# 0Cr20Al3

GB/T 1234-2012

Fe-Cr-Al grade with the best cold-working behaviour in its class: low room-temperature brittleness, high elongation and clean weldability.

| 1100 °C | 1.23 μΩ·m | 7.35 g/cm³ | ≥80 h |
|---|---|---|---|
| MAX. WORKING TEMPERATURE | RESISTIVITY AT 20 °C | DENSITY | ACCELERATED LIFE AT 1250 °C |

## PRODUCT OVERVIEW

0Cr20Al3 — also supplied as 0Cr21Al4 — is the Fe-Cr-Al grade with the most forgiving cold-working behaviour. Against high-aluminium grades such as 0Cr25Al5 or 0Cr21Al6Nb its room-temperature brittleness is markedly lower and elongation is higher, typically above 20 %. That makes it the natural choice for elements that have to be deep drawn, cold formed into complex shapes, or drawn down to very fine wire without repeated intermediate annealing.

Its maximum working temperature of about 1100 °C is below that of the high-aluminium grades, which is the trade-off for formability. Within that range it keeps the intrinsic advantages of the Fe-Cr-Al family — high resistivity and a dense $Al_2O_3$ surface film — and in air at 1000–1100 °C its oxidation life is generally better than that of Cr20Ni80 at the same temperature. It also avoids the grain coarsening that embrittles nickel-chromium alloys in long service.

Holding aluminium near 4 % rather than above 5 % removes most of the weld cracking seen in high-aluminium alloys. The grade can be joined by conventional resistance welding or TIG, with a wider process window and higher yield than 0Cr25Al5.

**ALSO KNOWN AS**

0Cr21Al4 · Resistohm 123 · CrAl 193 · GFC123 / GFC123W · 0Cr19Al3 · FCHW-2 / FCHR-2 · CrAl 20 5

## CHEMICAL COMPOSITION

| C | P | S | Mn | Si | Cr | Ni | Al | Fe |
|---|---|---|---|---|---|---|---|---|
| ≤0.08 | ≤0.025 | ≤0.02 | ≤0.5 | ≤0.7 | 18.0–21.0 | ≤0.6 | 3.0-4.2 | Bal. |

Values in weight %. Balance (Bal.) is iron. Composition based on GB/T 1234-2012.

## TYPICAL APPLICATIONS

- Heating elements needing complex cold forming
- Deep-drawn parts and very fine wire
- Industrial furnaces below 1100 °C
- Domestic heating appliances
- Welded assemblies (resistance or TIG)

## PHYSICAL & MECHANICAL PROPERTIES

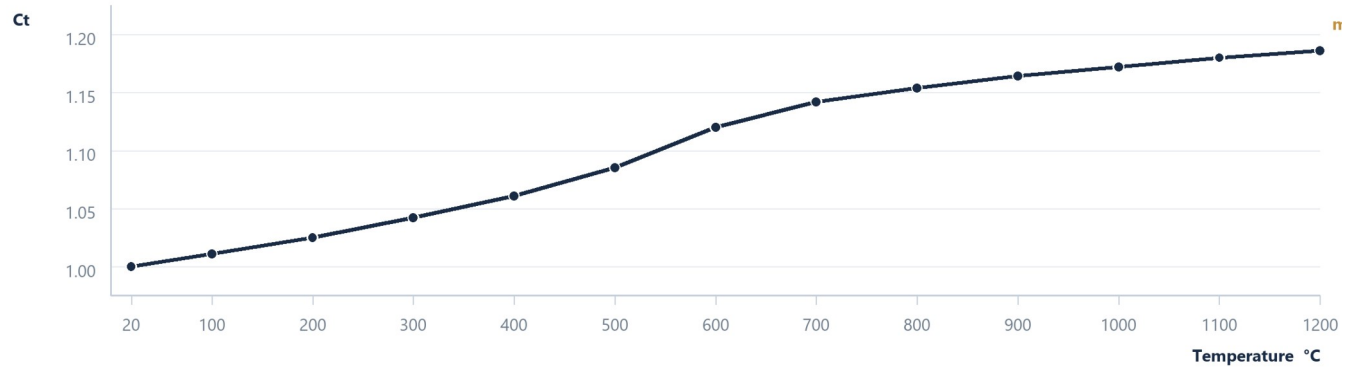
| Property | Value | Property | Value |
|---|---|---|---|
| Max. working temperature | 1100 °C | Resistivity at 20 °C (μΩ·m) | 1.23 ± 0.07 |
| Density | 7.35 g/cm³ | Thermal conductivity (20 °C) | 13 W/(m·K) |
| Mean linear expansion 20–1000 °C | 13.5 × $10^{-6}$ /K | Specific heat capacity | 0.49 J/(g·K) |
| Approx. melting point | 1500 °C | Elongation after fracture A/% | ≤3.0 mm: ≥12 %<br>>3.0 mm: ≥15 % |
| Tensile strength Rm | ≥580 MPa | Accelerated life test | ≥80 h at 1250 °C |
| Micrographic structure | Ferrite | Magnetic properties | Magnetic |

## TEMPERATURE FACTOR OF RESISTIVITY

Ct is applied to the 20 °C resistivity to obtain the value at working temperature:

**R (T) = R (20 °C) × Ct**

| Temp. °C | 20 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1100 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ct** | 1.000 | 1.011 | 1.025 | 1.042 | 1.061 | 1.085 | 1.12 | 1.142 | 1.154 | 1.164 | 1.172 | 1.180 | 1.186 |




## AVAILABLE FORMS & SUPPLY RANGE

| Form | Surface / finish | Size range |
|---|---|---|
| **Wire** | Bright, soft annealed | 0.05 – 1.6 mm |
| **Wire** | Acid-pickled | 1.0 – 12.0 mm |
| **Rod** | Oxidized, acid-pickled or bright finish | 6.0 – 150.0 mm |
| **Flat wire** | Bright & soft annealed | width 0.2 – 6.0 mm · thickness 0.08 – 1.0 mm |
| **Heating ribbon** | Oxidized, acid-pickled or bright finish | width 5.0 – 300 mm · thickness 0.05 – 4.0 mm |

## TECHNICAL PARAMETERS

Standard diameters 0.05 – 9.0 mm: resistance, yield length and weight per metre. Calculated to GB/T 1234-2012.

| Ø mm | Ω/m at 20 °C | m/kg | g/m | Ø mm | Ω/m at 20 °C | m/kg | g/m |
|---|---|---|---|---|---|---|---|
| 0.05 | 626.434 | 69292.01 | 0.01443 | 1.1 | 1.2943 | 143.17 | 6.98493 |
| 0.06 | 435.024 | 48119.45 | 0.02078 | 1.2 | 1.0876 | 120.30 | 8.31265 |
| 0.07 | 319.609 | 35353.06 | 0.02829 | 1.3 | 0.9267 | 102.50 | 9.75582 |
| 0.08 | 244.701 | 27067.19 | 0.03695 | 1.4 | 0.7990 | 88.38 | 11.31444 |
| 0.09 | 193.344 | 21386.42 | 0.04676 | 1.5 | 0.6960 | 76.99 | 12.98851 |
| 0.1 | 156.609 | 17323.00 | 0.05773 | 1.6 | 0.6118 | 67.67 | 14.77804 |
| 0.11 | 129.429 | 14316.53 | 0.06985 | 1.7 | 0.5419 | 59.94 | 16.68302 |
| 0.12 | 108.756 | 12029.86 | 0.08313 | 1.8 | 0.4834 | 53.47 | 18.70346 |
| 0.13 | 92.668 | 10250.30 | 0.09756 | 1.9 | 0.4338 | 47.99 | 20.83934 |
| 0.15 | 69.604 | 7699.11 | 0.12989 | 2.0 | 0.3915 | 43.31 | 23.09069 |
| 0.17 | 54.190 | 5994.12 | 0.16683 | 2.2 | 0.3236 | 35.79 | 27.93973 |
| 0.19 | 43.382 | 4798.62 | 0.20839 | 2.4 | 0.2719 | 30.07 | 33.25059 |
| 0.21 | 35.512 | 3928.12 | 0.25457 | 2.6 | 0.2317 | 25.63 | 39.02326 |
| 0.25 | 25.057 | 2771.68 | 0.36079 | 2.8 | 0.1998 | 22.10 | 45.25775 |
| 0.27 | 21.483 | 2376.27 | 0.42083 | 3.0 | 0.1740 | 19.25 | 51.95404 |
| 0.29 | 18.622 | 2059.81 | 0.48548 | 3.2 | 0.1529 | 16.92 | 59.11216 |
| 0.31 | 16.296 | 1802.60 | 0.55475 | 3.4 | 0.1355 | 14.99 | 66.73208 |
| 0.35 | 12.784 | 1414.12 | 0.70715 | 3.6 | 0.1208 | 13.37 | 74.81382 |
| 0.40 | 9.788 | 1082.69 | 0.92363 | 3.8 | 0.1085 | 12.00 | 83.35738 |
| 0.45 | 7.734 | 855.46 | 1.16897 | 4.0 | 0.0979 | 10.83 | 92.36275 |
| 0.50 | 6.264 | 692.92 | 1.44317 | 4.5 | 0.0773 | 8.55 | 116.89660 |
| 0.55 | 5.177 | 572.66 | 1.74623 | 5.0 | 0.0626 | 6.93 | 144.31679 |
| 0.60 | 4.350 | 481.19 | 2.07816 | 5.5 | 0.0518 | 5.73 | 174.62332 |
| 0.65 | 3.707 | 410.01 | 2.43895 | 6.0 | 0.0435 | 4.81 | 207.81618 |
| 0.70 | 3.196 | 353.53 | 2.82861 | 6.5 | 0.0371 | 4.10 | 243.89538 |
| 0.80 | 2.447 | 270.67 | 3.69451 | 7.0 | 0.0320 | 3.54 | 282.86091 |
| 0.85 | 2.168 | 239.76 | 4.17076 | 7.5 | 0.0278 | 3.08 | 324.71278 |
| 0.90 | 1.933 | 213.86 | 4.67586 | 8.0 | 0.0245 | 2.71 | 369.45098 |
| 0.95 | 1.735 | 191.94 | 5.20984 | 8.5 | 0.0217 | 2.40 | 417.07552 |
| 1.00 | 1.566 | 173.23 | 5.77267 | 9.0 | 0.0193 | 2.14 | 467.58640 |

### TOLERANCE OF RESISTANCE PER METRE

0.03 – 0.06 mm ±10 % · 0.07 – 0.12 mm ±8 % · 0.13 – 0.17 mm ±7 % · 0.18 – 0.32 mm ±6 % · above 0.32 mm ±5 %

Applies to the resistance values listed in the technical parameter table above.

### NOTICE

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