

OXYGEN CONCENTRATOR (OC)

USER MANUAL



MIC Electronics Limited
Hyderabad, Telangana, India



Please make sure that all the information contained in this manual is studied and understood, before attempting to operate the Oxygen concentrator (OC) MLTX-10

Please pay particular attention to the usage guidelines, safety notes and alarms included in the manual.



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01 Introduction

Oxygen is the life supporting component of air and has been an integral part of the therapeutic process in the medical field for a long time. The havoc created by the deadly Corona virus all over the world has further highlighted the importance of Oxygen manifold and made the sources of Oxygen truly 'Mission Critical' equipment. Oxygen Cylinders, Oxygen concentrator OCs, and piped Oxygen from Oxygen tanks are the three sources in wide use. Of the three, concentrators have certain definite advantages over the other two. The Concentrators supply inexhaustible medical grade Oxygen using electrical power, by continuous production from ambient air, without the need for purchase, storage and handling of Oxygen cylinders or tanks.

Even when we do come out of the present COVID Crisis, the applications of Oxygen In the medical field are going to be permanent in several situations like Neonates, Paediatrics, Obstetrics, Internal Medicine, Emergency care, Surgery, Trauma, Hypoxemia and other survival services.

Hypoxemia, or low blood Oxygen saturation is common complication of a range of clinical conditions. Oxygen is essential for the treatment of Hypoxemia and should be given to the patient to improve and stabilize blood Oxygen saturation levels.

Government of India have taken several measures to combat the horrid pandemic that has been sweeping the country. One of the initiatives is 'PM Cares' and as part of this initiative, Oil and Natural Gas Commission (ONGC) foundation, a central government organization, has been entrusted with the responsibility of spotting competent manufacturing agencies to deliver high performance Oxygen concentrators (OC)s to make the country self-sufficient in this field which can contribute significantly in reduction of mortality across all sections of society in the country. MIC Electronics Ltd is one of the selected organizations and the company offers its product MLTX-10. The present document outlines the Operational and usage aspects of the MLTX-10.

02 About MIC's

Oxygen concentrator (OC) MLTX-10

2.1 Scope of Applications:

As outlined earlier, this device is meant for supplying Oxygen for medical purposes to patients, young and old, as the Doctors prescribe. The scope of applications is vast and covers Pulmonary problems, Cardiac problems, Blood Vessel Problems and the like. Hospitals, Hotels, Military Camps , Sanatoriums and other Health care organizations will be needing these devices for both chronic and emergency medical situations.

2.2 Specifications of the Oxygen concentrator (OC):

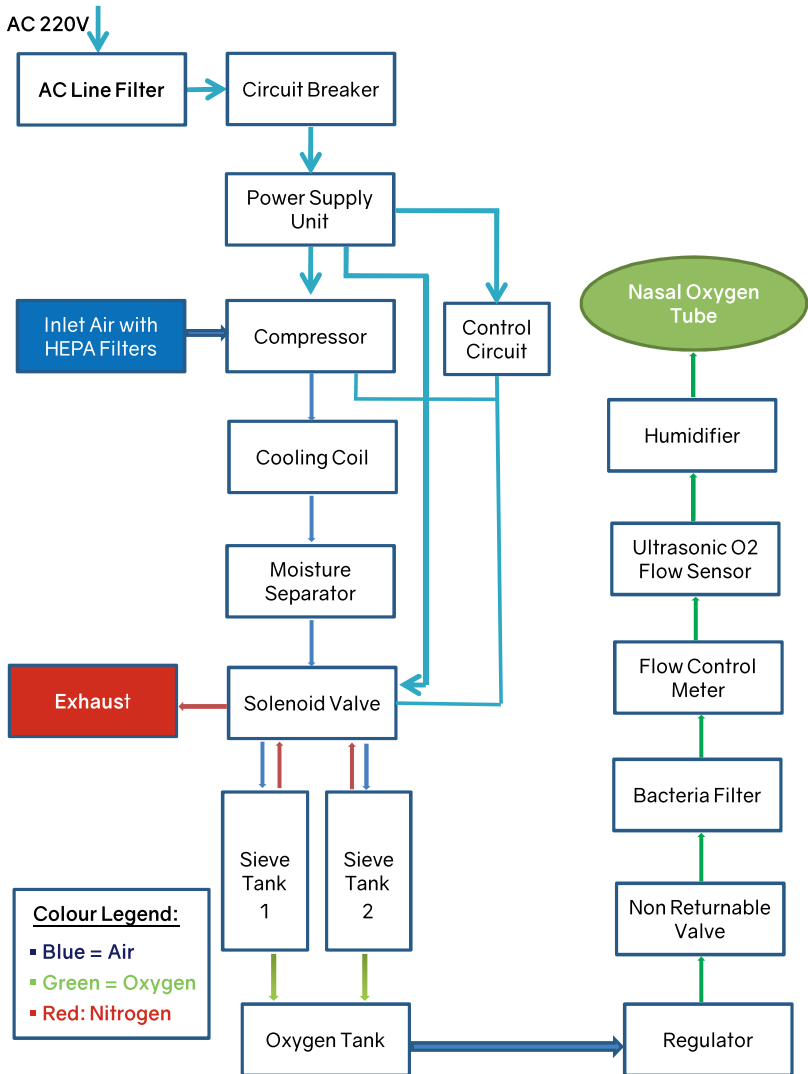
Oxygen concentration	: 93± 3%
Flow	: 1-10LPM (Litres Per Minute)
Output Pressure	: 6-14 PSI
Average Power Consumption	: 720W – 850W
Operating Temperature	: 5°C - 40°C
Sound Level	: <65db
Voltage	: 220VAC @50Hz
Alarms	- Low Oxygen
	- Very Low Oxygen
	- High / Low Voltage
	- Compressor Failure
	- Mother Board Failure
Usage	: 24X7, Can be used round the clock
Standard	: EN 60601-1 or equivalent
Dimensions (DXWXH)	: 420mm X 500mm X 655mm with wheels
Net Weight	: 42.5 Kg Approx.

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About MIC's

Oxygen concentrator (OC) MLTX-10

2.3 Block schematic diagram of MLTX-10



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Oxygen concentrator (OC) MLTX-10

2.4 Functioning of the Oxygen Concentrator (OC) MLTX-10

The Oxygen Concentrator (OC) is an electrically powered medical device. The atmospheric air is drawn through an Air inlet filter and is moved through a compressor. The pressurized air is moved through cooling coil to reduce the air temperature and passed through a moisture separator, before entering sieve bed towers that contain Zeolite, a mineral material that preferentially adsorbs Nitrogen (N₂) at high Pressures. As each sieve bed is depressurized, Nitrogen (N₂) is released through an outlet filter. This process, called Pressure Swing Adsorption (PSA) enriches the Oxygen above 90% to medical grade Oxygen. Valves open to deliver concentrated Oxygen into an Oxygen reservoir where it accumulates.

This medical grade Oxygen then flows through a bacteria filter and into the cannula/mask through a humidifier. From here, medical grade Oxygen flows through a non-returnable valve and a bacteria filter. Finally, a flow control meter is used to adjust the flow rate of the Oxygen and continuous release of Oxygen takes place.



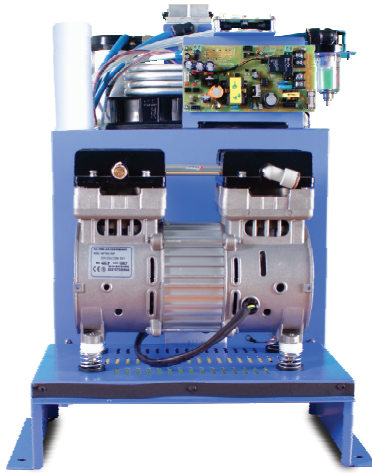
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Oxygen concentrator (OC) MLTX-10

2.5 Parts of the Oxygen Concentrator (OC) and their functions

OC Front View










OC Rear View



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About MIC's









Oxygen concentrator (OC) MLTX-10

S.No	Part	Image	Function
01	Outer Cabinet		Encloses all the components of the OC
02	Inlet Air with HEPA Filters		Filters coarse particulate matter to extend intake filter life.
03	Compressor		Pressurizing and pumps air into the system
04	Fan		Circulates the air inside the enclosure and cools the compressor
05	Cooling Coil		Dissipates heat generated by Air compression
06	Moisture filter		Reduces moisture from the air flow stream
07	Oxygen Measuring Unit		Analyses the system state, measures the Flow rate & Purity of Oxygen.

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S.No	Part	Image	Function
08	Valve Assemblies		Control the flow processes for the sieve and the exhaust
09	Sieve beds		Separate the gases as air is moved in and out
10	Exhaust muffler		Expels the Nitrogen with minimum noise.
11	Oxygen Tank		Oxygen accumulator for providing a steady and continuous flow of Oxygen
12	Flow meter		Controls the delivery flow rate
13	Humidifier		Humidifies the delivered Oxygen
14	User Interface Module		Displays the Oxygen Level & flow rate and alarms when the prescribed threshold values are crossed
15	Bacteria Filter		Traps the Bacteria

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Oxygen concentrator (OC) MLTX-10

2.6 Indicators and Controls

- **Power Switch** : Can be used to power-on or power-off the unit and it has an internal LED lamp which will glow when the unit is in ON condition.
 - **Enter Button** : Can be used to stop the Buzzer (both red lamp & audible alarm). After resolving the alarm this has to be pressed again to generate new alarms.
 - **Analog Oxygen Flow Meter** : The location of the float in the Oxygen flow meter indicates the Oxygen flow rate (L/min). This is in addition to a digital flow meter.
 - **Oxygen Flow Meter Knob** : It is used to control the outlet Oxygen flow.
 - 5 press buttons are provided below the 5 Digit 7-Segment LED Display are used for internal purpose & will be used by production team to set few parameters & clock
 - LCD Display has been provided to configure the unit related parameters. It will display the Clock during idle time of LCD Display.
 - 5 Digit 7 Segment LED display (green color) has been provided to show the Alarm (1 to 5), Clock in 24 Hour format & Working hours of the unit
 - Two 3 Digit 7 Segment LED displays (green color) have been provided to show the parameters related to Oxygen. The top one shows the Oxygen Flow in LPM and the bottom one shows the Oxygen Purity in %
 - 5 lamps provided (Alarm-Red lamp, Clock, Hrs, Timer & Com. Status) on top of the 5 Digit 7-Segment LED Display indicate the present data displayed on the 5 Digit display corresponds to any of the 5 sources & they will glow in sync with the data displayed on 5 digit displays.
- a. When the "Alarm" red lamp glows, that means the data shown on the 5 digit display is related to Alarms & it can be any one of "AL 2"/"AL 3"/"AL 4"/"AL 5".
 - b. When the "Clock" green lamp glow that means the data shown on the 5 digit display related to Clock in 24 hour format.
 - c. When the "Hrs" green lamp glow that means the data shown on the 5 digit display indicates the number of hours the O2 Concentrator is functional so far.
 - d. Both "Timer" & "Com. Status" are not used & are reserved for future usage.

2.7 Alarms

The following 5 alarms are provided and their descriptions are as follows:

1. Mother Board Failure Alarm

Mother Board Failure Alarm will be indicated by Buzzer (both RED Lamp & Audible alarm) & this alarm will be triggered when the Control Circuitry fails. Press the "Enter" button to acknowledge the alarm.

2. Low Oxygen Concentration Alarm

The Oxygen concentration will rise to the normal level in five minutes of operation. When Oxygen purity is <82%, red lamp (Buzzer) is on along with audible alarm, indicating low purity. The same will be Displayed in 5 Digit Display as AL 2, indicating as Low Oxygen Concentration. Press the "Enter" button to acknowledge the alarm.

3. Very Low Oxygen Concentration Alarm

The Oxygen concentration will rise to the normal level in five minutes of operation. When Oxygen purity is <70%, red lamp (Buzzer) is on along with audible alarm, indicating Very low purity. The same will be displayed in 5 Digit Display as AL 3, indicating as Very Low Oxygen Concentration Alarm. Press the "Enter" button to acknowledge the alarm.

4. Compressor Failure Alarm

Compressor Failure will be diagnosed by the Control Circuitry and it will be indicated through red lamp (Buzzer) along with audible alarm. The same will be displayed in 5 Digit Display as 'AL 4', indicating as Compressor Failure Alarm. Press the "Enter" button to acknowledge the alarm.

5. High/Low Voltage Alarm

AC Main input voltage is measured and if it is over 275V or below 180V, High/Low Voltage Alarm will be generated & AC power will be tripped to Compressor. The same will be indicated through red lamp (Buzzer) with an audible alarm. The same will be displayed in 5 Digit Display as 'AL 5', indicating as High/Low Voltage Alarm. Press the "Enter" button to acknowledge the alarm.

03 Installation and Use

A short video is provided to help outline the steps to be followed in the installation and commissioning of the Oxygen concentrator (OC). This can be downloaded at www.mic.co.in

Before powering on the equipment, physical examination has to be done to ensure that there are no damages to the packaged unit. If there are any physical damages, please contact as per the details mentioned at the end of this manual.

- After opening the carton box, the equipment supplied needs to be verified with the packing list attached to the OC package. Shortages if any have to be notified to the concerned authorities immediately.
- Please ensure that the surplus accessories and spares are stored separately under the custody of the authorized official.
- Position the main equipment on a stationary platform and power on the Oxygen concentrator (OC). Note the values on the displays and indications of the indicator lamps. When all the signals are satisfactory and when the purity of Oxygen is indicated above 90%, the performance of the OC can be taken to be in conformity with the laid down specifications. The OC can be moved to the required location (near the patient) and made operational.

The following is a brief list of key procedures to perform for installation of the Oxygen concentrator (OC):

- Avoid placing the unit in a confined area – place the unit so that all sides are at least 30 cm or 12 inches away from a wall or other obstruction to ensure adequate airflow to the device and heat dissipation;
- Avoid placing the unit in direct sunlight;
- Position the unit away from all potential fire hazards, including curtains or drapes, heaters and fireplaces.
- While an Oxygen concentrator (OC) is easily movable by an individual, Oxygen concentrator (OC) units may be installed in a fixed position to prevent damage, loss.

Operating Instructions

- Unscrew the cap from the humidifier, pour in proper distilled water or cold boiled water between the maximum line and the minimum line then close the top cover to the humidifier bottle.
- Connect the nasal Oxygen cannula to the humidifier outlet nozzle or to the concentrator outlet if a humidifier has not been prescribed. Then set the nasal Oxygen cannula over patient's ears, insert the nasal Oxygen cannula into patient's nostrils to absorb Oxygen; The nasal Oxygen cannula should be limited to 2 meters or approx. 6 feet long, in order to ensure that the Oxygen flow rate remains within specifications.

03 Installation and Use

- Insert the power plug of the Oxygen concentrator (OC) unit into the electrical outlet then set the I/O power switch to the "I" position to turn the unit ON.
- To set the flow of Oxygen, turn the knob of Oxygen flow meter clockwise or counter clockwise until the ball inside the flow meter centers on the flow line number recommended. The flow rate is also seen in the LED display. Give the machine 20-30 seconds to stabilize the flow after each adjustment. Turn the knob gently and gradually. The maximum recommended flow is 10LPM.

Handling and use

In general, concentrated Oxygen is delivered to the patients such that their Oxygen saturation stabilizes and is maintained within normal ranges. Exposure to too much or too little Oxygen can harm patients, especially neonates.

Cleaning and decontamination

The exterior of the Oxygen concentrator (OC) should be wiped after disconnecting from the power supply. Clean the exterior of Oxygen concentrator (OC) using a mild detergent or cleaning agent. Allow the solution to remain on the surface for 10 minutes and then rinse off and dry.

Cleaning and disinfection protocols should always be followed if nasal prongs are reused, and requires: cleaning with soap and water; soaking in dilute bleach solution; rinsing in clean water; and allowing to dry in room air – as prescribed by doctors

When humidifiers are used, they should have clean water replaced daily and be soaked in dilute bleach for 15 minutes, weekly (and between patients), and then dried.

04 Safety Notes

Warning – Describes a hazard or unsafe practice that can result in severe bodily injury or death

- This unit is not a life-support device, and in certain circumstances Oxygen therapy can be hazardous, it is suggested that if any patient who needs Oxygen treatment, please follow doctor's advice to choose the right flow and period for Oxygen before using the Oxygen concentrator (OC).
- In the event of an alarm, you observe your Oxygen concentrator (OC) not working properly, or if patients feel discomfort, consult the physician immediately.
- Use voltage specified on rating label.
- This device produces high concentration Oxygen, which promotes rapid burning. Keep Oxygen concentrator (OC) far away from open flames and no smoking should be allowed.
- Do not leave a nasal Oxygen cannula under bed coverings or chair cushions. If the unit is turned on without use, the Oxygen will help the flammable material get ignited.
- Use no lubricants, grease, or petroleum-based products on or near your Oxygen concentrator (OC)
- Electrical shock hazard. Do not remove covers while the unit is plugged in. Only Equipment Provider or a qualified service technician should remove the covers or service the unit.
- Care should be taken to prevent the unit from getting wet or allowing water to enter the unit.

Caution – Describes a hazard or unsafe practice that can result in property damage

- The Oxygen concentrator (OC) should be used in a dust free environment
- Do not place the Oxygen concentrator in surroundings where its air flow is obstructed.
- Do not place items on top of the concentrator.
- Always place the concentrator on a hard surface. Never place the concentrator on an elevated surface such as bed or couch, where the concentrator may trip or fall.
- NEVER leave the concentrator unattended when plugged in.

04 Safety Notes

- Ensure the base of the OC is clear of any objects and properly ventilated, during operating, or else the Oxygen concentrator (OC) will be over-heated
- Allow for 2-5minutes for the OC to reach operating parameters for the flow and purity and nominal performance
- The plug is the disconnection device of the Oxygen concentrator (OC), when the plug is pulled, there is no power supply. In order to pull the plug easily, be certain to place the unit where all sides are at least 30 cm away from walls, draperies, furniture, or other obstructions. Do not place the unit in a confined area.
- It is very important to select only the prescribed level of Oxygen. Change the flow selection only under the guidance of your physician.

05 Potential Hazards

These are repeated again to make sure that all precautions are taken to avoid any fire hazards.

Oxygen concentrator (OC)s produce a high concentration of Oxygen, which increases the danger of fire for other objects, causing them to burn more readily. The following fire safety and hazard precautions are highlighted and should be addressed during installation and training of clinical and technical staff:

- Immediately replace damaged electrical cables or plugs;
- Utilize firebreak connectors to stop the Oxygen flow in the event of fire;
- Set the concentrator power switch to “off” when is not in use;
- When not in use, do not leave nasal catheters or prongs in contact with bed sheets or blankets – this is an infection hazard as well as a fire hazard if the concentrator is turned on, as the Oxygen will make the bedding material much more flammable;
- Keep anything that might create a spark or flame, such as cigarettes, candles, lanterns, portable heaters, stoves and electrical appliances, well away from concentrators.
- Do not use oil, grease or petroleum-based products on or near the unit, as these increase the risk of explosion and fire;
- Place the concentrator on a flat surface to prevent inadvertent rolling or damage to the compressor.

06 Troubleshooting & Maintenance

6.1 Troubleshooting

If your concentrator fails to operate properly, please refer to the troubleshooting chart on the following pages for probable causes and solutions. If problems with the equipment continue, please contact MIC as per contact details in the last page.

TROUBLESHOOTING GUIDE FOR END USER

S.No	Problem	Possible Cause	Solution
1.	O2 Concentrator does not turn ON, but Power switch in ON position.	<ul style="list-style-type: none"> No power to unit. Unit circuit breaker tripped/faulty Faulty electrical connections Faulty circuit board Faulty power switch. 	<ul style="list-style-type: none"> Check wall outlet for power Reset or replace circuit breaker Check electrical connections Replace circuit board Replace power switch.
2.	Compressor runs and shuts down periodically.	<ul style="list-style-type: none"> Restricted air flow Unit overheating due to improper location Compressor thermally cut off due to excessive heat. NOTE: It will not restart until it cools down. Faulty cabinet fan 	<ul style="list-style-type: none"> Remove obstruction Locate unit away from heating source, providing adequate ventilation on all sides Replace cabinet fan
3.	Circuit breaker repeatedly trips.	<ul style="list-style-type: none"> Faulty electrical connection Faulty compressor capacitor Faulty circuit breaker Faulty compressor Faulty circuit board 	<ul style="list-style-type: none"> Repair electrical connection Replace compressor capacitor Replace circuit breaker Replace compressor Replace circuit board
4.	Cabinet fan does not turn.	<ul style="list-style-type: none"> Faulty electrical connections Faulty cabinet fan 	<ul style="list-style-type: none"> Check electrical connections Replace cabinet fan
5.	Flow meter fluctuates	<ul style="list-style-type: none"> Improperly set or faulty receiver tank regulator Leak Reduced air intake in compressor Faulty flow meter Worn compressor Faulty circuit board Faulty solenoid valve. 	<ul style="list-style-type: none"> Set /repair/ replace regulator Leak test and repair leak Check compressor intake path/tubing Replace flow meter Replace compressor Replace circuit board Replace solenoid valve

06 Trouble shooting & Maintenance

S.No	Problem	PossibleCause	Solution
6.	Limited or low flow	<ul style="list-style-type: none"> • Restriction in humidifier bottle/tubing • Receiver tank regulator pressure set too low • Leak • Reduced air intake in compressor • Weak compressor • Faulty circuit board • Faulty solenoid valve 	<ul style="list-style-type: none"> • Replace humidifier bottle or tubing • Adjust regulator setting • Leak test and repair • Check compressor intake path/tubing • Check system pressure and rebuild or replace compressor if low pressure • Replace circuit board • Replace solenoid valve
7.	No flow indicated on flow meter	<ul style="list-style-type: none"> • Internal leak or restriction of airflow • Flow meter knob is turned off • O2 Mask or nasal cannula tubing blocked /external restriction at outlet of unit 	<ul style="list-style-type: none"> • Leak test and repair. In particular, regulator / fittings following tubing to flow meter. Repair leaks • Turn flow meter knob to allow flow of Oxygen • Check O2 Mask or nasal cannula tubing, Replace if necessary
8.	Low Oxygen concentration.	<ul style="list-style-type: none"> • Leak • Reduced air intake • Restriction in exhaust muffler • Contaminated sieve beds • Weak compressor • Faulty circuit board • Faulty solenoid valve 	<ul style="list-style-type: none"> • Leak test and repair • Blocked air intake or exhaust • Replace or clean exhaust muffler • Replace sieve beds • Check system pressure and rebuild or replace compressor • Replace circuit board • Replace solenoid valve

6.2 Maintenance

Regular maintenance and specified service are vital to the long-term operation and proper functioning of Oxygen concentrators (OC)s. Keep in mind that concentrators are designed to run continuously for days. While the compressor is the primary moving component and most subject to wear over time, it may be repaired or replaced.

To maintain optimal performance over time, regular maintenance by both clinical and technical staff alike is required. In addition, maintenance should be scheduled, performed and documented by a trained technician at least once per year (ideally every three to four months). The frequency of maintenance checks varies by model, use and environment, but should be done at least annually or every 5000 hours of use. More frequent maintenance is needed for hot, humid and/or dusty operating environments.

06 Trouble shooting & Maintenance

Regular maintenance checks on the Oxygen concentration output with a calibrated Oxygen analyser is essential and must be carried out by a trained technician. As necessary, the pressure output is checked with a pressure gauge. These pressures may include output delivery pressure, pressure in the product tank and pressures in the sieve-bed ends at various points of the pressure cycle. The bubble test may also be performed as a quick check of connections for air/Oxygen leaks.

The sounds produced by the concentrator also provide information about performance status. If the compressor is particularly loud, it likely needs servicing. Additional troubleshooting and repair tasks may involve disassembling the equipment and replacing components. The general components of Oxygen concentrators (OC)s are illustrated and described in Figures and Table provided earlier. An understanding of each of these components and their function greatly enhances the technician's ability to properly maintain, diagnose and repair a concentrator.

07 Accessories and Consumables

The following accessories and consumables are supplied with the equipment by MIC

7.1 Accessories

SNo	Item	Qty
1	Humidifier Bottle	1
2	User Manual	1

7.2 Consumables:

SNo	Item	Qty
1	Nasal Canula Adult	1 (+ 18 by ONGC)
2	Nasal Canula Pediatric	1 (+6 by ONGC)
3	Generic Nebulization kit including Cup Masks and tubing - Adult	1
4	Generic Nebulization kit including Cup Masks and tubing - Pediatric	1
5	Inlet Air Filter - cum - Muffler	2
6	Oxygen Out Bacterial Filter	1

08 Warranty

MIC gives a standard warranty against all manufacturing defects for a period of two years from the date of shipment. The warranty card is enclosed. Users will have to preserve the warranty certificates furnished by MIC carefully and produce them while seeking maintenance services.

Maintenance services beyond the warranty period will be on chargeable basis and will be governed either by Annual Maintenance Contracts (AMCs) or on-call services. The terms and conditions of maintenance after warranty period, will be separately notified.

09 Contact details

The contact details of MIC officials are detailed outlined below:

Regarding supplies and shortages if any:

Name	Email id
Vijay S.	vijay@mic.co.in

Regarding breakdown and maintenance during warranty period

Please email: ServiceMOC@mic.co.in

In addition, toll-free number 1800 425 7778 is also provided for getting in touch with MIC for all MOC related problems.

For Marketing and Sales information

OCSales@mic.co.in

For more details please visit our website: www.mic.co.in

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