

## Custom Particle Parameters

### INTRODUCTION

The Lumetics LINK™ software platform scans network locations for new measurement data files, copies data directly to a centralized database, and provides a powerful user interface for rapid multi-measurement multi-technique data aggregation, visualization, analysis, and reporting. LINK employs a client/server-based architecture where the LINK server hardware is provided by the end user and resides on the end user's network. The LINK client is a portable web-based application that may be placed on any computer with network connectivity to the LINK server. For successful import, the LINK webserver requires read access to the folders where user data resides.

Custom Particle Parameters are user-defined parameters calculated for each particle detected by particle counting techniques when included in an import method. The parameter may be a mathematical function of exiting measured particle attributes (e.g. particle mass expressed as a function of particle diameter assuming particle volume and density). LINK will then calculate the particle count or concentration as a function of this new parameter and import as an additional xy raw data set for that measurement. Once created for a given Instrument, the particle count and concentration as a function of this new parameter, will be calculated automatically for all future measurement imports when the CPP is included in the import method.

### DETAILS

For instruments such as particle imaging systems, particles are binned using an import bin resolution value. This resolution may result in line charts with many empty bins (zero values). For these instruments, a Chart Resolution value can be configured that is different from the Import resolution. This can be configured for each x-axis particle parameter by navigating to the main LINK screen under Settings (gear icon) then LINK Configuration and selecting the instrument and parameter you wish to change the Chart Resolution for the Line Chart.

If utilizing a CPP calculation for a y-axis parameter on a Histogram vs. particle size, the CPP total/average/stdev for all the particles will import at the appropriate bin resolution for that specific instrument. When plotting a single measurement CPP (calc type = Total) on the y-axis of a histogram, the result will be the sum of the CPP values for each constituent import resolution bin. However, if plotting a CPP (calc type = Average) or CPP (calc type = STDEV), the result will be a weighted average of the constituent bins (based on the particle count in each of those bins).

The other type of CPP binning at import will be particle count/concentration vs. CPP bin, where the CPP bins are those that are specified in its definition (i.e. the start/stop/step). These bins are used when selecting the CPP as the x-axis for the histogram and count/concentration for the y-axis.

**New Custom Particle Parameter:** create a new Custom Particle Parameter.

**View Custom Particle Parameter:** view the definition of an existing Custom Particle Parameter.

**Delete Custom Particle Parameter:** delete a Custom Particle Parameter.

**Manage Custom Particle Parameters**

**New Custom Particle Parameter**

Custom Particle Parameters can be created using existing morphological parameters. Note this feature is only available for certain instruments.

**View Custom Particle Parameter**

**Delete Custom Particle Parameter**

Deleting a Custom Particle Parameter removes the parameter from all Projects. Import Methods that reference this parameter must be modified to operate properly. This operation cannot be undone.

## Create Custom Particle Parameter

A particle parameter is a measured characteristic of a particle such as its size, circularity, aspect ratio, length, intensity, etc. A Custom Particle Parameter is based on mathematical combinations of existing particle parameters. A value is calculated for each particle detected by a given particle counting technique. An example Custom Particle Parameter might be Particle Mass, or Sfactor.

Custom Particle Parameters defined here will be calculated automatically on import, for all imports performed after the parameter is created.

<b>Name</b> <input type="text"/>	<b>Instrument</b> <input type="text" value="Select an instrument."/>	
<small>Internal Name:</small>		
<b>Formula/Expression</b> <input type="text"/>	<b>Available Morphological Parameters</b> <input type="text" value="Select from list, and click '+' to add to Formula"/>	
<b>Parameter Range/Resolution</b> <small>Upon specifying a Parameter Range/Resolution for the defined Custom Particle Parameter, the particle count/concentration for each Custom Particle Parameter 'bin' will be determined and stored in the LINKdb. This information can then be used in a Histogram Dashboard to generate a Custom Particle Parameter frequency distribution. E.g. Particle count/concentration vs. Particle Mass.</small>		
<b>Start</b> <input type="text"/>	<b>Stop</b> <input type="text"/>	<b>Step</b> <input type="text"/>
<b>Custom Parameters vs Particle Diameter</b> <small>LINK will also calculate values of the Custom Particle Parameter over specified size ranges. These calculation types may be an Average, Total, or Standard Deviation. They are calculated at the native resolution of the particle counting technique (e.g. 0.25um for MFI). This information can then be used to produce Custom Particle Parameter vs. Particle Size distributions, or produce Computed LINKdb fields/Raw Data Calculations such as Total Mass of particles 2-10um.</small>		
<b>Calculation Type</b> <input type="text" value="Average"/>	<small><b>Average:</b> Calculates the average of the parameter values for the particles in each available size bin <b>Total:</b> Calculates the sum of the parameter values for each particle in each available particle size bin <b>Standard Deviation:</b> Calculates the standard deviation of the parameter values for the particles in each available size bin</small>	
<input type="button" value="Cancel"/>	<input type="button" value="Save"/>	

**Name:** assign a name for the new parameter.

**Instrument:** select the Instrument for which the parameter will be calculated on all future imports.

**Formula/Expression:** Define a formula that is a mathematical function of existing particle counter morphological parameters. Identify the correct syntax by selecting it in the pull-down list and using the + to add it to the formula bar. Valid formulas can contain:

- Standard mathematical operators + - / \*
- Constants: e.g. (AspectRatio + 10) / 5
- The following mathematical functions (Based on MariaDB/MySQL database engine):

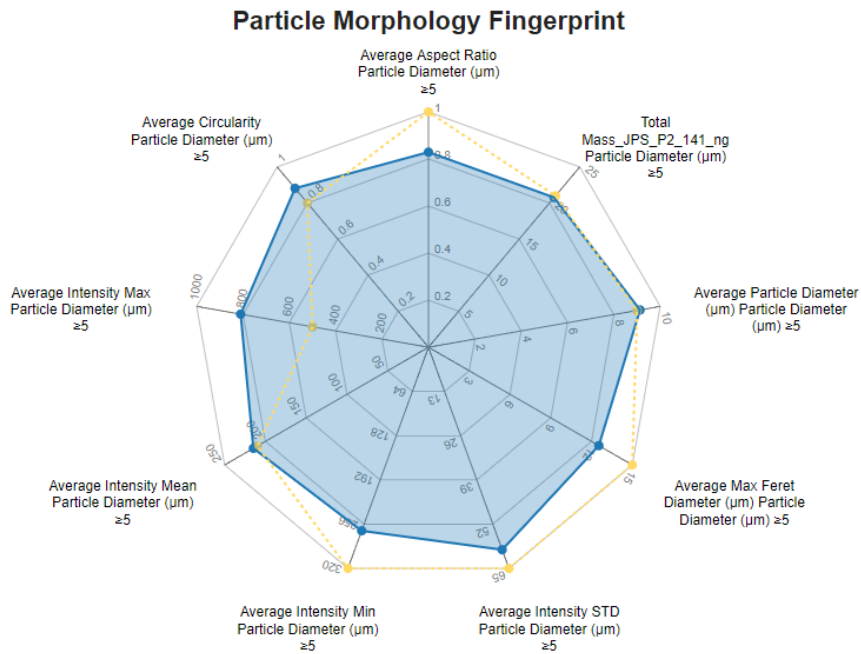
ABS()	ACOS()	ASIN()	ATAN2(), ATAN()
CEIL()	CEILING()	CONV()	COS()
COT()	CRC32()	DEGREES()	EXP()
FLOOR()	LN()	LOG10()	LOG2()
LOG()	MOD()	PI()	POW()
POWER()	RADIAN()	RAND()	ROUND()
SIGN()	SIN()	SQRT()	TAN()
TRUNCATED()			

**Parameter Range:** define the 'bins' over which particle count and particle concentration will be calculated. Determine the expected range for the new parameter, and select a **Start**, **Stop**, and **Step** such that the number of resultant bins will be less than 10,000.

**Calculation Type:** when requesting LINK to calculate the new parameter over a specified Particle Diameter range, select the type of calculation that should be applied; weighted **Average** (default) based on the particle count in the specified size range, or the **Total** (sum) considering the number of particles in the specified size range.

**EXAMPLE**

Included below is a sample Radar Chart type dashboard from multiple particle counter measurement files



Tabular Summaries – Measurement Summary Table

Sample Name	Total Mass_JPS_P1_141_ng (Particle Diam. (µm) >=5) - AVG	Total Mass_JPS_P2_141_ng (Particle Diam. (µm) >=5) - AVG	Total Mass_Spher_14_1_ng (Particle Diam. (µm) >=5) - AVG	Average Circularity (Particle Diam. (µm) >=5) - AVG	Average Particle Diameter (µm) (Particle Diam. (µm) >=5) - AVG	Average AspectRatio (Particle Diam. (µm) >=5) - AVG	Average MaxFeretDiameter (Particle Diam. (µm) >=5) - AVG	Average IntensitySTD (Particle Diam. (µm) >=5) - AVG	Average IntensityMin (Particle Diam. (µm) >=5) - AVG	Average IntensityMean (Particle Diam. (µm) >=5) - AVG	Average IntensityMax (Particle Diam. (µm) >=5) - AVG
Sample 1	0.00	13.66	0.00	0.85	8.37	0.69	11.62	178.96	226.74	584.83	809.80
Sample 1	0.00	104.49	0.00	0.65	11.15	0.49	31.24	117.35	424.82	651.47	811.62
Sample 1	0.00	29.37	0.00	0.83	9.76	0.69	13.94	177.05	237.57	578.36	808.97
Sample 1	0.00	11.89	0.00	0.83	9.28	0.70	12.59	168.05	259.94	593.12	811.40
Sample 2	0.00	40.68	0.00	0.84	10.19	0.72	13.05	198.44	175.94	554.37	810.95
Sample 2	0.00	49.10	0.00	0.77	10.27	0.62	15.41	151.59	307.94	607.74	810.64
Sample 2	0.00	0.00	0.00	0.85	8.37	0.69	11.62	178.96	226.74	584.83	809.80

**CONTACT LUMETICS**

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