Introduction

This document is the user manual of the SpiritIT Flow-Xpert software. SpiritIT Flow-Xpert provides flow and fluid property calculations that are commonly used in the oil and gas industry, both in metric and US customary units.

For more information

All publications of SpiritIT Flow-Xpert are available for free download from:

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<thead>
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<th>Search for:</th>
<th>IM/Xpert-EN</th>
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<tr>
<td>SpiritIT Flow-Xpert user manual</td>
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1 Introduction

This document is the user manual of the SpiritIT Flow-Xpert software product. SpiritIT Flow-Xpert provides flow and fluid property calculations that are commonly used in the oil and gas industry and in both metric and US customary units.

The purpose of the SpiritIT Flow-Xpert is to provide certified, documented and carefully tested calculations that can be used to verify calculations provided by other software and hardware products.

All calculations have been tested extensively against the corresponding API, ISO, AGA, GPA, ASTM and GERG standards and also against other established software products used in the industry for verification of flow and fluid property calculations.

SpiritIT Flow-Xpert is available in three editions. The Basic edition provides the full set of calculations through an intuitive ‘fill in the blanks’ Windows programs. Calculations can be saved and opened for future reference.

The Excel edition is an Excel add-in that provides a powerful tool to build complete applications to verify flow computer calculations starting from the raw input up to the final flow rates. The add-in provides all calculations as worksheet functions in a similar way to the standard Excel worksheet functions.

The DLL edition allows for integration in any application written in a language that provides support for DLLs. Examples include C++ and Visual Basic.

2 SpiritIT Flow-Xpert editions

SpiritIT Flow-Xpert is available in the following editions

Basic Edition
Basic flow calculation package with our appealing Web interface, for easy access to the flow calculations. The flow calculations include all oil and gas calculations as described and are partially validated by NMI and CEESI.

All flow calculations have been implemented as simple and straightforward web-like pages that are selected with an explorer-like navigation tree. This edition is mostly for customers who have a need of the calculations and want to be instantly up-and-running after installation of the software in a few minutes

Excel Edition
Complete package with all our flow calculations, available as Excel add-in where flow calculation functions can be inserted in your own flow calculation sheets.

All flow calculations have been implemented as simple and straightforward spreadsheet functions that can even be inserted to your own calculation and validation workbooks. From our rich flow calculation functions and sophisticated tables, charts can be easily created. Multiple gas compositions can be easily created to run larger sets of calculations on a single worksheet.

Being integrated in a modern Graphical User Interface environment, the user is offered a rich and powerful 2D and 3D charting environment with which, superb presentations of calculated results can be created.

You will be up-and-running in seconds with our intuitive library. The installation process is simple and straightforward and will take few minutes to complete.

Enterprise Edition
The Enterprise Edition allows you to develop your own software environment with our flow calculation package, based on our Component Object Model (COM) and C++ interface with our LIB/DLL/H interface.

All flow calculations have been implemented in a programming environment offering a Component Object Model (COM) interface as well as a traditional Windows API in .DLL format, complete with Library (.LIB) and Header file (.H). This software model allows for integration of our flow calculations in your corporate software tools and.
3 Software installation

Software requirements


SpiritIT Flow-Xpert Excel edition requires the 32-bit edition of Microsoft Excel 2007 SP2, Microsoft Excel 2010, Microsoft Excel 2013 or Microsoft Excel 2016. If you have not installed Microsoft Excel yet on your target machine, now is the time to install Microsoft Excel prior to installing SpiritIT Flow-Xpert. If you have an older version of Microsoft Excel, you might want to check for a newer version via http://office.microsoft.com/.

Ignoring this remark about updating your Microsoft Office product to the latest Service Release may cause problems using SpiritIT Flow-Xpert.

Installing SpiritIT Flow-Xpert on your computer

In order to install the software onto your hard disk, insert the disk in your CD-ROM drive (or browse to the directory containing the setup package), and install the FlowXpert Setup package. The following display page appears:

Figure 3-1 SpiritIT Flow-Xpert setup program

This page tells the user which version will be installed, or in case of upgrading which version will be upgraded. The "Next"-button may be pressed, after which the End User License Agreement dialog is displayed.

When the user has accepted the end-user license agreement, the install features and location can be selected.

Figure 3-2 Choosing installation options

The default folder on a 32-bit operating system is "C:\Program Files\FlowXpress". On a 64-bit operating system, the default installation folder is "C:\Program Files (x86)\FlowXpress". The user may select another existing program folder, or define a new folder for the program files.

Selecting Next will install the files to your computer.
When the copying process has been completed, the user is presented with a dialog containing license information.

**Figure 3-4 Entering license information**

End-user: Your full name, or the name of your department using the SpiritIT Flow-Xpert software, for example: “John Doe”, or “Flow Analytics”.

Company: The name of your organization to which the license will be granted, for example “JD & Partners”.

System: The name of the computer or system on which the software will be running, for example “FLOW-LAB-03” or “Greenfield metering station”.

When you have installed the software, a temporary license is automatically installed on your machine, with which you may run most portions of the software for a period of 15 days.

If you already have an installed permanent license, this license remains active. During product upgrades, no additional licenses have to be installed at all.
When the following dialog appears, the computer must be restarted prior to using the software:

![Figure 3-5 Setup has been completed](image)

Please restart the computer if this message is displayed, after which the installation process is completed.

**Using the License Manager**

SpiritIT Flow-Xpert uses a software based license system by default. Alternatively you can order a hardware dongle instead. The software license is based on the data that you have entered, as well as on the machine that the software is installed on.

If the machine on which the software is installed is replaced with another machine, you may request for a new authorization code, which will be generated and sent to you by ABB.

After initial installation you have a temporary license. A permanent license can be requested through the License Manager, which can be found in the Start menu of Windows:

![Figure 3-6 Using the License Manager](image)

You may use standard Windows Copy (<Ctrl-C>) and Paste (<Ctrl-V>) keys to create an e-mail message containing the above four fields: End-User, Company, System and the Machine Identification Code (“TK6NQ-9LQKN-LK3QA” in the example above).

Alternatively, you may generate a text file, which may be sent as a file attachment. To achieve this, select “Export” in the dialog.

![Figure 3-7 License manager utility](image)

Please send the e-mail with this data to: nl-spiritit-support@abb.com, after which you will obtain your authorization key and license number.

The 24-character authorization key consists of five fields, separated with a dash '-' character, as in the format: “AAAAA-BBBBBB-CCCCC-DDDDD-EEEE”.

Both the authorization key and the license number should be exactly entered in the dialog box above, in the ‘Authorization key’. The Install button verifies the authorization information and installs it to your computer.

When this process has been complete without error messages, the license installation process has been completed.

Congratulations! You are now up and running!
4 SpiritIT Flow-Xpert Basic Edition

Starting the application

In order to use the Basic mode the SpiritIT Flow-Xpert Basic license needs to be authorized.

The SpiritIT Flow-Xpert Basic Edition can be started from the Windows Task bar.

The calculations are grouped in US Customary and Metric units, each having the sub-groups 'Gas properties', 'Liquid properties' and 'Flow calculations'.

Each calculation is grouped in two sections: the 'Inputs' and the 'Results'.

Entering data

Input values that can be changed is identified with a pencil icon behind it.

To edit an input value, click on the value and enter the new value.

By using the up and down arrows or the TAB you can quickly go over all the input data.

Saving your work

The actual input values (parameters) can be saved to a file and be re-used later on.

To save the input values to a file select File, Save Parameters.
The restore a set of parameters, select File, Load Parameters and select the file.

**Working with application files**

⚠️ This feature is reserved for future use!

SpiritIT Flow-Xpert has the option to load a different application that contains a user-defined set of calculations.

To open a different application select File, Open

To automatically load a specific application at program startup select View, Settings

Select Custom and select the application that needs to be opened automatically at startup.
5 Using SpiritIT Flow-Xpert functions in Excel

In order to use the SpiritIT Flow-Xpress in Excel, the SpiritIT Flow-Xpert Excel license needs to be authorized.

Windows User Account Control Consideration

When User Account Control is active, Excel is required to be run in Administrator mode in order to use the SpiritIT Flow-Xpert functions. If User Account Control is not active, this paragraph does not apply.

To run Excel in Administrator mode, press and hold the shift key, right click the Excel icon, and select ‘Run as …’. When asked, provide the password and click OK. If asked whether you want to continue this action, select ‘yes’.

Using SpiritIT Flow-Xpert functions in Excel sheets

In SpiritIT Flow-Xpert a large number of worksheet functions is available to implement the required functionality for your application.

Most worksheet functions may be inserted using the ‘Insert Function’ button while in design-mode, or via the ‘Function’ option from the ‘Insert’ menu.

Figure 5-1 Various examples of the Insert function button
You may insert any type of worksheet function, SpiritIT Flow-Xpert and non-Flow-Xpert specific. You may also create your own worksheet functions that may be inserted in a SpiritIT Flow-Xpert application, or in any other type of Excel workbook. For SpiritIT Flow-Xpert functions, make sure to select the category ‘Flow-Xpert’ in the drop down box.

Figure 5-2 Insert Function dialog

After selecting the required function, a dialog similar to the one below is shown:

Figure 5-3 Function arguments dialog

This dialog helps in providing correct arguments to the function. It is allowed to provide values or cell references; If a value is located in another cell, the colored button may be pressed to allow the selection of the cell that contains the value for the argument.

A number of functions use [Name] as first argument. For Excel, this argument may be left blank, or an empty string, indicated by 2 double quotes with nothing in between (""").
A special case in above example is Composition. A composition is not a single value, but rather an array of numbers holding the values for all applicable components (methane, ethane, propane etc.).

All functions of SpiritIT Flow-Xpert that need a composition as an argument use the same component ordering, even if the specific function does not use all available components (such as NX19).

<table>
<thead>
<tr>
<th>Nr</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Methane</td>
</tr>
<tr>
<td>2</td>
<td>Nitrogen</td>
</tr>
<tr>
<td>3</td>
<td>Carbon Dioxide</td>
</tr>
<tr>
<td>4</td>
<td>Ethane</td>
</tr>
<tr>
<td>5</td>
<td>Propane</td>
</tr>
<tr>
<td>6</td>
<td>Water</td>
</tr>
<tr>
<td>7</td>
<td>Hydrogen Sulphide</td>
</tr>
<tr>
<td>8</td>
<td>Hydrogen</td>
</tr>
<tr>
<td>9</td>
<td>Carbon Monoxide</td>
</tr>
<tr>
<td>10</td>
<td>Oxygen</td>
</tr>
<tr>
<td>11</td>
<td>i-Butane</td>
</tr>
<tr>
<td>12</td>
<td>n-Butane</td>
</tr>
<tr>
<td>13</td>
<td>i-Pentane</td>
</tr>
<tr>
<td>14</td>
<td>n-Pentane</td>
</tr>
<tr>
<td>15</td>
<td>n-Hexane</td>
</tr>
<tr>
<td>16</td>
<td>n-Heptane</td>
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</tr>
<tr>
<td>21</td>
<td>Argon</td>
</tr>
<tr>
<td>22</td>
<td>Neo-Pentane</td>
</tr>
</tbody>
</table>

The composition is one parameter, an array parameter, in the function call; See the SpiritIT Flow-Xpert demo Excel application for an example how to handle compositions in function calls.

Some functions do not return a single value as result, but an array of values as well. This is also true for above example. SpiritIT Flow-Xpert excel functions return arrays as columns. In order to enter a function returning an array, select the cells where the output should go. Enter the function with its parameters as you would always do, but to complete the action do not just press ‘Enter’, but Ctrl-Shift-Enter. The fact that the function now returns an array rather than one function is indicated by curly brackets around the formula. E.g. \{fxAGA8_C(E35;E37;…;G67)\}. Do not enter these curly brackets yourself, Excel does this. For more information on working with arrays in Excel, please see Excel help, keyword ‘arrays’.
6 Revisions

Revision A
Date November 2017
- Update to new ABB lay-out
- New document code: CM/FlowX/FR-EN
- Reintroduce revisions chapter

Revision B
Date March 2018
- Moved calculations to function reference document