Dräger

PA-90 Series Service Manual

Notice

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UNITED STATES DEPARTMENT OF LABOR
MSHA
MINE SAFETY AND HEALTH ADMINISTRATION

U.S. Department of Health and Human Services
Center for Disease Control
NIOSH
National Institute
for Occupational Safety and Health

Both the **ProAir** and the **AirBoss** are approved by **NIOSH/MSHA** (gold label) in accordance with the code of Federal Regulations, Title 30, Chapter **11.**

In addition, the **AirBoss** is certified by the Safety Equipment Institute (red label) as meeting the requirements of NFPA 1981 Standard for **Open-**Circuit, Self-Contained Breathing Apparatus for Fire Fighters, 1992 ed.

SEI

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Rev. **1**
August 1996

Important Information

1. *The* ***ProAir*** *and* ***AirBoss*** *are approved by* ***NIOSH/MSHA*** **and** *the* ***AirBoss*** **meets NFPA** *standards. Any modifications, changes or deviations from the documentation contained herewith, will void the approval and may cause a safety hazard. Contact National Draeger for additional information concerning approval requiremen* ***ts.***

2. *This unit is intended for those purposes specified in the operating manual. Any deviations are not authorized,*

3. *Only original National Draeger replacement parts may be used in the maintenance and servicing of this unit. Deviation from this shall void any and all warranties and approvals.*

4. **All repairs to be accomplished by a National** *Draeger certified Level II technician.*

5. *Authorized repair facilities and their personnel shall assume all responsibility for timely and reliable repair actions.*

6. **All governing specifications and regulations** *must be observed in the repair, testing and operation of this equipment.*

IMPORTANT

For further information on any supportive documentation contained in this manual please contact National Draeger, Inc. Technical Service **Department.**

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I Theory of Operation

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1 Backplate

1.1 Purpose

The PA-90 Series backplate is ergonomically designed to provide maximum comfort and minimum stress on the back!

1.2 Construction

The PA-90 Series backplate is made of composite materials for maximum strength and minimum weight. The **ProAir** backplate may be blue or gray and is composed of nylon and fiberglass filaments. The **AirBoss** is black and is composed of nylon and carbon filaments.

1.3 Features

The PA-90 Series backplates have a shock absorbing rubber bumper on the base. The backplate also has convenient carrying handles on both sides and is highly chemically resistant.

The **AirBoss** backplate is anti-static.

2 Harness

2.1 Purpose

The harness is designed to be easily and quickly donned and adjusted to fit each individual.

2.2 Construction

The **ProAir** harness is composed of polyester webbing. The **AirBoss** harness webbing is composed of a **Kevlar/Nomex** PBI composite material. This material has unparalleled strength, fire retardation and wear resistance. It can be easily removed and washed if necessary for decontamination. Washing will not affect the above mentioned characteristics.

2.3 Features

The **ProAir** is fully adjustable for both the shoulder straps and waist strap. It can be easily removed from the backplate for cleaning if necessary. The **ProAir** has a highly fire retardant polymeric buckle.

The **AirBoss** is fully adjustable for both the shoulder straps and waist strap. The **AirBoss** harness has a pull-forward waist belt adjustment and a waist pad to transfer weight away from the shoulders for additional support and comfort. It also comes equipped with shoulder pads. A lung demand regulator (LDR) holder is provided on the waist belt for convenient stowage when not in use. The entire pneumatic system can be **readily** removed for decontamination. The waist belt buckle is either a push-button, stainless steel, automotive-type or highly fire retardant polymeric buckle.

3 Pressure Reducer

3.1 Purpose

The purpose is to reduce the cylinder pressure from a maximum 4500 psi down to a medium pressure between 87-130 psi while delivering high flow when needed.

3.2 Construction

The pressure reducer is a balanced piston type which provides a controlled medium pressure regardless of cylinder pressure. It contains a pressure relief valve to prevent over pressurization of the medium pressure chamber. It is connected to the cylinder by CGA fittings.

3.3 Features

High pressure air enters the reducer via a cylinder connector which is fitted with a sintered bronze filter.

The high pressure air flows through the piston into the reducer body which forms a medium pressure chamber. As the air flows into the medium pressure chamber, it forces the piston to close against the plunger, the medium pressure should read between 87-130 psi.

On inhalation, medium pressure air flows from the medium pressure chamber. As the pressure within the chamber is now reduced, the spring. reopens the piston allowing the cycle to be repeated.

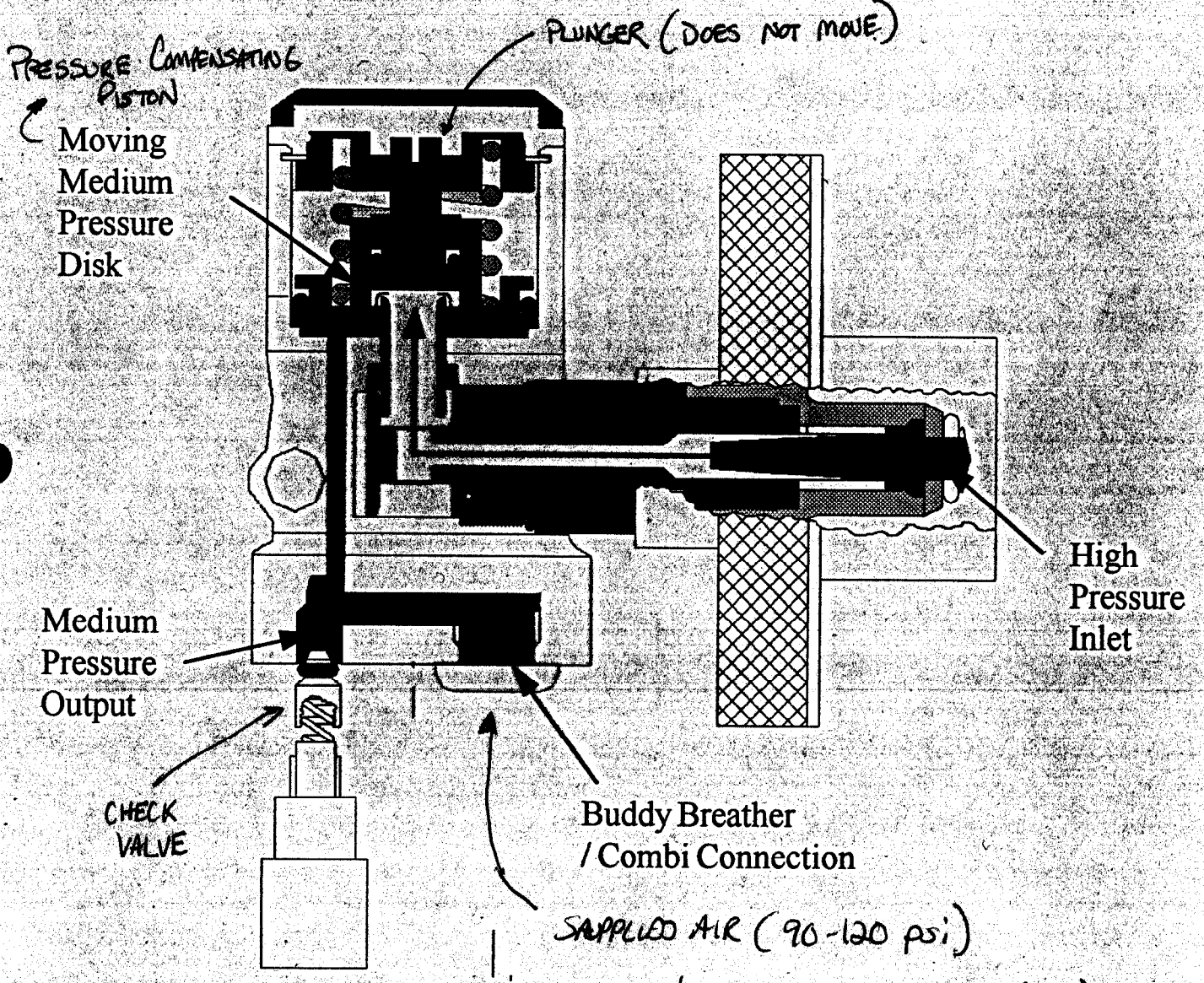
An optional pigtail with a female Cejn connector is available. When provided, it permits both buddy breathing or the connection of an external breathing air line. The pigtail is supported on the left side of the waist belt.

3.4 Technical Data

First Stage Reducer

Outlet to High Pressure Manifold	<25 lpm @ 2900 psi
Medium Pressure	87-130 psi
Relief Valve	160-230 psi

[redacted]


PLUNGER (DOES NOT MOVE)
PRESSURE COMPENSATING PISTON
Moving Medium Pressure Disk
High Pressure Inlet
Medium Pressure Output
CHECK VALVE
Buddy Breather / Combi Connection
SUPPLIED AIR (90-120 psi)
CAN GET DRAGER(CEJN) - HANSEN PIGTAIL FROM DRAGER
USE BUDDY BREATHER TO CONNECT TO!
TO LDV

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4 Chest Mounted Whistle Warning Unit

4.1 Purpose

The purpose is to audibly alert the user when the air supply reaches approximately 25% of full cylinder capacity.

4.2 Construction

The high pressure whistle warning unit is fitted to a manifold block. The manifold block is fitted to the gauge line. The whistle is located on the left shoulder harness, close to the ear, making it easier to hear the whistle.

4.3 Technical Data

Mean Flow Rate = 2 lpm

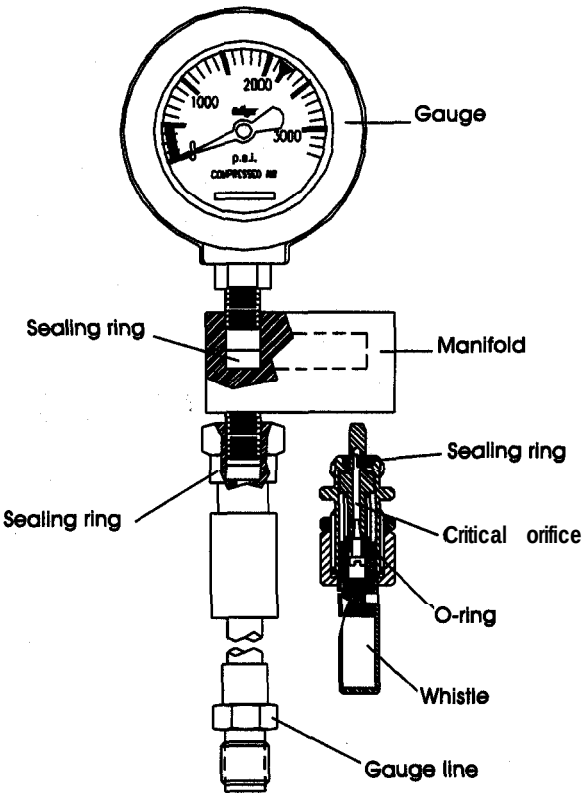

Figure 1

5 Chest Gauge

5.1 Purpose

The chest gauge allows the wearer to monitor the cylinder pressure at all times.

5.2 Construction

The chest gauge is a Bourdon type with a heavy-duty stainless steel case.

5.3 Features

The chest gauge has a large dial face for easy readability and luminous markings for visibility in low light conditions. The gauge is attached to the chest manifold.

Lung Demand Regulator

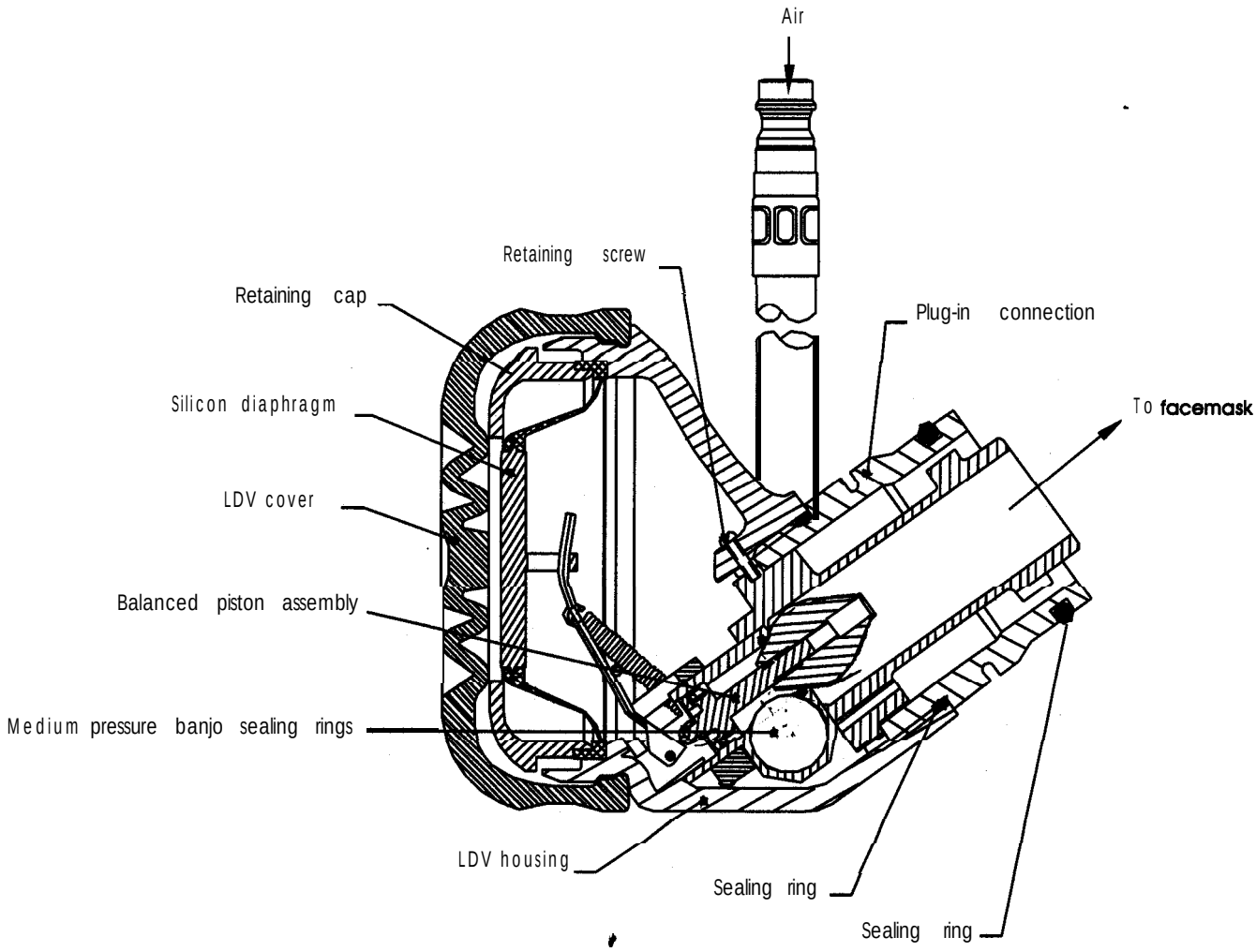

Figure 2

6 Lung Demand Regulator

6.1 Purpose

The lung demand regulator has **two main functions:**

1. To provide the air demanded by the respiratory system

2. To always provide a positive pressure to the mask interior

6.2 Features

LDV

The lung demand regulator (LDR) has automatic first breath activation to positive pressure. The bypass control on the right side of the housing can be depressed and locked in position to provide a constant flow of air. The donning lever is also on the right side. The lung demand incorporates a simple, effective "push-in" connection to the face mask port, and is sealed by a silicone o-ring.

6.3 Technical Data

Input pressure	87-130 psi
output flow	500 lpm
Bypass flow range	80 - 130 lpm
Static Positive Pressure	1 - 3.75 mbar
Positive Pressure Activation	≤ – 5 mbar

Panorama Nova Mask

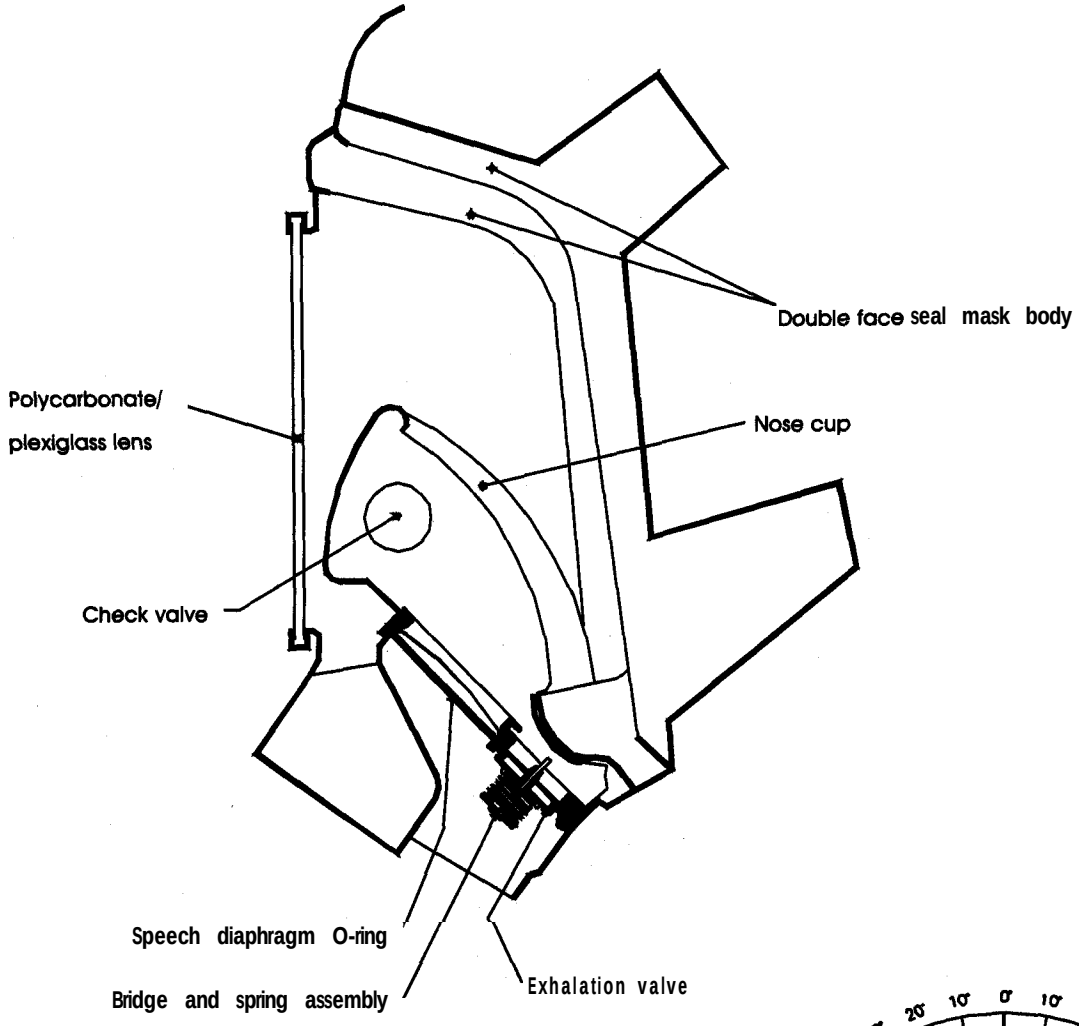

Diagram Field of Vision

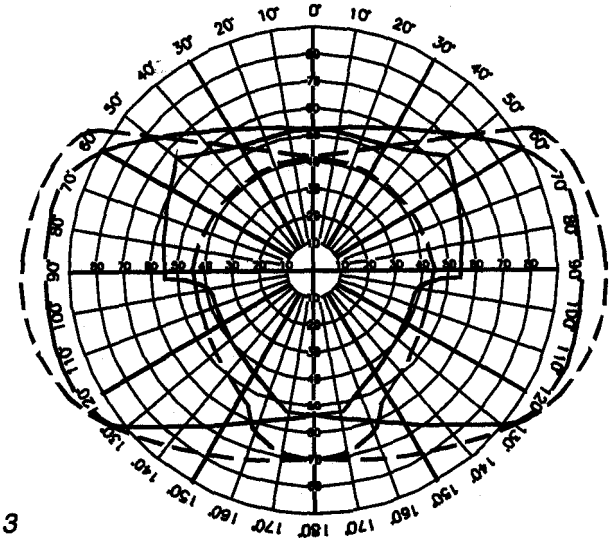

Figure 3

7 Panorama Nova Mask

7.1 Purpose

The Panorama Nova Mask is used with the quick disconnecting LDR to provide compressed air to the user's respiratory system.

7.2 Construction

The Panorama Nova Mask is available in three materials:

1. EPDM (Ethylene Propylene Dimonomer)
2. Silicone
3. Neoprene

Mask construction is the same for all materials.

7.3 Features

The Panorama Nova Mask uses a lens design that features 90% peripheral vision availability. The mask utilizes a five-point harness for proper sealing. Four of the harness points go on the sides of the head and one harness goes over the center of the head. A neck strap is also provided for transporting the mask.

The input connecting section is manufactured so that the incoming air is flushed past the lens and into the respiratory system. This system helps prevent fogging of the lens.

The mask comes standard with a **nosecup** that also helps reduce fogging, takes up dead-air space and channels the voice into the speech diaphragm. **Nosecup** usage is required by **NIOSH** when temperatures are below 32 **ºF.**

National Draeger uses a speech diaphragm made from stainless steel (stamped with the letter N). This material provides excellent sound transmittance and is less susceptible to chemical deterioration.

The mask is constructed with a double face seal to ensure a good fit over a wide range of facial features. One size fits all.

7.4 Technical Data

Material(s)	EPDM, Neoprene, Silicone
Exhalation Valve Opening	≥ 4.5 mbar
View Area	90 % of peripheral vision
Lens material(s)	Polycarbonate, Plexiglass

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8 Cylinder and Valve Assembly

8.1 Purpose

The PA-90 Series cylinders are used as light-weight storage containers for the breathing air.

To ensure the wearer's safety and that the cylinder remains free of contaminants, Grade D or better gaseous air, as specified by the Compressed Gas Association Commodity Specification for Air, G-7.1, ANSI 286.1 must be used in the cylinders.

8.2 Features

The cylinders use aluminum valves with CGA connectors. The valves have safety discs (burst discs) installed that are designed to prevent over-pressurization. These discs are designed to rupture at approximately **5/3** the rated service pressure. The valves utilize a straight thread design that permits the use of an o-ring seal when attaching to a reducer. This seal system ensures that the connection between the cylinder and the reducer need only be **hand-tightened.**

8.3 Technical Data

Pressure/ Minutes	Weight, Lbs w/Air	SCF/ Liter
4500/30 FG	13.2	**51.7/1457**
4500/45 FG	20.2	**74.8/2108**
4500/60 FG	25.0	**98.9/2790**
4500130 Kv..	12.1	**51.7/1457**
4500145 **KV..**	17.0	74.812108
4500160 **KV..**	21.7	98.912790
2800145 FG	19.2	**68.4/1930**
2216/30 FG HW	16.1	**46.5/1311**
2216/30 FG FW..	13.2..	**46.1/1300**
2216/30 ALUM	21.3	45.911295

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II Disassembly/Assembly

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1 Pneumatic Arrangement Maintenance

Tools required

14 mm AF open ended spanner
20 mm AF open ended spanner or adjustable spanner

1.1 Replacing Pressure Gauge

- Hold manifold block (7) using either adjustable or 20 mm AF open ended spanner.
- Use 14 mm AF open ended spanner or adjustable to unscrew gauge (9) from manifold block.
- Remove gauge cover (10) (Figure 1).
- Remove sealing washer (8) from bore of manifold block and inspect bore thread for damage.
- Insert new sealing washer into manifold block.
- Refit gauge cover.
- Screw new gauge into manifold using spanners. Ensure correct orientation as shown in Figure 1.

NOTE

*Hold assembly with gauge vertical and apply Loctite **290** sparingly around gauge thread, following initial thread engagement,*

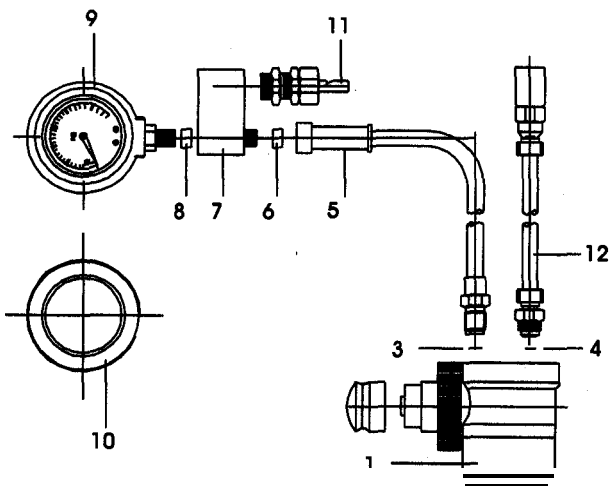

Figure 1

1.2 Disassembly/Assembly of Whistle Warning Unit

Tools required

16 mm AF open ended spanner
20 mm AF open ended spanner or adjustable spanner

- Hold manifold block using adjustable or 20 mm AF open ended spanners and unscrew whistle assembly from manifold block using 16 mm AF pen ended spanner.

Refer to Figure 2

- Using 16 mm AF open ended spanner, loosen locknut (6) and unscrew adjusting nut (1) from main body (7).
- Remove whistle tube (2) inspect o-ring (3), replace if necessary.
- Remove spring (4) from main body.
- Extract capillary assembly (5) by pushing through seal (8), in direction of arrow .

CAUTION!

Capillary Assembly (5, 5a) is factory set by Dräger. Do not attempt to adjust.

- Replace capillary tube assembly if damaged.
- Inspect seal (8). Replace if necessary. Ensure replacement seal is refitted with open end facing outward as shown in Figure 2.
- Reassemble whistle in reverse order of dismantling.
- To adjust whistle activation point, attach a fully charged cylinder.
- Attach lung demand regulator.
- Open cylinder.
- Close cylinder valve and using the lung demand slowly bleed pressure down to the activation point (25% ± 2% of full)
- Holding pressure at activation pressure, tighten adjusting nut (1) until whistle activates.
- Apply Loctite 242 to lock nut and lock in place by adjusting locking nut (6).

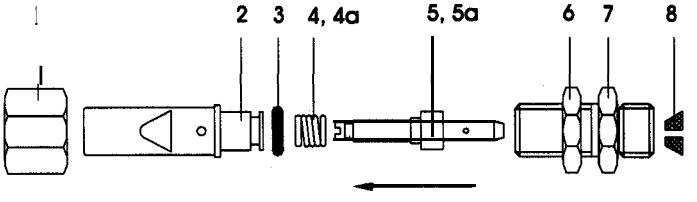

Figure 2

Whistle Warning Unit

Item No.	Description	Part No.
1-8	Whistle Complete 4500	3336143S
1-8	Whistle Complete 2216	3336142s
1	Adjusting Nut	3330674
2	Whistle Tube	3330679
3	O-ring	3330997
4	Spring (4500)	3336141
4 a	Spring (2216)	3330999
5	Capillary Assembly (4500)	3331018
5 a	Capillary Assembly (2216)	3336 146
6	Locknut	3330675
7	Main Body	3330673
8	Seal	3331696

1.3 Replacing High Pressure Hose

Tools required

10 mm AF open ended or 6" adjustable spanner
5 mm hexagon socket key
Holding tool P/N R27986
17 mm AF open ended spanner
20 mm open ended spanner
Torque spanner P/N R51 338
17 mm open ended socket PIN R51 334

- Unfasten hose loop on shoulder pads and backplate to release hoses.

NOTE

For the ProAir cut, remove and replace retaining ties.

- Using 10 mm AF spanner and 5 mm hexagon socket key, unscrew hexagon locknut on reducer securing bracket; remove socket head screw and washers to release pressure reducer.
- Using 10 mm AF spanner, remove nut from end of reducer mounting pin.
- Remove mounting pin from pressure reducer, along with spacer and plastic sleeve from hole in mounting pin.
- Grip pressure reducer holding tool in vice and screw reducer handwheel into holding tool.
- Unscrew pressure gauge hose (HP) from pressure reducer using 17 mm AF open ended spanner and remove copper washer (3).

L(D15437)

- Pull back plastic sleeve (5) if fitted, and hold hexagon using 17 mm AF open ended spanner.
- Using 20 mm AF open ended spanner on manifold block, unscrew hose from block (7) and remove sealing washer (6).
- Discard disassembled hose.
- To assemble new hose reverse the above procedure.

NOTE

Fit new copper washer (3) and copper sealing ring (6) (Figure 3).

Tighten hose to pressure reducer using torque spanner • Tighten to 20nm.

Ensure correct orientation of gauge when tightening manifold block to new hose.

Note orientation as shown in Figure 3.

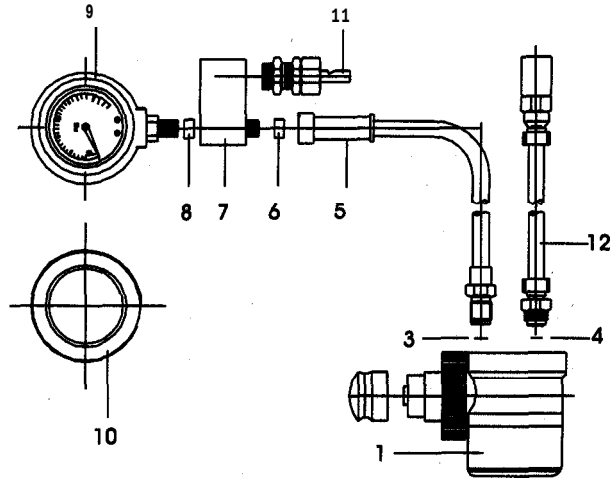

Figure 3

1.4 Replacing Medium Pressure Hose

Tools required

10 mm AF open ended spanner or 6" adjustable spanner
5 mm hexagon socket key
Holding tool P/N R27986
17 mm AF open ended spanner

- Unfasten hose loops on shoulder pads and backplate to release hoses.

NOTE

*For the **ProAir** cut, remove and replace re **taining** ties.*

- Using 10 mm AF spanner and 5 mm hexagon socket key, unscrew hexagon locknut on reducer securing bracket; remove socket head screw and washers to release pressure reducer.
- Using 10 mm AF spanner, remove nut from end of reducer mounting pin.
- Remove mounting pin from pressure reducer, along with spacer and plastic sleeve from hole in mounting pin.
- Grip pressure reducer holding tool in vice and screw reducer handwheel into holding tool.
- Unscrew medium pressure hose (12) from pressure reducer using 17 mm AF open ended spanner and remove sealing washer (4). (R18456)

NOTE

*This procedure is slightly different on the **ProAir.** The medium pressure line is a one piece unit into the **LDR.***

- Discard disassembled hose.
- To assemble new hose reverse above instructions.

NOTE

Fit new sealing washer (4) (Figure 3).

2 Demand Regulator Maintenance

NOTE

Before starting disassembly, disconnect demand regulator from apparatus.

Tools Required

Peg spanner P/N 1628089

2.1 Replacing Diaphragm

(Figure 4)

- Remove rubber cover (4) and using peg spanner (P/N 1628089) unscrew bayonet cap **(3).**
- Depress donning lever (6).
- Carefully remove diaphragm (2) by unhooking it from its central location on lever of balanced piston assembly.
- Relocate new diaphragm onto balanced piston lever inserting outer bead of diaphragm into locating groove in demand regulator body (1). For correct orientation see Figure 5.
- Moisten lip of bayonet cap with water ▪ refit bayonet cap (3) and tighten with peg spanner (P/N 1828089). Check diaphragm position (Figure 5). Note alignment of arrows.
- Press reset lever (6) ▪ positive pressure type only ▪ to lift diaphragm towards bayonet cap ▪ release reset lever and check that diaphragm has remained in position.
- Fit rubber cover (4).
- Carry out leak and functional tests.

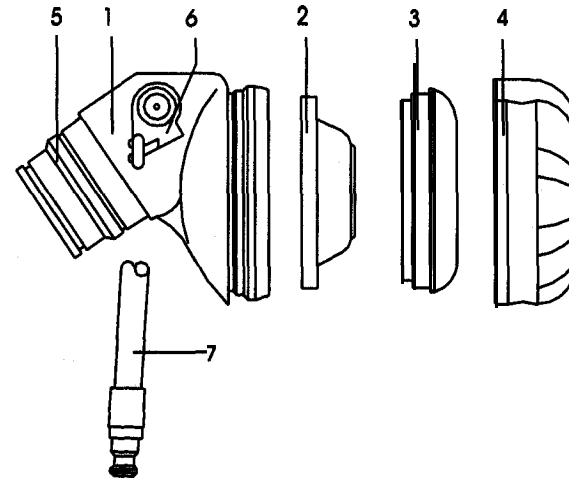

Figure 4

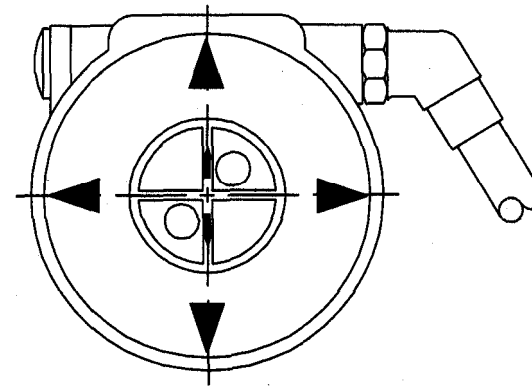

Figure 5

2.2 Replacing Balanced Piston Unit

NOTE

Balanced piston unit is factory set by ***Dräger,*** *do not attempt to adjust or dismantle this unit. Should problems occur - other than requirement to replace springs on positive pressure type units; units to be replaced with new factory set unit.*

To replace complete balanced piston unit or springs, follow these instructions:

Tools required

Peg spanner P/N 1628089
Fine point tweezers P/N 3333326
Fine point circlip pliers

- Remove rubber cover (4) and using peg spanner (P/N 1828089) unscrew bayonet cap. (3) (Figure 4)
- Depress reset lever (6) (Figure 4) - positive pressure type only.
- Carefully remove diaphragm (2) (Figure 4) by unhooking it from its central location on lever of balanced piston assembly.
- Using Posi-drive screwdriver, remove retaining screw. (1) (Figure 6)

a) Unscrew push-in connector (5) (Figure 4) counterclockwise from demand regulator body.

b) Using peg spanner (P/N 16 **23089),** unscrew. Screw in connector counterclockwise from demand regulator body.

NOTE

DO NOT attempt to remove push-in connector unless screw (1) (Figure 6) is removed from demand regulator body.

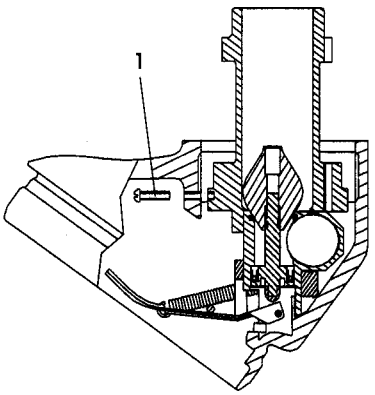

Figure 6

- Remove O-ring (5) from bypass button.
- Use a small screwdriver and remove the two small screws (6) located on the bypass button (1) and remove the bypassassembly. (Figure 7)
- Remove circlip (2) using finepoint circlip pliers and remove washer. (3) (Figure 7)
- Push end of banjo (2) and extract banjo/hose assembly (2) from demand regulator. (Figure 6)

NOTE

Ensure o-ring (1) is fitted to banjo.

- Remove balanced piston unit (1) from demand regulator body. (2) (Figure 9)

NOTE

Remove old grease using a lint free cloth from circumference of banjo and remove seals. It is recommended that all seals be replaced. Refit new seals and apply thin film of (Molykote 111) grease.

2.3 Replacing/Refitting PP Arm Return Spring

- Ensure PP arm (1) is in position with arm pointing as shown in Figure 10.
- Insert return spring (2) (Figure 10) over PP arm (1) and into housing recess with radial arm of spring correctly located in radial slot in demand regulator body.
- Hook axial arm of spring into radial slot in lever (4) (Figure 7) but not onto hexagon,

NOTE

Using finger inside demand regulator body press end of PP arm to hold in position and prevent axial movement.

- Carefully rotate lever arm, counterclockwise against spring tension until first hexagon flat aligns with hexagon on PP arm and press lever onto PP arm.

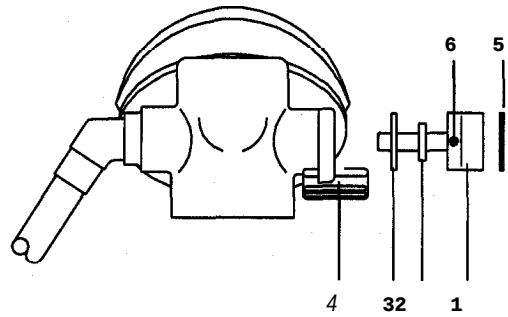

Figure 7

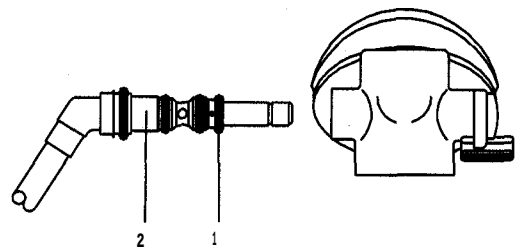

Figure 8

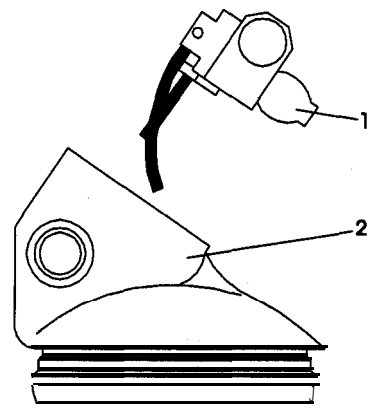

Figure 9

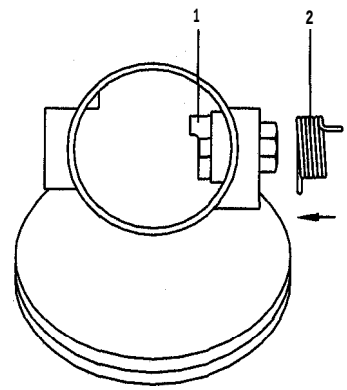

Figure 10

- Rotate lever, counterclockwise and carefully lift lever stop to opposite side of rib on demand regulator body.
- Check assembly by pressing lever. (4) (Figure 7) Lever should return easily.

2.4 Replacing Balanced Piston Springs

- Unhook each spring loop from location on balanced piston lever.
- Unhook each spring loop from location pins on block.
- Refit new springs to pins on block.

NOTE

Use fine point tweezers (P/N 3333326) to stretch spring to locate on lever arm.

- Hook each spring loop to location arm on balanced piston lever.
- Insert balanced piston unit into demand regulator body ensuring correct location onto internal location boss (Figure 11).
- Ensure banjo seals have fresh grease applied.
- Carefully insert banjo (2) (Figure 8) into bore of demand regulator body and align through bore in balanced piston block i.e., reverse Figure 8.
- Refit washer (3) and new circlip (2) (Figure 7).

NOTE

Check banjo swivels freely in assembly.

- Insert bypass assembly (1) (Figure 7) and snug smalls screws. Ensure bypass operates smoothly.
- Replace O-ring over small screws.
- Orientate and hold demand regulator with outlet port in vertical position. Insert anti-injector pipe into port while ensuring positive and correct location, (Figure 12)

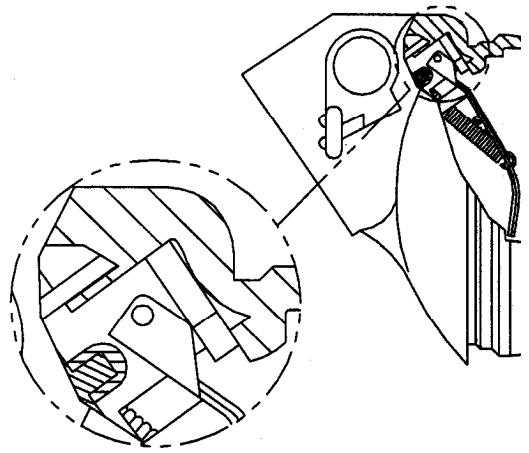

Figure 11

- Locate and screw connector into demand regulator body.

NOTE

Replace o-ring prior to fitting.

- Tighten push-in connector hand tight until anti-injector pipe is secure. Do not **over-**tighten.
- Carefully turn connector, counterclockwise until first space in castellations on connector aligns with retaining screw hole.
- Refit retaining screw (1) (Figure 6) ensuring it enters aligned space in castellation.
- If fitted, check action of positive pressure mechanism. i.e., press reset lever (4) (Figure 7) checking that balanced piston spring loaded lever lifts and holds in position after releasing reset lever.
- Gently press end of balanced piston lever to check lever releases under spring load. Repeat.
- Press reset lever and locate diaphragm (2) (Figure 4) onto end of balanced piston lever ▪ insert outer bead of diaphragm into locating groove in demand regulator body. Ensure correct orientation. (Figure 5)
- Moisten lip of bayonet cap with water ▪ refit bayonet cap (3) (Figure 4) and tighten with peg scanner (P/N 16 28089). Check position of diaphragm. (Figure 5) Note alignment of arrows.
- Press reset lever (4) (Figure 7) to lift diaphragm towards bayonet cap ▪ release reset lever checking that diaphragm remains in position. Gently press center of diaphragm to ensure that it releases and retracts. Repeat action.
- Fit rubber cover (4) (Figure 4).
- Press lever (4) (Figure 7) to check action and ensure lever returns easily after releasing.
- If lever does not retract easily, remove screw (1) (Figure **6),** rotate connector counterclockwise to next space in castellation.
- Following satisfactory assembly, carry out leak and functional tests.

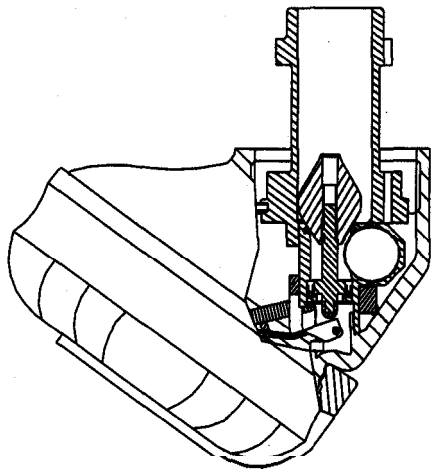

Figure 72

2.5 Replacing Demand Regulator Hose

Tools required

11 mm AF open ended spanner
14 mm AF open ended spanner
or 6" adjustable spanner

- Hold banjo flange across flats using 14 mm AF open ended spanner.
- Grip elbow on hose assembly, using 11 mm AF open ended spanner and unscrew elbow/ hose assembly from banjo (counter clock-wise).
- Discard disassembled hose.
- Before assembling new hose assembly, check that:

a) threaded bore in banjo is clean and undamaged

b) new O-ring is fitted to threaded end of banjo

- Apply one drop of Loctite 638 (P/N 3335389) To elbow thread (Ensure that Loctite does not enter bore.)
- Screw elbow to banjo and tighten using 14 mm AF spanner to grip banjo and 11 mm AF spanner to grip elbow.
- Leak test completed assembly. (Section III, 1 .1.6)

3 Panorama Nova Mask

Tools Required

7 mm open end wrench
Screwdriver, flat tip
Diaphragm spanner (P/N R26817)
End crimp pliers

3.1 Changing the Mask Lens

- Remove lens screws by turning them counter-clockwise with a screwdriver, while at the same time holding hexagon nuts.
- Carefully loosen both clamping frame halves (if necessary, by pushing the blade of screw-driver between the clamping pins) and remove them.
- Remove lens for reconditioning or replace-ment.
- First insert new lens in the top of retaining area.
- The center marks on the lens must coincide at the top and bottom with corresponding center marks on lens holder.
- Thoroughly moisten the outside of lens retaining area and the inside of lens frame (e.g. with soapy water).
- Place the frames over the lens retaining area. Take care to align the center marks of the lens frame with the center mold marking of the body.
- Bring the two frames (upper and lower) as close as possible.
- Screw set screws into hexagon nut.
- Hold hexagon nut and tighten set screws until the protruding end of screw is flush with the lower edge of hexagon nut.

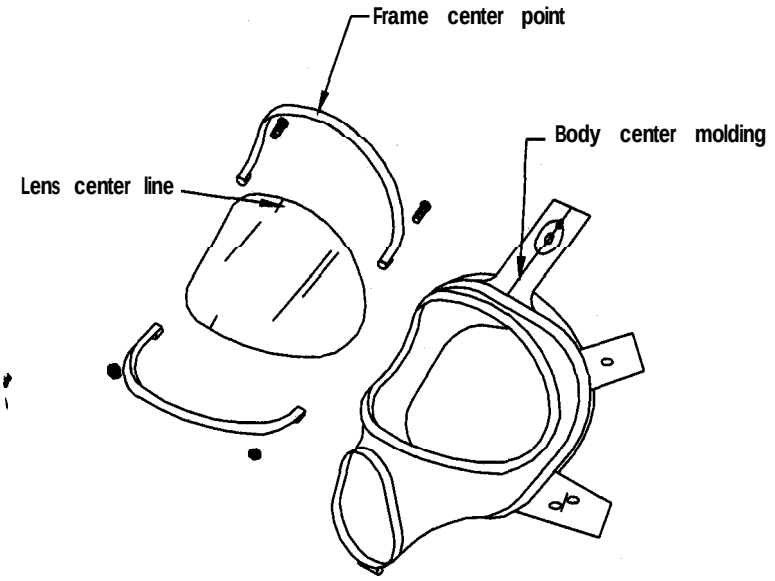

Figure 13

3.2 Changing the Exhalation Valve

- Remove plastic cap from connector.
- Slide bridge assembly to one side. Take it and spring out of the connector.
- Remove valve disc from guide and insert new one.
- Check opening pressure (min. 4.5 mbar). If it is not correct, install a new spring into bridge.

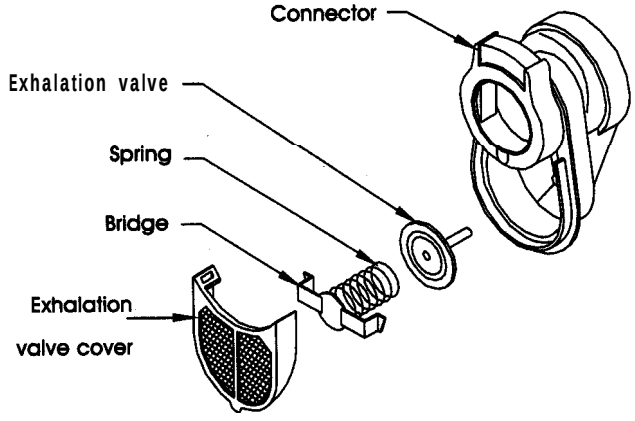

Figure 14

3.3 Changing the Speech Diaphragm

- Remove nosecup, unscrew threaded ring by turning it counterclockwise with wrench (R26617).
- Lightly tap face of mask until speech diaphragm falls out. Check the condition of the speech diaphragm.

If the speech diaphragm is deformed or shows signs of damage, it must be replaced. The speech diaphragm is a very thin foil, which could easily contribute to considerable leakage if it is damaged.

When inserting the speech diaphragm, always ensure that the gasket is present and in good condition.

NOTE

Take care not to crush the perforated section of the diaphragm.

If the perforated section of the diaphragm is crushed it will decrease the sound transmittance properties of the diaphragm.

- Insert diaphragm with perforated section facing the interior of mask.
- Install threaded ring and tighten with spanner wrench (R26817).
- Reinsert nosecup.

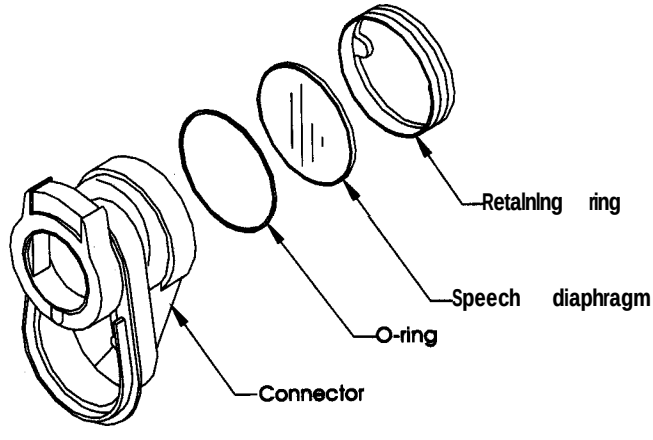

Figure 15

3.4 Changing the Connector

Screw Type Clamp

- Loosen screw of clamping collar with screwdriver and remove clamping collar with support plate.
- Take connector out of mask body.
- Insert new connector such that the center marks on the connector and on mask body coincide.
- Clamp support plate under collar and onto clamping frame and align it.
- Tighten screw until the protruding portion of screw is flush with the end of retaining nut.

Crimp Type Clamp

- Remove clamping band and discard band.
- Remove plastic protection band and gusset.
- Lift connector from mask body.
- insert new connector such that the center marks align with the mold marks on the center of mask body.
- Install plastic band around connector and insert gusset under lens frame and on top of plastic band.
- Place a new crimp style band over connector and plastic band and, using a set of end crimps, crimp band tightly.

NOTE

Ensure the mask body is not punctured at any time during this procedure.

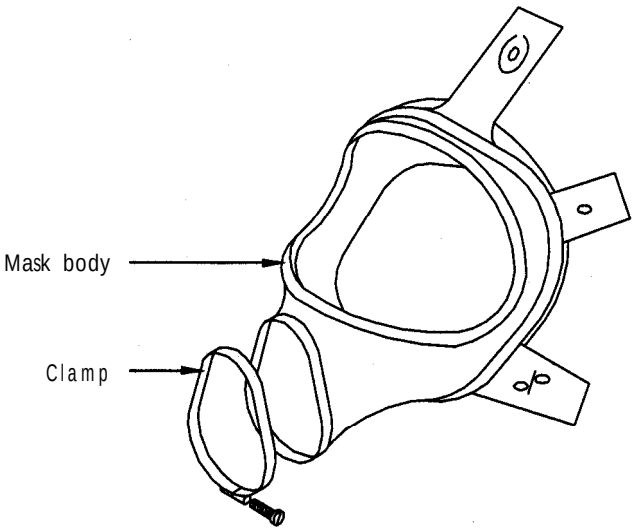

Figure 16

"P" Mask Maintenance Kit

Description	Part No.
Mask Maintenance Kit	4054420
Kit includes:	
Disc, Control Valve	RM08304
Disc, Exhalation Valve	R50073
O-ring, Speech Diaphragm	T10549
Diaphragm, Speech SS Mask	R51102

4 Backplate/Pneumatic Lines

- Using a 3 mm allen key, loosen and remove the ballnose o-ring P/N 4054431. Replace o-ring and tighten allen screw until tight.
- Using a 17 mm wrench, loosen the medium pressure line. Remove and replace rubber sealing ring P/N R16456. Tighten until snug.
- Using a 17 mm wrench, loosen the pressure line assembly at the reducer, remove the pressure line assembly and copper washer and replace with the new copper washer P/N D15438. Screw until tight.
- Using a 17 mm and 14 mm wrench, loosen the pressure gauge and remove it from the pressure line. Remove the copper washer from the pressure line and replace with a new copper washer P/N R50457. Screw until tight.
- Using a 13 mm wrench, loosen the buddy breather connection and remove. Lubricate with Molykote 111 and replace manifold o-ring P/N 4059265. To reinstall, apply a drop of Loctite 222 to the connection threads and tighten.
- Perform a high pressure leak test. (Section III, 1 .1.3)

5 Cylinder Valve

(Figure 17)

5.1. High Pressure Gauge

Tools Required

Flat tip screwdriver
Cut-out 1/2" socket
Small square key
(only on newer gauge covers)
Philips screwdriver

CAUTION

Ensure cylinder pressure has been complete/y drained before removing gauge.

- Remove screws (14) in top of rubber protective cap.
- Lift off cap (13), wave washer (12) and protective plastic cover (1 1).
- Place 1/2" cut-out socket on gauge nut.

NOTE

Make sure gauge indicating needle is not damaged.

- Remove gauge (2).
- Replace sealing o-ring P/N 4598340 or entire gauge assembly.

Install gauge assembly

- Apply Loctite 222 sparingly to gauge threads.
- Tighten gauge assembly in valve (1).

NOTE

Ensure pressure indicators are properly aligned.

CAUTION

Do not over tighten gauge assembly.

- Replace covers and washer in reverse order of disassembly.

5.2 Burst Disc

Tools Required

3/8" socket
Torque wrench (O-l 0 nm)

CAUTION

Ensure cylinder is completely empty before removing the seal.

- Remove 3/8" protective cap (10) with-socket.
- Remove copper disk (4) and sealing ring (9).
- Replace sealing ring (9).
- Replace burst disk (4).
- Apply Loctite 290 to protective cap (10).
- Install protective cap (10) and torque to 65 in/lbs (7 nm).

5.3 Handwheel

Tools Required

1" crows foot
Slotted 1/2" flat tip torque wrench (O-40 nm)

CAUTION

Ensure cylinder is completely empty before removing components.

- Remove handwheel retaining nut **(8),** handwheel **(7),** spring (21) and plate (20).
- Remove retaining bonnet (19) using 1" crowsfoot.
- Remove all internal components o-ring **(18),** gasket **(17),** stem (16) and valve and plug seat (15).
- Replace o-rings (5) as necessary.

Installation

- Screw in closing bolt (15) completely. Then screw out one turn.
- Insert all internal components, stem **(16),** gasket, (17) and o-ring (18).

NOTE

Inspect copper sealing ring (17). If it is damaged or leaks develop contact National Draeger Technical Service for replacement information.

- Torque retaining bonnet (19) to 24 **ft/lbs** (33 nm).
- Install spring plate **(20),** spring (21) and handwheel (7).
- Apply loctite 222 to retaining nut (8). Tighten until flush with upper spindle.

5.4 Valve Removal

Tools Required

Cylinder vise
1/2" drive valve replacement socket
1/2" drive torque wrench (O-l 50 nm)

CAUTION

Ensure cylinder is completely empty before disassembly.

- Secure cylinder.
- Insert valve socket over cylinder valve.
- Remove valve from cylinder.

Installation

- Replace sealing ring (3) on lower valve section.
- Torque valve housing to cylinder **(80 ± 10 ft/lbs) (110 ± 14 nm).**
- Apply pressure and check for leaks.

Cylinder Valve

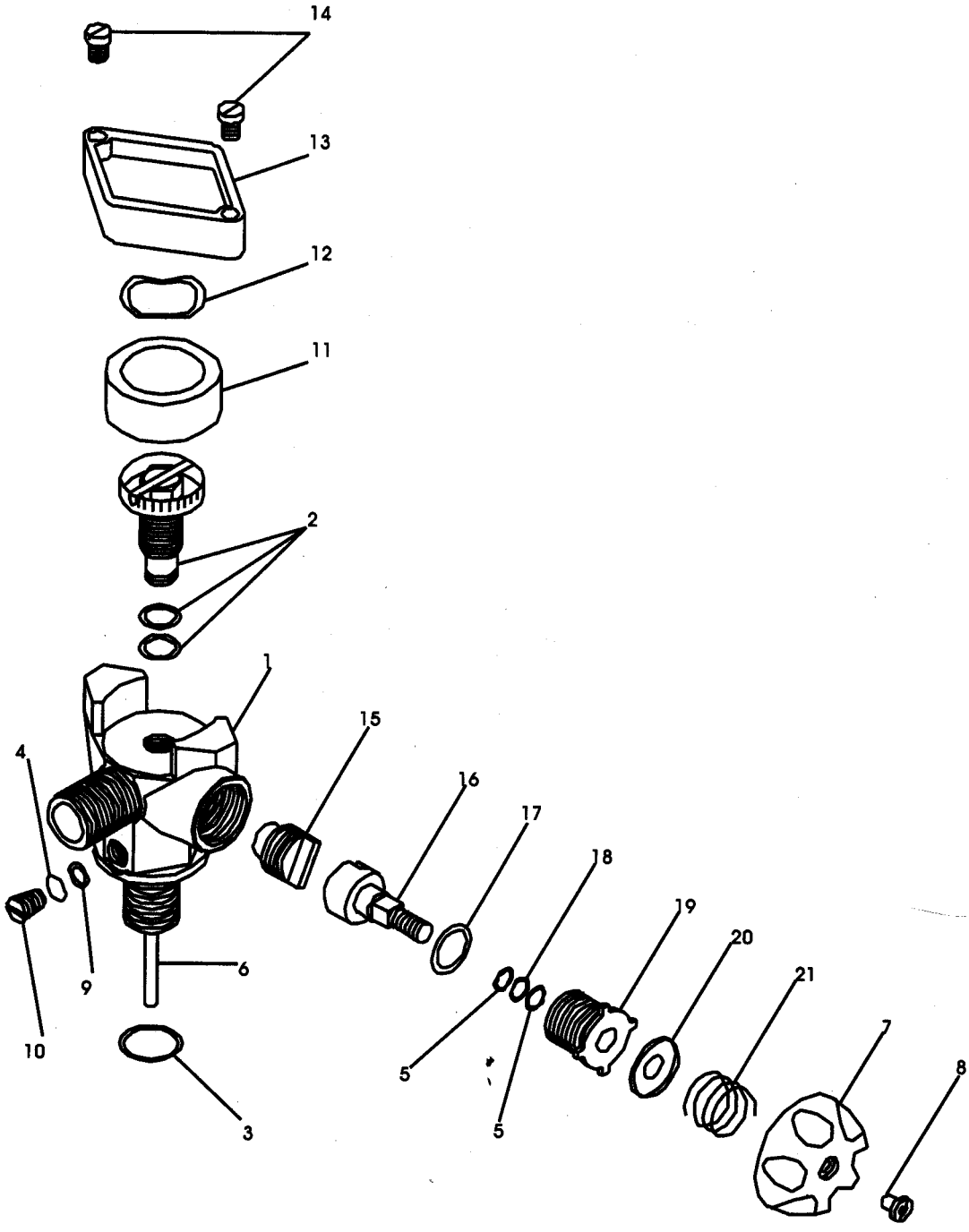

Figure 17

Cylinder Valve

Item No.	Description	Part No.		
		2216	2800	4500
	Valve, Complete, Maintenance Kit	4054415	4054416	4054417
1	Body			
2	Gauge Assembly 2216	4059036	4053359	4059026
3	O-Ring	4059037	4059037	4059027
4	Burst Disc	4059038	4053358	4059020
5	Half Washer	4059154	4059154	4059154
6	Drain Tube			
7	Handwheel			
6	Stem Nut			
9	Washer	4059019	40590 19	4059019
10	Plug, Safety	4052098	4052098	4052098
11	Gauge Cover			
12	Spring Wave Washer			
13	Bumper and Guard Assembly			
14	Screw			
15	Valve and Plug Seat	4052 103	4052 103	4052103
16	Stem			
17	Gasket	4052104	4052104	4052104
18	O-Ring	4059222	4059222	4059222
19	Bonnet			
20	Wear Washer			
21	Spring			

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III Testing/Troubleshooting

Section III
Rev. 2
August 1996

1 Testing/Troubleshooting

1.1 Test Kit Operations

NOTE

Before using the Test Kit P/N 4052350 the kit must be leak tested.

1.1.1 Leak Test "TEST KIT"

- Connect tubing to low pressure gauge.
- Close one open end and clamp. insert squeeze bulb in other end.
- Provide pressure (7 to 10 mbar) to the gauge and clamp off bulb.
- Ensure reading does not change in 60 seconds.

1.1.2 High Pressure Cylinder Test

Check High Pressure in Cylinder

- Connect the high pressure gauge to the high pressure cylinder.
- Ensure that relief valve is closed on the gauge and slowly open the cylinder valve.
- Note the reading on the SCBA test kit gauge and compare to the readings on the PA-90 Series high pressure ~~chest~~ gauge. The kit gauge should agree within ± 5%. OF BOTTLE
- Close the cylinder valve and slowly open the SCBA test kit gauge relief valve.

CAUTION

Ensure that the vent on the gauge is pointed away from face and hands.

I.e. 4500 (± 225)

1.1.3 High Pressure Leak Test

Test Complete Unit for Leakage

- Attach all components to backplate (LDV & cylinder).
- Ensure LDV is in donning mode. Open and close cylinder valve twice.
- Observe high pressure gauge and ensure pressure does not decrease more than 200 psi in 1 minute. if fail repeat twice. if still check for leaks
- After test, drain pressure from the system.

1.1.4 Medium Pressure Test

Test Medium Pressure

- Attach a high pressure cylinder to the reducer. Ensure there is enough air in the cylinder (>80%) for operation.
- Insert the medium pressure gauge in the medium pressure quick disconnect used for the LDV or the buddy breather.
- Ensure the gauge relief valve is closed and open the cylinder valve.
- Note the initial reading on the gauge and ensure that it falls within 87-130 psi.

NOTE
IGNORE

~~*Pressure may rise in one minute to a maximum of 140 psi. Following the settling period, the pressure may rise another 10 psi in one minute.*~~

- Close the cylinder valve. Open the relief valve on the gauge and bleed the pressure from the unit. Close the gauge relief valve.
- Disconnect gauge and reconnect the LDV to the medium pressure line.

1.1.5 Whistle Activation

- Switch LDV to donning mode.
- Open cylinder valve.
- Listen for chirp and close cylinder valve.
- Cover the LDV connector with the palm of your hand and depress the center of the blue LDV cover.
- Slowly move your palm away from the connector to allow a small amount of air to escape.
- Observe the chest gauge to determine the whistle activation point.

1.1.6 LDV Positive Pressure Leak Test

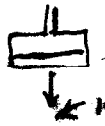
Test LDV for Leakage

- With LDV in donning mode, open cylinder valve.
- Connect LDV to test kit using connector adapter and hose. to magnahelic gauge (mbar)
- Attach squeeze bulb and apply positive pressure (7 to 10 mbar).
- Clamp off bulb and ensure pressure drop is c 1 **mbar/min.**
- Ensure that the pressure does not increase on the gauge. (means LDV leaks) balanced piston

1.1.7 LDV Static Positive Pressure Test

Test LDV for Static Positive Pressure

- Leave test setup same as in leak test above.
- Reverse squeeze bulb to create negative pressure.
- Depress and slowly release bulb. (HOLD THUMB OVER BULB EXIT PORT)
- **LDV should switch to positive pressure at a value of -5 mbar.** (i.e -6, -7...)
- Connect test tubing to adapter inside the **mask exhalation valve and ensure pressure** gauge indicates between **"1 and 3.75 mbar".**



PN #4054928 (ADAPTER)
(O-RING) 4054932

inside of mask

- Return LDV to donning mode and disconnect from tester.
- **Close cylinder valve.**

1.1.8 LDV Negative Pressure Leak Test

Test LDV for Leakage

- Disconnect LDV from unit (SCBA)
- Connect LDV to test kit using connector adapter and hose.
- Block hose inlet to LDV. (USE STOPPER)
- Attach squeeze bulb, and create **negative** pressure (-7 to -10 mbar).
- Ensure pressure does not drop more than 0.5 mbar in 30 seconds.
- Disconnect test kit and attach LDV to unit.

1.1.9 LDV Bypass Function

Test Function of the Bypass Control

- **Ensure the LDV is disconnected from the test kit.**
- Open cylinder valve and depress bypass to ensure air flow. USE FLOWMETER

NOTE

This test checks the bypass function. *If bypass function knob has been removed* ***and/or*** *replaced, this flow must be reset to 80 - 130 LPM (2.8 - 4.5 SCFM). Contact National Draeger Technical Service Department for details.*

- Close cylinder valve and depress bypass to relieve pressure.

ACE LITE (M.P 85-120)

Level III – deep cuts

STEPS TO SETTING WHISTLE

1. Put LDV in "Donning" mode.
2. Open cylinder valve; then close cylinder valve.
3. Bleed down LDV to 600 psi (2216 SCBA's) or 1200 psi (4500 SCBA's).
4. Put LDV back in "Donning" mode at desired setting.
5. Use 16 mm wrench and turn adjusting nut in clockwise direction until a steady whistle sound is heard.
6. Put LDV back in "Donning" mode.
7. Reopen cylinder valve; then close cylinder valve.
8. Bleed down LDV to check set point.
9. If no good, back out nut and go back to Step #1.
10. If good setting, lock in locking nut with 16 mm wrench [redacted] USE LOCKTITE 242 (DO NOT ON PA-80 only)
11. Check setting 1 more time.

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BLUE WHISTLE - HIGH PRESSURE

RED WHISTLE - LOW PRESSURE

1.1.10 Mask Leak Test

Leak Test Panorama Mask

- Inflate and moisten mask balloon. DO NOT OVER INFLATE !
- Moisten mask exhalation valve and attach mask to balloon. CONTINUE TO INFLATE !

NOTE

Ensure the balloon seams are not on the mask sealing surface.

- Connect mask to the test kit using the connector and hose.
- Attach squeeze bulb and create negative pressure (-7 to -10 mbar) in the mask.
- Clamp off the bulb and not that the pressure does not change more than 1 mbar/min.

1.1.11 Exhalation Valve Opening Test

Test Exhalation Opening Point

- Leave test setup as in the previous leak test.
- Reverse the squeeze bulb and slowly apply positive pressure.
- The pressure gauge needle will stop rising when the exhalation valve opens.
- The exhalation valve must not open before 4.5 mbar is indicated.

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SCBA TEST DATA LOG

UNIT SERIAL #_____

HIGH PRESSURE
REGULATOR SERIAL #_____

LDV
SERIAL # _____

MASK SERIAL #_____

HYDRO-DATE _____

DATE	11/15				
HIGH PRESSURE LEAK TEST (200 psi/l min.)	PASS				
LDV NEGATIVE PRESSURE LEAK TEST (< 0.5 **mbar/30** seconds)	PASS				
LDV POSITIVE PRESSURE LEAK TEST (c 1 **mbar/1** min.)	PASS				
POSITIVE PRESSURE ACTIVATION (z-5 mbar)	PASS (-12)				
STATIC POSITIVE PRESSURE (1 .O - 3.75 mbar)	PASS (2.5)				
FUNCTION OF BYPASS VALVE *See NOTE Section **1.1.9*** **(80 - 130 LPM) (2.8 - 4.5 SCFM)**	PASS (4)				
WARNING WHISTLE ACTIVATION (25% ± 2% of full **cyln.**)	PASS (1100)				
MEDIUM PRESSURE **(87 - 130 psi) (6 - 9bar)**	PASS (110)				
MASK LEAK TEST (< 1 **mbar/1** min.)	PASS				
EXHALATION VALVE OPENING (≥ 4.5 mbar)	PASS				

Fault	Cause	Remedy
Pressure Reducer*		
Audible leak from pressure reducer	Pressure relief valve operates indicating reducer failure	Replace complete reducer
High/low medium pressure	Reducer out of tolerance	Replace complete reducer
Continuous creep medium pressure Above 10 psi in one minute.	High pressure leak	Replace complete reducer
Lung Demand Regulator		
Inward/outward leak	Connection o-ring Diaphragm damaged	Replace Replace
Static pressure test Demand valve in test Mode i.e. non-positive pressure mode Pressure rise	Banjo o-rings leaking Balanced piston unit leaking	Replace complete balanced piston unit
Demand valve in positive pressure mode - high static pressure	Spring(s) too strong	Replace springs
Demand valve in positive pressure mode - low static pressure	Spring(s) too weak	Replace springs
No supplementary supply	Bent/damaged Balanced piston lever	Replace complete balanced piston unit
Demand valve fails to switch to positive pressure mode.	Bent/damaged Balanced piston Lever Bent/damaged switch "off" wire form	Replace complete balanced piston unit
Facepiece		
Inward leak	Face seals leaking Facepiece perforated (pin holes/cracking) Loose connections (clamp) Exhalation valve leaking	inspect for damage Replace if necessary Tighten connections replace exhalation valve disc/rubber Inspect seat in front port for damage
Outward leak (to atmosphere)	As above	As above
Facepiece - will not hold/maintain positive pressure	Weak exhalation valve spring	Replace spring
Exhalation resistance too high	Exhalation Spring too strong	Replace spring
Unable to maintain headstrap adjustment	Strap ratchets worn Buckle rollers reversed i.e. incorrectly fitted	Replace headstrap Assemble correctly

*IMPORTANT INFORMATION

Pressure reducers of certified apparatus are sealed by National Draeger. If original seal cap has been broken, or removed, apparatus is not guaranteed as being operational in accordance with approval standards.

*To achieve full operational status: through authorized maintenance National Draeger can only be liable if pressure reducer is **serviced** and resealed by National Draeger. This is only the case when pressure reducers are fitted with original **Dräger** components and sealing caps.*

Dräger

IV Maintenance Schedules/Equipment

including tool list

1.1 Maintenance Procedures

IMPORTANT

The following standards ***must*** *be met when performing any maintenance procedure.*

- *Visually inspect and hydrotest all cylinders at a DOT certified* hydrotest facility. Composite *cylinders must be hydrotested every three years; metal* ***cylinders*** *every five years.*
- *Accurate documentation should be recorded and filed, by serial* number, as each unit is tested *or maintained.*

Protection against pathogens is important. With Draeger **SCBAs,** all exhaled air vents through the exhalation valve in the facepiece. Since no exhaled air contacts the LDV only the facepiece requires disinfecting against pathogens. The LDV only needs cleaning annually unless the unit has been subjected to unusual contamination.

Carefully clean, disinfect and thoroughly dry contaminated dirty components as necessary. Use only Drager Safety Wash for cleaning and **Desi/EW80-Des** for disinfecting baths. Immerse and **manually agitate** components in baths. Drager recommends that no form of mechanical, electrical or ultrasonic agitation be used.

NOTE

If lung demand regulator assemblies are regularly *immersed in solutions,* ***Dräger*** *recommends that banjo O-rings are* ***re-greased*** *after 100 clean and disinfect* cycles, *by a* properly trained *technician. (Level I technician using an SCBA Test Kit).*

SAFETY NOTE

Refer to manufacturers' usage instructions when using cleaning and disinfecting agents. It is important to pay attention to the concentration and reaction times. Do ***not*** *use organic solvents such as acetone, alcohol, white spirit,* ***trichloroethylene*** *or similar.*

If required, Drager recommends the following:

Cleaning
Draeger Safety Wash
Do not exceed a temperature of 86 **°F.**

Disinfecting
Desi/EW80-Des
Do not exceed a temperature of 86 "F.

Details of cleaning and disinfecting agents are available from Drager on request.

Rinsing and Drying
Remove cleaning and disinfecting solutions by rinsing in clean water, followed **by drying.** **Do not** exceed a temperature of 140 **°F** when drying components.

1.1.1 Facepiece

- Disengage LDV from facepiece.
- Lift off the exhalation valve protective cover from the facepiece.
- Examine the exhalation valve for visible damage and ensure that the valve is free from dirt or debris.
- Check the ease of movement of the exhalation valve and ensure it is not sticking to the valve seat.
- Check the headstraps, body, **nosecup** and speech diaphragm. There should be no damage or signs of degradation.

NOTE

Wear suitable eye protection.

- Clean and disinfect all components of the facepiece.

1. Immerse, and manually agitate facepiece in **Dräger** Safety Wash. (Refer to **Dräger** Safety Wash instructions).
2. After cleaning, rinse components in clean water.
3. Immerse and manually agitate facepiece in **Desi/EW80-Des.** (Refer to **Desi/EW80-Des** instructions).
4. After disinfection, rinse components in clean water.
5. Dry at temperature less than 140 **°F.**
6. During drying, avoid accumulation of water in the exhalation valve housing. Improper rinsing and drying can result in sticking or leaking of the exhalation valve.
7. Reinstall protective cover over exhalation valve.

1.1.2 Lung Demand Valve (LDV)

It is important to follow these instructions to internally clean and disinfect the lung demand regulator (Refer to Figure 1).

1. Press reset lever (Figure 1; 6) of lung demand regulator. Do **not** press center of rubber cover (Figure 1; 4) while pressing reset lever, or force lever against stop.
2. Remove rubber cover (Figure 1; 4). Using plate spanner (P/N **R26817),** unscrew bayonet cap (Figure 1; 3).
3. Carefully unhook diaphragm (Figure 1; 2) from lever of balanced piston lever.

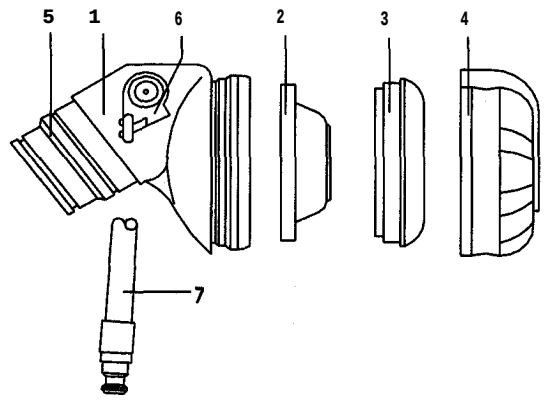

Figure 1

NOTE

Wear suitable eye protection.

4. Assemble rubber cover (Figure 1; 4) to demand valve body to protect balanced piston lever.

5. If required, immerse and manually agitate lung demand regulator in **Dräger** Safety Wash (Refer to **Dräger** Safety Wash instructions).

6. After cleaning, rinse in clean water.

7. If, required, immerse and manually agitate lung demand regulator in **Desi/EW80-Des.** (Refer to **Desi/EW80-Des** instructions).

8. After disinfection, remove rubber cover (Figure 1; 4) and rinse components in clean water. Take care not to damage balanced piston lever.

9. Press reset lever of lung demand regulator. Turn 'ON' air supply.

10. Gently depress balance piston lever, blowing out fluid residue.

11. Disconnect from air supply, dry components and, if necessary, remove excess fluid.

12. **After** drying, insert balanced piston lever into hole in center boss of diaphragm (Figure 1; **2),** (chamfered side of boss towards lever) and carefully locate outer bead of diaphragm into groove in demand valve body ▪ note orientation (Figure 2).

13. Moisten lip of bayonet cap (Figure 1; 3) with clean water. Re-fit bayonet cap.

NOTE

Re-check orientation of diaphragm. (See Figure 2).

14. **Assemble** rubber cover (Figure 1; 4).

15. Press reset lever of lung demand regulator. Do not press center of rubber cover while pressing reset lever, or force lever against stop.

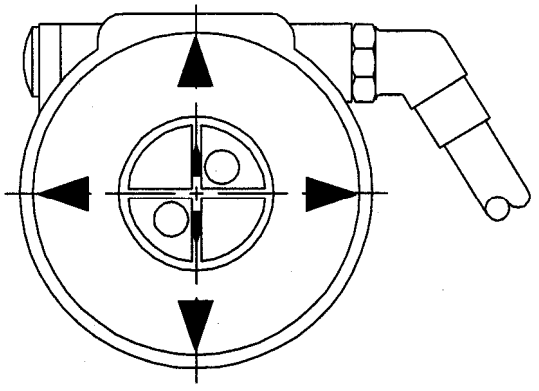

Figure 2

IMPORTANT

A negative pressure leak test must be performed by a properly trained technician (Level I technician using a SCBA Test Kit). Refer to published service manual for details.

1.1.3 Pressure Reducer and Hose Assem biy

NOTE

These procedures must be performed by a properly trained technician (Level I, using a SCBA Test Kit).

1. For cleaning and disinfecting, remove pressure reducer and hose assembly from backplate.
2. Unfasten hose loops, releasing hoses and remove reducer and hose assembly.

NOTE

*Do **not** immerse pressure reducer in cleaning or disinfecting baths.*

3. Using a clean cloth moistened in **Dräger** Safety Wash or **Desi/EW80-Des,** remove dirt and contaminants from pneumatic assembly.
4. Using a clean cloth moistened in clean water, remove cleaning or disinfecting residue. Dry.

NOTE

*Do Not exceed a temperature of **140 °F** when drying* components.

5. Reassemble reducer and **hose** assembly to backplate.

1 .1.4 After Each Use

- Recharge orreplace the cylinder with a National Draeger approved cylinder charged to full service pressure. Use only cylinders with current hydrostatic test pressure dates.
- Inspect the unit for worn or damaged parts with particular focus on the pressure reducer o-ring, LDV o-ring and the exhalation valve. Check these parts for damage or debris which may jeopardize its seal. Remove any debris that may be present. *REPLACE ALL WORN OR DAMAGED PARTS **IMMEDIATELY!***
- Check the LDV connector o-ring for lubrication. If dry, apply a thin film of Dow Corning 111.

1.1.5 Functional Test

* Ensure that a properly trained technician (Level I technician using an SCBA Test Kit) tests any component whose function or seal may have been altered due to service by cleaning or replacement.

- Perform a function test on the apparatus.

  1. Cylinder Pressure and Gauges:

  Open the cylinder valve and note the pressure reading on the cylinder pressure gauge. Compare chest gauge reading to the cylinder gauge reading. The two values must be within ± 10% of the full scale.

  For example: the gauges on a 4500 unit read O-5000 psi. Each gauge has an accuracy of ± 5% or 250 psi. When comparing gauges, total accuracy is ± 10% or 500 psi.

2. High Pressure Leak Test:

Close the cylinder valve and observe the pressure gauge on the apparatus. After one minute, reopen the cylinder valve and observe the pressure gauge needle for movement. If the needle moves less than one graduation on the gauge (200 psi), proceed to step 3.

3. Whistle Operation:

Ensure that operation and activation of the whistle is satisfactory by opening the cylinder valve to pressurize the system then closing the cylinder valve. Place the palm of the hand over the connection port of the LDV and activate. Move palm of hand from regulator connector until only a small volume of air can escape. This will allow the pressure to drop slowly. Observing the apparatus pressure gauge while the pressure is dropping slowly, ensures that the whistle activates when the pressure reaches 25 ± 2% of rated cylinder pressure.

4. LDV Operation:

Set the regulator to the donning mode, simply depress the donning switch. Open cylinder. Depress bypass to ensure air flow. Close cylinder valve.

5. Low Pressure Leak Test:

Close cylinder valve. Depress the bypass to bleed air from the system. Once this is done no more air should be able to be drawn from the system.

6. LDV and Facepiece Connection:

Connect the LDV to the facepiece and check for a snug fit. Uncouple the regulator by depressing the button on the facepiece connector and pulling the regulator out of the facepiece. Check that the o-ring on the regulator connector is in good condition and lightly lubricated.

1.2 Maintenance Schedule

0 **Dräger** Recommendation.

■ Lightly grease lung demand regulator connector o-ring (Molykote 111) as required.

❒ If lung demand regulator assemblies are **regularly** immersed in solutions, **Dräger** recommends that banjo o-rings are re-greased after 100 clean & disinfect cycles,

		After each use	Every month	Every year
Complete Apparatus	Clean and disinfect as necessary	O		
	Visual inspection	O		
	Functional & leak testing (as defined in operating manual)	**0**		
	Bypass flow and static test per manufacturer's instructions			**0**
Lung Demand **Regulator**	Clean and disinfect as necessary	❒ ■		**0**
Pressure Reducer	Medium pressure check			**0**
	Replace CGA connector o-ring			**0**
Cylinder	Charge to correct pressure	**0**		
	Charged pressure check. Check test date stamped on cylinder.		**0**	
	Cylinder pressure test (according to national standards). Recertification			
Cylinder Valve	Basic overhaul (as necessary or at time of cylinder recertification)			

NOTES

Maintenance procedures are subject to recommended or required laws or standards from the following agencies: ***NIOSH,*** *OSHA, NFPA, ANSI. In addition, state or local agencies may have other requirements. It is the responsibility of SCBA users to determine which of these standards apply in their jurisdiction.*

This periodic maintenance schedule is based on normal usage and wear. Heavy usage, use where harmful chemicals are present, or damage may require more frequent service. Accurate documentation should be recorded as each unit is tested and maintained.

Repairs or replacement of parts shall be performed only by National Draeger ***certified*** *technicians. Please contact National Draeger Service if there are further questions.*

1.3 Maintenance Equipment

The following is a list of Level I and II tools which are available for maintenance of our SCBAs. Please refer to this chart when determining which tools are needed for your specific SCBA.

1.3.1 Maintenance Support Equipment

Operational - Level I - Level II		
Part #	Description	Comments
4052512	Adjustable Wrench I-I /8"	
4052024	SCBA Tool Kit	Use on all respiratory equipment
	(includes the following)	
1628084A	Lung Demand Spanner	All Lung Demands
R26817	Face Mask Spanner	All Panorama Masks
R21402	Seal Ring Lifters	Use for all o-rings
4059039	3 mm Allen Key	All Ballnose o-rings
1627244-A	Flat Tip Screwdriver	1/4" Blade Width
4053480	Wrench 7 x 6 mm	All Equipment
4053479	Wrench 10 x 8 mm	All Equipment
4053478	Wrench 12x 12 mm	All Equipment
4053481	Wrench 14x 15 mm	All Equipment
4053482	Wrench 17x 19 mm	All Equipment
4053483	Needle Nose Pliers	All Equipment
4053705	Reg. Phillips Tip Driver	All Equipment
4052511	Ring Spreaders	Plus/90 LDR
1618946	2 mm Allen Key	Plus/90 LDR
4054839	16 mm wrench	Plus/90 Whistle
4053476	Jewelers Screwdriver	Plus/90 LDR
4054838	Small Phillips Tip Driver	Plus/90 LDR

PA-80 "Plus/90" Service Tool List		
Part #	Description	Comments ,
4054142	Torque Wrench O-l 00 ft/lbs	Cyl. Valve Replacement
40525 14	Torque Wrench O-l 50 in/lbs	Burst Disk Removal
4052530	1/2" Drive Socket	Cyl. Valve Replacement
4052532	Cut-Out 1/2" Socket	Valve Gauge Removal
40525 13	3/8" Socket	Burst Disk Replacement

Maintenance Test Equipment		
Part #	Description	Comments
4052350	SCBA Test Kit	Mandatory for Levels I & II
4054001	Aerotest Kit	Low Pressure 150 psi max
D20700-R	Aerotest Kit	High Pressure 4500 psi max
4054968	Bypass Flow Meter	LDV Bypass Flow 80 to 130 lpm (2.8 to 4.5 SCFM) (Mandatory for bypass adjustment)

Recommended But Not Mandatory Equipment		
	Ultra-sonic Cleaner	MFG Branson, Model 5200

1.3.2 Torque Specifications

A. **Cylinder Valves and Components**		
Valve to Cylinder	Torque	Comments
PA-90 22 16 *4052006* PA-90 4500 4052012	**80 ± 10 ft. lbs.**	replace and relubricate o-ring, 4059037 replace and relubricate o-ring 4059027
Safety Plug to Valve	Torque	Comments
Safety Plug, 4052098 (all PA-80 Series)	*65* ± 10 in. **lbs.**	add drop of Loctite 290, *4054087*

NOTE

Prior to tightening; inspect threads and sealing surface for damage. Threads and sealing surface must be clean and undamaged before tightening, otherwise damage to components may occur.

Exceeding recommended specification may result in damage to components.

1.3.3 Lubricants and Adhesives

A. **Lubricants**		
Lubricant	Part Number	Comments
Dow Corning Molykote 111	4059123	use sparingly on all rubber o-rings, recommended for use on silicone o-rings

B. **Adhesives**		
Adhesive	Part Number	Comments
Loctite 222	4054086	-apply to reducer threads prior to tightening ballnose -apply to PA-80 Plus valve gauges, 4059026 and 4059036, prior to tightening -apply to nut, 1335022, following adjustment of bypass flow of all lung demand regulators
Loctite 290	4054087	-apply to safety plug, 4052098, prior to assembly, -apply to chest gauge threac
Loctite 242		-apply to whistle locking nut
Loctite 638		-apply to LDV hose connection

NOTE

Use adhesive only on fittings noted by National Draeger. Excessive or improper use may result in damaged components or reduced performance of apparatus.

Dräger

V Service Reporting

Section V
Rev. 1
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1 Service Repotting

National Draeger, Inc. strives to improve the quality of our products at all times. One method used to accomplish the highest quality possible is to periodically review the service logs for our devices and determine what, if anything, needs to be modified or improved to increase the quality of the device. As a certified service technician for the PA-90 Series, your input into our continuous improvement is vital. After servicing a unit in the PA-90 Series we ask you to complete the following procedure:

1. Make copies of the attached "SCBA Service Log" form.
2. Complete the form.
3. Return the form to the following address:

National Draeger, Inc.
Attn: Technical Service Department
101 Technology Drive
Pittsburgh, PA 15275

Upon receipt of the log form, we will enter the data into our service database along with the data from our internal service department. This will ensure that we have a complete understanding of the service history, leading to improvements in design, durability, or robustness. By actively participating in this effort you are helping us to improve our products for your continued satisfaction.

2 SCBA Service Log

Unit Serial Number		
Problem or Part Replaced	Sub Assembly(s) Serial Number or Lot Number	Corrective Action
1		
2		
3		
4		
5		
6		
7		
8		

Please mail or fax a copy of this completed form for each SCBA repaired to:

National Draeger, Inc.
Attn: Technical Service Department
101 Technology Drive
Pittsburgh, PA 15275

Fax: 412-787-2207

3 Terms of Payment

- 1% discount within ten (10) days after invoice date (contingent upon credit approval).
- Net 30 days after invoice date.

. For payments later than 30 days, a finance charge is applied at 1 -1/2% per month.

4 Return Goods Policy

- A "Return Goods Authorization" (RGA) must be issued by National Draeger prior to any materials being returned. Contact National Draeger's customer service department for necessary authorization.
- No materials can be returned for credit if value is less than $60.00 at invoiced price unless National Draeger is in error.
- All materials being returned for credit as a result of shipping error on part of National Draeger must be returned to National Draeger within ten (10) days after receipt of incorrect material.
- On items ordered incorrectly or no longer needed by the customer, a minimum restocking charge of 15% will be assessed, unless it is a detection tube; then a minimum restocking charge of 30% or $50.00, whichever is greater, will be assessed.
- Return of parts older than one year subject to refusal due to shelf life of parts.
- Goods must be received in the same condition as originally shipped.
- Repair orders must be accompanied by a purchase order number. This includes warranty repairs.

5 Emergency and Rush Orders

. All emergency orders will be shipped the same day, if called in by 3:00 P.M. eastern standard time. WE CONSIDER AN ORDER AN EMERGENCY ONLY WHEN AIR FREIGHT IS REQUESTED. UPS Second Day Service is not considered an emergency order.

- All emergency and rush orders (air freight and next day services) will be subject to a special handling charge.
- All next day emergency orders placed after the cutoff time will be assessed a $25.00 handling fee.

6 Return Goods Authorization

1. Return Goods Authorizations (RGA's) are issued to a customer who requests to return a product to National Draeger for the following reasons:

   a. Ordering error

   b. Shipping error

   c. Duplicate order

   d. Damaged merchandise

   e. Processing error

   An RGA number must be acquired from National Draeger's Customer Service Department before returning and shipping any goods.

2. The following information is required by our Customer Service Department to issue an RGA.

   a. Customer's company name

   b. Customer contact name and telephone number

   c. Customer's purchase order number

   d. Part number and quantity of item being returned

   e. Reason for return

3. After receiving an RGA number, please reference that number on the outside of the package being returned to National Draeger.

4. All discrepancies on an order must be reported to National Draeger within ten days of receipt of that order.

5. On items ordered incorrectly or no longer needed by the customer, a minimum restocking charge of 15% or $50.00, whichever is greater, will be assessed.

6. An RGA will not be issued if the value of the item being returned is less than $60.00 at invoiced price, unless National Draeger is in error.

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7 National Draeger's Product Service In The U.S.A.

If it becomes necessary to return an instrument to National Draeger for repair in the United States, follow these guidelines:

- Contact National Draeger's Technical Service Department at (412) 7665527 or (412) 788-5525 and ask for a Service Return Authorization (SRA) Number. This number tells our receiving department to forward the package to the service department for repair, and also allows our technicians to match repairs to work orders. SRA numbers are valid for 30 days from the date they are assigned.
- When you request your SRA number, please have the following information handy:

  the purchaser's name and address,

  the model number of the instrument to be repaired,

  the serial number of the instrument to be repaired,

  the purchase order number for the repair along with any other applicable information or confirmation including warranty repair period,

  the phone numbers of persons in your company who National Draeger should contact about the product or repairs,

- Place this information inside the shipping package.
- Include a short note inside the package that explains the symptoms or cause of the damage. For example, if the instrument was immersed in water just before it malfunctioned, tell us that.
- Include all necessary options and accessories in the package you are returning.
- Ship the unit in sturdy packaging.
- Send the package to:

  Technical Service Department
  SRA #_____
  National Draeger, Inc.
  101 Technology Drive
  Pittsburgh, PA 15275

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VI Service Instruction History