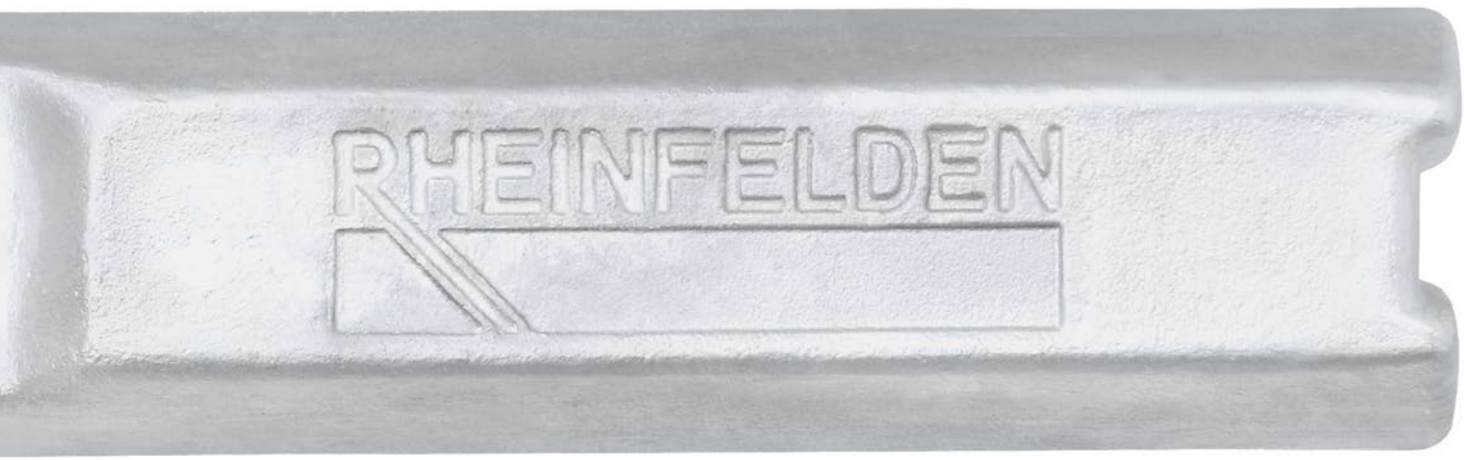
# Value base for processing our
## Primary aluminium
# Casting alloys

RHEINFELDEN ALLOYS




RHEINFELDEN
Solutions thru Innovation

# Chemical compositions

Alloys of a consistently high purity are key to producing high-quality castings. The RHEINFELDEN ALLOYS quality system allows this level of purity to be met.

The main alloy components are printed in bold. Individual values in the table are the maximum contents of alloy and accompanying elements. The alloys which RHEINFELDEN ALLOYS supplies sometimes have narrower alloy component ranges and a lower content of impurity than stipulated in the standard. This ensures good uniformity in the casting process and other properties.

European standard EN 1676 for alloyed aluminium in ingots applies. The numerical alloy denomination is based on the European standard (EN). Alloys without these denominations are not included in the EN. Alloys with special compositions can be produced by agreement.

In the case of aluminium-silicon alloys, on request a modified microstructure with sodium (modified subsequently or in advance) or strontium (permanently modified) can be set rather than the granular microstructure. This choice is indicated by the denomination (Na/Sr) in the last column.

| **Brand name** | **Chemical denomination** | **Numerical denomination** | **Composition** [% of mass] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Si** | **Fe** | **Cu** | **Mn** | **Mg** | **Zn** | **Ti** | **other** |
| Anticorodal-04 | AlSi0.5Mg | | **0.3 – 0.6** | **0.8** | 0.01 | 0.01 | **0.3 – 0.6** | 0.07 | **0.01** | |
| Anticorodal-50 | AlSi5Mg | | **5.0 – 6.0** | 0.15 | 0.02 | 0.10 | **0.4 – 0.8** | 0.10 | **0.20** | |
| Anticorodal-70 | AlSi7Mg0.3 | 42 100 | **6.5 – 7.5** | 0.15 | 0.02 | 0.10 | **0.30 – 0.45** | 0.07 | **0.18** | **(Na/Sr)** |
| Anticorodal-78dv | AlSi7Mg0.3 | 42 100 | **6.5 – 7.5** | 0.12 | 0.02 | 0.05 | **0.30 – 0.45** | 0.07 | **0.18** | **Sr** |
| Anticorodal-71 | AlSi7Mg0.3-E | | **6.5 – 7.5** | 0.15 | 0.01 | 0.01 | **0.30 – 0.45** | 0.07 | **0.01** | **(Na/Sr)** |
| Anticorodal-72 | AlSi7Mg0.6 | 42 200 | **6.5 – 7.5** | 0.15 | 0.02 | 0.05 | **0.50 – 0.70** | 0.07 | **0.18** | **(Na/Sr)** |
| Silafont-30 | AlSi9Mg | 43 300 | **9.0 – 10.0** | 0.15 | 0.02 | 0.05 | **0.30 – 0.45** | 0.07 | 0.15 | **(Na/Sr)** |
| Silafont-36 | AlSi10MnMg | 43 500 | **9.5 – 11.5** | 0.15 | 0.03 | **0.5 – 0.8** | **0.1 – 0.5** | 0.07 | 0.15 | **Sr** |
| Silafont-38 | AlSi10MnMgZn | | **8.5 – 10.0** | 0.15 | **0.1 – 0.4** | **0.5 – 0.8** | **0.1 – 0.5** | **0.1 – 0.4** | 0.15 | **Sr** |
| Silafont-09 | AlSi9 | 44 400 | **9.5 – 10.6** | **0.4** | 0.02 | **0.4** | 0.05 | 0.10 | 0.10 | |
| Silafont-13 | AlSi11 | | **10.0 – 13.5** | 0.15 | 0.02 | 0.05 | 0.05 | 0.07 | 0.15 | **(Na/Sr)** |
| Silafont-20 | AlSi11Mg | 44 000 | **10.0 – 11.8** | 0.15 | 0.02 | 0.05 | **0.10 – 0.45** | 0.07 | 0.15 | **(Na/Sr)** |
| Silafont-70 | AlSi12CuNiMg | 48 000 | **11.0 – 13.5** | 0.15 | **0.8 – 1.3** | 0.05 | **0.9 – 1.3** | 0.10 | 0.10 | **0.8 – 1.3 Ni** |
| Silafont-90 | AlSi17Cu4Mg | | **16.0 – 18.0** | 0.3 | **4.0 – 5.0** | 0.15 | **0.5 – 0.6** | 0.10 | 0.20 | |
| Castaman-35R | AlSi10MnMg | | **9.5 – 11.0** | 0.2 | 0.03 | **0.5 – 0.8** | **0.2 – 0.5** | 0.10 | 0.15 | **Sr** |
| Castasil-37 | AlSi9MnMoZr | | **8.5 – 10.5** | 0.15 | 0.05 | **0.35 – 0.6** | **0.06** | 0.07 | 0.15 | **0.1 – 0.3 Mo**<br>**0.1 – 0.3 Zr** |
| Castasil-21 | AlSi9Sr | | **8.0 – 9.0** | **0.5 – 0.7** | 0.02 | **0.01** | 0.03 | 0.07 | **0.01** | **Sr** |
| Unifont-90 | AlZn10Si8Mg | 71 100 | **8.5 – 9.3** | 0.15 | 0.03 | 0.10 | **0.3 – 0.5** | **9.0 – 10.0** | 0.15 | **(Na/Sr)** |
| Unifont-94 | AlZn10Si8Mg | | **8.5 – 9.5** | **0.4** | 0.03 | **0.4** | **0.3 – 0.5** | **9.0 – 10.0** | 0.10 | |
| Castadur-30 | AlZn3Mg3Cr | | 0.15 | 0.2 | 0.05 | **0.1 – 0.2** | **2.5 – 3.0** | **2.2 – 2.8** | **0.15** | **0.2 – 0.4 Cr; Be** |
| Castadur-50 | AlZn5Mg | | 0.15 | 0.2 | 0.05 | **0.1 – 0.2** | **0.4 – 0.8** | **4.9 – 5.8** | **0.15** | **0.2 – 0.4 Cr** |
| Peraluman-30 | AlMg3 | 51 100 | 0.45 | 0.15 | 0.02 | **0.01 – 0.4** | **2.7 – 3.5** | 0.10 | **0.01 – 0.15** | **Be** |
| Peraluman-36 | AlMg3Si | | **0.9 – 1.3** | 0.15 | 0.02 | **0.01 – 0.4** | **2.7 – 3.5** | 0.10 | **0.01 – 0.15** | **Be** |
| Peraluman-50 | AlMg5 | 51 300 | 0.30 | 0.15 | 0.02 | **0.01 – 0.4** | **4.8 – 5.5** | 0.10 | **0.01 – 0.15** | **Be** |
| Peraluman-56 | AlMg5Si | 51 400 | **0.9 – 1.3** | 0.15 | 0.02 | **0.01 – 0.4** | **4.8 – 5.5** | 0.10 | **0.01 – 0.15** | **Be** |
| Magsimal-59 | AlMg5Si2Mn | 51 500 | **1.8 – 2.6** | 0.20 | 0.03 | **0.5 – 0.8** | **5.0 – 6.0** | 0.07 | 0.20 | **Be; V** |
| Alufont-47 | AlCu4TiMg | 21 000 | 0.15 | 0.15 | **4.2 – 5.0** | 0.10 | **0.20 – 0.35** | 0.07 | **0.15 – 0.25** | |
| Alufont-48 | AlCu4TiMgAg | | 0.05 | 0.10 | **4.0 – 5.0** | **0.01 – 0.5** | **0.15 – 0.35** | 0.05 | **0.15 – 0.35** | **0.4 – 1.0 Ag** |
| Alufont-52 | AlCu4Ti | 21 100 | 0.15 | 0.15 | **4.2 – 5.2** | **0.01 – 0.5** | 0.03 | 0.07 | **0.15 – 0.25** | |
| Alufont-60 | AlCu5NiCoSbZr | | 0.20 | 0.30 | **4.5 – 5.2** | **0.1 – 0.3** | 0.10 | 0.10 | **0.15 – 0.30** | **1.3 – 1.7 Ni**<br>**0.10 – 0.40 Co**<br>**0.10 – 0.30 Zr & Sb** |
| Thermodur-72 | AlMg7Si3Mn | | **3.0 – 3.8** | 0.15 | 0.05 | **0.5 – 0.8** | **7.0 – 8.0** | 0.10 | 0.20 | **Be; V** |
| Thermodur-73 | AlSi11Cu2Ni2Mg2Mn | | **10.0 – 11.8** | 0.15 | **1.8 – 2.3** | **0.4** | **1.8 – 2.3** | 0.10 | 0.10 | **1.8 – 2.3 Ni; Sr** |
| Rotoren-Al 99.7 | Al99.7-E | | **0.20** | **0.25** | 0.01 | 0.02 | 0.02 | 0.07 | **0.02** | Mn+Ti+V+Cr≤0.02% |
| Aluman-16 | AlMn1.6 | | 0.15 | **0.2 – 0.9** | 0.03 | **1.4 – 1.6** | 0.05 | 0.10 | 0.15 | |

# Physical properties

The details of physical properties relate to heat-treatable alloys in a heat-treated state. They are heavily influenced by fluctuations in the alloy composition and the microstructure state. This explains why some of the measurement ranges are so large.

The details for the melt and solidification ranges take into account the initial signs of partial melting resulting from segregation in the cast structure, which may occur in particular when heating up quickly at far below the theoretical equilibrium temperature.

| Density (approximate value) | E Modul | Linear thermal expansion coeffizient 20–200 °C | Thermal conductivity 20–200 °C | Electrical conductivity | | Linear shrinkage | | | Melt and solidification range |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sand casting | Gravity die casting | High pressure die casting | |
| kg/dm³ | GPa | $\frac{1}{K} \times 10^{-6}$ | $\frac{W}{K \times cm}$ | m/(Ω × mm²) | % IACS | % | % | % | °C |
| 2.67 | 66–73 | 23 | 2.0 | 29–31.5 | 50.0–54.0 | 1.1–1.2 | 0.8–1.1 | 0.5–0.7 | 600–650 |
| 2.67 | 65–75 | 23 | 1.5 | 21–26 | 36.0–45.0 | 1.1–1.2 | 0.8–1.1 | | 550–625 |
| 2.66 | 69–75 | 22 | 1.6 | 21–27 | 36.0–46.5 | 1.1–1.2 | 0.8–1.1 | | 550–625 |
| 2.66 | 69–75 | 22 | 1.6 | 21–27 | 36.0–46.5 | 1.1–1.2 | 0.8–1.1 | | 550–625 |
| 2.66 | 69–75 | 22 | 1.8 | 27–29 | 46.5–50.0 | 1.1–1.2 | 0.8–1.1 | | 550–625 |
| 2.66 | 71–75 | 22 | 1.5 | 20–26 | 34.5–45.0 | 1.1–1.2 | 0.8–1.1 | | 550–625 |
| 2.65 | 74–83 | 21 | 1.5 | 21–26 | 36.0–45.0 | 1.0–1.1 | 0.7–1.0 | | 550–600 |
| 2.64 | 74–83 | 21 | 1.5 | 21–26 | 36.0–45.0 | | | 0.4–0.6 | 550–590 |
| 2.67 | 74–83 | 21 | 1.4 | 21–22 | 36.0–38.0 | | | 0.4–0.6 | 550–585 |
| 2.65 | 62–78 | 21 | 1.4 | 18–24 | 31.0–42.0 | | | 0.4–0.6 | 550–595 |
| 2.64 | 65–81 | 21 | 1.4 | 17–27 | 29.5–46.5 | 1.0–1.1 | 0.7–1.0 | | 565–585 |
| 2.64 | 76–83 | 21 | 1.4 | 18–26 | 31.0–45.0 | 1.0–1.1 | 0.7–1.0 | | 565–585 |
| 2.68 | 77–83 | 21 | 1.2 | 16–22 | 27.5–38.0 | 1.0–1.1 | 0.7–1.0 | 0.4–0.6 | 545–600 |
| 2.73 | 77–83 | 18 | 1.1 | 14–17 | 24.0–29.5 | 0.6–0.8 | 0.4–0.6 | 0.3–0.5 | 510–650 |
| 2.64 | 74–83 | 21 | 1.4 | 21–26 | 36.0–45.0 | | | 0.4–0.6 | 550–590 |
| 2.69 | 68–75 | 21 | 1.3 | 18–22 | 31.0–38.0 | | | 0.4–0.6 | 550–595 |
| 2.65 | 62–78 | 21 | 1.7 | 25–28 | 43.5–45.0 | | | 0.4–0.6 | 550–595 |
| 2.85 | 74–80 | 21 | 1.2 | 16–20 | 27.5–34.5 | 1.1–1.2 | 0.8–1.1 | | 550–650 |
| 2.85 | 74–80 | 21 | 1.2 | 16–20 | 27.5–34.5 | | | 0.5–0.8 | 550–650 |
| 2.74 | 70–72 | 24 | 1.2 | 17–20 | 29.5–34.5 | 1.0–1.4 | 0.7–1.1 | | 555–650 |
| 2.78 | 71–74 | 24 | 1.3 | 18–21 | 31.0–36.0 | 1.0–1.4 | | | 555–655 |
| 2.66 | 63–73 | 24 | 1.3 | 16–23 | 27.5–40.0 | 1.1–1.5 | 0.8–1.2 | | 560–650 |
| 2.66 | 66–74 | 24 | 1.2 | 15–23 | 26.0–40.0 | 1.1–1.5 | 0.8–1.2 | | 560–650 |
| 2.63 | 63–73 | 24 | 1.2 | 15–21 | 26.0–36.0 | 1.0–1.4 | 0.7–1.1 | | 545–645 |
| 2.63 | 68–75 | 24 | 1.1 | 14–21 | 24.0–36.0 | 1.0–1.4 | 0.7–1.1 | | 545–645 |
| 2.63 | 70–80 | 24 | 1.1 | 14–16 | 24.0–27.5 | | | 0.6–1.1 | 580–618 |
| 2.75 | 65–72 | 23 | 1.3 | 17–23 | 29.5–40.0 | 1.3–1.5 | 0.8–1.2 | | 540–650 |
| 2.79 | 65–72 | 23 | 1.3 | 17–23 | 29.5–40.0 | 1.3–1.5 | 0.8–1.2 | | 525–645 |
| 2.75 | 65–73 | 23 | 1.3 | 17–23 | 29.5–40.0 | | 0.7–1.2 | 0.6–1.1 | 540–650 |
| 2.84 | 72–76 | 22.5 | 1.2 | 17–21 | 29.5–36.0 | 1.3–1.5 | | | 545–650 |
| | | | | | | | 0.7–1.2 | 0.6–1.1 | |
| | | | | | | 1.0–1.1 | 0.7–1.0 | 0.4–0.6 | |
| 2.67 | 65–70 | 24 | 2.3 | 34.5–36.5 | 59.5–63.0 | 1.5–1.8 | | 1.0–1.4 | 655–660 |
| 2.73 | 65–72 | 24 | 1.5 | 20–26 | 34.5–45.0 | 1.2–1.5 | | 0.8–1.2 | 645–660 |

# Thermal treatment

Castings cooled in permanent molds take the shortest annealing time. Those cooled in sand take the longest. For AlCu alloys, the annealing time figures apply to castings with wall thickness to 8 mm. Castings with thicker walls should be annealed at temperatures 10 °C lower for 12–18 hours.

**Treatment state**

| | | | |
|---|---|---|---|
| **F** | as-cast state | **T5** | quenched and artificially aged |
| **O** | annealed | **T6** | artificially aged |
| **T1** | self-aged | **T64** | partially aged |
| **T4** | naturally aged | **T7** | overaged |
| **T5** | stabilised | | |

| **Alloy** | **Chemical denomination** | State | Solution heat treatment temperature **°C** | Solution heat treatment duration **h** | Quenching water temperature **°C** | Ageing temperature **°C** | Ageing duration **h** |
|---|---|---|---|---|---|---|---|
| Anticorodal-04 | AlSi0.5Mg | T6 | 520–530 | 6–8 | 20 | 180–190 | 6–8 |
| | | T7 | 520–530 | 6–8 | 20 | 220–240 | 4–6 |
| Anticorodal-50 | AlSi5Mg | T6 | 520–535 | 4–8 | 20 | 155–160 | 7–9 |
| | | T4 | 520–535 | 4–8 | 20 | 15–30 | 120 |
| Anticorodal-70 | AlSi7Mg0.3 | T6 | 520–545 | 4–10 | 20 | 155–165 | 6–8 |
| | | T64 | 520–545 | 4–10 | 20 | 150–160 | 2–3 |
| Anticorodal-78dv | AlSi7Mg0.3 | T6 | 520–545 | 4–20 | 20 | 145–160 | 2–15 |
| Anticorodal-71 | AlSi7Mg0.3-E | T6 | 520–545 | 4–8 | 20 | 155–165 | 6–8 |
| | | T7 | 520–545 | 4–8 | 20 | 200–230 | 6–8 |
| Anticorodal-72 | AlSi7Mg0.6 | T6 | 520–545 | 4–10 | 20 | 155–165 | 6–8 |
| | | T64 | 520–545 | 4–10 | 20 | 150–160 | 2–3 |
| Silafont-30 | AlSi9Mg | T6 | 520–535 | 6–10 | 20 | 160–170 | 6–8 |
| | | T5 | – | – | Air | 210–230 | 6–8 |
| Silafont-36 | AlSi10MnMg | T6 | 480–490 | 2–5 | 20/Air | 155–170 | 2–6 |
| | | T7 | 480–490 | 1–5 | 20/Air | 190–230 | 1–3 |
| | | T4 | 480–490 | 2–5 | 20/Air | 15–30 | 120 |
| | | T5 | – | – | 20 | 155–190 | 2–5 |
| Silafont-38 | AlSi10MnMgZn | T6 | 470–490 | 1–3 | Water | 155–190 | 1–3 |
| | | T6 | 470–490 | 1–3 | Air | 155–210 | 1–3 |
| Silafont-13 | AlSi11 | O | 520–530 | 6–8 | 20 | – | – |
| Silafont-20 | AlSi11Mg | T6 | 520–535 | 6–10 | 20 | 130–170 | 6–8 |
| | | T5 | – | – | Air | 210–230 | 5–8 |
| Silafont-70 | AlSi12CuNiMg | T6 | 520–530 | 5–10 | 20–80 | 165–185 | 5–8 |
| | | T5 | – | – | Air | 210–220 | 10–12 |
| Castaman-35R | AlSi10MnMg | T6 | 480–490 | 2–5 | 20/Air | 155–170 | 2–6 |
| Castasil-21 | AlSi9Sr | O | 345–355 | 1–2 | Air | – | – |
| Alufont-47 | AlCu4TiMg | T4 | 520–530 | 8–16 | 20–80 | 15–30 | 120 |
| Alufont-48 | AlCu4TiMgAg | T6 | 525–530 | 8–16 | 20–80 | 160–180 | 6–7 |
| Alufont-52 | AlCu4Ti | T6 | 525–535 | 8–16 | 20–50 | 160–175 | 6–7 |
| | | T64 | 525–535 | 8–10 | 20–50 | 135–145 | 6–7 |
| Alufont–60 | AlCu5NiCoSbZr | T7 | 535–545 | 10–15 | 80 | 210–220 | 12–16 |
| | | O | 345–355 | 5–10 | Air | | |
| Thermodur–73 | AlSi11Cu2Ni2Mg2Mn | T5 | – | – | Air | 210–270 | 10–12 |

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