Thermo Scientific

King Fisher Flex

User Manual

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For Laboratory Use

thermo scientific

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For descriptions of symbols on product labels or product documents, go to thermofisher.com/symbols-definition.

The information in this guide is subject to change without notice.

Revision history

Revision	Date	Description
B.0	April 2021	Change of template. Updates on display functions.

About This User Manual

Intended use

This user manual is written for the actual end user, for example, research scientist or laboratory technician, and provides information on the Thermo Scientific™ KingFisher™ Flex, including the installation and operating instructions.

Read the manual in its entirety before operating the instrument.

How to use this user manual

This user manual is designed to give you the information to:

- Review safety precautions
- Install the KingFisher Flex
- Use the KingFisher Flex in routine jobs – the processing step
- Perform basic cleaning and maintenance procedures
- Troubleshoot the instrument performance

This user manual also describes all the features and specifications of the KingFisher Flex hardware and onboard software. Refer to Chapter Technical specifications.

In Chapter Routine operation you find explanations of the processing principles and procedures and on how to use the KingFisher Flex internal software.

In Chapter Troubleshooting guide you find explanations of error and warning messages and a problem-solving guide. The user should be familiar with the contents of Chapter Maintenance. For ordering information, refer to Chapter Ordering information.

For more information

For PC software-related issues, refer to the Thermo Scientific™ *BindIt™ Software User Manual* (N07974).

For the latest information on products and services, visit our websites at:

http://www.thermoscientific.com

http://www.thermoscientific.com/kingfisher

http://www.unitylabservices.com

In our efforts to provide useful and appropriate documentation, we appreciate your comments on this user manual to your local Thermo Fisher Scientific representative.

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 KingFisher Flex

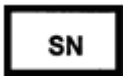
These symbols and markings appear on the type label and the instrument itself.

Power ON

Power OFF

Warning Hot surface, risk of burns.

Warning Risk of body parts, hair, jewelry or clothing getting caught in a moving part.



Serial number

Catalog number

Date of manufacture

Consult instructions for use

WEEE symbol This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EC.

A black label with this text (Figure 4)

WARNING: DISCONNECT SUPPLY BEFORE SERVICING

AVERTISSEMENT: COUPER L'ALIMENTATION AVANT L'ENTRETIEN ET LE DEPANNAGE

Warnings and other markings used in documentation

These symbols and markings appear in this user manual.

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.

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

Instrument safety and guidelines for use

- Always obey basic safety precautions when using the KingFisher Flex to reduce the risk of injury, biohazardous contamination, fire, or electric shock.
- Read this user manual in its entirety prior to operating the instrument. Failure to read, understand, and obey the instructions in the manual may result in damage to the instrument, injury to laboratory and operating personnel or poor instrument performance.
- Observe all “Warning”, “Caution”, and “Note” statements as well as safety symbols and markings on the instrument and in the documentation.
- The device shall be operated only with software specifically designed for the device.
- Never open any other covers of the KingFisher Flex than the transparent lid or the sliding door (Figure 3) while the instrument is plugged into a power source.
- Never force a microplate onto the instrument.
- The KingFisher Flex is intended for laboratory use only. Observe proper laboratory safety precautions, such as wearing protective clothing and obeying approved laboratory safety procedures.

- Preventive maintenance instructions should be obeyed closely to keep the instrument in the best condition for maximum reliability. A poorly maintained instrument will not give the best results.

Warning This product contains very strong permanent magnets. People wearing a pacemaker or metallic prostheses should not use this product. A pacemaker or prostheses may be affected or damaged if it comes in close contact with a strong magnetic field.

Warning If the device is not used according to manufacturer's instructions the protection provided by the device cannot be guaranteed.

Contents

Chapter 1
Introduction to the KingFisher Flex

Intended use

The Thermo Scientific™ KingFisher™ Flex magnetic particle processor is intended for professional laboratory use by trained personnel. The instrument is intended for automated transfer and processing of magnetic particles in a microplate scale. Use for self-testing is excluded. It is recommended that Good Laboratory Practice (GLP) is obeyed to guarantee reliable analyses.

Refer to Chapter 6.

Principle of operation

The KingFisher Flex magnetic particle processor is designed for automated transfer and processing of magnetic particles in microplate format.

The patented technology of the KingFisher Flex system is based on the use of magnetic rods covered with a disposable, specially designed tip comb and plates. The instrument functions without any dispensing or aspiration parts or devices.

Before the run, samples and reagents, including magnetic particles, are dispensed manually into the plates according to the corresponding instructions. The protocol that is selected by the user via the keypad and display has already been preloaded into the onboard software. Thermo Scientific™ BindIt™ Software can be used to create and run protocols.

Figure 1. KingFisher Flex magnetic particle processor

Advantages of using KingFisher Flex

The KingFisher Flex magnetic particle processor has several operational advantages:

- Enables automation of complicated manual steps
- Enables simultaneous processing and purification
- Binding and elution are enhanced due to the heating option
- Enables concentration of the sample during processing
- Facilitates a good collection of bead-bound sample due to the efficiency of the magnet
- Enables a quicker reaction and a more efficient wash due to the technology of moving magnetic particles instead of liquids
- No carryover
- No cross-contamination
- Facilitates the whole processing with the aid of an internal program/BindIt Software.

Chapter 2
Functional description

Instrument layout

This section shows the front, back and side views of the KingFisher Flex instrument.

Front view

The front views of the KingFisher Flex instrument are shown in Figure 2 and Figure 3.

Figure 2. KingFisher Flex front view without transparent lid

1	Loading station	5	Interchangeable KingFisher Flex head
2	Keypad	6	Shield plate
3	Display	7	Plate station (1-8)
4	Heating block	8	Turntable

Figure 3. KingFisher Flex front view with transparent lid and plates

1. Transparent lid
2. Sliding door (open)

Back / side view

The back view of the KingFisher Flex instrument is shown in Figure 4 and the side view in Figure 5.

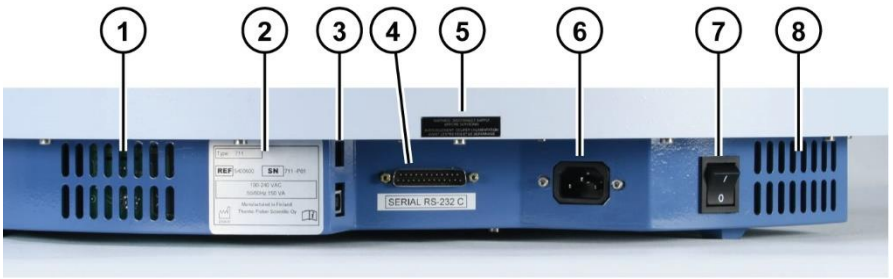


Figure 4. KingFisher Flex back view

1	Cooling air inlet	5	Warning marking
2	Type label	6	Mains power supply connector
3	USB port	7	ON/OFF switch
4	Serial port RS-232C	8	Cooling air outlet

Figure 5. KingFisher Flex side view

KingFisher Flex magnetic particle processor

The KingFisher Flex (Figure 6) has room for eight plates. The tip combs are compatible with the plates. During the individual steps, the plates are kept stationary, and the only moving assembly is the processing head with tip comb and magnetic rods. The head consists of two vertically moving platforms. One is needed for the magnetic rods (24 or 96 pieces) and the other one for the plastic tip comb.

Up to eight plates can be simultaneously on the turntable. However, during one sample processing, the protocol enables the use of more than eight plates in total. One tip comb contains 24 or 96 tips used for processing 24 or 96 samples at a time.

Before starting the magnetic particle processing via the keypad and display, the samples and reagents are dispensed into the plates and the tip comb is placed onto a KingFisher plate, from which it is automatically loaded. The plates are placed onto the turntable into the corresponding plate stations according to the protocol instructions. During the operation, the sliding door can be closed or open (Figure 3) or the whole transparent lid can be absent. The closed door protects the processing against environmental contamination.

The operating principle employed is MPP (inverse magnetic particle processing) technology (Figure 7). Rather than moving the liquids, the magnetic particles are moved from plate to plate containing specific reagents, in contrast to the external magnet method. Magnetic particles are transferred with the aid of magnetic rods covered with a disposable, specially designed plastic tip comb.

Figure 6. KingFisher Flex magnetic particle processor

Principle of magnetic particle processing

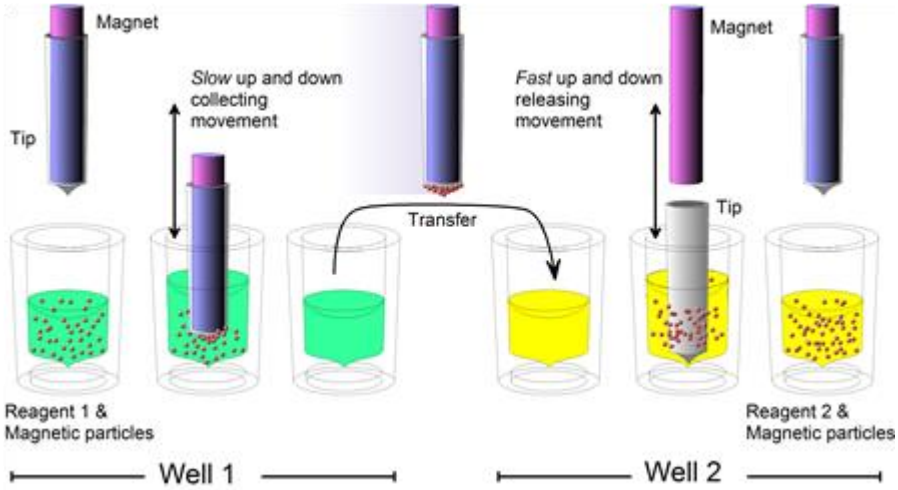


Figure 7. Inverse magnetic particle processing

Working with a magnetic rod

Working with magnetic particles can be divided into five separate processes:

- collecting magnetic particles
- releasing magnetic particles
- washing magnetic particles
- incubation
- concentration

Colleting magnetic particles

During the collection of the magnetic particles, the magnetic rod is fully inside the tip. The magnetic rods together with the tip comb move slowly up and down in the plate and the magnetic particles are collected onto the edge of the tips. The

magnetic rods together with the tip comb, having collected the magnetic particles, can be lifted out of the plate, and transferred into the next plate.

Releasing magnetic particles

After collection of the magnetic particles, the magnetic rods together with the tip comb are lifted from the plate. The magnetic rods are lifted off and the tip comb is lowered into the next plate containing a reagent.

Magnetic particles are released by moving the tip comb up and down several times at considerably high speed until all the particles have been mixed with the substance in the next reaction.

Washing magnetic particles

Washing the magnetic particles is a frequent and an important processing phase. Washing is a combination of the release and collection processes in a plate filled with washing solution.

To maximize washing efficiency, the magnetic rods together with the tip comb are designed to have minimized liquid-carrying properties.

Incubation

To keep the magnetic particle suspension evenly mixed in long-running reactions, the tip comb can be moved up and down in the solution.

Changing the volume during the magnetic particle processing

The volume of the first plate can be larger than the volume of the next plate, and this is used for concentration purposes (refer to Figure 8).

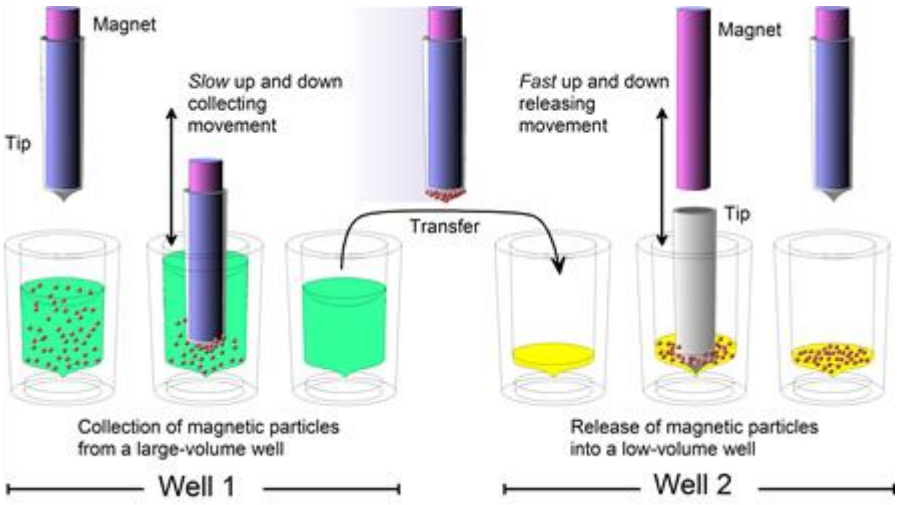


Figure 8. A concentration step during magnetic particle processing

Chapter 3
Installation

Delivery

This section covers the relevant procedures to be carried out on receipt of the instrument.

Unpacking

Move the packed instrument to its site of operation. To prevent condensation, the instrument should be left in its protective, antistatic plastic wrapping until the ambient temperature has been reached. Unpack the KingFisher Flex instrument and accessories carefully with the arrows on the transport package pointing upwards. Remove the instrument from the package and place it on a level surface. Refer to the enclosed unpacking instructions.

These notes and instructions are sent with the instrument and are immediately available when you open the package:

- BindIt 4.1 and KingFisher Instruments User manuals CD (100098397)
- Certificate of Conformance (100079752)

Caution Do not touch or loosen any screws or parts other than those specifically designated in the instructions. This can cause misalignment and will void the instrument warranty.

Warning The KingFisher Flex weighs approximately 28 kg [62 lbs.] without the transport package and should be lifted with care. It is recommended that two persons lift the instrument together, taking proper precautions to avoid injury.

To lift the instrument, put your fingers under the bottom on either sides and lift it with your back straight.

Keep 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 can invalidate the warranty. Keep also all instrument-related documentation provided by the manufacturer for future use.

Examine the delivery

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

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 keep 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.

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

Requirements

When you set up your KingFisher Flex, avoid sites of operation with excess dust, vibrations, strong magnetic fields, direct sunlight or UV light, 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, and reagent bottles.
- Make sure there is enough room behind the instrument to enable disconnecting the device.
- 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).
- Make sure relative humidity is between 10% and 80% (non-condensing).

Leave enough space (at least 10 cm) on both sides and at the back of the unit to allow adequate air circulation.

The KingFisher Flex does not produce operating noise at a level that would be harmful. No sound level measurements are required after installation.

Caution Do not operate the instrument in an environment where potentially damaging liquids or gases are present.

Place the instrument on a normal laboratory bench. The net weight of the entire equipment is approx. 28 kg [62 lbs.].

The instrument operates at voltages of 100–240 Vac and the frequency range of 50/60 Hz.

Precautions and limitations

- Always make sure that the local supply voltage in the laboratory conforms to that specified on the type label on the back of the instrument (Figure 4).
- Do not smoke, eat, or drink while using the KingFisher Flex.
- Wash your hands thoroughly after handling test fluids.
- Obey normal laboratory procedures for handling potentially dangerous samples.
- Wear proper protection clothing, such as disposable gloves and laboratory coats, according to good laboratory practice.
- Make sure that the working area is well ventilated.
- Never spill fluids in or on the equipment.

Caution The KingFisher Flex should not be kept in close proximity to magnetic tapes, computer discs or other magnetic storage systems, such as credit cards, as these can be damaged by the strong magnetic field of the KingFisher Flex heads.

Do not hold the KingFisher Flex heads close to a PC display, since this can cause damage to the display.

Do not use metal tools when you handle KingFisher Flex heads.

Warning This product contains very strong permanent magnets. People wearing a pacemaker or metallic prostheses should not use this product. A pacemaker or prostheses can be affected or damaged if it comes in close contact with a strong magnetic field

Installation setups

This section describes the installation setups that you must do before operating or relocating the instrument.

Release the transport locks

The instrument comes with two transport locks (Figure 9): the tip comb holder transport lock and the heating block transport lock. Remove both the transport locks.

Make sure both the transport locks are released before you put the instrument into operation.

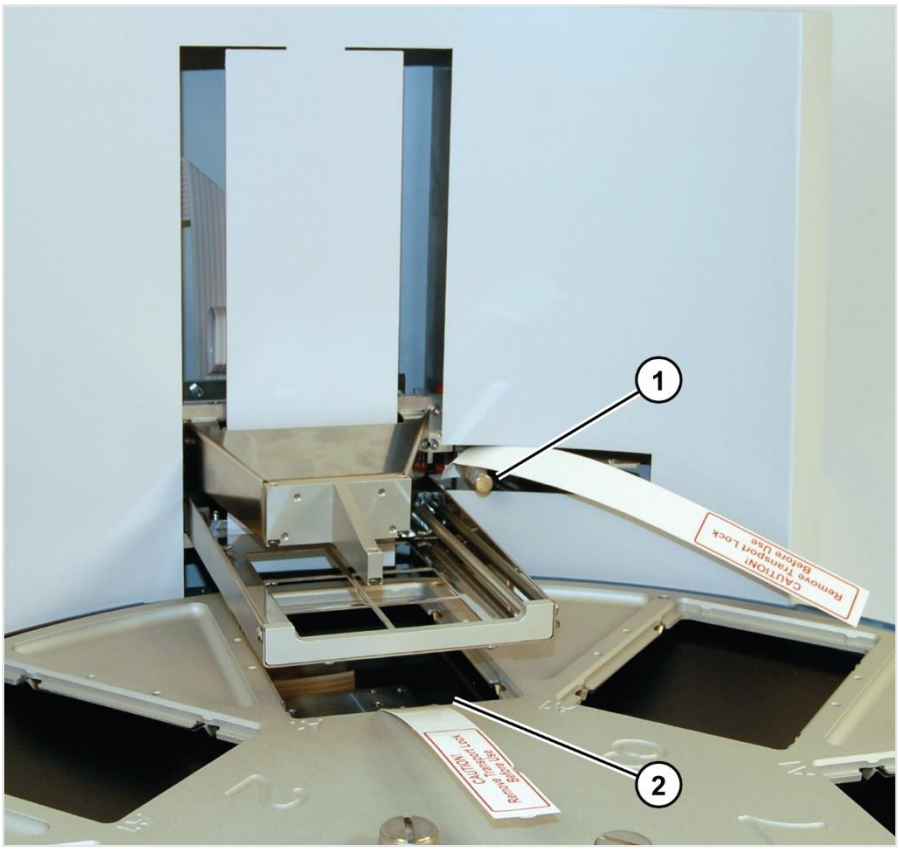


Figure 9. KingFisher Flex transport locks fitted

1. Tip comb holder transport lock
2. Heating block transport lock

To remove both the transport locks, do these steps:

1. To remove the transport lock of the tip comb holder, take hold of the transport lock screw and firmly turn it counterclockwise according to Figure 10.

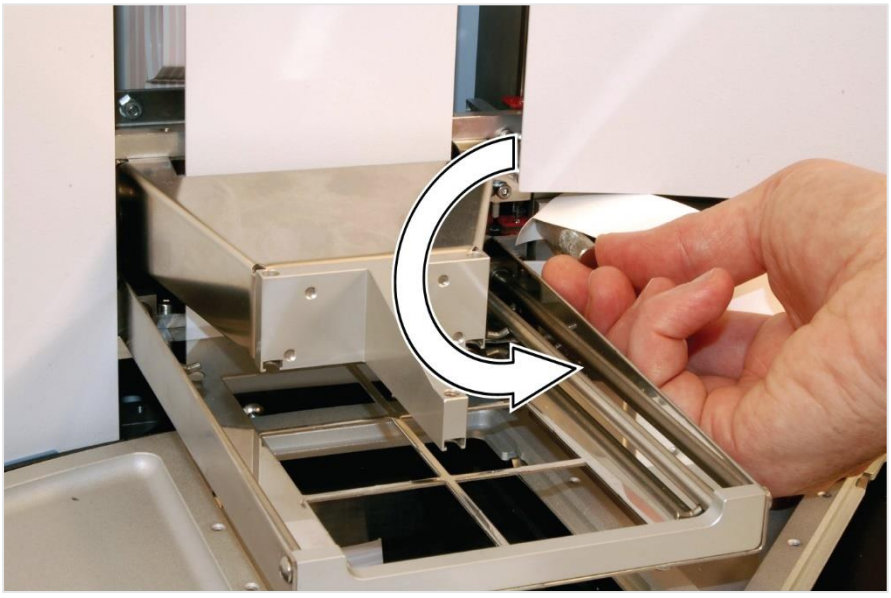


Figure 10. Remove the transport lock of the tip comb holder

2. Pull the transport lock out of the hole and store it for future relocation (Figure 11). When you relocate the instrument, refer to How to refit the transport lock of the tip comb holder.

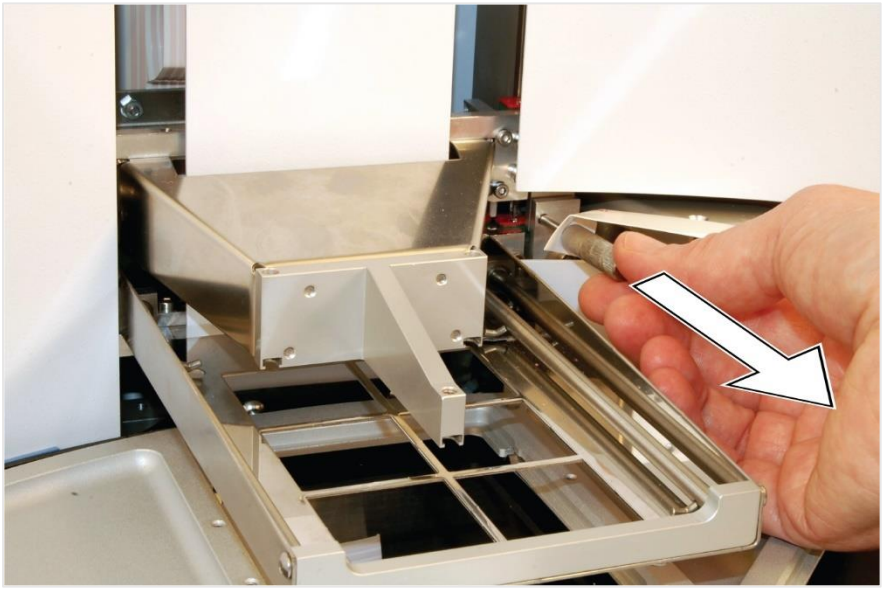


Figure 11. Tip comb holder transport lock removed

3. Remove the transport lock of the heating block according to Figure 12. Unscrew the transport lock screw counterclockwise (Figure 12). Lift the screw with the label attached (Figure 13).

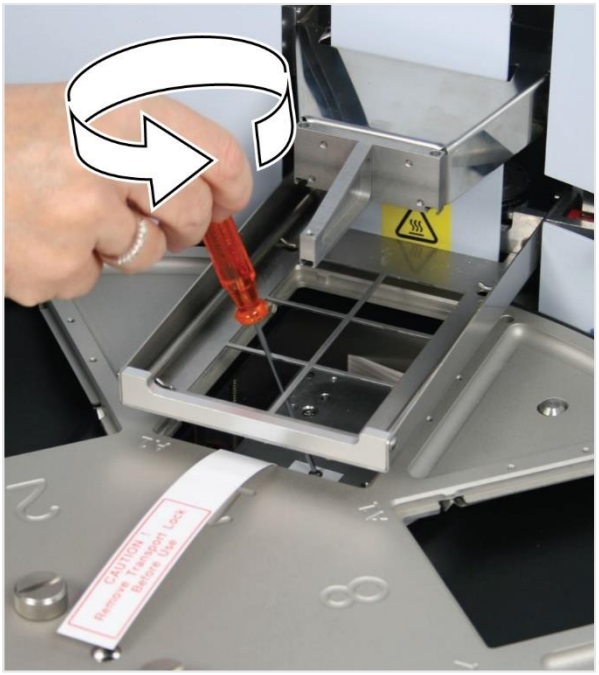


Figure 12. Remove the transport lock of the heating block (A)

4. Remove the transport lock screw from the label.

Figure 13. Remove the transport lock of the heating block (B)

5. Fasten the screw clockwise to its storage site on the heating block base. The two screws on the heating block base guide the heating block into the correct position.

Note Keep the transport locks (Figure 11 and Figure 13) for future transportation of the instrument.

Both the transport locks have been successfully removed. When you relocate the instrument, refer to How to refit the transport lock of the heating block and How to refit the transport lock of the tip comb holder.

How to ensure startup

1. Connect the mains supply cable to the mains power connector (Figure 14) at the bottom left of the back/side panel. If you need to use any other type of mains supply cable than supplied, use only cables certified by the local authorities. Before you plug in the power cable, make sure that the voltage on the type label at the bottom left of the back/side panel (Figure 4) corresponds to the local voltage.
2. Connect the instrument to a correctly installed line power outlet that has a protective conductor that is grounded.

Warning Make sure that the mains switch (Figure 4) on the bottom left of the back/side panel is in the OFF position. Never operate your instrument from a power outlet that has no ground connection.

Caution Always connect or disconnect the serial cable when the power is off.

Figure 14. Mains supply cable and serial cable connected

How to fit the subassemblies of the instrument into place

This section describes the installation setups of the shield plate, the heating block, the interchangeable KingFisher Flex heads and the transparent lid.

Shield plate

To install the shield plate, do these steps:

1. Make sure that the power is set to OFF.
2. The shield plate must be installed prior to use of the instrument. Use a hexagonal screwdriver (Allen key) to fasten the two screws (Figure 15).

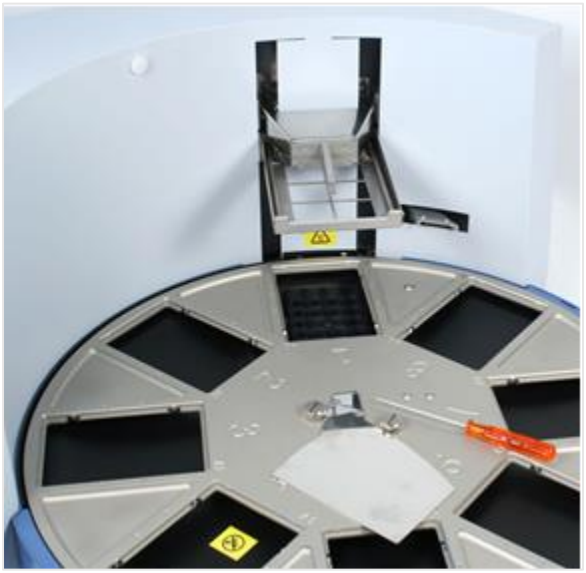


Figure 15. Shield plate prior to fitting

3. First insert the shield plate into its slot (Figure 16).

Figure 16. Insert the shield plate

4. When you fasten the two plate retaining screws (Figure 17), be careful not to drop them inside the instrument. Figure 18 shows the shield plate installed.

Figure 17. Fasten / loosen the shield plate

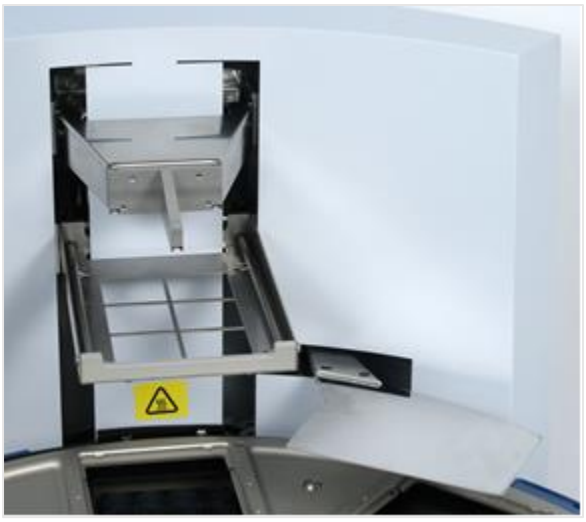


Figure 18. Shield plate fitted

Heating block

Fastening/changing the heating block is controlled by the software. Do the following to fit the heating block.

1. Choose the *Change_heatblock* protocol under the **Maintenance** menu. Use the up and down cursor keys.
2. Press **START**. The heating block rises.
3. Insert the heating block by first setting it and then pressing it hard into place (Figure 19 and Figure 20). The heating block snaps into place at both ends if you have done it correctly.

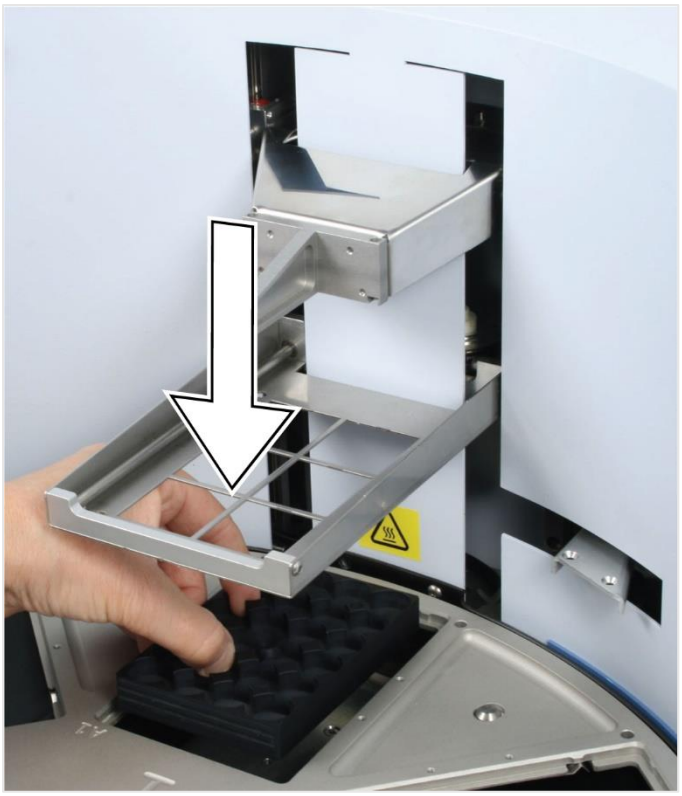


Figure 19. Insert the heating block

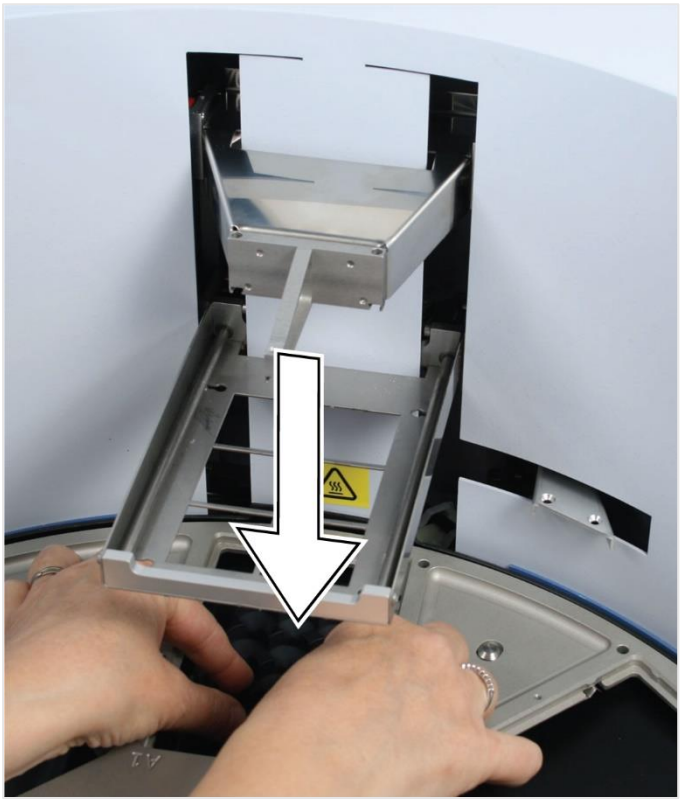


Figure 20. Press the heating block into place

You can add a heating step of ambient temperature +5°C to +115°C to a protocol. The heating block is preheatable, but no

cooling can be carried out. All KingFisher Flex plates can be heated.

There are four different kinds of interchangeable heating blocks available, for KingFisher 24 deep well plates, Thermo Scientific™ Microtiter™ deep well 96 plates, KingFisher 96 plates, and PCR plates (Table 1).

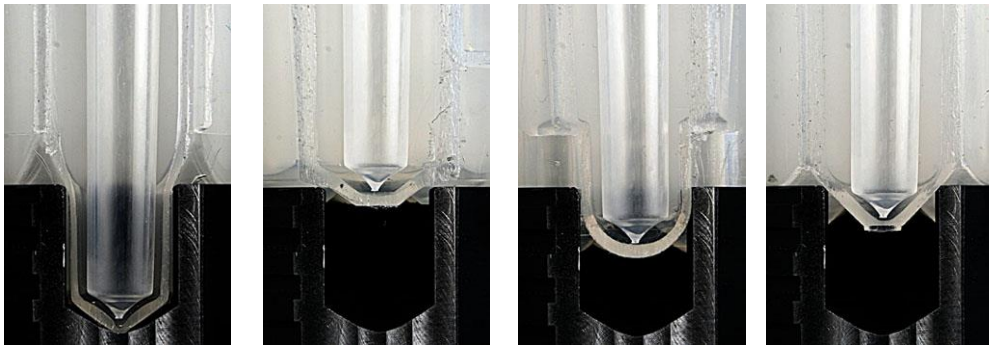
Table 1. Plates vs. heating adapter(s)

		Table Heading	Table Heading
	KingFisher 24 deep well plate (200 µl – 5 mL*)		Heating block for KingFisher 24 deep well plate
	Microtiter® deep well 96 plate (50–1000 µl*)		Heating block for Microtiter 96 deep well plate
	KingFisher 96 plate (20–200 µl*)		Heating block for KingFisher 96 plate
	PCR plate (20–100 µl*), skirted (for example, AB gene SuperPlate # AB-2800)		Heating block for PCR plate

* = recommended filling volume

Warning The heating block surface can be hot. Do not touch.

Caution The heating block is specifically designed for the plates listed below to ensure even heating during the sample process (Figure 21). Using other plates than those recommended may damage the instrument and diminish the application performance.



A B C D

Figure 21. Sectional view of the Microtiter deep well 96 plate (a), deep well 96 plates of other manufacturers (b, c, d) and the KingFisher Flex 96 deep well heating block

You can only use these 24 and 96-well plates for heating:

- KingFisher 24 deep well plate (200 µl – 5 mL*)
- Microtiter deep well 96 plate (50–1000 µl*)
- KingFisher 96 plate (20–200 µl*)
- PCR plate (20–100 µl*), skirted

* = recommended filling volume

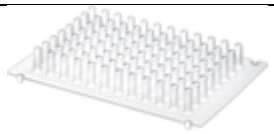
Interchangeable KingFisher Flex heads

There are four kinds of interchangeable KingFisher Flex heads available, for KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates. The KingFisher Flex heads all have corresponding disposable plastic tip combs (Table 2).

Note KingFisher Flex heads do not fit into the KingFisher 96 and vice versa.

Caution Do not place the KingFisher Flex heads on top of the instrument or any metal surfaces. Keep the KingFisher Flex heads always in their own plastic boxes when not in use. It is very important to keep the KingFisher Flex heads away from each other, and other magnets at all time. Interference of the magnets on one another can cause serious damage to the magnets.

Table 2. Magnetic head vs. tip comb

Magnetic head	Description	Tip comb	Description
	KingFisher Flex head for KingFisher 24 deep well plate		Tip comb for KingFisher 24 deep well plate
	KingFisher Flex head for Microtiter deep well 96 plate		Tip comb for Microtiter deep well 96 plate
	KingFisher Flex head for KingFisher 96 plate		Tip comb for KingFisher 96 plate
	KingFisher Flex head for PCR plate		Tip comb for PCR plate

Keep the KingFisher Flex heads always in their own plastic storage boxes when they are not in use.

Figure 22. KingFisher Flex heads in their storage boxes

Caution The KingFisher Flex should not be kept in close proximity to magnetic tapes, computer discs or other magnetic storage systems, such as credit cards, as these can be damaged by the strong magnetic field of the KingFisher Flex heads. Do not hold the KingFisher Flex heads close to a PC display, since this may cause damage to the display. Do not use metal tools when you handle KingFisher Flex heads.

Warning This product contains very strong permanent magnets. People wearing a pacemaker or metallic prostheses should not use this product. A pacemaker or prostheses can be affected or damaged if it comes in close contact with a strong magnetic field.

To insert KingFisher Flex heads, choose the *Change_magnet* protocol under the Maintenance menu (**Maintenance** > **Change_magnet**) by using the up and down cursor keys. Then press **START**. Insert the KingFisher Flex head so that the three pins (shown with black arrows) slot into place (Figure 23 and Figure 24). When you insert the KingFisher Flex head, be careful not to damage the magnet rods against the tip comb holder frame. Confirm the end of the protocol by pressing **START**.

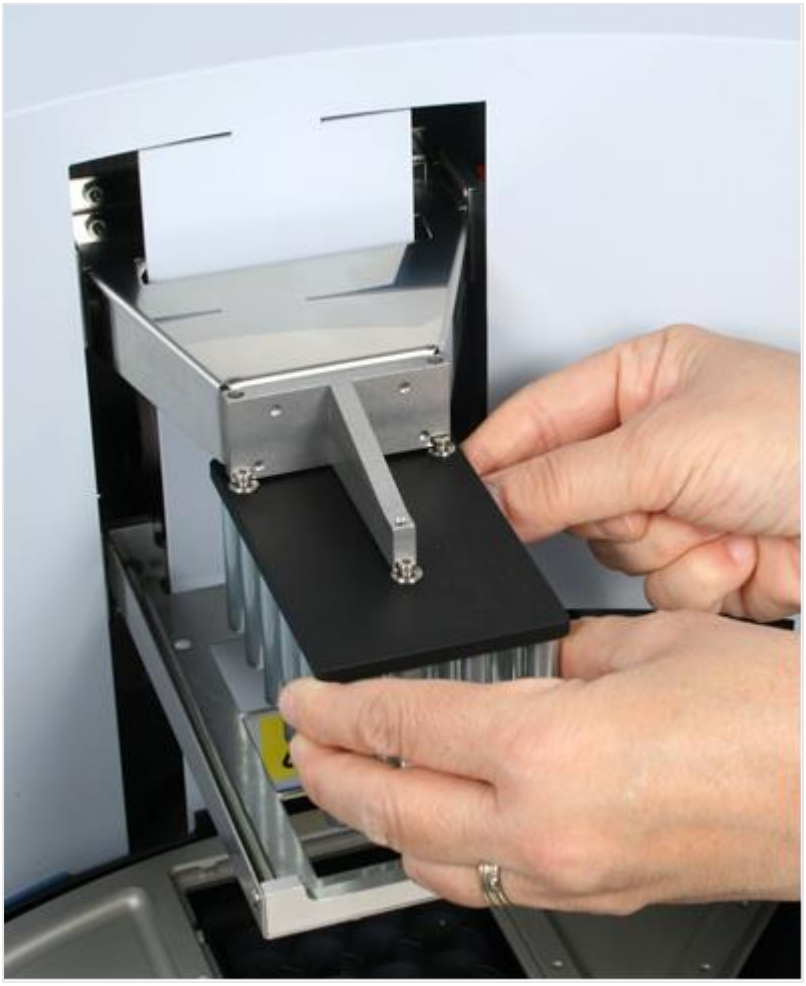


Figure 23. Insert the KingFisher Flex head

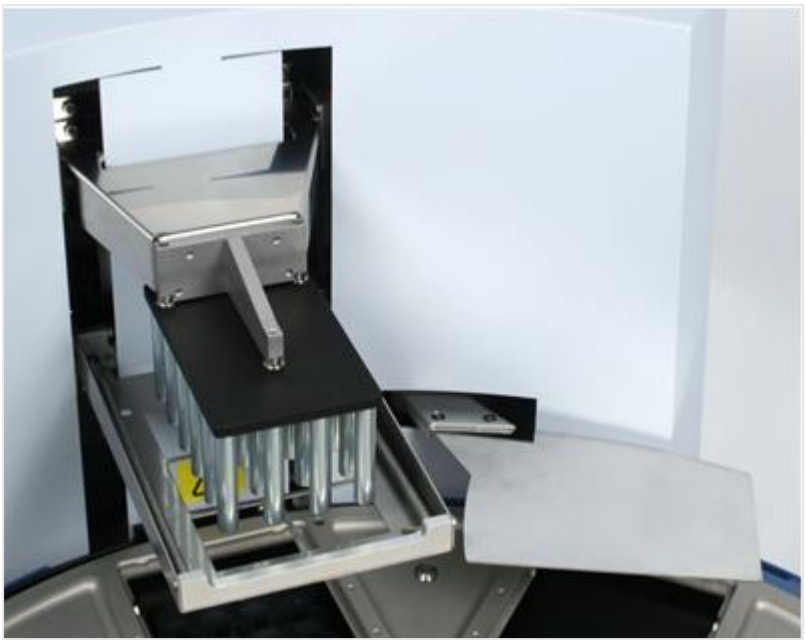


Figure 24. KingFisher Flex head for KingFisher 24 deep well plate fitted

Transparent lid

During operation, the sliding door can be open or closed or the whole transparent lid can be absent (Figure 25). The closed door protects the processing against environmental contamination.

Figure 25. Transparent lid fitted

1. Transparent lid
2. Sliding door (open)

Operational check

First set the instrument **ON**. The instrument performs initialization tests and adjustments.

The display quickly shows the internal software version. This happens when the initialization tests and adjustments have been completed.

It is recommended that you carry out a check run using a demo protocol to verify proper instrument operation. Run the check protocol (*Check_96dw_tip, Check_kf96_tip, Check_pcr_tip*, or *Check_24dw_tip*) under the **Maintenance** menu according to the KingFisher Flex head and plastic consumables you are using. If the check is all right, proceed with your own runs.

How to pack the instrument for transportation

This section describes how to refit both the transport locks, the transport lock of the heating block and that of the tip comb holder.

How to refit the transport lock of the heating block

To refit the transport lock of the heating block, do these steps:

1. Remove the heating block in this way:
   - ✓ First choose the *Change_heatblock* protocol.
   - ✓ Then press **START**.
   - ✓ Remove the heating block by pulling it out.
   - ✓ Press the START key when the task has been completed.
2. Set the power to off.
3. Take the transport lock screw from its storage site.
4. Insert the transport lock screw into the label and refit the transport lock of the heating block into its place (Figure 26).

Figure 26. Refit the transport lock of the heating block (A)

1. The transport lock of the heating block is refitted according to Figure 27. Screw the transport lock screw clockwise (Figure 27). Figure 31 shows both the transport locks refitted.

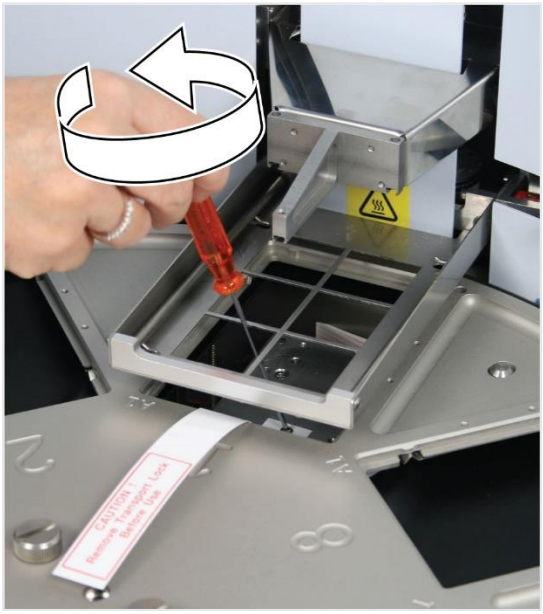


Figure 27. Refit the transport lock of the heating block (B)

How to refit the transport lock of the tip comb holder

To refit the transport lock of the tip comb holder, do these steps:

1. Press the tip comb holder downwards evenly with both hands (Figure 28).

Caution Make sure that the power is set to off.

Figure 28. Press the tip comb holder downwards

2. Insert the transport lock screw of the tip comb holder with transport lock tag first by adjusting the screw into the lock position so that both the holes are opposite each other and aligned with the thread in the chassis (Figure 29).

Note One of the holes is inside the instrument and not clearly visible.

3. Fasten the screw by turning it firmly clockwise.

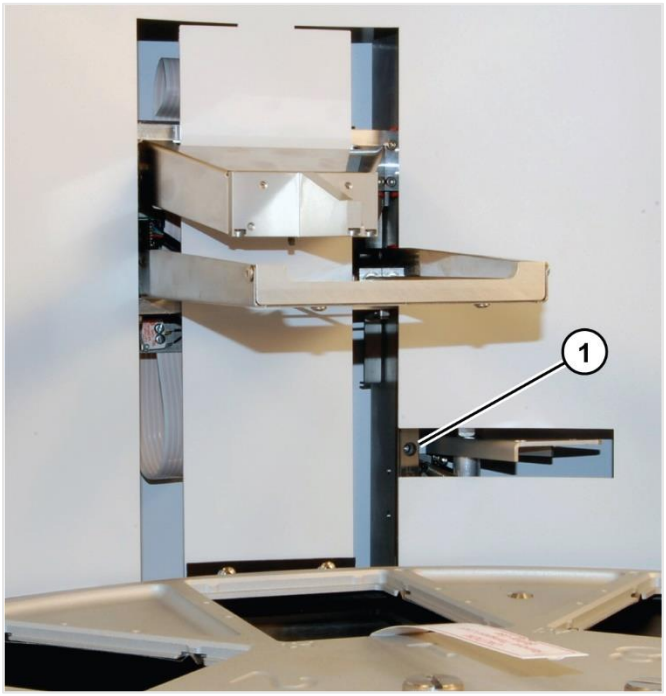


Figure 29. Location of the locking hole

1. Locking hole

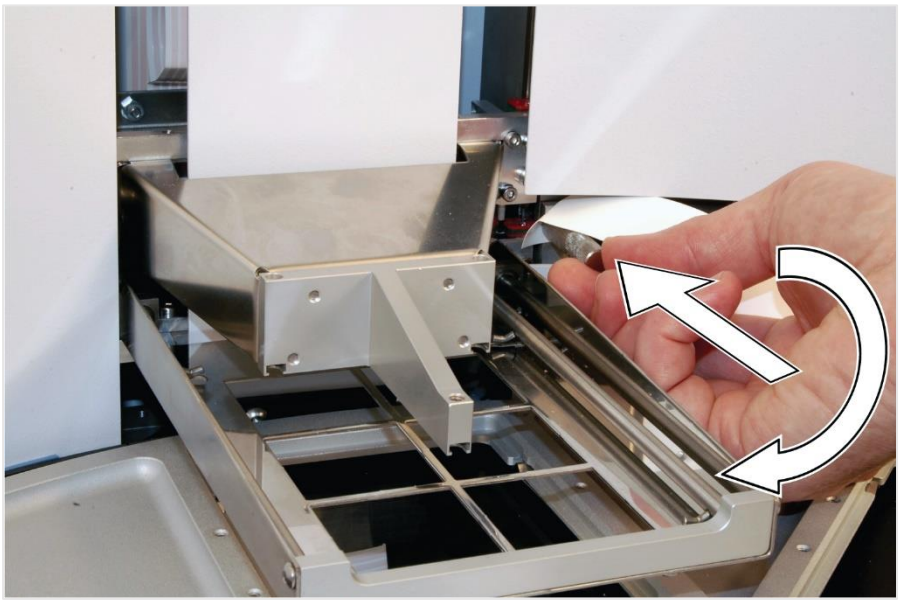


Figure 30. Fit the transport lock of the tip comb holder

Figure 31. Both transport locks refitted

Figure 31 shows both the transport lock of the heating block and the tip comb holder refitted.

Chapter 4
Routine operation

Do's and Don'ts of the KingFisher Flex

This section on summarizes all the relevant procedures on what to do and what not to do.

What you should do

- In case of any emergencies occurring during operation, set the power to off and unplug the instrument immediately. Do corrective measures. If the corrective measures taken do not help, contact authorized technical service.
- Do the operational check prior to normal use.
- Only when the instrument power is set to off, can you push the heads or turn the turntable manually.
- When placing a microplate onto the tray, always make sure that the correct plate type has been selected in BindIt Software (**Plate Editor > Plate Configuration**…) before you do anything else.
- Always use correct volumes on the plates because the movements of the tip comb are conducted according to the volumes.

What you should not do

- Use for self-testing is excluded.
- Do not touch or loosen any screws or parts other than those specifically designated in the instructions. This can cause misalignment and will invalidate the instrument warranty.
- Never open any other cover of the KingFisher Flex than the transparent lid or the sliding door (Figure 3) while the instrument is plugged into a power source.
- Do not disconnect the RS-232C or USB cable before the PC and the instrument are set to off.
- Do not use the instrument if it appears that it does not function properly.
- Do not under any circumstances use formaldehyde.

- Do not spill any alkaline onto any instrument surfaces to avoid damage of the instrument. If needed, use suitable protection covering.
- Do not use any solvents that cause corrosive vapors.

Set on

Before you set the KingFisher Flex to on, make sure that the voltage on the type label at the bottom left of the back/side panel (Figure 4) corresponds to the local voltage.

Warning Never operate your instrument from a power outlet that has no ground connection.

Control panel

This section describes the KingFisher Flex control panel and internal software.

Keypad

The keypad is shown in Figure 32.

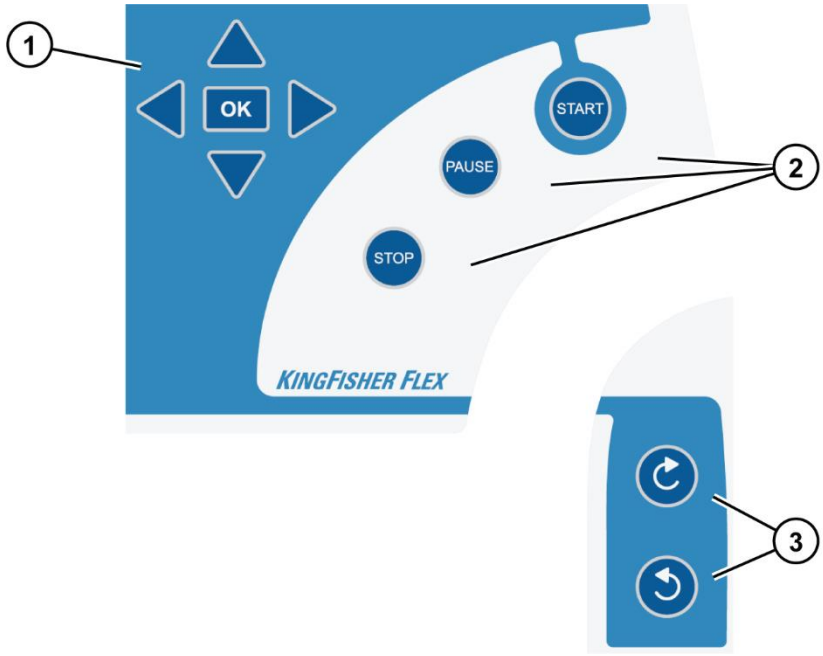


Figure 32. Keypad of the KingFisher Flex

1. Arrow keys and OK button
2. START, PAUSE and STOP function buttons
3. TURNTABLE ROTATION CLOCKWISE and COUNTERCLOCKWISE buttons

Keys

The relevant keys and control buttons are described in detail below.

The arrow keys are used to select the next protocol and to navigate in the display.

To accept the selection.

To initiate the run.

To confirm a performed step in the protocol, for example, plate loading or removal.

To pause/terminate the processing step. In short:

STOP (paused)/ START (the instrument continues after a Pause step)

STOP (paused)/ STOP (the processing is terminated).

To pause the run. It will pause at the end of the ongoing processing step.

To rotate the turntable clockwise (TURNTABLE ROTATION CLOCKWISE button).

To rotate the turntable counterclockwise (TURNTABLE ROTATION COUNTERCLOCKWISE button).

Display

The liquid crystal display is a 240 x 360-pixel display.

The main view in the display is shown in Figure 33.

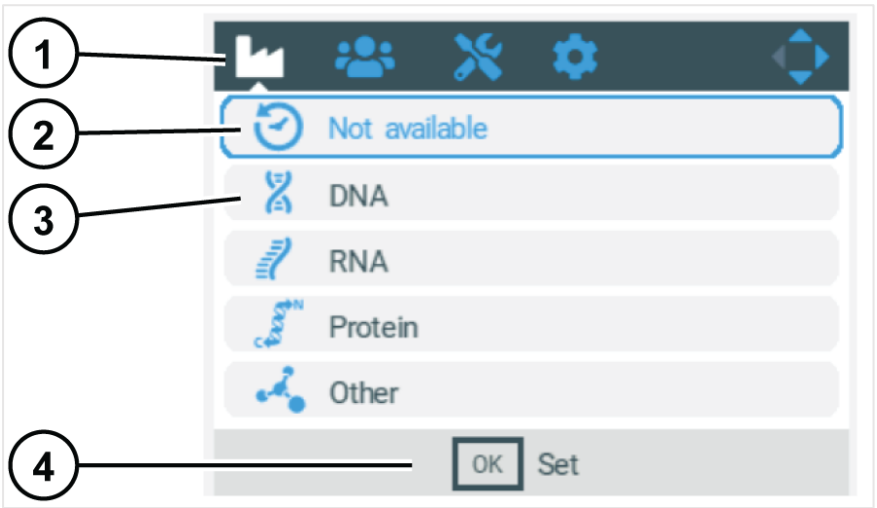


Figure 33. Main view on the display of the KingFisher Flex

1. Menu
2. Main view row
3. Icon
4. Info text bar

There are four menus in the KingFisher Flex user interface: Factory protocols, User protocols, Maintenance, and Settings.

In routine use you mainly navigate in the Factory/User protocols menu. In advanced level options there is one extra menu, Maintenance. You can navigate between these three menus using the **Left** and **Right** arrow keys.

The main view row is either colored (active) or uncolored/different colored (inactive).

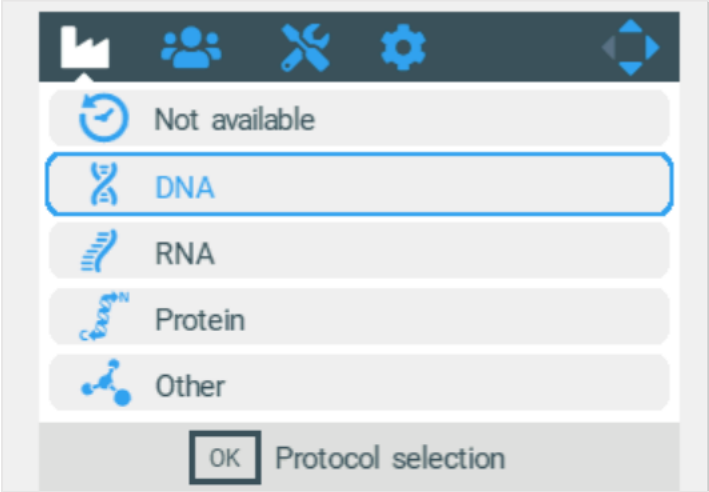
All the descriptive icons used in the main view are shown in Table 3.

The info text bar shows explanatory information on how to proceed and which keys to use.

Navigation

This section visualizes navigation in the KingFisher Flex user interface.

The main view changes according to the selections you make either with the **Up** or **Down** arrow keys or the **OK** button. The available buttons and their function are shown on the info text bar.



The color of the items, for example, the icon and main view row, in the main view changes from grey to blue when they are selected (active/inactive).

To move from one menu to another, make sure you are in the main view of one of the menus and use the **Left** and **Right** arrow keys.

The main views of each menu tab are shown on Table 3**Error! R eference source not found.**.

Table 3. Main views

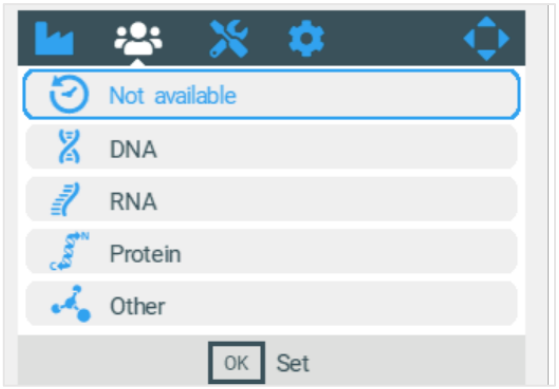
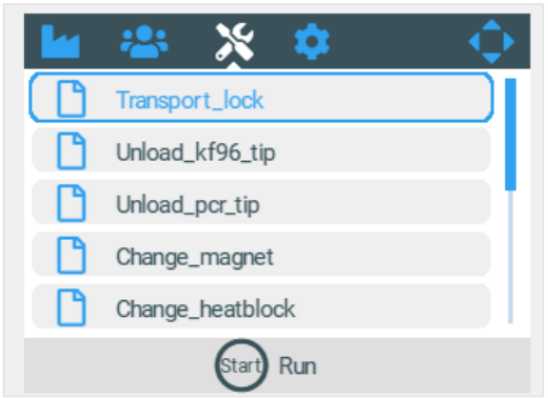
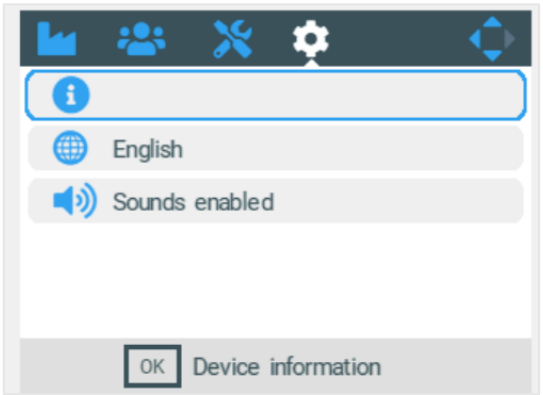
	Factory protocols
	User protocols
	Maintenance
	Settings

Table 4. Icons

Menu	Icon	Function
		Not available
		DNA
		RNA
		Protein
		Other
		Maintenance protocol
		Device information
		Language
		Sound on
		Sound off

Use of KingFisher Flex PC software

The operation of the KingFisher Flex magnetic particle processor can also be controlled by an external computer and run on BindIt Software. In addition to the KingFisher Flex internal software features, you can also download protocols to the instrument or back up protocols from one instrument and transfer them to another.

For more information, refer to the *BindIt Software User Manual* (N07974).

Use of internal software

This section describes procedures related to the KingFisher Flex internal software.

Factory / User protocols

Factory protocols are protocols which are preloaded into the instrument internal memory in the factory, for example, demo protocols.

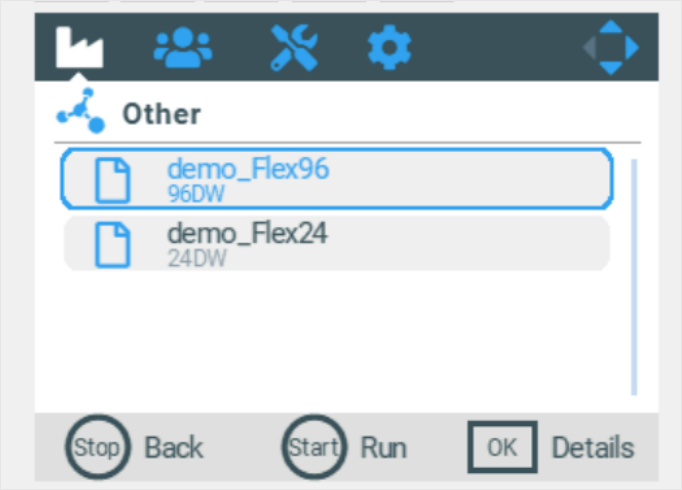
User protocols are protocols which are made and transferred using BindIt Software.

Run a protocol

To run a protocol, first select the protocol.

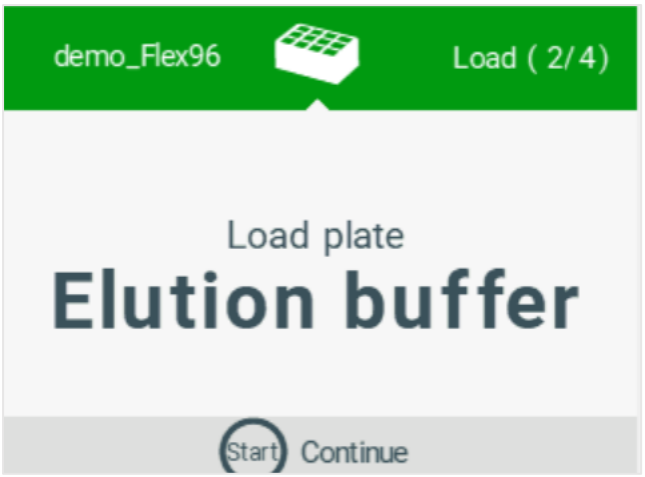
Use the arrows to move to the protocol you want to run.

The example shows *demo_Flex96* protocol.

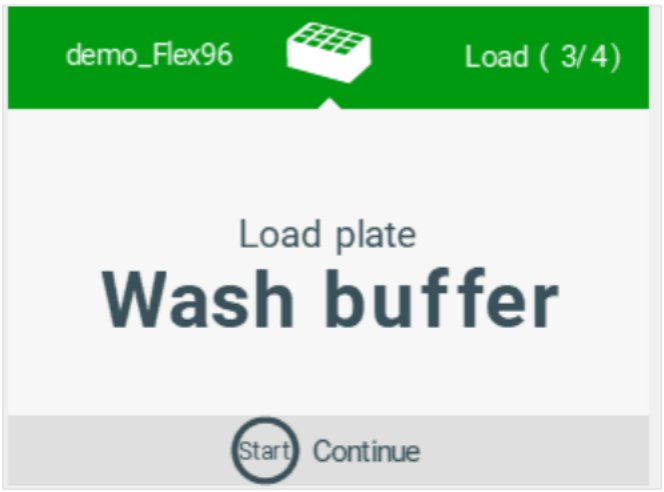


1. Press **START** to run the protocol. Follow the instructions on the screen.
2. First load the Tip plate.

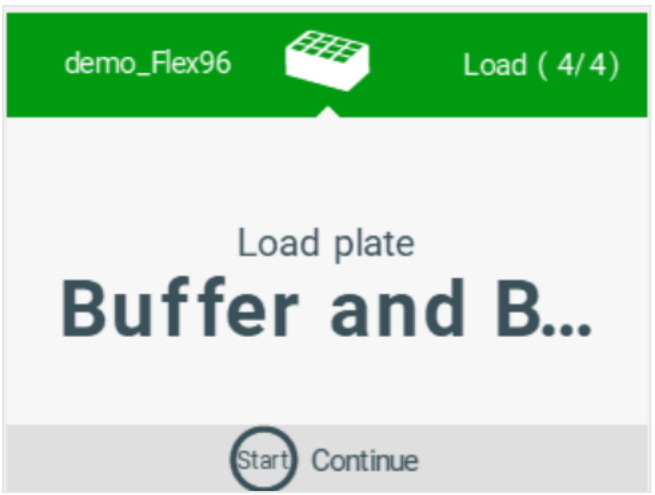
3. Press **START** to continue. Add the elution buffer.



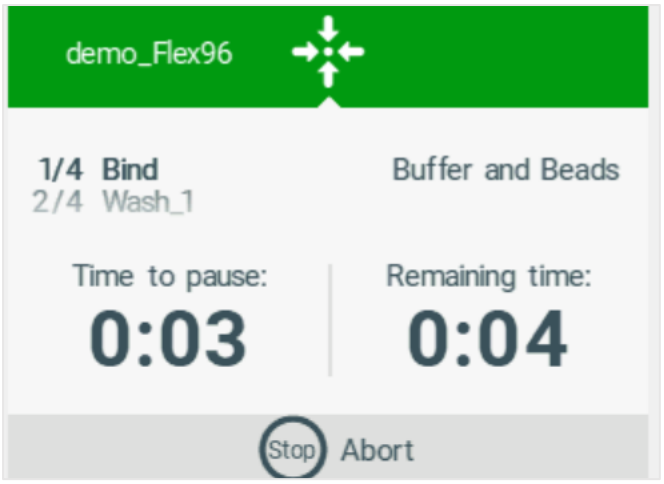
4. Press **START** to continue. Load the wash buffer.



5. Press **START** to continue. Load the buffer and beads.



6. Press **START** to continue. The screen tells you how much time remains before the protocol finish.



7. Press **STOP** to abort the protocol.

Set the default protocol

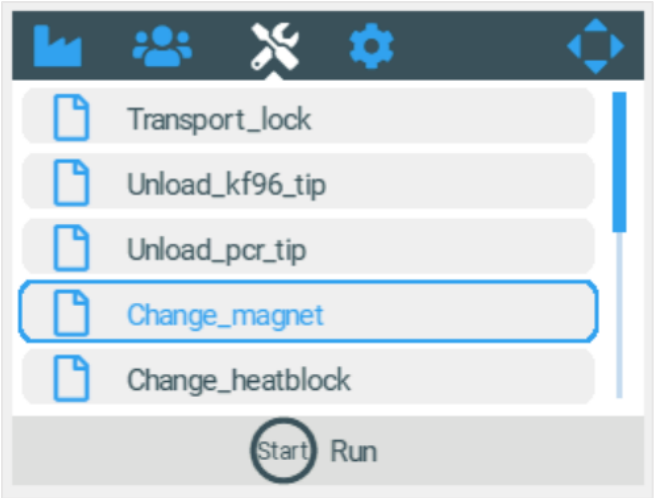
Go to the **Last used/Default protocol** row in Factory protocols / User protocols menu.

The last protocol you used is shown.

Press **OK** to set your default protocol.

Maintenance protocol

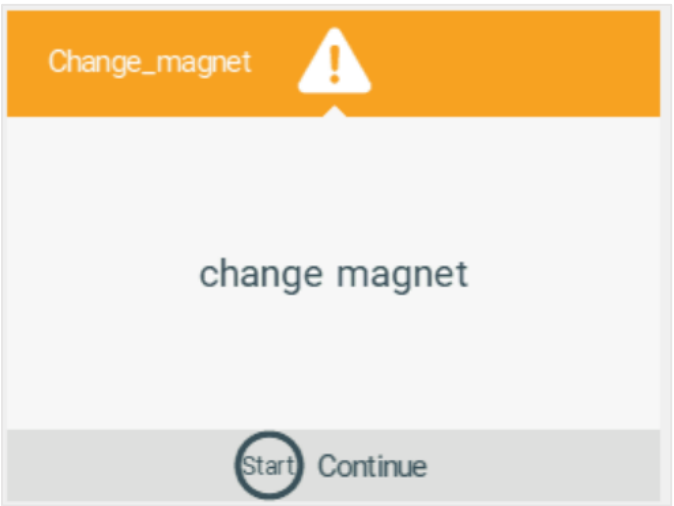
Go to the **Maintenance** menu.



You can view all available maintenance protocols.

Use the **Up** and **Down** arrow keys to select the maintenance protocol.

1. Press **START** to run the desired protocol. Follow the instructions on the screen.



2. Press **START** to continue.

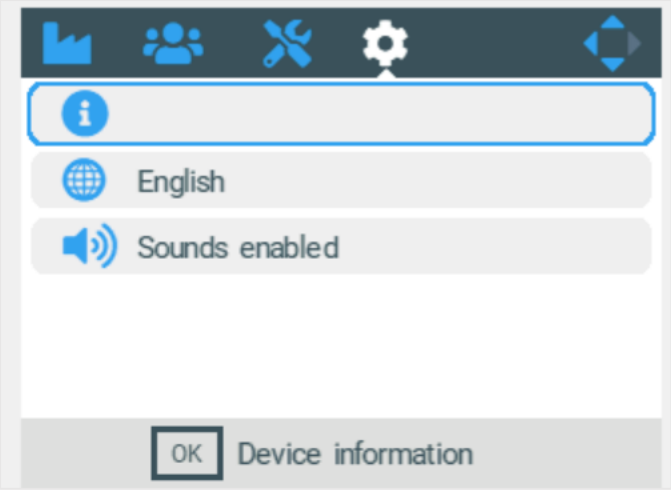
Instrument options

This section describes the instrument parameters. All these parameters are set in the **Settings** menu. The values shown in the Settings menu remain in the instrument memory and are instrument specific, not protocol specific.

Device information

The device information shows the name of the instrument, the internal software version and the serial number of the instrument unit.

Go to the **Settings** menu.



Press **OK** to view the device information.

Computer interface

There are two types of computer interfaces available: RS-232 and USB.

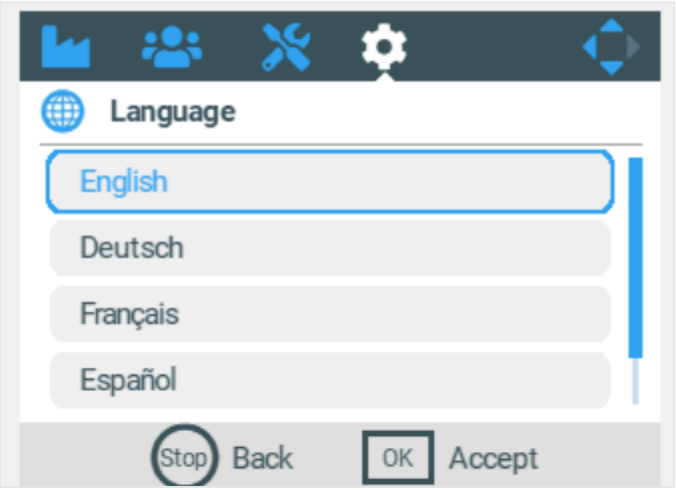
The instrument connects automatically to the interface that is first used after the power is switched on.

Language

You can set the language of the internal software.

Go to the **Settings** menu. Select the **Language selection** row.

Press **OK**.



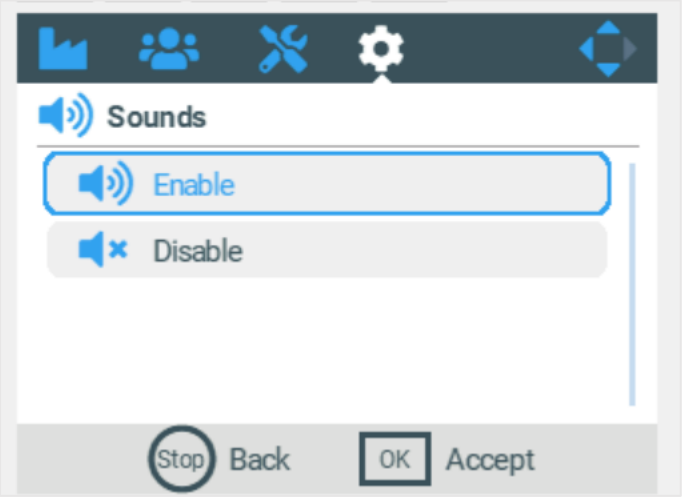
Use the **Up** and **Down** arrow keys to select the language in use. The available languages are English, German, French, Spanish and Portuguese. The default language is English.

Press **OK**.

Sound

You can choose if the instrument produces a sound for different functions. Note that all functions make a certain sound.

Go to the **Settings** menu. Select the **Sounds** row.



Use the **Up** and **Down** arrow keys to select whether sounds are enabled or disabled.

Press **OK**.

How to handle tip combs

To handle 96 deep well tip combs correctly, do these steps:

1. Take a 96 deep well tip comb package containing two tip combs.

Figure 34. Tip comb package with two tip combs

2. Open the package and separate the two tip combs (Figure 35). Place one of the tip combs onto the KingFisher 96 plate (= tip-plate).

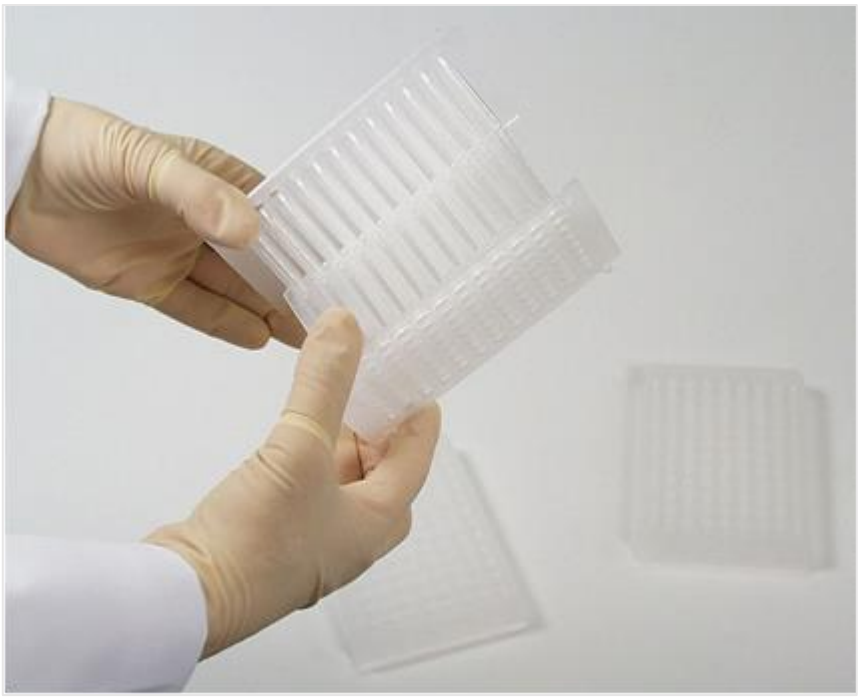


Figure 35. Separate the two tip combs

3. Place the other unused tip comb onto another plate for storage. In this way, you avoid bending of the tip combs and make sure the instrument operates properly.

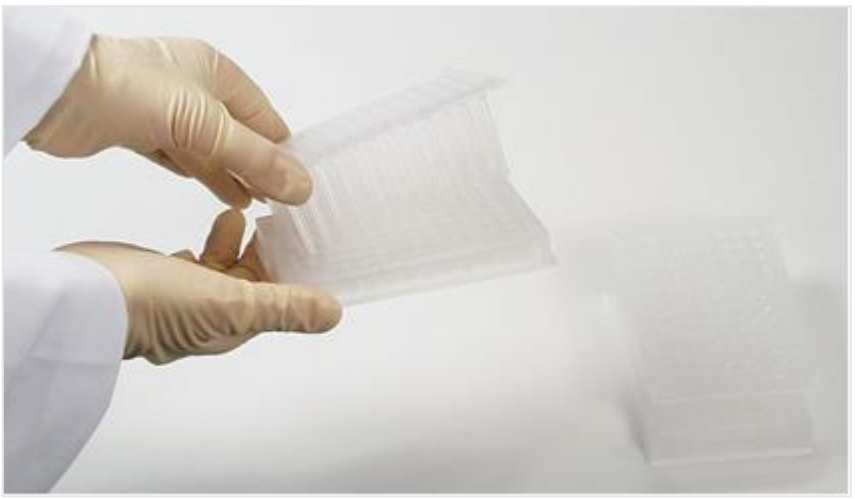


Figure 36. Store the other tip comb on a KingFisher 96 plate for further use

Do this to handle PCR tip combs correctly.

1. Take a PCR tip comb package containing eight tip combs within each other on a screen plate.

Figure 37. PCR tip comb package

2. Open the package, take out one PCR tip comb and place it on a KingFisher plate.

If the tip combs do not load properly, refer to **Q1** in Frequently asked questions.

Do this to handle 24 deep well tip combs correctly.

1. Take a 24 deep well tip comb package where the unattached tip comb is packed onto a KingFisher 24 deep well plate.

Figure 38. 24 deep well tip comb package

2. Open the package.
3. Before you take the tip comb into use, press the tip comb evenly against the enclosed 24 deep well plate with the aid of a magnetic head or another object.

How to start

Do this to get started.

1. Use the cursor keys to select a protocol. Press **START** OR use BindIt Software to run the desired protocol via the PC.
2. Open the sliding door if the transparent lid is in place (Figure 3).
3. Load the plates in the order that the protocol requests (Figure 41 through Figure 43). Place the A1 well of the plate so that it is in the upper right corner. The first A1 row is consequently always in the inner circle. Once you have loaded the requested plates into the plate stations, press **START**.

Place the tip comb always manually onto a KingFisher plate (Figure 39 through Figure 41). The instrument also functions with either one plate or up to eight plates depending on the number of steps.

Place only one tip comb onto a KingFisher plate (= tip-plate) per run (Figure 40). Press **START** to confirm the plate loading.

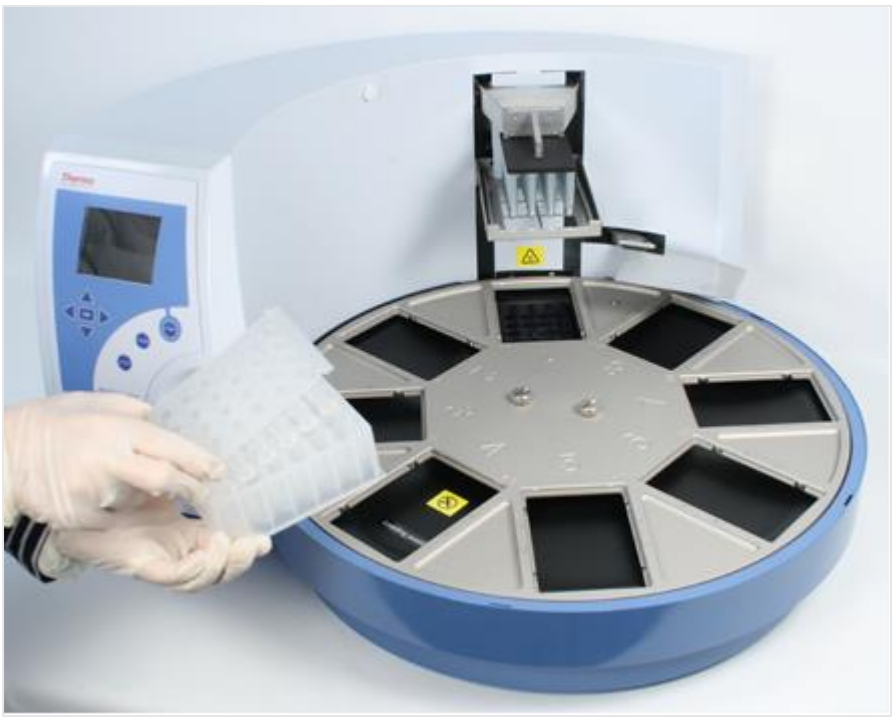


Figure 39. Combine the tip comb and KingFisher plate (A)

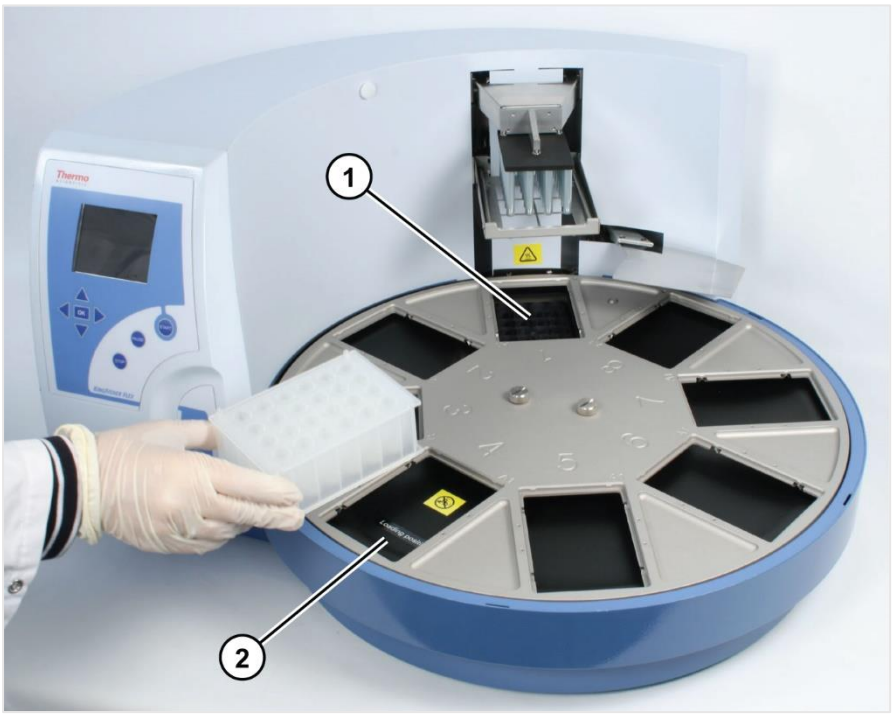


Figure 40. Combine the tip comb and KingFisher plate (B)

1. Plate station 1
2. Loading position plate station 4

The loading position, that is, plate station 4 (when the turntable is in its basic position), is labeled. The eight plate stations and the A1 positions of the eight plate stations are clearly marked on the turntable. When the instrument is in its basic position, plate station 1 is under the KingFisher Flex head. The plate station position depends on the protocol used. After the protocol has been run, note that the turntable may stop in a different position than the basic position.

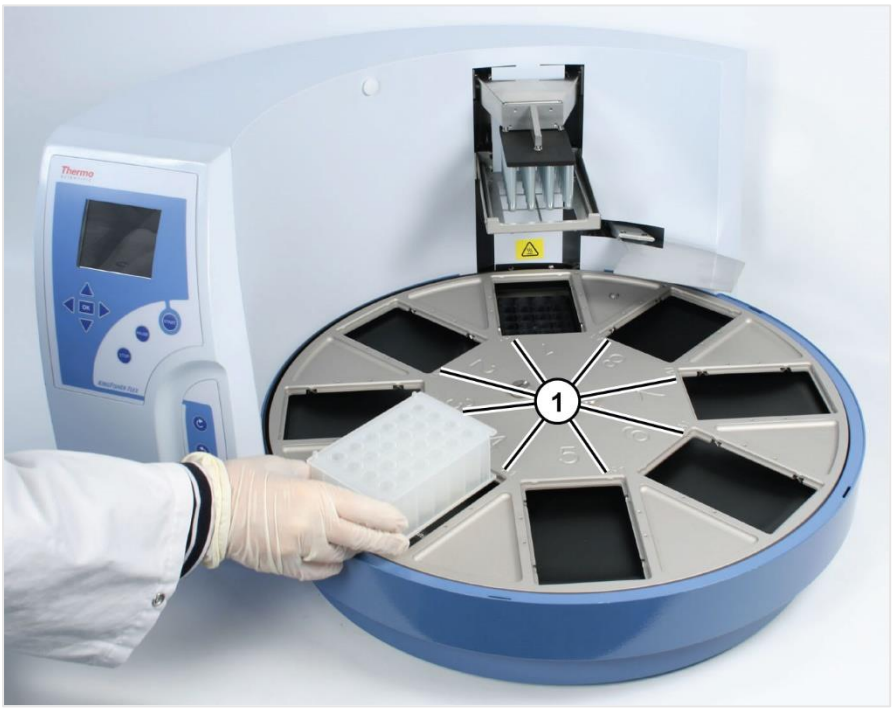


Figure 41. Load the tip-plate

1. A1 corner

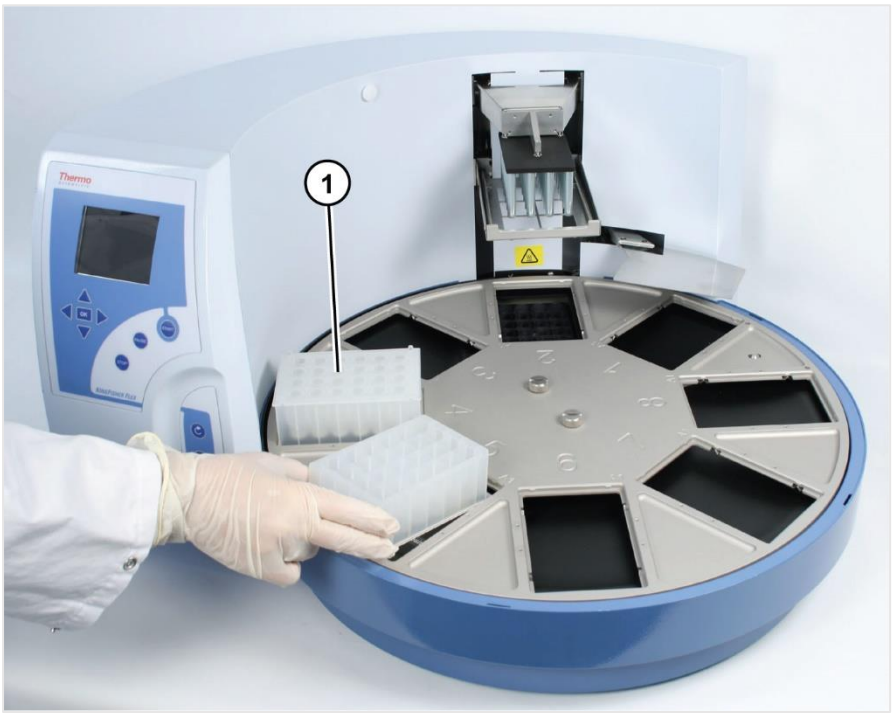


Figure 42. Load the plates

1. Tip plate

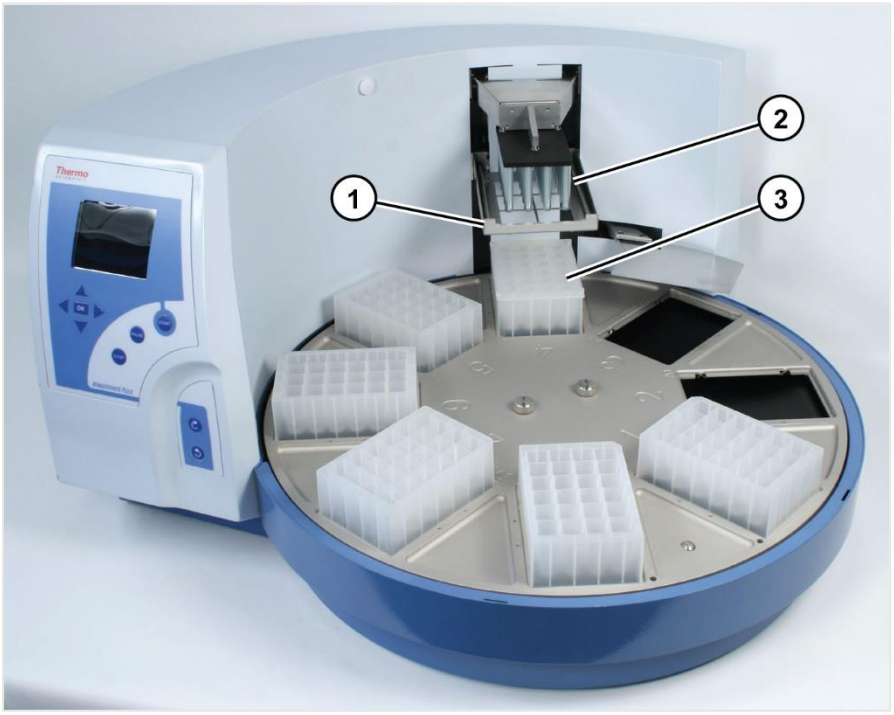


Figure 43. Plates loaded

1. Tip comb holder
2. Magnetic rods
3. Tip plate

4. The tip comb is automatically locked onto the tip comb holder from the tip-plate (Figure 44).

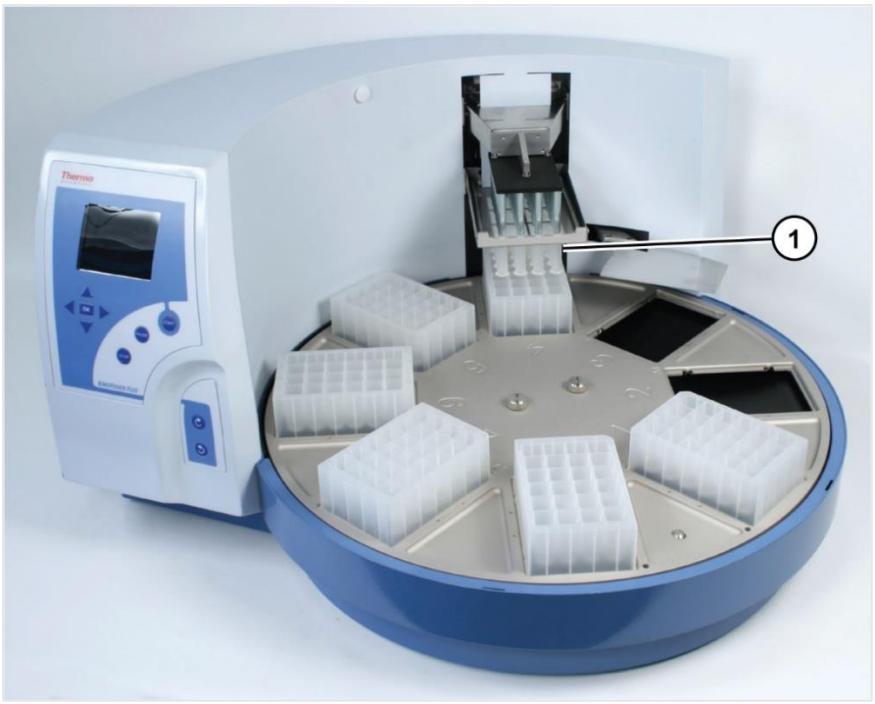


Figure 44. Tip comb in the tip comb holder

1. Tip comb in the tip comb holder

5. When the turntable moves, the shield plate moves over the plate situated underneath (Figure 45) forming a protective cover.

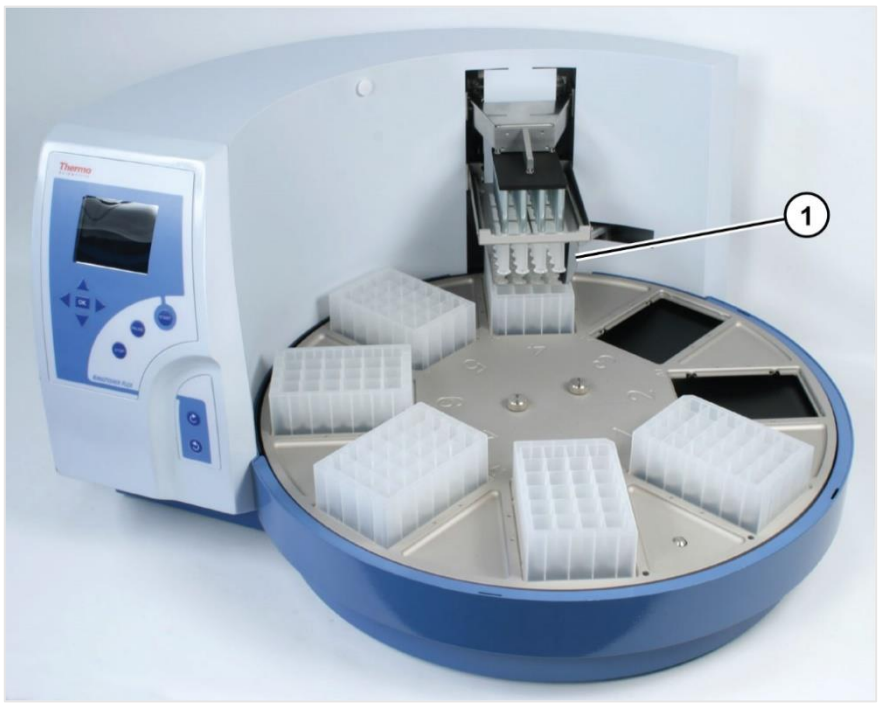


Figure 45. Shield plate in function

1. Shield plate

6. Close the sliding door. The transparent lid (if in place) protects the instrument against environmental contamination.

Note You can leave the sliding door open or remove the transparent lid. This action does not break the run.

7. After the run, remove the plate(s) according to the protocol request. Press **START** to confirm each plate removal.
8. Press **STOP** after completing the run.

Figure 46. KingFisher Flex plates

Caution Do not use other plates than the ones listed in Table 5. Other plates may not be compatible with the KingFisher Flex heating blocks. They can cause unexpected problems, such as cross-contamination due to the divergent well volume and bottom height of the plate.

The KingFisher Flex is compatible with KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates (Figure 46 and Table 5. Processing volumes vs. plate types and magnetic heads). Specially designed magnetic rods (KingFisher Flex heads) and tip combs that protect the magnets during the process are available for different plate types and applications.

Table 5. Processing volumes vs. plate types and magnetic heads

Head / Plate	KingFisher 24 deep well plate	Microtiter deep well 96 plate	KingFisher 96 plate	PCR plate, skirted
KingFisher Flex head for KF 24 deep well plate	200–5000 µl	–	–	–
KingFisher Flex head for Microtiter deep well 96 plate	–	50–1000 µl	50–150 µl	–
KingFisher Flex head for KF 96 plate	–	–	20–200 µl	–

Head / Plate	KingFisher 24 deep well plate	Microtiter deep well 96 plate	KingFisher 96 plate	PCR plate, skirted
KingFisher Flex head for PCR plate	–	–	20–200 µl	20–100 µl

Change the heating block

The heating block change is controlled by the software. Do this to change the heating block.

1. Choose the *Change_heatblock* protocol. Use the up and down cursor keys.
2. Press **START**. The protocol requests you to remove the magnets and, in the end, to insert them. The heating block rises.
3. Remove the heating block and then replace it (Figure 47 and Figure 48).
4. Insert the heating block by first setting it and then pressing it hard into place. The heating block will snap into place at both ends if you have done it correctly.
5. Press the **START** key when the task has been completed.

Figure 47. Insert the heating block

Figure 48. Press the heating block into place

You can add a heating step of ambient temperature +5°C to +115°C to a protocol. The heating block is preheatable, but no cooling can be carried out. All KingFisher Flex plates can be heated.

There are four different kinds of interchangeable heating blocks available, for KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates (Figure 49 and Table 6).

Figure 49. Four different heating blocks available

Table 6. Heating blocks vs. plate types

Heating block / Plate	KingFisher 24 deep well plate	Microtiter deep well 96 plate	KingFisher 96 plate	PCR plate, skirted
Heating block for KingFisher 24 deep well plate	X	–	–	–
Heating block for Microtiter deep well 96 plate	–	X	–	–
Heating block for KingFisher 96 plate	–	X	X	–
Heating block for PCR plate	–	–	–	X

Warning The heating block surface can be hot, whereby there can be risk of burns.

Caution The heating block is specifically designed for the plates listed below to ensure even heating during the sample process (Figure 21). Using other plates than those recommended may damage the instrument and diminish the application performance.

Shutdown

To shut down the KingFisher Flex, do the steps below:

1. Set the KingFisher Flex to off by pressing the power switch (Figure 4) at the bottom left of the back/side panel of the instrument into the OFF position.

Warning Discard the plastic tip comb onto the plate. Dispose of all tip combs as biohazardous waste.

Remove any plates still in the instrument. Dispose of all microplates as biohazardous waste.

2. Wipe the turntable surface and the adjacent instrument surface with a soft cloth or tissue paper moistened with distilled water, a mild detergent (SDS, sodium dodecyl sulfate) or soap solution.
3. If you have spilled infectious agents on the turntable, disinfect with 70% ethanol or another disinfectant (refer to Decontamination procedure).

Emergency situations

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

1. Set the instrument to off (Figure 4).
2. Unplug the instrument immediately from the power supply.
3. Carry out appropriate corrective measures. However, do not disassemble the instrument.
4. If the corrective measures taken do not help, contact authorized technical service or your local Thermo Fisher Scientific representative.

Chapter 5
Maintenance

Regular and preventive maintenance

For reliable daily operation, keep the instrument free of dust and liquid spills.

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 enough.

Clean the outside of the instrument and the turntable with clean low-pressure compressed air or a cloth dampened with water or a mild detergent when necessary.

Although the KingFisher Flex 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.

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

Clean the display areas with a mild laboratory detergent. The keypad has a wipe-clean surface.

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

Warning If any surfaces are contaminated with biohazardous material, a mild sterilizing solution should be used.

Caution Do not autoclave any part of this instrument except the shield plate.

How to clean the turntable

Keep the turntable surface clean to avoid dust and dirt entering the instrument. Clean the turntable surface at least once a week using a soft cloth or tissue paper soaked in a mild detergent solution (SDS), soap solution or alcohol.

The turntable can be detached for cleaning purposes (Figure 50 through Figure 52).

Unscrew the two finger screws. Note that the screws remain attached to the turntable when the screws are unfastened.

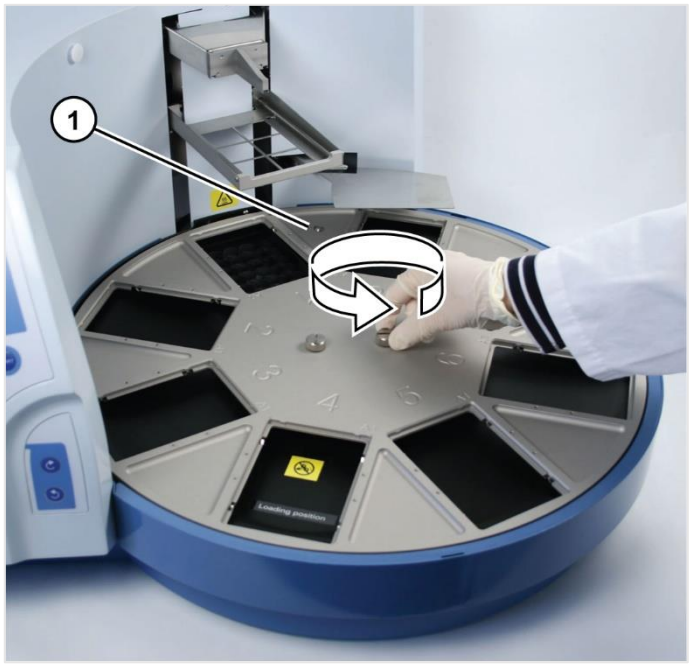


Figure 50. Unfasten the two finger screws

1. Alignment stud

Lift the turntable off.

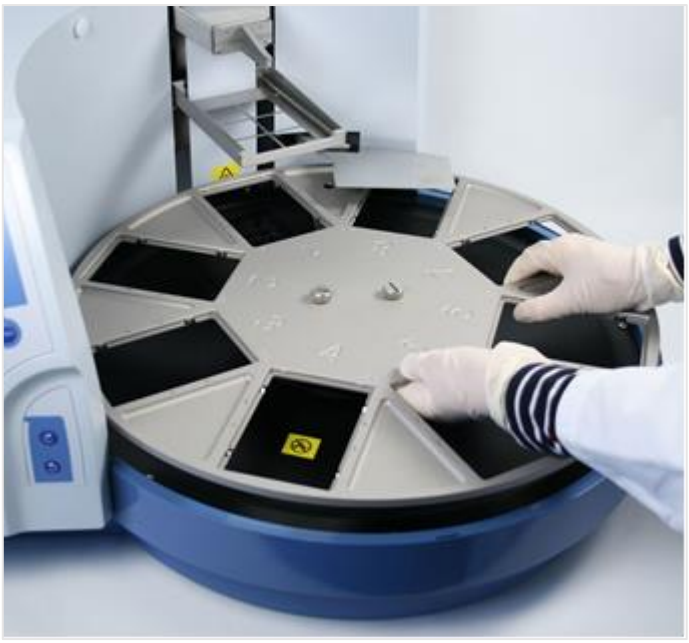


Figure 51. Remove the turntable

If you have spilled infectious agents on the turntable, clean it with a cloth dampened with water or a mild detergent.

Clean the black spill shield and the turntable using a soft cloth or tissue paper soaked in a mild detergent solution (SDS), soap solution or alcohol.

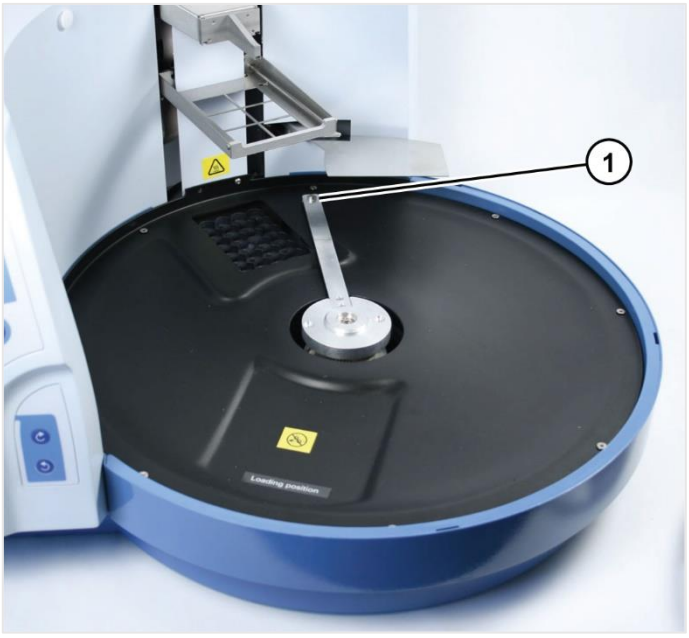


Figure 52. Black spill shield exposed for cleaning

1. Alignment stud

When you replace the turntable, insert the turntable so that you place it first onto the aligning stud. Then fasten the two finger screws.

You can gently rotate the turntable while the instrument is set to off.

How to clean the magnetic rods

If required, wipe the magnetic rods using a soft cloth or tissue paper soaked in a mild detergent solution (SDS), soap solution or alcohol.

Caution The KingFisher Flex should not be kept in close proximity to magnetic tapes, computer discs or other magnetic storage systems, such as credit cards, as these can be damaged by the strong magnetic field of the KingFisher Flex heads.

Do not hold the KingFisher Flex heads close to a PC display, since this may cause damage to the display.

Do not use metal tools when handling KingFisher Flex heads.

Be careful not to break the magnets while cleaning.

Warning This product contains very strong permanent magnets. People wearing a pacemaker or metallic prostheses should not use this product. A pacemaker or prostheses may be affected or damaged if it comes in close contact with a strong magnetic field.

How to clean the shield plate

If required, wipe the shield plate using a soft cloth or tissue paper soaked in a mild detergent solution (SDS), soap solution or alcohol. The shield plate is autoclavable (at 1 bar pressure and 121°C for 20 minutes).

Disposal of materials

Obey laboratory and country-specific procedures for the disposal of biohazardous or radioactive waste. Refer to local regulations for the disposal of infectious material.

Warning The samples can be potentially infectious. Dispose of all used plates, disposable gloves, syringes, disposable tips, and so on as biohazardous waste.

Decontamination procedure

If you have spilled infectious agents, carry out the decontamination procedure.

Warning The decontamination procedure should be performed by authorized trained personnel in a well-ventilated room wearing disposable gloves, protective glasses and clothing.

Perform decontamination in accordance with normal laboratory procedures. Any decontamination instructions provided with the reagents used should be obeyed.

It is strongly recommended to perform the complete decontamination procedure before relocating the instrument from one laboratory to another or before sending it to service.

Example of decontaminants:

- Ethanol 70%
- Virkon™ solution 1–3%
- Glutaraldehyde solution 4%
- Chloramine T
- Microcide SQ™ 1:64
- Decon™ 90 min. 4%

Warning The decontamination procedure should be performed by authorized trained personnel wearing disposable gloves, protective glasses and clothing in a well-ventilated room.

1. Prepare the decontaminant: 200 ml 4% glutaraldehyde solution (or another agent recommended by your safety officer).
2. Empty the turntable.
3. Set the power to off and disconnect the mains supply cable (Figure 14).
4. Disinfect the outside of the instrument using a cloth dampened with 70% ethanol.
5. Place the instrument in a large plastic bag. Ensure that the transparent lid has been removed.
6. Place a cloth soaked in the prepared solution into the bag. Ensure that the cloth does not contact the instrument.
7. Close the bag firmly and leave the instrument in the bag for at least 24 hours.
8. Remove the instrument from the bag.
9. Clean the instrument using a mild detergent.
10. Remove any stains using 70% ethanol.

Pack for service

To pack for service, obey the guidelines presented below.

Caution It is important that the instrument is thoroughly decontaminated before it is removed from the laboratory or any servicing is performed on it.

When you ship the instrument for service, remember to:

- Inform about the use of hazardous materials.
- Decontaminate the instrument beforehand.
- Install the transport locks.
- Place the KingFisher Flex head into its transportation box.
- Pack the instrument according to the enclosed packing instructions.
- Use the original packaging to ensure that no damage will occur to the instrument during shipping. Any damage will incur additional labor charges.
- Enclose the return goods 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 technical service department.

Refer to General specifications for details on storage and transportation temperatures.

Service contracts

It is recommended to maintain and service the instrument regularly every 12 months on a contract basis by the manufacturer's trained service engineers. This ensures that the product is properly maintained and gives trouble-free service. Contact the Thermo Fisher Scientific technical service department for more details.

Discard the instrument

If the KingFisher Flex must be discarded, obey the guidelines below.

Warning Decontaminate the instrument before disposal. Refer to Decontamination procedure about decontamination.

Obey laboratory and country-specific procedures for biohazardous or radioactive waste disposal.

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

Pollution degree	2 (see “Safety specifications” on page 70)
Method of disposal	Electronic waste
	Contaminated waste
	(Infectious waste)

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

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

Chapter 6
Technical specifications

General specifications

Thermo Fisher Scientific reserves the right to change any specifications without prior notice as part of our continuous product development program. The general specifications are presented in Table 7.

Table 7. General specifications

General specifications	
Overall dimensions – instrument – transport package	 *ca.* 680 mm (W) x 600 mm (D) x 380 mm (H) [26.8” (W) x 23.6” (D) x 15” (H)] 800 mm (W) x 1200 mm (D) x 710 mm (H) 31.5” (W) x 47.2” (D) x 28” (H)
Weight – instrument – incl. transport package	 *ca.* 28 kg [62 lbs.] *ca.* 44 kg [97 lbs.]
Operating conditions (indoor use)	+5°C to +40°C; maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C Indoor use only
Transportation conditions	-40°C to +60°C, packed in transport packaging
Storage conditions	-25°C to +50°C, packed in transport packaging
Mains power supply	100–240 Vac, 50/60 Hz, nominal Automatic voltage detection
Power consumption	175 VA max.; 55 VA standby
Heat dissipation	341 BTU max.
Computer interface	USB or serial RS-232C port. Baud rate 9600. Character format 1 start bit, 8 data bits, 1 stop bit, and no parity. Flow control XON/XOFF.
Internal software	Space for max. 512 internal protocols
Normal use	10 runs/day, 250 days/year, with 40 min protocols having a medium speed setting, RT

Performance specifications

The performance specifications are presented in Table 8.

Table 8. Performance specifications

Performance specifications	
Processing volume	24: 200 µl – 5 mL • 200–500 µl performance may vary depending on the mixing speed and liquid 96: 20–1000 µl
Capacity	96 samples/run
Collection efficiency of the particles (indoor use)	> 95%, KingFisher 96 plate neutral wash buffer containing detergent, 2.8 µm particles, 3 collections, RT
Magnetic particle size	*ca.* > 1 µm
Magnet rods	24 or 96 in one frame Interchangeable KingFisher Flex heads
Plate types (disposable) * Recommended filling volume	24 / 96-well plates – KingFisher 24 deep well plate (200 µl – 5 mL*) – Microtiter deep well 96 plate (50–1000 µl*) – KingFisher 96 plate (20–200 µl*) – PCR plate (20–100 µl*), skirted
Tip combs (polypropylene – disposable)	24 / 96 in one frame – for KingFisher 24 deep well plate – for Microtiter deep well 96 plate – for KingFisher 96 plate – for PCR plate
Heating block temperature	From +5°C above ambient temperature to +115°C
Heating block accuracy	± 1°C, up to +80°C, ± 2°C, up to +115°C, instrument in RT
Keypad/ Display	START / PAUSE / STOP / OK / TURNTABLE ROTATION CLOCKWISE / TURNTABLE ROTATION COUNTERCLOCKWISE / four cursor keys/ LCD

Safety specifications

This section describes the safety specifications for the KingFisher Flex instrument.

In conformity with the requirements

KingFisher Flex bears these markings:
Type 711
100–240 Vac, 50/60 Hz, 175 VA
CE mark
NRTL certification for US/CA

KingFisher Flex conforms to these requirements:
2014/35/EU (Low Voltage Directive)
2014/30/EC (Electromagnetic Compatibility Directive, EMC)
FCC Part 15, Subpart B/Class B (July 2004)
2012/19/EC (Waste of Electrical and Electronic Equipment)
EU Directive 2011/65/EU and Commission Delegated Directive (EU) 2015/863 (RoHS Directive – restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment)

Safety performance:
EN 61010-1, UL 61010-1, CSA C22.2 No 61010-1, IEC/EN 61010-2-010, UL 61010-2-010, CSA C22.2 No 61010-2-010 IEC/EN 61010-2-081, UL 61010-2-081, CSA C22.2 No 61010-2-081

The safety specifications are also met under these environmental conditions in addition to or in excess of those stated in the operating conditions:	
Altitude	Up to 2000 m
Temperature	+5°C to +40°C
Humidity	Maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C
Mains supply fluctuations	± 10% from nominal
Installation category (overvoltage category)	II according to IEC 60664-1 (see Note 1)
Pollution degree	2 according to IEC 60664-1 (see Note 2)

Note 1 The installation category (overvoltage category) defines the level of transient overvoltage which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and its overvoltage protection means. For example, in CAT II which is the category used for instruments in installations supplied from a supply comparable to public mains, such as hospital and research laboratories and most industrial laboratories, the expected transient overvoltage is 2500 V for a 230 V supply and 1500 V for a 120 V supply.

Note 2 The pollution degree describes the amount of conductive pollution present in the operating environment. Pollution degree 2 assumes that normally only nonconductive

pollution, such as dust, occurs except for occasional conductivity caused by condensation.

Chapter 7
Frequently asked questions

Q1: What does the KingFisher Flex system do?

A1: Thermo Fisher Scientific now offers a complete KingFisher Flex system – the magnetic particle processor – for the purification and processing of proteins, DNA, RNA and cells in a 24 or 96-well format. The processor handles particles automatically according to the preloaded purification protocols. For more information on these applications, contact Thermo Fisher Scientific.

Q2: What plates can be used with the KingFisher Flex?

A2: The KingFisher Flex is compatible with four different plate types: KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates. Each plate type has an optimized KingFisher Flex head and tips. Of the four plates, the KingFisher 96 plate can be used with all three kinds of magnets (for example, KingFisher 96 plates can be used together in a protocol with either Microtiter deep well 96 plates or PCR plates).

Q3: Can I use plates from other manufacturers?

A3: No, it is highly recommended to use plates listed in Table 12. These plates are specifically designed to be used with KingFisher Flex tip combs to attain maximal performance. Plates from other manufacturers may not be compatible with the KingFisher Flex heating blocks. They may also cause unexpected problems, such as cross-contamination, due to the divergent well volume and bottom height of the plate.

Q4: Will the magnet get weaker? If so, how long can they be used?

A4: The KingFisher Flex magnets are made of material that is very stable. The magnetic field will not get weaker. However, extreme mechanical force or heating can cause damage to the magnets.

Caution It is very important to keep the KingFisher Flex heads away from each other and other magnets at all times. Interference of the magnets on one another may cause serious damage to the magnets.

Q5: How strong are the magnets? Can they, for example, disturb some sensitive equipment?

A5: The KingFisher Flex should not be kept near magnetic tapes, computer discs or other magnetic storage systems, such as credit cards, as these can be damaged by the strong magnetic field of the KingFisher Flex heads.

Do not hold the KingFisher Flex heads close to a PC display, since this may cause damage to the display. Do not use metal tools when handling KingFisher Flex heads.

Warning This product contains very strong permanent magnets. People wearing a pacemaker or metallic prostheses should not use this product. A pacemaker or prostheses may be affected or damaged if it comes in close contact with a strong magnetic field.

Q6: How can the KingFisher Flex heads be changed?

A6: By running the *Change_magnet* protocol under the Maintenance menu using the up and down cursor keys.

Q7: Can I concentrate the sample during the run?

A7: Both deep well plates and KingFisher 96 plates can be used during the same run. Therefore, it is possible to start the processing by using larger volumes (in a deep well plate) and elute the purified sample to a smaller volume (in a KingFisher 96 plate).

Q8: How does the heating block work?

A8: The heating block is located inside the instrument and can be used automatically during the protocol. All KingFisher Flex plates can be heated using specially designed, interchangeable heating blocks. Any number of heating steps can be added to the protocol. During the protocol, when the protocol enters the heating step, the plate is automatically moved to the dedicated heating position for heating. After the heating step the protocol continues automatically to the next step.

Note No cooling steps can be added.

Q9: How long does it take the heater to warm up from RT to 80°C?

A9: The heating block warms up about 10 degrees per minute, so it will take about 6 minutes.

Q10: What should I do if the magnets set are dirty?

A10: Wipe the magnetic rods with a soft cloth or tissue paper soaked in a mild detergent solution, soap solution or alcohol.

Q11: What should I do if I forget to insert the tip combs into the tip comb holder?

A11: The protocol will not start without the tip combs inserted into the tip comb holder.

Q12: What if the magnetic particles remained in the sample well?

A12: If the starting material is too viscose, the magnetic rods will not be able to collect the particles. Dilute the sample and make sure that the sample is properly homogenized/lysed.

Adding low amounts of detergent will improve the collection of magnetic particles as well.

Quickly centrifuge the plate to sediment the particles to the bottom of the plate.

When you use a tip comb for PCR magnets, do the collecting twice to get all particles.

Q13: What if the magnetic particles are attached to the tip combs after the run?

A13: This happens sometimes but it will not affect the yield because the sample has been released from the particles.

Q14: Are the volumes of reagents in each well critical?

A14: It is strongly recommended that you keep the specified volumes within the defined limits to avoid spillover in the performance of the chemical reactions and the processor and to keep the best performance at the most efficient level.

Q15: Are there any limitations in the use of mixing speeds?

A15: It is recommended to use bottom mix only for short mixing times, max. approx. 30 s at a time. This should especially be considered when using heating and/or 24-well plates.

To enhance a heating step instead of using bottom mix/fast throughout the step, loop pause and short bottom mix/fast several times within a step.

Q16: Is it always compulsory to use the transport locks?

A16: The transport locks are only necessary when relocating the instrument.

Q17: What should you do if the tip loading fails?

A17: Try first to manually stretch the tips both lengthwise and width wise to level the tip comb.

Chapter 8
Troubleshooting guide

Note Do not use the instrument if it appears that it does not function properly.

The instrument does not verify the logic flow of the received commands.

Error messages and warnings

When an error is detected, the current operation is terminated. After an error, it is best to abort the current run and restart from the beginning after the problem is fixed. The KingFisher Flex internal software has these error messages and warnings (Table 9).

Table 9. Error messages reported

Code	Error message	Description
0	No error	–
1	The command was not recognized as a valid command	The command was not recognized as a valid KingFisher Flex command.
2	The tip comb holder lifting mechanism is out of position	The magnetic head position is in error.
3	The turntable rotating mechanism is out of position	The turntable position is in error.
4	The magnetic head holder lifting mechanism is out of position	The magnetic tips lift position is in error.
5	The heating block lifting mechanism is out of position	The heater lift position is in error.
6	The shield plate turning mechanism is out of position	The shield plate position is in error.
7	Serial number already set	Attempt to set the serial number when it is already set.
8	Invalid command parameter	Invalid command argument.
9	Permanent parameters lost	Non-volatile parameters lost.
10	Protocol name already used in another directory	Cannot record a protocol with the same name to another directory.
11	Internal software error	This error is never reported because the firmware halts on detection of an internal error. However, this error may show up in the error log.
12	The requested movement is not allowed	Cannot perform the requested movement. For example, the head and the magnets cannot move down when the shield

Code	Error message	Description
		plate is in place, or the turntable cannot rotate when the heater is up.
13	The plastic tip combis not attached to the holder	No plastic tips attached to the head. The range of movement of the head and the magnets is limited if the tips are not attached to the head. This is to prevent bringing the magnets in direct contact with the magnetic particle solution.
14	The magnetic head is not inserted to holder	The magnets are missing. The range of movement of the head and the magnets is limited if the magnets are not attached to the magnet lift. This is to prevent running a purification sequence without the magnets.
15	The command is not recordable	The command is not recordable. This error is reported if a nonrecordable command is received when recording is on.
16	Not enough memory available for recording operation	Not enough memory available for operation. For example, maximum exceeded in recording.
Code	**Warning**	**Description**
100	Timer expired	Timer already expired. This warning is reported if a wait for a timer (WAI) command is executed and the timer has already expired.

Troubleshooting guide

A troubleshooting guide for the KingFisher Flex instrument is presented in Table 10.

Table 10. Actions taken against error messages and warnings

Code	Error message	Action
0	No error	–
1	The command was not recognized as a valid command	Contact authorized technical service.
2	The tip comb holder lifting mechanism is out of position	Set the instrument to OFF and ON and try again. If the error appears during initialization or is otherwise repeated, contact service.
3	The turntable rotating mechanism is out of position	Set the instrument to OFF and ON and try again. If the error appears during initialization or is otherwise repeated, contact service.
4	The magnetic head holder lifting mechanism is out of position	Set the instrument to OFF and ON and try again. If the error appears during initialization or is otherwise repeated, contact service.
5	The heating block lifting mechanism is out of position	Set the instrument to OFF and ON and try again. If the error appears during initialization or is otherwise repeated, contact service.
6	The shield plate turning mechanism is out of position	Set the instrument to OFF and ON and try again. If the error appears during initialization or is otherwise repeated, contact service.
7	Serial number already set	Contact authorized technical service
8	Invalid command parameter	Contact authorized technical service.

9	Permanent parameters lost	Contact authorized technical service.
10	Protocol name already used in another directory	Either record to the directory where the protocol is or delete the original protocol before recording this new one.
11	Internal software error	Contact authorized technical service
12	The requested movement is not allowed	Press the STOP button twice.
13	The plastic tip combis not attached to the holder	Examine if the tips are present. If it looks all right, turn ON and OFF, and run the check protocol according to the KingFisher Flex head and plastic consumables you are using (see Operational check).
14	The magnetic head is not inserted to holder	Examine that the magnets are fully inserted.
15	The command is not recordable	Contact authorized technical service
16	Not enough memory available for recording operation	Delete some unnecessary protocols from the internal memory with BindIt Software and try again. Repeat this procedure until the protocol fits. It is recommended that you cleanup the program memory from unnecessary protocols about once a month to prevent this error from occurring.
Code	**Warning**	**Description**
100	Timer expired	Contact authorized technical service.

Chapter 9
Ordering information

Contact your local Thermo Fisher Scientific representative for ordering and service information. Ordering information codes are presented in Table 11 through Table 13.

KingFisher Flex

Table 11. Codes for products

Code	Instrument / System
5400610	KingFisher Flex – 96 PCR head
5400620	KingFisher Flex – 96 KF head
5400630	KingFisher Flex – 96 deep well head
5400640	KingFisher Flex – 24 deep well plate

List of accessories and consumables

Table 12. Codes for accessories and consumables

Code	Item	Quantity
N07669	*KingFisher Flex User Manual*	1
5189009	BindIt Software	1
24074411	KingFisher Flex 96 PCR head and heating block	1
24074421	KingFisher Flex 96 KF head and heating block	1
24074431	KingFisher Flex 96 deep well head and deep well and KF heating blocks	1
24074441	KingFisher Flex 24 deep well head and heating block	1
24074410	KingFisher Flex 96 PCR head	1
24074420	KingFisher Flex KF head	1
24074430	KingFisher Flex 96 deep well head	1
24074440	KingFisher Flex 24 deep well head	1
24075410	KingFisher Flex 96 PCR heating block	1
24075420	KingFisher Flex 96 KF heating block	1
24075430	KingFisher Flex 96 deep well heating block	1
24075440	KingFisher Flex 24 deep well heating block	1
97002514	KingFisher Flex 96 tip comb for PCR magnets	80 pcs
97002524	KingFisher Flex 96 tip comb for KF 96 magnets	100 pcs
97002534	KingFisher Flex 96 tip comb for DW magnets	100 pcs

Code	Item	Quantity
97002610	KingFisher Flex 24 deep well tip comb and plate	50 pcs of each
97002540	KingFisher 96 KF plate (200 µl)	48 pcs
95040450	Microtiter deep well 96 plate, V-bottom	50 pcs
95040460	Microtiter deep well 96 plate, V-bottom, sterile	50 pcs
95040470	KingFisher Flex 24 deep well plate	50 pcs
95040480	KingFisher Flex 24 deep well plate, sterile	50 pcs

List of spare parts

Table 13. Codes for spare parts

Code	Item	Quantity
2305290	Serial cable F9/F25 (for RS-232C port)	1
N04001	USB A-B device cable 1.8 m*	1

* Longer USB cables available from PC stores