Software Development Kits (SDKs) are add-on features that 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. Three SDKs are available: TC-Python, TQ-Interface, and TC-Toolbox for MATLAB®. Each SDK incorporates an application programming interface (API), a programmer’s guide, and a collection of examples to help users get started.

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.

Extract Most Quantities and Properties
Most of the quantities that are possible to evaluate in Thermo-Calc can be readily extracted using the SDKs. These quantities can be extracted under equilibrium conditions, but also for metastable or non-equilibrium states, by changing the status of the phases under consideration. Additionally, precipitation and diffusion simulations, as well as Property Model and Process Metallurgy Module calculations are possible with TC-Python and TC-Toolbox for MATLAB®.

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 subsidiaries in the USA and South Korea, 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, the Diffusion Module (DICTRA), and the Precipitation Module (TC-PRISMA). More than 30 thermodynamic and properties databases and 10 mobility databases are available for use with the SDKs.
Software Development Kits

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

Optimize 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

TC-Python

TC-Python is a powerful Python™ language-based SDK available with Thermo-Calc that allows users to openly couple Thermo-Calc calculations with other software. This API is built in 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.

TC-Toolbox for MATLAB®

TC-Toolbox for MATLAB® provides an interface to the commonly-used MATLAB® software for scientific and engineering computing. The API offers the same functionality as TC-Python, but is well suited for users who already have a license for MATLAB®, want to connect to other programs offered by MATLAB®, or are familiar with the MATLAB® programming language.

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 three SDKs.

Three carbides precipitation

![Three carbides precipitation graph](image)

TC-Python

![TC-Python interface](image)

TC-Toolbox for MATLAB®

![TC-Toolbox for MATLAB® interface](image)

TQ-Interface

![TQ-Interface interface](image)