# INTRODUCTION

The 6425 is designed to give fast and accurate readout of component values, easy sorting of resistors, capacitors and inductors, detailed analysis of networks, and rapid monitoring of changing values. An extended measurement range, wide choice of operating frequency and adjustable drive level make the Analyzer a powerful tool in design laboratories, goods inwards sections, test departments and in connection with chemical and physical research work.

A cathode-ray tube is used to present clear and unambiguous results in numeric and graphic form, to display warning and other messages and, under software control, it automatically labels a set of ten 'soft' keys to show the parameter selection available for each mode of operation. All key settings are retained in non-volatile memory. Because there are no variable controls requiring user adjustment, and values can be read directly in the terms required, confidence in the validity of results is maximized for all levels of operator skill.

Four-terminal connections provide continuous correction for losses occurring in measurement leads or fixtures, ensuring the maintenance of dependable five-figure resolution and the specified accuracy over the full C, L and R ranges. The number of digits displayed - up to a maximum of six - is automatically adjusted to be commensurate with the accuracy. Trimming (O/C and S/C) is, in each case, a simple push-button operation, with corrections applied automatically to suit the particular measurement conditions at any time.

Range selection is automatic, with manual over-ride provided, together with a visual reminder when an alternative range would offer better resolution. Should a measurement lie beyond the range selected manually, the display is blanked, obviating false results.

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Sorting, pass/fail and deviation operations are all provided for. A numeric keypad allows limits to be set precisely, in % or Absolute terms, with the software guiding the user through the procedure and warning of any missing or invalid keying operations. A keyboard lockout function protects against unauthorized or inadvertent changes to established measurement conditions.

Other features include direct readout of D,Q or loss resistance at the same time as C or L, choice of equivalent series or parallel circuit values, display of actual signal level at the test point and provision for introducing dc polarizing voltages.

Options for the Precision Component Analyzer include an RS232-C Printer Interface; a GPIB Interface (to IEEE Std 488-1978); a Standard Handler Interface and Analog Outputs of 2 measured parameters. Basic information on these options is included in this Manual : for further details please contact your Supplier.

# SPECIFICATION



**MEASUREMENT SYSTEM**

Microprocessor-controlled.
'Soft' keys for measurement functions & conditions.
Selected functions held in non-volatile memory.
Electronic 'lock-out' of key functions.
Measurement trigger by remote contacts.
Plug-in options for interface with controllers/ printers/plotters/sorters.

**DISPLAY**

7-inch (18cm) CRT for values, conditions, soft-key functions, instructions and warning messages.
Number of digits displayed (max: 6) depends on measurement accuracy.

**MEASUREMENT FUNCTIONS**

C & D, C & Q, C & R } Series or parallel
L & D, L & Q, L & R } equivalent circuit
C & G, L & G Parallel equivalent circuit
Z & ∠θ, Y & ∠θ Signal level at Unknown

Deviation: % change from measured Nominal (L C Z or Y).
Limits: % or Absolute for Go/Nogo testing, with Analog Bar Display.
Binning: Sorts by major/minor term limits into 9 bins (tenth for rejects).
Auto-Trim: Compensates for residual series impedance and parallel capacitance of measurement leads up to 1 Ω /50pF maximum. Trimmed value held in non-volatile store.

**MEASUREMENT CONDITIONS**

Frequency (Hz): 20, 25, 30, 40, 50, 60, 80, 100, 120, 150, 200 etc, repeats each decade up to 60k, then 75k, 100k, 120k, 150k, 200k, 300k (42 frequencies).
Frequency accuracy: ±0.01%.

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MEASUREMENT CONDITIONS (continued)

AC Drive level:

10mV - 500mV (10mV steps) } Available if Unknown
520mV - 1.0V (20mV steps) } impedance > 10Ω
1.05V - 2.5V (0.05V steps) } Available if Unknown
2.6V - 5.0V (0.1V steps) } impedance > 80Ω
1mA - 50mA (1mA steps) } Available if Unknown
52mA - 100mA (2mA steps) } impedance < 10Ω

Drive mode (current/voltage) selected automatically as a function of impedance range.

When in current drive, with Z or Y selected, the voltage across the Unknown can be displayed, and vice versa.

At 300kHz, voltage drive restricted to 3V maximum.

AC Level accuracy (at source):

30Hz - 120kHz: voltage ±4% ±2mV
" " current ±5% ±200μA

20Hz & 25Hz voltage ±7.5% ±2mV
120kHz - 200kHz current ±8.5% ±200μA

300kHz: voltage ±11.5% ±2mV
" current ±12.5% ±200μA

Source loading. Max level reduction at Zu = 10Ω:

Capacitive or Inductive Unknown:
4% (voltage drive)
3% (current drive)

Resistive Unknown:
18% (voltage or current drive).

DC Bias voltage.

Internal: adjustable supply with separate on/off switch and safety link.
0.1V - 5V (0.1V steps)
5.2V - 10V (0.2V steps)
10.5V - 20V (0.5V steps)
Open- circuit accuracy ±2% ±60mV
Max. continuous leakage current in Unknown: 3mA +0.25mA/V.
Charge/discharge limited to <1A or <500V/sec.

DC Bias voltage (continued)

External: additional supply can be connected in series with internal supply to increase available voltage. Controlled by internal on/off switch. Supply current limited to 1A.

Max. total voltage (internal + external): 50V.

Open-circuit accuracy at measurement terminals: ±2% ±60mV.

Max. continuous leakage current in Unknown: 3mA.

MEASUREMENT RANGES

Automatic range selection can be inhibited by Hold function (Range Error shows when a change of range could give improved accuracy). When in Hold, a desired range can be selected by keying the corresponding code.

| Range Number | Impedance coverage | Maximum ac Drive Level |
|---|---|---|
| 1 | < 1.25Ω | 100mA |
| 2 | < 10Ω | 100mA |
| 3 | > 10Ω | 1V |
| 4 | > 80Ω | 5V |
| 5 | > 640Ω | 5V |
| 6 | > 5.12kΩ | 5V |
| 7 | > 41kΩ | 5V |
| 8 | > 328kΩ | 5V |

Range 8 available up to 10kHz.

Range 7 available up to 60kHz.

For drive levels below 25mA, Range 1 not available.

For drive levels below 250mV, highest range at each frequency not available.

At 300kHz, max level = 3V.

**MEASUREMENT ACCURACY**

At 1V or 100mA. Slow Speed. (See also page 2-7). Resolution figures apply from 250mV or 25mA upwards. From 30mV to 240mV, and 3mA to 24mA, multiply by 10.

**Resistance (R)**

Basic accuracy (1kHz): ±.05% 0.2Ω - 12MΩ

Full details on pages 2-8 and 2-9.

Resolution: 0.005mΩ up to 10kHz
0.05mΩ at 100kHz
0.2mΩ at 300kHz

**Conductance (G)**

Basic accuracy (1kHz): ±.05% 80nS - 5S

Full details on pages 2-8 and 2-9.

Resolution: 0.01nS up to 10kHz
0.2nS at 20kHz
1nS at 50kHz
5nS at 100kHz
0.02μS at 300kHz

**Capacitance (C)**

Basic accuracy (1kHz): ±.05% 20pF - 1800μF

Full details on pages 2-10 and 2-11.

Resolution: 0.002pF at 1kHz
0.0002pF at 10kHz
0.002pF at 50kHz
0.01pF at 100kHz

**Dissipation Factor (D)**

Basic accuracy (1kHz): ±.0002 60pF - 320μF

Full details on pages 2-12 and 2-13.

Resolution: 0.00005 up to 10kHz
0.0005 at 100kHz
0.002 at 300kHz

**Inductance (L)**

Basic accuracy (1kHz): ±.1% 3μH - 200H

Full details on pages 2-14 and 2-15.

Resolution: 0.1nH from 5kHz upwards

**Quality Factor (Q)**

Basic accuracy (1kHz): ±(.05Q)% 40μH - 160H

Full details on pages 2-16 and 2-17.

Resolution:

better than 2% for Q $\geq$ 1400 up to 10kHz
Q $\geq$ 140 at 100kHz
Q $\geq$ 32 at 300kHz

| | |
|---|---|
| MEASUREMENT SELECTION | Repetitive (free-running) or Single shot triggered by dedicated front-panel key or remote contact via 3.5mm jack on front panel. This key remains active during keyboard lockout. |
| Measurement Speeds | Normal: Approx 400ms/measurement above 300Hz. Slows progressively below 300Hz to approx 600ms at 20Hz.<br>Fast (reduced accuracy): Approx 125ms/measurement above 300Hz. Slows progressively below 300Hz to approx 600ms at 20Hz.<br>Slow (improved resolution): Approx 1.3s/measurement up to 75kHz. 750ms/measurement for 100kHz and above. |
| MEASUREMENT CONNECTIONS | Four BNC connectors permit 2, 3 and 4-terminal connections with screens at ground potential. Connection diagrams available on CRT display. Terminals withstand connection of charged capacitors, up to 50V (100mF max) or up to 500V (2µF max), either polarity.<br>Rear panel safety link can be removed to inhibit internal dc bias. External bias supply connects in place of safety link. Circuits are NOT protected against reverse-connected external supply. |
| TEMPERATURE RANGE | Storage: -40°C to +70°C (-40°F to +158°F).<br>Operating: 0°C to +40°C (+32°F to +104°F).<br>Full Accuracy: 10°C to +30°C (+50°F to +86°F). |
| POWER SUPPLY | 115V ±10% or 230V ±10% ac only.<br>Consumption nominally 70VA.<br>Instruments may be converted for 50Hz or 60Hz operation by fitting an internal wire link. Operation is possible with this link incorrectly set, but full accuracy may not be maintained. |

| | | |
|---|---|---|
| DIMENSIONS | Width: | 443mm (17.5in.) |
| | Height (inc. feet): | 195mm (7.7in.) |
| | Depth (overall): | 470mm (18.5in.) |
| | Weight | 16kg (35lb) |

ACCESSORIES

1. Type 1305 or 1505: 4-terminal crocodile-clip leads.
2. Type 1405 or 1605: 4-terminal Kelvin clip leads.
3. Component Fixture type 1005, suitable for radial and axial components.

As standard, 6425 is supplied with accessory type 1605.

OPTIONS

RS232C Interface: provides automatic output of measurement data (e.g. to a printer).

GPIB Interface: provides either

i) automatic output of measurement data (e.g. to a printer), or

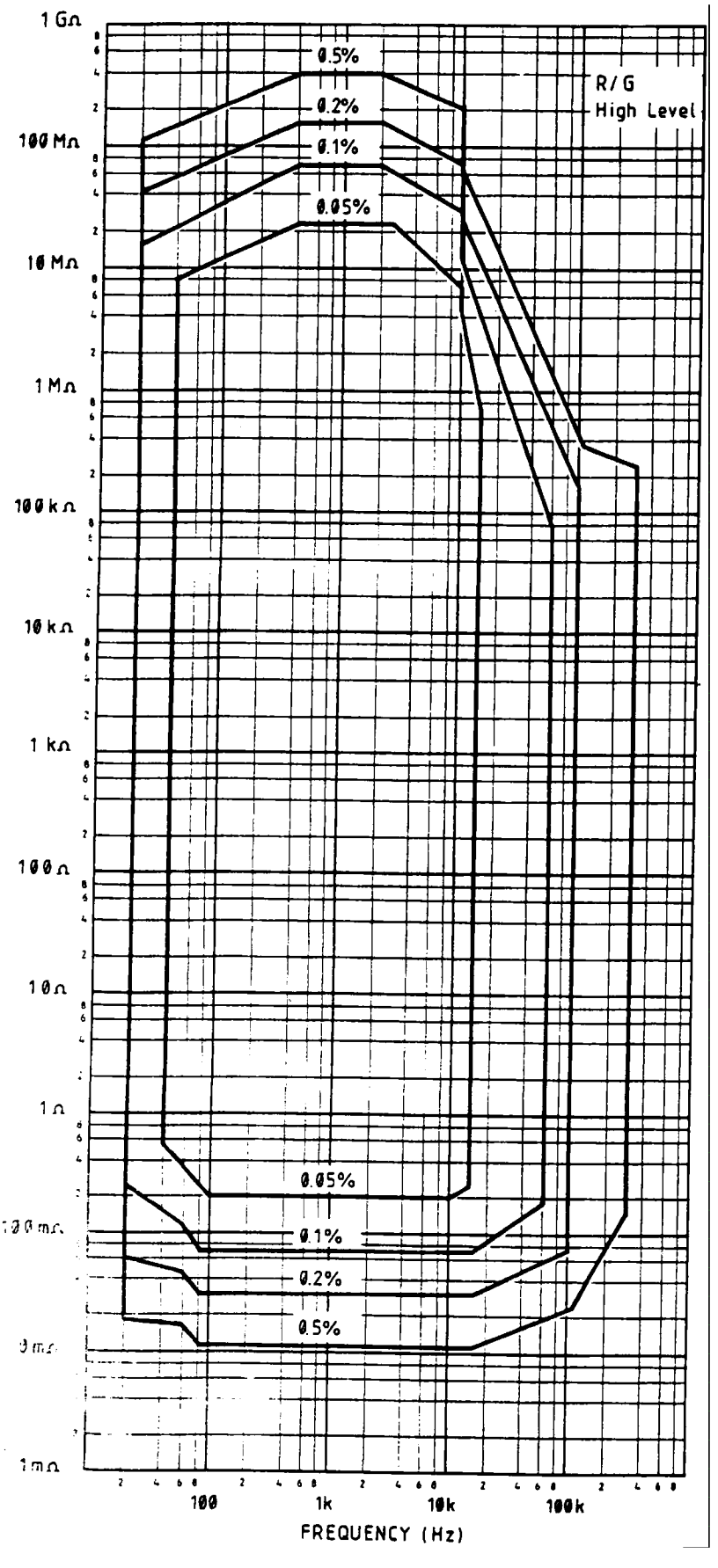
ii) full remote control of all functions via IEEE-488.

In step with rapidly developing technology the Company is continually improving its products and therefore reserves the right at any time to alter specifications or designs without prior notice.

## MEASUREMENT ACCURACY

Iso-Accuracy charts define the measurement ranges available, at specified accuracies, over the available frequency band. For each of the five parameters - R/G, C, D, L and Q - two sets of curves are given: one for measurements at an ac level of 1V/100mA, the second for a level of 200mV/20mA. All curves assume that the Slow measurement speed is used, that the Analyzer has been trimmed at the frequency used for measurements and that the component under test is pure. Beside each chart is a summary of these conditions and information on the accuracy applicable when some or all of the conditions change.

## R/G High Level Accuracy




CONDITIONS
AC Drive Level: 1V/100mA
Slow Speed
Analyzer trimmed at measurement frequency
Q ⩽ 0.1
Except on highest and lowest measurement ranges, the adjacent Iso-Accuracy chart applies also as follows:
250mV - 5V and 25mA - 100mA
Normal Speed
Interpolated trim
For Fast Speed, on all ranges, the Normal Speed accuracy figures must be doubled. Supply frequency rejection is also reduced, causing additional unquantifiable errors dependent on measurement lead layout, particularly at frequencies below 600Hz and low a.c. drive levels.

O/C and S/C Trim corrections under various conditions of interpolation, speed and level are given in the table following these Iso-Accuracy charts.

For impure components, and for measurements on the highest or lowest available ranges, the full accuracy expressions, shown below, apply. During the first hour of operation, parallel capacitance trim may drift by up to 0.05pF, series impedance by up to 0.2mΩ. Subsequent drifts, including ambient temperature change not exceeding 5°C, are included in the interpolated trim correction figures in the table (page 2-18).

For $1 > Q > 0.1$ multiply accuracy by $(1+Q)$

For $Q > 1$ (loss resistance of inductor)
see Q accuracy chart (page 2-16)
$D < 1$ (loss resistance of capacitor)
see D accuracy chart (page 2-12)

High R values: Accuracy = $\pm(A + 100\ Y_T.Rx)\%$

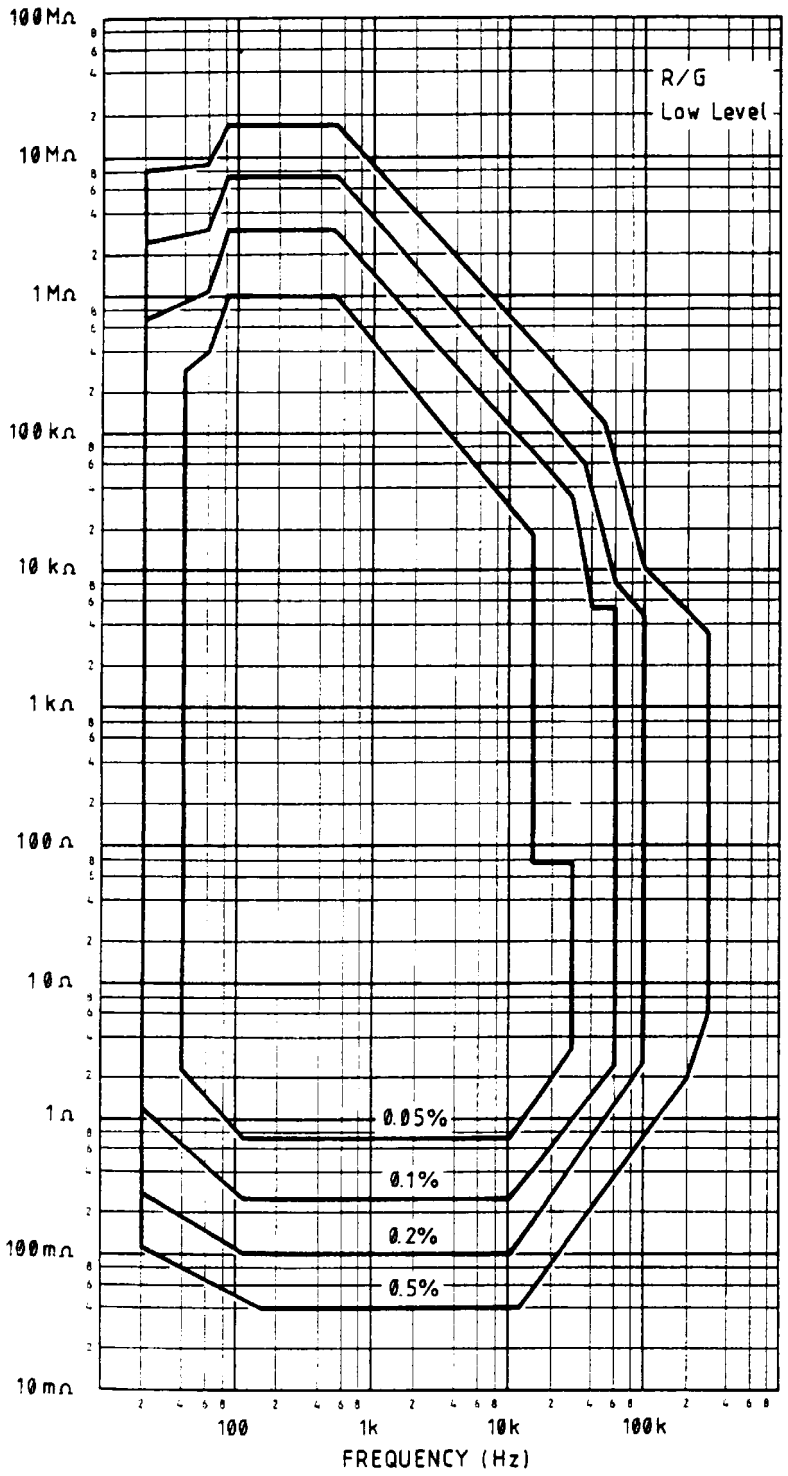
Low R values: Accuracy = $\pm(A + 100R_T/Rx)\%$

where
A = Accuracy from adjacent chart
Rx = measured value of unknown component
$Y_T$ = sum of $Y_I$, $Y_N$, $Y_L$ (as appropriate, from Table - page 2-18).

$R_T$ = sum of $Z_I$, $R_N$, $R_L$ (as appropriate, from Table - page 2-18).

Conductance (G): Find accuracy for equivalent R value from R = 1/G

## R/G Low Level Accuracy




CONDITIONS
AC Drive Level: 200mV/20mA
Slow Speed
Analyzer trimmed at measurement frequency
$Q \leq 0.1$
Except on highest and lowest measurement ranges, the adjacent Iso-Accuracy chart applies also as follows:
50mV - 240mV and 5mA - 24mA
Normal Speed
Interpolated trim
For Fast Speed, on all ranges, the Normal Speed accuracy figures must be doubled. Supply frequency rejection is also reduced, causing additional unquantifiable errors dependent on measurement lead layout, particularly at frequencies below 600Hz and low a.c. drive levels.

O/C and S/C Trim corrections under various conditions of interpolation, speed and level are given in the table following these Iso-Accuracy charts.

For impure components, and for measurements on the highest or lowest available ranges, the full accuracy expressions, shown below, apply. During the first hour of operation, parallel capacitance trim may drift by up to 0.05pF, series impedance by up to 0.2mΩ. Subsequent drifts, including ambient temperature change not exceeding 5°C, are included in the interpolated trim correction figures in the table (page 2-18).

For $1 > Q > 0.1$ multiply accuracy by $(1+Q)$

For $Q > 1$ (loss resistance of inductor)
see Q accuracy chart (page 2-17)
$D < 1$ (loss resistance of capacitor)
see D accuracy chart (page 2-13)

High R values: Accuracy $= \pm (A + 100\ Y_T . Rx)\%$

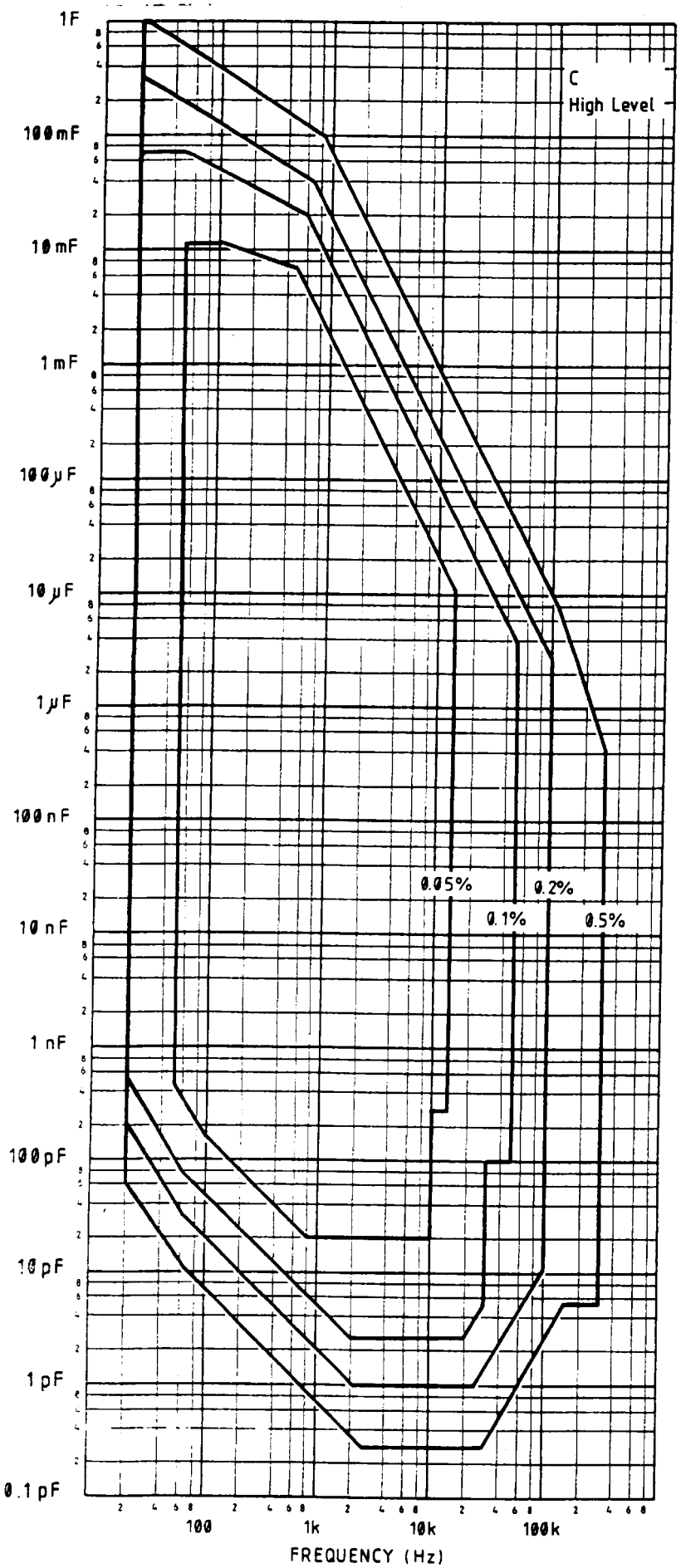
Low R values: Accuracy $= \pm (A + 100 R_T/Rx)\%$

where
A = Accuracy from adjacent chart
Rx = measured value of unknown component
$Y_T$ = sum of $Y_I$, $Y_N$, $Y_L$ (as appropriate, from Table - page 2-18).

$R_T$ = sum of $Z_I$, $R_N$, $R_L$ (as appropriate, from Table - page 2-18).

Conductance (G): Find accuracy for equivalent R value from R = 1/G

## C High Level Accuracy




CONDITIONS
AC Drive Level: 1V/100mA
Slow Speed
Analyzer trimmed at measurement frequency
D ≤ 0.1
Except on highest and lowest measurement ranges, the adjacent Iso-Accuracy chart applies also as follows:
- 250mV - 5V and 25mA - 100mA
  Normal Speed
  Interpolated trim

For Fast Speed, on all ranges, the Normal Speed accuracy figures must be doubled. Supply frequency rejection is also reduced, causing additional unquantifiable errors dependent on measurement lead layout, particularly at frequencies below 600Hz and low a.c. drive levels.

O/C and S/C Trim corrections under various conditions of interpolation, speed and level are given in the table following these Iso-Accuracy charts.

For impure components, and for measurements on the highest or lowest available ranges, the full accuracy expressions, shown below, apply. During the first hour of operation, parallel capacitance trim may drift by up to 0.05pF, series impedance by up to 0.2m Ω. Subsequent drifts, including ambient temperature change not exceeding 5°C, are included in the interpolated trim correction figures in the table (page 2-18).
If D > 0.1, multiply C accuracy by (1 + D)
High C values: Accuracy = $\pm(A + 100X_T.\omega Cx)\%$

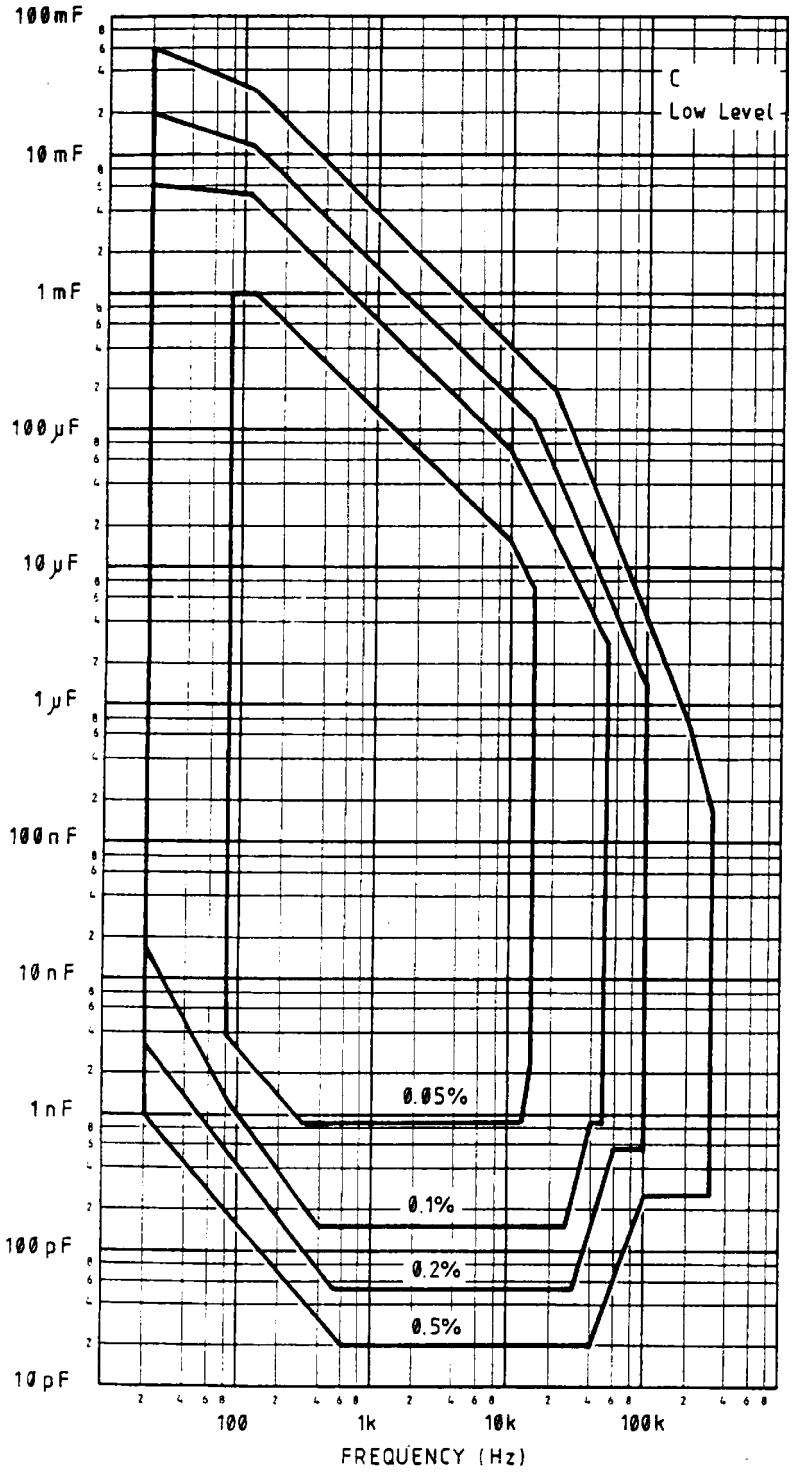
Low C values: Accuracy = $\pm(A + 100C_T/Cx)\%$

where
A = Accuracy from adjacent chart
Cx = measured value of unknown component
$X_T$ = sum of $Z_I$, $X_N$, $X_L$ (as appropriate, from Table - page 2-18).

$C_T$ = sum of $C_I$, $C_N$, $C_L$ (as appropriate, from Table - page 2-18).

$\omega$ = 2π x frequency

## C Low Level Accuracy




CONDITIONS
AC Drive Level: 200mV/20mA
Slow Speed
Analyzer trimmed at measurement frequency
D ≤ 0.1
Except on highest and lowest measurement ranges, the adjacent Iso-Accuracy chart applies also as follows:
50mV - 240mV and 5mA - 24mA
Normal Speed
Interpolated trim
For Fast Speed, on all ranges, the Normal Speed accuracy figures must be doubled. Supply frequency rejection is also reduced, causing additional unquantifiable errors dependent on measurement lead layout, particularly at frequencies below 600Hz and low a.c. drive levels.

O/C and S/C Trim corrections under various conditions of interpolation, speed and level are given in the table following these Iso-Accuracy charts.

For impure components, and for measurements on the highest or lowest available ranges, the full accuracy expressions, shown below, apply. During the first hour of operation, parallel capacitance trim may drift by up to 0.05pF, series impedance by up to 0.2m Ω. Subsequent drifts, including ambient temperature change not exceeding 5°C, are included in the interpolated trim correction figures in the table (page 2-18).
If D > 0.1, multiply C accuracy by (1 + D)
High C values: Accuracy = $\pm(A + 100X_T.\omega\ Cx)\%$

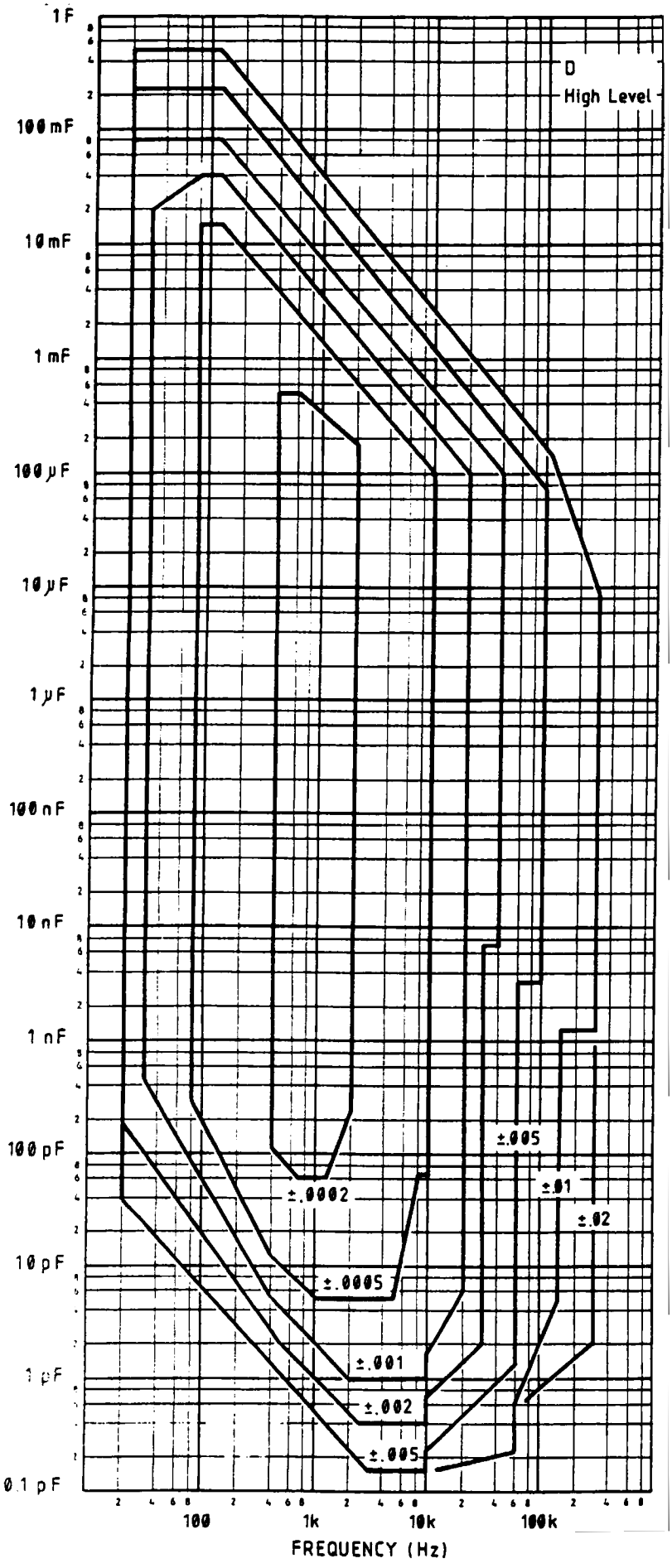
Low C values: Accuracy = $\pm(A + 100C_T/Cx)\%$

where
A = Accuracy from adjacent chart
Cx = measured value of unknown component
$X_T$ = sum of $Z_I$, $X_N$, $X_L$ (as appropriate, from Table - page 2-18).

$C_T$ = sum of $C_I$, $C_N$, $C_L$ (as appropriate, from Table - page 2-18).

$\omega$ = $2\pi$ x frequency

## D High Level Accuracy




CONDITIONS
AC Drive Level: 1V/100mA
Slow Speed
Analyzer trimmed at measurement frequency
D ≯ 0.1
Except on highest and lowest measurement ranges, the adjacent Iso-Accuracy chart applies also as follows:
250mV - 5V and 25mA - 100mA
Normal Speed (not ± .0002 curve)
Interpolated trim
For Fast Speed, on all ranges, the Normal Speed accuracy figures must be doubled. Supply frequency rejection is also reduced, causing additional unquantifiable errors dependent on measurement lead layout, particularly at frequencies below 600Hz and low a.c. drive levels.

O/C and S/C Trim corrections under various conditions of interpolation, speed and level are given in the table following these Iso-Accuracy charts.

For impure components, and for measurements on the highest or lowest available ranges, the full accuracy expressions, shown below, apply. During the first hour of operation, parallel capacitance trim may drift by up to 0.05pF, series impedance by up to 0.2mΩ. Subsequent drifts, including ambient temperature change not exceeding 5°C, are included in the interpolated trim correction figures in the table (page 2-18).

If D > 0.1, multiply D accuracy by $(1 + D^2)$.
High capacitance values :
D accuracy = $\pm(A + R_T . \omega Cx)$

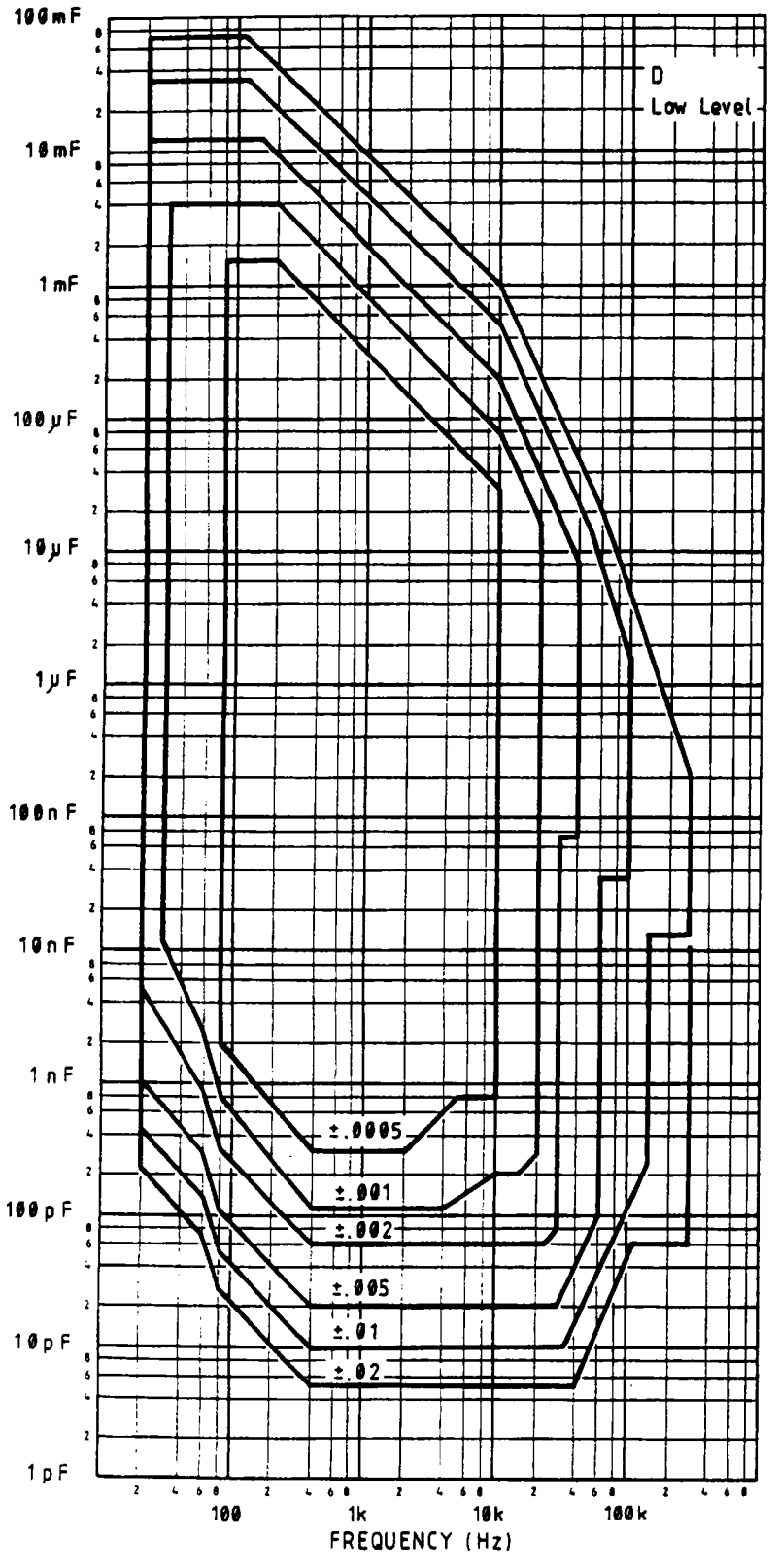
Low capacitance values :
D accuracy = $\pm (A + Y_T/\omega Cx)$

Capacitor series loss resistance (esr)
- accuracy = $\pm (A/\omega Cx)\ \Omega$
Capacitor parallel loss resistance (epr)
- accuracy = $\pm (100A.Rx/\omega Cx)\%$

where
A = Accuracy from adjacent chart
Cx = measured value of unknown component
Rx = measured value of unknown component
$R_T$ = sum of $Z_I$, $R_N$, $R_L$ (as appropriate, from Table - page 2-18).

$Y_T$ = sum of $Y_I$, $Y_N$, $Y_L$ (as appropriate, from Table - page 2-18).
$\omega$ = 2π x frequency

# D Low Level Accuracy




CONDITIONS
AC Drive Level: 200mV/20mA
Slow Speed
Analyzer trimmed at measurement frequency
D ∤ 0.1
Except on highest and lowest measurement ranges, the adjacent Iso-Accuracy chart applies also as follows:
50mV - 240mV and 5mA - 24mA
Normal Speed
Interpolated trim
For Fast Speed, on all ranges, the Normal Speed accuracy figures must be doubled. Supply frequency rejection is also reduced, causing additional unquantifiable errors dependent on measurement lead layout, particularly at frequencies below 600Hz and low a.c. drive levels.

O/C and S/C Trim corrections under various conditions of interpolation, speed and level are given in the table following these Iso-Accuracy charts.

For impure components, and for measurements on the highest or lowest available ranges, the full accuracy expressions, shown below, apply. During the first hour of operation, parallel capacitance trim may drift by up to 0.05pF, series impedance by up to 0.2mΩ. Subsequent drifts, including ambient temperature change not exceeding 5°C, are included in the interpolated trim correction figures in the table (page 2-18).

If D > 0.1, multiply D accuracy by $(1 + D^2)$.
High capacitance values :
D accuracy = $\pm(A + R_T . \omega Cx)$

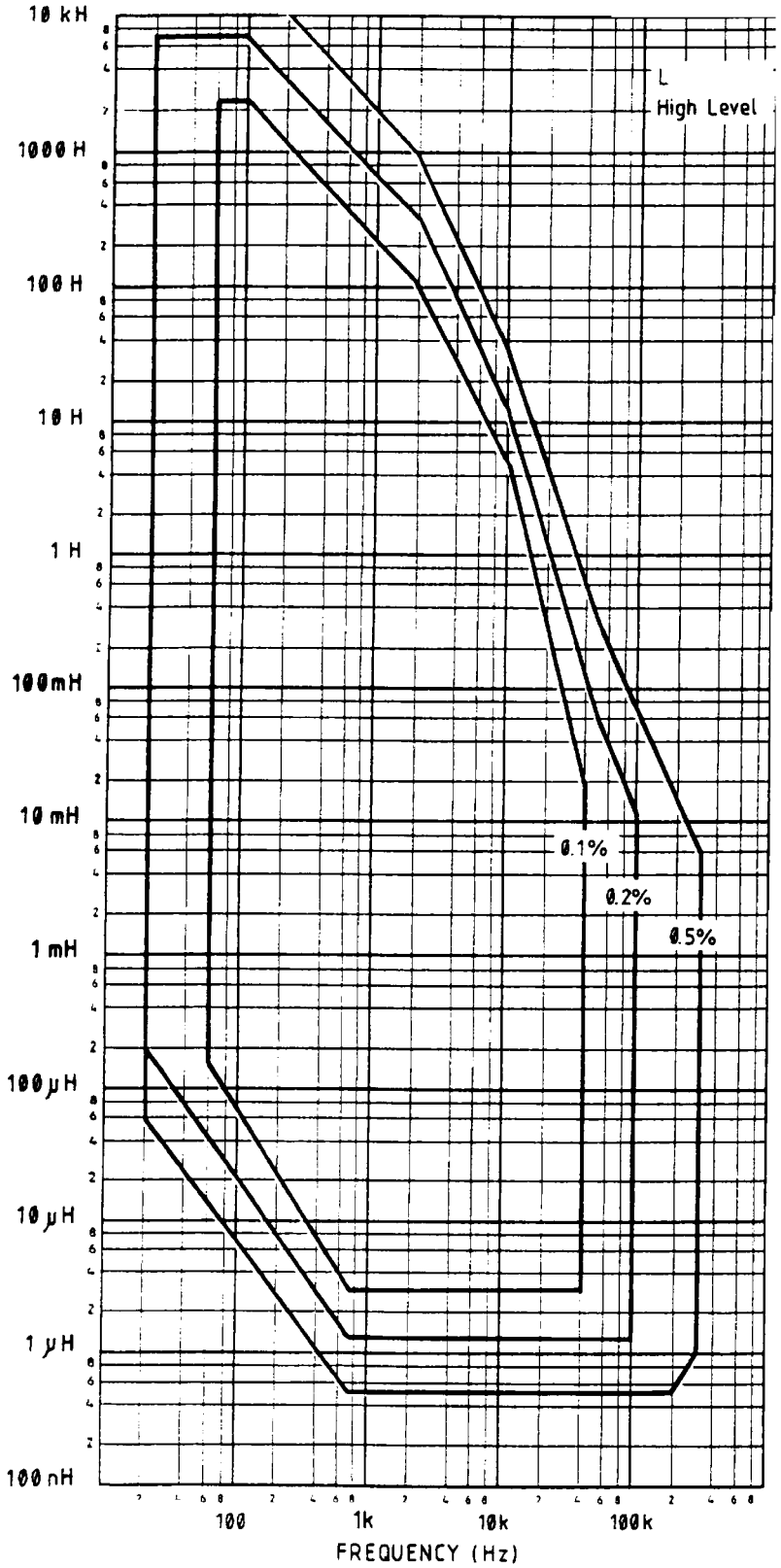
Low capacitance values :
D accuracy = $\pm (A + Y_T/\omega Cx)$

Capacitor series loss resistance (esr)
- accuracy = $\pm (A/\omega Cx)\Omega$
Capacitor parallel loss resistance (epr)
- accuracy = $\pm (100A.Rx/\omega Cx)\%$

where
A = Accuracy from adjacent chart
Cx = measured value of unknown component
Rx = measured value of unknown component
$R_T$ = sum of $Z_I$, $R_N$, $R_L$ (as appropriate, from Table - page 2-18).

$Y_T$ = sum of $Y_I$, $Y_N$, $Y_L$ (as appropriate, from Table - page 2-18).
$\omega$ = 2π x frequency

# L High Level Accuracy




CONDITIONS
AC Drive Level: 1V/100mA
Slow Speed
Analyzer trimmed at measurement frequency
Q ≯ 10
Except on highest and lowest measurement ranges, the adjacent Iso-Accuracy chart applies also as follows:

250mV - 5V and 25mA - 100mA
Normal Speed
Interpolated trim

For Fast Speed, on all ranges, the Normal Speed accuracy figures must be doubled. Supply frequency rejection is also reduced, causing additonal unquantifiable errors dependent on measurement lead layout, particularly at frequencies below 600Hz and low a.c. drive levels.

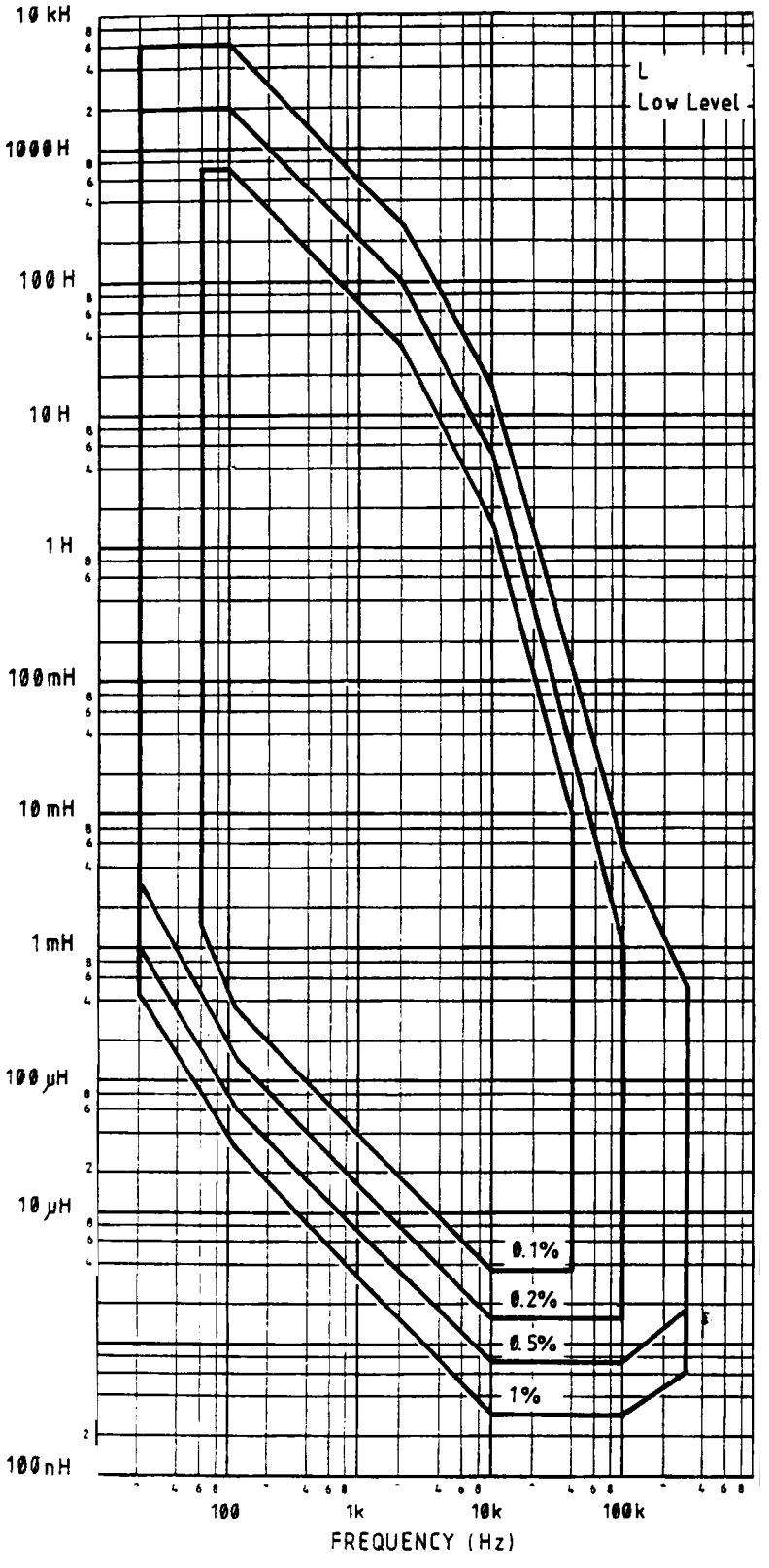
O/C and S/C Trim corrections under various conditions of interpolation, speed and level are given in the table following these Iso-Accuracy charts.

For impure components, and for measurements on the highest or lowest available ranges, the full accuracy expressions, shown below, apply. During the first hour of operation, parallel capacitance trim may drift by up to 0.05pF, series impedance by up to 0.2mΩ. Subsequent drifts, including ambient temperature change not exceeding 5°C, are included in the interpolated trim correction figures in the table (page 2-18).

If Q < 10, multiply L accuracy by (1 + 1/Q).
High L values:
Read accuracy direct from chart
Low L values:
Accuracy = $\pm (A + 100L_T / Lx)\%$

where
A = Accuracy from adjacent chart
Lx = measured value of unknown component
$L_T$ = sum of $L_I$, $L_N$, $L_L$ (as appropriate, from Table - page 2-18).

# L Low Level Accuracy




CONDITIONS
AC Drive Level: 200mV/20mA
Slow Speed
Analyzer trimmed at measurement frequency
Q ≯ 10
Except on highest and lowest measurement ranges, the adjacent Iso-Accuracy chart applies also as follows:

50mV - 240mV and 5mA - 24mA
Normal Speed
Interpolated trim

For Fast Speed, on all ranges, the Normal Speed accuracy figures must be doubled. Supply frequency rejection is also reduced, causing additional unquantifiable errors dependent on measurement lead layout, particularly at frequencies below 600Hz and low a.c. drive levels.

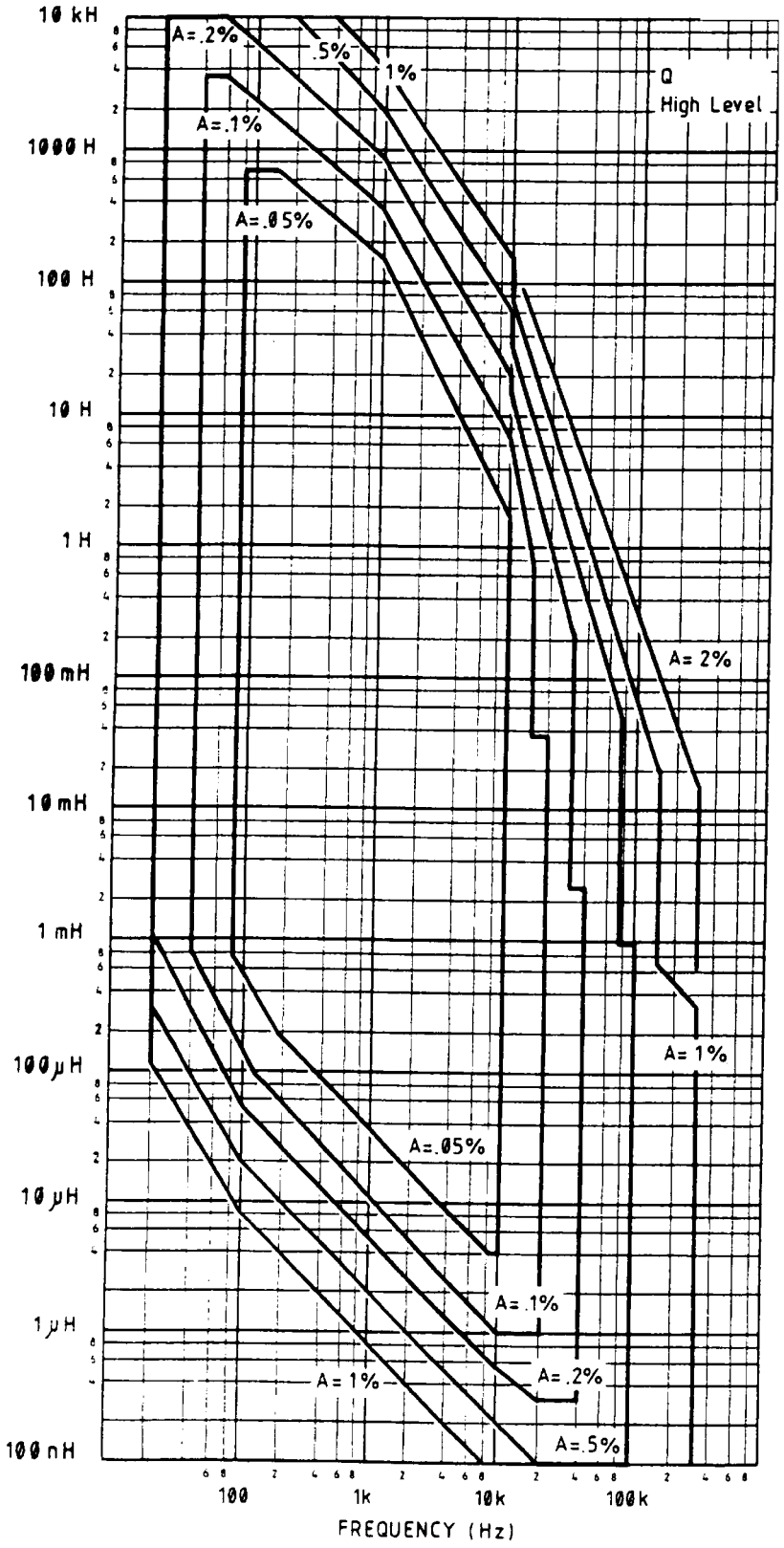
O/C and S/C Trim corrections under various conditions of interpolation, speed and level are given in the table following these Iso-Accuracy charts.

For impure components, and for measurements on the highest or lowest available ranges, the full accuracy expressions, shown below, apply. During the first hour of operation, parallel capacitance trim may drift by up to 0.05pF, series impedance by up to 0.2mΩ. Subsequent drifts, including ambient temperature change not exceeding 5°C, are included in the interpolated trim correction figures in the table (page 2-18).

If Q < 10, multiply L accuracy by (1 + 1/Q).
High L values :
Read accuracy direct from chart
Low L values :
Accuracy = $\pm (A + 100L_T / Lx)\%$

where
A = Accuracy from adjacent chart
Lx = measured value of unknown component
$L_T$ = sum of $L_I$, $L_N$, $L_L$ (as appropriate, from Table - page 2-18).

## Q High Level Accuracy




CONDITIONS
AC Drive Level: 1V/100mA
Slow Speed
Analyzer trimmed at measurement frequency
Except on highest and lowest measurement ranges, the adjacent Iso-Accuracy chart applies also as follows:
250mV - 5V and 25mA - 100mA
Normal Speed
Interpolated trim
For Fast Speed, on all ranges, the Normal Speed accuracy figures must be doubled. Supply frequency rejection is also reduced, causing additional unquantifiable errors dependent on measurement lead layout, particularly at frequencies below 600Hz and low a.c. drive levels.

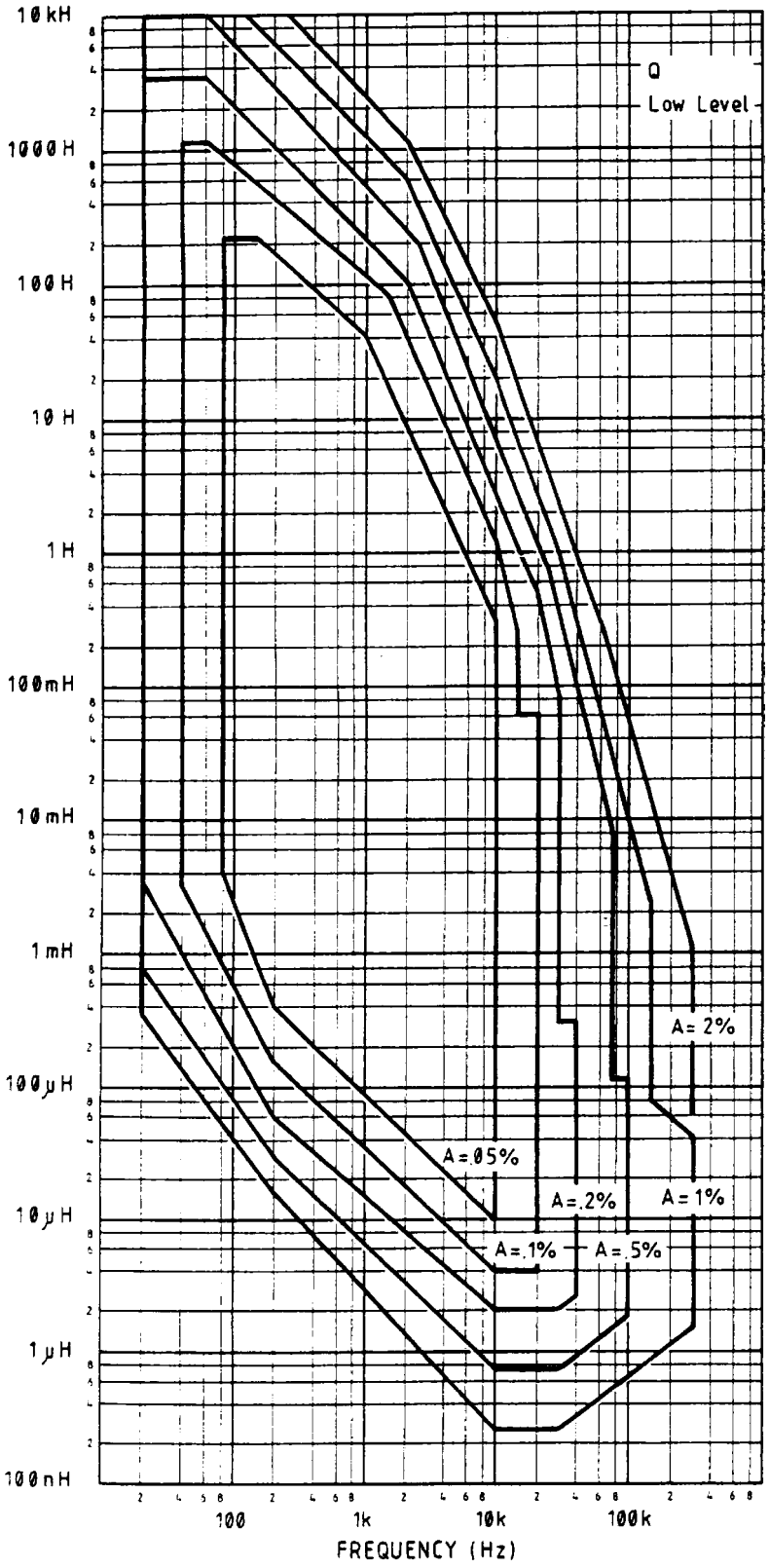
O/C and S/C Trim corrections under various conditions of interpolation, speed and level are given in the table following these Iso-Accuracy charts.

For impure components, and for measurements on the highest or lowest available ranges, the full accuracy expressions, shown below, apply. During the first hour of operation, parallel capacitance trim may drift by up to 0.05pF, series impedance by up to 0.2mΩ. Subsequent drifts, including ambient temperature change not exceeding 5°C, are included in the interpolated trim correction figures in the table (page 2-18).

For all Q values:
Q accuracy = $A(Q + 1/Q)$
High inductance values:
Read Q accuracy direct from chart
Low inductance values:
Q accuracy = $\pm(A + 100R_T/\omega Lx)(Q + 1/Q)\%$
Inductor series loss resistance
- accuracy = $\pm(A.\omega Lx/Rx)\%$
Inductor parallel loss resistance
- accuracy = $\pm(A.\omega LxRx)\%$
where
A = Accuracy from adjacent chart
Lx = measured value of unknown component
Rx = measured value of unknown component
$R_T$ = sum of $Z_I$, $R_N$, $R_L$ (as appropriate, from Table - page 2-18).

$\omega$ = $2\pi$ x frequency

# Q Low Level Accuracy




CONDITIONS
AC Drive Level:200mV/20mA
Slow Speed
Analyzer trimmed at measurement frequency
Except on highest and lowest measurement ranges, the adjacent Iso-Accuracy chart applies also as follows:

50mV - 240mV and 5mA - 24mA
Normal Speed
Interpolated trim

For Fast Speed, on all ranges, the Normal Speed accuracy figures must be doubled. Supply frequency rejection is also reduced, causing additional unquantifiable errors dependent on measurement lead layout, particularly at frequencies below 600Hz and low a.c. drive levels.

O/C and S/C Trim corrections under various conditions of interpolation, speed and level are given in the table following these Iso-Accuracy charts.

For impure components, and for measurements on the highest or lowest available ranges, the full accuracy expressions, shown below, apply. During the first hour of operation, parallel capacitance trim may drift by up to 0.05pF, series impedance by up to 0.2mΩ. Subsequent drifts, including ambient temperature change not exceeding 5°C, are included in the interpolated trim correction figures in the table (page 2-18).

For all Q values:
Q accuracy = $A(Q + 1/Q)$
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- accuracy = $\pm(A.\omega LxRx)\%$
where
A = Accuracy from adjacent chart
Lx = measured value of unknown component
Rx = measured value of unknown component
$R_T$ = sum of $Z_I$, $R_N$, $R_L$ (as appropriate, from Table - page 2-18).

$\omega = 2\pi \times$ frequency

O/C TRIM CORRECTIONS  f = frequency in kHz

| | INTERPOLATION | | NORMAL SPEED | | LEVEL .5 - 5V | | LEVEL .25V | | LEVEL .1V | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY RANGE (Hz) | $Y_I$ (nS) | $C_I$ (pF) | $Y_N$ (nS) | $C_N$ (pF) | $Y_L$ (nS) | $C_L$ (pF) | $Y_L$ (nS) | $C_L$ (pF) | $Y_L$ (nS) | $C_L$ (pF) | |
| 20-60 | .13 | .02/f | .04 | .007/f | .2 | .032/f | .2 | .032/f | .5 | .08/f | For drive levels below .1V multiply level corrections by .1V/level. |
| 80-1k | .13 | .02/f | .03 | .005/f | .1 | .016/f | .2 | .032/f | .5 | .08/f | |
| 1k2-10k | .13xf | .02 | .02 | .003/f | .1xf | .016 | .2xf | .032 | .5xf | .08 | |
| 12k-60k | .2xf | .032 | .01xf | .002 | .16xf | .025 | .32xf | .05 | 1.3xf | .2 | |
| 75k-300k | 1.6xf | .25 | .03xf | .005 | .32xf | .05 | .64xf | .1 | 4xf | .6 | |

| | INTERPOLATION | | NORMAL SPEED | | | LEVEL = 50mA | | | |
|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY RANGE (Hz) | $Z_I$ (μΩ) | $L_I$ (nH) | $R_N$ (μΩ) | $X_N$ (μΩ) | $L_N$ (nH) | $R_L$ (μΩ) | $X_L$ (μΩ) | $L_L$ (nH) | |
| 20 - 60 | 300 | 50/f | 50 | 25 | 4/f | 125 | 125 | 20/f | For drive levels below 50mA multiply level corrections by 50mA/level. |
| 80 - 250 | 120 | 20/f | 25 | 25 | 4/f | 125 | 125 | 20/f | |
| 300 - 10k | 50 | 8/f | 25 | 25 | 4/f | 40 | 20 | 3.2/f | |
| 12k - 30k | 4xf | 1.0 | 25 | 25 | 4/f | 4xf | 2xf | .4 | |
| 40k - 100k | 30xf | 5 | .5xf | 0 | 0 | $.13xf^2$ | $.065xf^2$ | .01xf | |
| 120k- 300k | 30xf | 5 | .5xf | 0 | 0 | 13xf | 6.5xf | 1.0 | |