

*iQ Explorer II*  
**Data Analysis**

## Introduction

This document will explain how to use the Data Analysis features in the iQ Explorer II software package. It will include a detailed explanation of how to configure available settings as well as instructions on how to assemble Data Analysis charts with existing cycle data files.

## Purpose

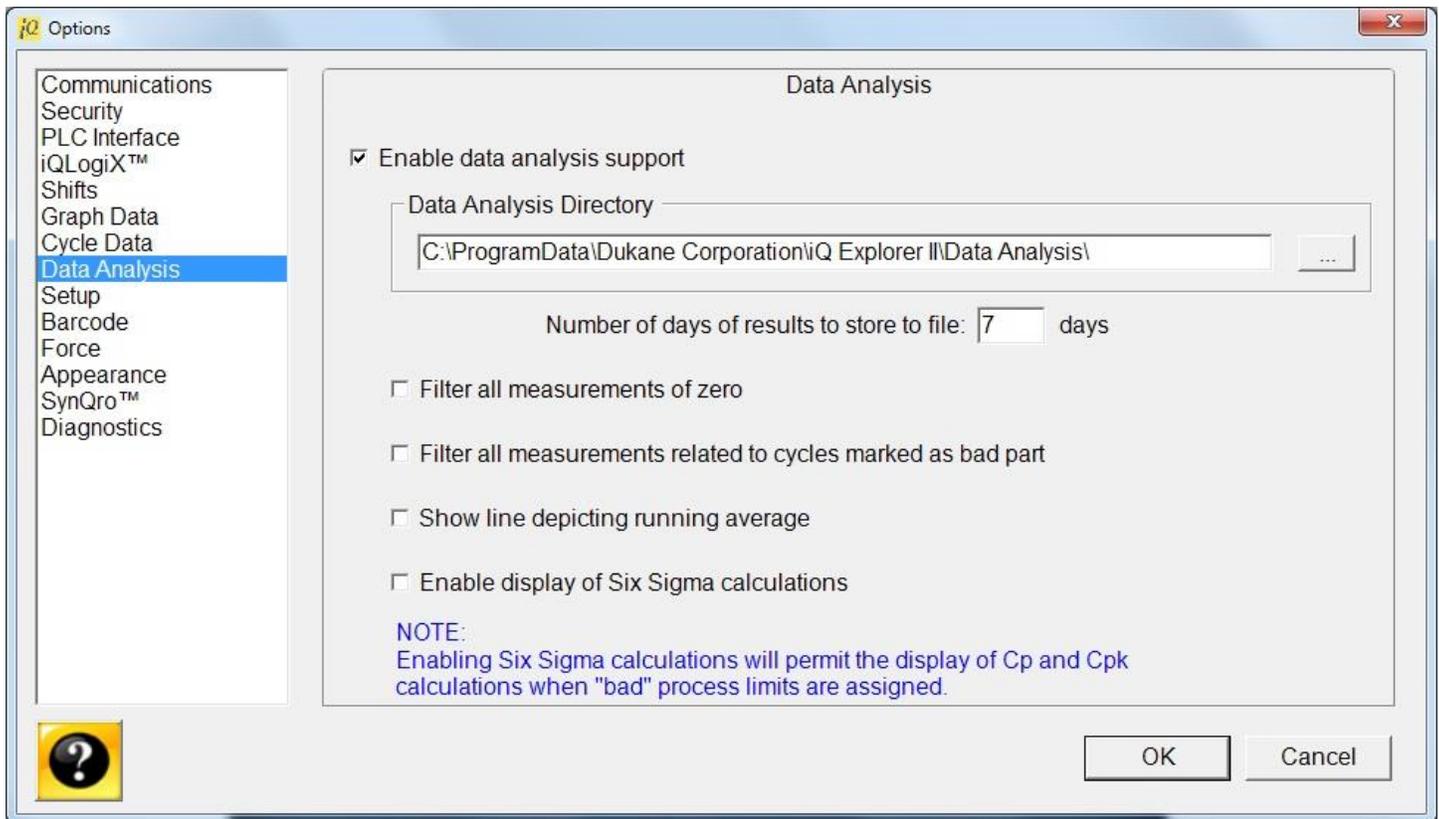
iQ Explorer II added Data Analysis support to provide the ability to aggregate and chart large quantities of cycle data results. In displaying this data, the user will be able to observe any changes of process both while parts are actively welded in production as well as the ability to view stored data for later analysis. The drifting of results over time or the variance of cycle data results from parts of different batches will be clearly visible. When coupled with properly defined process limits, this feature can also include the display of some basic Six Sigma calculations.

## Options Settings

Data Analysis is disabled by default. After the user enables this feature, a new tab will be added to an active welder connection labelled “Data Analysis”. Also, when cycle data files are opened from iQ Explorer II, the “Data Analysis” tab will be added so that the user may immediately view the set of results per process limit. Lastly, a “Data Analysis” dropdown menu will be added to the main menu, offering a set of file operations specific to Data Analysis files.

## Restrictions

Since “Data Analysis” works best with one setup on one welder, Dukane does not recommend enabling this feature if during production the setup name is changed frequently. This condition is more likely when Setup Control is driven by “Automation” or “iQ Sequence”. This feature works best in production when the setup name remains constant when welding batches of similar parts.



#### Explanation of features:

##### 1) *Data Analysis Directory*

Data analysis files are automatically saved to this directory. The extension associated with data analysis files is “\*.DAT”.

##### 2) *Number of days of results to store to file*

This is the maximum number of consecutive days of acquired cycle data files that are aggregated into a single data analysis file. The start time of the first cycle in the cycle data will be used as the start time for this counter. Once this day limit is met and the last record of cycle data is saved to its “\*.XML” file, any new cycle data will be stored to a new data analysis file.

The other triggers to start storing cycle data to a new data analysis file include: powering up the generator, resetting part count to 1, and executing welds from a recipe of a different setup name.

Data that have been accumulated in this feature are not committed to file until the termination of the connection to the welder or one of the previously mentioned triggers occur.

##### 3) *Filter all measurements of zero*

Since cycle data in some fields may result in zero when the cycle is incomplete (e.g. due to an alarm), this option is available to exclude results containing zero from all computations. The intent is to prevent severe skewing of results due to the occasional incomplete cycle. When filtered, the measurement will not be plotted, and a gap will be in its place.

##### 4) *Filter all measurements related to cycles marked as bad part*

When bad process limits are specified, there will be times when cycle data may report a bad part. When a bad part is detected during the cycle, the weld is aborted, and the head is moved immediately to top of stroke. Fields contained within a cycle data record from such a cycle may contain acceptable data if the measurements occurred before the alarm. Any measurements after the alarm will likely be considered

unacceptable. If this filter is enabled, the measurements for all fields of this cycle data will be excluded from the chart and subsequent calculations. A gap will remain in the chart in its place.

5) *Show line depicting running average*

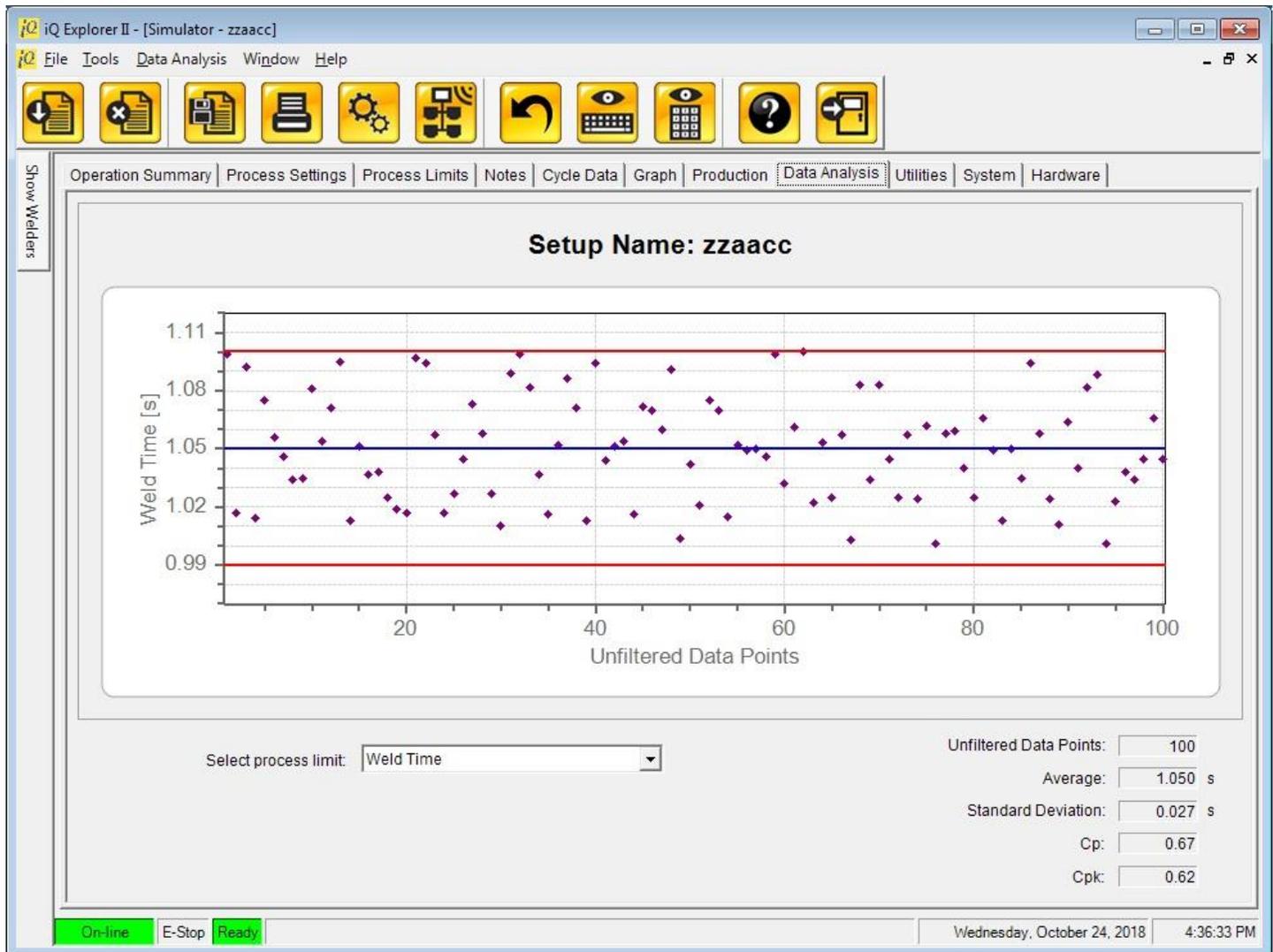
This feature will illustrate the average of the measurements displayed in the plotted chart.

6) *Enable display of Six Sigma calculations*

This feature will display the Cp and Cpk calculations for the measurements displayed in the plotted chart. Note that, by definition, Cp and Cpk calculations require specified bad limits.

## Populating the Chart

Below is an example of a populated Data Analysis chart.



The setup name is always in the title.

The scatter plot contains the measurements in chronological order of the cycle data of the selected process limit.

X-Axis is an index to the cycle data results. This is NOT part count.

Y-Axis is in the units of the selected process limit.

The user may change the contents of the chart by changing the selected process limit from the dropdown list.

The blue line represents the computed average of the displayed measurements (excluding filtered results).

The red lines represent the user-specified upper bad limit and the lower bad limit.

Other data displayed include the number of unfiltered (or post-filtered) data points in the chart, the computed average, the computed standard deviation, and the Six Sigma Cp and Cpk computations.

Chart limits are calculated dynamically.

## **Data Analysis File Contents**

Data Analysis files are saved with a “\*.DAT” extension. The format of the stored cycle data in this type of file is compressed binary. This makes it possible for these files to contain extremely large quantities of cycle data while keeping the file size reasonable so that they can be saved and read in a timely basis. That being stated, if the user plans to store more than a million records of cycle data per “Data Analysis” file, understand that it will still take a significant amount of time to populate the chart with the stored data.

## **Manual Assembly of Data Analysis Files**

In iQ Explorer II, cycle data is primarily stored to file in XML format. By design, these files contain the user-defined process limits that can affect the stored data. The “Data Analysis” menu provides the means to combine cycle data results to help determine trends during production. The user may build a “Data Analysis” file by loading cycle data XML files that have been stored prior to the existence of the “Data Analysis” feature.

To build a “Data Analysis” file manually, follow the following steps:

- 1) From the “Data Analysis” menu, select “New”. This will create a window that will display an empty Data Analysis chart.
- 2) From the “Data Analysis” menu, select “Load Cycle Data...”. This will show a popup listing the XML files stored in the primary cycle data directory. Select one or more files that you would like to see populated in the chart. Remember that the files of cycle data must have been produced from the same welder and setup name for the data to be combined.
- 3) After loading the cycle data files, change the selection of the dropdown list labelled “Select process limit” to specify which set of results with which you would like to populate the chart.
- 4) The cycle data is stored in chronological order.

After aggregating cycle data, there exists the ability to save this composition to file. From the “Data Analysis” menu, select “Save As...” and a file in the “\*.DAT” format will be saved.

## **Automatic Archiving**

At the beginning of every month, iQ Explorer II archives all stored cycle data files, graph data files, and now data analysis files to their own compressed subdirectories. The purpose for this background action is to keep as much space on the hard drive available for future data to be stored.

Since “Data Analysis” may involve multiple days of storage before the file is closed, the archiving feature will not trigger until the last record of cycle data is stored to the “Data Analysis” file. Normally, archiving of data files triggers on the first day of the month.

**Dukane IAS, LLC**  
**Intelligent Assembly Solutions**

2900 Dukane Drive  
St. Charles, IL 60174 USA  
Tel: (630) 797-4900  
Fax: (630) 797-4949

<http://www.dukane.com>

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