LCR News

ISSUE ONE

High on performance ... keen on price!

The IA3255 Inductance Analyzer is designed to appeal to users who design and manufacture inductors and transformers and are looking for high performance and value for money. Lightweight and portable, the IA3255 includes many features - such as an extensive range of measurement functions, fast testing speeds, wide frequency range and full remote control - typically associated with more expensive units.

Measurement functions represent those most commonly used by manufacturers and include - Inductance (L), Impedance (Z), Rac, Rdc, Phase (ø), Quality factor (Q), Turns Ratio, Capacitance (C) and Dissipation factor (D). The IA3255 can also measure relative values including % from nominal value.

With the ability to measure Inductance over a wide range of voltages, the IA3255 enables users to accurately check air gaps, correct grades of core material and right number of turns while low level Rdc test avoids overheating or magnetisation problems. Inductance capability is further enhanced by an AC drive level up to 10 V, measurement connection via 4-terminal Kelvin leads, high speed testing under GPIB control, automatic level control over the full impedance range and on-screen absolute or relative indication.

Operating at selectable speeds of up to 20 measurements per second, the IA3255 ensures a consistently high component throughput.

The bright, back-lit liquid crystal display (LCD) clearly shows the measurement results and the various tasks being performed while the master controls, connections and keypad are grouped intuitively so that users can quickly become familiar with the IA3255's functions thereby maximising the time spent on testing.

Welcome

... to *LCR News* which has been designed to provide you with all the latest news from Wayne Kerr's Instrument Division. *LCR News* will keep you informed of new products, enhancements and services which affect you and the industry in which you operate.

We always welcome comment about our news-letters and issues that affect you. Please email us at sales@wayne-kerr.co.uk or send a fax to *LCR News* on +44 (0)1243

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New Meter Trio offers Powerful Capabilities

Providing low cost, straightforward and accurate measurement of components - in a service, production or laboratory environment - the Wayne Kerr 4200 series of automatic LCR meters comprises three versatile models which offer a combination of powerful capabilities to meet the most demanding requirements, quickly, effectively and cheaply.

Whichever of the models is selected, operation is simple and straightforward with measurements undertaken at a wide range of test frequencies and voltage levels. Features include a choice of interfaces, comprehensive measurement functions including DC Resistance, a bin handling capability and component characterisation to 1 MHz.

The models 4270 and 4265 have the widest choice of test frequencies. For testing primary power components such as transformers and filter capacitors, these instruments have 50 and 60 Hz test frequencies together with 100 and 120 Hz frequencies. In the 100 Hz to 20 kHz range, both LCR meters provide 100 Hz resolution for precision frequency characterisation. For testing small value capacitors, 100 kHz is also provided in the 4265, while the test frequency of the 4270 is continuously adjustable up to 1 MHz.

Component test voltage levels are variable from 2 V right down to only 50 mV, to keep sensitive semiconductor junctions below their voltage thresholds. DC bias can be added, either from the built-in source or from an external source up to 40 V DC.

Testing electronic components with Wayne Kerr 4200 series LCR meters is easy, and in less than a second you'll see all you need to know on the large, easy-to-read LCD display. The dominant component value can be measured with a basic accuracy of 0.1% and displayed with its equivalent circuit diagram.

Whatever the requirement, these versatile units have the solution.

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Forward Look

For this issue, '*LCR News*' asked Kevin Lench, Wayne Kerr Manager (Instruments) for his views on the trends and developments which will have the greatest impact on the worldwide market for instrumentation as we head into the new Millennium.

How will new regulations affect your business?

It will affect us in two ways. Firstly because we have to ensure our products meet the new regulations. Secondly we have to ensure we incorporate new regulatory requirements into our test instruments in order that our customers are able to meet their requirements.

What are the current industry trends?

The explosive growth in Information Technology, that is mobile communications, the internet and computing, has introduced a number of additional requirements on our test instruments.

How are your customers needs changing?

As the electronics industry grows and changes so our customers needs are also changing. The main changes we see are the need to test components in a more controlled and stringent environment. Also as businesses look for ever more efficiency gains our customers are asking us to respond by providing solutions to their particular need.

MEET THE TEAM!

Introducing your key Wayne Kerr contacts. The voices may already be familiar to you - but the faces may not! They are there to answer your questions so please do give them a call or send them an email.

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GETTING THE MOST FROM YOUR WOUND COMPONENTS

Measurement needs, problems and solutions - by David Sheath

Wound components appear to be simple devices - easy to design, manufacture and test. In reality they are complex components. To manufacture them well requires technical knowledge, practical experience and considerable skill. Efficient and comprehensive design analysis and testing is vital.

Parametric measurements need to be undertaken to establish the dynamic characteristics of the device. For inductors, these characteristics will almost certainly be:

L	Inductance
Q	Quality factor
Rdc	DC (winding) resistance
Z	Impedance
θ	Phase angle

and, additionally, for transformers:

	Number of turns
	Turns ratio
Lm	Mutual inductance
	Leakage inductance

A number of secondary parameters, often considered equally important, may also be required for inductors. These are:

Main parameter alternation with Direct Current (DC bias) flowing
Resonant frequency
Self capacitance

and for transformers:

Inter-winding capacitance (useful for checking balance)

There are several alternative methods of measuring the required parameters but the most popular method, allowing quick and reliable access to a comprehensive set of measurements, is an AC component tester, commonly called a 'bridge'. Good examples, for inductance measurement, are Wayne Kerr's 3260A and 3255 instruments. This class of instrument will allow comprehensive analysis of all the required parameters.

The measurement bridge should offer:

1) a number of test frequencies covering the widest possible range so that the inductance value can be measured at its most suitable test frequency. This aspect also enables the quality factor to be established and, at suitable frequencies, such values as self-capacitance and resonant frequency to be measured or calculated. Controlled frequency conditioning will also allow such parameters as skin-effect to be assessed. This may be important as it affects the dynamic equivalent series resistance (ESR) of an inductor and its ability to work effectively at higher frequencies.

When DC flows in a conductor, the current is distributed across the whole cross-section of that conductor. As the stimulus frequency is increased, the current tends to migrate away from the centre and thus reduces the current flow. This is seen as a rise in the effective ESR. Because current flow is finally limited to a physical depth around the conductor, the proportion of 'used' area is much more marked in large conductors which will therefore be affected even at relatively low frequencies. Thus, unless special precautions are taken with the design of the inductor to alleviate the skin-effect - such as using specially plied multi-strand wiring - it would be useful to measure this parameter too.

The component tester should also offer:

2) a controlled progression of stimulus voltage steps. This is a very important feature because inductors, particularly those using iron, ferrite or iron dust as a core material, are notoriously level sensitive. This means that they often exhibit changes of inductance relative to the stimulus voltage level but not in a linear fashion. The reason for this is that a certain amount of energy, determined by physical factors, is lost in energising the core material. This shows as a major deviation from the expected inductance value until the core is fully energised after which the value will remain relatively stable.

With too little energy, the magnetic dipoles in the core are not very active, thus restricting the flux which couples the distributed windings of the inductor. With adequate magnetising energy the dipole activity is optimised. As the energy increases, the dipoles will again suffer restricted activity and thus the inductance will once more be affected. This is more apparent at low frequencies when core saturation will have the effect of distorting the current waveform flowing in the inductor as a result of the sinusoidal voltage applied.

From this one can see that an inductor designed for a particular stimulus level should be measured at that level. Another level is likely to give an incorrect value of inductance. This becomes more noticeable when the results from two component test instruments are compared, especially when one relies on 2-terminal measurement. Any stimulus generated by the 2-terminal test set will be attenuated by its output impedance and the device under test.

A test instrument using 4-terminal measurements is better because it overcomes not only the lead drop error (removed in trimming) but also the contact variation at the Kelvin clip jaws and provides a true voltage drop reading across the unknown inductance.

The component tester should also provide:

3) a method of measuring values of inductance with direct current flowing in the coil. Many inductors are used in circumstances where direct current must flow through them. Application examples might include power supplies or powerful transmitters. The ability of the device to pass DC is as important as its ability to perform as an inductor. DC flowing in an inductor will create a unidirectional magnetic field which, if enclosed within a magnetic core, will tend to restrict the movement of magnetic dipoles within that core.

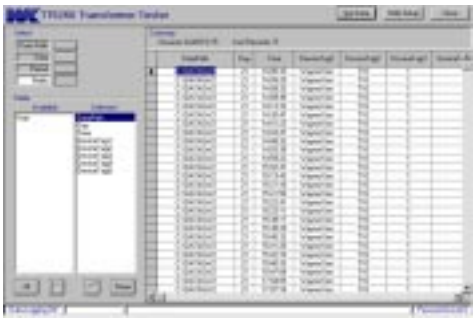
As the DC is increased, the dipole movement will become more restricted until at saturation, all

continued overleaf

Transformer Testing - at the double!

The Wayne Kerr TT5260 automatic transformer test system has been developed to provide the complete solution for production testing of inductors and transformers. By providing a high integrity, accurate and simple measurement system manufacturers are able to meet their entire test needs in a straightforward, no fuss manner.

The TT5260 uses the latest Windows software to provide an intuitive and straightforward user interface. Whether it's writing a test procedure,



Selecting test data for reporting

running a test routine or gathering test data for statistical analysis the TT5260 makes setup and running the system simple.

Test sequence edit page

But that's not all! When you add a measurement system which can accurately measure low and leakage values, Wayne Kerr's worldwide service

Typical test run page

and calibration capability and fixtures for any type of component, it all adds up to an impressive solution.

GETTING THE MOST FROM YOUR WOUND COMPONENTS

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movement will virtually cease. When current is reduced, activity will commence at a different level from where it stopped thus giving rise to the well known B-H or hysteresis loop. This aspect is theoretically non-existent in air-cored inductors but the physical size of an air-cored inductor compared to the same value with a magnetic core will often prohibit the use of air-cored coils. Air-cored coils also exhibit other susceptibilities which may also preclude their use. Thus the provision of DC current bias for testing magnetic cored inductors should be regarded as of prime importance for both analytical and testing purposes.

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