



Flexible Packers

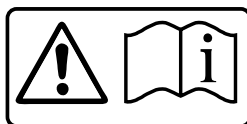
Product Manual



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WARNING: Carefully read this manual before operating.

NOTICE: The manufacturer takes no responsibility for the consequences of actions not complying with the instructions given in this manual.

1. INTRODUCTION & OVERVIEW

1.1. PURPOSE

This manual outlines the safe storage, handling, and operation of the Leak-Away™ Flexible Packer range from MFC International, used for point pipe repair of damaged pipelines with suitable resin-soaked fabrics.

1.2. OVERVIEW OF FLEXIBLE PACKERS

Flexible Packers provide an easy-to-use no-dig solution for point repairs to pipelines when a crack is detected. A flexible packer consists of an inflatable outer tube composed of natural/polybutadiene (NR/BR) rubber, securely fitted to aluminium end caps. The end caps have an integral female pneumatic coupling (Type KD25) to connect the Flexible Packer to a compressed air supply for inflation. Larger flexible packers incorporate a bypass hose in the centre, allowing water to flow through the packer during the repair process.

To conduct a repair, wrap the packer with a combination repair patch comprising textile sheeting impregnated with epoxy resin. Insert the packer into the pipe and position it so that the damaged area is in the middle of the packer. Inflate the packer until the repair patch is compressed against the inside surface of the pipe. The repair patch is then allowed to cure. Once cured, deflate and withdraw the Flexible Packer. The cured repair patch remains in place, effectively sealing the breach.

Leak-Away Flexible Packers are suitable for patch repairs in pipes ranging from 100mm to 600mm in diameter, with repair lengths ranging from 850mm to 4900mm. The wheel system of the flexible packer allows easy positioning along the pipe. Flexible Packers bend, allowing them to fit through features such as manholes easily. They are available in a range of diameters and can be fitted inside ruptured pipes of various sizes quickly and efficiently.

Flexible Packers are suitable for use on PVC, steel, concrete or clay pipes that are either above ground or accessible via manhole covers. Take extra care when locating and fitting packers when they are used on underground pipes. Refer to section 4.3 for instructions on how to locate the Flexible Packer correctly within a manhole opening. Do not use Flexible Packers in any application or condition not described in this document.

Read these instructions carefully before attempting to use the flexible packer system.

1.3. TECHNICAL DATA

Flexible packers are available in a range of lengths and diameters. The data associated with each flexible packer specification is shown on the table below.

Product Code	Size (mm)	Minimum Usable Size. (mm)	Maximum Usable Size (mm)	Working Pressure (bar)	Diameter of Deflated Packer [ØPK] (mm)	Length of Deflated Packer (mm)	Weight (kg)	Rubber Length [L _r] (mm)	Bypass Dia. (female)
PFL101510/001	100-150 x 1.0	100	150	2.5	65	1080	2.1	1000	N/A
PFL101515/001	100-150 x 1.5	100	150	2.5	65	1580	2.5	1500	N/A
PFL101520/001	100-150 x 2.0	100	150	2.5	65	1980	2.8	1900	N/A
PFL101525/001	100-150 x 2.5	100	150	2.5	65	2580	3.3	2500	N/A
PFL101530/001	100-150 x 3.0	100	150	2.5	65	3080	4.2	3000	N/A
PFL101540/001	100-150 x 4.0	100	150	2.5	65	4080	5.0	4000	N/A
PFL101550/001	100-150 x 5.0	100	150	2.5	65	4980	6.0	4900	N/A
PFL152510/001	150-250 x 1.0	150	250	2.0	112	1080	8.0	1000	2"
PFL152515/001	150-250 x 1.5	150	250	2.0	112	1580	9.5	1500	2"
PFL152520/001	150-250 x 2.0	150	250	2.0	112	1980	11.0	1900	2"
PFL152525/001	150-250 x 2.5	150	250	2.0	112	2580	14.3	2500	2"
PFL152530/001	150-250 x 3.0	150	250	2.0	112	3080	15.2	3000	2"
PFL152540/001	150-250 x 4.0	150	250	2.0	112	4080	17.2	4000	2"
PFL152550/001	150-250 x 5.0	150	250	2.0	112	4980	21.4	4900	2"
PFL203010/001	200-300 x 1.0	200	300	1.5	210	1080	11.3	1000	2"
PFL203015/001	200-300 x 1.5	200	300	1.5	210	1580	12.3	1500	2"
PFL203020/001	200-300 x 2.0	200	300	1.5	210	1980	13.3	1900	2"
PFL203025/001	200-300 x 2.5	200	300	1.5	210	2580	14.3	2500	2"
PFL203030/001	200-300 x 3.0	200	300	1.5	210	3080	15.2	3000	2"
PFL203040/001	200-300 x 4.0	200	300	1.5	210	4080	17.2	4000	2"
PFL203050/001	200-300 x 5.0	200	300	1.5	210	4980	19.1	4900	2"
PFL304010/001	300-400 x 1.0	300	400	1.5	210	1080	19.2	1000	3"
PFL304015/001	300-400 x 1.5	300	400	1.5	210	1580	21.6	1500	3"
PFL304020/001	300-400 x 2.0	300	400	1.5	210	1980	25.0	1900	3"
PFL304025/001	300-400 x 2.5	300	400	1.5	210	2580	30.0	2500	3"
PFL304030/001	300-400 x 3.0	300	400	1.5	210	3080	33.0	3000	3"
PFL304040/001	300-400 x 4.0	300	400	1.5	210	4080	41.5	4000	3"
PFL304050/001	300-400 x 5.0	300	400	1.5	210	4980	47.0	4900	3"
PFL456010/001	450-600 x 1.0	450	600	1.2	340	1080	34.5	1000	3"
PFL456015/001	450-600 x 1.5	450	600	1.2	340	1580	36.6	1500	3"
PFL456020/001	450-600 x 2.0	450	600	1.2	340	1980	41.6	1900	3"
PFL456025/001	450-600 x 2.5	450	600	1.2	340	2580	50.0	2500	3"
PFL456030/001	450-600 x 3.0	450	600	1.2	340	3080	53.0	3000	3"

1.3.1. Calculating the contact length

The contact length of the packer with the pipe will depend on the diameter of the pipe, the diameter of the packer and the length of the packer. This can be calculated using the formula below:

$$CL = L_P - 20 - \left(\pi^* \left(\frac{\varnothing P - \varnothing PK}{2} \right) \right)$$

Where:

CL	Contact Length (mm)	ØP	Diameter of the pipe being repaired (mm)
Lp	Rubber length of deflated packer (in mm)	ØPK	Diameter of deflated packer (mm)
π	Pi (3.14)		

Example:

For model number PFL101530/001, a 100-150mm 3m long packer with a deflated diameter of 65mm, if this is used in a 125mm pipe the contact length can be calculated as follows

$$\begin{aligned} CL &= 3000 - 20 - \left(3.14^* \left(\frac{125-65}{2} \right) \right) \\ &= 2885.8\text{mm} \\ &= 2.89\text{m} \end{aligned}$$

2. STORAGE

2.1. TEMPERATURE RANGE AND ORIENTATION



Flexible packers should be stored flat and away from direct sunlight. The storage temperature should ideally be between +5° and +25°C (41 to 77°F).

Flexible packers should always be stored in a horizontally or hung vertically from eye-bolts to protect the inflation connectors, wheels, and eye-bolts against mechanical and abrasion damage. For shipping, packers may be folded or have the air sucked out of them, but as soon as they are received they should be unpacked, laid flat and allowed to 're-inflate' back to atmospheric pressure.

3. SAFETY AND PERSONAL PROTECTIVE EQUIPMENT

Leak-Away Flexible Packers are intended to be used at pressure and with fibreglass and resin materials. Therefore, a number of safety considerations should be observed, and appropriate Personal Protective Equipment worn while using the equipment.

Condition

Background information



The system employs both glass fibre matting and epoxy resin. Gloves should be worn when handling these products.



The system employs both glass fibre matting and epoxy resin. Suitable eye protection should be worn.



Flexible Packers are heavy. Protective footwear must be worn.



Ear plugs or defenders should be worn during inflation, deflation and while the packer is pressurised.



High Pressure Equipment. Follow safety rules.



The system contains glass fibre and epoxy resin. Do not ingest.



Ensure that you comply with regulations on the use of resins for pipeline repair and rehabilitation.

3.1. NOTE: Leak-Away packers and associated equipment operate at high pressure and should only be used by competent, trained personnel.

3.2. UNSAFE CONDITIONS

The flexible packer should never be used in an unsafe condition. Such conditions may arise with (but are not limited to) the following:

- Incorrect use of the Flexible Packer (see 4.4).
- Operation of the flexible packer using defective equipment.
- Operation of the flexible packer with damaged couplings, or with couplings that are incorrectly connected or not fully functional.
- Connecting equipment with the incorrect coupling type
- Not following the guidance contained in these operating instructions with respect to storage, operation and maintenance of the flexible packer.
- Failure to inspect accessories or parts subject to wear prior to use.
- Any previous maintenance and repair work that has been incorrectly carried out.
- Pipes that have not been properly prepared for repair (see 6.1 & 6.2).

3.3. INFLATION EQUIPMENT

- Packers should only be inflated with compressed air from an appropriately rated source (e.g. compressor) which is free of oil and other contaminants. **The compressed air source should not exceed the maximum working pressure of the controller.**
- Packers should only be inflated using the appropriate Leak-Away controller, or other approved controller with the appropriate pressure rating
- **NOTE:** If not constrained within a pipe, Flexible Packers should only ever be inflated to a maximum of 0.5 bar for a safety inspection.

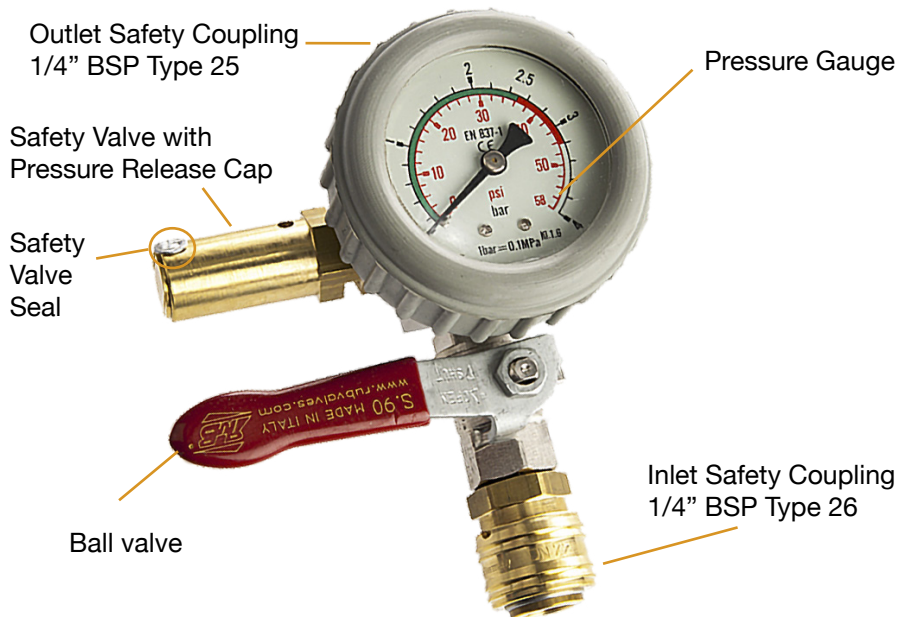
3.3.1. Leak-Away Hoses

- MFC International manufacture a range of Leak-Away connecting hoses compatible with Leak-Away flexible packers and Leak-Away controllers.

3.3.2. Leak-Away Controller

- Leak-Away controllers consist of a ball valve, pressure gauge, inlet and outlet safety couplings and a pressure release safety valve that corresponds to the maximum permitted operating pressure of the packer (see 1.3. Technical Data). Ensure you are using a controller with the correct working pressure for your chosen packer. If the maximum operating pressure is exceeded, the safety valve will release.
- Leak-Away controllers are available in a range of different operating pressures, always select a controller with the appropriate operating pressure for the chosen packer. The pre-set pressure in the controller must not be changed.

- Should the seal on the upper part of the safety valve be removed, safe operation can no longer be guaranteed and the valve must be replaced. The working pressure range of the controller (indicated in green on the pressure gauge) must not be exceeded.



Leak Away Controller (2.5 bar)

4. PREPARATION FOR USE

4.1. SAFETY PRECAUTIONS



Read and familiarise yourself with these instructions prior to using the product.

4.2. DISPOSAL OF PACKAGING



The outer packaging is made from fully-recyclable cardboard, and should be disposed of in recycling bins marked for this kind of material. The protection sleeves for the end caps should be recycled with plastics.

4.3. INSPECTION OF THE FLEXIBLE PACKER

Prior to use, the Flexible Packer should be fully inspected for damage. If the packaging has been damaged, the packer should be checked for mechanical or chemical damage, including tears, bubbles, and evidence of the fabric lining showing through the rubber sleeve. Particular attention should be made to the mechanical parts, including the condition of the pneumatic fittings and the stainless-steel plug/rubber sleeve interface.

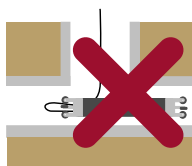
Check that the inflation coupling is free from damage and that the locating wheel sets turn normally. Ensure that the controller and connection hoses do not show any signs of damage or wear.

4.4. POSITIONING THE FLEXIBLE PACKER.

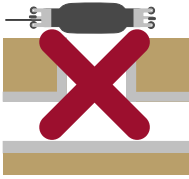
Most applications for flexible packers involve positioning them through man hole's and into underground piping. Depending upon the length of packer selected for the repair, this may represent a significant issue and it is essential that the packer is fitted in the correct way.



Never allow the flexible packer to rest in an upright position as this may cause damage to the end fixtures and fittings.



Never allow the pneumatic pipe attached to the flexible packer to become trapped or twisted.



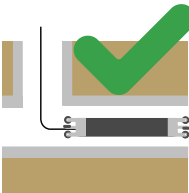
Never inflate the flexible packer when it is not inserted into a pipe for repair (except for periodic maintenance and inspection at low pressure, as detailed in section 7.2).



Do not bend the packer over sharp corners or flex it to such an extent that it becomes difficult to push/pull into position.



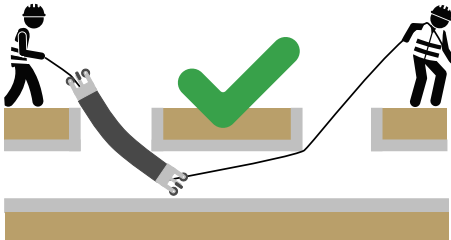
Do not allow the flexible packer to be abraded against hard surfaces or sharp edges, or to drag against the ground when moving/positioning



Always ensure that the flexible packer is positioned horizontally and that the pneumatic hose attached is free from kinks and sharp changes in direction.



Always position a flexible packer with the aid of a work colleague.



Position the flexible packer from above ground wherever possible, ensuring that it doesn't get damaged. Take care to avoid dragging the packer over sharp edges or corners.

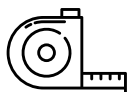
5. SAFETY WARNINGS

5.1. INFLATION

The flexible packer is intended for inflation while constrained within a pipe only. If the flexible packer needs to be leak tested or otherwise inflated while outside of a constraining pipe, it should only be inflated to a maximum of 0.5 bar pressure, and fully deflated before use.

5.2. OPERATIONAL CONSIDERATIONS

5.2.1. Packer Selection



Only use a flexible packer of the correct size for the intended repair. Section 1.3 shows the pipe diameter range for which each packer model can be used, together with the contact surface for the maximum pipe diameter (see 1.3.1). **DO NOT use a flexible packer in a pipe diameter that is narrower or wider than the quoted working range - using a packer of the incorrect size can damage the packer.**

5.2.2. Handling



Flexible packers should be carried either vertically or horizontally. When carrying vertically ensure the inflation connector always faces upwards to prevent damage in case the packer drops

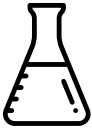
Flexible packers are available in a variety of sizes and weights. Packers under 20kg in weight can be carried by one person, but longer lengths may require two people to manoeuvre the product safely. Products over 20kg in weight will require a minimum of two people to carry.

5.2.3. Working Temperature Range



Leak-Away Flexible packers can be used in pipes with surface temperatures between -20°C (-4°F) and $+80^{\circ}\text{C}$ (176°F). Use outside this temperature range may damage the packer and lead to a product failure.

5.2.4. Chemical Resistance



Leak-Away Flexible Packers are resistant to sewage and domestic waste water. If you suspect that other more aggressive chemicals may be present, contact MFC International for advice (see the contact number at the back of these instructions).

5.2.5. Area of Operation



Packers are operated at pressure. Only appropriately trained personnel should be in the working area and this number should be kept to the safe minimum. Working areas should be well lit, well ventilated and free from other hazards.

6. USING THE FLEXIBLE PACKER

6.1. PRE-INSTALLATION INSPECTION OF WORK AREA

Always visually inspect the inside of the pipe section to be repaired using an extendible CCTV camera or endoscope. Inspect the area to identify any conditions that may prevent proper installation of the repair (see below) and pay attention to the cleanliness of the contact area where adhesion will take place. Consult your Leak-Away representative if necessary.

Issues that can prevent proper installation

- Pipe not cleaned or obstructed (full of dirt/soil or roots)
- Pipe contains sharp debris/fragments (packer can burst)
- Incorrect packer diameter (either pipe too big or packer too small)
- Pipe sections not in-line
- Excessive water flow (divert the water)

6.2. CLEANING AND MARKING OF THE PIPE.

Insert the camera or endoscope into the pipe and place the head of the camera at the centre of the damaged area. Stop the camera and attach a piece of tape to the camera cable at the entry point into the pipe. In the next step this tape mark will be transferred to the push rods, cable or air hose to indicate the distance to position the centre of the damaged area. Clean the internal walls of the pipe using a detergent cleaner and clean water.

Prior to installation of the repair, clean the pipe by removing all debris, solids, plant roots, other deposits and any sharp edges that could puncture or indent against the packer during installation. Visually inspect the pipe again to be sure it is ready to be repaired.

6.3. PREPARING TO INSERT THE FLEXIBLE PACKER

If using push-rods to position the packer, connect the push-rod (plug) to the flexible packer quick coupling socket. Assemble the necessary number of push-rods to the flexible packer, locking each connection together using the locking ring on each coupling socket to prevent accidental disconnection within the pipe. Place the camera head at the centre of the packer and transfer the measurement from the camera cable to the assembled push-rods.

If you are using a cable for positioning the packer, attach the cable to the towing point and lay the cable out in a straight line away from the towing point, in line with the packer. Place the camera head at the centre of the packer and transfer the measurement from the camera cable to the towing cable.



6.4. TEST THE FLEXIBLE PACKER FIT

In a convenient, open space, place the flexible packer inside a piece of plastic pipe of the same diameter as the pipe to be repaired. Inflate the packer until reference lines for the maximum repair length at the maximum pipe diameter are tight within the pipe and note the pressure used (in BAR). This is the minimum pressure you will need to use for the point repair process (see caution note in **Section 6.7.5**). **Note:** this process needs to be carried out for each repair as the pressure required will change over the life of the packer.



Max repair length at min pipe diameter	Max repair length at max pipe diameter	Centre Line	Max repair length at max pipe diameter	Max repair length at min pipe diameter
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Allow the packer to dwell fully inflated inside the test pipe for five minutes to allow for settling. After five minutes, fully deflate the packer via the regulator relief valve (leave just enough air in the packer that it maintains its shape when deflated, this will make it easier to handle during the preparation stages).

Check the push rods or air hose to verify that there are no restrictions to air flow. Consult your Leak-Away representative if you have any equipment testing questions.

6.5. TRIAL RUN

Place the protective polythene sheet over the packer. Secure the sheet to the ends of the packer with the adhesive tape provided. Push the flexible packer without a repair patch to the point in the pipe to be repaired (as marked on the push-rods). Verify that the packer can reach the area to receive the repair.

⚠ WARNING: DO NOT INFLATE THE FLEXIBLE PACKER AT THIS POINT!

Once you have established that the flexible packer can safely reach the area to be repaired, pull the packer out of the pipe using the pull cable and proceed to the next step.

6.6. LAY OUT THE REPAIR MATERIALS

Prior to use, the repair materials should be laid out and inspected.

- Clear the work area of any unnecessary items and materials. The preparation of the patch repair should only be performed on a flat, tidy, surface (Fig. 1).
- Ensure that all materials required for the repair are complete and easily accessible (Fig. 2 & 3). You will need the fibreglass sheet patch, resin, gloves a spreader, adhesive tape, tie wraps, scissors and polythene sheeting (used for wrapping the packer and as a work surface).
- If applicable, join tie-wraps together to make them long enough to go around the wrapped packer. The largest diameters of flexible packers may require several tie-wraps to comfortably fully-encompass them. Ensure that these are ready, should you need them.



Fig. 1 Lay out a clean polythene sheet on a flat surface to work on.



Fig. 2 Unpack the fibreglass sheets and resin bags and necessary tools.



Fig. 3 Lay out the fibreglass sheets ready for the application of the resin.

6.7. PREPARE THE PACKER

6.7.1. Tape the protective polythene sheet.

Replace the protective polythene sheet around the packer from the trial run. **DO NOT REUSE THE PROTECTIVE SHEET.** Using the tape provided, secure the protective sheet to the ends of the packer. Take care that the taped ends do not restrict inflation or water flow. Place 2 small slits in the sheet at each end of the packer to provide a means for air to escape the protective sheet during the inflation of the packer.



Fig. 4 Placing tape around the ends of the flexible packer.

6.7.2. Mix the resin

The resin is delivered in sealed bags and may be activated by either removal of the inner pin from the outer pin (pin type) or by breaking the inner seal (heat seal type). Identify which type of resin bags you have before activating them (Fig. 5) and mixing the components within the sealed bag.



Fig. 5 Activate your resin pack and massage it from the outside for at least one minute to ensure that it is fully mixed.

6.7.3. Applying the resin to the fibreglass

Lay out the fibreglass sheeting and prepare it for the resin coating.

Cut off a corner of the bag containing the resin and pour half of the mixed resin on to the biaxial (smoother) side of the fibreglass matting (depending on the type of matting both sides may be smooth, in which case you can start with either side).

Using the spreader provided, spread the resin to evenly saturate the fibreglass mat (Fig. 6). Flip the entire mat over to the chop strand (rough) side. Pour the remaining resin on the mat and spread out evenly. Remove excess resin by gently scraping it to the side.



Fig. 6 Pour the well-mixed resin onto the fibreglass matting and spread out evenly.

Fold the right side of the mat over as shown (Fig. 7), taking the edge to the centre line of the mat. Fold the left side over so that the left edge butts up to the right edge in the centre of the matting (see illustration below) - the chop side of the mat should now be covered completely. If using 2 pieces of fibreglass, wet out both of them simultaneously (on both sides), then place one mat on top of the other, chop (rough) sides together.

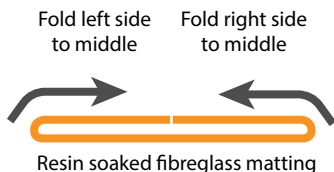




Fig. 7 Ensure that the resin is well mixed with the fibreglass and lift it as one piece.

6.7.4. Apply the mix to the flexible packer.

Centre the fibreglass and resin mat on the protected packer. Tightly roll the mat around the protected packer so that it overlaps itself. Secure the mat to the protected packer using the nylon ties provided. Position one tie 25mm (1") from one end of the mat and another tie 25mm (1") from the other end of the mat. Position one tie in the middle of the mat. If using a 1.2m (48") repair, position the 2 remaining ties in the middle of each remaining gap.



Fig. 8 Place the polythene-covered flexible packer on the mat so that the mat sits between the reference lines.



Fig. 9 Roll the resin-infused fibreglass around the polythene-covered flexible packer.



Fig. 10 Secure the resin-infused fibreglass using the supplied tie wraps, cut off the excess tie material after securing.

⚠ WARNING: DO NOT USE MORE THAN ONE TIE ON ANY SINGLE SPOT.

Pull the nylon ties snug and cut off any tails. Reattach the packer to the pre-measured push rods and pull cable.

6.7.5. Position the packer in the pipe

Introduce the packer into the pipe and position it at the point to be repaired, as marked on the push-rods; where possible, avoid dragging the resin-coated surface across the pipe during positioning.

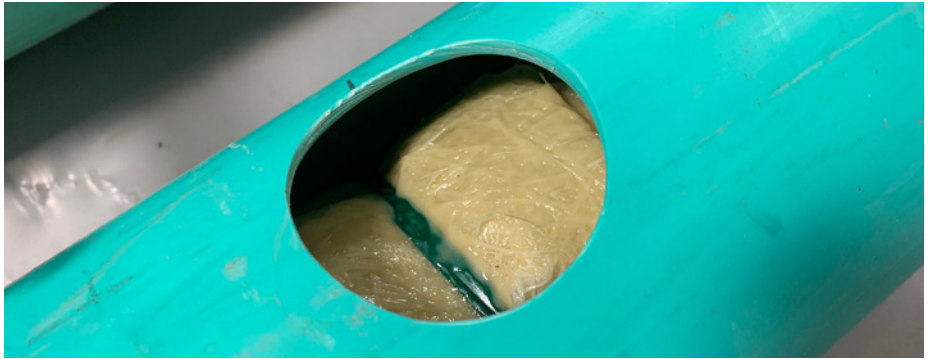


Fig. 11 Patch located centrally at the point to be repaired

⚠ FOR SAFE OPERATION, THE PACKER MUST BE FULLY INSERTED INTO THE PIPE.

⚠ NEVER INFLATE A PACKER OUTSIDE THE PIPE

(except for periodic maintenance and inspection at low pressure, as detailed in section 7.2).

Connect the pneumatic connection and ensure that it is tightened appropriately.

6.7.6. Inflation of the Flexible Packer.

Using the air regulator, slowly inflate the packer to the predetermined working pressure (see Section 7). The nylon ties will release allowing the wetted mat to be pressed against the inner surface of the pipe at the point of the repair.



⚠ WARNING: The inflation pressure can only be correctly checked with the ball valve in the closed position (see 3.2.2). Proceed slowly and regularly check the pressure in the packer, checking more frequently as you approach the working pressure. This will minimize the possibility of damaging the pipe or the packer.

If the safety valve is triggered during filling of the packer (this will be clearly audible) immediately close the ball valve.

The controller **MUST** remain connected to the packer during inflation and while it is under pressure.

⚠ KEEP CLEAR OF THE PACKER AND THE PIPE OPENING DURING INFLATION AND WHILE IT IS UNDER PRESSURE - failure to follow these instructions may result in injury or death.

⚠ NEVER EXCEED THE RATED WORKING PRESSURE OF THE PACKER.

Contact your Leak-Away representative if you have any installation questions or queries.

6.7.7. Deflation and removal of the flexible packer.

Do not attempt to remove the Flexible Packer until the epoxy resin is fully set and there is no possibility of the repair coming free from the inside face of the pipe. Check the curing time in the instructions for use of your selected resin; the packer should not be removed until the recommended curing time has elapsed.

Once the resin has cured, fully deflate the packer by turning the pressure relief tap at the top of the controller safety valve and then remove using the attached pull cable (**do not pull the packer by the inflation hose**). When the Flexible Packer has been removed from the pipe, inspect the point of the repair with the CCTV camera, and ensure that the seal looks good.

Remove the polythene sheeting from the Flexible Packer tube and clean off any debris.



Dispose of the sheet and the used resin bags appropriately.

6.7.8. After Use

Clean the packer and hoses with warm water, neutral cleaning agent (i.e. liquid dish soap) and, if necessary, with a stiff-bristle brush and a sponge. Rinse & allow the packer and hoses to dry at naturally normal room temperature.

7. CARE AND MAINTENANCE OF EQUIPMENT

7.1. MAINTENANCE INTERVALS

When to Check	What to Check	How to Check	Who Checks
Before Each Use	Packer	Visual Inspection	Operator
	Controller	Visual Inspection	Operator
	Hoses	Visual Inspection	Operator
After each use	Packer	Visual Inspection	Operator
	Hoses	Visual Inspection Function Test	Operator
	Controller	Visual Inspection Function Test	Operator
At least once per year	Packer	Visual Inspection	Approved Service Engineer
	Hoses	Visual Inspection Function Test	Approved Service Engineer
	Controller	Visual Inspection Function Test	Approved Service Engineer

Keep maintenance records and user instructions for the life of the product.

7.2. PACKER VISUAL INSPECTION

7.2.1. Uninflated Inspection

Visually check the uninflated packer for abnormal bulges, punctures, cuts or other mechanical damage.

7.2.2. Inflated Inspection

Inflate the packer up to a maximum of 0.5 bar. Visually check for any unusual bulges, punctures, cuts, or any other mechanical damage.

Spray or brush the packer with soapy water and look for signs of air escaping (small bubbles forming on the packer surface, joints and couplings).

7.3. CONTROLLER VISUAL INSPECTION

Check the following items for signs of damage:

- Inlet and outlet couplings
- Pressure gauge and cover
- Safety valve
- Controller body

7.4. CONTROLLER FUNCTION TEST

⚠ THESE TESTS ARE CONDUCTED AT PRESSURE AND SHOULD BE CONDUCTED OUTDOORS AT A SAFE DISTANCE FROM OTHER PEOPLE AND PROPERTY.

7.4.1. Check for leaks

Connect the controller to an appropriate pressure adjustable air source and inflate it to half the rated working pressure. Check all connections for leaks by spraying or brushing the controller with soapy water and look for signs of air escaping (small bubbles forming on the controller joints and surface).

If no leaks are found proceed to the pressure gauge and safety valve tests. If leaks are detected take the controller out of service.

7.4.2. Pressure Gauge Test

Note: A high accuracy calibrated reference pressure gauge with a similar pressure range to the controller is required to conduct the test.

Connect the reference gauge and the tested pressure gauge in series to a pressure-adjustable air source. Gradually increase the pressure and record the deviation of the tested pressure gauge from the reference gauge at 1/3 of the rated pressure of the controller, 2/3 the rated pressure and the full rated pressure.

If the deviation between any of the readings exceeds 5% of the controller's rated value, the controller has failed the test and should be taken out of service.

7.4.3. Safety Valve Test

Note: A high accuracy calibrated reference pressure gauge with a similar pressure range to the controller is required to conduct the test.

Connect the controller to a pressure-adjustable air source and gradually increase the pressure in the controller up to a maximum value of $1.3 \times$ the rated working pressure, or until the safety valve is activated (safety valve begins to leak). The safety valve is functioning correctly if it activates within $\pm 5\%$ of $1.1 \times$ the controller working pressure. If the safety valve fails to operate, or operates outside this range, the controller has failed the test and should be taken out of service.

7.5. VISUAL INSPECTION OF HOSES

Check the couplings and hose for signs of damage. If you spot ruptures, cuts, signs of damage from contact with acids (stiffness or discolouration), or any other damage, the connecting hose is no longer fit for use.

7.6. HOSE FUNCTION TEST

7.6.1. Check for leaks

Connect the hose to the air source and inflate it to $0.5 \times$ working pressure using a stop coupling to close the other end of the hose. Immerse the hose completely in water and check it for leaks. Remove the hose and allow to dry naturally.

If no leaks are found proceed to the pressure tests. If leaks are detected take the hose out of service.

7.6.2. Pressure Test

⚠ THIS TESTS IS CONDUCTED AT PRESSURE AND SHOULD BE CONDUCTED OUTDOORS AT A SAFE DISTANCE FROM OTHER PEOPLE AND PROPERTY.

Connect the hose to a an appropriate controller and air supply. Gradually increase the pressure in the hose up to the maximum working pressure of the controller. Close the controller valve and monitor the pressure drop on the pressure gauge. The pressure should drop by no more than 5% over 30 seconds; if the pressure droops by more than 5% the hose has failed the test and should be taken out of service.

8. Troubleshooting

Fault	Cause	Action
Cannot properly connect the hose to the controller or packer	Incompatible couplings	Check the couplings are the male and female of the same connector type
	Dirt on the connector or coupling	Clean the plug and coupling
	Connector or coupling are damaged	Replace the hose or controller
Packer fails to inflate	Incorrect setting	Check that all hoses are correctly connected and the and that the ball valve of the controller is open
	Damaged controller	Replace the controller
	Blocked coupling	Check and clean all couplings
	Pressure relief tap of the safety valve is open	Close the pressure relief tap on the safety valve
	Air supply interruption	Check the air source and repair or replace if necessary
	Incorrect compressor	Check that the compressor can deliver air at the required pressure
Rapid pressure drop in the packer. <i>(Note A small drop in pressure shortly after inflation is normal due to the stretching & settling of the packer)</i>	The packer leaks	Try to maintain pressure in the packer through continuous inflation until the repair is complete. Do not start a repair with a packer with a known leak. If this is not possible abort the repair, deflate and remove the packer and replace it.

Fault	Cause	Action
The controller safety valve cap cannot be unscrewed during deflation of the packer	Pressure relief cap of the safety valve is blocked	Wearing appropriate PPE carefully disconnect the hose from the controller. ⚠ WARNING: THE HOSE AND PACKER ARE UNDER PRESSURE AND CAN MOVE UNEXPECTEDLY DURING DISCONNECTION CAUSING INJURY Replace the controller ⚠ WARNING: DO NOT ENTER THE OPERATING AREA
Packer does not deflate, even after disconnection of the hose from the controller	Coupling on the hose or packer is blocked	Consult with a supervisor or safety engineer or an authorised Leak-Away International representative. Clean the coupling on the hose Clean the coupling on the packer

9. SHELF LIFE & WARRANTY

The shelf life of Leak-Away Packers is 15 years, after which time they should be removed from service.

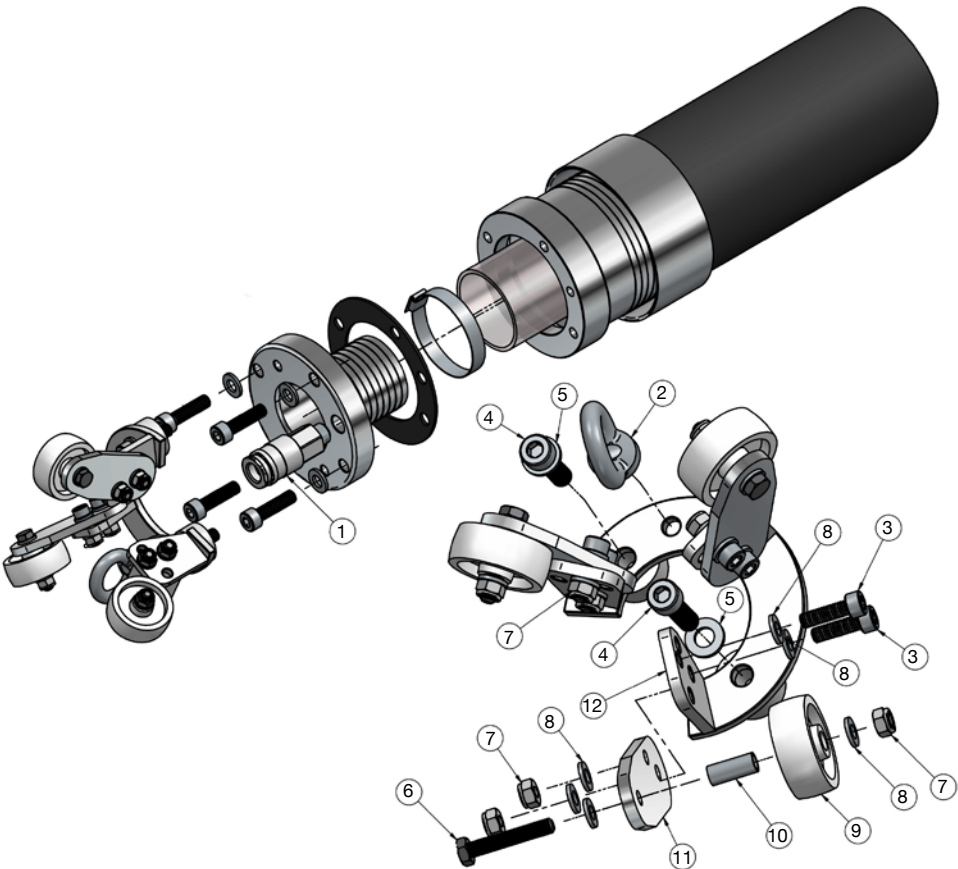
The warranty for Leak-Away packers is for 12 months from the date of delivery. The warranty covers defects in material and workmanship, subject to normal use, maintenance and storage of the product.

This warranty does not cover misuse or mishandling of the product (including, but not limited to, damage caused by improper use or neglect, improper maintenance, use outside of the products intended application or vandalism). Use of unauthorized components or equipment or adjustments or repairs performed by anyone other than Leak-Away, MFC International or its authorized agents will also invalidate the warranty.

To make a warranty claim please visit **www.leak-away.com/warranty**

10. ASSEMBLY & SPARE PARTS

Item	Description	Qty	Replacement Part No.
1	Quick Coupling KD S25 1/4" BSP	2	010475
2	M8 Lifting Eye Bolt	2	030187
3	M6 x 20 Socket Head Cap Screw	12	030193
4	M8 x 30 Socket Head Cap Screw	12	030194
5	M8 Flat Washer	12	030202
6	M6 x 35 Hex Bolt 0	6	30195
7	M6 Nyloc Nut	18	030197
8	M6 Flat Washer	36	030201
9	40mm Packer Wheel	6	240057
10	40mm Wheel Sleeve	6	240058
11	Girder FP 15-25	6	240066
12	FLEX BRACKET 15-25 BP	2	240051





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*Leak-Away is the sewer maintenance products brand of MFC International,
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