airbond

THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2019

Airbond Splicers

135 Series Splicers

Splicers for Carpet and Upholstery Yarns

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The new-generation Airbond splicers

Airbond has a well-established reputation for supplying tough, reliable splicers. We have achieved this reliability by developing simple designs, and by the use of rugged components.

We have now moved on; our products are now even simpler, and even stronger. We've done this by investing in cutting-edge new additive-manufacturing (3d printing) technology.

From 2020 onward, all Airbond products will be printed, in materials which are more durable than those used in the past.

The first generation of printed products will be familiar to our customers; they are direct replacements for the existing products - identical in shape and function.

The Model 135 is the printed equivalent of the established 105

Model 135

All the features of the Model 105 – but simpler and stronger.

The Airbond Model 135 continues Airbond's programme of continuous innovation. Functioning in exactly the same way as the established Model 105, the 135 is printed, so it is lighter but stronger than its predecessor.

Loaded with clever technology, the 135 is, like the 105, an advance on the industry-standard Model 101, which has been used world-wide by carpet manufacturers and spinners for many years.

Like the Model 101, the 135 can join a vast range of yarns. It can join high- or low-twist, S-twist or Z-twist without changing chambers. It can even splice S-twist to Z-twist, wool to cotton, glass to tyre cord.

What distinguishes the Model 135 from the 101 is its built-in adaptability. Since it is printed, it can be easily adapted to customer needs. It can be a tiny splicer, designed to work in confined spaces; but it can be fitted with handles, or with a hanging device to be used in a fixed position, or with a carriage for sliding along a rail.

So 135s are available a number of forms – and Airbond's manufacturing methods even permit the production of bespoke versions, if users have special requirements.

Splice format:	Ends together
Applications:	Carpet weaving, carpet tufting, upholstery yarns, fancy yarns
Yarns:	Synthetic C.F., synthetic staple, woollen spun, worsted spun, all blends.
Yarn counts:	Nm 0.7 to 200, 5 to 1500 tex.
Twist:	Any twist direction and level. S twist to Z twist. No modification needed.

Getting started

Model 135 – 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 may have some or all of the following:

- Additional splicing chamber(s)
- Optional hanger
- Optional hanging clip
- Optional flow control device

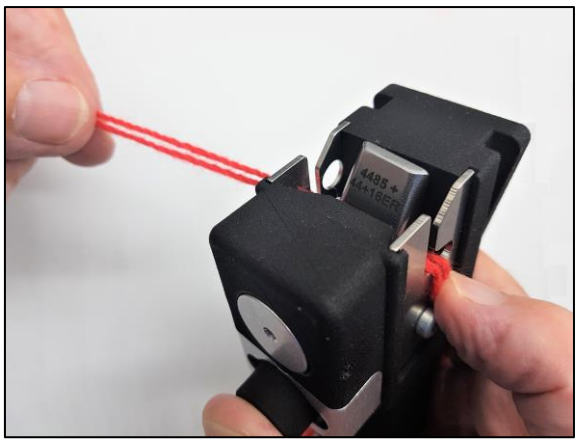
It may be useful to have a fixed place to store the splicer temporarily when the operator has finished, in which case you will have specified the "W" modification. This modification will change the splicer designation – the Model 135 H, for example, becomes the 135 HW. If it has been supplied, bolt the hanging clip to a convenient spot on a machine. 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.

You may have chosen to have a flow control device fitted. In that case, you will have specified the "F" modification. This modification changes the splicer designation further – the Model 135 H, for example, becomes the 135 HF, and the Model 135 HW becomes the 135 HFW.

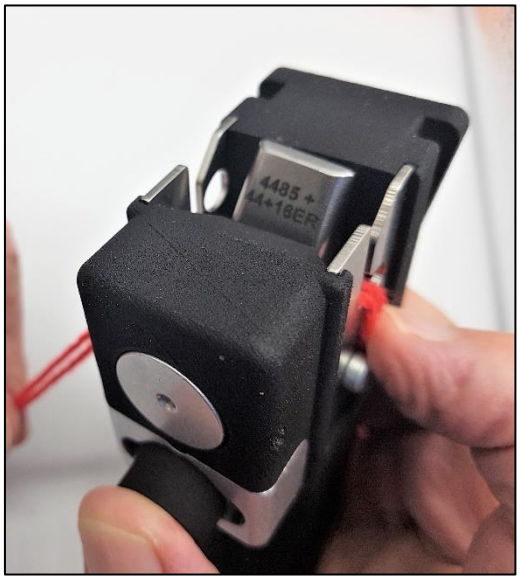
Connect the splicer to an air line.

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

Making a splice



The yarns pass over the edge of the Knife on the left-hand side.



For a clean cut, the yarns must be pulled down sharply over the knife edge.

The precise moment of cut will depend on the splicing procedure chosen.
(See next page)

A completed splice emerging from the right-hand side of the splicer.

Normally, the splice will escape from the splicer without any intervention by the operator. Occasionally, it may be helpful to draw the yarns downward gently with the fingertip.

Waste ends of yarn, which have been cut off on the left-hand side, are discarded.

Optimising splicing performance - relative timing of blast and cut

Different yarns require different treatment during splicing. For example, 60% fine wool, being relatively fragile, requires a short blast, while tough yarns such as polypropylene can survive being exposed to a more violent blast.

Because, on the Model 135, blast and cut are completely independent, three splicing procedures are available to the user. All involve squeezing the trigger to close the chamber and initiate the blast, and all involve cutting; but the relative timing of blast and cut can be altered.

Splice method 1- "Early cut"

Half press the trigger, so that the chamber pad closes, but not so far as to start the blast
Cut the yarn bundle by pulling down across the blade
Depress the trigger fully, so that the blast enters the chamber.
Keep the trigger depressed fully.
The splice should jump out of the chamber after less than a second

Splice method 2 – "Standard cut"

Press the trigger all the way down, so that the pad closes, and the blast enters the chamber.
At the same time as pressing the trigger, cut the yarn bundle by pulling down across the blade
Keep the trigger depressed fully.
The splice should jump out of the chamber after less than a second

Splice method 3 – "Late cut"

Press the trigger all the way down, so that the pad closes, and the blast enters the chamber.
Allow the blast to disturb the yarn for a short time; then cut the yarn bundle by pulling down across the blade.
Keep the trigger depressed fully.
The splice should jump out of the chamber after about one second

Important service information

Apart from accidental damage, and the occasional replacement of cutters, the Model 135 requires very little attention. However, one aspect of maintenance should NEVER be neglected. The upper bore, in which the chamber pad moves, needs regular lubrication. The frequency of lubrication depends upon the nature of the factory environment and the workload on the splicer.

As a general rule, the cap and pad assembly should be removed and greased with Molykote 111 (available from the company) at least once per month. The service interval should be reduced if the splicer experiences very heavy work loads.

Model 135 – general product information

Introduction

For many years, the Airbond Models 101 and 105 set the highest standards for the joining of yarns for carpets and upholstery products. Many of these splicers are in operation world-wide.

Despite its success, some customers requested improvements. They identified a series of technical requirements which resulted in a re-think of the design, and the adoption of new manufacturing techniques. Airbond needed to develop a product which resembled the 105, but which was superior in a number of aspects.

Development work to meet these new requirements has led to the Model 135, and its variants.

Being 3d-printed, the Model 135 is made in one piece – the handle and body are combined, producing a lighter but stronger structure. And, being printed from tough PA12 polymer, the 135 is capable of standing up to heavy-handed use, but is still much lighter than its predecessor.

Like its predecessors, all the Model 135 splicers have a simple straight-line string-up, and a simple and very strong construction, machined out of a solid block of alloy.

The splicer's yarn guide plates are much stronger than is necessary for their function as guides; the thick stainless steel plates give the splicer a strong box-like structure.

Like the 105, the Model 135 can be kept in active service with a minimum of maintenance.

The inner splicer unit has a novel, patented design, which is simple to operate and extremely simple to repair. The number of components has been reduced, when compared to the 105, and it can be dismantled and re-assembled in about five minutes, without any special tools.

General description

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

Trigger – the first pressing of the trigger causes the pad to move until it closes the splicing chamber

Pad - further pressure on the trigger pushes the pad firmly against the splicing chamber, causing the chamber to move back.

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.

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.

(Sometimes) Restrictor plate - attached to the splicing chamber, to extend its range of operation.

Knife and guide plates - the plates provide a means of guiding the yarn across the splicing chamber; a static knife on the exit side enables the yarn to be severed during splicing.

The Model 135 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.

135 Model range

135 H	Splicer with 100 mm handle
135 HW	Splicer with 100 mm handle, wedge hanging assembly
135 HF	Splicer with 100 mm handle and flow control device.
135 HWF	Splicer with 100 mm handle, wedge hanging assembly and flow control device.
135 M	Splicer with 60 mm handle
135 MW	Splicer with 60 mm handle, wedge hanging assembly
135 MF	Splicer with 60 mm handle and flow control device.
135 MWF	Splicer with 60 mm handle, wedge hanging assembly and flow control device.
135 S	Splicer with no handle – just a simple lower section.
135 SW	Splicer of 135 S form, with wedge hanging assembly
135 SF	Splicer of 135 S form, with a flow-control device.
135 SWF	Splicer of 135 S form, with wedge hanging assembly and a flow-control device.
“Specials”	
135 B	Splicer of 135 S form, modified to run along a rail
135 *E	Splicer with extended knife separation

Example:

Splicer Model 135 HW, fitted with wedge hanger.

Note the QR code; scanning this code will enable the user to access the Airbond web site - and an on-line version of this technical manual for the splicer

Model 135 – maintenance

Model 135 splicing chambers - bath-tubs, and restrictor plates

All Model 135 splicing chambers are asymmetric in design; the nature of the asymmetry is what gives the Model 135 its excellent performance. The chambers come in two forms; those with a "restrictor plate" and those with a built-in "bath tub".

The picture below shows three chambers. The two on the left are “bath-tubs”. A scooped section is machined out of one end of the chamber; this is the reason for the bath-tub name. The one on the right is more conventional, with a bowl, fitted with a “restrictor plate” to provide the asymmetry.

Bath-tubs are the chambers which are fitted most commonly to the Model 135.

The most common form of bathtub chamber is shown in the centre.

The yarns enter the chamber from the Side with the small V cross-section. The cutter knife is fitted next to the wider section.

The bath-tub chamber has the virtue of extreme simplicity, being a single element.

It might seem that the simplicity should result in a limited range of performance. Not so; the bath-tub chamber covers an enormous range of yarns, and the other designs incorporating restrictor plates are used only in special applications

.

Changing splicing chambers

Uniquely, the Model 135 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 chamber - during routine maintenance, or because the splicer has become fouled with fibre particles.

To release the splicing chamber, remove the single fixing screw Item 908 from the rear of the splicer body, when the splicing chamber can be lifted clear of the splicer.

Usually, it is not necessary to remove the yarn guide side plates, but if the interior of the splicer is particularly filthy, removal of the plates will help cleaning.

This photo shows the splicer with the splicing chamber removed.

Note the asymmetric design of the chamber profile – the bath-tub form in this case.

WARNING: If the splicing chamber is removed while the splicer is connected to the air supply DO NOT press the trigger; the pad will be blown out of the main chamber. There will almost certainly be damage to the extension spring.

Splicer dismantling – yarn guide plates

Removal of the yarn guide plate, knife side, Item 1031

Remove the torx-head screw, Item 1191

Removal of the yarn guide plate, knife side, Item 1031.

The design of the splicer body is different from that of the older Model 105

The yarn guide plate is more securely held in the new design – it is must be slid upwards from a recess in the body before removal

Removal of the yarn guide plate, knife side, Item 1031.

This photo shows the splicer with the side-plate removed.

The cutter knife, Item 909, is clearly visible, fitted into a recess in the splicer body.

Removal of the side plate exposes the cutter knife, Item 909.

This can be lifted out of the body – BUT TAKE CARE as the upper edge is sharp

The splicer body with components removed.
From top:
Chamber screw, Item 908
Splicing chamber
Side plate screw, Item 1191
Side plate, knife side, Item 1031

Removal of the yarn guide plate, yarn entry side, Item 1032.

Remove the torx-head screw, Item 1191.

Removal of the yarn guide plate, yarn entry side, Item 1032.

It must be slid upwards as shown.

Splicer dismantling - trigger assembly

Trigger assembly removal

The trigger assembly can be removed without disturbing any other elements of the splicer.

The trigger button is secured by a socket set screw, Item 1017 and is released by a hexagon wrench.

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Trigger assembly removal

Using the hexagon wrench, unscrew the trigger button securing screw.

Once the securing screw is partly withdrawn, the trigger button moves freely on the air valve stem, and can be removed completely.

Splicer dismantling - valve assembly

Valve assembly removal

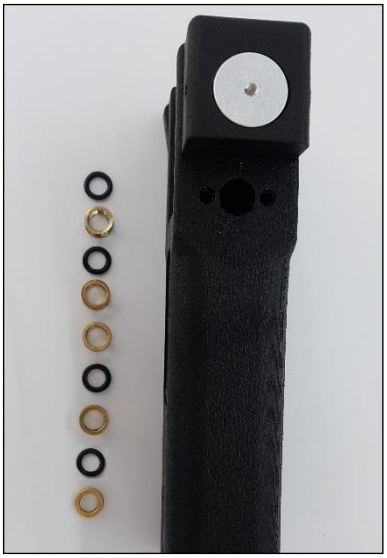
With the securing screw withdrawn, and the trigger button removed, the air valve Item 1310 can be seen, protruding from the metal trigger surround, Item 1309

Valve assembly removal

With both screws (Item 1191) removed, the trigger cover can be removed, exposing more of the air valve. In this state, the air valve can be removed.

This photo shows the air valve, removed from the splicer body.

The O-rings and shells, which control The motion of the air valve, remain in the body at this stage

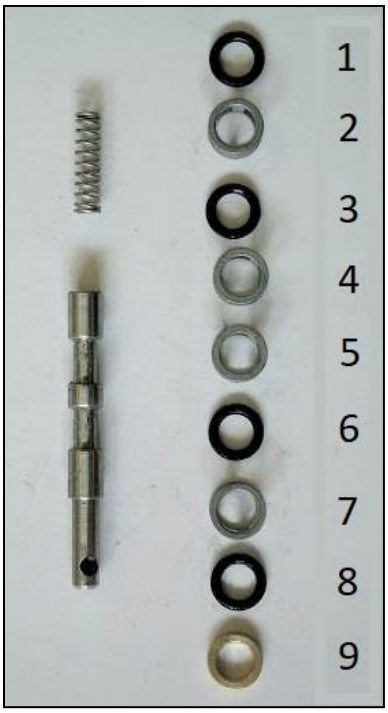


Valve assembly removal

Using an appropriate tool, withdraw the O-rings, shells, and compression spacer from the valve bore in the splicer body.

Valve assembly removal

This photograph shows the valve, and its associated air shells and O-rings, after removal from the small bore.



Valve assembly removal

Note the following:

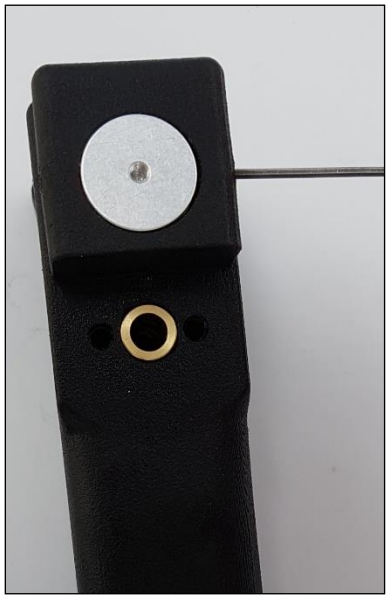
Small hole in the lower end of the valve stem. This is the hole which locates the socket set screw restraining the trigger button.

Small return spring, Item 787, at the top end of the valve. This is the air valve return spring. It is easily lost, but can be kept in position by applying a small amount of Molykote grease to the hole in the right-hand end of the valve.

Note the brass spacer, numbered 9, Item 902, at bottom. This spacer is important; it compresses the O-rings, so that the assembly seals properly.

Sequence of components during reassembly; 1 – 9.
First item placed in the bore is the O-ring, Item 264, followed by the shell, Item 276, and so on to the spacer, Item 902.

Splicer dismantling - chamber pad and spring



Chamber pad assembly removal

The first stage of removing the pad assembly involves loosening the two screws which secure the upper sealing plug – one on either side of the body.

These are socket set screws, M3 x 10, Item 1128.

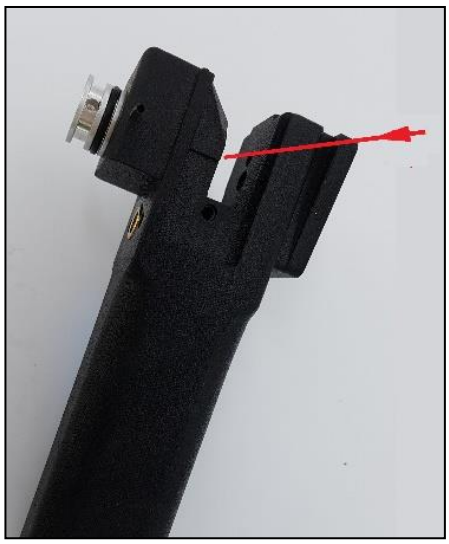
Loosen and remove the screws using a hexagon wrench.

Chamber pad assembly removal

Note:

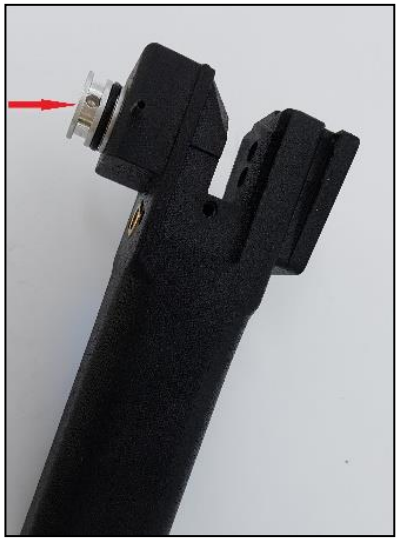
The screws must be withdrawn some distance before the plug can be freed – this is because the tips of the screws, when properly in place, are located in holes in the plug.

With the screws removed, the upper sealing plug can be removed.



Chamber pad assembly removal

Using the tip of a screwdriver, press on The surface of the circular chamber pad. This will release the sealing pad from the body of the splicer, so that the Complete sealing plug / chamber pad assembly can be removed.



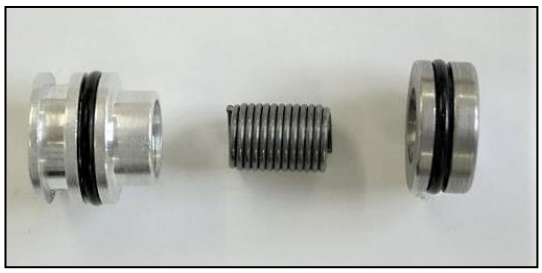
Chamber pad assembly removal

Alternatively, insert a short length of threaded rod into the sealing plug.

Pull the screw to withdraw the entire sealing plug / chamber pad assembly.

Chamber pad assembly removal

With the screws removed, the upper sealing plug can be removed.



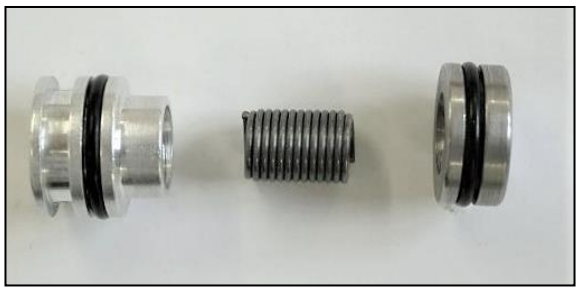
The pad is tethered to the upper sealing plug by an extension spring. The extension spring is screwed into the sealing plug, and the pad screwed to the spring. When the splicer has been dismantled, we recommend that the spring always be replaced.

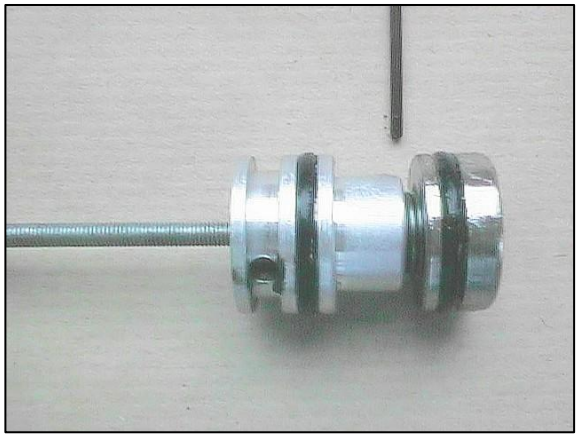
Unscrew the pad from the spring, and the spring from the sealing plug. Discard the spring.
Thoroughly clean and de-grease the screw threads in the sealing plug and pad.

We recommend that a special flat-tipped M10 tap be used to clean out the threads in plug and pad.

Before reassembly, ensure that the sealing plug, spring, and pad will fit together correctly. We recommend that the components first be 'dry assembled'.

Screw the spring into the sealing plug until four or five coils of the spring remain exposed. Screw the pad onto the spring for a few turns.





Check that the pad is approximately parallel to the sealing plug and that a gap of 1.5 to 2.0 millimetres between sealing plug and pad can be achieved. If the components are markedly out of parallel, discard the spring.

If the 'dry assembly' is satisfactory, dismantle and repeat the operation Using adhesive. Apply a drop of Loctite Structural Adhesive 326 to the coils at one end of the spring, and screw the spring into the sealing plug until four or five coils of the spring remain exposed.

Apply more adhesive to the exposed coils of the spring and screw the pad onto the spring, ensuring that the gap between sealing plug and pad is roughly parallel and is between 1.5 and 2.0 mm. Allow the adhesive to cure for about 30 minutes.

Before replacing the assembly, lightly smear the 'O' ring in the pad with Molykote grease. Apply a small amount of grease to the surface of the main bore.

Compressed air

Pneumatic splicers are operated by compressed air. Therefore the air supply must be appropriate.

The following points are important:

Splicers generally operate at a pressure between 3 and 8 bar.

Pressure may vary according to application, but it must be as uniform as possible.

The air supply should be reasonably dry and clean, with the lowest possible flow resistance.

Because the time taken to make a splice is short, transient pressure drops associated with other demands in the mill may become important,

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.

Compressed air installations should therefore be designed to minimise pressure drop.

Never use narrow-bore supply tube; this introduces resistance.

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 tend to be significant.

Sometimes, static line pressure is known to be adequate, but there sometimes serious problems with transients. Then it may be useful to fit a few metres 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.

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. Compressed air is dangerous: avoid any bodily contact with it.

Always follow the safety precautions recommended by the compressor manufacturer. Always ensure that unions and connectors are fully tightened and sealed, and that there are no leaks.

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.

Do not look into the working parts of the splicer when it is being operated.

If a splicer malfunctions, do not use it until it has been repaired by qualified personnel.

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:

- Before undertaking any service work, disconnect the splicer from the air supply.
- Under normal circumstances, always refit safety covers before reconnecting the splicer to the air supply.
- 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.

Troubleshooting

Trouble with splicers generally takes one of two forms: poor splicing or component malfunctioning.

1) Splicing performance.

If there is no apparent damage to the splicer, there may still be something subtle, which cannot easily be seen. It will be best, however, to look at the possible causes which are easy to spot. These include:

Simple checks:

- Has yarn **specification** changed markedly? The splicer is very flexible, but it can't do ALL yarns on one configuration. If the yarn has changed, take another look at your operating procedures and – possibly – the splicing chamber specification. If, for instance with glass, the yarn count has remained constant, but the level of sizing has increased, it may be necessary to increase air pressure and/or increase the duration of the blast.

- Is the air pressure as it should be? The line pressure may have changed – upward or downward. Excessive air pressure will cause bad filamentation, and low air pressure will result in weak splices. Consideration should be given to using flow-control versions of the splicer.

- If you have a splicer with flow control – has the position of the flow controller shifted? This can happen if the clamping screw has come slightly loose.

- Are there any obstructions in the main air line or in the splicer itself? It has been known for foreign matter to get into the air-line, and to obstruct the chamber blast hole; this is usually accompanied by a reduction in the noise level of the blast.

- Have operating procedures changed? In normal operation, the splicer requires the operator to make several splices in a line (usually three, spaced at about 40 mm). If the procedure changes (perhaps making two splices instead of three, or making a single “smeared” splice, performance will change.

- Are the splice ends being trimmed properly? All splicers rely for perfect performance on the waste ends being trimmed efficiently. The splicer has a “razor-blade” form of cutter, and the yarns are pulled down sharply over the cutter edge. If the edge has become dull, poor cutting – and hence poor splicing – will result. At that time, the knife should be replaced; it is an inexpensive consumable item. With a relatively soft material such as 80/20 wool/nylon, a service lifetime of around one month can be expected. This lifespan will be reduced if the material being spliced is durable, and tough to cut - yarns such as continuous-filament polypropylene.

2) Sticking closure pad

Occasionally, the main valve in the splicing unit may stick. This could be the result of some form of damage to the internal components, but the explanation is normally much simpler; a lack of lubrication around the O-rings which seal the pad assembly, or an extension spring which has come adrift.

Remove the entire valve / O-ring assembly from the splicer unit, as shown in the main text. Clean the components and the surface of the large bore with a small quantity of light solvent

Examine the components for signs of damage - particularly a damaged or displaced O-ring, or extension spring. If there is damage to any of the components, proceed as in the maintenance section of the main text, replacing components as appropriate.

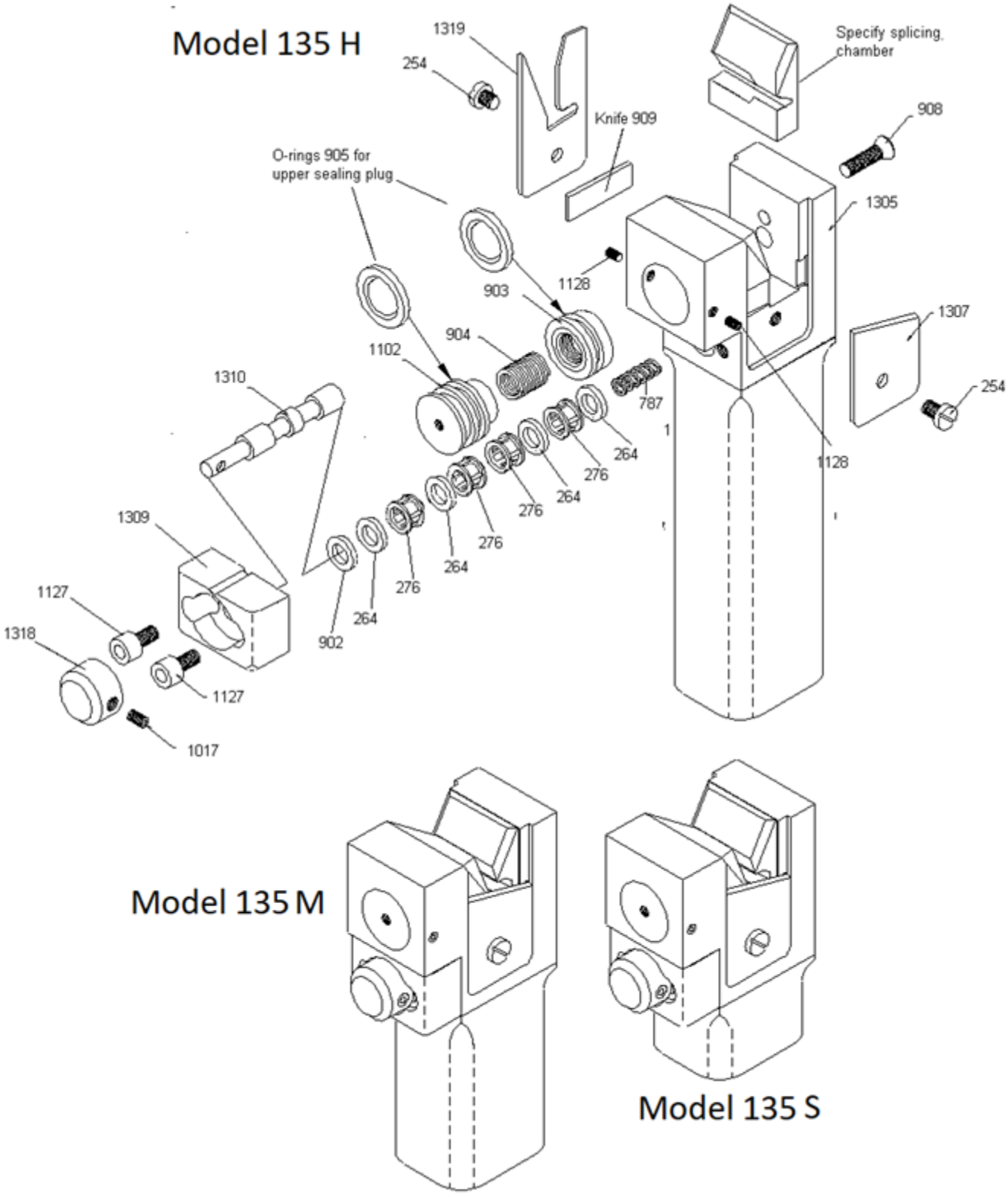
Examine the surface of the large bore. Minor scuffing - the stuff of normal wear and tear in service - should be of no consequence. Look closely, to determine whether the bore surface is scratched. This is a very rare occurrence, usually associated with an earlier rebuild having gone wrong. Minor scratching can generally be rectified with careful use of a reamer.

When any faults have been eliminated, reassemble as in the main text.

135 Series - Parts list

Description	Item No.	Part No.	Quantity
'O' Ring - BS010	264	01-10-10	4
Shell for air valve	276	2200-43-04	4
Air valve return spring	787	10-136-018	1
Splicing chamber		SPECIFY	1
Spacing bush	902	10-133-114	1
Pad (with item 905) – Item 889 without O-ring 905	903	10-113-112A	1
Extension spring	904	10-136-113	1
O-ring pad/upper sealing plug RM-0140-20	905	02-14-20	2
M4 x 16 countersunk slotted head screw	908	16-14-16	1
Knife	909	10-106-114	1
Blast valve & yarn clamp adjusting screw	1017	10-138-118	1
Yarn guide plate – Knife side	1031	10-105-149	1
Yarn guide plate - Yarn entry side	1032	10-105-150	1
Upper sealing plug	1102	10-135-126	1
M3 x 10 socket set screw	1128	17-13-10	2
M4 x 12 torx cap head self tapping screw	1191	19-44-12	4
Blast valve	1310	10-113-126	1
Trigger button	1318	10-114-103	1
Splicer body - 135H	1326	10-133-126	1
Splicer body - 135HW	1327	10-133-127	1
Splicer body - 135HE	1331	10-133-131	1
Splicer body - 135HWE	1332	10-133-132	1
Trigger housing 135	1346	10-121-109	1
Name plate (45 x 16)	1503	10-139-153	1

Hanging Assembly parts			
Splicer holding clip	170	201-1199	SPECIFY


Model 135 H
1319
254
Knife 909
Specify splicing chamber
908
O-rings 905 for upper sealing plug
1305
903
1128
1307
904
1102
254
1310
787
264
276
1128
276
264
1309
276
264
276
1127
264
1318
902
1127
1017
Model 135 M
Model 135 S

airbond