

Thermo Scientific KingFisher Duo

User Manual

Rev. 1.0



Thermo Scientific KingFisher Duo

User Manual

Rev. 1.0, Cat. no. N12420

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Patents

This product is protected by the following patents:

US 6447729, Method and means for magnetic particle specific binding assay, and US 6448092, Separation device for microparticles involving a magnetic rod.

KingFisher Duo also has national and international patents pending.

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No liability for consequential damages

Thermo Fisher Scientific shall not be liable for any damages whatsoever arising out of the use or inability to use this product.

Power failure

The system requires uninterrupted power supply in order to operate correctly. Thermo Fisher Scientific has no responsibility whatsoever for system malfunctions arising from power failures.

About This User Manual

Intended users

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 Duo magnetic particle processor, including the installation and operating instructions.

How to use this user manual

This user manual is for the KingFisher Duo instrument (Cat. no. 5400100). It aims to give you the information you need for:

- Reviewing safety precautions
- Installing the KingFisher Duo
- Using the KingFisher Duo in routine jobs – the processing step
- Performing basic cleaning and maintenance procedures
- Troubleshooting the instrument performance

This user manual also describes all the features and specifications of the KingFisher Duo instrument as well as ordering information.

Note that simulated data appears in the screen captures.

Read the manual in its entirety before operating the instrument.

Keep the user manual for future reference. The user manual is an important part of the instrument and should be readily available during use of the instrument.

For more information

For PC software-related issues, refer to the *Thermo Scientific BindIt Software User Manual* (Cat. no. N07974).

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

<http://www.thermoscientific.com>

<http://www.thermoscientific.com/kingfisher>

In our efforts to provide useful and appropriate documentation, we would appreciate any comments you may have 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 Duo

The following 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 2002/96/EC. ▲

Warning and other markings used in the documentation

The following 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 follow basic safety precautions when using the KingFisher Duo 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 follow 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 Duo than the front lid or the maintenance door (Figure 2–3) while the instrument is plugged into a power source.
- Never force a microplate onto the instrument.
- The KingFisher Duo is intended for laboratory research use only. Observe proper laboratory safety precautions, such as wearing protective clothing and following approved laboratory safety procedures.
- Preventative maintenance instructions should be followed 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. ▲

Contents

	Intended users	3
	How to use this user manual	3
	For more information	3
	Safety symbols and markings.....	4
	Safety symbols and markings used on the KingFisher Duo.....	4
	Warning and other markings used in the documentation	5
	Instrument safety and guidelines for use.....	6
Chapter 1	Introduction to the KingFisher® Duo	11
	Intended use.....	11
	Principle of operation.....	11
Chapter 2	Functional Description	13
	Instrument layout.....	13
	Front view.....	13
	Back / internal view.....	14
	KingFisher Duo magnetic particle processor.....	14
	Principle of magnetic particle processing.....	15
	Working with a magnetic rod.....	16
	Collecting magnetic particles.....	16
	Releasing magnetic particles	16
	Washing magnetic particles and incubation.....	16
	Changing the volume during the magnetic particle processing	16
	Magnet heads.....	17
	Heating blocks	17
	Elution blocks	18
	Shield plate	18
	USB port for PC	18
	USB ports for memory devices	18
	Consumables.....	18
	Reagents.....	19
Chapter 3	Installation	21
	What to do upon delivery	21
	Unpacking the instrument	21
	Checking delivery for completeness and damage	22
	Environmental requirements.....	22
	Precautions and limitations	22
	Installation setups.....	23
	Releasing the transport lock.....	23
	Connecting the power supply cable.....	24
	Operational check.....	25
	Fitting the subassemblies of the instrument into place.....	25

	Changing the heating blocks	25
	Interchangeable heating blocks	26
	Interchangeable KingFisher Duo magnet heads.....	27
	Changing the magnet head.....	28
	Packing the instrument for transportation.....	30
	Refitting the transport lock	30
Chapter 4	Routine Operation	33
	Switching on	33
	Control panel.....	33
	Keypad.....	33
	Keys	33
	Display.....	34
	Navigating	35
	Using KingFisher Duo PC software	38
	Using internal software.....	38
	Factory / User protocols	38
	Selecting the protocol.....	38
	Run menu.....	39
	Instrument options.....	43
	Export device report.....	43
	Export run log.....	44
	Import protocol	45
	Export protocol.....	46
	Maintenance protocol	47
	Information.....	47
	Language.....	48
	Buzzer	49
	Date and time	49
	Handling the consumables	51
	Tip combs.....	51
	Plates.....	52
	Elution strip.....	53
	How to start.....	53
	Shutdown	56
	Emergency situations	56
Chapter 5	Maintenance	57
	Regular and preventive maintenance	57
	Cleaning the turntable.....	57
	Cleaning the magnetic rods.....	58
	Cleaning the shield plate	58
	Disposal of materials	58
	Decontamination procedure.....	58
	Packing for service.....	60
	Service contracts.....	61
	Maintaining a system log.....	61
	Disposal of the instrument	61

Chapter 6	Technical Specifications	63
	General specifications.....	63
	Performance specifications	64
	Safety specifications.....	64
	In conformity with the requirements.....	64
Chapter 7	Troubleshooting Guide	67
	Troubleshooting guide	67
Chapter 8	Ordering Information.....	69
	KingFisher Duo	69
	List of accessories and consumables	69
	List of spare parts	70
	List of KingFisher Kits	70
Appendix A	Certificate of Decontamination.....	71
Appendix B	System Log	73

Chapter 1

Introduction to the KingFisher® Duo

Intended use

The KingFisher Duo magnetic particle processor (Figure 1–1) is intended for professional research use by trained personnel. The instrument is intended for automated transfer and processing of magnetic particles in a microplate format. Use for self-testing is excluded. It is recommended that Good Laboratory Practice (GLP) is followed to guarantee reliable analyses.

Refer to Chapter 6: “Technical Specifications”.

Principle of operation

The KingFisher Duo magnetic particle processor (Figure 1–1) is designed for automated transfer and processing of magnetic particles in microplate format.

The patented technology of the KingFisher Duo 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.

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



Figure 1–1. KingFisher Duo magnetic particle processor

Introduction to the KingFisher® Duo
Principle of operation

Chapter 2

Functional Description

Instrument layout

This section shows the front, back and internal views of the KingFisher Duo instrument.

Front view

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

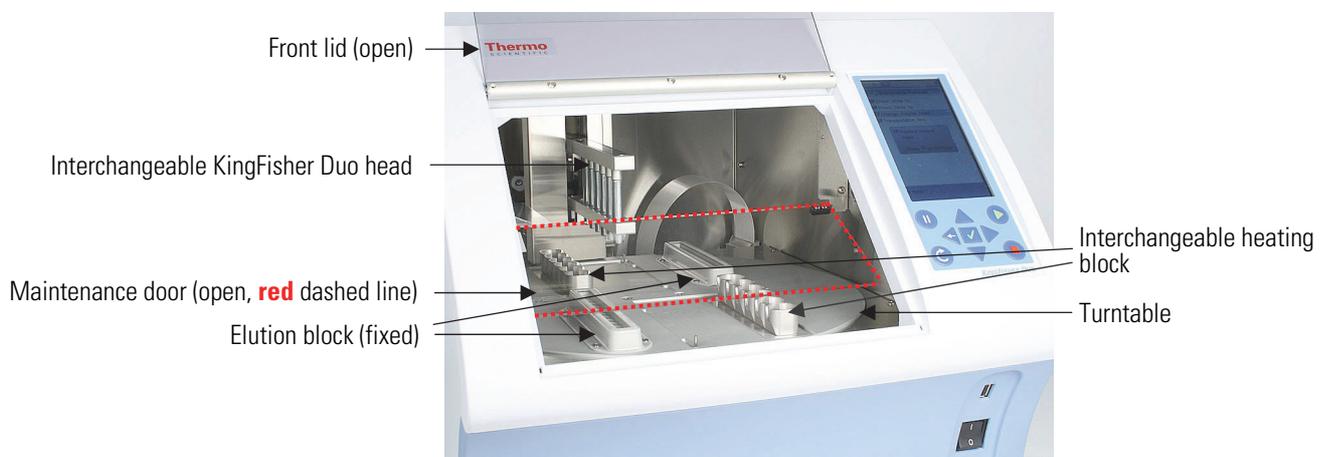


Figure 2–2. KingFisher Duo front view with front lid and maintenance door open

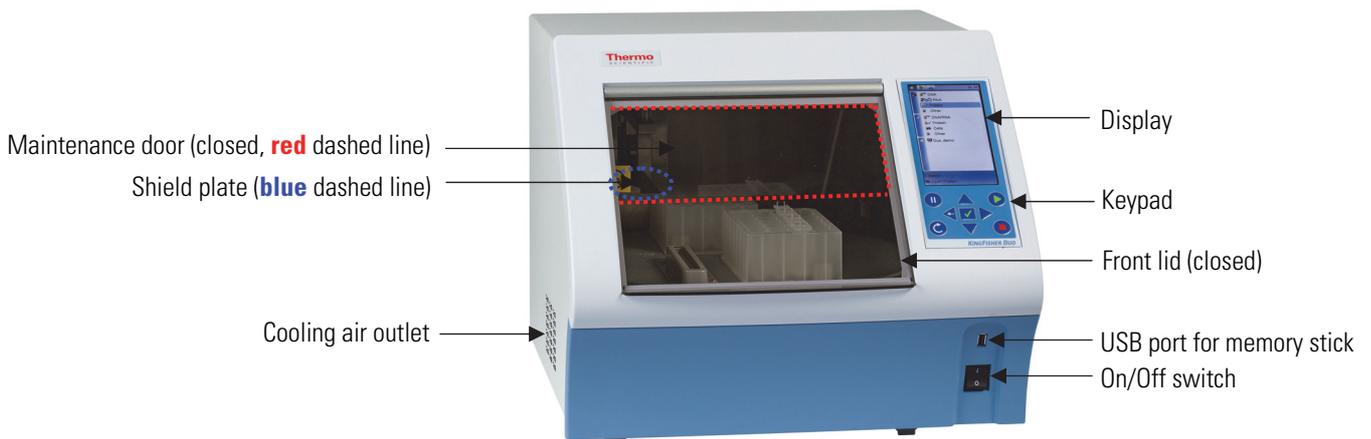


Figure 2–3. KingFisher Duo front view with plates and front lid and maintenance door closed

Functional Description

KingFisher Duo magnetic particle processor

Back / internal view

The back view of the KingFisher Duo instrument is shown in Figure 2–4 and the internal view in Figure 2–5.

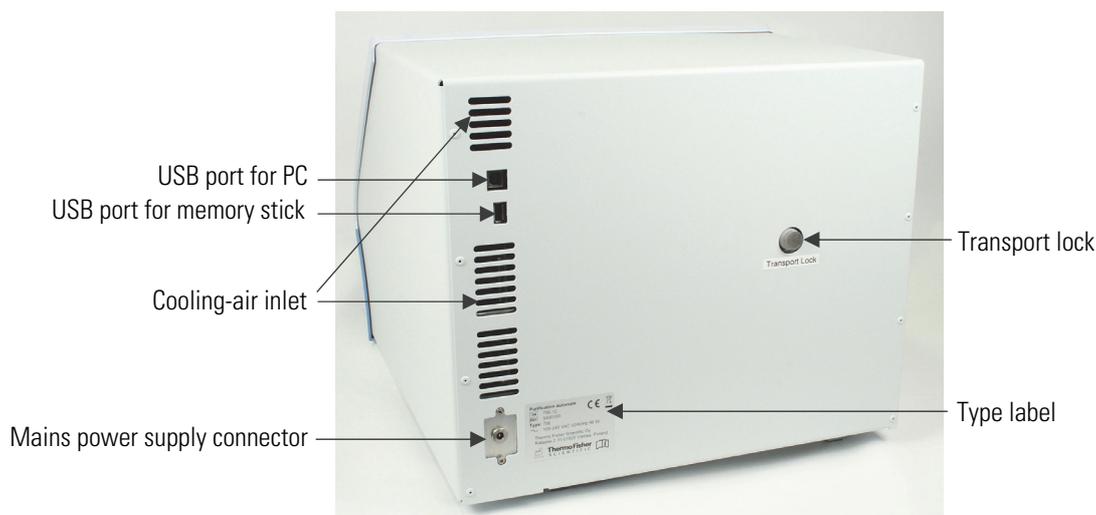


Figure 2–4. KingFisher Duo back view

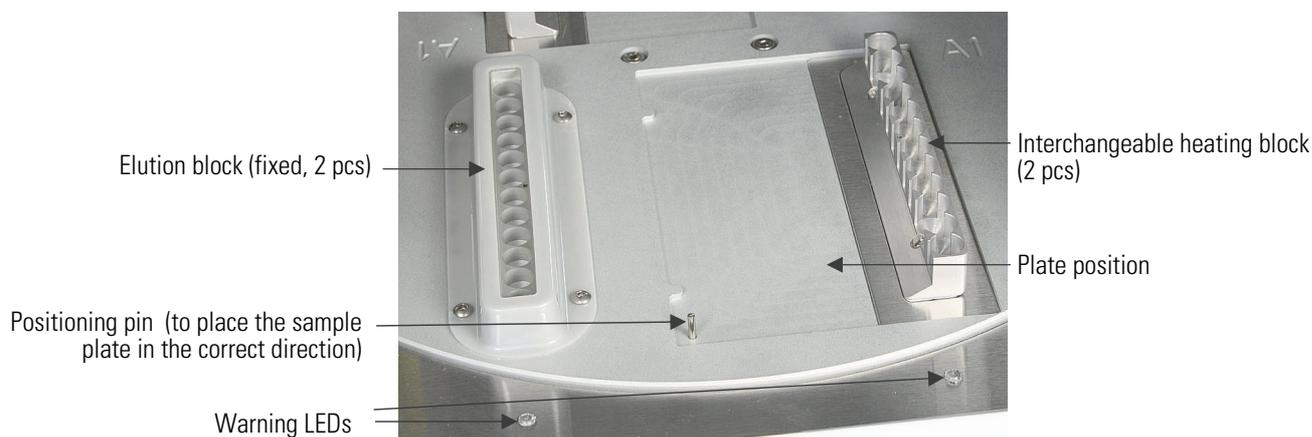


Figure 2–5. KingFisher Duo internal view the from front processing position

KingFisher Duo magnetic particle processor

The KingFisher Duo (Figure 2–6) has room for two plates and two elution strips. 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 (12 or 6 pieces) and the other one for the plastic tip comb. For more details, refer also to “Magnet heads” on page 17, “Heating blocks” on page 17 and “Elution blocks” on page 18.

Up to two plates can be simultaneously on the turntable and processed automatically one after another. The processing of two sequential runs is started with the 1st plate with samples in a 96-well plate. Then you prepare the 2nd sample plate while the first plate is still being processed, select the protocol and place the plate onto the turntable. The processing of the 2nd plate starts automatically after the 1st one is completed. Max. 24 samples in a 96 deep well plate can be processed

without interruptions. When using large-volume configurations on 24-well plates, usually two plates are used in a run.

Before starting the magnetic particle processing via the keypad and display, the samples and reagents are dispensed into the plate(s)/strip(s) and the tip comb is placed onto the preset row of the sample plate, default row B, from which it is automatically loaded. The plate(s) are placed onto the turntable into the corresponding plate position according to the protocol instructions. During the operation, the front lid can be closed or open (Figure 2–3). The closed door protects the processing against environmental contamination.

The operating principle employed is MPP (inverse magnetic particle processing) technology (Figure 2–7). Rather than moving the liquids, the magnetic particles are moved row wise on the plate(s)/strip(s) 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 2–6. KingFisher Duo magnetic particle processor

Principle of magnetic particle processing

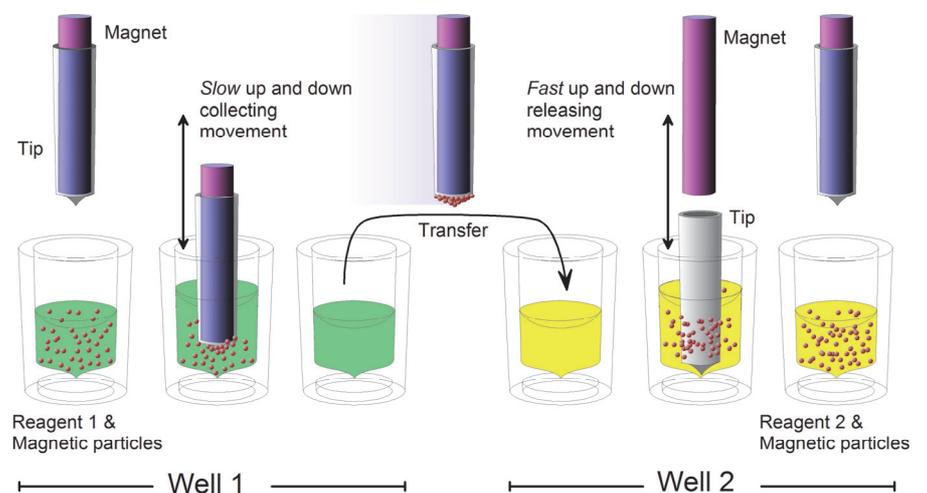


Figure 2–7. Inverse magnetic particle processing

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

Collecting 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 wells and transferred into the next wells.

Releasing magnetic particles

After collection of the magnetic particles, the magnetic rods together with the tip comb are lifted from the wells and transferred into the next wells containing the reagent, the magnetic rods together with the tip comb are lowered into the wells and the magnetic rods are lifted off.

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 and incubation

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

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

To keep the magnetic particle suspension evenly mixed in incubating 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 row of the plate can be larger than the volume of the next row, and this is used for concentration purposes (see Figure 2–8 below).

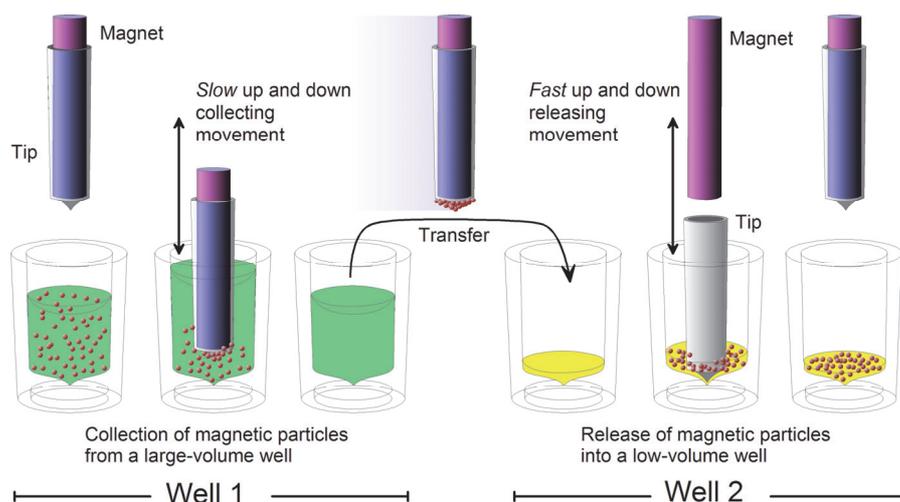


Figure 2–8. A concentration step during magnetic particle processing

Magnet heads

The KingFisher Duo can be used with one processing head at a time. The instrument comes equipped with two interchangeable KingFisher Duo magnet heads, a 12-pin magnet head and a 6-pin magnet head. The magnet head options have been designed for different volume needs.

The 12-pin magnet head is used with a corresponding plastic 12-tip comb and a Thermo Scientific Microtiter deep well 96 plate and the 12-well KingFisher Duo elution strip.

- *12-pin magnet head*
 - 1–12 samples per run
 - 8 processing positions including the elution strip
 - Up to 1 ml processing volume

The 6-pin magnet head is used with a corresponding plastic 6-tip comb and a Thermo Scientific KingFisher Flex 24 deep well plate.

- *6-pin magnet head*
 - 1–6 samples per run
 - 3 processing positions (optionally with two plates up to 7 positions)
 - Up to 5 ml processing volume

If necessary, the factory set 12-pin magnet head can be changed to the 6-pin magnet head. Refer to “Interchangeable KingFisher Duo magnet heads” on page 27, “Changing the magnet head” on page 28 and “List of spare parts” on page 70.

Heating blocks

The KingFisher Duo comes equipped with two interchangeable KingFisher Duo heating blocks, either 12- or 6-well and with two

pieces each. The two parallel 12-well KingFisher Duo heating block rows installed at the factory can be changed to two parallel 6-well heating blocks if necessary. Refer to “Changing the heating blocks” on page 25 and “Interchangeable heating blocks” on page 26.

Elution blocks

There are two parallel fixed 1 x 12-well elution blocks (Figure 2–2 and Figure 2–5) with a heating and cooling option. The elution blocks can only be used with a 12-pin magnet head. A plastic KingFisher Duo 1 x 12 elution strip can be placed onto the block.

Following the process, the elution block can be set to cool and thus act as a cooling block to better preserve the samples.

Shield plate

Always when the turntable rotates as well as at the end of each protocol, the tip moves on top of the fixed shield plate that serves as a protective cover (Figure 2–3).

USB port for PC

There is a USB port for PC located on top of the USB port for memory stick on the back panel (see Figure 2–4). A USB cable (Cat. no. N04001) is supplied with the instrument.

USB ports for memory devices

There are two parallel USB ports, one on the back panel and one on the front panel (Figure 2–4 and Figure 2–3), designed for:

- Protocol import/export
- Export of the run log file for traceability

The user can either use the USB port on the back panel or the front to accept an external memory device (Figure 2–4 and Figure 2–3).

It is convenient and user friendly to use the front USB port for importing or exporting protocols. PC connection is not necessary. You can also export the run log file for traceability.

It is recommended to use FAT16 or FAT32 formatted USB memory devices.

It is not recommended to use multiple drive USB memory devices that contain virtual CD drives. For more information, refer to Chapter 7: “*Troubleshooting Guide*”.

Consumables

For more details and ordering information on plastic consumables, such as plates, tip combs, elution strips, etc. used with the KingFisher Duo instrument, refer to “List of accessories and consumables” on page 69.

Reagents

There is a wide selection of optimized Thermo Scientific KingFisher Kits for low or medium throughput available for purification of DNA or RNA. The versatile kit selection is intended for a large variety of starting materials, such as blood, cells, tissues or cell-free body fluids. The DNA or RNA purified with the KingFisher Kits is of high quality and free of proteins, nucleases, and other contaminants or inhibitors. The kits are therefore suitable for direct use in many different downstream applications, such as PCR (polymerase chain reaction), restriction analysis and in several enzymatic reactions.

The KingFisher Kits are listed below:

- KingFisher Blood DNA Kit (Cat. no. 97010196)
- KingFisher Cell and Tissue DNA Kit (Cat. no. 97030196)
- KingFisher Plant DNA Kit (Cat. no. 97050196)
- KingFisher Total RNA Kit (Cat. no. 97020196)
- KingFisher Viral NA Kit (Cat. no. 97040196)

For more details, refer to “List of KingFisher Kits” on page 70 or visit our website <http://www.thermoscientific.com/kingfisher>.

Thermo Scientific Pierce Protein Research Products are available for protein applications. For more details on kits available, visit <http://www.piercenet.com>.

The KingFisher Duo is an open system, which gives an opportunity to use also other magnetic particle kits. The optimal magnetic particle size for the KingFisher Duo is 0.8–10 μm .

Functional Description
Reagents

Chapter 3

Installation

This chapter describes the installation of the KingFisher Duo instrument.

What to do upon delivery

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

Unpacking the instrument

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 Duo 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.

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

- *Thermo Scientific KingFisher Duo Brief User's Guide*
- BindIt™ Software installation CD
 - *KingFisher Duo User Manual*
 - *BindIt Software for KingFisher Instruments User Manual*
 - *Thermo Scientific User Awareness of Symbols*
 - *Declaration of Conformity* document



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



Warning The KingFisher Duo weighs approximately 16 kg [35 lbs.] without the transport package and should be lifted with care. It is recommended that two persons lift the instrument together, taking the 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.

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.

Checking delivery for completeness and damage

Check the enclosed packing list against order. Visually inspect the transport package, the instrument and the accessories for any possible transport damage. If any parts are damaged, contact your local Thermo Fisher Scientific representative or Thermo Fisher Scientific Oy.

Environmental requirements

When you set up your KingFisher Duo, avoid sites of operation with excess dust, vibrations, strong magnetic fields, direct sunlight or UV light, draft, excessive moisture or large temperature fluctuations. Place the instrument on a normal laboratory bench. Make sure that:

- The working area is flat, dry, clean and vibration-proof and leaves additional room for accessories, cables, and reagent bottles.
- There is at least 10 cm on the laboratory bench of free space around the instrument for ventilation.
- The ambient air is clean and free of corrosive vapors, smoke and dust.
- The ambient temperature range is between +5°C (41°F) and +40°C (104°F).
- The humidity is low so that condensation does not occur (relative humidity is between 10% and 80%).

Install the KingFisher Duo in a protected location where no one can step on or trip over the power cord, and where the power cord remains accessible if the unit needs to be unplugged.



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

Precautions and limitations

- Always ensure that the local supply voltage in the laboratory conforms to that specified on the type label on the back of the instrument (Figure 2–4).
- Do not smoke, eat or drink while using the KingFisher Duo.
- Wash your hands thoroughly after handling test fluids.
- Observe normal laboratory procedures for handling potentially dangerous samples.

- Wear proper protection clothing, such as disposable gloves and laboratory coats, according to good laboratory practice.
- Ensure that the working area is well ventilated.
- Never spill fluids in or on the equipment.



Caution The KingFisher Duo 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 Duo heads.

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

Do not use metal tools when handling KingFisher Duo 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. ▲

Installation setups

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

Releasing the transport lock

The instrument comes with one transport lock (Figure 3–9). Release the transport lock.

Make sure the transport lock is released before you put the instrument into operation.

To release the transport lock:

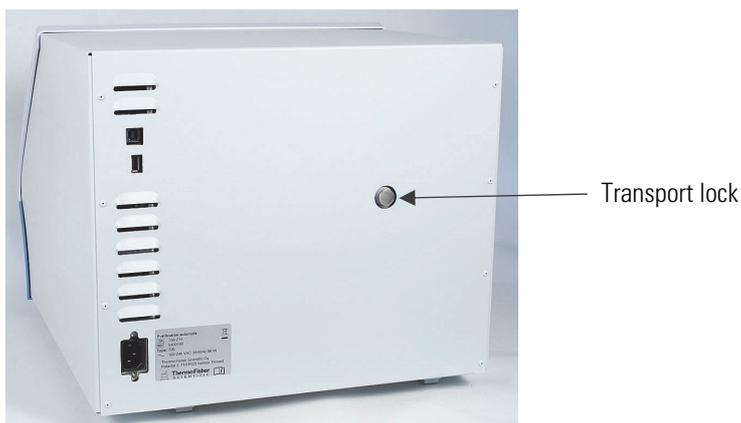


Figure 3–9. KingFisher Duo transport lock fitted

1. Unscrew the transport lock finger screw with spring suspension counterclockwise Figure 3–10. The loosened finger screw stays in the same location by spring force.

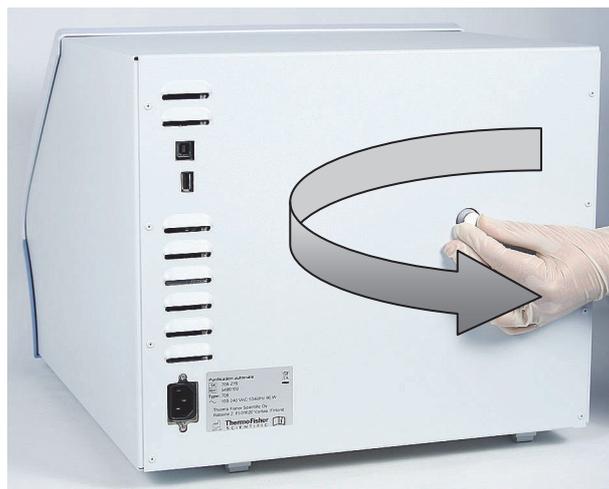


Figure 3-10. Releasing the transport lock

2. The transport lock has been successfully released (Figure 2-4). When relocating the instrument, refer to “Refitting the transport lock” on page 30.

Connecting the power supply cable



To connect the power supply cable:

Warning Ensure that the mains switch (Figure 2-4) on the front panel is in the OFF position. Never operate your instrument from a power outlet that has no ground connection. Never use a power supply cable other than the Thermo Scientific power supply cable designed for your region. ▲

1. Connect the power supply cable to the power supply connector and plug in the instrument (Figure 3-11).
2. Connect the power supply to a correctly installed line power outlet with a grounded conductor.



Figure 3-11. Mains supply cable connected

Operational check

First switch the instrument ON. The instrument performs initialization tests and adjustments.

The display briefly 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 maintenance protocol to verify proper instrument operation. Run the check protocol (Check_12-tip or Check_6-tip) under the **Maintenance** menu according to the KingFisher Duo head and plastics you are using. Ensure that the correct magnet head is attached. If the check is all right, proceed with your own runs.

Fitting the subassemblies of the instrument into place

Changing the heating blocks

This section describes the installation setups of the interchangeable KingFisher Duo heating blocks and magnet heads.

When necessary, the factory set 12-well heating blocks can be changed to the 6-well heating blocks.

To change the heating blocks:

1. Take away the heating block by lifting it.
2. Insert the first new heating block by setting it and snapping it into place (Figure 3–12).

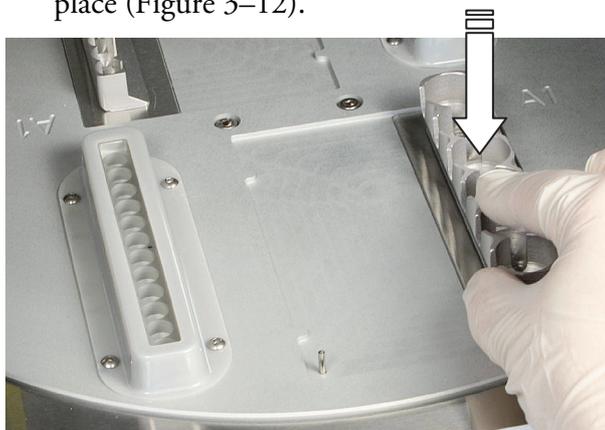


Figure 3–12. Changing the heating block

-  3. Press the **ROTATE** button to get the other heating block in the front and take away the heating block.
4. Insert the second new heating block by setting it and snapping it into place. ▲

Interchangeable heating blocks

There are two different kinds of interchangeable heating blocks available, for KingFisher Flex 24 deep well plates and Microtiter® deep well 96 plates (Table 3-1).

You can add a heating step of +10°C to +75°C to a protocol. Row A of the above-mentioned 24 and 96 deep well plates can be heated.

Table 3–1. Plates vs. heating adapter(s)

Plate	Description	Heating adapter(s)	Description
	KingFisher Flex 24 deep well plate (200–5000 µl*)		KingFisher Duo heating block for 24 DW plate
	Microtiter deep well 96 plate (50–1000 µl*)		KingFisher Duo heating block for 96 DW plate
	KingFisher Duo elution strip (30–130 µl*)		KingFisher Duo heating block for elution strip (fixed)

* = recommended filling volume



Warning The heating block and/or the elution 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 (Table 3–1). Using other plates than those recommended may damage the instrument and diminish the application performance. ▲

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

- KingFisher Flex 24 deep well plate (200–5000 µl*)
- Microtiter deep well 96 plate (50–1000 µl*)

* = recommended filling volume

Interchangeable KingFisher Duo magnet heads

There are two kinds of interchangeable KingFisher Duo magnet heads available, for KingFisher Flex 24 deep well plates and Microtiter deep well 96 plates. Both KingFisher Duo heads have corresponding disposable plastic tip combs (Table 3–2).



Caution Do not place the KingFisher Duo heads on top of the instrument or any metal surfaces. Keep the KingFisher Duo heads always in their respective plastic boxes when not in use (Figure 3–13). It is very important to keep the KingFisher Duo heads away from each other and other magnets at all times. Clashing of the magnets together may cause serious damage to the magnets. ▲

Table 3–2. Magnet head vs. tip comb

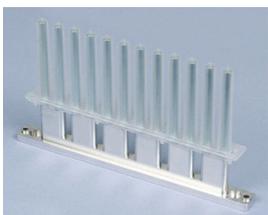
Magnet head	Description	Tip comb	Description
	KingFisher Duo head for 24 DW plate		KingFisher Duo 6-tip comb
	KingFisher Duo head for 96 DW plate		KingFisher Duo 12-tip comb



Figure 3–13. KingFisher Duo head in its storage box



Caution The KingFisher Duo head 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 Duo heads.
Do not hold the KingFisher Duo heads close to a PC display, since this may cause damage to the display.
Do not use metal tools when handling KingFisher Duo 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. ▲

Changing the magnet head

The factory set 12-pin magnet head can be changed to the 6-pin magnet head. Fastening/changing the magnet head is controlled by the software.

To change the magnet head:

1. Unscrew the maintenance door by turning the two **red** finger screws clockwise (Figure 3–14).

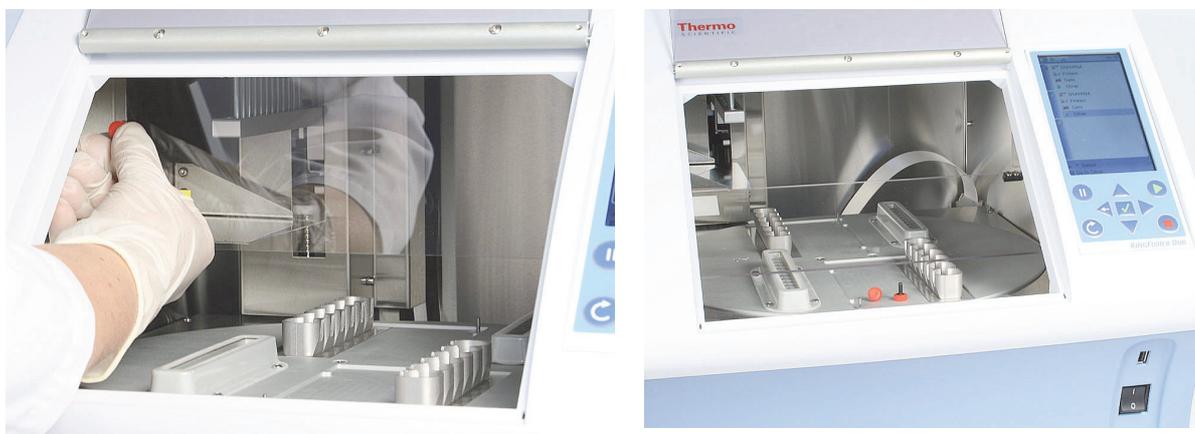


Figure 3–14. Unscrewing the maintenance door



2. To fit the magnet head, choose the Change_magnet_head protocol under the **Maintenance** menu by using the **Up** and **Down** arrow keys.



3. Then press the **START** key.

4. Take away the magnet head by turning the two finger screws on top of the magnet head clockwise when instructed (Figure 3–15). When you remove the KingFisher Duo head, be careful not to damage the magnet rods against the tip comb holder frame.

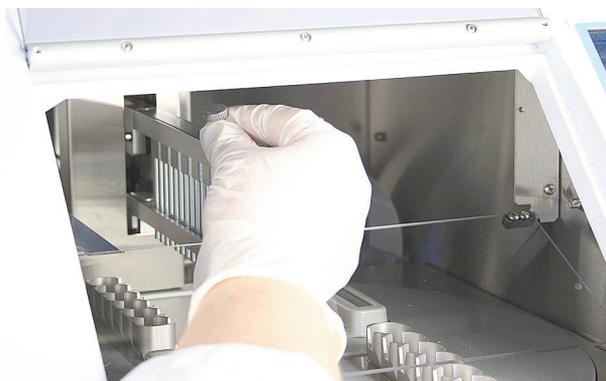


Figure 3–15. Removing the two finger screws on top of the magnet head

5. Insert the other magnet head by slotting it into the tip comb holder and by refitting the two finger screws on top of the magnet head (Figure 3–16 and Figure 3–17).
6. The tip moves on top of the shield plate at the end of the changing process.
7. Screw the maintenance door on again by screwing the two **red** screws on counterclockwise. ▲



Figure 3–16. Inserting the KingFisher Duo head

Installation

Packing the instrument for transportation



Figure 3–17. KingFisher Duo 6-pin head for KingFisher Flex 24 deep well plate fitted

Packing the instrument for transportation

Refitting the transport lock

This section describes how to refit the transport lock when packing the instrument for transportation or service.

To refit the transport lock:



1. To fit the transport lock, choose the `Transportation_lock` protocol under the **Maintenance** menu by using the **Up** and **Down** arrow keys.



2. Then press the **START** key.
3. Switch off the power.
4. Refit the transport lock into place by screwing the finger screw with spring suspension clockwise (Figure 3–18). There is only one possible position for the finger screw to lock once the processing head is correctly located after Steps 1–2.



Figure 3–18. Refitting the transport lock

5. Figure 3–19 shows the transport lock refitted. ▲



Figure 3–19. Transport lock refitted



Caution Ensure that the power is switched off. ▲

Installation

Packing the instrument for transportation

Chapter 4

Routine Operation

Switching on

Before you switch on the KingFisher Duo, ensure that the voltage on the type label at the bottom left of the back panel (Figure 2–4) 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 Duo control panel and internal software.

Keypad

The keypad is shown in Figure 4–20.

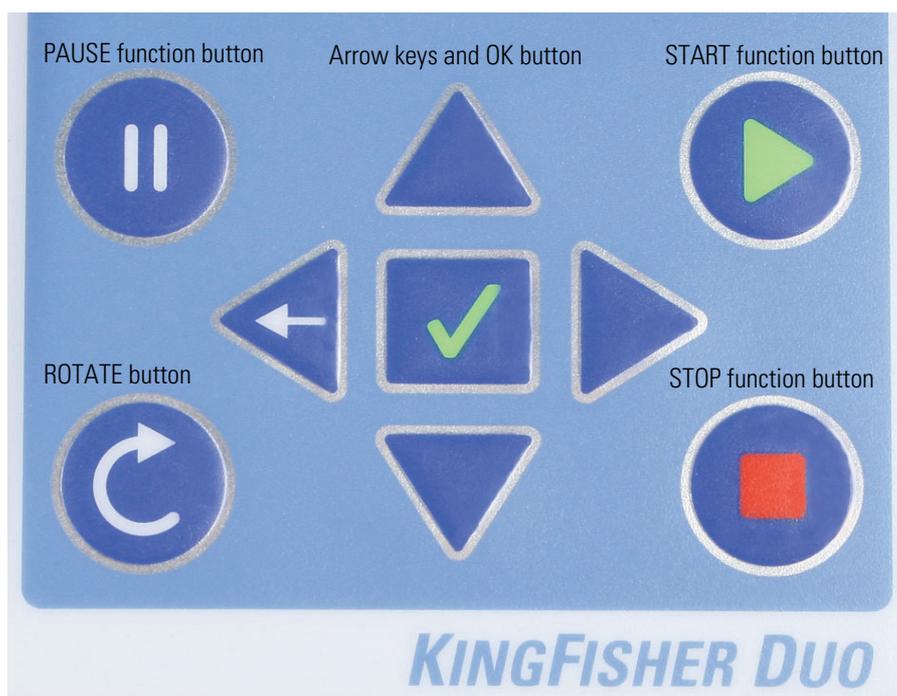


Figure 4–20. Keypad of the KingFisher Duo

Keys

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



To select the protocol and to navigate on the display.



To accept the selection.

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

-  To initiate the run.
-  To terminate the protocol(s).
-  To pause the run. It will pause at the end of the ongoing processing step.
-  To rotate the turntable.

Display The liquid crystal display is a 5” 480 x 800 pixel display.
The main view in the display is shown in Figure 4–21.

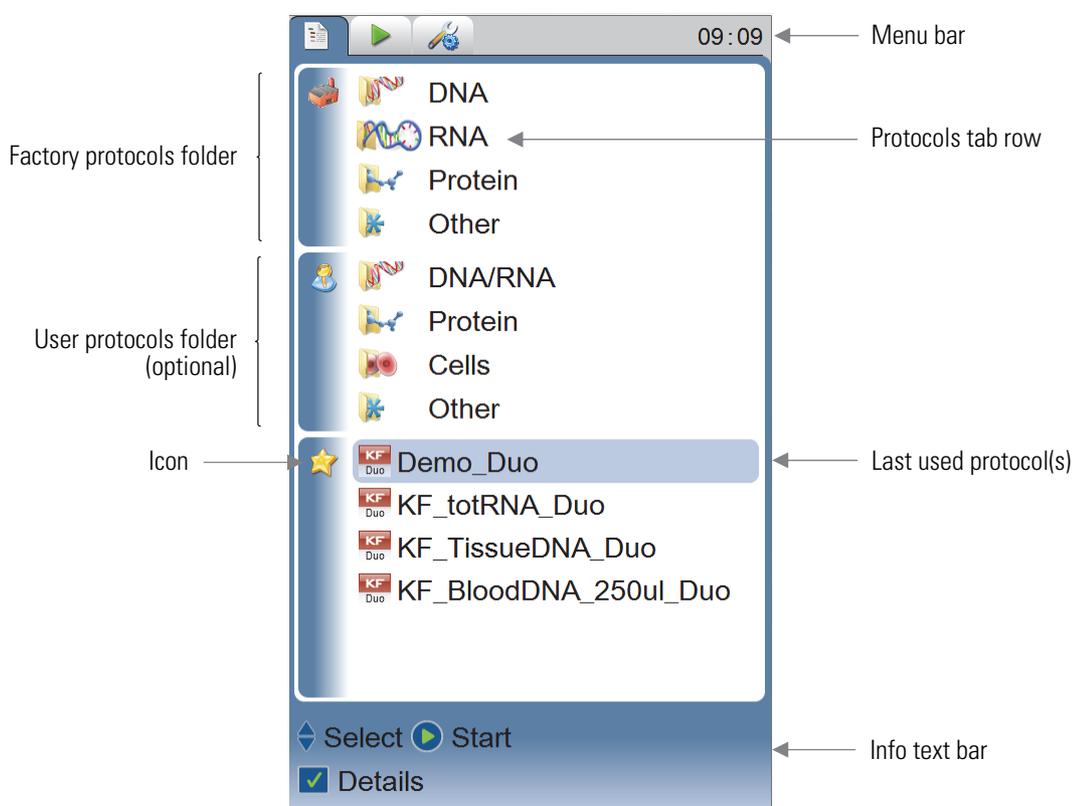


Figure 4–21. Main view on the display of the KingFisher Duo

There are three *menus* in the KingFisher Duo user interface: **Protocols**, **Run** and **Maintenance**. In routine use you mainly navigate in the **Protocols/Run** menu. You can navigate between the menus using the **Left** and **Right** arrow keys.



The clock on the menu bar shows real time.

The *factory protocols* are arranged into folders according to the type of analyses.

The *protocols tab row* is either colored (active) or uncolored/different colored (inactive).

All the descriptive *icons* used in the main views are shown in Table 4–3 below.

Last used protocol(s) are shown below the factory and user protocols folders. The number of displayed protocols is limited by the available space.

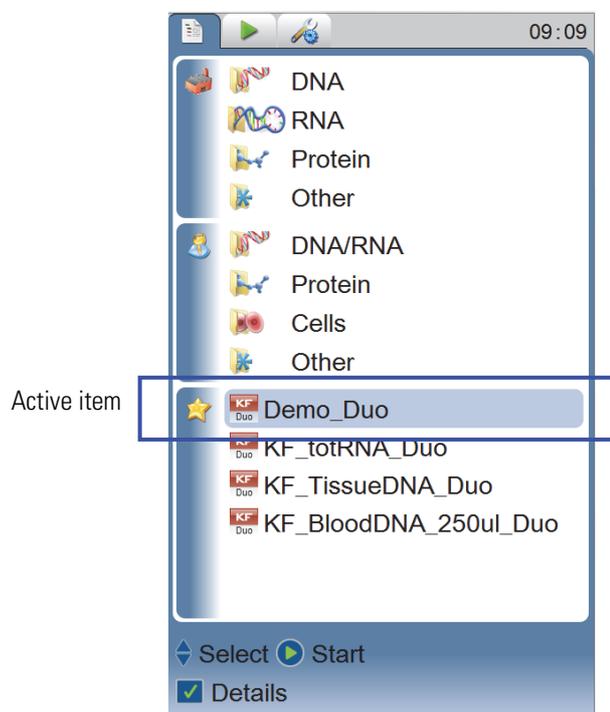
The *info text bar* shows explanatory information on how to proceed and which keys to use.

Navigating

This section visualizes navigation in the KingFisher Duo user interface.



The main view changes according to the selections you make either with the **Up** or **Down** arrow keys or the **OK** button. To move into the submenus, use 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 when they are selected (active/inactive).



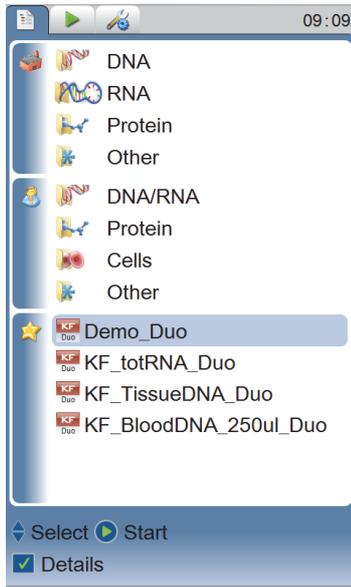
To move from one menu to another, make sure you are in the main view of one of the menus and use the **Left** and **Right** arrow keys.

To return from the submenus to the main views, use the **Left** arrow key.

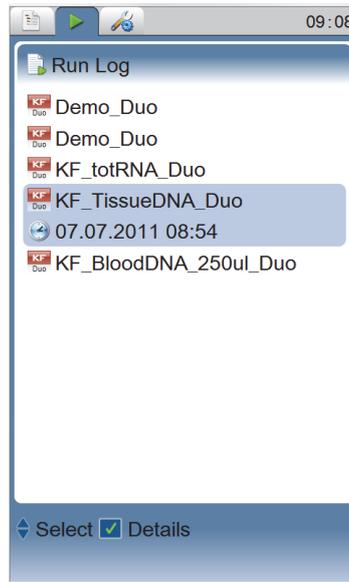
Routine Operation

Control panel

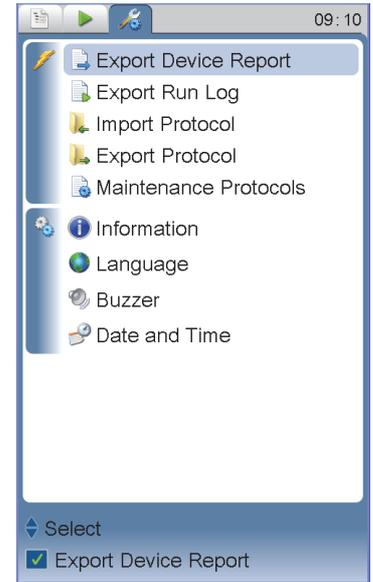
The main views of each menu tab are shown below.



Protocols



Run



Maintenance

Table 4–3. Icons in the main view

Menu / Folder	Icon	Function
		"Factory / User protocols" on page 38
		"Selecting the protocol" on page 38 DNA (Factory) / DNA/RNA (User)
		RNA (Factory)
		Protein
		Cells (User)
		Other
		Last used protocol(s)
		"Run menu" on page 39 Run Log / Run
		"Instrument options" on page 43
		"Export device report" on page 43
		"Export run log" on page 44
		"Import protocol" on page 45
		"Export protocol" on page 46
		"Maintenance protocol" on page 47
		"Information" on page 47
		"Language" on page 48
		"Buzzer" on page 49
		"Date and time" on page 49

Using KingFisher Duo PC software

The operation of the KingFisher Duo magnetic particle processor can also be controlled by an external computer and run on BindIt Software. In addition to the KingFisher Duo internal software features, you can 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* (Cat. no. N07974).

Using internal software

This section describes procedures concerning the KingFisher Duo internal software.

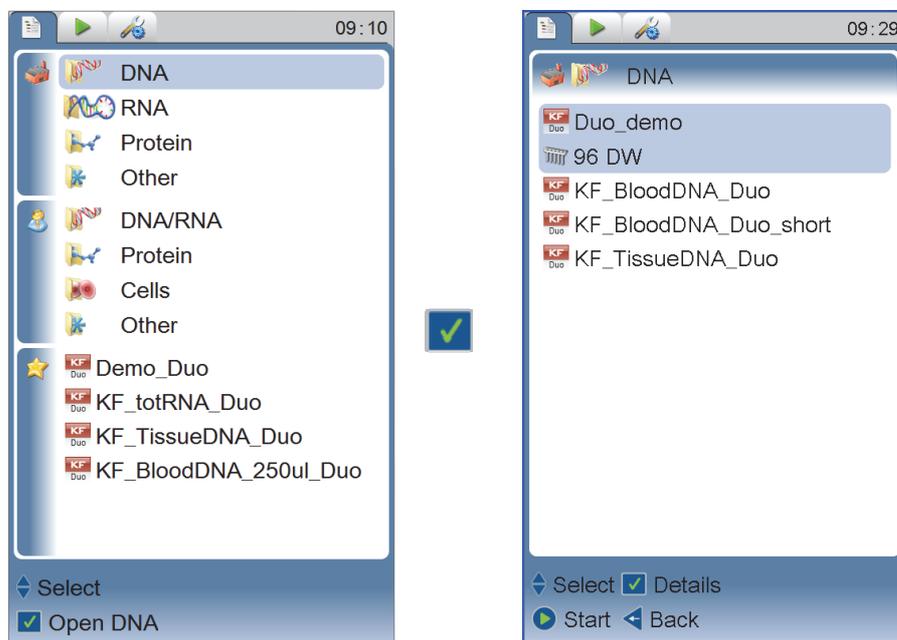
Factory / User protocols



This section describes the factory/user set protocols. They are found in the **Protocols** menu. Factory protocols are protocols which are created by Thermo Fisher Scientific and preloaded into the instrument internal memory in the factory (e.g. Thermo Scientific KingFisher Kit protocols) or downloaded from the KingFisher website (www.thermoscientific.com/kingfisher). User protocols are protocols which are created by the user and transferred using BindIt Software.

Selecting the protocol

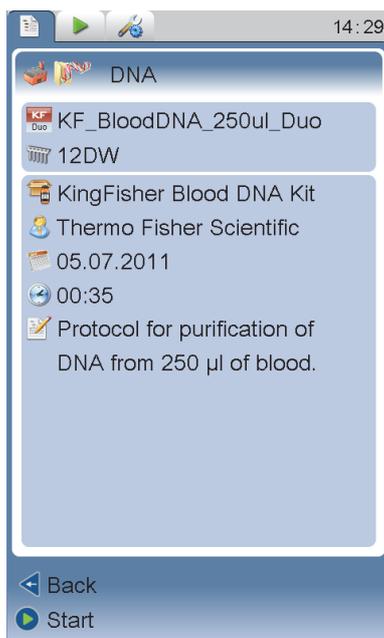
Go to the **Protocols** menu. Select, for example, the **DNA** row of the factory protocols and press **OK**.



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



Press **OK** to see the protocol details.



-  Press **START** to run the protocol either from the details view or from the previous view on page 38.
-  Press the **Left** arrow key to return.

Run menu

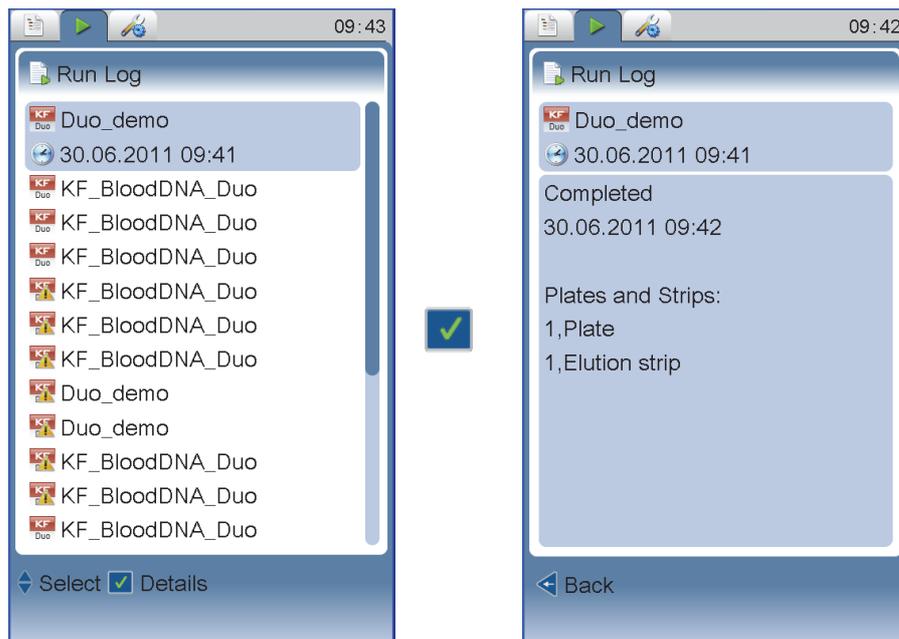


In the **Run** menu, the **Run Log** view is shown, when there is no ongoing run. Once a protocol run is on, the **Run** view is shown.

Go to the **Run Log** menu. Select the protocol of which you want to see the run log and press **OK** to see the details. The time shown refers to when this protocol was last started. Used plates and strips, and when the protocol was last run are also shown.

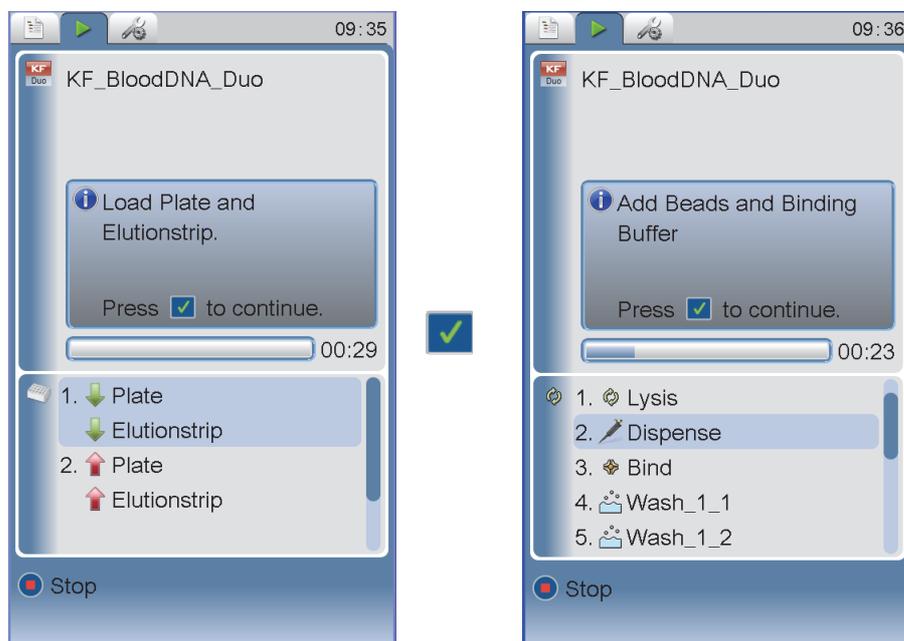
Routine Operation

Run menu



← Press the **Left** arrow key to return.

Once a protocol run has been started from the **Protocol** menu, you can see the progress of the selected protocol as shown below. Refer to “Selecting the protocol” on page 38.

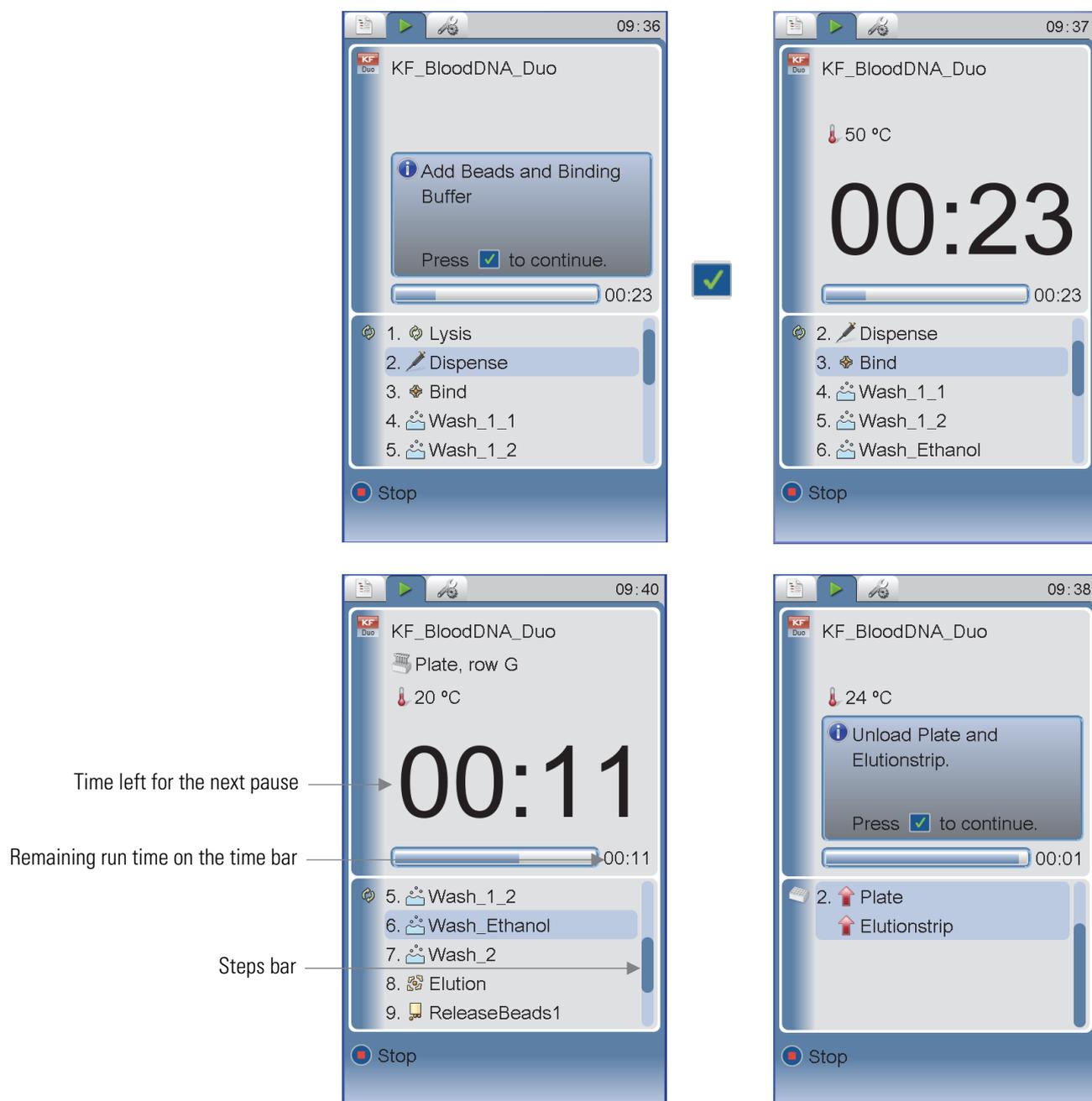


⏹ Press the **STOP** button if you want to terminate the run. You are asked to confirm the termination or to continue.



Note that whenever a user pauses the operation by pressing the **PAUSE** button during a run, the **Pause** icon flashes on the menu bar after the Pause message appears on the display.

In addition to user pauses, the run can include pauses created by the protocol itself, such as a pause to change plates, load a plate, unload a plate, dispense, and so on. See more below.



 Press OK to continue.

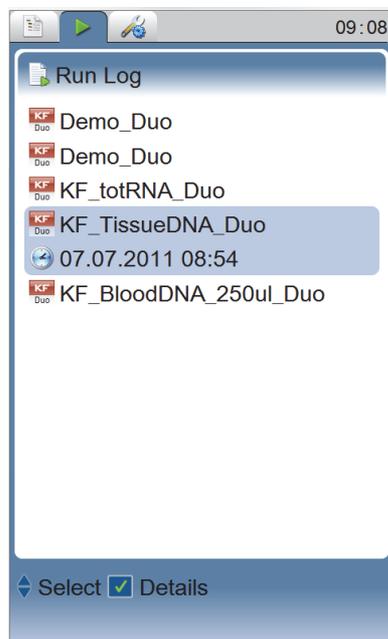
During the run, the remaining run time is shown in smaller numericals on the time bar. The time shown in bold and larger numericals in the middle of the window indicates the time remaining until the following pause. During the pause, the user must be prepared, for example, to load the plate, dispense, or unload the plate and elution strip.

Routine Operation

Run menu

On the right-hand margin of the window, you can see how the steps bar progresses.

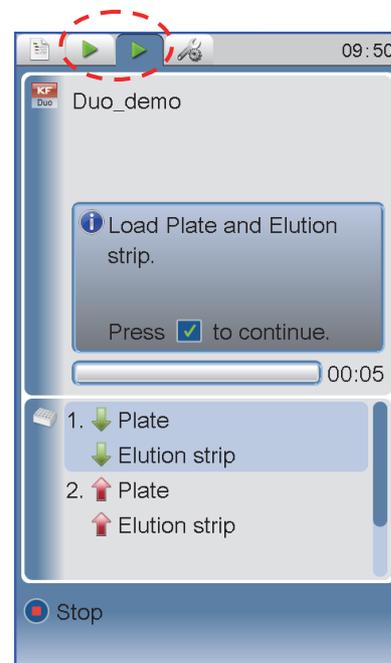
Once the protocol is completed, the **Run Log** view appears (see view below).



 Duo_demo

When a protocol is started in the **Protocol** menu, a small **Run** icon  is superimposed on the protocol symbol of the active protocol.

The views of a one-protocol and a two-protocol run are shown below.



Instrument options



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

The device reports, run logs and/or protocols that are exported or imported go to the *KingFisher_Duo* folder on the USB memory device.



Once the USB memory device is plugged in, a small memory stick icon appears at bottom right of the window.

Export device report



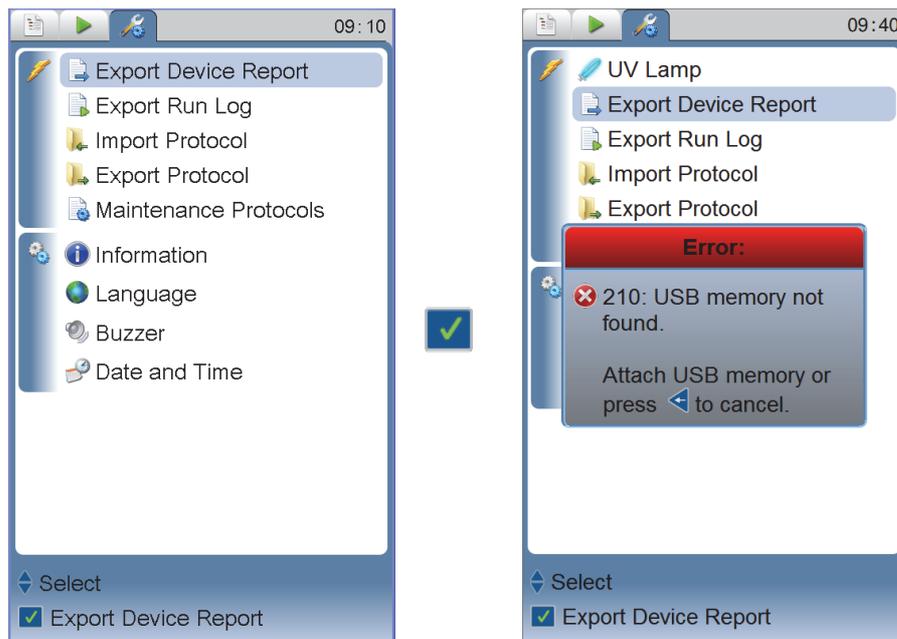
You can export the instrument report. A USB memory device has to be plugged in to the instrument (Figure 4–22 B).



Figure 4–22. USB memory device unplugged (A) and plugged in (B)

The KingFisher Duo device report includes the serial number, software versions, motor offsets and accelerations, temperature control parameters, the startup status, statistics, the run user, factory and maintenance protocols, error logs, settings as well as miscellaneous information.

Go to the **Maintenance** menu. Select the **Export Device Report** row and press **OK**.



◀ Attach the USB memory device or press the **Left** arrow key to cancel.

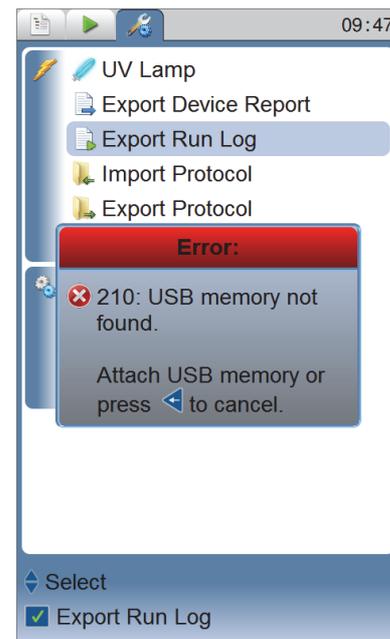
Export run log



You can export the run log. A USB memory device has to be plugged in to the instrument (Figure 4–22 B).

The KingFisher Duo run log includes the protocol name, when the protocol was started and stopped, and the plates and strips used of the all the user and factory protocol runs as well as those of all the UV protocol and maintenance protocol runs.

Go to the **Maintenance** menu. Select the **Export Run Log** row and press **OK**.



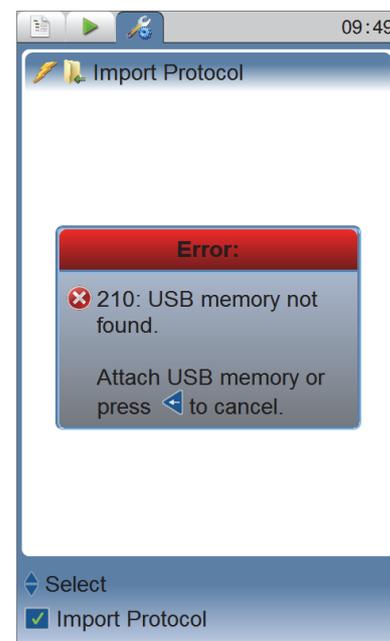
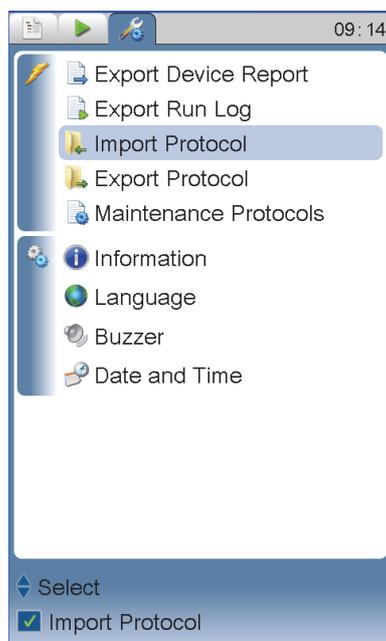
Attach the USB memory device or press the **Left** arrow key to cancel.

Import protocol



You can import a protocol, for example, a BindIt protocol file (.bdz) from BindIt Software or another instrument. A USB memory device has to be plugged in to the instrument (Figure 4–22 B).

Go to the **Maintenance** menu. Select the **Import Protocol** row and press **OK**.



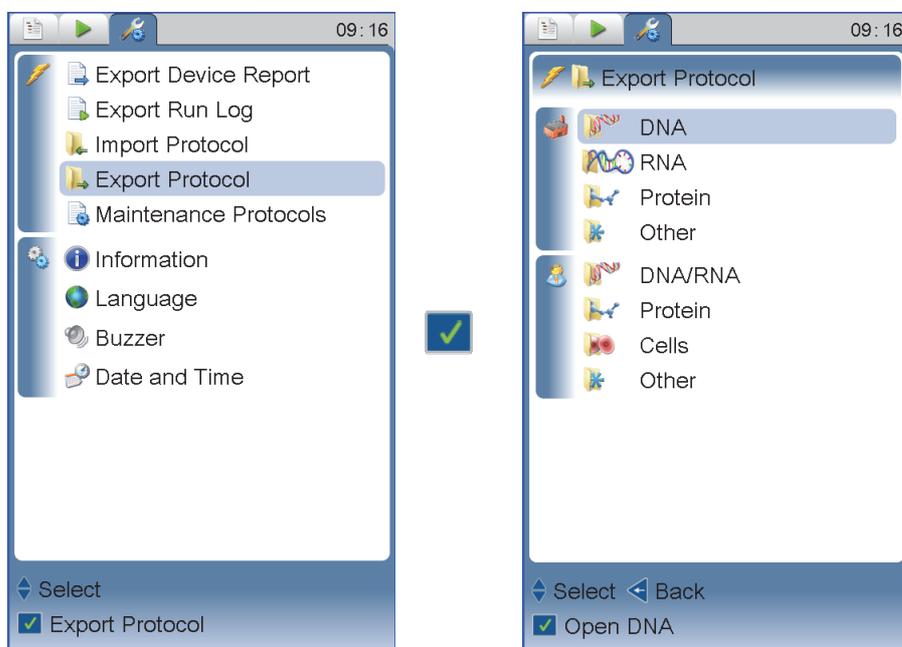
Attach the USB memory device or press the **Left** arrow key to cancel.

Export protocol



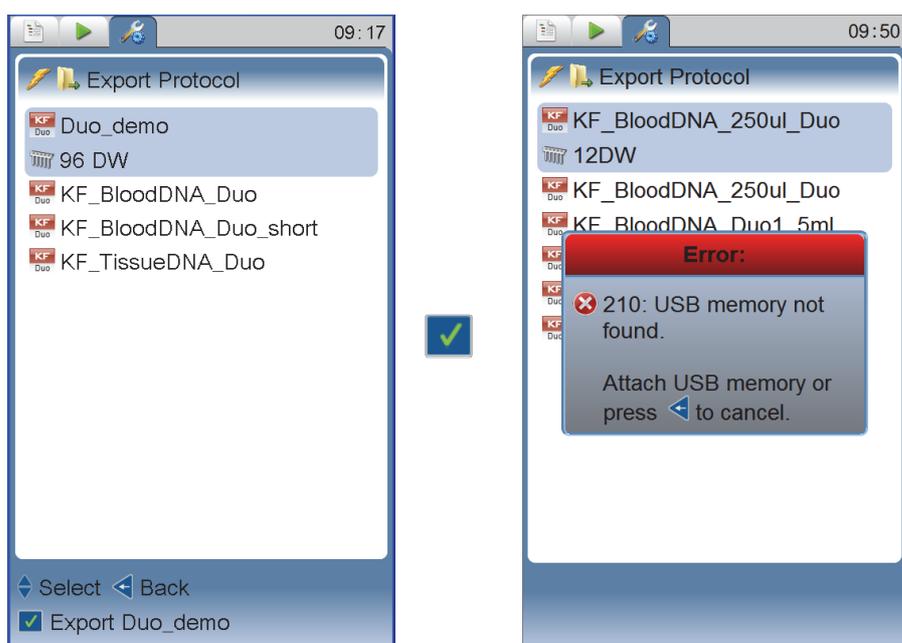
You can export a protocol, for example, a BindIt protocol file (.bdz) to BindIt Software or another instrument. A USB memory device has to be plugged in to the instrument (Figure 4–22 B).

Go to the **Maintenance** menu. Select the **Export Protocol** row and press **OK**.



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

Press **OK** to continue.



Attach the USB memory device or press the **Left** arrow key to cancel.

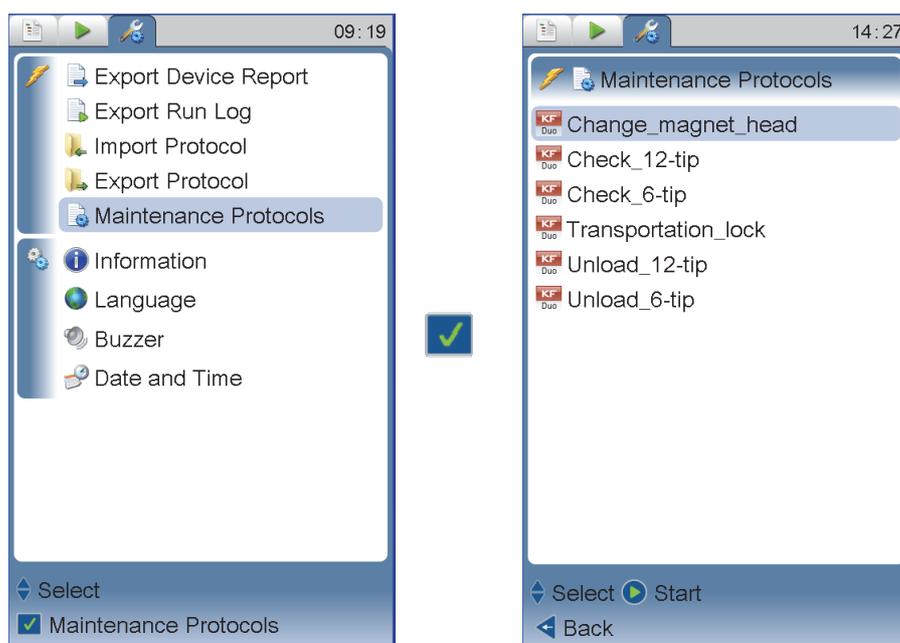
Maintenance protocol



You can set which protocol is automatically selected as the maintenance protocol when the KingFisher Duo is powered on.

The maintenance protocols include, for example, the protocols needed to refit the transport lock, change the magnet head, change the heating block or run the operational check protocol.

Go to the **Maintenance** menu. Select the **Maintenance protocol** row and press **OK**.



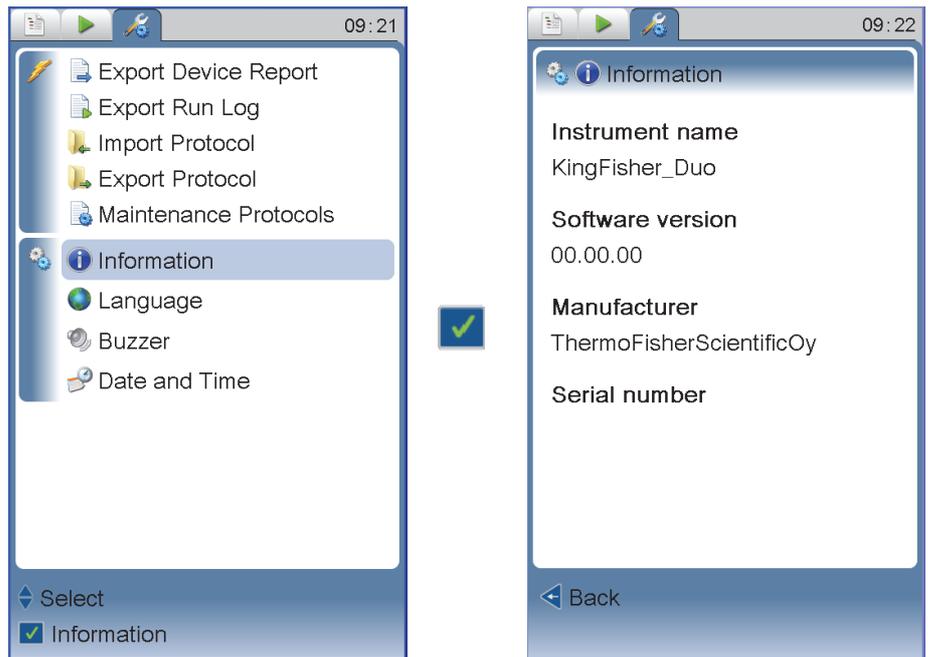
- ◆ All available maintenance protocols will be displayed. Use the **Up** and **Down** arrow keys to select the maintenance protocol.
- ▶ Press **START** to run the desired protocol.
- ◀ Press the **Left** arrow key to return.

Information



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

Go to the **Maintenance** menu. Select the **Information** row and press **OK**.



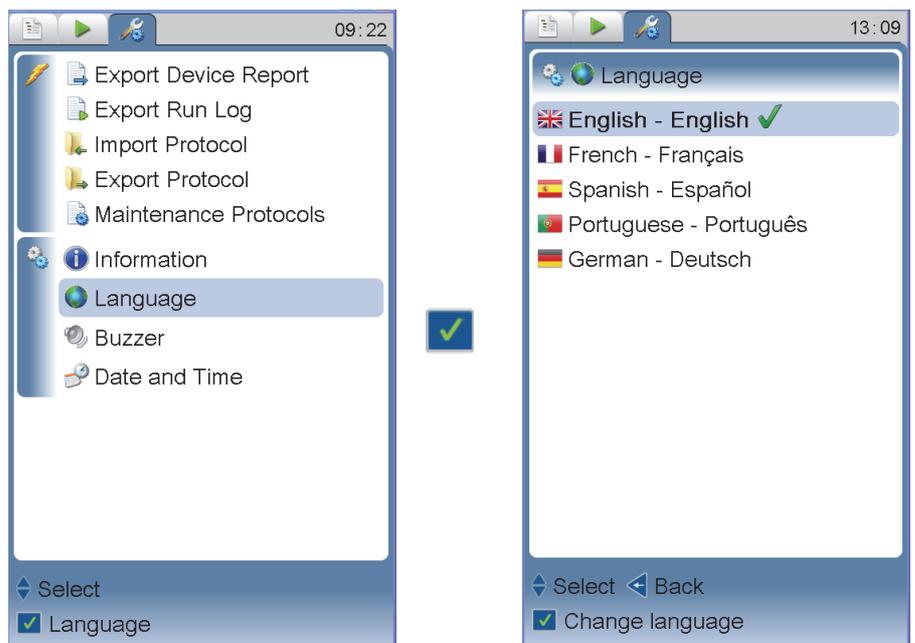
- ◆ Use the **Up** and **Down** arrow keys to select.
- ◀ Press the **Left** arrow key to return.

Language

You can set the language of the internal software.



Go to the **Maintenance** menu. Select the **Language selection** row and press **OK**.



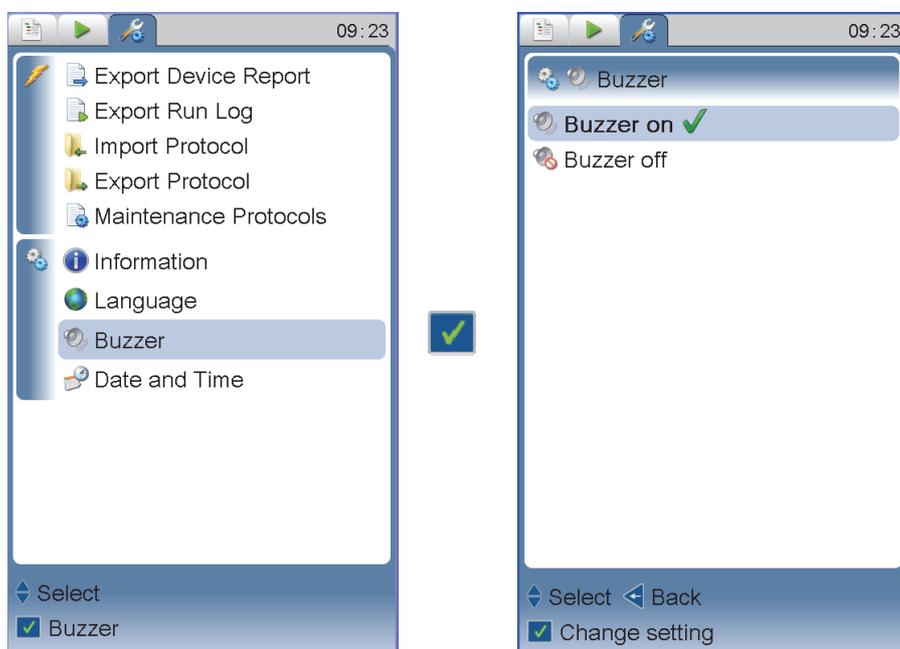
- ◆ Use the **Up** and **Down** arrow keys to select language settings. The available languages are *English, French, Spanish, Portuguese* and *German*. The default language is *English*.
- ✓ Press **OK** to change the language.
- ◀ Press the **Left** arrow key to return.

Buzzer



You can choose whether or not the instrument produces a sound for different functions. Note that all functions make a certain sound.

Go to the **Maintenance** menu. Select the **Buzzer on/off** row and press **OK**.



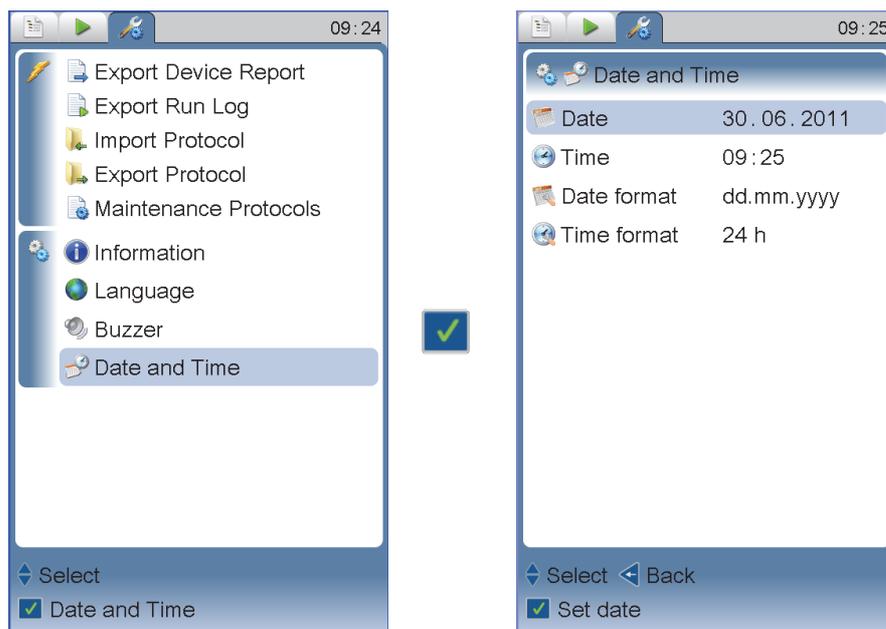
- ◆ Use the **Up** and **Down** arrow keys to select whether the buzzer (audible sound) is on or off. The default is *Buzzer on*.
- ✓ Press **OK** to accept the selection.
- ◀ Press the **Left** arrow key to return.

Date and time



You can set the date and time of the instrument.

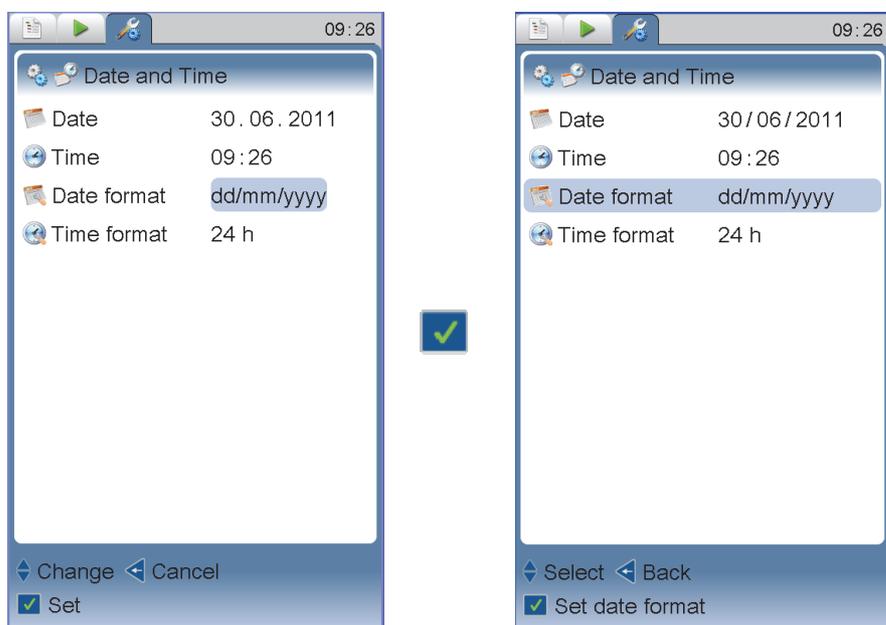
Go to the **Maintenance** menu. Select the **Date and Time** row and press **OK**.



Use the **Up** and **Down** arrow keys to select the date, the time, the date format or the time format.

Press **OK** to set, for example, the date format.

Use the **Up** and **Down** arrow keys to select the desired date format. The available date formats are: dd.mm.yyyy, dd/mm/yyyy, dd-mm-yyyy, mm/dd/yyyy, and yyyy-mm-dd. The default is *dd.mm.yyyy*.



Press the **Left** arrow key to cancel or return.

Handling the consumables

How to handle the KingFisher Duo consumables, such as tip combs, plates and elution strip, are described below. For more information, refer to Chapter 8: “*Ordering Information*”.

Tip combs

Specially designed tip combs that protect the magnets during the process are available for different plate types and applications.

To handle KingFisher Duo 12-tip combs correctly:

1. Take an individual KingFisher Duo 12-tip comb from the package (Figure 4–23).



Figure 4–23. KingFisher Duo 12-tip comb packed in a separate bag

2. Unpack the plastic bag and place one of the tip combs onto the tip row (default row B) of the KingFisher 96 deep well plate (Figure 4–24). Avoid bending the tip combs to ensure proper instrument operation.



Figure 4–24. Placing the KingFisher Duo 12-tip comb

To handle KingFisher Duo 6-tip combs correctly:

1. Take a KingFisher Duo 6-tip comb package where four unattached tip combs are packed onto a KingFisher Flex 24 deep well plate (Figure 4–25).

Routine Operation

Handling the consumables



Figure 4–25. KingFisher Duo 6-tip comb package with four tip combs

2. Place one of the tip combs onto the tip row (default row B) of an empty KingFisher Flex 24 deep well plate (Figure 4–26).



Figure 4–26. KingFisher Duo 6-tip comb inserted

3. Before you use the tip comb, press the tip comb evenly by hand against the enclosed 24 deep well plate.

Plates

The KingFisher Duo is only compatible with two deep well plates, KingFisher Flex 24 deep well plates and Microtiter deep well 96 plates (Figure 4–27 and Table 4–4).

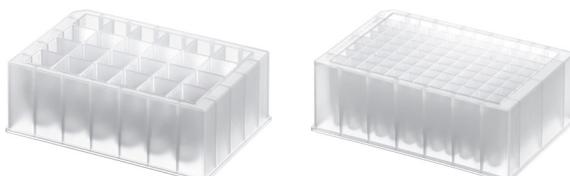


Figure 4–27. KingFisher Duo plates



Caution Only use plates that are listed in Table 4–4. Other plates may not be compatible with the KingFisher Duo heating blocks. They may also cause unexpected problems, such as cross-contamination due to the divergent well volume and bottom height of the plate. ▲

Table 4–4. Processing volumes vs. plate types and magnet heads

Head / Plate	KingFisher Flex 24 deep well plate	Microtiter deep well 96 plate	KingFisher Duo elution strip
KingFisher Duo head for 24 DW plate	200–5000 µl	–	–
KingFisher Duo head for 96 DW plate	–	50–1000 µl	30–130 µl

Elution strip

The KingFisher Duo elution strip can only be used with a KingFisher Duo instrument installed with a 12-pin magnet head (Figure 4–28).

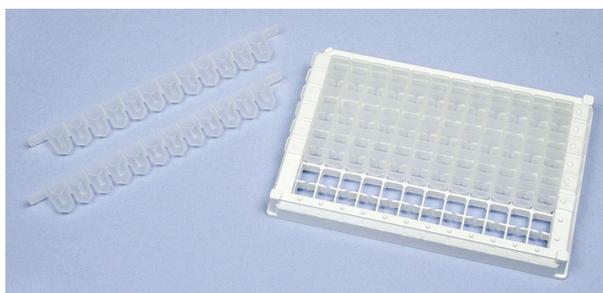


Figure 4–28. KingFisher Duo elution strips, separate and in a frame

The elution strip is typically used to perform the elution step that concentrates the purified sample. It is easy to pipette small volumes into the elution strip due to its low design. The eight elution strips are also convenient for storage and can be collected onto the 96 elution frame (Figure 4–28).

How to start

To start the instrument:



1. Select a protocol by using the arrow keys and press **START** or use BindIt Software to run the desired protocol via the PC.
2. Ensure that the front lid is open (Figure 2–3).



3. Load the plate(s) and elution strip(s) in the order that the protocol requests (Figure 4–30). Place the A1 well of the plate ensuring 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 their respective plate positions, press **OK**. The instrument

Routine Operation

How to start

functions with either one or two plates depending on the number of steps. The tip comb always has to be placed manually onto a KingFisher plate (Figure 4–29). **Only one tip comb can be placed onto a KingFisher plate per run.**



Figure 4–29. Combining the tip comb into the B row of the plate

The two plate positions and the A1 positions of the two plate positions are clearly marked on the turntable. When the instrument is in its basic position, plate position 1 is under the KingFisher Duo head. Note that at the end of a protocol run, the turntable may stop in a different position than the starting position. Loading the plate and elution strip is shown below (Figure 4–30 and Figure 4–31). Make sure that the elution strip is placed in the correct direction into the elution block. Ensure that the perforated end is facing towards the user.



Figure 4–30. Loading the plate



Figure 4–31. Loading the elution strip

4. The tip comb automatically locks onto the tip comb holder from the plate (Figure 4–32).



Figure 4–32. Tip comb in the tip comb holder

5. When the turntable rotates, the magnet head moves on top of the fixed shield plate that forms a protective cover.
6. Close the front lid. The front lid protects the instrument against environmental contamination.



Note The front lid can be left open if desired. This action does not break the run. ▲



7. After the run, remove the plate(s) and strip according to the protocol request. Confirm each plate removal by pressing the **OK** button.

Shutdown

To shut down the KingFisher Duo:

1. Switch the KingFisher Duo off by pressing the power switch (Figure 2–3) on the front panel of the instrument into the OFF position. It is recommended to shut down the instrument for the night and weekends.



Warning Remove any plates, strips or tip combs still in the instrument. Dispose of all microplates, strips and tip combs 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 it with 70% ethanol or another disinfectant (see “Decontamination procedure” on page 58).

Emergency situations

If an abnormal situation occurs during operation, such as fluids spilling inside the instrument, follow the steps below:

1. Switch OFF the instrument (Figure 2–3).
2. Unplug the instrument immediately from the power supply (Figure 2–4).
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.

Do not use abrasive cleaning agents, 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 with a warm, mild detergent solution will be sufficient.

Clean the outside surfaces 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 Duo 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 they may cause damage. ▲

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. ▲

Cleaning the turntable

Keep the turntable surface clean to prevent dust and dirt from 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.

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

The turntable can only be detached for service purposes, and not for cleaning purposes.

You can gently rotate the turntable while the instrument is switched off.

Cleaning 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 Duo should not be kept close to magnetic tapes, computer discs or other magnetic storage systems, such as credit cards, as they can be damaged by the strong magnetic field of the KingFisher Duo heads.

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

Do not use metal tools when handling KingFisher Duo 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. ▲

Cleaning 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.

Disposal of materials

Follow 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 disposable plates, strips and tip combs, 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 followed.

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. Wear disposable gloves to protect yourself.
2. Prepare the decontaminant: 200 ml 4% glutaraldehyde solution (or another agent recommended by your safety officer).
3. Empty the turntable.
4. Switch OFF the power and disconnect the mains supply cable (Figure 3–11).
5. Disinfect the outside of the instrument using a cloth dampened with 70% ethanol.
6. Place the instrument in a large plastic bag. Ensure that the front lid is open.
7. Place a cloth soaked in the prepared solution into the bag. Ensure that the cloth does not come into contact with the instrument.
8. Seal the bag and leave the instrument in the bag for at least 24 hours.

9. Remove the instrument from the bag.
10. Clean the instrument using a mild detergent.
11. Remove any stains with 70% ethanol.
12. After performing this decontamination procedure, enclose a signed and dated Certificate of Decontamination inside the transport package and attached to the outside of the package (see Appendix A: “*Certificate of Decontamination*”).

Packing for service



To pack for service, follow 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 lock.
- Place the KingFisher Duo head into its transport package.
- 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 a dated and signed Certificate of Decontamination (see Appendix A: “*Certificate of Decontamination*”) inside and attached to the outside of the package, in which you return your instrument (or other items).
- Enclose the return goods authorization number (RGA) given by your Thermo Fisher Scientific representative.
- Indicate the fault after you have contacted your local Thermo Fisher Scientific representative or Thermo Fisher Scientific’s technical service department.

Refer to “General specifications” on page 63 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.

Maintaining a system log

A system log, which includes a short summary of the use, maintenance procedures, error messages and other information on the use of the system is useful in properly maintaining the system. Refer to Appendix B: "System Log". Copy the table as many times as necessary, but leave the blank original inside the user manual.

Disposal of the instrument

If the KingFisher Duo has to be disposed of, follow the guidelines below.



Warning Decontaminate the instrument before disposal. Refer to "Decontamination procedure" on page 58. ▲

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



Warning The used lithium (Li) battery is regulated waste and must be disposed of according to local regulations. The Li battery has to be changed by an authorized service technician only. Instructions for changing the Li battery are described in the service manual. ▲



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 64)
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.

Maintenance

Disposal of the instrument

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 6–5.

Table 6–5. General specifications

General specifications	
Overall dimensions	
– instrument	ca. 400 mm (W) x 460 mm (D) x 340 mm (H) [15.7" (W) x 18.1" (D) x 13.4" (H)]
– transport package	520 mm (W) x 570 mm (D) x 540 mm (H) 20.5" (W) x 22.4" (D) x 21.3" (H)
Weight	
– instrument	ca. 16 kg [35 lbs.]
– incl. transport package	ca. 21 kg [46 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 +70°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	96 VA max.; 10 VA standby
Heat dissipation	328 BTU max.
Internal memory	Space for ca. 200 protocols
Protocol import	Using PC or USB memory device
BindIt Software compatibility	Yes
Computer interface	USB
Robot compatibility	No
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 6–6.

Table 6–6. Performance specifications

Performance specifications	
Processing volume	50–1000 µl (96 DW plate, 12-pin magnet head) 30–130 µl (elution strip, 12-pin magnet head) 200–5000 µl (24 DW plate, 6-pin magnet head)
Capacity (samples per run)	Up to 12 (12-pin magnet head) Up to 6 (6-pin magnet head)
Collection efficiency of the particles (indoor use)	≥ 95%, Microtiter deep well 96 plate, neutral wash buffer containing detergent, 2.8 µm particles, 3 collections, RT
Magnetic particle size	ca. > 1 µm
Magnet rods	12 or 6, interchangeable KingFisher Duo heads
Plates per deck	2
Plate types (disposable) * Recommended filling volume	Microtiter deep well 96 plate (50–1000 µl*) KingFisher Flex 24 deep well plate (200–5000 µL*)
Elution strip	Special design, 1 x 12 format
Tip combs (polypropylene – disposable)	12 / 6 in one frame for Microtiter deep well 96 plate or KingFisher Flex 24 deep well plate
Automatic tip load	Yes
Heating/cooling temperature - plate row block - elution strip block	From +10°C to 75°C, instrument in RT From 4°C to 75°C, instrument in RT
Heating block accuracy	± 1°C, up to +75°C, instrument in RT
Keypad / Display	START / PAUSE / STOP / OK / ROTATE / four arrow keys & BACK (Left arrow key) / LCD 5" 480 x 800 pixel color display

Safety specifications In conformity with the requirements

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

KingFisher Duo bears the following markings:

Type 706

+15 VDC / 6 A

CE mark

KingFisher Duo 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 (July 2004)
2002/96/EC (Waste of Electrical and Electronic Equipment)
2002/95/EC (RoHS Directive – Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment)
2006/42/EC (Machinery Directive)

The safety specifications are also met under the following 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.

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 with the exception of occasional conductivity caused by condensation. ▲

Technical Specifications

In conformity with the requirements

Chapter 7

Troubleshooting Guide



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

Troubleshooting guide

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. A troubleshooting guide for the KingFisher Duo instrument is presented in Table 7–7.

Table 7–7. Actions taken against error messages and warnings

Code(s)	Description	Action
2, 3, 260	The command was not recognized as a valid command.	Contact authorized technical service.
4	The tip comb holder lifting mechanism is out of position.	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.
5	The track mechanism is out of position.	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.
6	The turntable rotating mechanism is out of position.	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.
7	The magnet head holder lifting mechanism is out of position.	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.
8	The requested head movement is not allowed.	Press the STOP button.
9	The requested track movement is not allowed.	Press the STOP button.
10	The requested turntable movement is not allowed.	Press the STOP button.
11	The plastic tip comb is not attached to the holder.	Check if the tips are present. If it looks all right, turn ON and OFF, and run the check protocol according to the KingFisher Duo head and plastics you are using.
12, 21, 23–24	Error in temperature control.	Contact authorized technical service.
13	Permanent parameters lost.	Contact authorized technical service.
0–1, 15–20, 50–58, 104, 200, 288–289	Error.	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.

Continued

Troubleshooting Guide

Troubleshooting guide

Cont.

Code(s)	Description	Action
22, 102	Target temperature not reached.	Make sure that the target temperature difference to ambient temperature is within the operational range. If yes then contact authorized technical service
103	Cooling power has been limited to prevent condensation.	No action needed. Information only.
100–101	Protocol timing is inaccurate.	No action needed. Information only.
201	Performing memory maintenance...	No action needed. Information only. If the error is repeated, contact service.
210	USB memory not found.	Attach the USB memory device.
211	No protocols found from USB memory.	Copy the protocol to the USB memory device.
212	USB memory is detached.	Attach the USB memory device.
213	Import failed.	Try another USB memory device. If the error still appears, contact service.
214	Export failed.	Try another USB memory device. If the error still appears, contact service.
215	Attached USB memory is not supported.	Possible NTFS formatted USB memory. Change memory or reformat to FAT.
220–235, 261, 270–271, 285	File system error.	Contact authorized technical service.
250–251	Corrupt transfer file.	Contact authorized technical service.
280–284	Corrupted settings.	Contact authorized technical service.
286–287, 290	Invalid value.	Contact authorized technical service.
300–308	Software update failed.	Contact authorized technical service.
59, 309–310	Unrecoverable error: Switch power off.	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.
320	Front cover open, close cover.	Close the front cover.
321	Protocol aborted by user.	No action needed. Information only.
322	Clock battery is empty.	Contact authorized technical service.
323	Aborted because there was an error in another protocol.	No action needed. Information only.

Chapter 8

Ordering Information

Contact your local Thermo Fisher Scientific representative for ordering and service information. Ordering information codes are presented in Table 8–8 through Table 8–10.

KingFisher Duo

The following configurations of the KingFisher Duo system are available (Table 8–8).

Table 8–8. Codes for products

Code	Instrument / System
5400100	KingFisher Duo

List of accessories and consumables

The following accessories and consumables are to be used with the KingFisher Duo instrument (Table 8–9).

Table 8–9. Codes for accessories and consumables

Code	Item	Quantity
5189010	BindIt Software package	1
97003500	KingFisher Duo 12-tip comb, for Microtiter deep well 96 plate	50 pcs
97003510	KingFisher Duo 6-tip combs and KingFisher Flex 24 deep well plate (12 pcs of 24 DW plates, each including 4 tip combs)	48 pcs
97003520	KingFisher Duo elution strip	40 pcs
97003530	KingFisher Duo Combi pack for Microtiter deep well 96 plate (tip combs, plates and elution strips for 96 samples)	1
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

Ordering Information

List of spare parts

List of spare parts

The following spare parts are to be used with the KingFisher Duo instrument (Table 8–10).

Table 8–10. Codes for spare parts

Code	Item	Quantity
N12459	KingFisher Duo head for 96 DW	1
N12460	KingFisher Duo head for 24 DW	1
N12461	KingFisher Duo heating block for 96 DW plate	1
N12462	KingFisher Duo heating block for 24 DW plate	1
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

List of KingFisher Kits

The following optimized DNA/RNA purification kits for the KingFisher Duo are available (Table 8–11).

Table 8–11. Codes for purification kits

Code	Item	Package size
97010196	KingFisher Blood DNA Kit	1 x 96
97030196	KingFisher Cell and Tissue DNA Kit	1 x 96
97050196	KingFisher Plant DNA Kit	1 x 96
97020196	KingFisher Total RNA Kit	1 x 96
97040196	KingFisher Viral NA Kit	1 x 96

Appendix A

Certificate of Decontamination

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 procedure¹: _____

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): _____

PHOTOCOPIABLE

¹ Please include decontaminating solution used.

Certificate of Decontamination

Glossary

elution strip The elution strip is a disposable consumable typically used for the elution step to concentrate the purified sample (Figure 4–28).

frame The frame where the eight elution strips are placed (Figure 4–28).

heating block There are two different kinds of interchangeable heating blocks available, that is, for KingFisher Flex 24 deep well plates and Microtiter deep well 96 plates (Table 3–1).

KingFisher Duo head There are two kinds of interchangeable KingFisher Duo heads available, for KingFisher Flex 24 deep well plates and Microtiter deep well 96 plates (Table 3–2). The KingFisher Duo heads all have corresponding disposable plastic tip combs.

magnetic bead (magnetic particle) The magnetic particles attach to the magnetic rods (Figure 2–7 and Figure 2–8) that are protected by a disposable tip comb. The magnetic particles enable the purification of a variety of target molecules.

magnetic rod The rods which are magnetic and collect magnetic particles (Figure 4–32). The rods do not collect the particles on their own; the magnetic rods must always be protected by a tip comb.

plate The disposable plates (1–2) where all the reagents and samples are located and where the processing takes place. Two different types of 24 and 96-well plates (Figure 4–27) that can be used are as follows:

- KingFisher Flex 24 deep well plate (200–5000 μl^*)
- Microtiter deep well 96 plate (50–1000 μl^*)

* = recommended filling volume

shield plate When the turntable rotates, the tip comb moves over the shield plate (Figure 2–3), which forms a protective cover.

tip comb Protects the magnetic rods (12 or 6 in a pin). A disposable tip comb always has to be placed onto the microplate prior to processing. There are two different kinds of disposable tip combs available (Figure 4–23 through Figure 4–25):

- for KingFisher Flex 24 deep well plates
- for Microtiter deep well 96 plates

turntable A rotating turntable with two plate and elution strip positions (Figure 2–2).

Index

- A**
- accessories, 18, 21, 22, 69
 - application, 2, 5, 26
- B**
- BindIt Software, 3, 11, 21, 38, 45, 46, 53, 63, 69
 - buzzer, 37, 49
- C**
- Cell, 19, 70
 - Certificate of Decontamination, 60, 71
 - changing the heating block, 18, 25
 - changing the magnet head, 17, 28
 - clean, 22, 57, 58, 60
 - magnetic rods, 58
 - shield plate, 58
 - turntable, 57
 - computer interface, 63
 - concentration, 16, 17
 - consumables, 18, 51, 69
 - control panel, 33
- D**
- date and time, 49
 - decontaminating the instrument, 56, 58, 61, 71
 - decontamination, 56, 58, 59, 60, 61, 71
 - decontamination procedure, 56, 58, 59, 60, 61, 71
 - deep well plate, 14, 17, 25, 26, 27, 30, 51, 52, 53, 64, 69, 70, 75
 - device information, 47
 - device report, 43
 - display, 11, 15, 23, 28, 30, 33, 34, 57, 58, 64
 - disposal of instrument, 61
 - disposal of materials, 58
 - DNA, 19, 37, 38, 70
 - DNA/RNA, 37, 70
- E**
- elution, 14, 17, 18, 26, 41, 51, 53, 54, 55, 64, 69, 75
 - block, 14, 18, 26
 - strip, 14, 17, 18, 26, 41, 51, 53, 54, 55, 64, 69, 75
 - environmental requirements, 22
 - error logs, 43
 - error message, 61, 67
 - export, 18, 37, 43, 44, 46
 - device report, 37, 43
 - protocol, 37, 46
 - run log, 37, 44
- F**
- factory protocols, 34, 37, 38
 - fitting the subassemblies of the instrument into place, 25
 - frame, 29, 53, 64, 75
 - front lid, 6, 13, 15, 53, 55, 59
- H**
- handling the consumables, 51
 - heating block, 14, 17, 18, 25, 26, 47, 53, 64, 70, 75
- I**
- icon, 35, 37, 40, 42, 43
 - import protocol, 37, 45
 - incubation, 16
 - information, 2, 3, 4, 5, 18, 35, 37, 38, 43, 47, 51, 61, 69, 71
 - installation, 3, 21, 22, 23, 25, 60, 65
 - installing the KingFisher Duo, 21, 23, 65
 - instrument layout, 13
 - instrument options, 37, 43
 - intended use, 3, 11
 - inverse magnetic particle processing, 15
- K**
- keypad, 11, 15, 33, 57, 64
 - keys, 28, 30, 33, 34, 35, 38, 46, 47, 48, 49, 50, 53, 64
- L**
- language, 37, 48, 49

M

magnet head, 14, 17, 18, 25, 27, 28, 29, 47, 53, 55, 64
magnetic particles, 11, 15, 16, 75
 collection of, 16
 release of, 16
 wash of, 16
magnetic rod, 2, 11, 14, 15, 16, 29, 58, 64, 75
maintain, 57
maintaining a system log, 61
maintaining the instrument, 28, 30, 34, 37, 43, 44, 45, 46, 47, 48, 49, 57
maintenance, 55
 menu, 28, 30, 43, 44, 45, 46, 47, 48, 49
 protocol, 37, 43, 44, 47

N

navigating, 35

O

operational check, 25, 47
ordering information, 3, 18, 51, 69
Other, 37, 53

P

packing, 21, 22, 30, 60, 61
 for service, 60
 instructions, 21, 60
 list, 21, 22
 materials, 61
pause, 34, 40, 41, 64
PCR, 19
plate, 26, 52, 53, 54, 55, 64, 69, 75
 position, 15, 53, 54, 75
processing head, 14, 17, 31
Protein, 19, 37
protocols, 11, 14, 15, 18, 25, 28, 30, 33, 34, 35, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 53, 54, 56, 63
purification kit, 19, 70

R

reagents, 11, 15, 59, 75
refitting the transport lock, 24, 30, 31
releasing the transport lock, 23, 24
RNA, 19, 37, 70

S

samples, 11, 14, 15, 17, 18, 23, 26, 53, 56, 58, 64, 69, 75
selecting the protocol, 37, 38, 40
service, 30, 56, 58, 59, 60, 61, 69, 75
 packing for, 60
shield plate, 18, 29, 55, 58, 75
shutting down, 56
spare parts, 17, 70
specifications, 3, 11, 63
 general, 60, 63
 performance, 64
 safety, 61, 64, 65
switching on, 33, 43
symbols, 4
system log, 61, 73

T

tip comb, 11, 14, 15, 16, 17, 18, 27, 29, 51, 52, 54, 55, 56, 58, 64, 69, 75
 holder, 15, 29, 55
transport, 21, 22, 23, 24, 30, 31, 47, 60, 63
 damage, 22
 lock, 23, 24, 30, 31, 47, 60
 package, 21, 22, 60, 63
troubleshooting, 3, 18, 67
 guide, 67
 the instrument, 67
turntable, 14, 15, 18, 34, 54, 55, 56, 57, 58, 59, 75

U

unpacking, 21, 51
USB, 18, 43, 44, 45, 46, 63, 70
 memory device, 18, 43, 44, 45, 46
 port for PC, 18
 ports for memory sticks, 18
user pause, 40, 41
user protocols, 35, 37, 38
using BindIt Software, 38
using internal software, 38

W

warnings, 4, 5, 6, 21, 23, 24, 26, 28, 33, 56, 57, 58, 59, 61
working with a magnetic rod, 16

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