



Smart Membrane Solutions
Putting Process Managers at Ease

Membrane Removal Toolkit Fibre Reinforced Plastic (FRP) Housings Manual



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INSTRUCTION MANUAL

MTK-FRP v2

This product manual is delivered to the end user with the Smart Membrane Solutions membrane removal tools. Information in this manual is subject to change without notice. When the manual is changed, the revised copy is published at www.smartmembranesolutions.co.nz.

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1. Introduction

The Smart Membrane Solutions Membrane toolkit includes several tools that ensures the safe removal of membranes and anti-telescopic devices from your plant.

1.1 Toolkit Description

The Fibre Reinforced Plastic (FRP) Housing Membrane Removal toolkit is designed for use within the water industry where FRP membrane housings are predominately used.

Figure 1.1 below shows a picture of a membrane removal toolkit. The end cap compression tool (A) is used in conjunction with the clamp (B), see figure 1.5, to compress the bearing plates that have the shim spring design. The Bearing Plate Removal Tool (C) removes the bearing plate. The push-rod tool set (D) enables you to push out, up to seven membrane elements. These have a single handle and end cap (E) which is complete with UHMWPE plastic on the end to prevent any damage to the inside of the FRP pressure vessels and the end cap screws onto one end of a push rod.

Pig (F) is a UMPHE block with hydraulic lip seals to push out tight membranes using high pressure / low flow water. The end cap compression tool (A) also allows the user to safely compress bearing plates into the housing after new membranes have been fitted, at the time of reinstating the vessel bearing plates.

Figure 1.1









1.2 General Safety Considerations

The following general safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture and intended use of the equipment.

Smart Membrane Solutions assumes no liability for the customers' failure to comply with these requirements. If this equipment is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.

Smart Membrane Solutions will not be liable for malfunctions or damage resulting from any modification made to this equipment by the customer.

The following safety symbol marks are used in this user manual and instrument:

	This indicates a WARNING. It provides safety precaution information needed to avoid injury.
	This indicates a CAUTION. It provides safety precaution information needed to avoid damage to or the destruction of all or part of the equipment.
	This indicates that something is IMPORTANT for the operation of the equipment to avoid damage or failure.
	This indicates a NOTE which contains additional information and hints.

1.3 Warranty

All Smart Membrane Solutions products are guaranteed to be free of material or workmanship defects. Smart Membrane Solutions provides a limited warranty that covers the repair or replacement, without charge, of any defected product or part that occurs within two (2) years from the date of delivery. The repair can only be done by an authorised Smart Membrane Solutions repair facility.

Warranty does not cover normal wear and tear of the product over time, or any products that are handled, installed or used against the manufacturer's guidance.

1.4 Disposal

This is a long-life product that is not intended to be disposed.



2. Operation – Fibre Reinforced Plastic (FRP) Housing Toolkit

2.1 General



Important! The tools are only to be used after the plant has been shut down for maintenance.



Warning! Operators must keep body parts clear of the action of the tools and should not pull directly towards themselves with pulling tools.



Warning! Ensure there is a safe platform to stand on when operating the tools.



Warning! Be aware of the weight of the feed cap when using the bearing plate removal tool. Prevent this from falling when removing it from the housing.



Important! Ensure that the toolkit is stored at ground level to prevent the need to lift. Transport the toolkit by using the handle to wheel it to the plant requiring it.

2.2 Extracting an End Cap Out of a Housing

- Fit the rubber lined clamp to the outside of the pressure vessel (figure 1.2(a)).
- Remove the shim springs as shown in figure 1.2(b) and 1.2(c).
- Fit the bearing plate removal tool (figure 1.3), do the nut up against the jacking plate and turn the nut on the bearing plate removal tool (figure 1.4). This will loosen the bearing plate.
- Once the bearing plate is loose, pull the end cap compression tool towards you and this will remove the bearing plate, unscrew the end cap removal tool to detach the bearing plate.
- Using the push rods supplied (figure 1.5), fit the End Cap (figure 1.5(a)), and handle (figure 1.5(b)) supplied to the push rods (figure 1.5(c)). Then push out the membranes from the pressure vessels.
- **Replace membranes.**
- Once the replacement membranes are in place, refit the bearing plate, refit the end cap compression tool (figure 1.6) and use the end cap compression tool to reset the bearing plate in the housing (figure 1.6(a)). Remove end cap compression tool (figure 1.6a) and refit shim retainers (figure 1.6(b)) and 1.6(c)).
- Refit external pipe work, check all connections and components and the system will be ready for recommissioning.

Figure 1.2(a)



Figure 1.2(b)



Figure 1.2(c)





Fig 1.3



Fig 1.4



Fig 1.5



Fig 1.5(a)



Fig 1.5(b)



Fig 1.5(c)



Fig 1.6



Fig 1.6(a)



Fig 1.6(b)



Fig 1.6(c)

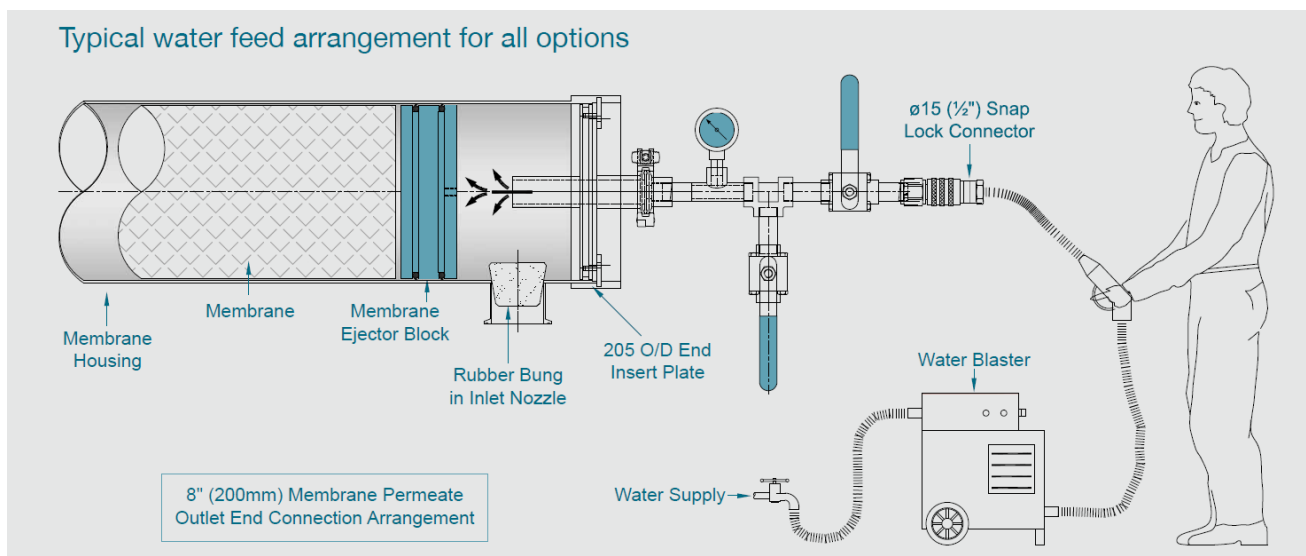


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2.3 Pigging Out Stuck Membranes

- We recommend stuck/tight membranes are hydraulically pushed from the permeate outlet end of the vessel, with membranes being removed from the feed end of the vessel.
- Ensure that the end membrane has gone past the outlet port to the width of the hydraulic pig.
- Place the pig inside the housing, make sure it pushes past the outlet port. Ensure the hydraulic seal edges are facing towards you.
- Place a plug/ bung in the outlet port hole at the bottom (or top) of the housing to stop extraction liquid by-passing.
- Reinstate the permeate spigot end cap. Secure the cap or with end cap compression tool and shim springs if using on 8" RO.
- Attach the, independently supplied, water blaster connection to the permeate outlet fitting, with appropriate safety devices (isolation, drain valves, pressure indication etc).
- We recommend you use a small domestic, 7-10 litre per minute, water blaster that will provide a gentle hydraulic push of the membranes in series.
- Please refer to our website, listed below, for the MTK-FRP brochure and for further details.



3. Toolkit Specification

Component	Part Code	Quantity	Material of Construction	Length or other Dimensions
Case for FRP Toolkit	MTK-FRP-CASE	1	Waterproof, high impact.	45kg, 140 x 45 x 18cm
RO End Cap Compression Tool	MTK-FRP-8COMPRESS	1	304L Stainless Steel	Designed to remove FRP type RO vessel end caps that are retained by shims
Vessel Clamp	MTK-FRP-CLAMP	1	304L Stainless Steel	Rubber lined for FRP housings
Bearing Plate Removal Tool	MTK-FRP-EXTRACTOR	1	304L Stainless Steel	C/W screw and nut
Membrane Removal Pushrods	MTK-FRP-PUSHROD	6	304L Stainless Steel	1.2 meters each (for removal of up to 7 elements per vessel)
Membrane Removal Pushrod Handle	MTK-PUSHRODTBAR	1	304L Stainless Steel	
Membrane Removal Pushrod End Cap	MTK-PUSHRODEND	1	304L Stainless Steel and UHMW Polyethylene	Suitable for 8.0" FRP vessels
Hydraulic Ejector Block (Pig)	MTK-MBOR-8.0	1	UHMW Polyethylene and EPDM Seal Combination	To fit 8.0" FRP membrane vessels
Hydraulic Ejector Port Bung	MTK-RB-45	1	Natural Rubber	Conical shape to vit various size retentate or feed ports

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4. Maintenance and Trouble Shooting

4.1 Installation

- Ensure a good membrane mapping system is used during installation. We recommend the SMS barcode system.
- Handle the membranes carefully during installation, taking care not to drop or damage.
- Ensure correct and careful component installation i.e. seals and bearing plates (see our videos on how best to do this).
- Use little amounts of lubricant for seals, water is preferred to glycerin.
- Take care with height work, ensure membranes and personnel are well supported.
- Check vessels for and remove any foreign matter, if necessary, clean out the vessels with suitable materials.

4.2 Membrane Killers

- Aggressive plant starts after installation, ensure plant is started slowly, gently filled with water and ensure all air is removed before full ramp up/operation.
- High pressure drop.
- Permeate backpressure.
- High fluid velocity (linked to excessive different pressure).
- Ineffective cleaning, including low flows.
- High temperatures.

For further servicing information please refer to: www.smartmembranesolutions.co.nz

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