

9. INSTALLATION OF THE AIR MOTOR SPINDLE

CAUTION

- When installing an Air Motor Spindle, do not hit, drop or cause shock to the Air Motor Spindle. This may cause damage to internal components and result in malfunctions.
- When mounting the Air Motor Spindle, be sure to secure within Clamping Area etched on the Air Motor Spindle O.D. If the Air Motor Spindle is installed incorrectly, damage to the internal components is possible.
- Cautions when tightening the securing bolts on to a Split Type Holder
Do not over-tighten the bolt. This will cause damage to Air Motor Spindle's precision. Tighten the bolt until the Air Motor Spindle body can not be rotated by hand within the fixture. Extreme tightening is not necessary or recommended.
Apply working force and check that the Air Motor Spindle is tight before using.

- When mounting an Air Motor Spindle, refer to the Clamping Area etched on the Air Motor Spindle. These Air Motor Spindle have 2 Clamping Area refer to "6 - 2 Outside View (Fig. 1 - Fig. 6).
- When installing an Air Motor Spindle to the holder, recommended installation method is shown Fig 13. Refer to "③ How to fabricate the Split Type Holder".
If this is not possible, install as shown in Fig. 14.

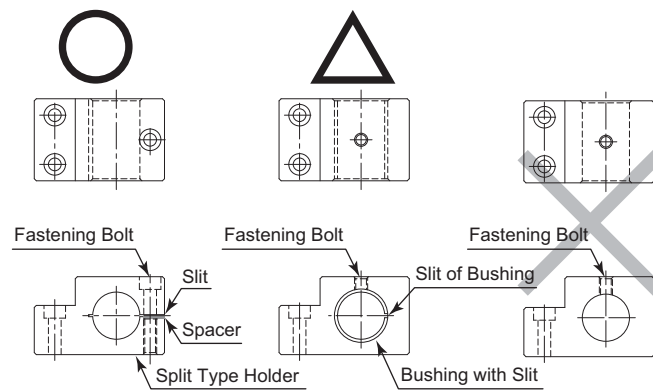


Fig. 13

Fig. 14

Fig. 15

CAUTION

- Do not allow set screws to come directly in contact with the Air Motor Spindle body as shown in Fig. 15, as this will result in damage to the Air Motor Spindle housing and internal components.
When installing, never clamp directly over the bearings, as this will result in bearing damage. (Refer to Fig. 16)

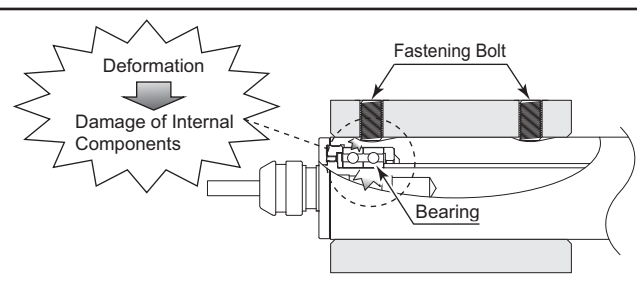


Fig. 16

- How to fabricate the Split Type Holder
 - Rough bore the inside diameter of the Split Type Holder.
 - Cut a slit. (Ex. Slit 2mm) wide.
 - Tighten the Screw for Removal and Force Open the Slit Area.
 - Insert a spacer (Ex. thickness = 2mm) into the Slit Area.
 - Loosen the Screw for Removal, and tighten the fastening bolt with its specified torque.
 - Finish the Split Type Holder so that the inside diameter of the Split Type Holder is Air Motor Spindle's outside diameter (Refer to Table 4). The correct tolerance range for the holder is -0.01mm to -0.015mm and a roundness and cylindricity of less than 5µm.

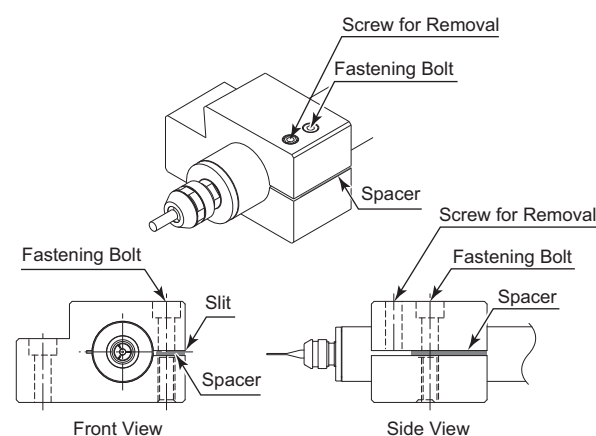


Fig. 17

Table 4

Clamping Area	Outside Diameter of Air Motor Spindle	Tolerance of Inside Diameter
Clamping Area ①	φ 19.05	0 -0.01
	φ 20	-0.01 -0.015
Clamping Area ②	φ 22	-0.01 -0.02
	φ 22	-0.02 -0.025

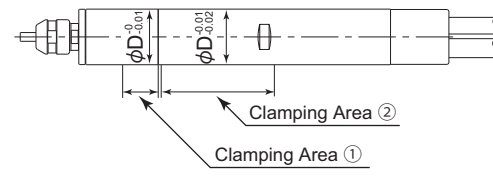


Fig. 18

- When inserting the Air Motor Spindle loosen the Fastening Bolt, and tighten the Screw for Removal, widening the Slit Area.

CAUTION

- The final responsibility for ensuring holder's safety for use in a given application is left to the designer of the equipment in which NAKANISHI's Air Motor Spindle is installed. NAKANISHI offers Air Motor Spindle with a wide variety of capabilities and specifications. Please carefully check the Air Motor Spindle's specifications against the requirements of your equipment and verify suitability and safety of the Holder prior to initial use.

10. INSTALLATION OF THE JOINT (RA TYPE)

CAUTION

- The standard length of supply air / oil hose is 2m, and exhaust air / oil hose is 1m. When the supply and exhaust air / oil hose is longer than the standard length, the rotating speed is decreased.

- Insert the Air Motor Spindle to the front of the holder and fix the Air Motor Spindle.
- Mount the joint (1pc. Each) to the air Inlet port and air outlet port of the Air Motor Spindle.
- Insert the Supply and Exhaust Air / Oil Hose to the Quick Disconnect joint of the Air Motor Spindle.

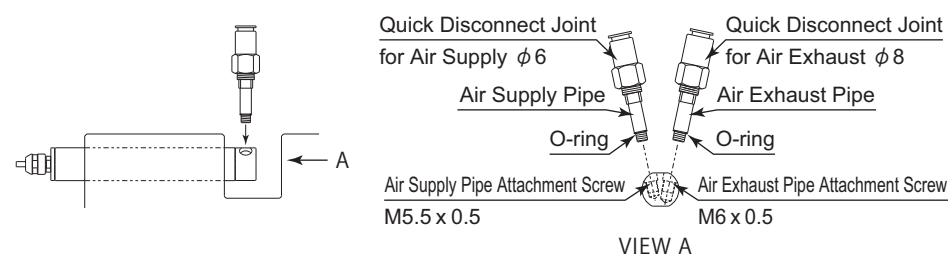


Fig. 19

11. CONNECTION TO THE 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 of the supply air / oil hose to the Secondary Joint (φ6 One - Touch Joint) of the Air Line Kit (Fig. 20 ①).
- Fill Oil Reservoir through the Oil Filler Cap with recommended NAKANISHI Lubricating Oil (K - 211 : Air Line Kit's Standard Accessories) to Upper Limit. Disconnect from air supply prior to opening Oil Filler Cap. Do not over or under fill.
- Connect the connection hose (Air Line Kit's Standard Accessories) to the Primary Joint of the Air Line Kit and Compressor (Fig. 20 ②).
- Supply air from the air compressor and turn the Regulator Knob to set air pressure between 0.3 - 0.5 MPa (43.5 - 72.5psi).
- 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 the Operation Manual of the Air Line Kit for detailed information.
- Be sure to adjusted to proper Oil Drip Rate before using the Air Motor Spindle.

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

CAUTION

- 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, 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 input air supply connection hose and supply air / oil hose securely to avoid accidental disconnection during use. Input air pressure should never exceed 1.0MPa (145psi). Air pressure exceeding 1.0MPa (145psi) may cause the supply connection hose and air / oil hose supply to rupture.
- Make sure operation air pressure is less than 1.0MPa (145psi) before connecting the input supply connection hose and air / oil supply hose. If operation air pressure is exceeds 1.0MPa (145psi), injury to the operator may occur by accidental disconnection before or during use.
- Before use, carefully read " Air Line Kit Operation Manuals " regarding the correct connection, operation and cautions when using the Air Line Kit.

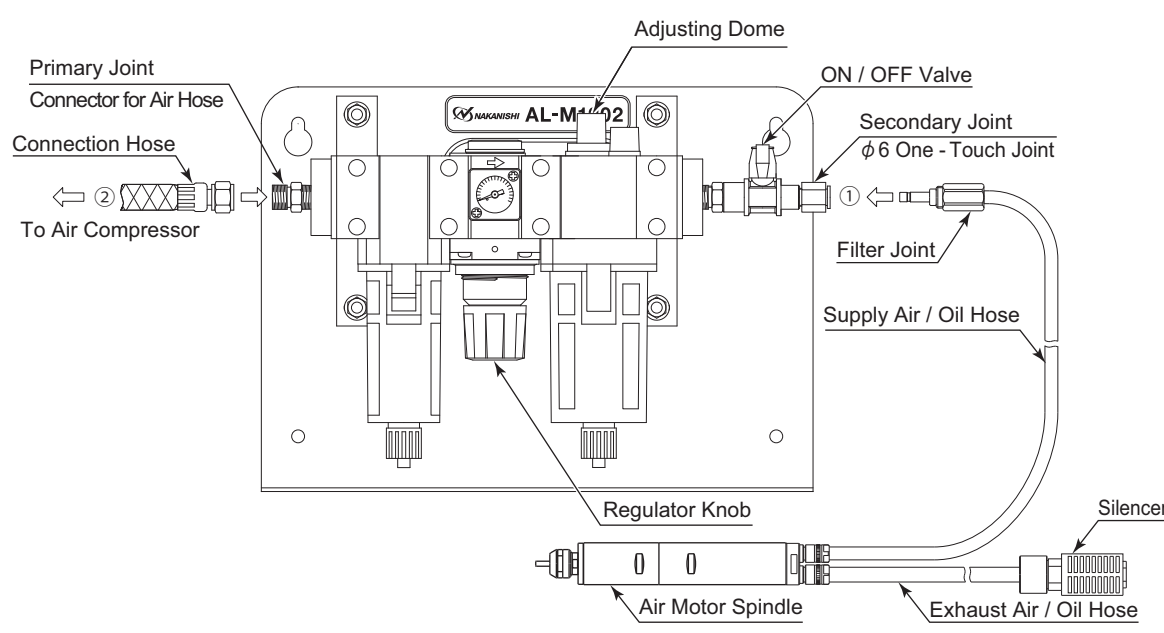


Fig. 20 Connection of Air Line Kit " AL - M1202 (Sold Separately) "

12. 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. 21. If the overhang must exceed 13mm, reduce the motor speed in accordance with Table 5.
- 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 clean. If contaminants are left in the collet or collet nut, excessive run-out will cause damage to the cutting tool and or spindle.
- Do not strike or disassemble the spindle.
- Please set the cutting tools to minimize the overhang amount. 13mm is the maximum amount of overhang to maintain high accuracy and safety.

Table 5 Overhang and Speed

Overhang (mm)	Max. Speed (min ⁻¹) (rpm)
20	N x 0.5
25	N x 0.3
50	N x 0.1

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

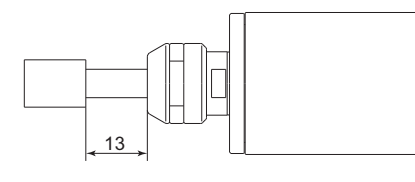


Fig. 21

13. TROUBLESHOOTING

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

Trouble	Cause	inspection / Corrective Action
Air Motor Spindle does not rotate or rotate smoothly.	Air flow does not reach the Air Motor spindle.	Check if input supply connection hose or air / oil supply hose is broken, bent or disconnected. Check connection of the input supply connection and air / oil supply hoses. Check the compressor power supply and the air compressor output. Check the Regulator and set to the correct air pressure. Check all connections input supply and air / oil supply hose.
	The spindles ball bearings have been damaged.	Replace the ball bearings. (Return to NAKANISHI dealer service.)
	The motor has been damaged by for no Lubricating Oil.	Replace the motor. (Return to NAKANISHI dealer service.)
	Air Motor Spindle speed is too slow.	The connection hose or air / oil supply hose have been damaged. Replace the input supply and or air / oil supply hoses. Poor connection of input supply or air / oil supply hose. Check all threaded joints and re-tighten if necessary. Low air pressure. Check the Compressor, Air Circuit, and Regulator. 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. Water, dirt and debris are collected in the Air Filter. Drain water, dirt and debris from the Air Filter Bowl. Water in Lubricating Oil reservoir. Drain water from Lubricating Oil reservoir and replace with clean Lubricating Oil.
Unequal motor rotation.	Lubricator inclined or upside down. (Air Line Kit " AL - 0304 or K - 239 " only.)	Inclined or upside down lubricator will flood spindle with lubricating Oil.
	Excessive Oil Drip Rate flooding the bearings. Over filled lubricator. (Air Line Kit " AL - 0304 or K - 239 " only.)	Oil drip rate exceeds the recommended amount. Adjust for the proper Oil Drip Rate. Drain the Lubricating Oil from Reservoir to meet indicated levels. Excess lubricant will flood spindle.
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. The spindles ball bearings have been damaged.	Replace the ball bearings. (Return to NAKANISHI dealer service.)
Tool slippage.	Collet or collet nut are not correctly installed.	Check and clean the collet and collet nut. Reinstall the collet and collet nut.
	The collet and the collet nut are worn.	Replace the collet and collet nut.
High run-out.	The tool is bent.	Change the tool.
	Collet nut is not correctly installed.	Secure the collet and the collet nut correctly.
	The collet and the collet nut are worn.	Replace the collet and the collet nut.
	Inside of the spindle is worn.	Replace the spindle shaft. (Return to NAKANISHI dealer service.)
	Contaminants inside the collet and the collet nut or the spindle. The spindle ball bearings has been damaged.	Clean the collet, collet nut and the inside of the taper and spindle. Replace the ball bearings. (Return to NAKANISHI dealer service.)

14. 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.