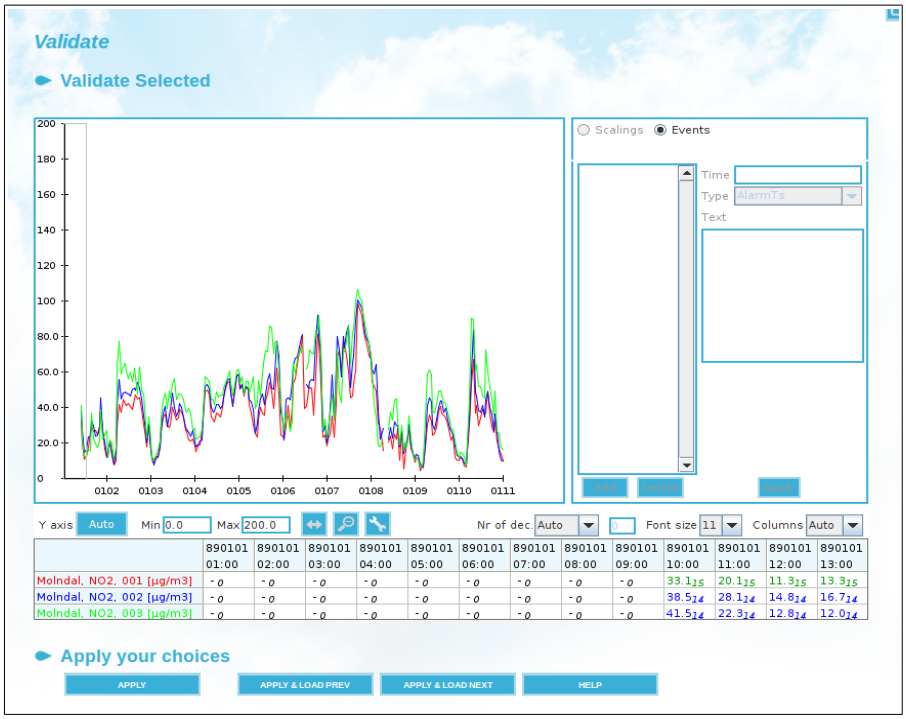
Apertum

Volume 5

Airviro User's Reference

Using the Indico Validation Module



How to validate measured data

Amendments

Version	Date changed	Cause of change	Signature
3.11	January 2009	New Module	GS
3.12/3.13	January 2009	Upgrade	GS
3.20	June 2010	Upgrade	GS
3.21	Dec 2010	Upgrade	GS
3.21	June 2012	Review	GS
3.22	April 2013	Upgrade	GS
3.23	May 2013	Upgrade	GS
3.23	March 2014	Review	GS
4.00	June 2015	Upgrade	GS
4.01	April 2019	Upgrade	GS
5.00	Nov 2019	Review|	GS
5.00	July 2020	Review	GS
5.00	March 2021	Review	DC

Contents

5.1 INTRODUCTION

This module runs on any PC or other devices running Internet Explorer 6 or later, Firefox or any other mozilla based browsers. Unless you have Airviro version 5.01 or higher installed, this module requires Java Runtime Environment Plugin to be installed and enabled in your web browser.

Indico Validation is - along with Indico Administration, Indico Report and Indico Presentation - one of the main tools in Airviro Air Quality Management, intended for acquiring, storing, editing, presenting, analysing, validating, reporting and exporting time series data.

Indico Validation is used to validate the data. Data is usually collected through a modem. The Airviro server first runs an **protocol** (data collection program), which contacts a remote **station**. The station answers and waits for instructions. The protocol then sends instructions to the remote station requesting the latest data. The station responds to the instructions, the computer receives the new data and ends the communication. The new data is then loaded into the **time series database** so that other applications, such as Indico Presentation and Indico Validation, can access it.

Automatic data collection (Indico Administration module) is carried out via protocol programs. Different loggers require different protocols. Therefore, it is not within the scope of this manual to explain the configuration of data collection. See the *Indico Administration* manual.

With Indico Validation the contents of the time series database can be viewed and edited. If raw (not scaled) data has been stored in the time series database, you can configure scaling of them, so then you will have both, raw and scaled data in the database.

First you must select the data you want to edit, either by clicking on the **TIME SERIES** menu or by loading an existing Indico Presentation macro by clicking on the **MACROS** menu.

5.1. What is Indico Validation?

Indico Validation is a powerful tool for presenting, editing and checking data in the time series database. With Indico Validation, you can

- View data and its status in a table and in a graph at the same time.
- Indicates statuses with colour coding.
- Edit and mark as invalid individual data as well as blocks of data while keeping the original raw value.
- Scale data with zero and span point from calibrations.
- Scale data with data from multi point calibrations.
- Save validated data in a new time series.
- Delete blocks of data from the time series database.
- Define events. The information about anything that has happened in a station or with a time series can be stored as an event and later be viewed along with the data from the station.

5.2 GETTING STARTED

Indico Validation is used to access and validate data stored in the Time Series Database.

Once Airviro has been installed on the Server, you can start using it by typing the correct URL in your web browser over the Intranet/Internet.

After logging in to Airviro with your user-ID and password, a domain must first be selected, and then **Indico Validation** should be chosen from the available modules. (*Figure 5.2.1*).

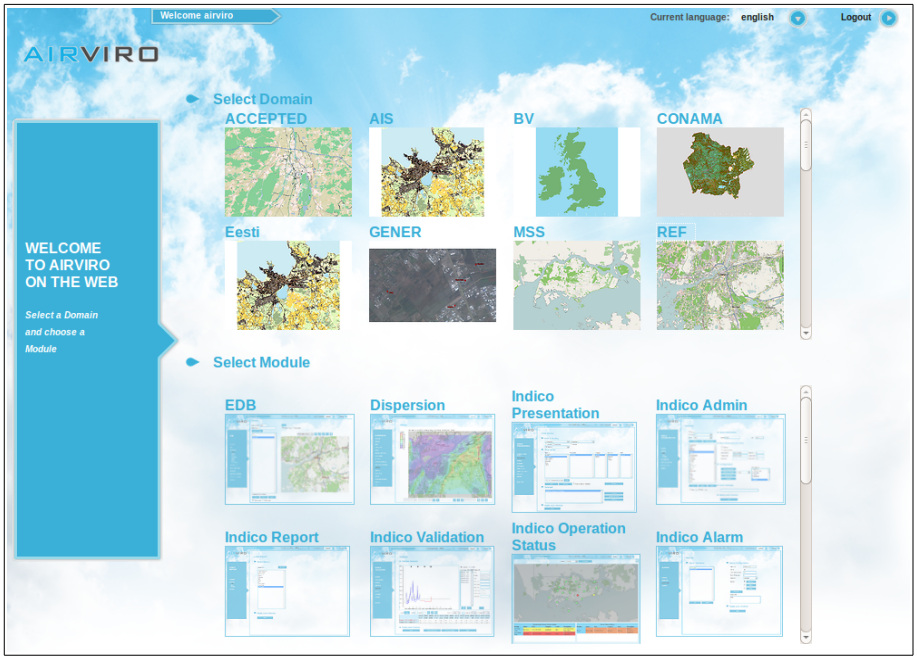


Figure 5.2.1. Getting started.

Once **Indico Validation** has been loaded into the web browser, you will see the main menu options on the left side

The Indico Validation main menu has the following options:

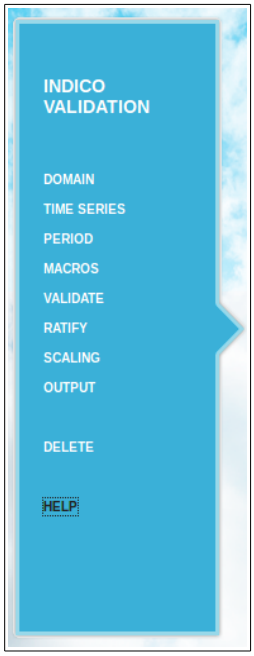


Figure 5.2.2. Menu.

DOMAIN Allows you to select a domain and time resolution, for example: REF and 1 hour data. This works in the same way as for Indico Presentation.

TIME SERIES Allows you to select the Time Series to validate. This works in the same way as for Indico Presentation.

PERIOD Allows you to select a time period for the validation session. This works in the same way as for Indico Presentation.

MACROS Allows you to load time series macros created using the Indico Presentation module. See the Indico Presentation user reference for a detailed explanation on creating & saving macros.

VALIDATE Starts a validation session.

RATIFY Starts a ratification session. Data can be stored as a new time series.

SCALING An alternative way of inputting scaling factors to Validate.

OUTPUT Displays the selected time series in a new window, either as text or in excel format.

DELETE Allows the user to delete a selected time series.

HELP Opens a pop up window with a text describing: session, interface, mouse, keys, color coding by status and scaling formula.

5.3 VALIDATING TIME SERIES DATA

The time series database for a certain domain may contain a large number of monitoring stations and parameters. The parameters can be related to mass concentrations of pollutants or meteorological data, traffic intensities, instrument readings of other kinds or quality control data from data loggers. For each parameter there is also a quality flag (status).

Data can also come from some other source and it can be imported into the time series database using Indico Administration or Waved. Time series data can also be generated by the postprocessor in Dispersion or by statistical forecasting in Aircast or by a meteorological agency.

Normally **Indico Validation** is used by working through all menus from **Domain & Time resolution** down to **Time**, excluding **Macros**, which is a shortcut to load time series specified in the macro.

5.3.1 Domain

Here you can select domain and the time resolution. Different domains may contain different sets of time resolutions, times series and macros related to the selected domain (*Figure 5.3.1.*)

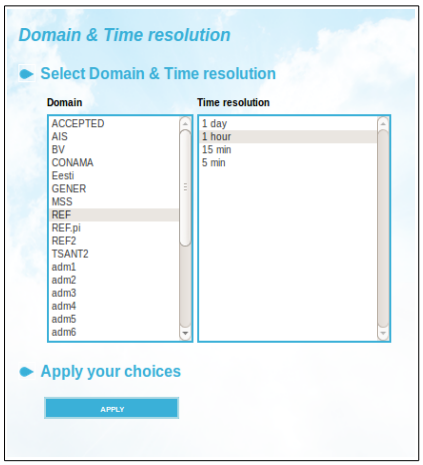


Figure 5.3.1. Domain and Time Resolution

It is possible to work with several instances of Indico Validation simultaneously. Multiple users can work at the same time without any substantial risk for interference.

5.3.2 Selecting time series

In **Time Series**, lists with all stations - active or inactive - and all observed parameters in the parameter database, regardless the station, are displayed. When you select a station in the station list, you will get a list of parameters measured by that station. Clicking **[RE-SCAN]** will update the lists from the time series database to include any new time series that have been added since the session started.

Clicking **[CLEAR]** removes the current selections and fills the lists with all stations and parameters. On the other hand, if you are interested in all stations that measure a certain parameter, start by clicking on the parameter in the parameter list (*Figure 5.3.2.*)

It is possible to **sort** the stations or the parameters in the list box alphabetically, by station key or parameter key by selecting sort key in the associated drop-down list box.

Checking/unchecking **Reverse** re-sort the list in the order accordingly. It is also possible to promote active stations by moving them to the top of the list by checking **Active first**. Sorting stations also by reverse death time creates a list of increasingly older stations. Click [**CLEAR]** to get a full list of stations. Operational stations are shown preceded by an asterisk (*), these stations collect data automatically (*Figure 5.3.2.)*

After you have selected both a station and a parameter, you will get the instances list for the actual parameter. The instance is used to differentiate among multiple measurements of the same parameter at the same site.

There are three different kind of instances. The letter in brackets after the three letter instance specifies the type. The type [v] means a raw value that can be scaled in the validation process. Usually time series values of this type are read only and can not be changed. The type [M] means data that are editable. These can originate from raw data (scaled or copied from raw data) or be loaded directly into the time series database. The type [O] indicates an editable value with an additional standard deviation from the integration period as well as a light intensity. All types also has a status flag assigned by the quality control in Indico Administration. (*Figure 5.3.2.*)

Once you have selected a station, parameter, instance and attribute, the time series is uniquely identified (for the current time resolution). Click [**NEW]** to select the time series for further processing. Please remember that the variables are numbered according to the order in which they are listed in the “Selected” list box. You can remove a highlighted selected variable from the list box with the [**REMOVE SELECTED]** button or replace it with another selection and clicking [**REPLACE]**. If you click [**CLEAR ALL]**, all variables will be removed in the “Selected” list box.

Here, the same restrictions for selecting the time series as in the Indico Presentation are used.

When you are satisfied with your time series selections, click [**APPLY]** to save your settings. (*Figure 5.3.2*.)

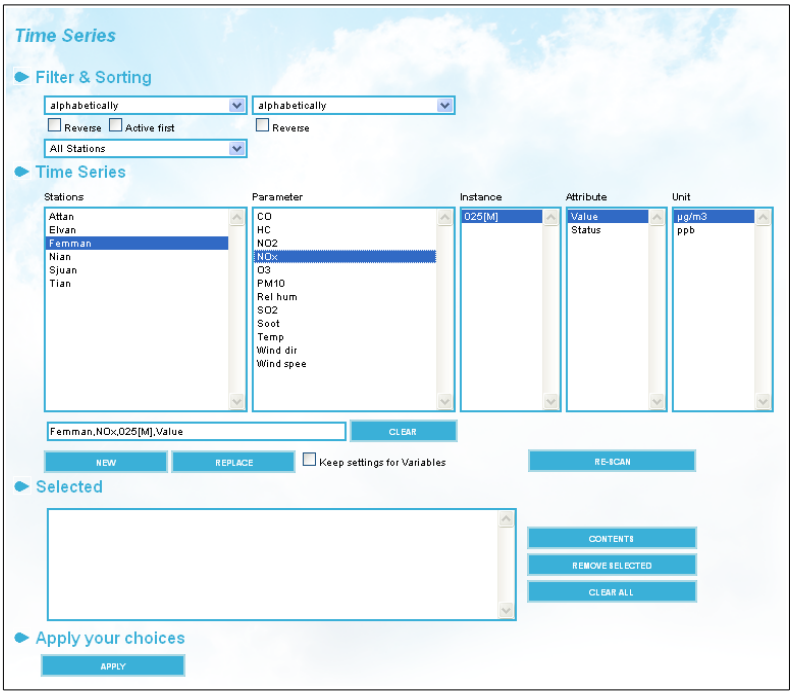


Figure 5.3.2. Time Series Window.

5.3.1.1. Period

The last week is selected by default but you can select any time period. Date and time can be displayed in European, UK or US date format. If you want to set another starting date, you can write the date in the **From** box. Alternatively, you can use the double arrows buttons between the From and To boxes to copy a date from one text box to the other . You can also use the buttons [+] / [-] adjacent to Year, Month, Week, Day or Hour to move time forwards or backwards. You can always reset the **To** box to present time by clicking [**PRESENT]**.

When you have selected a period, click [**APPLY]**. (*Figure 5.3.4*.)

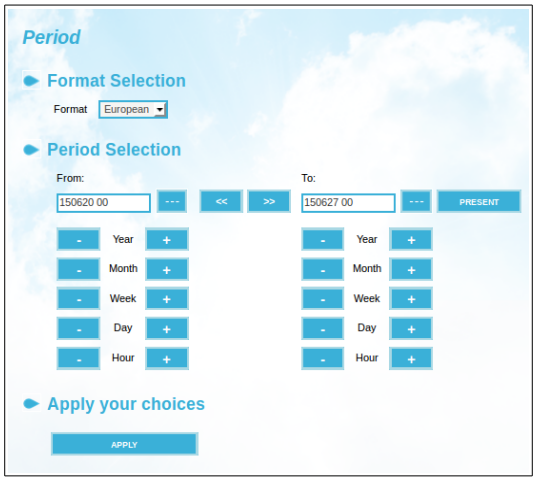


Figure 5.3.4. Period.

The hour starting at 00:00 and ending at 01:00 is labeled 01. The hour starting 23:00 and ending 00:00 is labeled 00 the next day.

The date and time given is exclusive in the From box and inclusive in the To box.

The date and time can also be specified by pressing the button **[...]** besides the date text box. Clicking it, a calendar is open. *Figure 5.3.4.*

5.3.3 Macros

Here you can select a macro previously created using the Indico Presentation module. *Figure 5.3.5.*

In Indico the settings for a graph can be saved in a macro. Macros are stored in folders, each user have their own folder, a common folder and some other folders may also be created. Macros are saved from Indico Presentation and can be used from several other Airviro modules.

To load a macro:

- Select the folder where the macro is saved from the left list.

- Select the macro from the right list.

- Decide if you want to change period:

  — **Time from macro:** It uses the same period that was set when the macro was saved.

  — **Keep current period:** It keeps the period. currently set in the menu **Period.**

  — **Latest 24 hrs:** Period is set to the last 24hrs from the present period.

  — **Today:** It is the period between 00 and 23hrs (00:00 ≤ x < 00:00).

  — **Yesterday:** Period is set to the 24 hrs of the yesterday day.

  Latest 7 days: Period is set to the last 7days from the present period.

  — **This month:** Period is set to the present month.

  — **Previous month:** Period is set from the previous month to present month.

  — **This year:** Period is set to the present year.

- Press the [**Load**] macro button

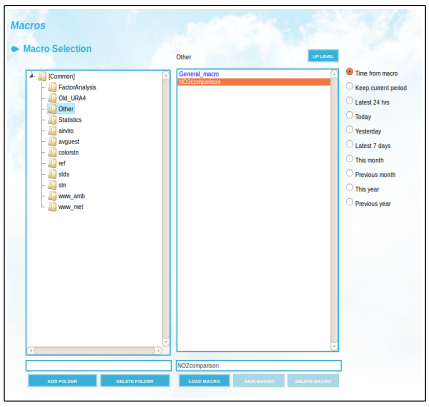


Figure 5.3.5. Macros.

5.3.4 Validate

In this page the user can view or edit the Time Series Data for the selected domain. The user must select time series before starting a validation session.

- **Session**

A session consists of 1 to 12 time series of data for a specified time period.

If there are Scalings available for the selected time period, the first active scaling before the selected period will be included.

Both raw and scaled data will be loaded for each time series if available. Raw data is never modified in any way, but scaled data can be edited or modified by adding, modifing or deleting scaling.

If no raw data is available, no scaling can be applied and it is only possible to edit data. No changes are actually saved to the database until the [**APPLY]** button is pressed. (*Figure 5.3.6.*)

The data is usually captured from the data logger configured using Indico Administration module. Collected data is stored as raw data if a status flag is assigned to the parameter in the protocols settings using Indico Administration

- **User Interface**

Spreadsheet	Spreadsheet contains an active time window, which usually is a subset of the whole session. The active window may also contain one value that has keyboard focus (marked with a black square).
Graph	If no time series in the spreadsheet has focus, all time series in the session will be shown. Graphs will be colour coded per time series in the same way as the time series labels in the spreadsheet. If one time series has focus, only that time series will be shown. Graph will be colour coded by value status in the same way as the data in the spreadsheet. The active window is marked with a light grey rectangle in the graph. Any Scalings are marked with triangles at the top of the graph area. Active Scalings have a dark triangle and inactive ones have a grey triangle. If a scaling is selected in the Scalings list, the corresponding marker in the graph will be slightly lower than the others. When a shorter time period is shown, each value is marked with a diamond. This disappears when there are too many values to be shown.
Scaling	If there are raw data available, the Scalings interface will be shown to the right of the graph. Here it is possible to add, edit and delete Scalings.

Axis	If auto scaling of the x-axis is enabled, the application will try to find the best possible scaling. It is also possible to enter manual limits to the x-axis. To enter manually the Y-axis scale, just type the min and max value for it in the test boxes and press enter after that.
Fonts & Columns	The size of the text in the spreadsheet and the number of columns can be selected. These settings will be saved in a cookie between sessions.

- **Mouse**

Clicking on a spreadsheet value will set focus to that value. Clicking on the time series labels to the left will remove focus from an individual value. Clicking on the graph will set the focus on the nearest value and move the active window so that it is centred on the value. Pressing and holding down the left mouse button will allow interactive dragging of the active window.

- **Keys**

Page Up	Scroll active window back one window size.
Page Down	Scroll active window forward one window size.
Arrow Up	Move focus to cell above (if possible).
Arrow Down	Move focus to cell below (if possible).
Arrow Left	Move focus to cell to the left (if possible).
Arrow Right	Move focus to cell to the right (if possible).

Home	Move active window to beginning of session.
End	Move active window to beginning of session.
Esc	If editing a value, this will abort the editing without changes; otherwise it will remove focus from the spreadsheet.
Enter	If editing a value, this will confirm the changes you have made and return to spread sheet.
SHIFT+ALT+Arrow Up	Copy value to cell above and move focus.
SHIFT+ALT+Arrow Down	Copy value to cell above and move focus.
SHIFT+ALT+Arrow Left	Copy value to cell above and move focus.
SHIFT+ALT+Arrow Right	Copy value to cell above and move focus.
d	Delete current value (status 2).
D	Delete a number of values. Time period entered in dialog.
u	Undelete current value (change status 2 to 15).
U	Undelete a number of values. Time period entered in dialog.
e	Edit current value.
m	Set current value as missing or missing with a specified

	reason. Status will be set to 2 for just missing values without a justification or it will be set to 9 for justified deleted values.
M	Set a range of values as missing (status 2) or missing with a specified reason (status 9). Time period entered in dialog.
f	Apply ramp on a series of values. Time period, offsets and multiplication factor entered in dialog. The offset is applied before the multiplication factor.
r	Restore current value to the original value at the start of this session.
R	Restore a number of values. Time period entered in dialog.
i	Recover current value from raw value with applied scaling. Overrides status 2, 9 and 15.
I	Recovers a number of values. Time period entered in dialog.
s	Search for values of a certain status and perform one of the following operations to the value: 1. Set the value to a specified value. 2. Set the value as missing (status 2).

	3. Set the value as missing with a reason (status 9). Time period, status and new value entered in dialog. Note: Applies to all loaded time series, not only the active time series.
t	Apply a lower threshold on a series of values. Time period and the lower threshold entered in dialog. If "Delete" is checked, the data below the threshold value is deleted with or without reason depending on what is selected, otherwise it is set to the threshold value.
T	Apply an upper threshold on a series of values. Time period and the upper threshold entered in dialog. If "Delete" is checked, the data above the threshold value is deleted with or without a reason depending on what is selected, otherwise it is set to the threshold value.
z	Toggle graph between zoomed mode and whole mode. Only the data in the active window will be shown when in zoomed mode.
w	Zoom out to whole session.

- **Colour coding by status**

The following colour codes are used for statuses:

1	Blue	Unchecked (should not appear)
2	Dark red	Manually marked invalid.
3	Red	Error from logger.

4	Red	Value below configured minimum.
5	Red	Value above configured maximum.
6	Red	Exceeded maximum configured gradient.
7	Red	Variations less than configured minimum.
8	Red	Too large standard deviation (OPSIS only)
9	Red	< not used >
10	Orange	Logger warning.
11	Orange	< not used >
12	Orange	< not used >
13	Orange	< not used >
14	Blue	Value checked ok.
15	Green	Manually changed.

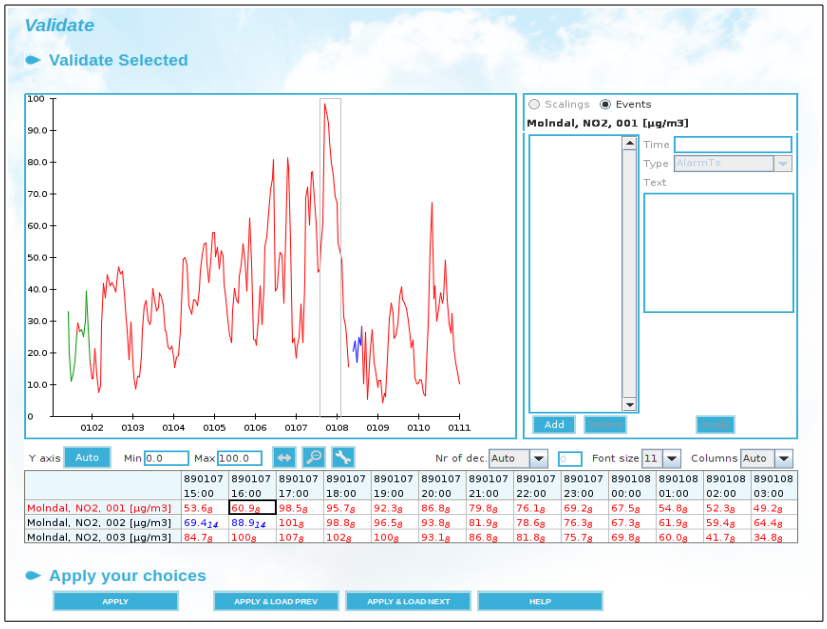


Figure 5.3.6.Example of the Validation.

Some tools exist that provides usefull functions:

 Restores the time period shown to the one in the beginning of the session.

 Zooms out of the graph.

 **Settings.** With **Settings** you can control some features:

- Show raw values in graph
- Show supporting lines from y –axis in graph
- Immediate auto-rescaling of y-axis
- Auto minimum on y-axis
- Show focus value into window

With **[APPLY & LOAD PREV/NEXT]** you can step forwards or backwards the selected period.

HELP shows the documentation of the module in a new window.

- **Events**

When a time series is selected it is possible to display either events or scalings using the radio buttons above the scaling window. In the Events windows, you can define new events for the selected time series or station. A date/time and event type must be defined and a comment is normally entered. Over the graph icons indicates when an event has occurred. The events during the period shown in the graph are listed in the event list. Events are shown for the selected time series and for the station of the time series. The event type configuration is made using Indico Administration.

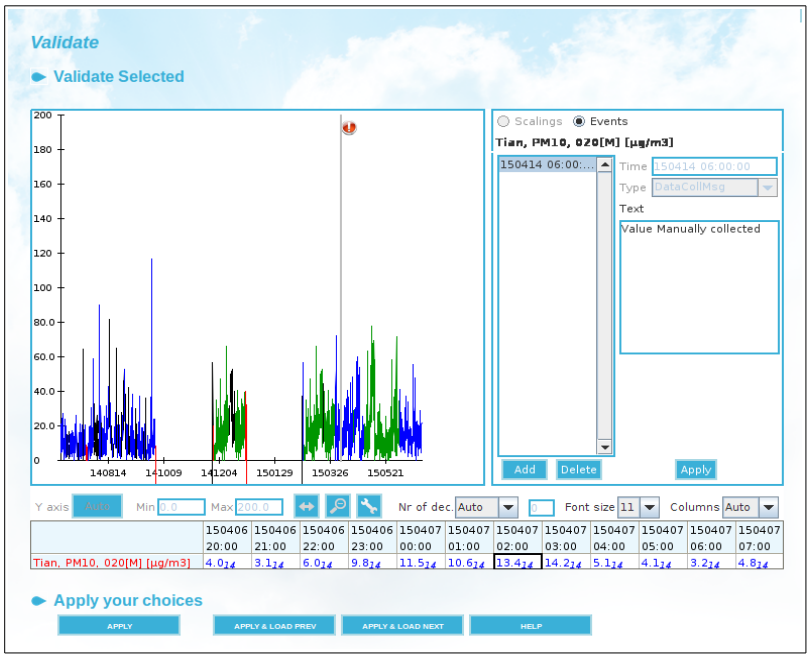


Figure 5.3.7 Events.

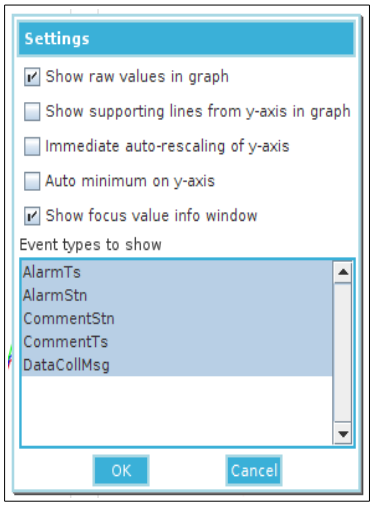


Figure 5.3.8 Event type selection.

- **Scalings**

In the **Scaling** window, you can define new scalings for the selected stations.

Scaling can be managed either from the Validate / Ratify windows or from the Scaling menu option. Both ways are quite similar. However, the menu option allows you to change the parameters selected, add a comment, and some other information. (see 5.3.6 Scalings)

From the Scaling menu option. After having selected a station from the **Stations** list, you must define a **Date/time**. Also must choose a **Type** (linear, raw, scaled, linear2) for the scaling and select the time Resolution for the time series (1h, 30 min, 5 min, etc). A Comment can also be entered to identity the new scaling instance.

Finally, using the button [**CHANGE PARAMETERS]**, the parameters associated to the Station and chosen time resolution, must be selected and the values obtained during the calibration of the actual analysers must be defined. (*Figure 5.3.9.*)

To add a new Scaling from the Validate/Ratify window, click on [**ADD]** and then enter Time, Usage, Type and their characteristics. The usage combo box has different options

available (inactive, used or discarded.) The option type, has three different options (raw, scaled or linear) and for each of them their characteristics must be set up according to this detail:

- Raw: Cylinder concentration, user span and user zero must be entered.
- Scaled: Auto span, auto zero, user span and user zero must be entered.
- Linear: Line slope and line offset must be entered.

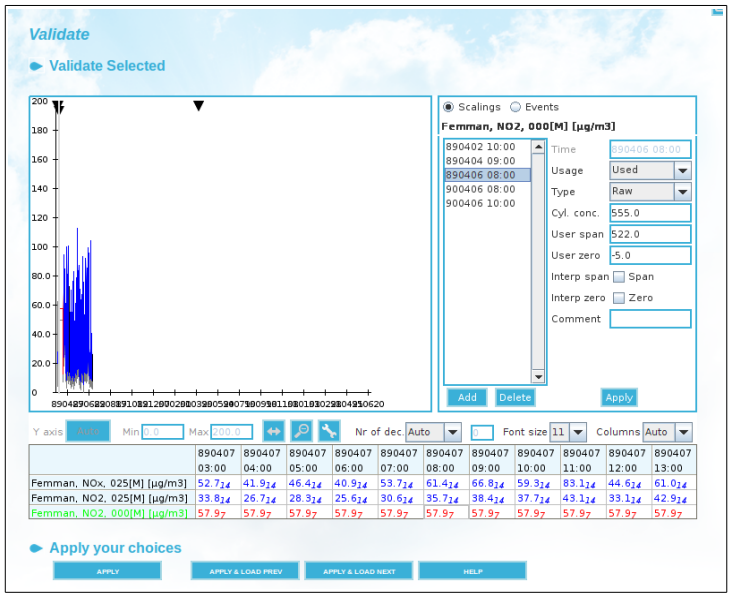


Figure 5.3.9.Example of the Scalings.

When you define a scaling for a TSDB, for the first time in the Validate… Scaling sub window (Scaling frame), it is necessary to click [**APPLY]** to visualize the new values in the graph and tables. Values that appear on the graph with status 1-Blue-Unchecked should not appear.

The Scalings are defined in **Scalings** subwindow if it is available. The characteristics of the validated data are:

- The letter M is assigned to an instance of validated data.

- Raw data is zero if it is not associated to a scaling
- Raw or validated data can be visualized in the **OUTPUT** menu.

When a scaling is defined for the time series, using the **Scaling** windows, this scaling will be applied from the defined date/time up to the next scaling definition, or indefinitely if there are no more scalings defined..

To zoom in the graph, click on the right mouse button and hold it down while moving the mouse pointer to define a rectangle, then release the button.

- **Scaling formula – Raw**

In this case the values received from the logger/instrument are unscaled, e.g. mV values.

$$V_{scaled} = (V_{raw} - Z_u)\frac{CC}{(S_u - Z_u)}$$

Where:

V_{scaled}	The scaled value calculated in Airviro.
V_{raw}	The value received from the logger/instrument.
Z_u	The zero point entered.
S_u	The span point entered.
CC	Span gas cylinder concentration.

- **Scaling formula – Scaled (by calibration)**

In this case the values received from the logger/instrument are scaled using the latest valid calibration.

$$V_{scaled} = (V_{raw} - Z_m)\frac{S_u}{(S_m - Z_m)} + Z_u$$

Where:

V_{scaled}	The scaled value calculated in Airviro.
V_{raw}	The value received from the logger/instrument.
Z_m	The zero point measured in calibration.
S_m	The span point measured in calibration.
Z_u	The zero point entered.
S_u	The span point entered.

- **Scaling formula – Linear**

In this case the values received from the logger/instrument are scaled using a linear transformation. Useful for entering multipoint calibrations.

$$V_{scaled} = V_{raw} \cdot L_k + L_m$$

Where:

V_{scaled}	The scaled value calculated in Airviro.
V_{raw}	The value received from the logger/instrument.
L_m	Offset.
L_k	Slope.

- **Scaling formula – Linear 2**

This is just another variant of the Linear transformation above.

$$Vscaled = (Vraw – Lm) \cdot Lk$$

Where:

Vscaled	The scaled value calculated in Airviro.
Vraw	The value received from the logger/instrument.
Lm	Offset.
Lk	Slope.

5.3.5 Ratify

Here you can make some fine tuning to the data and then save it as a new instance.

The "Ratify" function is more or less the same as "Validate". The main difference is that when you press [**Apply**], you can enter a different instance name to save the data , e.g. one named RAT.

When you have finished ratifying, click on [**APPLY]** to save your data. See *Figure 5.3.10.*

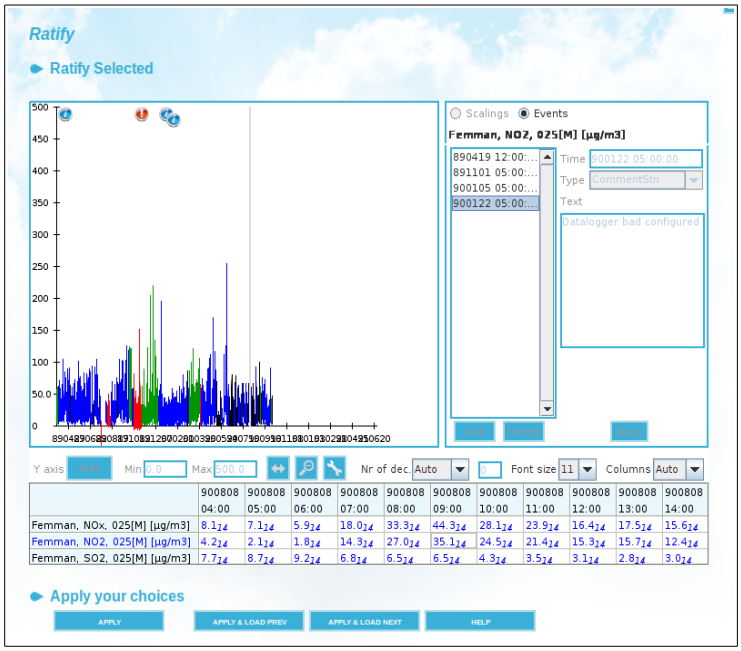


Figure 5.3.10.Ratify

5.3.6 Scaling

This is an alternative way to enter scalings. Here all scalings for a certain time, station and type of scaling are grouped together and it is possible to add, edit and delete scalings for the station.

The same scaling parameters can be entered here as in Validation with some additions: A comment can be entered for the whole scalings group (scalings with the same time stamp, type of scaling and station).

A list of stations are shown in the leftmost list. Only active stations will be listed by ticking off the **Active** check box. (*Figure 5.3.11.*) If the system has a large number of stations, two available filters (**Protocol** and **Group**) can be used to reduce the number of Stations that are displayed by default in the Station list. Select the station for which you will define a scaling. That will show all the available scalings for the selected station.

Click on one of the scalings to list all the characteristics that have already been configured for that scaling type, then you can choose one for editing.

Click on [**ADD]** to add a new scaling.

Date/time is the time from which this scaling will be applied. **Type** is the type of scaling. **Resolution** specifies the time resolution to which the scalings will be applied . Different scaling parameters can be entered depending on the scaling type that has been selected.

The first columns shows parameter and instance. The parameters included in the scalings can be changed using the [**Change parameters…]** button.

In raw case the values received from the logger/instrument are un-scaled, you must enter :

- A zero point entered (Z_u)
- A span point entered (S_u)
- Span gas cylinder concentration (CC)
- Status: inactive, used and discarded

Note: columns Z and S are calculated. Z is Z_u and S is (CC / S_u - Z_u) * 1000

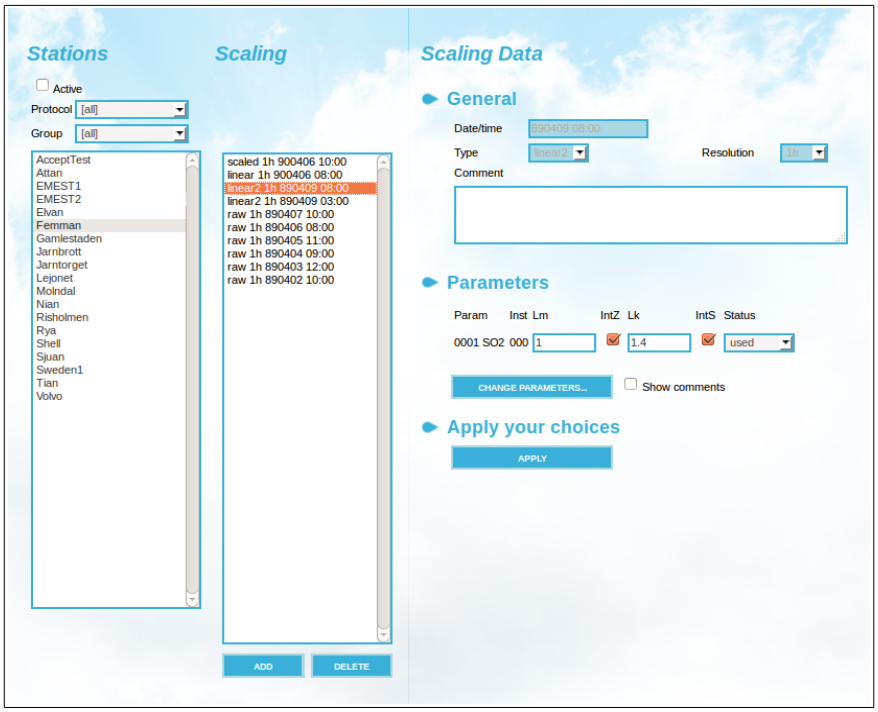


Figure 5.3.11. Scaling

In this scaled case, values received from the logger/instrument are scaled using the latest valid calibration, you must enter the following data:

- zero point measured in calibration (Z_m)
- span point measured in calibration (S_m)
- zero point entered (Z_u)
- span point entered (S_u)

In this linear case, values received from the logger/instrument are scaled using a linear transformation, you must enter:

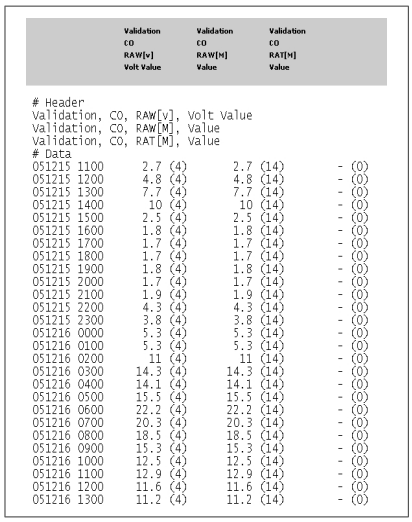
- offset (Lm)
- slope (Lk)

Click on [**APPLY]** to save your changes. (*Figure 5.3.11.*)

5.4 OUTPUT

The **Output** menu option, opens a new window listing the stations and time series data selected either in text or excel format.

The Header includes the station name , parameter, instance and attribute. The reports generated look like the following figure:



	Validation CO RAW[v] Volt Value	Validation CO RAW[M] Value	Validation CO RAT[M] Value
# Header			
Validation, CO, RAW[v], Volt Value			
Validation, CO, RAW[M], Value			
Validation, CO, RAT[M], Value			
# Data			
051215 1100	2.7 (4)	2.7 (14)	- (0)
051215 1200	4.8 (4)	4.8 (14)	- (0)
051215 1300	7.7 (4)	7.7 (14)	- (0)
051215 1400	10 (4)	10 (14)	- (0)
051215 1500	2.5 (4)	2.5 (14)	- (0)
051215 1600	1.8 (4)	1.8 (14)	- (0)
051215 1700	1.7 (4)	1.7 (14)	- (0)
051215 1800	1.7 (4)	1.7 (14)	- (0)
051215 1900	1.8 (4)	1.8 (14)	- (0)
051215 2000	1.7 (4)	1.7 (14)	- (0)
051215 2100	1.9 (4)	1.9 (14)	- (0)
051215 2200	4.3 (4)	4.3 (14)	- (0)
051215 2300	3.8 (4)	3.8 (14)	- (0)
051216 0000	5.3 (4)	5.3 (14)	- (0)
051216 0100	5.3 (4)	5.3 (14)	- (0)
051216 0200	11 (4)	11 (14)	- (0)
051216 0300	14.3 (4)	14.3 (14)	- (0)
051216 0400	14.1 (4)	14.1 (14)	- (0)
051216 0500	15.5 (4)	15.5 (14)	- (0)
051216 0600	22.2 (4)	22.2 (14)	- (0)
051216 0700	20.3 (4)	20.3 (14)	- (0)
051216 0800	18.5 (4)	18.5 (14)	- (0)
051216 0900	15.3 (4)	15.3 (14)	- (0)
051216 1000	12.5 (4)	12.5 (14)	- (0)
051216 1100	12.9 (4)	12.9 (14)	- (0)
051216 1200	11.6 (4)	11.6 (14)	- (0)
051216 1300	11.2 (4)	11.2 (14)	- (0)

0Figure 5.4.1. Output: text.

5.5 DELETE

Using **Delete**, you can delete whole time series. Use the filtering options and press the **[Update]** button to list time series matching your selections.. *Figure 5.5.1.*

Bear in mind that once the time series are deleted, you can not restore them. Only the system administrator can recover the data.

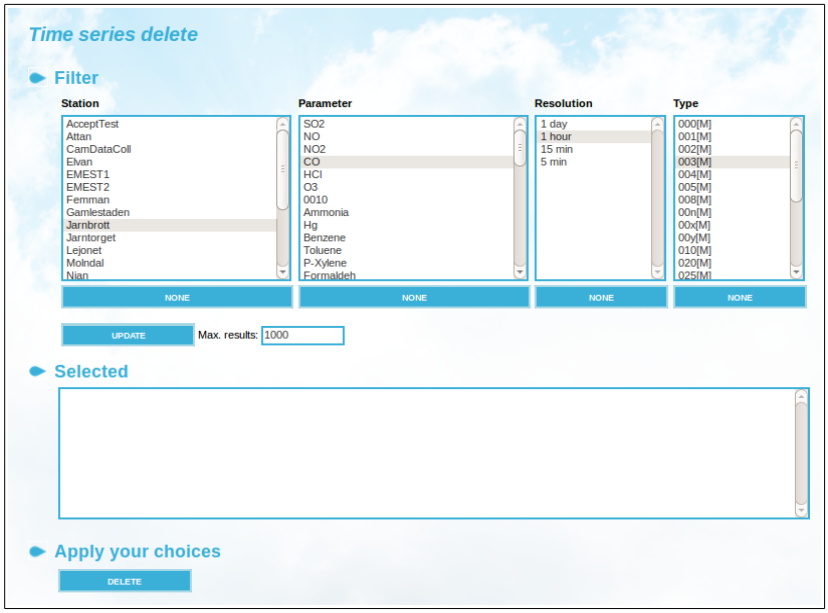


Figure 5.5.1. Delete

5.6 HELP

It opens a new pop up window displaying a text to assist you with some concepts and functionalities. For example, what is a session?, what identifies an interface? , which formulas are used?, how to use the graphic interface? Shortcuts, etc.