

### **What are Reasonable Limits and how are they used in WinSPC?**

#### Introduction

In addition to standard SPC limits such as Specifications Limits/Engineering Limits and Control Limits, WinSPC includes a set of limits that serves a different purpose. Reasonable Limits offer remedies to a variety of scenarios that are occasionally problematic -- in particular, two scenarios relating to data collection and one related to histograms.

#### Understanding Reasonable Limits

Reasonable Limits are values that mark the boundary between data that is reasonably possible (reasonable data) versus data you can't realistically expect to collect (unreasonable data). Values that fall outside of Reasonable Limits are considered to be erroneous outliers that are so far beyond data you would expect in actual production. That data serves no purpose, and to record that value would be statistically irrelevant. These unreasonable values are commonly attributable to data-entry errors -- pressing 9 on a keyboard instead of 0, for instance, or neglecting to enter in a decimal (.) in the proper location. Reasonable Limits are always wider than Specification Limits and Control Limits. In WinSPC, Reasonable Limits are primarily used to:

Detect and reject unreasonable data  
Route ambiguous data from a device  
Manipulate the default amount of blank space on a histogram

#### Reasonable Limits in a Fresh Installation of WinSPC

In a clean installation of WinSPC, Reasonable Limits are enforced, by default, via the Standard Template that includes a Reject Trigger on the 'Outside Reasonable Limits' Sample Level Test.

NOTE: You can't edit or delete the 'Standard Template', but you can unlink/unapply the Standard Template to effectively deactivate it.

#### Using Reasonable Limits to Detect and Reject Unreasonable Values

To preclude the complications and false alarms that unreasonable values can prompt, many operations automatically test incoming data against reasonable limits and block values found to be unreasonable from entering the WinSPC database. Following is one procedure to do this in WinSPC:

In the "Administrator" window, double-click the collection plan that contains or will contain the collection plan step for which you would like values tested against reasonable limits. Create the desired collection plan step, if it has not already been created. With the desired step selected, click the "Characteristic Tests" button. In the "Test Selection" dialog that is displayed, under "Sample Level Tests", select "Out of reasonable limits" if it does not already have a green check beside it. (If it has a green check beside it, the test is already enabled. In this case go to step 6 below.) Click the "Enable Test" button at the top of the prompt. With the test selected, click the "Add Trigger" button in the top right of the prompt. In the "Trigger Setup" prompt that appears, at "Trigger Type", select "Reject". Click the "OK" button at the "Trigger Setup" prompt. Click the "OK" button at the "Test Selection" prompt.

Once the collection plan step is set up in this manner, any value that exceeds the reasonable limits will be rejected. If desired, additional triggers can be associated with the Out-of-reasonable limits test to cause other events to automatically occur, for example notifying users of the rejection.

## Using Reasonable Limits to Route Ambiguous Data from a Device

Sometimes the collection plan step to which a reading should be routed is ambiguous when collecting data from an external data source. Under certain circumstances, this ambiguity can be resolved with reasonable limits. For a full explanation of using Reasonable Limits to route ambiguous data from a Device, see the following in our Tips - Tricks section of the Knowledgebase:

<https://knowledgebase.winspc.com/questions/329/>

## Using Reasonable Limits to Manipulate the Amount of Blank Space on a Histogram (Histogram X-Axis Scaling)

In WinSPC's Data Collection mode the visible area of a histogram is bounded by the lower reasonable limit on the left and the upper reasonable limit on the right. In some cases, this results in too much or too little blank space preceding the first histogram bar and following the last histogram bar. To increase this blank space, the reasonable limits of the histogram variable can be widened. Similarly, to decrease this blank space, the reasonable limits of the histogram variable can be tightened.

NOTE: While Reasonable Limits still act as the default X-Axis scaling, in WinSPC's Variable Analyzer, Dashboards and Report Templates, you can select other limits to manipulate the amount of blank space on a histogram using Chart Schemes. For more on this feature, please reference the following Knowledgebase article: <https://knowledgebase.winspc.com/questions/309/>

### Default Reasonable Limits

All Variables have Reasonable Limits.

The default upper reasonable limit is 50% of the difference between the upper specification limit and the target value added to the upper specification limit. In mathematical terms this is:  $USL + 0.5(USL - \text{Target Value})$  The default lower reasonable limit is 50% of the difference between the lower specification limit and the target value subtracted from the lower specification limit. In mathematical terms this is:  $LSL - 0.5(\text{Target Value} - LSL)$  The default Upper Reasonable Limit is 50% of the difference between the Upper Specification Limit and the Target value added to the Upper Specification Limit. In mathematical terms this is:  $USL + 0.5(USL - \text{Target Value})$  The default Lower Reasonable Limit is 50% of the difference between the Lower Specification Limit and the Target value subtracted from the Lower Specification Limit. In mathematical terms this is:  $LSL - 0.5(\text{Target Value} - LSL)$

### Specifying Custom Reasonable Limits

For instructions on specifying Reasonable Limits for a variable, go to the WinSPC Help System ab under the 'Contents' tab see "Setting Up WinSPC" &rarr; "Setting Up Parts Or Processes" &rarr; "Setting Up Variables" &rarr; "Setting Up Variable Specifications (Advanced)".

<https://knowledgebase.winspc.com/questions/184/>