

Thermo Scientific ALPS 3000™
Automated Laboratory
Plate Sealer
User Manual





ALPS 3000™ Heat Sealer

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1. Introduction

The ALPS 3000 has been designed for robotic integration, or stand alone sealing, offering a fast effective solution for the heat-sealing of microplates for experimentation, storage or transportation.

ALPS 3000

Heat sealing is now widely considered to be the most effective way of sealing plates for assays, thermal cycling, storage and shipping. The extensive range of sealing materials available for our new instrument offer permanent or peelable high integrity seals, for most plate material types.

The range of sealing materials includes ultra clear materials for colorimetric or fluorimetric assays, along with solvent resistant seals with exceptional low temperature (-200 C) storage characteristics.

The ALPS 3000 has a compact footprint saving bench space. It features a serial port allowing RS232 and external foot switch operation, for robotic control, plus a touch screen for manual operation.

Both seal time and temperature are fully adjustable and the unit has built-in sensors to monitor seal presence and provide output error warning signals. The unit produces no waste material and seals plates of different heights without the need for plate carriers.

ALPS 3000 is designed to be integrated into robotic platforms from all leading automation companies.

Procedure

The unsealed plate is placed on a shuttle which extends from the front of the sealer, allowing full access with a robotic arm or stacking system. The shuttle is drawn into the unit automatically and the plate is sealed in 6 to 12 seconds, depending on the sealing time. The shuttle then slides out, presenting the sealed plate in its original position.

The sealer, as part of a fully automated plate handling system, is controlled by RS232 communication (see page 14). Alternatively, the ALPS 3000 can be manually operated as a stand alone unit (see page 13).

Each roll of sealing film is sufficient for approximately five thousand plates. The cutting system cuts the film to cover the entire plate surface but does not permit any overhang that would effect the plates handling, or the visibility of barcodes.

The rolls of sealing film, either aluminium or clear laminates, are able to produce permanent, pierceable or peelable seals with Polypropylene, Polystyrene or Polyethylene plates.

To keep the size and weight to a minimum, the unit uses laboratory compressed air and all parameters, such as temperature and time are fully adjustable to ensure a perfect, even seal with different plate and film formats. Should a compressor be needed if lab air is not available please contact Thermo Fisher Scientific.

User safety has been carefully considered during the design process, eliminating risk of contact with hot surfaces or the internal mechanism during operation.

2. Health and Safety Notes

It is important that the ALPS 3000 is installed and operated in such a way that all applicable Health and Safety requirements are met. It is the user's responsibility to ensure that all relevant Health and Safety regulations are identified and complied with. Failure to do so, may result in damage to the equipment and could cause personal injury. In particular, the user should study the contents of this guide carefully before handling or operating this equipment.

Under no circumstances will the supplier of this equipment be liable for any incidental, consequential or any special damages of any kind whatsoever, including but not limited to lost profits arising from, or in anyway connected with the use of this equipment or this instruction manual.

WARNING SYMBOLS Used In Accordance With IEC 417

RISK OF ELECTRIC SHOCK



WARNING!

Refer to accompanying documentation.



HOT SURFACE/HOT AREA

This instrument is fitted with an internal heater with a maximum temperature of 200° C when in use



PROTECTIVE CONDUCTOR TERMINAL



MAINS SWITCH SYMBOLS

I - 0
I = ON 0 = OFF

PROTECTIVE CONDUCTOR TERMINAL
I-0

Environmental Requirements

Temperature Range	Operating	15° C to 40° C
	Storage	0° C to 40° C
Relative Humidity:	Operating	10% to 80% Non-condensing
	Storage	10% to 80% Non-condensing

3. Cautionary Notes

Statement: WARNING: Do not operate this instrument in an atmosphere containing explosive gases.

Statement: WARNING: Only approved, supplied mains cord must be used with this instrument.

Statement: WARNING: If it is required to use an extension lead, the lead **MUST** be grounded.

Statement: VOLTAGE: The ALPS 3000 is supplied for direct connection to normal 115VAC or 240VAC supply, with a variation in supply that gives a voltage range of 108VAC to 250VAC

- Safety guards **MUST** be used at ALL times of operation of the unit.
- At no time should the sealing film be in place while the unit is being transported.
- The ALPS 3000 is designed to be operated with a maximum sealing temperature of 200° C
- The ALPS 3000 should be switched on ten minutes prior to use, to enable the set temperature to be reached.
- The unit should only be used in a suitably ventilated area. The use of solvents on the unit is not recommended.
- Certain components become hot during the correct operation of the equipment. These components are marked as described above. Due care should be taken to avoid personal injury.
- The Air Supply must be removed and the electrical supply disconnected, prior to the removal of any safety guards.
- Thermo Fisher Scientific accepts no responsibility for the misuse of this equipment.

The Mains Plug supplied with the ALPS 3000 unit, is fitted with the following fuse:

Supply	Fuses Fitted in Plug	Fuses Fitted in Sealer
230VAC	13 Ampere	T5AH 250V
115VAC	No Fuses	T5AH 250V

Only refit the correct type of Fuse. Must be IEC127 approved for use in EC Countries.

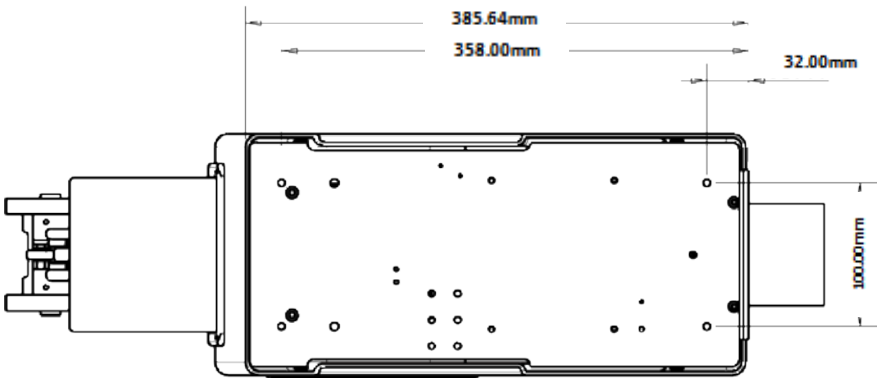
Must be C.S.A. or UL listed or recognized for use in Canada or the United States of America.

4. Operating Environment & Footprint

The ALPS 3000 should be operated in an environment with a temperature range of 15° C - 40° C and a non-condensing relative humidity range of 10% - 80%.

The unit should be kept out of drafts and air currents as they will have an adverse effect on the temperature stability of the sealing plate. Since the ALPS 3000 will not seal if the temperature is not at the set temperature, if the sealing plate is cooled by drafts then the time between cycles may be increased.

The machine should be mounted on a sturdy bench to avoid any movement during operation. When locating the machine there should be enough space allowed for the shuttle to move out without hitting anything or anyone. The reduced weight compared to the previous model does make the ALPS 3000 much easier to move into a suitable position.



Note: Allow 170mm at the front of the unit for the plate carrier to open and 100mm at the back and top for the seal roll.

5. Connecting the Air Supply

All electrical and pneumatic connections are made to the lower rear of the unit, this is the only point of interconnection to the sealer.

UK Europe and Asia supplied units.

The unit is supplied with a 6mm push-in connector to fit into the 1/4 BSP inlet.

USA supplied units.

The unit is supplied with a 1/4 inch push-in connector to fit into the Filter Regulator input.

When fitting an air connector to the ALPS 3000 always use 2 spanners, one to tighten the connector and one to prevent the bulkhead fitting from turning. If the bulkhead fitting is allowed to rotate it may become loose.

The air supply for the ALPS 3000 should be 80psi (5.5 bar) and a maximum of 87psi (6 bar).

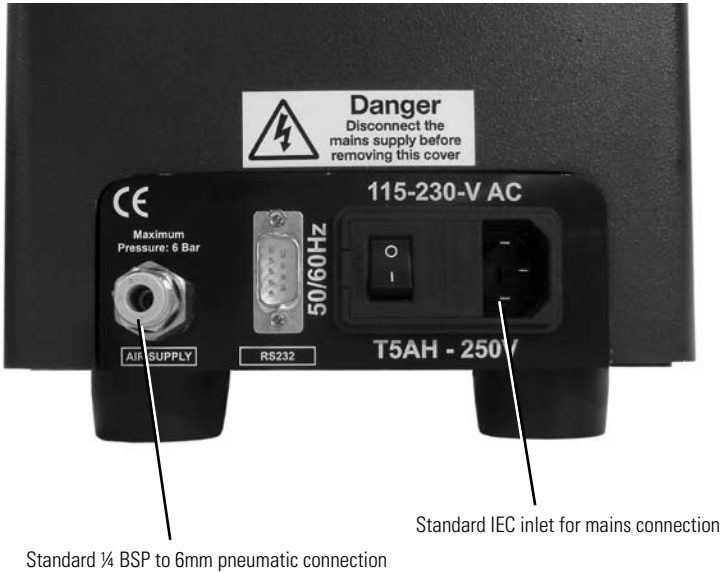
The supply should be able to provide 50 litres/minute through a pressure regulator as there is no regulation of the air within the ALPS 3000 Exceeding the maximum pressure may damage the unit. The air supplied must be clean, dry and oil-free. Most air regulators include a water filter but not an oil filter; this may need to be fitted separately.

6. Connecting the Voltage Supply

The ALPS 3000 utilizes a standard IEC inlet, which is fused and switched.

Plug the IEC Lead in the inlet and switch on the Rocker I.O. Switch. The display that is mounted on the front of the unit should illuminate.

NOTE: The system is self regulated to sense voltage differences between 100 and 240 VAC.



7. Foil/Film Loading

Loading the ALPS 3000 with heat sealing film:

We recommend the unit be cold when loading the film to minimize the possibility of personal injury. To allow the film to be threaded through the system, the air and electrical supply must be connected and turned on to open the foil gripper and foil clamp assembly, .

The electrical power must be connected to load the foil/film.

- 7.1 - Ensure the power is on the unit, enter the setup menu, which will then display an option to load foil.
- 7.2 - Press the load foil button, this will open the foil gripper and foil clamp allowing you to insert the foil loading tool through the plate shuttle access to machine.
- 7.3 - Slide the tool through the foil gripper, then through the cutting section and finally bring the tool out to the rear of the machine, this is best carried out by placing the foil loading tool flat on the plate shuttle, with no plate present, then sliding the foil loading tool carefully through the machine.
- 7.4 - Allow one turn of the roll as slack, to feed through the unit.
- 7.5 - Fold the foil end into a point, alternatively the foil may also be cut to a point.
- 7.6 - Insert folded point into the slot in the loading tool, ensuring that the foil is not twisted, with the sealing surface facing away from the machine.
- 7.7 - Carefully pull the foil loading tool through the machine and ensure that it is sitting flat and central.
- 7.8 - Remove foil from the loading tool.
- 7.9 - Keeping a firm hold of the foil, press the trim foil button on the display and slowly pull the foil away from the machine, keeping your hand out of the machine.

8. Operational Procedure

The ALPS 3000 has been designed to reliably seal plates of different heights and different plastics, using a variety of films. These components will require different sealing conditions.

The quality and strength of the seal created between the sealing film will vary with different conditions. In general, increasing either the sealing temperature or duration of seal, gives a stronger, more complete seal; however over-sealing on a regular basis can cause damage to the plate being sealed. This in turn, reduces the number of times a particular plate can be resealed. Therefore a balance has to be achieved that gives an acceptable seal with the minimal plate damage or distortion.

Another optimization factor to be taken into account is the surface area of the plate.

Plate with thin raised rims around each tube, have a reduced surface area compared to a plate with wide raised rims. Therefore less heat is needed to seal the thin rim plate in comparison to the wide rim.

The pressure that the heater plate exerts during sealing is pre-set and cannot be adjusted. Plates without raised seals are not considered suitable for heat sealing.

8.1 - Temperature and Time Setting:

The following table gives a guide as to the sealing time and temperature for different materials.

Plate Material	Temperature Setting	Time Setting
Polystyrene	145° C - 165° C	3 Seconds - 5 Seconds
Polypropylene	150° C - 175° C	3 Seconds - 5 Seconds
Polyethylene	150° C - 170° C	3 Seconds - 5 Seconds

8.2 - Commands, Indications and warnings:

The ALPS 3000 is software controlled, employing micro-controllers. All commands, indications and warnings are effected via the touch sensitive LCD display panel located on the front of the unit.

The sequence of events is as follows:

8.3 - Setting the sealing operation:

With a plate in position on the Shuttle, the SEAL segment is pressed to start the sealing operation.

If the sealing plate is not up to temperature, the display will indicate it is heating, and the actual temperature compared to the set temperature. The display flashes 'Sealing' during the operation and then returns to the seal screen, ready for another operation.

8.4 - To set Sealing Time:

Press Settings > Time > Increment Up/Down > Save



8.5 - To set Sealing Temp:

Press Settings > Temp > Increment Up/Down > Save



8.6 - To Load Foil:

Press Settings > Load Foil > remove and load new foil > Whilst holding surplus foil pulled through with foil loader, centre foil on shuttle and Press Trim. Whilst trimming pull gently on foil until fully removed from machine.



8.7 - To set Remote Mode:

Press Settings > Next > Remote Mode > Next



8.8 - To set Local Mode:

Press Settings > Next > Local Mode > Next



8.9 - To Park the Machine:

NOTE: Remove foil before setting machine in park

Press Settings > Next > Park > Remove Foil > OK > Turn off machine



9. Communication Protocol

ALPS 3000 Host Communications Protocol 19/02/06

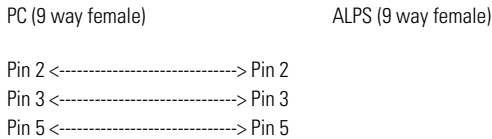
9.1 - Serial Port Setup:

Baud rate	9600	Data bits	8
Parity	none	Stop bits	1
Flow control	none		

All communications via ASCII.

9.2 - Cable:

Connection is via a straight cable – not a modem cable.



9.3 - Message Response time:

The unit responds to each message within 100 msec.

9.4 - Configuring for remote operation:

On the touch-screen use the advanced menu to set the following:

9.5 - "Remote" to "Local":

This sets the unit into remote mode and ignores commands issued from the touch screen. This is strongly recommended when controlling the unit from a host computer.

9.6 - System Initialization:

The system automatically initializes on power up. While initializing the system status is reported as "busy."

ALPS 3000 Host Communication Protocol - Continued

9.7 - Status Message:

PC sends: ?<cr>
 ALPS 3000 replies: <status byte><cr>

The status byte is a hexadecimal value represented in ASCII, i.e. the characters "ff" means 0xff hex.

9.8 - Bit values:

Bit 0	No Foil
Bit 1	Error
Bit 2	Busy
Bit 3	Waiting For Seal Temperature
Bit 4	Plate Not Present
Bit 5	Low Air
Bit 6	Foil Load Mode After Park
Bit 7	Park Mode

When checking the communication using, for example Hyper-terminal, the responses to the status message enquiry are hexadecimal values which when converted to binary values allow the status to be interpreted. For example, when the unit is heating or cooling and so not at the sealing temperature, the response is 08. In binary this is 1000. Taking the bit values from 0-7 from the right bits 3 is at 1. The status is 'not at seal temperature' as listed above.

9.9 - Seal Plate Command:

PC sends: S<cr>
 ALPS 3000 replies: ok<cr>

If the sealing operation has commenced

Or: err<cr>

If it is unable to seal the plate.

9.10 - The ALPS 3000 will not seal the plate if the following conditions exist:

Status:

Bit 0	No Foil
Bit 1	Error
Bit 2	Busy
Bit 3	Not at seal temperature

9.11 - Error Message:

PC sends: E<cr>
ALPS 3000 replies: ##<cr>

Where ## is a decimal value represented in ASCII, i.e. the characters "01" means error

9.12 - Error numbers:

ERROR DOWN 1
ERROR UP 2
ERROR SHUTTLE_IN 3
ERROR SHUTTLE_OUT 4
ERROR MAINS_AIR 13
ERROR THERMOCOUPLE 7
ERROR OVERHEATING 9
ERROR NO_FOIL 10

9.13 - Sealing Temperature message:

PC sends: A###<cr>
ALPS 3000 replies: ok<cr>

Where ### is a 3 digit decimal number represented in ASCII, i.e. the string A180<cr> sets the sealing temperature to 180° C.

9.14 - Sealing Time message:

PC sends: B##<cr>
ALPS 3000 replies: ok<cr>

Where ## is a 2 digit decimal number represented in ASCII, i.e. the string B25<cr> sets the sealing time to 2.5 seconds.

9.15 - To read back sealing temperature set point:

PC sends: C<cr>
ALPS 3000 replies: ###<cr>

Where ### is a 3 digit decimal number represented in ASCII, i.e. the string 170<cr> means the current set point is 170° C.

9.16 - To read back sealing time:

PC sends: D<cr>
ALPS 3000 replies: ##<cr>

Where ## is a 2 digit decimal number represented in ASCII in units of 10ths of a second i.e. the string 25<cr> means the current sealing time is 2.5 seconds.

9.17 - To read back sealing temperature actual value:

PC sends: F<cr>
ALPS 3000 replies: ###<cr>

Where ### is a 3 digit decimal number represented in ASCII, i.e. the string 170<cr> means the actual value is 170° C.

10. Cleaning the ALPS 3000



Before using any cleaning or decontamination method, other than that recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the unit.



Always remove the power and pneumatic supplies before cleaning the unit.



Never turn on power and pneumatic supplies before the unit is fully dry.



DO NOT USE ACETONE OR ABRASIVE CLEANERS.

11. Specifications

Specifications of ALPS 3000

Power Supply:	115 - 240 - V AC 50/60Hz
Power Consumption:	600 Watts Nominal
Fuse Rating:	5 Amp anti-surge (T5AH 250V)
Internal Heaters:	4 x 100 Watts (Sealing Plate)
Dimensions:	185 x 350 x 414mm (W x H x D)
Weight:	12Kg
Air Input:	1/4 BSP Female Thread
Air Requirement:	50 Litres per minute
Air Input Pressure:	5.5 Bar (80 PSI)
Minimum Operating Pressure:	5.5 Bar (80 PSI)
Minimum Operating Ambient Temperature:	15° C
Maximum Working Temperature Ambient:	40° C
Minimum Sealing Plate Height:	8mm
Maximum Sealing Plate Height:	46mm
Maximum Sealing Temperature:	200° C
Protection:	IP20
Fire Retardancy:	Plastic Case & Trays ECCEN 6073
Cycle Time Minimum:	5 Seconds

12. Fault Finding

NOTE: THIS EQUIPMENT SHOULD ONLY BE DISMANTLED BY PROPERLY TRAINED PERSONNEL. REMOVING THE MAIN COVER EXPOSES POTENTIALLY LETHAL MAINS VOLTAGES.

The ALPS 3000 System has been designed to give long term reliability with the minimum of maintenance. Annual maintenance is recommended to maintain instrument integrity and optimal performance. Should a problem occur with the sealing, an initial inspection may identify its cause and the necessary corrective action. The following list highlights potential faults and the course of action to take.

If you are continuing to have problems with your ALPS 3000 or are interested in one of our maintenance contracts please contact us:

North America:

Thermo Fisher Scientific
Hudson, NH 03051 USA
Tel: 800.363.6631

Europe:

Thermo Fisher Scientific
Cheshire, U.K
Tel: +44 (0) 161 486 2112

FAULT	ACTION
Foil loading tool will not pass through the rear clamp.	Air supply not connected. Connect air to open clamp.
Foil will not pull through.	Pulling the foil loading tool too fast or insufficient slack fed off the roll.
Foil not transported across in clean-up cut.	Foil not trimmed square after pulling through. Remove waste and reset under front clamp.
Failure of any air operated part to move properly or stops during operation.	Check air supply is at the correct pressure and that there is sufficient volume. If no improvement call for service.
Fails to respond to an input.	Check air as above.
Doesn't cut properly.	Tool setting problem – call for service.
Foil not picked up.	Check display for vacuum error. Check air supply. If no improvement call for service.
Vacuum error.	Check air supply.
Doesn't seal properly.	Time or temperature setting incorrect.
Poor seal.	Unsuitable plate. No plate support or incorrect plate support.
Punch hits plate support with 384 PCR plate or no plate.	Check and, if necessary, reset rear shuttle stop.
External fuse blows.	Replace and if it fails again call for service.
No power.	Check fuses. If OK, call for service.
The display shows 'thermocouple error'	The ambient temperature is too low for the unit to operate.

14. Sealing Tapes

3000 Heatsealer Compatible Sealing Tape

Name	Compatible Plate material	Sealing Conditions	Seal Integrity Range
AB-3720 Easy Pierce 20 µM	PP, PE	0.5-2.0 seconds at 165° – 175° C	-80 C to 80 C and up to 120° C with cyclers lid pressure
Description: Thin foil material; easily pierced; peelable bond that can be removed by hand; second seal can be applied over existing seal; recommended for use with DMSO		Applications: Suitable for PCR (requires pressure from a screw down lid), especially 384 well formats where piercing is a useful method for sample retrieval	
AB-3738: Easy Pierce	PP, PE	0.5-3.0 seconds at 165° to 175° C	-80° C to 80° C and up to 120° C with cyclers lid pressure
Description: Foil material; easily pierced; peelable bond that can be removed by hand; second seal can be applied over existing seal; recommended for use with DMSO		Applications: Suitable for PCR (requires pressure from a screw down lid), especially 384 well formats where piercing is a useful method for sample retrieval	
AB-3739: Easy Peel	PP, PE, COC	1.5-2.5 seconds at 165° – 170° C	-200° C to 90° C and up to 120° C with cyclers pressure
Description: Foil laminate; difficult to pierce; peelable bond that can be easily removed by hand, but forms weld with PE plates; can be removed and new seal applied several times; some solvent resistance and suitable for DMSO use below 4 C		Applications: Long term storage at low temperatures (-200° C). Suitable for PCR with screw down heated lid thermal cyclers only.	
AB-3797: Clear Seal	PP, PS, PE	1.5 seconds at 170 C	-80° C to 80° C and up to 120° C with cyclers pressure on
Description: Thin polymer material; able to be pierced; peelable seal when layered; good optical clarity; some solvent resistance		Applications: Ideal for ABI-3730 Sequencer applications. Suitable for PCR applications with screw down or clip down heated lid thermal cyclers only	
AB-4124: Diamond Seal	PP, PS, PE, COC	1.5-3.0 seconds at 170° C	-80° C to 120° C
Description: Thin polymer material; peelable seal; good optical clarity; some solvent resistance		Applications: Suitable for PCR with screw down or clip down heated lid thermal cyclers only. Ideal for fluorescence and colorimetric applications such as QPCR.	

14. Sealing Tapes continued

Alps 3000 Heatsealer Compatible Sealing Tape

Name	Compatible Plate material	Sealing Conditions	Seal Integrity Range
AB-3559 Thermo Seal	PP	0.5-2.0 seconds at 165° – 175° C	-80 C to 120° C
Description: Foil laminate Very strong seal with excellent chemical resistance Recommended for use with DMSO The robust sealing option		Applications: Foil laminate is ideal for sealing polypropylene microplates for long term storage including transportation and low temperature as well as high temperature applications such as PCR Including use in water bath Thermal Cyclers ☐	
AB-3686 Clear Seal Strong	PP	0.5-3.0 seconds at 165 °to 175° C	-80° C to 120° C
Description: Clear Seal Strong clear polyester polypropylene seal cannot be peeled or pierced Optically transparent for sample inspection		Applications: Clear polyester polypropylene laminate heat seal is designed to provide a weld seal on polypropylene plates that cannot be peeled or pierced	



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