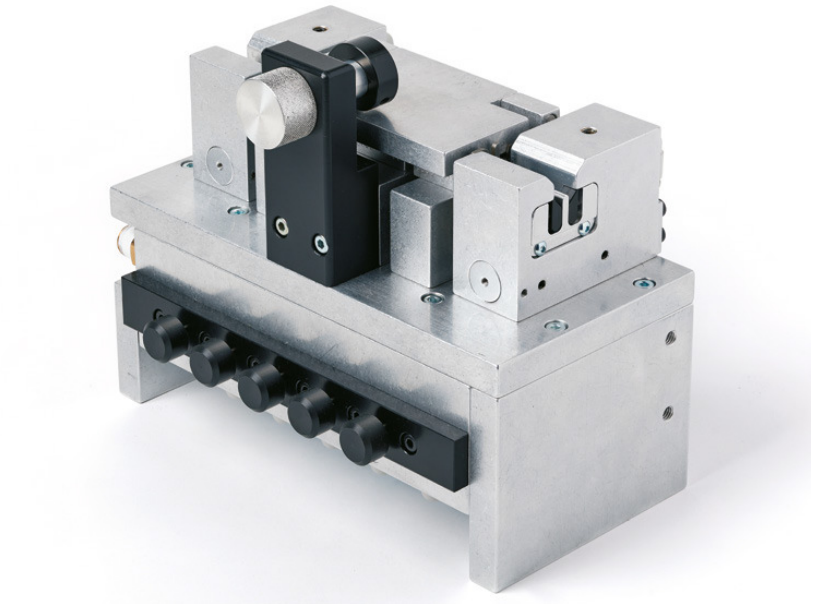
GTW Developments Ltd.

122 Series splicers

Advanced splicer for heavy yarns and tows



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About the splicer

The Model 122 is a completely new form of yarn splicer, with a number of advanced features. It has been designed to make splices of the highest quality in modern materials such as carbon fibre, which are used in composites for new engineering applications. These composites demand excellent appearance and unmatched consistency.

To meet the new standards, the Model 122 has some new features. It has:

- electronic control of splicing parameters
- multiple splicing chambers
- an advanced cutting system

Why multiple splicing chambers?

This element of the design is relevant to:

Carbon and glass fibre yarns

Tough yarns such as aramids

Very large yarns and tows

- Carbon fibre and glass fibre are strong in extension, but they are brittle in bending. When exposed to the powerful jet of air in the single chamber of a conventional pneumatic yarn splicer, filaments of glass and carbon are bent violently, and disintegrate, resulting in a weak splice and many broken filaments. Using multiple splicing chambers allows the splicer to operate at lower pressures; the result is that the fibres are not damaged. This principle has been used successfully for some years on our Models 110, 113 and 701 splicers.
- Tough yarns such as aramids do not have the brittleness problem of carbon. However, the immense strength of aramids in extension poses problems. The strength of the splice is produced by inter-filament friction, so that the absolute strength of an aramid splice is not much greater than that of a nylon splice. This means that the strength of the splice as a percentage of the parent yarn strength tends to be lower with aramid. Using multiple splicing chambers allows the splicer to increase the levels of inter-filament friction – and therefore increase the strength of the splice.

- Very large yarns and tows pose a problem with conventional splicers, because of their physical size. To maintain satisfactory performance, as the count of a yarn rises, so too should the splice length. There is a good physical explanation for this observation, but it is too complex to discuss in this introduction to the splicer. Using multiple splicing chambers allows us to increase the length of the spliced joint to suit the demands of the increased yarn count.

Why an advanced cutting system?

Carbon fibre and glass fibre are generally used in the form of tows – from perhaps 600 tex to 9600 tex, and above. Large tows, because of their size, are difficult to cut with conventional scissor systems. Aramid yarns are simply very difficult to cut, and they cause conventional scissor knives to go blunt very quickly.

So an improved cutting system is needed both for large tows and for aramids.

Safe use and care of your splicing equipment

This product is only designed for factory use. Any other use may invalidate the guarantee and might be dangerous. We have designed and made this product to meet European safety standards, but as with any pneumatic equipment you must take certain precautions, to ensure personal safety, and to maximise the working life of the product.

Here are some recommendations:

- Read these instructions carefully before you try to use the equipment.
- If anything goes wrong, do not try to fix it yourself; get a qualified service agent to look at it.
- Protect the airline feed. Ensure that the lead cannot be walked on, crushed, chafed, cut, or otherwise damaged.
- Do not expose the equipment to harsh conditions such as wet or strong vibration.
- Never push objects into holes and ventilation slots.
- Small parts. Do not let young children play with the equipment.

Getting started

Please read this section before you start operating the splicer. The rest of the manual deals with maintenance, and with details of products; those sections will not be needed immediately.

Remove all packaging. For each splicer, you will have the appropriate splicing chamber – which will usually already be fitted.

Depending on what you have ordered, you will have some or all of the following:

- Splicer
- Additional splicing chamber(s)
- Optional carrying strap
- Optional buckle
- Optional hanger and screws
- Optional hanging clip

If they have been supplied, place the buckle and strap over the air union, before connecting the splicer to the air supply. The operator may then loop the strap round his wrist to reduce the likelihood of the splicer being dropped.

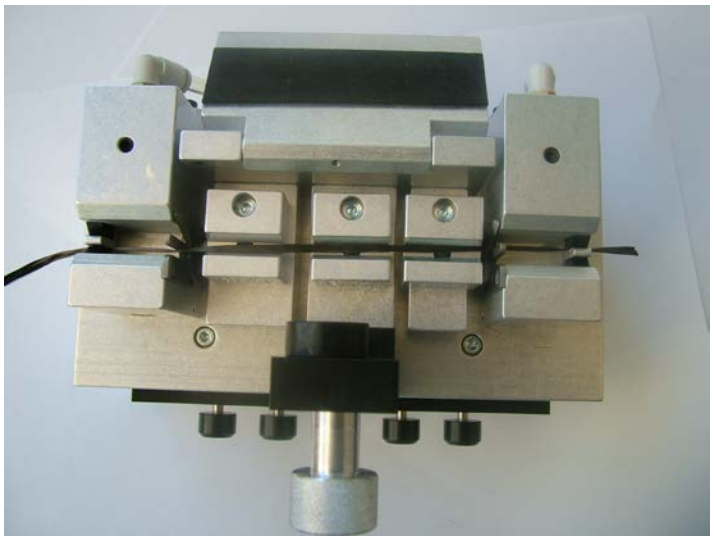
It may be useful to have a fixed place to store the splicer temporarily when the operator has finished. If it has been supplied, bolt the hanging clip to a convenient spot on a machine. Fix the hanger to the back of the splicer, using the screws provided. (This operation will involve the removal and replacement of the splicing chamber). The splicer can then be placed in the hanging clip when not in use. This reduces the likelihood of the splicer being dropped and damaged in service.

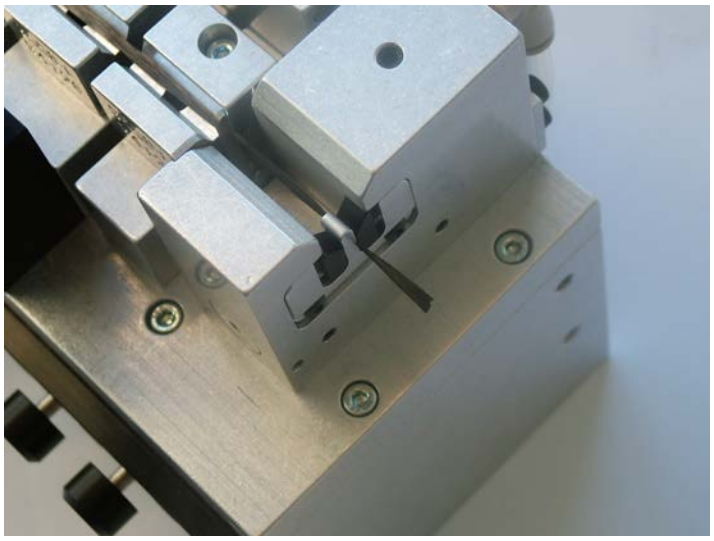
Connect the splicer to an air line

Under normal circumstances, the line pressure should be around 8 bar. The line should preferably be fitted with a pressure regulator so that adjustment may be made to suit local needs.

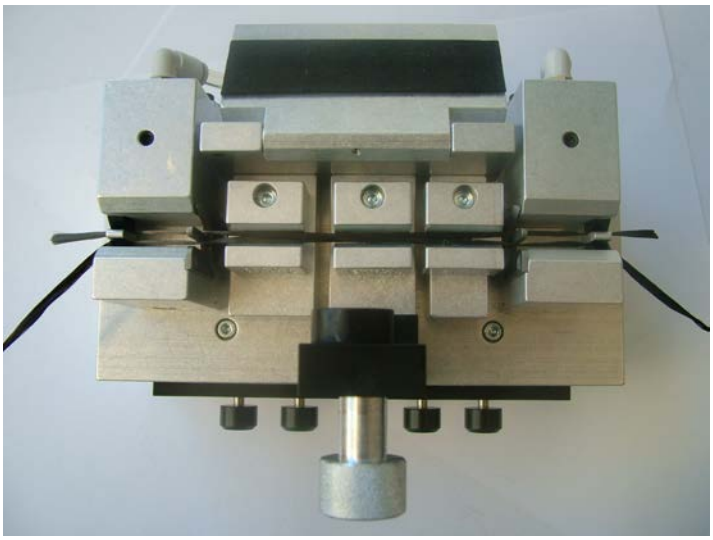
Splicer threading

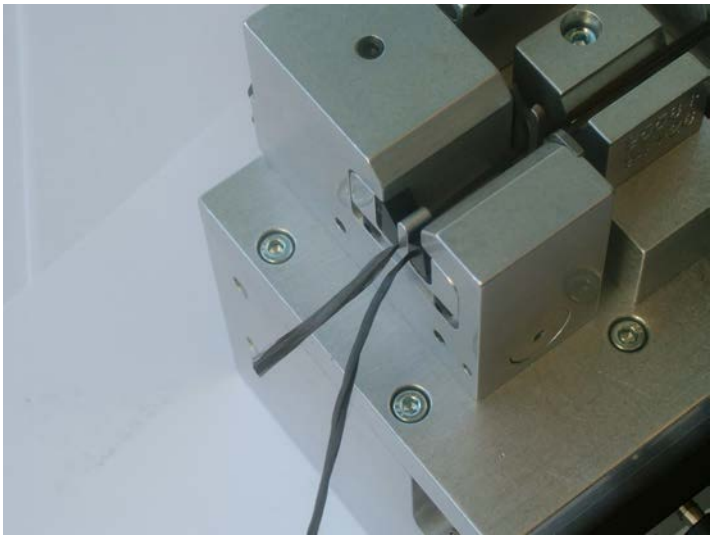
1. Select the first yarn. Take a length of yarn which is sufficient to pass through the splicer, leaving an excess length of about 5 - 10 cm.
2. Thread the first yarn through the splicer, from left to right, so that the free end projects on the right hand side.
3. The first yarn should pass through the knife scissors at the righthand end of the splicer, but it must not pass through the knife scissors at the left hand end.
4. The yarn should be secured in the clamps at either end of the splicer.
5. Ensure that the yarn passes cleanly through the three splicing chambers, so that no stray filaments escape from the chambers.

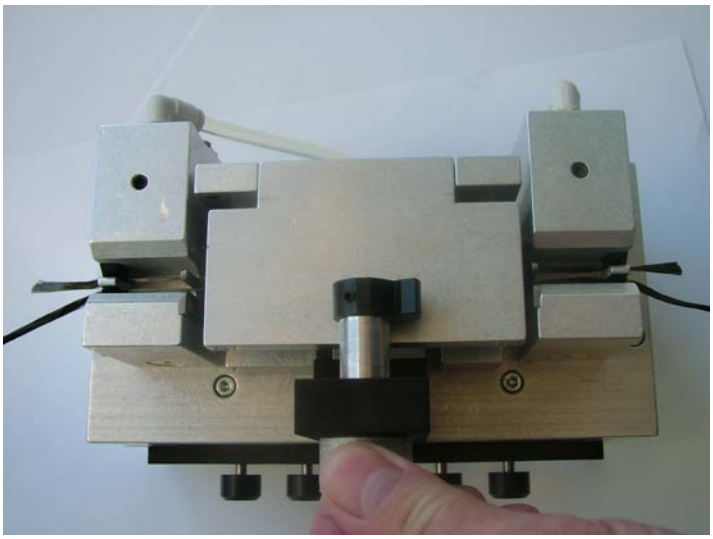




6. Select the second yarn, again with 5 - 10 cm of excess length.
7. Thread the second yarn through the splicer, from right to left, so that the free end projects on the left hand side.
8. The second yarn should pass through the knife scissors at the left hand end of the splicer, but it must not pass through the knife scissors at the right hand end.
9. As before, ensure that the yarn passes cleanly through the three splicing chambers, so that no stray filaments escape from the chambers.
10. These two pictures show the yarns in their final positions.
10. Close the lid, secure the cam and then press the 5 button sequence from left to right.







What happens in the splicing process?

The central chamber is actuated first. A single point of intermingling will be created by this blast, similar to that shown here. In this illustration, the partially-completed splice has been removed from the splicer, so that it can be seen more clearly. The creation of this single intermingled zone stabilises the structure, so that the yarns remain in the correct relationship during the formation of the remainder of the spliced joint.

The two outer chambers then blast in sequence. Finally, the powered knives operate in sequence, to complete the splice.

Once the splicing process is completed the splice is created, and may be removed.

Optimising the splicing performance

The operator has a number of operating parameters which can be changed at will, so that the optimum performance may be achieved for a given situation. The following variations are possible:

- Change of air pressure.
- Change of air duration.
- Change of splicing chamber.

As a general rule, the more prone to damage the fibre, the lower the air pressure should be. Clearly, all operating parameters will ultimately depend on the exact requirements of the user, but we recommend as starting point, the following air pressures:

Carbon (2400tex)	60 psi	4 bar approx.
Glass / acrylic (2400tex)	100 psi	7 bar approx.
Nylon / polyester (2400tex)	90 psi	6 bar approx.
Kevlar (2400tex)	90 psi	6 bar approx.

Important maintenance information

Apart from accidental damage, and the occasional replacement of cutters, the Model 122 requires very little attention. However, one aspect of maintenance should NEVER be neglected. The trigger button assembly plus knife block assembly, needs lubrication. The <u>frequency</u> of lubrication depends upon the nature of the factory environment and the workload on the splicer.

As a general rule, they should be removed and greased with Molykote 111 (available from the company) at least once per year. The service interval should be reduced if the splicer experiences very heavy work loads. The removal of this component is shown in the following maintenance section.

General product information

General description

The advanced splicing unit has four principal components mounted on a body in which airways conduct the compressed air for the splicing action.

1. Trigger - pressing the trigger initiates the splicing operation.
2. Valve - operation of the trigger moves the valve allowing compressed air to pass into the body head for splicing.
3. Splicing chamber - has a profiled recess on the front face which, with the closed pad, forms a chamber in which the splice is made. Air enters into the chamber to form the splice.
4. Guide plates - the plates provide a means of guiding the yarn across the splicing chamber.

The advanced splicing unit is simple, and easy to maintain. Moreover, its construction is such that it is extremely rugged, and requires very little attention in service. The splicer has completely new splicing chamber technology, which enables the splicer to make joints in a wide range of heavy yarns, currently up to about 6000 tex (though development work is being directed towards 10000 tex).

The advanced splicing unit makes a splice in a form which we call "ends-opposed"; such splices are suitable for applications where smooth structure and appearance are of crucial importance.

Maintenance

Introduction

The 122 has been designed to accomplish its greater variety of functions in the simplest manner possible - great attention has been paid to durability, and ease of maintenance. The base splicer of the 122 range has seven sub-assemblies, mounted on a simple body, through which air-ways conduct the compressed air for the splicing action.

1. **Trigger**. Pressing the trigger initiates the splicing operation.

2. **Air valve - blast**. When the trigger is pressed, it moves the valve, allowing compressed air to pass into the main splicer body for splicing.

3. **Air valve - knife**. When the trigger is pressed, it moves the valve, allowing compressed air to pass into the main splicer body for cutting of the waste yarn ends.

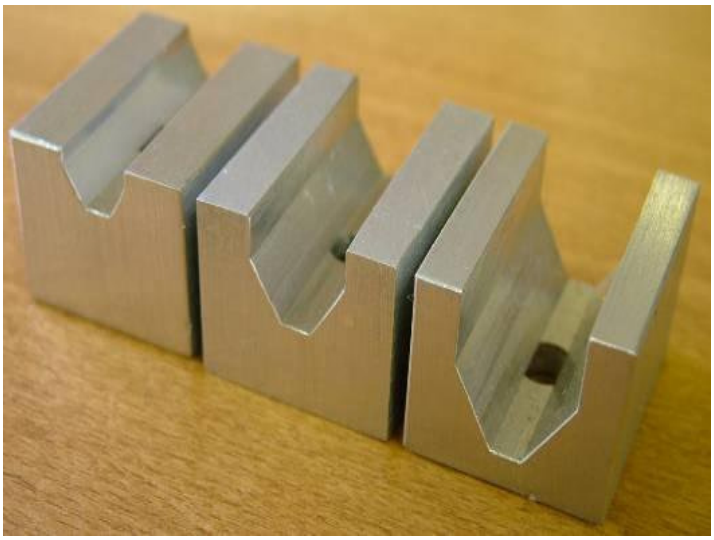
4. **Hinged Pad.** When the operator closes the lid, this acts as the closure of the pad onto the surface of the splicing chamber, prior to the splicing operation.

5. **Splicing chamber** This has a profiled recess on the front face which, with the closed pad, forms the volume in which the splice is formed. Movement of the air valve allows compressed air to enter the chamber, to form the splice.

6. **Yarn clamps** Yarn clamps attached to the side plates, on either side of the splicing chamber, restrain the yarns, holding them in the correct position for the splicing operation.

7. **Knives** Two pairs of scissor-knives are fitted, one pair on either side of the splicing chamber. These cut off waste yarn during the splicing operation.

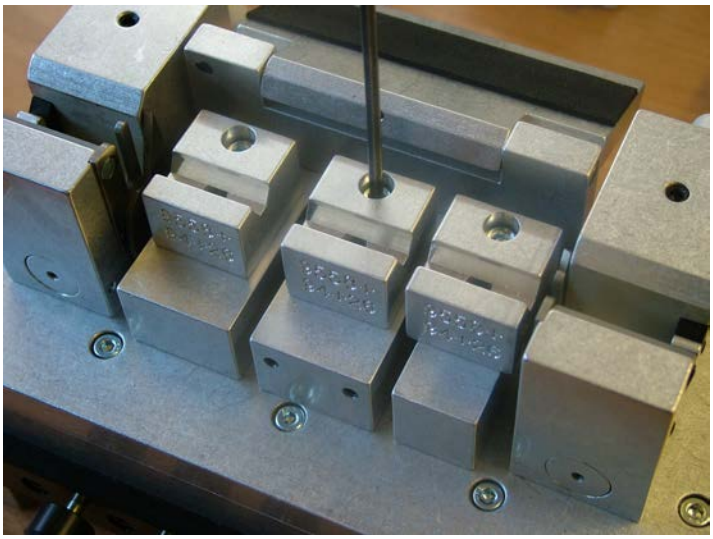
Advanced splicing unit chambers



All chambers are symmetrical in design, but the cross-sectional profile of the chambers may be varied, according to customer needs. These photographs show how the splicing chamber profiles can be changed as yarn counts vary.

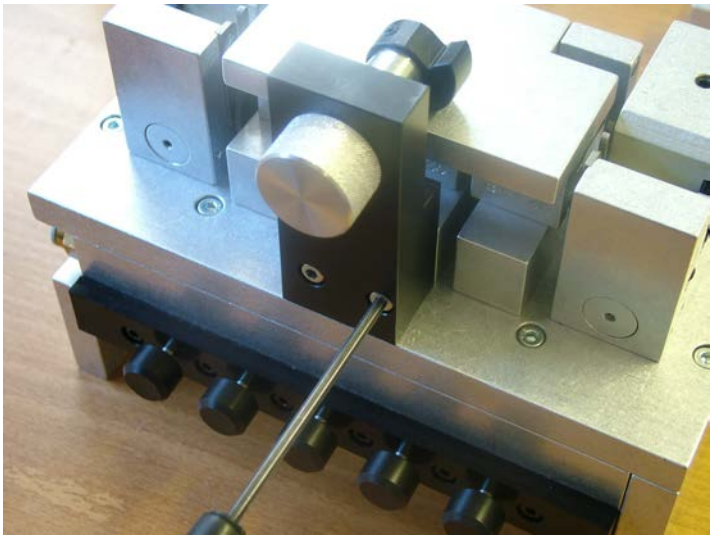
Uniquely, the advanced splicing unit can splice a wide range of textile yarns on a single splicing chamber, so it is rarely necessary to change chambers. Nevertheless, you will sometimes need to remove the splicing chambers - during routine maintenance, or because the splicer has become fouled with fibre particles.

Removal of splicing chambers



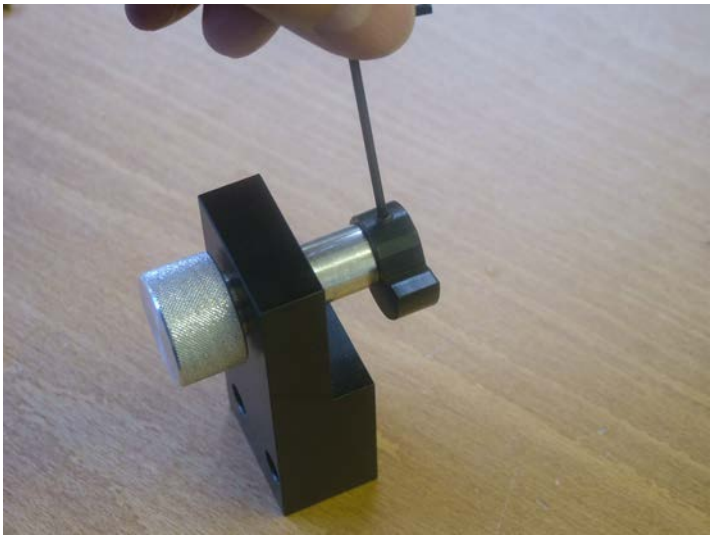
To release a splicing chamber, remove the fixing screws, Item 649, from the back end of the chamber, when the splicing chamber can be lifted clear of the unit.

Removal of cam assembly



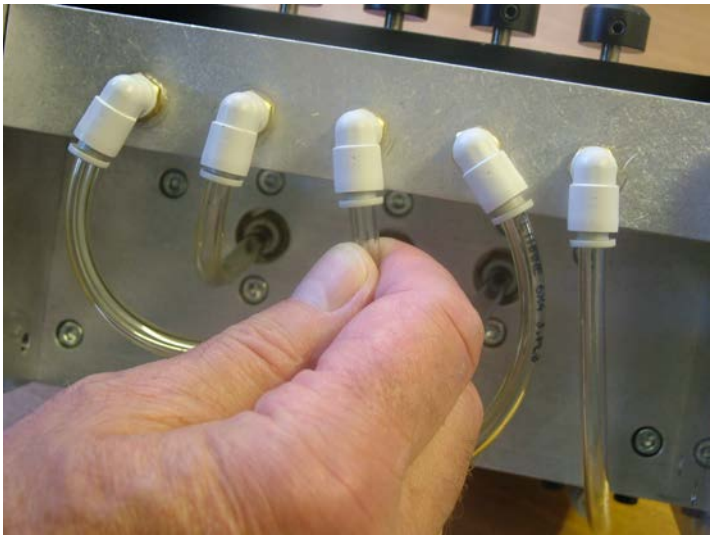
To release the cam assembly, remove the two fixing screws, Item 1056, from the base.

Replacing the cam

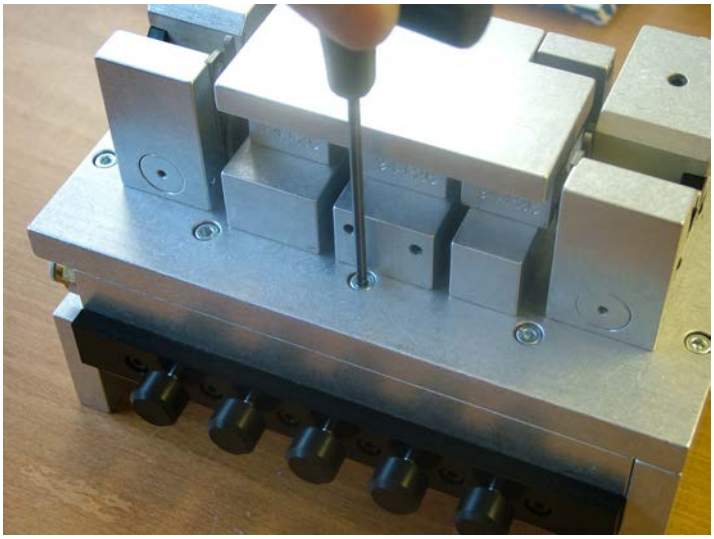


To replace the cam, remove the grub screw from the cam itself.

Removal of trigger block assembly

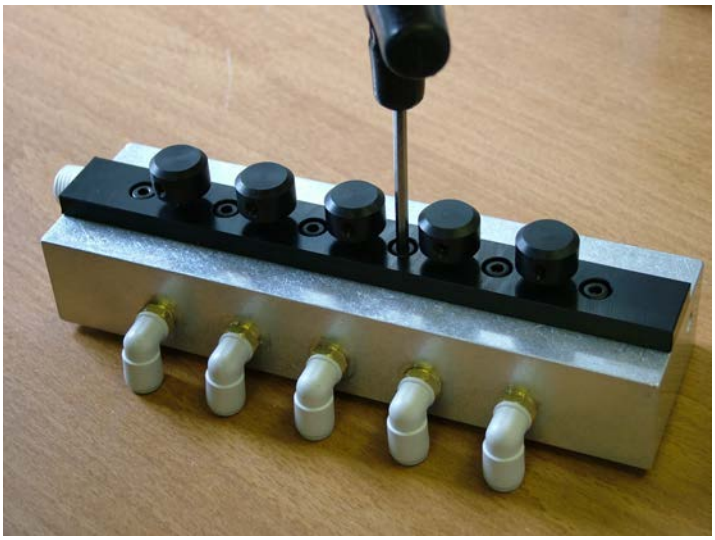


Firstly, remove all the pipes from the push fittings. The sequence for reassembly is 1 = Middle chamber; 2 = Left chamber; 3 = Right chamber; 4 = Left knife and 5 = Right knife.

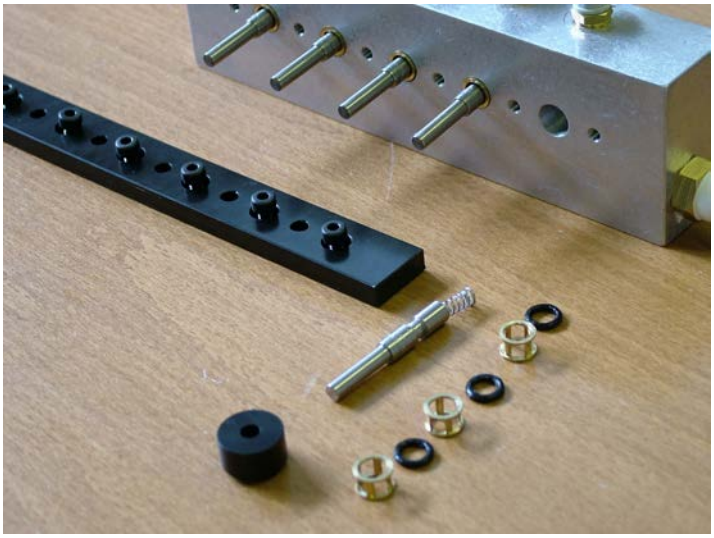


The trigger block assembly has four sections – the trigger, valve, retaining plate and the trigger block. Remove the 3 screws, Item 649, from the top of the base plate; this will release the whole trigger block assembly.

The trigger needs to be removed first. This is done by removing the grub screw, Item 1040, as shown.



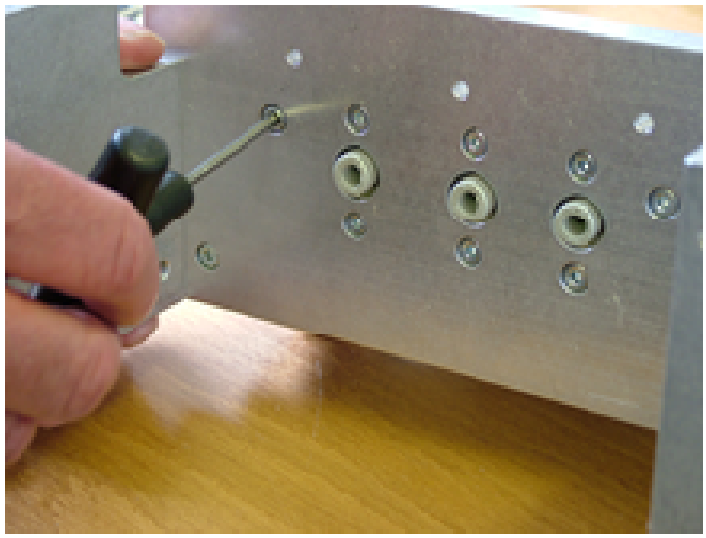
Once all the trigger grub screws have been removed, you can now undo the retaining plate by removing the 6 fixing screws, Item 1127.



Once the retaining plate has been removed, it will reveal the 5 air valves and around each valve will be a series of shell (Item 276), o-rings (Item 264) and a spring (Item 787). Sequence of components: shell; o-ring; shell; o-ring; shell; o-ring; spring.

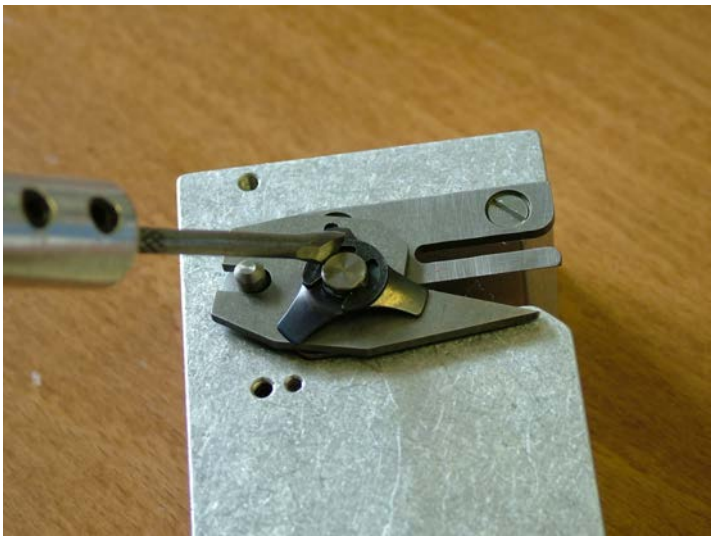
This valve needs to be greased with white grease depending on usage.

Removal of knife block assembly



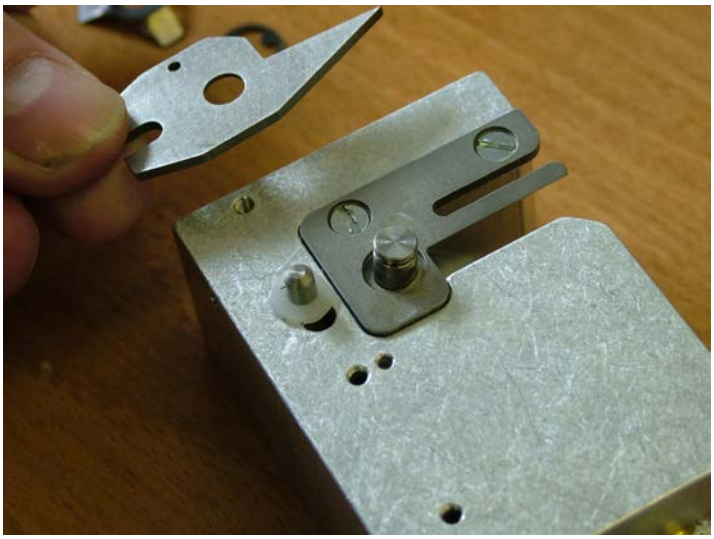
To release a knife block, remove the two fixing screws, Item 649 and 1237, from the bottom of the knife block assembly.

NOTE: smaller screw (Item 1237) is at the rear of unit.

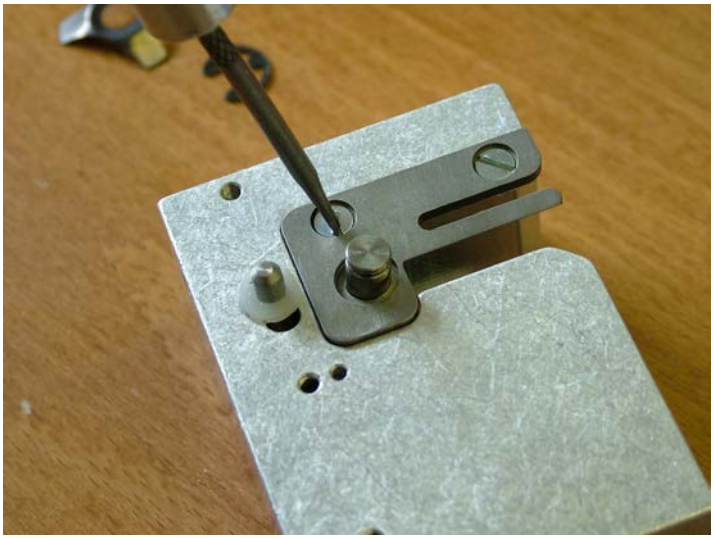


The knife has three sections – the fixed knife, moving knife and knife spring/circlip assembly. The circlip (Item 1124) is removed using a screw driver to lever it off; this will release the knife spring.

The knife spring (Item 241) is removed; this will release the moving knife

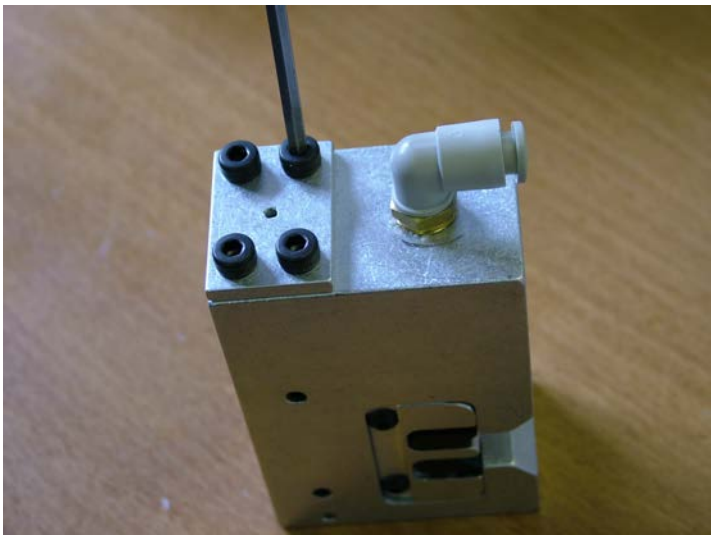


The moving knife (Item 1115/7) is removed; this will release the fixed knife

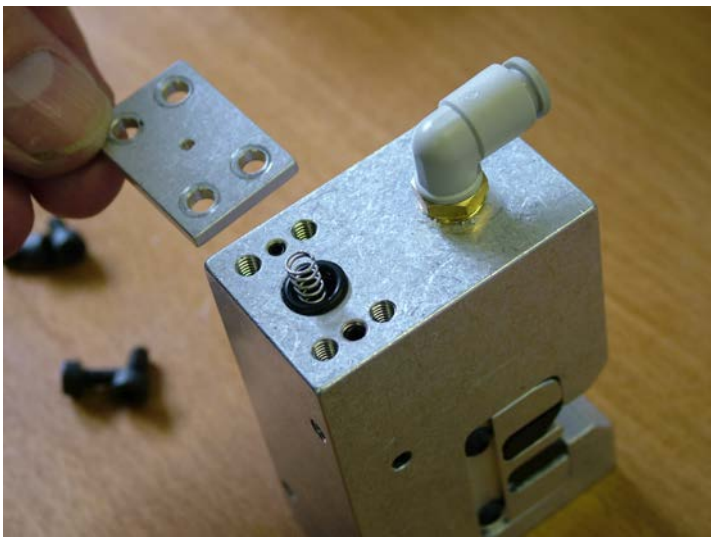


The fixed knife (Item 1116/8) requires three screws to be removed.

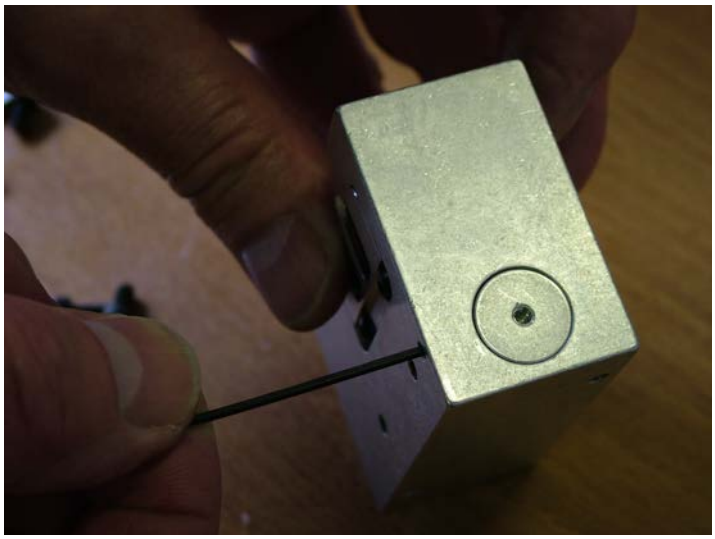
NOTE: Both sets of knives will require sharpening over time (especially with Kevlar and high yarn count applications).



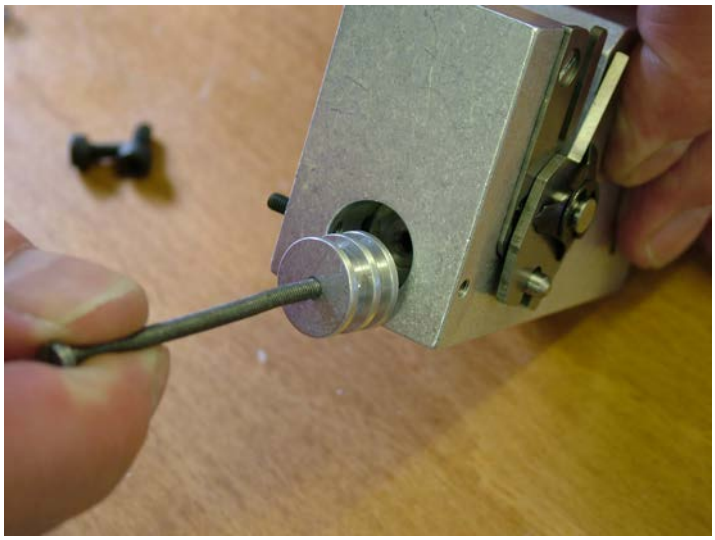
To remove the knife valve for re-greasing, you need to remove the 4 screws, Item 1127.



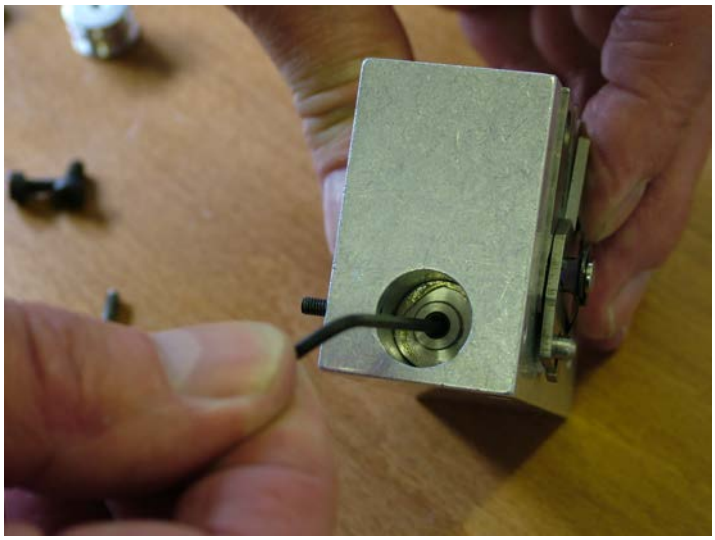
Once the screws are removed, you can remove the knife valve retaining plate, Item 1217.



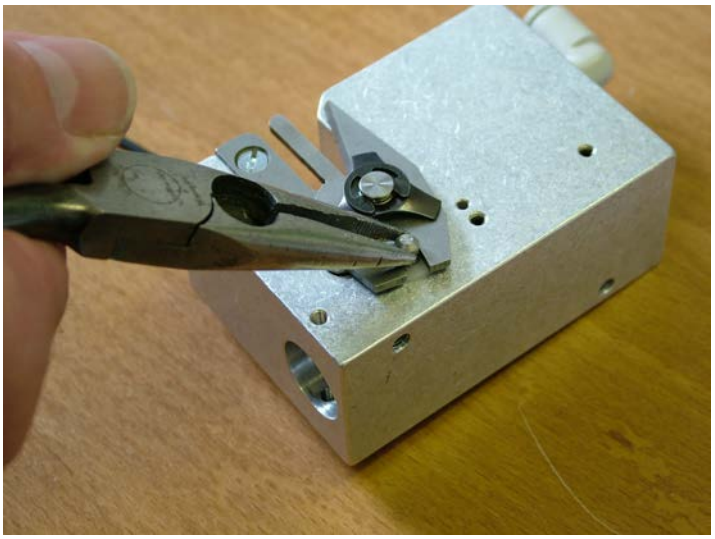
On the other side of the knife block, you need to remove a grub screw, Item 1128. This will free the sealing plug, Item 1005.



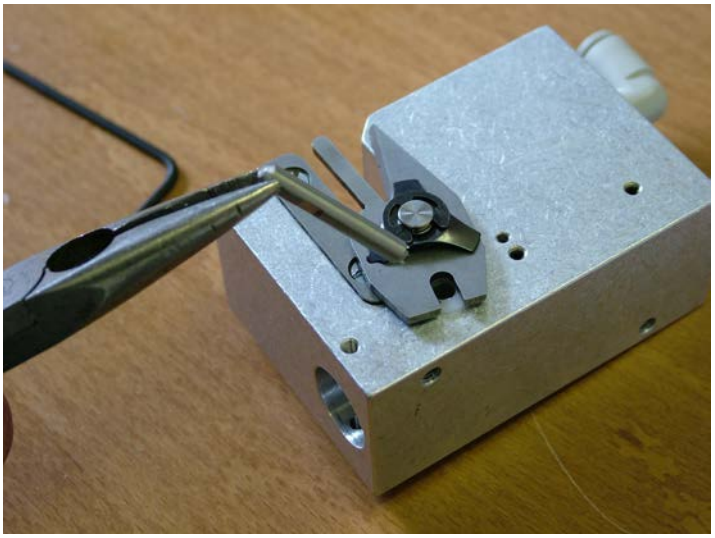
The sealing plug can easily be removed by using any M3 thread and pulling it out.



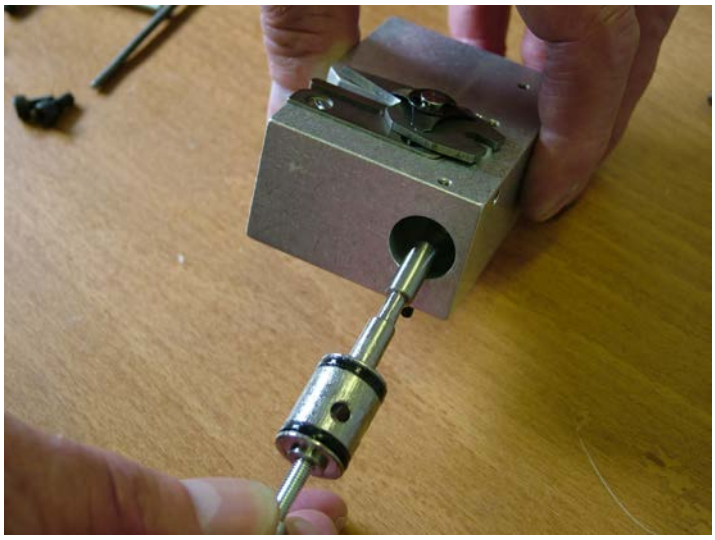
Once the sealing plug is removed, you can remove the M4 grub screw, as shown in the photo.



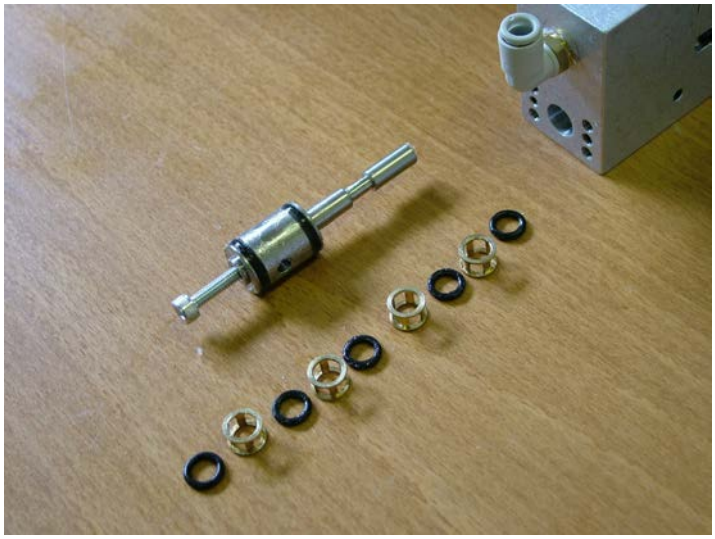
Once this grub screw is removed, you can freely pull out the knife shaft (Item 1028), which will release the knife valve.



View of knife shaft.



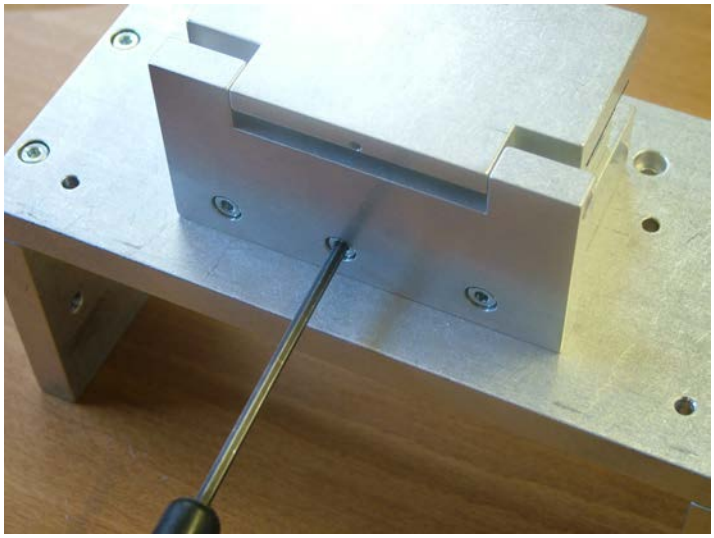
Again for ease of removal, you can use M4 thread to remove the knife valve.



Around the knife valve will be a series of shells and o-rings. Sequence of components: o-ring, shell; o-ring; shell; o-ring; shell; o-ring; shell; o-ring.

This knife valve needs to be greased with white grease depending on usage.

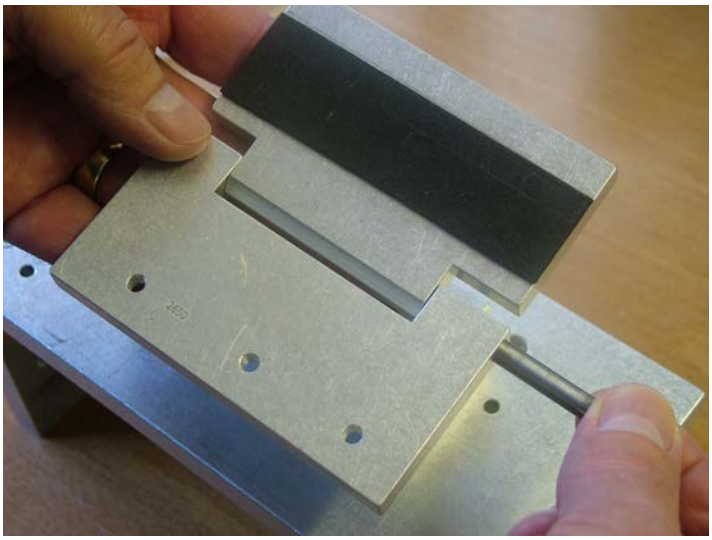
Removal of hinge back plate



To release a hinge back plate, remove the three fixing screws, Item 1237, from the back face.

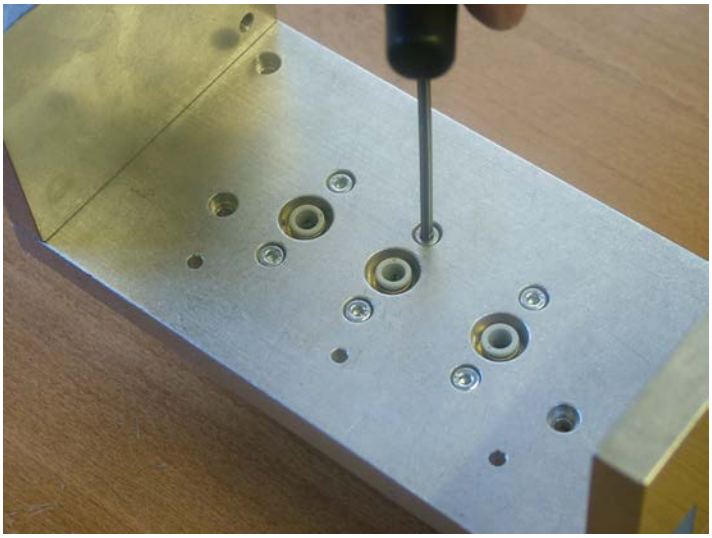
NOTE: this needs to be completed before the removal of chamber blocks.

Removal of hinge lid and rubber strip assembly

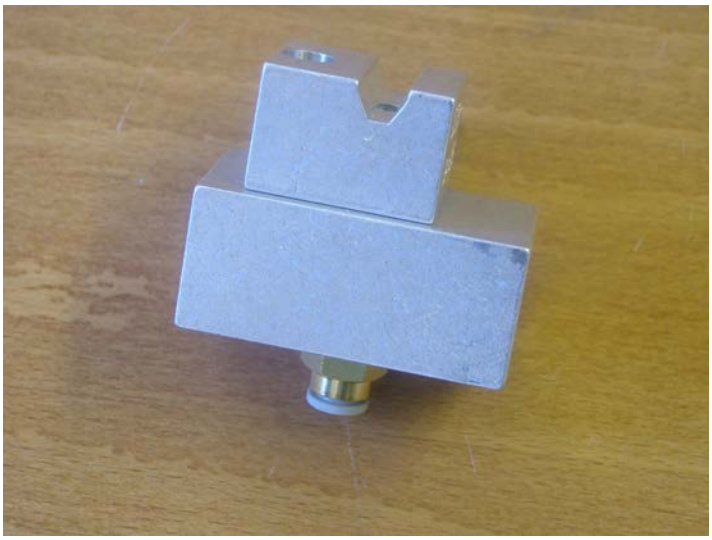


To release a hinge lid and rubber strip assembly, remove the hinge pin. It is size for size so can easily be pushed through by hand.

Removal of chamber block assembly

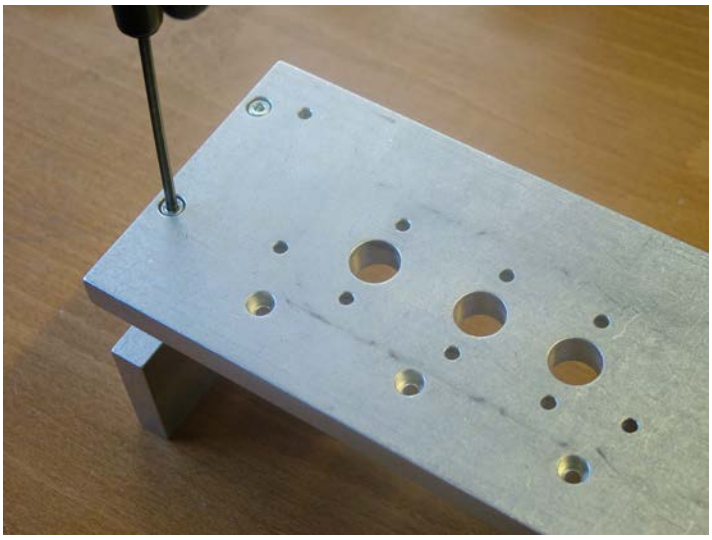


To release the chamber blocks, remove the six fixing screws (2 on each block), Item 649, from underneath.



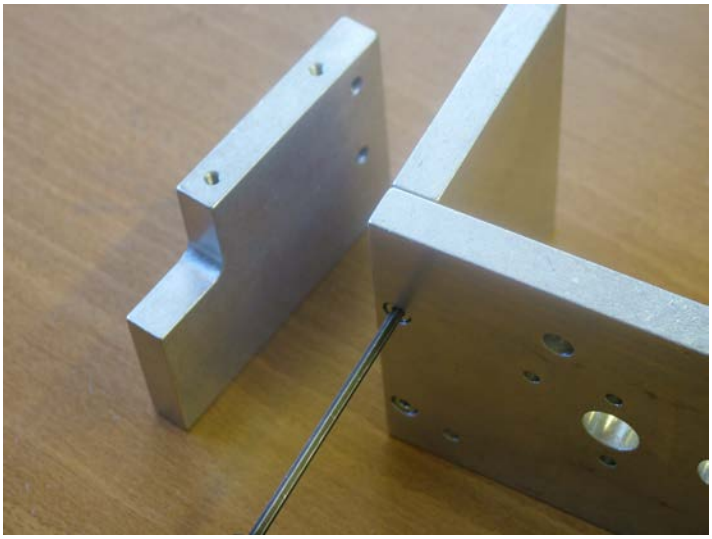
Chamber block assembly. The push fit connector can be removed from underneath the block.

Removal of leg supports



To release a left and right leg supports, remove the 4 fixing screws (2 on each side), item 649, from each side of the base plate.

(Left hand)



(Right hand)

Compressed air

Pneumatic splicers are operated by compressed air. Therefore, the air supply must be appropriate. The following points are important:

1. Splicers generally operate at a pressure between 3 and 8 bar.
2. Pressure may vary according to application, but it must be as uniform as possible.
3. The air supply should be reasonably dry and clean, with the lowest possible flow resistance.
4. Because the time taken to make a splice is short, transient pressure drops associated with other demands in the mill may become important,
5. When the splicer is operated, line pressure at the splicer head normally drops by about 1 bar. If there are restrictions in the line, air will not be replenished, so that the pressure drop will be greater; weak splices may result.
6. Compressed air installations should therefore be designed to minimise pressure drop.
7. Never use narrow-bore supply tube; this introduces resistance.
8. When there is doubt about the quality of the air supply system, a pressure gauge should be fitted - temporarily - as near as possible to the splicer, so that static pressure and pressure drop can be monitored. This is particularly desirable in an installation which uses long lengths of coiled hose; losses in such hoses then to be significant.
9. Sometimes, static line pressure is known to be adequate, but there are demonstrable problems with transients. Then it may be useful to fit a few meters of wide-bore pipe or other form of plenum, close to the splicer. This will act as a reservoir, to minimise pressure drops while the splicer is in use.
10. Do not fit lubricators in the line very near to the splicer; an excess of oil on the yarn may weaken the splice.

Compressed air and safety

All our splicers have been designed with safety in mind. The few moving parts have been enclosed or shielded to reduce the possibility of injury to the operator. In normal use, the only component which is in any way a source of hazard is the knife assembly. By design, however, the blades are difficult to reach, and are not dangerous in any normal circumstances. Knives represent a hazard only during removal and disposal. So, in normal use, the splicers present no risk.

However, the splicers do use compressed air, and that has the potential to cause injury.

1. Compressed air is dangerous: avoid any bodily contact with it.
2. Always follow the safety precautions recommended by the compressor manufacturer.
3. Always ensure that unions and connectors are fully tightened and sealed, and that there are no leaks.
4. Check the conditions of air supply lines on a regular basis. Always ensure that any flexible hoses are unblemished; if there are any cuts or abrasions to the outer surface of the hose, stop using the splicer and have the hose replaced by qualified personnel.
5. Do not look into the working parts of the splicer when it is being operated.
6. If a splicer malfunctions, do not use it until it has been repaired by qualified personnel.
7. For maintenance staff, additional advice is necessary. When cleaning or servicing is being carried out, access to the internal mechanism of the splicer is essential. Under these circumstances, maintenance engineers will be at greater risk than ordinary users. The engineer should adhere strictly to the following guidelines:
8. Before undertaking any service work, disconnect the splicer from the air supply.
9. Under normal circumstances, always refit safety covers before reconnecting the splicer to the air supply.
10. Under exceptional circumstances, it may be necessary - for test purposes - to reconnect the splicer to the air supply without its safety covers. While the splicer is being tested, wear protective gear and exercise due caution.

Compressed air and noise

A splicer uses compressed air, which for a brief period - about 1 to 2 seconds - is vented to atmosphere while the splice is being made. Air at perhaps 7 bar pressure escapes through a small blast hole, creating intense turbulence in a small volume. Noise is inevitable.

Typical maximum noise levels vary from 80 db to 98 db, depending on the splicing chamber. Some chambers are quieter than others, simply because they have a smaller blast-hole, and allow less air to emerge.

Our noisiest splicer, with the biggest blast hole in our range, generates a noise spectrum as shown in the table below:

Hz	63	125	250	500	1000	2000	4000	8000	16000
dB	47	52	57	63	74	89	92	93	95

In practice, splicers are barely noticeable in a textile mill. This is because the other mill machinery tends to be very noisy, and the sound of the splicer is lost in the general noise. Also, the blast only lasts for about one second. Nevertheless, in compliance with UK health and safety regulations, we recommend that ear defenders (to local standards equivalent to British Standard 6344 Part 1) be worn.

122 Series – Parts list

Description	Item No.	Quantity
1/4" BSPP x BSPP adaptor	157	1
Knife spring	241	2
Shutter spindle-30.3mm long	252	2
O-Ring - BS010	264	25
Shell for air valve-43004-A3	276	23
Yarn clamp spring	307	4
M3 x 4 socket set screw	501	4
M3 x 6 socket set screw flat point	502	2
M3 x 6 slotted countersunk head screw	516	4
M3 x 6 socket button head screw	517	4
M4 x 16 Socket head cap screw	649	18
Air valve return spring LC-022B-8SS	787	7
M4 x 6 socket set screw	869	5
Lower sealing plug 103	1005	2
O-Ring lower bore	1014	4
Blast valve & yarn clamp adjusting screw	1017	4
Knife shaft 103	1028	2
M4 x 4 socket set screw	1040	9
M4 x 25 socket cap head screw	1056	2
Knife pivot	1106	2
Yarn clamp pad 111	1108	4
Right hand moving knife 111	1115	1
Right hand fixed knife 111	1116	1
Left hand moving knife 111	1117	1
Left hand fixed knife 111	1118	1
Circlip	1124	2
M6 x 6 socket set screw	1125	3
M4 x 8 socket cap head screw	1127	14
M3 x 10 socket set screw	1128	2
Chambers (Please specify)	1213##	3
Knife Valve Plate	1217	2
Knife Valve 122	1218	2

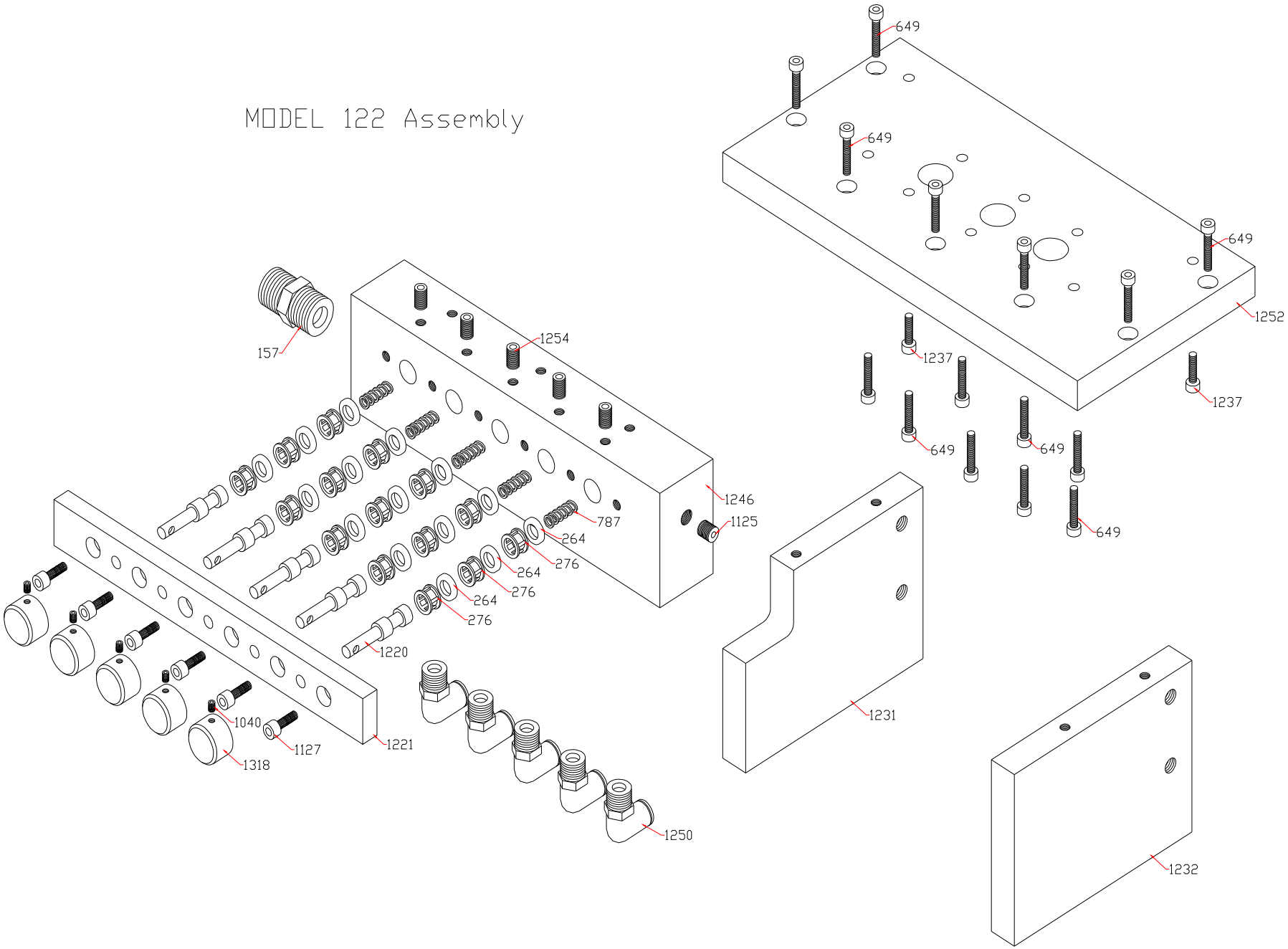
Yarn clamp block 122	1219	2
Air valve 122	1220	5
Valve retaining strip	1221	1
Knife Block - LH	1223	1
Knife Block Assembly - LH	1224	
Knife Block - RH	1225	1
Knife Block Assembly - RH	1226	
Chamber Block – LH	1228	1
Chamber Block – M	1229	1
Chamber Block – RH	1230	1
Left Support	1231	1
Right Support	1232	1
Hinge Back Plate	1233	1
Hinge Pin	1234	1
Hinge Lid & Rubber Strip Assembly	1235	1
M4 x 12 socket cap head screw	1237	5
Cam 122	1239	1
Cam Support Block	1240	1
Cam Spindle	1241	1
Valve Block 122	1246	1
Spacing-Moving Knife 122	1249	2
Feed Tube Connector Elbow	1250	7
Chamber Block Connector	1251	3
Base Plate	1252	1
Air Feed Tube 122 (specify position)	1253	5
M5 x 8 socket set screw	1254	5
Trigger button 105/113/114	1318	5
Hanging assembly parts (if not custom)	1242	
Splicer holding clip	170	2
M4 x 16 countersunk slotted head screw	908	4
Splicer mounting adaptor plate	1008	2
Hanging Block 122 - LH	1244	1
Hanging Block 122 - RH	1245	1
M6 x 25 socket cap head screw	1247	4

Cam Assembly Parts	1236	
M4 x 6 socket set screw	869	1
M4 x 25 socket cap head screw	1056	2
Cam 122	1239	1
Cam Support Block	1240	1
Cam Spindle	1241	1
Flow Control Parts		
M3 x 6 socket button head screw	517	3
O-ring BS006	788	2
Chamber Block – LH (Flow compatible)	1255	1
Chamber Block – M (Flow compatible)	1256	1
Chamber Block – RH (Flow compatible)	1257	1
Flow Restrictor Valve 122	1258	3

Note:

When ordering the following spare parts please ensure that you quote your unit serial number. These parts were updated September 2016.

- Chamber block (Items 1228, 1229, 1230)
- Chamber (Item 1213##)
- Hinge back plate (Item 1233)


MODEL 122 Assembly
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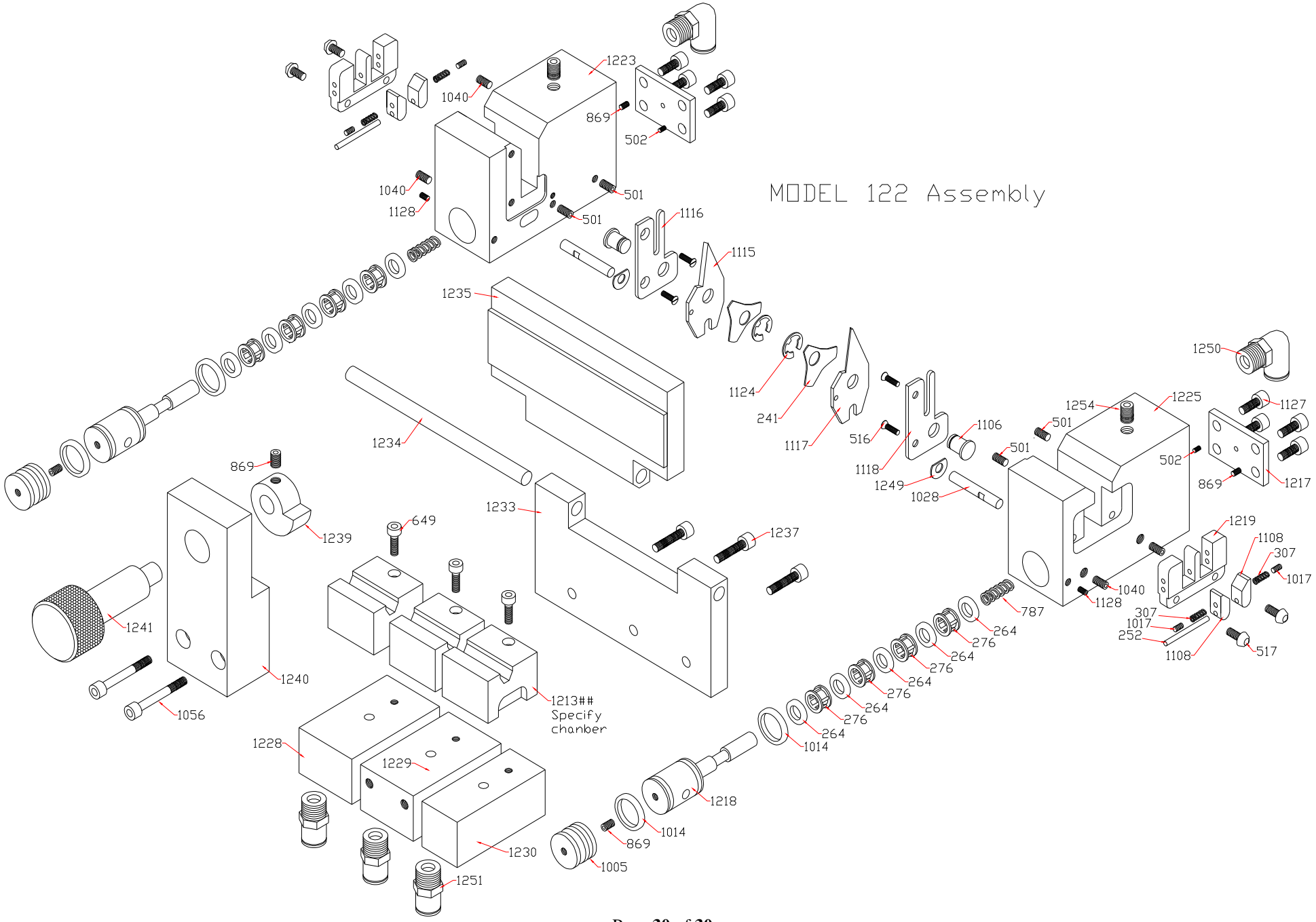
MODEL 122 Assembly
1223
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502
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1128
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501
1116
1115
1235
1234
1124
241
1117
516
1118
1249
1028
1106
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264
1014
1218
1014
869
1005
1251
1230
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1229
1213## Specify chamber
1233
1237
869
1239
649
1241
1240
1056