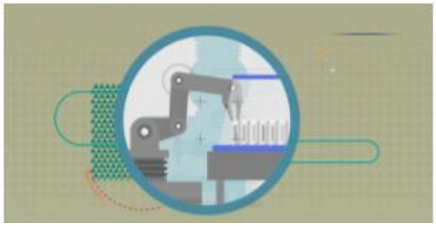
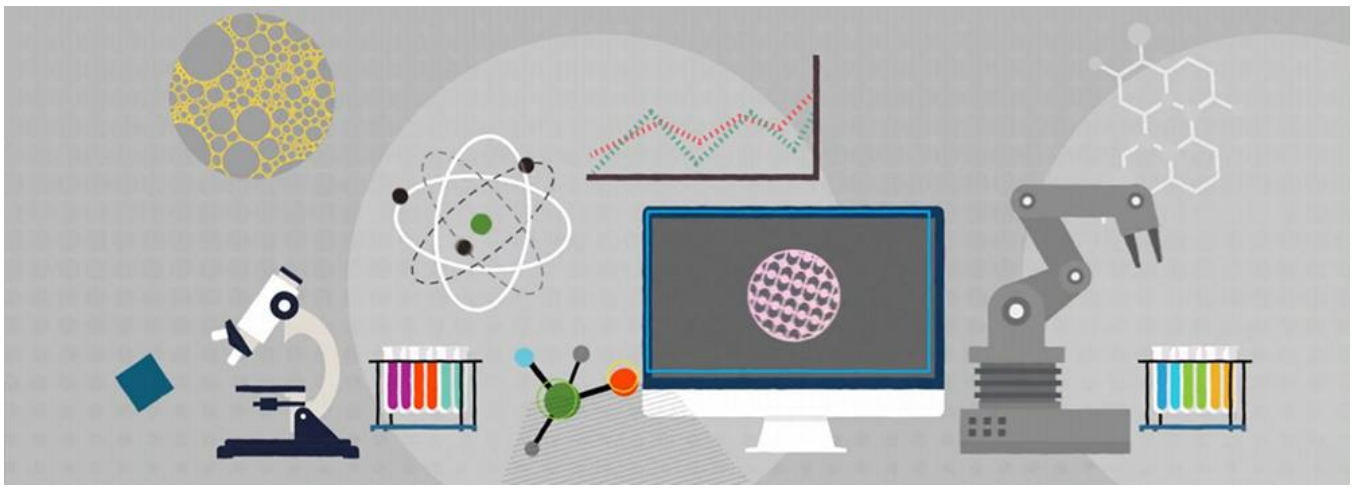


FORMULATION MEASUREMENT



LUMISIZER

Lumisizer©

WHAT IS IT?

The Lumisizer is a dispersion analyser that tracks changes over time at different temperatures. It works on centrifugal technology and detects changes in light transmission that characterizes processes such as sedimentation, flotation and consolidation.

Near infrared light illuminates the entire sample cell and the transmitted light is detected using a CDD-line, transmission is converted into extinction.

SAMPLE TYPE

This instrument allows the user to obtain the particle velocity distribution of a range of samples without having to know the specific material constants associated with the sample. A variety of aqueous and non-aqueous systems can be measured using this system.

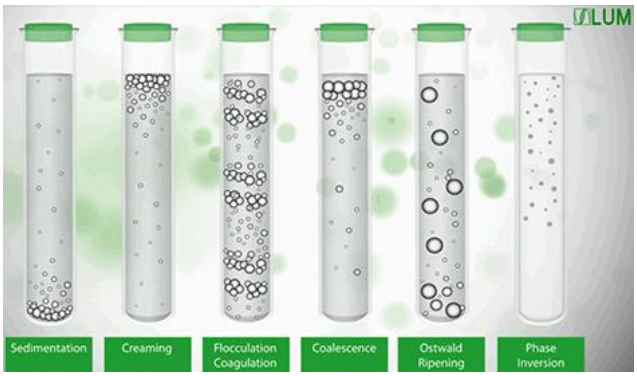
Samples are measured at temperatures from 4 °C to 60 °C and a range of different concentrations and viscosities can be used.

MEASURMENT PRINCIPLE

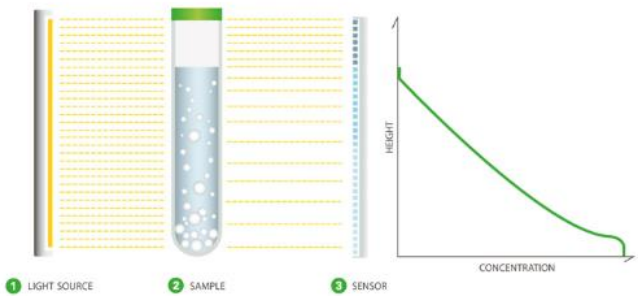
There is a choice of transparent plastic cells (2 and 10 mm diameter) where the sample (liquid to cream) is filled to the indicated fill volume. The cell is loaded onto the sample holder disc and secured. The disc is spun under the input protocol parameters (speed, temperature, time) and light transmission measured.

STEP TECHNOLOGY?

The key to this equipment is the cutting edge STEP (**S**pace and **T**ime resolved **E**xtinction **P**rofiles) technology® which allows the user to characterise the sample. By illuminating across the whole sample, small changes can be detected instantaneously.



STEP®-TECHNOLOGY



QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.lumisizer.com

TURBISCAN

Turbiscan©

WHAT IS IT?

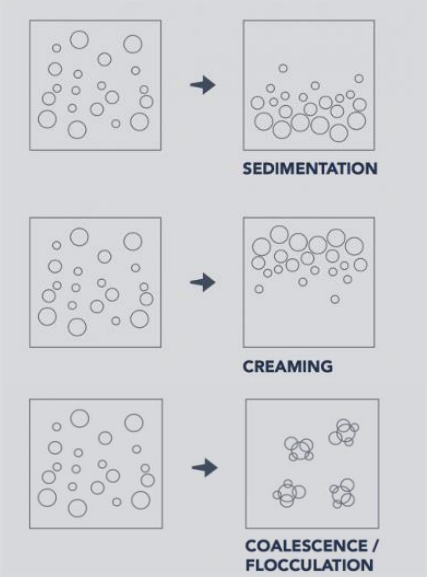
The Formulaction Turbiscan is the ideal instrument for ageing and shelf life testing of emulsions, suspensions, dispersions and foam.

Stability results are obtained 200 times faster than the naked eye and unlike a particle size analyser no product dilution is required.

The high throughput screen platform contains a storage station, a robot arm and smart software for the automatic sample handling and treatment.

SAMPLE TYPE

The Turbiscan scans the sample at user defined time intervals and the whole sample is scanned bottom to top with reading taken every 20 um. The software generates a simple stability index / rating from the data and a variety of substances can be analysed from inks, cosmetics, pharmaceuticals, emulsions and suspensions. The identification of sedimentation, creaming and coalescence within a sample provides valuable information when designing novel formulations.



Turbiscan©

SPECIFICATIONS

- Light source 880 nm
- Detection S-MLS
- Cell volume 20 mL
- Temperature control from room temperature to 60 °C
- 54 samples can be loaded at one time

QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.formulaction.com

DIFFERENTIAL SCANNING CALORIMETRY

SAMPLE TYPE

The Discovery DSC can measure a range of different samples. The amount of sample required is determined by the property to be measured, but it is typically in the range of 1-10 mg.

WHAT IS IT?

The TA Instruments Discovery Differential Scanning Calorimeter (DSC) measures temperatures and heat flows associated with thermal transitions in a material. Properties measured by TA Instruments' DSC techniques include phase changes, glass transitions, melting, crystallization, purity, heat capacity and oxidative stability. This information helps to identify processing and end-use performance.

WHY USE THE TA INSTRUMENTS DISCOVERY DSC?

- Tzero® Press and Pans for fast, simple and reproducible sample preparation
- Discovery DSC AutoLid for more accurate and reproducible measurements
- Gas delivery module is capable of switching between two different purge gases at any point during an experiment
- User friendly interface with customizable view panels

Discovery DSC©

Discovery DSC©

SPECIFICATION / ATTACHMENTS

- 54-Position Autosampler
- Temp. Range: -90 to 400 °C
- Temp. Accuracy: ± 0.025 °C
- Temp. Precision: ± 0.005 °C
- Temp. Repeatability: ± 0.025 °C
- Enthalpy Precision: ± 0.04%

QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.tainstruments.com

SLS MASTERSIZER

SAMPLE TYPE

The Mastersizer can measure the particle size of wet samples (samples within a suitable dispersant) within the 10 nm-3.5 mm range or dry samples (samples dispersed in an inert gas) within the 1-3500 µm range.

A range of dispersion units are available depending on the volume of sample.

WHY USE SLS MASTERSIZER?

- Widely used technique for nanoparticle, colloid and protein particle sizing
- Suitable for the analysis of dry samples
- Software provides expert advice on data quality and suggestions for improvement
- Hydro Sight accessory allows visualisation of your samples and video recording

SAMPLE DISPERSION UNITS

Hydro SV: Dispersion unit for small volumes (5.6 mL)

Hydro MV: Automated wet dispersion unit for medium sized samples (120 mL)

Hydro EV: A dip in wet dispersion unit for larger volumes (800/1000 mL)

Aero S: A dry powder dispersion unit suitable for cohesive powders to fragile materials

Increasing sample volume

Aero S

WHAT IS IT?

A static light scattering (SLS) technique where a dispersed sample is illuminated with a laser and a series of detectors accurately measure the intensity of light scattered by the particles.

A combination of red (633 nm) and blue (432 nm) lasers enables a large particle size range of 10 nm-3.5 mm to be measured.

A range of sample dispersion units are available for small samples (5.6 mL) up to large sample volumes (1000 mL).

Mastersizer 3000©

SPECIFICATION / ATTACHMENTS

Malvern Mastersizer 3000

- Both wet and dry sample dispersion
- Hydro Sight allows visualisation of sample dispersion
- Accuracy >0.6%
- Precision/Repeatability >0.5%
- Analysis via Mie or Fraunhofer scattering

QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.malvern.com

DLS ZETASIZER ZS

SAMPLE TYPE

The Zetasizer ZS has the ability to measure particle size in the 0.3 nm-1 µm range within a suitable dispersant.

This instrument can also determine the zeta potential of 3.8 nm-100 µm particles and the zeta potential of solid surfaces using the surface zeta potential kit.

WHY USE DLS ZETASIZER?

- Widely used technique for nanoparticle, colloid and protein particle sizing
- Rapid particle sizing technique
- Small volumes required (typically 1-2 mL)
- Zeta potential analysis

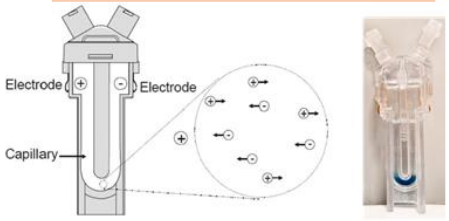
ZETA POTENTIAL ANALYSIS

Zeta potential is a measure of the magnitude of the electrostatic interaction between particles and is one of the fundamental parameters known to affect stability.

Particles with zeta potential >30 mV or <-30 mV are considered stable and unlikely to undergo flocculation or precipitation.

We have folded capillary cells for liquid zeta potential and the surface kit for surface zeta potential analysis.

Folded Capillary Cells



Surface Zeta Potential Kit

WHAT IS IT?

A dynamic light scattering (DLS) technique which measures the diffusion of particles moving under Brownian motion. The software converts this motion into size and a size distribution using the Stokes-Einstein relationship.

A surface zeta potential accessory using tracer particles to measure the electro-osmosis close to a sample surface and calculate the zeta potential of the surface.

Zetasizer ZS©

SPECIFICATION / ATTACHMENTS

Malvern DLS Zetasizer ZS

- 0.3 nm-1 µm measurement range
- Minimum sample volume 12 µm
- Accuracy +/-2%
- Precision/Repeatability +/-2%
- NanoSampler for automated sample loading
- MPT-2 for automated measurement of pH and conductivity.
- Range of Zeta potential sample holders

QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.malvern.com

PLATE RHEOMETER

THE BENEFITS OF RHEOLOGY:

Most industrially relevant materials exhibit complex rheological behaviour. These properties determine a material's end-use performance and "processability". This means that rheological measurements are critical to a wide range of industries including aerospace, asphalt, automotive, ceramics, elastomers, electronics, food, personal care, biomedical, paints and coatings, inks, petroleum products, pharmaceuticals, and more. A rheometer can be used to measure and understand how rheological properties influence every stage of industrial production.

The TA Instruments ARES-G2 is one of the most advanced rotational rheometers for deformation control, with a torque rebalance transducer and a force rebalance transducer for independent shear stress and normal stress measurements. An extensive range of accessories are provided including: Peltier temperature controllers, immersion cup, cup and bob geometries and a range of specially designed plate geometries.

Additional capability?

- Unrivalled data accuracy
- Unmatched strain and new stress control
- Fully integrated fast data sampling
- New Smart Swap™ environmental systems
- Patented Active Temperature Control
- Advanced accessories
- TRIOS Software providing extreme testing flexibility

WHAT IS IT?

Rheology is the study of flow and deformation of materials. Deformation and flow are referred to as strain or strain rate, respectively, and indicate the distance over which a body moves under the influence of an external force, or stress. For this reason, rheology is also considered to be the study of stress-strain relationships in materials.

ARES-G2©

SPECIFICATION / ATTACHMENTS

- 30 mm cup for Couette geometry
- 40 mm Cross Hatched / serrated upper plate
- 27.7 mm recessed din bob upper cylinder for Couette geometry
- PPS ARES 50mm 0.04 rad cone
- 15 x 38 mm Vane geometry
- 25 and 50 mm flat plate for parallel plate geometry

QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.tainstruments.com

SURFACE TENSIOMETER

SAMPLE TYPE

Surfactants and detergents are used in a variety of industries to enhance the physical properties of materials and formulations. The ability to perform high throughput screening with minimal sample consumption enables new and exciting products to be rapidly developed.

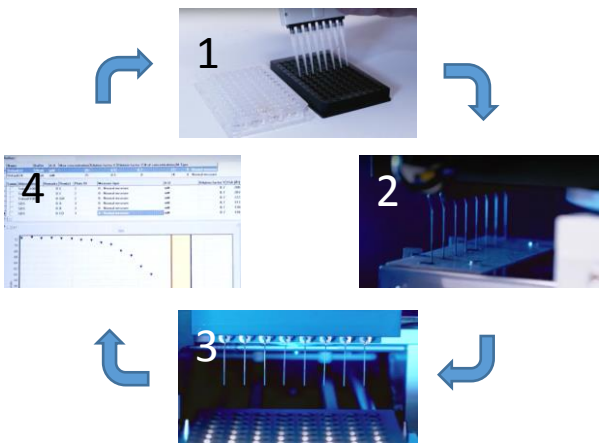
The Kibron Delta 8 uses a 96 multiwell plate format requiring only 50 µl of sample per well with a fully automated cleaning protocol. Each of the eight DyneProbes is cleaned using an internal furnace which heats each DyneProbe to 600 °C. The process for a typical analysis is as follows:

1. Dispense aliquot of solution into a 96 multiwall plate

2. DyneProbe cleaning using 600 °C furnace

3. Immersion and withdrawal of DyneProbes into sample wells

4. Analysis using built in software or raw data export



WHAT IS IT?

The Delta-8 is a high throughput platform for critical micelle concentration (CMC) and surface tension measurements using a standard 96 well plate format.

The system has an automated cleaning programme to ensure minimum downtime and cross contamination.

The Delta-8 manager software has built in CMC seeker programme to rapidly determination the CMC value for each specific well.

Kibron©

SPECIFICATION / ATTACHMENTS

- Temperature range 18-30 °C
- Measurement volume 50 µl/ well
- Surface tension range 10-100 N/m Resolution 0.01 mN/m
- Measurement time 3 minutes
- Uses the du Nouy-Padday method

Additional capability?

The Delta-8 manager software has built in CMC seeker programme to rapidly determination the CMC value for each specific well.

QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.kibron.com

KRUSS K100 FORCE TENSIOMETER

SAMPLE TYPE

A range of samples can be analysed using the K100 including inks, polymers, surfactants and novel formulations.

An integrated stirring function ensures optimum homogenization of dispersions before measurement and a range of temperatures from 20°C to 70°C to be tested.

A Micro Dispenser system for the fully automatic measurements of critical micelle concentration (CMC) of surfactants is also available.

HOW THE K100 WORKS?

The principal measurements used by the K100 are based on the force experienced when wetting a measuring probe or a solid sample.

A high resolution force sensor is used to obtain reliable and accurate measurements for determining the surface and interfacial tension of a range of samples.

Kruss©

TASKS AND APPLICATIONS

- Analysis of surface modifications
- Wetting properties of inks and textiles
- Development of cosmetic products
- Determination of the effectiveness of surfactants by critical micelle contraction (CMC) measurements

WHAT IS IT?

The Kruss K100 performs highly precise and reliable measurements of surface tension and interfacial tension.
The software controllable sample stage moves in a wide speed range and communicates its position to the software with a resolution of 0.1 µm which is essential for performing Du Nouy ring measurements.

Kruss©

SPECIFICATION / ATTACHMENTS

- Maximum load 210 g
- Resolution 10 µg
- Travel Speed 0.09 to 500mm/min
- Du Nouy ring surface tension range: 1 to 2000 mN/m with a resolution of 0.001 mN/m
- Wilhelmy plate method range: 1-2000 mN/m with a resolution of 0.02 mN/m

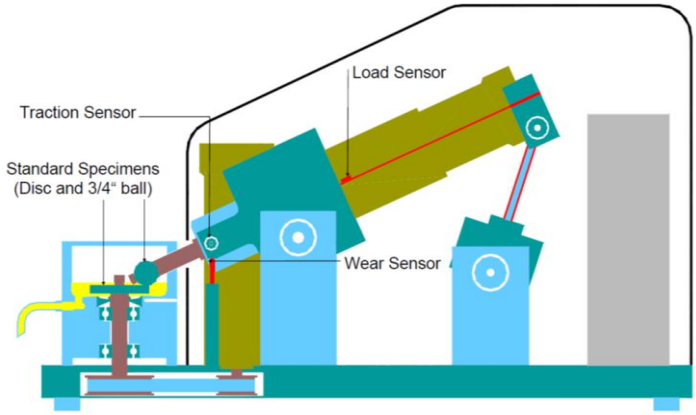
QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.kruss.de

MINI TRACTION MACHINE



MAIN APPLICATIONS

- Wear measurement and testing
- Soft contact investigation
- Automotive fuel modelling
- Traction coefficients
- Traction measurement

TECHNICAL SPECIFICATION

- Load: 0 to 75 N
- Contact pressure: 0 to 1.25 GPa
- Speed: -4 to 4 ms^{-1}
- Temp range: 150 °C
- Sample volume: 35 mL

WHAT IS IT?

The Mini Traction Machine (MTM) is a tribometer used to assess a fluid lubricity through the measurement of friction generated in a rubbing contact between a spinning ball and a rotating disc while immersed in a heated fluid.

During an experiment, the ball is loaded against the face of the disc and the ball and disc are driven independently to create a mixed rolling/sliding contact. Rolling potentially generates hydrodynamic films to separate the ball from the disc while sliding generates the friction associated with this film thickness.

If the hydrodynamic film thickness is not sufficiently greater than the combined surface roughness of the ball and the disc, then fluid becomes excluded from the contact and the resulting friction depends on the performance of any protective adsorbed boundary films. The frictional force between the ball and disc is measured by a force transducer.
Additional sensors measure the applied load, the lubricant and pot temperatures, and the amount of wear.

MTM (Mini Traction Machine)©

QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.pcs-instruments.com

METROHM AUTOTITRATOR

SAMPLE TYPE

The Metrohm Autotitrator can carry out automated titrations on up to 11 samples at once, and can dose up to 3 titrants per sample, enabling the user to carry out all common titration types simply. It can also be used for automated pH adjustment and provides an easy mechanism to study a wide range of liquid samples.

SOFTWARE

The Metrohm Autotitrator uses ***tiamo***© software which gives you full control of your titration processes, devices and data.

The user-friendly software allows you to create the method which exactly suits your requirements, as straightforward or as elaborate as you need it to be.

WHAT IS IT?

The equipment consists of 3 Titrando© dosing units and a 12 slot automated rack processor. A dispensing head delivers titrants to the sample, as well as holding a pH probe and a stirrer for sample agitation. All probes and dispensing units are cleaned between samples to give accurate results every time and reduce sample contamination.

Metrohm Autotitrator©

WHY USE METROHM AUTOTITRATOR?

- Enables accurate and time-efficient titrations.
- Up to 11 pH adjustments at a time.
- Data driven by Excel

QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.metrohm.com

OPTICAL MICROSCOPY

SAMPLE TYPE

Optical microscopy, when employed using different types of transmitted illumination, can be used to study a variety of transparent specimens, including liquids. Examples of the use of optical microscopy include:

- Determination of particle size, area fraction and volume fraction (using image analysis)
- Assessment of polymer solutions and the quality of emulsions

WHAT IS IT?

A visible light microscope, combined with a digital colour camera and image analysis software

Olympus©

DIC micrograph of crystals in an aqueous solution

WHY USE OPTICAL MICROSCOPY?

- Fast, with little or no preparation required
- A large number of imaging modes can be employed
- Often used as a precursor to more detailed microstructural or chemical characterisation e.g. SEM/EDS, RAMAN

Observation modes available on the BX53 optical microscope

Transmitted brightfield illumination – in this mode contrast arises from attenuation of the light transmitted by the specimen

Transmitted polarised light microscopy – this technique uses plane-polarized light to enhance contrast; it is employed to study birefringent (doubly-refracting) materials

Transmitted Differential Interference Contrast (DIC) – this is a technique that can be used when brightfield illumination yields little or no contrast. It uses a beam-shearing interference system (this technique is also known as Nomarski)

SPECIFICATION / ATTACHMENTS

Olympus BX53 optical microscope

- Transmitted light illumination
- 10X, 20X and 40X UPLFLN (dry) objective lenses
- Olympus DP26 digital colour camera (5 megapixel)
- Image analysis software (Stream)

QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.olympus.co.uk

QUANTOS POWDER DOSING SYSTEM

WHY QUANTOS DOSING SYSTEM?

The precise and correct weighing of your substance is often the first and most critical step in an analytical method.

Very small target weights and tight tolerances make the weighing of powders a challenging part of an experiment, particularly if handling hazardous or toxic substances safely.

Powders can also exhibit a diverse range of characteristics including particle size, shape, surface texture and this causes them to behave differently when being measured.

WHAT IS IT?

Quantos uses an automated process to dose free-flowing powders directly into your target container with an accuracy unmatched by a manual process.

A range of dosing heads are available for dosing: fine, fluffy, static, compacted, granular or heterogeneous substances. Powders remain sealed within the dosing head keeping aerosol formation to a minimum, useful for hazardous and toxic substances.

Mettler Toledo©

Mettler Toledo©

QUANTOS DOSING HEADS

Automated dosing can reduce the minimum net sample weight of your by up to 30% and the risk of over dosing is reduced to a minimum. This reduces waste and saves money when working with rare or expensive materials.

The following dosing heads are available in the MIF:

BNMW
LNMP
LNCT
LNLW

See website for Full details

SPECIFICATION / ATTACHMENTS

- Maximum fine range capacity: 81g
- Maximum full range capacity: 220 g
- Repeatability (5% load): 0.005 mg
- Settling time: 3.5 s
- Minimum weight: 1.0 mg

QUESTIONS? - CONTACT US.

mifinfo@liverpool.ac.uk

0151 795 7100

Supplier website: www.mt.com