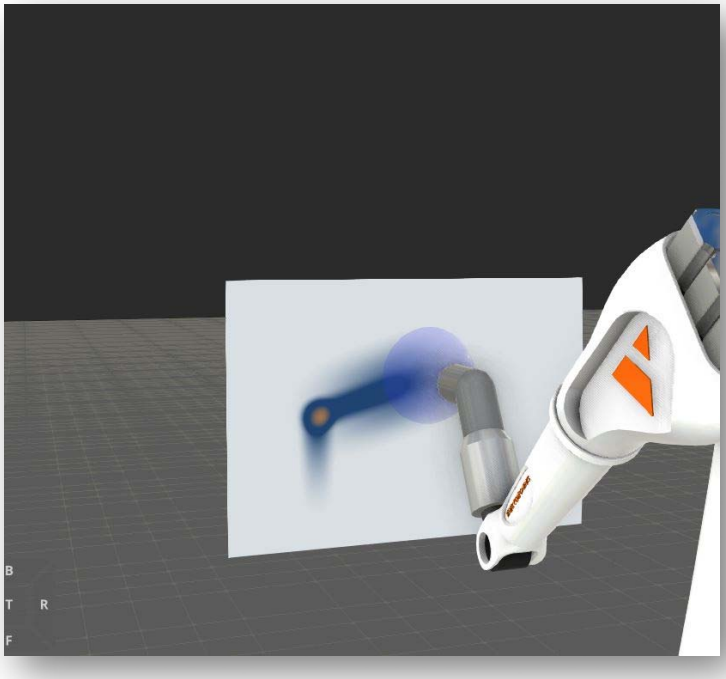
Paint Feature

Visual Components Premium 4.2 | Version: April 29, 2020



This tutorial will introduce the paint feature, PaintGun -component, and mathematics used in paint calculations. This tutorial requires basic knowledge from Visual Components UI and robotics.

In this tutorial, you will go through:

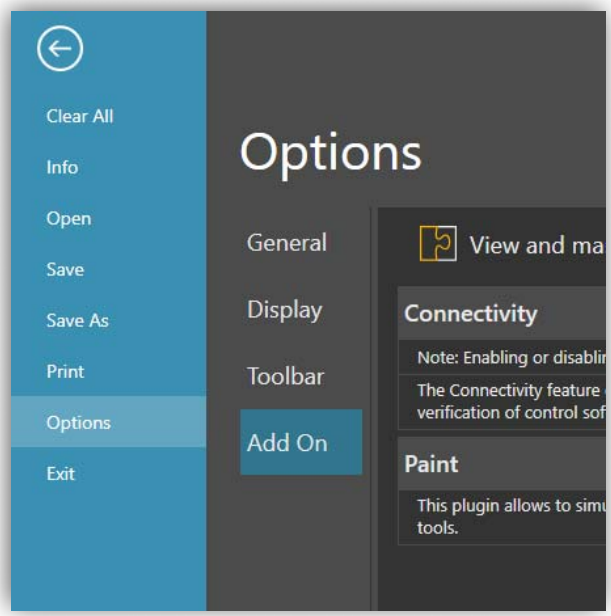
- Quick setup tutorial
- Distribution Paintgun properties
- Theory

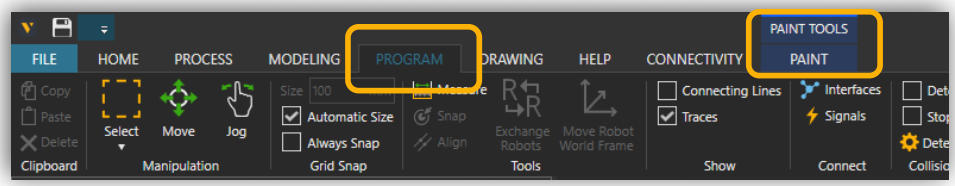
Support
support@visualcomponents.com
Visual Components Forum
forum.visualcomponents.com

Quick setup

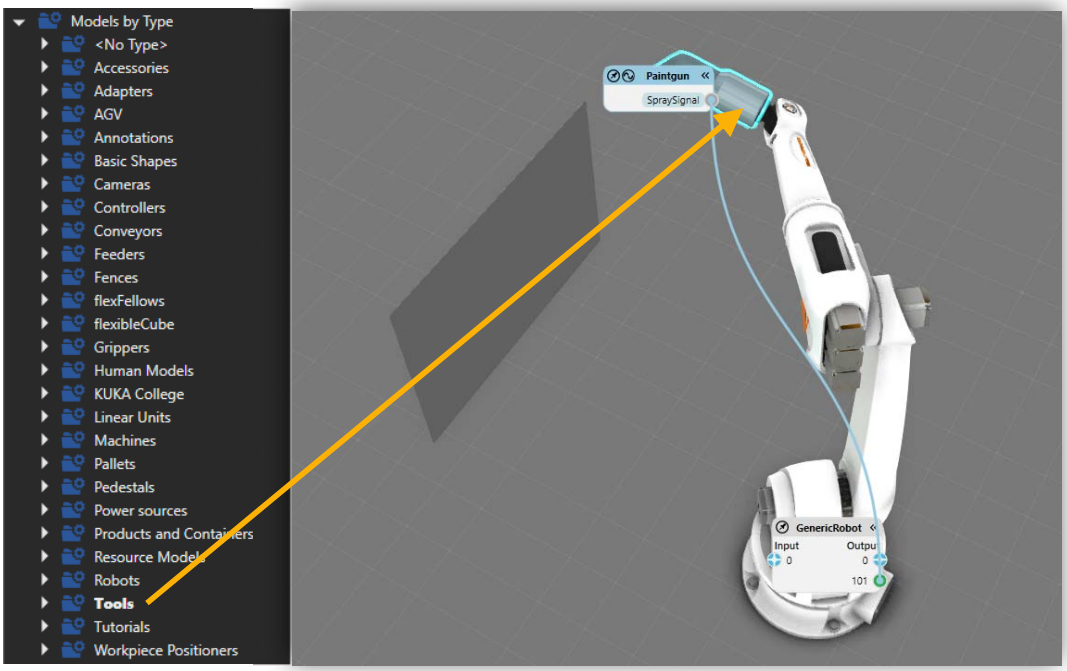
Please note that the paint feature requires the Visual Components Premium version.

Enable Paint addon on the backstage

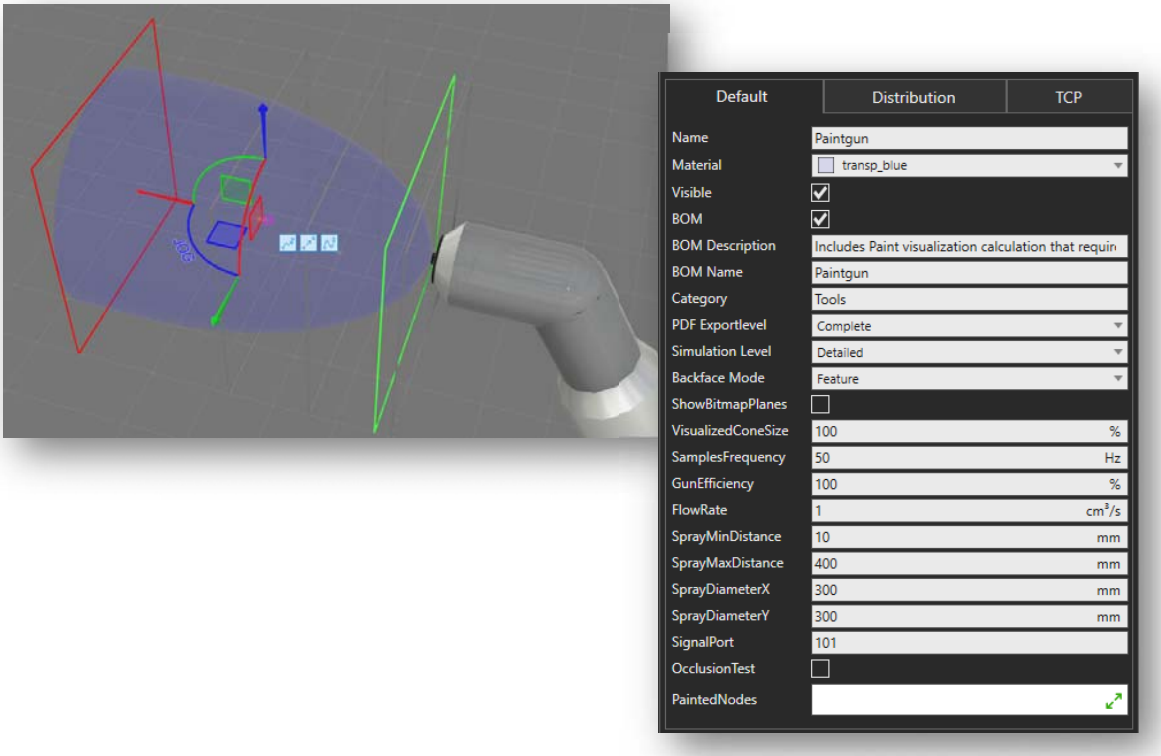




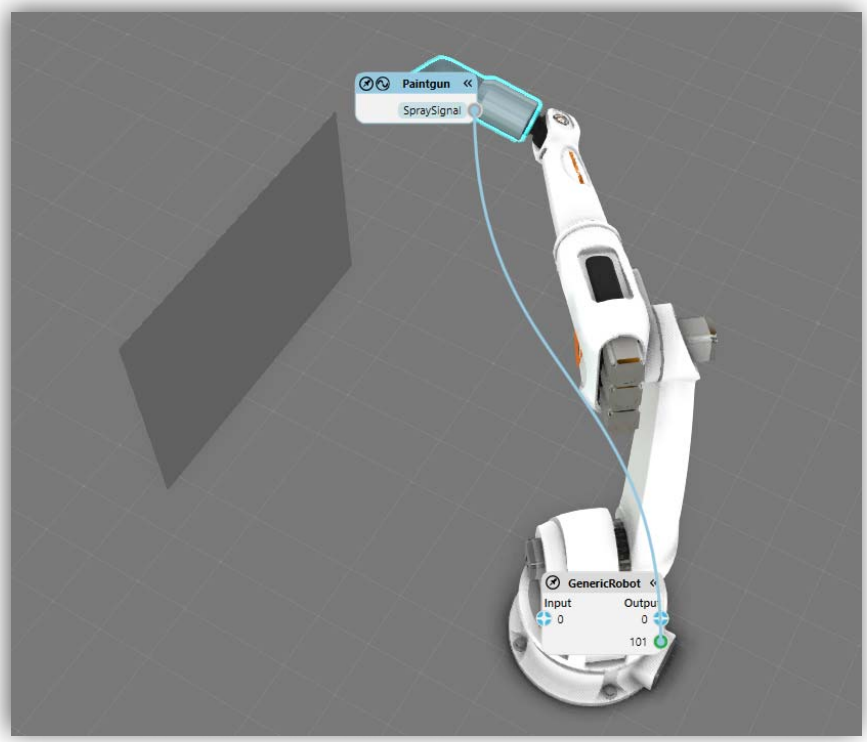
Requires a specific end effector



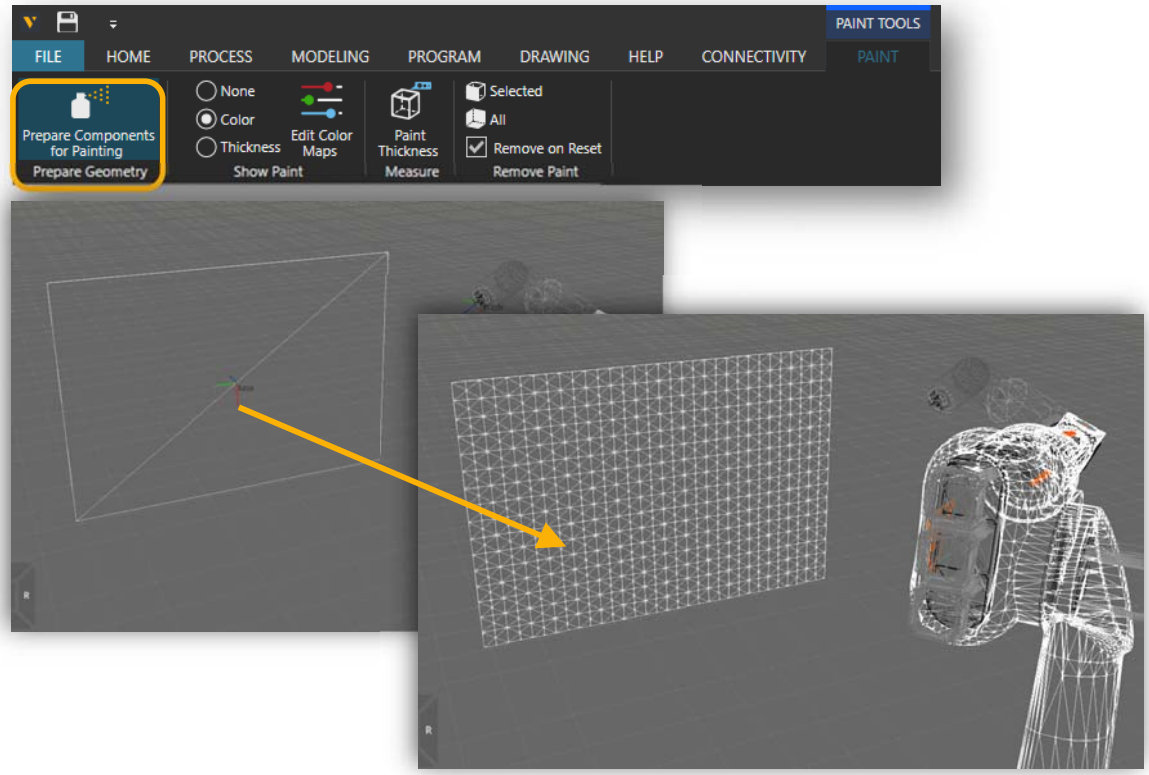
Part of the functionality is implemented in the end effector properties



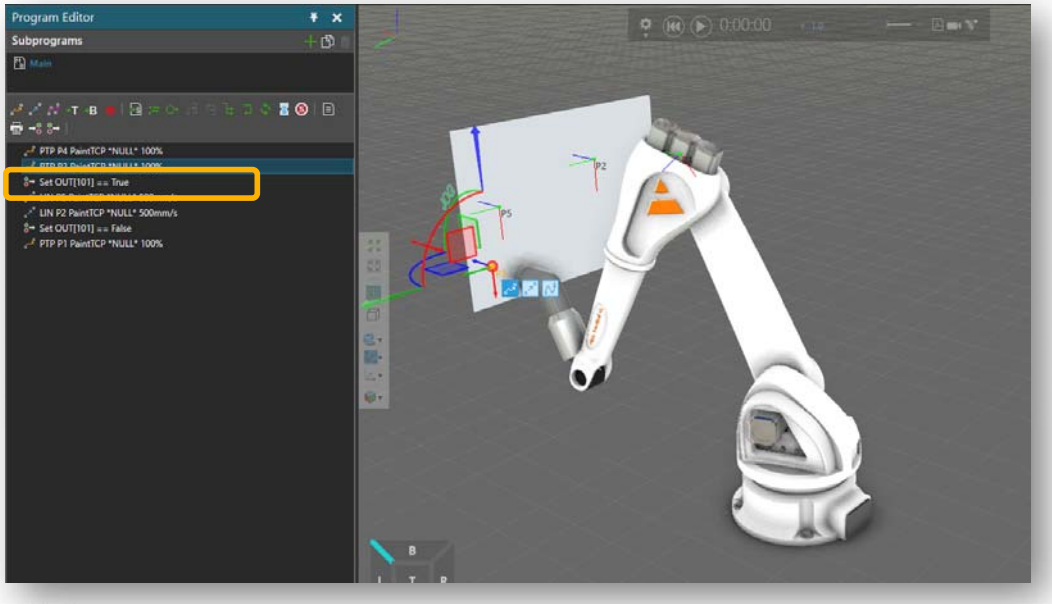
Connect end effector component to the robot and connect signals (if not done automatically)



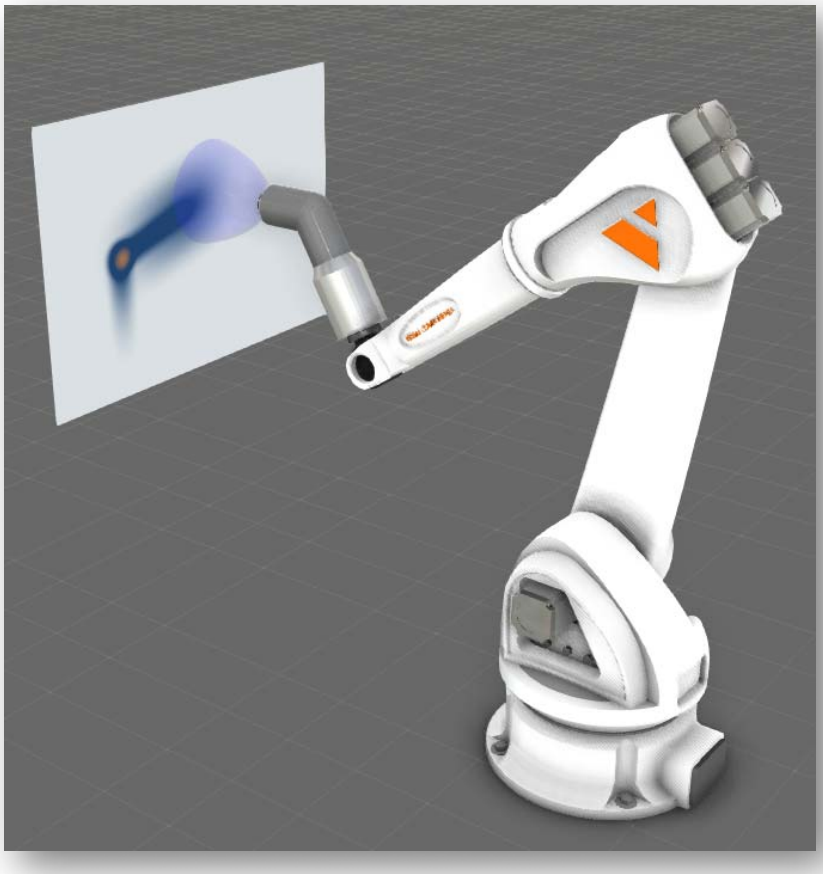
Prepare component(s) for painting



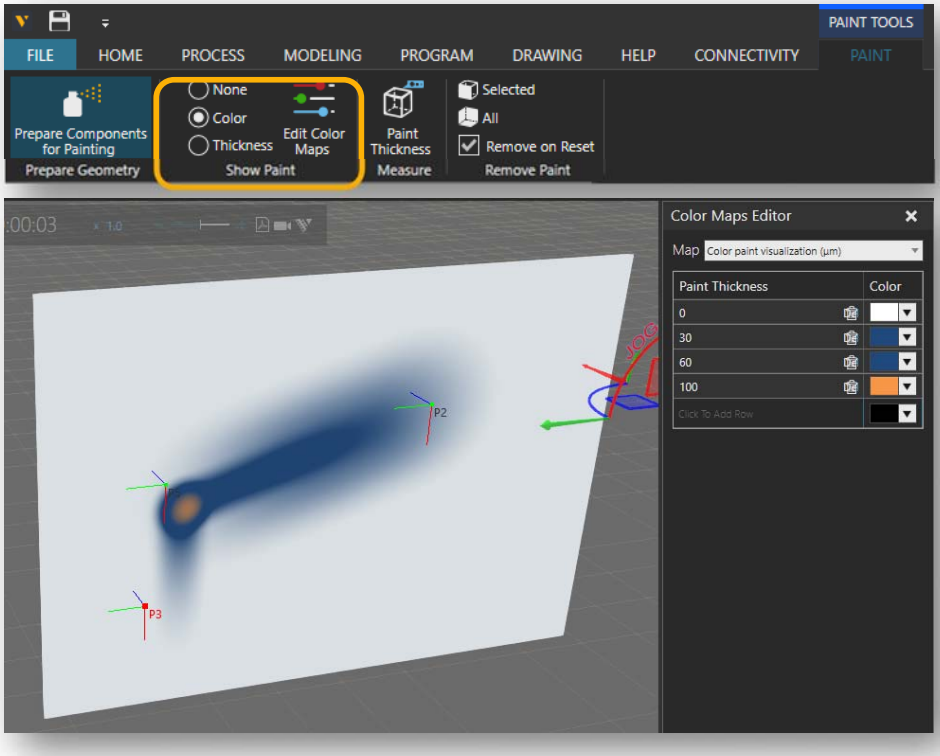
Create a robot program and set connected binary IO to turn end effector on/off



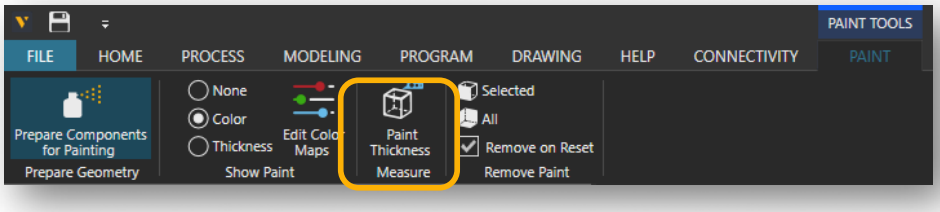
Run simulation

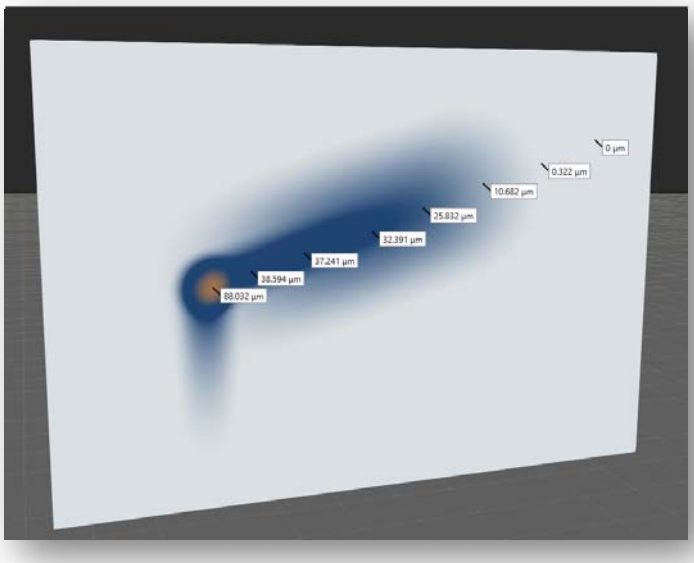


Use Show Paint properties to visualize paint thickness



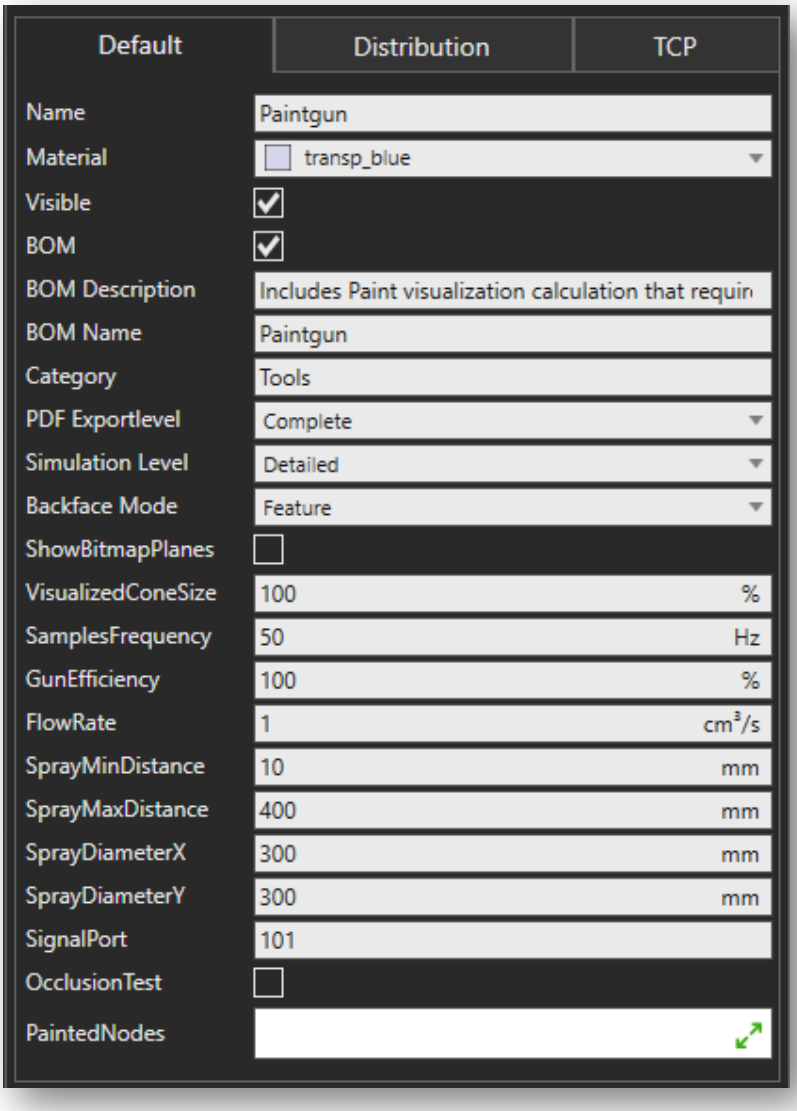
Use Paint Thickness tool to measure paint thickness





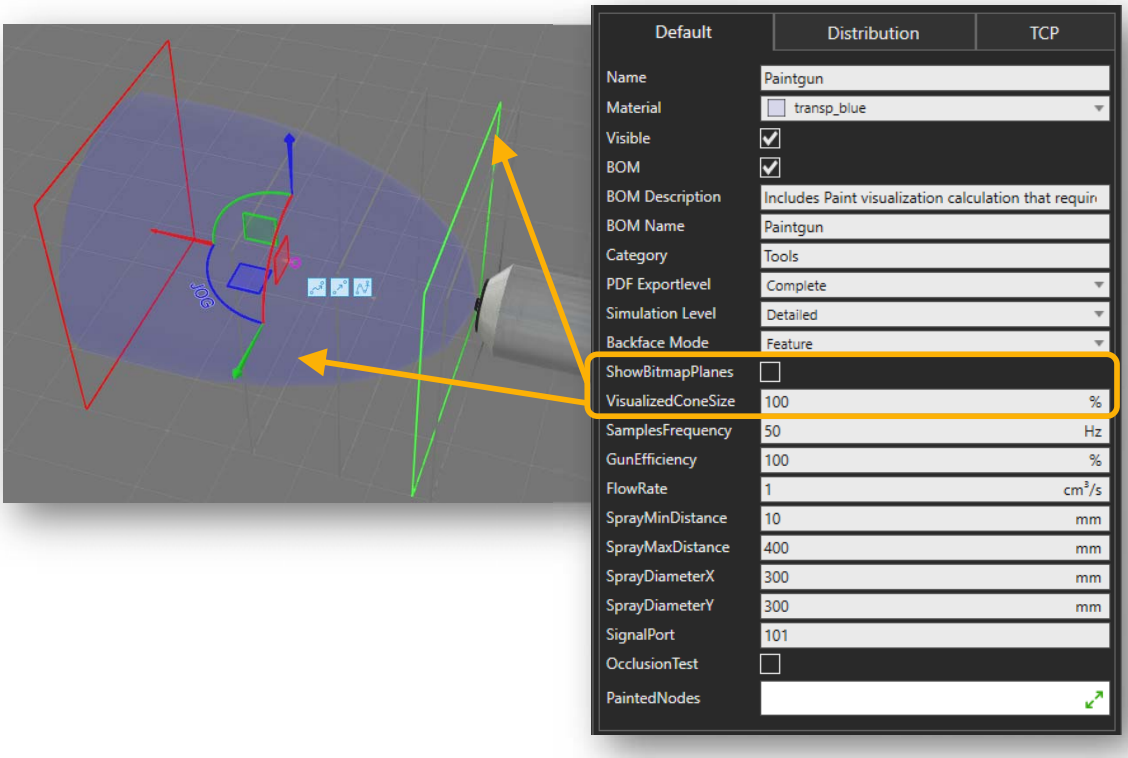
Distribution Paintgun properties

Paint flow and distribution properties can be found in the paint gun

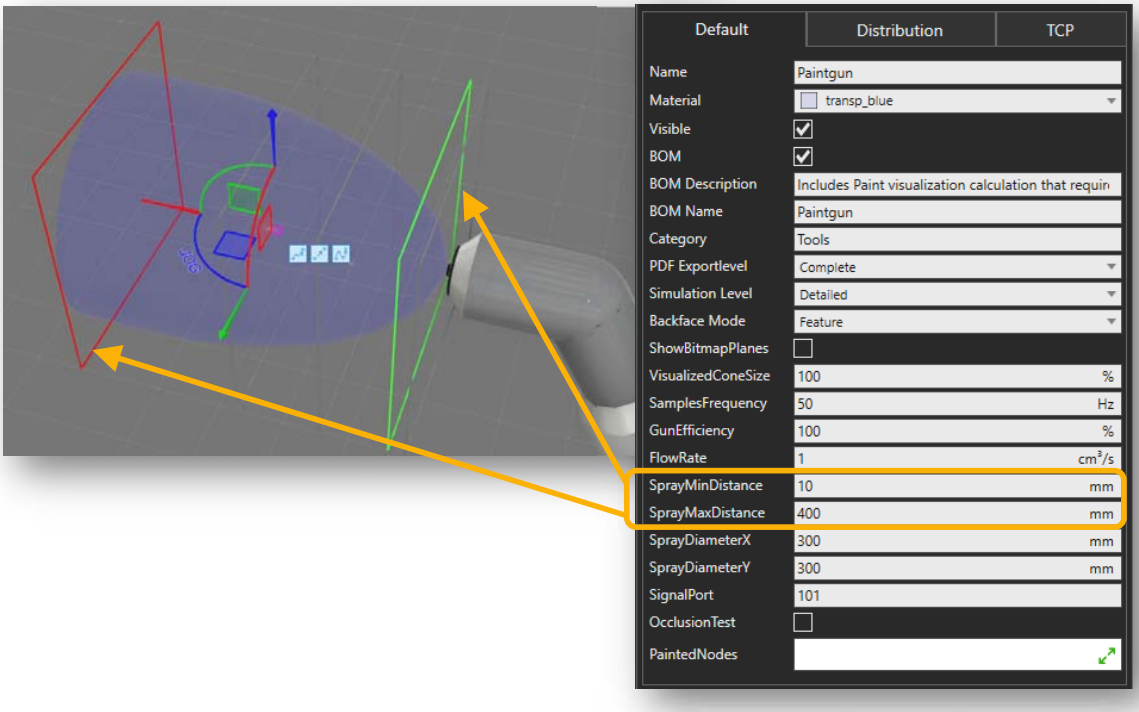


ShowBitmapPlanes toggles Distribution map distance visualization planes

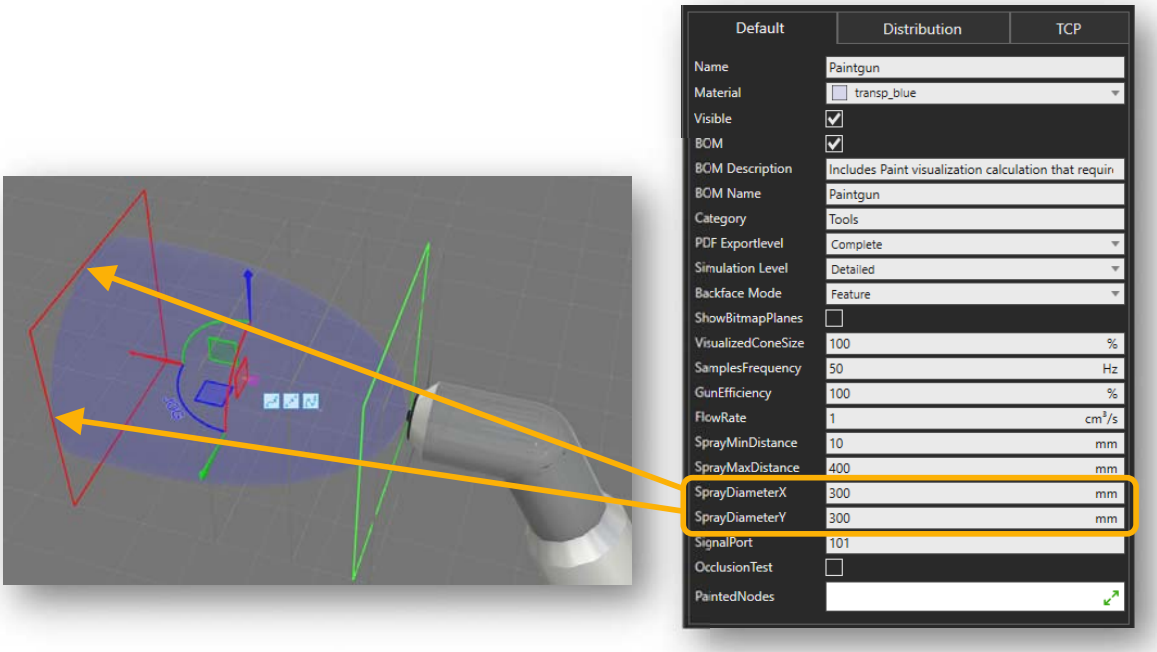
VisualizedConeSize scales paint cone visualization



Spray Min and Max distance defines the minimum painting distance and the range of the paint gun



Spray diameter properties adjust the paint ellipse diameters

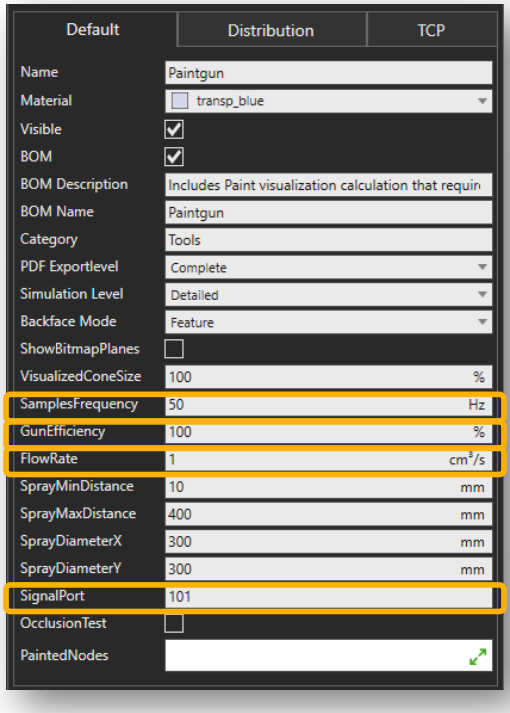


SamplesFrequency defines the paint distribution calculation frequency (calculation cycles per second). A higher value produces more detailed paint distribution at the cost of performance

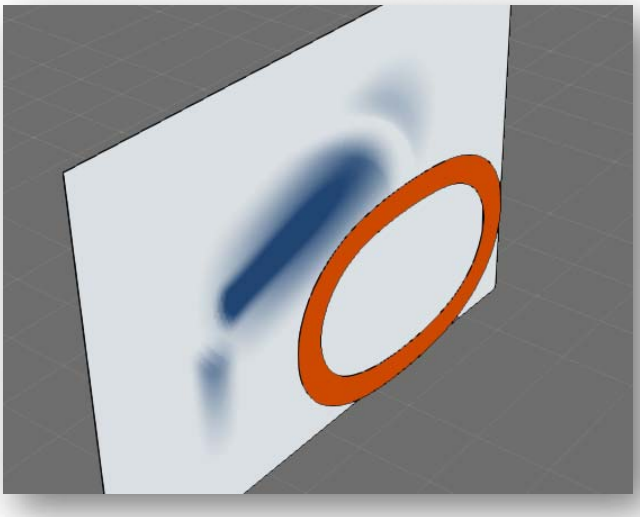
GunEfficiency is the efficiency factor for the overall paint flow

Flowrate defines the volume of paint distributed to surface per second

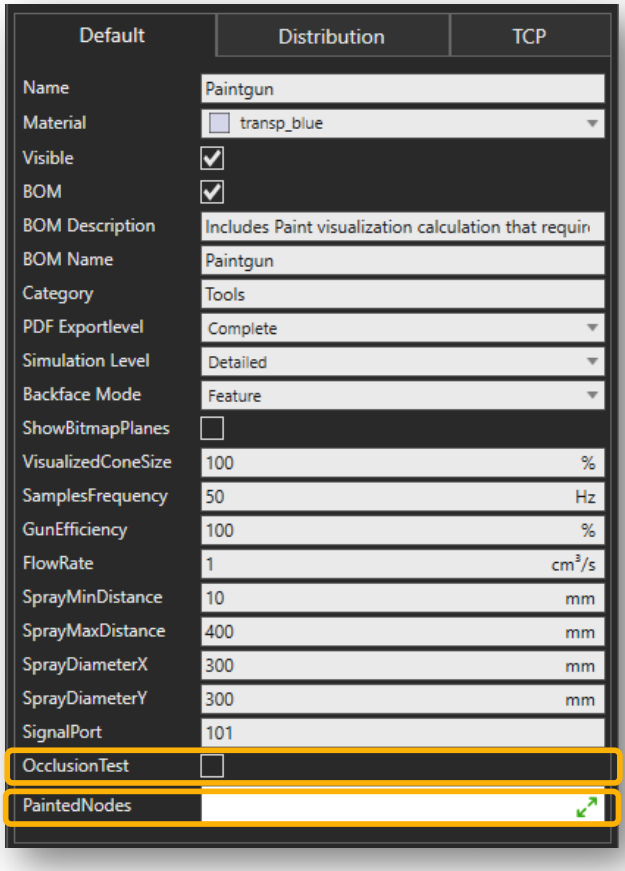
SignalPort defines the port number that component is automatically using when connected to the robot.

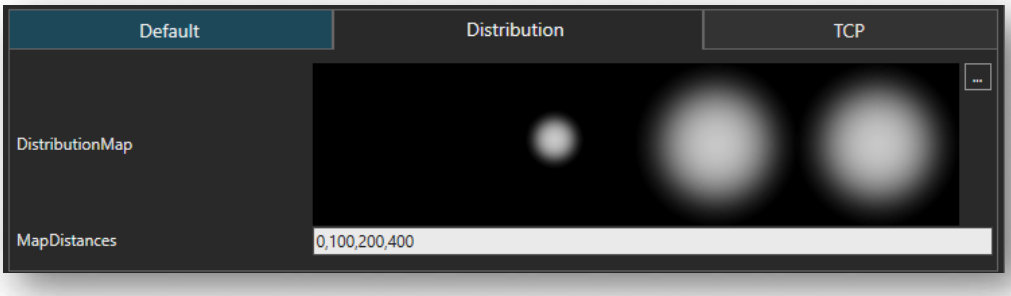


OcclusionTest enables raytracing method to detect is the painted area occluded by some other component



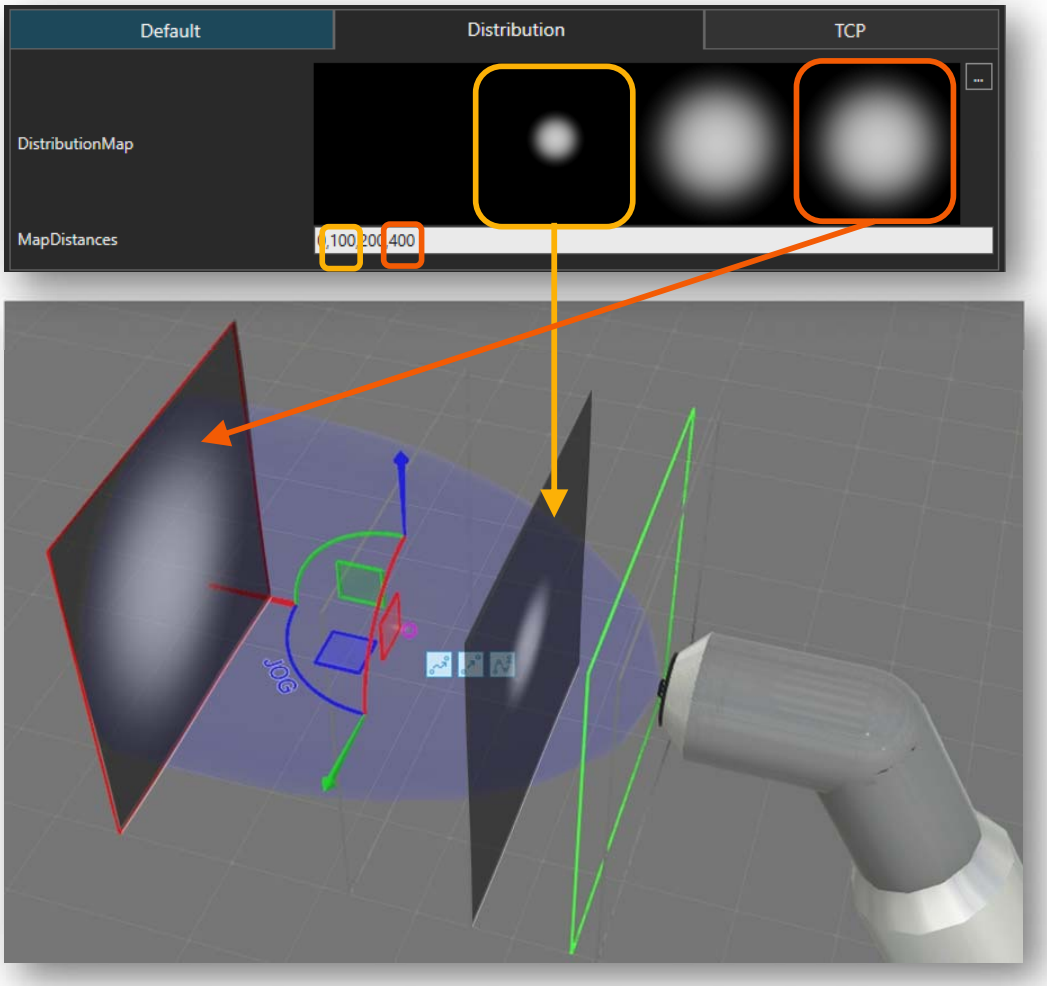
PaintedNodes can be used to define beforehand which (prepared) nodes are affected by the paint gun.



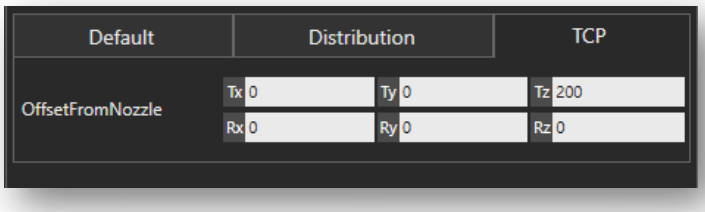


DistributionMap is used to define the distribution of paint in different distances from paint gun's nozzle using a bitmap. The distribution between **MapDistances** is blended.

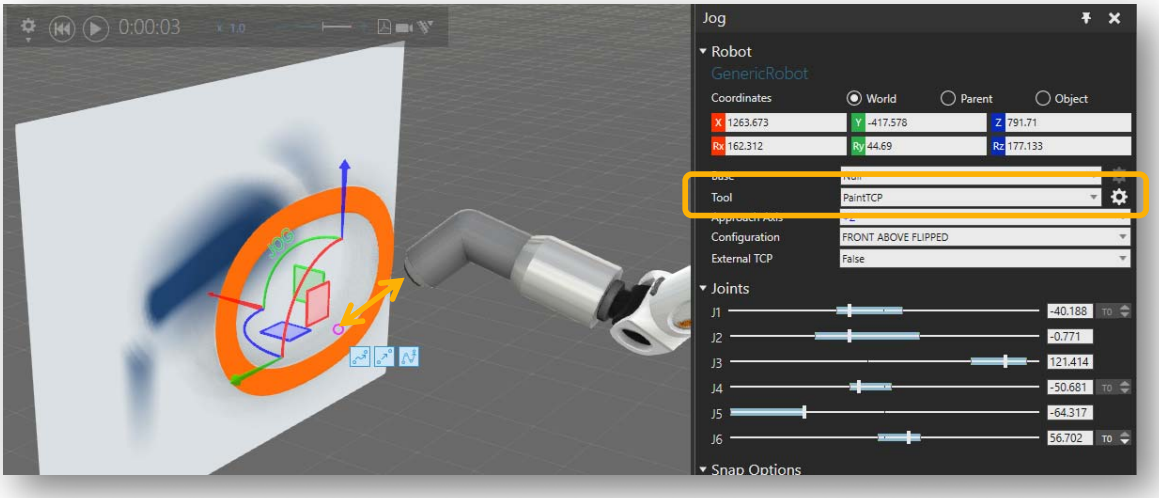
If the distribution map is a single image, same distribution is used regardless the distance of surface from the paint gun's nozzle.



Distribution map is .jpg file with size of Width = n x Height where n in number of layers / map distances.



OffsetFromTheNozzle defines the offset of the TCP point when teaching.



Theory

Every second when paint gun is enabled, there is defined volume of paint per second that can be distributed into surface:

Volume = FlowRate x GunEfficiency

*Volume = 1 cm3/s * 100%*

Volume = 1 cm3/s

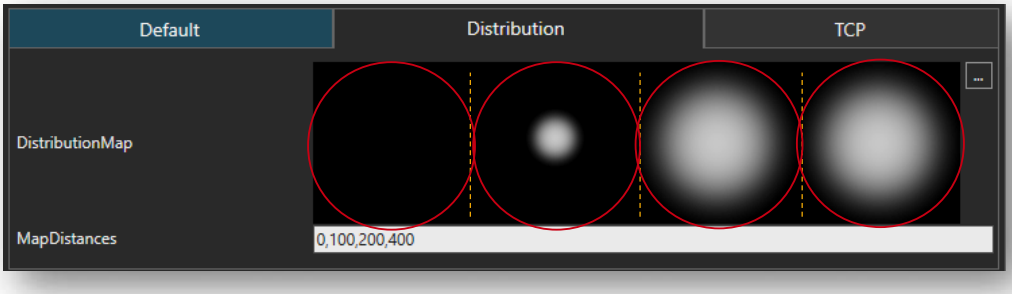
This volume is distributed into an area of paint gun's cone

*Area = (SprayDiameterX * 0.5) * (SprayDiameterY * 0.5) * pii*

*Area = (300 * 0.5) * (300 * 0.5) * pii*

Area = 70 685,83 mm2 = 70 6,86 cm2

Because paint gun is using ellipse as painting area, distribution map paint density (white) should be inside circular area (red)



If the distribution map is full White, then paint thickness distributed to the surface should be:

Thickness = Volume / Area

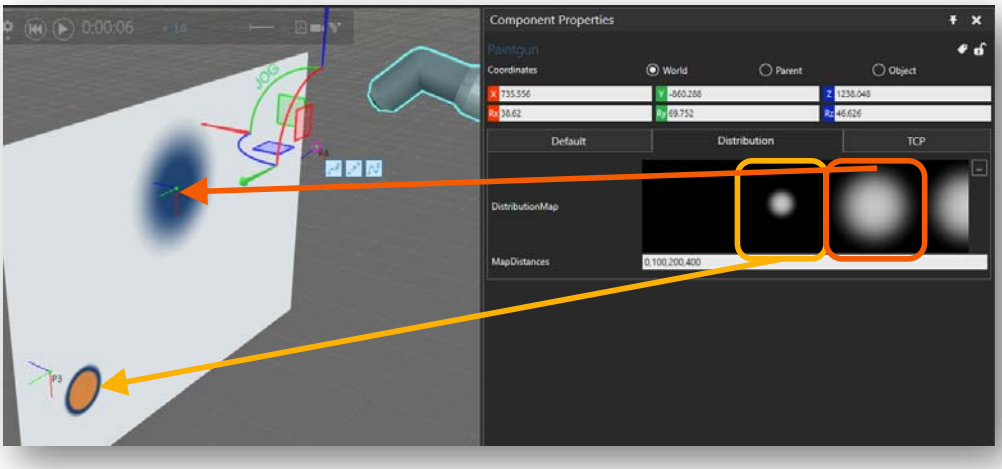
Thickness = 1 cm3/s / 706,68 cm2

Thickness = 0,00141 cm =~ 14,1ym

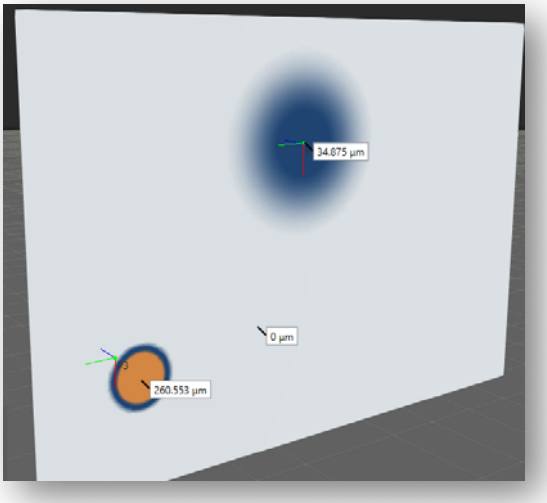
Distribution map resolution affects the total paint per ”pixel” in calculations, so map resolution affects thickness result slightly.

If the distribution map is not ”Full white,” then the volume of paint is distributed to non-black areas based on the map’s pixel’s value (thus, one 100% white pixel receives more paint than in the example above).

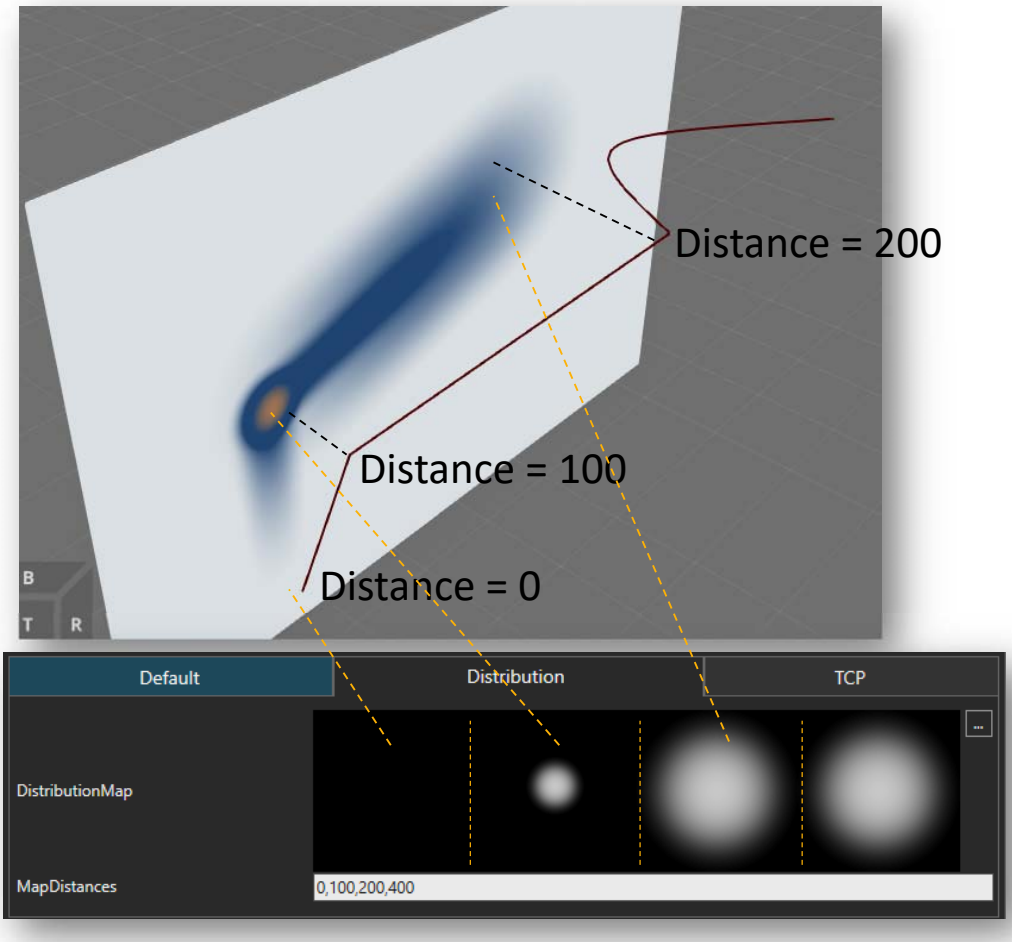
> *Saturation is calculated per map by accumulating the total amount of ”white” on the map. Then the total map paint area is divided with this value to get the saturation multiplier for this map. So the total thickness will be:*
>
> *(Volume / Area) * pixel’s value * saturation*



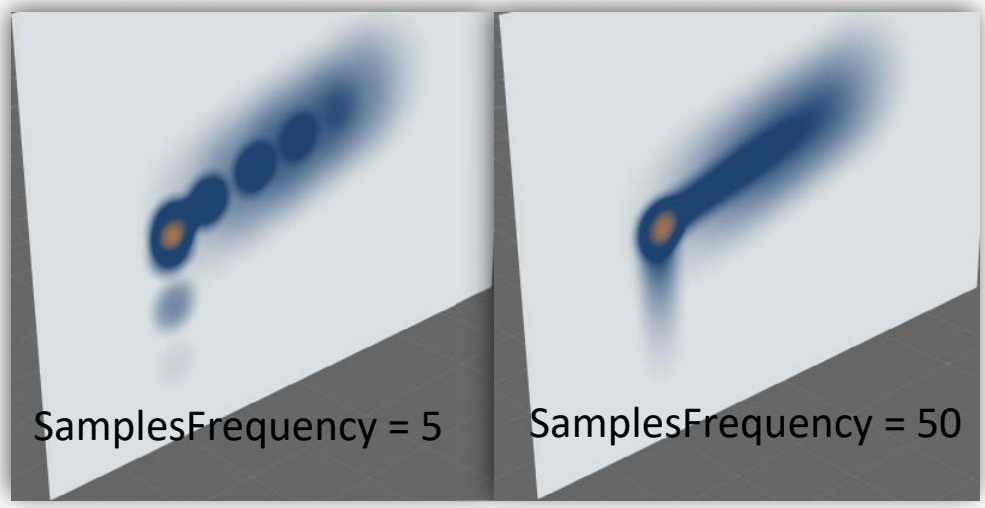
Because the same volume of paint per second is sprayed, a smaller distribution map/area will produce a much thicker layout of paint than a more spread/bigger map.



The distribution map is blended between map distances



Frequency affects the paint result (how often one ”layer” of paint is distributed to the surface). Faster the end effector/robot moves, more samples are needed



Surface angle (normal) vs. paint gun nozzle angle affects the paint thickness by increasing the surface area when the same paint volume hits. But also paint particle distance may vary and different paint particles may use different distribution maps.