Volume 5

Apertum

Airviro User's Reference

Using the Indico Validation Module

How to validate measured data

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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
5.01	Nov 2019	Review|	GS
5.01	Oct 2022	Review	GS
5.10	Nov 2022	Upgrade	GS
6.00	Oct 2023	New version	GS
6.00	Feb 2024	Review	DC
6.00	Nov 2025	Review	DC

Contents

5.1 INTRODUCTION

The Indico Validation module does not require any installation on the PC. Anyone who knows the URL, user id, password and has sufficient privileges to the Airviro server can access the databases. Indico Validation can be executed from a PC or any other device running later versions of Microsoft Edge, Firefox, Chrome or Safari.

Indico Validation is - together with Indico Administration, Indico Report and Indico Presentation - part of the integrated Indico package intended for acquiring, storing, editing, presenting, analyzing, validating, reporting and exporting time series data.

Indico Validation is used to validate the data. Data is usually collected through a modem. The Airviro computer first runs a **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 programs (such as the Indico Presentation module 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 and then have both raw and scaled data in the database.

First you must select the data you want to edit either click on the **Time Series** menu or by

loading an existing Indico Presentation macro click on the **Macros** menu.

5.1.1 What is Indico Validation?

Indico Validation is a powerful tool for presenting, editing, checking and validating data stored in the time series database. Indico Validation allows you to:

- View data and its status in a table and in a graph at the same time.
- Indicates statuses with color 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 block 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 together the data from the station.

5.2 GETTING STARTED

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

After logging into the application by entering an username and password, the user is presented with a list of all available Domains, if none has been previously selected and stored (*Figure 5.2.1*). By selecting a **Domain** the options list will be updated to show all Airviro Modules available for the selected domain.

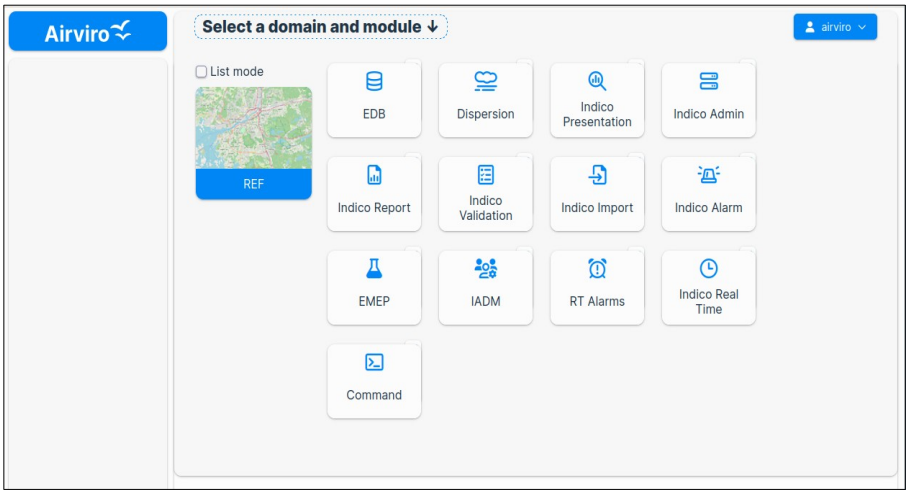


Figure 5.2.1. Getting started.

Click on the corresponding option to load Indico Validation. The Indico Validation menu options are:

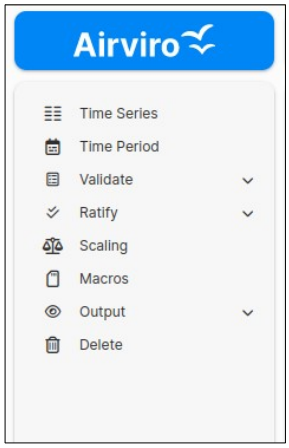


Figure 5.2.2. Menu.

TIME SERIES Provides an interface to the Time Series Database, where you can select time series (the stations, parameters, and instances).

TIME PERIOD Select time period for the validation session.

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.

MACROS Load time series macros. These are created using the Indico Presentation module.

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

DELETE Allows the user to delete a selected time series.

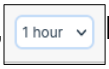
5.3 VALIDATING TIME SERIES DATA

The time series database for a given 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 be originated from other sources, and it can be imported into the time series database using Indico Administration or Waved. Time series data can also be generated by the post-processor in Dispersion or by statistical forecasting in Aircast or by a meteorological agency.

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

5.3.1 Time Resolution

Here you select a domain (*Figure 5.2.1*) and then, the time resolution, by pressing the button. By default, 

hourly data is selected.

You may get a different set of time resolutions, times series and macros, corresponding to the selected domain.

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

Under **Time Series**, you will see a list with all stations - active or inactive - and all observed parameters in the parameter database, regardless of the station. When you select a station in the station list, you will get a list of parameters corresponding to that station. Clicking on **[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. By checking the button "**Show only time series in the period selected"** it is possible to refresh the list of available stations and parameters, for the previously selected time period.

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

Clicking on **[Clear]** clears the current selections and populates the lists with all available stations and parameters. On the other hand, if you are interested in all stations that measure a certain parameter, start click on the parameter in the parameter list (*Figure 5.3.2.*)

Checking/unchecking **Reverse** re-sort the list in the order accordingly. It is also possible to only show active stations by checking **Active only**. 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 a list of instances for the actual parameter. An instance is used to differentiate among multiple measurements of the same parameter at the same site.

There are three different kinds of instances. The letter in brackets after the three letters instance specifies the type. Type [v] means a raw value that can be scaled in the validation process. Normally time series values of this type are read only and can not be changed. Type [M] means data that are editable. These can origin from raw data (scaled or copied from raw data) or be loaded directly into the time series database. Type [O] indicates an editable value with an additional standard deviation from the integration period as well as a light intensity. All types also have 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 **[Add]** 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]** or replace it with another selection clicking on **[Replace**]. If you click **[Clear all]**, all variables will be removed in the “Selected” list box.

The same restrictions apply here for selecting time series as in the Indico Presentation. The user can select up to 12 time series.

Once you are satisfied with your time series selections, click **[Apply]** to save your settings. (*Figure 5.3.2*.) Click **[Apply & Validate]** to save your settings and open the validate window.

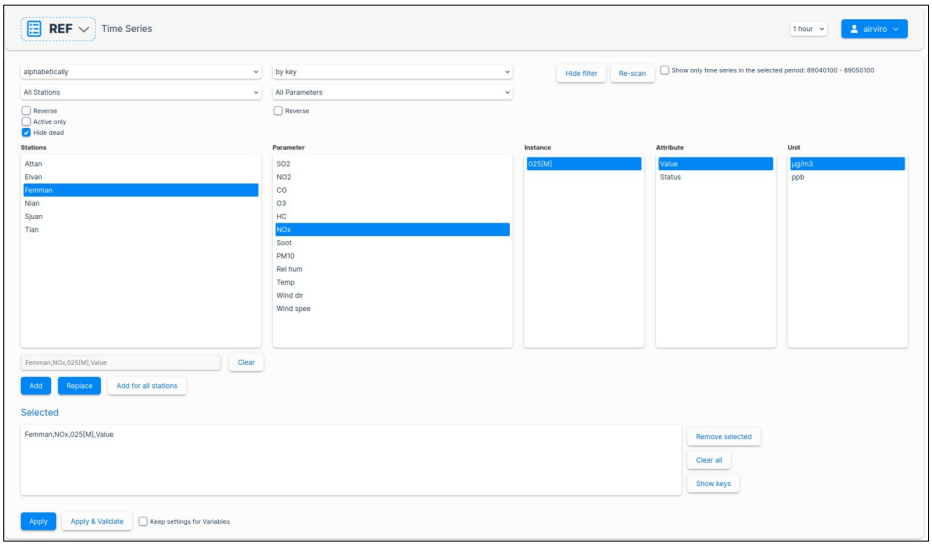


Figure 5.3.2. Time Series Windows.

5.3.3 Time Period

The last week is selected by default, but you can select any other time period. Date and time can be presented in European, UK or US date format. To set other start/end dates, you can type them in the corresponding **From/To** input boxes. Alternatively, you can use the double arrows buttons between the From and To boxes to transfer a date between them. You can also use the buttons [+] [-] adjacent to Year, Month, Week, Day or Hour to move time forwards or backwards

Buttons **[** **]** display a calendar, that can be used to select a date.Button **[Now]** sets the current date time from the server.

Once you have selected a period, click **[Apply]**. (*Figure 5.3.3.*) Click **[Apply & Validate]** to save your settings and open the validate window.

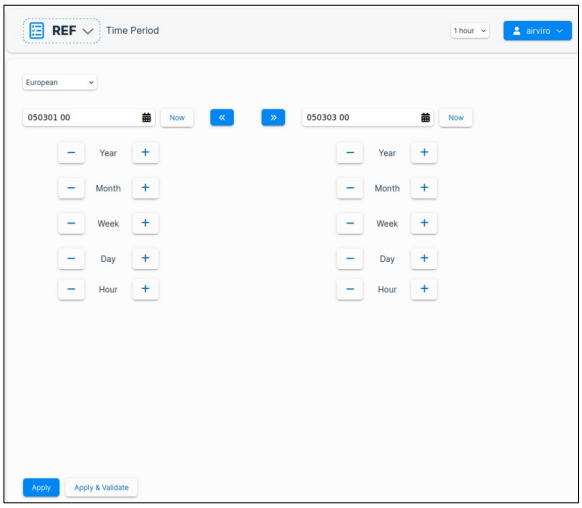


Figure 5.3.3. Period.

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.

5.3.4 Macros

Under **Macros** you can select a macro previously created using the Indico Presentation module. *Figure 5.3.4.*

In Indico, the settings for a graph can be saved as a macro file. Macros are stored in folders, each user has 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 other Airviro modules.

To load a macro:

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

- Select the macro from the list on the right side.

- Select a time period:

  — **Time from macro:** the same period that is used during the saved in this macro.

  — **Keep current period:** it is the present period.

  — **Latest 24 hrs:** the last 24hrs from the present period.

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

  — **Yesterday:** the 24 hrs of yesterday.

  — **Latest 7 days:** the last 7days from the present period.

  — **Latest 14 days:** the last 14days from the present period.

  — **This month:** it includes the present month.

  — **Previous month: it** is a previous month to present month.

  — **This year:** it includes the present year.

  — **Previous year**: it includes the previous year.

- By pressing **[Load]**, to load the macro for the selected time period.

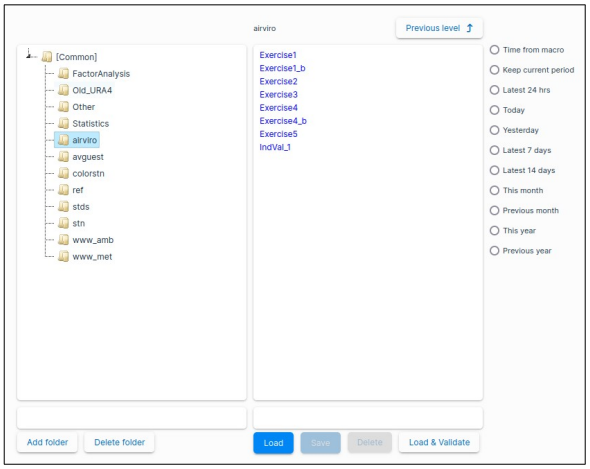


Figure 5.3.4. Macros.

5.3.5 Validate

A time series must be selected before starting a validation session. With the **Validate** option, the validation page will replace the current one in the browser. On the other hand, if you select **New window**, the validation page will be open in a new window.

Use this page to view or edit the Time Series Data for the selected domain.

5.3.5.1. Session

A session consists of 1 to 8 time series of data over a limited 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 may be edited or changed by adding, changing or deleting scalings.

If no raw data is available, no scaling can be applied, and it is only possible to edit data. No changes are saved to the database until the **[Apply]** is pressed. (*Figure 5.3.5.*)

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

5.3.5.2. 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 color 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 gray 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.

5.3.5.3. 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 centered on the value. Pressing and holding down the left mouse button will allow interactive dragging of the active window.

5.3.5.4. Keys

Page Up	Scroll active window back one window length.
Page Down	Scroll active window forward one window length.
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 several values. Time period entered in dialog.
u	Undelete current value (change status 2 to 15).
U	Undelete several 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 several values. Time period entered in dialog.
i	Recover current value from raw value with applied scaling. Overrides status 2, 9 and 15.
	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.

5.3.5.5. Color coding by status

The following color 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.

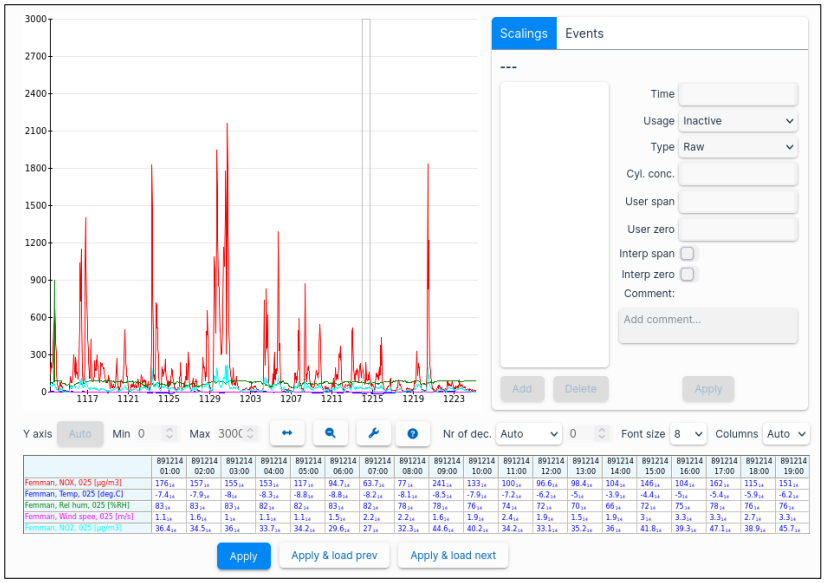


Figure 5.3.5.Example of the Validation.

Some tools exist that provides useful functions:

Restores the time period shown to the one at 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.

shows the documentation of the module in a new window.

5.3.6 Scalings

Once a time series is selected, it is possible to show either events or scalings using the tabs on the top right side of the scaling window. The Scalings are defined in **Scalings** subwindow if it is available. The characteristics of the validated data are:

- validated data have as instance the letter M
- 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 period until finding another scaling definition.

You can Zoom in on the graph by pressing the **Ctrl** key and the left mouse button, holding it down while you move the pointer to define a rectangle, and then releasing the left mouse button.

With **[Apply & load prev/ Apply & load next]** you can step forward or backwards the selected period.

Use the **Scaling** window to define new scalings for the selected station for a specific hour and day. (*Figure 5.3.6.*) To add a new Scaling, click on **[Add]** and then enter Time, Usage, Type and their characteristics. In the usage combo box different options are available (inactive, used or discarded.) **Type** has three different options that can be selected (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 5.3.6. Scalings example.

5.3.6.2 Scaling formula – Raw

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

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.

5.3.6.3 Scaling formula – Scaled (by calibration)

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

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.

Where:

V_{scaled}	The scaled value calculated in Airviro.
V_{raw}	The value received from the logger/instrument.
L_{m}	Offset.
L_{k}	Slope.

5.3.6.4 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.

5.3.6.5. Events

Once a time series is selected, it is possible to show either events or scalings using the tabs on the top right side of the scaling window. The Events tab, can be used to 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. Events during the period displayed in the graph are listed in the event list. Events are shown for the selected time series and for the station. The configuration of an event type is done through Indico Administration.

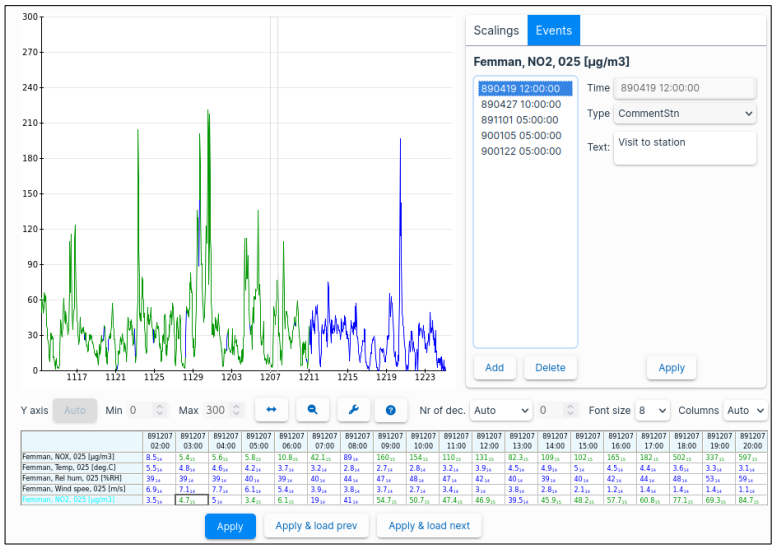


Figure 5.3.7 Events example.

Enter date and , type:

AlarrmStn: station alarm

Alarmts: time series alarm

CommentTS: time series comment

CommentSTn: station comment

DataCollMsg: data collection message

In Text, write down a description for the event type and click on **[Apply]** to save your data.

5.3.7 Ratify

Use this window to ratify data, i.e. make some fine adjustments to the data and then save it as a new instance.

The "Ratify" function is similar to "Validate". The main difference is that when you press **[Apply]**, you can enter a different instance name to save the data. This means you can save it as ratified data as another instance, e.g. named RAT.

Once you have finished ratifying, click on **[Apply]** to save your data. See *Figure 5.3.8.*

With **[Apply & load prev/next]** you can step forwards or backwards the selected a new ratify instance (RAT).

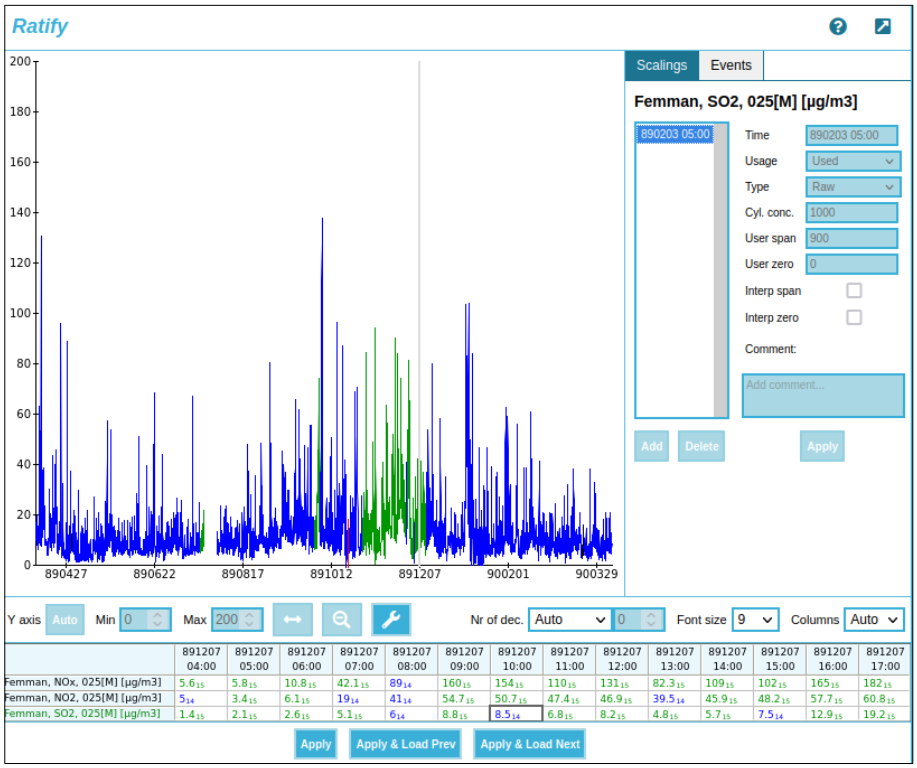


Figure 5.3.8. Ratify.

5.3.8 Scaling

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

Select **Scaling** from the main menu. A list of stations is shown in the top list. Active stations are filtered by checking the **Active** check box. (*Figure 5.3.9.*) 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 on which a scaling will be defined. When you click on a station, the bottom list will show all the available scalings, if any, for the selected station.

Click on one of the scalings, to view 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 at which the scalings will be applied. Different scaling parameters can be entered depending on the scaling type that has been chosen.

Use **[Upload]** to insert data from a calibration file**.**

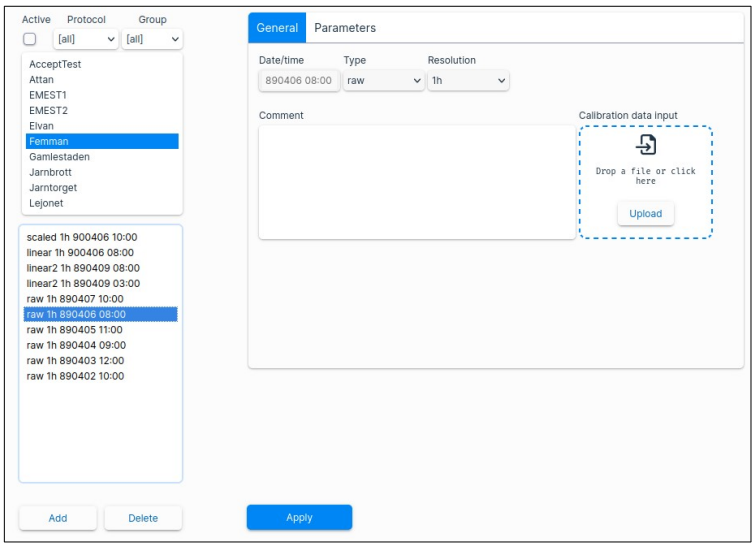


Figure 5.3.9. Scaling

The **Parameters** tab, shows parameters and instances. The content of each row depends on the scaling type selected.

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

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

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

For scaled type, the values received from the logger/instrument are scaled using the latest valid calibration, you must input 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)

For linear type the values received from the logger/instrument are scaled using a linear transformation, you must input:

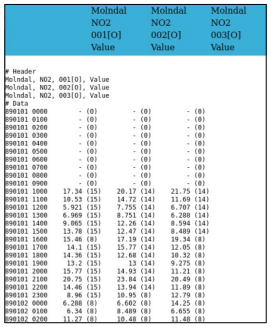
- offset (Lm)
- slope (Lk)

Click on **[Apply]** to save your changes.

5.4 OUTPUT

Data can be shown either as a spreadsheet or as text in a table with fixed headers.

The Header includes the name of the station, parameter, instance and attribute. The following is a typical table for a station:



	Molndal NO2 001[O] Value	Molndal NO2 002[O] Value	Molndal NO2 003[O] Value
# Header			
Molndal, NO2, 001[O], Value			
Molndal, NO2, 002[O], Value			
Molndal, NO2, 003[O], Value			
# Data			
890101 0000	- (0)	- (0)	- (0)
890101 0100	- (0)	- (0)	- (0)
890101 0200	- (0)	- (0)	- (0)
890101 0300	- (0)	- (0)	- (0)
890101 0400	- (0)	- (0)	- (0)
890101 0500	- (0)	- (0)	- (0)
890101 0600	- (0)	- (0)	- (0)
890101 0700	- (0)	- (0)	- (0)
890101 0800	- (0)	- (0)	- (0)
890101 0900	- (0)	- (0)	- (0)
890101 1000	17.34 (15)	20.17 (14)	21.75 (14)
890101 1100	10.53 (15)	14.72 (14)	11.69 (14)
890101 1200	5.921 (15)	7.755 (14)	6.707 (14)
890101 1300	6.969 (15)	8.751 (14)	6.288 (14)
890101 1400	9.065 (15)	12.26 (14)	8.594 (14)
890101 1500	13.78 (15)	12.47 (14)	8.489 (14)
890101 1600	15.46 (8)	17.19 (14)	19.34 (8)
890101 1700	14.1 (15)	15.77 (14)	12.05 (8)
890101 1800	14.36 (15)	12.68 (14)	10.32 (8)
890101 1900	13.2 (15)	13 (14)	9.275 (8)
890101 2000	15.77 (15)	14.93 (14)	11.21 (8)
890101 2100	20.75 (15)	23.84 (14)	20.49 (8)
890101 2200	14.46 (15)	13.94 (14)	11.09 (8)
890101 2300	8.96 (15)	10.95 (8)	12.79 (8)
890102 0000	6.288 (8)	6.602 (8)	14.25 (8)
890102 0100	6.34 (8)	8.489 (8)	6.655 (8)
890102 0200	11.27 (8)	10.48 (8)	11.48 (8)

Figure 5.4.1. Output: text.

5.5 DELETE

Using **Delete**, you can delete whole time series. For each station, and using the available filters, along with the **[Update]** button, you can select, which time series you want to delete. *Figure 5.5.1.*

It is important to remember that once a time series was deleted, there is no way for an ordinary user to recover the deleted data. However, the system administrator can recover the data.

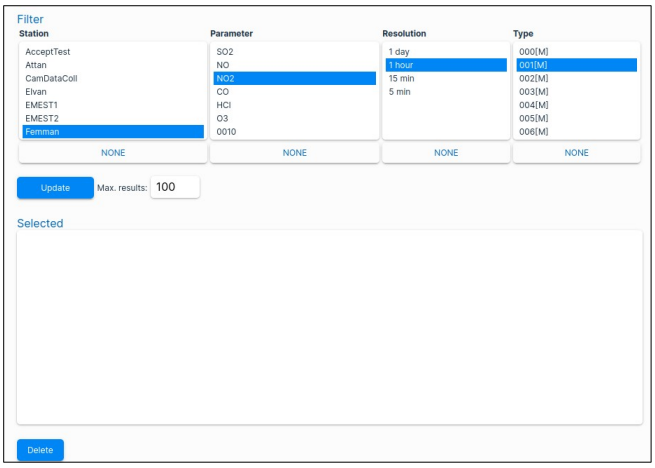


Figure 5.5.1. Delete