# Chapter 4. Working With Graphs

Chapter 4. Working With Graphs ..... 1
4.1 The graphs window ..... 2
4.2 Graph configuration ..... 12
4.3 Technical Analysis Instruments ..... 43
4.4 Methods of Technical Analysis ..... 55
4.5 Bonds Yield Graph ..... 90

This section describes working with charts, instruments, and methods of technical analysis.

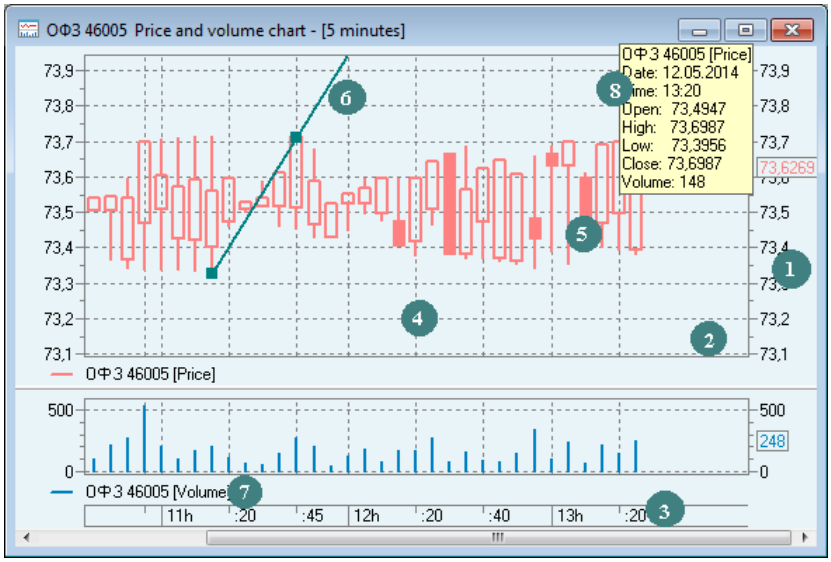
# 4.1 The graphs window

menu **Create window/ Chart...** or button

> **The Charts window is designed for graphical representation of changes in indices during a trading session.**

### 4.1.1 Window format

The program window in which graphs are drawn is named a chart and looks as follows:




The graph window allows for the application of the linked windows mode (for details, see Chapter 2, “Basic Operating Principles”, sub-section 2.7).

Diagram elements:

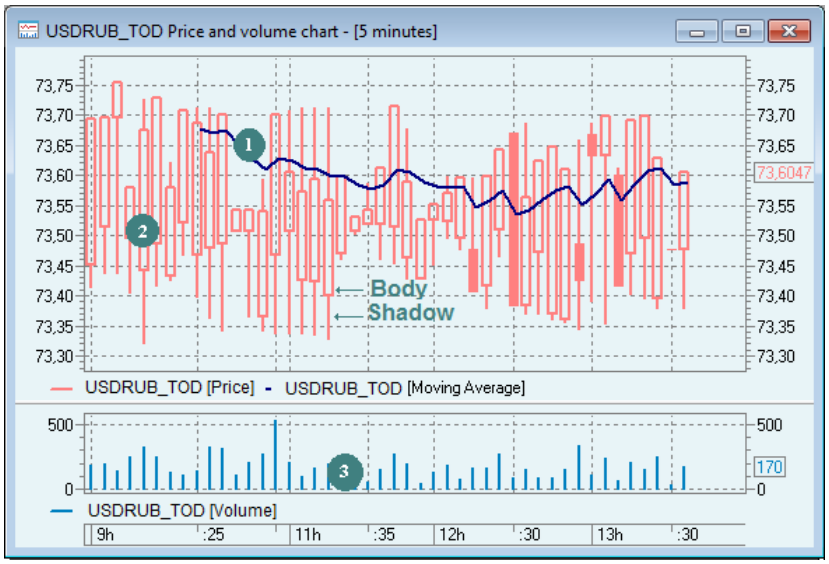
1. **The chart window.** A chart can be separated vertically into several windows that have the same time scale. You can create graphs of different parameters in different windows (for example, display Last trade price changes in one window and Last traded volume changes in another window). The window's proportions can be changed by moving the separator between windows. A single chart can include up to 15 windows.
2. **The plotting area.** The area within the window where graphs are displayed.
3. **Scale.** The plotting area includes reference axes: the horizontal time scale and the vertical (left and right) scales that represent the range of values of the chart variables. The vertical scale of the left and right axes can be different for convenient display of graphs of different variables in one window.
4. **Grid.** The grid divides the plotting area into equal intervals both horizontally and vertically. The grid step is equal to the step of the relevant scale.
5. **Graph.** The graph displays the value of the parameter as function of time. There are different types of graphs provided for different parameters. One chart may include up to 15 charts.
6. **Trend.** A line that indicates a general direction in which the parameter changes.

7. **Legend.** The graph caption that defines the correspondence between lines in a chart and the parameters.
8. **Tooltip.** The pop-up window with numerical data for a particular segment of a graph. Appears when the cursor hovers over a graph.

### 4.1.2 Chart types

Depending on time:

1. **Tick.** A new segment is drawn every time the parameter is changed. For example, for the Prices graph, every time a trade is completed.
2. **Interval.** A new segment of a graph is drawn at equal time intervals. Current variations of a parameter are displayed through changing of the graph's last segment appropriately.




Depending on line types:

1. A **Line chart** is a graph in the form of a broken line **(1)** in which data points represent the parameter values at particular points in time or the last parameter value within the time interval (for interval graphs).
2. A **Candlesticks chart** is a 'Japanese candlestick' chart **(2)**. It is used to display trade prices. Each graph segment represents a special element (candlestick) with the following meaning:

   - **Body** of a candlestick is a rectangle that depicts price change between the beginning of a period (the opening price) and the end of that period (the closing price). If a candlestick is colored, this means that the trade price has decreased, if not, the trade prince has increased;
   - **Shadow** or **Candlewick** is a thin line that indicates the range of trade price fluctuations over a period of time. The upper end of the line shows the highest trade price, the lower end shows the lowest price.

> **The edges of a candlestick's body and the shadow may coincide. For example, if a colored candlestick has no upper shadow, this means that the opening price matched the highest trade price within this time period.**

> **When several charts are displayed in the same plotting area, charts are shifted by 1-2 pixels horizontally relative to each other to avoid overlapping of 'candlewicks' of different graphs.**

3. A **Histogram** is a graph consisting of columns **(3)**. It is used to display trade volumes. The column's height indicates the trade volumes within a period of time.
4. A **Bar** chart, also called a linear graph, is a graph consisting of bars. Each element of the graph is a vertical segment whose ends correspond to the maximum and minimum price values for a time period. Two short horizontal lines indicate the opening price (to the left of the vertical segment) and the closing price.

### 4.1.3 Methods of creating new charts

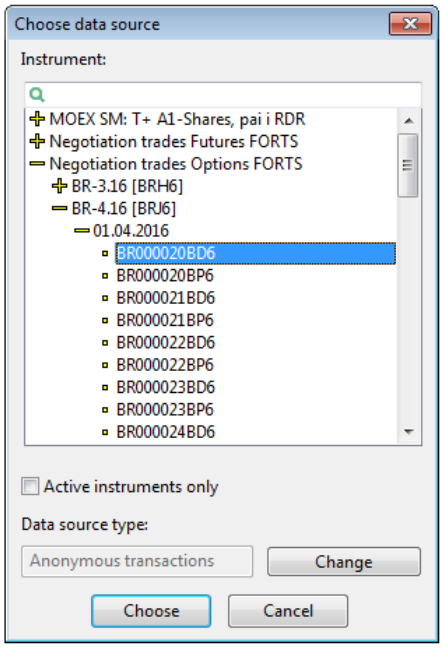
There are two ways to plot a chart:

- Quick – by selecting the shortcut menu item of creating a graph in any table;

> **When creating a chart from Quotes table, parameter and the instrument are determined by the cell from which the shortcut menu was called.**

  A chart window with settings from a template will open.
- Step by step – the Graph wizard helps you to create a new chart with arbitrary settings (the default parameters are defined in a template). To create a chart using the Graph wizard, follow these steps:

  - Create a new chart by one of the following ways:
    - Select the menu item **Create window / Chart…;**
    - Use button on the toolbar;
    - Select the program's menu item Action / New chart… in the active window of the chart.
  - Select a data source for the chart from the list of available items.

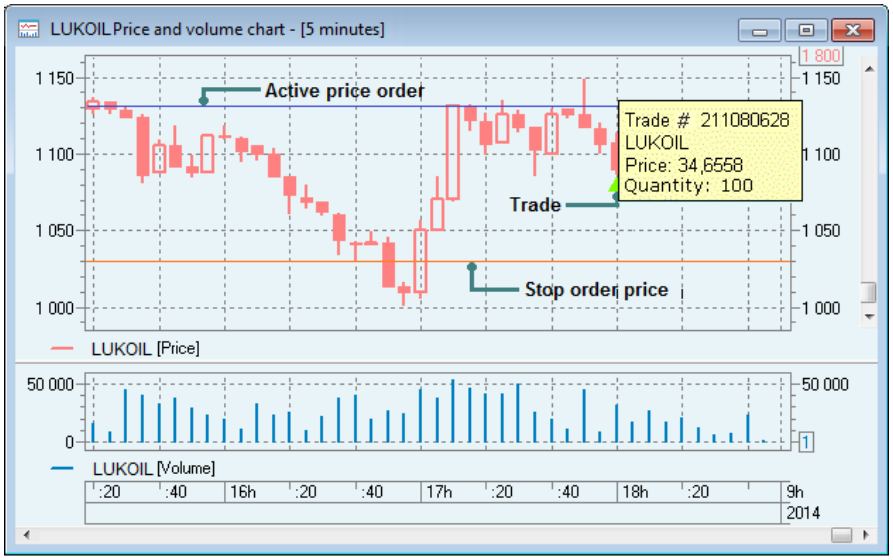



**If the text entered in the search box is included to the class name, then all instruments of this class are displayed in the search results.**

- Select a source type for the chart:
  - From the Time and Sales table;
  - From Quotes history table.

**In addition, a new graph can be created through copying an existing graph by pressing Ctrl+N.**

### 4.1.4 Displaying orders and trades in a graph




Active orders, stop orders, and trades of the user can be displayed in the graph window.

Orders and stop orders are displayed on a graph as colored horizontal lines that correspond to the price levels of orders.

Trades are displayed as triangles:

- Buy trades are marked with an upturned triangle,
- sell trades are marked with a downturned triangle.

When the cursor hovers over an indicator (on a triangle or line), a tooltip window with the following values will pop up: the trade number, instrument, type of trade (buy or sell), price and volume.

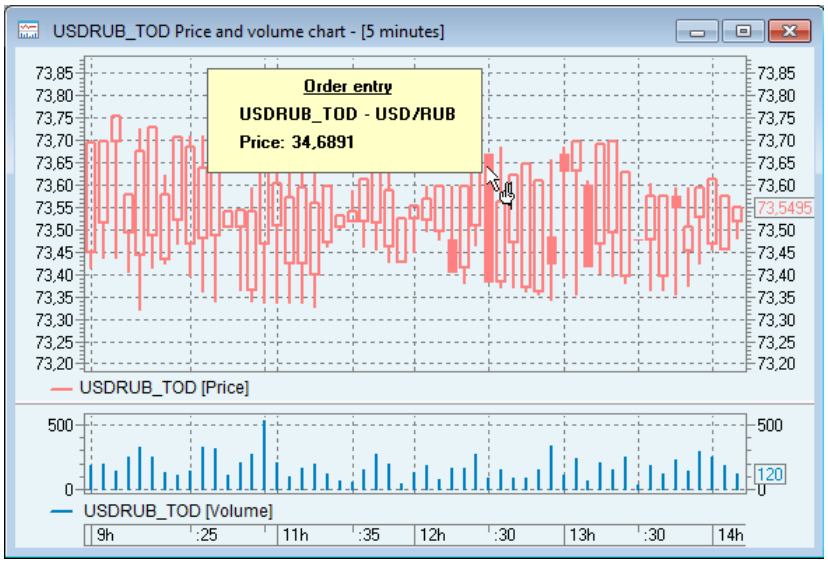
For more information about display settings for orders and trades, see 4.2.3.

### 4.1.5 Entering orders from the Charts window

You can enter orders from the **Charts** window using one of the following methods:

1. On a graph, hover the cursor over the candlestick's body and left-click on it while holding down the Ctrl key.
2. Enable the order entry mode from the chart window by clicking on the **Charts** toolbar. In this case, the order entry window opens when you click on the chart.
3. Select **New order** / **New stop order** from the shortcut menu on a line or on graph's legend.

Using methods **(1)** and **(2)** requires pressing and holding the left mouse button. This displays the **Order sending** tooltip showing the instrument name and the price that corresponds to the cursor position on the chart. You can select the desired order price by moving the cursor up or down.




Then release the left mouse button. At that the order entry window with the selected price value appears on the screen. The **Instrument** field is automatically filled in by name of the instrument that was displayed on the graph that you clicked on to open the order form. Other fields contain the default settings.

To quit the order entry mode, just move the cursor outside of the charts window and release the left mouse button once the cursor turns into the **Cancel** icon.

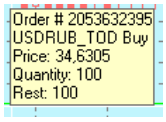
1. **Orders can be entered only when you are connected to the server.**
2. **The Client Code field can be automatically filled in:**

- with the value specified in the program settings (the Client code field in the Trading section under **System / Settings / General settings**...);
- with the value specified in the 'global filter', if only one client code is selected in that filter and the 'Use global filter' checkbox is selected in the chart settings when displaying the trading operations.

### 4.1.6 Managing orders with the mouse cursor

**Order parameters**

When the cursor hovers over the order line, the tooltip with the order parameters appears. The cursor changes its appearance as shown in the image. Lines of stop orders display the parameters of stop orders.




The **Take-profit and stop-limit** orders are displayed on graphs as two lines of the same color. When the cursor hovers over such a line, a tooltip pops up. For orders with the **Stop-limit** condition, the tooltip displays **Stop-limit** parameters. For orders with the **Take-profit** condition, the tooltip displays **Take-profit** parameters.

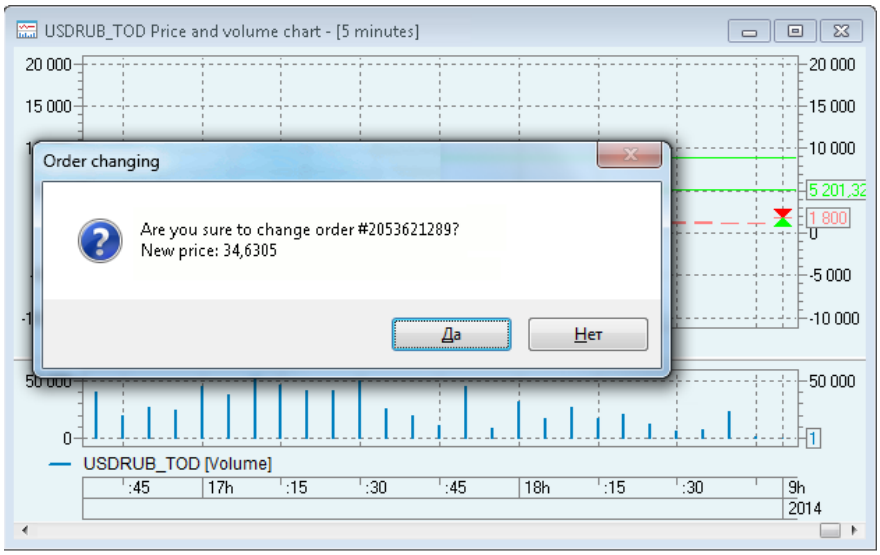
If the condition includes **At market price** parameter, the tooltip displays the **At market price** value instead of the **Price** and the **Protective spread** parameters. If the **Take-profit** order activation price and the **Stop-limit** condition price are the same, only one line is displayed on the graph, and the tooltip includes parameters of both order conditions.

Take-profit and stop-limit
Stop order # 100099
LUKOIL Buy
Condition instrument: LUKOIL
Take-profit Stop price: 5 458,5
Offset from min: 0,5 (in price units)
Spread: 0,5 (in price units)
Stop-limit Stop price: 5 458,5
Price: 5 340
Quantity: 50
Rest: 50

**Order entry**

Description of an order entry from the chart window is given in 4.1.5.

**Replacing and cancelling order**




If display of horizontal lines corresponding to prices of active orders and stop orders is enabled in the Charts window (see 4.2.3), you can replace an order by moving the corresponding line with the mouse cursor.

To replace an order using an exchange transaction, enable the **Amend order by trading system** and **Amend order by trading system if possible** check boxes (menu **System / Settings / General settings**, section **Trading / Orders / Order amendment**). If the **Amend order by trading system if possible** check box is clear and the user amends an active order, this order is cancelled and a new order is placed with changed parameters.

Press and hold down the left mouse button and drag the line up and down the chart:

1. Moving the line up replaces the active order with a new one and increase its price to the specified level.
2. Moving the line down replaces the active order with a new one and decrease its price to the specified level.
3. Moving the cursor outside of the current graph plotting area cancels the active order.

You can move the lines of **Stop-limit** and **Stop price by another instrument** conditional orders, as well as the lines of orders with the 'If done' conditions while holding the Ctrl key down or without doing it. The following options are possible:

- If you move a line when the Ctrl key is pressed, both the stop price and the price of the limit order placed upon execution of the conditional order change;
  In case of **Stop-limit** conditional orders and 'If done' orders, both prices change by the same amount equal to the difference between the old and new stop prices. The prices change in the same way when you move a line of a conditional order of the **Stop price by another instrument** type if the stop price instrument and the stop order instrument are the same. Otherwise, when the instruments are different, the stop order price changes by the same percentage as the stop price;
- If you move a line when the Ctrl key is not pressed, only the stop price value changes, and the price of the limit order created upon execution of the conditional order remain unchanged.

You can move the lines of conditional orders of the **Take-profit and stop-limit** and **Take-profit and stop-limit placed upon execution of an active order** types while holding the Ctrl key down or without doing it:

- When a take-profit line is moved, the old stop order is cancelled and a new one with a new take-profit stop price is created; the other conditions of the order remain unchanged. In this case, it does not matter whether you press the Ctrl key or not;
- When a stop-limit line is moved, the old stop order is cancelled and a new one with a new stop price of the stop-limit is created. If the Ctrl key is held down, both the stop price and the order price change by the value equal to the difference between the old and the new stop price of the stop-limit.

Replacement or cancellation of an order must be confirmed by user.

If, after moving a stop order line, the new stop price value is not a multiple of the price step for this instrument class, the stop order price is automatically rounded to the closest multiple according to the rules of arithmetic rounding. When moving, the order line is displayed on graph with a new price multiple to the price step selected for given instrument class.

If the instrument for the condition of a **Stop price by another instrument** order is different from the instrument of the stop order to be placed, when you move the line of that conditional order while holding the Ctrl key down, the stop order price is automatically rounded to the closest multiple according to the rules of arithmetic rounding.

If acceptable price ranges were set for the instrument specified in a conditional order (the **System / Settings / Instrument parameters**... menu), then, when the stop order line is moved, the new price value is checked against the set price ranges. When the price goes outside the allowable range, an error message appears and the order is not moved. In this case, retry the operation but select a price within the allowable range.

When a partially filled stop order with a linked order type is replaced, the volume of the new stop order and of the limit order dependent on it is equal to the unfilled volume of the contingent limit order that is being replaced.

> **Important points to be aware of when replacing orders 'with a linked' type:**

Orders of this type are integrated orders that consist of two orders of the same direction: a stop order and a limit order (for details, see Chapter 5, “Client Operations”, sub-section 5.5). When such a stop order is replaced by moving its line on a graph, only the stop price of the conditional order is replaced; the price of the limit order dependent on it remains at the old level. If a limit order line is shifted, the linked stop order is cancelled. If the Ctrl key is pressed when you move a stop order line or limit order line, both linked orders will be replaced. In this case, the stop price, the price of the stop order and the price of the linked limit order will be changed by the same value equal to the difference between the values of the old and the new price of the order whose line was moved.

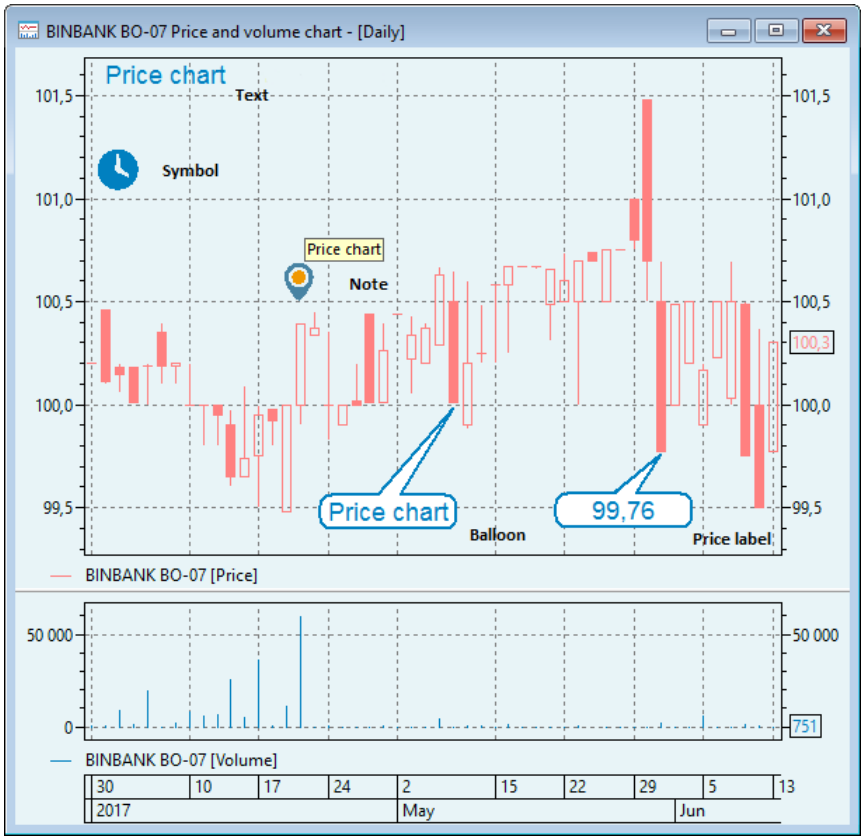
Important points to be aware of when replacing 'If done' conditional orders
When an active order is replaced, all conditional 'If done' orders that are contingent on the replaced order is cancelled.

When a partially filled conditional 'If done' order is replaced, the volume of the new stop order is equal to the unfilled amount of the limit primary order.

### 4.1.7 Displaying labels on a graph

The user can put labels on a graph. Labels can be of the following types:

- **Text** contains descriptions of the graph or its contents;
- **Note** is a text description displayed on the graph when hovering on the tag label.
- **Balloon** is a note pointing to a certain point on the graph.
- **Price label** is a note, which contains the price in a certain point on the graph.
- **Image from file** is any image, to which a text can be linked. The image is to be loaded from file by a user.
- **Symbol** is an image from a fixed set.




To create a new label, select the label type in the **Label...** shortcut menu on the desired plotting area of the chart. Next:

- To add a price label or a symbol click left mouse button on the point, where the label will be linked to the graph (label locating spot). The second left mouse button click points the place of a note for the price label (second label locating spot);
- To add a text, a note, a balloon or an image from file click left mouse button on the point, where the label will be linked to the graph (label locating spot) and specify the new label parameters (for detailed information about the settings, see 4.2.13). The second left mouse button click points the place of a note for the balloon label (second label locating spot)

Labels bound to one of the graph elements move with the chart when it moves. The labels not bound remain in their positions when the instrument displayed in the graph window moves.

To move a label, hover over the label binding location (a label in form of a wrist will appear near the cursor) and holding down the left mouse button drag it where you need.

To copy a label, hover over it, click the left mouse button holding the Ctrl key and drag it where you need.

The width of note can be changed for a balloon or a price label. To do it select a label by clicking on it with the left mouse button, move the cursor to the second label locating spot (a label in form of a wrist will appear near the cursor) and holding down the left mouse button pull it to the right or to the left to make it wider or tighter.

Functions available from the label shortcut menu are as follows:

- **Edit...** is for opening the Edit label dialog box to set up a label's parameters (see 4.2.13).
- **Copy** (or **Ctrl**+**C**) is for copying a selected label to the clipboard.

  To insert the copied label to the graph select Insert item in the shortcut menu of the graph area or use Ctrl+C key pattern.

- **Delete** label (or **Del**) is for deletion of a selected label.

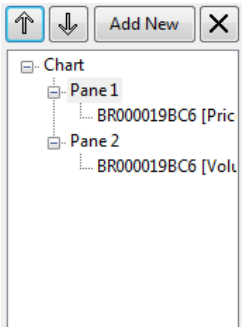
The QPILE language supports working with labels; you can use it to set, change, and edit labels. For detailed information about the language functions, see Chapter 8, "QPILE Language", sub-section 8.22.

## 4.2 Graph configuration

Window of chart parameters configuration can be launched by one of the following ways:

- Select the menu item of the chart **Action / Edit...** when the chart window is active. Window of configuration opens in Chart parameters dialog (see 4.2.1).
- Select the shortcut menu item **Edit...** when the chart is active:
  - On the graph plotting area – configuration dialog opens in edit window of the plotting area settings (see 4.2.2);
  - On the graph's line or legend – configuration dialog opens in the edit window of the graph (see 4.2.3).
- Double left click on:
  - On the graph plotting area – configuration dialog opens in edit window of the plotting area settings (see 4.2.2);
  - On the graph's line or legend – configuration dialog opens in the edit window of the graph (see 4.2.3).

List of graphs and indicators displayed on the chart is presented in the left part of the window. Plotting areas are located in the order they appear on the chart. The arrangement of objects within a plotting area is determined by Order of displaying layers on chart.




- To change the order of displaying graphs in the current chart window, use arrow keys 'up' and 'down'. herein the first graph in the list is located in the uppermost layer on the diagram;

> **To quickly move the graphs and plotting areas, use 'drag-and-drop' mode.**

- To add a new graph, use button **Add**. At that the new plotting area with the graph is added to the end of the list; new graph is added to the existed plotting area to the beginning of the list (upper layer of the chart window);
- To remove a graph from the list, use button 'X'.

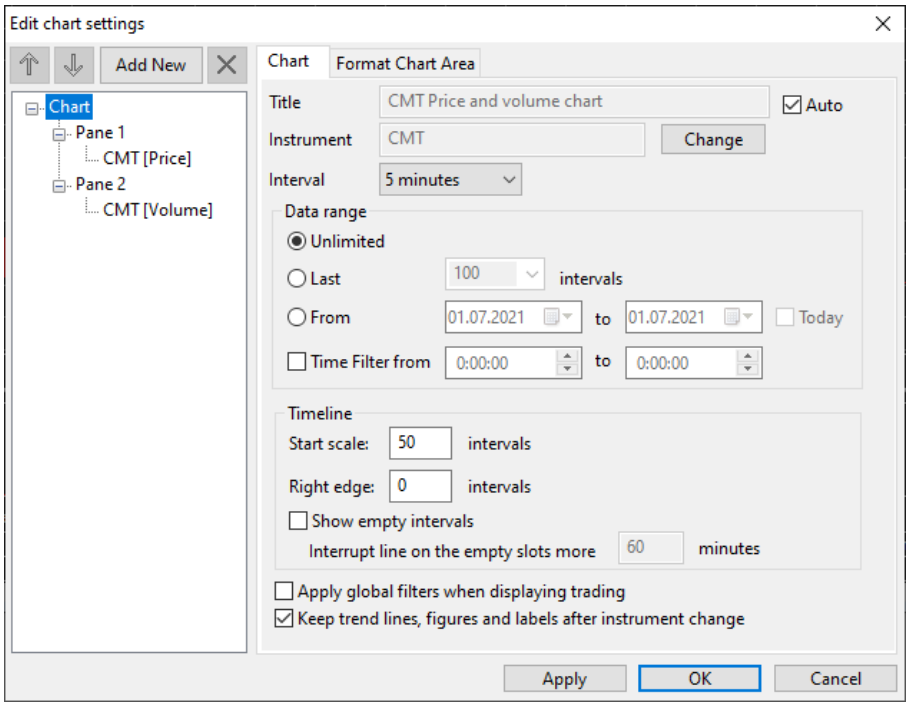
> **Plotting area of graphs is moved / removed along with the contained graphs and indicators.**

Configuration parameters are displayed in the right part of the window. Configuration dialog of chart settings is divided into pages. Switch between them in area on the left.

### 4.2.1 Configuring chart parameters

Chart parameters dialog is to configure the general parameters of chart.

**Chart Tab**



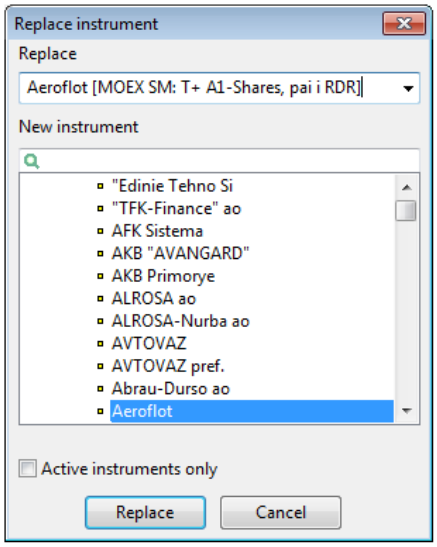

1. **Title** is the chart title.

   _ **Auto** – if the checkbox is selected, the title is assigned automatically and cannot be edited.

   > **Upon the enabled linked window mode, value of the field changes automatically along with the instrument change.**

2. **Instrument** – name of the instrument for which the graph is formed. If a chart contains graphs for different instruments the filed takes value: 'Several instruments'.

- **Change** – change the instrument to which the graphs on the chart are related. Dialog of changing the instrument contains the following fields:




  - **Replace** – instrument (or a list of instruments) selected as a data source for the chart. If more than one instrument available, the instrument being a source for the greatest number of graphs on the chart is selected by default. In the absence of a priority by the number of graphs, the instruments are sorted in alphabetical order;
  - **New instrument** – list of instruments grouped by classes;
  - Setting **Active instruments only** allows excluding from the list instruments or contracts without orders, trades or open positions. Active instruments are those with orders, trades or open positions (for futures) available on Exchange within a current trading session. QUIK Workstation determines this fact by values of Quotes table parameters: Best bid price, Best offer price, Number of trades, Number of open positions.

    > **If the list of received parameters is set manually, and it does not include the parameters listed above, the attribute 'Active instruments only' does not function correctly.**

3. **Interval** sets time intervals for plotting new segments on a chart. If the **Tick** value is selected, a tick graph is created. The interval value is displayed in square brackets on the right of the chart window's heading and separated from the heading by symbol "-".
4. **Data range** is a range of displayed values:
   - Select **Unlimited** to show the values for the entire time period available;
   - Select **Last ... intervals** to show the specified number of intervals on a graph. Data for earlier time periods is removed from the plotting area. This option is recommended for monitoring short-term behavior of parameter variation;
   - Select **From... to...** to show the selected dates interval for the chart;
   - Select **Today** to show data for the current day;
   - Select **Time Filter from... to...** to show data for the selected time period.

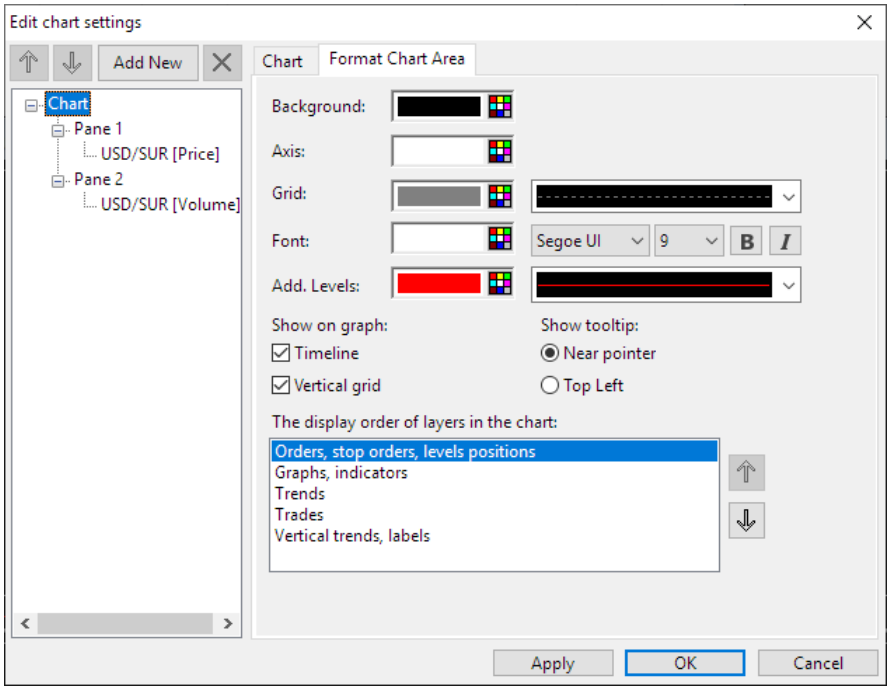
5. **Timeline**:

   - **Start scale... intervals** – minimum allowed number of intervals on a graph. The parameter is set at the beginning of the trading session to prevent stretching the intervals in the entire width of the plotting area;
   - **Right edge... intervals** – number of empty intervals added at the right on a graph. The parameter is used to extend the trend lines for future periods;
   - **Show empty intervals** displays all time intervals on the time scale; if it is disabled, only the intervals that contain trades are displayed. This checkbox is unchecked by default;
   - **Interrupt on the empty slots more... minutes** does not allow drawing a line during plotting a **Line** or **Dotted line** graph if the sequence of empty intervals is less than the specified value. This setting is enabled if the **Show empty intervals** checkbox is selected.

6. Select **Apply global filter when displaying trading** to display orders and trades on a graph in accordance with global filters. Detailed description of the general filters is given in Chapter 2, "Basic Operating Principles". section 2.3.
   If the only one client code is selected in general filter, the **Client code** field in a new order form opened from a graph is filled in automatically upon the selected filter **Apply global filter when displaying trading**. Description of entering orders from the chart window is given in 4.1.5.
7. **Keep trend lines, figures and labels after instrument change** enables displaying on the chart trend lines, figures and labels after instrument change. This checkbox is checked by default.

Press **Apply** to make values refresh in accordance with the configured settings. Click **OK** to close the configuration dialog with saving changes or **Cancel** to close it without saving.

**Format Chart Area Tab**



Here you can specify colors of the chart elements (background, axes, grid, fonts, color and thickness of trend lines). For color configuration settings, see Chapter 2, "Basic Operating Principles", 2.8.4.

**Settings on the Current pane tab**

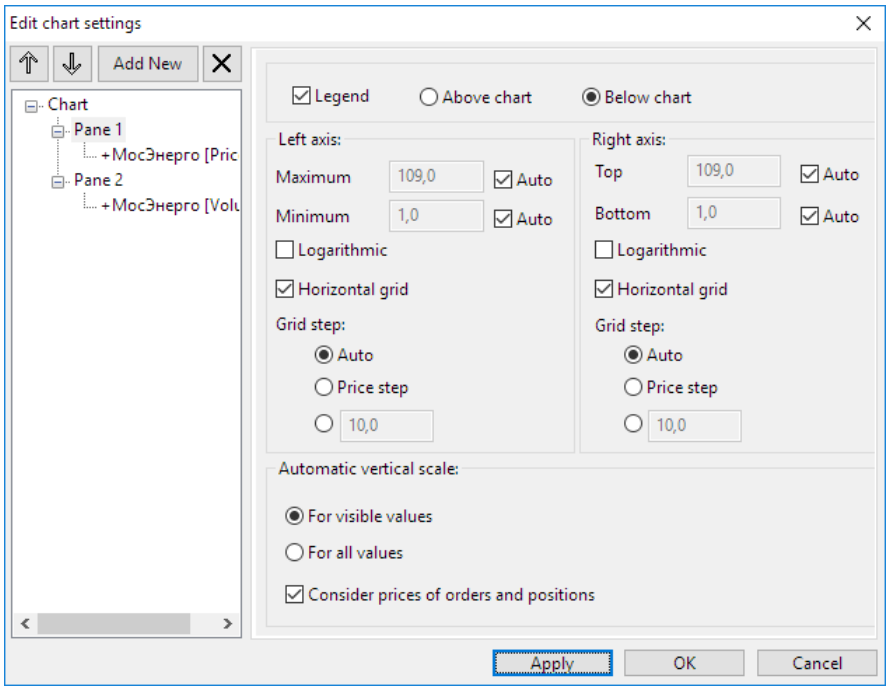
Additional parameters:

1. **Show on graph** settings are intended to configure displaying of the chart elements:
   - **Timeline** – show values on the time scale (horizontal axis);
   - **Vertical grid** – show vertical grid lines on the plotting area;
2. **Show tooltip** settings are intended to select the method of displaying parameters of the selected candlestick:
   - **Near pointer** – when hovering the cursor on a candlestick a tooltip appears near it;
   - **Top Left** – parameters are displayed in the upper left corner of the chart.
3. **The display order of layers in the chart** area is to configure order of displaying the chart layers. To change the order use button 'up' and 'down'. At that the uppermost layer in the list is the lowermost on chart.

Click **Apply** to make values refresh in accordance with the configured settings. Click **OK** to close the configuration dialog with saving changes or **Cancel** to close it without saving.

### 4.2.2 Plotting area configuration

Dialog Pane <number of pane> is intended to configure parameters of the graph's plotting area.




1. **Legend** enables displaying of the chart legend and configuring of its position relative to the plotting area.

- **Above chart** places the legend above the plotting area;
- **Below chart** places the legend below the plotting area;

2. **Left / right axis:**

   - **Maximum** sets the maximum scale value;
   - **Minimum** sets the minimum scale value;
   - **Logarithmic** scale is to select the type of the graph scale. If the checkbox is not selected, the linear scale is used;
   - **Horizontal grid** displays horizontal grid lines in the plotting area;
   - **Grid step** is intended to specify a grid step;
     - **Auto** enables automatic setting of the vertical scale (maximum and minimum values of parameters within the displayed time range).
     - **Price step** indicates that the vertical scale is determined depending on the minimum instrument price step.
     - The value of the price step set manually.

3. **Automatic vertical scale**:

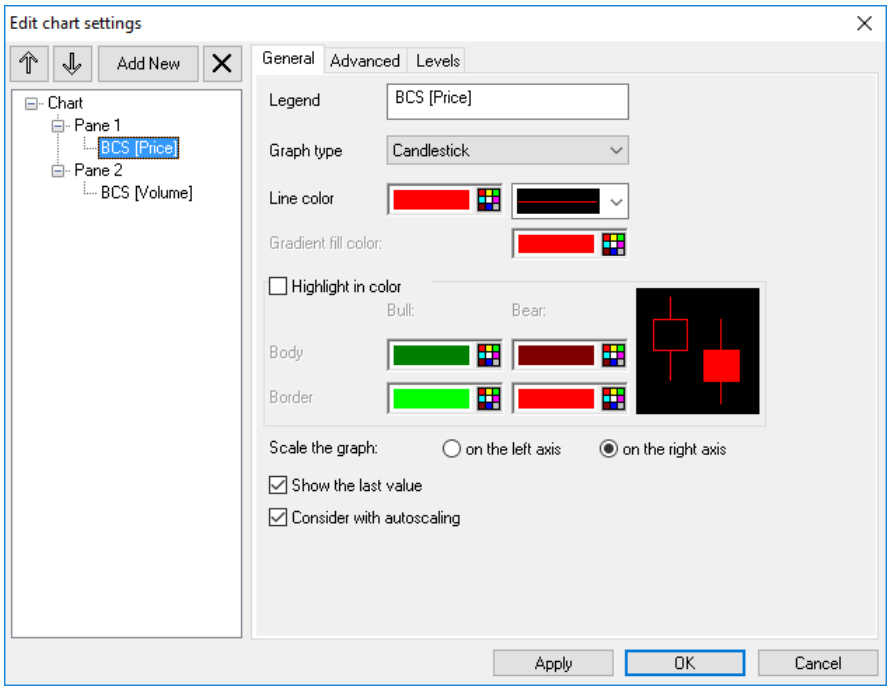
   - **For visible values** – vertical scale of a graph is adjusted automatically by range of minimum and maximum values of candlesticks located in visible area of the chart;
   - **For all values** – vertical scale of a graph is adjusted by maximum/minimum of all candlesticks values on the chart;
   - **Consider prices of orders and positions** – if the checkbox is selected vertical scale of a graph is adjusted with consideration of orders and trades prices displayed by lines and labels. If the checkbox is cleared the chart scale is defined by settings of the previous points.

When satisfied with the settings, click **Save**. A new window will open – **Add graph**.

### 4.2.3 Configuring chart view

Dialog <Instrument name> [<Chart view>] is intended to configure parameters of a particular graph view.

### General Tab




1. **Legend** allows the user to edit the line caption on a graph, for example, to make the legend more compact.
2. Select the graph type in the **Graph type** field:

   - Candlestick;
   - Line;
   - Line with lighting;
   - Line with gradient;
   - Histogram;
   - Bar;
   - Dot;
   - Dotted line.
3. **Line color** defines the line's color and thickness.
4. **Gradient fill color** is used to select the color of gradient fill for the chart. By default, the line color is used. Available for editing if the Graph type "Line with lighting" or "Line with gradient" is selected.
5. When **Highlight in color** is selected, the graph's elements are highlighted with different colors depending on the direction in which the indicator is changing in the relevant interval:

   - **Rise** defines the color that indicates increase in the value;
   - **Fall** defines the color that indicates decrease in the value.

   The **Price** and **Volume** charts change their color depending on the direction of price change in a given interval.

This setting is available for **Candlesticks, Bar**, and **Histograms**. Graphs of **Candlestick** type provide the possibility to select different colors for candlestick body and its boundaries.

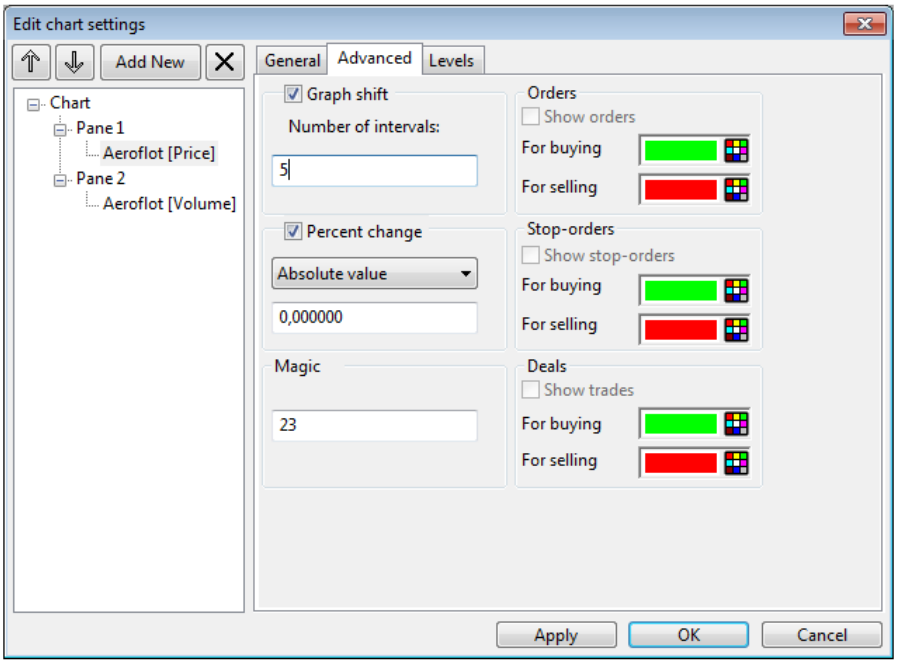
6. In the **Scale the graph** group, select which axis (left or right) will be used for vertical scaling of the graph.
7. Select **Show the last value** to display the last value of price (or a configurable indicator) on the graph's axis.
8. Select **Consider when autoscaling** to autoscale the chart, considering this graph, if several graphs are displayed on the chart. This checkbox is checked by default.

> **The option should be enabled for at least one graph on the chart.**

**Parameters Tab**

The tab contains parameters of indicators configuration and available for indicators of the technical analysis (see 4.4).

**Advanced Tab**




1. Select **Graph shift** to shift the graph alongside the time axis by a specified number of intervals. To shift forward (in the future), use positive values; to shift backward, use negative ones.
2. When **Percent change** is selected, the value axis (the axis of ordinates) of the graph shows the relative deviation of the parameter as a percentage of the initial value instead of the absolute value of the parameter. The initial value can be:
   - **Absolute value** – the value specified in the lower field;
   - **Closing price** – the preceding day closing price.
3. **Magic** is a unique string identifier of the graph. This identifier is used in Lua or QPILE language tools to get access to the specified graph.
4. **Orders** section is to configure displaying orders on the graph:

- **Show orders** shows horizontal lines on the chart representing the prices of the client's active orders;
- **For buying, For selling** are line colors for orders to buy and to sell.

5. **Stop orders** section is to configure displaying stop orders on the graph:

   - **Show stop orders** shows horizontal lines on the graph representing the prices of the user's active stop orders;
   - **For buying, For selling** are line colors for orders to buy and to sell.

   The lines representing conditional orders are displayed on different levels depending on the order's type:

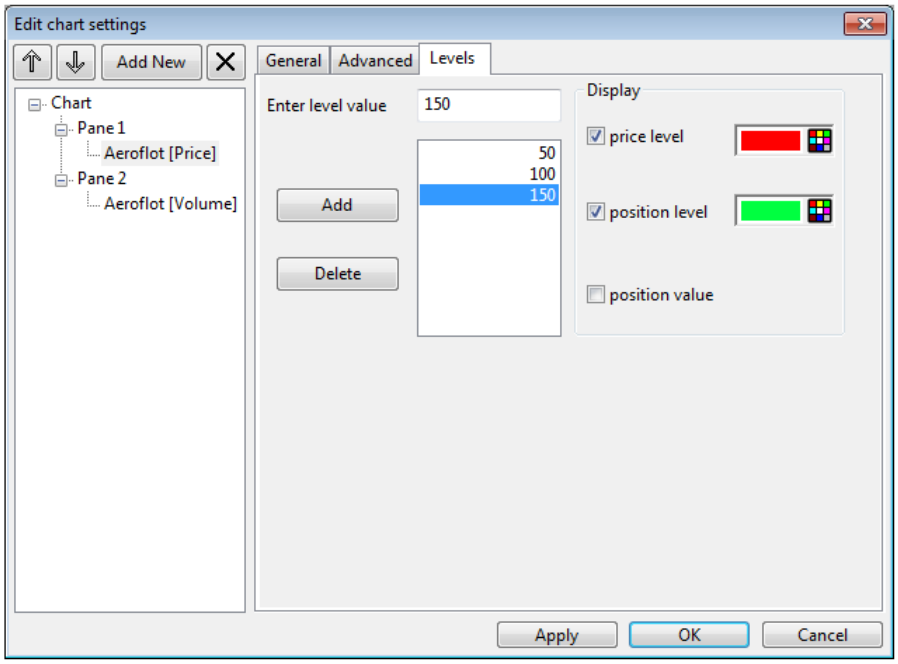
   - **Stop-limit, With linked order** are displayed at the stop price level;
   - **Stop price by another instrument** are displayed at the stop price level (the line is displayed on the graph of the instrument specified in the condition);
   - **Take-profit** and **Take-profit and stop-limit** are displayed at the level of the stop price the take-profit.

6. **Deals** section is to configure displaying trades on the graph:

   - **Show trades** displays the user's trades on the graph. Trades are represented by triangular markers that indicate the trade's direction (up for buying, down for selling);
   - **For buying, For selling** are marker colors for trades at buy and sell prices.

**Levels Tab**

On the **Levels** tab of the line parameters editing window, you can set values for horizontal lines (levels) displayed on a graph. Levels are plotted up the axis that the graph is linked to.




To set a new level, specify its value in the **Enter level value** field and click **Add**. The value will be added to the list located below.

> **This value is specified in price units, except for the graphs for which the 'Percent change' attribute is enabled on Advanced Tab.**

To delete a level, select it in the list and click the **Delete** button.

The checkboxes in the **Display** section allow the user to display the following levels on the graph and select their colors:

> **The settings are available for a graph created by parameter other than 'Price'.**

- **Price level** shows a line at the level of the last trade price;
- **Position level** shows a line at the level of acquisition price taken from the **Positions in instruments** table for this client code and this instrument;
- **Position value** shows the position value on the vertical scale.

Configured price levels are saved in the graph template. When the graph window is copied with Ctrl+N, they are copied to the new window.

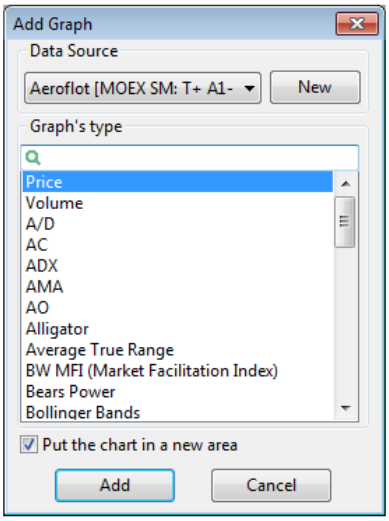
### 4.2.4 Adding a graph to a chart

A graph can be added to the chart by one of the following ways:

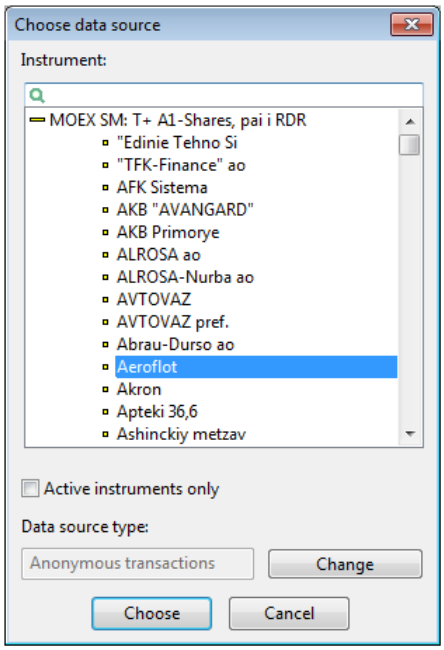
- Click the button on the **Chart** toolbar;
- Select the shortcut menu item **Add graph (indicator)** in the active chart window;
- Select the **Action / Add graph (indicator)...** when the chart window is active;
- Press button 'Insert' in the active chart window;
- Press **Add** in the left part of the chart's configuration dialog.

> 1. **The graph is added to the new plotting area.**
> 2. **Indicators Alligator, AMA, Bollinger Bands, Envelopes, Fractals, Ichimoku, Parabolic SAR, Price Channel are added to the Price graph of the selected instrument. Other indicators are added to the new plotting area.**

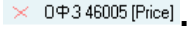
Dialog of adding a graph to a chart contains the following settings:




1. The **Data Source** field provides selection of an instrument and parameter to be plotted. This window shows all sources displayed on this graph. To add a new source, click the **New** button. This window contains the following settings:

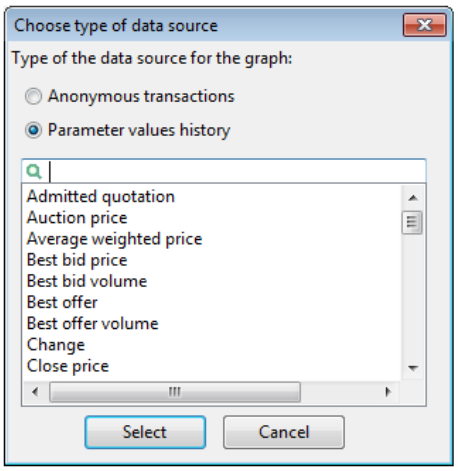



- **Instrument** is to select an instrument from the list;
- **Active instruments only** checkbox allows excluding from the list instruments or contracts without orders, trades or open positions.

**If a selected instrument is not found in the dictionary, a notification of the following view appears: 'Chart <...>: failed to create graph <...>, instrument <...> was not found'. The legend of such a graph is as follows:** 

.

- **Data source type** is to select a data source for a graph. Use button **Change** to change a source of data.




- Select Time and Sales table to create a graph of trade's price and volume (recommended).
- Table of Parameters values history allows creating graphs for a greater number of parameters listed below.

**Recommendations to select a source of data:**

- The changes in parameters are saved in the Quotes history table at specified intervals; therefore, certain trades may be skipped. To plot a trade price and volume graph, use the Time and Sales Table source;
- Data in the Quotes History table is accumulated during the connection to server and may have gaps for the periods when there was no connection to the server. To obtain continuous data, select Get missing data in the Program/Saving Data section under System / Settings / General settings…;
- Data from the Quotes History table is not archived and unavailable for plotting a graph for several days;
- When a graph is plotted based on the Time and Sales table, the data is taken from this table if the user has created at least one table of this type. If there is no Time and Sales Table, then data is requested from the server. The data is divided into chunks of the specified length to minimize the traffic.

2. Select the **Graph's type** from the list of available types. The **Price** value corresponds to the last trade price graph, and the **Volume** value to the last trade volume graph. Other types of graphs are various technical analysis indicators.
3. Select **Put the chart in a new area** checkbox to create a new plotting area for the new graph.

### 4.2.5 Working with graphs in the drag-and-drop mode

**Changing graphs display order in the current chart window**

To change graphs' display order in the drag-and-drop mode, their legends must be displayed in the chart window.

Charts and indicators are displayed in the order in which their legends are located on the chart. Therefore, the graph whose legend is the last one is displayed above all other graphs and indicators.

If the cursor appears as when the graph legend is moved, it means that this graph cannot be moved. In such cases, nothing will happen when you release the mouse button.

The sequence of actions:

1. Place the cursor on the selected legend and press the left mouse button (the cursor will appear as ).
2. Holding the left mouse button, move the cursor with legend of the selected graph to the desired position in the list of the chart's legends. Release the mouse.

   Example:


**Moving a graph**

To move a graph between plotting areas in a chart window or to move it into another chart window, position the cursor on the legend of this graph, press the left mouse button, and,

holding the mouse, move the cursor with the legend to the desired location and then release the left mouse button. The legend of the moved graph will become the last legend in the chart panel.

When you move a graph, the following associated objects are moved with it:

- Orders;
- Stop orders;
- Trades;
- User levels;
- Price levels;
- Position levels;
- Trend lines.

If the **Ask for confirmation when moving and deleting items using Drag-and-Drop** checkbox is selected in the **Windows / Tables** section under **System/Settings/General settings...**, the system asks for confirmation before moving or deleting a graph when:

- the chart is moved to a window which has legend display disabled;
- the chart is moved to the window of another chart.

**Deleting a graph**

To delete a graph, position the cursor on the legend of the selected graph and press the left mouse button (the cursor will appear as ). Holding the mouse button, move the cursor with the legend beyond the chart window (the cursor will change to ) and release the mouse button.

If the **Ask for confirmation when moving and deleting objects using Drag-and-Drop** checkbox is selected in the **Windows / Tables** section under **System/Settings/General settings...**, the system asks for confirmation before deleting a graph.

### 4.2.6 Graph tips

1. Which of the two possible tables should be selected as data source for a graph?

   _ For trade price and volume graphs, it is recommended that the **Time and Sales table** with full information on all trades entered, be used. For other parameters, use the Quotes History table.

2. How to rename a parameter caption in a legend?

   _ Open **Edit...** in the configuration dialog of the chart and change the name in the **Legend** field.

3. How to place graphs for different instruments in the same plotting area?

   _ Plot a standard graph;
   _ Then select **Add graph (indicator)** from the shortcut menu;
   _ Click the **New** button and select the instrument to be added and click **Select**;
   _ Drag the created graph to the desired plotting area.

4. How to place price and volume graphs in the same plotting area?

   - Plot a price and volume graph;
   - Double left click on legend of the created graph and call the configuration dialog.
     - In the left part of the window drag the created graph to the plotting area where price graph is placed;
     - In the right part of the window select **On the left axis** value for **Scale the graph** setting.
   - Click **Save**.

5. How to place several diagrams on the screen in an optimal way?

   - If many charts are configured, and they do not fit into the screen, place them on different tabs. The QUIK system has no limitations on the number of configured charts and screen tabs. The recommended number of charts on one tab on a 800x600 resolution display is from 2 to 4.

6. How to make all data on a chart fit on the display without scrolling?

   - Open a graph's shortcut menu and select **Entire chart**, or click .

7. How to change an instrument in an existing graph?

   - Double-click on the blank space of the graph to open the settings window. On the **Chart** window click the **Change** button and select a new instrument from the list to display the graph using the current settings. Detailed description of change instrument dialog see in 4.2.1.

8. How to transfer graph settings to a new window?

   - Create a copy of the window with the graph by pressing Ctrl+N. Then, if you need to change an instrument in the new window, follow the steps described in the previous paragraph.

### 4.2.7 Working with graph templates

A **Template** is the configuration of a **Graph** window saved under a specific name. Such a template can be applied to existing windows or used to quickly configure a new graph.

1. To **view the template list,** click **Chart template / Templates...** from the graph window's shortcut menu or the program menu item **Action / Chart template / Templates...**

   - **To set up a default template,** select the required window configuration from the list of available templates and, then, click **Use as default**. The template name will be shown in the **Default template** area;
   - **To rename a template,** select the required template and, then, click **Rename**. In the dialogue that opens, enter the new name and press **Enter**;
   - **To delete a template,** click **Delete**;
   - **To apply a template to several windows,** click the **Apply to all windows** button to apply the settings from the selected template to all charts; click **Apply to tab windows** to apply the settings to the windows on the current tab.

2. Create a template.

   - Configure a new quotes graph window or select an existing graph to use as a template;

- Select **Chart template / Save as template...** from the graph's shortcut menu;
- To edit a template, select its name in the window that appears and click **Save**;
- To create a template, click **Save as new**. In the dialogue that opens, enter the name and press **Enter**;
- Click **Exit**.

3. **Template application.** To configure a graph's settings using a template, select **Chart template/<Template name>** from the shortcut menu or the corresponding item of **Action** menu.

### 4.2.8 Using the toolbars

We recommend the **Graph** panel be enabled on the toolbar to facilitate working with charts.

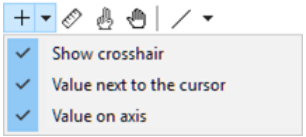
Purpose of the buttons on the Graph panel:

> **Buttons which are displayed differently for the interface dark mode are enumerated in the table separated by the '/' symbol.**

| Button | Purpose |
|---|---|
| / | Add a graph to the current window (chart) |
| M5 | Modify an interval |
| | Configure displaying of information on cursor location on the graph's plotting area. Description is given below |
| / | Display the entire graph area in the window if the graph scale was increased or reduced |
| / | Increase the graph scale |
| / | Reduce the graph scale |
| | Measure the distance between points on a chart |
| / | Enable the order entry mode in the chart window. If this setting is disabled, orders cannot be transferred or placed from the chart window |
| / | Drag a graph using the mouse |
| | Draw trend lines and figures |
| | Draw a trend line |
| | Draw a horizontal line |
| | Draw a horizontal ray |

| Button | Purpose |
|---|---|
| | Draw a vertical line |
| | Draw a rectangle |
| | Draw a triangle |
| | Draw an ellipse |
| | Draw the Fibonacci Arcs |
| | Draw the line speed |
| | Draw the Fibonacci Fan |
| | Draw the Fibonacci Retracement |
| | Draw the Fibonacci Time Zones |
| | Draw a channel |
| | Draw a market depth |
| | Put a label to the graph |
| Aa | Put a text label to the graph |
| | Put a note to the graph |
| | Put a balloon to the graph |
| | Put a price label to the graph |
| | Put an image loaded from file to the graph |
| | Put an image, selected from a set of inbuilt images, to the graph |
| | Enable / disable showing trend lines, figures and labels on the graph |
| | Freeze the instrument selected in the toolbar. For details see 4.2.10 |

The panel includes the **Crosshair** button that enables the display of information about the cursor position in the graph plotting area. Enabling the **Crosshair** button will bring up a drop-down menu that will give you the option to select the way the cursor coordinates will be displayed:



You can select one or several options. If none of the options is selected, the **Crosshair** button is inactive. The selection is saved when the **Crosshair** button is disabled. Possible display options of the cursor coordinates:

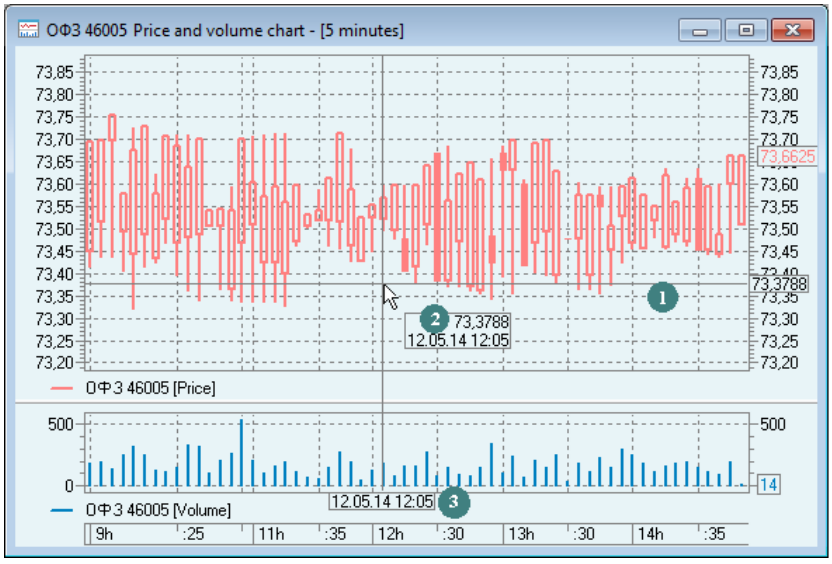
- **Show crosshair** displays the crosshair lines with axes **(1)**;
- **Value next to the cursor** displays information next to the cursor in a rectangle **(2)** in the following format:

```
[axis value]
DD.MM.YY HH:MM
```

If the graph is linked to the left or right axe (when there are two graphs in one window), the value is displayed in the following format:

```
[left axis value] [right axis value]
DD.MM.YY HH:MM
```

- **Value on axis** displays information on axes as rectangular notes **(3)** that display the date and time (the abscissa) and values corresponding to them (the ordinate). The notes move along the axes as the cursor moves across a graph.




### 4.2.9 Editing graphs with the mouse

1. Viewing and editing:
   - Hover the cursor over the graph to display the tooltip window with numerical values of the parameters for this graph segment;
   - Double-click to call the edit graph dialog.
2. Chart scaling:

- Click and hold the mouse on the vertical scale and drag it up or down to adjust the vertical scale of the graph. Double click on the scale to resume automatic scaling;
- Click and hold the mouse on the horizontal scale and drag it to the left or right to change the scale of the graph along the time axis.

3. Control a graph by turning the mouse wheel:

- Over the plotting area: scroll the graph to the left/right;
- Over the plotting area if the graph extends beyond the vertical border of the plotting area: scroll the chart up/down;
- Over the vertical scroll bar: scroll the graph up/down;
- Over the horizontal graph's scale: scroll the graph to the left/right.

### 4.2.10 Available operations

- **Ruler** – measure the distance between the points on a chart (see 4.2.14). The operation is available on the toolbar "Graph".

Functions available for the chart can be launched from **Action** menu item or from the shortcut menu of the chart's plotting area:

> **(*) The function is available only from the Action menu.**

> **(**) The function is available only from the shortcut menu.**

- **New chart** *: create a new chart;
- **New chart for bond equivalent yield** * – create a new chart for bond equivalent yield (see 4.5);
- **Add graph (indicator)...** (or 'Insert'): add a new graph (indicator) to current window of the chart;
- **Draw** **: add an element to the graph:

  - Trend line;
  - Horizontal line;
  - Horizontal ray;
  - Vertical line;
  - Rectangle;
  - Triangle;
  - Ellipse;
  - Fibonacci Arc;
  - Speed lines;
  - Fibonacci fan;
  - Fibonacci Retracement;
  - Fibonacci Time Zones;

- Channel;
- Market Depth.

- **Label…:** add a user label type. Clicking left mouse button on the graph (in label linking point) opens the selected label type setting dialog.

  - Text…;
  - Note…;
  - Balloon…;
  - Price label…;
  - Image from file…;
  - Symbol…

  For detailed information about the user's label settings, see 4.2.13.

- **Add pane…**: add a new plotting area for creating graphs to the current chart.
- **Insert** (or Ctrl+V): put the copied element to the graph: trend line, figure, label.

> **The element copy is put above the initial element and has the same parameters.**

- **Delete:** deletes the selected graph;

  - Pane <number of pane>: delete the graph's plotting area. When deleting a plotting area, all contained graphs are deleted as well;
  - <Name of graph>: delete the graph;
  - Delete all trends and figures in the current pane**: delete all trends, channels, lines, Fibonacci levels from the current plotting area. Price/volume graph and indicators are not affected. Trends are deleted with a previous confirmation;
  - Delete all labels: remove all labels from the graph. Labels are deleted with a previous confirmation.

- **Connect to channel**: link a window to a main table (for more information about linked-windows mode, see Chapter 2, "Basic Operating Principles", 2.8.6).

  - **<Table name>** – link a window to this table;
  - **Disconnect from channel** – detach a linked table from the channel.

- **Hide drawings / Show drawings**: enable / disable displaying trend lines, figures and labels on the graph.

> **Adding a new element to the graph makes all the elements visible.**

- **Fix tool**: if the mode is enabled (the menu item has a tick), then the tool selected in the toolbar for operations with trend lines, figures or labels is enabled and is used again. The selected tool can be disabled in one of the following ways:

  - Second click on this tool button in the toolbar;
  - Pressing **Esc**.

If the mode is disabled (the menu item has no a tick), then the selected tool is used once.

- **Edit**: open the configuration dialog:
  - In the configuration dialog of plotting area settings – when calling the function from the shortcut menu of the graph's plotting area;
  - In the configuration dialog of general settings of chart – when calling the function from **Action** menu.
- **Refresh** (or F5): refresh the content of the graph's window. The operation is available for graphs created by Quotes table data;
- **Interval:** choose the interval size (tick, 1 minute, etc.);
- **Zoom in** increases the graph horizontal scale;
- **Zoom out** reduces the graph horizontal scale;
- **Entire chart** displays the entire graph in the window;
- **Create copy** (or Ctrl+N) – create a new graph window based on an existing one.
- **Show legend** **: enable/disable displaying of legend in the current plotting area;
- **Show tooltip** **: enable/disable displaying of a tooltip on a candlestick;
- **Chart template:** configure the used template:
  - **Save as template...:** save the window settings as a template;
  - **<Name of template>**: apply settings saved in the selected template to the chart;
  - **Templates...:** open the graph templates window;

  Working with templates is described in 4.2.7.
- **Save image...:** save the chart image to a file in Microsoft Bitmap (BMP) or Microsoft Enhanced Metafile (EMF) formats. For details, see 4.2.11.

**The shortcut menu of a line (or a line legend) on the graph:**

- **New order:** open a new order form for the graph's instrument;
- **New stop order:** open a new conditional order form for the graph's instrument;
- **Quotes <instrument>:** open Level II quotes table for the instrument;
- **Market Depth**: add the Market Depth histogram to the graph. For details, see 4.2.15.
- **Edit...:** open the configuration dialog in the edit window of the current graph's type;
- **Change instrument:** change the instrument for which the graph is created. Dialog of changing an instrument is described in 4.2.1.
- **Delete graph:** delete the current line of the graph;
- **Save data:** save the chart image into a text file *.txt. For details, see 4.2.12.

### 4.2.11 Saving graph image to file

A configured image of the chart window can be saved into a file in Microsoft Bitmap (BMP) or Microsoft Enhanced Metafile (EMF) formats. You can do this by selecting **Save image...** from the chart shortcut menu.

The chart will be saved exactly as it appears on the screen, with overlaid labels, indicators, and other elements. When a chart is saved to a file, not only its visible part but the entire chart

is saved for all periods that can be viewed by scrolling image in the window. The chart is zoomed vertically in a way that all chart candles are displayed.

It is possible to save the image of a size that does not exceed 1 Gb to a file without user confirmation. If the size is between 1 and 4 Gb, then the following notification appears: "The result image dimensions are too big. It is recommended to zoom out the chart to prevent possible problems with viewing. Continue anyway?".

> **Saving the image in EMF format reduces the file size and simplifies its processing in image editing programs.**

### 4.2.12 Saving graph data to file

The numerical values on which the graph is based can be saved to a file. Both quotes and indicators can be saved. Price/volume values and indicators are saved to files of different formats. Information written into the file covers the time period as displayed on the graph.

How to do this:

1. Select the graph line you would like to save.
2. Select **Save data** from the shortcut menu of the line.
3. In the window that will open, specify the file name and select a folder on the drive.

The format of a file of price and volume values is compatible with the Equis Metastock format:

| <TICKER> | <PER> | <DATE> | <TIME> | <OPEN> | <HIGH> | <LOW> | <CLOSE> | <VOL> |
|---|---|---|---|---|---|---|---|---|
| Ticker | Period | Date | Time | Opening price | Price maximum | Price minimum | Closing price | Volume |

Where:

- **Ticker** – Instrument ID [Class code]

Example:

```
<TICKER>,<PER>,<DATE>,<TIME>,<OPEN>,<HIGH>,<LOW>,<CLOSE>,<VOL>
HYDR [TQBR],5,20100921,125500,2.072000,2.073500,.2068700,2.069000,29419.000000
HYDR [TQBR],5,20100921,130000,2.069000,2.071400,2.067000,2.071400,44473.000000
```

The file format for indicators:

| <TICKER> | <PER> | <DATE> | <TIME> | Line 1 | Line 2 | Line 3 | … | Line N |
|---|---|---|---|---|---|---|---|---|
| Ticker | Period | Date | Time | Line #1 | Line #2 | Line #3 | … | Line #N |

Where:

- **Ticker** – Instrument ID [Class code]

A sample file for the Alligator indicator:

```
<TICKER>,<PER>,<DATE>,<TIME>,<LINE_LIPS>,<LINE_JAW>,<LINE_TEETH>
HYDR [TQBR],5,20100921,133500,2.072900,2.072268,2.072268
HYDR [TQBR],5,20100921,134000,2.071000,2.072015,2.072015
```

### 4.2.13 Configuring user labels

For details on displaying of labels on a graph, see 4.1.7.

The **Edit label** dialog can be opened in one of the following ways:

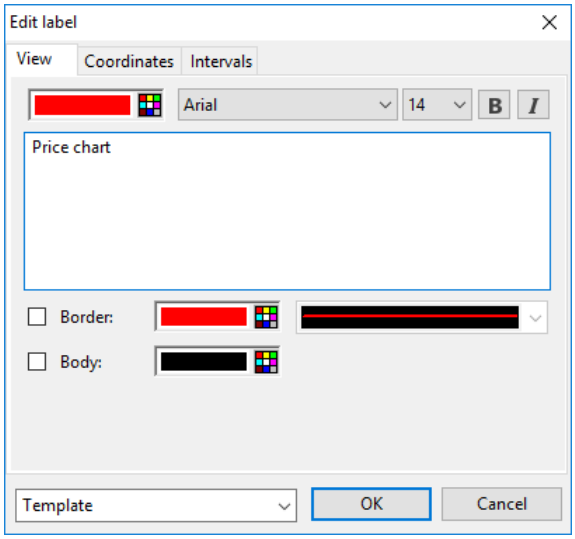
- To add a new label select the label type under the **Label...** shortcut menu on the desired position of the graph's plotting area and clicking left mouse button on the label linking to the graph spot (label locating spot);
- To edit the existing label:
  - Select the shortcut menu item **Edit...** on the desired label;
  - Double left click on the desired label.

The **Edit label** dialog contains the following parameters:

> **Values of parameters selected when creating a previous label are used by default.**

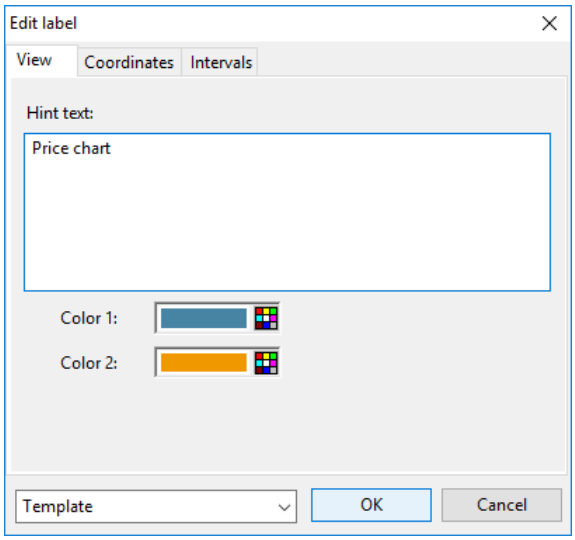
**View tab**

- **Text label**:



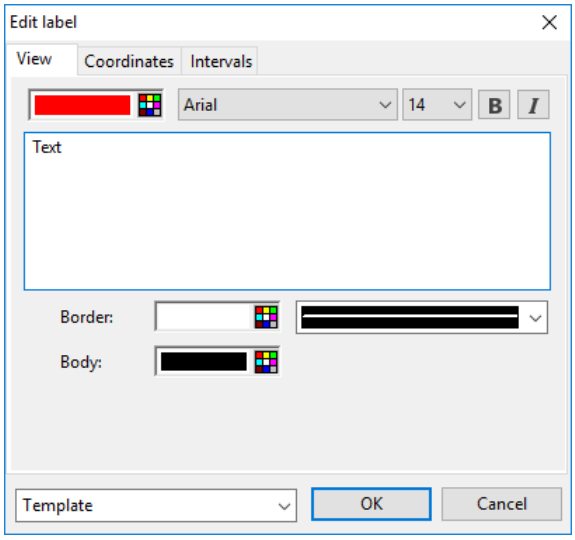
- Settings of the label text: color, font, size, style.
- Label text entry box.
- **Border** enables label border displaying and specifies the border color and width.
- **Body** enables label background filling and specifies the filling color.

- **Note label:**



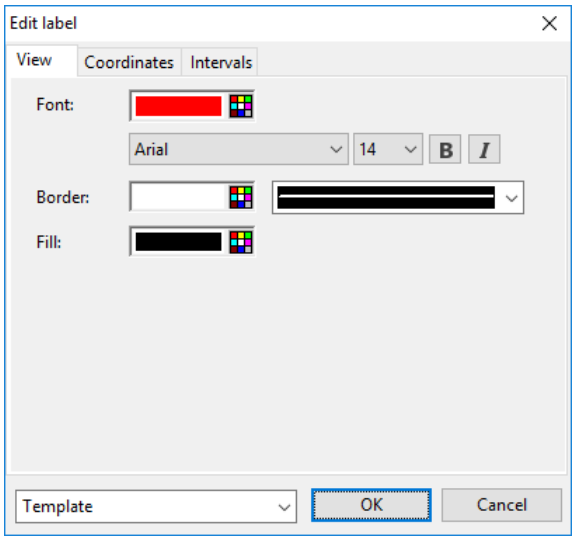

- **Hint text** is displayed on hovering on the label.
- **Color 1** specifies the main label color.
- **Color 2** specifies the color of label's internal.

- **Balloon label**:



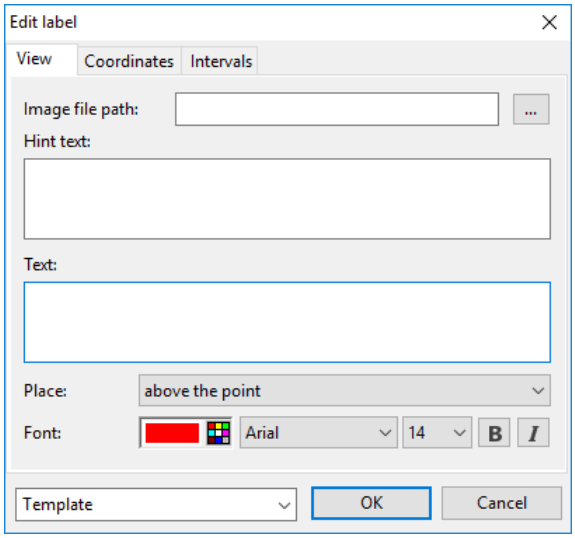

- Settings of the label text: color, font, size, style.
- Label text entry box.
- **Border** specifies the border color and width.
- **Body** specifies the background filling color.

- **Price label**:



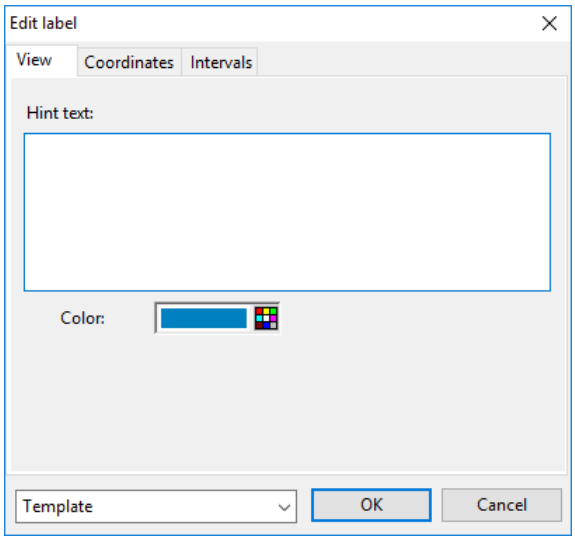

  - **Font**: settings of the label text: color, font, size, style.
  - **Border** specifies the border color and width.
  - **Body** specifies the background filling color.

- **Image from file** label:



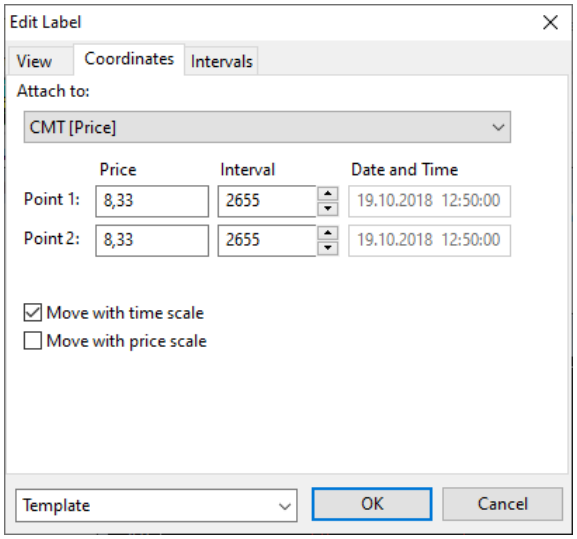

  - **Image file path**: select an image file. The supported file formats are BMP and JPEG;
  - **Hint text** is displayed on hovering over the label.
  - **Text** is displayed near the image.
  - **Place:** select how the label will be placed relative to the label locating spot;
    - the left of the point;
    - the right of the point;
    - above the point;
    - under the point.
  - **Font**: settings of the label text: color, font, size, style.

- **Symbol label**:




  - **Hint text** is displayed on hovering over the label.
  - **Color** defines the label color.

**Coordinates tab**

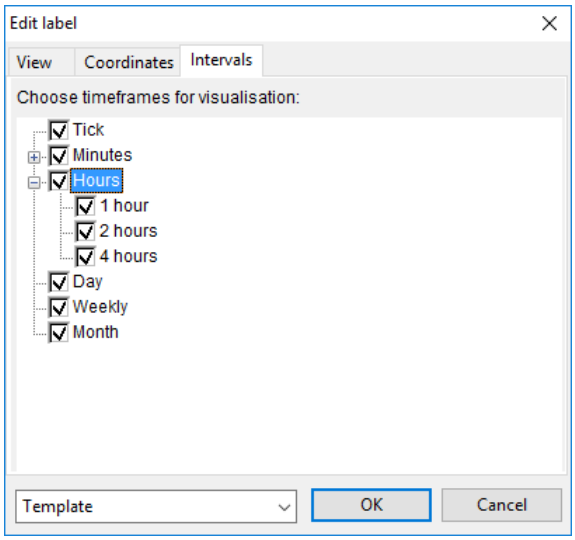



1. **Attach to** – select a graph to attach the label to.
2. **Point 1**: coordinates of the label locating spot:
   - **Price:** value on the vertical axis. The box is editable when the **Move with price scale** checkbox is selected.
   - **Interval:** number of the interval with the label locating spot.
   - **Date and Time:** starting date and time of the interval with the label locating spot. If the spot is in the future time interval, then the box displays the number of shift intervals with a plus (+) sign. The box is not editable.
3. **Point 2**: coordinates of the second label locating spot (text linking point). The set of fields is displayed for balloon and price label.
   - **Price:** value on the vertical axis. The box is editable when the **Move with price scale** checkbox is selected.

- **Interval:** number of the interval with the label locating spot.
- **Date and Time:** starting date and time of the interval with the label locating spot. If the spot is in the future time interval, then the box displays the number of shift intervals with a plus (+) sign. The box is not editable.

4. **Move with time scale**: link the label to the graph's time scale.
5. **Move with price scale:** link the label to the graph's price scale.

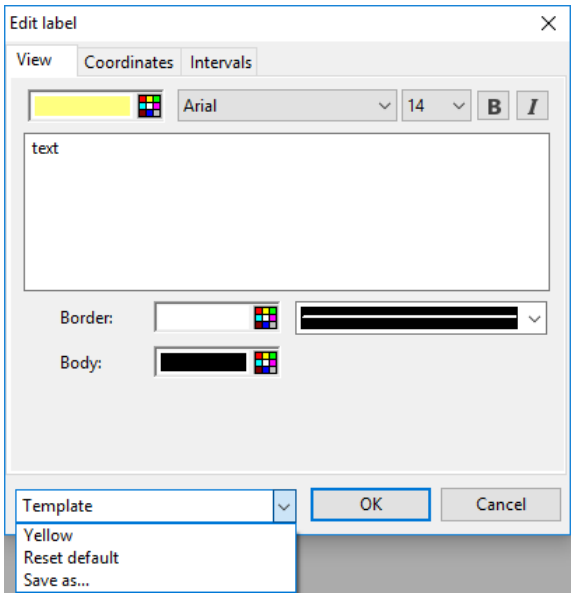
### Intervals tab




The label visibility in different interval lengths is set up on this tab. Valid values:

- Tick;
- Minutes (from 1 to 6, 10, 15, 20, 30);
- Hours (1, 2, 4);
- Day;
- Weekly;
- Month.

### Template



Set up the label template to be used:

- **Reset default:** apply the default settings to the label.
- **Save as:** save label settings to the template. The template name is to be specified in the opened dialog box.
- <Template name>: apply the settings of the selected template to the label. To delete a template from the list click "X" in a row with the template name.

### 4.2.14 Measuring distances

To measure the distance between the points on a chart, use one of the following methods:

- Selecting the **Ruler** option in the Graph toolbar:

  _ Click the **Ruler** button in the toolbar;

  _ Plot the first point on the chart by clicking the left mouse button and holding it move the cursor to the second point, then release the mouse button.

  To move the ruler, click and drag it where you wish.
- Using the mouse wheel:

  _ Plot the first point on the chart by pressing the mouse wheel and holding it move the cursor to the second point, then release the mouse wheel.

The following elements are displayed on a chart when measuring the distance:

- The area between the points is shown as a rectangle. The area fill color corresponds to the selected grid color of the chart with transparency of 50%, without borders;
- The dashed line is drawn from start to end point;
- The information about the results of measuring:

  _ The first line (vertical measuring) – the difference between the parameter values of the end and start points. It is displayed with a sign (for price values – with an accuracy of instruments). The change in % is displayed in brackets (with accuracy to two decimal places);

  _ The second line (horizontal measuring) – the number of intervals, the time difference. The time difference is displayed as days, hours and minutes. If the unit of measure has a zero value, it is not displayed (for example, "1 h" is displayed instead of "1 h 00 m".

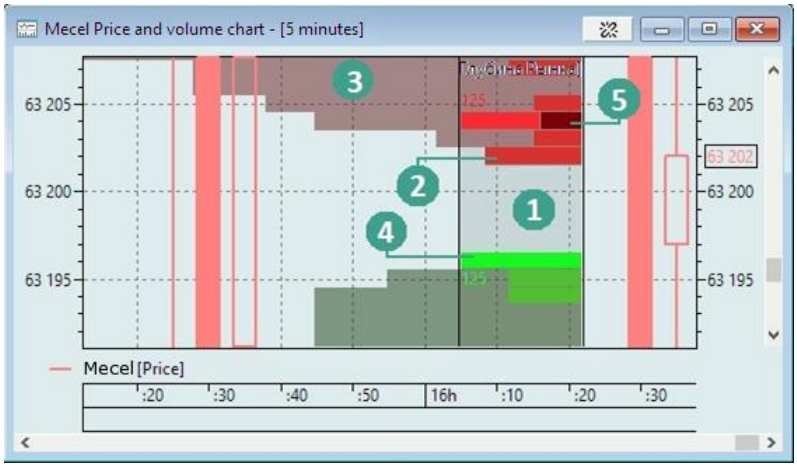
  If there is an object on this chart linked to another scale, then the information will be displayed in three lines. The first line contains the values of the left scale, the second one contains the values of the right scale, and the third one contains the values of the time scale.

To cancel changes, click anywhere in the chart plotting area.

### 4.2.15 Market depth histogram

To add a histogram, follows the steps:

1. Select the **Market Depth** item in the Draw menu item on the Graph toolbar or under the shortcut menu of the line.
2. Left-click the desired location on the diagram.




Histogram elements:

1. **Histogram area**. An area inside the graph area where the orders volume, maximum volume and personal orders are displayed.
2. **Orders volume**.
3. **Total volume**.
4. **Maximum volume**.
5. **Own quotes**.

When you drag the mouse pointer over the bars, a pop-up tip appears under the histogram title showing the order's direction, price and volume.

To move the histogram, drag the mouse pointer over its title, left-click and drag to the desired location. To change the histogram area, drag the mouse pointer over its left/right edge, left-click and drag to the desired location.

**Histogram settings**

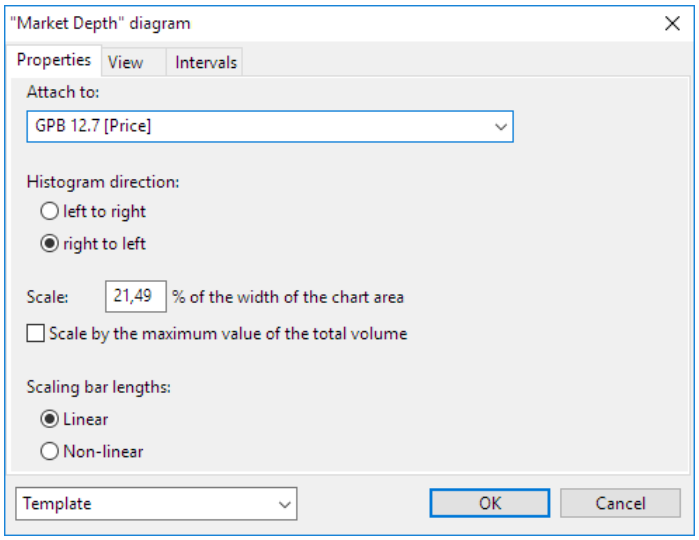
The window **"Market Depth" diagram** can be launched by one of the following ways:

- Right-click the histogram's title or edge and then select **Edit...**.
- Double left click on the histogram's title or edge.

**Properties tab**

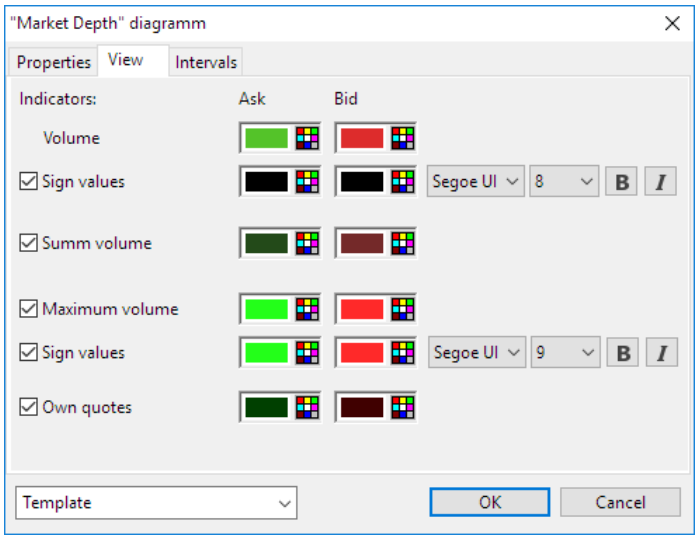
Available parameters:

1. **Attach to** – select a graph to which to attach a histogram.
2. **Histogram direction**:
   - **left to right**;
   - **right to left**.
3. **Scale ... % of the width of the chart area**.




4. **Scale by the maximum value of the total volume** – if selected and the **Sum volume** check box is selected on the **View** tab, then the volume of current active orders is displayed on a scale taking into account the maximum volume. If the check box is clear, and the **Sum volume** check box is selected on the **View** tab, then the volume of current active orders is displayed on a scale taking into account the maximum volume and the sum volume is displayed in the entire chart area.
5. **Scaling bar lengths**:
   - **Linear**;
   - **Non-linear** – it is recommended to use if there are orders on the market with the volume significantly higher the volumes of other orders.

**View tab**




These settings allow selecting colors and fonts for the figure indicators. For color configuration settings, see Chapter 2, "Basic Operating Principles", 2.8.4.

Available parameters:

1. **Indicators** – indicator values for purchase and sale:

   - Volume – color for order volumes.
   - Sign values – color and font for the tip text.
   - Sum volume – color for the total volume of orders.
   - Maximum volume – color for the maximum volume of orders.
   - Own quotes – color for own orders.

**Intervals tab**

The histogram visibility in different interval lengths is set up on this tab. Valid values:

- Tick;
- Minutes (from 1 to 6, 10, 15, 20, 30);
- Hours (1, 2, 4);
- Day;
- Weekly;
- Month.

**Template**

Set up the histogram template to be used:

- **Reset default:** apply the default settings to the histogram.
- **Save as:** save histogram settings to the template. The template name is to be specified in the opened dialog box.
- <Template name>: apply the settings of the selected template to the histogram. To delete a template from the list click "X" in a row with the template name.

Click **OK** to close the configuration dialog with saving changes or **Cancel** to close it without saving.

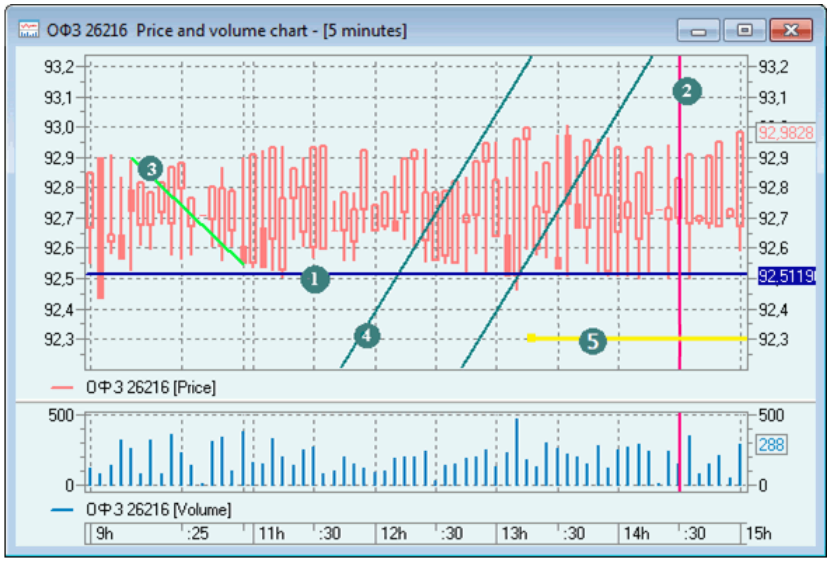
**Operations available under the shortcut**

- **Edit...**: open the **"Market Depth" diagram** to set up the parameters of a histogram (see 4.2.15).
- **Copy** (or **Ctrl+C**): copy the selected histogram to the clipboard.
  To insert the copied element to the graph select **Insert** item under the plotting area shortcut or press **Ctrl+C**.
- **Delete figure** (or **Del**): delete the selected histogram from the graph.

# 4.3 Technical Analysis Instruments

To analyze trade prices behavior using graphs, QUIK allows you to draw lines and technical analysis indicators.

### 4.3.1 Drawing lines




1. To draw a horizontal line:

   _ Click — on the toolbar, or select the **Draw / Horizontal line** from the shortcut menu of the graph's plotting area;

   _ Left-click on the graph window and drag the line that appears to the required level, then release the left mouse button.

2. To draw a vertical line:

   _ Click | on the toolbar, or select the **Draw / Vertical line** from the shortcut menu of the graph's plotting area;

   _ Left-click on the graph window and drag the line that appears to the required value, then release the left mouse button.

3. To draw trend lines:

   _ The first method: press and hold the **Shift** key, then click on the line start point and drag in the required direction to draw a line;

- The second method:
  - press the **Shift** key you can click on the toolbar, or select the **Draw / Channel** from the shortcut menu of the graph's plotting area;
  - press the left mouse button at the line start and drag it in the desired direction to draw a line.

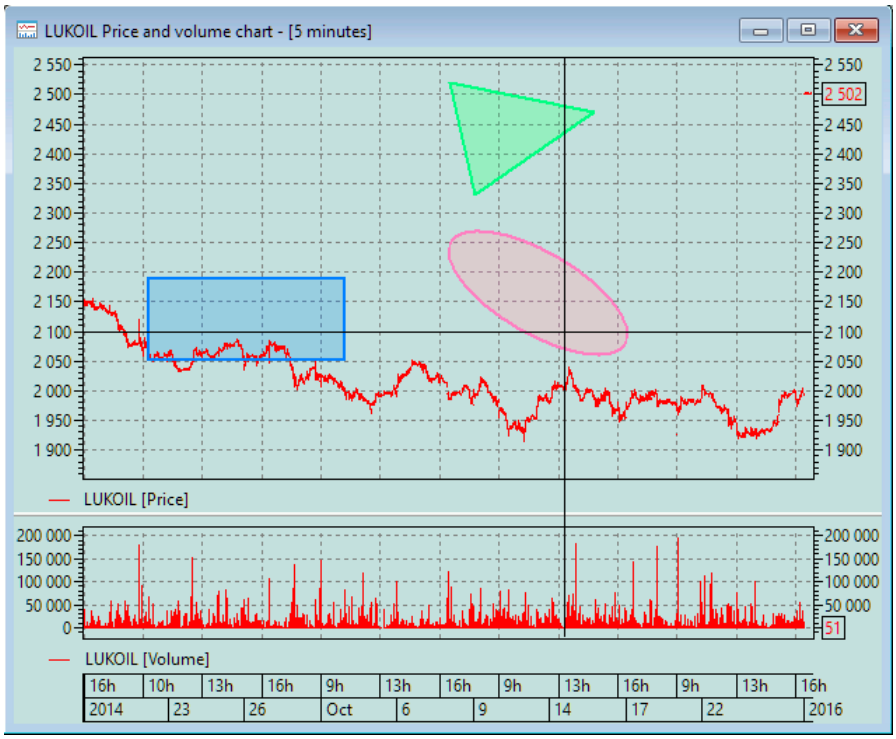
4. To draw channels:

   - Click on the toolbar, or select the **Draw / Channel** from the shortcut menu of the graph's plotting area;
   - Left-click on the line start point in the graph window and drag it in the required direction to draw a line. Once you release the left mouse button, the first line of the channel will be fixed in this position;
   - Generate the channel width by moving the cursor up and down, then left-click. The second line of the channel will be fixed in this position.

5. To draw a horizontal ray:

   - Click on the toolbar, or select the **Draw / Horizontal ray** from the shortcut menu of the graph's plotting area;
   - Left-click on the ray start point in the graph window, and after that a horizontal ray will continue to right. The ray direction (right, left, both) is set in the trend line settings (for the **Coordinates** tab description, see 4.3.5).

### 4.3.2 Drawing geometric shapes




1. Drawing a rectangle:

   - Click on the toolbar or select Draw/Rectangle in the shortcut menu of the chart plot area;
   - Press and hold the left mouse button in the starting point of a rectangle (for example, the upper left corner) and move in the desired direction to draw a rectangle. After

releasing the left mouse button, the end point of a rectangle (for example, the lower right corner) will be fixed.

The price and time marks corresponding to four anchor points of a rectangle are displayed on the axes while drawing.

**2.** Drawing a triangle:

- Click on the toolbar or select Draw/Triangle in the shortcut menu of the chart plot area;
- Press and hold the left mouse button in the starting point of a triangle and move in the desired direction to the second point, then release the left mouse button to fix the second point. After that, move in the desired direction to the third point and press the left mouse button to fix the third point.

  The price and time marks corresponding to three anchor points of a triangle are displayed on the axes while drawing.

**3.** Drawing an ellipse:

- Click on the toolbar or select Draw/Ellipse in the shortcut menu of the chart plot area;
- Press and hold the left mouse button in the starting point of an ellipse and move in the desired direction to the second point to set a longitudinal diameter of an ellipse, then release the left mouse button to fix the second point. After that, move the mouse to set the cross diameter and press the left mouse button to fix it.

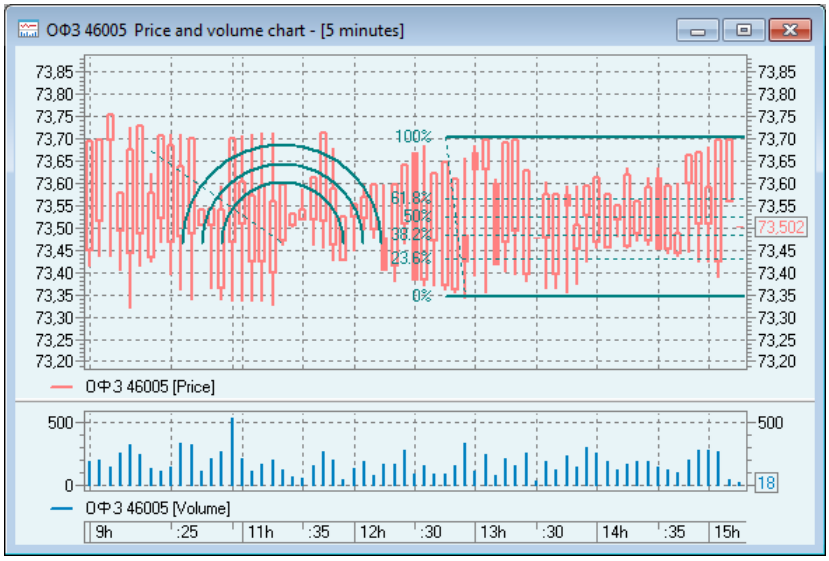
  The price and time marks corresponding to two anchor points of an ellipse are displayed on the axes while drawing.

### 4.3.3 Linear instruments

Linear instruments are geometric figures placed on prices or indicators charts, for example Fibonacci lines.

**Fibonacci numbers** are the sequence in which every successive number is the sum of two preceding numbers. 1,1,2,3,5,8,13,21,34,55,89,144, etc. This sequence has some internal interdependencies. For example, every number in this sequence, except for the first three numbers, is approximately 1.618 time larger than the preceding number and 0.618 time smaller than the next number. Use of Fibonacci lines relies on the assumption that focal points of prices behavior are located near Fibonacci lines.

Available line types:




1. – Fibonacci Arcs consist of three arcs with radii of 38.2%, 50.0%, and 61.8% of the price value differences at the start and the end of the line.
2. – Fibonacci Fan consists of three inclined lines that cross a vertical line plotted from a later point at levels of 38.2%, 50.0%, and 61.8% of the price value difference at the start and the end of the line.
3. – Fibonacci Retracement consists of nine horizontal lines at levels set by Fibonacci numbers 0.0, 23.6, 38.2, 50.0, 61.8, 100, 161.8, 261.8, and 423.6%.
4. – Fibonacci Time Zones are a series of vertical lines running at intervals that correspond to numbers 1, 2, 3, 5, 8, 13, 21, 34 and so on.
5. – Speed Resistance Lines are three inclined lines that cross the vertical line plotted from the later point at levels of 1/3, 2/3 and 1 of the price value difference at the start and the end of the line.

Use of linear instruments is similar to drawing lines:

- Select the line type by clicking the buttons on the toolbar or select the appropriate item under Draw menu from the shortcut menu of the graph's plotting area;
- Draw a line on the chart to connect the extrema of the price (the maximum and the minimum).

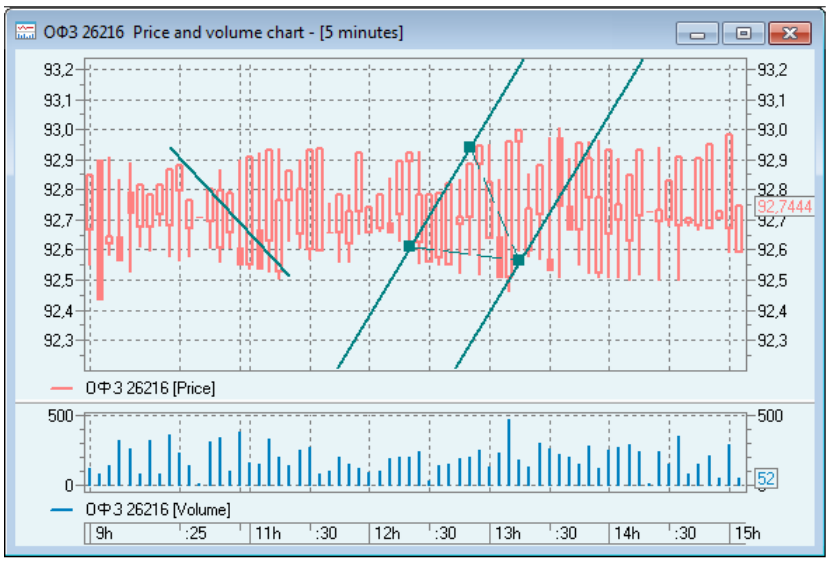
### 4.3.4 Operations with trend lines and figures

**Operations available under the shortcut**

- **Edit...**: open the **Edit <line (figure) type name>** to set up the parameters of a trend line or a figure (see 4.3.5).
- **Copy** (or **Ctrl+C**): copy the selected trend line or figure to the clipboard.
  To insert the copied element to the graph select **Insert** item under the plotting area shortcut or press **Ctrl+C**.
- **Delete trendline / Delete horizontal ray / Delete figure** (or **Del**): delete the selected trend line or figure from the graph.

**Additional operations**

1. Mark a trend line or a figure: visually mark the grid points by hovering over the line or the figure body and clicking left mouse button:




Use one of the following ways to mark a trend line or a figure:

- Hover over the trend line (figure's border), click left mouse button. To unmark move the cursor from the trend line (figure's border);
- Hover over the trend line (figure's border), Click left or right mouse button in the plotting area out of the trend line (figure's border) to unmark it.

2. Change trend line or figure: move the cursor to the grid point (a label in form of a wrist will appear near the cursor) and holding down the left mouse button pull it to change the figure. A rectangle sides are parallel to the net lines, figure incline is not supported.
   When a figure is edited price and time marks, which correspond to the figure grid points, are displayed on the axes.
3. To change slope and/or width of channel select the channel, then:
   - To change slope of the channel's lines press left button of mouse in the grid point of line which has two grid points (image in form of hand will appear near the cursor) and drag in desired direction;
   - To change space between the channel's lines press right button of mouse in the grid point of line which has one grid point (image in form of hand will appear near the cursor) and drag the cursor un/down to form width of the channel.
4. Move trend line or figure: left-click on the trend line or figure middle (a crosshair icon will appear next to the cursor) and drag it in the required direction.
5. Copy trend line or figure: press and hold the Ctrl key, then left-click
   - on the trend line ок figure's border line (for parallel transfer);
   - or on the grid point (to create a new line or figure that has a common vertex with the previous one).
6. Delete trend line or figure: delete element by one of the following ways:

- Select the shortcut menu item **Delete trend / Delete horizontal ray / Delete figure** for element;
- Select element and press **Delete** button. The line / figure will be deleted requiring confirmation.

**Properties of trend lines:**

1. When a chart is rescaled, trends change their appearance together with their graphs.
2. If a chart displays two graphs in the same plotting area, to scale a trend line correctly, you must specify the graph to which it belongs. This can be done from the **Link to...** item in <Line (figure) type> properties dialog.
3. When you delete a graph to which a trend is linked, the trend lines are deleted as well.
4. A trend line cannot be drawn if there are no graphs in the plotting area.
5. Trend lines are not saved when you close the program.
6. Default color and thickness of trend lines can be specified in Edit chart settings dialog **Format Chart Area** tab.
7. Copy settings of the current trend. Customized settings of the current trend (through <Line (figure) type> properties dialog) are automatically accepted for the following trends of the same type. Otherwise the default settings are used.

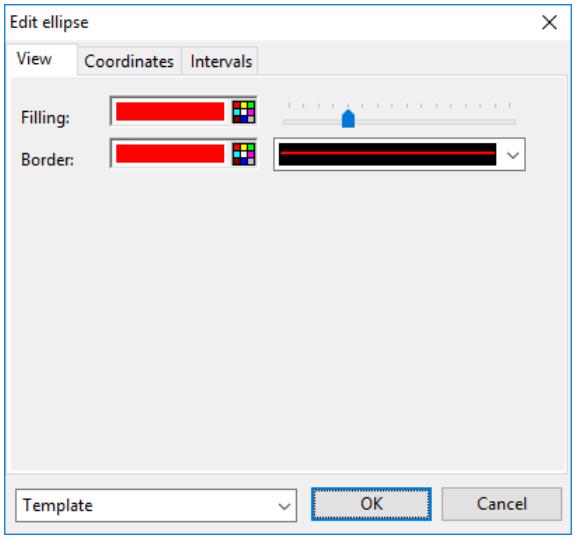
### 4.3.5 Figures and trend lines setup

The Edit <line (figure) type> dialog box is opened by one of the following ways:

- Press the right mouse button on the selected trend line or the edge of the figure and select the **Edit...** menu item.
- Double click on the selected trend line or the edge of the figure.

> **The set of parameters on tabs depends on the type of trend lines and figures.**

**View tab**




On the View tab the view of lines and figures is set up:

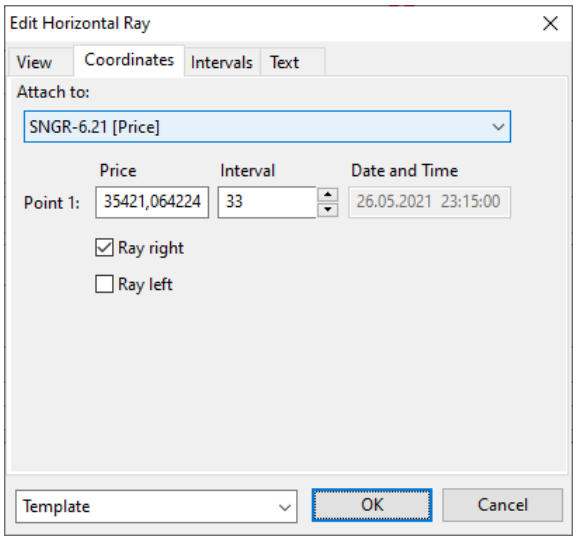
1. **Style** – select color, style and width of the main line. It is specified for lines of Trend line, Horizontal line, Horizontal ray, Vertical line, Fibonacci time zones types.
2. **Extend to left** – extend the line to the left making a half-line. It is specified for Trend lines;
3. **Extend to right** – extend the line to the right making a half-line. It is specified for Trend lines;
4. **Always show the value on the price axis** – show the trend value on the vertical axis. If the checkbox is disabled, then a value is shown on the vertical bar, only when the trend is selected. It is specified for Horizontal lines and Horizontal rays.
5. **Main line** – select color, style and width of the main line. It is specified for lines of Fibonacci arc, Fibonacci fan, Fibonacci retracement, Speed lines types.
6. **Resistance line** – select color, style and width of the resistance line. It is specified for lines of Fibonacci arc, Fibonacci fan, Fibonacci retracement, Speed lines, Channel types.
7. **Support line** – select color, style and width of the support line. It is specified for lines of Fibonacci arc, Fibonacci fan, Fibonacci retracement, Speed lines, Channel types.
8. **Filling** – select color and clearance level of the filling. It is specified for lines of Rectangle, Triangle, Ellipse types.
9. **Border** – select color, style and width of the figure's border. It is specified for lines of Rectangle, Triangle, Ellipse types.
10. **Build by counter trend** – build by an opposite trend. It is specified for lines of Fibonacci fan type.
11. **Level marks** – show the labels to the chart lines:

    - on the left;
    - on the right.

    It is specified for lines of Fibonacci retracement type.

Color settings are described in Chapter 2, "Basic Operating Principles", sub-section 2.8.4.

**Coordinates tab**




1. **Attach to** – select the chart the trend line or figure is attached to.
2. Coordinates of trend lines' and figures' grid points:

- **Price:** value on the vertical axis. For a rectangle it is displayed at lower and upper borders.
- **Interval:** number of the interval with the grid point.
- **Date and Time:** starting date and time of the interval with the grid point. If the spot is in the future time interval, then the box displays the number of shift intervals with a plus (+) sign, for example, +2. For a rectangle it is displayed at left and right borders. The box is not editable.

The number of grid points depends on the graph type:

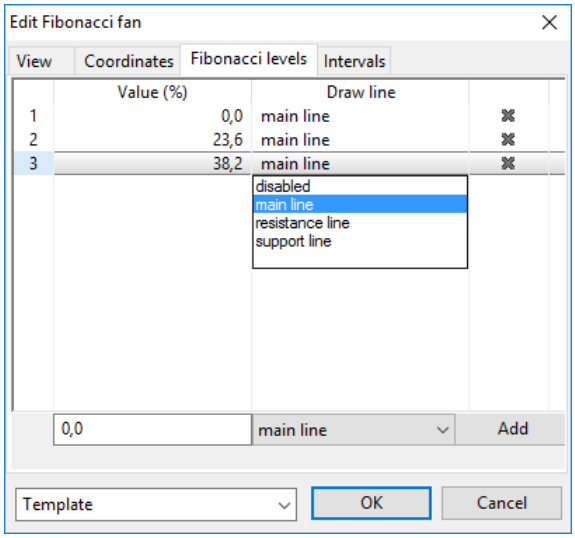
- Horizontal line, Horizontal ray, Vertical line – one grid point.
- Trend line, Rectangle, Fibonacci arc, Fibonacci fan, Fibonacci retracement, Speed lines, Fibonacci time zones – two grid points.
- Ellipse, Triangle, Channel – three grid points.

3. Horizontal ray direction:

- Ray right – a ray is directed to right. Set for Horizontal ray lines.
- Ray left – a ray is directed to left. Set for Horizontal ray lines.

Both directions may be selected simultaneously.

**Fibonacci levels tab**




Fibonacci levels are set up on this tab. The tab is displayed in settings of Fibonacci arc, Fibonacci fan, Fibonacci level types.

1. **Value (%)**: level value;
2. **Draw line**: select line:

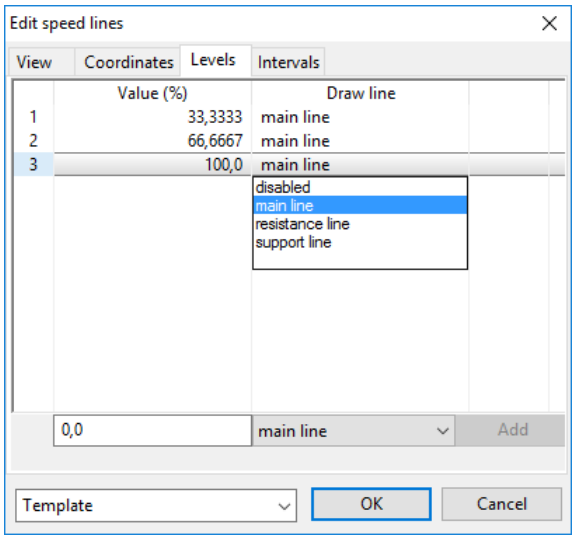
- disabled: disable level displaying;
- main line;
- resistance line;
- support line.

Minimum level quantity: 1.

To add a new level change the level parameters in the lower window part and click **OK**.

To delete a level click on “X” on its right or disable its displaying and specify a zero value: levels with this parameters are deleted from the list automatically.

### Levels tab




Correction levels are set up on this tab. The tab is displayed in settings of Speed lines.

1. **Value (%)**: level value;
2. **Draw line**: select line:

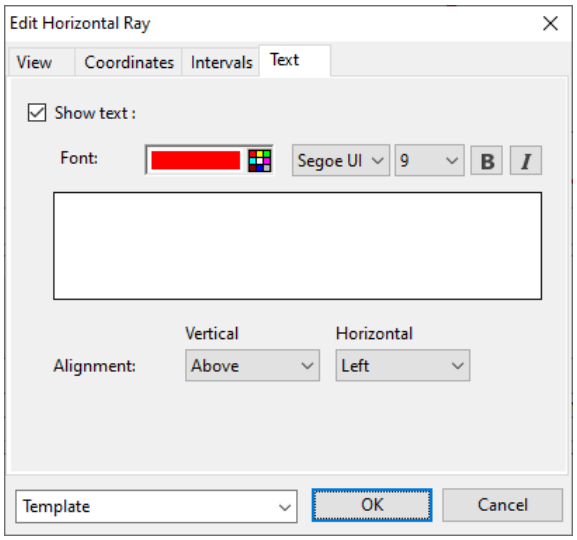
   - disabled: disable level displaying;
   - main line;
   - resistance line;
   - support line.

Minimum level quantity: 3.

To add a new level change the level parameters in the lower window part and click **OK**.

To delete a level click on “X” on its right or disable its displaying and specify a zero value: levels with this parameters are deleted from the list automatically.

**Text tab**



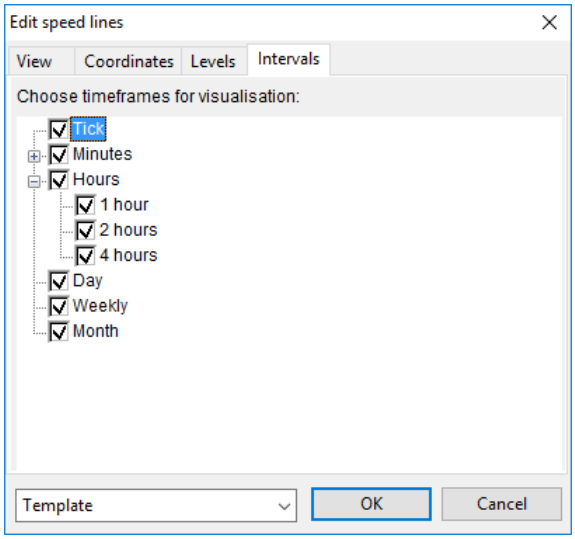

Label text for Horizontal ray line type is set on this tab.

1. **Show text** – indicates that a horizontal ray is accompanied by text. If the check box is selected, other parameters are available.
2. **Font** – setting the color, font, size and font style. Color settings are described in Chapter 2, "Basic Operating Principles", sub-section 2.8.4.
3. Box for horizontal ray text.
4. **Alignment** – text alignment relative to a horizontal ray:

   _ Above / below;

   _ Left / Right.

**Intervals tab**

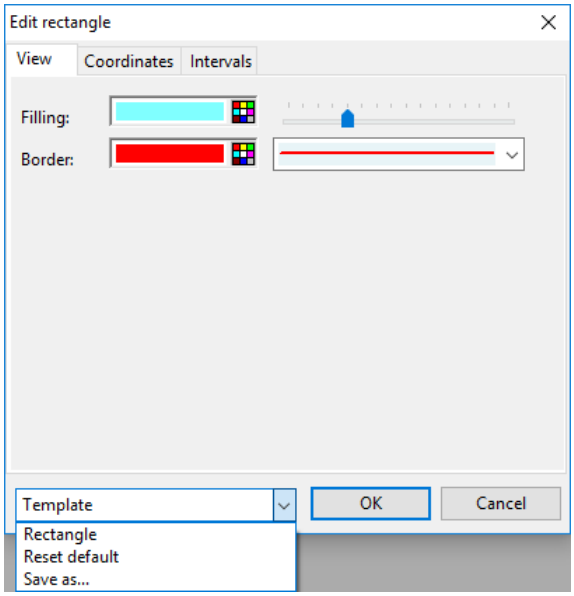



The visibility of the trend line or figure at different interval lengths is set up on the tab. Possible values:

- Tick;
- Minutes (from 1 to 6, 10, 15, 20, 30);

- Hours (1, 2, 4);
- Day;
- Weekly;
- Month.

**Template**

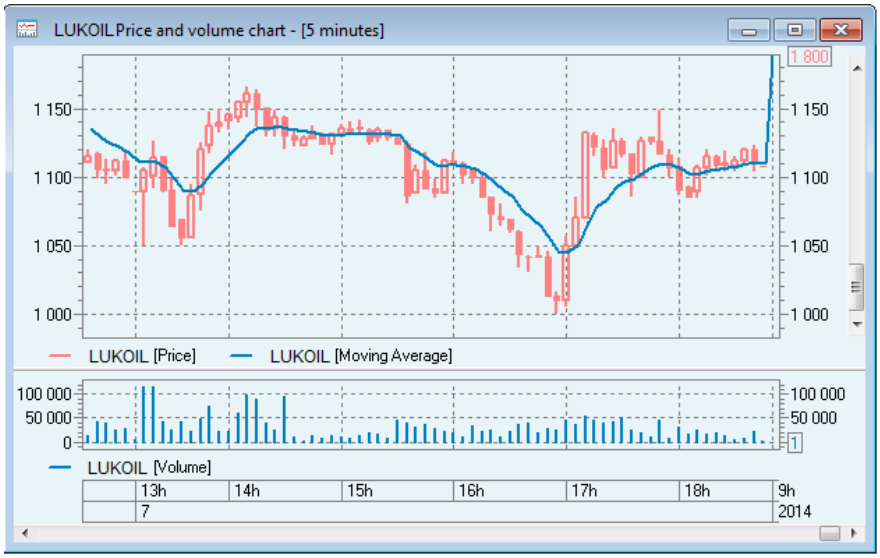



The trend line or figure template can be set up:

- **Reset default** – apply the default settings to a trend line or figure.
- **Save as...** – save the trend line or figure settings to a template. Specify the template name in the window that opens.
- **<Template name>** – apply the saved trend line or figure settings of the template to a figure. To delete a template from the list, use the X button located in the string with the template name.

### 4.3.6 Moving averages

The lines plotted using moving averages show an average price value for several preceding periods.




To add this technical analysis indicator to a chart, select **Add graph (indicator)** from the shortcut menu and then select **Moving Average** from the list of available parameters.

The indicator settings are located on the **Parameters** tab of the next step of graph configuration.

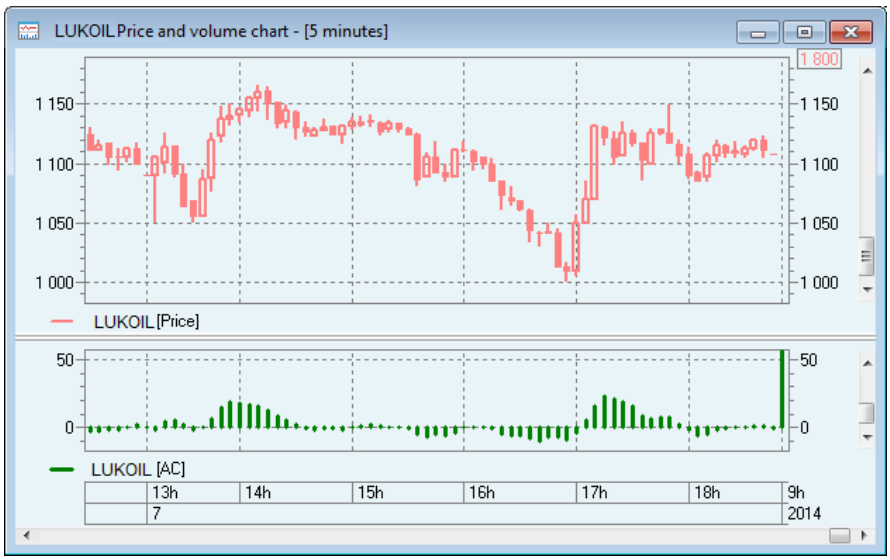
The following types of moving averages are available in QUIK:

| Indicator name | Calculation | Settings |
|---|---|---|
| Simple moving average<br>Simple Moving Average (SMA) | **SMA = sum($P_i$) / n,**<br>Where **$P_i$** is the price value in the ith period | 1. **Number of periods:** positive integer n.<br>2. **Method:** selecting the method of calculating the moving average (Simple, Exponential, Vol. Adjusted, Smoothed).<br>3. **Price field:** selection of the price value used in the formula.<br>_ **Open**: the opening price (the first trade price) in a period;<br>_ **High**: the maximum price;<br>_ **Low**: the minimum price;<br>_ **Close**: the closing price (the last trade |
| Exponential moving average<br>Exponential Moving Average (EMA) | **$EMA_i$ = ($EMA_{i-1}$*(n-1) + 2*$P_i$) / (n+1),**<br>where:<br>_ **$P_i$** is the price value in the current period;<br>_ **$EMA_i$** is the EMA value of the current period;<br>_ **$EMA_{i-1}$** is the EMA value of the previous period;<br>Initial value is equal to parameter by which the indicator is calculated:<br>**$EMA_0$=$P_0$ –** when calculating by price | |
| Volume adjusted moving average<br>Volume Adjusted Moving | **VMA = sum($P_i$*$V_i$) / sum($V_i$),**<br>where:<br>_ **$P_i$** is the price value in | |

| Indicator name | Calculation | Settings |
|---|---|---|
| Average (VMA) | the ith period;<br>– $V_i$ is the volume value in the ith period | price);<br>– **Median** = (High+Low)/2;<br>– **Typical** = (High+Low+Close)/3 |
| Smoothed moving average<br>Smoothed Moving Average (SMMA) | **$SMMA_i$ = (sum($P_i$) – $SMMA_{i-1}$ + $P_i$) / n,**<br>where **$P_i$** is the price value in the ith period.<br>Initial value is equal to parameter by which the indicator is calculated:<br>**$SMMA_0$=sum($P_i$) / n –** when calculating by price | |

# 4.4 Methods of Technical Analysis

### 4.4.1 AC (Acceleration/Deceleration)




The AC indicator (Accelerator/Decelerator Oscillator) measures the acceleration and deceleration of the current market driving force. Market driving force changes before any changes in the price take place. Before the market driving force changes its direction, its acceleration must slow down to zero. After that, it will begin to accelerate in the opposite direction until the price begins to change its direction.

The AC indicator changes direction before any changes in the driving force, which, in its turn, changes its direction before the price. The AC indicator can be used as an early warning and can give you certain advantages.

Calculation:

**AC = AO – SMA (AO, S),**

where **AO = SMA (MEDIAN PRICE, S) – SMA (MEDIAN PRICE, L)**

**S** is the duration of the short period; the default value is 5;

**L** is duration of the long period; the default value is 34;

**MEDIAN PRICE** is the median price, **MEDIAN PRICE = (HIGH + LOW) / 2**

**HIGH** is the maximum bar price;

**LOW** is the minimum bar price;

**SMA** is simple moving average;

**AO** is the Awesome Oscillator indicator.

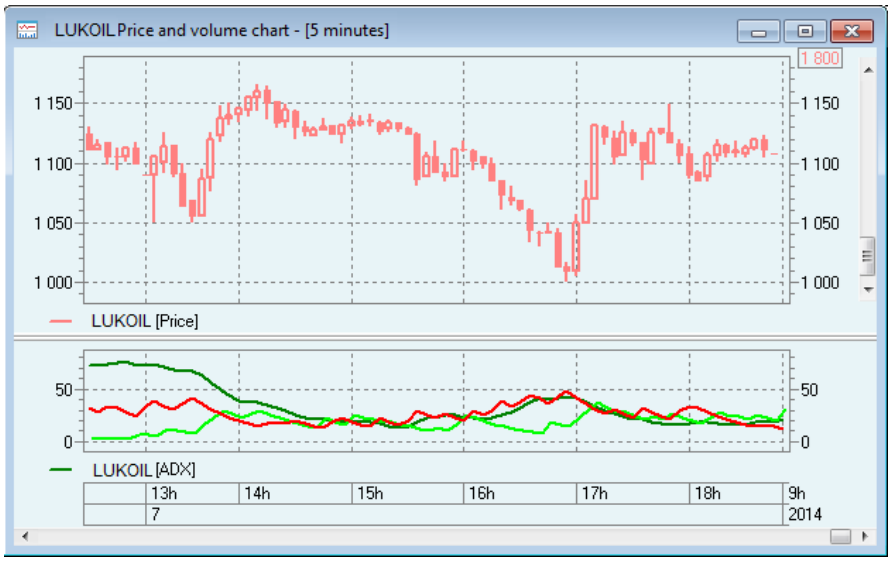
The AC column chart is the difference between the value of 5/34 of the driving force column chart and 5-period exponential moving average taken from that column chart.

Settings:

1. **Short period** is the duration of the **S** short period for MA calculation.
2. **Long period** is the duration of the **L** long period for MA calculation.
3. **Method** is the **MA** calculation method (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Exponential'.

### 4.4.2 ADX (Average Directional Movement Index)

The ADX indicator (Average Directional Movement Index) serves to indicate the direction of the average price determined by comparing two directional indicators: the 14-period +DI (positive price change) and the 14-period -DI (negative price change). Welles Wilder, the author of the indicator, recommends buying when +DI is higher than -DI and selling when -DI is above +DI.



Calculation:

$$ADX_j = EMA\ (DX_j, N),$$

where $DX_j$ is calculated as follows:

$$DX_j = |(+DI_j - -DI_j)| / (+DI_j + -DI_j)*100$$

$$+DI_j = EMA\ (+SDI_j, N)$$

$$-DI_j = EMA\ (-SDI_j, N)$$

$+SDI_j = +DM_j / TR_j * 100$ if $TR_j <> 0$, otherwise $+SDI_j = 0$

$-SDI_j = -DM_j / TR_j * 100$ if $TR_j <> 0$, otherwise $-SDI_j = 0$

$TR_j = max(|HIGH_j - LOW_j|, |HIGH_j - CLOSE_{j-1}|, |LOW_j - CLOSE_{j-1}|)$

$+DM_j = |HIGH_j - HIGH_{j-1}|$ if $HIGH_j > HIGH_{j-1}$, otherwise $+DMj = 0$

$-DM_j = |LOW_{j-1} - LOW_j|$ if $LOW_j < LOW_{j-1}$, otherwise $-DMj = 0$

if $+DM_j > -DM_j$, then $-DM_j = 0$

if $-DM_j > +DM_j$, then $+DM_j = 0$

if $+DM_j = -DM_j$, then $+DM_j = 0$, $-DM_j = 0$

**CLOSE** is the closing price;

**LOW** is the minimum price of the interval;

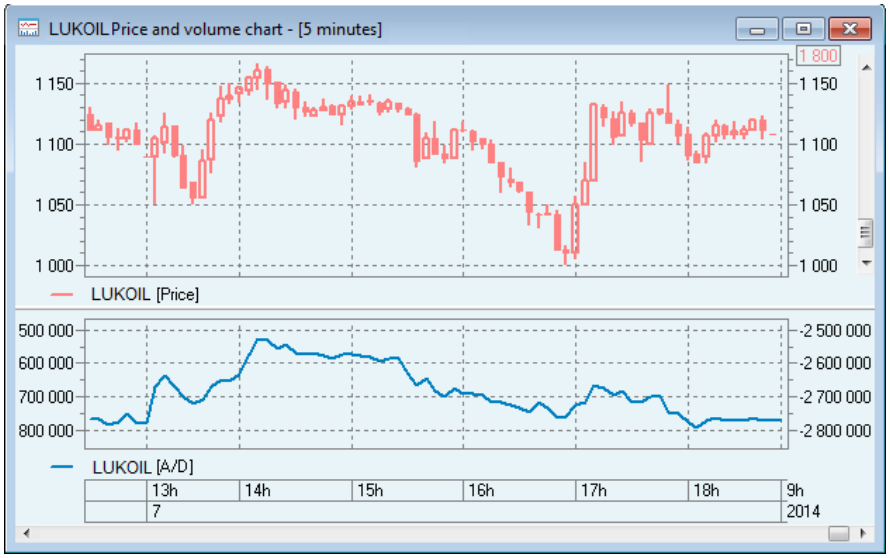
**HIGH** is the maximum price of the interval.

> **Values of indicators +DI and −DI are accounted with accuracy of two decimal places.**

Settings:

1. **Number of periods** is the number **N** of periods for MA calculation.
2. **Method** is the **MA** calculation method (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Exponential'.
3. **Color +DI**: line color for the +DI.
4. **Color -DI**: line color for the -DI.

### 4.4.3 A/D (Accumulation/Distribution)




The Accumulation/Distribution indicator is determined by changes in the price and volume. Volume serves as a weighting factor for price: the larger the volume (the factor), the greater the contribution of the price change (within this time period) to the indicator value.

When the indicator grows, this means accumulation (buying) of an instrument, since the overwhelming share of trading volumes is related to a price uptrend. When the indicator drops, it means distribution (selling) of the instrument, since the overwhelming share of trading volumes is related to a price downtrend.

Calculation:

$$\mathbf{CumAD = AD_n + CumAD_{n-1}},$$

where $\mathbf{AD_n = (2*CLOSE_n - LOW_n - HIGH_n) * VOLUME_n / (HIGH_n - LOW_n)},$

and $\mathbf{CumAD_0 = AD_1}$.

**CLOSE** is the closing price;

**LOW** is the minimum price of the interval;

**HIGH** is the maximum price of the interval;

**VOLUME** is the volume.

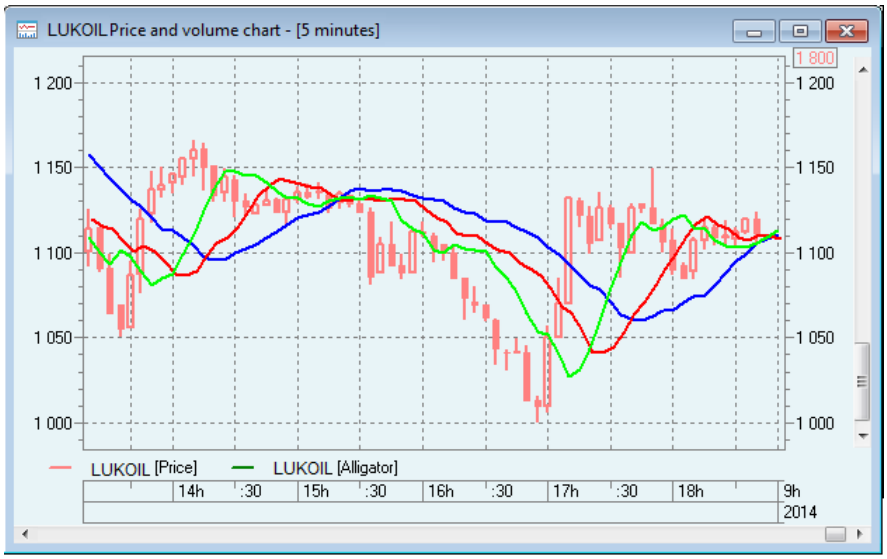
There are no settings available.

> **If the value of HIGHn – LOWn in the denominator equals zero, the indicator value is calculated for the previous candlestick. If there is no previous candlestick, the indicator value equals zero.**

### 4.4.4 Alligator

The Alligator indicator is a combination of balance lines (Moving Averages) that use fractal geometry and nonlinear dynamics.

- Blue line (Alligator's jaw) is the balance line for the period used to build the chart (13-period smoothed moving average shifted into the future by 8 intervals);
- Red line (Alligator's teeth) is the balance line for the period of one level lower (8-period smoothed moving average shifted into the future by 5 intervals);
- Green line (Alligator's lips) is the balance line for the period of one more level lower (5-period smoothed moving average shifted into the future by 3 intervals).




Calculation:

**ALLIGATORS JAW = SMMA (MEDIAN PRICE, 13, 8)**

**ALLIGATORS TEETH = SMMA (MEDIAN PRICE, 8, 5)**

**ALLIGATORS LIPS = SMMA (MEDIAN PRICE, 5, 3)**

where **MEDIAN PRICE** is the median price, **MEDIAN PRICE = (HIGH + LOW) / 2**

**HIGH** is the maximum price of the period;

**LOW** is the minimum price of the period;

**SMMA (A, B, C)** is smoothed moving average, where: **A** is the value being smoothed, **B** is the number of smoothing periods, **C** is the shift into the future;

**ALLIGATORS JAW** is the alligator's jaw;

**ALLIGATORS TEETH** is the alligator's teeth;

**ALLIGATORS LIPS** is the alligator's lips.

Settings:

1. **Jaw**: parameters for the **ALLIGATORS JAW**:
   - **Number of periods** defines the number of smoothing periods, **B**;
   - **Shift** defines the number of shift periods, **C**;
   - **Line color**: line color for the Blue line.
2. **Teeth**: parameters for the **ALLIGATORS TEETH**:
   - **Number of periods** defines the number of smoothing periods, **B**;
   - **Shift** defines the number of shift periods, **C**;
   - **Line color**: line color for the Red line;
   - **Method** defines the **MA** calculation method (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Smoothed'.
3. **Lips:** are the parameters for the **ALLIGATORS LIPS**:
   - **Number of periods** defines the number of smoothing periods, **B**;
   - **Shift** defines the number of shift periods, **C**;
   - **Line color**: line color for the Green line.

### 4.4.5 AMA (Adaptive Moving Average)

The AMA indicator (Adaptive Moving Average) is used to plot a moving average with low sensitivity to noise in price series. It is characterized by the lowest delay for trend determination. One of the shortcomings of various algorithms for smoothing price time series lies in the fact that accidental price spikes can cause false signals of the emergence of a trend. On the other hand, smoothing causes inevitable delays in signaling that the trend has stopped or reversed. This indicator was developed by Perry Kaufman to overcome both of these shortcomings.

Calculation:

$$AMA_i = AMA_{i-1} + SSC_i^2 * (P_i - AMA_{i-1}),\ i>n$$ is the current AMA value

**$AMA_i = P_i$, i=n**

**$SSC_i = ER_i * (fSC - sSC) + sSC$** is the variable smoothing constant

**$ER_i = Signal_i / Noise_i$** is the efficiency ratio

**fSC = 2 / (fn + 1)**

**sSC = 2/ (sn + 1)**

**$Signal_i = abs(P_i - P_{i-n})$** is the current signal value

**$Noise_i = \sum_{j=i-n+1}^{i} abs(P_j - P_{j-1})$** is the current noise value

where **sn** is Slow EMA period,

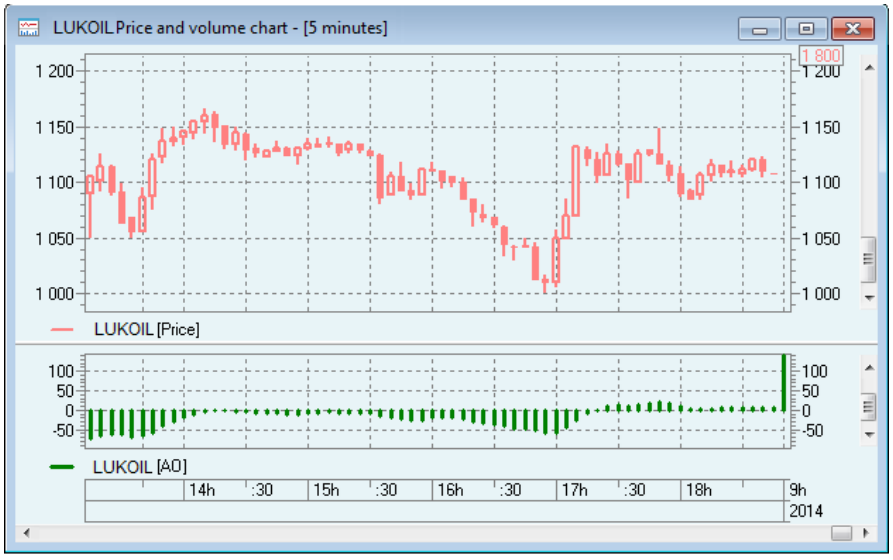
**fn** is Fast EMA period

Parameters:

1. **AMA periods** is the number of **n** periods for AMA calculation.
2. **Fast EMA periods** is the number of periods for Fast EMA calculation.
3. **Slow EMA periods** is the number of periods for Slow EMA calculation.
4. **Price Field** is the interval price value used for **P** (Open, High, Low, Close, Median, Typical); the default value is 'Close'.

### 4.4.6 AO (Awesome Oscillator)

Awesome Oscillator, developed by Bill Williams, helps to determine the current behavior of the market driving force.




Calculation:

**AO = SMA (MEDIAN PRICE, S) – SMA (MEDIAN PRICE, L)**

where **S** is the duration of the short period; the default value is 5;

**L** is the duration of the long period; the default value is 34;

**MEDIAN PRICE** is the median price, **MEDIAN PRICE = (HIGH + LOW) / 2**

**HIGH** is the maximum bar price;

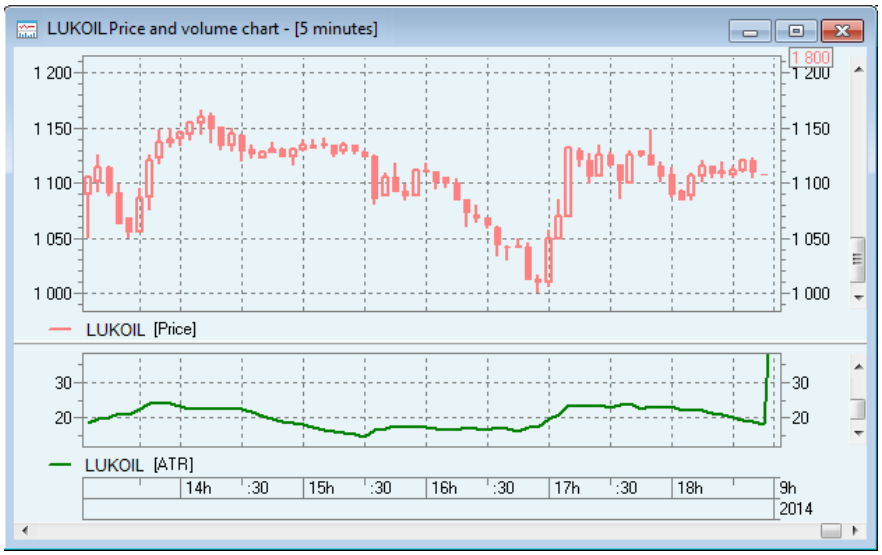
**LOW** is the minimum bar price;

**SMA** is the simple moving average.

Settings:

1. **Short period** is the duration of the **S** short period for MA calculation.
2. **Long period** is the duration of the **L** long period for MA calculation.
3. **Method** is the **MA** calculation method (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Exponential'.

### 4.4.7 ATR (Average True Range)




The ATR indicator is an oscillator that shows volatility of the market. The ATR indicator is required to determine the resistance and support levels. Since the ATR indicator is an oscillator, it can be analyzed using the analysis techniques for classical oscillators.

- Low ATR indicates absence of trend and quiet trade operations within a narrow range;
- High ATR level shows a strongly pronounced trend and intensive trade operations.

The ATR indicator does not show the anticipated direction and duration of movement, it only shows the level of market activity.

Calculation:

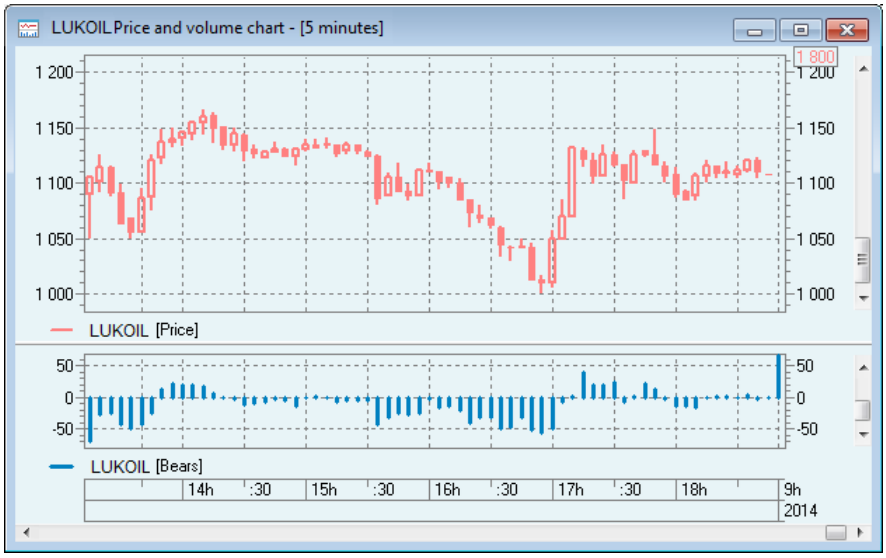
$$ATR_i = \begin{cases} 0, & 0 < i < n \\ \left( \sum_{j=1}^{n} TR_j \right) / n, & i = n \\ \dfrac{ATR_{i-1} \cdot (n-1) + TR_i}{n}, & i > n \end{cases}$$

$$TR_1 = |H_1 - L_1|$$
$$TR_i = MAX\left(|H_i - L_i|, |H_i - C_{i-1}|, |L_i - C_{i-1}|\right), i > 1$$

Settings:

- **Number of periods** is the number **n** of periods.

### 4.4.8 Bears Power




The Bears Power oscillator was developed by Alexander Elder to estimate 'bears power' balance and forecast possible change in the trend direction. This indicator is based on the difference between the minimum price and 13-period exponential moving average. In combination with 13-period EMA and the Bulls Power oscillator, this oscillator forms the Elder Ray technical indicator.

Calculation:

$$\mathbf{Bears_i = L_i - EMA_i}$$

where **L** is the minimum price in the current period;

**EMA** is EMA of the current period.

Settings:

- **Number of periods** is the number **n** of periods for EMA calculation.

### 4.4.9 Bollinger Bands

Bollinger Bands are two bands plotted in the price graph area with the width proportional to the standard price deviation. The width of these bands shows market volatility: bands widen when the market becomes more volatile and narrow when the prices become less volatile.

Calculation:

**BBLower = MA(P,N) – k * StDev(P,N)** is the lower band;

**BBMiddle = MA(P,N)** is the moving average;

**BBUpper = MA(P,N) + k * StDev(P,N)** is the upper band;

where **P** is the price;

**N** is the number of periods used for calculation of the moving average;

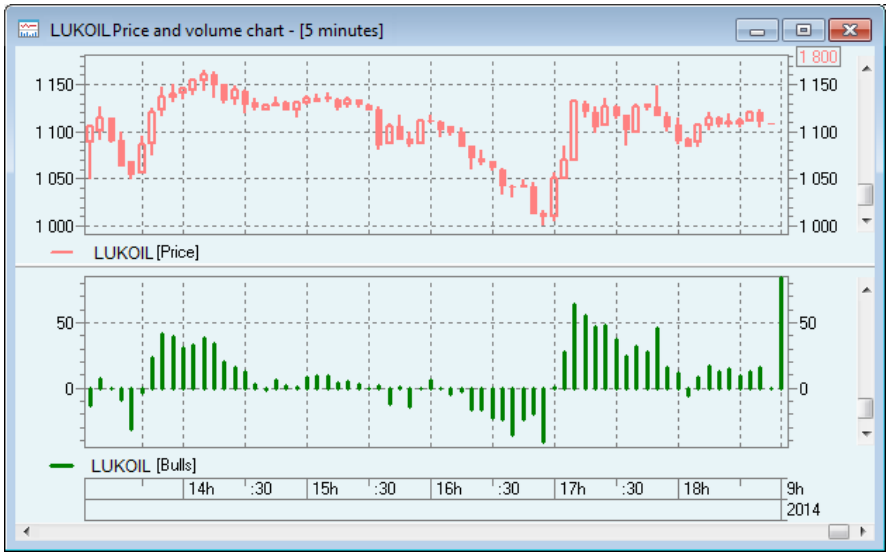
**k** is the number of standard deviations.

Settings:

1. **Number of periods** is the number **N** of periods for MA calculation.
2. **Deviations** is the number of standard deviations (**k**).
3. **Method** is the method used to calculate **MA** (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Simple'.
4. **Price Field** is the interval price (**P**) (Open, High, Low, Close, Median, Typical); the default value is 'Close'.

### 4.4.10 Bulls Power

The Bulls Power oscillator was developed by Alexander Elder to estimate the 'bulls power' balance and forecast possible change in the trend direction. This indicator is based on the difference between the maximum price and 13-period exponential moving average. In combination with 13-period EMA and the Bears Power oscillator, this oscillator forms the Elder Ray technical indicator.




Calculation:

$$\mathbf{Bulls_i = H_i - EMA_i}$$

where **H** is the maximum price in the current period;

**EMA** is EMA in the current period.

Settings:

- **Number of periods** is the number **n** of periods for EMA calculation.

### 4.4.11 CCI (Commodity Channel Index)

Commodity Channel Index (CCI) measures the deviation of the instrument price from its statistical mean. High values of the index indicate that the price is unusually high as compared to the average price, and low values indicate that it is too low. Despite the name, this indicator is applicable to financial instruments, not only to commodities.

Calculation:

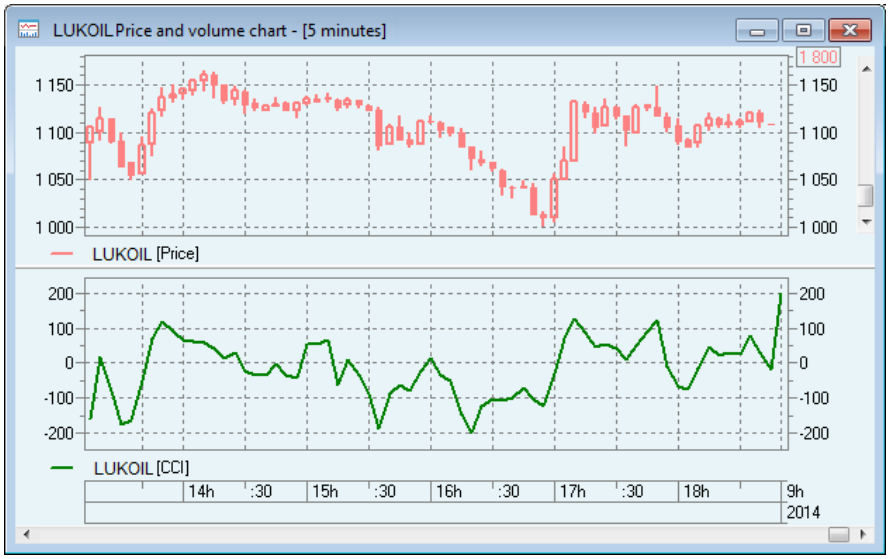
$$\mathbf{CCI = (TP - MA\ (TP, N)) / (MD * 0.015)}$$

where $\mathbf{MD = SUM\ (ABS\ (MA\ (TP, N) - TP_i)) / N}$ is probable deviation;

**TP = (HIGH + LOW + CLOSE) / 3** is a typical price;

**MA** is the moving average;

**N** is the number of periods.

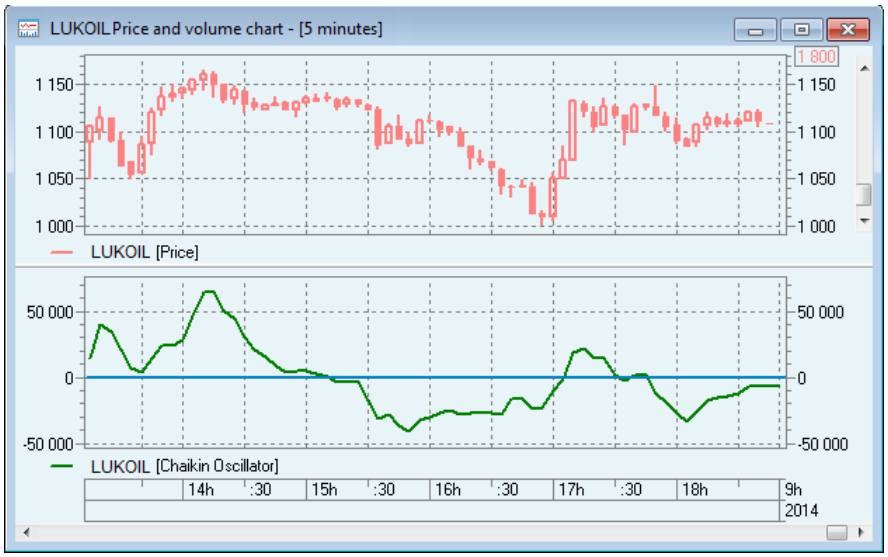



Settings:

1. **Number of periods** is the number **N** of periods for MA calculation.
2. **Method** is the **MA** calculation method (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Exponential'.

### 4.4.12 Chaikin Oscillator

The Chaikin Oscillator is the difference between exponential moving averages of the Accumulation/Distribution indicator with averaging periods of 3 (short period) and 10 (long period) respectively.




Calculation:

**CO = MA (Nshort, CumAD) – MA (Nlong, CumAD),**

where **MA (N, CumAD)** is the moving average of **CumAD** for **N** periods;

**CumAD** is the value of the Accumulation/Distribution indicator;

**Nshort** is the number of intervals in the short period;

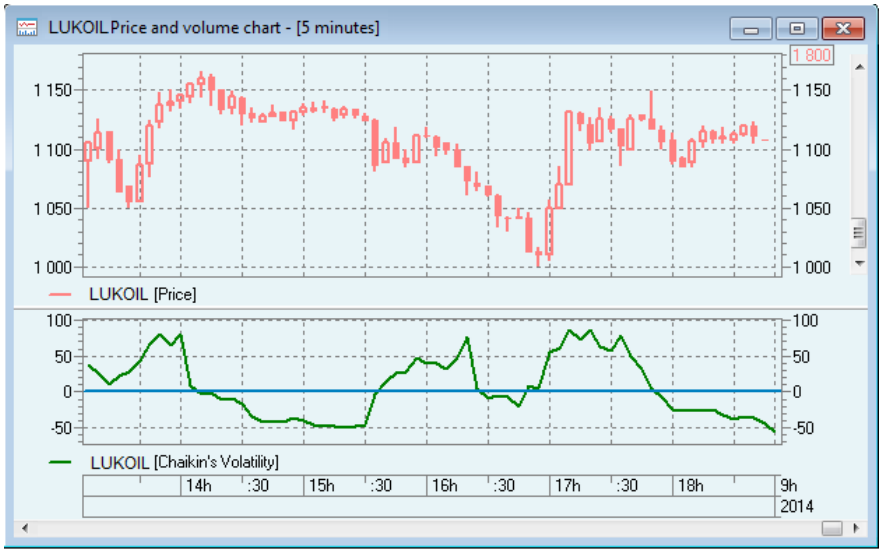
**Nlong** is the number of intervals in the long period.

Settings:

1. **Short period** sets the value of **Nshort**; the default value is 3.
2. **Long period** sets the value of **Nlong**; the default value is 10.
3. **Method** is the **MA** calculation method (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Exponential'.

### 4.4.13 Chaikin's Volatility

The Chaikin's Volatility indicator reacts to changes in the difference between the maximum and the minimum prices. It quantifies volatility as a widening of the range between these extreme values.




Calculation:

$$CV = (MA_n(i, SP_n) - MA_{n-i}(i, SP_n)) * 100 / MA_{n-i}(i, SP_n),$$

where $SP_n = HIGH_n - LOW_n$,

**MA (i, SP)** is the moving average of **SP** with period of **i**;

$HIGH_n$ is the maximum trade price in the **n**th interval;

$LOW_n$ is the minimum trade price in the **n**th interval.

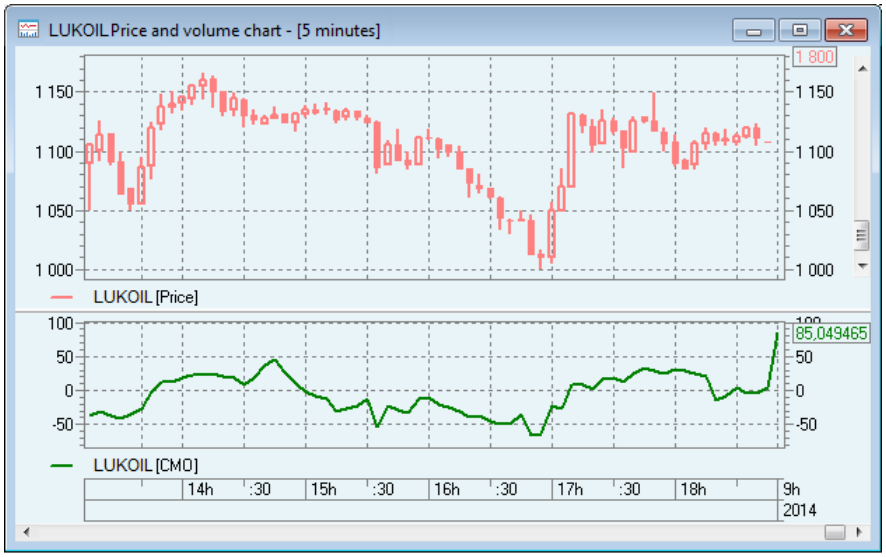
Settings:

1. **Number of periods** sets the number of periods **i** of **MA** averaging, the default value is 10.
2. **Method** is the **MA** calculation method (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Exponential'.

### 4.4.14 CMO (Chande Momentum Oscillator)

Main applications of the Chande Momentum Oscillator:

- Generally, CMO is interpreted to indicate that an instrument is overbought or oversold. An instrument is overbought when the oscillator is above +50 and oversold when below -50. These levels correspond to levels 70 and 30 of the RSI indicator;
- Trend indicator. When CMO of the long period crosses CMO of the short period, it means a buy signal and, conversely, when CMO of the short period crosses CMO of the long period, it means a sell signal.




Calculation:

**CMO = (SUM1 – SUM2) / (SUM1 + SUM2) * 100**

where **SUM1 = SUM (CMO1, n)** is the total value of **CMO1** for n periods;

**SUM2 = SUM (CMO2, n)** is the total value of **CMO2** for n periods;

**diff = $P_i$ – $P_{i-1}$**;

If **diff > 0**, then **$CMO1_I$ = diff, $CMO2_I$ = 0**;

If **diff < 0**, then **$CMO2_I$ = -diff, $CMO1_I$ = 0**;

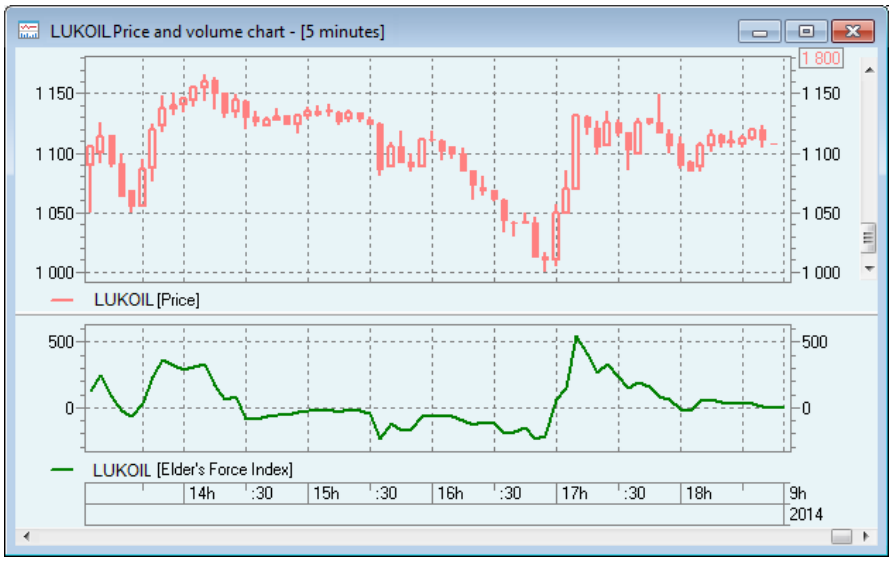
**$P_i$** is the price (usually the closing price) of the current period;

**$P_{i-1}$** is the price (usually the closing price) of the previous period.

Settings:

1. **Number of periods** is the change in the **n** number of periods; the default value is 14.
2. **Price Field** is the interval price (**PRICE)** (Open, High, Low, Close, Median, Typical); the default value is 'Close'.

### 4.4.15 Elder's Force Index




The Elder's Force Index (EFI), developed by Alexander Elder, measures strength of bulls after each increase and strength of bears after each decline. This indicator helps to find the best moment to open and close positions. It is better to buy when the indicator takes negative values and to sell when the value is positive.

Calculation:

$$\mathbf{EFI_N = MA(i, FI),}$$

where $\mathbf{FI = (1 - PRICE_{n-1} / PRICE_n) * VOLUME_n;}$

**MA (i, FI)** is the moving average of **FI** with period of **i**;

$\mathbf{PRICE_n}$ is the price in the nth interval;

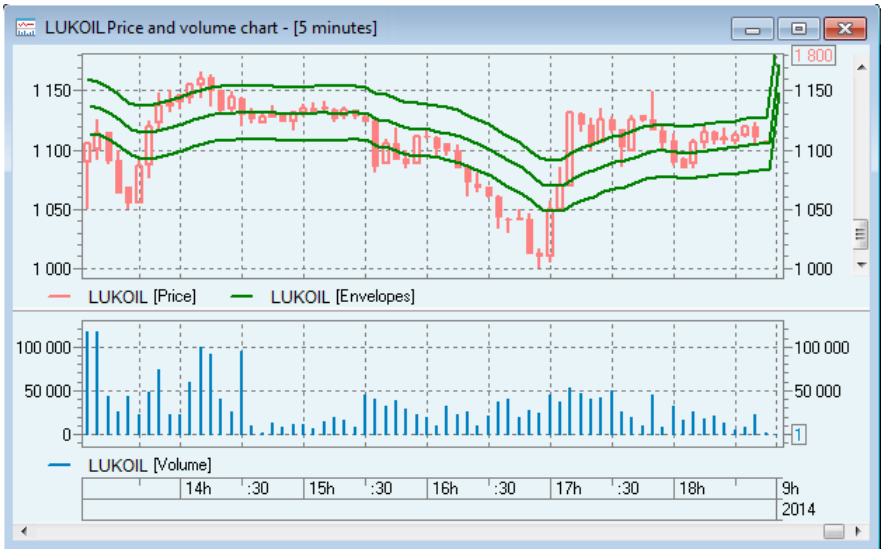
$\mathbf{VOLUME_n}$ is the trade volume of the nth interval.

Settings:

1. **Number of periods** sets the number of periods **i** of **MA** averaging, the default value is 13.
2. **Method** is the **MA** calculation method (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Exponential'.
3. **Price Field** is the interval price (**PRICE)** (Open, High, Low, Close, Median, Typical); the default value is 'Close'.

### 4.4.16 Envelopes

The Envelopes indicator (Envelopes, Envelope lines) is formed with two moving averages (MA). One MA is shifted upward and another one is shifted downward. The envelope lines indicate the upper and the lower levels of the 'normal' trade range of an instrument. A sell signal is generated when the instrument price reaches the upper level, and a buy signal is generated when the price reaches the lower level. An optimal shift value (expressed as a percentage) depends on volatility of the instrument. Higher volatility means larger shift.




Calculation:

**Lo = MA(n, PRICE)** is the middle line;

**Lup = Lo * (1 + k/100)** is the upper line;

**Ldown = Lo * (1 – k/100)** is the lower line;

where **MA(n)** is the moving average of **PRICE** with a period of **I**;

**k** is the shift coefficient, %;

**PRICE** is the interval price.

Settings:

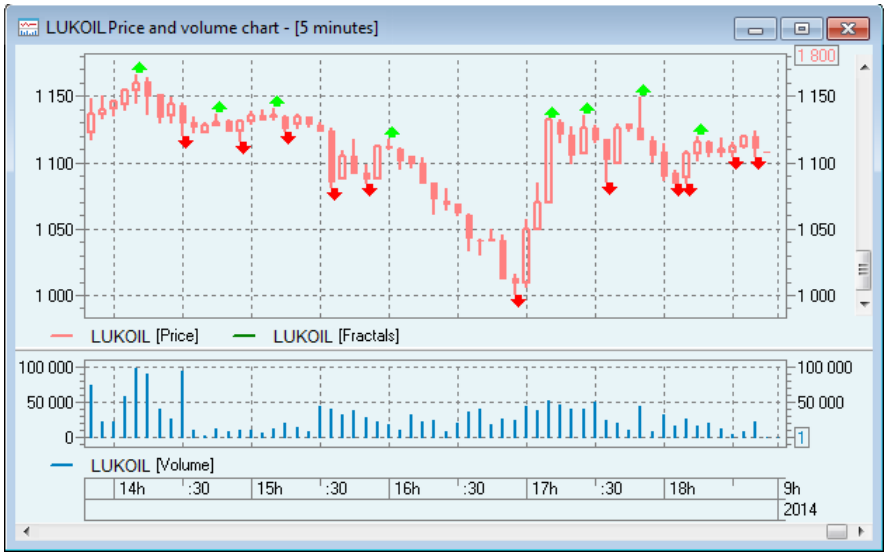
1. **Coefficient** is the shift value **k**; the default value is 2.
2. **Number of periods** sets the number of periods **n** of **MA** averaging, the default value is 20.
3. **Method** is the **MA** calculation method (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Exponential'.
4. **Price field** is the interval price value used for **PRICE** (Open, High, Low, Close, Median, Typical); the default value is 'Close'.

### 4.4.17 Fractals

The Fractals indicator consists of a series of successive candlesticks and may be of two types:

- An 'up fractal' is a series of at least five successive candlesticks with the maximum of the middle candlestick being higher than the maximums of the two preceding and two following candlesticks;
- A 'down fractal' is a series of at least five successive candlesticks with the minimum of the middle candlestick being lower than the minimums of the two preceding and two following candlesticks.

Fractals on a graph have **High** and **Low** values and are marked with up arrows and down arrows.

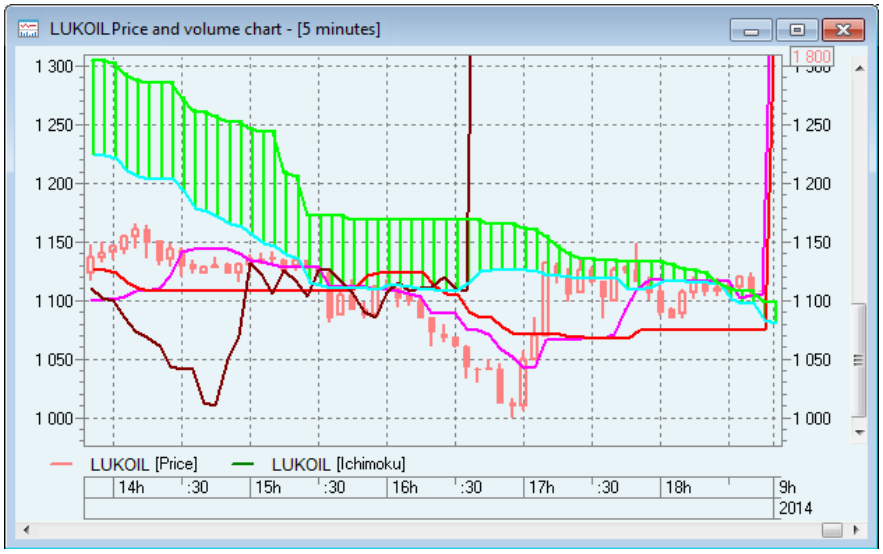



### 4.4.18 Ichimoku

The Ichimoku Kinko Hyo indicator is designed for determining a market trend, support and resistance levels, and for generating signals of buying and selling. This indicator works best at weekly and daily graphs.

The dimension of parameters are determined using four time intervals of different length. The values of individual lines that form this indicator are based on these intervals:

1. Tenkan-sen (the pink line) shows the average price during the first time interval. Tenkan-sen is used as an indicator of the market trend. If this line rises or falls, the trend exists. If it is horizontal, the market has come into a channel.
2. Kijun-sen (the red line) shows the average price during the second time interval and is used as an indicator of the market movement. If the price is higher than this indicator, the prices are likely to continue to increase. When the price crosses this line, changes in the trend are likely to occur. Kijun-sen can be also used to signal: a buy signal is generated when the Tenkan-sen crosses the Kijun-sen from below; a sell signal is generated when the Tenkan-sen crosses the Kijun-sen from above.
3. Senkou Span A (the blue line) shows the middle of the distance between two previous lines shifted forward by the value of the second time interval.
4. Senkou Span B (the green line) shows the average price during the third time interval shifted forward by the value of the second time interval. The distance between the Senkou lines is shaded with another color and is called a 'cloud'.
5. Chinkou Span (the brown line) shows the closing price for the current candlestick shifted backward by the value of the second time interval. If the price is between the lines of the 'cloud', then the market is considered to be non-trending, and the edges of the 'cloud' form the support and resistance levels. If the price is above the 'cloud', then its upper line forms the first support level and its second line forms the second support level. If the price is below the 'cloud', then its lower line forms the first resistance level and its second line forms the second resistance level. If the Chinkou Span crosses the price chart from below, this is a signal to buy. If the Chinkou Span crosses the price graph from above, this is a signal to sell.

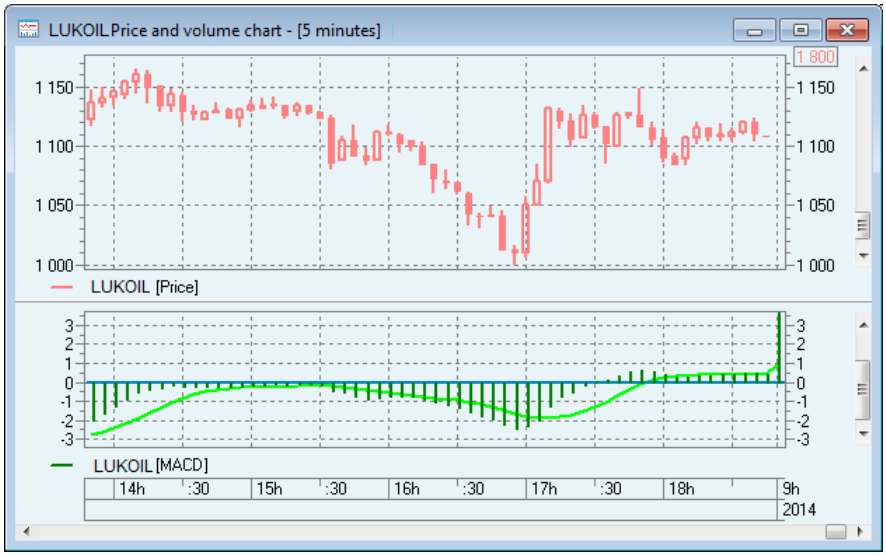



Settings:

1. **Tenkan** is the period length for the Tenkan-sen.
2. **Kijun** is the period length for the Kijun-sen.
3. **Senkou** is the period length for the Senkou Span A.
4. **Chinkou** is the period length for the Chinkou.
5. **Horizontal shift** is the shift length for the Senkou Span B.
6. **Line colors** defines the color of the lines.

### 4.4.19 MACD (Moving Averages Convergence/Divergence)

This indicator consists of two lines: MACD, the column chart that shows the difference between two exponential MAs, and MACD Signal, the 'signal' MA line based on the MACD value.




Calculation:

in points **MACD = MA(P, Nshort) – MA(P, Nlong),**

as a percentage **MACD = 100% * (MA(P, Nshort) - MA(P, Nlong)) / MA(P, Nlong)**

**MACD Signal = MA(MACD, N),**

where **MA(P, Nlong)** is the moving average of price (**P**) for **Nlong** periods (usually 26);

**MA(P, Nshort)** is the moving average of price (**P**) for **Nshort** periods (usually 12);

**MA(MACD, N)** is the moving average of **MACD** for **N** periods (usually 9).

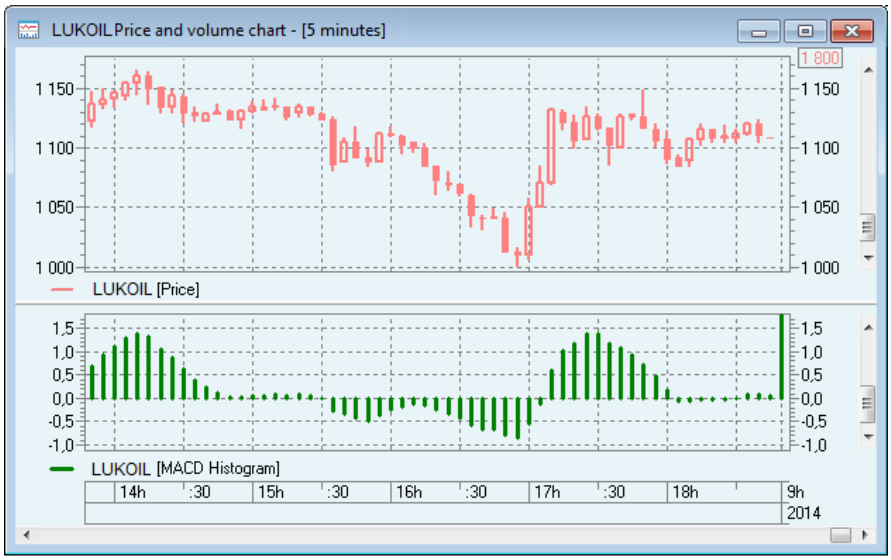
Settings:

1. Settings **Moving averages, Method** are the same as for Price Oscillator.
2. **Signal moving average:**

- **Number of periods** is **N** number of periods for calculating **MA** of **MACD**;
- **Method** is the method used to calculate **MA** from **MACD** (Simple or Exponential); the default value is 'Simple';
- **Graph view** allows the user to select the graph view (lines, dots, or dashes);
- **Line color** allows the user to select the color for the signal line.

### 4.4.20 MACD-Histogram

The MACD column chart is based on the difference between MACD and its signal line (by default, it is 9-period exponential MA).




Calculation:

**MACD Histogram = MACD – MACD Signal**

where **MACD = MA(P, Nlong) – MA(P, Nshort)**;

**MA(P, Nlong)** is the moving average of price (**P**) for **Nlong** periods (usually 26);

**MA(P, Nshort)** is the moving average of price (**P**) for **Nshort** periods (usually 12);

**MACD Signal = MA(MACD, N)** is the 'signal line', the moving average of **MACD** for **N** periods (usually 9).

Settings:

1. **Moving averages** are the same as for the MACD and Price Oscillator.
2. Settings **Signal moving average, Method** are the same as for the MACD.

### 4.4.21 BW MFI (Bill Williams Market Facilitation Index)

Bill Williams Market Facilitation Index shows changes of price for one tick. Absolute values of this indicator are not indicative of anything, only relative changes have sense:

- Simultaneous growth of the MFI and the volume means that more and more players are entering the market (the volume increases) and new players open positions in the direction of bar development;
- Simultaneous decrease of the MFI and of the volume means that the participants are losing interest in advancing further;
- If the MFI increases, but the volume falls, the price movement is not supported by the market. The price movement is the result of speculation;
- If the MFI falls, but the volume increases, this means that 'bears' and 'bulls' are in a desperate struggle (the volume has increased), but their forces are roughly equal (the indicator has fallen). Williams called such a bar a 'squat bar'. In general, a breakthrough of such a bar is very important in terms of the future price behavior.

Calculation:

**BW MFI = (HIGH – LOW) / VOLUME,**

where **HIGH** is the maximum price of the current period;

**LOW** is the minimum price of the current period;

**VOLUME** is the trade volume of the current period.

There are no settings available.

### 4.4.22 Momentum

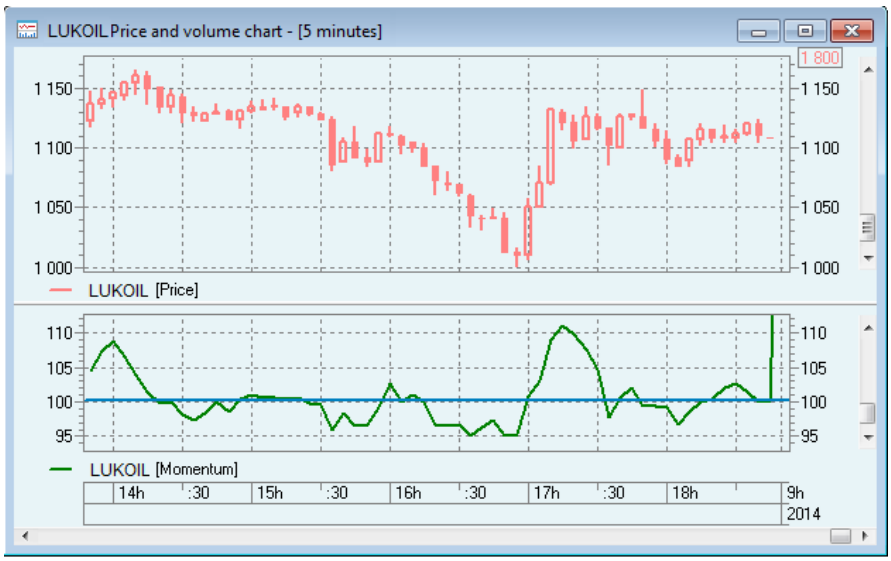
The price 'momentum' is the ratio of the current price to the price i periods ago.

Calculation:

$$\mathbf{MOM_n = PRICE_n / PRICE_{n-i} * 100},$$

where $\mathbf{PRICE_n}$ is price in the **n**th period;

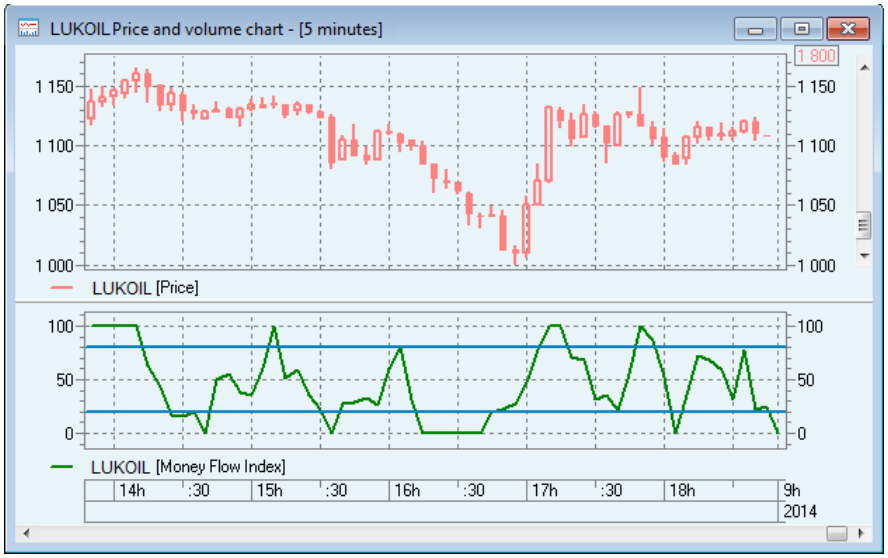
**i** is the number of preceding periods.




Settings:

1. **Number of periods** is the number of preceding periods (**i**); the default value is 5.
2. **Price Field** is the interval price (**PRICE)** (Open, High, Low, Close, Median, and Typical); the default value is 'Close'.

### 4.4.23 Money Flow Index




The Money Flow Index indicator (MFI) money flow (investment and withdrawal) for an instrument based on the comparison of positive and negative money flows.

Money flow is calculated by comparing the average price during the current period with the average price during the previous period.

Calculation:

**MFI = 100 – 100/(1 + Ratio)**,

where **Ratio = $Fp_n$ / $Fn_n$**

**$Fp_n$ = $Fp_{n-1}$ + $TP_n$ * VOLUME$_n$** , if **$TP_n$ > $TP_{n-1}$** is a positive money flow;

**$Fn_n$ = $Fn_{n-1}$ + $TP_n$* VOLUME$_n$** , if **$TP_n$ < $TP_{n-1}$** is a negative money flow;

**$TP_n$ = (HIGH$_n$ + LOW$_n$ + CLOSE$_n$) / 3** is a typical price;

**n** is the number of periods for calculation;

**HIGH$_n$** is the maximum trade price in the **n**th interval;

**LOW$_n$** is the minimum trade price in the **n**th interval;

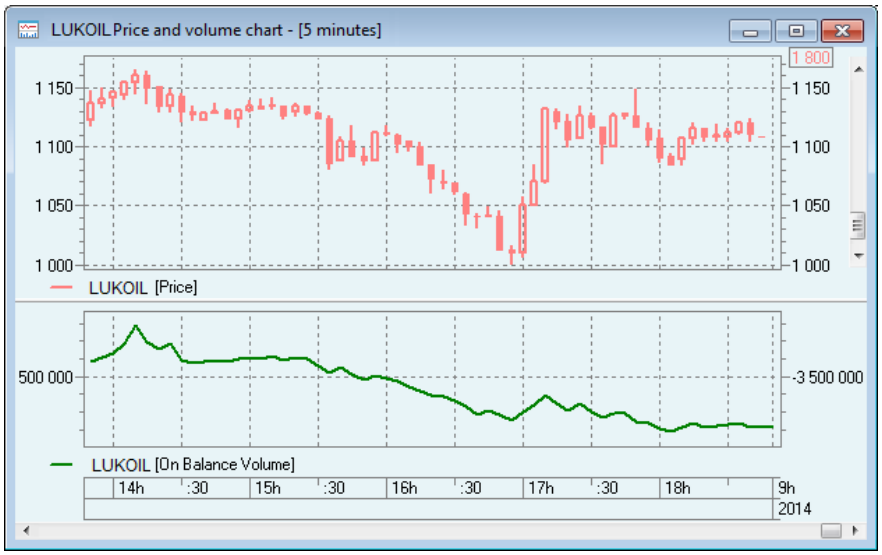
**CLOSE$_n$** is the last trade price in the **n**th interval;

**VOLUME$_n$** is the volume of trades in the **n**th interval.

Settings:

- **Number of periods** is the number of periods **(n)**; the default value is 3.

### 4.4.24 On Balance Volume




The On Balance Volume indicator shows the direction of the volume flow: in or out of the market.

If the closing price is higher than the previous closing price, the total volume of the period is considered positive. If the closing price is lower than the previous closing price, the total volume of the period is considered negative.

Calculation:

$$OBV_n = OBV_{n-1} + VOLUME_n, \text{ if } PRICE_n > PRICE_{n-1}$$

$$OBV_n = OBV_{n-1} - VOLUME_n, \text{ if } PRICE_n < PRICE_{n-1}$$

$$OBV_n = OBV_{n-1}, \text{ if } PRICE_n = PRICE_{n-1}$$

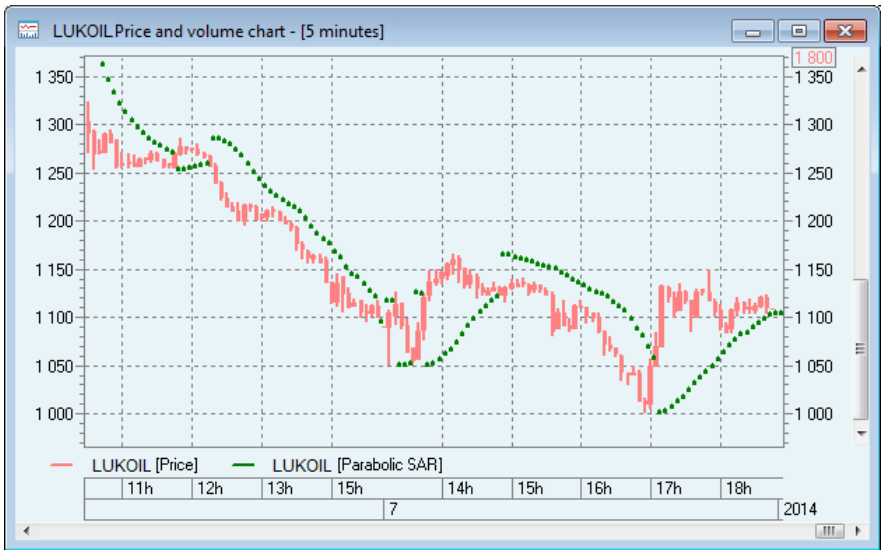
where $VOLUME_n$ is the volume of trades in the **n**th period;

$PRICE_n$ is the price for the **n**th period.

Settings:

- **Price Field** is the interval price value used for **PRICE** (Open, High, Low, Close, Median, Typical); the default value is 'Close'.

### 4.4.25 Parabolic SAR




Parabolic SAR ('Stop and Reverse') is the system used to identify potential reversals. This indicator is plotted on a price graph. Its meaning is similar to that of the moving average, the only difference is that the Parabolic SAR has a faster acceleration and can change its position relative to the price. If the price crosses the Parabolic SAR, the indicator reverses and its next values emerge on the other side of the price. Reversal of this indicator means that the trend has either ended or reversed.

The Parabolic SAR should be only used when there are trends. When there is no trend, it gives many false signals.

Calculation:

1. For long positions:

   $$SAR_i = SAR_{i-1} + AF * (HIGH_{i-1} - SAR_{i-1})$$

2. For short positions:

   $$SAR_i = SAR_{i-1} + AF * (LOW_{i-1} - SAR_{i-1}),$$

   where **$HIGH_{i-1}$** is the highest price of the previous period;

   **$LOW_{i-1}$** is the lowest price of the previous period;

   **$SAR_{i-1}$** is SAR in the previous period;

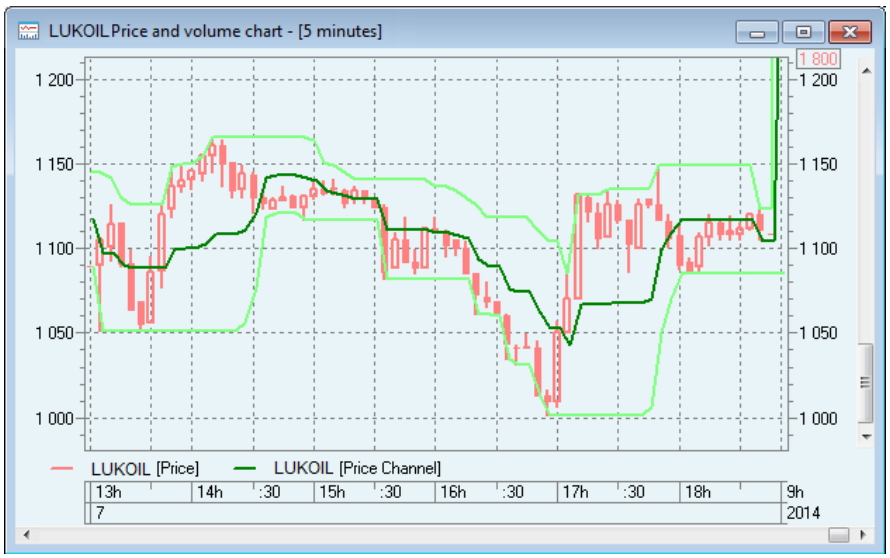
   **AF** is the acceleration factor.

Settings:

1. **Step** is the increment of the closing price of a position (of the **AF** acceleration factor), the recommended value is 0.02.
2. **Max.step** is the maximum increment value, the recommended value is 0.2.

### 4.4.26 Price Channel

The Price Channel indicator consists of two boundary lines: the upper line is the price maximum during N periods, and the lower line is the price minimum during N periods. Channel lines can be interpreted as dynamic lines of support and resistance. The middle line is arithmetic mean of the two lines.




Calculation:

**$PCh_i=max([H_{i-n};H_i])$** is the upper line (resistance),

**$PCl_i=min([L_{i-n};L_i])$** is the lower line (support);

**$PCm_i=(PCh_i+PCl_i)/2$** is the middle line

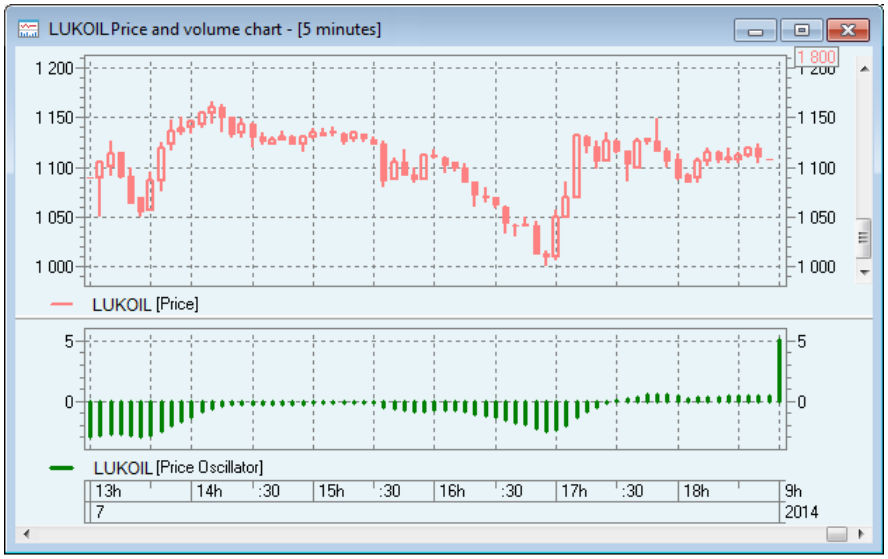
where **$i \geq n$**

Settings:

1. **Number of periods** is the number of periods (**n**); the default value is 10.
2. **Upper color** is the color of the upper line.
3. **Lower color** is the color of the lower line.

### 4.4.27 Price Oscillator

This indicator represents the difference of moving averages formed for two periods. This difference can be expressed both as a percentage and as absolute values.




Calculation:

**PO = MA(P, Nshort) – MA(P, Nlong),**

where **MA(P, Nshort)** is the moving average of the price **P** for **Nshort** periods;

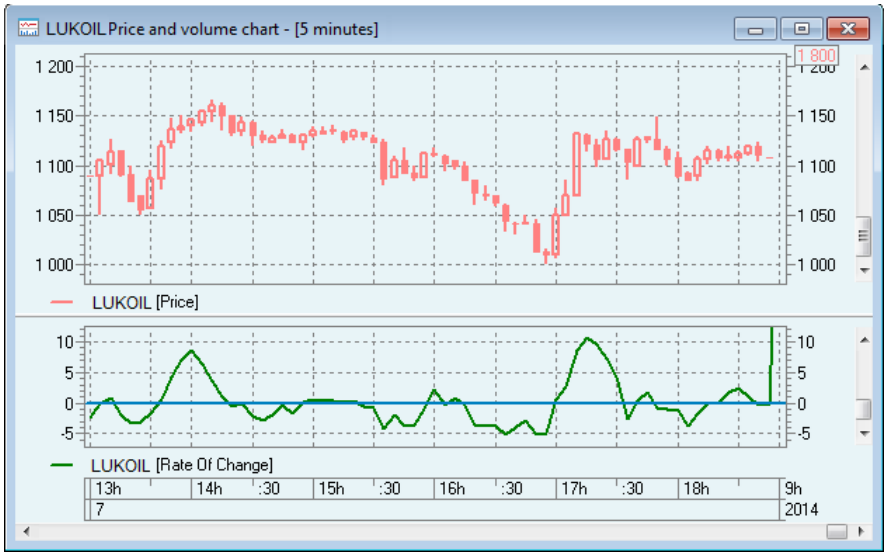
**MA(P, Nlong)** is the moving average of the price **P** for **Nlong** periods.

Settings:

1. Moving averages:
   - **Short period** is the **Nshort** period value for the first (short) **MA**;
   - **Long period** is the **Nlong** period value for the second (long) **MA**;
   - **Method** is the method used to calculate **MA** (Simple, Exponential, Vol.Adjusted, and Smoothed); the default value is 'Exponential';
   - **Price Field** is the interval price value used for **P** (Open, High, Low, Close, Median, and Typical); the default value is Close.
2. **Method** is used to select the method for **MA** comparison (Percentage, Dots).

### 4.4.28 Rate Of Change

The Rate Of Change indicator (Price Rate-Of-Change – ROC) is calculated as the ratio of the closing price for a certain period to the closing price at the beginning of that period. The result shows the percent change in price during a given number of periods.




Calculation:

$$ROC = (PRICE_n - PRICE_{n-i}) / PRICE_{n-i} * 100,$$

where $PRICE_n$ is the price for the **n**th period;

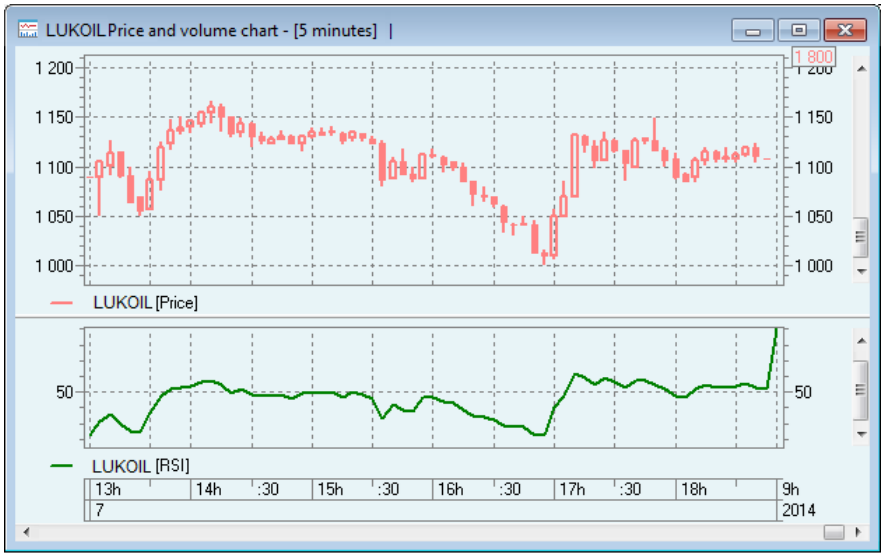
**i** is the number of periods.

Settings:

1. **Number of periods** defines the number **i** of periods; the default value is 5.
2. **Price Field** defines the interval price (**PRICE)** (Open, High, Low, Close, Median, and Typical); the default value is 'Close'.

### 4.4.29 Relative Strength Index

Relative Strength Index (RSI) is a price-following oscillator that ranges between 0 and 100. A popular method of analysing the RSI is to look for a divergence between prices and the indicator value at which the price forms a new maximum, and RSI cannot exceed its previous maximum. This divergence indicates the possibility of a reversal.



This indicator has two control levels (30 and 70 by default) on a graph represented by two horizontal lines. When the RSI goes above the upper control level, the indicator is considered to be in overbought territory. When the RSI goes below the lower control level, the indicator is considered to be in oversold territory.

Calculation:

**RSI = 100 / (1 + D(P,N) / U(P,N)),**

where **U(P,N)** is the moving average of **P** price growth for **N** periods;

**D(P,N)** is the moving average of the decrease in price **P** during **N** periods.

Settings:

1. **Number of periods** is the number **N** of periods for calculation of moving averages.
2. **Price Field** defines the interval price value used for **P** (Open, High, Low, Close, Median, and Typical).

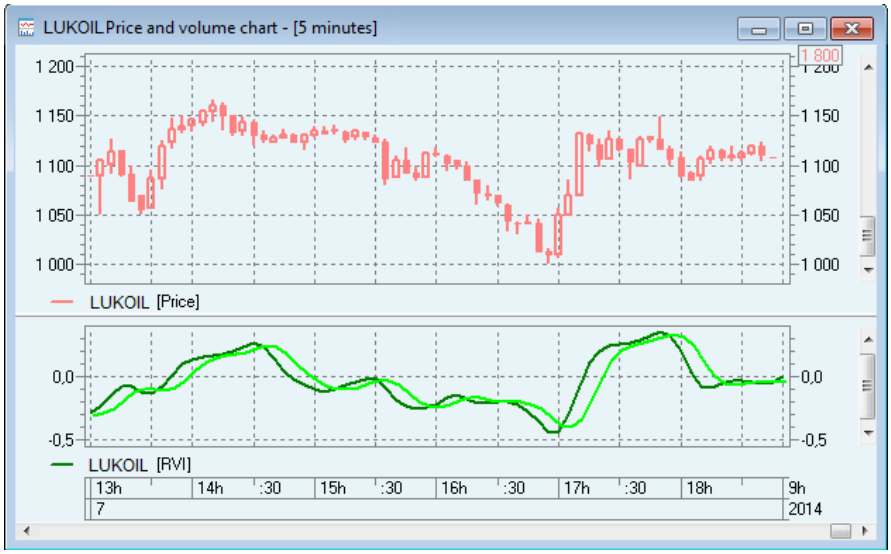
### 4.4.30 Relative Vigour Index

The Relative Vigour Index measures the certainty of the current price movement and the likelihood that it will continue.

The RVI compares the position of the closing price relative to the price range, and the result is smoothed by calculating a moving average of the values. The moving average, in turn, reflects the average equilibrium value for a particular period. In this case, a 4-period moving average of the Relative Vigour Index value, which is meant to reduce uncertainty, serves as a signal line.

**The fast RVI line (blue)** indicates the energy of marked movement, which is based on the fact that the closing prices are higher than the opening prices, and reflects the equilibrium of the market crowd during a short time period. The slower **signal line** reflects equilibrium of the market crowd during a longer time period. The combination of the two lines provides crossing signals typical of oscillators.

When the fast RVI line crosses the slow signal line from below, this signals that buyers are currently strong on the market and it is better to open buy positions. When the fast RVI line crosses the slow signal line from above, this signals that sellers are currently stronger on the market and it is better to open only sell positions.




Calculation:

$$RVI_i = \frac{\sum_{j=i-n+1}^{i} MoveAverage_j}{\sum_{j=i-n+1}^{i} RangeAverage_j}, \mathbf{i \le n + 3}$$

$$\mathbf{MoveAverage_i = (C_i - O_i) + 2\,(C_{i-1} - O_{i-1}) + 2\,(C_{i-2} - O_{i-2}) + (C_{i-3} - O_{i-3}),\ i > 3}$$

$$\mathbf{RangeAverage_i = (H_i - L_i) + 2\,(H_{i-1} - L_{i-1}) + 2\,(H_{i-2} - L_{i-2}) + (H_{i-3} - L_{i-3}),\ i > 3}$$

$$\mathbf{RVI_Signal_i = (RVI_i + 2RVI_{i-1} + 2RVI_{i-2} + RVI_{i-3})/6,\ i \ge (n + 3) + 3}$$

where $\mathbf{C_i}$ is the closing price of the ith period;

$\mathbf{H_i}$ is the maximum price of the ith period;

$\mathbf{L_i}$ is the minimum price of the ith period;

$\mathbf{O_i}$ is the opening price of the ith period.

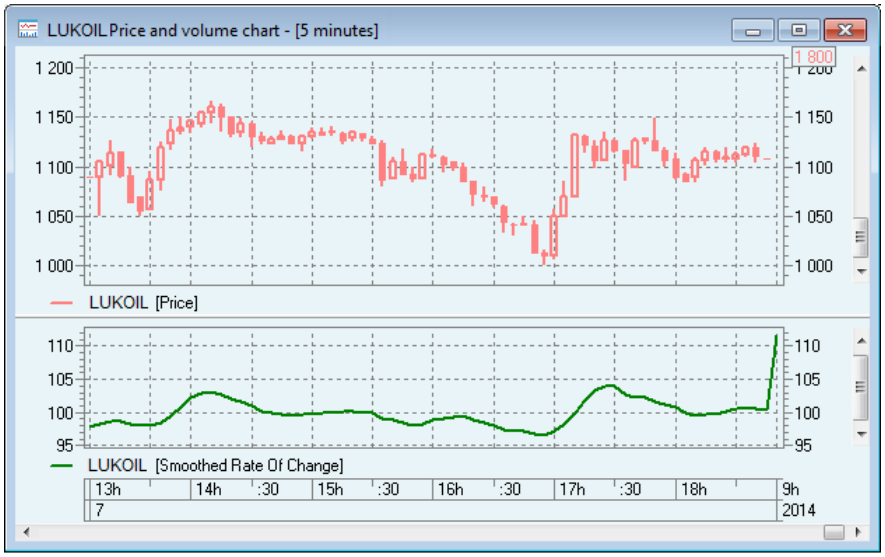
Settings:

1. **Number of periods** is the number **n** of periods for calculation of moving averages.
2. The **Signal parameters** group contains the settings for the display of the signal line:
   - **Graph view** defines the way the signal line is displayed. The default value is 'Dashes';
   - **Line color** defines the line color.

### 4.4.31 Smoothed Rate Of Change

The Smoothed Rate Of Change indicator (S-RoC) compares values of exponential moving averages instead of price values at two moments of time. Therefore, contrary to the Rate Of

Change indicator, it reacts to each data element once rather than twice. This oscillator produces fewer but more reliable signals.




Calculation:

**SROC = MA(n) / MA(n-k) * 100,**

where **MA(n)** is the moving average of the **PRICE**;

**n** is the number of periods for **MA** averaging;

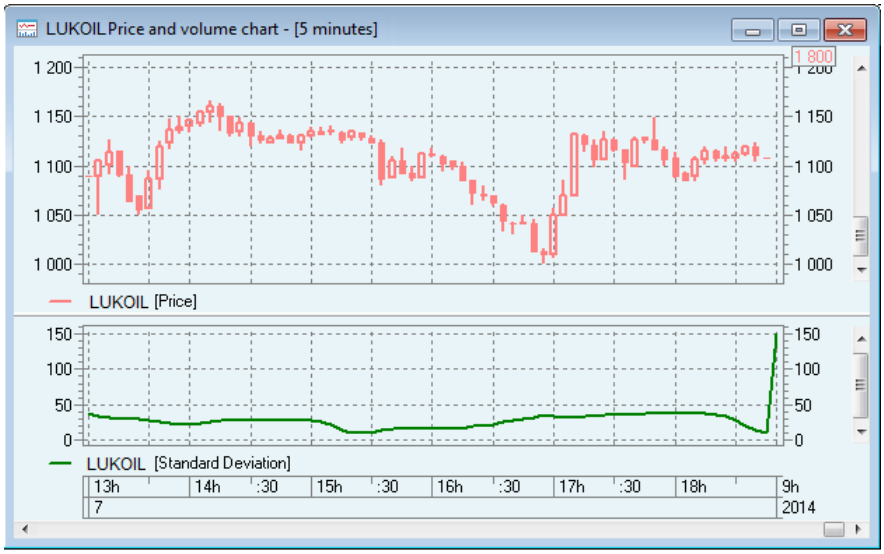
**k** is the smoothing coefficient.

Settings:

1. **Coefficient** defines the value of the **k** smoothing coefficient; the default value is 5.
2. **Number of periods** sets the number of periods **n** of **MA** averaging, the default value is 10.
3. **Method** is the **MA** calculation method (Simple, Exponential, Vol.Adjusted, and Smoothed); the default value is 'Exponential'.
4. **Price field** is the interval price value used for **PRICE** (Open, High, Low, Close, Median, Typical); the default value is 'Close'.

### 4.4.32 Standard Deviation

The standard deviation is a statistical method for measuring market volatility. This indicator is rarely used by itself. Most often, it is used as a part of another indicator. For example, standard deviation is used to calculate the Bollinger Bands.




Calculation:

**StDev = SQRT(SUM((Pi – SMA(P,N))^2)/N),**

where **SMA** is the simple moving average of price **P** during **N** periods;

**N** is the number of periods;

**SQRT ()** is the square root.

Settings:

1. **Number of periods** is the number **N** of periods for **MA** calculation.
2. **Price Field** is the interval price (**P**) (Open, High, Low, Close, Median, and Typical); the default value is 'Close'.

### 4.4.33 Stochastic Oscillator

The Stochastic Oscillator shows moments when the price comes close to its price range over a given time period. This indicator consists of two lines: the fast line (%K) and the slow line (%D).

Calculation:

**%K(m) = 100 *SMA (C – $LLV_n$, m) / SMA ($HHV_n$ – $LLV_n$, m),**

**%D = MA (%K, s),**

where **SMA** is the Simple Moving Average;

**C** is the closing price of the current period;

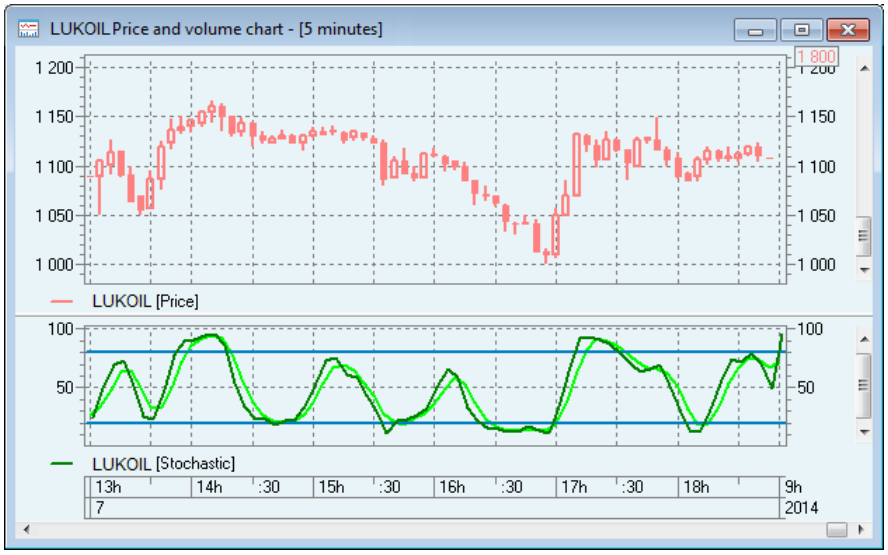
**$LLV_n$** is the minimum price for the last **n** periods;

**$HHV_n$** is the maximum price for the last **n** periods;

**m** is the number of smoothing periods;

**n** is the number of periods (usually from 5 to 21);

**s** is the number of periods used for calculation of the moving average.




Settings:

1. Parameters of %K:

   - **Number of periods** is the number **n** of periods;
   - **Smoothing** is the period used for internal smoothing of values **%K**. A value of 1 is considered a strong (fast) stochastic. A value of 3, which is the default value, is considered a slow stochastic.

2. Parameters of %D:

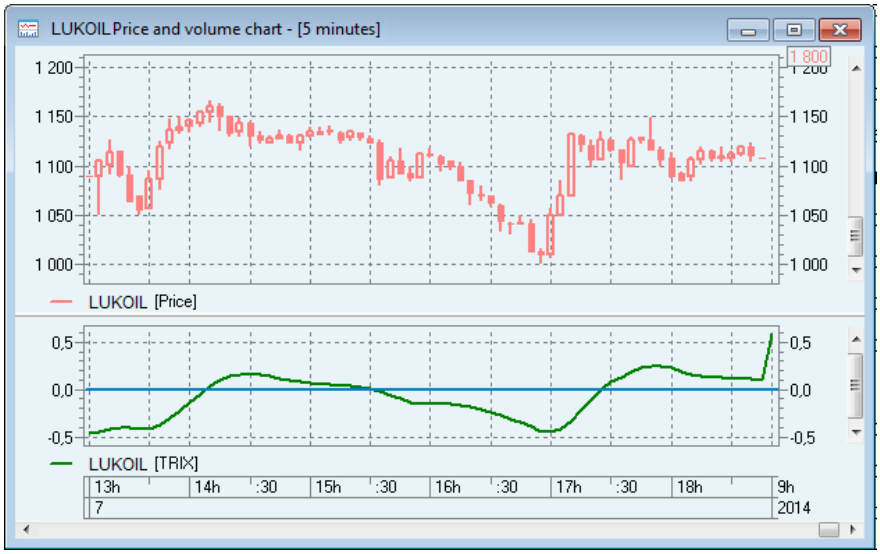
   - **Number of periods** defines the number of periods for **MA** calculation;
   - **Method** is the method used to calculate **MA** (Simple or Exponential); the default value is 'Simple';
   - **Graph view** allows the user to select the graph view (lines, dots, or dashes);
   - **Line color** defines the line color.

### 4.4.34 TRIX (Triple Exponential Moving Average)

The TRIX indicator is a dynamic indicator that displays the percent rate of change of a triple exponentially smoothed moving average of the instrument's closing price. The TRIX indicator oscillates around zero and is used to filter out the instrument's movements that are insignificant relative to a larger trend of the instrument.

The TRIX is calculated as follows:

1. Obtain the exponential MA.
2. Obtain the exponential MA of EMA obtained at step 2.
3. Obtain the exponential MA of EMA obtained at step 3.
4. Calculate the 1-period difference between the results of triple smoothing: the value of step 4 of the current period is subtracted from the value of step 4 of the previous period.
5. The value obtained at step 5 is divided by the value of step 4 of the previous period and multiplied by 100 for convenient display on a graph.




Calculation:

$$TRIX_i = (3MA_i - 3MA_{i-1}) / 3MA_{i-1} * 100$$

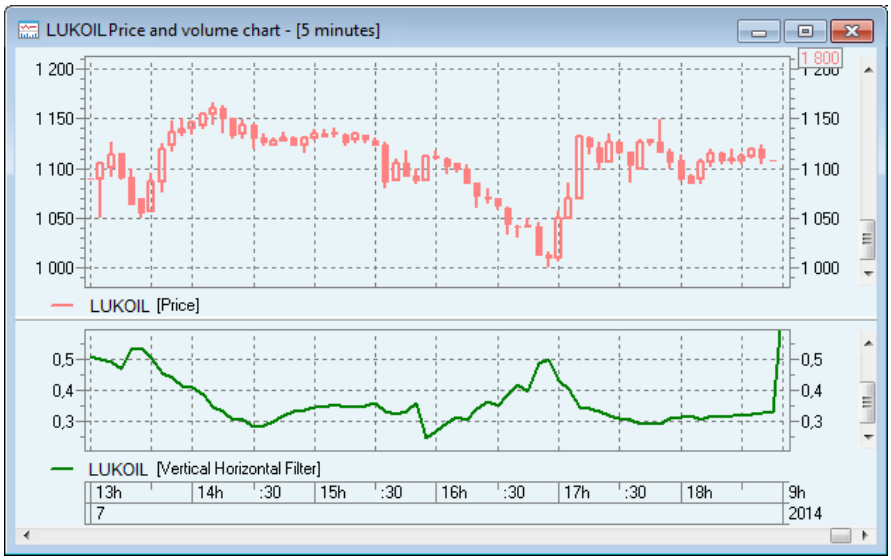
where **3MA=MA(MA(MA(H / L / O / C)))**

**MA** is the moving average with parameters set by the user;

**H / L / O / C** is the price field selected by the user.

### 4.4.35 Vertical Horizontal Filter

The Vertical Horizontal Filter indicator (VHF) is used to determine if market is trending and identifies whether the prices are in a trending phase or a congestion phase. The VHF compares the sum of ROC indices for a particular period to the difference between the maximum and the minimum price in the same period.




Calculation:

**VHF = A / B,**

where **A = HH – LL**;

**HH** is the maximum price in the selected period;

**LL** is the minimum price in the selected period;

**B = SUM (ABS($PRICE_n$ – $PRICE_{n-1}$))** in the selected period.

Settings:

1. **Number of periods** defines the number **n** of periods; the default value is 28.
2. **Price Field** defines the interval price value used for **PRICE** (Open, High, Low, Close, Median, and Typical); the default value is 'Close'.

### 4.4.36 Volume Oscillator

The Volume Oscillator is the difference between two MAs of trade volume for an instrument expressed as a percentage.

The difference between two MAs of the volume with different period lengths can be used to determine a general trend in the volume movement (increase or decrease). If the Volume Oscillator rises above zero, this means that the short-term MA of the volume is above the long-term MA, i.e., that the short-term volume trend is higher than the long-term trend.

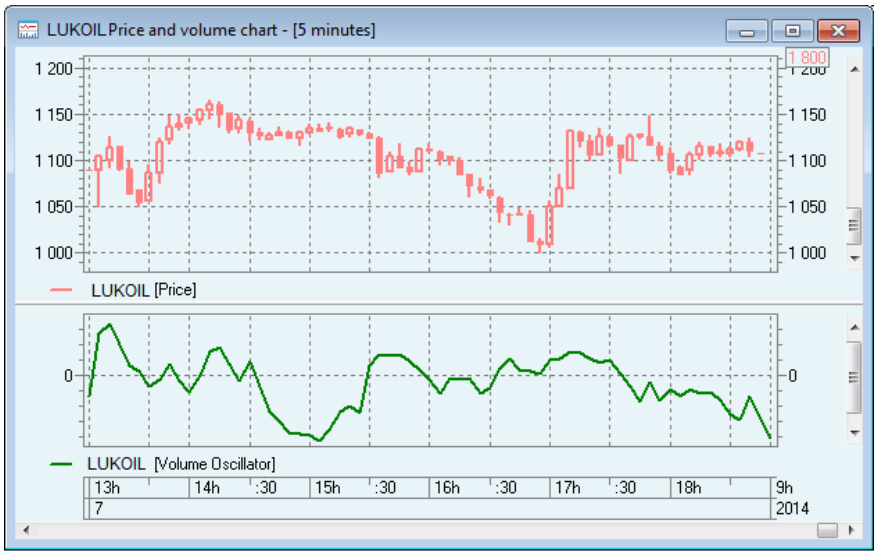
Calculation:

**VO = (MA(Nshort, VOLUME) – MA(Nlong, VOLUME) ) / MA(Nlong, VOLUME) * 100,**

where **MA(N, VOLUME)** is the moving average of the volume (**VOLUME**) for **N** periods;

**Nshort** is the length of the short period;

**Nlong** is the length of the long period.



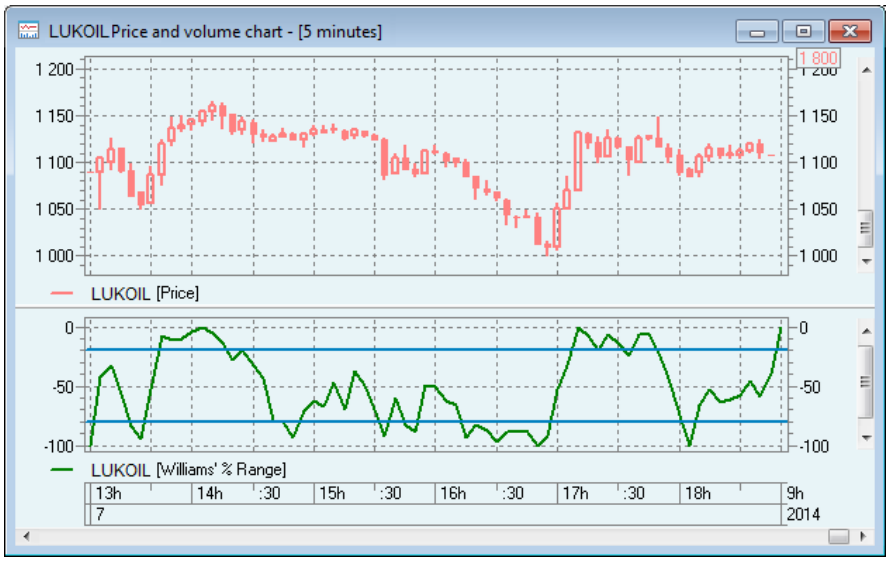
Settings:

1. **Short period** defines the value of **Nshort** for the first (short) **MA**; the default value is 5.
2. **Long period** defines the value of **Nlong** for the second (long) **MA**; the default value is 10.
3. **Method** is the method used to calculate **MA** (Simple, Exponential, Vol.Adjusted, Smoothed); the default value is 'Exponential'.

### 4.4.37 Williams' % Range

The Williams' Percent Range indicator (%R) is a dynamic indicator that measures overbought and oversold market conditions.

This indicator is formed on the reversed scale where 0 is in the upper part and 100 is in the lower part of the scale; therefore, to show this indicator, a minus symbol is placed before each value.




Calculation:

**%R = -100 * (H – C) / (H – L),**

where **C** is current closing price;

**L** is the minimum price in the last **n** periods;

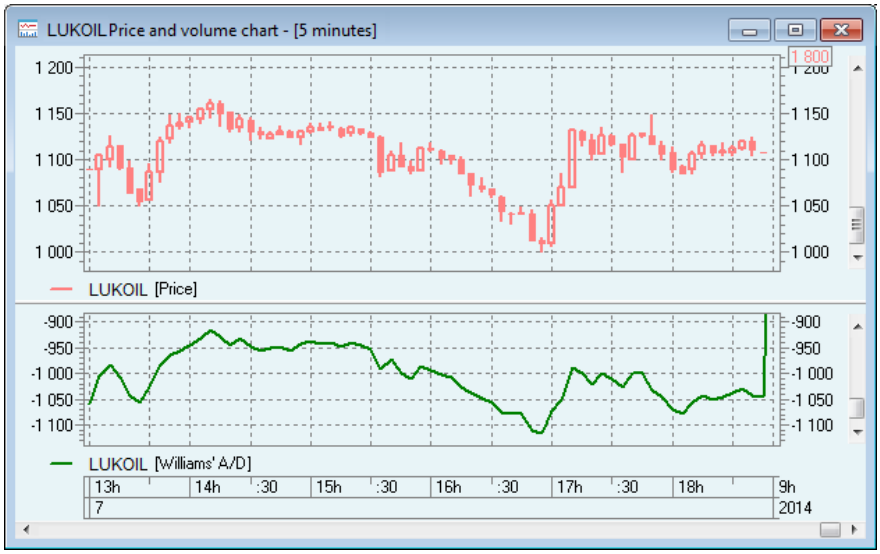
**H** is the maximum price in the last **n** periods.

Settings:

- **Number of periods** defines the number **n** of periods.

### 4.4.38 Williams' Accumulation / Distribution

The Williams' Accumulation/Distribution indicator (Williams' A/D) shows the distribution of instruments if the prices of trades for an instrument form new maximums, but the indicator's values cannot form a new maximum. The indicator shows accumulation of instruments when prices of trades reach new minimums, but the indicator cannot reach a new minimum.




Calculation:

**$CumWAD_n = CumWad_{n-1} + WAD_n$,**

where **$WAD_n = PRICE_n - TL$, for $PRICE_n > PRICE_{n-1}$,**

**$WAD_n = PRICE_n - TH$, for $PRICE_n < PRICE_{n-1}$,**

**$WAD_n = 0$, for $PRICE_n = PRICE_{n-1}$,**

**$TH = max(PRICE_{n-1}, HIGH_n)$** is True Range High;

**$TL = min(PRICE_{n-1}, LOW_n)$** is True Range Low;

**$PRICE_n$** is the closing price in the **n**th interval;

**HIGH** is the maximum price in the **n**th interval;

**LOW** is the minimum price in the **n**th interval.

There are no settings available.

# 4.5 Bonds Yield Graph

The **Create window / New chart for bond-equivalent yield** menu or the button

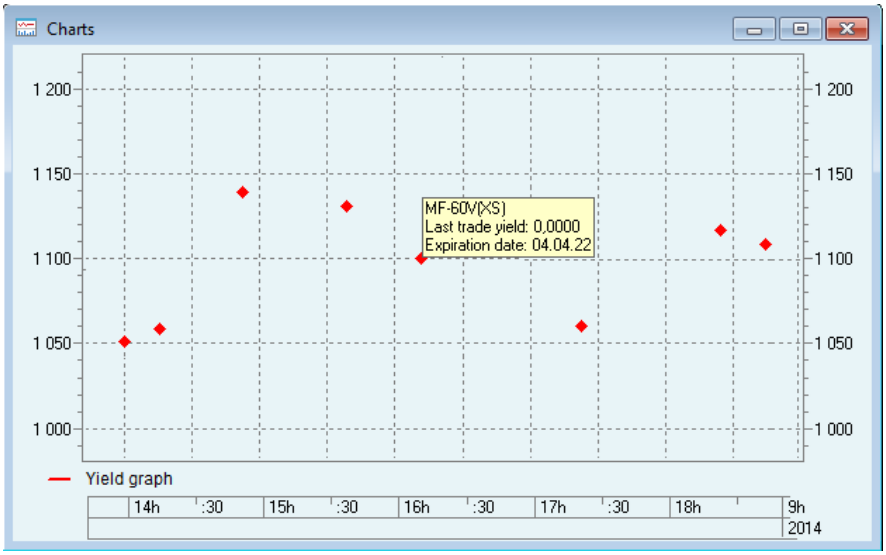
The bonds yield graph displays yield for the selected set of bonds depending on their expiry date (or the offer).

### 4.5.1 Window format

The graph consists of multiple points each of which corresponds to a single bond. The positions of the points on the graph are determined by two parameters:

- Along the time axis: the closest of the two dates: the expiry date or the offer date;
- Along the vertical axis: the **Last trade yield** value or the **AWP yield** value. Configure plotting yield labels in the program settings (see 4.5.2).

The names of the parameters selected for a label on the graph, as well as their values, are displayed on the graph when the cursor hovers over the point.



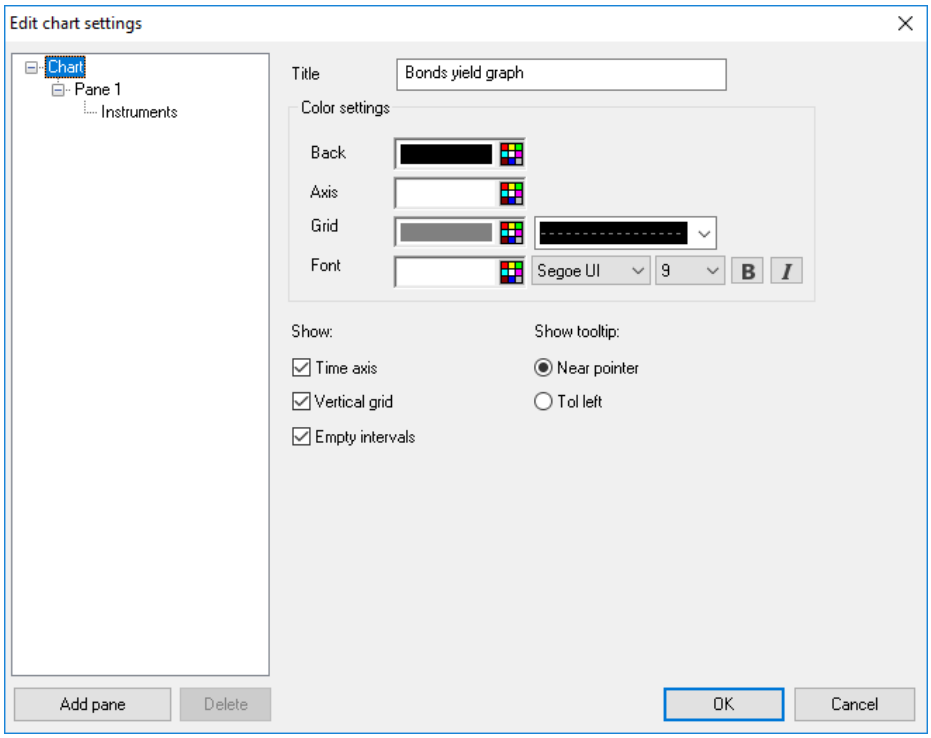

### 4.5.2 Configuring chart parameters

A new chart can be created in one of the following ways:

- Select the program menu item **Create window / New chart for bond-equivalent yield;**
- Use button on the toolbar;
- Select the menu item **Action / New chart for bond-equivalent yield** when the chart window is active**.**

Chart parameters are configured when creating a new graph or from the shortcut menu on plotting area of an active graph:

### Configure general parameters of chart




1. **Title** allows the user to specify the heading of the graph window.
2. **Color settings** allow to customize colors of graph's elements (back, axis, grid and font). Rules of colors configurations are described in Chapter 2, "Basic Operating Principles", sub-section 2.8.4.
3. **Show** allows to customize displaying of graph's elements:

   _ **Time axis** – display values on time axis (horizontal axis);

   _ **Vertical grid** – display vertical lines of grid on plotting area;

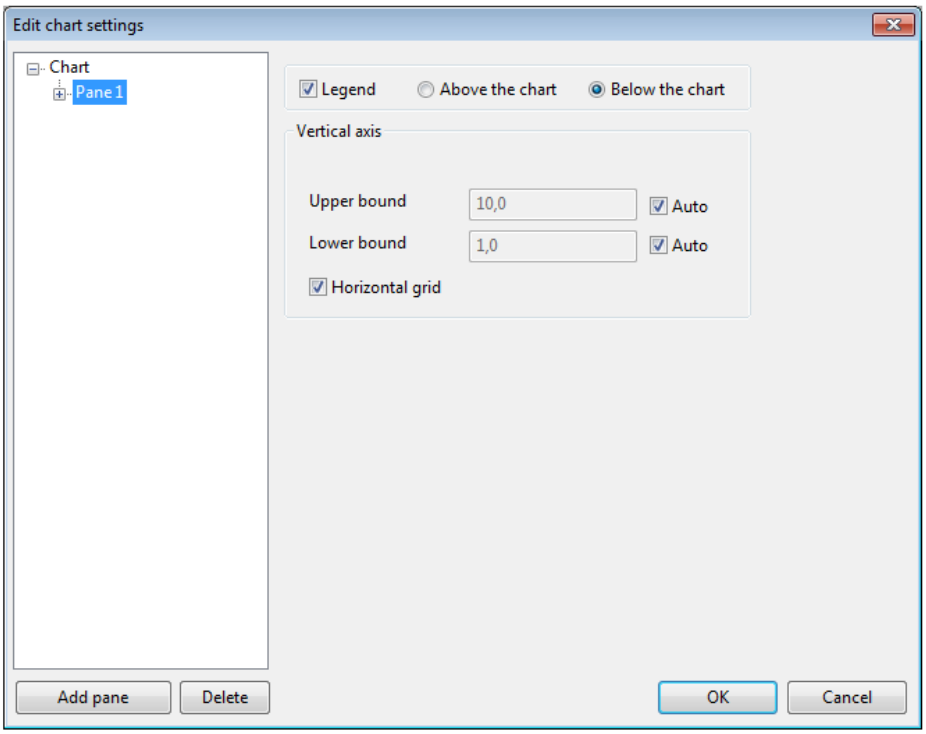
   _ **Empty intervals** –if the checkbox is selected (by default), all time intervals are displayed on the time axis; is the checkbox is cleared, only intervals the include values are displayed.

4. **Show tooltip** allows selecting a way of displaying bonds parameters when hovering the cursor on the graph's point:

   _ **Near pointer** – when hovering the cursor on the graph's point a tooltip appears near it;

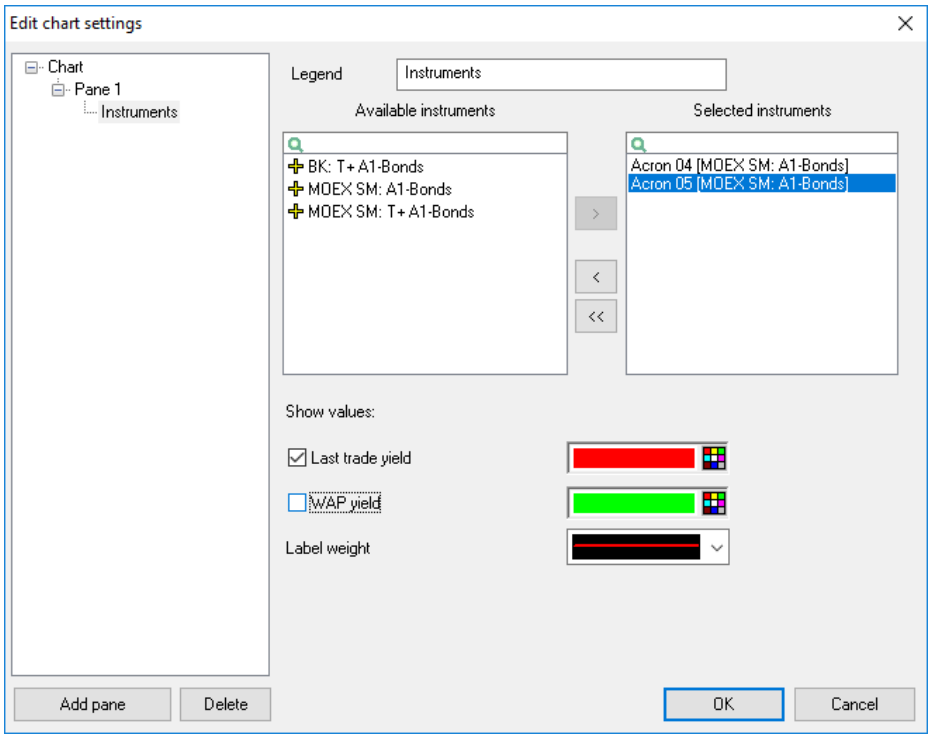
   _ **Top left** – parameters are displayed in the upper left corner of the chart.

### Configuring parameters of plotting area




1. **Legend** enables displaying of the graph's legend and configuring its location relative to the plotting area:
   - Above the chart – above the plotting area;
   - Below the chart – under the plotting area.
2. **Vertical axis**:
   - **Upper bound** – set the maximum scale value;
   - **Lower bound** – set the minimum scale value;
   - **Horizontal grid** – enable displaying of horizontal lines of grid on plotting area;
   - **Auto** – automatic defining a scale of the vertical axis (minimum and maximum values of parameters in the displayed time range).

**Configuring graph's appearance**




1. **Legend** allows to edit the legend name.
2. **Available instruments, Selected instruments** allow the user to configure the list of bonds displayed on the graph. The list of selected bonds is configured separately for each pane on the graph. To do so, in the left part of the dialog select the graph in the desired plotting area. Then in the right part configure the list of bonds for the graph.
3. In the **Show values** list, select parameters and color settings to be displayed on the graph:

   - **Last trade yield** shows yield values calculated according to the last trade price;
   - **AWP yield** shows yield values calculated according to the WAP;
   - **Label width** configures width of labels on the graph.

### 4.5.3 Available operations

Actions to perform for a graph can be called from the **Action** menu item or from shortcut menu on the graph's plotting area:

> **(*) The operation is available only from the Action menu.**

> **(**) The operation is available only from the shortcut menu.**

1. **New chart...** creates a chart for the desired instruments and parameters.
2. **New bonds yield chart...** creates a new bonds yield chart.
3. **Label...:** add a user label type. Clicking left mouse button on the graph (in label linking point) opens the selected label type setting dialog.

   - Text…;
   - Note…;

- Balloon…;
- Price label…;
- Image from file…;
- Symbol…

For detailed information about the user's label settings, see 4.2.13.

4. **Delete** deletes the chart's element:
   - Pane <number of pane>: delete the graph's plotting area. When deleting a plotting area, all contained graphs are deleted as well;
   - Delete all labels: remove all labels from the graph. Labels are deleted with a previous confirmation.
5. **Edit**: open the configuration dialog:
   - In the configuration dialog of plotting area settings – when calling the function from the shortcut menu of the graph's plotting area;
   - In the configuration dialog of general settings of chart – when calling the function from **Action** menu.
6. **Zoom in** increases the graph horizontal scale;
7. **Zoom out** reduces the graph horizontal scale;
8. **Entire chart** displays the entire graph in the window;
9. **Show legend:** enable/disable displaying of legend in the current plotting area;
10. **Show tooltip:** enable/disable displaying of a tooltip on a candlestick;
11. **Save image...:** save the chart image to a file in Microsoft Bitmap (BMP) or Microsoft Enhanced Metafile (EMF) formats. For details, see 4.2.11.
12. **Print:** print a visible chart's area.

**Actions performed from the graph's point's shortcut menu**

1. **Edit...** opens the graph view configuration window. For details, see 4.5.2.
2. **Delete graph** deletes the current graph.
3. **Save data** saves the data of the current graph as a text file; file format is described in 4.5.4.

### 4.5.4 Saving graph data to a file

The numeric values of a graph can be saved to a file. The data on all instruments displayed in the selected graph window is saved to the file.

To do this, follow these steps:

1. Select a point in the graph window that you want to save.
2. From the shortcut menu of that point, select **Save graph**.
3. In the window that opens, specify the file name and select a folder on your drive.

The file format is as follows:
The first line contains names of the parameters in angle brackets separated by commas. The subsequent lines contain the data on bonds in the ascending order of their expiry dates. The yield parameter saved to the file are those parameters that were configured for display on the graph (see 4.5.2, "Show values" option).

Example of a file:

```
<Instrument>,<Expiration>,<Last trade yield>,<WAP yield>
Ust-Luga1,11.02.10,18.520000,0.000000
Rusfinans4,12.02.10,24.140000,0.000000
```