

AIR MOTOR SPINDLE

AMX Series

OPERATION MANUAL

OM-K0339E Rev.A

Thank you for purchasing AMX Series.
 AMX Series is an air motor spindle for drilling or milling with NC lathes or special purpose machines.
 " Air Line Kit(with lubricator) " is required to drive AMX Series.
 Please read this Operation Manual carefully prior to use.

1 Cautions in Handling

Read these cautions carefully and only use in the manner intended.
 Safety instructions are intended to avoid potential hazards that could result in personal injury or damage to the device. Safety instructions are classified as follows in accordance with the seriousness of the risk.

Class	Degree of Risk
WARNING	A hazard that could result in bodily injury or damage to the device if the safety instructions are not followed.
CAUTION	A hazard that could result in light or moderate bodily injury or damage to the device if the safety instructions are not followed.

WARNING

AMX Series is not a hand tool. It is designed to be used on NC lathes or special purpose machines.

DO NOT touch the motor, spindle or cutting tools when the spindle is rotating.
 Always wear safety glasses. Everyday eyeglasses only have impact resistant lenses, they are not safety glasses. Also use a dust or face mask whenever the motor is running.
 Make sure that the collet chuck is firmly tightened prior to rotating the spindle.

CAUTION

DO NOT hit, drop or subject motor, spindle or control unit to shock as this will cause damage to internal components and result in malfunctions.

Clean the shank frequently not to stick dirt into the chuck as to increase runout or reduce the clamping strength of the chuck.

Need to drain water or dirty from air filter. If not, this will cause that the spindle is rusted away or damaged.

Need to use lubricator for maintaining a motor speed and a long use.
 Make sure that the air hose is firmly connected prior to use for fear that the air hose may be ejected during rotation.

Make sure that the air hose is tightened with machines not to obstruct the work.

For long periods of non operation, please follow the break-in procedure for 15-20 minutes to reach the maximum motor speed gradually and check if the abnormal noise is made prior to use.

As part of your routine, please check the following items prior to use: inspect the tools, collet and chuck nut for damage, rotate the spindle by hand and check the feel of the bearings, they should rotate freely and without any scratchy feel, check the air regulator for proper air pressure settings, check that the filter is clean and contains no water.

DO NOT apply excessive loads to the spindle for rotation, for this may cause the slip or damage of tools.

Be careful not to tighten the collet chuck to excess, this may cause damage of spindles.

About the axis(arbor) diameter of tools, recommend to use tolerance $^{+0}_{-0.01}$ to inside diameter of the collet chuck. Can attach tolerance $^{+0}_{-0.1}$ of the axis (arbor) diameter (except ESX-16). If use the non recommended tolerance's collet chuck, this may cause faults (the bar is slide or the shortage of maintenance)

2 Features

AMX series air motor spindle is a short body and has a wide variety of sizes and configurations of air inlet and outlet. Thus, it is easy to install in a small place.

AMX is a compact size and high output air motor spindle.

Because of full air system, the heat rise is limited to minimum for a long use.

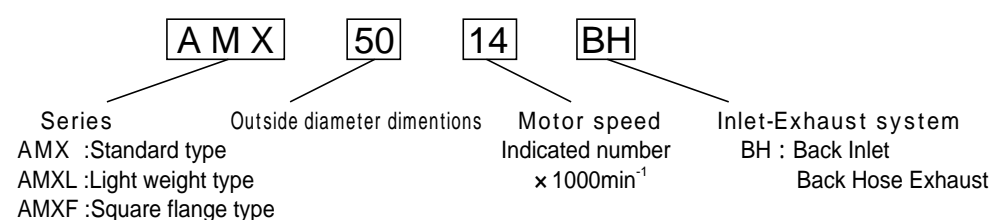
AMX with a flange is available for easy installation.

Three sizes of outside diameter (50, 65 and 80), three types of speed reducer ratio (1/1,1/3 and 1/9) are available.

3 Specifications

3-1

The meaning of AMX series



Inlet-Exhaust System (BH type)

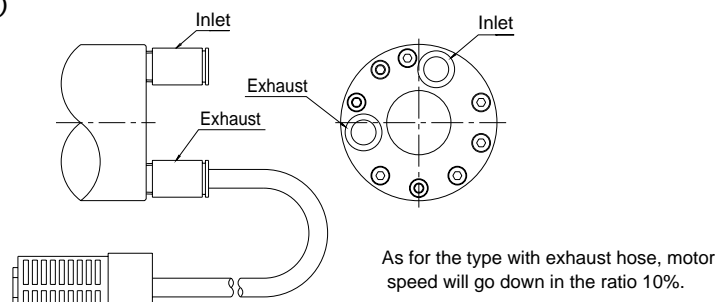


Fig.1

3-2

AMX-50 Series

12,400min⁻¹

Type	Weight	Appropriate Air Pressure	Spindle Accuracy	Air consumption	Stop Torque	Processable diameter for milling	Standard attachment · accessories
AMX-5014BH	1,050g	0.3-0.5MPa	Within 2 μm	160Nℓ/min	27cN · m	1.0mm (Appropriate)	· Collet cap · Inlet Hose · Exhaust Hose · Spanner(Wrench) 12 x 14 2pc
AMXL-5014BH	615g						
AMXF-5014BH	1,130g						

4,800min⁻¹

Type	Weight	Appropriate Air Pressure	Spindle Accuracy	Air consumption	Stop Torque	Processable diameter for milling	Standard attachment · accessories
AMX-5005BH	1,160g	0.3-0.5MPa	Within 2 μm	150Nℓ/min	110cN · m	2.0mm (Appropriate)	· Collet cap · Inlet Hose · Exhaust Hose · Spanner(Wrench) 12 x 14 2pc
AMXL-5005BH	795g						
AMXF-5005BH	1,260g						

1,600min⁻¹

Type	Weight	Appropriate Air Pressure	Spindle Accuracy	Air consumption	Stop Torque	Processable diameter for milling	Standard attachment · accessories
AMX-5002BH	1,380g	0.3-0.5MPa	Within 2 μm	150Nℓ/min	310cN · m	4.0mm(MAX)	· Collet cap · Inlet Hose · Exhaust Hose · Spanner(Wrench) 12 x 14 2pc
AMXL-5002BH	1,015g						
AMXF-5002BH	1,480g						

Option

Collet chuck(CHK-)	0.5mm- 6.0mm in 0.1mm increments and 2.35, 3.175, 6.35mm
Collet cap	K-265

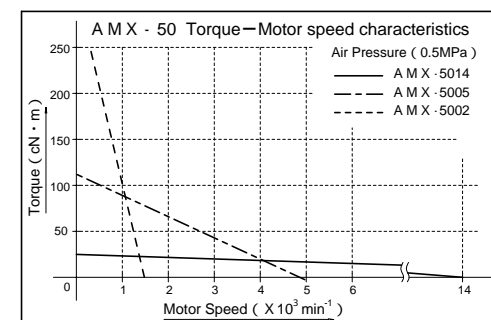


Table 1

AMX-65 Series

8,000min⁻¹

Type	Weight	Appropriate Air Pressure	Spindle Accuracy	Air consumption	Stop Torque	Processable diameter for milling	Standard attachment · accessories
AMX-6510BH	2,100g	0.3-0.5MPa	Within 2 μm	160Nℓ/min	46cN · m	1.5mm (Appropriate)	· Collet cap · Inlet Hose · Exhaust Hose · Spanner(Wrench) 12 x 14 2pc
AMXL-6510BH	1,220g						
AMXF-6510BH	2,280g						

2,800min⁻¹

Type	Weight	Appropriate Air Pressure	Spindle Accuracy	Air consumption	Stop Torque	Processable diameter for milling	Standard attachment · accessories
AMX-6503BH	2,300g	0.3-0.5MPa	Within 2 μm	150Nℓ/min	170cN · m	2.5mm (Appropriate)	· Collet cap · Inlet Hose · Exhaust Hose · Spanner(Wrench) 15 x 17 · Spanner(Wrench) 22 x 27
AMXL-6503BH	1,565g						
AMXF-6503BH	2,460g						

950min⁻¹

Type	Weight	Appropriate Air Pressure	Spindle Accuracy	Air consumption	Stop Torque	Processable diameter for milling	Standard attachment · accessories
AMX-6501BH	2,700g	0.3-0.5MPa	Within 2 μm	150Nℓ/min	410cN · m	4.5mm(MAX)	· Collet cap · Inlet Hose · Exhaust Hose · Spanner(Wrench) 15 x 17 · Spanner(Wrench) 22 x 27
AMXL-6501BH	1,815g						
AMXF-6501BH	2,860g						

Option

Collet chuck(CHK-)	0.5mm - 6.0mm in 0.1mm increments and 2.35, 3.175, 6.35mm
Collet cap	K-265

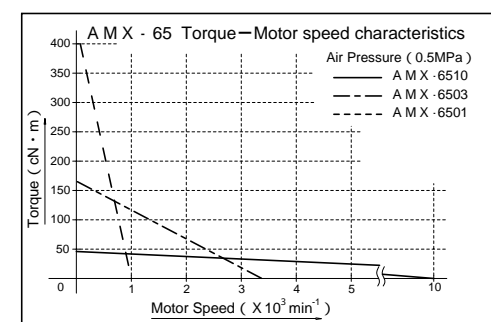


Table 2

AMX-80 Series

7,200min⁻¹

Type	Weight	Appropriate Air Pressure	Spindle Accuracy	Air consumption	Stop Torque	Processable diameter for milling	Standard attachment · accessories
AMX-8008BH	3,070g	0.3-0.5MPa	Within 2 μm	260Nℓ/min	80cN · m	1.5mm (Appropriate)	· Collet cap · Inlet Hose · Exhaust Hose · Spanner(Wrench) 12 x 14 2pc
AMXF-8008BH	3,850g						

2,200min⁻¹

Type	Weight	Appropriate Air Pressure	Spindle Accuracy	Air consumption	Stop Torque	Processable diameter for milling	Standard attachment · accessories
AMX-8003BH	3,900g	0.3-0.5MPa	Within 2 μm	235Nℓ/min	270cN · m	4.0mm(MAX)	· Collet cap · Inlet Hose · Exhaust Hose · Spanner(Wrench) 20 x 24 2pc
AMXF-8003BH	4,680g						

750min⁻¹

Type	Weight	Appropriate Air Pressure	Spindle Accuracy	Air consumption	Stop Torque	Processable diameter for milling	Standard attachment · accessories
AMX-8001BH	4,900g	0.3-0.5MPa	Within 2 μm	225Nℓ/min	820cN · m	6.0mm(MAX)	· Collet cap · Inlet Hose · Exhaust Hose · Spanner(Wrench) 20 x 24 2pc
AMXF-8001BH	5,680g						

Option

Collet chuck(CHK-)	0.5mm - 6.0mm in 0.1mm increments and 2.35, 3.175, 6.35mm
Collet cap	K-265

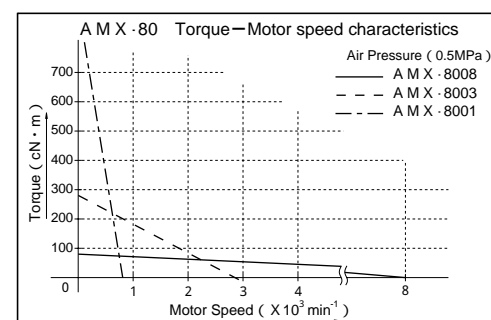
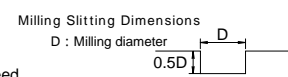


Table 3

CAUTION Conditions about milling diameter: material to be milled S45C, feed,100mm/min Tools Ultra Hard milling slitting (Refer to the right Fig.)
 (Appropriate): By milling company recommend milling diameter based on motor speed.
 (MAX): max. milling diameter calculated from max. torque. Not consider a life of endmill because not count by motor speed.



3-3 Dimensions

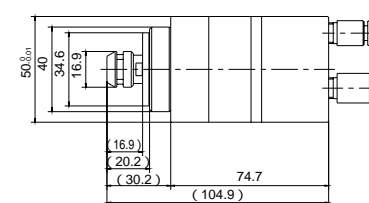


Fig.2 AMX-5014BH
 AMXL-5014BH

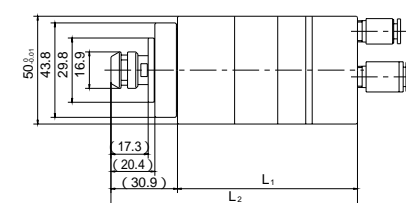


Fig.3

AMXL-5002BH	101.4	(132.3)
AMX-5002BH		
AMXL-5005BH	83.5	(114.4)
AMX-5005BH		
Type	L ₁	L ₂

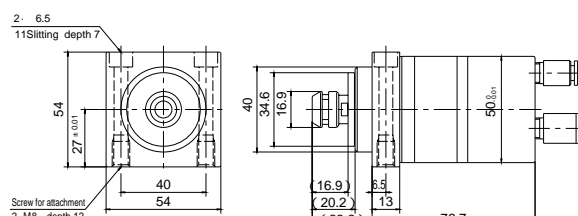


Fig.4 AMXF-5014BH

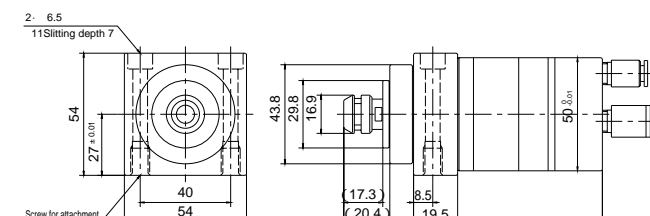


Fig.5

AMXF-5002BH	101.4	(132.3)
AMXF-5005BH	83.5	(114.4)
Type	L ₁	L ₂

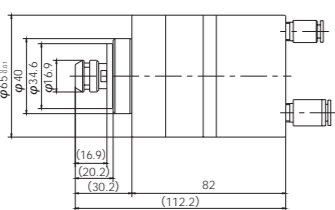


Fig.6 AMX-6510BH
AMXL-6510BH

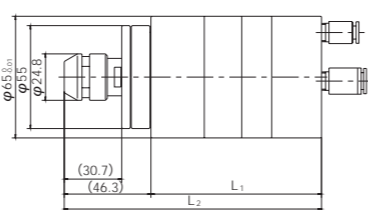


Fig.7

AMXL-6501BH	111.8	(158.1)
AMXL-6503BH	91.1	(137.4)
Type	L ₁	L ₂

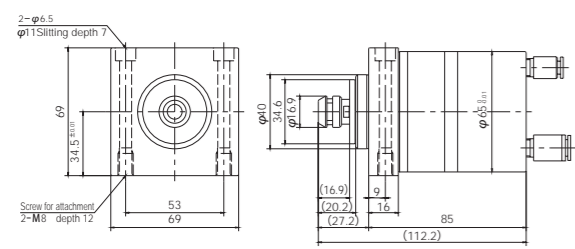


Fig.8 AMXF-6510BH

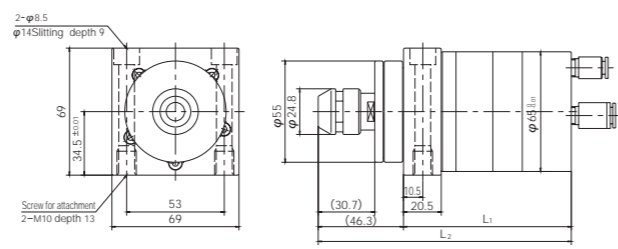


Fig.9

AMXF-6501BH	111.8	(158.1)
AMXF-6503BH	91.1	(137.4)
Type	L ₁	L ₂

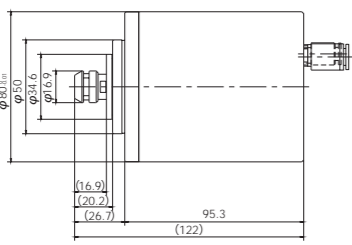


Fig.10 AMX-8008BH

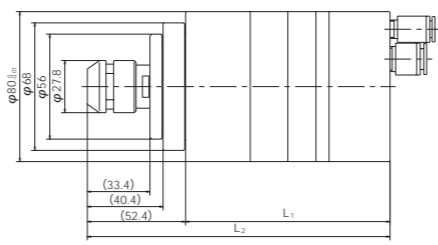


Fig.11

AMX-8001BH	141	(193.4)
AMX-8003BH	109	(161.4)
Type	L ₁	L ₂

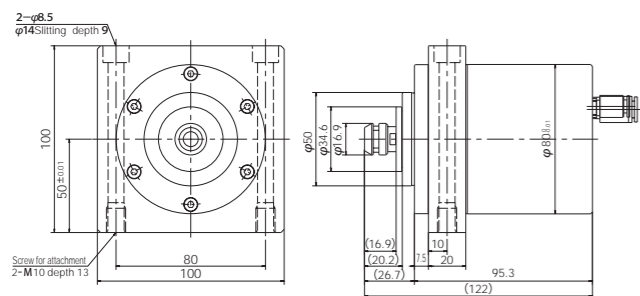


Fig.12 AMXF-8008BH

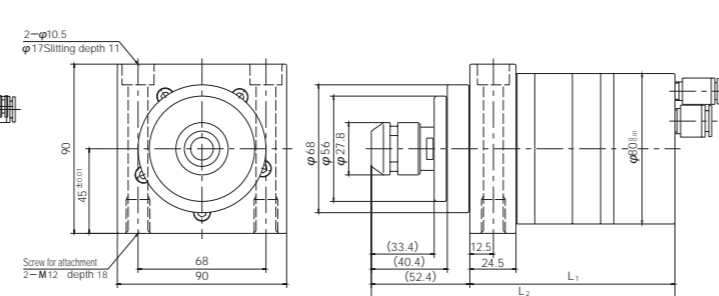


Fig.13

AMXF-8001BH	141	(193.4)
AMXF-8003BH	109	(161.4)
Type	L ₁	L ₂

4 Changing Cutting Tools

- Set the provided 12mm spanner(wrench) on the spindle.
[Use 17mm spanner (wrench) for AMX(L • F)6503 • 6501, and 20mm spanner(wrench) for AMX(F)8003 • 8001.]
- Place the provided 14mm wrench on the chuck nut and turn it counterclockwise to loosen the collet and remove the cutting tool. (The first turn will loosen the chuck nut, but the tool will not release and turning will become stiff. Keep turning through the stiffness and the collet will open.)
[Use 22mm spanner (wrench) for AMX(L • F)6503 • 6501, and 24mm for AMX(F)8003 • 8001]
- Insert the new tool and tighten the collet by turning clockwise.

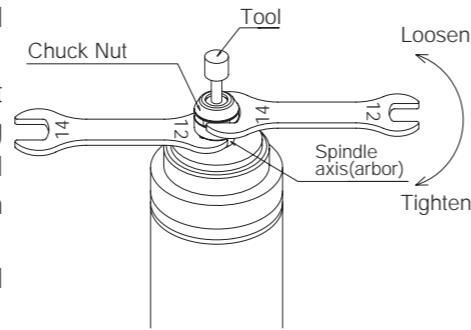


Fig.14

CAUTION

Never install a collet into the spindle quill without first assembling it in the chuck nut. DO NOT tighten the collet without mounting a cutting tool or dummy bur as this will result in damage to the collet, spindle and collet nut and make it impossible to remove the collet.

5 Replacing the Collet

- Remove the cutting tool according to the "Changing Cutting Tools" procedure above and remove chuck nut assembly. (Fig.15)
- The collet and chuck nut are held together by a groove in the collet and a flange in the chuck nut. To remove the collet hold the chuck nut in one hand and push diagonally down on the collet. The collet should pop out. (Fig.15)
- Install the new collet in the chuck nut by positioning the collet in the chuck nut and pressing down on a flat surface. (Fig.16)

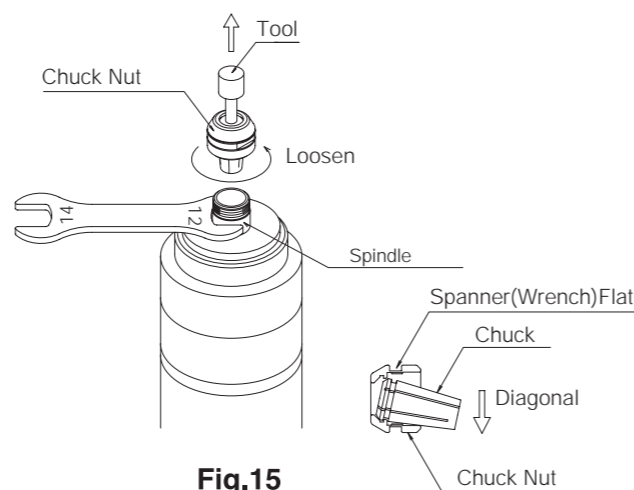


Fig.15

Fig.16

6 Fixturing the Air Motor and Spindle

When attaching the spindle to holder, recommend the fixturing(Fig.17) (If this is not possible, install as shown in Fig.18) DO NOT use set screws directly in contact with the motor or spindle body as shown in Fig19, this will result in damage to the housing and internal components. When using the type with flange(AMXF),set the screws for attachment of flange.

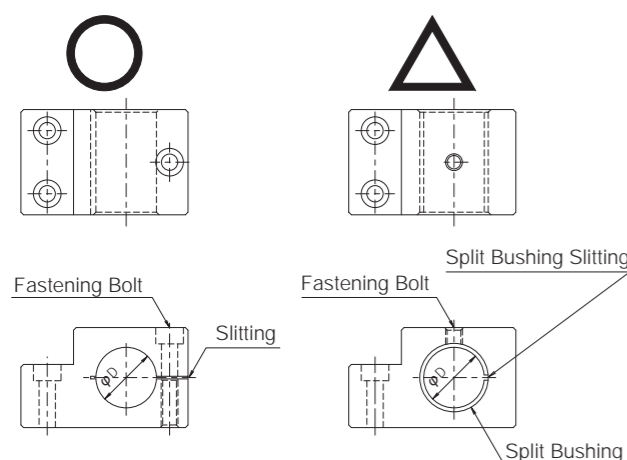


Fig.17

Fig.18

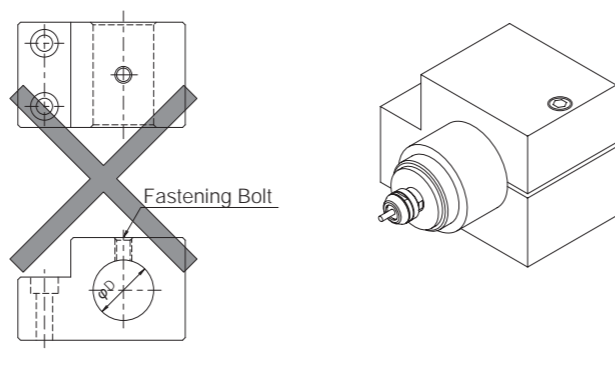


Fig.19

7 Air Line Kit Installation and Operation

- Connect the filter joint at the edge of the inlet hose of air motor spindle to the connector for hose.
- Fill oil reservoir through the Oil Filler Cap with the provided lubricator(liquid paraffin ISO VG 15) to upper limit on the reservoir. (Disconnect from air supply prior to opening oil filler cap.)
- Connect the hose for air piping to the connector for air hose.
- Connect the conversed side of the hose for air piping to the air compressor.
- Supply air from the air compressor and turn regulator knob clockwise(clockwise=high)to set air pressure between 0.3-0.5MPa.
- Open air ON/OFF valve and Run the air motor at the proper pressure. Close the oil drip rate adjusting screw by turning counterclockwise and then turn oil drip rate adjusting screw clockwise to adjust drip rate to 30-40 drops/min.(For the detail, refer to Air Line Kit operation manual)
- After adjusting the proper drop rate, use the spindle.

CAUTION

Read Air Lin Kit operation manual on installations,operations, and cautions.

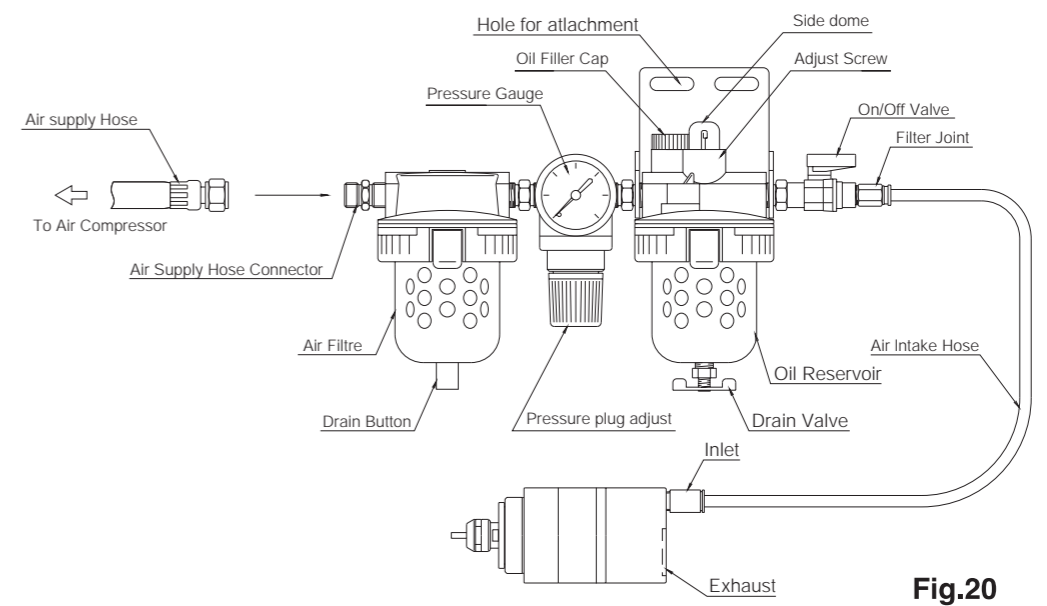


Fig.20

8 Cutting tool cautions

- The proper surface speed for vitrified grindstones is 600-1800m/min.

CAUTION

Do not exceed a surface speed of 2,000m/min for grinding.

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

- Do not exceed 13mm overhang for mounted grindstones. In case overhang must exceed 13mm reduce the motor speed in accordance with Fig.21 and Table 4.
- Do not use tools with bent or broken shanks, cracks or excessive runout.
- Dress the grindstone prior to use.
- For grinding the maximum depth of cut should not exceed 0.01mm radially or axially. Reciprocate the tool several times after each in feed step.
- Always operate tools within the tool manufacturer's recommended speed limits. Use of a tool outside of the manufacturer's recommended speed limits could cause damage to the spindle and injury to the operator.
- Keep the tool shank and collet clean. If contaminants are left in the collet, they can cause excessive runout and damage the tool and spindle.
- DO NOT drop or hit spindle, and DO NOT disassemble it.

Table4 Overhang and Speed

Overhang (mm)	Speed (min ⁻¹)
20	N × 0.5
25	N × 0.3
50	N × 0.1

N=Max. operating speed at 13mmoverhang.

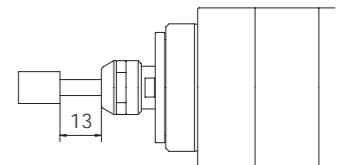


Fig.21

9 Trouble Shooting

When trouble is found, please check the following prior to consulting your dealer.

Trouble	Cause	Inspect/Corrective Action
Excessive Runout	Contaminants inside the collet or spindle.	Clean the inside of collet chuck and spindle.
	Collet Nut is not properly positioned	Position the collet nut properly
	Cutting tool is bent	Change cutting tool.
Noise or vibration during rotation	Ball bearing is worn	Send to NAKANISHI for Repair
	Use the bent tool	Change the tool.
	Foreign Particles stuck in the collet chuck or spindle. Ball bearing is worn.	Send to NAKANISHI for Repair
Low Rotation Speed	Partial disconnection of hose or leaking connection.	Check all joints and re-tighten seal connections.
	Broken Hose	Replace the hose.
	Low air flow or pressure	Check the air circuit.
	No or low oil supply	Check the oil volume in the oil reservoir and increase the drip rate. When using NAKANISHI's lubricator, adjust to 30-40 drops/min, 1-3 drops/min for other lubricators that supply oil directly into the air hose.
	Incline or vibrate lubricator	If inclining or vibrating lubricator, a large volume of oil will be flowed and be rotated irregularly.
	Excessive oil in oil reservoir.	A large volume of oil will be flowed and be rotated irregularly. Drain oil to the appropriate volume by loosening the cock.
	Excessive oil drip rate	Decrease drip rate to stabilize motor speed.
No Rotation	Moisture in the oil reservoir.	Drain moisture from the lubricator and replace oil.
	Moisture in the air filter.	Drain moisture in the air filter.
	No air flow	Check the regulator and set at the appropriate air pressure. Check all hose connections.
	Damaged motor bearings	Check air compressor power supply and air outlet. Check hoses for leaks, bends or disconnections. Send to NAKANISHI for Repair

※Specifications may be changed without notice.

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