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**REASON FOR UPDATE:**

Change of owner – was A. Douglas  
Associated documents added.  
Section 2b – Improvement of hole cutting instruction and valve fitment solution process  
Section 5 – JWC-FP-23844 added as correct profile for inflation test  
Section 5 – Addition of post bench test air test for push in valves.  
Section 6 – Removal of secondary inspection requirement  
Section 7 – Requirement for food use label captured

**ASSOCIATED DOCUMENTS:**

[F343b](#), [SOP0308](#), [F645](#)

**1. PURPOSE**

1.1 To provide a procedure for manufacture and fabrication of seals for Millipore.

**2. SCOPE**

2.1 This document applies to all those involved in the manufacture and fabrication of seals for Millipore.

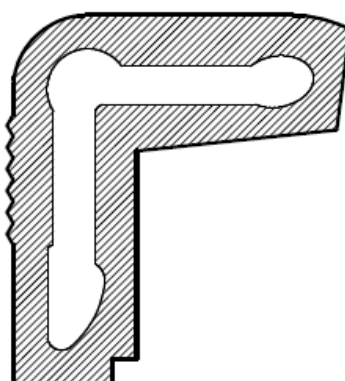
**3. RESPONSIBILITY**

3.1 The Unit Shift Manager is responsible for updating and communicating the details within this procedure.

**4. PROCEDURE**

*These instructions cover the fabrication of seals for the above customer from the following section:*

**Part 1 – Extrusion & Curing:**



Die and joining mould number as specified on JW Drawing and production paperwork

The section should be extruded using the 90mm Iddon, and pre-entered settings in the computer.

The extrusion should be run on to the take-off belt, with a 300-400mm gap between the die head and the belt to allow a loop to form.

A solution of Alkon 7310 should be poured into the section and a quantity maintained at the base of the loop to prevent the section adhering to itself whilst hot.

The extruded lengths are kept straight and allowed to cool completely.

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To cure, aluminium angle is carefully pushed down the center and the section placed in the curing formers which have been cleaned and sprayed with Ambersil Formula 6. Care must be taken to avoid stretching the uncured section during this operation. Partial inflation of the section with low pressure compressed air for approximately 1 second at 2 second intervals helps this process. The top of the section is also lightly sprayed with Ambersil Formula 6 to help prevent water marking. The whole assembly is then placed in the pre-warmed autoclave, with the door set to, for five minutes and then checked for any settlement of the section. It is then autoclaved as per the guidelines set out in OPI 21.

The section is then stripped from the former and the center bar removed, after which the extrusion is kept straight whilst cooling. The cooled vulcanized section is then placed in the sink, and the center washed through using a hosepipe until the water runs clear. Washed extrudate is then allowed to dry and should be stored straight, or coiled carefully for storage to avoid kinking.

A finished extrusion length of at least 100mm shall be submitted to the lab for finished part testing with a completed F014 form for each autoclave cycle completed. Compression set testing is carried out on the finished extrusion sample length to ISO 815-1 (particular care shall be taken to prepare plane parallel test pieces). See images below of special attachment for the guillotine for cutting samples.



On completion of satisfactory compression set testing ( $\leq 60\%$ ) the extrusion department shall be notified of the test result to allow extruded lengths to be delivered to the joining table.

## Part 2 – Pneumatic connection

When cool, cut the seals to length and record the length on the Dimensional Inspection Report (F343b).

### A) Old type vulcanized connector

Cut the seal on the guillotine and insert the one foot length of aluminium angle with a cast profile of the section down one end.

Measure 100 – 150mm back from the end and mark a circle equal to the valve base at the centre of the back of the seal.

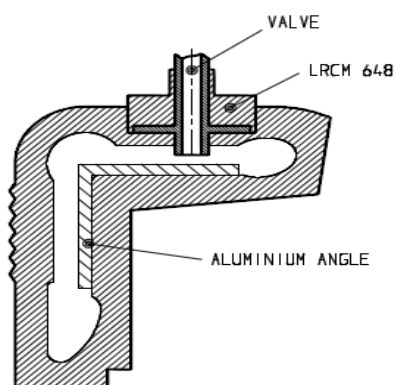
With the 12mm flat bottom drill bit, make a  $3.0^{+0/-0.3\text{mm}}$  deep blind hole on the marked area. With a 3.8mm diameter cutter, cut a hole through to the aluminium in the centre of the recess.

Roughen the recess and surrounding area with Scotch Brite, clean with toluene and then paint with LRCM 648 joining solution (see Note 1). N.B. New tubs and brushes are to be used for each production batch.

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Clean the valve with “medium” grade emery paper and then degrease with toluene. Paint the base of the valve with Chemosil 211 to a height of 8mm and, when dry, with Chemosil 225. Apply a coat of LRCM 648 joining solution over the Chemosil 225.

Cut a disc from 3.5mm thick unvulcanised LRCM 648 rubber to fit snugly into the drilled recess, place over the top of the valve and push to base.



Take a strip of 3mm wide, 0.5mm thick unvulcanised LRCM 648 rubber and wrap around the valve stem just above the disc.

Pre-heat the joining mould in the Vulcaniser to  $155 \pm 5$  °C. Verify the mould platen temperature using a calibrated temperature probe.

Insert the valve into the recess, place a strip of aluminium angle under the valve area (to ensure the mould is completely full), place the section into the mould and tighten up.

Place the mould into the vulcaniser, the valve just protruding, turn the handwheel to hand tight and then by another three-quarters of a turn.

Vulcanise for 20 minutes at  $155 \pm 5$ ° C.

Remove the section from the mould and allow it to cool. Remove the length of aluminium and check that the hole at the base of the valve is clear. Ensure no Chemosil can be seen above the rubber section. If Chemosil is visible, remove with Scotch Brite. Trim as necessary. Check that the rubber is fully bonded, and no lifting is apparent at any point around the rubber “patch”.

## B) SCREW-IN CONNECTOR

Cut the seal on the guillotine and insert the one foot length of aluminum angle with a cast profile of the section down one end.

All valves must be inspected to ensure they have the ‘V’ shape groove in the base as shown in the left hand image on the next page. Any valves which are flat as per the right hand image must be rejected and a non-conformance raised against the supplier.

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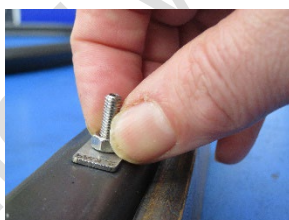


2 X 4MM dia. holes are to be cut into the inflatable seal using a metal insert and a 4mm dia. punch to ensure consistency and uniformity. The cut quality is aided by the use of the metal insert which provides a solid surface for punching the holes, whilst also preventing the hole penetrating into the underside wall of the seal.

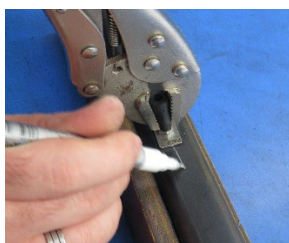
For correct hole location, measure 150mm back from the end and cut the first hole. The second hole is to be cut diametrically opposite to hole 1. This is achieved by calculating the overall length of the seal, dividing by 2 and then adding the 150mm to account for the position of hole 1.

Push the heel of the connector through the hole (use some soap solution as a lubricant if necessary), and place the rectangular plate in position.

Screw the valve nut down by hand until it comes into contact with the rectangular plate.

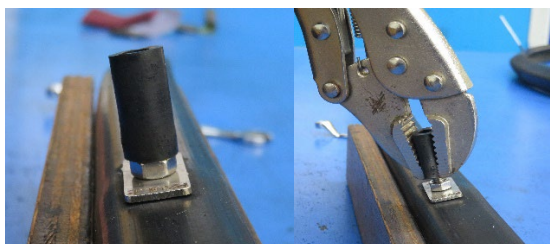


Using a paint pen, or similar, mark a small line out from the valve plate in-line with the seal.



Place a small length of rubber tubing over the valve stem. Then using a pair of Mole Grips lightly grip the valve stem to stop it from rotating.

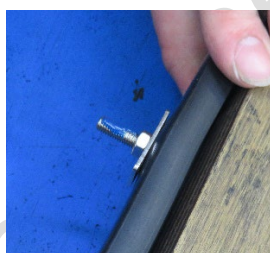
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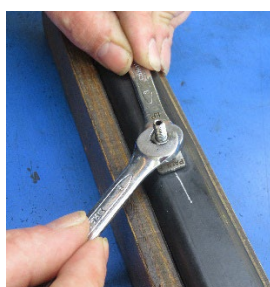
Using a small 8mm spanner, firstly, align it with the small line on the seal, then tighten the nut  $1\frac{3}{4}$  rotations of the spanner, using the line as a datum.



Remove the Mole Grips and thread protection before adding a small amount of thread lock adhesive to the threads of the valve stem.

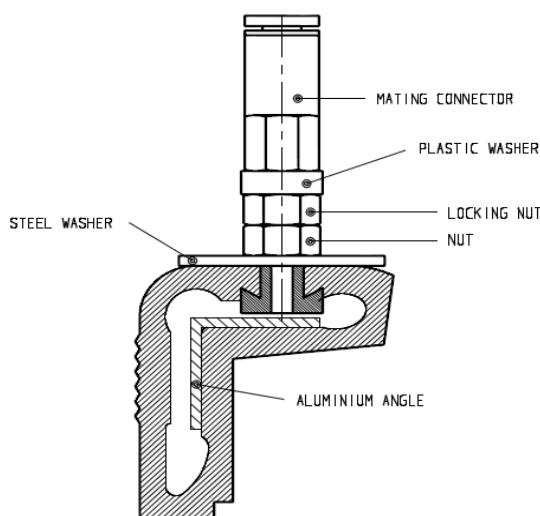


Screw the lock nut onto the valve stem until it abuts the valve nut. Using the 8mm spanner to hold the valve nut in place then take a second 8mm spanner and tighten the locknut onto the valve nut.



The plastic washer should be positioned over the lock-nut on the connector stem, and the mating connector screwed on top (see below).

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### Part 3 – Joining:

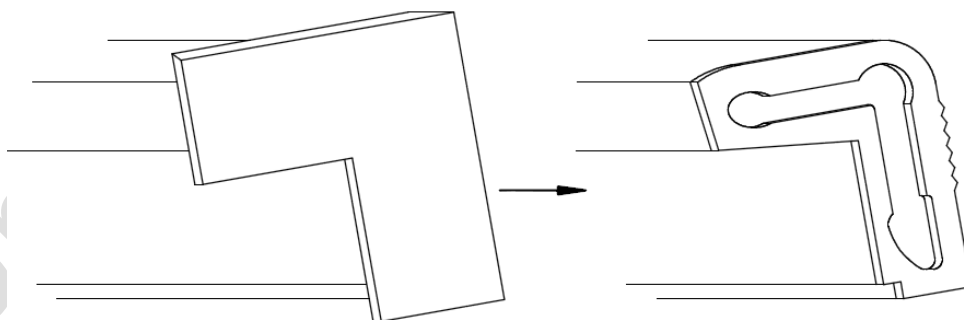
The extruded section requires heating at the ends to remove unwanted moisture picked up during the autoclave cycle, which can give porosity problems at the join. To remove this, 150mm at each end should be left on the vulcaniser platen at  $155\pm 5^{\circ}\text{C}$  for approximately 20 minutes.

Roughen both ends and clean with toluene.

Coat each face with LRCM 648 joining solution (see Note 1), allowing each coat to dry. The solution should be able to run off a knife blade, leaving a thin even coat of rubber. *N.B. new tubs and brushes are to be used for each production batch.*

Take some 0.3 to 0.5mm thick LRCM 648 joining rubber (see Note 2), clean with toluene and stick an appropriate outline to the face at the valve end when the joining solution has dried.

When the rubber has stuck, trim the outside, leaving an excess of 5mm around the section and the inside is cut flush with sharp scissors.

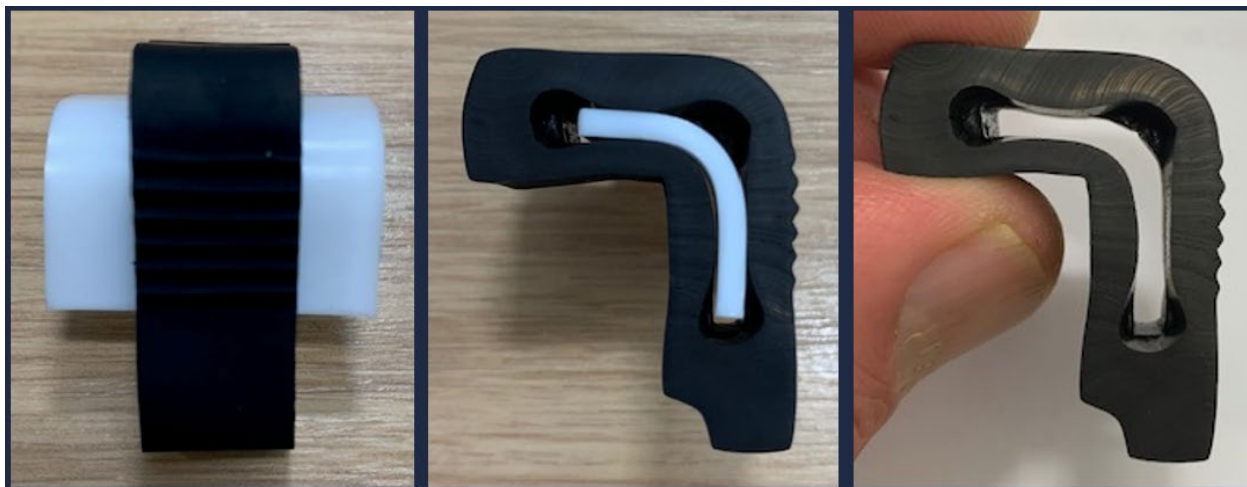


Clean the trimmed face with toluene. Check clamps. Use the special long wooden blocks in the clamp. The blocks should be  $\leq 20\text{mm}$  from the mould when in closed position.

A PTFE insert of 25mm Wide X 28mm Long X 2mm Thick, with rounded corners, bent to a curved  $90^{\circ}$  angle to be positioned internally across the join of the seal.



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Pre-heat the joining mould in the vulcaniser to  $155\pm 5^{\circ}\text{C}$ . Verify the mould platen temperature using a calibrated temperature probe. Dis-assemble the mould immediately prior to inserting the section. Keep the mould top hot whilst leaving the base in position. Insert the valve end in the long static clamp and close the retention clamp to hold the section secure.

Insert the other end in the long mobile clamp with the join clamping mechanism open approx. 28mm when measured from the mould face. A removable spacer block is an effective measure of this gap. Line up the ends of both sections in the mould, and secure the sections by clamping in position, holding them in the wooden blocks. Slightly close the join clamping mechanism. The clamps should close to within 20mm of the mould, giving 5mm of 'compression' after closure of the join.

Close the join clamping mechanism completely and fit the mould top. Vulcanise for 20 minutes at  $155\pm 5^{\circ}\text{C}$ . Verify the mould platen temperature using a calibrated temperature probe. Dis-assemble the mould and remove from the vulcaniser.

#### Part 4 - Trimming

Inflate the seal to approx. 1 Bar, and without damaging the section remove excess flash. Clean the join with fine emery paper and Scotch Brite. Ensure that the sealing ridges align and are trimmed to a high standard.

Do not use any cyanoacrylate adhesives or surface treatments to enhance the appearance.

**Eye protection must be worn when using compressed air.**

#### Part 5 - Testing

The join should show no signs of parting or splits when flexed around a 150mm mandrel. The sizes and general appearance are to normal JW inspection standards.

An inflation test is required in order to prove the joint integrity in accordance SOP0308 (only applies to JWC-FP-213844 profiles)

The results should be recorded on a James Walker form F645 and additional Leak Test Tag, (Tag stock number Part E11-6, the tags are stocked in the logistics consumables stores if none are to hand)

The pressure and time should be recorded on the tag (as shown below).

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If no leaks are found then a green pass stamp should be recorded on the tag and the tag attached to the seal.

If leaks appear then a red fail stamp should be recorded on the tag and the tag attached to the DJ for evidence of the test.

\*example of tie tag

**Eye protection must be worn when using compressed air.**

Push in valves are to be verified in the air test tank post bench test, to ensure that no damage had occurred to the valve during the bench test. Verification to be recorded on form F645.

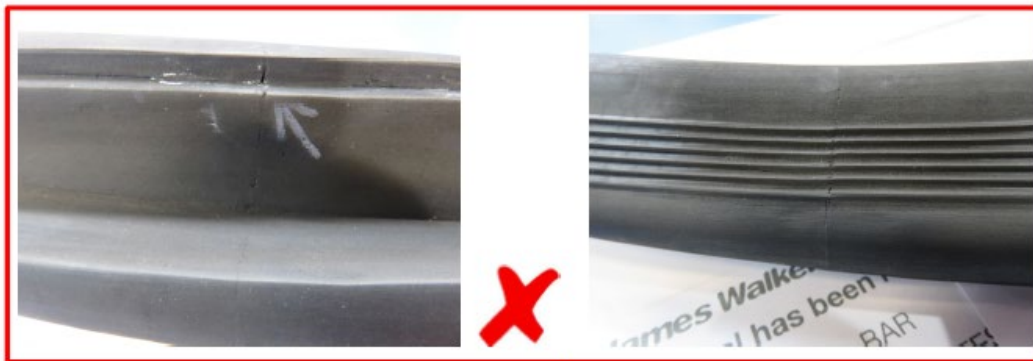
**Part 6 – Inspection and Engraving**

All joins must be inspected under 2 X magnification following visual inspection guide on the following page:



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Not Acceptable

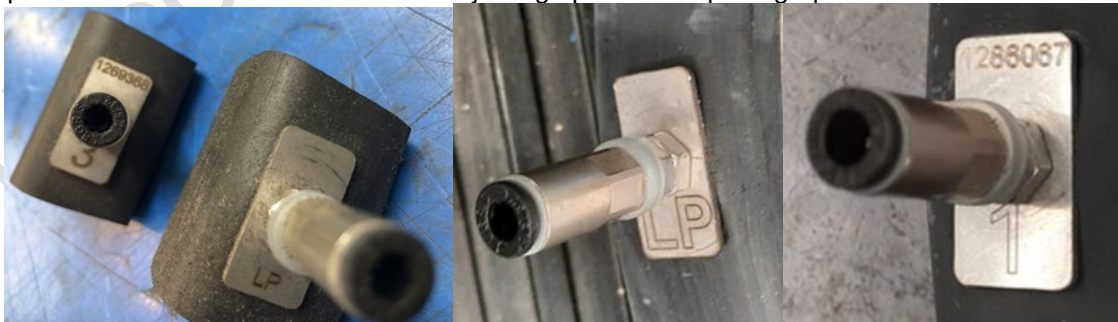


Acceptable



Record the profile dimensions for each seal on the Dimensional Inspection Report (F343b).

Mark the DJ number and seal serialisation number (1, 2, 3 etc) onto one of the valve plates. The other valve plate is to be marked with initials of the joining operator. as photograph indicates below:



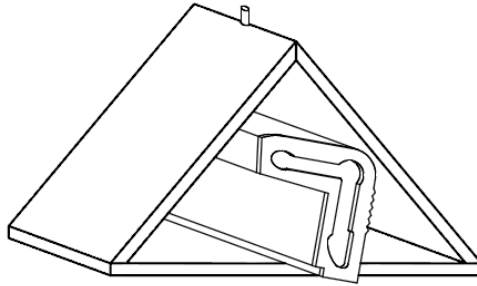
Add a copy contents label to the reverse of the pressure test tag.  
Take photographs of both sides of join and store these in a LionShare location.

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## Part 7 – Packing

Completed seals must be cleaned with alcohol wipes to remove any surface debris.

The moulded in “valve” (pneumatic connection) is prone to damage and requires support during transport and storage. Duo-board folded around the section and taped together minimise the risk of damage, and should be applied to all seals with this type of connector prior to despatch (see below).



Seals with ‘push in’ valve require protective packaging foam wrapped around the valve and secured in place with a cable tie. All completed seals are tied to a duo-board backing piece using protective bubble wrap and ribbons then inserted into cardboard ‘pizza boxes’.

Items over 700mm diameter will require ‘kidneying’ in order to fit on the duo-board backing. Seals must not be creased.

Add a warning sticker and food use label (as shown below) anywhere on the interior of the box, and on the opening side of the exterior of the box.



Take photograph of seal fully packaged within box.

A copy of the Certificate of Conformity is emailed to JWF by logistics upon release.

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#### Note 1

LRCM 648 Joining Solution is produced by the addition of solvent to the LRCM 648 joining compound in a suitable container in the ratio as indicated in the table below.

#### LRCM 648 Joining Solution (20% Solids by Weight)

| Ingredients      | Weight (g) | S.G. (g/cm <sup>3</sup> ) | Volume (mL) |
|------------------|------------|---------------------------|-------------|
| LRCM 648 Joining | 10         | 1.11                      | 9           |
| Toluene          | 40         | 0.87                      | 46          |
| Total Weight (g) | 50         | % by Weight               | 20          |

Standard quantity would be suitable small container using amounts above i.e. 10g LRCM 648 Joining compound and 46ml of Toluene.

Once joining solution is produced this must be labelled with the batch number of the joining compound and a 2 week expiry date applied from the day this is first combined i.e. Batch - XX/XXX/XX-XXX Expiry - DD/MM/YY.

#### Note 2

LRCM 648 joining compound is produced on request by Laboratory / Materials Engineering staff. This is done using LRCM 648 compound mixed as per slab item RC11147X with extra curatives added on the mill to ensure the formulation now matches LRCM 648 joining compound as per slab item K0T314824. This will have a batch number assigned as per normal stage 1 laboratory procedures and a standard shelf life issued as per OPI 27 Shelf Life of Unvulcanised Rubber Compounds of 26 weeks.