

Step by Step Sizing a Robot with MotoSize Estimated Data

Introduction:

It is always important to have the correct mass data for your End-Of-Arm Tool (EOAT) for sizing the correct robot model and using that tool data in the robot's controller. However, what if the tool is not designed yet? The only known data is just an estimated size and weight.

What if there is no CAD software to pull mass data from?

Below are step by step instructions to size a robot based on just estimated tool data.

STEP 1: Things to know in Advance

1. Estimated tools will be simple representations only. The maximum detail allowed is 5 blocks.
2. Be aware that these blocks are solid (see Figure 1); if the actual tool (Figure 2) has a series of gaps in the structure the MotoSize results will overestimate the loading.

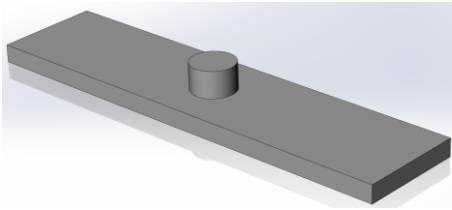


Figure 1: Solid, Simple Tool

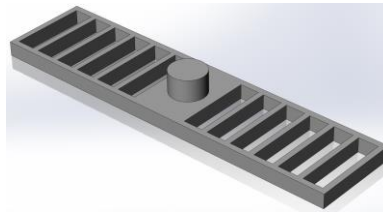


Figure 2: Actual Tool

3. The only units accepted are meters and kilograms.
4. MotoSize estimated results only account for the 5th and 6th axes (B and T).
5. In addition to the tool mass, the mass of the part being picked needs to be represented, since it can significantly impact the overall mass properties.
 - a. Select the largest, heaviest part that the tool will pick.

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STEP 2: Enter the Data in MotoSize

Login to MotoSize.motoman.com

At the main page select the option for **CHECK ROBOT VIA ESTIMATED DATA**

At the Data Input Screen:

1. Choose a section that best represents the overall shape of the tool and fill in the data base off the reference images associated with it.

Evaluate Arm Load

Clear Input Fields

Save Robot Input Data

Import Existing Input Data

View Existing Robot Report

Robot Selection Filters

Controller Type:
 Application Specific Robot:
 Number of Axes:
 Select Robot:

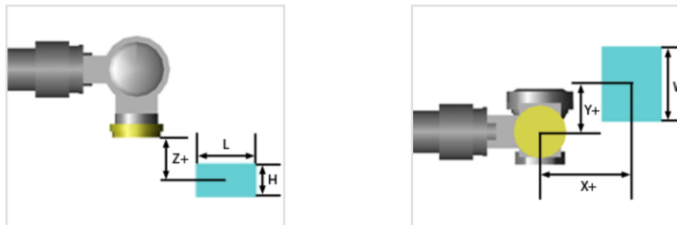
- GP110B
- GP110H
- GP180-120
- GP165R
- GP165RXP
- GP180
- GP200R
- GP200S
- GP215

 Show Only Active Robots

Mechanical Description of End of Arm Load

NOTE: Additional load weight (ie. valve pack mounted on upper arm) is not taken into consideration in estimating the robot load.

Rectangular Components



Dimensions

	Mass (kg)	H (m)	W (m)	L (m)	Z (m)	X (m)	Y (m)
Block #1	130	.254	.508	.508	.35	.25	0
Block #2							
Block #3							
Block #4							
Block #5							

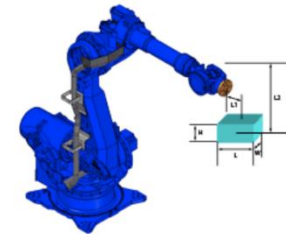
NOTE:
The accuracy of the results directly corresponds to the accuracy of the input data.

Robot
Headstock
Multi Axis Positioner
Table
Linear Track

Using Calculated Tool Data

Using Estimated Tool Data

[Check Robot Load via Estimated Tool Data](#)



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2. Selection of the robot model can be assisted by using the Controller, Application, and Axes filters.

Evaluate Arm Load

Clear Input Fields

Save Robot Input Data

Import Existing Input Data

View Existing Robot Report

Robot Selection Filters

Controller Type:

Application Specific Robot:

Number of Axes:

Mechanical Description of End of Arm Load

NOTE: Additional load weight (ie. valve pack mounted on upper arm) is not taken into consideration in estimating the robot load.

Select Robot:

- PL190
- PL320
- PL500

Show Only Active Robots

Rectangular Components

3. Once all data is filled in, select the Evaluate **Arm Load** button.

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STEP 5: Review the Results

If a 4-axis arm was selected

Create New Robot Report

Save Robot Input Data

View Existing Robot Report

Evaluation Results

Robot: Robot Part #:

Application: Assembly Part #:

of Axes:

Rated Max	Application	% Max
Payload		
Mass: <input type="text" value="190"/>	<input type="text" value="130.0"/> kg	<input type="text" value="68.4"/> %
Moment		
<div style="background-color: green; color: white; padding: 5px; display: inline-block;">Moment Arm Rating</div>		
T-Axis: <input type="text"/>	<input type="text"/> kgf-m	<input type="text"/> %
B-Axis: <input type="text"/>	<input type="text"/> kgf-m	<input type="text"/> %
Moment of Inertia		
T-Axis: <input type="text" value="90.0"/>	<input type="text" value="13.716"/> kg-m ²	<input type="text" value="15.2"/> %
B-Axis: <input type="text"/>	<input type="text"/> kg-m ²	<input type="text"/> %

As can be seen, everything is green. This model can safely perform its tasks up to 100% speed.

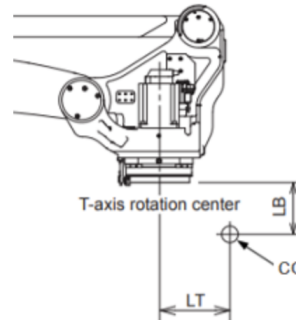
Damage starts when any value hits 100%

This damage causes wear and tear to each axis gear drive.

If all values are below 100% then the robot will run normally, barring any external forces or external collisions.

Let's dive into the results of a 4-axis robot:

1. The first result is always mass. If over on mass, then either change the robot or change the tool.
2. The Moment Arm Rating displays the EOAT Cg (X) in relation to different curves of load limits. This X is well within the max load limit of 190Kg.
3. The moment of inertia only affects the T-axis for this model, and it is very low. A high value exceeding 100% would be a problem if the program required the T-axis to actively rotate.



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If a 6-axis arm was selected

Create New Robot Report

Save Robot Input Data

View Existing Robot Report

Evaluation Results

Robot: Robot Part #:

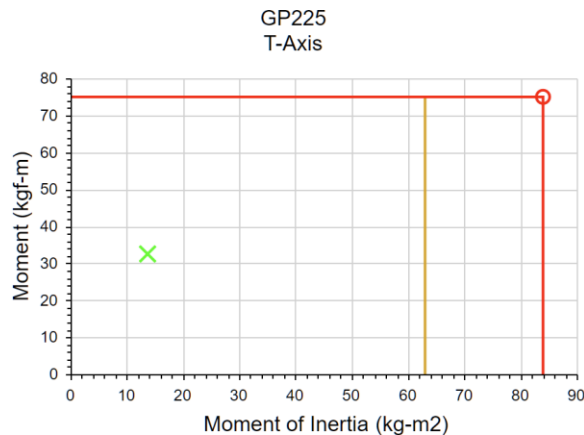
Application: Assembly Part #:

of Axes:

	Rated Max	Application		% Max
Payload				
Mass:	<input type="text" value="225"/>	<input type="text" value="130.0"/>	kg	<input type="text" value="57.8"/>
Moment				
T-Axis:	<input type="text" value="75"/>	<input type="text" value="32.5"/>	kgf-m	<input type="text" value="43.3"/>
B-Axis:	<input type="text" value="140"/>	<input type="text" value="84.5"/>	kgf-m	<input type="text" value="60.4"/>
Moment of Inertia				
T-Axis:	<input type="text" value="84.0"/>	<input type="text" value="13.716"/>	kg-m ²	<input type="text" value="16.3"/>
B-Axis:	<input type="text" value="145.0"/>	<input type="text" value="58.42"/>	kg-m ²	<input type="text" value="40.3"/>

% Color Key

< 75%
75 - 89.9%
90 - 99.9%
100% and >



○ Rated Max: 84.0 kg-m², 75 kgf-m
 X Application: 13.716 kg-m², 32.5 kgf-m

As can be seen, everything is green. This model can safely perform its tasks up to 100% speed.

Damage to the robot starts when any value hits 100%

This damage causes wear and tear to each axis gear drive.

If all values are below 100% then the robot will run normally, barring any external forces or external collisions applied.

Let's dive into the results of a 6-axis robot:

1. The first result is always mass...if over on mass, then either change the robot or change the tool.
2. Moment Rating displays the percentage of static moment for the B and T axes. If an axis is red and is being used against gravity, then there will be a problem.
3. The moment of inertia also affects the B and T-axes. A high value exceeding 100% would be a problem if the program required any of the upper axes to actively rotate.
4. The charts for the B and T axes visually show where the results for each axis are related to the moment and moment of inertia.

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STEP 6: Saving the Results

Once satisfied with the results, they can be saved to a PDF, or the results can be saved as an XML file.

Most people, though, prefer the PDF.

1. Select **Create New Robot Report**

Create New Robot Report

Save Robot Input Data

View Existing Robot Report

Evaluation Results

Robot: Robot Part #:

Application: Assembly Part #:

of Axes:

	Rated Max	Application	% Max
Payload			
Mass:	<input type="text" value="180"/>	<input type="text" value="114.287"/> kg	<input type="text" value="63.5"/> %
Moment			
T-Axis:	<input type="text" value="63"/>	<input type="text" value="0.184"/> kgf-m	<input type="text" value="0.3"/> %
R-Axis:	<input type="text" value="102"/>	<input type="text" value="57.050"/> kgf-m	<input type="text" value="53.0"/> %

% Color Key

- < 75% (Green)
- 75 - 89.9% (Yellow)

2. Fill in the Customer field and any other optional field desired

Summary Report

* These fields must be completed before viewing the report.

Customer: *

Installation:

Engineer:

Tool ID:

Robot ID:

Serial Number:

Date: * (mm/dd/yyyy)

Comment:

Tooling Image: No file chosen

3. A useful option is to include an image of the actual tool. Just select the Tooling Image button and choose any image file.

4. When ready, select **View Report**

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- The finished report will appear. Just select **Printer Friendly Page**

Printer Friendly Page

% Color Key

- < 75%
- 75 - 89.9%
- 90 - 99.9%
- 100% and >

Summary Report

This report will NOT be saved until the report is downloaded by clicking the "Save Report" button below.

Report Details

Customer: Installation:

Engineer: Tool ID:

Robot ID: Serial Number:

Date:

Comment:

- The printer friendly page will display a message reminding the user to verify their browser background graphics are checked in the printer settings.
 - If not, then the color key will be gray only and harder to interpret.

- Select the **Hide** button to remove the message,
- Use the browser to print to PDF (built-in to Chrome and Edge browsers)
- Done

If the colors in the report do not print correctly, ensure that background color and image printing is enabled in your browser.
Click the "Hide" button before printing this page.

MotoSize Robot Summary Report

Report Details

Customer: Installation:

Engineer: Tool ID:

Robot ID: Serial Number:

Date:

Comment:

Version: Robot model data (3/11/2021 5:09:12 PM); Website calculations (2022-02-8)

NOTE:
The accuracy of the results directly corresponds to the accuracy of the input data.

% Color Key

- < 75%
- 75 - 89.9%
- 90 - 99.9%
- 100% and >

Evaluation Results

Robot: Robot Part #:

Application: Assembly Part #:

of Axes:

	Rated Max	Application	% Max
Download			
Mass:	<input type="text" value="180"/>	<input type="text" value="114,287"/> kg	63.5 %
Moments:			
T-Axis:	<input type="text" value="63"/>	<input type="text" value="0,184"/> kgf-m	63 %
B-Axis:	<input type="text" value="107"/>	<input type="text" value="0,1400"/> kgf-m	62 %