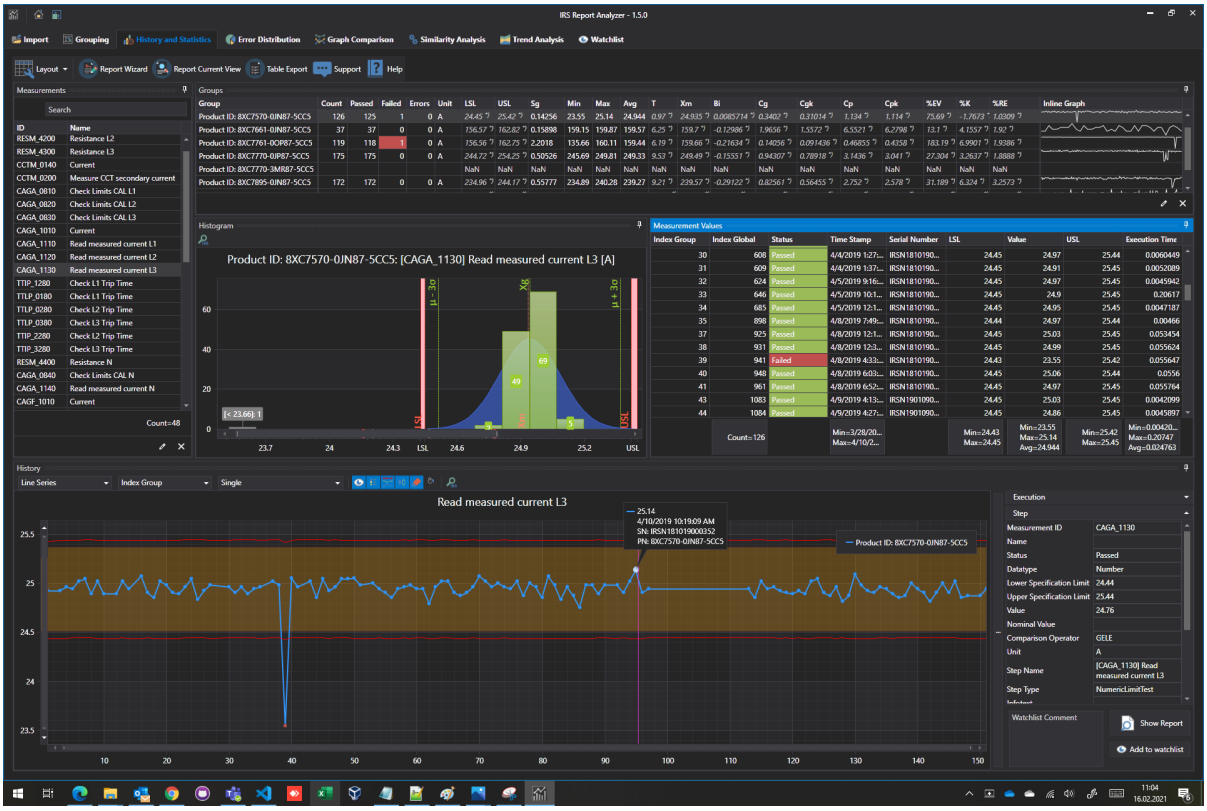
IRS Report Analyzer

User Manual V1.6



IRS Systementwicklung GmbH
Pfaffenthanner Weg 5 | 93179 Brennberg
+49 9484 9500-0 | info@irs.systems
www.irs.systems

Proprietary data, company confidential. All rights reserved.
Confié à titre de secret d'entrepr ise. Tous droits réservés.
Comunicado como segredo empresarial. Reservados todos os direitos.
Confiado como secreto industrial. Nos reservamos todos los derechos.

CONTENT

- Overview
  - New in version 1.6
    - Performance optimizations
    - New column "Deviating Limits" in analysis tables.
    - Export context menu for all tables
    - Deleting test executions directly from the measurement value table or detail view
    - Default automatic formatting of Cg, Cgk, Cp and CpK
  - Features
    - Supported data types
    - The most important features at a glance
  - Preparation / optimization of report data
    - Adding metadata to the report
    - Measurement ID
  - Quick Start / Workflow
- Program functions in detail
  - System requirements
  - Installation
  - Activation
  - General program functions
    - Window arrangement
    - Visible columns
    - Sorting by columns
    - Filtering the columns
    - Conditional formatting
  - Home screen
    - Save data set
    - Load data set
  - Main screen
    - Toolbar
    - Tabs
  - Import (Tab)
    - Import Sources (Panel)
    - Imported Executions (Panel)
    - Import Tips
    - Custom plugins
    - Import filter

 © IRS Systementwicklung GmbH

- Grouping (Tab)
  - General rules & tips for groups
  - Grouping via filter
  - Grouping by columns
  - Combined grouping
  - Manage groups
  - Save/Apply filter set
- History and Statistics (Tab)
  - Measurement Analysis Table (Panel "Group")
  - Common MSA analysis parameters by company
  - History Chart
  - Histogram (panel)
  - Measurement Values (Panel)
  - Report Wizard (Button)
  - Report Current View (Button)
  - Export Table (button)
- Error Distribution (Tab)
  - Details
  - Measurements
  - Diagrams
  - Executions
  - Export
- Graph Comparison
  - YY Diagram
  - XY Diagram
- Similarity Analysis
  - Export
- Trend Analysis (Tab)
  - Settings (Panel)
- App Settings (Dialog)
  - General
  - Default Analysis Parameters
  - View Settings
  - Export Settings
- Watchlist

 © IRS Systementwicklung GmbH

1. Overview

- How many tests were performed on which product?
- What is the percentage of failed tests?
- Which test steps have mainly led to failure?
- On which workpiece carrier do most test items fail?
- When was the last failure in test step X in product Y on system Z?
- In which product types do which failures occur more frequently?
- How good are my measurements (Cp, Cpk and other MSA relevant values)?
- How large is the dispersion of the measured values?
- Are reasonable limits defined for measurement X?
- Are there trends in the measured values?
- How long does a test execution (min, max, average) take overall?
- Are there similarities or dependencies between certain measurements?
- Which measurements might cause problems?

IRS Report Analyzer answers all these questions with just a few mouse clicks!

Have you ever had to create an MSA report for the acceptance of a plant and have been provided with an Excel template? Probably you have already spent many minutes or even hours to create the evaluation of a single criterion.
With IRS Report Analyzer you can import, filter, group and analyze ALL measurements including PDF reports in less than five minutes.

1.1. New in version 1.6

1.1.1. Performance optimizations

Performance has been significantly improved in many places, especially in the area of group management

Please note that all used runtime libraries are compiled at the first start. This may take a few minutes. The process requires administrator rights.

Subsequent program starts should be noticeably faster.

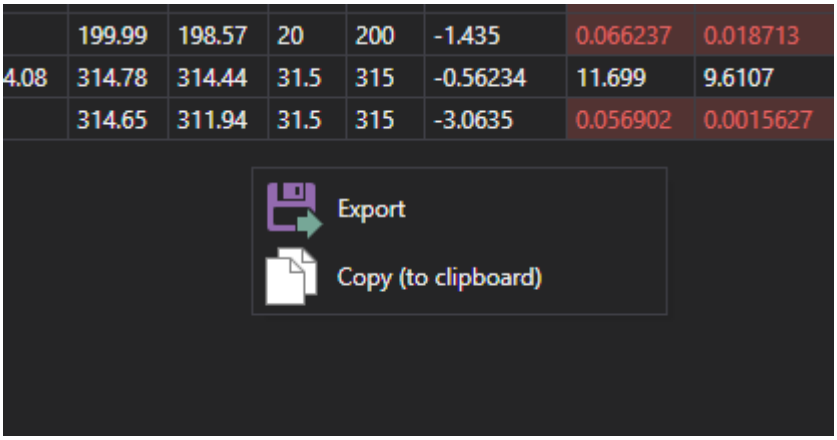
1.1.2. New column "Deviating Limits" in analysis tables.

This allows measurements to be filtered according to whether the core values have been changed. In this case, either manually changed limits or automatically generated substitute values in the case of non-uniform limits are considered as changes.
Note: The column is hidden by default, but can be activated in the column chooser dialog (right mouse button on a column header)

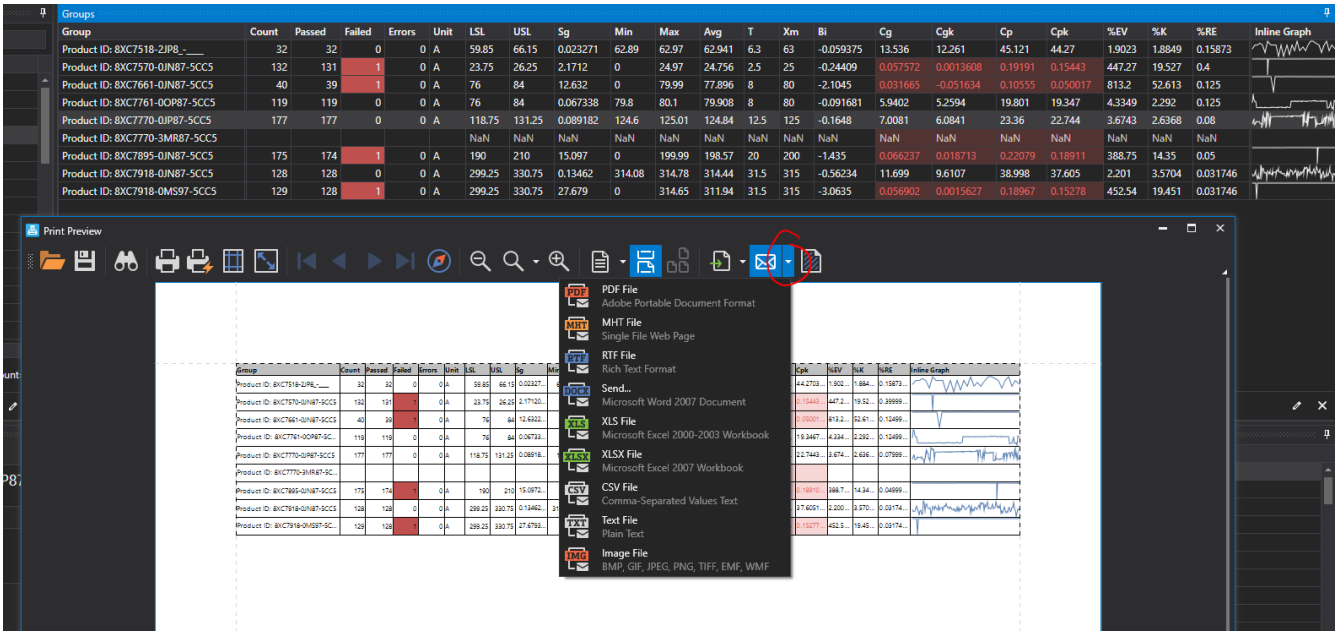
© IRS Systementwicklung GmbH

1.1.3. Export context menu for all tables

Using the context menu, almost all tables can now be exported in many different formats. In most cases, visual formats are also exported, but this depends on the selected output format. The selection of columns is based on the current view (with some exceptions).
To start the export of a table open the context menu with the right mouse button click on "Export":



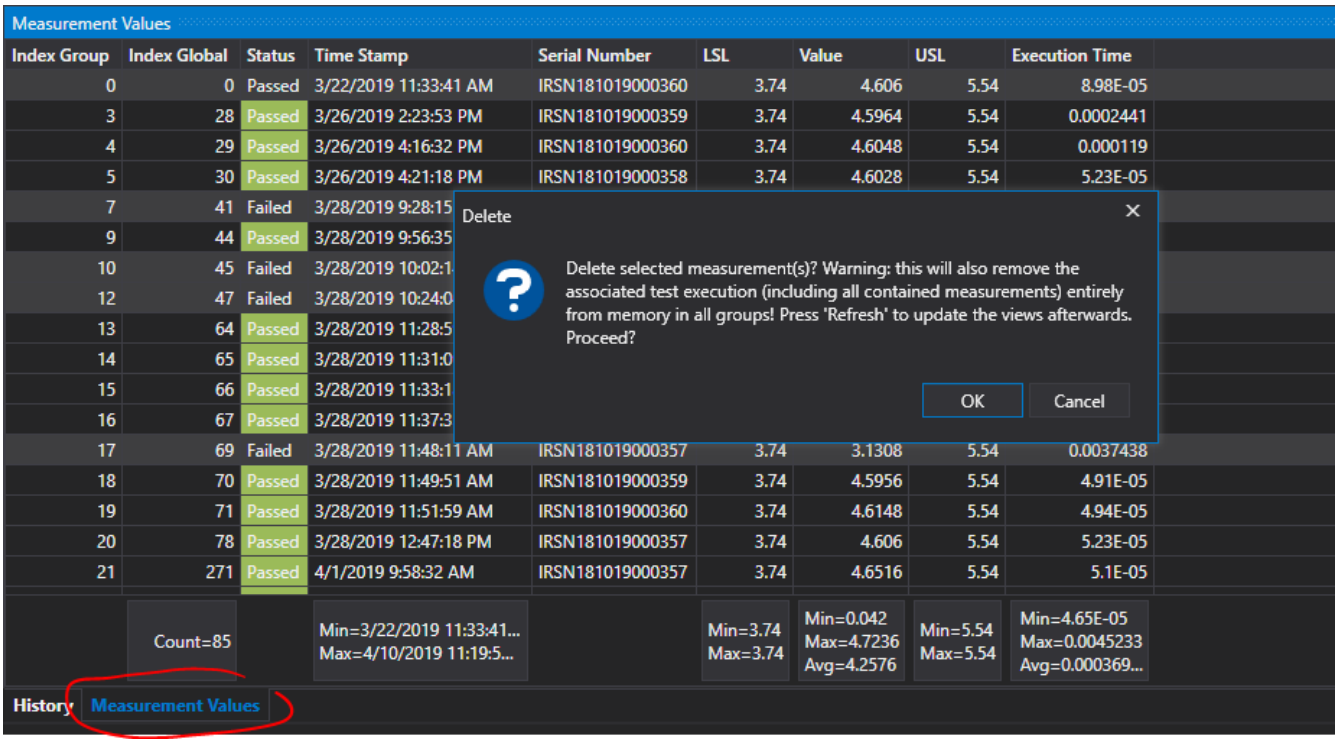
A dialog with preview opens. Here you can adjust the page format and choose an output format:



Alternatively, you can copy the contents of the table to the clipboard and paste it e.g. into an Excel spreadsheet (also via the context menu, see above)

1.1.4. Deleting test executions directly from the measurement value table or detail view

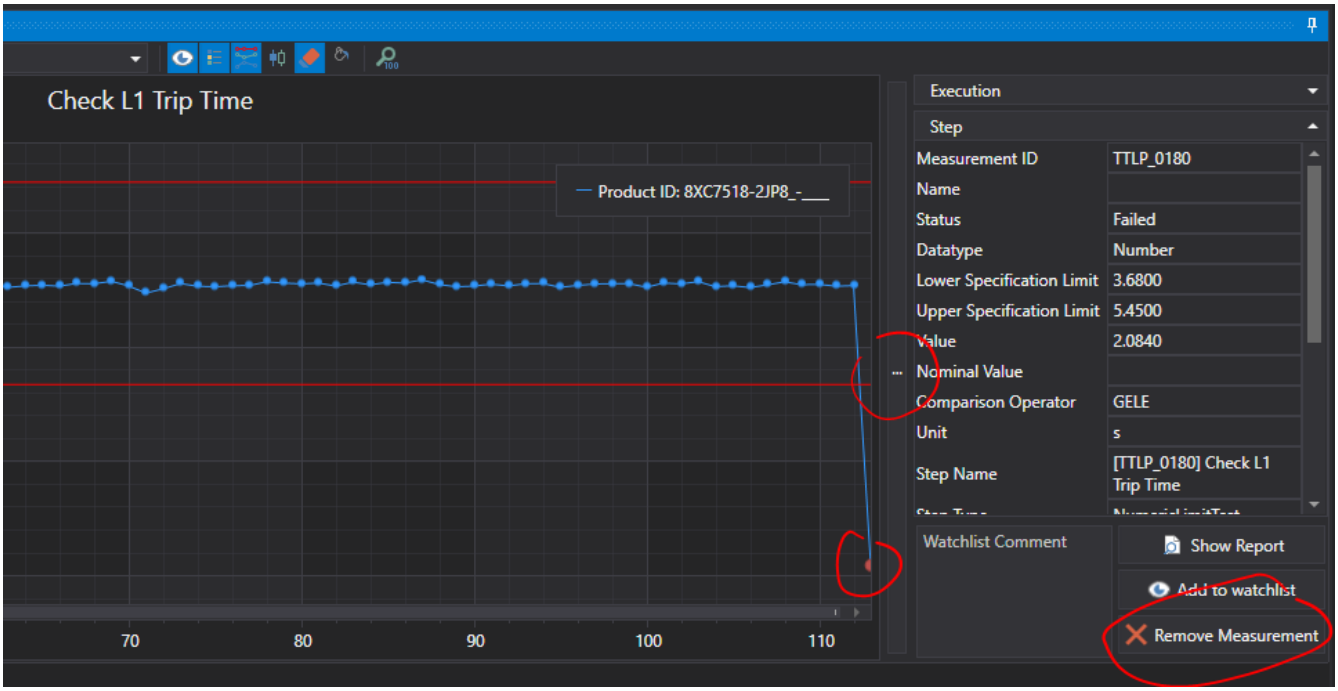
Unwanted measurements can now be selected and deleted directly from the measured value table. To do this, the respective measured values are selected (if necessary, with the help of the shift or control key) and then the DEL key is pressed. After a confirmation prompt, the corresponding measurements are then removed.



To delete a measurement directly from the graph panel proceed as follows:

- Click on the measurement point (the points must be visible and the zoom level must not be too small if there are many measurement points).
- The detail view opens (right panel)
- Click here on "Remove measurement" and confirm the security prompt
- To make the changes visible immediately, click the "Refresh" button and re-select the measurement to update the graph.

 © IRS Systementwicklung GmbH



Attention: In both methods the corresponding test executions including ALL test steps are removed from ALL groups and the import list!

Important: *To avoid unnecessary waiting times due to sometimes time-consuming recalculations of the analysis values after the deletion process, a new analysis is not performed automatically, but must be triggered either via the "Refresh" button or by switching to another module (e.g. error distribution)!*

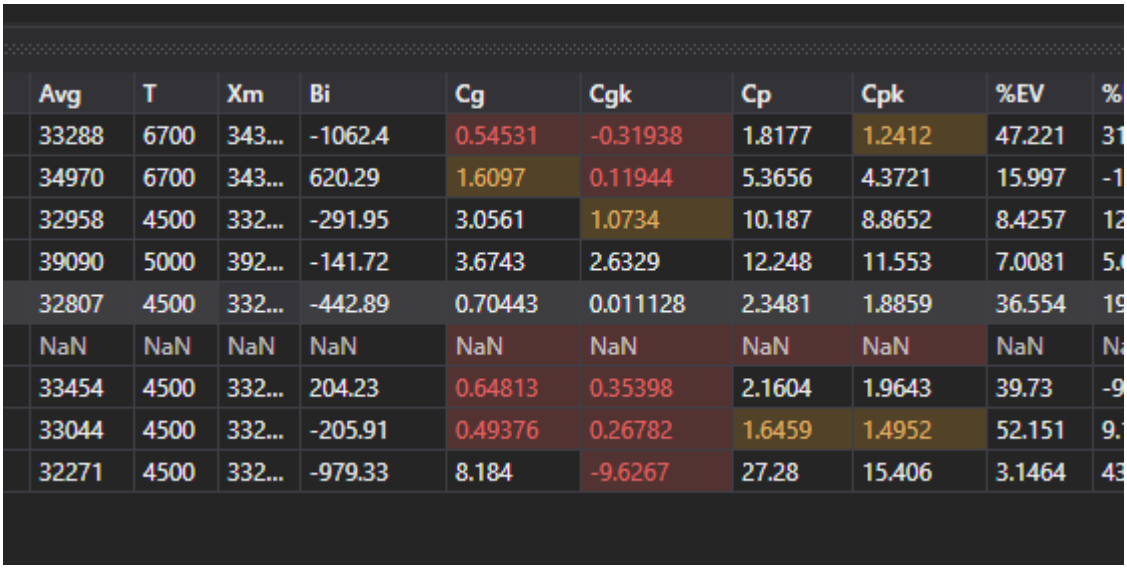
1.1.5. Default automatic formatting of Cg, Cgk, Cp and CpK

The mentioned columns are now colored by default according to the following rules:
Values up to 1: red
Values up to 2: yellow

The selected threshold values of 2 for "good" may be overly critical and can be adjusted if necessary (see below).

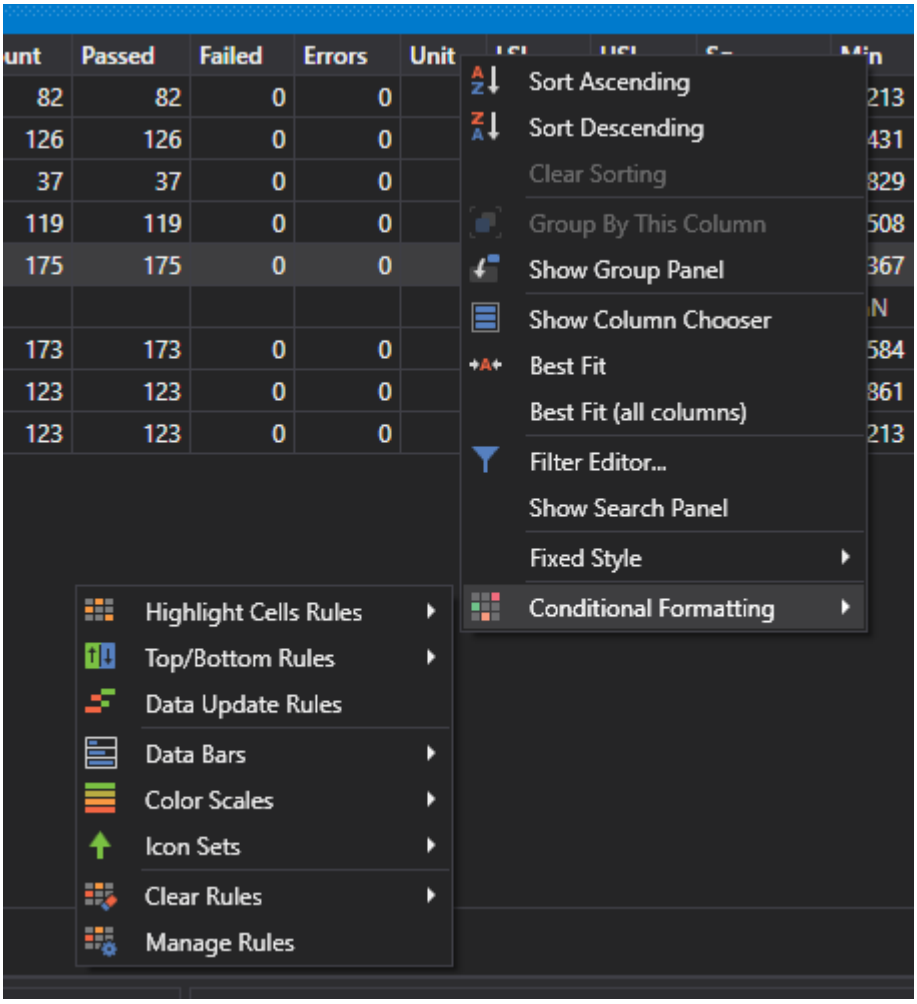
Background: Unfortunately, rational number values have to be entered in the currently selected number format, i.e. either as comma or decimal point. Therefore, we cannot preset this setting with e.g. "1.66". In addition, this is to avoid that bad values are possibly overlooked depending on the selected formula settings.
All in all, the default setting also serves more as an indication of the possibilities of conditional formatting, which you are welcome to adjust according to your wishes.

 © IRS Systementwicklung GmbH



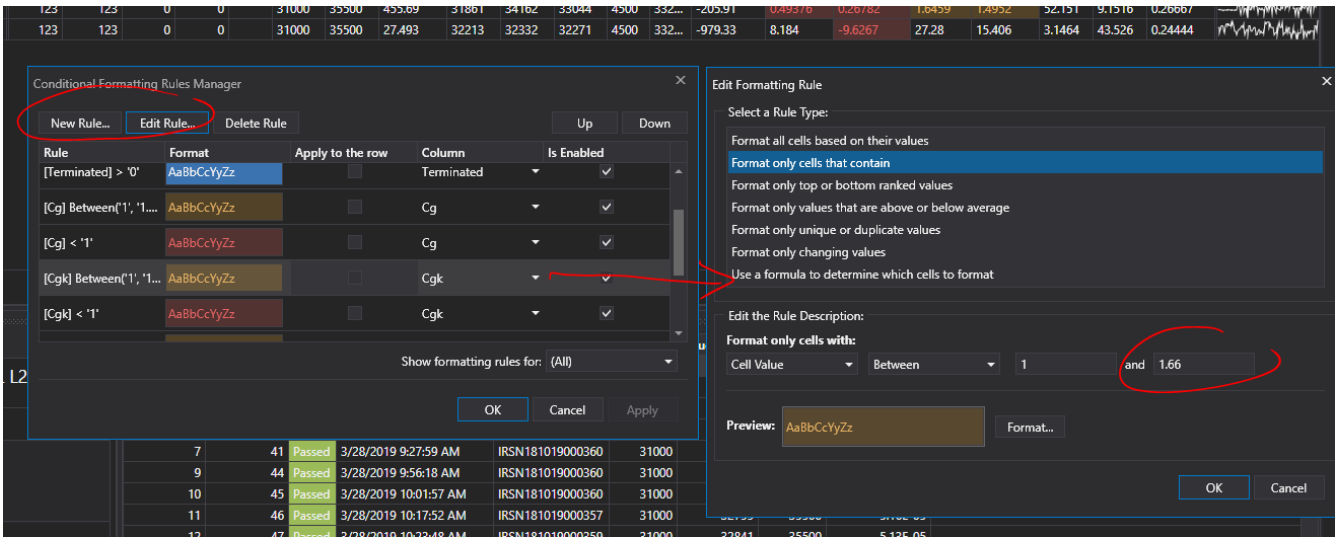
Avg	T	Xm	Bi	Cg	Cgk	Cp	Cpk	%EV	%
33288	6700	343...	-1062.4	0.54531	-0.31938	1.8177	1.2412	47.221	31
34970	6700	343...	620.29	1.6097	0.11944	5.3656	4.3721	15.997	-1
32958	4500	332...	-291.95	3.0561	1.0734	10.187	8.8652	8.4257	12
39090	5000	392...	-141.72	3.6743	2.6329	12.248	11.553	7.0081	5.
32807	4500	332...	-442.89	0.70443	0.011128	2.3481	1.8859	36.554	19
NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	Na
33454	4500	332...	204.23	0.64813	0.35398	2.1604	1.9643	39.73	-9
33044	4500	332...	-205.91	0.49376	0.26782	1.6459	1.4952	52.151	9.
32271	4500	332...	-979.33	8.184	-9.6267	27.28	15.406	3.1464	43

For this setting to take effect, the default layout may need to be reset.
Alternatively, or to adjust the limits, this behavior can be created or changed manually if necessary:



- right click on a column header
- "Conditional Formatting" => "Manage Rules"
- "New rule", or "Edit rule".
- Customize the rule according to your needs,e.g. change the limit value

 © IRS Systementwicklung GmbH



1.2. Features

The IRS Report Analyzer is an application for viewing, filtering and analyzing measurement reports.

The data from many test protocols are grouped together and aggregated based on the individual measurements that occur. Thus, for each measurement, the course over time (history), the distribution of values in certain groups (histogram) as well as statistical values can be determined, which provide information about the quality of the measurements, visualize the course of measured values over time or can be used to do so.

With only a few mouse clicks, complete MSA reports of all measurements of all groups can be generated as PDF files.

1.2.1. Supported data types

- IRS XML Report (IRP)
- NI TestStand XML Report
- NI TestStand ATML5 Report
- NI TestStand ATML6 Report

If you need support for the import of special formats, please do not hesitate to contact us. We will gladly make you an offer. You can also inform us about feature requests/bugs directly or via the support form within the software.

1.2.2. The most important features at a glance

IMPORT

- Importing reports from various sources
- Filtering according to specific criteria
- Viewing the reports
- Create and manage import filters

- Export multiple executions in a PDF report

GROUPING

- Creation and comparison of groups according to any criteria or filters
- Filter settings can be saved as a set

HISTORY & STATISTICS

- Automatic creation of metrics of all occurring measurements (MSA type 1 analysis)
- Analysis parameters adaptable for different standards and procedures
- Visualization of the value course incl. 3-sigma limits and limits
- Support of variable limit values
- Visualization of the accumulation of measured values (histogram)
- Visualization of the status distribution (Pass/Fail) in the histogram anch value ranges
- Display of all corresponding single measured values including status
- Display of the source report if required
- Simultaneous display of measurement series of all groups (overlay or stacked)

REPORTING AND EXPORT

- Export single or multiple test reports as PDF, Word, Excel or HTML
- Storage and reuse of report presets
- Adaptation of the names of the individual measurements for the report
- Bookmark function for commenting and reviewing conspicuous measurement points
- MSA (Type 1) Analysis
- Report of the statistical analysis values of selected measurements and groups including value history, histogram, data table and serial numbers
- Individual PDF report of the current screen view

ERROR DISTRIBUTION

- Graphical comparison of groups based on their status values (Pie Chart)
- Listing of errors per measurement
- Visualization of the top sources of error
- Comparison of the error frequency over different groups
- Export of the data as CSV

GRAPH COMPARISON

- Graphical comparison of different measurements within a group
- Report of the current view as PDF

SIMILARITY ANALYSIS

 © IRS Systementwicklung GmbH

- Comparison of the correlation of selected measurements of a group
- Visualization of the correlation as a color scale
- Export as CSV

TREND ANALYSIS

- Display of the moving average of selected quality titers for each measurement
- Adjustable window size

GENERAL

- languages: German / English
- Themes: Dark / Light
- Pluginfähig
- Platform: Windows 7/8/10 32/64-bit, .NET >= 4.5
- Single user license, bound to computer
- RAM: 4GB min, 8GB recommended

1.3. Preparation / optimization of report data

1.3.1. Adding metadata to the report

The capabilities of the analysis stand or fall with the available data. To get the most out of the analysis, reports should **at a minimum** include the following information:

Per test execution:

- Serial number
- PartNr (or Product ID)
- Date of test execution
- overall result

Ideally, the reports contain further metadata and also user-defined fields on product properties or test environment. ***You can filter and group by this data later****. This information can be added to the test sequence very easily if the special test steps are needed.*
In the program directory you will find examples and instructions on how to optimize your test sequences for the Report Analyzer. *This is not a technical requirement for operation, but it improves the possibilities of evaluation enormously!*

Per test step:

- Measurement ID
- Name of the measurement

 © IRS Systementwicklung GmbH

- Measurement value
- Data type
- Limits
- Timestamp
- Execution time

1.3.2. Measurement ID

At the very least, however, you should know the conventions for forming the Measurement ID, which is used to identify measurements in the Report Analyzer.
For this purpose, the respective step name is preceded by a unique identifier in square brackets, e.g. instead of

`Voltage Input Channel 1` => `[ADC_0010] Voltage Input Channel 1`

Content and length of this ID are arbitrary. However, IRS recommends a short combination of the acronym of the respective test sequence and a consecutive number with sufficient reserve intervals.

results in the Report Analyzer:

- Measurement ID: `ADC_0010`
- Measurement Name: `Voltage Input Channel 1`

The use of the ID is not technically required, but if the Measurement ID is missing, the very cryptic TestStand Step ID is used as a substitute for reasons of unambiguity (e.g. *ID#:OgNqkZFG6RGN9ggAJw99EB*).

Please also refer to the enclosed, more detailed information about the IRS Report Format and also to the already above mentioned example sequences in TestStand format.

1.4. Quick Start / Workflow

The workflow basically consists of the following steps:

1. import data
2. structure (group) data
3. evaluate data
4. export evaluation

In the program, this workflow is structured by arranging the program tabs from left to right.

 © IRS Systementwicklung GmbH

Import data

The measurement protocols can be imported from different sources. Special plugins are provided for this purpose. All available plugins are visible in the tab **Import** under *Import Sources* and can be opened by clicking on the button.

Structure data (group)

In order to be able to analyze large data sets in a meaningful way, it may be necessary to structure the data set. This structuring can be done in the tab **Grouping**. To structure the dataset, filters can be set and various groups can be formed. A later performed analysis will always be executed on all defined groups. The results of the groups can be compared (graphical + tabular) afterwards.

At least one group must be created. This can contain e.g. all available data.

Analyze data

There are different ways to analyze the data. A separate tab is available for each type of analysis. The following tabs are available for data analysis:

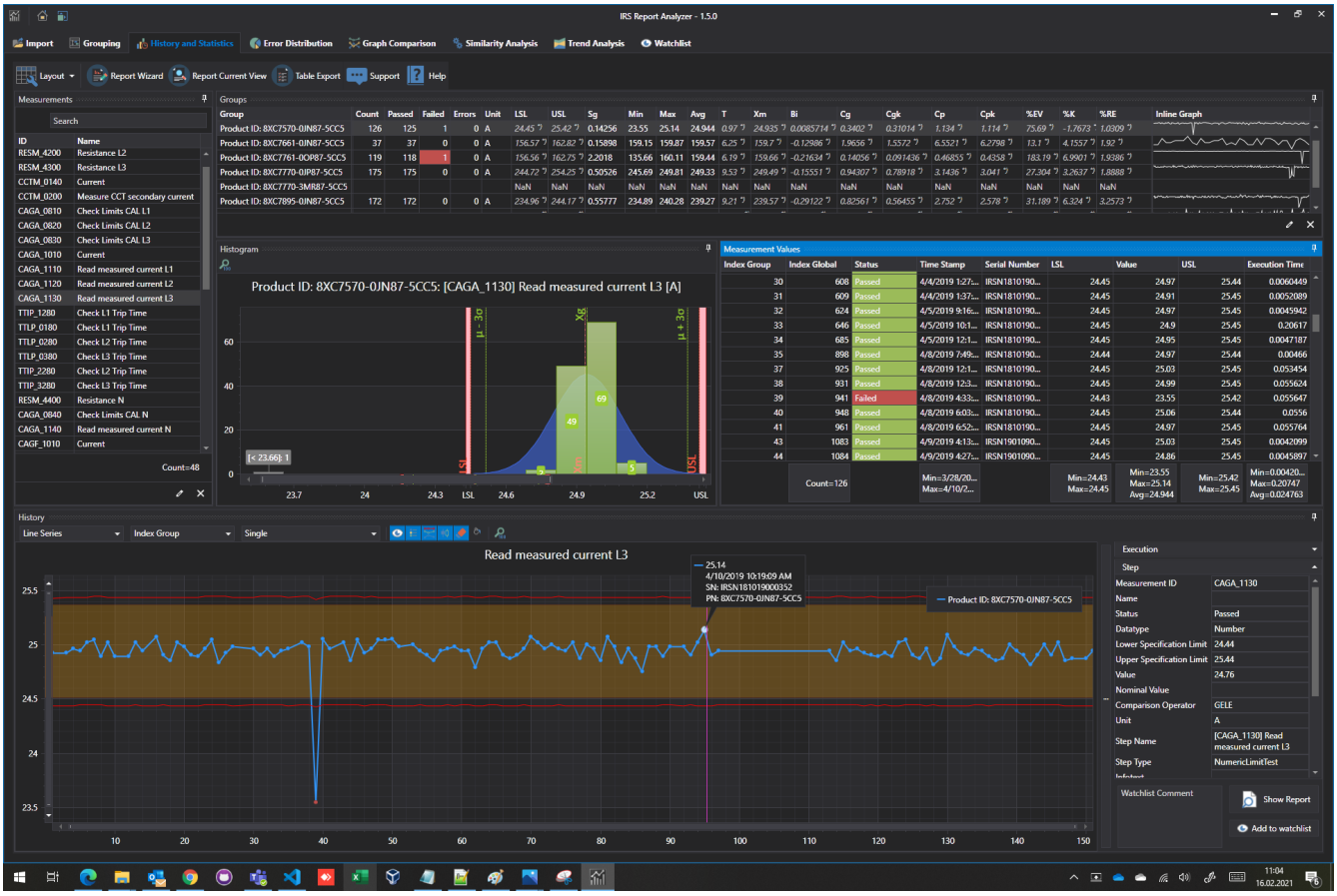
- *History and Statistics:* Display of the measured value histories, calculation of statistical key figures and display of the distribution of the measured values.
- *Error Distribution:* Calculation and display of the group specific error distribution and comparison of the error distribution with other groups
- *Graph Comparison:* Display and comparison of any measured value curves in a diagram
- *Similarity Analysis:* Calculation of the similarity of selected measured values based on cross correlation
- *Trend Analysis:* Recognition of trends in measured value curves and calculation of compensation curves.

Within each analysis tab the respective configuration options and evaluations are displayed.

Export analysis

Each analysis method has one or more specific export formats. These are listed in the top line of the respective tab. Depending on the analysis, overall overviews, tables, graphs or detailed reports can be created.

2. Program functions in detail



The software is available in several languages. The screenshots of this user manual have been made in the English version. The names of the windows, buttons, etc. are therefore also in English in this manual and may differ from the actual representation of the respective language.

2.1. System requirements

- Windows 7, 8, 10 (32/634 bit)
- 4GB RAM minimum, 8GB recommended
- .NET 4.6.2 or higher

2.2. Installation

To install the program, run the installer and follow the instructions.

2.3. Activation

The software must be activated with a valid license to use it.

For a period of up to 60 days the software can be tested in trial mode. The trial mode is identical to the licensed version in terms of functionality. Only the created exports (PDF, Word, etc) are watermarked.

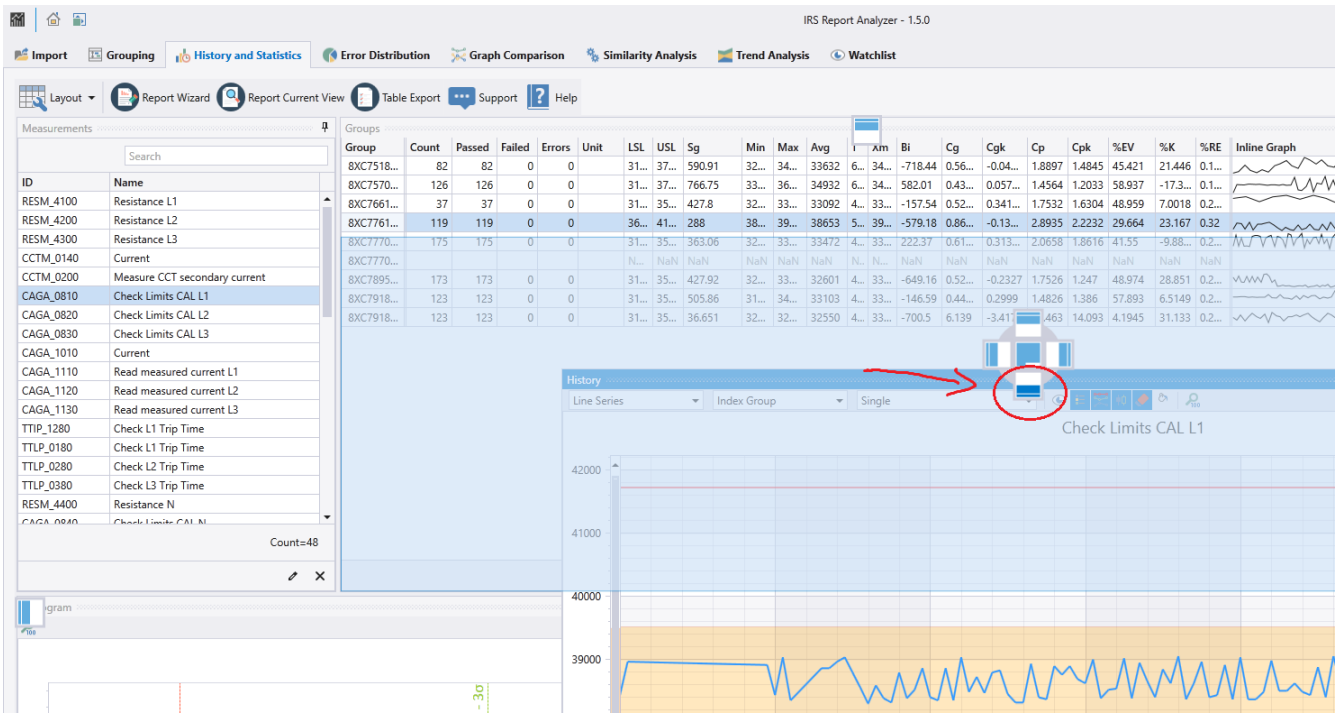
For activation a valid license key is required to unlock the software. The license key must be activated once on the IRS server.

The documentation for software activation can be found here.

2.4. General program functions

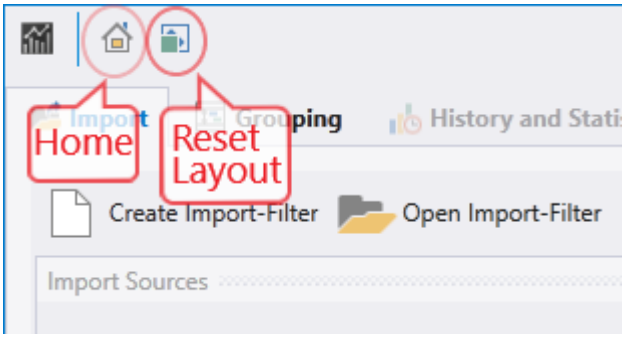
2.4.1. Window arrangement

The arrangement and size of all windows or panels can be adjusted by the user according to his own ideas. To do this, a panel is held at the title bar and moved. Then drag the mouse pointer with the mouse button held down to the corresponding docking symbol in the target area. The panels can be arranged on top of each other, side by side or overlapping.



The panel arrangement is saved when the program is closed. When the program is restarted, the panels are automatically arranged as last configured.

The arrangement of the panels can be reset to a standard layout using the "Reset Layout" button in the main toolbar:

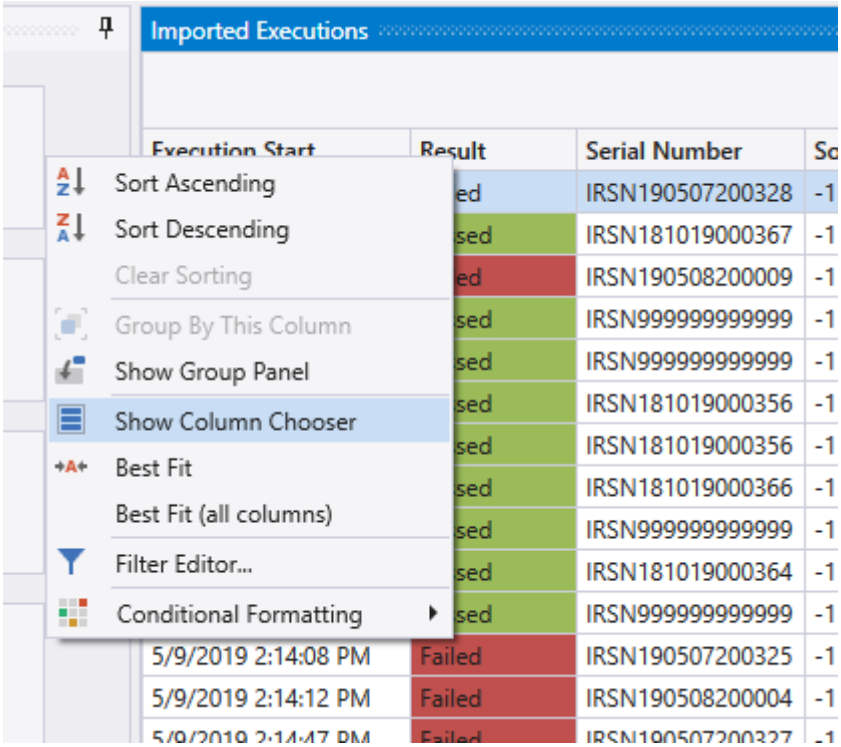


2.4.2. Visible columns

 © IRS Systementwicklung GmbH

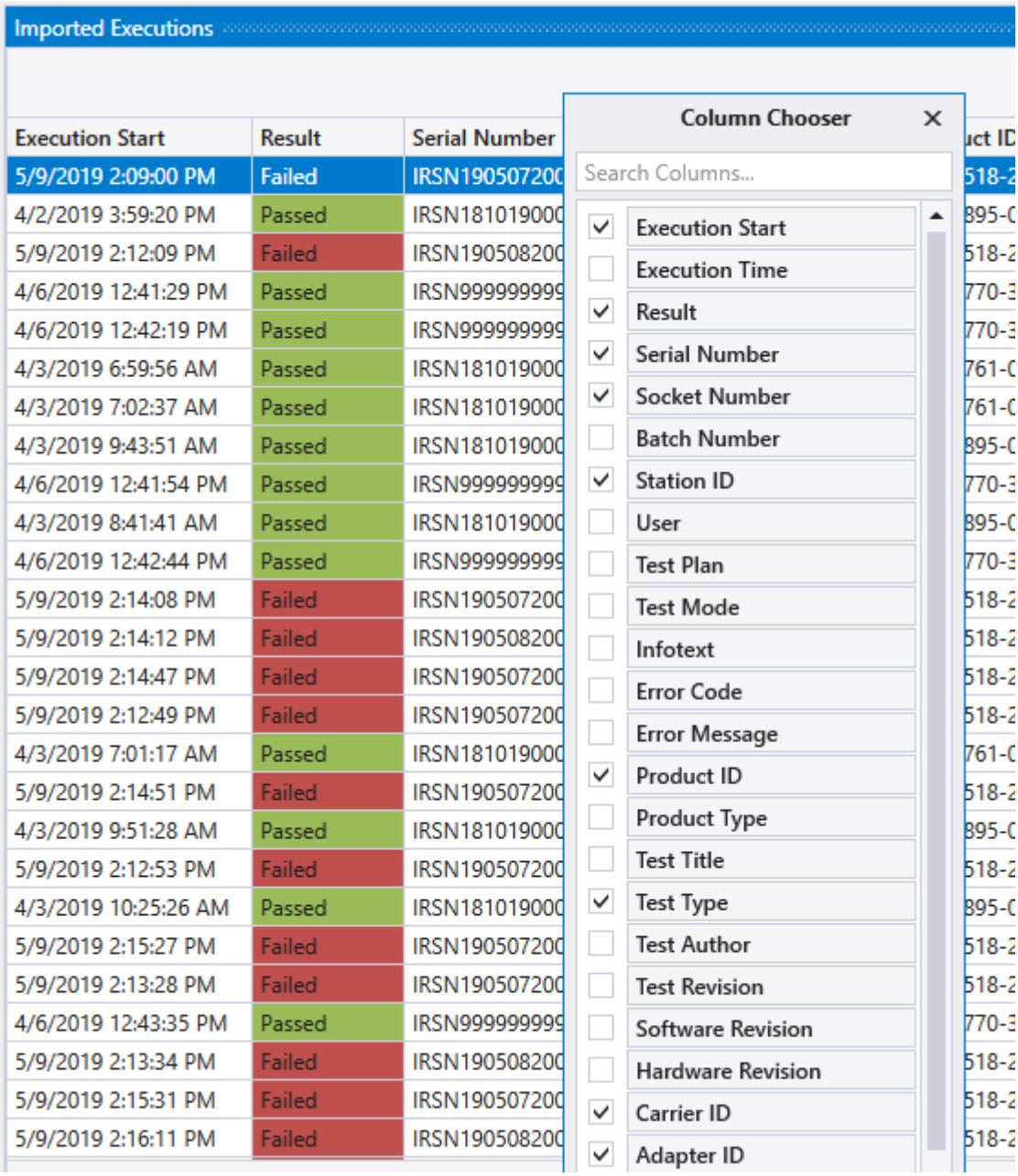
In most tables, only some of the available columns are displayed. Additional columns can be shown or hidden user-specifically.

By right-clicking on the table header line and selecting the **Show Column Chooser** entry, a dialog opens in which the columns to be displayed can be selected.



This allows the active columns to be set by checkboxes and their order by drag & drop. This mechanism is basically valid for all tables available in the program

 © IRS Systementwicklung GmbH



2.4.3. Sorting by columns

By left-clicking on the header of a column, the table is sorted in ascending or descending order by the selected column. A triangle symbol indicates the sorting direction.

2.4.4. Filtering the columns

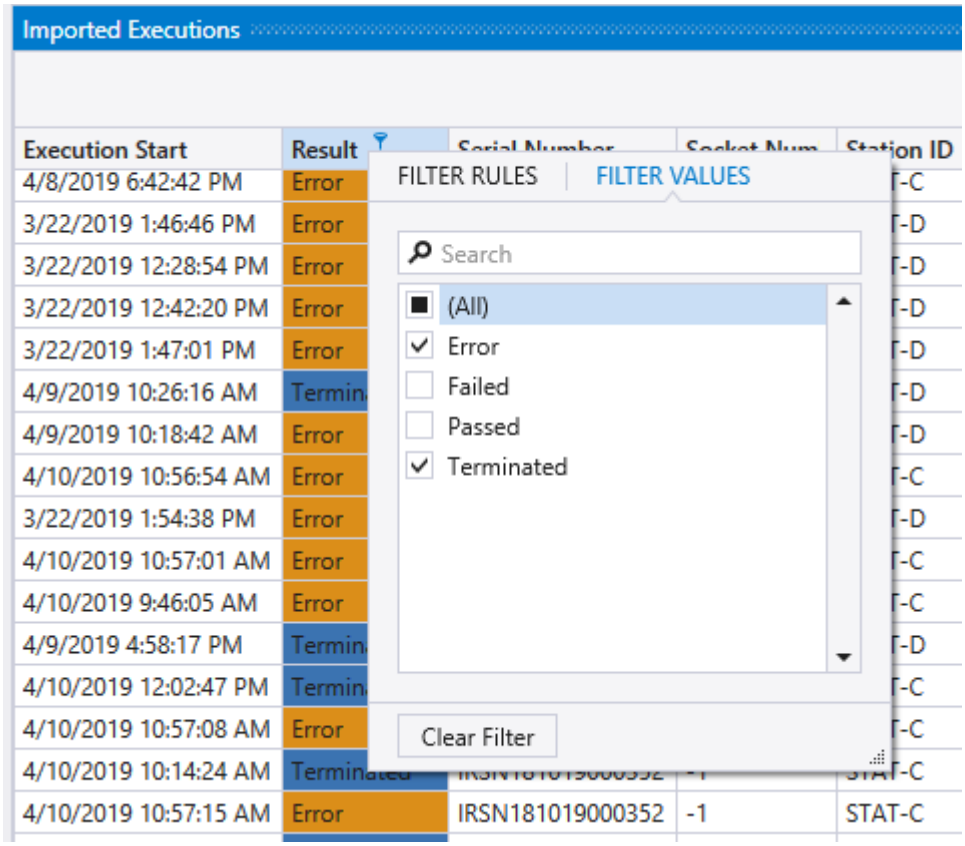
For large tables or data sets, individual rows can be filtered user-specifically. This function is especially useful for preselecting and defining groups

The tables can be filtered in three different ways:

1. by values (single column)
2. by rules (single column)
3. filter editor (several columns)

 © IRS Systementwicklung GmbH

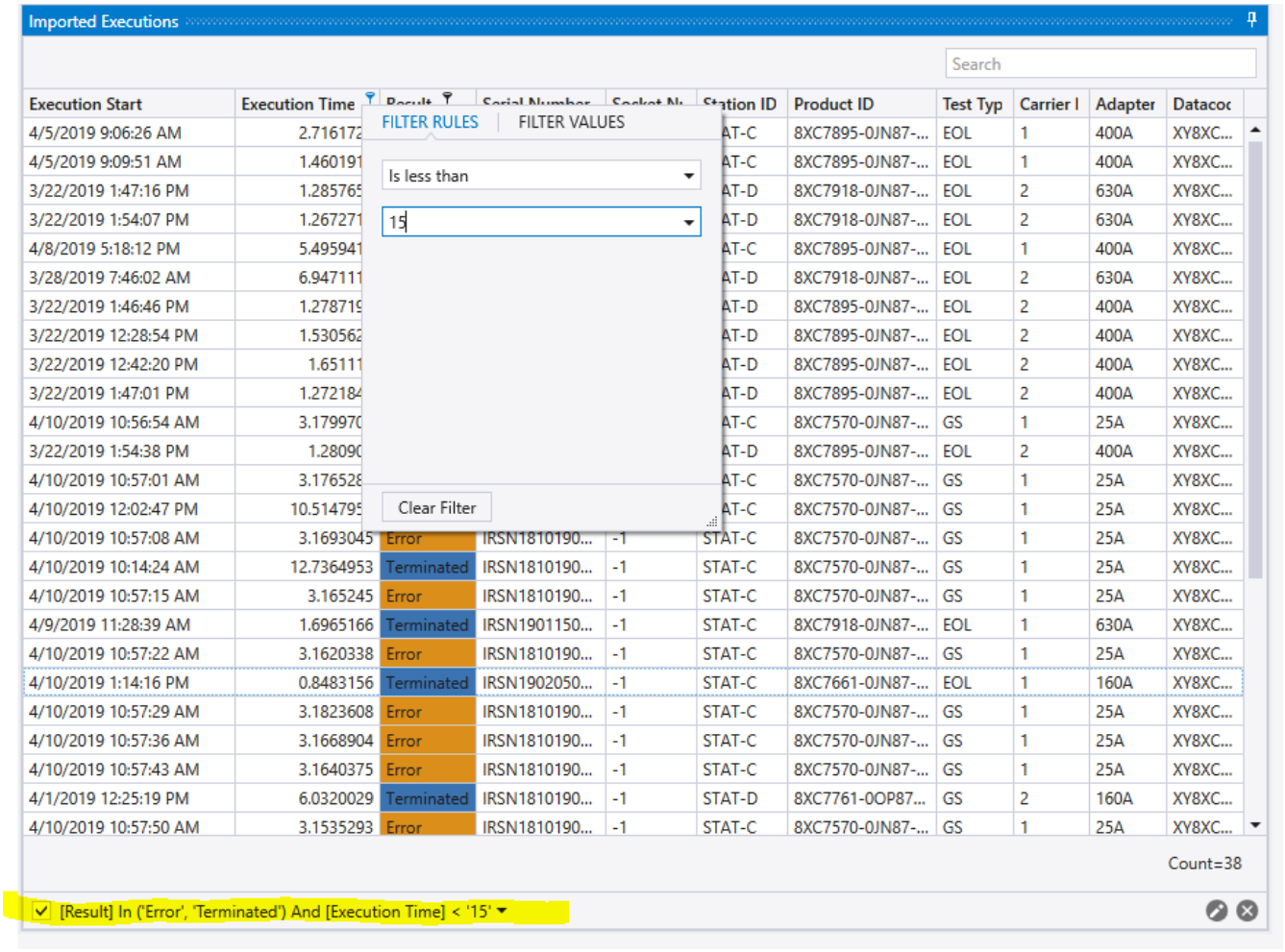
2.4.4.1. Filter by values (single column)



If you move the mouse over a column header, the filter symbol appears. Left-clicking on it opens a menu with an active tab **Filter Values**, which lists all possible values of this column. The user can now select the desired values by clicking into the checkbox. The search function in the upper part of the window can be used to narrow down the selection. The functionality is similar to that in Microsoft Excel.

2.4.4.2. Filter by rules (single column)

© IRS Systementwicklung GmbH

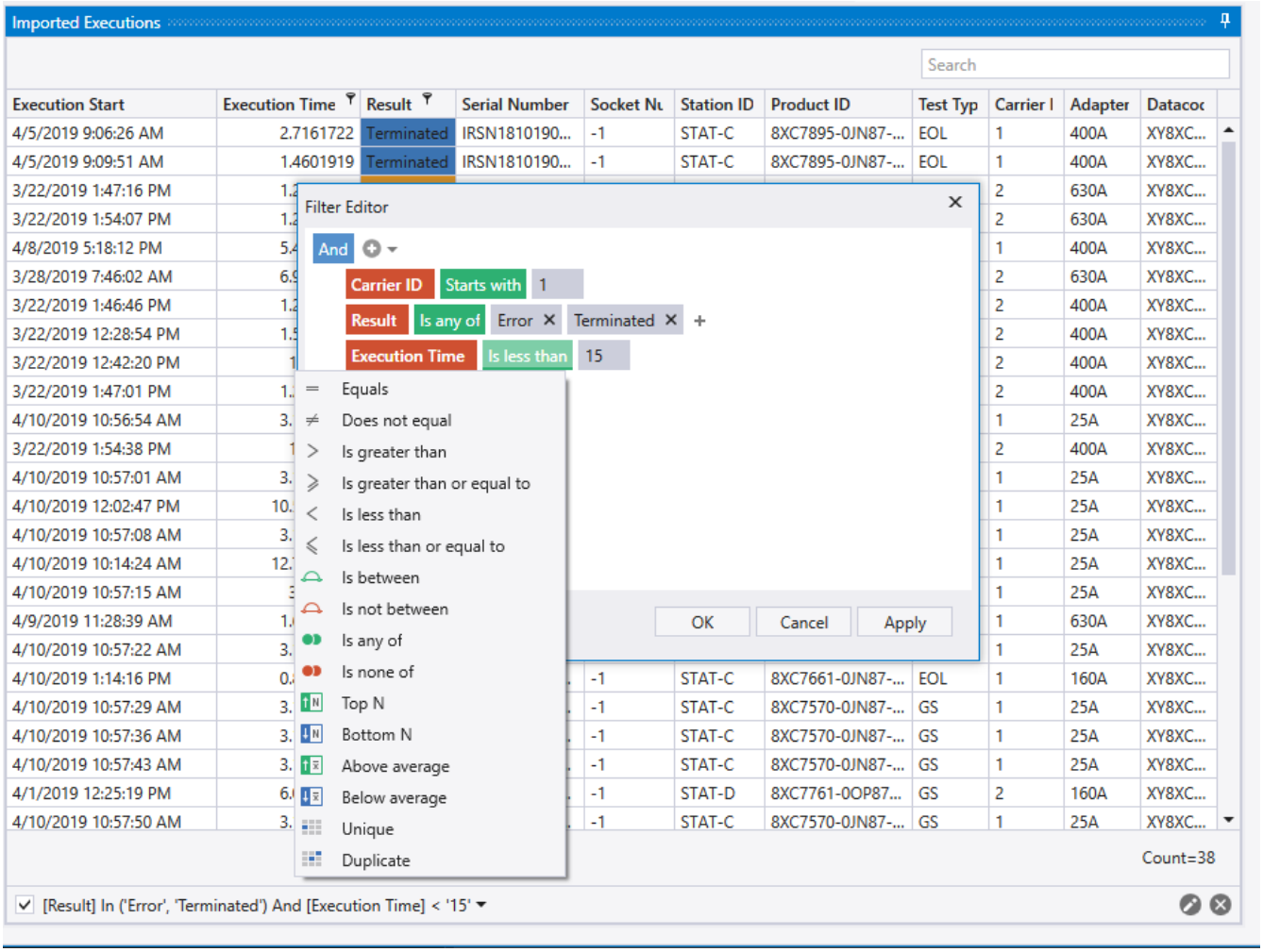


If you move the mouse over a column header, the filter symbol appears. Clicking on it opens a menu in which you have to switch to the left tab **Filter Rules**. In this tab you can set a rule for filtering the column.

2.4.4.3. Filter Editor (multiple columns)

The Filter Editor can be used to create extensive filter expressions. It is opened by right-clicking on the table header line and selecting the **Filter Editor**.

 © IRS Systementwicklung GmbH



With the help of the filter editor several filter operations can be created and linked by boolean operations.

> *Note: If a filter is active, the filter expression is displayed in the footer of the table. By clicking on the pencil symbol, it can be edited. The filter is removed by clicking on the X.*

2.4.5. Conditional formatting

Similar to the conditional formatting in Excel, cells of a table can be specially displayed according to certain rules. For example, cells can be colored or bars or symbols can be displayed. The dialog for configuring conditional formatting can be accessed by right-clicking on the header of a column and selecting the **Conditional Formatting** option.

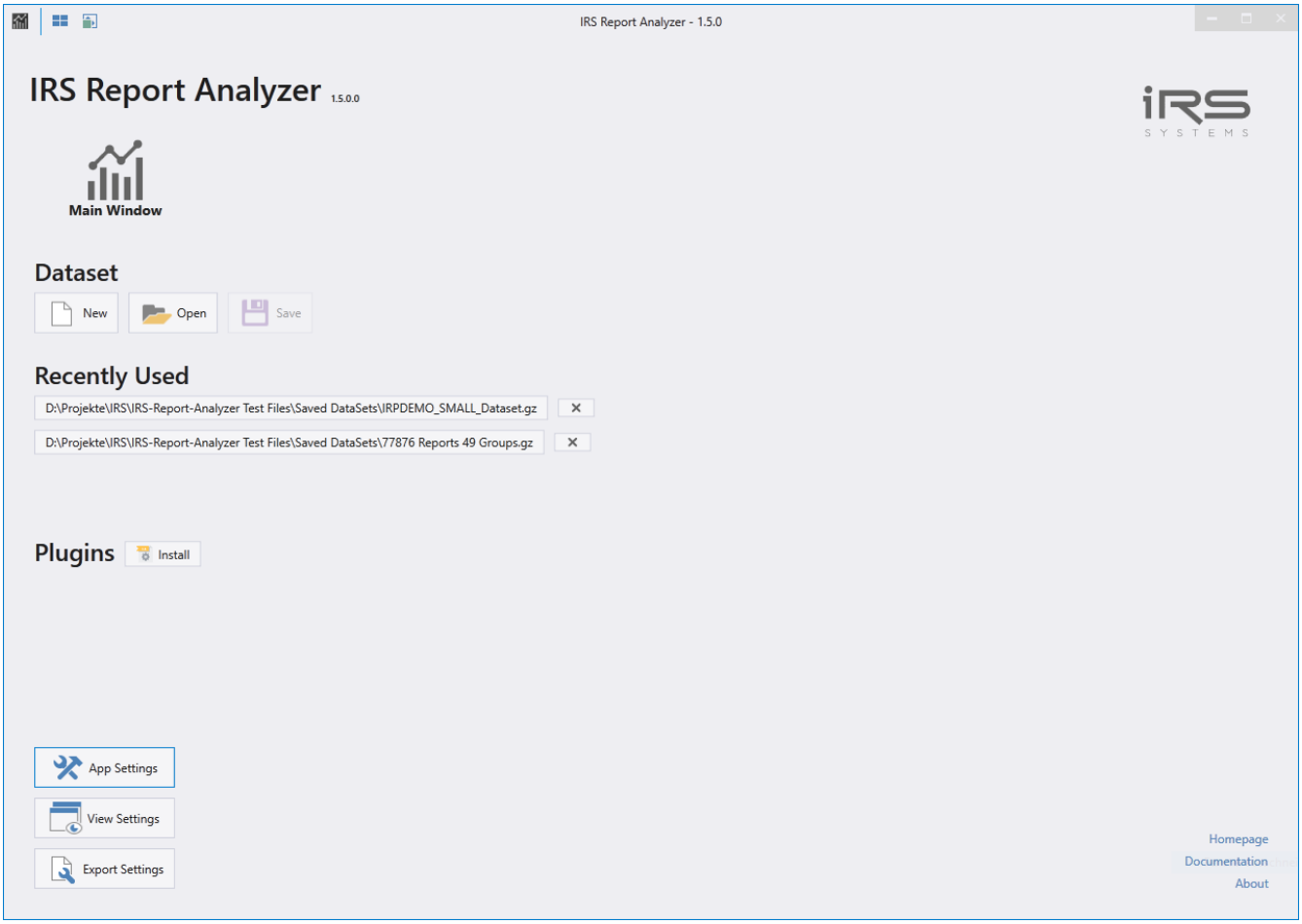
> *Note: The adjustments described in this chapter which are made to display the tables are saved when the program is closed. When the Report Analyzer is restarted, these settings are applied automatically. Under certain circumstances it can happen that records are not displayed because of the filter settings, because a filter is active.*

 © IRS Systementwicklung GmbH

 © IRS Systementwicklung GmbH

2.5. Home screen

The following figure shows the user interface of the Report Analyzer.



The following actions can be performed on the start screen:

- Change to main screen
- Load data record
- Save record
- Change application settings (see App Settings
- Change display settings (see View Settings)
- Change export settings (see Export Settings)
- Contact support

The start page offers the following information and setting options:

- Application version number
- used license key
- Link to this documentation
- Link to the releases

2.5.1. Save data set

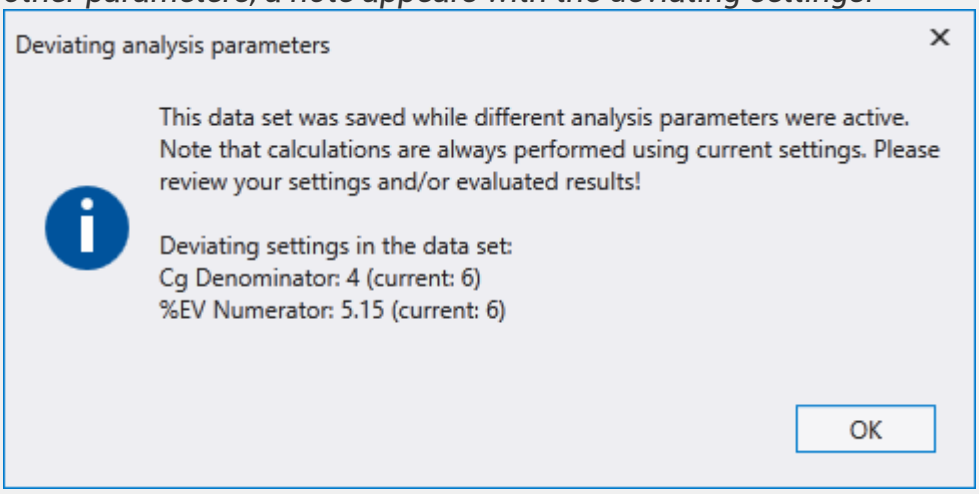
 © IRS Systementwicklung GmbH

With this function all loaded and pre-filtered executions including the defined groups can be stored as a single data set. Changes made like MeasurementFilter are also taken into account. If a data set is needed again and again, this can speed up the work considerably. The originals of the reports are not needed for this. The analysis data and graphs are not part of the data set, these data will be recalculated if necessary.

2.5.2. Load data set

A previously saved data set can be loaded either by clicking the corresponding Open button or by using the list of recent projects.

Note: The current analysis parameters always apply! If the data set was saved using other parameters, a note appears with the deviating settings.



The subsequent calculation is nevertheless performed with the current parameters!

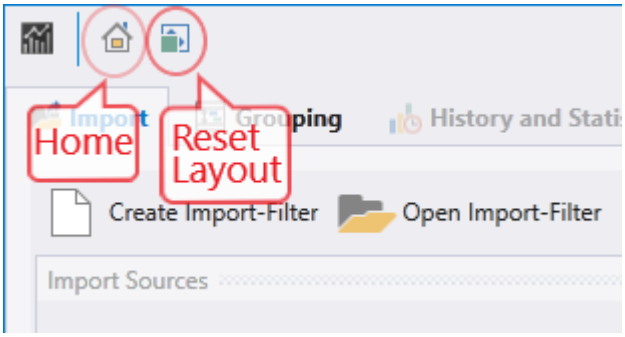
 © IRS Systementwicklung GmbH

2.6. Main screen

The main screen consists of only two areas:

- Tool bar
- Tabs

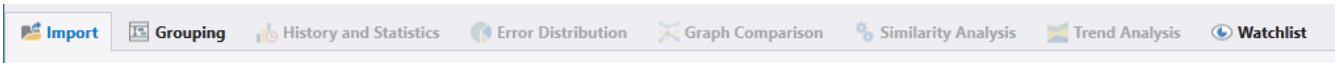
2.6.1. Toolbar



: Click on this icon to switch to the start screen

: Clicking on this icon resets the display and arranges the windows in the default layout

2.6.2. Tabs



Tabs represent certain workflow steps and guide the operator through the program:

- Import
- Grouping

The following tabs are available if import and grouping tasks are completed:

- History and Statistics
- Error Distribution
- Graph Comparison
- Similarity Analysis
- Trend Analysis
- Watchlist

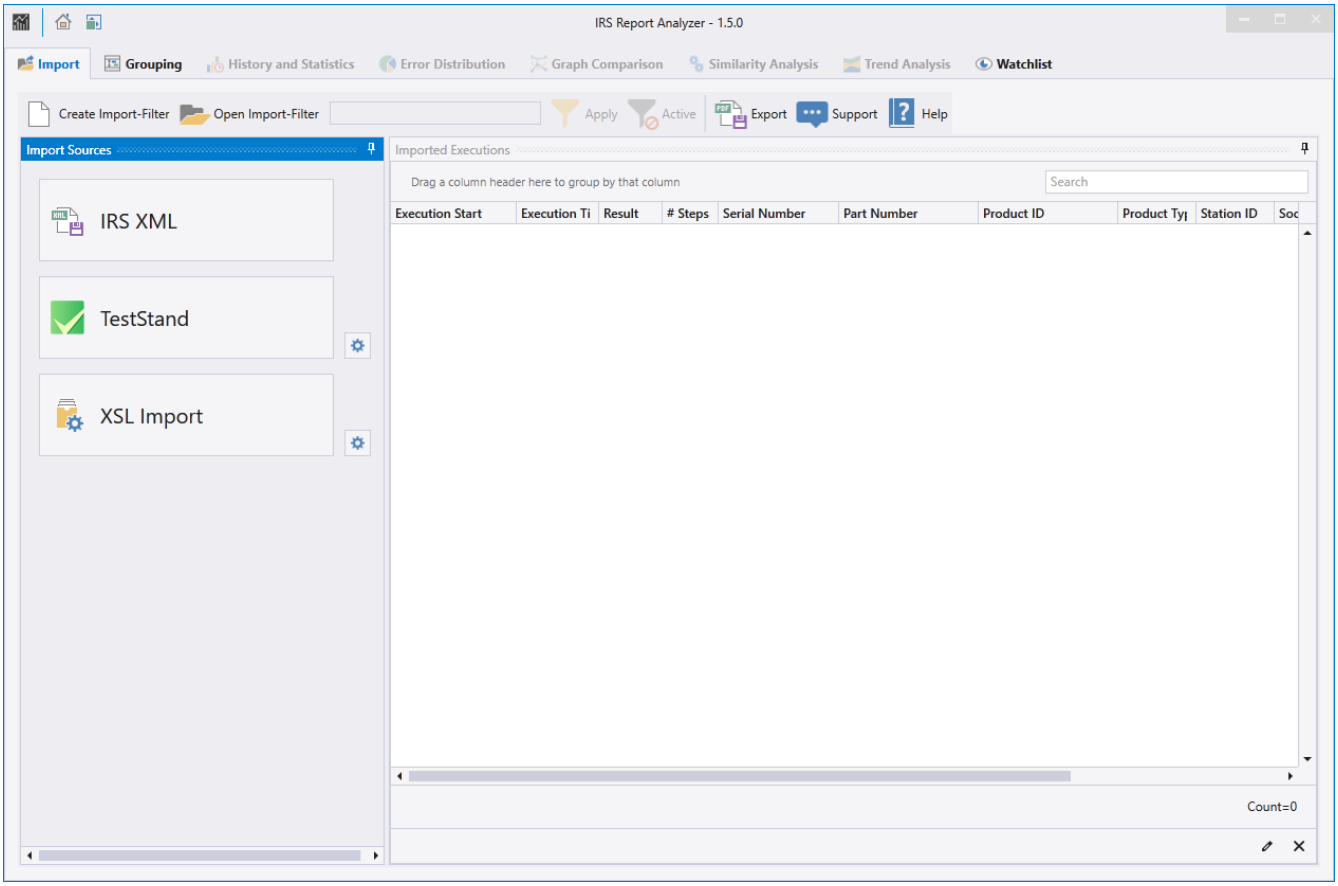
A tab consists of several areas and usually contains its own menu bar. In this menu bar, tab-specific buttons are displayed which the user can use to call up special functions. For example, the display can be changed, the help can be called up or the data export can be started.

 © IRS Systementwicklung GmbH

2.7. Import (Tab)

The import area is displayed by selecting the **Import** tab and consists of three sub-areas:

- Menu bar / Toolbar
- Import sources
- Imported Executions



The Report Analyzer allows the import from different data sources. For each data source type individual plugins are available. Depending on the version, the number of available plugins can vary. Additional plugins can be used for example to import data from CSV files or databases. The imported data is displayed in the **Imported Executions** area.

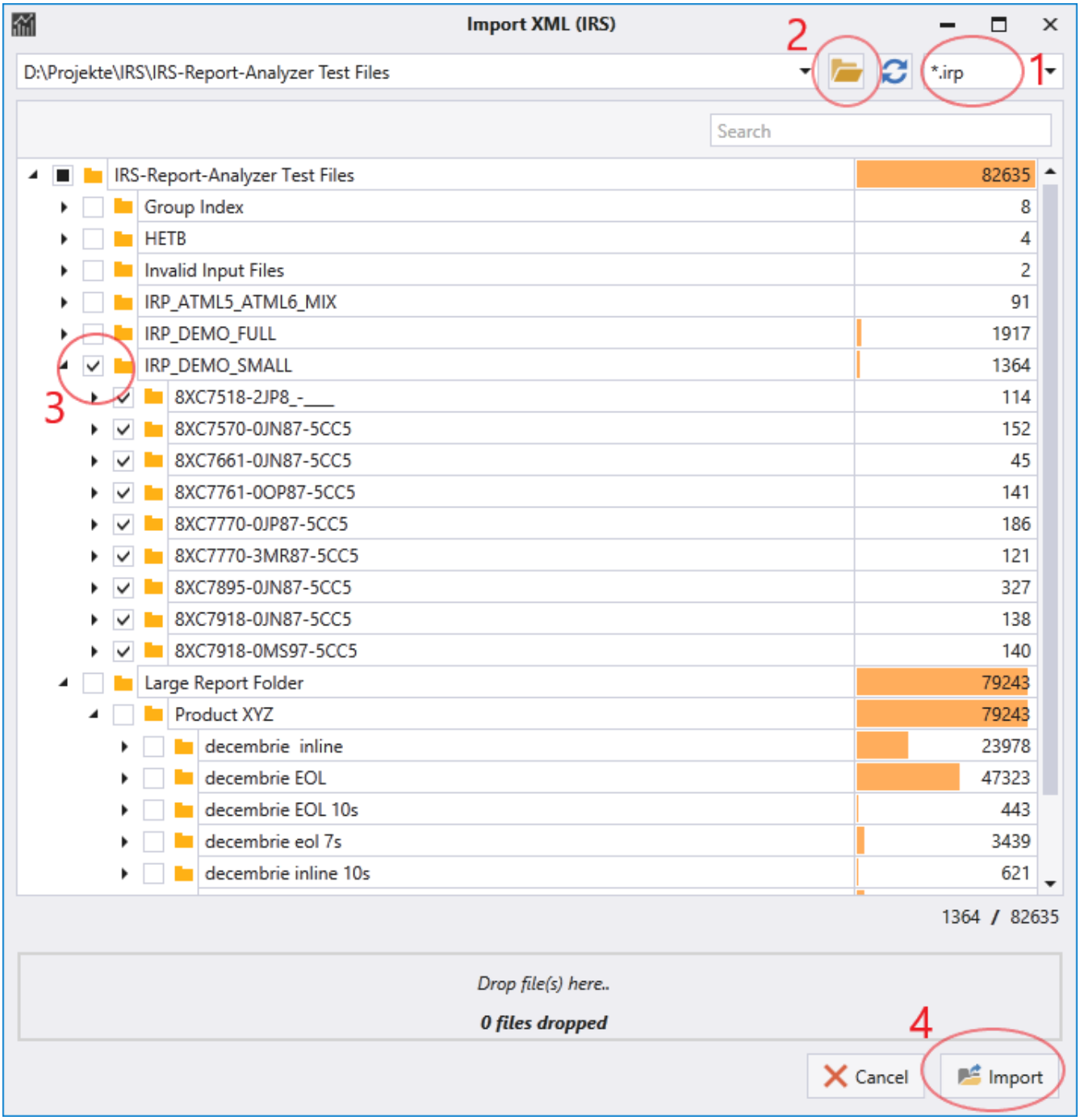
2.7.1. Import Sources (Panel)

All available import plugins are listed here. Each Plugin appears as button and if necessary an additional button for specific settings. By clicking the button the Plugin dialogue is opened, which initiates the respective import process.

All test protocols imported by the plugin are displayed in the list of imported executions.

2.7.1.1. IRS XML Plugin

 © IRS Systementwicklung GmbH



The IRS XML Import Plugin is a file-based import plugin that can load IRS test reports.

> *Note: The IRS report format is also the data model that Report Analyzer works with internally. Since the data does not need to be converted, the import process is usually faster than from foreign formats, also the generated data is smaller and supports compression methods if needed. Ask for the IRS Report Plugin!*

The plugin supports the following files:

- Uncompressed files in IRS format: *.xml, *.irp
- Compressed files in IRS format: *.gz, *.irpz

 © IRS Systementwicklung GmbH

- Appended Reports (multiple executions within one test report)

In the import dialog the files to be imported are selected. A report can contain one or any number of executions. All executions contained in the report file will be imported automatically.

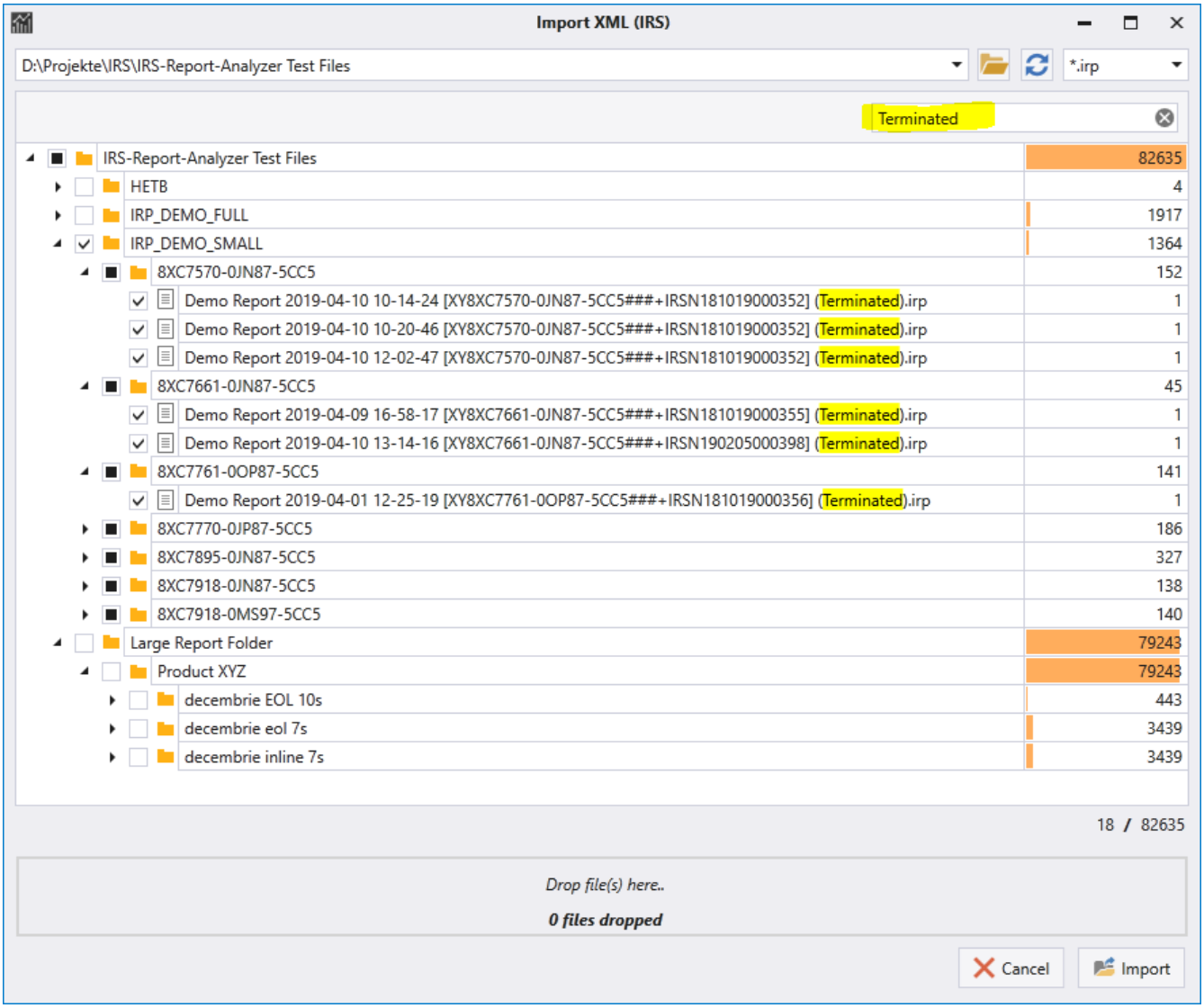
Procedure

1. Select the appropriate file filter (default: *.irp). The selected filter is automatically saved and will be kept until the next change.
2. Select the base path using the Browse button ... or select a path from the dropdown menu of recently selected paths. The Refresh button refreshes the file list in the left pane if necessary and lists all subfolders and files starting from the base path.
3. The files to be imported are selected via the checkboxes in front of the respective folder or file name. You can select complete folders incl. subfolders or single files
4. click on Import to start the import process.

Import with search filter

The dialog offers a search field, which can be used to search within file names. The previous selection of files is retained! When clicking on whole folders in search mode, however, only the displayed files are added or removed.
This is e.g. very helpful to filter only successful (or only failed) tests already during import!

 © IRS Systementwicklung GmbH



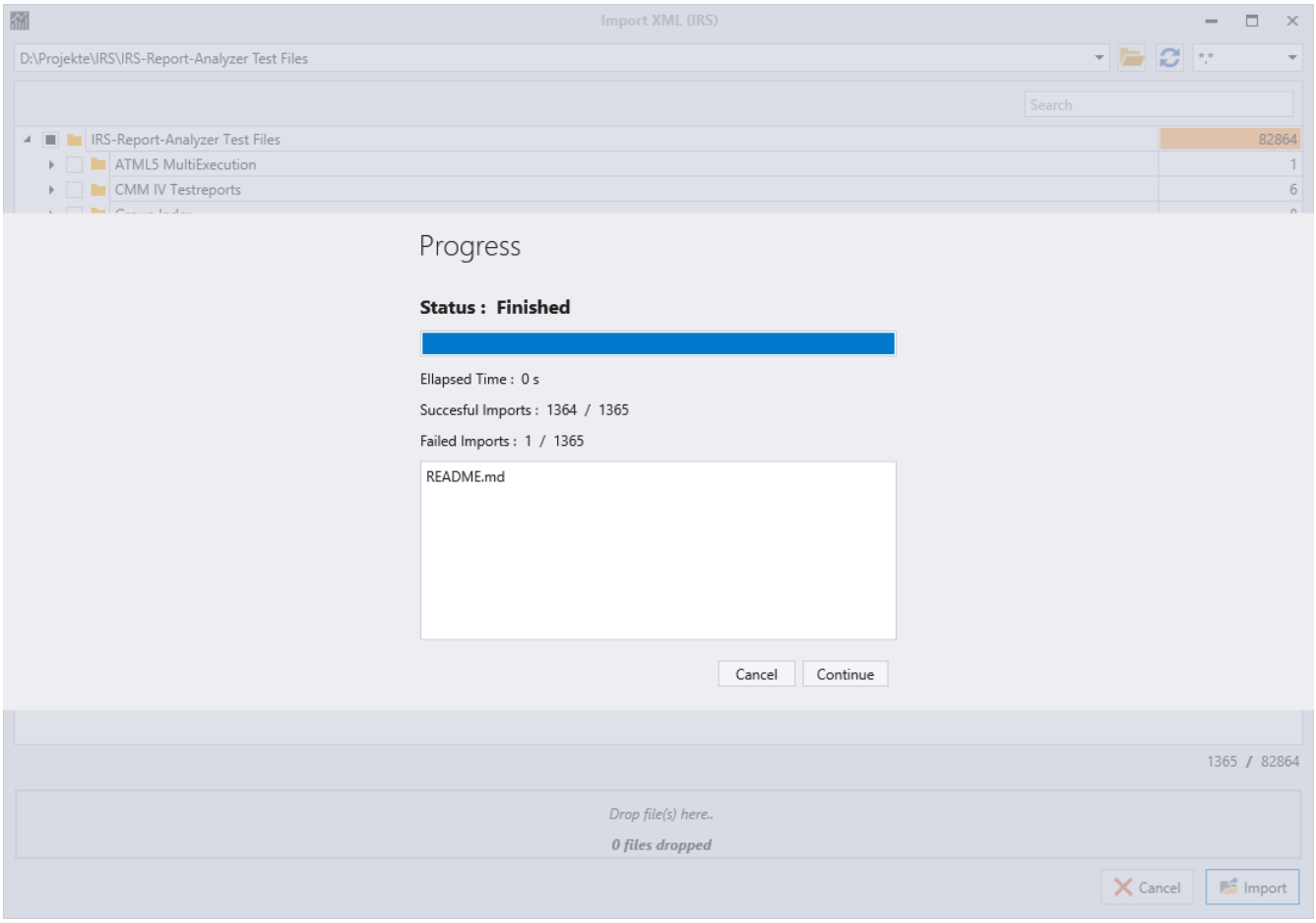
Import via Drag & Drop

At the bottom of the dialog there is a "Drop Area". Drag files or folders to this area to add them automatically to the selection. Attention: Search terms or the current file filter will be ignored! If the selection is successful, the number of detected files will be updated. A list is not displayed.

Starting the import process

By clicking on "Import" an attempt is made to load all selected files.
During the import it is checked if the Execution ID of the report has already been loaded.
In this case the file will be ignored. After the import process is finished, a summary is displayed:

 © IRS Systementwicklung GmbH



After confirmation the dialog closes and the newly imported reports are listed

(see Import-General)

> *Tip: The plugin can be opened and executed multiple times to import data from different sources*

IRS Test Report Structure

For better understanding, the general data structure of an IRS report is shown here, as it is then processed by the Report Analyzer.
However, the Report Analyzer only uses the "Execution" level and below after the import:

- File
  - Report
    - **Execution**
      - Attribute (Meta Data)
      - Attribute
      - TestStep
      - TestStep
        - Attribute (Additional Results)

 © IRS Systementwicklung GmbH

        - TestStep
    - **Execution**
        - Attribute (Meta Data)
        - Attribute
        - TestStep
        - ...
- ...

Execution Properties

An execution contains both defined property fields (Properties) and individually usable attributes. The predefined properties are supported in all tables.
Since version 1.4.23 the grouping page can also be used to filter and group by attributes

Step Properties

Additional attributes for steps are displayed in the Details window and in the report. However, they cannot be used for filtering or grouping.

2.7.1.2. NI TestStand Plugin

Until version 1.4.3, only reports in the native IRS XML format could be used. Therefore the IRS XML TestStand plugin had to be installed to generate this specific format. Even though it still offers advantages for the measurement data analysis due to its compactness, this format is no longer a mandatory requirement!

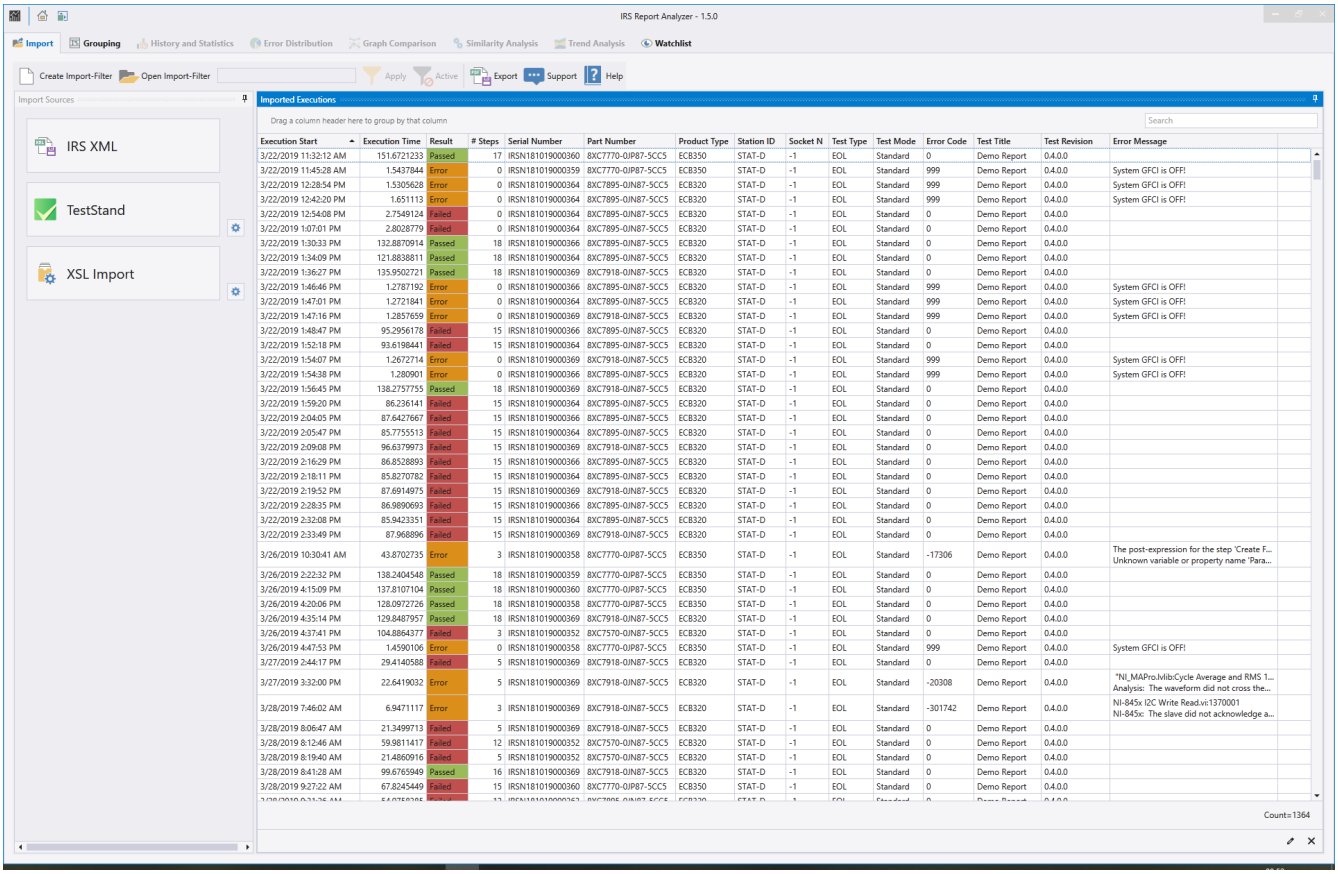
Starting with version 1.5, the new NI TestStand plugin offers the possibility to directly read the standard formats NI XML, ATML5 and ATML6 used by TestStand!

The used format is automatically recognized by the plugin and the corresponding import type (XML / ATML5 / ATML6) is selected. If the file type is known, it can be set explicitly in the plugin settings, which can slightly speed up the import process.

Otherwise the handling does not differ from the IRS XML plugin.

2.7.2. Imported Executions (Panel)

 © IRS Systementwicklung GmbH

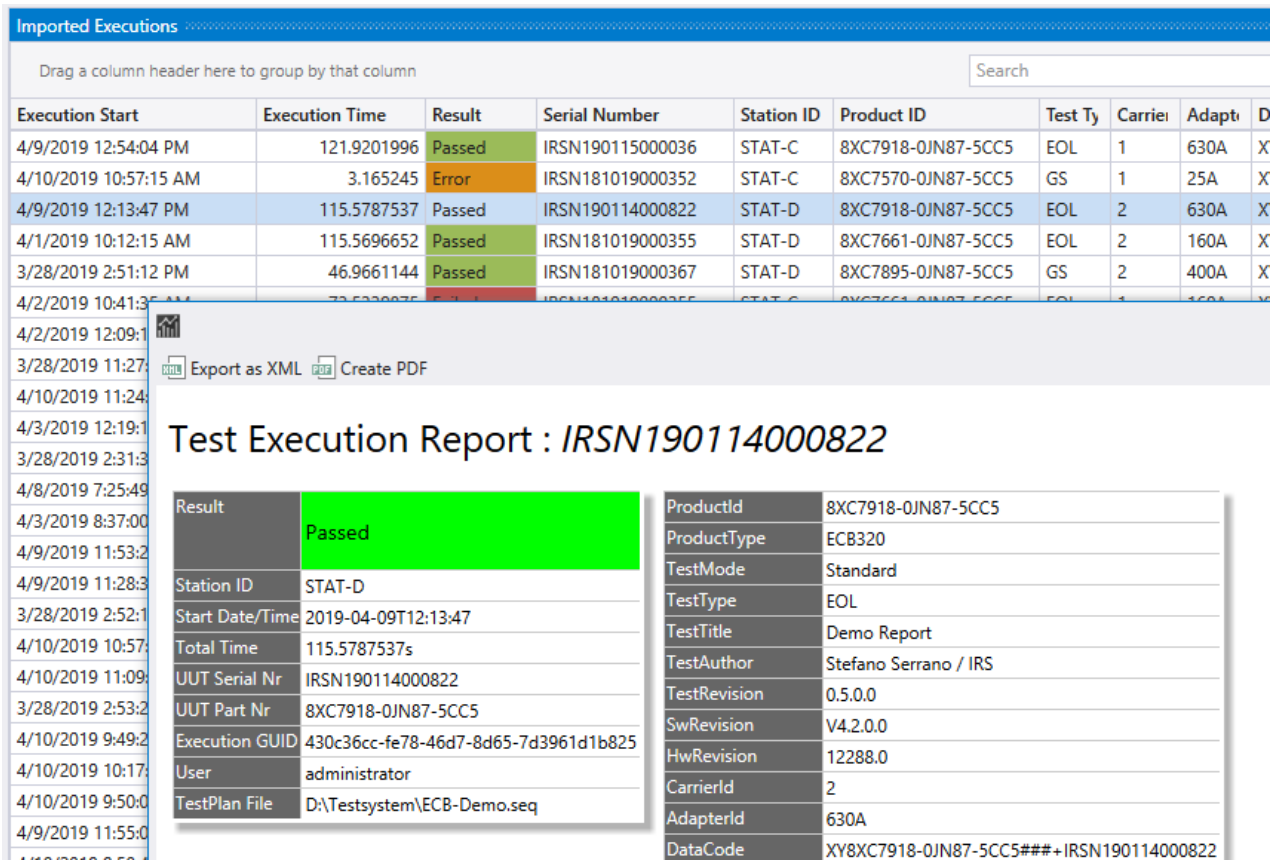


The Imported Executions window displays all the imported executions. The table contains meta information such as the test time, the serial number and the overall result

> *Info: An Execution is a test run and contains all executed test steps. A report can contain several executions.*

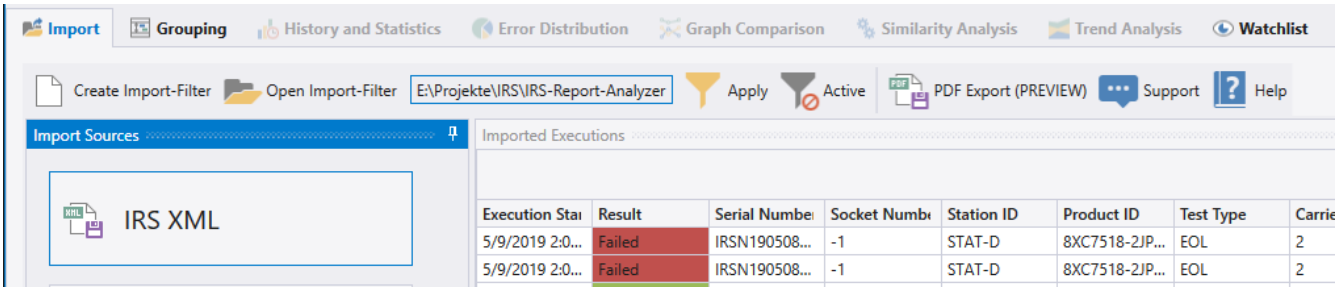
2.7.2.1. Viewing and grouping

- Double-click on an execution to open it in the Report Viewer and view the report. Measurement filters already applied are also taken into account.



- As already described in the section "Filtering", the executions can be filtered by properties. The set of all executions that match the filter criteria remains.
- Executions can be grouped in this view as well. To do so, drag the column header into the grouping area. However, this grouping only serves the current display and has no influence on the later necessary grouping.

2.7.2.2. Menu bar



In the menu bar an import filter can be created, loaded and applied (see Import Filter)

2.7.2.3. Select and delete unwanted executions

It is often useful (e.g. due to aborted tests or during the commissioning phase) to remove certain executions from the data set before the data is analyzed.

- Press CTRL+A followed by DEL to remove all currently visible executions from memory. For example, a filter can be used to display all executions with status "Error" and "Terminated" and then remove them all at once.

- Single or multiple Executions can be removed from the table by left clicking (+ CTRL key for multiple selection) and pressing the DEL key

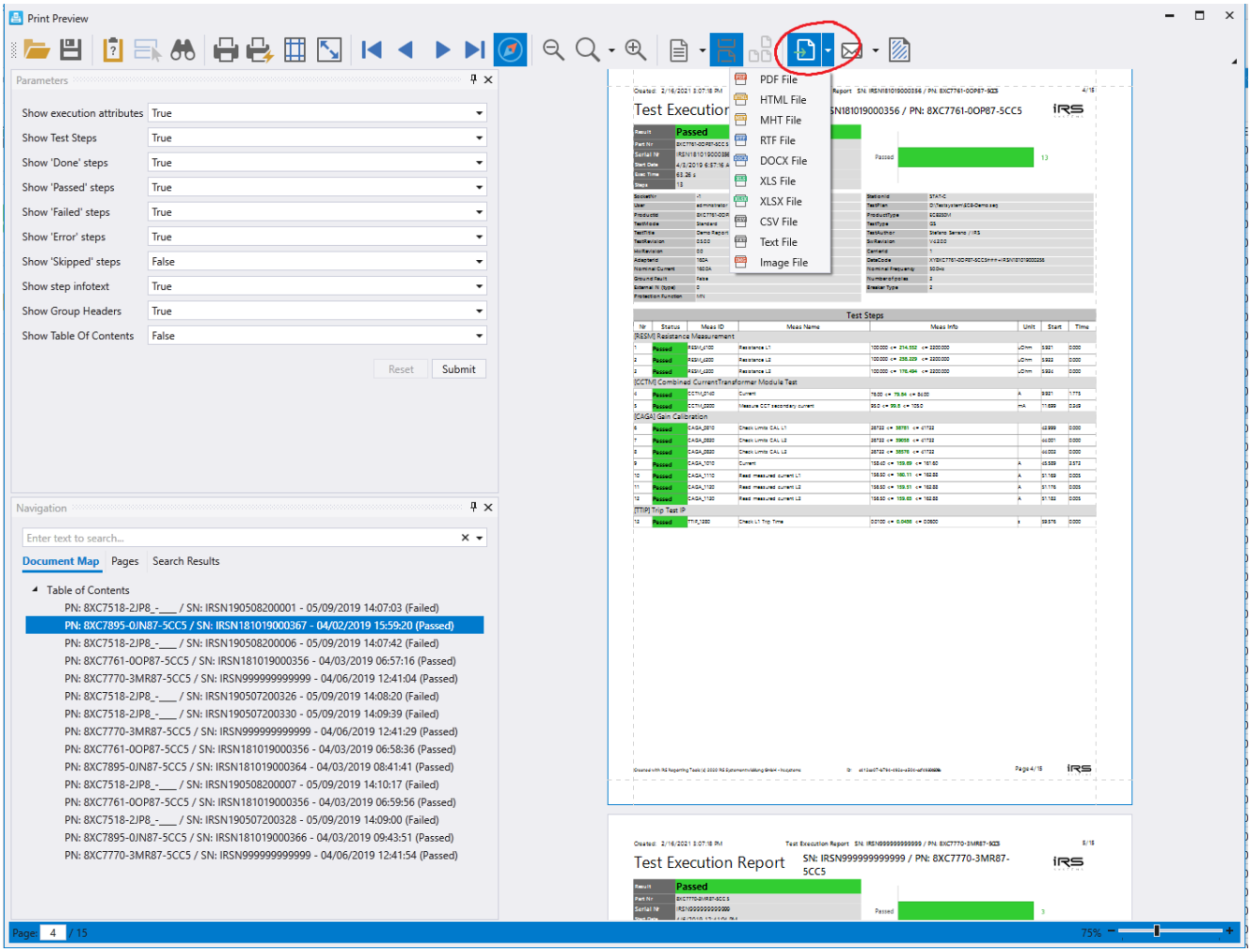
>
>
> *Tip: After the cleanup is complete, all executions can be combined as a data set in a single file. The function "Save record as..." on the start page serves this purpose.*

- It is not possible to load the same execution multiple times. Already loaded executions are recognized by their unique ID and skipped. *Note: When reloading, the existing execution is NOT changed. Steps removed by measurement filters will not come back in this case! To actually reload an execution, it must be removed from the list first!*
- **Changes to the execution list lead to a recalculation of the results. However, already created groups remain as long as they contain at least 1 Execution. It is possible that deleting already created graphs will invalidate them if the measurements used no longer exist afterwards.**
  Therefore groups should be created only after the import process is finished.

2.7.2.4. Export execution reports

To create an overall report for multiple test executions, select the desired rows and press "Export". A dialog will open with various options to show/hide specific content components. Configure the desired view and select the desired export format using the "Export" drop-down button:

 © IRS Systementwicklung GmbH



2.7.3. Import Tips

- *The import process can be repeated as often as you like. Thus the data set can be composed of several sources. For example, it can be composed of files that are imported from different folders or drives. It is also possible to assemble the data set from different sources, e.g. a combination of files and database entries.*
  *Complex data sets from different sources can be exported and later reloaded with the function **Save data set**. This saves you from having to make another time-consuming data selection.*
- *Existing data sets can be continuously extended by importing additional executions and can be used for a long-term evaluation, for example. After adding the new executions, the data set can be saved again.*

2.7.4. Custom plugins

To integrate a custom plugin into the software, it must be placed in the subfolder 'Plugins' in the installation directory. After a restart it will be recognized automatically.

2.7.5. Import filter

When importing data into the Report Analyzer, all test steps of an execution are imported by default. During subsequent analysis, each imported test step is analyzed.
Since the executions often contain considerably more steps than are of interest for the analysis, the executions can be reduced to the relevant test steps by so-called import filters.

The import filter is a list of measurement IDs. All steps whose measurement ID is found in the list are kept, the rest is discarded. The filter can be applied later to the loaded list above already during the loading process.

Tip: The Import Filter is a simple text file. If necessary, it can be edited with any text editor or Excel. One Measurement ID is defined per line.

Advantages:

- The clarity is improved, irrelevant measurement steps are removed from the lists
- The processing speed for a large number of executions is increased
- Memory requirements are reduced (both in RAM and when saving data sets)

Downside:

- Accidentally removed steps can only be retrieved by removing the execution from the list and then re-importing
- The status of the execution is maintained. This can lead to inconsistent displays and interpretation problems, e.g. if the filter has removed all erroneous steps, but the overall result is still "Failed" or "Error".

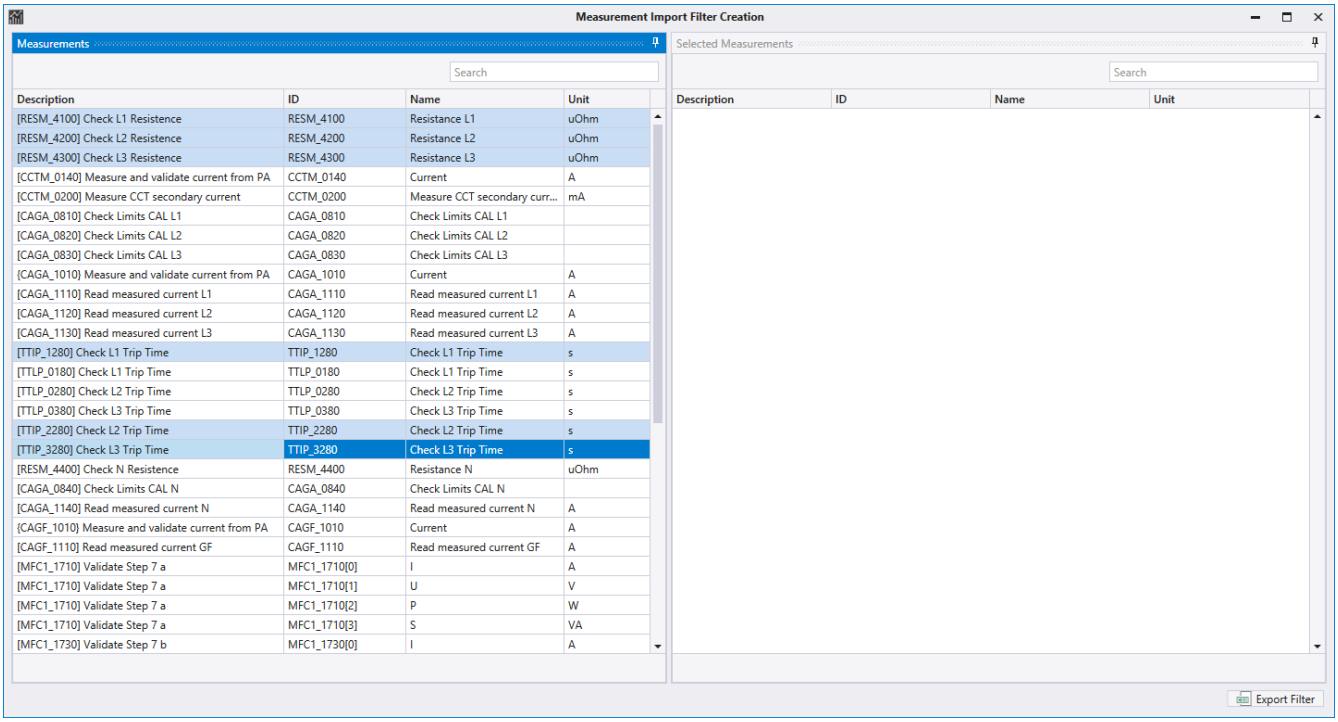
A test step is always identified by its unique **Measurement ID**.

2.7.5.1. Create Import Filter

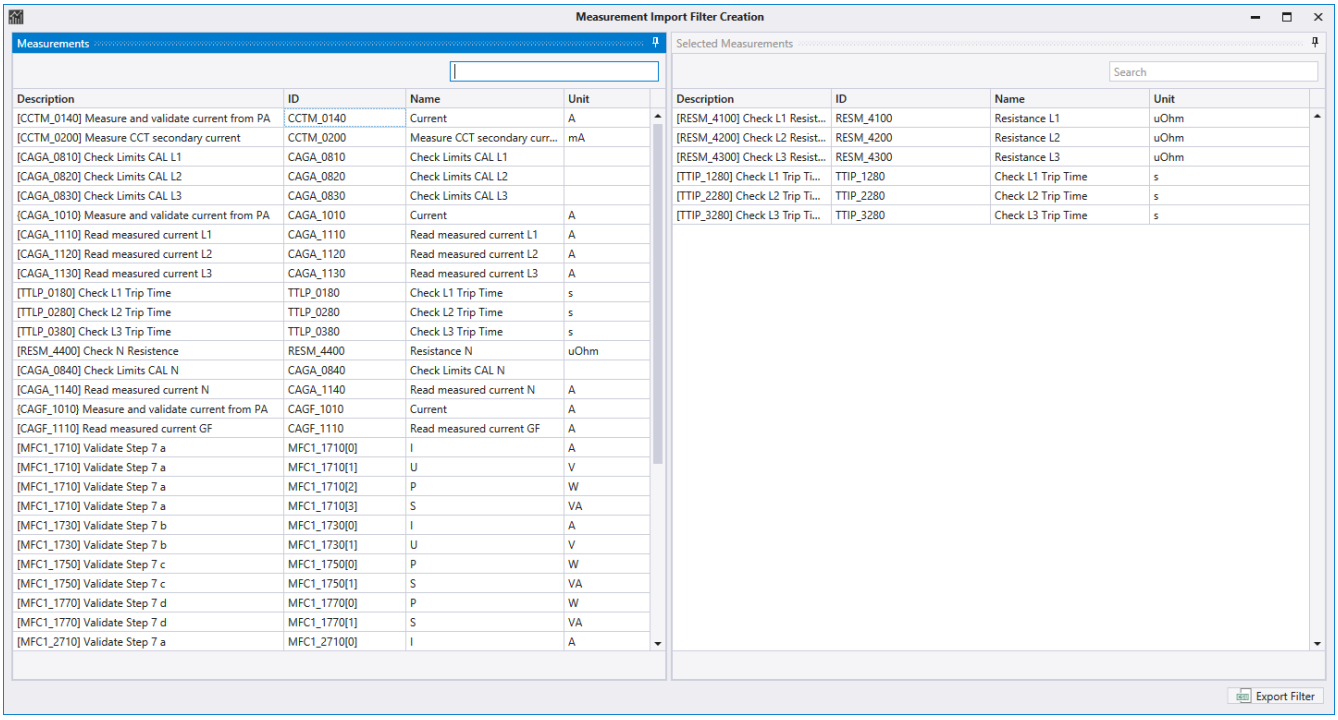
To create the import filter, select the **Create Import-Filter** button in the Import tab of the menu bar.

Note: The Create Import Filter dialog offers all known test steps. This assumes that data has already been imported

 © IRS Systementwicklung GmbH

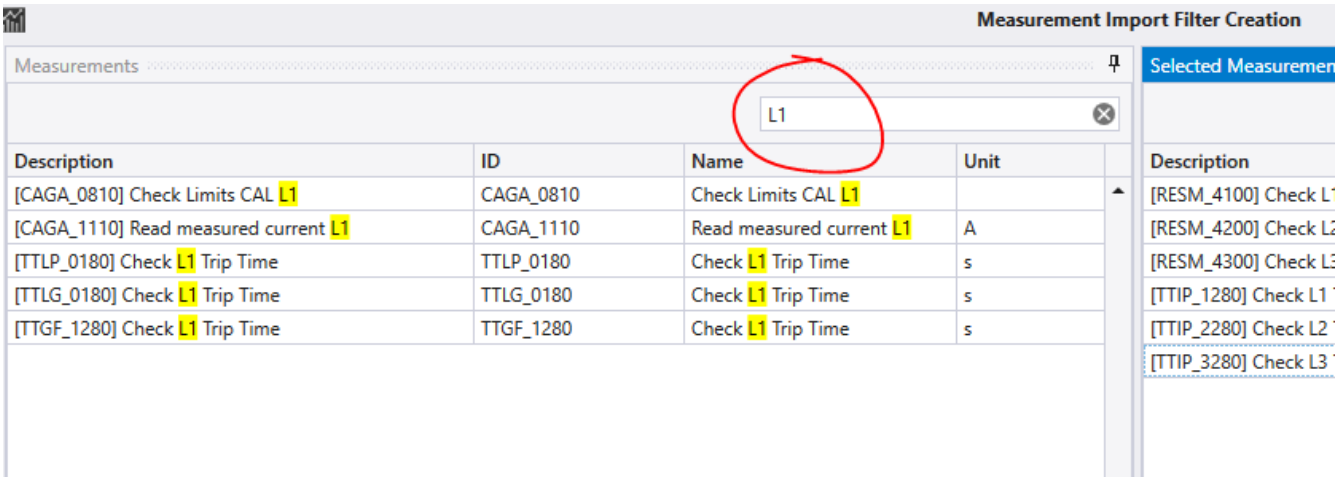


All available test steps are displayed on the left side of the window. By dragging and dropping, all test steps to be included in the filter are dragged to the right side of the window.



Using the input field, the list of test steps can be restricted to the search term entered:

 © IRS Systementwicklung GmbH



After all test steps have been selected, the filter is saved by clicking the Export Filter button and the dialog can be closed.

2.7.5.2. Load import filter

The Open Import Filter button loads the import filter (but not yet applied). There are now two ways to use the filter:

2.7.5.3. Apply filter once

The previously loaded filter is applied by the **Apply** button. The program processes all previously imported executions and discards all test steps that are not listed in the import filter. Depending on the number of loaded executions this process can take some time. With this method the test executions are first loaded completely into memory and then the unneeded test steps are removed.

2.7.5.4. Apply filter during import

If the filter criteria are already known and the filter already exists, filtering can take place during the import process. For this purpose the button **Active** is selected before the import. Now the filter function is activated and when importing new executions the loaded filter is used.
This filter method is recommended when importing large data sets where not all test steps are required but a large number of executions must be processed, e.g. for trend analysis. The working memory is already released during the import process.

> *Tip: With a double click on an Execution, the Report Viewer is opened. After applying the filter, only the test steps that were listed in the Import Filter are contained there.*

 © IRS Systementwicklung GmbH

> *Tip: The overall result of the Report is not changed. For example, if "Failed" test steps were removed from the report and only "Passed" steps are contained, the overall result will still be "Failed".*

 © IRS Systementwicklung GmbH

2.8. Grouping (Tab)

In the tab **Grouping** the loaded data set can be filtered and grouped according to properties of the executions. The groups formed here are the basis for further analysis.

Groups are a central topic in the Report Analyzer. They are used to compare data sets according to arbitrarily defined criteria. These can be different product types, but also different users or characteristics of the test item or the test environment. In MSA analysis, groups are given additional significance in certain cases.

The prerequisite for this is that there is also data that allows grouping. Please refer to the section on optimizing report data (adding header information)!

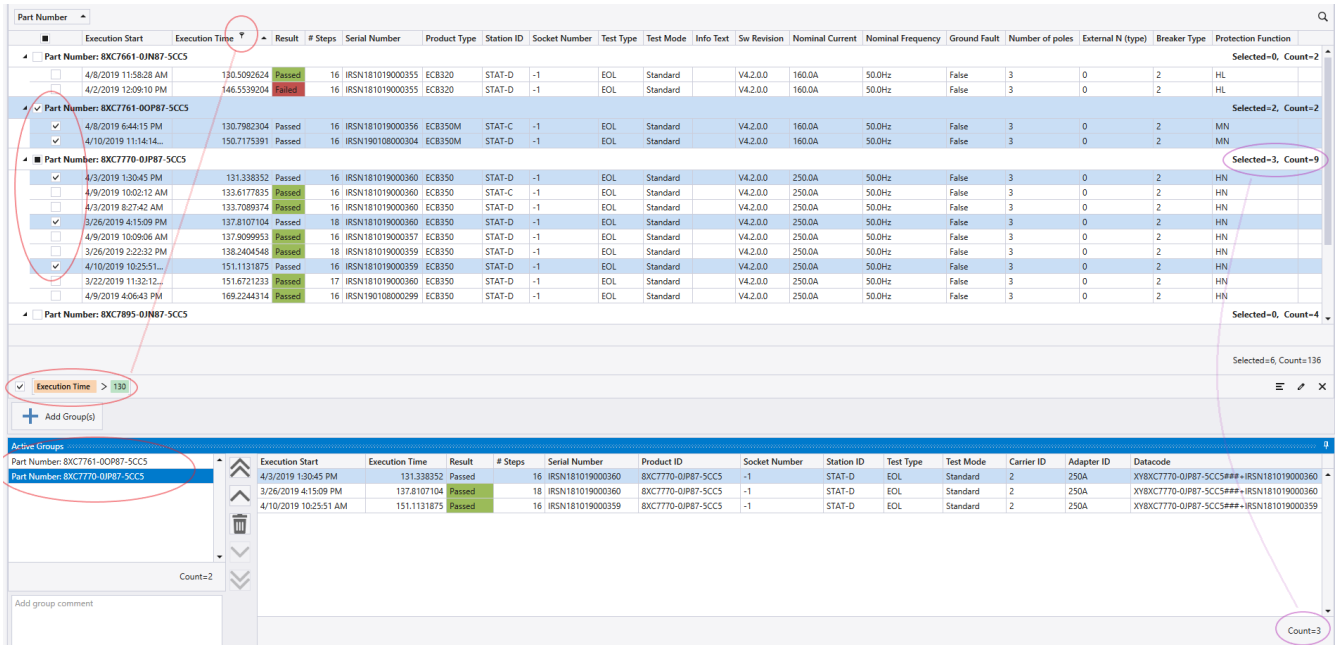
For all created groups, a statistical analysis is performed for each measurement. Some analysis tools allow to compare the results of the groups.

- *Even if you have not defined any special properties, there are still many standard fields that support grouping and filtering (e.g. SeriesNr, BatchNr, SocketNr, TestPlan, StationId, Execution Time, and many more). However, we strongly recommend that you add additional fields to the test sequence to allow for more targeted filtering. The Report Analyzer can also group by self-assigned properties! (see examples "Nominal Current", "Nominal Frequency", "Number of Poles", etc.).*
- *Even if no structuring of the data set is desired, at least one group must still be created so that the program can perform the analyses. In this case, simply click **Add Group(s)** without filtering to create a default group.*

The figure below shows the layout of the Grouping Tab. This consists of three sections:

- **Upper half**: Overview of all available Executions, either as a flat list or in groups, depending on how they are arranged. Here you can select the executions that should be created as new group(s).
- **Bottom left**: Overview of all already created groups (*Active Groups*). These can be moved, renamed or deleted. A subsequent addition of executions is not possible.
- **Bottom right**: Overview of all executions of the group selected on the left. If necessary, executions can be deleted here. Results will be recalculated.

 © IRS Systementwicklung GmbH



Procedure

1. The upper view is configured using grouping (*drag a column header in the grouping area above the table header*) or filtering as desired
2. via the **Add Group(s)** button all groups or executions selected via checkbox will be added as new group(s). If nothing is selected, all currently visible executions and groups will be added.
3. In the list of active groups, the group name can be adjusted (F2) and the order can be changed. In the order defined here, the analyses will later be executed, displayed and structured in the export. The order can also be changed later. The selected groups are removed via the "Trash" button after confirmation.
4. A (re)calculation of the analysis is started automatically when leaving the grouping page.

2.8.1. General rules & tips for groups

- Simplified group naming can be activated in the application settings. In this case, only the values without the column names are used as groups.
  (e.g. instead of "ProductId: xyz" only "xyz").
- Groups can be added or deleted later. The analysis and graphs will then be recalculated. If the corresponding group is no longer available, it will be removed from the graph.
- Individual executions can be selectively deleted from already created groups. When leaving the grouping page, a new analysis will be started.
- Not all executions have to be assigned to a group.
- Only executions in groups are analyzed.

 © IRS Systementwicklung GmbH

- An execution can also be assigned to several groups and will then be considered in both groups during the analysis.
- The button Assignments can be used to display which executions are not assigned to any or several groups (see Manage groups).

>
>
> *Attention*
> *When the program is closed, all filter settings are saved and automatically applied when the program is restarted. If you have set a filter when creating the group, when loading the next dataset it may happen that all executions over the filter are hidden. If you remove the filter, the data will be visible again.*

2.8.2. Grouping via filter

Here, the groups are formed individually via the filter settings. The filter is set as required (see chapter Filtering) and the visible executions are added as a group.
The process is repeated until all desired groups are present.

This procedure is recommended for the following scenarios:

- No grouping necessary (corresponds to the creation of exactly one group).
- Grouping by time ranges
- Complex groupings that cannot be realized via automated grouping

Procedure

1. the executions are filtered so that only the required entries are visible Only these entries are included in the group
2. click on **Add Group(s)** to create a group with a default name (e.g. Group_0)
3. with F2 the group can be renamed
4. steps 1-3 can be repeated as often as you like to create multiple groups

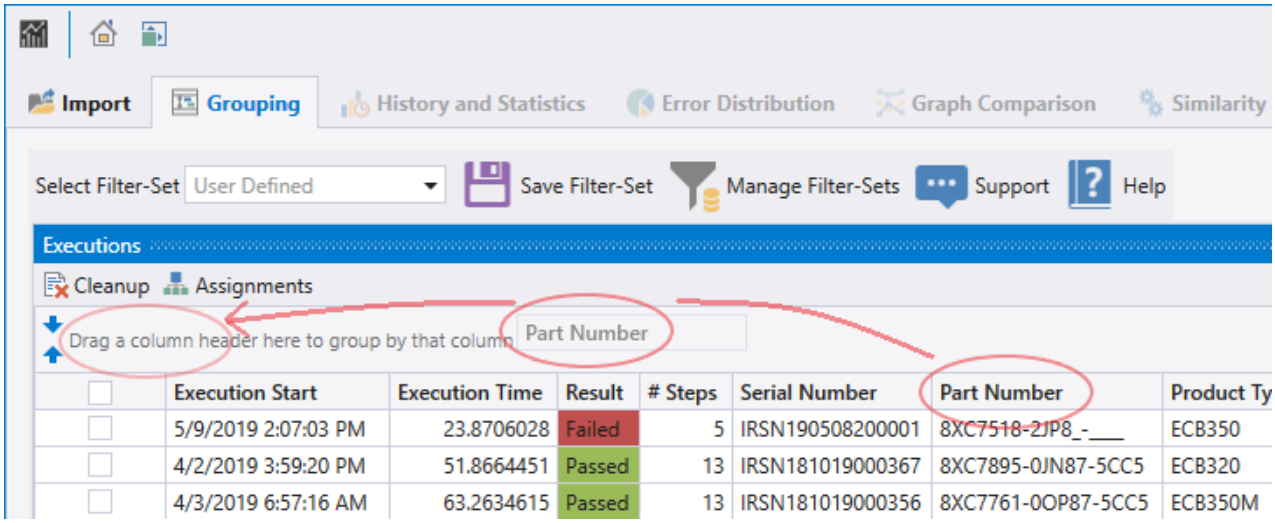
2.8.3. Grouping by columns

The fastest way to structure the data set is to use automated grouping. To do this, simply drag the column header to be grouped into the grouping area above the table header.

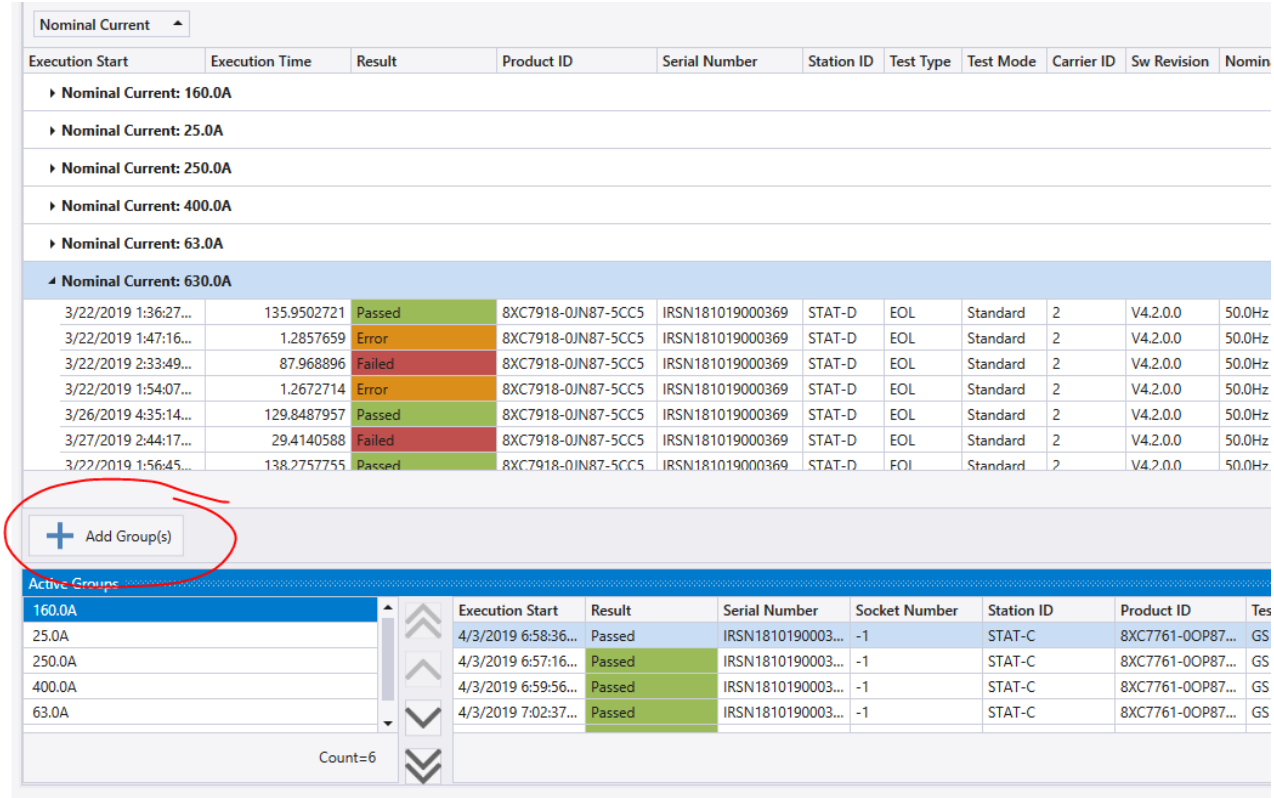
Procedure

1. Drag and drop the desired column header into the empty area above the table ("Drag a column header here to group by that column.")

 © IRS Systementwicklung GmbH



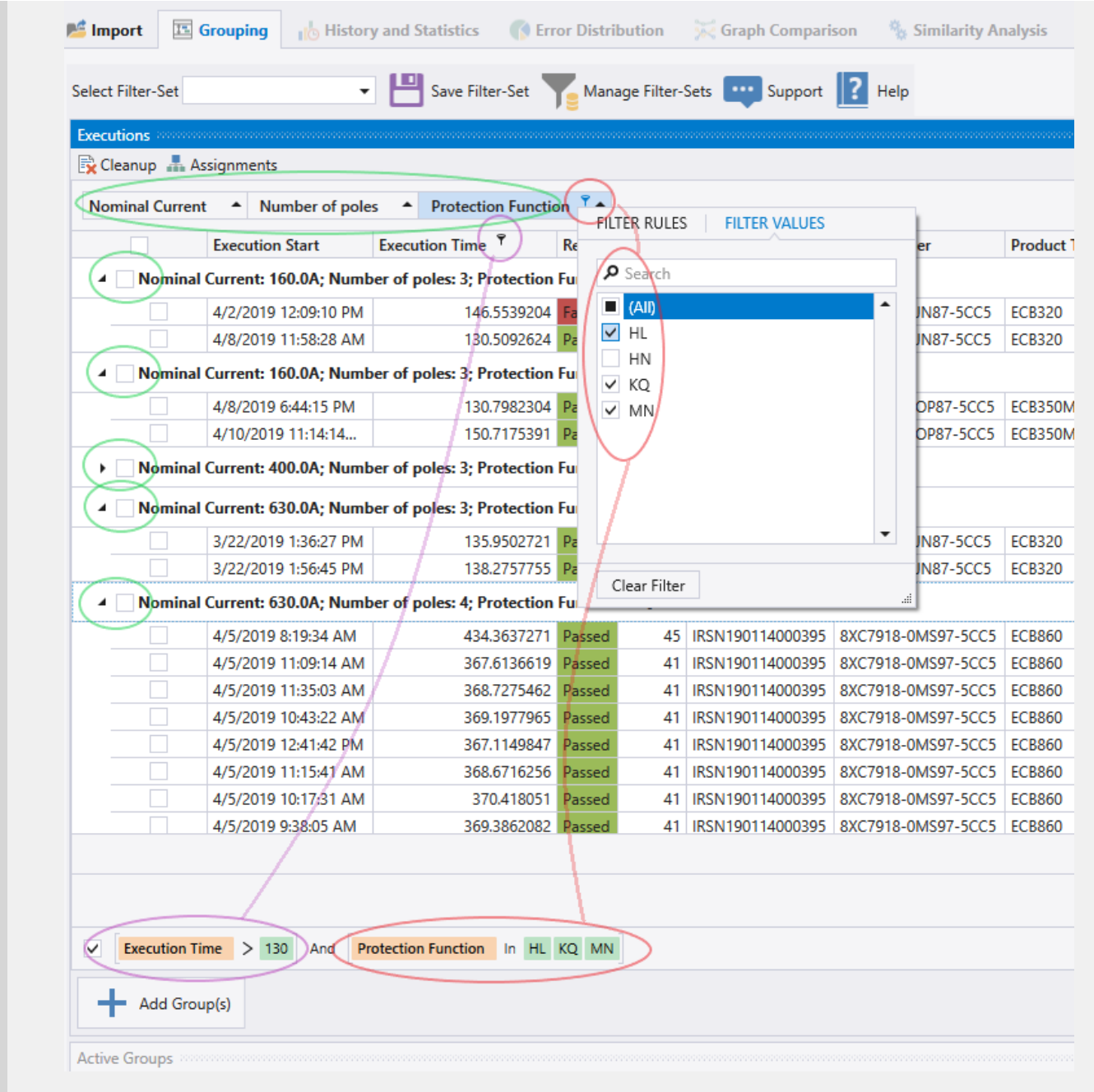
The program now groups the data according to the values of the column you selected. The table immediately displays all the groups that have been formed as a preview. Use the arrow symbol to view the contents of the group.



2. Click Add Group and the groups are created with a default name and added to the list under **Active Groups**. The group names can be renamed with F2 if necessary.

Tip: A combined grouping is also possible. Simply drag another column header into the grouping area and the second level of the grouping is immediately visible in the preview:

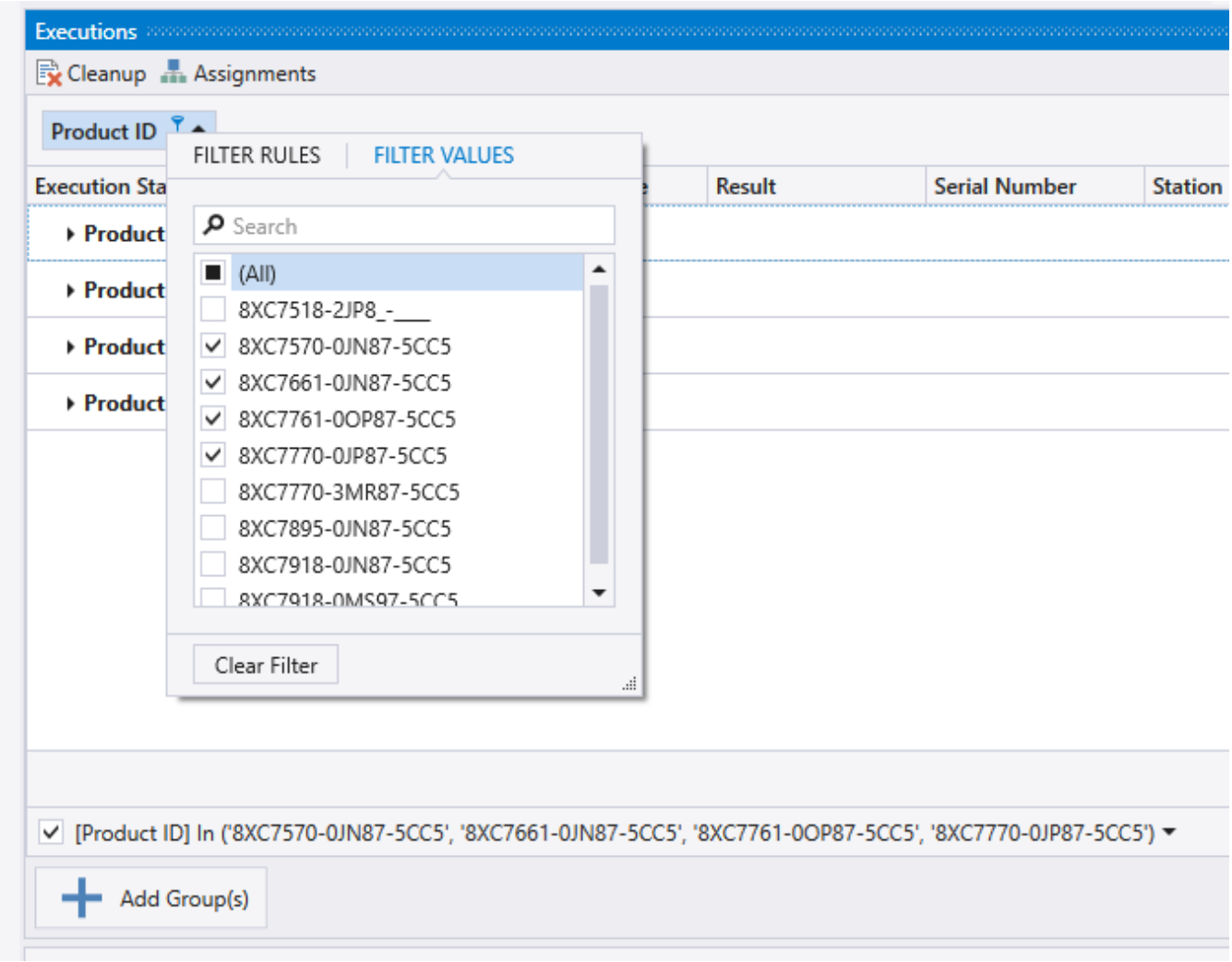
 © IRS Systementwicklung GmbH



2.8.4. Combined grouping

Automatic groupings can also be filtered, allowing you to combine both approaches. For example, you can group by ProductID and then use filters to select only some of the automatically created groups:

 © IRS Systementwicklung GmbH



2.8.5. Manage groups

The button **Assignments** allows an analysis of the distribution of executions to groups.

A table lists all executions and informs about the number of assignments and the assigned groups to an execution.
This makes it easy to detect wrong or unwanted multiple assignments or even forgotten groups.

For this purpose the table offers additional predefined filters:

- **All**: Shows all imported executions
- **Duplicates**: Displays only those executions that are assigned to multiple groups
- **Unrelated**: Displays only those executions that are not assigned to a group

In the main view of the Grouping Tab there is also the possibility to remove unassigned executions and thus free memory. To do this, just click on **Cleanup**.

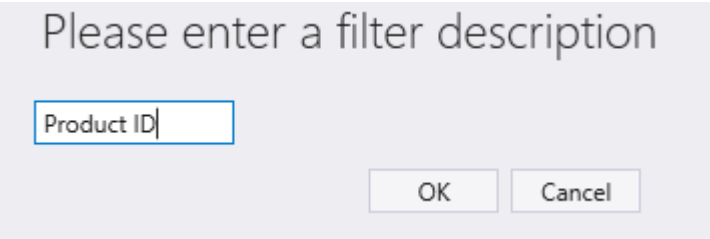
2.8.6. Save/Apply filter set

 © IRS Systementwicklung GmbH

Creating groups can be very time-consuming, especially creating complex filter expressions using the Filter Editor. Therefore, it is possible to save the current grouping visible in the **Executions** as a filter set and to load and apply this set again later.

Save filter set

To save, simply click on the Save Filter Set button and enter the name of the set. The set will automatically be saved in the app data and displayed in the drop down list.

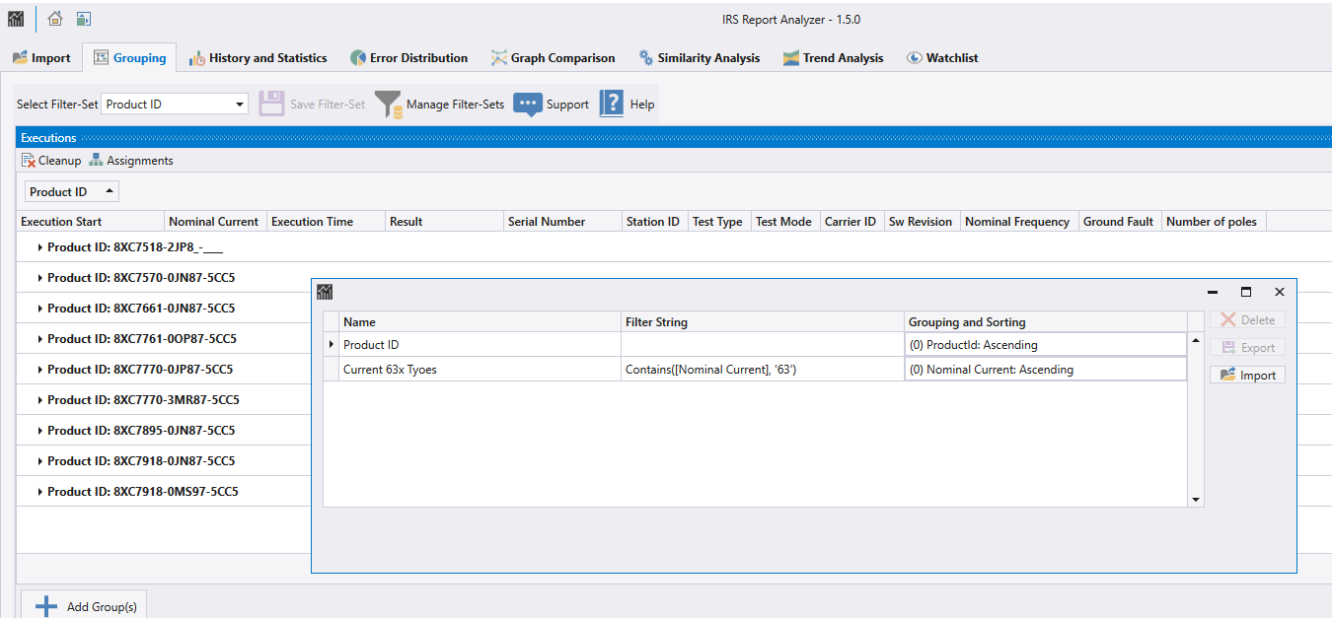


Apply filter set

If a filter set is to be applied, it only needs to be selected from the drop-down list. The settings take effect immediately. Existing other filters are reset.

Manage Filter Sets

With the button Manage Filter-Sets the filter sets can be managed:



Export: The selected filter set is exported as an XML file and can be copied to other computers, for example

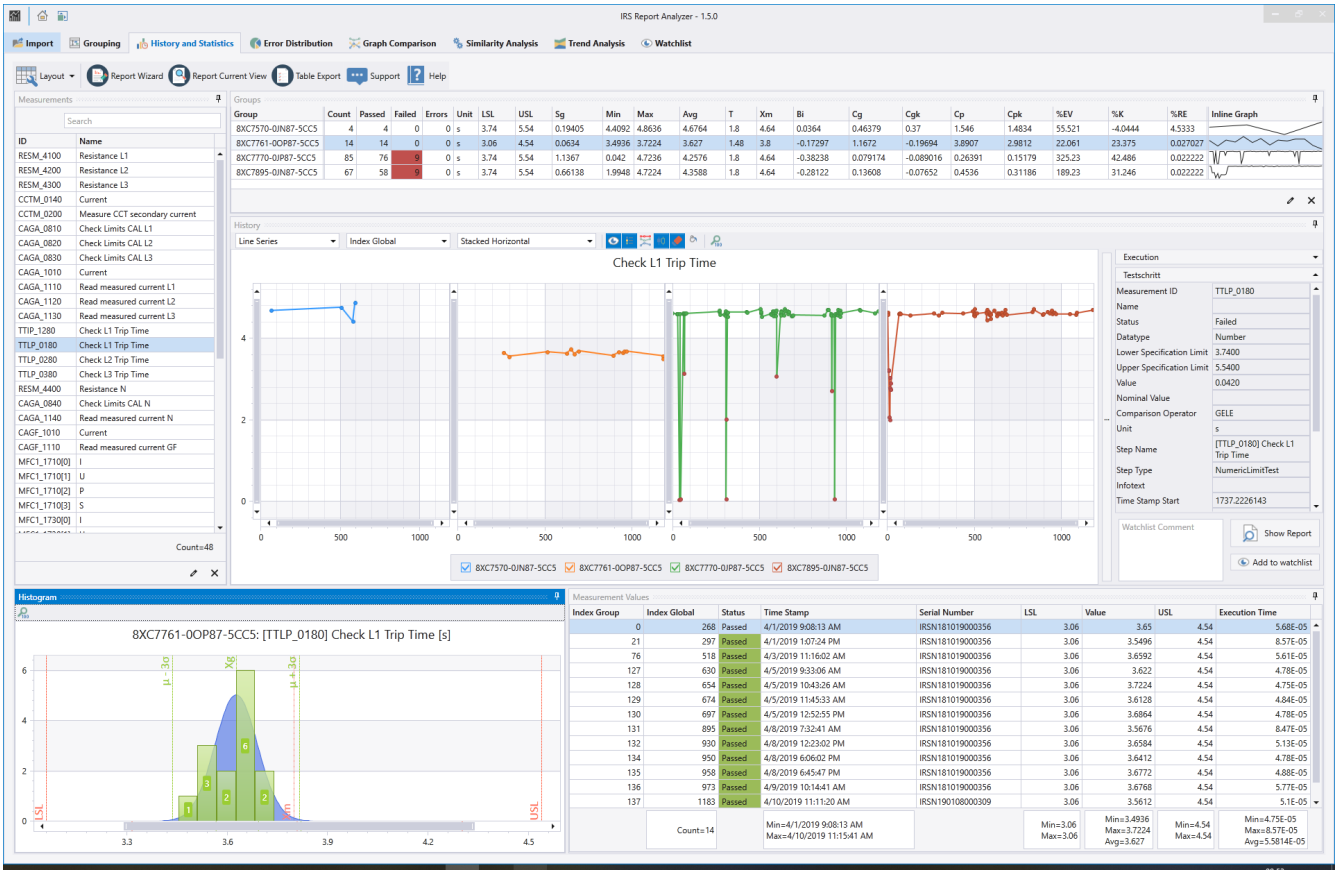
Import: A previously exported XML filter set can be imported

Delete: The selected filter set is removed from the list

 © IRS Systementwicklung GmbH

2.9. History and Statistics (Tab)

This module shows the statistical analysis for each measurement, visualizes the history of the corresponding measured values and provides a histogram. The statistical key figures are calculated for each measurement for all groups to allow the comparison of measurements within different groups. The history diagram also allows the graphical comparison between groups. The results can be easily exported in different formats.



- Select the desired measurement and group. The view is adjusted accordingly.
- To create an MSA type 1 report, press "Report Wizard"

Note: Please note that the diagrams and tables are located in dock panels, which can be arranged dynamically on the screen and may be hidden.

2.9.1. Measurement Analysis Table (Panel "Group")

This table shows the statistical analysis values (MSA type 1) for the selected group and measurement.

The page supports two different views: Group First / Measurement First (Default).

Depending on the selected view, the table shows either a comparison of the groups based on the measurement or a list of all measurements for the selected group.

Meaning of the columns:

Name(s)	Meaning	Formula
Count	Total number of measurements	
CountValid	Number of measurements without NaN or INF values	
CountError	Number of measurements with step status "Error"	
CountDone	Number of measurements with step status "Done"	
CountFail	Number of measurements with step status "Failed"	
CountPassed	Number of measurements with step status "Passed"	
CountTerminated	Number of measurements with step status "Terminated"	
Avg (or Xg)	Arithmetic average of all measurements	SUM(measurements)/Count() without NaN
Min	Minimum value of all measurements without NaN	
Max	Maximum value of all measurements without NaN	
LSL	Lower specification limit	from test step (if not unique, the highest found lower limit will be used as a surrogate value)

© IRS Systementwicklung GmbH

Name(s)	Meaning	Formula
USL	Upper specification limit	from test step (if not unique, the lowest found upper limit will be used as a surrogate value)
T	Tolerance	USL - LSL
Xm	Nominal value	Average of LSL and USL
Sg	Sigma	Corrected sample standard deviation (using N-1)
Bi	Bias / Systematic Error	Xg - Xm
Cg	Repeatability / Gage capability	((*CgNumerator* * T) / (*CgDenominator* * Sg))
Cgk	Gage capability (biased)	(*CgkNumerator* * T - Abs(Bi)) / (*CgkDenominator* * Sg)
Cp	Capability of process	T / (6 * Sg)
Cpk	Critical process capability	Min((USL - Avg) / (3 * Sg) , (Avg - LSL) / (3 * Sg))
%EV	Reliability - Equipment Variation	((*EvPercNumerator* * Sg) / T) * 100
%K		(2 * (Xm - Xg) / T) * 100
%RE	Resolution	RE / T * 100, where RE is the minimum distance between any measurements (but not 0) and without NaN

Attention: There is no uniform calculation rule for the values Cg, Cgk and %EV. They are therefore calculated using configurable parameters (shown in italics)! Make sure that the selected parameters correspond to the specifications of your employer / your application! The values can be changed in the application settings. The changes take effect immediately, a recalculation is not necessary.

2.9.2. Common MSA analysis parameters by company

Here is a short overview of the usual settings for C_g and C_{gk} in different standards and companies.

Data without guarantee! In case of doubt, please ask the company for the parameters used!

 © IRS Systementwicklung GmbH

Company / Procedure	Calculation C_g	Calculation C_{gk}	Limit value C_g
MSA 3:2002	(0,2 * T) / (5.15 * S_g)	(0,1* T - |Bi|) / (2,575 * S_g)	C_g >= 1,33
GM, Bosch, MSA 4:2010	(0,2 * T) / (6 * S_g)	(0,1* T - |Bi|) / (3 * S_g)	C_g >= 1,33
BMW, Q-DAS GmbH, VW / Audi, VDA 5 (09/2010)	(0,2 * T) / (4 * S_g)	(0,1* T - |Bi|) / (2 * S_g)	C_g >= 1,33
Ford	(0,15 * T) / (6* S_g)	(0,1* T - |Bi|) / (3 * S_g)	C_g >= 1,0
Ford	0,15 * $\sigma_{Process}$ / S_g	(0.45 * $\sigma_{Process}$ -|Bi|) / (3 * Sg)	C_g >= 1,0

2.9.3. History Chart

This view shows all measurement values available for the selected measurement in a dynamic diagram. The values can be arranged by timestamp, global index, index group or serial number.

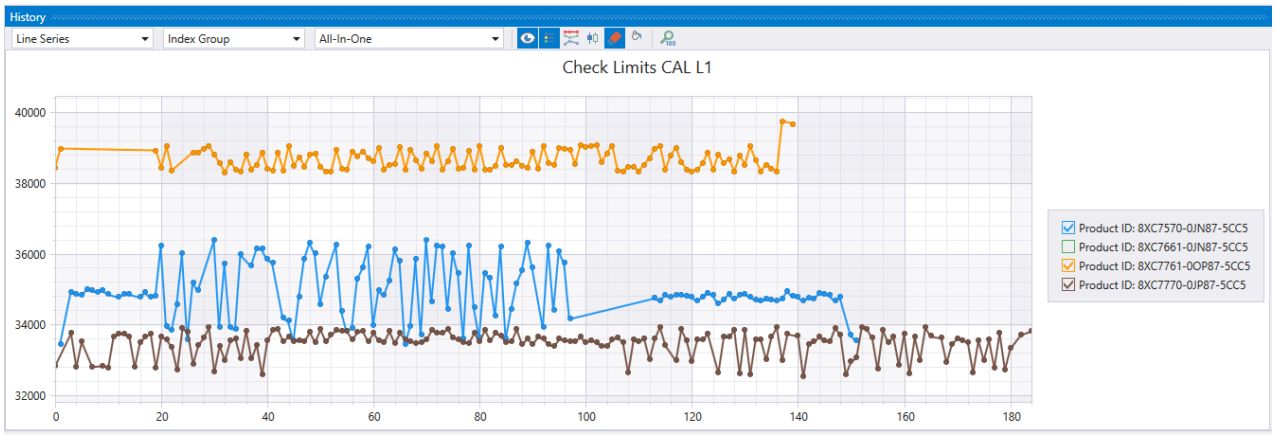
Certain elements can be shown or hidden. These include markers, the diagram legend and the limit values. The area between the lower specification limit and the upper specification limit can be filled optionally.
Also the limit errors can be highlighted to get a quick overview of all errors.

The diagram also supports various **views**, display options and X-axes:

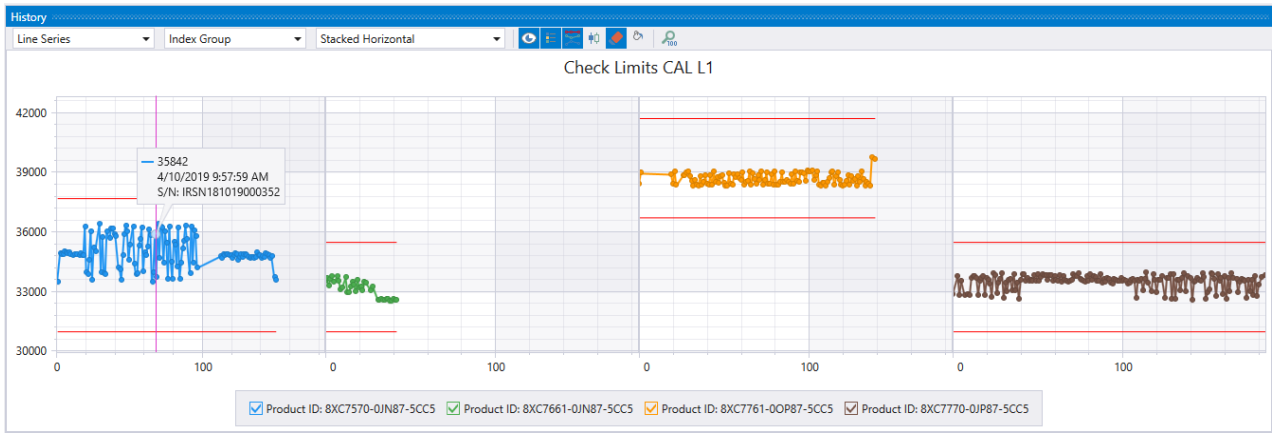
- Single: Only graph for the selected group is shown

- All-in-one: The graphs of all available groups are superimposed. Here it is recommended to switch off the limit value display. With the checkboxes of the legend you can hide unwanted graphs

 © IRS Systementwicklung GmbH



- Stacked horizontally: The graphs of all groups are displayed side by side in their own diagrams



- Stacked vertical: The graphs of all groups are displayed one below the other in their own diagrams

With the mouse wheel or by dragging an area with the mouse the shown section of the graph can be enlarged / zoomed. After zooming, the visible section can also be moved with the mouse. For "stacked" views, the zoom is applied to all diagrams simultaneously.
By clicking the "Reset Zoom" button the view can be reset to 100%.

Display options

- Lines (directly connected points)
- Points

 © IRS Systementwicklung GmbH

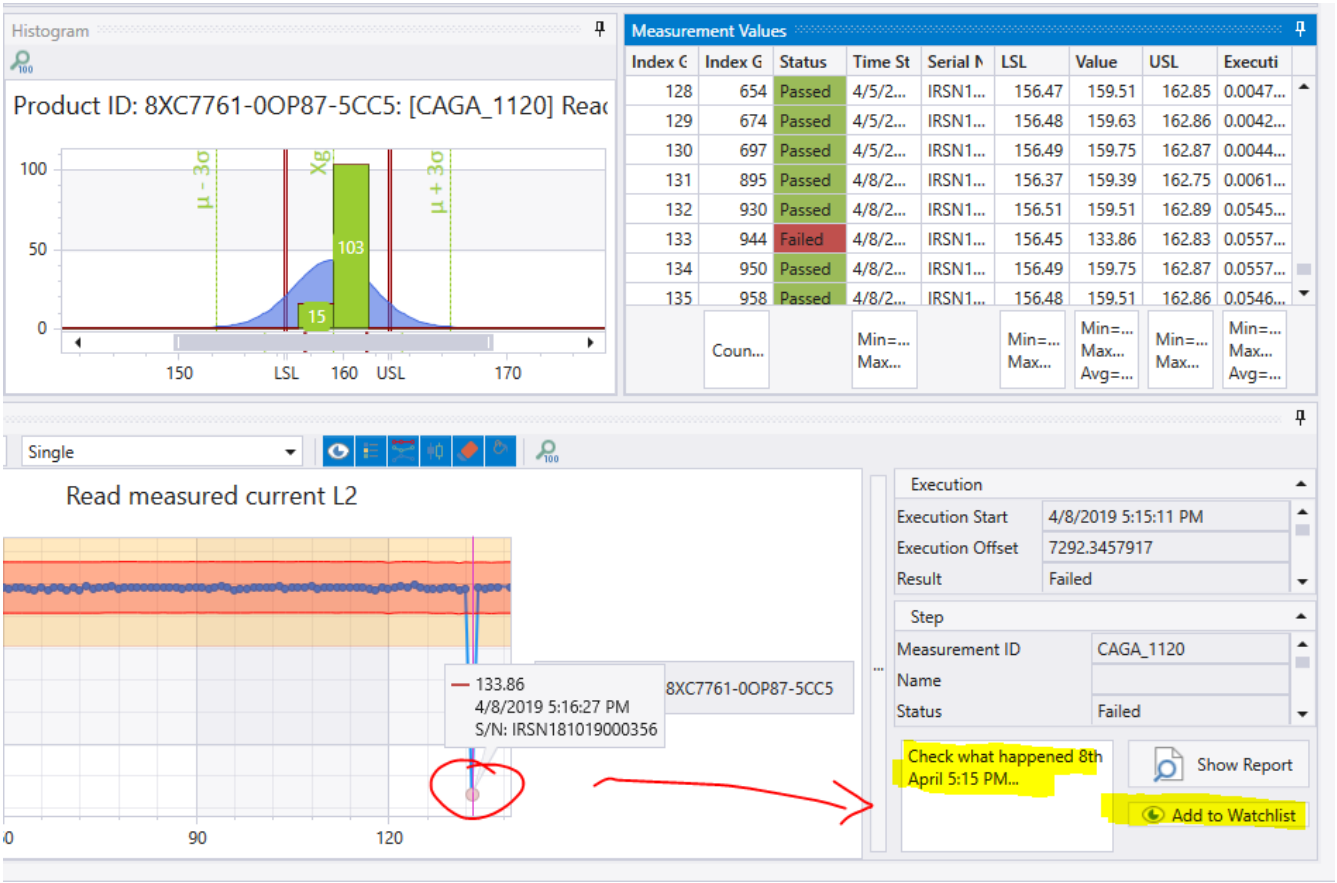
- Bars
- Spline (Interpolated Curve)
- Steps (points connected as steps)

X-Axis Options

- Index Global: X-axis is oriented according to the index position of the execution in a global comparison (sorted by execution start)
- Index Group: X-axis is oriented according to the index position of the execution within the selected group (sorted by execution start)
- Timestamp: X-axis represents the absolute time
- Serial Nr: Here the points are sorted according to the serial number of the test object

Watchlist Function

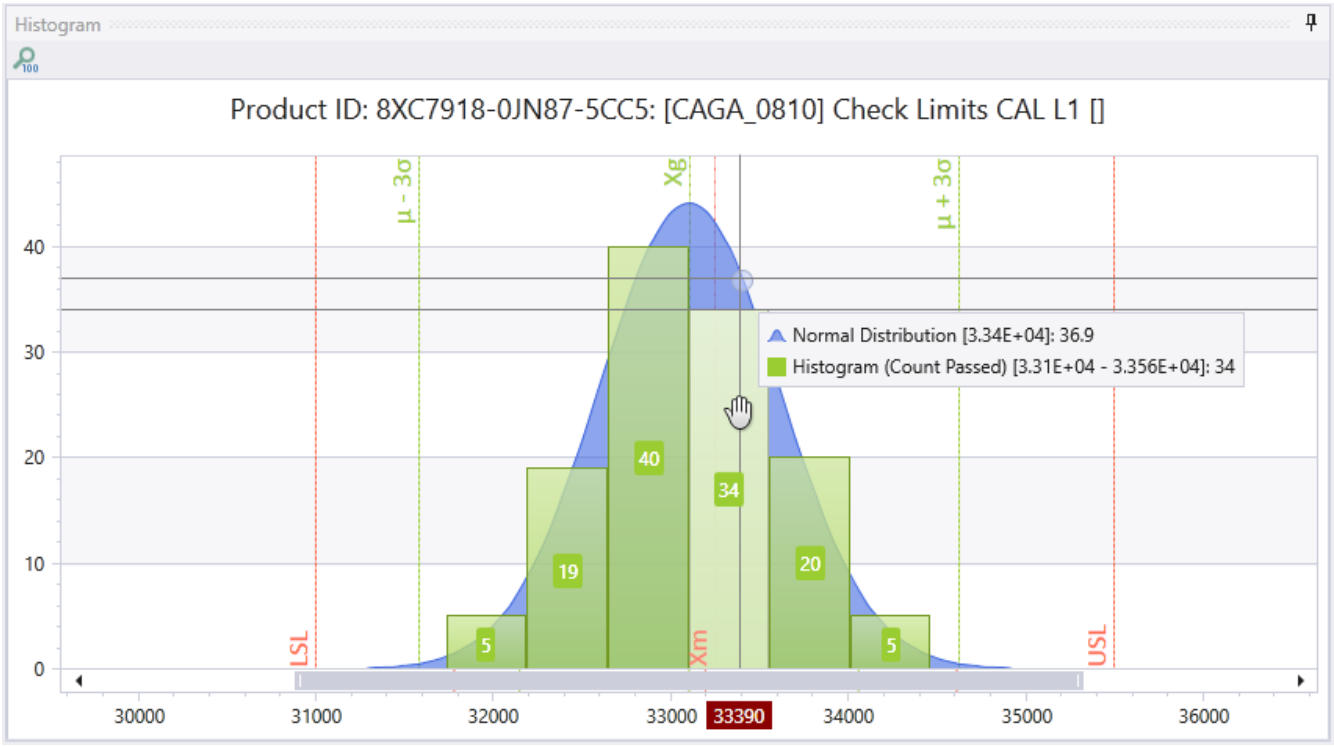
Clicking on a measured value in the diagram opens a detail table that displays all available information for the corresponding test step and test execution. Within this window, an execution can be enriched with comments and added to the watchlist to mark it for further analysis. The corresponding report can also be opened.



2.9.4. Histogram (panel)

2.9.4.1. Representation

The histogram diagram shows the statistical distribution of measured values of the selected measurement. Value ranges are automatically grouped and the number of measured values that lie within these limits are displayed as bars. Within these bars the status is also grouped by Passed (green) and Failed (red).



The groups are formed around the mean value in the range +/-6 sigma. The number of groups can be defined in the application settings. If the number is set to 0, the system calculates a reasonable value depending on the number of measured values.

The histogram also shows the expected normal distribution around the arithmetic mean (Xg/Avg), as well as the critical limits +/-3 sigma and, if possible, the limits LSL and USL and the nominal value (Xm). The latter depend on whether the limits within the measurement series are unambiguous and valid.

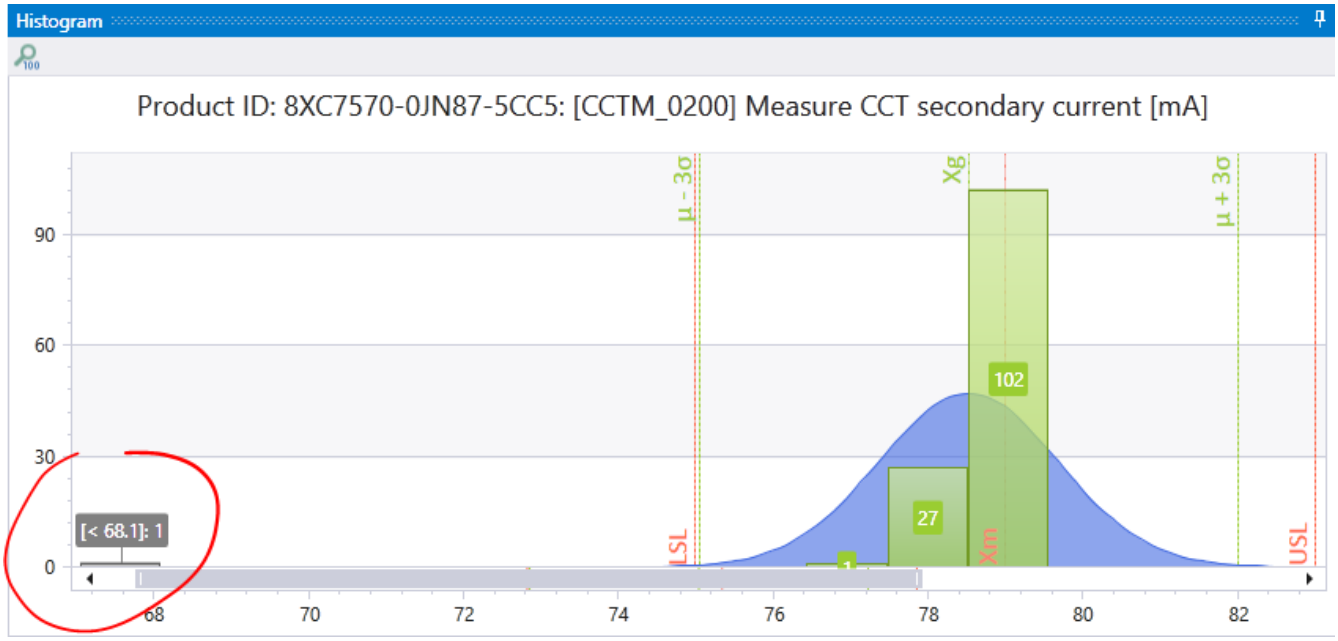
2.9.4.2. Treatment of inconsistent limits

If the limits within the series differ from each other, it is usually not possible to calculate values that depend on the lower and upper specification limits (Nominal, T, Cg, Cgk, Cp, Cpk, %EV, ...).
In this case, the narrowest occurring limits are used as a substitute for calculation and the values are displayed in the table in italics. The found value ranges are displayed in the histogram as bands, which mark the largest and smallest occurring limit values:

 © IRS Systementwicklung GmbH

2.9.4.3. Treatment of extreme values

Values outside the +/- 7-sigma range are visualized in the histogram in two special groups as gray bars. Values contained here (independent of the bar width) then lie outside the range of Xg +/-7 sigma:



2.9.5. Measurement Values (Panel)

This view shows all measured values in a sortable and filterable data table.

The values can be sorted by clicking on a column header. Additionally, each column header has a symbol for filtering the values. In the lower area, sum information such as Min, Max, Avg is offered for selected columns.

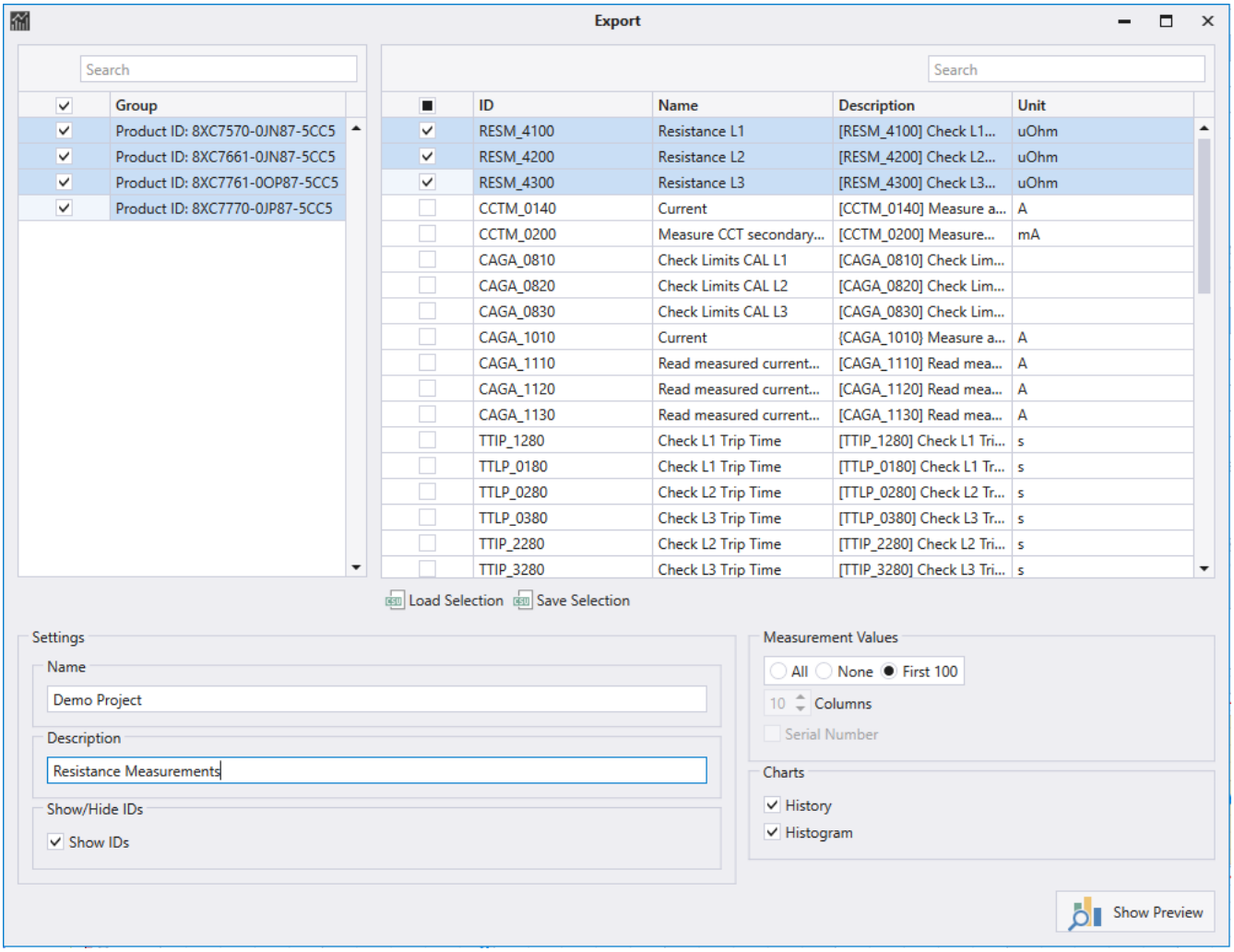
Measurement Values

Index Group	Index Global	Status	Time Stamp	Serial Number	LSL	Value	USL	Execution Time
0	6	Passed	3/26/2019 4:37:48 PM	IRSN181019000352	100	638.73	2500	0.0001007
1	8	Passed	3/28/2019 8:12:52 AM	IRSN181019000352	100	503.19	2500	9.14E-05
2	9	Passed	3/28/2019 8:19:46 AM	IRSN181019000352	100	538	2500	8.89E-05
3	16	Passed	3/28/2019 10:32:54 AM	IRSN181019000352	100	500.26	2500	0.0001219
4	17	Passed	3/28/2019 10:33:56 AM	IRSN181019000352	100	1122.7	2500	8.85E-05
5	18	Passed	3/28/2019 10:34:56 AM	IRSN181019000352	100	1194.8	2500	8.85E-05
6	19	Passed	3/28/2019 10:35:56 AM	IRSN181019000352	100	1641.1	2500	9.4E-05
7	20	Passed	3/28/2019 10:36:56 AM	IRSN181019000352	100	1798.4	2500	8.98E-05
8	21	Passed	3/28/2019 10:37:57 AM	IRSN181019000352	100	1697.6	2500	8.85E-05
9	22	Passed	3/28/2019 10:38:58 AM	IRSN181019000352	100	1487.1	2500	8.89E-05
10	23	Passed	3/28/2019 10:39:58 AM	IRSN181019000352	100	1494.4	2500	9.11E-05
11	24	Failed	3/28/2019 10:40:59 AM	IRSN181019000352	100	2819.2	2500	0.0042763
12	25	Passed	3/28/2019 10:41:18 AM	IRSN181019000352	100	2397.1	2500	9.24E-05
	Count=49		Min=3/26/2019 4:37:48 PM Max=4/10/2019 2:00:16 PM		Min=100 Max=100	Min=352.12 Max=2980.8 Avg=943.73	Min=2500 Max=2500	Min=8.73E-05 Max=0.0042763 Avg=0.00023023

2.9.6. Report Wizard (Button)

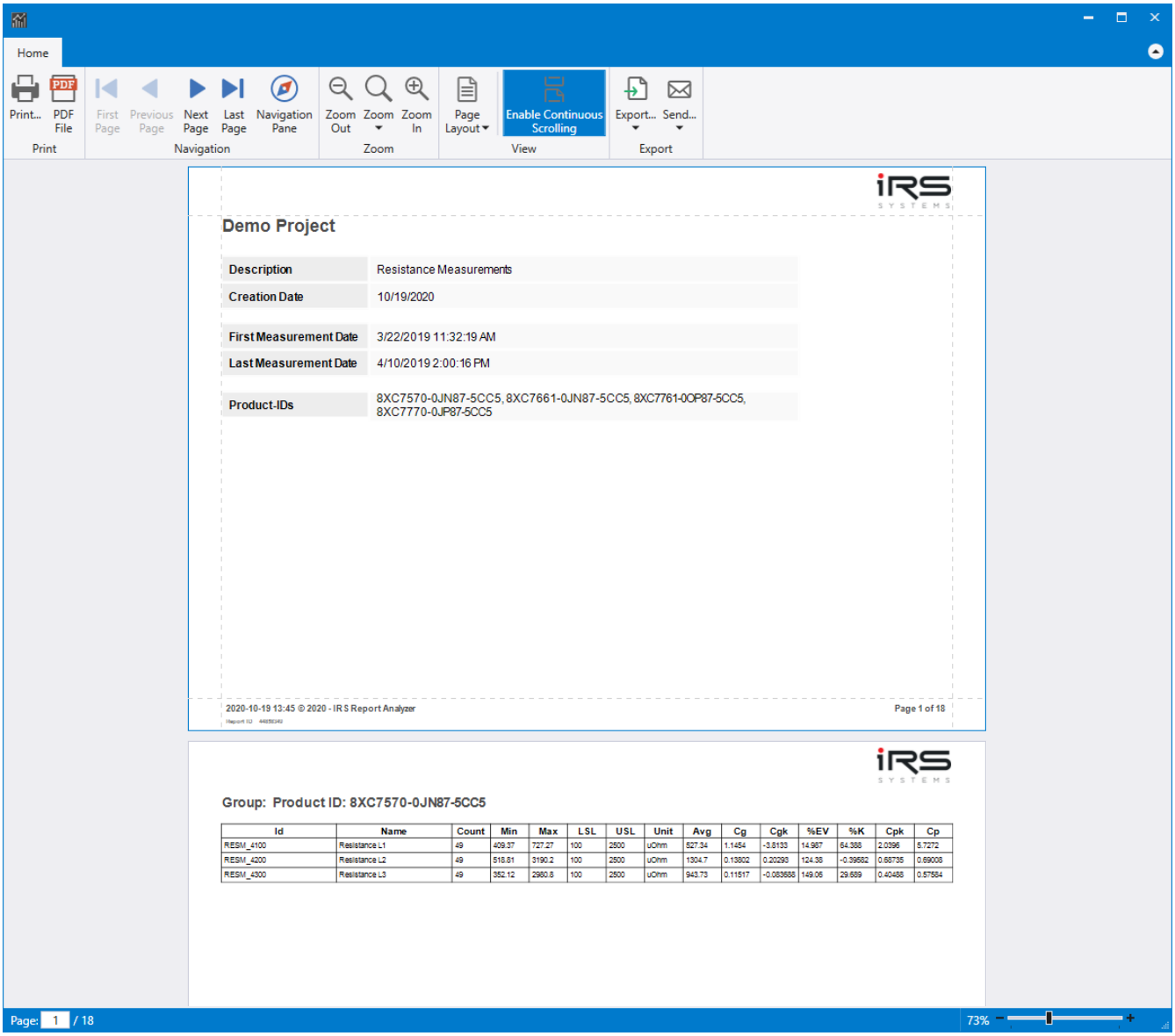
This button starts a dialog that helps to select the contained measurements and groups for the report.

© IRS Systementwicklung GmbH

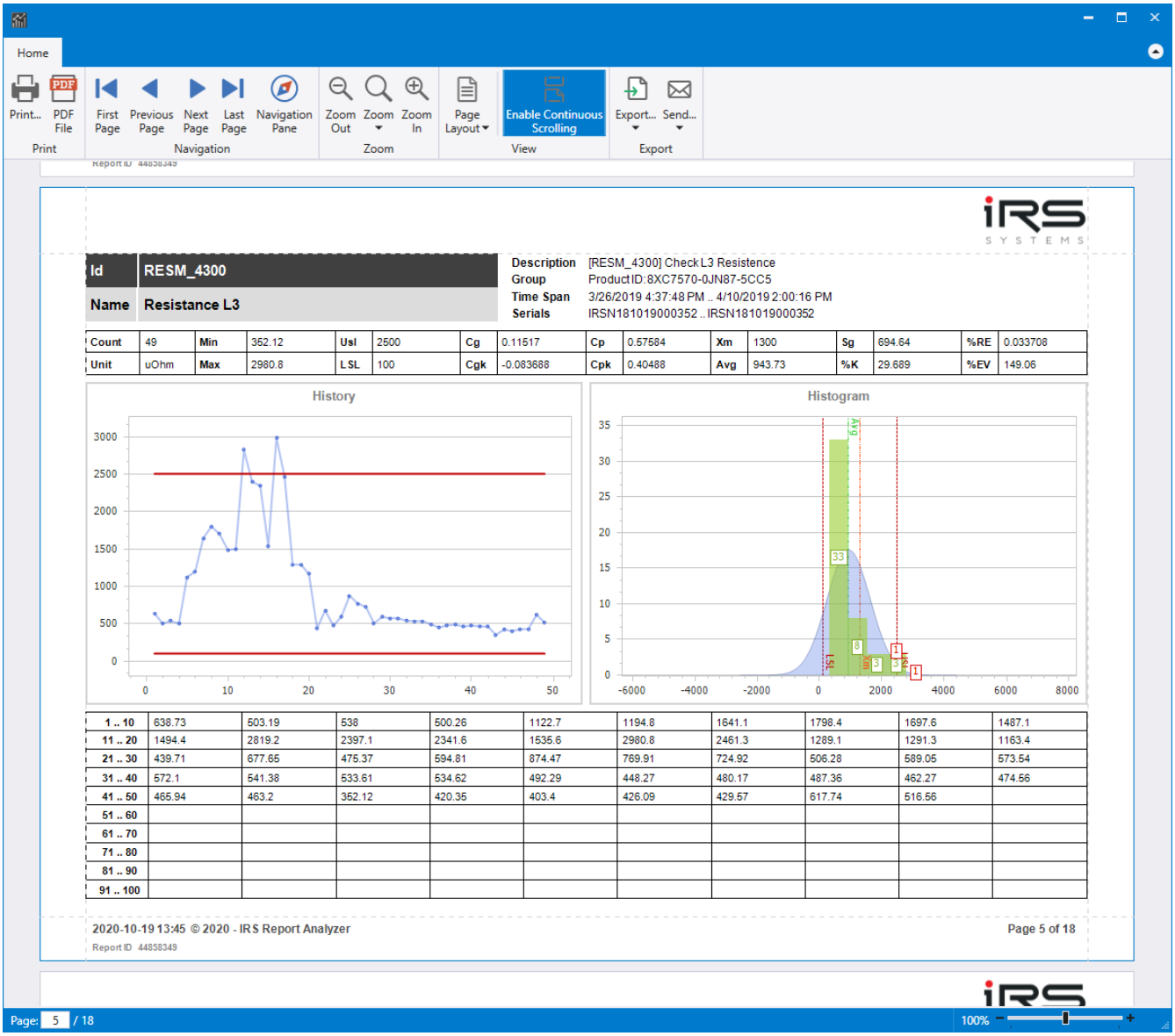


The selected composition can also be saved and reloaded. Click on **Show Preview** to open the preview of the report. From here, the **Export** button can be used to save the file in various target formats (PDF, Word, Excel, HTML, CSV)

 © IRS Systementwicklung GmbH



Id	Name	Count	Min	Max	LSL	USL	Unit	Avg	Cg	Cgk	%EV	%K	Cpk	Cp
RESM_4100	Resistance L1	49	409.37	727.27	100	2500	uOhm	527.34	1.1454	-3.8133	14.967	64.388	2.0396	5.7272
RESM_4200	Resistance L2	49	518.81	3190.2	100	2500	uOhm	1304.7	0.13802	0.20293	124.38	-0.39582	0.68735	0.69008
RESM_4300	Resistance L3	49	352.12	2980.8	100	2500	uOhm	943.73	0.11517	-0.083688	149.06	29.689	0.40488	0.57584



2.9.7. Report Current View (Button)

Pressing this button opens the currently selected measurement including all measured values, diagram and histogram as preview without further configuration. With the **Export** button, the document can be saved in various formats (PDF, Word, Excel, HTML, CSV).

2.9.8. Export Table (button)

The Export Table button allows the selected measurement to be exported in CSV format

2.10. Error Distribution (Tab)

This analysis method allows you to view the error distribution of a group and compare it with other groups.

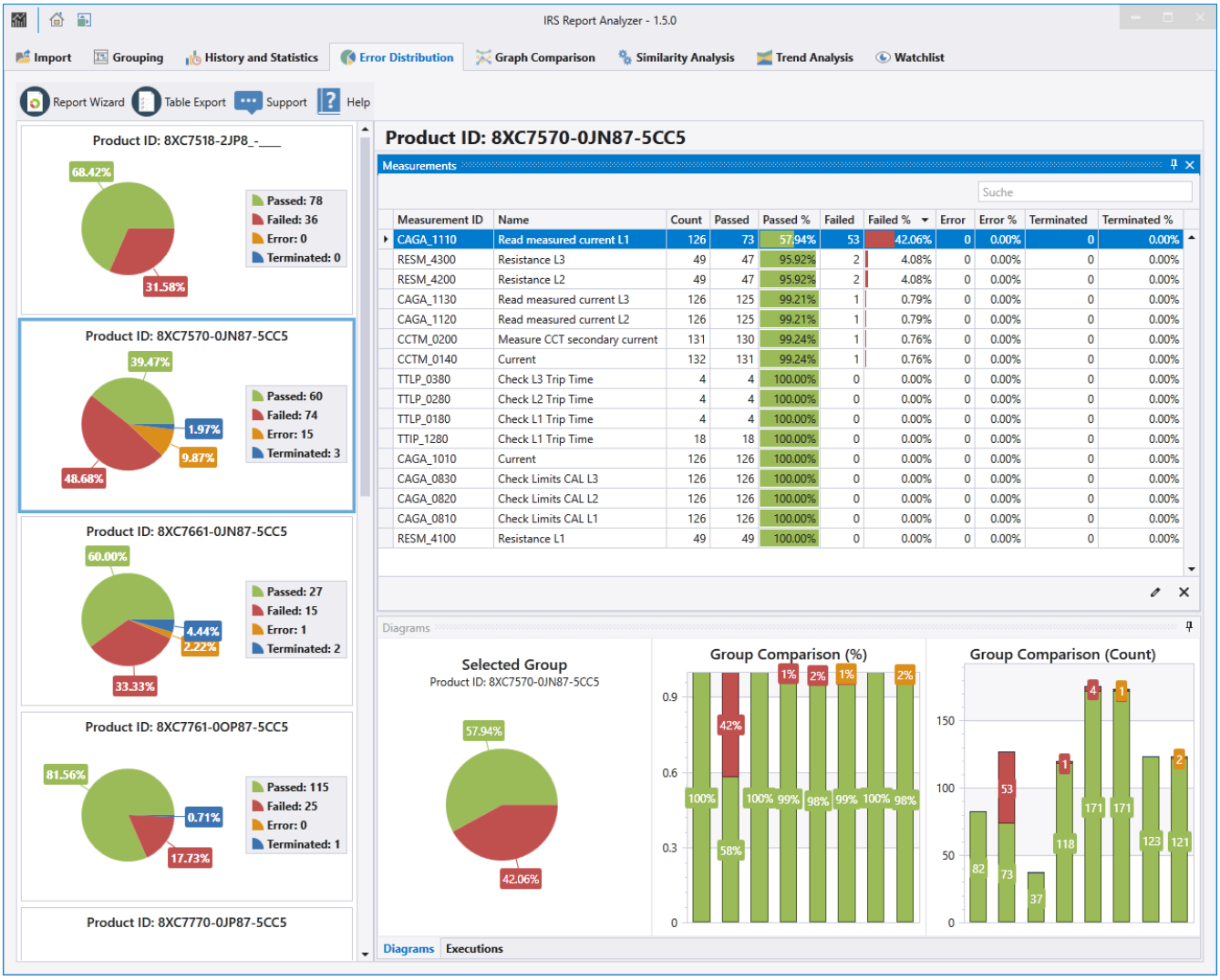
The error distribution is always calculated in groups in two steps:
1st stage: The "Result" entry of an execution is considered, i.e. the overall result of an execution
Step 2: The "Status" entry of a test step is considered, i.e. the partial result of an execution

The following figure shows the start page of the "Error Distribution" analysis method

The error distribution of the executions (1st level) of each group is displayed in a diagram.
If you click on a diagram, you get to the Details view and get the additional information about the error distribution of the test steps (2nd level). In addition, the failures between the groups can then be compared.

> *Note: With the Import Filter, test steps can be filtered from an execution. Thereby it can happen that a test step with the status "Fail" is removed and only "Pass" entries are left. However, the overall result is not changed by the Report Analyzer, so it remains on "Fail".*

2.10.1. Details



The detail view of the error distribution is structured as follows:

- On the left is the selection of the group to be viewed
- In the middle you see an overview of all test steps ("Measurements")
- Below you can switch between two panels: "Diagrams" and "Executions".

2.10.2. Measurements

This panel lists all test steps contained in the executions.
The MeasurementID, the step name and the description are displayed.
You can also see how often a step was executed and the status is "Pass", "Fail", "Error" or "Terminated".
This value is also set in relation to the total number of steps performed and is displayed as a percentage value.
The operator can sort and filter the table as desired and can also store a conditional formatting.

If the operator selects a row in the "Measurements" panel, the "Diagrams" and "Executions" panels are updated for the selected measurement.

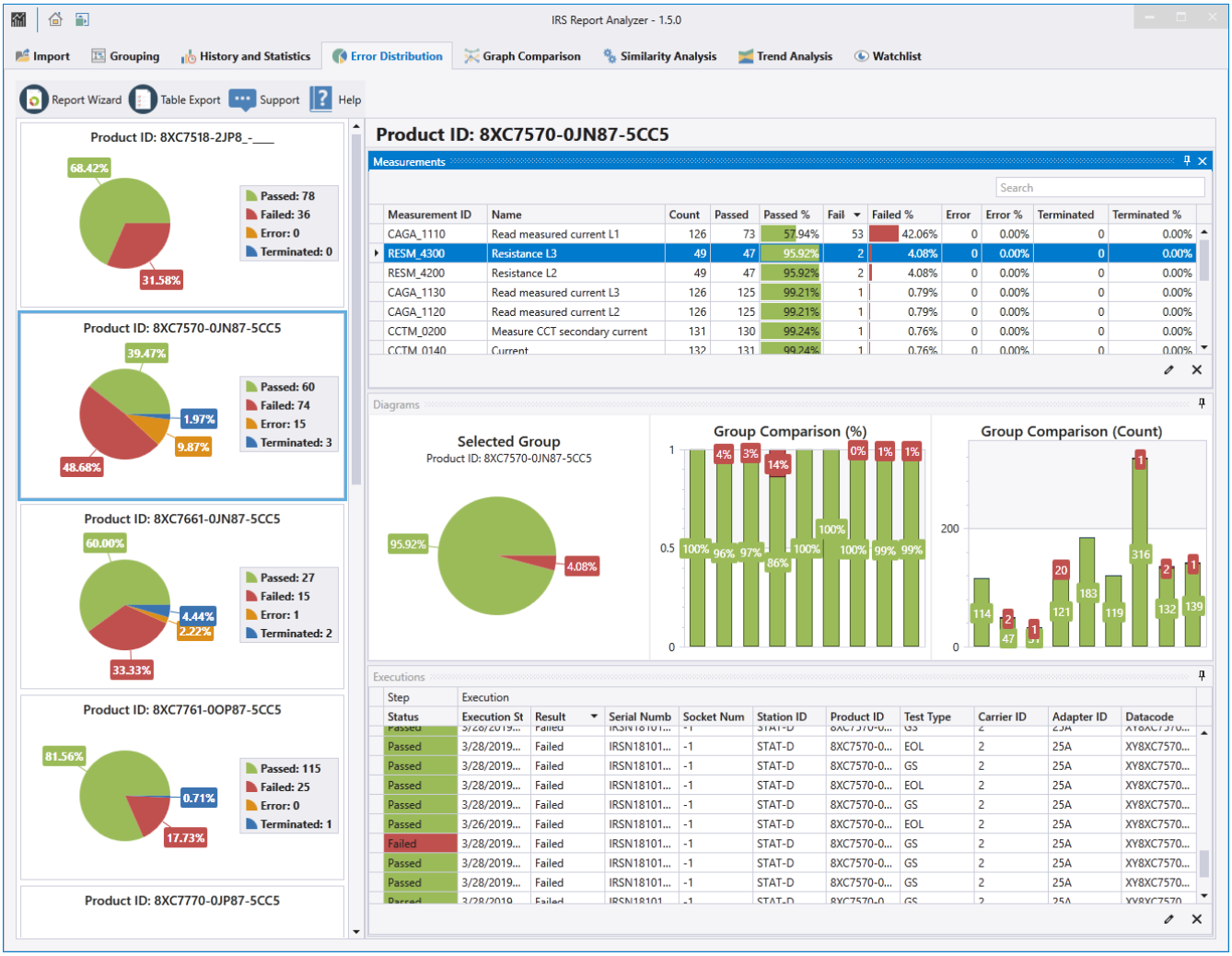
2.10.3. Diagrams

This panel is divided into three areas.

In the left area, a diagram is displayed which shows the status of all steps performed (as shown in the "Measurements").

In the middle, the results of all defined groups are compared in percent. Each group is displayed as a separate bar, so that a comparison across groups is quickly possible. If you move the mouse pointer over a bar, the group name and further information is displayed.

The right area is identical to the middle area, but the values are shown in absolute numbers instead of percentages. This also allows you to quickly determine whether, for example, groups have the same workload or whether errors occur group-specifically or across groups.



2.10.4. Executions

If the operator is not only interested in the distribution but also wants to take a closer look at the logs, which are e.g. failed, he can do this in the panel "Executions".

This panel lists all executed executions that have executed the selected test step. The operator gets various information displayed, such as the serial number. The test report can be opened and viewed by double clicking on a line.

 © IRS Systementwicklung GmbH

In the case of repeated measurements, it is thus possible to determine, for example, whether a failure occurs only with a single assembly or batch.

2.10.5. Export

There are three possibilities to export the analysis data of the error distribution:

1. Report Wizard
2. Table export
3. Windows clipboard

2.10.5.1. Report wizard

- Select the desired groups and measurements which should be included in the report:
- Click on preview

A preview is then automatically generated for each selected group, which contains the following information:

- Complete overview of all executions (1st part)
- Complete overview of all currently visible test steps per selected group (2nd part)

As soon as the preview is completely generated, the report can be saved in various formats. This can be done with the button "Export..." or the arrow below the button.

2.10.5.2. Report current view

The overview of all test steps is exported in the same way as the "Measurements" table is displayed in the Report Analyzer. I.e. filter, sorting and conditional formatting is taken 1:1 from the display.

2.10.5.3. Table Export

The user selects in the displayed dialog which groups and test steps are to be exported.
This export method saves the table entries of the "Measurements" panel for each selected measurement line by line in a text file.
This can then be opened in Excel, for example, and further processed as required.
In addition, it can configure the following settings:

- File extension
- column separator
- Decimal point separator
- Output folder
- File name
  Click on "Export" to create the desired file.

 © IRS Systementwicklung GmbH

2.10.5.4. Windows clipboard

In each table, the operator has the possibility to select cells or rows and copy them to the Windows clipboard by pressing CTRL+C.
The data can then be pasted into a text file or Excel spreadsheet. With the shortcut CTRL+A the complete table can be selected.
For example, the data can be exported from the panel "Executions".

 © IRS Systementwicklung GmbH

2.11. Graph Comparison

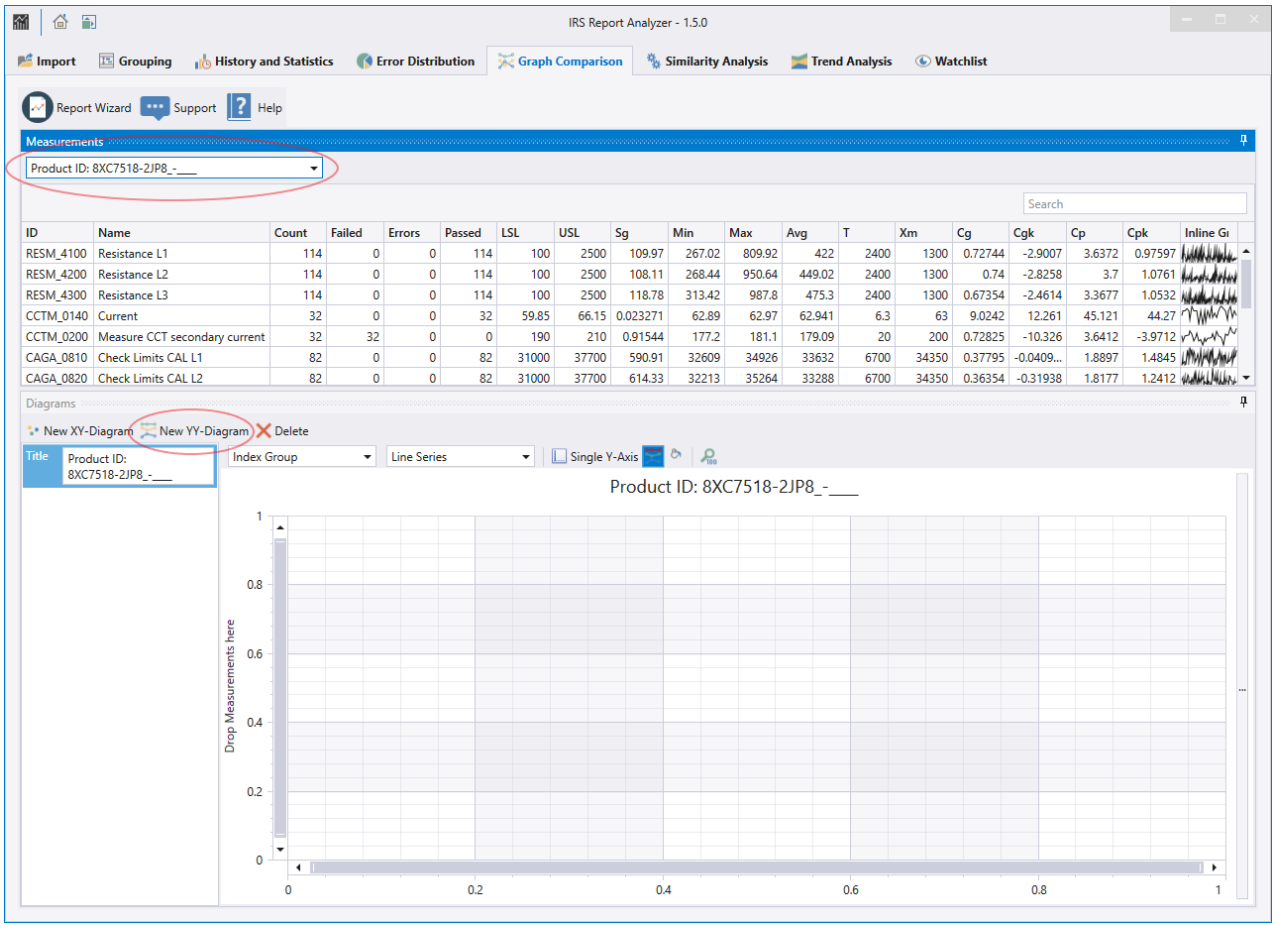
2.11.1. YY Diagram

In the History & Statistics module, graphs for the same measurement from different groups can already be compared.

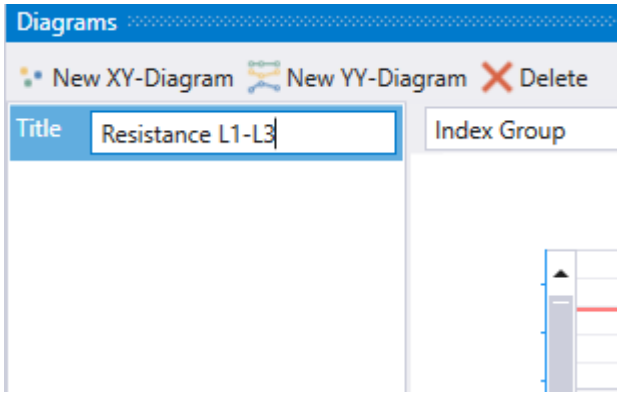
The "Graph Comparison" module also offers the possibility to compare any measurements within the same group. This is helpful, for example, if the measurements are similar to each other, but were taken at different measurement points.

Procedure

1. Select the desired group and click on **New YY Diagram**

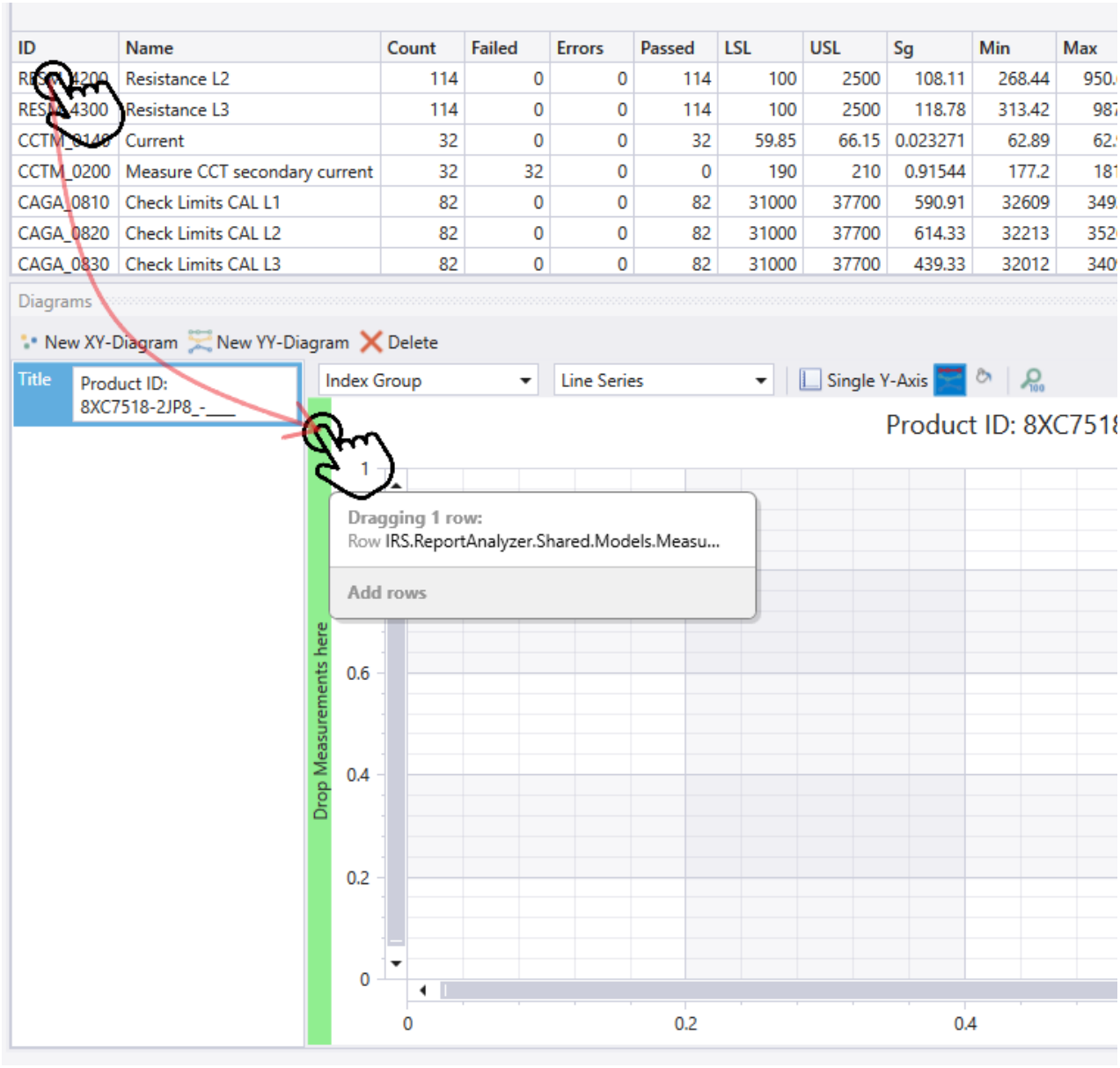


2. Rename the title if necessary:



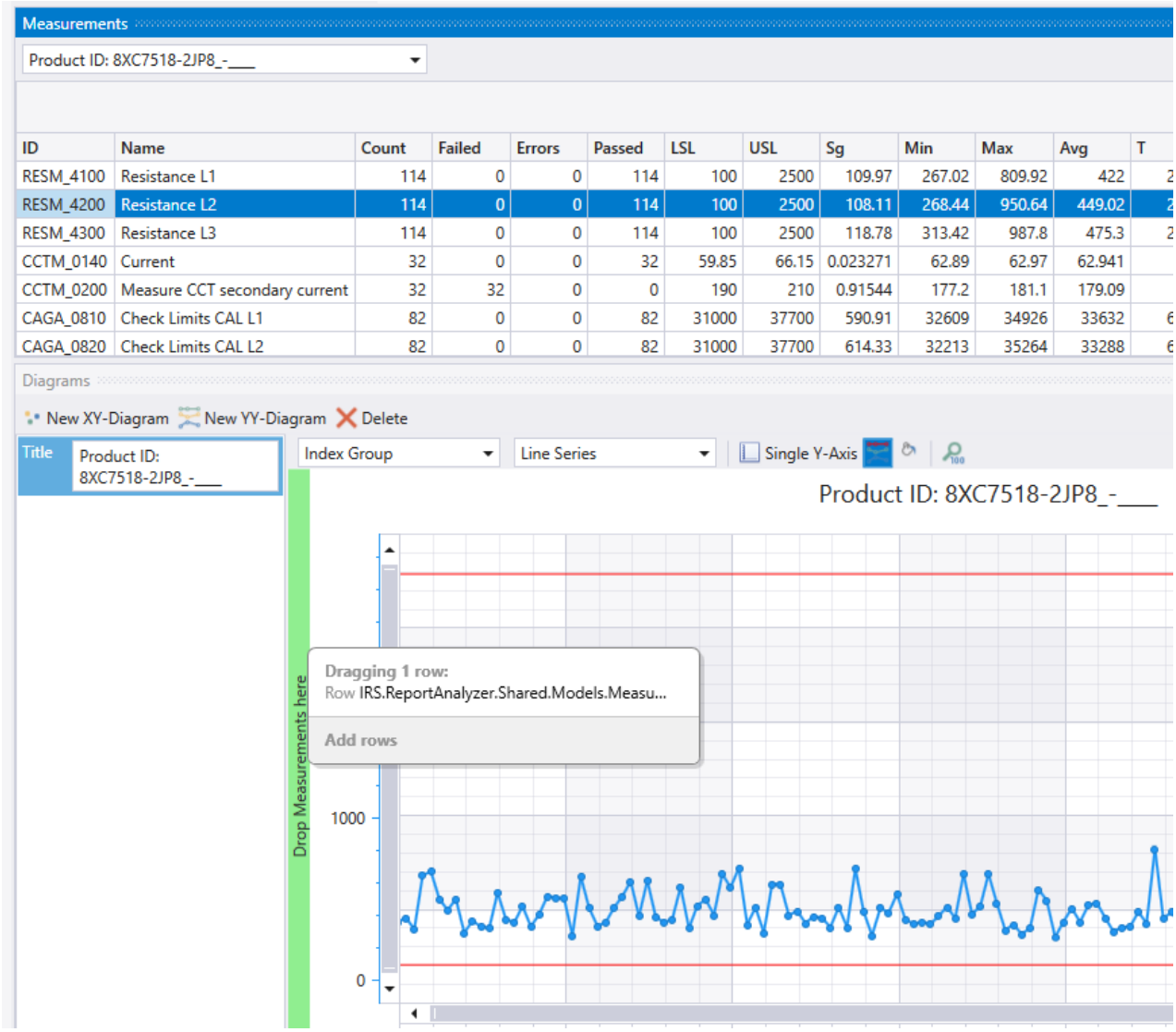
 © IRS Systementwicklung GmbH

3. Drag the desired measurement from the "ID" column in the graphs near the Y-axis When a green solid vertical bar appears, release the mouse button. The measurement series is added to the graph:



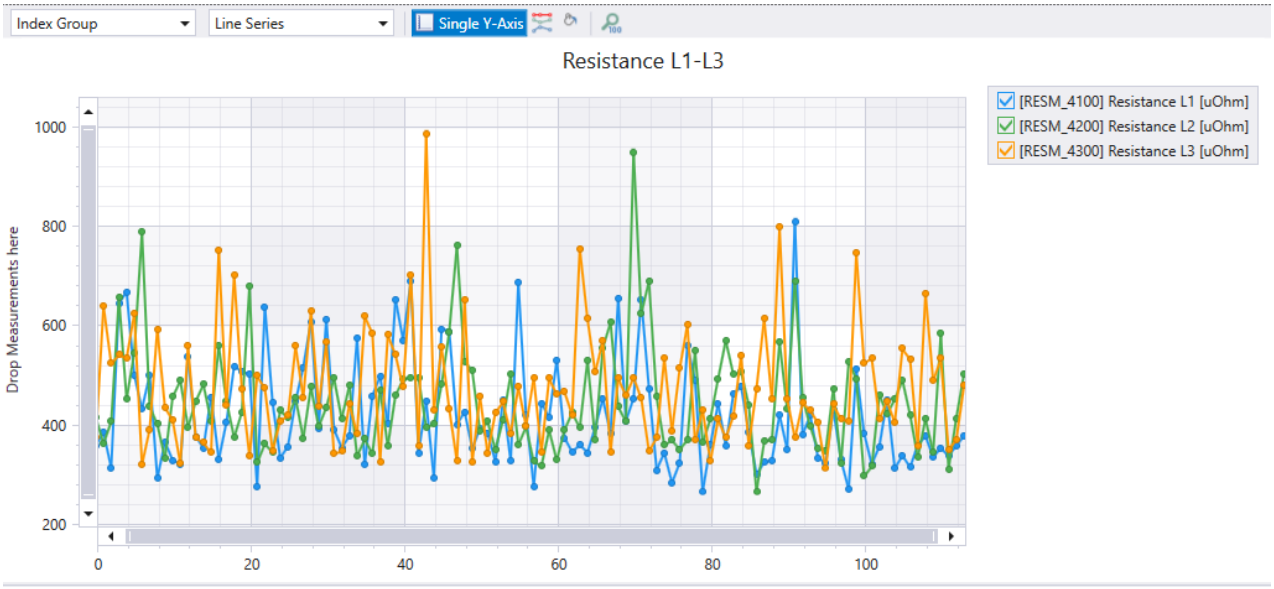
4. Repeat step 3 until all desired graphs are included in the diagram:

 © IRS Systementwicklung GmbH



5. After adding three measurement series our example now looks like this

6. Each graph has an additional Y-axis. If all values are in a similar range, you should activate **Single Y-Axis**:



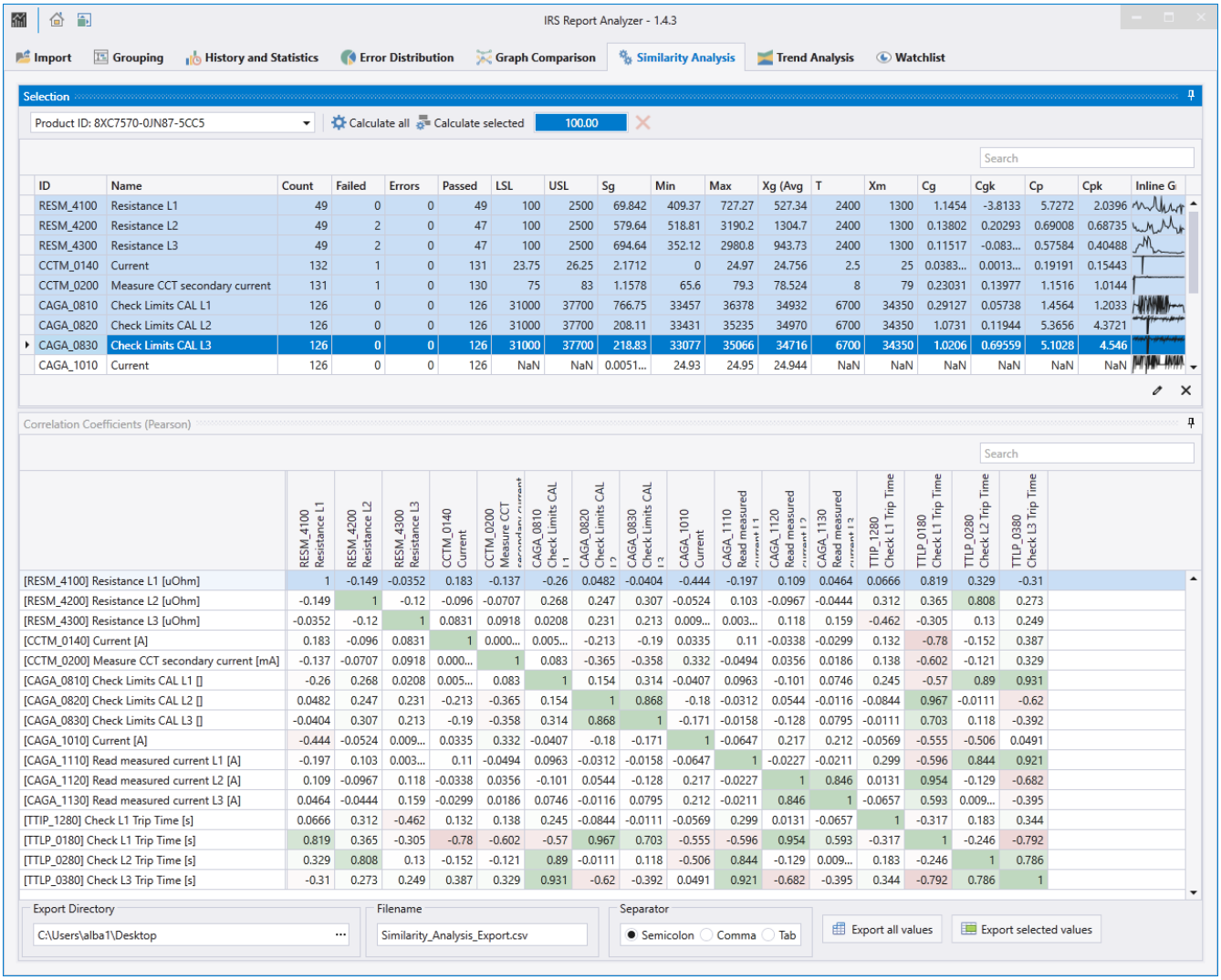
2.11.2. XY Diagram

For an X-Y diagram, proceed in the same way, but here one measurement is drawn to the X-axis and a second to the Y-axis. The resulting X/Y values are entered as points:

 © IRS Systementwicklung GmbH

2.12. Similarity Analysis

The similarity analysis shows linear relationships between at least two measurements. For this purpose the correlation coefficients are calculated according to Karl Pearson and displayed in a matrix. The correlation factors have values between -1.0 (direct negative correlation, red) and 1.0 (direct positive correlation, green). The cells are colored with a gradient based on their value. The stronger the correlation deviates from 0 (transparent), the stronger the cell is colored.



The correlation can be calculated for a selected group between selected or all measurements. The selected measurements are plotted as columns.
For each existing measurement the factors are then calculated in one row.
The selection therefore only affects the columns. The rows are always created over all measurements.

2.12.1. Export

- **Export All Values**: All visible results are written to the selected file in CSV format according to the settings

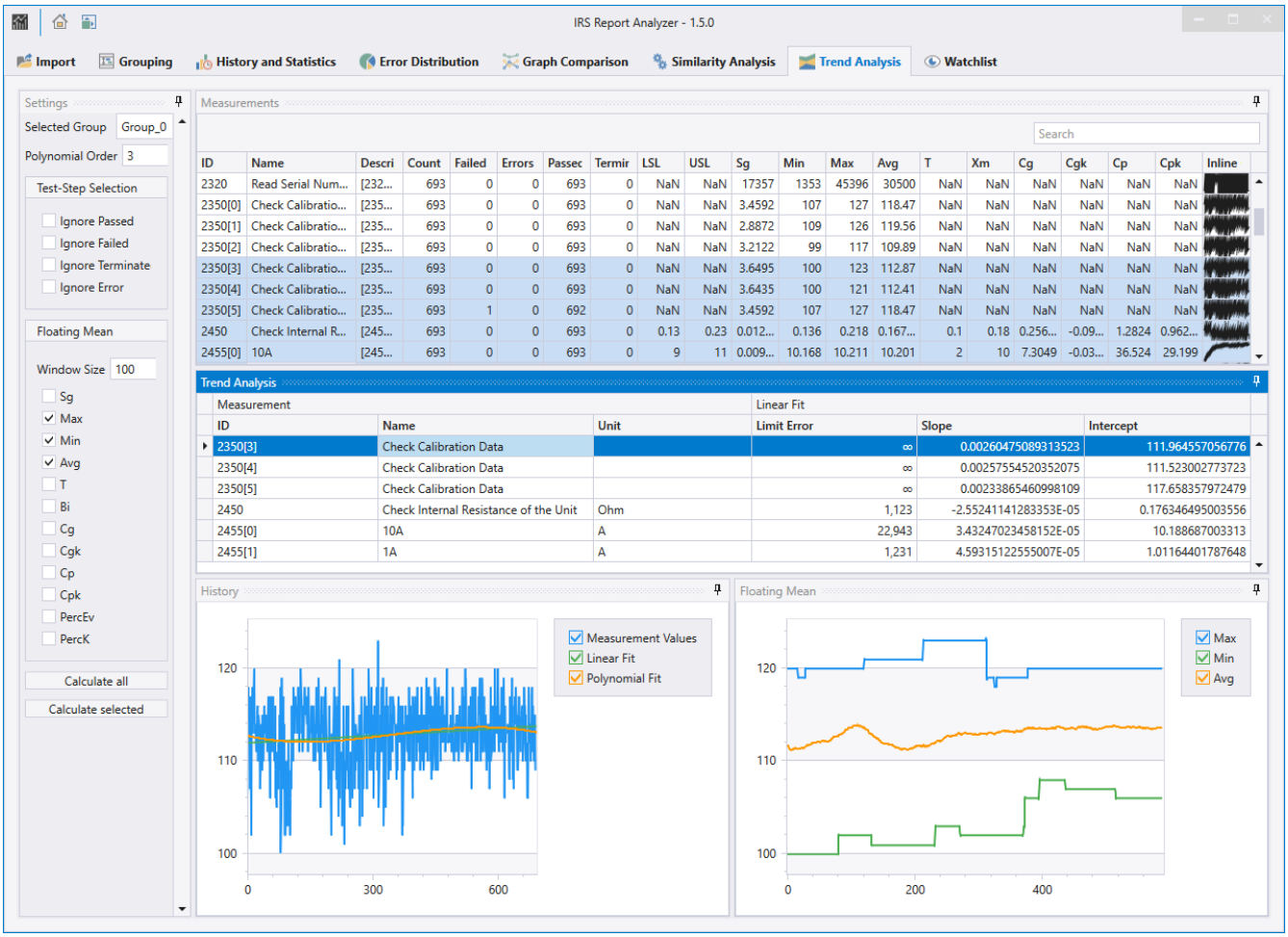
- **Export Selected Values**: Only the selected rows of the result table(!) are written to the selected file in CSV format according to the settings

 © IRS Systementwicklung GmbH

2.13. Trend Analysis (Tab)

The trend analysis can show whether a trend can be identified when a series of measurements is viewed over the long term. Since trends usually develop very slowly due to wear, material aging or mechanical effects, it is necessary to use either very large amounts of data or suitable samples over a longer period of time.

> *Tip: When using very large data sets, it is advisable to use suitable import filters with only the relevant measurement IDs to keep the memory requirements small!*



2.13.1. Settings (Panel)

In the settings, the desired group is set first.

In the **Test Step Selection** section, you can optionally hide entries of failed tests to avoid falsifying the result by bad parts. Finally, the system influence shall be recognized here.

In the section **Floating Mean** the window size for the floating average is set. A minimum of 20 or 10% of the total number is recommended (e.g. 100 for 1000 measurements)

© IRS Systementwicklung GmbH

Afterwards, the parameters whose trend is to be analyzed are selected. A curve is calculated for each value selected here and displayed in the "Floating Mean" panel. Note: The window may be in the background by default.

- **Calculate All**: all available measurements are calculated
- **Calculate Selected**: only the upper part of selected measurements are calculated

For each calculation, one result row is entered in the "Trend Analysis" table. When clicking on the respective row, the corresponding graphs are displayed.

History (Panel)
This graph shows the course of the measured values (raw data) as well as a linear interpolation and an interpolation with a polynomial of adjustable degree. From this, an overall trend can already be read off if necessary.

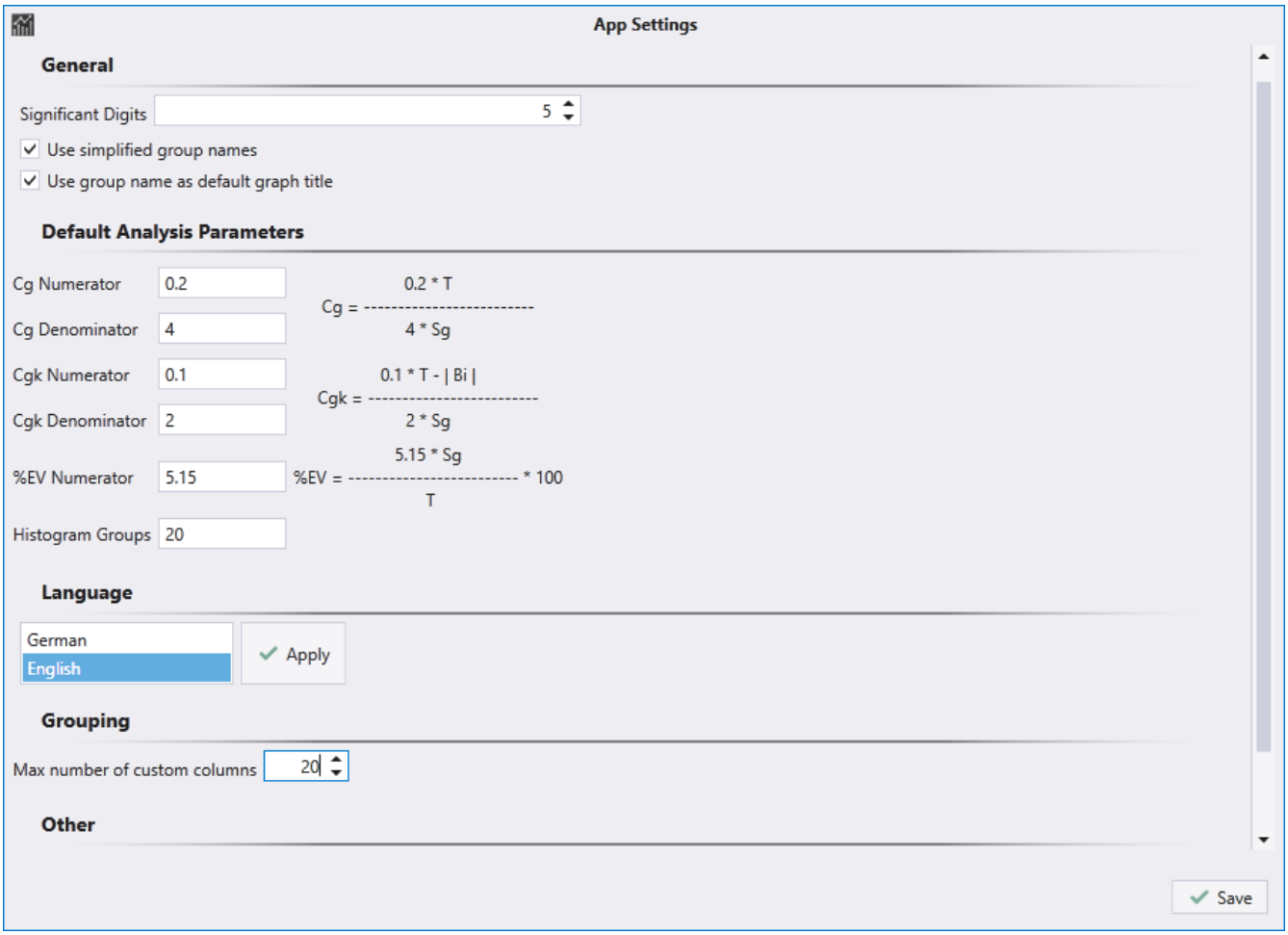
Floating Mean (Panel)
This graph shows the smoothed course of selected metrics of the measurement. The window size of the moving average can be adjusted.

Tip: If value ranges of the graphs do not fit together, deactivate individual graphs by clicking into the legend, if necessary, to achieve a better representation.

 © IRS Systementwicklung GmbH

2.14. App Settings (Dialog)

Here basic settings for the application are made, which can influence both the display and the calculation.



2.14.1. General

- **Significant Digits**: Sets the number of significant digits if numbers are rounded or formatted for display or in the report
- **Use simplified group names**: Concerns the automatic naming of groups. If activated, the name of the grouped column is omitted and only the value itself is used as name of the group, e.g. instead of "Product ID: XYZ" only "XYZ". Depending on the source of the grouping in the report, this will be easier to read. If the grouping is unclear, a descriptive name can also be helpful
- **Use group name as default graph title**: If activated, the "Graph Comparison" module uses the group name as default for the graph name. Otherwise the name remains empty and must be set by the user

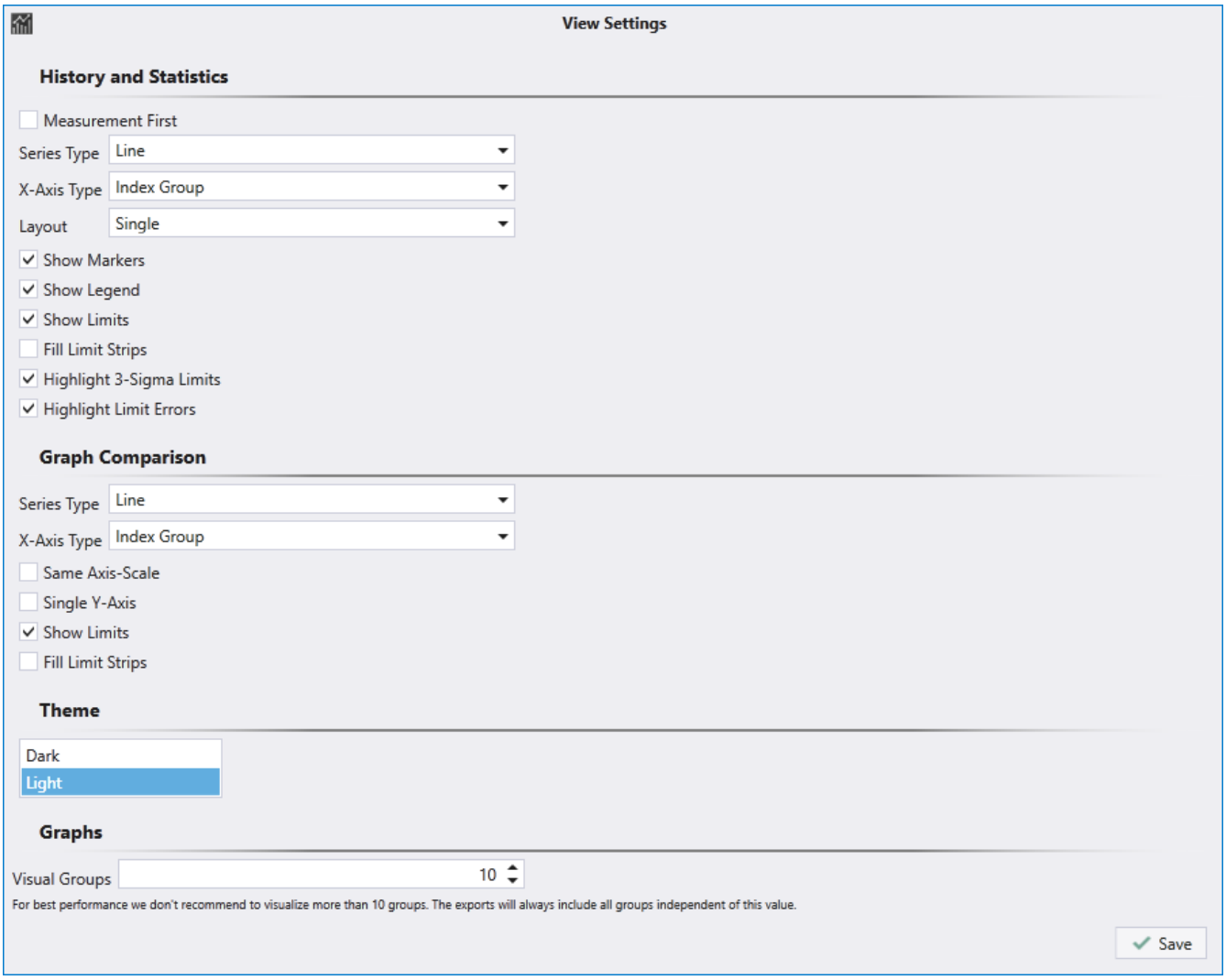
2.14.2. Default Analysis Parameters

 © IRS Systementwicklung GmbH

Defines the parameters for the calculation of some process parameters. When changes are made, the formulas are automatically updated to visualize the effects. See also the section *Measurement Analysis Table*!

- **Histogram Groups**: Sets the number of groups used for histogram generation. If "0" is entered here, the program will automatically calculate a reasonable number based on the number of measurement data

2.14.3. View Settings



The sections **History and Statistics** and **Graph Comparison** of the View Settings define preferences for the view in the respective modules.

Theme: Changes the display of the whole application (dark / light)

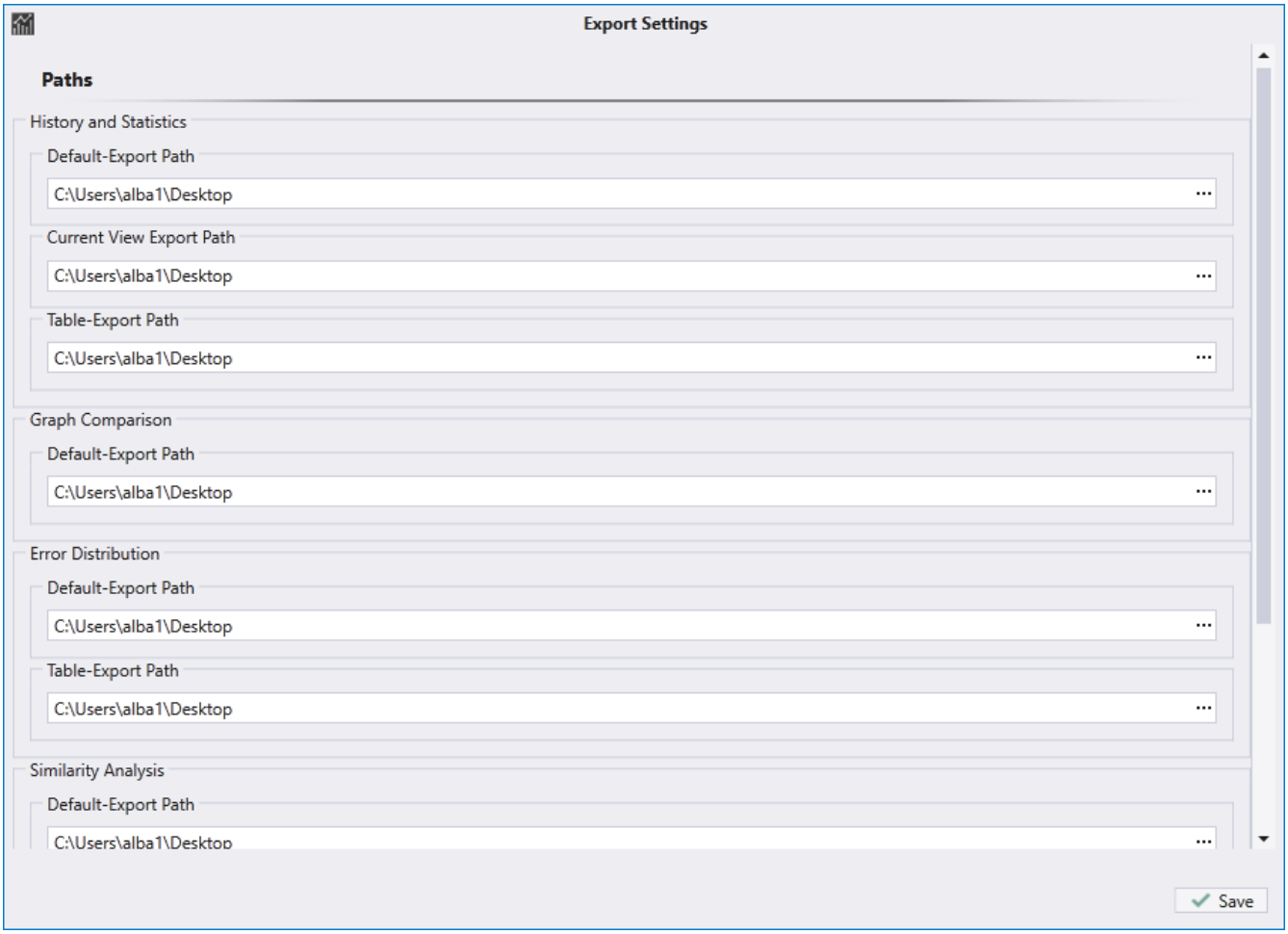
Graphs

- Visual Groups: Specifies the maximum number of groups that are visualized in the graph at the same time. If there are more groups, only the number set here will be displayed in graphs. This has no influence on the number of groups in the tables.

 © IRS Systementwicklung GmbH

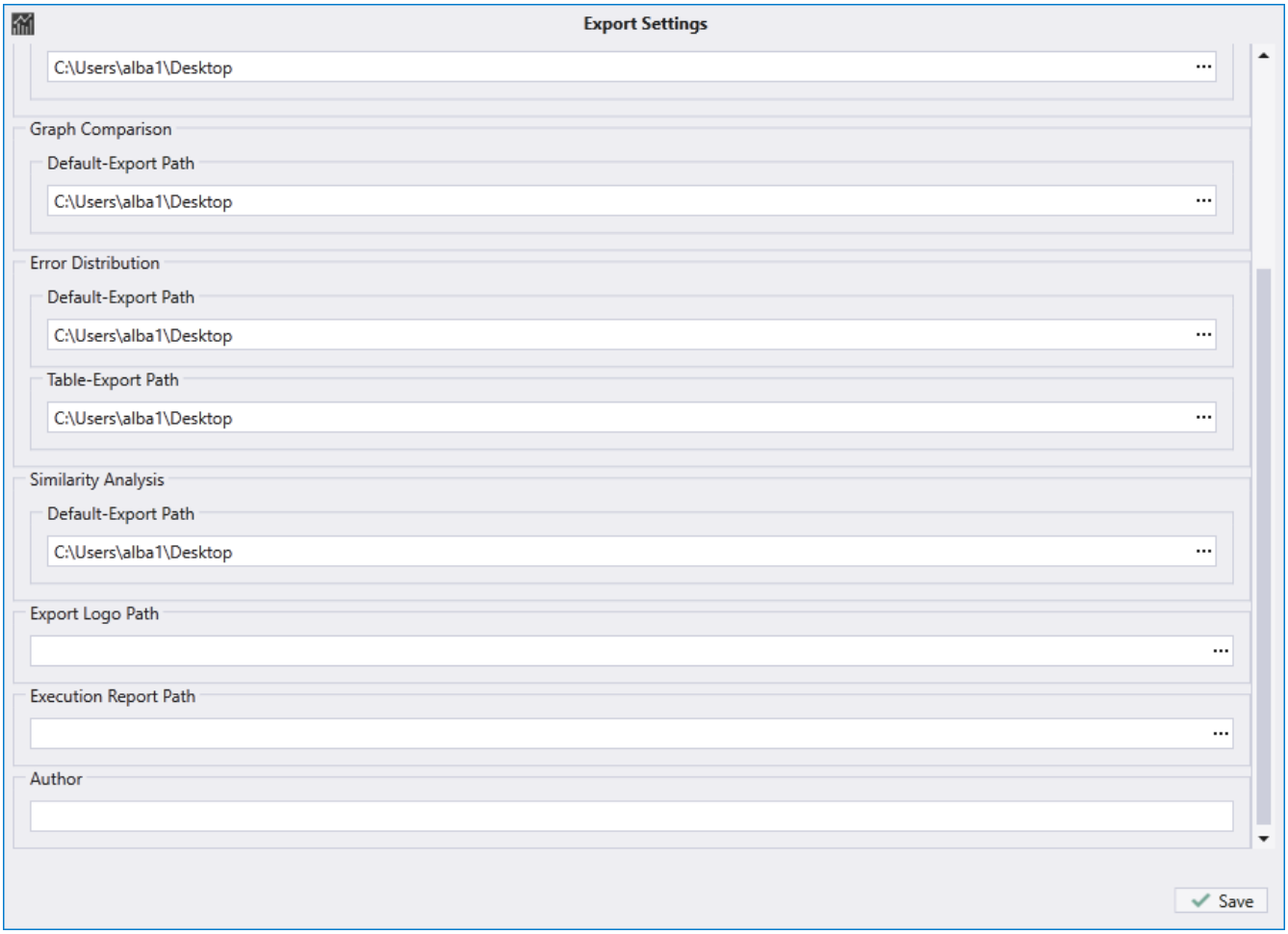
2.14.4. Export Settings

Here the default paths for various export files are set.



You can also define your own logo for the report, which will replace the IRS logo

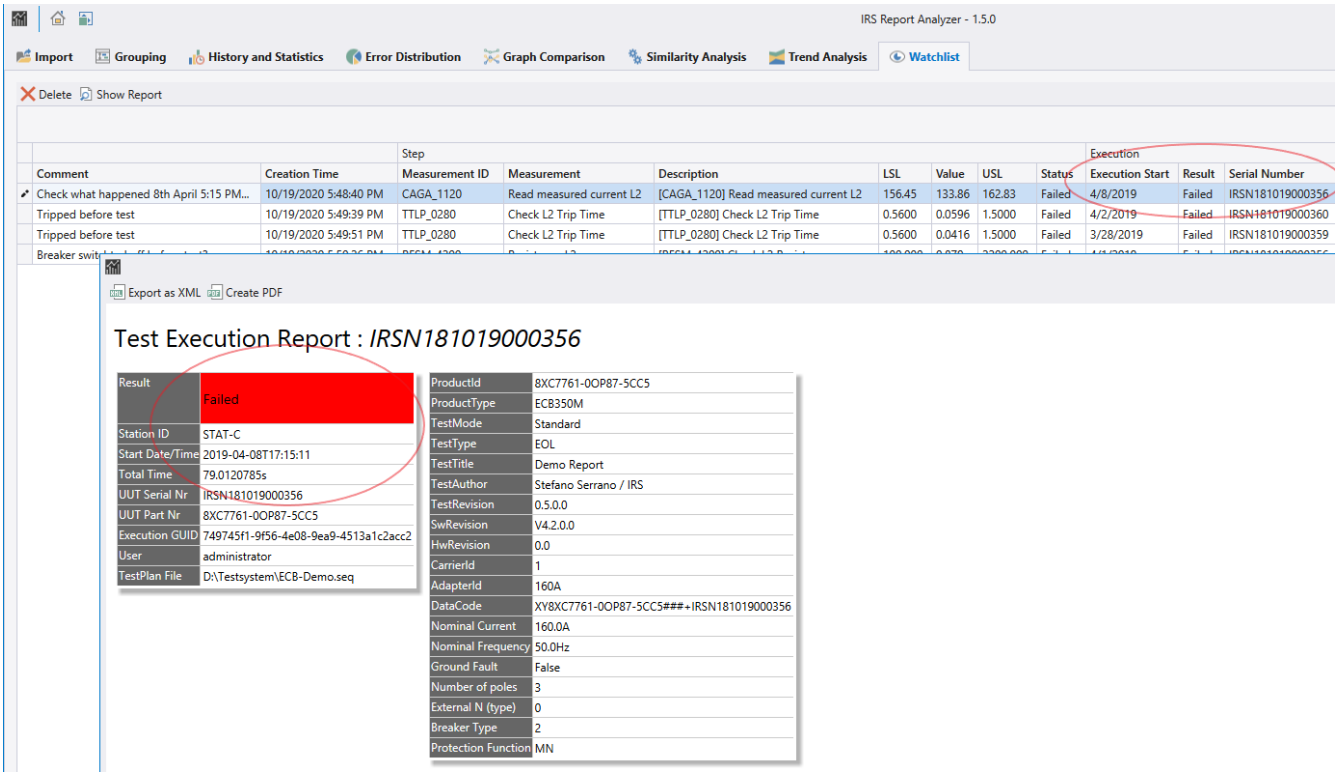
 © IRS Systementwicklung GmbH



2.15. Watchlist

- The watchlist lists all entries and comments added via the corresponding watch function, see for example the comment function in History Chart.
- The comments are saved as Data Set when you save the file
- A double click on an entry (or click on the button "Show Report") opens the corresponding test report.
- Click on "Delete" to delete the selected entry.

 © IRS Systementwicklung GmbH



 © IRS Systementwicklung GmbH