FICO® Xpress Kalis Library APIs

13.4.3

USER GUIDE

FICO® Xpress Optimization

Artelys
solutions en optimisation

FICO®

©2005–2026 Fair Isaac Corporation and Artelys SA. All rights reserved. This documentation is the property of Fair Isaac Corporation ("FICO"). Receipt or possession of this documentation does not convey rights to disclose, reproduce, make derivative works, use, or allow others to use it except solely for internal evaluation purposes to determine whether to purchase a license to the software described in this documentation, or as otherwise set forth in a written software license agreement between you and FICO (or a FICO affiliate). Use of this documentation and the software described in it must conform strictly to the foregoing permitted uses, and no other use is permitted.

The information in this documentation is subject to change without notice. If you find any problems in this documentation, please report them to us in writing. Neither FICO nor its affiliates warrant that this documentation is error-free, nor are there any other warranties with respect to the documentation except as may be provided in the license agreement. FICO and its affiliates specifically disclaim any warranties, express or implied, including, but not limited to, non-infringement, merchantability and fitness for a particular purpose. Portions of this documentation and the software described in it may contain copyright of various authors and may be licensed under certain third-party licenses identified in the software, documentation, or both.

In no event shall FICO or its affiliates be liable to any person for direct, indirect, special, incidental, or consequential damages, including lost profits, arising out of the use of this documentation or the software described in it, even if FICO or its affiliates have been advised of the possibility of such damage. FICO and its affiliates have no obligation to provide maintenance, support, updates, enhancements, or modifications except as required to licensed users under a license agreement.

FICO is a registered trademark of Fair Isaac Corporation in the United States and may be a registered trademark of Fair Isaac Corporation in other countries. Other product and company names herein may be trademarks of their respective owners.

Patent(s): www.fico.com/en/patents

FICO® Xpress Kalis 13.4.3 (FICO® Xpress 9.9)
Deliverable Version: A
Last Revised: 15 May, 2026

How to Contact the Xpress Team

Sales and Maintenance

If you need information on other Xpress Optimization products, or you need to discuss maintenance contracts or other sales-related items, contact FICO by:

- Phone: +1 (408) 535-1500 or +44 207 940 8718
- Web: www.fico.com/optimization and use the available contact forms

Product Support

Customer Self Service Portal (online support): www.fico.com/en/product-support

Email: Support@fico.com (Please include *'Xpress'* in the subject line)

For the latest news and Xpress software and documentation updates, please visit the Xpress website at http://www.fico.com/xpress or subscribe to our mailing list.

How to Contact Artelys

Artelys SA

Information and Sales: info-kalis@artelys.com
Licensing and Product Support: support-kalis@artelys.com

Tel: +33 1 44 77 89 00
Fax: +33 1 42 96 22 61

12, rue du Quatre Septembre
75002 Paris Cedex
France

For the latest news about Kalis, training course programs, and examples, please visit the Artelys website at http://www.artelys.com.

Contents

1 Kalis Library Guide 1

1.1 Introduction . . . 1
1.2 Installation and Licensing . . . 1
1.3 Prerequisites . . . 1
1.3.1 Setting Environment Variables on Windows . . . 1
1.3.2 Setting Environment Variables on Linux, MacOS . . . 2
1.3.2.1 Linux . . . 2
1.3.2.2 MacOS . . . 2
1.4 Documentation . . . 3
1.4.1 Kalis Libraries User Guide . . . 3
1.4.2 Kalis Libraries Reference Manuals . . . 3

Appendix 4

A Contacting FICO 4

FICO Customer Support . . . 4
Documentation . . . 4
FICO Learning . . . 5
Sales and maintenance . . . 5
About FICO . . . 5

CHAPTER 1

Kalis Library Guide

1.1 Introduction

This document introduces the Xpress Kalis APIs. In addition to Kalis for Mosel, Xpress Kalis includes application programming interfaces for C++, Java, and Python to formulate Constraint Programming (CP) models and solve them using the Kalis constraint programming engine for applications developed in those languages.

1.2 Installation and Licensing

During the installation of Xpress, you will be asked whether you would like to install Xpress Kalis. If you choose to install and accept the license terms, the Xpress Kalis libraries with be installed into the `<XPRESSDIR>/lib` folder and the corresponding binaries in the `<XPRESSDIR>/bin` folder. `<XPRESSDIR>` is the folder in which you have installed Xpress. The distribution includes the Kalis Mosel User Guide and Kalis Mosel Reference Manual which can be found in PDF format in `<XPRESSDIR>/docs/solver/kalis`.

You need a valid license file to use the Kalis engine. To obtain a license, please contact your sales representative or see the 'How to Contact the Xpress Team' section. See the FICO Xpress Licensing section on how to setup Xpress licenses.

1.3 Prerequisites

Please refer to the list of supported platforms to determine the supported platforms for installing and using the Xpress Kalis APIs. To use the Xpress Kalis APIs, it is assumed that you have installed Xpress and have setup the licenses appropriately as described in the previous sections. It is also assumed that you have installed the programming language (C++, Java or Python) that you wish to use to develop Xpress Kalis applications.

1.3.1 Setting Environment Variables on Windows

In order to run Xpress Kalis binary or executable files from anywhere on your Windows machine, as well as load dynamic libraries (or DLLs) used by Xpress Kalis at runtime, it is necessary to make sure that the `PATH` system environment variable is set properly on your Windows machine. In particular, you must update the system PATH environment variable so that it indicates the locations of the `<XPRESSDIR>/lib` and `<XPRESSDIR>/bin` folders.

Note that you may need to restart your Windows machine after modifying the environment variables, for the changes to take effect. Simply logging out and relogging in is not enough. Moreover, if the `PATH` environment variable points to more than one folder that contains an executable or DLL of the same name, the one that will be chosen is the one whose folder appears first in the `PATH` variable definition.

1.3.2 Setting Environment Variables on Linux, MacOS

In order to run Xpress Kalis binary or executable files from anywhere on your Linux or MacOS computer, as well as load dynamic, shared libraries (*i.e.* `.so` or `.dylib` files) used by Xpress Kalis at runtime, it is necessary to make sure that several environment variables are set properly on your machine.

You must also update the `LD_LIBRARY_PATH` (`DYLD_LIBRARY_PATH` on MacOS) environment variable so that it indicates the location of the `<XPRESSDIR>/lib` directory.

Setting the `PATH` and `LD_LIBRARY_PATH` (`DYLD_LIBRARY_PATH` on MacOS) environment variables on can be done as follows. In the instructions below, replace *<file_absolute_library_path>* with the full path to the directory containing the Xpress Kalis shared object library (*e.g.*, the `<XPRESSDIR>/lib` directory) and *<file_absolute_path>* with the path to the directory containing the binary files (*e.g.*, the `<XPRESSDIR>/bin` directory).

1.3.2.1 Linux

If you run a bash shell, then type:

```
> export PATH=<file_absolute_path>:$PATH
> export LD_LIBRARY_PATH=<file_absolute_library_path>:$LD_LIBRARY_PATH
```

If you run a csh or tcsh shell, then type:

```
> setenv PATH <file_absolute_path>:$PATH
> setenv LD_LIBRARY_PATH <file_absolute_library_path>:$LD_LIBRARY_PATH
```

1.3.2.2 MacOS

Determine the shell being used:

```
> echo $SHELL
```

If you run a bash shell, then type:

```
> export PATH=<file_absolute_path>:$PATH
> export DYLD_LIBRARY_PATH=<file_absolute_library_path>:$DYLD_LIBRARY_PATH
```

If you run a csh or tcsh shell, then type:

```
> setenv PATH <file_absolute_path>:$PATH
> setenv DYLD_LIBRARY_PATH <file_absolute_library_path>:$DYLD_LIBRARY_PATH
```

Note that the value of the environment variable is only valid in the shell in which it was defined. Moreover, if a particular environment variable points to more than one directory that contains a binary or dynamic library of the same name, the one that will be chosen is the one whose directory appears first in the environment variable definition.

1.4 Documentation

Please refer to the following links for documentation on how to use the Xpress Kalis Libraries.

NOTE that upon clicking the links below, you will be leaving https://www.fico.com and directed to Artelys' website https://www.artelys.com.

1.4.1 Kalis Libraries User Guide

Solving a constraint problem

Continuous variables and numerical CSP

Optimizing with Kalis

Controlling the solution search

Improvement Techniques

Debugging and Tracing

Advanced Search Strategies

Define your own constraints

Constraints examples

Scheduling

Glossary

1.4.2 Kalis Libraries Reference Manuals

C++ reference

Java reference

Python reference

Appendix A

Contacting FICO

FICO provides clients with support and services for all our products.

FICO Customer Support

FICO Customer Support offers technical support and services ranging from self-help tools to direct assistance with a FICO technical support engineer. Support is available to all clients who have an active maintenance contract.

The FICO Customer Self-Service Portal (support.fico.com) is a secure web portal that allows users to open, review, and update their support cases; manage their organization's portal users; find solutions to common problems in the FICO Knowledge Base; and view the availability of their cloud applications 24 hours a day, 7 days a week.

You can find support contact information and a link to the FICO Customer Self-Service Portal (online support) on the Product Support home page (www.fico.com/en/product-support).

Please include *'Xpress'* in the subject line of your support queries.

Documentation

FICO continually looks for new ways to improve and enhance the value of the products and services we provide.

If you have comments or suggestions regarding how we can improve this documentation, let us know by sending your suggestions to techpubs@fico.com. Please include your contact information (name, company, email address, and optionally, your phone number) so we may reach you if we have questions.

FICO Learning

FICO Learning is the principal provider of product training for our clients and partners. FICO Learning offers instructor-led classroom courses, web-based training, seminars, and training tools for both new user enablement and ongoing performance support.

For additional information, visit the FICO Learning home page at www.fico.com/en/product-training or email producteducation@fico.com.

Sales and maintenance

If you need information on other Xpress Optimization products, or you need to discuss maintenance contracts or other sales-related items, contact FICO by:

- Phone: +1 (408) 535-1500 or +44 207 940 8718
- Web: www.fico.com/optimization and use the available contact forms

About FICO

FICO (NYSE:FICO) is a leading analytics software company, helping businesses in 90+ countries make better decisions that drive higher levels of growth, profitability, and customer satisfaction. Learn more at www.fico.com or contact us at www.fico.com/en/contact-us.