SoftMotion Robotics HMI Example

The sample project 'MotionHMI.project' demonstrates some of the features available in SoftMotion Robotics. This project also includes a visualization and a Depictor object to visualize the movements. The project supports up to 6 axes.

Softmotion Robotics HMI Example with Companion Specification

The sample project 'MotionHMI_Robot_Companion_Specification' demonstrates an example implementation of the OPC UA Robot Companion Specification, with this the client application recives the specific data.

Product description

Licensing:

No license is required.

With the sample project 'SoftMotion Robotics HMI Example', the users can configure an axis group (in the project) with any kinematics supported by CODESYS and control the axis group (from the visualization) either manually by jogging the axes or automatically by programming the movements. The robot's movement can be visualized in 3D making use of the Depictor object configured inside the project. With the sample project 'SoftMotion Robotics HMI Example Robot Companion Specification' the client application is visualized with the help of an companion specification.

The following sections give a summary of various features in the project's visualization, their functionality and how to use them.

State

This is the default screen that appears when the project is online. It displays the status of the axis group as a whole and also the status of individual axes along with their current position. The users can turn the axis group or any individual axis on or off. The current TCP position of the robot is displayed in world coordinates. The current status of the axis group is displayed on the top of all visualization screens used.

SoftMotion
20.01.2021 - 16:32:52

○ State idle

○ Emergency STOP

State
Teaching
Programming
Settings

Axis group

Power - all ○
Reset error ●

Robot position (cartesian)

X:	510.19	mm
Y:	112.80	mm
Z:	470.69	mm
A:	-0.00	°
B:	0.00	°
C:	0.00	°

Robot Position (axis space)

Axis1:	12.47	mm|°
Axis2:	-54.43	mm|°
Axis3:	16.87	mm|°
Axis4:	180.00	mm|°
Axis5:	127.56	mm|°
Axis6:	347.53	mm|°

Axis1
Power ○
Error ●
Current position: 12.47 mm\|°

Axis2
Power ○
Error ●
Current position: -54.43 mm\|°

Axis3
Power ○
Error ●
Current position: 16.87 mm\|°

Axis4
Power ○
Error ●
Current position: 180.00 mm\|°

Axis5
Power ○
Error ●
Current position: 127.56 mm\|°

Axis6
Power ○
Error ●
Current position: 347.53 mm\|°

Teaching

This screen offers three features:

- **Jogging:** Either individual axes or the robot TCP in the Cartesian coordinate systems WCS (world coordinate system), MCS (machine coordinate system) or TCS (tool coordinate system) can be jogged.
- **Coordinate Systems:** Up to 6 coordinate systems can be defined. A coordinate system consists of a base coordinate system and a frame. A coordinate system can either be set directly via the frame or taught step by step. The different coordinate systems can be chained. However, the last coordinate system of a chain must always be based on the MCS (machine coordinate system).
- **Positions:** Up to 64 positions can be stored for further use in the Programming screen. To save a position in a variable, select an ID, give the variable a name and select a coordinate system. Jog the axis group to the desired position and click the "Save current robot position" button. You can also define positions by directly entering values into the respective fields in the visualization. To move the axis group to a previously saved position, select the desired position variable via the spin control 'ID' and click the 'Move to position' button.

Each coordinate system and position has a state that is indicated by a colored button and can be changed by clicking on it. The states are 'Not Set', 'Not Teached' and 'Teached'. In the Programming screen, no program is executed that contains positions or coordinate systems that are not teached.

SoftMotion

20.01.2021 - 16:23:10

State idle

Emergency STOP

| State |
| Teaching |
| Programming |
| Settings |

Axis1	Axis2	Axis3
5.00 mm|°	0.69 mm|°	-23.32 mm|°

Axis4	Axis5	Axis6
147.83 mm|°	21.64 mm|°	0.15 mm|°

Jog Cart. WCS MCS TCS

X:	463.08 mm
Y:	79.91 mm
Z:	470.69 mm
A:	16.35 °
B:	93.98 °
C:	-29.36 °

Legend

Not Set Teached Not Teached

Teach   Position   Coordinate System

ID: 7
Name: CS 7
Base CS: MCS

X: 500.19 mm   Y: 92.80 mm   Z: 470.69 mm
A: 0.00 °   B: 0.00 °   C: 0.00 °

Teach   Edit

SoftMotion

20.01.2021 - 16:28:08

State idle

Emergency STOP

| State |
| Teaching |
| Programming |
| Settings |

Axis1	Axis2	Axis3
12.47 mm|°	-54.43 mm|°	16.87 mm|°

Axis4	Axis5	Axis6
180.00 mm|°	127.56 mm|°	347.53 mm|°

Jog Cart. WCS MCS TCS

X:	510.19 mm
Y:	112.80 mm
Z:	470.69 mm
A:	-0.00 °
B:	0.00 °
C:	0.00 °

Legend

Not Set Teached Not Teached

Teach   Position   Coordinate System

ID: 1   CS: CS 7
Name: POS 1
Save current robot position

X:	[10.00]	10.00 mm|°
Y:	[20.00]	20.00 mm|°
Z:	[0.00]	0.00 mm|°
A:	[-0.00]	0.00 °
B:	[0.00]	0.00 °
C:	[0.00]	0.00 °

Move to the selected position

Cancel movement

Velocity [%]

Acceleration [%]

Jerk [%]

Programming

On this screen the users can define programs. Each program can contain up to 50 commands.

Supported commands

Move

- Point to point: MoveDirectAbsolute (PTP)
- Linear: MoveLinearAbsolute (CP)
- Linear Relativ: MoveLinearRelative (CP)
- Circular: MoveCircularAbsolute (CP)

Setting

- Blending
- Transition Mode
- Axis Velocity
- Axis Acceleration
- Axis Jerk
- Velocity

- Acceleration
- Jerk
- Set Tool

Special

- Wait
- Set Variable
- Wait Until

More information on the individual commands can be found on the help page. You can open the help page by clicking on the help symbol in the upper right corner of the program memory area. The help page contains a short explanation for each command and its parameters.

Edit Program

Use the Spin-Control 'ID' to select a program that you want to edit or execute.

A new command can be added via the '+' symbol. Subsequently, you can edit existing commands by clicking on the corresponding command. You can use the 'Insert' button to insert a copy of the command next to the original command. Furthermore, you can use the 'Delete' button to delete the command and the 'Move' button to move the command within the program.

Once all commands and their parameters have been configured, the entire sequence of commands can be saved with the desired name. The project offers the following possibilities for programs:

- Save program
- Delete program
- Undo unsaved changes
- Overwrite a previously saved program

Execute Program

A program can either be executed once or in a continuous loop. In addition, a program can be executed step by step.

Settings

This page contains the general settings of the axes group and its axes.

SoftMotion

20.01.2021 - 16:34:54

○ State idle

Emergency STOP

| State |
| Teaching |
| Programming |
| Settings |

Axis1

Tippdistance:	50.00	mm|°
Tippvelocity:	10.00	%
Tippacceleration:	50.00	%
Tippjerk:	100.00	%

Axis2

Tippdistance:	50.00	mm|°
Tippvelocity:	10.00	%
Tippacceleration:	50.00	%
Tippjerk:	100.00	%

Axis3

Tippdistance:	50.00	mm|°
Tippvelocity:	10.00	%
Tippacceleration:	50.00	%
Tippjerk:	100.00	%

Axis4

Tippdistance:	50.00	mm|°
Tippvelocity:	10.00	%
Tippacceleration:	50.00	%
Tippjerk:	100.00	%

Axis5

Tippdistance:	50.00	mm|°
Tippvelocity:	10.00	%
Tippacceleration:	50.00	%
Tippjerk:	100.00	%

Axis6

Tippdistance:	50.00	mm|°
Tippvelocity:	10.00	%
Tippacceleration:	50.00	%
Tippjerk:	100.00	%

World coordinates X Y Z

Tippdistance:	50.00	mm
Tippvelocity:	10.00	mm/s
Tippacceleration:	50.00	mm/s²
Tippjerk:	1000.00	mm/s³

World coordinates A B C

Tippdistance:	50.00	mm
Tippvelocity:	10.00	mm/s
Tippacceleration:	50.00	mm/s²
Tippjerk:	1000.00	mm/s³

Initial Setup (MotionHMI.project)

1. Open the project and under Project -> Project Settings: update the compiler version, SoftMotion package and visualization profile according to the versions installed in your codesys environment.
2. Update the controller (e.g. CODESYS SoftMotion WinV3 3.5.12.0).
3. Configure the axis group in the axis group editor with the desired kinematics.
4. The project uses softmotion virtual axes (Axis1…Axis6) by default. If real axes should be used, then the corresponding fieldbus master, slave and slave axes should be inserted.
5. Download the project onto a controller (e.g. SoftMotion WinV3), open the visualization screen found under the visu folder in the project and run the project.
6. The movements of the configured kinematics can be viewed in 3D by opening the Depictor object.

Note

1. When the project is online, there are errors that may appear because of expressions in the Depictor object that cannot be evaluated. Nevertheless you can ignore the errors and proceed with running the project.

Initial Setup (MotionHMI_Robot_Companion_Specification.project)

1. Open the project and set in appearing dialog everything to newest version (Set All to Newest).
2. Update the devices (e.g. CODESYS Softmotion WinV3 3.5.18.0).
3. Install required companion specification (Tools -> OPC UA Information Model Repository -> Install …).
4. The companion specification is included in package, or can be found here:
   https://opcfoundation.org/markets-collaboration/robotics/
5. Update possibly all variables in the Datasource (Variables -> Update variables).
6. Anonymous login in server (Device) should be enabled (Device editor -> Communication Settings -> Device -> Change Runtime Security Policy.. -> Allow anonymous login).
7. In this example the ip address needs to be adjusted individually in Data Source Manager -> Datasource -> Communication.

General information

Supplier:

CODESYS GmbH

Memminger Strasse 151

87439 Kempten

Germany

Support:

https://support.codesys.com

Item:

Softmotion Robotics HMI Example

Item number:

Sales / Source of supply:

CODESYS Store

https://store.codesys.com

Included in delivery:

CODESYS Package with sample projects

System requirements and restrictions

Programming System	MotionHMI.project requires: • CODESYS Development System Version 3.5.16.0 or higher • Softmotion Version 4.3.1.0 or higher • Depictor Version 1.1.0.0 or higher MotionHMI_Robot_Companion_Specification.project additional: • CODESYS Development System Version 3.5.18.0 or higher • CODESYS Visualization Version 4.1.0.0 or higher • CODESYS Communication Version 4.2.0.0 or higher
Runtime System	CODESYS Control V3.5.16.0 or higher MotionHMI_Robot_Companion_Specification.project requires: CODESYS Control V3.5.18.0 or higher
Supported Platforms/ Devices	Platform and device-independent, according to the availability of the CODESYS Development System. Note: Use the project "Device Reader" to find out the supported features of your device. "Device Reader" is available for free in the CODESYS Store.
Additional Requirements	-
Restrictions	-
Licensing	 NO LICENSE No license is required.
Required Accessories	-

Note: Not all CODESYS features are available in all territories. For more information on geographic restrictions, please contact sales@codesys.com.

Note: Technical specifications are subject to change. Errors and omissions excepted. The content of the current online version of this document applies.