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I. INTRODUCTION

Daybook Data Manager is at the end of a quality control workflow, that starts from the image acquisition and continues through the generation and tracking of quality data (cf. Figure 1).

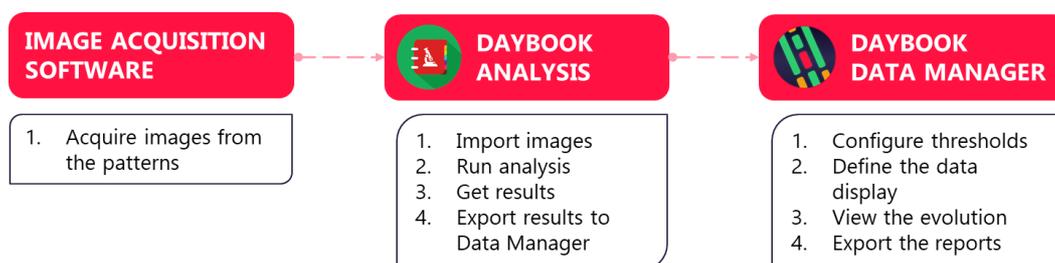


Figure 1: Schematics of the quality control workflow with Daybook Analysis and Daybook Data Manager.

The “Monitoring” tab of Daybook Data Manager gives access to:

- The display of your analysis results along a timeline.
- The tracking of specific performance metrics and alerts based on pre-defined tolerance thresholds.
- The centralization of the quality control data and events about a system.



II. TIMELINE MANAGEMENT

In the “Monitoring” tab, the timeline displays the evolution of specific metrics over time (cf. Figure 2).

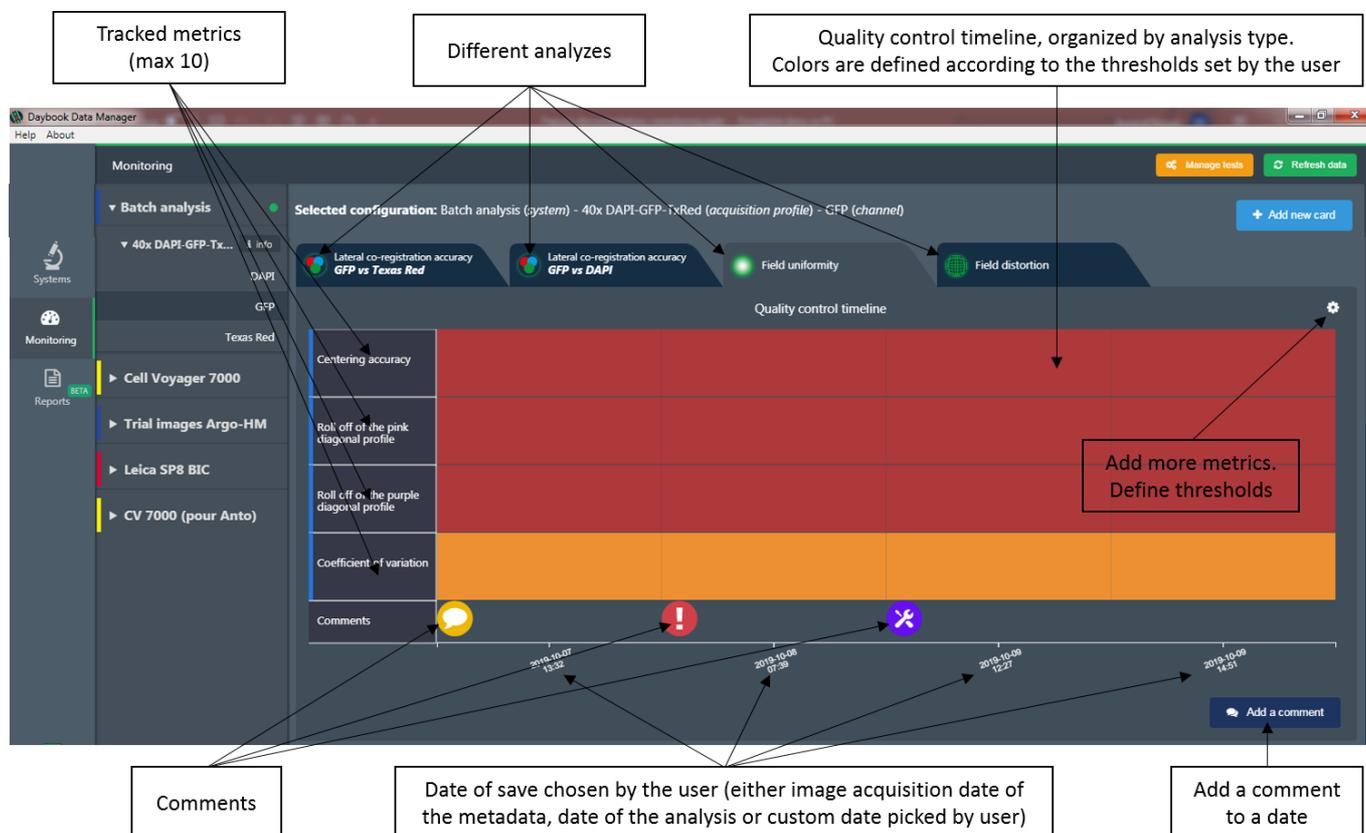


Figure 2: Quality control timeline.

1. DISPLAY ANALYSIS RESULTS ON THE TIMELINE

1- How to add a result to the timeline?

All data displayed on the timeline come from the analyses previously carried out in Daybook Analysis.

When a valid Daybook Data Manager license has been registered, the results (from Daybook Analysis results pages) can be transferred into Daybook Data Manager thanks to the “Save in Data Manager” button (cf. Figure 3).



Figure 3: Transfer of results from Daybook Analysis to Daybook Data Manager.



Daybook Analysis will require to select the system, acquisition profile and corresponding channel. By default, the results will be saved at the acquisition date of the image if available in the metadata. If the acquisition date is not available in the metadata of the image, it is possible to save the results at the present date (date of the analysis) or at a custom date (cf. Figure 4). The chosen date is the one that will be displayed within the timeline of Daybook Data Manager.

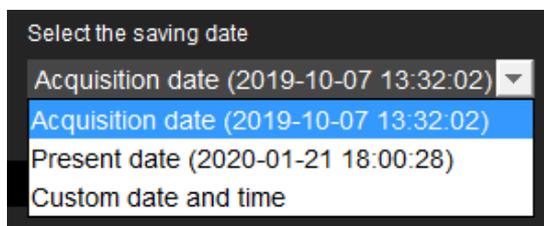


Figure 4: Choose the saving date that will be displayed in Daybook Data Manager.

Many channels can be created within Daybook Data Manager. Each channel has its own timeline.

Notes:

- A channel is a set of image acquisition settings (excitation and emission wavelengths, illumination power, detector exposure time and/or gain, etc.) that are used to acquire the patterns images of Argolight hardware products.
- You can save two subsequent results in Daybook Data Manager that are separated by a ***minimum time interval of one second***.

2- How to add several results in one go to the timeline?

Several quality points can be added in one go when using the “batch analysis” feature in Daybook Analysis. The “batch analysis” is carried out in Daybook Analysis and the results are displayed in Daybook Data Manager.

If the acquisition date is available within the metadata of the analyzed images, then the batch analysis saves the results with the date at which the images were acquired, called the “acquisition date” in the algorithm metadata.

If the acquisition date is not available within the metadata, then the batch analysis saves the results at the current date, called the “analysis date” in the algorithm metadata.

We advise to read the batch analysis documentation (found in Daybook Analysis) to know more.

3- Frequently asked questions

- **The result is not displayed in the timeline**

If the result does not appear in the timeline after clicking on “Save in Data Manager”:

We recommend refreshing the data thanks to the “Refresh data” button in the Monitoring tab of Data Manager, at the top right-hand corner.



If the result still does not display:



We recommend verifying that the metrics corresponding to the result (see below “Metrics in the timeline”) are amongst the displayed metrics.

- **Metrics in the timeline**

Each analysis has a list of associated metrics.

The timeline can display up to 10 metrics per test at the same time.

To see how to add more metrics on the timeline display, please refer to chapter 3 “Track metrics and set quality thresholds”.

4- How to remove a result from the timeline?

The results can be removed from the timeline.



On the Monitoring tab, click on the “Manage tests” button. You will access the list of all your systems, acquisition profiles, channels and the associated tests.

Tests can be deleted one by one or as a complete Quality Point regrouping several tests.

2. ADD COMMENTS

Comments can be useful to keep trace of a specific event: write a warning, add a note, register the visit of the maintenance technician, etc.

Note: Comments will not be exported into the PDF reports.

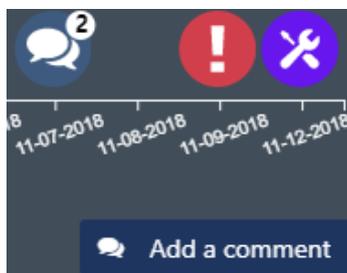


Figure 5: Comments on the timeline.

On the Monitoring tab, click on the “Add a comment” button (cf. Figure 5).

A window will appear in which you can select the date, the concerned item (system, acquisition profile or channel), the type of comment (Maintenance, Note, Warning, Other) and the author (optional).

This will display the comment at the bottom of the timeline.

When several comments are allocated to the same date, a bubble will show the number of comments (cf. Figure 5). Clicking on the bubble will display all the comments linked to this date.

To edit or delete a comment, click on its bubble (cf. Figure 6).

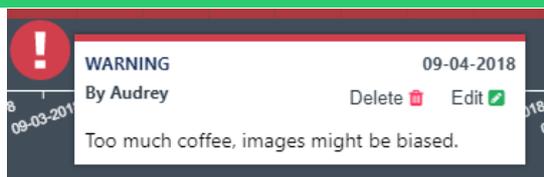


Figure 6: Edit or delete a comment.

3. TRACK METRICS AND SET TOLERANCE THRESHOLDS

The timeline gives a visual indication on the status of your metrics, thanks to a red-orange-green color range. The color changes depending on values the user has previously set as tolerance thresholds for each metric.

1- Add a metric

Click on the  button, at the top right-hand corner of the timeline.

More performance metrics can be added (cf. Figure 7):

- Either one by one: click on the “Add new metric” button.
- Either from a metrics template: To help the user, we have defined templates of metrics that includes pre-defined tolerance thresholds, depending on typical types of microscope. They are issued from our experience, gathered from the literature and/or recommended by experts.

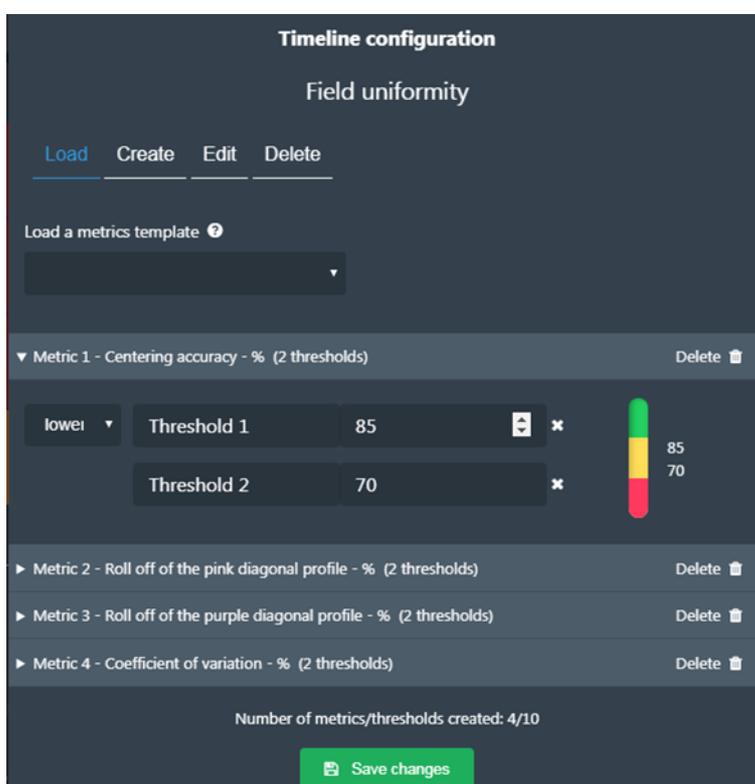


Figure 7: Configuration of metrics and tolerance thresholds.



If you are familiar with the usual metrics values of your system, we recommend to modify the tolerance thresholds accordingly and save them as your own metrics template.

If you do not know the usual metrics values of your system, we recommend to start monitoring them, to gain understanding on how your system usually behaves, and then to set the tolerance thresholds accordingly.

We recommend monitoring the primary metrics of each analysis, shown in Table 1.

ANALYSIS NAME	PRIMARY METRICS WE RECOMMEND MONITORING
POWER METER	Power average Power stability
FIELD UNIFORMITY	Centering accuracy Roll-off of the pink diagonal profile Roll-off of the purple diagonal profile Coefficient of variation Field uniformity
FIELD DISTORTION	Geometrical distortion rate Maximum distortion rate along X Maximum distortion rate along Y Maximum of the vector magnitudes
LATERAL CO-REGISTRATION ACCURACY	Pearson correlation coefficient Maximum of the vector magnitudes
LINE SPREAD FUNCTION	FWHM of the left curve in the horizontal and vertical profiles FWHM of the right curve in the horizontal and vertical profiles SNR in the horizontal and vertical profiles
RING SPREAD FUNCTION	FWHM of the left curve in the horizontal and vertical profiles FWHM of the right curve in the horizontal and vertical profiles SNR in the horizontal and vertical profiles
LATERAL RESOLUTION	Lateral resolution at zero contrast SNR
STAGE REPOSITIONING REPEATABILITY STAGE DRIFT DURING TIMELAPSE STAGE DRIFT DURING Z-STACKING	Maximum of the drifts along X wrt reference position Maximum of the drifts along Y wrt reference position Maximum of the drift magnitudes wrt reference position
ACCURACY OF 3D RECONSTRUCTION	Difference between the measured and expected ratios
INTENSITY RESPONSE 4x4 AND 2x16	Pattern dynamic range Intensity maximum Intensity minimum Pearson correlation coefficient of the actual intensity response
SPECTRAL RESPONSE	Partial correlation coefficient Roll-off
POINT SPREAD FUNCTION	FWHM of the fitting function along X, Y and Z SNR along X, Y and Z

Table 1: Suggested metrics to monitor for each analysis.

2- Define a tolerance threshold

Each metric can have a maximum of two thresholds: a higher one and a lower one.

To change the threshold, click on the metric and modify the value.

You can remove a threshold by clicking on the cross in front of it. You can add a threshold by clicking on the blue button “Add a threshold” (cf. Figure 8).

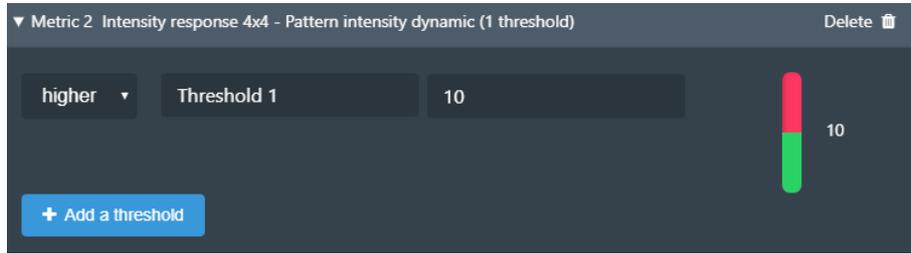


Figure 8: Add a threshold.

3- Remove a metric

You can remove each metric one by one from the timeline. Deleting a metric in the timeline will not affect the data in the database; you will be able to add it again later.

Click on the  button, at the top right-hand corner of the timeline. Click on the “Delete” button in front of the metric you would like to remove (cf. Figure 9).

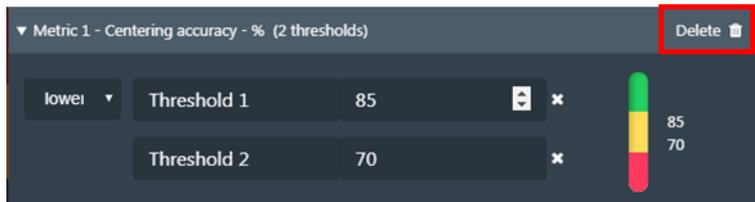


Figure 9: Remove a metric.



III. DATA MANAGEMENT

1. RESULTS PANEL

The “results panel” is automatically displayed and cannot be removed. It displays the same results (images, heat maps, graphs and tables) as in Daybook Analysis. These results are spatially organized the same way as in the results page of Daybook Analysis. The adding value of this panel is that the display of the results can be switched by date, via the purple buttons at the top right-hand corner (cf. Figure 10).

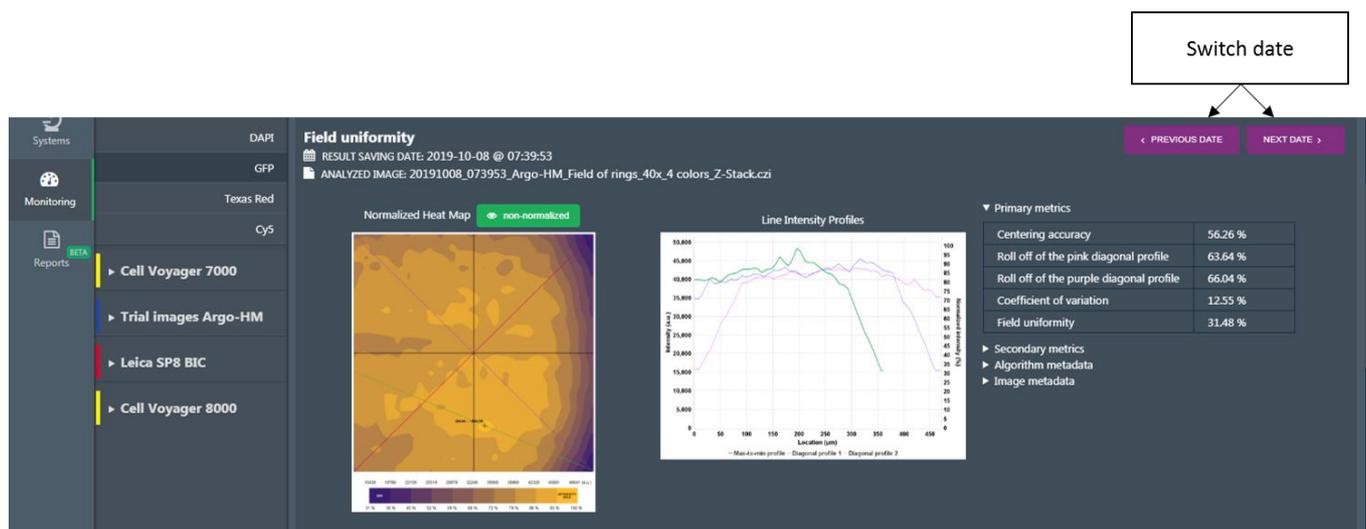


Figure 10: Results panel.

2. CARDS

1- Generalities

Results gathered from Daybook Analysis can be displayed below the timeline as “cards”.

There are three types of cards:

- The “**line chart**” card, which displays the evolution of a specific metric over time.
- The “**table**” card, which displays a table of relevant parameters of an analysis.
- The “**image**” card, which displays an image generated by an analysis.

There is no limit in the number of cards that can be displayed.

On the “monitoring” tab, click on the “Add new card” button, just above the timeline. You will access the types of card and the metrics associated to the analysis currently displayed in the timeline (cf. Figure 11). The new card will then be added below the quality control timeline.

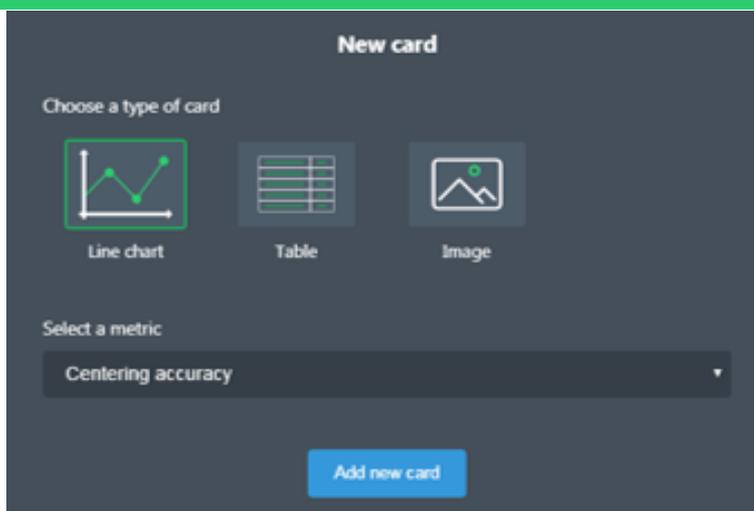


Figure 11: Add a new card.

Right-click on a card to save its content either as a PNG or JPEG file (for line charts and images), or as a TXT or CSV file (for line charts and tables).

To remove a card, click on the bin icon, at the top right-hand corner of the card. Removing a card will not affect the data in the database. You will be able to re-create the card later-on if needed.

2- “Line chart” card

An example of a “line chart” card is shown below (cf. Figure 12). It displays the evolution of results of a single monitored metric (here the “Centering accuracy” of the “Field uniformity” analysis) versus time.

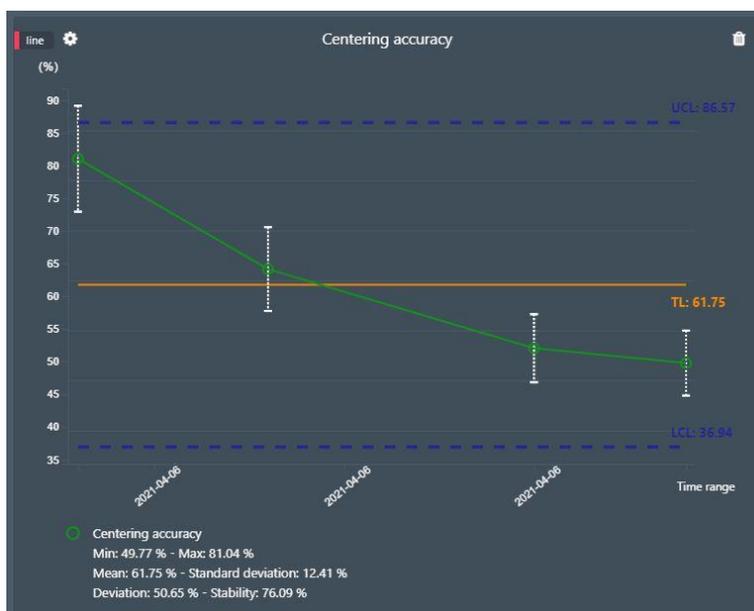


Figure 12: Example of a “line chart” card, including all the available options: error bars, trend line, upper control limit (UCL), lower control limit (LCL), and statistics (min, max, mean, standard deviation, deviation and stability).



To define the settings of the “line chart”, click on the cog, at the top-left hand corner of the card. In the opened panel, you will be able to add into the displayed data: error bars, a trend line, upper and lower control limits, as well as statistics (cf. Figure 13).

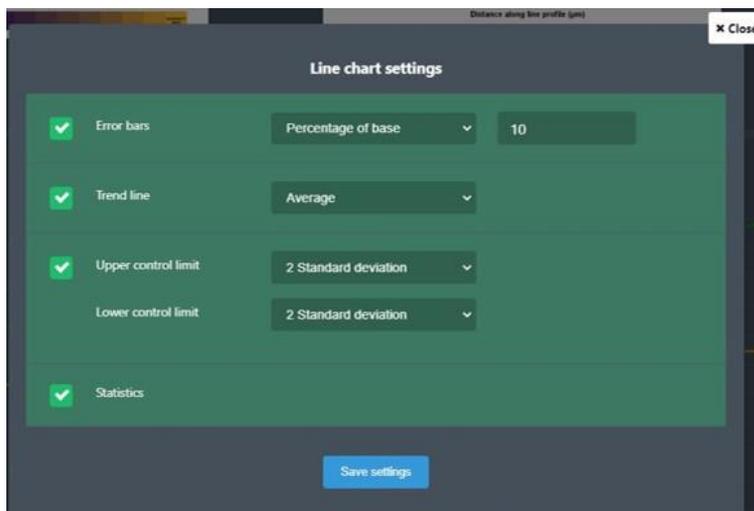


Figure 13: Settings window for the “line chart” card.

The statistics are calculated as follows:

- The minimum is the minimum value V_{min} .
- The maximum is the maximum value V_{max} .
- The average for n values V_i :

$$Average = \frac{1}{n} \sum_{i=1}^n V_i$$

- The standard deviation for n values V_i :

$$SD = \sqrt{\frac{1}{n} \left(\sum_{i=1}^n V_i^2 \right) - Average^2}$$

- The deviation (in %):

$$Deviation = 100 \times \frac{V_{max} - V_{min}}{Average}$$

- The stability (in %):

$$Stability = 100 \times \left(1 - \frac{V_{max} - V_{min}}{V_{max} + V_{min}} \right)$$



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