Wayne Kerr
Electronics

LCR Meter

4310 4320 4350 43100

Product Specification

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4300 SPECIFICATION SUMMARY

Models	4310, 4320, 4350 & 43100		
Parameters	Impedance (Z)	Phase Angle (A)	Capacitance (C)
	Dissipation Factor (D)	Inductance (L)	Quality Factor (Q)
	AC Resistance (R)	Conductance (G)	Susceptance (B)
	Reactance (X)	Admittance (Y)	DC Resistance (Rdc)
Frequency	4310:	20Hz to 100kHz	
	4320:	20Hz to 200kHz	
	4350:	20Hz to 500kHz	
	43100:	20Hz to 1MHz	
Test Signal	AC:	10mV to 2V (200 steps)	
	DC:	1V & 2V	
	Source Impedance:	100Ω ±1%	
DC Bias	Internal:	2.0V ±5%	
	External:	≤ ±40V	
Time	Number of speeds:	4	
	Fastest AC Time:	12-17ms	From Trigger to EOM in Binning
		72ms	Total measurement time
	Fastest DC Time:	119ms	Total measurement time
Range	Impedance:	10.0000µΩ to >100.000GΩ	
Modes	One or Two Test Mode		
	Measurement , Limits-Scale & Operator Modes		
	Save & Recall:	20 setups	
Accuracy	Basic Accuracy:	±0.1%	
External Control	GPIB, USB, LAN and RS232		
General	AC Input:	90 to 264V AC auto ranging	
	Remote Control:	RS232, GPIB, LAN & USB	
	Height:	104mm (4.1”)	
	Width:	322mm (12.7”)	
	Depth:	285mm (11.2”)	
	Weight:	3kg (6.6lbs)	
Options	/S1 (Scaleizer Type 1)		
	/S2 (Scaleizer Type 2)		
	/B1 (Bin Handler non-isolated)		
	/B2 (Bin Handler isolated)		

1. Models

The 4300 range consists of four models:

Model	Measurement Frequency	
	Minimum	Maximum
4310	20Hz	100kHz
4320	20Hz	200kHz
4350	20Hz	500kHz
43100	20Hz	1MHz

All instruments have a common specification with the exception of the maximum measurement frequency. Frequency step sizes are the same for each model up to the supported maximum frequency.

2. Measurement Parameters

The 4300 can measure 11 different AC parameters and 1 dc parameter in any combination.

2.1. AC Parameters

Series and parallel equivalent AC circuit models are supported which may be set independently for each test in Two Test mode.

The following parameters are supported:

- Impedance (Z)
- Phase Angle (A)
- Capacitance (C)
- Dissipation Factor (D)
- Inductance (L)
- Quality Factor Q)
- AC Resistance (R)
- Conductance (G)
- Susceptance (B)
- Reactance (X)
- Admittance (Y)

2.2. AC Equivalent Circuit

Series

Any two series AC equivalent circuit parameters can be displayed at the same time as Function 1 and Function 2.

Parallel

Any two parallel AC equivalent circuit parameters can be displayed at the same time as Function 1 and Function 2.

2.3. DC Resistance (Rdc)

Rdc can be set as Function 1 only.

Function 2 is not available when Function 1 is set to Rdc.

3. Frequency

The frequency range of the AC measurement signal is determined by the 4300 model.

3.1. Range

Model	Frequency Range	Number of Frequency Points
4310	20Hz to 100kHz	557
4320	20Hz to 200kHz	577
4350	20Hz to 500kHz	637
43100	20Hz to 1MHz	737

3.2. Step Size

Frequency	Resolution
20Hz to 1kHz	5Hz
1kHz to 10kHz	50Hz
10kHz to 100kHz	500Hz
100kHz to 1MHz	5kHz

3.3. Accuracy

±0.005% (50ppm).

4. Test Signal

4.1. AC Voltage Drive Level

Drive Range	Detail	Resolution
10mV to 2V	into open circuit	10mV (200 steps)

4.2. DC Voltage Drive Level

Drive Range	Detail	Resolution
1V or 2V	into open circuit	1V (2 steps)

4.3. Source Impedance

Source Impedance: 100Ω ±1%

4.4. Front Panel BNC's

Four front panel BNC (female) connectors provide a 4-terminal connection to the Device Under Test. The BNC screens are at ground potential.

4.5. Measurement Circuit Protection

The 4300 measurement circuit can withstand connection of a charged capacitor up to following limits:

Parameter	Specification
Voltage	50V to 500V
Stored Energy	<0.25J
Polarity	Both

4.6. Range Of Readings

The 4300 can display readings in the following ranges.

The accuracy of these readings is specified in Section 9 Measurement Accuracy.

Parameter	Range
R, Z , X	10.0000µΩ to >100.000GΩ
G, Y, B	1.00000pS to >10.0000kS
L	100.000pH to >100.000MH
C	10.0000fF to >1.00000F
D, Q	0.00001 to 99999.9
A	-180.000° to +180.000°
Rdc	0.1000mΩ to >10.000GΩ

5. DC Bias

A DC bias voltage (derived from an internal or external source) can be applied to the Device Under Test (typically a capacitor) during AC measurements.

5.1. Internal DC Bias Voltage

Parameter	Specification
DC bias voltage	2.0V ±5%
Peak short circuit current	≤ 10mA

5.2. External DC Bias Voltage

Parameter	Specification
Maximum bias voltage	≤ ±40V
Peak short circuit current	≤ 225mA

The bias voltage is obtained by connecting an external power supply to the bias terminals on the rear panel of the 4300.

A resettable trip protects the bias circuit against a continuous short circuit.

6. Measurement Speed

There are four selectable speeds for all measurement functions. Selecting a slower measurement speed reduces measurement noise by increasing the averaging applied and may increase the resolution of the results.

6.1. AC Measurements

The fastest measurement time (defined as the time from trigger to end of measurement in bin handler mode) is 12 - 17ms with optimum conditions.

The following total measurement times (includes keyboard scan and display update) are typical in One Test Mode for measurements > 850Hz.

Speed	Duration	Averaging	Suggested Application
Maximum	72ms	1 acquisition	Automatic sorting
Fast	108ms	4 acquisitions	Non-critical measurements
Medium	253ms	8 acquisitions	Improved resolution
Slow	445ms	16 acquisitions	Best accuracy & enhanced supply frequency rejection

Total measurement times will be longer for frequencies less than 850Hz and also in Two Test Mode.

6.2. DC Measurements

The following total measurement times (includes keyboard scan and display update) are typical in One Test Mode.

Speed	Duration	Averaging	Suggested Application
Maximum	119ms	1 acquisition	Automatic sorting
Fast	312ms	4 acquisitions	Non-critical measurements
Medium	568ms	8 acquisitions	Improved resolution
Slow	1081ms	16 acquisitions	Best resolution & enhanced supply frequency rejection

7. Modes Of Operation

7.1. One & Two Test Modes

Measurements are displayed in either One Test Mode or Two Test Mode.

One Test Mode

Test 1 (Function 1 & Function 2) is shown.

Test 2 is turned off and not shown.

Two Test Mode

Test 1 (Function 1 & Function 2) is shown.

Test 2 (Function 1 & Function 2) is shown.

The following combinations are possible:

Test	Function	AC parameter	DC resistance
1	Function 1	Any	Rdc
	Function 2	Any or Off [2]	None [1]
2	Function 1	Any	Rdc
	Function 2	Any or Off [2]	None [1]

[1] Function 2 is not available when Function 1 is set to Rdc.

[2] When Function 1 is set to an AC parameter Function 2 may be hidden.

In Two Test Mode the following parameters can be varied between Test 1 and Test 2:

Function 1	Function 2
Equivalent Circuit	Frequency
Drive Level	Range

The following parameters are kept the same in Test 1 and Test 2:

Speed	DC Bias

7.2. Measurement Mode

Single and repetitive measurements of Function 1 and Function 2 in One Test Mode and Two Test Mode

7.3. Limits-Scale Mode

One Test Mode

Single and repetitive measurements of Function 1 and Function 2 and scale bar graphs. Each bar graph has configurable Hi/Lo limits giving a PASS/FAIL result and a visual indication of result relative to limits.

Two Test Mode

As Measurement Mode plus a table with configurable Hi/Lo limits giving PASS/FAIL result for each function and overall PASS/FAIL decision.

7.4. Operator Mode

Single and repetitive measurements displayed with LOW/PASS/HIGH result (based on Limits-Scale Mode settings) for every function and overall PASS/FAIL decision.

8. Save and Recall

20 different measurement set-ups can be saved in non-volatile memory with user defined names. Any saved setup can be recalled. User defined names can be up to 10 characters long.

9. Measurement Accuracy

The following sections and iso-accuracy charts define the specified accuracies over the available frequency range and impedance range under defined conditions. Failure to comply with any of these conditions means that the specified accuracy is no longer guaranteed.

Conditions:

AC Drive Level:	1V
Trim:	Instrument trimmed at measurement frequency
Fixture:	Wayne Kerr 1EV1006 Component Fixture
Temperature:	23±5ºC

AC supply frequency rejection may also cause additional unquantifiable errors dependant on measurement lead layout, particularly at frequencies below 600Hz and at lower AC Drive Levels.

For above and below the areas indicated in the following charts, the accuracy degrades linearly with increasing/decreasing logarithmic DUT value.

9.1. Impedance (Z)

Use the Z accuracy value on the Impedance (Z) Iso-accuracy Chart .

9.2. Admittance (Y)

Use Z = 1/Y

Use the Z accuracy value on the Impedance (Z) Iso-accuracy Chart

9.3. Resistance (R)

For Q < 0.1

Use Z = R, then use the Z accuracy value on the Impedance (Z) Iso-accuracy Chart

For 0.1 <Q< 1

Use Z = R, find the Z accuracy value on the Impedance (Z) Iso-accuracy Chart then multiply by (1+Q)

9.4. Reactance (X)

For D < 0.1

Use Z = X then use the Z accuracy value on the Impedance (Z) Iso-accuracy Chart

For 0.1 <D< 1

Use Z = X, find the Z accuracy value on the Impedance (Z) Iso-accuracy Chart then multiply by (1+1/D)

9.5. Conductance (G)

For Q < 0.1

Use Z = 1/G then use the Z accuracy value on the Impedance (Z) Iso-accuracy Chart

For 0.1 <Q< 1

Use Z = 1/G, find the Z accuracy value on the Impedance (Z) Iso-accuracy Chart then multiply by (1+Q)

9.6. Susceptance (B)

For D < 0.1

Use Z = 1/B then use the Z accuracy value on the Impedance (Z) Iso-accuracy Chart

For 0.1 <D< 1

Use Z = 1/B, find the Z accuracy value on the Impedance (Z) Iso-accuracy Chart then multiply by (1+1/D)

9.7. Capacitance (C)

For D < 0.1

Use the C accuracy value on the Capacitance (C) Iso-accuracy Chart

For 0.1 <D< 1

Find the C accuracy value on the Capacitance (C) Iso-accuracy Chart then multiply by (1+D)

9.8. Inductance (L)

For Q > 10

Use the L accuracy value on the Inductance (L) Iso-accuracy Chart

For 1 <Q< 10

Find the L accuracy value on the Inductance (L) Iso-accuracy Chart then multiply by (Q+1/Q)

9.9. D (Dissipation Factor)

Find the Z accuracy value on the Impedance (Z) Iso-accuracy Chart then multiply by $(1+D^2)/100$

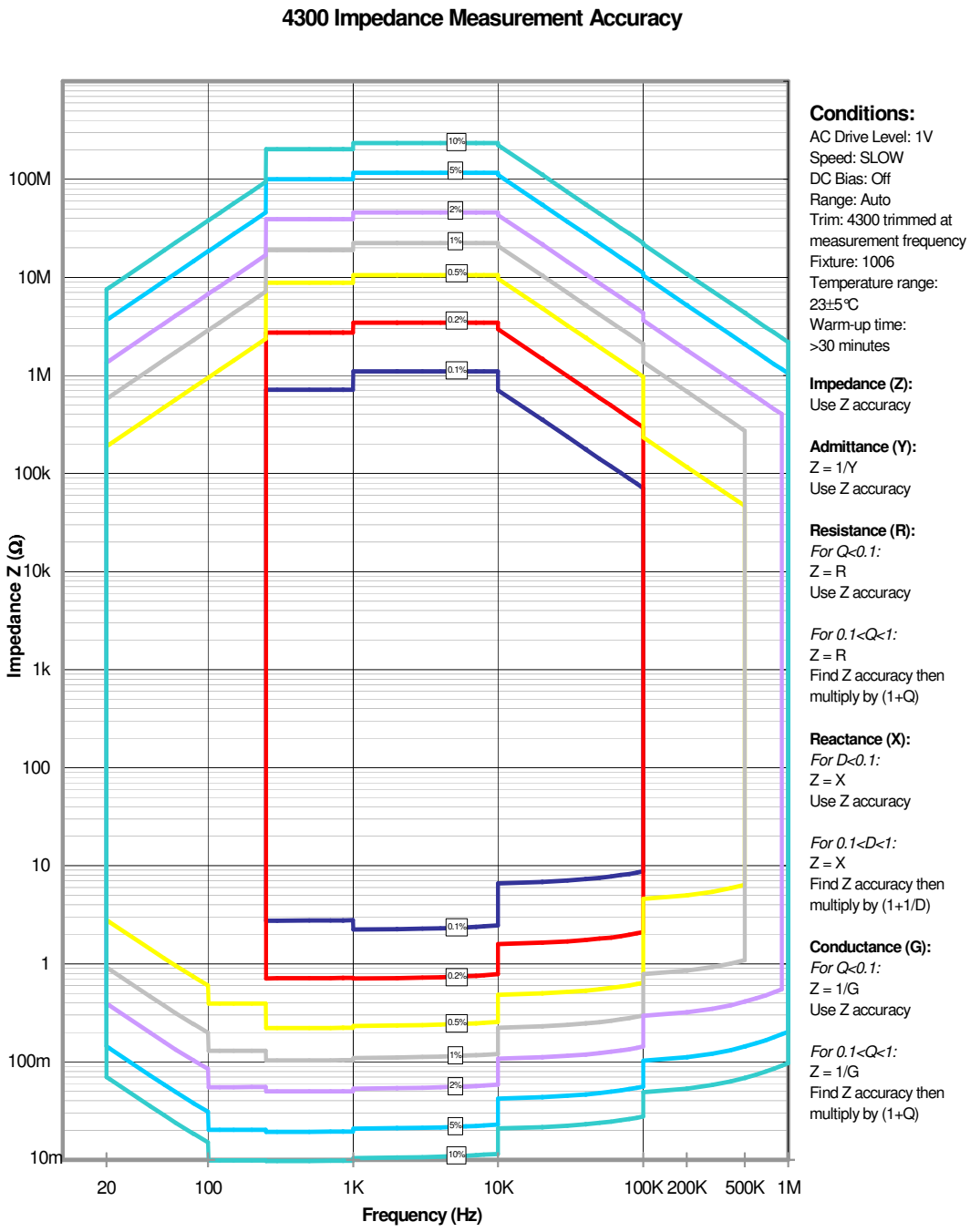
9.10. Q (Quality Factor)

Find the Z accuracy value on the Impedance (Z) Iso-accuracy Chart then multiply by (Q+1/Q)

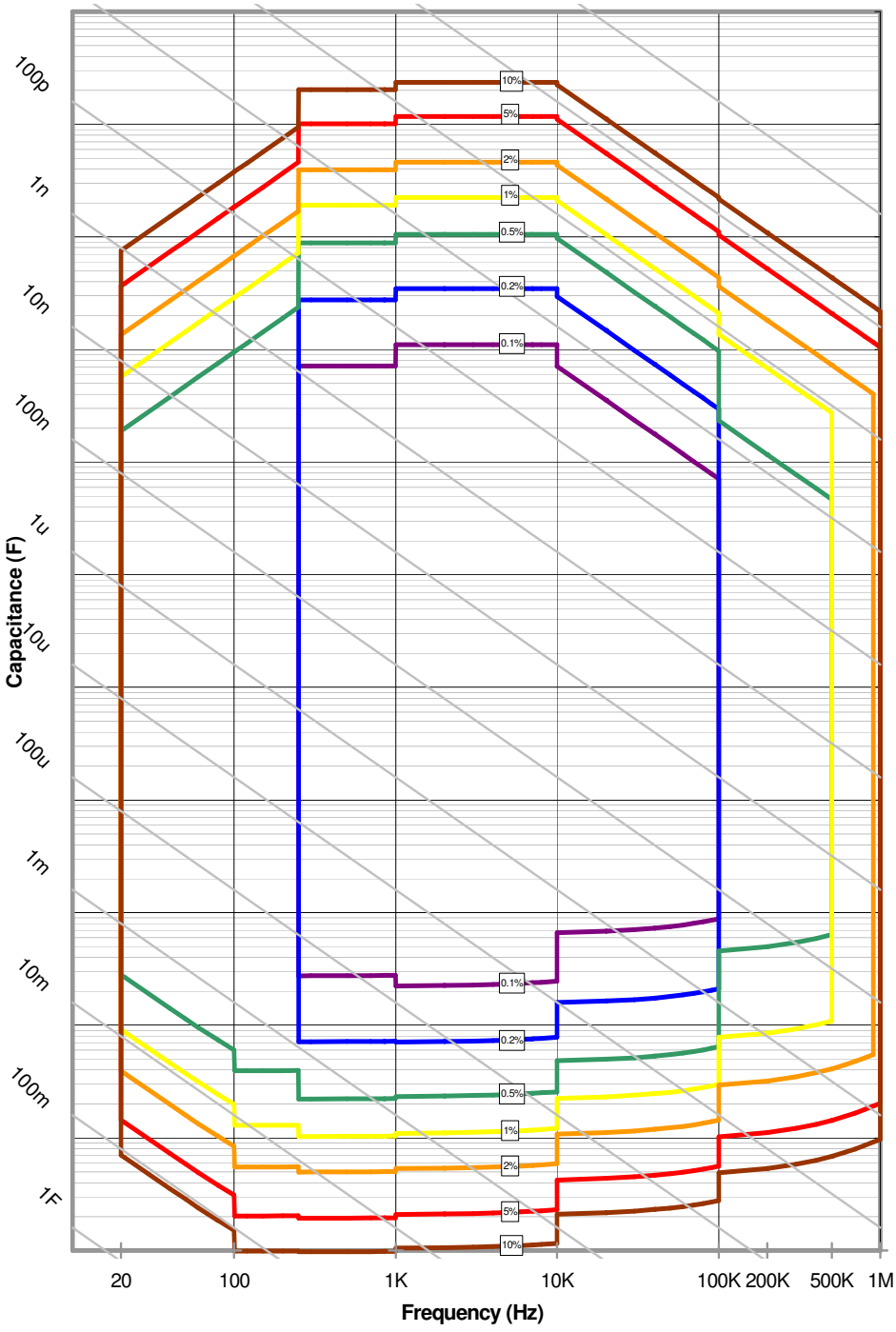
9.11. Rdc Accuracy

Resistance Range	Accuracy
10Ω to 1MΩ	±0.2%

9.12. Accuracy Charts



4300 Capacitance Measurement Accuracy

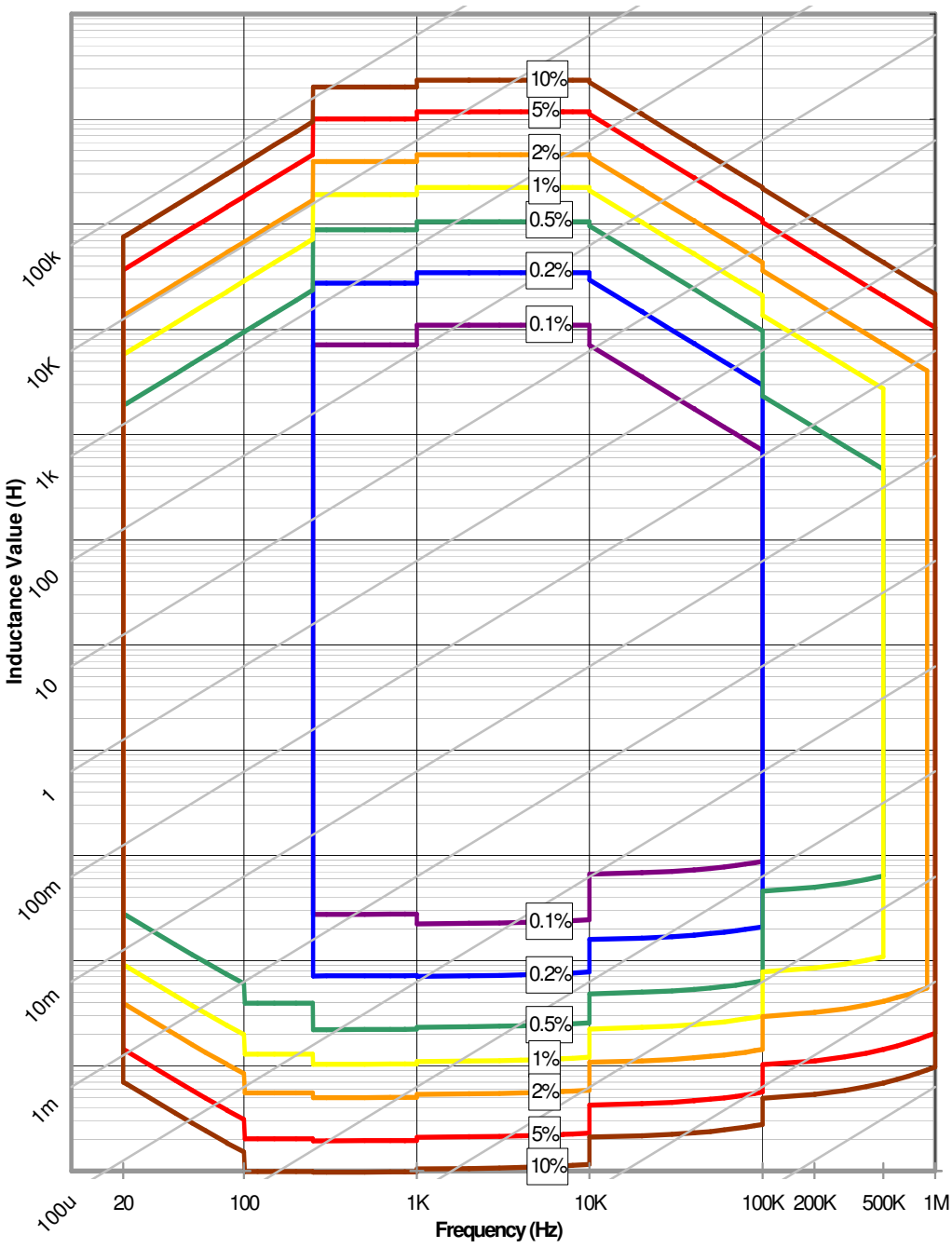


Conditions
AC Drive Level: 1V
Speed: SLOW
DC Bias: Off
Range: Auto
Trim: 4300 trimmed at measurement frequency
Fixture: 1006
Temperature range: 23±5°C
Warm-up time: >30 minutes

Capacitance (C):
For D<0.1:
Use C accuracy

For 0.1<D<1:
Read C accuracy then multiply by (1+D)

4300 Inductance Measurement Accuracy



Conditions
AC Drive Level: 1V
Speed: SLOW
DC Bias: Off
Range: Auto
Trim: 4300 trimmed at measurement frequency
Fixture: 1006
Temperature range: 23±5°C
Warm-up time: >30 minutes

Inductance (L)
For Q>10:
Use L accuracy

For 1<Q<10:
Find L accuracy then multiply by (Q+1/Q)

10. General

10.1. AC Input

Parameter	Specification
Voltage	90 to 264V AC autoranging
Frequency	45 to 63Hz
Power	15W max
Input fuse rating	1.6A T HRC (quantity 2)

10.2. Display

3.8” (96.5mm) ¼VGA

320 x 240 pixels.

High contrast (adjustable) black and white LCD module with CPL back lighting.

10.3. Remote Control

RS232C

Connector: 9-pin female D-type

Parameter	Specification
Baud rate	9600bps
Character length	8bits
Stop bit	1bit
Parity	Non-parity
Character	ASCII character

GPIB

Connector: 24-pin GPIB

IEEE 488.1 bus standard and IEEE 488.2 code standard are supported. The command set has been designed to the SCPI 1992.0 standard.

USB

Connector: USB socket Type A

USB 1.1 compatible. A USBTMC driver must be installed on the controller PC.

LAN

Connector: RJ45 (8P8C)

Ethernet compatible with IEEE 802.3 and 10BASE-T PHY

Remote Trigger (Trigger In)

Rear panel BNC with internal pull-up, operates on logic low or contact closure.

10.4. Mechanical

Parameter	Specification
Height	104mm (4.1")
Width	322mm (12.7")
Depth	285mm (11.2")
Weight	3kg (6.6lbs)

10.5. Environmental Conditions

This equipment is intended for indoor use only in a non-explosive and non-corrosive atmosphere.

Temperature Range

Parameter	Specification
Storage	-40℃ to +70℃
Operating	0℃ to 40℃
Normal accuracy	18℃ to 28℃ (1)

Relative Humidity

Up to 80% non-condensing.

Altitude

Up to 2000m.

Installation Category

II in accordance with IEC664.

Pollution Degree

2 (mainly non-conductive).

Safety

Complies with the requirements of EN61010-1.

EMC

Complies with EN61326 for emissions and immunity.

11. Options

Only one internal option (S1, S2, B1 or B2) can be fitted to an instrument.

11.1. Scaleizer (S1 & S2)

The Scaleizer module uses two relays (RL A and RL B) to provide two basic signals which indicate the PASS/FAIL decisions obtained in Limits-Scale Mode and Operator Mode.

S1 Signals

One Test Mode:

RL A closes when Test 1 result is a PASS

RL B is the inverse of RL A

Two Test Mode

RL A closes when both Test 1 and Test 2 results are a PASS

RL B is the inverse of RL A

S2 Signals

One Test Mode:

RL A closes when Test 1 result is a PASS

RL B is the same as RL A

Two Test Mode:

RL A closes when Test 1 result is a PASS

RL B closes when Test 2 result is a PASS

Scaleizer (S1 & S2) Electrical Ratings

Parameter	Specification
Output on-state current:	≤50mA at 24V 200mA total for all outputs
Output off-state current:	< 0.5mA
Source/Sink impedance:	1Ω typical
Trigger input high current:	> 6mA
Trigger input high voltage:	16V minimum 26.5V maximum
Trigger input low current:	< 0.5mA
Trigger input low voltage:	< 2V
Maximum reverse voltage (any input / output)	48V
Maximum voltage between any pin and ground	48V

11.2. Bin Handler (B1 & B2)

The Bin Handler module provides binning signals based on user set limits in Binning Mode. Two Interface options are available.

B1 Non-Isolated Interface

Parameter	Specification
Output High Voltage:	>4.0V
Output Low Voltage:	<1.0V
Input High Voltage:	>3.5V
Input Low Voltage:	<1.5V
Current Capability Low:	10mA (sink) typical
Current Capability High:	30µA (source) typical

B2 Opto Isolated Interface

Parameter	Specification
Output On-state Current:	<10mA at 24V
Output Off-state Current:	<0.5mA
Input Voltage:	-1.5V at 10mA
Input High Current:	>3mA
Input Low Current:	<1.25mA
Input High Voltage:	>15.4V
Input Low Voltage:	<8V

12. Part Numbers

12.1. Models

4310 (100kHz LCR Meter)	1J4310R
4320 (200kHz LCR Meter)	1J4320R
4350 (500kHz LCR Meter)	1J4350R
43100 (1MHz LCR Meter)	1J43100R

All instruments are supplied with the following items:-

User Manual	9H4300
Calibration Certificate	QF110
USB Cable (Type A – Type A)	HCUSBAA2M
Kelvin Leads	1EVA40150

12.2. Options

Only one option can be fitted per instrument.

Scaleizer S1	Add /S1
Scaleizer S2	Add /S2
Bin Handler B1 4300 Bin Handler Manual also supplied	Add /B1
Bin Handler B2 4300 Bin Handler Manual also supplied	Add /B2

12.3. Accessories

SMD Tweezers	1EVA40120
Large Jaw Kelvin Clips	1EVA40180
1006 Component Fixture	1EV1006
Crocodile Clips	1EV1505

See www.waynekerrtest.com for a full list of accessories.

Wayne Kerr Electronics Limited reserves the right to change this specification without notice.