Priorclave

Installation Manual

Top Loading Compact Series
Priorclave Laboratory Autoclaves

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Introduction

Priorclave autoclaves are a range of general-purpose laboratory autoclaves intended primarily for media preparation, the making safe of ordinary laboratory and pathological waste and other apparatus sterilisation purposes. The autoclaves are manufactured to a high standard and feature a number of patented innovative design features. The sophisticated **TACTROL** microprocessor control system provides a very simple method of setting even the most complex cycles. The machines have been designed from the outset for easy and safe operation and maintenance.

Properly looked after and serviced your autoclave should give years of valuable and trouble free service.

Priorclave Service

Model No: ..... *

Serial Number: .....

Date of Manufacture: .....

Software Version: .....

Please quote the above when asking for parts or service:

*** Model Numbers are in the formatted as PS/Mxx/znnn**

Mxx **MID** - Non – Vacuum models, **MVA** - Vacuum Models

Z V for vertical, H for Horizontal, C indicating Compact model, either 40 litre horizontal or60 litre vertical. (Horizontal 60 litre units have 'H' in this position)

nnn Nominal working volume in Litres

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129 -131 Nathan Way
West Thamesmead Business Park
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SE28 0AB

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E-mail: service@priorclave.co.uk
Website: www.priorclave.co.uk

or your local service agent:

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Notices and Important Information

Symbols used on the product and in this manual and their meanings

WARNING: Mechanical Hazard

In this manual, warnings draw attention to the potential for Danger to personnel up to and including risk of severe injury or death. Each Mechanical Hazard Warning is emphasised by this icon.

WARNING: Electrical Hazard

In this manual, warnings draw attention to the potential for Danger to personnel up to and including risk of severe injury or death. Each Electrical Hazard Warning is emphasised by this icon.

WARNING: Bio-hazard

In this manual, warnings draw attention to the potential for Danger to personnel up to and including risk of severe injury or death. Each Bio-hazard Warning is emphasised by this icon.

Caution: -Heavy

In this manual, cautions draw attention to the potential for injury to personnel where a product or item has a weight of over 18kg and reference should be made to your in-house procedures for heavy lifting before attempting to move or lift it. Each Caution Heavy Warning is emphasised by this icon.

Caution: -Please Note

In this manual, cautions draw attention to the potential for Damage to equipment. Each caution warning is emphasized by this icon.

Hazard - Isolate before Access

When one of these stickers has been placed on a removable panel the power must be switched off before the panel is removed. There may be a number of areas behind the labelled panel that constitute a hazard. All such panels are service access panels only and should not be removed unless there is a full understanding of the equipment.

Electrical Hazard - Isolate before Access

When one of these stickers has been placed on a removable panel the power must be switched off before the panel is removed. There may be a number of areas behind the labelled panel that constitute an electrical shock hazard. All such panels are service access panels only and should not be removed unless there is a full understanding of the equipment.

Electrical Earth Point

This protective label indicates a point at which an electrical earth cable should be connected. When removing and replacing panels after maintenance electrical earth cables **must** be reconnected at these points.

Mechanical Hazard

When one of these stickers has been placed on a removable panel the power must be switched off before the panel is removed. There may be a number of areas behind the labelled panel that constitute a mechanical hazard. All such panels are service access panels only and should not be removed unless there is a full understanding of the equipment.

Caution Hot Surface.

Parts of the surface to which one of these stickers are attached may become uncomfortably hot during the operation of the equipment. Take care if touching these surfaces without heat protection.

Refer to Manual

General Safety Instructions

All cleaning and servicing requires the autoclave to be isolated from the power source and disconnected.

This equipment weighs in excess of 18kg (40Ibs) and requires at least 2 persons to lift.

Should a fault occur with the autoclave, immediately isolate and disconnect the incoming power.

When the autoclave is being transported it should be sat firmly on its feet. The machine should be strapped upright to a flat pallet during transport.

When the machine is not in use, where possible the electrical supply and water supply should be disconnected.

Ensure the equipment is installed, operated and maintained by trained and authorised personnel.

Always isolate the autoclave before cleaning or maintenance

Always ensure the machine is level when in use.

If fitted, in the event of an emergency press the red 'E'stop button situated on the front of the autoclave.

The autoclave should be used as provided and should not be tampered with or altered as the machine contains inbuilt safety systems, which could be compromised by any interference.

During operation some autoclave surfaces may become uncomfortably hot. Take care if touching these surfaces without thermal protection.

Care should be taken when opening the autoclave after a Sterilising cycle as it will be hot and steam may be released. Heatproof gloves and a face shield should always be worn when unloading autoclaves.

When operating the autoclave contains steam at elevated temperature and pressure. Always take care when operating autoclaves.

The autoclave should only be used for its intended purpose. You must consult the manufacturer or supplier before using the autoclave for anything other than its intended purpose.

Specification Table

Model:		PS/MID/C60	PS/MVA/C60
Intended use.		**Principle uses:** Preparation of Laboratory growth media and sterilisation of laboratory waste prior to disposal. **Additional uses:*** sterilisation of bottled liquids and glassware, sterilisation of unwrapped instruments and porous loads. * dependent upon options fitted #	
		This equipment has not been designed for or intended for use as a medical steriliser.	
Capacity (L)		60	60
Dimensions	External (mm) (wxdxh)	502x620x900	707x620x900
Weight kg (Approx.)	Unloaded	100	110
	With water charge	110	120
	Door	20	20
	Pressure Vessel	15	15
Electrical	Voltage (V)	230	
	Frequency (Hz)	50/60	
	Phases	Single Phase with earth	
	Max. Current Rating (A)	14	
	with Drying# (A)	14	
	Heater power kW	2.9	
Steam	Steam Supply Required	Not Applicable	
Water	**Softened** Water Supply Required	Hand Fill	
	With Auto-waterfill:	15mm BSP	
Drainage	Main Drain Connection	15mm BSP	
	Secondary Drain Connections (where Applicable)	15mm BSP	
Max. Sound Level	Without Vacuum Pump	Approx. 30db @ 1M	
	With Vacuum Pump	Approx. 65db @ 1M	
Max. Heat Emission	Full Cycle - to thermal lock temperature*	((2.9h 1.45p)x0.75)/t) kW/Hour	
		Where: h = heat-up time (hrs) p = process time (hrs) t = Total cycle* (hrs)	

Must be fitted with option PC/MID/VDY. Please refer to your order paper work or the specification sheet enclosed with this manual

Important Notices and Warnings

Before despatch from our works all Priorclaves are subjected to rigorous electrical safety tests to the appropriate standards. Should you or your contractors carry out further insulation and flash tests as part of your internal procedures please disconnect the switch mode power supply before testing. Failure to do so will result in a test failure and may lead to corruption of the microprocessor memory which cannot be covered by our warranty.

Safety

If you are unclear about any aspects of this manual, the use and operation of the autoclave or your autoclave process please contact Priorclave or your authorised Priorclave dealer before proceeding.

Always wear gloves, a facemask and adequate protective clothing when unloading an autoclave and ensure that the workload does not exceed safe limits.

Priorclave are pleased to arrange training for operators in the use of their autoclaves at a small extra charge.

Thermal Lock

The safety Thermal Lock (80°C door retention device) has been set in accordance with the load and procedure defined in paras. 3.3.3.2.3 and 3.3.3.3 of BS2646 Part 5:1993.

The relatively light load defined under this procedure may not be appropriate to the load to be autoclaved in your Priorclave. Therefore, to ensure compliance with Health & Safety Executive Guidance Note PM73 'Safety at Autoclaves' and to avoid possible injury you are strongly advised to have your autoclave with its normal working load formally validated, and the thermal lock set up accordingly by properly trained personnel.

Stainless Steel Pressure Vessels.

Vessels are manufactured from grade 316 stabilised stainless steel, designed built and tested in accordance with PD5500 category 3 as required by BS2646 Part 1.

Grade 316 stainless steel is employed to reduce the corrosive effects of substances such as hydroxides and chlorine. However we recommend that the interior of the vessel is kept free of such potentially harmful substances and is regularly cleaned out with soft water. The use of chlorine based or other aggressive cleaners is not recommended. Exposure to such chemicals could damage the surface finish and the integrity of the pressure vessel and door. Care should also be taken not to routinely introduce such chemicals where they are used to pre-wash items that form part of the load. In such cases the items should be thoroughly rinsed before autoclaving.

Product Life

Due to fatigue occurring in normal use the life of all pressure vessels is finite regardless of corrosion, erosion or other damage. Using calculations from PD5500, and assuming working at the maximum working pressure of 2.4 bar this gives the autoclave vessel a projected fatigue life of 15,000 operating cycles. The lifespan of the autoclave will obviously depend upon frequency of use, but for example (based on a 365 day working year) if the autoclave is used two or four times per day this gives a working life of 20.5 to 10.2 years respectively. Your own usage of the autoclave should be considered to determine the actual lifespan of the autoclave.

Cleaning

External cleaning should only be carried out with a damp cloth or with proprietary, non-abrasive cleaners.

Water Supply and Quality

This autoclave has been designed to operate most effectively with softened water.

Unless this autoclave has been specifically adapted for purified water supplies * then demineralised, distilled or RO water supplies **MUST NOT** be used as the controls fitted rely on electrical conductivity to detect water levels.

Connection to a hard water supply can lead to a build-up of scale and will damage the heaters and other parts of the system and could invalidate the warranty.

RO and Ultra-Pure water can also damage some elements of the steam generation system unless the autoclave has been specified and modified to operate with water of this quality*.

The usual method of filling is by hand.

* Please refer to the specification sheet included with this manual for details.

Servicing and Maintenance of Priorclave Autoclaves

Priorclave Laboratory Autoclaves are complex pressure systems designed and built to special regulations and as such should only be serviced or maintained by properly trained personnel.

If your autoclave is run at an average frequency of more that 3 times per week then we strongly recommend that it should be serviced every six months, even during its initial 12 month manufacturer's warranty in order to maintain it in peak operating condition. Autoclaves used less frequently can be serviced at 12 month intervals.

Service contracts for preventative routine maintenance can be arranged with Priorclave Service (service@priorclave.co.uk) or with your Priorclave authorised service agent.

Priorclave Ltd. cannot be held responsible for hazards or damage resulting from work carried out on the pressure system including its closure components by untrained or unauthorised personnel. If in doubt please contact Priorclave Service (service@priorclave.co.uk) or your nearest authorised service agent.

Faults caused by servicing by unauthorised service agents will not be covered by any warranty supplied with the autoclave.

CE Marking

The CE mark applied to this autoclave is applied in relation to the EMC (Electromagnetic Compatibility) directive and the Low Voltage directive of the European Community. This indicates that this Priorclave autoclave meets the following technical standards:

BSEN61000-6-3

Electromagnetic Compatibility. Generic Emission Standard. Residential, Commercial & Light Industry.

BSEN61000-6-1

Electromagnetic Compatibility. Generic Immunity Standard. Residential, Commercial & Light Industry.

BSEN61010-1

Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory use.

BSEN61010-2-040

Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory use; Part 2-041, Particular Requirements for Autoclaves using Steam for the treatment of Medical Materials and for Laboratory Processes.

Pressure vessels

PD5500

Unfired fusion welded pressure vessels

BS2646 1996

Autoclaves for sterilisation in laboratories

Conformity assessment modules B1 + D of the European Pressure equipment directive have been applied to ensure compliance with the essential safety requirements.

A "Declaration of Conformity" in accordance with the above standards has been made and is on file at:

Priorclave Ltd.
129 /131 Nathan Way
West Thamesmead Business Park
London SE28 0AB

Environmental Conditions

This equipment has been designed for safe operation within the following environmental conditions:

- Indoor Use.
- Altitude up to 2,000 M (~ 6500 feet).

  At this altitude the standard safety valve set at sea level will limit the upper temperature to around 136°C. Adjustments can be made to compensate for this if required. See Appendix B - Steam Table for special conditions affecting calibration for operation at elevated altitudes.
- Operating temperatures between 15°C and 27°C. - The cooling performance of air cooled autoclaves, however will be significantly affected at higher temperatures in this range.
- Maximum Relative Humidity of 85% at any temperature between 15°C and 27°C, Non Condensing.
- Mains Supply Voltage Variations not exceeding $^{+}/_{-}$10% of that shown on the Serial Plate.

Electromagnetic Interference

This equipment has been designed to comply with the requirements for immunity from electromagnetic interference under normal conditions of use. Care should be taken when positioning the equipment however, to avoid interference from potential extreme sources of interference such as MR scanners or x-ray equipment.

Quick Opening Doors

Extracts from **NON-MANDATORY APPENDIX FF (GUIDE FOR THE DESIGN AND OPERATION OF QUICK-ACTUATING (QUICK-OPENING) CLOSURES)** from ASME **SECTION VIII DIVISION 1**

FF-6 INSPECTION

II is recommended that the user inspect the completed Installation Including the pressure gauges before it is permitted to operate. Records of this inspection should be retained.

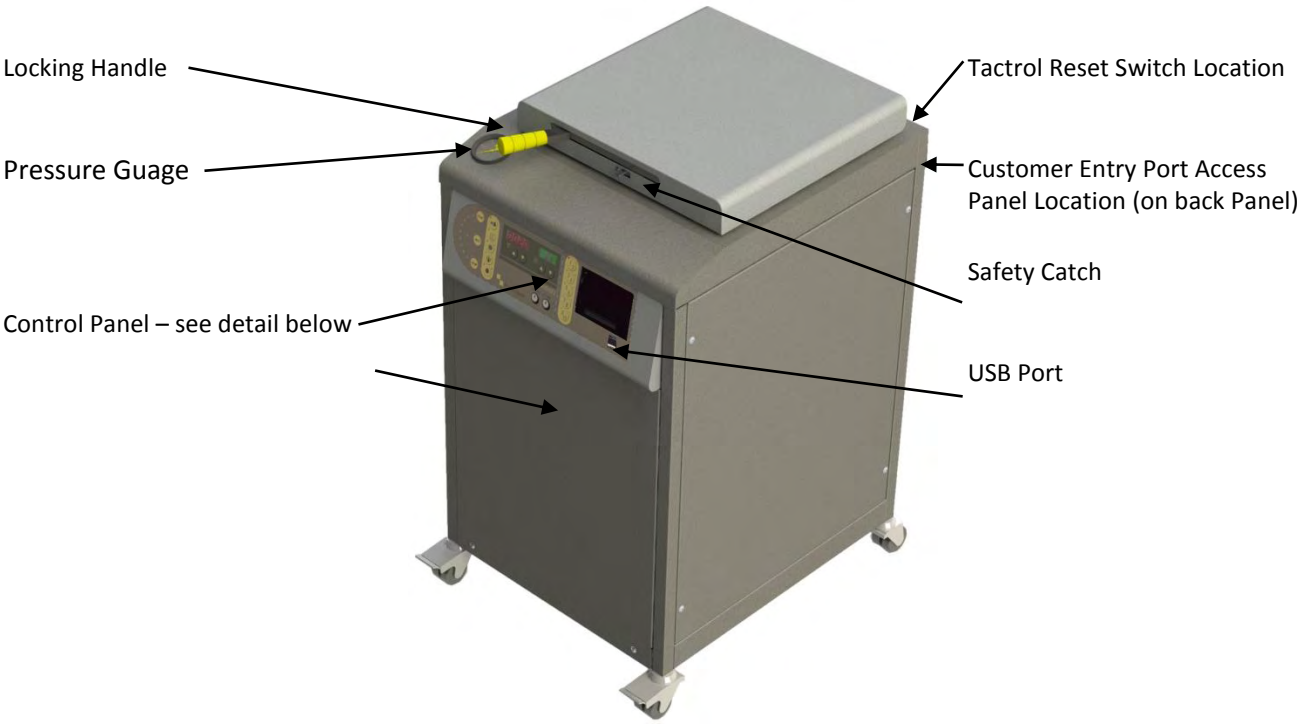
It is recommended that the user establishes, and documents a periodic in-service inspection program, and that, this program is followed and documented.

FF-7 TRAINING

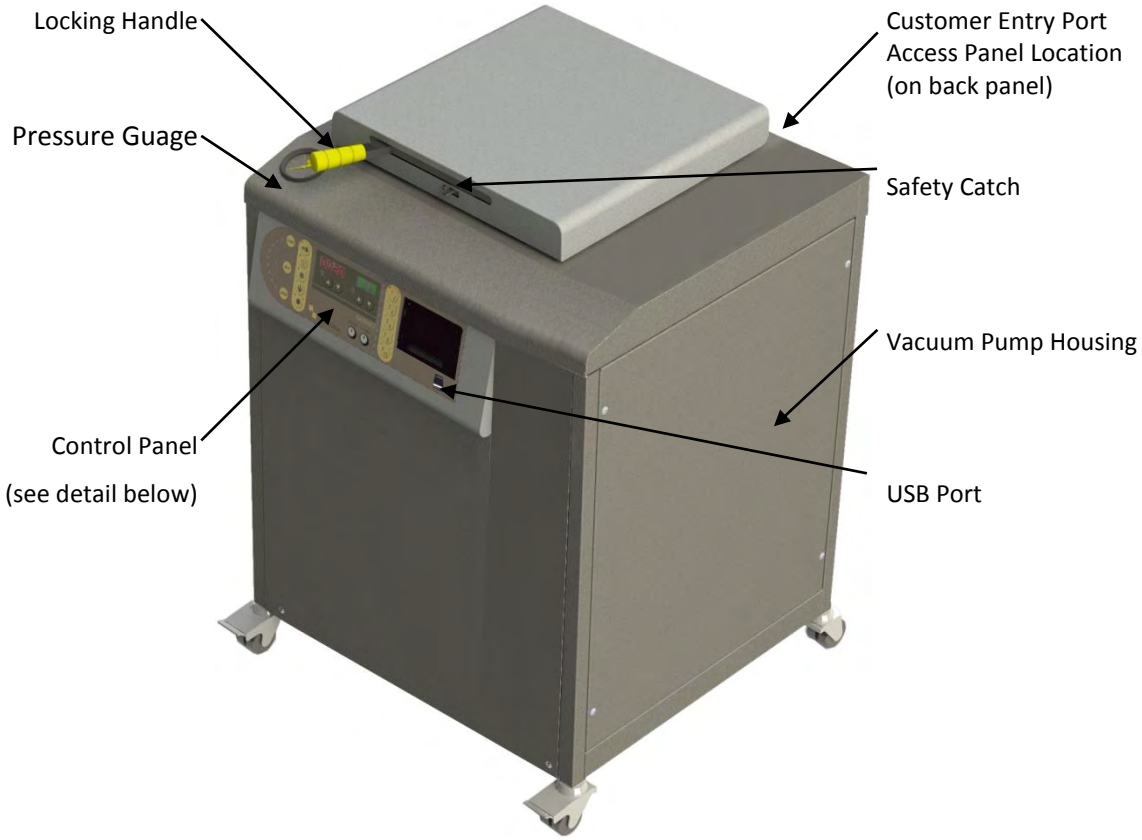
Many accidents involving quick-actuating closures have occurred because the operators have been unfamiliar with the equipment or its safety features. The greater safety inherent in current designs has sometimes been produced by the use of sophisticated mechanical, electrical and electronic control devices. To ensure these features produce the maximum safety, personnel should be properly trained in their operation and maintenance.

Layout Diagram

Non Vacuum Models



Vacuum Models



Control Panel Details

1	Door Button & Indicator	**7**	Time Display & Setting Buttons
2	Cycle Progress Display	**8**	Program Buttons & Indicators (Optional)
3	Vent Button & Indicator	**9**	Printer (Optional)
4	Start Button & Indicator	**10**	Setting Lock Keyswitch (Optional)
5	Option Setting Buttons & Indicators	**11**	Thermal Lock Keyswitch
6	Temperature Display & Setting Buttons	**12**	Hidden 'till lit fault display

Receipt and Unpacking

Unpack the autoclave and check against the delivery note that all items ordered have been delivered.

This equipment weighs in excess of 18kg (40 Ibs) and requires at least 2 persons to lift. Reference should be made to your in-house procedures for heavy lifting before attempting to move unpack or lift it.

Any shortages or damage **must** be reported to Priorclave within 7 days of delivery.

Positioning

When positioning the autoclave consideration should be given to proper access for servicing and maintenance purposes. Space must also be allowed for pipe-work and electrical connections.

The autoclave has castors fitted to assist positioning and should be positioned within easy reach of a suitable isolatable electrical supply and drain (if required). (See Installation).

Floor loading

A 60 litre Compact autoclave weighs in the region of 110kg when empty. So it is necessary to consider the strength of the floor or floor covering on which the autoclave is stood.

Consideration should also be given to the weight of water in the autoclave reservoir and more especially to the weight of the anticipated load, which in extreme cases could double the weight.

It is sometimes, although rarely, necessary to fill the autoclave vessel with water at some stage during its life span in order to conduct a hydrostatic pressure test. It may be prudent to take account of this additional weight when considering the loading.

This equipment weighs in excess of 18kg (40lbs) and requires at least 2 persons to lift. Reference should be made to your in-house procedures for heavy lifting before attempting to move or lift it.

“Empty” Weights of Autoclave Models:

Basic 60L	Vacuum 60L with all options fitted
110kG (242 lbs)	130kG (286 lbs)

Maintenance access

Minimum Provision of space around the autoclave

When positioning the autoclave consideration should be given to proper access for servicing and maintenance purposes. Space must also be allowed for pipe-work and electrical connections.

Some standards (mostly related to larger and more complex autoclaves) stipulate that autoclaves should have 1 metre clear space all round to allow for service access. We recognise that this can be difficult to provide and the minimum dimensions shown in the diagram below take this into account.

Where it is not possible to provide the minimum recommended space then it may be acceptable to provide space to one side only provided that the autoclave can be moved without difficulty.

In the case of all pipe connections provision should be made to ensure that rigid pipe work can be readily disconnected.

For autoclaves with exhaust filters a space of at least 500mm should be allowed at the rear of the autoclave.

Installation Dimensions (please refer to drawing below)

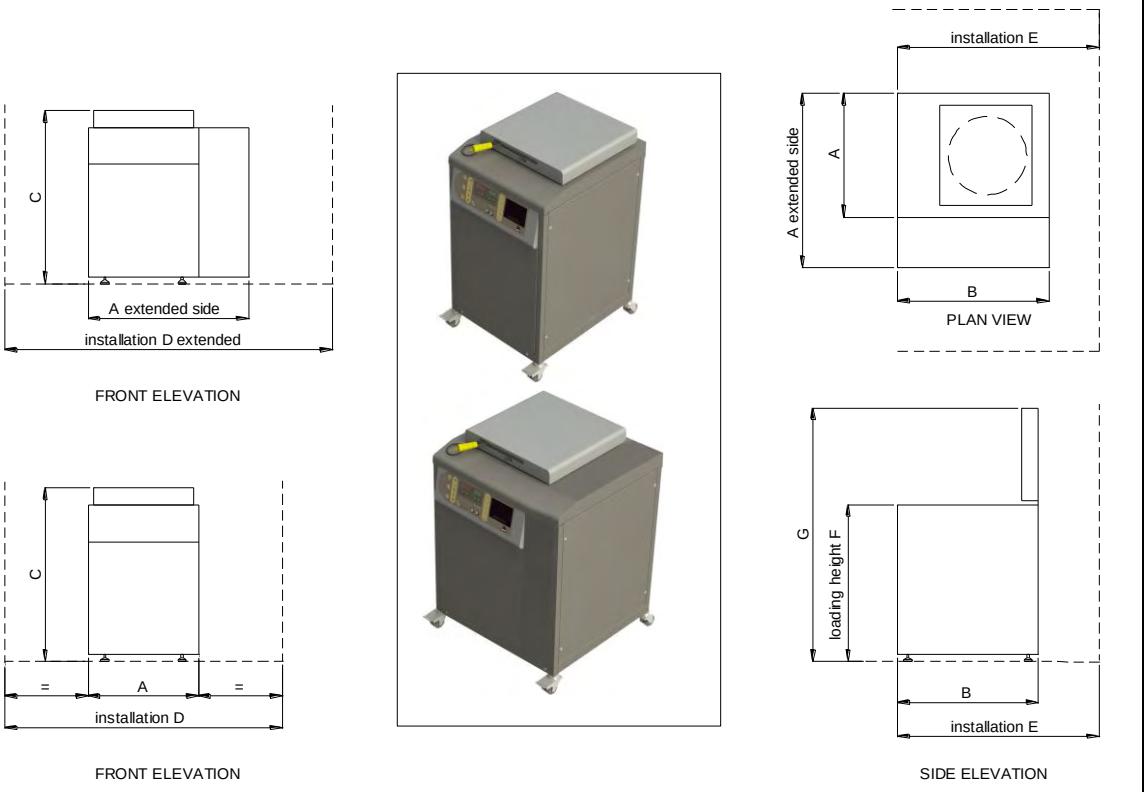
Model	A	B	C	D	E	F	G
PS/MID/C60	505	590	900	1505	910	850	1395
PS/MVA/C60	710	590	900	1710	910	850	1395

Notes:

The extended dimension A & D are required when Vacuum and / or automatic water-fill options are added.

When 2 or more machines are installed next to each other the minimum distance between them should be 500mm.

Top Loading Priorclave Autoclaves – Installation Dimensions



Heat emission

All autoclaves during their process cycle will release steam and heat, and this should be taken into consideration when choosing a site in your laboratory in which to install your autoclave

Regardless of insulation arrangements etc employed to reduce the temperature of the autoclave outer casing all autoclaves will emit heat into the work area. For the comfort of staff it is recommended that autoclaves are installed in air conditioned areas. Heat output from the autoclave will vary at different stages of the cycle. For the purpose of calculating loading placed on the air conditioning system by the autoclave it should be adequate to allow for a figure of one third of the total heater power of the autoclave, although the actual output will vary according to the autoclave settings used.

Air cooled autoclaves cool more quickly in a cool room, and therefore high ambient temperatures increase autoclave cycle times. This can become particularly problematic if the ambient temperature exceeds 35°C

Steam emission

If correctly installed as described below, there should be no steam emitted to the work area during operation, there may however be some steam emitted when the autoclave door is opened. Under normal circumstances the thermal cooling lock will prevent the door from being opened until most of the steam in the chamber has condensed, however under certain circumstances such as the when the thermal cooling lock override is used significant amounts of steam can be released. Consideration should be given to how this steam may affect smoke and heat detectors etc.

Extractor Hoods

An extractor hood fitted above the autoclave will eliminate any remaining difficulties related to steam emission, and will also be beneficial in reducing heat build-up. Autoclaves used for processing waste materials may produce unpleasant odours, the autoclaving of waste plastic ware may also produce potentially harmful fumes, the effects of these will also be minimised by an extractor hood. An air flow rate of 0.5M^3/sec is often specified for a medium sized autoclave, although this should be considered along with the hood size. It is possible to provide an output from the autoclave to boost fan speed immediately prior to door opening.

The minimum practical size of extractor hood for an autoclave is around 1 metre square. In the case of top loading autoclaves this should be positioned directly above the autoclave. In the case of front loading autoclaves the hood should extend beyond the front of the autoclave by approximately 700mm. This will be sufficient to minimise steam and fume emission into the work area, but it may also be desirable to extend the area of the hood to cover the entire autoclave to reduce the amount of heat released into the room. In the case of direct steam heated autoclaves it may also be advisable to arrange the hood or incoming steam supply in such a way as to cover the incoming steam supply pipe work and reducing valves etc. This will further assist in the elimination of heat build-up within the work area.

Provision of Space and Access for Accessories

Autoclaves with drain condensers

Drain condensers are usually fitted to the rear panel of compact autoclaves, and require sufficient space to be allowed for pipe-work to enter the condenser. Drain condensers for compact autoclaves may be supplied as separate units if there is not sufficient space available in the autoclave location and in such cases consideration should be given to where the condenser is to be located as it may not be practical to site this to the rear of the autoclave. Drain condensers may operate at high temperature depending on final settings, and effectiveness of the cooling water supply. Consideration should be given to heat hazards when deciding on the location of a condenser.

When all pipe-work is complete the condenser will occupy a space of approximately 300 x 500mm.

Autoclaves with exhaust filtration

The location of exhaust filters will vary according to the individual specification of the autoclave.

In the case of Compact autoclaves it is not possible to locate the filter inside the vessel due to space constraints and limitations of currently available filter mediums. It is then necessary for the filter to be located in a separate pressure vessel outside of the autoclave. External exhaust filter housings are located to the upper rear of the autoclave, and protrude from the left-hand side as viewed from the front of the autoclave by up to 200mm. In normal circumstances the filter housing will fit into the 300mm space already provided to the rear of the autoclave. Special arrangements for the location of exhaust filters can be made on request.

It is normal for exhaust filter housing to reach temperatures in excess of 100°C, therefore consideration should be given to heat hazards when deciding on the location of an autoclave with

an exhaust filter. Provision should be made to protect personnel from heat hazards whilst maintaining adequate access for filter replacement. A minimum height of 500mm is required above the top of the filter housing for replacement of the filter.

Provision should be made to guard or insulate pipes exiting the autoclave where these may present a heat hazard.

Installation

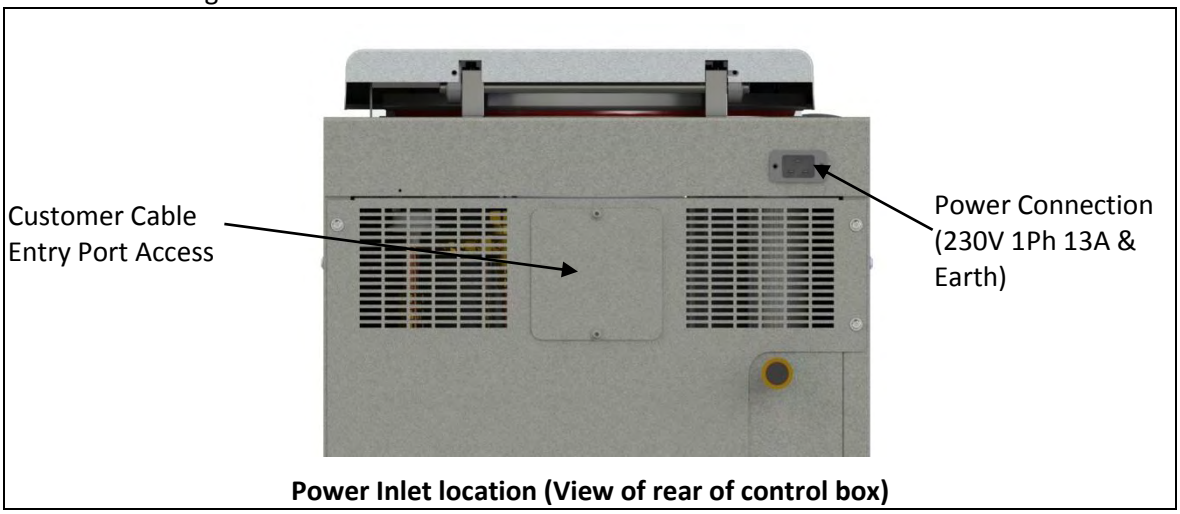
Electrical

Connection to UK & EC power supplies

To connect your Priorclave to the power supply simply plug the power lead provided into a suitable socket. If the plug is removed the autoclave must be connected via a plug and socket or isolator rated for at least 13 Amps.

This Equipment **MUST** be earthed

Connection is via a standard **3-pin C20** type socket mounted on the back of the autoclave as shown in the diagram below:



Power Inlet location (View of rear of control box)

Heating is by a 3kW immersion element within the autoclave's water reservoir.

The plug supplied with the autoclave is fused at 13A. The main processor control board is independently fused at its power supply.

See Wiring Diagram for more details.

If a cable and plug has been supplied with the autoclave there should be no need for any further electrical installation.

Connection to other power supplies

The instructions above relate to connection to 220-240V single phase supplies.

For areas where a 110V single phase or 220V three phase supply is usual the autoclave can be connected across phases to operate on a 220V supply.

If not already supplied as a supplementary sheet to this manual separate instructions are available by contacting Priorclave - service@priorclave .co.uk – making sure to include the autoclave serial number in your correspondence.

Drainage and Exhaust Gas Ventilation

General Advice

Autoclaves used for processing laboratory waste should be provided with drainage. A connection will also be required if the autoclave is fitted with any free-steaming or vacuum options as significant amounts of steam will be released from the autoclave at different stages of the cycle.

Priorclave Ltd will not be held accountable for the consequences of the installation of one of their autoclaves outside of the guidance below.

If you wish to install your autoclave in any other way Priorclave Ltd. strongly recommends that you carry out a risk assessment according to the nature and categorisation of the microorganisms processed in your laboratory.

The various inlets and outlets are situated at the back of the autoclave and are labelled with their individual functions. Within the space constraints of the autoclave cabinet, where possible drains and inlets have been combined to reduce the number of connections required. Please read the following guidance before proceeding with connection to drains and water supplies.

General

Autoclaves used for processing laboratory waste must be provided with a drainage connection as described below. This is a requirement of British Standard 2646. A connection will also be required if the autoclave is fitted with any free-steaming or vacuum options as significant amounts of steam will be released from the autoclave at different stages of the cycle. The hazard groups below are as defined by the Advisory Committee on Dangerous pathogens as published in *Categorisation of Pathogens According to Hazard and Categories of Containment.*

Extract from BS2646 Part 2 1990

7.2 Drainage system

"The drainage system from the autoclave should prevent dispersion of splashes and steam into the working area. For autoclaves designed for a make-safe process, discharge should be directed to a sealed discharge system; the system should lead by direct connection to a building drain or catchment tank.

An open tun dish is not suitable for the discharge line of a laboratory autoclave, which is to be used for a make-safe process.

The sealed discharge system should be vented to a high level by a pipe not less than 30mm diameter. The vent pipe should be directed outside the building. Steam should not emit from the vent pipe."

From Scope of BS2646

"This Part of BS2646 gives guidance on the planning for, and installation in laboratories of, autoclaves for the sterilisation of materials and equipment, including those which may be contaminated with organisms categorised as Hazard Groups 1, 2 or 3. It does not cover the installation of autoclaves used for material contaminated with organisms categorised as Hazard Group 4, for which complete containment of condensate is considered to be essential."

A further comment in a later clause adds…

"In certain circumstances, e.g. special research activities involving high concentration and/or large volumes of agents in Hazard group 3, additional safeguards may be required. The advice of the Health and Safety Executive should be sought in each such case. Further containment than that detailed above, (Generally as described below in this case.) *filtration or heat treatment of discharge is only necessary for autoclaves used to process material contaminated with organisms in Hazard Group 4."*

In case of any doubt the full text of BS2646 should be consulted.

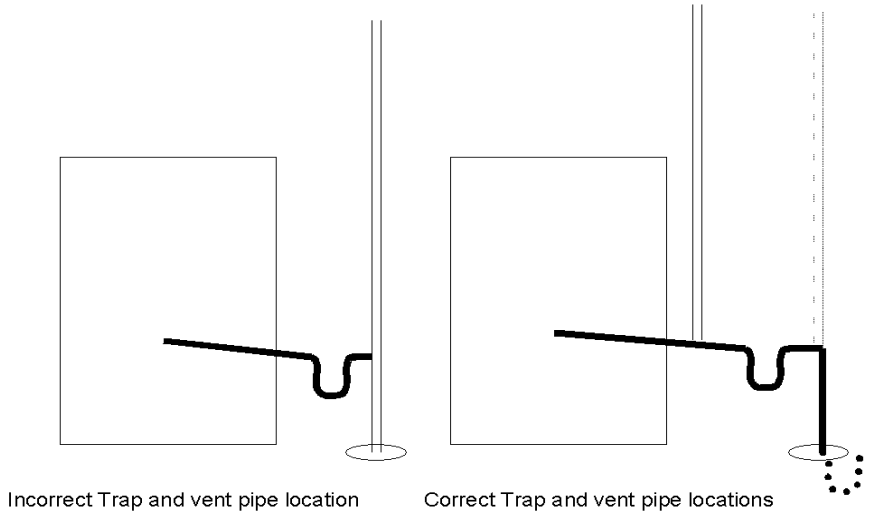
The following is a list of recommendations for exhaust and drainage connections and installation.

The drainage system from the autoclave should prevent dispersion of splashes and steam into the working area. For autoclaves designed for a make-safe process, discharge should be directed to a sealed discharge system; the system should lead by direct connection to a building drain or catchment tank.

An open tun dish is not suitable for the discharge line of a laboratory autoclave, which is to be used for a make-safe process.

The sealed discharge system should be vented to a high level by a pipe not less than 30mm diameter. The vent pipe should be directed outside the building. Steam should not emit from the vent pipe.

The autoclave requires a sealed connection to a trapped building drain. This drain should be provided with a heat resistant vent pipe of 30mm minimum diameter vented freely to atmosphere at a safe location outside the building. Care must be taken in the design of the drainage connection to ensure that an air break will be preserved at all times to prevent the autoclave from sucking water back from the drain as it cools. Excessive back pressure produced by restrictions in the vent pipe may impair the function of the autoclave. Note that at some stages of the cycle the autoclave may discharge steam under pressure, and if vent flow is inadequate steam may be forced to exit via other interconnected drains.



Incorrect Trap and vent pipe location Correct Trap and vent pipe locations

If possible it is always advisable to connect the autoclave to a drain to cut down on the amount of steam discharged into the laboratory. A compression fitting should be incorporated in the drainpipe in an easily accessible location to enable easy disconnection for maintenance purposes.

All drain piping should head downward towards the drain to prevent water collecting in the pipe.

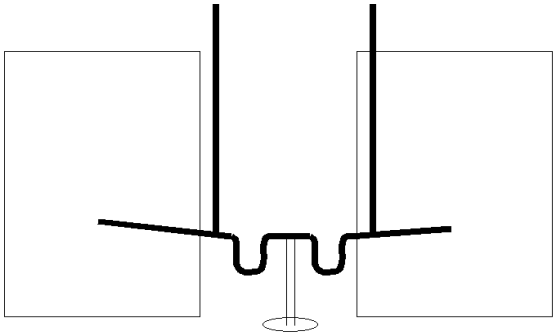
Attention should be paid to the material of the vent pipe as steam and water discharged from the autoclave can be at temperatures in excess of 100°C. In the case of autoclaves with pulsed free-steaming, vacuum drying, and vacuum cooling it may be advisable to fit a drain condenser to cool the autoclave discharge, and condense the steam.

The drain and vent pipe should be in place prior to commencement of installation. It will then be possible to make connections from the autoclave directly into the drainage services provided.

The point where connection from the autoclave to the drainage system is made should be within 2 metres of the autoclave. The location of individual connections is shown on the installation drawings.

Multiple autoclaves in a single location

If more than one autoclave is to be installed at a single location then the services described need to be provided for each autoclave. If more than one autoclave is utilising the same drain and/or vent arrangement, then there may be problems due to cross flow of effluent between autoclaves. For example if one autoclave is being loaded by the operator whilst the other is in the free-steaming stage, then it may be possible for hot air and steam being discharged by one autoclave to enter the other presenting a hazard to the operator. If common services are to be shared it is essential that these are sufficiently isolated from one another to prevent cross flow.



If two autoclaves share a common drain separate vent pipes and traps are required to prevent cross flow of steam and water

Safety Valve

All autoclaves are fitted with an over pressure safety valve to protect the autoclave from over pressurisation. This valve will emit large volumes of steam in the event of the autoclave exceeding its maximum working pressure. It is a requirement during safety valve function, and routine testing to be able to see and hear if the safety valve has operated.

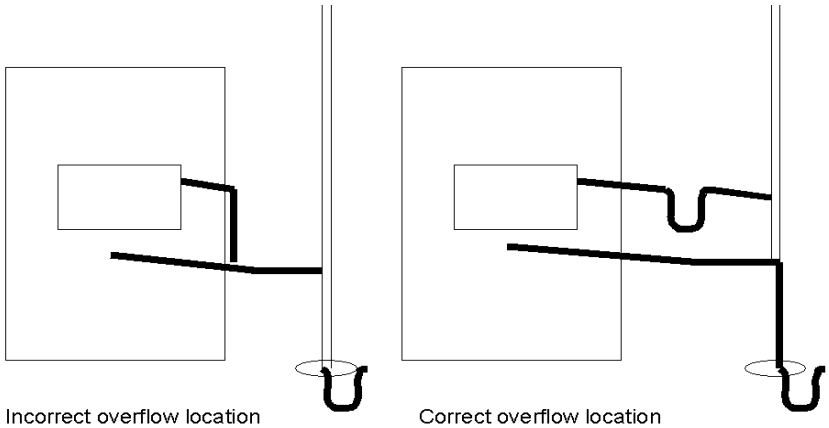
It is Priorclave's preferred policy to direct the safety valve outlet to discharge to the floor at the rear of the autoclave, however some establishments prefer safety valve outlets to be piped to a high level outside the building.

If this is required the pipe-work for this should be provided, and terminated within 1 metre of the safety valve discharge point at the rear of the autoclave. All safety valve pipe-work should be DN25. A drainage point should be provided at the lowest point of the safety valve pipe-work. This should be a pipe of approximately 6mm (¼ in) ID, and should be positioned to discharge into a suitable receptacle to the rear of the autoclave. No valve should be fitted to this drainage point thereby allowing it to act as a "tell tale" indicating if the safety valve is operating.

Under no circumstances must any isolating valve be fitted to the safety valve pipe-work. External pipe-work must be designed to be self draining, and under no circumstances should water be able to collect in a trap, which could freeze in cold weather.

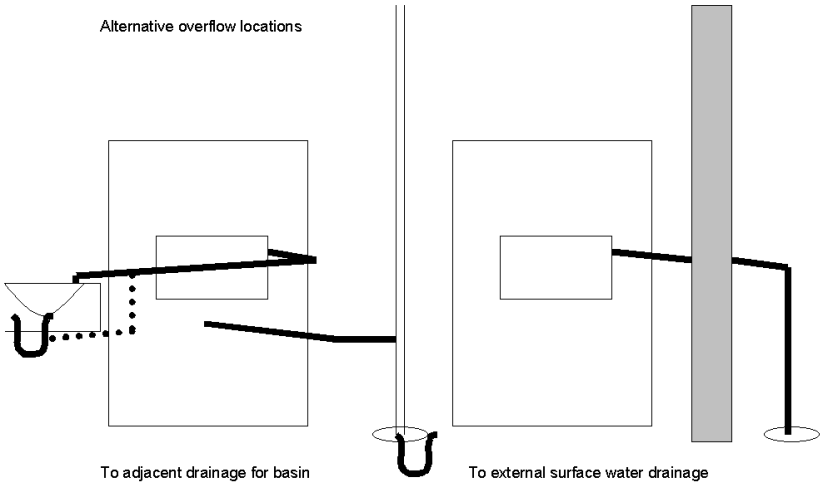
Autoclaves with water tanks and drip trays

A separate drain is required for the connection of water tank and drip tray outlets. This may be a common connection to the same drainage system as above, but in such cases a sufficient level of isolation (such as a deep trap) is required to prevent the cross flow of steam between the drains. The drip tray and water tank overflow can be connected to an open tundish if desired. This has the advantage of making any discharge from the overflow visible, which is often a requirement of local water bylaws.



Incorrect overflow location

Correct overflow location



Water Supplies and Back-flow Prevention

The detail of water supply regulations will differ in detail from location to location. You are strongly advised to check the rules and regulations in place in your location.

Note: When connecting to water supplies please be aware of the possibility of back flow from this pressurized equipment into the water supply.

The back-flow prevention measures already provided within the autoclave are as follows:

Autoclaves with Automatic Water Fill Systems

Water is fed to the autoclave vessel via a header tank with an air gap and overflow. Provided that the supply to the autoclave is delivered via a header tank with similar prevention means elsewhere in the building the installation should be compliant with most requirements.

Autoclaves with Water Cooled Condensers

Due to the pressure and flow rates required for the condensers to work effectively it is not practical to provide header tanks locally to the autoclave. The condenser will work more effectively when more cooling water flow is achieved across the condenser, therefore the more head of water that can be provided the better.

Arrangements to meet the back-flow prevention requirements will therefore need to be made at a high level. If a water feed from a suitable header tank arrangement to satisfy regulations cannot be provided it will be necessary to take other measure such as the provision of a break tank and pump arrangement locally to the autoclave.

General

All water supplies should be terminated on the wall to the rear of the autoclave, at a point within one metre (39 in) of the point of connection to the autoclave.

In hard water areas it will be necessary to use softened water for the supplies to the autoclave to prevent scaling of the autoclave vessel and heating elements. Hard water can also reduce the life span of drain condensers when fitted, however the cost of supplying treated water to these may be considered prohibitive, and if this is the case, then a second water supply will be required.

If the autoclave is to be connected to a distilled or de-mineralized or RO water supply care should be taken to guard against the corrosion of copper pipe-work due to excessive purity of the water supply. The water level detection system of most autoclaves is operated on a conductivity-based system, due to this feed water requires a minimum conductivity level of 10-15 micro Seimens.

Because of these factors, unless the autoclave has been specified and manufactured to use a distilled or de-mineralized or RO water supply these water supplies should **NOT** be connected to this equipment.

Autoclaves with an automatic water fill system require a ½ in water supply terminated in an appliance tap with a suitable connector for a standard appliance hose.

Autoclaves with drain condensers require a water supply for the condenser. The size of connection for this will vary depending upon the specification for the individual autoclave. In most cases a supply ¾ in will suffice, however in some cases expanding up from a ½ in supply locally in the area of the autoclave may not provide a sufficient water flow to reduce the autoclave discharge to the desired temperature.

Consideration should be given to the discharge from the Vent and Safety Valve outlets, which should be directed in such a way as to not cause a hazard. This will be determined by the location of the autoclave.

Service inlets and outlets will be differently positioned according to the specification of the autoclave and the accessories fitted to it. The table and diagram below gives a general indication of position and pipe size. **All inlets and outlets are clearly labelled with their functions.**

Inlet and Outlet sizes
vent outlet -15mm copper (½ in)
safety valve outlet -15mm (½ in) copper
Optional waterfill tank inlet -15mm (½ in) copper*
Optional waterfill tank overflow -22mm (¾ in) copper
drain outlet and vent (vacuum models) -15mm (½ in) copper
Optional condenser water inlet - 15mm (½ in) copper
Optional condenser outlet (combined with drain and vent if relevant) - 15mm (½ in) copper

***If the autoclave has been manufactured to use RO water then grade 316 stainless steel pipe will be used in place of copper.**

Initial Commissioning

Priorclave Autoclaves are given a full operational test before leaving the factory and as such arrive ready for immediate use after installation. It is advisable however to run a simple cycle with the autoclave empty before processing a working load to check that no problems have arisen during transport.

1. Check electricity supply is **ON**, and that the power is switched on.
2. As you are powering up the autoclave for the first time the fault code **F004** will be displayed on the temperature display. You may ignore this at this stage as opening the autoclave and filling it with water will reset this error code.
3. Press the 'Door' button on the control panel there will be a bleep and the message '**Hold**' will be displayed in the temperature display. Wait for a short time until the temperature display returns to normal, there is another bleep and the door indicator illuminates. The door button can now be pressed again to release the lock.

4. Move the locking handle to the right until it reaches its safety stop. Do not lift handle until the lock has withdrawn as this may lead to damage.
5. Release the safety catch by pushing it down with your thumb and lift the locking handle to the top of its travel. The door can now be opened.
6. Top up with water if necessary to below the load support plate in the bottom of the autoclave.
7. Set the temperature to 121°C using the up/down keys.
8. Set the process time to 15 minutes using the up/down keys.
9. Set / select other functions i.e. free-steam, rapid cooling etc., as required and if fitted.
10. Carefully close the door with the locking handle fully to the right.
11. Move the locking handle to the left in one action to lock the door.
12. Wait a few seconds for the 'start' indicator to illuminate, and press the 'start' button to begin the cycle.
13. During the cycle, check that there are no problems during heat-up and process.

Following successful completion of the commissioning cycle your Priorclave is ready to process its first working load.

Please refer to the Operation manual before running your first working load as this gives further details on operation of the autoclave and on the control options which may be fitted

If you experience any problems during this procedure please contact Priorclave service or your local agent.

Full Commissioning and Performance Qualification

If you are having the unit commissioned by a Priorclave Approved technician this will be a simple matter of checking for correct installation, checking that all functions are operating correctly, and familiarising you with the autoclave. There are, however some benefits that can be gained from having your Priorclave commissioned to suit your particular loads and requirements. Some examples of settings that can be optimised during commissioning, and the advantages these can provide are listed below.

- Establishing optimum Free-Steam temperatures for effective air displacement.
- Establishing optimum Free-Steam time for effective air displacement, whilst eliminating unnecessary time and energy consumption.

- Establishing optimum process time and temperature to ensure complete sterilisation, whilst maintaining minimum cycle time and energy consumption.
- Setting thermal lock release temperature to suit your particular load, to eliminate unnecessary cooling time whilst ensuring safety.

If you feel that any or all of the above would be of use to you then please contact Priorclave Service.

Priorclave Autoclaves are given a full operational test before leaving the factory and as such arrive ready for immediate use after installation. It is advisable however to run a simple cycle with the autoclave empty before processing a working load to check that no problems have arisen during transport.

If commissioning has been ordered with the autoclave this will be carried out by a Priorclave Approved technician otherwise follow this simple procedure to check the operation of your Priorclave.

Changing Date & Time

A number of additional control system settings can be accessed via a “Hidden Menu”.

To access these settings turn & hold the thermal lock key in the override position. Press the time up or down keys. Release the thermal lock key. **1** is displayed on the temperature display, by default **0** will displayed on the time display. The temperature display now shows the number of a list of operating parameters, the value for the parameter is shown in the time display. Scroll through the list of available parameters using the temperature up/down keys.

After no keys are pressed for eight seconds the display returns to normal.

The function of these settings is as follows:

	Temp. Display	Time Display	Function	Action
		The autoclave can be set for the cycle to start after a pre-programmed delay, for example to allow a media preparation cycle to complete shortly prior to the start of the working day. Setting the value of parameter 1 to 1 in the time display switches delayed start on.		
	1	0-24	Delayed Start Time Hour [+]	Enter required Start time hour (24 hour clock)
	2	0-59	Delayed Start time Minute [+]	Enter required Start time minute
	3	0/1	Start Delay Select On/Off [+]	1= ON 0= OFF
*	4	0-999	Print Interval	Enter time (minutes)between printing during process time (0= printer disabled)
	5		Year Setting	Enter Year
	6		Month Setting	Enter Month
	7		Date Setting	Enter Day of month
	8		Hour Setting	Enter Hour (24 Hr Clock)
	9		Minute Setting	Enter Minute
	10		Second Setting	Enter Second.
			Scroll back up to parameter 1 to confirm the new or current time settings.	
#	11	1-999	Cycle Repeats	Enter Number of Cycles Required
[+]	The time is set in real time, therefore the clock has to be correctly set for this to work properly. After one delayed start operation, delayed start automatically switches off, and the autoclave returns to normal operation.			
#	**Models fitted with optional Cycle Repeat Facility only**			
*	**Models fitted with 5 or 10 Program Memory** **Setting marked * are program number related, and therefore should you wish to use different values for these in different programs this can be done by changing the value when the correct program is selected.**			

Warning Indicators and Fault Codes

On the control panel there are a series of 'hidden until active' warning indicators. Some of these indicators will appear in conjunction with a fault code in the temperature display. The meaning of these warnings, why they appear, and what to do when they appear, is as follows.

SERVICE

This means that 500 cycles, or six months have passed since the autoclave was last serviced. The engineer will cancel the message when the autoclave is serviced.

WATER + FAULT CODE F004

The water level has fallen below the minimum level and must be topped up before the autoclave can be run. The warning will automatically cancel when the door is opened and the water level is topped up. The low water condition may have caused a running cycle to abort, and the load may need to be autoclaved again.

O/HEAT + FAULT CODE F003

If fitted, the heater over-temperature protection temperature sensor may have sensed that the heating element became too hot. This is probably due to a low water condition, which was not sensed by the low water probe. The water level and the condition of the probe (see Maintenance) should be checked before attempting to use the autoclave again.

If heater over protection is not fitted then the over-heat cut out will only operate under extreme conditions, such as a failure of the temperature control system. The next attempt to run the autoclave should be closely observed and if problems persist contact Priorclave Service.

FAULT + FAULT CODES F000, F002, F005, F006, F007, F008, F009, F010 & F011

The fault indicator illuminates under conditions that may invalidate the autoclaving process, and may result in the load requiring to be autoclaved again. The fault condition will be triggered by any of the following:

F006 Power to the autoclave being interrupted when a cycle is in the heating or process dwell stage of the cycle.

F005 The chamber temperature falling below the set temperature by more than 3°C during the process dwell time.

F002 Failure of the temperature control, display, or load simulator temperature sensor.

F000 If your autoclave is fitted with the optional self-validation system, an error in the temperature measurement system is signalled by fault code **F000**. Usually this would mean that a critical error has developed in the temperature measurement system, however, as the detection system is extremely sensitive it is possible that it may be triggered by fluctuations in the electrical power supply. If fault code **F000** appears it may be cleared by the method described below. If the fault code will not clear, or continues to re-appear then the user cannot correct the fault. In such a case please contact Priorclave service or your local Priorclave approved service agent.

F007 Vacuum stage timeout (loop break). The autoclave has not achieved the pre-set level of vacuum during the Pre-cycle vacuum stage during the pre-set time.

F008 Heating stage timeout. The autoclave has not reached process temperature within the Pre-set time.

F009 Vacuum cooling set-point not achieved. The autoclave has not achieved a low enough level of vacuum during the post cycle vacuum stage (Vacuum Cooling or Drying Cycle)

F010 Air detector input activated. If fitted the air detector system has detected an over pressure condition symptomatic of excess air remaining in the load.

F011 Printer Timeout / Malfunction. The control system has not received confirmation from the printer within its pre-set timeout.

F012 Door micro-switch fault. If a door micro-switch opens during a cycle this fault code is displayed

F013 Jacket Timeout -If a jacket is fitted it has not reached the required temperature within the Pre-set time. This would indicate a problem with steam supply or inlet or drain valve operation

F014 Jacket Over temperature - If a jacket is fitted the temperature has exceeded the pre-set alarm temperature

F015 Jacket under temperature - If a jacket is fitted the temperature has fallen below the pre-set operating temperature band.

F016 Water Fill Timeout - The upper level water probe level has not been reached within the allowed time for filling and the filling operation has been stopped. This function prevents continuous unsupervised operation of the water fill, which could lead to flooding.

F017 Free-Steam - During Pulsed Free-steaming operation the lower of the two set temperatures has not been achieved. The temperature has not fallen sufficiently following the opening of the vent valve.

F018 Heater Overheat. If this fault occurs then the most likely cause is a Low Water condition. Check the water supply is turned on and the condition of the heater before resetting this fault.

LOCK

This warning will light when the thermal lock keyswitch is in the override position.

LOAD + FAULT CODE F001

This warning is activated in the event of the failure of the load sensing temperature sensor. The temperature sensor should be replaced as soon as possible. Great care should be taken to ensure that loads which would ordinarily be autoclaved with load sensed process timing are adequately sterilised.

CANCELLING FAULT MESSAGES

The fault messages are cancelled by first correcting the source of the original fault, then turning the setting lock key switch to position 3. If a key-switch is not fitted they are cancelled by pressing the reset button.

If 2 or more faults occur at the same time, the one with the highest priority is displayed. (F000 is the highest priority and F012 is the lowest.) If a higher priority fault is cleared it will be replaced by the next active fault, unless this too is cleared by the same action.

Fault Finding & Rectification Guide

Symptom	Possible Cause	Possible Solution
No Power	Power switched off at isolator	Check
	Circuit Breaker Tripped	Call Engineer
	Electrical Failure	Call Engineer
	Emergency Stop Button in (if fitted)	Release Emergency Stop
Cycle does not commence when start button is pressed (Fault indicator flashes)	Door is not closed properly	Open & Re-close.
	Micro-switch Failure	Check Micro-switches
Heating slow or not apparent	Controller incorrectly set	Check setting & reset if necessary
	Circuit Breaker Tripped out	Check Circuit Breaker position. Check cause of trip & reset if necessary.
	Heater(s) Failed	Check & call Engineer to replace as necessary. Check Low Water Probes.
	Heaters Over-scaled	Check & call Engineer to replace as necessary.
	Water Reservoir overfilled	Check Water Level. Remove water if necessary.
	Fault in control circuit.	Check all connections, output board function & thermal cut-out(s).
	Fault in control circuit.	Check all connections & thermal cut-out(s).
Low Water Indicator (F004) stays lit when correct water level is achieved	Low Water Conductivity i.e. Distilled water	Add Tap Water
	Probe dirty, damaged or missing	Visually check probe. Clean/Replace as necessary
	Wiring connections loose or damaged	Check connections to probe and main control board.
Autoclave does not pressurise	Vent button in open position	Check Vent Indicator and switch off
	Free-Steam time not completed (if option is selected)	Check Cycle Progress Indicator Display
	Air purge valve failure	Check and replace internal parts or valve.
	Vent Valve stuck open	Check & Replace if necessary
	Safety Valve stuck open	Check for obstructions on lifting handle.
	Door incorrectly closed	Check door position and lid micro-switch settings

Symptom	Possible Cause	Possible Solution
Incorrect Temperature/Pressure Correlation	Air not fully purged from autoclave. Due to :	
	Incorrect Load Packing	Re-Load and re-start cycle with (more) Free-Steaming.
	Faulty Air Purge Valve	Check & Replace if necessary
	Water covering Controller Probe	Check Water Level
	Faulty Controller or Gauge	Check function and calibration
Safety Valve opening	Temperature set too high	Check Temperature Setting
	Contactor Failure	Check & Replace if necessary.
	Safety Valve Faulty	Check the seal on the valve is intact and has not been tampered with and that the lifting handle is not obstructed. Check the pressure shown on the gauge is above 2.4 Bar. If not replace the valve
	Output board Failure	Check & Replace if necessary
Door will not open once Autoclave has cooled to 80°C	Thermal Lock Temperature not yet reached in Load Simulator	**WAIT.** Thermal Lock is set to Load and not Chamber temperature.
Door does not open when door button is pressed	Safety delay not completed	Wait while **'Hold'** is displayed in the temperature display
	Thermal Lock Temperature not yet reached in load simulator	Check Cycle Complete indicator is lit on cycle progress display.
	Faulty Door Solenoid	Check Solenoid and Output Board Function. Replace if necessary.
	Thermal Lock previously overridden	Use thermal lock key to open door. Normal function will return after a complete cycle has been run.
Fault Indication will not go out	Fault not Re-set. (Refer to manual for list of Fault Codes)	Rectify cause of fault and reset with Key-switch or re-set button.

Autoclaves are pressure equipment and as such are potentially extremely hazardous if not correctly serviced.

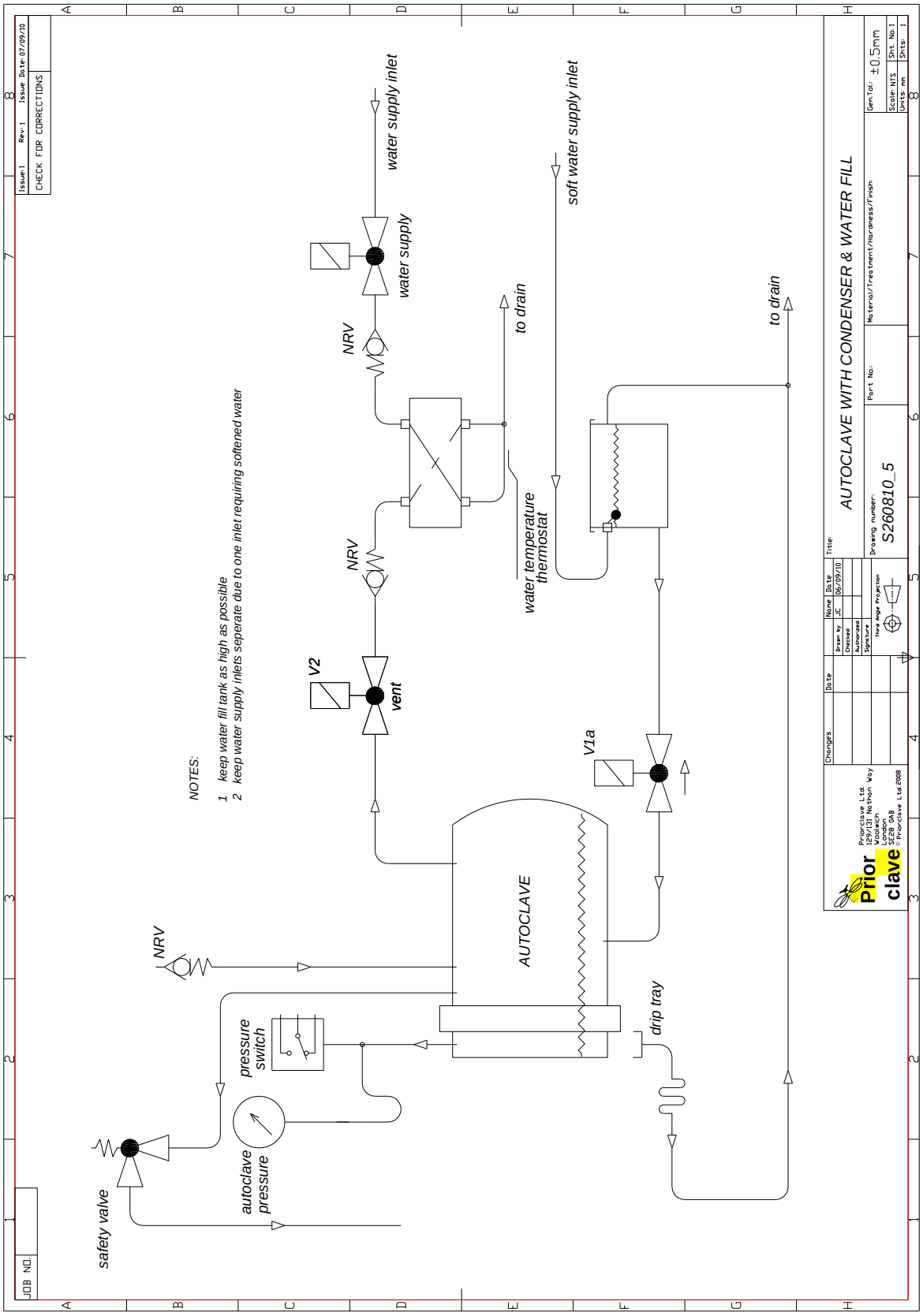
If you have any doubts or If you do not feel competent to carry out any of the above procedures then do not hesitate to call Priorclave or your nearest Priorclave approved service agent.

This device may be fitted with a non-resettable thermal cut out to protect the heater. In the event of failure of this device contact Priorclave Service or your local authorised service agent.

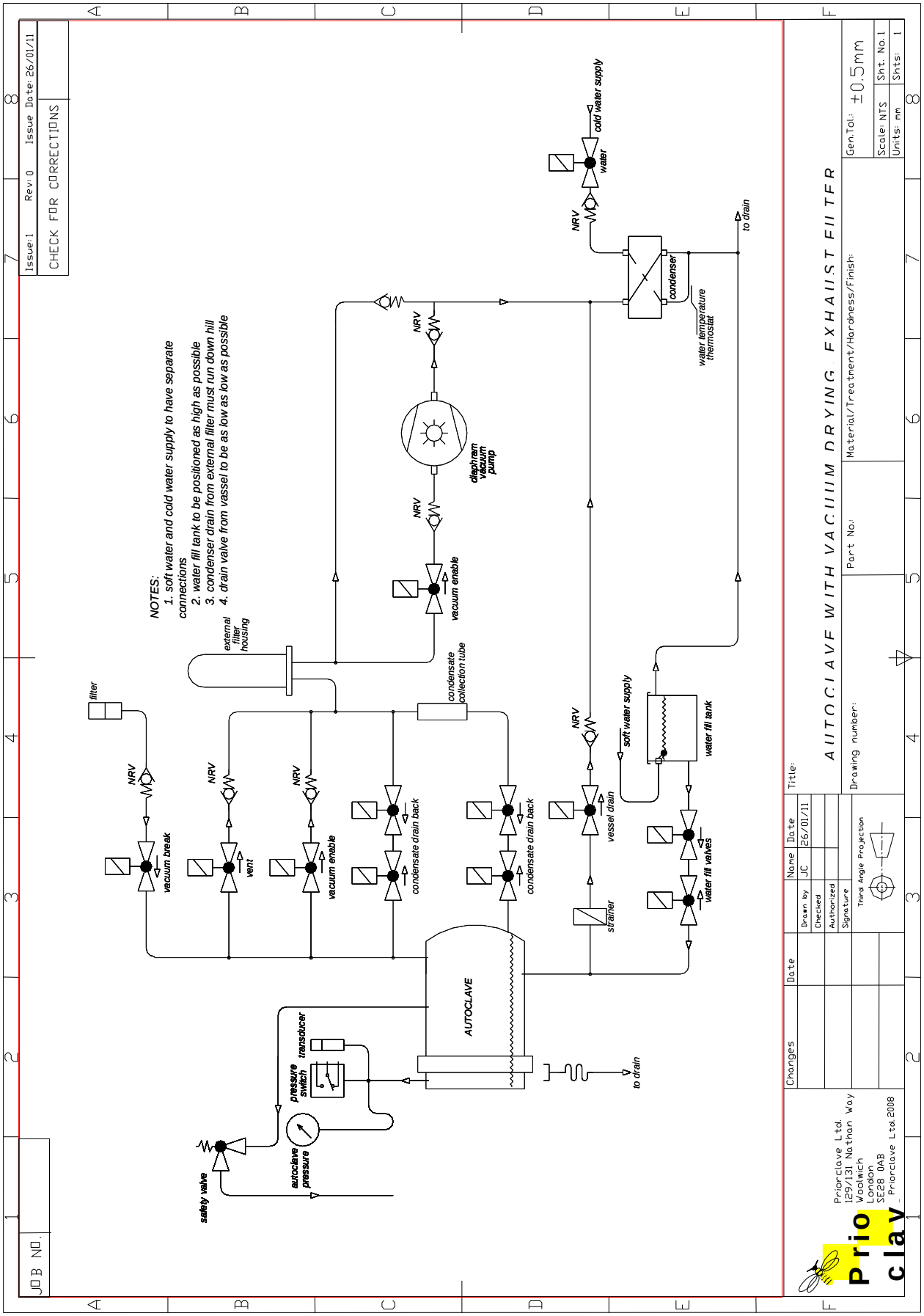
Pipe-work Schematics

The schematics shown here include options and accessories which may not be fitted to this autoclave.

Standard Models



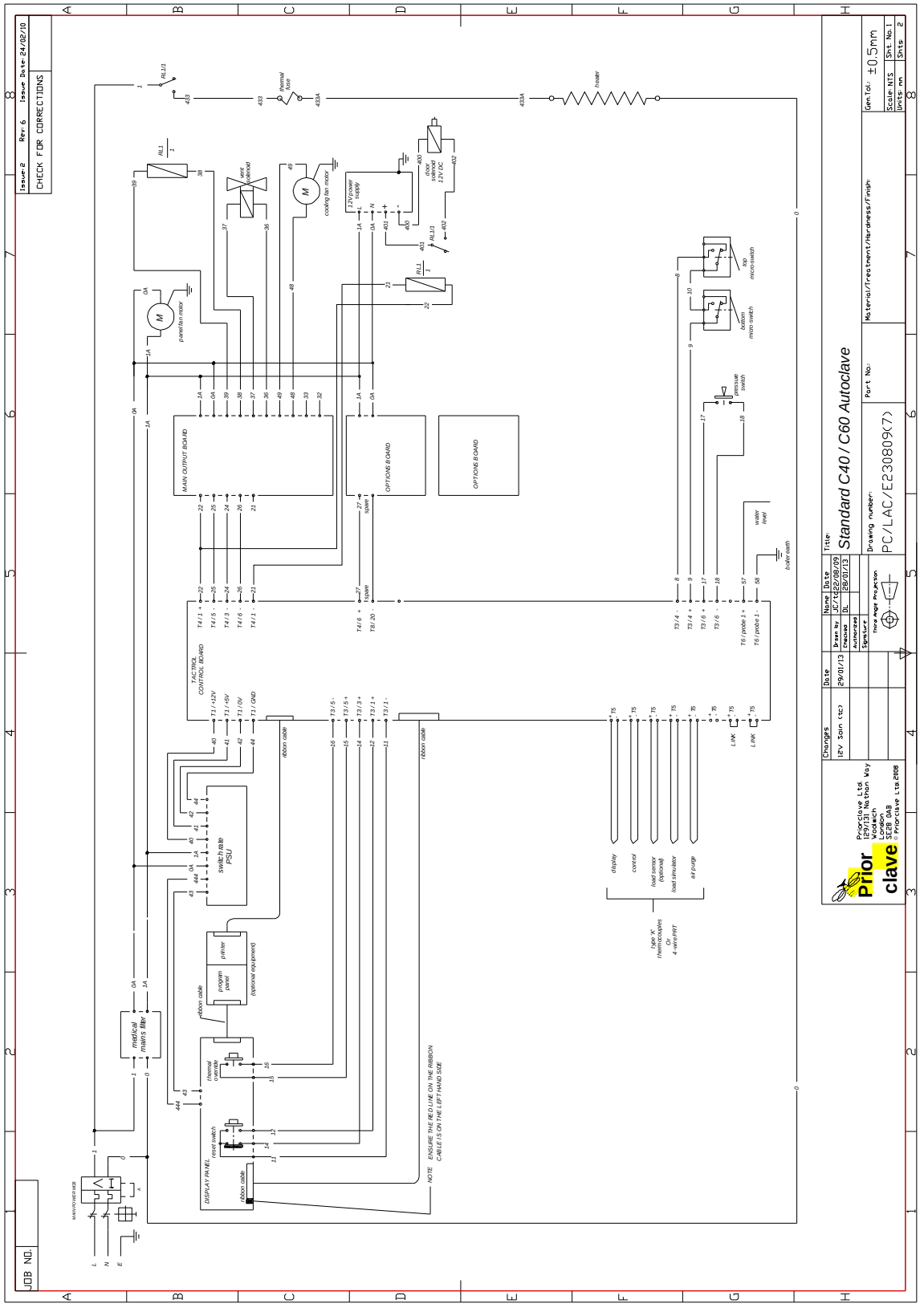
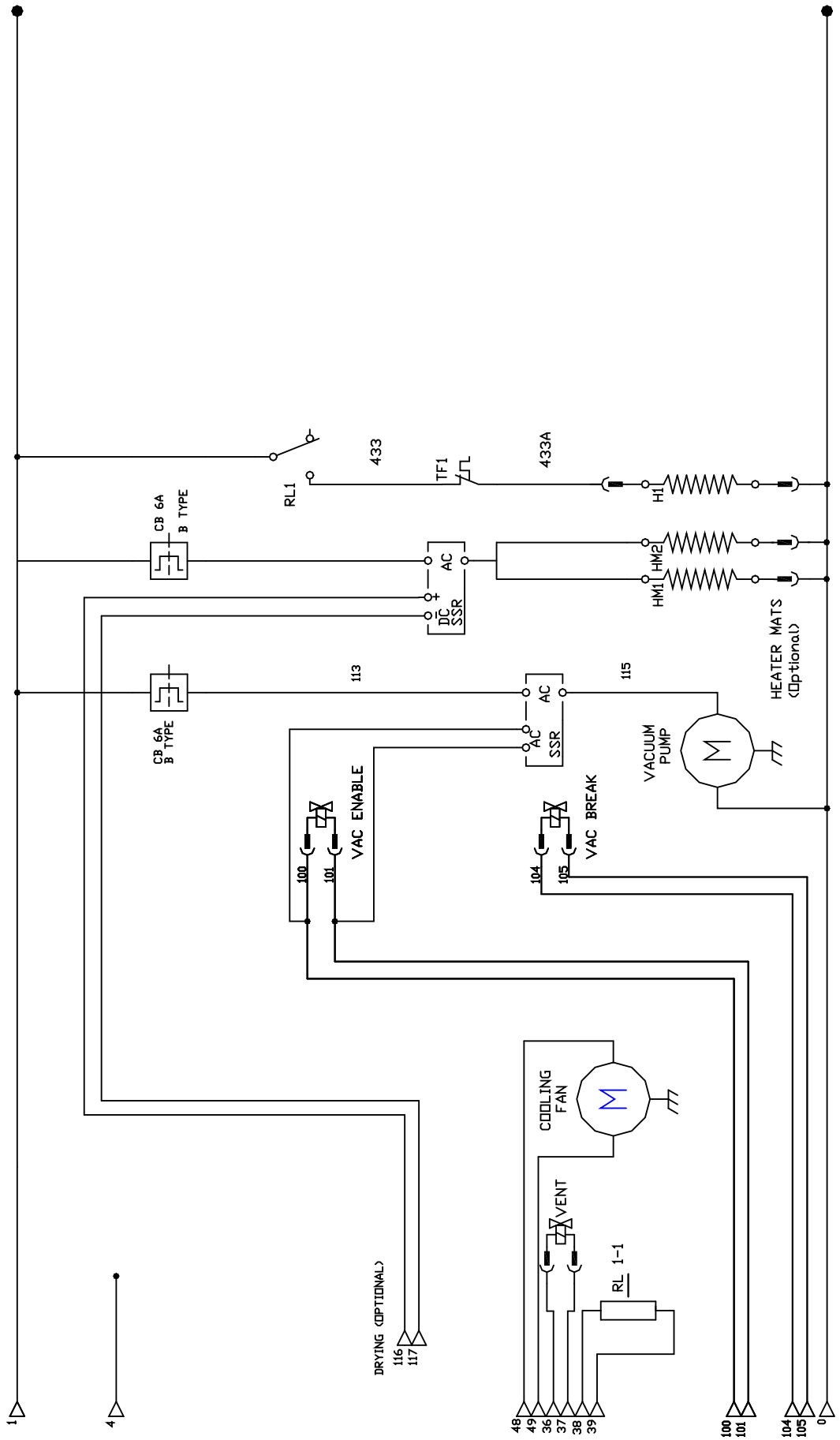
Vacuum Models



Electrical Circuit Diagrams

The diagrams shown here include options and accessories which may not be fitted to this autoclave.

Standard Models



Vacuum and other options