

The NSK logo is displayed in a bold, blue, sans-serif font.

Please read this Operation Manual carefully before use, and file for future reference.

Ti-Max X

X450L/X450
X450KL/X450SL
X450BLED/X450WLED
X450M4

Air Turbine

MADE IN JAPAN

OM-T0418E



Powerful Partners®

Symbol



This product is Autoclavable up to Max.135°C.



This product can be washed via Thermo Disinfector.



Conforms to CE European Directive of "Medical equipment directive 93/42/EEC."



Manufacturer.



Authorised representative in the European community.

Rx Only

Caution: U.S. Federal law restricts this device to sale by or on the order of a licensed physician.



1. User and Intended Use

User: Qualified Professionals

Intended Use: Dental Treatment (Operations on third molars and impacted tooth removal)

2. Precautions for handling and operation

- Please read these precautions carefully and use only as intended or instructed.
- 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 serious injury or damage to the device if the safety instructions are not followed.
 CAUTION	A hazard that could result in light or moderate injury or damage to the device if the safety instructions are not followed.
NOTICE	General product specification information highlighted to avoid product malfunction and performance reduction.

CAUTION

- Read this Operation Manual before use to fully understand the product functions.
- When operating the handpiece always consider the safety of the patient.
- Users are responsible for the operational control, maintenance and continual inspection of this product.
- Do not attempt to disassemble the handpiece or tamper with the mechanism except as recommend by NSK in this Operation Manual.
- Do not allow any impact on to the handpiece. Do not drop the handpiece.
- Operators and all others in the area must wear eye protection and a mask when operating this handpiece.
- Should the handpiece function abnormally, cease operation immediately and contact your Authorised NSK Dealer.
- Depressing the push button while the handpiece is rotating will result in OVERHEATING of the chuck mechanism. Special caution must be exercised during use to keep cheek tissue AWAY from the push button. Contact with cheek tissue may cause the push button to be depressed and cause a burn injury to the patient.
- Do not use high acid water or sterilizing solutions to wipe, immerse or clean the handpiece.
- The products are delivered in a non-sterile condition and must be autoclaved prior to use.
- Perform regular function and maintenance checks.
- If the product is not used for a long period check it is functioning correctly before using on a patient.
- To avoid clinical downtime it is recommended that a spare be kept on hand in case of a breakdown during surgery.

- Avoid continual eye contact with the LED light. (X450BLED, X450WLED)
- This product is classified as a Class 1 LED Product. (X450BLED, X450WLED)
- Use a power source which meets the following requirements. (X450BLED, X450WLED)
 1. The electricity supply of the power source is below 15W both under normal and single-failure conditions.
 2. The power source uses a SELV circuit for electricity supply.
 3. The output voltage of the power source is within the range recommended by the manufacturer of this product.
- U.S. Federal law restricts this device to sale by or on the order of a licensed physician.

3. Setting of Air & Water Supply Pressure

Measure the supply pressure at the handpiece / hose connection point and set the pressure to the value specified on the specification table. (Fig. 1)

For Multi Gauge information refer to Option Parts List.

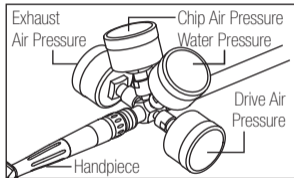


Fig. 1

WARNING

Do not exceed the optimum pressure specified on the specification table.

CAUTION

Do not use air contaminated by dust, moisture and oil.

4. Connection & Disconnection of the Handpiece

- 4 Refer to Operation Manuals of coupling and hose before connecting the handpiece.

X450L/X450

(1) Connection

- 1) Insert the handpiece into the Coupling.(Fig. 2)
- 2) Make sure the handpiece is firmly connected to the coupling.

(2) Disconnection

Pull back the Retention Lock Ring and remove the handpiece from the Coupling.(Fig. 2)



CAUTION

Do not operate the Retention Lock Ring while under drive air pressure. The high pressure may cause sudden release of the handpiece from the coupling.

X450M4

(1) Connection

- 1) Insert the handpiece correctly into the hose connector and tighten the hose nut.(Fig. 3)
- 2) Make sure the handpiece is connected firmly to the hose.

(2) Disconnection

Loosen the Hose Nut and remove from the Hose.

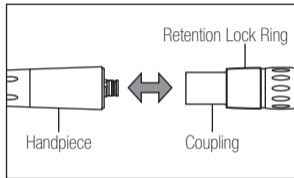


Fig. 2

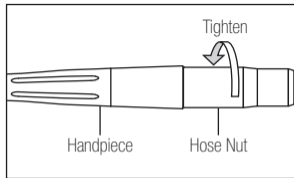


Fig. 3

5. Insertion & Removal of the Bur

5-1 To Insert the Bur

- 1) Insert the bur until it is correctly seated in place. (Fig. 4)
- 2) Depress the Push Button and insert the bur into the chuck until it is secure then release the button.
- 3) Ensure that the bur is secure by gently pulling and pushing the bur **WITHOUT** depressing the Push Button.

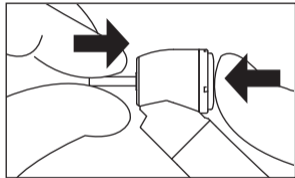


Fig. 4

5-2 To Remove the Bur

Depress the Push Button firmly and remove the bur.

NOTICE

Grip the handpiece while placing your thumb tip on the Push button which makes it easier to depress the button.



CAUTION

- Always insert the bur all the way into the chuck.
- Remove the bur only after the handpiece has completely stopped rotating.
- Always keep the bur shank clean.
- Entry of debris into the chuck, via the bur shank, could cause bur rotation slip and also prevent the bur from being securely located in the chuck.
- Do not exceed the bur speed recommended by the bur manufacturer.
- Do not exceed maximum bur length recommended by the handpiece manufacturer.
- Do not apply excess pressure to the bur as it may break or bend or become difficult to remove.
- DO NOT use burs with problems listed below as the bur may break or disengage from the chuck.
 - Bent, deformed, anisomorous (worn), rusted, broken, deficient bur.
 - Bur which is cracked on the edge or axis.
 - Non-ISO standard, or tampered bur

6. Check before treatment

Check that the Head Cap is firmly tightened. Also check for handpiece vibration, noise and overheating. If any abnormalities are found do not use the handpiece and contact your Authorised NSK Dealer.

7. Maintenance

After each patient maintain the handpiece as follows.

7-1 Cleaning handpieces with the NSK Clean-Head System

After the treatment of each patient, clean the Clean Head.

- 1) Remove dirt and debris from the Clean Head Holes with the cleaning wire and brush (supplied as an accessory for the handpiece). (Fig. 5)
- 2) Half fill a cup with clean water.
- 3) Rotate the handpiece and immerse half of the handpiece head in the cup of water. (Fig. 6)
- 4) Rotate then stop intermittently the handpiece 3 times for 2 to 3 seconds each time.
- 5) Wipe the handpiece dry.

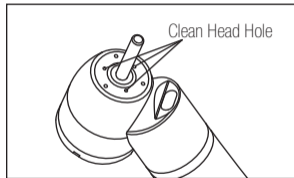


Fig. 5

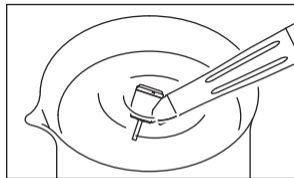


Fig. 6

7-2 Cleaning (Handpiece)

- 1) Remove dirt and debris from the handpiece. Do not use a wire brush.
- 2) Wipe clean with alcohol-immersed cotton swab or cloth.



This icon denotes that the handpiece can be washed via Thermo-Disinfector.

Refer to the Thermo-Disinfector manual.



CAUTION

- After washing with Thermo-Disinfector and prior to lubrication, dry the handpiece until all internal moisture is thoroughly removed. Thermo-Disinfector moisture remaining inside the handpiece could reduce the effect of lubrication and could cause corrosion.
- To clean the handpiece never use any solvent such as benzine or thinner.

7-3 Cleaning (Optic)

Wipe clean the Glass Rod tip with an alcohol-immersed cotton swab. Remove all debris and oil. (Fig. 7)



CAUTION

Do not use a sharp tool to clean the Glass Rod. It could damage the glass and reduce the light transmission.

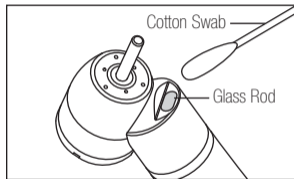


Fig. 7

7-4 Cleaning (Spray Port)

When spray ports are clogged, or spray does not exit evenly from the ports, clean the ports as follows. (Fig. 8)



CAUTION

- Do not forcibly insert the wire into the port. Resultant port damage could cause the spray to be directed away from the bur, and the cooling efficiency reduces.
- Do not blow the air into the Clean Head Hole.

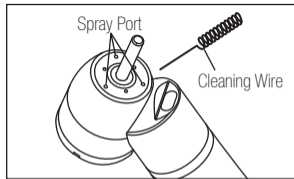


Fig. 8

7-5 Lubrication

■ NSK PANA SPRAY Plus

X450L/X450/X450KL/X450SL/X450BLED/X450WLED

Apply NSK PANA SPRAY Plus every time after each use and/or before autoclaving.

- 1) Remove the bur from the handpiece.
- 2) Insert the Spray Nozzle into the Spray Port nozzle on the can.
- 3) Insert the Spray Nozzle in rear of the handpiece. Hold the handpiece and spray for approximately 2-3 seconds. Apply lubricant until it expels from the handpiece head for at least 2 seconds. (Fig. 9)

X450M4

- 1) Remove the handpiece from the hose.
- 2) Mount the arrow-head spray nozzle tip into the spray can port. (Fig. 10)
- 3) Insert the Spray Nozzle into the Drive Air Port of the handpiece. Hold the handpiece and spray for approximately 2-3 seconds. Apply lubricant until it expels from the handpiece head for at least 2 seconds. (Fig. 11)

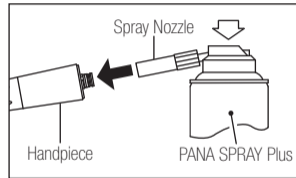


Fig. 9

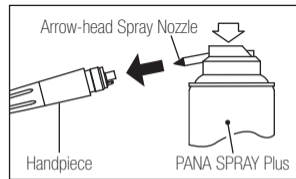


Fig. 10

CAUTION

- When applying spray be sure to hold the handpiece firmly to prevent the handpiece from slipping out of the hand due to the spray pressure.
- Hold the spray can upright.

■ Lubrication Oil (X450M4)

- 1) Remove the handpiece from the hose.
- 2) Apply 1-2 drops of lubrication oil into the Drive Air Port shown in the Fig. 11.
- 3) Connect the handpiece to the hose. Operate the handpiece for about 10 seconds.

■ Chuck cleaning

Clean Push Button chuck once a week.

- 1) Mount the arrow-head spray nozzle tip into the spray can port.
- 2) Lubricate the chuck for 1 to 2 seconds directly through the bur insertion hole. (Fig. 12)
- 3) Lubricate handpiece by using NSK PANA SPRAY Plus or Care3 Plus.

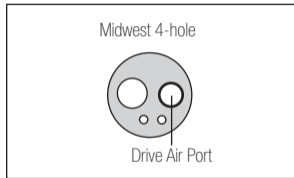


Fig. 11

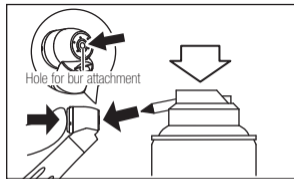


Fig. 12



CAUTION

If the chuck is not regularly cleaned the chuck grip may be weakened and the bur may be accidentally released while in operation.

■ NSK Care3 Plus

When using NSK Care3 Plus automatic handpiece cleaning and lubrication system, refer to the Care3 System instructions.

7-6 Sterilization

Sterilize the product by autoclave sterilization. Remove the bur after each patient and sterilize as noted below.

- 1) Insert into an autoclave pouch. Seal the pouch.
- 2) Autoclavable under the conditions below.
Autoclave for more than 20 min. at 121°C, or 15 min. at 132°C, or 3 min. at 134°C.
- 3) The handpiece should remain in the autoclave pouch until required for use.



CAUTION

- Do not autoclave the handpiece with other instruments even when it is in a pouch. This is to prevent possible discolouration and damage to the handpiece from chemical residue on other instruments.
- Keep the handpiece in suitable atmospheric pressure, temperature, humidity, ventilation, and sunlight. The air should be free from dust, salt and sulphur.
- Immediately after use, the handpiece should be cleaned, lubricated and sterilized. If blood remains on the external or internal surfaces it can become clotted and cause rust.
- Do not heat or cool the handpiece too quickly. Rapid change in temperature could cause damage to the handpiece.
- If the sterilizer chamber temperature may exceed 135°C during the dry cycle then delete the dry cycle.
- Autoclave sterilization is recommended for the product. The validity of other sterilization methods is not confirmed.
- Do not touch the handpiece immediately after autoclaving as it will be very hot and must remain in a sterile condition.

NOTICE

NSK recommends Class B sterilizers as stated in EN13060.

8. Replacing the O-rings (X450L/X450)

Replace the O-rings if water is present in the exhaust air line. This is an indication of possible water leakage within the coupling. ALWAYS change the complete set of O-rings.

- 1) Loosen and Remove the taper ring at the rear of the handpiece. (Fig. 13)
 - 2) Gently remove each O-ring by hand. (Fig. 14)
 - 3) Insert the complete set of new O-rings in the correct grooves.
 - 4) Replace and firmly tighten the taper ring.
- *Refer to Spare Parts List to identify the correct parts.



CAUTION

- Do not force the new replacement O-ring with excessive pressure.
- When inserting new O-rings, make sure they are inserted in the correct grooves.
- Make certain that the taper ring is firmly tightened. If the taper ring is loose water and air leakage could occur.

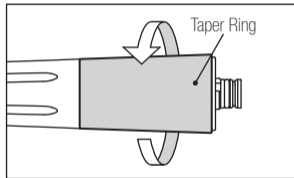


Fig. 13

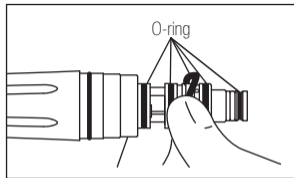


Fig. 14

9. Replacing the Non-Retraction Valve

A water Non-Retraction Valve is integrated in the Coupling Joint (the product below), which shuts off the water retraction directly at the handpiece head to prevent fluids infiltrating the water line. If water is beginning to leak from the handpiece, replace the non-retraction valve.

NSK Coupling

- 1) Remove the Coupling Joint from the hose.
- 2) Remove the back end Gasket.
- 3) Pull and remove the water tube, and replace the Non-Retraction Valve.
- 4) Insert the new Non-Retraction Valve securely and remount the back-end Gasket.

*Refer to Spare Parts List to identify the correct parts.

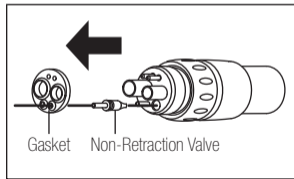


Fig. 15

X450BLED

- 1) Remove the handpiece from the coupling.
 - 2) Loosen and remove the Taper Ring.
 - 3) Pull out the joint.
 - 4) Pull out the old Non-Retraction Valve with a thin instrument. Insert a new Non-Retraction Valve securely.
 - 5) Insert the joint by aligning the joint holes with the pipes of the handpiece.
 - 6) Firmly tighten the Taper Ring while lightly pressing the bulb holder by a finger.
- *Refer to Spare Parts List to identify the correct parts.



CAUTION

- Tighten the taper ring firmly. A loose fitting taper ring could result in water and air leakage.
- Do not remove the internal circuit board when removing the taper ring. It might cause failure.

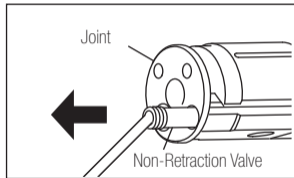


Fig. 16

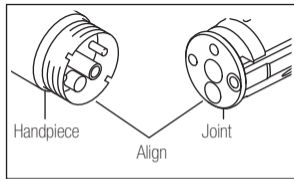


Fig. 17

10. Periodical Maintenance Checks

Perform periodical maintenance checks every three months, referring to the check sheet below. If any abnormalities are found, contact your Authorised NSK Dealer.

Points to check	Details
Head cap is loose	Check that the Head Cap is firmly tightened.
Rotation	Rotate the handpiece and check for abnormalities such as abnormal rotation, vibration, noise, and overheating.

11. Specifications

Model	X450L	X450	X450KL/X450SL	X450BLED/X450WLED	X450M4
Hose Connection Type	-				ISO9168 Type B
Max. Rotation Speed	380,000-450,000min ⁻¹				
Bur Type	ISO 1797-1 ø1.59-1.60mm Surgical Long Shank Bur (25mm)				
Chucking Length	10.7mm				
Max. Bur Length	25mm				
Max. Working Part Diameter	ø1mm				
Drive Air Pressure	0.25 - 0.3MPa (2.5 - 3.0kgf/cm ²)				0.18-0.22MPa (1.8-2.2kgf/cm ²)
Max. Air Consumption	45±5NL/min (0.25MPa)				35±5NL/min (0.22MPa)
Water Pressure	0.1-0.2MPa				
Optic	Glass Rod	-	Glass Rod	White LED	-
Voltage	-			AC/DC 3.3 ±0.05V	-
Active Voltage	-			2.8 - 4.0V	-
Consumption Current	-			0.38A Typical(3.3V)	-
Use Environment	Temperature: 10-40°C		Humidity: 30-75%	Atmospheric Pressure: 700-1,060hPa	
Transportation and Store Environment	Temperature: -10-50°C		Humidity: 10-85%	Atmospheric Pressure: 500-1,060hPa	

*This handpiece is a water jet type. The coolant water is not sprayed.

12. Warranty

NSK products are warranted against manufacturing errors and defects in materials. NSK reserves the right to analyze and determine the cause of any problem. Warranty is voided should the handpiece be not used correctly or for the intended purpose or has been tampered with by unqualified personnel or has had non NSK parts installed. Replacement parts are available for seven years beyond discontinuation of the model.

13. Option Parts List

Model	Order Code
MG-4H Multi Gauge	Z109400

14. Spare Parts List

Model	Order Code	Compatible Product
PTL O-ring Set	Y900580	X450L/X450
Non-Retraction Valve	P401054	NSK coupling
Non-Retraction Valve	P826B042	X450BLED

15. Disposing product

In order to avoid the health risks of operators handling the disposal of medical equipment, as well as the risks of environmental contamination caused thereof, a surgeon or a dentist is required to confirm the equipment is sterile. Ask specialist firms who are licensed to dispose of specially controlled industrial wastes, to dispose the product for you.



The EU directive 93/42/EEC was applied in the design and production of this medical device.

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Specifications are subject to change without notice.

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