





## 6. ATTACHMENT TO MAIN SPINDLE OF MACHINING CENTER'S

### ⚠ DANGER

Do not rotate the machining center's main spindle with the SMS401 Air Motor Spindle installed. Rotating the machining center's main spindle with the SMS401 Air Motor Spindle installed can cause the Supply Air/ Oil Hose to become tangling will lead to a big accident.

### ⚠ WARNING

Confirm there is not a heat near Supply Air/ Oil Hose, as Supply Air/ Oil Hose might melt by heat.

### ⚠ CAUTION

Do not tighten the part of straight shank directly with screw, because there is a bearing inside the shank. This may cause the damage to the shank or heat generation.

- Attach the Air Motor Spindle to the main spindle of the machining center.
  - Hold the Supply Air/ Oil Hose length to the length of moving range of the main spindle.
  - Fix the Supply Air/ Oil Hose to the machine. Do not damaged to the Supply Air/ Oil Hose.
    - If the main spindle is rotate by mistake, stop the main spindle immediately.
- Make sure the not damaged to the machine, unit and Supply Air/ Oil Hose. Afterward, please carry out break - in as follow. Start rotating slowly and over a short period of 15 - 20minutes, increase speed gradually until allowable maximum speed.

## 7. CONNECTION OF AIR LINE KIT

### ⚠ CAUTION

Make sure to turn the compressed air supply to the Air Line Kit OFF, before replacing the Lubricating Oil or draining the water in Lubricating Oil.

- Connect the Filter Joint to the Secondary Joint ( φ6 One - Touch Joint) of the Air Line Kit.
- Connect the other side of the Supply Air/ Oil Hose to the φ6 One - Touch Joint of the Air Motor Spindle.
- Fill Oil Reservoir through the Oil Filler Cap with recommended NAKANISHI Lubricating Oil (K - 211 : Air Line Kit's Standard Accessories) to Upper Limit of the Fig. 14. Disconnect from air supply prior to opening Oil Filler Cap. Do not over or under fill.
- Connect the φ6mm air hose (Air Line Kit's Standard Accessories) to the Primary Joint of the Air Line Kit and Compressor.
- Supply air from the air compressor and turn the Regulator Knob (H direction : increased) to set air pressure between 0.3 - 0.5 MPa.
- Turn the ON / OFF Valve and rotate the Air Motor Spindle with recommended proper air pressure.
  - Adjust the Oil Drip Rate to the recommended volume which is 1 to 3 drops / min. (Commercially Air Line Kit is same Oil Drip Rate).
  - \*If using the "AL - 0304 " or " K - 239 " Air Line Kit, adjust the proper Oil Drip Rate to 30 - 40 drops / min. (Refer to "AL - 0304 " or " K - 239 " of the Air Line Kit Operation Manuals.
- Be sure to adjusted to proper Oil Drip Rate before using the Air Motor Spindle.

### ⚠ CAUTIONS IN USING AIR LINE KIT

- When connecting the Compressor and Air Line Kit, recommended install the air filter or air dryer to between Compressor and Air Line Kit in order to supply clean dry air to the Air Motor Spindle. Using compressed air containing excessive moisture could result in malfunction or failure of the Air Motor Spindle. If excessive moisture or condensation are found in Air Filter Bowl (Filter Regulator Bowl), it will be necessary to install a dryer and larger Air Filter on the Primary Joint side of the Air Line Kit to prevent and remove excessive moisture.
- Connect the air / oil hose securely to avoid accidental disconnection during use. Input air pressure should never exceed 1.0MPa. Air pressure exceeding 1.0MPa may cause the air / oil hose to rupture.
- Make sure operation air pressure is less than 1.0MPa before connecting the air / oil hose. If operation air pressure is exceeded the 1.0MPa, this may cause injury to the operator by accidental disconnection during use.
- Before use, carefully read " Air Line Kit Operation Manuals " regarding the correct connection, operation and cautions when using the Air Line Kit.

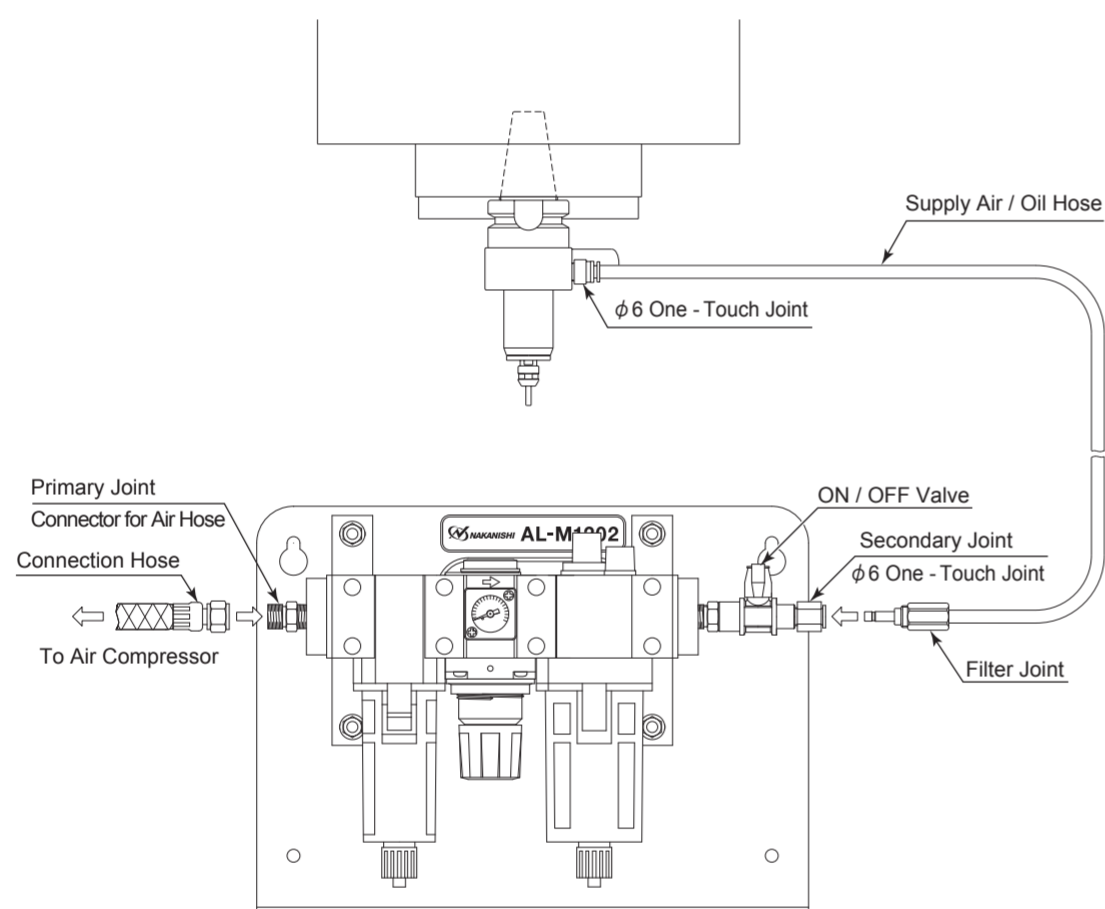


Fig. 12 Connection of Air Line Kit " AL - M1202 (Sold Separately) "

## 8. AIR LINE KIT OPERATION

### ① Draining from Air Filter (Fig. 13)

Opening and closing the Drain Valve.  
 O direction : Draining.  
 S direction : Stop Draining.

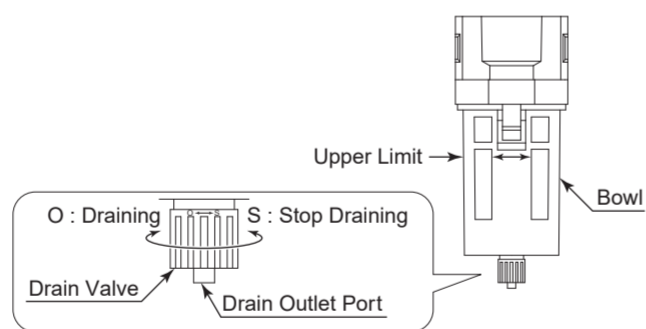


Fig. 13

### ② Regulator (Fig. 14)

< Lock and Release of the Regulator Knob >  
 Regulator Knob is equipped with Lock mechanism.  
 Release : Pull the Regulator Knob OUT to unlock.  
 Lock : Push the Regulator Knob IN to the Lock position.

#### < Adjusting Air Pressure >

Turn the Regulator Knob while watching pressure gauge increase or decrease.  
 H direction : Air pressure is increased.  
 L direction : Air pressure is decreased.

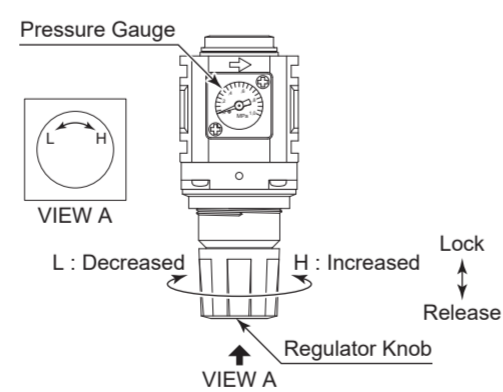


Fig. 14

### ③ Lubricator

### ⚠ CAUTION

- Make sure to turn the compressed air supply to the Air Line Kit OFF, before replacing the Lubricating Oil or draining the water in Lubricating Oil.
- Check the Lubricating Oil level everyday and before use. If Lubricating Oil level is low, Fill the oil bowl with Lubricating Oil up to the Upper Oil Limit on the bowl.
- If collected water in the lubricator taints Lubricating Oil, replace the Lubricating Oil immediately.

#### < Oil Amount (Fig. 15) >

Check the Oil Amount in the Window.  
 If the Lubricating Oil level is low, add additional oil.  
 (Supply Lubricating Oil to Upper Oil Level Limit of Fig. 15.)

< Replacing the Lubricating Oil and draining the water in the Lubricating Oil (Fig. 15) >

Opening and closing the Hand Operating Knob.  
 O direction : Draining.  
 S direction : Stop Draining.

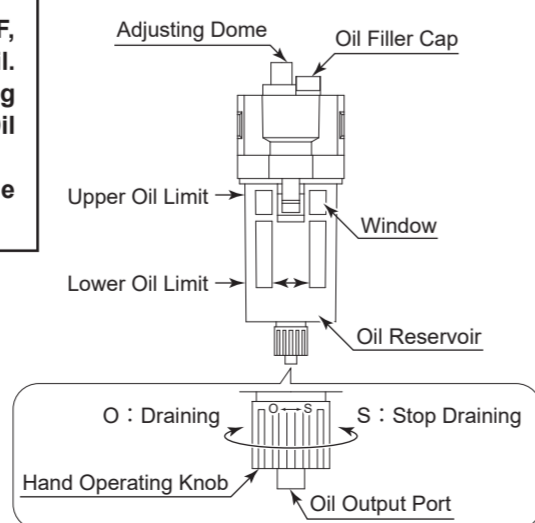


Fig. 15

#### < Adjustment of Oil Drip Rate (Fig. 16) >

Set the air pressure to the Air Motor Spindle recommended maximum air pressure. Turn the adjusting dome and adjust the Oil Drip Rate to the recommended volume which is 1 to 3 drops / min (If using the "AL - 0304 " or " K - 239 " Air Line Kit, adjust the proper Oil Drip Rate to 30 - 40 drops / min).

O direction : Increase  
 S direction : Decrease

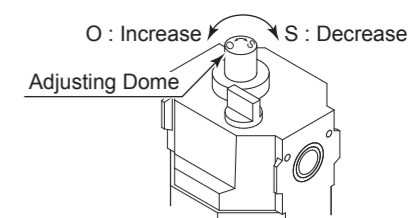


Fig. 16

### ④ Lubricating Oil

Use ISO VG15 Liquid Paraffin (Shell Ondina Oil #15) in the Air Line Kit lubricator bowl. (For U.S.A. specification, use Chevron Superla #9).

Model
• Lubricating Oil (K - 211) 70cc
• Lubricating Oil (K - 202) 1ℓ

## 9. CAUTIONS WHEN USING GRINDSTONES AND TOOLS

### ⚠ CAUTION

The maximum surface speed or rpm is always specified for a grindstone. Do not exceed the maximum speed with reference to the calculating chart below. Always follow the grindstone manufacturer's recommendations.

$$\text{Surface Speed (m / s)} = \frac{3.14 \times \text{Diameter (mm)} \times \text{Rotation Speed (min}^{-1}\text{) (rpm)}{1,000 \times 60}$$

- The proper surface speed for general grindstones is 10 - 30m / s.
- Do not exceed 13mm of overhang for mounted grindstones as shown in Fig. 17. If the overhang must exceed 13mm, reduce the motor speed in accordance with Table 2.
- Dress the grindstone prior to use.
- Do not use cutting tools with bent or broken shanks, cracks or excessive run-out.
- For grinding, the maximum depth of cut should not exceed 0.01mm radially or axially. Reciprocate the tool several times after each pass to eliminate tool pressure.
- Always operate cutting tools within the allowable recommended speed of the cutting tools. Use of a cutting tool outside of the allowable speed of the cutting tools could cause damage to the spindle and injury to the operator.
- Keep the cutting tool shank and collet chuck clean. If contaminants are left in the collet chuck or chuck nut, excessive run-out will cause damage to the cutting tool and or spindle.
- Do not strike or disassemble the spindle.
- Please minimize the tool overhang amount to maintaining high accuracy. 13mm is the maximum amount of overhang to maintain high accuracy and safety.

Table 2. Overhang and Speed

Overhang (mm)	Max. Speed (min <sup>-1</sup> ) (rpm)
20	N x 0.5
25	N x 0.3
50	N x 0.1

\*N = Max. Operating Speed with 13mm overhang.

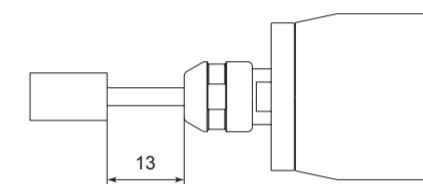


Fig. 17

## 10. TROUBLESHOOTING

If a problem or concern occur, please check the following items prior to consulting your dealer.

Trouble	Cause	inspection / Corrective Action
Spindle does not rotate or rotate smoothly.	Air flow does not reach the Air Motor Spindle.	Check if air / oil hose is broken, bent or disconnected. Check connection of air / oil hoses. Check the compressor power supply and the air compressor output. Check the Regulator and set to the correct air pressure. Check all air / oil hose connections.
	The spindles bearings have been damaged.	Replace the ball bearings. (Return to NAKANISHI dealer service.)
	The motor has been damaged.	Replace the motor. (Return to NAKANISHI dealer service.)
	Motor speed decrease.	The air / oil hose has been damaged. Replace air / oil hose. Bad connection of air / oil hose. Check all threaded joints and re-tighten if necessary. Poor air flow and air pressure. Check if the air circuit is damaged.
Unequal motor speed.	Low Lubricating Oil.	Check lubricator for proper lubricant level. Set the Oil Drip Rate from 1 to 3 drops / min. *If using the "AL - 0304 " or " K - 239 " Air Line Kit, adjust the proper Oil Drip Rate to 30 - 40 drops / min.
	No Lubricating Oil.	Clean inside of the motor use the Lubricating Oil. Removing the Filter Joint from Air Line Kit, supply a small amount of Lubricating Oil directly into the Filter Joint. Afterwards, supply air pressure and rotate the Air Motor Spindle. Flush dirt in the motor and repeatedly do this work about three times. When the improvement is not seen, return to NAKANISHI dealer service.
	Excess oil drips.	An excessive amount of oil drips into the system will cause the bearings to flood, slowing the speed or causing the Air Motor Spindle speed to fluctuate. Drain the Lubricating Oil in the bowl to the proper level by loosening Drain Valve. Use the Adjusting Dome to adjust the Oil Drip Rate.
	Water, dirt and debris are collected in the Air Filter.	Drain water, dirt and debris from the Air Filter bowl.
Overheating during rotation.	Cutting debris has contaminated the ball bearings, and the ball bearings are damaged.	Replace the ball bearings. (Return to NAKANISHI dealer service.)
	Abnormal vibration or noise during rotation.	The tool shank is bent. Replace the tool. Cutting debris has contaminated the ball bearing. Replace the ball bearings. The spindles bearings have been damaged. (Return to NAKANISHI dealer service.)
Tool slippage.	Collet chuck or chuck nut are not correctly installed.	Check and clean the collet chuck and chuck nut. Reinstall the collet chuck and chuck nut.
	The collet chuck and the chuck nut are worn.	Replace the collet chuck and chuck nut.
High run-out.	The tool is bent.	Change the tool.
	Chuck nut is not correctly installed.	Secure the collet chuck and the chuck nut correctly.
	The collet chuck and the chuck nut are worn.	Replace the collet chuck and the chuck nut.
	Inside of the spindle is worn.	Replace the spindle shaft. (Return to NAKANISHI dealer service.)
Contaminants inside the collet chuck and the chuck nut or the spindle.	Contaminants inside the collet chuck and the chuck nut or the spindle.	Clean the collet chuck, chuck nut and the inside of the taper and spindle.
	The spindle bearings has been damaged.	Replace the ball bearings. (Return to NAKANISHI dealer service.)

## 11. DISPOSAL OF THE AIR MOTOR SPINDLE

When disposal of an Air Motor Spindle is necessary, follow the instructions from your local government agency for proper disposal of industrial components.

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