# trimal®-34E

## Die cast alloy for electromobility

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# trimal®-34E
## Die cast alloy for electromobility

**trimal®-34E** (AlSi0.2Fe0.2Mg0.2) was developed especially for rotors in the asynchronous machines (ASM) of electric vehicles. Similar to casings for electronic components or heat exchangers, these are produced in the die casting process. The alloy is characterized by a particularly high conductivity combined with good mechanical strength.

**trimal®-34E** (AlSi0.2Fe0.2Mg0.2) is suitable as a die cast alloy for components with the highest requirements in terms of conductivity with simultaneously good mechanical properties. Due to the overall low content of alloying elements, the material's thermal and electrical conductivity is comparable to that of pure aluminium Al99.7E (electric grade). The alloying elements Si, Fe and Mg were chosen to influence conductivity as little as possible. At the same time, only environmentally compatible and sustainable elements were used. The mechanical properties have been set in such a way that the material is able to help boost the performance of state-of-the-art electric motors. At TRIMET, the material is produced from ultrapure base metal with particularly low contents of Mn, Ti, V and Cr, which eliminates the need for an expensive melt treatment and enables the material to be produced economically.

### Chemical composition

The following table shows a reference analysis for the described material in weight percent. Customer specifications may vary.

| % | Si | Fe | Cu | Mn | Mg | Ti/V/Cr | o. e. | o. t. | Other |
|---|---|---|---|---|---|---|---|---|---|
| Min. | 0.15 | 0.15 | | | 0.15 | | | | |
| Max. | 0.25 | 0.25 | 0.05 | 0.05 | 0.25 | 0.05 | 0.05 | 0.15 | Al |

### Mechanical properties

The mechanical properties were determined with separately cast gravity die casting samples. The properties and castability were confirmed in die casting tests with real ASM rotors.

| Temper | Yield strength Rp0.2 in MPa | Tensile strength Rm in MPa | Elongation A5 in % | Electrical conductivity in MS/m | Electrical conductivity IACS in % |
|---|---|---|---|---|---|
| F | 42–44 | 83–89 | 33–37 | 32 | 55 |
| T0 (5 h@250 °C) | 41–47 | 83–87 | 32–38 | 33 | 57 |
| T0 (100 h@250 °C) | 45–51 | 84–90 | 29–37 | 34 | 59 |
| Reference Al99,7E | 15–20 | 60 | 35–38 | 34–36 | 59–62 |

The mechanical properties show that strength is maintained even after prolonged use at elevated temperatures. The material withstands the stress that can occur in electric motors, for example. The conductivity increases due to the influence of heat up to the level of Al99.7E. In contrast, the stability of the pure aluminium alloy for electrical applications is significantly lower due to its low yield and tensile strength.

### Summary

> The conductive alloy **trimal®-34E** is suitable for the die casting of ASM rotors in modern electric motors
> The electrical and thermal conductivity is comparable to that of pure aluminum
> The increased strength of the material makes rotors more resilient
> Use in heat exchangers and electrical conductors is also possible



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**TRIMET Aluminium SE** • Aluminiumallee 1 • D-45356 Essen
Tel. +49 201-3660 • www.trimet.de

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