Controlling the Quality of Liquids
Breaking New Ground
An Innovative Concept
for the Quality Control of Liquid Samples

- Smart instruments
- Efficient teams
- Powerful systems

Tokar
Head of Quality Assurance

Automation. Combination. Integration: LiquiPhysics™
Excellence is so much more than reliable stand alone instruments – it is a highly flexible concept.

Density Meters
DM density meters determine the density and/or specific gravity of liquids quickly and accurately. The results are automatically converted into one or several pre- or user-defined units such as Brix, API degrees and alcohol concentrations etc.

Refractometers
Brix, refractive index or concentrations of thin, highly volatile, dark or viscous liquids. RM refractometers master the quality control of a wide variety of challenging samples.

Cell Modules
Density and refractive index are frequently determined in the same lab and, increasingly frequently, simultaneously. The upgrade of an instrument with a DX density cell module or an RX refractive index cell module is the most cost effective and space-saving solution – making it the perfect combination for any lab demanding fast and accurate results.
Flexible Expansion
LiquiPhysics™ Excellence can combine more than density and refractive index. The systems can also be flexibly upgraded to measure pH, conductivity and color simultaneously.

The Perfect Solution Today –
A Valuable Foundation for Tomorrow
Sugar and Alcohol
Plain Vanilla with One Click™

• Pioneering product-oriented approach
• Automatic error detection
• Advanced barcode features

Effortless
With Smartcodes™, LiquiPhysics™ Excellence takes a decisive step forward in barcode reading initiatives. If the sample name and product information are specified within a barcode, measurements can be started by simply scanning them in eliminating even the need to click a button!

Safe
Most measuring errors due to air bubbles, remaining rinsing liquids, faulty adjustments and solid particles are eliminated. Comprehensive test and error detection capabilities automatically detect such errors and warn operators accordingly.

Straight
Thanks to the innovative One Click™, an operator simply clicks on the type of product to be examined. The measurements are carried out with ideal settings and the results are automatically compared with correct target values and limits. No method to select, no settings to change, no results to judge and therefore-no errors!

Yolanda
Quality Control Assistant

Fruit juice, concentrates and even pulp. Thanks to invaluable options, the RM refractometers can cope with practically any type of sample.
When determining Brix, cleaning is often more time consuming than the all important measuring process. No more wasted time with the RM refractometers. Cleaning is much easier or can even be skipped when working with a FillPal™ sampling pump.

Reliable Measurements with Greatly Reduced Effort
Flavor and Fragrance
Robots that Cater to Specific Industries

- Effortless barcode reading
- All parameters measured simultaneously
- Smooth ERP integration

Bernhard
Senior Perfumer

LiquiPhysics™ Excellence is comprised of all the tools to automate the determination of the most relevant parameters within the routine quality control of flavors and fragrances.

Non-stop
ScanStraighth™ provides the most simple and convenient way to input sample data when performing measurements on a sample changer. Once the vials are placed on the tray, LiquiPhysics™ Excellence takes care of the rest automatically.

All-round
Several properties are determined in each sample within the quality control of flavors and fragrances. LiquiPhysics™ Excellence can perform all such measurements in one run saving time, space and money.

Cross-linked
High sample throughput means highly increased data output. A seamless integration of the tools used for quality control with ERP or LIMS intelligently organizes and controls all data. The LabX™ PC software creates the required connectivity while expanding system capabilities.
Comprehensive – Sample List Import
Automated production environments generally provide sample lists containing all the relevant data for quality control in an electronic format. LabX™ can use such data directly to entirely automate the QC process.

Production and Quality Control
Closely Connected
Fuel and Lubricants
Refined Features for Harsh Environments

- Powerful sampling
- Efficient cleaning
- Contact-free operation

Bob
Shift Supervisor

Density, refractive index and color in one sample run. LiquiPhysics™ Excellence offers first class performance for the quality control of lubricants.

Rugged
No mouse to connect, no button to click: Gloves protect your skin as the ErgoSens™ protects your instrument. The sensor makes the instrument obey a simple hand movement – no need to touch anything to start measurements!

Versatile
Concerned about bunker oils, viscosity improvers, lubricating grease or paraffins? Let Liqui-Physics™ Excellence take care of them! The powerful SC1 and SC30 automation units can completely automate the measurements of such products, even for samples that are solid at ambient temperature.

Efficient
The SC1 and SC30 automation units save time and money: The solvents used for cleaning are mixed with air and pumped through the system at high speed resulting in a strong pulsating flow. In addition to saving time, this process uses less rinse solvents as well.
When measuring petroleum products, hexane and toluene are good for cleaning, but prolonged exposure can be harmful. Automatic measuring systems protect operators from direct contact with toxic solvents or vapors.

**Convenient Health Protection**

**High Occupational Safety**

**Low Operational Costs**
Drug Development and Production
Compliance at Your Fingertips

- Full 21 CFR Part 11 support
- Biometric user management
- Unambiguous documentation

Paul
Lab Manager

Extensive monitoring functions, combined standards and barcoded certificate data: LiquiPhysics™ Excellence is a collection of excellent tools to ensure data security.

Security
From stand alone instruments to full-blown computer controlled multi parameter measuring systems. LiquiPhysics™ Excellence offers complete user management in every configuration. This includes LogStraight™, the most secure and fastest way to inform the system about operator details.

Traceability
LabX™ laboratory software offers full support to comply with the 21 CFR Part 11 regulations. Audit trails, versioned methods and extensive test and adjustment histories are only a few examples of the traceability features LabX™ offers.

Integrity
LabX™ conveniently manages measurement results, performance tests and adjustments – presenting them in reports which can be freely adapted to correspond to a specific corporate layout.
Automated Combined Performance Tests

Combined liquid reference materials from METTLER TOLEDO are certified for both density and refractive index. They come in vials which can be directly used on the SC1 and SC30 automation units without any need for a syringe.

Convincing Concepts

Ensure Consistent Data
Maximum Performance
Requires More than Excellent Instruments

• Amazing solutions to maximize security
• Qualified support to provide proper installation
• Comprehensive service offering to ensure smooth and continuous operation

Reliable Systems

Powerful automation units reduce work and increase certainty
The SC1 and SC30 automation units provide additional security while reducing the work involved in measurement taking.

They offer:
• Maximum ease of use. Handling errors are greatly reduced.
• Automatic possible error source detection. Erroneous results can be safely ruled out.
• No direct chemical contact. Increased operator safety.
• WasteSens™ level sensor eliminates the risk of overfilling the waste container.

Sophisticated performance test features: Traceable accuracy
Comprehensive test functions ensure the instruments always provide exact results:
• Cell test function. Automatic insufficient cleaning detection.
• Scheduled tests. The key to sustainable accuracy.

Flexible product/method concept:
Fine-tuned quality control
The unique method/product concept of LiquiPhysics™ Excellence offers two key benefits:
• Flexible structure, conditions, formula editor and user tables. Measuring procedures can be tailored to fulfill even very particular needs.
• Product database. No methods to select, no results to judge.

Automatic adjustment verifications: Significant added security
LiquiPhysics™ Excellence has a built-in automatic adjustment analysis. Faulty adjustments as the most frequent cause for erroneous results are definitely a thing of the past!
Service and Support

Professional Installation
Increasing regulatory demands and the necessity for instrument qualification demand that documented procedures prove relevant quality and security standards compliance. The service products of METTLER TOLEDO provide the necessary security that LiquiPhysics™ Excellence systems are installed and qualified according to the quality standards appropriate for individual products worldwide.

IPac
IPac is an Initial Qualification Package comprising Installation Qualification (IQ), Operational Qualification (OQ), recommendation for Performance Qualification (PQ) and the definition of the Maintenance Qualification (MQ).

EQPac
EQPac is an Equipment Qualification Package providing comprehensive and detailed qualification (IQ/OQ) whilst satisfying even the highest documentation requirements. This package also offers a freely expandable logbook for equipment monitoring, logging and instrument lifetime records archiving.

Calibration, preventive maintenance and continuing support
Make the smart decision and make the most of the full range of services METTLER TOLEDO offers. Our service contracts, including annual inspection and calibration, are tailored according to specific needs and ensure reliable results.

Traceable Verification
Ensuring consistent results relies on two key factors: Traceable system performance tests and regular preventive maintenance.

METTLER TOLEDO offers combined liquid standard reference material which reduces uncertainty, eliminates time-consuming and error-prone sample transfers and facilitates fully automatic performance verification.

Two parameters in one
The standards are certified for density value and refractive index at three different temperatures.

Certificate in a barcode
All the information contained in the certificates is coded in one single barcode – no need to input data manually.

No syringe required
All standards come in vials which can directly be used on the SC1 and SC30 automation units.
### A Complete Range of Tools
Hand-Picked Solutions for Every Purpose

**Density and Refractive Index Instruments and Cell Modules**

![Image of DM and DX Density Meters and Cell Modules](image)

DM Density Meters and DX Density Cell Modules are the perfect solution wherever the density, specific gravity or related parameters of liquid samples need to be determined. They automatically detect measuring errors and feature a wide measuring temperature range, extremely fast heating-up and cooling down-rates and very short measuring cycles. DM and DX are undoubtedly the state-of-the-art pinnacle for digital density measurement.

RM Refractometers and RX Refractive Index Cell Modules offer far more possibilities than ordinary digital refractometers and are the best choice for a wide range of applications from routine Brix measurements at 20 °C to refractive index determinations of bitumen at 100 °C. No more manual cleaning, no more contact with solvents and greater result reliability: RM and RX are the only refractive index measuring devices which can be completely automated.

Determination of the thermal expansion coefficient in one run, simultaneous determination of specific gravity and refractive index or the routine quality control of edible oils – wherever densities or refractive indexes have to be measured simultaneously, at different temperatures or independently, LiquiPhysics™ Excellence has the perfect solution as all DM density meters and RM refractometers can be combined with both types of cell modules.

#### Technical Data

<table>
<thead>
<tr>
<th>Density</th>
<th>DM40/DX40</th>
<th>DM45/DX45 DeltaRange</th>
<th>DM50/DX50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range [g/cm³]</td>
<td>0.0000 ... 3.0000</td>
<td>0.000000 ... 3.000000</td>
<td>0.000000 ... 3.000000</td>
</tr>
<tr>
<td>Limit of error density [g/cm³]</td>
<td>0.0001</td>
<td>0.000002 / 0.000005</td>
<td>0.00002</td>
</tr>
<tr>
<td>Temperature range [°C]</td>
<td>0.00 ... 91.00</td>
<td>0.00 ... 91.00</td>
<td>0.00 ... 91.00</td>
</tr>
<tr>
<td>Limit of error temperature [°C]</td>
<td>0.05</td>
<td>0.02 / 0.05</td>
<td>0.02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Refractive Index</th>
<th>RM40/RX40</th>
<th>RM50/RX50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range nD</td>
<td>1.3200 ... 1.7000</td>
<td>1.320000 ... 1.580000</td>
</tr>
<tr>
<td>Limit of error nD</td>
<td>0.0001</td>
<td>0.00002</td>
</tr>
<tr>
<td>Measuring range Brix [% w/w]</td>
<td>0.00 ... 100.00</td>
<td>0.00 ... 100.00</td>
</tr>
<tr>
<td>Limit of error Brix [% w/w]</td>
<td>0.10</td>
<td>0.014</td>
</tr>
<tr>
<td>Temperature range [°C]</td>
<td>5.0 ... 100.0</td>
<td>5.00 ... 75.00</td>
</tr>
<tr>
<td>Limit of error temperature [°C]</td>
<td>0.1</td>
<td>0.03</td>
</tr>
</tbody>
</table>

1) in the range 0.70000 ... 1.00000 g/cm³ / 15.00 ... 20.00 °C
**DeltaRange™ Density Measuring Cells**

Five decimal place measuring accuracy is rarely needed over the entire density and temperature measuring ranges for density determinations. Only samples such as organic solvents and alcohol/water mixtures sometimes need to be measured with five decimal place accuracy. All these products have densities lower than 1 g/cm\(^3\) and the measurements are normally carried out at temperatures between 15 and 20 °C. The DeltaRange™ density measuring cells are tailor-made solutions for such applications as they offer five decimal place accuracy in exactly this range at a significantly lower cost than full range five decimal place cells.

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**Accessories**

Unrivaled Flexibility to Promote Your Advantage

<table>
<thead>
<tr>
<th>Automation</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DryPal™ drying pump for DM density meters and DX measuring cells</td>
<td>51337029</td>
</tr>
<tr>
<td>FillPal™ Food Sampling pump for aqueous products</td>
<td>51337027</td>
</tr>
<tr>
<td>FillPal™ Chem Sampling pump for aggressive samples (acids, bases, solvents)</td>
<td>51337028</td>
</tr>
<tr>
<td>SC1 automation unit for individual samples. Automatic sample recovery function. Suitable for highly viscous samples. Sample vials 6, 9 or 20 mL. (Also available as heated version SC1H)</td>
<td>SC1 (SC1H)</td>
</tr>
<tr>
<td>SC30 sample changer with 30 positions. Automatic sample recovery function. Suitable for highly viscous samples. Sample vials 6, 9 or 20 mL. (Also available as heated version SC30H)</td>
<td>SC30 (SC30H)</td>
</tr>
<tr>
<td>Printer USB P-25 dot matrix printer</td>
<td>11124301</td>
</tr>
</tbody>
</table>

**Barcode scanner**

- **Hand scanner** USB for 1D barcodes, requires cable 21901309 | 21901297 |
- **ScanStraight™** Automatic scanner for SC30 sample changer for 1 and 2D barcodes | 51337185 |

**Connecting sets for additional parameters** complete without auxiliary instruments

<table>
<thead>
<tr>
<th></th>
<th>Part No.</th>
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</thead>
<tbody>
<tr>
<td>pH connecting set for SevenEasy™ pH meter</td>
<td>51337023</td>
</tr>
<tr>
<td>Conductivity connecting set for SevenEasy™ conductivity meter</td>
<td>51337022</td>
</tr>
<tr>
<td>Color connecting set for Lovibond PFX 8XX and PFX 9XX colorimeters from Tintometer</td>
<td>51337021</td>
</tr>
</tbody>
</table>

**Sensors**

- **AtmoSens™** barometric USB pressure sensor. Ensures reliable adjustments of DM density meters and DX measuring cells. | 51337020  |
- **WasteSens™** level sensor. Safely prevents waste container overfilling when working with automation units. | 51337026  |
- **LogStraight™** fingerprint scanner. Biometric login – no more passwords to input | 51192107  |
- **ErgoSens™** infrared optical sensor for hands-free operation | 11132601  |

**Key options for RM refractometers and RX refractive index measuring cells**

- **Flow cell** for automatic refractive index measurements (FillPal™, SC30 or SC30) | 51337024  |
- **Press** to measure semi-solid products such as fruit pulp | 51337155  |
World-Leading Performance
For a Wide Range of Applications

We have built up our expertise in weighing, thermoanalysis, titration and density/refractive index measurements systematically, uncompromisingly, and precisely over many years. One result of this is a wide range of comprehensive solutions bearing a name that enjoys a worldwide reputation for excellence: METTLER TOLEDO.

Excellence Level Balances
Excellence level analytical balances offer world-leading weighing performance, unprecedented ergonomics and advanced solutions for data management.

Thermal Analysis Excellence
The thermal analysis excellence line features innovative technology, versatile modularity and Swiss quality in the field of DSC and TGA analysis.

Thermal Value Excellence
The innovative METTLER TOLEDO melting point system offers far more than simply determining the melting point or melting range very accurately. Built-in video observation makes it possible to investigate color changes, clear points and decomposition temperatures.

Titration Excellence
One Click Titration™ for any application is simple, efficient, secure and modular. No matter what tasks arise, the METTLER TOLEDO titration excellence line offers tailor-made solutions.

www.mt.com/LiquiPhysics
For more information

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