Thermo-Calc Installation Guides

Thermo-Calc Version 2024a

Including the TC-Python and TC-Toolbox for MATLAB® Installation Guides

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Installing Thermo-Calc

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Key to Using this Guide

This guide is available in PDF format: (1) On the website or (2) when in Thermo-Calc go to **Help → Manuals Folder → Installation**.

This installation guide is for all Thermo-Calc installations running on Windows, macOS, or Linux operating systems. It is also applicable to previously installed versions of Thermo-Calc (the new version is installed next to the old version).

This guide includes information about:

- The types of licenses and installations available.
- Installing the Thermo-Calc software and its components on standalone computers, servers, and client computers.
- Installing the license management software for network installations.
- Retrieving and installing license files.
- Details about the specific instructions needed to install two of the SDKs, *TC-Python* and *TC-Toolbox for MATLAB®*.
- Troubleshooting to solve common installation problems.
- Updating and uninstalling the software.

Icons in this Guide

Name	*Description*
Information	Provides important information and indicates that more detail is located in the linked or named topic.
Note	The information can be of use to you. It is recommended that you read the text or follow the link.
Operating system	The operating system is indicated when the information is specific to a *Windows*, *macOS*, or

Name	*Description*
	Linux operating system.
License file	The Thermo-Calc license file, which contains the license keys and is installed on either a standalone computer or a network server.
	The Thermo-Calc software and its components (including databases and SDKs) to be installed.

Typographical Conventions

Convention	*Definition*
Forward arrow →	The forward arrow symbol → instructs you to select a series of menu items in a specific order. For example, **File → Save Project** is equivalent to: From the **File** menu, select **Save Project**.
Boldface font	A **boldface** font indicates that the given word(s) are shown that way in on a toolbar button or as a menu selection. For example, if you are told to select a menu item in a particular order, such as **File → Save Project**, or to click **Save**.
Italic font	An *italic* font indicates the introduction of important terminology. Expect to find an explanation in the same paragraph or elsewhere in the guide.
`code` and **`code bold`**	A `code` font indicates you are to make a keyboard entry. It also shows a programming code or code examples. The **`code bold`** font highlights the entry.

Installation Terminology

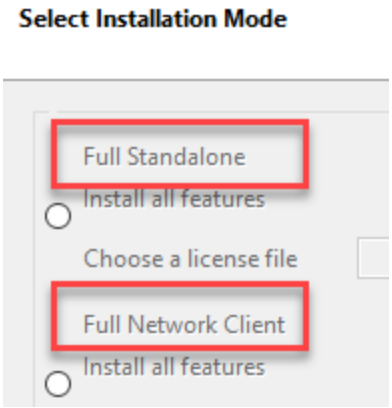
Term	*Definition*
client	A computer without a license file of its own but connected through the network to a computer with the license information. The client receives a license token from the computer where the license management software is installed.
consolidated network	A type of network installation where the Thermo-Calc software and a Thermo-Calc licensing software are installed on a single server computer. This allows all computers in the network to access both the software and a license on the server via a client installation.
distributed network	A type of network installation where the Thermo-Calc software is installed on one server computer in a network and the Thermo-Calc licensing software is installed on a different computer. After a thin client installation, all computers in the network can access both the software and the network license key via the server.
host ID	The MAC address on the computer that a license is locked to.
license file	The file (called *lservrc*) that contains all the purchased license keys. It is issued by Thermo-Calc Software, usually by email.
license key	The information contained in the license file that represents the products purchased and which is then authorised for installation.
license management software (see Sentinel RMS License Software)	The Thermo-Calc license management software. When working in Windows it is called *License Manager* (full name is Sentinel RMS License Manager by SafeNet) and on Linux it is called *License Server* (full name is Sentinel License Sever by Safenet).
license server	The use of the term *license server* (lower case letters) is reserved for use for scripts and option files (for example, in an "Unattended Network Client Installations" on page 64). For the purposes of the step-by-step instructions it is not used to refer to the type of network installation that runs the license management program. See *Sentinel RMS Software* below.
Network License (NWL)	The license type used with the licensing software. The NWL can only be used on one specific computer that hosts the licensing software. This restricts license usage to a certain subnet or subnets. The software may be used on the number of sites you have paid for and by the number of persons you have paid for on any number of network connected computers
Sentinel RMS License Software	The Thermo-Calc license management software that supplies the client computers in your network with license tokens when it runs the Thermo-Calc software. This is available for both Windows (called the License Manager) and Linux (called the License Server, but not to be confused with *license server* in lower case letters reserved for scripts).

Term	*Definition*
Single-User-Node Locked-License (SUNLL)	A unique license file for one designated computer at one designated site. It cannot be copied or moved outside the site. If the software is installed on a portable computer, it can be temporarily used off-site. The license can be used without network access (to the License Server).
standalone computer	A computer which uses a SUNLL license type.
TC-Toolbox	The short name for the TC-Toolbox for MATLAB® SDK.
thin client	An installation where the software is installed on a file server but is run from a client computer. The licensing software may be installed on the file server (consolidated network installation) or on a different computer (distributed network installation).
XQuartz	An open-source X Windows System, which is required to run Thermo-Calc on a Mac.

About the Thermo-Calc Components Being Installed

What is Installed with a Full Standalone or Full Network Client Option?

At the start of the installation process, the following components are installed when you choose either the **Full Standalone** or **Full Network Client** options. If you want to exclude a component (perhaps one of the SDKs), then you would use the **Custom** option.



A full installation means that all listed feature components are installed but the availability of the individual components is based on the license you have. This is also applicable to the databases and software development kits (SDKs).

Thermo-Calc

The Thermo-Calc software includes several add-on features and capabilities that are packaged with the software and included with a full standalone or network client installation. For example, there are the specialized add-on products Diffusion Module (DICTRA), Precipitation Module (TC-PRISMA), and Process Metallurgy Module as well as the Steel Model Library. For most of these specialized features, demonstration (*demo*) versions and/or examples are available for all users but advanced features are only available with a license.

Databases

All the latest databases are installed. As with the software features, availability of a specific database in the software itself is based on license. However, several demonstration (*demo*) databases are included and available to all users.

Software Development Kits (SDKs)

When the **Full Standalone** or **Full Network Client** option is chosen, it also installs the software development kits (SDKs) (e.g. TC-Python, TQ-Interface, TC-Toolbox for MATLAB®, etc.).

TC-Python

The TC-Python program is installed when the **Full Standalone** or **Full Network Client** option is chosen, but there are additional steps required to complete the installation as described in the *TC-Python Installation Guide*.

TC-Toolbox for MATLAB®

If a MATLAB® installation on your computer is found during this installation process, the TC-Toolbox for MATLAB® (available only for Windows) is automatically installed, otherwise you may need to do a manual installation. For details, see the *TC-Toolbox for MATLAB Installation Guide®*.

What Does the Custom Option Allow Me to Do During an Installation?

During the installation process, there is some flexibility to choose what to include or exclude with the installation by choosing the **Custom** option. This is primarily to the level of being able to choose the SDKs or to exclude all databases or Thermo-Calc itself. That is, you cannot choose specific Thermo-Calc features or databases as these are controlled by the license and not the installation procedure.

System Requirements

"About the Thermo-Calc Components Being Installed" on page 8

General

A full list of system requirements and program availability is found on the Thermo-Calc website. You can also see the roadmap for platform support to use for planning purposes.

Network Client Installations: Sentinel RMS License Software

Network client installations using the Sentinel RMS license management software require the use of the most recent version, 9.7.

For details of the system requirements to install Sentinel RMS, see "Windows: About Installing the License Manager" on page 47 and "Linux: About Installing the License Server" on page 52.

For macOS, the Sentinel RMS License software is installed on a Windows or Linux computer server where the Thermo-Calc license file must also be located.

Platforms Tested and SDK Availability

A full list of system requirements and program availability is found on the Thermo-Calc website. You can also see the roadmap for platform support to use for planning purposes.

Platforms Tested

Thermo-Calc and its components are tested on these platforms for Thermo-Calc 2024a:

Windows	*macOS*	*Linux*[1, 2]
• Windows 10 64-bit • Windows 11	• Sonoma 14.x • Ventura 13.x • Monterey 12.x	• Ubuntu 22.04 (Jammy Jellyfish) • Ubuntu 20.04 (Focal Fossa) • CentOS 7.9 • OpenSUSE 15.4 and 15.5 (Leap)

[1] Thermo-Calc Software cannot guarantee full functionality if the software is installed on other Linux distributions.

[2] If you are installing on CentOS 7, it is recommended you install gtk2 before you run the installation script.

SDK Availability by Platform

The software development kits (SDKs) are available as follows for the indicated platforms:

SDK	*Windows*	*macOS*	*Linux*
TC-Python	x	x	x
TQ-Interface	x	not available	x
TC-Toolbox for MATLAB®	x	not available	not available
TC-API	x	not available	x

License and Installation Types

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Multi-User Network Installations (NWL) 16

License and Installation Types

Installation procedures are based on the license type, the installation type, and the operating system.

Visit our website for more information about Licensing Options.

For macOS, the Sentinel RMS License software is installed on a Windows or Linux computer server where the Thermo-Calc license file must also be located.

License type	*Installation Type*	*Windows*	*macOS*	*Linux*
SUNLL	Standalone	Yes	Yes	Yes
NWL	Consolidated network	Yes	No	Yes
	Distributed network	Yes	No	Yes
	License installations on a server network	Yes	Yes	Yes

Sentinel RMS License Management Software: Use Current Version

The most recent version (9.7) of the Sentinel RMS License Manager (Windows) and License Server (Linux) is included with the network license Thermo-Calc software download.

However, due to security issues reported by the vendor, it is important that previous network license installations of the Sentinel RMS are upgraded to this version number.

For more information for your operating system, see "Windows: About Installing the License Manager" on page 47 and "Linux: About Installing the License Server" on page 52

About License Keys and Files

To run Thermo-Calc and its components you need a valid license key for each product. The license keys are included in the license file emailed to you by Thermo-Calc Software.

You can copy the license file to the applicable computer(s) before or after installing the software—the license file itself is not required during the installation process. However, it is required to make calculations in Thermo-Calc.

"Request a License File from Thermo-Calc Software" on page 67

Standalone Installations (SUNLL)

The standalone installation is used with the Single-User Node-Locked License (SUNLL). The Thermo-Calc software and a Thermo-Calc license file are installed on a standalone computer. You can do a full (all operating systems) or a custom installation (Windows and Linux only).

To get started, go to "First Steps of Installation" on page 20 and then "Standalone Installations" on page 35.

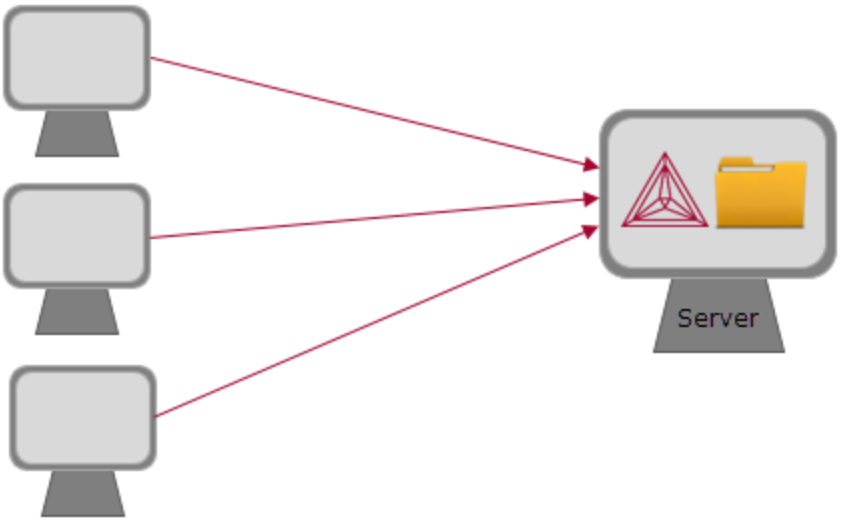
Multi-User Network Installations (NWL)

There are different types of multi-user network installations: consolidated, distributed, and where the licensing software is installed on a computer network. There is also a subtype of installation called thin client, which is a step done with the consolidated and distributed network installations.

Thin client installations: A thin client installation is where the Thermo-Calc software is installed on a computer server but is run from a client computer. The licensing software can be installed on the computer server (a consolidated network) or on a different computer (a distributed network). This type of installation is available for Windows and Linux operating systems. The client computer must have the Thermo-Calc software installed. This type of installation mainly sets environmental variables and paths on the client computer.

Consolidated Network Installations

The consolidated network installation is used with a Network License (NWL) and it is available for Windows and Linux operating systems.

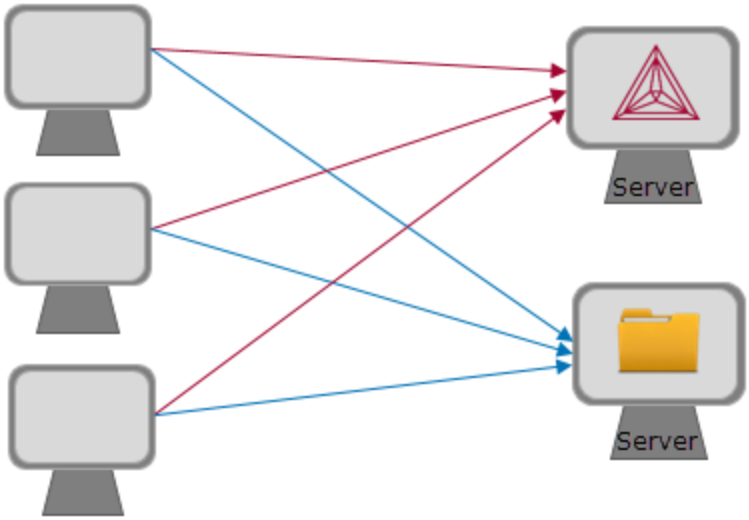


The Thermo-Calc software and the license management program are installed on the same server where the license file is also copied. A thin client installation allows all computers (the clients) in the server network to access both the software and the licensing on the same computer server.

To get started, go to "First Steps of Installation" on page 20 and then "Network Client Installations" on page 44.

Distributed Network Installations

The distributed network installation is used with a Network License (NWL) and is available for Windows and Linux operating systems.

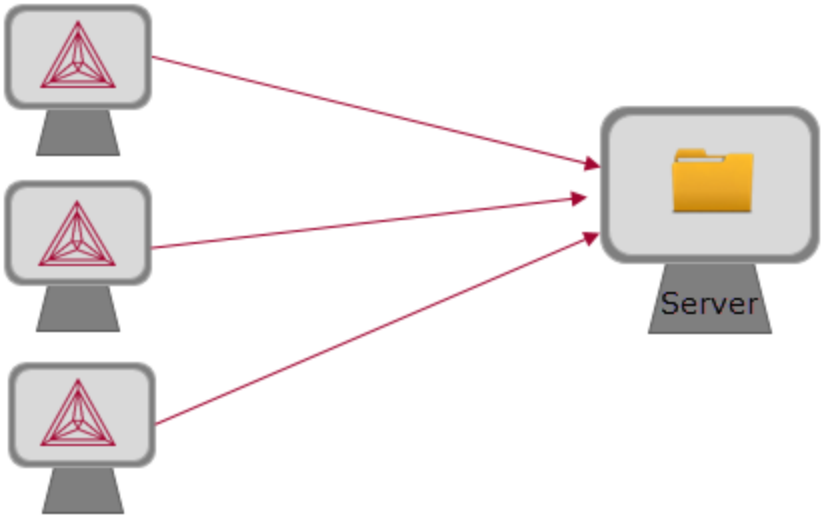


The Thermo-Calc software is installed on one computer server in a network and the licensing software is installed on a different computer server where the license file is also copied. A thin client installation allows all computers (the clients) in the server network to access both the software and the licensing on the two computer servers.

To get started, go to "First Steps of Installation" on page 20 and then "Network Client Installations" on page 44.

License Installations on a Server Network

When a license file is installed on a server network, it is used with a Network License (NWL). It is available for all platforms. However, for macOS the server containing the licensing software must be set up on Windows or Linux.



The licensing software is installed on a computer server where the license file is also copied. The Thermo-Calc software is installed on every computer in the network that needs it.

To get started, go to "First Steps of Installation" on page 20 and then "Network Client Installations" on page 44.

Preparing for Installation

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First Steps of Installation

This section reviews some of the things you need to do before installing the Thermo-Calc software.

- Learn about the different default directories where the software and license files are installed.
- For network installations, collect subnet information.
- Make sure the person installing the software has administrator rights for Windows and macOS.
- For macOS, install XQuartz and make sure the security preferences are set correctly.
- For a Linux Cent OS 7 installation, also install gtk2 before you run the installation script.

```
yum install gtk2
```

Should I get my license file before or after software installation? The Thermo-Calc license file itself is not required during the installation process. However, it is required to make calculations in Thermo-Calc. The license file has details about your computer(s) that in some cases cannot be determined accurately until *after* installation (especially for a network installation). For most users it is recommended you request the file before you start installing.

Installation Default Directories and the License File

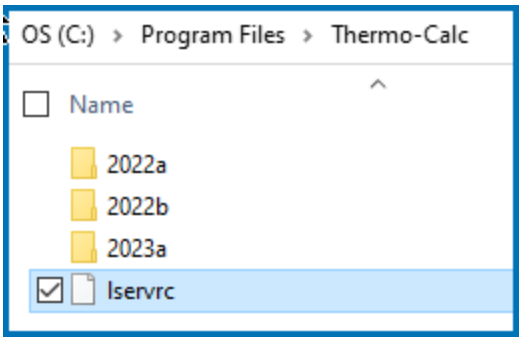
The default directories where the software and its components are installed, including where the license file is stored, vary by platform and user type.

If you want to select specific components to install or if you want to install the software in a non-default installation directory, then do a **custom** installation (Windows and Linux only). In the table, *<user>* stands for the user name and *<version>* for the version of Thermo-Calc, for example 2024a.

License File Installation Location for All Operating Systems

The Thermo-Calc license file is installed outside of the installation program folder. If you have more than one version of Thermo-Calc installed then there are additional folders by version number with only one license file.

For macOS the license file is put in `/Users/Shared/Thermo-Calc`. The example below is for a Standalone Windows installation.



See the following for more information:

- "Installation Default Directory: Windows" on the next page
- "Installation Default Directory: macOS" on page 23
- "Installation Default Directory: Linux" on page 24
- "Installation Default Directory: Databases, Database Checker, and TDB Editor" on page 25
- "Installation Default Directory: Materials" on page 27
- "Installation Default Directory: Process Metallurgy Materials" on page 29
- "Installation Default Directory: Custom Property Models" on page 30
- "Installation Default Directory: TC-Python" on page 94
- "Installation Default Directory: TC-Toolbox and the Examples" on page 104

Installation Default Directory: Windows

Administrative rights are required to install and uninstall Thermo-Calc.

Windows User Type	*Default Directory*

Administrator	The Thermo-Calc program is installed here:
	`Program Files\Thermo-Calc\<version>`
	The default folders where documents, materials files, examples, and other folders that sometimes require additional licenses are installed under **Public Documents** for ALL USERS.
	For a local user these files are copied to the user's **Documents** folder where this local copy is associated to the user login. The **Public Documents** folder always contains the original set of contents as per the installation.
	`C:\Users\Public\Public Documents\Thermo-Calc\<version>`
	After installing Thermo-Calc, and when you first open the program, the set of folders is copied from the source Public Documents location into a user Documents folder:
	`C:\Users\<user>\Documents\Thermo-Calc\<version>`
	It is recommended that you work with the files that are copied to the *user* folder.
	In some cases when an interim software update is installed there is also a backup folder created in this folder. For details, see "Updating the Software for Interim Releases" on page 145.

Server network	License software installations on a server network (the License Manager software) `C:\Program Files (x86)\Common Files\SafeNet Sentinel\Sentinel RMS License Manager\WinNT\`

Installation Default Directory: macOS

macOS User Type	*Default Directory*

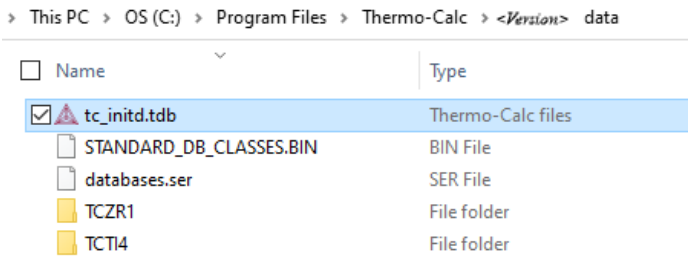
Administrator (user name and password required)	The Thermo-Calc program is installed in the **Applications** folder:
	`Thermo-Calc-<version>.app and uninstall-Thermo-Calc-<version>.app`
	The documents, materials, examples, and other folders that sometimes require additional licenses are installed here:
	`/Users/Shared/Thermo-Calc/<version>`
	In some cases when an interim software update is installed there is also a backup folder created in this folder. For details, see "Updating the Software for Interim Releases" on page 145.
	To go to this folder, in Finder, from the **Go** main menu select **Go to folder**. Enter the above file path and click **Go**.

Installation Default Directory: Linux

Linux User Type	*Default Directory*
Non root user	The Thermo-Calc program including the documents, materials, examples, and other folders that sometimes require additional licenses are installed here: `/home/<user>/Thermo-Calc/<version>`
Root user	The Thermo-Calc program including the documents, materials, examples, and other folders that sometimes require additional licenses are installed here: `/opt/Thermo-Calc/<version>` In some cases when an interim software update is installed there is also a backup folder created in this folder. For details, see "Updating the Software for Interim Releases" on page 145.
License software installations on a server network (the License Server software)	If you are doing a network installation then these files are available as a tar-file from the Thermo-Calc website. Contact Support for more information. In the downloaded tar-file, there is a **restart_lserv** script file, which can be used as a template for creating a script that starts up the License Server.

Installation Default Directory: Databases, Database Checker, and TDB Editor

The standard Thermo-Calc databases and the database initialization file `tc_initd.tdb` are located in a subfolder to the Thermo-Calc installation. For example, in a Windows Standalone installation, you can find these in a folder called **data** where the file path is *C:\Program Files\Thermo-Calc\<version>\data*.



Database Checker

The Thermo-Calc software package includes a program to check that the syntax of unencrypted database files is correct. The program applies the syntax rules set out in the *Database Manager User Guide* and reports errors and issues warnings. This program is intended for advanced users who develop and manage databases.

Thermo-Calc accepts some deviations from these syntax rules. Although warnings can be ignored, errors must be corrected. Reported errors must be corrected in the TDB file before the database can be loaded by the application. Sometimes the warnings can also reveal the need for additional corrections as shown in the example below.

For example, a warning is generated if a phase name is detected that is also an abbreviation of another phase name in the database. Although allowed, it is not recommended as this can (in some cases) lead to unexpected results because abbreviations are also used when entering commands in the Console and included in macro files. The following shows why in this case an abbreviation is not recommended.

Imagine that a macro file uses the abbreviation `ABC` to refer to a phase in a database that is named `ABCDE`. As long as there is no other phase in the database with the same exact name or initial abbreviation, it works. But if a new phase is added to the database and is actually named `ABC` then the macro can in error refer to the wrong phase. The macro still runs but now refers

to the phase `ABC` instead of `ABCDE` because `ABC` is an exact match, *which takes precedence over abbreviations*. The Database Checker displays a warning because this situation can only occur when one phase name is an abbreviation of another.

With respect to using this tool, the executable `DatabaseChecker` file is found in the Thermo-Calc home directory.

The program can also be launched by selecting **Tools →** **Database Checker** from the main menu in Thermo-Calc.

TDB Editor

The TDB Editor is an editing tool for those who develop their own custom databases for use with Thermo-Calc or other applications. The tool speeds up the database editing process by providing immediate feedback through syntax coloring, syntax checking, and by allowing formatting and easy navigation to items of interest in the TDB file.

During installation, the `tdb-language-support.vsix` file is installed in the Thermo-Calc home directory.

In order to access the most-up-to-date version of the VSCode plugin, it must be updated every time a *new* version of Thermo-Calc is installed.

For information about installing the TDB Editor, which is separate from the main installation and can be done later, see the *Database Manager's User Guide* contained in the *Thermo-Calc Documentation Set* or press F1 in Thermo-Calc and search the help.

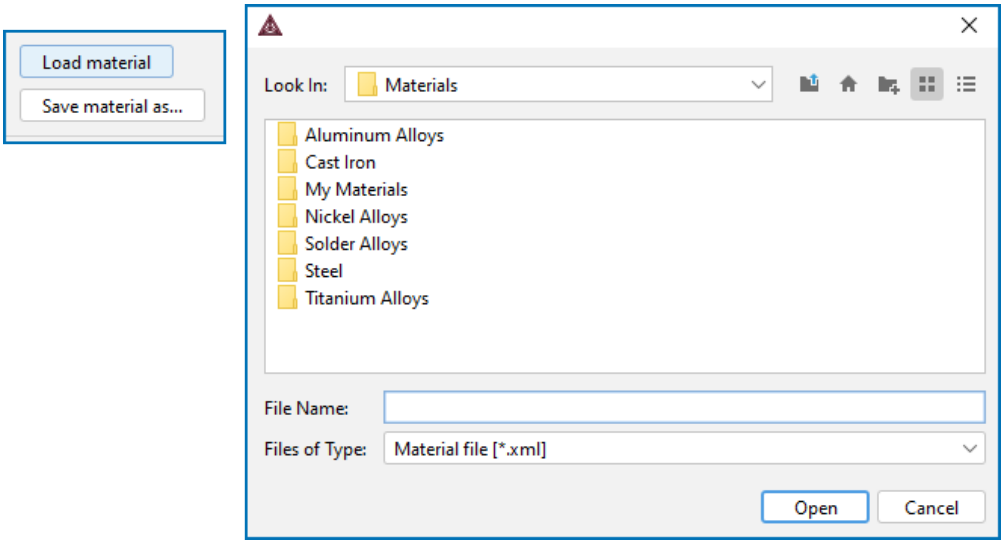
Installation Default Directory: Materials

When you are working with the System Definer or Material to Material Calculator you can open the default **Materials** folder included with your installation.

At the bottom of the window under **Material**, click **Load material** to navigate to a material file.

There is a separate folder for materials saved using the Process Metallurgy Calculator. See "Installation Default Directory: Process Metallurgy Materials" on page 29.

For the Additive Manufacturing (AM) Module, the Material Properties library is managed by the software.



The default directory where these material files are stored is based on operating system:

Operating System	*Materials Installation Directory*
Windows	`C:\Users\<user>\Documents\Thermo-Calc\2024a\Materials`
Linux	On Linux all user files are installed where the program is installed. If installed as root the default is: `/opt/Thermo-Calc/2024a/Materials`

Operating System	*Materials Installation Directory*
macOS	`/Users/Shared/Thermo-Calc/2024a/Materials`

Installation Default Directory: Process Metallurgy Materials

With the Process Metallurgy Calculator you can save materials to work with again. This is the default folder where these are stored based on your operating system:

Operating System	*Process Metallurgy Materials Installation Directory*
Windows	`C:\Users\<user>\Documents\Thermo-Calc\2024a\ProcessMetallurgyMaterials`
Linux	On Linux all user files are installed where the program is installed. If installed as root the default is: `/opt/Thermo-Calc/2024a/ProcessMetallurgyMaterials`
macOS	`/Users/Shared/Thermo-Calc/2024a/ProcessMetallurgyMaterials`

Installation Default Directory: Custom Property Models

All Property Models (whether these are predefined or custom models) must be located in a subdirectory of the Property Model directory. You can go to the **Options** window then on the **General** tab the **Model directory** field displays the default directory.

To open the **Options** window:

- Windows: Select **Tools** → **Options**.
- Mac: Select **Thermo-Calc** *<version>* → **Preferences** or **Settings** or press <⌘> on the keyboard.

Predefined models included with the Property Model Calculator are installed in the locations below based on your operating system. If you create your own models using TC-Python, this is the default directory where these are saved.

Operating System	*Property Model Installation Directory*
Windows	`C:\Program Files/Thermo-Calc/2024a\PropertyModels`

Linux	On Linux all user files are installed where the program is installed. If installed as root the default is:
	`/opt/Thermo-Calc/2024a/PropertyModels`
	or:
	`/home/<username>/Thermo-Calc/2024a/PropertyModels`

macOS	`/Applications/Thermo-Calc-2024a.app/Contents/Resources/PropertyModels`

Subnet Information for Network Licenses

This is related to "Full Network Client Installations" on page 45.

For network licenses, the subnet information is also required. Ask your network administrator for the *network address for the subnet*. Additional requirements are included elsewhere for network installations.

- Subnets should be in the format aaa.bbb.ccc*** (for example: 192.168.29.0/24 or 192.168.29.*
- When installing on Sentinel RMS License Server version 9.7, a maximum of seven (7) subnets are permitted.

An alternative way to get this information is to run the command:

- *Windows:* `ipconfig /all`
- *macOS/Linux*: `ip a`

macOS Installation Notes

How to Restart After an Installation

In some types of installations (e.g. a network installation), you may have to restart your Mac to use Thermo-Calc for the first time.

How to Install XQuartz

The XQuartz open-source X Windows system is required to run Thermo-Calc on macOS but it is not required to install Thermo-Calc. Before installing Thermo-Calc, you may also need to ensure that the computer security permissions are set.

1. In a web browser go to https://www.macupdate.com or to download it directly from XQuartz, https://www.xquartz.org/.
2. In the **Search Mac Apps** field, enter *XQuartz*.
3. Click the **XQuartz** search result. For example, based on the recent version, the name is XQuartz-2.7.11.dmg.
4. Click **Download**.
5. Double-click the **XQuartz.pkg** file. Follow the instructions.
6. Click **OK** when the message about logging out displays and click **Close** when the installation is successful.

How to Enable the Security Settings

1. From the Apple main menu, select **System Preferences**.
2. Click **Security and Privacy**.
3. Click **General**. At the bottom of the **Security & Privacy** window, click the lock icon to make changes. Enter the administrator password as required.
4. If you have already tried to launch the Thermo-Calc installer, you can click **Open Anyway** to proceed. Otherwise, under **Allow apps downloaded from:** click **Anywhere** and then **Allow from Anywhere**.
5. Continue with the applicable installation type (standalone or network).

Remember to reset your security after installing Thermo-Calc.

Linux Installation Notes

The following are details you need to know regarding your Linux installation as well as how to open Thermo-Calc.

openSUSE Administration (sudo) Users

Note the following if you are a sudo user (administrator) in openSUSE installing Thermo-Calc using this command:

```
sudo ./Thermo-Calc-linux-<full-version-number>.run
```

When this command is used, you will do a text-based installation instead of having a graphical interface to guide you. The information is the same, just without the user interface.

For example, the *<full-version-number>* is not just 2024a, it is what is found in the **Help → About** window in Thermo-Calc and it changes every release. You can find the current full version number listed on our website.

Opening Thermo-Calc in Linux

To open Thermo-Calc double-click the **Thermo-Calc-2024a** application or from the Thermo-Calc installation directory enter `$ ./Thermo-Calc-2024a.sh` in the terminal.

Standalone Installations

You can either do a full or a custom standalone installation. The license type is called a Single-User Node-Locked License (SUNLL).

In this section:

Full Standalone Installations 36

Custom Standalone Installations 40

Add New Components to an Existing Installation 43

Full Standalone Installations

The following describes a full standalone installation. These steps assume you have completed the section "First Steps of Installation" on page 20.

Step 1. Request your License File from Thermo-Calc Software

Updates to Thermo-Calc: Customers who subscribe to the annual maintenance plan can skip this step if you have received your license file in an email from Thermo-Calc Software AB. Save the license file to your computer to use during software installation. The license file name must be the same as the existing file name to ensure there are no errors during the update.

Follow the instructions for your operating system in the section "Request a License File from Thermo-Calc Software" on page 67.

Step 2. Download your Thermo-Calc Installation Software

- *Web downloads*: For web links sent in an email from Thermo-Calc Software, go to the URL and log in with the information provided to download the software.
- *DVD installations*: Insert the DVD and follow the instructions.

Step 3. Run the Applicable Installation File for your Operating System

1. Navigate to the folder for your operating system and click the link to download the software package, then go to the folder where you downloaded it.

Administrative rights are required for Windows and macOS installations.

Windows

Double-click the **.exe** file to launch the **Setup** program.

macOS

Double-click the downloaded file then follow the instructions.

For macOS and when you first run the installer, you may see a message that *Thermo-Calc-osx-<version> can't be opened because Apple cannot check it for malicious software*. If this happens, select **Show in Finder**. Then, in the opened **Finder** window right-click the downloaded file `Thermo-Calc-osx-<version>` and select **Open**.

Linux

To start the Setup Wizard in a Terminal window, enter these commands in the directory where the installation file is saved:

```
> chmod +x linux-installation-x64-2024a.run
> ./linux-installation-x64-2024a.run
```

If you are an openSUSE root user, see "Linux Installation Notes" on page 34 for some information about your installation.

2. On the **Setup** window click **Next**.
3. On the **License Agreement** window click the button to accept the license agreement then click **Next**.

Step 4. Select the Installation Type and Upload the License File

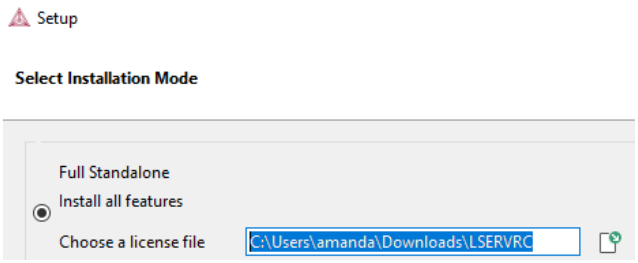
"About the Thermo-Calc Components Being Installed" on page 8

1. In the **Select Installation Mode** window click **Full Standalone: Install all features**.

If you want to exclude a component (e.g. an SDK), then use the **Custom** option. See "Custom Standalone Installations" on page 40. For TC-Toolbox for MATLAB®, also see "Installing TC-Toolbox with the Custom Option" on page 107.

TC-Python is installed when the **Full Standalone** or **Full Network Client** option is chosen, but there are additional steps required as described separately for this SDK.

2. For a **Full Standalone** installation, in the **Choose a license file** field either enter the file path or click the file button to navigate to where you saved the license file emailed to you from Thermo-Calc Software. The license file is called **lservrc**.



To prevent errors, leave this field blank if you did not get a license file yet.

TC-Python is installed for all users even without a license. The **Install TC-Python** window is a reminder that additional installation procedures are required after Thermo-Calc is installed.

Step 5. Install the Software and Start Using Thermo-Calc

1. In the **Ready to Install** window click **Next**.

   See the separate instructions for TC-Toolbox for MATLAB®.

2. Click **Finish** and start using Thermo-Calc. For Linux users, log out and log back in to finish the installation.

macOS installations and if you have previous Thermo-Calc installations: When you launch Thermo-Calc with the new or updated version, the splash screen hides the **Import User Settings** dialog box. In order to proceed you need to click the splash screen and then click **Yes** or **No** in the dialog box.

If you did not get your license file see "Request a License File from Thermo-Calc Software" on page 67.

Custom Standalone Installations

"About the Thermo-Calc Components Being Installed" on page 8

Use the **Custom** option to have more control over what component features to include or exclude, for example, to exclude an SDK.

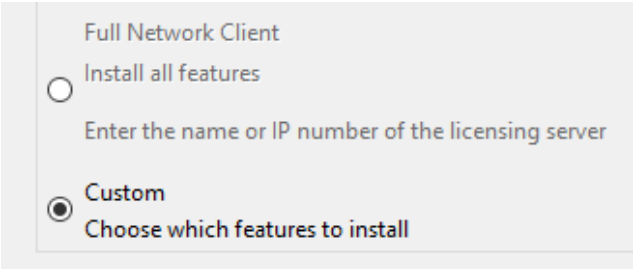
This topic describes how to do a custom installation on a standalone computer for either a Windows or Linux operating system. These steps assume you have completed these sections:

- "First Steps of Installation" on page 20
- Steps 1 to 3 of a "Full Standalone Installations" on page 36 where you request your license file, download the software and then have started to set up the program up to the **Select Installation Mode** window.

Step 1. Select the Installation Mode and the Components to Include or Exclude

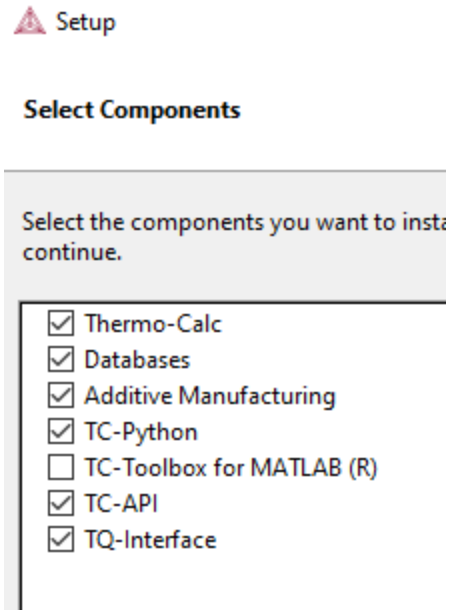
"About the Thermo-Calc Components Being Installed" on page 8

1. In the **Select installation mode** window click **Custom** (the option appears greyed out, but it is available to select). Click **Next**.



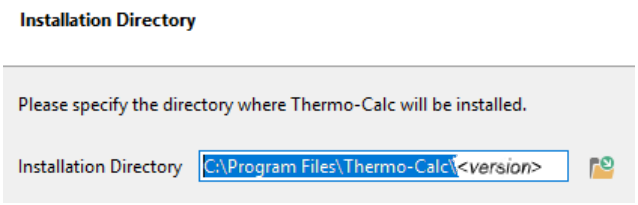
2. On the **Specify Configuration** window the **Create Shortcut on Desktop** checkbox is selected by default. Click **Next**.

3. In the **Select Components** window, click to select or deselect the checkboxes as needed. Click **Next**.



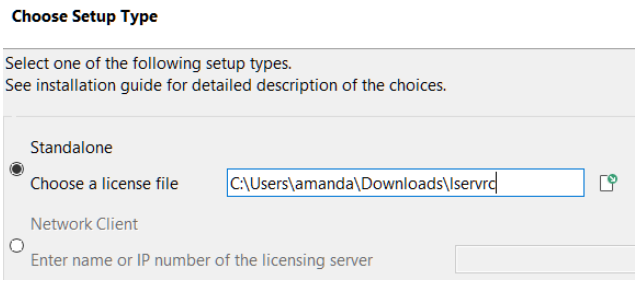
Step 2. Set the Installation Directory and Choose the License File

1. In the **Installation Directory** window, either accept the default path or enter a path to where you want to install the software (see "Installation Default Directories and the License File " on page 21). Click the file button to **Browse for Folder** and navigate to another directory.



> To prevent errors, leave this field blank if you do not have a license file yet.

2. In the **Choose Setup Type** window, click **Standalone**.



3. In the **Choose a license file** field enter the path to your license file (called **lservrc**) or click the file button to navigate to a location on the computer and open the file.
4. TC-Python is installed for all users even if you do not have a license. The **Install TC-Python** window is a reminder that additional installation procedures are required after Thermo-Calc is installed. See the *TC-Python Installation Guide* for details.

Step 3. Install the Software and Start Using Thermo-Calc

1. In the **Ready to Install** window click **Next**.

   See the separate instructions for TC-Toolbox for MATLAB®.

2. Click **Finish** and start using Thermo-Calc. For Linux users, log out and log back in to finish the installation.

macOS installations and if you have previous Thermo-Calc installations: When you launch Thermo-Calc with the new or updated version, the splash screen hides the **Import User Settings** dialog box. In order to proceed you need to click the splash screen and then click **Yes** or **No** in the dialog box.

If you did not get your license file see "Request a License File from Thermo-Calc Software" on page 67.

Add New Components to an Existing Installation

If you want to add new components to an existing Thermo-Calc installation (for example, you purchased a license for TC-Toolbox for MATLAB®), run the installation file again as in Step 3 of "Full Standalone Installations" on page 36.

1. For all OS you need to have administrative level rights. For example in Windows, when you double-click the executable Thermo-Calc installation **.exe** file to launch the **Setup** program.

   Linux OS: If Thermo-Calc was not installed by root the first time, then administrative rights are not required.

2. Click **Next**. Click to accept the license agreement.

3. Select the additional component(s) to install.

4. Click **Next** to start the installation, which adds the new component(s).

Use the **Uninstall** program to *remove* components. See "Uninstalling Thermo-Calc" on page 151 or "Uninstalling TC-Toolbox for MATLAB®" on page 114.

Network Client Installations

This installation type is available for all operating systems, however for macOS the License Server must be run on a Windows or Linux computer. It is applicable to the consolidated and distributed network types of installations as well as for the licensing installation on a server network.

"About the Thermo-Calc Components Being Installed" on page 8

In this section:

Full Network Client Installations 45
Windows: About Installing the License Manager 47
Windows: Installing the Sentinel RMS License Manager 49
Linux: About Installing the License Server 52
Linux: Installing the Sentinel RMS License Server 55
Thin Client Installations 58
Custom Network Client Installations 61
Unattended Network Client Installations 64

Full Network Client Installations

The following outlines how to do a full network client installation.

Step 1. Install the Sentinel RMS Management License Software

Follow the instructions for your operating system:

Windows

- "Windows: About Installing the License Manager" on page 47
- "Windows: Installing the Sentinel RMS License Manager" on page 49

Linux

- "Linux: About Installing the License Server" on page 52
- "Linux: Installing the Sentinel RMS License Server" on page 55

Step 2. Complete Steps 1 to 3 of a Full Standalone Installation

These steps assume you have completed the instructions for "Full Standalone Installations" on page 36 to download and run the software up to the **Select Installation Mode** window. It is up to you whether you get the computer information for the license files before or after installing the software.

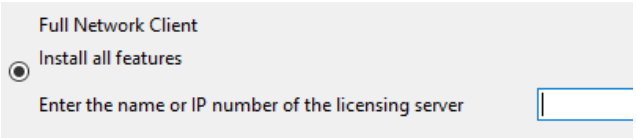
Step 3. Choose the Installation Type and Enter the Computer Server Details

"About the Thermo-Calc Components Being Installed" on page 8

1. In the **Select Installation Mode** window click **Full Network Client** to **Install all features** (the option appears greyed out, but it is available to select).

> If you want to exclude a component (perhaps one of the SDKs), then use the **Custom** option and see "Custom Network Client Installations" on page 61.

2. In the field, enter the name or IP number of the computer where the licensing software is installed. Click **Next**.



3. TC-Python is installed for all users even if you do not have a license. The **Install TC-Python** window is a reminder that additional installation procedures are required after Thermo-Calc is installed. See the *TC-Python Installation Guide* for details.
4. In the **Ready to Install** window click **Next**.
5. When the **Completing the Thermo-Calc Setup Wizard** window opens, click **Finish**. For *Linux* users, log out and log back in to start using Thermo-Calc.

> macOS installations and if you have previous Thermo-Calc installations: When you launch Thermo-Calc with the new or updated version, the splash screen hides the **Import User Settings** dialog box. In order to proceed you need to click the splash screen and then click **Yes** or **No** in the dialog box.

If you did not get your Thermo-Calc license file see "Request a License File from Thermo-Calc Software" on page 67.

Windows: About Installing the License Manager

If you have previously installed an older version of Sentinel RMS License Manager, you must first uninstall the old version then **reboot** the server before starting with a new installation.

The Sentinel RMS License Manager service supplies the client computers in your network with license tokens when it runs Thermo-Calc software. The Sentinel RMS License Manager software is installed on a computer that acts as a license server in your network. This is related to "Full Network Client Installations" on page 45 and administrative rights are required for all steps.

Remember to collect subnet information before beginning. See "Subnet Information for Network Licenses" on page 31.

A network license can only be used on one specific computer that hosts the License Manager. The network license determines which client computers receive license tokens using the IP addresses and IP ranges.

Supported Windows Versions

These Windows operating systems are supported for the installation of Sentinel RMS License Manager. When ready, go to "Windows: Installing the Sentinel RMS License Manager" on page 49.

For macOS, the Sentinel RMS License software is installed on a Windows or Linux computer server where the Thermo-Calc license file must also be located.

Windows 32-bit Operating Systems

- Windows 7
- Windows 8.1
- Windows 10 v1909
- Windows Server 2008

Windows 64-bit Operating Systems

- Windows 7
- Windows 8.1
- Windows 10 v1909
- Windows Server 2008
- Windows Server 2008 R2
- Windows Server 2012
- Windows Server 2012 R2
- Windows Server 2016
- Windows Server 2019

Windows: Installing the Sentinel RMS License Manager

First review "Windows: About Installing the License Manager" on page 47. Then if this is a new installation of the Sentinel RMS License Manager, start with Step 2.

Step 1. Uninstall Any Older Versions of Sentinel RMS License Manager

1. With Administrator rights, log onto the server that hosts the Sentinel RMS License Manager.
2. Save a copy of the license file LSERVRC found in the default directory—the license file can be saved as a text file: `C:\Program Files (x86)\Common Files\SafeNetSentinel\Sentinel RMS License Manager\WinNT\`.

   After saving the existing license file and uninstalling the old version of Sentinel RMS, ensure you delete the old license file (LSERVRC) in the above folder. This license is not required anymore.

3. Reboot the computer hosting the Sentinel RMS License Manager.
4. Continue with the installation and use the preselected default settings.

Step 2. Download and Install Thermo-Calc

This step is not required to complete the server installation, however some administrators may want to do it at this point.

1. Download Thermo-Calc.

   - *Web downloads*: For web links sent in an email from Thermo-Calc Software, go to the URL and log in with the information provided to download the software.
   - *DVD installations*: Insert the DVD and follow the instructions.

2. Install Thermo-Calc. For testing purposes, and in order to confirm the installation is working correctly, install the Thermo-Calc software on the same computer as the

Sentinel RMS License Manager. If required after testing, Thermo-Calc can always be uninstalled.

Step 3. Install the Sentinel RMS License Manager Software

1. From the download, extract the files `license_server_win_9.7.zip` and `LS_tools_win.zip`.
2. Right-click `setup.exe` and select **Run as Administrator** from the menu.

Step 4. Choose the Installation Directory

1. Click to accept the license agreement.
2. Enter your **User Name** and **Organization** and select to install the License Manager for **All users**.
3. In the **Destination Folder** window click **Next** to accept the suggested destination directory or **Change** to select another directory.

Step 5. Choose the Setup Type and Install the Software

1. In the **Setup Type** window, select **Complete**. Click **Next**.
2. Select the **Unblock the system firewall for the Sentinel RMS License Manager** checkbox.

Selecting the checkbox is required to run Thermo-Calc.

3. Click **Next** and then **Install**.
4. Click **Finish** to exit the InstallShield Wizard.

Step 6. Install the Thermo-Calc Network License Using WIAdmin

Only the WlAdmin tool can be used to update the network license used by the License Manager.

1. Save the source file containing the license code. The source file can be kept as a .txt file
2. Go to the previously saved file `LS_tools_win.zip`.
3. Right-click the file `WlmAdmin.exe` and select **Run as Administrator** from the menu.
4. If the license server is not found under subnet servers, go to **Edit → Defined Server List**.
5. Enter the host name or IP address of the license server.
6. Click **Add** and then **OK**.
7. Click **View → Refresh All** to update the list.
8. In the left main window right-click the name of a License Manager.
9. From the menu select **Add Feature → From a File → To Server and its File**.
10. To add the license from a file, select **From a File**. This permanently adds the license code to the License Manager license file as well as to the License Manager memory.
11. In the windows that open, browse to the source file that contains the license code and click **Open**.

Step 7. Install Additional Tool Options

"Sentinel RMS License 9.7 Tools" on page 127

Linux: About Installing the License Server

The Sentinel RMS License Server service supplies the client computers in your network with license tokens when it runs Thermo-Calc software. The Sentinel RMS License Server software is installed on a computer that acts as a license server in your network. This is related to "Full Network Client Installations" on page 45.

Preparing for Installation

Read and be aware of the following before you begin the section "Linux: Installing the Sentinel RMS License Server" on page 55.

Remember to collect subnet information before beginning. See "Subnet Information for Network Licenses" on page 31.

Uninstall Older Versions of the License Server

- Older versions of the License Server must be stopped by with `lsrvdown` before running the new installation. This is Step 1 in "Linux: Installing the Sentinel RMS License Server" on page 55.
- If you have a license server: Upgrade your license server if the new one is a higher version than the present one. Clients work with newer license servers (managers) but not necessarily with ones older than the client.

Requires Root Access or sudoers List

Root access to your computer is required or you need to be on the `sudoers` list.

Linux 32-bit Installations on a 64-bit OS

To run a license server 32-bit on a Linux 64-bit OS, 32-bit library support is needed.

Thermo-Calc License File

> The name of the **license file** must be in lower case letters (**lservrc**) because Linux commands and operations are case-sensitive.

- You need a valid **lservrc** network license file supplied by Thermo-Calc Software ("Requesting the License File for Windows or Linux" on page 69) as well as the actual License Server—a file (program) called **lserv**.
- The Thermo-Calc license file needs to be readable and writable by the license server (license manager).

Differences Between 32- and 64-bit Scripts

Sentinel RMS License Server version 9.7 supports both 32- and 64-bit. However, when writing scripts be aware of script naming and do not mix the scripts.

- All 32-bit scripts are named *<script_name>*, for example `restart_lserv`
- All 64-bit scripts are named *<script_name>64*, for example, `restart_lserv64`

> It is not possible to use Linux 32-bit scripts/tools to manage license server 64-bit and vice versa, you cannot use Linux 64-bit scripts/tools to manage license server 32-bit

openSUSE Administration (sudo) Users

Note the following if you are a sudo user (administrator) in openSUSE installing Thermo-Calc using this command:

```
sudo ./Thermo-Calc-linux-<full-version-number>.run
```

When this command is used, you will do a text-based installation instead of having a graphical interface to guide you. The information is the same, just without the user interface.

For example, the *<full-version-number>* is not just 2024a, it is what is found in the **Help → About** window in Thermo-Calc and it changes every release. You can find the current full version number listed on our website.

Supported Linux Operating Systems and Versions

For macOS, the Sentinel RMS License software is installed on a Windows or Linux computer server where the Thermo-Calc license file must also be located.

Both Linux 32-bit and 64-bit operating systems are supported for the installation of Sentinel RMS License Server.

- Red Hat Enterprise Linux (RHEL) 7.x
- Red Hat Enterprise Linux (RHEL) 8.x
- SUSE Linux Enterprise Server (SLES)12.x
- SUSE Linux Enterprise Server (SLES) 15.x
- Debian Linux 9.x
- Debian Linux 10.x
- Ubuntu Linux 16.x (LTS)
- Ubuntu Linux 18.x (LTS)
- Ubuntu Linux 20.x (LTS)
- OpenSUSE Leap 42.x
- OpenSUSE Leap 15.x

Linux: Installing the Sentinel RMS License Server

First review "Linux: About Installing the License Server" on page 52. Then if this is a new installation of the Sentinel RMS License Server, start with Step 2.

Sentinel RMS License Server version 9.7 supports both 32- and 64-bit. However, when writing scripts be aware of script naming and do not mix the scripts.

- All 32-bit scripts are named *<script_name>*, for example `restart_lserv`
- All 64-bit scripts are named *<script_name>64*, for example, `restart_lserv64`

It is not possible to use Linux 32-bit scripts/tools to manage license server 64-bit and vice versa, you cannot use Linux 64-bit scripts/tools to manage license server 32-bit

Step 1. Stop Older Versions of the Sentinel RMS License Server

1. To stop an old version of the License Server already running, go to the directory where the old file is found, and enter the commands:

   - 32-bit license server

     ```
     >chmod +x <lsrvdown>
     >./lsrvdown <host_name>
     ```

   - 64-bit license server

     ```
     >chmod +x <lsrvdown64>
     >./lsrvdown64 <host_name>
     ```

2. Edit existing scripts that start the older version of the License Server so that they start the newer version instead.

   For more information about the **lservdown utility**, go to https://docs.sentinel.thalesgroup.com/softwareandservices/rms/

Step 2. Write a Script to Start the License Server

The following is an excerpt from the template script for starting the License Server found in the restart_lserv file.

Replace the paths for LICENSE_SERVER_DIR, LICENSE_FILE_DIR and LOG_DIR to match your system. Save it as a script:

```
# set the directory where the executables are located
LICENSE_SERVER_DIR=/usr/local/Thermo-Calc/2024a/Licensing-files
# set the directory of the license file lservrc
LICENSE_FILE_DIR=/usr/local/Thermo-Calc/2024a/Licensing-files
# set the directory where you wish to save the log-files
LOG_DIR=/tmp
# stop the running server
# (omit this line if calling this script at startup)
$LICENSE_SERVER_DIR/lsrvdown $HOSTNAME
# start the license server
$LICENSE_SERVER_DIR/lserv -s $LICENSE_FILE_DIR/lservrc -l $LOG_DIR/lserv_use.log -f
$LOG_DIR/lserv_err.log
```

Step 3. Confirm the HOSTNAME variable and open the UDP port

The hostname should always correspond to the DNS record verify this by doing the following.

1. Before starting the License Server make sure that the value of the $HOSTNAME variable is correct. This value can be shown by typing the `> nslookup $HOSTNAME` command in the terminal window:

   The value should be the same IP address that is shown when you use the ifconfig command.

2. Open the UDP port 5093 in your firewall. In case you have installed SELinux you might also need to disable it by setting `SELINUX=permissive` in the `/etc/selinux/config` file.

Step 4. Start the License Server

1. To start the License Server, run the script created as root. Enter these commands in the console:

   ```
   > chmod +x <name_of_script_file>
   > ./<name_of_script_file>
   ```

2. If you want the License Server to start when you boot the system, put a copy of the start script under `/etc/rc.d/init.d` and start the script from the file `/etc/rc.d/rc.local`.

Step 5. Install Additional Tool Options

"Sentinel RMS License 9.7 Tools" on page 127

Thin Client Installations

This topic describes how you install a thin Thermo-Calc client to run Thermo-Calc from a file server. It is applicable to consolidated and distributed network installations for either a Windows or Linux operating system.

Installation Requirements

- You need access to the directory where Thermo-Calc is installed on the file server.
- You need the IP number or name of the computer where the license file is installed.
- For *Linux* you may have to disable your firewall. If SELinux is installed, try disabling it by setting `SELINUX=permissive` in `/etc/selinux/config`.

Windows Installations

The following details may also be of use to those installing in a Windows environment.

- Requests license server name or address and sets LSHOST as a user environment variable accordingly.
- Sets TC*<version>*_HOME (where *<version>* is the software version, e.g. TC22A_HOME) as a user environment variable to point to the location from which the thin client installer is running.

The default folders where documents, materials files, examples, and other folders that sometimes require additional licenses are installed under **Public Documents** for ALL USERS. See "Installation Default Directory: Windows" on page 22.

How to Install a Thin Client on Windows

1. Map the file server share as a network drive so that it gets an assigned drive letter (e.g. **E:**).

2. Open the **\Thermo-Calc***<version>*** directory on the file server, where *version* is the current version of the software.

3. Open the directory **Thin-client**. Double-click the `Thermo-Calc-client-windows-<version>.exe` file.

4. Click to accept the terms of the license agreement. Click **Next**.

5. Enter the name or IP number of where the license file and the License Manager software is installed. Click **Next**.

6. By default the **Create Shortcuts on Desktop** checkbox is selected. Click **Next**.

   The shortcuts to the program are added to the user's Windows roaming profile as well as placed on the user's Desktop (not the system's).

7. In the **Ready to Install** window, click **Next**.

8. Click **Finish**. To start Thermo-Calc find the program on the server and start it from there.

How to Install a Thin Client on Linux

1. Add the following to the `smb.conf` file, where *<user>* is your user name:

   ```
   [public]
   path=/home/<user>/Thermo_Calc/2024a
   public=yes
   writable=yes
   comment=smb share
   guest OK=yes
   force user=<user>
   ```

2. From the client, mount the directory on the server computer that contains the Thermo-Calc server installation (by default, this directory is called **/Thermo-Calc/2024a**). How the directory is mounted depends on the Linux distribution being used as well as how the Thermo-Calc directory on the server computer is shared. Use the Linux command `mount`. For example:

   ```
   > mkdir public
   > sudo mount -t cifs //ip_number_server_computer/public ./public -o
   user=<user>
   ```

3. Open the mounted directory on your computer, and run `client-install-linux-x64.run` or `client-install-linux-x86.run` in the **/Thin-client** directory.

4. If you do this from the terminal window, use the following to start the installation (assuming that the file server is a 64-bit computer):

   > ./client-install-linux-x64.run

5. Click **Forward** and click to select the license agreement. Click **Forward**.
6. Enter the name or IP number of the License Server. Click **Forward**.
7. If you are installing as a non-root user, by default, the **Create Shortcuts on Desktop** checkbox is selected. Click **Forward**.
8. In the **Ready to Install** window click Forward.
9. Click **Finish**. Log out and log back in to start using Thermo-Calc.

Custom Network Client Installations

This installation type is available for all operating systems, however for macOS the License Server must be run on a Windows or Linux computer.The requirements are the same as for a full client installation.

Step 1. Install the Licensing Software

Follow the instructions for your operating system:

- "Windows: About Installing the License Manager" on page 47, or
- "Linux: About Installing the License Server" on page 52

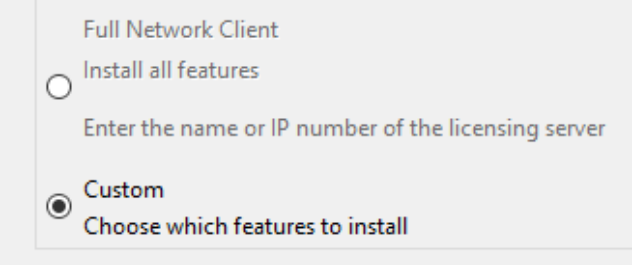
Step 2. Complete Steps 1 to 4 of a Full Standalone Installation

Follow the instructions for "Full Standalone Installations" on page 36 to download and run the software. It is up to you whether you get the computer information for the license files before or after installing the software.

Step 3. Select the Installation Mode and the Components to Include or Exclude

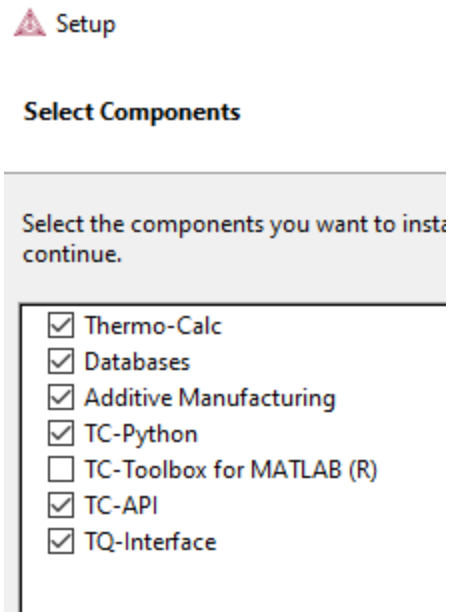
"About the Thermo-Calc Components Being Installed" on page 8

1. In the **Select installation mode** window click **Custom** (the option appears greyed out, but it is available to select). Click **Next**.



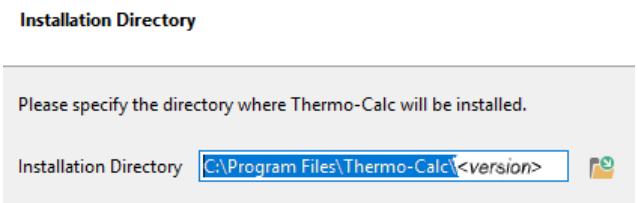
2. On the **Specify Configuration** window the **Create Shortcut on Desktop** checkbox is selected by default. Click **Next**.

3. In the **Select Components** window, click to select or deselect the checkboxes as needed. Click **Next**.



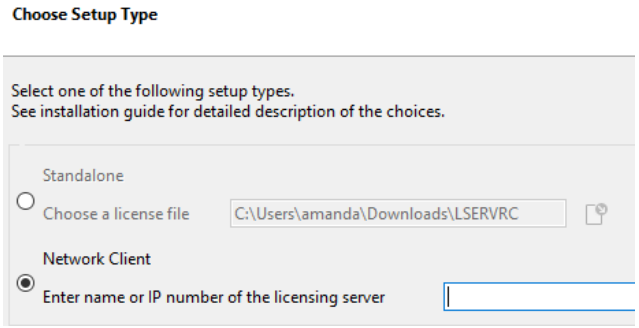
Step 4. Set the Installation Directory and the File Path to the License

1. In the **Installation Directory** window, either accept the default path or enter a path to where you want to install the software (see "Installation Default Directories and the License File " on page 21). Click the file button to **Browse for Folder** and navigate to another directory. Click **Next**.



> To prevent errors, leave this field blank if you do not have a license file yet.

2. In the **Choose Setup Type** window, click **Network Client** and enter the name or IP number of the computer where the licensing software is installed. Click **Next**.



> If you have selected to install **TC-Python** there is a reminder window that additional installation procedures are required after Thermo-Calc is installed. See the *TC-Python Installation Guide*.

Step 5. Install the Software and Start Using Thermo-Calc

1. In the **Ready to Install** window click **Next**.

   See the separate instructions for TC-Toolbox for MATLAB®.

2. Click **Finish** and start using Thermo-Calc. For Linux users, log out and log back in to finish the installation.

> macOS installations and if you have previous Thermo-Calc installations: When you launch Thermo-Calc with the new or updated version, the splash screen hides the **Import User Settings** dialog box. In order to proceed you need to click the splash screen and then click **Yes** or **No** in the dialog box.

If you did not get your license file see "Request a License File from Thermo-Calc Software" on page 67.

Unattended Network Client Installations

Terminology note: The use of the term *license server* (lower case letters) is applicable to the option files as described in this section. For the purposes of the step-by-step instructions it is not used to refer to the type of network installation that runs the licensing software.

Sometimes it is convenient to install Thermo-Calc network clients without providing user input after the installation is initiated (an unattended network client installation). This is available for Windows and Linux operating systems.

Make sure you know the name or IP number of the computer where the licensing software and the license file are to be installed.

Step 1. Create an Option File in a Text Editor to Enter the Options

The following is an example of an option file for a custom network client installation, where *<name/IP number>* is the name or IP number of the computer where the license file is installed:

```
installation_mode=custom
setup_type=client
enable-components=thermo,databases,tq,tcapi,toolbox,tcpython
icons=1
license_server=<name/IP number>
```

Below is a shorter example, specifying that a full Thermo-Calc network client should be installed:

```
installation_mode=full_client
license_server=<name/IP number>
```

Step 2. Go to the Directory Where the Installation File is Saved

Thermo-Calc can only be installed in unattended mode from the command line prompt.

Start the installation in unattended mode using the option file created with this command:

- For *Windows*: `<installationfile>.exe --mode unattended --optionfile <path\optionfile>`
- For *Linux*: `<installationfile>.run --mode unattended --optionfile <path/optionfile>`

To see other options when you start the Thermo-Calc installation program from the command line prompt, run this command:

- For *Windows*: `<installationfile>.exe --help`
- For *Linux*: `<installationfile>.run --help`

Request License Files

In this section:

Request a License File from Thermo-Calc Software 67

Getting License Information Using Thermo-Calc 68

Requesting the License File for Windows or Linux 69

Requesting the License File for macOS 71

Request a License File from Thermo-Calc Software

The following explains how to retrieve the necessary diagnostic and network adaptor information about your computer and then send an email to Thermo-Calc Software to get your license file(s) containing the license key(s).

To set up the correct licensing:

1. Make a note of your company or organization's *site number*. You can find the site number on an invoice or any correspondence from Thermo-Calc Software.
2. Retrieve your computer diagnostic and network adapter information.
3. Email Thermo-Calc Software with this information.
4. A Thermo-Calc Software representative emails you the license file. Save the license file **lservrc** (there is no file suffix) to a location where you can easily access it later.

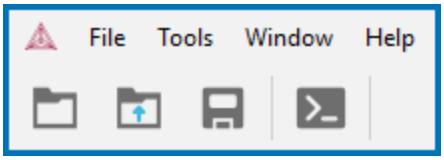
Thermo-Calc Support Center on our website

Getting License Information Using Thermo-Calc

If you have already installed Thermo-Calc, you can view the license information in the GUI. Select **Help →** **Show License Info**.

In Console Mode you can run the SYS module command DISPLAY_LICENSE_INFO.

1. Open Thermo-Calc.
2. Click **Switch to Console Mode**.



3. At the `SYS:` prompt, enter `DISPLAY_LICENSE_INFO`.You can output the information to a `FILE` or to the `SCREEN`.

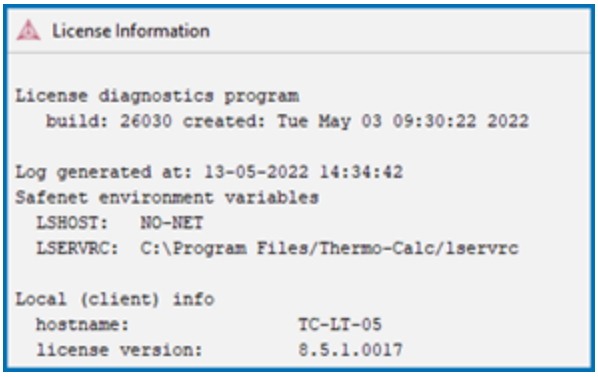
```
SYS:DISPLAY_LICENSE_INFO
OUTPUT TO SCREEN OR FILE /SCREEN/:SCREEN
```

4. For both options, the information is displayed on screen. Copy the section containing the **Ethernet** and **IP address**. You can save it to a text file or paste it directly into an email. If you choose `FILE` as the output, then you can attach the file to an email.

Requesting the License File for Windows or Linux

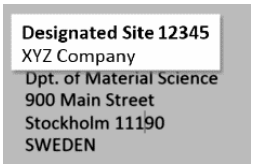
Upgrades to a new version of Thermo-Calc: Skip this section if you are upgrading to a new version of Thermo-Calc and (and you have a maintenance plan). Your license is sent to you in an email from Thermo-Calc Software AB. Save it to your computer to use during software installation.

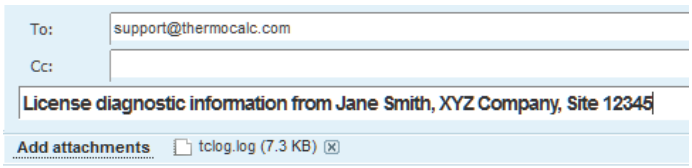
1. To access the computer information you need to provide to get a license, start Thermo-Calc and select **Help → Show License Info**.



2. Copy the information from the **License Information** window. A lot of information may be shown below the initial screen, so make sure you scroll down to the end when you select and copy the window's contents. (Alternatively, you can copy the same information from the console by using the SYS module command DISPLAY_LICENSE_ INFO.)
3. Send an email to support@thermocalc.com. Make sure to include the following in the subject line:

   License diagnostic information from <Name> where Name is replaced with your **name**, the **organization name** and the **Site Number**. *You can find the five-digit site number on an invoice or any correspondence from Thermo-Calc Software.*



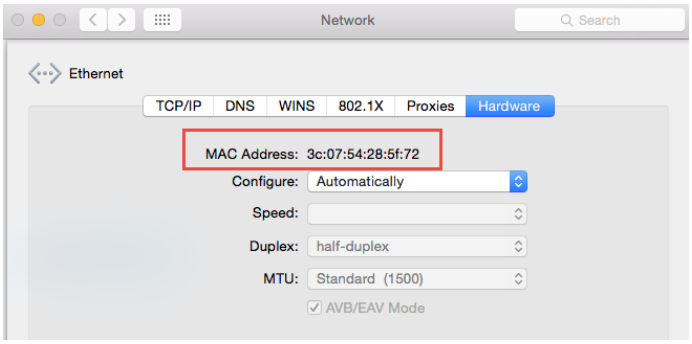


4. A representative from Thermo-Calc Software replies to the email and attaches your license file(s).
5. Save the license file(s) to your computer or network.

Requesting the License File for macOS

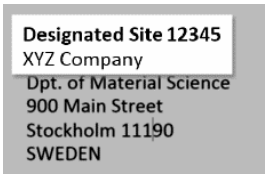
Upgrades to a new version of Thermo-Calc: Skip this section if you are upgrading to a new version of Thermo-Calc and (and you have a maintenance plan). Your license is sent to you in an email from Thermo-Calc Software AB. Save it to your computer to use during software installation.

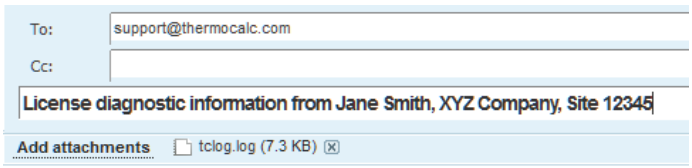
1. From the Apple main menu, select **System Preferences**.
2. Click **Network**.
3. In the left column select **Ethernet** or **Built-in Ethernet** (do not select a WiFi connection as a local static MAC address is required).
4. Click **Advanced → Hardware**. The **Network** window shows you the **MAC Address**. For example, the MAC address (the host ID) might be **3c:07:54:28:5f:72**.



5. Send an email to support@thermocalc.com and copy and paste the MAC address into the body of the email. Make sure to include the following in the subject line:

   License diagnostic information from <Name> where Name is replaced with your **name**, the **organisation name** and the **Site Number**. *You can find the five-digit site number on an invoice or any correspondence from Thermo-Calc Software.*





6. A representative from Thermo-Calc Software replies to the email address provided and attaches your license file or files.
7. Save your license file to your computer or network.

Quick Install Guides

In this section:

Windows® Standalone Quick Install Guide 74

macOS® Standalone Quick Install Guide 78

Windows® Standalone Quick Install Guide

This quick guide helps you do a full standalone installation. A *standalone* installation is used with the Single-User Node-Locked License (SUNLL), where the software and the license file are together on one computer.

This guide is applicable to:

- Windows operating systems
- Full Standalone installation (SUNLL)
- Upgrading to a new standalone version of Thermo-Calc (maintenance plan only)

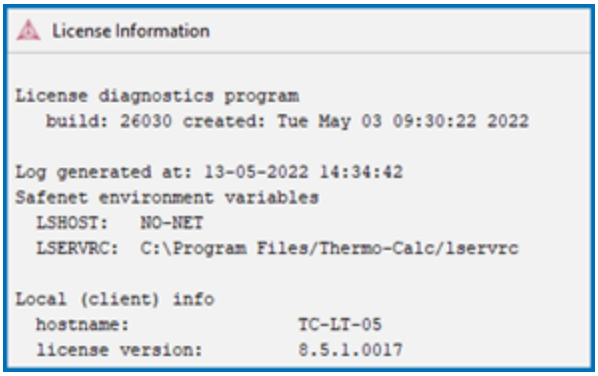
Other Installations

For instructions about other operating systems, network installations, or installing an SDK (e.g. TC-Python or TC-Toolbox for MATLAB®) search the *Thermo-Calc Installation Guide*, which is also available on our website. You can also review the Licensing Options included on our website.

Request a License File

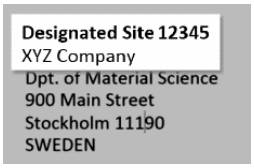
Upgrades to a new version of Thermo-Calc: Skip this section if you are upgrading to a new version of Thermo-Calc and (and you have a maintenance plan). Your license is sent to you in an email from Thermo-Calc Software AB. Save it to your computer to use during software installation.

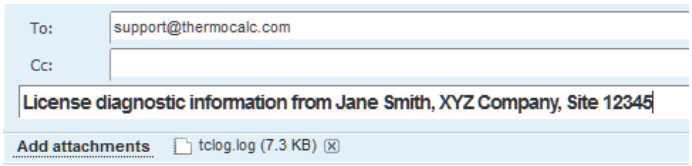
1. To access the computer information you need to provide to get a license, start Thermo-Calc and select **Help → Show License Info**.



2. Copy the information from the **License Information** window. A lot of information may be shown below the initial screen, so make sure you scroll down to the end when you select and copy the window's contents. (Alternatively, you can copy the same information from the console by using the SYS module command DISPLAY_LICENSE_ INFO.)
3. Send an email to support@thermocalc.com. Make sure to include the following in the subject line:

   License diagnostic information from <Name> where Name is replaced with your **name**, the **organization name** and the **Site Number**. *You can find the five-digit site number on an invoice or any correspondence from Thermo-Calc Software.*





4. A representative from Thermo-Calc Software replies to the email and attaches your license file(s).
5. Save the license file(s) to your computer or network.

Install the Software

Download and Run your Thermo-Calc Installation Software

> Administrative rights are required to complete this installation.

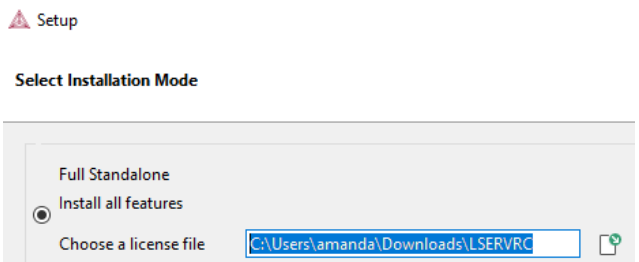
1. For web links sent in an email from Thermo-Calc Software, go to the URL and log in with the information provided. Then navigate to the Windows folder and click the link to download the software.
2. Go to the folder where you downloaded the software. Double-click the **.exe** file to launch the **Setup** program.
3. On the **Setup-Thermo-Calc** window click **Next**.
4. On the **License Agreement** window click to accept the license agreement. Click **Next**.

Select the Installation Mode

1. In the **Select Installation Mode** window click **Full Standalone: Install all features**.

> TC-Python is installed when the **Full Standalone** or **Full Network Client** option is chosen, but there are additional steps required as described separately for this SDK.

2. For a **Full Standalone** installation, in the **Choose a license file** field either enter the file path or click the file button to navigate to where you saved the license file emailed to you from Thermo-Calc Software.



The license file is called **lservrc**. Click **Next**. To prevent errors, leave this field blank if you did not get a license file yet.

TC-Python is installed for all users even if you do not have a license. The **Install TC-Python** window is a reminder that additional installation procedures are required after Thermo-Calc is installed. See the *TC-Python Installation Guide*.

3. In the **Ready to Install** window click **Next**. Click **Finish** and start using Thermo-Calc.

macOS® Standalone Quick Install Guide

This quick guide helps you do a full standalone installation. A *standalone* installation is used with the Single-User Node-Locked License (SUNLL), where the software and the license file are together on one computer.

This guide is applicable to:

- macOS
- Full Standalone installation (SUNLL)
- Upgrading to a new standalone version of Thermo-Calc (maintenance plan only)

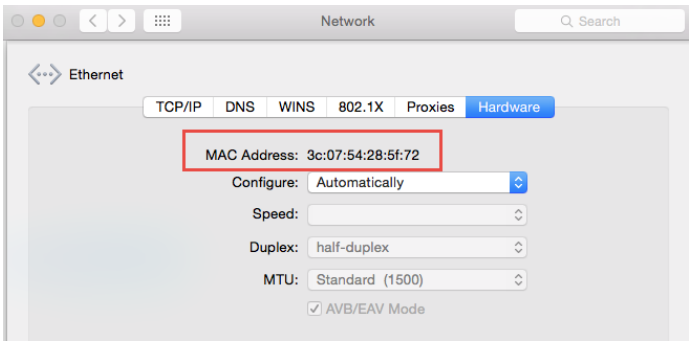
Other Installations

For instructions about other operating systems, network installations, or installing an SDK (e.g. TC-Python or TC-Toolbox for MATLAB®) search the *Thermo-Calc Installation Guide*, which is also available on our website. You can also review the Licensing Options included on our website.

Request a License File

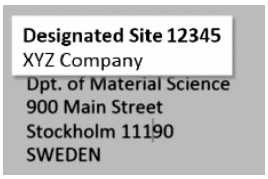
Upgrades to a new version of Thermo-Calc: Skip this section if you are upgrading to a new version of Thermo-Calc and (and you have a maintenance plan). Your license is sent to you in an email from Thermo-Calc Software AB. Save it to your computer to use during software installation.

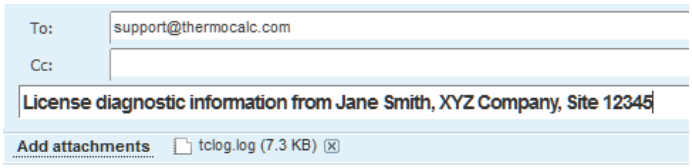
1. From the Apple main menu, select **System Preferences**.
2. Click **Network**.
3. In the left column select **Ethernet** or **Built-in Ethernet** (do not select a WiFi connection as a local static MAC address is required).
4. Click **Advanced → Hardware**. The **Network** window shows you the **MAC Address**. For example, the MAC address (the host ID) might be **3c:07:54:28:5f:72**.



5. Send an email to support@thermocalc.com and copy and paste the MAC address into the body of the email. Make sure to include the following in the subject line:

   License diagnostic information from <Name> where Name is replaced with your **name**, the **organisation name** and the **Site Number**. *You can find the five-digit site number on an invoice or any correspondence from Thermo-Calc Software.*





6. A representative from Thermo-Calc Software replies to the email address provided and attaches your license file or files.
7. Save your license file to your computer or network.

Install the Software

Download and Install XQuartz

The XQuartz open-source X Windows system is required to run Thermo-Calc on macOS X.

1. In a web browser go to https://www.macupdate.com or to download it directly from XQuartz, https://www.xquartz.org/.
2. In the **Search Mac Apps** field, enter *XQuartz*.
3. Click the **XQuartz** search result. For example, based on the recent version, the name is XQuartz-2.7.11.dmg.

4. Click **Download**.
5. Double-click the **XQuartz.pkg** file. Follow the instructions.
6. Click **OK** when the message about logging out displays and click **Close** when the installation is successful.

Download and Run your Thermo-Calc Installation Software

Administrative rights are required to complete this installation.

1. For web links sent in an email from Thermo-Calc Software, go to the URL and log in with the information provided. Then navigate to the Mac folder and click the link to download the software.

2. Double-click the downloaded file to launch the installation.

   For macOS and when you first run the installer, you may see a message that *Thermo-Calc-osx-<version> can't be opened because Apple cannot check it for malicious software*. If this happens, select **Show in Finder**. Then, in the opened **Finder** window right-click the downloaded file `Thermo-Calc-osx-<version>` and select **Open**.

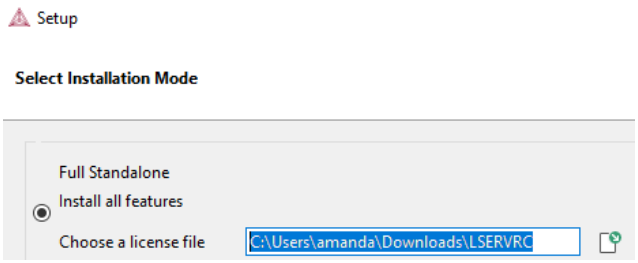
3. On the **Setup-Thermo-Calc** window click **Next**.
4. On the **License Agreement window** click to accept the license agreement. Click **Next**.

Select the Installation Mode

1. In the **Select Installation Mode** window click **Full Standalone: Install all features**.

   TC-Python is installed when the **Full Standalone** or **Full Network Client** option is chosen, but there are additional steps required as described separately for this SDK.

2. For a **Full Standalone** installation, in the **Choose a license file** field either enter the file path or click the file button to navigate to where you saved the license file emailed to you from Thermo-Calc Software.



> The license file is called **lservrc**. Click **Next**. To prevent errors, leave this field blank if you did not get a license file yet.

> TC-Python is installed for all users even if you do not have a license. The **Install TC-Python** window is a reminder that additional installation procedures are required after Thermo-Calc is installed. See the *TC-Python Installation Guide*.

3. In the **Ready to Install** window click **Next**. Click **Finish** and start using Thermo-Calc.

> macOS installations and if you have previous Thermo-Calc installations: When you launch Thermo-Calc with the new or updated version, the splash screen hides the **Import User Settings** dialog box. In order to proceed you need to click the splash screen and then click **Yes** or **No** in the dialog box.

TC-Python Installation Guide

In this section:

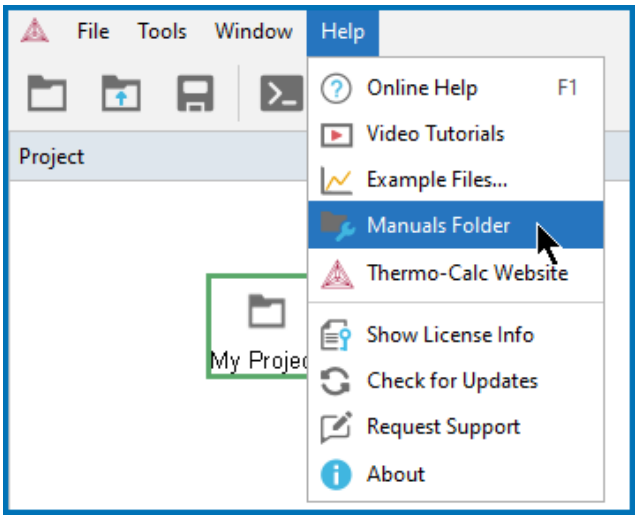
About the TC-Python Documentation 83
Which TC-Python Installation Should I Choose? 85
Installing TC-Python with a Bundled Python-interpreter 86
Installing TC-Python Into a Python-interpreter of Your Choice 90
Installation Default Directory: TC-Python 94
macOS: Setting Environment Variables 95
Fixing Potential Issues with the Environment 96
Optional Packages 97
Updating to a Newer Version 98
TC-Python Diagnostic Script 99

About the TC-Python Documentation

The TC-Python help is available on the Thermo-Calc website where you can also access additional resources. You can alternatively access the locally installed documentation from the **Help** menu in Thermo-Calc.

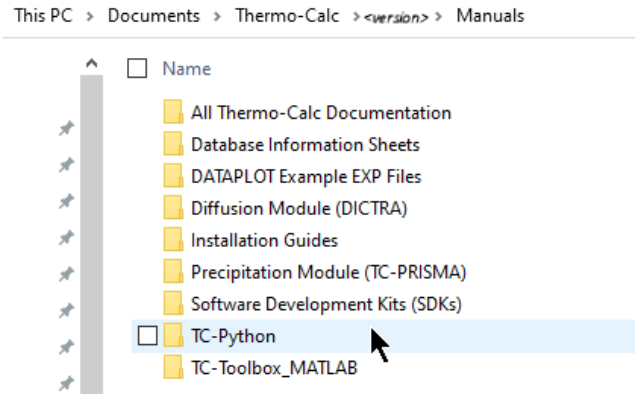
Opening the Locally Installed Documentation

1. In Thermo-Calc from the menu, select **Help → Manuals Folder**.

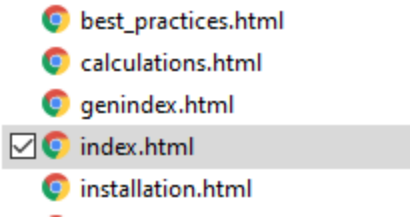


You can also navigate to the **Manuals** folder outside of Thermo-Calc and based on your operating system installation location.

2. In the window that opens, double-click to open the **TC-Python** folder.



3. Double-click the **Index** HTML file (or any of the HTML files).



4. The API reference documentation opens as a searchable HTML file in your local browser.

Which TC-Python Installation Should I Choose?

A license is required to run TC-Python. Also remember to review the System Requirements page on our website.

There are these options to install TC-Python.

See the Videos about TC-Python page for additional learning resources.

Install with the Bundled Python-interpreter

This is a straightforward installation where TC-Python is preinstalled together with some popular Python packages.

This is the recommended option for new users to TC-Python who may only want to run the examples. The available preinstalled packages (e.g. numpy, scipy, scikit-learn, pyvista, and matplotlib) can also be sufficient for many advanced users.

"Installing TC-Python with a Bundled Python-interpreter" on the next page.

"Optional Packages" on page 97

Install with a Python-interpreter of Your Choice

This installation requires additional steps and is the recommended option for more advanced use and has full flexibility.

"Installing TC-Python Into a Python-interpreter of Your Choice" on page 90.

Installing TC-Python with a Bundled Python-interpreter

TC-Python can be installed using a Python-interpreter that is bundled to Thermo-Calc. This interpreter has TC-Python preinstalled together with some popular Python packages. This is the recommended option for new users to TC-Python who may only want to run the examples. The available preinstalled packages (e.g. numpy, scipy, scikit-learn, pyvista, and matplotlib) can also be sufficient for many advanced users.

The bundled interpreter package is also used to run the Property Models in Thermo-Calc. Do not make changes to interpreter packages or this can stop Thermo-Calc from working correctly. To fix issues caused by changes to an interpreter, completely uninstall Thermo-Calc and start over, either with the bundled interpreter package or using interpreters of your choice.

If you are planning to do more advanced calculations that require other external packages then you may want to follow these instructions instead: "Installing TC-Python Into a Python-interpreter of Your Choice" on page 90

Limitations

The following examples cannot be run with the bundled Python-interpreter as additional packages are required: `pyex_M_01_Input_from_file.py` (pandas) and `pyex_M_02_Output_to_file.py` (pandas, lxml, h5py).

The bundled Python 3.9.18 interpreter contains the following major packages.

If you have recommendations for additional packages to include (see below), send an email to Thermo-Calc Support.

Package	*Version*
matplotlib	3.8
numpy	1.26.0
scikit-learn	1.3.1
scipy	1.11.3
pyvista	0.42.2
TC-Python	2024a

Step 1. Install an IDE (Integrated Development Environment)

Any editor can be used to write the Python code, but an IDE is recommended, e.g. PyCharm. These instructions are based on the use of PyCharm.

Use of an IDE gives you access to code completion, which helps when you use the API as it gives you the available methods on the objects you are working with.

1. Navigate to the PyCharm website: https://www.jetbrains.com/pycharm/download.
2. Click to choose your OS and then click **Download**. You can use the **Community** version of Pycharm.
3. Follow the instructions. It is recommended you keep all the defaults.

For Mac installations, you also need to set some environment variables as described below in "macOS: Setting Environment Variables" on page 95.

Step 2. Configure PyCharm to Use the Bundled Python-interpreter

Open PyCharm and configure the interpreter:

1. Go the menu **File → Settings**.
2. Navigate in the tree to **Project: YourProjectName** and choose **Project Interpreter**.
3. Click on the settings symbol close to the **Project Interpreter** dropdown menu and choose **Add**.
4. Select **System Interpreter** and add the bundled Thermo-Calc Python 3 interpreter, which is located in a folder based on the operating system:

Operating system	*Path to the bundled Python-interpreter*
Windows	`C:\Program Files\Thermo-Calc\2024a\python\python.exe`
Linux	`/home/UserName/Thermo-Calc/2024a/python/bin/python3`
macOS	`/Applications/Thermo-Calc-2024a.app/Contents/Resources/python/bin/python3`

5. Select the interpreter and confirm.

Step 3. Run a TC-Python Example

It is recommended that you open one or more of the included examples to both check that the installation has worked and to start familiarizing yourself with the code.

Open the TC-Python Project in PyCharm

When you first open the TC-Python project and examples, it can take a few moments for the Pycharm IDE to index before some of the options are available.

1. Open PyCharm and then choose **File → Open**. The first time you open the project you will need to navigate to the path of the TC-Python installation based on your operating system.

Operating system	*Path to the TC-Python folder*
Windows	`C:\Users\UserName\Documents\Thermo-Calc\2024a\SDK\TC-Python`
Linux	`/home/UserName/Thermo-Calc/2024a/SDK/TC-Python`
macOS	`/Users/Shared/Thermo-Calc/2024a/SDK/TC-Python`

2. Click the **Examples** folder and then click **OK**.

3. From any subfolder:

    - Double-click to open an example file to examine the code.

    - Right-click an example and choose **Run**.

If you are not following the recommended approach and create a *new* project (**File → New Project…**), you need to consider that by default the options to choose the interpreter are hidden within the **Create Project** window. For this, click **Project Interpreter: New Virtual Environment** and in most cases choose your *System Interpreter* containing the Python bundled to Thermo-Calc instead of the default *New Virtual Environment*.

Installing TC-Python Into a Python-interpreter of Your Choice

TC-Python can be installed using a Python-interpreter of your choice. This is the recommended option for any more advanced usage and provides full flexibility.

If you are new to TC-Python and want to mainly run the examples, then it is recommended you install the bundled Python-interpreter. The available preinstalled packages (e.g. numpy, scipy, scikit-learn, pyvista, and matplotlib) can also be sufficient for many advanced users. See "Installing TC-Python with a Bundled Python-interpreter" on page 86.

Step 1. Install a Python Distribution

If you already have a Python distribution installation, version 3.8 or newer, skip this step.

These instructions are based on using the Anaconda platform for the Python distribution. Install version 3.8 or newer to be able to work with TC-Python, although it is recommended that you use the most recent version.

Install Anaconda

1. Navigate to the Anaconda website: https://www.anaconda.com/download/.
2. Click to choose your OS (operating system) and then click **Download**. Follow the instructions. It is recommended you keep all the defaults.

Step 2. Install Thermo-Calc and the TC-Python SDK

1. Install Thermo-Calc.
2. When the installation is complete, open the TC-Python folder that includes the *.whl file needed for the next step. There is also an **Examples** folder with Python files you can use in the IDE to understand and work with TC-Python.

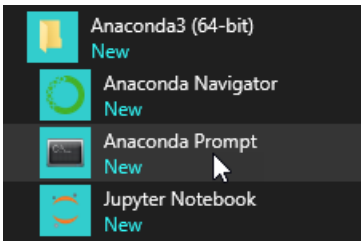
Step 3. Install TC-Python

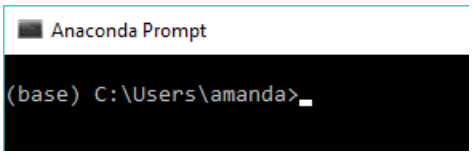
"Updating to a Newer Version" on page 98

On Windows, it is recommended you use the Anaconda distribution prompt (i.e. Anaconda), especially if you have other Python installations.

> Do not use Virtual Environments unless you have a good reason to do so. Also see "Fixing Potential Issues with the Environment" on page 96.

1. Open the command line. For example, in Anaconda on a Windows OS, go to **Start** → **Anaconda** → **Anaconda Prompt**.





2. At the command line, enter the following. Make sure there are no spaces at the end of the string or in the folder name or it will not run:

```
pip install <path to the TC-Python folder>/TC_Python-<version>-
py3-none-any.whl
```

> On Linux, and depending on the interpreter, *pip3* is typically used.

Operating system	*Path to the TC-Python folder*
Windows	`C:\Users\UserName\Documents\Thermo-Calc\2024a\SDK\TC-Python`
Linux	`/home/UserName/Thermo-Calc/2024a/SDK/TC-Python`
macOS	`/Users/Shared/Thermo-Calc/2024a/SDK/TC-Python`

3. Press <Enter>. When the process is completed, there is a confirmation that TC-Python is installed.

> If your computer is located behind a proxy-server, the default pip-command will fail with a network connection error. In that case you need to install the dependency py4j in a special configuration:

```
pip install -proxy user:password@proxy_ip:port py4j jproperties
```

> Go to the TC-Python Help **Troubleshooting** section for detailed information. This can be found on our website or from the installed documentation where you can search for "pip install fails" with “Failed to establish a new network connection” or similar.

Step 4. Install an IDE (Integrated Development Environment)

Any editor can be used to write the Python code, but an IDE is recommended, e.g. PyCharm. These instructions are based on the use of PyCharm.

Use of an IDE gives you access to code completion, which helps when you use the API as it gives you the available methods on the objects you are working with.

1. Navigate to the PyCharm website: https://www.jetbrains.com/pycharm/download.
2. Click to choose your OS and then click **Download**. You can use the **Community** version of Pycharm.
3. Follow the instructions. It is recommended you keep all the defaults.

> For Mac installations, you also need to set some environment variables as described below in "macOS: Setting Environment Variables" on page 95.

Step 5. Open the IDE and Run a TC-Python Example

After you complete all the software installations and set up the pip install path, you are ready to open the IDE to start working with TC-Python.

It is recommended that you open one or more of the included examples to both check that the installation has worked and to start familiarizing yourself with the code.

Open the TC-Python Project in PyCharm

When you first open the TC-Python project and examples, it can take a few moments for the Pycharm IDE to index before some of the options are available.

1. Open PyCharm and then choose **File** → **Open**. The first time you open the project you will need to navigate to the path of the TC-Python installation based on your operating system.

Operating system	*Path to the TC-Python folder*
Windows	`C:\Users\UserName\Documents\Thermo-Calc\2024a\SDK\TC-Python`
Linux	`/home/UserName/Thermo-Calc/2024a/SDK/TC-Python`
macOS	`/Users/Shared/Thermo-Calc/2024a/SDK/TC-Python`

2. Click the **Examples** folder and then click **OK**.
3. From any subfolder:
   - Double-click to open an example file to examine the code.
   - Right-click an example and choose **Run**.

Also see "Optional Packages" on page 97 if you are using the Additive Manufacturing Module for simulations.

Installation Default Directory: TC-Python

These are the default paths to the TC-Python folder based on your operating system.

Operating system	*Path to the TC-Python folder*
Windows	`C:\Users\UserName\Documents\Thermo-Calc\2024a\SDK\TC-Python`
Linux	`/home/UserName/Thermo-Calc/2024a/SDK/TC-Python`
macOS	`/Users/Shared/Thermo-Calc/2024a/SDK/TC-Python`

For a bundled Python-interpreter installation, these are the paths to this location based on your operating system.

Operating system	*Path to the bundled Python-interpreter*
Windows	`C:\Program Files\Thermo-Calc\2024a\python\python.exe`
Linux	`/home/UserName/Thermo-Calc/2024a/python/bin/python3`
macOS	`/Applications/Thermo-Calc-2024a.app/Contents/Resources/python/bin/python3`

macOS: Setting Environment Variables

In order to use TC-Python on Mac you need to set some environment variables.

```
TC24A_HOME=/Applications/Thermo-Calc-2024a.app/Contents/Resources
```

If you use a license server:

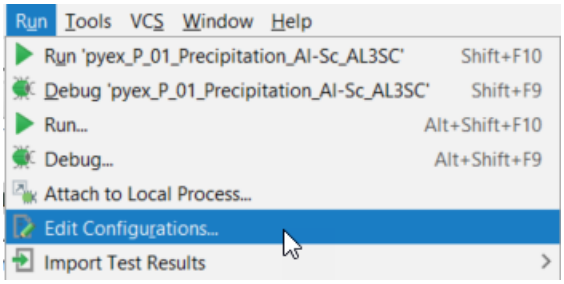
```
LSHOST=<name-of-the-license-server>
```

If you have a node-locked license:

```
LSHOST= NO-NET
LSERVRC=/Users/Shared/Thermo-Calc/lservrc
```

In PyCharm, you can add environment variables in the configurations.

Select **Run** → **Edit Configurations** to open the **Run/Debug Configurations** window. Enter the environment variable(s) by clicking the button to the right of the **Environment Variables** text field. Now the environment variables(s) will be set for each new configuration by default. The same way for configuring the environment variables can be used on other operating systems as if necessary.



Fixing Potential Issues with the Environment

In most cases you should run TC-Python within your **global** Python 3 interpreter and not use Virtual Environments unless you have a good reason to do so.

If there are problems with the interpreter settings, for example, a common problem when you first use TC-Python is the message *No module named tc_python*, which you can resolve in the Settings window as follows:

1. Go the menu **File** → **Settings**.
2. Navigate in the tree to *<Project.YourProjectName>* and choose **Project Interpreter**.
3. Click on the settings symbol close to the **Project Interpreter** drop-down menu and choose **Add**.
4. Now choose **System Interpreter** and add your existing Python 3 interpreter.
5. Select your added interpreter and confirm.

If you are not following the recommended approach and create a *new* project (**File → New Project…**), you need to consider that by default the options to choose the interpreter are hidden within the **Create Project** window. For this, click **Project Interpreter: New Virtual Environment** and in most cases choose your *System Interpreter* containing the Python bundled to Thermo-Calc instead of the default *New Virtual Environment*.

If you really need to use a Virtual Environment, it is recommended you review the hints provided in the **Best Practices** section in the full TC-Python HTML help or PDF.

Optional Packages

Plotting results of Additive Manufacturing simulations requires the package *pyvista*. It is automatically installed if using the option *[am-plotting]* during the installation:

```
pip install <path to the TC-Python folder>/TC_Python-<version>-py3-none-any. ,!whl
[am-plotting]
```

The bundled interpreter contains *pyvista* by default.

Updating to a Newer Version

If you are using the bundled Python-interpreter automatically installed with Thermo-Calc, these steps are not required.

These steps are required if you have previously followed the instructions in "Installing TC-Python Into a Python-interpreter of Your Choice" on page 90.

When updating to a newer version of Thermo-Calc, you always need to also install the latest version of TC-Python. It is not sufficient to run the installer of Thermo-Calc (except for bundled versions of the Python interpreter).

```
pip install <path to the TC-Python folder>/TC_Python-<version>-py3-none-any.whl
```

In case of problems you may wish to uninstall the previous version of TC-Python in advance:

```
pip uninstall TC-Python
```

```
pip install <path to the TC-Python folder>/TC_Python-<version>-py3-none-any.whl
```

However, this should not normally be required.

On Linux typically *pip3* is used.

You can check the currently installed version of TC-Python by running:

```
pip show TC-Python
```

TC-Python Diagnostic Script

A diagnostic script is available to help you if you have problems running TC-Python.

It is important to run the diagnostic script EXACTLY the same way as you run your TC-Python script (in the same IDE, same project, same Python environment, same Jupyter notebook, etc).

The script automatically prints useful suggestions that, in many cases, will help you to fix the problem yourself. If you are unable to solve the problem, contact us for support. You can find the script in these locations:

- Miscellaneous example (diagnostics.py)
- In the **Troubleshooting** section of the *TC-Python API Reference Documentation*. Also refer to the **Best Practices** in the same guide to see if there are any other solutions or tips.
- On our website.

TC-Toolbox for MATLAB® Installation Guide

In this section:

About TC-Toolbox for MATLAB® 101
TC-Toolbox Documentation 102
Installation Default Directory: TC-Toolbox and the Examples 104
Installing TC-Toolbox 105
Installing TC-Toolbox with the Custom Option 107
Testing a TC-Toolbox Installation 111
TC-Toolbox Installation Troubleshooting 112
Uninstalling TC-Toolbox for MATLAB® 114

About TC-Toolbox for MATLAB®

TC-Toolbox for MATLAB® (TC-Toolbox) provides an interface to the commonly used MATLAB® software for scientific and engineering computing. This software development kit (SDK) is ideal for fast realization of ideas and visualization of results during research and development activities. The TC-Toolbox API includes calculation types available in Thermo-Calc such as single point equilibrium, property (step) and phase (map) diagrams, Scheil solidification simulations, as well as all the general Thermo-Calc Property Models (e.g. yield strength, spinodal, driving force, etc.).

With the addition of licenses for the applicable software and databases, you can further maximize your integration with MATLAB® to include the capabilities of the Steel Model Library Property Models (e.g. bainite, pearlite, etc.), as well as access the range of functionality included with the Diffusion Module (DICTRA) and the Precipitation Module (TC-PRISMA). Generally, all the functionality available in Graphical Mode or via the TC-Python SDK is available.

TC-Toolbox for MATLAB® is available on Windows platforms.

A license is required to run TC-Toolbox for MATLAB® and MATLAB® must also be installed on your computer prior to the TC-Toolbox installation. Also remember to review the System Requirements page on our website.

TC-Toolbox Documentation

There are various locations and formats of the documentation you need related to this SDK.

The *TC-Toolbox for MATLAB® API Reference Documentation* is available from these general locations (1) within the MATLAB® environment—both as help and as part of the tab completion (2) directly on the Thermo-Calc website, and (3) locally in the Thermo-Calc installation (**Help>Manuals Folder**).

API Reference Documentation

The *TC-Toolbox for MATLAB® API Reference Documentation* is available either as interactive help (in HTML format or when in MATLAB® using tab completion or accessed via different menus or key combinations) or as a standalone PDF.

There are these ways to access the content:

- Directly in MATLAB® via the Help menu then under **Supplemental Software** click **TC-Toolbox**. Help is also available when writing code and using the tab completion feature and/or pressing different key combinations as described in the *Best Practices* section of the help.
- From the website: HTML Help or PDF
- Locally in a Thermo-Calc installation:
    - HTML: **Help > Manuals Folder > TC-Toolbox_MATLAB**, then click any HTML file.
    - PDF: **Help > Manuals Folder > Software Development Kits (SDKs)**, then double-click to open the *TC-Toolbox for MATLAB® API Programmer Guide*. This is a copy of the HTML API reference documentation.

Installation Instructions

The installation instructions are only included in the Thermo-Calc help (press F1), and in the PDF version of the main installation guide found, for example:

- On our website as part of the full Thermo-Calc Installation Guide.
- Once Thermo-Calc is installed:
  - Locally in a Thermo-Calc installation: **Help > Manuals Folder >Installation Guides**.
  - Press F1 in Thermo-Calc to search the help.

Thermo-Calc Help (Limited)

For TC-Toolbox, there is limited content included in the Thermo-Calc help (press F1 when in Thermo-Calc) because it is replaced by the *TC-Toolbox for MATLAB® API Reference Documentation*. The exception is installation instructions to describe how to install the SDK.

Installation Default Directory: TC-Toolbox and the Examples

The software component and the examples are installed as described below.

This is the default path to the installation folder for the TC-Toolbox component on Windows operating systems. Be aware that the initial *installation files and examples* are placed in **Public\Documents**, then after opening Thermo-Calc for the first time, these are copied to the **Documents** folder for each user. The *documentation* is installed elsewhere and as described in "TC-Toolbox Documentation" on page 102.

There are included examples with all TC-Toolbox installations. These are the same as the examples included with TC-Python although with a different suffix (*matex*) and prefix (*.*m*) in the file name. You can read summaries about the examples as described for TC-Python in the online help.

Path to the TC-Toolbox folder

Both the installation files AND the examples are installed in the following folders.

The default Windows folders where the TC-Toolbox examples are installed starts with the original installation placing these under **Public Documents** for ALL USERS.

For a local user, and after Thermo-Calc is opened for the first time, these files are copied to the user's **Documents** folder where this local copy is associated to the user login. The **Public Documents** folder always contains the original set of contents as per the installation.

```
C:\Users\Public\Public Documents\Thermo-Calc\<version>\SDK\TC-Toolbox-MATLAB
```

After installing Thermo-Calc, and when you first open the program, the set of folders containing the examples is copied from the source Public\Documents location into a user Documents folder:

```
C:\Users\<user>\Documents\Thermo-Calc\<version>\SDK\TC-Toolbox-MATLAB\Examples
```

It is recommended that you work with the files that are copied to the *user* folder.

Installing TC-Toolbox

There are automatic or manual installation instructions for TC-Toolbox for MATLAB®.

Automatic Installation of TC-Toolbox

When the following conditions are met, Thermo-Calc automatically installs the TC-Toolbox for MATLAB® component on your computer.

1. MATLAB® is already installed.
2. There is only one Windows user on the computer where TC-Toolbox is being installed.

Administrator privileges are needed when you start the Thermo-Calc installer.

Then follow the regular installation instructions for Thermo-Calc, choosing whether you use a Standalone or Network installation. If required also see "Testing a TC-Toolbox Installation" on page 111.

A reminder regarding the license. Although you do not need to have a license file during the installation process (it can be added after the fact), you do need to have purchased a license for TC-Toolbox for MATLAB® to run the program within MATLAB®.

Manual Installation of TC-Toolbox

The installation is not automatic if:

- There are multiple Windows users on the same machine, or
- The installer cannot find the directory path to the MATLAB installation.

Multiple Windows Users on Same Machine

If there are multiple windows users on the same machine, then the following manual steps are done at the end of the automatic installation.

1. A message at the end of the Thermo-Calc installation process displays with instructions.
2. An Explorer window automatically opens to the `C:\Users\Public\Documents\Thermo-Calc\2024a\SDK\TC-Toolbox-MATLAB` folder.
3. Double-click the `InstallTCToolboxMATLAB.cmd` file to finalize the process. This briefly launches MATLAB® and installs TC-Toolbox. If required see "Testing a TC-Toolbox Installation" on page 111.

Installer Cannot Find the MATLAB® Installation Directory

If the Thermo-Calc installer cannot find the MATLAB® installation directory,

1. Start the version of MATLAB® that you want to install TC-Toolbox in.
2. Open and run the MATLAB® script included with your installation of Thermo-Calc.

   For example on Windows, `C:\Users\<username>\Documents\Thermo-Calc\2024a\SDK\TC-Toolbox-MATLAB\setupTCToolbox.m`

You can also follow the instructions for "Installing TC-Toolbox with the Custom Option" on the next page.

Installing TC-Toolbox with the Custom Option

MATLAB® must be installed before you install TC-Toolbox.

As described in "Installing TC-Toolbox" on page 105, if MATLAB® is already installed, then Thermo-Calc automatically installs the files you need either using the *Full Standalone* or *Full Network Client* installation where you **install all features**. Otherwise you need to use the **Custom** installation.

The following generally describes the **Custom** option for either a Standalone or Network installation. Use the **Custom** option if MATLAB® is installed but the Thermo-Calc installer is not finding the directory path so you need to enter the path manually.

Some steps are described in more detail in other parts of this guide.

Step 1. Request your License File from Thermo-Calc Software

A reminder regarding the license. Although you do not need to have a license file during the installation process (it can be added after the fact), you do need to have purchased a license for TC-Toolbox for MATLAB® to run the program within MATLAB®.

Step 2. Download your Thermo-Calc Installation Software

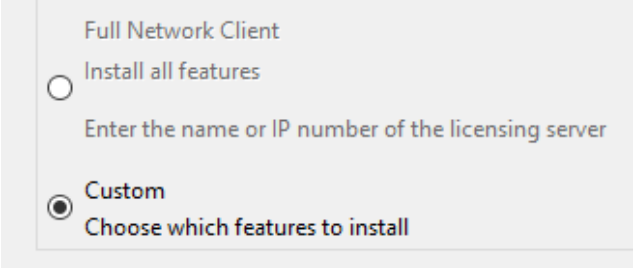
Step 3. Install MATLAB®

Step 4. Run the Thermo-Calc Installation File as an Administrator

1. Locate the Thermo-Calc installation file on your computer. Right-click the **.exe** file and choose **Run as administrator** to launch the **Setup** program.
2. Accept the **License Agreement** and click **Next**.

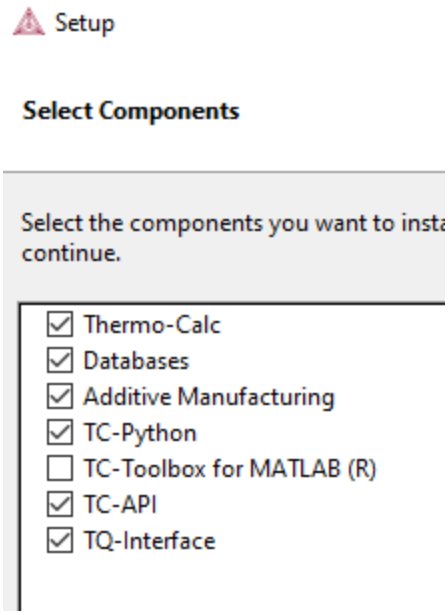
Step 5. Select the Custom Installation Type

1. In the **Select Installation Mode** window click **Custom** (the option appears greyed out, but it is available to select). Click **Next**.



2. On the **Specify Configuration** window the **Create Shortcut on Desktop** checkbox is selected by default. Click **Next**.

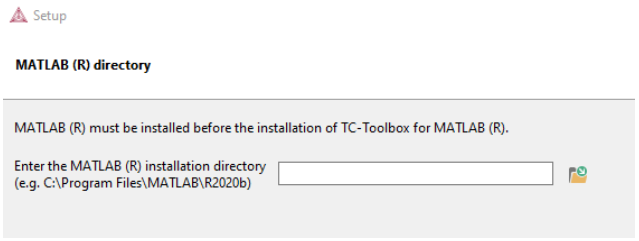
3. In the **Select Components** window, click to select the **TC-Toolbox for MATLAB** checkbox.



> Remember, you must have MATLAB® already installed and may need to know the file path to the MATLAB® folder. If the **TC-Toolbox for MATLAB** checkbox is NOT selected, this confirms that the Thermo-Calc installer did NOT locate the MATLAB® installation (or it is not installed yet).

4. Click **Next**.

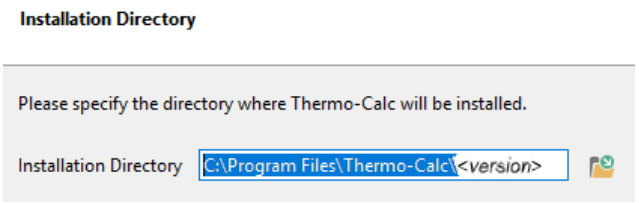
5. If you selected the **TC-Toolbox for MATLAB** checkbox, the **MATLAB directory** window opens.



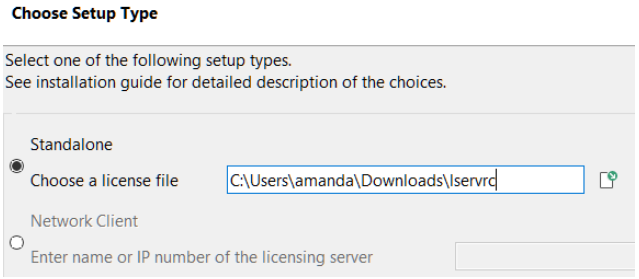
   - If MATLAB® is already installed but the Thermo-Calc installer could not find the path, then enter the file path to the MATLAB® installation directory or click the file button to **Browse for Folder** and navigate to the directory. Click **Next**.
   - If MATLAB® is NOT installed, click **Cancel** to exit the Thermo-Calc installer program. Once MATLAB® is installed you can return to this process.

Step 6. Set the Thermo-Calc Installation Directory and Choose the Setup Type

1. In the **Installation Directory** window, either accept the default path or enter a path to where you want to install the Thermo-Calc software. Click the file button to **Browse for Folder** and navigate to another directory.



2. In the **Choose Setup Type** window, click **Standalone** or **Network Client**.



- For a Standalone installation: In the **Choose a license file** field enter the path to your license file (called **lservrc**).

- For a Network installation: Enter the details as required into the **Enter the name or IP number of the licensing server** field. Click **Next**.

> If the **TC-Python** checkbox is also selected to be installed (which it is by default), the **Install TC-Python** window is a reminder that additional installation procedures are required after Thermo-Calc is installed.

Step 7. Install and Start Using Thermo-Calc as an Add-on in MATLAB®

1. In the **Ready to Install** window click **Next**.

> If MATLAB® is not installed (and you selected the TC-Toolbox checkbox) a message displays to confirm that TC-Toolbox will not be installed until you complete the MATLAB® installation. If MATLAB is installed, click **Back** to confirm that the installation path is correct, otherwise **Cancel** this Thermo-Calc installation, install MATLAB and start again.

2. Click **Finish**.

Step 8. Test the Installation

"Testing a TC-Toolbox Installation" on the next page

Testing a TC-Toolbox Installation

Generally you can check the installation by first looking in the **Home** tab to see if the program is in the menu. Then proceed to running the diagnostic script or another example.

To check the installation, in MATLAB®:

1. From the **Add-Ons** menu, select **Manage Add-Ons**.

   If TC-Toolbox is in the list it is likely it installed correctly but it is recommended you run the diagnostic script or another example to confirm.

2. Run the diagnostics script from the folder `C:\Users\<user>\Documents\Thermo-Calc\2024a\SDK\TC-Toolbox-MATLAB\Examples\Miscellaneous` or open and run any other example to test.

   The TC-Toolbox diagnostic script is also available from our website.

TC-Toolbox Installation Troubleshooting

Below are some suggestions to help troubleshoot a TC-Toolbox for MATLAB® installation.

Diagnostic Script

A diagnostic script is available to help you if you have problems running TC-Toolbox.

It is important to run this script EXACTLY the same way as you run your MATLAB® script.

The script automatically prints useful suggestions that, in many cases, will help you to fix the problem yourself. If you are unable to solve the problem, contact us for support.

The script is based on the version of Thermo-Calc installed and named `tc-toolbox-diagnostic-script-2024a.m`. You can find the script in these locations:

- As an example (`diagnostics.m`) located in this folder `C:\Users\<user>\Documents\Thermo-Calc\2024a\SDK\TC-Toolbox-MATLAB\Examples\Miscellaneous`
- In the **Troubleshooting** section of the *TC-Toolbox for MATLAB® API Reference Documentation*. Also refer to the **Best Practices** in the same guide to see if there are any other solutions or tips.
- On our website.

MATLAB® Installation Directory Not Found

For Windows installations of the TC-Toolbox for MATLAB® component, you may get an error message or window asking for the MATLAB® installation directory path.

The most common reason for this is that MATLAB® is not installed. If this is the case, exit the Thermo-Calc installation, install MATLAB® and then run the Thermo-Calc installation program again.

If MATLAB® is installed and Thermo-Calc just did not find the file path during the installation setup process, then enter the path in the field when prompted.

Determining the Licensing Software Version (Network Installs)

Sometimes you may need to know the version of License Manager (Windows) or License Server (Linux) software being used. This can be useful while troubleshooting network installations.

- On *Windows* open a command prompt and go to the directory where `lservnt.exe` is found. For example:

  ```
  >C:\Program Files (x86)\Common Files\SafeNet Sentinel\Sentinel RMS
  License Manager\WinNT
  ```

  Type the command `>lservnt.exe -help` and the version is displayed.

- On *Linux* open a Terminal window and go to the directory where the `lserv script` is saved. For example:

  ```
  >cd opt/Thermo-Calc/<version>/Licensing-files
  ```

  Type the command `>./lserv -help` and the version is displayed.

Uninstalling TC-Toolbox for MATLAB®

Uninstallation requires that the user is logged in with administrator rights and Thermo-Calc is installed for this same user. Then the uninstallation is automatically completed as part of the uninstallation of Thermo-Calc. Otherwise a manual step is required.

To uninstall TC-Toolbox (when not automatically uninstalled):

1. Start MATLAB®.
2. In the **Home** tab from the **Add-Ons** menu, select **Manage Add-Ons**.
3. Right-click **TC-Toolbox** and choose **Uninstall**.

Troubleshooting

There are diagnostic scripts available for TC-Python and TC-Toolbox for MATLAB® (these are included as examples in the Miscellaneous folder). These scripts are also available on our website.

In this section:

License Errors 116

Determining the Current License File Directory Path 118

Specifying a New Server Name or IP Number 120

Firewalls 121

Client/Server Mismatch 122

macOS Installations: Running the License Initialization Script 124

Linux Installations: Running the License Initialization Script 125

License Errors

Issue	*Platform*	*Installation type*	*Action or link to more information*
How do I add or update a standalone (SUNLL) license on a Windows computer where Thermo-Calc is already installed?	Windows	Standalone	"Determining the Current License File Directory Path" on page 118
How do I add or update a standalone (SUNLL) license on a Linux computer where Thermo-Calc is already installed?	Linux	Standalone	"Determining the Current License File Directory Path" on page 118
How do I add or update a network license on Windows?	Windows	Network	"Determining the Current License File Directory Path" on page 118
How do I add or update a network license on Linux?	Linux	Network	"Determining the Current License File Directory Path" on page 118
No license file found. Copy a valid license file to the installation directory after completing the installation.	All	All	You get this message if the wrong path or no license file is found at a path entered during the installation process. See "Installation Default Directories and the License File " on page 21 and "Determining the Current License File Directory Path" on page 118
TC-Toolbox for MATLAB®	Windows	All	"TC-Toolbox Installation Troubleshooting" on page 112
Warning Environment variable “LSHOST” is not set. Software will not function properly.	All	Network	"Specifying a New Server Name or IP Number" on page 120
Problem running post-install step. Installation may not complete correctly. Unable to run post-installation script, run the license initialization script as root after the installation.	Linux and Mac	Standalone	"macOS Installations: Running the License Initialization Script " on page 124or "Linux Installations: Running the License Initialization Script" on page 125

Issue	*Platform*	*Installation type*	*Action or link to more information*
Firewall warnings related to license management software (License Manager and License Server)	Windows and Linux	Network	"Firewalls" on page 121
Client / Server naming mismatches	Windows and Linux	Network	"Client/Server Mismatch" on page 122
InstallScript engine missing	Windows	Network	You are not notified if the InstallScript scripting engine is not installed. Install the ISScript.msi file and then run the downloaded file from Thermo-Calc again as described in "Windows: About Installing the License Manager" on page 47

Determining the Current License File Directory Path

This topic explains how to find out where your license file is installed, either by default or if a different directory was chosen for previously installed versions. For new installations, where you may not have had a license file when you installed Thermo-Calc, you can also use these instructions to determine the correct file path.

From Thermo-Calc

If you have already installed Thermo-Calc, you can view the path to the license file in the GUI. Select **Help → Show License Info**.

In Console Mode you can run the SYS module command DISPLAY_LICENSE_INFO.

Windows Standalone Installations

How do I add or update a standalone (SUNLL) license on a Windows computer where Thermo-Calc is already installed?

1. Unpack the .zip file that contains your standalone license and save the LSERVRC file on your computer. Find out where to place the new license file by opening a Command Prompt Window (cmd.exe) and type in the command line:

   ```
   >set LSERVRC
   ```

2. Press `Enter`. The output from the command is the path to the license file (including the name of the license file). For example: if the output is

   ```
   LSERVRC=C:\Users\<user>\Documents\Thermo-Calc\lservrc
   ```

   then the new license file should be placed in `C:\Program Files\Thermo-Calc\2024a\`

Linux Standalone Installations

How do I add or update a standalone (SUNLL) license on a Linux computer where Thermo-Calc is already installed?

Find out where to place the new license file by opening a Terminal window and type in the command line:

```
echo $LSERVRC
```

Windows Network Installations

How do I add or update a network license on Windows?

Only the WlAdmin tool can be used to update the network license used by the License Manager. See Install the Thermo-Calc Network License Using WIAdmin.

Linux Network Installations

How do I add or update a network license on Linux?

Replace your current license file with the new license file. The license file is located in the same directory as the license server.

Specifying a New Server Name or IP Number

The Thermo-Calc Setup wizard does not warn you if the name or IP number entered to the server (with the license management software) is incorrect.

If the name or IP number is not set at all, or if it is set to an empty string, then when you start Thermo-Calc the following message displays: *Warning Environment variable "LSHOST" is not set. Software will not function properly*.

Windows

This section explains how to specify or change the name or IP number of the server where the License Manager is installed and for a consolidated network client installation.

To install a license for an existing Thermo-Calc program, follow these steps:

1. Close all running Thermo-Calc programs.
2. Open a command line window.
3. Specify the name or IP number of the licensing software server. Type:

   ```
   set LSHOST=<name/IP number>
   ```

   To display the current name or IP number, type:

   ```
   set LSHOST
   ```

macOS

Permanently set the environmental variable LSHOST to specify a new licensing server name or IP number. Refer to the file `/Applications/Thermo-Calc-2024a.app/Contents/Info.plist`.

In this file, you can manually set the TC24A_HOME variable, which specifies the home directory of the Thermo-Calc program. See the `Info.plist` file for an example.

Linux

You can set or change the name or IP number of the license server at a later time by setting the environmental variable "LSHOST" to this name or number.

Firewalls

Windows

For a Windows License Manager installation you may have to change the system firewall settings to allow the License Manager to communicate with the computers running the client applications. Go to the Windows Firewall settings window to see if there are any problems. If prompted, select Unblock the system firewall for the Sentinel RMS License Manager and click Next.

Linux

For a Linux License Server installation you need to open the UDP port 5093 in your firewall. In case you have installed SELinux you might also need to disable it by setting SELINUX=permissive in the /etc/selinux/config file.

Client/Server Mismatch

For some network installations there can be a naming mismatch that causes errors. The server (where the license management software is installed) gets information from its DNS servers that an IP address (aaa.bbb.ccc) belongs to a computer (Computer A). But the client computer identifies itself as having a different IP address (aaa.bbb.ccc.eee) for the same computer (Computer A).

Even if the IP address of the client computer belongs to a subnet range listed in the license file, there is a problem with accessing the license file because the computer name does not match the information.

You may need your organisation's network administrator to assist with this issue.

How to Check

Compare computer names on the client computer and server

1. On the client computer, start a command prompt **cmd.exe** and type `ipconfig /all`. Press `Enter`. A variety of data is displayed on screen. Write down the following information for later comparison:
    - Hostname
    - DNS Suffix
    - Current IPv 4 Address
2. In the command window, type `nslookup` *<client_computer_name>,* where *client_computer_name* is the actual name of the client. Press `Enter`.

    This shows what information is saved on the DNS Servers used by the client computer. This information should match what is shown in the output from the first step.

3. On the server that holds the license management software, open a command prompt and run the command line: `nslookup client_computer_name`. The output lists the information for this server.

    Does it match the information given by the command ipconfig /all on the client computer? If not try the following.

Try these options to correct the issue

1. If the client computer has a dynamic (DHCP) IP address, either change it to a static one or make a reservation on the DHCP Server so that the computer always get the same IP address.
2. Update the records on the DNS Servers used by both the client computer and the server computer.

You can also configure the computer names and IP addresses in the local Hostfile of the client and server:

1. On the client computer, make a backup copy of the file C:\Windows\System32\drivers\etc\hosts.
2. Open the original in a simple text editor.
3. Add a new line which contains the IP and name of the server, for example: 192.168.29.27 license_server.thermocalc.se.
4. Save the changes.
5. On the server, make a backup copy of the file /etc/hosts.
6. Open the original in a simple text editor.
7. Add a new line which contains the IP and name of the client, for example: 192.168.29.47 Computer_A.thermocalc.se.
8. Save the changes.
9. In the host file, there is an example of how the operating system (Windows or Linux) wants the line in the hosts file to look like.

macOS Installations: Running the License Initialization Script

As part of the Standalone installation of Thermo-Calc, the Setup runs a license initialization script. If this part of the installation process did not complete properly for a standalone installation, you must manually run the license initialization script. You need the administrator username and password for these steps.

How to Run the Script

For this script to successfully initialize the license, the license file must be called **lservrc** and be located in the folder:

```
/Users/Shared/Thermo-Calc
```

"Installation Default Directory: macOS" on page 23

1. Open a terminal window. The **Terminal** application is in the */Applications/Utilities* folder.
2. At the prompt, enter this command:

   ```
   $ sudo /Applications/Thermo-Calc-
   2024a.app/Contents/Resources/license-initialization-macOS-x86_
   64.sh
   ```

   If you are not already logged in as an administrator, you probably cannot run the `sudo` command. If this is the case, then you can use the `su` command in the terminal window to login as an administrator. Contact your local system administrator for help.

3. Enter the administrator password and press `Enter`.
4. When you restart your computer and run the license initialization script, you are ready to start using Thermo-Calc.

> If you did not install a license file during this procedure, you can still start Thermo-Calc although you will get the **No license file found** message.

Linux Installations: Running the License Initialization Script

As part of a Standalone installation of Thermo-Calc, the Setup runs a license initialization script. If you get a warning message during the standalone installation Unable to run post-installation script, run the license initialization script as root after the installation, then you need to manually run the script as root.

openSUSE Administration (sudo) Users

Note the following if you are a sudo user (administrator) in openSUSE installing Thermo-Calc using this command:

```
sudo ./Thermo-Calc-linux-<full-version-number>.run
```

When this command is used, you will do a text-based installation instead of having a graphical interface to guide you. The information is the same, just without the user interface.

For example, the *<full-version-number>* is not just 2024a, it is what is found in the **Help → About** window in Thermo-Calc and it changes every release. You can find the current full version number listed on our website.

How to Run the Script

For this script to successfully initialize the license, the license file must be called **lservrc** and be located in the directory where you have installed Thermo-Calc.

"Installation Default Directory: Linux" on page 24

1. In the console, go to the Thermo-Calc installation directory.
   - The license file is put in `/home/<user>/Thermo-Calc` if you are installing as a non-root user, where `<user>` is your user name.
   - If you are installing as root, then this directory is `opt/Thermo-Calc/`.

2. Enter this command:

```
$ sudo sh license-initialization-linux.sh
```

   If you are not able to execute the `sudo` command because you are not on the sudoers list, you must log in as a root user with the command `su`, and then use `sh` to run the license initialization script. For example, on a 64-bit computer, enter the following:

```
$ sh license-initialization-linux.sh
```

3. Log out of Thermo-Calc and then log back in to save these changes.

Sentinel RMS License 9.7 Tools

These tools relate to Network Client installations of the Sentinel RMS License software.

"Windows: Installing the Sentinel RMS License Manager" on page 49 or "Linux: Installing the Sentinel RMS License Server" on page 55

In this section:

GetHostID: Get HostID/Mac Address 128
lsmon: Monitor License Manager Transactions 129
lspool: Maintain Redundant License Manager Pool 130
lsrvdown: Shut Down the License Manager 132
lswhere: Display a List of License Managers 133
WlmAdmin Administrative Tool 134
Sldemo: Show Basic API Functions 138
Wechoid: Get a Computer Locking Code 142

GetHostID: Get HostID/Mac Address

GetHostID is a tool that retrieves the HostID/Mac address from the computer hosting the license server and saves it to a text file.

For Linux the output file is called `gethostid.log`. For Windows it is called `TC_Hostid.txt`.

- This is related to the "Full Network Client Installations" on page 45 using the Sentinel RMS License Manager (Windows) or Server (Linux), version 9.7.
- The tool is applicable to Windows and Linux (32-bit and 64-bit) operating systems. See "Windows: Installing the Sentinel RMS License Manager" on page 49 or "Linux: Installing the Sentinel RMS License Server" on page 55.

Windows

1. Extract `getHostID_win.zip`.
2. Right-click `getHostID_win.bat` and select **Run as Administrator** from the menu.

   The output is saved in a file: `TC_Hostid.txt` located in the same folder as `getHostID_win.bat`.

Linux 32-bit

1. Extract `gethostid.tar`.
2. Run the command: `>./gethostid`.

   The output is saved in a file: `gethostid.log` located in the same directory as `gethostid`.

Linux 64-bit

1. Extract `gethostid64.tar`.
2. Run the command: `>./gethostid64`.

   The output is saved in a file: `gethostid.log` located in the same directory as `gethostid64`.

lsmon: Monitor License Manager Transactions

- This is related to the "Full Network Client Installations" on page 45 using the Sentinel RMS License Manager (Windows) or Server (Linux), version 9.7.

- The tool is applicable to Windows and Linux (32-bit and 64-bit) operating systems. See "Windows: Installing the Sentinel RMS License Manager" on page 49 or "Linux: Installing the Sentinel RMS License Server" on page 55.

Platforms

Windows, Linux 32-bit, Linux 64-bit

The tool retrieves information about all features currently licensed by the Sentinel RMS License Manager, licenses, and clients.

On UNIX computers, you can use "Poll-interval-in-seconds" to specify that lsmon should keep monitoring and reporting usage activity instead of displaying information once and stopping. If specified, lsmon waits for that many seconds between re-polls of the License Manager.

lsmon monitors all licensed applications supported by a License Manager. If the License Manager supports licensed applications from multiple vendors, then all licenses for all vendors are displayed.

- On Windows, use `lsmon` *[Server-host]*
- On Linux 32-bit, use `lsmon` *[Poll-interval_in_seconds] [Server-host]*
- On Linux 64-bit, use `lsmon64` *[Poll-interval_in_seconds] [Server-host]*

Options

- *Poll-interval_in_seconds*: Enable periodic update at indicated rate. This option is supported on UNIX only).
- *Server-host*: The name of the computer on which the License Manager is running. If Server-host is omitted, lsmon will attempt to talk to the Sentinel RMS License Manager on the computer indicated in the LSHOST environment variable or in the LSHOST (or lshost) file. If the variable or the file does not exist, then it will attempt to contact a License Manager using the broadcast mechanism. If lsmon fails to find a Sentinel RMS License Manager, it will display an error message and exit.

lspool: Maintain Redundant License Manager Pool

- This is related to the "Full Network Client Installations" on page 45 using the Sentinel RMS License Manager (Windows) or Server (Linux), version 9.7.

- The tool is applicable to Windows and Linux (32-bit and 64-bit) operating systems. See "Windows: Installing the Sentinel RMS License Manager" on page 49 or "Linux: Installing the Sentinel RMS License Server" on page 55.

lspool is a redundant License Manager administration utility (command-line) for Windows and UNIX.

Options

- `h` Displays a list of lspool usage options.
- `a` *<license manager>* Adds the License Manager to the redundant License Manager pool. Specify the hostname or IP address of the License Manager system. Modifies the redundant license file.. On Windows, dynamic addition of License Manager in an existing redundant pool is not supported.
- `d` *<license manager>* Deletes the License Manager from the redundant License Manager pool. Specify the hostname or IP address of the License Manager system. Modifies the redundant license file. On Windows, dynamic deletion of License Manager in an existing redundant pool is not supported.
- `l` Displays the host name of the leader redundant License Manager.
- `p` Displays the list of License Managers in the redundant License Manager pool.
- `g` *< feature> <version>* Displays the license token distribution criteria for the specified feature/version. If the version is not specified, it must be replaced with empty quotation marks: " ".
- `L` *<event> <OFF|ON>* Disables/enables logging for an event. The events you select will be logged into the License Manager trace log file (only if error logging is enabled).

lspool - L Options

Events that can be logged using the -L option are given below. The following events are temporarily logged (except 1) and need to be set each time the License Manager is restarted.

- `0` Logs all events.
- `1` Logs when the License Manager is up. On by default. 2 Logs election of the leader License Manager.

- 3 Logs the two-way redundant License Manager heartbeat:> Leader License Manager periodically logs the update status received from all its followers

  > Follower License Manager periodically logs the update about the contact established with the current leader License Manager

- 5 Logs the usage information event, shared by the leader, regarding the number of tokens issued. 7 Logs the license token distribution information synchronization event.
- 9 Logs when the License Manager is down.
- 11 Logs addition of a license into the file or memory. Also logs deletion of a license from the memory.

lsrvdown: Shut Down the License Manager

- This is related to the "Full Network Client Installations" on page 45 using the Sentinel RMS License Manager (Windows) or Server (Linux), version 9.7.

- The tool is applicable to Windows and Linux (32-bit and 64-bit) operating systems. See "Windows: Installing the Sentinel RMS License Manager" on page 49 or "Linux: Installing the Sentinel RMS License Server" on page 55.

lsrvdown utility is used to shut down the named License Manager.

Platforms

Windows, Linux 32-bit, Linux 64-bit

- On Windows and Linux 32-bit use `lsrvdown host-name`
- On Linux 64-bit use `lsrvdown64 host-name`

lsrvdown can be run from the operating system command prompt by an administrative user on a client or License Manager computer.

- On UNIX, only the user logged in as “root” can use lsrvdown.
- On Windows, any user with administrative privileges may use lsrvdown unless the License Manager was started by a user logged in as Administrator, in which case only Administrator can shut the License Manager down. The computer on which you are running lsrvdown must be in the same network domain as the License Manager computer.

The same user must install the Sentinel RMS License Manager and also run this utility.

lswhere: Display a List of License Managers

- This is related to the "Full Network Client Installations" on page 45 using the Sentinel RMS License Manager (Windows) or Server (Linux), version 9.7.

- The tool is applicable to Windows and Linux (32-bit and 64-bit) operating systems. See "Windows: Installing the Sentinel RMS License Manager" on page 49 or "Linux: Installing the Sentinel RMS License Server" on page 55.

Platforms

Windows, Linux 32-bit, Linux 64-bit

lswhere command displays the network names of the computers running the License Manager. By default, lswhere displays for each License Manager the address of the computer on which that License Manager is running as well as its host name.

lswhere can be run on Windows and UNIX. lswhere should be run from the operating system command prompt by an administrator or application user on a standalone, client, or License Manager computer.

lswhere should be run in the following format:

- Windows and Linux 32-bit: `lswhere` *[option]*
- Linux 64-bit: `lswhere64` *[option]*

Options

- `d` Displays details on the License Managers found on the network.
- `r` Displays only the IP addresses of the License Managers found on the network (resolves the host names). lswhere can also be run without specifying any command line options.

WlmAdmin Administrative Tool

- This is related to the "Full Network Client Installations" on page 45 using the Sentinel RMS License Manager for Windows, version 9.7.
- The tool is applicable to Windows operating systems. See "Windows: Installing the Sentinel RMS License Manager" on page 49.

WlmAdmin performs a variety of administrative functions for the license management activities. It displays elaborate information that includes the License Manager information, feature information, and license and client information.

Platform

Windows

WlmAdmin can administer a remote Linux license server.

WlmAdmin Functions

- Provides information on the License Managers.
- Details on licenses and clients using them in the network. For example, the administrator can see which users have acquired that license and who are in a queue waiting for the license.

If you are using redundant License Managers, you can use WlmAdmin as an informational tool to:

- Add or delete a redundant License Manager from the redundant License Manager file.
- Display a list of all License Managers in the redundant License Manager pool and display the name of the License Manager leader.
- Display the distribution criteria for specific licenses (only high assurance model is allowed, where the reigning leader server keeps all the license tokens).

View License Manager Information

- Click the name of a License Manager in the left-hand pane of the main window. In the right-hand pane of the display, you see the IP address of the computer containing the License Manager and its host name.

Add or Remove a License Manager from the Defined Server List

- To add a License Manager: Right-click the name of a License Manager in the list of Subnet Servers. From the menu select **Add to Defined List**.
- To remove a License Manager: Right-click the name of a License Manager in the list of Defined Servers. From the menu select **Remove from Defined List**.

Add a License Code to the License Manager from a File

1. Right-click the name of a License Manager in the left-hand pane of the main window.
2. From the menu select **Add Feature > From a File > To Server and its File**.
3. To add the license from a file, select **From a File**. This permanently adds the license code to the License Manager license file as well as to the License Manager memory.
4. In the new windows, browse to the source file that contains the license code and click **Open**.
5. Select the license code file.

Delete Old License Features from the License Manager

1. Right-click the file `WlmAdmin.exe` and select **Run as Administrator**.

   If the license server is not found under subnet servers, go to **Edit > Defined Server List**.

2. Enter the host name or IP address of the license server.
3. Click **Add** and **OK**.
4. Click **View > Refresh All** to update the list.
5. Right-click the name of a License Manager in the left-hand pane of the main window.
6. From the menu select **Remove all Features**

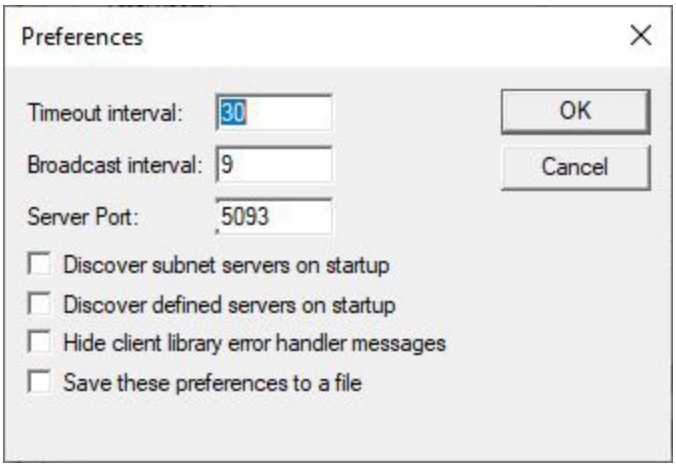
Shut Down a License Manager

- Right-click the name of a License Manager in the left-hand pane of the main window. From the menu select **Shutdown Server**.

Setting WlmAdmin Preferences

WlmAdmin allows you to choose what to display when it starts.

From the **Edit** menu, select the **Preferences** command to view WlmAdmin Preferences:



- **Timeout Interval**: The number of seconds after which WlmAdmin will stop trying to contact a License Manager. If you have a large network or a slow one, you might want to increase this number if you find WlmAdmin has difficulty retrieving information from License Managers.

- **Broadcast Interval**: Specify the number of seconds between broadcasts to the network to discover License Managers.

- **Server Port**: To set any custom port (other than the default port 5093) on which the RMS License Manager is running.

  Set this port number before you add that License Manager in the list of defined servers.

- **Discover subnet servers on startup**: To automatically discover and display the License Managers on your subnet.

- **Discover defined servers on startup**: To always show the License Managers you have defined.
- **Show client library error handler messages**: To pass license management error messages from Sentinel RMS to WlmAdmin.
- **Save these preferences to a file**: To save your choices.

Sldemo: Show Basic API Functions

- This is related to the "Full Network Client Installations" on page 45 using the Sentinel RMS License Manager for Windows, version 9.7.
- The tool is applicable to Windows operating systems. See "Windows: Installing the Sentinel RMS License Manager" on page 49.

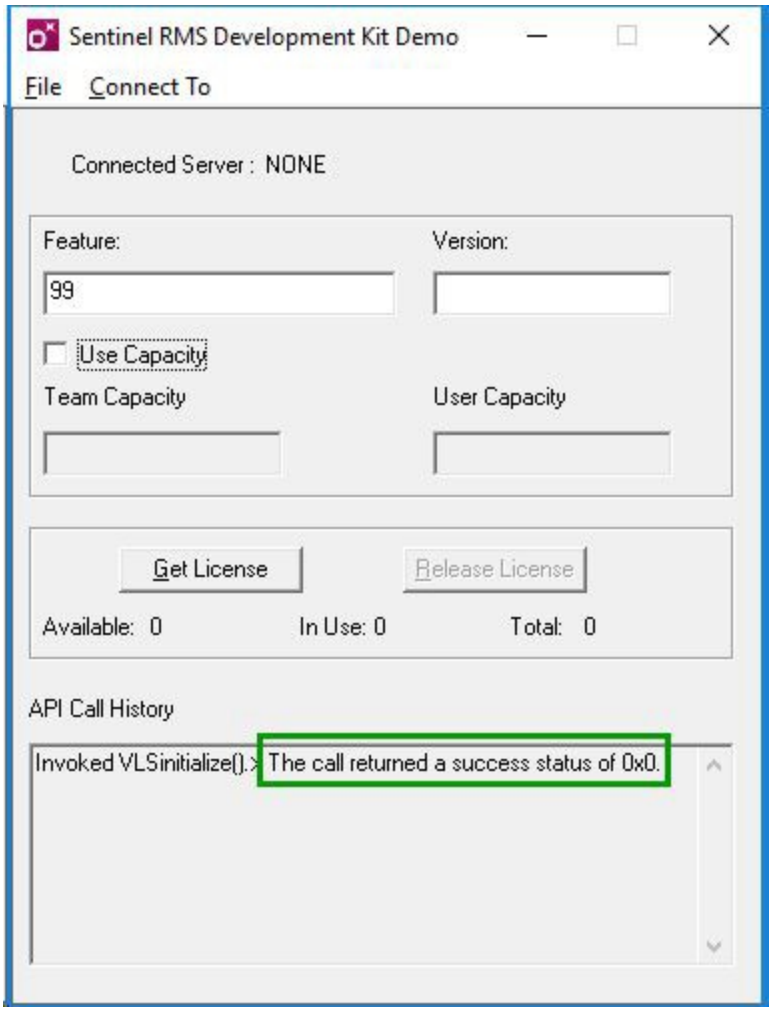
slmdemo is a Windows-based graphical sample program to show basic API functions. Evaluate it using the steps described here to understand the basic API calls and test the connectivity between client and license server

slmdemo can be used to test the connectivity to a remote Linux license server

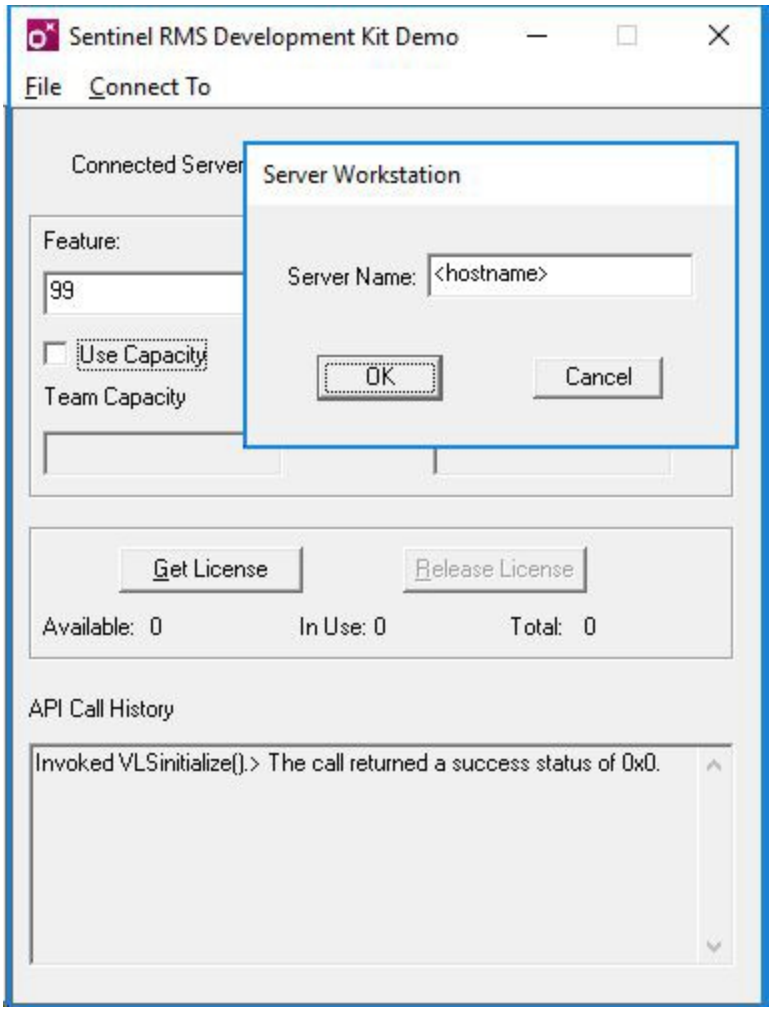
Platform

Windows

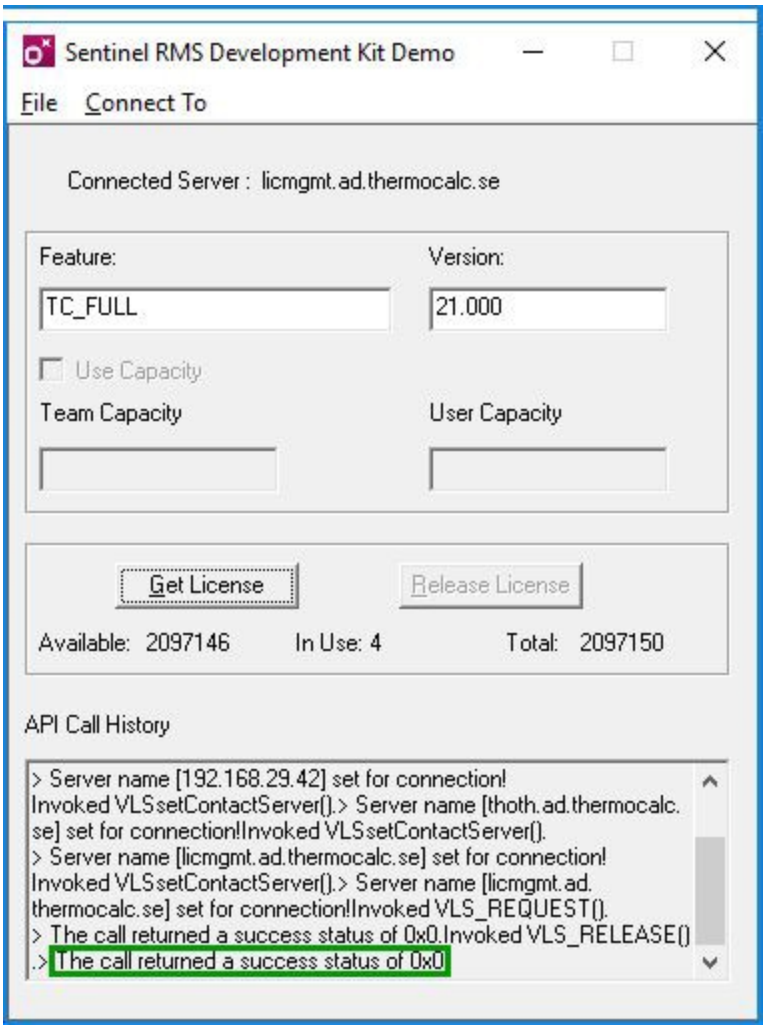
Right-click on the executable and select **Run as administrator**. slmdemo calls the VLSinitialize API when the application is invoked successfully.



Set the contact server (License Manager) under the **Connect To > Server** menu option. Enter a `hostname` , which is the hostname or IP address of the License Server.



Click **OK** and enter in the field one of the license features available in the network license file. Where *Feature* is the name of the feature ex. **TC_FULL** and *Version* is the license version in the NWL (Network) license. Click **Get License**. The message `The call returned a success status of 0x0` means that the connection client <> license server works.



To save the log, click **File > Save log**.

Wechoid: Get a Computer Locking Code

- This is related to the "Full Network Client Installations" on page 45 using the Sentinel RMS License Manager for Windows, version 9.7.

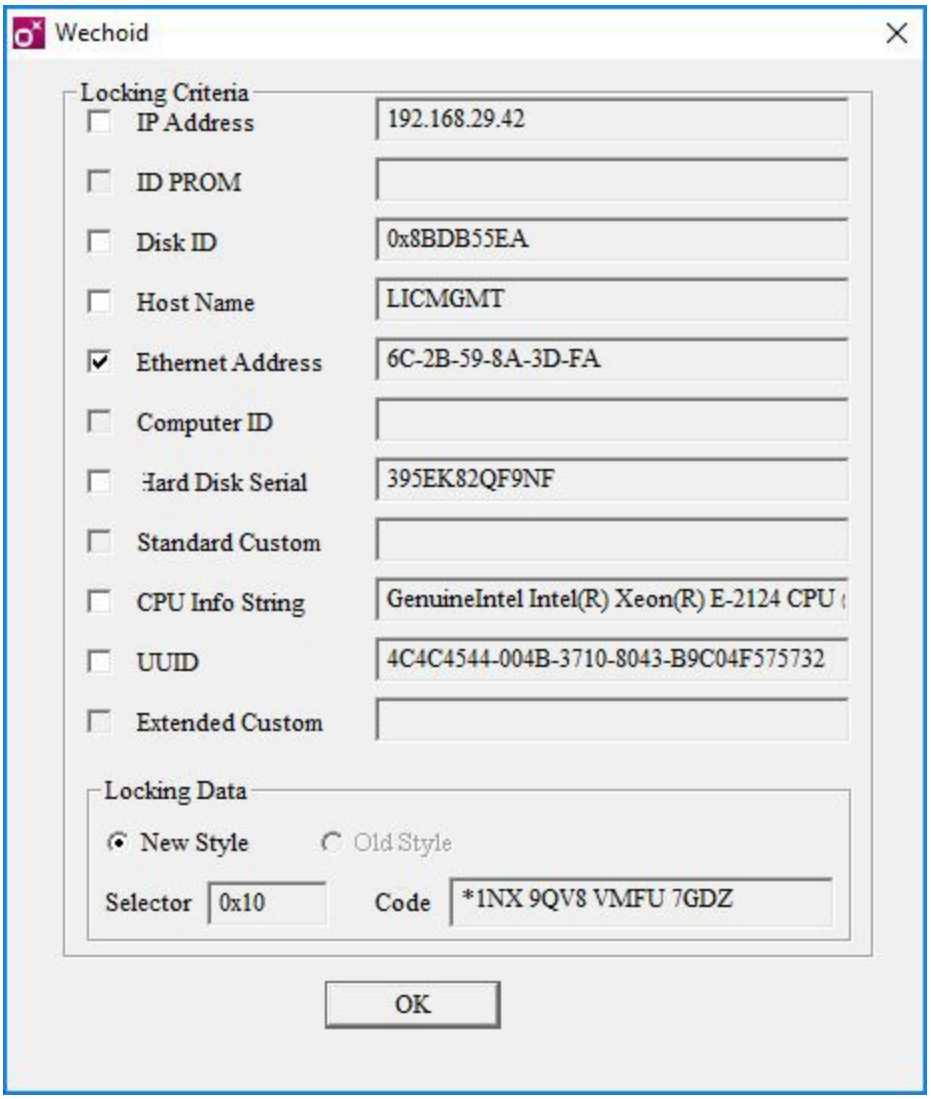
- The tool is applicable to Windows operating systems. See "Windows: Installing the Sentinel RMS License Manager" on page 49.

Before your software vendor creates a license code with any computer restrictions, you must get the locking code for your computer with the Wechoid program. Your software vendor will tell you which computers you must run Wechoid on. The Wechoid utility outputs either one or two hexadecimal locking codes depending upon how your software vendor has configured it. You will send all locking information to your software vendor. Your software vendor will use this information, which is specific to your computers, to generate new license codes.

Platform

Windows

When launched, the utility shows the available lock criteria (a checkmark is added next to each) and the values. Click to clear (uncheck) all checkboxes except for **Ethernet Address**.


Wechoid
Locking Criteria
IP Address
192.168.29.42
ID PROM
Disk ID
0x8BDB55EA
Host Name
LICMGMT
Ethernet Address
6C-2B-59-8A-3D-FA
Computer ID
Hard Disk Serial
395EK82QF9NF
Standard Custom
CPU Info String
GenuineIntel Intel(R) Xeon(R) E-2124 CPU
UUID
4C4C4544-004B-3710-8043-B9C04F575732
Extended Custom
Locking Data
New Style
Old Style
Selector
0x10
Code
*1NX 9QV8 VMFU 7GDZ
OK

Updating or Uninstalling the Software

Also see "Uninstalling TC-Toolbox for MATLAB®" on page 114

In this section:

Updating the Software for Interim Releases 145

Uninstalling Thermo-Calc 151

Updating the Software for Interim Releases

The full version of Thermo-Calc software is released twice a year. The software releases are named after the year of the release followed by an “a” for the first release of the year or a “b” for the second release of the year. For example, this release is 2024a.

Occasionally after a full release, an interim release version, an update, is required to fix a serious bug or to address an external issue that occurred after the full release. Software licenses come with a free 12 month Maintenance & Support Subscription, starting from the time of purchase, and this includes these software updates.

Go to our website to confirm the current distributed software version and determine if there are updates, or to learn more about Maintenance and Support options.

Installing an Updated Version of the Software

Step 1. Check for a Software Update

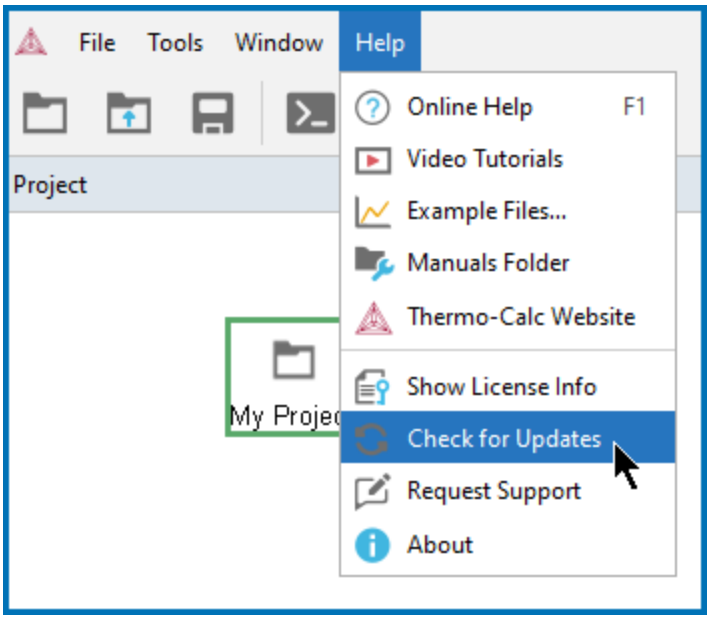
You can set your software to automatically check for updates upon start up.

- From within the software on the **Options** window, **General** tab, set **Check update interval** to **On start up**.

  To open the **Options** window:

  - Windows: Select **Tools** → **Options**.
  - Mac: Select **Thermo-Calc** *<version>* → **Preferences** or **Settings** or press <⌘> on the keyboard.

- If you do not have Automatic Updates on you can go to **Help** → **Check for Updates** .



Step 2. Follow the Installation Instructions for the Applicable OS

After the software has checked for updates and determined there is one, the applicable installation file for your operating system is downloaded. Then follow the instructions provided in the Installation Guide for the specific operating system and license type.

For an update to the software, no additional license files are required.

Step 3. Option to Save Backup User Created Files

There are significant operating system differences regarding what backup files are saved if you are installing an update on Windows versus macOS or Linux.

During the installation process, several default folders are added to your system that include documentation, materials, and example files. This is the same for all operating systems. During an update, Thermo-Calc runs a check of these default folders to determine if there are changed or new user files that are saved in these folders. For example, you might have saved a completely new project `*.tcu` file into the Examples folder, or after running one of the included examples such as *T_06_Serial_Equilibrium_Calculators.tcu*, the default file is changed and now includes results.

On Windows operating systems, Thermo-Calc gives you the opportunity after the installation to specifically save a backup of these user created or modified files to your Documents folder when you open Thermo-Calc for the first time after the update.

However, for macOS and Linux operating systems, the behavior is different due to limitations enabling the identification of changes to some files.

Operating System	*When does backup occur?*	*What files are copied?*
Windows	After installation, when you open the software for the first time	Documents, Materials, and/or Examples files are copied when you choose **Yes** at the prompt (see the Windows section for details).
macOS	During installation	There is an option during the installation process to save a backup copy of the Examples folder even if no changes are made to files (see the macOS or Linux sections for details). Materials and Documents folders are not automatically copied even if there are file changes or additions. However, you can always manually back up these folders (see the macOS or Linux sections for details).
Linux		

Windows

First complete the installation update. Then when you open Thermo-Calc for the first time, and if Thermo-Calc identifies that there are changed files, you are prompted with a **Software Update - Action Required** window that identifies the folders where the applicable files are changed or added.

These file types are not kept, i.e. these are excluded: dll, exe, lib, mltbx, pdf, whl, html, and htm.

Click **Yes** to save a backup of these changed files or **No** to continue opening Thermo-Calc as normal where the default set of folders are copied from the source `Public Documents` location into a user `Documents` folder.

If you choose to save a backup of the files, the new backup folder is added to this same location, for example:

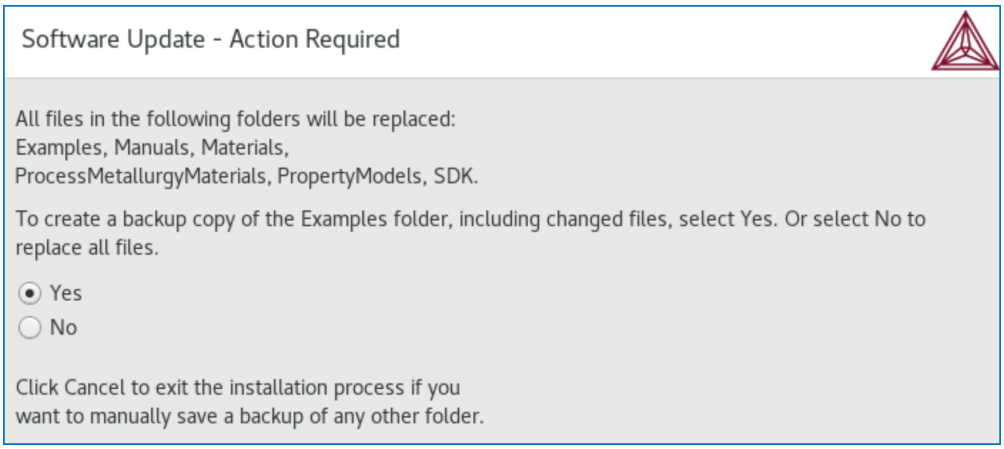
`C:\Users\<user>\Documents\Thermo-Calc\2024a_backup`

"Installation Default Directory: Windows" on page 22

macOS

During the installation process you are prompted with a **Software Update - Action Required** window.

This window always displays whether there are changes or additions to the folders or not.



The Materials and Documentation folders do not automatically have a backup saved. If you think there are user files you want to keep it is recommended that you click **Cancel** at this prompt to exit the installer, then manually copy the folders to another location. Then start the installation update process again.

To create a backup copy of the `Examples` folder, including changed files (i.e. all files are copied, not just the changed or new ones). Options at this prompt are to click:

- **Yes** to create the backup.
- **No** to replace all files.
- **Cancel** to exit the installation process, i.e. to manually save a backup of any other folder.

The default backup folder containing a full copy of all the contents of the `Examples` folder is saved to this location, for example:

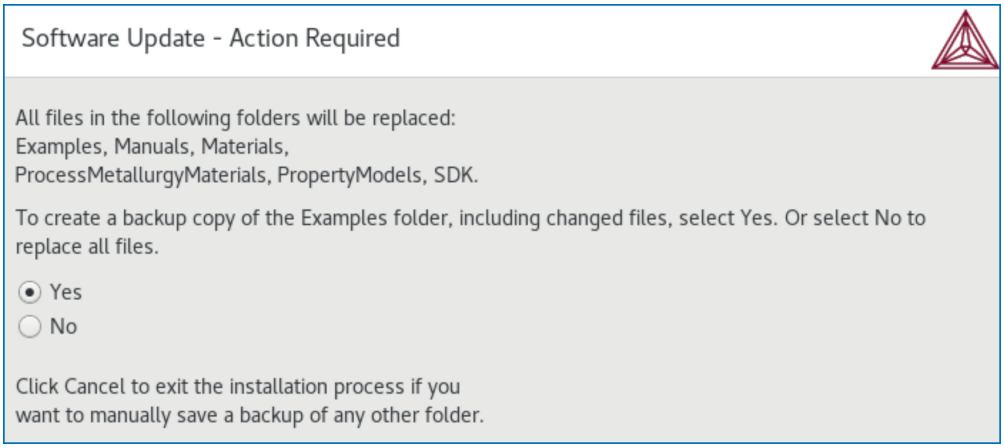
```
/Users/Shared/Thermo-Calc/2024a/Examples_backup
```

"Installation Default Directory: macOS" on page 23

Linux

During the installation process you are prompted with a **Software Update - Action Required** window.

This window always displays whether there are changes or additions to the folders or not.



The Materials and Documentation folders do not automatically have a backup saved. If you think there are user files you want to keep it is recommended that you click **Cancel** at this prompt to exit the installer, then manually copy the folders to another location. Then start the installation update process again.

To create a backup copy of the `Examples` folder, including changed files (i.e. all files are copied, not just the changed or new ones). Options at this prompt are to click:

- **Yes** to create the backup.
- **No** to replace all files.
- **Cancel** to exit the installation process, i.e. to manually save a backup of any other folder.

The default backup folder containing a full copy of all the contents of the `Examples` folder for Linux depends if you are a root super user requiring administrative privileges or a common user.

For example, for a common user:

```
/home/<user>/Thermo-Calc/2024a/Examples_backup
```

For example, for a root user:

```
/opt/Thermo-Calc/2024a/Examples_backup
```

"Installation Default Directory: Linux" on page 24

Uninstalling Thermo-Calc

"Uninstalling TC-Toolbox for MATLAB®" on page 114

Windows 10

1. From the **Control Panel** Desktop app, go to **Programs → Programs and Features → Uninstall or change a program**.
2. In the list of programs, locate the version of Thermo-Calc you want to uninstall. Click to highlight that row.
3. Click **Uninstall/Change**.
4. In the **Setup** window, **Uninstallation Mode** dialog box, choose to uninstall the **Entire application** or **Individual components**. Follow the instructions to finish.

macOS

Deleting the program from the Applications folder does not remove the program from your operating system. Run the **Thermo-Calc-***<version>***-uninstaller** program located in the Applications folder.

1. Go to the **Applications** folder and double click the file that starts with **Thermo-Calc-***<version>***-uninstaller**. Enter the administrator's user name and password.
2. Click **Yes** to choose **Entire application** or select individual components. Otherwise click **No** to quit.
3. The **Uninstalling Thermo-Calc** window shows the progress. Click **OK** when prompted.

Linux

1. To start the uninstallation procedure, in the Thermo-Calc installation directory use the command

   ```
   ./Thermo-Calc-2024a-uninstaller.run
   ```

   For *Thin Client* installations, use the command

   ```
   ./Thermo-Calc-client-2024a-uninstaller.run
   ```

2. To remove the whole application, including all its components, select **Entire application** and click **Forward**, or to remove specific components, select **Individual components** and click **Forward**.

If you intend to reinstall Thermo-Calc 2024a it is important to (1) Restart the computer before you reinstall the software and (2) remove the environmental variable TC24A_HOME.