DIA-STRON
DELIVERING MEASUREMENT SOLUTIONS

Skin Testing Instrumentation

Ballistometer

Overview —

The Ballistometer (BLS) is based on the traditional ballistometric principle of impacting an object at a constant force. Firmness is measured by indentation and dynamic resilience by the degree of rebound. The innovation in the Ballistometer arises from the inclusion of a torsional wire mechanism, which makes the instrument non-gravity dependant and well suited to less accessible test sites.

Principle benefits:

- Works at any angle, non-gravity dependant
- Measures small, inaccessible test sites
- Bespoke software with automated analysis
- User can define the amount of energy put into the skin so that different layers may be studied

Applications and claims:

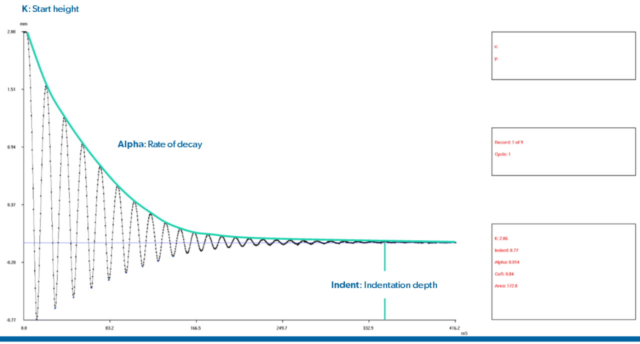
- “Elasticity” and “firmness” claims
- “Hydration” and “anti-ageing” claims
- Cellulite related product claims
- Evaluating medical conditions such as scleroderma/oedema
- Assessing the quality of skin/wound healing and scar tissue

Metrology principle —

The Ballistometer consists of a slim line probe only 25cm long and a small control unit connected to a PC USB port. The probe contains a rigid low mass arm suspended at its balance point on a torsion wire, with a ruby tipped stylus fixed to one end. The arm is activated by a solenoid that elevates the probe tip from the test surface. On release, the arm oscillates around its balance position and the stylus bounces repeatedly on the test site before coming to rest. The position of the arm is monitored by an optical sensor and the positional data transmitted to the PC via the control unit.

In free air, oscillations decrease slowly due to damping by the surrounding air and mechanical losses. When the oscillating probe comes into contact with a sample, the damping is much more rapid as energy is absorbed by the material. By measuring how much energy is absorbed and returned to the probe, the elasticity of the sample can be measured. By measuring the indentation of the probe into the sample, the 'hardness' of the sample can be measured.

The two main factors that influence the data are the impact force and the dynamic properties of the test site. The user can control the impact force of the stylus using a mechanical switch that is recessed into the Ballistometer probe. At any one setting the elevation and release of the arm generates a constant amount of kinetic energy so that the data is influenced only by the nature of the test site.



Control and analysis software —

The Ballistometer is supplied with Windows MApp software to control the instrument, to display the acquired data and to run the data analysis. The following relevant parameters are calculated.

- Indentation: the peak penetration depth of the probe tip beneath the skin level (skin datum)
- K: the start height of the probe tip above the skin surface. This is related to the energy stored in the torsion wire
- Alpha: the rate of energy damping. Large values indicate energy absorbing (in-elastic) samples
- Coefficient of Restitution - CoR: a high value indicates a highly elastic sample
- Area: the area between the bounce profile and the skin zero datum

The user can view the graphical display and the numerical parameters are calculated automatically and displayed on the screen. The analysed parameters and raw data can be exported into tab delimited text files.

References —

Publications:

- Langton, A.K., Graham, H.K., Griffiths, C.E.M., Watson, R.E.B. (2019), “Ageing significantly impacts the biomechanical function and structural composition of skin”, Exp. Dermatol., 28:8, 981-984.
- Jongmi Lim, M.S., et al. (2019) “Antiaging and antioxidant effects of topical autophagy activator: A randomized, placebo-controlled, double-blinded study”, Journal of Cosmetic Dermatology, 18:1, 197 -203
- Willard, J. (2012) “Mechano-modulation of Burn Wound Repair”, Thesis, The Ohio State University

Examples of use in patent claims:

- WO2019245229A1 Cosmetic composition comprising nanoemulsion in which 7-dehydrocholesterol, cholesterol, and stearic acid encapsulated in internal phase of hyaluronic acid-ceramide np complex, Dec 2019 (Gowoon Sesang Cosmetic Co.)
- WO2017077497 Synergistic extract of Palmaria Palmata and Jasmine, compositions comprising same and uses thereof, May 2017 (Ashland)
- US20120115956 Use of isoleucine n-hexadecanoyl as a "volumizing" and/or "plumping" agent for human skin, May 2012 (Seppic)
- US7737179 Methods for treatment of dermatological conditions, June 2010 (Johnson and Johnson)

Translucency Meter

Overview —

The Translucency Meter (TLS) assesses how light interacts with the skin structure and pigmentation, absorption levels and sub-surface scattering phenomena. The TLS is not sensitive to any surface optical effects, measuring how light is absorbed and scattered within the skin structure itself, and is ideal for measuring skin translucency and supporting “radiance” product claims.

Translucency is an important phenomenon in that it contributes to measurement errors using standard colorimeters or spectrophotometers and changes the ‘appearance’ of materials to the eye.

Applications and claims:

- Assessing the coverage of foundations and powders
- Assessing skin ageing
- “Radiance” related claims
- Skin colour (Erythema and Melanin content)

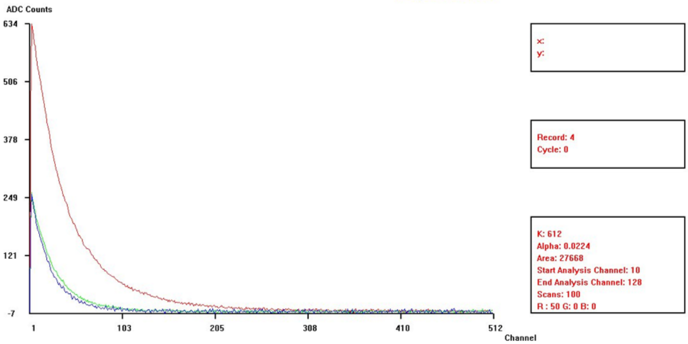
Metrology principle —

The Translucency Meter uses a novel method developed by Dia-Stron. A narrow light beam from an RGB LED source illuminates the test sample. Translucent materials scatter the light within the material, and a proportion of this scattered light is returned to the probe. Using a fibre optic faceplate (FOP), the object can be mapped, and the back-scattered light collected by the probe. The collected light can then be displayed on a computer as light level as a function of distance from the point of sample illumination.

The key feature is that only internally scattered light is collected—not light reflected from the surface as with conventional instruments. Translucency is quantified by the rate of lateral scatter of light and the total amount of back-scattered light. The measurements can be carried out using single colour mode of red, green or blue from the LED.

The hand-held probe consists of an RGB LED light source and a fibre optic faceplate to transmit back-scattered light to a NMOS photodiode array. The captured signal is digitised by a microprocessor and the data corrected for background lighting conditions. The results are transferred by a USB link to the MApp software for data collection, display and analysis.

A parallel support arm option can be used with both the BLS and TLS. It is intended to lower the probe vertically on to the test site with a controlled downward force. A foot pedal is also available to trigger the data acquisition.



References —

Publications:

- Im Jang, S., Lee, M., Han, J. et al. (2020), "A study of skin characteristics with long-term sleep restriction in Korean women in their 40s", Skin Res. Technol., 26:2, 193-199
- Kim, M.A., Kim, E.J., Kang, B.Y. and Lee, H.K. (2017), "The effects of sleep deprivation on the bio-physical properties of facial skin", Journal of Cosmetics, Dermatological Sciences and Applications, 7:1, 34-47
- Hae-In Pyeon , Jia Bak, Jin-I Seok, Soojeong So, Hwa-Jin Suh, Mikyung Oh, Segi Kim, Chung-Eun Yang, Il Kyung Chung 5, Yun-Sik Choi (2017), "Effects of nano-sized bee pollen as a new cosmetic ingredient", Korea Institute of Dermatological Sciences, Asian J. Beauty Cosmetol., 15:1, 1-9.

Examples of use in patent claims:

- WO2019149450A1 Use of cyclic peptides in cosmetic, August 2019 (Sederma)
- WO2017103052A1 Cosmetic composition based on white pigments and spherical titanium dioxide aggregates, June 2017 (L'Oreal)

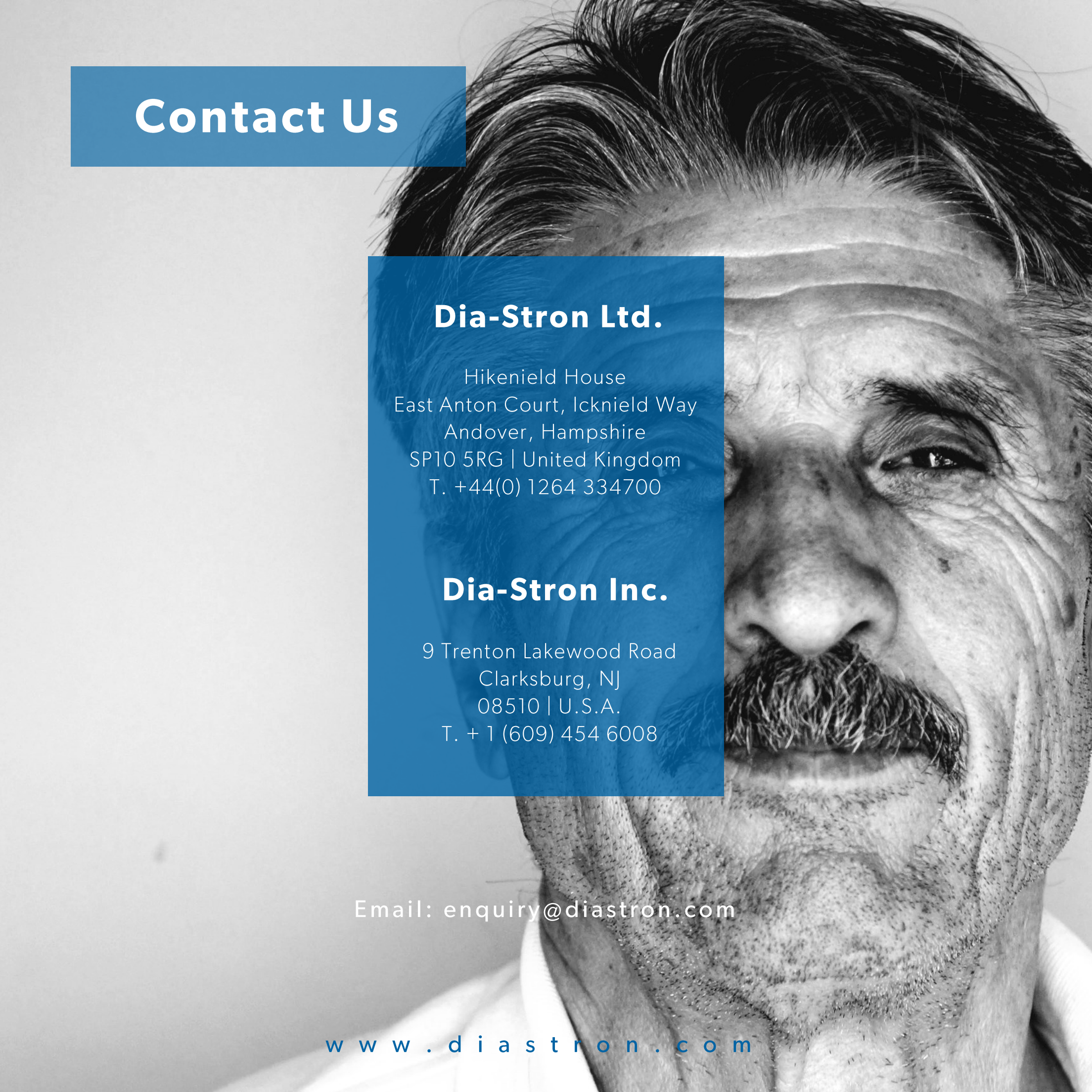
Technical Specifications

BLS785

Control Unit	
Net weight	1kg
Control unit width	160mm
Control unit height	38 mm
Control unit depth	130mm
Measurement Probe	
Probe length	250mm
Probe height	40mm
Probe width	50mm
Stylus energy adjustment	Manual
General Specifications	
Power	24V 12W
Universal input voltage and frequency	90-260V 47-63Hz
Socket(s)	1
Computer connection	USB
Content	
BLS785 Probe BLS785 Control Unit USB Cable Foot pedal to initiate the acquisition Power Supply MApp Software (Windows compatible) - supplied on a USB drive	
Options	
Parallel Support Arm	

TLS855

Programmable Features	
Number of scans	1-10,000
Illumination	% R, G & B
Measurement protocol	RGB scan, R-G-B scans
Measurement Specifications	
LED	R, G & B
Diode array channels	512
Physical Specifications	
Net weight	800g
Probe unit (W x H x D)	80 x 35 x 150mm
General Specifications	
Power	5V 2.5W
Socket(s)	1
Computer connection	USB
Content	
TLS855 Probe USB Cable Foot pedal to initiate the acquisition MApp Software (Windows compatible) - supplied on a USB drive	
Options	
Parallel Support Arm	



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