Smooth Operator

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No time for downtime

ISCAR PLUS

ROBOTIQ

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What is the Smooth Operator?

The Smooth Operator is a complete product consisting of a Universal Robots UR10e Robotic arm combined with a Robotiq end affector (gripper system) guided by software and additional sensors to effectively automate existing CNC machine tools.

HOW DOES IT WORK?

First the Smooth Operator Uses a wrist guided camera to identify parts to be machined, determines the best way to pick them up and then places them in your CNC machine.

Then the machine tending software enables a pneumatic switch to press the cycle start button. Tower light sensors monitor the status of the CNC machine until the cycle finishes and then the robotic arm removes the part and replaces it with the next job, rinse and repeat until all your jobs are completed!

Is it hard to program?

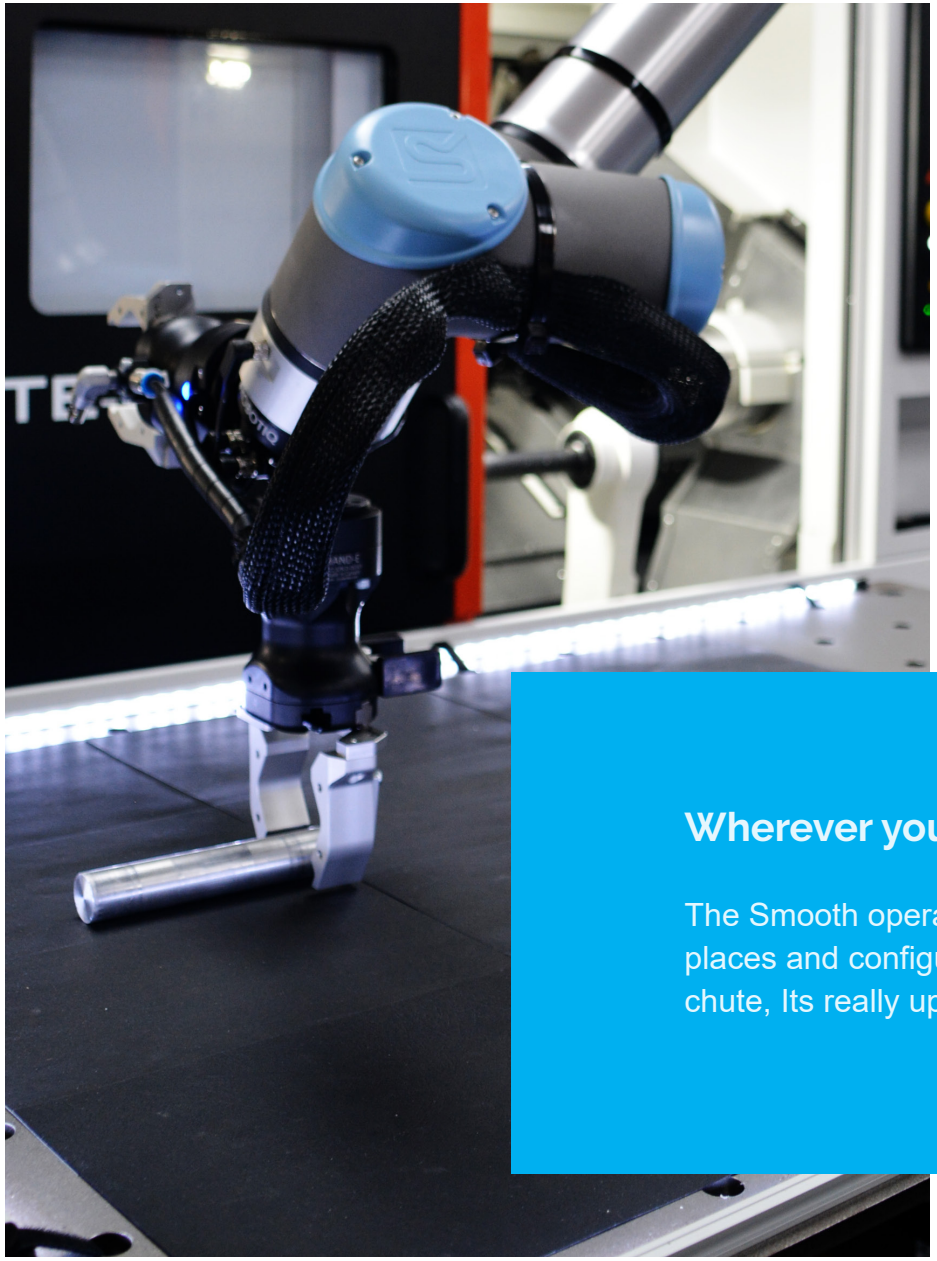
No, anyone can learn to set up and deploy/redeploy the smooth operator, it works very similarly to conversational CNC machine controls in that you outline movement zones and can pick sections of previous programs to use in future setups!

Is it safe? Where are the cages and laser grids?

The Smooth operator is a Collaborative Robot, or COBOT for short, as such it has force sensors built into every joint, as soon as one of these sensors detects an anomaly (i.e. it bumps into something) it will pause to let you clear the obstruction.

But I don't have an automatic door!

Not a problem, the Smooth Operator can open and close the door of your machine just as an operator would.



Where do the finished parts go?

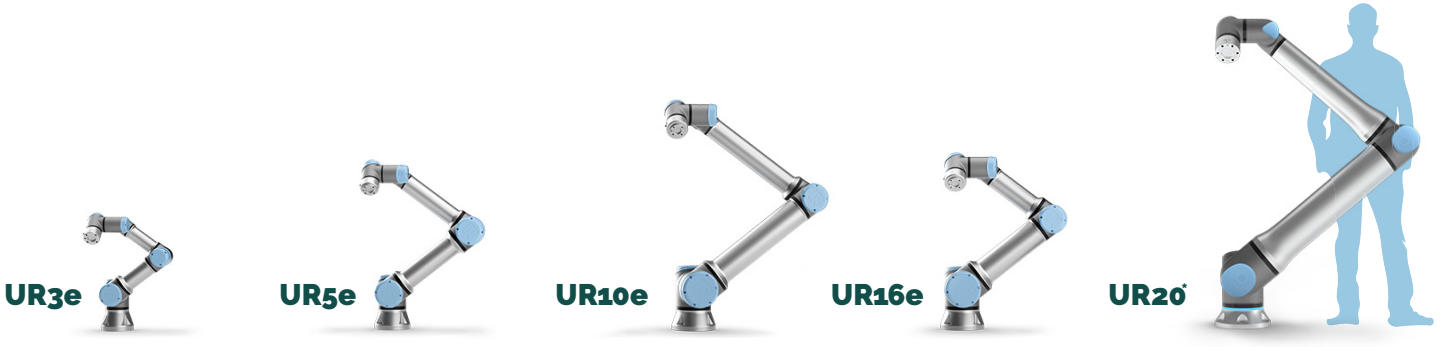
Wherever you would like them to!

The Smooth operator can be programmed to drop finished parts into several places and configurations, such as onto a conveyer belt, into a bin, down a chute, Its really up to you!

UNIVERSAL ROBOTS

Robot arm

Technical specification



Specification

	UR3e	UR5e	UR10e	UR16e	UR20
Payload at full CoG offset and in the entire workspace	3 kg (6.6 lbs)	5 kg (11 lbs)	12.5 kg (27.5 lbs)	16 kg (35.3 lbs)	20 kg (44.1 lbs)
Reach	500 mm (19.7 in)	850 mm (33.5 in)	1300 mm (51.2 in)	900 mm (35.4 in)	1750 mm (68.9 in)
Degrees of freedom	< 6 rotating joints >			< 6 rotating joints >	
Programming	< 12 inch touchscreen with PolyScope graphical user interface >			< 12 inch touchscreen with PolyScope graphical user interface >	

Performance

	UR3e	UR5e	UR10e	UR16e	UR20
Power consumption					
Maximum power	300 W	570 W	615 W	585 W	750 W
Moderate operating settings	100 W	200 W	350 W	350 W	500 W
Safety	< 17 configurable safety functions >			< 17 configurable safety functions >	
Certifications	< EN ISO 13849-1, PLd category 3, EN ISO 10218-1 >			< EN ISO 13849-1, PLd category 3, EN ISO 10218-1 >	

Force sensing, tool flange	**Force, x-y-z**	**Torque, x-y-z**	**Force, x-y-z**	**Torque, x-y-z**	**Force, x-y-z**	**Torque, x-y-z**	**Force, x-y-z**	**Torque, x-y-z**	**Force, x-y-z**	**Torque, x-y-z**
Range	30.0 N	10.0 Nm	50.0 N	10.0 Nm	100.0 N	10.0 Nm	160.0 N	10.0 Nm	200 N	20.0 Nm
Precision	2.0 N	0.1 Nm	3.5 N	0.2 Nm	5.0 N	0.2 Nm	5.0 N	0.2 Nm	5.5 N	0.2 Nm
Accuracy	3.5 N	0.1 Nm	4.0 N	0.3 Nm	5.5 N	0.5 Nm	5.5 N	0.5 Nm	10 N	1 Nm

Movement

	UR3e	UR5e	UR10e	UR16e	UR20
Pose repeatability per ISO 9283	± 0.03 mm	± 0.03 mm	± 0.05 mm	± 0.05 mm	± 0.05 mm

Axis Movement	**Working range**	**Maximum speed**	**Working range**	**Maximum speed**	**Working range**	**Maximum speed**	**Working range**	**Maximum speed**	**Working range**	**Maximum speed**
Base	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 120°/s	± 360°	± 120°/s	± 360°	± 120°/s
Shoulder	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 120°/s	± 360°	± 120°/s	± 360°	± 120°/s
Elbow	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 150°/s
Wrist 1	± 360°	± 360°/s	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 210°/s
Wrist 2	± 360°	± 360°/s	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 210°/s
Wrist 3	Infinite	± 360°/s	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 180°/s	± 360°	± 210°/s

Features

	UR3e	UR5e	UR10e	UR16e	UR20
IP classification	IP54	IP54	IP54	IP54	IP54
ISO 14644-1 class cleanroom	5	5	5	5	5
Noise	> 60 dB(A)	> 65 dB(A)	> 65 dB(A)	> 65 dB(A)	> 65 dB(A)
Robot mounting	Any Orientation	Any Orientation	Any Orientation	Any Orientation	Any Orientation
I/O Ports					
Digital in	2	2	2	2	2
Digital out	2	2	2	2	2
Analog in	2	2	2	2	2
Tool I/O power supply voltage	12/24 V	12/24 V	12/24 V	12/24 V	12/24 V
Tool I/O power supply	600 mA	1.5 A (Dual pin) 1 A (Single pin)	2 A (Dual pin) 1 A (Single pin)	2 A (Dual pin) 1 A (Single pin)	2 A (Dual pin) 1 A (Single pin)

Physical

	UR3e	UR5e	UR10e	UR16e	UR20
Footprint	Ø 128 mm	Ø 149 mm	Ø 190 mm	Ø 190mm	Ø 245 mm
Materials	< Aluminium, Plastic, Steel >			< Aluminium, Plastic, Steel >	
Tool flange connector type	< M8 | M8 8-pin (male), EN ISO-9409-1-50-4-M6 >		< M8 | M8 8-pin (male), EN ISO-9409-1-50-4-M6 >		M8 | M8 8-pin (female) EN ISO-9409-1-80-6-M8
Cable length (robot arm)	< 6 m (236 in) >			< 6 m (236 in) >	
Weight including cable	11.2 kg (24.7 lbs)	20.6 kg (45.4 lbs)	33.5 kg (73.9 lbs)	33.1 kg (73 lbs)	64 kg (141.1 lbs)
Operating temperature range	< 0-50 °C (32-122 °F) >			< 0-50 °C (32-122 °F) >	
Humidity	< 90%RH (non-condensing) >			< 90%RH (non-condensing) >	

UNIVERSAL ROBOTS

Control box and teach pendant

Technical specification

Control box	CB 5.2	CB 5.5*	OEM 5.2	OEM 5.5*
Features				
Robot types	UR3e, UR5e, UR10e, UR16e	UR3e, UR5e, UR10e, UR16e, UR20	UR3e, UR5e, UR10e, UR16e	UR3e, UR5e, UR10e, UR16e, UR20
Software compatibilityP	olyScope 5 and below	All PolyScope versions	PolyScope 5 and below	All PolyScope versions
IP classification	IP44	IP44	IP20	IP20
ISO 14644-1 class cleanroom	66		66	
Operating temperature range	0-50 °C (32-122 °F)	0-50 °C (32-122 °F)	0-50 °C (32-122 °F)	0-50 °C (32-122 °F)
I/O Ports				
Digital In	16	16	16	16
Digital Out	16	16	16	16
Analog In	22		22	
Analog Out	22		22	
Quadrature Digital Inputs	44		44	
I/O power supply	24V, 2A	24V, 2A	24V, 2A	24V, 2A
Communication	Modbus TCP PROFINET Ethernet/IP USB 2.0, USB 3.0	Modbus TCP PROFINET Ethernet/IP USB 2.0, USB 3.0	Modbus TCP PROFINET Ethernet/IP USB 2.0, USB 3.0	Modbus TCP PROFINET Ethernet/IP USB 2.0, USB 3.0
RAM	2 GB	4 GB	2 GB	4 GB
Power Source	100-240 VAC, 47-440 Hz	100-240 VAC, 47-440 Hz	AC model: 100-240 VAC, 47-440 Hz DC model: 24 - 48 VDC	AC model: 100-240 VAC, 47-440 Hz DC model: 24 - 48 VDC
Physical				
Control box size (W x H x D)	460 mm x 449 mm x 254 mm (18.2 in x 17.6 in x 10 in)	460 mm x 449 mm x 254 mm (18.2 in x 17.6 in x 10 in)	451 mm x 168 mm x 150 mm (17.6 in x 6.6 in x 5.9 in)	451 mm x 168 mm x 150 mm (17.6 in x 6.6 in x 5.9 in)
Weight	12 kg (26.5 lbs)	12 kg (26.5 lbs)	AC model: 4.7 kg (10.4 lbs) DC model: 4.3 kg (9.5 lbs)	AC model: 4.7 kg (10.4 lbs) DC model: 4.3 kg (9.5 lbs)
Power supply output	UR3e: 600 W UR5e, UR10e, UR16e: 1500 W	UR3e: 600 W UR5e, UR10e, UR16e, UR20: 1500 W	UR3e: 600 W UR5e, UR10e, UR16e: 1500 W	UR3e: 600 W UR5e, UR10e, UR16e, UR20: 1500 W
Materials	Powdered coated steel	Powdered coated steel	Aluminium	Aluminium
Humidity	90 %RH (non-condensing)	90 %RH (non-condensing)	90 %RH (non-condensing)	90 %RH (non-condensing)

Teach pendant	Standard	3PE
Features		
Robot types	e-Series (standard)	e-Series (optional), UR20 (standard)
IP classification	IP54	IP54
Incl. in certifications	EN ISO 10218-1 EN ISO 13849-1	EN ISO 10218-1 EN ISO 13849-1
Humidity	90 %RH (non-condensing)	90 %RH (non-condensing)
Display resolution	1280 x 800 pixels	1280 x 800 pixels
Freedrive	1 button	2 buttons to support for right and left handed operation
Physical		
Materials	Plastic (PC/ASA)	Plastic (PC/ASA)
Teach pendant size	300 mm x 231 mm x 50 mm (11.8 in x 9.1 in x 1.97 in)	300 mm x 231 mm x 50 mm (11.8 in x 9.1 in x 1.97 in)
Weight (incldng 1 m TP cable)	1.6 kg (3.5 lbs) 1	.8 kg (3.961 lbs)
Cable length(Teach pendant)	4.5 m (177.17 in)	4.5 m (177.17 in)

ROBOTIQ

WRIST CAMERA

VISION MADE FOR UNIVERSAL ROBOTS

EASY TO USE

- **Teach, edit, and run via the teach pendant**
- **Accelerate changeovers with Visual Offset**
- **Operate with any expertise level**

CAD IMPORTC

VISUAL OFFSET

ODE READING

APPLICATIONS

PICK & PLACE

MACHINE TENDING

QUALITY TESTING

ASSEMBLY

FEATURES	BENEFITS
CAD Import	Teach a model using your own CAD file
One-click workplane	Create additional workplanes for your pick and place application with only one click
Auto-pick	Automatically creates the picking action with a centered position
Parametric part teaching	Ideal for faster blank programming
Gripper clearance check	Robust program minimizes production downtime
Visual offset	Use the Robotiq tag to offset the robot program and accelerate changeovers
1D and 2D barcode reading	Perform real time quality control
Image saving	Trace parts in a product assembly Program picture parameters for a personalized visual traceability
Shape programming wizard	Program complex parts in minutes
Assembly management	Simultaneously manage different parts for flexible assembly sequences Enables robot to work in structured or unstructured environments

SPECIFICATIONS

Sensor & Optics	5 MP color sensor, electrically adjustable focus, 70 mm to infinity
Integrated Lighting	Two units (diffused white LED)
Programmable Parameters	• CAD file import teaching (.dxf) • Automatic part teaching (user defined arbitrary shape) • Parametric part teaching (circle, ring, square, rectangle) • Edge editing, object color and clearance validation • Automatic and manual camera parameters: exposure, focus, LED lighting, white balance
Electrical	Direct communication with UR controller (via USB), and power supply from controller (24 V)
Mass	160 g
Operating Temperature0	˚C to 50˚C
Camera Internal Image Buffer	DRAM memory

* All specifications are provided for reference only. See User Manual at support.robotiq.com for official specifications.

ROBOTIQ

HAND-E
ADAPTATIVE GRIPPER

THE GRIPPER
FOR COLLABORATIVE ROBOTS

- Plug + Play and easyt o program
- Ideal for precision assembly tasks
- Ergonomic shape for hand-guiding
- Built for industrial applications and harsh environments
- Automatic partd etection, position feedback, andp art validation

Pick & Place | Assembly | Machine Tending | Quality Testing

UP TO 4.7 KG PAYLOAD	IP67 RATING	5,000,000 CYCLES WARRANTY*

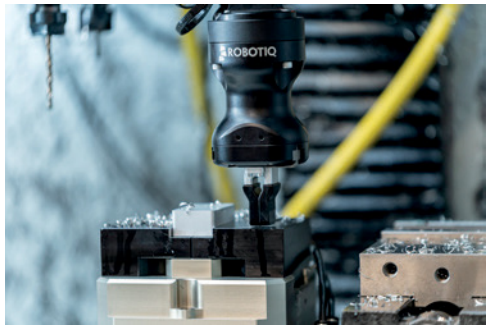
*Excludes fingertips

Extenders sold separately

Take full control

50-mm stroke gripper is suited to collaborative robots

Adapt the hand-e to your parts with accesories or custom fingerprints



Force Copilot sold separately

Unlock full potential with Force Copilot

Path recording node

Insertion node

Find surface node

Force control node

SPECIFICATIONS	HAND-E	
Stroke (adjustable)	50 mm	2 in
Grip force (adjustable)	20 to 185 N4	.5 to 41 lbf
Form-fit grip payload	5 kg	11 lbs
Friction grip payload*	4.7 kg	8.8 lbs
Gripper mass	1 kg	2 lbs
Position resolution (fingertip)	0.2 mm	
Closing speed (adjustable)	20 to 150 mm/s0	.8 to 5.9 in/s
Communication protocol	Modbus RTU (RS485)	
Ingress protection (IP) rating	IP67	

* Calculated for the use of silicon covered fingertips to grip a steel object, at a low robot acceleration.
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ISCAR PLUS

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