Atlas™ High Temperature Film Maker Accessory

User Manual

2I-15800-20

List of Safety Symbols

Safety Symbol	Meaning
	General Caution. (Reference ISO 7000-0434B, 2004-01)
	Caution – Hot Surface. Reference IEC 60417-5041, 2002-10)
	Caution – Possibility of Electric Shock
	Indoor Use Only

Electrical Safety

Warning: The temperature controller supplied with the accessory are of Class 1 (earthed) construction and must be connected to an earthed mains socket outlet.

Warning: Disconnect the mains from the temperature controller before cleaning. Clean only with a soft cloth, lightly moistened with water.

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Contents - User Manual

1. Introduction

New polymers and plastics are constantly being developed to withstand high temperatures and pressures in commercial use.
The Atlas™ High Temperature Film Maker Accessory allows for a quick thin film sample preparation for the quantitative and qualitative analysis of such polymers (eg. PEEK) via spectroscopic measurement. Other mechanical properties for the sample type can also be evaluated after film preparation.

The Atlas™ High Temperature Film Maker Accessory is a compact system, with built in heated platens and cooling system will produce thin films from polymer or plastic beads, fibers, ropes, foams and extruded pieces in typically 10-40 minutes depending on the type of material. It has been designed to be used within the following Specac hydraulic presses:

Atlas™ Manual 15T – P/N GS15011.
Atlas™ Manual 25T – P/N GS25011.
Atlas™ Power 8T – P/N GS25400.
Atlas™ Autotouch 8T – P/N GS25800.

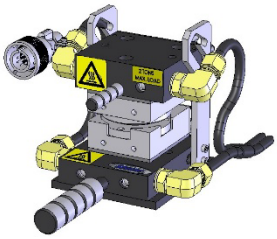
The Atlas™ High Temperature Film Maker Accessory is powered by a dedicated 4000 Series Temperature Controller. The following user instruction manual is for explanation and understanding in use of the Film Maker Accessory itself. A separate user instruction manual is provided for the 4000 Series Temperature Controller to be used in conjunction with the High Temperature Film Maker Accessory.

2. Unpacking and Checklist

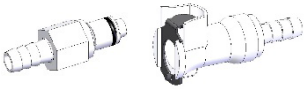
The system is packed into two boxes: a carry case containing the High Temperature Film Maker Unit Assembly with accessories and a box containing the 4000 Series Temperature Controller.

Please check that the following have been provided in the carry case.

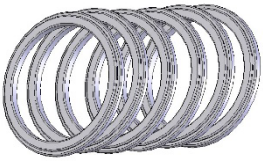
- One Atlas™ High Temperature Film Maker unit fitted with 0.5 meters of silicone rubber tubing and Quick Connect (Insert and body) couplings for water cooling.



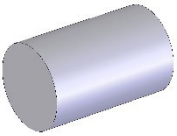
- Two 1-meter lengths of silicone rubber tubing for water cooling fitted with Quick Connect (insert and body) couplings.



- One set of matching steel spacer rings. These are engraved with letters to denote the following nominal thicknesses. A=15μm, B =25μm, C=50μm, D=100μm, E=250μm, F=500μm



- One spacing bar (aluminum cylinder block).



- One set of forceps.
- One stainless steel spatula.
- One sample cup making tool.
- One foam pad for sample cup making tool.
- One packet of Specacards (20 cards).
- One box of aluminum foil discs. (200 discs).
- One modified rear safety guard (shortened) for use with Atlas™ Manual Hydraulic Presses.

- One magnetic catch stop fitting.
- One user instruction manual for the High Temperature Film Maker Accessory.

Please check that the temperature controller box contains the following.

- One 4000 Series Temperature Controller for operation of the Atlas™ High Temperature Film Maker Accessory.
- One mains lead power cable.
- One user instruction manual for the 4000 Series Temperature Controller.

3. Specifications of the Atlas™ High Temperature Film Maker Accessory

Maximum load	:	2 tons
Temperature range	:	Ambient - 400°C
Load required for pressing	:	1 - 2 tons
Nominal thickness of films	:	15, 25, 50, 100, 250, 500μm
Diameter of pressed film	:	29mm
Integral heated platens	:	30 volts low voltage for safety
Maximum heater power		600 Watts
Altitude	:	Up to 2000m
Pollution Degree	:	II
Integral cooling system	:	Water cooling using Quick Connect couplings and 4.5mm i.d silicone tubing
Temperature controller	:	Digital automatic with dual temperature indicators (**set** and **actual**)
Heating rate	:	13 mins - 400°C 7 mins - 300°C
Cooling rate at 1 Litre/min flow	:	22 mins from 400°C - 60°C 19 mins from 300°C - 60°C
Thermal safety cut-off switches on cooling blocks	:	70° ± 3°C cut-off 55° ± 4°C reset
Material of polished platens/ Rings	:	Hardened alloy (stainless steel)

4. Safety Considerations

Safety Warnings When Operating The High Temperature Film Maker Accessory

The Atlas™ High Temperature Film Maker Accessory has been designed to be as safe as possible in usage. The instructions that follow help to advise for a safe operation, but the greatest risk to safety may be presented by the actual sample itself to be heated and pressed in an exposed environment. If in any doubt of the risks involved in usage of a chemical in this way, then seek assistance.

A) DO NOT exceed a load of 2 tons in use of the High Temperature Film Maker Accessory. It is very important that any applied load is spread over the whole surface area of the heated, polished pressing faces. A localised “point loading” could cause damage to the heated pressing surfaces.

B) DO NOT attempt to press potentially explosive materials.

C) DO NOT attempt to press potentially combustible materials, or materials with a low flash point temperature.

D) DO NOT use the High Temperature Film Maker Accessory **without** a continuous flow of cooling water. A water flow **must be on at all times** to avoid overheating of the heated platen pressing surfaces and risk of damage.

E) If the cooling water flow is interrupted, thermal safety cut-off switches will turn off any power to the heated platens pressing surfaces. DO NOT re-establish a water flow until the water cooling blocks temperature falls below 55ºC.

F) AVOID BURNS. DO NOT touch the heated platen heated surfaces with bare hands. They may be VERY HOT! Samples may take longer to cool than the heated platens themselves. Use a sample handling tool or wear suitable gloves to avoid the risk of burns to hands.

Caution: Always follow local laboratory safety protocols and procedures when using potential toxic or flammable substances with this equipment.

The equipment is intended for use by suitably trained personnel only.

Caution: No user serviceable parts within, contact the manufacturer or approved service agent for advice if the product is not functioning correctly or is visibly damaged.

Caution: If the equipment is used in a manner not specified by the manufacturer within this manual, the protection provided by the equipment may be impaired

Warning: Risk of burns when operated at high temperatures on accessible parts surrounding assembly. Always use suitable PPE equipment when operating this device.

End of Lifetime Equipment Use

If any parts have reached their limit of lifetime and need to be replaced, use appropriate WEEE and other local regulations for the safe disposal of electrical equipment and toxic chemicals.

Note on Thermal Safety Cut-Off Switches

The Atlas™ High Temperature Film Maker Accessory incorporates thermal safety cut-off switches (**1**). These have been fitted to the top (**2**) and lower (**3**) water cooling block parts of the top (**4**) and lower (**5**) heated pressing assemblies at the rear of the unit. (See **Fig 1.**)

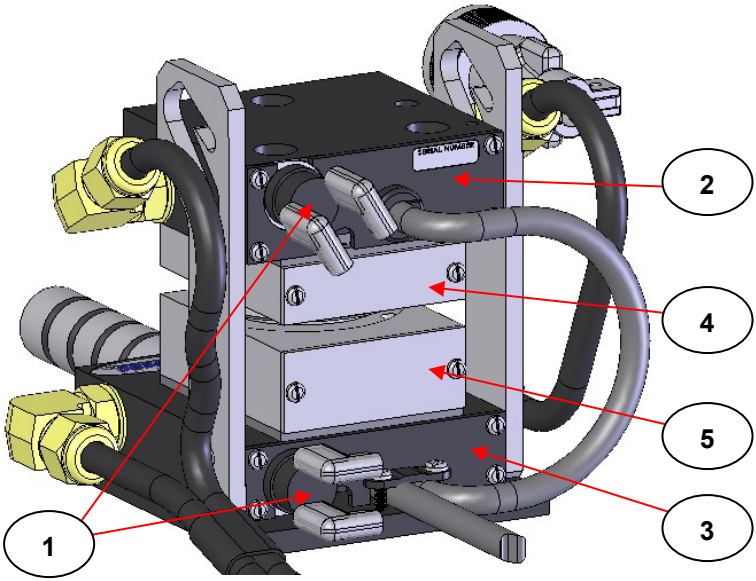


Fig 1. Thermal Safety Cut-Off Switches on the High Temperature Film Maker Accessory

One cut-off switch (**1**) will be activated when the flow of a cold, water supply is interrupted and the top (**2**) or lower (**3**) cooling blocks temperature exceeds about 70°C. Should this happen, the system will operate at half power using only two of the four heaters. Therefore, the temperature range will be limited. If the temperature of both the top (**2**) and lower (**3**) cooling blocks exceeds 70°C both cut-off switches (**1**) will be activated and heating to the system will cease. The thermal cut-off

switches (**1**) will reset themselves when the temperature of the cooling blocks (**2**) and (**3**) returns to about 55°C.

The thermal cut-off switches (**1**) also act as a safeguard if the thermocouple connection is broken, and the system goes open circuit. In this condition power would be continuously fed to the four heaters and the cooling blocks (**2**) and (**3**) would get very hot. However, when the temperature of either or both blocks exceed 70°C the thermal cut-off switches will operate and therefore stop any “temperature runaway” of the system.

Pressing Considerations

When using the Atlas™ High Temperature Film Maker Accessory in an Atlas™ Manual 15T or 25T Press (P/N’s GS15011 or P/N GS25011 respectively) although the tonnage loads to be applied for pressing are typically low at 1 - 2 tons, with a **maximum** load specification to 2 tons, Specac recommend that the safety guards fitted to the Press as standard **are used at all times**.

For protection against tonnage overloading the High Temperature Film Maker Accessory of parts when samples are to be pressed, **it is a requirement** that the pressure relief valve assembly on a manual hydraulic T15 or T25 press (the valve is located under the load gauge on the press), is set to read a **2 tons maximum load** at the load gauge. You should adjust the pressure relief valve assembly as necessary following instructions for the procedure from the press’s own user instruction manual.

When using the Atlas™ High Temperature Film Maker Accessory in an Atlas™ Power or Autotouch 8T Press (P/N GS25400 or P/N GS25800 respectively), the front safety guard of the press MUST be closed to allow for the Press to operate. The Atlas™ High Temperature Film Maker Accessory has been designed to fit into these presses for operation when the front safety guard is closed. When using these presses ensure that a load of up to **2 tons maximum ONLY** is selected to apply to the High Temperature Film Maker Accessory. Any higher loads that can be applied from these presses will result in damage to the top (**4**) and lower (**5**) heated pressing surface assemblies.

5. Installation of the High Temperature Film Maker Accessory

For installation of the Atlas™ High Temperature Film Maker Accessory into a Specac Press the procedure is as follows.

Connecting the Cooling Water System

A cold, water supply for the cooling water system circuit is required for operation of the Atlas™ High Temperature Film Maker Accessory. After passage through the cooling system, the water can flow to a drain or be re-circulated if a suitable thermo-circulating system has been employed for use in the cooling water circuit. (See water cooling thermo-circulator systems, Specac P/N's GS11127 and GS11128.)

The High Temperature Film Maker Accessory will be supplied with water cooling black silicone tubing and Quick Connect couplings (**6**) and (**7**) already connected to the top (**2**) and lower (**3**) cooling block parts to allow for cooling water to be introduced. The top (**2**) and lower (**3**) cooling blocks will also already be connected by black silicone tubing to allow the flow of cooling water from one block through to the other.

By convention, any supply of cooling water is introduced into the lower cooling block (**3**) and then passes to flow through the top cooling block (**2**). The black silicone tubing attached to the lower cooling block (**3**) for water introduction is supplied finished with a Quick Connect **body** coupling (**6**). The black silicone tubing attached to the top cooling block (**2**) for water flow out is supplied finished with a Quick Connect **insert** coupling (**7**). (See **Fig 2.**)

The Quick Connect couplings are a simple push fit from the insert (**7**) into the body (**6**). The parts will "click" together when fully engaged. To disconnect, the silver disc on the body (**6**) is pushed down whilst the couplings are being pulled apart. When these Quick Connect couplings are disconnected, water is prevented from leaking out of the silicone tubing, thus avoiding accidental spillage.

Disc to Push

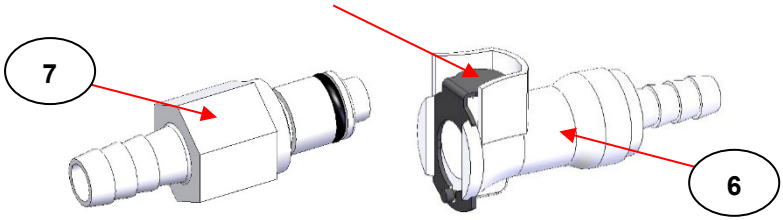


Fig 2. Quick Connect Body and Insert Couplings for Cooling Water Black Silicone Tubing

To connect a cooling water supply to the High Temperature Film Maker Accessory, take the length of black silicon tubing supplied finished with the Quick Connect **insert** (**7**) coupling and attach the open end of the silicone tubing to a cold water tap or supply of water from a thermo-circulating system. The insert (**7**) coupling is connected (click fit) to the **body** (**6**) coupling of the silicone tubing that feeds into the lower cooling block (**3**).

Take the other length of black silicone tubing supplied finished with the Quick Connect **body** (**6**) coupling and connect to the **insert** (**7**) coupling (click fit) fitted to the silicone tubing that allows the cooling water out after passage through the top cooling block (**2**). Insert the open end of this tubing connection into a drainage system, sink, or back to any water thermo-circulating system being used.

Additional cooling water tubing may be required to connect to the drainage side of the cooling water circuit if the Press to be used is a considerable distance away from any sink or thermo-circulating unit.

When the appropriate black silicone tubing and Quick Connect **body** (**6**) and **insert** (**7**) couplings have been made for the cooling water circuit of the High Temperature Film Maker, the water in and water out points are shown for **Fig 3**.

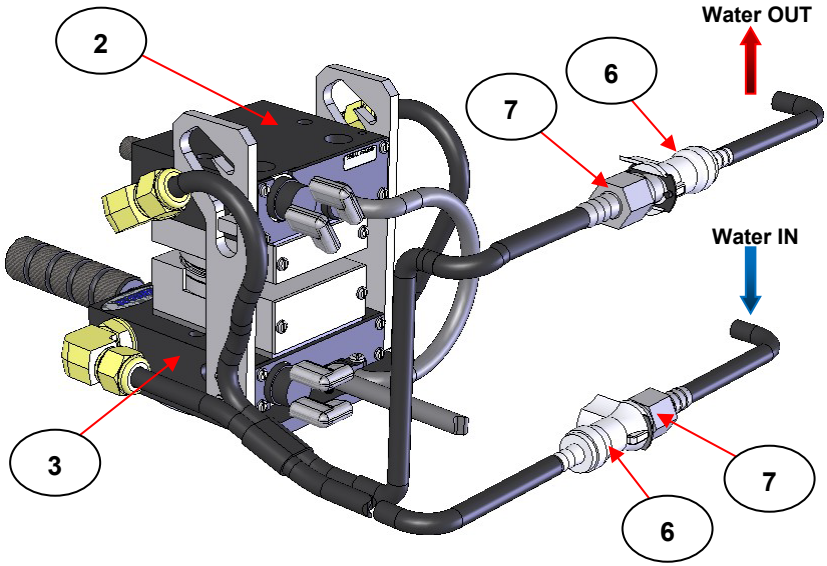


Fig 3. Water In and Water Out Connections for High Temperature Film Maker Accessory

Preparing the Press and Film Maker for Use

The following explanation is for installation of the Atlas™ High Temperature Film Maker Accessory into an Atlas™ Manual 15T or 25T Hydraulic Press. However, a similar installation procedure can be adopted if using an Atlas™ Power 8T or Autotouch 8T Press.
Ideally, any Specac Press to use will be situated close to a clean, cold water supply and a drainage facility for provision of cooling water to the High Temperature Film Maker Accessory in operation. If this is not possible to accommodate, even by using additional lengths of cooling water tubing, then use of a remote and portably sited water thermo-circulating system may be suitable to facilitate water cooling.

For use of the High Temperature Film Maker Accessory in **any compatible Specac Press**, the top bolster pressing face (**8**) MUST be fitted into the lead screw (**9**) of the Press. (See **Fig 4**.)

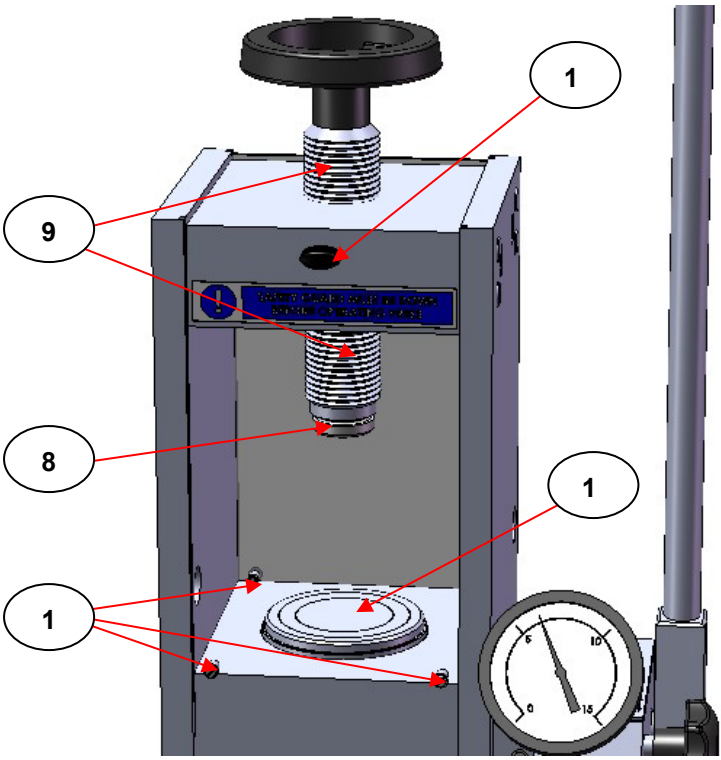


Fig 4. Lead Screw and Top Bolster Pressing Face of the Atlas™ Manual Hydraulic Press

Safety Guards and Magnetic Catch Stop Parts

For installation of the High Temperature Film Maker Accessory into an Atlas™ Manual Hydraulic Press the modified (shortened) safety guard and magnetic catch stop parts supplied with the Accessory need to be fitted to the Press.

Note: *These parts are not required if using the High Temperature Film*

Maker Accessory in the Atlas™ Power or Autotouch 8T presses.

Remove the original **rear** safety guard fitted to the back of the Manual Hydraulic Press. Similar as the front safety guard, the rear guard slides up and down for access to and protection of the pressing area and is closed when the two screw stops (**10**) are resting on the lower edge of the pressing area. (See **Fig 4.**) To change over the rear guard for use of the shortened, modified guard, the two screw stops (**10**) need to be removed (unscrewed) from the original guard to allow it to slide up and completely out of its runner grooves. Use the lifting knob (**11**) by unscrewing it from the original rear guard and affixing it to the shortened, modified guard and then insert this new shortened guard assembly into position into the guard runner grooves at the rear of the Press.

Take the magnetic catch stop to fit the original **front** guard of the Press. Remove the backing paper from the adhesive strip on the magnetic catch stop and stick this surface of the catch to the inside face of the front guard at its bottom edge with the magnetic catch parts facing upwards. Ensure that the magnetic catch stop is also positioned to one side of the front safety guard so that it will not rest on the High Temperature Film Maker Accessory loading handle (**12**) when the Accessory is installed in the Press and the front guard is down.
(See **Fig 8**.)

When positioned for use on the Manual Hydraulic Press, the modified guard and magnetic catch parts allow for the following:

- A good flow of air around the system to stop the cooling blocks (**2**) and (**3**) from getting too hot when operating at maximum temperatures (up to 400°C) for the heated pressing assemblies (**4**) and (**5**).

- A good air flow stops the guards getting hot, expanding and jamming inside the Press.

- The magnetic catch stop holds the front guard in the up position when pulled all the way up, allowing clear access to load and unload a film sample into the heated pressing area of the Accessory.

Protective Films on the Polished Pressing Surfaces

When the High Temperature Film Maker Accessory is supplied from new, the top (**13**) and lower (**14**) polished pressing surfaces, housed within in their respective top (**4**) and lower (**5**) heated pressing surface assemblies, have been covered in a protective film coating that needs to be removed before use.

Take the High Temperature Film Maker Accessory and lift and slide the Top Half Assembly (the top cooling block (**2**) and heated pressing surface assembly (**4**)) between the two side supporting brackets (**15**) all the way to the top by use of the lifting handle (**16**) on the Top Half Assembly. Then rotate the complete Top Half Assembly upside down and backwards (through 210°) away from the forward projection of the lifting handle (**16**) when in the normal horizontal pressing position and secure it into the top rest slots (**17**) of the side supporting brackets (**15**). (See **Fig 5**).

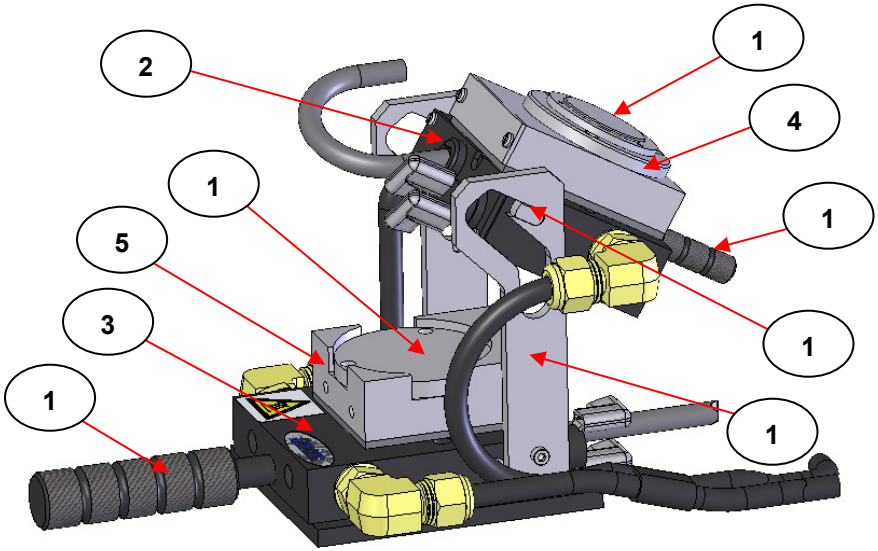


Fig 5. Top Half Assembly Positioned for Access to Protective Films for Their Removal

This positioning and holding of the Top Half Assembly will allow access to the protective film on both the top (**13**) and lower (**14**) polished pressing surfaces. Remove (peel away) the protective films from both the top (**13**) and lower (**14**) polished surfaces and clean the surfaces using a soft lint free cloth or tissue and a suitable solvent (e.g. a degreaser or acetone). Similarly clean all the spacer rings (**18**) (sizes A through to F) before their initial use in the formation of a thin film.

Installation of the High Temperature Film Maker Accessory into a Press

After removal of the protective films from the polished pressing surfaces (**13**) and (**14**), return the Top Half Assembly of the Accessory back to the **Sampling Position**, such that it is resting on top of the Lower Half Assembly (lower cooling block (**3**) and heated pressing surface assembly (**5**)). (See **Fig 6.**)

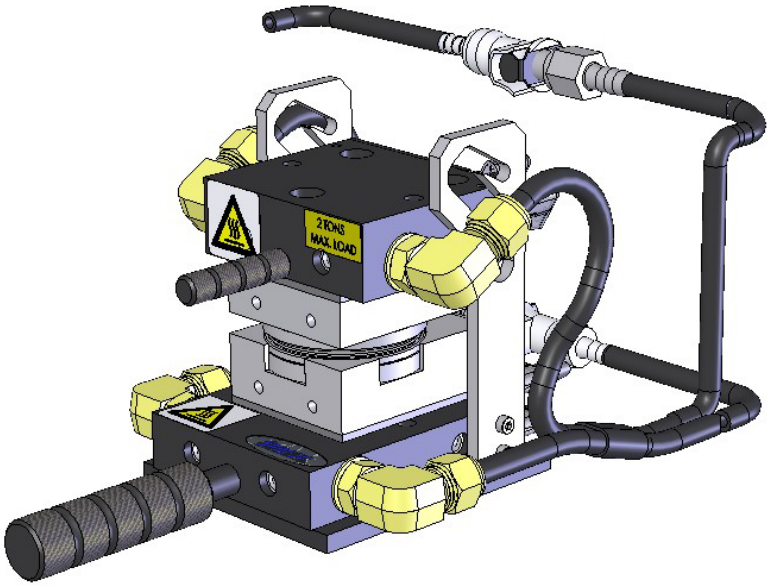


Fig 6. High Temperature Film Maker Accessory Ready for Installation into the Press (Sampling Position)

Create an appropriate gap in the Press between the top pressing bolster surface (**8**) of the lead screw (**9**) and the lower bolster pressing piston surface (**19**) by appropriate clockwise or anticlockwise rotation of the lead screw (**9**) of the Press to accommodate the High Temperature Film Maker Accessory when in the **Sampling Position.** (See **Fig 4**.) It is necessary for operation of the Accessory to have an appropriate gap between the lead screw top bolster (**8**) and lower pressing piston (**19**) surfaces that will allow for the overall height of the Accessory with the supplied aluminium cylinder block spacing bar (**20**) resting on the top cooling block (**2**) when installed. (See **Fig 8.)**

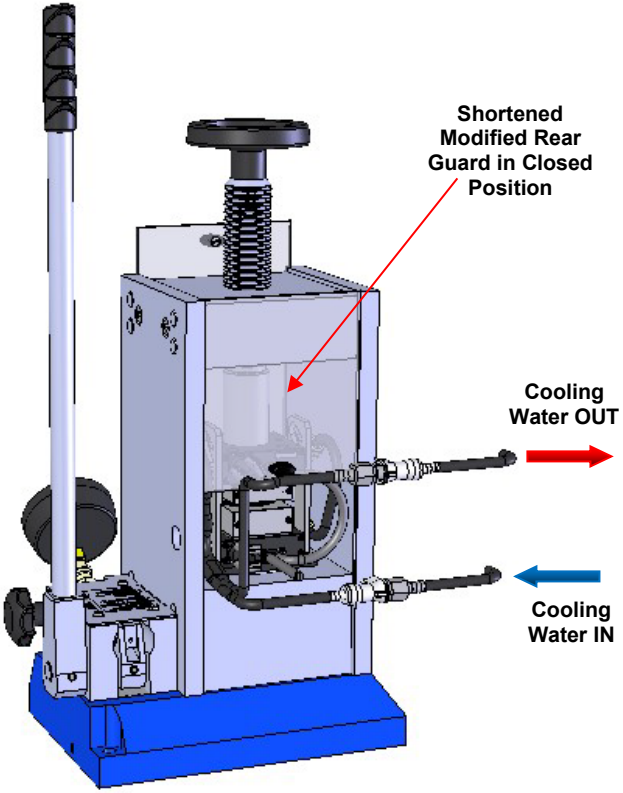


Fig 7. Rear View of Press with High Temperature Film Maker Accessory Installed (in the Sampling Position)

Lift both the original front safety guard with magnetic stop catch and the modified rear safety guard on the Press and feed through the High Temperature Film Maker Accessory from the rear of the Press with the handles (**12**) and (**16**) on the Accessory projected towards the front of the Press. In this orientation the cooling water tubing connections will be projecting away from the rear of the Press. Ensure that the recess diameter hole at the base of the lower cooling block (**3**) fits perfectly over the lower bolster piston pressing surface (**19**) of the Press.

The rear modified safety guard on the Press can now be lowered such that it comes to rest on top of the cooling water silicone tubing and power cables for the High Temperature Film Maker Accessory that are projecting outwards from the rear of the Press. (See **Fig 7**.)

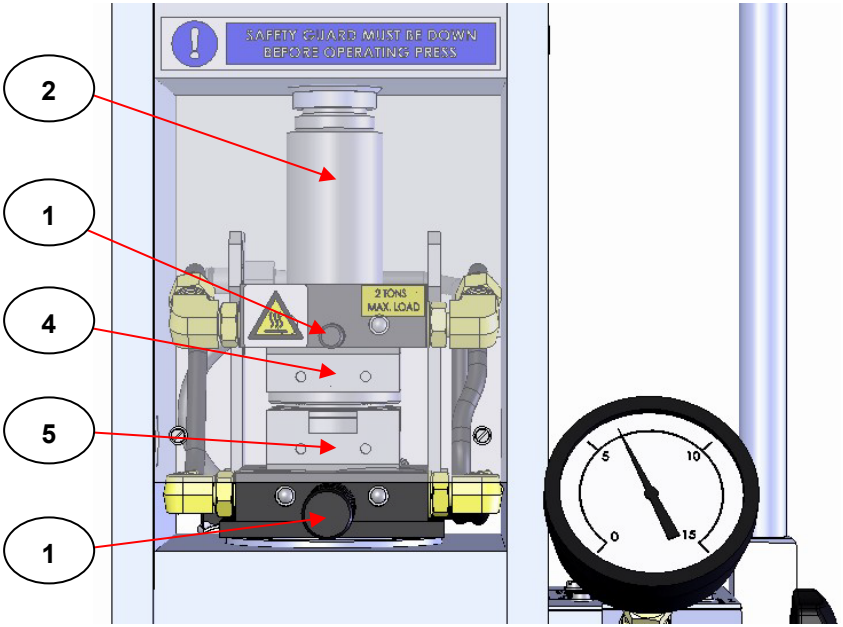


Fig 8. High Temperature Film Maker Accessory Installed into a Manual Hydraulic Press (Sampling Position - Front Guard Closed)

The front safety guard can be left open in its raised position (it will be kept open because of the magnetic stop catch fitting) to allow for access to the Film Maker Accessory for installation of a foil disc and sample "sandwich" to be heated and pressed.

At this stage a water supply can be switched on for the cooling circuit of the Film Maker Accessory. An adequate water flow rate for appropriate water cooling is circa 1 Litre/minute.

Installation into Atlas™ Power and Autotouch Presses

For installation of the High Temperature Film Maker Accessory into an Atlas™ Power 8T or Autotouch 8T Press, it is a similar procedure to that described for the Atlas™ Manual Hydraulic Press, but the **entire Accessory** with the water cooling tubing fitted and electrical cable connections are passed through the **front** of the Press (front safety guard is raised) and the tubing and electrical cable connections are carefully routed through the recess gap at the rear and to the base of the **permanently fixed rear** safety guard on these presses.

Note: *For Atlas™ Power and Autotouch Presses the **front safety guard** is a crucial safety feature for operation. The front safety guard **must** be used in a down/closed position to allow power to be supplied for automatic operation of the piston mechanism. When the front safety guard is raised, power is cut for any pressing operations.*

6. Using the Film Maker Accessory

The Atlas™ High Temperature Film Maker Accessory comprises of a top (**4**) and lower (**5**) heated platen pressing assembly that each contain a respective top (**13**) and lower (**14**) polished pressing surface. A thin film of 29mm diameter and up to 0.5mm thickness can be formed between these polished pressing surfaces by heating and pressing of a polymeric or plastic type sample, but **a specific preparation** of the sample is required.

The thickness of the film to be produced is controlled by a specific sized spacer ring (**18**) used within and between the top (**13**) and lower (**14**) polished pressing surfaces. The film thickness is also determined from any procedural method that is adopted. Factors that influence a method are the amount of sample introduced for pressing, the temperature and the load applied whilst pressing.

The Aluminium Foil Discs

The 40mm diameter aluminium foil discs (**21**) supplied are an important part of the film preparation procedure and are used to “sandwich” a polymeric or plastic type sample between them, before melting and pressing of the sample in the Film Maker Accessory of parts. The spacer rings (**18**) have been specifically designed to accommodate two aluminium foil disc (**21**) thicknesses. One foil disc (**21**) will be in contact with the top polished pressing surface (**13**) and the other in contact with the lower polished surface (**14**) to produce films corresponding to a **nominal** thickness for the spacer ring size selected.

The foil discs (**21**) can be used as supplied in the Film Maker Accessory for any sample pressings, but they can also be formed into the parts that constitute a “sample cup”. The use of an aluminium foil sample cup can help to retain more easily any polymeric or plastic samples that are in a bead or pellet form that can roll about and would be difficult to contain centrally within the Film Maker Accessory of parts for a correct pressing.

Note: *The aluminium foil discs* (**21**) *have a matt surface and a shiny surface. Contact of a specific foil surface with the sample*

whilst pressing, will determine the amount of spectroscopic interference fringes produced by the thin film. If a reduction in spectroscopic interference fringes are sought, the matt surfaces of the two foils should be in contact with the sample. Conversely, if fringes are required, (e.g. to measure the film thickness) then the shiny surfaces should be in contact with the sample.

Making the Aluminium Foil Sample Cup

The aluminium foil sample cup consists of a lower sample cup (**22**) part and a top cover (**23**) part made from the 40mm diameter aluminium foil discs (**21**) supplied. These cup parts are made using the special cup making tool (**24**). A foam pad (**25**) with two different size recesses is used with the special cup making tool (**24**) to create the sample cup parts (**22**) and (**23**) from a foil/foam pad/foil "sandwich" of components that are compressed within the circular jaws of the cup making tool (**24**). (See **Fig 9.**)

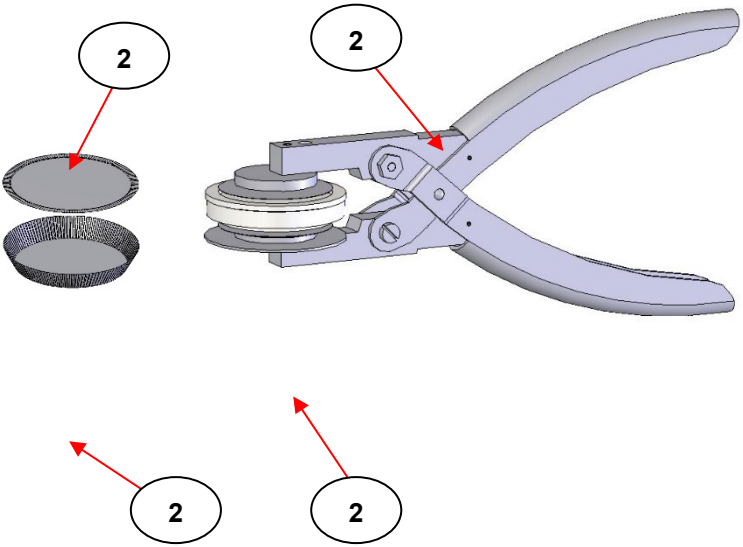


Fig 9. Parts of the Aluminium Foil Sample Cup and Cup Making Tool

To make a sample cup (**22**), using the forceps supplied first place a 40mm diameter foil disc (**21**) inside the large (40mm diameter) recessed area of the foam pad (**25**). The foil discs (**21**) have two different surface finishes – one shiny and one matt. If a reduction of spectroscopic interference fringes is sought for thin films, then the foil disc (**21**) should be placed matt side up in the foam pad (**25**). Conversely if fringes are required, for example to measure the thickness of a prepared film, then place the foil disc (**21**), shiny side upwards in the foam pad (**25**). (See **Fig 10**.)

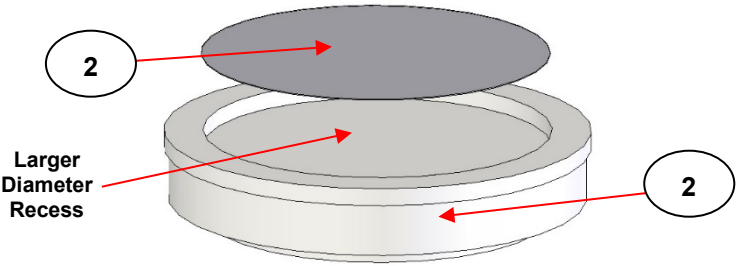


Fig 10. Foil Disc to Place in Foam Pad for Pressing in Sample Cup Tool to Make the Sample Cup

To make the sample cup cover (**23**) hold the sample cup making tool (**24**) in one hand. The pressing disc part of the tool with the three locating prongs should be the lower pressing surface with the prongs facing upwards when the tool is being gripped.

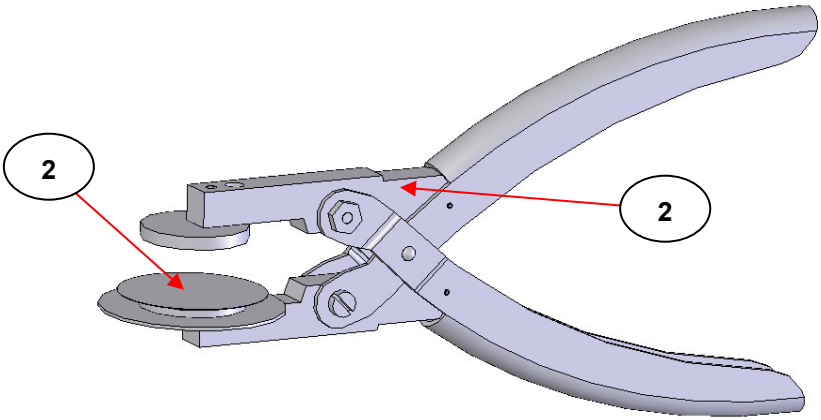


Fig 11. Foil Disc for Pressing in Sample Cup Tool to Make the Sample Cup Cover

Using the forceps supplied place an aluminium foil disc (**21**) inside the three locating prongs of the cup making tool (**24**). If a reduction in spectroscopic interference fringes is sought for thin films, then the foil disc (**21**) should be placed matt side up. Conversely if fringes are required, then place the foil disc (**21**) shiny side upwards inside the three locating prongs of the sample cup tool (**24**). (See **Fig 11.)**

Now, very carefully place the already prepared foam pad (**25**) with the foil disc (**21**) (from **Fig 10**.) uppermost between the pressing surface jaws of the sample cup making tool (**24**) and over the foil disc (**21**) held within the three locating prongs, such that the smaller diameter underside of the foam pad (**25**) locates within the prongs. (See **Fig 12.)**

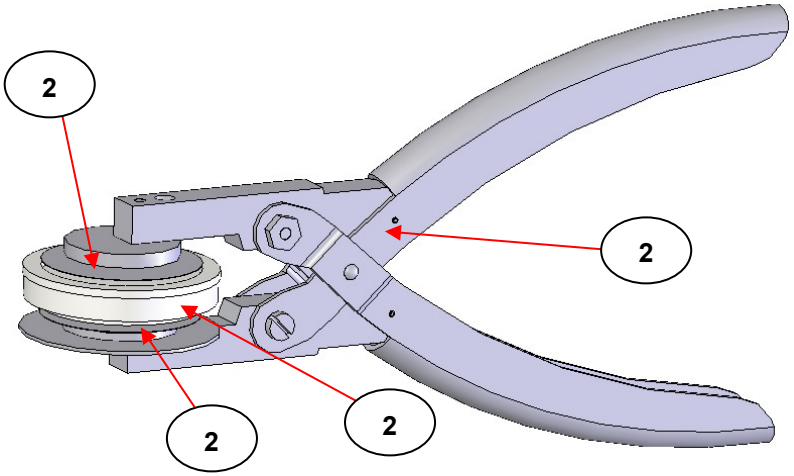


Fig 12. Foil Discs and Foam Pad for Pressing in Sample Cup Tool to Make the Sample Cup and Sample Cup Cover

Squeeze together, gently but firmly, the two arms of the sample cup making tool (**24**) to compress the foam pad (**25**) to produce a sample cup (**22**) at the top pressing face and a sample cup cover (**23**) at the lower pressing face of the sample cup tool (**24**).

Relax your grip on the arms of the sample cup tool (**24**) to allow the pressing surface jaws to separate. Now, very carefully remove the foam pad (**25**) and cup parts (**22**) and (**23**) from the sample cup tool (**24**) and then carefully remove the cup parts (**21**) and (**22**) from the foam pad (**25**). Set these pre-formed cup parts (**22**) and (**23**) aside to use when introducing a sample into the High Temperature Film Maker Accessory that has been installed into the Press.

Placing a Sample into the Film Maker Accessory

When a sample cup (**22**) and sample cup cover (**23**) have been prepared, a sample can be introduced into the Film Maker Accessory that has already been installed into the Press.

To accept a sample cup with sample, the Top Half Assembly of the High Temperature Film Maker Accessory should be re-positioned from the **Sampling Position** (See **Fig 6**.) to the Loading Position (See **Fig 13**.) The Top Half Assembly is moved by use of the lifting handle (**16**) into the top resting slots (**17**) of both side support brackets (**15**) as shown in **Fig 13**, for the **Loading Position**.

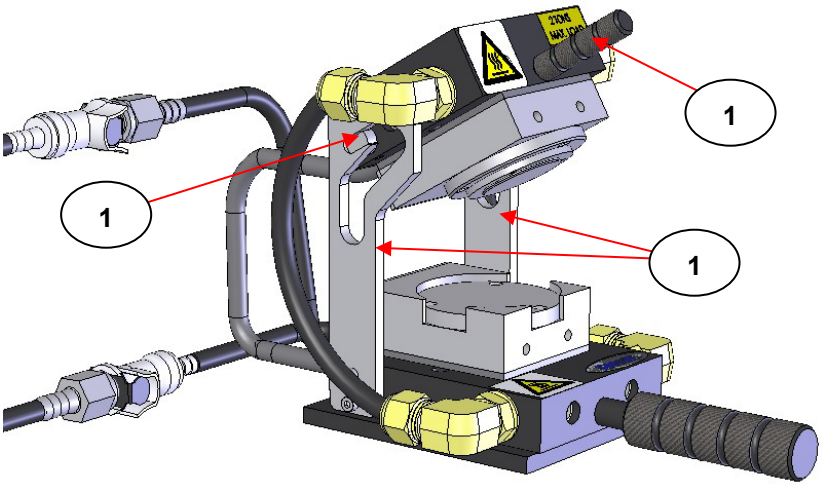


Fig 13. Loading Position of the High Temperature Film Maker Accessory (Shown Outside of Press for Clarity)

Note: *To create the space within the Press to allow the Top Half Assembly to be lifted and held in the **Loading Position**, the spacer bar (**20**) is removed and the top bolster pressing face (**8**) of the Press lead screw (**9**) may need to be raised by turning the lead screw (**9**) anticlockwise. However, with removal of the spacer bar (**20**) itself from the components to press, a large enough gap may be created to allow the Film Maker Accessory*

*to be converted to the **Loading Position** without any adjustment of the Press lead screw (**9**) being necessary.*

Lift the Top Half Assembly of the High Temperature Film Maker Accessory within the Press into the **Loading Position**.

From the spacer rings (**18**) (A to F), select the most appropriate spacer ring to use for a **nominal thickness** to be made. (See Note 2: Spacer Ring Tolerances and Thicknesses – page 36).

The spacer rings (**18**) have two distinctive surfaces – a flat surface and a recessed edge surface. (See **Fig 14**.)

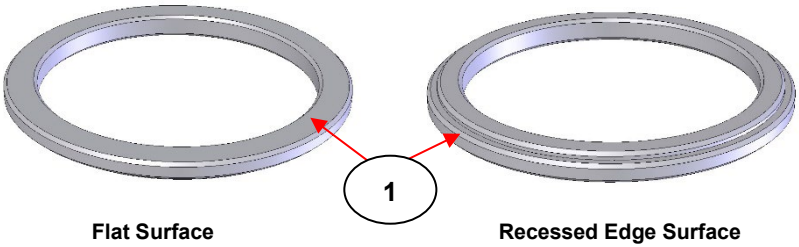


Fig 14. Spacer Ring Surfaces

Locate the spacer ring (**18**) onto the lower polished pressing surface (**14**), ensuring that the **recessed edge surface is face down** in contact with the polished pressing surface (**14**). The spacer ring (**18**) will be held correctly and centrally in position by the surrounding lower heated pressing surface assembly of parts (**5**). With the Spacer ring (**18**) correctly positioned this way up on the lower polished pressing surface (**14**), a recess groove is created around the circumference between the spacer ring (**18**) and polished surface (**14**). Should it be necessary to do so, a small flat screwdriver blade can be used in this groove to prise the spacer ring away from its location if it has become stuck fast (e.g. from a flow of excess molten sample that has cooled on the spacer ring and polished surface), from an incorrect film making procedure. (See **Fig 15.)**

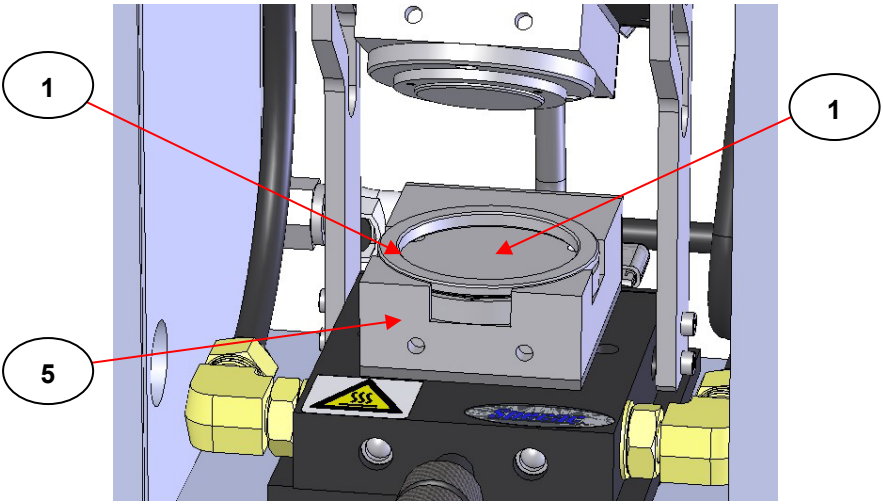


Fig 15. Spacer Ring Positioned in Lower Heated Pressing Surface Assembly

With the Spacer ring (**18**) correctly positioned on the lower polished surface (**14**), using the forceps supplied place either a flat aluminium foil disc (**21**) or an already prepared aluminium foil sample cup (**22**) inside the spacer ring (**18**). When using a sample cup (**22**), make sure it is centred within the spacer ring (**18**). Where interference fringes are required the shiny surface of the aluminium foil should be in contact with the sample to be heated and pressed. (See **Fig 16.**)

Take the sample to be melted and pressed and place it carefully into the centre of the lower foil disc (**21**) or sample cup (**22**). The amount of sample to use will vary depending on the thickness of spacer ring (**18**) chosen. (See **Fig 17.**)

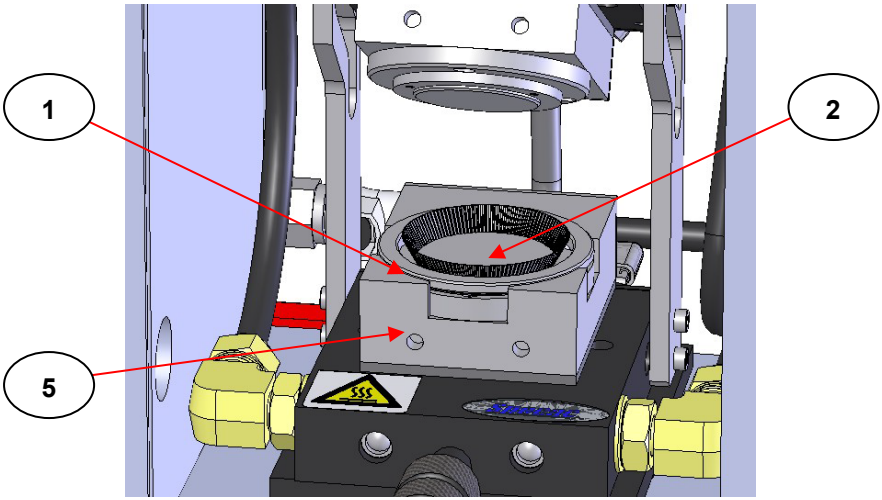


Fig 16. Lower Aluminium Sample Cup Positioned in Lower Heated Pressing Surface Assembly

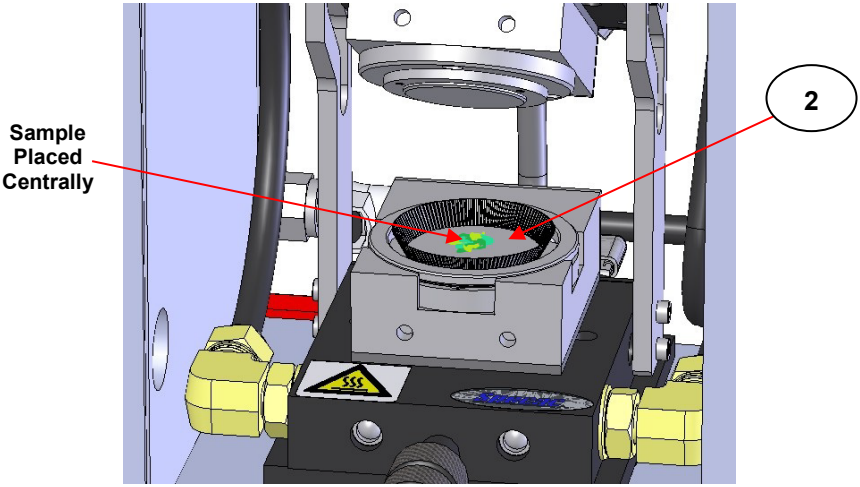


Fig 17. Lower Aluminium Sample Cup and Sample Positioned in Lower Heated Pressing Surface Assembly

.
Now, very carefully place a second aluminium foil disc (**21**) or the sample cup cover (**23**) over the foil disc or sample cup and sample already placed within the spacer ring (**18**) on the lower polished pressing surface (**14**) of the Film Maker Accessory. Try not to disturb any sample placement when introducing the top foil disc (**21**) or sample cup cover (**23**) and be sure that the correct shiny surface of the top foil disc (**21**) is in contact with the sample if fringes are required. (The sample cup cover (**23**) will have already been prepared accordingly with a matching shiny or matt surface to use against the sample with its appropriate sample cup.) (See **Fig 18**.)

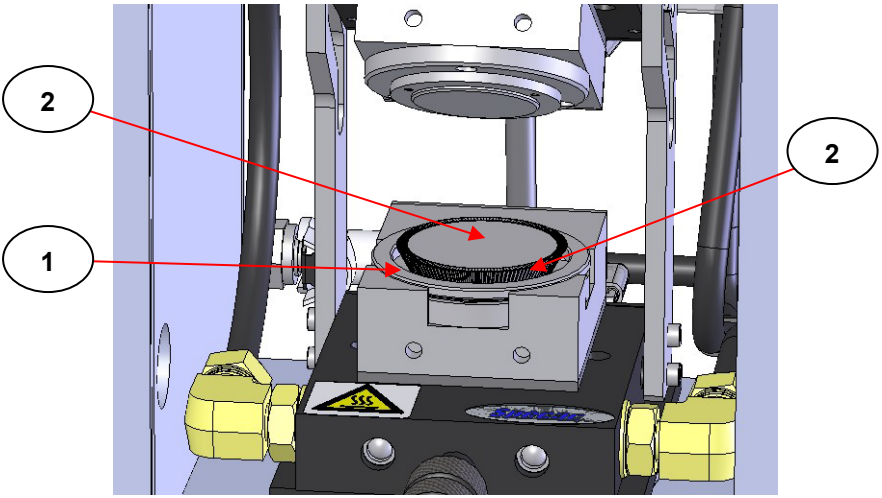


Fig 18. Lower Aluminium Sample Cup, Sample and Cover Positioned in Lower Heated Pressing Surface Assembly

Using the lifting handle (**16**) and loading handle (**12**) of the Film Maker Accessory for support, gently lower the Top Half Assembly from the **Loading Position** to the **Sampling Position**. Ensure that the foil discs and sample "sandwich" is not disturbed when moving the Top Half Assembly to the **Sampling Position**.

Replace the spacer bar (**20**) centrally onto the top cooling block (**2**) and slowly lower the top bolster pressing surface (**8**) by a clockwise rotation of the lead screw (**9**) until **all the components of the pressing system** (the top bolster surface (**8**), the spacer bar (**20**), Top Half Assembly, foils and sample "sandwich" and Lower Half Assembly) are just touching each other. These components should be loosely clamped together at this stage, prior to heating and melting of the sample. (See **Fig 19.)**

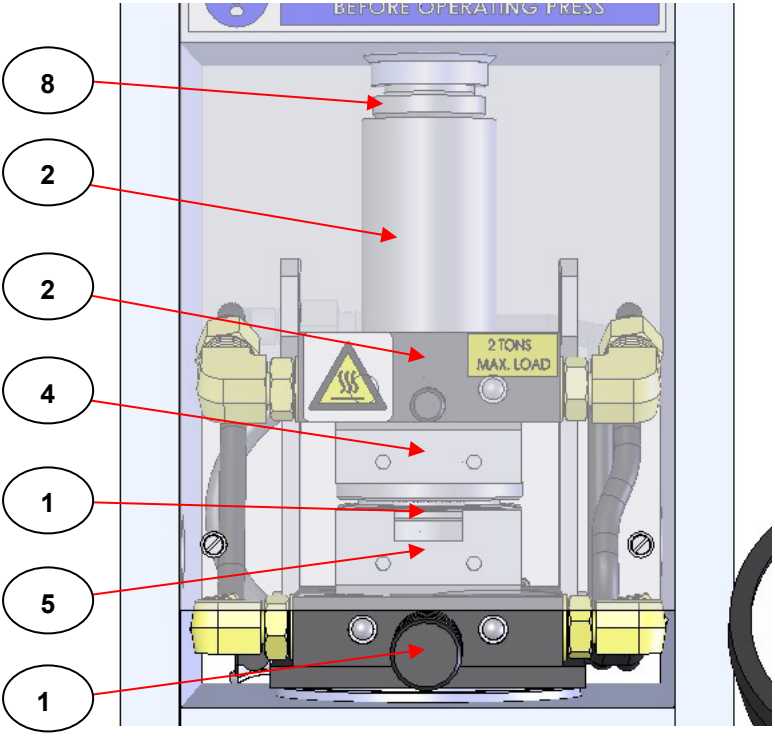


Fig 19. Components of Pressing System in Sampling Position Loosely Clamped Together Prior to Heating

Note: *A tonnage load to pressurise the components together should* ***NOT*** *be applied via pumping of the press piston at this time.*

Carefully lower the front safety guard of the Manual Hydraulic Press such that it comes to rest on the loading handle (**12**) of the Lower Half Assembly (that is projecting out of the front of the Press), prior to any tonnage load compression. (See **Fig 19**.)

Note*: If using an Atlas™ Power or Autotouch Press, the front safety guard **MUST** be closed prior to any power being supplied for operation of and application of a tonnage load. The forward projection of the loading handle (**12**) does not interfere with the closure of the front safety guard on these Presses.*

The components to be pressed are loosely clamped together to determine the melting point of the material to be pressed. When applying power to heat the top (**4**) and lower (**5**) heated pressing surface assemblies, as the sample material within the High Temperature Film Maker Accessory begins to soften, the Top Half Assembly and spacer bar (**20**) components will sink down under their own weight and a visible gap is created between the top bolster pressing surface (**8**) and the top of the spacer bar (**20**). **Only when this phenomenon occurs** is it safe to start pressing the material via the Press piston to apply a tonnage load. Up until this point the sample material may still be too hard to compress and could preferentially rupture the aluminium foil discs (**21**) or sample cup parts (**22**) and (**23**) and worse, damage the highly polished pressing surfaces (**13**) and (**14**) of the top (**4**) and lower (**5**) heated pressing surface assemblies, even if loads of 1 to 2 tons are applied.

However, this visual indicator point may be reached when a material starts to soften and **before** it has reached its actual melting point. The resultant film from any pressing and tonnage load application may not be ideal. Therefore, it is most important to try and press the film at **the actual melting point** of the sample to obtain the best results.

Note: *If you know the melting point of the sample material to be pressed, that can be applied as a **set** temperature on the 4000 Series controller that powers the High Temperature Film Maker Accessory, it will help substantially in the whole process of the thin film preparation and production.*

Heating the Sample

When the sample to heat and press has been installed into the High Temperature Film Maker Accessory and the component parts to press have been loosely clamped together (**a tonnage load force has not been applied**), a temperature to heat the sample can be set for the heated pressing surface assemblies (**4**) and (**5**).

Note: *At this stage, please read the user instruction manual supplied with the dedicated 4000 Series™ Temperature Controller that powers the High Temperature Film Maker Accessory to familiarise yourself with its use in control of a temperature to apply to the Accessory.*

Select a known melting or a "test" **set** temperature on the 4000 Series controller of the High Temperature Film Maker Accessory. When the **set** temperature has been input and accepted, the temperature controller will power both the top (**4**) and lower (**5**) heated pressing surface assemblies to reach this temperature. Wait for the softening or melting point to be reached. Visual identification occurs when there is a gap between the top bolster pressing surface (**8**) and the spacer bar (**20**). Then turn the lead screw (**9**) of the Press clockwise to lower the top bolster pressing surface (**8**) onto the spacer bar (**20**) and all the other components involved in the pressing, thereby closing the gap.

Allow time for the **set** temperature and **actua**l temperature to stabilize and reach equilibrium and then apply a compressive load from the pumping system and piston of the Press. A maximum of 2 tons load can be applied to the Atlas™ High Temperature Film Maker Accessory, but in most cases 1 tons is a suitable compressive load for the preparation of thin films. Allow the High Temperature Film Maker Accessory components to stay at the tonnage load and **actual** temperature being applied for as long as your procedure for a sample film pressing may require. The thermocouple of the Accessory is connected to the lower heated pressing surface assembly (**5**) only and is very close to the lower polished pressing surface (**14**). Therefore, the **actual** temperature registered will be very close to the sample temperature itself.

Cooling the Sample

After appropriate time has elapsed for pressing at the **actual** melting temperature, reduce the **set** temperature on the 4000 Series temperature controller back to a room temperature value (e.g. 20ºC) to stop power being applied to the heated pressing surface assemblies (**4**) and (**5**).

When power is cut to the High Temperature Film Maker Accessory to reduce the **actual** temperature, maintain the pressing load on the Accessory. The temperature level will reduce at a rate determined by the immediate surroundings and local conditions prevailing at that time. The rate of temperature change in time to reduce from an **actual** melt temperature at for example 300°C to a reduced **set** temperature of 200°C will be faster than a similar temperature rate reduction from an **actual** of 200°C to **set** at 100°C.

You may observe a decrease in the load on the load gauge of the Press, which is normal when a compressed material “relaxes” on cooling. Simply re-apply the pressing load via the piston if this effect is seen and you wish to maintain the tonnage load that had been applied.

Note: *For more efficient cooling the top (**4**) and lower (**5**) heated pressing surface assemblies should be kept together and therefore, the pressure (from an applied tonnage load) should not be allowed to drop to zero. Maintaining the load while cooling is particularly recommended for samples that relax during cooling. Any effect of a tonnage load application during the cooling stage may be considered as part of a **particular procedure** that is required in the production of consistent and reproducible thin films for the sample material type.*

Accessing the Film Sample

Caution! *Be sure to wear safety gloves and spectacles when gaining access to a thin film sample from the High Temperature Film Maker Accessory after a heating and pressing procedure. Certain components may still be too hot to touch with bare hands and so these precautions minimize the risk of accidental burns.*

When the **actual** temperature being indicated on the 4000 Series controller display has fallen sufficiently (to about 60°C), release any tonnage load force being applied by the Press being used.

Raise the front safety guard and rotate the lead screw (**9**) anticlockwise of the Press sufficiently to allow for removal of the spacer bar (**20**).

Carefully lift the Top Half Assembly using the lifting handle (**16**) from the **Sampling Position** to the **Loading Position** (See **Fig 11.**).

Using the forceps supplied remove the spacer ring (**18**). If the spacer ring (**18**) has become stuck into position and is not easily removed using the forceps, then a small flat bladed screwdriver may be employed within the groove around the spacer ring circumference (see **Fig 12.** page 21) to carefully prise out of its location.

On separation of the Top Half Assembly to install into the **Loading Position**, the pressed thin film at a 29mm diameter contained between the foil discs (**21**) may be attached to either the top (**13**) or lower (**14**) polished pressing faces or attached to the spacer ring (**18**).

The sample film “sandwich” can be carefully removed from the top (**13**) and/or, lower (**14**) polished pressing faces, or the spacer ring (**18**), by use of the forceps that are provided. Similarly, the forceps can then be used to separate and peel away the foil discs (**21**) from the compressed thin film sample.

The prepared thin film can then be mounted in a Specacard (P/N GS03800 or P/N GS03810) or a magnetic film holder P/N GS03820 for spectroscopic analysis.

7. Notes for Operation of the High Temperature Film Maker Accessory

This section provides some additional information, hints and tips about the Atlas™ Film Maker Accessory for its correct use in the preparation of thin films and their production.

Note 1: Using the Aluminium Foil Discs

The Atlas™ High Temperature Film Maker Accessory has been designed to accommodate two foil disc (**21**) thicknesses to produce films corresponding to the spacer ring (**18**) selected. The aluminium foil has been specially selected for its consistent thickness of 12 microns and grease free surface.

Certain polymeric samples, particularly those containing fillers, may give release problems. If the sample tends to stick to the aluminium foil disc (**21**), this may be pre-coated with a light smear of a non-silicone based releasing agent. This requires treating a batch of aluminium foil discs (**21**) according to the instruction of the releasing product. Any contamination of the pressed film may be removed by wiping clean.

If the sample sticks stubbornly to the aluminium foil discs (**21**) after heating and pressing, the foil discs (**21**) can be removed by immersion of the sample film and foils into a solution of concentrated sodium hydroxide.

Caution: *Wear safety spectacle and gloves when handling the foil discs (**21**) and using a powerful, corrosive chemical such as sodium hydroxide. Be sure to check prior to this procedure that the sample itself will not be attacked or affected by the sodium hydroxide, if using this strong chemical agent to dissolve the aluminium foils.*

Note 2: Spacer Rings - Tolerances and Film Thickness

The spacer rings (**18**) have been manufactured such that the sample thickness tolerances are +/- 3 microns for rings A and B and +/- 10 microns for all other rings. The tolerance limit relates to the absolute **overall thickness** produced for a pressed film. The spacer ring (**18**) thickness as marked allows for a **nominal** thickness of film to be produced from a methodology or operational procedure and the size of the spacer ring (**18**) is an indication of, potentially, **the minimum film thickness** that can be produced using this appropriate thickness spacer ring. E.g. if a film of between 25 microns and 50 microns thickness is to be made, then the spacer ring **B** (**18**) for 25 microns thick films should be used and any film thickness produced will have an expected tolerance limit thickness of +/- 3 microns.

For a consistent “pressing cycle procedure” to be established that allows for a high degree of reproducibility for a film to be made from any spacer ring (**18**) size being used, the following factors need to be considered:

- The size of spacer ring (**18**) used.
- The positioning of the foil discs (**21**) if thin films with fringing patterns are to be prepared.
- The quantity of sample used for the spacer ring (**18**) size that is chosen.
- The temperature of the sample (**set** on the 4000 Series controller).
- The tonnage load applied whilst the sample is hot and compressible.
- The tonnage load applied (if any) whilst the sample is cooling.
- The temperature of the cooling sample when it is removed from the High Temperature Film Maker Accessory.

Both the top (**13**) and lower (**14**) platen polished surfaces are removable from their respective heated pressing assemblies (**4**) and (**5**) by releasing their three fixing screws in each case. (See **Fig 20.**)

If the polished surfaces deteriorate over time, it may be possible to improve their surface condition from a re-polishing (if any blemishes or imperfections are not too severe), by removal of the polished surfaces from their heated pressing assembly to use against a suitable flat polishing/lapping device. However, any re-polishing of the **top** polished

surface (**13**) can affect the expected **tolerance limit** for the thickness of film produced in subsequent pressings, although an overall film thickness **reproducibility** will be maintained, provided an established pressing cycle procedure is followed. (See points/factors above.)

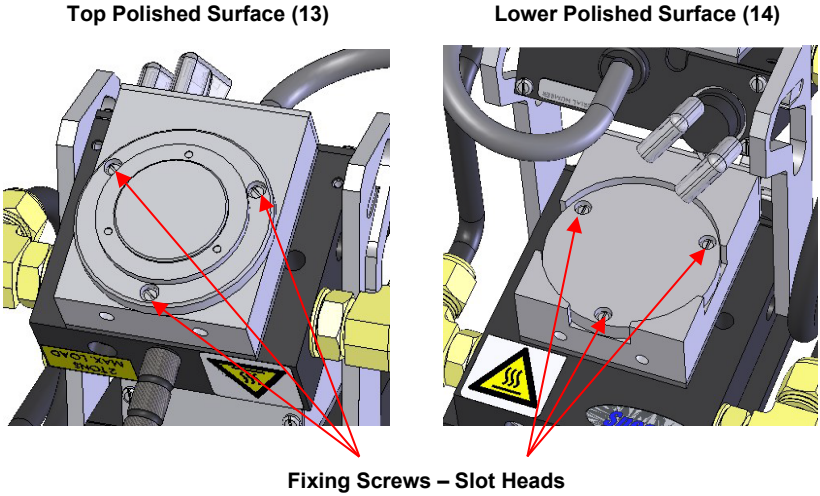


Fig 20. Top and Lower Polished Pressing Surfaces Fixing Screws

Should it be necessary, if the polished surfaces (**13**) and (**14**) have become too badly damaged from scoring and gouging in use, spare replacement polished surface parts (**13**) and (**14**) are available from Specac for a correct tolerance compatibility to the spacer rings (**18**).

The film thickness produced may sometimes deviate from the specified spacer ring (**18**) size **nominal** and/or **minimum** thickness. This is due to the nature of the material being pressed. (e.g. PTFE films tend to shrink on cooling.) However, the film thickness achieved will be reproducible, provided a consistent method of preparation is adopted. (See points/factors for the pressing cycle procedure.)

Note 3: Tips on Pressing

Warning: ***SAMPLES MUST NOT BE PRESSED IN THE ATLAS™ HIGH TEMPERATURE FILM MAKER ACCESSORY WHEN IT IS COLD.***

Polymeric samples in bead form may require pre-crushing while cold so that the Top Half Assembly may be mounted more easily for the **Sampling Position** when a foil disc/sample/foil disc "sandwich" has been positioned into the Lower Half Assembly. (See page 28, **Fig 17.)** Pre-crushing can be done in a Specac Press itself (without the Atlas™ High Temperature Film Maker Accessory in position) using a 13mm diameter evacuable pellet die P/N GS03000.

Some experiments will be required to determine the **optimum** amount of sample to load for any given thickness of film to produce from the spacer ring (**18**) chosen. If an insufficient amount of sample is used, the melted sample when pressed will not completely cover the polished surfaces (**13**) and (**14**) and the produced film will be too thin and probably wedge-shaped. If the pressed 29mm diameter film does completely cover the polished surface areas, the central 15mm diameter area will give the required thickness. A measurement for the thickness of film could be made and the pressing cycle procedure can be amended accordingly to calculate a correct amount of sample required to obtain a specific thickness of film. If too much sample is loaded, although the 29mm diameter film produced may provide a consistent thickness for the sample over the inner 15mm diameter area, a thick rim may be obtained on the film which may make mounting of the film difficult or cause the spacer ring (**18**) to stick to the assembly of components.

Note: *An optimum amount of sample to press for the particular thickness of film required is key to thin film reproducibility.*

Careful monitoring of the temperature will be required for samples (e.g. Nylon) which oxidize at temperatures slightly above the softening temperature. If the temperature of the High Temperature Film Maker Accessory is raised slowly, a Nylon bead within the Film Maker Accessory can be tested for softening by "feeling" through the handle of the lead screw (**9**) and top polished pressing surface (**13**) when gentle

tightening is necessary. In general, these sample types should be pressed as soon as softening is observed. It is important to ensure that all the components used in the pressing cycle are not over pressurised in the Press when the sample is cold. Failure to observe this will result in the sample cutting through the aluminium foil discs (**21**) and, when subsequently melted and pressed, sticking to the polished surfaces (**13**) and (**14**).

Note 4: Cleaning of Components

Ensure that the polished pressing surfaces (**13**) and (**14**) and spacer rings (**18**) are kept as clean as possible between pressings of samples. Remove all sticky materials by carefully scraping with a sharp blade (avoid gouging the surface) and wipe the surfaces with lint-free tissues and a suitable solvent. Water, methanol and acetone may be suitable solvents, but DO NOT use acidic or basic solutions to clean the metal parts.

If the Atlas™ High Temperature Film Maker Accessory is not being used for a while, (e.g. a few days), then any cooling water that is within the top (**3**) and lower (**4**) cooling blocks or black silicone water tubing should be removed.

This is easily achieved by keeping the Quick Connect body (**6**) and insert (**7**) couplings fixed together (see **Fig 2.** page 11) to allow for the water to flow. Disconnect the initial inlet black silicone tubing from a water supply/tap and blowing through the water contained within the cooling water circuit via this disconnected silicone tubing opening using a compressed air or nitrogen supply line supply. The force of the air or nitrogen gas will dispel the water through the entire cooling water circuit away to the drain outlet tubing opening of the cooling water circuit or back to a thermo-circulator system water reservoir.

When using the High Temperature Film Maker Accessory again, even if it does not require re-installation into the Press because it had not been necessary to remove it completely since last use, the initial input silicone tubing can easily be reconnected to the water supply/tap again to facilitate for the necessary cooling water requirement.

8. Atlas™ High Temperature Film Maker Accessory Operating Parameters on Controller

The Atlas™ High Temperature Film Maker Accessory is provided with its own dedicated 4000 Series Temperature Controller. A separate manual is supplied for operation of the 4000 Series Temperature Controller.

For operation of the Atlas™ High Temperature Film Maker Accessory the parameters of the 4000 Series Temperature Controller have been factory set as shown on the following page. Not all the displayable parameters can be changed but have been listed for reference purposes. If you ever need to change a parameter or autotune the controller for a specific temperature range of operation, certain parameter settings will be altered. You can get back to the original factory settings by reprogramming the controller for the accessible parameters with these original values if so wished.

Specifications

Accessory Type P/N GS15800

Voltage	**230V**	**110V**	**100V**
Frequency	50HZ	60HZ	50/60HZ
Max Power	600 Watts	600 Watts	600 Watts
Fuse Rating	5 Amps	8 Amps	8 Amps
Fuse Type	T (antisurge)	T (antisurge)	T (antisurge)

Insulation rating of external circuits (appropriate for single fault condition) = basic insulation and protective (earth) bonding.

Humidity operation range – 20% to 90% relative humidity non-condensing.

Displayable Parameters for High Temperature Film Maker Accessory P/N GS15800 with WEST 6100+ (4000 Series) Controllers

Parameter Display (In Green)	Parameter Name	Parameter Factory Set Value
FiLt	Input Filter Time Constant	3.0
OFFS	Process Variable Offset	0
PP␣␣	Primary (Heat) Output Power	0
Pb_P	Primary Output Proportional Band	1.5
ArSt	Automatic Reset (Integral Time Constant)	0.26
RAtE	Rate (Derivative Time Constant)	0.06
BiAS	Manual Reset (Bias)	25
SPuL	Setpoint Upper Limit	400
SPLL	Setpoint Lower Limit	0
OPuL	Primary (Heat) Output Upper Power Limit	100
Ct I	Output 1 Cycle Time	1
PhAl	Process High Alarm	400
AHyl	Alarm 1 Hysteresis	1
PLA2	Process Low Alarm	0
AHy2	Alarm 2 Hysteresis	1
Apt	Auto Pre-Tune enable/disable	diSA
PoEn	Manual Control select enable/disable	diSA
SPr	Setpoint Ramping enable/disable	EnAb
RP	Setpoint Ramp Rate Value	3600
SP	SP Value	400
Sloc	Set-up Lock Code	10

9. Legend – Bubble Number Part Identification

(**1**) Thermal cut-off switch.
(**2**) Top cooling block assembly.
(**3**) Lower cooling block assembly.
(**4**) Top heated pressing surface chamber.
(**5**) Lower heated pressing surface assembly.
(**6**) Quick Connect body coupling.
(**7**) Quick Connect insert coupling.
(**8**) Top bolster pressing surface (of the lead screw).
(**9**) Lead screw (of the Press).
(**10**) Safety guard lower screw stop (of Manual Hydraulic Press).
(**11**) Safety guard lifting knob (of Manual Hydraulic Press).
(**12**) Loading handle of High Temperature Film Maker Accessory.
(**13**) Top polished pressing surface.
(**14**) Lower polished pressing surface.
(**15**) Side support bracket.
(**16**) Lifting handle on Top Half Assembly (of Film Maker Accessory).
(**17**) Top resting slot in side support bracket.
(**18**) Spacer ring.
(**19**) Lower pressing piston surface (of Press).
(**20**) Spacer bar (aluminium cylinder block).
(**21**) Aluminium foil disc (40mm diameter).
(**22**) Aluminium foil sample cup.
(**23**) Aluminium foil sample cup cover.
(**24**) Cup making tool.
(**25**) Foam pad for cup making tool.

10. Spares and Consumables

P/N GS15627 Packet of (200) aluminium foils (40mm diameter).
P/N GS15805 Atlas™ High Temperature Film Maker Accessory replacement spacer rings (set of 6 – sizes A to F).
P/N GS03800 Packet of (100) Specacards (25mm diameter aperture).
P/N GS03810 Packet of (100) Specacards (10mm x 25mm aperture).
P/N GS03820 Magnetic film holder (25mm diameter aperture).

Notes for Use of Atlas™ High Temperature Film Maker Accessory

User Manual

Analysis Advancing Life™

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