DURAPAC
ENGINEERED FOR RELIABILITY

Instruction Manual

Kevlar® Power Lift Air Bags
Model – KPL Series

Maximum Operating Pressure – 8 bar

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This is a safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid injury or death

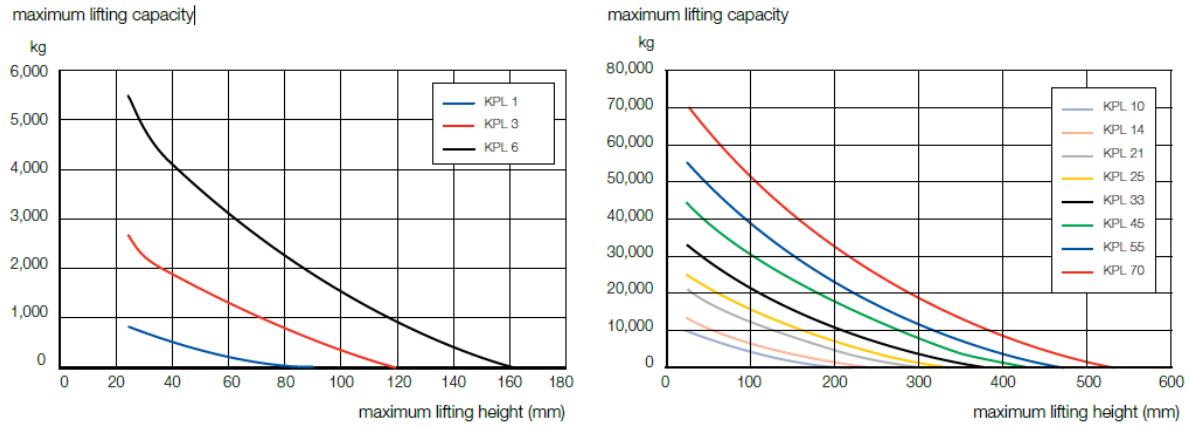
1.0 Product Information

DURAPAC – Kevlar® Power Lift Air Bags are engineered to meet Industrial Standards for Performance and Safety. The KPL Series high-pressure air bags feature Kevlar® cord reinforcing. The patented construction utilises state-of-the-art design for long life and ease of use.

Metal parts are solid brass. The bags are thin, light and simple to use. Two bags can be stacked safely on top of each other due to the special dimpled surface. Eleven models of air bags are available with lifting capacities ranging from 800 to 70,400 kilograms.

The lifting capacity decreases in proportion to the increase of lifting height. This is because the increasing convexity (bulge) during the lifting procedure decreases the contact surface between the air bag and the load. Refer to the graph below or if in doubt, contact a Durapac representative.

LIFTING CAPACITY VS LIFTING HEIGHT GRAPH



Special skill, knowledge and training may be required for a specific task and the product may not be suitable for all jobs. The user must ultimately make the decision regarding suitability of the product for any given task and assume the responsibility of safety for all in the work area. Contact a Durapac representative if you are unsure of your air bag's suitability for a particular application.

2.0 Receiving Instructions

It is recommended prior to use that an inspection be done by qualified personnel and that any missing or damaged parts, decals, warning/safety labels or signs are replaced with Durapac authorised replacement parts only. Any air bag that appears to be damaged in any way, is worn, leaking or operates abnormally should be removed from service immediately until such time as repairs can be made. Any air bag that has been or suspected to have been subject to a shock load should be removed from service immediately until inspected by a Durapac authorised service centre. Owners and operators of this equipment should be aware that the use and subsequent repair of this equipment may require specialised training and knowledge.

3.0 Safety

Save these instructions. For your safety, read and understand the information contained within. The owner and operator should have an understanding of this product and safe operating procedures before attempting to use this product. Instructions and safety information should be conveyed in the operator's native language before use of this product is authorised. Make certain that the operator thoroughly understands the inherent dangers associated with the use and misuse of the product. If any doubt exists as to the safe and proper use of this product as outlined in this factory authorised manual, remove from service immediately.

DANGER:

- To avoid personal injury keep hands and feet away from work area during operation
- Stay clear of loads supported by an air bag. An air bag, when used as a load lifting device, should never be used as a load holding device. After the load has been raised or lowered, it must always be supported mechanically

WARNING:

- The system operating pressure must not exceed the pressure rating of the lowest rated component in the system. Install pressure gauges in the system to monitor operating pressure. It is your window to what is happening in the system
- Always wear appropriate personal protective equipment (PPE) when operating hydraulic equipment. The operator must take precaution against injury due to failure of the tool or work piece(s)
- All personnel must be clear before lowering load or depressurising the system

IMPORTANT:

- If at any stage, the safety related decals become hard to read, these must be replaced
- Minimum age of the operator must be 18 years. The operator must have read and understood all instructions, safety issues, cautions and warnings before starting to operate the equipment. The operator is responsible for this activity towards other persons

3.1 Air Bag

- **Do NOT** lift with more than two air bags stacked upon each other
- Air bags need to be transported with the inflation nozzle facing upwards to avoid impact damage to the inflation mechanism
- Large, heavy air bags are to be carried by at least two persons
- Heat and temperatures exceeding the permissible level can damage the air bag. If the surface temperature of the object to be lifted exceeds 55^{o}C, the part of the air bag that is in contact with the object is to be protected by fibreboard
- It is important that the work area is well illuminated
- **Do** use a gauge or other load measuring instrument to verify load

- **Do NOT** exceed the rated capacity of the air bag or any equipment in the system. Burst hazard exists if connection pressure exceeds rated pressure
- **Do NOT** operate the system with bent or damaged couplers or damaged threads
- **Do NOT** subject the air bag and its components to shock loads
- Use only Durapac approved accessories and components
- **Do NOT** overload equipment. Overloading can cause equipment failure and possible personal injury

FAILURE TO HEED THESE WARNINGS MAY RESULT IN PERSONAL INJURY AS WELL AS PROPERTY DAMAGE.

4.0 Installation

⚠ **IMPORTANT:** Always secure threaded port connections with high grade, non-hardening pipe thread sealant. Teflon tape can be used if only one layer of tape is used and it is applied carefully, two threads back, to prevent the tape from being introduced into the system, which could cause jamming of precision-fit parts

Familiarise yourself with the specifications and illustrations in this owner's manual. Know your air bag, its limitations and how it operates before attempting to use. Refer to the specification chart below or if in doubt, contact a Durapac representative.

Model No.	Max. Lifting Capacity (kg)	Max. Lifting Height (mm)	Thickness (mm)	Insertion Height (mm)	Dimensions (mm x mm)	Max. Air Requirment (L)	Max. Inflation Preassure (bar)	Min. Burst Preassure (bar)	Weight (kg)
KPL 1	**800**	80	25	26	150 x 150	5	8	32	0.55
KPL 3	**2,700**	130	25	26	225 x 225	15	8	32	1.25
KPL 6	**5,500**	160	25	26	300 x 300	42	8	32	2
KPL 10	**10,100**	210	25	26	380 x 380	86	8	32	3.5
KPL 14	**13,500**	250	25	26	450 x 450	152	8	32	5
KPL 21	**21,100**	300	25	26	550 x 550	296	8	32	7
KPL 25	**25,200**	340	25	26	610 x 610	416	8	32	9
KPL 33	**33,000**	380	25	26	690 x 690	621	8	32	11
KPL 45	**44,600**	420	25	26	780 x 780	921	8	32	14
KPL 55	**55,000**	470	25	26	870 x 870	1,305	8	32	18
KPL 70	**70,400**	520	25	26	945 x 945	1,505	8	32	22.5

4.1 Inflation System Overview

4.1.1 Prior to using the air bag, set the pressure to 8 bar using the pressure reducing valve. Ensure the two filling valves on the dual controller are closed.

4.1.2 Connect the air bag to the distribution pipes and set it to the correct lifting position. Open left or right filling valve on the dual controller.

4.1.3 Using the pressure gauge, check the working pressure and the air bag operation at inflation. Once lifting or separating is complete, close the filling valve on the controller (see Figure 1).

4.1.4 To release the air, open the safety valve on the dual controller.

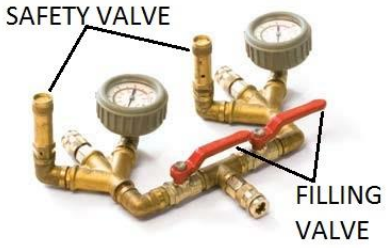


Figure 1 – Dual Safety Controller

4.1.5 Remove the air bags from the site of use, disconnect, press out the remaining air and clean the air bags.

⚠ When using Durapac air bags, **always** use the combination of controller, inflation hose and air bag in order to stay within the permissible inflation pressure. **Do NOT** connect the pressure reducer directly to the air bag

- Controllers are equipped with safety valves and pressure gauges which are calibrated to the corresponding pressure area
- The controller pressure gauges indicate the internal pressure in the air bags and possible incorrect inflation procedures
- Inflation hoses are of different colours to simplify the connection to the controller
- The inflation hoses are equipped with couplings with double guards; they only open if the male part of the coupling is drawn and the protecting ring of the female part is pulled back simultaneously (see Figure 2)

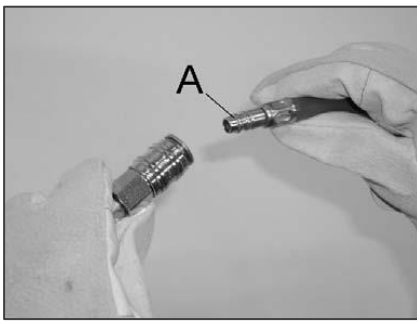


Figure 2 – Couplings with Double Guards

4.2 Air Supply

Any air source not exceeding the relative test pressure of 12 bar may be used to inflate the air bags. If the inflation pressure exceeds 12 bar, a pressure reducer should be applied.

The air bags may also be activated by the inflation pressure lower than 8 bar but it will not be possible to reach the maximum lifting capacity.

If compressed air contains oil, use an oil separator.

4.3 Use of a Compressed Air Bottle, 200 or 300 bar

4.3.1 Connect the pressure reducer by a threaded nipple to the compressed air bottle.

4.3.2 Close the air outlet by turning a regulating screw (C) on the pressure reducer (see Figure 3).

4.3.3 Open the compressed air bottle valve (A). The pressure gauge (B) indicates the pressure in the bottle.

4.3.4 Adjust the outlet pressure using regulating valve (D) to the value of 10 to 12 bar, which is shown on the pressure gauge (E). Repeatedly open (C)

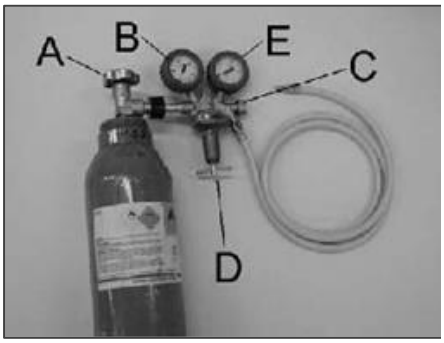


Figure 3 – Compressed Air Bottle

⚠ **IMPORTANT: Always** connect the air supply hose on the pressure reducer with the controller. Insert the male part into in the female part and press to connect. **Do NOT** connect the pressure reducer directly to the air bag

4.4 Increasing lifting height or weight capacity

- Stacking two air bags (one upon another) will increase lifting **height** capacity
- A side by side arrangement will increase lifting **weight** capacity
- With two air bags stacked, the combined weight-lifting capacity of the bags is equal to the **weight** lifting capacity of the **smaller air bag**
- Figure 4 (below) shows two air bags, placed side by side on cribbing foundations. The first air bag can lift 8 tons, the second can lift 12 tons. Individually, neither bag can lift the load of 15 tons. However, when side by side, and inflated together at the same time, they are able to lift 20 tons.

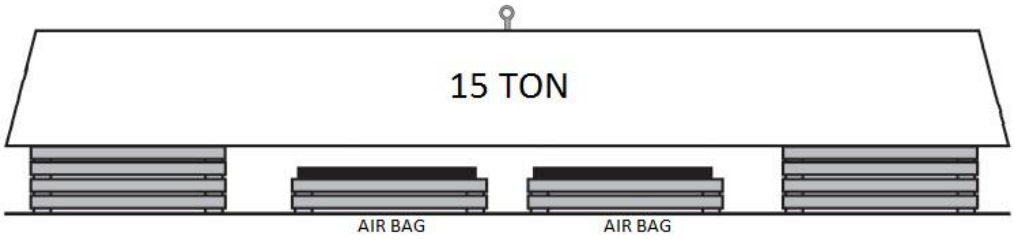


Figure 4 – Increased Lifting Weight Capacity

5.0 Operation

IMPORTANT:

- Clean the work area of all glass fragments and other foreign particles, which might damage the air bag
- If the air bag is to be used on a smooth or slippery surface, sprinkle the surface with sand or other suitable, granulated material. If the air bag is to be used on soft ground,

a solid support of fibreboard should be placed under the air bag

5.1 Lifting Air Bags with the AB-3 Controller

5.1.1 Connect the controller by the air supply hoses with the air bags (using different colours).

5.1.2 Insert the nipple (A) in the female part of the coupling with a double guard and press to connect (see Figure 2 above).

5.1.3 Connect the air supply from the compressed air bottle with the controller. If any other compressed air sources are used, adjust the inlet pressure to the maximum of 12 bar or use a pressure reducer.

5.1.4 Inflate the air bags by pulling the lever (A) on the controller (Figure 5).

5.1.5 Check the pressure gauges (B), which indicate the current pressure and load in the air bags.

5.1.6 When the required height or the maximum relative operating pressure of 8 bar is reached, interrupt the inflation by releasing the lever.

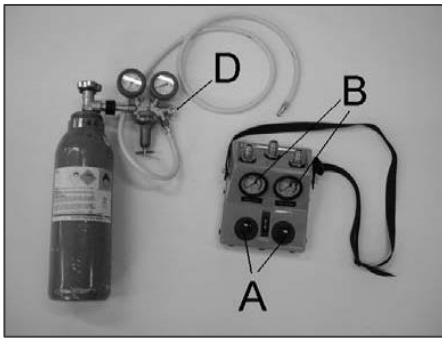


Figure 5 – AB-3 Controller

5.1.7 The lever automatically returns to the neutral position (position of safety guard). If the pressure in the air bag exceeds 8 bar, it is automatically released by the safety valve.

5.1.8 Use lever (A) for deflating the bag or lowering the load.

5.1.9 When the lifting procedure is completed and the load fixed, shut the regulating valve (D) on the pressure reducer.

5.1.10 Release the inflation hose pressure by quickly pushing the lever.

5.2 Lifting Air Bags with Standard Single and Dual Controllers

5.2.1 Use air supply hoses of different colours to connect the standard single or dual controller with one or more air bags.

5.2.2 Insert the nipple (A) in the female part of the coupling with a double guard and press to connect (see Figure 2 above).

5.2.3 Connect the compressed air supply from the compressed air bottle with a controller. If any other compressed air sources are used, adjust the inlet pressure to the maximum of 12 bar or use a pressure reducer.

5.2.4 Inflate the air bags by opening the ball valve (A) on the controller (C) (see Figure 6).

5.2.5 Check the pressure gauges (B), which indicate the current pressure in the air bag(s) and the load.

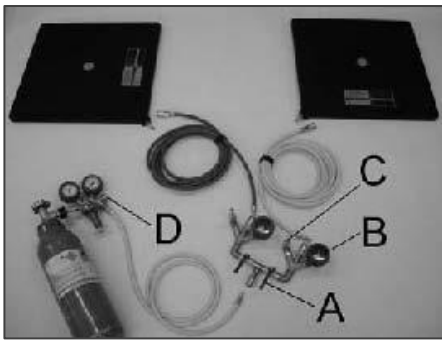


Figure 6 – Standard Controller

5.2.6 When the required height or the maximum relative operating pressure of 8 bar is reached, interrupt the inflation by shutting the ball valve (A). If the pressure in the air bag exceeds 8 bar, it is automatically released by the safety valve.

5.2.7 When the lifting procedure is completed and the load fixed, shut the regulating valve (D) on the pressure reducer.

5.2.8 Release the inflation hose pressure by quickly opening the ball valve (A).

5.2.9 If you wish to empty the bag or lower the load, turn the outlet valve left.

5.3 Use of other Compressed Air Sources

⚠ If the maximum pressure of compressed-air exceeds 12 bar, use the pressure reducer and reduce the pressure to approximately 12 bar.

There are various adapters available for applying other sources of compressed air (see Figure 7).

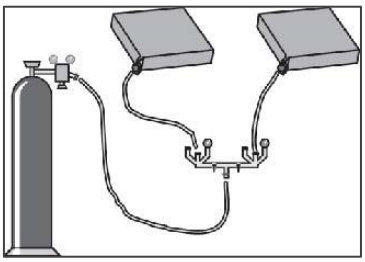


Figure 7 – Other Compressed Air Sources

5.4 Lifting Using a Single Air bag

5.4.1 Position the air bag in a prearranged place or on a constructed foundation (see Figure 8).

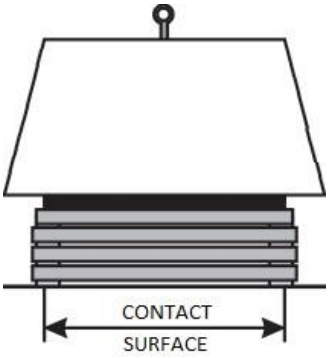


Figure 8 – Initial Surface Contact

NOTES:

- A fully empty air bag contains very little air
- Air bags can be protected from sharp objects using flexible or non-flexible mats
- When placing an air bag on the ground, cribbing, mats or other surfaces, consider the effect of the weight on the entire supporting surface structure. Be certain the surface structure will be able to support the total weight without significant distortion or displacement

5.4.2 During the inflation, as the air bag fills and develops a spherical shape (see Figure 9), the air column and lifting height are increasing, while the surface contact between the air bag and object is decreasing. This will result in less lifting force as the height increases.

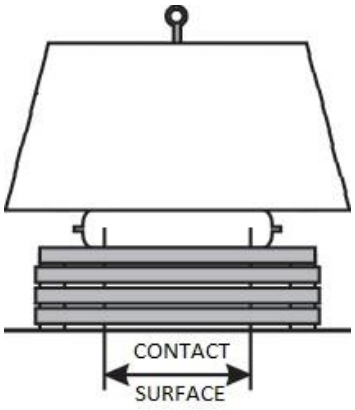


Figure 9 – Partial Fill / Contact Surface

⚠ Maximum force can be attained only at the beginning of inflation, when the lifting height is low and maximum surface area is in contact with the load

⚠ The amount of weight that can be lifted is directly related to the amount of surface area in contact with the load. For further details, see the Lifting Capacity vs Lifting Height Graph shown in Section 1.0 Product Information

5.4.3 When the air bag is fully inflated, the contact surface and lifting capacity reach their minimum and the lifting height its maximum (see Figure 10).

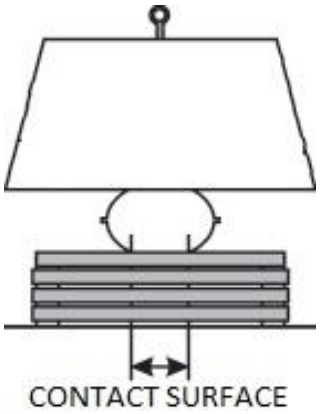


Figure 10 – Min. Contact Surface/Max. Lifting Height

5.4.4 When there is more than a 70mm space between the ground and the object to be lifted, a firm, high enough foundation should be built, leaving just enough space to insert the deflated bag(s) (see Figure 11).

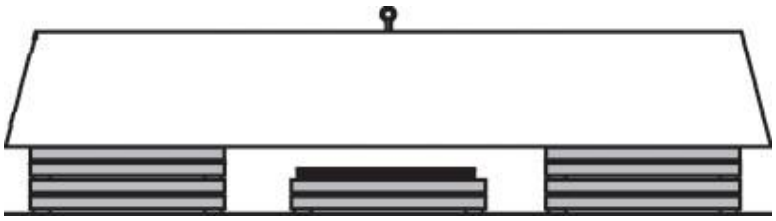


Figure 11 – Raised Foundation & Additional Supports

⚠ The upper surface of the foundation should be without any gaps, to fully support the air bag during inflation.

5.4.5 On each side of the air bag foundation, additional safety supports, such as cribbing, matting or blocking, (or a combination of all) should be used (see Figure 11). This reduces the height from which the object could fall in case of a loss of air in the air bag or malfunction of the inflation system.

5.4.6 The air bag should be placed in the middle of the foundation. The inflation nozzle should be pointing to the front (left or right side). Ensure that the air bag surface lies against the lower surface of the object. Insufficient contact surface area can cause the object to slide during inflation or the air bag to become dislodged.

5.4.7 Inflate the air bag to achieve the required height then add safety supports as high as possible (see Figure 12).

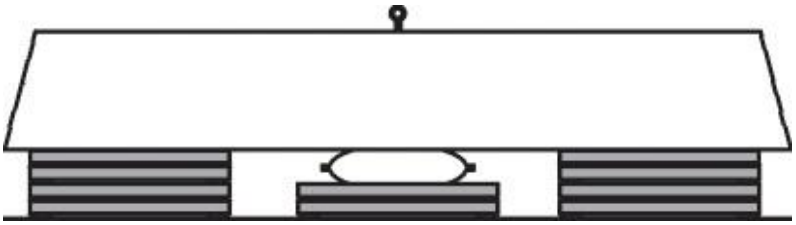


Figure 12 – Additional Supports

⚠ Safety supports should be built incrementally with the air bag inflation.

5.4.8 To lower the load, slowly deflate the air bag, allowing the object load to rest upon the safety supports. Progressively remove the air bag supports.

5.5 Lifting Using Two Air bags

⚠ Up to two air bags can be stacked in order to increase lifting height

5.5.1 Construct a foundation, as per single bag use.

5.5.2 Place the larger air bag at the base and the (next sized) smaller bag on top and in the centre of the larger one. Ensure that the inflation nipples for both bags are facing the same direction, front right or left (see Figure 13).

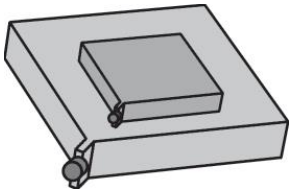


Figure 13 – Placement of two Air Bags

5.5.3 Inflate the lower, larger air bag first, so as to allow the smaller (upper) one to touch the object to be lifted.

5.5.4 Fully inflate the upper air bag and if necessary, further inflate the lower air bag, until the required lifting height is achieved. Safety supports are to be added under the load with care.

5.5.5 When lowering, slowly empty the top air bag first, then the lower bag.

5.6 Lifting Objects with Unusual Shapes

5.6.1 Small Contact Surface Area – When lifting objects such as beams or pipes, a steel plate or fibreboard must be placed between the air bag and the object before lifting *(see Figure 14).*

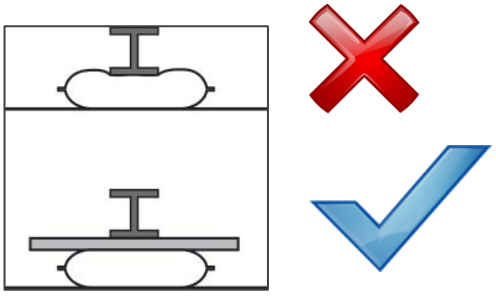


Figure 14 – Small Contact Surface Area

5.6.2 Large Cylindrical Object – Lifting objects such as a tank may require two air bags, side-by-side (see Figure 15). The object needs to be firmly fastened to prevent it shifting and/or rolling away. Inflate both bags at the same time to minimize danger.

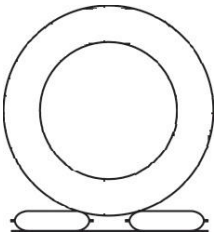


Figure 15 – Large Cylindrical Object

5.7 Separating and Pushing using Air Bags

Air bags can also be used to separate and move objects. Ensure that the air bag is reclined against a rib, pillar or another tough ridged element or fibreboard is used between the air bag and the object if the object's walls may be damaged by the pressure of the air bag (see Figure 16).

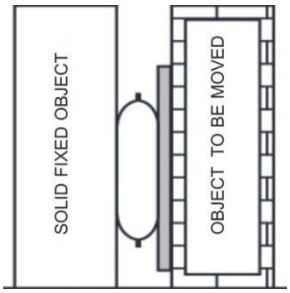


Figure 16 – Separating and Pushing using Air Bags

5.8 Cleaning after Use

An air bag needs to be cleaned after each use. Please follow the steps in 6.1 – Cleaning an Air Bag in the Maintenance Section.

5.9 Checking after Use

⚠ An air bag needs to be put out of operation if a cut or hole is identified in the air bag and the armature is visible. Due to safety reasons, an air bag in this state is **NOT** allowed to be repaired.

5.9.1 When dry, check the air bag for air blisters, notches or worn out segments.

5.9.2 Check the nozzle for any damage and replace if necessary following the steps shown in the Air Bag Nozzle Repairs table in the Maintenance Section.

5.9.3 Starting with the pressure of 0.5 bar, carefully inflate the air bag to check for damage. If there are no visible damages, increase the pressure to 4 bar and repeat the visual check-up. Mark any damage or defects with chalk and contact a Durapac authorised service centre.

5.9.4 Deflate air bag and store following the steps in 6.3 – Storage in the Maintenance Section.

6.0 Maintenance

IMPORTANT:

- An air bag should not be used for more than 15 years. Although a visual check-up may show that the air bag is in good condition, they are made from rubber and so exposed to aging
- Tighten connections as needed. Use non-hardening pipe thread compound when servicing connections

Maintenance is required when wear or leakage is noticed. Periodically inspect all components to detect any problem that may require service and maintenance.

6.1 Cleaning an Air Bag

6.1.1 With the air bag in an upright position with the nozzle at the top, the air bag is to be knocked against the floor to shake off any dirt.

6.1.2 Wipe metal parts using a soft cloth.

6.1.3 Check the opening in the nozzle; remove any dirt using a thin piece of wire. Care needs to be taken to ensure that the dirt is drawn out and not pushed inside the air bag.

6.1.4 To remove stubborn dirt from the air bag surface, use a brush with hard bristles. Move the brush in all directions. Do not use sharp objects to remove dirt from the air bag surface.

6.1.5 Soak any spots with a light solution of warm water a mild detergent (eg. dishwashing detergent) and a brush to remove any remaining dirt.

6.1.6 Rinse the air bag surface with cold, fresh water. A strong water jet should remove all the dirt and detergent which might have remained on the air bag surface.

6.1.7 With the upright position, wipe the nozzle using a clean cloth.

6.1.8 Let the air bag air dry. Do not use a drier or place the air bag close to a source of heat to speed up the drying process.

6.2 Sequence of Check-ups

6.2.1 Visual and operational.

6.2.2 Air supply hoses and couplings.

6.2.3 Safety valves, couplings and pressure gauges on controllers.

6.2.4 Pressure reducer operation.

6.2.5 Air bag nozzles.

6.2.6 Mark with chalk any damage or defects identified during the cleaning process and if not listed below in Air Bag Nozzle Repairs, then contact a Durapac authorised service centre.

6.3 Storage

6.3.1 Store in a clean, dry environment. Avoid temperature extremes.

6.3.2 An air bag may be stored in either a vertical or horizontal position but the nozzle must always face out/up so that it will be seen, can be shielded by hand and protected from damage when next used.

6.3.3 For transportation, carry air bag with the inflation nozzle facing upwards to avoid impact damage to the inflation mechanism.

Air Bag Nozzle Repairs

Air bag nozzle replacement; using a corresponding key, unwind the damaged nozzle. Be careful not to move the threaded section. Rewind on a new nozzle.

Removal of ice; use a quick defrosting spray or manually warm the nozzle. Use protective gloves.

Removal of foreign particles; remove any dirt using a thin piece of wire. Care needs to be taken to ensure that the dirt is drawn out and not pushed inside the air bag.