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Wellwash®

Thermo Scientific Wellwash® 4 Mk 2

User Manual

Rev. 2.4, Cat. no. 1507340

Thermo SCIENTIFIC

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Thermo Scientific Wellwash 4 Mk 2, Cat. no. 5160772 (115 V), 5160770 (230 V) or 5160771 (100 V)

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1 Safety Symbols and Markings

These symbols are intended to draw your attention to particularly important information and alert you to the presence of hazards as indicated.

Safety symbols and markings used on the Wellwash 4 Mk 2

Power ON

Power OFF

SN **Serial number**

REF **Catalog number**

Date of manufacture

Consult Instructions for Use

In Vitro Diagnostic Medical Device

WEEE symbol This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC.

Warning markings used in the documentation

Warning: Risk of electric shock.

Warning: Biohazard risk.

Warning: Risk of injury to the user(s).

Caution: Risk of damage to the instrument, other equipment or loss of performance or function in a specific application.

Other markings used in the documentation

Note: Marks a tip, important information that is useful in the optimum operation of the system, or an item of interest.

2 About the User Manual

This User Manual has been written for the actual user (e.g., laboratory technician) and provides information on the Thermo Scientific Wellwash 4 Mk 2 microplate strip washer, including installation and operating instructions.

Read the manual in its entirety prior to operating the instrument.

This User Manual has been designed to give you the information you need to:

- Review safety precautions
- Install the Wellwash 4 Mk 2
- Carry out washing procedures
- Perform basic maintenance procedures
- Troubleshoot the instrument performance
- Maintain the instrument

This User Manual also describes features and specifications of the Wellwash 4 Mk 2 hardware and on-board software.

Chapter 6 explains the operating procedures.

The user should be familiar with the contents of Chapter 7 on maintenance procedures that may be performed by the user.

For warranty and ordering information, refer to Chapters 10 Ordering Information and 11 Warranty .

3 Introduction to the Wellwash 4 Mk 2

The Wellwash 4 Mk 2 is a semiautomatic microplate washer, comprising pump and washer units. The instrument is supplied with both 8- and 12-way wash heads, four program cards and an accessory pack.

Your local Thermo Fisher Scientific representative can arrange instrument training at the commissioning of the instrument for extra charge, if required.

3.1 Intended use

The Wellwash 4 Mk 2 is a microplate washer for 96-well plates. It can be used in research or routine-test laboratories by trained personnel to wash Microtiter microplates and strips in 96-well plate format that meet the SBS standards.

For verification of the entire system, it is recommended that Good Laboratory Practices (GLP) be followed to guarantee reliable analyses.

Use for self-testing is excluded.

If the assay performance is essential for the analysis, the test result has to be ensured with internal quality controls or with an alternative test.

3.2 Principle of operation

The instrument provides the following wash functions initiated through the keypad and control switches or a preprogrammed wash card:

1. Liquid dispensing into wells (microplate or microstrip)
2. Liquid aspiration from wells (microplate or microstrip)

With their unique and proven design, the coaxial wash heads of the Wellwash 4 Mk 2 ensure excellent washing efficiency and low residual volumes of less than 5 µl. For clean delivery of washing buffer, the inner dispensing tubes are made of stainless steel. A continuous vacuum in the outer tube prevents cross contamination and ensures complete liquid removal.

For fast and accurate selection of routine protocols, the Wellwash 4 Mk 2 comes with four standard program cards (1 to 4 washing cycles) as well as a programmable card. This switch card permits a quick selection of all wash parameters, including soak times and final wash protocols.

The quick release bottle caps of the Wellwash 4 Mk 2 ensure easy buffer changes. An additional rinse bottle can be connected, making it easier to purge wash buffer from the wash head or change to a different wash buffer. Automatic pump shutdown reduces wear and noise levels. If unused for 30 seconds, the wash pump of the Wellwash 4 Mk 2 automatically switches off.

3.3 Advantages of using Wellwash 4 Mk 2

The Wellwash 4 Mk 2 provides several advantages relating mainly to the principle of operation in that it has:

- Unique coaxial wash heads for trouble-free washing and low residual volumes
- 8- and 12-way interchangeable wash heads
- Easy to program
- Excellent washing performance
- Quick release wash/waste bottle caps
- Automatic pump shutdown

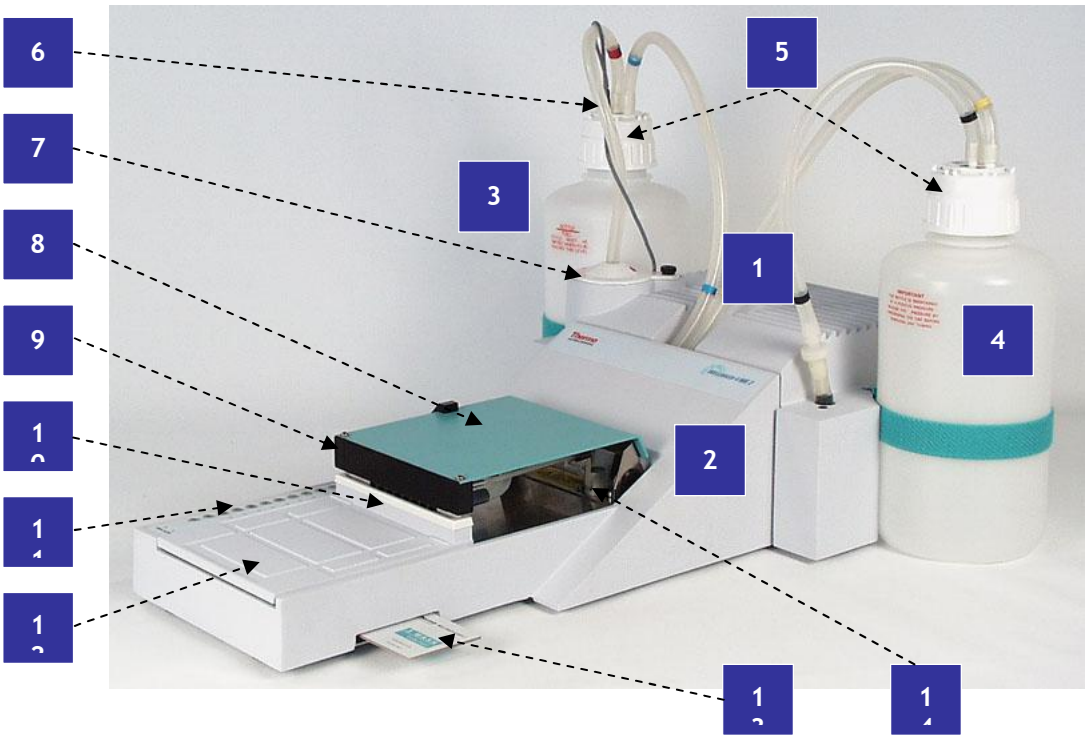
- Effective liquid management

4 Functional Description

The Wellwash 4 Mk 2 is designed to wash wells in an 8 x 12 microplate. It comprises a pump unit and a washer unit (Fig. 4.1), which are connected by power, air and liquid lines.

The **pump unit** consists of a double-headed vacuum pump with high-density polythene reagent and waste bottles and a liquid trap. The main power ON/OFF switch is at the rear of the pump unit. The frequency selector switch is located on the bottom side of the pump model Cat. no. 5190771 near the transport locking screws.

The keypad is located on the left-hand side of the **washer unit** and the microprocessor and associated control electronics are housed under the keypad. The wash head is located above the plate carrier slideway, which can be either 8- or 12-way. The plate carrier moves the microplate accurately beneath the wash head and incorporates a priming reservoir at its leading edge. The plate carrier is indexed forward by means of a magnetic coupling to the drive system housed inside the washer.



1. Pump unit
2. Washer unit
3. Waste bottle
4. Wash bottle
5. Bottle caps
6. Liquid level sensor
7. Liquid trap bottle
8. Wash arm assembly
9. Wash head and wash head holders
10. Priming reservoir
11. Keypad
12. Plate carrier
13. Program card
14. Pinch valve

Fig. 4.1 Wellwash 4 Mk 2 microplate washer

The pump creates pressure to the wash bottle (Fig. 4.1, item 4) allowing the wash liquid to be dispensed through the pinch valve (Fig. 4.1, item 14) into the microplate wells and a vacuum to the waste bottle (Fig. 4.1, item 3) to aspirate the used wash liquid into the waste bottle.

4.1 Controls and indicators

Here is a description of the controls and indicators on the Wellwash 4 Mk 2.

POWER ON/OFF switch

This two-position switch at the rear of the pump unit controls the electrical power to both the pump and washer units.

Fig. 4.2 Keypad

PRIME push button

A momentary action switch that starts the PRIME function. An audible tone will sound when pressed to confirm operation.

PRIME indicator

This yellow LED (light-emitting diode) located to the right of the PRIME button flashes to indicate that the PRIME function is required and, when continuously ON, indicates that the washer is primed and ready for use. The indicator will turn off after a while, but the instrument remains ready for use.

ROW SELECT (1 – 12) push buttons

These are momentary action switches that select the last row to be washed in any chosen program sequence. An audible tone will sound when pressed to confirm operation.

ROW SELECT indicators

These yellow LEDs located to the right of the ROW SELECT push buttons, when illuminated, indicate the rows selected for washing.

START push button

This momentary action switch initiates the wash cycle. An audible tone will sound when pressed to confirm operation.

RESET push button

When pressed, the RESET button will reset the washer to its pre-programmed state. An audible tone will sound when pressed to confirm operation.

POWER indicator

This green LED is located at the bottom left of the keypad and, when illuminated, indicates that the POWER switch is ON.

VAC FAIL indicator

A yellow LED which, when flashing, indicates that the waste bottle is full or that there is a vacuum failure.

5 Installation

5.1 Installation check list

The section on installation will contain an outline of the points mentioned in the check list below.

Table 5.1 Installation check list

Tick	Item
❑	Unpack the Wellwash 4 Mk 2 instrument carefully. Refer to 5.2.1. Keep the original packaging and packing material for future transportation.
❑	Check the delivery for completeness. Refer to 5.2.2.
❑	Check for damage during transport. Refer to 5.2.3.
❑	Place the instrument on a normal laboratory bench taking into account both the environmental and technical prerequisites. Refer to 5.2.4 and 5.2.6. Leave sufficient clearance on both sides and at the rear of the unit.
❑	Install the instrument:
❑	Remove the transit screws. Refer to 5.3, step 1.
❑	Check the voltage and frequency of the electrical supply. Refer to 5.3, step 2.
❑	Remove the pinch valve holder. Refer to 5.3, step 4.
❑	Install the wash head. Refer to 5.3, steps 5 and 6.
❑	Connect the tubing and the liquid level sensor cord to the pump unit. Refer to 5.3.1, steps 1 to 5.
❑	Connect the washer unit to the pump unit. Refer to 5.3.1, steps 6 and 7.
❑	Fill the wash bottle and tighten both bottle caps. Refer to 5.3.1, steps 8 and 9.
❑	Slide the plate carrier to its place. Refer to 5.3.1, step 10.
❑	Connect the mains supply cable (cord) to the mains input socket. Refer to 5.3.2.
❑	Carry out the operational check. Refer to 5.4.

5.2 What to do upon delivery

5.2.1 How to unpack

Move the unpacked instrument to its site of operation. Unpack the Wellwash 4 Mk 2 instrument and accessories carefully with the arrows on the transport package pointing upwards. The following notes and instructions are sent with the instrument and are immediately available when you open the package:

- the Warranty Certificate card
- the packing instructions/packing list
- the Transportation discrepancy report
- the User Manual

Caution: DO NOT touch or loosen any screws or parts other than those specially designated in the instructions. Doing so might cause misalignment and will invalidate the instrument warranty.

Fig. 4.1 shows the pump and washer units in their entirety.

Lift out the washer and pump units, removing the shaped packing pieces from around the washer, and place them on a flat level surface.

To lift the instrument, put your fingers under the bottom on both sides and lift it with your back straight. The net weight of the instrument is 10 kg (22 lbs.).

Caution: When unpacking the instrument, it is recommended that two people lift the instrument together, taking proper precautions to avoid injury.

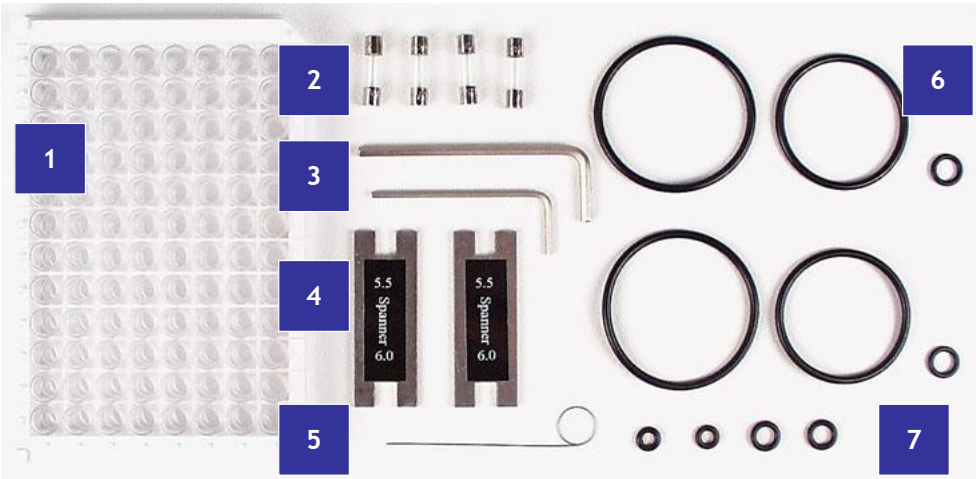
Retain the original packaging and packing material for future transportation. The packaging is designed to assure safe transport and minimize transit damage. Use of alternative packaging materials may invalidate the warranty. Also, retain all instrument-related documentation provided by the manufacturer for future use.

Note: Before use remember to remove the transit screws at the bottom of the instrument and save them in the adjoining screw holes (marked with the text "Transit screw storage"). Remove and save the pinch valve holder until needed for future transportation of the instrument.

5.2.2 Checking delivery for completeness

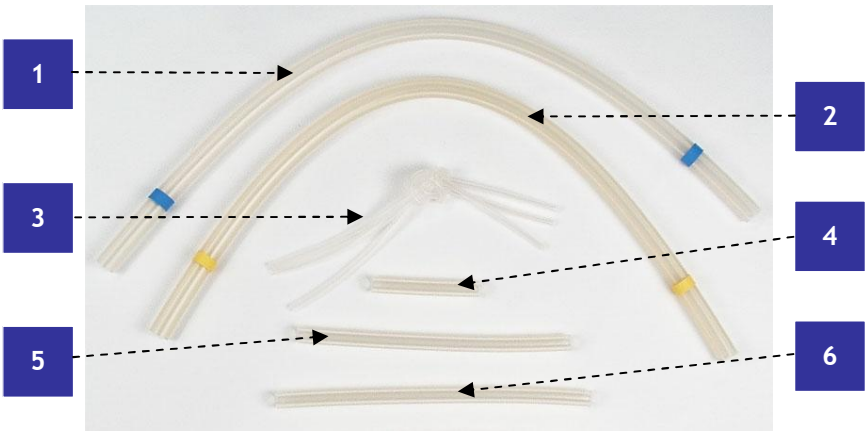
Check the enclosed packing list against order. In case of any deviations, contact your local Thermo Fisher Scientific representative or Thermo Fisher Scientific Oy.

The instrument is supplied with both 8- and 12-way wash heads, four program cards, the user manual, the mains supply cable and an accessory pack. The content of the accessory pack is shown in Fig. 5.1 and Fig. 5.2. Store the accessories in their bags until you need them.



1. Combiplate
2. 4 spare fuses (see Section 7.1.10 Fuse replacement)
3. 2 Allen keys (see Section 5.3 Installation procedure, step 1)
4. 2 spanners (see Section 5.3.2 Wash head height)
5. De-clogging tool (see Section 7.1.9 Unclogging tips)
6. 6 spare O rings for the bottle caps
7. 4 spare O rings (see Section 5.3 Installation procedure, step 5)

Fig. 5.1 Accessories included with the instrument.



1. Waste liquid spare tube
2. Reagent liquid spare tube
3. Pinch valve spare tubes (item 3 in Fig. 5.3) (see Section 7.1.8 Pinch valve)
4. Wash arm assembly spare tube (item 2 in Fig. 5.3)
5. Wash arm assembly spare tube (item 4 in Fig. 5.3)
6. Wash arm assembly spare tube (item 1 in Fig. 5.3)

Fig. 5.2 Spare tubing

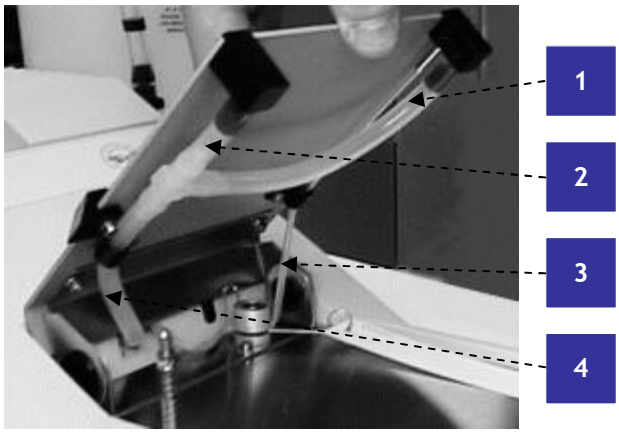


Fig. 5.3 Wash arm assembly tubing

5.2.3 Checking for damage during transport

Visually inspect the transport package, the instrument and the accessories for any possible transport damage.

If the carton has been damaged in transit, it is particularly important that you retain it for inspection by the carrier in case there has also been damage to the instrument.

Neither the manufacturer nor its agents can be held responsible for any damage incurred in transit, but the manufacturer will make every effort to help obtain restitution from the carrier. Upon receipt of the carrier's inspection report, arrangements will be made for repair or replacement.

Visually check all interconnections in the basic instrument. Check that there are no loose parts inside the instrument.

If any parts are damaged, contact your local Thermo Fisher Scientific representative or Thermo Fisher Scientific Oy.

5.2.4 Environmental requirements

When you set up your Wellwash 4 Mk 2, avoid sites of operation with excess dust, vibrations, strong magnetic fields, direct sunlight, draft, excessive moisture or large temperature fluctuations.

- Make sure the working area is flat, dry, clean and vibration-proof and leave additional room for accessories, cables, wash bottles, etc.
- Leave sufficient space (at least 10 cm) on both sides and at the back of the unit to allow adequate air circulation.
- Make sure the ambient air is clean and free of corrosive vapors, smoke and dust.
- Make sure the ambient temperature range is between +5°C (41 F) and +40°C (104 F), preferably between +15°C (59 F) and +25°C (77 F).
- Make sure relative humidity is between 10% and 90% (non-condensing).

Note: The use of the instrument in strong, direct sunlight or next to radiators and other heat sources may markedly increase the temperature prevailing at the instrument. This should be taken into account when deciding where the instrument should be located and operated.

The Wellwash 4 Mk 2 does not produce operating noise at a level that would be harmful. No sound level measurements are required after installation.

Warning: DO NOT operate the instrument in an environment where potentially damaging liquids or gases are present.

5.2.5 Things to avoid

DO NOT smoke, eat or drink while using the Wellwash 4 Mk 2. Wash your hands thoroughly after handling test fluids. Observe normal laboratory procedures for handling potentially dangerous samples. Use proper protective clothing. Use disposable gloves. Be sure the working area is well ventilated.

Never spill fluids in or on the equipment.

Only use the instrument for its intended purpose. Refer to Section 3.1.

5.2.6 Technical prerequisites

The washer and pump units require no special site preparations. A normal laboratory bench close to a mains supply socket is quite suitable. The net weight of the instrument is 10 kg (22 lbs.).

Check that the voltage label on the rear panel of the pump unit conforms to the supply voltage used in the laboratory. The instrument operates at voltages of 100 – 120 Vac, 220 – 240 Vac and the frequency range 50/60 Hz (see Section 5.3, step 2).

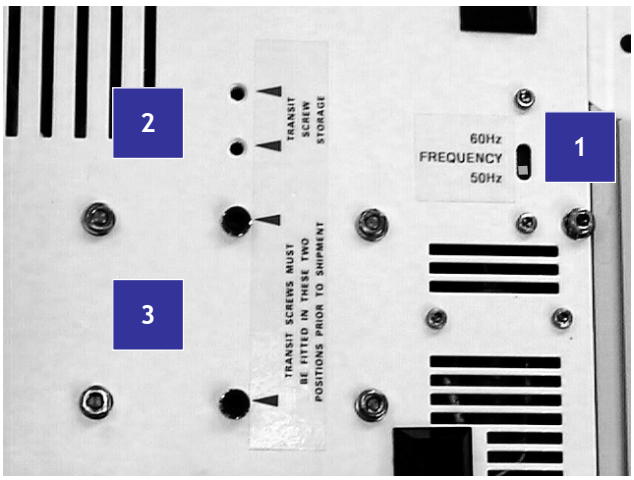
5.3 Installation procedure

Any suitably skilled person using standard tools may carry out the following procedure.

1. Rest the pump unit on its side and remove the transit screws (the Allen cap head type is painted red) using the key supplied (Fig. 5.1, item 5). Relocate them in the retaining holes provided (Fig. 5.4).

Note: When relocating this instrument or returning it for repair, it is essential that the transit screws are refitted. **Failure to do so could invalidate the warranty.**

2. Ensure that the pump mains switch is in the OFF position. After checking that the electrical supply conforms to that specified on the voltage label on the rear panel of the unit, slide the frequency selector switch (in the pump model Cat. no. 5160771) to the 50 Hz or 60 Hz position depending on the mains supply voltage frequency (Fig. 5.4). (Other pump models do not include a frequency selector.)



1. Location of the frequency selector switch
2. Retaining holes for the transit screws
3. Transit screws during transportation

Fig. 5.4 Location of the frequency selector switch and the transit screws

3. Turn the pump unit back to its normal position.

4. Lift the wash arm assembly (the stainless steel cover). Remove the pinch valve holder (Fig. 5.5) before use. Store the wire holder for future use.

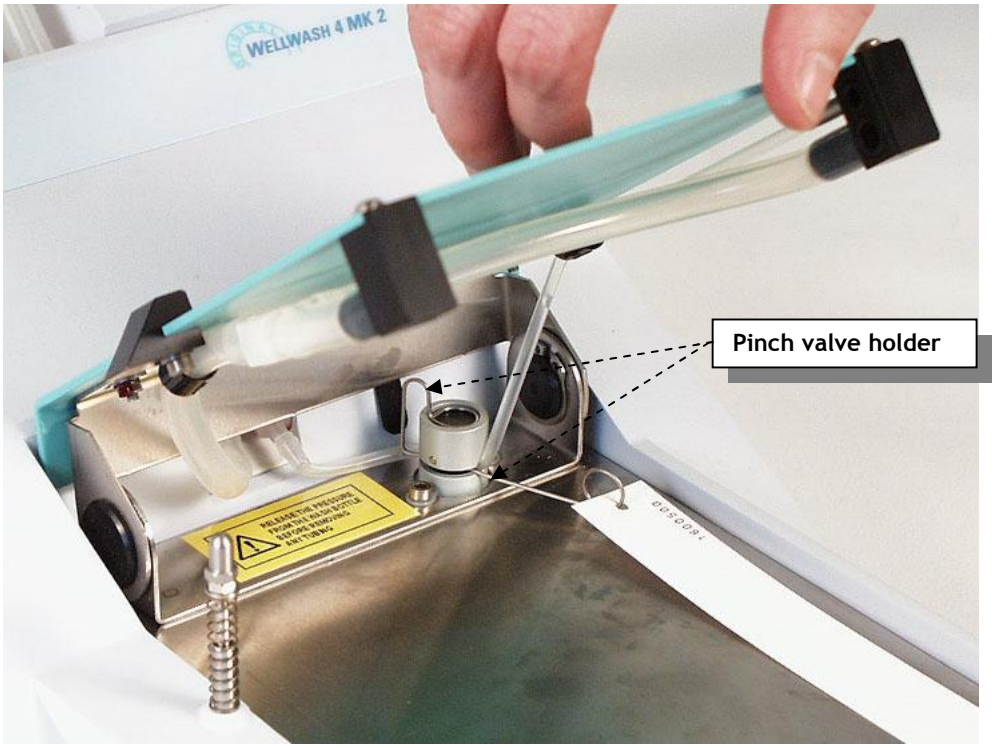


Fig. 5.5 Pinch valve holder

Note: The wash heads are packed separately. Install them before use.

5. Install first the four (4) small O-rings to the wash head holders, two (2) on both sides (Fig. 5.6).

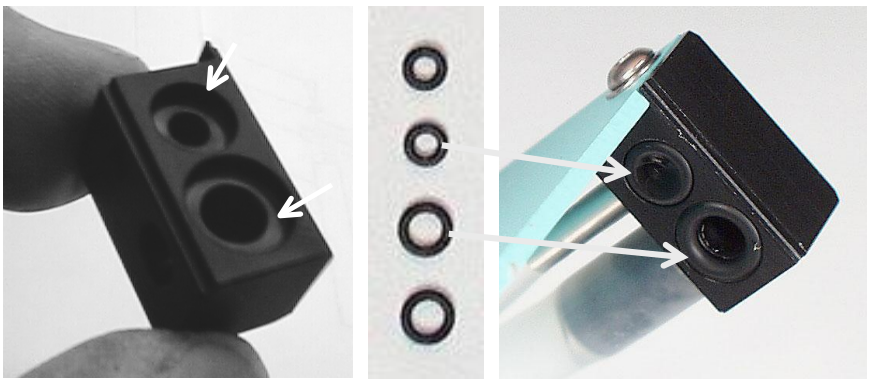


Fig. 5.6 Installing the O rings to the wash head holders

6. Slide the wash head between the holders (Fig. 5.7).

Note: The wash heads will only fit into the end slots when the raised flange on the wash head is facing the front.

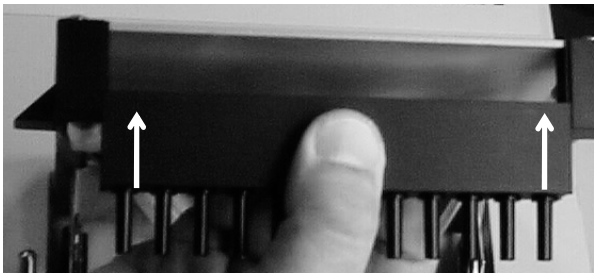


Fig. 5.7 Sliding the wash head between the holders

5.3.1 How to install the pump unit and washer unit connections

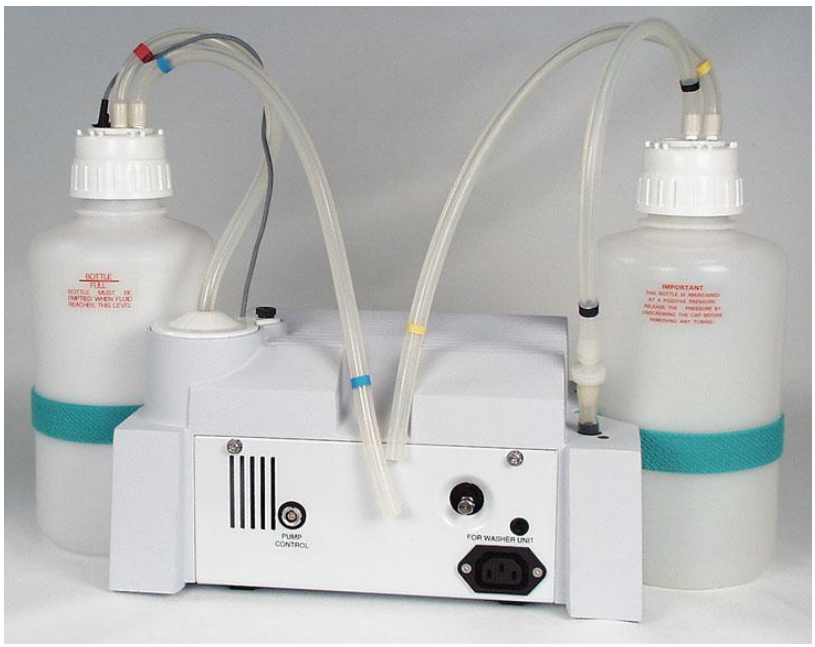


Fig. 5.8 Pump unit with tubes installed

1. The wash bottle with the black connections is located on the right-hand side of the pump unit and the waste bottle to the left. All the tubing and connections are color coded to ensure correct connection (Table 5.2).

Table 5.2 Silicon tubing color-codes

Black	Pressure feed from the pump to the wash bottle
Yellow	Pressuring wash reagent from the wash bottle to the washer unit
Red	Vacuum feed from the pump to the waste bottle
Blue	Waste feed from the washer unit to the waste bottle

2. Connect the pressure feed from the pump on the right to the wash bottle using the black-coded tube.
3. Connect the vacuum feed tube (red) from the pump to the waste bottle (Fig. 5.9, item 2).
4. Connect the liquid level sensor cord from the liquid trap bottle to the waste bottle. Make sure the black connector is firmly in place (Fig. 5.9, item 1).

△ **Caution:** The liquid level sensor does not function if the connector is not properly inserted: the black connector has to be pushed down all the way. The waste bottle may otherwise overfill and cause the liquid trap bottle to start filling. If at that point the liquid trap bottle is not emptied, the overflowing waste liquid can enter the pump unit and damage it.

1. Liquid level sensor connector
2. Vacuum feed tube
3. Liquid trap bottle cover

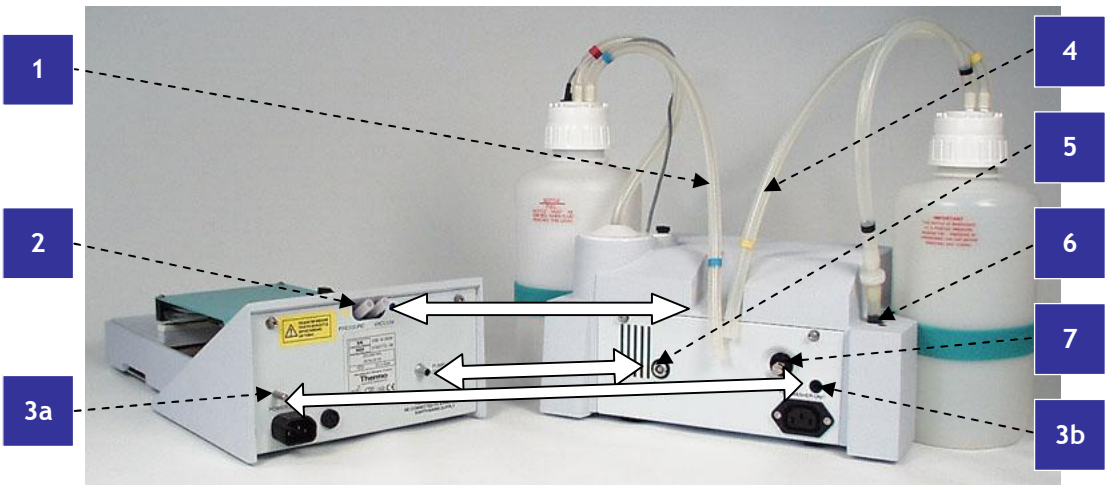
Fig. 5.9 Liquid level sensor system

5. Check that the tubes are properly connected to the pinch valve under the wash arm assembly on the washer unit (Fig. 4.1, item 14). The thin tube going through the valve should not be pinched by the edges of the valve.

6. Remove the three (3) black plastic caps from the hose connectors and the pump control at the rear of the washer unit (Fig. 5.10).

Fig. 5.10 Removing the plastic caps

7. Slide the two units together until the locating dowel and electrical connectors are firmly engaged (Fig. 5.11).



1. Silicone tube (waste, blue color code)
2. Manifold pipes (PRESSURE for reagent tube/yellow, VACUUM for waste tube/blue)
3. Locating pin (a) and friction bush (b)
4. Silicone tube (wash, yellow color code)
5. Signal connectors (with text PUMP CONTROL)
6. Silicone tube (pressure, black color code)
7. Pump pressure adjustment screw (do not touch –for authorized service personnel only!)

Fig. 5.11 Connection of pump and washer units

8. Open the wash bottle (Fig. 4.1, item 4) by rotating the cap ring, while the white plug remains stationary. Lift the cap ring and open the plug. Fill the wash bottle up to the shoulder with wash reagent and reconnect ensuring that the plug mates correctly with the bottle insert (Fig. 5.12) and that the cap ring is tightly screwed down.

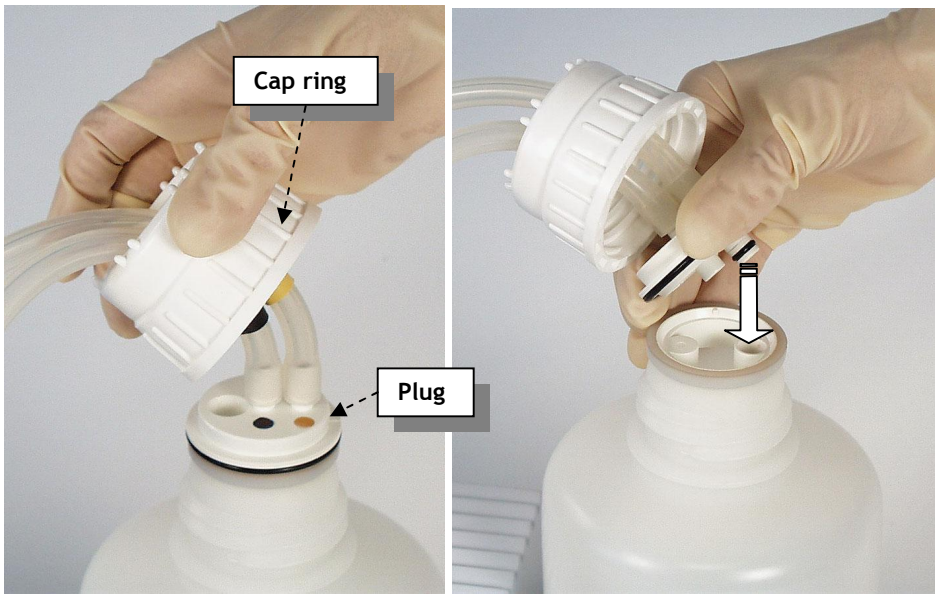
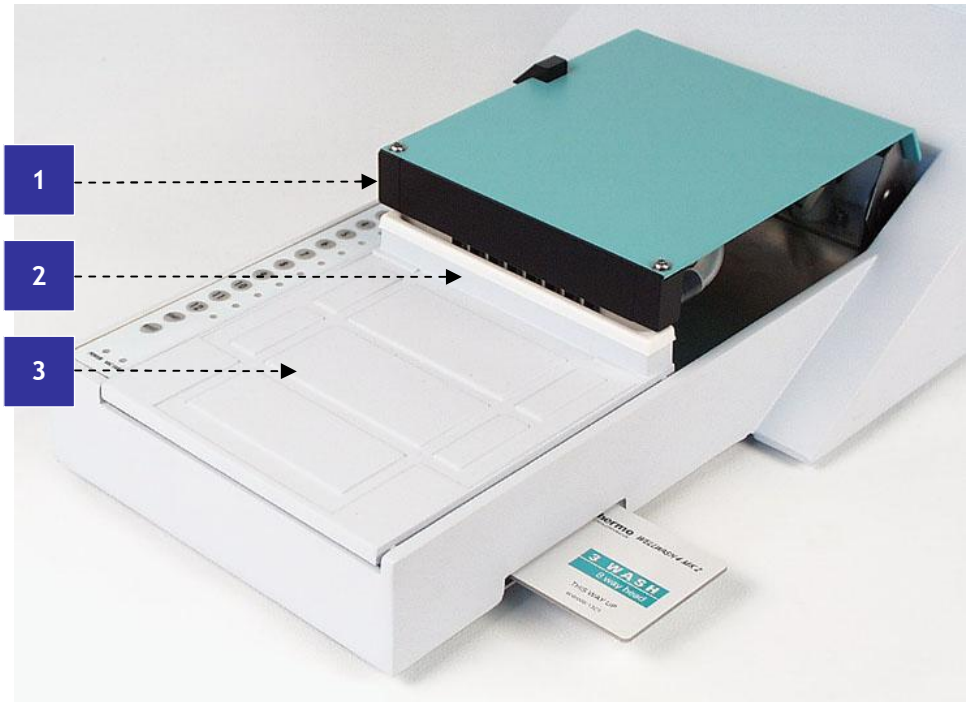


Fig. 5.12 Opening and closing the bottle

9. Tighten the cap on the waste bottle.
10. Lift the wash head and slide the plate carrier onto the stainless steel slideway so that the reservoir is under the wash head (Fig. 5.13).



1. Wash head
2. Priming reservoir
3. Plate carrier

Fig. 5.13 Correct position of the plate carrier

5.3.2 Wash head height

To accommodate the differences in size and volume capacity of manufacturers' microplates, the height of the wash head is adjustable. This means that a positive meniscus can always be obtained without an unnecessary waste of wash reagent.

The wash head is factory-set at a nominal height to suit the most commonly used microplates. Should adjustment be required follow these instructions:

1. Make sure the wash bottle is empty to facilitate the adjustment. Start a simple wash routine and wait until the wash arm assembly starts to slide backwards. Turn OFF the instrument from the power switch at the back of the pump unit. The wash head is now in the **raised** position.
2. A stainless steel head lift rod is located on the left-hand side of the washer unit immediately above the keypad. There is a domed nut at the top of the rod with a locknut underneath.
3. Perform the adjustment using the two spanners 5.5/6.0 supplied with the instrument.

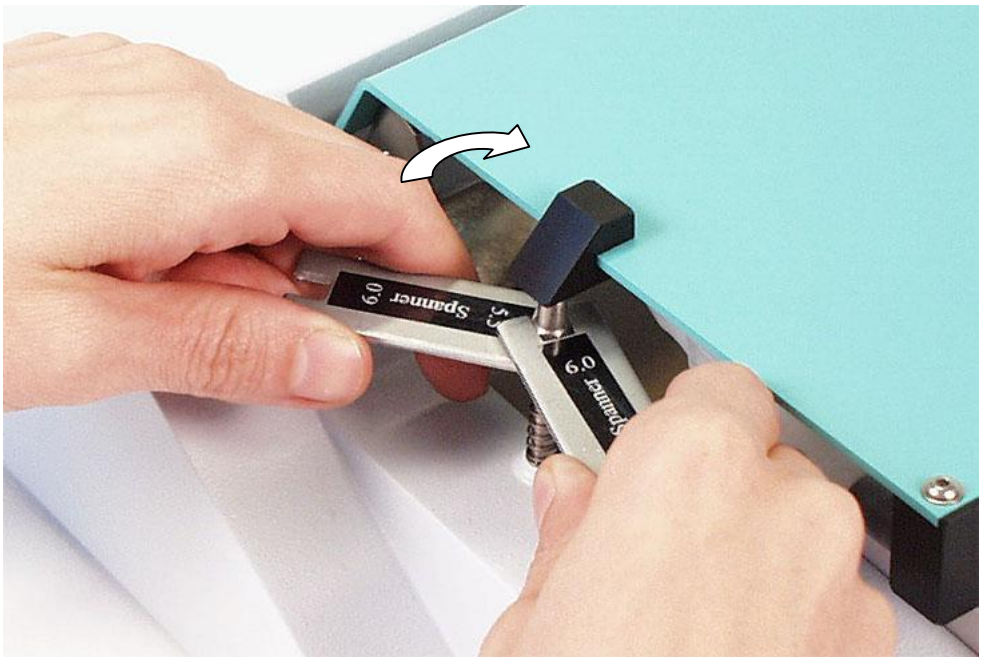


Fig. 5.14 Loosening the locknut with spanners

4. Loosen the locknut (Fig. 5.14) by keeping the 6.0-spanner stationary while turning the 5.5-spanner clockwise.
5. Adjust the height by rotating the domed nut, clockwise to lower the wash head and anticlockwise to raise the wash head.
6. Set the tips of the wash head to approx. 1.5 mm to 2.0 mm above the height of a microplate on the plate carrier, when the wash head is in the **raised** position.
7. Lock the domed nut into position with the locknut. When locking the domed nut into position, keep it still with the spanner 6.0 and only rotate the locknut anticlockwise using the spanner 5.5.

5.3.3 Mains supply cable

Warning: Never operate your instrument from a power outlet that has no ground connection. Never use a mains supply cable (cord) other than the Thermo Scientific mains supply cable designed for your region.

1. Ensure that the mains switch at the rear of the pump unit is in the **OFF** position.
2. Connect the mains supply cable (cord) to the mains input socket at the rear of the pump unit. If you need to use any other type of mains supply cable than supplied, use only cables certified by the local authorities.
3. Connect the instrument to a correctly installed line power outlet that has a protective conductor that is grounded (earthed).

5.3.4 Changing wash heads

You can change the wash head to either 8-way or 12-way. Lift the head assembly (Fig. 4.1, item 8), grasp the wash head (Fig. 4.1, item 9) at both ends and slide it down in the direction of the tips until it clears the end caps. Check that the two O rings in each end cap are in position and undamaged. To install the alternative wash head, slide it upwards onto the slots making sure that it is fully engaged (Fig. 5.7).

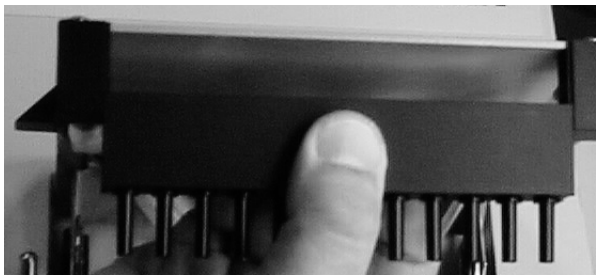


Fig. 5.15 Changing the wash head

Note: The wash heads will only fit into the end slots when the raised flange on the wash head is facing the front.

Remember to check the program card accordingly (8-way or 12-way).

5.4 Operational check

The following procedure should be completed to confirm the correct functioning of the washer prior to normal use.

1. Check that the wash head is correctly located by means of its guide slots in the head assembly (Fig. 5.7). The operational check is performed faster with the 12-way wash head.
2. Add approximately 2 to 3 dl of distilled aqua to the wash bottle and make sure that both bottle caps are firmly tightened.
3. Switch ON the mains power supply by depressing the POWER ON switch positioned on the rear panel of the pump unit.

   The POWER indicator on the keypad (Fig. 4.2) will be illuminated and a countdown sequence will begin on the row indicators. The row 12 indicator will illuminate first followed by row 11, row 10, row 9, and so on, at one-second intervals until the PRIME indicator is reached. The pressure

generation takes 10 seconds. The PRIME indicator continues flashing to prompt the user to prime the system.

4. Select the preprogrammed wash card for 1 wash and for the 12-way wash head. Plug it into the slot on the right-hand side of the washer unit (Fig. 4.1, item 13).
5. Lift the wash head and slide the plate carrier onto the stainless steel slideway so that the reservoir is under the wash head (Fig. 5.13).
6. The instrument should now be primed. Press the PRIME button to initiate the sequence. The wash head will lift and the pinch valve will open for one second allowing wash fluid to flow into the priming reservoir. The wash head will then lower itself to empty the prime reservoir. The PRIME indicator will turn off when the priming is complete.

   If no further key entry is made within ten (10) seconds of priming, the pump will automatically switch OFF. The instrument will then enter its idle state, waiting for instructions from the keypad and program card.
7. Place a microplate onto the plate carrier. When using a 12-way wash head, the well A1 of the microplate should be positioned in the top left-hand corner. When using an 8-way wash head, the well A1 should be positioned in the top right-hand corner. See Fig. 5.16.

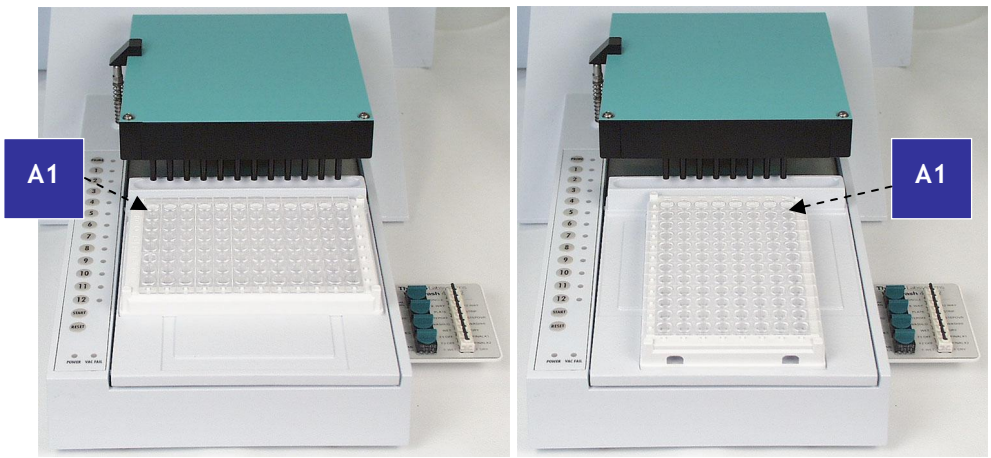


Fig. 5.16 Placing the microplate with 12-way and 8-way wash head

8. Select the row number of the last row to be washed on the keypad (e.g., when button 4 is pressed, rows 1 to 4 will be washed).

Note: When the 12-way program card is installed, buttons 9 to 12 are inoperative.

9. Press the START button to set the washing cycle into operation. The plate carrier will be drawn into the washer, filling and aspirating each row according to the sequence selected on the program card. At the end of a sequence, rows will be left substantially dry and the plate carrier will stop with the priming reservoir under the wash head.
10. The instrument is performing properly, if the wells are dry. If they are not, check that both bottle caps are firmly closed

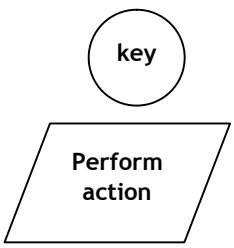
6 Operation

6.1 Operational checklist

Table 6.1 Operational checklist

Tick	Item
❑	Fill the wash bottle with appropriate washing reagent.
❑	Select the program card and insert it.
❑	When using the programmable switch card, check the settings.
❑	Switch the instrument ON.
❑	Prime the instrument.
❑	Place a microplate onto the plate carrier.
❑	Select the row number of the last row to be washed.
❑	Start the wash sequence.
❑	When the wash sequence has finished, remove the microplate.
❑	Shut down the instrument.

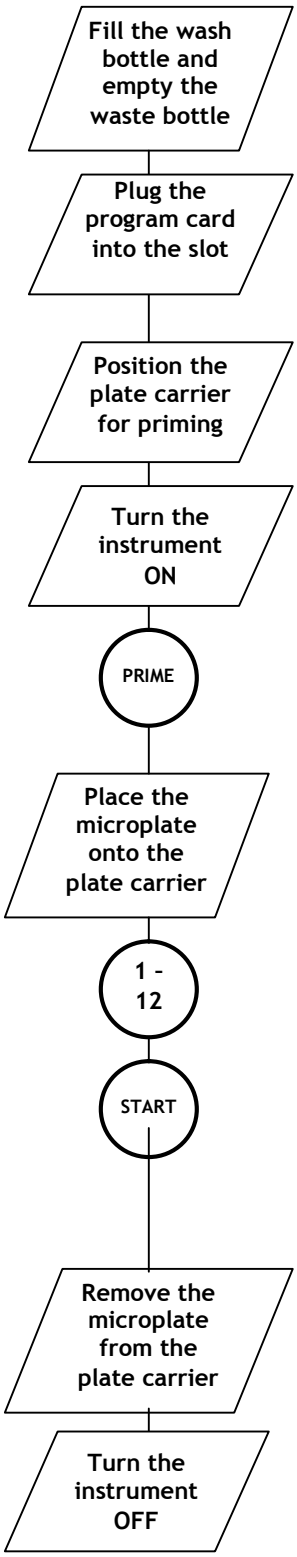
The following symbols are used in the flowchart below:



Press the key.

Indicates the actions you should take.

6.2 Washing a microplate



Ensure that the instrument is switched OFF.

Open the wash bottle cap (Fig. 6.1) very carefully to release any residual pressure. Let the hissing sound end prior to opening the cap all the way. Fill the wash bottle with appropriate washing reagent and tighten the bottle cap firmly (see Fig. 5.12).

Select either one of the preprogrammed wash cards or the programmable switch card (see Section 6.5).

Before inserting any program card, ensure that it is clean and dry. Wiping the surfaces with a soft dry cloth will suffice. If any liquid is present on the card, a malfunction of the program may occur.

Position the plate carrier on its slideway with the priming reservoir to the rear under the wash head (see Fig. 5.13).

The POWER indicator on the keypad (Fig. 4.2) illuminates and a countdown sequence will begin on the row indicator LEDs.

The PRIME indicator flashes until you prime the system (Section 6.3).

The priming function is complete when the PRIME indicator turns OFF.

If no further key entry is made within fifteen seconds of priming, then the pump will automatically switch OFF. The instrument will then enter the idle state, waiting for instructions from the keypad and program card.

Check that the correct wash head (8-way or 12-way) is fitted.

Check that the plate is placed properly onto the plate carrier (Fig. 5.16).

Select the row number of the last row to be washed. If no row is selected, the whole plate will be washed.

The instrument performs the wash sequence.

After pressing the START button, there may be a delay of up to 15 seconds before the run begins to allow the reagent and waste bottles to reach the working pressure.

The plate carrier will advance into the washer aspirating and filling selected rows in the sequence determined by the program card fitted. On completion of the protocol, the plate carrier will come to rest with the wash head lowered into the priming reservoir.

Warning: If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired. See Section 9.1 General specifications.

Caution: Handle the microplate with care to avoid any contamination of the instrument and the subsequent specimens. The contamination of the specimen will lead to incorrect results.

If the contents of the microplate does spill, however, follow the decontamination procedure presented in Section 7.3. Also, follow the system supplier's instructions in regard to the reagent kit and specimen handling in the event of contamination.

Warning: Never open the wash bottle, detach any of the tubing or press the black top of the pinch valve without first releasing the pressure by slightly opening the bottle cap. Let the hissing sound end prior to opening the cap all the way.

Warning: If you are using a washing reagent that is either volatile or splashes easily, keep yourself at a safe distance from the instrument while it is operating to avoid exposure. Place the instrument into a fume hood.

Warning: When washing microplates with samples of human or animal origin, keep yourself at a safe distance from the instrument while it is operating to avoid exposure. Place the instrument into a fume hood.

Note: If the pump fails to start or if the bottle caps are loose, an audible warning will be heard and the VAC FAIL indicator will illuminate. This condition will clear once the pump has started. If the VAC FAIL indicator does not clear after the pump has started, the RESET key must be depressed. Also, check that the waste bottle is not full.

Note: The priming procedure must be repeated whenever the POWER switch has been engaged or if there has been an interruption of the power supply.

Caution: Make sure that sufficient reagent is present in the wash bottle to complete the required protocol. See Fluid consumption in Section 9.1 General specifications.

Caution: If you use the programmable switch card, ensure that the **8 WAY - 12 WAY** switch is in the correct position (for either the 8-way or the 12-way wash head).

Caution: If removable-well microplates are being used, make sure that there are no missing wells in the rows to be washed **and that all the wells are at the same level**.

Note If you press the RESET button on the keypad at any stage, this will stop the immediate washing sequence and reset the system to its pre-programmed state.

Caution: DO NOT smoke, eat or drink while using the Wellwash 4 Mk 2. Wash your hands thoroughly after handling test plates. Observe normal laboratory procedures for handling potentially dangerous plates. Use proper protective clothing. Use disposable gloves. Ensure that the working area is well ventilated.

Caution: Never spill fluids in or on the equipment. Prevent any liquid from entering the instrument.

Caution: Immediately wipe away spilled liquids from outer surfaces to prevent damage and wipe over with a mild detergent.

Caution: Keep the instrument free of dust and other foreign matter. Clean the plate carrier and the plate carrier slideway and keep them dry to prevent jamming.

6.3 Priming procedure

Position the plate carrier on its slideway with the priming reservoir to the rear under the wash head (see Fig. 5.13). Press the PRIME button. The wash head will lift and the pinch valve will open for one second allowing wash fluid to flow into the priming reservoir. The wash head will then lower itself to empty the priming reservoir. The priming function is complete when the PRIME indicator turns OFF.

If no further key entry is made within ten seconds of priming, the pump will automatically switch OFF. The instrument will then enter the idle state, waiting for instructions from the keypad and program card.

If the pump fails to start or if the bottle caps are loose, an audible warning will be heard and the VAC FAIL indicator will illuminate. This condition will clear once the pump has started. If the VAC FAIL indicator does not clear after the pump has started, the RESET key must be depressed. Check also that the waste bottle is not full.

Note: The priming procedure must be repeated whenever the POWER switch has been operated or if there has been an interruption of the power supply.

6.4 Adding wash reagent

To add wash reagent, first release the pressure from the wash bottle by carefully opening the bottle cap (see Fig. 6.1). Let the hissing sound end prior to opening the cap all the way.

Fig. 6.1 Releasing the pressure from the wash bottle

Also, when you are changing the used reagent and you wish to rinse and clean the tubing, first release the pressure from the tubing and the wash bottle by slightly opening the wash bottle cap.

Close the wash bottle tightly (Fig. 5.12).

The waste bottle needs to be emptied when the wash bottle is filled.

6.5 Program selection

Choose an appropriate card for the wash routine. Plug the card into the slot located at the base to the right of the washer unit.

Note: Before inserting any program card, ensure that it is clean and dry. Wiping the surfaces with a soft dry cloth will suffice. If any liquid is present on the card, a malfunction of the program may occur.

Note 1: If a run is started without a program card or any row selection, the instrument will signal an error by sounding the audible warning device 3 times.

Note 2: If a run is started with the rows selected but with no program card inserted, the instrument aspirates the rows selected and returns to its idle state with the wash head lowered into the priming reservoir.

Note 3: If a run is started without any rows selected but with a program card fitted, the instrument will aspirate all the rows in accordance with the card configuration, i.e., 8-way or 12-way wash head.

The preprogrammed wash cards will dispense and aspirate the plate row by row for the number of times indicated on the card. There are four cards which can be inserted either side up to perform the wash routine indicated on the side facing up.

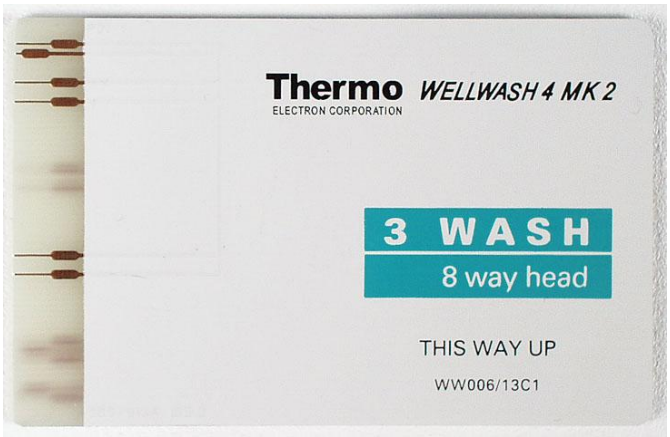


Fig. 6.2 Preprogrammed card: three washes with an 8-way wash head

Contained on the programmable switch card are four (4) rotary type and nine (9) two-way type switches each marked with their function. The setting of these switches controls the function of the washer, enabling a wide variety of protocols to be performed.

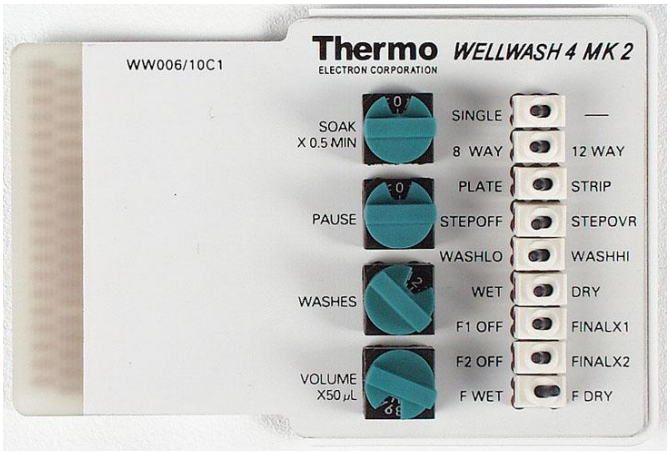


Fig. 6.3 Programmable switch card

6.5.1 Two-way switch functions

Switch settings	
SINGLE Make sure that this switch is always set to single wash head.	—
8 WAY Use with an 8-way wash head.	12 WAY Use with a 12-way wash head.
PLATE All selected rows are washed once, the instrument waits during the PAUSE setting, and the following wash cycle is started.	STRIP Each row is washed the set number of times (WASHES). The PAUSE setting is between each row.
STEPOFF The plate carrier will only pass over the selected rows. With this selection, the plate processing times are kept to a minimum.	STEPOVR The plate carrier will pass over all the rows, not washing the rows not selected. With this selection, the time used for each plate remains constant.
WASHLO The wash head fills the well while rising from the bottom of the well.	WASHHI The wash head fills the well from the raised position.
WET The plate will remain filled after washing. Use this setting with soak period.	DRY The plate will be aspirated after washing.
F WET The plate will remain filled after the final wash.	F DRY The plate will be aspirated after the final wash.

F1 OFF – FINAL X1 and F2 OFF – FINAL X2

Table 6.2 Number of washes after a soak period

Settings		Number of washes
F1 OFF	F2 OFF	0
FINAL X1	F2 OFF	1
F1 OFF	FINAL X2	2
FINAL X1	FINAL X2	3

PLATE – STRIP and WET – DRY

Table 6.3 Aspiration after the final wash

Settings		
PLATE	WET	No aspiration (wells filled)
PLATE	DRY	All rows aspirated after the final wash
STRIP	WET	No aspiration (wells filled)
STRIP	DRY	Each row aspirated after its final wash

6.5.2 Rotary switch functions

SOAK

Set the soak period (Table 6.4), which commences after all the presoak wash routines (WASHES) are complete. Make sure you have selected WET.

Table 6.4 Soak period (in minutes)

Setting	0	1	2	3	4	5	6	7
Soak time (minutes)	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5

Setting	8	9	A	B	C	D	E	F
Soak time (minutes)	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0

PAUSE

Set the pause between each wash cycle (Table 6.5). During the strip wash mode, the pause is between each row. During the plate wash mode, the pause is between each pass over the plate.

Note: The times currently available are subject to approval and may be altered to suit individual customer requirements.

Table 6.5 Pause (in seconds) between each washing cycle

Setting	0	1	2	3	4	5	6	7
Strip wash mode (seconds)	0	1	2	3	4	5	6	7
Plate wash mode (seconds)	0	5	10	15	20	25	30	40

Setting	8	9	A	B	C	D	E	F
Strip wash mode (seconds)	8	9	10	15	20	30	45	60
Plate wash mode (seconds)	50	60	75	85	105	120	180	240

WASHES

Set the number of washes to be performed before a soak period (Table 6.6).

Table 6.6 Number of washes before soaking

Setting	0	1	2	3	4	5	6	7
Number of washes	0*)	1	2	3	4	5	6	7

Setting	8	9	A	B	C	D	E	F
Number of washes	8	9	10	11	12	13	14	15

*) No wash, only aspirate

VOLUME

Set the volume dispensed during washing (Table 6.7).

Table 6.7 Washing volume (in µl)

Setting	0	1	2	3	4	5	6	7
Washing volume (µl)	0	50	100	150	200	250	300	350

Setting	8	9	A	B	C	D	E	F
Washing volume (µl)	400	450	500	550	600	650	700	750

Note: The dispense volume is less than the wash volume to avoid overfilling the wells.

6.6 Resetting

If you press the RESET button on the keypad at any stage, this will stop the immediate washing sequence and reset the system to its pre-programmed state.

6.7 Shutdown procedure

Warning: Remove any microplate still on the plate carrier. Dispose of all microplates and strips as biohazardous waste.

The wash reagents may contain buffer salts, which can crystallize when the washer is not in use. This may cause clogging of the wash/aspirate tips. To avoid this, the following procedures should be followed.

6.7.1 Daily shutdown procedure

When the last wash cycle of the day is complete, switch the power OFF through the switch at the rear of the pump unit. Fill the priming reservoir of the plate carrier with distilled water and lower the wash head tips into the priming reservoir. Do not detach the tubes unless you first open the wash bottle cap slightly to release the pressure.

Wipe the instrument surfaces with a soft cloth or tissue paper moistened with deionized distilled aqua, a mild detergent (SDS, sodium dodecyl sulfate) or soap solution.

If you have spilt infectious agents on the instrument, disinfect with 70% alcohol or other disinfectant. See the Wellwash 4 Mk 2 User Manual, Section 7.3.

Last of all, put the dust cover on.

6.7.2 Long-period shutdown

If the washer is not likely to be used for a long period, you should flush the system through with distilled water prior to carrying out the DAILY shutdown procedure. Empty and clean the waste bottle and check that the liquid trap is dry.

When the washer is to be used after a prolonged shutdown, you should prime the system (Section 6.3) at least four (4) times prior to carrying out any wash function.

6.8 Emergency situations

In case there is any abnormal situation during operation, such as fluids spilling inside the instrument, follow these steps:

1. Switch OFF the instrument.
2. Unplug the instrument from the mains.
3. Perform appropriate corrective actions. However, do not touch the interior of the instrument.
4. Contact authorized technical service or your local Thermo Fisher Scientific representative.

7 Maintenance

7.1 Regular and preventive maintenance

7.1.1 Service contracts

It is strongly recommended that this instrument be regularly maintained and serviced every twelve (12) months on a contract basis by trained service engineers of the manufacturer. This will ensure that the product is properly maintained and that it gives trouble-free service. For more details, contact Thermo Fisher Scientific's service department.

7.1.2 Maintenance check list

The check list below contains a recommended maintenance schedule .

Table 7.1 Maintenance check list

Item	As required	Daily	Weekly	Monthly	Yearly
Wipe the case of the instrument.		●			
Cover the instrument with the dust cover after use.		●			
Clean the instrument and the keyboard with a cloth dampened with mild detergent, followed by deionized distilled aqua. See Sections 7.1.3 and 7.1.4			●		
Check the condition of the tubing and the wash and waste bottles. See Sections 7.1.5 and 7.1.6		●			
Check the pinch valve. See Section 7.1.8.		●			
Unclog the wash head tips. See Section 7.1.9.	●				
Change the fuses when blown. See Section 7.1.10.	●				
 Decontaminate the instrument if any biohazardous material has been spilled on it or when shipping it to service. See Section 7.3.	●				
Perform the operational check regularly. See Section 5.4.				●	
Arrange for the yearly servicing of the instrument (Section 7.1.1 above).					●

7.1.3 General

Routine and service procedures must be performed by the user to prevent unnecessary wear or hazards and are described below at the frequency with which they should be applied.

For reliable daily operation, keep the instrument free of dust and spills from liquids. It is also advisable to cover the instrument with the dust cover supplied when not in use. In the event of any damage, contact your local Thermo Fisher Scientific representative for service.

Abrasive cleaning agents are not recommended, because they are likely to damage the paint finish.

It is recommended that you clean the case of the instrument periodically to maintain its good appearance. A soft cloth dampened in a warm, mild detergent solution will be sufficient.

Caution: Painted surfaces can be cleaned with most laboratory detergents. Dilute the cleaning agent as recommended by the manufacturer. DO NOT expose painted surfaces to concentrated acids or alcohols for prolonged periods of time as damage may occur.

Clean the keypad with a mild laboratory detergent.

Plastic covers and surfaces can be cleaned with a mild laboratory detergent or alcohol.

Warning: If any surfaces have been contaminated with biohazardous material, a mild sterilizing solution should be used. See Section 7.3.

Warning: If, for any reason, you need to move the instrument, release first the pressure from the tubing by slightly opening the bottle cap. Let the hissing sound end and then detach the yellow and blue coded tubes from the instrument.

7.1.4 Immediate

Although the Wellwash 4 Mk 2 is constructed from high-quality materials, you must immediately wipe away spilled saline solutions, solvents, acids or alkaline solutions from outer surfaces to prevent damage and wipe with deionized distilled aqua.

Spillages of liquid on the carrier slideway should be wiped off promptly, as this may cause the plate carrier to drag during operation.

Caution: DO NOT use any solutions containing hypochlorite, such as bleach, on any of the stainless steel surfaces, as this may cause permanent damage to the finish.

7.1.5 Tubing

Inspect the condition of the tubing regularly. When you notice that a tube is becoming harder and it is no longer clear, it should be replaced. Only use tubing supplied by Thermo Fisher Scientific Oy. The instrument is supplied with spare tubes (Fig. 5.2). See Chapter 10 Ordering Information.

Warning: Never detach a tube without first releasing the pressure by slightly opening the bottle cap. Let the hissing sound end prior to detaching any of the tubes.

7.1.6 Reagent / waste bottles

Due to the nature of the materials used for the manufacture of our reservoir bottles, our suppliers have recommended that they be replaced after two years of use. This replacement policy must be more frequent if the bottles are stored or used in direct sunlight for long periods of time.

Thermo Fisher Scientific Oy is aware of a potential risk of leakage in the pressure bottles when they have been subjected to long periods of UV radiation. Although

this occurrence is very rare, our customers are urged to follow this piece of advice.

Bottles are available from Thermo Fisher Scientific Oy for the Wellwash 4 Mk 2 (Cat. no. WW934/1). Spare O rings for the bottle plugs are included in the spare parts bag delivered with the instrument (see Fig. 5.1, item 6). See Chapter 10 Ordering Information.

Ensure that the waste bottle is emptied regularly and at least every time the wash bottle is filled. Do not let the liquid level exceed the level mark on the bottle.

The waste bottle is fitted with a liquid level sensor. The sensor prevents the use of the instrument after the waste bottle is filled to the mark.

7.1.7 Liquid trap bottle

The liquid trap bottle prevents liquid from entering the pump and **it should be kept dry at all times**. Liquid should enter the liquid trap bottle only if the liquid level sensor is not properly connected (Fig. 7.1, item 1) and the waste bottle overflows. If that happens, follow immediately the steps below:

1. Switch OFF the instrument and make sure there is no pressure in the wash bottle by opening the wash bottle cap slightly.
2. Open the black screw on the cap of the liquid trap bottle cover (Fig. 7.1, item 2).

1. Liquid level sensor
2. Liquid trap bottle cover screw

Fig. 7.1 Liquid level sensor and liquid trap bottle cover

3. Release the cover by slightly lifting the tube and slide the cover then upwards along the tube (Fig. 7.2)

Fig. 7.2 Opening the liquid trap bottle cover

4. Pull the thick vacuum tube (with the 90° angle) out of the liquid trap bottle.

Fig. 7.3 Pulling the thick tube out of the liquid trap bottle

5. Pull the thin tube out of the liquid trap bottle.

Fig. 7.4 Pulling the thin tube out of the liquid trap bottle

6. Let the red-coded tube remain connected to the bottle cap and take the bottle out, unscrew the liquid trap bottle cap and empty the bottle.

Fig. 7.5 Opening the liquid trap bottle

7. Close the bottle. Make sure the end of the red-coded tube is about 2 cm deeper inside the bottle than the thin tube will be. Put the bottle back to its place, but don't push it yet all the way down.
8. Insert the thin tube back through the liquid trap bottle cap so that the mark on the tube (Fig. 7.4, item 1) is at the level of the cap.
9. Push the bottle all the way down. Push the thick vacuum tube as far as it goes. Its end should now be approximately at the same level as the red-coded tube's end.
10. Slide the cover back down and screw the black screw back on. You can pull the red-coded tube slightly out to make sure the cover is tightly on.

7.1.8 Pinch valve

Occasionally the tube passing through the pinch valve becomes permanently closed, i.e., it will not return to its normal shape when the valve opens while in use. This tends to occur after extended periods of non-operation.

Release the pressure in the tubing by opening the wash bottle cap slightly. To unpinch, locate the valve under the wash arm assembly. Press the black top of the valve to release the tube, and pull the tube gently through the pinch valve a few millimeters; the valve will now pinch into a new position. See Fig. 7.6.

Warning: Never press the black top of the pinch valve without first releasing the pressure by slightly opening the wash bottle cap. Let the hissing sound end prior to pushing the valve top.

Fig. 7.6 Unpinching the tube

If the washer is run now, the liquid will flow normally.

It may be necessary to replace the tube after extended periods of use due to fatigue. Use the spare tubes supplied with the instrument (Fig. 5.2, item 3).

1. Switch OFF the instrument and make sure there is no pressure in the wash bottle by opening the wash bottle cap slightly.
2. Press the black top of the valve to release the tube and slide the tube gently out of the pinch valve through the slit on the side.
3. Disconnect the tube from both ends and replace with a new one.
4. Press the black top of the valve and slide the new tube back into the valve through the slit. Make sure the tube is properly in place through the valve and is not pinched especially on the rear side of the valve.

7.1.9 Unclogging tips

The dispense/aspirate tips of the wash head may become clogged with salt deposits. To clear them, switch OFF the washer, lift up the wash arm assembly

and unclog the tips using the small de-clogging tool provided (see Fig. 7.7). Push the de-clogging tool into the thin metal tube.

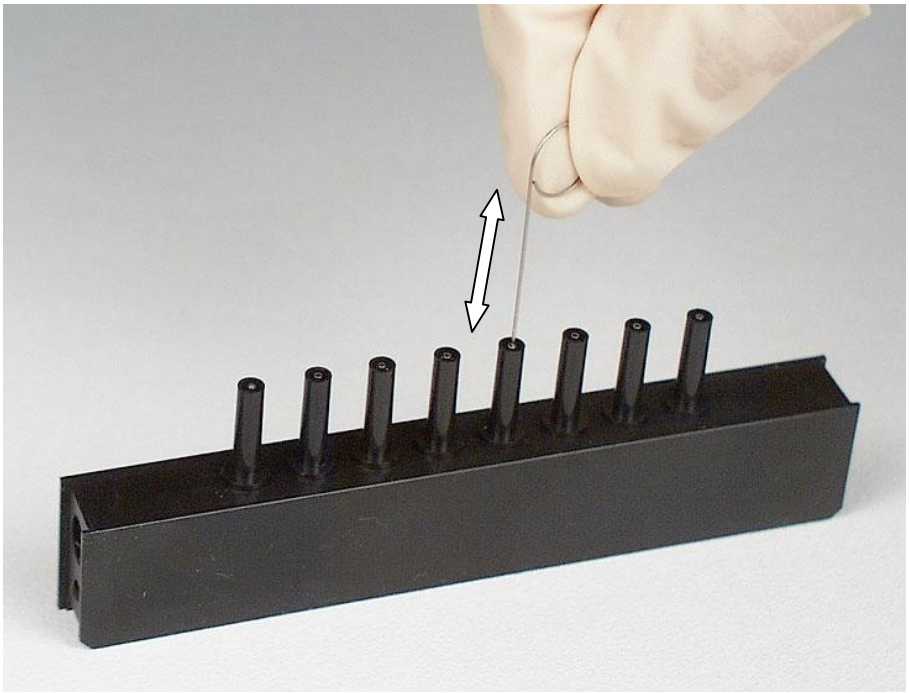


Fig. 7.7 De-clogging the wash head

7.1.10 Fuse replacement

1. Switch OFF the washer and disconnect the mains supply cable.
2. Slide the washer and pump units open, and disconnect the pressure and vacuum tubing from the washer unit.

Warning: Never disconnect the pressure tubing without first releasing the pressure by slightly opening the wash bottle cap. Let the hissing sound end prior to disconnecting the tubing.

3. Locate the fuse holders at the rear of the washer and pump units.
4. On the washer unit, use a screwdriver to remove the fuse holder cap. Turn the screwdriver counterclockwise about 45° to release it and then pull it out (Fig. 7.8).

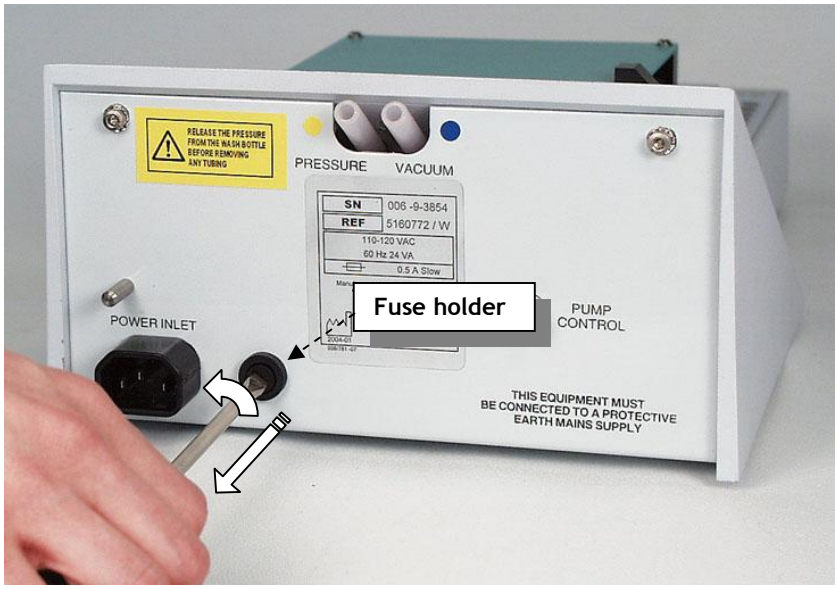


Fig. 7.8 Opening the fuse holder of the washer unit

5. Remove the faulty fuse and discard it.

Fig. 7.9 Washer unit fuse and fuse holder

6. Ensure that the replacement has the same rating as appears on the rating label on the rear panel of the washer unit. Only use fuses specified by Thermo Fisher Scientific Oy.
7. Insert the new fuse to the fuse holder and push the holder into its place. Turn the holder clockwise about 45° with the screwdriver.
8. On the pump unit, use the screwdriver to gently pry the fuse folder open.

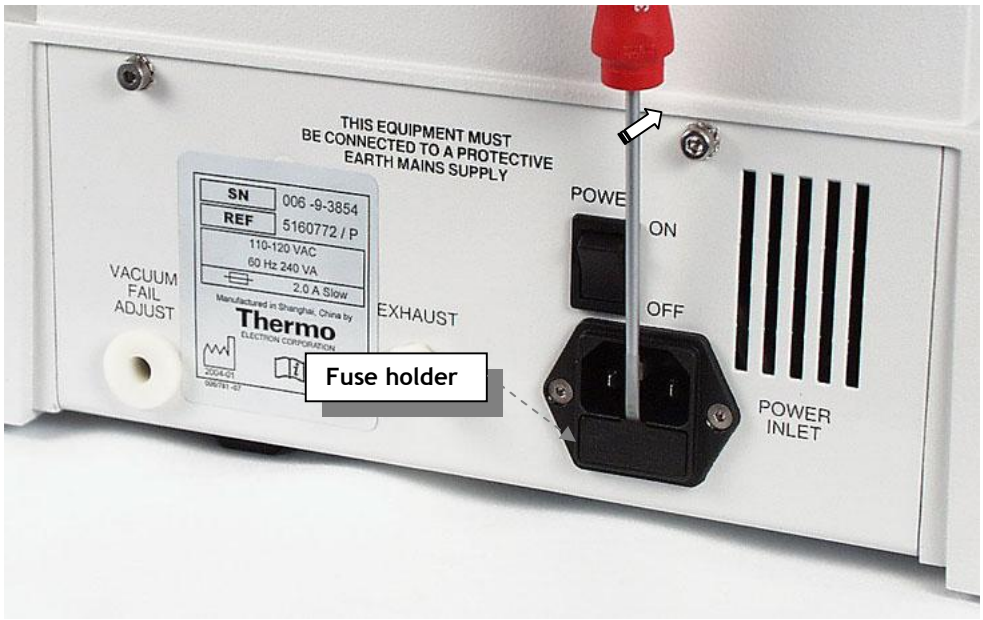


Fig. 7.10 Opening the fuse holder of the pump unit

9. There are two fuses inside the holder. The outer one is a spare fuse and the inner one is the one in use.

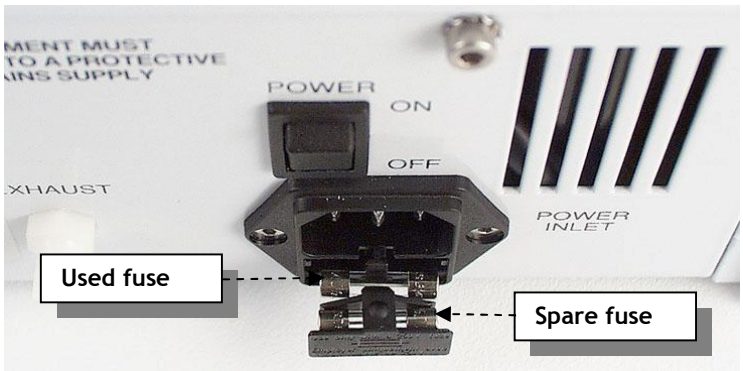


Fig. 7.11 Pump unit fuse holder opened

10. Remove the inner fuse and discard it.
11. Ensure that the replacement fuse have the same rating as appears on the rating label on the rear panel of the pump unit.
12. Insert the new fuse (the spare fuse) to the inner slot of the fuse holder and push the holder into its place.
13. Reconnect the tubing and the washer and pump units. Reconnect the instrument to the mains supply.

If the fuses blow again, contact authorized service. See Section 8.2.

Note: Ensure that only fuses with the required rated current and of the specified type are used for replacement. The use of makeshift fuses and the short-circuiting of fuse holders are prohibited.

7.2 Disposal of materials

When disposing of used material, follow the Good Laboratory Practices. Refer to local regulations for the disposal of infectious material.

Warning: The samples can be potentially infectious. Dispose of all used microplates, microstrips, disposable gloves, syringes, disposable tips, etc., as biohazardous waste.

7.3 Decontamination procedure

Decontamination should be performed in accordance with normal laboratory procedures. Any decontamination instructions provided with the reagents used should be followed.

A decontamination procedure is only recommendable when infectious substances have been in direct contact with any part(s) of the instrument.

If there is any risk of contamination with biohazardous material, the procedure recommended below or some other corresponding decontamination procedure must be performed.

It is strongly recommended that the complete decontamination procedure be performed before relocating the instrument from one laboratory to another. See Section 7.4 How to pack for service.

Decontamination is not required for the proper functioning of the instrument.

Example of decontaminants

- Ethanol 70%
- Virkon solution 1 – 3%
- Glutaraldehyde solution 4%
- Chloramine T
- Microcide SQ™ 1:64

Caution: If local or laboratory regulations prescribe regular decontamination, it is not advisable to use formaldehyde, since even small traces of formaldehyde affect the enzyme being used in EIA tests in a negative way resulting in bad test results.

Caution: Do not use sodium hypochlorite as a decontaminant. The wash head will be damaged by it.

Warning: Always use disposable gloves and protective clothing and operate in a well-ventilated area.

7.3.1 How to decontaminate the instrument

1. Prepare the decontaminant: e.g., 200 ml 10% formaldehyde solution, 1 – 3% Virkon solution or 200 ml 4% glutaraldehyde solution (or another agent recommended by your safety officer).
2. Prime the unit with distilled water from the wash bottle.

3. Lift the wash head and fill the prime tray with glutaraldehyde solution.
4. Aspirate the prime tray using the wash head, and then reprime the prime tray with distilled water.
5. Remove the plate carrier and the wash head and place into a glutaraldehyde solution for 24 hours.
6. Empty the fluid containers.
7. Switch OFF the power and disconnect the mains supply cable.
8. Decontaminate the outside of the unit using a wad of cotton wool soaked in 70% alcohol.
9. Place the entire instrument into a large plastic bag. Ensure that the reagent containers are disconnected and open.
10. Place a wad of cotton wool soaked in 10% formaldehyde solution into the bag. Ensure that the wad does not make contact with the instrument.
11. Close the bag firmly and leave the instrument in the bag for at least 24 hours.
12. Remove the instrument from the bag.
13. Clean the instrument using a mild detergent.
14. Remove any stains using 70% alcohol.
15. Take the plate carrier and the wash head out of the glutaraldehyde solution and rinse with distilled water. Reposition them on the unit.
16. Flush the fluid path of the instrument with deionized distilled aqua using the priming procedure.
17. The wash heads can be sterilized in 70% ethanol.
18. Also, wash and decontaminate the wash, rinse and waste bottles.

7.4 How to pack for service

When you ship the instrument for service, remember to:

- Inform about the use of hazardous materials.
- Decontaminate the instrument beforehand.
- Screw the transit screws into the bottom of the instrument to the correct shipment location.
- Pack the instrument according to the enclosed packing instructions (Section 7.4.1).
- Use the original packaging to ensure that no damage will occur to the instrument during shipping. Any damage will incur additional labor charges.
- Enclose a dated and signed Certificate of Decontamination (Appendix B) both inside and attached to the outside of the package, in which you return your instrument (or other items).
- Enclose the return authorization number (RGA) given by your Thermo Fisher Scientific representative.
- Indicate the fault after you have been in touch with your local Thermo Fisher Scientific representative or Thermo Fisher Scientific's service department.

See Section 9.1 for details on storage and transportation temperatures. See also Section 8.2 Service request protocol.

7.4.1 Packing

The Wellwash 4 Mk 2 comprises two units that are packed in a single box. For packing the washer and pump units, follow the procedure below:

1. Place the box on the floor and open the top. Put the bottom part of the package shock absorber at the bottom of the box.
2. Wrap the washer and pump units into plastic. Drop them into their own places onto the bottom part of the package shock absorber.
3. Put the top part of the package shock absorber into the box. Ensure correct positioning and the correct location for the manifold support piece.
4. Put the bottles into Minigrip plastic bags and drop them into their own locations in two corners of the box.
5. Put the two small carton boxes onto the top part of the package shock absorber. DO NOT place the small boxes on top of each other, but place them instead into their own specific locations.
6. Put the rest of the items (user manual, labels, notice, packing list, etc.) into a Minigrip plastic bag and place it into its own position on the top part of the package shock absorber.
7. Close and seal the box.

7.5 Disposal of the instrument

Warning: Decontaminate the instrument prior to disposal. See Section 7.3 and Appendix B on decontamination. Also, wash and decontaminate the bottles prior to disposal.

Dispose of the instrument according to the legislation stipulated by the local authorities concerning take-back of electronic equipment and waste. The proposals for the procedures vary by country.

Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State European Country, and this product should be disposed of or recycled through them. Further information on Thermo Fisher Scientific's compliance with these Directives, the recyclers in your country, and information on Thermo Fisher Scientific products which may assist the detection of substances subject to the RoHS Directive are available at www.thermo.com/WEEERoHS.

Regarding the original packaging and packing materials, use the recycling operators known to you.

For further information, contact your local Thermo Fisher Scientific representative.

8 Troubleshooting

Warning: DO NOT use the instrument if it appears that it does not function properly.

8.1 Troubleshooting guide

The problems covered below in Table 8.1 are considered as faults that require repair or corrective repair. If the installation procedure is carefully followed, no faults should arise. However, if problems occur or reoccur, contact authorized technical service immediately.

Table 8.1 Troubleshooting list

	Error	Cause	Action
1	No POWER ON indicator	Mains lead not connected	Connect the lead to an appropriate supply.
		Fuse blown	Replace the fuse.
		The pump unit POWER switch is OFF	Switch the POWER switch ON.
2	VAC FAIL illuminated	Wash bottle is full	Empty the waste bottle.
		Air leaks	Check the bottle caps for leaks and tighten as required.
		Constricted tubing	Check the tubing for kinks.
		Pump failure	Check that the pump unit is switched ON.
			Check that the pump unit is correctly connected to the washer unit.
			Check the pump unit fuse and replace it, if required.
3	Carrier does not move when START is pressed, audible warning sounds 3 times	Program card not inserted	Insert the program card (6.5).
		No row is selected	Select the row number of the last row to be washed.
4	No delivery of wash reagent into wells	Silicon tube in pinch valve constantly pinched	Push the pinch valve and pull the tubing through the valve and reform (7.1.5).
		Air leaks at the wash bottle cap	Tighten cap; replace gasket if necessary.
		Tubing leaks	Check the tubing and tube connectors.
5	Too small dispensing of wash reagent into wells	Constricted or clogged tubing	Check the tubing and tube connectors for kinks and obstacles.
6	Unequal dispensing or aspirating of wash reagent	Microplate incorrectly positioned on the plate carrier	Check and adjust the position of the plate carrier.
		Strips incorrectly installed in the holder	Check that the strips are correct and adjust as necessary.
		One or more dispense tips clogged	De-clog the washer tip(s) (7.1.9).
7	Overfilling of wells during washing	Wash head height requires adjustment	By using the spanners supplied, adjust the wash head height by loosening the locknut, lowering the domed nut and locking into position on the head lift rod (5.3.2).
		Air leaks at the waste bottle cap	Tighten cap; replace gasket if necessary.
8	Leakage between wash cycles	Pinch valve not functioning properly	Push the pinch valve and pull the tubing through the valve and reform (7.1.5).
9	Wash arm assembly not moving as it should		Contact authorized service.

10	Plate carrier not moving as it should	Obstacle on the plate carrier slideway	Keep the slideway clean.
11	Wash cycle does not correspond to the program card	Program card not inserted all the way Program card is dirty Program card is damaged	Push the program card all the way into the slot. Clean the program card. Replace the program card. Contact your local Thermo Fisher Scientific representative.
12	Instrument not functioning as it should		Press the RESET button. If that doesn't help, switch the instrument OFF and ON again. If the problem persists, contact authorized service. DO NOT use the instrument if it appears that it does not function properly.

If you were able to correct the error without having to turn off the instrument, you may continue instrument operation by pressing **start**.

8.2 Service request protocol

If the Wellwash 4 Mk 2 requires service, contact your local Thermo Fisher Scientific representative or Thermo Fisher Scientific's service department. DO NOT under any circumstances send the instrument for service without any prior contact. It is imperative to indicate the fault and nature of the required service. This will ensure a faster return of the instrument to the customer.

Your Thermo Fisher Scientific representative or distributor will take care of sending a complaint form (Complaint-order) to Thermo Fisher Scientific's service department. The Complaint-order contains a more detailed description of the fault, symptom or condition. Give all the necessary information to the distributor, who will fill in and forward the Complaint-order to Thermo Fisher Scientific's service department.

Check Section 7.4 How to pack for service. You will find instructions on how to proceed before shipping the instrument for service.

Check that any necessary decontamination procedure has been carried out before packing. See Section 7.3 Decontamination procedure. Ensure that the Certificate of Decontamination (see Appendix B) as well as the return authorization number (RGA) are sent with the instrument.

Thermo Fisher Scientific's service department will keep you up to date with the progress of service and provide you with any further details you might need, e.g., on maintenance, serviceability, troubleshooting and replacement.

8.3 Limitations, warnings and cautions

This instrument is designed to provide full user protection. When correctly installed, operated and maintained, it will present no hazard to the user.

The following recommendations are given for added user safety.

8.3.1 Liquid reservoir – IMPORTANT

Due to the nature of the materials used for the manufacture of our reservoir bottles, our suppliers have recommended that they are replaced after two years of use. This replacement policy must be more frequent if the bottles are stored or used in direct sunlight for long periods of time.

Thermo Fisher Scientific Oy is aware of a potential leak in the pressure bottles when they have been subjected to long periods of UV radiation. Although this occurrence is very rare, our customers are urged to follow this piece of advice.

Bottles are available from Thermo Fisher Scientific Oy for the Wellwash 4 Mk 2 (Cat. no. WW934/1). See Chapter 10 Ordering Information.

8.3.2 Electrical

Ensure that the mains supply cable supplied with the unit is always used. **If a correct type of mains cable is not provided, use only cables certified by the local authorities.**

The mains plug should only be inserted into a socket outlet provided with a protective ground contact. The protective action must not be negated by use of an extension cable without a protective ground wire.

Warning: DO NOT replace fuses without first disconnecting the mains supply cable. Only use fuses specified by Thermo Fisher Scientific Oy.

Ensure that only fuses with the required rated current and of the specified type are used for replacement. The use of makeshift fuses and the short-circuiting of fuse holders are prohibited.

Warning: When the instrument is connected to the mains supply, the opening of covers or the removal of components is likely to expose live parts. Before the instrument is opened for any adjustment, replacement, maintenance or repair, disconnect it from all voltage sources by disconnecting the mains supply cable.

Any adjustment, maintenance or repair of the opened instrument under voltage should be avoided, if possible, but, if unavoidable, should be carried out only by a skilled technician aware of the hazard.

The same precautions applicable when using any electrical equipment should naturally be observed with this instrument. DO NOT touch switches or electrical outlets with wet hands. Switch the instrument OFF before disconnecting it from the mains supply.

8.3.3 Mechanical and environmental

Mechanical

The wash head is a free-moving mechanical device controlled by the instrument and not directly by the operator. It is designed for "hands-off" operation and should be used as such. Never reach into the workspace while the instrument is performing a wash cycle. If it is necessary to stop the operation of the equipment, press the RESET button on the keypad.

Never open the wash bottle, detach any of the tubing or press the black top of the pinch valve without first releasing the pressure by slightly opening the bottle cap. Let the hissing sound end prior to proceeding.

Environmental

Infectious clinical samples and corrosive fluids are commonly used with this equipment. The "hands-off" nature of the system allows the user to wash the reaction wells without getting into direct contact with these fluids. However, wells that have been in contact with potentially hazardous fluids must be handled before and after the wash process, and this should be done with utmost care. Hand and eye protections should always be worn as well as corrosive resistant laboratory coats.

If you are using a washing reagent that is either volatile or easily splashing, or when you are washing microplates with samples of human or animal origin, keep yourself at a safe distance from the instrument while it is operating to avoid exposure. Place the instrument into a fume hood.

When spills get into contact with the carrier slideway, it should be decontaminated with a hard surface disinfectant (see Section 7.3).

Observe Good Laboratory Practices (GLP) when handling potentially hazardous samples.

8.4 Defects and abnormal stresses

Whenever it is likely that the protection has been impaired, the instrument should be made inoperative and be secured against any unintended operation.

The protection is likely to be impaired if, for example, the instrument:

1. Shows any visible damage
2. Fails to perform the intended functions
3. Has been subjected to prolonged storage under unfavorable conditions
4. Has been subjected to severe transport stresses

8.5 Before operation

Read this manual in its entirety, as it contains information necessary to ensure safe operation.

8.5.1 Installation

The instrument should be unpacked and installed in accordance with Chapter 5. Particular attention should be paid to the correct fitting of the tubing to obviate leaks (Fig. 5.11). Always ensure that the electrical supply in the laboratory conforms to that specified on the voltage label on the rear panel of the pump unit.

8.5.2 In operation

Ensure that the waste bottle is emptied regularly and at least every time that a wash bottle is loaded. The liquid trap bottle that prevents liquid from entering the pump should be kept dry at all times.

8.6 Cleanliness

Clean the instrument regularly as stated below.

1. It is recommended that the case of the instrument is cleaned periodically to maintain its good appearance. It is particularly essential that the carrier slideway be clean and dry to prevent jamming. A soft cloth dampened in warm, mild detergent solution will suffice.

2. If any surfaces have been contaminated with biohazardous material, a mild sterilizing solution should be used. See Section 7.3 Decontamination procedure.

Caution: DO NOT use any solutions containing hypochlorite, such as bleach, on any of the stainless steel surfaces, as this may cause permanent damage to the finish.

9 Technical Specifications

9.1 General specifications

General specifications			
Overall dimensions	**Washer unit** 41 cm x 22 cm x 12 cm [16.1" x 8.7" x 4.7"]	**Pump unit** 30 cm x 18 cm x 16 cm [11.8" x 7.1" x 6.3"]	
Weight	**Washer unit** 4.5 kg [10 lbs.]	**Pump unit** 5.5 kg [12 lbs.]	**Total** 10 kg [22 lbs.]
Mains power supply	220 – 240 Vac, 50 Hz 110 – 120 Vac, 60 Hz 100 Vac, 50/60 Hz		
Power consumption	300 VA		
Heat dissipation	1024 BTU		
Operating cycle	Continuous		
Fuse requirements	**220/240 Vac 50 Hz**	**100/110/120 Vac**	
Washer unit:	2 x 0.5 A/250 V UL 198G Time Delay	2 x 0.5 A/250 V UL 198G Time Delay	
Pump unit:	2 x 1.0 A/250 V UL 198G Time Delay	2 x 2.0 A/250 V UL 198G Time Delay	
Operating conditions	**Indoor use**		
Temperature	Operating range+5°C to +40°C		
	Full specification range	+15°C to +25°C	
	Storage temperature range	-10°C to +70°C, packed in transport packaging	
	Transport temperature range	-40°C to +70°C, packed in transport packaging	
Relative humidity	90% max. non-condensing		
Pressure	Max. pressure on vessel	7 psi (0.5 bar) (self-limiting)	
Plate type	96-well plate		
Containers	Material: HDPE (high density polyethylene)		
	Wash bottle capacity	2 liters	
	Waste bottle capacity	2 liters	
	Additional wash bottle capacity	2 liters	
Fluid consumption	Wash fluid consumption	approx. 150 ml/complete microplate	
	Priming consumption	approx. 15 – 20 ml	
Residual aspiration volume	< 5 µl per well, using 0.02% Tween solution		
Dispensing precision	5%, using 0.02% Tween solution		
Wash heads	8-way and 12-way Material: POM (polyoxymethylene, polyacetals)		
Wash program cards	1 – 4 washes		
Programmable card	Volume	0 – 750 µl	
	Washes	1 – 15	
	Soak time	0 – 10 minutes	
	Pause	0 – 4 minutes	
Wash time	120 s, 3 x 350 µl with 12-way wash head 165 s, 3 x 350 µl with 8-way wash head		

9.2 Safety specifications

Safety performance:
EN 61010-1:1993 + A2:1995/IEC 61010-1:1990 + A1:1992 + A2:1995, including CENELEC Common Modifications, US and CA National differences
EN 61010-1:2001 (Ed. 2)

9.3 In conformity with the requirements

Wellwash 4 Mk 2 bears the following markings:
Type 006
100 – 120 Vac, 200 – 240 Vac 50/60 Hz, 300 VA
CE mark

Wellwash 4 Mk 2 conforms to the following requirements:
2006/95/EC (Low Voltage Directive)
2004/108/EC (Electromagnetic Compatibility Directive, EMC)
FCC Part 15, Subpart B/Class B
2002/96/EC (Waste of Electrical and Electronic Equipment)

EMC performance:	
EN 50081-1:1992	Generic emission standard. Residential, commercial and light industry.
EN 50082-1:1997	Generic immunity standard. Residential, commercial and light industry.
EN 61326-1:1997 + A1:1998	Product family standard.

10 Ordering Information

Contact your local Thermo Fisher Scientific representative for ordering and service information.

Code	Instrument
5160770	Wellwash 4 Mk 2 220 – 240 V AC/50 Hz
5160772	Wellwash 4 Mk 2 110 – 120 V AC/60 Hz

10.1 List of accessories

Code	Product
N03283	2 l wash bottle
1514313	2 l waste bottle
WW004/1	12-way wash head
WW004/11	8-way wash head
WW004/48	Wash height adapter

10.2 List of recommended spare parts

Code	Product
006/612; 006/613; 006/613J	Spare parts bag for 220 V; (see Fig. 5.1) Spare parts bag for 110 V; Spare parts bag for 100 V
004/023D	Spare tubes bag (see Fig. 5.2)
1210840; 1210890; 1210920	Spare fuses 0.5 A; Spare fuses 1 A (for 220 V); Spare fuses 2 A (for 100 V and 110 V)

11 Warranty Certificate

Thermo Fisher Scientific Microplate Instrumentation Business's Wellwash 4Mk2 is fully guaranteed against defective parts and materials including defects caused by poor workmanship for a period of twelve (12) months from the date of delivery.

Thermo Fisher Scientific will repair or replace defective parts or materials during the term of warranty at no extra charge for materials and labor provided that the products were used and maintained in accordance with Thermo Fisher Scientific's instructions. Warranty is invalid if products have been misused or abused.

For this warranty to be effective, the product must have been purchased either directly from Thermo Fisher Scientific or from an authorized Thermo Fisher Scientific distributor. The guarantee is not transferable to a third party without prior written approval from Thermo Fisher Scientific.

This guarantee is subject to the following exclusions:

- Any defects caused by normal wear and tear.
- Defects caused by fire, lightning, flood, earthquake, explosion, sabotage, war, riot or any other occurrence of the character listed above.
- Refurbished products, which are subject to different warranty conditions.

THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The seller is not liable for any loss or damage arising out of or in connection with the use of the product or other indirect damages.

Full warranty terms and conditions can be obtained from your local Thermo Fisher Scientific dealer.

This document acts as warranty certificate.

11.1 Warranty limitations

Consumables are not included in the warranty.

12 Index

13 Glossary and Abbreviations

EIA	Enzyme immunoassay. An immunoassay using a color-changing enzyme-substrate system for indicating results. A diagnostic test method to measure or detect a substance using antibody-antigen reactions.
EN	European Norm.
EU	European Union.
IEC	International Electrotechnical Commission.
Microplate	A rigid or framed polystyrene plate with microwells in different well formats (e.g., 6, 12, 24, 48, 96, 384, 864, etc., wells) for ease of use in performing multiple tests through techniques such as EIA or ELISA.
Priming	Completely filling the pump tubing and syringe with bubble-free fluid to allow sustained, reproducible pumping action. The air in an unprimed line acts as a spring, adversely affecting accuracy and precision.
Reagent	A substance or solution used to produce a characteristic chemical reaction in a sample that allows an analyte to be detected and measured.
RS-232C	EIA approved standard used in serial data transmission, covering voltage and control signals. The data is transferred serially (one digital bit at a time) via one path, but some control signals can be transferred simultaneously via parallel paths.

13.1 Keywords for web pages

EIA
ELISA
enzyme immunoassay
liquid handling
microplate
microplate washing
Microtiter plate
microwell plate
plate
sandwich assay
separation technique(s)
sandwich assay
solid phase assays
Thermo Scientific
Thermo Fisher Scientific
washing

13.2 Literature

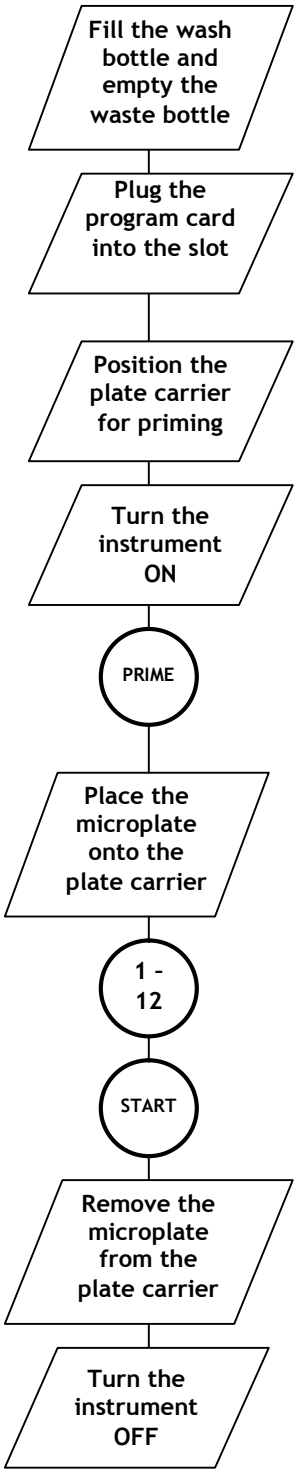
Newman, D.J. and C.P. Price (1997) Separation Techniques. In: Principles and Practice of Immunoassay 2nd ed. (eds. Price, C.P. and Newman, D.J.) pp. 154 – 172 (Stockton Press, New York)

Coupe, N.B. and A.M. Cain. Microplate washing – the most important step in the ELISA process. Labsystems-Denley application note.

Beumer T., Stoffelen, E., Smits, J. and Carpay, W. (1992). Microplate washing: process description and improvements. J. Immunol. Methods **154**, 77 – 87.

Parry, J.V., Mortimer, P.P., Friederich, P. and Connell, J.A. (1997). Faulty washers and soiled micropipettors may generate false positive serological results. Clinical and Diagnostic Virology **7**, 173 – 181.

Appendix A: Wellwash 4 Mk 2 Quick Reference Guide



Ensure that the instrument is switched OFF.

Open the wash bottle cap (Fig. 6.1) very carefully to release any residual pressure. Let the hissing sound end prior to opening the cap all the way. Fill the wash bottle with appropriate washing reagent and tighten the bottle cap firmly (Fig. 5.12).

Select either one of the preprogrammed wash cards or the programmable switch card (Section 6.5).

Before inserting any program card, ensure that it is clean and dry. Wiping the surfaces with a soft dry cloth will suffice. If any liquid is present on the card, a malfunction of the program may occur.

Position the plate carrier on its slideway with the priming reservoir to the rear under the wash head (see Fig. 5.13).

The POWER indicator on the keypad (Fig. 4.2) illuminates and a countdown sequence will begin on the row indicator LEDs.

The PRIME indicator flashes until you prime the system.

The priming function is complete when the PRIME indicator turns OFF.

If no further key entry is made within fifteen seconds of priming, then the pump will automatically switch OFF. The instrument will then enter the idle state, waiting for instructions from the keypad and program card.

Check that the correct wash head (8-way or 12-way) is fitted.

Check that the plate is placed properly onto the plate carrier (Fig. 5.16).

Select the row number of the last row to be washed. If no row is selected, the whole plate will be washed.

The instrument performs the wash sequence.

Appendix B: Certificate of Decontamination

The decontamination procedure is required prior to shipping the instrument to Thermo Fisher Scientific Oy, e.g., for repair. If, for any reason, the instrument is shipped back to Thermo Fisher Scientific Oy, it must be accompanied by a dated and signed Certificate of Decontamination, which must be attached to the outside of the package containing the instrument. See Section 7.3 Decontamination procedure.

Failure to confirm decontamination will incur additional labor charges or at worst the items will be returned for proper cleaning.

Before returning any instrument(s) or item(s), ensure that they are fully decontaminated. Confirm A or B status:

Name: _____

Address: _____

Tel./Fax: _____

Name: _____ Serial no.: _____

A)
I confirm that the returned items have not been contaminated by body fluids, toxic, carcinogenic or radioactive materials or any other hazardous materials.

B)
I confirm that the returned items have been decontaminated and can be handled without exposing the personnel to health hazards.

Materials used in the unit: Chemicals + Biological • Radioactive *)

Specific information about contaminants: _____

Decontamination procedure[1]: _____

Date and place: _____

Signature: _____

Name (block capitals): _____

*) The signature of a Radiation Safety Officer is also required when the unit has been used with radioactive materials.

This unit is certified by the undersigned to be free of radioactive contamination.

Date and place: _____

Signature: _____

Name (block capitals): _____

[1] Please include decontaminating solution used.

Please send to Thermo Fisher Scientific Oy
Fax: +358-9-32910415

Appendix C: Wellwash 4 Mk 2 Feedback Form

Cat. no.	Serial no.
PURCHASED BY	**PURCHASED FROM**
Company/Organization	Distributor
Department	
Address	Address
Tel.	Tel.
Fax	Date of delivery
Internet home page	
Date of purchase	
Your research area	
Dr. ☐ Mr. ☐ Mrs. ☐ Ms. ☐ Job title/Position	
Surname (block capitals)	First name (block capitals)
Internet e-mail address	

	Excellent	Above expectations	As expected	Below expectations	Comments
Reagent kit/Instructions	☐	☐	☐	☐	
Instrument/User manual	☐	☐	☐	☐	
Operational reliability	☐	☐	☐	☐	
Design	☐	☐	☐	☐	
Ease of use	☐	☐	☐	☐	
Operational costs	☐	☐	☐	☐	
Customer support	☐	☐	☐	☐	

Further instrument/system developments desired:

Further applications desired:

Where did you first learn about the product?

Would you like to receive information about other Thermo Fisher Scientific products?

Appendix D: Addresses

For the latest information on products and services, visit our worldwide web sites on the Internet at:

http://www.thermo.com

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Distributed by:

Notes

Notes

Notes