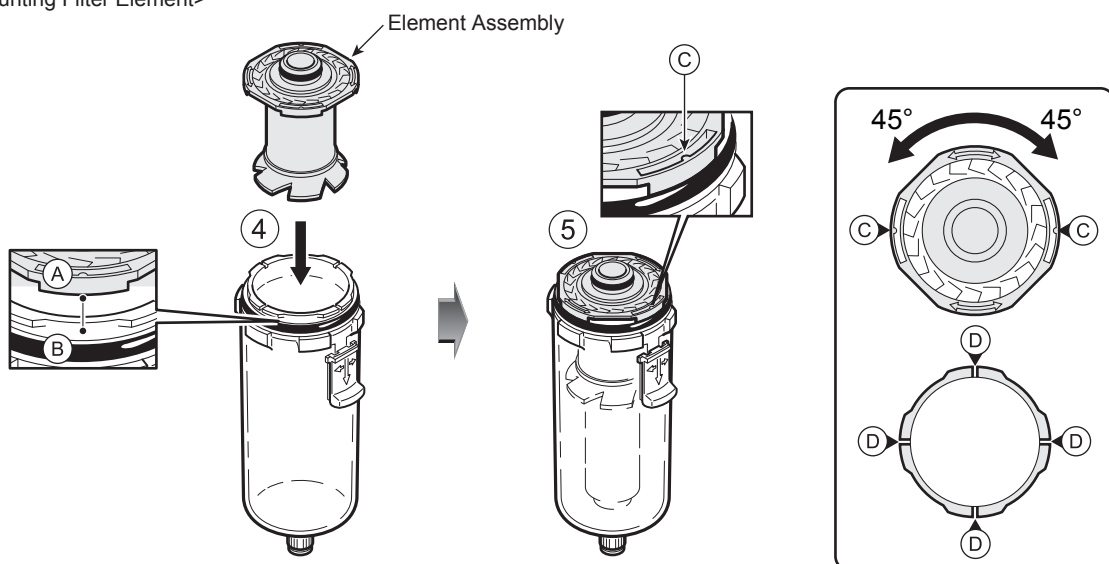
NOTE

Insert the case assembly so that the lock button is aligned with the groove after rotating the case assembly 30 degrees. (Fig. 2 ⑧)

<Removing Filter Element>



<Mounting Filter Element>



<Mounting Case Assembly>

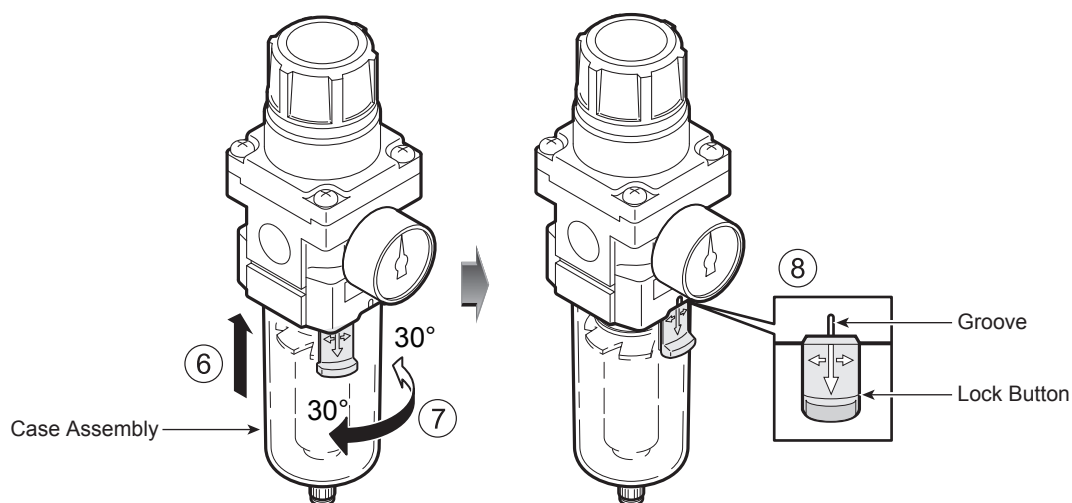


Fig.2

- 7) Replace the filter element of the mist separator by following the procedure below (for 15000 min⁻¹/20000 min⁻¹ specification):
- Slide the lock button downward, raise the case assembly and then pull down the case assembly to remove it while rotating it 30 degrees clockwise or counterclockwise. (Fig. 1 ⑥)
 - Remove the old filter element and mount a new one in place. (Fig. 1 ⑦)

- c) Mount the case assembly to its original position.
- 8) Reattach the air hoses removed in step 5). (Fig. 1 ⑧)
- 9) Remove the padlock and turn the residual pressure exhaust valve 90-degree counterclockwise to restart compressed air supply.
- 10) Check for air leakage and confirm that the pressure gage indicates 0.5 MPa.

20.7 Replacing Filter Element of Multi Dry Filter (Option)

This filter unit removes moisture or oil from compressed air. Replace the filters by following the procedure below as moisture and oil in compressed air cannot be removed if the filters are clogged.



CAUTION

If waterdrops fall from the oil mist drain valve, replace the second element and the oil mist element immediately.

[Spindle abnormal noise and seizure/Pneumatic unit malfunction]

<Replacement Interval>

First element: Clean or replace it every 2 years

Second element and oil mist element: Replace them every 1000 hours or when waterdrops fall from the oil mist drain valve.

<Necessary Parts>

Filter Element

Name	Part No
First element	U29235
Second element + oil mist element set	U29236



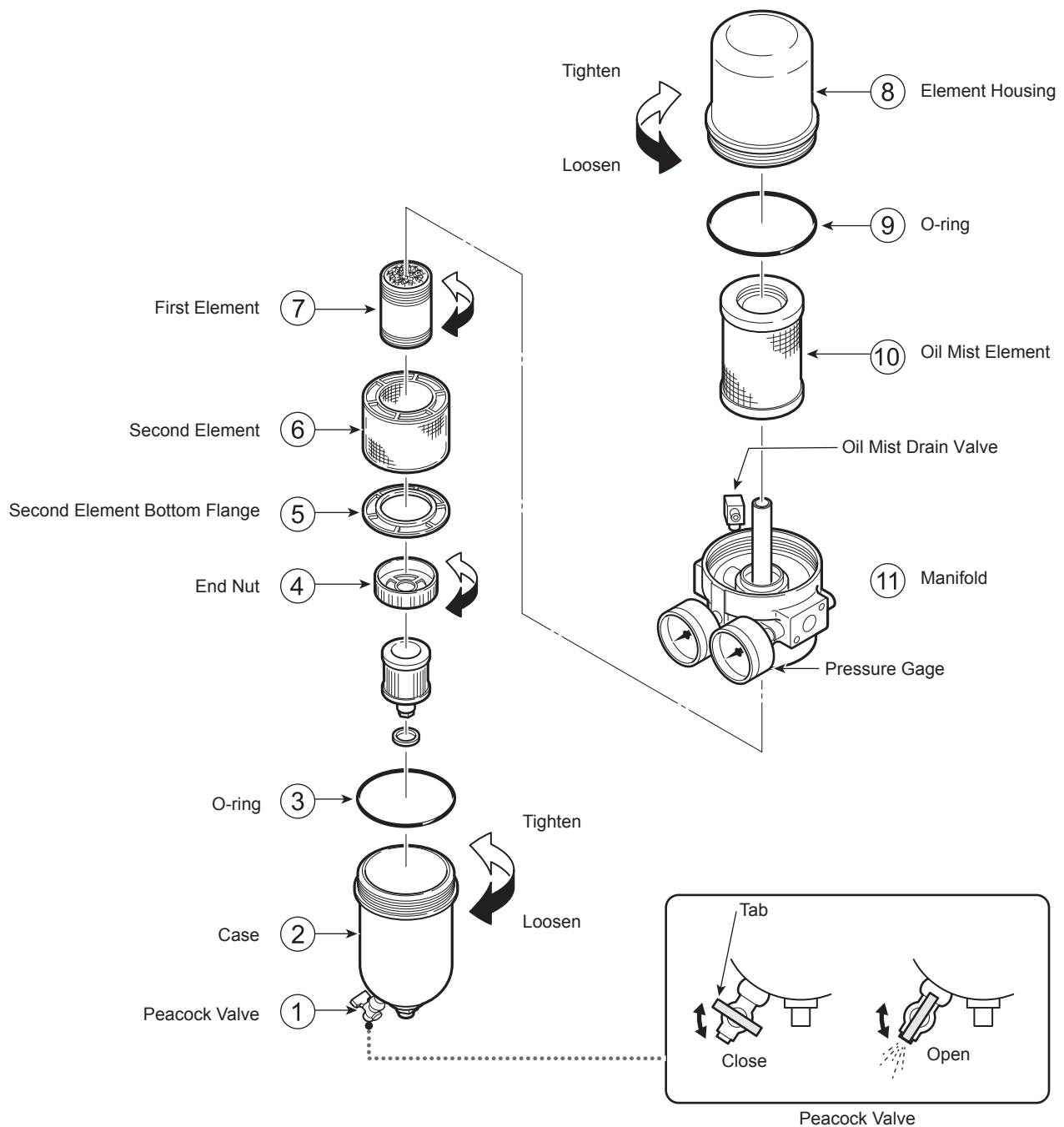
NOTE

1. Inform the DMG MORI Service Department of the above part numbers when ordering the first element and the second element and oil mist element set.
2. Replace the second element and the oil mist element at the same time.

<Procedure>

- 1) Turn OFF the main power.
- 2) Turn the valve handle mounted on the left piping of the multi dry filter to a horizontal position to shut off the compressed air supply.

- 3) Turn the residual pressure release valve of the pneumatic devices 90-degree clockwise to remove residual pressure.



<Multi Dry Filter>

- 4) Open the peacock of the multi dry filter by making the tab parallel to the air discharging direction and remove residual pressure. (①)
- 5) Confirm that the pressure gage of the multi dry filter indicates 0 MPa.
- 6) Remove the first element and the second element.
 - a) Turn the case counterclockwise and remove it. (②)

NOTE

Be careful not to lose the O-ring of the case. (③)

- b) Turn the end nut counterclockwise and remove it. (④)
- c) Remove the second element bottom flange. (⑤)
- d) Remove the second element by pulling it downward. (⑥)
- e) Turn the first element counterclockwise and remove it. (⑦)

f) Clean the first element with a neutral detergent if it is not replaced.

7) Remove the oil mist element.

a) Turn the element housing counterclockwise and remove it. (⑧)

 NOTE

Be careful not to lose the O-ring of the element housing. (⑨)

b) Remove the oil mist element by pulling it up. (⑩)

8) Mount the new oil mist element.

a) Insert the oil mist element so that the O-ring inside the oil mist element firmly seals the inside.

 NOTE

Rotate the oil mist element slightly after inserting it. If it does not rotate, the O-ring may be twisted.

b) Remount the element housing after securely remounting the O-ring on the top of the manifold. (⑪)

9) Mount the new first element and the second element.

a) Screw the first element clockwise into the bottom of the manifold.

b) Insert the second element with the side where rubber is attached facing upward.

c) Remount the second element bottom flange at the bottom of the second element with the projection side facing upward.

d) Remount the end nut on the threaded part at the bottom of the first element.

e) Remount the case after securely remounting the O-ring on the top of the case.

10) Turn the residual pressure release valve of the pneumatic devices 90-degree counterclockwise to return it to the original position.

11) Close the peacock of the multi dry filter by making the tab vertical to the air discharging direction.

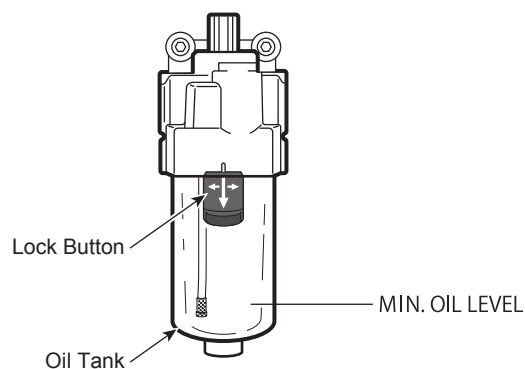
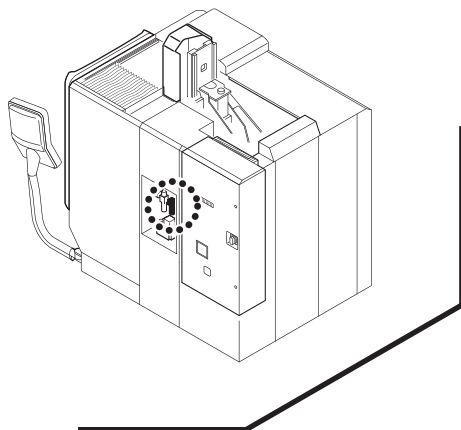
12) Turn the valve handle of the multi dry filter to the vertical position to restart compressed air supply.

13) Confirm that no air leakage occurs.

21 TOOL UNCLAMP CYLINDER LUBRICATOR

21.1 Checking Oil Level

Replenish oil if the oil level is below the MIN. OIL LEVEL line.



Lubricator

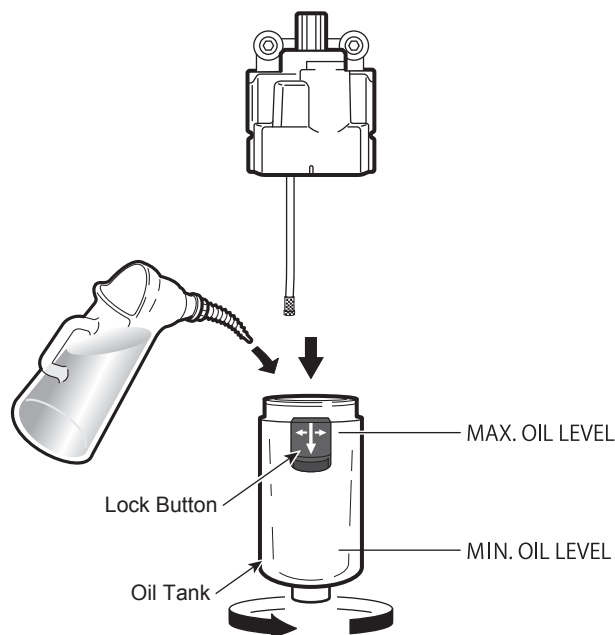
21.2 Replenishing Oil



WARNING

Turn OFF the main power.

<Procedure>



- 1) Turn OFF the main power.
- 2) Turn the residual pressure exhaust valve 90-degree clockwise to remove residual pressure.
- 3) Confirm the pressure gage on the pneumatic device indicates 0 MPa.
- 4) Padlock the residual pressure exhaust valve.
- 5) Slide the lock button downward and rotate the oil tank counterclockwise to remove it.

NOTE

Take care not to damage the O-ring mounted in the upper part of the oil tank.

- 6) Replenish oil to the MAX. OIL LEVEL.
 "OILS/COOLING FLUID" (page 8-23)

NOTE

Apply some oil to the O-ring of the oil tank.

- 7) Remount the oil tank.

NOTE

Do not use tools when reinstalling the oil tank to prevent damage to the case.

- 8) Remove the padlock and turn the residual pressure exhaust valve 90-degree counterclockwise to restart compressed air supply.

22 ELECTRICAL CABINET

22.1 Precautions when Performing Maintenance Work on Electrical Cabinet

DANGER

Prior to performing electrical cabinet maintenance and inspections, turn OFF the main power and disconnect the plant side power supply (breaker). Even when the main power switch on the electrical cabinet is turned OFF, parts in the cabinet may still hold residual current resulting in an electric shock if touched accidentally.

WARNING

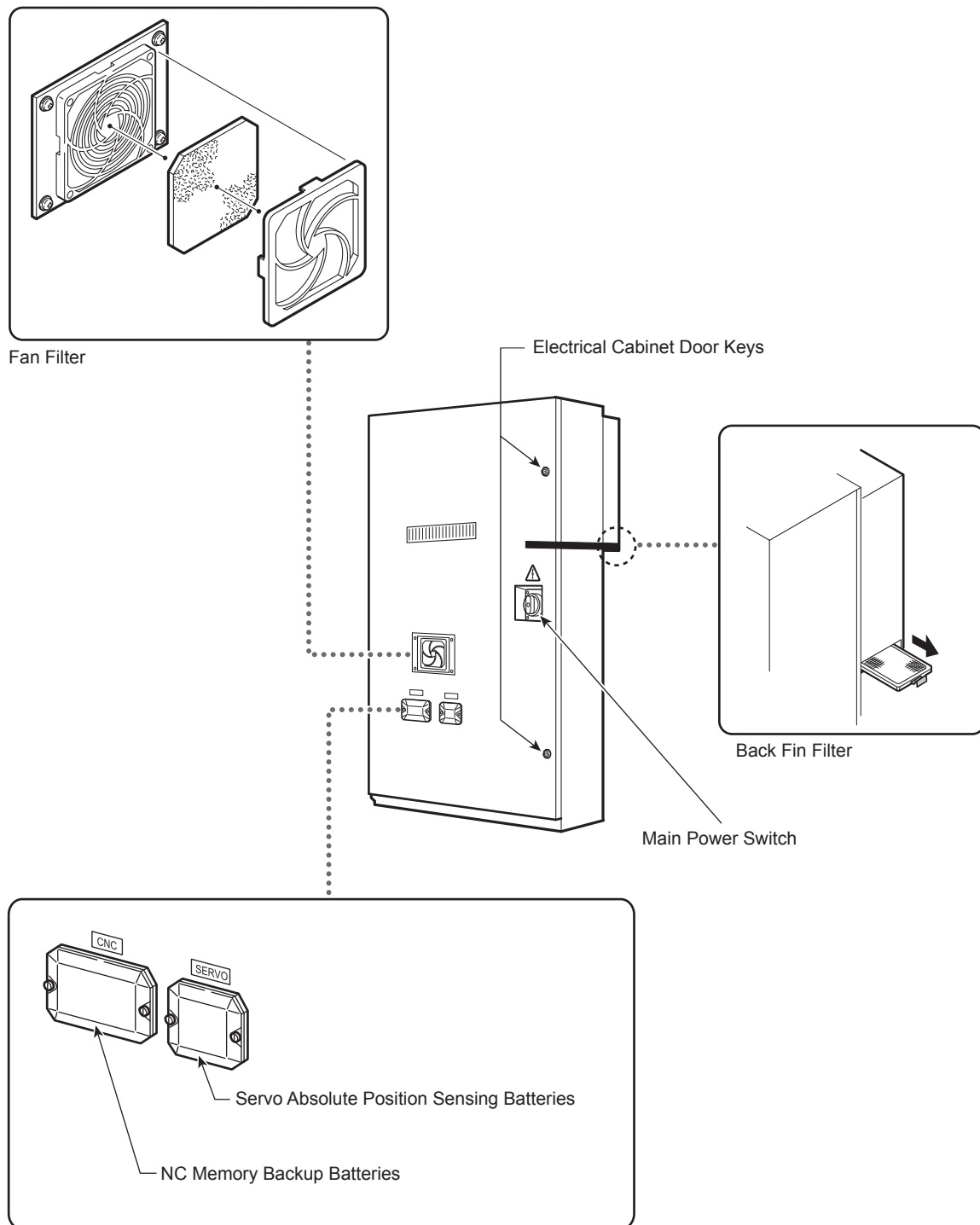
1. When an alarm is triggered and it is necessary to open the electrical cabinet while the power is supplied for maintenance purposes, contact the DMG MORI Service Department for assistance as specialized knowledge is required for this purpose.
All activities and procedures for responding to the alarm are to be performed with extreme care by licensed electrical technicians with maintenance experience in strict accordance with the recommendations of the DMG MORI Service Department.
2. When using a ladder or a service platform, make sure it is stable.
[Serious injury]

CAUTION

Periodically clean the filter and the fan in the electrical cabinet. Foreign matter adhering to the filter or the fan will impair cooling performance.

[Machine malfunction/Malfunction of electrical components/Machine damage]

22.2 Electrical Cabinet View



Main power switch: "PRIOR TO MAINTENANCE WORK" (page 8-12), Machine operation

22.3 Opening/Closing Electrical Cabinet Door

22.3.1 Precautions when Opening/Closing Electrical Cabinet Door



DANGER

Prior to performing electrical cabinet maintenance and inspections, turn OFF the main power and disconnect the plant side power supply (breaker). Even when the main power switch on the electrical cabinet is turned OFF, parts in the cabinet may still hold residual current resulting in an electric shock if touched accidentally.

 NOTE

1. Do not touch devices installed inside the electrical cabinet at heights of 2 m or greater as these devices do not require maintenance and inspections.
2. Keep the keys in user's responsibility to prevent the loss.

22.3.2 Opening Electrical Cabinet Door with Main Power OFF

<Procedure>

- 1) Insert the key into the electrical cabinet door key.
- 2) Turn the key to release the door lock.
- 3) Place the main power switch in the **[OPEN RESET]** position.

 CAUTION

If the main power switch is in a position other than **[OPEN RESET]**, the door cannot be opened. Attempting to force the door open in this condition could damage the electrical cabinet door or the main power switch.

- 4) Open the electrical cabinet door.

22.3.3 Closing Electrical Cabinet Door with Main Power OFF

<Procedure>

- 1) Check that the main power switch is in the **[OFF]** position and close the electrical cabinet door.

 NOTE

1. A "click" is clearly audible when the door is completely closed.
 2. The main power switch cannot be turned when the door is not completely closed. In this case, close the door again.
- 2) Insert the key into the electrical cabinet door key.
 - 3) Turn the key to lock the door.
 - 4) Remove the key.

22.3.4 Opening Electrical Cabinet Door with Main Power ON

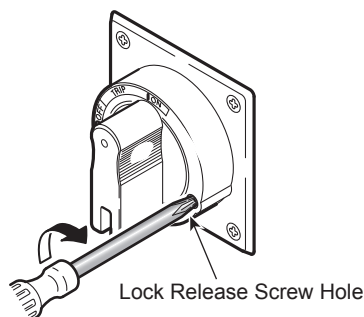
 WARNING

When an alarm is triggered and it is necessary to open the electrical cabinet while the power is supplied for maintenance purposes, contact the DMG MORI Service Department for assistance as specialized knowledge is required for this purpose.

All activities and procedures for responding to the alarm are to be performed with extreme care by licenced electrical technicians with maintenance experience in strict accordance with the recommendations of the DMG MORI Service Department.

<Procedure>

- 1) Insert the key into the electrical cabinet door key.
- 2) Turn the key to release the door lock.
- 3) Insert a phillips head screwdriver into the lock release screw hole provided on the main power switch and open the door while turning the screwdriver right.



22.3.5 Closing Electrical Cabinet Door with Main Power ON

Procedure

- 1) Check that the main power switch is in the [ON] position and close the electrical cabinet door.

NOTE

1. A "click" is clearly audible when the door is completely closed.
 2. The main power switch cannot be turned when the door is not completely closed. In this case, close the door again.
- 2) Insert the key into the electrical cabinet door key.
 - 3) Turn the key to lock the door.
 - 4) Remove the key.

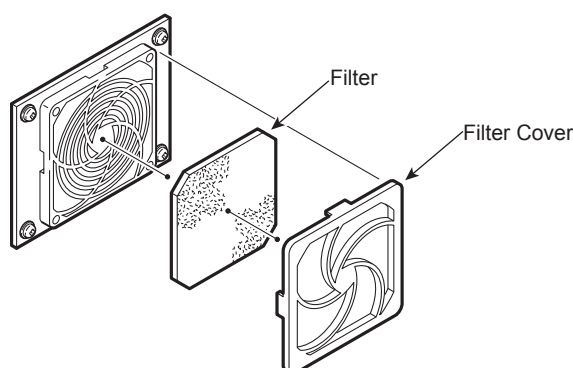
22.4 Cleaning Fan Filter for Electrical Cabinet Heat Exchanger

WARNING

Turn OFF the main power and disconnect the plant side power supply (breaker).

CAUTION

1. Dust and dirt may damage the fan and prevent air flow. Clean the filter periodically.
2. Do not rub the filter when washing.
[Filter damage]
3. If the filter deteriorates, replace it with a new filter.
Part No.: E18099



<Procedure>

- 1) Turn OFF the main power.
- 2) Disconnect the plant side power supply (breaker).
- 3) Remove the filter.
- 4) Clean the filter using one of the following methods:
 - Pressing on the filter in a tank of water.
 - Using a vacuum cleaner.
 - Blowing compressed air

CAUTION

Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]

- 5) If the fan is soiled, wipe it clean using a clean cloth.
- 6) Remount the filter.

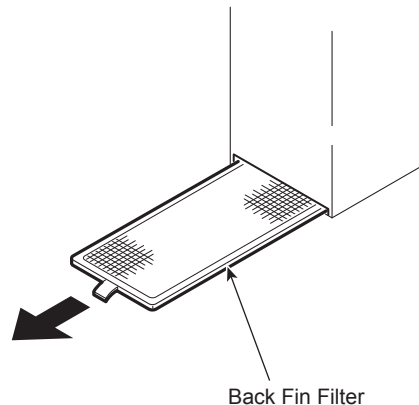
22.5 Cleaning Electrical Cabinet Back Fin Filter

WARNING

Turn OFF the main power and disconnect the plant side power supply (breaker).

CAUTION

1. Dust and dirt may damage the fan and prevent air flow. Clean the filter periodically.
2. Do not rub the filter when washing.
[Filter damage]
3. The filter may gradually deteriorate after being cleaned about 5 - 10 times. If the filter deteriorates, replace it with a new filter.
Part No.: E18103



<Procedure>

- 1) Turn OFF the main power.
- 2) Disconnect the plant side power supply (breaker).
- 3) Pull out the filter.
- 4) Clean the filter using one of the following methods:
 - Pressing on the filter in a tank of water.
 - Using a vacuum cleaner.
 - Blowing compressed air

CAUTION

Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]

NOTE

Using neutral detergent is effective for removing oily foreign matters.

- 5) Remount the filter.

22.6 Replacing Battery

This section describes the procedure for replacing the NC memory back up battery and servo absolute position sensing battery.

22.6.1 Precautions when Replacing Battery

CAUTION

1. Change the NC memory backup battery and servo absolute position sensing battery with power supplied to the NC. If the batteries are changed with the NC power supply turned OFF, the data stored in the memory may be lost.
2. Before changing the batteries, save the memory data such as parameters and programs as backup in an external I/O device such as a USB memory. DMG MORI is not liable for problems that result from destroyed programs or lost data that have not been backed up.
3. Always ensure that the polarity of the batteries is correct. If the polarity is reversed, the memory data may be lost when turning OFF the NC power. It also causes leakage, heat or explosion of the battery.
4. Tighten the screws properly to secure the battery cover. Mist may enter the interior of the electrical cabinet through the clearance.

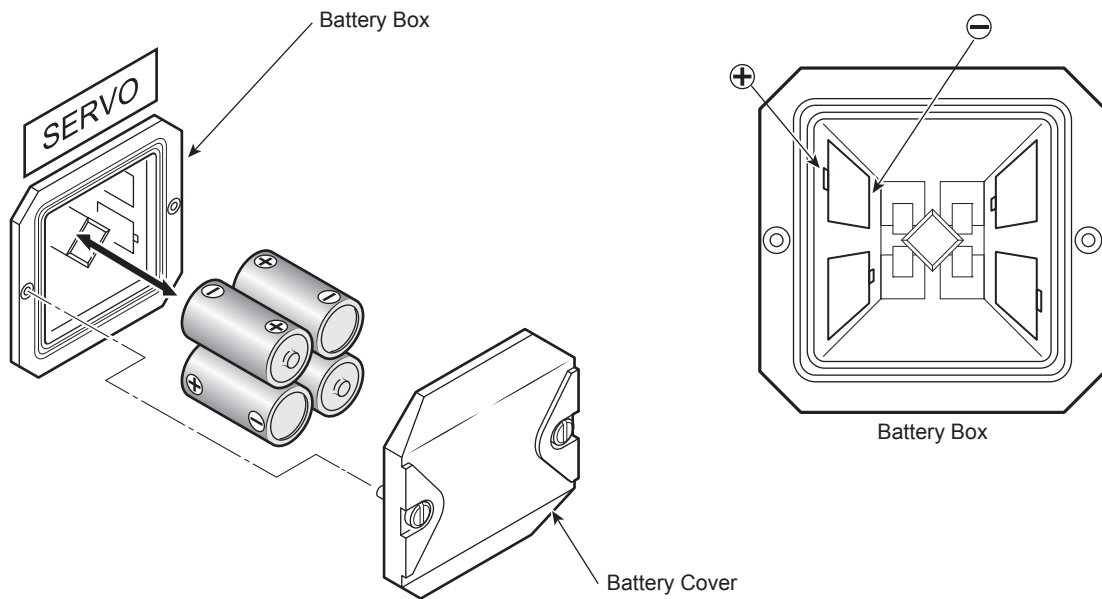
5. Make sure to check the recommended use-by date on replacement batteries and use the batteries that are within the use-by date.
6. Do not mix old and new batteries or different types of batteries.
7. Use only the specified batteries.

22.6.2 Procedure for Replacing Battery

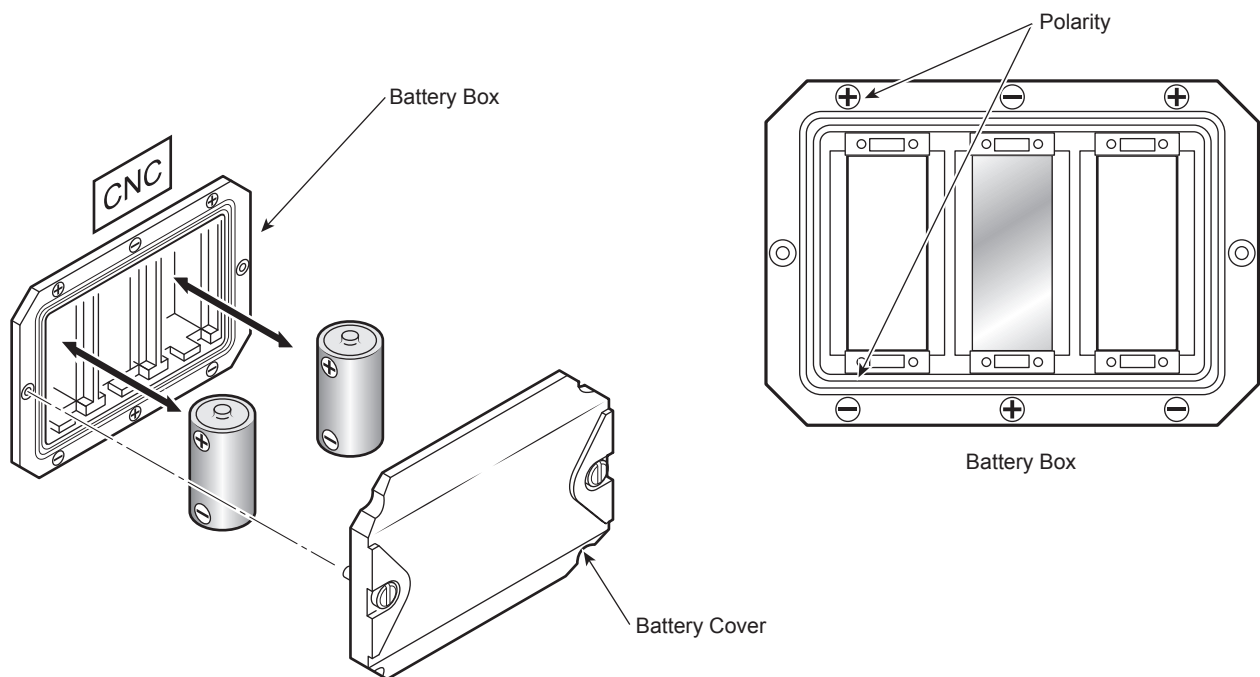
Display the 'PERIODICAL INSPECTION 1' screen. If the 'NEXT CHECK DATE' of the 'BATTERY REPLACEMENT' approaches, replace the NC memory backup batteries and the servo absolute position sensing batteries, and then perform the 'CHECK COMPLETE' operation on the screen.

Function selection key  (SYSTEM) → [PERIODIC INSPECT]

MEM	***	***	***	***	0 mm/min	00002	N00000
						09:59:44	
PERIODICAL INSPECTION 1							
PERIODICAL CHECK ITEM		UNFINISHED CHECK ITEM NUMBER		NEXT CHECK DATE			
50 HOUR CHECK		0		50 HOUR			
150 HOUR CHECK		0		150 HOUR			
1000 HOUR CHECK		0		1000 HOUR			
2000 HOUR CHECK		0		2000 HOUR			
1 WEEK CHECK		0		2012/06/14			
2 MONTH CHECK		0		2012/08/06			
1 YEAR CHECK		0		2013/06/07			
BATTERY REPLACEMENT		0		2013/06/07			
MACHINING CHAMBER WINDOW		0		2017/06/06			
>							
<	I/O	PERIODIC INSPECT	NC SYSTEM	MACHINE STATUS	SYSTEM CONFIG.	CHECK CONTENT	PERIODIC CHECK 2
							PERIODIC CHECK 3
							MCN. STS. ANALY.



Servo Absolute Position Sensing Battery: 4 Alkaline D Batteries



NC Memory Backup Battery: 2 Alkaline D Batteries

Name	Part No.
Alkaline D battery (1 battery)	E30061
Alkaline D batteries (4 batteries)	E30144

- 1) Check the 'NEXT CHECK DATE' of the 'BATTERY REPLACEMENT' on the 'PERIODICAL INSPECTION 1' screen.
- 2) Remove the battery cover.
- 3) Replace the old batteries with new ones.

NOTE

Ensure to insert the batteries correctly with due attention to the polarity marked on the following locations:

- Servo absolute position sensing battery: inside of the battery box
- NC memory backup battery: battery box frame

- 4) Remount the battery cover.
- 5) Open the electrical cabinet door with the main power ON.
 "Opening Electrical Cabinet Door with Main Power ON" (page 8-83)
- 6) To confirm that the batteries are replaced correctly, measure the voltage of batteries on the back side of battery box.
 - Servo absolute position sensing battery: 6 VDC
 - NC memory backup battery: 3 VDC
- 7) Close the electrical cabinet door.
 "Closing Electrical Cabinet Door with Main Power ON" (page 8-84)
- 8) Move the cursor to 'BATTERY REPLACEMENT' and press **[CHECK CONTENT]** on the 'PERIODICAL INSPECTION 1' screen.
[The 'INSPECTION DETAILS' screen is displayed.]
- 9) Confirm the information displayed on the 'INSPECTION DETAILS' screen.
- 10) Move the cursor to the completed 'CHECK ITEM' and press **[CHECK COMPLETE]** → **[EXECUTE]**.
[Dates of 'FINAL CHECK DATE' and 'NEXT CHECK DATE' are updated.]

23 MAGAZINE

23.1 Precautions when Cleaning Magazine

DANGER

Turn OFF the main power.

WARNING

Clean inside magazine to prevent the entry of chips into drive components.
[Machine deterioration, component malfunction]

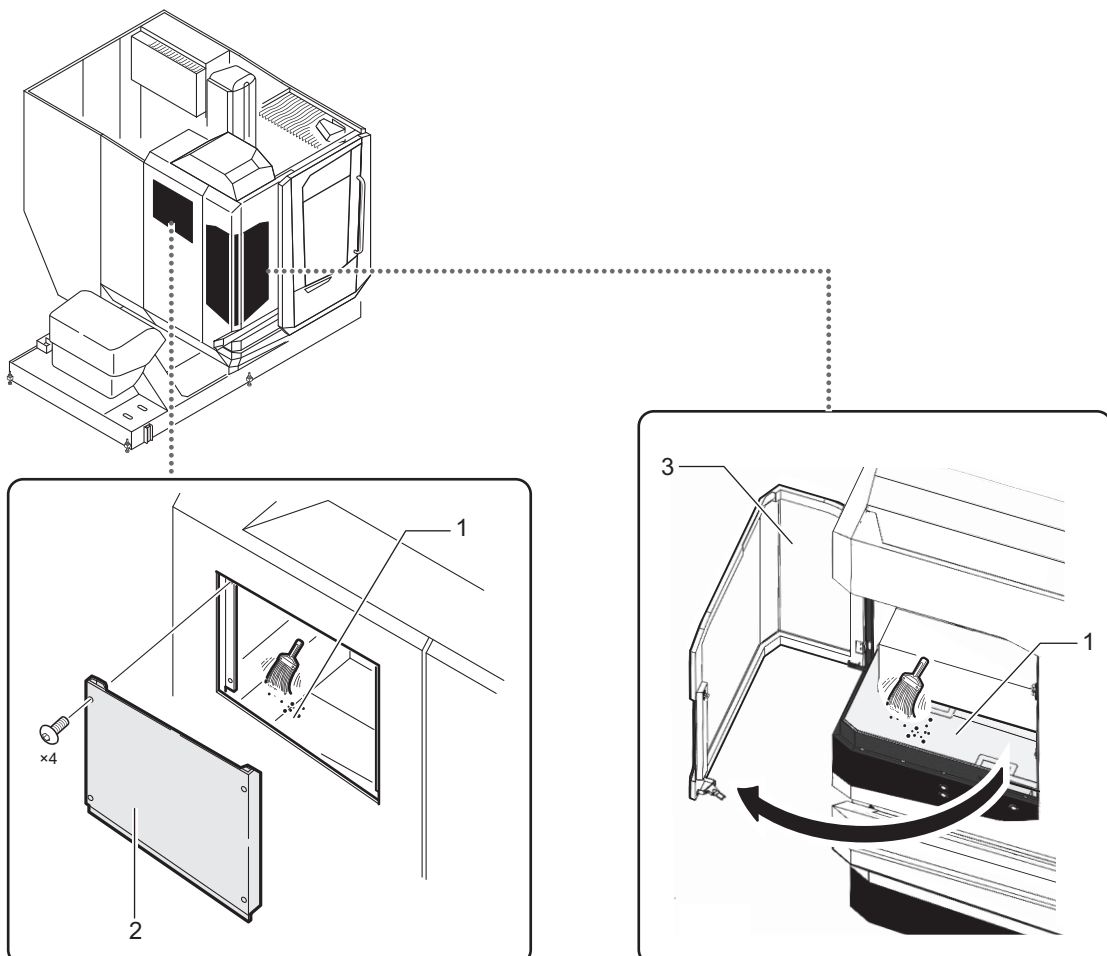
CAUTION

1. Do not use compressed air to clean the machining chamber.
[Chips may enter the driving unit, causing machine damage.]
2. Do not touch chips with bare hands. If handling chips, wear gloves that have resistance to cutting.
[Injury]

23.2 Cleaning Inside Magazine

DANGER

Turn OFF the main power.



1

Oil Pan

2	Maintenance Cover
3	Magazine Door

<Procedure>

- 1) Turn OFF the main power.
- 2) Remove the left side maintenance cover.

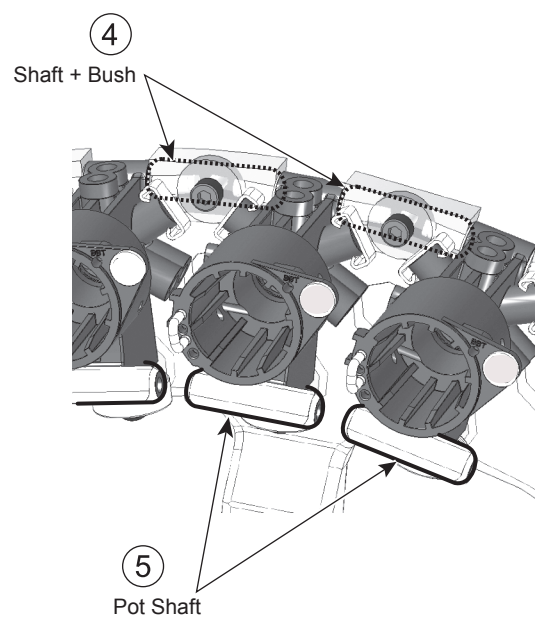
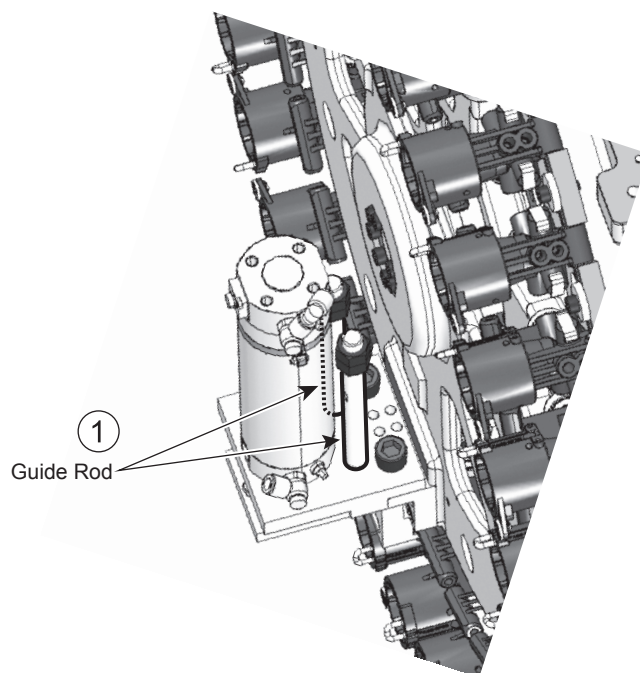
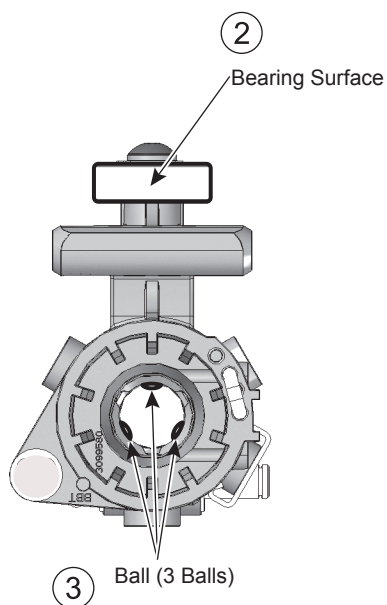
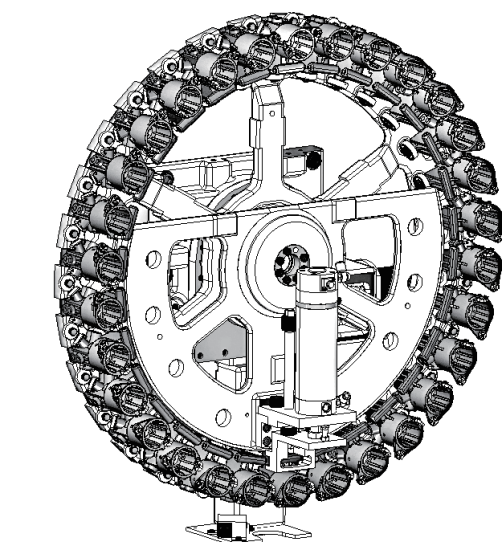
**NOTE**

For the machine with the magazine door (option), open the magazine door.

- 3) Remove chips that have accumulated in the oil pan inside the magazine with a broom.
- 4) Remount the maintenance cover.

23.3 Replenishing Grease

No.	Supplied to	Name	Quantity (L)	Replenishment Interval
①	Guide rod	Shell Shell Gadus S2 V220 0	Adequate quantity	As required
②	Bearing surface			
③	Ball			
④	Shaft + bush			
⑤	Pot shaft			

**NOTE**

1. Uniformly grease the surfaces of the balls.
2. Do not grease the tapered section of the pot. Greasing the tapered section of the pot may lead to runout at the tool tip during spindle tool rotation, resulting in adverse effects on the machining accuracy.

24 CHIP CONVEYOR (REAR DISPOSAL TYPE) (OPTION)

 Chip conveyor (left disposal type) (option): CHIP CONVEYOR INSTRUCTION MANUAL

24.1 Precautions when Using External Chip Conveyor



WARNING

1. Do not operate the chip conveyor or perform maintenance and inspection tasks without reading and obtaining a thorough understanding of the instruction manual supplied by chip conveyor manufacturer.
2. Keep the instruction manual supplied by chip conveyor manufacturer on hand to enable immediate reference when operating the chip conveyor and performing maintenance and inspection tasks.
3. Do not place hands or feet inside the chip conveyor during operation.
[Entanglement, serious injury]
4. Before placing rags on the conveyor belt to clean, stop the chip conveyor.



CAUTION

1. Do not operate the chip conveyor intermittently.
2. The chip conveyor cannot carry materials larger than cutting chips.

NOTE

1. Close the operation panel side door before starting the chip conveyor operation.
2. Carefully consider the appropriate cutting conditions to generate chips which can be removed from the machining chamber.
3. When operating the chip conveyor, pay careful attention to the followings;
 - Check if there is any foreign matter on the chip conveyor belt.
 - Check if too many chips have accumulated on the chip conveyor belt.
 - Check if there is any abnormal noise during the operation.

24.2 Operating Chip Conveyor

 Machine operation

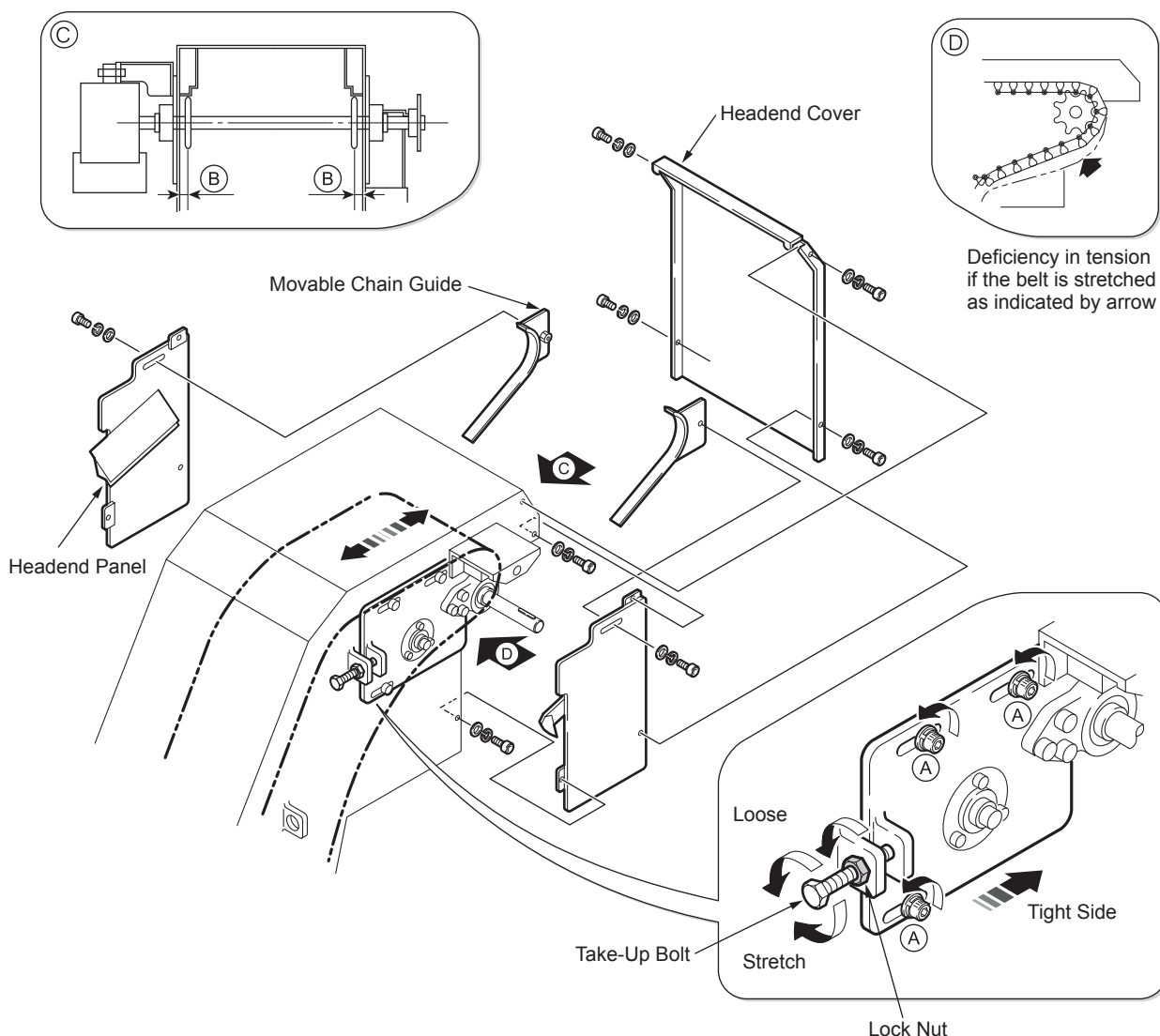
24.3 Cleaning Chip Conveyor

 Instruction manual supplied by chip conveyor manufacturer

24.4 Adjusting Chip Conveyor Belt

NOTE

Adjust the chip conveyor belt two or three months after the start of the operation for the first adjustment. Adjust the chip conveyor belt once a year thereafter.



WARNING

Turn OFF the main power before take-up adjustment.

[Entanglement of hands or feet/Serious injury]

<Procedure>

- 1) Remove the headend cover, movable chain guide, and headend panel in this order.
- 2) Loosen the bolt (A).
- 3) Loosen the lock nut of the take-up bolt.
- 4) Turn the take-up bolt CW to the end and tension the belt enough.
- 5) Return the take-up bolt about one and half turn CCW.

NOTE

Adjust the right and left tension of the belt equally.

- 6) If the gap between the main chain gear and frame (B) is not even, readjust the take-up bolt.
- 7) Tighten the lock nut.
- 8) Remount the parts and covers.

25 COOLANT CHILLER (OPTION)

25.1 Precautions when Using Coolant Chiller

WARNING

1. Operate the coolant chiller or perform maintenance and inspections with reading and obtaining a thorough understanding of the contents of the instruction manual supplied by coolant chiller manufacturer.
2. Keep the instruction manual supplied by coolant chiller manufacturer on hand to enable immediate reference.

CAUTION

When using the coolant chiller, always use it with machine temperature follow-up control. Do not use the unit with constant temperature control or room temperature follow-up control even when the control method can be switched.
[Thermal displacement adversely affecting machining accuracy]

25.2 Visually Inspecting Coolant Chiller

Visually inspect the following items periodically. If any abnormality is found, contact the DMG MORI Service Department.

- Abnormal noise
- Damage to the external appearance
- Corrosion
- Rusting
- Oil leakage
- Frost on the condenser

25.3 Cleaning Air Filter and Condenser

WARNING

1. Turn OFF the main power.
2. Do not pour water over the coolant chiller.

CAUTION

1. The coolant chiller may stop when dust or dirt of the air filter prevents airflow. If this case, push in the pressure switch to reset the switch after cleaning the air filter.
2. Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]
3. Take care not to damage the copper pipe of the condenser.
[Gas leakage]

<Procedure>

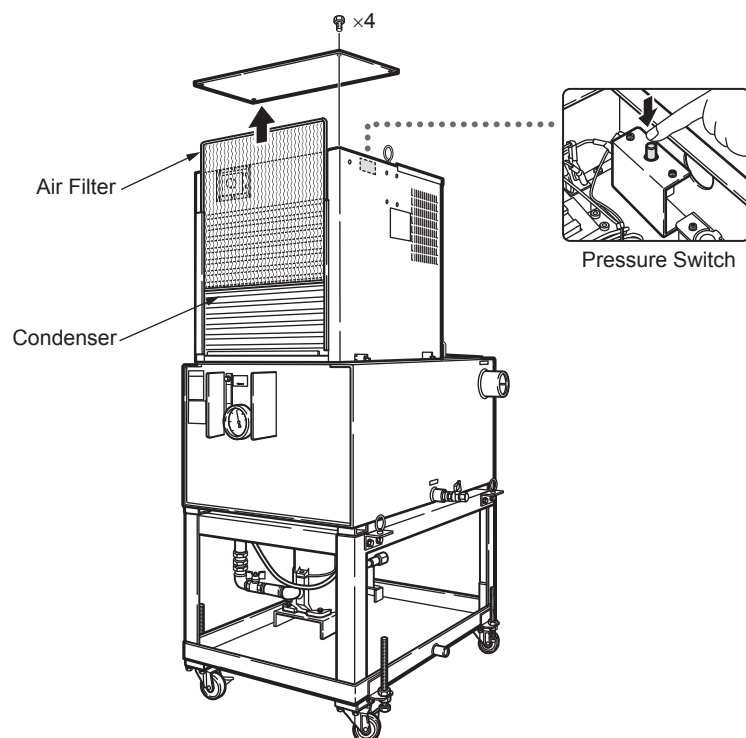
- 1) Turn OFF the main power.
- 2) Remove the air filter.

NOTE

The condenser is exposed when the filter is removed.

- 3) Clean the air filter using one of the following methods:
 - Blowing compressed air
 - Washing with a neutral detergent
- 4) Clean the condenser using one of the following methods:
 - Using a brush
 - Blowing compressed air

5) Remount the air filter.



26 MIST COLLECTOR (OPTION)

WARNING

Turn OFF the main power.

CAUTION

Wear protective gloves during maintenance work to prevent injuries.

26.1 AFS Series

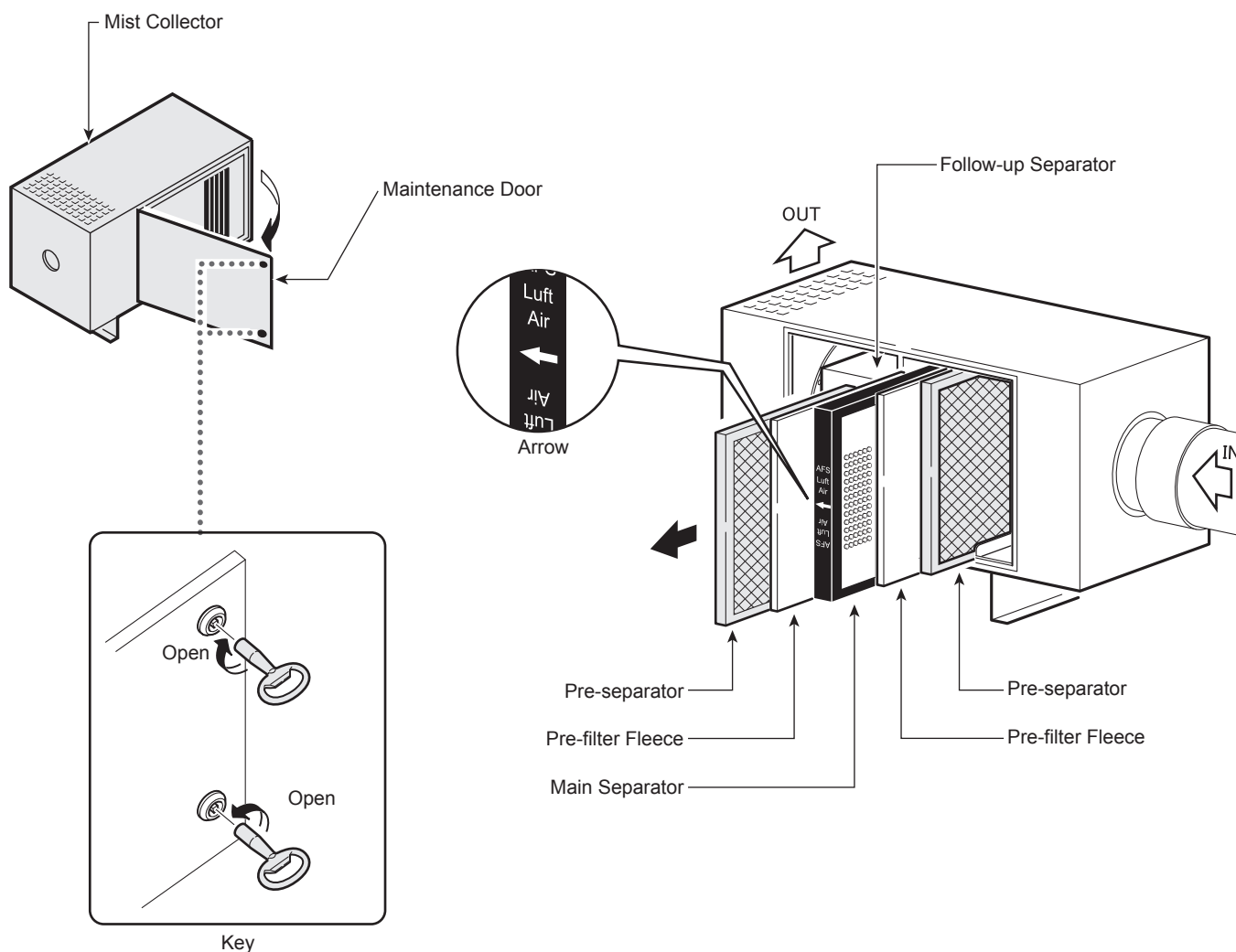
<Necessary Parts>

- Cleaning cloths
- Fat-dissolving cleaning agent (Do not use organic solvent)
- Wet vacuum cleaner
- Fitting tools

NOTE

Use the cleaning fluid that satisfies the following conditions:

- 80°C or lower
- No effect on aluminum or plastic



NOTE

1. Use the supplied key to open/close the maintenance door.
2. The direction to open/close the maintenance door differs depending on the machine.

26.1.1 Checking and Cleaning Pre-separator/Main Separator

<Procedure>

- 1) Turn OFF the main power.
- 2) Open the maintenance door.
- 3) Pull out the pre-separators, the main separator, and the pre-filter fleeces.
- 4) Clean the floor of the mist collector using a wet vacuum cleaner or cleaning cloth.
- 5) Check the pre-separators and the main separator and clean them using hot water and fat-dissolving cleaning agent if necessary.

NOTE

1. Do not open or disassemble the main separator.
 2. Although the main separator has the self-cleaning function, clean the main separator if seriously soiled or clogged.
- 6) Replace the pre-filter fleeces with new ones if necessary.

NOTE

Pre-filter fleece part No.

- AFS 600: SBF6013158
- AFS 1100/AFS 1600: SBF6010082

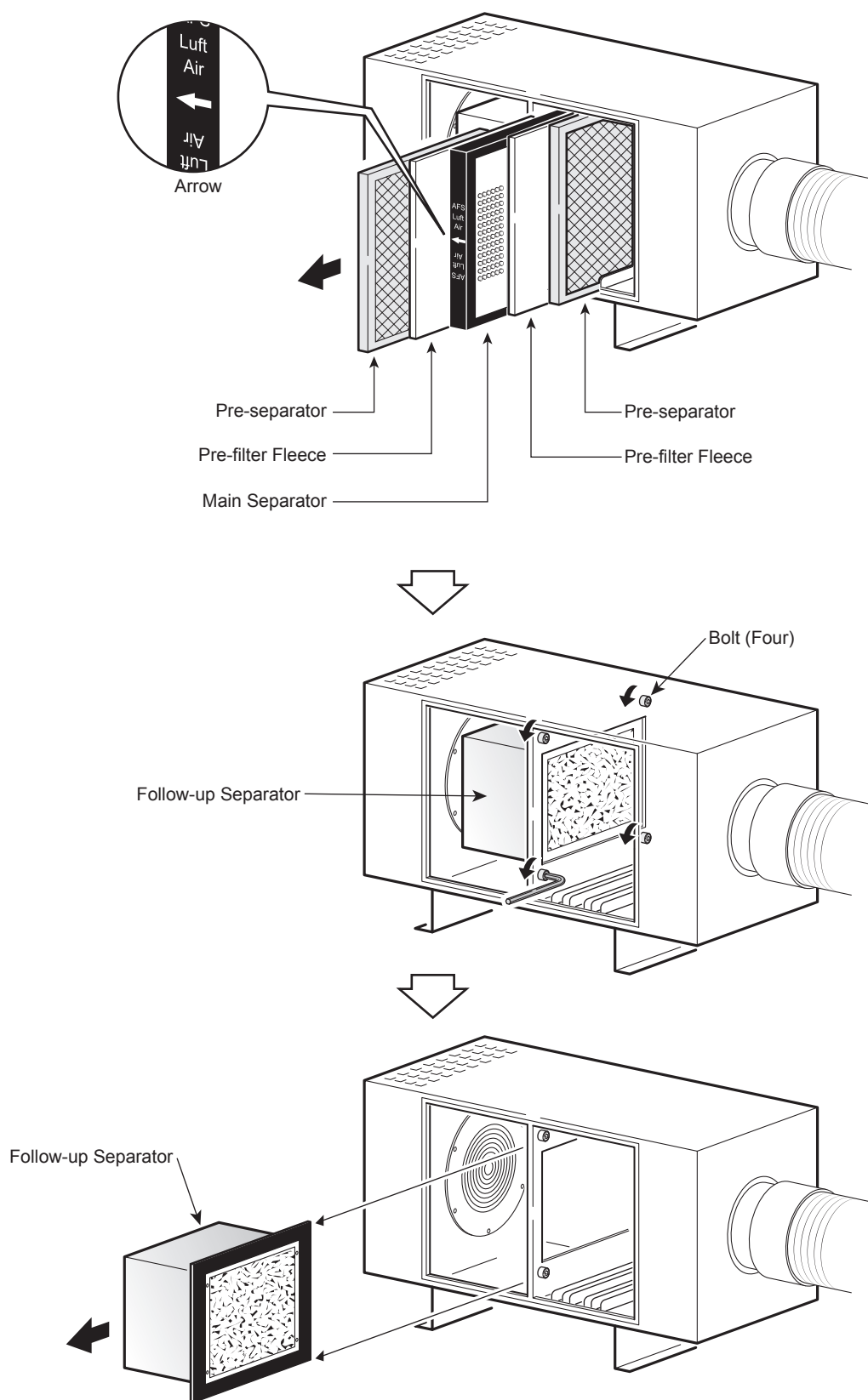
- 7) Reinsert the pre-separators, the main separator, and the pre-filter fleeces.

NOTE

When inserting the main separator, pay attention to the directions of the arrows on the main separator frame. The mist collector will not function properly if the main separator is reinserted in the wrong direction.

- 8) Close the maintenance door.

26.1.2 Checking and Cleaning Follow-up Separator



<Procedure>

- 1) Turn OFF the main power.
- 2) Open the maintenance door.
- 3) Remove the pre-separators, the main separator, and the pre-filter fleeces.
- 4) Loosen the four bolts on the retainer plate to remove the follow-up separator.
- 5) Clean the floor of the mist collector using a wet vacuum cleaner or cleaning cloth.

- 6) Check the follow-up separator and clean it using hot water and fat-dissolving cleaning agent if necessary.
- 7) Reinsert the follow-up separator.
- 8) Tighten the four bolts on the retainer plate.
- 9) Reinsert the pre-separators, the main separator, and the pre-filter fleeces.

NOTE

When inserting the main separator, pay attention to the directions of the arrows on the main separator frame. The mist collector will not function properly if the main separator is reinserted in the wrong direction.

- 10) Close the maintenance door.

26.2 HVS- Series



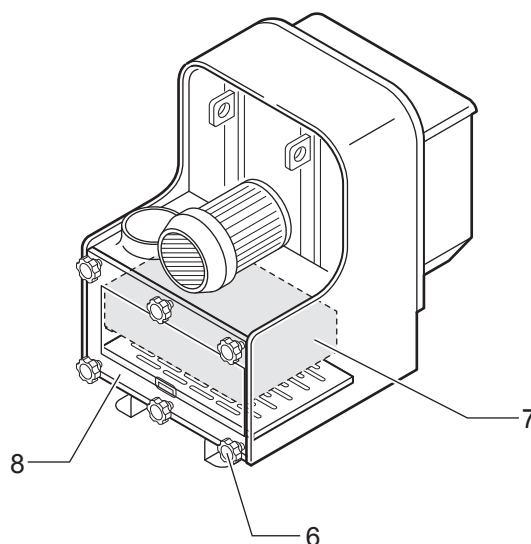
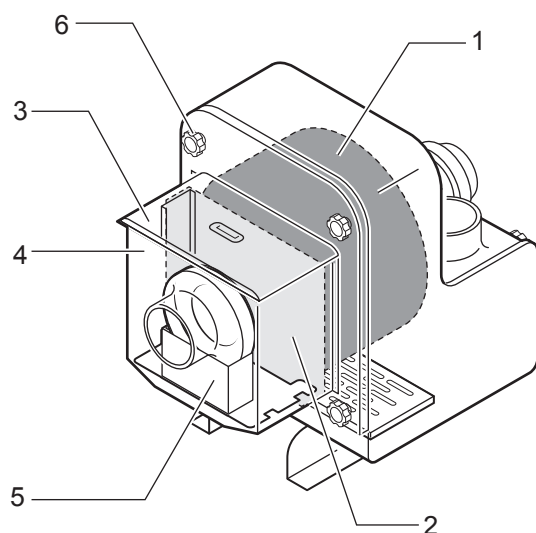
WARNING

Wait until the fan has stopped rotating.



CAUTION

Maintenance work must be performed by qualified personnel.



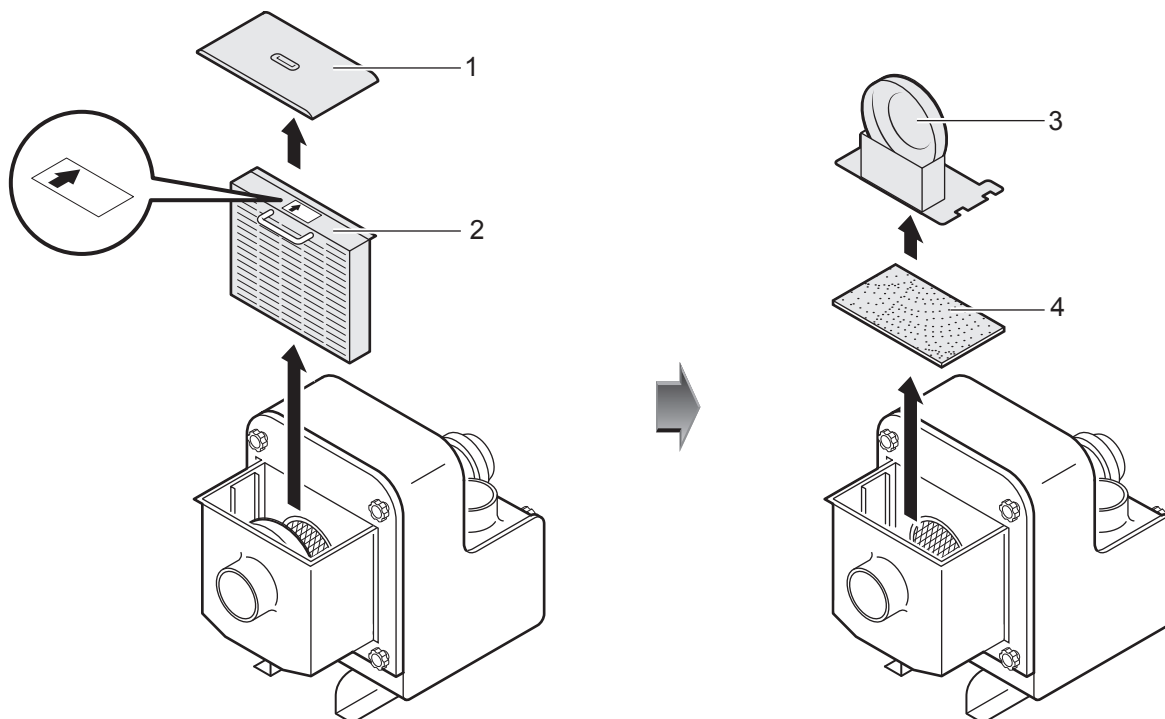
1	Drum filter unit
2	Louver unit
3	Pretreatment box lid
4	Pretreatment box
5	Baffler unit
6	Knob
7	Final filter
8	Rear lid

26.2.1 Cleaning Louver Unit/Baffler Unit

<Procedure>

- 1) Turn OFF the main power.
- 2) Pull up the pretreatment box lid (1).
- 3) Pull out the louver unit (2) upward.
- 4) Pull out the baffler unit (3) upward.

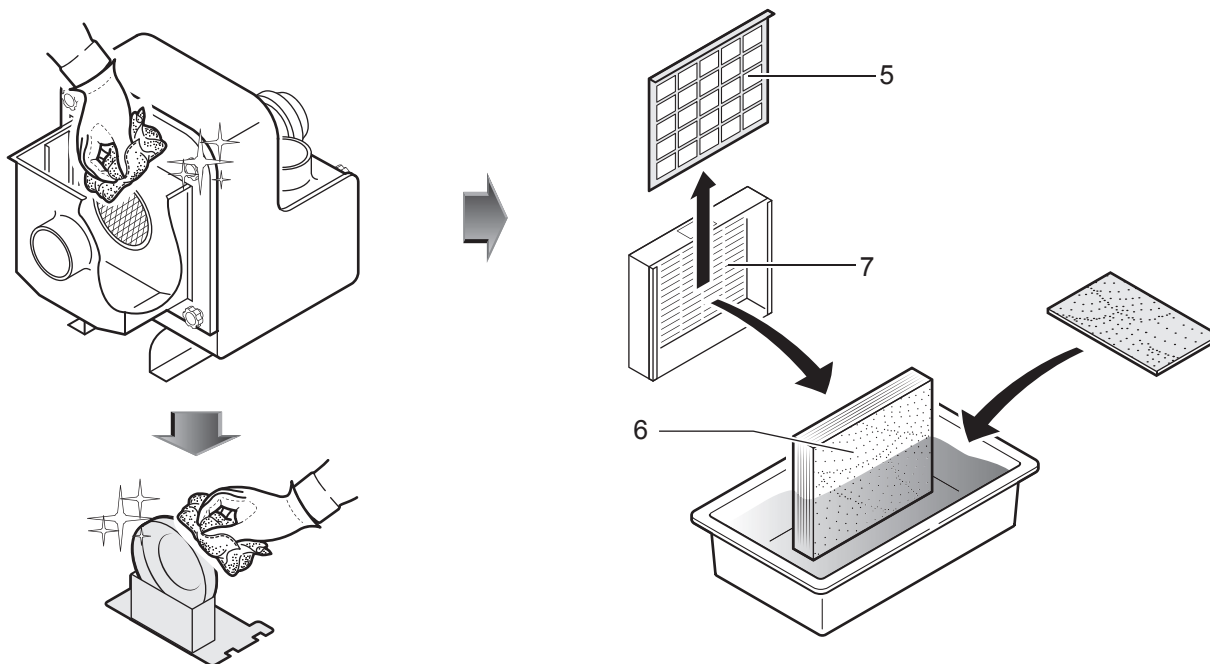
- 5) Remove the bottom mat for the pretreatment box (4).



- 6) Clean the inside of the louver unit.
 7) Clean the baffler unit.
 8) Pull out the grid cover (5) on the back side of the louver unit and remove the filter (6).
 9) Clean the louver (7) of the louver unit.
 10) Clean the filter of the louver unit and the bottom mat for the pretreatment box by soaking them in the cleaning water.

NOTE

Push water out of the filter after soaking. The filter may be damaged if it is twisted.



- 11) Mount the filter and the grid cover to the louver unit.
 12) Remount the bottom mat for the pretreatment box, the baffler unit, and the louver unit.



WARNING

Ensure that the parts are mounted in the correct direction.

13) Remount the pretreatment box lid.



CAUTION

Mount the lid so that there is no gap.

[Low performance]

26.2.2 Cleaning Drum Filter/Demister

<Procedure>

- 1) Turn OFF the main power.
- 2) Remove the knob (1) fixing the pretreatment box.
- 3) Open the pretreatment box.



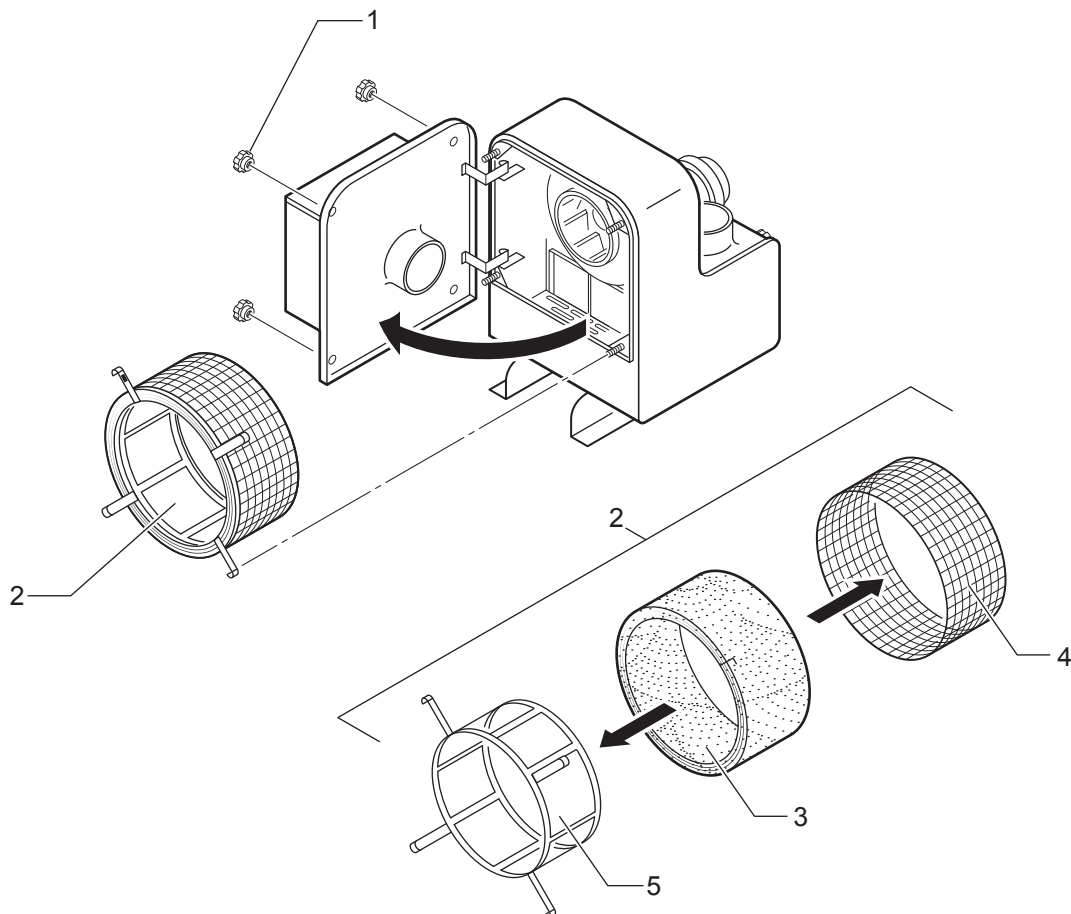
NOTE

Slightly draw the pretreatment box and then open it to the left.



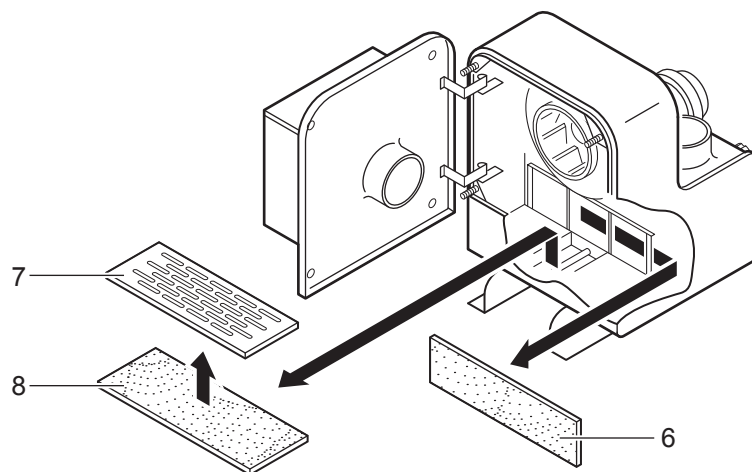
 Pull up the pretreatment box to remove it.

- 4) Pull out the drum filter unit (2).
- 5) Remove the filter holding net (4) and the filter frame (5) from the drum filter (3).



- 6) Pull out the demister (6).**

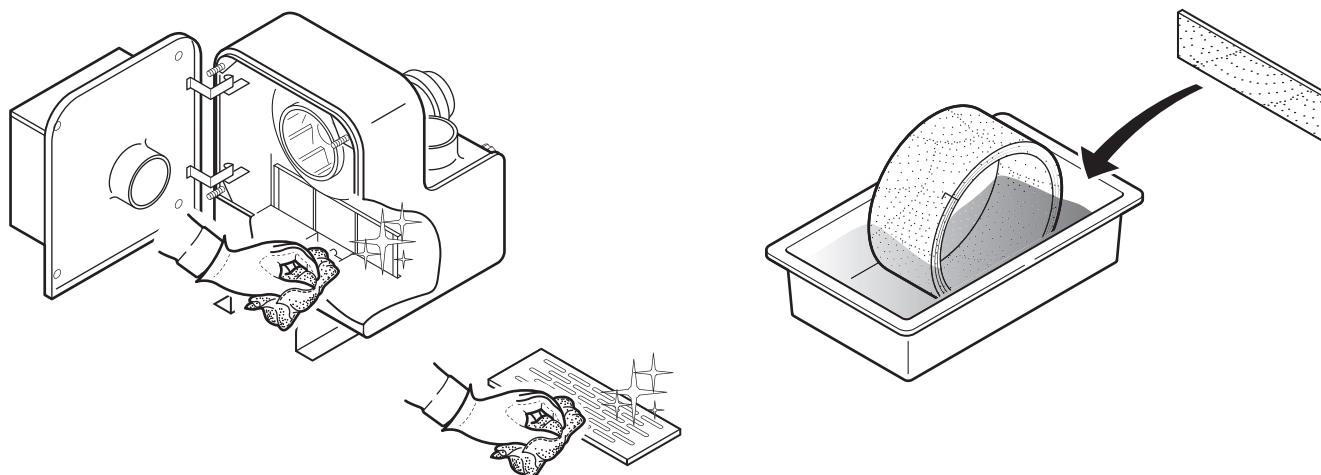
- 7) Remove the retainer plate (7) and the bottom mat (8).



- 8) Clean the inside and the retainer plate.
9) Clean the drum filter and the demister by soaking them in the cleaning water.

NOTE

Push water out of the filter after soaking. The filter may be damaged if it is twisted.



- 10) Remount the demister, the bottom mat, and the retainer plate.
11) Mount the filter frame and the filter holding net to the drum filter.

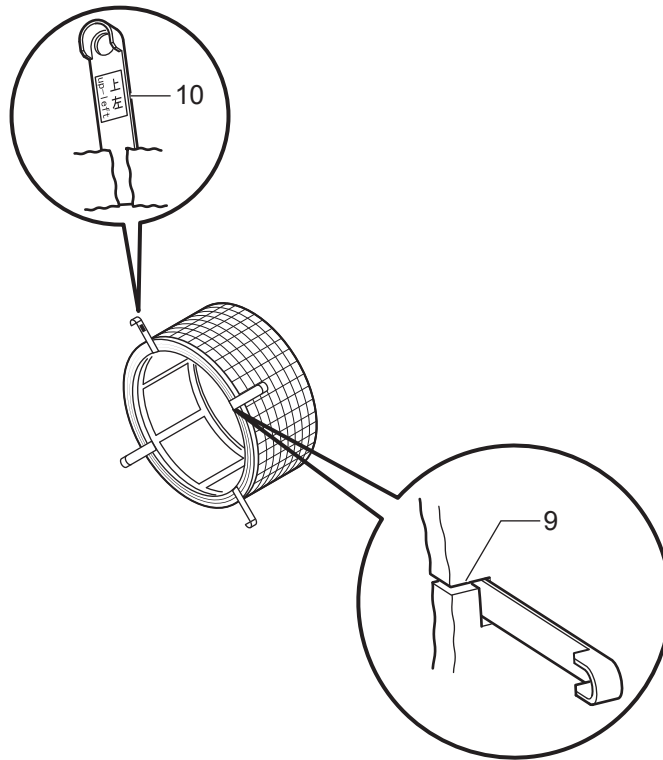
NOTE

Mount the filter frame to fit the slit (9) of the drum filter.

- 12) Remount the drum filter unit.

 NOTE

Mount the drum filter unit with the seal (10) positioned upper left.



13) Close the pretreatment box and fix it with the knob.

**WARNING**

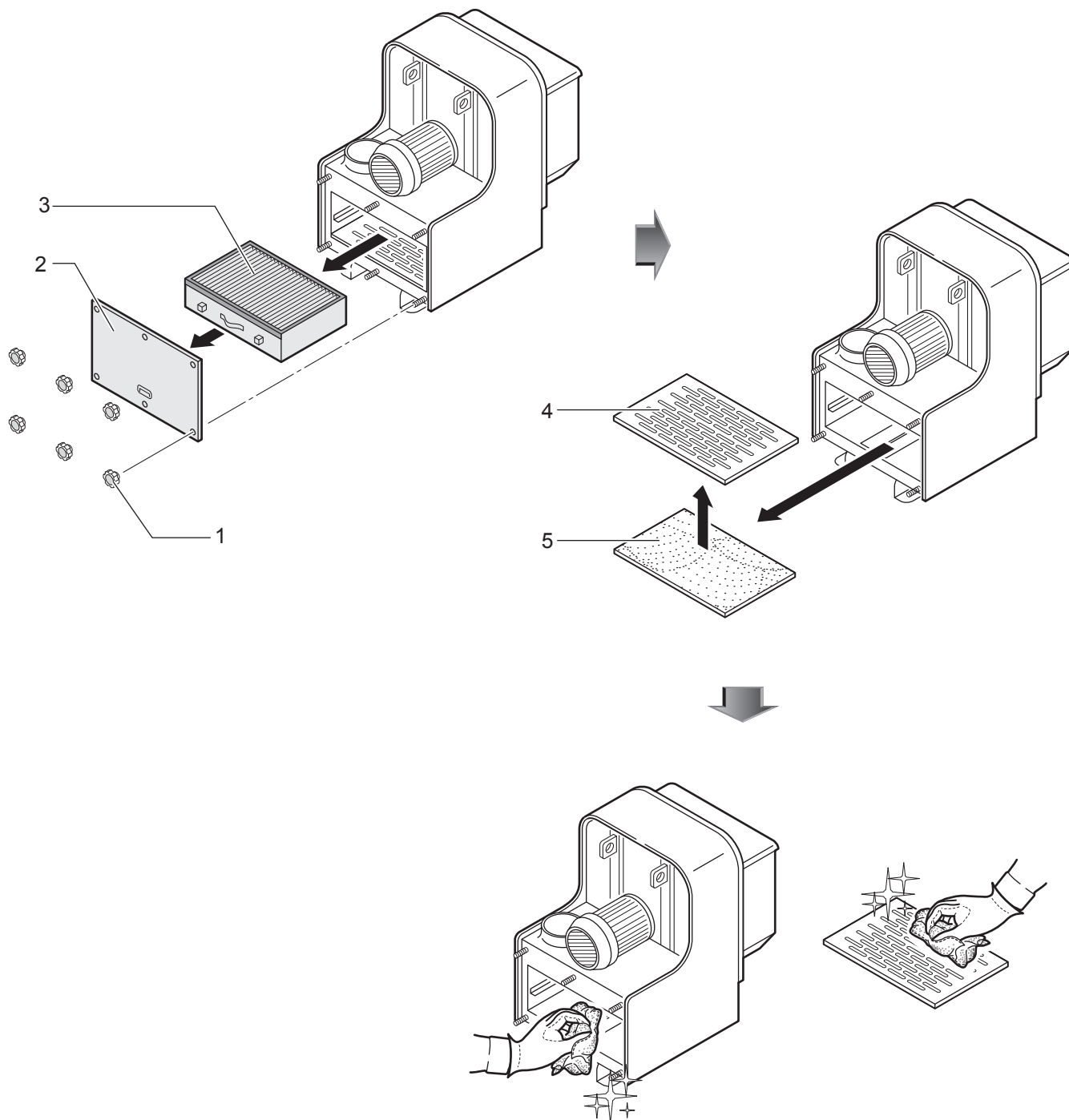
Tighten the knob evenly and securely.
[Oil leakage]

26.2.3 Replacing Final Filter

<Procedure>

- 1) Turn OFF the main power.
- 2) Remove the knob (1) fixing the rear lid.
- 3) Remove the rear lid (2).
- 4) Pull out the final filter (3).
- 5) Remove retainer plate (4) and the bottom mat (5).

6) Clean the inside and the retainer plate.



7) Remount the bottom mat and the retainer plate.

8) Mount a new final filter.

WARNING

Ensure that the parts are mounted in the correct direction.

9) Fix the rear lid with the knob.

WARNING

Tighten the knob evenly and securely.

[Oil leakage]

27 HYDRAULIC UNIT (OPTION)

NOTE

This hydraulic unit is installed for the hydraulic fixture I/F specification or the APC specification.

! DANGER

Turn OFF the main power.

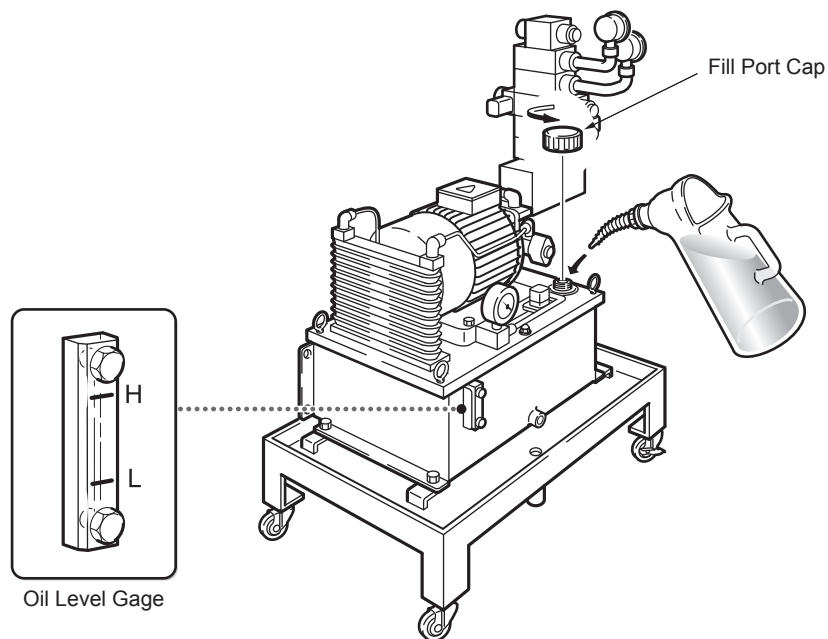
! CAUTION

1. If the oil level decreases rapidly, the pump unit or the machine may be malfunctioning. Contact the DMG MORI Service Department for assistance.
2. Maintain oil at the correct level to prevent air being suctioned through the pump unit.
3. Keep oil free from contamination.
4. If foreign matter accumulates in the tank, oil cannot be kept free from contamination, causing pump damage.
5. Clogged radiator causes oil pressure to be raised.
6. Clogged suction strainer causes pumps and piping damage.
7. If the oil pressure setting is incorrect, hydraulic unit malfunction and damage may result.

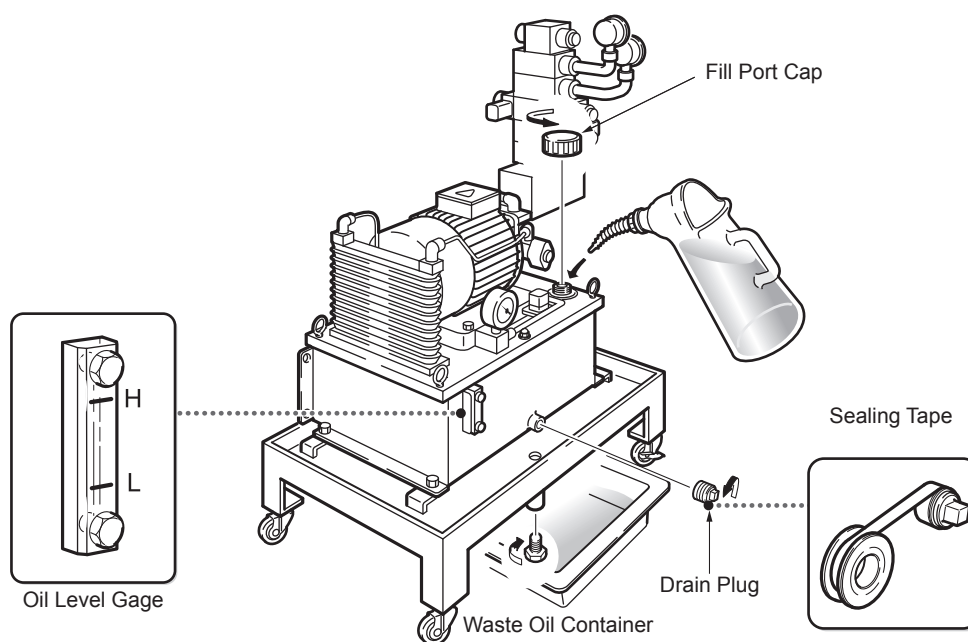
27.1 Checking Oil Level/Replenishing Oil

Turn OFF the main power and supply oil when the oil level is lower than the lower limit on the oil level gage.

 "OILS/COOLING FLUID" (page 8-23)



27.2 Replacing Oil



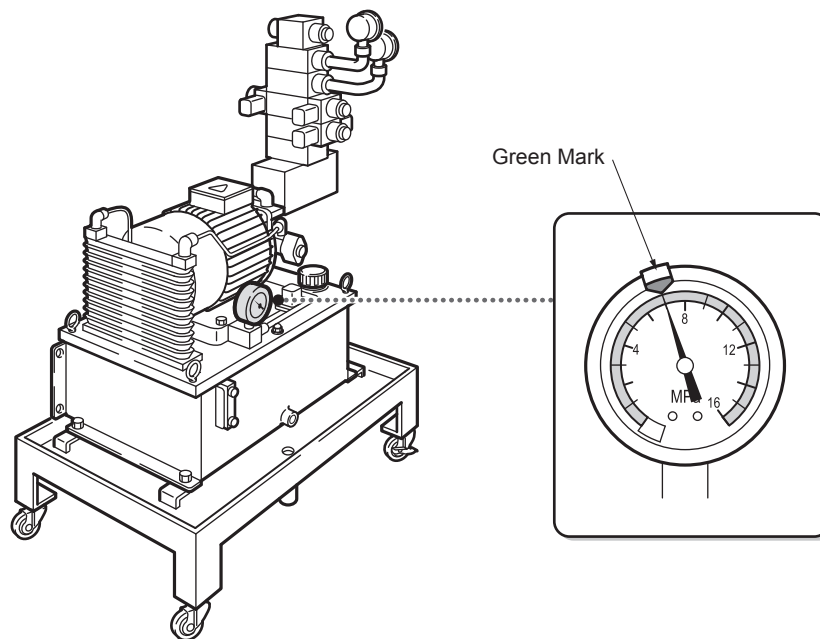
<Procedure>

- 1) Turn OFF the main power.
- 2) Remove the fill port cap.
- 3) Place the waste oil container beneath the oil pan's drain plug.
- 4) Remove the oil pan's drain plug.
- 5) Remove the drain plug from the hydraulic unit and drain the oil from the tank.
- 6) Wrap sealing tape around the threaded section of the drain plug for the hydraulic unit.
- 7) Remount the drain plug to the hydraulic unit.
- 8) Supply oil while checking the oil level gage.
- 9) Remount the fill port cap.
- 10) Remount the drain plug to the oil pan.
- 11) Turn ON the main power.
- 12) Confirm pump pressure and suction noise are normal.

NOTE

If the suction sound is louder than prior to oil replacement, check the oil level again.

27.3 Checking Pressure Gage



<Procedure>

- 1) Turn ON the main power and control power supplies.

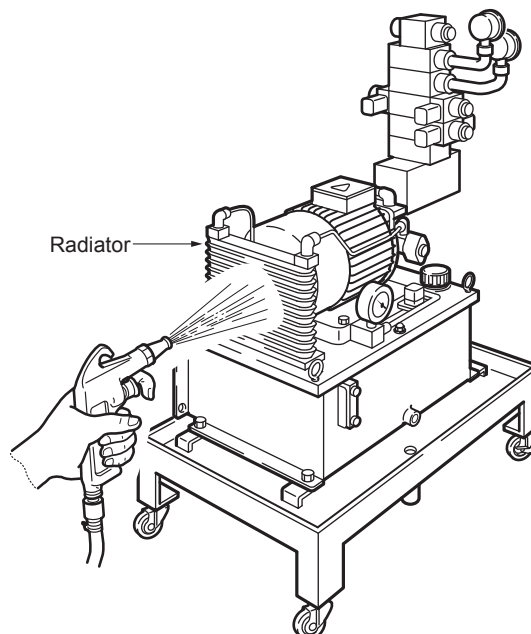


NOTE

Confirm all machine operations have come to a complete stop.

- 2) Confirm the pressure is set at the point indicated by the green mark.

27.4 Cleaning Radiator



<Procedure>

- 1) Turn OFF the main power.
- 2) Clean the radiator by blowing compressed air.



CAUTION

Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]

27.5 Cleaning Suction Strainer and Tank

<Procedure>

- 1) Turn OFF the main power.
- 2) Drain oil in the tank.
 Refer to the steps 3) - 7) in "Replacing Oil" (page 8-106).
- 3) Disconnect the piping.



NOTE

The pipes are color-coded. Check the colors before reconnecting the pipes.

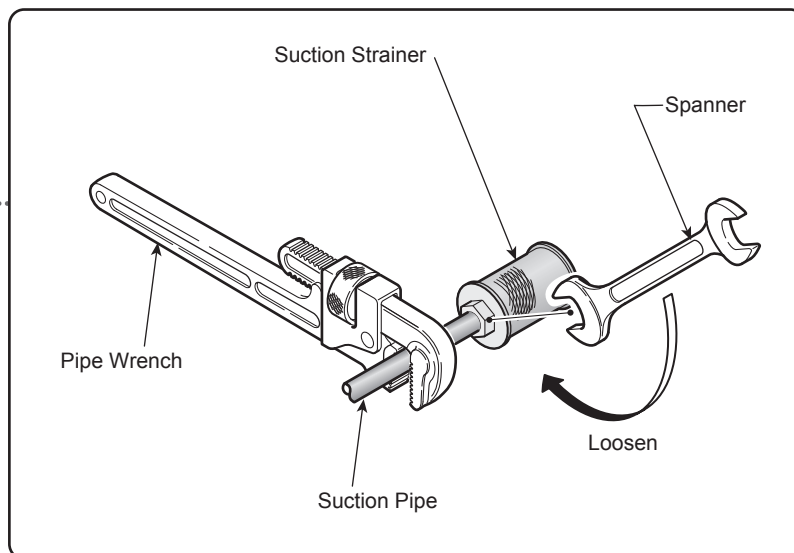
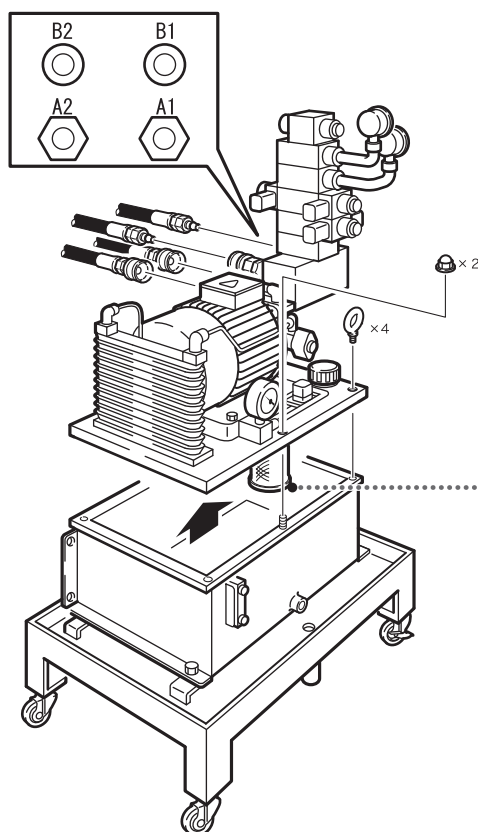
- 4) Remove the tank upper plate.
- 5) Clean the suction strainer using the following procedure:
 - a) Remove the suction strainer.



CAUTION

Clamp the suction pipe with a pipe wrench and turn the suction strainer counterclockwise using a spanner. If the suction strainer is turned without the suction pipe being clamped with a pipe wrench, the suction pipe will turn simultaneously, causing oil leakage.

Fixture 2 Fixture 1



- b) Clean the suction strainer with kerosene.



CAUTION

Use caution when using kerosene, and make sure there is no open flame in the vicinity.

- c) Dry the suction strainer by blowing compressed air.



CAUTION

Wear safety goggles without air vent at all times while blowing compressed air.

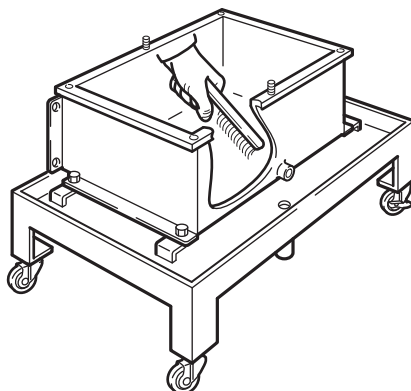
[Eye damage due to ejected foreign matter]

- d) Apply sealing tape to the threaded section of the suction pipe and reattach the suction strainer.
- 6) Clean the inside of the tank with kerosene.

⚠ CAUTION

Use caution when using kerosene, and make sure there is no open flame in the vicinity.

- 7) Remove foreign matter from around the drain plug using a brush.



- 8) Remount the hydraulic unit.

27.6 Replacing Line Filter Element

The line filter is mounted to remove foreign matter from the hydraulic oil. If the filter is clogged, the hydraulic oil cannot pass through the filter element and foreign matter in the oil cannot be removed. Replace the filter element by following the procedures below.

<Replacement Interval>

Annually, when replacing the hydraulic oil or when the visual indicator turns red.

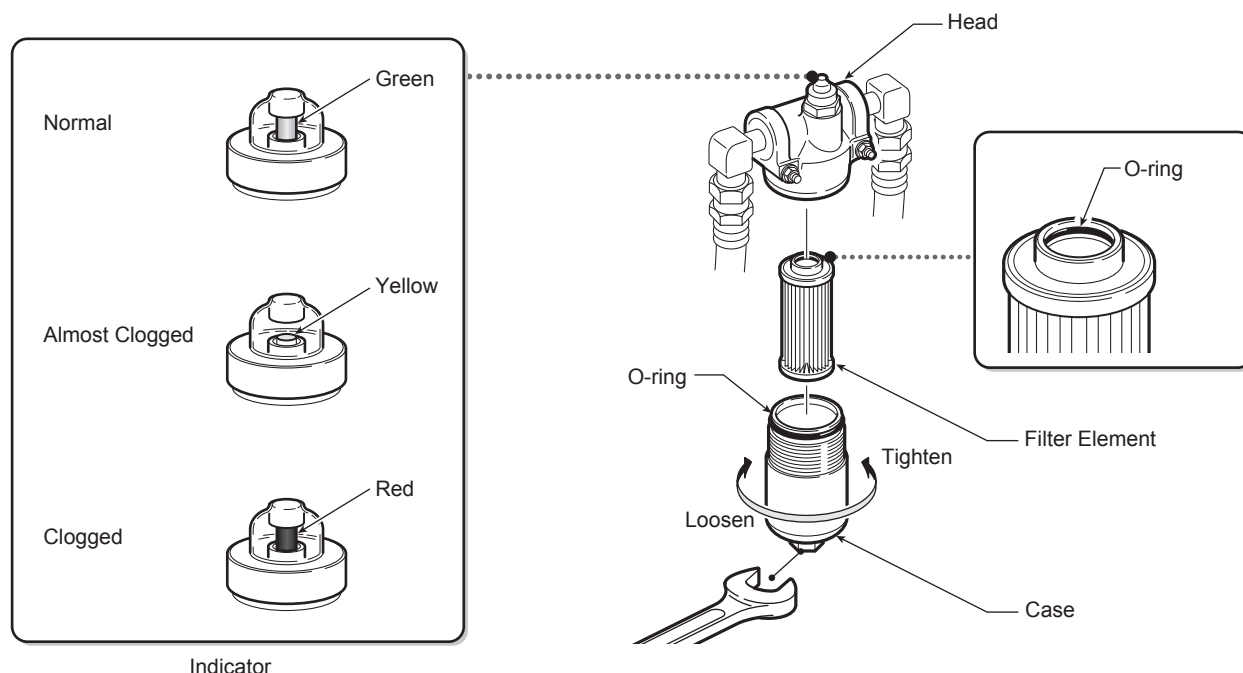
NOTE

Perform visual inspection of the indicator daily. When the machine is not in operation, the indicator will not be displayed in red.

<Necessary parts>

Filter Element (with an O-ring for the case)

“CONSUMABLE PARTS LIST” (page 8-25)



NOTE

The location of the line filter may differ depending on the machine model.

<Procedure>

- 1) Turn OFF the main power.

- 2) Remove the case from the head by turning the hexagonally-shaped part at the bottom of the case counterclockwise with a spanner.

 NOTE

Put the waste oil container underneath the line filter in order to catch the spilt oil.

- 3) Replace the filter element by following the procedure below:

- a) Remove the old filter element.



It is easy to take the filter element off the case, as it is secured only with the O-ring.

- b) Apply some oil* on the inner diameter of the O-ring in the new filter element.

 NOTE

1. The new filter element comes with an O-ring set inside. Apply oil on the O-ring without removing it.
2. * Use the same oil that is used in the hydraulic unit.

- 4) Replace the O-ring in the case.
- 5) Wipe any stains off from inside the case.
- 6) Mount the new filter element on the case.
- 7) Turn the case clockwise to reinstall it on the head.
- 8) Tighten the hexagonally-shaped part at the bottom of the case with a spanner.
Tightening Torque: 25 - 35 N•m

28 ELECTRICAL CABINET CHILLER (OPTION)

28.1 SK Series

As the condenser surface is covered with a dirt-repelling RiNano coating, use of the filter is not required in environments with a little dust (the filter is not supplied with the electrical cabinet chiller). Clean the external circuits such as the condenser periodically using a compressed air.

The following two types of filters are available as options.

- Polyurethane filter: for environments with heavy dry dust when the filter can be cleaned or replaced frequently.
- Metal filter: for environments with risks of sticky dirt such as oil mist

Model No.	Material	Part No.	Cleaning/Replacement
SK3303.520 SK3361.520	Polyurethane	E55486 (3 filters/1 package)	Consumables (Reusable by cleaning with a compressed air, depending on dirt or soils on them.)
SK3304.520		E18224 (3 filters/1 package)	
SK3303.520 SK3361.520	Metal	E55360 (1 filter/1 package)	Reusable by cleaning
SK3304.520		E55489 (1 filter/1 package)	

28.1.1 Cleaning Condenser

Clean the condenser every 2000 operating hours. Depending on the environment in which the machine is used, cleaning interval may be reduced.



DANGER

1. Turn OFF the main power.
2. Do not use inflammable products.
[Burns]



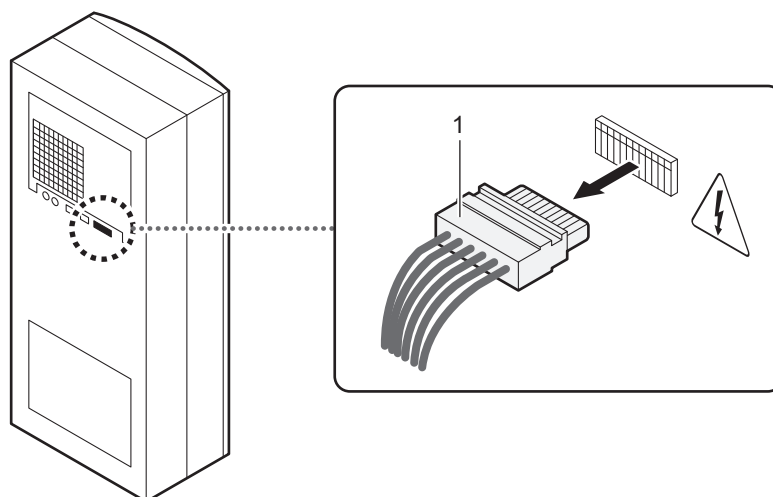
CAUTION

Wear safety goggles without air vent at all times while blowing compressed air.

[Eye damage due to ejected foreign matter]

<Procedure>

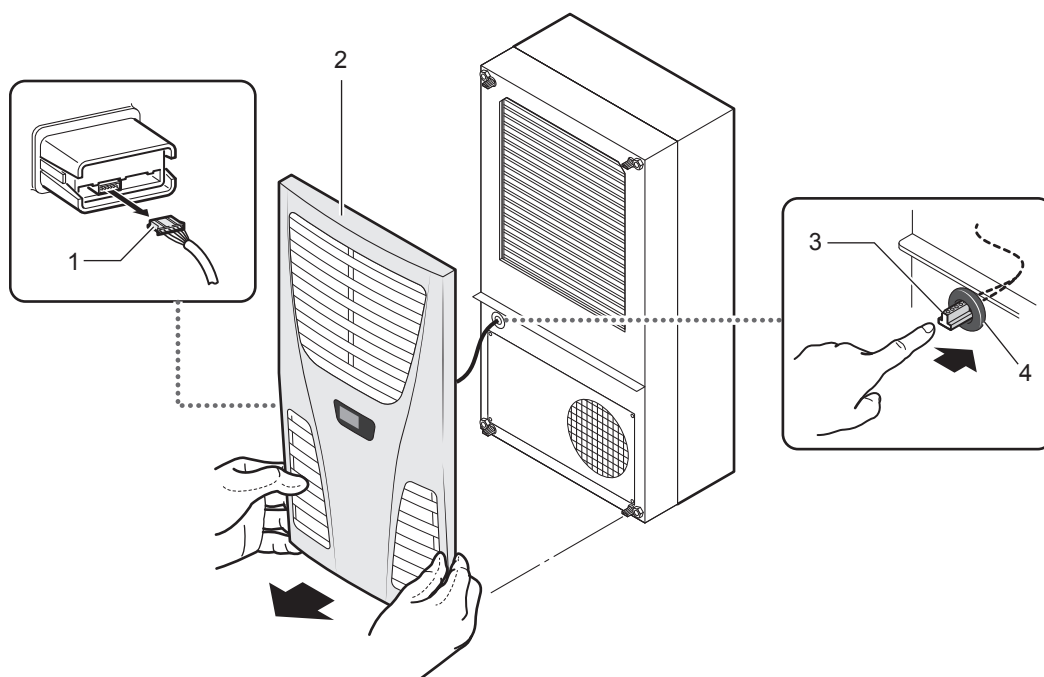
- 1) Turn OFF the main power.
- 2) Open the electrical cabinet door.
 "Opening/Closing Electrical Cabinet Door" (page 8-82)
- 3) Disconnect the power plug.



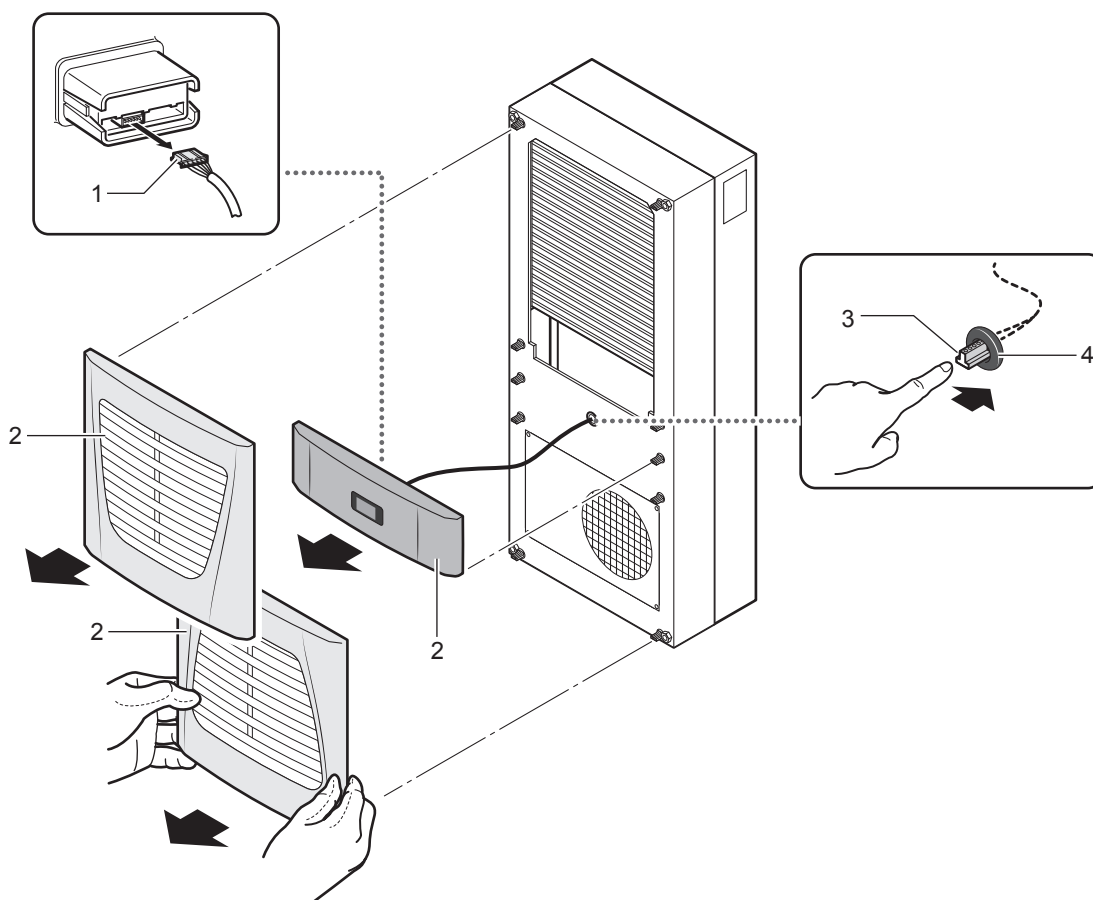
1

Power plug

- 4) Remove the louver.
 - 5) Disconnect the connector from the display.
 - 6) Push the display cable back inside the unit through the cable gland.
- <SK3303.520, SK3361.520>



<SK3304.520>

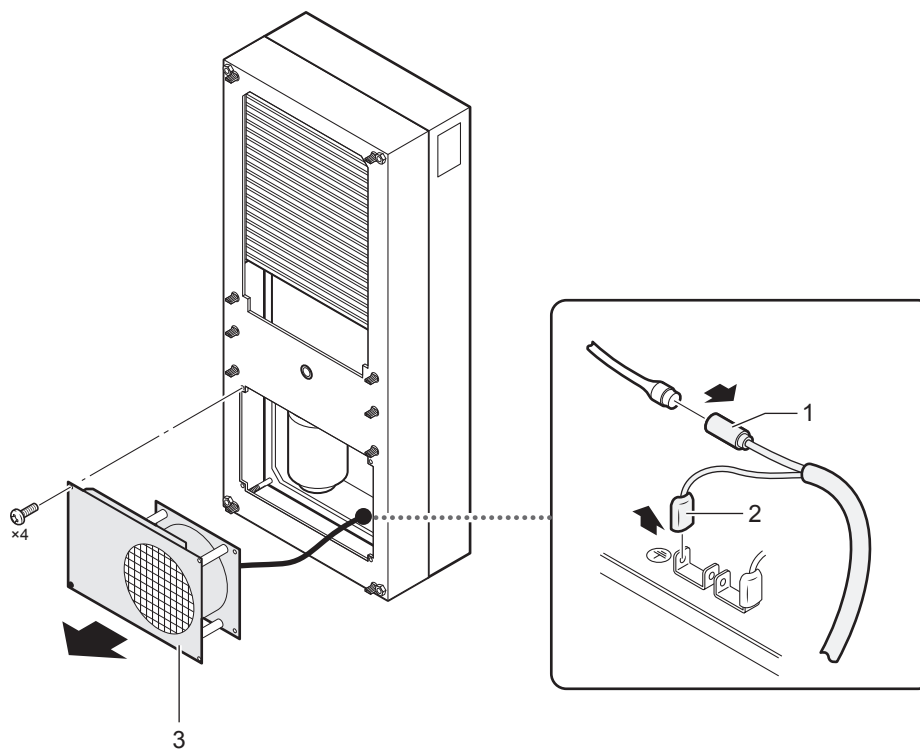


1	Connector
2	Louver
3	Cable

4	Cable gland
---	-------------

7) Remove the external circuit fan panel.

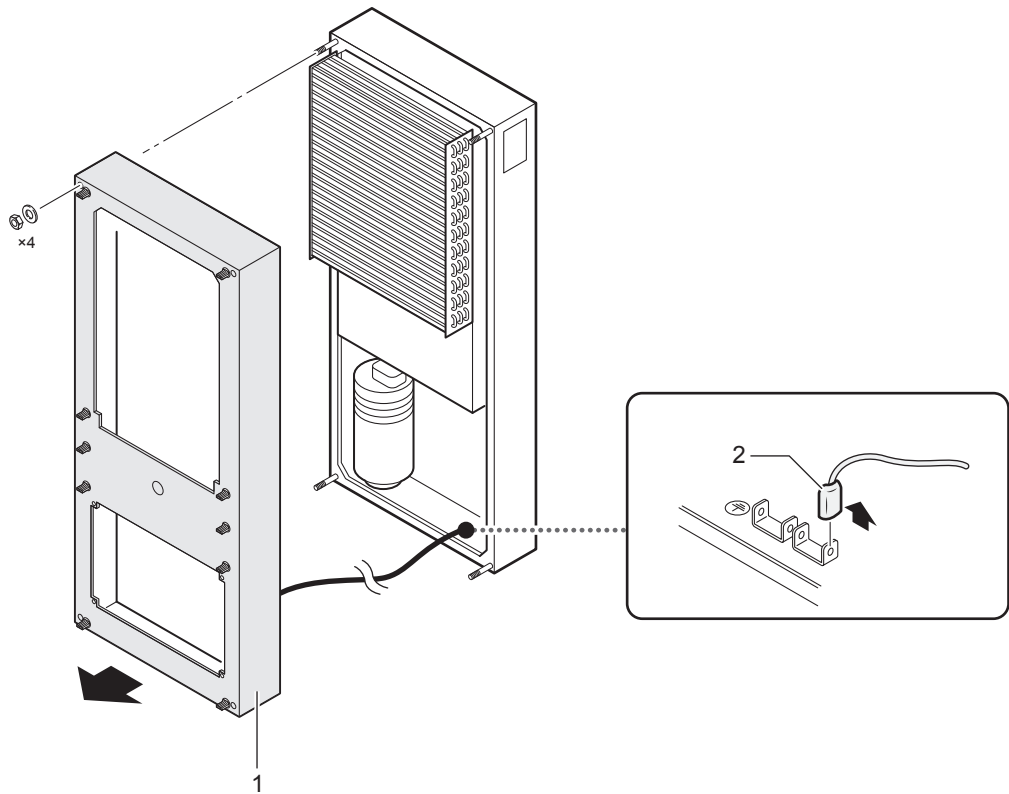
8) Disconnect the connector and remove the earth cable.



1	Connector
2	Earth cable
3	External circuit fan panel

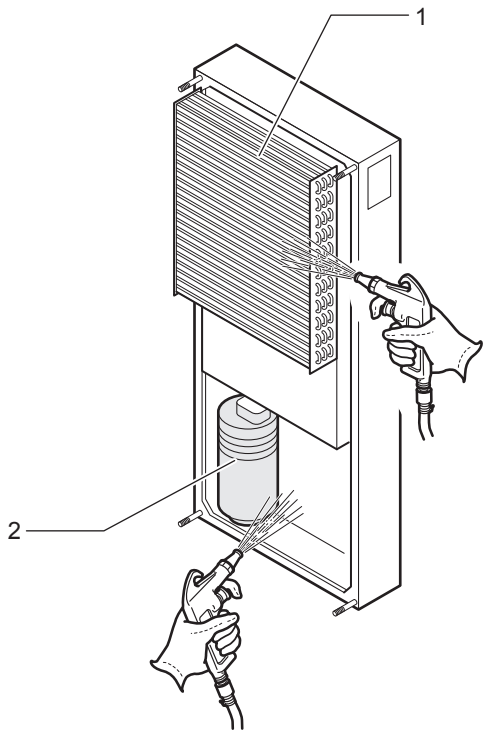
9) Remove the unit cover.

10) Remove the earth cable.



1	Unit cover
2	Earth cable

11) Clean the condenser and the compressor chamber using compressed air.



1	Condenser
2	Compressor

12) Remount the unit cover, the external circuit fan panel, and the louver by performing steps 3) to 9) in reverse.

13) Connect the power plug and turn ON the main power.

14) Check for noise levels and abnormal noises of the compressor and the fan.

28.2 ENC- Series



WARNING

1. Maintenance work must be performed by qualified personnel.
2. Do not directly touch the compressor and the refrigerant pipe during or immediately after the cooling operation since they may get hot.



CAUTION

Inspect and clean the drain hose or the drain pipe periodically.
[Drain hose clogging/Water leakage]

28.2.1 Cleaning Filter

Clean the filter periodically. When the filter is heavily soiled or damaged, replace it.



NOTE

1. Filter part No. (two filters)
ENC-GS620L: E55483
ENC-GS1120L: E55484
ENC-GR500LE/ENC-GR1100LE: E55485
2. ENC-GR500L/ENC-GR1100L does not need the filter cleaning.

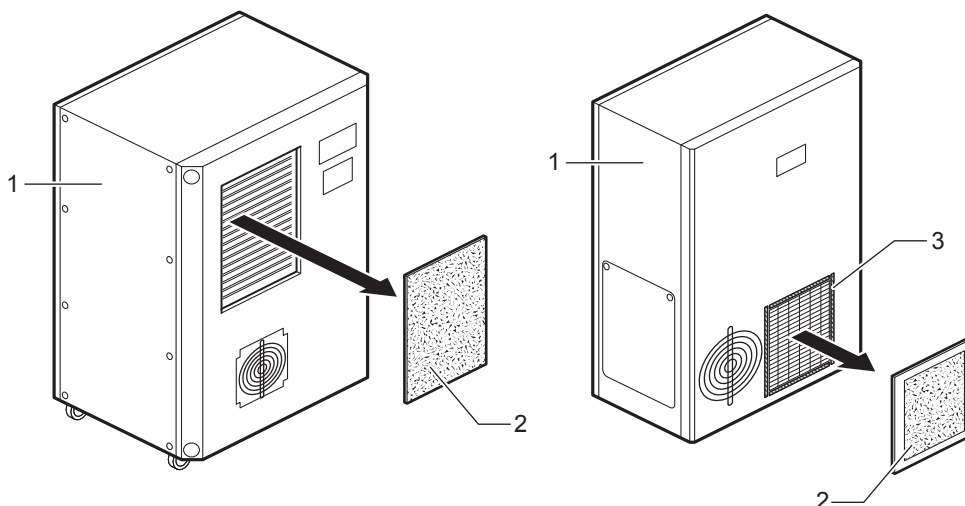


WARNING

Turn OFF the main power and disconnect the plant side power supply (breaker).

<ENC-GS620L/ENC-GS1120L>

<ENC-GR500LE/ENC-GR1100LE>



1	Electrical cabinet chiller
2	Filter
3	Hook-and-Loop fastener

<Procedure>

- 1) Turn OFF the main power.
- 2) Disconnect the plant side power supply (breaker).
- 3) Remove the filter.
- 4) Rinse the filter with a small amount of neutral detergent diluted with water.
- 5) Dry the filter.

6) Remount the filter.

29 OIL SKIMMER (OPTION)

29.1 Adjusting Oil-water Separation Tank Drain

When oil is not removed from separation tank or coolant is removed with the waste oil into the waste oil container, adjust the height of the drain adjustment nut.

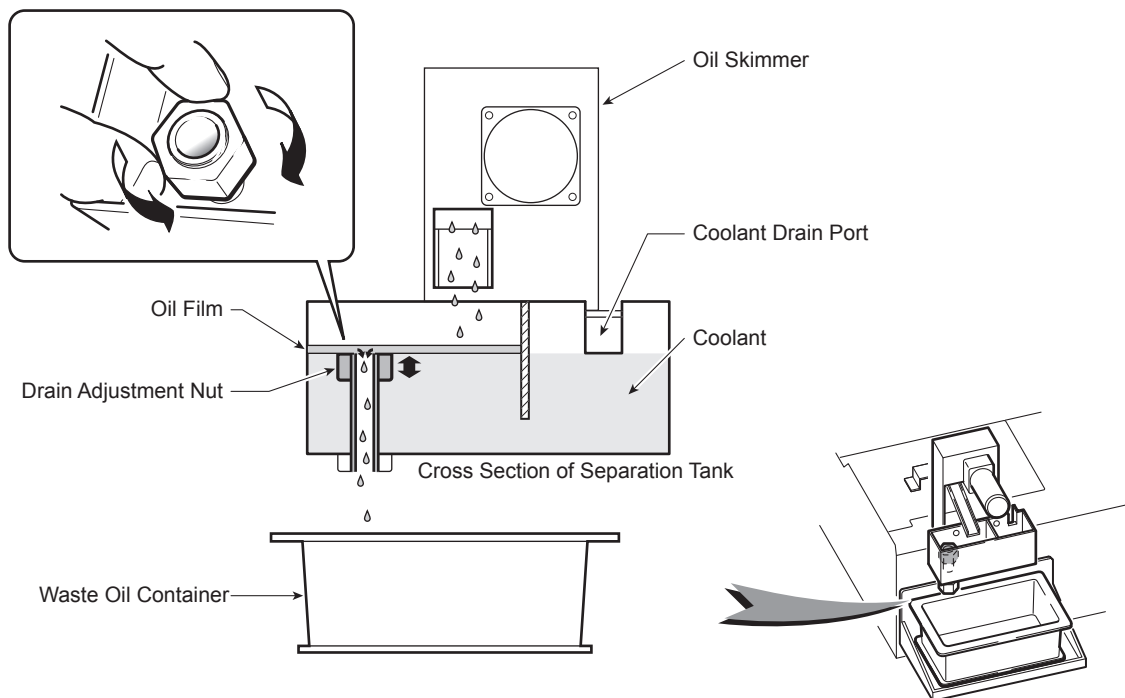
<When oil is not removed into waste oil container>

Rotate the drain adjustment nut clockwise to lower the height.

<When coolant is removed with waste oil into waste oil container>

Rotate the drain adjustment nut counterclockwise to raise the height.

Adjusting Height of Drain Adjustment Nut



29.2 Inspecting and Cleaning Oil-water Separation Tank

Check periodically if any foreign matter such as sludge accumulates in the separation tank. If the sludge accumulates, remove it using a suction device or remove the tank from the machine for cleaning.

NOTE

1. Dispose of waste oil in the waste oil container regularly.
2. If a considerable amount of coolant is contained in the waste oil container, there is a possibility that foreign matter accumulates in the tank. Check and clean the separation tank if necessary.

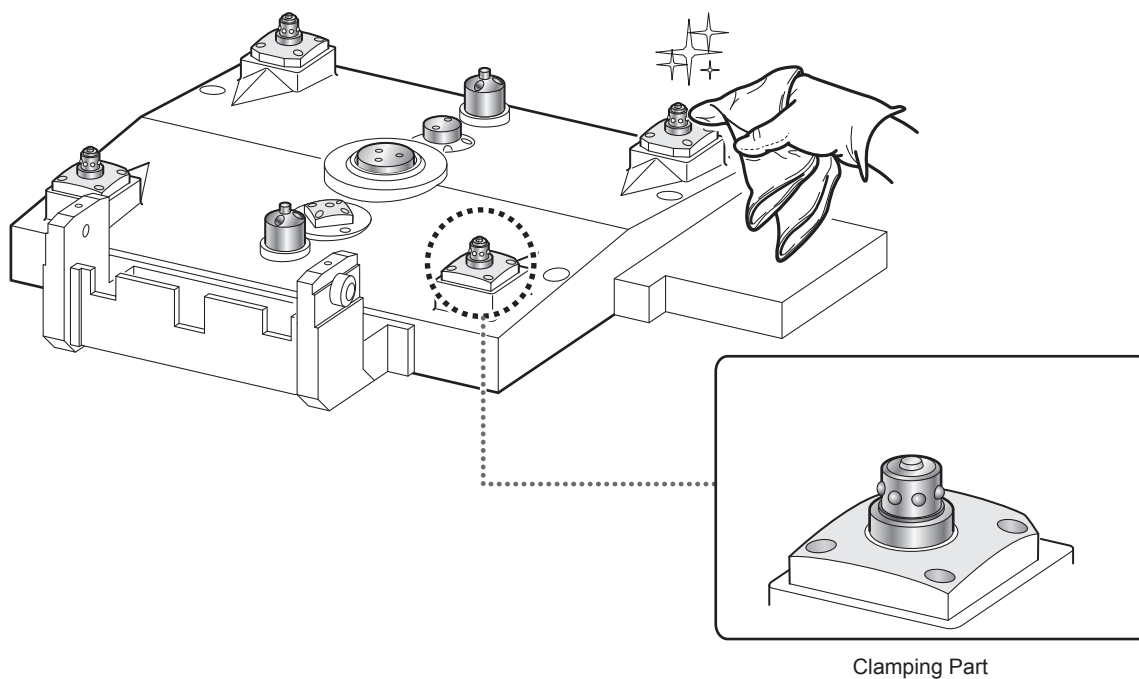
30 PALLET CHANGER (OPTION)

30.1 Cleaning Pallet Clamping Part

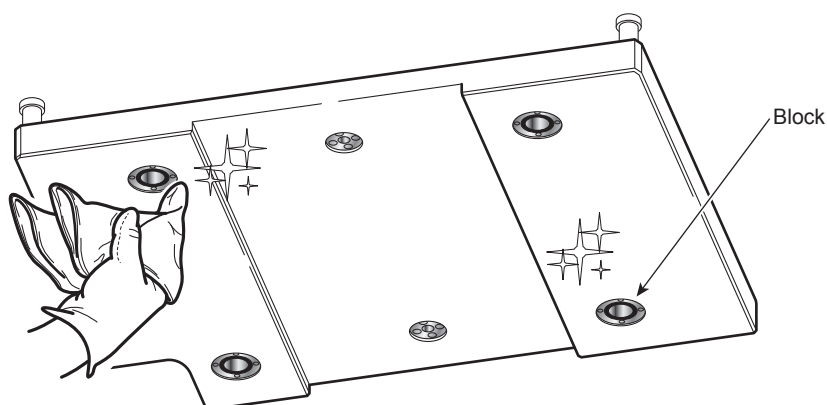
Remove dust and chips from the pallet clamping parts and the back surface of the pallet using a clean cloth.

DANGER

Turn OFF the main power.



Back Surface of Pallet



8-2 TROUBLESHOOTING

1	ALARM MESSAGE.....	8-121
2	ALARM LIST.....	8-122
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12	ALARM RELATED TO IN-MACHINE MEASURING SYSTEM (OPTION).....	8-151
13	WHEN 300 APC ALARM: 'n AXIS NEED ZRN' IS DISPLAYED.....	8-157
14	WORKPIECE SEATING DETECTION PRESSURE SWITCH.....	8-159
15	SOFT-OVERTRAVEL ALARM.....	8-161
16	ALARMS RELATED TO TOOL CLAMPING.....	8-162
17	REMOVING CHIPS ENTANGLED IN CUTTING TOOL AND WORKPIECE.....	8-163
18	CHECKING/CORRECTING INACCURATE MACHINING.....	8-164
19	POWER SUPPLY CUT OFF DURING ATC OPERATION.....	8-166

1 ALARM MESSAGE

When an alarm occurs, a message appears on the screen on the NC operation panel. Note the number and the details of the alarm, which are necessary when contacting with the DMG MORI Service Department.

1.1 NC Alarm

Numerical controller (NC) related alarms, including failed programming, servomotor or servo amplifier malfunctions.

If a NC alarm occurs, The screen automatically changes to the 'NC ALARM' screen, which displays the alarm number and the message. Eliminate the cause of the alarm by confirming the details of the alarm message on the screen, then press the  (RESET) key.



NOTE

If a PLC alarm occurs while the 'NC ALARM' screen is displayed, a PLC alarm indicator at the top right-hand side of the screen flashes red.



Instruction manual supplied by NC manufacturer

1.2 PLC Alarm (Alarm Starting with “EX”)

Machine parts and electrical failure related alarms.

If a PLC alarm occurs, the screen automatically changes to the 'PLC ALARM' screen, displaying the alarm number and message. The alarm cannot be reset because machine damage will result unless properly corrected. Contact the DMG MORI Service Department for assistance.



The reasons and measures for the PLC alarm can be verified on the screen (Alarm Help Function).



Machine operation



NOTE

If an NC alarm is triggered while a PLC alarm message is displayed, the NC alarm indicator at the top right-hand side of the screen flashes red.



Ladder diagram

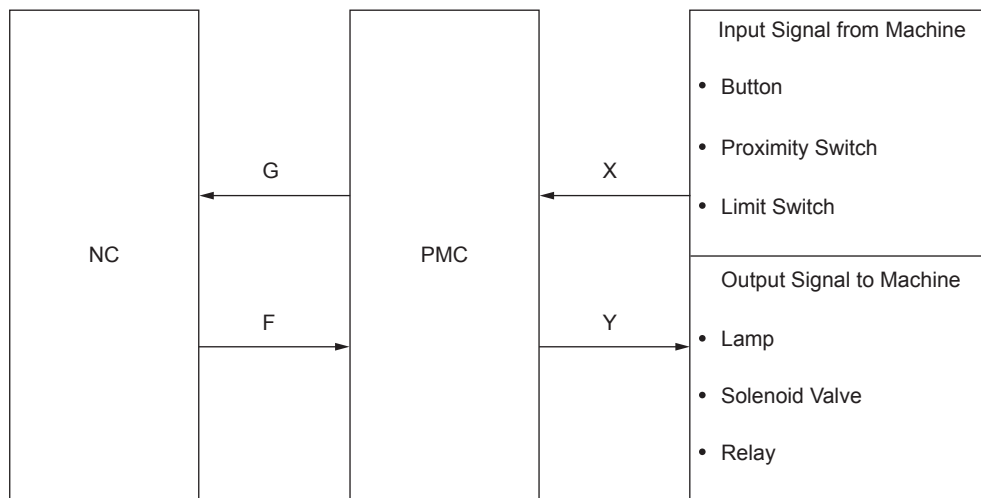
2 ALARM LIST

In this section, major alarms and their displayed messages are summarized. For details on the recovery procedure, refer to the "Reference" page. For other alarms, refer to the ladder diagram or the manuals supplied by the NC unit manufacturer.

Alarm No.	Message	Reference
300	'n AXIS NEED ZRN'	8-127 8-157
306	'APC ALARM: n AXIS BATTERY ZERO'	8-127
307	'APC ALARM: n AXIS BATTERY DOWN 1'	8-127
308	'APC ALARM: n AXIS BATTERY DOWN 2'	8-127
EX0021	(Alarm related to tool clamping)	8-162
EX0069	'DOOR LOCK TIME OVER'	8-125
EX0165	(Alarms related to tool clamping)	8-162
EX0166		
EX0167		
EX0509	'THRU SP. COOLANT FILTER CLOGGED'	8-50
EX0560	'AIR PRESSURE LOW'	8-145
EX0561	'HYDRAULIC PRESSURE LOW'	8-148
EX0562	'LUBRICANT PRESSURE LOW'	8-135
EX0566	'THRU SP.CLNT.UNIT ALARM'	8-50
EX0567	'LUBRICANT WATCH DOG ALARM'	8-135
EX0568	'HYDRAULIC OIL LEVEL LOW'	8-149
EX0580	'HYDRAULIC PUMP OVERLOAD'	8-149
EX1976	'SPINDLE SENSOR ALARM'(1)	8-151
EX2550	'THERMAL OVERLOAD TRIP 1'	8-146
EX2551	'THERMAL OVERLOAD TRIP 2'	8-134
EX2561	'SERVO BATTERY ABNORMAL'	8-127
EX2562	'NC BATTERY ABNORMAL'	8-127
EX2957	'TABLE SENSOR ALARM'(1)	8-153
(OT)05**	(Soft-overtravel alarm)	8-161

3 INPUT/OUTPUT SIGNAL CONFIRMATION PROCEDURE

When machine malfunctions occur, confirm the cause of the problem by checking the status of input and output signals on the diagnostic screen. For reference purposes, a system outline of this machine is shown below.



PMC (Programmable Machine Controller) = Sequencer: relays signals between machine and NC

<Meaning of Signals>

Signal	Item
X	Input signals from operation panel or machine side limit switches.
Y	Output signals from PMC to display panel or solenoid valve.
G	Output signal from PMC to NC
F	Output signal from NC to PMC

<Diagnostic Screen Display Procedure>

Find out the input signal address by checking the Ladder Diagrams or the Electrical Diagram to check the signal status on the screen to locate the cause of the malfunction.

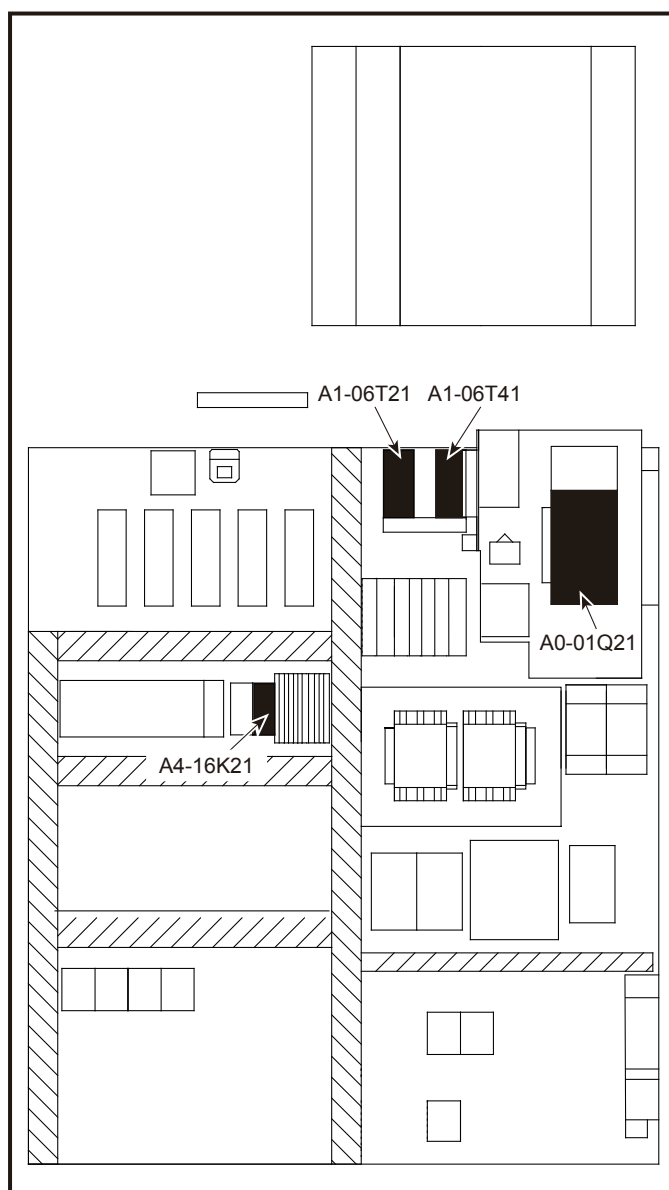
Function selection key  (SYSTEM) → [NC SYSTEM] →
[>] → [>] → [PMC MAINTEN] → [STATUS]

For example, the coolant pump signal status is shown in address "Y5.0".

- 1) Input Y, and 5.0 with the data entry keys on the 'PMC SIGNAL STATUS' screen and press the [SEARCH] soft-key to display the screen above.
- 2) If the 0 bit value in address "Y0005" is "1", the coolant pump signal is turned ON.

4 MALFUNCTIONS AT MAIN POWER ON

When trouble occurs following turning ON of the main power supply, perform the following recovery procedures referring to the Electrical Cabinet Parts Layout below.



4.1 Screen Not Displayed when Power Turned ON

Perform the following confirmation procedures. Contact DMG MORI prior to performing the procedures as specialized knowledge is required. All procedures are to be performed with extreme care by licensed electrical technicians with maintenance experience in strict accordance with the recommendations of the DMG MORI Service Department.

<Confirmation>

1. Plant-side main breaker is turned ON.
2. Main power is turned ON.
3. When the NC power is turned ON, A4-16K21 is activated.
4. A1-06T21, A1-06T41 power lamps are illuminated.

4.2 Screen Displayed but Cannot Advance when [OK] Soft-Key Pushed

Possible causes are operation panel function key malfunction, cable breakage or poor connector connection. Contact the DMG MORI Service Department for assistance.

4.3 'OPEN DOOR THEN CLOSE' Display does Not Disappear when Door Opened/Closed

Open/close the door once again. If the message is still displayed, contact the DMG MORI Service Department for assistance.

4.4 EX0069 'DOOR LOCK TIME OVER'

This alarm is triggered when the operation panel side door unlock signal (Y6.3) is turned OFF but the operation panel side door lock completion signal (X5.0) is not turned ON. Contact the DMG MORI Service Department as specialized knowledge is required for confirmation. All procedures are to be performed with extreme care by licensed electrical technicians with maintenance experience in strict accordance with the recommendations of the DMG MORI Service Department.

<Confirmation>

1. The operation panel side door unlock command is turned OFF (Y6.0 = 0) on the 'PMC SIGNAL STATUS' screen*.
2. The relay (B7-01K71) in the electrical cabinet is OFF.
3. The door lock mechanism coil (B7-01B31) is OFF.
4. The confirmation switch B7-01B31 (11-12) of the door lock device is turned ON.
5. The lock confirmation switch B7-01B31(21-22) of the door lock device is turned ON.
6. The following LED of the IO module are turned ON:
 - A5-02K31 XT4.44
 - A5-02K51 XT4.44
7. The operation panel side door lock completion signal (X7.2) is turned ON on the 'PMC SIGNAL STATUS' screen.
8. The operation panel side door lock completion signal (X7.2) is turned ON on the DCS'PMC SIGNAL STATUS' screen.

5 WHEN BATTERY REPLACEMENT REQUESTED

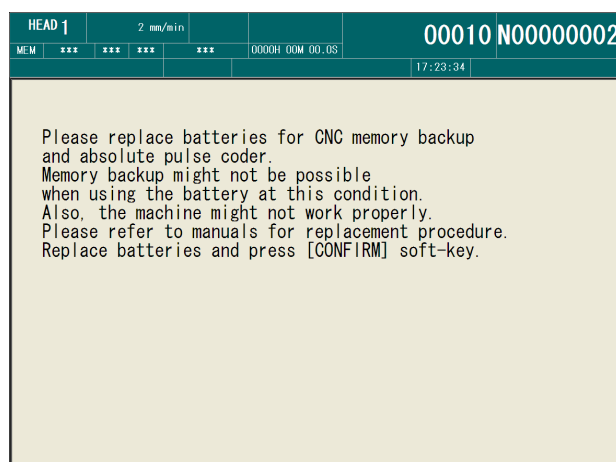
When the screen displays the message requesting battery replacement or any of the battery low voltage alarms, change the battery. Continued usage of the machine without replacement of the batteries while the alarms are displayed may cause the memory data and servo motor position data to be lost.

5.1 Message Requesting Battery Replacement

CAUTION

If the screen displays the message requesting battery replacement, change the NC memory backup battery and the servo absolute position sensing battery. Continued usage of the machine without replacement of the batteries while the alarms are displayed causes the battery low voltage alarms to occur. Replacing the batteries after the alarms are activated shuts off the power and deactivates the alarm and may cause the memory data to be lost.

<Message Requesting Battery Replacement>



When the 'NEXT CHECK DATE' of the 'BATTERY REPLACEMENT' on the 'PERIODICAL INSPECTION 1' screen is reached, the message requesting battery replacement is displayed. Change the batteries when this message is displayed then press **[CONFIRM]**.

NOTE

Pressing **[CONFIRM]** displays the 'PERIODICAL INSPECTION 1' screen.

 "Procedures to Replace Batteries" (page 8-127)

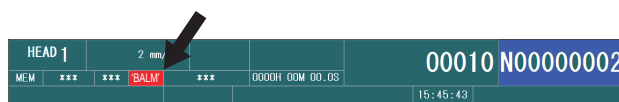
<'PERIODICAL INSPECTION 1' screen>

MEM	***	***	***	***	0 mm/min	00002 N00000	
						09:59:44	
PERIODICAL INSPECTION 1							
PERIODICAL CHECK ITEM				UNFINISHED CHECK ITEM NUMBER		NEXT CHECK DATE	
50 HOUR CHECK				0		50 HOUR	
150 HOUR CHECK				0		150 HOUR	
1000 HOUR CHECK				0		1000 HOUR	
2000 HOUR CHECK				0		2000 HOUR	
1 WEEK CHECK				0		2012/06/14	
2 MONTH CHECK				0		2012/08/06	
1 YEAR CHECK				0		2013/06/07	
BATTERY REPLACEMENT				0		2013/06/07	
MACHINING CHAMBER WINDOW				0		2017/06/06	
>							
<	I/O	PERIODIC INSPECT	NC SYSTEM	MACHINE STATUS	SYSTEM CONFIG.	CHECK CONTENT	PERIODIC CHECK 2
							PERIODIC CHECK 3
							MON. STS. ANALY.

5.2 Battery Low Voltage Alarms

When the battery level falls, the battery low voltage alarms are activated and either the message requesting battery replacement or the following alarm messages are displayed. 'BALM' on the upper side of the screen becomes red at this time. Change the NC memory backup battery and servo absolute position sensing battery and deactivate the alarms.

HF-CMX-C0EN



<NC Memory Backup Battery>

Alarm No.	Message
EX2562	'NC BATTERY ABNORMAL'

<SERVO Absolute Position Sensing Battery>

Alarm No.	Message
EX2561	'SERVO BATTERY ABNORMAL'
300	'n AXIS NEED ZRN' *2
306	'APC ALARM: n AXIS BATTERY ZERO' *1*2
307	'APC ALARM: n AXIS BATTERY DOWN 1' *1*2
308	'APC ALARM: n AXIS BATTERY DOWN 2' *1*2

NOTE

*1 APC: Absolute Pulse Coder

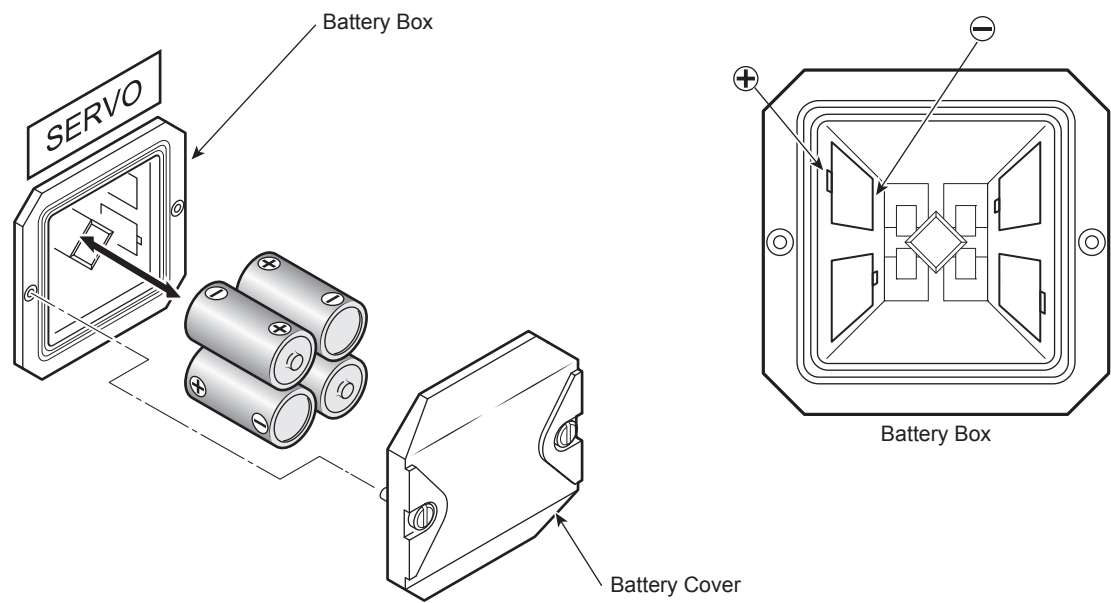
*2 The name of the axis is indicated in "n". If the (n-axis) is unclear for indication, contact the DMG MORI Service Department.

5.2.1 Procedures to Replace Batteries

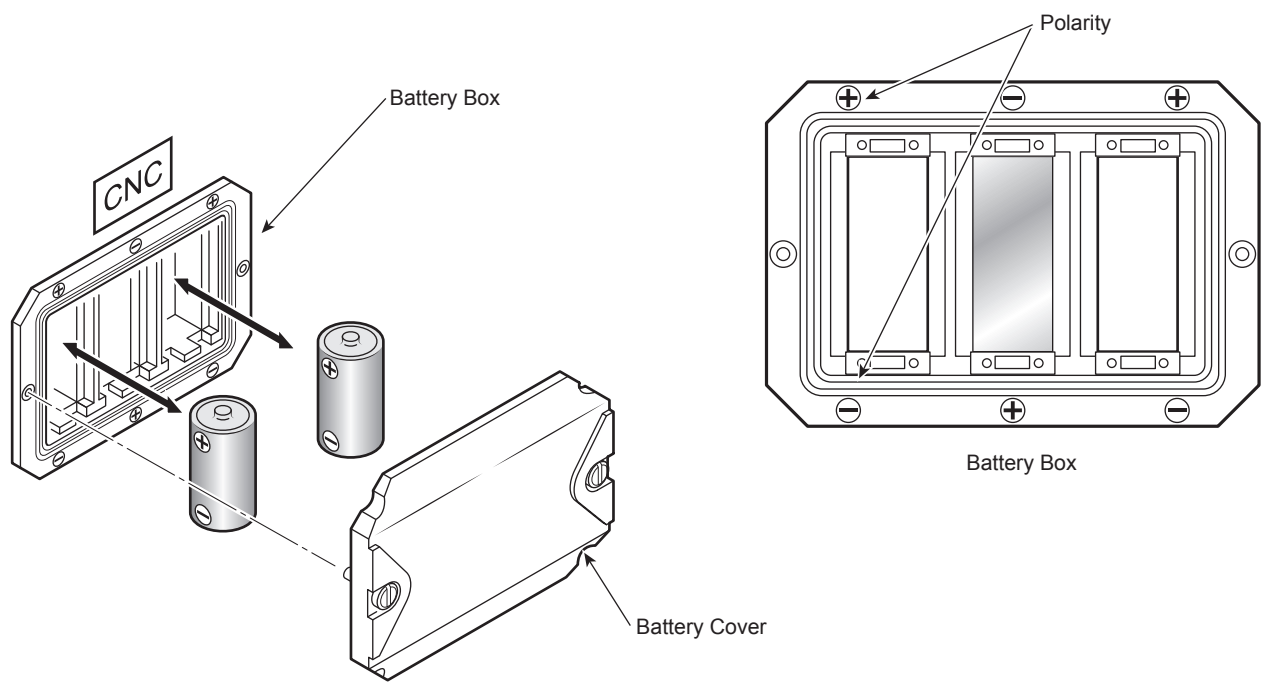
CAUTION

1. Change the NC memory backup battery and servo absolute position sensing battery with power supplied to the NC. If the batteries are changed with the NC power supply turned OFF, the data stored in the memory may be lost.
2. Before changing the batteries, save the memory data such as parameters and programs as backup in an external I/O device such as a USB memory. DMG MORI is not liable for problems that result from destroyed programs or lost data that have not been backed up.
3. Always ensure that the polarity of the batteries is correct. If the polarity is reversed, the memory data may be lost when turning OFF the NC power. It also causes leakage, heat or explosion of the battery.
4. Tighten the screws properly to secure the battery cover. Mist may enter the interior of the electrical cabinet through the clearance.
5. Make sure to check the recommended use-by date on replacement batteries and use the batteries that are within the use-by date.
6. Do not mix old and new batteries or different types of batteries.

7. Use only the specified batteries.



Servo Absolute Position Sensing Battery: 4 Alkaline D Batteries



NC Memory Backup Battery: 2 Alkaline D Batteries

Name	Part No.
Alkaline D battery (1 battery)	E30061
Alkaline D batteries (4 batteries)	E30144

- 1) Remove the battery cover.
- 2) Replace the old batteries with new ones.

NOTE

Ensure to insert the batteries correctly with due attention to the polarity marked on the following locations:

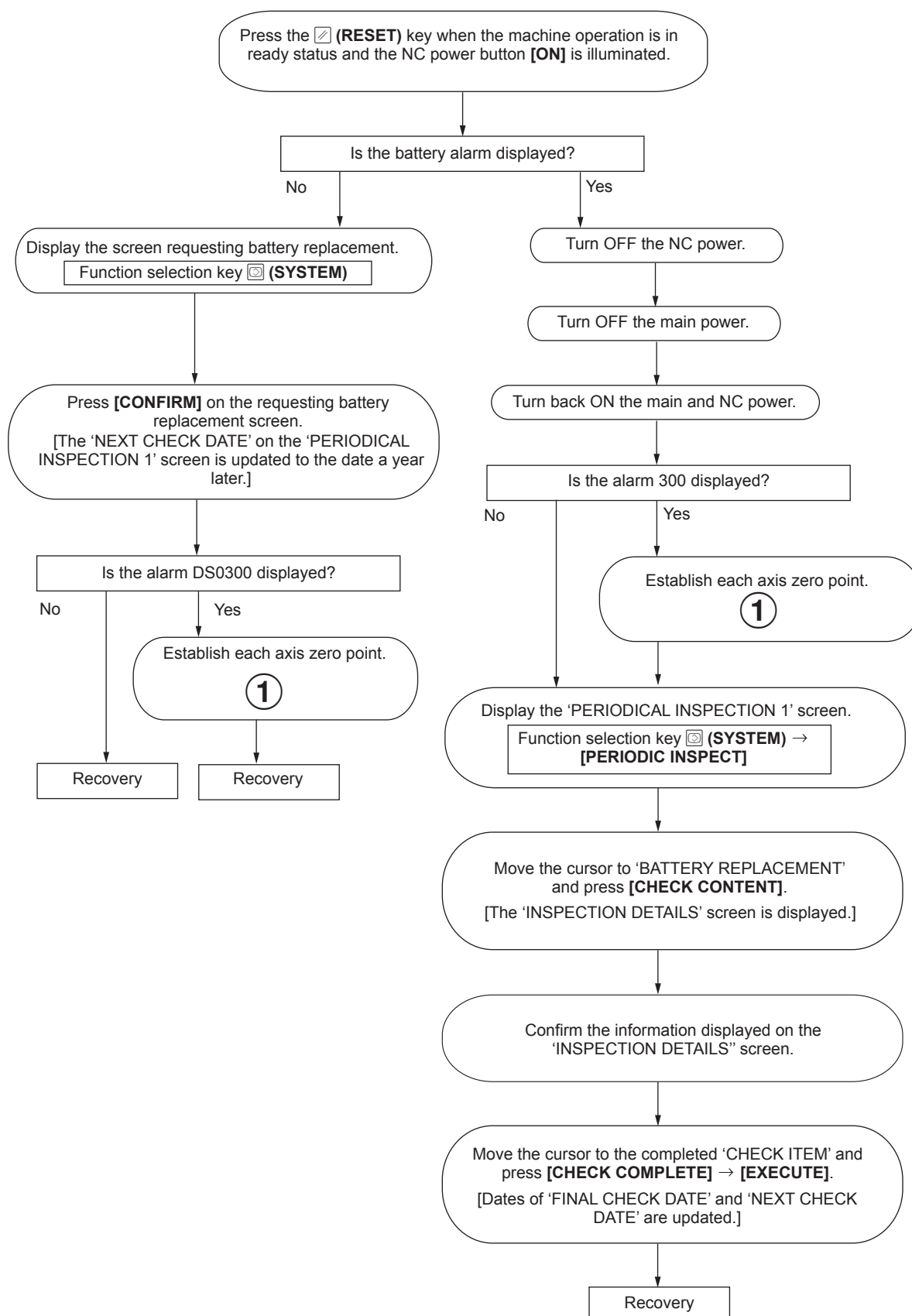
- Servo absolute position sensing battery: inside of the battery box
- NC memory backup battery: battery box frame

- 3) Remount the battery cover.

- 4) Open the electrical cabinet door with the main power ON.
 "Opening Electrical Cabinet Door with Main Power ON" (page 8-83)
- 5) To confirm that the batteries are replaced correctly, measure the voltage of batteries on the back side of battery box.
 - Servo absolute position batteries: 6 VDC
 - NC memory backup batteries: 3 VDC
- 6) Close the electrical cabinet door.
 "Closing Electrical Cabinet Door with Main Power ON" (page 8-84)

<Procedures to Clear Alarms>

After completing the battery replacement, clear the alarms in the following flowchart and reset the accumulate time.

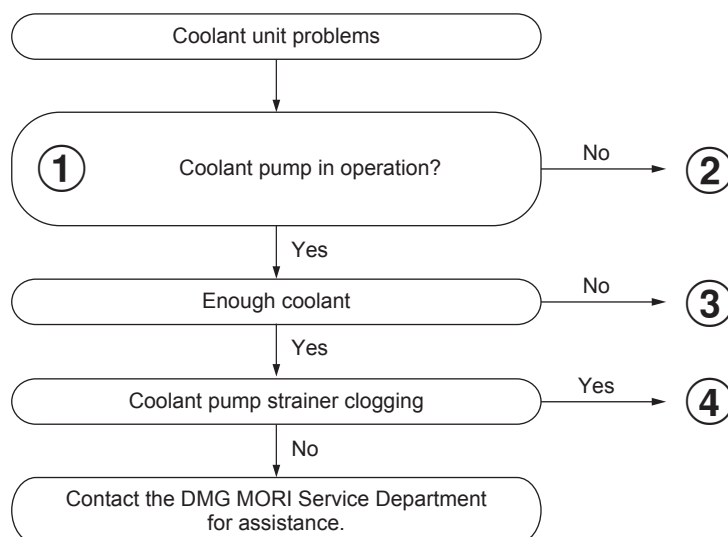


No.	Refer to
①	"WHEN 300 APC ALARM: 'n AXIS NEED ZRN' IS DISPLAYED" (page 8-157)

6 COOLANT UNIT PROBLEMS

6.1 When Coolant is Not Supplied

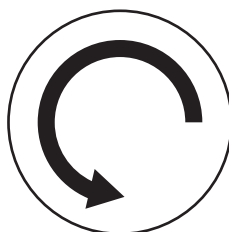
Problems related to the supply of coolant can be divided into two categories; cases when coolant is not supplied when the coolant pump is operating; and cases when the coolant pump is not operating. The confirmation and recovery procedures for both cases are outlined below.



No.	Refer to
①	"Coolant Pump Operation Check" (page 8-131)
②	"When the Coolant Pump is Not Operating" (page 8-133)
③	"Coolant Level Check" (page 8-131)
④	"Coolant Pump Strainer Clogging" (page 8-132)

6.1.1 Coolant Pump Operation Check

Check if the coolant pump is rotating in the direction of the arrow on the pump.



NOTE

1. If the pump is rotating in the opposite direction, wiring is connected in the reverse phase. Confirm the machine main breaker and plant-side connections.
2. Do not run the pump at idle speed. Idle running will result in damage to the pump.

6.1.2 Coolant Level Check

Check the coolant level using the level gage on the coolant tank. Replenish coolant if the gage indicates that the coolant level is close to the lower limit ("L" mark).

"Replenishing Coolant" (page 8-47)

6.1.3 Coolant Pump Strainer Clogging



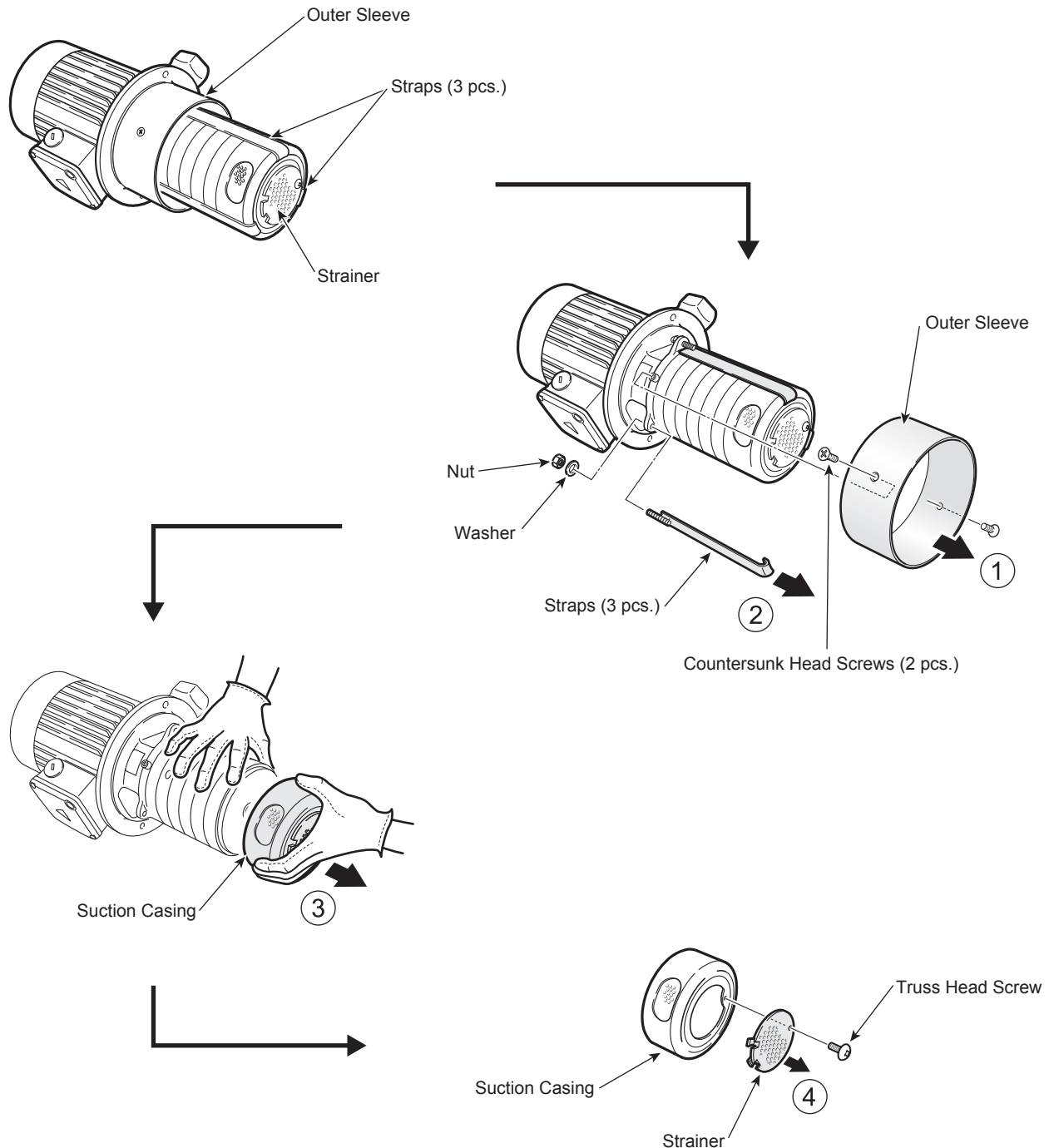
WARNING

Turn OFF the main power.

<Procedure>

- 1) Turn OFF the main power switch.
- 2) Disconnect the piping and cables.
- 3) Remove the four M6 hexagon socket head cap screws on the coolant pump.
- 4) Pull the coolant pump out of the coolant tank.
- 5) Remove the two countersunk head screws on the outer sleeve.
- 6) Remove the outer sleeve.
- 7) Remove the strainer using the following procedure:
 - a) Remove the nuts to remove three straps.
 - b) Remove the suction casing.

c) Remove the strainer from the suction casing.



- 8) If clogged, clean the strainer.
- 9) Reverse the above procedure to reassemble the pump.
- 10) Operate the coolant pump to confirm coolant is supplied.

6.1.4 When the Coolant Pump is Not Operating

<Procedure>

- 1) Check if the coolant button  [ON] (On) on the operation panel is illuminated.
- 2) If it is not, check the following points.
 - Vertical soft-key [ATC HOME POSITION] on the operation panel is illuminated.
 - Door is closed.

NOTE

Depending on the parameter settings, an interlock that prohibits coolant supply when the door is open may be activated.

- Machine is NOT in the emergency stop condition.
- 3) Open the electrical cabinet to confirm the motor breaker (B2-01Q21) is ON.

 PLC alarm EX2551 'THERMAL OVERLOAD TRIP 2' occurs when the motor breaker is OFF.

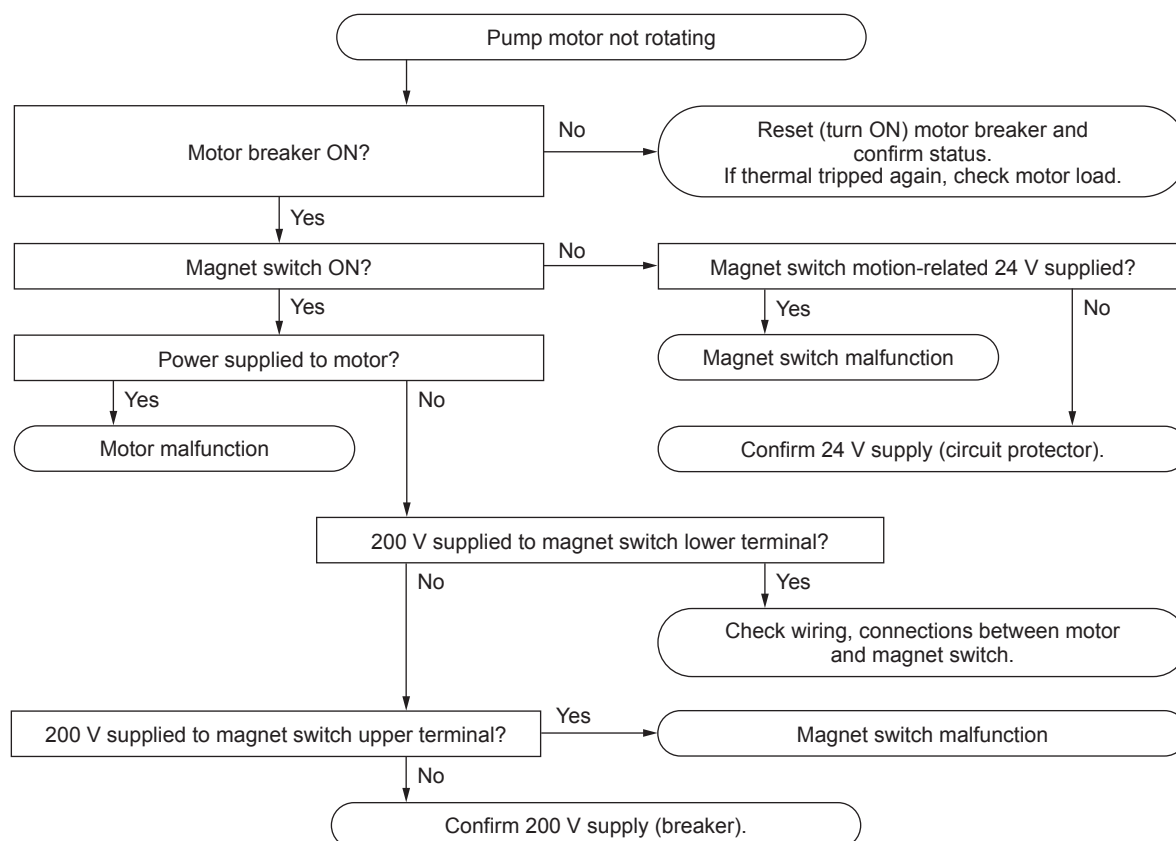
4) If not turned ON, activate the thermal.

NOTE

Do not change the value (A) set on the thermal current setting dial.

When the cause of problem cannot be determined after checking the points above, qualified electrical technicians familiar with the necessary electrical safety precautions are to perform the checks in the following flowchart.

If machine check and recovery are difficult for the users to perform, contact the DMG MORI Service Department for assistance.



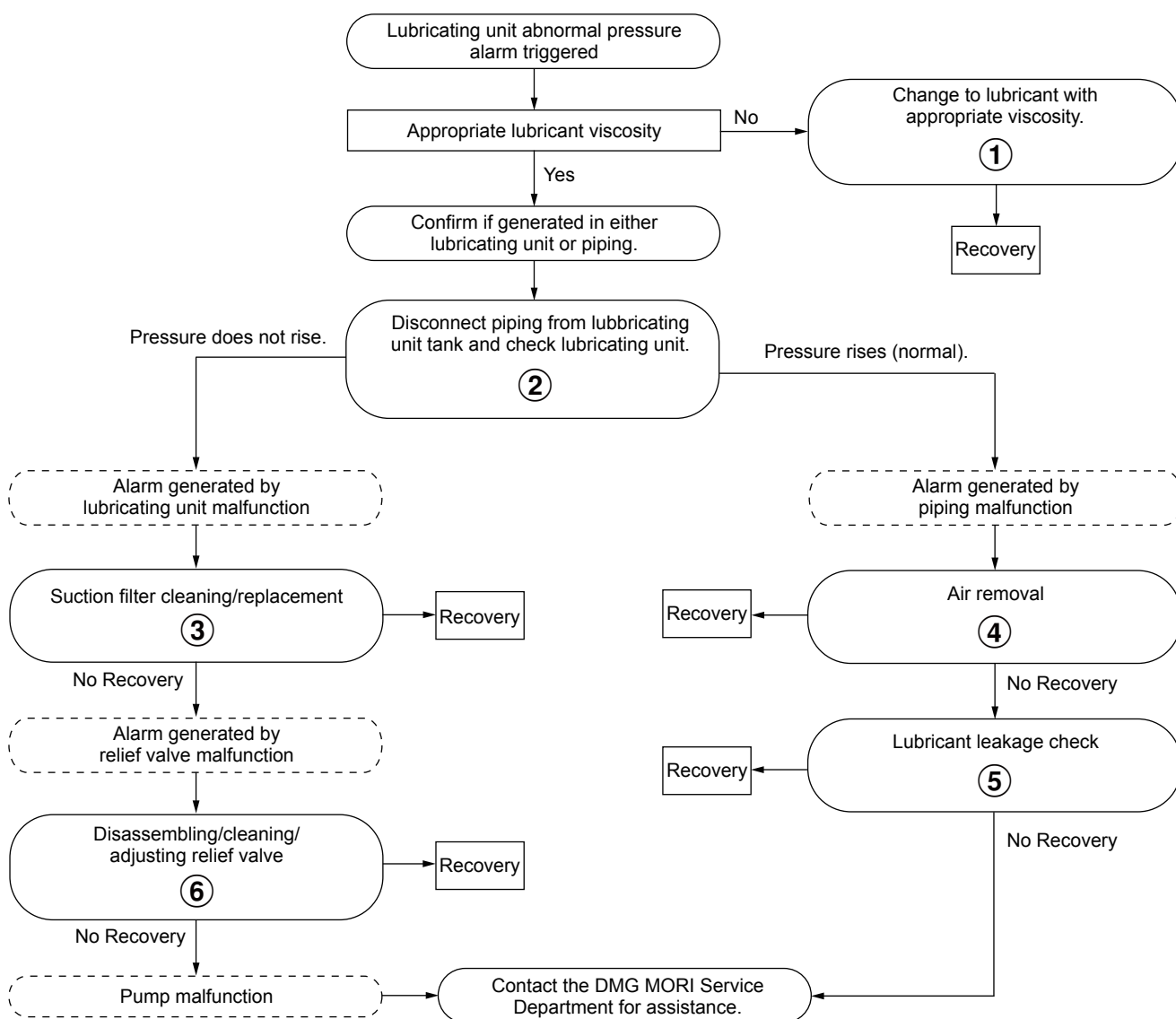
6.2 Abnormal Sounds emitted from Coolant Pump

The possible causes of abnormal sounds emitted when the coolant pump is operating are outlined below. Replenish the coolant or perform maintenance work when it becomes necessary.

Cause	Reference Items
Low coolant level in the coolant tank	"Coolant Level Check" (page 8-131)
Coolant pump strainer clogging	"Coolant Pump Strainer Clogging" (page 8-132)
Malfunction of coolant pumps	Contact the DMG MORI Service Department for assistance.

7 LUBRICATING UNIT ALARMS

7.1 EX0562 'LUBRICANT PRESSURE LOW'



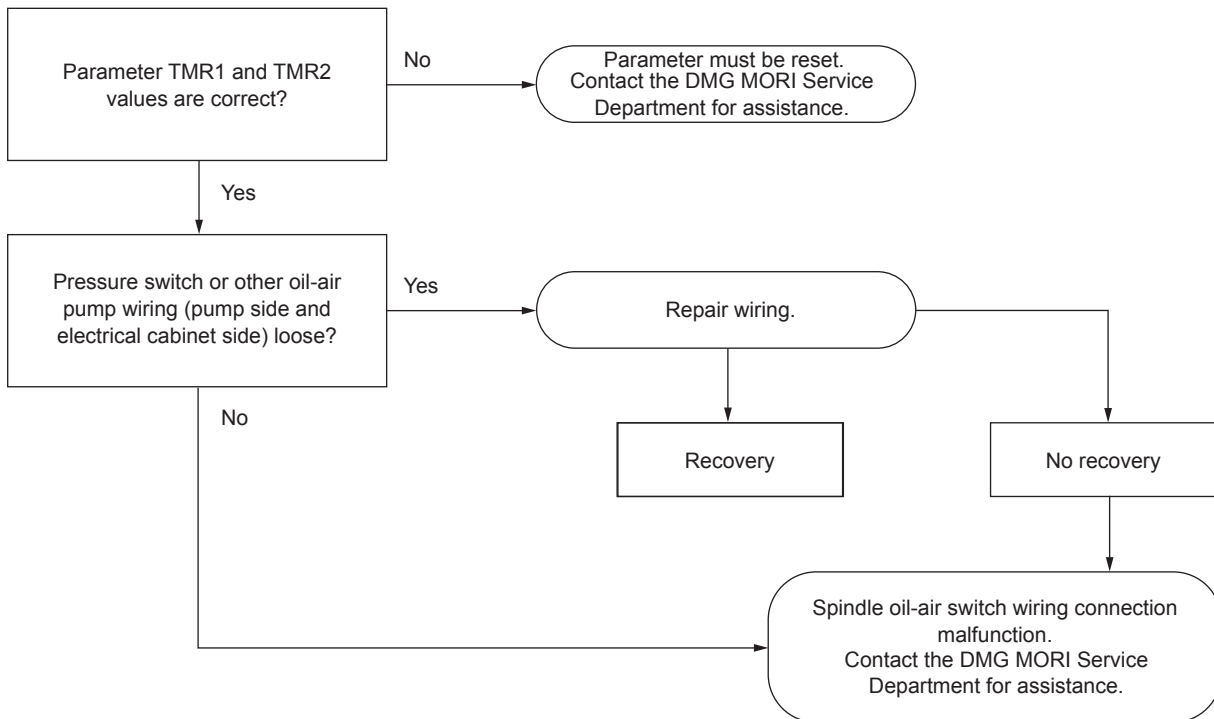
No.	Refer to
①	"OILS/COOLING FLUID" (page 8-23)
②	"Cleaning Lubricating Unit Tank, Suction Filter and Fill Port Filter" (page 8-62), "Checking Lubricating Unit Operation" (page 8-136)
③	"Cleaning Lubricating Unit Tank, Suction Filter and Fill Port Filter" (page 8-62)
④	"Air Bleeding from Piping" (page 8-140)
⑤	"Lubricating Oil Leakage Check" (page 8-140)
⑥	"Relief Valve Disassembly/Cleaning" (page 8-136), "Relief Valve Adjustment" (page 8-139)

7.2 EX0567 'LUBRICANT WATCH DOG ALARM'

EX0567 'LUBRICANT WATCH DOG ALARM' is triggered if lubrication pump pressure is not turned ON within a certain amount of time or if PC parameters are not set properly. Respond in accordance to the recovery procedure below.

NOTE

Parameter values differ depending on the machine type. Refer to the value in the parameter chart attached when shipping.



7.3 Checking Lubricating Unit Operation

Confirm if the cause of the lubricating unit abnormal pressure alarm is in either the lubricating unit or piping by checking the lubricating unit operation.

<Procedure>

- 1) Remove the discharge piping from the line filter.
- 2) Place a plug over the line filter discharge outlet.
- 3) Operate the lubricating pump for about 10 seconds.

NOTE

If the pressure gage stylus reaches the green mark on the line filter meter, the lubricating unit is normal. If not, the cause of the alarm is a lubricating unit malfunction.

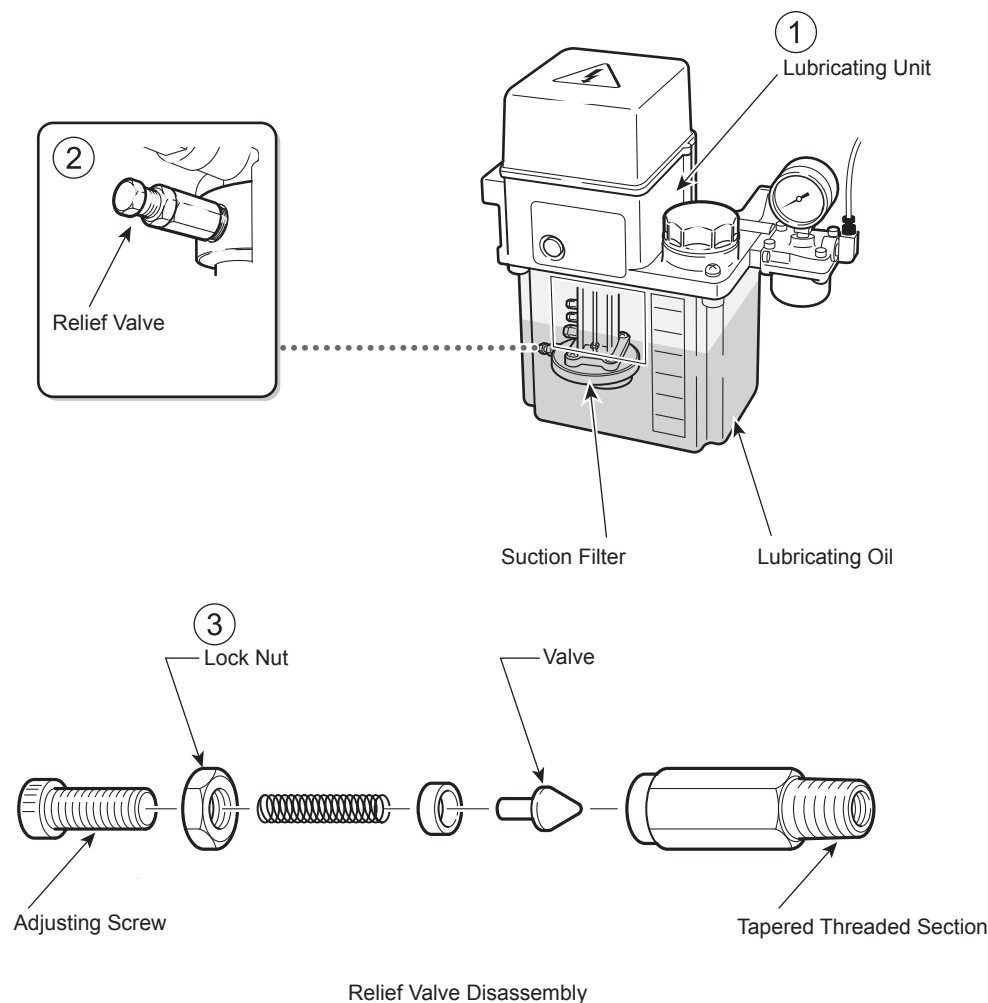
Recovery sequence for further countermeasures: "EX0562 'LUBRICANT PRESSURE LOW'" (page 8-135)

7.4 Relief Valve Disassembly/Cleaning

If a lubricating unit abnormal pressure is caused by a relief valve malfunction, disassemble and clean the relief valve according to the following procedure.

⚠ WARNING

Turn OFF the main power.



NOTE

The shape of the lubricating unit differs according to the machine model.

<Procedure>

- 1) Remove the lubricating unit from the tank (①).
- 2) Detach the relief valve from the pump using a single-ended spanner (②).
- 3) Loosen the lock nut and remove the adjusting screw (③).
- 4) Clean the disassembled relief valve using one of the following methods:
 - Blowing compressed air
 - Using kerosene

⚠ CAUTION

1. Wear safety goggles without air vent at all times while blowing compressed air.
[Eye damage due to ejected foreign matter]
2. Use caution when using kerosene, and make sure there is no open flame in the vicinity.

NOTE

Take care to check for dust contamination of the tapered section. If scratches are visible on the tapered section of the relief valve, replacement is necessary.

- 5) Perform the above procedure in reverse to reassemble the relief valve and remount it on the pump.

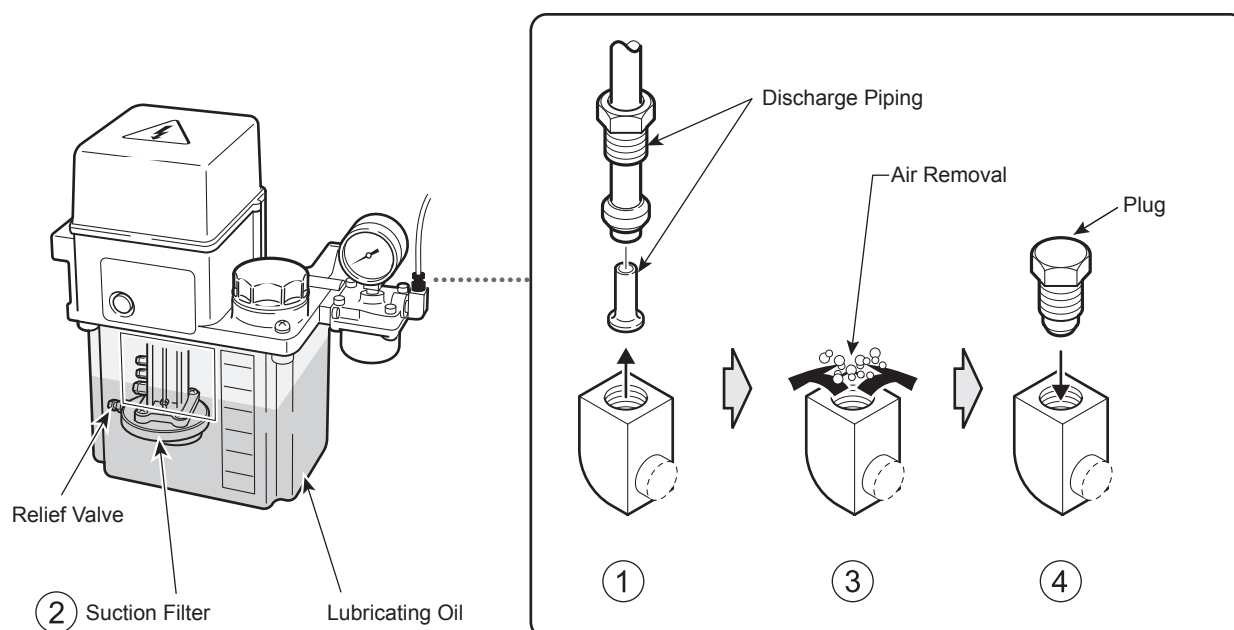
NOTE

Ensure that foreign matter such as flakes from the sealing material does not enter the tapered section during reassembly.

- 6) Remove air from the lubricating unit.

 "Lubricating Unit Air Removal" (page 8-138)

7.5 Lubricating Unit Air Removal



NOTE

The shape of the lubricating unit differs according to the machine model.

<Procedure>

- 1) Remove the discharge piping from the line filter (①).
- 2) Soak the suction filter in lubricating oil in the tank (②).
- 3) Operate the lubricating pump to bleed air from the piping (③).

NOTE

To ensure that all residual air is bled from the piping, continue to operate the pump until lubricating oil is discharged.

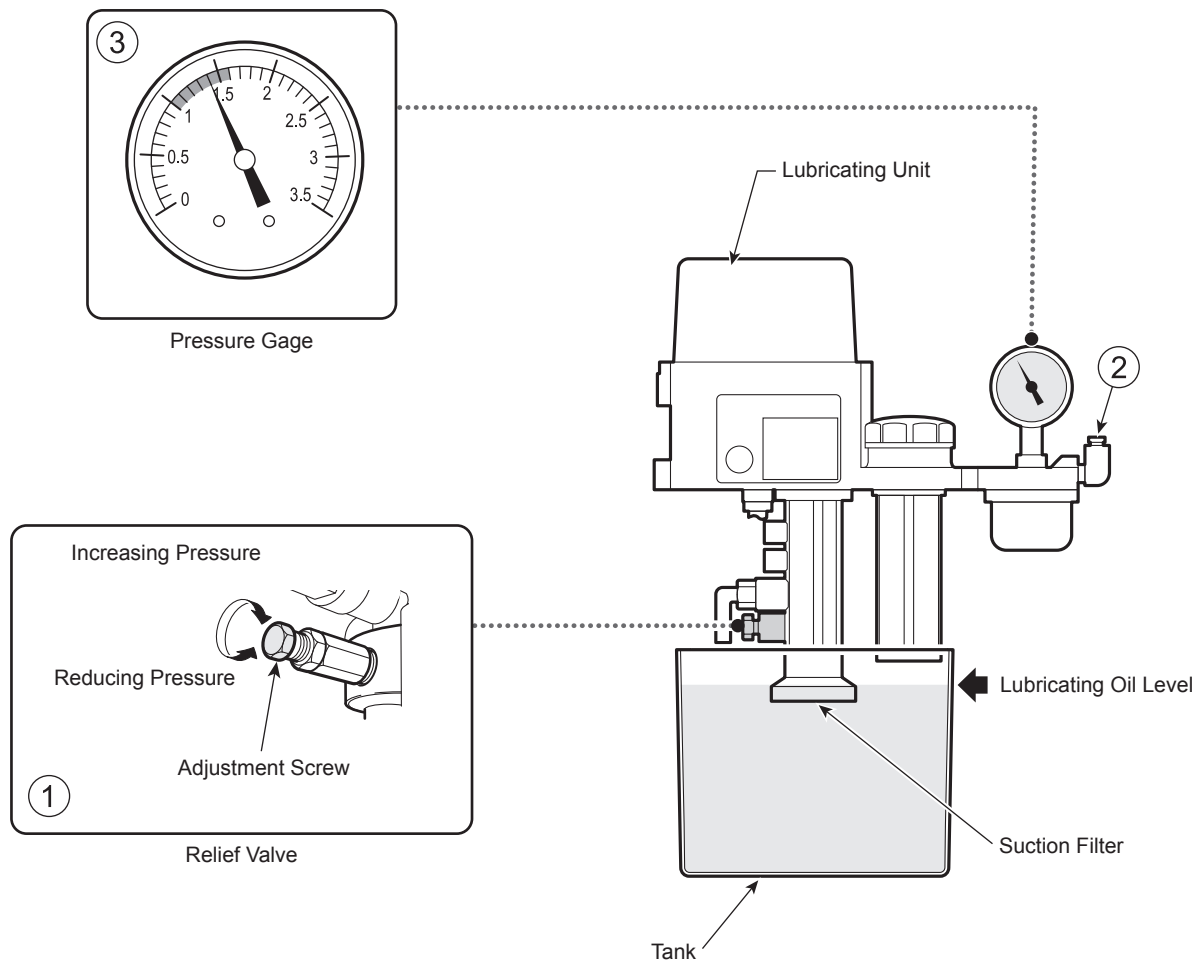
- 4) After air removal is completed, insert a plug into the pump discharge outlet (④).

 "Relief Valve Adjustment" (page 8-139)

7.6 Relief Valve Adjustment

Following relief valve disassembly and cleaning, adjust the relief valve using the following procedure. It is necessary to bleed air from the lubricating unit to adjustment.

 "Lubricating Unit Air Removal" (page 8-138)



NOTE

The shape of the lubricating unit differs according to the machine model.

<Procedure>

- 1) Lift the pump until positioned close enough to the oil level to enable adjustment of the relief valve adjustment screw.

 "Cleaning Lubricating Unit Tank, Suction Filter and Fill Port Filter" (page 8-62)

NOTE

Adjust the relief valve while the suction filter is soaking in the lubricating oil.

- 2) Adjust the relief valve using the following procedure:
 - a) Operate the lubricating pump.
 - b) Set the pump discharge pressure to 1.4 MPa, using the relief valve adjustment screw. (①)
 - Increasing pressure:
Turn the adjustment knob to the right.
 - Reducing pressure:
Turn the adjustment knob to the left.

NOTE

If unable to set the pressure to 1.4 MPa, the pump is malfunctioning. Contact the DMG MORI Service Department for assistance.

- c) Tighten the lock nut after adjustment.
- 3) Return the pump to its original position and remount the lubricating unit.
- 4) Remove the plug from the discharge outlet and mount the discharge piping (②).
- 5) Bleed air from the piping sufficiently and ensure the discharge pressure is 1.4 MPa (③).

 "Air Bleeding from Piping" (page 8-140)

- 6) Confirm the following points if the pressure level set in the above procedure differs remarkably from the pressure of the pump with the line filter discharge outlet disconnected to the piping route.

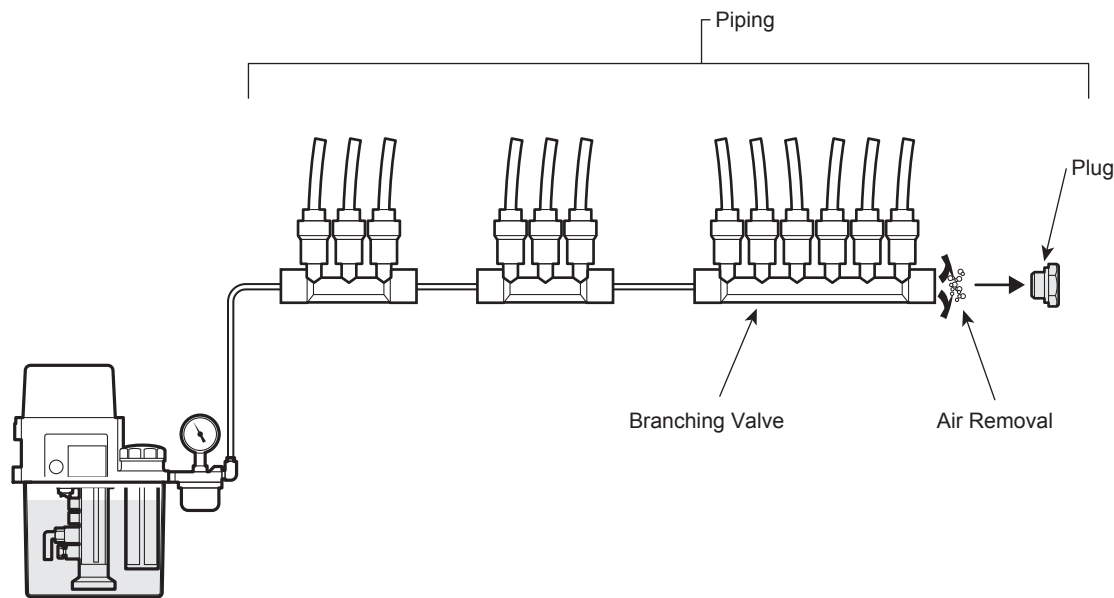
- Lubricating oil leakage is not occurring.

 "Lubricating Oil Leakage Check" (page 8-140)

- Distributor is not malfunctioning.
- Air removal has been performed sufficiently.

7.7 Air Bleeding from Piping

If the lubricating unit operation is normal, bleed air from the piping and check for lubricating oil leakage from the piping.



- 1) Mount the discharge piping on the line filter.
- 2) Operate the lubricating pump for about 10 seconds.
- 3) Repeat step 2) above 3 or 4 times at intervals.
- 4) Confirm that the lubricating oil pressure rises to between 1.4 MPa.

7.8 Lubricating Oil Leakage Check

<Procedure>

- 1) Confirm that the discharge piping is mounted on the line filter.
- 2) Operate the lubricating pump for about 10 seconds.

NOTE

If the pressure gage stylus reaches the green mark on the line filter meter, the discharge piping connection is loose or piping is damaged.

- 3) Check if visible discharge piping connections are loose or piping is damaged.

NOTE

To check piping and piping connections that are not visible for looseness or damage, contact the DMG MORI Service Department for assistance.

8 WATER-GLYCOL CHILLER ERRORS (20000 min⁻¹ SPECIFICATION)

8.1 Alarm Not Triggered but Operation Abnormal

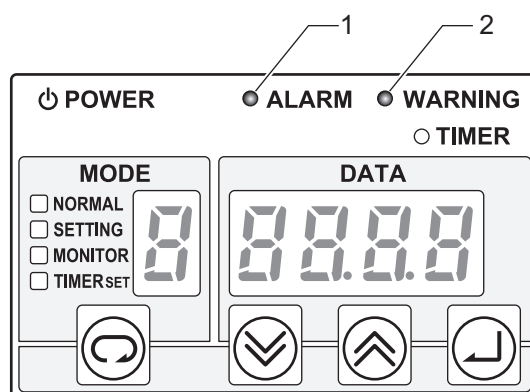
Status	Cause	Countermeasure	Reference
Controller not operating. (Power indicator lamp on operation panel not illuminated.)	Main power not supplied, or wiring to power source (L11, L12, L13) disconnected.	• Contact the DMG MORI Service Department for assistance.	—
Lamp is not illuminated when controller is operating.	Lamp defective.	• Replace the lamp. (For required parts, contact the DMG MORI Service Department for assistance.)	—
Cooling fluid not supplied when pump operating. Low fluid circulation with loud pump noise.	Piping on suction side of pump loose.	• Check the piping seals and tighten if necessary. If the malfunction continues to occur, contact the DMG MORI Service Department for assistance.	—
	Cooling fluid in reservoir tank is contaminated.	• Replace cooling fluid in reservoir tank.	"Replacing Cooling Fluid" (page 8-70)
	Fluid level in reservoir tank too low.	• Add cooling fluid.	"Replacing Cooling Fluid" (page 8-70)
	Pump or motor bearing damaged.	• Contact the DMG MORI Service Department for assistance.	—

8.2 Warning Code/Alarm Code

If the warning lamp or the alarm lamp of the water-glycol chiller is illuminated/flashs, contact the DMG MORI Service Department.

NOTE

1. The illuminated warning lamp indicates the minor warning and the flash of the warning lamp indicates the serious warning.
2. If the alarm lamp is illuminated, the compressor stops. If the alarm lamp flashes, the operation of the water-glycol chiller stops.



1	Alarm lamp
2	Warning lamp

8.2.1 List of Warning Code

Warning Code	Description	Cause
H1	Room temperature thermistor error	Disconnection or short circuit of room temperature thermistor (when not used for control)
JH	Evaporator outlet water temperature thermistor error	Disconnection or short circuit of evaporator outlet water temperature thermistor (when not used for control)
	Inlet water temperature thermistor error	Disconnection or short circuit of inlet water temperature thermistor (when not used for control)
J3	Discharge pipe temperature thermistor error	Disconnection or short circuit of discharge pipe temperature thermistor
J4	EV valve outlet temperature thermistor error	Disconnection or short circuit of EV valve outlet temperature thermistor
J5	Suction pipe gas temperature thermistor error	Disconnection or short circuit of suction pipe gas temperature thermistor
J6	Condenser temperature thermistor error	Disconnection or short circuit of condenser temperature thermistor
P4	Radiator fin temperature thermistor error	Disconnection or short circuit of radiator fin temperature thermistor
F6	High pressure error	Air filter clogging or obstacles prevent air flow
		Operation outside the high temperature range
3E	Temperature range warning 3	The monitor temperature has exceeded the preset temperature. (not a fault of the water-glycol chiller)
4E	Temperature range warning 4	
5E	Temperature range warning 5	

8.2.2 List of Alarm Code

Alarm Code	Description	Recovery Procedure
AA	Heater overheat	Water is not flowing.
A6	DC fan motor lock error	Rotation speed of fan motor is insufficient due to drop of DC voltage by breaking wire or looseness of connector.
		Communication error between fan motor and control board
		Fault of the DC fan motor
E1	System error	Internal parameter setting is invalid.
E3	High pressure error	The water temperature or room temperature is higher than the specified range.
		There is an obstacle near the air intake/exhaust port.
		The air filter is clogged, or the condenser is soiled.
		Any factor other than the above.
E5	Compressor high temperature error	The water temperature or room temperature is higher than the specified range.
		There is an obstacle near the air intake/exhaust port.
		The air filter is clogged, or the condenser is soiled.
E6	Compressor lock	Fault of the compressor

Alarm Code	Description	Recovery Procedure
EH	Pump overcurrent relay is activated	The pump is overloaded with the high-viscosity water.
		The pump current has increased as the power supply voltage falls below the operating range.
		The pump motor wiring has a break (open-phase).
		Entry of foreign matter into the pump or failure of the pump motor
EJ	Optional protection device is activated	The optionally-connected protection device or factory-connected protection device has been activated.
FE	Water temperature error	The water temperature is higher than 65°C.
FH	Evaporator outlet water temperature is higher than 60 °C	The heating value of the machine has exceeded the cooling capacity of the water-glycol chiller.
		There is an obstacle near the intake/exhaust port, resulting in cooling capacity deterioration.
		The unit is running under capacity suppressing control, because the standard temperature (room temperature: 25°C, water temperature: 25°C) has been exceeded.
		Temperature control is disabled because the unit is operated in Mode9 (capacity direct designation mode).
		The refrigerant gas has leaked.
	Falling suction gas temperature Freeze water	Refrigerant suction gas temperature is less than 0°C.
H1	Air temperature thermistor error Th1: Machine temperature tracing type thermistor Th3: Room temperature thermistor	Disconnection or short circuit of the air temperature thermistor required for control
JH	Evaporator outlet water temperature thermistor error	Disconnection or short circuit of the evaporator outlet or tank water temperature thermistor (when used for control)
	Tank internal water temperature thermistor error	
L0	Inverter/compressor error	The compressor or inverter has a fault.
L4	Radiator fin temperature thermistor error	The water temperature or room temperature is higher than the specified range.
LC	INV-temperature control CPU communication error	Communication failure between the temperature control microprocessor and the inverter microprocessor
U0	Gas shortage	The refrigerant piping is damaged by excess vibration during transportation, resulting in refrigerant gas leak.
U1	Power supply reverse-phase/open-phase connection, Low voltage (power voltage)	The power supply is connected in reverse phase.
		Open phase
		The fuse in the noise filter board has blown.
		The power voltage is under about 130 V.
U2	Low voltage (DC voltage on main inverter circuit)	Circuit protection for surge current restriction is activated due to excess ON/OFF switching of power supply.
		Unconnection of DCL
		Decrease of the DC voltage of the main circuit due to break-ing of wiring or disconnection of connector
		Power voltage sag (interrupt) often occurs.
U9	Other system communication error (Slave communication error)	Communication error with a slave

Alarm Code	Description	Recovery Procedure
UH	System failure (EEPROM error)	The parameter stored in the control board is invalid.
UJ	Optional protection device is activated	The optionally-connected protection device or factory-connected protection device has been activated.
J3	Discharge pipe temperature thermistor error	Disconnection or short circuit of the discharge pipe temperature thermistor
J4	EV valve outlet temperature thermistor error	Disconnection or short circuit of the EV valve outlet temperature thermistor
J5	Suction gas temperature thermistor error	Disconnection or short circuit of the suction gas temperature thermistor
J6	Condenser temperature thermistor error	Disconnection or short circuit of the condenser temperature thermistor

9 ALARMS RELATED TO PNEUMATIC DEVICES

9.1 EX0560 'AIR PRESSURE LOW'

The three primary causes of an air pressure abnormality are outlined below. Check the air pressure by following the procedures below and perform troubleshooting procedures as necessary.

1. Filter element clogging:

- "Manual Draining from Air Filter" (page 8-73)
- "Replacing Filter Element of Air Filter/Mist Separator" (page 8-73)

2. Incorrect adjustment of air pressure switch:

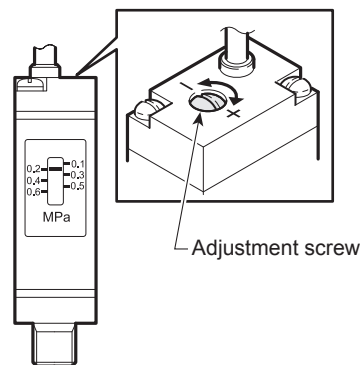
- "<Incorrect Adjustment of Air Pressure Switch>" (page 8-145)

3. Air pressure switch malfunction:

- "<Air Pressure Switch Malfunction>" (page 8-145)

<Incorrect Adjustment of Air Pressure Switch>

If the cause of the problem is not related to the filter element, check the air pressure switch to confirm the air pressure is at the set value. While observing the gage on the air pressure switch, use a flat head screwdriver to rotate the adjustment screw on the pressure switch to set the pressure value.



Air Pressure Switch

<Air Pressure Switch Malfunction>

When neither clogging of the filter element or incorrect adjustment of the air pressure switch is the cause of the problem, the pressure switch may be malfunctioning. Contact the DMG MORI Service Department for assistance.

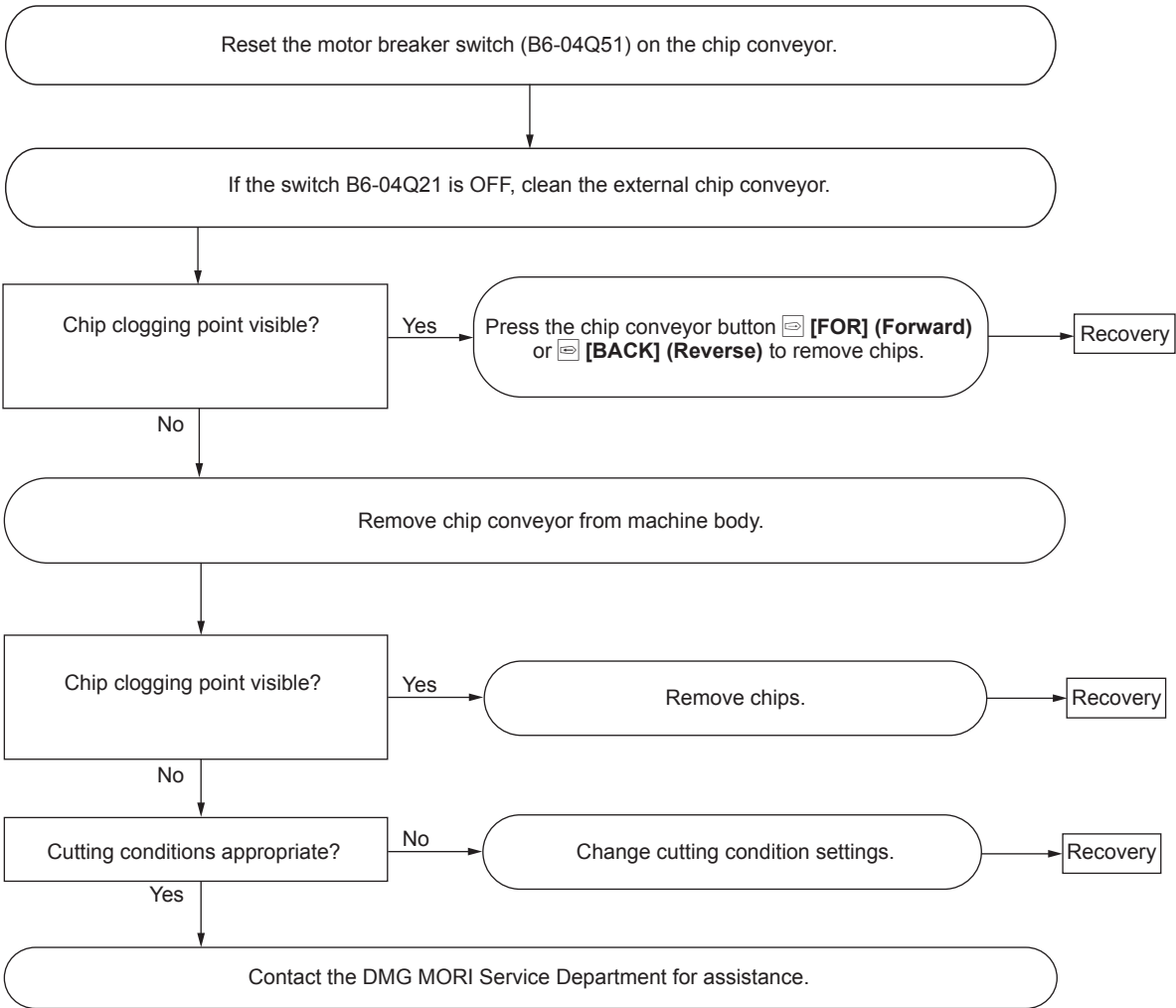
10 CHIP CONVEYOR (OPTION) ALARMS

10.1 EX2550 ‘THERMAL OVERLOAD TRIP 1’

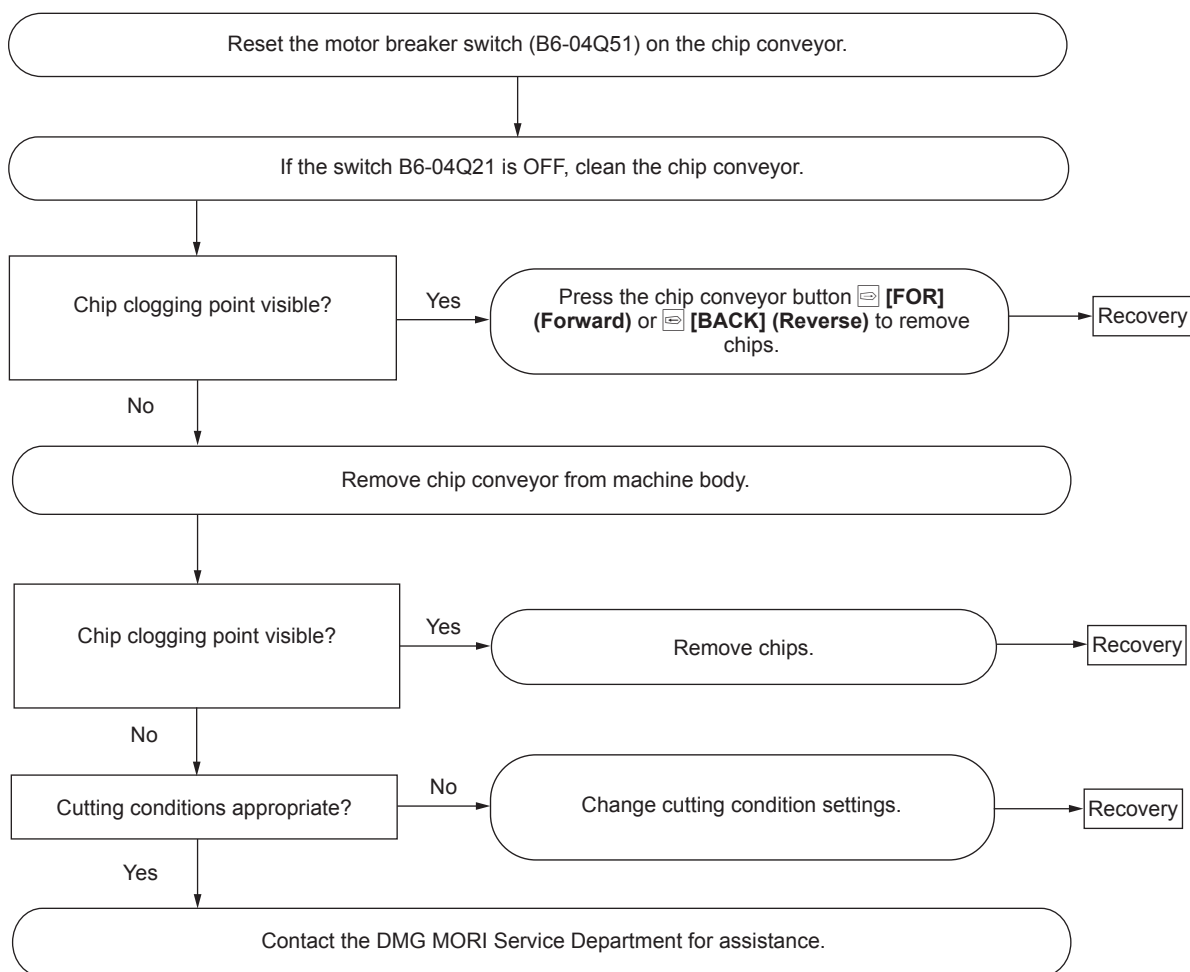
NOTE

EX2550 also occurs when the following motor breakers are OFF:

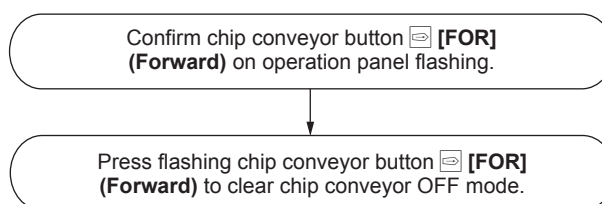
- The motor breaker (S5-01Q21) of the coolant gun (option)
- The motor breaker (S2-01Q21) of the shower coolant (option)



10.2 EX0583 'CHIP CONVEYOR OVERLOAD'



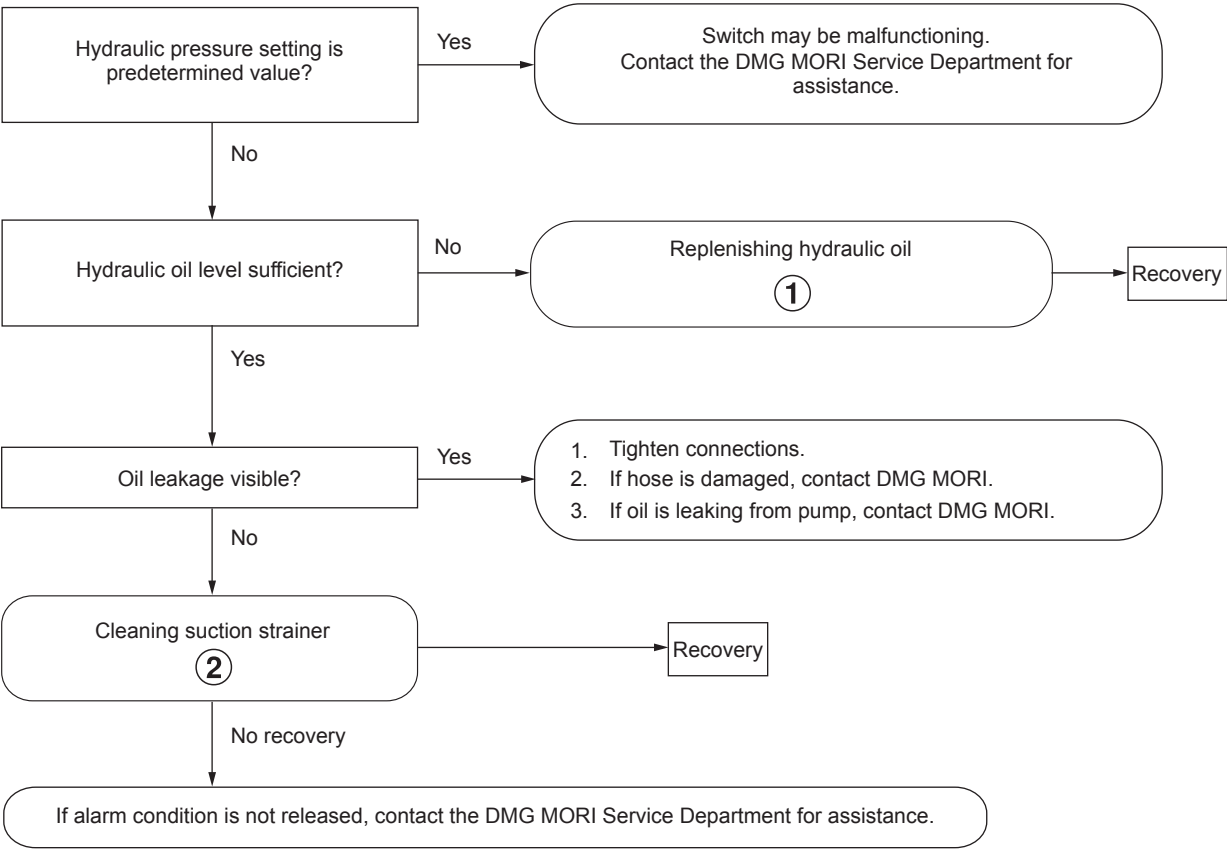
10.3 EX2564 'CHIP CONVEYOR OFF-MODE TIMED OUT'



Holding down the chip conveyor button [STOP] (Stop) for longer than 1 second activates the chip conveyor OFF mode and disables the chip conveyor start operation.

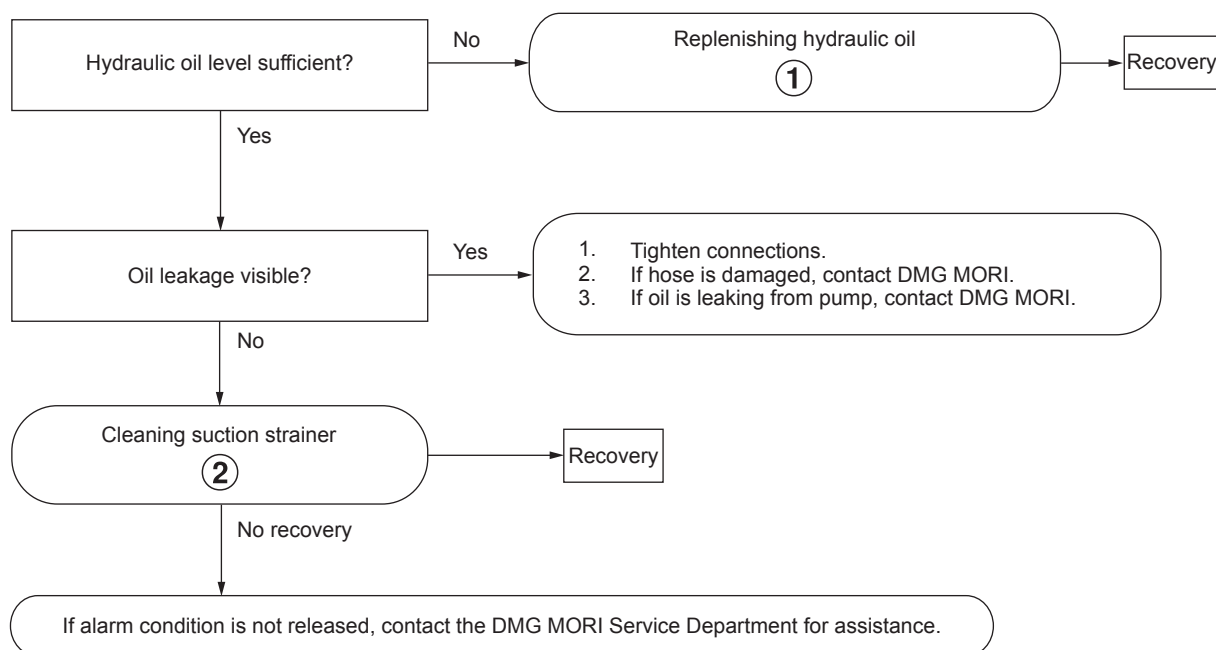
11 HYDRAULIC UNIT ALARMS

11.1 EX0561 ‘HYDRAULIC PRESSURE LOW’



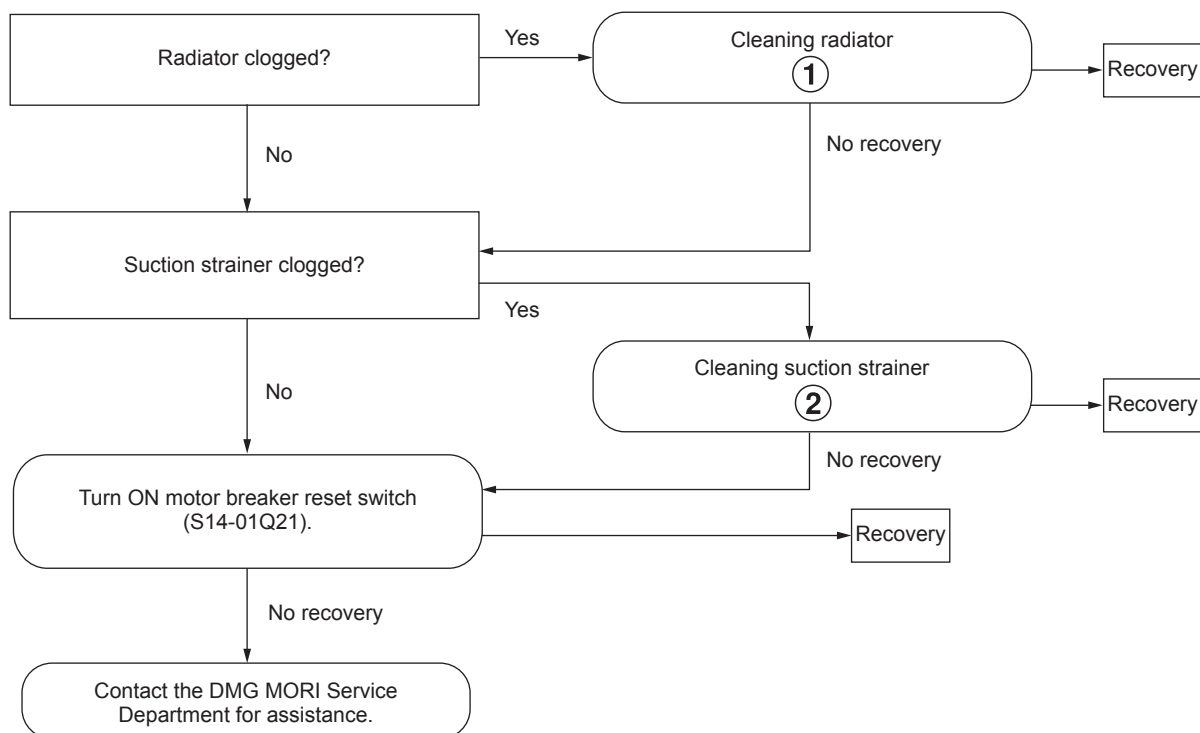
No.	Refer to
①	“Checking Oil Level/Replenishing Oil” (page 8-105)
②	“Cleaning Suction Strainer and Tank” (page 8-108)

11.2 EX0568 'HYDRAULIC OIL LEVEL LOW'



No.	Refer to
①	"Checking Oil Level/Replenishing Oil" (page 8-105)
②	"Cleaning Suction Strainer and Tank" (page 8-108)

11.3 EX0580 'HYDRAULIC PUMP OVERLOAD'



No.	Refer to
①	"Cleaning Radiator" (page 8-107)
②	"Cleaning Suction Strainer and Tank" (page 8-108)

11.4 Alarm Not Triggered but Operation Abnormal

Item	Status	Cause	Reference Items/Recovery Procedures
1	Pressure Does Not Rise	Low Oil Level In Tank	"Checking Oil Level/Replenishing Oil" (page 8-105) "Replacing Oil" (page 8-106)
		Suction Strainer Clogging	"Cleaning Suction Strainer and Tank" (page 8-108)
2	Pressure Fluctuation	Air Entry Into Piping	Item "4"
		Pressure Gage Reading Abnormal	Item "1" When necessary to replace the pressure gage, contact the DMG MORI Service Department for assistance.
3	Abnormal Noise Generated	Hydraulic Oil Viscosity Inappropriate	"OILS/COOLING FLUID" (page 8-23)
		Low Oil Level In Tank	"Checking Oil Level/Replenishing Oil" (page 8-105) "Replacing Oil" (page 8-106)
		Suction Strainer Clogging	"Cleaning Suction Strainer and Tank" (page 8-108)
		Pressure Fluctuation	Item "2"
		Pump Component Damage/Wearing	Contact the DMG MORI Service Department for assistance.
4	Oil Leakage	Oil Leakage From Connections	Tighten connections.
		Hose Deterioration, Damage	Contact the DMG MORI Service Department for assistance.
		Oil Leakage From Pump	Contact the DMG MORI Service Department for assistance.

12 ALARM RELATED TO IN-MACHINE MEASURING SYSTEM (OPTION)

12.1 EX1976 'SPINDLE SENSOR ALARM' (1)

Replace the spindle sensor batteries when EX1976 (1) occurs.

NOTE

Battery part No.: E30401 (two 1/2 AA (3.6 V) lithium-thionyl chloride batteries)

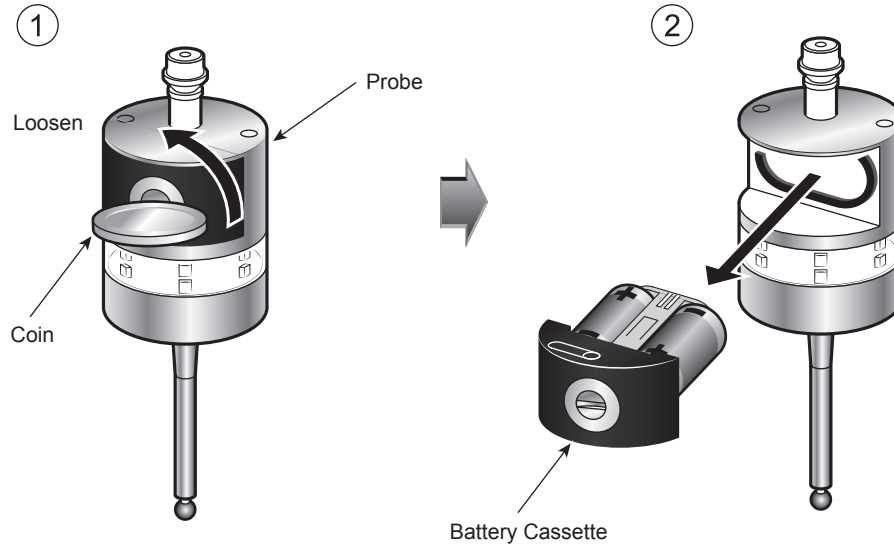
12.1.1 Replacing Battery

CAUTION

1. Do not leave dead batteries in the probe.
2. When replacing batteries, do not allow coolant or chips to enter the battery cassette.
3. Always ensure that the polarity of the batteries is correct.
4. Take care to avoid damaging the battery cassette seal.
5. Use only the specified batteries.
6. Do not mix old and new batteries or different types of batteries.
7. Contact local governments for disposing of used batteries appropriately. Do not incinerate the batteries.

<Procedure>

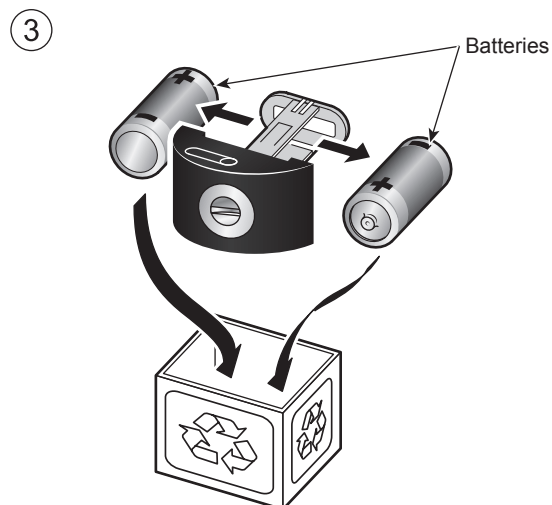
- 1) Loosen the fixing screw of the battery cassette (①).
- 2) Remove the battery cassette (②).



- 3) Remove the old batteries and replace them with new ones (③).

CAUTION

After removing the old batteries, wait more than 5 seconds before inserting the new batteries.

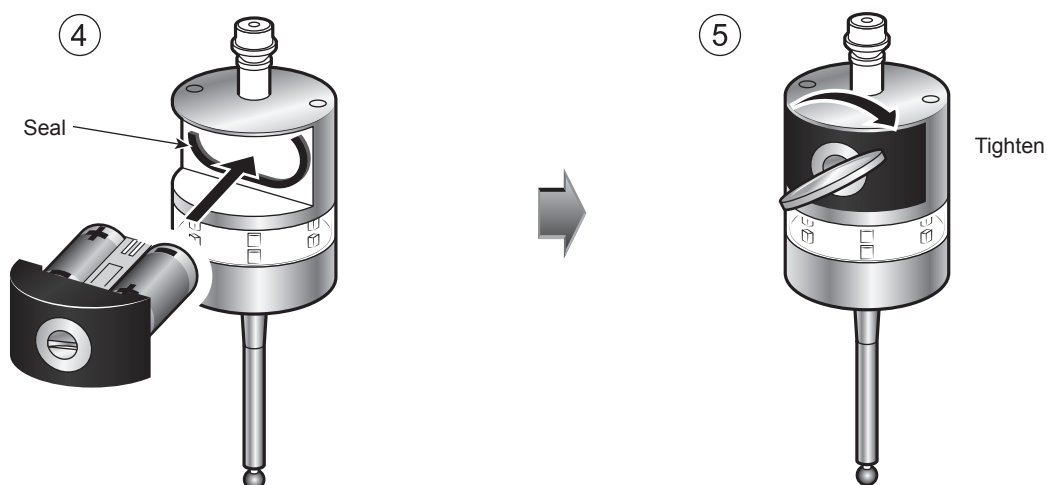


- 4) Remount the battery cassette (④).

CAUTION

Ensure that the cassette seal and its contact surface are clean and free from dust before remounting the battery cassette.

- 5) Tighten the fixing screw (⑤).



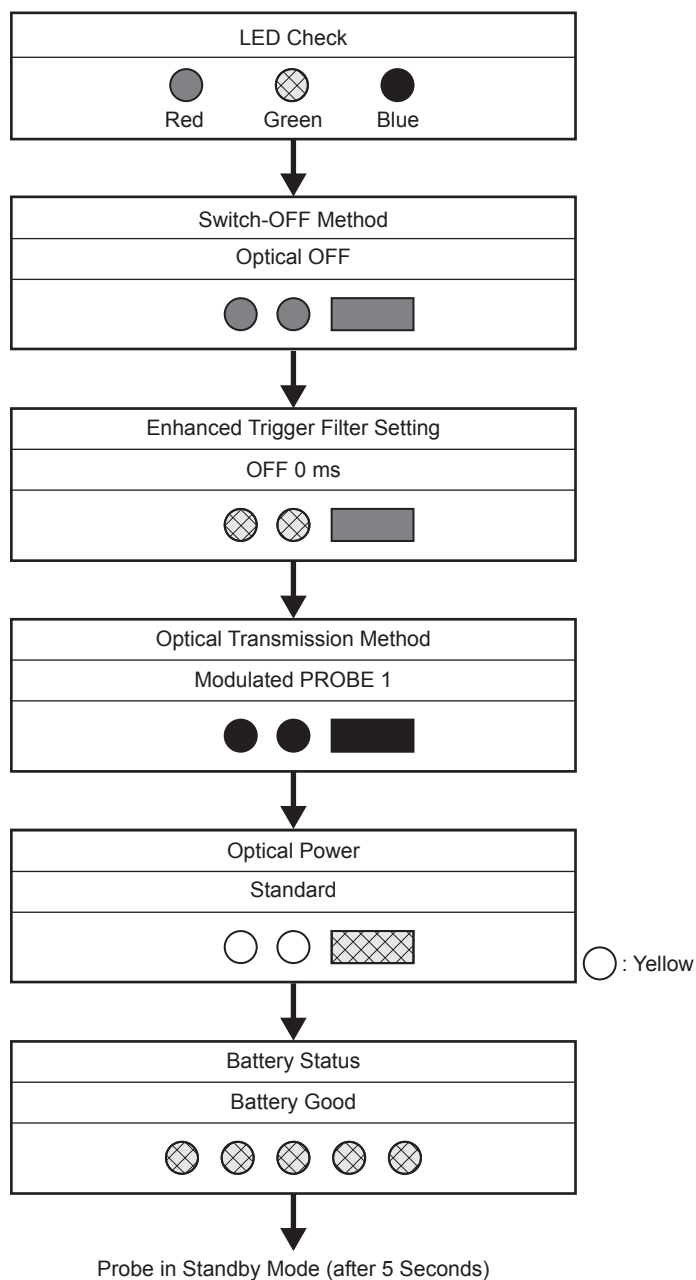
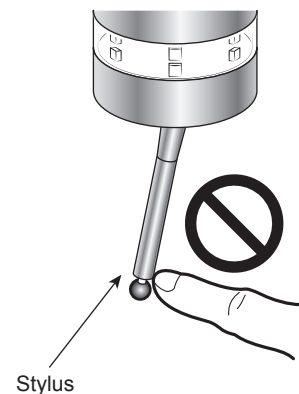
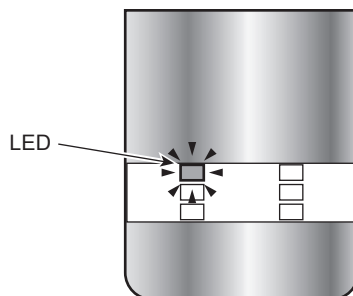
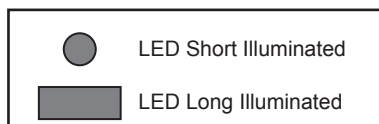
- 6) Check the probe setting.

NOTE

1. Confirm that the LED on the sensor is illuminated according to the following flowchart.
2. Do not touch the stylus.

CAUTION

If exhausted batteries are inserted by mistake, the LED will remain a constant red.



12.2 EX2957 'TABLE SENSOR ALARM' (1)

Replace the table sensor batteries when EX2957 (1) occurs.

 NOTE

Battery part No.: E30401 (two 1/2 AA (3.6 V) lithium-thionyl chloride batteries)

12.2.1 Replacing Battery



DANGER

Turn OFF the main power.

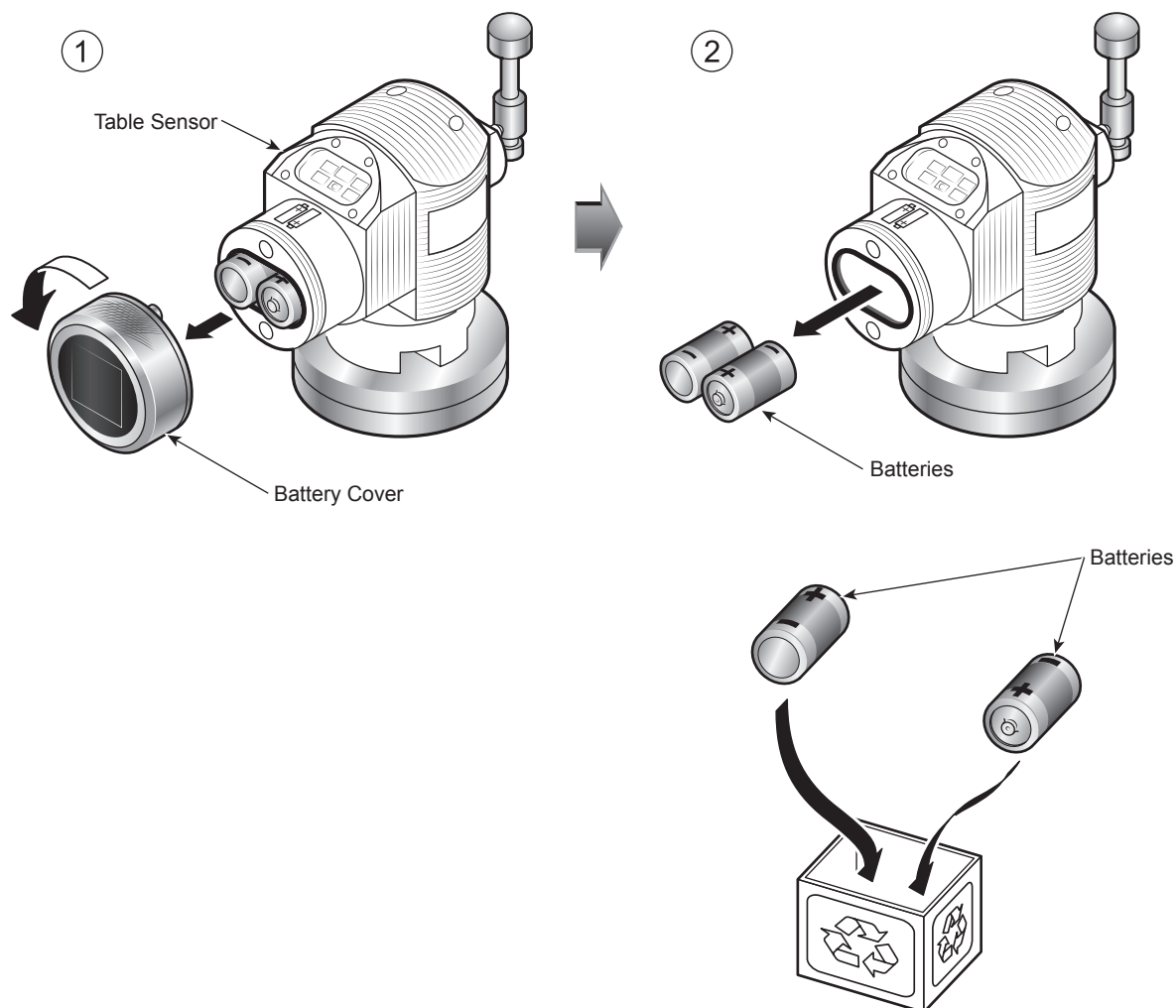


CAUTION

1. Do not leave dead batteries in the probe.
2. When replacing batteries, do not allow coolant or chips to enter the battery housing.
3. Always ensure that the polarity of the batteries is correct.
4. Take care to avoid damaging the battery housing packing.
5. Use only the specified batteries.
6. Do not mix old and new batteries or different types of batteries.
7. Contact local governments for disposing of used batteries appropriately. Do not incinerate the batteries.

<Procedure>

- 1) Open the operation panel side door.
- 2) Turn OFF the main power.
- 3) Remove the battery cover (①).
- 4) Remove the old batteries (②).



- 5) Insert new batteries (③).

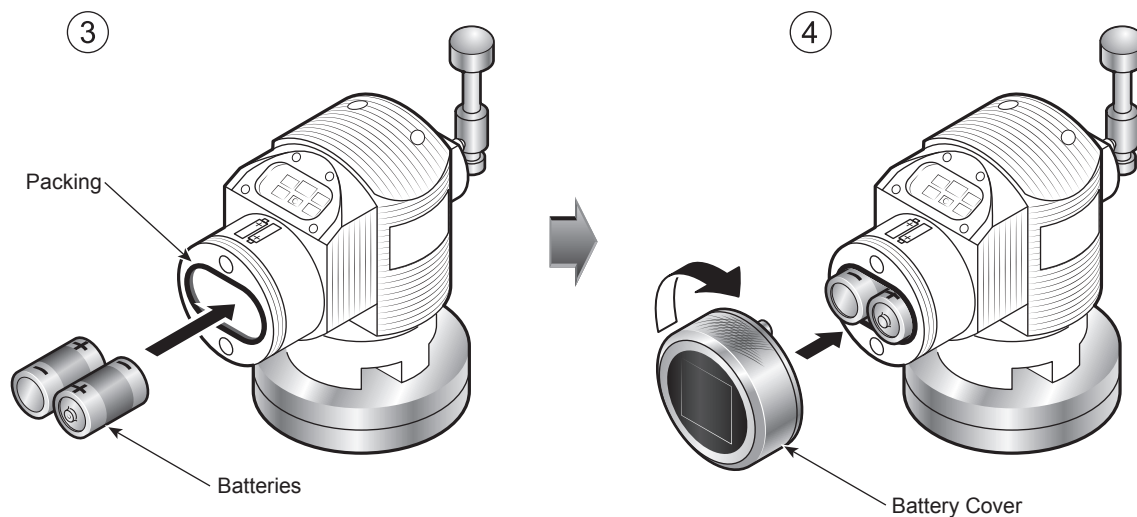
⚠ CAUTION

After removing the old batteries, wait more than 5 seconds before inserting the new batteries.

- 6) Remount the battery cover (④).

⚠ CAUTION

Ensure that the packing and its contact surface are clean and free from dust before remounting the battery cover.



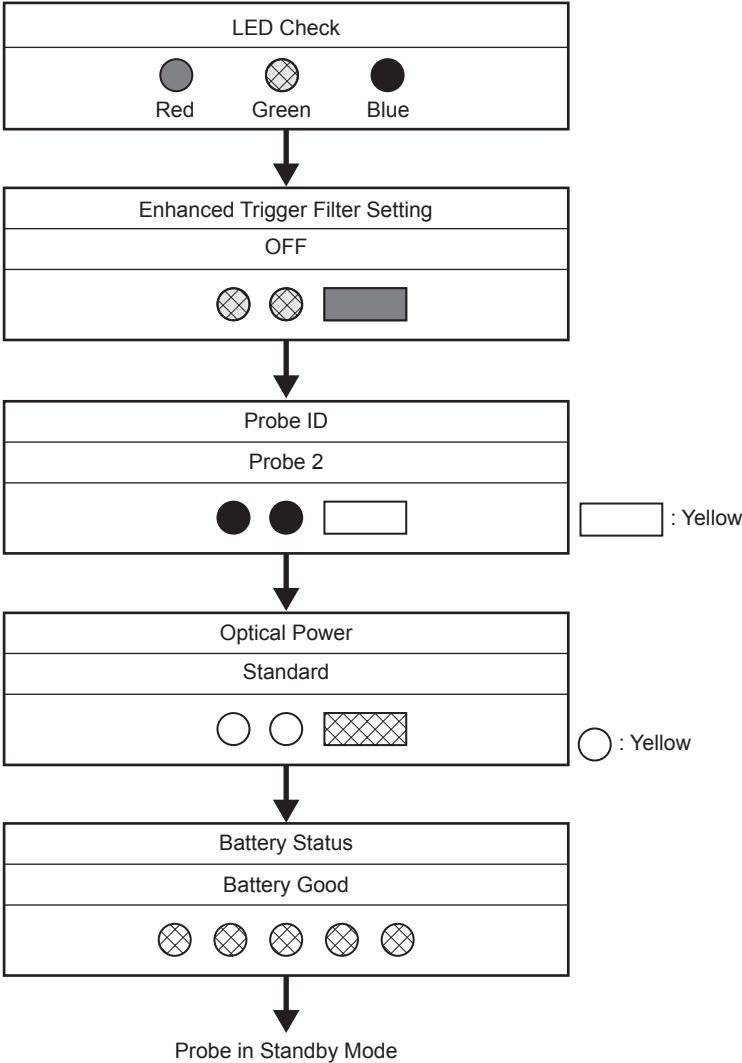
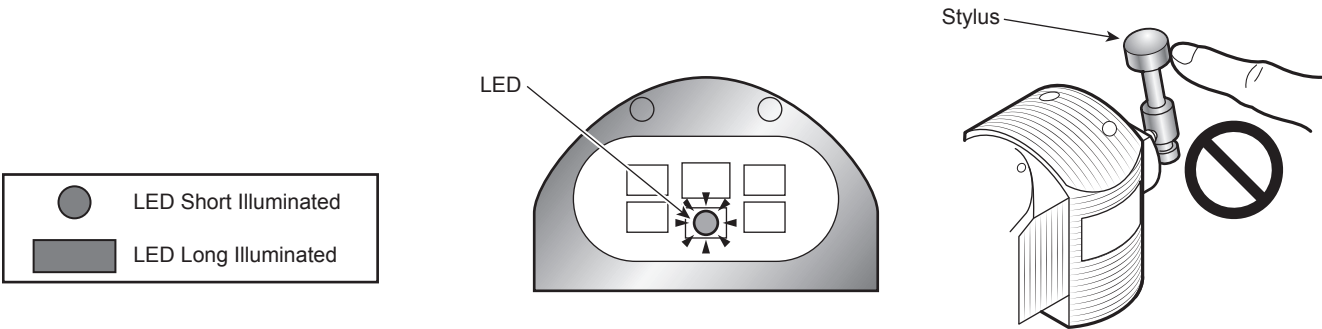
- 7) Check the probe setting.

NOTE

1. Confirm that the LED on the sensor is illuminated according to the following flowchart.
2. Do not touch the stylus.

CAUTION

If exhausted batteries are inserted by mistake, the LED will remain a constant red.



13 WHEN 300 APC ALARM: 'n AXIS NEED ZRN' IS DISPLAYED

NOTE

1. The name of the axis is indicated in "n".
2. APC: Absolute Pulse Coder

<Procedure>

- 1) Change the batteries.

 "Replacing Battery" (page 8-85)

- 2) Display the 'OPERATION PANEL' screen.

Function selection key  (SETTING) → [OPE. PANEL] → [OPE PANEL]

- 3) Validate the 'ZERO POINT SET'.

CAUTION

If 'ZERO POINT SET' is set to 'VALID' with no present position data available, all feed axis interlocks are cancelled, and therefore axis movement should be conducted with extreme caution.

[Table or saddle contact with protective covers]

- 4) Prepare for handle feed operation using the following procedure:
 - a) Place the door interlock key-switch in the [NORMAL] position.
 - b) Close the operation panel side door.
 - c) Turn the operation selection key-switch to  [ON] or  [PANEL/EDIT].
 - d) Select the axis feed amount  [×100] with the axis feed amount selection button or switch.
 - e) Select a feed axis using the axis selection switch.
- 5) Make the NC read the one revolution signal of the motor on the axis, which establishes zero point using the following procedure:
 - a) Rotate the manual pulse generator to move the table close to the center of the stroke.
 - b) Rotate the manual pulse generator to feed the axis close to the zero point position.

WARNING

Do not stand near moving machine parts when an axis is fed. Before starting axis feed, always confirm that there are no personnel or obstacles near moving parts.

[Entanglement/Component Interference]

CAUTION

1. When the table stops at the end of the stroke, pay close attention to the axis feed direction (+/−).
[Machine interference, damage]
 2. Do not rotate the manual pulse generator any faster than five rotations per second. If rotated faster than the above, the actual axis feed amount will not coincide with the number of pulses indicated.
[Machine damage]
 3. The stored stroke check function is invalid. Take the proper precautions to ensure the axis feed is not excessive. If the axis is fed excessively, machine damage may result.
- 6) Rotate the manual pulse generator to feed the axis in the minus direction (opposite direction to zero return).

NOTE

1. As zero point establishment is not complete, refer to the ABSOLUTE value on the screen to check the distance to feed each axis.
 2. Proximity switches are not installed to confirm zero point return completion as this model applies the dogless type zero point return method.
 3. If operating in zero point return mode, axis movement in a direction opposite to a zero point return is not possible even when pressing the axis feed buttons.
- 7) Establish the zero point using the following procedure:
 - a) Press the mode selection button  [ZRN] (Zero Return).
 - b) Press the [RAPID OVERRIDE] (Rapid Traverse Rate Override) switch  [1%].
 - c) Press the axis feed button to select the direction in which the axis is to be returned to the zero point.
[The axis approaches the zero point and stops at the zero point automatically.]

 CAUTION

If the alarm is triggered, turn OFF the power and perform step 5) again. This alarm may be generated when the manual pulse generator is rotated too slowly. If the alarm cannot be reset, contact the DMG MORI Service Department for assistance.

- d) Confirm the zero point return is complete with the Status Indicator.

 CAUTION

If the markers do not meet (positioning error), parameters must be changed. Contact the DMG MORI Service Department for assistance.

[Machine interference, damage]

- 8) Press the  (RESET) key to reset the alarm.
[‘ZERO POINT SET’ of the ‘OPERATION PANEL’ screen changes to ‘INVALID’.]

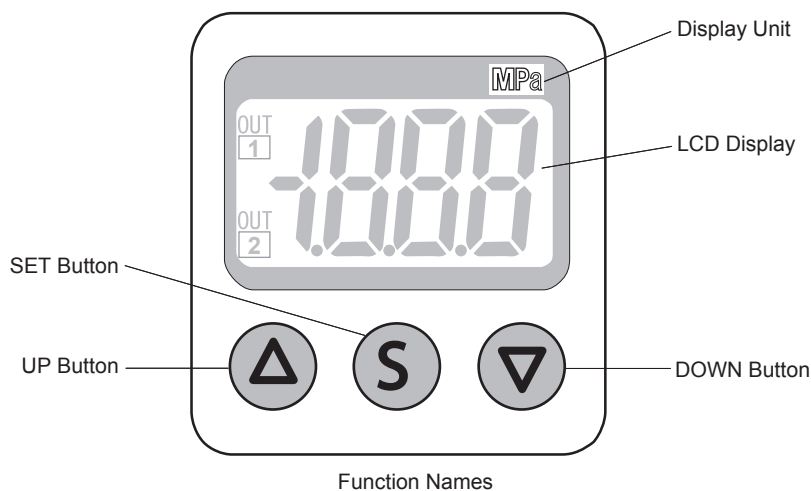
 CAUTION

When the alarm is triggered for multiple axes, perform steps 1) to 7), and then return to step 3) to establish the zero point return position for the remaining axes.

14 WORKPIECE SEATING DETECTION PRESSURE SWITCH

WARNING

For details, refer to the instruction manual supplied by pressure switch manufacturer. Do not use the pressure switch without reading and obtaining a thorough understanding of the contents of the instruction manual supplied by pressure switch manufacturer.



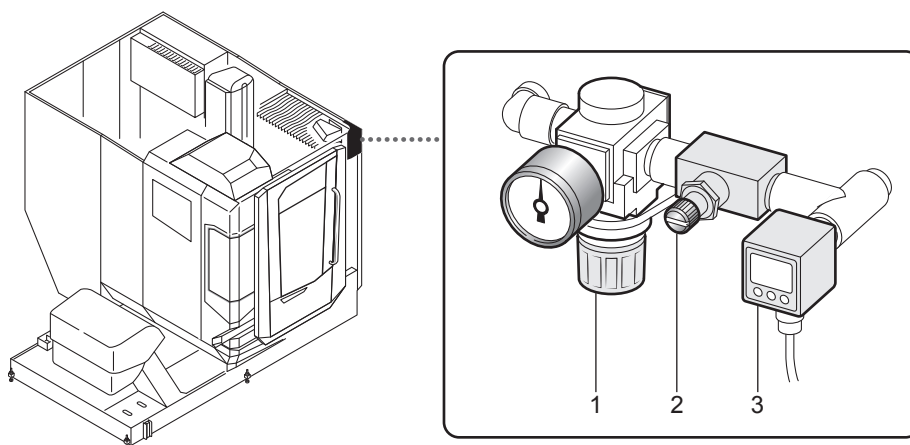
14.1 Pressure Value Confirmation and Adjustment

WARNING

Stop the machine before adjusting the pressure setting of the pressure switch.

[Serious injury]

<Procedure>



1	Regulator
2	Speed Controller
3	Pressure Switch

NOTE

- The default settings are as follows:
 - Reducing valve: 0.1 MPa
 - Speed controller: 1.5 turns open from fully-closed
 - Pressure switch -P1 (OUT1): 70 kPa

2. P2 (OUT2) is not used.

1) Check the pressure values and correct them if necessary using the following procedure:

a) Press the 'SET' button in the measurement mode.

[Changed to the pressure settings mode, and 'P_1' and the setting value are displayed alternately]

b) Set the value using the 'UP' and 'DOWN' buttons.

c) Press the 'SET' button.

d) Press the 'SET' button again to return to the measurement mode.

15 SOFT-OVERTRAVEL ALARM

Software limit positions are set with parameters or a program. If an axis is fed beyond its limit, the following alarm occurs, stopping the axis feed. This alarm is called as the “soft-overtravel alarm”.

- (OT)05**



NOTE

** Alarm numbers differ depending on machine types.

<To Cancel the Alarm State>

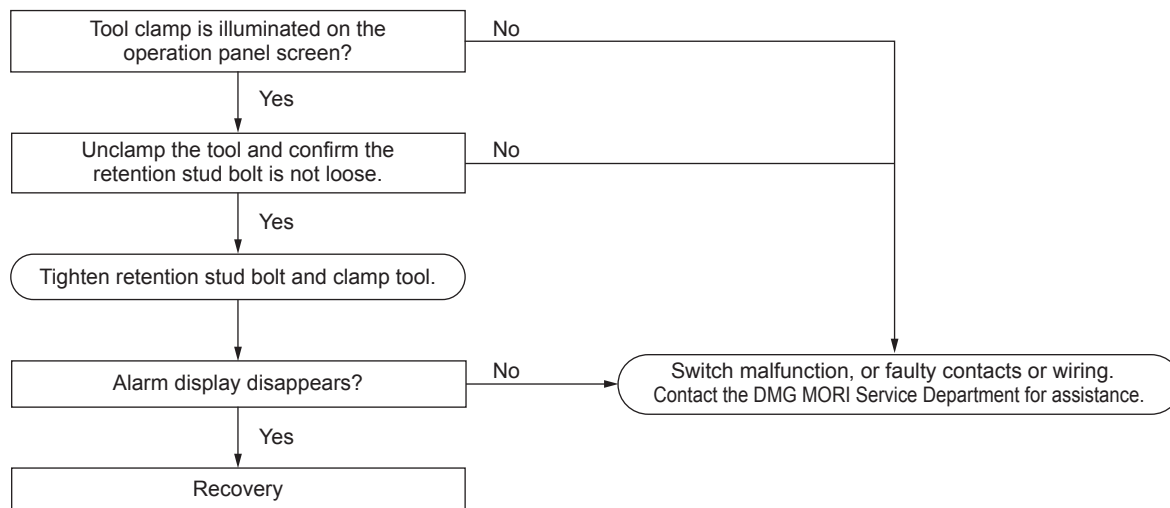
1. Read the alarm number and message displayed on the screen.
2. Place the door interlock key-switch in the **[NORMAL]** position.
3. Close the operation panel side door.
4. Select a manual mode.
5. Feed the axis that caused the soft-overtravel alarm in the opposite direction, away from its limit. For this operation, use handle feed, jog feed, or rapid traverse mode.
6. Press the  (**RESET**) key.
[The alarm state is cleared.]

16 ALARMS RELATED TO TOOL CLAMPING

When an alarm (EX0021, EX0165, EX0166, EX0167) related to tool clamping is triggered, the retention stud bolt may be loose or the switch may be malfunctioning. Confirm according to the following procedure.

NOTE

An alarm is triggered if the next command is specified without the tool being clamped. Ensure the tool is clamped before issuing the next command.



17 REMOVING CHIPS ENTANGLED IN CUTTING TOOL AND WORKPIECE



WARNING

1. Always stop the machine before removing chips inside it during operation.
[Entangled or crushed by the moving parts]
2. Stop the machine and coolant supply before adjusting the direction or volume of coolant supply.
[Entanglement or crushing by moving parts]
3. Stop spindle rotation before opening the door during automatic operation. Pressing the automatic operation button  [STOP] (Stop) during automatic operation stops axis movement but not spindle rotation.
[Entangled with the spindle]
4. Before opening the door to remove chips during machining operation, make sure that the door interlock function is [NORMAL]. After removing chips, close the door before restarting machine operation.
[Injuries]



CAUTION

1. Do not touch chips or cutting tools with your bare hands.
[Injury]
2. Do not move the axes or change cutting tools manually while automatic operation is suspended and manual operation mode is selected. If it becomes necessary to do these manually, always return the axes or the tools to the previously located position before restarting the program.
[Tool collision with workpiece or fixture/Machine damage]

<Procedure>

- 1) Press the automatic operation button  [STOP] (Stop) to suspend program execution at a position where chips will be removed from the workpiece easily.
- 2) Select any of the manual mode keys.
- 3) Press the spindle rotation button  [STOP] (Stop).
[Spindle rotation stops.]
- 4) Make sure the door interlock key-switch is in [NORMAL].
- 5) Open the door.
- 6) Remove chips from the workpiece using a proper hand tool.
- 7) Close the door.
- 8) Press the spindle rotation button  [NOR] (Forward) or  [REV] (Reverse).
[The spindle restarts rotating at the speed it was rotating before stopped.]
- 9) Press the mode selection button  [MEM] (Memory).
- 10) Press the automatic operation button  [START] (Start).
[The program is restarted.]

18 CHECKING/CORRECTING INACCURATE MACHINING

Inaccurate machining is caused by various cutting conditions and factors such as the type of jigs, tools and coolant used. If we consider the machine body, a reduction in machining precision is caused primarily by incorrect machine level adjustment and excessive backlash. Check the items below to confirm machine body-related precision adjustments.

18.1 Adjusting Machine Level

Using a level, measure the machine horizontal level and degree of twisting. Machine level adjustment is required as incorrect machine level adjustment or excessive twisting will result in a reduction in machining precision.

 Installation

18.2 Backlash Check

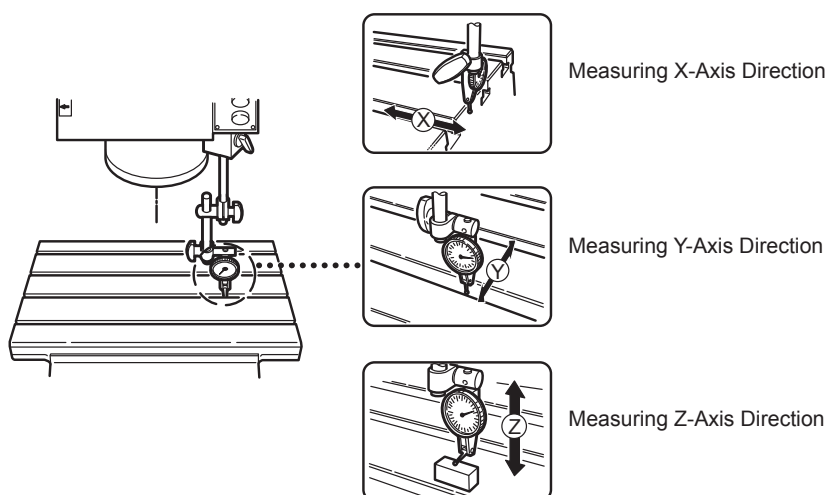
When machining accuracy varies substantially, confirm the machine backlash.

<Procedure>

- 1) Using a magnet stand, attach a lever type dial test indicator to the spindle head.
- 2) Prepare for handle feed operation using the following procedure:
 -  Machine operation
 - a) Place the door interlock key-switch in the **[NORMAL]** position.
 - b) Close the operation panel side door.
 - c) Turn the operation selection key-switch to  **[ON]** or  **[PANEL/EDIT]**.
 - d) Select the axis feed amount  **[×1]** with the axis feed amount selection button/switch.
 - e) Select the axis to be measured using the axis selection switch.
- 3) While observing the lever type dial test indicator, rotate the manual pulse generator until the gage stylus is aligned with the measuring point.

NOTE

1. Take care not to rotate the needle on the lever type dial test indicator more than a single rotation to prevent damage to the gage.
2. Press the **[×10]** or **[×100]** button as necessary if the distance to be moved is large. However, when the needle on the lever type dial test indicator is to be aligned with the measuring point, always select the **[×1]** button.



- 4) Stop rotating the manual pulse generator when the needle turns 1/4 of a rotation and set the scale to "0".
- 5) Display the 'CURRENT POSITION' ('RELATIVE COORDINATE') screen using the following procedure:

Function selection key  (**POS**) → **[REL.]**

 Machine operation

- a) Press **[ORIGIN]**.
- b) Press **[ALL AXES]**.

[The incremental coordinate position data for all the axis (X, Y, Z) is reset to "0.000".]

- 6) Measure the X-axis backlash using the following procedure:

 NOTE

1. Take care not to rotate the needle on the lever type dial test indicator more than a single rotation to prevent damage to the gage.
2. When measuring the backlash, specify motion in one direction only to position the axis.
 - a) Turn the manual pulse generator to feed the X-axis in the plus direction until the value on the screen reads "X: 0.050".
 - b) Feed the X-axis in the minus direction until the value on the screen reads "X: 0.000".
 - c) Read the dial on the lever type dial test indicator and record the value.



 Here, the value on the dial is assumed to be "0.013".
 - d) Feed the X-axis in the minus direction until the value on the screen reads "X: -0.050".
 - e) Feed the X-axis in the plus direction until the value on the screen reads "X: 0.000".
 - f) Read the dial on the lever type dial test indicator.



 Here, the value on the dial is assumed to be "0.004".

The difference between the values recorded in steps **c)** and **f)** " $0.013 - 0.004 = 0.009$ " is the axis backlash.
- 7) Measure the other axis using the same procedure.
- 8) Record the backlash measurements and contact the DMG MORI Service Department for assistance.

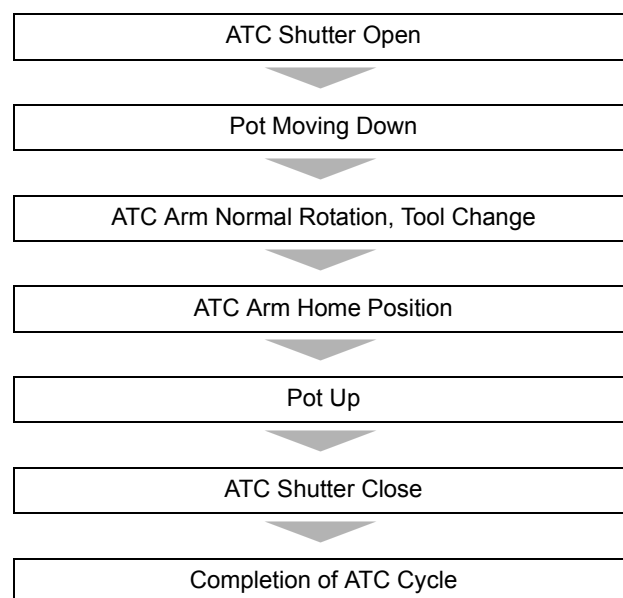
19 POWER SUPPLY CUT OFF DURING ATC OPERATION

When power supply is cut off during ATC operation, complete the ATC operation by moving the ATC manually.

CAUTION

1. Contact the DMG MORI Service Department for assistance prior to performing a magazine/ATC recovery operation. DMG MORI does not accept responsibility for accidents that occur as a result of recovery operations performed at the discretion of the user.
2. Do not perform a manual magazine/ATC operation unless absolutely necessary to rectify a problem that has occurred. Starting a manual operation without taking the necessary precautions will cause the ATC arm or tool to collide or interfere, resulting in damage to the machine.

19.1 ATC Cycle



 "Confirming ATC Stopped Position" (page 8-167)

19.2 Conditions Required for ATC Operation

The conditions to carry out the ATC cycle are described below.

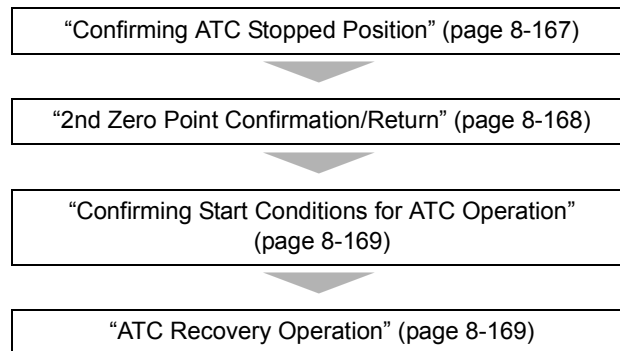
When changing or returning a tool by executing an M06 (tool change) or M33 (tool return) command, the conditions required for ATC operation must be satisfied. If the ATC cycle cannot be executed even if the correct operation sequence is followed, check the ATC if the following conditions are satisfied.

<Conditions>

1. The operation panel side door and the magazine door (option) are closed.
2. An automatic mode (memory, MDI, DNC) is selected.
3. The machine operation is in ready status.
4. The machine is not in the reset state.
5. X-, Y-, and Z-axes are at the second zero point.
6. An ATC cycle has completed.
7. The vertical soft-key **[ATC HOME POSITION]** is illuminated.
The conditions that display the vertical soft-key **[ATC HOME POSITION]**, shown below, are satisfied.
 - The ATC main arm must be at the home position.
 - The pot must be moved up.
 - The tool must be clamped.
(The vertical soft-key **[TOOL CLAMP]** is lit.)
 - ATC shutter is closed.
8. For a sensor tool, the spindle orientation has completed.
( **[ORT] (Spindle Orientation)** button lamp is illuminated.)

9. The machine is not in the synchronized tapping operation.
10. There is no magazine or ATC related alarm.
11. The interlock functions are not bypassed.
12. A T command is specified.

19.3 ATC Recovery Sequence



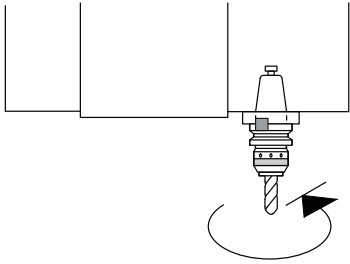
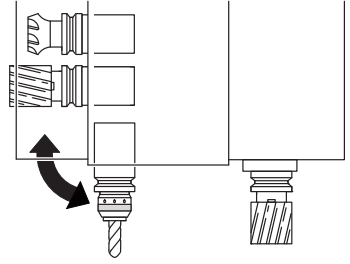
19.4 Confirming ATC Stopped Position

Check the status when the ATC stops and the operation necessary for recovery from the stop position in the table below.

NOTE

1. If a tool is mounted on the pot or spindle, check the condition of the tool and remove the tool if there is any abnormality in it.
2. Perform the ATC recovery operation under the following conditions:
 - 'MAIN ARM ON THE ORBIT' lamp is illuminated
When the lamp is extinguished, press the manual axis feed button **[+X]** after key in the number heading 'MAIN ARM ORBIT RETURN' and press **[INPUT]** key.
 - ['MAIN ARM ON THE ORBIT' lamp is illuminated]
 - X-, Y-, and Z-axes 2nd zero point

"2nd Zero Point Confirmation/Return" (page 8-168)

No.	Status when ATC Stops	Recommended Recovery Procedure
A		'SP.ORIENTATION'
	ATC Shutter Open	'ATC SHTR. CLOSE'
B	 Pot moving up/down	'POT UP' → 'ATC SHTR. CLOSE'

No.	Status when ATC Stops	Recommended Recovery Procedure
C	Before tool change*1	'ATC ARM BACKWARD' → 'POT UP' → 'ATC SHTR. CLOSE'
	After tool change*2	'ATC ARM FORWARD' → 'POT UP' → 'ATC SHTR. CLOSE'
D	During tool unclamp	'ATC ARM FORWARD' → 'POT UP' → 'ATC SHTR. CLOSE'
 NOTE *1 Before tool change: The spindle tool data on the screen does not coincide with the actual tool. *2 After tool change: The spindle tool data on the screen coincides with the actual tool.  Selected tools screen: Tool/Workpiece systems		

19.5 2nd Zero Point Confirmation/Return

If the X-, Y-, and Z-axes are not at the 2nd zero points, return each axis to the 2nd zero point by following the procedure below.

NOTE

Confirm that the 2nd zero point return marks of the X-, Y-, and Z-axes are displayed on the screen.
If the 2nd zero point return marks of the X-, Y-, and Z-axes are displayed, the procedure below is not necessary.
Perform the ATC recovery operation.

 "ATC Recovery Operation" (page 8-169)

WARNING

1. Return the X-, Y-, and Z-axes carefully. To return each axis to the 2nd zero point, the axis interlock must be released. Since the axes can be moved even if the ATC arm is not in the home position during interlock bypass ON (M31), component interference may occur.
2. Do not approach moving parts during operation.

<Procedure>

- 1) Place the door interlock key-switch in the **[NORMAL]** position.
- 2) Close the operation panel side door and the magazine door (option).
- 3) Turn the operation selection key-switch to  **[ON]** or  **[PANEL/EDIT]**.
- 4) Display the 'PROGRAM CHECK' (MDI) screen.

Mode selection button  **[MDI] (MDI)** → Function selection key  **(PROG)**

- 5) Input "M31" and press the  **(INSERT)** key.
- 6) Press the automatic operation button  **[START] (Start)**.
[interlock bypass mode is now valid.]
- 7) Select the setting  **[x1]** using the axis feed amount selection buttons or switch.
- 8) Select the axis to be moved.
- 9) Move each axis to the 2nd zero point by rotating the manual pulse generator.

NOTE

Confirm the 2nd zero point return positions in the parameter No.1241.

- 10) Specify "G0 G91 G30 X0 Y0 Z0" in the MDI mode to complete the X-, Y-, and Z-axes 2nd zero point return.

- 11) Execute the M32 command.
[Interlock bypass mode is now invalid.]

19.6 Confirming Start Conditions for ATC Operation

When operating ATC manually, confirm the start conditions for each operation.

CAUTION

1. An ATC operation performed with ATC interlocks released will allow each operation without ATC start conditions, causing machine interference. When interlocks are released to perform an ATC recovery operation, ensure all interlocks are reactivated immediately following completion of the operation.
2. If ATC operation start conditions are not satisfied prior to initiating an ATC cycle, an alarm is generated.

'ATC MANUAL OPERATION' Screen	Operation Start Conditions
'ATC SHTR. OPEN'	• The operation panel side door and the magazine door (option) must be closed. • The ATC main arm must be at the home position. • The pot must be up.
'ATC SHTR. CLOSE'	
'POT UP'	• The operation panel side door and the magazine door (option) must be closed. • The ATC main arm must be at the home position. • The magazine rotation must be completed. • The ATC shutter must be opened.
'POT DOWN'	• The operation panel side door and the magazine door (option) must be closed. • The ATC main arm must be at the home position. • The pot must be up. • The magazine rotation must be completed. • The ATC shutter must be opened.
'ATC ARM FORWARD'	• The operation panel side door and the magazine door (option) must be closed. • X-, Y-, and Z-axes must be at the 2nd zero point. • The spindle orientation must be completed. • The pot must be down. • The ATC shutter must be opened. • The ATC main arm must be on the main arm orbit.
'ATC ARM BACKWARD'	
'SP.ORIENTATION'	• The operation panel side door and the magazine door (option) must be closed. • The ATC main arm must be at the home position.
'MAIN ARM ORBIT RETURN'	• The operation panel side door and the magazine door (option) must be closed. • X-, Y-, and Z-axes must be at the 2nd zero point. • The spindle orientation must be completed. • The pot must be down. • The ATC shutter must be opened. • The ATC main arm must not be on the main arm orbit.

19.7 ATC Recovery Operation

CAUTION

1. When operating ATC manually, confirm the start conditions for each operation. ("Confirming Start Conditions for ATC Operation" (page 8-169))
2. Contact the DMG MORI Service Department for assistance prior to performing a manual operation. DMG MORI does not accept responsibility for accidents that occur as a result of recovery operations performed at the discretion of the user.
3. Always follow the guidance displayed on the screen when operating the ATC manually.

<Procedure>

- 1) Place the door interlock key-switch in the [NORMAL] position.
- 2) Close the operation panel side door and the magazine door (option).
- 3) Turn the operation selection key-switch to  [ON] or  [PANEL/EDIT].

- 4) Press the mode selection button  **[MDI] (MDI)**.
- 5) Display the 'ATC MANUAL OPERATION' screen.

Function selection key  **(SETTING)** → **[OPE. PANEL]** → **[ATC MANU.OPE.]**

- 6) Key in the number heading the required operation and press the  **(INPUT)** key.

 "Confirming ATC Stopped Position" (page 8-167)

- 7) Press the **[EXECUTE]**.

 NOTE

When rotating the ATC arm forward or backward, follow the guidance message and press the manual axis feed button **[+X]** or **[-X]**.
[ATC moves as requested.]

- 8) After completing manual operation, press the **[EXIT]**.
- 9) Confirm the vertical soft-key **[ATC HOME POSITION]** is illuminated.

 NOTE

Automatic operation is not possible unless the ATC is in the home position. When the following conditions are met, the vertical soft-key **[ATC HOME POSITION]** is illuminated.

- ATC shutter closed
- Main arm in home position
- Tool clamp completed
- Pot move up completely

Perform recovery operation until **ATC HP (ATC home position)** lights up.

- 10) Check the tool data.
- 11) Correct the tool data as necessary.

 Machine operation

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