Thermo Scientific Multiskan FC

User Manual

Rev. 2.4, Cat. No. N07710



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Cat. No. N07710
April 2019

About This User Manual

Intended users

The Thermo Scientific™ Multiskan™ FC, as standalone or with Thermo Scientific™ SkanIt™ Software, can be used in research and routine-test laboratories by professional personnel.

How to use this user manual

This user manual is for the following instruments, Multiskan FC/Multiskan FC with incubator: Cat. No. 51119000, 51119050, 51119100, and 51119150. It has been designed to give you the information you need to:

- Review safety precautions
- Install the Multiskan FC
- Navigate and edit in the Multiskan FC user interface
- Make a protocol and measure
- Perform basic cleaning and maintenance procedures
- Troubleshoot the instrument performance

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

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. Keep the user manual together with the instrument in case you distribute it onwards.

For more information

For PC software-related issues, refer to the *Thermo Scientific™ SkanIt™ Software for Microplate Readers User Manual* (Cat. No. N16243) or *SkanIt Software for Microplate Readers Technical Manual* (Cat. No. N16046).

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

http://www.thermoscientific.com

http://www.thermoscientific.com/platereaders

http://www.thermofisher.com/instrumentrepair

In an effort to produce useful and appropriate documentation, we appreciate your comments on this user manual to your local Thermo Fisher Scientific representative.

Manufacturer

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Singapore 739256

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 Multiskan FC

The following symbols and markings appear on the type label and the instrument itself.

Power ON



Power OFF



Warning! The plate carrier may come out, risk of operational failure or damage.



Warning! Hot plate, risk of burns.



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 the following text (Figure 11):

CAUTION: WARNING: DISCONNECT SUPPLY BEFORE SERVICING and AVERTISSEMENT: COUPER L'ALIMENTATION AVANT L'ENTRETIEN ET LE DEPANNAGE.

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! Hot plate, risk of burns.



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.

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Chapter 1: Introduction to the Multiskan FC

The Multiskan FC (Figure 1) is a high-quality filter-based microplate photometer. It is used to measure absorbance from appropriate 96 or 384-well plate formats in the wavelength range of 340 to 850 nm. The instrument allows shaking. The instrument is controlled through the built-in graphical user interface and keypad. Multiskan FC can be connected to the SkanIt Software.

The Multiskan FC is available in the following configurations:

- Multiskan FC
  - 96-well plate reading with internal shaking
- Multiskan FC with incubator
  - 96 and 384-well plate reading with shaking and incubation



Figure 1. Multiskan FC microplate photometer

Intended use

The Multiskan FC is a microplate photometer for measuring absorbance from suitable microplates and strips in 96-well plate formats and optionally microplates in 384-well plate formats that meet the ANSI/SBS standards.

The Multiskan FC, as standalone instrument or with SkanIt Software, can be used in research or routine-test laboratories by professional personnel.

The Multiskan FC is part of the analyzing system used by the end user, who therefore is responsible for validation of the whole system for reliable and safe results.

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

It is recommended to use Good Laboratory Practice (GLP) during the analyzing process.

Principle of operation

The Multiskan FC is a filter-based microplate photometer. Measurement is vertical. The instrument reads from bottom to top.

The optical system is based on one-channel optics with a tungsten halogen lamp as the light source (Figure 2). Wavelength selection is made by means of interference filters.

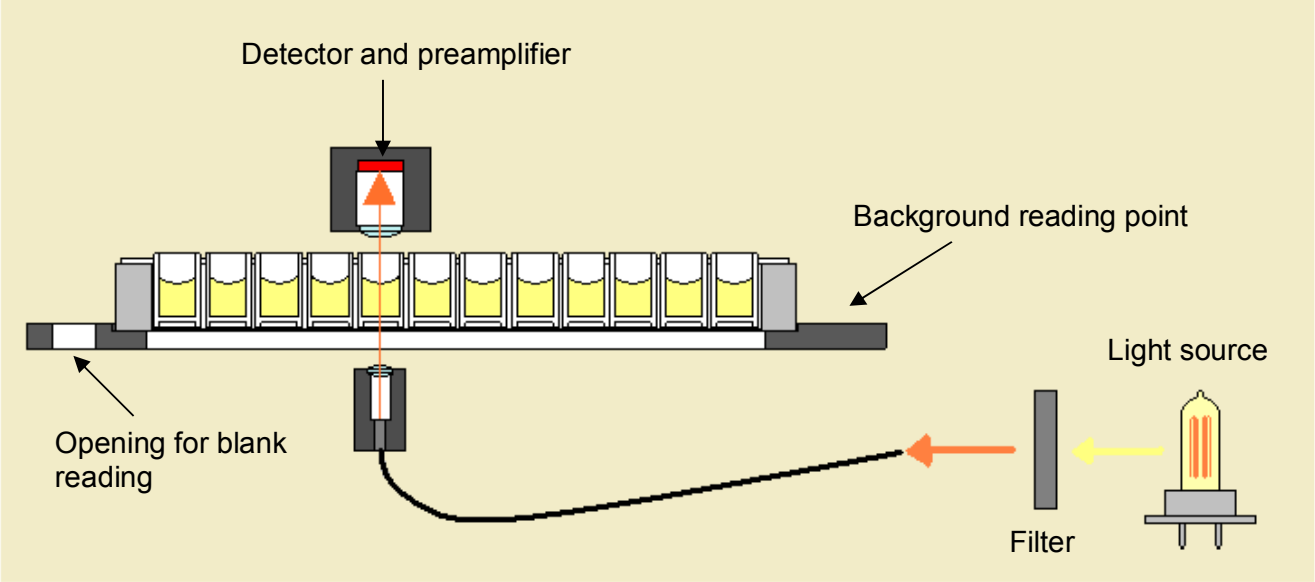


Figure 2. Optical system

The selected wavelength is directed at a moving measurement head by an optic fiber. The measurement head moves to select the well column and the track to select the row.

During measurement, the light from the lamp passes through an interference filter to an optic fiber. The filter selects from the lamp spectrum the exact wavelength desired. The optic fiber directs the light below the selected well of the plate. After passing through the well, the light is sensed by a photodetector in the measurement head above the well.

Blank (air) and dark level measurements are needed to calculate the absorbances. The Multiskan FC performs these measurements once at each measured row. The blank is measured from an opening at the left end of the plate tray and the dark signal when the plate tray edge opposite the blank hole blocks the light path.

Chapter 2: Installation

Warning! The Multiskan FC weighs 8.5 kg [18.7 lbs.] and care must be taken when lifting it.

Unpacking

How to unpack

Move the packed instrument to its site of operation. To prevent condensation, the instrument should be left in its protective plastic wrapping until the ambient temperature has been reached. Unpack the Multiskan FC instrument and accessories carefully with the arrows on the transport package pointing upwards. Place the instrument onto a laboratory bench.

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

Retain the original packaging 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.

If you relocate your instrument or ship it for service, refer to “How to pack for service”.

Checking delivery for completeness or 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 missing or damaged, contact your local Thermo Fisher Scientific representative.

Caution! If the instrument has been mechanically damaged, ship it for service.

Environmental requirements

When you set up your Multiskan FC, avoid sites of operation with excess dust, vibrations, strong magnetic fields, direct sunlight, draft, excessive moisture, or large temperature fluctuations. Make sure:

- the working area is flat, dry, clean, and vibration-proof, and leave additional room for cables, covers, and so on
- there is sufficiently room behind the instrument to enable disconnecting the device
- there is enough clearance in front of the instrument for the plate carrier to come out freely
- the ambient air is clean and free of corrosive vapors, smoke, and dust
- the ambient temperature range is between +10°C (50°F) and +40°C (104°F)
- the humidity is low so that condensing does not occur (relative humidity is between 10% and 80%, non-condensing).

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

Setups

Releasing the transport lock

Caution! Make sure the transport lock has been released before you put the instrument into operation.

1. Open the lamp and filter wheel chamber cover (Figure 3).

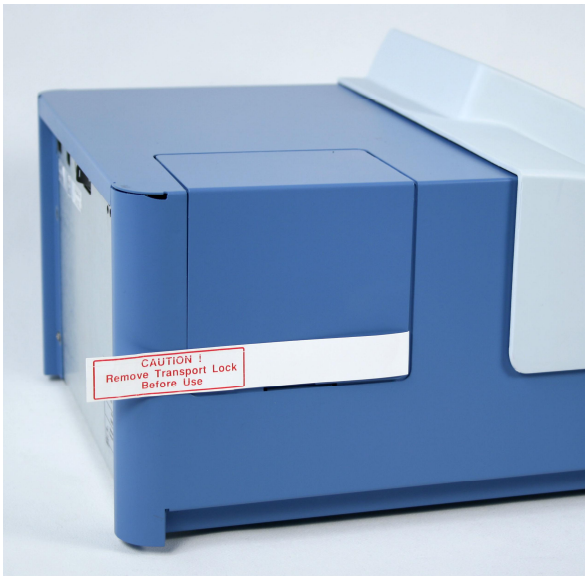


Figure 3. Transport lock (inside the instrument) and transport lock tag

2. Unfasten the transport lock bar counterclockwise using the Allen key supplied (Figure 4).



Figure 4. Unfastening the transport lock

3. Pull the transport lock bar out (Figure 5).



Figure 5. Pulling the transport lock out

4. Keep the transport lock bar and tag (Figure 6) for future relocation or transportation of the instrument.

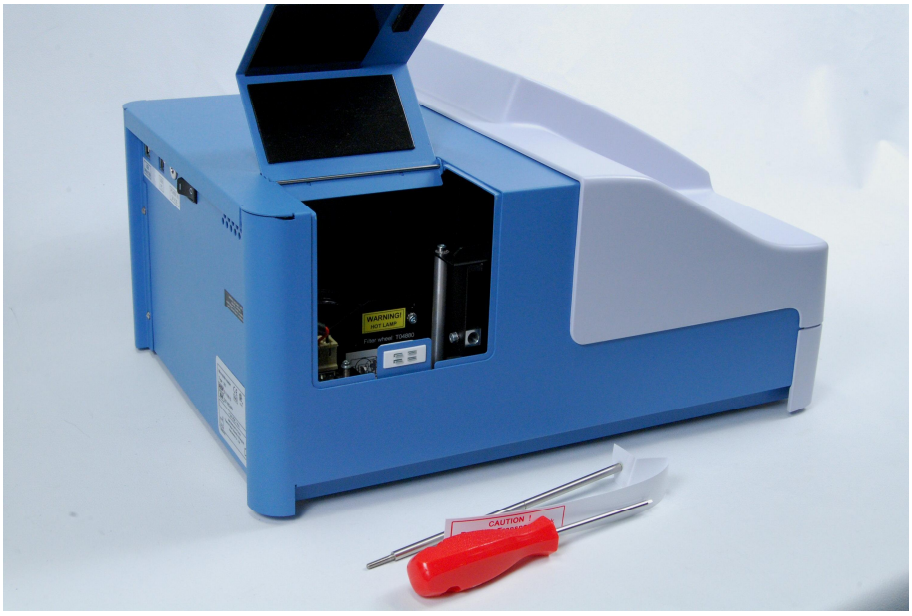


Figure 6. Transport lock bar and tag removed

Installing the filter wheel

1. Unpack the filter wheel (Figure 7). It is delivered in a filter wheel box. Check that all filters are clean and undamaged.

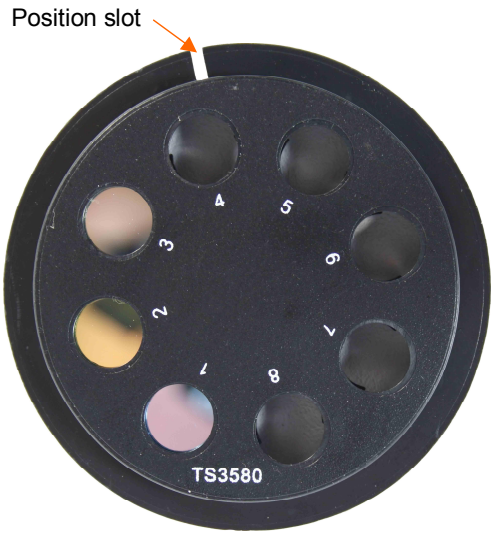


Figure 7. Multiskan FC filter wheel

Caution! Do not touch the filters with your bare hands.

Caution! When installing the filter wheel, do not touch any other mechanical or electronic part.

2. Place the filter wheel into the filter slot so that the filter wheel numbers (1-8) face outwards (Figure 8). A magnet locking mechanism will automatically lock the wheel in the correct position and the optical filter position sensor will make sure the correct filter is used during measurement.



Figure 8. Placing the Multiskan FC filter wheel into the filter slot

If the filter wheel seems to be "jumping" in the filter wheel slot, you have inserted the wheel incorrectly and the magnet is rejecting it. Turn the wheel over.

3. Close the lamp and filter wheel chamber cover.

Connecting the power supply cable

Warning! Do not operate your instrument from a power outlet that has no ground connection. Do not use a power supply cable other than the Thermo Scientific power supply cable designed for your region.

1. Ensure that the ON/OFF switch (Figure 9) at the back of the instrument is in the OFF (**O**) position.
2. Connect the power supply cable to the power supply connector and plug in the instrument.
3. Connect the power supply to a correctly installed line power outlet with a grounded conductor (Figure 9).

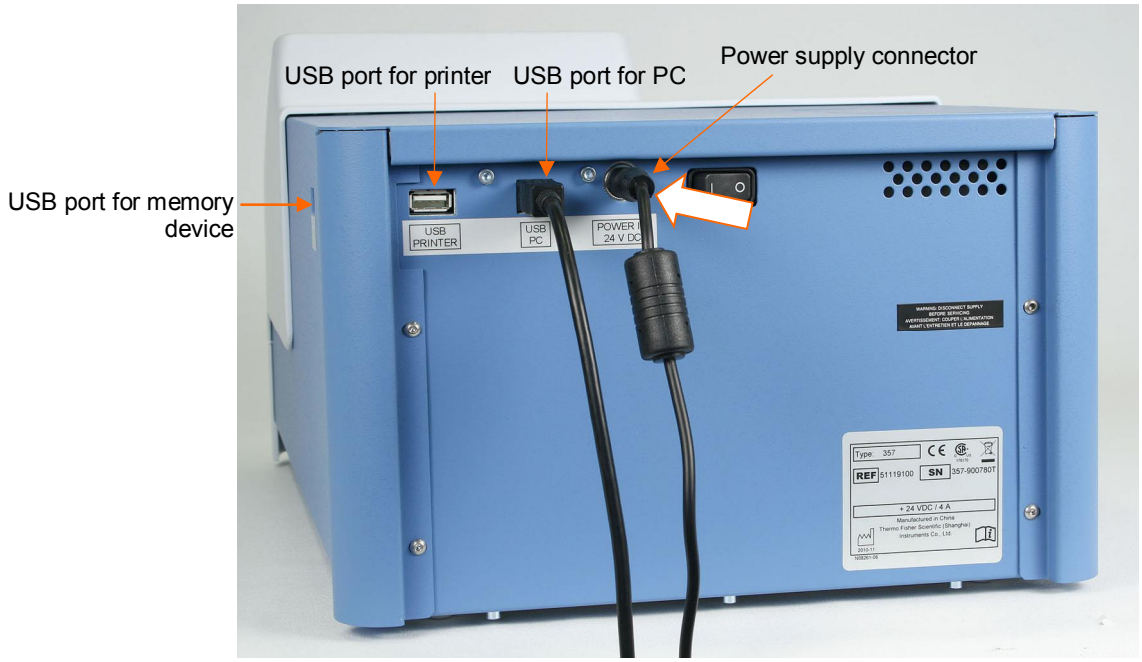


Figure 9. Connecting the power supply cable

Connecting to a computer

If you are using a computer with the Multiskan FC, connect the communication cable to the USB port for the computer (Figure 9).

Connecting to a printer

If you are using a printer, connect it to the USB port for the printer (Figure 9). The external USB printer protocol that can be used is HP PCL5, PCL5e or PCL5c.

Switching on

Check that all the cables are properly fitted according to the installation instructions. Switch the instrument ON.

Caution! 1) Do not switch the power off during “Performing self diagnostics”. 2) Do not plug/unplug the printer cable during Importing/Exporting data from/to the USB memory device. 3) Do not plug/unplug the USB memory device during “Printing” or “Performing self diagnostics”.

Performing the operational check

Before you take the instrument into use, make time to perform the following operational check:

1. Switch the instrument ON.
2. Check that the plate carrier comes out from the instrument and the “*Self diagnostics passed*” text is shown for a while on the display.



3. Press the **START** button twice.
4. Check that the plate carrier moves in and the measurement chamber door closes properly.

The instrument starts the measurement. After the measurement the plate carrier comes out. No error messages should appear on the display.



5. Press the **F2** key to close the result table.



6. Press the **Left** arrow key twice to return to the **Main** menu.

Settings after installation

If you want to change the language or add additional filters to the filter wheel, modify the required settings in the **Settings** menu. Refer to the instructions in “Settings menu”.

Installation of SkanIt Software for Microplate Readers

For installing SkanIt Software for Multiskan FC, refer to the *SkanIt Software for Microplate Readers User Manual* (Cat. No. N16243).

Caution! Operate the instrument only with software and hardware that is specifically designed or selected for it. Thermo Fisher Scientific assumes no liability when third-party software applications are used.

The instrument has one computer interface: USB.

When the instrument is connected to SkanIt Software, the “*Remote mode active*” text is shown on the display.





The **STOP** button on the keypad can be used to terminate the computer remote control.

Chapter 3: Multiskan FC Main Parts

Front view

The front view of the Multiskan FC instrument is shown in Figure 10.

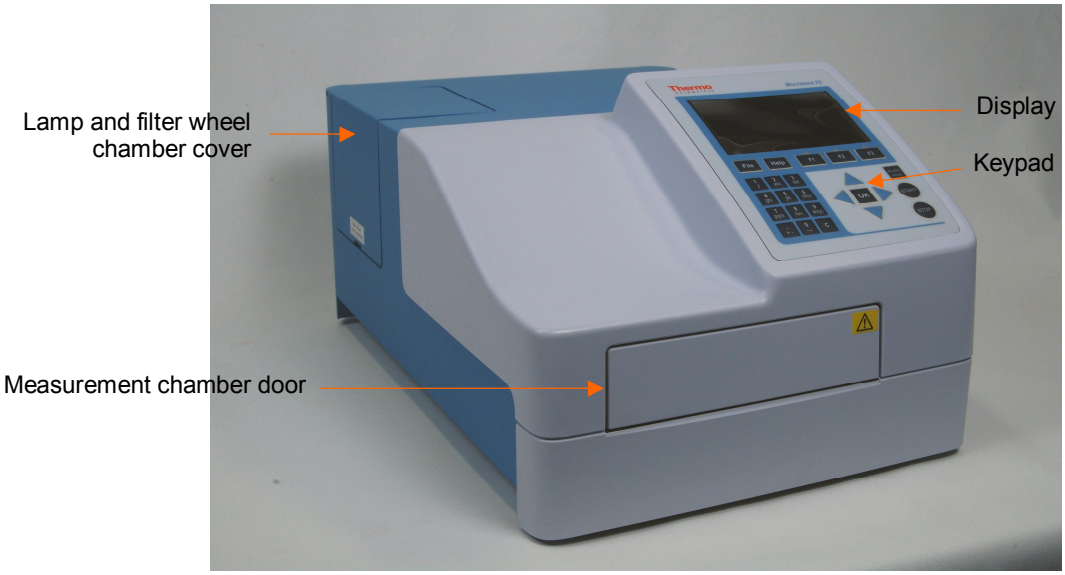


Figure 10. Multiskan FC front view

Back view

The back view of the Multiskan FC instrument is shown in Figure 11.

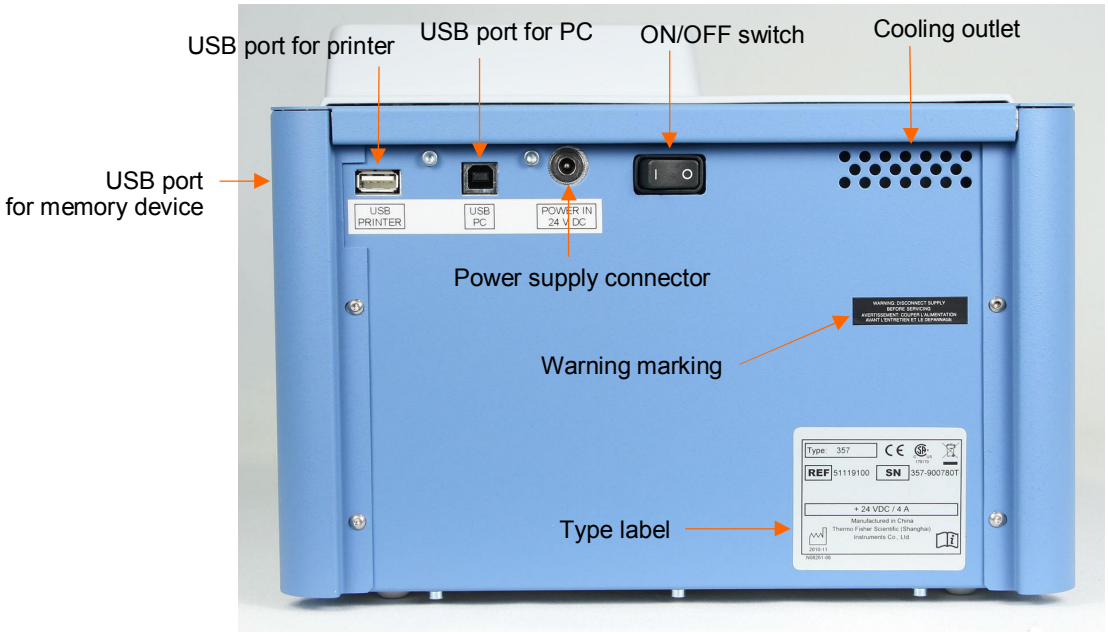


Figure 11. Multiskan FC back view

Side view

The side view of the Multiskan FC instrument is shown in Figure 12.

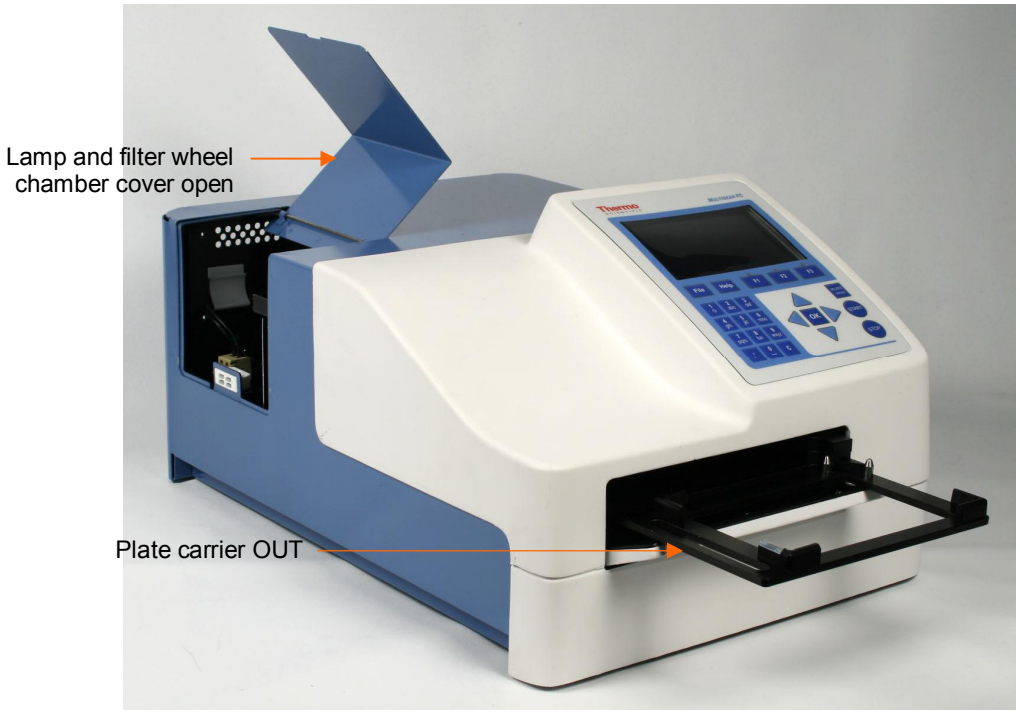


Figure 12. Multiskan FC side view

USB memory device port

The instrument is equipped with a USB port for an external memory device (Figure 11). You can transfer measurement data to the PC and assay protocols from an instrument to another with the USB memory device.

Note! It is recommended to format the USB memory device if export or import fails. For more information, refer to Chapter 15: “Troubleshooting Guide”.

Incubator

The optional incubator is only available with the Multiskan FC with incubator model. The incubator chamber consists of thermal elements on the top and bottom of the incubator chamber. The upper electrical thermal element prevents condensation on the microplate that is being incubated.

The incubation temperature ranges from 25 to 50°C (max.) in increments of 1°C.

When the background incubation (Settings > Startup > **Temperature**) temperature is set, the incubation temperature is activated once the instrument is switched on. The temperature is then kept constant all the time.

During measurement the background temperature is used if the protocol incubation temperature (Main > **Incubation**) is not in use (“*No*”).

When the protocol temperature is set, it is used as the incubation temperature during measurement. After measurement, the background temperature is taken into use again.

Background incubation is also possible during kinetic measurements.

Warning! The incubator thermal plates inside the instrument may be hot.

Shaker

The linear shaker operates at three different speeds (Table 1).

Table 1. Shaking speeds

Speed name	Speed
Slow	5 Hz, amplitude 15 mm
Medium	11 Hz, amplitude 3 mm
Fast	20 Hz, amplitude 1 mm

Background shaking is also possible during kinetic measurements.

Internal memory

There is memory for 99 assay protocols and at least assay results for 100 microplates.

Chapter 4: Operating the Internal Software

Display and keys for navigating and editing

The keypad and display are shown in Figure 13.

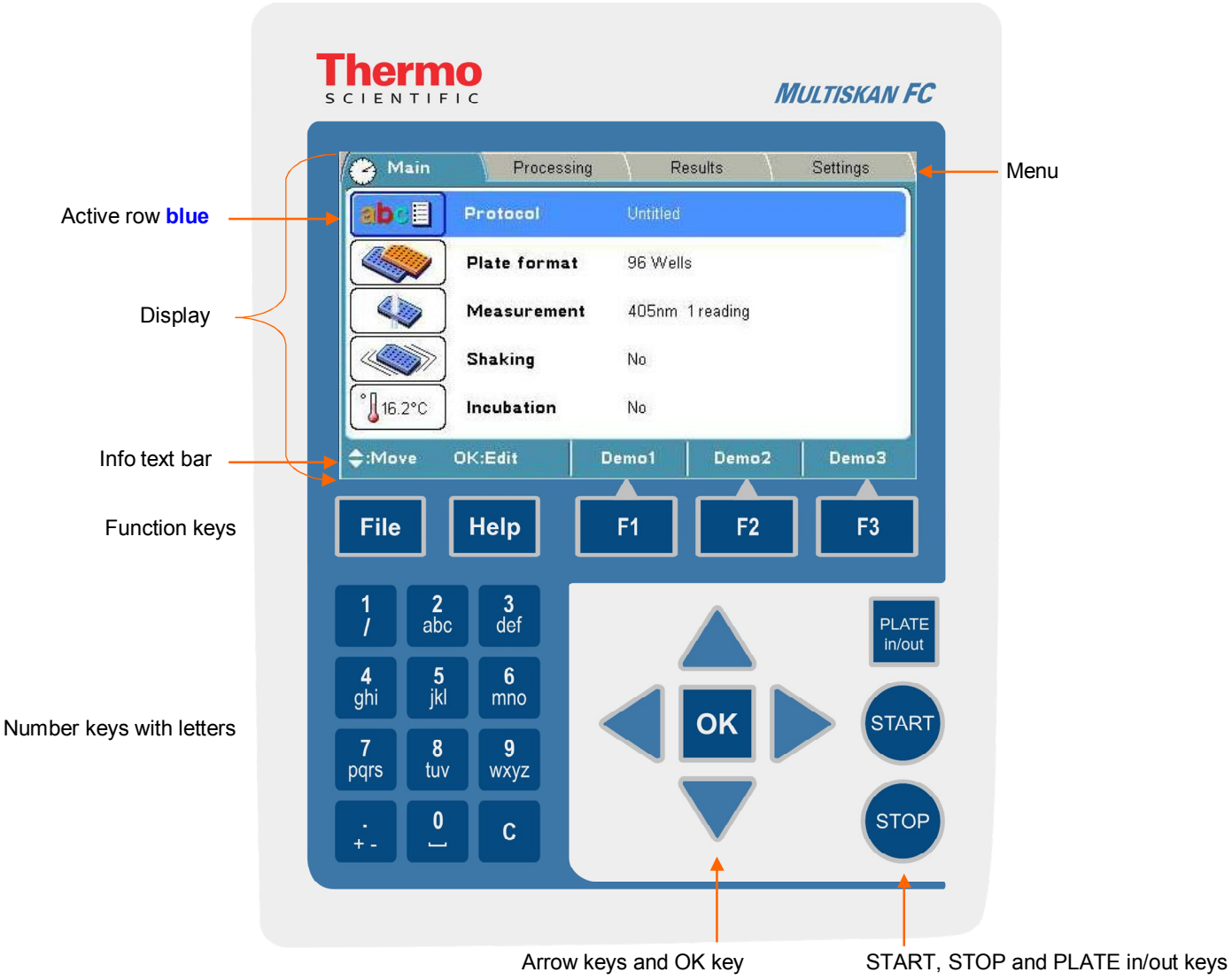
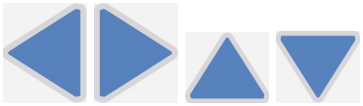


Figure 13. Keypad and display of the Multiskan FC

Keys / Action

The relevant keys for navigating and editing are described in detail below. The keys also have other functions depending on the level in the internal software.

The active row is colored **blue**.



Use the **Left**, **Right**, **Up** and **Down** arrow keys to navigate. You can speed up the selection by holding down the arrow key continuously.



Press the **OK** button to select and edit the highlighted item.



Use the character keys to enter numerical data and text.

- ( ) and µ are found under the **1** / key.



The **CLEAR** (**C**) key is used to delete written text or numbers.



Use the **F1-F3** keys to select the corresponding action from the info text bar (Figure 14). The information on the info text bar is updated according to the active menu.

Info text bar	***Protocol 1***	***Protocol 2***	***Protocol 3***
Function button			

Figure 14. Info text bar of the Multiskan FC user interface



Press the **FILE** key, for example, for saving the protocol in the **Main** menu. Depending on the level of the internal software, the **FILE** key opens a list of actions possible for the current protocol: ***New***, ***Open***, ***Save***, ***Save As***, ***Export***, ***Export All Protocols***, ***Export As Text***, ***Import***, ***Print, Print Protocol***, ***Print Results***, and ***Delete***.



Use the **HELP** key for more detailed instructions.



Press the **PLATE in/out** button to move the plate carrier in or out.



Press the **START** button to start reading using the currently selected protocol.



Press the **STOP** button to terminate the reading process. Data from the plate in progress is lost. It can also be used to terminate the possible computer remote control.

Chapter 5: Menus and Parameters

This section describes the menus and the relevant main parameters of the internal software for creating and editing protocols.

The internal software includes the **Main**, **Processing**, **Results**, and **Settings** menus.

The menu tree is displayed in Table 2.

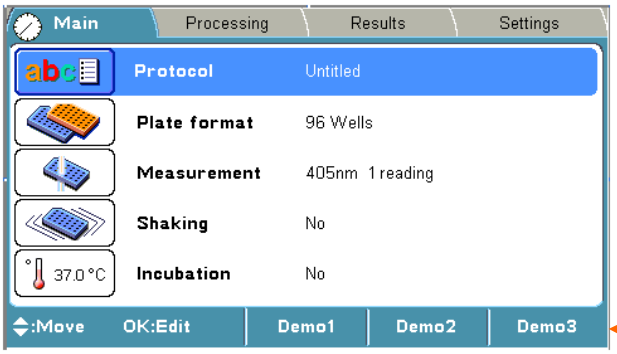
Table 2. Menu tree

Main	Processing	Results	Settings
Protocol	Plate layout	Raw data	System
Plate format	Preprocessing	Calculated results	Filters
Measurement	Calculation	Calibration curve	Printer
Shaking	Interpretation	Quality control	Startup
Incubation	Quality control	Results in list format	

Main menu

You can specify the instrument-related parameters in the **Main** menu.

The **Main** menu contains the **Protocol**, **Plate format**, **Measurement**, **Shaking**, and **Incubation** parameters.



The clock on the Main tab shows the real time.

The Incubation icon also shows the current temperature (only Multiskan FC with incubator model).

See the info text bar for the required actions of the **F1-F3** keys. The action text on the info text bar changes according to the level of the internal software.

Note! The parameters of the **Main** menu are locked when the run (measured data) for the protocol exists. After the measurement, the plate format, measurement, shaking, and incubation parameters cannot be changed. For more information, refer to Chapter 6: “Starting Ready-made Protocols”.

Table 3. Main parameters

Main		
└ **Protocol**		
	↳ Protocol: Created: Modified: Runs:	
└ **Plate format**		
	↳ 96 Wells ↳ 384 Wells	
└ **Measurement**		
	↳ Filter 1 (nm)	
		↳ No filter ↳ 405 (#1) ↳ 450 (#2) ↳ 620 (#3)
	↳ Filter 2 (nm)	
		↳ No filter ↳ 405 (#1) ↳ 450 (#2) ↳ 620 (#3)
	↳ Mode	
		↳ Fast ↳ Normal
	↳ No of readings (1-100)	
		↳ 1
└ **Shaking**		
	↳ Mode	
		↳ No ↳ Before measurement ↳ Background
└ **Incubation**		
	↳ Temperature (°C)	

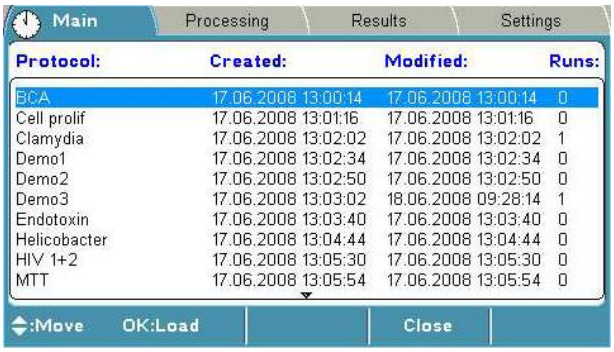
Main		
		↳ No ↳ 25–50
	↳ Wait for warm up	
		↳ Yes ↳ No
	↳ Time (hh:mm:ss)	
		↳ 00.00.00

Depending on the level of the internal software, the **FILE** key opens a list of actions possible for the current protocol.

Protocol

The **Protocol** row in the **Main** menu shows the name of the active protocol. You can open another protocol by pressing the **OK** button on the **Protocol** row or by pressing the **FILE** key. The list of protocols saved in the internal software will appear.

You can also open a particular run of the protocol in question (protocol with measured data) with the **Menu** function. Also the runtime is shown on the **Protocol** row. For more details on opening a protocol, refer to “Opening a new protocol”.



The maximum number of protocols is 99.

Table 4. Protocol structure

Protocol 1	
	Run 1
	Run 2
Protocol 2	
	Run 1
	Run 2
	Run 3

A measured run of a protocol includes run data and protocol information for that run.

You can start the measurement of an active protocol with the name “*Untitled*” but the results of an “*Untitled*” protocol are not saved unless you save the active protocol, including the measured run data with a new name.

Note! It is recommended to back up the protocols regularly. The backup is created by exporting the protocols to the USB memory device.

Note! If you make any changes to the processing parameters of a measured run in the **Processing** menu, the changes are made to that run only. If you want to make changes to the protocol and thereby to the future runs, you must open the protocol, make the changes, and press the **FILE** key/**Save** to save the changes.

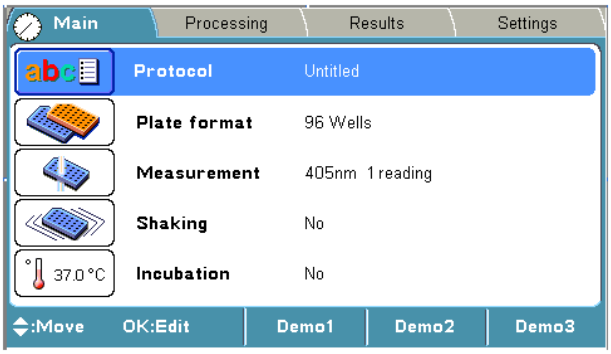
Note! When you press the **START** button, the software always loads the saved protocol, regardless of what parameters are active on the display.

For instructions on how to start and create protocols, refer to Chapter 6: “Starting Ready-made Protocols” and Chapter 7: “Protocol Creation”.

Plate format parameters

You can select the plate format 96 or 384 in the **Plate format** window.

Note! The 384 format is only available if the instrument configuration supports 384-well plate measurements.



Note! Use only plates manufactured according to ANSI/SBS standard dimensions.

The dimensions of the available plates are given in Table 5 and Table 6.

Table 5. 96-well plate dimensions

96-well plate	Dimension (mm)
Plate height	14.35
Plate length	85.48
Plate width	127.76
First well position X	14.38
First well location Y	11.24
Corner distance X	99
Corner distance Y	63

Table 6. 384-well plate dimensions

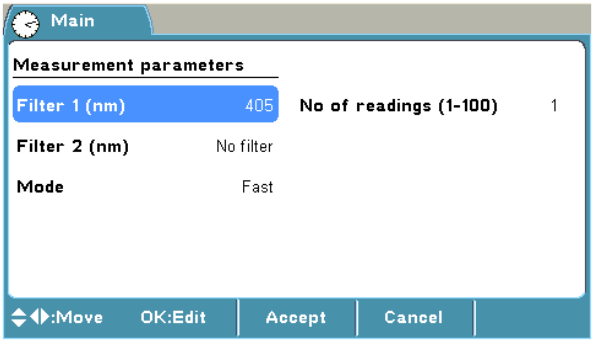
384-well plate	Dimension (mm)
Plate height	14.35
Plate length	85.48
Plate width	127.76
First well position X	12.13
First well location Y	8.99
Corner distance X	103.5
Corner distance Y	67.5

Measurement parameters

You can define the measurement filter(s), number of readings, and measurement mode in the **Measurement** window.

Filters

Filter 1 defines the first (main) filter wavelength. Filter 2 defines the second (reference) filter wavelength.



You can select the suitable filter from the list of available filters. You must physically install the filter into the filter wheel, as well as introduce the additional filter to the internal software of the instrument in the **Settings** window. Refer to “Introducing a filter to the internal software”.

Measurement modes

There are two measurement modes: **Normal** and **Fast**.

The measurement head stops on each well in the **Normal** measurement mode. The **Normal** mode produces the most accurate results with measurement times that are fast enough for most purposes.

The head moves continuously in the **Fast** measurement mode. The **Fast** mode produces fast results with a slightly narrower linear absorbance range than with the **Normal** mode.

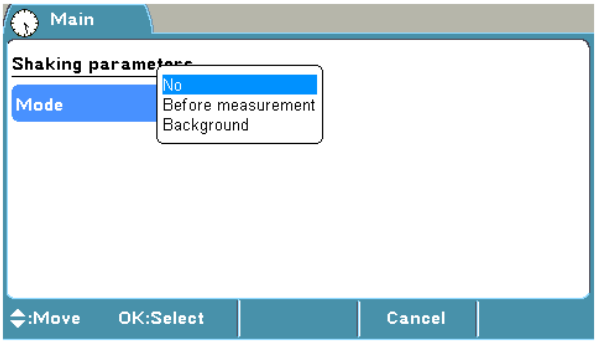
Number of readings sets the number of measurements per well. One means that each well is measured only once, and two or more means that the measurement is repeated (kinetic). The number of readings can be anything between 1 and 100.

If the **Number of readings** is higher than 1, the measurement is considered kinetic, and the interval time between the readings must be set. Kinetic calculations can be added to the protocol.

For instructions on how to program a wavelength, for example, refer to “Programming a wavelength”.

Shaking parameters

You can define the shaking parameters in the **Shaking** window.



You can select between no shaking, shaking before measurement, and background shaking.

The shaking speed can be set to *Slow*, *Medium* or *Fast*. Refer to Table 1.

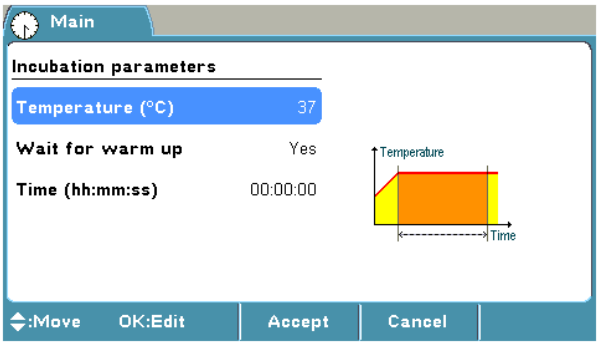
Background shaking is active during the intervals of kinetic measurements. The shaker shakes in sections of 1 second with the slow speed.

For instructions on how to program shaking, refer to “Programming shaking”.

Incubation parameters

Note! Incubation is only available if the instrument configuration supports incubation.

You can define the incubation parameters, incubation time, and temperature in the **Incubation** window.



The Incubation icon (and row) is visible in the **Main** menu of the instruments with an incubator indicating the present temperature.

The temperature range is from 25 to 50°C in increments of 1°C. Refer to Table 17.

When the protocol temperature is set, it is used as the incubation temperature during measurement. After measurement, the background temperature is taken into use again.

If **Wait for warm up** is set to *Yes*, the assay incubation is not started until the temperature is reached.

During measurement the background temperature is used if the protocol incubation temperature (Main > **Incubation**) is not in use ("*No*").

Background incubation is also possible during kinetic measurements.

When the background incubation (Settings > Startup > **Temperature**) temperature is set, the incubation temperature is activated once the instrument is switched on.

Note that the cooling of the incubation chamber takes time. If you get the warning of "*Temperature is not changing*", it means that the incubator chamber is cooling slowly. It is possible to start the run despite of the warning message in case the incubation temperature is not critical for the application.

The limits for the incubation time are 00:00:00-99:59:59.

The temperature in Kelvin is calculated according to the following equation:

$K = t + 273.16$

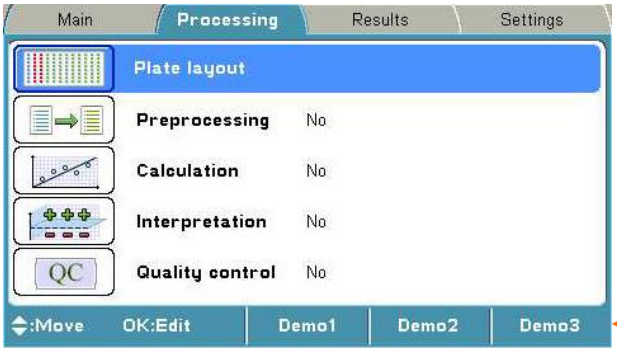
where K denotes Kelvin and t the temperature in degrees Celsius (°C).

Processing menu

You can specify the calculation parameters in the **Processing** menu. These parameters supplement the parameters programmed in the **Main** menu.

The **Processing** menu contains the following parameters:

- **Plate layout** (with well information)
- **Preprocessing** (for example, kinetic calculations)
- **Calculation** (for example, curve fit)
- **Interpretation** (for example, limit calculation)
- **Quality control** (rules for quality control)



See the info text bar for required actions.

Plate layout parameters

You can set the plate map of the protocol in the **Plate layout** window. The calculations of the results are made based on the plate layout.

The plate layout parameters have to be set prior to measurement. The parameters cannot be changed after measurement.

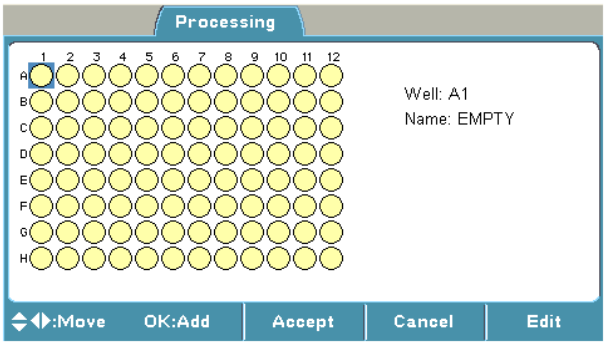
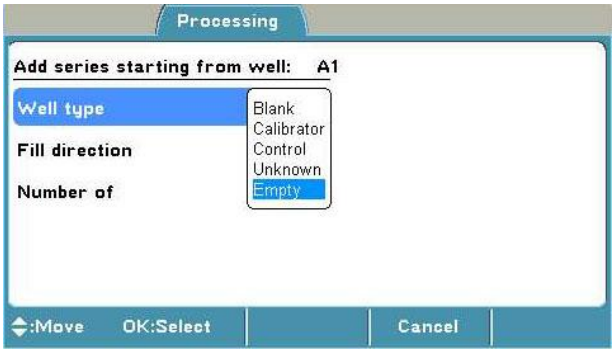


Table 7. Processing parameters

Processing / Plate layout			
└ **Plate layout**			
	↳ Well: A1 Name: EMPTY		
		↳ Well type	
			↳ Blank ↳ Calibrator ↳ Control ↳ Unknown ↳ Empty
		↳ Fill direction	
			↳ Down ↳ Right
		↳ Replicate direction	
			↳ Down ↳ Right
		↳ Number of	
			↳ 1
		↳ Replicates	
			↳ 1

Depending on the level of the internal software, the **FILE** key opens a list of actions possible for the current protocol.

You can start filling the plate layout on any of the wells of the plate. You start the fill procedure from the well marked with a **blue** square. You can start filling a series of samples by pressing the **OK** button in the highlighted well. You can edit and delete a single well with the **Edit** function.



Note! Blank subtraction is made automatically if the plate layout includes blanks. The blank used in the calculations is always an average of the blanks included in the layout.

You can determine the sample type in **Well type**. The sample types are *Blank*, *Calibrator*, *Control*, *Unknown* or *Empty*.

Note! The results will not be calculated for the *Empty* sample type.

Note! The calibrator concentrations are programmed in the **Plate layout** window. You can define calibrator concentrations when you create a calibrator series or activate a single calibrator. A calibration concentration of 0 is not accepted.

Fill direction can be either to the right or downwards from the active well in the **Plate layout** window.

Fill replicate direction can be either the same or different from the fill samples direction in the **Plate layout** window.

You can define the number of samples belonging to the group, for example, the number of different calibrators or the number of different unknown samples in **Number of**. You define the number of replicates for each sample type in **Replicate**.

Note! The **Replicate** number is the same for samples, for example, for different controls when using **Add series** starting from the well programming. Use the **F3** (**Edit**) key to program each sample individually, if a different replicate number for the samples are needed.

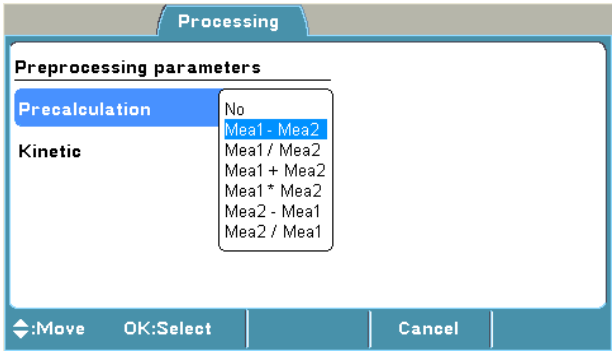
When filling the plate with the **Add series** function, note that adding a group of samples of the same type to another location will delete the first group. If you want to add the same well type into several separate locations on the plate layout, use the **Edit** function.

For instructions on how to program the plate layout, refer to “Programming a plate layout”.

Preprocessing parameters

You can define the preprocessing parameters in the **Preprocessing** window.

Preprocessing includes two different types of data processing: **precalculations** and **kinetic calculations**.



Preprocessing is used with dual (two wavelength) measurements, for example, to subtract the reference wavelength data in dual measurements and with kinetic measurements to reduce data in kinetic calculations.

Table 8. Processing / Preprocessing parameters

Processing / Preprocessing					
↳ **Preprocessing**					
	↳ Pre-Calculation				
		↳ No ↳ Mea1 – Mea2 ↳ Mea1 / Mea2 ↳ Mea1 + Mea2 ↳ Mea1 * Mea2 ↳ Mea2 – Mea1 ↳ Mea2 / Mea1			
	↳ Kinetic				
		↳ Type			
			↳ No ↳ Average rate		
				↳ Kinetic rate	
					↳/s ↳/min
				↳ Ignore from beginning	
					↳0
				↳ Ignore from end	
					↳0
			↳ Maximum rate		
				↳ Kinetic rate	
					↳/s ↳/min
				↳ Ignore from beginning	
					↳0
				↳ Ignore from end	
					↳0
				↳ Window	
					↳2
				↳ Reaction	
					↳Undefined ↳Increasing ↳Decreasing
			↳ Time to maximum rate		
				↳ Kinetic rate	
					↳/s ↳/min
				↳ Ignore from beginning	
					↳0
				↳ Ignore from end	
					↳0
				↳ Window	
					↳2
				↳ Reaction	
					↳Undefined ↳Increasing

Processing / Preprocessing					
					↳Decreasing
			↳ Time to change		
				↳ Ignore from beginning	
					↳0
				↳ Ignore from end	
					↳0
				↳ Window	
					↳2
				↳ Reaction	
					↳Undefined ↳Increasing ↳Decreasing
				↳ Baseline readings	
					↳100
				↳ Readings from	
					↳Beginning ↳End
				↳ Change	
					↳0.00
				↳ Change type	
					↳Absolute ↳Relative (%)
			↳ Maximum of well		
				↳ Ignore from beginning	
					↳0
				↳ Ignore from end	
					↳0
			↳ Time to maximum		
				↳ Ignore from beginning	
					↳0
				↳ Ignore from end	
					↳0

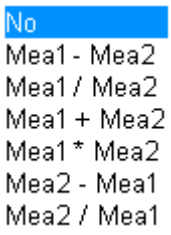
Depending on the level of the internal software, the **FILE** key opens a list of actions possible for the current protocol.

Precalculations

Precalculation is used in the context of dual (two wavelength) measurements when Filter 1 (main filter) and Filter 2 (reference filter) are defined in the **Main** menu.

The purpose of the precalculation is to merge the data from the two measurements into one data set, which can then be further processed, for example, using kinetic calculations or a curve fit.

The most common example of precalculation is the subtraction of the reference wavelength, where absorbance values of Measurement 2 (measured with Filter 2) is subtracted from the absorbance values of Measurement 1 (measured with Filter 1).



Kinetic calculations

Kinetic calculations can be used when the number of readings is more than 1 in the measurement parameters (see Measurement parameters). Also the results of a kinetic calculation can be used as source data for further calculations.

The available kinetic calculation types are:

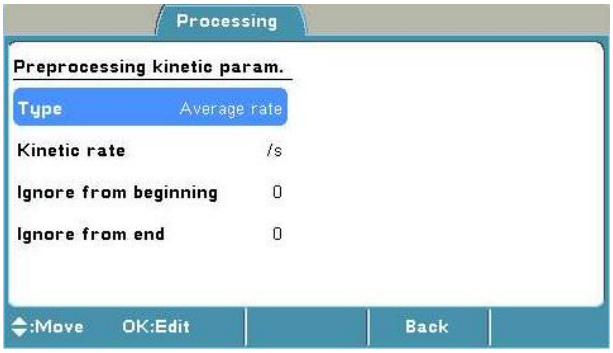
- Average rate
- Maximum rate
- Time to maximum rate
- Time to change
- Maximum of well
- Time to maximum

Note! If the message "*Kinetic processing failed*" appears, check the calculation parameters first.

Average rate

Average rate is also known as normal rate. The average kinetic rate (slope of the absorbance (Abs) vs. time curve) is calculated by linear regression (linear least squares method or LLS) using all the measurement readings within the selected raw data and time range.

You can define the following settings:



- **Kinetic rate** – Select to view the results in either seconds (s) or minutes (min). The Kinetic rate is always calculated per second but if you select per minute, the time is automatically converted to minutes after the calculations.
- **Ignore from beginning** – Ignores a defined number of points (readings), counted from the first reading.
- **Ignore from end** – Ignores a defined number of points (readings), counted from the last reading.

Maximum rate

If the maximum rate is selected, the software searches the data for the maximum rate found in each well. To obtain the maximum rate, a series of linear curve fits will be performed for different segments of the measurement value, absorbance vs. time curve (Figure 15). The first segment starts at the first data point within the selected time and measurement range, the second segment starts at the second data point, and so on, until all the data points have been analyzed. All the rate calculations are evaluated to determine the maximum rate. In other words, the LLS fit of *m* span points are sequentially fitted through each of the *n* data points. There will be *n - m + 1* curves produced from this. You can specify the number of data points in a segment with the **Window** setting.

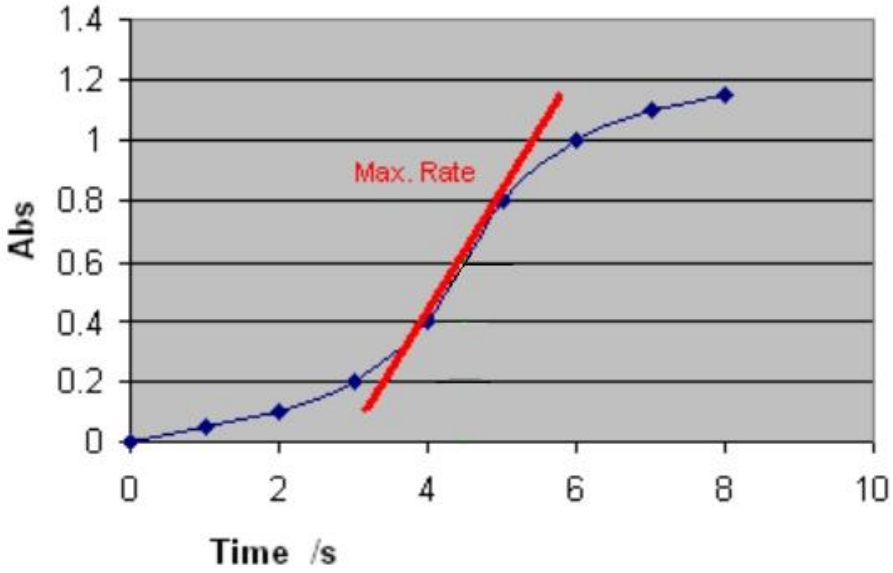
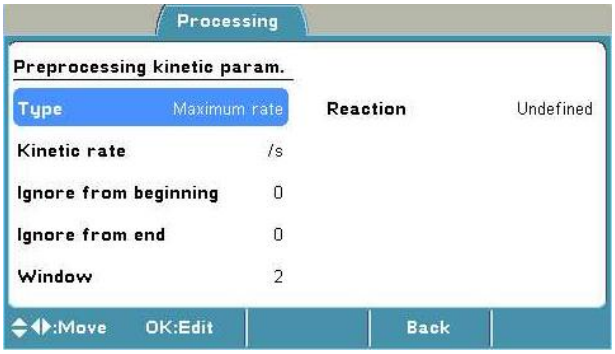


Figure 15. Determining the maximum rate with window value 2

You can define the following settings:



- **Reaction** – Define whether the reaction is supposed to produce increasing or decreasing signal levels. There are three options for this setting:
  - **Undefined** (default) – The reaction can be increasing, decreasing or both (for example, first increase and then decrease, that is, peaking). The software does not produce any warnings in either case. It searches for the absolute maximum rate. If the highest absolute rate value is increasing, it is shown as a positive number. If the maximum rate is decreasing, it will be presented with the prefix "-".
  - **Increasing** – The software searches for the maximum increasing rate. The rate is shown as a positive number. If no increasing rate is found, the result is "NaN" (not a number).
  - **Decreasing** – The software searches for the maximum decreasing rate. The rate is shown as a positive number. If no decreasing rate is found, the result is "NaN" (not a number).
  - **Kinetic rate** – Select to view the results in either seconds (s) or minutes (min). The kinetic rate is always calculated per second but if you select per minute, the time is automatically converted to minutes after the calculations.
  - **Ignore from beginning** – Ignores a defined number of points (readings), counted from the first reading.
  - **Ignore from end** – Ignores a defined number of points (readings), counted from the last reading.
  - **Window** – Select the number of consecutive readings to use for evaluation. The highest reaction rate for each well is calculated using a sliding window. A window defines how many measurement points are included in the measurement calculations. The size of this window is given in the Window parameter box. For example, if the number of measurements is ten and the Window parameter is three, the system will calculate the first rate using the measurements

1 to 3, the second rate using the measurements 2 to 4, and so on up to measurements 8 to 10. The maximum rate will be the maximum value among these calculated rates.

Time to maximum rate

The time to maximum rate is calculated similarly to the maximum rate, but the result is reported as the time in seconds from the first reading to the point on the line where the maximum rate occurs instead of the rate itself. Refer to Figure 16.

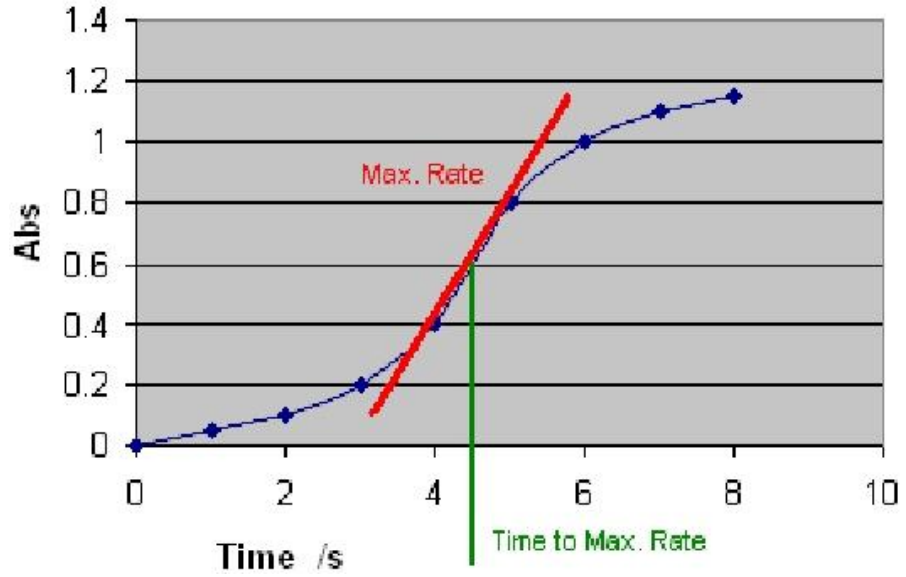
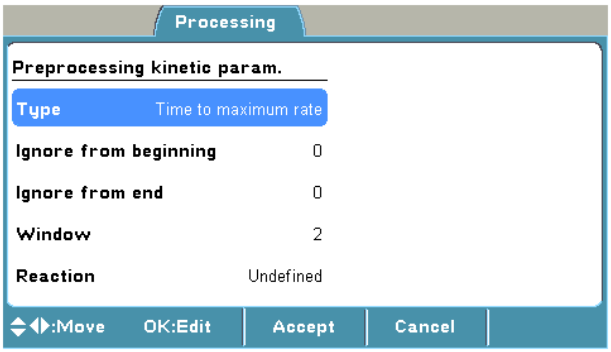


Figure 16. Determining the time to maximum rate

You can define the following settings:



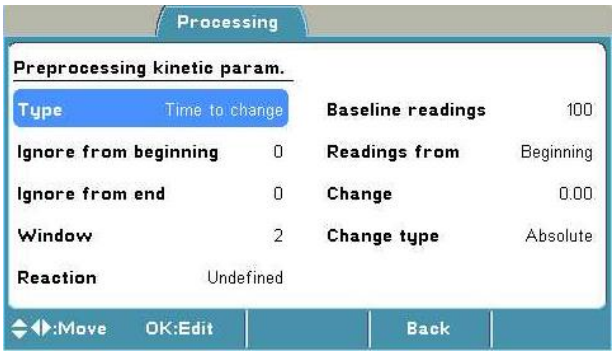
- **Reaction** – Define whether the reaction is supposed to produce increasing or decreasing signal levels. There are three options for this setting:
  - **Undefined** – Searches for the absolute maximum rate, and returns the corresponding time.
  - **Increasing** – Searches for the maximum increasing rate, and returns the corresponding time. If no increasing rate is found, the result is “NaN” (not a number).
  - **Decreasing** – Searches for the maximum decreasing rate, and returns the corresponding time. If no decreasing rate is found, the result is “NaN” (not a number).
- **Ignore from beginning** – Ignores a defined number of points (readings), counted from the first reading.
- **Ignore from end** – Ignores a defined number of points (readings), counted from the last reading.
- **Window** – The number of consecutive readings to use for evaluation.

Time to change

The time to change is used for calculating the time required to reach a defined change in the signal (in each well). The time is given in seconds or minutes from the first reading.

First define the base value by entering the number of readings from the start in baseline. The base value is the average of results of the given baseline count from the beginning or end of results. Then select whether the change from the base value is evaluated as a relative (%) or an absolute value and define that percentage or value. This change is then added to the base value to create a required change value. The average of the sliding window is compared to the limit. The result is the exact interpolated time where the given change occurs.

You can define the following settings:

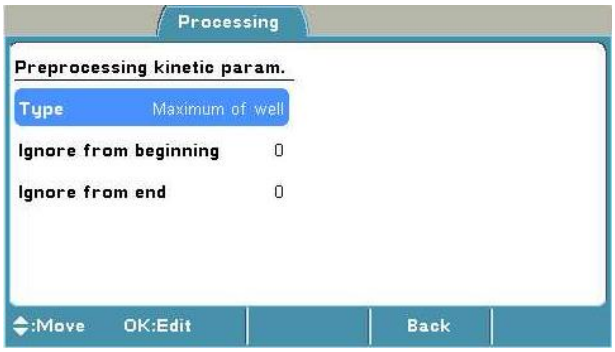


- **Ignore from beginning** – Ignores a defined number of points (readings), counted from the first reading.
- **Ignore from end** – Ignores a defined number of points (readings), counted from the last reading.
- **Window** – The number of consecutive readings to use for evaluation.
- **Reaction** – Define whether the reaction is supposed to produce increasing or decreasing signal levels. There are three options for this setting:
  - **Undefined** – Searches for the defined change in signal, regardless of the rate polarity (positive or negative), and returns the corresponding time.
  - **Increasing** – Searches for the increasing defined change in signal, and returns the corresponding time. If no increasing rate is found, the result is “NaN” (not a number).
  - **Decreasing** – Searches for the decreasing defined change in signal, and returns the corresponding time. If no decreasing rate is found, the result is “NaN” (not a number).
- **Baseline readings** – The Baseline readings parameter is the number of initial readings, calculated from the beginning (*first*) or end (*last*) of the measurement, used for the baseline calculation. The baseline can also be zero, which means that the comparison will be made against zero. In the Baseline readings the software chooses as many measurement points as exist in the baseline and calculates the mean thereof. The mean equals the baseline value. If *last* is selected, the change is searched starting from the end of the measurement.
- **Readings from** – There are two options for this setting: *Beginning* (default) or *End*.
- **Change** – The change in signal is specified and compared to the baseline.
- **Change type** – The relative change from the baseline in percent or the absolute change. The default is *Absolute*.

Maximum of well

The maximum of well is used to search for the maximum measurement value in each well.

You can define the following settings:

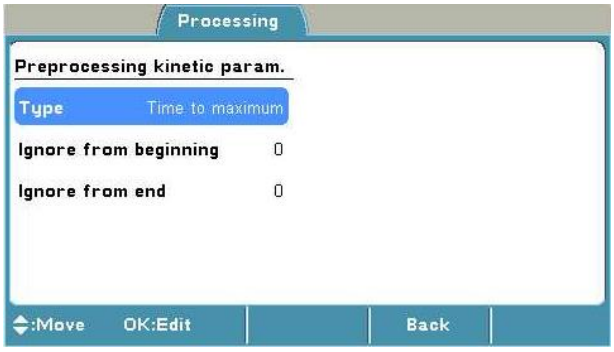


- **Ignore from beginning** – Ignores a defined number of points (readings), counted from the first reading.
- **Ignore from end** – Ignores a defined number of points (readings), counted from the last reading.

Time to maximum

The time to maximum is used to calculate the time elapsed before the maximum measurement signal in each well is reached.

You can define the following settings:



- **Ignore from beginning** – Ignores a defined number of points (readings), counted from the first reading.
- **Ignore from end** – Ignores a defined number of points (readings), counted from the last reading.

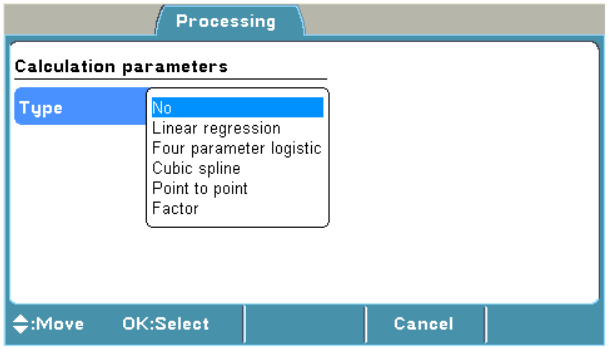
Calculation parameters

You can define the calculation parameters in the **Calculation** window.

The plate layout parameters have to be set prior to measurement. The parameters cannot be changed after measurement.

The available calculation types are: **curve fits** and **factor**.

You can select different calibrator curve fit types for quantitative calculation or a factor. You can also use a stored curve for quantitative calculation.



Note! Blank subtraction is made automatically if the plate layout includes blanks. The blank used in the calculations is always an average of the blanks included in the layout.

Note! The plate layout must include calibrators and corresponding calibrator parameters, such as concentrations, to enable them for further calculations, for example, curve fits. Refer to “Curve fits” and “Programming a plate layout”.

Table 9. Processing parameters / Calculation

Processing / Calculation				
Calculation				
	↳ Type			
		↳ No ↳ Linear regression		
			↳ Conc. Transfor.	
				↳ Linear ↳ Logarithmic
			↳ Meas. Transfor.	
				↳ Linear ↳ Logarithmic
			↳ Extrapolation	
				↳ Yes ↳ No
		↳ Four parameter logistic		
		↳ Cubic spline		
			↳ Conc. Transfor.	
				↳ Linear ↳ Logarithmic
			↳ Meas. Transfor.	
				↳ Linear ↳ Logarithmic
		↳ Point to point		
			↳ Conc. Transfor.	
				↳ Linear ↳ Logarithmic
			↳ Meas. Transfor.	
				↳ Linear ↳ Logarithmic
		↳ Factor		
			↳ Value	
				↳ 1.000

Depending on the level of the internal software, the **FILE** key opens a list of actions possible for the current protocol.

Curve fits

The curve fit types of the calibrators are:

- Linear regression
- Four parameter logistic
- Cubic spline
- Point to point

Linear regression

Linear regression is a term usually reserved for the simple linear model involving a response, *y*, that is, a continuous variable and a single explanatory variable, *x*, related by the equation

$y = a + bx$

where *y* denotes the expected value.

The minimum number of calibrators for this fit type is two.

Extrapolation is only available for the linear regression fit type. The extrapolation result is merely indicative and needs to be confirmed. Results using extrapolated data are marked with "*" in list format. In matrix format the extrapolated results are not marked.

Four parameter logistic

The four-parameter logistic method uses the fit model below:

$$y = b + \frac{a - b}{1 + (xc)^d}$$

In the equation above, *y* is the signal, *x* the concentration, *a* the response at high asymptote, *b* the response at low asymptote, *c* the 1/concentration at the curve's inflection point (i.e. where the curvature changes from concave upwards to downwards, or vice versa), and *d* the slope factor at f(c).

The minimum number of calibrators for this fit type is five.

The Concentration logarithmic transformation is not available for this fit type.

Extrapolation is not available for the four-parameter logistic fit type.

Cubic spline

This method is a smoothed point-to-point method where the adjacent calibration points are connected together using cubic polynomials (see the equation below) and optimizing the connecting points as smoothly as possible to avoid sharp angles. The results are calculated by first searching for the correct interval and then using a bisectional method to find the answer from the corresponding equation. The minimum number of calibrators for this fit type is five.

$y_i = a_i + b_i x_i + c_i x_i^2 + d_i x_i^3$

Only the means of the measured calibrator replicates can be used, not the individual replicate values.

Extrapolation is not available for the cubic spline fit type.

Point to point

The point-to-point method connects the adjacent response-concentrations coordinates, that is, the calibration points, together using a straight line (see the equation below), which is different for each of the intervals. The results are calculated by first searching for the correct interval and then using the corresponding equation. The minimum number of calibrators for this fit type is two.

$y_i = a_i + b_i x_i$

Only the means of the measured calibrator replicates are used in the calculations. The replicates are visible in the graph but they are not used in calculations.



Note! The method always returns the first value found for a sample. Therefore, ensure that the calibration points behave monotonously.

Extrapolation is not available for the point-to-point fit type.

Factor

Measured absorbances are multiplied with a factor given by the user to obtain the concentrations. The concentration is calculated according to the following equation:

Concentration = Factor x absorbance

Stored curve

You can use a stored curve for an assay (a run). You can only use a stored curve with the protocol it was created with. After the curve has been stored, the plate layout may be modified to contain, for example, only unknowns. You can save the curve from the curve window using **FILE/*Save calibrators*** and load it using **FILE/*Load curve***.

Note! The stored curve must be older than the measured run data. This means that if a new curve is stored, the earlier saved assay run data cannot be recalculated against the new curve.

Interpretation parameters

You can define the qualitative calculation (classification) in the **Interpretation** window.

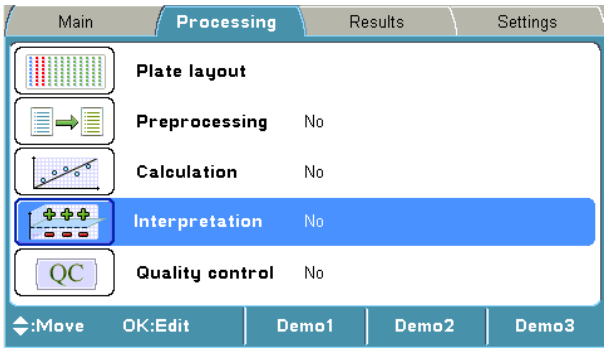


Table 10. Processing parameters / Interpretation

Processing / Interpretation				
└ **Interpretation**				
	↳ Source data ↳ Interpretation 1 ↳ Limit 1			
		↳ Sample		
			↳ BLA	
				↳ Raw Blanked Dual Kinetic Concentration*
			↳ CAL1-CAL12	
				↳ Raw Blanked Dual Kinetic Concentration*
			↳ CTRL1-CTRL5	
				↳ Raw Blanked Dual Kinetic Concentration*
		↳ Operator		
			↳ + - * / ( )	
		↳ Constant		
			↳ 1.00	
		↳ Function		
			↳ SD CV%.	
		↳ Delete		
	↳ Interpretation 2			
		↳ Enter class in free text field		
	↳ Interpretation 3			

* The pop-up menu appears when you press **OK**.

Depending on the level of the internal software, the **FILE** key opens a list of actions possible for the current protocol.

Interpretation (classification) can be used in a qualitative assay (a run), where no absolute concentration is calculated, and it can also be used for a quantitative assay (a run) when the interpretation is made based on the calculated concentration (Figure 17).

In a qualitative classification analysis (interpretation), the results are divided into separate categories. The data is categorized using cutoff values (**Limit 1** and **Limit 2**) for up to three different categories (Figure 17).

The limits (cutoff values) can be set as a number, a formula, a specified sample, or a formula containing both samples and numbers.

The absorbances or concentrations of the samples are compared to the limits and defined, for example, as negative or positive.

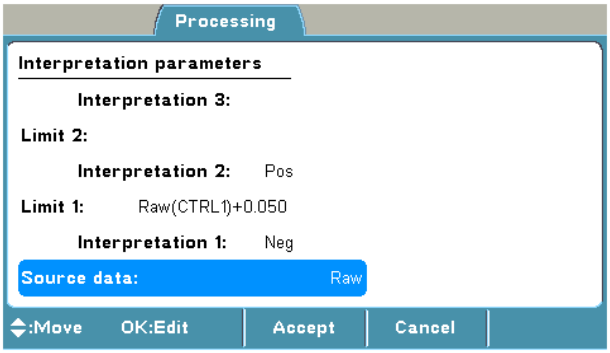
Source data

You must define the **Source data** for the interpretation calculation. The source data used for interpretation can include the following data types:

- Raw absorbances (Raw)
- Blank subtracted absorbances (Blank)
- Precalculated absorbances (Dual)
- Preprocessed kinetic values (Kinetic)
- Calculated concentrations

For further information, refer to “Preprocessing parameters”.

Interpretation and limits



An interpretation calculation always contains at least one limit and two categories. A limit can be a value or a formula. Refer to Figure 17.

Interpretation 1 is a typed name for the sample result in the category less than Limit 1, for example, *Neg*.

Interpretation 2 is a typed name for the sample result in the category of higher than Limit 1 but less than Limit 2, for example, *Pos*.

Interpretation 3 is a typed name for the sample result in the category of higher than Limit 2, for example, *High pos*.

The interpretation limits can be entered with an editor. The editor contains the following items:

- **Sample** – You can select a sample to be used for a limit calculation. The **Sample types** can be blank (BLA), Calibrator (CAL1-CAL2) or Control (CTRL1-CTRL5). If the sample has replicates, the average value of these is automatically selected. Both raw and calculated data of a sample can be used as criteria.
- **Operator** – One of the following can be chosen to be used in the formula: +, -, *, / or ( ).
- **Constant** is the numeric value used for the calculation. A constant can be entered with the number keys on the keypad.
- **Function** can be a standard deviation (SD) or a coefficient variance percentage (CV%). SD calculates the standard deviation of the sample. CV calculates the coefficient of variation for the sample.
- **Delete** deletes the created formula digit by digit.

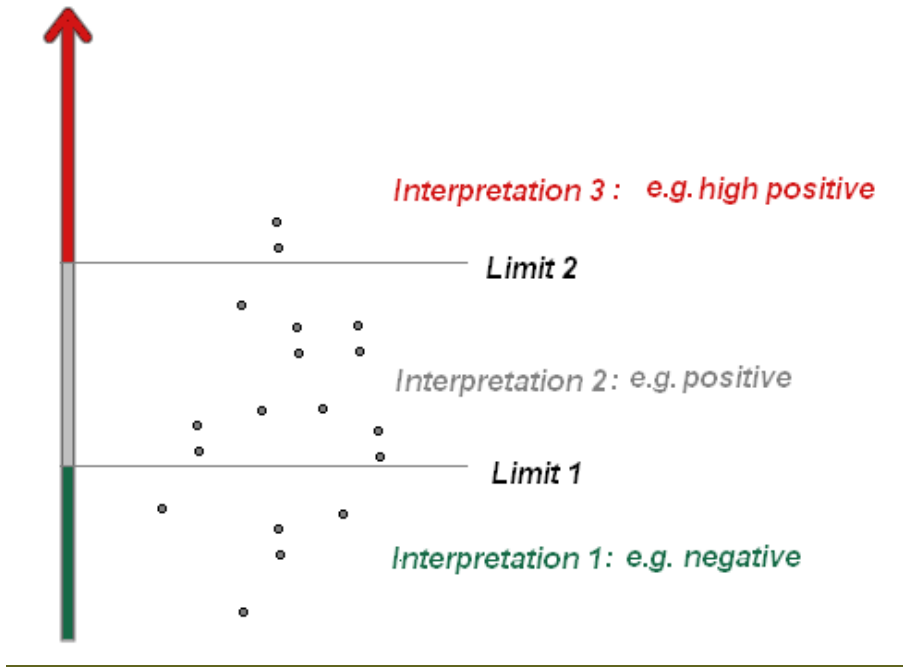


Figure 17. Interpretation and limits

For instructions on how to program an interpretation to the protocol, refer to “Programming an interpretation”.

Quality control parameters

Quality control (QC) is used to program rules for quality control and thereby ensure that the assay works as expected. You can set a maximum of four QC rules per protocol.

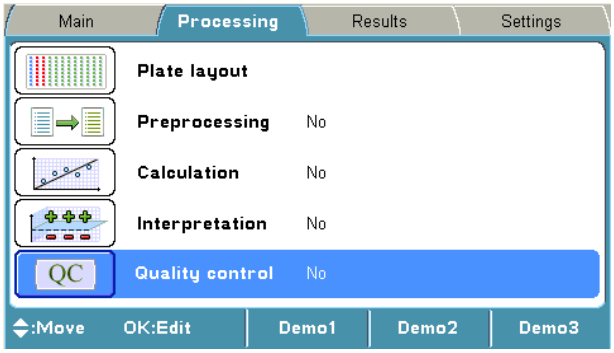


Table 11. Processing parameters / Quality control

Processing / Quality control			
└ **Quality control**			
	↳ Enable quality control		
		↳ Yes	
			↳ Rule 1 ↳ Rule 2 ↳ Rule 3 ↳ Rule 4
		↳ No	

Depending on the level of the internal software, the **FILE** key opens a list of actions possible for the current protocol.

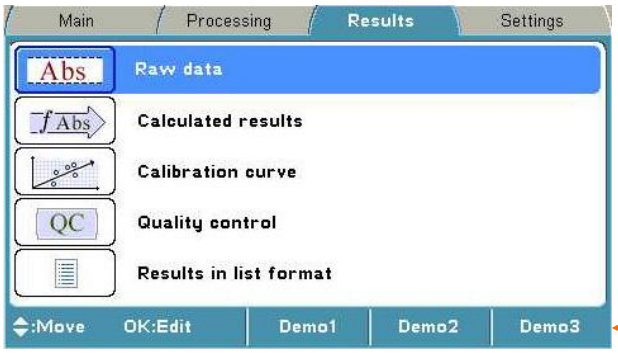
The rules (formulas) can be entered with a QC rule editor. The editor contains the following items:

- **Sample** – Select the sample to be checked. It can be any of the calibrators or controls present in the layout or the blank. If the sample has replicates, the average value of these is automatically selected for the QC check. Both raw and calculated data of a sample can be used as criteria.
- **Operator** – One of the following can be chosen to be used in the formula: +, -, *, /, (,), > or <.
- **Constant** – A constant can be entered with the number keys on the keypad.
- **Function** – SD or CV% of a sample can be added. SD calculates the standard deviation of the sample. CV calculates the coefficient of variation of the sample.
- **Delete** deletes the created formula digit by digit.

For instructions on how to add a QC rule to a protocol, refer to “Adding a QC rule to the protocol”.

Results menu

You can view the results of a measured run (assay) in several formats in the **Results** menu, depending on the protocol settings in the **Processing** menu: raw data in list and table format, calculated results in list and table format, and graphs (calibration and kinetic curves).



The assay data that is linked to the protocol consists of raw data and all the information needed for calculations programmed in the **Main** and **Processing** menus.

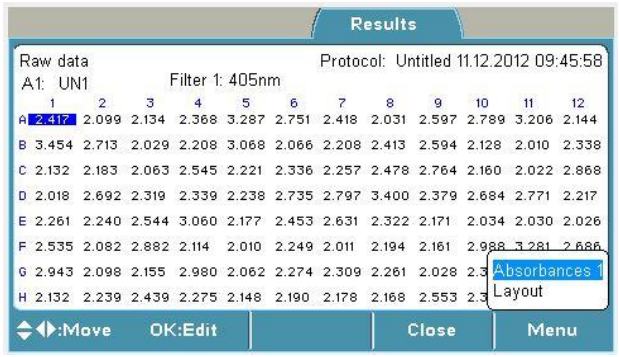
The result of the previously run assay protocol (measured protocol) is shown as default (if exists). When another protocol is selected from the **Main** menu, the result view is cleared to avoid any conflicts.

Note! The instrument measures the absorbance with four decimals. Absorbance data is presented with three decimals. However, all measured decimals are used in further calculations.

Note! Results over 4 Abs are calculated but they are struck through, and interpretations for these results are not given.

Raw data

You can see the unprocessed data (raw absorbances) of the assay in the **Raw data** window.

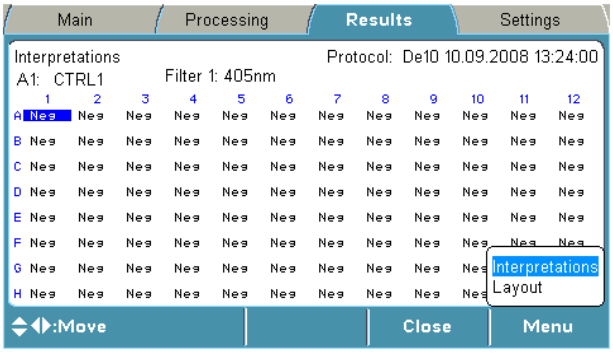


You can disable/enable samples and sample replicates from the raw data by pressing the **OK** button. Select *Disable* and press the **OK** button. If the user enables automatically disabled data, the user is responsible for data quality.

You can print or export the selected data. For further information, refer to Chapter 8: “Viewing Results”.

Calculated results

The calculated results are shown in the **Interpretations** window.



In situations where the result cannot be calculated from the available data, the result is expressed as “NaN” (quantitative) or “Undefined" (qualitative). Examples of such situations are:

- The divisor is zero (0).
- The kinetic calculation cannot be processed.
- Concentrations for extrapolated data cannot be calculated when extrapolation is disabled.
- The qualitative range is undefined.
- If previous calculation results are “NaN”.

Note! Blank subtraction is made automatically if the plate layout includes blanks. The blank used in the calculations is always an average of the blanks included in the layout.

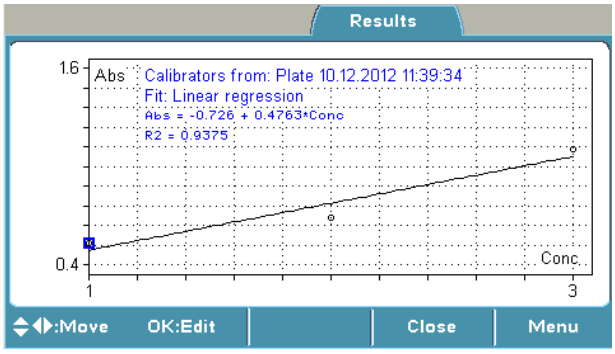
Note! The results of precalculations are not available in the data view. They are only available in exported or printed reports.

The kinetic timing is relative. This means that each time point is calculated from the first measurement point with the filter.

You can print or export the selected data. For further information, refer to Chapter 8: “Viewing Results”.

Calibration curve

The calibration curve is shown in the **Calibration curve** window.



The report also includes the calculated fit parameters of the curve.

You can use both the curve on the plate and a previously created calibration curve of the same assay protocol. You can store a curve for future use with the **FILE** function. You can load a saved curve for the active protocol with the **FILE** function.

If a stored curve is in use for calculation, the calibrators measured with the current plate can be taken into use with the **Menu** function.

Note! The plate layout must include calibrators and corresponding calibrator parameters, such as concentrations, to enable them for further calculations, for example, curve fits. Refer to “Curve fits” and “Programming a plate layout”.

Note! Verify the correctness of the calibration curve.

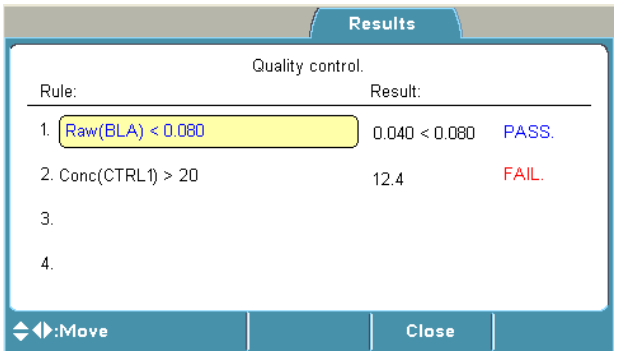
You can disable and enable calibrator replicates from the curve by pressing the **OK** button in the **Calibration curve** window. If the user enables automatically disabled data, the user is responsible for data quality.

You can print or export the selected data. For further information, refer to Chapter 8: “Viewing Results”.

Quality control (QC)

You can view the quality control data in the **Quality control** window.

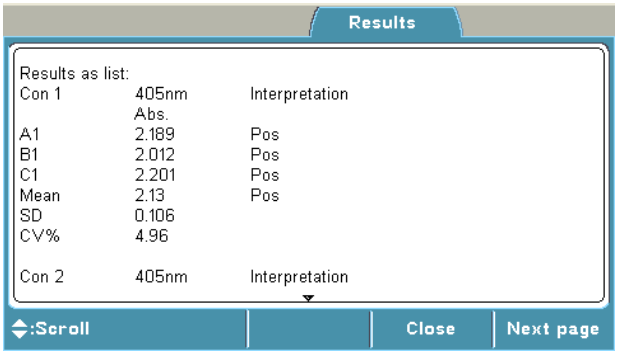
If the QC rules are not fulfilled and the assay is therefore not valid, the QC view is not opened until after the measurement.



You can print or export the selected data. For further information, refer to Chapter 8: “Viewing Results”.

Results in list format

The assay results can be viewed in list format in the **Results as list** window.



You can print or export the selected data. For further information, refer to Chapter 8: “Viewing Results”.

Settings menu

You can set the instrument parameters in the **Settings** menu.

The values shown in the **Settings** menu remain in the instrument memory and are instrument-specific, not protocol-specific.

You can define **System**, **Filters**, **Printer**, and **Startup** settings.

For instructions on how to modify different settings, refer to Chapter 11: “Modifying Settings”.

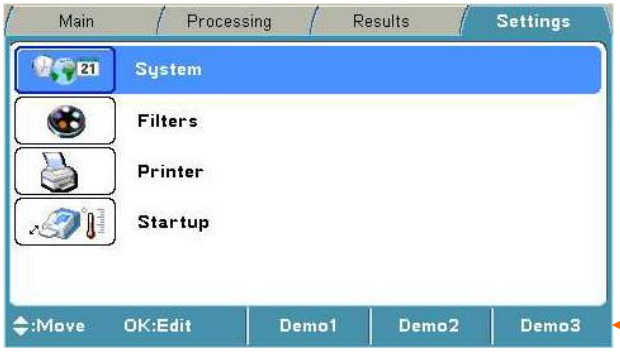


Table 12. Settings parameters

Settings			
System			
	↳ Date		
		↳ 22.09.2008 14:19:01	
	↳ Date format		
		↳ dd-mm-yyyy ↳ dd/mm/yyyy ↳ dd.mm.yyyy ↳ yyyy-mm-dd ↳ mm/dd/yyyy	
	↳ Time format		
		↳ 12 hour ↳ 24 hour	
	↳ Language		
		↳ English ↳ Russian ↳ French ↳ Spanish ↳ Chinese ↳ Japanese ↳ Portuguese ↳ German	
Filters			
	↳ Wavelength		
		↳ 405 (1) ↳ 450 (2) ↳ 620 (3)	
	↳ Comment		
Printer			
	↳ Printer parameters		
		↳ Enable header	
			↳ Yes ↳ No
	↳ Header text		

		↳ For example, Laboratory 123	
↳ **Startup**			
	↳ Plate position		
		↳ In ↳ Out	
	↳ Temperature (°C)		
		↳ No ↳ 25–50	

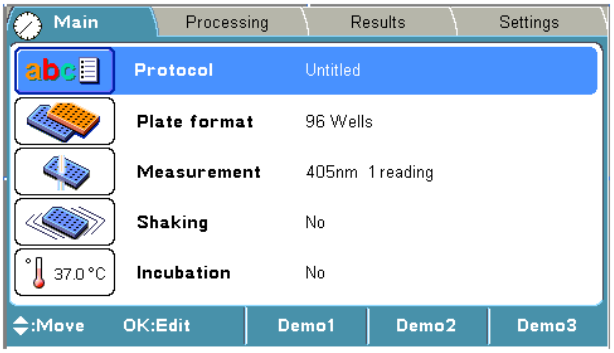
Depending on the level of the internal software, the **FILE** key opens a list of actions possible for the current protocol.

Chapter 6: Starting Ready-made Protocols

Note! Make sure the lamp and filter wheel chamber cover is closed before starting a measurement.

Starting a ready-made protocol with the quick keys (F1-F3)

Use the **F1-F3** function keys reserved for ready-made, demo or favorite protocols to measure routine assays quickly. Three default protocols can be connected to the **F1-F3** keys. You can change these protocols from Protocol > OK > FILE > Quick Key > **Set/Clear F1-F3**.





1. Press, for example, the **F1** key (*Demo1*) in the **Main** menu.



2. If the plate carrier is inside the instrument, press the **PLATE in/out** button. Insert the assay microplate so that the A1 corner is positioned in the top left corner of the plate carrier (Figure 18).

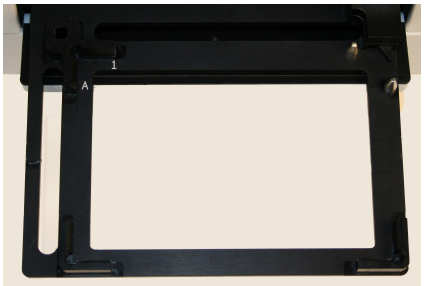


Figure 18. Multiskan FC plate carrier

Warning! The plate carrier opens automatically. Make sure there is enough clearance in front of the instrument for the plate carrier to come out freely.

Caution! Check that the plate carrier moves in, the measurement door closes properly, and the lamp and filter wheel chamber cover is closed.



3. Press the **START** button.



4. Enter the unknown count with the number keys.



5. Press the **START** or **OK** button to accept the selection and to start the measurement.

Note! If you want to cancel the run, press the **F2** key.



6. The microplate is measured and the results are automatically calculated according to the predefined protocol.

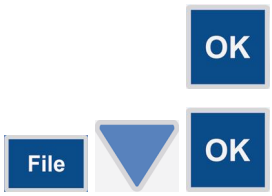
Note! During the run you can press the **STOP** button to abort the run.



7. Press the **F2** key to close the result table, and then press the **Left** arrow key twice to return to the **Main** menu.

Note! The main parameters are locked when a run (measured data) for this protocol exists.

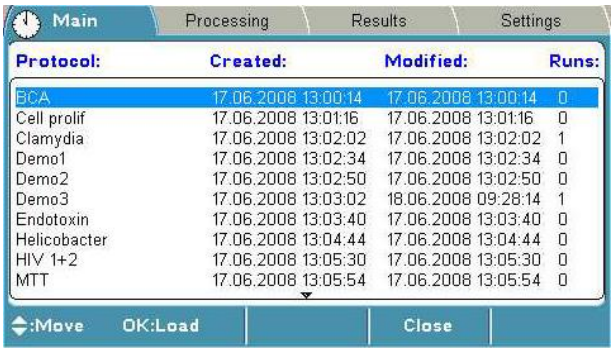
Starting a ready-made protocol from the list



1. Press the **OK** button on the **Protocol** row in the **Main** menu

   OR

   Press the **FILE** key in the **Main** menu and select *Open* using the **Down** arrow key, and then press the **OK** button.



Example protocol list



2. Select the ready-made assay protocol you want to run from the protocol list using the **Down** arrow key, and then press the **OK** button.

Note! The protocol name selected is shown on the **Protocol** row in the **Main** menu.



3. If the plate carrier is inside the instrument, press the **PLATE in/out** button. Insert the assay microplate so that the A1 corner is positioned in the top left corner of the plate carrier.

Warning! The plate carrier opens automatically. Make sure there is enough clearance in front of the instrument for the plate carrier to come out freely.



4. Press the **START** button.



5. Enter the unknown count with the number keys.



6. Press the **START** or **OK** button to accept the selection and to start the measurement.

Note! If you want to cancel the run, press the **F2** key.



7. The microplate is measured and the results are automatically calculated according to the predefined protocol.

Note! During the run, you can press the **STOP** button to abort the run.



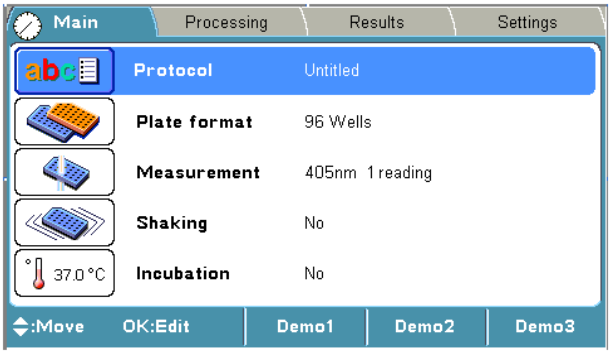
8. Press the **F2** key to close the result table, and then press the **Left** arrow key twice to return to the **Main** menu.

Note! The main parameters are locked when a run (measured data) for this protocol exists.

Chapter 7: Protocol Creation Examples

This section provides examples on how to open a new protocol, how to program main parameters (wavelength, shaking, and incubation), the plate layout and precalculation, calculation and interpretation parameters, and how to save the protocol.

Note! The **Incubation** row is only active with the Multiskan FC with incubator model.



Note! Ensure that you save the changes you make in each step. Refer to “Saving a new (active) protocol”.

Opening a new protocol



1. Press the **FILE** key in the **Main** menu.



2. Select *New* and press the **OK** button.

Programming a wavelength



1. Select the **Measurement** row in the **Main** menu using the **Down** arrow key and press the **OK** button.



2. Press the **OK** button at the **Filter 1 (nm)** item and select, for example, *450* as the filter 1 value using the **Down** arrow key, and then press the **OK** button.



3. Press the **F1** key to accept the selection and return to the **Main** menu.

Programming shaking parameters



1. Select the **Shaking** row in the **Main** menu using the **Down** arrow key and press the **OK** button.



2. Press the **OK** button at the **Mode** item and select, for example, *Before measurement* as the shaking mode using the **Down** arrow key, and then press the **OK** button.



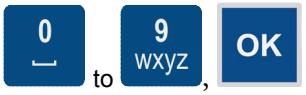
3. Select the **Speed** item using the **Down** arrow key and press the **OK** button.



4. Select, for example, *Fast* as the shaking speed using the **Down** arrow key, and then press the **OK** button.



5. Select the **Time (hh:mm:ss)** item using the **Down** arrow key and press the **OK** button.



6. Select, for example, *20* seconds (= *00:00:20*) as the shaking time by using the number keys, and then press the **OK** button.



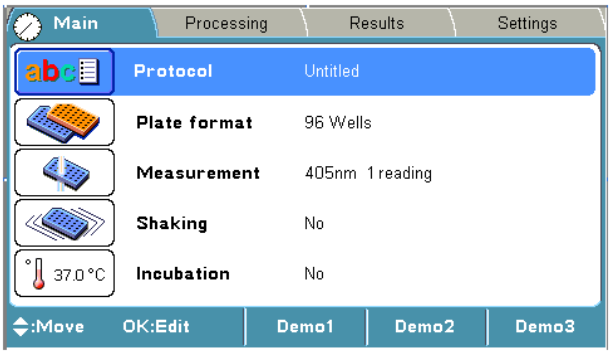
7. Press the **F1** key to accept the selection and return to the **Main** menu.

Programming incubation

You can set the incubation time and temperature in the **Incubation** window.

Note! The **Incubation** row is only active with the Multiskan FC with incubator model.

Note! The temperature set in the protocol overrules the startup temperature. If the protocol does not include incubation, the startup temperature remains.





1. Select the **Incubation** row in the **Main** menu using the **Down** arrow key and press the **OK** button.



2. Press the **OK** button on the **Temperature** row and use the **Down** arrow key to select the preferred temperature from the list. The temperature range is from 25 to 50°C in increments of 1°C. Then press the **OK** button.

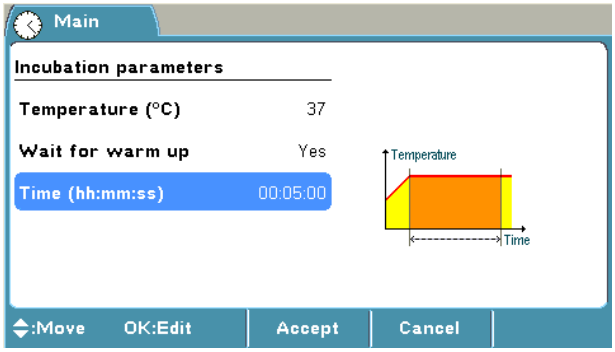
3. If **Wait for warm up** is set to *Yes*, the assay will not start until the temperature is reached. If **Wait for warm up** is set to *No*, the assay will start.



4. Select the **Time (hh:mm:ss)** item using the **Down** arrow key and press the **OK** button.



5. Select, for example, *5 min* (00:05:00) as the incubation time by using the number keys, and then press the **OK** button.





6. Press the **F1** key to accept the incubation parameters.

Programming a plate layout

You can start filling the plate layout on any of the wells of the plate. You start the fill procedure from the well marked with a **blue** square. You can start filling a series of samples by pressing the **OK** button in the highlighted well. You can edit and delete a single well with the **Edit** function.

The plate layout parameters have to be set prior to measurement. The parameters cannot be changed after measurement.

In this example,

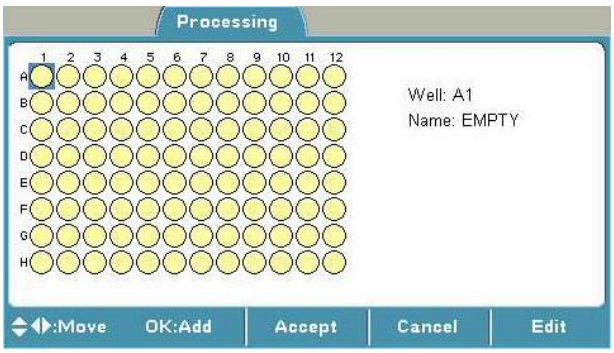
- a blank sample,
- Calibrator 1 (Conc. 1),
- Calibrator 2 (Conc. 2),
- Calibrator 3 (Conc. 3),
- a control sample, and
- 91 unknown samples

are programmed.

To create the plate layout of this example protocol:



1. Select the **Plate layout** row in the **Processing** menu using the **Right** arrow key. Then press the **OK** button to open the **Layout** window.





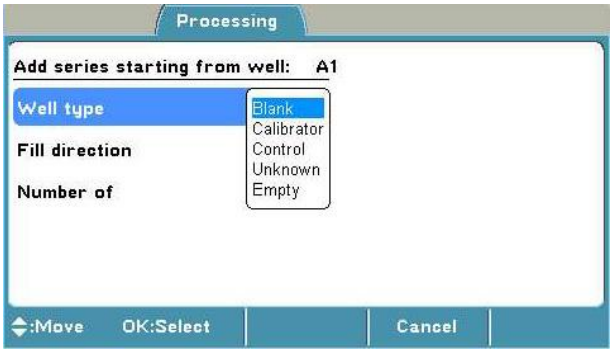
2. Press the **OK** button to start filling the plate from well A1.



3. Select the **Well type** item in the **Add series starting from well: A1** window and press the **OK** button.



4. Select, for example, a *Blank* sample using the **Up** arrow key, and then press the **OK** button.





5. Press the **F1** key to accept the selection and return to the **Layout** window (well A2).



6. Select well B1 using the **Down** and **Left** arrow keys, and press the **OK** button to start filling the plate from well B1.



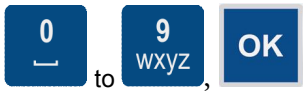
7. Select the **Well type** item in the **Add series starting from well: B1** window and press the **OK** button.



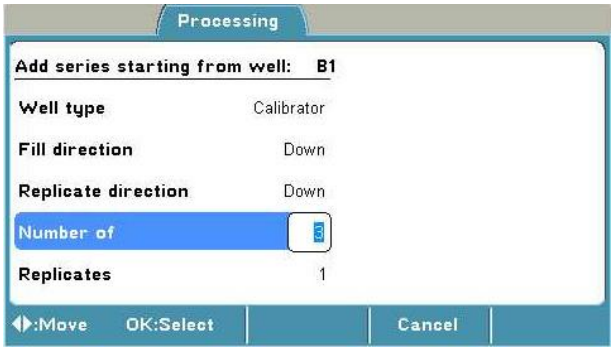
8. Select, for example, a *Calibrator* sample using the **Up** arrow key, and then press the **OK** button.



9. Select the **Number of** item using the **Down** arrow key and press the **OK** button.



10. Select, for example, *3* by using the number keys, and then press the **OK** button.





11. Press the **F3** (**Conc.**) key to program the concentrations for the calibrators.



12. Select the **Cal 1** item using the **Down** arrow key and press the **OK** button.

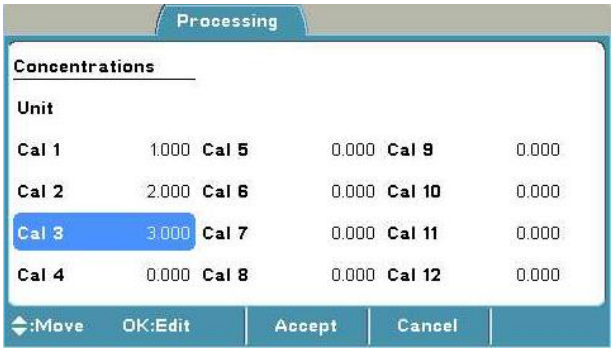
13. Enter, for example, *1* (*1.00*) as the Cal 1 concentration using the number keys, and then press the **OK** button.

14. Select the **Cal 2** item using the **Down** arrow key and press the **OK** button.

15. Enter, for example, *2* (*2.00*) as the Cal 2 concentration using the number keys, and then press the **OK** button.

16. Select the **Cal 3** item using the **Down** arrow key and press the **OK** button.

17. Enter, for example, *3* (*3.00*) as the Cal 3 concentration using the number keys, and then press the **OK** button.



18. Press the **F1** key to accept the concentrations and return to the previous view, i.e., the **Add series starting from well: B1** window.

19. Press the **F1** key to accept the concentrations and to return to the **Layout** window.

20. Press the **OK** button to start filling the plate from well E1.

21. Select the **Well type** item in the **Add series starting from well: E1** window and press the **OK** button.

22. Select, for example, a *Control* sample using the **Up** arrow key, and then press the **OK** button.

23. Press the **F1** key to accept the selection and return to the **Layout** window.

24. Press the **OK** button to start filling the plate from well F1.

25. Select the **Well type** item in the **Add series starting from well: F1** window and press the **OK** button.



26. Select, for example, an *Unknown* sample using the **Up** arrow key, and then press the **OK** button.



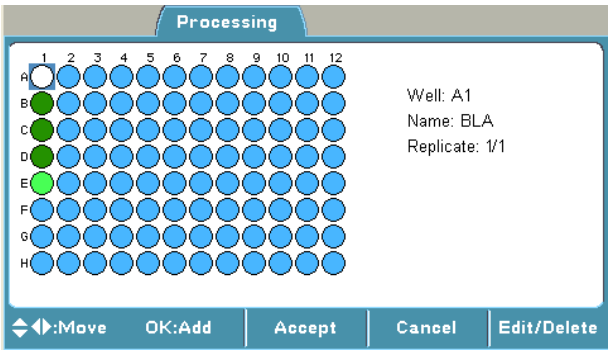
27. Select the **Number of** item using the **Down** arrow key and press the **OK** button.



28. Select, for example, *91* using the number keys, and then press the **OK** button.



29. Press the **F1** key to accept the selection and return to the **Layout** window. The filled wells will show the following colors: white for blank wells, **green** for calibrators, **bright green** for controls, and **blue** for unknowns.





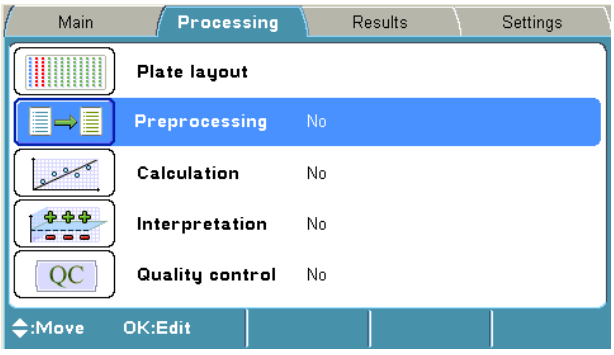
30. Press the **F1** key again to accept the plate layout and to return to the **Processing** menu.

Programming calculations and interpretations

Programming precalculations

Preprocessing carries out calculations that are normally made as a first step in result handling, that is, preprocessing and kinetic calculations.

Precalculation is used with dual (two wavelength) measurements, for example, subtracting the reference wavelength from the assay measurement wavelength.

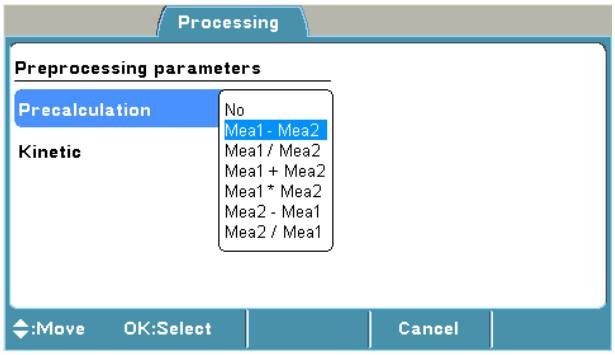




1. Select the **Preprocessing** row in the **Processing** menu using the **Down** arrow key and press the **OK** button.



2. Select the **Precalculation type** and press the **OK** button. Select, for example, *Mea1-Mea2* using the **Down** arrow key and press the **OK** button.





3. Press the **F1** key to accept the precalculation.



4. Press the **Left** arrow key to return to the **Main** menu.

Programming calculations



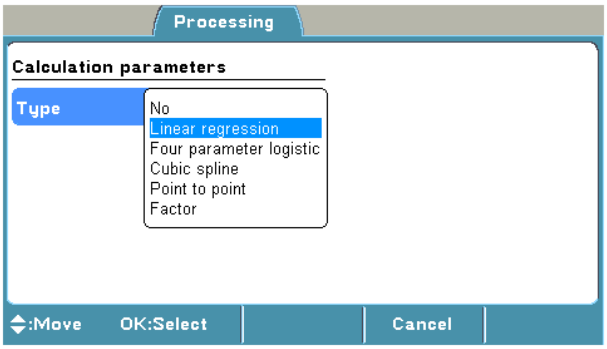
1. Select the **Calculation** row in the **Processing** menu using the **Down** arrow key and press the **OK** button.



2. Select **Type** and press the **OK** button.



3. Select, for example, *Linear regression* as the calculation type (calibrator curve fit) using the **Down** arrow key, and then press the **OK** button.





4. Press the **F1** key to accept the selection.



5. Press the **Left** arrow key to return to the **Main** menu.

Programming an interpretation

The following example shows how to add an interpretation to a protocol.

The interpretation limit in this example is *the absorbance of the negative control + 0.05 Abs*. The samples below the limit are categorized as *negative* (*Neg*) and the samples above it as *positive* (*Pos*).



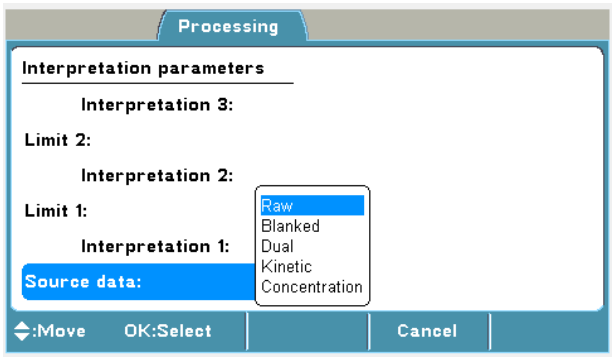
1. Select the **Interpretation** row in the **Processing** menu using the **Down** arrow key and press the **OK** button.



2. Select **Source data** and press the **OK** button.



3. Select, for example, *Raw* using the **Down** arrow key, and then press the **OK** button.





4. Select **Interpretation 1** using the **Up** arrow key and press the **OK** button.

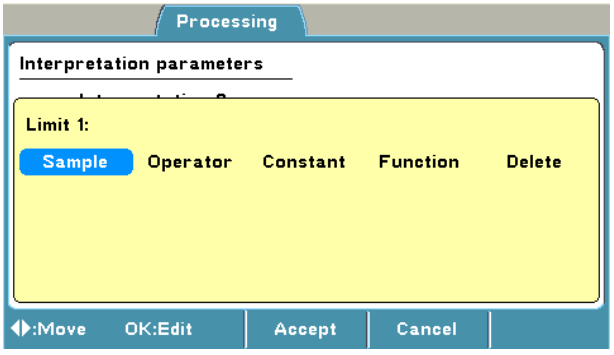


5. Enter the category name, for example, *Neg*, by using the letter keys and press the **OK** button.



6. Select **Limit** using the **Up** arrow key and press the **OK** button.

   The limit editor is opened.





7. Select **Sample** and press the **OK** button.



8. Select *CTRL 1* by using the **Down** arrow key and press the **OK** button.



9. Select *Raw* and press the **OK** button.



10. Select **Operator** using the **Right** arrow key and press the **OK** button.



11. Select + and press the **OK** button.



12. Select **Constant** using the **Right** arrow key and press the **OK** button.



13. Enter the constant, for example, *0.050*, using the number keys and press the **OK** button.



14. Press the **F1** key to accept the formula.



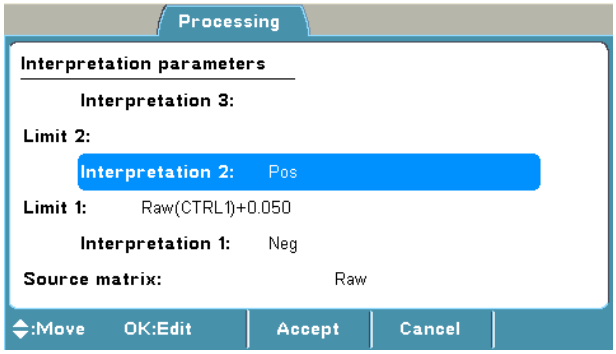
15. Select **Interpretation 2** using the **Up** arrow key and press the **OK** button.



16. Enter the category name, for example, *Pos* (*positive*), using the letter keys, and then press the **OK** button.



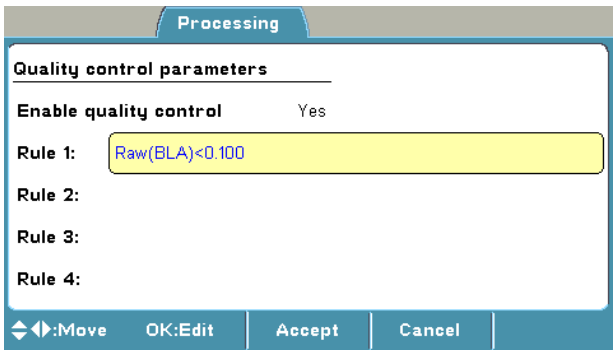
17. Press the **F1** key to accept the interpretation.



Adding a QC rule to the protocol

The rules are normally given in the kit insert and can read, for example, *the absorbance of Blank has to be smaller than 0.100 Abs*. In this case the rules to be entered would be: *Sample: Raw (BLA)*, *Operator: <*, *Constant: 0.100*.

The following example shows how to add a Quality Control (QC) rule to a protocol.





1. Select the **Quality Control** row in the **Processing** menu using the **Down** arrow key and press the **OK** button.



2. Press the **OK** button on the **Enable quality control** and select *Yes* using the **Up** arrow key, and then press the **OK** button.



3. Select the **Rule 1** row using the **Down** arrow key and press the **OK** button.



4. Select **Sample** and press the **OK** button.



5. Select *BLA* (blank) and press the **OK** button.



6. Select *Raw* and press the **OK** button.



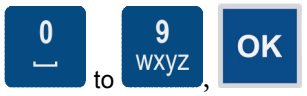
7. Select **Operator** using the **Right** arrow key and press the **OK** button.



8. Select < using the **Down** arrow key and press the **OK** button.



9. Select **Constant** using the **Right** arrow key and press the **OK** button.



10. Enter the constant, for example, *0.100*, using the number keys, and press the **OK** button.



11. Press the **F1** key to accept the **Rule 1** formula.

Note! The maximum number of QC rules is four. If additional QC rules are needed, the assay performance has to be checked separately.



12. Press the **F1** key to accept the **Quality control** parameters and to return to the **Processing** menu.

Saving a new (active) protocol



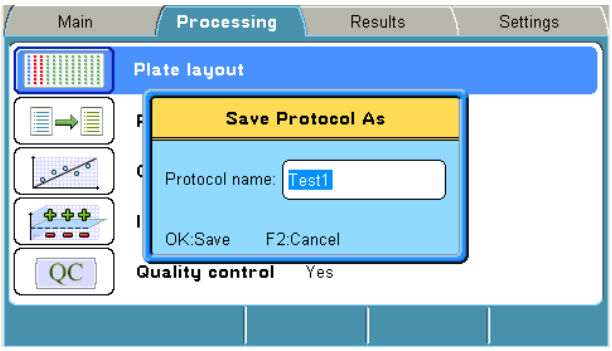
1. Press the **FILE** key in the **Main** or **Processing** menu.



2. Select *Save As* using the **Down** arrow key and press the **OK** button. The *Save Protocol As* dialog opens.

0 _ to 9 wxyz, OK

3. Enter the protocol name, for example, *Test1*, by using the number and letter keys, and then press the **OK** button.



Note! You cannot use the protocol name "*Untitled*".

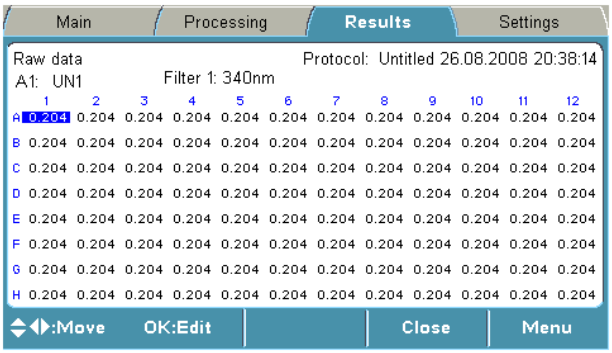
Note! The results of an "*Untitled*" protocol are not saved unless you save the active protocol, including the measured run data with a new name.

Chapter 8: Viewing Results

The results can be viewed in several formats (depending on the protocol settings): raw data in list and table format, calculated results in list and table format, and graphs (calibration or kinetic curves).

You can disable/enable samples and sample replicates from the raw data in table format. If the user enables automatically disabled data, the user is responsible for data quality.

After the run has finished, the data view of a run is automatically shown (see example view below).



The order of the data views (results) to be shown is according to the following list, depending on which calculations were used in the protocol:

- Assay quality control (if failed). The results of a failed run are flagged.
- Interpretation
- Quantitative results
- Precalculated results
- Raw data

F3

1. Press the **F3** (**Menu**) key to enable menus of different data views in order to view them.



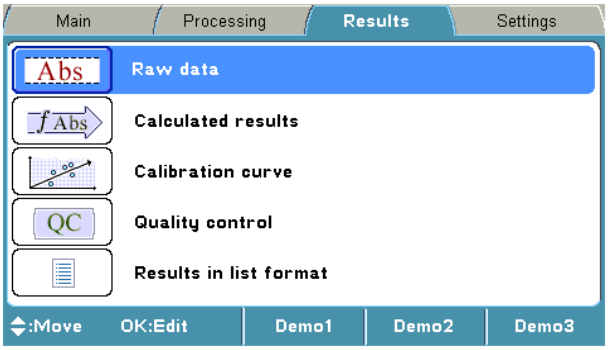
2. Select another data view using the **Up** and **Down** arrow keys, and press the **OK** button.



3. Press the **FILE** key in the data view to print or export a data view. Select ***Export As Text*** or ***Print*** using the **Down** arrow key if necessary, and then press the **OK** button.



4. Press the **F2** key to close the data view.



Note! It is possible to select which information to be exported or printed by pressing the **FILE** key. Refer to Chapter 9: “Exporting and Importing”.



5. To view another row from the **Results** menu using the **Up** and **Down** arrow keys, and press the **OK** button. To view different data views or to print, refer to Steps 2-4.



6. Press the **F2** key to close the data view.



7. Press the **Left** arrow key to return to the **Main** menu.

Chapter 9: Printing, Exporting or Importing

It is possible to export and import the stored protocols to or from an instrument to another of the same type.

When exporting a protocol, it is also possible to include measurement data in the exported file. This feature can be used as a backup for the measurement data.

Note! It is highly recommended to take a database backup before deleting runs. Taking a backup is the responsibility of the user.

It is only possible to import measurement data to the same instrument as it was generated from.

Before running the imported protocol, check that the filter and filter position to be used are correct.

The calculated results or stored protocols can be printed after the measurement using the **FILE** key. The printout is sent to the external printer according to the general settings of the instrument. The printed data can be selected.

The report to be printed can be defined by **FILE/Print/Define Report** in the main level of **Results**.

Each active data table can also be defined by using **FILE/Print**.

Results data is expressed as "#####" when available space is too little.

Note! It is recommended to format the USB memory device if export or import fails.

Printing or exporting data

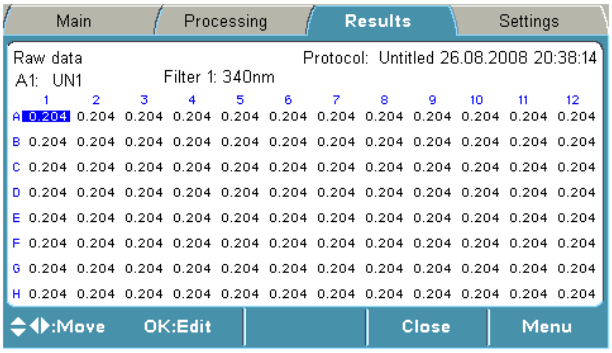
This section provides information on how the active run data (measurement results) can be printed or exported to the USB memory device.

1. If you are exporting data, insert the USB memory device into the USB memory device port of the instrument

   OR

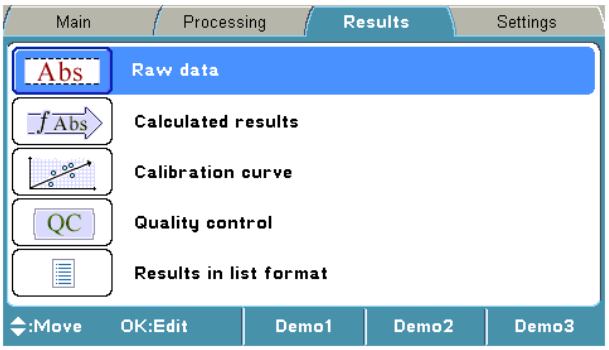
   If you are printing data, ensure that the printer is connected and switched on.

Note! If you have a similar data view as the one below, the main view of the **Results** menu will open by pressing the **F2** (Close) key.





2. If you are in the **Main** menu, press the **Right** arrow key continuously till you get to the **Results** menu.





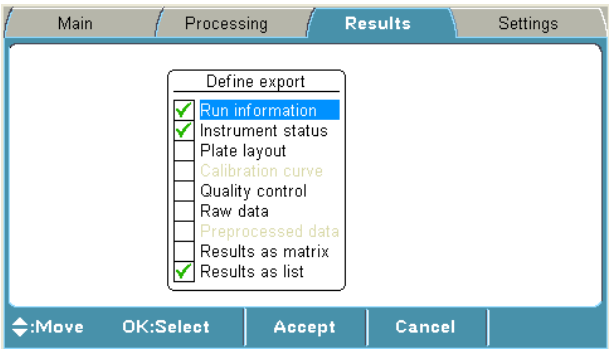
3. Press the **FILE** key.



4. Select ***Export Results As Text*** or ***Print Results*** and press the **OK** button.



5. The *Define export/Print* box is opened. Select the information you want using the **Down** arrow key and tick the check box with the **OK** button.





6. Press the **F1** key to accept the desired data.

   Data is exported to the USB memory device or printed to the external printer depending on the selection.

Run information includes all protocol and processing parameters.

The naming of an export file is automatic with a running number, that is, the instrument searches for the first number available.

Note! The data format should be UTF 8 when the *.txt file is opened in, for example, Microsoft™ Excel™.

Note! The internal software uses 32-bit floating point numbers in processing.

Note! It is recommended to format the USB memory device if export fails. For more information, refer to Chapter 15: “Troubleshooting Guide”.

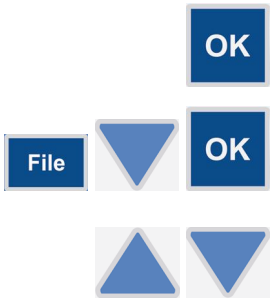
Exporting a protocol

The calculated results or stored protocols can be exported to the USB memory device via the USB port (Figure 9) by using the **FILE** key. Runs, including protocol information and data, can be exported. Protocols can be exported and imported to another Multiskan FC instrument with the same configuration. Import of runs is only possible to the same instrument as backup.

In the main level of **Results**, the results or protocols to be exported can be defined by **FILE/Export**.

A protocol can be transferred from an instrument and imported to another instrument.

1. Insert the USB memory device into the USB memory device port of the instrument.



2. Press the **OK** button on the **Protocol** row in the **Main** menu

   OR

   Press the **FILE** key and select *Open* using the **Down** arrow key, and then press the **OK** button.

3. Select the protocol you want to export from the protocol list using the **Up** or **Down** arrow key.





4. Press the **FILE** key and select *Export* using the **Down** arrow key. Then press the **OK** button.



5. If you also want to export the runs that are created (measured) with the protocol, press the **OK** button. If not, press the **Right** arrow key, and then the **OK** button.

Protocol information will be exported.

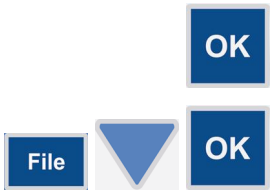


6. Press the **F2** key to close the protocol list and return to the **Main** menu.

Note! When a protocol is exported to the USB memory device, the data is saved in one file and the protocol name is stored in file “mapping.fc”. Do not delete the mapping file.

Importing a protocol

1. Insert the USB memory device into the USB memory device port of the instrument.



2. Press the **OK** button on the **Protocol** row in the **Main** menu

   OR

   Press the **FILE** key in the **Main** menu and select *Open* using the **Down** arrow key. Then press the **OK** button.



3. Press the **FILE** key and select *Import* using the **Down** arrow key, and then press the **OK** button.



4. Select the protocol you want to import from the USB protocol list using the **Up** or **Down** arrow key, and then press the **OK** button.

Note! You can only import the runs to the same instrument they were created with. You can also import the protocol to an instrument with the same configuration.

Note! It is recommended to format the USB memory device if export fails. For more information, refer to Chapter 15: “Troubleshooting Guide”.



5. Press the **F2** key to close the protocol list and return to the **Main** menu.

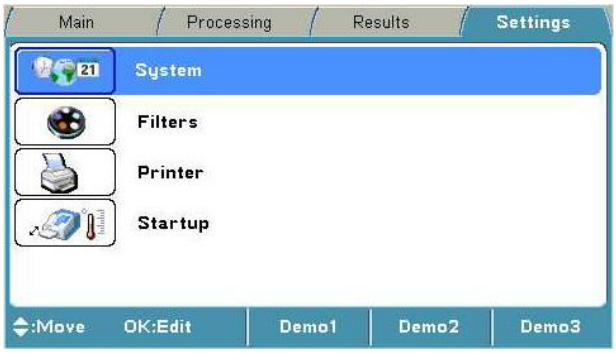
Chapter 10: Shutdown



1. Remove any plates still in the instrument.
2. Press the **PLATE in/out** button. Make sure the plate carriage goes inside the instrument and check that the measurement chamber door closes properly.
3. Switch off the instrument.
4. If you have spilt infectious agents on the instrument, disinfect with 70% ethanol or some other disinfectant (see “Decontamination procedure”).

Chapter 11: Modifying Settings

You can modify settings related to the system, filters, printer or startup in the **Settings** menu.



System settings

The Multiskan FC instrument’s internal software version, serial number, and model are shown in the **System** settings window. Model 1 refers to Multiskan FC and Model 2 to Multiskan FC with incubator.



You can set the date, date and time format, and language in the **System** settings parameter window.

Select the item to be changed with the **Up** and **Down** arrow keys, and press the **OK** button.

Setting the date

You can change the date in the **System** settings.



The **Left** and **Right** arrow keys are used to move from one position to another in the **Date** setting. Enter the values with the number keys.

Changing the language

You can set the internal software language by moving to **Language** and selecting the preferred language from the drop-down list.



1. In the **Main** menu, select the **Settings** menu using the **Left** arrow key.



2. Select the **System** row and press the **OK** button.



3. Select the **Language** item using the **Down** arrow key and press the **OK** button.





4. Select the internal software language, for example, *Francais*, using the **Down** arrow key, and then press the **OK** button to accept the selection.



5. Press the **F2** key to confirm the selection and to close the system parameters.



6. Return to the **Main** menu using the **Right** arrow key.

Filters

Multiskan FC comes with installed filters of 405 nm, 450 nm, and 620 nm.

You can introduce a filter to the internal software by moving to the **Filters** settings. The filter wavelength must be between 340 and 850 nm.

The **Filters** settings window shows the current filters of the filter wheel.

Introducing a filter to the internal software

This section provides an example on how to enter the information of an additional filter, which has been added to the filter wheel.



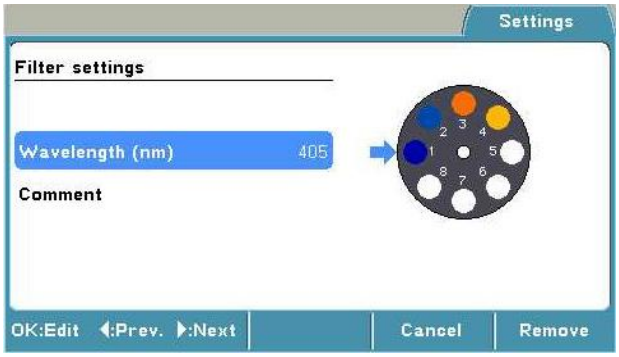
Note! Before introducing the additional filter to the internal software, make sure the filter is physically inserted into the next free filter position in the filter wheel and the filter wheel is placed into the filter wheel slot.



1. In the **Main** menu, select the **Settings** menu using the **Left** arrow key.



2. Select the **Filters** row using the **Down** arrow key and press the **OK** button.





3. Select the empty filter position by pressing the **Right** arrow key until the filter wheel on the display rotates to the empty position, and the text "*Empty*" is shown.



4. Press the **OK** button. Enter the wavelength of the filter, for example, *492*, with the number keys, and then press the **OK** button.



5. Press the **F1** key to accept the filter settings.

Note! The instrument starts the filter initialization.



6. Press the **Right** arrow key to return to the **Main** menu.

Removing a filter

You can remove a filter from the instrument settings by selecting the position and pressing the **F3 (Remove)** key.

Note! The filter must physically be removed from the filter wheel.

Printer

You can add a header in the **Printer** parameter window, for example, the laboratory information, to all of the reports to be printed. You can do this by selecting *Yes* for the **Enable header**.

The maximum length of the header is about 50 characters.

Startup

In the **Startup** parameters, the **Plate position** setting defines the plate carrier position after the instrument is switched on.

You can set the startup temperature. The instrument starts to warm up to the set temperature immediately after it has been switched on.

Note! The set startup temperature is only activated when the instrument is powered (switched on). The temperature set in the protocol overrules the startup temperature. If the protocol does not include incubation, the startup temperature remains.

Chapter 12: Emergency Situations

Handling emergency situations

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

1. Switch off the instrument (Figure 9).
2. Unplug the instrument immediately from the power supply (Figure 9).
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 13: Maintenance

Regular and preventative maintenance

Contact local authorized technical service or your local Thermo Fisher Scientific representative for assistance, if necessary.

Maintenance checklist

This chapter contains an outline of the points mentioned in the checklist below (Table 13).

Table 13. Maintenance checklist

Item	d.	wk.	mo.	yr.	If req.
Keep the instrument free of dust. See “General”.	✓				
Avoid disturbing any of the optical system components, including optical covers. See “General”.	✓				
Clean and check the condition of the filters and the filter wheel position slot.				**2 x**	
Wipe away spilled saline solutions, solvents, acids, or alkaline solutions from outer surfaces immediately to prevent damage, and wipe with deionized distilled water. See “Immediate”.	✓				
If any surfaces have been contaminated with biohazardous material, disinfect with a mild sterilizing solution. See “General”.	✓				
Clean the case of the instrument periodically. See “Cleaning of the instrument”.		✓			
Clean the plate carrier when necessary. See “Cleaning of the instrument”.		✓			
Check the condition of the filter(s) regularly. See “Cleaning a filter”.				✓	
Change the lamp when blown. See “Changing the lamp”.	✓				
Ensure proper shutdown. See Chapter 10: “Shutdown”.	✓	✓			
Decontaminate the instrument when relocating the instrument or sending it for service. See “Decontamination procedure”.				✓	✓
Perform verification with the Multiskan Verification Plate, Cat. No. 24072800.				✓	
Service the instrument regularly. See “Cleaning of the instrument” and “Maintaining a system log”.				✓	

✓ = depending on the laboratory conditions and the use and configuration of the instrument

General

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

Always ensure that the electrical supply in the laboratory conforms to that specified on the type label of the instrument.

To guarantee the continuous reliability and accuracy of the Multiskan FC, avoid disturbing any of the optical system components. A misalignment of the light path affects measurements.

- Keep the filters clean to ensure proper function and accurate results.
- Prevent any liquid from entering the instrument.
- Keep the instrument free of dust and other foreign matter.
- Avoid touching the lens surfaces, filters or detectors with your bare hands.
- Perform the operational check regularly (see “Performing the operational check”).

In the event of any damage, contact your local Thermo Fisher Scientific representative for service.

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

It is recommended that you clean the case of the instrument periodically to maintain its good appearance (see “Cleaning of the instrument”).

Clean the keypad and display surface with a mild laboratory detergent.

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



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



Caution! Do not autoclave any part of this instrument.

Immediate

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

Cleaning a filter

1. Remove particles, for example, dust, with clean pressurized air.
2. If necessary, clean the filters with a lintfree tissue soaked in 70% ethanol.



Caution! Do not use any other liquids to clean the optics. Avoid any harsh treatment.

3. Wipe over the filter in a straight movement from inside to out. Do not use any circular movements when cleaning the filter.
4. If the filter is not clean, repeat the procedure.



Caution! Check the condition of the filter(s) regularly.

Cleaning of the instrument

Clean the instrument regularly as stated below.



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

1. Switch the power off and unplug the instrument.
2. Use disposable gloves.
3. Clean the instrument outside and the plate carrier with a soft cloth dampened with water or mild detergent.
4. If you have spilled infectious agents on the instrument, decontaminate the instrument. Refer to “Decontamination procedure”.



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

Disposal of materials

Follow laboratory and country-specific procedures for biohazardous or radioactive waste disposal. 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. Be cautious and always use gloves.

Decontamination procedure

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

Decontamination should be performed 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.

Example of decontaminants:

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



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

1. Prepare the decontaminant.
2. Empty the plate carrier. Ensure that you are wearing disposable gloves.
3. Switch off the power and disconnect the power supply cable.
4. Disinfect the outside of the instrument or to remove stains using a cloth dampened with 70% ethanol.
5. Place the instrument in a large plastic bag. Ensure that the lamp and filter wheel chamber cover and measurement chamber door are open and the plate carrier is out.
6. Place a cloth soaked in the prepared decontaminant solution into the bag. Ensure that the cloth does not come into contact with 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. After decontamination clean the instrument using a mild detergent.
10. After performing this decontamination procedure, enclose a signed and dated *Certificate of Decontamination* both inside the transport package and attached to the outside of the package.

Adding individual filters to the filter wheel

This section explains how to replace a filter in the filter wheel or add an additional filter to the filter wheel.

Caution! Only use filters approved by the instrument manufacturer.

Caution! For certain filters, you can use the Thermo Scientific™ Multiskan™ Verification Plate (Cat. No. 24072800) to verify filters added.

Note! The filter is a consumable and should be changed regularly.

1. Switch the power off.
2. Open the lamp and filter wheel chamber cover.

Caution! When handling the filter wheel, do not touch any other mechanical or electronic part.

3. Lift the filter wheel from the filter wheel slot (Figure 8 and Figure 19). Do not touch the filter surfaces.



Figure 19. Removing the filter wheel

4. Remove the filter spring by unscrewing the four (4) spring position holding screws (Figure 20 and Figure 21).

Caution! Do not touch the filter glass surfaces with your bare hands.

Caution! The magnet in the middle of the filter wheel attracts both the screwdriver and the screws. Make sure the screwdriver or the screws do not scratch the filters.



Figure 20. Removing the spring position holding screws

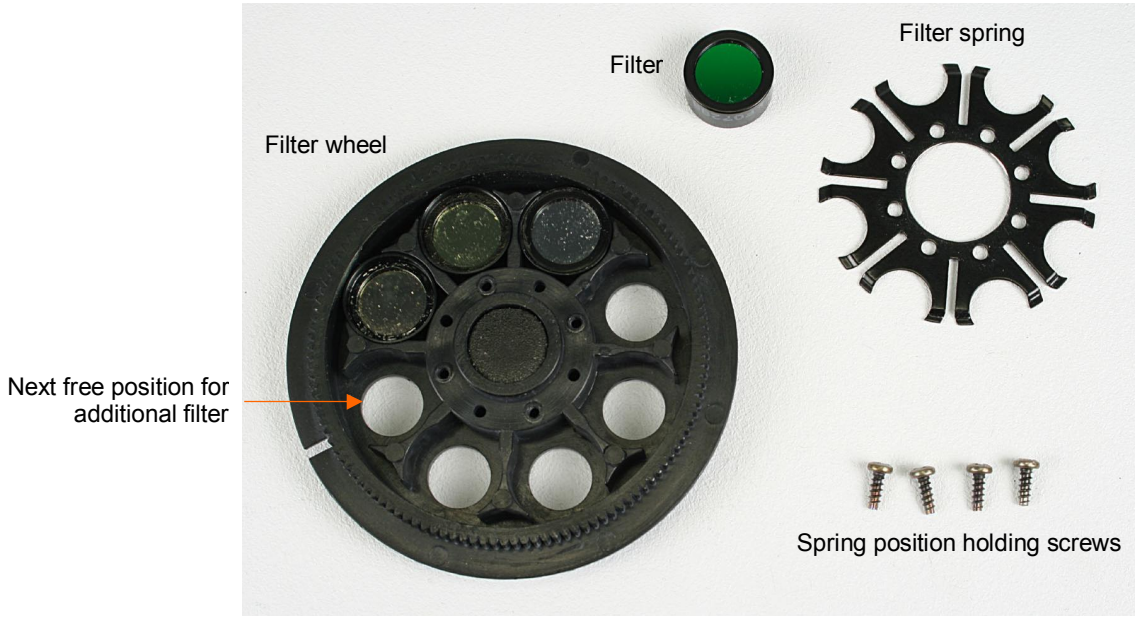


Figure 21. Filter wheel parts



Figure 22. Individual filter showing the arrow



Figure 23. Inserting a filter into the next free position in the filter wheel

5. Insert a new filter or an additional optional filter (Figure 22) into the next free position in the filter wheel (Figure 23). When inserting the filter, the arrow must be pointing upwards as in Figure 23. The wavelength of the filter is marked on the filter package as well as on the filter side, that is, the three digits before the last digit of the number sequence: xxxxx NNNx, where NNN is the wavelength. The filter positions are marked on the other side of the filter wheel. The filter wheel has at present three filters factory installed (Table 14).

Note! Do not change the positions of the factory or earlier installed filters. Insert the optional filters into filter wheel positions after the earlier installed filters.

Table 14. Example of the filters in the filter wheel positions 1-8

Filter wheel position	Wavelength (nm)
1	405 (example of factory installed filter)
2	450 (example of factory installed filter)
3	620 (example of factory installed filter)
4	
5	
6	
7	
8	

6. Write down in Table 14 the additional filters you have installed into the filter wheel. It is recommended to add the filters in ascending wavelength order.
7. Place the filter spring into its original position and fasten the four screws symmetrically.
8. Slide the filter wheel back into the filter wheel slot with the filter numbers (1-8) facing outwards (Figure 8). The magnet locking mechanism will automatically lock the wheel in the correct position. Refer to “Installing the filter wheel”.
9. Close the lamp and filter wheel chamber cover.
10. Switch the instrument on.
11. Add the filters to the internal software’s general instrument parameters. These parameters are set in the **Settings** menu. Refer to “Settings menu” and Table 14.

Note! The measurement results will be incorrect, if the filter parameters differ from the actual filters in the filter wheel.

Now the filters are ready for use.

Changing the lamp

Caution! Only use the lamp approved by the supplier: Cat. No. 1410101, Lamp, quartz-halogen lamp (Osram 64222, 6V/10W).

1. Switch the power off and unplug the instrument.
2. Open the lamp and filter wheel chamber cover.

Warning! If the instrument has been in use and you need to replace a burned lamp, the lamp and its surroundings may be very hot. Wait for the lamp to cool down before replacing it.

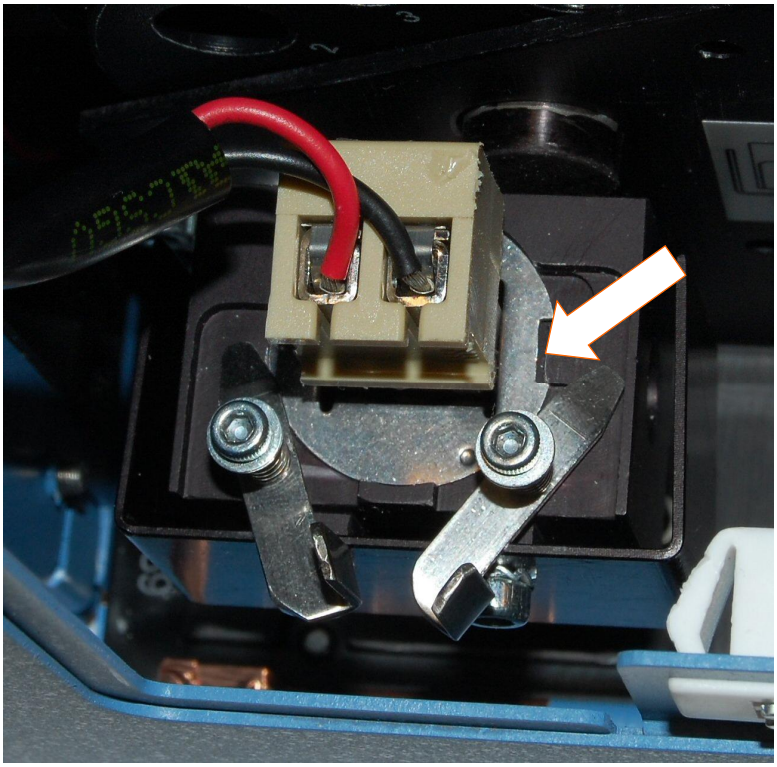
Caution! When handling the lamp, do not touch any other mechanical or electronic part.

3. Turn aside the two clamps, which keep the lamp in place (Figure 24 and Figure 25).
4. Lift the lamp up with the terminal socket.
5. Loosen the two screws of the terminal socket and pull the lamp from the terminal socket.



Figure 24. Changing the lamp

6. Refit the terminal socket to the contacts of the new lamp approved by the manufacturer (Osram 64222, 6V/10W).
7. Tighten the screws of the terminal socket and put the new lamp in place.



Match the notch of the lamp with the alignment tab!

Figure 25. Clamps open

Note! Place the lamp and terminal socket into the correct position. Refer to Figure 25.

8. While holding the lamp in place, turn the two clamps to lock the lamp into position (Figure 26).

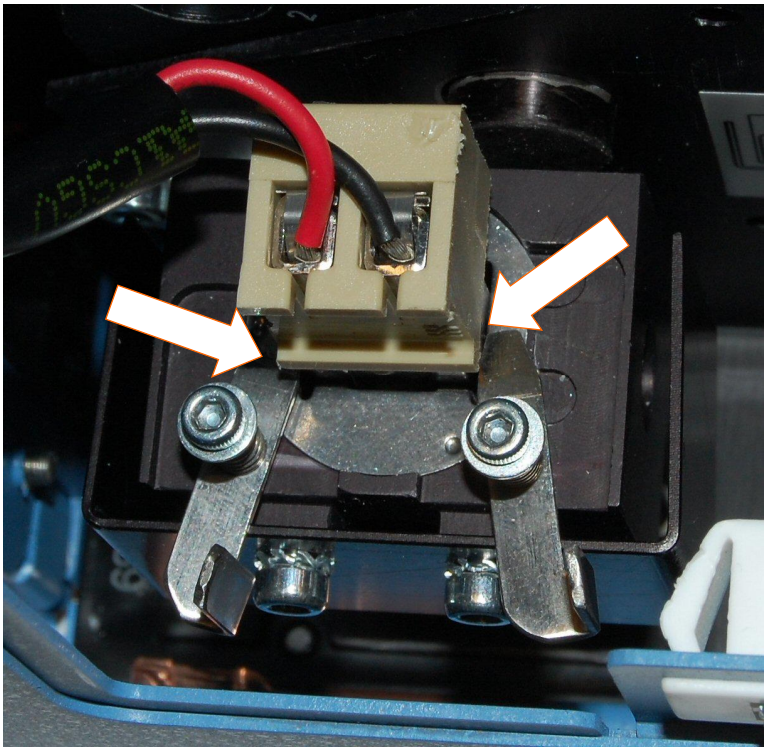


Figure 26. Lamp changed and clamps closed

9. Close the lamp and filter wheel chamber cover.
10. Plug in the instrument and switch the power on.

Refitting the transport lock

When you relocate the instrument or ship it for service, make sure you refit the transport lock.

1. The instrument has to be powered on.



2. Press the **PLATE in/out** button so that the plate carrier goes in.

3. Switch the power off.

4. Open the lamp and filter wheel chamber cover.

5. Push the transport lock bar through the hole in Figure 27 into the hole in the measurement head.



Figure 27. Refitting the transport lock bar into the measurement head

6. Push the transport lock bar in as far as possible (Figure 27).

7. Fasten the transport lock bar and tag clockwise using the Allen key supplied (Figure 28). Ensure that the transport lock bar is completely tightened.



Figure 28. Fastening the transport lock

8. Close the lamp and filter wheel chamber cover.

The transport lock bar and tag are now refitted (Figure 29).

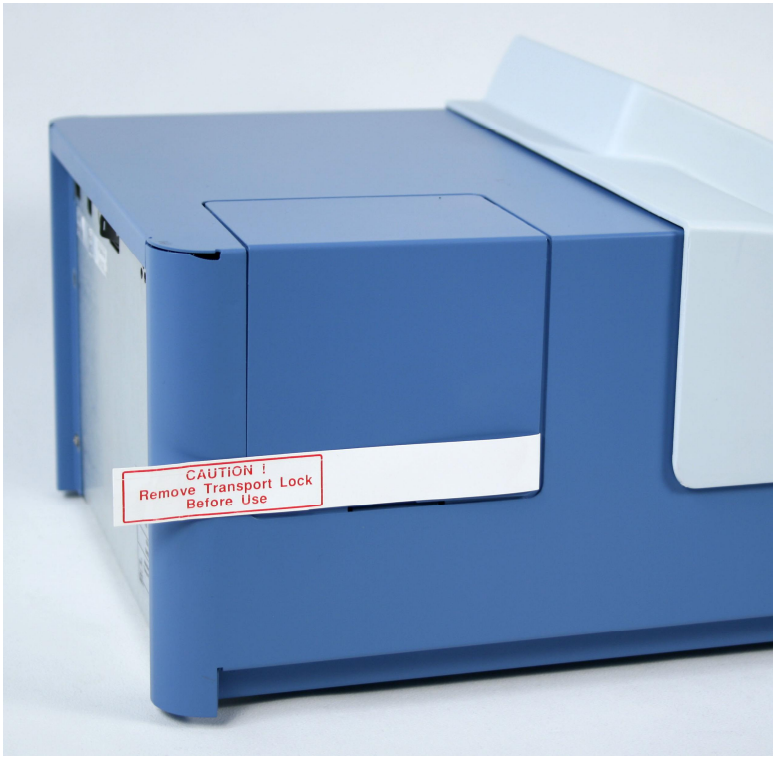


Figure 29. Transport lock bar and tag refitted

Maintaining a system log

A system log, which includes a short summary of the use, maintenance procedures, error messages, and other information about the use of the system, is useful in properly maintaining the system. Refer to Appendix A: “System Log”.

How to pack for service

To pack the Multiskan FC for service:

- Inform about the use of hazardous materials.
- Remove any microplate before decontamination. Also remove the filter wheel and put it into its transportation box. Decontaminate the instrument.
- Refit the transportation lock. Refer to “Refitting the transport lock”.
- Close the lamp and filter wheel chamber cover and the measurement chamber door.
- Pack the instrument according to the packing instructions.
- Use the original packaging for shipping.
- Enclose a dated and signed “*Certificate of Decontamination*” (see Appendix B) both inside and attached to the outside of the package, in which you return your instrument (or other items).
- Enclose the return authorization number (RGA) given by your local Thermo Fisher Scientific representative.
- Indicate the fault after you have been in touch with your local Thermo Fisher Scientific representative or the Thermo Fisher Scientific technical service department.

Disposal of the instrument

If the Multiskan FC is exposed to potentially infectious chemical samples, toxic or corrosive chemicals or radioactive chemicals, waste management of the complete instrument must be carried out to ensure that there is no risk of contamination.



Warning! Decontaminate the instrument before disposal. Refer to “Decontamination procedure”.

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.



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

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

Do not treat electrical and electronic equipments as unsorted waste. Collect waste from electrical and electronic equipment separately.

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 14: 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.

Table 15. General specifications

General specifications	
Overall dimensions	ca. 290 mm (W) x 400 mm (D) x 220 mm (H) [11.4” (W) x 15.7” (D) x 8.7” (H)]
Weight	8.5 kg [18.7 lbs.]
Operating conditions	+10°C to +40°C; maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C, non-condensing 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
Power consumption	100 VA max., standby 8 VA
Heat dissipation	341 BTU max.
Noise	< 60 db (at a distance of 500 mm)
Display	High contrast color display with 480 x 272 dots
Keypad	Four arrow keys; **OK** button; three function keys **F1-F3**; **FILE** and **HELP** keys; **0-9** number keys; **a-z** letters with the number keys; **C** key; **START**, **STOP**, and **PLATE in/out** buttons
User interface	Internal software or PC control with SkanIt Software
Computer interface	USB 1.1 (2.0 compatible)
Plate types	96 and 384-well plates Maximum height 15.3 mm
Shaker	Linear shaking, 3 speeds: Slow (5 Hz, amplitude 15 mm), Medium (11 Hz, amplitude 3 mm), and Fast (20 Hz, amplitude 1 mm)
External printer type	HP PCL5, PCL5e or PCL5c

Performance specifications

Table 16. Photometry

This section provides the performance specifications at typical laboratory conditions (22°C, relative humidity 40%) for the relevant measurement technique and other instrument capabilities.

Performance specifications / Photometry	
Optical system	Quartz-halogen lamp (Osram 64222, 6V/10W), interference filter (in the filter wheel), fiber, fiber end optics, photodetector, signal processing
Wavelength range	340–850 nm
Filters	8-position filter wheel The instrument is delivered with the following standard filters installed: 405 nm; 450 nm, and 620 nm. Additional filters can be ordered separately.
Half-bandwidth of filters	3–9 nm
Wavelength accuracy	± 2 nm
Detector	One silicon photodetector
Linearity (405 nm)	0–3 Abs, ± 2%, 96-well plate 0–2.5 Abs, ± 2%, 384-well plate
Measurement range	0–6 Abs
Absorbance resolution	0.001 Abs
Accuracy (405 nm, normal mode)	± 1% (0–3 Abs) or ± 0.003 Abs which ever is greater
Precision (405 nm, normal mode)	CV ≤ 0.2% (0.3–3 Abs)
Startup time	Approx. 30 s
Measurement time	7 s (96-well plate), fast mode 13 s (96-well plate), normal mode 16 s (96-well plate), fast mode, dual wavelength 13 s (384-well plate), fast mode 34 s (384-well plate), normal mode 28 s (384-well plate), fast mode, dual wavelength
Long-term stability	Instrument is stable due to autoblanking procedure.

Table 17. Incubator

Performance specifications / Incubator	
Temperature range	Ambient +4°C to 50°C in increments of 1°C
Liquid warm-up time	Liquid warm-up time < 40 min from 25°C to 37°C, 96-well plate, 200 µl water/well
Uniformity	± 1°C across the plate (at 37°C)

Safety specifications

This section describes the safety specifications for the Multiskan FC instrument.

In conformity with the requirements

Multiskan FC bears the following markings:
Type 357
100–240 Vac, 50/60 Hz, 100 VA max.
CE marking
CSA monogram or similar

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.

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 with the exception of occasional conductivity caused by condensation.

Chapter 15: Troubleshooting Guide

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

Error and warning codes

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 error (Table 18) and warning codes (Table 19) that may appear in SkanIt Software for Microplate Readers are presented below.

Table 18. Error codes reported

Code	Explanation	Suggested action
0	The command was executed successfully.	
2	The instrument did not recognize the command it received.	Please restart both the instrument and PC. Contact the PC software vendor.
3	The arguments of the received command are not valid.	Please restart both the instrument and PC. Contact the PC software vendor.
4	Plate positioning error.	Check that there is nothing preventing free plate movement. Contact service.
5	Measure head positioning error.	Check that there is nothing preventing free measure head movement. Contact service.
6	Filter wheel positioning error.	Check that the filter wheel is in place. Contact service.
7	AD converter offset voltage is too high.	Contact service.
8	AD converter noise level is too high.	Contact service.
9	Lamp failure.	Replace the lamp. It is also possible to get this error if either one of the measure head or plate motors has lost steps so that the position is wrong.
10	Non-volatile parameters lost.	Contact service.
11	Attempt to set the instrument serial number when it already has been set.	Do not try to set the instrument serial number.
12	Not enough memory for a new user-defined parameter.	The internal memory is full. Take a backup by exporting the protocols/runs. Refer to Chapter 9: “Printing, Exporting and Importing”. Release space from the internal memory by deleting protocols/runs from the internal memory.
13	Such an error during startup, which prevents measurement.	Restart the instrument. If you are unable to eliminate the error, contact service.
14	The distance between plate wells is too short for scan measurement.	Ensure that the well distance in the PC software plate template is large enough or use Normal measurement mode.
15	The sampling time for a single result is too long for scan measurement. The plate cannot be moved as slowly as the sampling time requires.	Contact the PC software vendor.
16	Failed to adjust a suitable lamp intensity for a filter.	Check that there actually is a filter in all used filter positions. If the error persists, contact service.
17	Too high dark signal level. The dark level is checked once for each measured plate row/column.	This error may also be caused by a measure head or plate position error – see errors 4 and 5. Contact service.
18	Measure signal saturation.	Contact service.
19	No filters defined.	Define at least one filter you are using.
20	The USB memory device/printer interface is not working.	Contact service.
21	The USB memory device/printer interface firmware is corrupted.	Contact service.
22	XY table position calibration failed. This may be reported after startup.	Contact service.
23	Command parser optimization failure.	Contact service.
24	Temperature reference is out of limits. Incubation is not available if this error is reported.	Contact service.
25	Parameters memory not found.	Contact service.
26	Parameters memory erase failure.	Contact service.
27	Parameters memory write failure.	Contact service.
28	Temperature is not changing.	Use a at least a 4°C higher incubation temperature than the environmental temperature. This applies to both the protocol and startup temperature.

Code	Explanation	Suggested action
		Contact service.
29	One or more heaters not ok.	Contact service.
50	File open error. File not found.	Contact service.
51	Filter 1 not selected in measure parameters.	Select filter 1.
52	Filter information in the protocol does not match the filter wheel.	Edit the protocol or add the correct filter to the filter wheel.
53	The file already exists.	Save with another file name.
54	The file does not exist.	Contact service.
55	The media is full.	First take a backup and then delete some protocols or runs. If “Defragmenting file system” messages start to appear on the display, you should already at this stage make more space by deleting some protocols or runs.
56	End of file.	Contact service.
57	Other file error (none of the previous).	Contact service.
58	Firmware update aborted by user.	
59	Printer not attached.	Connect the external printer.
60	The printer is out of paper.	Add paper to the printer.
61	Printing error.	Retry and if the error persists, contact service.

Table 19. Warning codes reported

Code	Explanation	Suggested action
100	Unable to comply with the defined kinetic interval.	The minimum timing depends on the combination of measure parameters, plate movement parameters, number of wavelengths and number of measured wells.
101	The timer is not (anymore) running. Your timing requirement is not met.	Contact the PC software vendor.
102	Temperature is not changing.	Please note that the cooling of the incubation chamber takes time. If you get the warning of “Temperature is not changing”, it means that the incubator chamber is cooling slowly. It is possible to start the run despite of the warning message in case the incubation temperature is not critical for the application.

USB memory device

It is recommended to format the USB memory device if export or import fails.

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.

The multiple drive USB memory devices normally contain one or more removable disk-type memory spaces, but can also contain virtual CD drive-type memory spaces. The Multiskan FC does not support virtual CD drive-type memory spaces.

It is possible to check if there is a virtual CD drive present when inserting a multiple drive USB memory device into the PC USB port.

1. Select **My Computer** and note the new drives that appear in the list when the multiple drive USB memory device is inserted.
2. Check all the appearing items by using the right-click mouse menu and selecting **Properties**.
3. The item type "Removable Disk" is stated for the USB memory device in the **General** sheet. It is compatible with the Multiskan FC if the File system is FAT16 or FAT32.
4. If the item is a virtual CD drive, then the type will be "CD Drive". This may cause the USB memory device to be incompatible with the Multiskan FC.

Warnings and cautions

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

The following recommendations are given for added user safety.

Electrical

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

The power plug should only be inserted into a socket outlet provided with a protective ground contact. Never use an extension cable without a protective ground wire.



Warning! Only authorized technical service personnel are allowed to open the instrument. Disconnect the instrument from all voltage sources by disconnecting the power supply cable before opening it.

The same precautions applicable when using any electrical equipment should naturally be observed with this instrument.



Warning! Do not touch switches or electrical outlets with wet hands. Switch the instrument off before disconnecting it from the mains supply.

Defects and abnormal stresses



Warning! If the instrument is not functioning properly, it may create electromagnetic perturbation, which could impair the operation of other devices or equipment in the usual laboratory environment.

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

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

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

Chapter 16: Ordering Information

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

List of filters

Table 20. Codes for filters

Code	Item
1423405	Optical filter 340 nm
1423755	Optical filter 375 nm
1424055	Optical filter 405 nm
1424145	Optical filter 414 nm
1424505	Optical filter 450 nm
1424925	Optical filter 492 nm
1425205	Optical filter 520 nm
1425305	Optical filter 530 nm
1425405	Optical filter 540 nm
1425505	Optical filter 550 nm
1425605	Optical filter 560 nm
1425705	Optical filter 570 nm
1425955	Optical filter 595 nm
1426205	Optical filter 620 nm
1426305	Optical filter 630 nm
1426505	Optical filter 650 nm
1426905	Optical filter 690 nm
1427405	Optical filter 740 nm
1427505	Optical filter 750 nm
1428205	Optical filter 820 nm

List of spare parts and accessories

Table 21. Codes for spare parts and accessories

Code	Item	Quantity
5187139	SkanIt Software for Microplate Readers, Research Edition CD	1
5187149	SkanIt Software for Microplate Readers, Drug Discovery Edition CD	1
1410101	Halogen lamp 6V/10W	1
N04001	USB A-B device cable	1

List of Thermo Scientific plates

Table 22. Codes for plates

Code	Item
9503060	MultiFrame
	Immulon™ Plates, 96 Well
3355	Flat, 1 B, Medium Binding
3455	Flat, 2 HB, High Binding
3855	Flat, 4 HBX, High Binding Extra
	Microtiter™ 96 Well Plates
9502227	Flat, Universal Binding
95029330	Flat, Enhanced Binding
	Microtiter 384 Well Plates
95040000	Round, 384 Plate
8555	Immulon 1 B Plate, square well
8755	Immulon 4 HBX, square well
	Immulon Strip Assemblies (in frames)
6310	Flat, 1 B, Medium Binding, 1 x 12
6505	Flat, 1 B, Medium Binding, 2 x 8
6309	Flat, 2 HB, High Binding, 1 x 12
6506	Flat, 2 HB, High Binding, 2 x 8
6405	Flat, 4 HBX, High Binding Extra, 1 x 12
6508	Flat, 4 HBX, High Binding Extra, 2 x 8
	Immulon Strips
6301	Flat, 1 B, Medium Binding, 1 x 12
6302	Flat, 2 HB, High Binding, 1 x 12
6404	Flat, 4 HBX, High Binding Extra, 1 x 12
	Microtiter Breakable Strip Assemblies (in frames)
95029390	Flat, Universal Binding, 1 x 8
95029180	Flat, Enhanced Binding, 1 x 8
	Microtiter Solid Strip Assemblies (in frames)
95029350	Flat, Universal Binding, 1 x 8
95029100	Flat, Enhanced Binding, 1 x 8

Verification tools

Table 23. Codes for verification tools

Code	Item	Quantity
24072800	Multiskan Verification Plate	1
IOPQDOCEN08265	Multiskan FC IQ/OQ/PQ (English)	1

Appendix A: System Log

Instrument name/number:

User	Date	Comments

Appendix B: Certificate of Decontamination

Name: _____

Address: _____

Tel./Fax: _____

Instrument: Serial No.: _____

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

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

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

Specific information about contaminants:

_____

_____

Decontamination procedure[1]:

_____

_____

Date and place: _____

Signature: _____

Name (block capitals): _____

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

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

Date and place: _____

Signature: _____

Name (block capitals): _____

Please include decontaminating solution used.

Glossary

absorbance (optical density)	A logarithmic function of the transmission of a wavelength of light through a liquid. log (I/I_0) dimension [*Abs*]
decontamination	Removal or neutralization of radiologic, bacteriological, chemical or other contamination.
disinfection	The destruction of pathogenic bacteria, usually with an antiseptic chemical or disinfectant.
EIA	Enzyme immunoassay. An immunoassay using a color-changing enzyme-substrate system for indicating results. A diagnostic test method to measure or detect a substance using antibody-antigen reactions.
ELISA	Abbreviation for enzyme-linked immunosorbent assay.
error message	Indication that an error has been detected.
fast mode	The detector moves over the well without stopping.
filter	An optical component to select a wavelength.
initialization tests	So-called self-tests, which are carried out before operation to ascertain that the necessary instrument adjustments have been carried out.
kinetic measurement	Measurement over a time period at certain intervals.
normal mode	The detector stops over the measured well.
optical density (absorbance)	log (1/transmittance) = log (I/I_0) dimension [*O.D.*]
photometer	A device measuring absorbance or optical density.
photometry	The measurement of the properties of light, particularly (luminous) intensity.
self-tests	Initialization tests which the instrument performs before operation.
single measurement	Synonym to endpoint measurement/assay/method. The measurement is only done with a single reading.
transmittance	The ratio of transmitted (I) and incident light (I_0), I/I_0.
USB	Universal serial bus.

Index

Use the **Find** option for searching words/information in this user manual.