



**Database name:** ThermoTech Mg-based Alloys Database  
**Database acronym:** TTMG4 **Database version:** 4.1  
**Database owner:** ThermoTech  
**Database segment:** Magnesium Based Alloys

**Brief description**

TTMG4 is a comprehensive database for Mg-alloys that can be used for all major types of commercial Mg-alloys ranging from pure Mg to complex commercial alloys.

**Applications**

Mg-based alloy design and engineering.

**Included Elements**

Al Ca Ce Cu Fe Gd La Mg Mn Nd Sc Si Sr Y Zn Zr

**Included Phases**

AL11MN4	AL4MN	BETA_MN	MG17SR2	MGZN
AL11RE3_ALPHA	AL5CU2MG8SI6	CU2MG	MG24Y5	MGZN2
AL2FE	AL5FE2	DHCP	MG2CA	PHI_ALMGZN
AL2RE	AL6MN	FCC_A1	MG2CU	Q_AL7CU3MG6
AL2ZR	AL8FEMG3SI6	FE	MG2SI	SILICON
AL3FE	AL8MN5	HCP_A3	MG2ZN3	T_ALCUMGZN
AL3RE_D019	ALPHA	LIQUID	MG3RE_D03	
AL3ZR	ALPHA_MN	MG12RE	MG41RE5	
AL4M_D13	ALPHA_ZR	MG17AL12	MG5GD	

**Assessed Systems**

All phases have been critically assessed and treated by some appropriate thermodynamic models (e.g. the Sublattice Model for solid solutions and liquid mixture phases), which are applicable over a wide temperature-pressure-composition range.

**Validation**

TTMG4 is a sister database to TTAI and helps provides new insight into phase equilibria behaviour in complex Mg-alloys. Like TTAI it is well suited for use in the modelling of non-equilibrium solidification processes. As part of a validation process of the database, extensive comparison has been made between the simulated results and available experimental data for Mg-alloys. The database performs at accuracy close to the level expected of the experiments.

The Liquid and HCP-A3 phases are modeled as substitutional mixing phases, with the HCP-A3 phase corresponding to the Mg-rich solid solution. The other phases are often stoichiometric with respect to at least one element, although a number of other elements may mix in the phase. The nomenclature surrounding the various intermetallic phases can differ depending on which reference text is used as a basis.

The database can be used for predictions of all types of equilibria, gamma/gamma-prime, gamma-prime solvus, solidus/liquidus relations etc. Using the SCHEIL module in the TCC and TCW software, it is also possible to make solidification simulations which provide predictions for non-equilibrium micro-segregation, fs vs T plots, heat evolution etc. For more complex modeling, the calculations provide critical information which can otherwise only be found by the use of expensive experimental techniques.

**Limits**

Combinations of several critically-assessed systems can calculate and extrapolate higher-order multicomponent systems. Such extrapolations require experience and understanding and the producer or vendor should be contacted if problems occur. Critical calculations must always be verified by equilibrium experimental data; it is the user's responsibility to verify the calculations but Thermo-Calc Software is interested to know about any significant deviations in order to improve any future release.

**Scientific Models & References**

See the Thermo-Calc Software reference list available at:

[http://www.thermocalc.com/DOWNLOAD\\_AREA/References.html](http://www.thermocalc.com/DOWNLOAD_AREA/References.html)