CALCULATE

Amount and composition of phases
Phase transformation temperatures, such as liquidus and solidus temperatures
Thermochemical properties, e.g. Gibbs Energies, chemical potentials, enthalpy, heat capacity, etc.
Driving forces
Diffusion coefficients
Derivatives of state functions
Partition coefficients
Precipitation simulations
Invariant temperatures, liquidus-/solidus- temperatures and composition-dependence
T0-temperature, A1/A3/A4-temperatures, adiabatic temperature, chill factors, composition derivatives of temperature, etc.
Thermodynamic limits for partitionless transformations and for transformations under para-equilibrium and quasi-paracoconditions

PLATFORM
Windows: All four SDKs
Linux: TC-Python, TQ-Interface and TC-API
MAC OS: TC-Python
Refer to our website for complete system requirements

LICENSES
Single machine or network install
Annual or perpetual options
License fees depend on several factors, i.e., database selection
TC-Toolbox for MATLAB® requires a separate Matlab license

Software Development Kits (SDKs) are add-on features which allow users to call Thermo-Calc functions and access the thermodynamic and mobility databases directly from within their own software codes or other software programs. Four SDKs are available: TC-Python, TQ-Interface, TC-API and TC-Toolbox for MATLAB®.

Easy to Use
SDKs make coupling with Thermo-Calc easy, allowing for a dynamic and flexible interaction between Thermo-Calc and a user's own code or other programs. Since calls to Thermo-Calc are made via function and sub-routine calls that are similar in syntax to that used in the Thermo-Calc console mode, users familiar with the console mode commands and experienced in programming will find using the SDKs a natural extension. Documentation on each function and its syntax is provided, along with example codes.

Consistently Maintained and Updated
The SDKs are directly linked to the underlying Thermo-Calc code, so they are updated as Thermo-Calc is updated. Thermo-Calc, and thus the SDKs, are on a two-times-per-year release cycle and customers with a valid maintenance and support subscription for the SDKs receive these updates for free.

Technical Support and Training
Thermo-Calc is backed by a dedicated customer technical support team. We also have agents around the world, as well as a subsidiary in the USA, who provide local customer support.

High Quality Thermodynamic and Mobility Databases
SDKs allow users to access the same thermodynamic and mobility databases used by Thermo-Calc, DICTRA and TC-PRISMA. More than 30 thermodynamic databases and 10 mobility databases are available for use with the SDKs.

TC-Python
This API uses the popular Python language so that users can couple Thermo-Calc with a wide variety of other programs such as numerical packages NumPy and SciPy. TC-Python was designed to be easy to use - it supports intelligent code completion and an object-oriented approach makes it easy to reuse information. This is the only Thermo-Calc API that works with precipitation calculations.
**APPLICATIONS**

SDKs can be used to understand many different phases in the life-cycle of a material, such as:

- Alloy and materials development
- Metallurgical extraction and refining
- Additive manufacturing
- Casting
- Forging/Hot rolling
- Heat treatment
- Joining/Welding/Soldering
- Quality control
- Materials selection
- Corrosion
- Underlying causes of failure
- Waste and recycling

**BENEFITS**

**Reduce** costly, time-consuming experiments and testing

**Increase** the value of experiments through better pre-screening and interpretation of the results

**Optimise** and define safe processing windows

**Base** decisions on scientifically supported data and models

**Shorten** development time and bring products to market faster

**Build** and safeguard intellectual knowledge

**Improve** the quality and consistency of products through deeper understanding

**Make** predictions that are difficult or even impossible with an experimental approach

### TQ-Interface

TQ-Interface is designed for time-critical, computationally intensive application software that is most likely but not necessarily written in FORTRAN. It constitutes a collection of FORTRAN subroutines and functions supplied in the form of a DLL (Dynamically Linked Library). There are also C functions matching all the FORTRAN subroutines in order to facilitate users who wish to program in languages other than FORTRAN. TQ-Interface offers the fastest calculations of the four SDKs.

### TC-API

TC-API consists of a library with C functions and was originally intended to facilitate programmers who wished to use a programming language other than FORTRAN. It offers access to most of the commands in the TDB, POLY3 and POST-processor modules, as well as to some important commands in the GES module.

### TC-Toolbox for MATLAB®

The TC-Toolbox for MATLAB® provides an interface to the commonly-used MATLAB® software for scientific and engineering computing. This SDK is ideal for users familiar with scripting in MATLAB but not programming in languages such as Fortran and C. Through this toolbox, more than 50 Thermo-Calc commands are made available within MATLAB®, including a set of commands also used within the Diffusion module (DICTRA).