

## Ultra Precision Metal Film Leaded Resistors



### FEATURES

- Exceptional low TCR:  $\pm 2$  ppm/K to  $\pm 10$  ppm/K
- Super tight tolerance:  $\pm 0.01$  % to  $\pm 0.25$  %
- Exceptional overall stability: class 0.02
- Wide resistance range:  $22 \Omega$  to  $1 \text{ M}\Omega$
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### DESCRIPTION

UXA 0204, UXB 0207, and UXE 0414 high precision leaded thin film resistors combine the proven reliability of the professional products with an exceptional level of precision and stability. Therefore they are perfectly suited for applications in the fields of precision test and measuring equipment and particularly for the design of calibration references and standards.

### APPLICATIONS

- Precision test and measuring equipment
- Design of calibration references and standards

| TECHNICAL SPECIFICATIONS                                                           |                                                          |                                                          |                                       |
|------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|---------------------------------------|
| DESCRIPTION                                                                        | UXA 0204                                                 | UXB 0207                                                 | UXE 0414                              |
| DIN size                                                                           | 0204                                                     | 0207                                                     | 0414                                  |
| CECC size                                                                          | A                                                        | B                                                        | D                                     |
| Resistance range                                                                   | $22 \Omega$ to $221 \text{ k}\Omega$                     | $10 \Omega$ to $1 \text{ M}\Omega$                       | $22 \Omega$ to $511 \text{ k}\Omega$  |
| Resistance tolerance                                                               | $\pm 0.25$ %; $\pm 0.1$ %;<br>$\pm 0.05$ %; $\pm 0.01$ % | $\pm 0.25$ %; $\pm 0.1$ %;<br>$\pm 0.05$ %; $\pm 0.01$ % | $\pm 0.1$ %; $\pm 0.05$ %             |
| Temperature coefficient                                                            | $\pm 10$ ppm/K; $\pm 5$ ppm/K;<br>$\pm 2$ ppm/K          | $\pm 10$ ppm/K; $\pm 5$ ppm/K;<br>$\pm 2$ ppm/K          | $\pm 10$ ppm/K; $\pm 5$ ppm/K         |
| Rated dissipation:                                                                 |                                                          |                                                          |                                       |
| $P_{85}$                                                                           | 0.05 W                                                   | 0.125 W                                                  | 0.25 W                                |
| $P_{70}$                                                                           | 0.1 W                                                    | 0.25 W                                                   | 0.5 W                                 |
| Operating voltage, $U_{\text{max}}$ AC/DC                                          | 200 V                                                    | 250 V                                                    | 300 V                                 |
| Operating temperature range <sup>(1)</sup>                                         | $-20$ °C to $125$ °C                                     |                                                          |                                       |
| Peak permissible film temperature <sup>(1)</sup>                                   | $125$ °C                                                 |                                                          |                                       |
| Insulation voltage:                                                                |                                                          |                                                          |                                       |
| 1 min.; $U_{\text{ins}}$                                                           | 300 V                                                    | 500 V                                                    | 800 V                                 |
| Continuous                                                                         | 75 V                                                     | 75 V                                                     | 75 V                                  |
| Max. resistance change at $P_{70}$ for resistance range, $\Delta R/R$ max., after: | $100 \Omega$ to $100 \text{ k}\Omega$                    | $100 \Omega$ to $250 \text{ k}\Omega$                    | $100 \Omega$ to $100 \text{ k}\Omega$ |
| 2000 h                                                                             | $\leq 0.05$ %                                            | $\leq 0.05$ %                                            | $\leq 0.05$ %                         |
| Max. resistance change at $P_{85}$ for resistance range, $\Delta R/R$ max., after: | $100 \Omega$ to $100 \text{ k}\Omega$                    | $100 \Omega$ to $250 \text{ k}\Omega$                    | $100 \Omega$ to $100 \text{ k}\Omega$ |
| 1000 h                                                                             | $\leq 0.02$ %                                            | $\leq 0.02$ %                                            | $\leq 0.02$ %                         |
| 8000 h                                                                             | $\leq 0.04$ %                                            | $\leq 0.04$ %                                            | $\leq 0.04$ %                         |
| 225 000 h                                                                          | $\leq 0.12$ %                                            | $\leq 0.12$ %                                            | $\leq 0.12$ %                         |
| Failure rate: FIT <sub>observed</sub>                                              | $\leq 0.1 \times 10^{-9}/\text{h}$                       |                                                          |                                       |



| TEMPERATURE COEFFICIENT AND RESISTANCE RANGE |                          |           |                                 |          |
|----------------------------------------------|--------------------------|-----------|---------------------------------|----------|
| TYPE                                         | TCR                      | TOLERANCE | RESISTANCE <sup>(1)(2)(3)</sup> | E-SERIES |
| UXA 0204                                     | ± 10 ppm/K               | ± 0.25 %  | 22 Ω to 221 kΩ                  | E192     |
|                                              |                          | ± 0.1 %   | 43 Ω to 221 kΩ                  | E192     |
|                                              |                          | ± 0.05 %  | 100 Ω to 180 kΩ                 | E192     |
|                                              |                          | ± 0.01 %  | 200 Ω to 150 kΩ                 | E192     |
|                                              | ± 5 ppm/K                | ± 0.25 %  | 47 Ω to 150 kΩ                  | E192     |
|                                              |                          | ± 0.1 %   | 47 Ω to 150 kΩ                  | E192     |
|                                              |                          | ± 0.05 %  | 100 Ω to 150 kΩ                 | E192     |
|                                              |                          | ± 0.01 %  | 200 Ω to 150 kΩ                 | E192     |
|                                              | ± 2 ppm/K <sup>(3)</sup> | ± 0.25 %  | 100 Ω to 100 kΩ                 | E192     |
|                                              |                          | ± 0.1 %   | 100 Ω to 100 kΩ                 | E192     |
|                                              |                          | ± 0.05 %  | 150 Ω to 100 kΩ                 | E192     |
|                                              |                          | ± 0.01 %  | 200 Ω to 100 kΩ                 | E192     |
| UXB 0207                                     | ± 10 ppm/K               | ± 0.25 %  | 10 Ω to 1 MΩ                    | E192     |
|                                              |                          | ± 0.1 %   | 10 Ω to 1 MΩ                    | E192     |
|                                              |                          | ± 0.05 %  | 24 Ω to 301 kΩ                  | E192     |
|                                              |                          | ± 0.01 %  | 24 Ω to 301 kΩ                  | E192     |
|                                              | ± 5 ppm/K                | ± 0.25 %  | 10 Ω to 1 MΩ                    | E192     |
|                                              |                          | ± 0.1 %   | 10 Ω to 1 MΩ                    | E192     |
|                                              |                          | ± 0.05 %  | 24 Ω to 221 kΩ                  | E192     |
|                                              |                          | ± 0.01 %  | 24 Ω to 221 kΩ                  | E192     |
|                                              | ± 2 ppm/K <sup>(3)</sup> | ± 0.25 %  | 100 Ω to 150 kΩ                 | E192     |
|                                              |                          | ± 0.1 %   | 100 Ω to 150 kΩ                 | E192     |
|                                              |                          | ± 0.05 %  | 150 Ω to 150 kΩ                 | E192     |
|                                              |                          | ± 0.01 %  | 200 Ω to 150 kΩ                 | E192     |
| UXE 0414                                     | ± 10 ppm/K               | ± 0.1 %   | 22 Ω to 511 kΩ                  | E192     |
|                                              |                          | ± 0.05 %  | 100 Ω to 301 kΩ                 | E192     |
|                                              | ± 5 ppm/K                | ± 0.1 %   | 47 Ω to 301 kΩ                  | E192     |
|                                              |                          | ± 0.05 %  | 100 Ω to 301 kΩ                 | E192     |

**Notes**
<sup>(1)</sup> Resistance values to be selected from the E192 series, for other values please contact the factory.

<sup>(2)</sup> TCR 10 and TCR 05 are specified over the temperature range from -20 °C to +85 °C.

<sup>(3)</sup> TCR 02 is specified over the temperature range 0 °C to +60 °C.

**PART NUMBER AND PRODUCT DESCRIPTION**

PART NUMBER: UXB02070F1001AC100

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U | X | B | 0 | 2 | 0 | 7 | 0 | F | 1 | 0 | 0 | 1 | A | C | 1 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| TYPE / SIZE                   | VARIANT     | TCR                                                          | VALUE                                                                                                                                                                              | TOLERANCE                                                                   | PACKAGING                  | SPECIAL                         |
|-------------------------------|-------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------|---------------------------------|
| UXA0204<br>UXB0207<br>UXE0414 | 0 = neutral | H = $\pm 2$ ppm/K<br>G = $\pm 5$ ppm/K<br>F = $\pm 10$ ppm/K | 3 digit value<br>1 digit multiplier<br>Multiplier<br>9 = $\times 10^{-1}$<br>0 = $\times 10^0$<br>1 = $\times 10^1$<br>2 = $\times 10^2$<br>3 = $\times 10^3$<br>4 = $\times 10^4$ | T = $\pm 0.01$ %<br>A = $\pm 0.05$ %<br>B = $\pm 0.1$ %<br>C = $\pm 0.25$ % | C1<br>CU<br>R1<br>R2<br>RP | Up to 2 digits<br>00 = standard |

PRODUCT DESCRIPTION: UXB 0207-10 0.05 % C1 1K0

| UXB               | 0207                 | 10                                               | 0.05 %                                                      | C1                         | 1K0                                                               |
|-------------------|----------------------|--------------------------------------------------|-------------------------------------------------------------|----------------------------|-------------------------------------------------------------------|
| TYPE              | SIZE                 | TCR                                              | TOLERANCE                                                   | PACKAGING (1)              | RESISTANCE VALUE                                                  |
| UXA<br>UXB<br>UXE | 0204<br>0207<br>0414 | $\pm 2$ ppm/K<br>$\pm 5$ ppm/K<br>$\pm 10$ ppm/K | $\pm 0.01$ %<br>$\pm 0.05$ %<br>$\pm 0.1$ %<br>$\pm 0.25$ % | C1<br>CU<br>R1<br>R2<br>RP | 1K0 = 1.0 $\Omega$<br>47K = 47 k $\Omega$<br>50R5 = 50.5 $\Omega$ |

**Note**

- The part number is shown to facilitate the introduction of a unified part numbering system.

**PACKAGING**

| TYPE / SIZE | CODE | QUANTITY | PACKAGING STYLE                                  | WIDTH | PITCH | DIMENSIONS             |
|-------------|------|----------|--------------------------------------------------|-------|-------|------------------------|
| UXA 0204    | CU   | 100      | Taped acc. to IEC 60286-1<br>fan-folded in a box | 53 mm | 5 mm  | 74 mm x 42 mm x 184 mm |
|             | C1   | 1000     |                                                  |       |       |                        |
| UXB 0207    | CU   | 100      | Taped acc. to IEC 60286-1<br>fan-folded in a box | 53 mm | 5 mm  | 75 mm x 40 mm x 187 mm |
|             | C1   | 1000     |                                                  |       |       |                        |
|             | R1   | 1000     | Taped acc. to IEC 60286-1<br>on a reel           | 53 mm | 5 mm  | 315 mm x 70 mm x 80 mm |
|             | RP   | 5000     |                                                  |       |       | 315 mm x 76 mm x 86 mm |
| UXE 0414    | CU   | 100      | Taped acc. to IEC 60286-1<br>fan-folded in a box | 53 mm | 5 mm  | 47 mm x 84 mm x 374 mm |
|             | C1   | 1000     |                                                  |       |       |                        |
|             | R2   | 2500     | Taped acc. to IEC 60286-1<br>on a reel           | 53 mm | 5 mm  | 315 mm x 80 mm x 90 mm |

**SCRIPT MARKING** - Printed resistance value and letter coding for TCR and tolerance

| RESISTANCE VALUE          | TOL. (%)   | LETTER CODE | TCR (ppm/K) | LETTER CODE |
|---------------------------|------------|-------------|-------------|-------------|
| Clear text code for value | $\pm 0.25$ | C           | $\pm 10$    | B           |
|                           | $\pm 0.1$  | B           | $\pm 5$     | A           |
|                           | $\pm 0.05$ | A           | $\pm 2$     | T           |
|                           | $\pm 0.01$ | T           | -           | -           |



## DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous film of metal alloy is deposited on a high grade ceramic body (85 %  $\text{Al}_2\text{O}_3$ ) and conditioned to achieve the desired temperature coefficient. Nickel plated steel termination caps are firmly pressed on the metallized rods. Special laser devices are used repeatedly to achieve the target value by slowly and smoothly cutting a helical groove in the resistive layer without damaging the ceramics. A further conditioning is applied in order to stabilise the trimming result. Connecting wires of electrolytic copper plated with pure tin are welded to the termination caps. The resistors are covered by protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure tin on nickel plating. Script marking designates the resistance value plus coded TCR and tolerance.

The result of the determined production is verified by an accelerated aging (burn-in) and extensive testing procedure performed on 100 % of the individual resistors. Only accepted products are stuck directly on the adhesive tapes in accordance with **IEC 60286-1**.

## ASSEMBLY

The resistors are suitable for processing on automatic insertion equipment and cutting and bending machines. Excellent solderability is proven, even after extended storage. They are suitable for automatic soldering using wave or dipping. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The suitability of conformal coatings, if applied, shall be qualified by appropriate means to ensure the long-term stability of the whole system. The resistors are completely lead (Pb)-free, the pure tin plating provides compatibility with lead (Pb)-free and lead-containing soldering processes. The immunity of the plating against tin whisker growth has been proven under extensive testing.

## MATERIALS

Vishay acknowledges the following systems for the regulation of hazardous substances:

- IEC 62474, Material Declaration for Products of and for the Electrotechnical Industry, with the list of declarable substances given therein <sup>(1)</sup>
- The Global Automotive Declarable Substance List (GADSL) <sup>(2)</sup>
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) <sup>(3)</sup> for its supply chain

The products do not contain any of the banned substances as per IEC 62474, GADSL, or the SVHC list, see [www.vishay.com/how/leadfree](http://www.vishay.com/how/leadfree).

Hence the products fully comply with the following directives:

- 2000/53/EC End-of-Life Vehicle Directive (ELV) and Annex II (ELV II)
- 2011/65/EU Restriction of the Use of Hazardous Substances Directive (RoHS) with amendment 2015/863/EU
- 2012/19/EU Waste Electrical and Electronic Equipment Directive (WEEE)

Vishay pursues the elimination of conflict minerals from its supply chain, see the Conflict Minerals Policy at [www.vishay.com/doc?49037](http://www.vishay.com/doc?49037).

## APPROVALS

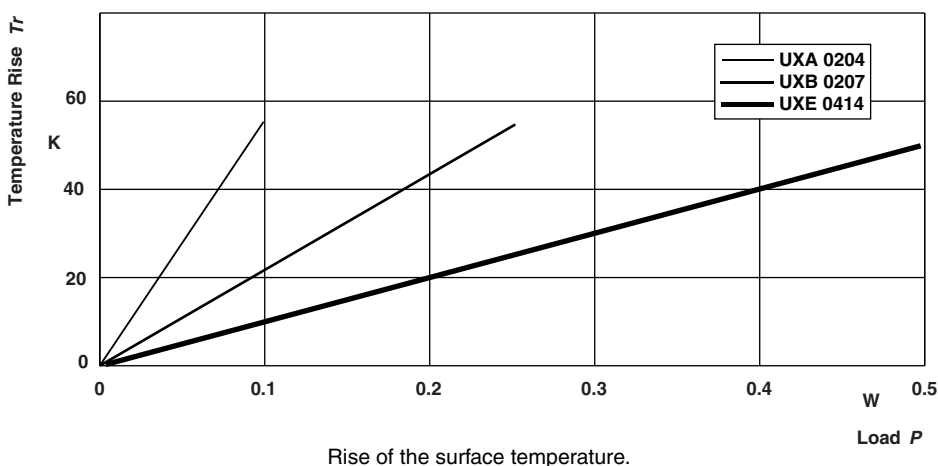
Where applicable, the resistors are tested in accordance to **EN 60115-1** and **EN 140100**.

Vishay Beyschlag has achieved “**Approval of Manufacturer**” in accordance with **IEC QC 001002-3, clause 2**. The release certificate for “**Technology Approval Schedule**” in accordance with **CECC 240001** based on **IEC QC 001002-3, clause 6** is granted for the Vishay Beyschlag manufacturing process.

## Notes

- <sup>(1)</sup> The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at <http://std.iec.ch/iec62474>.
- <sup>(2)</sup> The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council and available at [www.gadsl.org](http://www.gadsl.org).
- <sup>(3)</sup> The SVHC list is maintained by the European Chemical Agency (ECHA) and available at <http://echa.europa.eu/candidate-list-table>.

**FUNCTIONAL DESCRIPTION**

**Derating - Standard Operation**

**Temperature Rise**

**Current Noise  $A_1$  in accordance with IEC 60195**

**TESTS AND REQUIREMENTS**

Essentially all tests are carried out in accordance with the following specifications:

- EN 60115-1, Generic specification (includes tests)

The Test Procedures and Requirements table contains only the most important tests. For the full test schedule refer to the documents listed above. The testing also covers most of the requirements specified by EIA/IS-703 and JIS-C-5202.

The tests are carried out in accordance with IEC 60068-2-xx test method and under standard atmospheric conditions in accordance with IEC 60068-1, 5.3. Climatic category -20 °C / +125 °C / 56 days (rated temperature range: Lower category temperature, upper category temperature; damp heat, long term, 56 days) is valid.

Unless otherwise specified the following values apply:

- Temperature: 15 °C to 35 °C
- Relative humidity: 45 % to 75 %
- Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

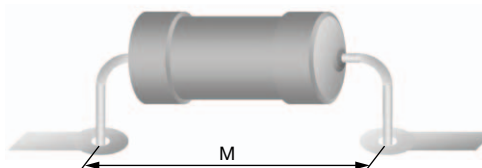
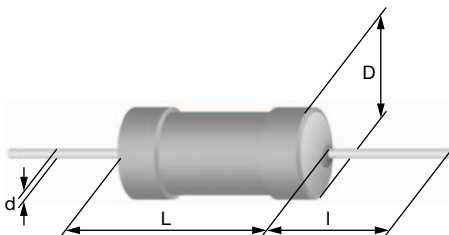
For testing the components are mounted on a test board in accordance with IEC 60115-1, 4.31 unless otherwise specified.

In the Test Procedures and Requirements table only the tests and requirements are listed with reference to the relevant clauses of IEC 60115-1 and IEC 60068-2-xx test method. A short description of the test procedure is also given.

| <b>TEST PROCEDURES AND REQUIREMENTS</b> |                                  |                              |                                                                                                 |                                                          |                                                                       |                                                                    |
|-----------------------------------------|----------------------------------|------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------|
| IEC<br>60115-1<br>CLAUSE                | IEC<br>60068-2<br>TEST<br>METHOD | TEST                         | PROCEDURE                                                                                       | REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )           |                                                                       |                                                                    |
|                                         |                                  |                              | Stability for product types:                                                                    |                                                          |                                                                       |                                                                    |
|                                         |                                  |                              | <b>UXA 0204</b>                                                                                 | 100 $\Omega$ to 100 k $\Omega$                           | 22 $\Omega$ to < 100 $\Omega$<br>> 100 k $\Omega$ to 221 k $\Omega$   | -                                                                  |
|                                         |                                  |                              | <b>UXB 0207</b>                                                                                 | 100 $\Omega$ to 250 k $\Omega$                           | 40.2 $\Omega$ to < 100 $\Omega$<br>> 250 k $\Omega$ to 301 k $\Omega$ | 10 $\Omega$ to < 40.2 $\Omega$<br>> 301 k $\Omega$ to 1 M $\Omega$ |
|                                         |                                  |                              | <b>UXE 0414</b>                                                                                 | 100 $\Omega$ to 100 k $\Omega$                           | 22 $\Omega$ to < 100 $\Omega$<br>> 100 k $\Omega$ to 511 k $\Omega$   | -                                                                  |
| 4.5                                     | -                                | Resistance                   | -                                                                                               | $\pm 0.25\%$ ; $\pm 0.1\%$ ; $\pm 0.05\%$ ; $\pm 0.01\%$ |                                                                       |                                                                    |
| 4.7                                     | -                                | Voltage proof                | $U_{RMS} = U_{ins}$ ; 60 s                                                                      | No flashover or breakdown                                |                                                                       |                                                                    |
| 4.8                                     | -                                | Temperature coefficient      | At (20 / -20 / 20) °C and (20 / 85 / 20) °C                                                     | 10 ppm/K; 5 ppm/K                                        |                                                                       |                                                                    |
|                                         |                                  |                              | At (20 / 0 / 20) °C and (20 / 60 / 20) °C                                                       | 2 ppm/K                                                  |                                                                       |                                                                    |
| 4.13                                    | -                                | Short time overload          | Room temperature;<br>$U = 2.5 \times \sqrt{P_{70} \times R}$ or<br>$U = 2 \times U_{max}$ ; 5 s | $\pm (0.01\% R + 0.01 \Omega)$                           | $\pm (0.01\% R + 0.01 \Omega)$                                        | $\pm (0.02\% R + 0.01 \Omega)$                                     |
| 4.16                                    | 21 (Ua)<br>21 (Ub)<br>21 (Uc)    | Robustness of terminations   | Tensile, bending, and torsion                                                                   | $\pm (0.01\% R + 0.01 \Omega)$                           | $\pm (0.01\% R + 0.01 \Omega)$                                        | $\pm (0.02\% R + 0.01 \Omega)$                                     |
| 4.17                                    | 20 (Ta)                          | Solderability                | at +235 °C; 2 s;<br>solder bath method;<br>SnPb40                                               | Good tinning (> 95 % covered); no damage                 |                                                                       |                                                                    |
|                                         |                                  |                              | at +245 °C; 3 s;<br>solder bath method;<br>SnAg3Cu0.5                                           |                                                          |                                                                       |                                                                    |
| 4.18.2                                  | 20 (Tb)                          | Resistance to soldering heat | Unmounted components;<br>(260 $\pm$ 5) °C; (10 $\pm$ 1) s                                       | $\pm (0.01\% R + 0.01 \Omega)$                           | $\pm (0.01\% R + 0.01 \Omega)$                                        | $\pm (0.02\% R + 0.01 \Omega)$                                     |
| 4.19                                    | 14 (Na)                          | Rapid change of temperature  | 30 min at -55 °C<br>30 min at +125 °C<br>5 cycles                                               | $\pm (0.01\% R + 0.01 \Omega)$                           | $\pm (0.01\% R + 0.01 \Omega)$                                        | $\pm (0.02\% R + 0.01 \Omega)$                                     |
| 4.22                                    | 6 (B4)                           | Vibration                    | 10 sweep cycles per direction;<br>10 Hz to 2000 Hz<br>1.5 mm or 200 m/s <sup>2</sup>            | $\pm (0.01\% R + 0.01 \Omega)$                           | $\pm (0.01\% R + 0.01 \Omega)$                                        | $\pm (0.02\% R + 0.01 \Omega)$                                     |

| TEST PROCEDURES AND REQUIREMENTS |                            |                                         |                                                                                                                               |                                                                                                       |                                                                                                       |                                                                                                       |
|----------------------------------|----------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| IEC 60115-1<br>CLAUSE            | IEC 60068-2<br>TEST METHOD | TEST                                    | PROCEDURE                                                                                                                     | REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )                                                        |                                                                                                       |                                                                                                       |
|                                  |                            |                                         | Stability for product types:                                                                                                  |                                                                                                       |                                                                                                       |                                                                                                       |
|                                  |                            |                                         | UXA 0204                                                                                                                      | 100 $\Omega$ to 100 k $\Omega$                                                                        | 22 $\Omega$ to < 100 $\Omega$<br>> 100 k $\Omega$ to 221 k $\Omega$                                   | -                                                                                                     |
|                                  |                            |                                         | UXB 0207                                                                                                                      | 100 $\Omega$ to 250 k $\Omega$                                                                        | 40.2 $\Omega$ to < 100 $\Omega$<br>> 250 k $\Omega$ to 301 k $\Omega$                                 | 10 $\Omega$ to < 40.2 $\Omega$<br>> 301 k $\Omega$ to 1 M $\Omega$                                    |
|                                  |                            |                                         | UXE 0414                                                                                                                      | 100 $\Omega$ to 100 k $\Omega$                                                                        | 22 $\Omega$ to < 100 $\Omega$<br>> 100 k $\Omega$ to 511 k $\Omega$                                   | -                                                                                                     |
| 4.23                             |                            | Climatic sequence:                      |                                                                                                                               |                                                                                                       |                                                                                                       |                                                                                                       |
| 4.23.2                           | 2 (Ba)                     | Dry heat                                | 125 °C; 16 h                                                                                                                  |                                                                                                       |                                                                                                       |                                                                                                       |
| 4.23.3                           | 30 (Db)                    | Damp heat, cyclic                       | 55 °C; 24 h;<br>90 % to 100 % RH; 1 cycle                                                                                     | $\pm (0.04 \% R + 0.01 \Omega)$ ;<br>no visible damage                                                | $\pm (0.05 \% R + 0.01 \Omega)$ ;<br>no visible damage                                                | $\pm (0.06 \% R + 0.01 \Omega)$ ;<br>no visible damage                                                |
| 4.23.4                           | 1 (Aa)                     | Cold                                    | -55 °C; 2 h                                                                                                                   |                                                                                                       |                                                                                                       |                                                                                                       |
| 4.23.5                           | 13 (M)                     | Low air pressure                        | 8.5 kPa; 2 h;<br>15 °C to 35 °C                                                                                               |                                                                                                       |                                                                                                       |                                                                                                       |
| 4.23.6                           | 30 (Db)                    | Damp heat, cyclic                       | 55 °C; 5 days;<br>95 % to 100 % RH; 5 cycles                                                                                  |                                                                                                       |                                                                                                       |                                                                                                       |
| 4.23.7                           |                            | DC load                                 | apply rated power for 1 min                                                                                                   |                                                                                                       |                                                                                                       |                                                                                                       |
| 4.24                             | 78 (Cab)                   | Damp heat, steady state                 | (40 $\pm$ 2) °C; 56 days;<br>(93 $\pm$ 3) % RH                                                                                | $\pm (0.04 \% R + 0.01 \Omega)$                                                                       | $\pm (0.05 \% R + 0.01 \Omega)$                                                                       | $\pm (0.06 \% R + 0.01 \Omega)$                                                                       |
| 4.25.1                           | -                          | Endurance (at 70 °C)                    | $U = \sqrt{P_{70} \times R}$ or<br>$U = U_{max.}$ ;<br>1.5 h on; 0.5 h off<br>70 °C; 2000 h<br>85 °C; 1000 h<br>85 °C; 8000 h | $\pm (0.05 \% R + 0.01 \Omega)$<br>$\pm (0.02 \% R + 0.01 \Omega)$<br>$\pm (0.04 \% R + 0.01 \Omega)$ | $\pm (0.05 \% R + 0.01 \Omega)$<br>$\pm (0.03 \% R + 0.01 \Omega)$<br>$\pm (0.06 \% R + 0.01 \Omega)$ | $\pm (0.05 \% R + 0.01 \Omega)$<br>$\pm (0.04 \% R + 0.01 \Omega)$<br>$\pm (0.08 \% R + 0.01 \Omega)$ |
| 4.25.3                           | -                          | Endurance at upper category temperature | 125 °C; 1000 h                                                                                                                | $\pm (0.04 \% R + 0.01 \Omega)$                                                                       | $\pm (0.06 \% R + 0.01 \Omega)$                                                                       | $\pm (0.08 \% R + 0.01 \Omega)$                                                                       |
| 4.29                             | 45 (XA)                    | Component solvent resistance            | Isopropyl alcohol (used in industrial application)<br>+23 °C; toothbrush method                                               | Marking legible; no visible damage                                                                    |                                                                                                       |                                                                                                       |

## DIMENSIONS



| DIMENSIONS - Leaded resistor types, mass, and relevant physical dimensions |                           |                           |                           |                           |                           |              |
|----------------------------------------------------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------|
| TYPE                                                                       | D <sub>max.</sub><br>(mm) | L <sub>max.</sub><br>(mm) | d <sub>nom.</sub><br>(mm) | I <sub>min.</sub><br>(mm) | M <sub>min.</sub><br>(mm) | MASS<br>(mg) |
| UXA 0204                                                                   | 1.6                       | 3.6                       | 0.5                       | 29.0                      | 5.0                       | 125          |
| UXB 0207                                                                   | 2.5                       | 6.3                       | 0.6                       | 28.0                      | 7.5                       | 220          |
| UXE 0414                                                                   | 4.0                       | 11.9                      | 0.8                       | 31.0                      | 15.0                      | 750          |

**12NC INFORMATION FOR HISTORICAL CODING REFERENCE**

- The resistors have a 12-digit part number starting with 2312.
- The subsequent 4 digits indicate the resistor type, specification and packaging; see the 12NC Part Number table.
- The remaining 4 digits indicate the resistance value:
  - The first 3 digits indicate the resistance value.
  - The last digit indicates the resistance decade in accordance with the 12NC Indicating Resistance Decade table.

**Last Digit of 12NC Indicating Resistance Decade**

| RESISTANCE DECADE                | LAST DIGIT |
|----------------------------------|------------|
| 10 $\Omega$ to 99.9 $\Omega$     | 9          |
| 100 $\Omega$ to 999 $\Omega$     | 1          |
| 1 k $\Omega$ to 9.99 k $\Omega$  | 2          |
| 10 k $\Omega$ to 99.9 k $\Omega$ | 3          |
| 100 k $\Omega$ to 999 k $\Omega$ | 4          |

**12NC Example**

The part number of a UXA 0204 resistor, value 47 k $\Omega$  and TCR 10 with  $\pm 0.1$  % tolerance, supplied on bandolier in a box of 1000 units is: 2312 662 34703.

| <b>12NC PART NUMBER - Resistor type and packaging</b> |                |              |                     |                     |                      |                      |                      |
|-------------------------------------------------------|----------------|--------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| DESCRIPTION                                           |                |              | 2312 ... ..         |                     |                      |                      |                      |
|                                                       |                |              | BANDOLIER<br>IN BOX | BANDOLIER<br>IN BOX | BANDOLIER<br>ON REEL | BANDOLIER<br>ON REEL | BANDOLIER<br>ON REEL |
| TYPE                                                  | TCR            | TOL.         | CU 100 units        | C1 1000 units       | R1 1000 units        | R2 2500 units        | RP 5000 units        |
| UXA 0204                                              | $\pm 10$ ppm/K | $\pm 0.25$ % | 562 2....           | 662 2....           | 462 2....            | -                    | -                    |
|                                                       |                | $\pm 0.1$ %  | 562 3....           | 662 3....           | 462 3....            | -                    | -                    |
|                                                       |                | $\pm 0.05$ % | 562 4....           | 662 4....           | 462 4....            | -                    | -                    |
|                                                       |                | $\pm 0.01$ % | 562 7....           | 662 7....           | 462 7....            | -                    | -                    |
|                                                       |                | (1)          | 562 91...           | 662 91...           | 462 91...            | -                    | -                    |
|                                                       | $\pm 5$ ppm/K  | $\pm 0.25$ % | 563 2....           | 663 2....           | 463 2....            | -                    | -                    |
|                                                       |                | $\pm 0.1$ %  | 563 3....           | 663 3....           | 463 3....            | -                    | -                    |
|                                                       |                | $\pm 0.05$ % | 563 4....           | 663 4....           | 463 4....            | -                    | -                    |
|                                                       |                | $\pm 0.01$ % | 563 7....           | 663 7....           | 463 7....            | -                    | -                    |
|                                                       |                | (1)          | 563 91...           | 663 91...           | 463 91...            | -                    | -                    |
|                                                       | $\pm 2$ ppm/K  | $\pm 0.25$ % | 564 2....           | 664 2....           | 464 2....            | -                    | -                    |
|                                                       |                | $\pm 0.1$ %  | 564 3....           | 664 3....           | 464 3....            | -                    | -                    |
|                                                       |                | $\pm 0.05$ % | 564 4....           | 664 4....           | 464 4....            | -                    | -                    |
|                                                       |                | $\pm 0.01$ % | 564 7....           | 664 7....           | 464 7....            | -                    | -                    |
|                                                       |                | (1)          | 564 91...           | 664 91...           | 464 91...            | -                    | -                    |
| UXB 0207                                              | $\pm 10$ ppm/K | $\pm 0.25$ % | 572 2....           | 672 2....           | 472 2....            | -                    | 577 2....            |
|                                                       |                | $\pm 0.1$ %  | 572 3....           | 672 3....           | 472 3....            | -                    | 577 3....            |
|                                                       |                | $\pm 0.05$ % | 572 4....           | 672 4....           | 472 4....            | -                    | 577 4....            |
|                                                       |                | $\pm 0.01$ % | 572 7....           | 672 7....           | 472 7....            | -                    | 577 7....            |
|                                                       |                | (1)          | 572 91...           | 672 91...           | 472 91...            | -                    | 577 91...            |
|                                                       | $\pm 5$ ppm/K  | $\pm 0.25$ % | 573 2....           | 673 2....           | 473 2....            | -                    | 578 2....            |
|                                                       |                | $\pm 0.1$ %  | 573 3....           | 673 3....           | 473 3....            | -                    | 578 3....            |
|                                                       |                | $\pm 0.05$ % | 573 4....           | 673 4....           | 473 4....            | -                    | 578 4....            |
|                                                       |                | $\pm 0.01$ % | 573 7....           | 673 7....           | 473 7....            | -                    | 578 7....            |
|                                                       |                | (1)          | 573 91...           | 673 91...           | 473 91...            | -                    | 578 91...            |
|                                                       | $\pm 2$ ppm/K  | $\pm 0.25$ % | 574 2....           | 674 2....           | 474 2....            | -                    | 579 2....            |
|                                                       |                | $\pm 0.1$ %  | 574 3....           | 674 3....           | 474 3....            | -                    | 579 3....            |
|                                                       |                | $\pm 0.05$ % | 574 4....           | 674 4....           | 474 4....            | -                    | 579 4....            |
|                                                       |                | $\pm 0.01$ % | 574 7....           | 674 7....           | 474 7....            | -                    | 579 7....            |
|                                                       |                | (1)          | 574 91...           | 674 91...           | 474 91...            | -                    | 579 91...            |
| UXE 0414                                              | $\pm 10$ ppm/K | $\pm 0.1$ %  | 592 3....           | 692 3....           | -                    | 597 3....            | -                    |
|                                                       |                | $\pm 0.05$ % | 592 4....           | 692 4....           | -                    | 597 4....            | -                    |
|                                                       |                | (1)          | 592 91...           | 692 91...           | -                    | 597 91...            | -                    |
|                                                       | $\pm 5$ ppm/K  | $\pm 0.1$ %  | 593 3....           | 693 3....           | -                    | 598 3....            | -                    |
|                                                       |                | $\pm 0.05$ % | 593 4....           | 693 4....           | -                    | 598 4....            | -                    |
|                                                       |                | (1)          | 593 91...           | 693 91...           | -                    | 598 91...            | -                    |

**Note**

(1) Readable 12NC coding of resistance values is restricted to values with three significant digits. For resistance values with more than three significant digits, a non readable sequential number will be issued by the factory for each requested combination of resistance value and tolerance.



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.