TOP 10 THINGS TO CONSIDER WHEN MIGRATING BETWEEN THE MASTERSIZER 2000 AND MASTERSIZER 3000

Abstract:

Previously, we’ve published 11 things to consider when purchasing a laser diffraction system. With the launch of the Mastersizer 3000, how can you choose between the Mastersizer 3000 and the popular Mastersizer 2000 that has sold more than 11,000 units worldwide?

This white paper outlines the new capabilities of the Mastersizer 3000 and highlights the support Malvern provides to help you transfer methods from the Mastersizer 2000 to the new system.
1. HOW MUCH BENCH SPACE DO YOU HAVE?

<table>
<thead>
<tr>
<th>MS3000</th>
<th>MS2000</th>
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</thead>
<tbody>
<tr>
<td>690mm x 300mm x 450mm (LxWxH)</td>
<td>1293mm x 255mm x 375mm (LxWxH)</td>
</tr>
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</table>

Laser diffraction is now the world's most widely applied method for particle size analysis as part of quality control. As the technique has moved into standard laboratories, the pressure on bench space becomes an important consideration. In designing the Mastersizer 3000, Malvern has shortened the system footprint by almost half. The dispersers are also reduced in size and weight. This gives you the flexibility to place the system in the fume hood and frees up space for other vital equipment.

2. WHAT MEASUREMENT SIZE RANGE DO YOU REQUIRE?

<table>
<thead>
<tr>
<th>MS3000</th>
<th>MS2000</th>
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</thead>
<tbody>
<tr>
<td>10nm – 3500μm</td>
<td>20nm – 2000μm</td>
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</table>

When you purchase a particle size analyzer, you need one which can keep pace with your own product development requirements. This often means that acquiring an instrument which can operate over a wide particle sizing range can be advantageous to you and your organization.

In order to measure over a wide range, most laser diffraction systems use multiple wavelengths of light, or multiple light sources. There is also a requirement to measure over as extensive a range of scattering angles as possible. In the Mastersizer 3000, we have engineered our smallest
detector yet, enabling us to measure an upper size limit of 3.5mm, even though the optical bench size is much shorter than the Mastersizer 2000. In addition, we optimized the way measurements are made at different wavelengths. The Mastersizer 3000 introduces the red and blue light sources to the sample on exactly the same path. This allows much better integration of the red and blue scattering data into one result, offering better sensitivity in the 10nm-1000nm size range.

3. HOW MUCH SAMPLE DO YOU NEED FOR A MEASUREMENT?

Different applications require different dispersers. We know that some materials are best measured using dry dispersion, with the Aero S or the Scirocco 2000 dispersers, whereas others will need to be measured using liquid dispersion with our Hydro series of dispersion units.

Now the question is, how much material do you have? For dry dispersion, we can easily measure large samples of up to 10g using the hopper-based sample tray designed for the Aero S. However, the improvements we’ve made in dispersion efficiency, in combination with the ability of the Mastersizer 3000 to measure at an rapid data acquisition rate of 10,000 measurements a second, mean we can analyze small sample quantities as well. Although the smallest quantity we can measure is sample dependent, we have proven that the Aero S can measure as little as 5mg, and has precise dispersion pressure control for dispersing friable materials such as pharmaceutical actives or other organic compounds.

For typical wet applications, the Hydro LV provides similar capabilities to the Hydro 2000G, enabling larger samples of polydisperse materials to be measurements. For smaller sample quantities, the Hydro MV provides a
replacement for the Hydro 2000S, helping you minimize both the use of expensive organic dispersants and samples. All of the Mastersizer 3000 liquid sample handling units are chemically compatible, ensuring a wide range of dispersants can be used. Direct software control of variable power in-line sonication, sample pumping/stirring, system cleaning and dispersant filling are provided. If your samples do not require internal sonication, a syringe injection method can also be performed using the Mastersizer 3000’s wet measurement cell. This brings the total dispersant volume down to 10-15ml.

4. HOW EASY TO USE IS THE SOFTWARE?

The Mastersizer 2000 has always been praised for its software flexibility and ease of use. In developing the Mastersizer 3000, we wanted to build on this capability, bringing it up to date using the latest Microsoft software development tools.

When you look at the new Mastersizer 3000 software, all the elements you’d recognize from the Mastersizer 2000 are there, including the records view, report views, SOPs and data export capabilities. However, we’ve now made everything easier to access and set up. For example, reports can now be configured in-place. Filtering and sorting of measurement records has been significantly improved, allowing you to more easily find data relating to different product types. We’ve also made it possible to compare measurements between different measurement files without needed to make multiple copies of records. Finally, a new SOP comparison tool makes it easy to compare the methods applied in creating results, making it easier to detect any method differences and therefore troubleshoot any issues with measurement reproducibility.
5. HOW IS METHOD DEVELOPMENT CARRIED OUT?

The Mastersizer 3000 measurement interface is designed to provide you with instant feedback on the measurement process, allowing you to easily follow the process of method development. A new measurement manager guides users through each stage of the measurement process. During method development, it also gives direct access to all of the dispersion unit controls, allowing you to explore how changes in the dispersion conditions affect your measurements. The biggest improvement we’ve made over the Mastersizer 2000, however, is the inclusion of a live result trend view. This shows the current result and light scattering data along with a trend plot showing how the sample particle size has changed during the measurement sequence. This immediately allows you to assess the stability of your measurements. Automatic statistics calculations (mean, max, min, standard deviation) are also provided, allowing you to check if the measurement repeatability is within acceptable limits.

6. HOW DO YOU KNOW IF YOUR DATA QUALITY IS GOOD?

At Malvern, we always try to provide good training and support, in order to enable you to get the most out of your investment in a Mastersizer particle size analyzer. However, wouldn’t it be great to have a Malvern expert with you in the lab, to advise you on the quality of the measurements you make? The new Mastersizer 3000 Data Quality tool offers this capability, helping you to understand how your measurements can be optimized. Once this is done, we can also check the variability of your data, confirming whether your results meet the reproducibility...
Top 10 things to consider when migrating between the Mastersizer 2000 and Mastersizer 3000

requirements outlined in norms such as ISO13320:2009 and USP<429>. There is also an option to build in custom calculations for calculating your own quality parameters if needed.

7. HOW EASY IS THE MAINTENANCE OF THE SYSTEM?

With laser diffraction being used within many quality control applications, the data generated using the technique has become increasingly critical to the operation of business. This places requirements on the quality of the results generated by the system. However, it also requires that the system be easy to maintain between routine measurements.

The requirement for easy maintenance has led to the design of a new measurement cell for the Mastersizer 3000 system. The need for special tools and manual tightening of the measurement cell windows, such as is required with the Mastersizer 2000, has been removed. With Mastersizer 3000 a simple flip of a lever splits the measurement cell, making for faster and easier access to the inner surfaces of the cell windows for cleaning. This makes it easier to keep the system working optimally.
Malvern also understand that it can be difficult to remember to carry out routine maintenance tasks. To address this, we’ve introduced a maintenance scheduling tool in the Mastersizer 3000 system, which enables you to set up reminders for users to carry out simple preventative maintenance tasks. This can also be used to schedule yearly verification checks or routine service visits. In addition, a new system health check tool is available to ensure your system is set up correctly and responding to software commands as designed.

8. CAN YOU TRANSFER MEASUREMENT DATA FROM MASTERSIZER 2000 TO MASTERSIZER 3000?

Yes! From the outset, the Mastersizer 3000 has been developed with all the features required to ease method transfer from the Mastersizer 2000. Mastersizer 2000 record files can be opened within the Mastersizer 3000 software. What’s more, if the data is saved in a Mastersizer 3000 format measurement file (*.mmes) you can then reanalyze your results in the Mastersizer 3000 software using all of the standard analysis options from the Mastersizer 2000 software. The Mastersizer 3000 software therefore provides a long-term solution to accessing your archive of measurement results.
9. CAN YOU TRANSFER YOUR METHODS AND SPECIFICATIONS FROM THE MASTERSIZER 2000 TO THE MASTERSIZER 3000?

We have found that the MSastersizer 3000 gives measurements which are very close to the Mastersizer 2000. For this reason, many Mastersizer 2000 users have already transferred across to the new system. Malvern is also happy to analyze your samples to show the agreement between the two systems, to help you make your decision.

For course, there may be situations where differences in analysis performance may be observed. In particular, the measurement range of the Mastersizer 3000 system is wider than the Mastersizer 2000, which may cause particles to be measured which could not be observed using the Mastersizer 2000. In addition, we improved the measurement resolution below 1 micron for both wet and dry measurements. In order to cover these situations, Malvern has developed a Mastersizer 2000 analysis mode within the Mastersizer 3000 software. When this is used, the capabilities are the new system are switched to be exactly like the Mastersizer 2000, making specification transfer much easier to achieve.
10. DO YOU STILL GET SUPPORT FOR YOUR MASTERSIZER 2000 SYSTEM?

Every product has an end of life. Malvern make provisions and planning for hardware, software and applications support for up to seven years beyond the end of a product’s production cycle, and try our best to provide support beyond this if we can. As a result, there will be a significant period of time where both the Mastersizer 2000 and Mastersizer 3000 system will be supported together. Clearly, however, the expected lifetime of the Mastersizer 3000 extends further into the future compared to the Mastersizer 2000. This is why Malvern have worked hard to enable transfer to the new system to be achieved as easily as possible. We also offer full planning and assistance to our customers when change occurs.
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