



Industry Information Live

Spar tid og penge med Simatic Robot Integrator

Værter: Søren Jakobsen og Simon Sonne

Siemens Digital Industrien

Webinar

„Spar tid og penge med Simatic Robot Integration“

SIEMENS
Ingenuity for life

- Hvorfor Robot integration i Simatic?
- Industrirobot integration via interfaces i TIA Portalen
- Integration af eget robot-design i TIA Portalen
- Bonusinfo
- Q/A
- Kommende Webinar



Dagens værter

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Simon Sonne - Technology Specialist (Motion Control)



Søren Jakobsen - Technology Specialist (Motion Control)

Moderator – Lars Peter Hansen



SIMATIC Robot Integrator

Webinar



Webinar

„Spar tid og penge med Simatic Robot Integration“

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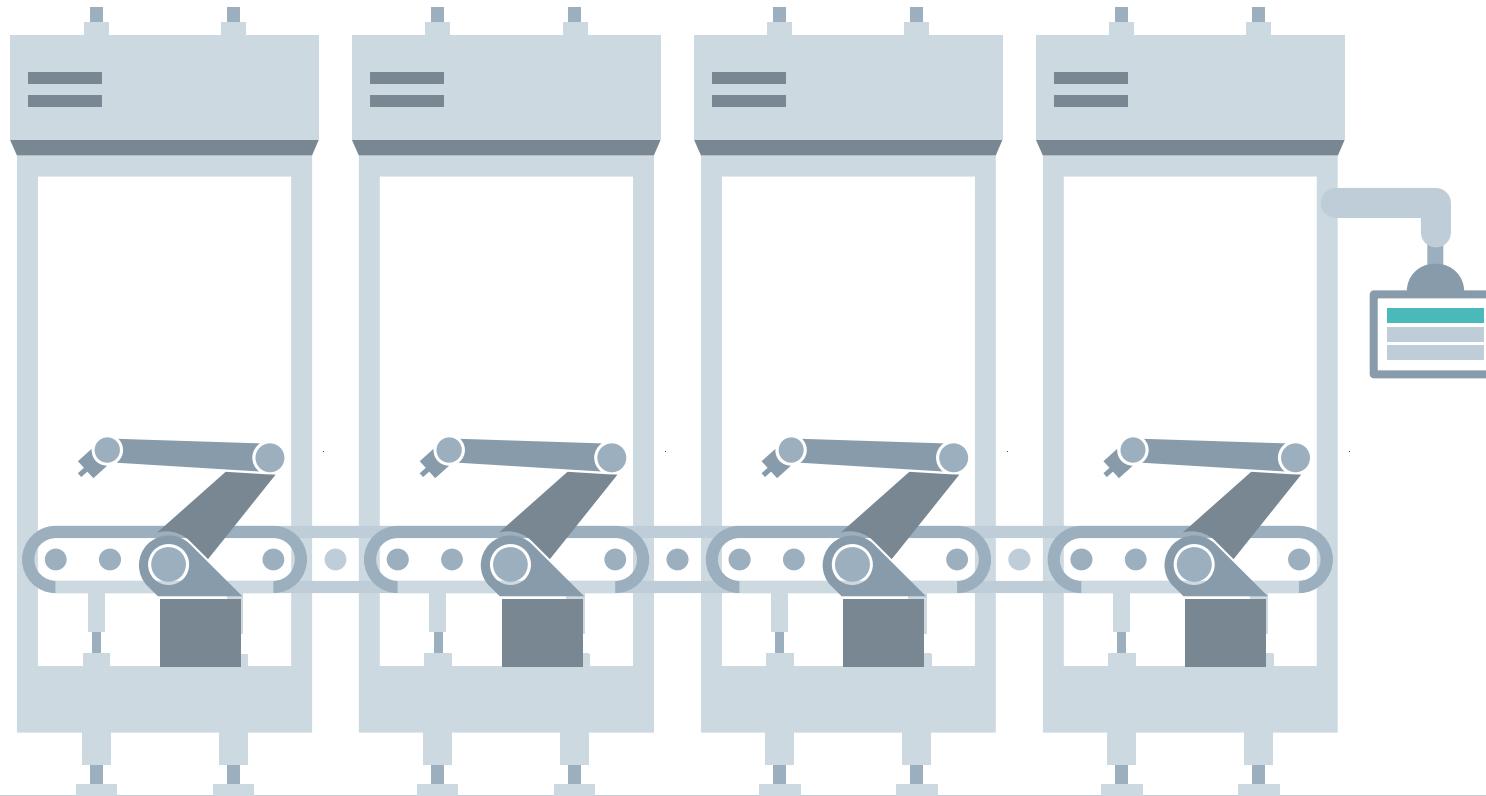
- **Hvorfor Robot integration i Simatic?**
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Why Robotics?

Benefits of using robots in machines

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Trends

- High level of automation
- More flexible solutions
- Falling prices
- Global growth +14% p.a
- Various branches
- Co-bots

The challenge

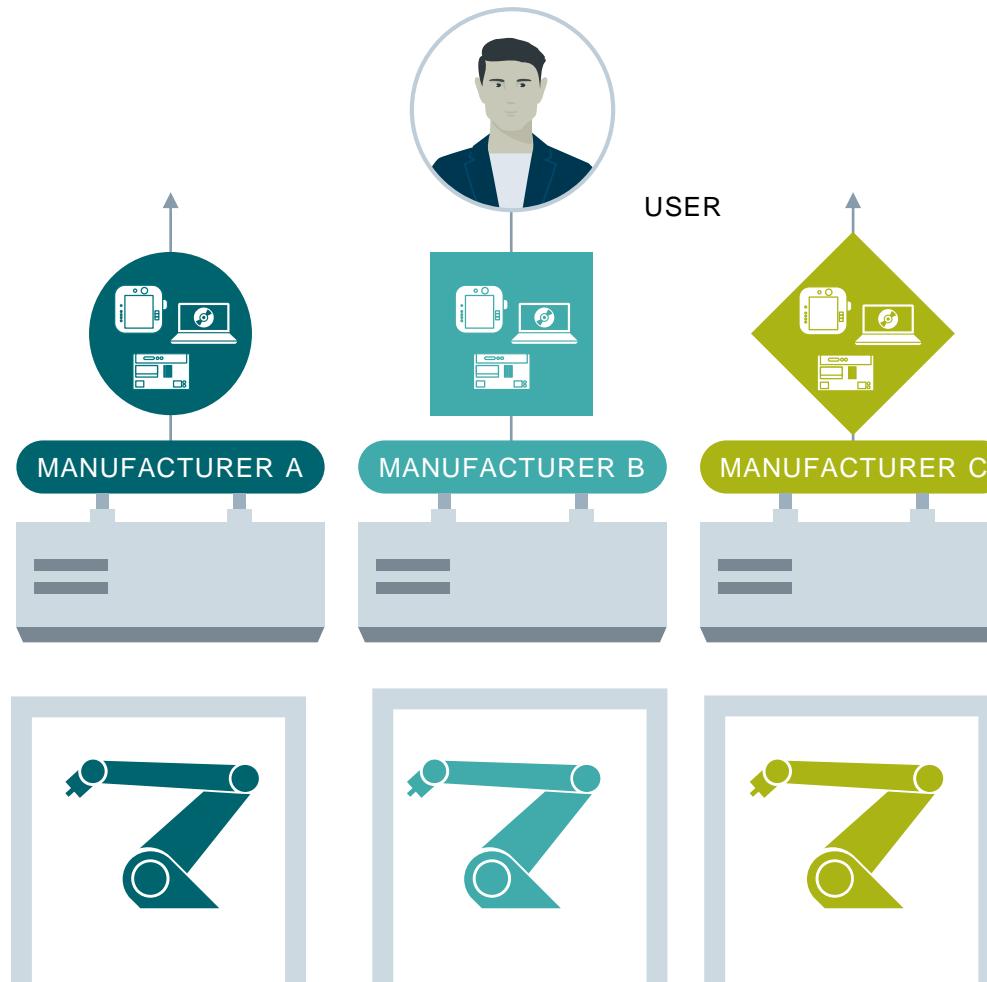
Robotic Automation Cost Breakdown

Average Cost Breakdown of Industrial Robotic Systems



The challenge

Increasing complexity due to robot manufacturer variance



Challenges

- Manufacturer programming
- Manufacturer interface
- Additional engineering tool
- Additional HMI devices

Webinar

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The situation today

Robot control via I/O commands

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SIMATIC

S7-1500 CPU



HMI



TIA Portal

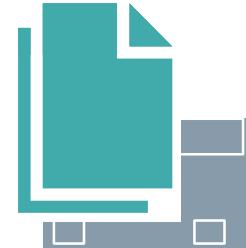


Kinematics



HMI device

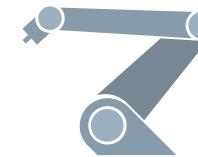
Robot
program



Controller



Engineering
software



Industrial robot

The situation today

Robot control via I/O commands

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SIMATIC

S7-1500 CPU

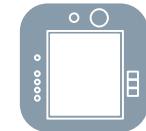


HMI



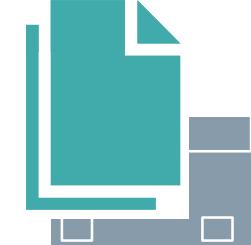
TIA Portal

Kinematics



HMI device

Robot program



Controller



Engineering software

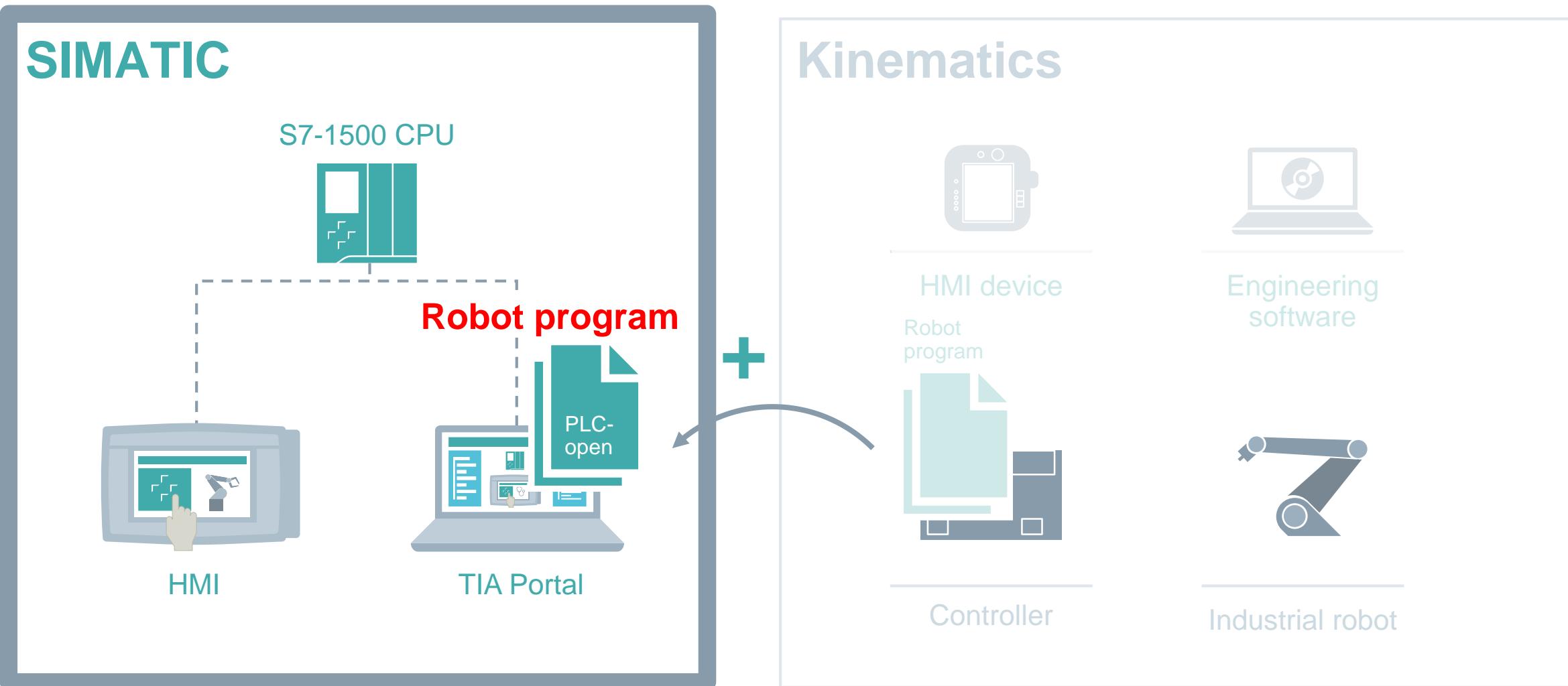


Industrial robot

The innovative solution

Robot programming in TIA Portal

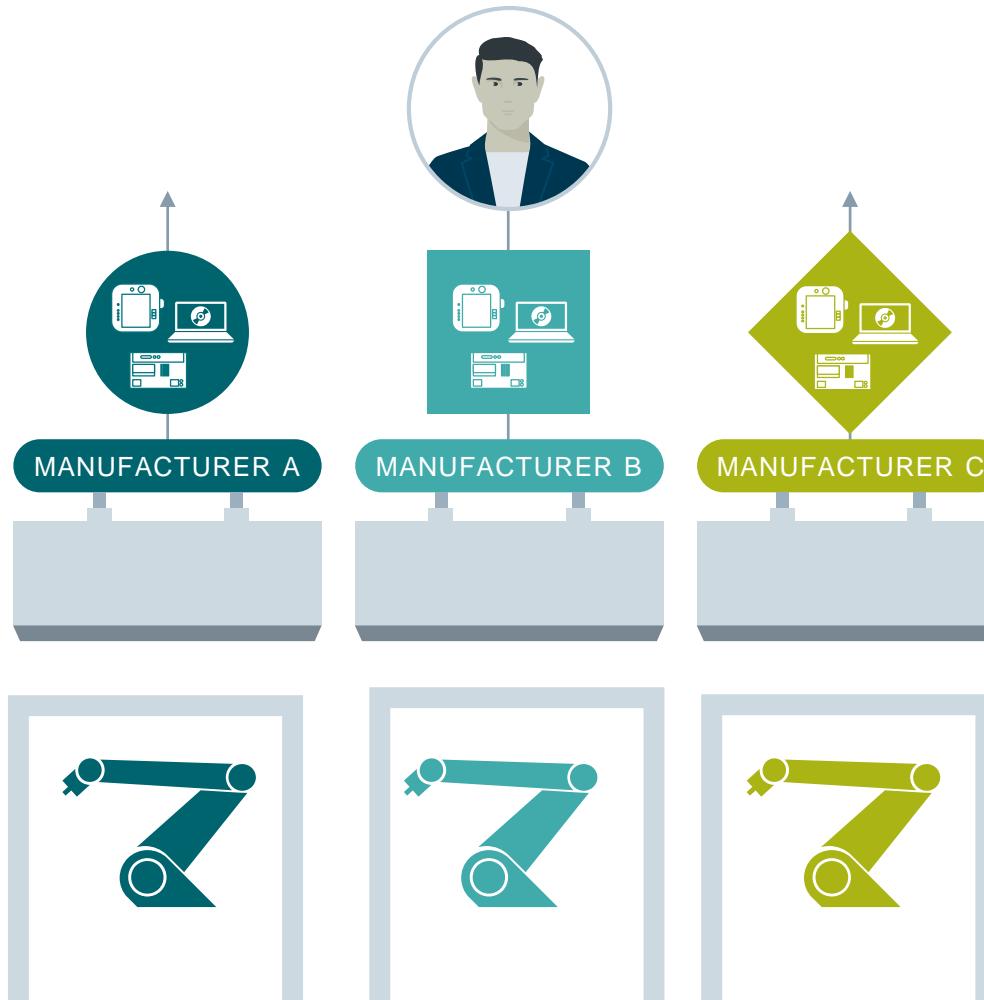
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SIMATIC Robot Integration

One application for robots from different manufacturers

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Functions

- Jog mode
- Teach-in of path points
- Creation of trajectory (online)
- Validate of trajectory
- Change configuration data (online)

Benefits



Robot programming in
the TIA Portal



Uniform programming
with SIMATIC HMI

SIMATIC Robot Integration

Robot Programm – PLC Open

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MC_MoveLinearAbsolute

AxesGroup	
Execute	Done
Position	Busy
Velocity	Active
Acceleration	CommandTranferred
Deceleration	CommandAborted
CoordSystem	Error
BufferMode	ErrorID
TransitionMode	MotionID
TransitionParameter	

MC_MoveLinearAbsolute

AxisGroup	
Execute	Done
Position	NextOptionPermit
Velocity	Busy
Acceleration	Active
Deceleration	CommandAborted
CoordinateSystem	Error
BufferMode	ErrorID
TransitionMode	ErrorIDEx
TransitionParameter	

MC_MoveLinearAbsolute

AxisGroupIdx	
Execute	ComDone
Position	ComBusy
Velocity	Busy
Acceleration	Active
CoordinateSystem	Done
OriType	CommandAborted
Approximate	Error
QueueMode	ErrorID

Stäubli

UniVal PLC

Denso

CommandSlave

KUKA

mxAutomation

The screenshot shows a software window with three tabs at the top: 'ADPalFuell.pcs', 'ADMoveCalc.pcs', and 'Pro1.pcs'. The 'Pro1.pcs' tab is active. The code in the main area is as follows:

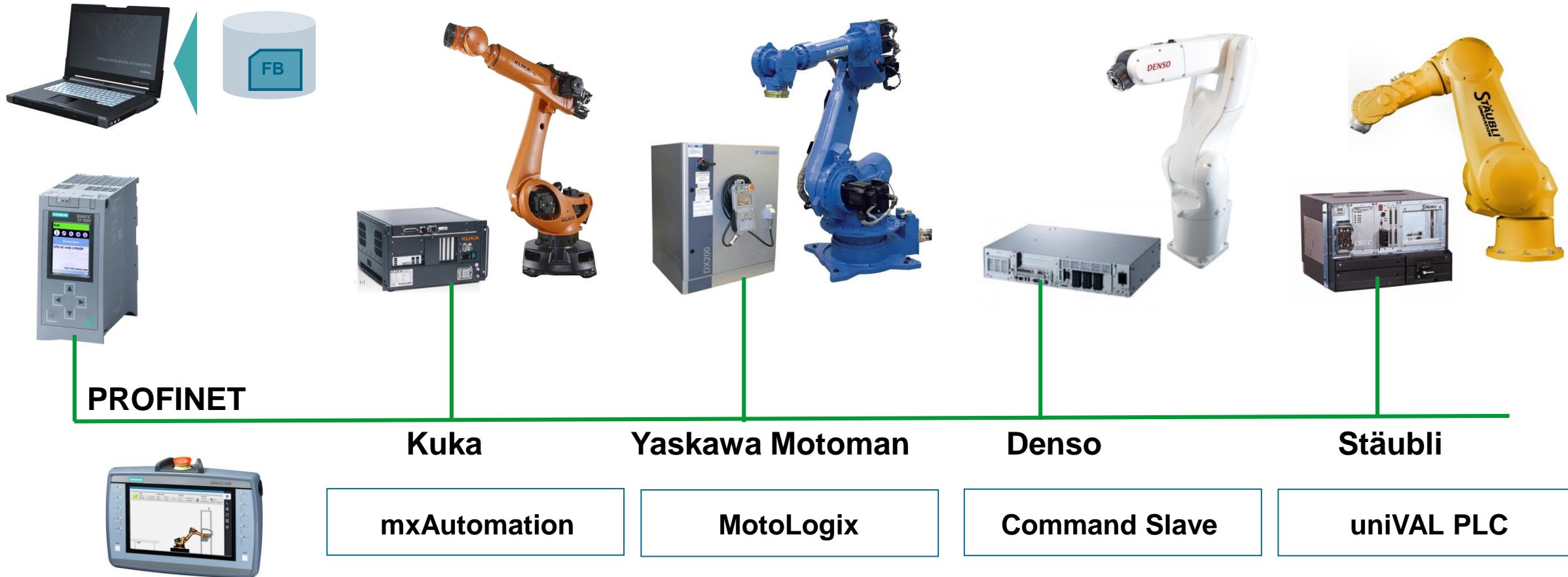
```
01 '!TITLE "Pro1.pcs"
02
03 Sub Main
04     TakeArm Keep = 0
05     MOVE P,@0 J[0]
06     APPROACH P,P[1],50
07     MOVE L,@0 P[1]
08     MOVE L,@0 P[2]
09     MOVE L,@0 P[3]
10     MOVE L,@0 P[4]
11     MOVE L,@0 P[5]
12     MOVE L,@0 P[6]
13     MOVE L,@0 P[7]
14     MOVE L,@0 P[8]
15     MOVE L,@0 P[1]
16     DEPART L,50
17
18     MOVE P,@0 J[0]
19 End Sub
20
21
22
```

GRF 1 ZU	Teil greifen
PTP X3 Y3 Z3 A3 B3 C3	Werkzeugmaschine anfahren
LIN X4 Y4 Z4 A4 B4 C4	Teil einlegen
GRF 1 AUF	Den Greifer öffnen
LIN X5 Y5 Z5 A5 B5 C5	Arm aus der Maschine herausfahren
S IA 1	Maschine starten (Impulsausgang 1 setzen)
WRT E2 H	Auf Fertigmeldung warten (High-Signal auf Eingang 2)
LIN X4 Y4 Z4 A4 B4 C4	Fertigteil anfahren
GRF 1 ZU	Fertigteil greifen
LIN X5 Y5 Z5 A5 B5 C5	Arm aus der Maschine herausfahren
PTP X6 Y6 Z6 A6 B6 C6	Ablage anfahren
GRF 1 AUF	Teil ablegen
END HP 1	Programmende wird automatisch erzeugt

SIMATIC Robot Integration

Available Libraries for PLC

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SIMATIC Robot Integration

Siemens offer

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YASKAWA

KUKA

DENSO
Crafting the Core

STÄUBLI

FAQ				
Programming guide + example				
Commissioning support				

SIMATIC Robot Integration

User interface

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Application Name | Robot Control

Robot
Robot 1 S I R Ext Tool : 1 Override
Base : 1 5 % Operator
siemens

Power Off On

Powered
No Error
Robot is ready to move
RESET
Abort

Cartesian Position Axis Position

	Cartesian Position	Axis Position
X	+280.00mm	
Y	+175.90mm	
Z	+505.96mm	
A	+180.00°	
B	+0.00°	
C	+180.00°	
S	2	
T	43	

Robot Messages

SIMATIC Robot Integration

Safety Integrated

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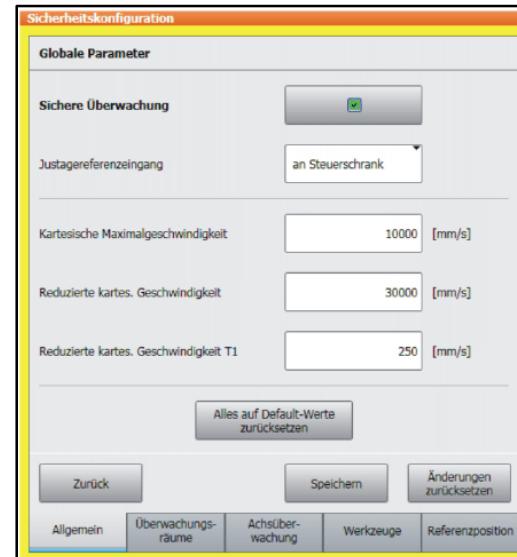
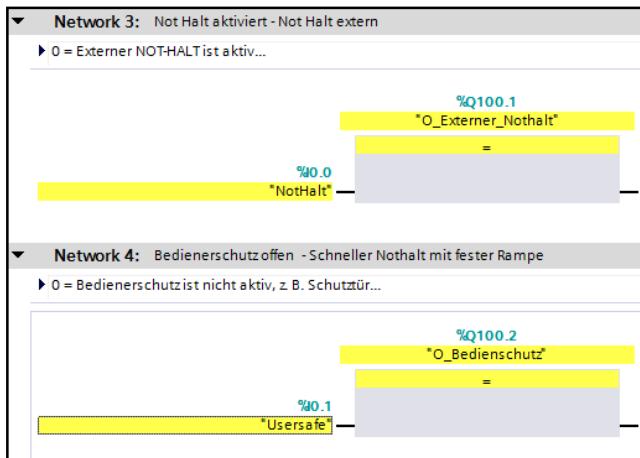
Simatic Failsafe



64 Bits Safety Message Frame



KR C4 Safe Operation



SIMATIC Robot Integration

Pros and Cons



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Well suited for

- Simple Pick & Place
- Palletizing
- Simple contours

Not well suited for

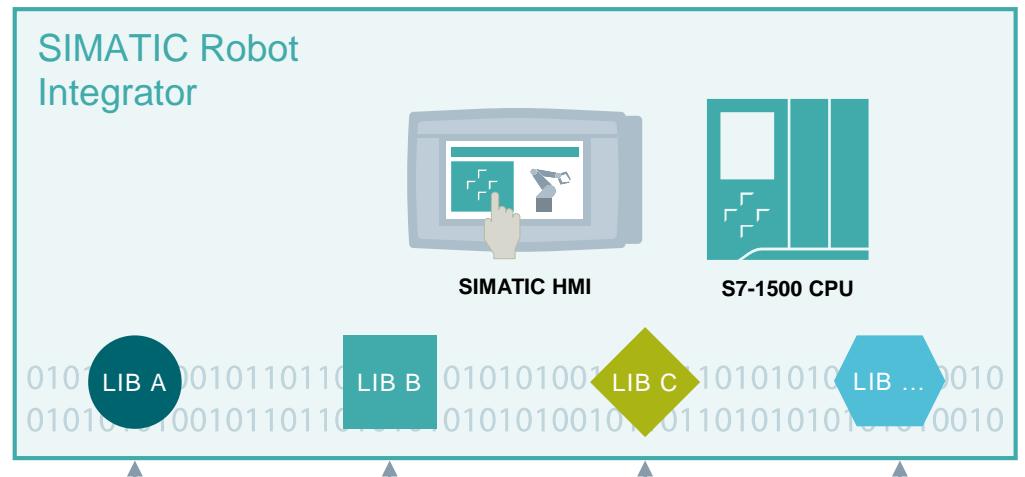
- Complex applications
- Conveyor tracking
- High speed Pick & Place
- Complex contours

Outlook

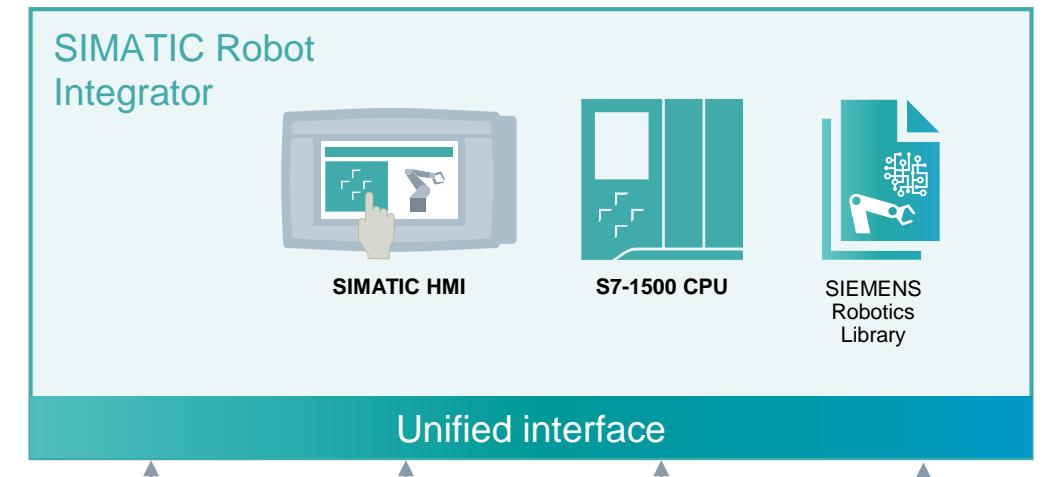
Universal Siemens Robotics library

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Today



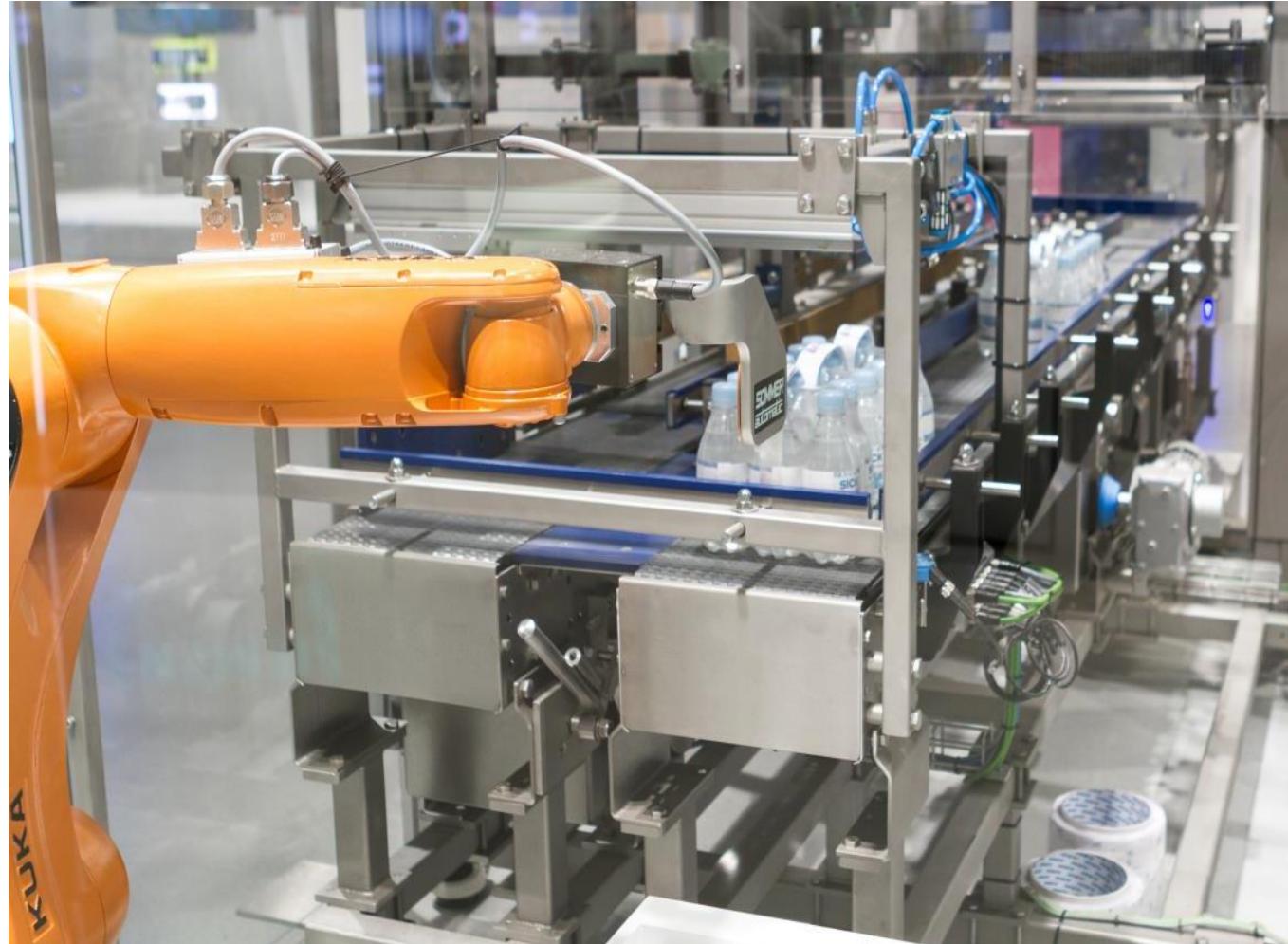
Tomorrow



SIMATIC Robot Integration

Summary

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Highlights

- One common engineering environment for PLC and robot
- Uniform robot programming language for different vendors
- Fixed Interfaces definition between PLC and robot
- Uniform robot operating interfaces (HMI)



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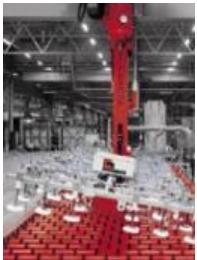


Tailored robotics with internal kinematics

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A

Kinematics managed by PLC



Tailored to machine process

Highly integrated in machine design

Standard motion controller

B

System with dedicated controller



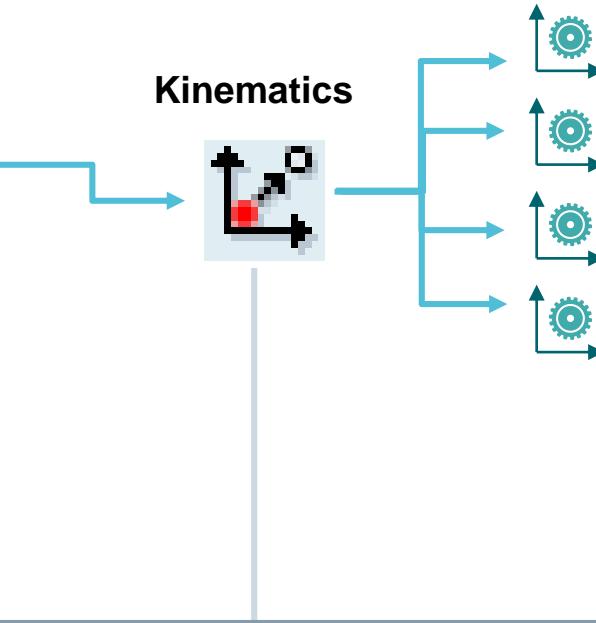
General purpose applications

Standalone system

Dedicated robot controller

PLC integration

Almost every type of 4D kinematic is supported



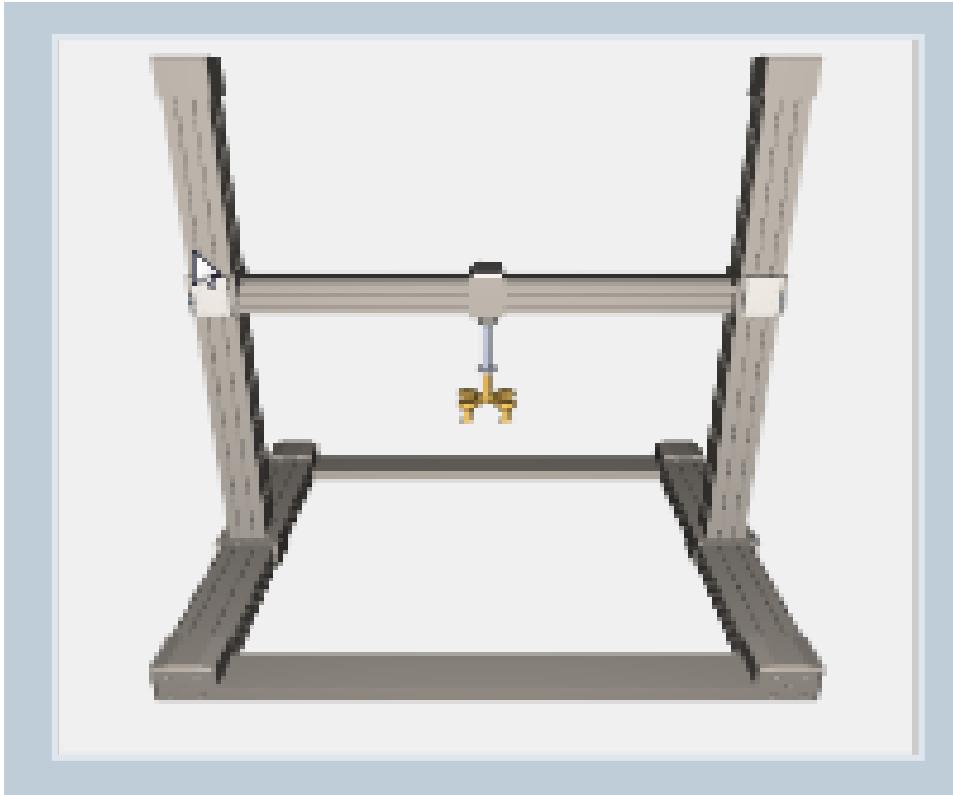
Motion (kinematics)	
MC_GroupInterrupt	Interrupt execution of motion
MC_GroupContinue	Continue execution of motion
MC_GroupStop	Stop motion
MC_MoveLinearAbsolute	Position kinematics with linear motion
MC_MoveLinearRelative	Position kinematics with linear motion relatively
MC_MoveCircularAbsolute	Position kinematics with circular motion
MC_MoveCircularRelative	Position kinematics with circular motion relativ...

4D-Kinematics

- Predefined kinematics
- Technology objects
- Graphically config
- PLC Open

PLC integration

Almost every type of 4D kinematic is supported



4D-Kinematics

- Predefined kinematics
- Technology objects
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PLC integration

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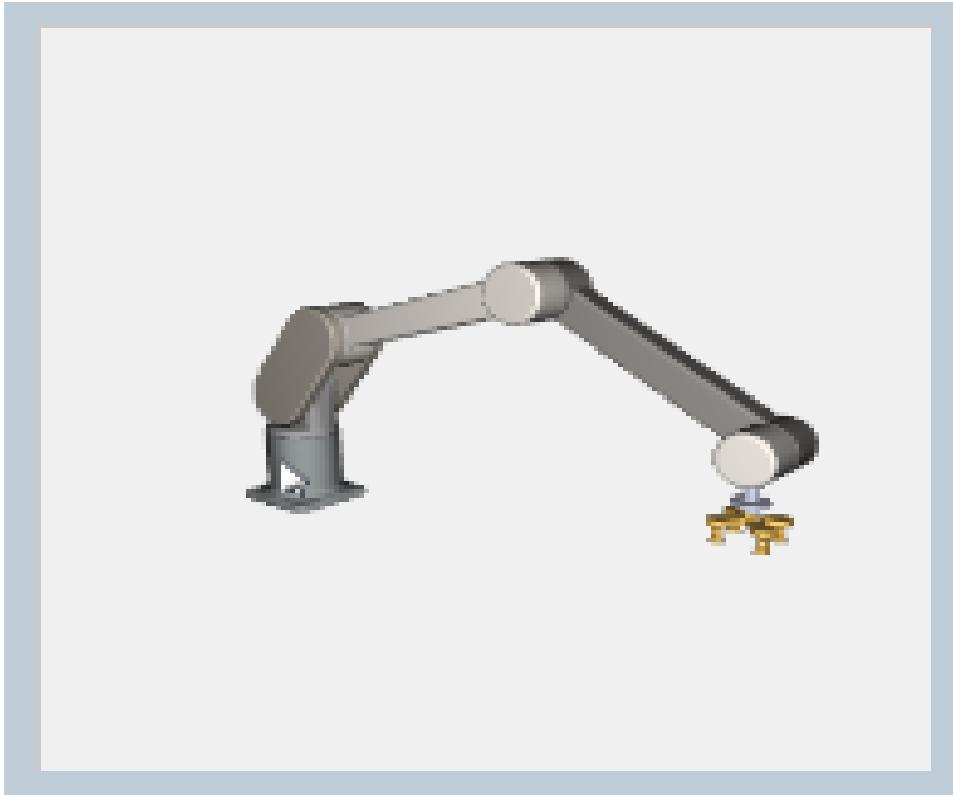
Ingenuity for life

4D-Kinematics

- Predefined kinematics
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PLC integration

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4D-Kinematics

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PLC integration

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4D-Kinematics

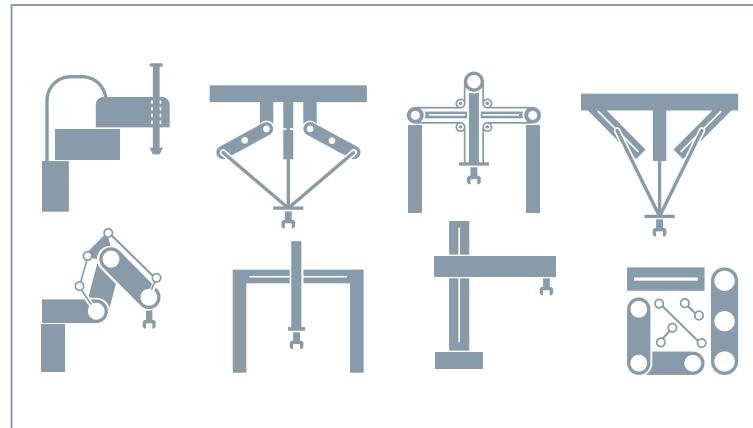
- Predefined kinematics
- Technology objects
- Graphically config
- PLC Open

Technology Object (TO) Kinematics

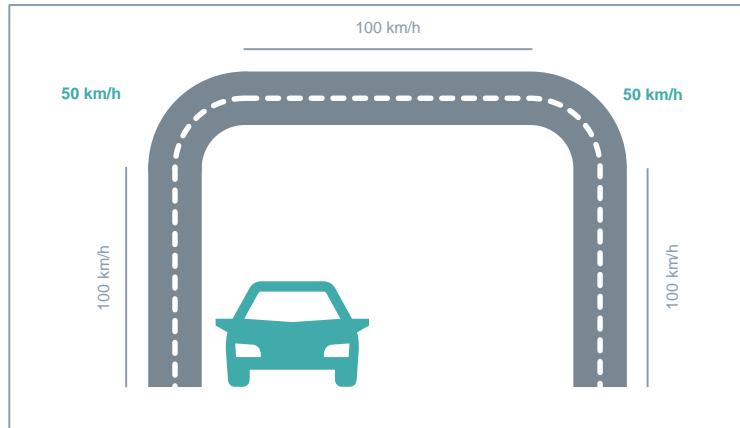
Main Features

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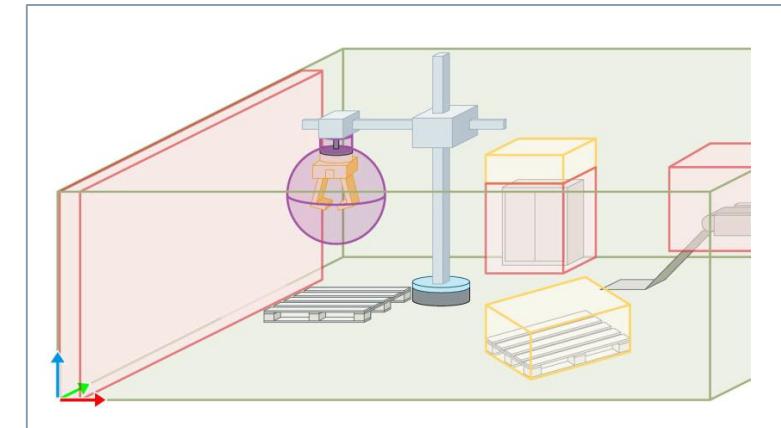
4D-Transformations



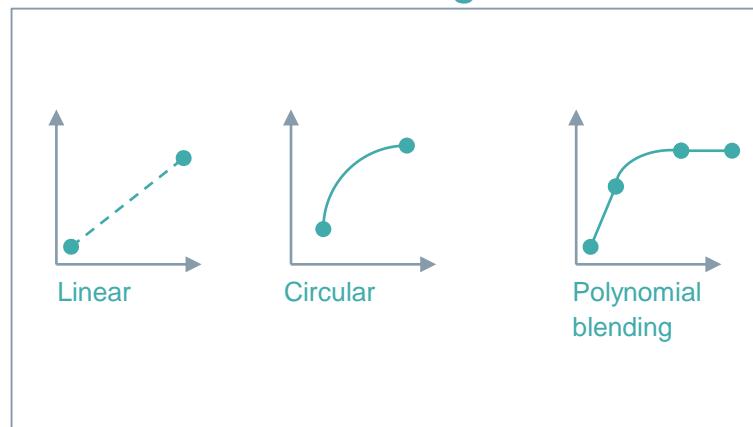
Dynamic Adaption



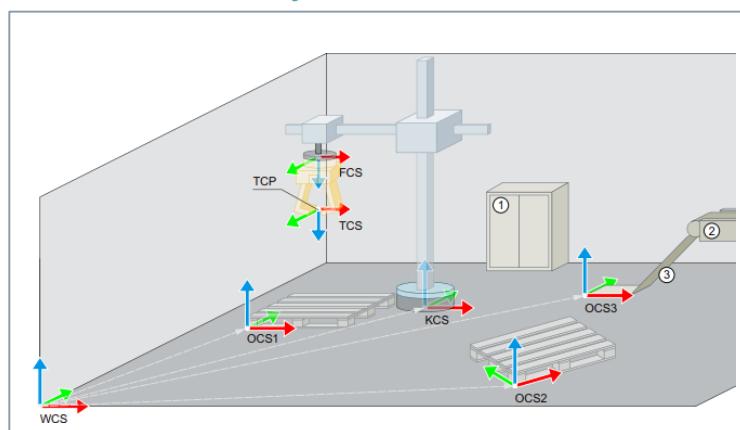
Zones



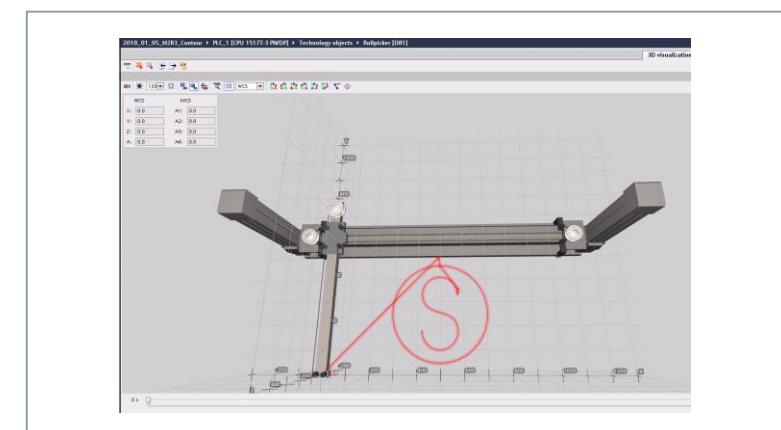
Motions with Blending



Coordinate Systems



Kinematics Trace

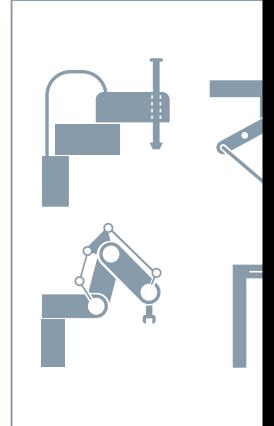


Technology Object (TO) Kinematics

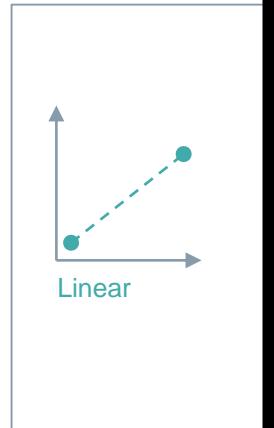
Main Features

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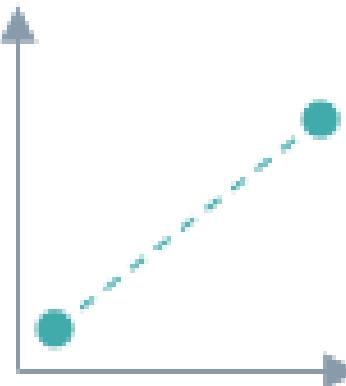
4D-Transformations



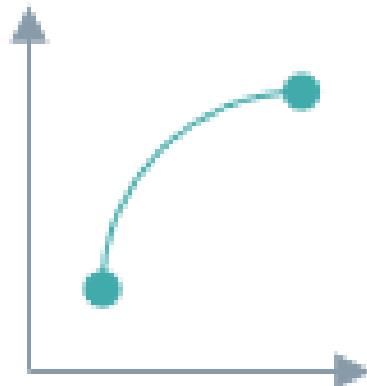
Path Motions with



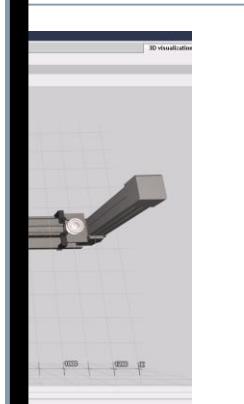
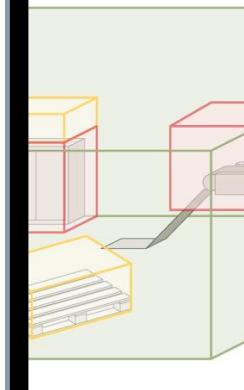
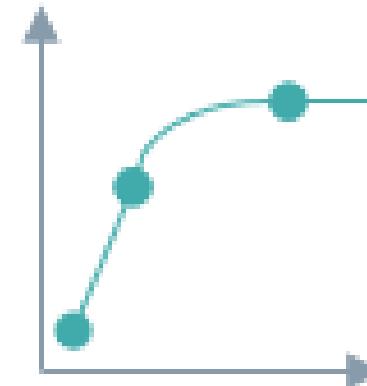
Linear



Circular



Polynomial
blending

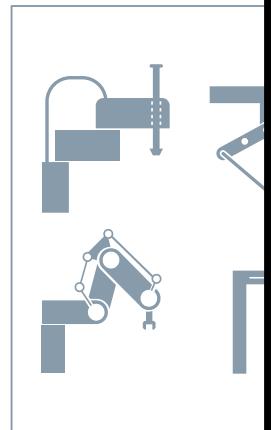


Technology Object (TO) Kinematics

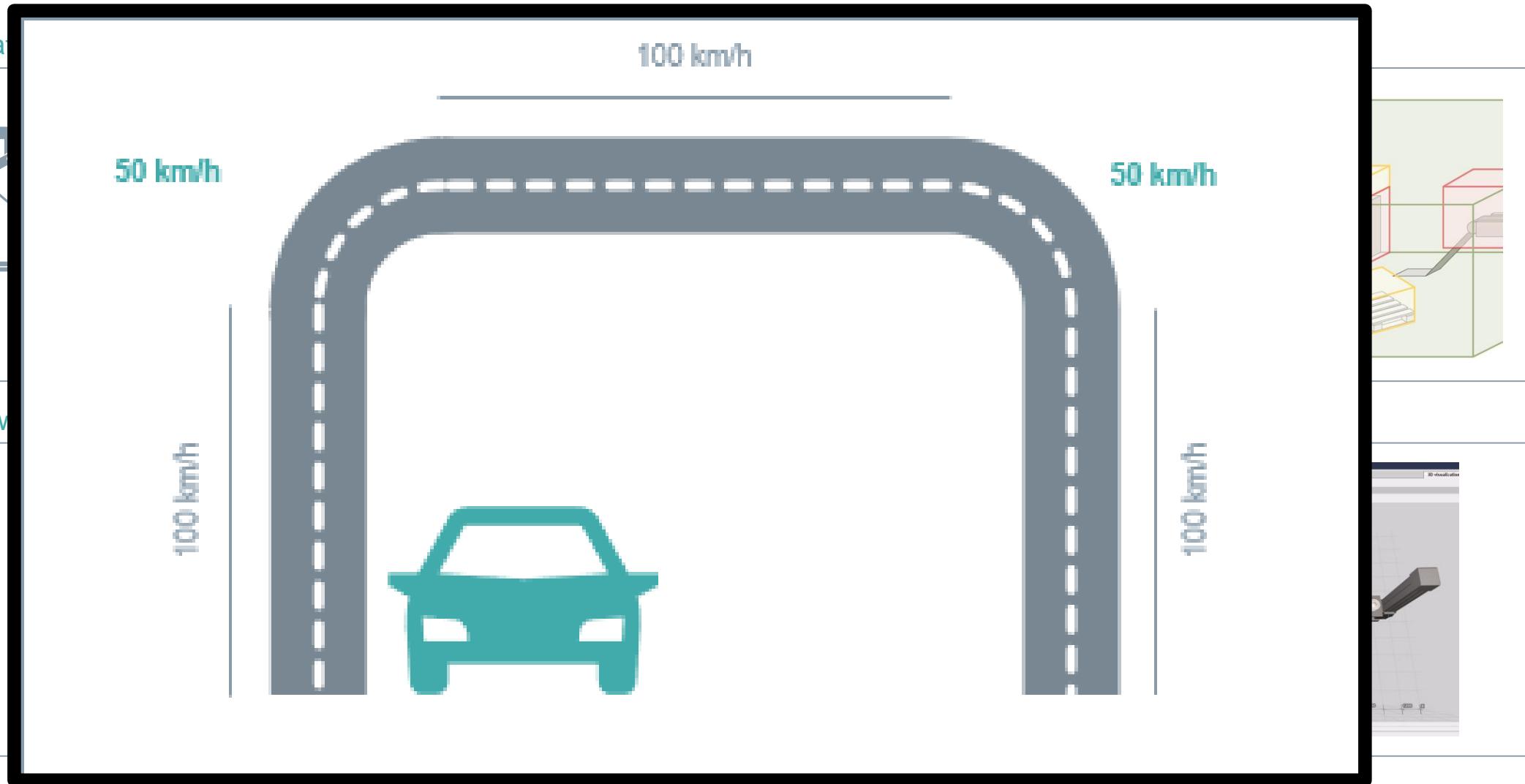
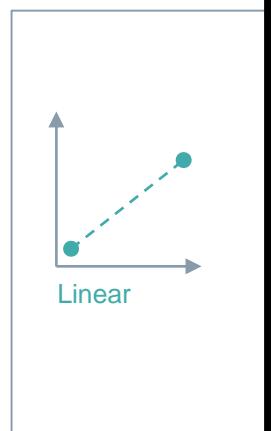
Main Features

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4D-Transformation



Path Motions with

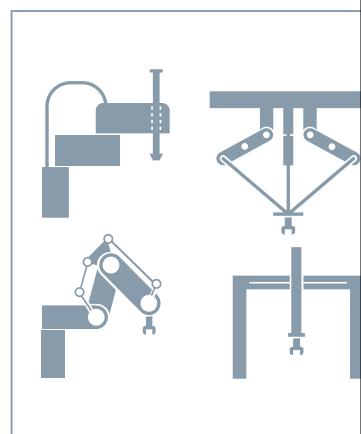


Technology Object (TO) Kinematics

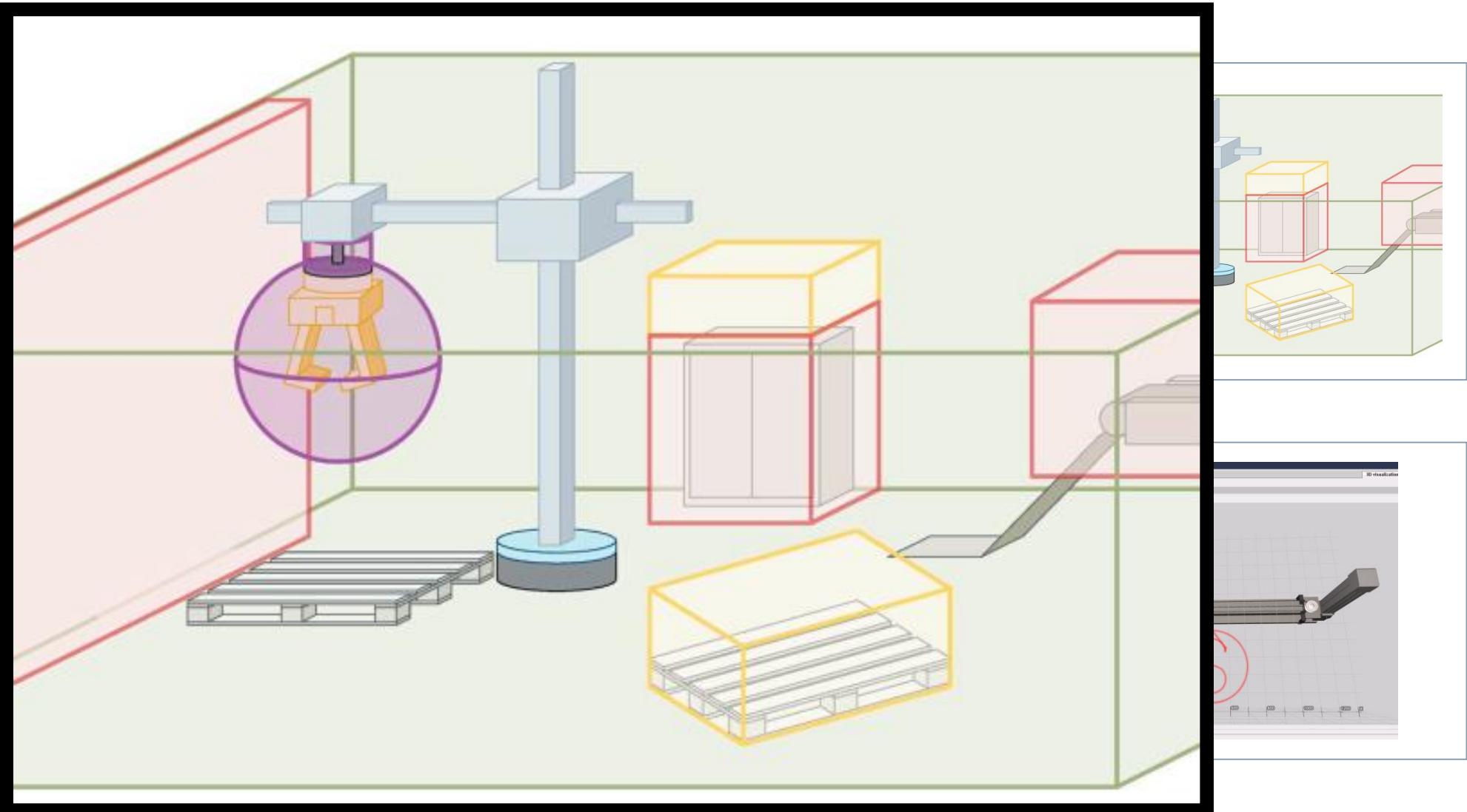
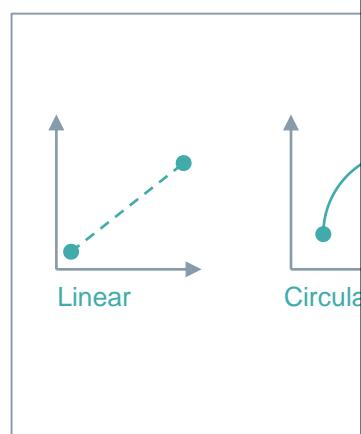
Main Features

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4D-Transformations



Path Motions with Blend

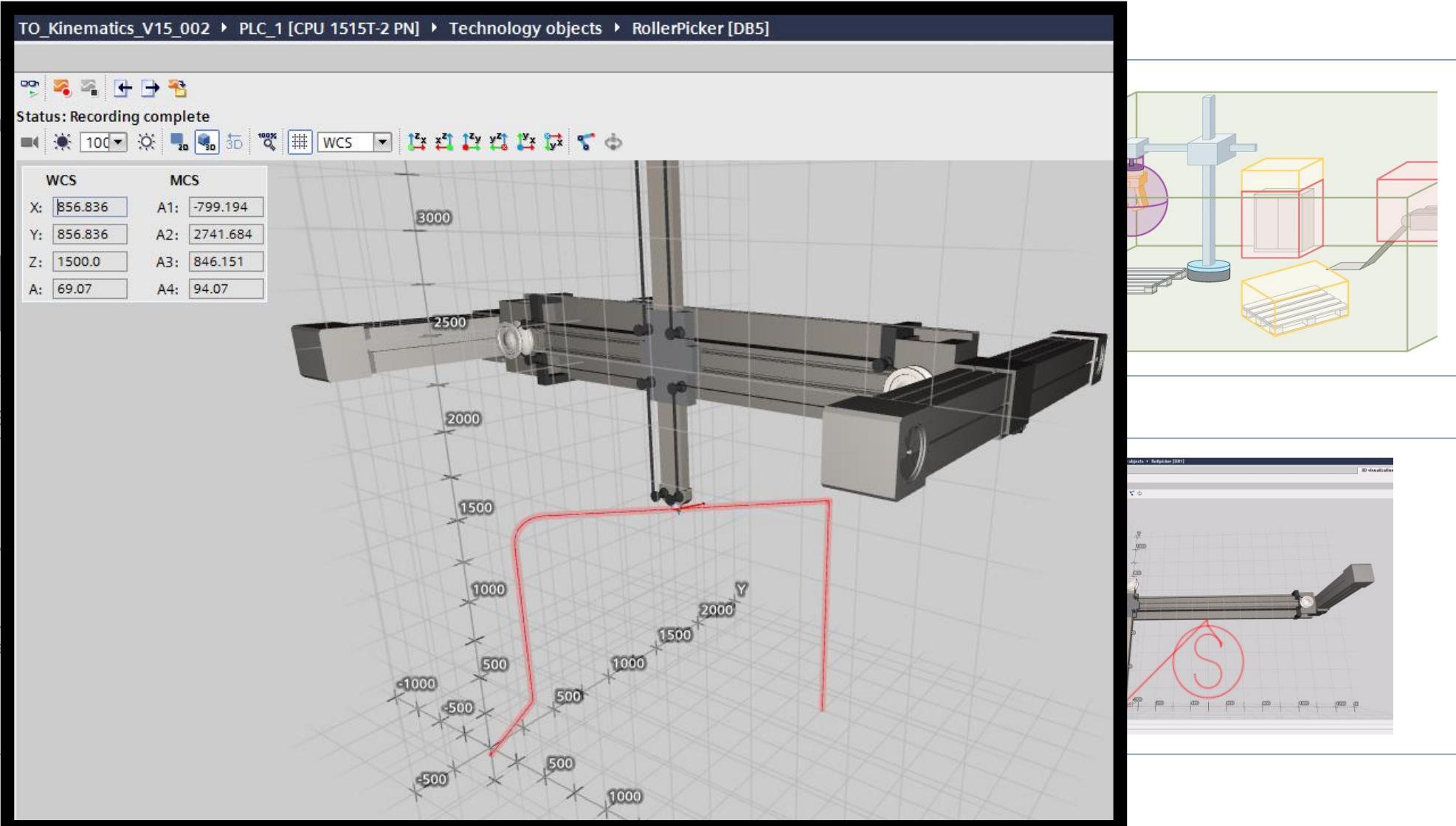
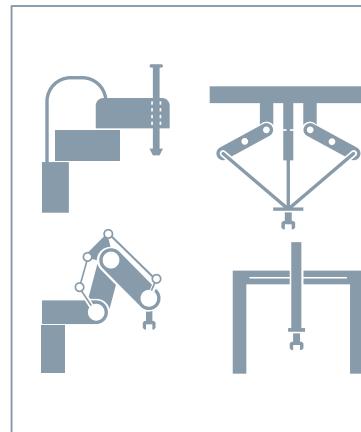


Technology Object (TO) Kinematics

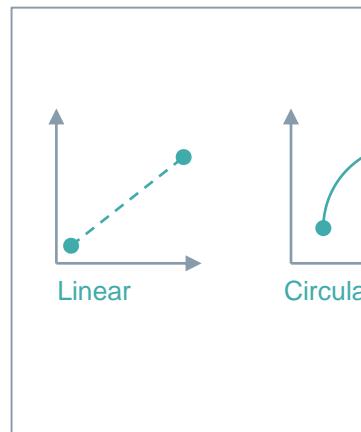
Main Features

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4D-Transformations



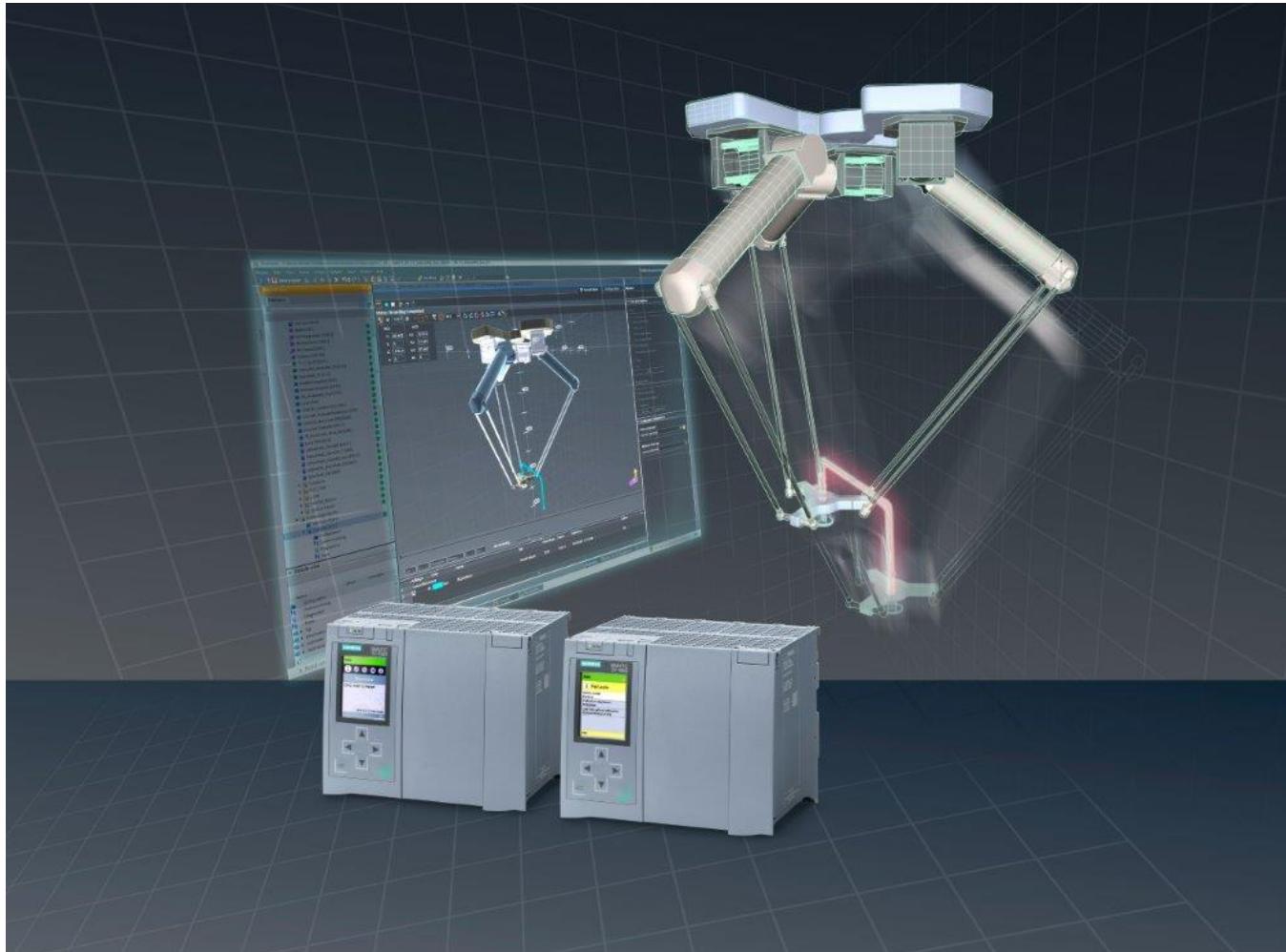
Path Motions with Blend



PLC integration

Summary

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Highlights

- Tailored to machine
- Cost effective
- Fully PLC integration
- High level of usability
- No expert knowledge



Webinar

„Spar tid og penge med Simatic Robot Integration“

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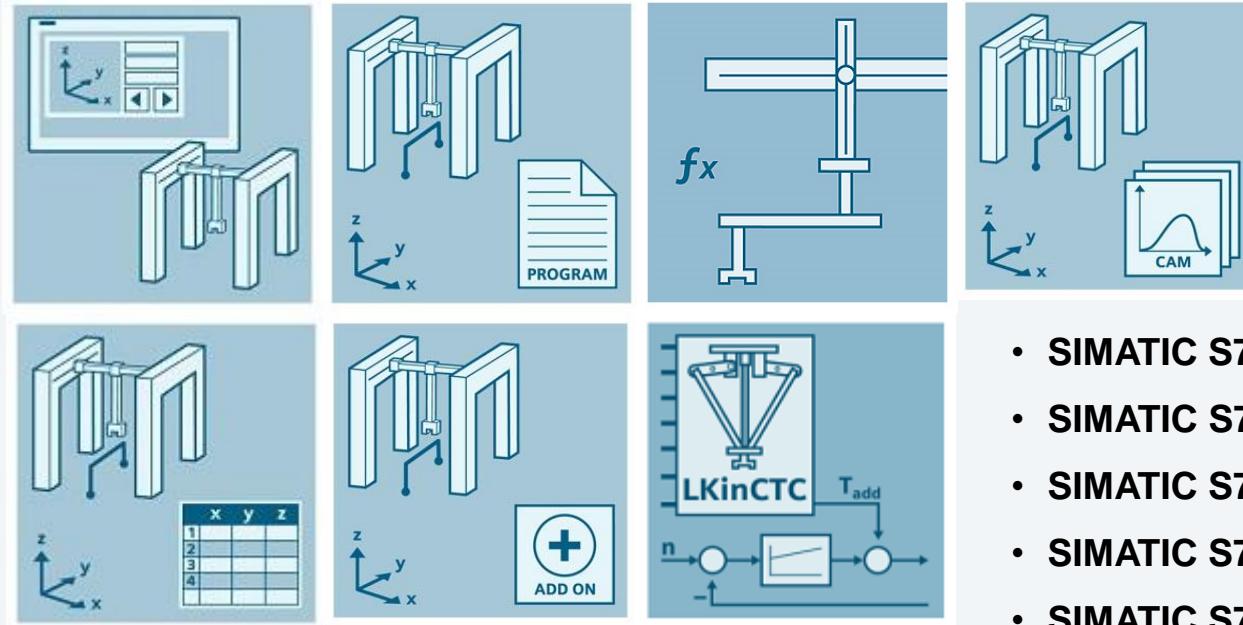
- Hvorfor Robot integration i Simatic?
- Industrirobot integration via interfaces i TIA Portalen
- Integration af eget robot-design i TIA Portalen
- **Bonusinfo - applikationseksempler**
- Q/A
- Kommende Webinar



Siemens software package

Easy robot handling with applications examples

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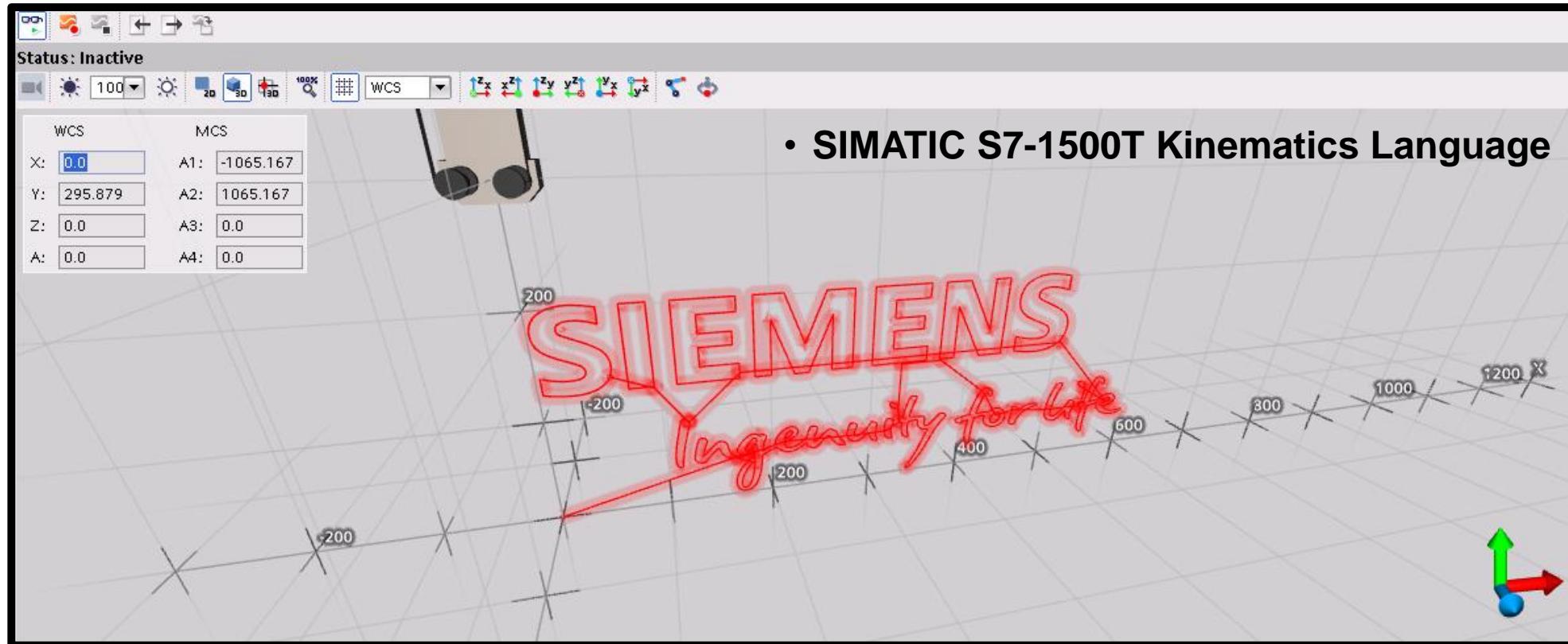
- SIMATIC S7-1500T Kinematics Manual Control
- SIMATIC S7-1500T Kinematics Control
- SIMATIC S7-1500T Kinematics AddOn
- SIMATIC S7-1500T Kinematics Transformation
- SIMATIC S7-1500T Kinematics Computed Torque Control
- SIMATIC S7-1500T Kinematics Cam Control
- SIMATIC S7-1500T Kinematics Language

Download free of charge, standard application software example

Siemens software package

Applications examples. G-Code easy robot handling

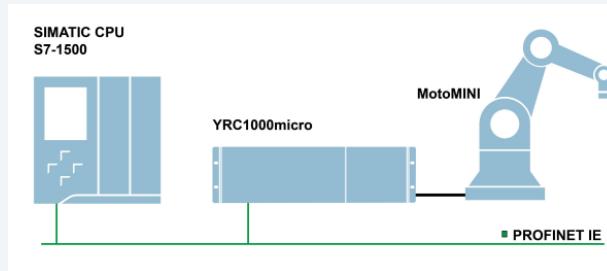
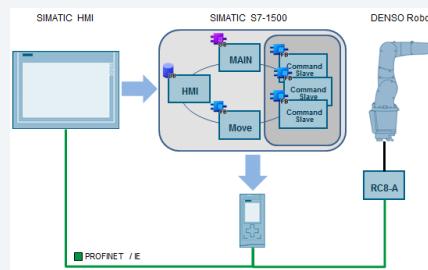
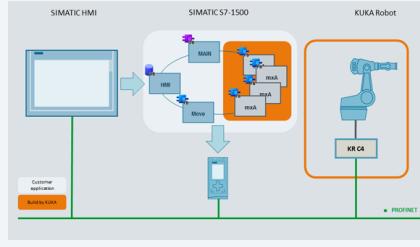
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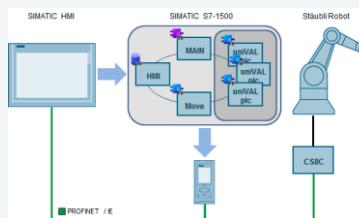
Siemens software package

Easy robot handling with applications examples

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- **FAQ SIMATIC Robot Integrator for KUKA**
- **FAQ SIMATIC Robot Integrator for Stäubli**
- **FAQ SIMATIC Robot Integrator for DENSO**
- **FAQ SIMATIC Robot Integrator for YASKAWA**



Download free of charge, standard application software example

Siemens Hardware package bundle

Easy robot handling with PLC and Tia Portal

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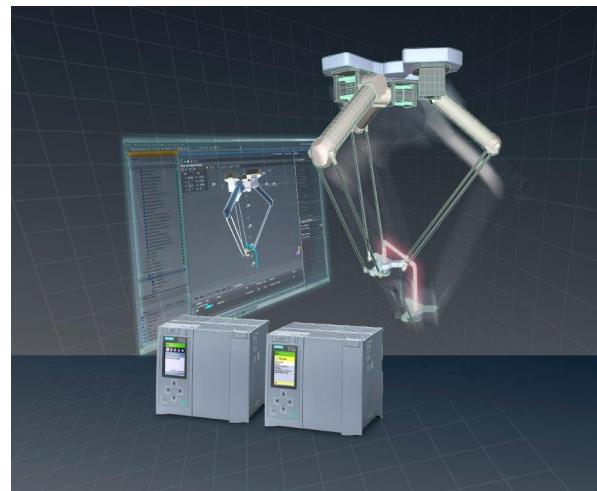
CPU 151x-T(F)



SINAMICS S210



Delta Picker D4



Hardware bundle from one supplier

Webinar

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- Kommende Webinar





Spørgsmål

Yderligere information



Gense webinar og download materiale på www.siemens.dk/di-webinarer

Kontakt

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Simon Sonne

Simon.Sonne@siemens.com

Ulf Lindhard

Ulf.Lindhard@siemens.com

Webinar

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- **Kommende Webinar**



Maskinsikkerhed med TIA-portalen

- integreret og skalerbart



Med afsæt i TIA-portalen vil vi præsentere de muligheder, du har med integration af safety-funktioner i automationsløsninger.

Få svar på hvad **Simatic Safety Integrated** er
– fra risikovurdering til implementering.

Se hvordan du enkelt kan integrere safety-funktioner med TIA-portalen og få eksempler på fleksibiliteten og diagnose-mulighederne.

Fredag d. 15. maj kl. 11.00





www.siemens.dk/di-webinarer