ZTS1240
VALIDATE YOUR ZETASIZER NANO SERIES SYSTEM

Introduction

Electrophoretic Light Scattering (ELS) is a first principles measurement and as such calibration is not required. However, regular verification that your system is operating as intended is recommended.

The zeta potential transfer standard (ZTS1240) is provided to help you with on-going zeta potential measurement Performance Verification of your Zetasizer Nano system(s).

ZTS1240 is supplied in 10 mL ready-to-use syringes and as such does not require any sample preparation prior to use. It is primarily intended for use with our folded capillary zeta cells, DTS1070, but may be used with other zeta capable cell types that are supported by your Zetasizer Nano system.

For details on how Malvern Panalytical validates the zeta potential transfer standard and how upper and lower limits are established please see the document "Validation of ZTS1240 Zeta Potential Transfer Standard" available from the Malvern Panalytical website.

Upon receipt of your box of 10 syringes of Zeta Transfer Standard:

Check the integrity of the packaging and that the contents have not leaked.

Exposure to high temperatures should be avoided. To confirm that this has not occurred during shipping, a temperature tell-tale label is provided on the outer packaging.

Please check this upon receipt; If the Zeta Transfer Standard has been exposed to temperatures of 49 °C or above the temperature tell-tale will indicate so with three or more black, filled, circles.

If this should occur the standard should be deemed unsuitable for use and discarded as per your local regulations. Please contact your supplier with details of the affected batch number, your order number and date of purchase for replacement.

CAUTION!
Make sure that use of this standard is in accordance with the safety data sheet (SDS) and applicable local regulations.

Storage

Short term storage in a cool place is acceptable and the Zeta Transfer Standard ships at ambient temperatures, however the recommended storage conditions are in a refrigerator (+4 - +8°C). Do not allow the standard to freeze and keep away from direct contact with any exposed cooling elements within the refrigerator to avoid accidental freezing.

System verification using ZTS1240

The following guidance focuses on verification of your system using the Zeta Transfer Standard in combination with a folded capillary zeta cell, since use of a new, correctly prepared capillary cell is the most robust format; avoiding any possibility of the cell being contaminated by previous use, or not functioning correctly through some other cause.

After verifying performance of the system, the Zeta Transfer Standard may subsequently be used to verify performance of other zeta capable cell types that are supported by your Zetasizer Nano system.

Before use

Remove the number of syringes you intend to use from refrigeration and allow to equilibrate to ambient temperature (approx.15 - 25°C) naturally by placing in the environment they will be used in for at least one hour prior to use.

CAUTION!
Do not heat the Zeta Transfer Standard to speed up the temperature equilibration time.

Check that the Zeta Transfer Standard is within its USE BY date by checking the label on the syringe.

Ensure you have a new DTS1070 capillary cell for use.

Note:
During preparation and loading of the capillary cell, ensure that the outer surfaces of the cell and cell electrodes do not become wet. If they do, carefully dry before proceeding to the measurement. Avoid touching the cell in the optical area (lower region of the capillary cell). Extra care must be taken if contamination of the optical area of the cell has occurred and any contamination must be removed using a lint free cloth.

Prepare the DTS1070 capillary cell

Before using a folded capillary cell for the first time it is recommended that the cell be wetted using the following procedure:

1. Fill a clean syringe (5-10 mL) with either ethanol or methanol (analytical grade or better).
2. Connect the syringe to one of the fill ports of the folded capillary cell.
3. Flush the folded capillary cell with the alcohol in the syringe.
4. Three quarter fill a clean syringe (5-10 mL) with deionized water and connect it to one of the fill ports of the folded capillary cell.
5. Connect a second clean syringe (the same volume/size as in step 4 above) to the other fill port of the folded capillary cell.
6. Ensure both syringes are connected securely to the folded capillary cell.
7. Flush the contents of the full syringe through the cell into the empty syringe.
8. Flush the liquid back and forth between the syringes five times.
9. Remove the full syringe and discard contents.
10. Remove as much of any residual water from the cell into the empty syringe, inverting the folded capillary cell will help with this.

11. Remove the remaining syringe and discard contents.

Fill the DTS1070 with ZTS1240

With a new syringe of Zeta Transfer Standard that is equilibrated to room temperature (approx. 15 - 25°C), fill the pre-wetted DTS1070 cell in the following way:

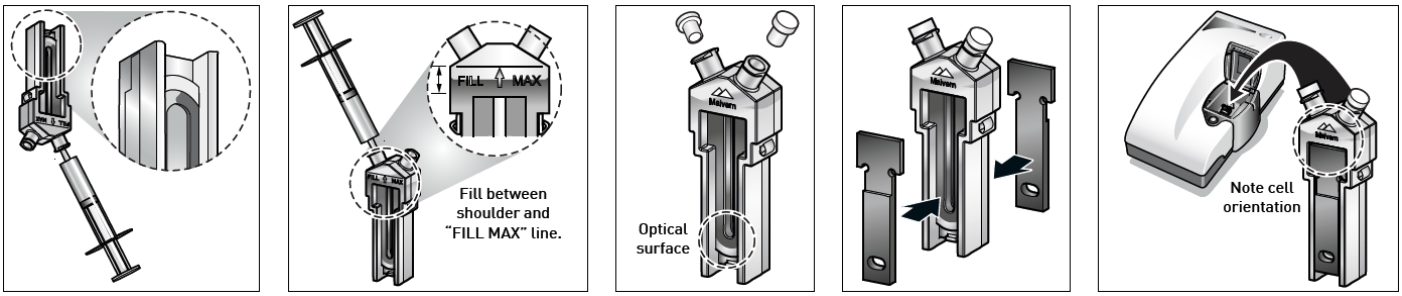

Figure 1: Wetting, filling and insertion of the folded capillary cell

1. Remove the protective cap from the Zeta Transfer Standard and, holding the syringe with Luer tip upwards, tap the syringe to dislodge any accumulated air bubbles, allowing them to collect at the syringe tip. Discharge a small amount of Zeta Transfer Standard to remove any air from the tip of the syringe.
2. Invert the folded capillary cell and securely attach the Zeta Transfer Standard syringe to one of the folded capillary cell fill ports.
3. With the folded capillary cell in its inverted position, slowly inject the Zeta Transfer Standard sample from its syringe into the cell, filling the capillary to just over halfway.
4. Check no air bubbles form in the cell. Tap the cell gently to dislodge any that do form.
5. Turn the folded capillary cell upright and continue slowly injecting the sample until the level is between shoulder and the "fill max" line, marked on the folded capillary cell.
6. Check again for bubbles in the cell. Tap the cell gently to dislodge any bubbles, top up with transfer standard as necessary.
7. Check that the internal faces of the gold electrodes are completely immersed.
8. Remove the Zeta Transfer Standard syringe and insert a cell stopper in to each fill port.
9. Remove any liquid that may have spilt on the outside of the gold electrode contacts that could interfere with electrical contact.
10. Check the optical area (bottom of the capillary) for any contamination or finger marks, remove any contamination with a lint free cloth.
11. Your zeta potential transfer standard is now ready to use.

Measure the ZTS1240 Zeta Potential Transfer Standard

With your freshly prepared sample of zeta potential transfer standard in the folded capillary cell follow the steps below.

Before commencing, ensure that you have access to the correct Zetasizer Nano SOP for ZTS1240 – the SOP is named "Zeta potential test sample v2 DTS1070.sop" and will be located in the Zeta folder of your SOP folder location this is

typically - C:\Users\UserName\Documents\Malvern Instruments\Zetasizer\SOP\Zeta\ on software versions 7.13.1 or later.

For Zetasizer Nano software versions between 7.02 to 7.13 the SOP can be downloaded as a ZIP file from the Malvern Panalytical Zeta Transfer Standard Web Page (www.malvernpanalytical.com/zts1240) . The ZIP file is named as "Zetasizer Nano Range ZTS1240 SOPs.zip". Once downloaded and unzipped, copy the contents into your SOP folder, typically - C:\Users\UserName\Documents\Malvern Instruments\Zetasizer\SOP\Zeta\.

1. Fit the thermal contact plates (NVA0823) to the outside of the folded capillary cell.
2. Place the cell into the instrument ensuring that the Malvern Hills Logo is facing towards the front of the instrument. Press down until the cell clicks into place.
3. Open and run the SOP Zeta potential test sample v2 DTS1070.sop.
4. When the SOP has completed create an average of the resulting records.

Assess the results

The individual and averaged zeta potential results must fall within minimum and maximum limits for the zeta potential transfer standard as presented in Table 1.

Test Parameter (units)	Minimum	Typical	Maximum
Zeta Potential (mV)	-45.8	-40	-34.2

Table 1 Limits for ZTS1240 measured on Zetasizer Nano using our recommended SOP

If the mean zeta potential is between the limits specified within table 1 then the instrument should be considered to have passed its zeta potential measurement performance verification.

Troubleshooting

If one or more of the results failed to pass the required specification, then check the following points, rectify and repeat the test.

1. Ensure that the correct SOP and disposable folded capillary cell (DTS1070) are being used.
2. Ensure that the Zeta Transfer Standard is within its USE BY date and has temperature equilibrated.
3. If the Zeta Transfer Standard syringe has been previously used, select a new syringe to refill the cell from and repeat the measurement.
4. Check the cell wall zeta potential is not significantly more negative than -60 mV, this may indicate contamination of the cell. If it is, then flush the cell as per the wetting instructions above, refill and repeat the measurement. If high wall zeta is still recorded, then replace the folded capillary cell and repeat from the beginning of the procedure.
5. Remove the folded capillary cell from the instrument and carefully recheck for any bubble formation generated during the experiment. Bubbles in the optical area of the folded capillary cell or at the electrode surfaces can adversely affect your measurements, tap gently to remove bubbles or partially refill the cell with Zeta Transfer Standard in the case that bubbles cannot be cleared easily. A low conductivity reading, below 0.20 mS/cm, can be indicative of shorting due to air bubbles or poor electrical contact between the instrument and folded capillary cell (see 6 & 7).

6. Check that the conductivity of the sample is not less than 0.2 mS/cm. A lower value may indicate poor electrical contact. Inspect the external electrical contacts at the electrodes on the folded capillary cell to ensure they are free from damage (bent or broken).
7. Check that the capillary cell was inserted fully into the instrument. Check the cell holder for any debris that may prevent full insertion of the folded capillary cell. After a successful visual inspection, check that the cell electrode contacts are touching the instrument contacts when the cell is re-inserted.
8. Repeat the check of the optical area of the cell for imperfections which might have been introduced (for example smudges or scratches). Replace the cell if imperfections are found. A Zeta Deviation value greater than 12mV for measurements performed in a capillary could indicate an optical imperfection or contamination of the folded capillary cell optical zone.

Further actions in the case of repeated failures

Instrument issues are rare, however can occur. To further rule out problems with the batch of Zeta Transfer Standard or the cell being used, the following steps should be taken wherever possible:

1. Where an alternative batch of Zeta Transfer Standard is available, the system should be retested with this. Repeat the measurements in a new, correctly prepared, folded capillary cell.
2. Check the Reference Beam Count Rate, values less than 1000 kcps may indicate an alignment or laser power issue with your system.

If, upon checking all the above points and repeating the testing, your instrument continues to fail the specifications in table 1 then contact your Malvern Panalytical representative for further advice.

Please ensure that you have the following information to hand:

- Serial number of the instrument under test.
- Zetasizer software version.
- Details of the measurement SOP used.
- Batch number(s) of the Zeta Transfer Standard tested.

Note:
To aid diagnosis, you may be asked, if possible, to provide a *.dts measurement data file containing the measurements where issues have been encountered.

General advice for verification of zeta capable cell accessories, and use with Zetasizer Nano software versions below 7.02

Cleaning and preparation of the accessory will be key to correct performance. Refer to the Zetasizer Nano accessories User manual for advice if required.

Where there is not an appropriate preconfigured SOP already available in the software, create a new zeta SOP using the following general guidelines, leaving settings that are not specifically mentioned as the default values:

- Measurement type: Zeta Potential.
- Temperature: 25 °C
- Equilibration time (seconds): 120 s (minimum – consider allowing longer for cells with a large thermal mass that may take longer to stabilize at the 25 °C measurement temperature).
- Cell: Select the Cell type being verified.
- Measurement: Set the Number of measurements to 3 repeats
- Measurement: Delay between measurements (seconds) to 60 s.

After performing the SOP create an average of the three measurements.

Check the reported average zeta value against those for the Zeta Transfer Standard provided in table 1.

Malvern Panalytical
a spectris company

MALVERN PANALYTICAL

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

Tel: +44 1684 892456
Fax: +44 1684 892789

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

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

info@malvernpanalytical.com
www.malvernpanalytical.com