GTW Developments Ltd.

701 Series splicers

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Model 701 - 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; these 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)
- Lanyard
- Optional hanger and screws
- Optional hanging clip

When the splicer is in use, the operator should 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 blanking plate). 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, minimum pressure 6 bar. **(See Appendix 1 for compressed air Health and Safety issues)**

Under normal circumstances, the line pressure should be around 6 bar. The line should preferably be fitted with a pressure regulator so that adjustment may be made to suit local needs.
Hold the splicer with the trigger button facing the body, and press the trigger with the thumb.

- Look down into the splicer
- Press trigger part-way down - see the pad move until it hits the chamber
- Press trigger further - Listen for the air blast

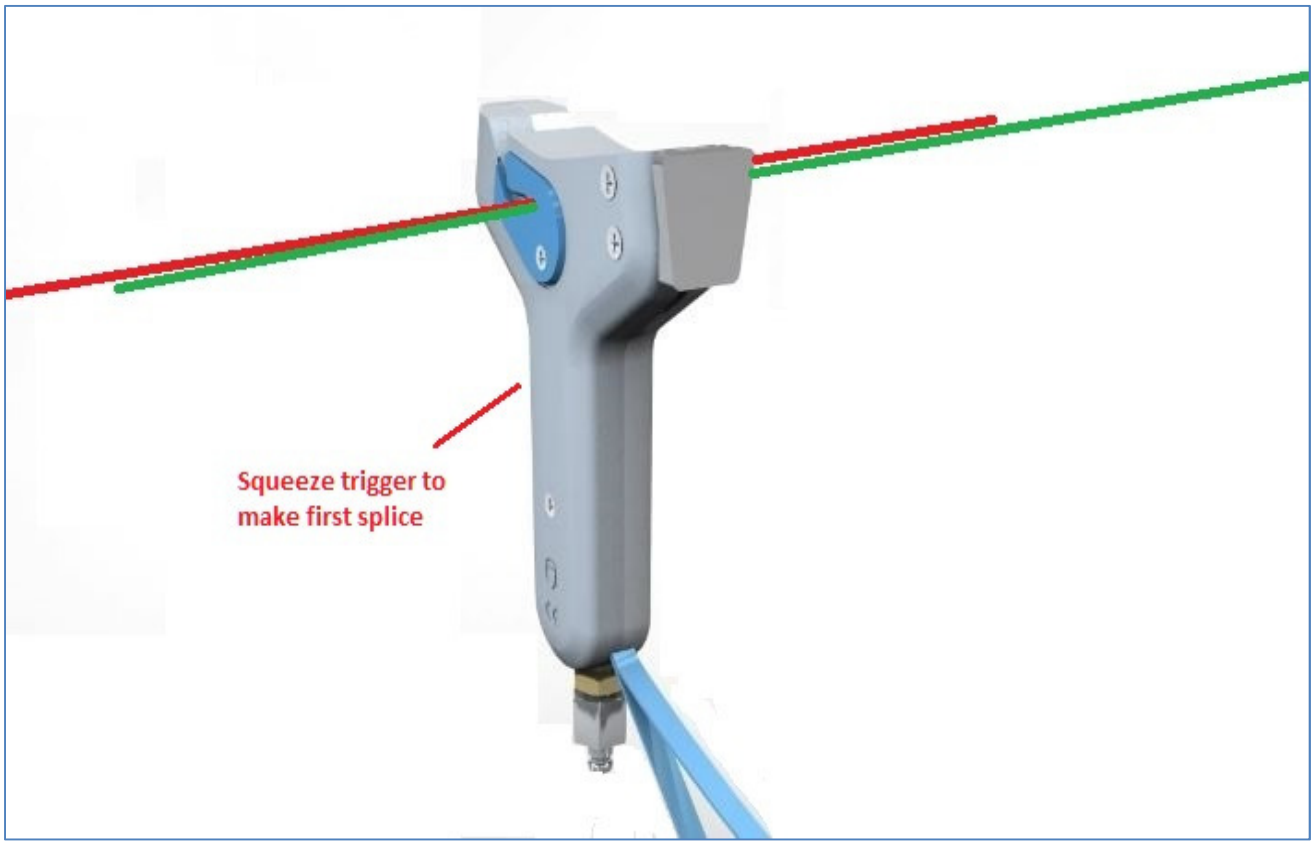
Splicer threading

The Model 701 has been designed to splice heavy-count yarns in materials such as glass and carbon.

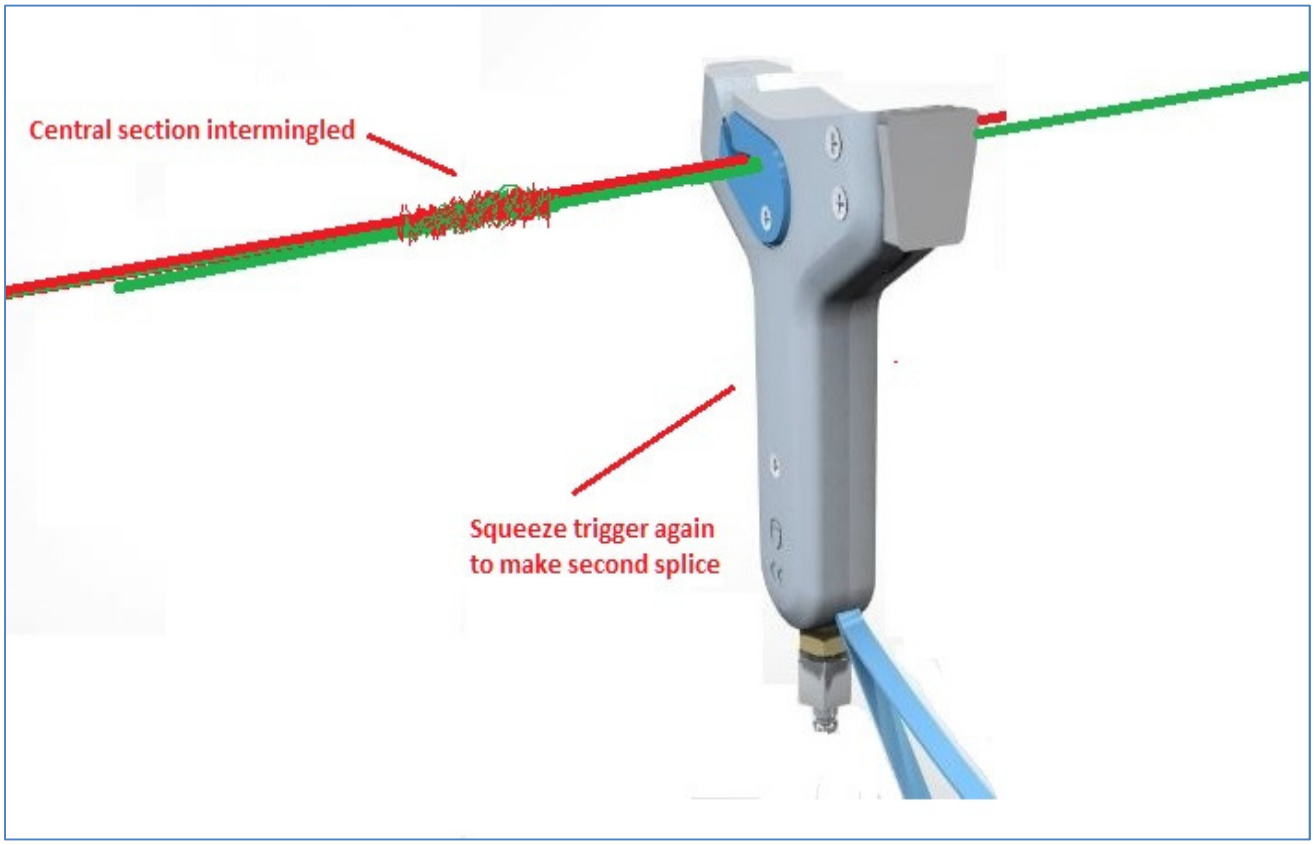
Airbond research has shown that standard splicers – which typically make joints of around 30 mm in length – produce splices which are weak. Heavy-count yarns demand longer splices, typically up to 150 mm for 4800 tex.

The Model 701 accomplishes this by making three or more splices in a line; it is this procedure which is described below. The splice is made in several stages: three intermingling steps, followed by hand-trimming of the finished joint.

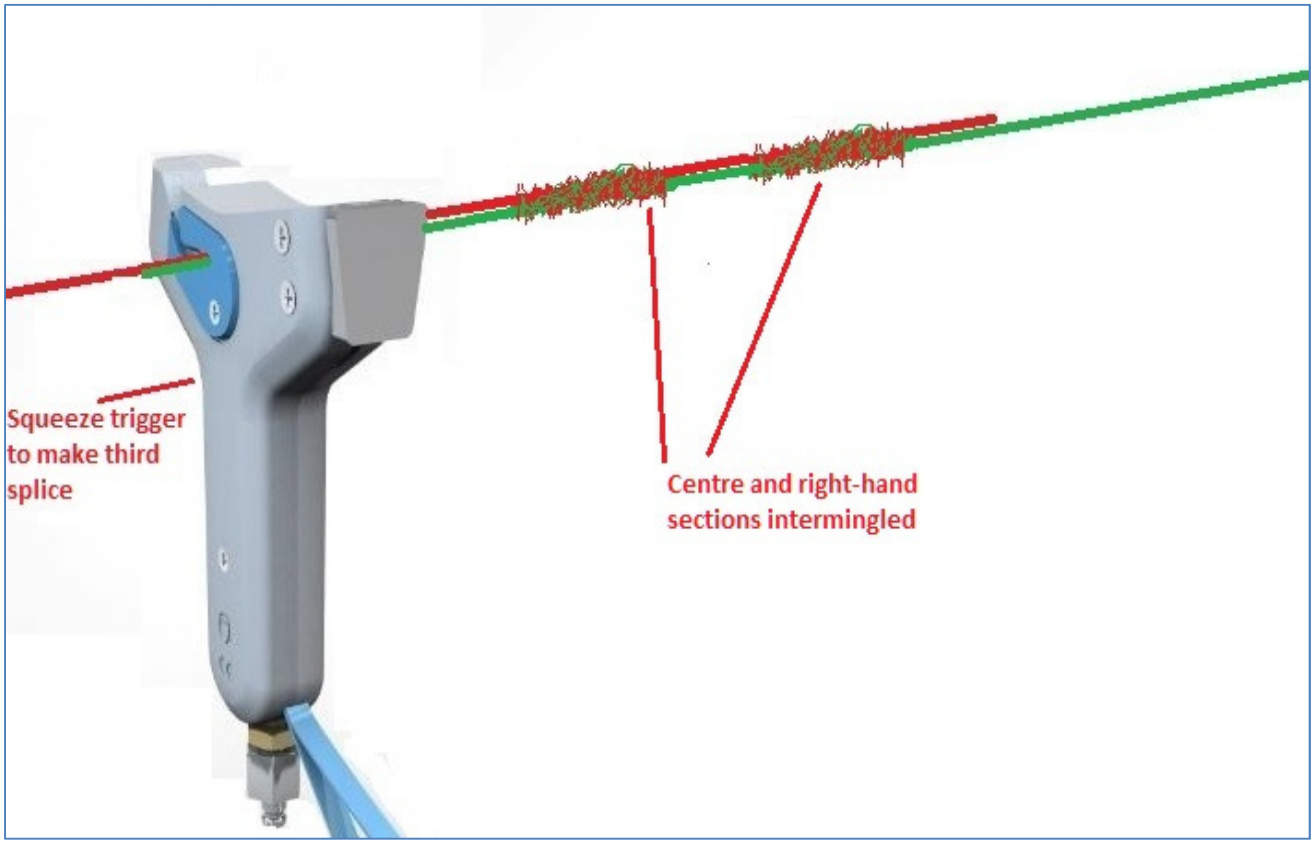
Overlap the yarns by 100 – 150 mm, place the splicer at the centre of the overlapped yarns, and squeeze the trigger to make the first splice.



Move the splicer to the right-hand end, and repeat.

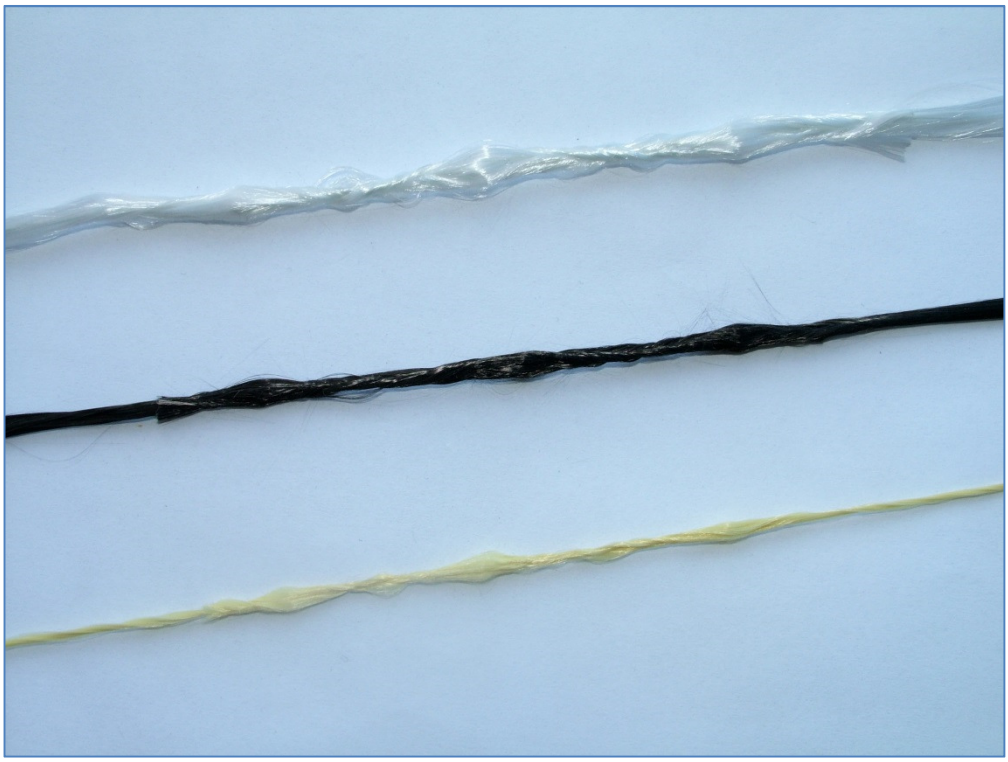


Move the splicer to the left-hand end, and repeat.



After the triple-splice has been completed, trim off the waste ends with a scissors.
This technique has proved very successful with a number of materials; the picture below shows splices in glass, carbon and aramid. It is clear that the result for carbon is excellent – the fibre is very easily damaged by conventional splicing processes.

The triple-splice structure of the compound joints is clearly visible in this photograph.



Model 701 – general product information

The Model 701 Splicer is unique, in that the splicer body is held inside a rugged ABS outer shell. The shell is capable of standing up to heavy-handed use, but even if the shell is badly damaged by some accident, the splicer body will almost certainly remain undamaged within. The result is that the outer shell can be considered as an inexpensive consumable, while the inner splicer – the expensive part - should have an extremely long service life.

The new splicer body of the Model 701 is itself completely new. It has a novel, patented design, which is simple to operate and extremely simple to repair. The working part has no screws in its construction, and it can be dismantled and re-assembled in about five minutes, without any special tools.

The splicer has a number of components mounted inside an ABS casing, via which compressed air is conducted for the splicing action.

1. Trigger – the first pressing of the trigger causes the pad to move until it closes the splicing chamber
2. Pad - further pressure on the trigger pushes the pad firmly against the splicing chamber, causing the chamber to move back.
3. Valve – the splicing chamber and valve form a single sub-assembly, which means that movement of the splicing chamber moves the valve, allowing compressed air to pass into the chamber for splicing.
4. Splicing chamber – this has a profiled recess on the front face which, with the closed pad, forms a confined space in which the splice is made.
5. Guide plates - the plates provide a means of guiding the yarn across the splicing chamber and across a static knife..

The Model 701 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 blast air technology, which is simple, revolutionary and patented. The splicer design allows the tool to make joints in a wide range of yarn counts without any change of configuration.

Introduction

The company's long-established Models 110 and 113 have been proven over years of service to be the most flexible and durable products in their market sector. They are simple to operate, and easy to repair. They also have a quite unique flexibility of operation; a very wide range of yarns can be spliced on a single splicer configuration. Uniquely, the products can join yarns from 100 tex to around 6000 tex in one configuration.

The special characteristics of the 110 and 113 have made them the splicers of choice for many producers and processors in the composites sector across the world.

More recently, there has been a demand for splicing still bigger yarns, up to around 16000 tex. The 110 and 113 were not up to this new requirement, so in 2012, Airbond introduced the Model 114 which can deal with these very high counts.

Airbond set out in 2013 to take a fresh look at the 110, 113, and 114, to see whether improvements could be made to the class-leading products. We have succeeded:

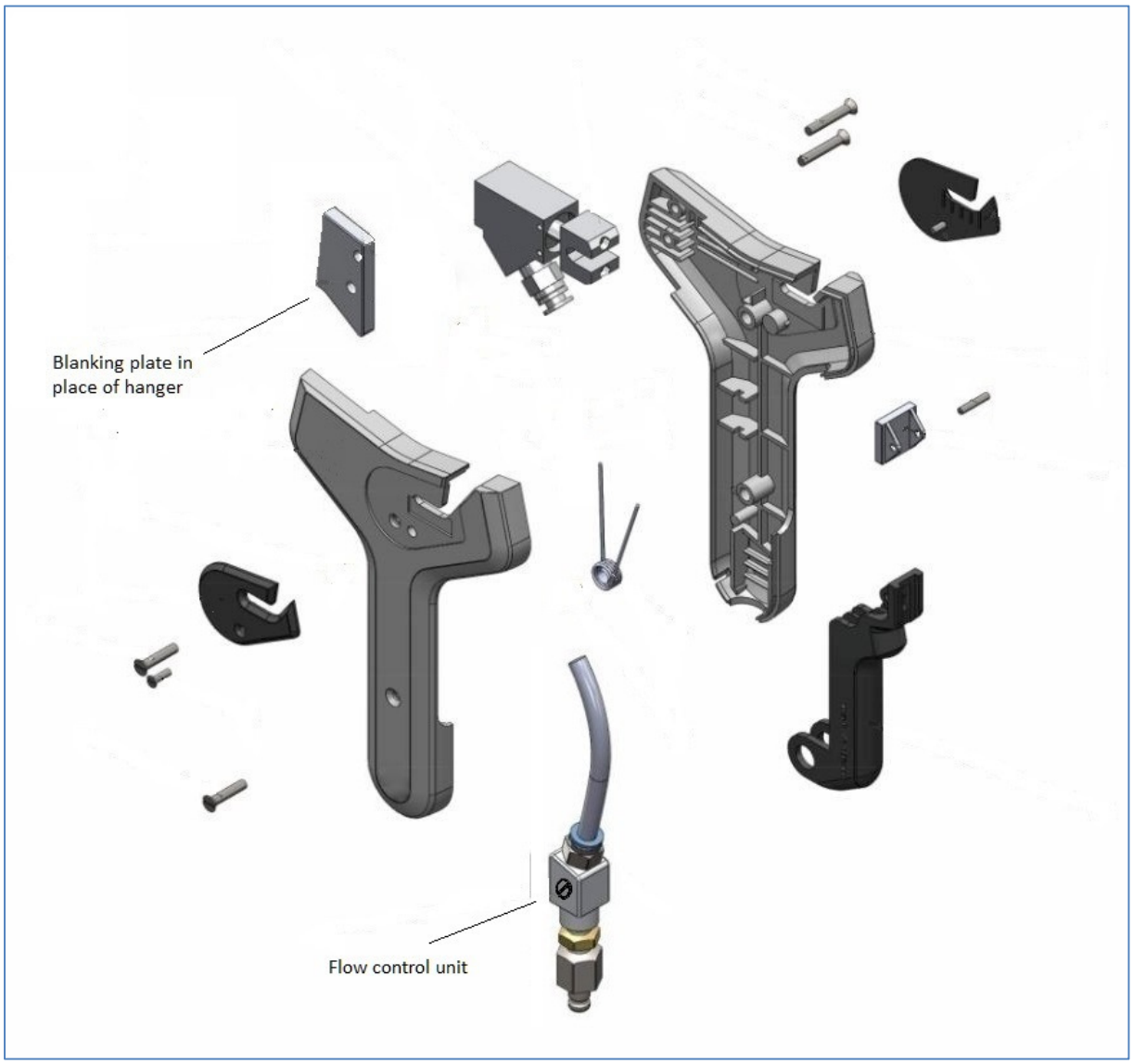
- The new 701 can splice the whole range, from 100 tex to 16000 tex.
- The splicer has a completely new and simplified method of operation – patents are pending for this splicing principle.
- The splicing unit is not exposed at all to everyday wear-and-tear – the unit itself is completely enclosed within a stout ABS outer shell; an accident in service, which might have rendered existing splicers useless, now will merely entail the replacement of the inexpensive outer case.
- The splicing unit has been constructed without screws; when maintenance is needed, the unit can be dismantled merely by pressing out two pins; the whole thing can be dismantled and reassembled in about two minutes.
- The closure pad has been radically simplified; instead of the traditional pneumatic / mechanical actuation, the pad simply pivots on a lever arm, and adjusts automatically to fit the chamber.
- The new splicer is two-thirds of the weight of its predecessor.
- The trigger design has been made to be more operator-friendly.
- The splicer has improved balance, and feels easier to handle.

Quite simply, the 701 sets a new standard as an effective and user-friendly tool for making splices in glass, carbon, and other modern materials.

The Model 701 is currently available in four forms, the Model 701 H, the Model 701 HW, The Model 701 HF, and the Model 701 HFW. Two of these four forms – HF and HFW – are fitted with a flow-control device, for the user who may need to use lower air flows for splicing the more fragile yarns such as carbon.

Model 701 H

This splicer is the simplest of the range. It has no hanging device, and no flow control valve.



Model 701 HF

Some users may have a range of yarns, with some more fragile than others. Although this splicer has no hanger, it does have a flow control valve, permitting the user to reduce the violence of the air blast when necessary.

Model 701 HW

Many users find it useful to “park” the splicer in a safe place when it is not in use. This is sound practice, because the splicer is unlikely to be damaged by being dropped, and it is not left lying on the floor, as a safety hazard. So this splicer is fitted with a wedge-shaped hanger. The splicer has no flow control valve.

Model 701 HFW

This splicer is the most complete of the range. It has a hanging device, and a flow control valve.

Maintenance

Splicer outer case dismantling

Place the splicer on a flat surface with the slotted countersunk screws facing upwards. This we define as the LEFT outer case. The other section is defined as the RIGHT outer case.

Remove the slotted countersunk screw, Item 516.
Remove the yarn guide plate, left side, Item 1616.

Lift off the yarn guide plate. This exposes the entry side of the splicing chamber.

Reverse the splicer and remove the slotted countersunk screw, Item 516.
Remove the yarn guide plate, right side, Item 1615.

Lift off the yarn guide plate. This exposes the other side of the splicing chamber.

Return the splicer to its original position. This allows access to the four main slotted countersunk screws, M4 x 12 mm, Item 606, and M4 x 20 mm, Item 705.

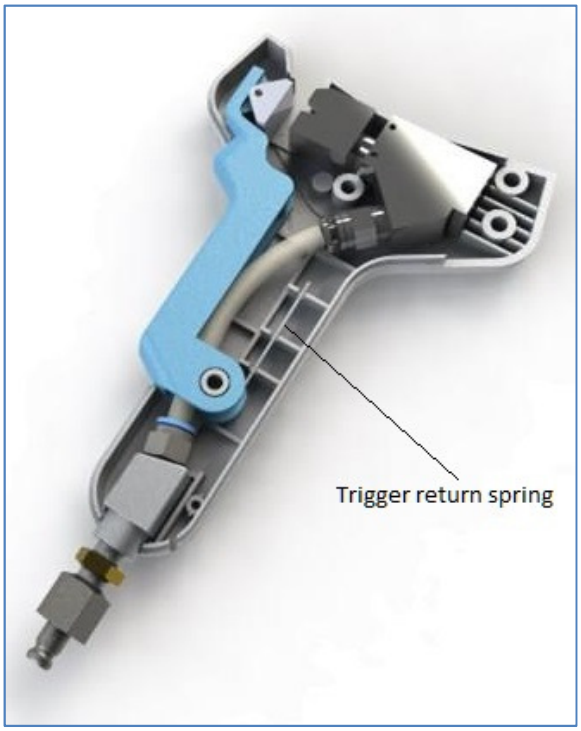
Remove all four screws, removal of the top two screws allows the hanging clip (or the hanging blanking plate) to be removed.

Lift off the right splicer outer case.

Removal of the right splicer outer case reveals:

- the main splicer block, (here dark grey)
- the trigger / pad assembly (here blue)
- The lanyard (here blue)

Remove the lanyard securing pin, and lift the lanyard away



This action reveals the trigger return spring. TAKE CARE at this point; the trigger return spring may suddenly escape from its restraint location; sore fingers may result.

Release the trigger return spring with care

The trigger return spring is shown here (red) in its released position; in this state it poses no risk.

Ease the upper compression fitting, to release the air union and feed tube. Remove the air union and feed tube.

Lift away the trigger assembly, together with the chamber pad. Keep the assembly as one unit, unless you need to remove the chamber for maintenance or replacement.

Remove the splicing unit, leaving the left splicer outer case empty.

If required, press out the pad retaining pin, and separate the trigger and closure pad.

Splicer body reassembly

Lay the left splicer outer case on a flat surface (the thread inserts should be facing upward.)

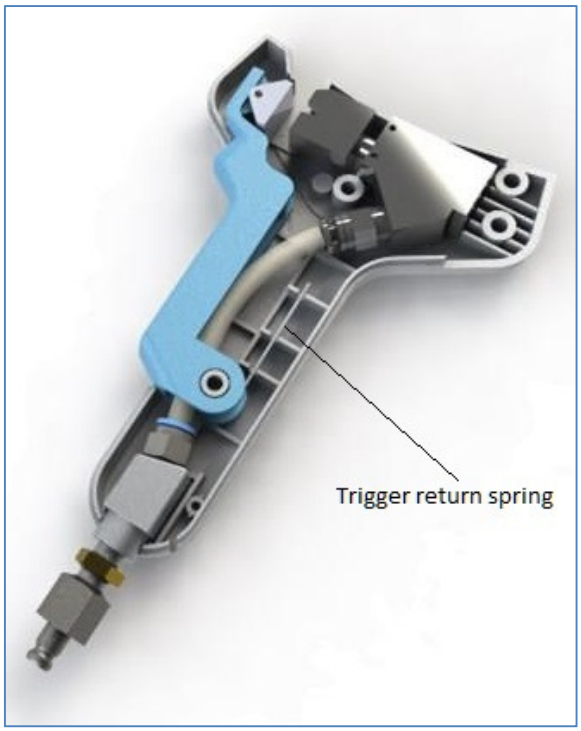
The closure pad mounting pin is an interference fit in the splicer trigger lever. This arrangement retains the closure pad, while allowing the pad to be a loose fit, so that it can align itself to the face of the splicing chamber.

Press the pin through the assembly until it is located symmetrically.

Place the splicer unit into the recess in the left outer case; ensure that it is seated snugly at the base of the recess.

Assemble the trigger sub-assembly and the spring onto the moulding, using the lower boss as a pivot.

Do not tension the spring (shown red) into place at this stage.



Push the air feed tube into the air union sub-assembly.

Locate the air union sub-assembly into the base of the outer case, feeding the air feed tube up through the trigger.

Push the air feed tube into the main splicer unit.

Compress the trigger return spring, so that it locates in its securing slots in the moulding.

Push the lanyard pin into position in the outer case, and position the lanyard.

Locate the right outer case, ensuring that the outer cases fit together properly, and that the lanyard pin is in place.

Slide the hanging clip (or the hanging blanking plate) into position between the outer cases.

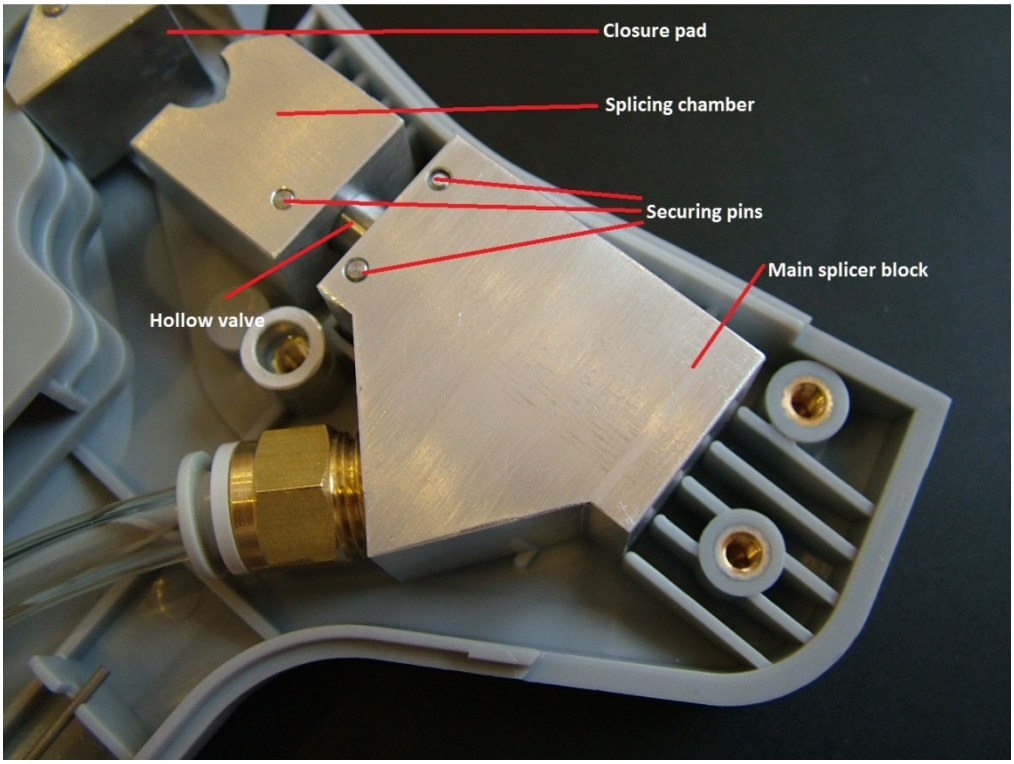
Assemble the splicer body, using an M4 x 12 mm slotted countersunk screw at the bottom, and three M4 x 20 mm slotted countersunk screws at the top.

Replace the side-plate, using an M3 x 6mm slotted countersunk screw.

Repeat this action on the other side, to secure the other side plate.

Splicing unit: Dismantling and reassembly

The splicing unit itself sits inside the outer moulding, so that it is not easily damaged in service. The entire splicing action is contained within the block shown in the photograph.

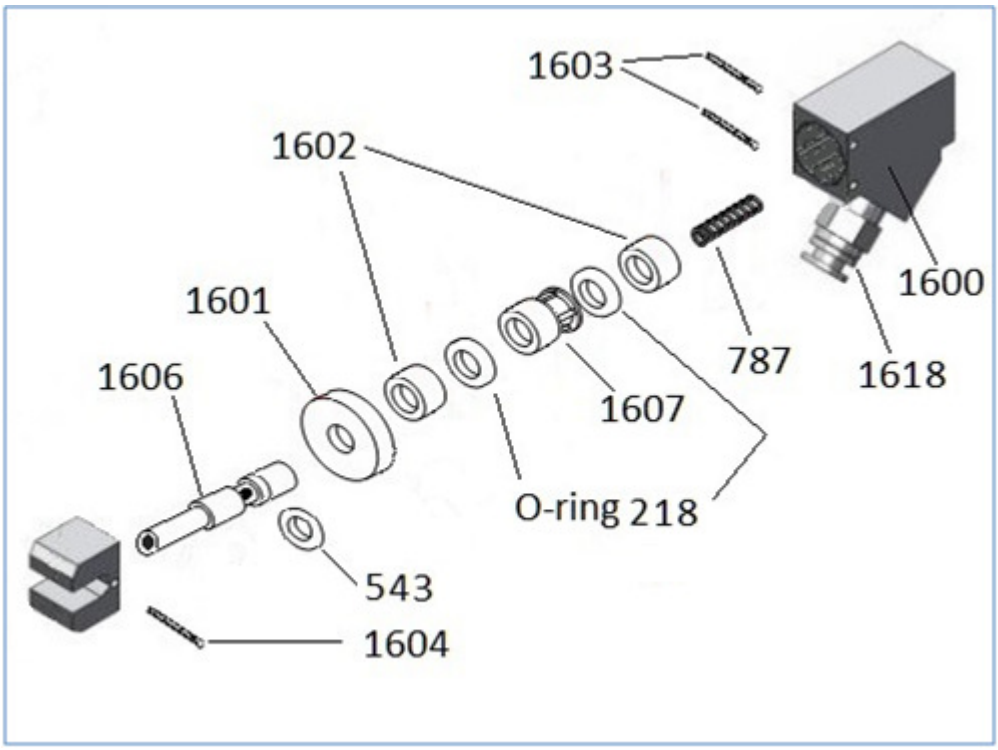


The closure pad is at the top left. The splicing chamber is secured to a valve which runs inside the main splicer block. The valve is hollow, such that air passing through the valve is directed into the chamber. When the chamber is in the resting position, the valve is closed, so that no air flows into the chamber.

Pressure on the trigger swings the pad forward. When the pad makes contact with the front face of the chamber, it aligns itself automatically, and applies a force to the chamber. When pressed by the pad, the splicing chamber slides back into the block, moving the air valve. After a short distance, the valve opens, allowing air into its hollow core, and thence into the chamber, causing the splicing action to start.

NOTE:

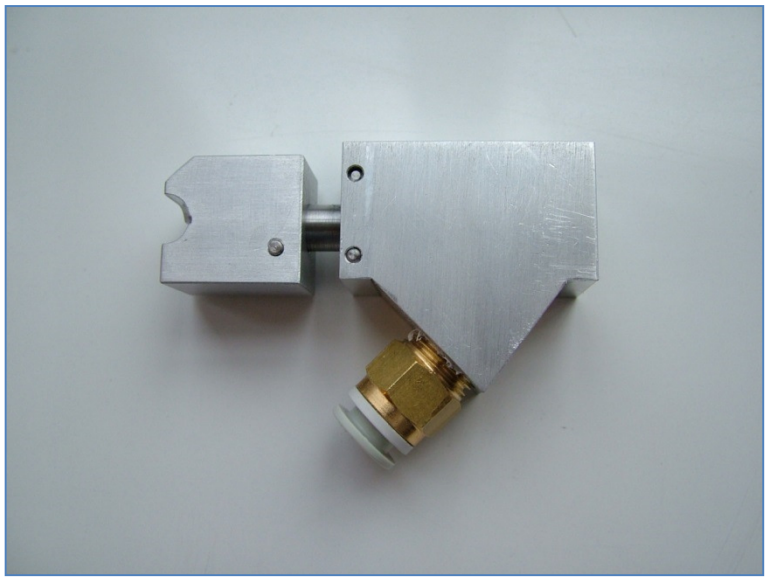
- The pad is secured to the trigger with a simple pin.
- The splicing chamber is secured to the valve with a simple pin.
- The valve is held in the main block by two simple pins.
- So the whole assembly is held together by pins, which can be pushed out; there are no screws.
- A design feature of the splicer is that the valve is freely-mounted in the main splicer block; so the chamber can be rotated, to suit left- or right-handed operators



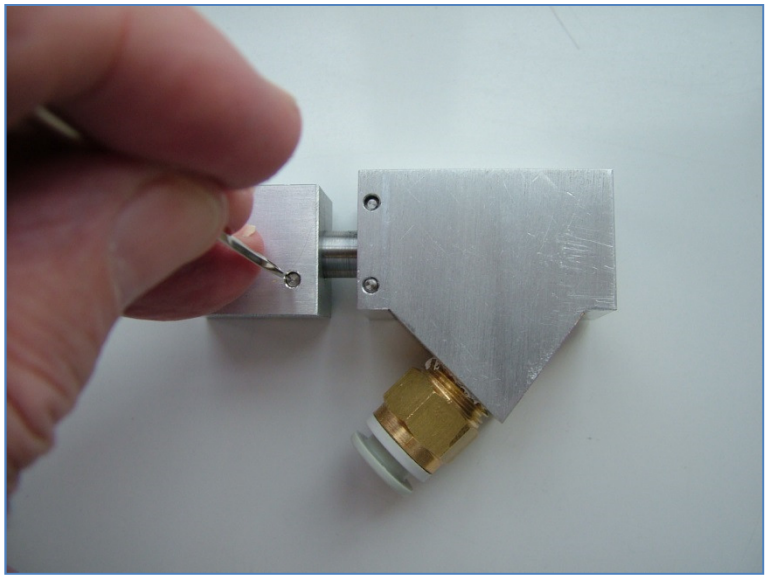
Components of the splicer unit.

From left to right:

- Splicing chamber (part number to be specified by customer)
- Chamber retaining pin 1604
- Valve 1606 (O-ring 543 placed on the valve)
- Retaining disc 1601
- Spacer 1602
- O-ring 218
- Shell 1607
- O-ring 218
- Spacer 1602
- Return spring 787



Lift the splicing unit out of the case, and detach the air feed tube, by compressing the quick-fit connector, and withdrawing the tube.



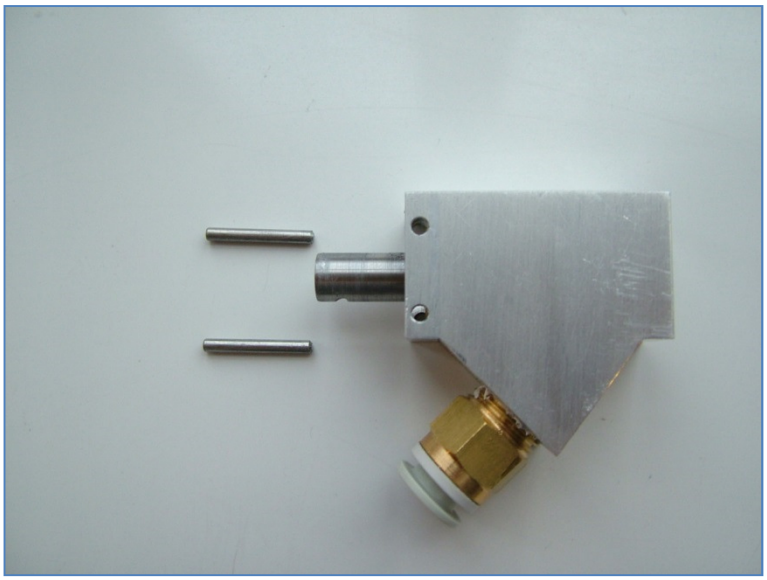
Remove the splicing chamber. With a small tool, press the chamber securing pin until it slides out. The chamber can then be removed from the valve.

If you are simply replacing the splicing chamber, and not doing a full strip-down:

slide the replacement chamber onto the valve

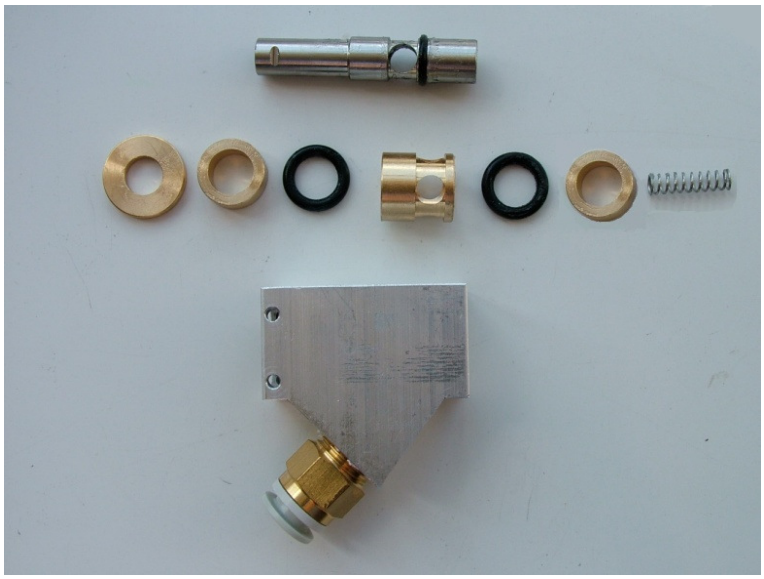
position the chamber so that the hole for the securing pin is aligned with the small groove in the valve stem

replace the chamber securing pin



With the chamber removed, the compression washer can be seen; it is retained in place by two pins. Using the same small tool as before, press out the pins, so that they come free from the main splicer body.

With the two pins removed, removal of the inner components – the final dismantling of the splicer unit - can commence.



This photograph shows the splicer unit completely dismantled.

To reassemble:

- Locate the return spring in the end of the valve.
- Push the internal components, one-by-one into the splicer body, starting with the brass spacer which can be seen at the extreme right:
- Then assemble in the order shown above and below.

Note the small machined “flat” near to the end of the valve 1606; this locates retaining pin 1604, to keep the splicing chamber in place.

Appendix 1 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. During service work, exercise care while handling knives and springs.
10. Under normal circumstances, always refit safety covers before reconnecting the splicer to the air supply.
11. 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 escape.

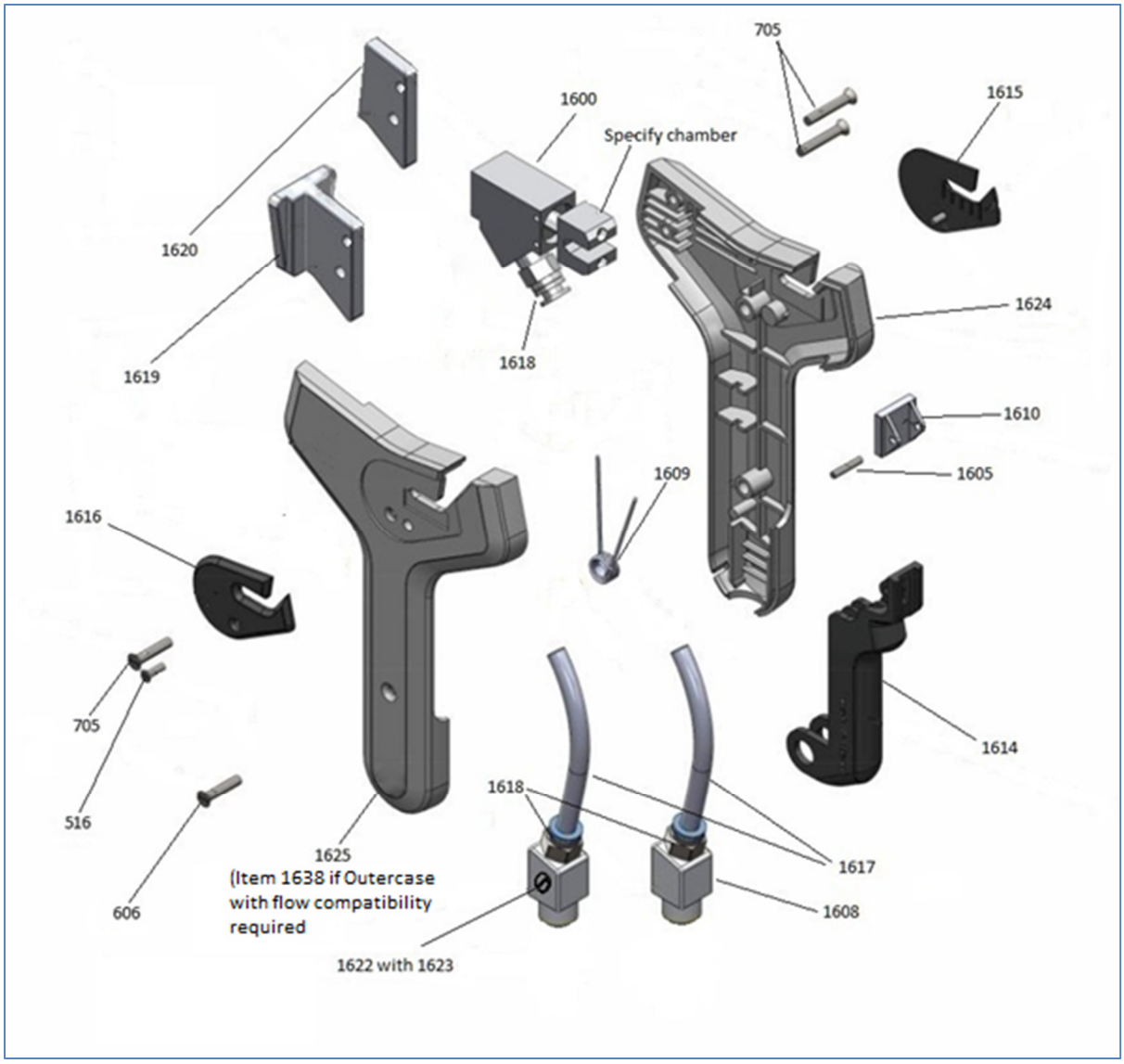
Our noisiest splicer, with the biggest blast hole in our range, generates a noise spectrum as shown in the table below:

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

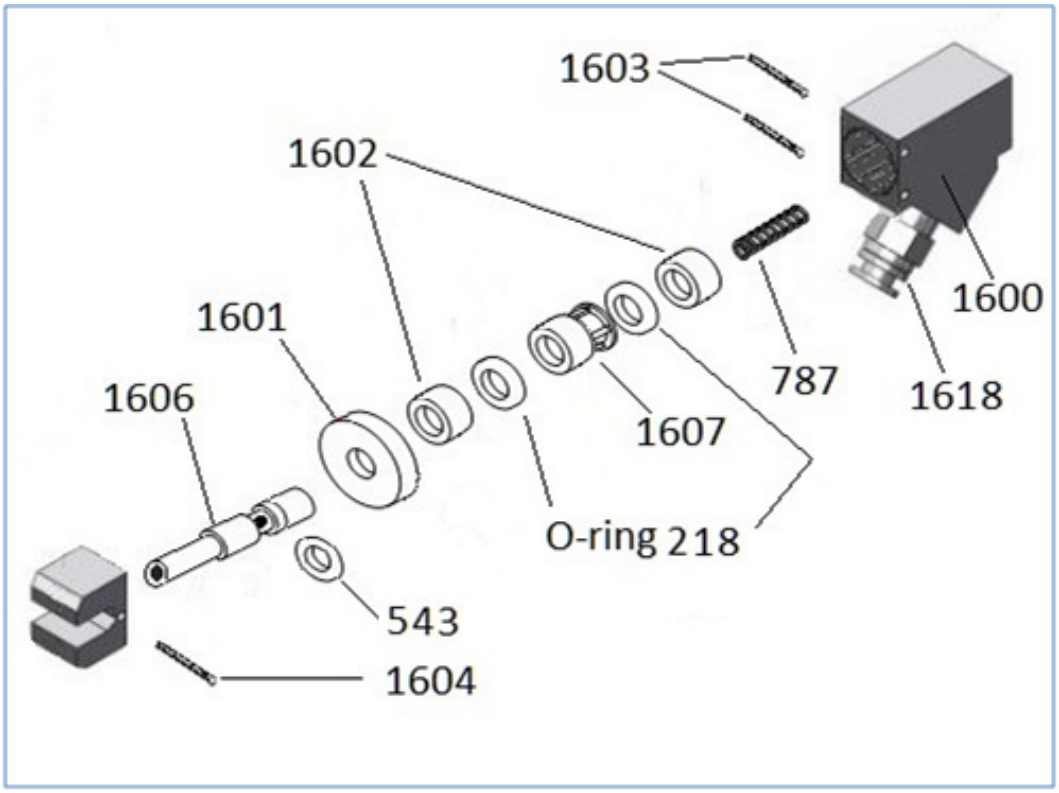
In practice, splicers are barely noticeable in a textile mill. This is because the other mill machinery tends to be very noisy, and the sound of the splicer is lost in the general noise. Also, the blast only lasts for about one second.

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.

Appendix 2 Model 701 splicer - Parts; outer case



Model 701 splicer - Parts; splicer unit



Model 701 - Parts list

Description	Item No.	Part No.
Splicer holding clip	170	201-1199
'O' Ring BS 110	218	01-11-10
M3 x 6 slotted countersunk head screw	516	16-43-06
'O' Ring RM0070-15	543	02-07-15
M4 x 12 slotted countersunk head screw	606	16-44-12
M4 x 20 slotted countersunk head screw	705	16-44-20
Air valve return spring	787	10-136-018
Valve body	1600	10-100-127
Retaining disc	1601	10-133-120
Brass spacer	1602	10-133-121
Retaining pin	1603	10-137-157
Chamber pin	1604	10-137-158
Shutter pad pin	1605	10-137-159
Compression Valve	1606	10-113-127
Shell	1607	2200-54-05
Bottom connector	1608	10-156-600
Trigger return spring	1609	10-100-128
Pad	1610	10-113-129
Lanyard	1611	10-156-602
Trigger	1614	10-156-605
Yarn guide plate right	1615	10-105-154
Yarn guide plate left	1616	10-105-155
Air feed tube (125mm)	1617	10-156-606
Feed tube connector	1618	10-156-607
Hanging clip	1619	10-165-110
Hanging blanking plate	1620	10-165-111
Outer case right (700 series)	1624	10-156-603
Outer case left (700 series)	1625	10-156-604
701 Label	1630	10-156-704
Splicing chamber	7000 Series	To be specified by customer
Flow Control Parts		
O-ring BS006	788	01-10-06
Bottom connector flow	1622	10-156-601
Flow restrictor valve	1623	10-113-128
Outer case right flow (700 series)	1638	10-156-705