WEBfactory®

WEBfactory 2010

Logging WhitePaper

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This whitepaper is a product of the company WEBfactory GmbH.

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We reserve the right to make technical changes!

1. Introduction

This whitepaper is intended for all the users of WEBfactory 2010 software and is designed to facilitate the understanding of WEBfactory 2010's approach on logging.

The document will present a Trending control overview as well as a guide through the workflow and configuration of the logging system.

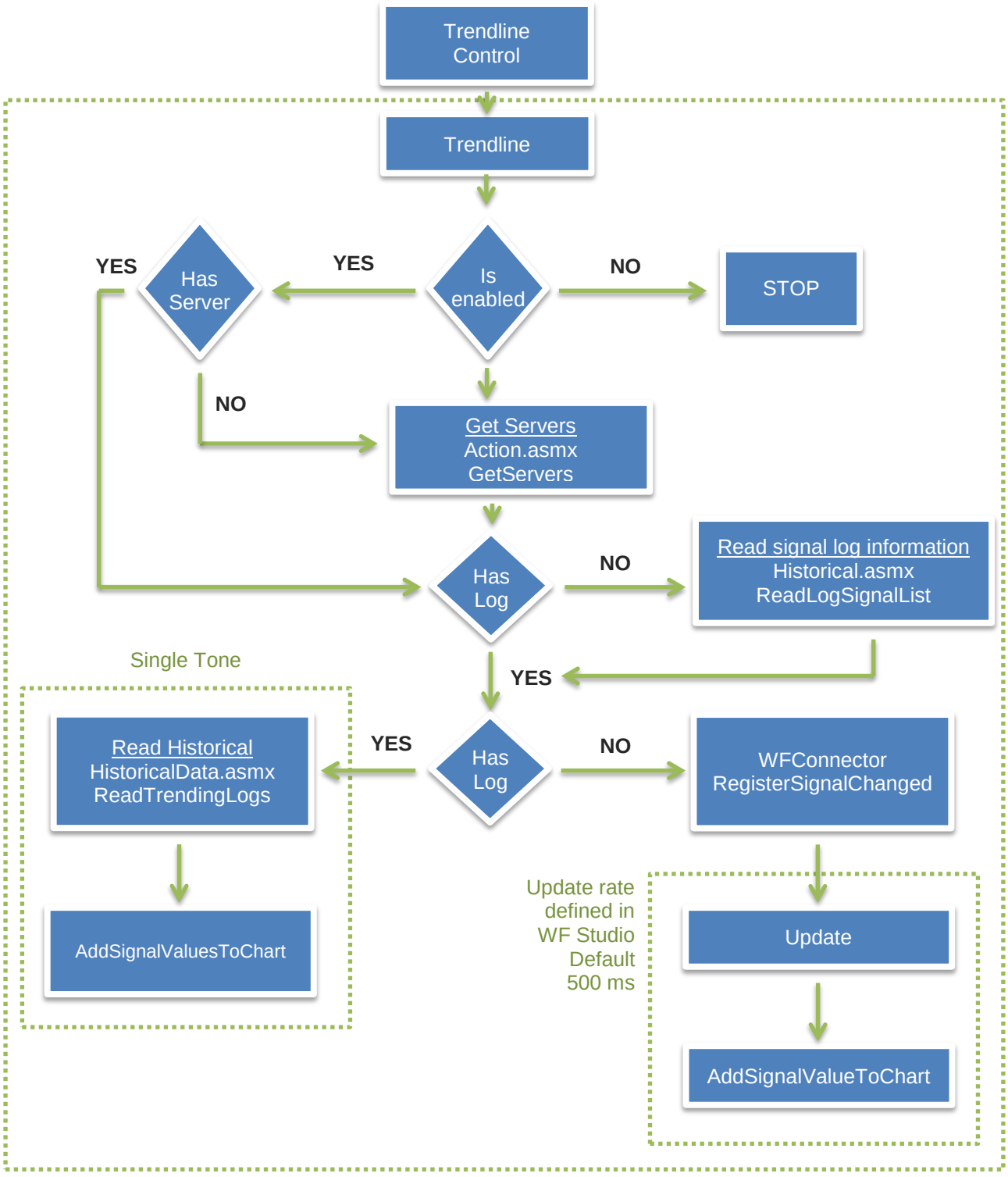
For a correct understanding of the following information, WEBfactory 2010 software and additional modules must be installed on the operating machine.

For more information about installing WEBfactory 2010, system requirements, licensing and release notes, please visit the WEBfactory Knowledge Base at:

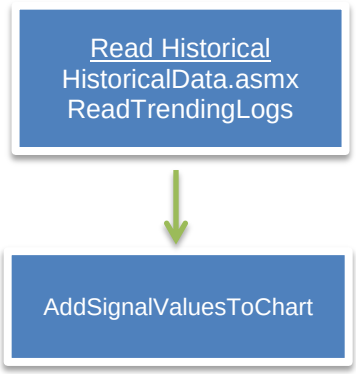
http://webfactory-support.de/assets/documentation/Default.htm .

2. Trending workflow overview

2.1. Online state visual representation



2.2. Offline state visual representation



2.3. Used webservices and methods

Webservice	Method
Action.asmx	GetServers
Historical.asmx	ReadLogSignalList
HistoricalData.asmx	ReadTrendingLogs AddSignalValueToChart

2.4. Trendline Control online workflow

Step 1. For each trendline, the Trendline control checks to see if it is enabled. If not enabled, the process stops.

Step 2. If the trendline is enabled, the servers are checked. If there are no servers, the GetServers method from Action.asmx webservice is called. This method retrieves the information about all the signals form the server.

Step 3. When servers available, the log of the signal is checked. If the signal has no log, ReadLogSignalList method from Historical.asmx webservice is called. The ReadLogSignalList method returns the information for the verified signal.

Step 4. The signal is checked for logging information again. If after ReadLogSignalList the signal has logging information, the ReadTrendingLogs method from the HistoricalData.asmx webservice is called. This method returns the trend data from the logs. The AddSignalValuesToChart method is called to write the historical values to the Trending control graphic.

If no logging information is retrieved after calling the ReadLogSignalList, the RegisterSignalChanged method from WFConnector is called. This method checks the value of the signal and updates it asynchronously. Again, the AddSignalValueToChart method is called, to write the online values retrieved by the WFConnector.

2.5. Trending control offline workflow

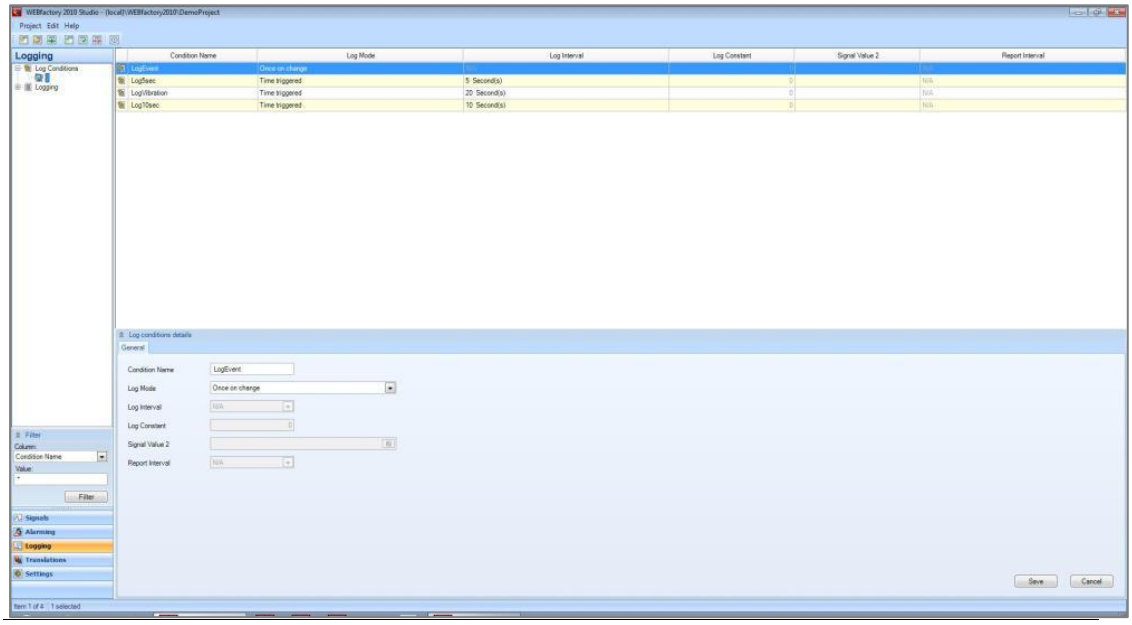
For each trendline, the ReadTrendingLogs method from HistoricalData.asmx is called, retrieving the historical data for the signal. The AddSignalValuesToChart method is called to write the values to the Trending control.

3. Logging Setup

3.1. Logging Tab - Log Conditions

Log condition

- is a criterion to be met in order to record the process values of a signal variable.
- is defined by means of signal variables, constants and criteria.
- is linked to a signal variable in the Logging area.
- can be individually defined for each parameterized WEBfactory server.



3.1.1.Log Conditions Grid

In the conditions table, logging conditions have already been set to a default state.

Define the log conditions.

- directly in the conditions grid
- in the Log condition details tab, under the conditions grid

Option	Description
Condition Name	Change the name of the log condition.
Log Mode	Select a log condition. Mode • Time triggered: Values are logged based on a the time cycle. • Once on change: Values are logged if there is a change in the process values. • Mean value (only time controlled): Calculate the average value of the process values with the logging and the reporting intervals as reference parameters • Counter mean value (only time controlled): Total average values. Parameters • Signal value: Process value of the signal variable to be recorded • Signal value 2: Process value of the signal variable that is selected below • Constant value: constant

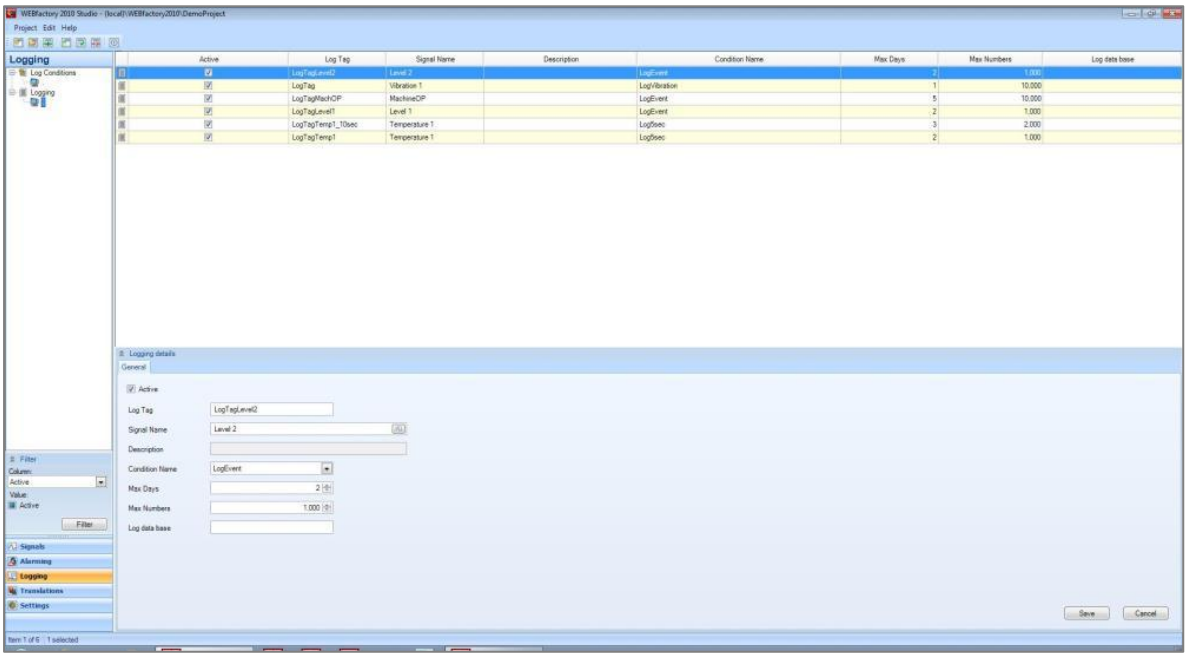
	Relational comparators <, >, <> (unequal), =
Log Interval	Select a time cycle for time-controlled recording. [N/A] means that there is no recording taking place.
Log Constant	Set a constant.
Signal Value 2	Select a signal whose value will be used for comparison
Report Interval	Select a reporting interval The average value is calculated by means of the reporting interval and is issued at the end of the interval (as a "report")
Save	Save changes.
Cancel	Discard changes.

Editing the Conditions Grid - contextual menu or Edit menu:

Option	Description
Edit	Edits the current selected attribute.
Copy	Copy log conditions.
New	Create a new log condition.
Delete	Delete a log condition.
Log Condition Details	Hide/show the Log Condition Details.
Refresh	Update the current view.

3.2. Logging Tab - Logging

- A log defines a way to store data for a specific signal depending on a log condition.
- If the logging condition is fulfilled, the process values of the signal variable are logged.
- Logs can be individually defined for each parameterised WEBfactory server.



In the parameters grid, logs that have already been set to the default values.

Edit logging parameters

- directly in the parameters grid
- in the Logging details

Logging parameters:

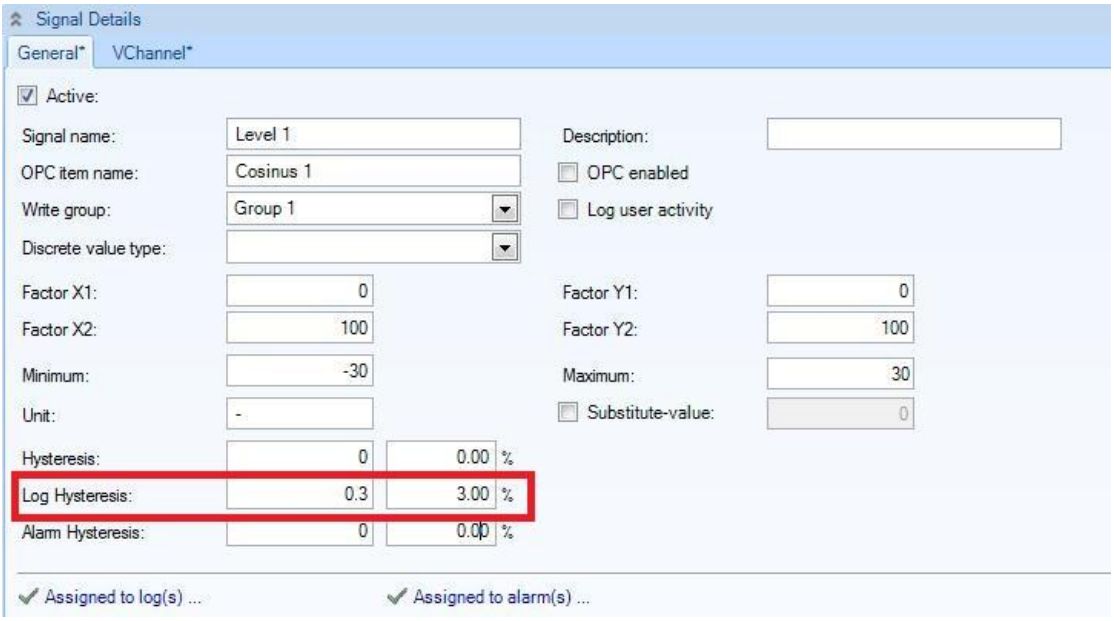
Option	Description
Active	Activate/deactivate log when the WEBfactory server is started.
Log Tag	Log name
Signal Name	Select an alarm signal whose values will be logged.
Description	Description of the signal whose values will be logged.
Condition Name	Select an log condition.
Max. Days	Set the maximum number of days for storage of data records (a ring buffer and/or the FIFO principle)
Max. Number	Set the maximum number of saved data (a ring buffer and/or the FIFO principle)
Log Database	The name of the database for data record storage • No name: The data record is saved in the default database. • Name: The data record is saved in a separate "Name" database.

Contextual menu available for the parameters grid - or via the Edit menu:

Option	Description
Copy	The action for this selection is deactivated.
New	Create a new log.
Delete	Delete a log.
Export	Export the log configuration into a standard format XML file.
Import	Import the log configuration from a standard format XML file.
Logging Details	Hide/show the Logging details.
Refresh	Update the current view.

3.3. Log Hysteresis

The Log Hysteresis option can be found in the signal details in WEBfactory Studio.



The Log Hysteresis option allows the user to specify a static or relative value (e.g. 0.3 or 3%) which is used when logging data in Float or Real format. The Log Hysteresis value will be used when the log condition for that signal is set to On Change, and acts like a minimum variation value.

This option is useful when the OPC Server is sending values with many decimals. If the 9th decimal is changing, when the log condition is set to On Change, the new value will be logged. In this case, difference might not be relevant to the user. Using Log Hysteresis, the user can define a value of minimum variation for the new value to be logged.

The Log Hysteresis value can be static – 0.3 or relative – 3%. If both static and relative values are specified (eg. 0.3 AND 3%), the new value will be logged only if the change of value is more than 0.3 AND 3% from the previous value.

3.4. Exposed functionality

The following methods are exposed by the Trending control so they can be used from code:

```
public void LoadConfiguration(string configuration)
```

loads the configuration named “configuration” and ConfigurationNamespace (control property)

```
public void AddChannel(string name, Color color)
```

if the configuration has been loaded from code (using LoadConfiguration method), the signals can be dynamically added to the Trending control, specifying the signal name and the color to have in the Trending control.

```
public void StartQuery()
```

if the configuration has been loaded from code (using LoadConfiguration method), the process of value updates can be started.

```
public void Dispose()
```

used to dispose objects and the resources used by the object.

```
public event EventHandler OnTrendconfigurationLoaded
```

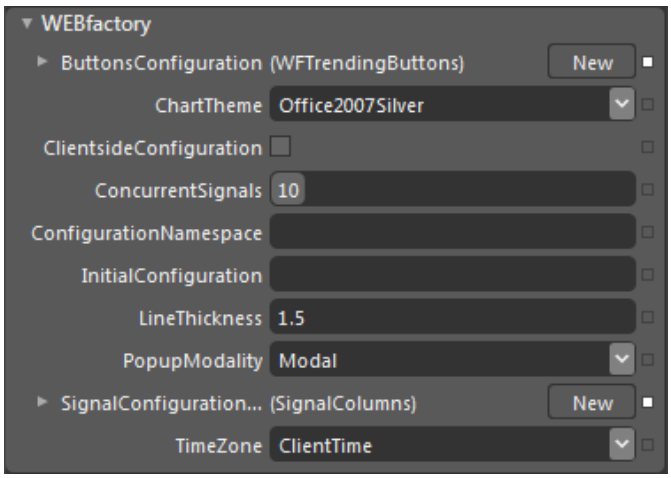
event that triggers when the configuration is changed. The event raises when:

- when the control starts with ClientsideConfiguration or InitialConfiguration;
- when the configuration in changed using the Load Configuration button;

- when the LoadConfiguration method is used and it succeeds.

4. The Trending Control at design time (Expression Blend).

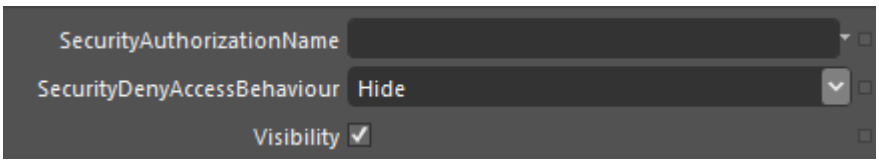
When working with the Trending control (WFTrending3) in Expression Blend, an important set of properties are exposed in under the WEBfactory category, in the Properties panel.



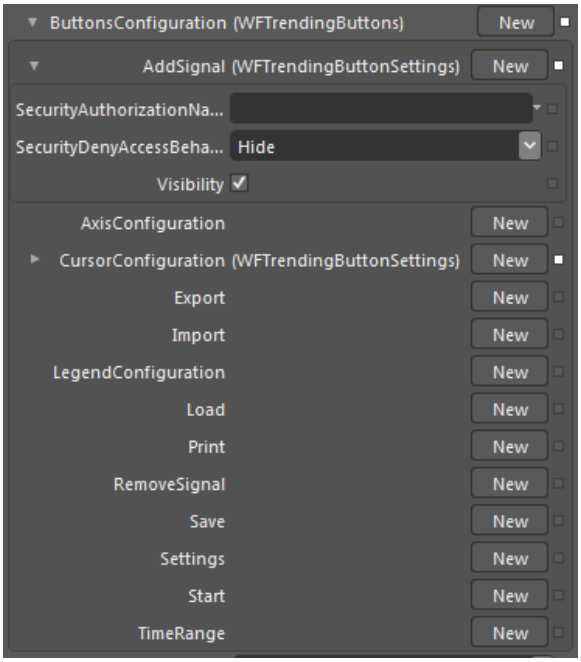
These properties are available when using WEBfactory Smart Editor for design time editing too, and can be found in the Property Inspector panel.

The properties listed at design time are:

- **ButtonsConfiguration** – allows the user to set security authorizations for the options bar buttons from the Trending control. For each button, the SecurityAuthorizationName and the SecurityDenyAccessBehaviour can be set.



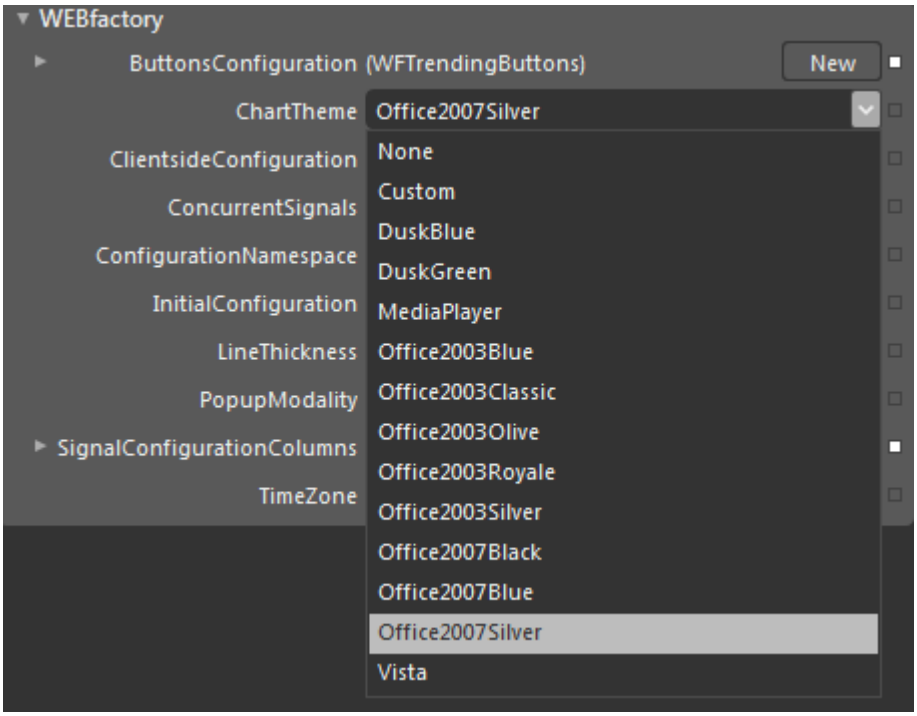
This means that the user can specify an authorization group that will have access to the button, and the behavior of the button if users belonging to other authorization groups than the one selected are using the control.



The buttons available for security access configurations are:

- AddSignal
- AxisConfiguration
- CursorConfiguration
- Export
- Import
- LegendConfiguration
- Load
- Print
- RemoveSignal
- Save
- Settings
- Start
- TimeRange

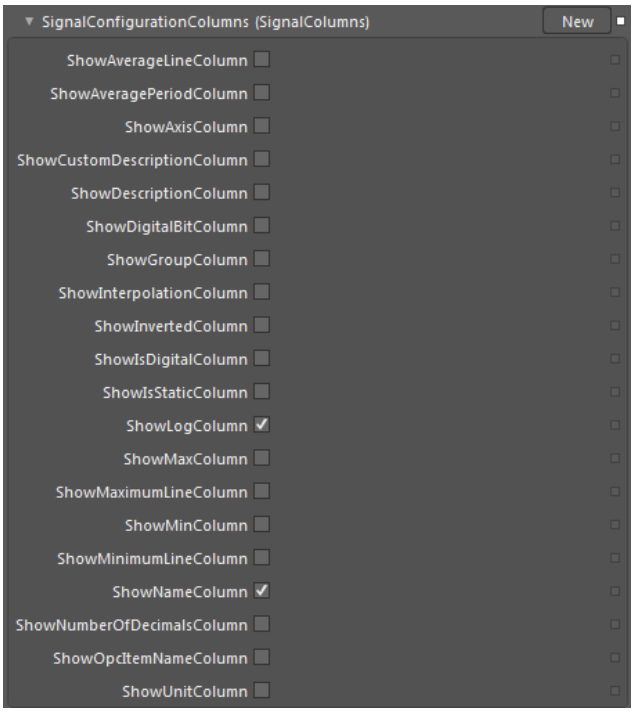
- ChartTheme – allows the user to select a visual theme for the Trending Control.



The available theme options are:

- None – default theme is applied;
- DuskBlue
- DuskGreen
- MediaPlayer
- Office2003Blue
- Office2003Classic
- Office2003Olive
- Office2003 Royale
- Office2003Silver
- Office2007Black
- Office2007Blue
- Office2007Silver
- Vista

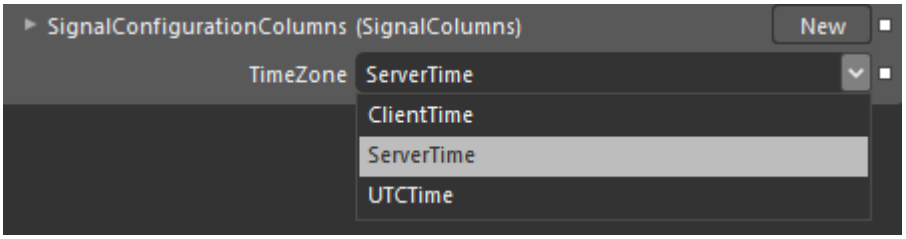
- ClientSideConfiguration – if set to on, the configuration will be stored on the local machine's Isolated Storage. The loading of the configuration will be made from the local Isolated Storage.
- ConcurrentSignals – the number of signals that can be displayed in the Trending graphic at the same time.
- ConfigurationNamespace – the namespace of the configuration. A configuration is defined by a name and a namespace. The combination of name and namespace must be unique. If a namespace is defined in this option, the Trending control will only be able to see the configurations that belong to this namespace, when loading them from the database.
- InitialConfiguration – the name of the configuration to be loaded by default. By declaring the namespace of the configuration (in the previous option) and the name of the configuration in the InitialConfiguration text field, the Trending control will load by default the specified configuration from de database.
- LineThickness – the thickness of the trendline in the Trending graphic.
- PopupModality – this settings allows the user to choose the modality for the popup windows displayed by the Trending control at runtime. The user can choose between modal and modeless.
- SignalConfigurationColumns – allows the user to choose which columns will be displayed at runtime in the signal grid from the Change Settings window.



The SignalConfigurationColumns options are:

- ShowAverageLineColumn – allows the user to enable a line that will mark the average of the values displayed by the Trending graph.
- ShowAveragePeriodColumn – allows the user to customize the period of time over which the Average Line is visible and calculated.
- ShowAxisColumn – enables the user to select an axis for the signal. Signals can be represented on custom axis, depending on the values or units.
- ShowCustomDescriptionColumn – allows the user to input a custom description for the current signal.
- ShowDescriptionColumn – shows the description of the signal, if available.
- ShowDigitalBitColumn – allows the user to assign a signal value that will represent the digital state of 1 in the digital graph.
- ShowGroupColumn – lists the signal group which current signal is assigned to.
- ShowInterpolationColumn – allows the user to set the algorithm used to draw the line between points.
- ShowInvertedColumn – allows the user to invert the digital representation of the signal.
- ShowDigitalColumn – allows the user to mark the signal to be represented in a digital format.
- ShowStaticColumn – allows the user to mark a signal as static.
- ShowLogColumn – shows the log name of the selected signal, if the signal has logging.
- ShowMaxColumn – defines the maximum value for the signal value.
- ShowMaximumLineColumn – if enabled, Trending graph will draw a line, marking the highest value of the current signal.
- ShowMinColumn – shows the minimum value for the signal value.
- ShowMinimumLineColumn – if enabled, Trending graph will draw a line, marking the lowest value of the current signal.
- ShowNameColumn – shows the name of the signal.
- ShowNumberOfDecimalsColumn – allows the user to specify the number of decimals the signal value will be displayed with.
- ShowOpcItemNameColumn – lists the OPC item name for the current signal.
- ShowUnitColumn – shows the unit of measurement for the signal value, if available.

- TimeZone – allows the user to choose the time zone for the Trending Control at runtime.

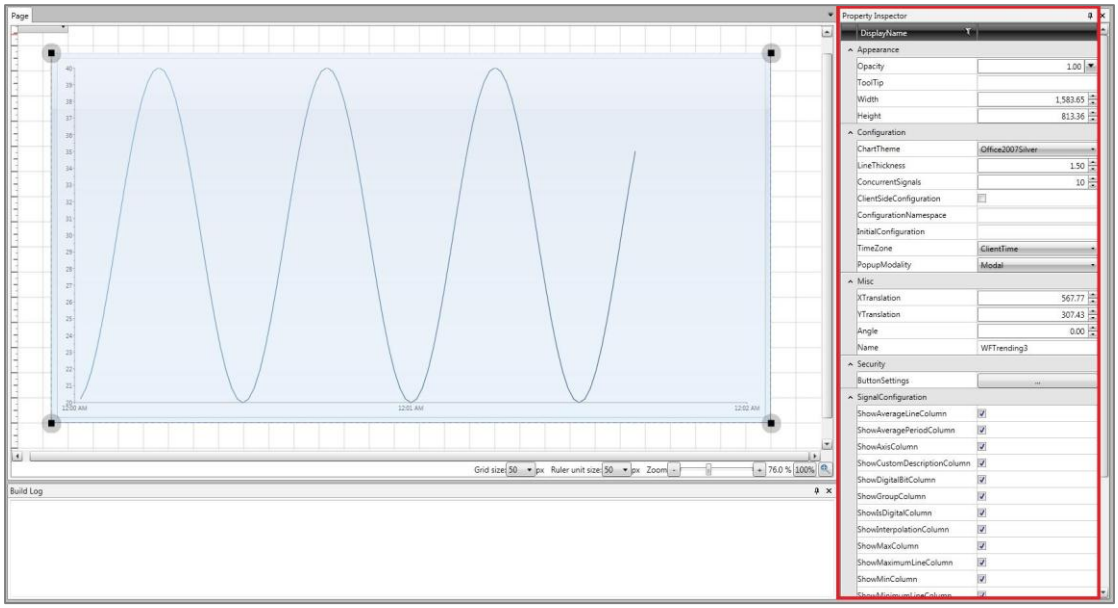


The options are:

  - ClientTime – the time zone of the machine where the visualization is running.
  - ServerTime – the time zone of the machine on which WEBfactory Server is running.
  - UTCTime – the UTC time zone.

5. The Trending Control at design time (Smart Editor).

In Smart Editor, the properties of the Trending Control are exposed in under the WEBfactory category, in the Property Inspector panel.

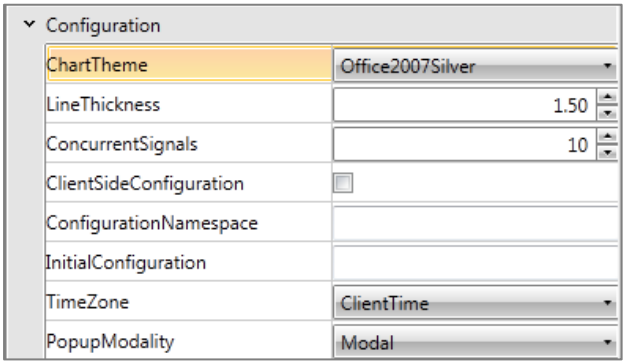


These properties are available in Expression Blend too, and can be located in the Properties panel.

The Trending Control specific properties are listed under three main categories:

- Configuration
- Security
- SignalConfiguration.

Configuration



- ChartTheme – allows the user to select a visual theme for the Trending Control. The available theme options are:
  - None – default theme is applied;
  - DuskBlue
  - DuskGreen
  - MediaPlayer
  - Office2003Blue
  - Office2003Classic
  - Office2003Olive
  - Office2003 Royale
  - Office2003Silver
  - Office2007Black
  - Office2007Blue
  - Office2007Silver
  - Vista
- LineThickness – the thickness of the trendline in the Trending graphic.
- ConcurrentSignals – the number of signals that can be displayed in the Trending graphic at the same time.
- ClientSideConfiguration – if set to on, the configuration will be stored on the local machine's Isolated Storage. The loading of the configuration will be made from the local Isolated Storage.
- ConfigurationNamespace – the namespace of the configuration. A configuration is defined by a name and a namespace. The combination of name and namespace must be unique. If a namespace is defined in this option, the Trending control will only

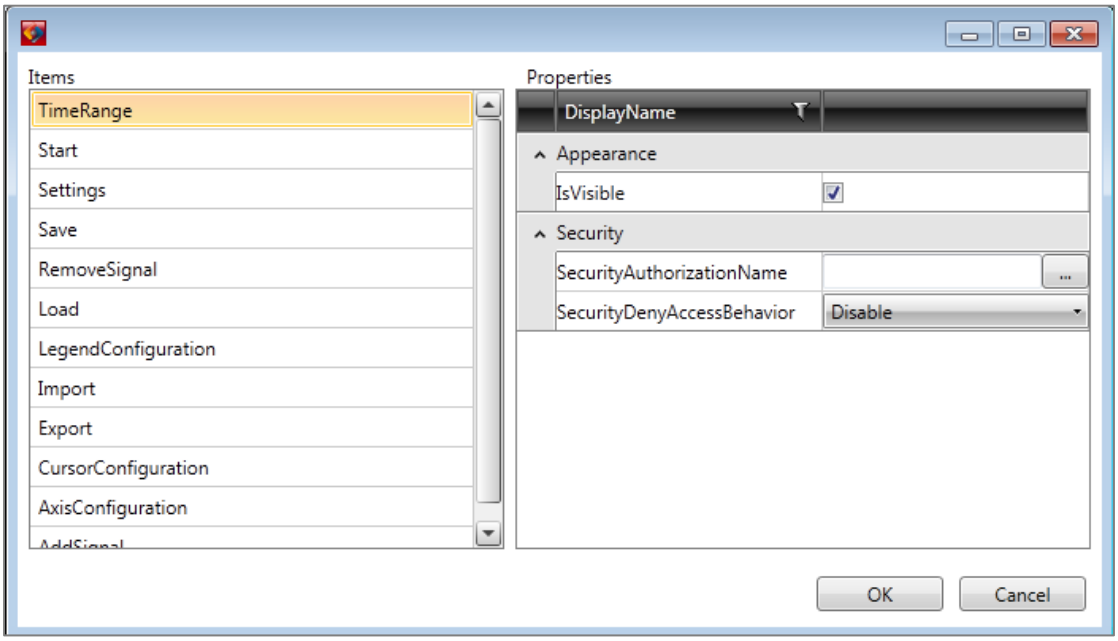
be able to see the configurations that belong to this namespace, when loading them from the database.

- InitialConfiguration – the name of the configuration to be loaded by default. By declaring the namespace of the configuration (in the previous option) and the name of the configuration in the InitialConfiguration text field, the Trending control will load by default the specified configuration from de database.
- TimeZone – allows the user to choose the time zone for the Trending Control at runtime. The options are:
  - ClientTime – the time zone of the machine where the visualization is running.
  - ServerTime – the time zone of the machine on which WEBfactory Server is running.
  - UTCTime – the UTC time zone.
- PopupModality – this settings allows the user to choose the modality for the popup windows displayed by the Trending control at runtime. The user can choose between modal and modeless.

Security

- ButtonsSettings – allows the user to set security authorizations for the options bar buttons from the Trending control. For each button, the SecurityAuthorizationName and the SecurityDenyAccessBehaviour can be set.

This means that the user can specify an authorization group that will have access to the button, and the behavior of the button if users belonging to other authorization groups than the one selected are using the control.

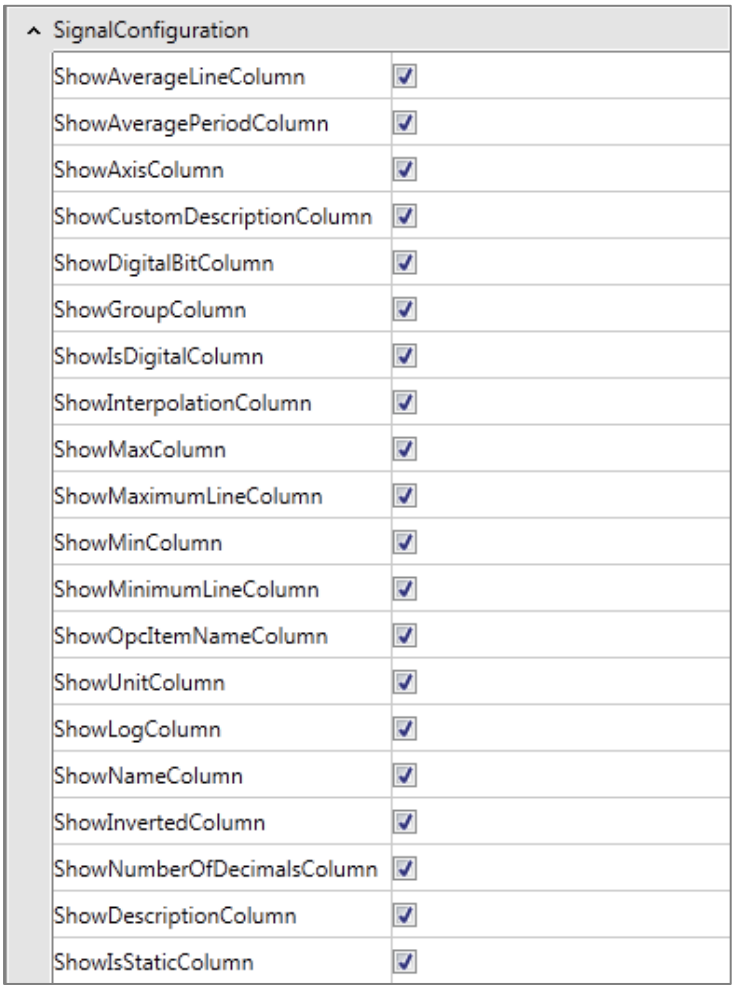


The buttons available for security access configurations are:

- TimeRange
- Start
- Settings
- Save
- RemoveSignal
- Load
- LegendConfiguration
- Import
- Export
- CursorConfiguration
- AxisConfiguration
- AddSignal

SignalConfiguration

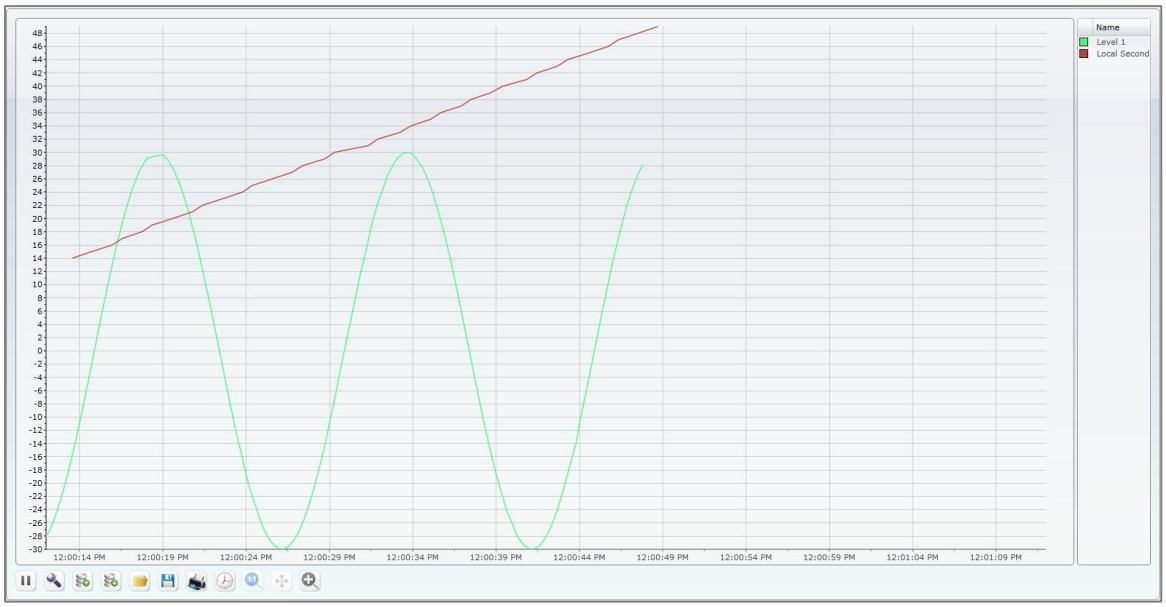
Allows the user to choose which columns will be displayed at runtime in the signal grid from the Change Settings window.



- ShowAverageLineColumn – allows the user to enable a line that will mark the average of the values displayed by the Trending graph.
- ShowAveragePeriodColumn – allows the user to customize the period of time over which the Average Line is visible and calculated.
- ShowAxisColumn – enables the user to select an axis for the signal. Signals can be represented on custom axis, depending on the values or units.
- ShowCustomDescriptionColumn – allows the user to input a custom description for the current signal.

- ShowDigitalBitColumn – allows the user to assign a signal value that will represent the digital state of 1 in the digital graph.
- ShowGroupColumn – lists the signal group which current signal is assigned to.
- ShowDigitalColumn – allows the user to mark the signal to be represented in a digital format.
- ShowInterpolationColumn – allows the user to set the algorithm used to draw the line between points.
- ShowMaxColumn – defines the maximum value for the signal value.
- ShowMaximumLineColumn – if enabled, Trending graph will draw a line, marking the highest value of the current signal.
- ShowMinColumn – shows the minimum value for the signal value.
- ShowMinimumLineColumn – if enabled, Trending graph will draw a line, marking the lowest value of the current signal.
- ShowOpcItemNameColumn – lists the OPC item name for the current signal.
- ShowUnitColumn – shows the unit of measurement for the signal value, if available.
- ShowLogColumn – shows the log name of the selected signal, if the signal has logging.
- ShowNameColumn – shows the name of the signal.
- ShowInvertedColumn – allows the user to invert the digital representation of the signal.
- ShowNumberOfDecimalsColumn – allows the user to specify the number of decimals the signal value will be displayed with.
- ShowDescriptionColumn – shows the description of the signal, if available.
- ShowStaticColumn – allows the user to mark a signal as static.

6. The Trending Control at runtime.



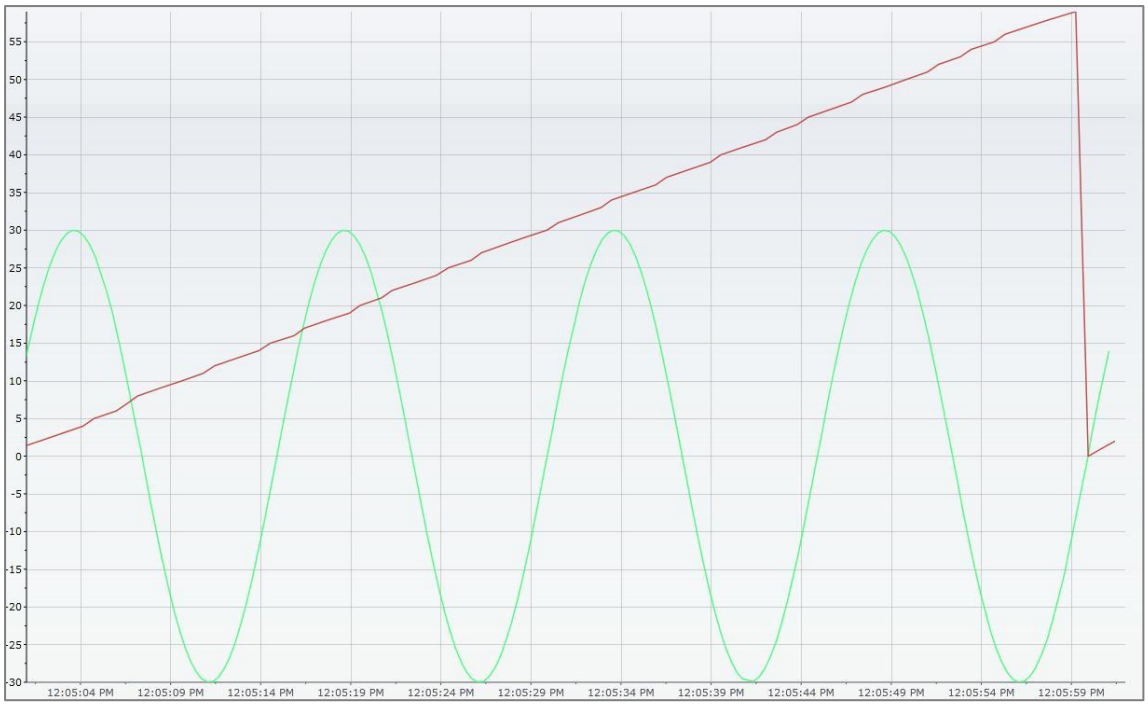
6.1. User Interface

The UI of the Trending Control is divided in three sections:

- The graph
- The legend
- The options bar

6.1.1.The graph

The Trending Control displays data in a multi axes graphic environment, using colored shapes for accurate data representation.



The two signals are displayed as lines, relative to values and timestamps. This section can be configured at runtime using the Settings button from the options bar.

6.1.2.The legend

The legend is the part of the Trending Control that holds the details of the signals represented in the graph part.

It can be configured at runtime using the Settings button from the options bar.

6.1.3.The options bar

Contains the all the possible options of the Trending control:

 - the Pause/Run button

 - the settings button, configures the trend display

 - loads configuration from database

 - saves configuration to database

 - import trend data (from xml)

 - export trend data (to xml)

 - prints the Trending control, without including the options bar

 - changes the time range

 - adjusts the zoom level to normal

 - move tool, useful to move while at high zoom

 - zoom tool, zooms in the graph

 - shift the timeline with one unit (hour/day/week/year) to the left. Available only in historical view.

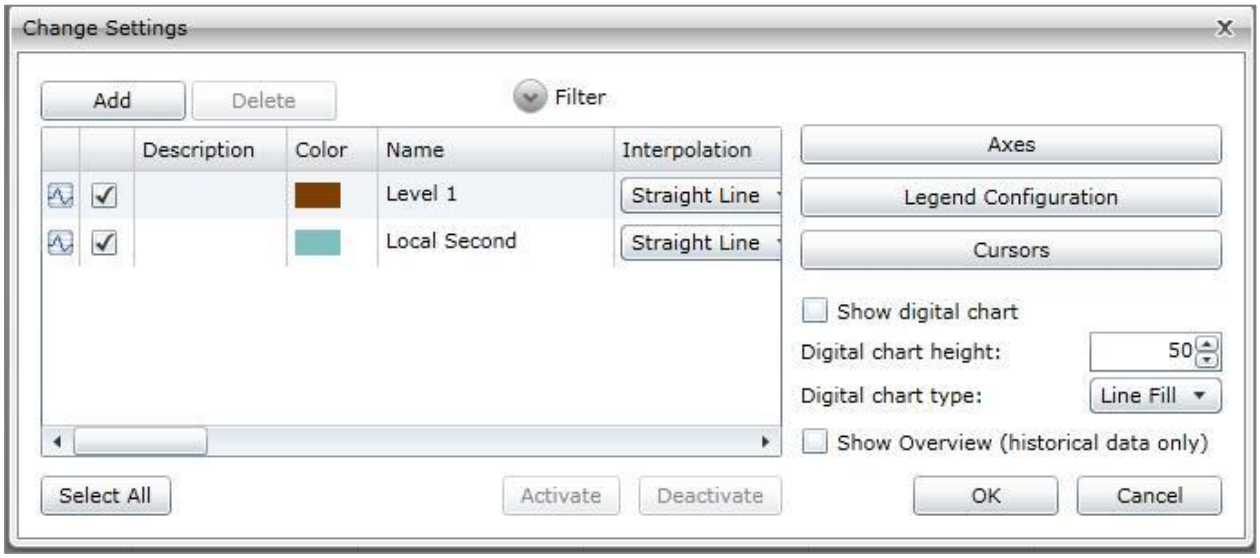
 - shift the timeline with one unit (hour/day/week/year) to the right. Available only in historical view.

6.2. Trending functionality

6.2.1. Changing settings

The base functionality of the Trending control can be adjusted using the Settings  button from the option bar. Pressing the Settings button will open the Change Settings window, which contains options to customize the core elements of the Trending control:

- The possibility to add and manage signals
- The axes setup
- The legend configuration
- The cursors configuration
- The way a signal is represented



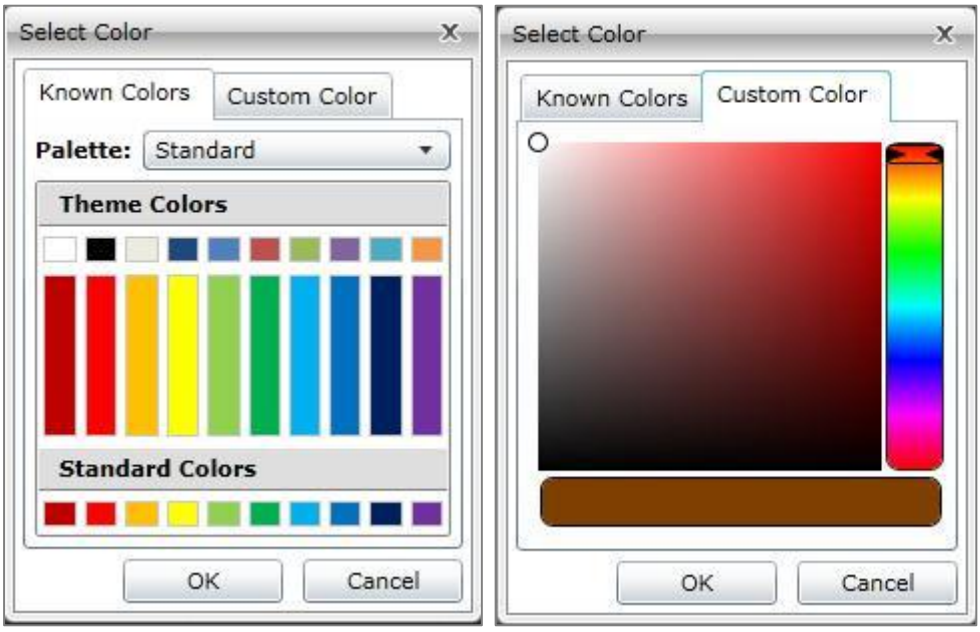
Managing the signals

The main part of the window is focused on signal management. It consists in a signal grid, which lists the signals from the Trending control as well as their attributes (listed in the grids columns).

The scroll bar at the bottom of the grid indicates that more columns are available. Setting which columns should appear in the grid, and thus, which attributes of the signals should be listed, is made at design time, in Smart Editor or Expression Blend.

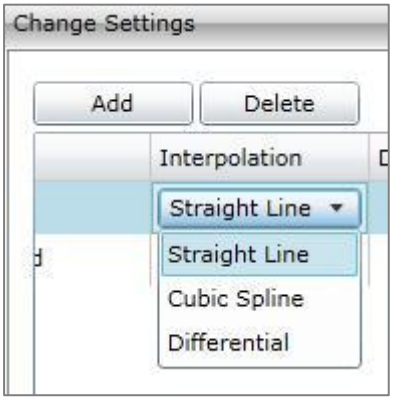
In the above example, all the available columns are listed:

- Active – contains a checkbox button toggling the shown/not shown state of the signal in the Trending control.
- Description – lists the description of the signal, if available. The signal's description can be set from WEBfactory Studio for each signal.
- Color – contains a color picker, indicating the color of the trend line, and allows the user to select a pre-defined color, or a custom color.



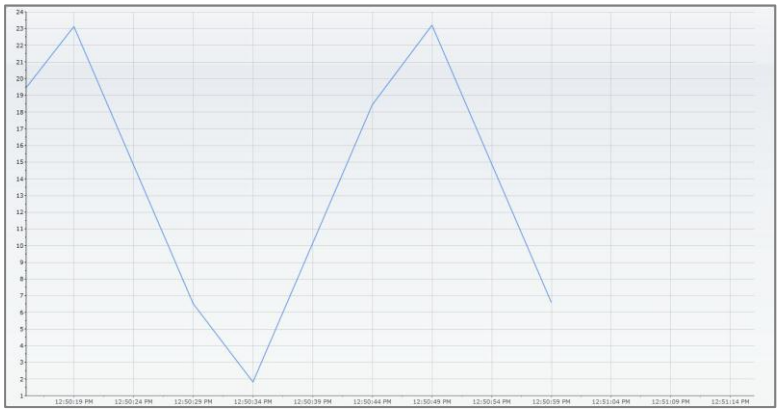
This color is randomly assigned when the signal is added with the signal Browser and can be changed.

- Name – displays the name of the signal.
- Interpolation – allows the user to set the algorithm used to draw the line between points.

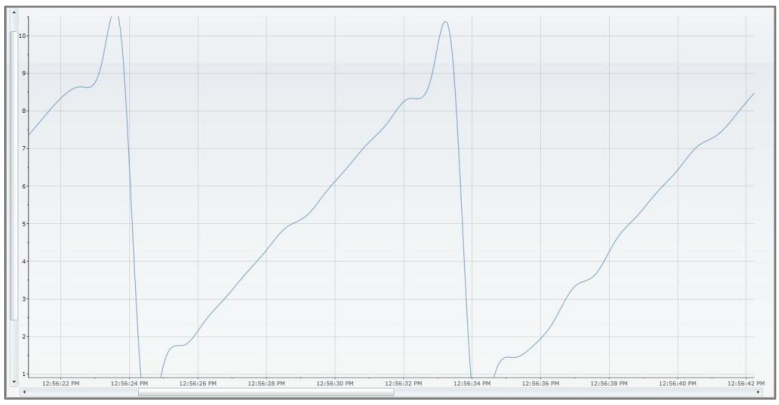


The options are:

- Straight line



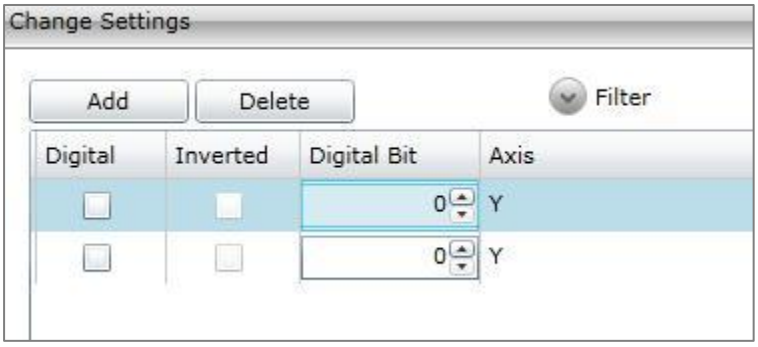
- Cubic Spline



- Differential

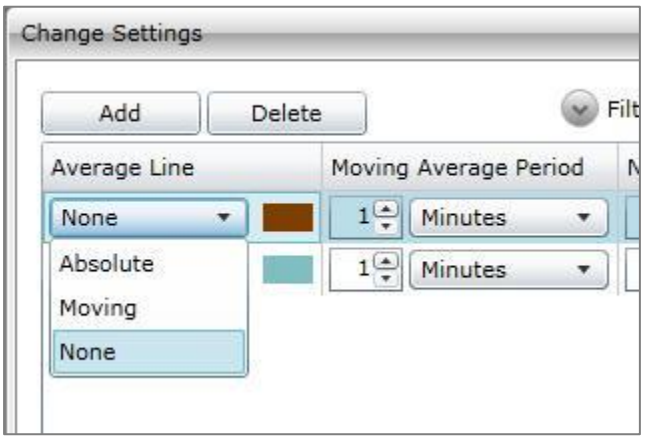
- Digital – marks the signal to be represented in a digital format. If a signal is marked as digital, a new digital graph will appear in the trending control, if the “show digital chart” option is checked. The base value is the Digital Bit.
- Inverted – inverts the digital representation of the signal. If the Digital Bit, by default the 1 state is set to a certain signal value, the inverted signal will display the signal value as 0, thus inverting the graphic representation.

- Digital Bit – allows the user to assign a signal value that will represent the digital state of 1 in the digital graph. If the signal outputs the value stated in the Digital Bit attribute, the digital graph will display the state 1. If any other value is output by the signal, the digital graph will state 0.
  The Digital Bit cannot have a negative value assigned.



- Axis – enables the user to select an axis for the signal. Signals can be represented on custom axis, depending on the values or units. The axes can be defined using the Axes button in the Change Settings window.
- Log – displays the log name of the selected signal, if the signal has logging. Logging will enable the Trending control to fetch the data from the database, not from the signal changed event, thus being able to optimize the data acquisition speed and to display historical values.
- Group – lists the signal group which current signal is assigned to.
- OPC Item Name – lists the OPC item name for the current signal.
- Unit – displays the unit of measurement for the signal value, if available.
- Min – defines the minimum value for the signal value.
- Max – defines the maximum value for the signal value.

- Custom description – allows the user to input a custom description for the current signal. This attribute can improve the filtering in some cases and the visualization on the signals in the legends.
- Minimum line – if enabled, Trending graph will draw a line, marking the lowest value of the current signal. The color can be changed using the color picker.
- Maximum line – if enabled, Trending graph will draw a line, marking the highest value of the current signal. The color can be changed using the color picker.
- Average Line – allows the user to enable a line that will mark the average of the values displayed by the Trending graph. There are two types of average lines:
    - Absolute – states the absolute average of the values.
    - Moving – states the real time average value for the signal.

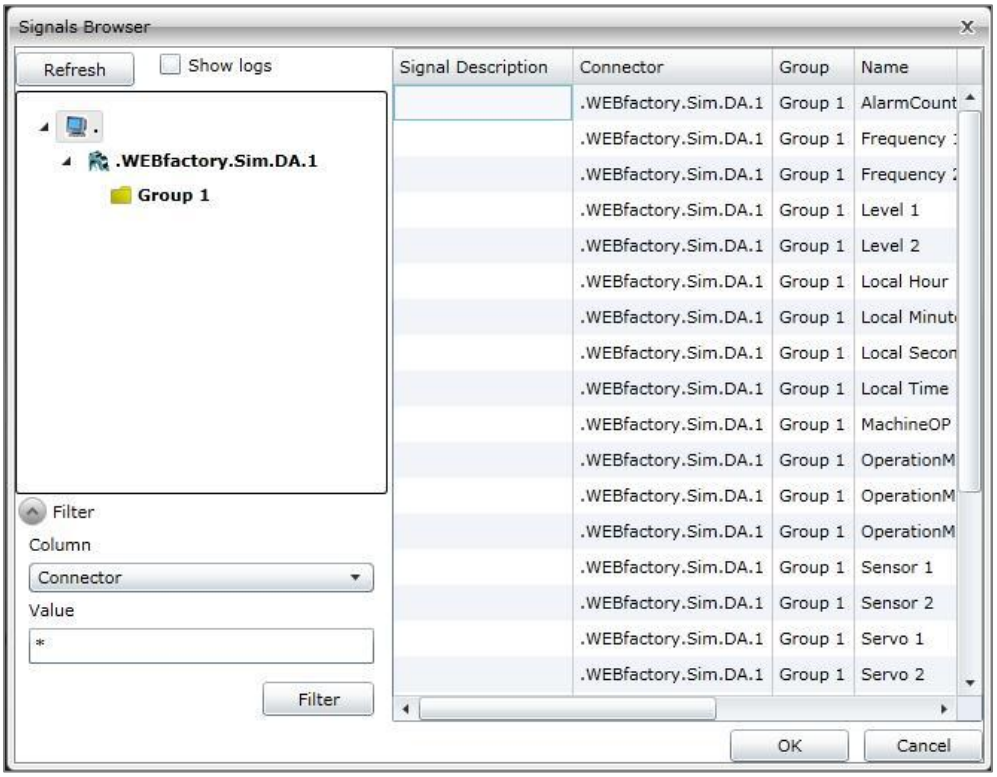


- Moving Average Period – allows the user to customize the period of time over which the Average Line is visible and calculated. The user can view the average value over a timespan of specified minutes, hours or days.
- Number of decimals – allows the user to specify the number of decimals the signal value will be displayed with. If the value of this attribute is set to 0, the signal value will be displayed with all its decimals.
- Cyclic acquisition – marks a signal as static. For a signal that has a lower frequency of value updates, this option will enable the Trending control to display the last value until the next value update, even if between the updates no data has been retrieved. The change of value will be visible marked in the graph. As an abrupt change, meaning that the signal had that curtain value until that time and from that point on it has a new value. At the start of the data acquisition faze the last know value for the signal, prior to the start of the selected time interval, will be fetched from the server in

order to display the current value of the signal until new updates come along. Also if the historical data is shown in the graph on a signal that is marked as static it will be represented in the same abrupt change mode.

Above the signals grid, the Add, Delete and Filter options are available:

- Add – adding one or more signals. Clicking the button will open the signal browser, allowing the user to select and add signals to the Trending control.



The main feature of the Signal Browser is the filtering. A very useful filter option is the Show Logs checkbox. If selected, the Signal Browser will list only the signals that have logging. This is useful when using historical views in the Trending control.

Other filtering options are available in the bottom-left side of the Signals Browser window. The further filtering can be made by:

- Column - with the options: Connector, Group, Name, Signal Description and OPC Item Name.
- Value – for each column selected, the user can input the value for filtering. Wildcards are available.

Note that you can set filter for each column. If you want to remove the filter from one column, set the value to *.

Delete – this option is plain forward. It deletes the selected signals.

Filter – the signals listed in the signal grid can be filtered by columns and values for the selected columns:

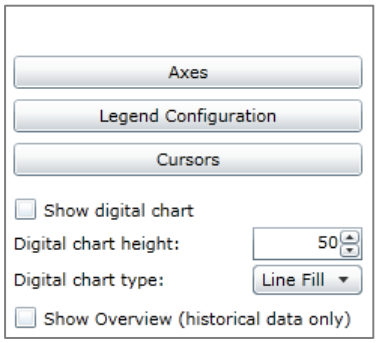
- Column - with the options: Connector, Group, Name, Signal Description and OPC Item Name.
- Value – for each column selected, the user can input the value for filtering. Wildcards are available.

Note that you can set filter for each column. If you want to remove the filter from one column, set the value to *.

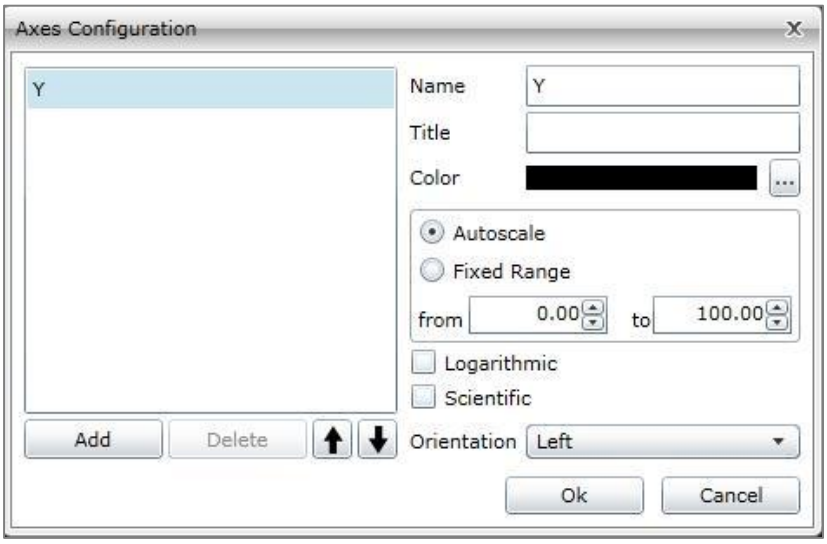
Under the signals grid are the Select All, Activate and Deactivate options. Like in the first column of the signals grid, the signals can be activated or deactivated. The advantage of using this options is that all the selected signals can be activated/deactivated at once.

Managing the trending graph and legend

The right side of the Change Settings window is focused on managing the graph and the legend.



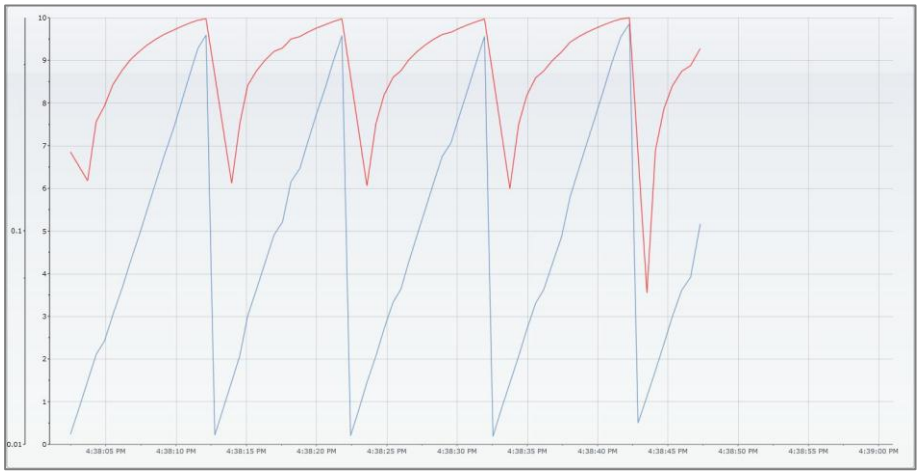
- Axes – the Axes button manages the Y axes that the signal can be displayed on. Clicking the button will open the Axes Configuration dialog.



The axes can be added to the graph by clicking the Add button. The axes will be listed in the left side of the window, the right side being used for configuring the selected axes:

  - Name – the name of the axes. It will be listed in the Axis column dropdown box.
  - Title – the title will be displayed in the Trending control graph. Each axis can have a representative title.
  - Color – the color of the axes. Clicking the corresponding button will open the color picker.
  - Autoscale – if enabled, the axis will modify its values according to the value of the signal/signals tied to this axis.

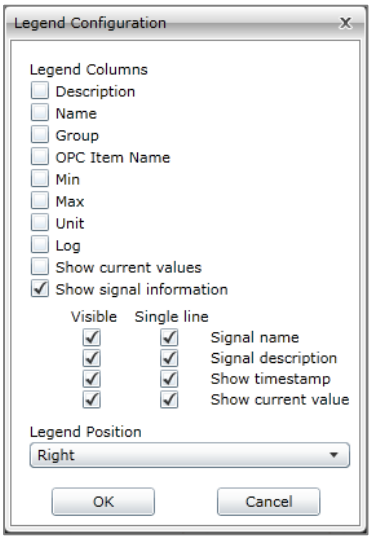
- Fixed range – the axis will have a fixed value representation, using the values specified below (from… to…). If the signal value goes over or below the specified values, the trend line will be cut off the graphic.
- Logarithmic – makes the values of the trend line to pass through a logarithmical function (ln) and then display the values on the chart. It can be useful when dealing with signals representing sound levels or earth movement.



*The same signal represented on a normal scale (blue) and on logarithmical scale (red)

- Scientific – enables the scale of the axis to be represented using scientific format (3.42E + 001). This is useful when dealing with extreme signal values (either very large values or very small values, negative or positive).
- Orientation – the axis can be placed either on the left side of the graphic or on the right side of the graphic. If no signal is assigned to a certain axes it will not be drawn on the chart.

- Legend configuration – allows the user to configure the legend (both analog and digital) of the Trending control. Clicking on the Legend Configuration button will open the Legend Configuration dialog.



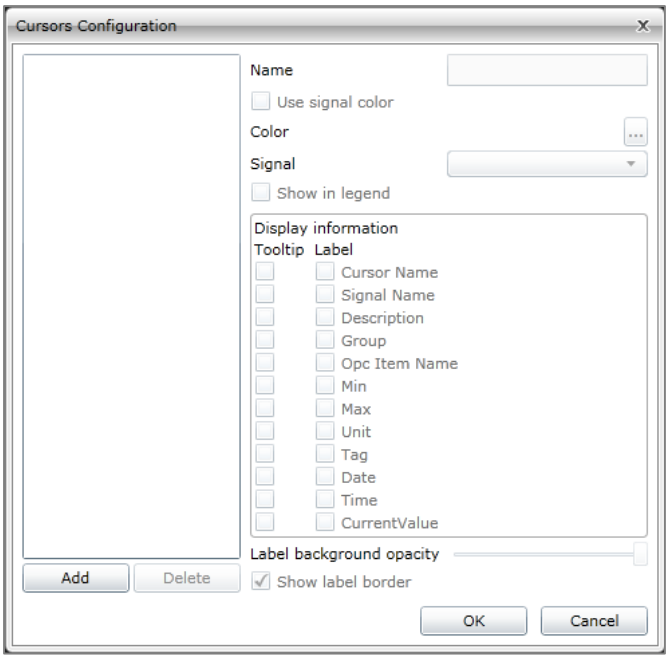
This dialog allows the customization of the legend columns and its position:

- Description column – displays the description of the signal in the legend.
- Name column – displays the name of the signal in the legend.
- Group column – displays the signal group in the legend.
- OPC Item Name column – displays the OPC item name in the legend.
- Min column – displays the minimum value of the signal.
- Max column - displays the maximum value of the signal.
- Unit column – displays the unit of the signal value.
- Log column – displays the logging info of the signal.
- Show current values – shows the current value of the signal if no cursor is defined in the trending, or if the cursor is placed before the last updated value. If the cursor is placed in a time range where the charts has data, the current value will be the closest value to the cursor position. This happens for all the trend lines.
-
- Show signal information – shows more signal information, with the ability to put different information on different lines (if more than one information is displayed on the same line, it will be split with the character '|'):
  - Signal name

- Signal description
- Show timestamp
- Show current value

  - Legend position – allows the user to select the position of the legend in the Trending control.

- Cursors – manages the configuration of the graphic cursor. If clicked, the Cursor Configuration window will open.



Cursors can be added and deleted using the Add/Delete buttons from the bottom-left side. The main part of the window focuses on cursor customization:

  - Name – cursor name.

- Use signal color – enables the cursor to use the signal color if it is attached to one signal.
- Color – allows the user to set a custom color for the cursor.
- Signal – allows the user to attach the cursor to a signal.
- Show in legend – displays the cursor information in the legend of the Trending control.

Display information – this table consists in options that can be marked to be displayed either in the tooltip of the cursor, the label of the cursor or both:

- Cursor Name – the name of the cursor.
- Signal name – the name of the attached signal.
- Description – the description of the signal, if available.
- Group – the signal group that the attached signal belongs to.
- OPC Item Name – the OPC item name of the attached signal.
- Min – the minimum value of the attached signal.
- Max – the maximum value of the attached signal.
- Unit – the unit of measurement of the signal's value.
- Tag – the tag of the signal.
- Date – the current date stamp of the signal.
- Time – the current timestamp of the signal.
- CurrentValue - the current value of the signal if no cursor is defined in the trending, or if the cursor is placed before the last updated value. If the cursor is placed in a time range where the charts has data, the current value will be the closest value to the cursor position. This happens for all the trend lines.

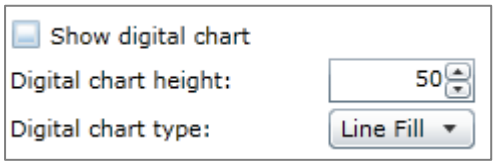
Below the main settings, the Cursors Configuration window displays two graphical settings for the cursors:

- Label background opacity – allows the user to set the percentage of opacity of the label.
- Show label border – displays a border around the label.

The signal of the cursor can be changed without the need to come to the configuration dialog. If a curtain cursor is selected and the user clicks on a different signal in the legend, the signal for that cursor will be changed along with its color.

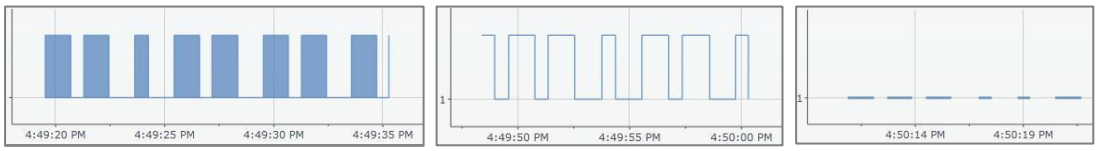
Digital chart

The digital chart options are located below the Cursors options. These settings are useful when dealing with signals marked as digital.



By enabling the Show digital chart option, a digital chard will be displayed below the main graphic in the Trending control, if we have at least one signal set as digital.

- Digital chart height – allows the user to set the desired height for the digital chart along with the height of the digital legend.
- Digital chart type – allows the user to choose between Area, Line and Line Fill types of digital representation of the data.



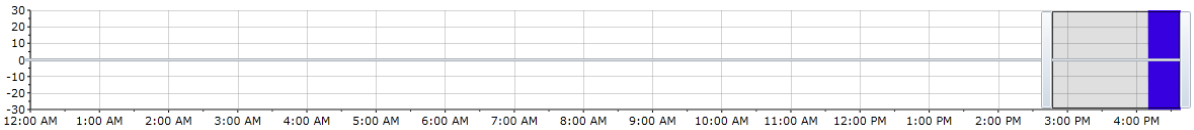
* Area, Line and Line Fill types of digital graphic

Overview

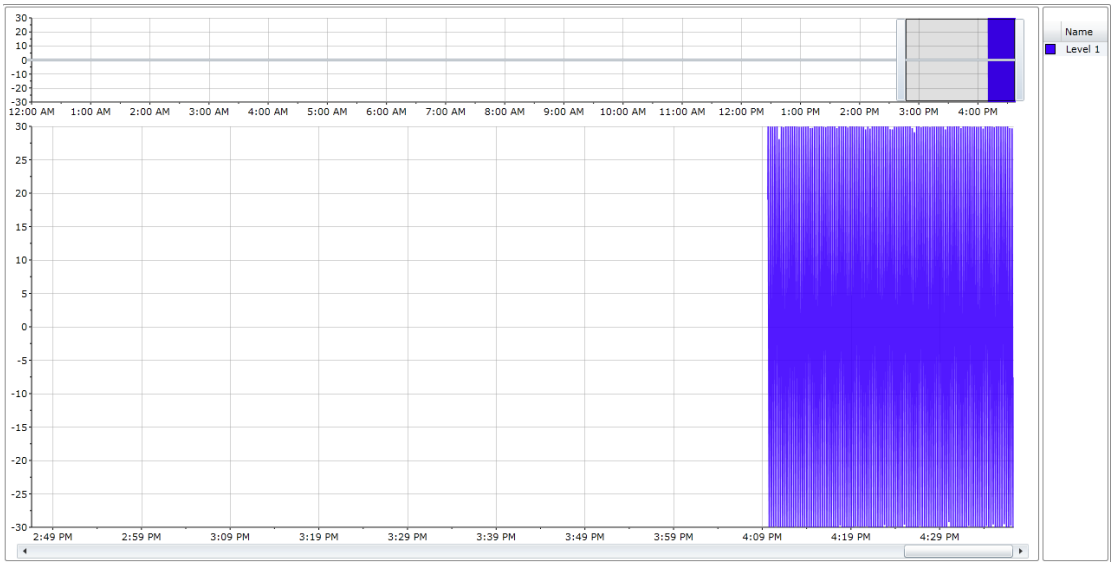
This option works when using historical data only. This means that only signal with logs will be displayed.

The Show overview option enables an overview graphic to be displayed above the main graphic, when in historical view mode. When in online mode, the overview graphic is not visible.

The overview graphic provides a quick and easy navigation through dense historical data, allowing the user to extend/move the part that the main graphic displays, or focus the main graphic view on different data.



When the main graphic is zoomed, the overview graphic allows the user to control the data displayed in the main graphic, by moving or extending/shrinking the selection area in the overview graphic.



Controlling the selection area is made by dragging the whole selection area or dragging the left or/and right selection handles.

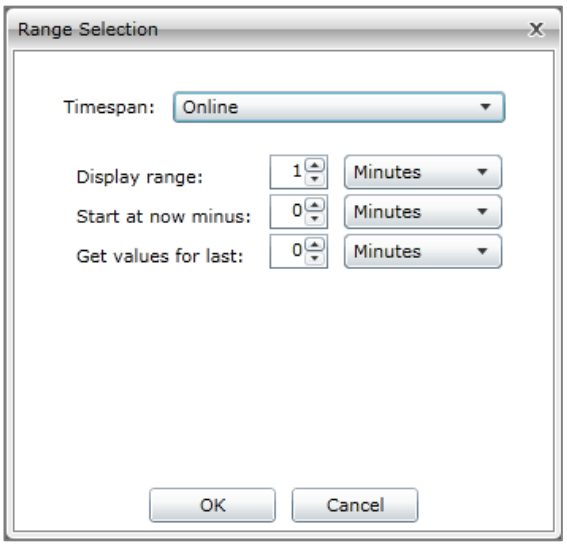
To move the selection area to a different location, click inside the selection area and drag it somewhere else on the overview graphic. Notice that the main graphic will update its view.

To resize the selection area, drag the left or right handles and adjust it to fit the desired portion of the overview graphic. Notice that the main graphic will update the view.

6.2.2.Online mode

The time range button  allows the user to switch from the online mode to the historical mode. Historical mode means viewing logged data from the signals. This is why only signals that have logging can be viewed in historical mode.

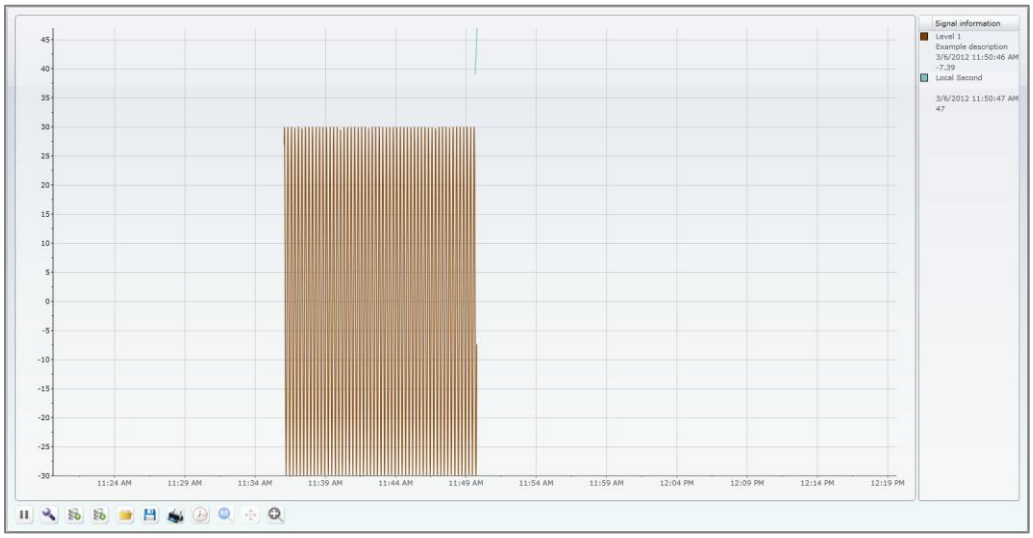
Clicking on the time range button will open the Range Selection dialog.



When online, the Range Selection dialog will display the options of viewing online data:

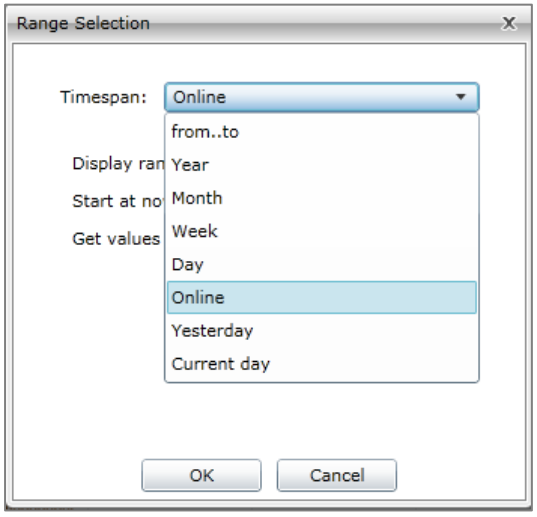
- Display range – the time range of the graphic. It can be set to days, hours or minutes.
- Start at now minus – sets the starting time of the graphic X minutes/hours/days after the normal start point.
- Get values for last – display the historical values for the last X minutes/hours/days and continues with the online data.

Combined, this settings allow the user to see data progress so far and the current data in real time.

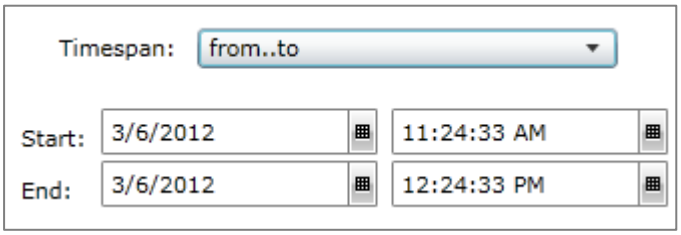


6.2.3.Historical mode

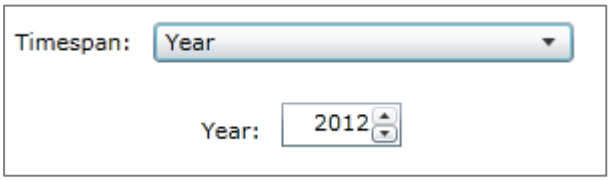
When selecting the Timespan option from the Range Selection dialog, the dropdown menu will list the options for displaying historical data.



- From…to - allows the user to select a time range using exact start and end points. The logged data (historical data) from that period will be displayed in the main graphic.

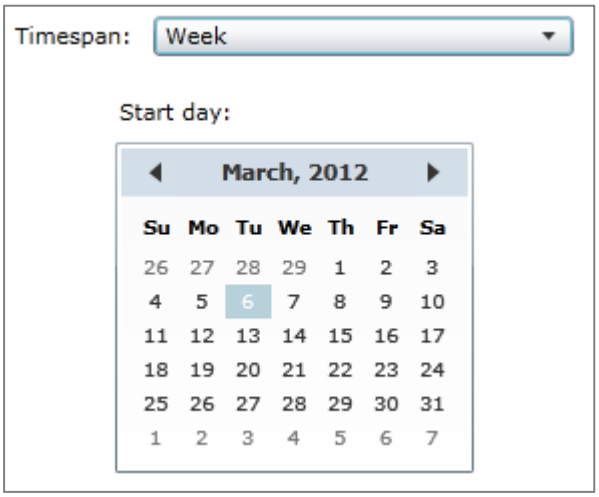


- Year – allows the user to select a specific year to be displayed in the timeline of the main graphic. This option will display the logged (historical) data from the whole year.

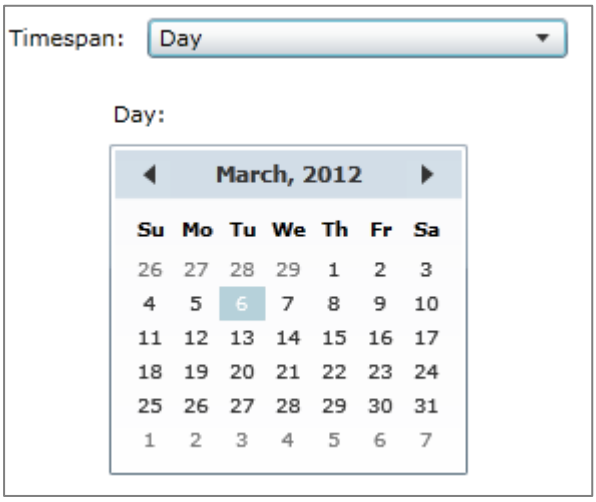


- Month – allows the user to select a specific month to be displayed in the timeline of the main graphic. This option will display the logged (historical) data from the whole month.

- Week – allows the user to select a specific week to be displayed in the timeline of the main graphic. This option will display the logged (historical) data from the whole week.



- Day – allows the user to select a specific day to be displayed in the timeline of the main graphic. This option will display the logged (historical) data from the whole day.



- Online – the online mode.
- Yesterday – displays the data from the day before the current day.
- Current day – displays the data from the current day, up to the point representing the current time of selection.

6.2.4.Save/Load Configuration

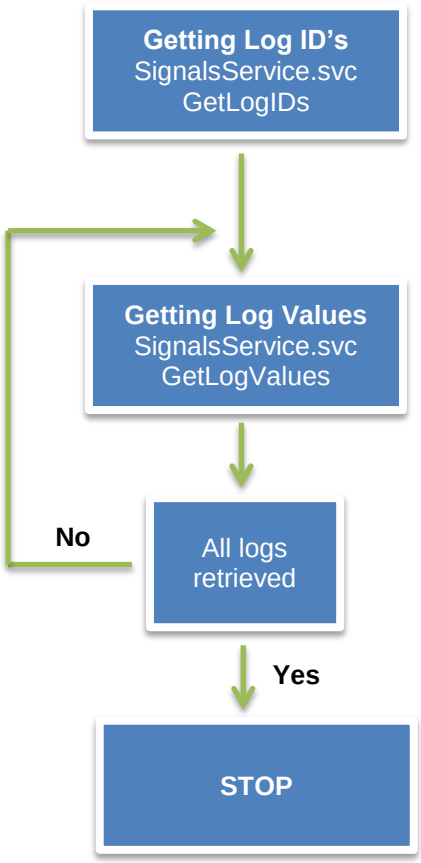
Loading and saving a configuration is done using the load () and save () buttons from the options bar.

The configurations are written to the database, and loaded from there back. The name of the configuration is case sensitive. If the name of the configuration already exists, the new save will overwrite the old one.

If a Namespace is set in the Trending Control at design time, only the configurations belonging to that namespace will be available to load from the database. Thus, a configuration is uniquely defined by its name and/or namespace.

7. DataTable control diagram

7.1. Get logs

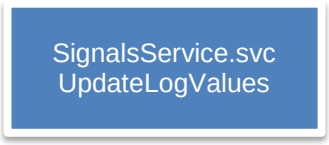


Webservices	Methods
SignalsService.svc	**GetLogIDs** List of SignalLogTagFilterDTO: • LogTag • SignalID
	GetLogValues List of LogID's and other parameters

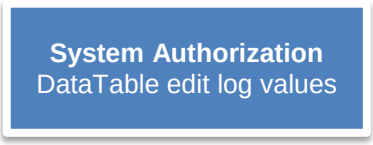
The GetLogValues method returns paged data, in a determined period of time or elements.

If a page returns empty it means that there is no data in the requested time frame. The GetLogValues method will be called for minimum 1 element from the left time (startDate) to the end of the global time frame (endDate). Then the method will retrieve paged data until the next empty frame.

7.2. Write Logs



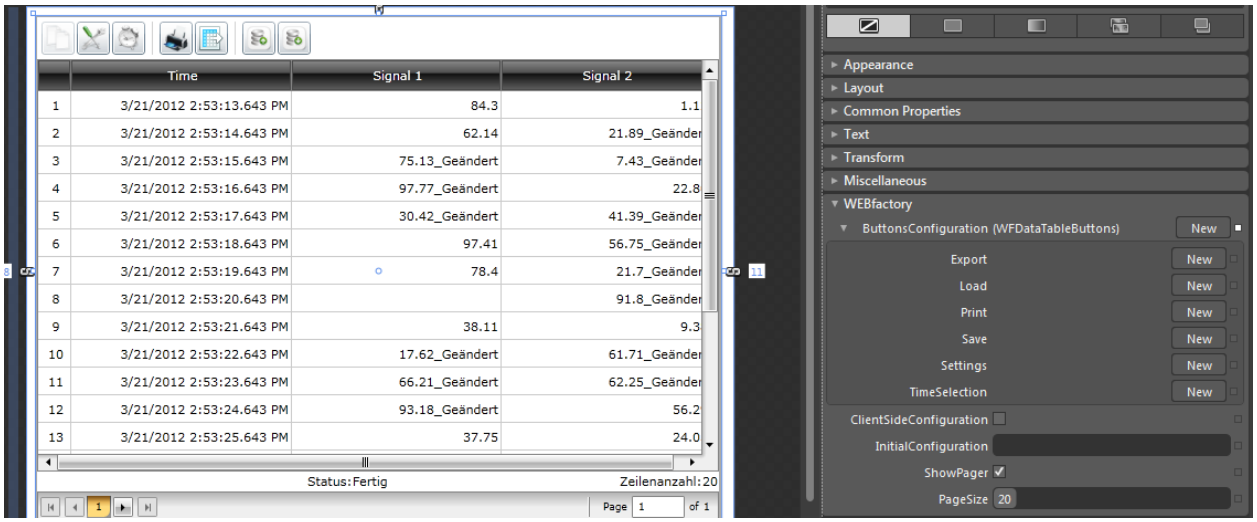
Required



Webservices	Methods
SignalsService.svc	**UpdateLogValues** Parameters: • logID • Time • EditedValue • EditedValue2 • Value • Value2

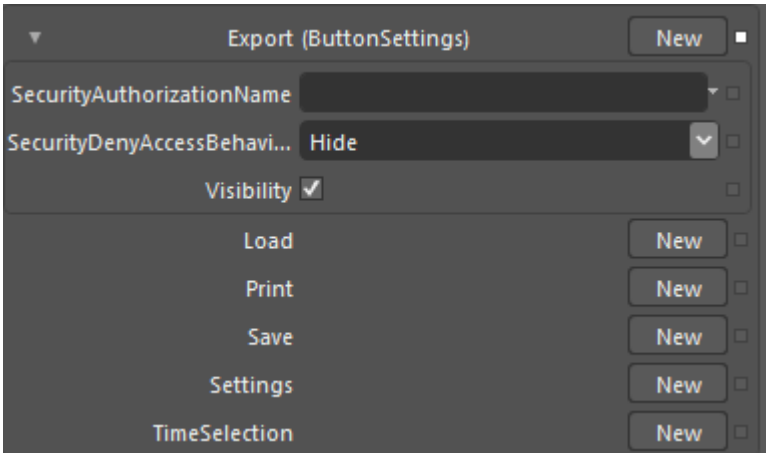
8. The DataTable control at design time

8.1. Expression Blend



The DataTable expose the following properties in Expression Blend:

- ButtonsConfiguration – allows the user to input a username in the SecurityAuthorizationName and an alternative behavior in the SecurityDenyAccessBehavior field, for each button from the options menu of the control:
  - Export
  - Load
  - Print
  - Save
  - Settings
  - TimeSelection



The SecurityDenyAccessBehavior options are:

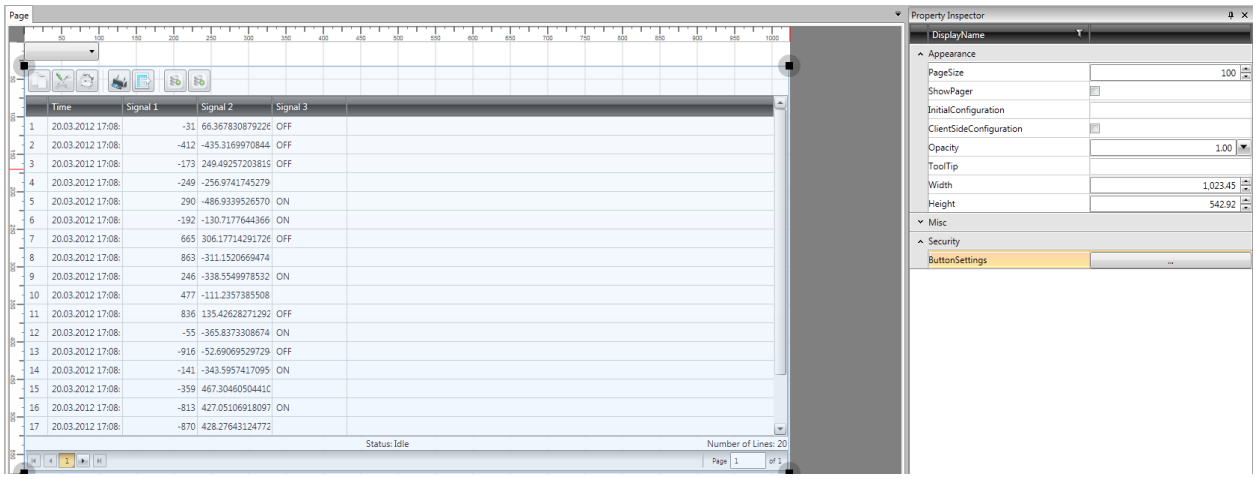
- Hide – the button is not displayed, if the other user than the one specified in the SecurityAuthorizationName uses the DataTable control.
- Disable - the button is displayed but disabled, if the other user than the one specified in the SecurityAuthorizationName uses the DataTable control.

The ButtonsConfiguration also allows the user to select for each button whether to be visible or not.

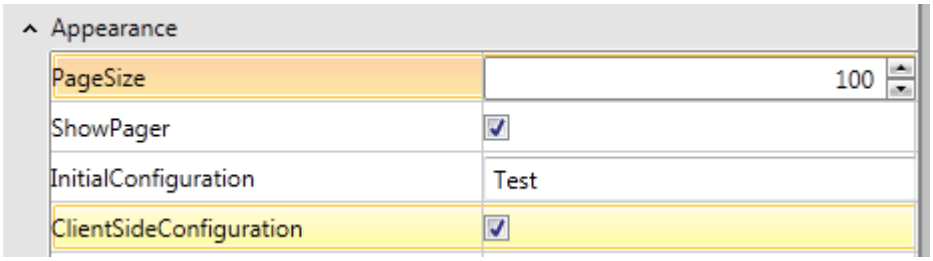
- ClientSideConfiguration – if set to on, the configuration will be stored on the local machine's Isolated Storage. The loading of the configuration will be made from the local Isolated Storage.

- InitialConfiguration – this option allows the user to enter the name of a saved configuration, this configuration being loaded as default configuration for the DataTable control. The configuration can be later changed at runtime.
- ShowPager – if on, this option will divide the DataTable entries in pages (the size of a page can be specified in the Page size option) and activates the navigation.
- PageSize – allows the user to select the maximum number of lines to be displayed in one page. The maximum number of displayed lines per page at runtime is 100.

8.2. Smart Editor

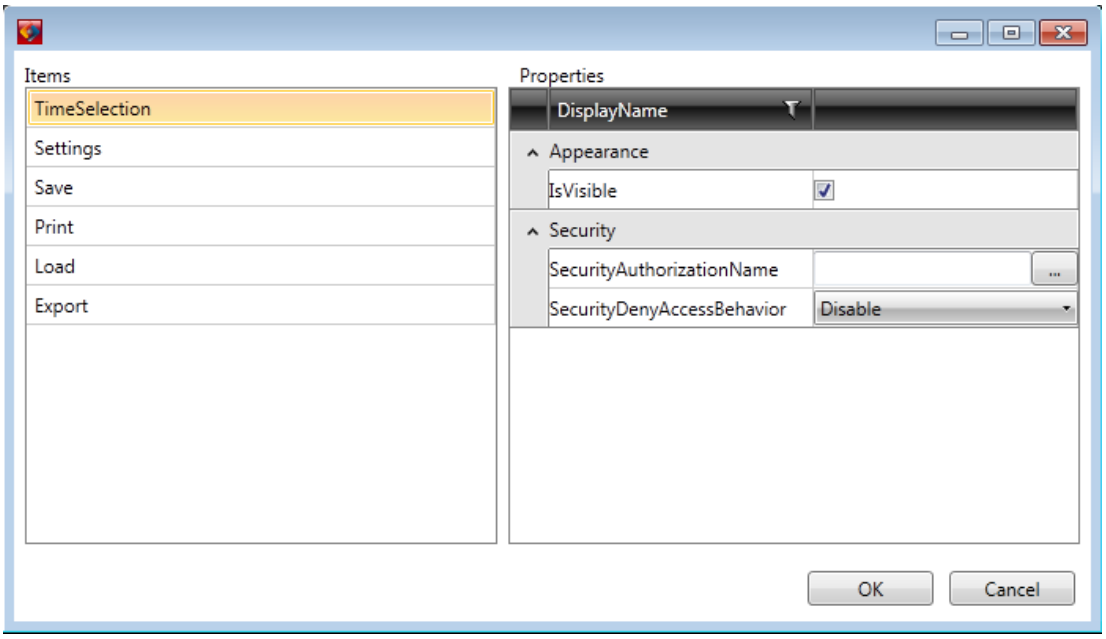


The DataTable expose the following specific properties in Smart Editor:



- PageSize – allows the user to select the maximum number of lines to be displayed in one page. The maximum number of displayed lines per page at runtime is 100.
- ShowPager – if on, this option will divide the DataTable entries in pages (the size of a page can be specified in the Page size option) and activates the navigation.
- InitialConfiguration – this option allows the user to enter the name of a saved configuration, this configuration being loaded as default configuration for the DataTable control. The configuration can be later changed at runtime.
- ClientSideConfiguration – if set to on, the configuration will be stored on the local machine's Isolated Storage. The loading of the configuration will be made from the local Isolated Storage.
- ButtonsConfiguration – allows the user to input a username in the SecurityAuthorizationName and an alternative behavior in the SecurityDenyAccessBehavior field, for each button from the options menu of the control:
    - TimeSelection

- Settings
- Save
- Print
- Load
- Export



The SecurityDenyAccessBehavior options are:

- Hide – the button is not displayed, if the other user than the one specified in the SecurityAuthorizationName uses the DataTable control.
- Disable - the button is displayed but disabled, if the other user than the one specified in the SecurityAuthorizationName uses the DataTable control.

The ButtonsConfiguration also allows the user to select for each button whether to be visible or not.

9. The DataTable control at runtime

The DataTable control displays the logged values of the selected signal in a tabular way. The control is divided in three main parts:

- options menu
- main view (grid of values)
- navigation

9.1. The options menu

	Copy Selection	This button activates only when one or more lines are selected from the data table. Copying to clipboard in Silverlight requires user permission.
	Settings	Allows the user to set up a configuration for the DataTable control and customize its appearance.
	Select time interval	Allows the user to select the time interval for displaying the data in the DataTable.
	Print data	Allows the user to print the data from the DataTable and tweak the printing settings.
	Export data	Allows the user to export the data from the DataTable to various file formats.

	Load configuration	Allows the user to load a configuration from the database.
	Save configuration	Allows the user to save the current configuration to the database.

9.1.1.Settings

The Settings window is organized in three tabs:

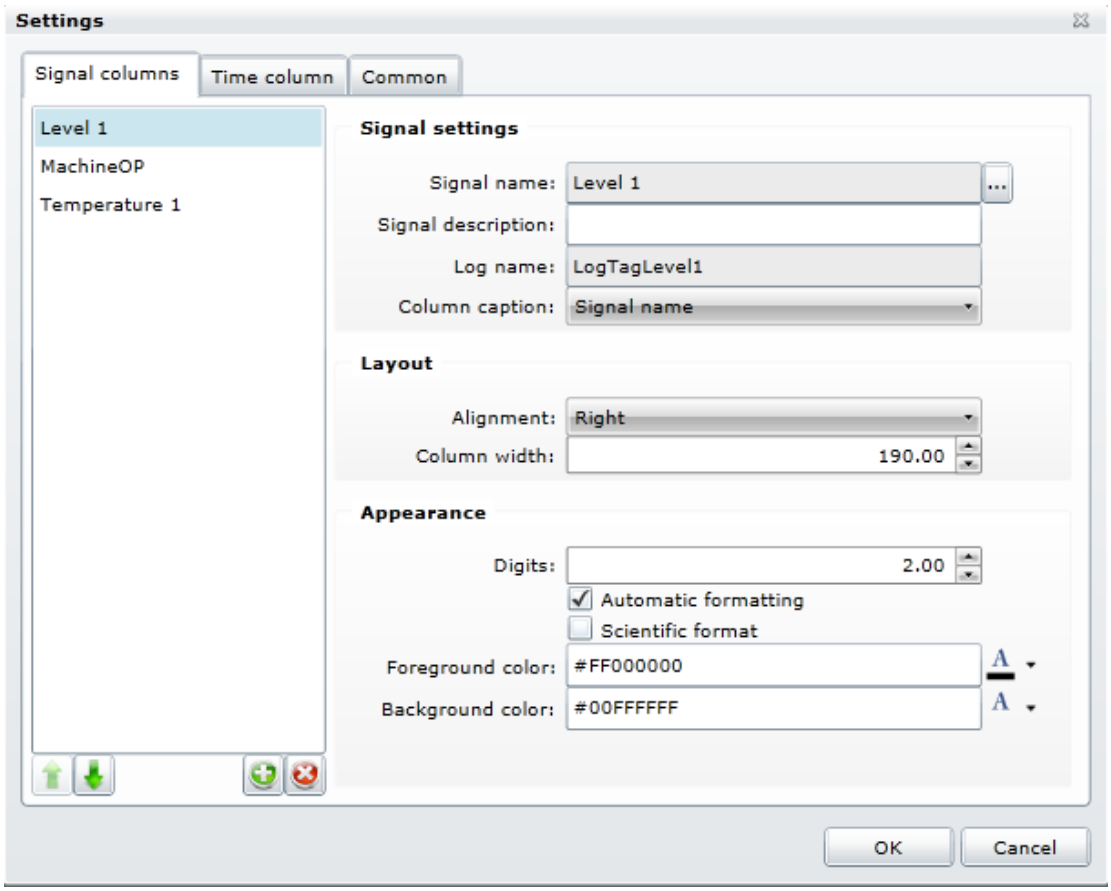
- Signal Columns
- Time Columns
- Common

9.1.1.1. Signal Columns

The signal management operation (add, delete, move up or down) are focused on the left side of this window, the right side displaying the signal details.

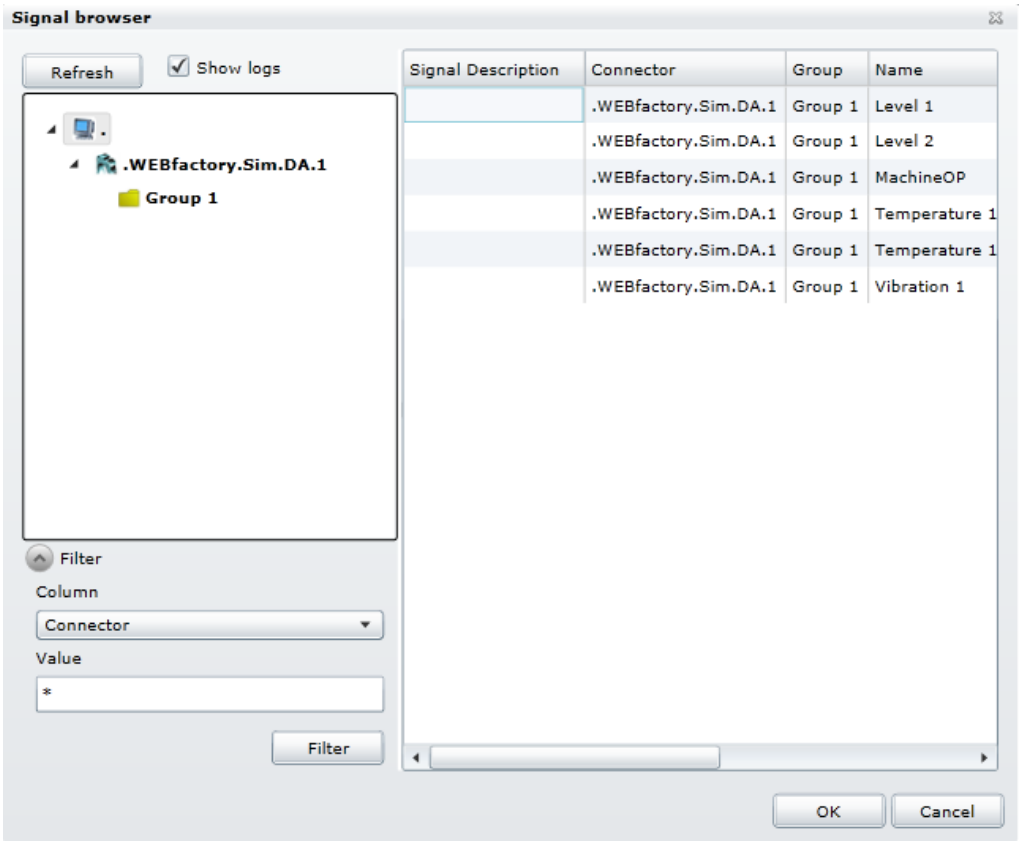
Using the bottom-left buttons the user can add, delete or move signals in the DataTable.

As the new signals are added, they will be listed above in the signals list. By selecting a signal from the list, the signal details can be edited.



Signal settings:

- Signal name – the user can select the signal name by clicking the browse  button. The Signal browser window will open, allowing the user to browse the connectors for signals.



- Signal description – the description of the signal can be added here.
- Log name – the name of the log assigned to the selected signal.
- Column caption – the tile of the column assigned to the signals value in the DataTable.

Layout:

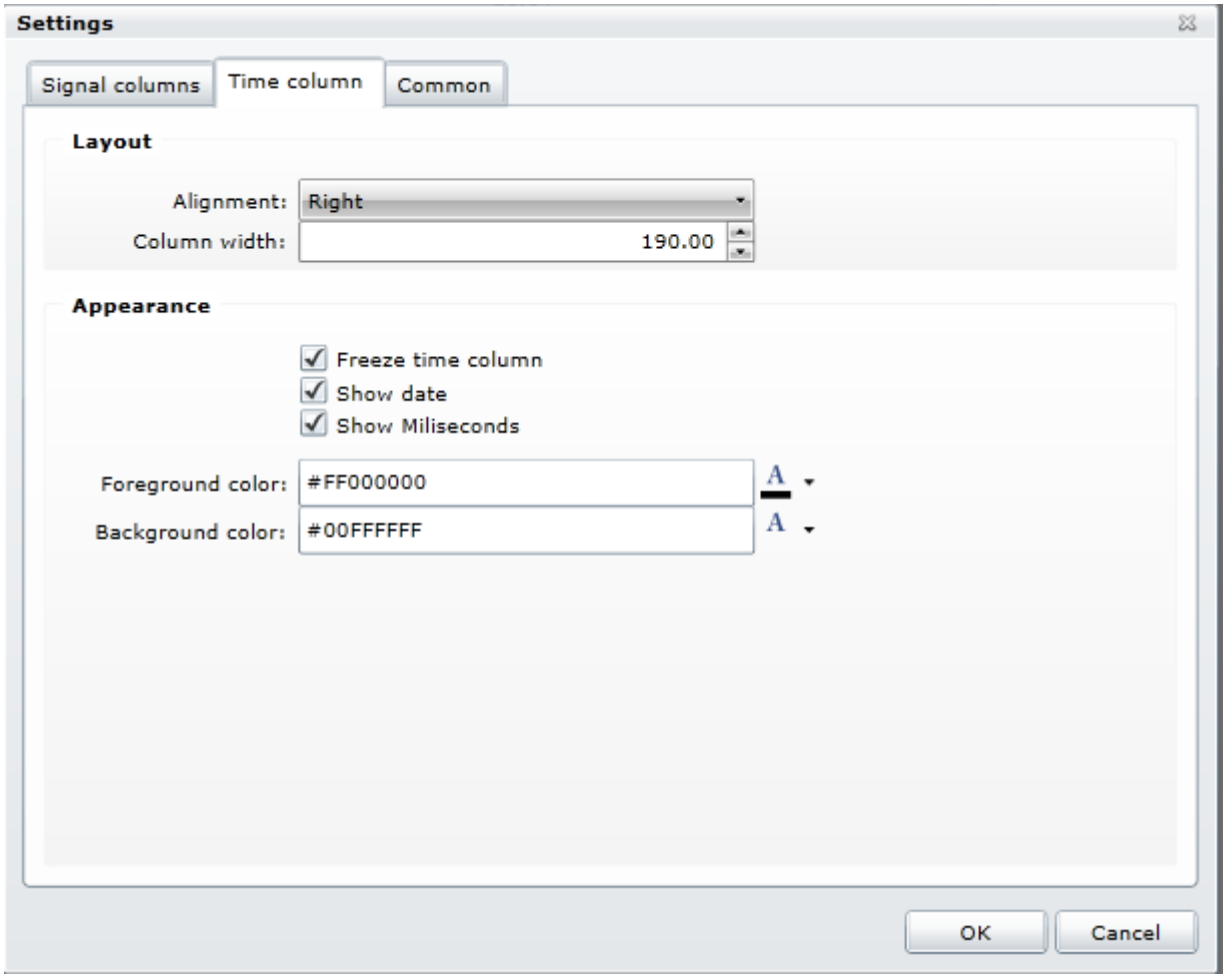
- Alignment – allows the user to set the default text alignment throughout the table.
- Column width – allows the user to set the default column width.

Appearance:

- Digits – allows the user to select the number of digits for the signal values.
- Automatic formatting – displays the values as they are stored in the data base. Overrides the Digits option.
- Scientific format – allows the user to select the scientific representation of the values.
- Foreground color – enables the user to select a custom color for the foreground of the control (text color).
- Background color – enables the user to select a custom color for the background of the control.

9.1.1.2. Time Column

The Time Column tab allows the user to make layout and appearance settings for the Time column of the DataTable.



Layout:

- Alignment – allows the user to select the alignment of the text inside the Time column.
- Column width – allows the user to select the width of the Time column.

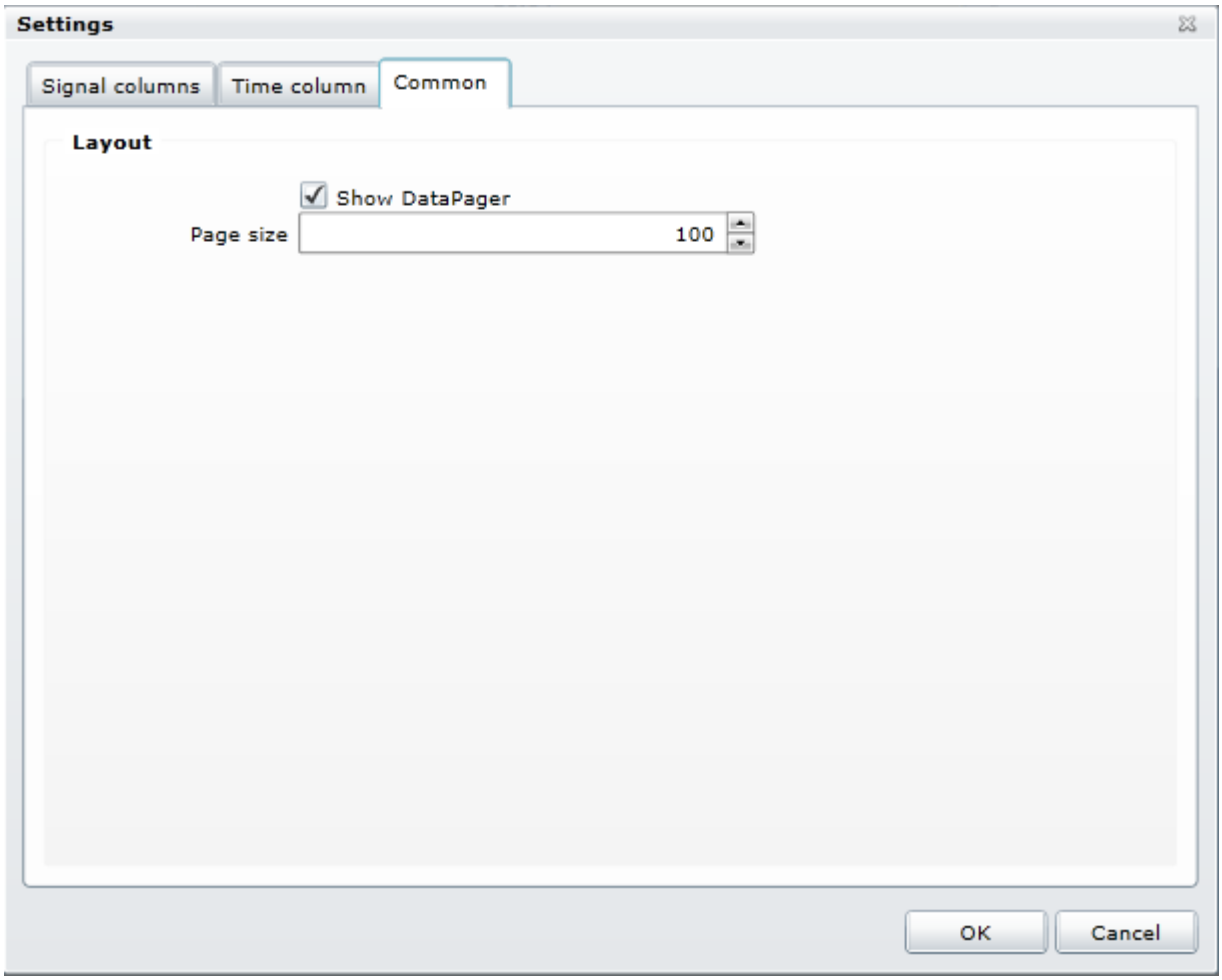
Appearance:

- Freeze time column – the time column stays fixed at the beginning of the table if the user scrolls horizontally through the table page.
- Show date – toggles the date on or off.

- Show Milliseconds – toggles the milliseconds on or off.
- Foreground color – enables the user to select a custom color for the foreground of the control (text color).
- Background color – enables the user to select a custom color for the background of the control.

9.1.1.3. Common

The Common tab offers the possibility to edit the page size and toggle on or off the DataPager.

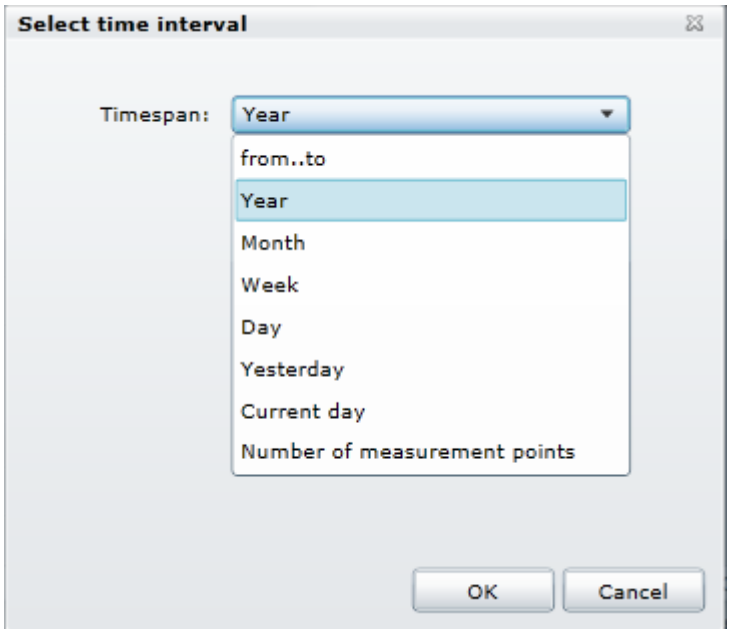


Layout:

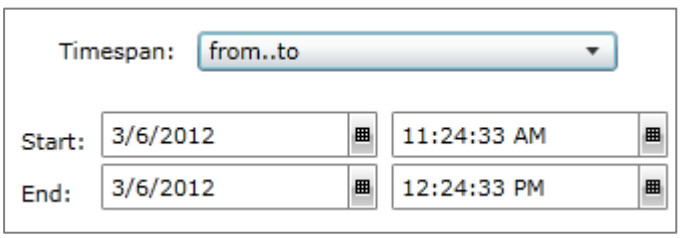
- Show DataPager – if on, this option will divide the DataTable entries in pages (the size of a page can be specified in the Page size option) and activates the navigation.
- Page size – allows the user to select the maximum number of lines to be displayed in one page. The maximum number is 100.

9.1.2.Select Time Interval

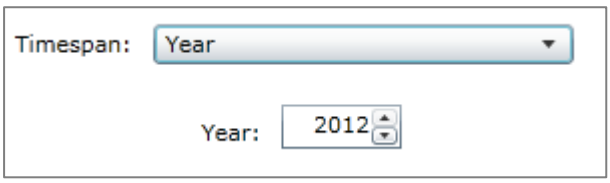
When selecting the Timespan option from the Time Interval dialog, the dropdown menu will list the options for displaying the data.



- From…to - allows the user to select a time range using exact start and end points. The logged data (historical data) from that period will be displayed in the main graphic.

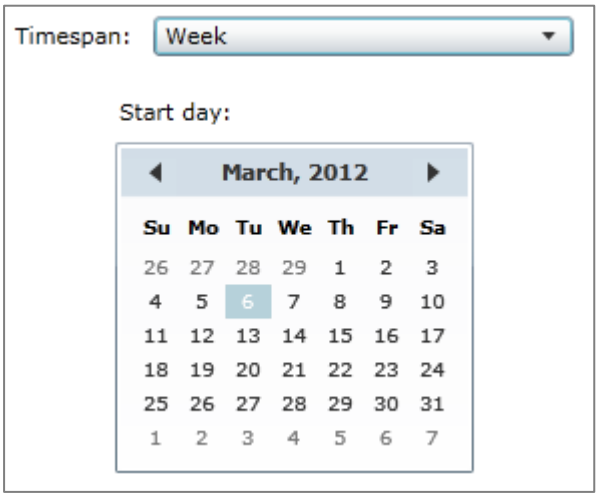


- Year – allows the user to select a specific year to be displayed in the timeline of the main graphic. This option will display the logged (historical) data from the whole year.

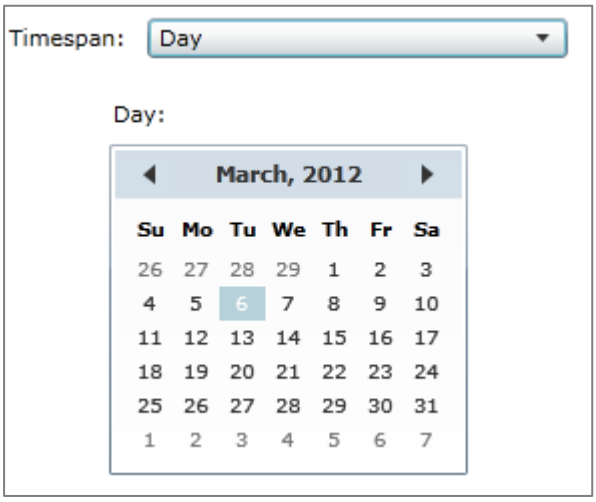


- Month – allows the user to select a specific month to be displayed in the timeline of the main graphic. This option will display the logged (historical) data from the whole month.

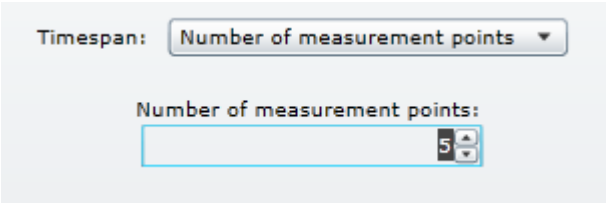
- Week – allows the user to select a specific week to be displayed in the timeline of the main graphic. This option will display the logged (historical) data from the whole week.



- Day – allows the user to select a specific day to be displayed in the timeline of the main graphic. This option will display the logged (historical) data from the whole day.

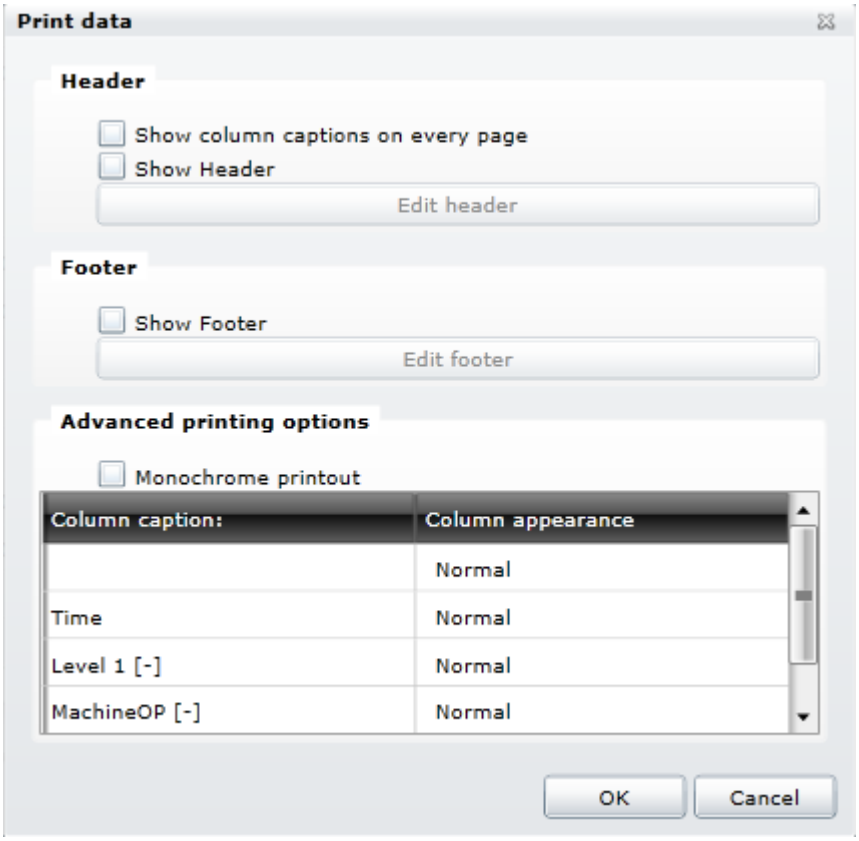


- Yesterday – displays the data from the day before the current day.
- Current day – displays the data from the current day, up to the point representing the current time of selection.
- Number of measurements points – displays the last X (value specified in the field) log recordings.



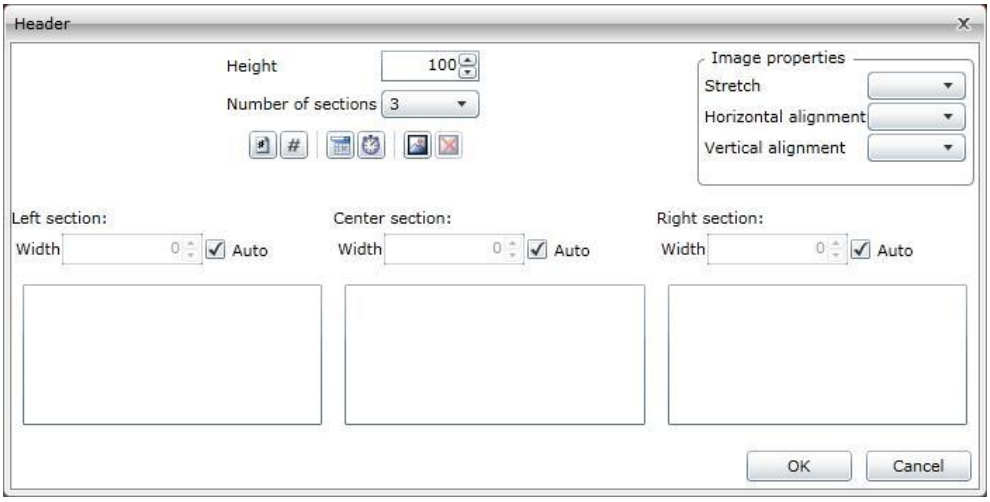
9.1.3.Print Data

The Print option allows the user to print the data content of the control, having the possibility to apply custom headers and/or footers to the page. Also, the possibility of printing the DataTable with column captions on each page is available.



Header:

- Show column captions on every page – displays the titles of the column on each printed page.
- Show Header – toggles the header on or off.
- Edit header – available only if the Show Header option in enabled.



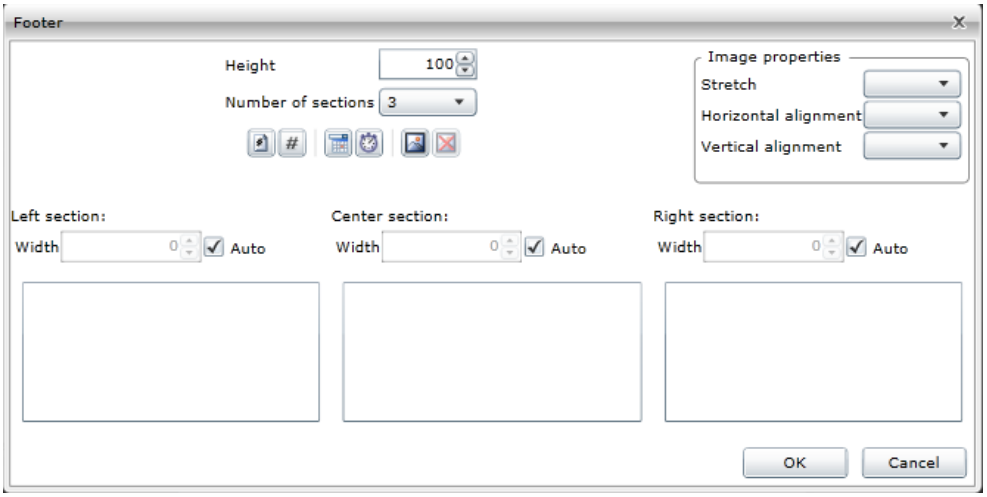
- Height - the height of the header/footer
- Number of sections - the number of sections the header/footer is divided in. The header/footer can have 1, 2 or 3 sections.
-  - inserts a page number placeholder
-  - inserts a total number of pages placeholder
-  - inserts a date placeholder
-  - inserts a time placeholder
-  - inserts an image
-  - deletes an existing image
- The width of the sections can be either set on auto or edited manually

Image properties

- Stretch - extends the image accordingly to one of the following settings: None, Fill, Uniform, UniformToFill
- Horizontal alignment - aligns the image horizontally
- Vertical alignment - aligns the image vertically

Footer:

- Show Footer – toggles the footer on or off.
- Edit Footer – available only if the Show Footer option in enabled.



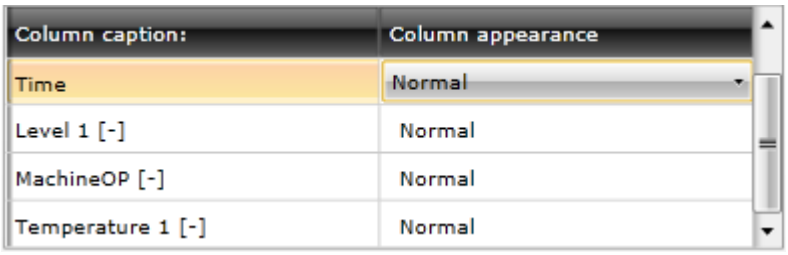
  - Height - the height of the header/footer
  - Number of sections - the number of sections the header/footer is divided in. The header/footer can have 1, 2 or 3 sections.
  -  - inserts a page number placeholder
  -  - inserts a total number of pages placeholder
  -  - inserts a date placeholder
  -  - inserts a time placeholder
  -  - inserts an image
  -  - deletes an existing image
  - The width of the sections can be either set on auto or edited manually

Image properties

  - Stretch - extends the image accordingly to one of the following settings: None, Fill, Uniform, UniformToFill
  - Horizontal alignment - aligns the image horizontally
  - Vertical alignment - aligns the image vertically

Advanced printing options:

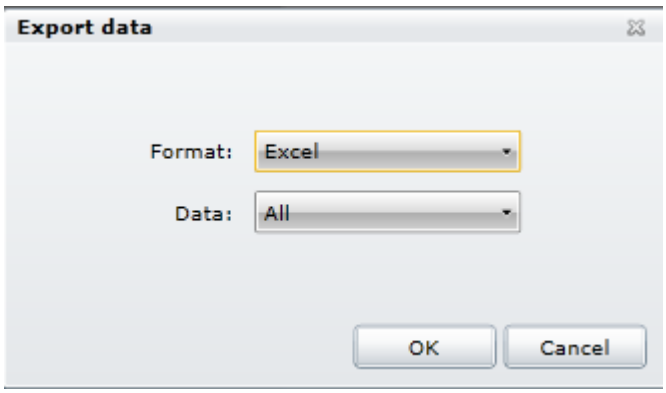
- Monochrome printout – toggles monochrome printing on or off.
- Advanced printing – allows the user to customize the appearance of each column. The options are Normal, Always Visible or Hidden.



  - Normal – the columns are printed normally on the page, from left to right, as the table fits to page.
  - Always Visible – preserves the column on each printed page. The time column can be useful when set to Always Visible.
  - Hidden – the hidden column is not printed.

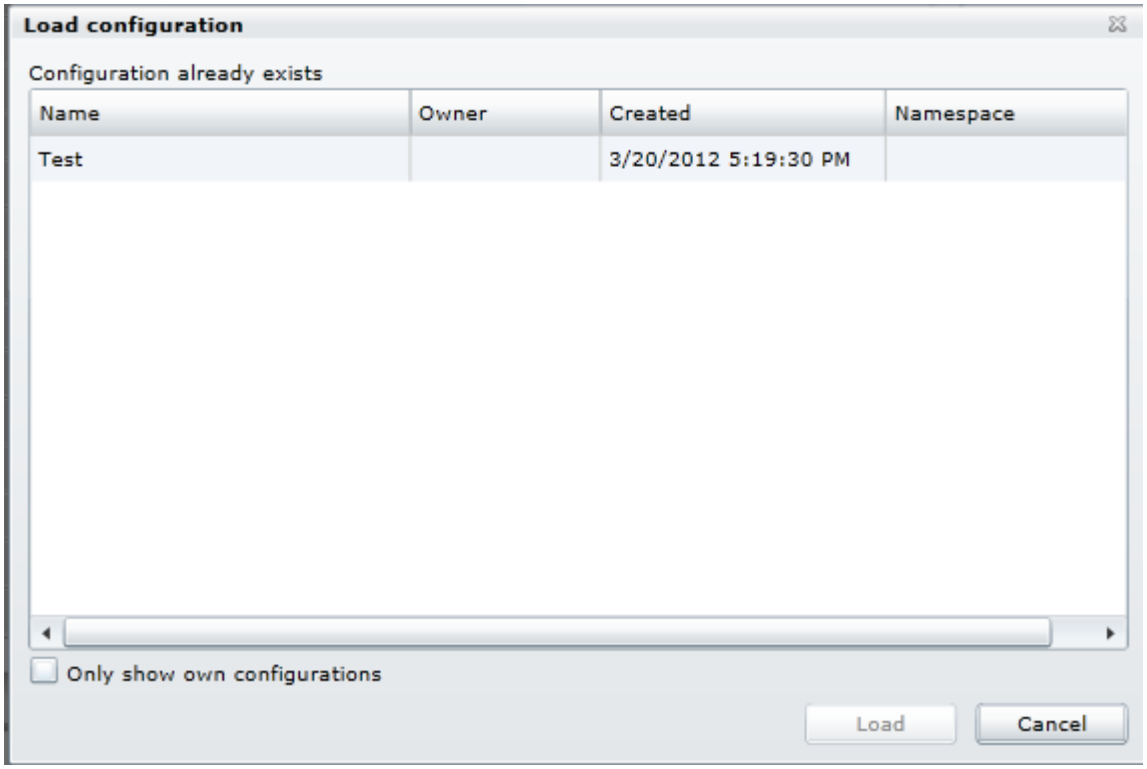
9.1.4.Export Data

The Export Data dialog allows the user to export all or just selected data from the DataTable control in several file formats: Excel, Excel XML, Word, Csv, Html.



9.1.5.Load Configuration

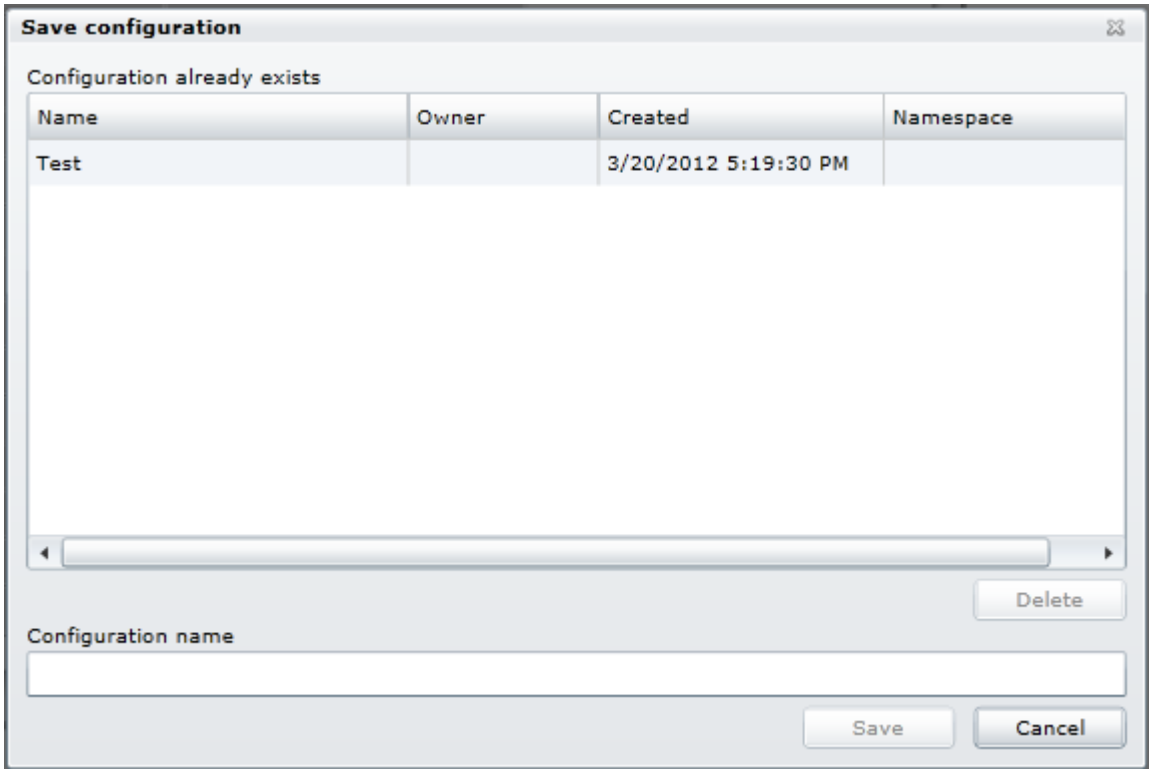
Load Configuration option allows the user to load an existing configuration from the database.



The Load Configuration dialog provides a simple filtering option, the Only show own configurations. When enabled, the Load Configuration window will list only configurations owned by the current user.

9.1.6.Save Configuration

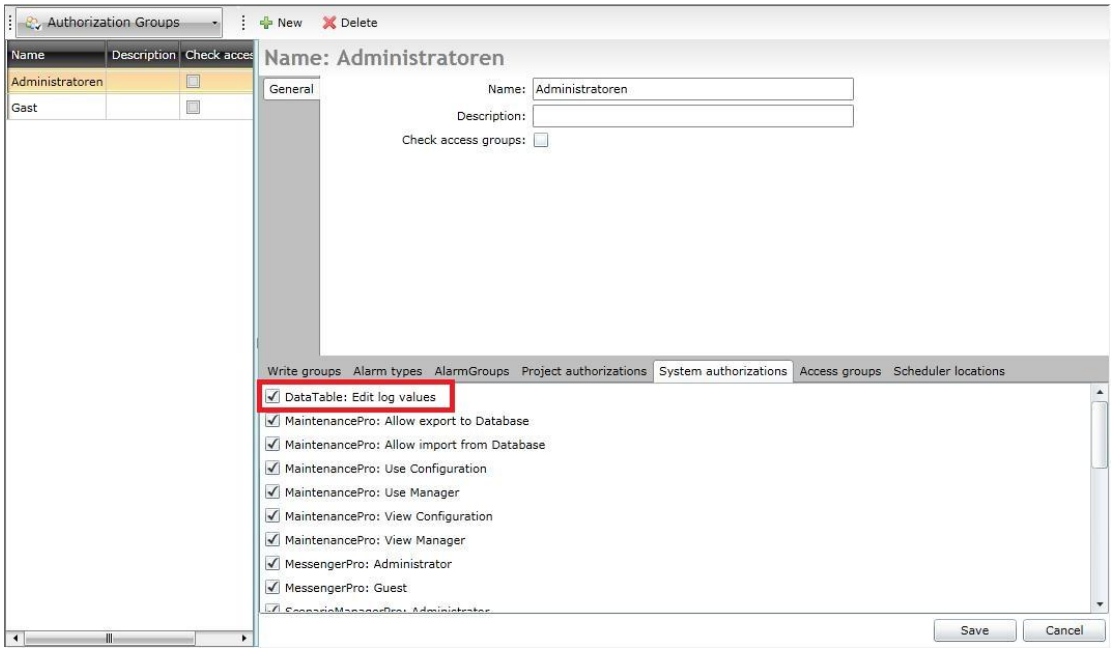
The Save Configuration option allows the user to save the current configuration to the database. The saved configuration can be loaded later using the Load Configuration option, or can be set as default user configuration at design time.



9.1.7.Editing logged values

The DataTable control allows the user to edit the logged values if the user has the required System Authorization – DataTable: Edit log values.

The Edit log values system authorization is granted Authorization Groups in WEBfactory User Manager.

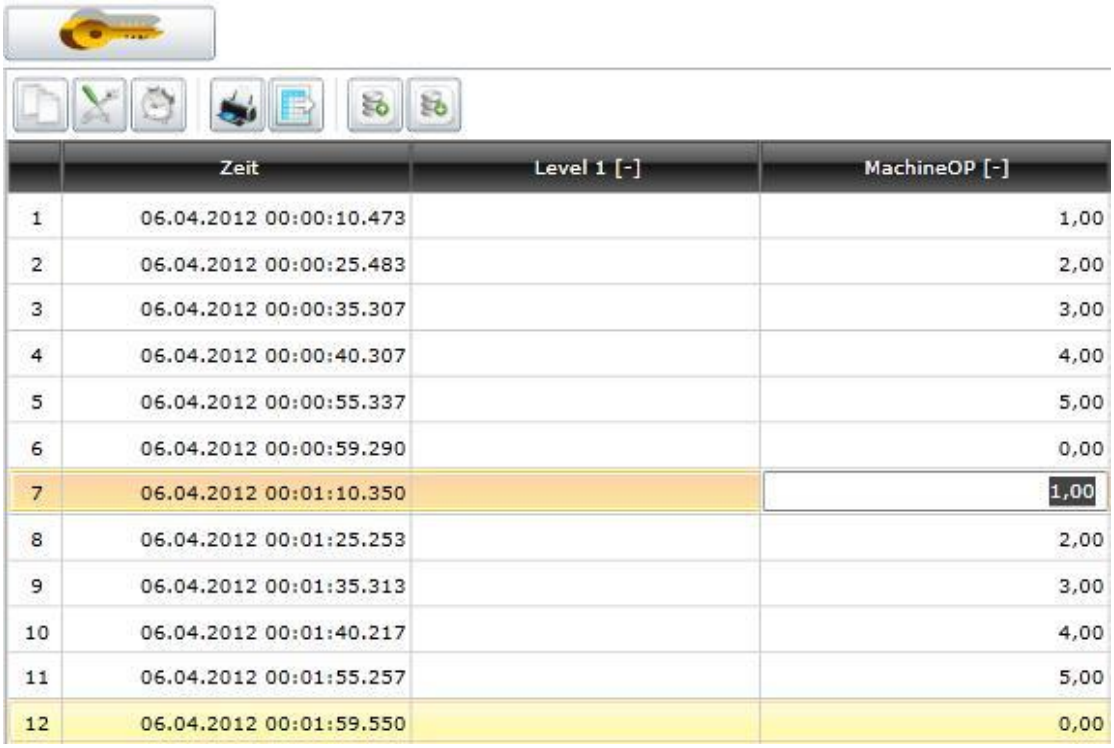


If the user belongs to an Authorization Group that has the DataTable: Edit log values System Authorization, the DataTable values can be edited.

The edited values will not overwrite the log value, but they will be stored separately (EditedLoggingValue if the value input can be converted to double or EditedLoggingValue2 if the value cannot be converted to double).

The edited value will be visible in the DataTable control only, and will not affect the historical data represented by the Trending control. The edited values will be marked by the symbolic text FSN_DataTable_WFDataTable.editedLogValue, placed as a suffix.

To edit logged values in DataTable, the user must be logged in the application using credentials that have the required system authorization. After logging in, the user will be able to double-click any data cell from the DataTable grid and edit the values. The editing will be confirmed upon pressing Enter.



	Zeit	Level 1 [-]	MachineOP [-]
1	06.04.2012 00:00:10.473		1,00
2	06.04.2012 00:00:25.483		2,00
3	06.04.2012 00:00:35.307		3,00
4	06.04.2012 00:00:40.307		4,00
5	06.04.2012 00:00:55.337		5,00
6	06.04.2012 00:00:59.290		0,00
7	06.04.2012 00:01:10.350		1,00
8	06.04.2012 00:01:25.253		2,00
9	06.04.2012 00:01:35.313		3,00
10	06.04.2012 00:01:40.217		4,00
11	06.04.2012 00:01:55.257		5,00
12	06.04.2012 00:01:59.550		0,00

After a value is edited, the suffix Edited (FSN_DataTable_WFDataTable.editedLogValue) will be displayed in the data cell.

6	4/6/2012 12:00:59.290 AM		0.00
7	4/6/2012 12:01:10.350 AM		2Edited
8	4/6/2012 12:01:25.253 AM		2.00

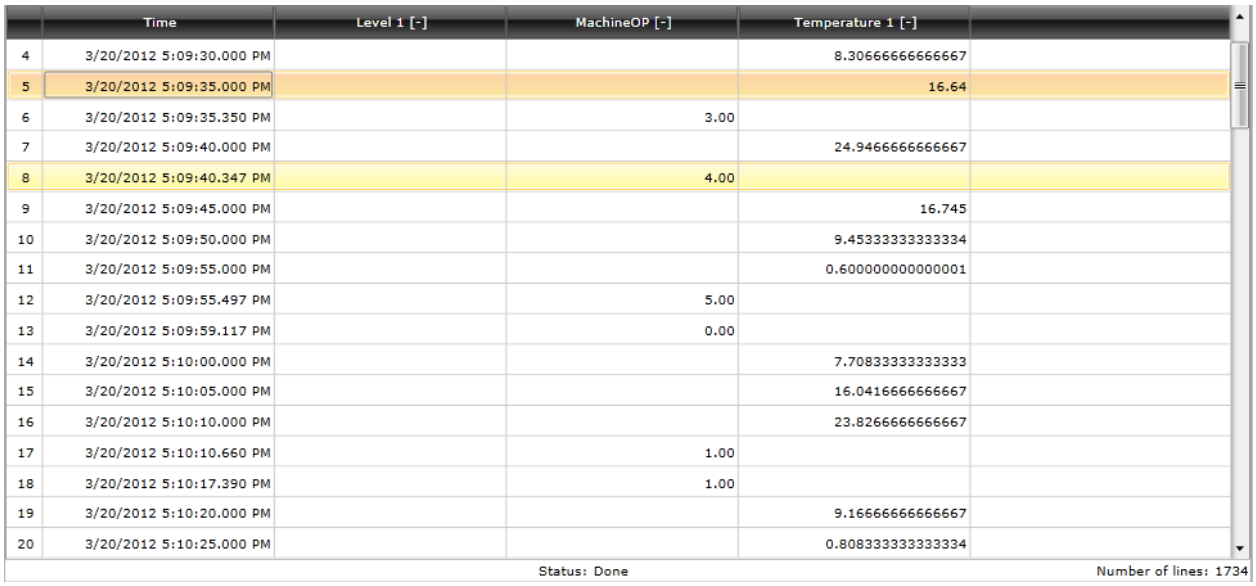
More information regarding the User Manager and System Authorizations can be found at http://webfactory-support.de/assets/documentation/Default.htm.

Click here for more information on System Authorizations and User Manager.

9.2. DataTable main view

The main view of the DataTable control consists in a grid of values logged at a specific time. The columns displayed by the grid of values are the time column and the signal columns.

The columns are customizable, the customization options being available in the Settings dialog.



	Time	Level 1 [-]	MachineOP [-]	Temperature 1 [-]	
4	3/20/2012 5:09:30.000 PM			8.30666666666667	
5	3/20/2012 5:09:35.000 PM			16.64	
6	3/20/2012 5:09:35.350 PM		3.00		
7	3/20/2012 5:09:40.000 PM			24.9466666666667	
8	3/20/2012 5:09:40.347 PM		4.00		
9	3/20/2012 5:09:45.000 PM			16.745	
10	3/20/2012 5:09:50.000 PM			9.45333333333334	
11	3/20/2012 5:09:55.000 PM			0.600000000000001	
12	3/20/2012 5:09:55.497 PM		5.00		
13	3/20/2012 5:09:59.117 PM		0.00		
14	3/20/2012 5:10:00.000 PM			7.70833333333333	
15	3/20/2012 5:10:05.000 PM			16.0416666666667	
16	3/20/2012 5:10:10.000 PM			23.8266666666667	
17	3/20/2012 5:10:10.660 PM		1.00		
18	3/20/2012 5:10:17.390 PM		1.00		
19	3/20/2012 5:10:20.000 PM			9.16666666666667	
20	3/20/2012 5:10:25.000 PM			0.808333333333334	

Status: Done Number of lines: 1734

All DataTable's columns can be sorted ascendant or descendant by clicking on the column header.

The Index column marks the line number. The total number of lines displayed by the control is listed at the bottom-right side of the main view.

The status indicator is displayed at the bottom of the main view.

9.3. DataTable navigation

The navigation controls of the DataTable are displayed only when the Show DataPager option is enabled (Settings > Common).

The navigation controls are placed below the main view (the grid of values), and allow the user to navigate through the DataTable pages.

10. Accessing the DataTable web services using HTML and JavaScript

Accessing the webservices using HTML and JavaScript is possible by using additional scripts. Follow this link to download the necessary scripts.

IMPORTANT: The jquery.ajaxdotnet.js script needs to be downloaded from our source. This version has an error handling bug fix which is not available in the original version of the script.

IMPORTANT: In order to work, the HTML file and the scripts need to be accessed using IIS and need to have the same protocol, host and port as the web services.

In order to access the scripts, the head of the HTML file must contain the links to the external scripts:

```
<script src="Scripts/jquery-1.5.1.min.js" type="text/javascript"/>
<script src="Scripts/json2.min.js" type="text/javascript"/>
<script src="Scripts/jquery.ajaxdotnet.3.js" type="text/javascript"/>
<script src="Scripts/knockout-2.0.0.js" type="text/javascript"/>
<script src="Scripts/helpers.js" type="text/javascript"/>
```

Besides the provided scripts, the HTML file must contain the actual code that will access the web service and retrieve the data. The web service call can be wrapped inside a function for easier usage:

```
function GetLogValues(arguments, successCallback, errorCallback){
$.ajaxDotNet("/_WEBFACTORY/WebServices/WCF/SignalsService.svc/js/GetLo
gValues",
                {
                    data: arguments,
                    success: function (data) {
                        successCallback(data.d);
                    },
                    error: function () {
                        errorCallback();
                    }
                }
            );
    }
```

The above function calls the GetLogValues method from the SignalService web service.

The GetLogValues function defined above will require additional filters in order to get the data properly from the web service:

```
GetLogValues({
            filter:{
                        LogIDs: ["299F590C-A740-4B7C-A762-802E3F208FA5"],
                        StartDate : {
                            DateTime: new Date(1900,0,0).toMsJson(),
                            OffsetMinutes: 0
                        },
                        EndDate : {
                            DateTime: new Date().toMsJson(),
                            OffsetMinutes: 0
                        },
                        MaxResults: 5,
                        SortOrder: 4
            }
        }
```

The values are written in the HTML table using JavaScript:

```
function(result){

                for(var i = 0; i<result.length;++i){
                    var item = result[i];
                    var cells = "";
                    cells += "<td>"+item.EntriesDate+"</td>";
                    cells += "<td>"+item.Values[0].EditedValue+"</td>";
                    cells += "<td>"+item.Values[0].EditedValue2+"</td>";
                    cells += "<td>"+item.Values[0].Value+"</td>";
                    cells += "<td>"+item.Values[0].Value2+"</td>";
                    $(".logValues tbody").append("<tr>"+cells+"</tr>");
                };

            }
```

If the GetLogValues method fails to retrieve the correct data, the following function executed:

```
function(){
                alert("Error");
            }
```

The Head of the HTML file should look like this:

```
<head>
    <meta charset="utf-8" />
    <script src="Scripts/jquery-1.5.1.min.js"
type="text/javascript"></script>
    <script src="Scripts/json2.min.js" type="text/javascript"></script>
    <script src="Scripts/jquery.ajaxdotnet.3.js"
type="text/javascript"></script>
    <script src="Scripts/knockout-2.0.0.js"
type="text/javascript"></script>
    <script src="Scripts/helpers.js" type="text/javascript"></script>

    <script type="text/javascript">
    function GetLogValues(arguments, successCallback, errorCallback){

$.ajaxDotNet("/_WEBFACTORY/WebServices/WCF/SignalsService.svc/js/GetLogVal
ues",
                {
                    data: arguments,
                    success: function (data) {
                        successCallback(data.d);
                    },
                    error: function () {
                        errorCallback();
                    }
                }
            );
    }

    $(document).ready(function(){

        GetLogValues({
            filter:{
                        LogIDs: ["299F590C-A740-4B7C-A762-802E3F208FA5"],
                        StartDate : {
                            DateTime: new Date(1900,0,0).toMsJson(),
                            OffsetMinutes: 0
                        },
                        EndDate : {
                            DateTime: new Date().toMsJson(),
                            OffsetMinutes: 0
                        },
                        MaxResults: 5,
                        SortOrder: 4
            }
        },function(result){
                for(var i = 0; i<result.length;++i){
                    var item = result[i];
                    var cells = "";
                    cells += "<td>"+item.EntriesDate+"</td>";
                    cells += "<td>"+item.Values[0].EditedValue+"</td>";
                    cells += "<td>"+item.Values[0].EditedValue2+"</td>";
```

```
                    cells += "<td>"+item.Values[0].Value+"</td>";
                    cells += "<td>"+item.Values[0].Value2+"</td>";
                    $(".logValues tbody").append("<tr>"+cells+"</tr>");
                };

            },
            function(){
                alert("Error");
            });
    });
        /*ko.applyBindings(viewModel);*/

</script>
</head>
```

The body of the HTML file will contain the table:

```
<body>
    <h1>Data Table</h1>
    <table class="logValues">
        <thead>
            <tr>
                <th>EntriesDate</th>
                <th>EditedValue</th>
                <th>EditedValue2</th>
                <th>Value</th>
                <th>Value2</th>
            </tr>
        </thead>
        <tbody >
            <tr>
                <td />
                <td />
                <td />
                <td />
                <td />
            <tr>
        </tbody>
    </table>
</body>
```