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# OXI-dive™3

## OXYGEN RESUSCITATION UNIT

## OPERATING MANUAL



**DISCLAIMER:** This manual is intended as a guide only. Medical Developments International Limited accepts no responsibility for incorrect operation of the equipment or incorrect management of patients. It is essential that all individuals operating this equipment are fully trained in anaesthetic procedures.

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This manual includes details of the design, operation and maintenance of the *OXI-dive*<sup>TM3</sup>. *It is not a training manual for resuscitation and/or oxygen administration and must not be used as a substitute for such training.*

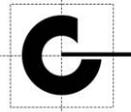
Users of the *OXI-dive*<sup>TM3</sup> should only be used by operators who have been trained in the use of oxygen.

See Appendix 1 brief descriptions of the **OXI-dive**<sup>TM1</sup> and **OXI-dive**<sup>TM2</sup> which are alternative models.

Medical Developments Australia Pty Ltd make no claim that the information, practices and procedures given in this manual will warrant correct or adequate treatment.



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**TABLE OF CONTENTS**

1 Oxygen Administration for Scuba Divers ..... 2

2 Duration of Oxygen Supply ..... 2

3 Components ..... 2

4 Major Components ..... 3

5 Operation of the Oxi-Dive™3..... 4

6 Cleaning, Disassembly and Decontamination..... 8

7 Storage and Servicing ..... 10

8 Specifications..... 10

9 Spare Parts..... 10

10 Guarantee..... 11

**APPENDICES**

1 Other OXI-dive™ Models..... 12

2 MTV-100 Manually Triggered Ventilator ..... 13

3 ‘Handicant’ Operating Instructions ..... 14

## 1 Oxygen Administration for Scuba Divers

It is important to administer high oxygen concentrations to divers with suspected decompression illness as soon as possible. Oxygen accelerates the removal of excess nitrogen from the body and increases the delivery of oxygen to damaged cells.

In a minor injury this may be all that is required. However if the patient is to be transported to a recompression facility, oxygen administration must continue during transport to improve the chances of a complete recovery.

## 2 Duration of Oxygen Supply

As most accidents occur several hours from a medical facility, divers should ensure that there is an adequate supply of oxygen

Larger boats or permanent sites use large oxygen cylinders (capacity of 3000-7000 litres) fitted with a regulator that is connected to OXI-dive™3 by an oxygen hose line (included).

Small cylinders (capacity of 320-440 litres) are used on smaller vessels and during transport. They provide approximately 30-40 minutes of oxygen

When oxygen is needed for extended periods, the PIBN pin-indexed bull nose adapter (provided) enables the pin-indexed LSP Regulator/Flowmeter to be attached to a large oxygen cylinder (which has a threaded valve)

The HANDICANT™ (optional) is a decanting tool, which enables small cylinders to be refilled on site from a large cylinder

## 3 Components

The OXI-dive™3 consists of the following components:

- Pelican case #1400 with a foam lid insert and dividers
- LSP regulator/flowmeter with two high flow outlets and one barbed flow outlet for the adjustable flowmeter (0-25L/min)
- Optional KDK™150 (0-15L/min with Oxygen flush)
- Cylinder valve key wheel with chain
- PIBN Adapter (Pin-Indexed Bull-Nose Adapter)
- The MTV-100/Manually Triggered Ventilator c/w 1.2m white oxygen hose fitted with a hand wheel diameter indexed for oxygen
- 2 Silicon Face Masks (Reusable)
- Set of 3 airways
- CPR-PRO™ pocket size resuscitator with an oxygen inlet and one-way valve
- Non-rebreathing therapy mask with a reservoir bag and green oxygen tubing (Single patient use)
- Operating Manual

## 4 Major Components

### LSP Regulator/Flowmeter

The LSP Regulator/Flowmeter has two high flow diameter indexed security system (DISS) outlets and a barbed oxygen outlet for selected flow rates of 1, 2, 4, 6, 10, 15 and 25 L/min

The yoke is pin-indexed for oxygen (Australian Standard AS 2472). A compact pressure gauge is incorporated to indicate the contents of the supply cylinder.

### The MTV-100/Manually Triggered Ventilator

The MTV-100/Manually Triggered Ventilator is an oxygen-powered breathing device which complies with the Australian Standard for 'Resuscitators intended for use with humans' AS 2488-1995. It is designed to deliver 100% oxygen to a breathing or non-breathing casualty. If the airway is obstructed, a safety feature prevents the continuation of the oxygen flow.

The MTV-100/Manually Triggered Ventilator may be attached to a portable oxygen cylinder fitted with a pressure reducing regulator or a central oxygen source. It can be used with a facemask, endotracheal tube or tracheotomy tube.

Inspiration during spontaneous breathing triggers the MTV which provides flow rates up to 100 L/min. However, to create a small negative inhalation pressure (-1 to -2.5 cm H<sub>2</sub>O) to initiate oxygen flow, the patient must be breathing sufficiently (as with any demand valve), If the patient is breathing too rapidly or weakly to open the valve effectively, the operator must manually operate the MTV-100.

The appropriate size silicone facemask (provided) is attached directly to the MTV. (Alternatively, the CPR-PRO™ mask can be attached to the MTV). With a good face seal, up to 100% inspired oxygen is provided to the breathing patient.

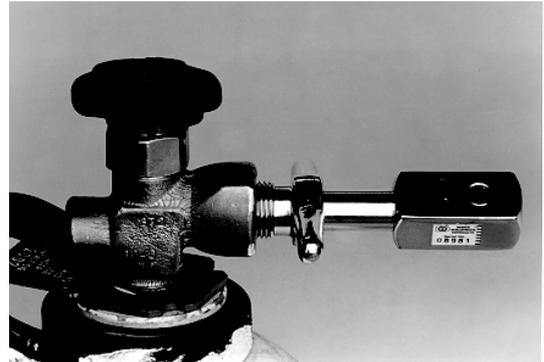
### Non-Re-breathing Mask with Reservoir Bag

The Non-Re-breathing Mask is for use with a second casualty. It includes a reservoir bag for oxygen which provides inspired oxygen concentrations up of about 60-70%. Start with an oxygen flow rate of 10 L/min and then increase or decrease the flow rate to keep the reservoir bag adequately constantly inflated.

A safety vent is incorporated on one side to enable air to be entrained if the patient requires more flow than can be provided by the oxygen in the reservoir bag.

### PIBN (pin-index to bull-nose) adapter

The LSP Regulator/Flowmeter has a pin-indexed yoke (Australian Standard AS2472) which connects directly to a small medical pin-indexed oxygen cylinder. However most large medical oxygen cylinders are fitted with a threaded valve (Australian Standard AS 2473).



The pin-index to bull-nose adapter (PIBN) enables the pin-indexed LSP Regulator/Flowmeter to be fitted to a large oxygen cylinder thereby increasing the versatility of the OXI-dive™3 oxygen resuscitation unit. Therefore the operator can use a small pin-indexed cylinder for short duration oxygen supply and a large cylinder for situations where oxygen may need to be administered for extended periods.

**NOTE:** As with all oxygen equipment, the adapter must be kept clean and free from all oil or grease.

### Pelican Case

The components of the OXI-dive™3 are enclosed in a robust Pelican case. When the Pelican Case is closed and the dial rotated to the closed position\*, it is airtight and waterproof and no damage should occur to the equipment if the case happens to be submerged in water.

\*NOTE: To reopen the case, loosen the dial.

## 5 Operation of the Oxi-Dive™3

### Precautions

- **Oxygen readily supports combustion.** The OXI-dive™3 must not be used near an open flame.
- Do not smoke while using the unit.
- Ensure the area is ventilated and nothing is burning in the immediate vicinity.
- **Oil or grease must not be used on any part of the OXI-dive™3.**

## To Check the Oxygen Supply

- Open the Pelican case and remove the required components.
- Fit *the LSP Regulator/Flowmeter* to a small pin indexed oxygen cylinder and tighten.
- Alternatively used the PIBN adapter to connect the *LSP Regulator/Flowmeter* to a large oxygen cylinder\*.
- Rotate the variable flow control of the *LSP Regulator/Flowmeter* to the 'OFF' setting (clockwise).
- Turn the cylinder valve ON at least one full turn (anti clockwise). Check the contents gauge.
- If there is a leak, the check that the sealing washer ('Bodok' seal) is in place.

\* *If a large cylinder with a threaded valve is used, first purge any dust from the cylinder valve: face the outlet away from all persons present and ease open the cylinder valve slowly to allow a small quantity of oxygen to flow and then turn it off again. Then screw the PIBN adapter firmly into place. Fit the LSP Regulator/Flowmeter to the pin-indexed fitting of the PIBN adapter. Turn the cylinder valve ON slowly to pressurize the LSP Regulator/Flowmeter. Now turn the cylinder valve OFF; observe the contents gauge and listen for an escape of oxygen. Rectify any leaks.*

## Spontaneously Breathing Patient

### a) *Using the MTV-100/Manually Triggered Ventilator*

#### **Note:**

- The MTV should be used when 100% oxygen concentrations are required (such as treating a scuba diver for decompression illness).
  - The MTV-100/Manually Triggered Ventilator is designed to be used on adults and children but should not be used on infants.
  - Depressing the Manual Control Button when the patient is breathing spontaneously may make it impossible for the patient to exhale.
  - Only trained personnel should use this equipment.
1. Screw (by hand) the nut at the free end of the oxygen hose fitted with the MTV onto a DISS outlet of the LSP Regulator/Flowmeter
  2. Ensure that the patient is breathing adequately.
  3. Reassure the conscious patient & explain what you are doing.
  4. Position the patient appropriately - consider the possibility of spinal injury and take appropriate precautions if necessary. An unconscious, breathing patient should be placed in the lateral position if practicable.
  5. Attach the appropriate size facemask directly to the MTV.
  6. Position the mask carefully over the casualty's nose and mouth (narrow portion over the nose). Ensure a good seal is obtained or the MTV may not function effectively.

7. Ask the patient to breathe normally. If the MTV is not triggering, ask the patient to breathe a little more deeply to trigger the valve. If the patient has difficulty using the MTV, use the Non-Rebreathing Mask with the reservoir bag (See below) or CPR-PRO™ pocket size resuscitator instead.
8. Carefully monitor the patient's condition and never leave the patient unattended.
9. Carefully monitor the oxygen supply and remove the mask prior to the supply becoming exhausted.

***b) Using the Non-Rebreathing Mask with the reservoir bag (NRB)***

**Note: The Non-Re-breathing mask is used .if the patient is having difficulty breathing from the MTV, and/or there is a second breathing patient requiring oxygen therapy.**

1. Explain and reassure the patient what is involved during the administration of oxygen.
2. Position the patient appropriately - consider the possibility of spinal injury and take appropriate precautions if necessary. An unconscious, breathing patient should be placed in the left lateral position if practicable.
3. Turn the oxygen cylinder valve ON (anti-clockwise)
4. Ensure the green oxygen tubing is not kinked, attach it firmly to the flow outlet on the LSP Regulator/Flowmeter and set the desired flowrate (usually 10L/min or more).
5. The reservoir bag must be adequately\* distended with oxygen before the mask is placed on the patient's face
6. \*The reservoir should not completely empty after breathing in
7. Position the mask over the mouth and nose and mould the metal band over the bridge of the nose to achieve a better seal and comfortable position. Place the supporting elastic band around the patient's head above the ears and tighten until comfortable and secure. Observe the reservoir bag to ensure it remains inflated. If it does deflate, the patient will be able to entrain air through the safety vent.
8. Carefully monitor the patient's condition: DO NOT leave the patient unattended.
9. Carefully monitor the oxygen supply. Replace the cylinder BEFORE it is completely exhausted.

## Resuscitating the Non-Breathing PATIENT

### a) *Using the MTV-100/Manually Triggered Ventilator Operation*

#### Note:

- Ensure the patient is not breathing.
  - If the airway of the patient is obstructed the MTV will stall; release the Manual Control Button, clear the airway and try again.
  - DO NOT depress the Manual Control Button if the patient is breathing as it may prevent exhalation.
1. Position the patient appropriately - consider the possibility of spinal injury and take appropriate precautions if necessary.
  2. Screw (by hand) the nut on the white oxygen hose to one of the DISS fittings of the LSP Regulator/Flowmeter.
  3. Fit the facemask on the MTV-100/Manually Triggered Ventilator.
  4. Turn the oxygen cylinder valve ON slowly (anti-clockwise).
  5. Verify that there are no obstructions in the patient's throat or mouth (vomitus, foreign bodies, broken dentures, etc).
  6. With one hand placed under the patient's chin, tilt the head back to clear the patient's airway and place the mask over the nose and mouth. Hold the mask in place with the thumb, index finger, and middle finger, using the 4th and 5th fingers under the chin to hold the patient's head back.
  7. Using the other hand, hold the MTV-100 /Manually Triggered Ventilator and face mask in place and depress the manual control button until the patient's chest rises. Then release the button and allow the patient to exhale. Repeat this cycle about 14 times per minute for an adult and 20 times per minute for a child. If the patient begins to breathe spontaneously, maintain the mask seal and the flow of oxygen, but do not depress the manual control button. The patient will receive 100% oxygen as a result of his inspiratory effort.
  8. Note: If the airway is obstructed the MTV will stall. Clear the patient's airway and retry.
  9. Carefully monitor the patient's condition and act accordingly.

### b) *Using The CPR-Pro™ Pocket Size Resuscitator With Oxygen Inlet & One-Way Valve*

1. Position the patient appropriately - consider the possibility of spinal injury and take appropriate precautions if necessary.
2. Ensure the green oxygen tubing is firmly attached to the CPR-PRO™ and to the flow outlet on the LSP Regulator/Flowmeter. Set the flow rate to 10L/min.
3. Position the CPR-PRO™ mask over the mouth and nose, with the narrow end over the nose, ensuring the best seal possible.
4. With the operator positioned behind the patient's head, support the jaw and tilt the head back firmly. If necessary open the airway using jaw thrust.

5. Using a 'mouth to mask' technique, ventilate the patient about 12-14 times per minute in an adult, 20 times per minute in a child.
6. When spontaneous breathing returns, turn the patient onto the side. Keep the resuscitation mask in position or change to the non-rebreathing mask and reservoir bag.

## 6 Cleaning, Disassembly and Decontamination

*\* The Australian Resuscitation Council (ARC) advised (July 1991) that the combination of 70% weight/volume (or 80% volume/volume) alcohol and chlorhexidine can be effective against a range of viruses and bacteria likely to be encountered in first aid and CPR practice, including Hepatitis B, HIV and Herpes and Tuberculosis. Effective broad spectrum germicides include 70% ethyl alcohol, 70% industrial (methylated) spirit and 95% isopropyl alcohol. The addition of 0.5% chlorhexidine enhances the bacterial properties of alcohol. Two-minute immersion in such a solution appears to be sufficient, provided the equipment has been thoroughly cleaned to remove organic material prior to disinfection.*

### **Pelican case**

Most scuffs and stains can be removed with a non-abrasive household cleaner and a sponge. Do not use any type of brush that will scratch the surface.

### **Contents**

1. Disassemble equipment as appropriate.
2. Discard any disposable parts into a sealed container suitable for the collection of medical disposable items.
3. Rinse washable parts in cold, running water to remove debris.
4. Wash the parts thoroughly in warm water with a mild soap solution. Careful scrubbing with a soft brush can be effective to remove dried body secretions.
5. Rinse parts thoroughly with clean water.
6. Check all matter has been removed by cleaning.
7. Dry parts thoroughly.
8. Carefully examine the parts and discard those that are cracked or damaged.
9. Disinfect parts by immersing in the appropriate disinfectant solution.
10. Rinse with clean water to remove disinfectant solution.
11. Dry thoroughly.
12. Reassemble and check for proper function.

### **LSP Regulator/Flowmeter**

The body of the LSP Regulator/Flowmeter may be wiped clean with soap and water or alcohol. The unit should not be immersed in liquid.

## The MTV-100/Manually Triggered Ventilator

1. Remove the outlet adapter and the exhalation valve assembly from the MTV-100/Manually Triggered Ventilator.
2. Clean all foreign matter from the outlet adapter and the exhalation valve assembly with a mild soap solution, being careful not to get any liquid inside the MTV-100/Manually Triggered Ventilator subassembly. Rinse the parts thoroughly in clean water.
3. Rinse outlet end of the MTV-100/Manually Triggered Ventilator body assembly thoroughly in clear water.
4. Carefully examine the parts of the MTV-100/Manually Triggered Ventilator. Replace any cracked or damaged parts.
5. After every use clean and disinfect the MTV-100/Manually Triggered Ventilator body assembly and components by cold disinfecting:

**Cold Disinfecting:** Immerse the outlet adapter and the exhalation valve assembly from the MTV-100/Manually Triggered Ventilator in a CIDEX solution according to the disinfectant manufacturer's instructions.

The MTV-100/Manually Triggered Ventilator body assembly can be flushed with water and CIDEX only from or through the outlet end of the valve. After flushing, rinse thoroughly with sterile water.

Remove the outlet adapter and the exhalation valve assembly from the CIDEX solution and rinse thoroughly with sterile water. Rinse repeatedly to be sure that all the CIDEX solution is removed from the parts. If the flapper valve is twisted or the locating bosses are not properly positioned, the MTV-100/Manually Triggered Ventilator will not function properly. Make sure that the flapper valve lies flat against the seat.

**Caution:** Do not submerge the MTV-100/Manually Triggered Ventilator body in liquid.

6. Connect the MTV-100/Manually Triggered Ventilator body assembly to an oxygen supply. Turn on the oxygen supply and depress the manual control button several times to blow out any liquid that may have entered.
7. Check the exhalation valve assembly to be sure the flapper valve is not twisted and the locating bosses are properly positioned.

## Face Mask

The silicone facemask is cleaned with warm soapy water and then cold disinfected but preferably boiled or autoclaved

## Non-Re-breathing Mask

Discard after use.

## Green Oxygen Tubing

Discard the green tubing after use and replace

## 7 Storage and Servicing

Ensure the cylinder is full and turned OFF. Check the LSP Regulator/Flowmeter is depressurized; the gauge reading must be zero.

Store the OXI-dive™3 equipment in a clean, dry and well ventilated area, away from sources of heat and combustible materials. Never allow oil, grease or flammable substances to come into contact with the equipment.

Regularly check the contents of the cylinder and functioning of the equipment to ensure proper performance. The frequency of testing should be established according to usage, but at least every two (2) months.

The OXI-dive™3 oxygen resuscitation unit should be inspected and serviced by an appropriately trained technician at yearly intervals. The LSP Regulator/Flowmeter should be sent to an authorized service centre at least every two (2) years for overhaul and cleaning. Contact Medical Developments Australia for your nearest service centre.

Ensure the cylinder is within the 10 year test period. The date is stamped on the neck of the cylinder.

Two spare sealing washers ('Bodok' seals) should be kept with the equipment.

Since the Pelican case is air tight, moisture can sometimes be trapped inside and therefore it is recommended that silica-gel moisture absorbing packets are used to remove moisture if stored for long periods. Check the 'O'-ring grooves in the base and lid of the Pelican case for debris. Ensure the large 'O'-ring within the lid is free of cuts, abrasions and debris.

## 8 Specifications

W: 335mm    H: 290mm    D: 150mm

Weight: 3.6kg

## 9 Spare Parts

CI-FM-S035    #3 silicone face mask

CI-FM-S055    #5 silicone face mask

AC-CPR-PRO    CPR-PRO™ pocket size resuscitator

AC-7595-17    Non-Rebreathing mask with reservoir bag and oxygen therapy tubing (2m)

ST-NDS/149    Bodok Seal (sealing washer) for LSP regulator

CY-7580-35    Oxygen cylinder key wheel with chain

## 10 Guarantee

Medical Developments International Limited (MDI) warrants to the original purchaser that any part or parts, which on examination by MDI, prove to be defective within 24 months from the date of delivery to the original purchaser, will be replaced free of charge. This warranty does not include freight costs, consumables, plastic and perishable items. MDI will not be responsible for labour or transportation charges incidental to the replacement of any part or parts. This warranty is in lieu of all other warranties, obligations or liabilities expressed or implied. MDI neither assume nor authorize any other person to assume liability in connection with the sale. This warranty will not apply to any product that has been subject to accident, abuse or misuse. The warranty is not applicable when unauthorized repairs or modifications have been attempted, or when entire units or parts are damaged by accident, misuse or improper handling procedures

When returning the product under warranty, please include the following details:

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Purchaser: .....

Address: .....

Post Code: ..... Country: .....

Model: ..... Serial No: ..... Date of Purchase: .....

Invoice No: ..... Supplier: .....

## Appendix 1

### 1 Other OXI-dive™ Models

**OXI-dive™1:** A closed circuit rebreathing system. Incorporates the KDK85 Autovalve™ and KAB™ carbon dioxide absorber. Extends the duration of oxygen supply up to 4 hours from a small oxygen cylinder

**OXI-dive™2:** Incorporates the *KDK8 Autovalve™*, the MTV-100/Manually Triggered Ventilator, a small oxygen cylinder for the first 30-40 minutes of oxygen administration and fittings to attach to an external oxygen supply. Optional pin-indexed to bull-nose adapter (PIBN)



## Appendix 2

### 2 MTV-100 Manually Triggered Ventilator



The MTV-100 Manually Triggered Ventilator is an oxygen-powered breathing device which complies with the Australian Standard for 'Resuscitators intended for use with humans' AS 2488-1995. It is designed to deliver 100% oxygen to a breathing or non-breathing casualty. It is fitted with a self-store hose assembly that is connected to the self-seal valve of the *KDK85 Autovalve™* by the diameter-indexed oxygen handwheel. The appropriate size facemask (provided) is attached directly to the MTV. (Alternatively, the *CPR-PRO™* Resuscitation Mask can be attached to the MTV). With a good face seal, up to 100% inspired oxygen is provided to a breathing or non-breathing patient.

In non-breathing patients, hold the MTV-100 Manually Triggered Ventilator and face mask in place and depress the manual control button until the patient's chest gently rises. Then release the button and allow the patient to exhale. Repeat this cycle about 12-14 times per minute for an adult and 20 times per minute for a child. If the patient begins to breathe spontaneously and triggers the MTV, maintain the mask seal and the flow of oxygen, but do not depress the manual control button. The patient will continue to receive up to 100% oxygen.

**Note: If the airway is obstructed the MTV will stall. Clear the patient's airway and retry**

In breathing patients, inspiration triggers the MTV which provides flow rates up to 100L/min. However the patient must be breathing sufficiently (as with any demand valve), to create a small negative inhalation pressure (-1 to -2.5cm H<sub>2</sub>O) to initiate oxygen flow. If the patient is breathing too rapidly or weakly to open the valve effectively, the operator must manually operate the MTV-100.

## Appendix 3

### 3 'Handicant' Operating Instructions

**Caution:** Oxygen vigorously supports combustion. Keep clear of flammable materials, particularly oil or grease. No smoking. Keep away from sources of ignition. Use in well-ventilated area. Cylinder contains high pressure. Open valve slowly. Use only with equipment designed for oxygen service. Do not use any of this equipment for purposes other than specified. Store all equipment in clean well-ventilated area.



#### 1. Supply Cylinder:

Ensure the supply cylinder is labeled 'medical oxygen' and is color-coded black body with white shoulders\*. Check the cylinder valve for any sign of dirt or grease or damage. If in doubt refer to supplier.

**\*Note: oxygen cylinder colors vary in different countries**

#### 2. Cylinder to be Filled:

Do not fill any other cylinder than that owned by the user. Check the cylinder is not corroded or has any dints or cuts, or any sign of fire exposure. Ensure that it is labeled "Medical Oxygen" and is color-coded for oxygen. Check that 10 years have not elapsed since last test date, which is stamped on the cylinder shoulder. Check the cylinder valve is clean from oil or grease and has no signs of damage. If any of these conditions are not satisfied return the cylinder to the nearest Medical Gas Test Station for inspection.

#### 3. Filling

- a. Fit "Handicant" to the supply cylinder and firmly hand tighten the white handwheel. Close the pressure release valve of the "Handicant"
- b. Fit small cylinder to "Handicant". Ensure the pins on the stirrup locate accurately and tighten the T-screw
- c. Manually support the cylinder throughout the operation
- d. Slowly open the valve of the cylinder to be filled
- e. Slowly open valve of supply cylinder. Filling will take up to 3 or 4 minutes. Chattering may occur and indicates filling is almost complete. Filling is complete when pressure on gauge stops rising
- f. Close supply cylinder valve. Check pressure on gauge. If the small cylinder is below 7000 kPa pressure it should be topped up from a fresh supply cylinder. Repeat steps 3a. to e. to top up small cylinder
- g. Close small cylinder valve, open the pressure release valve of the "Handicant" and disconnect the small cylinder from "Handicant"
- h. Listen near the small cylinder valve outlet to detect any leakage
- i. Remove "Handicant" from supply cylinder

#### 4 After Use

Ensure the "Handicant" is kept in a clean storage area.

#### 5 Catalogue Nos.:

Handicant: Cat. No: DC-C100330