ROBOTICS

Application manual

RobotLoad add-in

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Checked in 2025-01-22
Skribenta version 5.6.018

Application manual
RobotLoad add-in

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Overview of this manual

About this manual

This manual describes the RobotLoad add-in in RobotStudio. It contains descriptions of the functionality, and how to configure that functionality.



Note

It is the responsibility of the integrator to provide safety and user guides for the robot system.



Note

Screenshots in this manual are generally intended to show a language version corresponding to the language of the manual. In some cases, a translated manual still uses English screenshots if the localized user interface was not available at the time of publishing the manual.

Usage

This manual should be used together with the RobotLoad add-in.

References

Reference	Document ID
Operating manual - RobotStudio	*3HAC032104-001*



Tip

All documents can be found via myABB Business Portal, *www.abb.com/myABB*.

Revisions

Revision	Description
A	Released with RobotStudio 2021.2.
B	• Updated the description regarding coordinate system for payloads. • Updated the description of arm load on axis 6.

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1 About RobotLoad add-in

Introduction

The result from the RobotLoad add-in is only valid for standard robot applications. For over load cases and special applications, contact ABB for further analysis.

Installation

1. In RobotStudio, select the tab Add-In.
2. Search for RobotLoad and select the icon for RobotLoad.
3. Click **Add**. A license agreement is displayed.
4. Read the license agreement.
5. If you agree to the license agreement, click **Accept** to continue the installation.
6. Restart RobotStudio to enable the add-in.

Prerequisites

- Requires RobotStudio 2021 or later

Limitations

- The RobotLoad add-in does not verify if the maximum permitted arm load on the frame is exceeded. The product specification for the respective manipulator describes the maximum allowed extra load, if any.
- In wrist down mode, the RobotLoad add-in does not verify if the maximum permitted arm load on any location is exceeded. The product specification for the respective manipulator describes the maximum allowed extra load, if any.
- Arm loads do not affect the ratings T2 and T3 in wrist down mode.
- The only supported quaternion of tool inertia is [1,0,0,0]. Any other quaternion will be converted to [1,0,0,0].

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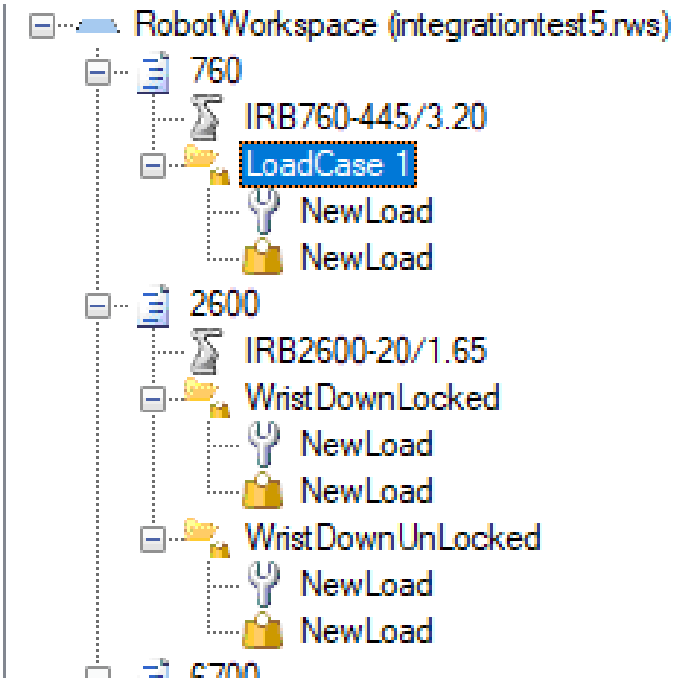
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2 The user interface

Robot Workspace

The **Robot Workspace** is located on the top right. It shows a tree view, consisting of projects. Each project has the following parts:

- Robot (the robot used for work)
- Load cases (in this folder you can see all load cases)
- Loads in load cases



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A load case consist a list of loads. For example: A gripper, a part for the gripper, and an upper arm load. Only one tool is possible in each load case.

Properties

The items in the Robot Workspace have properties that are shown in the **Properties** window below the tree view. The properties can be modified from this window.

In **Workspace Properties**, the warning level for calculations is set.

- If results are below this limit they are OK (green).
- If results are above this limit there will be a warning (yellow).
- If the results are above 100% they are not approved (red).

It is possible to define if the system parameter *PayloadsInWristCoords* should be used or not. This parameter is available from RobotWare 6.04.

Project Properties displays the name, station, robot serial number, etc.

Robot Properties displays the robot.

The **Load case Properties** displays the name on the load case and if the load case is a wrist down case. Max angle from a vertical line must be set. The angle can be between 0 and 25 degrees.

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The **Load Properties** displays name and mass data on the load, and the type of load.

Calculation result

The **Calculation result** window shows the calculated mass, center of gravity, and mass moments of inertia for the total handling weight (THW) and arm loads. The mass moments of inertia for axes five and six are also shown as **J5** and **J6**.

Load diagram and ratings

This **Load diagram and ratings** window shows the load diagram, center of gravity, and ratings for the actual load. Ratings are expressed as percentage of max allowed magnitude.

THW	Total Handling Weight
CoGZ	Distance to load diagram in Z-direction from center of gravity
CoGL	Distance to load diagram in L-direction from center of gravity
J5	Total Mass moments of inertia for axis 5
J6	Total Mass moments of inertia for axis 6
T6-T2	Static torque axes 2 to 6

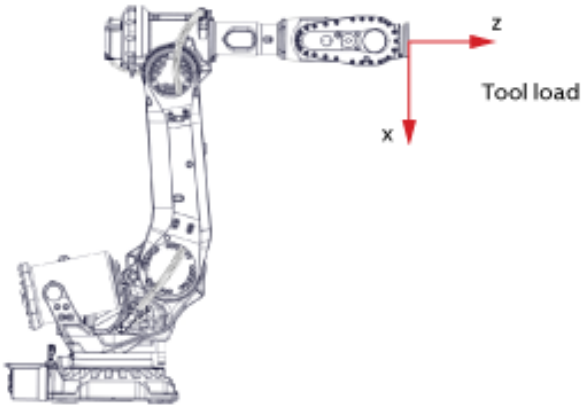
Coordinate system

Loads should be given in the correct coordinate system. When a load node in the Robot Workspace is selected it is possible to view the coordinate system for selected type of load, by clicking on the blue button marked with question mark in **Properties**.

Coordinate system for tool loads, also referred to as wrist coordinates:

Note

There is a difference in the coordinate system between arm load and tool load.



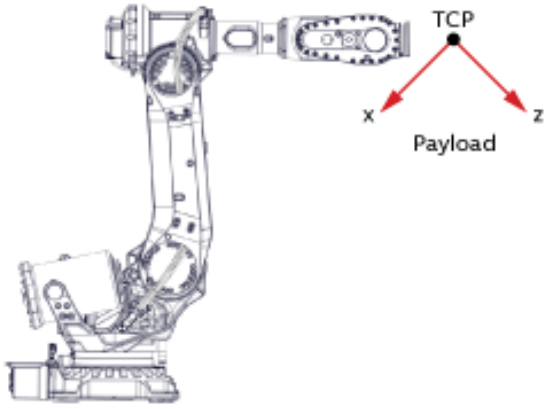
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Coordinate system for payloads:

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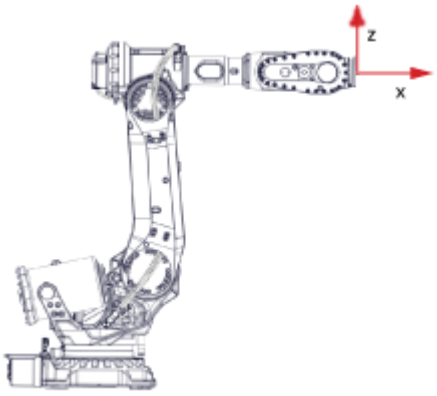
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(For coordinates relative to the wrist center point instead of the tool center point, select the **PayloadsInWristCoords** option in load case properties.)



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Coordinate system for loads on axis 6:



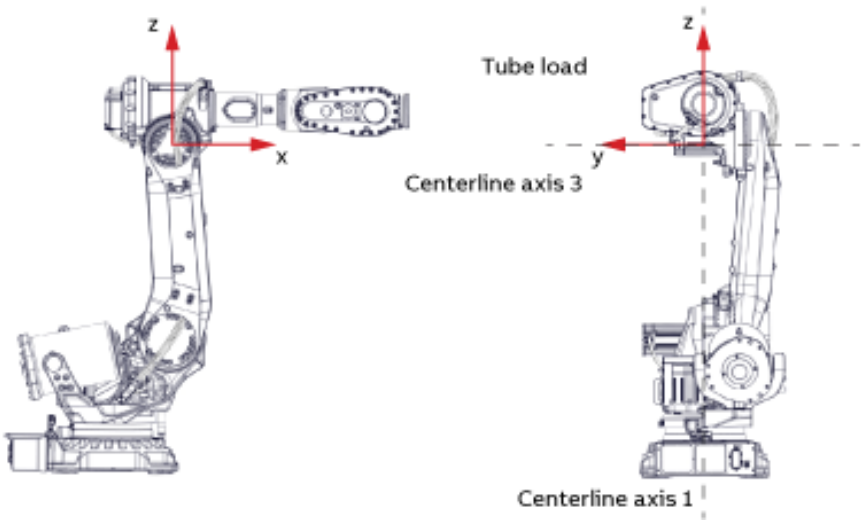
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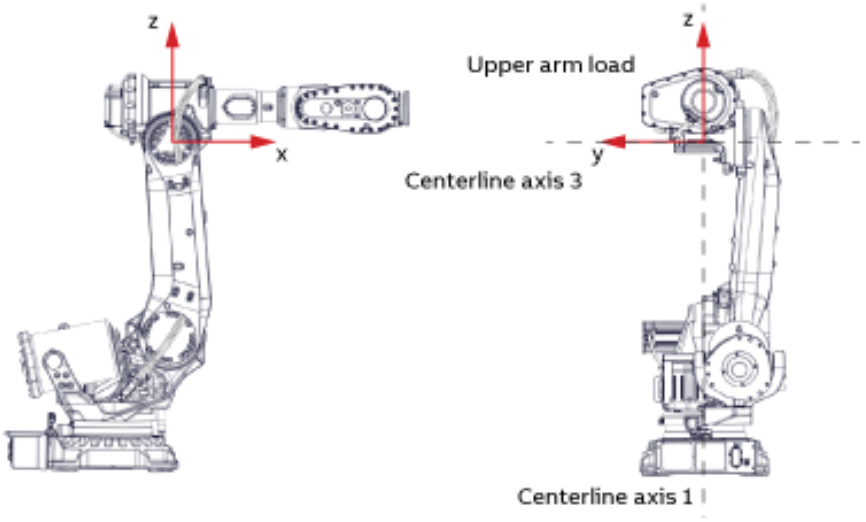
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Coordinate systems for loads on the tube:



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Coordinate systems for loads on the upper arm:

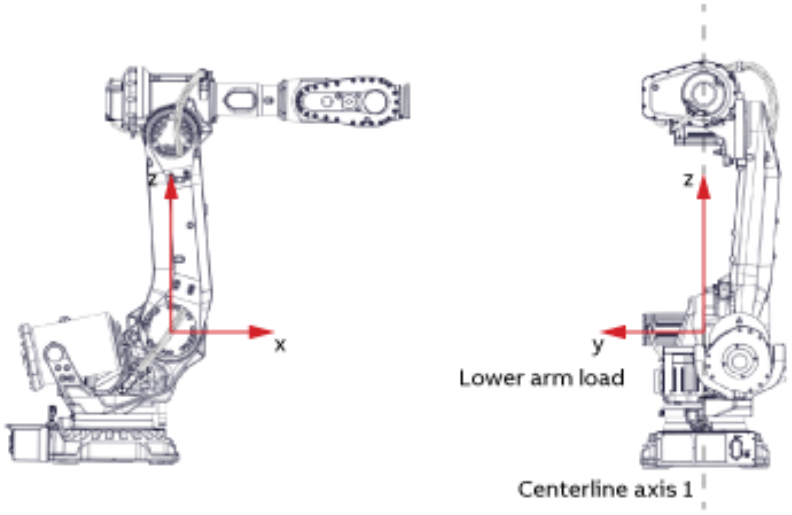


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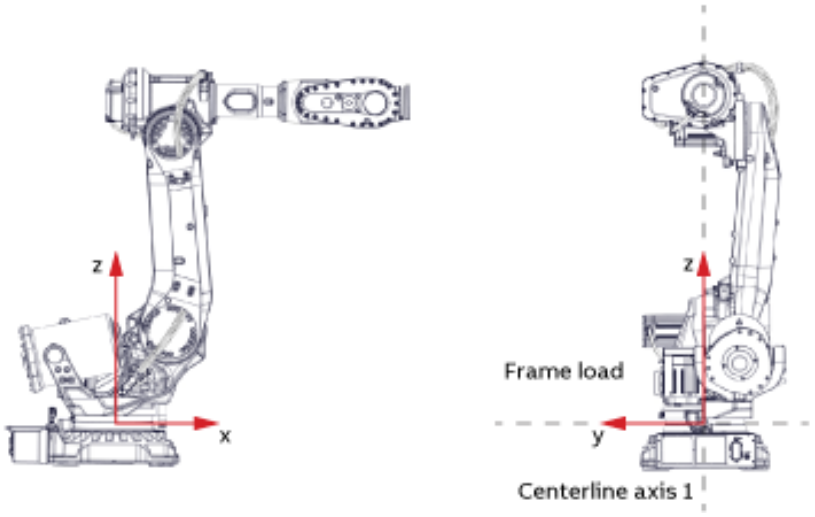
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Coordinate systems for loads on the lower arm:



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Coordinate systems for loads on the frame axis 1:



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3 Working with RobotLoad

Work spaces

To create a new Robot Workspace, select **File** -> **New**. An empty **Robot** node and **Project** node are created.

Work spaces can be opened, saved, and closed from the **File** menu.

Projects

A **Robot Workspace** can have several **Projects**. Use one of the following options to add a project to a robot workspace.

- In the Robot Workspace, right-click and select **Add Project**. This creates a default project.
- Click **Add Project**.
- Select the Robot Workspace node and then select **Project** -> **Import Projects**.

Projects can be deleted using the right-click menu on the project's node, or from the **Robot Workspace** menu.

LoadCase

A robot project can have several load cases. Each load case corresponds to a a folder in the Robot Workspace. Use one of the following options to add a load case to a project.

- In the Robot Workspace, right-click the Project node and select **Add Loadcase**. This creates a default LoadCase.
- Click **Add LoadCase**.
- Select the **Project** node and then select **Loadcase** -> **Import Loadcases**.

LoadCases can be copied, pasted, and deleted using the right-click menu on the LoadCase node.

Loads

Use one of the following options to add a load to a loadcase.

- Right-click the **LoadCase** node and select **Add Load**.
- In the **Load** menu, select **Add Load**.
- In the **Load** menu, select **Import Loads**.

Loads can be copied, pasted, and deleted using the right-click menu on the Load node.

Project information

The project information can be changed by clicking the on the Project node and then change the information shown below the Robot Workspace. The information is set when clicking in another box in the Project view. The project name can also be changed here.

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Calculate load diagrams

Load diagrams can be calculated once a project contains a robot and at least one loadcase. Use one for the following options to calculate load diagrams.

- Select the load case and then select **Calculate** -> **Calculate**.
- On the Load case node, right-click and select Calculate.

The load diagram window is shown to the left. If any errors occurred during the calculation, a message box is displayed. If there were errors there might not be a load curve.

To calculate several load cases at the same time, use the **File** menu, and select **Calculate Folder**. Select input and output folders. The program will calculate all the load cases and save the results and a log file in the output folder. Results will be saved in different sub folders depending on the results, if it was approved or not.

Print load diagrams

To print the load diagrams, select a load case and then select **Load** -> **Import Loads**.

Importing and exporting load cases and projects

Load cases and projects an be imported and exported from their node menus.

Define tool, payload, and arm load data

The TCP and mass data of the tool must be defined. Loads can be defined manually or copied from RAPID or *Motion* configuration files (MOC.cfg).

The units are [kg] for mass, [mm] for center of gravity, and [kgm^2] for mass moments if inertia (in center of gravity).

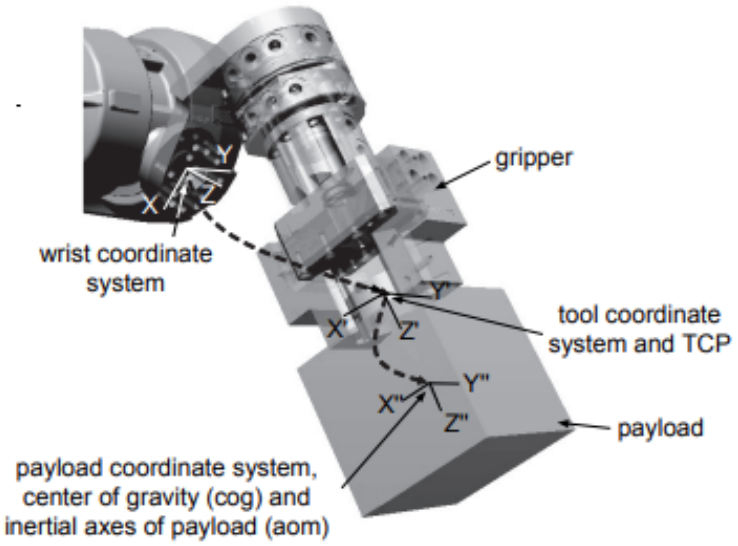
The only supported quaternion for entering inertia is [1,0,0,0]. That is, in the TCP(0) coordinate system for tool load and in the tool TCP coordinate system for payloads.

The TCP orientation and position can be given in Quaternions or Euler angles and mm.

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The payload coordinate system will be calculated from the tool coordinate system, see the following figure.



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Definition of the payload coordinate system frame in relation to the tool coordinate system.

It is possible to copy a tool load from a RAPID program module. Example: Copy:

```
PERS tooldata tool_prat:=[TRUE,[[-70,0,515],
     [0.696367,-0.696357,0.122791,0.122791]],
     [127,[112,16,316],[1,0,0,0],20.3,101,115]];
```

Paste by clicking **RAPID** and then **Paste text** in the tool load properties. It is also possible to copy the generated tool data if it has been made in the load and TCP properties manually.

Payload and arm load data can in a similar way be pasted and copied as tool data.

Arm loads can be copied from the MOC.cfg.

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