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Introduction

The Plus and PSS Series range of Lung Demand Valves are approved for use with approved Dräger Compressed Air Breathing Equipment (C.A.B.E.) and Facepieces.

The combination of Lung Demand Valve, C.A.B.E. and Facepiece provides the wearer of the equipment with respiratory protection when working in or escaping from a contaminated or oxygen deficient life-threatening environment.

For some markets the PSS prefix denotes ‘Short Hose LDV’.

Safety Warnings

- Explain - Instructions for Use supplied with the equipment must be adhered to.
- Maintain - the respiratory protection equipment must be maintained as outlined in Dräger Limited service schedules and maintenance instructions.

  Contact Dräger Limited, Blyth for details of Service Contracts and Service Training Courses.

- Train - potential wearers must be trained in how to wear, and use the equipment and to understand its limitations.

  Contact Dräger Limited, Blyth for details of Wearer Training Courses.
Positive Pressure - Type A Illustrated
Section 3  Product Description
Product Description

The variants of the Plus and PSS Series Lung Demand Valve are as follows:

- Type A - Positive Pressure with Push-In connector to facepiece.
- Type AE - Positive Pressure with M45 Screw-In connector to facepiece.
- Type N - Normal Demand with M40 (Rd40) Screw-In connector to facepiece.

The high performance Lung Demand Valves incorporate a precision factory set Air Transfer Block Assembly containing a pre-set and sealed balanced piston unit. These items have unlimited service life.

The Dräger Warranty and Guarantee is void should any attempt be made by customers to make adjustment to the balanced piston unit or to the associated Injector Pipe.

Re-adjustment of the main lever setting height will be required following the fitting of a replacement balanced piston unit to an existing Air Transfer Block, or the fitting of a replacement Air Transfer Block to an existing balanced piston unit.

The threaded handwheel connector of the screw-in variants (types AE and N) incorporate a swivel feature (patent pending) and when fitted to the facepiece this feature allows the demand valve a degree of radial movement during head and body movement of the wearer. The swivel feature is not however suitable for constant rotation.

Detachable variants of the lung demand valves have a medium pressure hose with a quick release male coupling to connect the demand valve to the female coupling of the medium pressure hose from the pressure reducer of the appropriate C.A.B.E. (PSS LDV Series are short hose configuration.)

Fixed variants of the lung demand valves incorporate a medium pressure hose having an end fitting design for connecting directly to the medium pressure outlet port of the pressure reducer of the appropriate C.A.B.E.

The housing of the lung demand valves are manufactured from a moulded composite glass filled material that provides a high degree of strength and durability.

Positive pressure types have a manually operated re-set button to switch ‘OFF’ the positive pressure function - this must be pressed before opening the valve of compressed air cylinder. First breath inhalation by the wearer will switch ‘ON’ the positive pressure.

All variants include a supplementary air supply facility that is made active by pressing the centre of the protective rubber cover at the front of the lung demand valve. Lung demand valves fitted to short duration C.A.B.E. and escape units will not normally include a supplementary air supply facility.
Section 4  Operating Principle
Operating Principle

Operation

Positive Pressure Lung Demand Valves - Types A and AE

Refer to Figure 1.

Before turning ‘On’ the high pressure air supply the positive pressure mechanism must be switched ‘Off’. This is achieved by pressing the re-set button at the top of the lung demand valve to lift and lock the main pivot lever and diaphragm. The conical compression spring, in the main chamber of the balanced the piston unit, acts against the piston flange resulting in the piston cone being pressed against the sealing rim of the piston housing - sealing ‘Off’ the outlet of the balanced the piston unit.

On opening the cylinder valve, medium pressure air flows from the reducer, through the medium pressure hose of the lung demand valve, into the air transfer block then into the main chamber of balanced the piston unit.

Refer to Figure 2.

When the wearer begins to inhale a negative pressure is created inside the facepiece and lung demand valve. Due to the negative pressure the ambient air pressure acts against the diaphragm. As the diaphragm deflects it then presses against the main hinged lever of the balanced piston unit resulting in the release of the positive pressure ‘Off’ mechanism.

Increasing deflection of the diaphragm, during inhalation, pivots the cam of the main lever against the secondary lever. The secondary lever then pivots and presses against the end cap of the piston - moving the piston axially against the conical spring - lifting the piston cone from its seating and releasing air from the lung demand valve into wearer’s facepiece. A compression spring attached to the front cover of the lung demand valve acts on the diaphragm, then the pivot levers and the conical compression spring, lifting the sealing cone and maintaining a positive pressure (above ambient) inside the facepiece.

When the wearer stops inhaling then begins to exhale, the diaphragm, pivot levers and sealing cone retract.

This cycle repeats as the wearer begins to inhale.
Fig. 1

Balanced Piston ‘Closed’

Medium Pressure (M.P.)

Fig. 2

Balanced Piston ‘Open’

M.P. Flow to Facepiece
Normal Demand Lung Demand Valves - Type N

Refer to Figure 3

The conical compression spring, in the main chamber of the balanced piston unit, acts against the piston flange resulting in the piston cone being pressed against the sealing rim of the piston housing - sealing ‘Off’ the outlet of the balanced piston unit.

On opening the cylinder valve, medium pressure air flows from the reducer, through the medium pressure hose of the lung demand valve, into the air transfer block then into the main chamber of balanced the piston unit.

Refer to Figure 4

When the wearer begins to inhale a negative pressure is created inside the facepiece and lung demand valve. Due to the negative pressure the ambient air pressure acts against the diaphragm, then the main hinged lever of the balanced piston unit.

Increasing deflection of the diaphragm, during inhalation, pivots the cam of the main lever against the secondary lever. The secondary lever then pivots and presses against the end cap of the piston - moving the piston axially against the conical spring - lifting the piston cone from its seating and releasing air from the lung demand valve into wearer’s facepiece.

When the wearer stops inhaling then begins to exhale, the diaphragm, pivot levers and sealing cone retract.

This cycle repeats as the wearer begins to inhale.
Fig. 3

Medium Pressure (M.P.)

Balanced Piston ‘Closed’

Fig. 4

M.P. Flow to Facepiece

Balanced Piston ‘Open’
Section 5  Servicing Instructions
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Section Description

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### 5.2 Service and Test Intervals

Carry out Inspection, Service and Testing of equipment according to this table. Record all necessary data in the logbook for the equipment. These instructions apply also to non-used in storage equipment.

**Important Note:** This table is intended as a general guide. Reference must also be made to the Inspection, Service and Test Intervals specified in the appropriate section of the relevant C.A.B.E. Training manual.

<table>
<thead>
<tr>
<th>Description</th>
<th>After Use</th>
<th>Every Month</th>
<th>Every Year</th>
<th>Every 6 Years</th>
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<tr>
<td>Complete Equipment</td>
<td>Clean and Disinfect</td>
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<td>Visual Inspection</td>
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<tr>
<td>Flow and Static Tests as per Manufacturers Instructions</td>
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<td>Demand Valve</td>
<td>Clean and Disinfect as necessary</td>
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<td>Pressure Reducer</td>
<td>Medium Pressure Check</td>
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<td>Replace Sintered Filter</td>
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<td>Replace H.P. Connector O-Ring</td>
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<td>Basic Overhaul (Repair Exchange Scheme)</td>
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<td>Re-Certification - Cylinder Pressure Test (According to National Standards)</td>
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<tr>
<td>Cylinder Valve</td>
<td>Overhaul as necessary, or at time of Cylinder Re-Certification</td>
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</table>

- Dräger Recommendation - UK.
- COSHH
- Type A - Push-In demand valve - apply grease (3331241) around the connector O-ring.
5.3 Cleaning, Disinfecting and Drying

5.3.1 Important Information
Dräger recommend that contaminated and dirty components or assemblies are carefully cleaned and disinfected then thoroughly dried after use, or as and when considered necessary by the user.

To ensure correct operational condition of the equipment use the cleaning and disinfecting solutions recommended by Dräger. The use of any other product will invalidate the Dräger warranty and guarantee.

When using baths to contain cleaning and disinfecting solutions the immersed components and assemblies must only be agitated manually. Any form of mechanical agitation, e.g. ultrasonic, washing machines, dishwashers e.t.c. must be approved and covered by a written agreement with Dräger.

Note: Cleaning solutions will eventually remove lubricants from moving parts. Following any cleaning, disinfecting and drying carry out functional tests. Re-lubricate moving parts as required.

Safety Note: When using cleaning and disinfecting agents refer to the relevant manufacturers’ usage instructions. It is important that attention be paid to concentration and reaction times. Do Not use organic solvents such as Acetone, Alcohol, White Spirit, Trichloroethylene or similar.

Dräger recommends the following:

1. Cleaning:
   Safety Wash
   - 1 Litre Dispenser 3380164
   - 1 Litre Refill 3380165
   - 5 Litre Dispenser 3380166
   - 5 Litre Refill 3380167
   Sekusept
   - 4 bottles @ 2 litres 7904071

   These products must be used with cold water however Never exceed a temperature of 30 degrees Celsius.

   Note: Rinse off cleaning solution in clean water before disinfecting.

2. Disinfecting:
   Wipex Cloths (for manual disinfecting)
   - Pack of 50 3380375
   Incidur (6 litre container) 7904072
   Incidur (30 litre container) 7904073

   This product must be used with cold water however Never exceed a temperature of 30 degrees Celsius.

   Note: Rinse off disinfecting solution in clean water before drying.
3. Rinsing and Drying
Remove cleaning and disinfecting solutions by rinsing in clean running water, followed by drying.

Do Not exceed a temperature of 60 degrees Celsius when drying components. Immediately remove from the drying cabinet when dry. Never exceed a period of 30 minutes.

5.3.2 Cleaning and Disinfecting
External cleaning of the lung demand valve may be carried out as required using a cloth dampened in the above cleaning solution.

Important Note: When cleaning using a dampened cloth, take care to prevent any fluid residue entering the demand valve.

When however the user considers it necessary to internally disinfect the lung demand valve then these instructions should be followed:

Note: 1 Detach demand valves (fitted with male coupling) from the female coupling of the medium pressure hose of C.A.B.E.

Note: 2 If necessary, demand valves attached directly to the reducer should be removed at the hose connection to the reducer. For details of removal refer to the appropriate section of the relevant C.A.B.E. Training Manual.

Tools Required
Plate Spanner R26817
Silicone Spray - SILKOSPRAY® (500ml) 1563343

Refer to Figure 1 – (Type A Illustrated.)

1 If required, detach demand valve from equipment.

2 Fold rubber cover (1) from front of lung demand valve. Using plate spanner inserted into radial slots of bayonet cap, turn bayonet cap (2) counter-clockwise and remove cap from body of demand valve.

Note: Types A and AE - the positive pressure spring remains attached to the bayonet cap. Do Not remove spring. Take care not to stretch or distort the spring.

3 Using the thumb and forefinger carefully grip the centre plate of the diaphragm (3), tilt centre plate and lift the diaphragm from the body of the lung demand valve. Remove slip ring (4).
4 Fold rubber cover back over the front of the body of the demand valve to cover and protect the main pivot lever (5). Immerse and manually agitate demand valve, diaphragm, slip ring and bayonet cap in cleaning fluid. (Refer to cleaning fluid instructions.)

**Note:** Types A and AE - Take care not to stretch or distort the positive pressure spring.

5 After cleaning, rinse components in clean water then immerse and manually agitate demand valve, diaphragm and bayonet cap in disinfecting fluid. (Refer to disinfecting fluid instructions.) After disinfecting, fold rubber cover away from the front of lung demand valve and rinse all components in clean water, taking care not to damage main pivot lever.

6 Press re-set button (6) of type A and AE demand valves to lift the main lever and to close the balanced piston.

7 Connect the medium pressure hose of the demand valve to a medium pressure air supply. Turn "ON" air supply then gently press main pivot lever to blow out fluid residue.

**Safety Note:** Wear suitable eye protection.

8 Press the re-set button of type A and AE demand valves to lift the main lever and to close the balanced piston. Turn ‘OFF’ and vent air supply then disconnect medium pressure hose of the demand valve from air supply. Thoroughly ‘dry’ components.

**Note:** Do Not exceed a temperature of 60 degrees Celsius when drying.

Refer to Figure 2.

9 **Lever Lubrication** - Hold the demand valve as shown in Fig. 2, with the main lever (1) positioned to achieve maximum access to the contact points of the main lever and the secondary lever (2). Direct and locate the nozzle outlet of the silicone spray canister inside the demand valve body and apply two short spray blasts of lubricant in the direction indicated by the arrow - Fig. 2.

**Safety Note:** Refer to the Caution and Warning information on the SILKOSPRAY® canister.

10 Carefully locate outer bead of diaphragm into groove in the body of the demand valve. Locate tapered side of slip ring into recess in bead of diaphragm.
Types A and AE - Locate positive pressure spring of bayonet cap into the recess in centre plate of diaphragm. Using plate spanner, inserted into radial slots of the bayonet cap, lock bayonet cap to body then fold rubber cover back over the front of the demand valve.

10 Press re-set button of type A and AE demand valves. Connect demand valve to equipment and carry out Leak Test and Functional Test.
5.4 Replacing Diaphragm

Tools Required
Plate Spanner
R26817

Refer to Figure 3 - Type A Demand Valve Illustrated.

1. Fold rubber cover (1) from front of lung demand valve. Using plate spanner, inserted into radial slots of bayonet cap, turn bayonet cap (2) counter-clockwise and remove from body of demand valve.

Note: Types A and AE - the positive pressure spring remains attached to the bayonet cap. Do Not remove spring. Take care not to stretch or distort the spring.

2. Using the thumb and forefinger carefully grip the centre plate of the diaphragm (3), tilt centre plate and lift the diaphragm from the body of the lung demand valve. Remove slip ring (4). Discard defective diaphragm.

3. Carefully locate outer bead of new diaphragm into groove in the body of the demand valve. Locate tapered side of slip ring into recess in bead of diaphragm.

Types A and AE - Locate positive pressure spring of bayonet cap into the recess in centre plate of diaphragm.

Using plate spanner, inserted into radial slots of the bayonet cap, lock bayonet cap to body then fold rubber cover back over the front of the demand valve.

4. Press re-set button of type A and AE demand valves. Connect demand valve to equipment and carry out Leak Test and Functional Test.
5.5 Replacing Positive Pressure Spring - Types A and AE

Tools Required
Plate Spanner
R26817

Refer to Figure 4 - Type A Demand Valve Illustrated.

1 Fold rubber cover (1) from front of lung demand valve. Using plate spanner, inserted into radial slots of bayonet cap, turn bayonet cap (2) counterclockwise and remove from body of demand valve.

Note: The positive pressure spring (3) remains attached to the bayonet cap.

2 When looking inside the bayonet cap and with the axial retaining leg of the spring at the 11 o’clock position, unhook the first coil of the spring from the retaining lug at the 2 o’clock position, then from the retaining lug at the 6 o’clock position. Turning the spring slightly anti-clockwise removes the coil from the final retaining lug (10 o’clock) allowing the axial retaining leg of the spring to be removed from the hole in the bayonet cap. Discard the defective spring.

3 Fit new spring as follows. When looking inside the bayonet cap and with the retention hole for the axial retaining leg of the spring at the 11 o’clock position, insert the axial retaining leg of the spring into the retention hole in the bayonet cap. Hook the first coil of the spring under the retaining lug at the 10 o’clock position - then under the retaining lug at the 6 o’clock position - then under the retaining lug at the 2 o’clock position.

Note: Ensure only one coil diameter of the spring is located under each of the three retaining lugs.

4 Check that the diaphragm and slip ring are still correctly located in the body of the lung demand valve then locate positive pressure spring of bayonet cap into the recess in centre plate of diaphragm. Using plate spanner, inserted into radial slots of the bayonet cap, lock bayonet cap to body then fold rubber cover back over the front of the demand valve.

5 Press re-set button and then connect demand valve to equipment and carry out Leak Test and Functional Test.
5.6 Replacing Medium Pressure Hose

5.6.1 Removing Medium Pressure Hose

Tools required

<table>
<thead>
<tr>
<th>Tool</th>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>Screwdriver</td>
<td>3336222</td>
</tr>
<tr>
<td>Plate Spanner</td>
<td>R26817</td>
</tr>
<tr>
<td>Retractor Tool</td>
<td>3310663</td>
</tr>
</tbody>
</table>

1. Disconnect demand valve from female quick release coupling of equipment.

Note: Fixed variants of the lung demand valves incorporate a medium pressure hose fitted directly to the medium pressure outlet port of the pressure reducer. These demand valves should be removed from the reducer. For details of removal of hose from the reducer refer to the appropriate section of the relevant C.A.B.E. Training Manual.

Refer to Figure 5. (Type A illustrated)

2. Fold the rubber cover (1) from front of lung demand valve. Using plate spanner inserted into radial slots of bayonet cap, turn bayonet cap (2) counter-clockwise and remove from body of demand valve.

Note: The positive pressure spring remains attached to the bayonet cap. Do Not remove spring. Take care not to stretch or distort the spring.

3. Using the thumb and forefinger carefully grip the centre plate of the diaphragm (3), tilt centre plate and lift the diaphragm from the body of the lung demand valve. Remove slip ring (4).

Refer to Figure 6.

Important Note: Spacer (1) must be removed before attempting to remove Clip (2).
4 Insert the hook end of the retractor tool into the hole in the side lugs of the spacer (1) - pull and remove spacer. While keeping the hose fully inserted into the air transfer block (3), slide the clip (2) towards the air transfer block to release clip from hole in body. Insert the hook end of the retractor tool under the extended pin of the clip (2) then pull to remove the clip from end fitting of the hose. Grip and pull the hose to remove the tailpiece from the body of the demand valve. Discard defective hose.

Note: Discard spacer (1) and clip (2) – Do Not re-use.

5.6.2 Assembly of Medium Pressure Hose

1 Check that O ring seals (1) and (2) Fig. 7 of tailpiece are fitted correctly and not damaged. If necessary replace O-rings. Apply thin coating of Molykote 111 grease around outside diameter of the O-rings.

Safety Note: Read instructions on Molykote 111 container regarding the safe handling of silicone grease.

Refer to Figure 8.

2 Fully insert tailpiece through hole in body of lung demand valve and into hole in air transfer block (3) then push and assemble a new clip (2) over the end fitting of hose - retaining the hose in position. Whilst keeping the end fitting of the hose fully inserted - slide the clip (2) away from the air transfer block - insert a new spacer (1) ensuring that the lugs of the spacer locate around the extended pin of the clip (2). See Fig. 8. Pull on the hose to check that it is secure.
3 Carefully locate outer bead of diaphragm into the body of the demand valve. Locate tapered side of slip ring into recess in bead of diaphragm then locate positive pressure spring of bayonet cap into the recess in centre plate of diaphragm.

Using plate spanner, inserted into radial slots of the bayonet cap, lock bayonet cap to body then re-fit and fold rubber cover over the front of the demand valve. Press re-set button to switch ‘Off’ positive pressure.

Note: Fixed variants of the lung demand valves should be fitted directly to the medium pressure outlet port of the pressure reducer. For details of fitting of hose to the reducer refer to the appropriate section of the relevant C.A.B.E. Training Manual.
5.7 Replacing Injector Pipe - A, AE, and N

Important Note: The Injector Pipes are pre-set units for use only with the correct variant of lung demand valve - A, AE or N. Do Not mix - fit only the correct Injector Pipe to the appropriate lung demand valve. For the purpose of ease of identification each type of Injector Pipe is colour coded - refer to Fig. 9.

Any attempts to rotate or adjust the cone end (1) Fig. 9 of the injector pipe assembly will invalidate the Dräger warranty and guarantee. If required to replace the injector pipe always replace with a new factory set assembly.

Tools required
Plate Spanner R26817
No. 2 Posi-Driv Screwdriver 3331245

AE and N
Assembly Tool – (Connector O ring) 3310664
Connector Tool 3310679

1 Refer to Figure 10. (Type A illustrated.)

2 Fold rubber cover (1) from front of lung demand valve and remove from lung demand valve. Using plate spanner, inserted into radial slots of bayonet cap, turn bayonet cap (2) counter-clockwise and remove from body of demand valve.

Note: Types A and AE - the positive pressure spring remains attached to the bayonet cap. Do Not remove spring. Take care not to stretch or distort the spring.

3 Using the thumb and forefinger carefully grip the centre plate of the diaphragm (3), tilt centre plate and lift the diaphragm from the body of the lung demand valve. Remove slip ring (4).
Refer to Fig. 11.

4 Using posi-driv screwdriver unscrew retaining screw (1) until the locking arm (2) is able to be withdrawn from castellation of connector (3).

5 Remove connector as follows.

**Note:** Do Not attempt to remove push-in or screw-in type connectors with locking arm located in the castellation of connector. Refer to instruction 4.

**Push-in Type - A**
Grip and unscrew push-in type connector (anti-clockwise) from demand valve body. Remove injector pipe (4).

**Screw-in Type - AE and N**
Using connector tool (3310679) - insert pins of tool into swivel connector - rotate to align slots of fixed end of connector and fully insert pins - unscrew (anti-clockwise) to remove screw type connector and handwheel assembly from demand valve body. Remove injector pipe (4).

6 Locate and correctly position the new injector pipe as shown in Fig. 12.

**Important Note:** Fit only the correct Injector Pipe to the appropriate lung demand valve.

7 Hold body of lung demand valve with the injector pipe in the vertical position then assemble connector as follows.

**Push-in Type - A**
Inspect and if necessary fit new O-ring to connector then screw connector into demand valve body. Tighten until flange of the connector contacts the body of the demand valve. **Do Not** overtighten.
**Screw-in Types - AE and N**

Check handwheel freely rotates on connector assembly. If necessary use assembly tool to assemble new O-ring to connector handwheel assembly then using tool (3310679) screw connector handwheel assembly into demand valve body until secure. Do Not overtighten.

Refer to Figure 13.

8 When viewing inside body of the lung demand valve - carefully turn the connector anti-clockwise until the first castellation tab of the connector is visible and centred between the internal slot in the demand valve body. Lift the locking arm and locate the fingers of the locking arm either side of the castellation preventing rotation of the connector. Ensure correct location then carefully tighten screw to secure the locking arm. Do Not overtighten.

9 Reassemble diaphragm - check that the outer bead of diaphragm is located into the body of the demand valve and that the slip ring is correctly located into recess in bead of diaphragm.

Types A and AE - Locate positive pressure spring of bayonet cap into the recess in centre plate of diaphragm. Using plate spanner, inserted into radial slots of the bayonet cap, lock bayonet cap to body then fold rubber cover back over the front of the demand valve.

10 Press re-set button of types A and AE demand valves. Connect demand valve to equipment and carry out Leak Test and Functional Test.
5.8 Air Transfer Block and Balanced Piston Assembly

Important Note: The Air Transfer Block and Balanced Piston Assembly is a precision pre-set unit that incorporates a factory set Air Transfer Block Assembly containing a pre-set and sealed balanced piston unit. These items have unlimited service life.

The Dräger guarantee is void should any attempt be made by customers to make adjustment to the balanced piston unit or the associated Injector Pipe.

Following the fitting of a replacement balanced piston unit to an Air Transfer Block, or the fitting of a replacement Air Transfer Block to an existing balanced piston unit will require re-adjustment of the main lever setting height.

5.8.1 Removing Air Transfer Block and Balanced Piston Assembly

Tools required
- Plate Spanner R26817
- Retractor Tool 3310663
- No. 2 Posi-Drive Screwdriver 3331245
- Ball End Setting Tool (1.5mm) 3310676
- AE and N Assembly Tool 3310664
- Connector Tool 3310679

1 If required disconnect demand valve from female quick release coupling of equipment.

Refer to Figure 14.

2 Fold rubber cover (1) from front of lung demand valve. Using plate spanner inserted into radial slots of bayonet cap, turn bayonet cap (2) counterclockwise and remove from body of demand valve.

Note: Types A and AE - the positive pressure spring remains attached to the bayonet cap. Do Not remove spring. Take care not to stretch or distort the spring.

3 Using the thumb and forefinger carefully grip the centre plate of the diaphragm (3), tilt centre plate and lift the diaphragm from the body of the lung demand valve. Remove slip ring (4).
Refer to Figure 15.

Important Note: Spacer (1) must be removed before attempting to remove Clip (2).

4 Insert the hook end of the retractor tool into the hole in the side lugs of the spacer (1) - pull and remove spacer. While keeping the hose fully inserted into the air transfer block (3), slide the clip (2) towards the air transfer block to release clip from hole in body. Insert the hook end of the retractor tool under the extended pin of the clip (2) then pull to remove the clip from end fitting of the hose. Grip and pull the hose to remove the tailpiece from the body of the demand valve.

Note: Scrap spacer (1) and clip (2) - Do Not re-use.

Refer to Fig. 16.

5 Using posi-drive screwdriver unscrew retaining screw (1) until the locking arm (2) is able to be withdrawn from castellation of connector (3).

6 Remove connector as follows.

Note: Do Not attempt to remove push-in or screw-in type connectors with locking arm located in castellation of connector.

Push-in Type - A
Unscrew push-in type connector (anti-clockwise) from demand valve body then remove injector pipe (4).

Screw-in Types - AE and N
Use connector tool (3310679) - insert pins of tool into swivel connector - rotate to align slots of fixed end of connector and insert pins - unscrew (anti-clockwise) to remove screw type connector and handwheel assembly from demand valve body. Remove injector pipe (4).
7 Remove Air Transfer Block and Balanced Piston Assembly (1) Fig. 17 as follows:

Types A and AE - Press re-set button to switch ‘off’ positive pressure.

Types A, AE and N - Using two fingers either side of the air transfer block push the Air Transfer Block Assembly from the outlet of the lung demand valve.

8 Refer to Fig. 18. To remove the balanced piston unit from the air transfer block grip the air transfer block and as shown insert ball end setting tool through slot in the main lever and against the end face of the balanced piston housing. Press in direction of arrow to push and extract the balanced piston unit. As necessary scrap either the air transfer block or balanced piston unit.

9 Check that the pivot lever (1) is in the correct position (see Fig. 18) then re-assemble new air transfer block or new balanced piston unit as required. Inspect O rings (2) and (3) and replace with new if necessary.

Important Note: Checking and possible re-adjustment of the main lever setting height will be required following the fitting of a replacement balanced piston unit to an existing Air Transfer Block, or the fitting of a replacement Air Transfer Block to an existing balanced piston unit.
5.8.2 Fitting Air Transfer Block Assembly – Lever Height Setting

Tools required
Plate Spanner R26817
No. 2 Posi-Drive Screwdriver 3331245
Molykote 111 Grease 3331241
Ball End Setting Tool (1.5mm) 3310676
Height Gauge 3310675

AE and N
Assembly Tool 3310664
Connector Tool 3310679

Refer to Figure 19.

1 Type A and AE demand valves - Press re-set lever to lift and lock the lever in the positive pressure ‘off’ position.

2 Insert the main pivot lever (2) through the outlet of the body of the lung demand and locate then push the housing of the air transfer block assembly (1) into the bore ensuring the flange of the housing is fully inserted.

Types A and AE demand valves:- while holding the housing of the air transfer block assembly (1) into the bore - check the function of the positive pressure mechanism as follows - press the main pivot lever to release the positive pressure mechanism then press re-set button (3) to switch ‘off’ positive pressure mechanism. If satisfactory proceed as follows.

3 Locate and position the correct injector pipe as shown in Fig. 20 then hold body of lung demand valve with the injector pipe in the vertical position and assemble the connector as follows.

Push-in Type - A
Inspect and if necessary fit new O-ring to connector then screw connector into demand valve body. Tighten until flange of connector contacts the body of the demand valve. Do Not overtighten.
Screw-in Types - AE and N

Check handwheel freely rotates on connector assembly. If necessary use assembly tool to assemble new O-ring to connector handwheel assembly then using tool (3310679) screw connector handwheel assembly into demand valve body until secure. Do Not overtighten.

Refer to Figure 21.

4 When viewing inside body of the lung demand valve - carefully turn the connector anti-clockwise until the first castellation tab of the connector is visible and centred between the internal slot. Lift the locking arm and locate the fingers of the locking arm either side of the castellation preventing rotation of the connector. Ensure correct location then carefully tighten screw to secure the locking arm. Do Not over-tighten.

5 Check that O ring seals (1) and (2) Fig. 22 of tailpiece are fitted correctly and not damaged. If necessary replace O-rings. Apply thin coating of Molykote 111 grease around outside diameter of the O-rings.

Safety Note: Read instructions on Molykote 111 container regarding the safe handling of silicone grease.
Refer to Figure 23.

6 Fully insert tailpiece through hole in body of lung demand valve and into hole in air transfer block (3) then push and assemble a new clip (2) over the end fitting of hose - retaining the hose in position. Whilst keeping the end fitting of the hose fully inserted - slide the clip (2) away from the air transfer block - insert a new spacer (1) ensuring that the lugs of the spacer locate around the extended pin of the clip (2). See Fig. 23. Pull on the hose to check that it is secure.

Important Note: If a replacement balanced piston unit has been fitted to an existing Air Transfer Block, or a replacement Air Transfer Block has been fitted to an existing balanced piston unit then checking and possible re-adjustment of the main lever height will be required. Check height setting as follows.

7 Type A and AE demand valves: - press the end of the main pivot lever to release the positive pressure mechanism.

8 Position and hold the body of the demand valve as shown in Fig. 24 then insert the Height Gauge as shown. Press down carefully then release the main lever ensuring it moves freely between the gauge plate. Check that when the main lever is released that the two fingers of the lever are positioned between the two engraved setting-lines on the face of the gauge plate. If the lever is too high or too low re-set as follows:

Insert the ball end setting tool through the slot at the pivot end of the main lever and insert end of tool into the slot of the adjusting set screw in the secondary lever. Rotate the set screw clockwise to increase height and anti-clockwise to reduce height of the main lever. Following each adjustment remove the tool and press down carefully then release the main lever and check that when the main lever is released that the two fingers of the lever are positioned between the two engraved setting-lines on the face of the gauge plate. Re-adjust as necessary and when set remove the Height Gauge.
9 Carefully locate outer bead of diaphragm into the body of the demand valve. Locate tapered side of slip ring into recess in bead of diaphragm.

Types A and AE - Locate positive pressure spring of bayonet cap into the recess in centre plate of diaphragm.

Using plate spanner, inserted into radial slots of the bayonet cap, lock bayonet cap to body then fold rubber cover back over the front of the demand valve.

10 Press re-set button of type A and AE demand valves. Connect demand valve to quick release coupling of equipment and carry out Leak Test and Functional Test.

Note: Fixed variants of the lung demand valves should be fitted directly to the medium pressure outlet port of the pressure reducer. For details of fitting of hose to the reducer refer to the appropriate section of the relevant C.A.B.E. Training Manual.
5.9 Lubrication of Connector Assemblies - M40 and M45

Important Note: Immersing of components will eventually remove lubricants. Following cleaning, disinfecting and drying it is recommended that functional tests be carried out. Re-lubricate as required. Refer to Page 5:3.

Tools required
- Plate Spanner
- No. 2 Posi-Driv Screwdriver
- Connector Tool

5.9.1 Removing Connector Assemblies from LDV - M40 and M45

1 If required disconnect demand valve from the female quick release coupling of equipment. Refer to Figure 25.

2 Fold back the rubber cover (1) then using plate spanner inserted into radial slots of bayonet cap, turn bayonet cap (2) counter-clockwise and remove from body of demand valve. Using the thumb and forefinger carefully grip the centre plate of the diaphragm (3), tilt centre plate and lift the diaphragm from the body of the lung demand valve. Remove slip ring (4).

Note: Type M45 - the positive pressure spring remains attached to the bayonet cap. Do Not remove spring. Take care not to stretch or distort the spring. Refer to Fig. 26.

3 Using posi-driv screwdriver unscrew retaining screw (1) until the locking arm (2) is able to be withdrawn from castellation of connector (3).

4 Remove connector as follows.

Note: Do Not attempt to remove connectors with the locking arm located in the castellation of the connector.

Use connector tool (3310679) - insert pins of tool into the swivel connector and rotate to align slots of fixed end of connector and insert pins - unscrew (anti-clockwise) to remove screw type connector and handwheel assembly from demand valve body. Remove injector pipe (4).
5.9.2 Disassembly of Connectors - M40 and M45

Tools required
Screwdriver
O ring Lifter

Refer to Figure 27.

1. Using the O ring lifter remove and discard O ring (1) and using suitable screwdriver open gap in circlip (2) and remove the circlip.

2. **M40** - Remove handwheel (3). Retrieve loose ball bearings (4).

   **M45** - Place the connector - back (5) on flat surface. Hold down connector (5) with thumbs and using fingers lift handwheel (6) and sleeve (7) until the ball bearings (4) are visible. Remove and retrieve ball bearings.

3. Carefully pull apart connector - back (5) and (8) from connector - front (9). Retrieve any loose ball bearings. Remove M45 handwheel and sleeve.

4. Using the O ring lifter remove and discard quad ring (10) from connectors (5) and (8).

5. Clean and inspect all components before re-assembly. Replace as necessary.
5.9.3 Assembly of Connector - M40

**Tools required**
- Assembly Tool 3310664
- Molykote 111 Grease 3331241

Refer to Figure 28.

1. Assemble new quad ring (10) to connector - back (8) and place flange of connector on a flat surface. Apply a thin film of Molykote grease around the outside of the quad ring and into the groove for the ball bearings. Apply a thin film of grease into the bore of connector (9) then push and assemble connector (9) to connector (8).

2. Insert a portion of Molykote grease into each of the three radial holes in the connector - front (9) then insert a ball bearing (4) into each hole. The grease will assist in holding the ball bearings in position.

3. Place the handwheel (3) over the connectors then assemble circlip (2) to secure the assembly.

Refer to Figure 29.

4. Using assembly tool assemble new O ring (1) to the connector assembly. Assembly of connector completed - assemble to lung demand valve Section 5.9.5.
5.9.4 Assembly of Connector - M45

Tools required
Assembly Tool 3310664
Molykote 111 Grease 3331241

Refer to Figure 30.

1. Assemble new quad ring (10) to connector - back (5) and place flange of connector on a flat surface. Apply a thin film of Molykote grease around the outside of the quad ring and into the groove for the ball bearings.

2. Assemble the sleeve (7) over the connector - front (9) sliding the larger diameter over the thread. Place the handwheel (6) over the sleeve (7) and again push back towards thread of connector. From inside the bore of the connector (9) insert a portion of Molykote grease into each of the three radial holes in the connector then insert a ball bearing (4) into each hole. The grease will assist in holding the ball bearings in position.

3. Place the handwheel and connector sub-assembly over the connector (5) then then push and assemble to connector (5). Assemble circlip (2) to secure the assembly.

Refer to Figure 31.

4. Using assembly tool assemble new O ring (1) to the connector assembly. Assembly of connector completed - assemble to lung demand valve. Section 5.9.5.
5.9.5 Assembly of Connector Assemblies to LDV - M40 and M45

Important Note: If the Injector Pipe has been removed then fit only the correct Injector Pipe to the appropriate lung demand valve. For the purpose of identification each type of Injector Pipe is colour coded - refer to Fig. 32. Any attempts to rotate or adjust the cone end (1) will invalidate the Dräger warranty and guarantee. If it is a requirement to replace the injector pipe then always replace with a new factory set assembly.

Tools required
Assembly Tool 3310664
Connector Tool 3310679
Plate Spanner R26817
No. 2 Posi-Driv Screwdriver 3331245

1 Locate and position the correct injector pipe as shown in Fig. 33 then hold the body of the lung demand valve with the injector pipe in the vertical position and assemble connector as follows.

2 Check handwheel freely rotates on connector assembly. If necessary use assembly tool to assemble new O-ring to connector handwheel assembly then using tool (3310679) screw connector handwheel assembly into demand valve body until secure. Do Not overtighten.
3 When viewing inside body of the lung demand valve - carefully turn the connector anti-clockwise until the first castellation tab of the connector is visible and centred between the internal slot. Lift the locking arm (2) and locate the fingers of the locking arm either side of the castellation preventing rotation of the connector. See Fig. 34. Ensure correct location then carefully tighten screw (1) to secure the locking arm. **Do Not** overtighten.

4 Carefully locate outer bead of diaphragm into the body of the demand valve. Locate tapered side of slip ring into recess in bead of diaphragm.

Types A and AE - Locate positive pressure spring of bayonet cap into the recess in centre plate of diaphragm.

Using plate spanner, inserted into radial slots of the bayonet cap, lock bayonet cap to body then fold rubber cover back over the front of the demand valve.

5 Press re-set button of type AE demand valve. Connect demand valve to quick release coupling of equipment and carry out Leak Test and Functional Test.

**Note:** Fixed variants of the lung demand valves should be fitted directly to the medium pressure outlet port of the pressure reducer. For details of fitting of hose to the reducer refer to the appropriate section of the relevant C.A.B.E. Training Manual.
Section 6 Test Procedures
Contents

Section Description

6.1 Test Procedures
6.1 Test Procedures

The Plus and PSS Series range of Lung Demand Valves are approved for use with approved Dräger Compressed Air Breathing Equipment (C.A.B.E.)

Standard test procedures for C.A.B.E. are as follows and are covered in the relevant Training Manual for the C.A.B.E.

- Cylinder Pressure Check and Valve Leak Test
- High Pressure Leak Test
- Whistle Warning Unit Test
- Full Flow Test
- Medium Pressure Test - Pressure Reducer

For detailed instructions of the following Functional Tests relating to the testing of the lung demand valve and associated ancillary items refer to the appropriate Test Equipment Manual.

**Type A and AE**

- Balanced Piston Leak Test
- Positive Pressure Balance Test
- Static Pressure Test
- Positive Pressure Switch Over

**Type N**

- Balanced Piston Leak Test
- Demand Valve Opening Pressure
Section 7   Fault Location
Contents

Section Description

7    Fault Location
7.1  Demand Valve
7 Fault Location

7.1 Demand Valve

The high performance Plus and PSS Series Lung Demand Valves incorporate a precision factory set Air Transfer Block Assembly containing a pre-set and sealed balanced piston unit. These items have unlimited service life.

The Dräger warranty and guarantee is void should any attempt be made by customers to make adjustment to the balanced piston unit or the associated Injector Pipe.

Following the fitting of a replacement balanced piston unit to an existing Air Transfer Block, or the fitting of a replacement Air Transfer Block to an existing balanced piston unit will require re-adjustment of the main lever setting height.

The following Fault - Cause - Remedy chart outlines a list of possible faults that may occur.

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inward/outward leak when in</td>
<td>Damaged/faulty connection O-Ring</td>
<td>Replace O-Ring</td>
</tr>
<tr>
<td>facepiece port</td>
<td>Damaged/faulty facepiece port</td>
<td>Replace facepiece port</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leak - Positive</td>
<td>O-Ring leak - tailpiece</td>
<td>Replace O-Rings</td>
</tr>
<tr>
<td>pressure 'Off'</td>
<td>Balanced piston unit leak</td>
<td>a. Replace external O-Rings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Replace Balanced Piston Unit.</td>
</tr>
<tr>
<td></td>
<td>Perforated hose</td>
<td>Replace hold</td>
</tr>
<tr>
<td>Leak - Positive</td>
<td>Incorrectly fitted or perforated diaphragm.</td>
<td>Re-assemble or replace as necessary.</td>
</tr>
<tr>
<td>pressure 'On'</td>
<td>Damaged/perforated switch off cover</td>
<td>Replace lung demand valve body.</td>
</tr>
<tr>
<td></td>
<td>A or AE - swivel connector leak</td>
<td>Replace O-Ring</td>
</tr>
<tr>
<td>High static pressure</td>
<td>PP spring not located in centre of diaphragm.</td>
<td>Locate spring correctly.</td>
</tr>
<tr>
<td></td>
<td>PP spring too strong - stretched</td>
<td>Replace spring.</td>
</tr>
<tr>
<td></td>
<td>Lever setting height too high</td>
<td>Reset lever height.</td>
</tr>
<tr>
<td>Low static pressure</td>
<td>PP spring too weak.</td>
<td>Replace spring.</td>
</tr>
<tr>
<td></td>
<td>Lever setting height too low.</td>
<td>Reset lever height.</td>
</tr>
<tr>
<td>Demand valve fails to switch</td>
<td>Faulty switch 'Off' mechanism</td>
<td>Replace air transfer block assembly</td>
</tr>
<tr>
<td>automatically to positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pressure mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No supplementary supply</td>
<td>Incorrect lever setting height</td>
<td>Reset lever height.</td>
</tr>
</tbody>
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1285.002 Lung Demand Valve - Screw-In - Type M45
1285.003 Lung Demand Valve - Screw-In - Type M40 (Rd40)
1285.005 Air Transfer Block and Balanced Piston Assemblies
1285.006 Lung Demand Valve - Screw-In - Type M40 (Rd40) - Straight Connector
1285.007 Connector Assemblies - M40 and M45
1285.008 Tool List