



**Malvern
Panalytical**
a spectris company

ZETASIZER ADVANCE SERIES BASIC GUIDE



ZETASIZER ADVANCE SERIES BASIC GUIDE

DISCLAIMER

Although diligent care has been used to ensure that the information in this material is accurate, nothing herein can be construed to imply any representation or warranty as to the accuracy, correctness or completeness of this information and we shall not be liable for errors contained herein or for damages in connection with the use of this material. Malvern Panalytical reserves the right to change the content in this material at any time without notice.

COPYRIGHT NOTICE

© 2021 Malvern Panalytical. This publication or any portion thereof may not be copied or transmitted without our express written permission.

Malvern Panalytical Ltd.
Groveood Road, Malvern,
Worcestershire, WR14 1XZ,
United Kingdom

Malvern Panalytical B.V.
Lelyweg 1, 7602 EA Almelo,
The Netherlands

Tel +44 1684 892456
Fax +44 1684 892789

Tel +31 546 534 444
Fax +31 546 534 598

info@malvernpanalytical.com

www.malvernpanalytical.com

Zetasizer® and MADLS® are a registered trademark in the UK and /or other countries, and is owned by Malvern Panalytical.

Windows® and Word is a registered trademark of the Microsoft Corporation.

Adobe® and Acrobat® are registered trademarks of Adobe Systems Incorporated.

CONTENTS

Chapter 1 Introduction	1
About the Zetasizer Advance Series	2
About this manual	3
Cover removal	4
Assumed information	5
Where to get help	6
Chapter 2 Health and safety	7
General safety issues	8
General maintenance warnings	15
Instrument warnings	15
Sample handling warnings	16
Fumes	17
Chapter 3 Site requirements	19
Introduction	20
Environmental conditions	20
Space required	21
Services	22
Purge specification	23
MPT-3 Multi-purpose Titrator Services	25
Computer specification	25

Chapter 4 Hardware overview	27
System overview	28
Instrument	29
Accessory options	36
Chapter 5 Quick start	39
Introduction	40
Start the system	40
Fill cells	41
Load cells into the instrument	45
Set up a measurement	48
Run a method	54
Analyze the results	57
Chapter 6 Maintenance	61
About maintenance procedures	62
Clean cells and accessories	62
Clean the covers	62
Appendix A Specifications	63
Specifications	64
Chemical compatibility	67
Appendix B Regulatory	69
CE Declaration of Conformity	70
Canadian Regulatory Information (Canada only)	70
VCCI acceptance (Japan only)	70
FCC Notice (US only)	71
Disposal of Electrical & Electronic Equipment	72

CHAPTER 1 INTRODUCTION

About the Zetasizer Advance Series	2
About this manual	3
Cover removal	4
Assumed information	5
Where to get help	6

About the Zetasizer Advance Series

The Zetasizer Advance Series instruments provide the ability to measure particle size and zeta potential of particles or molecules in a liquid medium. The Zetasizer Advance Series feature unique technology for measurements over a wide concentration range, and precise temperature control to give reproducible, repeatable and accurate measurements. Depending upon the options and accessories used, the system also has the ability to perform:

- Autotitration measurements if an MPT-3 Multi-purpose Titrator accessory is connected.

Other key parameters like conductivity, particle concentration, and with the MPT-3 Multi-purpose Titrator, pH can also be measured. The Zetasizer Advance Series range has been designed so that a minimal amount of user interaction is necessary to achieve precise and repeatable results.

The available options for the Zetasizer Advance Series are shown below:

Table 1.1 Zetasizer Advance Series instrument features

	Zetasizer Advance Series Instrument					
	Lab Blue	Pro Blue	Ultra Blue	Lab Red	Pro Red	Ultra Red
Core capability						
Side scatter	Y	N	Y	Y	N	Y
Back scatter	N	Y	Y	N	Y	Y
Forwards scatter	Y	Y	Y	Y	Y	Y
Zeta optics	Y	Y	Y	Y	Y	Y
Laser power (mW)	4	4	4	10	10	10
Features						
NIBS	N	Y	Y	N	Y	Y
MADLS	N	N	Y	N	N	Y
Zeta measurement	Y	Y	Y	Y	Y	Y
Particle concentration	N	N	N	N	N	Y
pH titration	O	O	O	O	O	O
DDLS	N	Y	Y	N	Y	Y
Fluorescence filter	N	Y	Y	N	Y	Y

'Y' indicates feature is available for this product type

'N' indicates feature is unavailable for this product type

'O' indicates an optional feature.

About this manual

This manual covers the following instruments:

Table 1.2 Instrument information

Instrument	Part number
Zetasizer Lab Blue	ZSU3100
Zetasizer Pro Blue	ZSU3200 (previously: ZSU5800)
Zetasizer Ultra Blue	ZSU3300
Zetasizer Lab Red	ZSU3105
Zetasizer Pro Red	ZSU3205
Zetasizer Ultra Red	ZSU3305 (previously: ZSU5700)

For information about the features available for each Zetasizer Advance Series instrument, see [About the Zetasizer Advance Series on the previous page](#).

Product documentation structure

This manual provides the essential information necessary for ensuring safe and efficient operation of the Zetasizer Advance Series. This manual:

- Provides essential health and safety information, which all users must read.
- Provides information on the site requirements of the system.
- Describes the Zetasizer Advance Series hardware components and setup procedures.
- Provides a brief description of the measurement process.
- Describes the basic maintenance procedures.
- Provides the specifications of the instrument.

This manual fits into the following information structure for this product:

- **Basic Guide** - (this manual) provides the essentials required to get started, hardware information and vital health and safety information. All users must read this manual before using the system.
- **User Guide** - provides detailed information on making a measurement and using the software.
- **Help** - integrated with the ZS XPLOER software, provides detailed information on using the system, video tutorials, and reference on all software features.
- **Accessories Guide** - gives detailed information about each cell and optional accessories, including the MPT-3 Multi-purpose Titrator.



WARNING!

The instrument and the samples measured may be hazardous if misused. Users must read the Health and Safety information in in this guide before operating this system.

Cover removal

Malvern Panalytical personnel (service engineers and representatives) are the only people authorized to perform any service procedures that may require the removal of the covers.



WARNING!

Removal of the main covers by unauthorized personnel will void the warranty of the instrument.



WARNING!

Failure to follow these guidelines could result in exposure to hazardous voltages and laser radiation.

Assumed information

General

The Zetasizer Advance Series instruments can be used with a variety of accessories that allow it to measure a variety of samples. Some of these accessories prepare and deliver the sample to the optical unit for measurement. For more information see the *Zetasizer Advance Series Accessories Guide*.

Naming convention

Within this manual:

- The Zetasizer Advance Series instruments are referred to either in full or as "the Zetasizer" or "the instrument".
- The accessories are referred to by name or as "the accessory".
- The combination of the instrument, one or more accessories, and the computer is referred to as "the system".

Software option selection


Software options are shown in bold and take the form **main option-sub option**. As an example, **Home-Measure size** refers to the need to select *Home* and then choose a Size measurement.

Where to get help

This section provides information on how to get help with your system.

Help desk

Direct all queries regarding the system to your local Malvern Panalytical representative, providing the following information:

- **Model and serial number of the instrument.** The serial number is shown when you hover over the instrument status on the bottom right of the software display, and also on the rear panel of the instrument.
- **The software version.** To find this, click  in the top left corner next to **Home**, and select **About**. The software version will be displayed.

Contact the International Helpdesk if the local Malvern Panalytical representative is not available:

Telephone: +44 (0) 1684 891800 or email: helpdesk@malvernpanalytical.com.

If located in the United Kingdom, contact:

Telephone: +44 (0) 1684 891800 or email: customersupport.uk@malvernpanalytical.com.

If located in the United States, contact the United States Helpdesk if the local Malvern Panalytical representative is not available:

Telephone: +1 800 279 7297 or email: support.us@malvernpanalytical.com.



Note:

The support lines are primarily English speaking.

Website - www.malvernpanalytical.com

The Malvern Panalytical website offers a comprehensive range of resources for customer use 24 hours a day, 7 days a week.

CHAPTER 2 HEALTH AND SAFETY

General safety issues	8
General maintenance warnings	15
Instrument warnings	15
Sample handling warnings	16
Fumes	17

General safety issues



WARNING!

Use of the system in a manner not specified by Malvern Panalytical may impair the protection provided by the system.

Site requirements

The system has specific site requirements that must be met to ensure safe operation of the instrument. Refer to [Site requirements on page 19](#).

Positioning the instrument



WARNING!

Do not position the instrument such that the power cord, where it exits the product, is unreachable for disconnection.



WARNING!

Do not obstruct the ventilation slots underneath the instrument or the fans on the rear panel. Restricting airflow can damage the instrument or cause overheating.

Purge warnings (MPT-3 Multi-purpose Titrator)



WARNING!

If a nitrogen supply is used, the system must be located in a well ventilated environment. Turn **off** the supply when not in use.



WARNING!

If a nitrogen supply is used, local Health and Safety requirements must be followed.

Temperature warnings



WARNING!

Warning triangles on the cuvette lid and thermal cap indicate potentially hazardous temperatures within the cell area. The temperature range of the cell area is 0 °C to 120 °C.



WARNING!

If the temperature is above 50 °C and the lid is opened, three successive beeps are repeated with a pause in between until the temperature has cooled to below 50 °C.

Laser safety warnings

The lasers fitted to the instruments are as follows:

- Blue label instruments (Lab Blue, Pro Blue and Ultra Blue) have a 4 mW He-Ne 632.8 nm laser.
- Red label instruments (Lab Red, Pro Red and Ultra Red) have a 10 mW He-Ne 632.8 nm laser.

The Zetasizer optical unit is a **Class 1** laser product and, as such, there is no exposure to laser radiation in its normal operation. The laser passes through the cell area which is enclosed when the cell is fitted and the lid is closed. When the cell is not fitted and the lid is open, a mechanical laser shutter prevents exposure to laser radiation.

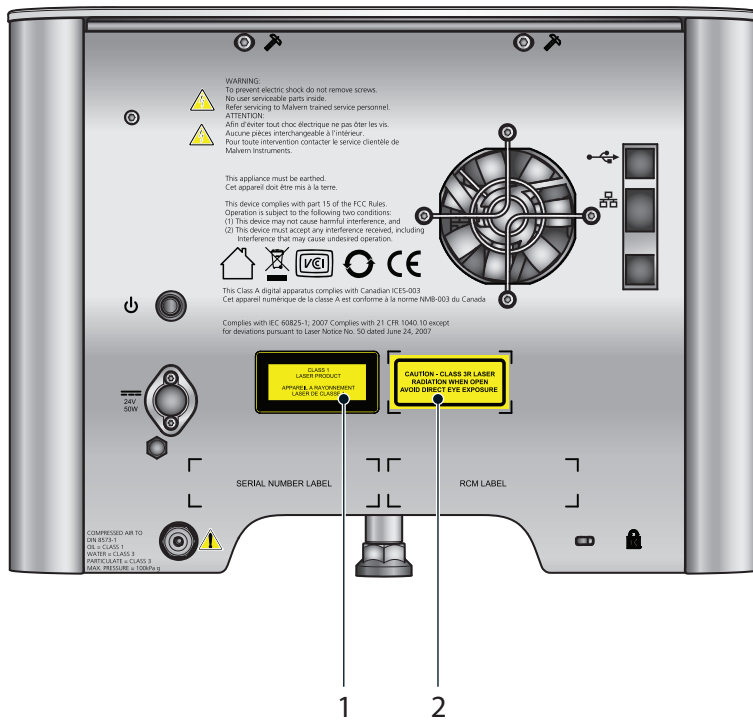


WARNING!

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Laser warning labels

The following diagram shows the location of the laser warning labels - for more technical details refer to [Specifications on page 64](#).



1. CLASS 1 LASER PRODUCT
2. CAUTION - CLASS 3R LASER RADIATION WHEN OPEN. AVOID EXPOSURE TO THE BEAM.

Figure 2.1 Laser warning labels



Note:

The Lab Red, Pro Red and Ultra Red instruments use a class 3B laser. The Lab Blue, Pro Blue and Ultra Blue instruments use a class 3R laser.

Electrical safety warnings

Take care when measuring samples not to spill liquid on the system covers. Conducting materials or liquids can damage insulation and cause dangerous conditions. If a spillage occurs, disconnect the power and clean up before re-applying power to the system. Users who suspect powder or liquid has entered the covers should call a Malvern Panalytical representative to arrange a service call.



WARNING!

Never attempt to remove the covers; always contact a Malvern Panalytical engineer.

PAT testing

If PAT testing is required, connect the earth lead to the appropriate earth stud. Malvern Panalytical recommends that the product is PAT tested annually, or if it is suspected that its electrical safety has been compromised.

Power cords and power safety

Power cord set requirements

Power cords must meet the requirements of the country where the product is used. For further information contact your Malvern Panalytical representative.

General requirements

The requirements listed below are applicable to all countries:

- The power cord must be approved by an acceptable accredited agency responsible for evaluation in the country where the power cord set will be installed.
- The power cord set must have a minimum current capacity of 10 A (7 A in Japan only) and a nominal voltage rating of 125 or 250 volts AC, as required by each country's power system.

- The area of the wire must be a minimum of 0.75 mm² or 18 AWG, and the length of the cord must be less than 3 m.
- The power cord must be routed to avoid: being walked on, pinched by items placed upon it or against it, or made wet. Pay particular attention to the plug, the electrical outlet, and the point where the cord exits the product.



WARNING!

Do not operate this product with a damaged power cord set. If the power cord set is damaged in any manner, replace it immediately.



WARNING!

Do not use the power cord received with this product on any other products.

Power safety information

The following notes indicate guidelines to follow when connecting the Malvern Panalytical power supply using single and multiple extension leads, connection via AC Adapters and use of Uninterruptible Power Supplies (UPS).



WARNING!

To prevent electric shock, plug the instrument or accessory into correctly earthed electrical outlets. Never use the system without a properly connected protective earth conductor.

The power cord supplied is equipped with a grounding connection to ensure grounding integrity is maintained.

Advice on use of extension leads

Follow this advice when using single or multiple socket extension leads. These are also called trailing sockets.

- Ensure the lead is connected to a wall power outlet and not to another extension lead. The extension lead must be designed for grounding plugs and plugged into a grounded wall outlet.

- Ensure that the total ampere rating of the products being plugged into the extension lead does not exceed the ampere rating of the extension lead.
- Use caution when plugging a power cord into a multiple socket extension lead. Some extension leads may allow a plug to be inserted incorrectly.
- Incorrect insertion of the power plug could result in permanent damage to the instrument or accessory, as well as risk of electric shock and/or fire. Ensure that the ground connection (prong/pin) of the power cord plug is inserted into the mating ground contact of the extension lead.

Advice on use of AC adapters



WARNING!

Do not use adapter plugs that bypass the grounding feature, or remove the grounding feature from the plug or adapter.

- Place the AC adapter in a ventilated area, such as a desk top or on the floor.
- The AC adapter may become hot during normal operation of the instrument or accessory. Use care handling the adapter during or immediately after operation.
- Use only the Malvern Panalytical-provided AC adapter approved for use with the instrument and/or accessory. Use of another AC adapter may impair the safety and performance of the unit.

Advice on use of Uninterruptible Power Supplies (UPS)

To help protect the instrument and/or accessory from sudden, transient increases and decreases in electrical power, use a surge suppressor, line conditioner or UPS.

Moving the system

Follow the guidelines in this section if it is necessary to move the system.

Moving the instrument

- Make sure that the unit has been powered down for 5 minutes: If measurements were run below ambient temperature, the area of the base below the cell area could be hot to touch.
- Disconnect the computer and power supply before attempting to move the system.
- Always lift the instrument by holding it under both of its short sides, with a firm grip on the metal base plate. Never lift an instrument by its covers.



WARNING!

The optical unit weighs 19 kg. Adopt proper lifting techniques to avoid back injury.

- If moving the instrument large distances, Malvern Panalytical recommends repacking the instrument in its original packaging.

Moving the MPT-3 Multi-purpose Titrator and Auto Degasser

If it is necessary to move the unit, follow these guidelines:

- Disconnect the power supply before attempting to move the unit.
- Disconnect and drain or vent any tubing that carries fluid or compressed air, including sample tubing, before moving the unit.
- Lift the unit by holding it under the base.



WARNING!

The MPT-3 Multi-purpose Titrator weighs 5.3 kg and the Auto Degasser weighs 2.75 kg. Adopt proper lifting techniques to avoid back injury.

- If moving the unit large distances, Malvern Panalytical recommends repacking the unit in its original packaging.

General maintenance warnings



WARNING!

Before performing any maintenance operation, read and observe all safety warnings listed in this chapter.



WARNING!

The system contains no internal serviceable parts. Never attempt to remove the covers of the optical bench or an accessory or dispersion unit. Removal of the covers voids the warranty and may expose the user to dangerous laser radiation.



WARNING!

Failure to follow these guidelines could result in the emission of laser radiation or exposure to hazardous voltages. Laser radiation can be harmful to the body and can cause permanent eye damage.

Instrument warnings



WARNING!

Before cleaning, always disconnect the unit from the power supply and computer and disconnect all electrical cables. Ensure the unit is completely dry before re-applying power.



CAUTION!

After the Zetasizer is powered off, you must wait at least 5 minutes before re-powering the system.

Sample handling warnings

- Always handle all substances in accordance with the COSHH (Control Of Substances Hazardous to Health) regulations (UK) or any local regulations concerning sample handling safety.
- Before using any substance, check the Safety Data Sheets for safe handling information.
- Use the instrument in a well ventilated room, or preferably within a fume cupboard, if the fumes from the sample or dispersant are toxic or noxious.
- Wear personal protective equipment as recommended by the Safety Data Sheets if toxic or hazardous samples are being handled, particularly during sample preparation and measurement.
- Wear appropriate protective gloves when handling hazardous materials that can cause skin irritation, damage or can be absorbed through the skin.
- Do not smoke during measurement procedures, particularly where flammable samples are used or stored.
- Do not eat or drink during measurement procedures, particularly where hazardous samples are used or stored.
- Take care when handling glass (e.g. glass cuvettes or capillaries). Hazardous materials may enter a wound caused by broken glass.
- Always test a new sample or dispersant for chemical compatibility before use.
- If hazardous samples are spilt, clean the system to remove any contaminants before making another measurement.
- Always label samples for analysis using industry standard labeling, particularly if they are handled by a number of staff or stored for long periods. Clearly mark any operator hazard and associated safety precautions that are required for the handling of dangerous materials.
- Keep a record of all hazardous substances used in the system for protection of service and maintenance personnel.
- Always adopt responsible procedures for the disposal of waste samples. Most local laws forbid the disposal of many chemicals in such a manner as to allow their entry into the water system. The user is advised to seek local advice as to the means available for disposal of chemical wastes in the area of use. Refer to the Safety Data Sheets.

- The surfaces of the system may be permanently damaged if samples are spilled on them. If a spillage does occur, disconnect the system from the power supply before scrupulously cleaning up the spillage. The surfaces of the system can be cleaned with mild soapy water and a soft lint free cloth.

Fumes



WARNING!

Use the system in a fume cupboard if using dispersants that emit hazardous fumes. Consult Malvern Panalytical before using dispersants with ignitable vapor.

CHAPTER 3 SITE REQUIREMENTS

Introduction	20
Environmental conditions	20
Space required	21
Services	22
Purge specification	23
MPT-3 Multi-purpose Titrator Services	25
Computer specification	25

Introduction

This section outlines the site requirements for the Zetasizer Advance Series. Make sure these requirements are met before the Malvern Panalytical engineer arrives to install and commission the system.

Environmental conditions

The site must be:

- Away from strong light sources (such as windows)
- Away from strong heat sources (such as radiators)
- Well ventilated (for noxious samples)
- On a horizontal vibration-free bench built to support the weight of the system (see [Space required on the facing page](#))

Table 3.1 Weight of unit

Unit	Weight
Zetasizer	19 kg
MPT-3 Multi-purpose Titrator	5.3 kg
Auto Degasser	2.75 kg

Store and operate the system in the following conditions:

Table 3.2 Environmental conditions

Condition	Requirement
IP rating	Designed to meet IP41B
Operational conditions	10 °C to 35 °C (50 °F to 95 °F)
Storage conditions	-20 °C to 50 °C (-4 °F to 122 °F)
Humidity	Maximum humidity 80% for temperatures up to 31 °C, decreasing linearly to 50% relative humidity at 40 °C.
Altitude	Up to 2000 m

Condition	Requirement
Mains supply voltage fluctuations	Up to $\pm 10\%$ of nominal voltage at 100-240 Vac, 50/60 Hz, 4.0 A
Overvoltage category	II (IEC 60664)
Pollution degree	2 (BS EN 60664-1:2003)
Installation category	II (BS EN 60664-1:2003)

In addition:

- Do not obstruct power sockets as they may need to be disconnected during an emergency.
- Avoid passing electrical cables through areas where liquids can be spilled.

Space required

Provide enough space to allow easy access to all components and connections. Allow at least 800 mm above the bench surface for access to the cell area and accessories. The following table lists the component dimensions.

Table 3.3 Dimensions of each system unit

Component	Width	Depth	Height
Zetasizer	322 mm	565 mm	245 mm
MPT-3 Multi-purpose Titrator	170 mm	390 mm	260 mm
Auto Degasser	75 mm	250 mm	130 mm
Computer and printer	See manufacturer's documentation		

The following diagram shows the minimum recommended space required for a typical system.

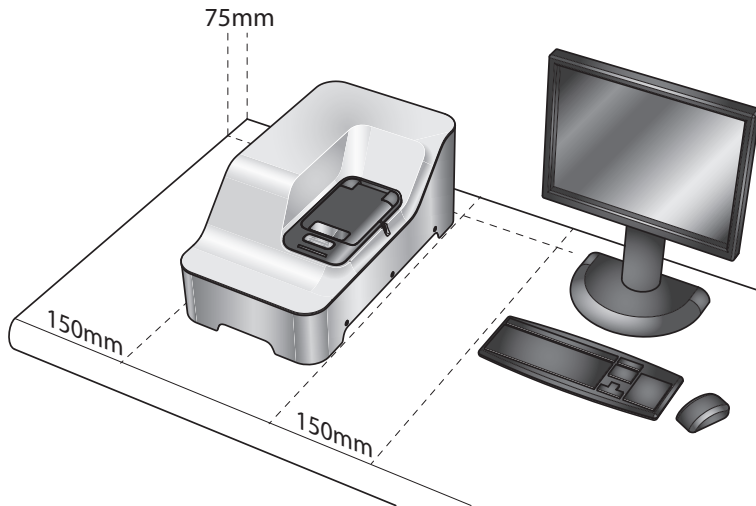


Figure 3.1 Space required

Services

This section describes the services required.

General

The following services are required for each component:

Table 3.4 Power sockets required for each system unit

Component	Power Sockets
Zetasizer	1
MPT-3 Multi-purpose Titrator	1
Auto Degasser	1
Computer and printer	1 or more. See manufacturer's documentation.

Power specification

The mains power supply must be clean and filtered. If necessary, use an Uninterruptible Power Supply (UPS) to remove any spikes or noise.

The power requirements are:

Table 3.5 Power requirements for each system unit

Component	Power Requirements
Zetasizer - from plug to PSU	~ 100-240 Vac, 50-60 Hz, 4.0 A
Zetasizer - from PSU to instrument	~ 24 Vdc, 9.2 A, 221 W Max.
MPT-3 Multi-purpose Titrator	~ 100-240 V, 50-60 Hz
Auto Degasser	~ 100-240 V, 50-60 Hz



CAUTION!

Only use the power supply unit and cables provided. Using another power supply unit voids any warranty and may be unsafe.

Laser safety

Zetasizer instruments are Class 1 laser products and as such, require no special laser safety considerations during normal operation. However, during servicing (which must be performed by a qualified Malvern Panalytical service engineer), the servicing engineer may be exposed to class 3B laser radiation. Malvern Panalytical therefore recommends that the administrative controls recommendations of the Laser Safety Regulations (ISO 60825-1:2014) are implemented.

Purge specification

If measuring samples at low temperatures there is a risk of condensation occurring on the cell; this occurs when the measurement temperature is less than the dew point of the ambient air surrounding the cell being measured. This is particularly likely in humid climates.

CHAPTER 3 SITE REQUIREMENTS

The purge inlet port can be used to connect a dry air supply to the instrument, for example, a supply with a dew point below the target temperature. This removes any moisture in the air immediately surrounding the cell and prevents condensation. The air supply must conform to the following specification:

- Compressed air to ISO 8573-1
- Oil = Class 1
- Water = Class 3
- Particulate = Class 3
- Pressure = 100 kPa g

The purge connection accommodates a push fitting for a 4 mm pressure rated hose.



CAUTION!

The purge air line supply must conform to the above specification. Failure to meet this specification may result in permanent damage to the instrument and invalidate the warranty.

An optional purge connection kit (part number ZEN1009) is available from Malvern Panalytical if this facility is to be used.

When performing a purge measurement, consider the following rules:

- The flow rate will be preset at 1.5 L/min at 1 bar.
- The instrument should be operated at a maximum temperature of 30 °C & 70% relative humidity when the requested temperature is below the dew point.
- When operating at a relative humidity higher than 50%, the measurement should allow a minimum equilibration time of 4 minutes to allow the temperature to stabilize.

MPT-3 Multi-purpose Titrator Services

Nitrogen purge specification



WARNING!

A nitrogen supply must be used in a well ventilated environment.



WARNING!

If a nitrogen supply is used, local Health and Safety requirements must be followed.

The MPT-3 Multi-purpose Titrator has a purge connector for connection of a nitrogen purge supply. This can be used to blanket the area directly above the sample and prevent any unwanted interactions with the atmosphere.

If a nitrogen supply is required, it must conform to the following specifications:

- The nitrogen supply must be dry, free from oil, and filtered to remove any contaminants that could affect the sample.
- The flow rate should be adjustable between 2 and 20 mL/min.

See the *Zetasizer Advance Series Accessories Guide* for more information on the MPT-3 Multi-purpose Titrator.

Computer specification

Contact Malvern Panalytical Support or see the website for the recommended computer specification. This is also provided in the Software Update Notification.

CHAPTER 4 HARDWARE OVERVIEW

System overview	28
Instrument	29
Accessory options	36

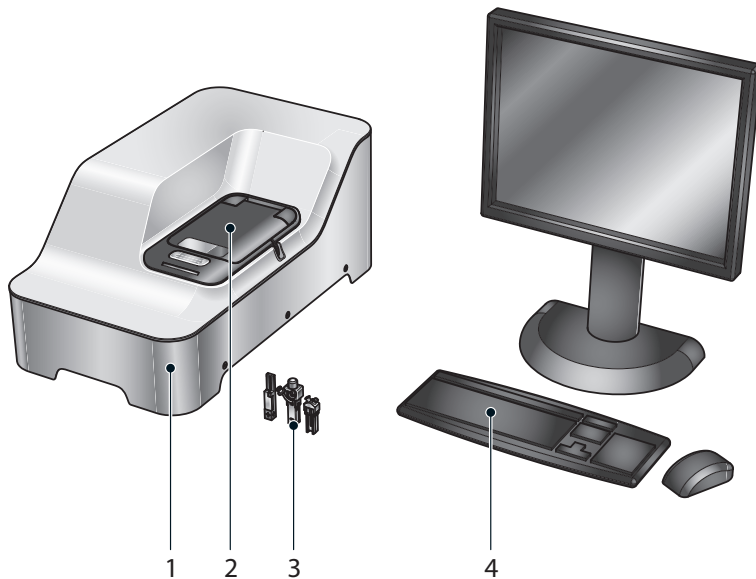
System overview



Note:

The Zetasizer is initially commissioned by Malvern Panalytical trained personnel. This section describes how to reinstall the system, typically required when moving the instrument or changing the computer.

The following image shows a typical Zetasizer instrument and its components. A cell is filled with the sample and loaded into the cell area on top of the instrument. A computer with the Zetasizer software (ZS XPLOER) is installed and controls the instrument.

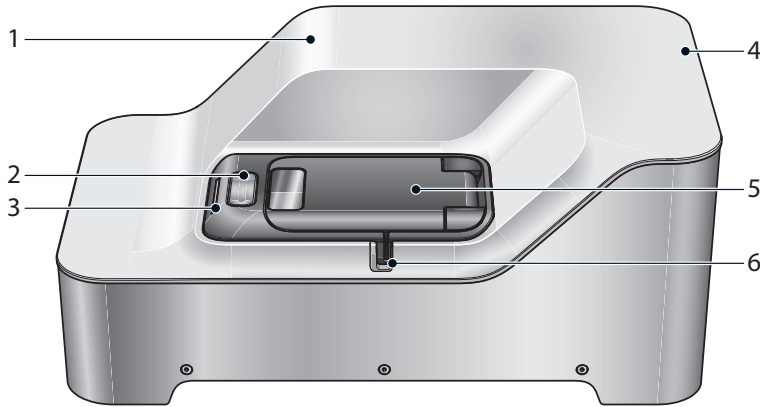


- | | |
|-------------------------|----------------------------|
| 1. Zetasizer instrument | 3. Cells |
| 2. Cell area lid | 4. Computer with ZS XPLOER |

Figure 4.1 System overview

Instrument

The following image and corresponding table describes the components in the Zetasizer instrument.



1. Instrument
2. Cell access button - press to open the cell chamber lid
3. Status indicator light - see below for more information
4. Rear panel - all instrument connections, see [Rear panel on page 31](#)
5. Cell chamber lid - opens to cell chamber, see [Cell chamber on page 32](#)
6. Tubing channel - to allow optional accessory tubing into the cell chamber

Figure 4.2 Instrument overview

Status indicator

The status indicator light is positioned below the cell access button and shows the operational state of the instrument.

The following table lists the indicator color and state and the function.

Table 4.1 Status indicator colors and meanings

Indicator color and state	Function
Amber - steady	Shows the start-up routine is running.
Amber - flashing every 5 s	Shows that the instrument is at “standby”. The instrument is functioning correctly but is either not connected to the computer or the software has not been started.
Green	Indicates the instrument is functioning correctly and is ready to start a measurement.
Blue - slow pulse	Occurs when the instrument is performing a measurement or scattering standard.
Blue - steady	A Method is running, but no measurement is currently taking place. For example, this light will show when the temperature is changing or during equilibrating.
Red - rapid flash followed by steady red	Indicates if the instrument has detected an error. The measurement will be stopped. Contact the Malvern Panalytical Helpdesk.
Green-blue - pulsing	Unit requires user interaction to proceed.

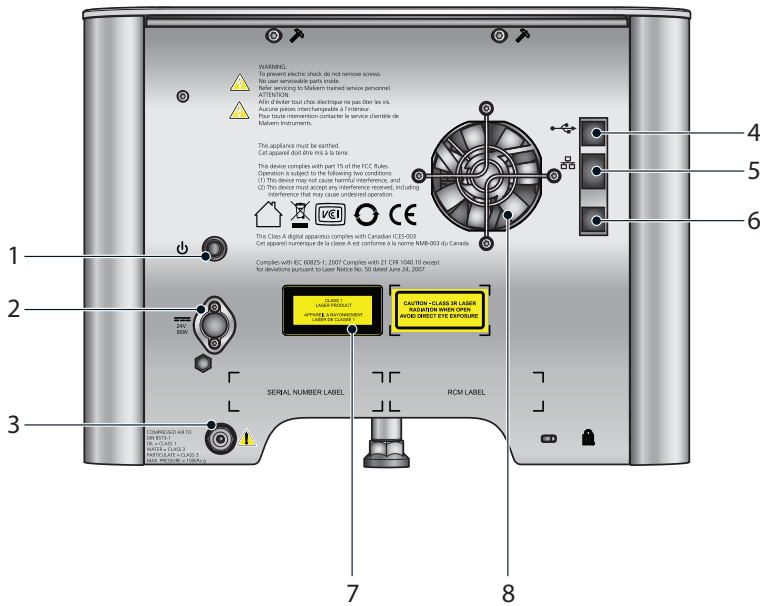
Rear panel

The rear panel provides all the connections. The following image and corresponding table describes the components on the rear panel.



WARNING!

Do not obstruct the ventilation slots underneath the instrument or the cooling fans on the rear panel.



- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Power switch 2. Power input socket - from external DC power supply 3. Purge connection 4. USB connection to computer | <ol style="list-style-type: none"> 5. Ethernet connection (diagnostic) 6. USB connection (diagnostic) 7. Laser warning label 8. Cooling fan |
|--|---|

Figure 4.3 Instrument rear panel

Cell chamber

The cell chamber is where all cells are inserted to undertake a measurement. The cell chamber controls the sample temperature over the range 0 °C to 120 °C.



WARNING!

The system is capable of heating the cell to high temperatures. Take care when removing the cells if a measurement has been made at high temperatures. Allow the cell chamber to cool before removing the cell.



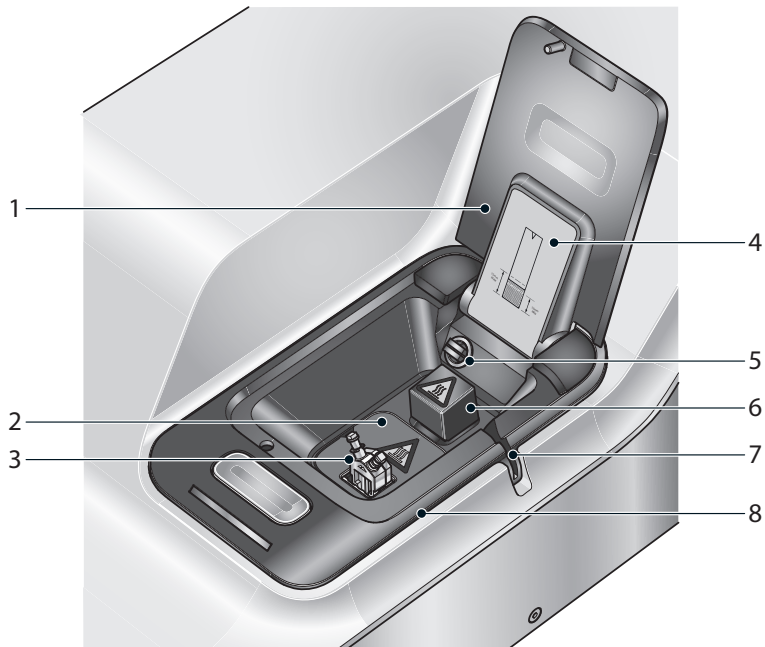
Note:

If the lid is opened with the cell area temperature above 50 °C the instrument beeps three times every few seconds to warn of high temperatures.

When the Zetasizer is initially switched on, the cell area will be driven to a default temperature of 25 °C. This will also happen if the software is closed, but the instrument is not switched off.

Press the cell access button to access the cell chamber.

The following image shows the components within the cell chamber of the instrument.







- | | |
|---|---|
| 1. Cell chamber lid | 5. Thermal contact plates holder - used with DTS1070 cells |
| 2. Cell basin | 6. Thermal cap (storage area) |
| 3. Cell holder - containing cell clamp, electrodes and drain port | 7. Tubing channel |
| 4. Cuvette fill level advice | 8. Drain channel |

Figure 4.4 The cell chamber - open

The following table describes some of the cell chamber components in more detail.

Table 4.2 Descriptions of cell chamber components

Component	Description
Cell chamber lid [1]	<p>Press the cell access button to open the lid. The lid will open allowing access to the cell chamber. When open, two safety interlocks are activated:</p> <ul style="list-style-type: none"> • Laser safety interlock - prevents any laser light from entering into the cell area. • Electrode voltage interlock - turns off any voltage to the cell electrodes. <p>To close the lid, push it down until it locks. No measurements can be made unless the lid is fully closed.</p>
Cell basin [2]	<p>The cell basin is made of an insulating material which provides protection from the heated cell holder and in conjunction with the thermal cap gives temperature stability when heating and cooling the sample.</p> <p>A warning label indicates that high temperatures may exist in the cell area.</p>
Cell holder [3] - electrodes	<p>The electrodes provide voltage for zeta potential measurements. Voltage is immediately turned off when the cell lid is opened.</p> <div style="display: flex; align-items: center;">  <p>Note: The maximum working voltage on the electrodes is ± 150 V (Measurement category I).</p> </div>
Cell holder [3] - cell clamp	<p>To keep the cell in the optimum position during a measurement, a cell clamp mechanism is incorporated into the wall of the cell holder. The clamp will push against the edge of the cell when inserted.</p> <div style="display: flex; align-items: center;">  <p>Note: When using glass or quartz cuvettes, first insert a disposable polystyrene cuvette into the cell holder. This ensures the cell clamp moves freely, and that no spilled sample has caused the mechanism to stick. Make sure to remove the polystyrene cuvette before inserting the glass/quartz cuvette.</p> </div>
Cell holder [3] - drain port	<p>In case of spillage within the cell area, there is a drain incorporated into the base of the cell holder. Any spillage will exit onto the bench area underneath the Zetasizer.</p>

Component	Description
Thermal cap [6]	<p>The thermal cap gives increased temperature stability for size measurements when heating and cooling the sample. This is important when measuring at either end of the operational temperature range. Place the thermal cap over the cell.</p> <p>WARNING!  With the thermal cap removed both the metal lining of the cap and the top of the cell holder will be exposed. Care should be taken when removing cells after a measurement has been performed at high temperatures. It is recommended that the cell area is allowed to cool before removing the cell. A warning triangle is provided on the top of the cap.</p> <p>A square recess storage position is provided in the cell chamber to store the thermal cap.</p> <p>Note:  The thermal cap is not compatible with the folded capillary cell, dip cell, high concentration cell, flow cell, or low volume disposable sizing cell.</p>
Access channel for MPT-3 Multi-purpose Titrator and flow cell tubes [7]	<p>A channel incorporated into the cell area allows sample tubes to be connected to the measurement cell. This facility is used with the MPT-3 Multi-purpose Titrator accessory. See the <i>Connecting the MPT-3 Multi-purpose Titrator</i> section in the <i>Zetasizer Advance Series Accessories Guide</i> for precise details on inserting cells with tubing.</p>
Drain channel [8]	<p>In case of spillage on the cover, a drainage channel is provided around the outside of the cell chamber. This is hidden from view under the main cover. Any spillage will flow along the drain into a hole at the back of the cell area. Any spillage will exit onto the bench area underneath the Zetasizer.</p>

Accessory options

A range of accessories and options, listed below, are available for more advanced measurement strategies. The specifications for each product are provided in the *Zetasizer Advance Series Accessories Guide*.

Table 4.3 List of Zetasizer accessories

Option	Part No.	Description
MPT-3 Multi-purpose Titrator	ZSU1001	A cost effective accessory designed to automate the measurement of size and zeta potential as a function of pH.
Auto Degasser	DEG0003	Used alongside the MPT-3 Multi-purpose Titrator, the Auto Degasser Unit continuously degasses titrants, which improves the accuracy of dispensing small volumes of titrant. This is particularly important when titrating around pH 7 where the titrant will have a greater effect on the pH compared to at more extreme pH levels.
Dip cell	ZEN1002	Used for zeta potential measurements where users do not require the benefits of the disposable DTS1070/1080 cells or where they require better chemical compatibility. Can also be used to measure in dispersants with very low dielectric constants, e.g. non-polar organic solvents.
High concentration cell	ZEN1010	For making zeta potential measurements on a concentrated aqueous sample. The cell is suitable for a broad range of conductivities.
Folded capillary cell	DTS1070/1080	A maintenance free, disposable capillary cell for size (backscatter and forward scatter) and zeta potential measurements. This cell also enables measurement using Malvern Panalytical's patented Diffusion Barrier technique for volumes as low as 20 μl and where sensitive samples, such as proteins, are being measured.
Low volume disposable sizing cell	ZSU1002	This cell is used for low volume size measurements. It can contain a measurement volume as small as 3 μl . It offers extended upper particle size range without the need to modify your sample dispersion conditions.

CHAPTER 4 HARDWARE OVERVIEW

Option	Part No.	Description
Cuvettes	See website	A range of cuvettes, including; disposable polystyrene, glass and quartz cuvettes, are available for the instrument. See the Malvern Panalytical website for more details.

CHAPTER 5 QUICK START

Introduction	40
Start the system	40
Fill cells	41
Load cells into the instrument	45
Set up a measurement	48
Run a method	54
Analyze the results	57

Introduction

This section describes the full process of making a measurement, from turning on the system through to analyzing the results. The example given is that of running a size measurement. Zeta potential measurements follow broadly the same principles.



Note:

This section does not cover how to run Titration or Particle Concentration measurements. Refer to the help system or *User Guide* for more information on these measurement types, or for more in depth information on the standard measurement types.

Start the system

Using the system for the first time

Windows 10 computers are delivered with the operating system inactivated. Follow the instructions given by Windows at startup to register and activate your copy of Windows.



Note:

You will need either to connect to the internet or to telephone Microsoft to complete the process.

Power on and start ZS XPLOERER

If it is not already switched on, do the following to turn on the Zetasizer and start the ZS XPLOERER software:

1. Close the lid, switch on power at the power socket, and turn the power switch on at the rear of the unit. The status indicator will show steady amber.
2. If it is not already switched on, turn on the computer.
3. Double-click the ZS XPLOERER Software icon on the desktop:

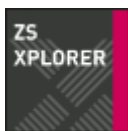


Figure 5.1 ZS XPLOER desktop icon

4. The initialization routine will then begin. When the status indicator shows steady green, the instrument has completed its initialization procedure.



Note:

Allow your Zetasizer to thermally stabilise for 30-minutes before use. If the instrument has been stored outside its nominal operating temperature range (10-35°C) a longer stabilization time maybe necessary.



Note:

You may leave the Zetasizer powered on if it is envisaged that the system will be in regular usage. We recommend the Zetasizer is switched off if it will not be used for periods longer than 2 days.



CAUTION!

After the Zetasizer is powered off, you must wait at least 5 minutes before re-powering the system.

Fill cells

This section gives information about how to correctly fill cells with sample.

Cell preparation (folded capillary cells)

For folded capillary cells, it is recommended to flush the cell to ensure cleanliness and reduce risk of bubble formation. The recommended procedure requires two syringes; filtered deionised (DI) water; and ethanol or methanol.

1. Flush the cell with ethanol to facilitate wetting.
2. Fill one of the syringes with the DI water and place in one of the sample ports on the cell, the empty syringe is placed into the other port.
3. Flush the contents of the full syringe, through the capillary, into the empty syringe, then flush back.
4. Repeat this process four more times before removing the syringes and performing a final flush with the dispersant being used for the measurement.
5. After this, the cell is ready for use.

Never attempt to clean the optical surface of the folded capillary cell as this will cause small surface scratches that will give inaccurate results.

Filling the Folded capillary cell

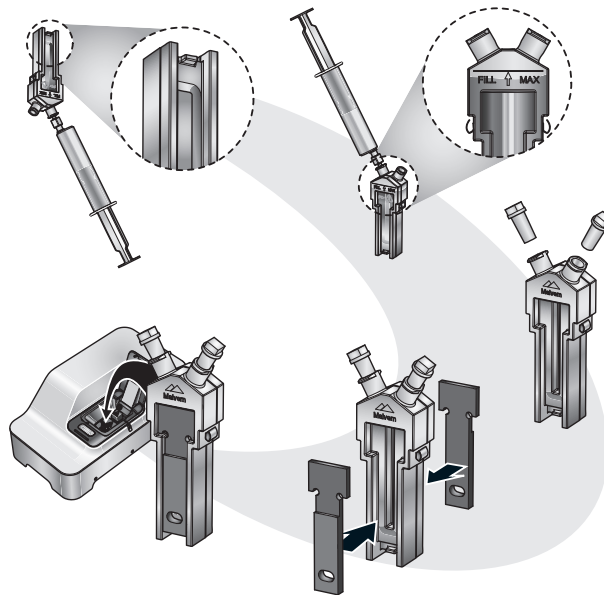


Figure 5.2 Filling a folded capillary cell

1. Invert the cell.
2. Using a syringe or pipette, slowly inject your sample into the cell, filling to just over halfway.
3. Check that no air bubbles are trapped in the cell. If there are bubbles, tap the cell gently to dislodge them.
4. Turn the cell upright and continue to inject the sample slowly, until the sample is at the top of the electrodes.
5. Remove the syringe and insert a cell stopper in each port.
6. Hold the cell near the top, away from the lower measurement area, and push into the cell holder until it stops. Ensure the Malvern logo is facing towards the front of the instrument.

Filling cuvettes

1. Fill the PCS8501, PCS1115, or DTS0012 cuvette with sample from a pipette or syringe as follows:
2. Tilt the cuvette and allow it to fill slowly, as shown.

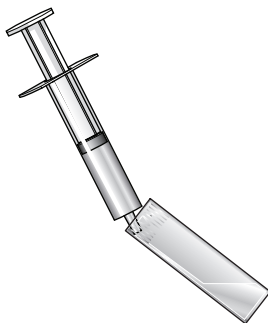


Figure 5.3 Filling the cuvette



Tip:

To stop bubbles forming, let the sample flow down the inside wall of the cuvette.

CHAPTER 5 QUICK START

3. Make sure the sample depth is between 10 mm and 15 mm by placing the cuvette against the diagram on the inside of the cell area lid, as shown:

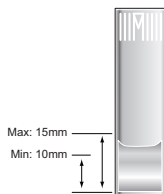


Figure 5.4 Correct sample depth

4. Push the lid securely onto the cuvette as shown:

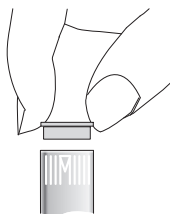


Figure 5.5 Putting the lid onto the cuvette



Note:

Most cuvettes have a triangle or spot mark, as shown below. This mark should face towards the front of the instrument.



Figure 5.6 Front-facing cuvette

Load cells into the instrument

This section gives information about how to load cells into the instrument correctly. See [Cell chamber on page 32](#) for more information about the cell chamber.

Pay particular attention to the type of cell that you are loading. Each cell has a specific direction in which it should be inserted into the cell chamber. The process is as follows:

1. Press the cell access button to open the cell chamber lid.
2. Insert the cell. Make sure that the orientation is correct.
3. If applicable, place the thermal cap on top of the cell.
4. Close the cell chamber lid after insertion.

Size cells

Insert a cuvette into the instrument in the direction shown in the following illustration:

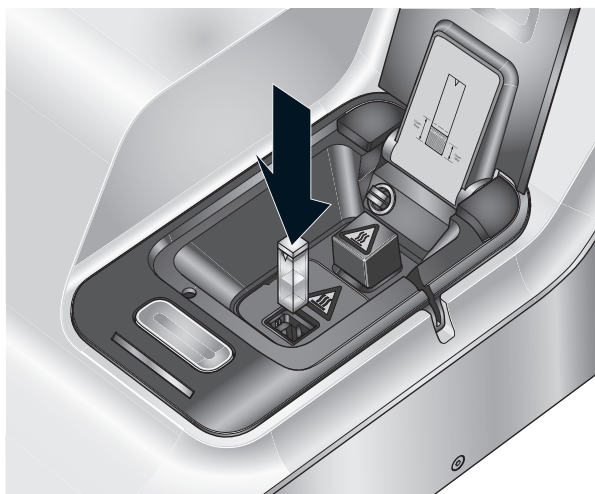


Figure 5.7 Correct cell insertion - Size cell

Zeta cells

Insert a folded capillary cell in the direction shown in the following illustration:

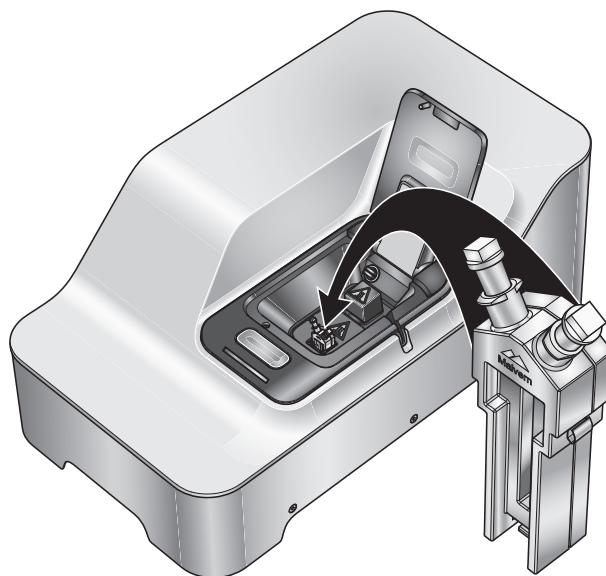


Figure 5.8 Correct cell insertion - Zeta cell



Note:

The Malvern hills logo on the folded capillary cell should face the front of the instrument when inserted.

Set up a measurement

The steps required to set up a measurement are as follows:

- Create a new **Method**.
- Specify the individual **Step** or **Group** settings.

About methods

To run a measurement you must create a **Method**.

The Method builder allows you to create methods. A Method consists of a number of **Steps** which together create a full measurement process. Steps can take the form of:

- **Measurement steps** - size, zeta, particle concentration and pH titration
- **Group** - a set of steps grouped together
- **Basic steps** - pause or show Instruction
- **Trend steps** - run steps while varying another parameter, such as pH

Once you have defined all step settings for the method, you can run it as a one-off, or save it to reuse later.



Note:

If you forget to save the method at run time, it can be extracted from results later on.

Create a method

Creating a **size** or **zeta** method is fundamentally the same process, but the types of measurement settings for each will differ.

Note:



This section gives the example of running a size measurement - for more detailed information, including details on how to run pH Titration or Particle Concentration measurements, see the Help system or the *Zetasizer Advance Series User Guide*.

1. Click **Measure**.



Figure 5.9 Selecting the Measure tab

2. Give your sample an appropriate name.

The screenshot shows a form with the following sections:

- Name:** A text input field containing the word "Zeta".
- Parameters:** A section with a green plus icon and the text "Add parameter".
- Cell:** A dropdown menu with "ZEN1002" selected.
- Material:** A dropdown menu with "Polystyrene I..." selected.
- Dispersant:** A dropdown menu with "Water" selected.
- Project:** A dropdown menu with "Project 1" selected and a green plus icon to its right.

Figure 5.10 Basic sample information window

3. Select the cell type from the drop down menu, as this influences the steps available to use.

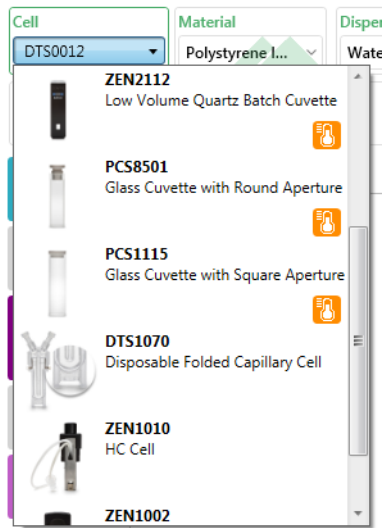


Figure 5.11 Selecting a cell type

4. Select the appropriate material and dispersant for your sample. Or, to add your own, refer to the *User Guide*.
5. Select an existing project to save the measurement results in, or create a new project.



Note:

The data is not necessarily saved to the open project within the Analyze view. Make sure you note which project your data is being saved to.

6. To build the method, add steps from the side panel by dragging or clicking.

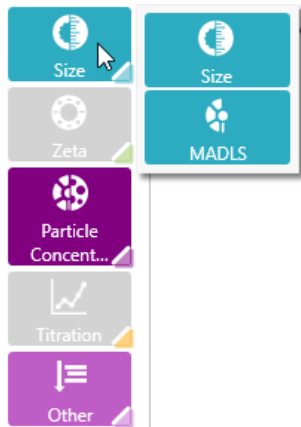


Figure 5.12 Selecting a step from the side panel

Note: Some steps may be grayed out depending on your chosen settings. For example, the cell selected in the image above cannot be used for zeta potential measurements, so the zeta measurement step is unavailable.

7. Define the required settings in the *Properties* area.

Tip: You may find it helpful to expand the *Properties* area for a clearer view. To do this, click the expand icon  in the header of the *Properties* area.

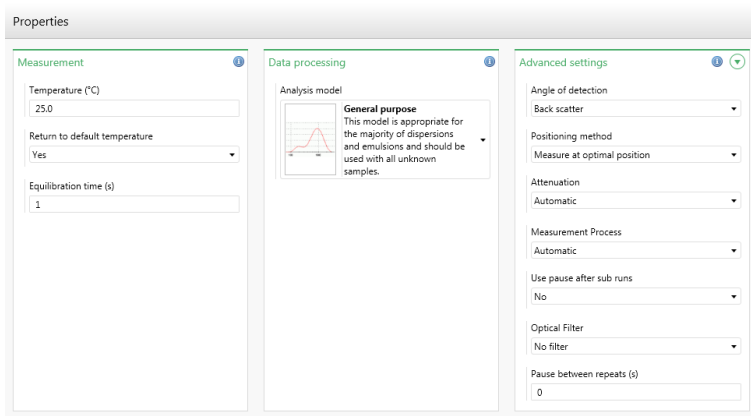


Figure 5.13 Expanded Properties window

Setting the step run order

Steps run in the order they are shown in the method, from top to bottom. Reorder steps by clicking on the gripper circled in the following image, and dragging them up or down as required:

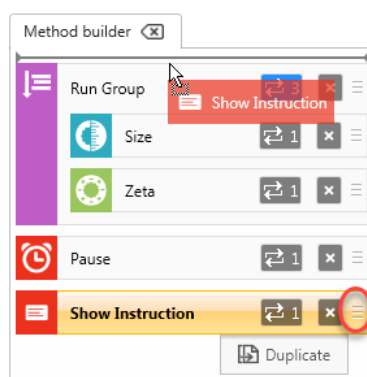


Figure 5.14 Reordering steps

Repeating steps or groups

Steps can be specified to repeat as many times as required, as can groups. Set the number of repeats by clicking on the repeat icon on the step.

In this example the step will run three times.



Figure 5.15 Repeating a step 3 times

Note:



If you repeat a zeta measurement three times, the system will only optimize once. However, if you run three separate zeta measurements, or repeat a group containing a single zeta measurement three times, then the system will optimize before each measurement i.e. three times.

Run a method

This section guides you through the process of running a method.

1. After setting up a method (see [Set up a measurement on page 48](#)), click **Start method** at the top of the window:

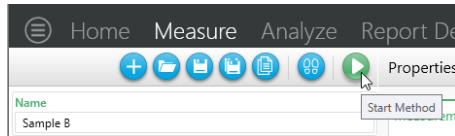


Figure 5.16 Running a method

2. The software will show the measurement progress.

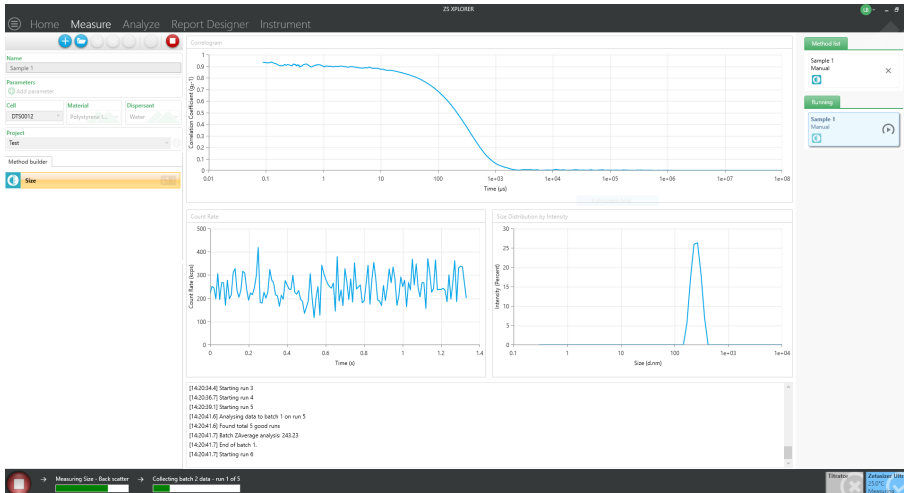


Figure 5.17 Measurement in progress

CHAPTER 5 QUICK START

- Each step runs in sequence. As the measurement is made, the graphs and *Method list* update in real time.



Tip:

You can carry on working in other areas of the software during the measurement - it is not necessary to observe the measurement taking place.



Note:

Abort the measurement at any time by clicking one of the red **Stop** buttons. The system will ask for confirmation before stopping the measurement.

- To set up a new measurement while another measurement is running, click the + button at the top of the window.

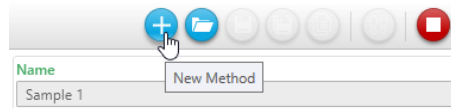


Figure 5.18 Setting up another measurement

- When the method completes, it is shown under the *Complete* tab in the *Method list*. It is also available from the general *Method list* to be edited and re-run.

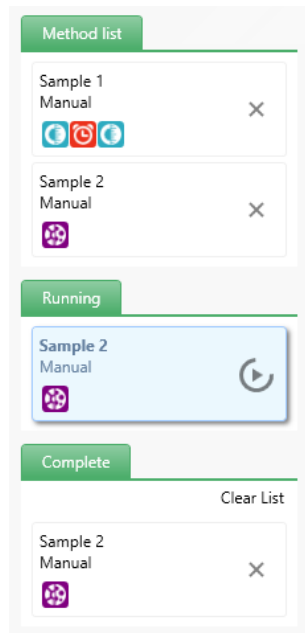


Figure 5.19 Completed measurements



Tip:

The step of the method which is currently running is shown by a flashing icon as in *Sample 2* above, where a Particle concentration measurement step is in progress.



Tip:

Clicking **Clear list** will remove the sample information from the *Method list* window. Clicking on a measurement in this window switches between their respective methods.



Note:

Clicking **Clear list** will only remove sample data from the *Method list*. You can still view the measurement data in the **Analyze** tab.

Analyze the results

This section gives information on how to analyze the results once you have run a measurement.

1. Select the **Analyze** tab from the top menu.
2. Select a measurement from the Record selector on the left.
3. Choose the **Summary**, **Size**, **Zeta**, **Particle Concentration**, **Titration** or **Custom** workspace. Each workspace displays different graphs by default. For example, the default **Size** workspace shows a Size distribution graph by Intensity, Correlogram, and Statistics table.

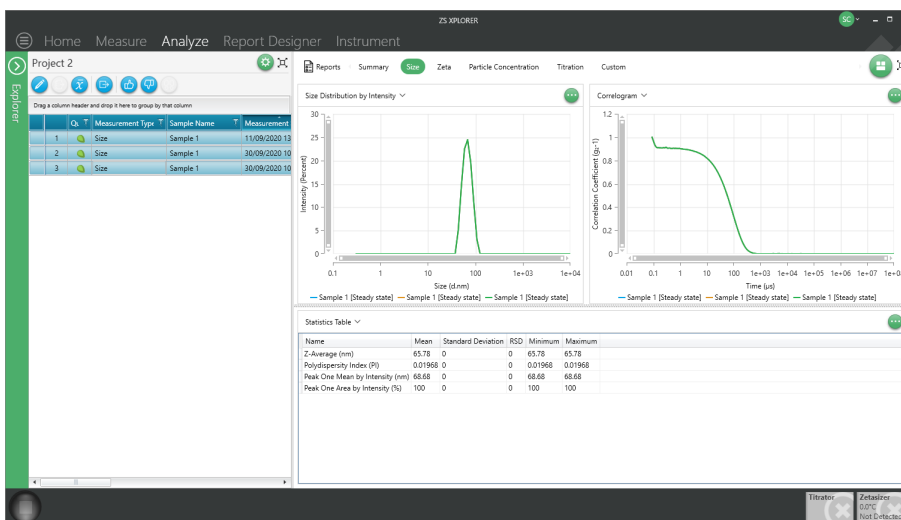




Figure 5.20 Default Size workspace



Tip:

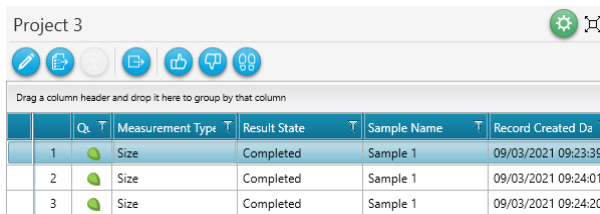
You can click  on a graph and then  to select further data options to be included in that graph. For example, the Correlogram includes the option to include *Transient* and *Unfiltered* data. This is described further in the ZS XPLORER Help and in the User Guide.

**Tip:**

To customize the workspace layout, click  in the top right corner and select a layout from the pop-up menu.


Record selector

The Record selector on the left of the **Analyze** window shows a table of results. From this table, results can be sorted by parameter values, edited, or selected for viewing in the workspace.



	QI	Measurement Type	Result State	Sample Name	Record Created Date
1		Size	Completed	Sample 1	09/03/2021 09:23:39
2		Size	Completed	Sample 1	09/03/2021 09:24:01
3		Size	Completed	Sample 1	09/03/2021 09:24:20

Figure 5.21 Record selector

To sort by a parameter value, click the relevant column header in the Record selector. To change the parameters shown, click  to open the parameter selection window:

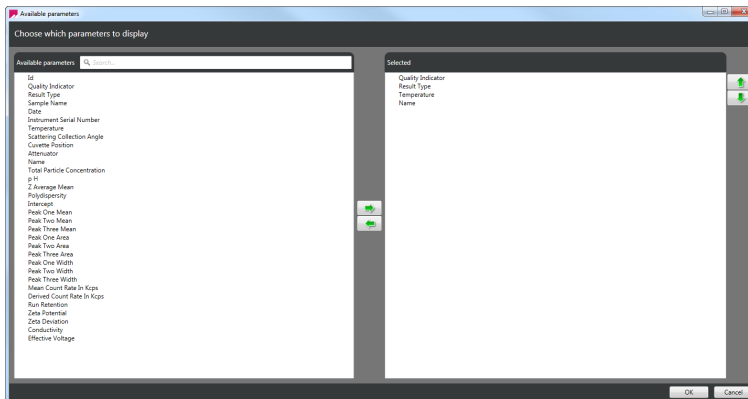



Figure 5.22 Changing the parameters in the table

The data shown in the Record selector depends on the project you have selected. Click the Explorer arrow icon  to show the Project Explorer.

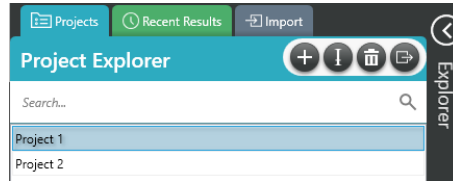


Figure 5.23 Switching between projects

Click on the required project to display it in the *Record selector*.



Note:

Each *Project* has its own table. You can choose which project your result will appear in when setting up the measurement.

CHAPTER 6 MAINTENANCE

About maintenance procedures	62
Clean cells and accessories	62
Clean the covers	62

About maintenance procedures



Note:

Maintenance procedures and details of consumable parts and kits for any accessories are provided in the *Zetasizer Accessories Guide*.

An operator can perform all maintenance procedures outlined in this section.

Clean cells and accessories

Clean cells thoroughly between measurements, especially between different types of sample. Cross-contamination between samples can significantly affect the results.

Refer to the *Zetasizer Accessories Guide* for information on cleaning and maintaining the cells and accessories associated with the Zetasizer instrument.

Clean the covers



CAUTION!

The surfaces of the system may be permanently damaged if samples or dispersants are spilled on them. If a spillage occurs, disconnect the system from the power supply before carefully cleaning it up.

Do the following to maintain the covers:

- Periodically clean the covers thoroughly using a mild soap solution.
- Never use excessive liquid for cleaning and always avoid electrical components (such as connectors) and the cell windows.
- Never use a solvent-based solution for cleaning; it may damage the surface.

APPENDIX A SPECIFICATIONS

Specifications	64
Chemical compatibility	67

Specifications

The following table lists the specifications of the Zetasizer. All specifications are correct at time of publication, but may be subject to alteration.

Table A.1 Zetasizer specifications

Size measurement specifications	
Parameter	Specification
Range (maximum diameter)	0.3 nm - 10 μm^* (Pro)
	0.3 nm - 10 μm^* (15 μm^Γ) (Lab/Ultra)
Minimum sample volume	12 μL (Pro)
	3 μL (Lab/Ultra)
Minimum concentration - Non-invasive back scatter (NIBS) (173 degrees)	0.1 mg/mL 15 kDa protein (Pro/Ultra)
Minimum concentration - Forward scatter (13 degrees)	10 mg/mL 15 kDa protein (Lab/Pro/Ultra Blue)
	5 mg/mL 15 kDa protein (Lab/Pro/Ultra Red)
Minimum concentration - Side scatter (90 degrees)	1 mg/mL 15 kDa protein (Lab/Ultra Blue)
	0.3 mg/mL 15kDa protein (Lab/Ultra Red)
Minimum concentration - Multi-angle dynamic light scattering (MADLS)	1 mg/mL 15 kDa protein (Ultra Blue and Red)
Maximum concentration - Non-invasive back scatter (NIBS) (173 degrees)	40% w/v † (bile acid) (Pro and Ultra)
Maximum concentration - Side scatter (90 degrees)	40% w/v †‡ (bile acid) (Lab and Ultra)
Measurement angles	90° and 13° (Lab)
	173° (water as sample dispersant) and 13° (Pro)
	173° (water as sample dispersant), 90° and 13° (Ultra)
Measurement technique	Dynamic light scattering (NIBS®), Multi angle dynamic light scattering (MADLS®), Dynamic light scattering (13/90/173 degrees)

Zeta potential measurement specifications	
Parameter	Specification
Size range suitable for measurement (diameter)	Minimum 3.8 nm, maximum 100 µm†
Zeta potential range	No effective limitations
Mobility range	Minimum zero, no effective maximum
Minimum sample concentration	10 mg/mL 15 kDa protein (Pro) 1 mg/mL 15 kDa protein (Ultra)
Maximum sample concentration	40% w/v †
Minimum sample volume	20 µL (using the Diffusion Barrier technique - patented)
Maximum sample conductivity	260 mS/cm
Conductivity accuracy	± 10%
Measurement technique	Mixed mode measurement Phase Analysis Light Scattering (M3-PALS)
Laser specifications	
Model	Specification
Zetasizer Blue Label Systems	<ul style="list-style-type: none"> • Type: HeNe gas laser • Max. output power: 4 mW • Beam diameter: 0.63 mm (1/e²) • Beam divergence: 1.5 mrad • Beam wavelength: 632.8 nm • Attenuation, transmission 100% to 0.0003%
Zetasizer Red Label Systems	<ul style="list-style-type: none"> • Type: HeNe gas laser • Max. output power: 10 mW • Beam diameter: 0.63 mm (1/e²) • Beam divergence: 1.5 mrad • Beam wavelength: 632.8 nm • Attenuation, transmission 100% to 0.0003%

CHAPTER A SPECIFICATIONS

General specifications	
Parameter	Specification
Detector	Avalanche photodiode QE >50% at 633 nm (Lab, Pro, Ultra)
Condensation control	Purge facility using dry air
Temperature control range	0 °C to 120 °C**
Compatible cell temperatures	0 °C - 120 °C - Glass and quartz cells 0 °C - 70 °C - Low volume disposable sizing cell 0 °C - 70 °C - Folded capillary cell, plastic disposable cells 0 °C - 70 °C - Dip cell 0 °C - 100 °C - High concentration cell
Product compliance	Product laser class 1, EN 60825-1:2014 and CDRH, LVD, EMC, RoHS
Dimensions	322 mm, 565 mm, 245 mm (W,D,H)
Weight	19 kg
Power requirements	AC 100-240 V, 50-60 Hz, 4.0 A
Power consumption	Max. 220 W
Ambient operating conditions	+10 °C to +35 °C (+50 to +95 °F) 10% to 90% RH (non-condensing)
Computer interface	USB 2.0
Recommended computer specification	Contact the Malvern Panalytical Helpdesk or website for the recommended computer specification, otherwise consult the Software Update Notification document supplied on the software CD.

* Peak mode range (diameter), 0.6 nm - 10 µm, sample and sample preparation dependent

** Temperature accuracy, 0.1 °C at 25 °C, 0.2 °C at 0 °C, 0.5 °C at 90 °C, 2.5 °C at 120 °C

† Sample dependent

‡ Using ZSU1002 low volume disposable sizing cell

Γ Indicative data available for particle sizes greater than 10 µm when using Extended size range analysis

MADLS © Multi Angle Dynamic Light Scattering

Chemical compatibility

Components of the Zetasizer that may come into contact with the sample are manufactured from materials that are considered to give the widest protection to stop degradation. However, it is important to check that any sample or titrant used is chemically compatible with the materials mentioned.



WARNING!

Malvern Panalytical advises that before inserting a sample, you check its chemical compatibility against the materials identified below. It is also recommended that you perform a test on the material with the sample before continuing with more permanent usage.

For details on cleaning and maintenance procedures, see [Maintenance on page 61](#).

Cell chamber

The only time the cell chamber may come in contact with the sample is if there is a spillage from the cuvette or cell. The materials list below details all components that may come into contact if this occurs.

Table A.2 Cell chamber materials

Component	Materials
Cell basin assembly (lid, basin and drain channel)	High impact polystyrene The outside of the cell basin and top of the cell lid are coated with a solvent resistant paint. This paint displays similar resistance properties to polypropylene. The inside of the cell basin and drain channel are not coated.
Drain tube	Tygon, F-4040-A
Electrodes	Gold plated beryllium/copper
Cell holder	Aluminum (anodized)

Cells and cuvettes

Refer to the descriptions in the *Zetasizer Accessories Guide* for the materials used for each of the available cells.

APPENDIX B REGULATORY

CE Declaration of Conformity	70
Canadian Regulatory Information (Canada only)	70
VCCI acceptance (Japan only)	70
FCC Notice (US only)	71
Disposal of Electrical & Electronic Equipment	72

CE Declaration of Conformity

The CE badge on this product signifies conformance to the relevant European Directives - consult the Declaration of Conformity certificate for the product for more information.

Canadian Regulatory Information (Canada only)

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Note that Canadian Department of Communications (DOC) regulations provide, that changes or modifications not expressly approved by Malvern Panalytical could void your authority to operate this equipment.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

VCCI acceptance (Japan only)

The Voluntary Control Council for Interference (VCCI) mark on this product signifies compliance to Japanese EMC regulations as specified by VCCI.

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用する
と電波妨害を引き起こすことがあります。この場合には使用者が適切な対策
を講ずるよう要求されることがあります。 **VCCI-A**

Translation:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

FCC Notice (US only)

The Federal Communications Commission (FCC) mark on this product signifies conformance to FCC regulations relating to Radio Frequency Devices. These have been satisfied by testing the product against, and being found to be compliant with:

FCC CFR 47 Part 15:October 2011.Class A digital device.

The device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Note:



This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



Note:

Changes or modifications not expressly approved by Malvern Panalytical could void the user's authority to operate the equipment.

Disposal of Electrical & Electronic Equipment

When the need arises to dispose of the system, this should be done in a responsible manner. Follow these guidelines:

- Refer to local regulations on disposal of equipment; in Europe refer to the information below.
- Seek advice from the local Malvern Panalytical representative for details.
- Decontaminate the instrument if hazardous materials have been used in it.

The following is applicable in the European Union and other European countries with separate collection systems.



This symbol on the product or on its packaging indicates that when the last user wishes to discard this product it must not be treated as general waste. Instead it shall be handed over to the appropriate facility for the recovery and recycling of electrical and electronic equipment.

By not discarding this product along with other household-type waste, the volume of waste sent to incinerators or landfills will be reduced and natural resources will be conserved.

For more detailed information about recycling of this product, please contact your local city office, your waste disposal service, or your Malvern Panalytical representative.



**Malvern
Panalytical**
a spectris company

MALVERN PANALYTICAL

Malvern Panalytical Ltd.
Groewood Road, Malvern,
Worcestershire, WR14 1XZ,
United Kingdom

Tel. +44 1684 892456
Fax. +44 1684 892789

MAN0593-06-EN

Malvern Panalytical B.V.
Lelyweg 1,
7602 EA Almelo,
The Netherlands

Tel. +31 546 534 444
Fax. +31 546 534 598

www.malvernpanalytical.com