CMX

Beamex CMX Calibration Software

User Guide

Trademarks

Beamex is a registered trademark owned by Beamex Oy Ab.

HART$^{®}$ is a registered trademark of the HART Communication Foundation.

FOUNDATION™ Fieldbus is a trademark of Fieldbus Foundation.

PROFIBUS$^{®}$ is a trademark of PROFIBUS International.

Windows, Microsoft Windows operating systems and Activesync are registered trademarks of Microsoft Corporation in the United States and other countries.

Other trademarks are property of their respective owners.

Table of Contents

Introduction

Beamex was founded in 1975 by people with experience in calibration and quality maintenance of instruments. CMX is developed based on that knowledge. CMX also represents Beamex's 3rd generation of calibration management software.

CMX has an "Explorer-like" user interface. This enables the software to be simple to use by any operator familiar with Windows$^{®}$.

CMX communicates with Beamex's communicating calibrators. Several calibrators by other manufacturers also communicate with CMX.

The main features are:

- Automated calibration and documentation
- Versatile calibrator communication
- Support for several database platforms
- Security and change management control
- Communication with Beamex **bMobile** Calibration Application
- Extensive services and support

CMX Family

CMX software is tailor made for different needs. Therefore there are different CMX Family members (versions) available. The following list presents all members of CMX Family:

- **CMX Professional**

  Calibration software with wide customization possibilities. CMX Professional has two installation options:

  ◦ **Workstation** installation and

  ◦ **Floating** installation on a network server.

- **CMX Enterprise**

  All in one calibration solution for large companies. One floating installation on the corporate server for sharing the same system in all locations worldwide.

See Feature Comparison for more information of differences between members of CMX Family.

How to see/know which CMX version you have

The splash screen shown when CMX is started shows which version you have at hand. Another way to identify your CMX version is opening the About screen using menu commands **Help** > **About**.

Also: A CMX Help window has in its upper right corner a picture that presents the CMX version the help was called from.

How to know which features presented here apply to your CMX

Features presented in this manual have in the beginning of the topic, a paragraph explaining differences in functionality between members of CMX family. This, of course, only if the feature differs between CMX family members.

Feature Comparison

The following table presents the features available in CMX products:

Table 1: Feature Comparison

CMX Features, Options and Related Products	CMX Professional	CMX Enterprise
LICENSES AND INSTALLATION		
Single workstation license with hardware license key	Professional	N/A
Floating server license with software license key	Professional FS	Standard
Cloud installation	Ask Beamex	Ask Beamex
DATABASE SUPPORT		
SQL Server (Express, delivered as default)	Standard	Standard
CMX database manager tool for SQL Server	Standard	Standard
Oracle database support (not available for new customers, existing databases supported)	Optional	Standard
ROLE-BASED ACCESS CONTROL		
User accounts, user groups and permissions	Standard	Standard
Site user maintenance	Standard	Standard
LDAP option to enable domain ID and password for CMX	Optional	Standard
INSTRUMENT MANAGEMENT		
1000 positions/devices in the database	Standard	N/A

CMX Features, Options and Related Products	CMX Professional	CMX Enterprise
5 000 positions/devices in the database	Optional	N/A
10 000 positions/devices in the database	Optional	N/A
Unlimited number of positions/devices in the database	Optional	Standard
Hierarchical plant structure	Standard	Standard
Position and device database	Standard	Standard
Position and device sets	Standard	Standard
Wizard for instrument database population	Standard	Standard
Calibration procedure management	Standard	Standard
Function templates to generate calibration procedures	Standard	Standard
User-defined transfer functions, temperature sensors, pressure units and list items	Standard	Standard
Saved filters	Standard	Standard
Electronic signatures for instruments*	Optional	Standard
Data Loader to add or edit large numbers of instruments	Optional	Standard
Business Bridge Equipment Import for importing instruments from CMMS	Optional	Optional
REFERENCE MANAGEMENT		
Calibrator database with manufacturer and model	Standard	Standard
Calibrator reference modules with e.g. quantities and ranges	Standard	Standard
Weight sets for weighing instrument calibration	Optional	Standard
Predefined uncertainty specifications for Beamex calibrators	Standard	Standard
User-defined calibrators/references	Standard	Standard
Calibrators due for calibration	Standard	Standard
Electronic signatures for calibrators*	Optional	Standard
CALIBRATION SCHEDULING AND GUIDED EXECUTION		
Scheduling instrument calibration	Standard	Standard
Calibration procedures and methods sent to mobile solutions to guide the execution	Standard	Standard

CMX Features, Options and Related Products	CMX Professional	CMX Enterprise
Approval of instruments and calibrators can be required for calibration execution*	Optional	Standard
Communication with documenting calibrators (MC6 family, MC4, MC2)	Standard	Standard
Communication with bMobile Calibration Application (requires CWSI)	Standard	Standard
Calibration Web Service Interface (CWSI) as the communication link between CMX and documenting calibrators or bMobile	Standard	Standard
Manual data entry	Standard	Standard
CALIBRATION RESULTS, REPORTING AND ANALYSIS		
Calibration results in numerical and graphical format	Standard	Standard
Full calibration history	Standard	Standard
Average and uncertainty calculation	Standard	Standard
Calibration certificates with As Found and As Left results	Standard	Standard
Automatic result validation with email notifications*	Optional	Standard
Result approval with electronic signature*	Optional	Standard
Standard reporting templates (19 pcs)	Standard	Standard
Report template import/export	Standard	Standard
Report Design for maintaining report templates	Optional	Standard
History Trend for analysing results over a period	Optional	Standard
CMX Analytics Dashboard for a visual overview of calibration data and KPIs	Optional	Optional
REGULATORY COMPLIANCE MANAGEMENT		
Change Management (includes many configurable functionalities marked with *)	Optional	Standard
Instruments, references and calibration results as electronic records*	Optional	Standard
Electronic signatures for electronic records*	Optional	Standard
Audit trail i.e. change log that tracks database changes and events*	Optional	Standard

CMX Features, Options and Related Products	CMX Professional	CMX Enterprise
Mobile Security Plus for ensuring calibration data integrity when executing calibrations offline (requires a MC6 family calibrator or bMobile)	Optional	Standard
ADVANCED APPLICATIONS		
Configurable User Interface (bundled with Report Design)	Optional	Standard
Maintenance Inspections (requires bMobile)	Optional	Standard
Weighing Instrument Calibration	Optional	Standard
Enhanced Work Order Handling (requires Business Bridge)	Optional	Standard
Business Bridge Work Order Handling (EWOH option recommended)	Optional	Optional
SOFTWARE UPDATES AND SUPPORT		
Software Service Agreement (SSA)	Optional	Optional

* part of Change Management option

SSA and Support

A Software Service Agreement (SSA) can be included in CMX. SSA is highly recommended because all updates during the SSA's duration are free. Also: Customers with a valid SSA have "priority one" service when contacting CMX support.

Table 2: Contact Information to Beamex Software Support

Telephone:	**+358 - 10 - 5505000** (Ask for Support)
E-mail:	**support@beamex.com**
Address:	**Beamex Oy Ab Ristisuonraitti 10, FIN-68600 Pietarsaari, Finland**

About This Document

The user of this document is expected to be familiar with the Windows® environment and such terms as **Clicking**, **Selecting**, **Double-clicking**, **Marking**, using the

Secondary Button of the mouse, **Drag and drop**, **Resizing a window**, etc. If you are unsure of a term, please refer to a Windows® User Guide.

This document focuses on giving you advice on how to use CMX. For information concerning a device communicating with CMX, please consult the instruction manual of that particular device.

The installation media in which the software was shipped also includes this document in PDF format.

Typographic Conventions

This document uses the following typographic conventions:

- All words related to a CMX window are shown using bold font style. Specifically:
  - Menu and submenu commands.

    Example: **File** > **Exit**

  - Command buttons:

    Example: Click **OK**.

  - Window names:

    Example: the **Calibrators** window.

- File names and directories are in capital letters.

  Example: D:\CMX\CMX.EXE.

A Short Presentation of the Sections in This Document

This chapter briefly presents all sections found in this document.

Introduction

Basic Information about CMX, this document and calibration.

Starting CMX

A short section telling you how to start CMX and how to select a database.

General Presentation of CMX

Gives you a detailed description of CMX's user interface, menus common features etc. A good read before you start taking CMX into serious use.

Basic Settings

Contains information that should be reviewed when CMX is taken into use. Many of the settings described in this section are usually done only once, like the Plant

Structure data. Certain parts, like the User and User Group settings are updated whenever changes occur.

Adding Instruments to the Database

Tells you how to add instruments to CMX's database using either the Wizard or entering Position, Device, Function and *Calibration Procedure* data one by one. This section also describes how to edit, link and unlink Positions/Devices.

Queries, Filters and Sets

A section for finding out what kind of tools CMX provides when you need to limit the displayed data somehow.

Check Out / Check In Feature

Check Out / Check In Feature is a tool for locking instruments chosen for calibration so no other user may edit the instrument data during calibration. After calibration is done, the instrument is unlocked. Locking instruments may be done manually or automatically depending on your settings.

Calibration

Here are the ways to utilize CMX for calibration presented: Communication with a calibrator as well as manual data entry. This section also includes a presentation on how to view the calibration results in CMX.

Calibration Certificates and Other Documents

Tells about the Documents types that are available in CMX: Calibration Certificates, Reports and Labels.

Change Management and Audit Trail

This feature is optional in CMX Professional.

Change Management and Audit Trail make it possible to log changes made to the database. This chapter also presents the Electronic Signature and Audit Trail archiving features.

Calibrating Weighing Instruments

This feature is optional in CMX Professional.

Weighing Instrument Calibration allows you to calibrate Weighing Instruments using the Manual Entry window. If you also have bMobile, you will furthermore be able to calibrate Weighing Instruments using it.

Maintenance Inspection

This feature is optional in CMX Professional.

Maintenance Inspection allows you to perform check procedures according to IEC 60079-17 standard and also according to your own needs. The actual check procedure is done using bMobile.

Work Order Handling

This feature is optional in CMX Professional.

Work Order Handling is a tool for handling work orders sent from asset and work management software. CMX receives the necessary data and after calibration using CMX manual entry, a calibrator or bMobile, updates and returns the work order data back to asset and work management software.

Mobile Security Plus

This feature is optional in CMX Professional.

Mobile Security Plus enables users of CMX and supported Mobile Devices to secure data integrity when performing calibrations.

Data Loader

This feature is optional in CMX.

Data Loader is a tool for importing instrument data from other systems to CMX via Excel file. CMX Data Loader Printing can also be used to create an Excel file, in which data can be edited and imported back to CMX.

Automated Result Validation

This feature is optional in CMX Professional.

Automated Result Validation allows CMX to automatically validate calibration result data according to a predefined set of validation rules. It is possible to configure and have CMX send second approval requests via e-mail when an automatically invalidated calibration result requires a second approval.

CMX Database Manager

Presents a tool for database experts. CMX Database Manager allows you to backup, restore and copy CMX databases.

Additional Information

Contains useful information of, e.g. calibrators communicating with CMX.

Other Documents

When CMX is installed, some additional Help files are also included:

- CMX Calculations

  This Help file presents all the calculations that CMX performs. This Help file can be opened from CMX Main Windows' Help menu. Select **CMX Calculations**.

- CMX Report Variables

  This Help file presents all variables available in the Report Designer. See Creating Your Own Certificates. This Help file can also be opened from CMX Main Windows' Help menu. Select **CMX Report Variables**.

- `CMX Application Server Help`

  This Help file presents the CMX Application Server shipped with CMX for Servers, available in CMX Enterprise or CMX Professional FS versions. This Help File can be opened in the CMX Server Service Manager Window' Help menu. Select **CMX Server Help...** in the **Help** menu.

- `Calibration Web Service Interface (CWSI) Help`

  This Help is installed separately with CWSI Client or CWSI Server. The help file presents all settings available in CWSI Client and CWSI Server and it can be opened either from the CWSI Client or the CWSI Server Configurator. Select **Help** or **Open help**.

> *i*   **Note:** These help files are also available pdf format in the Documents folder of CMX installation media.

What's New

The following main additions have been included into CMX version 2, revisions 2.13:

- New optional **Data Loader** tool added to be able to import instrument data to CMX via excel file. See section Data Loader.

The following main addition has been included into CMX version 2, revisions 2.13.2:

- The Audit Trail Archiving functionality makes it possible to mark Audit Trail events as archived. Archiving makes Audit Trail searches faster by hiding older Audit Trail events. See section Audit Trail Archiving.

The following sections/parts have been updated in this document when updating to CMX version 2, revisions 2.13:

- **Work Order Handling.** Work order handling supports multiple work orders in queue (FIFO) or in stack (LIFO). This was already implemented in CMX 2.12.2-2.12.6.

- **Error Calculation.** Improvements described.

The following sections/parts have been updated in this document when updating to CMX version 2, revision 2.14.1:

- **Automatic Result validation** is a new feature which allows CMX to automatically validate calibration result data according to a predefined set of validation rules. See section Automatic Result Validation.

- **Electronic Signature** functionality has been extended and is now also available for calibrators and external modules.

- **Automated Document Generation** makes it possible to configure CMX so that document file names are automatically generated in a certain file format. See section Automated Document Generation.

Other minor enhancements and additions have also been done.

For detailed information concerning CMX updates, including update history, see **Release Note** included on installation media.

About Calibration

A *Calibration Procedure* means measuring a process instrument's accuracy against another more accurate device, for example a calibrator. The calibrator normally contains measurement modules allowing the measurement of different engineering units at different ranges.

What is Calibrated?

The calibration may be carried out for a process Position (sometimes also called a "Tag") with an installed Device, or the calibration may be for an uninstalled Device; more precisely, the calibration is for a particular Function of the Position/Device.

The Three Steps

The calibration process is normally a three step event containing:

• **As Found calibration**, done to verify the current state of the instrument before adjustment.

• **Adjustment**, made to bring the instrument within the required specifications.

• **As Left calibration**, the final calibration in order to establish the state of the instrument after the adjustment.

When entering the result manually to CMX there is no limitations in the amount of As Found and As Left calibrations or the number of calibration points. If you are sending instruments for calibration using communicating calibrator, refer to the calibrator manual to find out whether there are any limitations in either the amount of As Found and As Left calibrations or the number of calibration points.

Starting CMX

With the CMX delivery, separate installation instructions are included on the installation media. Refer to them when installing CMX.

The installation instructions of all CMX family members are included on the installation media.

How to Start CMX

When CMX is installed you can start using the software. Locate the CMX icon in your Start menu to start the software.

Figure 1: CMX Icon

To use a fully functional CMX, the License Key must be in place. Without the License Key CMX starts up as a Limited Evaluation version. Detailed info of the License Key is in License Key.

CMX automatically places the current Windows User ID as the default user for logging into CMX. If you are logging in for the very first time you must use the Supervisor User ID and Password delivered with CMX. Then change the Supervisor User ID and add other Users according to your needs. Adding Users is described in Users and User Groups.

See also User Interface Language.

> **Note:** If you check Remember Used Id, next time you log in CMX uses the same User ID by default. CMX Professional with floating server license option and CMX Enterprise login is remembered also in last database opened.

> **Note:** If Lightweight Directory Access Protocol (LDAP) is enabled in CMX, use your network user name and password to log into CMX. More of LDAP in LDAP Options.
>
> Lightweight Directory Access Protocol is optional in CMX Professional.

Opening a Database

Available databases:

- **CMX_Demo_Database** is a demo database for getting acquainted with CMX. This is the default database when CMX is started for the first time after installation.

- **CMX_Database** is an empty database for creating your own database. When needed, you may switch to this database as described further on in this chapter.

> **Note:** You may also use **CMX_Demo_Database** as the basis for your own database. When the demo positions/devices are no longer needed, just remove them from the database.

> **Note:** By default, the Oracle database is case sensitive. Pay attention to letter cases when handling items in the Oracle database.

- **Other databases**. You may create your own CMX databases using the tools available in CMX Database Manager. This however requires that you have experience in working with databases and database servers.

> **Note:** All databases mentioned above have the same Supervisor User ID and Password (shipped with CMX installation media). More info of CMX versions is in CMX Family.

Switching between databases

During login CMX offers to connect to the latest database used. To switch database, select another (host and) database from the login window.

Alternatively, when CMX is already running, use the main window's menu to select:

- **File** > **Log Off** in CMX Enterprise or CMX Professional with the floating server license option or

- **File** > **Database** in CMX Professional without the floating server license option.

Then enter required information to log into another database.

> **Note:** CMX includes a possibility to utilize either *SQL Server Authentication* (default) or *Windows Authentication*. Use the **Authentication** selection list to choose the one you want.

See also User Interface Language.

User Interface Language

When starting CMX or switching between databases, the login window includes the possibility to select the user interface language from the **Language** combo. The available user interface language options depend on the selected user interface languages during installation.

> **Note:** During the installation, the base database was also selected. Certain pick-up list options are displayed using the language of the base database.
>
> Function Templates and their *Calibration Procedure*s have the same language as the base database.

Starting CMX Using Startup Parameters

CMX may also be started using certain startup parameters in the command line.

In 32 bit Windows$^®$ operating systems:

```
"C:\Program Files\CMX\BxbMUIPD.exe"  /DB:CMX_Demo_Database
/LANG:ENGLISH  /USER:123  /PWD:SECRET  /P:"101DR-PI0014"
```

In 64 bit Windows operating systems:

```
"C:\Program Files (x86)\CMX\BxbMUIPD.exe"  /DB:CMX_Demo_Database
/LANG:ENGLISH  /USER:123  /PWD:SECRET  /P:"101DR-PI0014"
```

Begin the command line entry with the path where your CMX is installed and the name of the CMX software (BxbMUIPD.exe) followed by the necessary parameters. Each parameter starts with a preceding space and a slash character.

The following command line parameters are available:

Table 3: Command Line Parameters

Parameter	Definition
/DB:*DATABASE NAME*	The name of the database to be opened. /DB: parameter is mandatory.

Parameter	Definition
/LANG:*LANGUAGE*	The user interface language. Language name should be written as is it seen in language selection list during normal start/login, e.g. "*FINNISH*".
	If no /LANG: parameter is specified, CMX uses the language chosen in a previous start.
	If no /LANG: parameter is specified and no previous starts (with current version of CMX) have been made, English language is used.
/USER:*USER ID*	User ID to be used when opening the database.
	If no /USER: parameter is specified, CMX login dialog is displayed.
/PWD:*PASSWORD*	Password to be used when opening the database.
	If password is required and no /PWD: parameter is specified, CMX login dialog is displayed.
/P:*POSITION ID*	The Position property window is opened and the data of the specified position is displayed.
	If the Position ID is invalid, the Position property window is not opened.
/D:*DEVICE ID*	The Device property window is opened and the data of the specified device is displayed.
	If the Device ID is invalid, the Device property window is not opened.

If both a /P: and a /D: parameter is entered, the /P: takes precedence and the /D: parameter is ignored.

Wildcards can also be used. For example "/P:101%" displays all positions that begin with "101". Wildcards used in a Microsoft SQL Server database are presented in Wildcards.

Note: Do not use the command line if there is a possibility that unauthorized people may get hold of User IDs and Passwords. The command line displays all text written in it, even the User ID and the Password.

Database settings must be set correctly before command line parameters can be used. Set the Provider, Server, Server Login and password settings to the database server where the wanted database is located. Set the parameters by opening the database manually before using the command line parameters.

Each time CMX is started with command line parameters, a new CMX instance will be started. So, to free CMX licenses, remember to close the CMX instance after use.

If your Position IDs and/or Device IDs contain space characters, include the ID inside quotes, e.g.:

.../P:"DEPT 714 - PT101.3".

License Key

The License Key must always be connected to the computer while you are using a fully functional CMX. Without the License Key, CMX starts up as a Limited Evaluation version. Most of the functionality is still available, but CMX uses a demo database with a limited amount of positions/devices. The maximum amount of positions/ devices in the demo database is 20.

Where should the License Key be located?

• In **CMX Enterprise** and **CMX Professional with the floating server license option:**

The License Key must be installed into the server where CMX Application Server is running.

• In **CMX Professional without the floating server license option**:

The License Key must be installed into the workstation where CMX is running.

General Presentation of CMX

The relation between CMX and its Instrument Database is like the relation between word processing software and the document you write. CMX, just like the word processor, is a tool for handling the information you create. With CMX you create a database instead of a document.

All instrument data as well as calibration history data is saved in the database. CMX is the tool for opening, viewing and editing the database.

About CMX's User Interface

A general description of CMX's user interface.

The Main Window
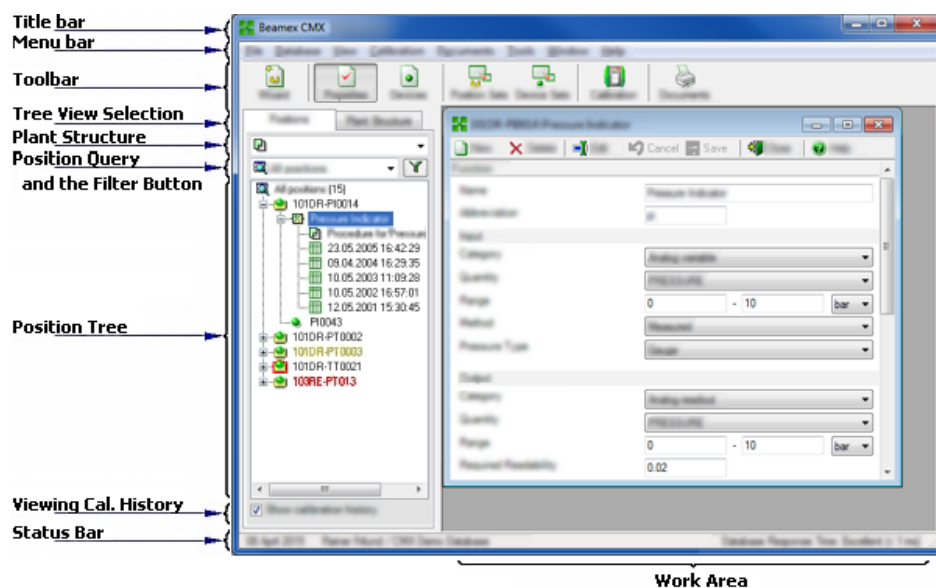
Figure 2: The Main Window

The Main Window is divided into following main parts:

1. **Title Bar**. Contains the Name of the software and sometimes also additional information depending on the selected item.
2. **Menu Bar**. The Menu structure is presented in a subsequent chapter.
3. **Toolbar**. The Toolbar structure is presented in a subsequent chapter.
4. **Tree View Selection Tabs**. Selects whether the Plant Structure Tree or the Position Tree is shown (Position Tree shown in the previous picture).

5. **Plant Structure List**. (Not shown when the Plant Structure Tree is shown instead of the Position Tree). This is the **primary** level filtering for the Positions shown in the Position Tree. More of the plant structure in a subsequent chapter.

6. **Position Query List**. (Not shown when the Plant Structure Tree is shown instead of the Position Tree). This is the **secondary** level filtering for the Positions shown in the Position Tree, i.e. the query is carried out to Positions located in the selected part of the plant structure. More of the queries in a subsequent chapter.

    The **Filter Button** is the **tertiary** level filtering for the Positions shown in the Position Tree. More of the filter in a subsequent chapter.

7. **Position Tree**. Shows a list of Positions (all or part of them depending on the selections in the two lists and the Filter button above the Position Tree) and their contents in a tree like structure. More of the tree structure in a subsequent chapter.

8. **Viewing Calibration History Check Box**. If unchecked, only the latest calibration is shown in the Position Tree. When checked, all calibrations are shown in the Position Tree.

9. **Status Bar**. Shows the current date, the name of the currently logged user and the database response time. Hints for increasing the response time can be found in CMX webhelp, see General Settings Fields.

10. **The Work Area**. A place for an opened **property window**, **Devices** window, **Set** windows, **Print** window, **Send to Calibrator** and **Receive from Calibrator** windows.

The Tree

The Tree Structure on the left side of CMX's main window shows either a list of positions (all or part of them depending on the Plant Structure List, Position Query List and Filter settings) or the Plant Structure including all Positions.

The color of the Position ID is:

• Black when the Position's calibration date is not due soon.

• Yellow when the Position is due for calibration but the next calibration date hasn't been exceeded yet. The time period when the Position ID is yellow is user defined. See Function Due List Options.

• Red when the Position's due date for the calibration has expired.

> **Note:** The same colors indicating the need of calibration are used for Calibrators, Devices, Calibrator Modules and Users in their respective trees.

The Tree Structure shows position data in the following hierarchical order:
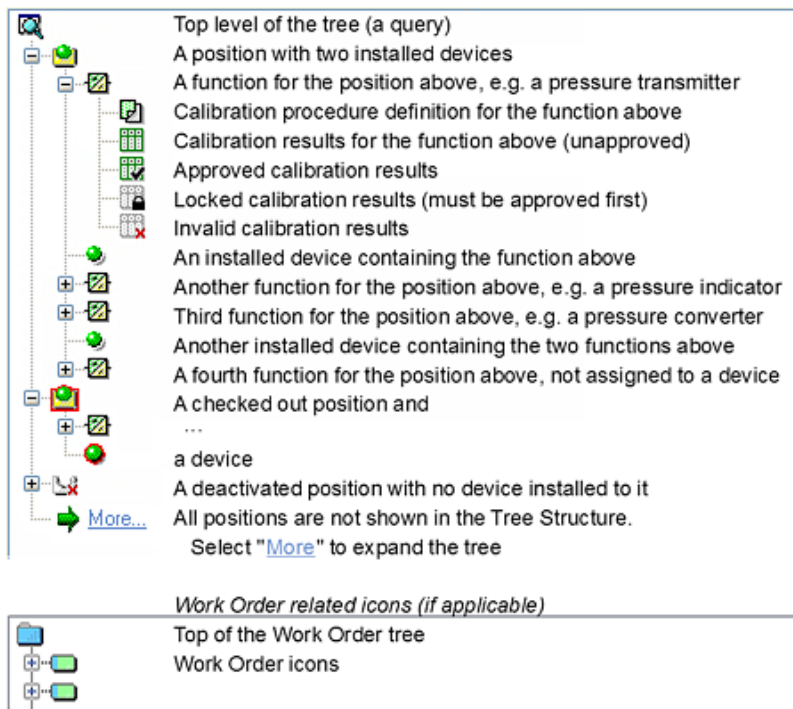
Figure 3: The Tree Structure

When you double-click one of the items in the Tree Structure, a property window opens in the Work Area. There all item related data is displayed for viewing and possible editing.

When the property window is already open, a single click in the Tree Structure changes the contents of the property window to display the data of the clicked item.

Several other main functions of CMX may also be started from the **Context Menu** "popping up" above the Tree Structure, but they are covered later in in this manual. This is just a reminder to frequently use the context menu that opens by clicking the secondary mouse key.

> **Note:** CMX supports deactivating items shown in the Tree Structure. Deactivation means that a Position/Device etc. is no longer in use. A deactivated item has a small red "x" in the lower right corner of the icon. A checked out Position/Device has a red border surrounding the icon. More of checking out in Check Out / Check In Feature.
>
> Work Order Handling is described in Work Order Handling.

The Work Area

The work area is used for showing the following types of windows:

• The property window for displaying additional information of the item selected in the Tree Structure.

- **Send To Calibrator** and **Receive From Calibrator** windows while communicating with a calibrator
- **Print** window for printing Certificates, Reports and Labels.
- **Devices** window (rightmost window in the picture below).
- **Position Sets** and **Device Sets** windows (also shown in the picture below).
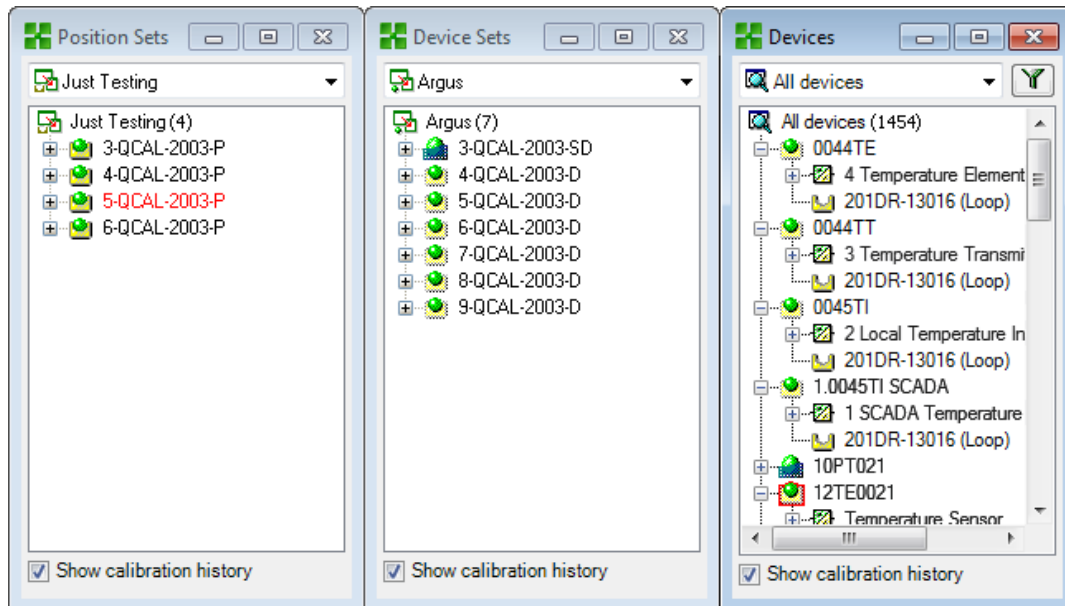
Figure 4: Devices window, Device Sets window and Position Sets window

The **Devices** window, **Device Sets** window and **Position Sets** window all work like the Tree Structure except that they are "floating" in the work area. Sets are described in Queries, Filters and Sets.

The Menu Structure

The menu structure is described in the table below:

Table 4: Menu Structure - File

File	
Database...	Opens a dialog for viewing/changing the database connection. Available in CMX Professional with **no** floating server license option.
Log Off...	Opens a dialog for viewing/changing the database connection. Available in CMX Enterprise and CMX Professional **with** floating server license option.

File	
Import, Document Layouts…	A possibility to import Certificate, Report and Label layouts from another database/source.
Export, Document Layouts…	A possibility to export Certificate, Report and Label layouts to make them available for another database.
Exit	Closes CMX

Table 5: Menu Structure - Database

Database	
Wizard…	Launches the Wizard that creates a new Position, a linked Device etc.
Device Manufacturers…	Opens the window for viewing/defining Device Manufacturers
Calibrators…	Opens the window for viewing/defining Calibrators (and further on the Calibrator Manufacturers)
Lists…	Opens the window for viewing/defining CMX lists, i.e. sets of predefined alternatives, available in several windows.
Function Template…	Opens the Function Template window where the Function Templates may edited and new Templates added.

Table 6: Menu Structure - View

View	
Properties	Opens/closes the property window
Devices	Opens/closes the **Devices** window
History Trend	Opens/closes the History Trend window. This is an optional feature in CMX Professional.
Position Sets	Opens/closes the **Position Sets** window
Device Sets	Opens/closes the **Device Sets** window
Refresh	Refreshes the active tree.

Table 7: Menu Structure - Calibration

Calibration	
Send…	Opens the window used for sending instruments/functions to the connected calibrator.
Receive…	Opens the window used for receiving calibration results of instruments/functions from the connected calibrator.
Manual Entry…	Opens the window used for entering calibration results. This is useful when a calibrator does not communicate with CMX.

Table 8: Menu Structure - Documents

Documents	
Certificates, Print…	Opens a window where you can select instruments with calibration results and print calibration certificates.
Certificates, Design…	A possibility to create your own certificates. This is an optional feature in CMX Professional.
Reports, Print…	Opens a window where you can select instruments and print reports.
Reports, Design…	A possibility to create your own reports. This is an optional feature in CMX Professional.
Labels, Print…	Opens a window where you can select instruments and print calibration labels.
Labels, Design…	A possibility to create your own labels. This is an optional feature in CMX Professional.
History Trend, Print…	Opens a window where you can select instruments and print history trend graphs. This is an optional feature in CMX Professional.
History Trend, Design…	A possibility to create your own history trend graphs. This is an optional feature in CMX Professional.
Data Loader, Print…	Opens a window where you can select instruments and save them into a Data Loader excel file. Data Loader is an optional feature in CMX Professional and CMX Enterprise .
Data Loader, Design…	A possibility to create your own Data Loader excel files. Data Loader is an optional feature in CMX Professional and CMX Enterprise. Report Design is an optional feature in CMX Professional.

Table 9: Menu Structure - Tools

Tools	
Audit Trail…	Opens the Audit Trail window. This is an optional feature in CMX Professional.
Options…	Opens the **Options** window. Here are all CMX's basic settings viewed/edited.
Security, Users…	Opens the window where Users and User Groups are maintained.
Security, Change Password…	Allows the current user to change one's CMX password. Note that this menu option is only available if passwords are required in the **Security** page of the **Options** window.

Tools	
Security, Change Mobile Password	Allows the current user to change ones Mobile Password. Note that this menu option is only available if **Mobile Security Plus** is activated in the **General** page of the **Options** window and **Mobile Passwords** are required. This is an optional feature in CMX Professional.
User Interface, Edit	Activates the Direct Edit of CMX's User Interface. This is an optional feature in CMX Professional.
User Interface, Save	Saves the changes made to the User Interface during Direct Edit. This is an optional feature in CMX Professional.
User Interface, Cancel Changes	Cancels the changes made to the User Interface during Direct Edit. This is an optional feature in CMX Professional.
User Interface, Customize…	Opens the window used for customizing CMX's user interface. This is an optional feature in CMX Professional.
External links	Allows you to add a quick link to any kind of file (including applications) recognized by the operating system. The linked files are listed in a submenu below the External Links menu option. The link may also be an internet link as long as the beginning (http://) is cut off.
Beamex Tools	Contains links to Beamex calibrator tools, e.g Picture Capturers, Device Description Senders, Demos etc.
Data Loader...	Opens the Data Loader window. This is an optional feature in CMX Professional and CMX Enterprise.

Table 10: Menu Structure - Window

Window	
Cascade	Reorders the subwindows found in the Work Area.
Tile Horizontal	Reorders the subwindows found in the Work Area.
Tile Vertical	Reorders the subwindows found in the Work Area.

Table 11: Menu Structure - Help

Help	
CMX Help…	Opens CMX's main help in the operating systems default browser.
CMX Calculations…	Opens CMX Calculations help which describes the calculations that CMX performs.
CMX Report Variables…	Opens CMX Report Variables help which describes CMX variables available in CMX's Report Design tool.
Index…	Opens CMX help's index page.

Help	
Search…	Opens CMX help's search page.
About CMX…	Opens the window where CMX's license and copyright info is displayed.

The Toolbar

The main window toolbar comprises of the following tools:

Table 12: The Toolbar

Wizard	Opens a Wizard utility for creating a new Position (and a Device). This is the fastest way of creating an instrument. Only the most significant fields are shown.
Properties	Opens/closes the Properties window in the Work Area.
Devices	Opens/closes the **Devices** window in the Work Area.
Position Sets	Opens/closes the **Position Sets** window in the Work Area.
Device Sets	Opens/closes the **Device Sets** window in the Work Area.
Calibration	Contains a menu with calibration related functions, the same as in the main windows' **Calibration** menu.
Documents	Contains a menu with available types of documents (Certificates, Reports, Labels, History Trend and Data Loader). Selecting one of the items opens a window with the possibility to print the selected type of Document.

Other Windows

There are three main types of windows in CMX:

1. The main window, described in the previous chapters.
2. Windows appearing in the work area of the main window, e.g. the item properties window.

   These windows are closely related to things presented in the main window. That's why they are located in the work area. Additionally, you may open several of this type of windows at the same time.
3. Windows that appear outside the CMX main window.

   More or less "stand-alone" windows available for a specific task, e.g. the **Calibrators** window.

You can open only one of these windows at a time. Also, working in the main window is not possible as long as one of these windows are open. To return to the main window, close the "stand-alone" window.

The **Manual Entry** window falls into this category with the following exceptions: You can open several **Manual Entry** windows and also use the main window while the **Manual Entry** window(s) is/are open.

The layout and functionality of the third and second type of windows vary a lot, so there are not many common features in them. The Toolbar is however relatively common:

Table 13: The Toolbar

New	Clears all fields in the window and allows data entry of a new item
Delete	Deletes the currently shown item.
Edit	Allows editing the fields of the currently shown item
Cancel	Active only when adding a new item or editing an existing item. Cancels the edited/added item.
Save	Active only when adding a new item or editing an existing item. Saves the edited/added item.
Close	Closes the window
Help	Opens the Help page displaying help for the task at hand.

Multiple Users

The following chapters describe how CMX handles Simultaneous Data Editing and Accessibility in a Multiple User Environment.

Simultaneous Data Editing

When multiple users are working on the same database and two or more users are simultaneously editing the same record, then the one who saves his edits first "wins". This is called **optimistic concurrency control**.

The changes made by other users are rejected and a message informing of the situation is shown for them.

See also Manual Check Out / Check In.

Accessibility

CMX's Accessibility feature allows limiting access of data on user group level. Define users in groups according to the department/plant etc. The accessibility for the following database items may be defined:

- Plant Structure, see Plant Node Fields, CMX webhelp.
- Calibrators, see Calibrator Fields, CMX webhelp.
- Calibrator Modules, see Calibrator Module Fields, CMX webhelp.
- Positions, see Position Property Window Fields, CMX webhelp.
- Devices, see Device Property Window Fields, CMX webhelp.
- Saved, see What Is a Filter.

The accessibility setting is done for each item individually (available among the item's properties). The setting is hierarchical; if the access of a plant node is denied for certain user groups, access to all nodes, positions and devices below that node are also denied.

This feature is useful, e.g. when a single database contains data of several departments/plants etc. Then users arranged to groups according to their department/plant see only the database items that concern them.

> **Note:** Only users with the proper authorization can view and/or edit accessibility settings. To edit accessibility you always need modify permission to the object that the accessibility affects. So e.g. if you want to edit Device Accessibility you must also have Device Edit permission.

> **Note:** When changing accessibility for a plant node containing sub-nodes, CMX confirms whether the accessibility is updated also for underlying plant nodes.

See also Users and User Groups and Site User Maintenance both in section **Basic Settings**.

Uncertainty Calculation

CMX's Uncertainty Calculation feature can be configured according to your own needs:

- The uncertainty of Beamex calibrator modules is automatically available, e.g. among calibration results.

- CMX supports up to eight user defined uncertainties (B type uncertainties). They may be activated via the user interface customization tool. See Customizing the User Interface.

- In Calibration Options, you may select whether the expanded uncertainty of all uncertainty components is shown among results or not.

Common Features

This chapter and its subchapters describe some features/utilities that is used not just in one window but in several CMX windows.

Context Menus (Pop-up Menus)

A Context Menu (pop-up menu) is a menu that appears when you click on the secondary mouse key. The menu is called a Context Menu because it provides tools suited for the place where the Context Menu was invoked.

CMX is provided with a wealth of Context Menus. If you are not sure what you can do at a certain moment or with a certain item, try opening the Context Menu. Then you will see a list of common tasks.

Drag and Drop Feature

Many of CMX's windows support the drag and drop feature. It is a quick tool for doing certain tasks in CMX, like selecting instruments for calibrations, printing, sets as well as linking Devices and Positions.

Selection List Features

Many of CMX's lists allow you to add a new item to it, if none of the available alternatives suit your needs.

If the item to be added does not require any additional information, e.g. a process connection, just write the new connection type and it is added to the list of process connections.

When the item to be added requires additional information, CMX shows an item titled "**<New…>**" in the list. Selecting this option opens a window where you can create an all new item for the list.

An example of the latter feature is when you add a new calibrator to the database. If the Calibrator Model you are adding is not listed among

Calibrator Models found in the database, select "**<New…>**". A window opens where you can add the new Model and its Manufacturer into the database. All this is done

without opening the **Calibrator Manufacturers** window where Calibrator Model and Manufacturer data is viewed and maintained.

Activation/Deactivation

CMX's Activation/Deactivation feature allows activation and deactivation of Positions, Devices as well as most of the other items shown in a Tree Structure. Deactivation of, e.g. a Device means that the Device is no longer used. The deactivated item has a small red "x" in the lower right corner of the icon shown in the Tree Structure.

Deactivation is hierarchical. When you, e.g. deactivate a Plant Structure node, all Positions, Devices, Functions and Procedures below that node are also deactivated. Furthermore: (re)activation is also hierarchical.

> **Note:** Deactivation is not possible for a Device that is installed in a Position. Unlink the Device and then deactivate it.

Check Out /Check In Feature

Check Out / Check In feature is a tool that locks Positions/Devices for other users than the one who did the Check Out. This feature is presented in Check Out / Check In Feature.

Calibration Result Lock/Unlock

Calibration Result Lock/Unlock allows locking/unlocking approved calibration results. Locking prohibits any unintentional changes to the calibration results.

This is an optional feature in CMX Professional.

This feature is presented in Locking Calibration Results.

> **Note:** This "Common Feature" is available only when Mobile Security Plus Option is in use

Document Links

Several items in CMX's database include a possibility to link documents to them.
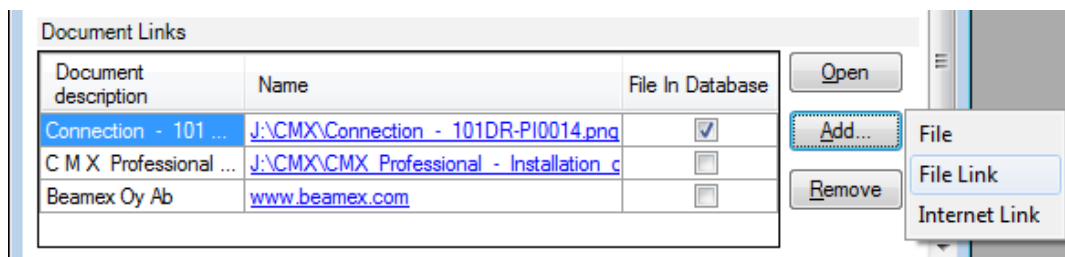
Figure 5: Document Links

CMX supports three kinds of methods for linking/embedding documents (options as seen in the pop-up menu that opens from the **Add** button):

• **File**. This embeds the document into the database. Because of the risk of increasing the database size, this option can be enabled/disabled in **CMX Options** windows' General Settings.

  For an embedded file, the check box in **File in Database** column is checked.

• **File Link**. This option adds a link to an external file. The file itself is not embedded in CMX's database, just the link. For a linked file, the check box in **File in Database** column is not checked.

• **Internet Link**. This adds an internet link to the list. When adding the link, omit the beginning (http://).

> **Note:** The number of links for each item is not limited. Additionally, there are no file type restrictions. Any file will do just as long as you have software suited to view the file.

> **Note:** It is not recommended to save a lot of large embedded documents in the database. Database size grows fast, which may cause performance issues. Use **File Link**s with large files.

User Fields

User Fields may freely be used for whatever suits your needs. They are however not visible by default.

> **Note:** This feature is a part of CMX Professional's option: "Configurable User Interface".

Figure 6: User Fields

To make the User Fields visible you must have the user rights to customize CMX's User Interface. Customizing is described in Customizing the User Interface.

The text fields and check boxes may be freely used. The label text for the free field may be edited using either the User Interface customizing tools or the Direct Editing of the User Interface tool (see Direct Editing of the User Interface).

Certain modern calibrators support calibration related User Fields and Checks. Any data entered into these fields are retrieved to CMX and can be seen among calibration results. To activate these fields in CMX (and compatible calibrators), customize the Calibration Result Properties window. See Customizing the User Interface.

Software Options

This chapter presents available software options for CMX, i.e. additional features that are purchased either at the same time as CMX or later on to add CMX's functionality.

> **Note:** All of the features presented further on are optional in CMX Professional and most are standard features in CMX Enterprise.

Report Designer Option

Allows you to create your own Calibration Certificate, Report, Label and History Trend Layouts.

See Creating Your Own Certificates.

Change Management and Audit Trail Option

Change Management and Audit Trail option is a tool for keeping track of changes made to CMX's database.

For more information, see Change Management and Audit Trail.

Weighing Instrument Calibration Option

Allows you to use CMX when calibrating Weighing Instruments.

For more information, see Calibrating Weighing Instruments.

Maintenance Inspection Option

A tool for doing checks that yield answers "yes" or "no".

More info in Maintenance Inspection.

Work Order Handling Option

An enhanced utility for handling work orders sent from/to ERP (Enterprise Resource Planning) or CMMS (Computerized Maintenance Management System) software.

For more information, see Work Order Handling.

History Trend Option

Allows you to view Calibration History data both numerically and graphically. The option makes it possible to evaluate calibrations and e.g. determine the instrument's drift between different calibrations.

For more information, see History Trend.

Mobile Security Plus Option

CMX's tool that conforms to data integrity requirements.

For more information, see Mobile Security Plus.

User Interface Configuration Option

Allows you to edit the user interface to suit your needs.

For more information, see Editing the User Interface.

LDAP Authentication Option

A possibility to use Lightweight Directory Access Protocol (LDAP) for user authentication.

For more information, see LDAP Options.

Data Loader Option

A tool for importing instrument data from excel file to CMX.

For more information, see Data Loader.

Basic Settings

The Basic Settings section contains information on CMX's settings that should be checked/edited before taking CMX into full use. All settings can be changed later on too, but going through the them first, makes the daily work more efficient.

> **Note:** If you utilize the Weighing Instrument Calibration feature, see Basic Settings for Weighing Instruments. It contains information of Weight Sets, Weights and other Weighing Instrument Calibration related Basic Settings.

The Options Window

The **Options** window can be opened from the main window's **Tools** menu. It allows you to define the following type of options:

- **General Settings**. What type of database queries are run at startup etc.

- **Function Due List**. Settings that define when CMX indicates that a Function is in need of calibration.

- **Calibrator Due List**. Settings that define when CMX indicates that a calibrator is in need of re-calibration.

- **ID Generation**. Needed if you want CMX to automatically generate Position/ Device IDs.

- **Certificate**. Contains fields for defining how the calibration certificate number is generated.

- **Calibration**. Fields for defining calibration related settings.

- **Security**. Whether a password is required when logging in to CMX as well as other security matters.

- **Mobile Security**. Data Integrity settings for Mobile Security Plus option.

  This is an optional feature in CMX Professional.

- **LDAP**. Lightweight Directory Access Protocol settings.

  This is an optional feature in CMX Professional.

- **Messages**. Message service related settings.

  This is an optional feature in CMX Professional.

- **Change Management**. Different Audit Trail and Electronic Signature related settings.

  This is an optional feature in CMX Professional.

- **Work Order**. Work Order related settings.

  This is an optional feature in CMX Professional.

The subsequent chapters have additional information of each setting.

> **Note:** Certain option pages may also be opened directly from a configuration window, e.g. the **Security** page may be opened from the **Tools** menu of the **Users** window.

General Settings

As the name implies, the page contains settings that define what is done while starting up CMX (e.g. Position Query) or when opening certain windows, like the **Calibrator** window.

Field level information is available in the webhelp delivered with CMX.

Function Due List Options

In the Tree view, CMX uses yellow text color for the Position ID / Device ID to indicate that one or more of the Position's/Device's Functions need to be calibrated soon. Here you can define the time interval CMX uses for activating the "Function in need of calibration" color.

> **Note:** Red text color for the Position ID / Device ID indicates that the calibration of one or more of the Position's/Device's Functions are overdue (the scheduled calibration date has expired).
>
> The same colors indicating the need of recalibration are used for Calibrators and Calibrator Modules in their respective trees.

Field level information is available in the webhelp delivered with CMX.

Calibrator Due List Options

This page allows you to define the time interval CMX uses for activating the yellow "Calibrator in need of re-calibration" color.

Field level information is available in the webhelp delivered with CMX.

ID Generation Options

Each Position and Device needs to have a unique ID. It is used for identifying Positions and Devices.

The Position ID and/or the Device ID can be manually entered or created automatically, if activated on this page. Also the format of the automatically created IDs (prefix-number-suffix) can be defined.

Field level information is available in the webhelp delivered with CMX.

Calibration Certificate Options

Each calibration is assigned with a unique certificate number. This number will appear on every calibration certificate which is produced for that calibration.

Field level information is available in the webhelp delivered with CMX.

Calibration Options

This page allows you to define calibration related settings, like is "**Save as Both**" allowed, i.e. the results of one calibration repeat is saved both as **As Found** and as **As Left** results when no adjustment was needed.

Field level information is available in the webhelp delivered with CMX.

Security Options

On this page you can define whether users need a password as well as various other password related settings.

Changing these settings is allowed to database administrators and users with the rights to change security options.

Field level information is available in the webhelp delivered with CMX.

Mobile Security Options

Mobile Security Plus is CMX's Data Integrity feature.

This is an optional feature in CMX Professional.

Field level information is available in the webhelp delivered with CMX.

LDAP Options

LDAP is short for **Lightweight Directory Access Protocol**. It is a method used in networks to authenticate/identify users. When you try to log on to a network, an LDAP server approves (or disapproves) your login.

This is an optional feature in CMX Professional.

If LDAP is enabled in CMX, it supersedes CMX's password settings. Then, instead of checking users' passwords from CMX's database, they are checked from an LDAP server on the network. The network user name must however exist as a CMX **User ID** too.

Changing these settings is allowed to database administrators and users with the rights to maintain LDAP options. Additionally: Editing LDAP settings should be performed by, or with the help of, people with experience of LDAP and knowledge of company's Local Area Network settings. Preferably someone from company's IT support.

Field level information is available in the CMX webhelp.

> **Note:** You may override LDAP authentication by using CMX's License Key number as the User ID and Master Password as the password. Both the License Key number and the Master Password were shipped with the original delivery of CMX.

Message Options

This page allows you to configure CMX to have it send messages via e-mail for certain events.

> **Note:** The messaging functionality requires internet access.

> **Note:** In CMX 2.14.1, the only available event is for second approval requests that are sent as a part of the automatic result validation.

Change Management Options

This is an optional feature in CMX Professional.

If Change Management feature is part of your CMX, this page allows you to change settings concerning changes to the instrument database.

The uppermost check box determines whether Audit Trail used or not. Other fields refine how Audit Trail is utilized.

If required, activate the Electronic Signature feature using the check box with the same name.

In this view you can manage Automatic result validation as well as the list of active rules. See Automatic Result Validation for more information.

Field level information is available in the webhelp delivered with CMX.

For more information about the Audit Trail window and the Electronic Signature, see Change Management and Audit Trail.

Work Order Options

This page allows you to configure work order related settings. It also lists some essential settings that are configured in *Business Bridge*.

Field level information is available in Work Order Options Fields.

Users and User Groups

The **Users** window can be opened from the main window's **Tools** menu. It is located in the **Security** submenu.

The left pane of the window displays either a Tree Structure list of Users or User Groups / Sites, depending on which tab is selected. The right pane displays property data for the User or User Group / Site, selected from the list on the left pane.

Actually, the tabs on the left pane do not reveal anything new (compared with each other). They display the same information but the viewpoint is different:

• When the **Users** tab is selected, all users are shown and for each user the groups he/she belongs to can be seen on the next tree level.

• When the **User Groups** tab is selected, all User Groups / Sites are shown and for each group/site, the users belonging to it can be seen on the next tree level.

To streamline the use of large corporate databases in CMX, a possibility to define Sites and Site Managers is also available. More of Site User Maintenance is available in Site User Maintenance.

> **Note:** Users entered into CMX's database need not be users that actually do calibrations. Users responsible for the calibration/maintenance duties may also be entered. They for instance sign calibrations and accept changes made to the database.

About What to Do With Users and User Groups

The easiest way to work with CMX is using only one user definition with the password security inactivated. The password security settings are easily available via the **Tools** menu in the **Users** window (as well as from the main window's **Tools** menu's **Options** window's **Security** page). The drawback for this easy method is that anyone with access to the computer where CMX is installed may start the software and do what they please.

When CMX is installed and started for the first time: The safe way is to change the administrator password from its default value (delivered in an envelope together with the software installation kit), memorize the new administrator password and create a suitable set of **Users** and **User Groups**.

Each User must belong to at least one User Group. If the password security is enabled, a button for defining the user's password is available in the user's property data.

Define the permissions (what the group members are allowed to do with CMX) for each User Group.

> **Note:** CMX automatically places the current Windows User ID as the default user for logging into CMX. For ease of use, enter the same User IDs into CMX.

Supervisors

Supervisors are by default allowed to do anything that can be done with CMX, e.g. add Users, reactivate a User account, define User Groups etc. A Supervisor need not be assigned to any Group, Supervisors have all rights anyhow.

Whether a user is a Supervisor or not, can be seen (or edited, if you have the permission) in the property data shown on the right hand side of the **Users** window.

There is no upper limit for the amount of Supervisors but at least one Supervisor is required. CMX does not allow deleting the last Supervisor.

See also note in User Deactivation and Lock Out.

Users

Each person using the database may be assigned a unique User ID (assigned by a Supervisor) and optionally a password. A User can belong to one or more User Groups depending on the duties of that particular User.

If **Mobile Security Plus** option is in use, define users of supported **Mobile Devices** as **Mobile Users** and, users who may have more permissions in the Mobile Devices, as a **Mobile Supervisor**. More of Mobile Security Plus in Mobile Security Plus.

Field level information is available in the webhelp delivered with CMX.

> *i* **Note:** The permissions are defined for User Groups. Once a User is assigned to a Group, he/she gets the permissions defined for that Group. If LDAP authentication is enabled, for all CMX users:
>
> Enter the same CMX User IDs as is used as User Names in Windows network. See also LDAP Options.
>
> At the **Users** window's bottom left corner is a check box: **Show only mobile users**. When checked, all non-Mobile Users are temporarily hidden. This is of use especially when Mobile Security Plus option is used and some users have been defined as **Mobile Users**.

Changing the Password

Each user may change their own password. Changing the password is available in the main window's **Tools, Security** menu (provided that passwords are used).

Supervisors (see Supervisors) and Users belonging to **User Groups** (see User Groups) with the permission to maintain Users and User Groups may change the password of all users in the **Users** window which can be opened from the main window's **Tools, Security** menu.

> *i* **Note:** If LDAP authentication is enabled, passwords are not changed in CMX. With LDAP, the handling of passwords is maintained in Windows. See LDAP Options.
>
> For details on how to change Mobile User Password, see Options Window.

User Deactivation and Lock Out

CMX automatically defines users as **Inactive Users** if the User's Expiration Date has passed. A User may also be **Locked** if too many illegal attempts to log into the database was done using that particular User Name.

The Supervisor and a User belonging to a User Group with the permission to maintain Users and User Groups have the rights to activate and release locked Users.

To activate a user, edit the **Expiration Date** field.

To unlock a User, click the **Release User** button.

> *i* **Note:** User's expiry date does not apply to Supervisors. A Supervisor can access the database as long as he/she has Supervisor rights.

User Groups

A Supervisor or a User belonging to a Group with permission to maintain Users and User Groups may add and remove User Groups as well as change the permissions of User Groups.

Field level information is available in the webhelp delivered with CMX.

Permissions

The permissions tab shown for User Groups contains a list of commands and tasks available in CMX.

A command or a task that is unchecked in the list may not be performed by users belonging to that group. They are disabled in CMX's menus and toolbars.

A list of available permissions is available in CMX webhelp.

See also Accessibility.

Site User Maintenance

CMX's Site User Maintenance makes it possible to organize the use of CMX in, e.g. large groups of companies.

Standard Users (see Users) and User Groups (see User Groups) are all managed by Supervisors (see Supervisors) or Users belonging to a User Group that have permissions to maintain Users and User Groups. However, when a CMX database is commonly managed for several sites, all Users with permissions to maintain Users and User Groups can see/edit all Users and User Groups.

When utilizing Site User Maintenance, Supervisors can create **Site Groups** and **Site Managers** who maintain Users in the site and groups they belong to only.

> _i_ **Note:** Site User Management affects **Accessibility** (see Accessibility), **Owner Group** and **Owner** selection lists. See Working with Site User Maintenance.

Working with Site User Maintenance

First of all, you need to enable Site User Maintenance. This is done in **Tools, Options** Window's **Security** section. Make sure the **Enable Site User Maintenance** check box is checked. Note that this setting can be changed by **Supervisors** and **Users** having the permission to maintain security options. After Site User

Maintenance is enabled, **Site Groups** and standard **User Groups** can be created by **Supervisors only**.

Here's how a Supervisor creates Site Groups and Site Managers and takes the feature into use:

1. Create new User Groups with **Site Group** check box checked. Each Site Group is a site/plant/company/sub-organization in the group of companies as defined by the Supervisor. Site Groups have special characteristics as presented further on.

2. Add a standard User Group with **User Maintain** permission, among other suitable permissions. You may name the User Group freely, but a descriptive one, like **Site Managers** is recommended.

3. If no standard User Groups with permissions for different tasks exist, create them.

4. Add all Users that you want to include as Site Managers to the Site Managers group, other applicable standard User Groups and applicable Site Group(s).

   Note that after Site User Maintenance is enabled, all new non-supervisor users need to belong to a Site Group.

5. Add/assign other Users to Site Groups and applicable standard User Groups, or give this task to a Site Manager.

6. Additionally, to fully utilize Site User Maintenance, the Accessibility settings should be set according to the current Site Group definitions. More of this further on.

_i_ **Note:** Adding standard User Groups is recommended, since they can be used to define different permissions for different Users. Each User is then assigned to (at least) one standard User Group that defines the User's permissions and also to a Site Group which defines the User's location in the organization.

Any non-supervisor Users added before Site User Maintenance was enabled may (inadvertently) be unassigned to a Site Group. Users not assigned to any Site Group are not able to log into CMX. Make sure all non-supervisor Users are assigned to at least one Site Group when Site User Maintenance is active.

About Site Managers

- A Site Manager is allowed to maintain users belonging to the Site Groups and Standard User Groups the Site Manager belongs to.

- If a Site Manager adds Users to CMX, each User must be assigned to a Site Group and (preferably) also to a standard User Group.

- Only the Site Groups and standard User Groups the Site Manager belongs to are visible to him/her.

- Site Managers may view but not edit the permissions of any groups visible to him/her.

- Site Managers cannot create new Site Groups or standard User Groups.

About Site Groups

- A **Site Group** is shown among standard **User Groups**. To distinguish a Site Group from a standard User Group, the group name for the Site Group is shown in blue in the tree structures. To more easily distinguish a Site Group from a User Group, the use of a prefix is recommended, e.g.: "**> Paper Mill, Finland**".

- Although permissions may be defined for a Site Group (by a Supervisor), it is not recommended. All Users assigned to a Site Group will inherit the permissions from the Site Group as well as the permissions from the standard User Group the User belongs to.

About Accessibility and Owner Settings

Site managers:

Accessibility, **Owner Group** and **Owner** are selection list fields available in several property windows. They define the visibility and ownership of the item currently viewed.

- **Accessibility** is available in:

  Plant Structure Node, Position, Device, Calibrator, Module and Filter property windows.

- **Owner Group** is available in:

  Plant Structure Node, Position and Device property windows.

- **Owner** is available in:

  Plant Structure Node, Position, Device and Procedure property windows.

The contents of the selection lists vary depending on whether Site User Maintenance is enabled or not:

- When Site User Maintenance is **enabled**:

  ◦ **Accessibility** and **Owner Group** selection lists contain Site Groups. Only the Site Groups the current User belongs to are shown. Supervisors have all Site Groups available.

  ◦ **Owner** selection list contains Users that belong to the same Site Group(s) the current User belongs to.

- When Site User Maintenance is **disabled**:

  ◦ **Accessibility** and **Owner Group** selection lists contains contains all User Groups.

  ◦ **Owner** selection list contains all Users.

For more information on accessibility, see Accessibility.

Plant Structure

The **Plant Structure** is opened from by selecting **Plant Structure** from the main window's **Tree View Selection Tabs**.

Working With Plant Structure Nodes

The Plant Structure displays a hierarchical view of where the Positions (instruments) are located.
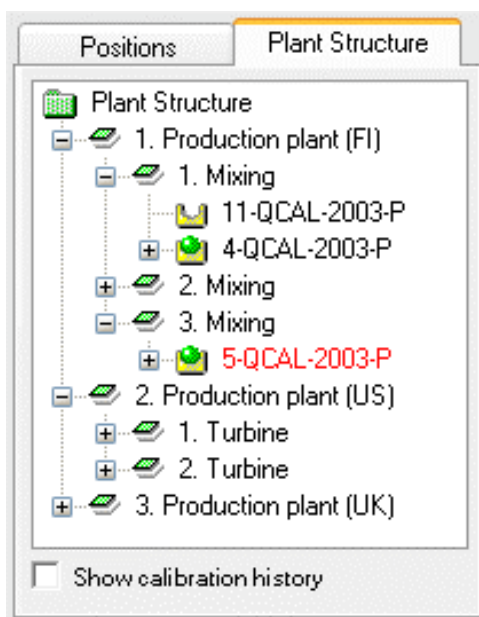
Figure 7: An Example of a Plant Structure

CMX's Plant Structure allows you to create as many levels as is needed for the Plant Structure. The green slanted squares in the example picture are "Plant Structure Nodes". A Node can be anything that somehow defines all or part of the plant.

Positions are at the end of a hierarchical chain of Nodes. Positions need not be located at a certain hierarchy level. They may be placed on any level.

Creating a Plant Structure is optional, but if you create one, we recommend creating it before you start adding Positions. Then, while adding Positions you are able to select its location in the readily made Plant Structure.

Adding Plant Structure Nodes

Adding a Plant Structure Node is done in the following manner:

1. Select an existing Node that is hierarchically just above the level of the intended new node (or the green folder on top of the Plant Structure).

2. Either click the secondary button on your mouse above the selected node or use the **New** button found in the Node Property window's toolbar.

    The new node is added hierarchically below the previously selected/viewed node.

3. Enter a **Name** for the Plant Node and make sure that the **Active Plant Node** Check box is checked. All other fields are optional.

All other fields are optional.

Full field level information of the Node properties are available in the webhelp delivered with CMX.

> ℹ️ **Note:** Adding a Node to a Position is not possible. A "chain of Nodes" ends in a Position.
>
> You cannot add a Position to the Plant Structure's top level (the green folder). The items just below the top level have to be Nodes. A description of how to add Positions to CMX's database is in Adding Instruments to the Database.

Editing Plant Structure Nodes

Make sure you have the properties window opened in the Main Window's Work Area. If not, click the **Properties** button in the Main Window toolbar.

To edit a Plant Structure Node, select it in the Tree Structure and click the **Edit** icon in the properties window's toolbar.

Deleting Plant Structure Nodes

To delete a Plant Structure Node, open the Context Menu (Pop-up Menu) and select the **Delete** option.

> ℹ️ **Note:** Deleting a node also deletes all items hierarchically below the node to be deleted.

Device Manufacturers

The **Device Manufacturers** window can be opened from the main window's **Database** menu. Select the **Device Manufacturers** option.

Working With Device Manufacturers

The **Device Manufacturers** window is primarily meant for editing existing Manufacturer and Model data. Adding Manufacturers and Models can easily be done in the main window while adding Devices. There is of course the possibility to add Manufacturers and Models in the **Device Manufacturers** window too, if you want it.

Also: Entering Device Manufacturer and Model data is optional. If full device data (e.g. rangeability, wetted parts material process connection etc.) is entered for all instruments anyhow, this is a way of creating "device templates" that speed up the adding of Positions (instruments to be calibrated) later on.

> *i* **Note:** There is a separate window for Calibrator Manufacturers (see Calibrator Manufacturers), so only data for instruments to be calibrated should be entered here.

Adding Device Manufacturers

To add a Device Manufacturer to CMX's database, select either **File, New, Device Manufacturer**, use the Context Menu or click the **New** icon on the **Manufacturers** window's toolbar while a Manufacturer is selected in the Tree Structure.

Full field level information of the Device Manufacturer properties are available in the webhelp delivered with CMX.

> *i* **Note:** A Device Manufacturer is also added to the list of Calibrator Manufacturers (see Calibrator Manufacturers).
>
> This minimizes the workload if a single manufacturer delivers both devices that need to be calibrated and calibrators.

Editing Device Manufacturers

To edit a Device Manufacturer in CMX's database, select it in the Tree Structure and choose either **File**, **Edit Record** or click the **Edit** icon on the **Manufacturers** window's toolbar.

Deleting Device Manufacturers

To delete a Device Manufacturer from CMX's database, select it and then choose either **File, Delete** or use the Context Menu or click the **Delete** icon on the **Manufacturers** window's toolbar.

> *i* **Note:** Deleting a Device Manufacturer is not possible if there is a reference to the Manufacturer in the database.

Working With Device Models

Device Models are a kind of "templates" in CMX. Create a model of all types of Devices a Device Manufacturer produces (and is in use on your plant). Then each time a new item of that same model is bought, you only need to select the model from CMX's list and enter the serial number to add the instrument to the database.

Adding Device Models

To add a Device Model to CMX's database, select either **File, New, Device Model**, use the Context Menu or click the **New** icon on the **Manufacturers** window's toolbar while a Device Model is selected in the Tree Structure.

Full field level information of the Device Model properties are available in the webhelp delivered with CMX.

> ℹ **Note:** The Device Model will be added to the selected Manufacturer on the Tree Structure. If a Device Model is selected, the new Device Model will be added to the same Device Manufacturer as the selected Device Model.
>
> Currently there is no possibility to move a Device Model from one Manufacturer to another.

Editing Device Models

To edit a Device Model in CMX's database, select it in the Tree Structure and choose either **File**, **Edit Record** or click the **Edit** icon on the **Manufacturers** window's toolbar.

Deleting Device Models

To delete a Device Model from CMX's database, select it and then choose either **File, Delete** or use the Context Menu or click the **Delete** icon on the **Manufacturers** window's toolbar.

> ℹ **Note:** Deleting a Device Model is not possible if there is a reference to the Device Model in the database.

Calibrators

The **Calibrators** window can be opened from the main window's **Database** menu. Select the **Calibrators** option.

Working With Calibrator Data

If you have purchased the Weighing Instrument Calibration option, see chapter **Basic Settings for Weighing Instruments** in section **Calibrating Weighing Instruments**. It contains information of Weight Sets, Weights and other Weighing Instrument Calibration related Basic Settings.

Here you can manage all the calibrators you use. Entering Calibrator, Calibrator Module and Module Range data is needed for the traceability of the performed calibrations. The Module Range is a quantity the module is capable of measuring or sourcing within a certain measurement range.

The left pane of the window contains a **Calibrators** and a **Modules** tab.

- The **Calibrators** tab displays a Tree Structure of all Calibrators with the installed Modules, suitable external Modules and the measurement Ranges of the Modules. The Tree Structure does however not show any free internal Modules.

- The **Modules** tab shows a Tree Structure of all modules. The Module's Ranges are shown and if the Module is installed in a Calibrator, the Calibrator is shown below the Module before the Ranges. The Tree Structure does however not show any Calibrators with no installed Modules.

To be able to use a Calibrator it has to have one or more Modules (with measurement Ranges) installed.

> **Note:** If you have a Calibrator that is not modular (or has only one module), just repeat the Calibrator data for the module and then add the Module Range(s) for the calibrator.
>
> Adding Calibrator Manufacturers and Models can be done while adding Calibrators. Just select the "**<New…>**" option from the list of Models/Manufacturers.

Adding Calibrators

How to add a Calibrator to CMX's database depends on the Calibrator at hand:

- For communicating Beamex Calibrators: Use the **Detect Calibrator** button found in the lower left corner of the **Calibrators** window or the **Detect Calibrator** option found in **Tools** menu. Then CMX will automatically add the connected Calibrator, its Modules and measurementRanges to the database.

> **Note:** Modern calibrators utilizing USB communication require that a USB driver is installed before they communicate with CMX. For more details, see Calibrators and USB Communication.

- All other Calibrators (and their Modules and measurement Ranges) are manually added to the database. Select either **File, New, Calibrator**, use the Context Menu or click the **New** icon on the Calibrators window's toolbar while a Calibrator is selected on the Tree Structure on the left.

The required fields are Calibrator Model and Serial Number. The Serial Number field is required since it identifies the new Calibrator from others that are of the same Model. Entering a Calibration due date, allows CMX to indicate the need to recalibrate. Therefore the Due Date field is recommended.

Select the Calibrator Model from the list of pre-entered Models. See Working With Calibrator Models or if you are adding a new Model, select the last item on the list: **<New…>** and enter new Calibrator Model data as described in Working With Calibrator Models.

Full field level information of Calibrator properties are available in the webhelp delivered with CMX.

To manually add Modules to a calibrator, see Adding Modules and Installing and Removing Modules to/from a Calibrator.

> **Note:** Adding a Calibrator manually while viewing the Tree Structure of the **Modules** tab gives seemingly no results. Since the new calibrator has no installed modules it is only shown in the Tree Structure of the **Calibrators** tab.

Adding Modules

When adding modules, check first where the highlight is in the Tree Structure:

- If you are viewing the **Calibrators** tab and the highlight is on the query level (the uppermost row of the Tree Structure), the new Module will be a free Module not shown in the Tree Structure of the **Calibrators** tab. To view your newly created Module, switch to the **Modules** tab.

- If you are viewing the **Calibrators** tab and the highlight is on any other level than the query level, the new Module will automatically installed to the highlighted Calibrator. If a Module or a Range is highlighted, the new Module will be installed to the same Calibrator as the highlighted Module/Range.

- If you are viewing the **Modules** tab and the highlight is on a Calibrator level, a new internal Module will automatically installed to the highlighted Calibrator. In all other cases, the new Module will be a free Module.

The required fields are: Module, Model Manufacturer and Serial Number. The Serial Number field is required since it identifies the new Model from others that are of the same Model.

Select the Manufacturer from the provided list. Similarly, select the Module Model from the list of pre-entered Module Models see Working With Module Models or if you are adding a new Model, select the last item on the list: **<New…>** and enter new Module Model data as described in Working With Module Models.

Full field level information of Calibrator Module properties are available in the webhelp delivered with CMX.

Adding Module Ranges

To add a measurement Range to a Module, select the Module or a Range that is already added to the Module. Then select either **File, New, Module Range**, use the Context Menu or click the **New** icon on the Calibrators window's toolbar while a measurementRange is selected on the Tree Structure on the left.

The primary required fields are: Range Name, Quantity, High Limit and Low Limit,

Pressure Type field is needed when the Quantity field is set to Pressure.

Temperature Scale and Sensor Type fields are needed when the Quantity field is set to Temperature.

Reference Junction and RJ Temperature fields are needed when the Sensor Type is a Thermocouple. If the RJ Mode field is set to "External", then also the External Sensor Type and External Wire field need values.

Wire is needed when the Sensor Type is a RTD-sensor or the unit for the Electrical quantity is "ohm" or "kohm".

Fields starting from Temp. Coefficient are needed for error calculation and uncertainty calculation. Leaving any of the fields unchecked may result in unpredictable error/uncertainty results.

Full field level information of the Calibrator Module Range properties are available in the webhelp delivered with CMX.

Installing and Removing Modules to/from a Calibrator

If you add Modules to CMX's database using the CMX's possibilities efficiently (see Adding Calibrators and Adding Modules), the Modules are automatically installed to the Calibrators.

If you however for some reason need to install or remove Modules, select the Calibrator in the Tree Structure (no matter on which tab, Calibrators or Modules), From the properties window on the right, select the Installed Modules tab. Then you will see a list of free Modules and Modules installed to that calibrator. Click the **Edit** button on the Property window's Toolbar. Then the buttons between the two lists allow you to move Modules from one list to another.

> **Note:** This chapter explains how to "install and remove" Modules from a Calibrator in CMX software. Refer to the Manuals of the Calibrators on how to do it for the actual Calibrator (if it is allowed for calibrator users).

Editing Calibrators/Modules/Module Ranges

To edit a Calibrator/Module/Module Range in CMX's database, select it in the Tree Structure and click the **Edit** icon on the property window's toolbar or select **Edit Record** from the **File** menu.

Deleting Calibrators/Modules/Module Ranges

To delete Calibrators/Modules/Module Ranges from CMX's database, select it and then choose either **File, Delete** or use the Context Menu or click the **Delete** icon on the **Calibrators** window's toolbar.

> **Note:** Deleting is not possible if there is a reference to the Calibrator/Module/Module Range in the database.
>
> If a calibrator to be deleted is on a list of **Calibrators to Use**, CMX asks for confirmation before the calibrator is deleted. **Calibrators to Use** field can be found among Calibration Procedure data. See Calibration Procedure Property Window Fields, CMX webhelp.
>
> When deleting a Calibrator/Module/Module Range, all items hierarchically below the item to be deleted will also be deleted.

Copying Calibrators

CMX includes a possibility to copy Calibrators together with its Modules and Module Ranges. This is useful when you have several similar calibrators in use. Add just one and copy the rest from the first one. All you need to do is add the serial numbers to the copied items.

When in **Calibrators** window, viewing Calibrators, click with mouse's secondary button (rightmost button for right handed users) on a Calibrator you want to copy. The pop-up menu includes a **Copy** option.

This pop-up menu option copies the calibrator, all modules and module ranges linked to it and prompts for serial numbers to the new Calibrator and its Modules.

The **Copy** option is also available in **Calibrators** window's **File** menu. The functionality is the same as for the option in the pop-up menu.

> **Note:** Possible document links are not copied.

Calibrator Manufacturers

The **Calibrator Manufacturers** window can be opened from the **Calibrators** window's **Database** menu. Select the **Calibrator Manufacturers** option.

Working With Calibrator Manufacturers

Just as with Device Manufacturers, entering Calibrator Manufacturer and Model data is optional but makes it easier to add similar Calibrators and Calibrator Modules to

the database. Full data is entered only once. Then only the unique data (e.g. the serial number) need to be entered for individual Calibrators and Calibrator Modules.

> **Note:** There is a separate window for entering Device Manufacturers, so only data of calibrators should be entered here. See Device Manufacturers.

Adding Calibrator Manufacturers

To add a Calibrator Manufacturer to CMX's database, select **File** > **New** > **Calibrator Manufacturer**, the **New** button in the toolbar or use the Context Menu.

The only required field is the Manufacturer **Name** field. All other fields are optional.

Full field level information of Calibrator Manufacturer properties are available in the webhelp delivered with CMX.

> **Note:** A Manufacturer of Calibrators is also added to the list of Device Manufacturers. See Device Manufacturers. This minimizes the workload if a single manufacturer delivers both calibrators and devices that need to be calibrated.

Editing Calibrator Manufacturers

To edit a Calibrator Manufacturer in CMX's database, select it in the Tree Structure and choose either **File**, **Edit Record** or click the **Edit** icon on the **Calibrator Manufacturers** window's toolbar.

Deleting Calibrator Manufacturers

To delete a Calibrator Manufacturer from CMX's database, select it and then choose either **File, Delete** or use the Context Menu or click the **Delete** icon on the **Calibrator Manufacturers** window's toolbar.

> **Note:** Deleting a Calibrator Manufacturer is not possible if there is a reference to the Manufacturer in the database.

Working With Calibrator Models

The functionality for handling Calibrator Models can be accessed inside the Calibrators Manufacturers window.

Adding Calibrator Models

To add a Calibrator Model to CMX's database, select **File** > **New** > **Calibrator Model**, use the Context Menu, or click the **New** button in the **Calibrator Manufacturers** window's toolbar while a Calibrator Model is selected in the Tree Structure.

The only required field is the **Model** field. All other fields are optional.

Full field level information of Calibrator Model properties are available in the webhelp delivered with CMX.

> **Note:** The Calibrator Model will be added to the selected Manufacturer on the Tree Structure. If a Calibrator Model or a Module Model is selected, the new Calibrator Model will be added to the same Calibrator Manufacturer as the selected Calibrator Model or Module Model.
>
> Currently there is no possibility to move a Calibrator Model from one Manufacturer to another.

Editing Calibrator Models

To edit a Calibrator Model in CMX's database, select it in the Tree Structure and choose either **File**, **Edit Record** or click the **Edit** icon on the **Calibrator Manufacturers** window's toolbar.

Deleting Calibrator Models

To delete a Calibrator Model from CMX's database, select it and then choose either **File, Delete** or use the Context Menu or click the **Delete** icon on the **Calibrator Manufacturers** window's toolbar.

> **Note:** Deleting a Calibrator Model is not possible if there is a reference to the Model in the database.

Working With Module Models

The functionality for handling Calibrator Module Models can be accessed inside the Calibrators Manufacturers window.

Adding Module Models

To add a Module Model to CMX's database, select **File** > **New** > **Module Model**, use the Context Menu, or click the **New** button in the **Calibrator Manufacturers** window's toolbar while a Module Model is selected in the Tree Structure.

The required fields are **Model**, **Manufacturer** and **Module Type**. In order to enable CMX to communicate with the calibrator in which the module is installed, a Communication Name must be defined. All other fields are optional.

Full field level information of Module Model properties are available in the webhelp delivered with CMX.

> **Note:** The Calibrator Module Model will be added to the selected Manufacturer on the Tree Structure. If a Calibrator Model or a Module Model is selected, the new Module Model will be added to the same Calibrator Manufacturer as the selected Calibrator Model or Module Model.
>
> Currently there is no possibility to move a Calibrator Module Model from one Manufacturer to another.

Editing Module Models

To edit a Module Model in CMX's database, select it in the Tree Structure and choose either **File**, **Edit Record** or click the **Edit** icon on the **Calibrator Manufacturers** window's toolbar.

Deleting Module Models

To delete a Module Model from CMX's database, select it and then choose either **File, Delete** or click the **Delete** icon on the **Calibrator Manufacturers** window's toolbar.

> **Note:** Deleting a Module Model is not possible if there is a reference to the Model in the database.

Lists

To minimize the workload of repetitive tasks, CMX offers the **Lists** functionality. Subsequent chapters describe the functionality and management of **Lists** and present them in details.

What is a List?

Most devices have a process connection, e.g. a ¼" thread for that particular purpose. If you enter a lot of device data it will be an arduous work to write the same connection info over and over. To minimize the workload of repetitive tasks, CMX offers the Lists.

Enter the frequently repeated data into the lists. Then whenever the data is needed you just pick it from the list of pre-entered options. No need to write it over and over again.

The **Lists** window is primarily meant for editing existing list data. Adding list items can easily be done while selecting data from a list seen in other windows. There you just enter the missing item to the list. There is of course the possibility to add list items in the **Lists** window too, if you want it.

Currently CMX provides the following lists:

- Calibrator Hierarchy

- Process Connection

- Process Medium

- Signature Status (*

- Audit Trail Description (*, and

- User Defined Units

*) Optional in CMX Professional

Editing Lists

The **Lists** window can be opened from the main window's **Database** menu. Select the **Lists** option.

Select one of the available lists and view the current list items in the table below.

Editing existing items in a list

Select **File, Edit**, click the **Edit** icon in the toolbar or use the Context Menu's **Edit** option.

Adding items to a list

Select **File, New**, click the **New** icon in the toolbaror use the Context Menu's **New** option.

Deleting items from a list

Select **File, Delete**, click the **Delete** icon in the toolbar or use the Context Menu's **Delete** option.

> **Note:**
>
> Adding User Defined Units is not done in **Lists** window. They can only be edited/deleted in **Lists** window.
>
> A User Defined Unit is added using one of the following methods:
>
> 1. Add a new instrument. See Adding Instruments to the Database For its Function, select **Value** as **Input** and/or **Output Quantity**. Then enter the Range values and instead of selecting an existing User Defined Unit, just write your own unit.
> 2. Create a new Function Template. See Function Templates. Set **Input** and/or **Output Quantity** as **Value** and enter a new User Defined Unit as part of the measurement/keyed **Range**.
> 3. Edit an existing Function with Value as Input and/or Output Quantity. Enter a new User Defined Unit as part of the measurement/keyed Range.
>
> When a User Defined Unit is added using one of the above mentioned methods, the new unit is included in the list of User Defined Units shown in Lists window.

Function Templates

CMX's Function Templates help adding Functions to Devices and Positions. CMX is shipped with a pre-entered set of Function Templates. The pre-entered Function Templates may be edited and new templates may be created/copied according to your own needs.

Each Function typically has at least one *Calibration Procedure*. The procedure contains, among other things, the *Calibration Points* and error limits.

To maintain the existing Function Templates and their Calibration Procedures, select **Database** > **Function Template** in the main window's menu.

Function Template fields are similar to Function Property Window Fields, see Function Property Window Fields, CMX webhelp.

Field level information of the Calibration Procedures is available in the webhelp delivered with CMX.

Editing Function Templates and Calibration Procedure Templates

Select the item you want to edit in the **Function Template** window. Then either press the **Edit** button on the Toolbar or use the **File** menu's **Edit Record** option.

To save or cancel the edits, use either the option available in the toolbar or the corresponding options available in the **File** menu.

Creating a New Function Template

To create a new Function Template from scratch:

Make sure you have selected a Function Template in the Tree Structure. Click **New** on toolbar. The fields in the property window are cleared to allow you to create a new Function Template from scratch.

Another way to create a new Function Template is using the **New** option either in the **File** menu or in the pop-up menu of a Function Template.

A new Calibration Procedure Template is automatically created for the new Function Template. Please check its contents to make sure it suits your needs.

Function Template fields are similar to Function Property Window Fields. See Function Property Window Fields, CMX webhelp.

See also Copying a Function Template. It allows you to make a new Function Template and Calibration Procedure Template(s) using an existing Function Template and its Calibration Procedure Template(s) as the sources for the new items.

Creating a New Calibration Procedure Template

To create a new Calibration Procedure Template from scratch:

Make sure you have selected a Calibration Procedure in the Tree Structure. Click **New** on toolbar. The fields in the property window are cleared to allow you to create a new Calibration Procedure from scratch.

Another way to create a new Calibration Procedure is using the **New** option either in the **File** menu or in the pop-up menu of a Calibration Procedure .

The new Calibration Procedure Template is automatically linked to the selected Function Template. If a Calibration Procedure Template was selected, the new Calibration Procedure Template is linked to the same Function Template that the selected Calibration Procedure Template is linked to. A Function Template may have several Calibration Procedure Templates or even no Calibration Procedure Template at all.

Calibration Procedure Template fields are similar to Calibration Procedure Property Window. See Calibration Procedure Property Window Fields, CMX webhelp.

See also Copying a Function Template. It allows you to make a new Function Template and Calibration Procedure Template(s) using an existing Function Template and its Calibration Procedure Template(s) as the sources for the new items.

> **Note: When adding Functions using the wizard:**
>
> The first active Calibration Procedure Template of a Function Template is always selected for use when creating a Position/Device/Function.
>
> **When adding Functions using the Tree Structure's pop-up menu:**
>
> The new Function contains all Procedures created for the selected Function Template.

Copying a Function Template

Copying allows you to create a new Function Template and *Calibration Procedure* Template based on existing ones.

To copy a Function Template and its Calibration Procedure Templates, select the **Copy** option from the pop-up menu appearing in the Tree Structure or use the corresponding option found in the **File** menu. Make sure you rename the new Templates according to your own needs.

The new Function Template inherits all the Calibration Procedure Templates of the original Function Template.

Deleting Function Templates and Calibration Procedure

When deleting a Function Template or a *Calibration Procedure* Template, use one of the following methods:

- Select **Delete** from the toolbar.
- Select **Delete** from the Tree Structure's Pop-up menu.
- Select **Delete** from the **File** menu.

Editing the User Interface

This is an optional feature in CMX Professional.

CMX has handy tools for editing the user interface according to your needs. All texts may be changed. Additionally, fields that are of no interest to you may be hidden (does not apply to required fields).

See also User Interface Language.

> **Note:** If you have activated Window's UAC (User Account Control) feature do as follows:
>
> Run CMX in **Run as administrator** mode when editing the User Interface. This is done, e.g. by clicking the secondary mouse button above CMX's icon and selecting **Run as administrator** from the pop-up menu. Otherwise you will lose all your edits.

Direct Editing of the User Interface

This is an optional feature in CMX Professional.

To use the Direct edit tool, select the main window's **Tools** menu's **User Interface** option. Choose the **Edit** option from the submenu. Now all fields in all CMX windows are available for editing.

Edit a field text by clicking on the secondary button of your mouse. Press Enter to stop editing the field text.

Remember to save the changes. The **Save** as well as the **Cancel Changes** options are in the menu where the editing was invoked.

Customizing the User Interface

This is an optional feature in CMX Professional.

User interface customizing is started from the main window's **Tools** menu's **User Interface** option. Choose the **Customize…** option from the submenu. Then a separate window for customizing the user interface is opened.

Select the window to be edited/customized from the list on the left side of the window. Press the **Edit** button and then edit/customize a field by clicking on the secondary button of your mouse.

The following editing/customizing utilities are available:

- **Editing** the field text
- Resetting the field to display the **default text**
- Defining a field as **hidden** or making a previously hidden field **visible**. This option is not available for required fields

Adding Instruments to the Database

CMX supports four ways of adding instruments to its database:

- Using the Wizard is the quick way of adding single Function Positions with an installed Device.

  See Using the Wizard.

- Using the Tree Views seen in the main window. This method leaves all control to you. Positions, Devices, Functions and *Calibration Procedure* definitions are all added according to your own needs.

  See Using the Main Window's Tree Views.

- Copying a Device and/or a Position. This possibility is found in the context menus of Tree Structures.

  See Copying Positions and Devices.

- Receiving new instruments from a calibrator supporting this feature (e.g. Beamex's communicating MC series calibrators do support this feature).

  See Receiving Calibration Result Data.

- Importing new instruments from an excel file with **Data Loader** tool.

  See Data Loader.

About Instruments, Positions and Devices

For CMX an *Instrument* is anything that need to be calibrated or otherwise periodically checked. CMX adds the Instruments as Positions and Devices containing Functions and *Calibration Procedure*s.

A **Position** (also called a "**Tag**") is the instrument's location seen in plans and drawings. Typically, it is the symbolic name for the Function(s) that is/are needed at a particular place of the plant (e.g. "TTIR" is the symbolic name used for a Temperature Transmitter, Indicator and Recorder found in instrumentation drawings).

A **Device** is the physical instrument installed into a Position. It realizes the Function(s) defined by the Position. Devices are occasionally removed from a Position (e.g. for maintenance), stored as Spare Devices and then reinstalled to either another Position or even the same Position it was installed in before.

CMX supports installation, removal and reinstallation of Devices. The chapters further on describe how to create and work with Positions and Devices.

Maximum Amount of Positions, Devices and Functions

The following table presents the amount of Positions, Devices and Functions that can be added to different CMX versions.

Table 14: Maximum Amount of Positions, Devices and Functions

CMX version	Max. amount of Positions/Devices	Max. amount of Functions inPositions/Devices
CMX Professional	1.000/1.000 5.000/5.000 10.000/10.000 or unlimited	1.300/1.300 6.500/6.500 13.000/13.000 or unlimited
CMX Enterprise	Unlimited	Unlimited

The maximum amounts in CMX Professional are fixed when CMX Professional is purchased.

Using the Wizard

The Wizard is a fast tool for creating a new Position and an installed Device. You only need to fill in the fields required to create a Position (and a Device).

> **Note:** The wizard creates a Position/Device with a single Function. To add more functions use the method described in Adding Functions.
>
> For maximum amount of Positions, Devices and Functions, see Maximum Amount of Positions, Devices and Functions.

Step 1 of 5 - Position Data

Enter the basic Position data and its location in the Plant Structure. Either enter the plant path manually or select it by opening the Plant Structure Tree from the button on the right side.

> **Note:** When entering the path manually, remember to use the path separator defined in General Settings.
>
> You cannot create the Plant Structure here, but select/enter the location of a previously added Plant Structure.

Field level information is available in the webhelp delivered with CMX.

Step 2 of 5 - Device Data

Enter the basic Device data.

Field level information is available in the webhelp delivered with CMX.

Step 3 of 5 - Function Template

Select one of the available Function Templates or use the last item on the list to create a User Defined Function.

All pre-entered templates are described in the webhelp delivered with CMX.

> **Note:** If a certain function need to be entered several times and there is no suitable Function Type available, consider creating a custom Function Type Template for it. See Function Templates, CMX webhelp.

Step 4 of 5 - Function Data

Specify the input and output data for the Function. The fields shown vary depending on the selected Function Template.

Field level information is available in the webhelp delivered with CMX.

Step 5 of 5 - Calibration Procedure Data

Remember to add a Calibration Due Date to the new Instrument and either accept or edit the default calibration procedure data values on the other fields.

See also chapter Advanced Error Limits.

Field level information is available in the webhelp delivered with CMX.

> **Note:** When you have added an instrument using custom User Defined templates in the wizard, please check all Function and Procedure fields in the property window. The wizard may have omitted some fields. In that case, enter necessary data manually.

Using the Main Window's Tree Views

The Wizard is a shortcut for making a Position/Device with a single Function. This chapter together with its subchapters describes how to make any type of instrument, e.g. one with multiple Functions.

All instrument data located in CMX's Instrument Database are hierarchically arranged in the same order as the following chapters.

Adding Positions

There are three ways of adding a Position in CMX:

• Click the *Secondary Button* on the mouse in the uppermost row of the **Position** Tree.

• Click the secondary button on the mouse above a Plant Structure node in the **Plant Structure** Tree.

• When viewing the **properties** of an existing Position there is a button for creating a **New** Position in the property window.

Position ID is the only required field, all others are optional. The Position ID field may have a default value based on your database settings. If it is empty, you need to enter a unique ID.

Field level information is available in the webhelp delivered with CMX.

> **Note:** A new position may also be created using the context menu of a tree. Open the menu with your mouse pointer above a position icon and select the **Copy** option.
>
> For maximum amount of Positions, see Maximum Amount of Positions, Devices and Functions.

Adding Devices

There are four ways of creating Devices in CMX:

- Click the *Secondary Button* on the mouse above a Position seen in the **Position** Tree.

- Click the secondary button on the mouse above a Position seen in the **Plant Structure** Tree.

- Click the secondary button on the mouse in the uppermost row of the **Device** Tree. Open the **Devices** window, if it is not visible.

- When viewing the **properties** of an existing Device there is a button for creating a **New** Device in the property window.

> **Note:** This note is for the two first methods. If the Position from which the adding of the Device was invoked has functions but no installed Devices, the new Device will be installed to the Position and automatically "inherits" the same functions as the Position.
>
> Otherwise the device will be added to the Device Tree as a free Device. All other methods also add the Device to the Device Tree as a free Device.

Device ID is the only required field, all others are optional. The Device ID field may have a default value based on your database settings. If it is empty, you need to enter a unique ID.

> **Note:** Adding Device Manufacturers and Models can be done while adding Devices. Just select the "**<New…>**" option from the list of Models/ Manufacturers.
>
> A new device may also be created using the copy option of a context menu of a tree. Open the menu with your mouse pointer above a device icon and select the **Copy** option.
>
> For maximum amount of Devices, see Maximum Amount of Positions, Devices and Functions.

Field level information is available in the webhelp delivered with CMX.

Adding Functions

To add Functions you need to have an existing Position or a Device to add the Function to. There are four ways of creating Functions in CMX:

- Click the *Secondary Button* on the mouse above a Position seen in the **Position** Tree.

- Click the secondary button on the mouse above a Position seen in the **Plant Structure** Tree.

- To add a Function to a Device, open the **Devices** window and click the secondary button on the mouse above a Device.

- When viewing the properties of an existing Function there is a button for creating a **New** Function in the property window. The new Function will be added to the same Position and/or Device as the previously viewed Function.

> **(i)** **Note:** Adding a Function to a Position with an installed Device automatically adds the new Function to the installed Device too. If the Position has several Devices installed to it, the new Function is added to the Position but not to any of the installed Devices.

The definition of a Function starts with selecting the Function Template.

Field level information for Function Templates is available in the webhelp delivered with CMX.

The fields to be entered depend very much on the chosen template. CMX helps you out by adding default values to the fields that do require some entry.

Field level information for Functions is available in the CMX webhelp.

For maximum amount of Devices, see Maximum Amount of Positions, Devices and Functions.

> **(i)** **Note:** If a certain function need to be entered several times and there is no suitable Function Template available, consider creating a custom Function Template for it. See Function Templates.

Fieldbus Device Specifics

This chapter presents some fieldbus instrument specifics allowing faster creation of these types of instruments.

FOUNDATION™ Fieldbus and Profibus PA Devices

When adding a FOUNDATION™ Fieldbus or a Profibus PA instrument into CMX's database, the following settings should be used: ®

- Select **Digital variable** as the **Output Category**.

- When you have chosen the **Output Quantity**, select either **Foundation H1** or **Profibus PA** as the **Output Method**.

HART® Devices

When adding a HART instrument into CMX's database, the Analog Output (AO) and the Digital Output (PV) should be added as two Functions with the following settings:

- The Analog Output (AO) as a **transmitter** with the output category **analog variable** selected.

- The Digital Output (PV) as a **transmitter** with the output category **digital variable** selected. Select the same Quantity both for the input and the output. Select **HART** as the **Output Method**

User Defined Transfer Function

Among Function data is a field for defining the instrument's **Transfer Function**, i.e. input/output correlation. In addition to standard Transfer Functions, an option called "**User Defined Transfer Function**" is also available. See User Defined Transfer Funtion, CMX webhelp.

This option is usable when CMX's standard Transfer Functions do not apply, but corresponding input/output pair values are known.

When user defined transfer function is selected as the instrument's Transfer Function, a table for entering up input/output pairs appears. You need not enter exactly ten input and output pairs, although it is the default amount of rows in the table, but as many as is needed (minimum amount: 3 rows). Leave excess rows empty and they will be removed when you finish editing and reopen the function property window. To add more rows to the table, move to the current last row and press the **Enter** key.

> **Note:**
> - First input and output pair (point) must be the same as input and output 0 % range values.
> - Enter absolute input and output values in increasing order (percentage of span point of view).
> - Last input and output values must be equal or greater than input and output 100 % range values.

> **Note:** CMX and calibrators supporting user defined transfer function approximate the values between entered input/output pairs by calculating a curve between a pair of points that connects smoothly to the adjoining curve. The entered input/output pairs need to be points of a strictly increasing function.
>
> User defined transfer functions are supported in CMX's manual entry and in modern calibrators, like Beamex MC4 and later. When trying to send instruments with "User Defined Transfer Function" as the **Transfer Function** to a calibrator not supporting this feature, the following error message appears:
>
> "Unsupported transfer function".

User Defined Pressure Units

CMX has a comprehensive set of pre-entered pressure units. If however they are not suited for your needs, you can create custom pressure units as follows:

1. Select the **Unit** list for a pressure input or output.
2. Scroll down to the bottom of the list and select option "**New**".

3.   Enter required data in the opened window:

- **Unit Name**. A free descriptive text. See note below.
- **Reference Unit**. The pre-entered unit that is used as the basis for calculating the user defined pressure unit.
- **Factor**. A factor for converting the measured pressure from the reference unit to the user defined pressure unit.

4.   Select OK and you are ready.

> *(i)* **Note:** To minimize the risk of confusion that may lead to serious accidents, avoid using unit names that resemble "reserved names", i.e. names of standard units available in CMX.
>
> Use some sort of prefix or suffix, e.g. "**#**", in the unit name. This is to indicate that this is a custom pressure unit, not to be confused with standard units available in CMX.
>
> Currently this feature is available in CMX's Manual Entry window and modern calibrators.

Editing/Deleting Custom Pressure Units

To edit, check or even delete a custom pressure unit, select the unit and close the list. Click the *Secondary Button* on the mouse above the unit list. A pop-up menu opens with the options **Edit** and **Delete**. Select appropriate option.
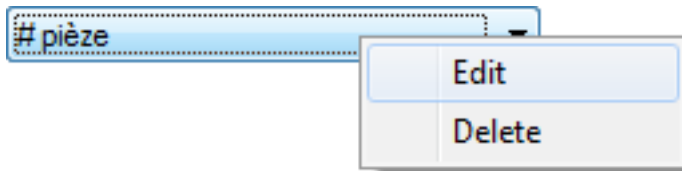
Figure 8: Editing/Deleting Custom Pressure Units

User Defined Temperature Sensors

CMX supports entering user defined temperature sensors used, e.g. as reference sensors. Here's how to add a user defined temperature sensor:

1.   Select the **Sensor Type** list for a temperature input or output.
2.   Scroll down to the bottom of the list and select option "**New**".
3.   Enter required data in the opened window. The contents depend on the selected sensor formula.

For Callendar - van Dusen user defined temperature sensors, enter the following data:

- **Sensor Name**. A free descriptive text. See note below.
- **High & Low Limit**. Defines the temperature range in which the custom sensor is used.
- **R0**. The custom sensor's resistance in Ohms at 0 °C.

- **A**, **B** & **C** are factors that customize the user defined temperature sensor.
- **Resolution**. The resolution of the custom sensor.

For ITS-90 user defined temperature sensors:

- **Sensor Name**. A free descriptive text. See note below.
- **High & Low Limit**. Defines the temperature range in which the custom sensor is used.
- **Rtpw**, the custom sensor's resistance in Ohms at 0 °C
- **Deviation Formula (Below Zero)**. Select the temperature range below zero.
- **A** & **B** are factors that customize the user defined temperature sensor below zero temperatures.
- **Deviation Formula**. Select the range/calibration point data from the available options.
- **A**,**(B, C & D)** are factors that customize the user defined temperature sensor. The amount of factors depends on the selected **Deviation Formula**.
- **Resolution**. The resolution of the custom sensor.

Using Factor for user defined temperature sensors:

- **Sensor Name**. A free descriptive text. See note below.
- **Factor**. A factor that offsets the standard temperature curve selected in **Sensor Type**.
- **Sensor Type**. Select a standard Sensor Type. A simple way of doing it is taking a standard RTD sensor with a 1 ohm resistance @ 0 °C, e.g. Pt1. Then enter the real resistance @ 0 °C as the **Factor**.
- **Resolution**. The resolution of the custom sensor.

> ⓘ **Note:** To minimize the risk of confusion that may lead to serious accidents, avoid using sensor names that resemble "reserved names", i.e. names of standard sensors available in CMX.
>
> Use some sort of descriptive text, e.g. sensor's serial number, in the sensor name. This is to indicate that this is a user defined temperature sensor, not to be confused with standard sensors available in CMX.
>
> User defined temperature sensors are supported by modern calibrators, e.g. Beamex MC6 Documenting Process Calibrator. MC4 and MC2 only supports Callendar - Van Dusen formula.
>
> More of **Callendar - van Dusen** equation in **CMX Calculations** help. Open it from CMX Main Windows' Help menu. Select option **CMX Calculations**. Look for main topic **User Defined Temperature Sensor Calculations** and from there subtopic **Callendar - van Dusen Equation**.

Editing/Deleting User Defined Temperature Sensors

To edit, check or even delete a user defined temperature sensor, select the sensor and close the list. Click the *Secondary Button* on the mouse above the sensor list.

A pop-up menu opens with the options **View**, **Edit** and **Delete**. Select appropriate option.
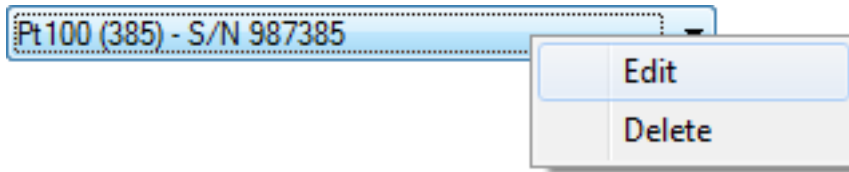
Figure 9: Editing/Deleting User Defined Temperature Sensors

Adding Procedures

CMX automatically creates a Procedure with default settings for new Functions except if the Function was created using the New button in the Function property window. Then the Procedure needs to be manually added.

Procedures may also be added if you need another Procedure for certain needs (e.g. there is a separate Procedure for quality related calibrations and another for less demanding calibrations).

There are four ways of creating Procedures in CMX:

• Click the *Secondary Button* on the mouse above a Function seen in the **Position** Tree.

• Click the secondary button on the mouse above a Function seen in the **Plant Structure** Tree.

• Click the secondary button on the mouse above a Function seen in the **Device** Tree.

• When viewing the **properties** of an existing Procedure there is a button for creating a **New** Procedure in the property window. The new Procedure will be added to the same Function as the previously viewed Procedure.

Enter a name for the Procedure and check the default values CMX have added to the fields that do require some entry.

See also chapter Advanced Error Limits.

> **Note:** CMX always uses the first available Procedure for the Function (the uppermost active Procedure shown in the Tree). If a Function has several Procedures, deactivate all Procedures preceding the one you want to use for calibration.
>
> There are no limitations for the amount of *Calibration Procedure*s, except the available memory in the computer(s)/server(s) used to run CMX and store its database.

Field level information for Calibration Procedures is available in the webhelp delivered with CMX.

Advanced Error Limits

CMX supports the defining of advanced error limits for Calibration Procedures. An **Advanced Error Limit** button entitled **Settings** is available in both the Wizard's Procedure page and Tree View's Procedure page. The button opens a window for defining the advanced error limits.

> ℹ️ **Note:** The advanced error limit settings can be viewed in CMX's **Manual Entry** window and in the **Calibration Result** window. The same **Settings** button can be seen there. It opens the windows presenting the advanced error limit definitions but the information is read only.

Multiple Error Limits

An instrument's measurement span may be divided into subranges. Each subrange may have their own constant and relative error limits. For each subrange, the limitations of Reject Error's Constant and Relative parts apply, but only for the subrange they are valid in, i.e. the combined Reject Error limit may not cross the zero error limit within the subrange. Additionally, the subrange's change points may be outside the span but the change points have to be in increasing order relative to the span.

The amount of subranges are not limited in CMX. However, certain calibrators/ devices may not support multiple error limits at all or support a limited amount of multiple error limits, e.g. max amount multiple error limits is 10.

When trying to send instruments with multiple error limits to a calibrator/device that cannot handle the amount of multiple error limits, CMX shows an error message. The instrument is not sent for calibration to the calibrator/device in question.

Asymmetric Error Limits

The **Advanced Error Limit Settings** window also includes the possibility to define an asymmetry for the error limits, e.g. the positive error limit is double the negative error limit. The **Error Limit's Asymmetric Expansion** is defined in two fields:

• The first field defines the multiplier. The value needs to be equal to one or larger.

• The second field defines which error limit is expanded using the multiplier.

Just as for **Multiple Error Limits**, if a calibrator/device does not support Asymmetric Error Limits, it is not possible to send an instrument for calibration to the calibrator/ device in question.

> **Note:** The multiplier applies to the full span of the instrument's measurement range, no matter how many subranges with different error limits the instrument has.

Other Instrument Related Functions

This section describes the following tasks:

- Linking and Unlinking Devices
- Assigning Spare Devices
- Copying Positions and Devices
- Editing Positions, Devices, Functions and Procedures
- Deleting Positions, Devices, Functions and Procedures

Linking and Unlinking Devices

When you link a Device to a Position you inform CMX that the physical Device is installed to that Position.

You may later produce a report detailing where a certain Device has been in the plant(s), or you may even see which Devices have been installed in a certain Position.

When you create a new Position and/or a Device, there is a simple possibility to link the Position and the Device. Existing Positions and Devices are linked by using another method. Both methods are described in the following subchapters.

Linking While Creating the Instrument Database

There are two ways to link a Device to a Position when creating (or adding a Device to) the database:

- Create a new Position using the Wizard.

  See Using the Wizard.

  Then you also add a Device to the Position. This method requires that neither the Position nor the Device already exist in the database.

- Add a Device to an existing Position seen in the **Position** Tree (alternatively, the Plant Structure Tree). Open the Context Menu (pop-up menu) of the Position and add a Device. Then the new Device inherits all Functions and Procedures of the Position and is automatically linked to the Position. This method requires that the Device does not already exist in the database but the empty Position with Functions does exist.

In both cases the new Device inherits all free Functions and Procedures of the Position and is automatically linked to the Position. Note that a Function and a Procedure added to the Position after the Device was created will only be the Position's Functions/Procedures, not the Device's. It's the creation order that determines what happens.

Keep in mind that these two last methods of linking are handy only when creating the instrument database (or adding a new Device). When both the Position and the Device already exist in instrument database, see subchapter below.

Linking Several Devices to the Same Position

Out of the two methods presented above, the latter allows you to link several Devices to the same Position. If a Device is linked to a Position but the Position still has free Functions, A new device created to the Position "inherits" all free Functions. As a result, the Position now has two installed Devices.

Additionally: If you add more Functions to the Position and then add a yet another Device, the new Device "inherits" the free Functions.

> **Note:** This method of linking several Devices to a Position is not the only way. See Linking Existing Positions and Devices to find out how to link several already existing Devices to an existing Position. There you can also find out how to link a single Device to several Positions.

Linking Existing Positions and Devices

To link a Device to a Position, open the Devices window, select an uninstalled Device (a green circle without a yellow "cup") and drag-drop it to the desired Position seen in the Position Tree (alternatively, the Plant Structure Tree).

A dialog window opens. There you can either link the device as an installed one or as a spare device for the Position.

Another way to link a Device is unlinking an already linked Device and selecting a spare Device as the new linked Device. Both the unlinking and the linking are done using the Context Menu (pop-up menu) available in the Position Tree (alternatively, the Plant Structure Tree).

If CMX displays an error message stating that automatic linking is not possible, drag-drop the Device's **Functions** to the Position's corresponding **Functions** one by one. This method is needed when the Position/Device has several similar Functions or the amount of Functions is not the same in the Position and the Device.

> **Note:** When linking a Device with existing Function(s)/Procedure(s) to a Position, the Device will automatically inherit Position's Function/ Procedure data with the following exceptions: **Initial Calibration Date**, **Initial Calibration Count** and **Total Calibrations** fields stay unique for Position and Device.

Linking Several Devices to the Same Position

If a Position has more Functions than the first linked Device, the free Functions of the Position may be linked to another Device with suitable Functions. To link: drag the Device's Functions to the Position's free Functions.

If the Position still has free Functions after linking the second Device's Functions, a third Device's Functions may be linked to the Position. The Position may have as many linked Devices as there are Functions and there is no limit to the amount of Functions in a Position.

> **Note:** This method of linking applies to situation when both the Devices and the Position already exist in the instrument database. See Linking While Creating the Instrument Database to learn how to add several **new** Devices to a Position.

Linking the Same Device to Several Positions

If a Device has more Functions than the Position it was first linked to, the remaining Functions may be linked to other Positions. Drag the free Functions to Functions in other Position.

The Device may be linked to as many Positions as there are Functions in the Device and there is no limit to the amount of Functions in a Device.

General Notes Concerning Linking

• In order to link a Device to a Position, the Functions' Input/Output Category, Input/ Output Quantity and Transfer Function of the Position and the Device data must "match". Rest of the function data will be synchronized (Position Function data overwrites possibly conflicting Device Function data).

• A Device with a Function can not be linked to a Position without a "matching" Function.

• An inactive Device cannot be installed to a Position.

• An already linked Device cannot be linked to another Position. The Device must be unlinked first.

• An unlinked Device can be a spare Device for many Positions, but as soon as it is installed into a Position, it can no longer be a spare for any Position. CMX automatically removes the spare Device definitions.

• A link leaves a "trace" in the CMX database only if the Device is calibrated while installed to a Position.

• Assigning a Device as a spare Device does not require that the Functions of the spare Device and the Position match.

Unlinking Devices

To unlink a Device open the Position Tree (alternatively, the Plant Structure Tree), expand the tree at the Position where the Device to be unlinked is located. Open the Device's Context Menu (pop-up menu) and select the **Unlink** option.

This method applies to both installed and Spare Devices.

Assigning Spare Devices

To assign a Device as a Spare Device to a Position, open the Device Tree, select an uninstalled Device and drag-drop it to the desired Position seen in the Position Tree (alternatively, the Plant Structure Tree).

A dialog window opens. Make sure that the "Install as Spare Device" check box is selected. Then select **Ok**.

If you want to assign an already installed Device as a spare Device for the same Position, click the secondary button on the mouse. The context menu has an option to assign the linked Device as a spare Device.

> ⓘ **Note:** Assigning a Device as a spare Device does not require that the Functions of the spare Device and the Position match.

Copying Positions and Devices

CMX's Position, Device and Plant Structure Trees have in their context menus the possibility to copy a Position and/or a Device.

Click your mouse's *Secondary Button* above either a Position or a Device. The context menu has a **Copy** option (provided you have the user privileges to create a Position and/or a Device).

• For an empty Position, a window opens where you can add the **Position ID**, **Name** and **Plant** path data.

  You may also set Position's **Accessibility**. This however, depends on your privileges to edit Accessibility data.

• For a free Device, a window opens where you can add the **Device ID**, **Serial Number** and **Model** data.

  You may also set Device's **Accessibility**. This however, depends on your privileges to edit Accessibility data.

• For a linked Position/Device, both previously mentioned windows are shown (one at a time).

> ⓘ **Note:** Copying a Position/Device also copies all Functions and *Calibration Procedure*s the original Position/Device had.

Editing Items Displayed in a Tree

When viewing the **properties** of an existing Position, Device, Function and Procedure there is a button for **Editing** the data in the property window.

Items shown in sub windows (**Manufacturers**, **Calibrators**, **Users**, **Lists** and **Function Template** windows) also have an **Edit Record** option in the window's **File** Menu.

Note: Editing linked Functions or *Calibration Procedure*s of linked Positions and Devices always apply to the Procedure/Function of both the Position and Device.

Deleting Items Displayed in a Tree

The option to delete an item shown in a Tree is shown in the item's Context Menu (pop-up menu). The toolbar also contains a button for deleting items.

Items shown in subwindows (**Manufacturers**, **Calibrators**, **Users**, **Lists** and **Function Template** windows) also have a **Delete** option in the window's **File** Menu.

Note: Editing linked Functions or *Calibration Procedure*s of linked Positions and Devices always apply to the Procedure/Function of both the Position and Device.

Queries, Filters and Sets

This section describes tools that help you sort, group and view the instrument data according to you own needs.

What Is a Query

A query is a tool found in all database software. It contains search criteria that select the data to be displayed.

Available Queries

CMX has queries available for Positions, Devices, Calibrators and Calibrator Modules. Queries are part of the software and therefore available at any time. Use filters for temporary filtering the instrument data.

The available queries are shown in a list just above the Tree. The following table describes all currently available queries.

Query Description	Position Queries	Device Queries	Calibrator/ Module Queries
Does not filter out anything. Everything is shown.	All Positions	All Devices	All Calibrators/ Modules
Shows only the items due (or overdue) for calibration.	Due for Calibration	Due for Calibration	Due for Calibration
Shows the items due within a specified period.	Due within…	Due within…	Due within…
Shows unlinked Positions/ Devices only.	Empty Positions	Free Devices	-
Shows all currently added Positions. See also the note below.	New Positions	-	-

> **Note:** The "New Positions" query is not available in the list of Position Queries. It is automatically created when adding Positions and also disappears automatically when you choose another query from the list.
>
> Keep in mind that the Position Query list is the **secondary** level query. The **Plant Structure List**, shown above the Position Query list, is the **primary** level filtering for the Positions shown in the Position Tree.

What Is a Filter

A filter is a handy tool for limiting the displayed data. You may define what to filter in the **Position Filter Conditions** window or **Device Filter Conditions** window.

> **Note:** You also have the possibility to save useful filters for future needs and create more sophisticated searches using the SQL Editor. See subsequent chapters.

How to Filter Data

To open the **Position Filter Conditions** window, press the filtering button on the right side of the Main Windows' Position query list. The button has an icon that looks like a funnel. The same feature is in the **Devices** window that displays the Device Tree.

When you click either of the filtering buttons, a window with all filterable fields is presented. Then select suitable filtering parameters.

For text fields: Enter any amount of characters that suit your filtering needs. While searching for matches, all fields starting with the same characters are selected for display in the Tree with the filtered data. See also Wildcards.

To activate a filter:

When all filter conditions are set, press the **Apply** button in the **Filter Conditions** window. Then the Position or Device Tree only shows the Positions/Devices that fit the filter parameters.

> **Note:** Both the Position Tree and the Device Tree may have their own independent filters active.
>
> Filters are not case sensitive. **TIRCA** and **Tirca** returns the same results.
>
> You may also search for empty fields. Enter **IS NULL** as the search criteria. This is the exception to case sensitivity: **IS NULL** need to be written with capital letters.
>
> For all error limit fields:
>
> When entering numeric values, use the same decimal separator as is defined for your CMX database. Keep in mind that the decimal separator in your database may differ from the decimal separator used by the operating system. When in doubt, consult your IT specialist.
>
> Check boxes have three possible states: **Checked**, **unchecked** or **mixed**. Mixed displays as a little green square in the check box. By default, all check boxes in Filter Conditions windows are displayed in mixed state. This means the value of the check box does not matter. If you change the check box's state to either checked or unchecked, the check box is part of the filter query.

To deactivate a filter:

- Double click the Filter icon seen in the Main Window.
- Open the **Filter Conditions** window again, press the **Clear Fields** button and then the **Apply** button.

Wildcards

Wildcard characters are special characters that represent one or more other characters. They help filtering data. The following table lists all supported wildcards and describes how they are used.

Table 15: Wildcards

Wildcard character	Wildcard description	Filtering example
%	Any string of zero or more characters.	Setting, e.g. the Position ID filter criteria to "**%CA**" the following Position IDs are accepted: LIR**CA**Z100, L**CA**101, PI**CA**102, T**CA**Z103

Wildcard character	Wildcard description	Filtering example
_ (underscore)	Any single character	Setting the Position ID filter criteria to "**_CA**" the following Position IDs are accepted (compared with the previous result): **LCA**101, **TCA**Z103
[ ]	Any single character within the specified range ([a-f]) or set ([abcdef]).	Setting the Position ID filter criteria to "**[A-L]CA**" the following Position ID is accepted (compared with the previous results): **LCA**101
[^]	Any single character **not** within the specified range ([^a-f]) or set ([^abcdef])	Setting the Position ID filter criteria to "**[^A-L]CA**" the following Position ID is accepted (compared with the previous results): **TCA**101

> **Note:** The above mentioned wildcards apply for Microsoft SQL Server. If you are using Oracle database, refer to Oracle's own wildcard definitions.

Using Saved Filters

If you have already saved a useful filter, you may take it into use by choosing from the **Filter Name** list.

Saving Filters

You may give a name to a filter, set its accessibility and enter a description for it using the uppermost fields in the **Filter Conditions** window.

> **Note:** If no user group is selected in the filter's **Accessibility** list, CMX treats the filter as private, i.e. no other user has access to it. If you want other users to have access to a filter you created, check as many user groups as you want in the **Accessibility** list.

To save a new filter, click the **New** button in the toolbar and then enter a name for the filter. After all settings are as required, save the filter by clicking the **Save** button in the toolbar.

To edit an existing filter, click the **Edit** button in the toolbar. Then do the necessary edits and click the **Save** button in the toolbar.

SQL Editor

The **SQL Editor** button found in the **Filter Conditions** window shows the current filtering settings as a standard SQL query.

The Filter Conditions windows' SQL Editor allows users with SQL knowledge to edit queries. E.g. all filter parameters in the normal filter window use the AND operator between all queried fields. In the SQL editor the operator may be changed to OR.
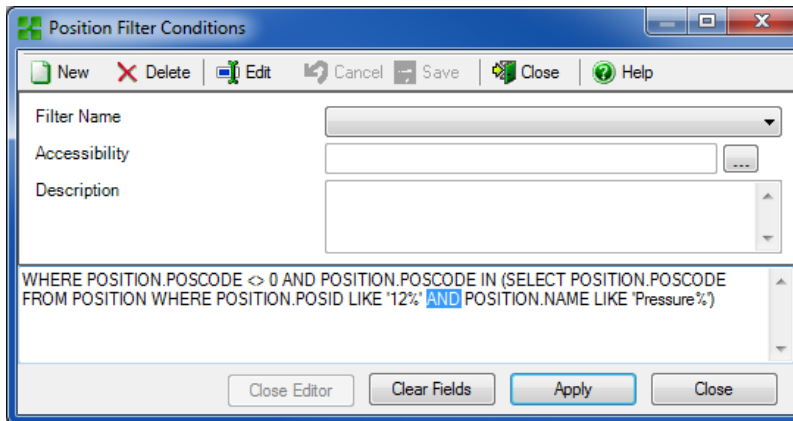
Figure 10: SQL Editor

A more advanced SQL query cannot be displayed in the normal filter window. In that case the **Close Editor** button is disabled and that particular query may only be edited in the SQL Editor view.

> **Note:** Your edits may create a query that does not give any results at all. Make sure you type all SQL parameters correctly.

What Is a Set

Sets are groups of Devices or Positions that are selected as part of a collection. Usually a set contains items that are calibrated at the same time and/or are located e.g. in the same department.

Device and Position Sets

The **Device Sets** as well as the **Position Sets** window is opened (and closed) from the main window's toolbar or from the **View** menu. The upper part of the window contains a list of existing sets. The last item in the list includes a possibility to create a new set.

A set is saved with the database and remain available until it is deleted.

Editing a Set

To **add** an item to a set, drag-drop it from a Tree containing similar items as the set.

- Devices can only be dragged from the Device Tree seen in the **Devices** window. If the window is not visible, open it from the main window's toolbar or the **View** menu.

- Positions can be dragged from the Position Tree or the Plant Structure Tree. One of the Trees is always available on the left side of the main window.

Removing an item from the set is done from the item's Context Menu (pop-up menu). Similarly, the whole set is deleted from the Context Menu opening from the set name (the uppermost row in the set Tree).

Check Out / Check In Feature

Check Out / Check In feature is a utility that allows you to "lock" the Positions/ Devices currently under calibration (or being edited). The data of Positions/Devices that are Checked Out may not be calibrated/edited by other CMX users than the one who did the Check Out. When Checking In, the Position/Device is "unlocked" and may again be calibrated/edited by all CMX users.

Check Out / Check In Characteristics

This chapter presents the common characteristics of the Check Out / Check In feature.

Automatic Check Out / Check In and Manual Check Out / Check In specifics are presented in their own subchapters.
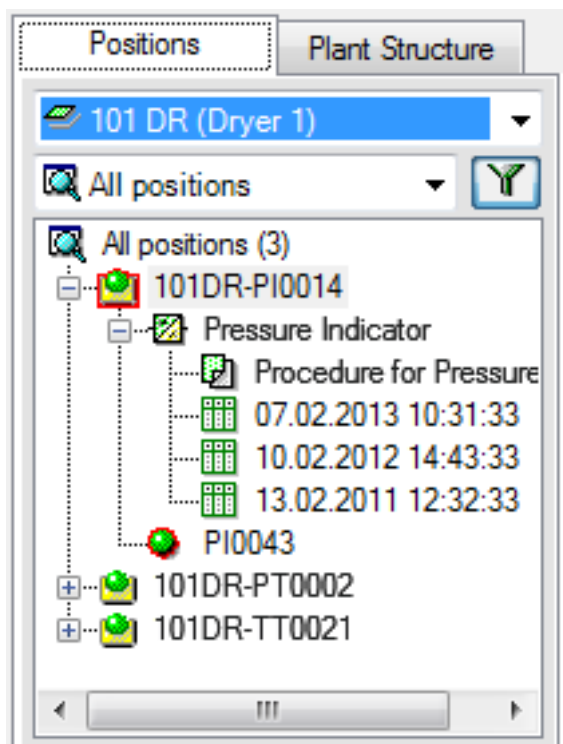
Figure 11: Locked Position and Device

- A Position/Device that is Checked Out, has a red frame around its icon (see picture above).

- When a Position/Device is Checked Out, all data belonging to it: **Position**, **Device**, **Function(s)**, **Procedure(s)** and **Calibration History** is locked.

- The data of a locked Position/Device may be deleted/edited only by the user that did the Check Out.

- A locked Position/Device may be sent for calibration or chosen for Manual Entry only by the user that did the Check Out.

- The uppermost row of a locked item's property window displays the following information:

[Checked Out By <User Name> / <Date> <Time>]

- A locked item does not lock documents linked to it.

- A locked item does not lock pick-up lists it uses.

- You may use CMX's filtering utility to find/view locked items.

- If you utilize Audit Trails (see Change Management and Audit Trail), all Check Outs and Check Ins are saved in the Audit Trail.

> **Note:** You may still calibrate Positions/Devices without utilizing the Check Out / Check In feature.

> **Note:** Calibration cannot be approved when Position/Device is Checked Out.

Automatic Check Out / Check In

When activated, the Automatic Check Out / Check In feature automatically checks out a Position/Device sent for calibration or selected for Manual Entry. Similarly, when the calibration results are saved to CMX's database, the instrument is automatically Checked In.

By default, Automatic Check Out / Check In feature is not activated. To activate it, use menu commands **Tools**, **Options**). Check the check box **Automatic Calibration Time Check Out / Check In** to activate Automatic Check Out / Check In feature. See General Settings.

> **Note:** Calibrating a single Function of a multi-function Position/Device locks the Position/Device and all its Functions until the single Function is calibrated and results are saved in the database.
>
> When several Functions of a multi-function Position/Device are sent for calibration, the Position/Device is locked until the results of all Functions are saved in the database.

Manual Check Out / Check In

Manual Check Out / Check In can be used no matter if Automatic Check Out / Check In is activated or not. Additionally, a Position/Device Checked Out using automatic Check Out may be checked in using manual Check In.

Manual Check Out / Check In is more versatile than Automatic Check Out / Check In. It can be used, e.g. for locking an item that needs editing. Then, in a multi-user environment, no other users may simultaneously edit the same data and cause clashes.

Checking Out a Single Instrument

An instrument may be manually Checked Out from any tree structure (**Position Tree, Device Tree, Plant Structure Tree, Position Set Tree, Device Set Tree**). Click on the mouse's *Secondary Button* to open a context menu above either a **Position** or a **Device**.

If the Position/device is not checked out, the context menu has a Check Out option.
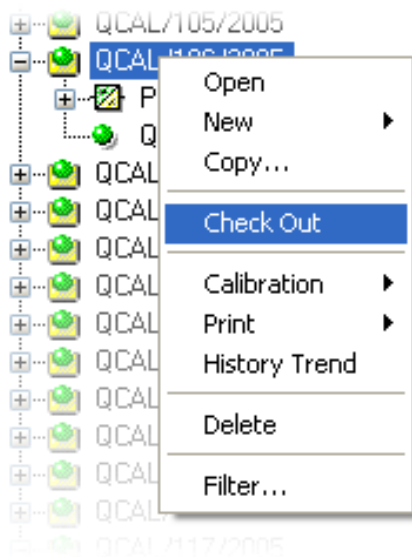
Figure 12: Checking Out a Single Instrument

> **Note:** Checking out/in is available only for users with permission to edit Position and Device data.

Checking Out Multiple Instruments

A group of instruments may be manually Checked Out from the **Query** level of a tree (the uppermost item in a tree, see the picture below).

This method locks all items belonging to the group except the items that were already locked. They stay locked for the user who originally checked them out.
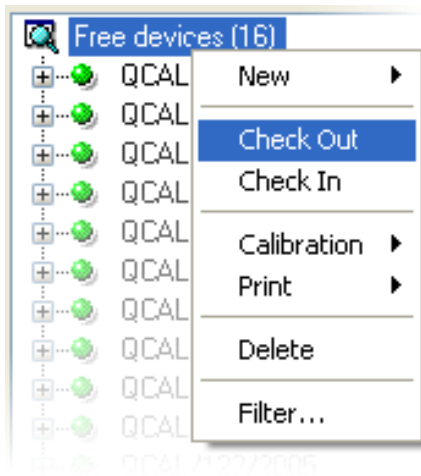
Figure 13: Checking Out Multiple Instruments

> ℹ️ **Note:** When doing multiple Check Outs, CMX displays a dialog asking to confirm the operation.

Checking In a Single Instrument

An instrument may be manually Checked In from any tree structure. Click on the mouse's secondary button to open a context menu above a Checked Out **Position** or **Device**.

> ℹ️ **Note:** The **Check In** option is available only for the user who Checked Out the instrument, for users with Supervisor privileges and the Database Administrator.
>
> Users with the permission to manually Check In and Check Out instruments may Check In instruments Checked Out by another user.

Checking In Multiple Instruments

To Check In multiple items, click on the mouse's secondary button above a **Query** (the uppermost item in a tree as shown in one of the previous pictures). Select **Check In** from the context menu.

This method unlocks all items Checked Out by the logged in user. If the logged in user has Supervisor privileges or is the Database Administrator, all items will be Checked In.

> ℹ️ **Note:** When doing multiple Check Ins, CMX displays a dialog asking to confirm the operation.

Calibration

Calibrations can be done after the necessary instrument data is entered into the database.

A Position must have an installed Device (with Functions) before a calibration can be performed, but a Device (with Functions) can be calibrated before it is installed into a Position. If a Device is installed into a Position, then only a Position calibration may be carried out, not a Device calibration.

CMX supports the following methods of calibration data entry:

1. **Offline Calibration** (sometimes also called Batch Calibration), where Instruments/Functions to be calibrated are sent from CMX to a Calibrator able to communicate with CMX. Then the calibrator is moved to the field/laboratory where the instrument is located. After the calibration is performed the calibrator is brought back and reconnected to CMX. The results of the calibration are then received to CMX.

    For more information, see Selecting Instruments for Calibration and Receiving Calibration Result Data.

2. **Manual Entry** is for situations, where a calibrator unable to communicate with CMX is used for calibration.

    For more information, see Manual Entry of Calibration Results.

Manual Entry supports multiple As Found and As Left test. In Offline Calibration, the amount of As Found and As Left repeats depends on the communicating calibrator. When in doubt, refer to the calibrator manual.

The communication cable used for calibrator communication is shipped with the calibrator.

> ⓘ **Note:** If you utilize the Weighing Instrument Calibration feature, some additional info on how to calibrate Weighing Instruments is presented in Calibrating Weighing Instruments.

Calibrators communicating via RS232-serial port:

Use only cables specifically done for communication between the calibrator and the computer.

Connecting and disconnecting the communication cable should be done when the power is off on both the computer and the calibrator.

For more details concerning calibrators utilizing USB port for communication, see Calibrators and USB Communication.

The Typical Calibration Procedure

The typical sequence of phases in a *Calibration Procedure* is as follows.

Selection of Functions and Downloading

The Functions due for calibration are selected from the database and sent to the appropriate calibrator. A query or a predefined set could be used to find the Functions due for calibration.
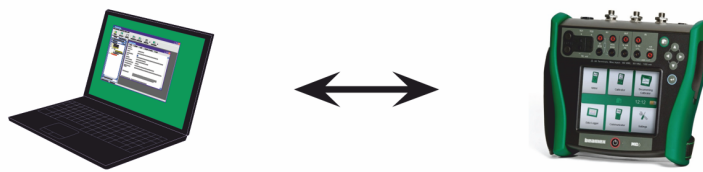
Figure 14: Selection of Functions and Downloading

As Found Calibration

The calibrator is moved into the field, and an As Found calibration is performed using the setup information in the memory. The results are saved in the memory of the calibrator.
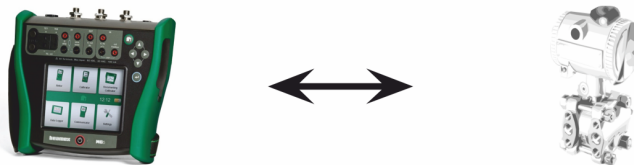
Figure 15: As Found Calibration

Instrument Adjustment

If needed, the instrument function is adjusted with the help of the calibrator measurement modules. The maximum error is reduced to the Adjust To limit.
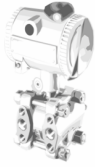
Figure 16: Instrument Adjustment

As Left Calibration

The instrument function is calibrated again, to check that the maximum error is at the desired level. The results are stored in the calibrator memory, and another scheduled calibration can be performed.
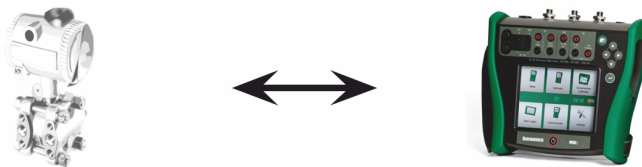
Figure 17: As Left Calibration

Receiving of Calibration Results

After all calibrations have been performed, the calibrator is reconnected to the computer, and CMX will receive the calibration results, and save the calibration data for use in the future.
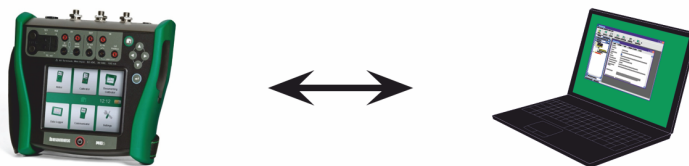
Figure 18: Receiving of Calibration Results

Printing of Results

CMX can then e.g. produce calibration certificates reports based on saved calibration data.
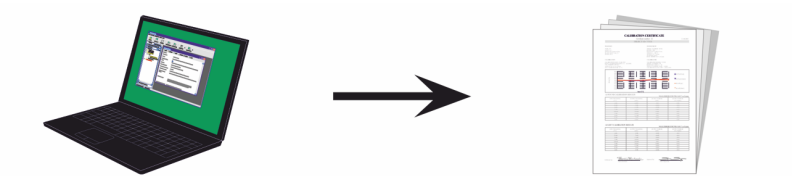
Figure 19: Printing of Results

Calibration Web Service Interface, CWSI

Calibration Web Service Interface, CWSI, is a tool for communication between calibrators and CMX in virtualized environments.

CWSI introduces two new components into CMX: **CWSI Server** and **CWSI Client**. **CWSI Server** is installed on a server, e.g. the same server as **CMX Server** is installed. **CWSI Client** is installed on all computers where CMX main software is run. More info of CWSI installation is in **CMX Installation Manual** and in CWSI Help file included in **CWSI Server** and **CWSI Client**. The help file is also available as a pdf file on CMX's installation disc.

bMobile utilizes **CWSI Server** to communicate with CMX.

Starting CWSI

Before using CWSI, **CWSI Client** must be started and connected to **CWSI Server**.

Use Windows' search tool to locate **CWSI Client**. How to invoke the search tool depends on the operating system version. The picture below is from Windows® 10.
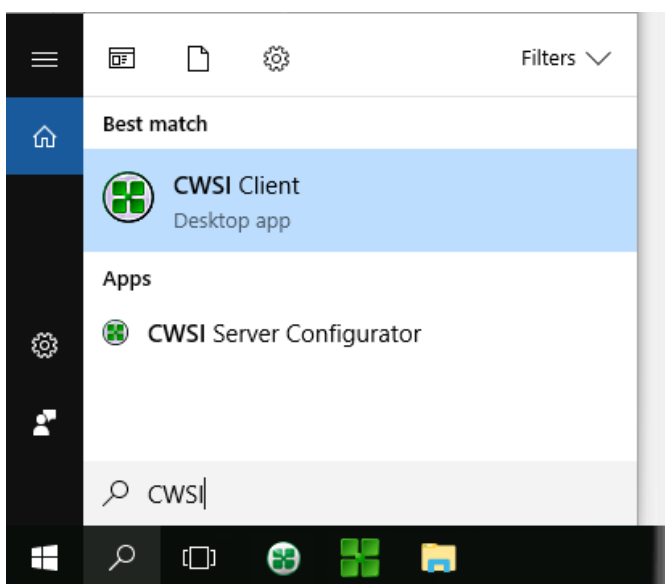
Ensure that the **CWSI Client** is found in the system tray:

The context menu of the system tray icon allows you to configure the connection to **CWSI Server** and connect to **CWSI Server**.

Configuring **CWSI Server** is done similarly, but on the computer it resides in, provided you have the rights to make changes to the computer. The configuration software is called **CWSI Server Configurator**.

Using CWSI in CMX

In CMX, CWSI is available in both **Send to Calibrator** and **Receive from Calibrator** windows. Select **CWSI** as your **Protocol**. The small button with three dots allows you to check/edit **CWSI Server** settings ensuring connection to **CWSI Server**. The picture below presents the default settings.
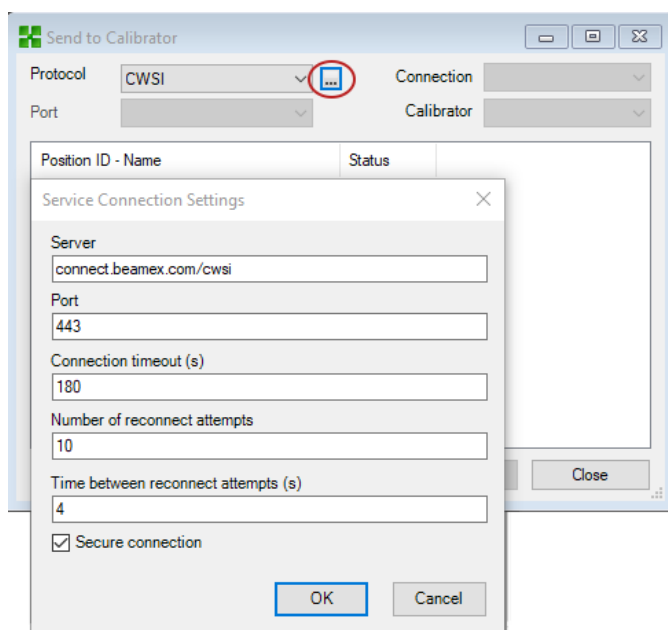
Figure 20: Using CWSI

If CMX connects to CWSI Server, then the **Connection** selection list shows all matching **CWSI Clients** where **CMX user id** (set in **CWSI Client**'s **Options**) is the same as **User ID** in CMX. Each connected calibrator of the **CWSI Client** is listed in the Calibrator list. In any other manner both Send and Receive windows can be used normally.

> **Note:** If your calibrator is missing from the **Calibrators** list, select **Connection** again. It refreshes the **Calibrators** list.
>
> If CWSI is configured to require a "Secret" (a password unique to CWSI), the "Secret" has to be entered before sending and receiving commences.

Selecting Instruments for Calibration

Since a calibrator treats each Function in an instrument as a separate item to be calibrated, CMX sends Functions to the calibrator, not instruments.

CMX has a separate window for collecting the Functions that will be sent to the calibrator. The window is opened using one of the following methods:

- Selecting **Send** from the main window's toolbar (found in a submenu that opens from the Calibration button).
- Selecting **Calibration**, **Send** from a suitable Context Menu (pop-up menu).
- Selecting the **Send** option from the main window's **Calibration** menu.

Adding Functions to be calibrated to the **Send to Calibrator** window is done using the following ways:

- Selecting **Calibration**, **Send to Calibrator** from a suitable Context Menu (pop-up menu). This option is available for the following items shown in one of CMX's Trees:

  ◦ A Position with an installed Device. If the Position contains several Functions, all Functions are added to the list.

  ◦ A Function in a Position with an installed Device.

  ◦ An uninstalled Device (containing Functions). If the Device contains several Functions, all Functions are added to the list.

  ◦ A Function in an uninstalled Device.

- Dragging Functions, Positions or Devices from a Tree to the **Send to Calibrator** window.
- Selecting the name of a query or a set (the uppermost row in a Tree) and dragging it to the **Send to Calibrator** window is also supported. Then all items included in the query/set are added to the list of Functions to be calibrated.
- Dragging a Plant Structure level from the Plant Structure Tree to the **Send to Calibrator** window. Then all Functions of Positions/Devices hierarchically below that Plant Structure level are added to the **Send to Calibrator** window.

Sending Instruments for Calibration
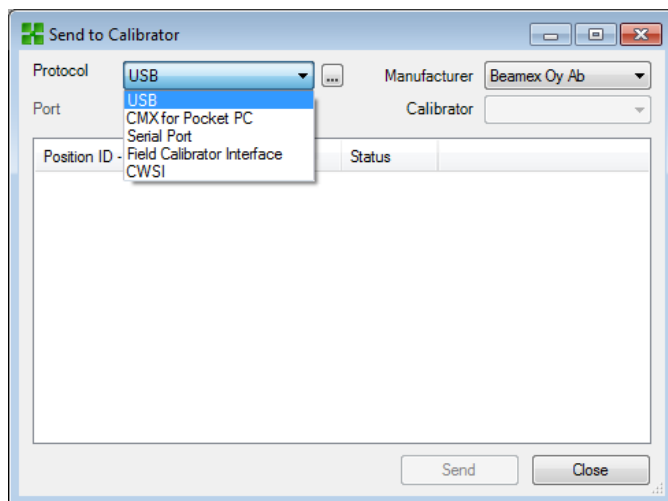
When you open the **Send to Calibrator** window, you first have to select the **Protocol**. The options are:

* *USB* for calibrators using USB port for communicating with the PC.
* *Serial Port* for communicating with older calibrators using serial communication and Beamex's CALIBINT legacy protocol. Remember to select the COM *Port* too.
* *Field Calibrator Interface* is for communicating with calibrators supporting standard FCINTF protocol.
* *CWSI* is for communicating with calibrators and *bMobile* via Calibration Web Service Interface (CWSI). See Calibration Web Service Interface, CWSI .

The calibrator may also be selected. Use the list of manufacturers and models to identify the calibrator.

When you press the **Send** button, the communication with the calibrator starts. The status column tells you how the communication advances.

Note: The "**Auto Detect**" option available for **Serial Port** protocol is fully compliant with Beamex calibrators. Other calibrator brands may not support auto detection.

CMX remembers the Protocol, Port and Calibrator settings so the next time you open the **Send to Calibrator** window, the settings are already according to your needs.

Closing the **Send to Calibrator** window before pressing the **Send** button cancels the sending procedure. Next time you open the **Send to Calibrator** window, the list of functions to be sent is empty.

When sending instruments to certain newer calibrators, the instrument's Plant Structure path may also be included in sent data. To activate this feature, open CMX's Options window.

Modern calibrators using Universal Serial Bus (USB) for communication require that a USB driver, shipped with the calibrator, is installed before they communicate with CMX. For more details, see Calibrators and USB Communication.

If the Calibration Options setting **Warn when Calibrator/Module is Overdue** is checked, CMX warns if you send instruments for calibration to a calibrator with an overdue calibration.

Note: If **Mobile Security Plus** option is in use:

• Mobile User information is sent from CMX to supported Mobile Device.

• If Site User Maintenance is used then only users belonging to the same site are sent to Mobile Device.

• Any possible locked Mobile User accounts are released by sending an instrument to a Mobile Device.

• Overwriting existing instruments containing calibration results in a supported Mobile Device is prohibited.

Receiving Calibration Result Data

To open the **Receive from Calibrator** window use one of the following methods:

• Select **Receive** from the main window's toolbar (found in a submenu that opens from the Calibration button).

• Select **Calibration**, **Receive** from a suitable Context Menu (pop-up menu).

• Select the **Receive** option from the main window's **Calibration** menu.

CMX remembers the latest Protocol and Port used as well as the latest manufacturer/calibrator settings, so normally you do not need to change the settings shown in the upper part of the **Receive from Calibrator** window. For available Protocol options, see Sending Instruments for Calibration.

Press the **Connect** button to see a list of Positions/Functions available in the calibrator's memory. The results column indicates whether a Position/Function contains calibration results or not.

Remember to check/uncheck the check boxes found at the bottom of the window according to your needs. Note that the **Delete Instruments After Receive from Calibrator** checkbox may be overridden in **Calibration Options**. Then you are not able to change the setting here. See also Receiving Instrument History and Avoiding Duplicate Results.

When you press the **Receive** button, the communication with the calibrator starts. The status column tells you how the communication advances.

Note: The **Receive from Calibrator** window has a **Confirm External References** check box. If it is checked, a window for entering external calibrator reference data opens for the following input/output methods:

- Input and/or *Output Method* is "**Keyed**".
- *Input Method* is set to "**Controlled and Measured**".

If the Instrument data of the instrument to be received differs from the data in CMX's database, CMX asks whether you want to receive the calibration results and update the instrument data in CMX or if you want to cancel the receiving of results.

When receiving calibration results of an instrument that is not in CMX's database, CMX asks if the new Device (Field Entry Device, a.k.a. **FED**) should be added to the database.

Adding instrument data is only available in modern calibrator types supporting this feature. If unsure, check by downloading a new instrument created in the calibrator. CMX informs you if it finds a new instrument and asks if the instrument should be added to CMX's database.

Modern calibrators using Universal Serial Bus (**USB**) for communication require that a USB driver, shipped with the calibrator, is installed before they communicate with CMX. For more details, see Calibrators and USB Communication.

Modern communicating calibrators may support long Position ID and Device ID fields or even instruments without either or both ID fields. CMX does not support empty ID fields or ID fields longer than 65 characters. When Positions/Devices with missing or too long IDs are received, CMX informs the user about this and offers a possibility to give/change Position ID and/or Device ID. The information will also be updated in the calibrator.

If the Calibration Options setting **Warn when Calibrator/Module is Overdue** is checked, CMX warns if you receive calibrated instruments from a calibrator with an overdue calibration.

If the field **Reject if Calibrator is Overdue** in an instrument's Calibration Procedure is checked, you cannot receive calibration results for that instrument from a calibrator with an overdue calibration.

> **Note:** If you have an instrument capable of communicating with other devices (e.g. a HART® or a fieldbus instrument) that you want to add to CMX's database, do as follows: Connect them to a calibrator with suitable communication capabilities, e.g. Beamex's MC6 Advanced Field Calibrator and Communicator. Read the instrument data into the Calibrator and connect the Calibrator to CMX. Receive the instrument data from MC6. This method enables you to build your database without retyping anything that is already available in the instrument's memory.

Receiving Instrument History

In **Receive from Calibrator** window:

If the Status column of the list of instruments contain data (e.g. "Current"), the instrument data has changed in the calibrator, e.g. the measurement span has been edited. If you want to save the instrument history and corresponding results, make sure you check the **Show Instrument History** check box below the list of instruments. The status may be:

- **Original**. In this calibration, the instrument is as they were during the earliest calibration.
- **Current**. In this calibration, the instrument is as it currently is in the calibrator.
- **Edited *X*** where *X* is a number starting from 1. These are intermediate versions between the "Original" and "Current"

This feature is available in modern calibrators.

Avoiding Duplicate Results

When receiving calibration results, CMX compares the calibration date of the results to be received with calibrations already received. If the dates and, when applicable, the errors match, CMX prompts you to confirm receiving these kind of results.

Receiving duplicates is easily avoided by deleting already received results from the calibrator. As mentioned earlier, this functionality is available with the **Delete Instruments From Calibrator After Receive** check box in **Receive from Calibrator** window.

Manual Entry of Calibration Results

If calibrations are carried out with a calibrator that is unable to communicate with CMX then Manual Entry is the solution. In Manual Entry calibration results and all calibration related data is typed into the database.

> **Note:** CMX supports opening several Manual Entry windows. This allows you to, e.g. calibrate several temperature sensors at the same time, each sensor having its own Manual Entry window open.
>
> If you utilize the Weighing Instrument Calibration feature, additional info on how to calibrate Weighing Instruments is presented in Calibrating Weighing Instruments.

Selecting Functions for Manual Entry

There are several ways of selecting a Function for Manual Entry:

- Select the Position/Device/Function to be calibrated from a Position Tree, Plant Structure Tree or a Device Tree and then select **Manual Entry** from the toolbar (found in a submenu that opens from the Calibration button).
- Select the Position/Device/Function to be calibrated from a Position Tree, Plant Structure Tree or a Device Tree and then select **Manual Entry** from the main window's **Calibration** menu.
- Click the *Secondary Button* on the mouse above a Position or a Function seen in the **Position** Tree. Then select **Calibration, Manual Entry**.
- Click the secondary button on the mouse above a Position or a Function seen in the **Plant Structure** Tree. Then select **Calibration, Manual Entry**.
- Click the secondary button on the mouse above a Device or a Function seen in the **Device** Tree. Then select **Calibration, Manual Entry**.

Using any of the above mentioned methods opens the **Manual Entry** window ready for data entry.

> **Note:** When selecting a Position/Device and choosing **Calibration, Manual Entry**, only the first (the uppermost) Function of the Position/Device is sent to the **Manual Entry** window. This is because CMX's Manual Entry currently only supports the calibration of one Function at a time. To select any other Function (as well as the first Function) in a Position/Device for Manual Entry, click the secondary button on the mouse above the Function instead of the Position/Device.

> **Note:** To be able to calibrate a Position, a Device (containing Functions) needs to be linked to it. A Device (containing Functions) may be calibrated although it is not linked to a Position. When a Device is linked to a Position, Manual Entry may be invoked for the Position only.

> **Note:** If Position/Device function contains data entered in *Before Calibration Note* field on procedure level, it is shown to the user separately after Manual Entry is started.

Entering Calibration Results

Enter the results in the grid shown on the **Results** tab. Also check the **Calibration Date** field and the **Calibrated By** fields shown in the same tab. You can select one or two users as the ones that carried out the calibration.

Enter calibration related data (e.g. the environment temperature) into the **Conditions** tab.

The **Procedure** tab contains read-only data about the *Calibration Procedure*, including possible instructions to guide you through the calibration.

Depending on your Calibration settings, you may have to select input and output calibrators and modules used in the calibration. See Calibration Options. Note that you may select multiple input/output calibrators and modules for each calibration point.

The way the Calibrators and Modules (references) are sorted in the **Manual Entry** window depends on settings defined in the **Options** window's **Calibration** section.

Field level information is available in the webhelp delivered with CMX.

> **Note:** For unstable readings, you may add the "**~**" character (tilde) after or before the calibration point values, e.g. **12.045~**. If you enter the "**~**" character before the numbers, CMX moves the character at the end of the number. This is done to avoid mix-up between the minus sign and the "**~**" character.
>
> Input values outside the calibration point's *Max. Deviation* limit are indicated in red. This does however not affect any calculations.
>
> If the Calibration Options setting **Warn when Calibrator/Module is Overdue** is checked, CMX warns if you select a calibrator or module with an overdue calibration.
>
> If Calibration Options setting **Chronological Date/Time Validation** is checked, saving results having the same date and time stamp is not allowed for a single calibration event. Each repeat must have a unique time stamp in correct chronological order and using the same format throughout. Certain repeats may not, e.g. have just the date and others both date and time.
>
> Also: No As Found results may be saved after the first As Left result. Skipping *Calibration Points* may be prohibited or a skipped point may require a comment.
>
> If Mobile Security Plus option is in use:
>
> The calibration date/time may can be prohibited by a permission 'Manual entry - Calibration time edit'. More of Mobile Security Plus in Mobile Security Plus.

New Repeat

To start entering the results of the next calibration repeat, press the **New** button in the **Manual Entry** window's toolbar. If you have entered any data into the **Conditions** tab, CMX automatically copies them as part of the new repeat's data. Edit them, if needed.

To view previously entered results the click icons on the left side of the **Manual Entry** window.

Saving the Results

When you press the **Save** button in the **Manual Entry** window's toolbar, CMX saves the results in the database. If you continue entering results, they will be saved as a separate calibration saved on the same day.

While saving results CMX displays information of each repeat in a window similar to the one below:
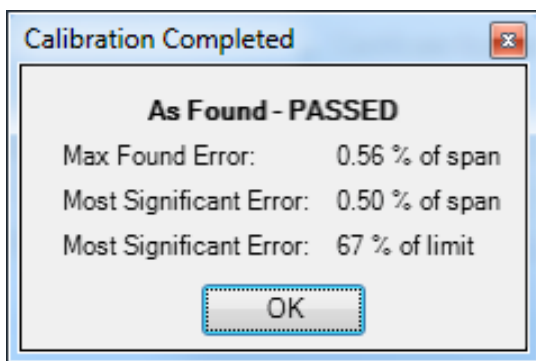
Figure 21: Calibration Completed

Fields:

• **Max Found Error** is the repeat's found maximum error value.

• **Most Significant Error** (value) is the numeric value of the found error that is closest to corresponding error limit.

• **Most Significant Error** (percentage) indicates how close to the calibration point's error limit the most significant error value is. The percentage value is less than or equal to 100 % if the calibration passed and more than 100 % if the calibration failed.

When the relative component of the Reject if Error limit is used, the Max Found Error may differ from Most Significant Error. More of Error Limit Function's components in CMX's webhelp. Another source for information of Error Limit Function is in CMX Calculations Help file. Open it from CMX Main Windows' Help menu. Select option **CMX Calculations**.

> **Note:** Depending on your calibration settings, results may be save "as both" (the results are saved both as As Found and as As Left results). This setting is among the **Calibration** options. See Calibration Options.
>
> If the field **Reject if Calibrator is Overdue** in an instrument's Calibration Procedure is checked, you cannot save calibration results, if you have selected a calibrator or module with an overdue calibration.

Ending Manual Entry

To end Manual Entry, press the **Close** button in the **Manual Entry** window's toolbar or select **Close** from the **File** menu. If the results of the last repeat was not (fully) saved, CMX prompts you to save them first.

> **Note:** If Position/Device function contains data entered in *After Calibration Note* field on procedure level, it is shown to the user separately after Manual Entry is closed.

Viewing the Results

The result property window can be opened from the following Trees:

- The **Position** Tree,
- The **Plant Structure** Tree and the
- The **Device** Tree.
- The **Position Set** and **Device Set** Trees.

In all cases: Click on the tree to see the results icon. It is located below the Function icon. Either double click on the results icon or select the **Properties** button in the main window's toolbar.

Figure 22: The Results Icon

The results are shown below in "latest repeat result first" order.

The **Valid Result** check box allows you to exclude somehow not usable results from calibration history analysis.

CMX uses the calibrator module specifications to calculate the input and output uncertainties shown in the result table.

The **Environmental Data** and the **Calibration Notes** found among the calibration results can be edited. Also the status of the **Valid Result** check box can be changed. To do it, click the **Edit** button found in the property window's toolbar.

> **Note:** If an input or output value ends in a "**~**" character (tilde), e.g. **12.045~**, the reading was unstable. Adding this character is possible in CMX's manual entry window and when appropriate, the character is automatically added in a reading when using certain modern calibrators.

> **Note:** If calibration time is manually entered by the user instead of using automatic system time, it is indicated in parentheses after calibration time as Saved on calibration time.

Average Results and Expanded Uncertainty

Average results and uncertainties can be shown among calibration results. They are individually activated/deactivated in the **Options** window's **Calibration** page. See Calibration Options. To open the **Options** window, select **Tools, Options** from CMX's main window's menu.

If **Show Average Results** is checked, the calibration result window includes an additional table of average results for all calibrations with more than one As Found or

As Left repeat. For Switches: Multiple switch cycles in a single calibration repeat is enough for CMX to calculate average results.

If **Show Expanded Uncertainty** is checked, the calibration result window includes an extra column of Expanded Uncertainty data among each calibration repeat. Also: the error graph displays uncertainty bars for each calibration point.

More info of average and uncertainty calculations in a separate help file entitled "**CMX Calculations**". Open it from CMX Main Windows' Help menu. Select option **CMX Calculations**.

Approving Calibration Results

The approval of calibration results vary depending on whether Change Management option and its Electronic Signature feature is active or not.

• With Change Management / Electronic Signature in use, a table of signatures and a **Sign** button is found at the bottom of the result window.

• Otherwise a table of approvals and an **Approval** button is found at the bottom of the result window.

To approve/sign results, press the Approve (or Sign) button and enter required information.

> **Note:** Approving/signing calibration results is allowed only if you have the appropriate user rights.
>
> Change Management / Electronic Signature is an optional feature in CMX Professional.

Locking Calibration Results

Locking Calibration Results is an optional feature in CMX Professional.

Approved calibration results may be locked, provided the user has appropriate rights. When the results have been locked, the results may not be changed in any way unless someone with appropriate rights unlocks the results.

To lock/unlock calibration results, position your mouse pointer above a calibration result icon in CMX's main window's **Positions**, **Plant Structure** or **Devices** tree structure. Click on the mouse's *Secondary Button* to open the pop-up menu and select **Lock** or **Unlock**.

Deleting Calibration Results

To delete calibration results, open the Context Menu and select the **Delete** option.

> **Note:** Deleting calibration results is allowed only if you have the appropriate user permissions.

History Trend

This is an optional feature in CMX Professional.

History Trend is a utility for viewing calibration history data. It is available both for Positions and Devices. The data is displayed graphically and is also available in numeric format in a table.

The biggest difference between the standard Calibration Results window and the History Trend window is that you can view several calibration results simultaneously in the History Trend window. It allows you to evaluate the calibrations of a Position or a Device for a longer time period compared to the normal calibration result view.

Examples of how to utilize the History Trend feature:

- Get an overview of how a particular device drifts between calibrations and also whether the drift increases with time.
- How different devices are suited for use in a particular Position.

> **Note:** For Weighing Instrument, the History Trend is available for the actual Weighing Test only.

Opening the History Trend Window

This is an optional feature in CMX Professional.

The History Trend window is opened using one of the following methods:

- Click the *Secondary Button* on your mouse above a **Position**, **Function**, **Procedure** or a **Result** icon seen in a main window Tree Structure. Select **History Trend** from the opened pop-up menu.
- Click the secondary button on your mouse above a **Device**, **Function**, **Procedure** or a **Result** icon seen in the **Devices** window. Select **History Trend** from the opened pop-up menu.
- The **View** menu of the main window includes a **History Trend** option.

Calibration Certificates and Other Documents

CMX allows the printing of the following document types:

- Calibration Certificates
- Reports,
- Labels
- History Trend graphs
- Data Loader and
- Audit Trail reports

To print documentation from CMX, use the Documents button found in the main window's toolbar or select the document type to be printed from the Documents Menu. A third possibility is using the Context Menu. In all cases: A more detailed print selection window will be open for that document type.

Exception: Audit Trail Reports are printed from the Audit Trail window. See The Audit Trail Window.

It is also possible to configure CMX to save the documents in files. See Automated Document Generation.

Printing Certificates

Select the certificate layout from the list available in the **Print Certificate** window. Then drag the Position, Device, Function or Result icon from a Tree to the print list. Note that a Position can only be dragged from a Position Tree, Position Set Tree and the Plant Structure Tree. A Device can only be dragged from a Device Tree and the Device Set Tree.

Use the **Preview** button to see on the screen how the printed certificate looks like.

> **Note:** Only Positions/Devices/Functions with saved calibration results may be dragged to the **Print Certificate** window.

Printing Reports

Select the report layout from the list available in the **Print Report** window. Then drag the Position from the Position Tree, Position Set Tree or the Plant Structure Tree and the Device from the Device Tree or the Device Set Tree.

About the check boxes:

If none of the check boxes are checked, the report contains data based on the latest repeat of the latest calibration.

- If only **All Repeats** is checked, the report contains data based on all repeats of the latest calibration.

- If **History** is checked, the report contains data based on all repeats of all calibrations for the selected items. In this case the **All Repeats** setting does not matter.

- If **Results** is checked, then the report includes data for all *Calibration Points*. Otherwise the data is presented on repeat level.

  Example: If a 5 point up-down calibration is done, then the report includes either one row of data (**Results** unchecked) or nine rows of data (**Results** checked).

- If **AVG Only** is checked, then the report includes average results only, omitting the individual repeats. If only one repeat was done, i.e. no average results are available, then that single repeat is printed no matter if **AVG Only** is checked or unchecked.

Use the **Preview** button to see on the screen how the printed report looks like.

> **Note:** AVG Only is visible only when **Calibration Options** field **Show Average Results** is checked.
>
> **AVG Only** can be changed when either **History** or **All Repeats** check box is checked.
>
> One of the available reports is called **Manual Entry Form**. Print it to have a practical form for manually entering calibration results.

Printing Labels

Select the label layout from the list available in the **Print Label** window. Then drag the Position from the Position Tree, Position Set Tree or the Plant Structure Tree and the Device from the Device Tree or the Device Set Tree.

Use the **Preview** button to see on the screen how the printed labels look like.

Printing History Trend Graphs

History Trend is an optional feature in CMX Professional.

Select the history trend layout from the list available in the **Print History Trend** window. Then drag the Position, Device or Function icon from a Tree to the print list. Note that a Position can only be dragged from a Position Tree, Position Set Tree and the Plant Structure Tree. A Device can only be dragged from a Device Tree and the Device Set Tree.

Use the **Preview** button to see on the screen how the printed history trend graph looks like.

> **Note:** Only **Positions**/**Devices**/**Functions** with saved calibration results may be dragged to the **Print History Trend** window.

Printing Data Loader

Data Loader is an optional feature in CMX Professional and CMX Enterprise.

Data Loader printing saves the instrument data to an excel file, which can be edited and imported back to CMX via Data Loader.

Select data loader layout from the list available in the **Print Data Loader** window. Then drag the Position from the Position Tree, Position Set Tree or the Plant Structure Tree and the Device from the Device Tree or the Device Set Tree.

Use the **Preview** button to see on the screen how the saved excel file content looks like.

See Data Loader.

Printing Audit Trail Reports

Audit Trail and Change Management are optional features in CMX Professional.

Audit Trail window has a toolbar button for printing a report of displayed Audit Trail data.

See The Audit Trail Window.

Importing/Exporting Document Layouts

Sometimes you need to copy document layout from a CMX database to another. The tools for doing that are in the File menu. To copy the document layout, do as follows:

1. Open the database where the document layout to be copied exists. Then select **File, Export, Document Layouts**.
2. Select the **Layout Type** and press the corresponding **Export** button. A dialog for selecting the folder appears.
3. Select appropriate folder and press **Save**.
4. Open the database where you want to have a copy of the exported document layout. Then select **File, Import, Document Layouts**..
5. Select correct **Layout Type** and then **Browse** to the folder where the exported layout is.
6. If applicable, edit the **Layout Name** and **Description**.
7. Press the **Import** button.

> **Note:** If you receive a standalone document layout, sent by mail from, e.g. Beamex, start from phase 4 in the list above. Just replace the word "exported" with "standalone".

Creating Your Own Certificates

This is an optional utility in CMX Professional.

The Report Design tool allows you to make your own Certificate, Report etc. layouts.

Since the software module used for creating layouts for Certificates, Reports etc. is a third party software it has its own online help made available while creating the layouts.

Adding/editing e.g. a new Calibration Certificate layout is done using menu commands: Documents, Certificates, Design. Others are added/edited similarly. Just change the document type.

Exception: Editing Audit Trail Reports is invoked in the Audit Trail window. More of this in The Audit Trail Window.

Also note that you can have only one Audit Trail Report Layout for each CMX database. You may however edit the existing one to suit your needs, provided you have the rights and tools to edit document layouts.

CMX is shipped with a Help folder called **CMX Report Variables**. It presents all variables available in the Report Designer. Open it from CMX Main Windows' Help menu. Select option **CMX Report Variables**.

> **Note:** If you have activated Window's UAC (User Account Control) feature, you'll need to run CMX as administrator to be able to save the edited documents. Otherwise you will get an error message and your edits are not saved.

Automated Document Generation

CMX documents can be saved in files instead of printing them on paper. Document file saving can be automated, so the same rules are always used when printing.

Automated Document Generation Options is started by selecting **Options...** from the **Documents** menu. 'Option maintain - Automated Document Generation User' - permission is needed to be able to configure Automated Document Generation.

File naming and printing rules are configured in this window.

User defines here how the filename is generated when saving document in a file in Print windows. The filename is built in the following way:

```
Variable1 + Constant1 + Variable2 + Constant2 + Date + . +
File Type
```

If any of the items, except File Type, is empty, it is not used in the file name generation.

Press **Ok** to save the configuration.

Each document type can be separately configured on its own page.

When Automated Document Generation is configured for a document type, CMX Print window uses these rules to preselect settings.

> **Note:** If both Show File Dialog and Show Print Options are disabled, Printing to file is done automatically. File saving is confirmed with Print successful message, which shows the folder where the file is saved.

Field level information is available in CMX webhelp.

Change Management and Audit Trail

This is an optional feature in CMX Professional.

Change Management and Audit Trail includes tools for keeping track of changes made to CMX's database. Additionally, whoever makes a change to the database may also be asked to give a description for the change.

Users with the proper authorization may review the change log (Audit Trail) and mark the changes reviewed.

The feature also includes a possibility to utilize electronic signatures.

Briefly, CMX's Change management feature includes all the tools required to comply with regulations of which most important are GAMP4 (Good Automated Manufacturing Practices) and 21 CFR Part 11 (Electronic records; Electronic signatures).

How to Change or check your Change Management and Audit Trail settings is described in The Options Window.

The Audit Trail Window

The **Audit Trail** window can be opened from the main window's **Tools** menu. Use the **Display** button in the toolbar to select the type of records you want to see.

Large Audit Trail databases (containing more than 50 000 rows) are opened showing the Audit Trail events according to "How many days back is the AT shown by default" setting. Use the date fields below the toolbar to select another time period for viewing.

To mark events as reviewed (requires that you have the rights to do it), press the **Edit** button in the toolbar. Then you can use one of the following methods:

• Use the check box in the next to last column to mark a single event as reviewed.

• Use the **Review All** button in the toolbar to mark all events as reviewed.

Hints.

• To sort the Audit Trail data, click on the header of the column you want to sort by.

• To copy Audit Trail data to the clipboard (for pasting into, e.g. Excel), highlight the part you want to copy. Then use the Windows standard keyboard shortcut for copying (Ctrl C).

- To print Audit Trail data, use the **Documents** button in the toolbar. The **Print** and **Print Preview** options print/display the Audit Trail data for the selected date range.

  The **Documents** button also has the **Design** option. It is active, provided the Report Design option is part of your CMX software. More of Reports and Calibration Certificates in Calibration Certificates and Other Documents.

The **Audit Trail** window toolbar contains the **Filter** button for filtering the Audit Trail data.

The **Audit Trail** window toolbar contains the **Archive** button for selecting how the archived Audit Trail events are shown:

1. **Only active** lists active Audit Trail events according to the *Active archive period in months* setting value.
2. **In same set and active** lists active Audit Trail events and events from the same Archive set, to which the selected Audit Trail event belongs. This is available only when opening Audit Trail from Electronic Signature table from position, device or calibration result view.
3. **All** lists all audit trail events. Note that this setting might take long time to list the audit trail events in big database.

The **Audit Trail** window toolbar contains the **Archive sets** button for opening the Manage Archive Sets view. See Audit Trail Archiving.

The fields available for filtering are presented in the webhelp delivered with CMX.

ℹ️ **Note:** Making changes that are recorded in Audit Trail may affect other items, dependent on the field that was changed, in the database. Changes in the dependent fields are not recorded in Audit Trail. Examples:

- A Function's span is changed from 100 mbar to 120 mbar. The change is automatically recorded to Audit Trail. If the Function is calibrated in three points (0 %, 50 % and 100 %), the original *Calibration Points* were 0 mbar, 50 mbar and 100 mbar. After the span change, the points are 0 mbar, 60 mbar and 120 mbar. The change of calibration points are not recorded in Audit Trail.

- A Weighing Instrument's d/e values are edited. The change is automatically recorded to Audit Trail. However, the change in d/e values may affect the Maximum Permissible Error (MPE) limits. The possible change is not recorded in Audit Trail.

  If the same CMX database is contacted from several time zones, consider setting the time format in CMX Options windows' General Settings Fields and Change Management Options Fields in CMX webhelp to suit your needs.

Audit Trail Archiving

The Audit Trail Archive -functionality makes it possible to mark Audit Trail events as archived. Archiving makes Audit Trail searches faster by hiding older Audit Trail events.

The functionality has to be enabled in **Tools** > **Options** > **Change Management** > **Audit Trail Archive**.

Users with Audit Trail Archive Management **modify permission** can create and unarchive the archive sets and can be prompted to create new archive sets based on the settings.

Users with Audit Trail Archive Management **view permission** can open the Manage Archive Sets view and select single archive set to see its audit trail rows.

Other users can use Audit Trail Archive filter to show or hide archived items.

Permitted users are notified about the need to create Audit Trail Archive set on CMX startup or when Audit Trail window is opened. It is recommended to allow CMX to create Audit Trail Archive sets.

Audit Trail Archive sets are sequentially created according to the *Archive set length in months* setting value.

> **Note:** Gaps between archive sets are NOT allowed. It could cause empty Audit Trail Archive sets, if no events exist in a certain period of time.

Manage Archive Sets Window

The **Manage Archive Sets** window can be opened from Audit Trail window's toolbar **Archive sets** button .

This window lists existing Audit Trail Archive Sets.

> **Note:** Archive Sets need to exist in sequential order without any gaps between periods.

Content of an individual Archive Set can be viewed by selecting desired Archive Set and pressing **View archive set rows** button. Audit Trail window containing Audit Trail events in the selected Archive Set is opened.

If other than non-regular Archive Set needs to be created, it can be done by defining Archive set period and pressing **Create archive set** button.

Last Archive Set can be unarchived by selecting latest Archive Set and pressing **Unarchive** button. Note that only the latest Archive Set can be unarchived.

Electronic Signature

If the Electronic Signature is activated, every time a change concerning Device, Position or Calibration data is made to the database, a window opens where the following fields are available:

- **Status**. A list of status values is presented. The following values are pre-entered in the database: **Approved, Draft, Pending Second Approval, Reviewed** and **Withdrawn**. The list is editable so you may also add your own status values.
- **Approved**. The master approval check box. Only user with permissions to approve may change this field.
- **User ID** and **Password**. The ID of the logged user is pre-entered, but any valid User ID may be entered. Remember to utilize password security!
- **Comment**. Optional user comment for the signature being given, which is saved together with the Electronic Signature.

This window will also open if the Electronic Signature for Calibrators is activated and when changes concerning Calibrator or External Module data are made to the database.

The Electronic Signature history of a Position, Device, Calibration, Calibrator or External Module can be found in the last items in the Properties window. Use the **Sign** button to change the status of the Device/Position/Calibration/Calibrator/External Module.

Electronic Record

Electronic Record is the name used for the group of data that has been approved with the Electronic Signature (see Electronic Signature). If anything that is part of a certain Electronic Record is changed after it was signed, the data requires a new approval using the Electronic Signature.

The following list describes what type of data belongs to the available Electronic Records:

Table 16: Data in Electronic Records

Type	Data belonging to the Electronic Record
Position	Data shown in the following property windows: • Position, • Function and • Procedure.

Type	Data belonging to the Electronic Record
Device	Data shown in the following property windows: • Device, • Function and • Procedure.
Calibration	Data shown in the Calibration results property window.
Calibrators	Data shown in the following property windows: • Calibrator, • Calibrator Modules and • Calibrator Module Ranges.
External Modules	Data shown in the following property windows: • External Module and • External Module Ranges.

Calibrating Weighing Instruments

Weighing Instrument Calibration feature is an optional feature in CMX Professional.

CMX's Weighing Instrument Calibration feature includes a possibility to add Weight Sets and Weights as well as Weighing Instruments to be calibrated into CMX's database. Weighing Instruments can then be calibrated by using either the **Manual Entry window** (see Manual Entry of Calibration Results) or by using **bMobile**.

CMX's Weighing Instrument Calibration feature is based on:

- OIML International Recommendation OIML R 76-1: 2015 (OIML = **Organization Internationale de Métrologie Légale** or **International Organization of Legal Metrology**).

- European standard EN45501:2015 + AC:1993.

- NIST Handbook 44 – 2017 / 2.20. Scales (NIST = **The National Institute of Standards and Technology**, US).

- **EURAMET cg-18, Version 4.0 (11/2015)** Earlier: **EA-10**/18 EA Guidelines on the calibration of non-automatic weighing instruments (EA = **European co-operation for accreditation**).

- **U.S. Pharmacopeia Convention's Chapter 41** (briefly **USP 41**). In USP 41, repeatability is assessed by weighing one test weight 10 times. Details of pre-USP 41 calculations and USP 41 calculations can be found in **CMX Calculations**, available in CMX main window's Help menu.

- **European Pharmacopeia supplement 10.6** (briefly **Ph. Eur.**). In Ph. Eur., repeatability is assessed by weighing one test weight 10 times. Sensitivity is assessed in a separate test using a single test load with a mass of between 5 percent and 100 percent of the capacity of the balance.

> **Note:** This document do not give an exhaustive presentation of what Weighing Instruments are and how they are calibrated in general. This document gives you help in how to do calibrations using CMX. To get deeper Weighing Instrument information, read the documents presented above and other Weighing Instruments related material.
>
> This section presents Weighing Instrument Calibration specific information. Where the functionality of CMX's Weighing Instrument Calibration is similar to other type of instruments and calibrators, this section refers to the more general presentation elsewhere in this document.

Basic Settings for Weighing Instruments

This chapter and its subchapters present basic settings specific for Weight Sets and Weights. Subjects like creating a Plant Structure are not described here. This is because Weighing Instrument Calibration does not affect it at all. See Basic Settings.

Entering Weight Sets and Weights

For CMX, Weight Sets, Weights and process instrument Calibrators are analogous in the following way:

- A set of weights used for calibrating Weighing Instruments equals a calibrator used for calibrating process instruments.
- A single weight equals a measurement module in a process instrument calibrator.
- Finally, the specifications of a weight equal a measurement range in the module of a process instrument calibrator.

Only the fields that have a specific meaning for Weights and Weight Sets are described in the following chapters. Equally important fields that have the same meaning for weights and calibrators are not discussed here. For descriptions of other fields, refer to section Description of Fields in the webhelp:

- Calibrator Fields,
- Calibrator Module Fields and
- Calibrator Module Range Fields

Finally, the following chapters present a straight forward method of adding Weight Sets, Weights and Weight Specifications. CMX's flexible user interface allows you to do the same thing using other views/windows too. Feel free to also experiment with the other possibilities, but use this as the way to get into entering Weight Set, Weight and Weight Specification data.

Weight Sets

To add a Weight Set, open the Calibrators window. Use the following menu commands when you are in the Main Window: **Database**, **Calibrators**.

To add a Weight Set, click the mouse's secondary button anywhere in the **Calibrators** tree structure. Select **New, Calibrator** (remember, a Weight Set is a "Calibrator for Weighing Instruments").
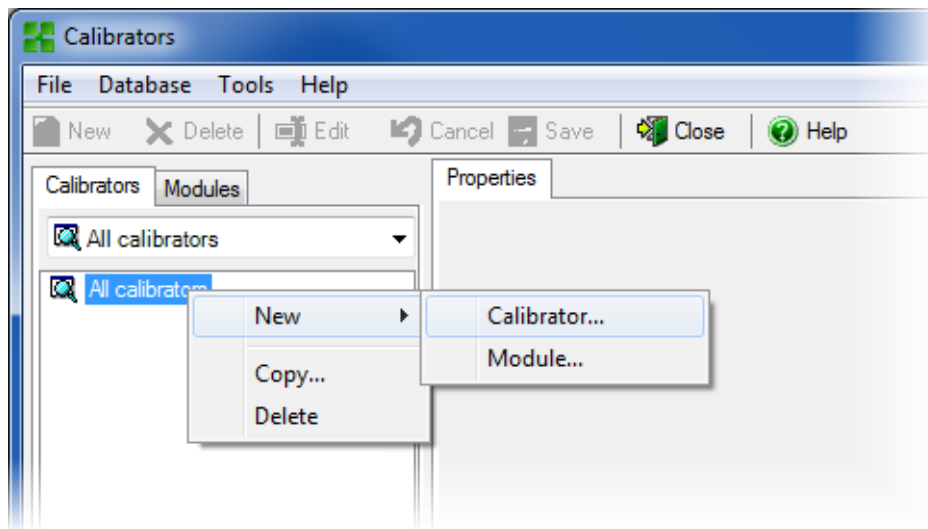
A window like the one below opens:
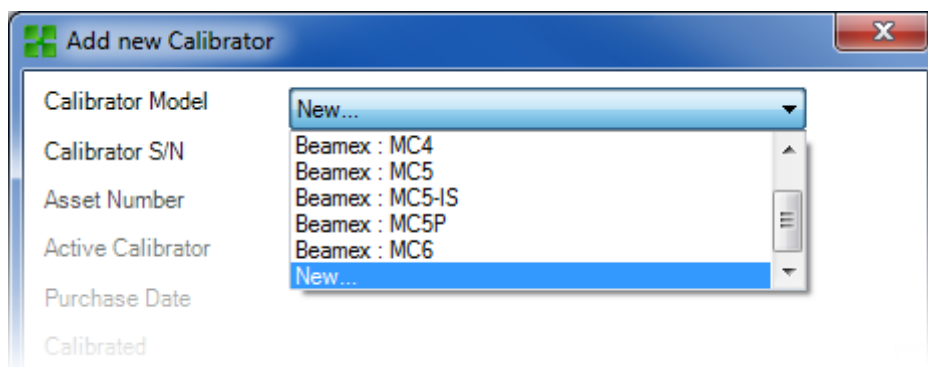
Select the **New** option in the **Calibrator Model** combo or select an existing Weight Set from the list if you are adding a new similar set. In the latter case, advance to **Adding "New Calibrator" Data**.

Adding a New Calibrator Model
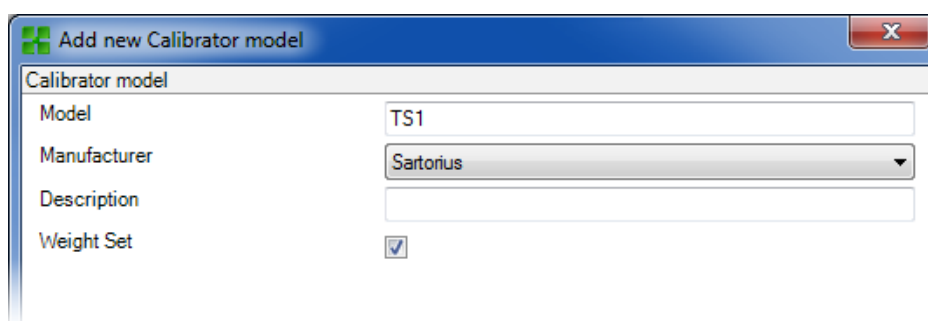
When adding a new Weight Set, enter the set's name as the **Model**. Also, assure that you check the **Weight Set** check box. Then CMX treats the new Calibrator Model as a Weight Set, not a Process Instrument Calibrator.

Full field level information is available in the webhelp delivered with CMX.

When ready, press the OK key to return to the **Add New Calibrator** window.

Adding "New Calibrator" Data

When the Calibrator Model is entered/selected, add a serial number to the Weight Set. The Serial Number field is a required field in CMX (together with the **Calibrator Model** field they identify the Calibrator / Weight Set). If the weight set has no serial number, enter its purchase date as a serial number.

Full field level information is available in the webhelp delivered with CMX.

Weights

To add a Weight to a Weight Set, click the mouse's secondary button above the Weight Set in the **Calibrators** window. The **Calibrators** window can be opened from the Main Window's **Database** menu. Select the **Calibrators** option. Select **New, Module** (remember, a Weight is a "Calibrator Module").
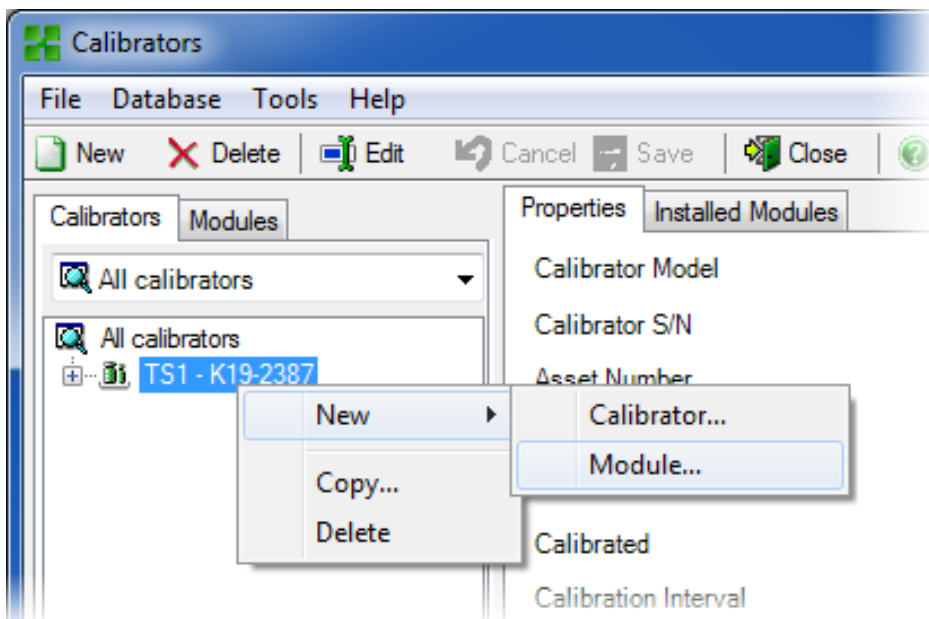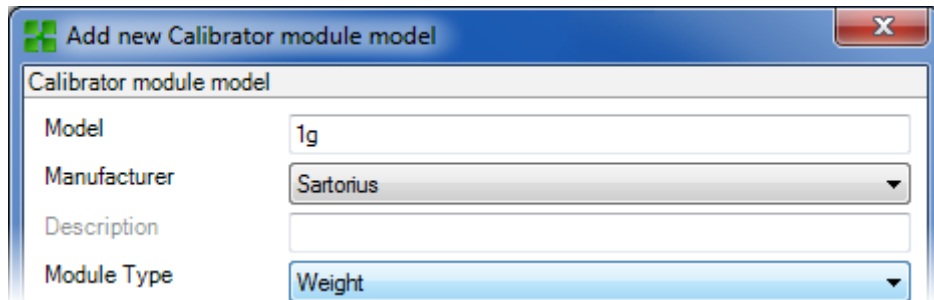
A window like the one below opens:

Select the **New** option in the **Module Model** combo or select an existing Weight from the list if you are adding a new similar Weight. In the latter case, advance to **Adding "New Calibrator Module" Data**.

Adding a New Calibrator Module Model
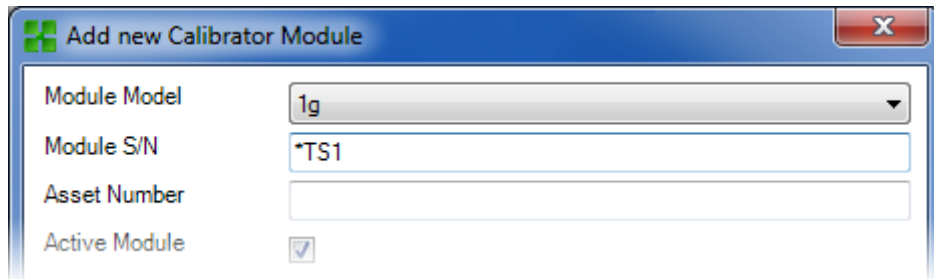
When adding a new Weight, enter it's weight as the **Model**. Also, assure that you select Weight from the **Module Type** combo. Then CMX treats the new Calibrator Module Model as a Weight, not a Process Instrument Calibrator Module.

Full field level information is available in the webhelp delivered with CMX.

When ready, press the OK key to return to the **Add New Calibrator Module** window.

Adding "New Calibrator Module" Data

When the Calibrator Module Model is entered/selected, add a "serial number" to the Weight. The Serial Number field is a required field in CMX (together with the **Module Model** field they identify the Module / Weight).

> **i** **Note:** Enter the Weight Set name as the Serial Number. This "ties" the weight to the set it belongs to. If you have several weights with the same nominal weight, include the identifying symbol (*) or number (1, 2 …) to the serial number.

Full field level information is available in the webhelp delivered with CMX.

Weight Specifications

To add Weight Specifications to a Weight, click the mouse's secondary button above the Weight in the **Calibrators window**. The **Calibrators** window can be opened from the Main Window's **Database** menu. Select the **Calibrators** option. Select **New, Module Range** (remember, a Weight Specification is a "Calibrator Module Range").

A window like the one below opens:

Some important fields are highlighted in the picture above. Enter a **Range Name** and set the **Method** field to "Keyed". Enter both the **Nominal** and **Conventional** ("true") mass for the weight.

If you want CMX to calculate uncertainties, a **Constant Error** (the uncertainty of the Conventional Mass or the Nominal Mass, depending on the instrument's **Calibration**

Procedure settings) need to be entered and an **Error Calculation Method** need to be selected.

Full field level information is available in the webhelp delivered with CMX.

Weighing Instrument Function Templates and Calibration Procedures

CMX is shipped with pre-entered Function Templates and *Calibration Procedure*s. This makes it easy to create new Functions for Positions and Devices. There is also a Function Template and Calibration Procedure suited for Weighing Instruments. Select them when creating a Weighing Instrument Function and edit them to suit the specifics of your Weighing Instrument.

The subchapters further on only present the Weighing Instrument specific fields.

> **Note:** You can also make you own Weighing Instrument Function Templates and Calibration Procedures using the Function Templates utility presented in **Basic Settings** section. See Function Templates. CMX automatically adds the Weighing Instrument specific fields if the new Function's **Input/Output Quantity** field is set to "Mass".

Function Fields Specific for Weighing Instruments

The table below presents the function fields specific for weighing instruments.

Table 17: Function Fields Specific for Weighing Instruments

Field	Description
Partial Weighing Ranges	Select the amount of unique partial weighing ranges found in the Weighing Instrument at hand.
	Example of Partial Weighing Ranges:
	A Weighing Instrument with a 100 gram span has two partial weighing ranges.
	• 0 to 20 g with a 0.001 resolution and
	• 20 to 100 g with a 0.01 resolution.
	Required field for Weighing Instruments.

Field	Description
*d1 … d4	Actual Scale Interval.
	OIML R 76-1: 2006
	the difference between the values corresponding to two consecutive scalemarks, for analogue indication, or the difference between two consecutive indicated values, for digital indication.
	This is the smallest change in mass that corresponds to a change in displayed value. On analog (mechanical) scales, this is the smallest subdivision of the scale dial or beam for analog indication. Example:
	A known weight of 12.0512 g is weighed on a scale with actual scale interval 0.1 g. The reading will be 12.1 g.
	Note that the "*Partial Weighing Ranges*" setting determines the amount of *Actual Scale Intervals* seen.
	Required field(s) for Weighing Instruments.
e1 … e4	Verification Scale Interval.
	The "Partial Weighing Ranges" setting determines the amount of Verification Scale Intervals seen.
	Required field(s) for Weighing Instruments.
	The smallest scale interval that can be used to determine price, when using a particular Weighing Instrument. Verification Scale Interval need not be the same as Weighing Instrument's Actual Scale Interval.
	Note: Editing the Scale Intervals affect the MPE values found among a Weighing Instrument's **Calibration Procedure data** (see Calibration Procedure Property Window Fields, CMX webhelp) unless you are using a custom **Accuracy Class**.
Scale Range 1 … ScaleRange 4	Defines the Scale's Partial Weighing Range.
	Visible only for Weighing Instruments with more than one weighing range.
	Required field(s) for Weighing Instruments.

Note: Make sure both input and output methods are set to "**Keyed**".

Full field level information is available in the webhelp delivered with CMX.

Calibration Procedure Fields Specific for Weighing Instruments

The table below presents the *Calibration Procedure* fields specific for weighing instruments.

Table 18: Calibration Procedure Fields Specific for Weighing Instruments

Field	Description
Accuracy Class	Weighing Instruments are grouped according to the amount of weighing ranges and actual/verification scale divisions (d and e). Accuracy Class determines the intended area of use for a Weighing Instrument. CMX presents a list of standard Weighing Instrument accuracy classes and a possibility to make a customized accuracy class. Available standard accuracy classes: • HB 44 I • HB 44 II • HB 44 III • HB 44 IIII • HB 44 IIIIL • OIML I • OIML II • OIML III • OIML IIII **HB 44**: NIST Handbook 44: 'Specifications, Tolerances and Other Technical Requirements for a Weighing and Measuring Devices'. Used in USA. **OIML**: 'International Recommendation OIML R 76-1', 2006. Used in Europe. **Note:** Selecting a standard **Accuracy Class** affects the **MPERange** and **MPE** fields. New **MPE** limits are calculated based on the Weighing Instrument's **Verification Scale Interval** data found among **Function data**. See Function Property Window Fields, CMX webhelp.

Field	Description
MPE Range	Maximum Permissible Error range(s) and their corresponding Maximum Permissible Error (MPE). The amount of MPE ranges depends on the selected **Accuracy Class**. Also note that selecting a standard **Accuracy Class** automatically defines the **MPERanges**. Edit the **MPERanges** and **MPE** limits only when using custom **Accuracy Class**es. Available error calculation methods: • % of accuracy class limit • % of load • absolute error
Repeatability Stdev. Limit	Maximum permissible standard deviation for repeatability test. If field is left empty, repeatability test's standard deviation error limit is not in use. More info of CMX's calculations can be found in a help file entitled "CMX Calculations". Open it from CMX Main Windows' Help menu. Select option **CMX Calculations**. _(i)_ **Note:** This field is visible for Weighing instruments and enabled only when **USP 41 / Ph. Eur. Repeatability** check box is **unchecked**.
Minimum Weight Limit	Maximum permissible minimum weight deviation error limit. Default value: 0.001 If the Minimum Weight Limit unit is changed to %, then the default value is 0.1 %. If you make a custom minimum weight test, make sure it requires at least ten repeats. Otherwise this deviation error calculation always fails. If field is left empty, minimum weight test's error limit is not in use and CMX indicates the test's status is "Passed". More info of CMX's calculations can be found in a help file entitled "CMX Calculations". _(i)_ **Note:** This field is visible for Weighing instruments and enabled only when **USP 41 / Ph. Eur. Repeatability** check box is **unchecked**.

Field	Description
Minimum Weight k-value	Is the coverage factor in a Weighing instrument's Minimum Weight Test. **Default value is 3,** which is for 99 % confidence level (USP requirement before USP 41). **Note:** This field is visible for Weighing instruments and enabled only when **USP 41 / Ph. Eur. Repeatability** check box is **unchecked**. More info of CMX's calculations can be found in a help file entitled "CMX Calculations". Open it from CMX Main Windows' Help menu. Select option **CMX Calculations**.
Repeatability Limit	Replaces **Minimum Weight Limit** when **USP 41 / Ph. Eur. Repeatability** is checked. This is the pass/fail limit for USP 41 / Ph. Eur. Repeatability. Default value: 0.0010. If the Repeatability Limit unit is changed to %, then the default value is 0.10 %. Note that the trailing zero is significant. **Note:** This field is visible for Weighing instruments and enabled only when **USP 41 / Ph. Eur. Repeatability** check box is **checked**.
Repeatability k-value	This field replaces **Minimum Weight k-value** when **USP 41 / Ph. Eur. Repeatability** is checked. **The value of this field should be 2** (USP 41 requirement / Ph. Eur. requirement). **Note:** This field is visible for Weighing instruments and enabled only when **USP 41 / Ph. Eur. Repeatability** check box is **checked**.
Repeatability Accuracy Limit	Accuracy limit for the repeatability test. Default value: **0.10 % of load** Needed when USP 41 / Ph. Eur. Repeatability is in use. (The Sensitivity Test check box needs to be unchecked). Visible for Weighing Instruments only (part of Weighing Instrument Calibration feature).

Field	Description
Sensitivity Limit	Sensitivity limit for the sensitivity test. Default value: 0.05 % of load. **Note:** This field is visible for Weighing instruments and enabled only when **USP 41 / Ph. Eur. Repeatability** check box is **checked**.
USP 41 / Ph. Eur. Repeatability	Checked if USP 41 / Ph. Eur. rules rules are enabled for Repeatability test. Default value: **Not Checked** Checking this field affects the following Calibration Procedure fields: • **Repeatability Stdev. Limit** is disabled, • **Minimum Weight Limit** changes to **Repeatability Limit,** • **Minimum Weight k-value** changes to **Repeatability k-value,** • **Repeatability Accuracy Limit** is enabled, • **Minimum Weight Test Calibration Points** are hidden. **Note:** Repeatability test also contains the Accuracy Test according to USP 41.
Sensitivity Test	Can only be checked if USP 41 / Ph. Eur. Repeatability is checked first. Default value: **Not Checked** Checking this field affects the following Calibration Procedure fields: • **Repeatability Accuracy Limit** changes to **Sensitivity Limit,** • **Sensitivity Test Calibration points** are shown. **Note:** When Senstivity Test is enabled, the Accuracy Test will not be used in the Repeatability Test. The Sensitivity test is defined in the European Pharmacopeia standard.

Field	Description
MPE in Service	Check if service error limits should be used.
	Maximum permissible errors are doubled when service error limits are used.
	If **MPE in Service** field is checked, both error limits, "normal" limit and service error limit, are shown in graph in Manual Entry, Result view, Certificates and in bMobile.
Hysteresis in Uncertainty	Check if the found hysteresis of a Weighing Instrument is to be included in uncertainty calculation.
Weight Mass	The mass value that is used when calibrating Weighing Instruments. Options:
	• *Conventional Mass*
	• *Nominal Mass*
	Note: This selection affects the calculations. More of this in CMX's webhelp files. See Calibrator Module Range Fields, CMX webhelp: • **Nominal Mass** • **Conventional Mass** • **Constant Error**
Eccentricity Uncertainty	How the found eccentricity should be included in uncertainty calculation. Options:
	• *Full Value*
	• *Half Value*
	• *Not Included*
Uncert. at No Load Point	How uncertainty at no load point is calculated. Options:
	• *As with other loads (default value)*
	• *No Load resolution (uncertainty only)*
	• Zero
	More info of uncertainty calculation in a help file entitled "CMX Calculations". Open it from CMX Main Windows' Help menu. Select option **CMX Calculations**.

Field	Description
No Load Resol. Uncert.	How the no load resolution uncertainty is calculated. Options: • *d0/(2*sqrt(3))* (default value) • *d0/(4*sqrt(3))* More info of uncertainty calculation in a help file entitled "CMX Calculations".
Eccentricity Test Calibration Points	In how many points the Eccentricity test is done. Select a value from the combo box. CMX updates the table below accordingly and shows a picture of the eccentricity test points.
Repeatability Test Calibration Points	How many repeats are done in the Repeatability test and what mass is used in the test. When **USP 41 Repeatability Test** check box **is checked**: The amount of similar Repeatability Test Calibration Points needs to be at least 10. They need to be between 5% and 100% of the balance capacity. If the points are not correct then an instructional error message is shown and the procedure cannot be saved before the test points are correct.
Weighing Test Calibration Points	*Calibration Points* to be used in the actual weighing test (linearity test). Select one from the list.
Minimum Weight Test Calibration Points	Select how many minimum weight test repeats are done and what mass is used for in test (percentage of full scale). To get minimum weight deviation calculation results, at least 10 repeats is needed. Note that this table of *Calibration Points* is visible for Weighing instruments only when **USP 41 Repeatability Test** check box is unchecked.

Full field level information is available in the webhelp delivered with CMX.

Adding Weighing Instruments to the Instrument Database

Weighing Instrument Calibration feature is an optional feature in CMX Professional.

Adding Weighing Instruments to CMX is done just as any other instrument. Remember to select a Function Type meant for Weighing Instruments when adding the Function(s). The fields unique for Weighing Instruments are presented in the two previous chapters. See:

• Function Fields Specific for Weighing Instruments.

- Calibration Procedure Fields Specific for Weighing Instruments.

General presentation of adding instruments is in Adding Instruments to the Database.

> ⓘ **Note:** You can also make you own Weighing Instrument Function Templates and Calibration Procedures using the **Function Templates** utility. See Function Templates. CMX automatically adds the Weighing Instrument specific fields if the new Function's **Input/Output Quantity** field is set to "Mass".

Weighing Instruments Calibration

Weighing Instrument Calibration feature is an optional feature in CMX Professional.

Calibrating Weighing Instruments requires good knowledge of Weighing Instrument Calibration practises. CMX gives you tools to document the calibration, but does not offer full Weighing Instrument Calibration theory. One of the following subchapters does however offer some basic terminology for the uninitiated.

Terminology

This section presents some Weighing Instrument Calibration related keywords. The focus is on the different types of calibrations that are part of Weighing Instrument Calibrations. The descriptions are based on the standard mentioned in the beginning of this section and "**EA-10**/18 EA Guidelines on the calibration of non-automatic weighing instruments"

(EA = European co-operation for accreditation).

Eccentricity Test

The test consists of placing a test load in different positions on the load receptor in such a manner that the centre of gravity of the load takes positions indicated in the adjacent picture.
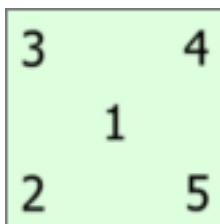
Figure 23: Eccentricity Test

The test load should not be below 10 % of full scale. Otherwise the uncertainty component of the eccentricity test may be too large for uncertainties close to full scale.

Repeatability Test

The test searches the difference between the results of several weighings of the same load. The conditions should, as far as possible, be identical. This applies to the handling of the load and the instrument as well as environmental conditions.

U.S. Pharmacopeia Convention's Chapter 41 (briefly USP 41) and European Pharmacopeia supplement 10.6 (briefly Ph. Eur.) define a new procedure for doing the repeatability and minimum weight tests. CMX supports calculating both the old Repeatability and Minimum Weight tests and the new test according to USP 41 / Ph. Eur. The standard to be used can be defined in Weighing Instrument's Calibration Procedure. When USP 41 / Ph. Eur. Repeatability is enabled, the Repeatability test also includes an Accuracy Test as defined in USP 41.

Weighing Test

This test is performed with at least five different test loads distributed fairly evenly over the normal weighing range. The purpose of this test is an appraisal of the performance of the instrument over the whole weighing range.

For people more familiar with calibrating process instruments, this test equals the typical "up/down" calibration of a process instrument.

Minimum Weight Test

Minimum weight test (also known as: Minimum Weighing Capability Test) determines the smallest weight the Weighing Instrument is able to detect. This test is based on USP's (United States Pharmacopeia) definition of Minimum Sample Weight.

See also **Repeatability Test** above.

Sensitivity Test

The sensitivity test assesses the parameter that most significantly influences the accuracy of the balance. The sensitivity deviation increases with the load, and thus is more significant in the upper part of the weighing range. Sensitivity is assessed using a single test load with a mass of between 5 percent and 100 percent of the capacity of the balance. The Sensitivity Test is defined in European Pharmacopeia supplement 10.6.

The Sensitivity Test can only be used when USP 41 / Ph. Eur. Repeatability is enabled. When the Sensitivity test is enabled, the Repeatability test will not include the Accuracy Test.

Sending Weighing Instruments to Manual Entry Window or to bMobile

Sending Weighing Instruments to the Manual Entry window or to bMobile is done as any other kind of instruments. Similarly, receiving the results do not require any special duties. Just do it as you have done for other kind of instruments.

For more information of selecting/sending, see Selecting Functions for Manual Entry and Sending Instruments etc. to bMobile.

> **Note:** You can do one **As Found** test and one **As Left** test for **Eccentricity**, **Repeatability**, and **Weighing tests**. You may however do several As Found and As Left **Minimum Weight test**s.
>
> After the first As Left test is saved, you may only do As Left tests.

Using Manual Entry

When entering calibration data of a Weighing Instrument, the Manual Entry window's result table adapts to the needs of Weighing Instrument Calibration.

Select the type of calibration from the list on the left. Then enter the results in the grid shown on the **Results** tab. Columns with a gray background are read-only data. Depending on your Calibration settings, you may have to select a Weight Set and Weight(s) used in the calibration. More about this in Calibration Options.

Also check the **Calibration Date** field and the **Calibrated By** fields shown in the same tab. You can select one or two users as the ones that carried out the calibration. Additionally, if a calibration certificate number is not automatically created, a field for adding the certificate number is shown. Whether the certificate number is automatically set by CMX or not, is part of CMX's configuration options. More of this in Calibration Certificate Options.

Enter calibration related data (e.g. the environment temperature) into the **Conditions** tab.

The **Procedure** tab contains read-only data about the calibration procedure, including possible instructions to guide you through the calibration.

Full field level information is available in the webhelp delivered with CMX.

Maintenance Inspection

Maintenance Inspection is an optional feature in CMX Professional.

Maintenance Inspection allows you to run check procedures either according to IEC 60079-17 standard or by creating custom check procedures. The checks and check procedure definitions are saved in CMX's database. When checks are scheduled to be done, the checks are sent to bMobile. After the checks are done, the results are returned to CMX.

bMobile is available in Google Play Store and App Store. See also note below. Find the App there, select and download it. The installation should start automatically and **bMobile** is immediately available for use.

> **Note:** In addition to Maintenance Inspection, bMobile supports all instruments available in CMX. This makes it a portable calibration manual entry device.

The requirements for **bMobile** are:

- Device: **Windows**® **10**[1] or later, **Android**®[2] version 5.1 or later and iPhone and iPad with iOS 13 or later.
- Recommended screen size: 4 inch or higher.
- Connection to a CWSI Server for communication with CMX.

Maintenance Inspection in CMX

All Checklist definitions are done in CMX. The following subchapters present how the Checklists are defined.

Function

When selecting a Function Template for a new Position/Device that is meant to be a Checklist, select one of the following templates:

- **Checklist**, includes a fully customizable Checklist with three pre-entered checks.
- **Checklist, IEC60079-17, Table 1**. A pre-entered Checklist according to IEC60079-17, Table 1. This may be customized, if needed.

---

[1] Windows is a trademark of *Microsoft Corporation*.

[2] Android is a trademark of Google Inc.

- **Checklist, IEC60079-17, Table 2**. A pre-entered Checklist according to IEC60079-17, Table 2. This may be customized too, if needed.

For a Checklist Function, the Quantity is **CHECKLIST**.

Procedure

Each procedure contains a single Checklist. A Checklist consists of an unbounded amount of Checklist items. The Checklist items may be arranged to unbounded amount of groups. The picture below presents a Checklist consisting of three Checklist items in a single group.

Figure 24: Checklist

The following Checklist items may be used for editing/configuring the Checklist, when procedure is in edit mode:

- All texts in italics in the picture above may be edited to suit your needs.
- The group name may be edited by double-clicking on the name (**"Group 1"** in the picture above).
- With the three check boxes (**Passed**, **Failed** and **Skipped**) you may define what kind of changes during the check procedure have to have a written note.
- The colorful round buttons to the right allow sorting, adding and deleting checklist items and groups.

Sending Instruments etc. to bMobile

To send instruments to a device with bMobile installed, first connect bMobile to a CWSI server.

Open the **Send to Calibrator** window and select **CWSI** as the protocol. Follow the instruction provided in bMobile's help. Send procedure is similar to sending any other instrument to a calibrator.

> **i** **Note:** bMobile can be used with only one CMX database at a time.

Receiving Results from bMobile

Open the **Receive from Calibrator** window and select **CWSI** as the **Protocol**. The receive procedure is similar to receiving any other instrument from a calibrator. I this case, the bMobile is the "calibrator" and the Checklist is the "instrument".

> **i** **Note:** bMobile can be used with only one CMX database at a time.

Viewing Checklist Results

The result view looks like procedure properties window with additional passed/failed status for each check and also the master pass/fail status.

Checklist Reports

Reports for checklists include instrument data as presented in regular certificates. The checklist results are shown below the instrument data in table format.

Work Order Handling

Enhanced Work Order Handling is an optional feature in CMX Professional. It should also be enabled in CMX database via Work Order Options Fields, CMX webhelp.

Enhanced Work Order Handling is a tool available in CMX. To fully utilize it, an ERP (Enterprise Resource Planning) or CMMS (Computerized Maintenance Management System) software together with **Beamex** *Business Bridge* software should be part of the system. The latter does the communication between the ERP/CMMS and CMX.

General

Enhanced Work Order Handling eliminates retyping calibration data/information to the ERP/CMMS software. Business Bridge takes care of transferring information between CMX and ERP/CMMS software.

CMX's Basic Work Order Handling

CMX has had, even from the beginning, basic non-optional work order handling for Positions. You can manually enter a work order to a Position.

However, with basic work order handling, there is no possibility to automatically reply from CMX back to the ERP/CMMS software. When the calibration/calibrations are done, the Work order has to be manually set to "Done" in the ERP/CMMS software.

CMX's Enhanced Work Order Handling

CMX's Enhanced Work Order Handling option makes CMX's work order handling more useful, especially when working with CMX in conjunction with ERP/CMMS software. *Business Bridge* software provides a transfer channel for sharing instrument, work order and basic calibration data between CMX ERP/CMMS software.

When CMX's Enhanced Work Order Handling option is active, the following fields are shown among instrument's *Calibration Procedure* data:

- **Work Order Number**
- **Work Order State**
- **Work Order Start Date**
- **Work Order End Date**

See also Work Order related fields, CMX webhelp.

Work Order State field has six possible states:

- **Empty**, (Currently no work order assigned),
- **Open**, (Work order assigned, but not calibrated, yet),
- **In Progress** (Work order calibrated, but not completed, yet),
- **Pending Second Approval** (Work order calibrated and approved, but one or more calibrations require a second approval),
- **Done**, (Work order completed),
- **Cancel**, (Work order cancelled),
- **Failed** (Failed to return work order to ERP/CMMS).

Work Order flow

Business Bridge and CMX change the Work Order State automatically based on information from ERP/CMMS software and CMX:

- When a Work Order is entered into ERP/CMMS software, Business Bridge communicates the **Work Order Number**, **Work Order Start Date** and **Work Order End Date**.

  Additionally: the **Work Order State** is set to **Open** in CMX.

- CMX fields included in Work Order message are locked in CMX side for editing. See Work Order related fields.

- When a calibration for a work order is saved in CMX, the state is changed to **In Progress**.

- Depending on settings in **Options** window's **Work Order** page, the state is changed to **Done** either manually or automatically in CMX. See Changes in CMX User Interface.

  ◦ The procedure work order status may change to **Pending Second Approval** in case a calibration result has been automatically invalidated. See Automatic Result Validation and Automatic Result Validation with Work Order for more information.

  ◦ The procedure work order status is set to **Done** only when all calibrations after the work order was issued have been approved and when work order trigger level is "Approved". This includes results that have been manually marked invalid.

- When a calibration is completed or canceled in CMX, Business Bridge communicates state **Done** or **Cancel** to ERP/CMMS software, then automatically sets the **Work Order State** in CMX to **Empty** and clears the **Work Order Number**, **Work Order Start Date** and **Work Order End Date** fields.

- When needed, the Work Order State can be manually changed in CMX to **Cancel** from the pop-up menu available in Work Orders Tree view or with **Cancel** button on Calibration Procedure page. See also Changes in CMX User Interface.

Note: The Work Order Number sent from ERP/CMMS is always located in a Procedure's **Work Order Number** field. Depending on your *Business Bridge* settings, it can also be located in a Position's **Work Order Number** field.

Free Devices do not have a **Work Order Number** field on their Device page. If you want to see the Work Order Number in the Device page, consult Beamex's support. Remember that the Work Order Number is always shown on free Device's Procedure page.

If a work order message from an ERP/CMMS software contains both the Position ID and the Function abbreviation, only the matching Function's Calibration Procedure will receive the Work Order.

If a work order message from an ERP/CMMS software contains the Position ID only, Position's all Functions / Calibration Procedures will receive the Work Order.

Work Order Start Date and **Work Order End Date** are not mandatory fields. Those fields can also be empty.

- If Work Order Start Date is included in a work order message, only calibrations made after this date are taken in account.

Note: Plant node, Position, Function or Procedure cannot be deleted if it or any underlying item is checked out or a related Work order status is other than **Open**.

Multiple Work Orders

It is possible to create more than one work order with different work order number for a CMX instrument. **Business Bridge** can be configured to define in which order the work orders are handled in CMX. Available orders are:

- FIFO - First In First Out.
- LIFO - Last In First Out.

Work order data is displayed in the different views according to the active work order, unless the view is opened from within the Work order tree. When the active work order is completed and returned to ERP/CMMS system, next work order from the list becomes active.

Work order tree view shows all work orders. From there any work order can be separately calibrated at any time.

Work Order related fields

When CMX receives work order from ERP/CMMS it may also contain data for other fields, which are then related to that work order. CMX shows data for these fields from currently active work order. The original data of these fields is kept in CMX and will be available again when instrument no more contains any work order.

Fields included in work order message can be configured via *Business Bridge* software schema. Following fields can be defined via work order message:

• Position, Device and Procedure Free text fields

• Position, Device and Procedure Free checkbox fields

• Procedure fields:

  ◦ Calibration Interval and interval unit

  ◦ Calibation Due Date

  ◦ Before Note

  ◦ Adjust Note

  ◦ After Note

Filtering Work Order related data

Filtering (including the "due within" and "due for calibration") using any of the work order related fields will check the active work order's data of a position or device. The equivalent position, device or procedure field is checked if the data in the active work order is empty.

Active work order depends on FIFO/LIFO setting, see Work Order flow.

When work order is completed, returned back to ERP/CMMS system and position/device does not contain any work order, CMX base data is used in CMX filtering.

See work order related fields in Work Order related fields.

Changes in CMX User Interface

When Enhanced Work Order Handling is Active, CMX's main window includes an additional tab beside the Position tree and the Plant Structure tree: **Work Orders** tree. It lists all existing work orders in the CMX database.

Any work order on the list can be cancelled via Context Menu (pop-up menu) on Work Order level. Select **Work Order** and **Cancel Work Order**

• **Cancel Work Order** sets a Work Order State to "**Cancelled**".

Calibration procedure page contains following buttons:

• **Complete** button sets work order state to **Done**. It can be used, when work order completion is manual and work order is in **In Progress** state. Note that work order completion rules needs to be fulfilled, otherwise an error message will be shown.

• **Cancel** button sets a Work Order State to "**Cancelled**".

> **Note:** A Work Order item in the **Work Orders** tree has no property data. It is a virtual element in the tree structure.
>
> Remember to Cancel/Complete all Functions/Procedures belonging to the Work Order. Otherwise, *Business Bridge* will not forward the data to ERP/CMMS.

Settings in CMX Options

In CMX's main window, select **Tools**, **Options**, **Work Order Settings** to edit **Enhanced Work Order Handling** options.

The following options are part of Enhanced Work Order Handling.

- **Enhanced Work Order Handling** enables/disables the Enhanced Work Order Handling feature in CMX.

- **Automatically Update Work Order State**

  When checked and when all Work Order related calibrations are done/approved, CMX changes **Work Order** State to "**Done**". Then *Business Bridge* software sends the Work Order State to ERP/CMMS software.

- **Work Order State change is allowed when calibration is**

  This is read only information received from Business Bridge software. Available options:

  ◦ *Saved*. CMX sets the **Work Order State** to "**Done**" when all required calibrations are saved.

  ◦ *Approved*. CMX sets the **Work Order State** to "**Done**" when all required calibrations are saved and approved in CMX.

- **Work Order Sequency Policy**

  This is read only information received from Business Bridge software. Available options:

  ◦ *First In-First Out (FIFO)*. CMX handles work orders in order. The work order that came first stays active until it is completed/cancelled. Once completed/cencelled, next WO becomes active, with relevant information and can be completed/cancelled until whole WO queue is empty.

  ◦ *Last In-First Out (LIFO)*. CMX handles received work orders in reversed order. Latest received Work Order becomes active in Calibration Procedure and can be completed or cancelled. Once completed/cancelled, previous WO becomes active, with relevant information and can be completed/cancelled until whole WO queue is empty.

- **Work Order Saved in Device Level Field**

  This is read only information received from Business Bridge software. It defines Device Free field, which contains work order number.

Calibration Using Enhanced Work Order Handling

When calibrations are done using Enhanced Work Order Handling, everything starts from your ERP/CMMS software. The work order is created in the ERP/CMMS software, transferred to CMX using *Business Bridge* software.

The actual calibrations are done just as always, nothing new there. The **Work Order State** changes according to CMX's settings:

- If the **Work Order State** is set to be **automatically** updated, the state is set to "**Done**".
- If the **Work Order State** is set to be **manually** updated, a dialog opens when the calibrations are saved/approved asking whether the state should be changed to "**Done**".

Then Business Bridge transfers data to your ERP/CMMS software, specifying the work order is done.

> **Note:** The pop-up menu on Work Orders tree and procedure page buttons allow you to change the **Work Order State**, when necessary. See Changes in CMX User Interface.

Special Situations

This chapter presents Enhanced Work Order related special situations.

Cancelling a Work Order in CMX

Sometimes there is a need to cancel a calibration. This can be done in CMX using the pop-up menu or Cancel button presented in Changes in CMX User Interface.

If an instrument has already been calibrated, you can still cancel it, provided the full work order is not yet set to "**Done**". Then *Business Bridge* communicates the value "**Aborted**", for that particular instrument, to ERP/CMMS software.

Emergency Calibration

An emergency calibration means that there is an acute need to calibrate an instrument but there is no time or no means to create a work order in the ERP/CMMS software first. CMX supports emergency calibrations as follows:

• Do the calibration normally and save the results in CMX's database.

• Afterwards, in ERP/CMMS software:

Create a **Work Order Number** and set the **Work Order Start Date** to a date prior to the moment the emergency calibration was performed. Send the work order to CMX.

• A person with **Calibration - Modify** permission edits the instrument's results to add the **Work Order Number** sent from ERP/CMMS software to the calibrated instrument's **Calibration Result** page.

• Depending on Work Order State's update settings in CMX, the state is either set to "**Done**" automatically or CMX asks you whether to update the state or not.

• When the Work Order State is "**Done**", *Business Bridge* communicates the Work Order Number and the Work Order State "**Done**" to the ERP/CMMS software.

This allows doing emergency calibrations without a pre-made work order. However, the work order state will still be included afterwards to ERP/CMMS software just as for "normal" calibrations.

> **ⓘ** **Note:** Emergency calibration of free devices is not supported.

Work order synchronization when linking device

When position and device is unlinked or linked and position or device contains existing work order, the work order is synchronized as follows:

• Unlinking a device from a position having an open work order will also unlink the work order from the device and its procedure(s).

• Linking a device when the position doesn't contain any work orders, but the device does, will link the device's work orders to the position.

• Linking a device when the position contains work orders, but the device doesn't, will link the position's work orders to the device.

• Linking a device when both the position and the device contains own work orders is not allowed.

Work order during calibration procedure activation change

When calibration procedure activation is changed and position or device contains assigned work order, the work order is handled as follows:

• If a calibration procedure is deactivated when having an open work order, then work order information is removed from the particular calibration procedure.

• If a calibration procedure is activated when having an open work order, then work order information is copied to the particular calibration procedure.

• A position/Device must have at least one active calibration procedure with Work Order information to enable completion.

Automatic Result Validation with Work Order

If enabled, approving calibration result triggers the automatic result validation. In case a validation rule invalidates the result that is being approved, it is signed by CMX as "Pending Second Approval".

In the above use case, if the instrument has an active work order and work order trigger rule **APPROVED** is used, the procedure's work order status will also change to "Pending Second Approval". When all calibrations related to the work order have been approved, having required second approval or not, the work order is or can be marked as "Done".

If work orders are used with *Business Bridge*, it is strongly recommended to set the work order trigger rule to **APPROVED** when enabling the automatic result validation. For example, if the work order trigger rule in the use case above would have been set to **SAVED**, then the work order could have been marked as "Done" *before* the related calibration(s) has/have been given the second approval. This all depends on whether the Enhanced Work Order Handling option and/or Automatically Update Work Order State settings are enabled.

Automatic Result Validation

The automatic result validation requires the change management option. It can be enabled in order to have CMX automatically validate calibration results. The validation of a calibration result is triggered upon approving the result.

CMX will sign the calibration result with a "Pending Second Approval" system signature if it is invalidated by any of the active validation rules. Approving a result that is pending second approval requires that another user, with the permission to approve invalidated results, reviews and gives the final approval.

If work orders are being used, then those are also being marked as "Pending Second Approval" until all related calibrations have been given a second approval. When all related results have been approved, having required second approval or not, the work order is or can be marked as completed. Do note that this is subject to different configurations. See Automatic Result Validation with Work Order for more details.

It is also possible to have CMX send second approval requests via e-mail when calibration results are invalidated. The e-mail message contains relevant data about the instrument that has a calibration result that requires a second approval.

Apart from enabling the "Automatic result validation" event, the target user(s) also need(s) to have:

- A valid e-mail address.
- Access to the instrument. The user must belong to the user- or site group defined by the accessibility of the instrument's position or device.
- The Calibration - invalidated result approve Permissions.

  The rules which CMX can automatically validate calibration results against are listed in Validation Rules.

> **Note:** Please see Automatic Result Validation with Work Order for details about using the feature with work orders.

Validation Rules

The validation rules window lets you manage the list of active validation rules. It is possible to change the name or to set a custom id for an activated rule.

Field level information is available in the webhelp delivered with CMX.

Only one instance of a validation rule can be created for most of the types. Multiple validation rule instances can, however, be created in those cases where the rule

makes use of configuration parameter(s), such as the "Calibration reference overdue" rule.

> **Note:** *Automatic result validation* in Change Management Options needs to be activated to be able to define Validation Rules.

To create or activate a validation rule, select the desired rule and click "New".

To delete a validation rule, select the instance from under the parent type and click "Remove".

> **Note:** The validation rule is permanently deleted from the database only in those cases where it has not yet been used. If it has been used, then it is only marked as removed.

The possible Validation rules to be executed after calibration is approved, are described in the table below:

Table 19: Validation Rules

Rule	Description
Incomplete calibration	Invalidates the calibration if it contains an incomplete repeat.
Failed Calibration	Invalidates the calibration if it contains a failed repeat.
Includes calibration note	Invalidates the calibration if a calibration note is given.
Includes calibration document	Invalidates the calibration if a calibration document or link is added.
Checklist item failed or skipped	Invalidates the calibration if a repeat contains a failed or skipped item.
Calibration done when overdue	Invalidates the calibration if it is done after the procedure's due date. If an active work order contains a value for the procedure due date, the calibration date is checked against that value instead.
Calibration point deviation exceeded	Invalidates the calibration if a calibration point deviates more than the defined max deviation. Requires that a max deviation is set for calibration points.
Calibration reference overdue	Invalidates the calibration if any of the used references are overdue. The threshold is configurable and value between 0 and 365 days can be set.

Rule	Description
Calibration point error with uncertainty outside the error limit	Invalidates the calibration if a calibration point error, together with the expanded uncertainty, is outside the error limit. This can be seen in the error graph of a calibration result where the point's error uncertainty bar crosses the error limit line. ⓘ **Note:** This rule does not affect, nor does it take into account, the passed or failed status of the saved calibration.

Click "OK" to save the changes made to the list of active validation rules.

ⓘ **Note:** Clicking "OK" in the validation rules window will only cache your changes. This means that if you cancel the options window it will discard your changes. To persist the changes to the database you also have to save the options window by clicking "OK".

Mobile Security Plus

Mobile Security Plus is optional in CMX Professional.

Data integrity has become a focal point in Pharmaceutical industry. Both, MHRA and FDA have published their own guidance document for the subject:

*   MHRA: GMP Data Integrity Definitions and Guidance for Industry (March 2015)
*   FDA: Data Integrity and Compliance With CGMP Guidance for Industry (April 2016, Draft)

Beamex's Mobile Security Plus is an optional tool in CMX, giving answers to problems presented in the documents mentioned above.

In addition to CMX **Mobile Security Plus** is supported in modern Beamex calibrators and other **Mobile Devices** as follows:

*   **MC6** Advanced Field Calibrator and Communicator, from firmware version 1.80 onwards.
*   **MC6-WS** Advance Workshop Calibrator and Communicator, from firmware version 1.80 onwards.
*   **MC6-Ex** Intrinsically Safe Advanced Field Calibrator and Communicator, from firmware version 3.00 onwards.
*   **bMobile** A software available in Windows® 10, Android® and iPhone and iPad (iOS 13 or later).

Terminology

Mobile Security Plus option terms are defined in the table below.

Table 20: Terminology

Term	Description
Mobile User	A CMX user that also uses any of the Mobile Devices listed in previous chapter.
	When Mobile Security Plus is active, CMX users defined as Mobile Users are the only ones allowed to calibrate instruments in supported Mobile Devices.
	More details in Users and Permissions Window.

Term	Description
Mobile Supervisor	A Mobile User may also be defined as a Mobile Supervisor, e.g. allowed to change date and time of a Mobile Device.
	Note that a Mobile supervisor must also be defined as a Mobile User.
	More details in Users and Permissions Window.
Mobile Password	When a CMX user is also defined as a Mobile User, a Mobile Password is also defined. Note that the Mobile Password is separate from the CMX user's password.
	More details, including supported characters, in Options Window.

Mobile Security Plus Option in CMX

The following chapters present Mobile Security Plus related settings etc. in CMX. Note that the things presented here are not the full settings available in CMX. This is a collection of items that may be useful when taking Mobile Security Plus in use.

> ⚠️ **Caution:** Before activating Mobile Security Plus in CMX, ensure that all existing calibration results on all mobile devices (MC6, tablet etc.) are received to CMX.

Options Window

To activate Mobile Security Plus option, open **Tools** menu on CMX's Main Window and select **Options**.

In **General Settings** (the page that opens first) is a check box labelled **Mobile Security Plus**. It activates Mobile Security Plus Page.

> ℹ️ **Note:** If the check box is disabled, your CMX does not include Mobile Security Plus option.

When Mobile Security Plus is activated, a Mobile Security icon is visible in the list of icons/subjects shown on the left side of the Options window. Select the icon to open Mobile Security page.

The following settings are available:

- **Password Required**. This allows you to activate a Mobile Password. This password is asked when utilizing supported Mobile Devices. When a CMX user has been defined as a Mobile User and a Mobile Password is required, the first time user logs into CMX, he/she can enter a Mobile Password. The allowed characters are listed below. The password is saved in CMX's database. See also notes below.

  When utilizing this feature, user has to be defined as a Mobile User in CMX. See Users and Permissions Window.

- **Minimum Password Length**. When Mobile Password is required, you may define the minimum password length here.

- **Password Change Interval** (days). Here you may define how often the Mobile Password should be changed.

- **Warn before password expires** (days). Time period for warning that the Mobile Password should soon be changed.

- **Number of previous passwords not accepted**. How many of the previous passwords are refused when changing the Mobile Password.

  0 = no check for previous passwords.

- **Illegal Login Attempts**. How many illegal attempts (i.e. wrong password entered) are allowed before Mobile User is locked from the Mobile Device. See also notes below.

- **Enforce Password Complexity**. When checked, the Mobile User's password has to include at least one of all the character groups presented below.

Supported characters for Mobile Passwords:

Table 21: Supported characters for Mobile Passwords

Character Group	Description
Upper Case	ABCDEFGHIJKLMNOPQRSTUVWXYZ
Lower Case	abcdefghijklmnopqrstuvwxyz
Numbers	1234567890
Special Characters	@'-!"#$%&()*,./:;?[\]^_{|}~+<=>

Calibration related settings in CMX's Mobile Security page

These settings are sent to Mobile Device when connecting to CMX:

- **Do not allow instrument to be deleted until all results are received for an instrument**. Instrument may not be deleted from Mobile Device's memory before they are received to CMX.

- **Restrictions for undo and result deletion on mobile devices**. A setting for defining what are the restrictions when trying to undo a calibration point and deleting results in Mobile Device.

- **User ID selection**. A setting for defining how user is identified in Mobile Device.

MC6 Family Calibrator related settings in CMX's Mobile Security page

- **Required firmware version**. A list of firmware versions supporting Mobile Security Plus in MC6 family calibrators.
- **Require Mobile Security Option**. Check this item to require that the MC6 family calibrator communicating with CMX must include Mobile Security Plus option.

Devices not Supporting Mobile Security settings in CMX's Mobile Security page

- **Disable communication**. Check this to prevent communication with calibrators that do not include Mobile Security Plus.

Note: A description of available options related to Mobile Security is available in the webhelp delivered with CMX.

Mobile Users must enter their Mobile Password in CMX before sending instruments for calibration to a Mobile Device.

Mobile Password can be entered/changed while working with CMX. In CMX's main window, do the following menu commands: **Tools**, **Security**, **Change Mobile Password**.

If a Mobile User's account has been locked in a Mobile Device, e.g. after too many illegal attempts, the account can be re-activated by synchronizing the Mobile Device with CMX.

When Mobile Security Plus is in use, **Use Electronic Signature ID as Calibrated By ID** field in Change Management Option Fields, CMX webhelp.

Calibration Options Page

Some of Calibration Options are useful to keep in mind when using Mobile Security Plus:

- **Add Database Name as 1st Plant Path Level**. This setting is of use if several CMX databases are in use, e.g. each plant has their own CMX database. Then when sending instruments to a supported Mobile Device, it is possible to identify instrument's source.
- **Deny Skipping Points**. When checked, calibrator technician may not skip a calibration point.
- **Require a Note for Skipped/Abnormal Points**. When checked, calibrator technician need to write a comment for all skipped calibration points.

Users and Permissions Window

Open **Users** window by doing following menu commands in CMX's main window: **Tools**, **Security**, **Users**.

In User Properties

User properties include two Mobile Security Plus related check boxes:

- **Mobile User**. When checked, CMX User also uses the Mobile Devices supporting Mobile Security Plus. If Mobile Security Plus is not part of your CMX or it is deactivated, this setting is obsolete.

  A Mobile User may not perform certain actions in a Mobile Device, e.g. deleting calibration results. The restrictions depend on settings done by Mobile Supervisor(s).

- **Mobile Supervisor**. If checked, a Mobile User also has supervisor rights. It allows the supervisor to define functionality restrictions for ordinary Mobile Users, e.g. deleting instruments with calibration results.

  The available functionality restrictions depend on the Mobile Device at hand. Refer to its own manual for details on what can be restricted.

  Note that a Mobile Supervisor has no Supervisor rights in CMX, unless he/she is also a CMX Supervisor.

A Mobile Password may be set for Mobile Users in CMX. Open main window's **Tools** menu and from there **Security** and **Change Mobile Password**. See also Options Window to get acquainted with Password related settings.

> **Note:** At the **Users** window's bottom left corner is a check box: **Show only mobile users**. When checked, all non-Mobile Users are temporarily hidden.

Permissions

The **Permissions** tab of **User Groups** has new Mobile Security Plus related items. Some of them are visible only when Mobile Security Plus option is included in your CMX:

- **Calibration - Lock**. Permission to lock approved calibration results so no further edit is allowed. More of locking and unlocking results in Locking Calibration Results.

- **Calibration - Unlock**. Permission to unlock previously locked calibration results making it possible to edit the results.

- **Manual Entry – Calibration time edit**. Allowed by default, but with this setting you may restrict certain User Groups from changing calibration date when doing calibration using Manual Entry, see table below.

Mobile security plus license option	User	User group has "Calibration time edit" permission	Expected result (calibration time editing possible)
OFF	Normal	-	Yes
ON	Normal/mobile	No	No
ON	Normal/mobile	Yes	Yes
ON	CMX supervisor	No	Yes
ON	Mobile supervisor	No	No
ON	Mobile supervisor	Yes	Yes

- **Option maintain - Mobile Security**. Permission to edit Mobile Security options.

Manual Entry in CMX

This chapter presents CMX Manual Entry's new items related to Mobile Security Plus. Not all items are uniquely part of Mobile Security Plus, but they are good to take into account when performing calibrations using the Manual Entry window.

- Depending on permissions, user may or may not alter the calibration time. See Users and Permissions Window.

- Depending on CMX options, user may or may not skip calibration points. See Options Window.

- If skipping a calibration point is allowed, user may be required to enter a note. This is also defined in CMX Options.

  The note may not be "invisible" characters.

  Again, see Options Window.

Calibration Results in CMX

The following settings do not require that Mobile Security Plus is active:

- When viewing results, any skipped points are indicated in the result window. If in **CMX Options**, the skipped point is required to have a comment, it is seen among the results.

- Also, if the calibration was saved as an incomplete calibration, it is indicated in the result page.

If Mobile Security Plus is active:

• Clicking the secondary mouse button above a calibration result icon in CMX main window's tree view, opens a pop-up menu where you can **Lock** or **Unlock** the calibration result.

Note that locking/unlocking requires permission to do changes to calibration results. See Users and Permissions Window.

A locked result's icon:

Figure 25: Locked Result

> **Note:** When Mobile Security Plus feature is in use, an electronic signature can only be given by the user who is logged in to the CMX. When Mobile Security Plus is not in use, then functionality is as before: Anyone can give the electronic signature.

Mobile Security in Mobile Devices

Mobile Devices have their own Mobile Security Plus related settings, provided their firmware support Mobile Security Plus. Refer to Mobile Device's own manual/help on what the settings are. When a Mobile Device is connected to CMX, CMX "pushes" some data/settings to the Mobile Device.

Mobile Security Plus related things when connecting CMX and a Mobile Device:

• CMX synchronizes the calendar and clock of a Mobile Device and the Computer CMX is installed to. The Mobile Device's clock is the one that is adjusted, if needed.

> **Note:** This does not apply to tablets with bMobile.

• CMX also synchronizes Mobile Security related settings in CMX to the Mobile Device.

• If Mobile Password is in use (see Options Window), CMX sends Mobile User credentials to the Mobile Device. Then the Mobile Device requires users to authenticate themselves when starting calibrations and also when saving a calibration result.

- If Mobile Password is **not** in use, the Mobile Device does not require a login or authentication when saving a calibration. However, Mobile Users defined in CMX are transferred to the Mobile Device. This allows calibration technician, a Mobile User, to select his/her name from a pick up list when saving a calibration.

- When communicating with a Mobile Device, CMX reads the Device's firmware version. If the firmware version does not support Mobile Security Plus, user is asked to update the firmware in the Mobile Device.

- If a Mobile Device contains an instrument with results, the same instrument may not be sent to the Mobile Device, overwriting the existing results.

- MC6 supports receiving instruments to it from several CMX Databases. When calibrating instruments, you first select a database and then the instrument.

> **Note:** This is not supported in bMobile.

Data Loader

The Data Loader Tool can be used to import or populate instrument data from another system via excel file into CMX database.

General

Data Loader in an optional feature in CMX Professional and CMX Enterprise.

Data Loader allows importing and populating instrument data from another system via excel file into the CMX database.

CMX allows also to create Data Loader excel file, which makes it possible to mass-update CMX data. Data Loader Print saves the excel file. Its content can be modified and imported back to CMX database via Data Loader.

To use Data Loader, user must have "Data Loader" license option enabled and Data Loader permission enabled. See chapter Permissions.

Data Loader window can be opened from the CMX main window's **Tools** menu.

Data Importing is started by selecting an excel file using the **Browse...** button in Data Loader window. File content is verified and file path is shown in Data Loader window whenever that file is Data Loader compatible. File content summary is shown.

> **Note:** It is recommended to make separate Data Import for different function types (transmitter, switch, weighing instrument and checklist) using designated excel files. CMX contains separate excel file templates for different function types. They are located in CMX application folder under **Files\Data Loader\Templates**. By using these templates, it is easier to fill only function type related fields in separate excel file, instead of having all possible fields in one excel file.

Validation and Import can be started.

Validation

Excel file content must be validated before importing is allowed. Validation checks excel file's content for possible warnings/errors in entered data. Validation does not check the data against the CMX database, which is done during the Import phase.

Validation is enabled when user has selected a Data Loader compatible excel file.

Validation is started by clicking **Validate** button in the **Validate** tab or in the Data Loader window's toolbar.

The progress of the Validation is shown in the progress bar during validation. The summary is shown under the progress bar.

When validation is completed, status of each instrument row in the excel file is shown in the Log table.

Validation log rows can be saved to a text file using the **Save Log** button. File name and location can be entered.

Import button is enabled when at least one of item passes validation.

Import

Instrument data from excel file can be imported to the database after excel file content is successfully validated.

Importing is started by clicking **Import** button in the **Import** tab or in the Data Loader window's toolbar.

A reminder to do a backup is shown as the first thing when Import is started.

It is possible to execute importing only when at least one of the items in the excel file has passed the validation. Only passed validations are imported.

Import progress is shown in the progress bar during importing. The summary is shown under the progress bar.

When importing is completed, status of each imported row is shown in the Log table.

Import log rows can be saved to a text file using the **Save Log** button. File name and location can be entered.

Instruments will be updated to CMX tree view after Data Loader window is closed.

Data Adaptation

CMX contains and references several fixed pick-up lists. One example of such list is the values for different transfer functions. The items in all of these pick-up lists are referred to by their corresponding database code. These do not change and are required when instrument import is being processed.

Data adaptation helps with use of these seemingly random database codes by letting the user to use a more descriptive value. The available aliases for all pick-up list codes are found in the DataAdapterConfig.xml file, located in the CMX installation folder.

The DataAdapterConfig.xml file contains a set of predefined aliases for each fixed pick-up list and new aliases can be added if needed. Presented below the example of adapting different values for Linear transfer function be:

```
<!--Transfer Function-->
<FunctionTransferFunction>
...
```

```
<LINEAR code="2">
<Alias default="true">Linear</Alias>
<Alias default="false">2</Alias>
<Alias default="false">Lineaarinen</Alias>
<Alias default="false">Lineární</Alias>
<Alias default="false">Linéaire</Alias>
<Alias default="false">Liniowa</Alias>
<Alias default="false">########</Alias>
<Alias default="false">Lineal</Alias>
<Alias default="false">Linjär</Alias>
</LINEAR>
...
</FunctionTransferFunction>
```

Using the example adaptation above, changing the transfer function of the imported instrument to a different value than the one defined in the used function template can be done by using any of the defined aliases or the transfer function code.

> **Note:** New codes or lists cannot be added to the DataAdapterConfig.xml file.

Print

Saving an Instrument to an excel file can be done by opening Data Loader printing and selecting instruments to be saved to an excel file.

Print menu is located in the CMX main window (Documents>Data Loader>Print..).

The **Print Data Loader** window can be opened from the CMX main window's **Documents** menu or CMX **Documents** toolbar .

See: Printing Data Loader for more information.

CMX includes Default Layouts that can be used to save different collection of fields to an excel file.

Report designer can be used to define own field collection in the excel file. Report layouts for Data Loader can be imported/exported using Importing/Exporting Document Layouts.

Default Layouts

CMX includes some premade layouts, which helps to save only certain level or function type related fields to the excel file. Following predefined layouts exist in CMX:

- **Plant Structure Excel file for Data Loader.lst**
  - Used for creating/modifying plant structure and data.

- **Position Excel file for Data Loader.lst**
  - Used for creating/modifying position data.

- **Device Excel file for Data Loader.lst**
  - Used for creating/modifying device data.

- **Regular Transmitter Excel file for Data Loader.lst**
  - Used for creating/modifying regular transmitter data.

- **Switch Excel file for Data Loader.lst**
  - Used for creating/modifying Switch instrument data.

- **Weighing Instrument Excel file for Data Loader.lst**
  - Used for creating/modifying Weighing Instrument data.

- **Checklist Excel file for Data Loader.lst**
  - Used for creating/modifying checklist instruments.

Descriptions of Fields in Data Loader

For detailed description of all fields available in Data Loader excel file, please see CMX webhelp.

CMX Database Manager

CMX Database Manager is a tool for doing backups of your databases as well as restoring databases using a backup database as the source. Additionally you can also install/uninstall, create and copy CMX databases.

> ℹ️ **Note: CMX Database Manager should be used by experienced database and database server users. Using this tool without knowing what you are doing may result in loss of valuable data.**

Starting CMX Database Manager

CMX Database Manager is installed in the same folder as CMX. Look for `BxbDatabaseSetup.exe`.

The next chapters describe the use of the Database Manager.

> ℹ️ **Note:** Start the CMX Database Manager in same computer where the CMX database server is.

Server Connection

The upper part of **CMX Database Manager**'s window contains server connection data. The data is pre-entered as needed for CMX. If you log into another server, you need to enter the server login and password accordingly. Click **Login**, to log into the server.

> ℹ️ **Note:** CMX Database Manager includes a possibility utilize either *SQL Server Authentication* (default) or *Windows Authentication*. Use the **Authentication** selection list to choose the one you want.

The following subchapters describe the functionality of the lower part of the window.

Backup and Restore a Database

Select the database to be backed up or restored from the Database Name list.

When making a backup copy of a CMX database, the backup file is named as the original file with the addition of the backup date (format: _yyyy-mm-dd_hh-mm). The path and the backup file name is editable but we recommend you use the default values.

To restore a database, first select the backup database to be used for restoring and then click the **Restore** button.

> **Note: Making database backups is highly recommended.** It minimizes data loss in case of power failure, network problems etc.
>
> CMX Database Manager must be run locally on the computer where the database is located, you can not, e.g. restore a database remotely (via the network) to another computer.
>
> If you get the following error message when restoring a backup file:
>
> **Restore failed for server 'computer name'\CMXSQLEXPRESS",**
>
> it means you are trying to restore backup file that is located in a path the SQL server does not have permissions to. An example is the desktop. Each user may copy files etc. to their own desktop, but the SQL server does not have permissions to the desktop.
>
> Copy the backup file to, e.g. the root of the C:\ disk. Then retry. Database backup and restore is not possible if the same database is in use in CMX. Close CMX before starting backup or restore procedures.

Installing and Uninstalling a Database

Available databases:

- **CMX_Demo_Database**, a demo database to see how the user interface looks like with some data added to the database. This is the default database when CMX is started for the first time after installation.

- **CMX_Database**, an empty database for creating your own database. When needed, you may switch to this database as described in Opening a Database.

If you want to either uninstall or reinstall one of the databases, use the tools found in the second tab.

First select which database you want to work with and then select the button that suits your needs (**Uninstall/Detach** or **Install/Attach**).

> **Note:** Uninstalling a Database is not possible if the same database is in use in CMX. Close CMX before starting the uninstall procedure.
>
> **If you have entered your own data into either of the databases shipped with CMX, uninstalling that database results in data loss!**

Creating a New Database

Allows you to create an all new (empty) CMX database. Give the new database a name. Standard Windows file naming conventions apply, except that you do not need to enter the file extension. Then click the **Create** button.

Taking the new database into use depends on the type of CMX software you have.

• In CMX Enterprise or CMX Professional with the floating server license option you first need to add the database to the CMX Application Server.

Open the Application Server from the icon found in the system tray ( ). Enter the following menu commands in the Application Server window: **Tools** > **Database Settings**.

During login CMX offers to connect to the latest database used. To switch database, select another (host and) database from the login window.

Alternatively, when CMX is already running, use the main window's menu to select:

• **File, Database** in **CMX Professional without the floating server license option** or

• **File, Host** in **CMX Enterprise** or **CMX Professional floating server license option**. Then enter required information to log into another database.

Copying a Database

This feature allows you to copy a backup database and create a new CMX database of it.

Click the **Browse** button to locate the backup file. The file must be on a local hard drive, on a CD-ROM or a DVD-ROM, not on a network drive.

Give the new database a name. Standard Windows file naming conventions apply, except that you do not need to enter the file extension. Then click the **Copy** button.

See the end of section in Creating a New Database for information on how to take use of the copied (new) database.

Deleting a Database

Select the database to be deleted from the list provided. Click the **Delete** button to do it.

> *i* **Note:** There is no way of retrieving a deleted database. Perform the delete only if you are sure that the database to be deleted is no longer of use at all.

Moving a Database

Select the database to be moved and the destination server. You may also rename the database to be moved.

> *i* **Note:** The source and destination databases have to be in the same computer when moving. If not, use CMX Database Manager's Backup and Restore tools.
>
> The **Move** utility includes a possibility to utilize either *SQL Server Authentication* (default) or *Windows Authentication*. Use the **Authentication** selection list to choose the one you want.
>
> If source and target SQL Server versions are different you may get a permission error. To fix this, it is required to give the service account of the target database engine read permission to the backup folder of the source. This folder is by default located in the installation folder of SQL server. Read permission can be given to either all users (builtin\users) or to the target's database engine service account directly.

Additional Information

This section includes additional information not related to CMX alone, but useful when working with calibrators communicating with CMX.

Calibrators and USB Communication

This chapter applies to **Beamex** calibrators that use USB communication when connected to a computer. This description is general, so check the calibrator's own manual for possible detailed information.

The first time you connect a calibrator to a computer, using the USB cable delivered with the calibrator, Windows' **Found New Hardware Wizard** initializes wanting to install a device driver.

The driver is available in the following locations:

*   In the folder where CMX is installed.

    Default path: `C:\Program Files\CMX`.

*   On CMX Calibration Maintenance Management software installation media.

    Path: `X:\Drivers\USB Drivers`.

*   On a CD-ROM called **Beamex Integrated Calibration Solutions** shipped with the calibrator.

    Path: `X:\Product related\Calibrator\Drivers`.

*   At Beamex's web site (https://www.beamex.com/). Look for downloads. The driver may be part of the calibrator's software update package or separately available. Check the web page's description.

Installing the driver

If the USB drivers have been installed during CMX's installation, the drivers are automatically available when a calibrator is connected to the computer.

If the drivers weren't installed during CMX's installation, they have to be installed manually as follows:

*   Connect the calibrator to the computer's USB port.
*   Open **Device Manager**. It can be opened, e.g. by clicking the mouse's secondary button above the Windows logo.

- In the Device Manager, open the **Other devices** list and click the mouse's secondary button above a Beamex calibrator.
- Select **Update Driver Software** form the pop-up menu.
- Select **Browse my computer for driver software** in the opened window.

To avoid further questions by the operating system, check the **Always trust software from "Beamex Oy Ab"** setting in the next dialog.

> **Note:** The driver has been tested in 64 bit versions of the recommended operating systems for CMX Client installation.
>
> Windows may warn that the driver is not digitally signed. Please ignore this warning and proceed with the installation. If your system administrator has not allowed using drivers without digital signature you must ask him to allow it.

Absolute Pressure Measurement and Uncertainty Calculation

Absolute Pressure Measurement uses two pressure modules simultaneously: a gauge pressure module and a barometric module. The total uncertainty of that kind of measurement is a combination of the uncertainties of both modules used in the calibration.

There's a catch in how CMX calculates the total uncertainty of an absolute pressure, but first we need to know what kind of pressure modules Beamex offers.

By default, Beamex calibrators use external pressure modules as follows:

- **High Accuracy EXT**(-IS) modules in

  MC5, **MC5-IS** and **MC5P**.

- **Standard Accuracy EXT-s**(-IS) modules in

  MC2, **MC2-IS**, **MC4** (and MC3).

The 1 year uncertainties of available external and internal barometric modules are as follows:

- **High Accuracy EXT B**:

  0.05 kPa / 0.5 mbar / 0.0073 psi

- **High Accuracy Internal Barometric Module** usedin

  MC5, **MC5-IS** and **MC5P**:

  0.05 kPa / 0.5 mbar / 0.0073 psi

- **Standard Accuracy Internal Barometric Module** usedin

  MC2, **MC2-IS**, **MC4** (and MC3):

  0.1 kPa / 1 mbar / 0.0146 psi

CMX's catch is that it assumes that the barometric module is of the same type as the gauge module.

So, if you are consistent with the use of pressure modules, i.e. you measure absolute pressure using a High Accuracy barometric module together with a High Accuracy gauge pressure module or a Standard Accuracy barometric module together with a Standard Accuracy gauge pressure module, you'll be fine. The uncertainty calculation works as it should.

But if you combine pressure module types when you measure absolute pressure, the uncertainty of the barometric module is assumed wrongly. Thus, depending on the combination, the total uncertainty is either 0.05 kPa (or 0.5 mbar / 0.0073 psi) too good or too poor.

Examples:

1. A **High Accuracy EXT2C** gauge module is used in an MC4 with a **Standard Accuracy Internal Barometric Module.**

    Then CMX assumes that the barometric module is a High Accuracy module too and uses a too good accuracy component when calculating the total uncertainty. You should add 0.05 kPa (or 0.5 mbar / 0.0073 psi) to the total uncertainty.

2. A **High Accuracy EXT B** barometric module is used in an MC4 with a **Standard Accuracy Internal Gauge Module.**

    Then CMX assumes that the barometric module is a standard accuracy module too and uses a too poor accuracy component when calculating the total uncertainty. You should subtract 0.05 kPa (or 0.5 mbar / 0.0073 psi) from the total uncertainty.

3. A **Standard Accuracy EXT2C-s** gauge module is used in an MC5 with a **High Accuracy Internal Gauge Module.**

    Then CMX assumes that the barometric module is a standard accuracy module too and uses a too poor accuracy component when calculating the total uncertainty. You should subtract 0.05 kPa (or 0.5 mbar / 0.0073 psi) from the total uncertainty.

> **Note:** If absolute pressure is always measured using the same pair of standard accuracy and high accuracy modules, consider editing the absolute pressure measuring range specifications for that particular gauge module. The field in question is Constant Error. More of specifications in Adding Module Ranges and Calibrator Module Range Fields, CMX webhelp.
>
> When performing this customization, you should record the change for future needs. If you later on purchase more pressure modules / calibrators and maybe use a different combination to measure absolute pressure, you need to assure the specifications are valid for that combination.

Temperature Blocks and CMX

When calibrating temperature instruments using Beamex' Temperature Blocks, such as FB Field Temperature Block series and MB Metrology Temperature Block series, there are some issues to be taken into account. Here's a brief description of them.

Specifications of Temperature Blocks

The specifications of Temperature Blocks are divided into several components as follows:

Table 22: Specifications of Temperature Blocks

Component	Description
Display Accuracy	The specification of the internal measurement.
Stability	The instability of the block's temperature
Axial Uniformity	The vertical temperature gradient in the block
Radial Uniformity	The horizontal temperature gradient in the block
Load Effect	Measurement probe(s) leaking heat to/from the block to the ambient
Hysteresis	The variation in readouts when reaching a certain temperature from higher or lower temperatures
Reference Connection	From reading the reference sensor connected to the Temperature Block

> **Note:** Not all components are valid in all applications using a Temperature Block.
>
> Detailed specification data is in the Temperature Block's User Guide.

Specifications of Temperature Blocks in CMX

In CMX, the uncertainty for a certain calibrator's/module's (sub-)range is saved as a Constant Error and a possible Relative Error, % of Reading. For Temperature Blocks, the Constant Error and Relative Error are combined from applicable components presented in Specifications of Temperature Blocks.

The possible methods of use are as follows:

Method 1: Temperature Block With Internal Temperature Measurement

A Temperature Block is used for creating the necessary temperature and the Temperature Block's internal temperature sensor is used for measuring the Block's temperature. The *Input Method* setting of the instrument to be calibrated is "Controlled/Measured" and no external reference sensor is connected to the calibrator or the Temperature Block.

The following specification components of the Temperature Block are combined in CMX's Constant Error and Relative Error data:

- *Display Accuracy*
- *Stability*
- *Axial Uniformity*
- *Radial Uniformity*
- *Load Effect*
- *Hysteresis*

Method 2: Reference Sensor Connected to R-type Temperature Block

An R-type Temperature Block controls the temperature and a reference sensor connected to the Temperature Block is used for measuring the temperature. The Input Method setting of the instrument to be calibrated is "Controlled/Measured".

In this case, the following specification components of the R-type Temperature Block are combined in CMX's Constant Error and Relative Error data:

- *Stability*
- *Axial Uniformity*
- *Radial Uniformity*
- *Load Effect*
- *Reference Connection*

In modern calibrators, communicating with a Temperature Block, you may define the used reference sensor model. When receiving calibration results to CMX, the reference sensor and, when applicable, its specifications are included with calibration result data. Also: The Temperature Block's specifications, as presented above, are included with calibration result data. See also note below.

> **Note:** For Beamex smart sensors, the specifications are already available in CMX. For other sensors and devices, the model and its specifications need to be added to CMX's database prior to using them in calibrations.

Method 3: Reference Sensor Connected to an External Device

Temperature Block controls the temperature and an external reference sensor is in the block, but the sensor is connected to an external temperature measuring device. The Input Method setting of the instrument to be calibrated is "Controlled".

In this case, the following specification components of the Temperature Block are combined in CMX's Constant Error and Relative Error data:

- *Stability*

- *Axial Uniformity*

- *Radial Uniformity*

- *Load Effect*

There are two possibilities for the refrence sensor connection:

A: The reference sensor is connected to the calibrator.

B: The reference sensor is measured using a third party device.

In modern calibrators, communicating with a Temperature Block, you may define the used reference sensor model and, when applicable, the third party device model used for measuring the reference sensor. When receiving calibration results to CMX, the reference sensor, the third party device and, when applicable, their specifications are included with calibration result data. Also: The Temperature Block's specifications, as presented above, are included with calibration result data. See also note in method 2.

How the Temperature Block's accuracy specifications are converted to uncertainty data in CMX

Equation:

$$u_{tb} = \sqrt{ \left(\frac{DA}{\sqrt{3}}\right)^2 + \left(\frac{St}{\sqrt{3}}\right)^2 + \left(\frac{AU}{\sqrt{3}}\right)^2 + \left(\frac{RU}{\sqrt{3}}\right)^2 + \quad \cdots \quad \left(\frac{LE}{\sqrt{3}}\right)^2 + \left(\frac{Hy}{\sqrt{3}}\right)^2 + \left(\frac{RC}{\sqrt{3}}\right)^2 }$$

Where

- u_{tb} — The standard uncertainty of a Temperature Block.

- DA — The Display Accuracy specification. Zero when using methods 2 and 3.

- St — The Stability specification.

- AU — The Axial Uniformity specification.

- RU — The Radial Uniformity specification.

- LE — Load Effect specification.

- Hy — The Hysteresis specification. Zero when using methods 2 and 3.

- RC — The Reference Connection specification. Zero when using methods 1 and 3.

> **Note:** All specifications have a rectangular probability distribution. That is why they are divided by the square root of three.
>
> In CMX, the uncertainties are saved as expanded uncertainties, i.e. the standard uncertainties are multiplied by two.

Application Logging

Application logging is enabled by default in CMX and can be used to track or troubleshoot certain issues by analyzing the logged events.

Most of the logging currently is done by the Data Loader tool but additional events will be added and logged in future versions.

The logging framework that is used is NLog, which is a free and flexible open-source logging framework. The default configuration in CMX is to log info or more severe events to a file in CMX's application data directory (%appdata%\Beamex Oy Ab\CMX Calibration Management Software\logs\).

The log target can be changed from a file target to something else if needed. Different logging targets and all their configurations can be found and viewed in the NLog documentation.

For detailed description of CMX's default file target settings, please see CMX webhelp.

Third Party Licenses

CMX, CWSI Server and CWSI Client include a number of third-party libraries that are used to provide certain features. Additional copyright and legal notices and license terms applicable to the third-party libraries may apply. A list of the third-party libraries included in CMX, CWSI Server and CWSI Client can be found in the pdf file *CMX-3rd-party-components*, located under the *Documents* folder in the installation media.

By accepting the terms of the Beamex software license agreement, You also accept the third party terms.

Glossary

B

Business Bridge

Beamex Business Bridge is a software that communicates between CMX and ERP/CMMS Asset Management software. When purchased, Beamex's support helps customizing Business Bridge to work between CMX and the Asset Management software in use.

C

Calibration Points

Calibration Points are the input signal values (sometimes the output signal values) used in the calibration of a function.

Calibration Procedure

The procedure includes information on how the calibration should be accomplished, like:

- Can the calibration be performed automatically or is it done manually
- Can the calibration be carried out on the field or not
- Recommended calibrator(s) to be used in the calibration.

D

d1, d2, d3 and d4

Actual scale interval. More information in CMX's help file. Search for "Actual scale interval".

Device

A Device is the physical instrument that can be installed into a Position.

E

e1, e2, e3 and e4

Verification scale interval. More information in CMX's help file. Search for "Verification scale interval".

ERP/CMMS

ERP = Enterprise Resource Planning.

CMMS = Computerized Maintenance Management System.

Both are asset management software.

F

Function

A single task done with an instrument, e.g. temperature transmitter, pressure indicator etc. Instruments capable of performing several tasks are called multifunction instruments.

Function Type is the description of the function (input/output quantities and ranges) and information concerning the calibration of the function (e.g. calibration points and error limits).

See also Multi-function.

I

Input Method

How the input signal of the instrument is obtained into CMX. Examples of Input Methods:

- Measured by the calibrator
- Sourced by the calibrator
- Controlled by a pressure controller and measured by the calibrator etc.

Instrument

For CMX, any Position seen on the main windows' Positions Tree are instruments. No matter what kind of function the instrument contains.

Instrument Collection

A collection of instruments located in the same database.

M

Multi-function

A multi-function Position or Device can carry out several operations, e.g. a temperature transmitter and a temperature indicator is an instrument with two functions.

O

Output Method

How the output signal of the instrument is obtained into CMX.

P

Position

A Position is the location in a process where a device can be installed. Positions often have symbolic names (tags) like TTI 215 in instrumentation drawings.

A Position can be calibrated only when a device is installed because a location cannot be calibrated.

S

Secondary Button

The mouse's secondary button is the rightmost one, if you are using the mouse with your right hand.

Sets

Sets are groups of Device's or Position's Functions that the user may create with the Set Maintain utility. Usually Devices or Positions belonging to a set have something in common, e.g. they are all calibrated during the same week, they are all located in the same unit of plant etc.

How the sets are devised depend on the user application requirements.

U

User ID

An abbreviation for identifying each user of CMX. Needed, e.g. when starting CMX. Using the same User IDs as is used on your network login is recommended.

UTC

UTC (abbreviation of Coordinated Universal Time) is the primary standard time, common to every place in the world. Formerly it was called Greenwich Mean Time (GMT). UTC is expressed using a 24-hour clock. An offset value is used to indicate a time zone's time difference to Greenwich Mean Time (UTC+0).

Table 23: Examples of Time Zones Presented in the UTC Format

Time zone	UTC
Central European Time	UTC+1
Central European Summer Time	UTC+2
US Central Standard Time	UTC-6
US Central Daylight Time	UTC-5

Index

A

B

C