Density and Refractive Index

Perfect Solutions
for Quality Control
of Liquids

Density- and Refractometers
Reliable Results and Unsurpassed Reproducibility

One Click® operation
One click on the selected product or measurement method starts the measurement of density, refractive index or related values. The built-in temperature control brings the sample to the required temperature, the measurement is done automatically and the result displayed on the touch screen. Unlike older methods like pycnometer, aerometers and Abbe refractometers, the results are operator independant, thus highly reliable and reproducible.

Simplified quality control
For quality control, target value and limits can be defined for each product. The measurement result is then displayed in red if it is out of limits.

Multiparameter measurement
The modular concept allows to upgrade any single instrument to a complete multiparameter system measuring density, refractive index (or related values), pH (or conductivity), acidity and color.

**Meters and
Cell Modules**
Compact Size
Great Specs

Automation
Less work
More accuracy

Valuable Options
Tailor Made Performance

**Density Meters
Refractometers
Cell Modules**

**Sampling pumps and
automation units**

Accessories

Density- and Refractometers
Compact Size. Great Specs.

Density
Compact

Refractive Index
Versatile

Cell Modules
Combined
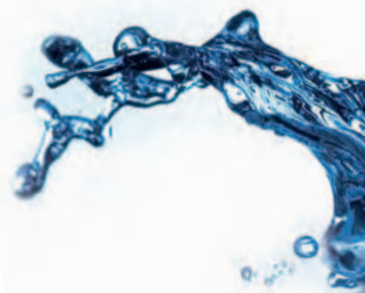
DM Density Meters
DM density meters determine the density and/or specific gravity of liquids quickly and accurately. The results are automatically converted into one or several pre- or user-defined units such as Brix, API degrees or alcohol concentrations etc.
Automatic error detection, entire temperature range adjustments and built-in algorithms shorten measurement times required by up to 75% – DM and DX are doubtlessly the state-of-the-art pinnacle for digital density measurement.

RM Refractometers
Brix, refractive index or concentrations of thin, highly volatile, dark or viscous liquids? The RM refractometers master the quality control of a wide variety of challenging samples from routine Brix measurements at 20 °C to refractive index determinations of bitumen at 100 °C. The measurements process can be completely automated with the added advantage of no more manual cleaning, no more contact with dangerous solvents and greater result reliability.

DX and RX Cell Modules
Density and refractive index are frequently determined in the same lab and, increasingly frequently, simultaneously. The upgrade of a DM density meter or an RM refractometer with a DX density cell module or an RX refractive index cell module is the most cost- and space-saving solution in such cases making it the perfect combination for any lab demanding fast and accurate results.

Please order our brochure
LiquiPhysics Excellence

The DeltaRange™ density measuring cells are tailor made solutions for applications such as alcohol content determinations or the quality control of organic solvents. They offer five place accuracy in the range required for such measurements at a significantly lower price than full range five decimal place cells.

▶ **www.mt.com/LiquiPhysics**

Technical specifications

Density meter Density Cell		DM40 DX40	DM45 DeltaRange DX45 DeltaRange	DM50 DX50
Measuring range	[g/cm³]	0.0000 ... 3.0000	0.00000 ... 3.00000	0.00000 ... 3.00000
Repeatability (S.D. n=10)	[g/cm³]	0.00005	0.000005	0.000005
Limit of error	[g/cm³]	0.0001	0.00002[1] 0.00005	0.00002
	Brix [% w/w]	0.03	0.02	0.01
	ethanol [% v/v]	0.1	0.02	0.02
Temperature range	[°C]	0.0 ... 91.0	0.00 ... 91.00	0.00. ... 91.00
Limit of error	[°C]	0.05 (10 ... 30 °C) 0.10 (0 ... 91 °C)	0.02 (15 ... 20 °C) 0.05 (0 ... 91 °C)	0.02 (10 ... 30 °C) 0.05 (0 ... 91 °C)

[1] in the range 0.70000 .. 1.00000 g/cm³ / 15.00 ... 20.00 °C

Refractometer Refractive Index Cell		RM40 RX40	RM50 RX50
Measuring range	[nD]	1.3200 ... 1.7000	1.32000 ... 1.58000
Repeatability (S.D. n=10)	[nD]	0.00005	0.00001
	Brix [% w/w]	0.05	0.01
Limit of error	[nD]	0.0001	0.00004
	Brix [% w/w]	0.1	0.02
Temperature range	[°C]	5.0 ... 100.0	5.00 ... 100.00
Limit of error	[°C]	0.1 (5 ... 100 °C)	0.03 (15–50) 0.05 (5–75)

Automation
Highly Reliable with Minimal Effort

FillPal
The Robust Approach

SC1
One Click®
Measurements

SC30
Maximum Performance

The FillPal sampling pumps simplify the measurement of low viscous samples. These pumps can be used for all DM density meters and RM refractometers and are suitable for all applications where the samples to be measured are of a similar nature and no intermediate complete rinsing and drying of the measuring cell is required. FillPal is available in two versions: FillPal Food for water based products and FillPal Chem for aggressive samples including most acids, bases and organic solvents.

The SC1 is the best guarantee for a fast payback of your measuring system as it automates the determination of the density and/or refractive index and additional parameters (color, pH and/or conductivity) of individual samples. Sampling, rinsing and drying cycles are also run automatically. With the SC1, measurements are a matter of one single click or even no click at all when working with a barcode scanner or an ErgoSens.

The SC30 is a sample changer with 30 positions. It can not only automate the sampling, measurement, rinsing and drying of sample series but, equipped with a ScanStraight option, it is even capable of scanning barcode stickers on the sample vials automatically.

SC1H and SC30H
Density determinations of samples which are solid at ambient temperature

The SC automation units are available as heated versions suitable for performing density measurements of samples which are solid at ambient temperature such as paraffins, vaseline, edible fats, etc. The SC1H and the SC30H can handle samples with a melting point of up to 60 °C.

DryPal
Accurate Adjustments

Prior to air adjustments, the density measuring cell needs to be dried completely. The DryPal carries out this task effectively. This air pump is only required for density meters which are used without SC1 or SC30 automation units.

Detailed technical specifications you find in the dedicated brochure

Technical specifications

	FillPal Chem	FillPal Food	SC1	SC30
Sample characteristics				
max. viscosity [mPa·s]	1'000	1'000	30'000	30'000
organic solvents	ok	acetone and alcohol only	ok	ok
acids	ok	no	no concentrated reducing acids	no concentrated reducing acids
bases	ok	ok	ok	ok
Sampling	suction	suction	overpressure	overpressure
Automatic rinsing	no	no	yes, with 2 rinsing liquids	yes, with 2 rinsing liquids
Drying	DryPal required	Drypal required	automatic	automatic
Sample recovery	no	no	yes	yes
Sample vials	any type	any type	6, 9 and 20 mL[1]	6, 9 and 20 mL[1]
Part No.	51337028	51337027	51326000	51327000

[1] Made of borosilicate glass. The 20 mL vials are also available in polypropylene. The vials can be closed and are opened by the SC immediately before the measurement starts. Different vial sizes can be used without having to adjust the sampling mechanism.

Valuable Options
Custom Tailored Performance

Multi-parameter Measurements
Enhanced Productivity

Density, refractive index (or related values), pH (or conductivity), acidity and color can be measured and analyzed in one go.

Advanced Barcode Features
Convenient Sample Data Input

LiquiPhysics Excellence is not only able to read barcodes; it can also accurately interpret their information. With Smart Codes containing information about the type of product to be measured, the operator simply scans in the barcodes to start the measurements. No additional button to click.

LiquiPhysics Excellence is even capable of scanning barcodes automatically. The SC30 sample changers can be easily equipped with ScanStraight, a built-in barcode reader.

Plug and Play Benefits
Features Tailored To Your Needs

LiquiPhysics systems can easily be upgraded to fulfill specific requirements. The LogStraight finger print reader greatly simplifies the log-in procedure at the instrument with no user names or passwords to enter. With ErogSens, there is no need to touch the instrument to start the measurements. AtmoSens ensures highly accurate 5 place density adjustments. LevelSens guarantees greater safety when working with automation units and makes sure that the waste container never becomes overfilled.

LabX Laboratory Software
Make the most of LiquiPhysics

LabX is a new concept for laboratory software (see pages 18–21). In addition to data aquisition, analysis and archiving, LabX offers SOP user guidance, manages products, methods, users and instruments. It connects density meters, refractometers, melting point instruments and balances. Connection to ERP or SAP allows full integration in the company IT world.

Traceable Standards
Improved Data Security

The combined liquid standard reference materials from METTLER TOLEDO facilitate reliable performance verification. They are certified for both density value and refractive index at three different temperatures (15, 20 and 25 °C). Combined measuring systems can be verified in one step. All the information contained in the certificates is coded in a barcode with no need to input data manually when performing a system performance test or calibration.

Standard Reference Material	Density [g/cm³] at 20 °C [1]	Refractive Index at 20 °C [2]	Part no.
Water	0.998..	1.333..	51338010
Dodecane	0.749..	1.422..	51338012
2,4-dichlorotoluene	1.250..	1.546..	51338013
1-bromonapthalene	1.481..	1.658..	51338014

[1] Uncertainty: 0.00003 g/cm³
[2] Uncertainty: 0.00002

Typical values: May change from batch to batch without prior notice

Qualification Services
For Regulatory Compliance

Professionally executed installation and qualification (IQ/OQ) including documentation is offered by METTLER TOLEDO for LiquiPhysics™ Excellence instruments.

Service	Product Families	Product Types	Order no.
EQPac Equipment Qualification Package	LiquiPhysics™ Excellence Density Meters	DM40/DM45/DM50 DX40/DX45/DX50	51710870
	LiquiPhysics™ Excellence Refractometers	RM40/RM50 RX40/RX50	51710873
IPac Initial Qualification Package	LiquiPhysics™ Excellence Density Meters	DM40/DM45/DM50 DX40/DX45/DX50	51710863
	LiquiPhysics™ Excellence Refractometers	RM40/RM50 RX40/RX50	51710866

Accessories
Ordering Information

Printer USB-P25 dot matrix printer	11124301
Barcode scanner	
Hand scanner USB for 1D barcodes	21901297
ScanStraight Automatic scanner for SC30 sample changer for 1D and 2D barcodes	51337184
Complete connecting sets for additional parameters (without auxiliary instruments)	
pH connecting set for SevenEasy™ / SevenCompact™ pH meter	51337023
Conductivity connecting set for SevenEasy™ / SevenCompact™ conductivity meter	51337022
Color connecting set for Lovibond PFX and PFXi 8XX and 9XX colorimeters from Tintometer	51337021
Color connecting set for Minolta CM5 and CR5 colorimeters from Konica Minolta	30025477
Sensors	
AtmoSens barometric USB pressure sensor	51337020
LevelSens level sensor. Safely prevents waste container overfilling	51337026
LogStraight fingerprint scanner for biometric user management	51192107
ErgoSens infrared sensor for hands-free operation	11132601
Top parts for RM refractometers and RX refractive index measuring cells	
Flow cell for automatic refractive index measurements (FillPal, SC1 or SC30).	51337024
Press to measure semi-solid products, such as fruit pulp	51337155
LabX Laboratory software	
LabX Express Edition for stand alone systems	11153130
LabX Server Edition for client server installations	11153131

Compact Solutions
For any Environment

DA-100M
Thermostat Included

Densito and Refracto
Best On-site
Performance

Refracto 30GS
Gold and saphire

The DA-100M density meter is
a compact three-decimal place
density meter. It is equipped with
a solid state thermostat and an
air pump to dry the measuring
cell. The optional ASU-100 sam-
pling pump greatly simplifies
density determinations of low
viscous samples.

Densito 30PX, Refracto 30PX
and Refracto 30GS offer all the
features required for successful
on-site density and refractive
index measurements including:
Automatic temperature compen-
sation, direct display of the result
in the desired unit, built-in clock
for full GLP compliance and data
output via infrared interface.
Densito and Refracto come with
practical carrying cases which
contain everything necessary to
carry out measurements.

The Refracto 30GS Refractometer
features a very wide measuring
range and a quick temperature
response thanks to its special
measuring cell equipped with
a gold plated stage ring and a
prism made of artificial sapphire.

Please refer to the dedicated brochures for more information about Densito and Refracto or visit

▶ **www.mt.com/Densito**
▶ **www.mt.com/Refracto**

Technical specifications

	Measuring range	Accuracy	Temperature range	Part. No.
DA-100M Density meter	0 – 2 g/cm³	0.001 g/cm³	15 – 40 °C (solid state thermostat)	51320001
Densito 30PX	0 – 2 g/cm³	0.001 g/cm³	5 – 35 °C	51324450
Refracto 30PX	1.32 – 1.50 (nD) 0 – 85% Brix	0.0005 (nD) 0.2% Brix	10 – 40 °C	51324650
Refracto 30GS	1.32 – 1.65 (nD) 0 – 100% Brix	0.0005 (nD) 0.2% Brix	10 – 40 °C	51324660

Accessories

ASU-100 sampling pump for DA-100M	ASU-100
Infrared adapter for data transmission (Densito and Refracto)	51325006
Adapter for external syringe (Densito)	51324402
Cleaning tissues (set of 10) for Densito 30PX, Refracto 30PX/GS and Quick-Brix™ 60/90	51325003
Protective cover for Densito 30PX	51324430
Density water standards (for DA-100M and Densito 30PX)	51325005

183