

## Usage of EA Generator for MT4

### Installation

Launch the EA Generator installation package. During the installation process you will be offered to select MT4 and MT5 terminals that will work with EA Generator. Press “Browse...” and select the necessary terminals. As a rule, the terminal folder looks like “C:\Program Files\Broker Name - Terminal Name”. You can skip the terminal selection step and copy the necessary EA Generator files manually. During the installation process you will be asked to disable User Access Control (UAC), because it helps to facilitates the usage of EA Generator. However, you can use EA Generator even if UAC is enabled.

### Preparation of EA Generator for operation on the MT4 terminal

Attention: you are allowed to use EA Generator without disabling User Access Control (UAC) only in case the MT4 terminal is not installed in the system folder (Program Files).

EA Generator can work on several MT4 terminals. The folder of each MT4 terminal intended to work with EA Generator must contain the files necessary for correct operation of EA Generator. If you turn off UAC, these files will be automatically copied to the selected EA Generator terminals.

If you want to copy the necessary files manually, simply open the Hlaiman EA Generator installation folder (for example, “C:\Program Files\Hlaiman\”).

The files “MakeSignals.ex4” and “MakeSignals.mq4” should be copied from the folder “Hlaiman\MQL4\Experts\” to the MT4 terminal folder “Experts”.

The files “makeEA.ex4” and “makeEA.mq4” should be copied from the folder “Hlaiman\MQL4\Experts\scripts\” to the MT4 terminal folder “Experts\scripts”.

The file “MT4.dll” should be copied from the folder “Hlaiman\MQL4\Experts\libraries\” to the MT4 terminal folder “Experts\libraries”.

In order for EA Generator to work correctly, you should enable the option “Allow DLL imports” and disable the option “Confirm DLL function calls” in the terminal settings. To do it, select “Tools” – “Options”, then open the tab “Expert Advisors” and do the necessary changes.

### Input Data for Creation of an MT4 Expert Advisor

The EA Generator software can use trade signals on any instrument chart as input data for creation of an advisor algorithm. Trade signals are the following graphic objects: “Arrow Up” – buying, “Arrow Down” – selling. The work with graphic objects in the MT4 terminal is a built-in function. For more detail, please, read the Help section of the MT4 terminal.

It is recommended to disable the option “Auto Scroll” on the selected chart for a more convenient placement of signals. In order to place a signal on the chart, select “Insert” – “Arrows” – “Arrow Up” for the buy signal or “Arrow Down” for the sell signal. Then left-click on the chart in the place you want to add the signal to.



Using the expert advisor makeSignals that is included to EA Generator, you can automatically place profitable trade signals on a chart of any instrument. On the chart the expert advisor makeSignals searches bars the difference between the minimal and the maximal price of which is more that the “BarPoints” variable, and places corresponding signals (“buy” if price is rising and “sell” if price is falling) before these bars.

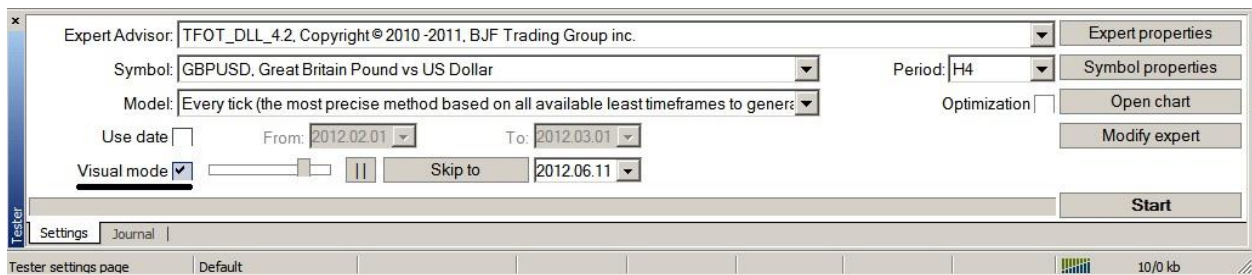
The makeSignals expert advisor variables:

- “BarsCount” - the number of successive bars the comparison of min. and max. price difference is carried out for;
- “BarPoints” - the value of minimal signal placement threshold (in points);
- “StartTime”, “EndTime” – the period the expert advisor places signals in;
- “ClearOnExit” – delete all “Arrow Up” and “Arrow Down” objects from the chart in case of removal of the expert advisor makeSignals.

After launching the expert advisor makeSignals, signals creation results will be displayed on the chart: Profit = 50 pips (BarPoints) in 1 bars (BarsCount), arrows upBUY = 343 dnSELL = 358 (the number of detected signals)



The EA Generator software can also use the “Arrow” graphic objects as trade signals. These graphic objects are created on the chart by a tester during testing of any expert advisor in the “Visual Mode”.



You can edit these graphic objects to make the best of the EA Generator expert advisor trading algorithm.



To create expert advisors, the EA Generator software uses fuzzy logic algorithms – neural networks the most important factor of successful work of which is input data. It is recommended using not less than 150 and no more than 300 signals in each direction to create profitable expert advisors (in case of default training data values). Excessive number of signals may increase neural network training time. A substantial increase in the number of input data and complexity of neural networks increases the demands on computer resources.

## MT4 Expert Advisor Creation

Using the EA Generator software, you can create an infinite number of expert advisors. An expert advisor created by means of EA Generator can contain trading algorithms for any number of instruments. The expert advisor can trade only on the instruments trading algorithms of which it contains. An expert advisor trading algorithm is a trained neural network. In order to create the expert advisor trading algorithm, you should place trade signals on a chart of a chosen instrument and start the process of neural network training. The makeEA script is used for training.

The MakeEA script variables:

“PattrenBarsCount” – the number of bars from a trade signal for using as input data for neural network training;

“NetLayersCount” – the number of neural network layers;

“NetNeuronsCount” – the number of neurons of a neural network layer;

“NetEpochCount” – the number of neural network training epochs;

“Normalize” – neural network data normalization (you should also enable normalization in settings of a trained expert advisor).

The MakeEA script variables serve for delicate adjustment of a neural network. It is recommended not to change the default values unless necessary.

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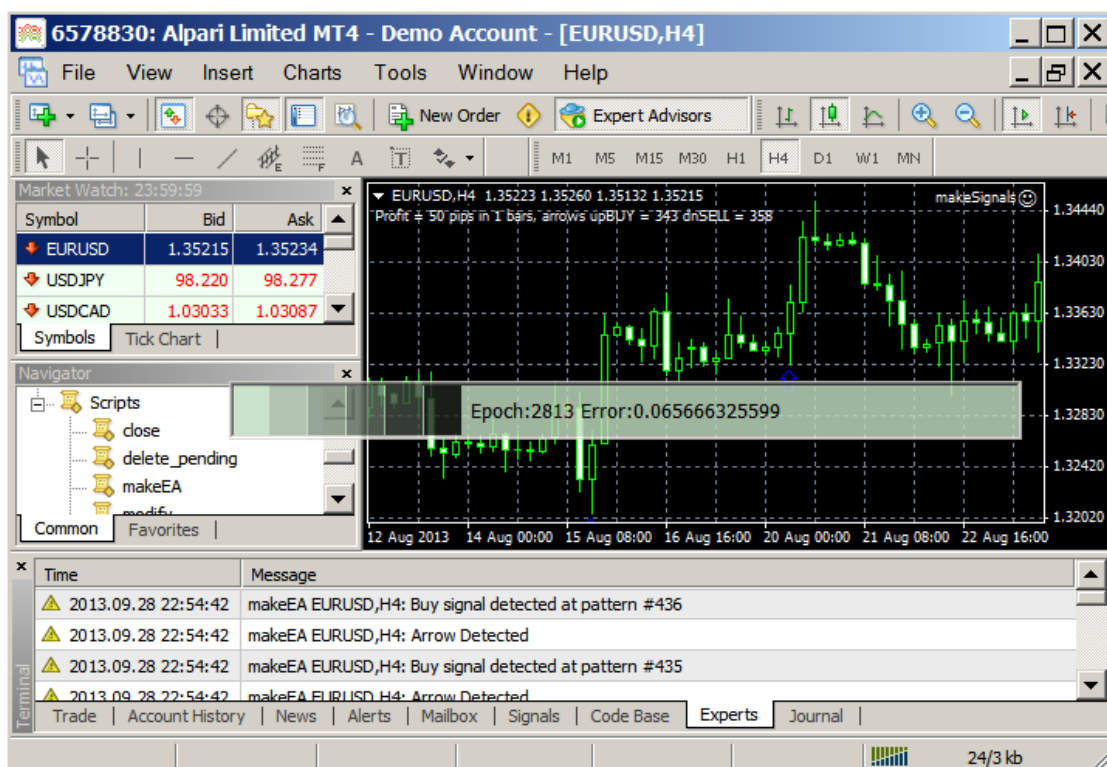
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To start expert advisor training, launch the MakeEA script on a chart with placed signals, change neural network settings on the tab “Inputs” (if necessary) and press “OK”. The window “Make Trading Strategy” will be displayed.



Input the name of the expert advisor in the field “Name”. If necessary, change additional expert advisor creation settings and press “OK” to start training. If the expert advisor with such name doesn’t exist it will be created. A neural network will be created and trained for the expert advisor. The duration of the training process depends of training parameters and can take from one to several dozen minutes. “Process Bar” will be displayed. Reports about the training process will be displayed on the tab “Experts” of the trading terminal. The MakeEA script excludes data from the training set if session breaks take place – the message “Aborted – Invalid pattern!” will be displayed. The message “Strategy generation Success! On X patterns” indicates successful neural network training. A newly created expert advisor will be displayed in the list of advisors only after restarting the terminal.



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Additional expert advisor creation settings:

“Export neural net to external library” – if this option is disabled, the trained neural network will be saved in a temporary expert advisor file in the MT4 terminal folder “Experts\Files\EA name.nnb”. If this option is enabled, the neural network will be integrated to the expert advisor external dynamic library in the MT4 terminal folder “Experts\libraries\EA name.dll”.

“Replace the neural network, if exists” – replacement of the existing neural network.

If you press the button “Shell”, GUI Hlaiman EA Generator will be displayed. In the current version, the EA Generator GUI has constrained functionality and serves for illustrative purposes only.

Important: Expert advisors with neural networks integrated to the dynamic library can be used for trading on any MT4 terminal installed on any computer, independently of EA Generator.

You should restart the terminal before integrating the neural network to the dynamic library (“Export neural net to external library” = true) in case the advisor was used for trading or in the tester since the launch of the terminal. If the neural network was trained for the expert advisor on a certain instrument at “Export neural net to external library” = false, then the last neural network trained on this instrument will be integrated to the expert advisor library during the next training of this expert advisor on the same instrument at “Export neural net to external library” = true (it will be done from a temporary file).

The expert advisor can keep neural networks for each accessible instrument in the library. You can retrain and test the expert advisor on different instruments without restarting the terminal as many times as you wish at “Export neural net to external library” = false. When you are completely satisfied with the trading results – restart the terminal and integrate the last trained neural networks of each instrument from temporary files to the expert advisor library (“Export neural net to external library” = true).

Important: If a neural network for a certain instrument exists both in temporary files and the expert advisor library, the neural network from temporary files will be used for trading or testing. Don’t forget cleaning temporary files of expert advisors.

## MT4 Expert Advisor

An MT4 expert advisor created by means of the EA Generator software consists of the following files:

<EA name>.mq4 – the expert advisor source code. It can be modified by a programmer to add new features. You can find it in the MT4 terminal folder “Experts”.

<EA name>.ex4 – the expert advisor compiled code. You can find it in the MT4 terminal folder “Experts”.

<EA name>.dll – the expert advisor external dynamic library. You can find it in the MT4 terminal folder “Experts\libraries”.

If you want to use expert advisors with trained neural networks integrated to the dynamic library on another MT4 terminal – simply transfer these files to the specified folders.

Temporary files of expert advisor neural networks are situated in the MT4 terminal folder “Experts\Files”.

Variables of the expert advisor created by means of EA Generator:

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“Lots” – the number of lots for trade;

“LotsPercentBalance” – per cent of current balance for dynamic calculation of the number of used lots;

“LotsPercentEquity” – per cent of current own funds amount for dynamic calculation of the number of used lots;

“LotsPercentFreeMargin” – per cent of current margin for dynamic calculation of the number of used lots.

Calculation of the number of used lots is carried out according to the formula  $Lots + LotsPercentBalance + LotsPercentEquity + LotsPercentFreeMargin$

“TakeProfit”, “StopLoss” – TakeProfit and StopLoss parameters;

“UseTrailingStop” – break-even function. Moves StopLoss to the break-even level when the trade profit is equal to the specified value, “0” – disabled.

“UseChannelOnBars” – the number of bars for channel calculation, channel trading strategy, “0” – disabled.

“UseMartingaleLot” – Usage of the martingale strategy.

“DelayedStops” – “Market Execution” support (for ECN brokers)

Opening of a trade is carried out in two stages:

1. Open a new order with “StopLoss” and “TakeProfit” values = 0;
2. Change StopLoss” and “TakeProfit” values of the order to the specified values.

“Normalize” – input data normalization (it should also be enabled at neural network training).

“AddFilter” – Usage of expert advisor neural networks trained on instruments different from the current one for filtering a signal about opening a trade.

Examples of values:

“+EURUSD60” – adds a filter of a neural network trained for the instrument “EURUSD” on the timeframe “H1”.

“+EURUSD60-USDCHF240” – adds a filter of a neural network trained for the instrument “EURUSD” on the timeframe “H1” and an inverted filter of a neural network for the instrument “USDCHF” on the timeframe “H4”. There could be even more filters. We will review creation of expert advisors with the use of filters in the section “Examples”.

“SoftFilter” – the value “false” – to open a trade, all filtering neural networks must send trade signals along with a trade signal from the neural network of a current instrument; otherwise a trade won’t be opened. The value “true” – a trade will be opened even in case of neutral signals of one or several filtering neural networks.

Expert advisor time trading filters:

“TradeTime” – time interval during which the expert advisor is allowed to open trades;

“MondayOn”, “TuesdayOn”, “WednesdayOn”, “ThursdayOn”, “FridayOn”, “SaturdayOn”, “SundayOn” – days of week;

“SunStartTime” – expert advisor trading start time on Sunday (by default – 23:00);

“FriStopTime” – expert advisor trading end time on Friday (by default – 15:00).



“BuyOpenDelta”, “SellOpenDelta” – neural network signal inaccuracy parameters of opening trades in %. The lesser the inaccuracy parameter is the stronger trade signal should be provided by the neural network to open a trade. A signal weakens at insufficient amount of training input data or inconsistency of these data. You can increase signal inaccuracies if the expert advisor opens too little trades, but in this case their quality might become worse.

“BuyCloseDelta”, “SellCloseDelta” – neural network signal inaccuracy parameters of closing trades in %. The lesser the inaccuracy parameter is the stronger the signal opposite to the opened trade should be to close the trade. Value “0” – close at “StopLoss” or “TakeProfit”.

Signal inaccuracy values are common both for the current instrument neural network and all its filters.

“MinOpenPoint” – the minimal number of points from bar open price in the direction of a trade that allows its opening;

“MaxClosePoint” – the maximal number of points of trade profit that allows its closing;

“MaxSpread” – the maximal spread value above which trading is forbidden;

“Slippage” – acceptable slippage;

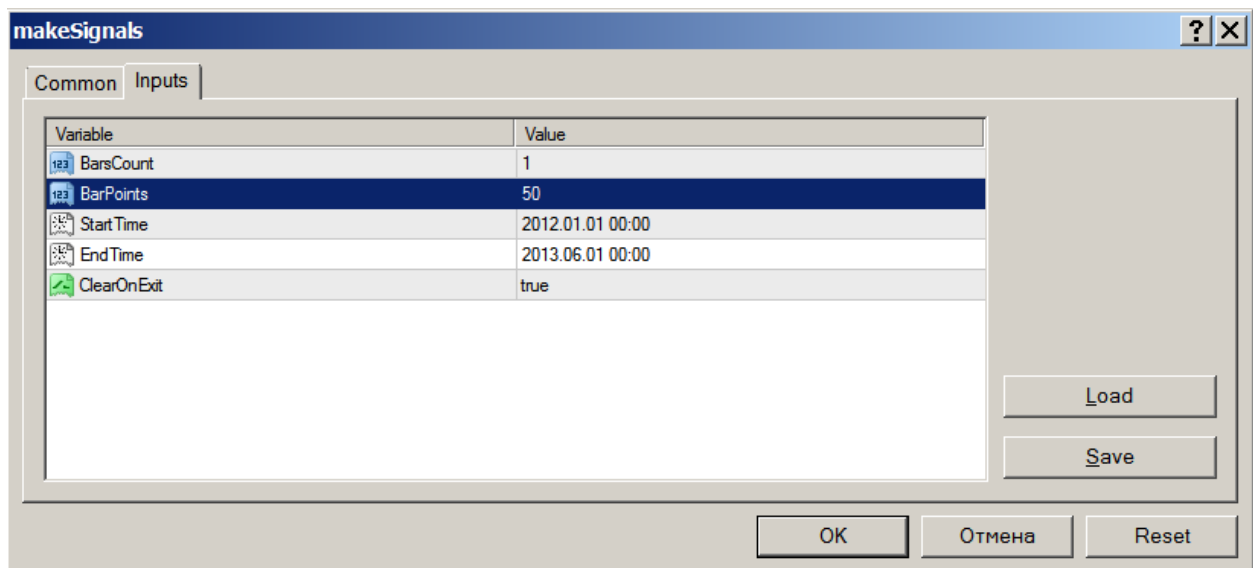
“ShellConnection” – displaying GUI Hlaiman EA Generator;

“MagicNumber” - ID of an order opened by the automated expert advisor. It should be unique for each expert advisor, if you use several EA Generator expert advisors simultaneously on different instruments.

## Examples of Expert Advisor Creation by means of EA Generator

### Creation of a Profitable Expert Advisor on EURUSD H4

Open EURUSD, H4 chart and launch the MakeSignals expert advisor. Let’s take trade signals placement period from “2012.01.01” to “2013.06.01” (StartTime, EndTime variables). Other variables should be default.



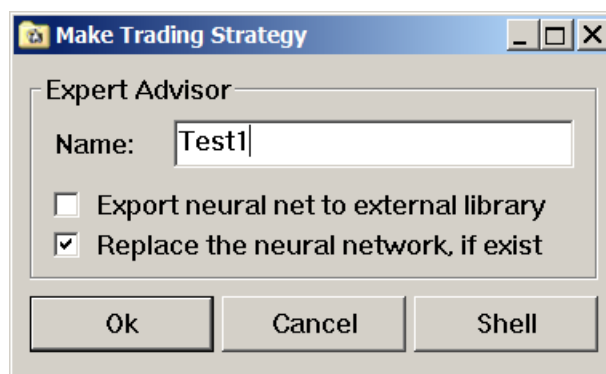
Expert advisor results: 80 buy signals, 79 sell signals.



The recommended number of signals for neural network training with default parameters (“PattrenBarsCount” = 12, “NetLayersCount” = 3, “NetNeuronsCount” =60, “NetEpochCount” = 10000) is 150 in each direction. If you want to increase the number of MakeSignals expert advisor signals on a chart you should increase the period and/or change values of “BarsCount” and “BarsPoint” variables. Set “BarsCount” = 3. The number of signals increased to 152 and 173 correspondingly.



Let’s launch the training script makeEA. Leave all default values of variables and press “OK”. Type the expert advisor name in the window “Make Trading Strategy”, for example, “Test 1”. Press “OK” to start expert advisor neural network training for EURUSD, H4.

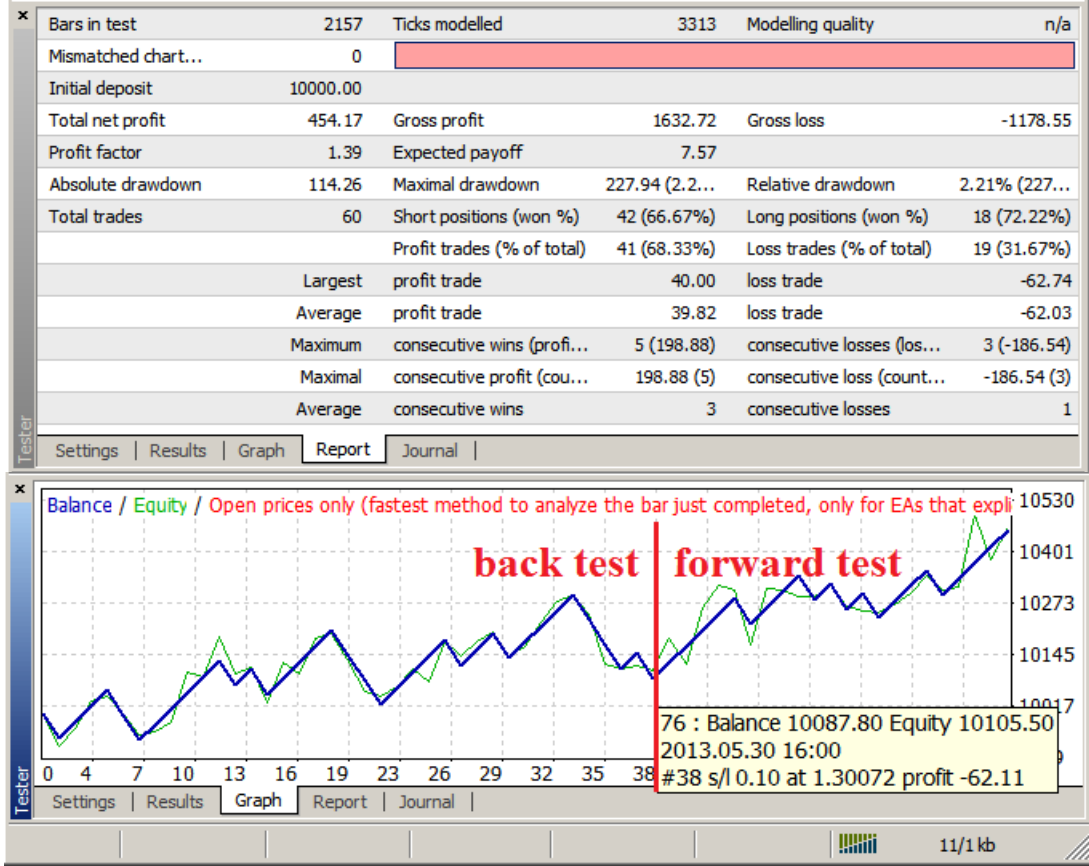


Wait till the end of neural network training and creation of a new expert advisor “Test1”.

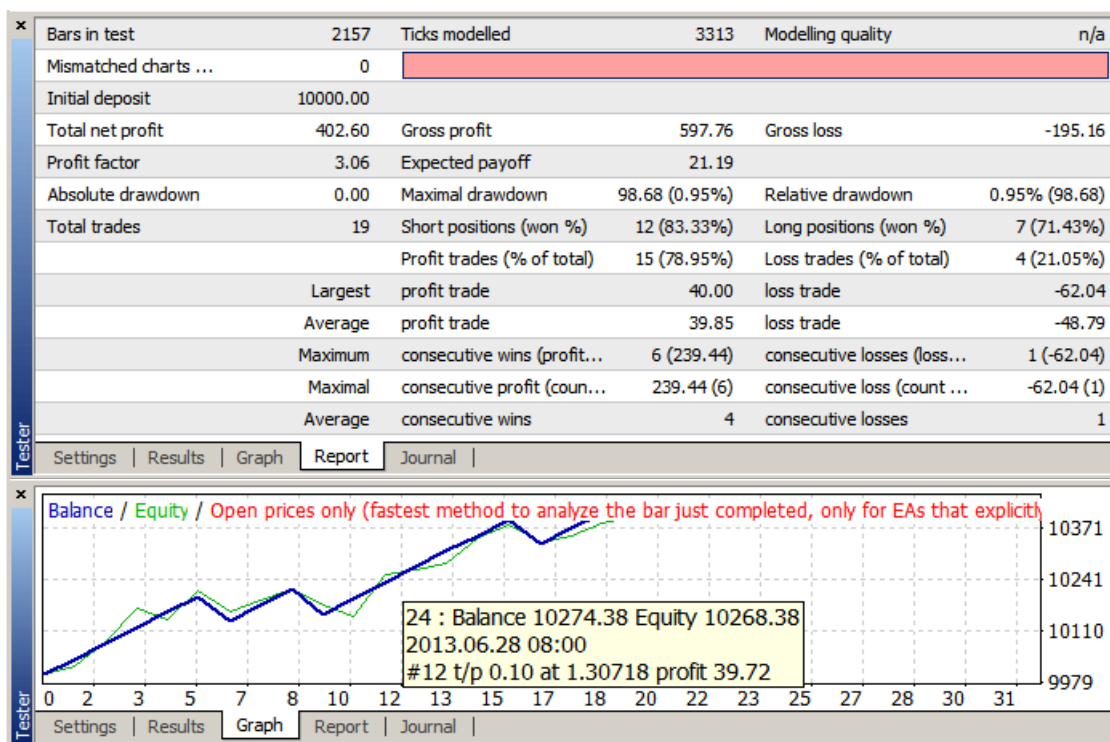




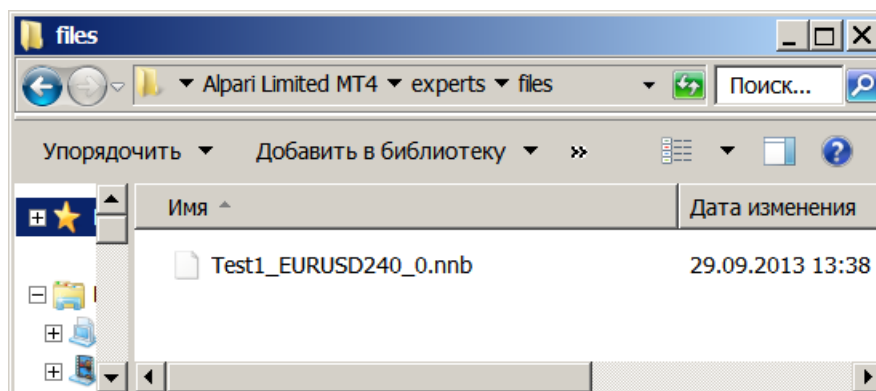
Restart the terminal to add the advisor to the MT4 terminal expert advisors list. Open Strategy Tester, select our expert advisor for testing, select the symbol and period EURUSD, H4. To speed up testing, let's use the model "Open prices only". Specify testing period from "2013.01.01" to "2013.10.01" – expert advisor trade till "2013.06.01" will be a back-test, and after "2013.06.01" – a forward-test. Launch testing.



The results may be called satisfactory. Let's try to retrain the expert advisor to achieve better results. Launch the training script makeEA. Leave all default values of variables and start training. When the training process is finished, launch testing.



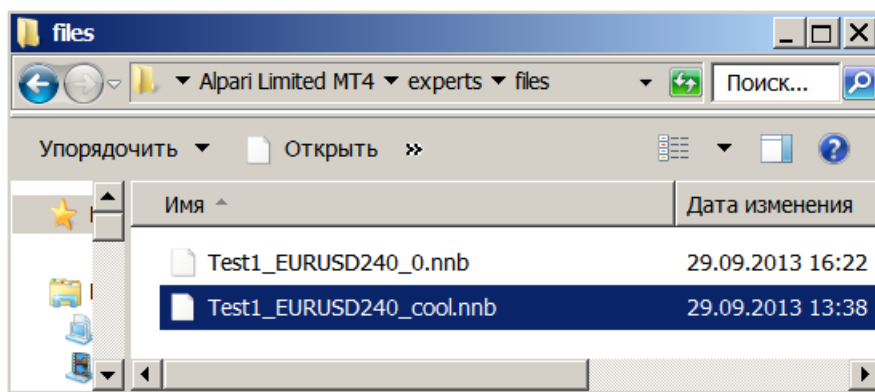
The expert advisor trading results became significantly better after retraining. Let's try to improve results, but keep the current expert advisor trading algorithm (the neural network). Open the expert advisor temporary files folder of the MT4 terminal, for example, "C:\Program Files\Alpari Limited MT4\experts\files".



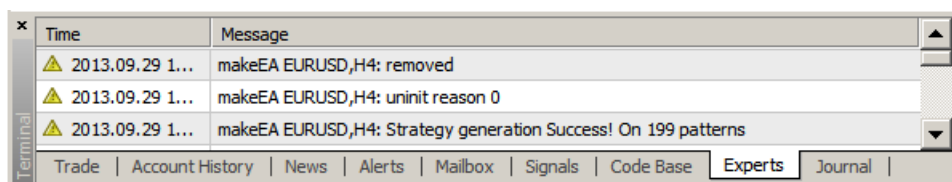
Rename the expert advisor neural network file Test1 for EURUSD, H4 from "Test1\_EURUSD240\_0.nnb" to "Test1\_EURUSD240\_cool.nnb". Repeat the training process of the expert advisor Test1 once again. Launch testing.

Bars in test	1511	Ticks modelled	2021	Modelling quality	n/a
Mismatched charts...	0				
Initial deposit	10000.00				
Total net profit	85.49	Gross profit	478.25	Gross loss	-392.76
Profit factor	1.22	Expected payoff	4.50		
Absolute drawdown	134.77	Maximal drawdown	134.77 (1.3...	Relative drawdown	1.35% (134...
Total trades	19	Short positions (won %)	15 (66.67%)	Long positions (won %)	4 (50.00%)
		Profit trades (% of total)	12 (63.16%)	Loss trades (% of total)	7 (36.84%)
	Largest	profit trade	40.00	loss trade	-62.74
	Average	profit trade	39.85	loss trade	-56.11
	Maximum	consecutive wins (profit...	5 (199.37)	consecutive losses (loss...	2 (-123.87)
	Maximal	consecutive profit (cou...	199.37 (5)	consecutive loss (count...	-123.87 (2)
	Average	consecutive wins	2	consecutive losses	1

This time, we couldn't improve the expert advisor results, so let's go back to the previous results. Open the expert advisor temporary files folder, delete a newly created neural network file "Test1\_EURUSD240\_0.nnb" and rename the file "Test1\_EURUSD240\_cool.nnb" to "Test1\_EURUSD240\_0.nnb".



Now let's integrate the successfully trained neural network to the external dynamic library of the expert advisor Test1. Restart the MT4 terminal and launch the training script makeEA on the chart EURUSD H4 with the enabled option "Export neural net to external library". The training progress bar won't be displayed, and the message "Strategy generation Success! On X patterns" indicates successful integration of the neural network from the temporary file to the dynamic library Test1.dll.



Copy expert advisor files "Test1.mq4" and "Test1.dll" from the MT4 terminal folders to use them on another computer.

Learn more: <http://eagenerator.com>