KELTON

Delivering Measurement Excellence

Software Applications

FLOCALC™ User Manual

Abstract

This document is the user manual for working with KELTON™ Standard Calculation Package (FLOCALC)

Contents

1.0 Revision Control

Rev	Issue date	Description	Prep.	App.
1	Jun 2013	Issued	MH	MH
1.1	Jul 2016	Reformatted	JON	MH
1.2	Jul 2016	Updated images	INB	JON
1.3	Nov 2017	Reformatted	KW	JON
1.4	Sep 2018	Updated in accordance with brand guidelines	KW	JON

2.0 Introduction

FLOCALC is the KELTON calculation package designed for flow measurement engineers and technicians. FLOCALC is the fourth generation of this application redesigned to work with current operating systems. FloXL enables FLOCALC calculations to be run as functions within Microsoft Excel 2010 workbooks.

3.0 FLOCALC Installation

FLOCALC is delivered with an installation manual to guide the installer through the process of installing the application and accessing your licensed calculations. The most recent copy of the installation manual is available from KELTON on request.

4.0 Getting Started

Running FLOCALC

FLOCALC, like any other Windows application, can be started from the Windows start menu; this is located under the Kelton Engineering Ltd group. Alternatively, a shortcut to the application is installed on the desktop. If FLOCALC is installed as part of KELTON MeterManager, it can be run from the FLOCALC icon.
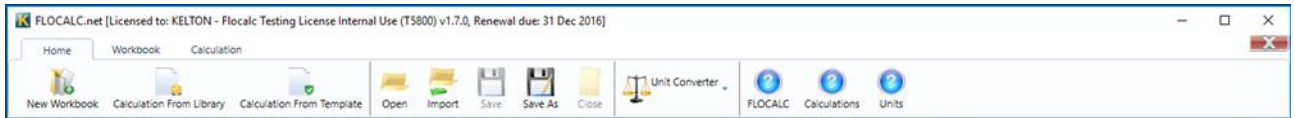
The FLOCALC Workspace

FLOCALC will open to show the main window from which all elements of the application can be accessed.

This window contains three toolbars and will switch between toolbar automatically as you use the application.

The Home Tab Toolbar

The Home tab contains the first toolbar you will see when you open the application.

This contains buttons for creating and saving workbooks and calculations along with common features such as viewing the help files and the unit converter utility.
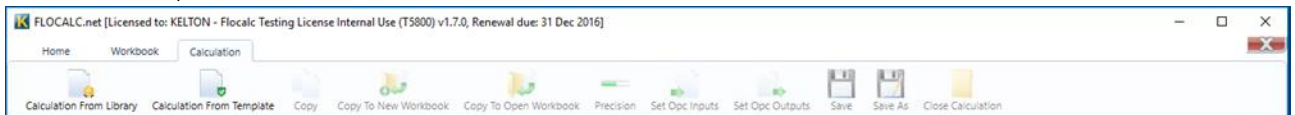
The Workbook Tab Toolbar

The Workbook toolbar is visible when working in a workbook and contains buttons to run common commands associated with manipulating workbooks.
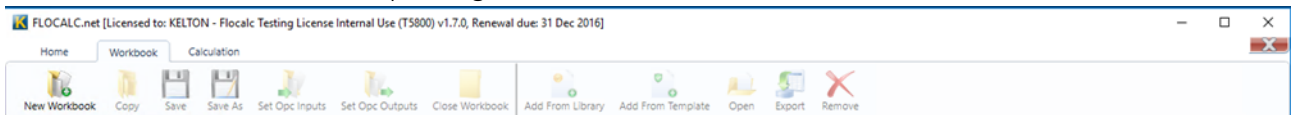
The Calculation Tab Toolbar

The Calculation toolbar is visible when working in a calculation and contains buttons to run common commands required.

5.0 Calculations

Opening a Calculation from the Library

FLOCALC accesses the KELTON Common Calculation Library (KCCL), a library of calculations which is continually updated as new standards and calculations are added. To select a new calculation, click on the Calculation from Library button on the Home toolbar. This button is also available on the Calculation tab.

Within KCCL Calculations are referenced by a number preceded by a C. This is the base calculation number which is used by KELTON for managing the calculation. Within FLOCALC there is also a

reference number proceeded by an F, which is the FLOCALC calculation reference number. Clicking the *Calculation*, '*F*' ref or *Title* headings will sort the calculation by the heading clicked. There are a number of options available to help find and select the required calculation.

Group

Calculations are grouped according to the standards they are referenced to; selecting a standard group in the left-hand pane will filter the list of calculations to show only those belonging to the standard group. The *All* group shows all calculations except the Legacy calculations.

Show Legacy Group

Check this option to display Legacy calculations. Legacy calculations are those which are included in the calculation library to maintain compatibility with calculations created in previous versions of the application. Most Legacy calculations will have been updated with a new version which may have more options or different calculation methods.

Show Locked Calculations

The list of calculations will only display those which are included in the purchased license. To see other calculations that are available, check the Show Locked Calculations check-box.

Opening a Calculation

To open a selected calculation, either double-click the calculation in the list or select by clicking the entry and then clicking the ok button.

Running Calculations

All FLOCALC calculations follow a similar structure and contain the following components.

General

The General tab contains header information which can be added to the calculation. This is particularly useful if a record of the calculation is to be saved or sent to another user. Information can be entered into a number of predefined fields such as Site, Tag and Client.

Other information on this tab is; the date the calculation was last modified, the KCCL reference and the date the calculation was last modified in KCCL.
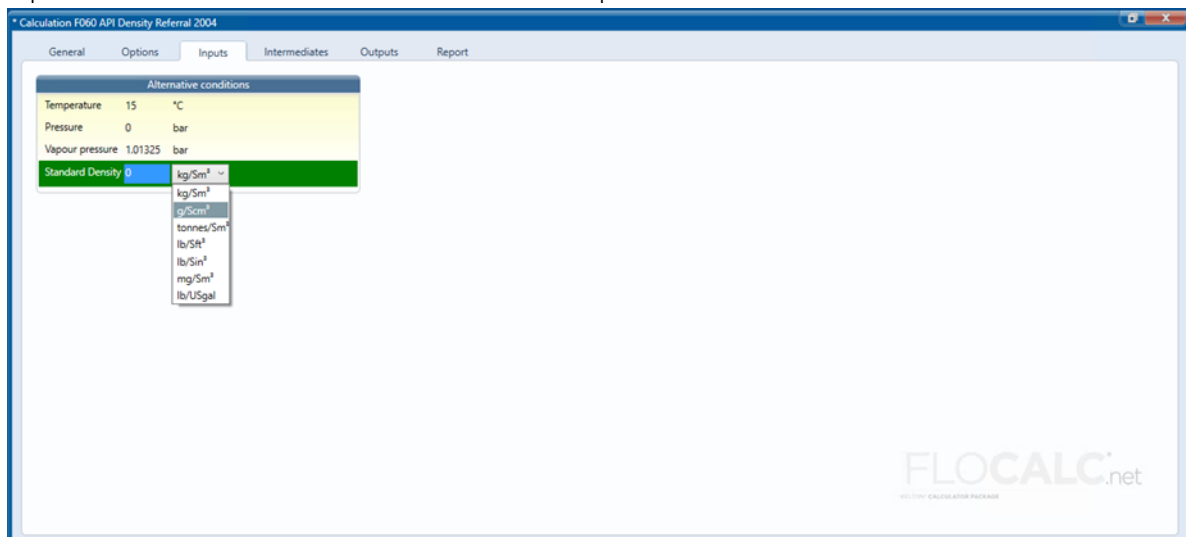
Options

Many of the calculations contain Options which control how the calculation is performed and the parameters used.

In this example, the user is provided with options for calculating standard density or density. Choosing the Commodity group and setting the reference temperature. In some calculations, choosing an option may introduce further options.
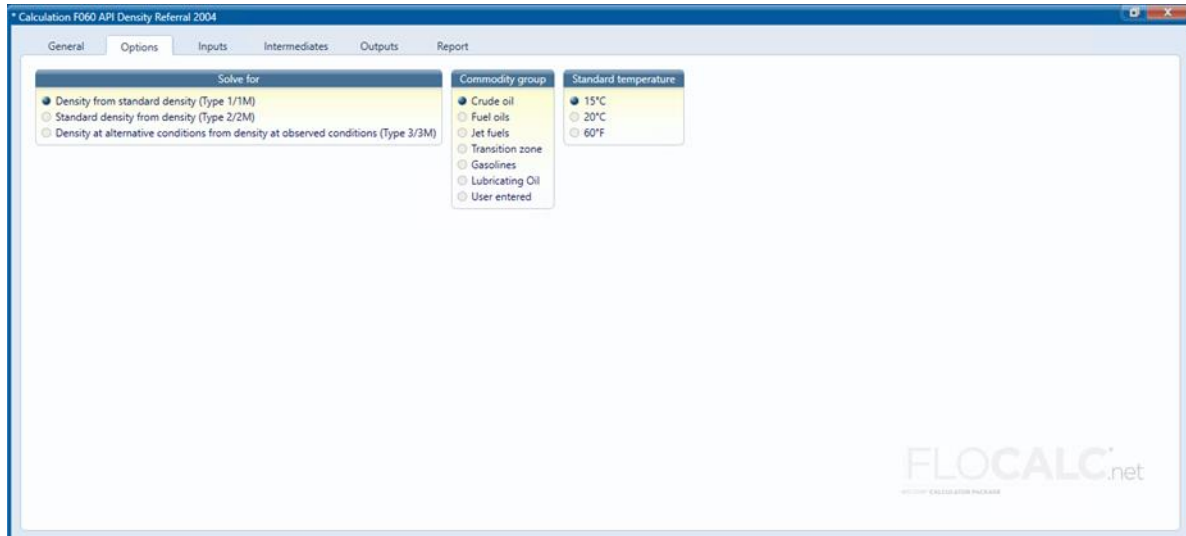
Inputs

Inputs for the calculation are entered under the inputs tab.

The selection of inputs for a calculation may change depending upon the options that are selected. In this example Standard Density is shown as an input because the option to solve for Density from standard density was selected; had the option to solve for Standard density from density been selected the input would have been Density.

The engineering unit for each input can be selected by clicking on the unit and picking from the drop-down list.

Intermediates

Intermediate results from a calculation are displayed in the intermediates tab. This feature is useful when investigating calculation errors or discrepancies.
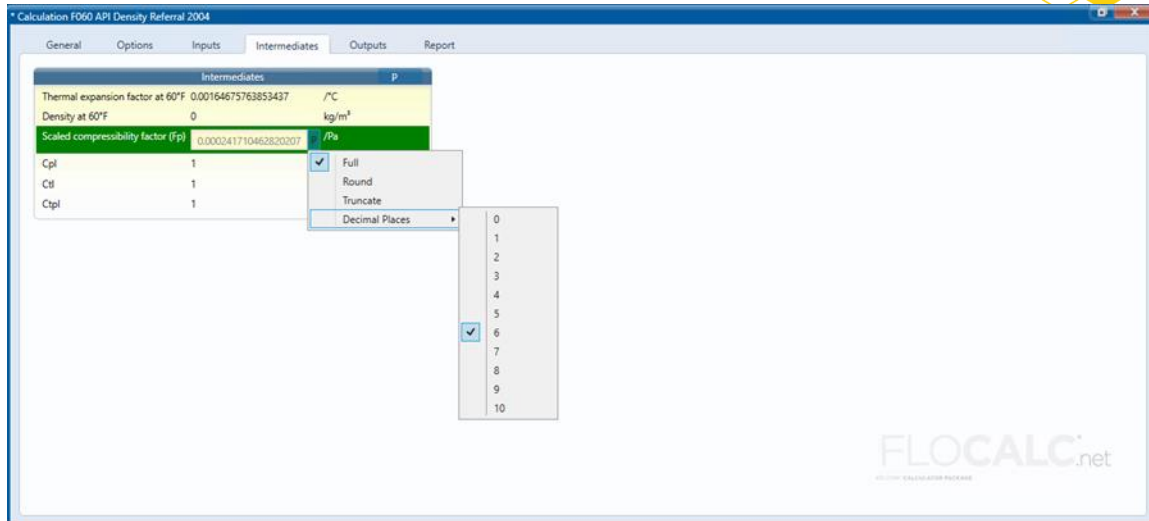
By default, the intermediate results are shown to the full precision but can be rounded or truncated by clicking on the 'P' (precision) button, selecting whether to round or truncate and then selecting the number of decimal places.

To round all items in a group to the same precision, click on the 'P' in the group heading. If you would like to round individual values to different levels of precision click on the value to round and then click the 'P' to the right of the value.
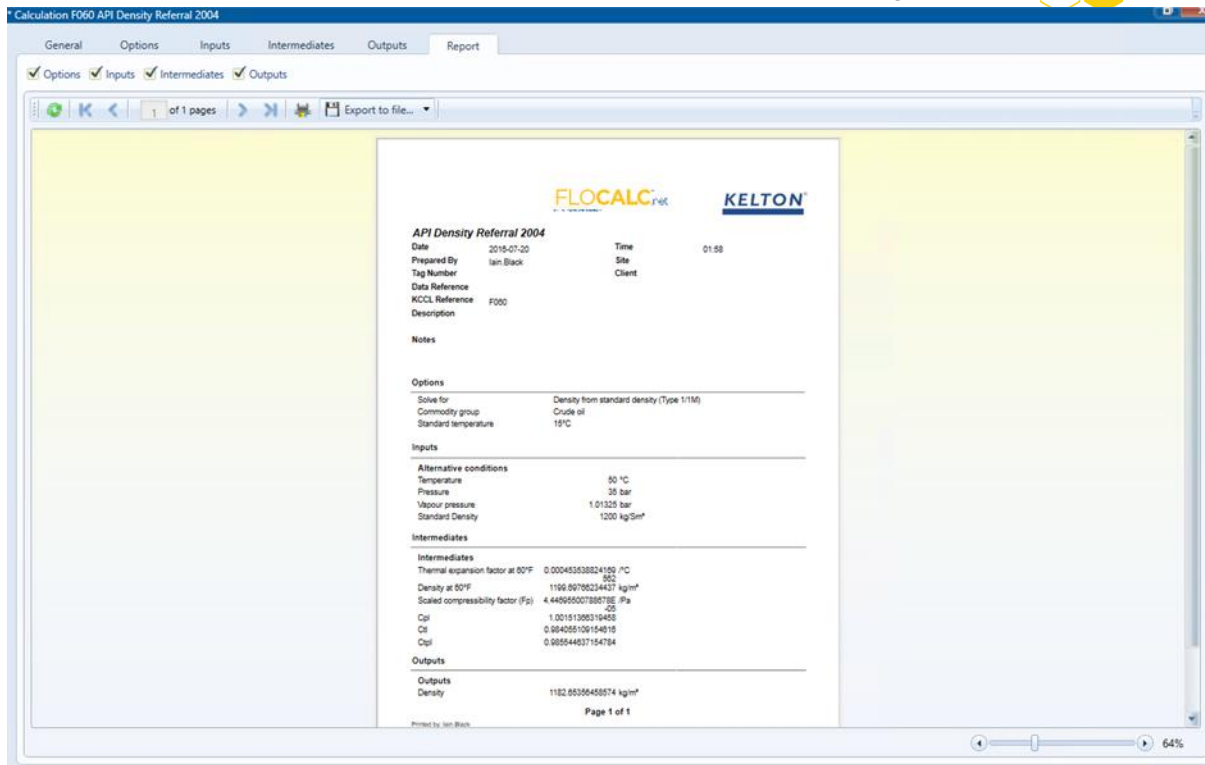

Outputs

Outputs are displayed in the same way as the intermediates. Both resolution and engineering units can be selected for intermediates and outputs.
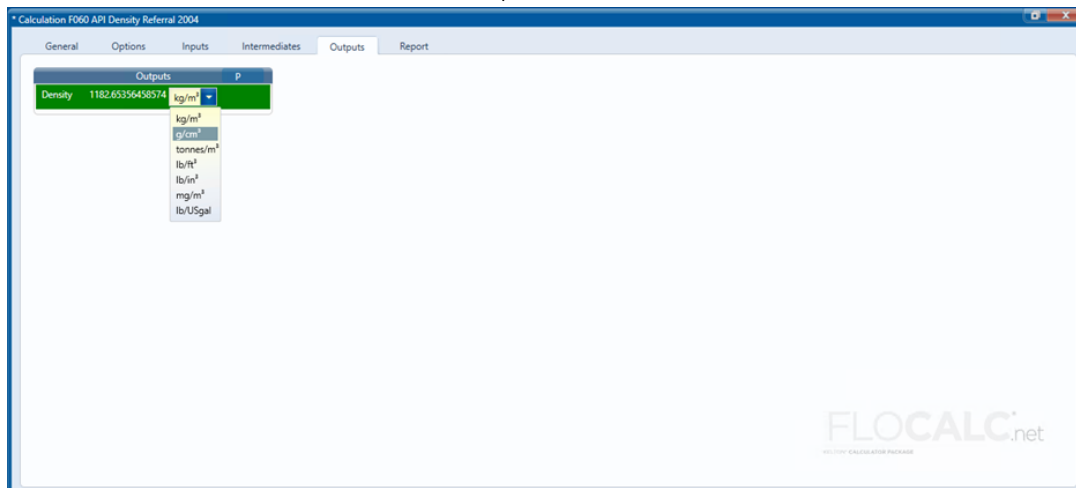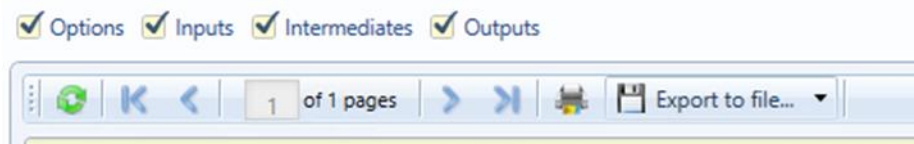

Report

The results of a calculation can be presented in the format of a report

Report Options

When generating a report, select the options to display by unchecking corresponding to each tab.

The report toolbar contains buttons for navigating between pages of the report, printing and exporting to file.

Warnings

Some calculations include logic to display warning messages when certain conditions occur; these are displayed in a warning tab which is otherwise hidden.
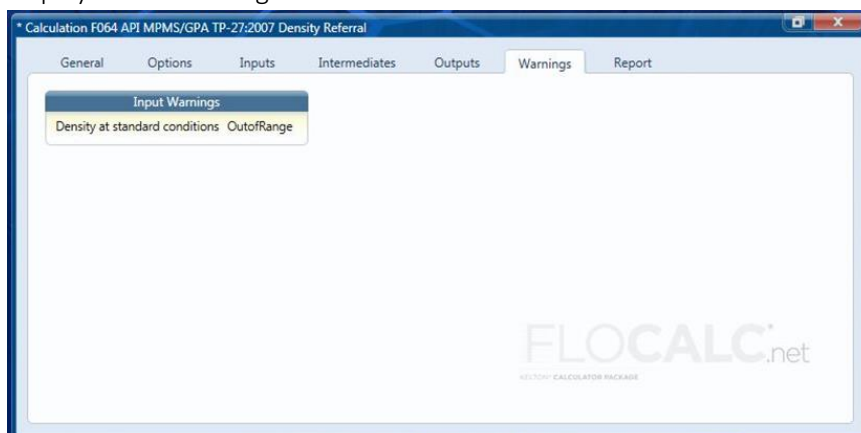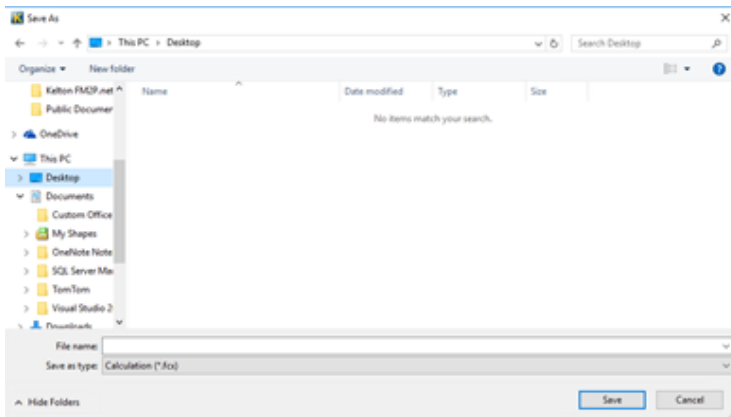

Saving Calculations

To save a calculation, click the save button on the Home or the Calculation toolbar. If the calculation has not been saved the standard Save As dialog will be displayed allowing the file to be saved in any

location with the FLOCALC calculation extension (*.fcx). The save button will be 'greyed' out if a saved calculation is saved but will become active once the calculation has been changed or information added. An asterisk at the start of the calculation title indicates that the calculation has been changed or edited since it was last saved.


Opening Calculations

To open a calculation which has previously been saved either click on the Open button on the Home Tab Toolbar

Calculation Templates

To repeat calculations with the same units or options, it may be advantageous to use calculation templates.

To create a template, open a calculation and then set the required options and units you would like saved. Click on the Save As button and choose to save as a Calculation Template (*.ftx).
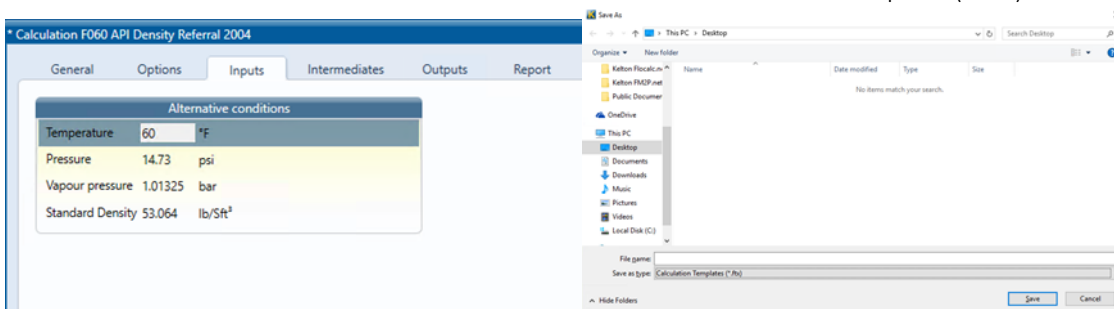
The advantage of using a template as opposed to saving and editing a calculation file is that a template will create a new calculation each time it is used whilst leaving the template itself intact.

Creating a Calculation from a Template

To create a calculation based on a preconfigured template click the Calculation from Template button on the Home Tab Toolbar. Note the calculation will have an asterisk next to the title indicting that it can be saved.

Clicking the save button will prompt the saving of the calculation as a new calculation file thus leaving the template intact.

Opening Calculations Saved in Previous Versions of FLOCALC

Click the Import button on Home Tab Toolbar to import a calculation created in previous versions of FLOCALC.

These will have the extensions:

FLOCALC Workbook (*.fcw)
FLOCALC Calculation (*.fcc)
FLOCALC Template (*.fct)

6.0 Calculation Workbooks

General

A FLOCALC calculation workbook is a collection of FLOCALC calculations that are saved as a single file. The purpose of a workbook is to keep related calculations together and to enable passing data from one calculation to another or to share inputs.

Microsoft Excel is a more convenient method of passing data from one calculation to another may be to use FloXL the Microsoft Excel interface which is included with FLOCALC.

Creating a New Workbook

To create a FLOCALC calculation workbook click on the Workbook button on the Home toolbar or the New Workbook button on the Workbook toolbar. When the new workbook is created the Workbook button will be selected.
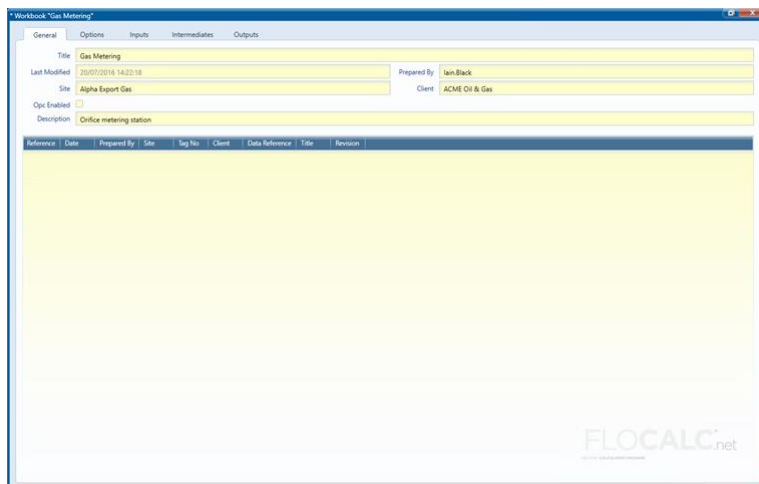
Header information can be entered into the Workbook as shown above.

Adding Calculations from the Library

To add a new calculation from the library, click the Add from Library button on the Workbook toolbar. This will open the same calculation selection window as described previously.

Adding Calculations from a Template

To add a new calculation based on a template (see Section 5) click the Add from Template button on the Workbook toolbar.

Adding saved Calculations

To import a calculation which has previously been created and saved, open the calculation as shown previously.

Using Workbooks

Once a workbook has been created and calculations have been added they will appear in a list:
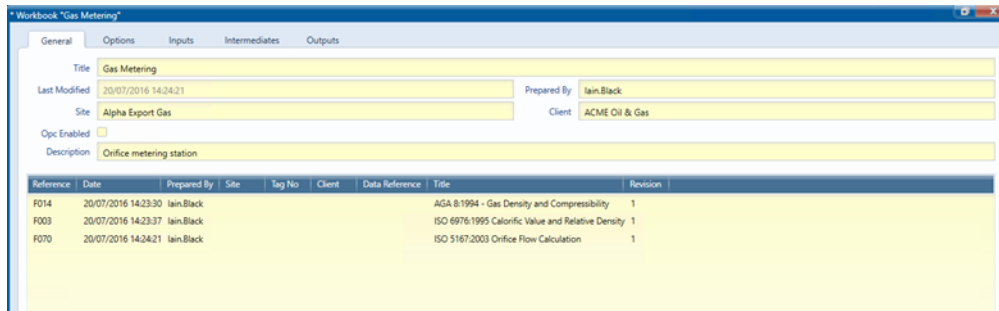

Calculations in the workbook can be opened and used in the same way as stand-alone calculations. Alternatively, the tabs at the top of the window can be used for setting options, entering inputs and viewing results from any calculation.

In this example, a workbook to calculate the mass and energy flow rate through an orifice meter has been created. The flow rate is calculated in accordance with ISO 5167, the density is calculated using AGA 8 and the calorific value is calculated using ISO 6976.

When adding calculations to a workbook the order is significant; calculations can only use values from other calculations if they appear before them in the list.
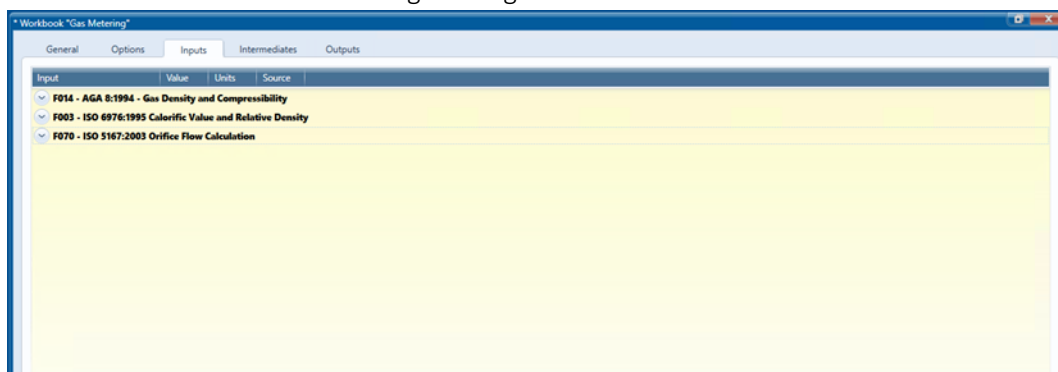
Setting Calculation Options

The Options tab will enable the expansion of each calculation in the workbook and set the options.
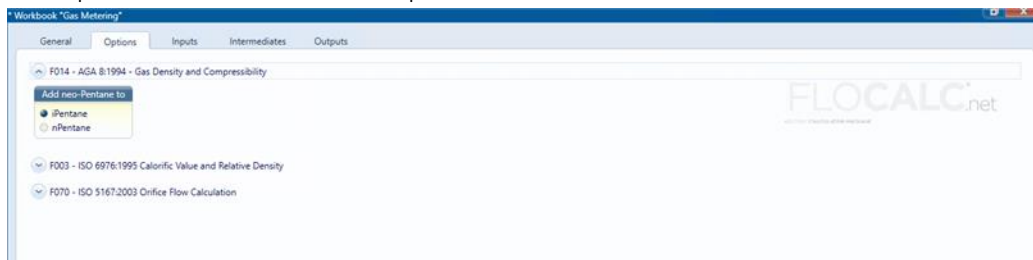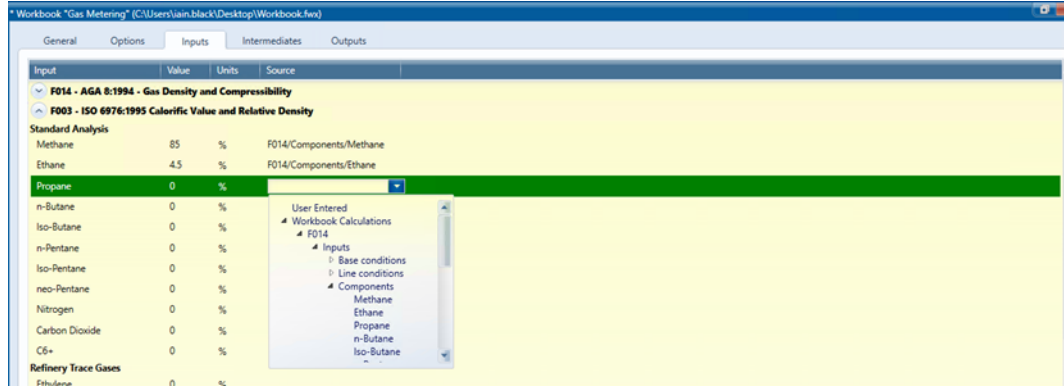

Inputs

The Inputs from for each calculation are grouped and can be expanded by clicking on the arrow to enter the values and select the engineering units.

On the first calculation in the list the only option available for inputs is User Entered but on subsequent calculations the inputs may be taken from previous calculations in the list.

In this example the input composition for F003 ISO 6976 is taken to be the same as the input composition for AGA 8; this will save entering the composition twice.

The outputs from F014 –AGA 8 and F003 ISO 6976 are fed into F027 – ISO 5167. This example shows the input for the line density required to calculate flow being linked to the density calculated by AGA 8.
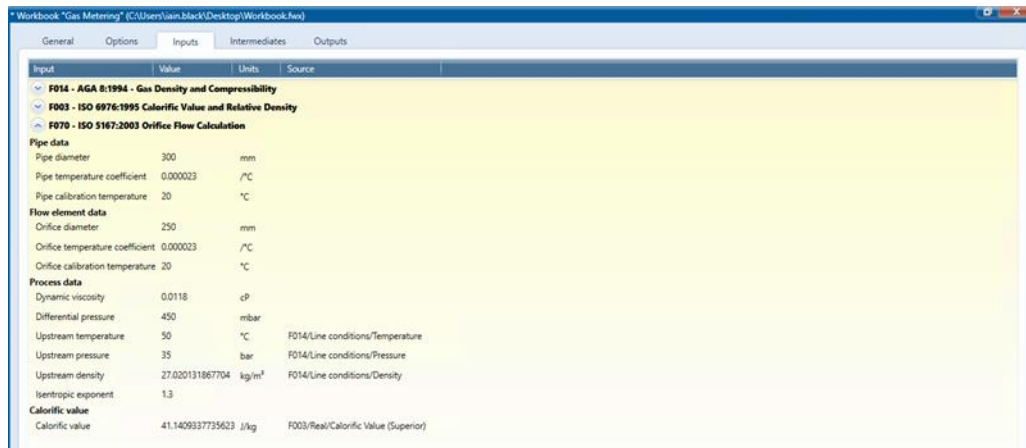
Intermediate and output values are displayed for each calculation:
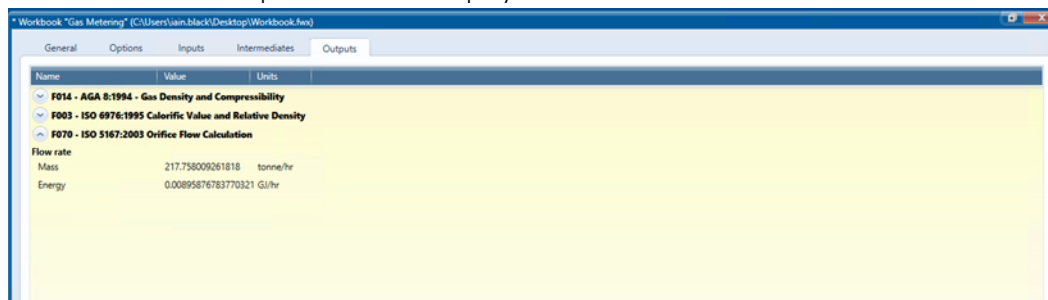
Once the links have been set up in a workbook it is recommended that the workbook be saved as a template so that similar calculations can be performed without having to go through the process of setting up links again.


7.0 FLOCALC Online

If FLOCALC is licenced as part of KELTON MeterManager (previously FM^{2}P.net), it is possible to perform a calculation using values that are read electronically from an OPC tags and write calculated

values back to OPC tags. To use this functionality, FLOCALC must be launched from within KELTON MeterManager.
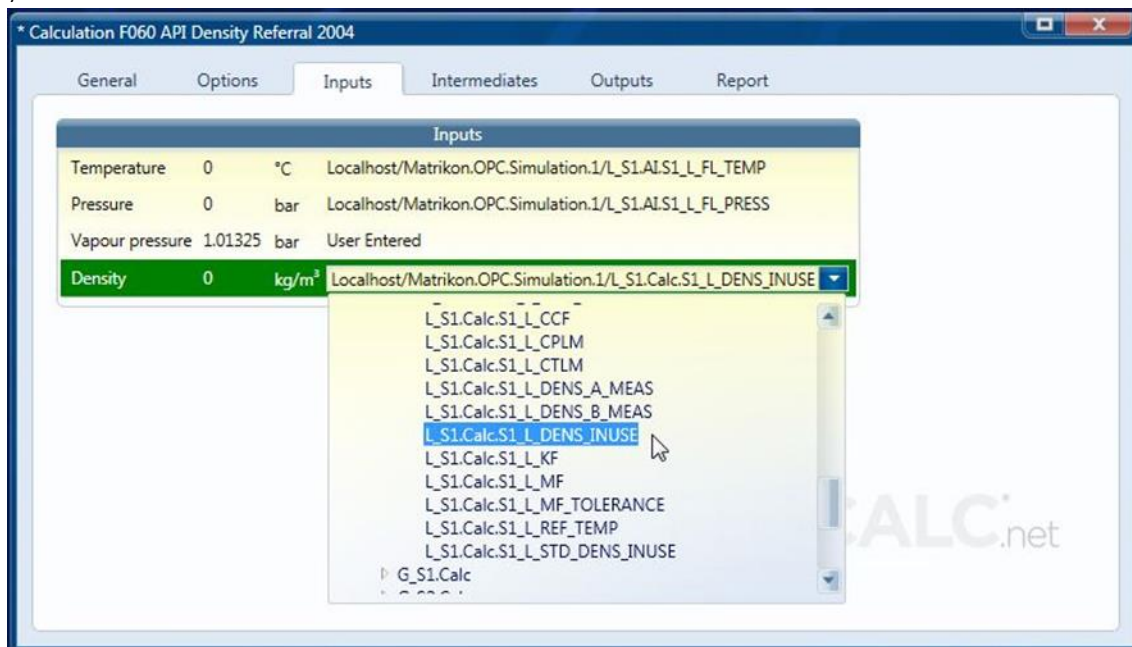
Enabling OPC

To enable OPC for a calculation check the OPC Enabled check-box:
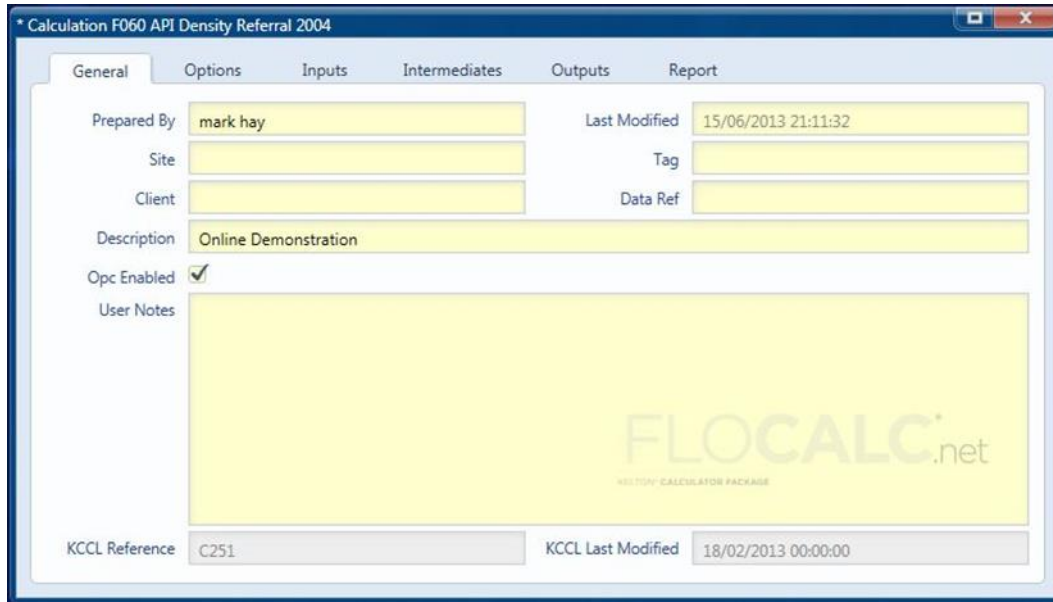
Set Up OPC Inputs

By default, the inputs will be user entered; by clicking on the box which displays the text User Entered you can browse to OPC sources.


Reading from OPC

To read values from the OPC tags click the Set OPC Inputs button on the Calculation toolbar. This will read the value from the OPC tag once; if the values on the OPC tags change the FLOCALC calculation will not be updated unless the Set OPC inputs button is clicked again.
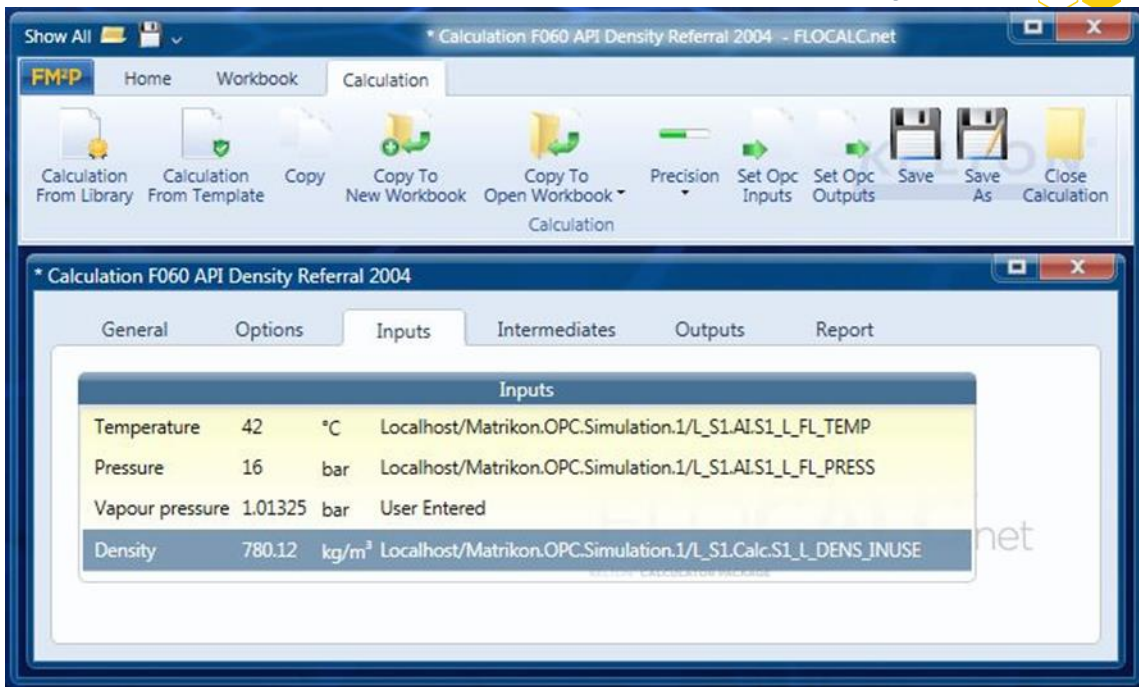
Writing to OPC

Calculated outputs and Intermediates can be written to OPC tags by linking to the OPC tag in the same way as the inputs were linked and then clicking on the Set OPC Outputs button on the Calculation toolbar.
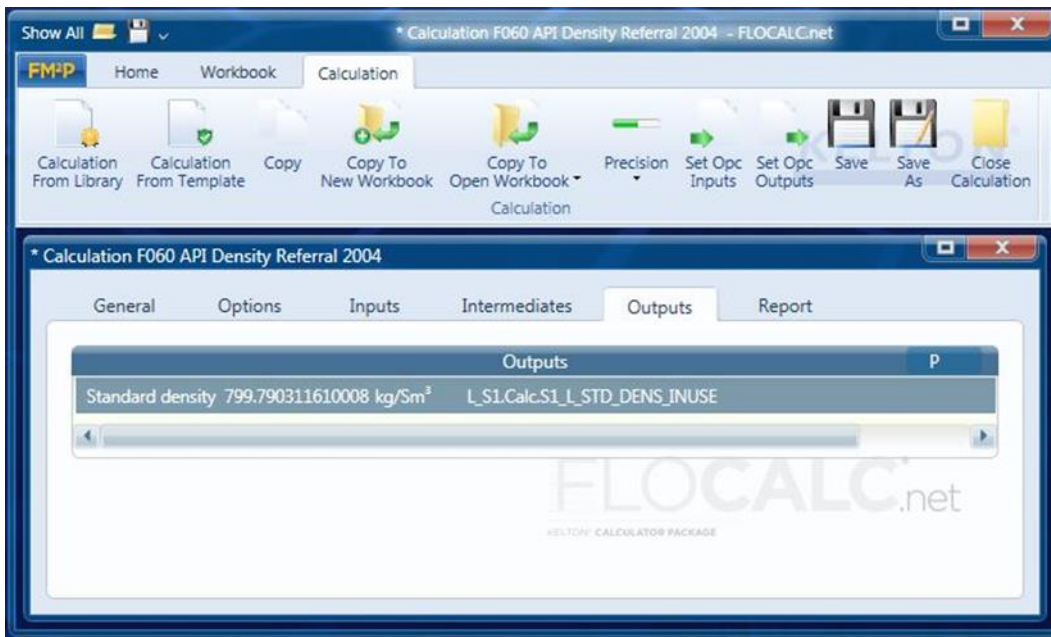
In this example, the fast-loop pressure and temperature were read from OPC tags along with the measured density. Values for the Cpl, Ctl and standard density were calculated by FLOCALC and written back to the appropriate OPC tags.

|	
L_S1.AI.S1_L_FL_PRESS	16.25
L_S1.AI.S1_L_FL_TEMP	42
L_S1.AI.S1_L_FREQ	0
L_S1.AI.S1_L_GOOD_PLS	0
L_S1.AI.S1_L_PRESS	16
L_S1.AI.S1_L_TEMP	42.5
L_S1.Calc.S1_L_CPLM	1.00156593028573
L_S1.Calc.S1_L_CTLM	0.973880634873268
L_S1.Calc.S1_L_DENS_INUSE	780.12
L_S1.Calc.S1_L_STD_DENS_INUSE	799.790311610008

8.0 FloXL

FloXL makes FLOCALC calculations available as functions when using Microsoft Excel. This feature is run from within Excel and there is no requirement to run FLOCALC to use FloXL.

Adding a FloXL Function

In this example, to add a function to calculate standard density from the measured density, pressure and temperature using the 2004 API density referral calculation.
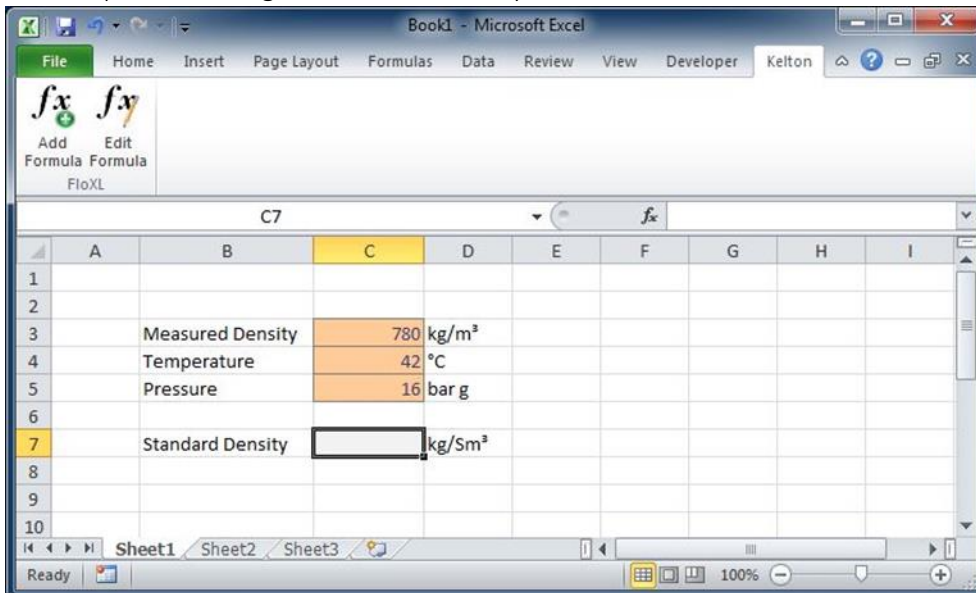
To add a FloXL function click on the Add Formula button on the KELTON toolbar; this will open a window which allows selection the appropriate calculation. As with FLOCALC, the calculations are grouped for easy selection.
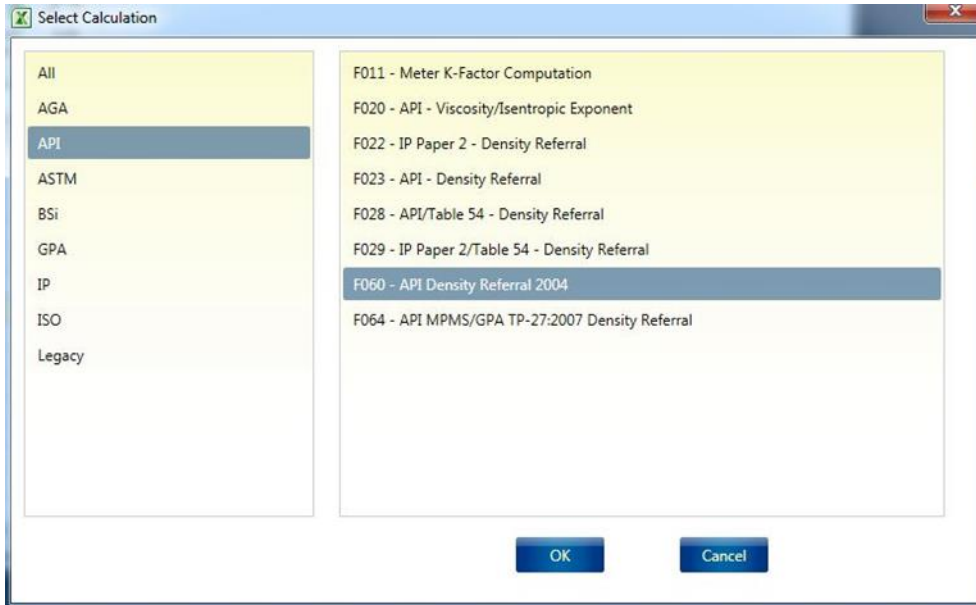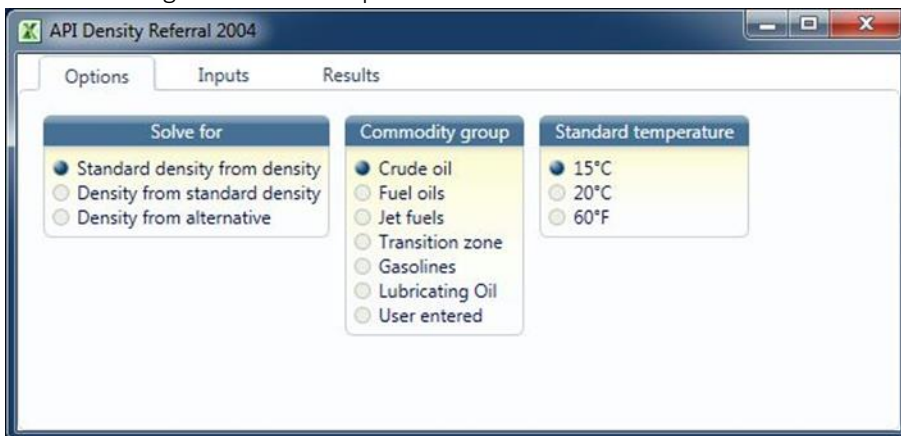
Configure Calculations

The FloXL calculation will open in a window similar to that when using a FLOCALC calculation.
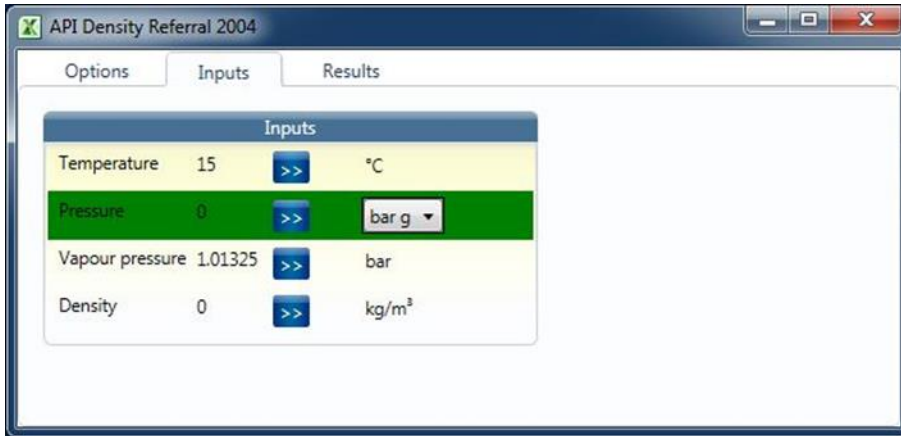
Options

Calculation options are set under the options tab; in this case to calculate the standard density of crude oil using a standard temperature of 15 °C.

Inputs

When setting up the inputs the units must match those used in the spreadsheet otherwise the calculation will not return the correct result.

There are a number of ways in which the input can be referenced to a cell in Microsoft Excel.

- Click and Select

To use this method, first click on the cell within Microsoft Excel to be linked and then click the button next to the parameter to use the value.

This method works best when manipulating the windows on the screen to display the Microsoft Excel workbook and the FloXL calculation window side by side.

Alternatively, switch between windows by clicking on the Microsoft Excel button on the taskbar at the bottom of the screen.

- Type the cell reference

The cell reference can be typed in place of the input value. Once the cell reference is entered it will be referenced to the Worksheet that is currently selected.

As with any other Excel functions absolute and relative cell references can be used by preceding the Row numbers and Column letters with a $.
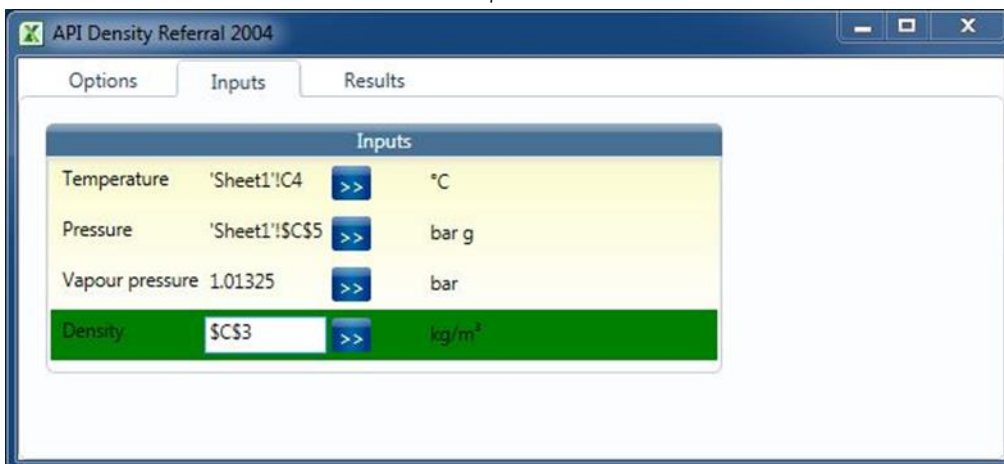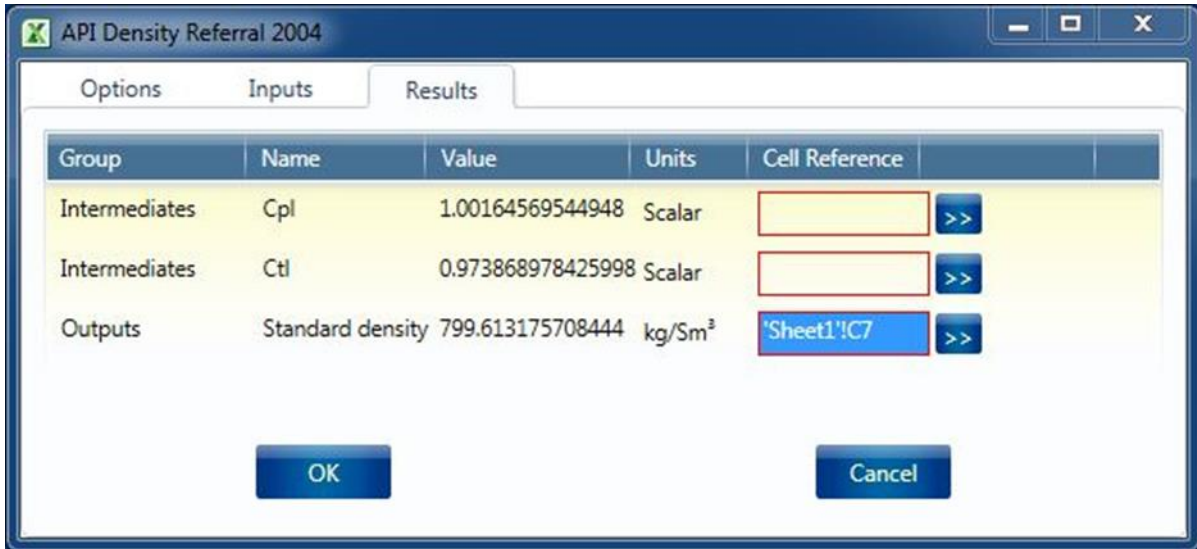
- Named cells

Named cells within Microsoft Excel works well with FloXL – simply type the name of the cell in place of the cell reference.
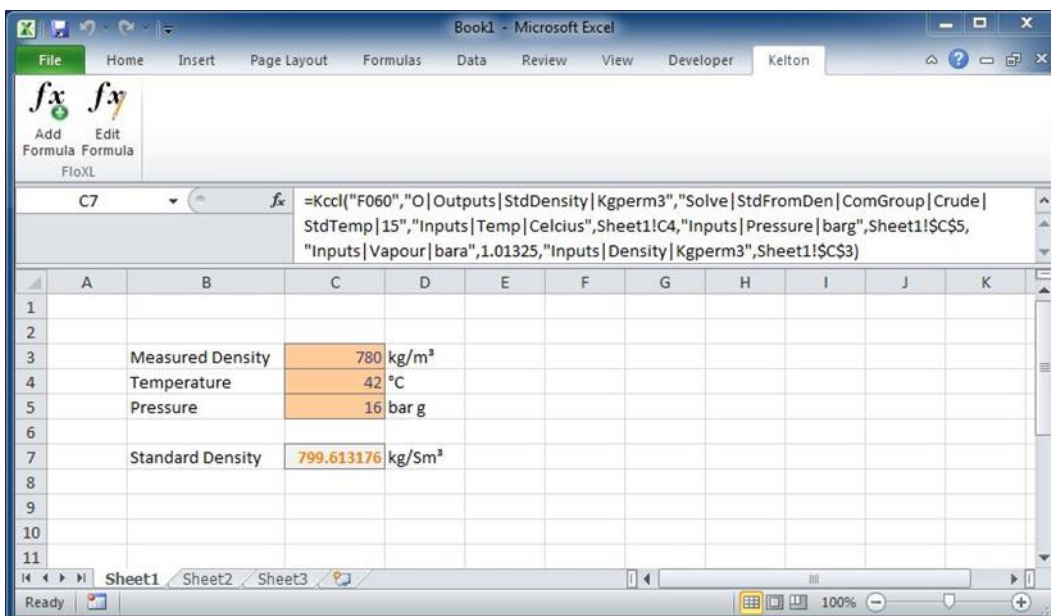
Results

Intermediates and outputs all appear in the results tab.

The method of linking results to Microsoft Excel is the same as when setting up inputs.


The Excel Function

When the FloXL Function is configured and clicked OK, the Microsoft Excel function will be entered in the cell which is referenced in the Results tab.


To edit the function, click the edit formula button on the KELTON toolbar as FloXL functions use too many arguments to use the fx button in the formula bar.

Functions will behave in the same way as a standard Microsoft Excel function and can be copied, moved, dragged and dropped. This example shows the density that would result from changing the temperature of the oil:
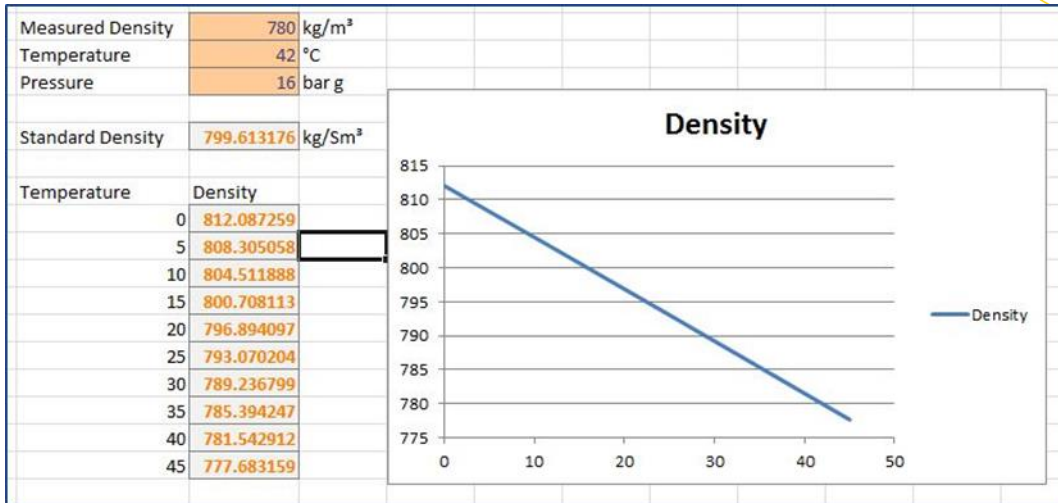
Multiple Outputs

A FloXL calculation may calculate a number of different parameters. In this example, calculated standard density from measured density there is also the option of calculating Cpl and Ctl. Selecting multiple results will result in multiple Microsoft Excel functions being created.
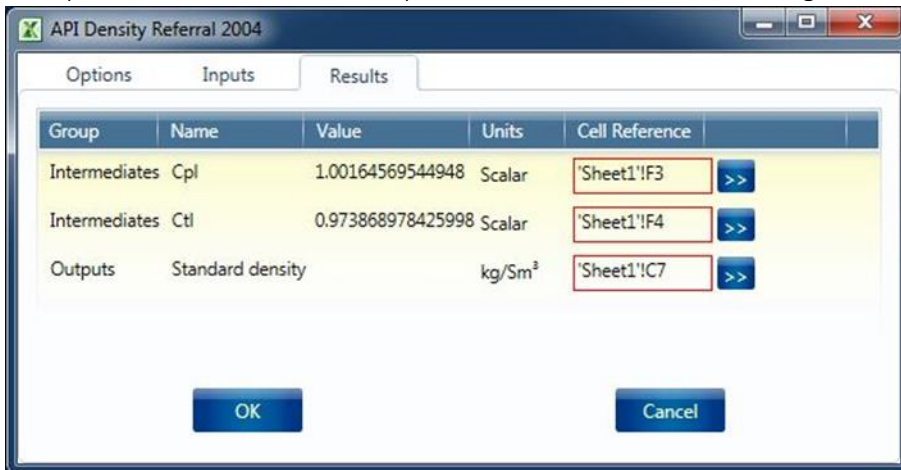
Linking Calculations

Using FloXL is particularly useful when linking calculations. In this example, a workbook has been set up to calculate energy flow rate using ISO 5167 with the CV coming from ISO 6976 and the density from AGA 8 etc.
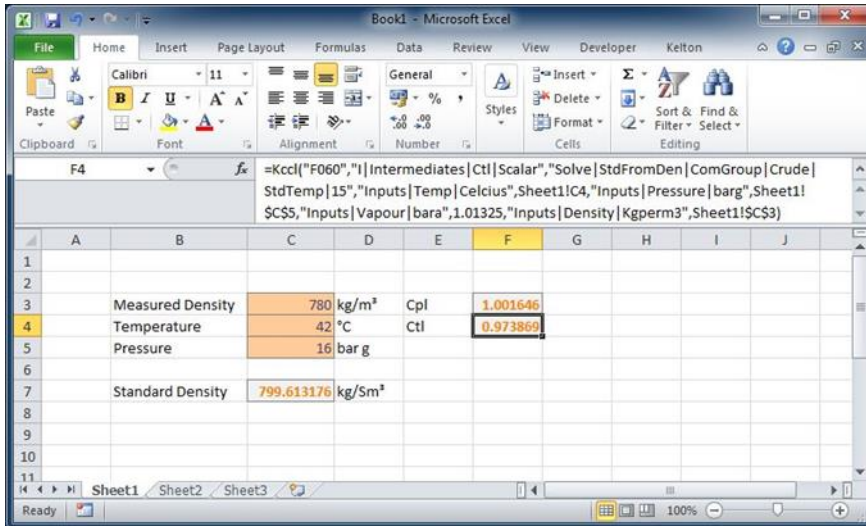
The calculation of calorific value, density, isentropic exponent and dynamic viscosity are all linked to the same input composition therefore changing a single parameter will filter through to the output.