SCHUNK SGC kits

HAUSEN ON AIR

- From grippers to grasping-



SCHUNK

About me.



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Market conference decission 2020/2021

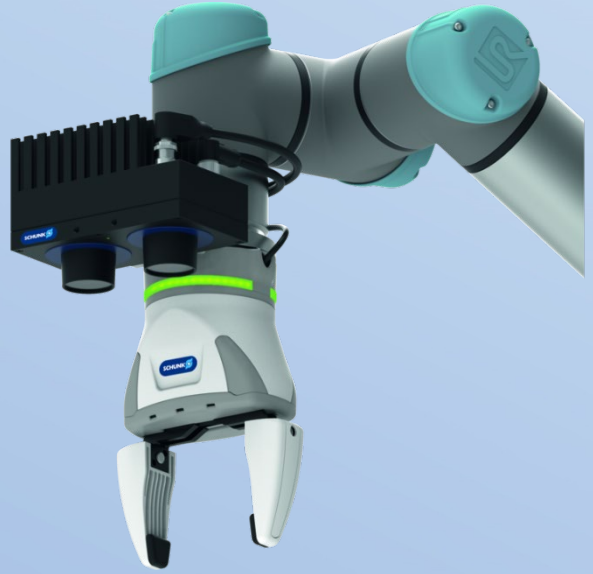
Market Conference Projects TOP 14

PRIOTITY	PROJECT
1	Task Force Cleanroom/MedTec/Pharma
2	Task Force Machine Tending
3	Task Force Sensors
4	Material Removal
5	Pneumatic universal gripper with long stroke
6	Electric universal gripper with long stroke
7	**Smart grasping**
8	Modular pneumatic long stroke, heavy duty gripper
9	Electric small parts gripper with long stroke
10	Soft-Gripping
11	Task Force Segmentation Pneumatic Gripper Portfolio
12	Manual finger changing system
13	MPG-plus protective cover
14	AGS portfolio

Continued Projects

PRIOTITY	PROJECT
15	Universal gripper JGP-P
16	SRM size 20, middle position, speed
17	Techman/Doosan Portfolio
18	EGI size 40, EtherNet/IP, EtherCAT
19	ADHESO (adhesion gripping technology)
20	ERT
21	EBW
22	SHS-B
23	FT-AXIA new size + software
24	LDx safety encoder TTK70S
25	PPU-E new sizes
26	PSH ATEX
27	MPG+ precision size 16, 20, 64
28	ALS

Smart Grasping | EGH

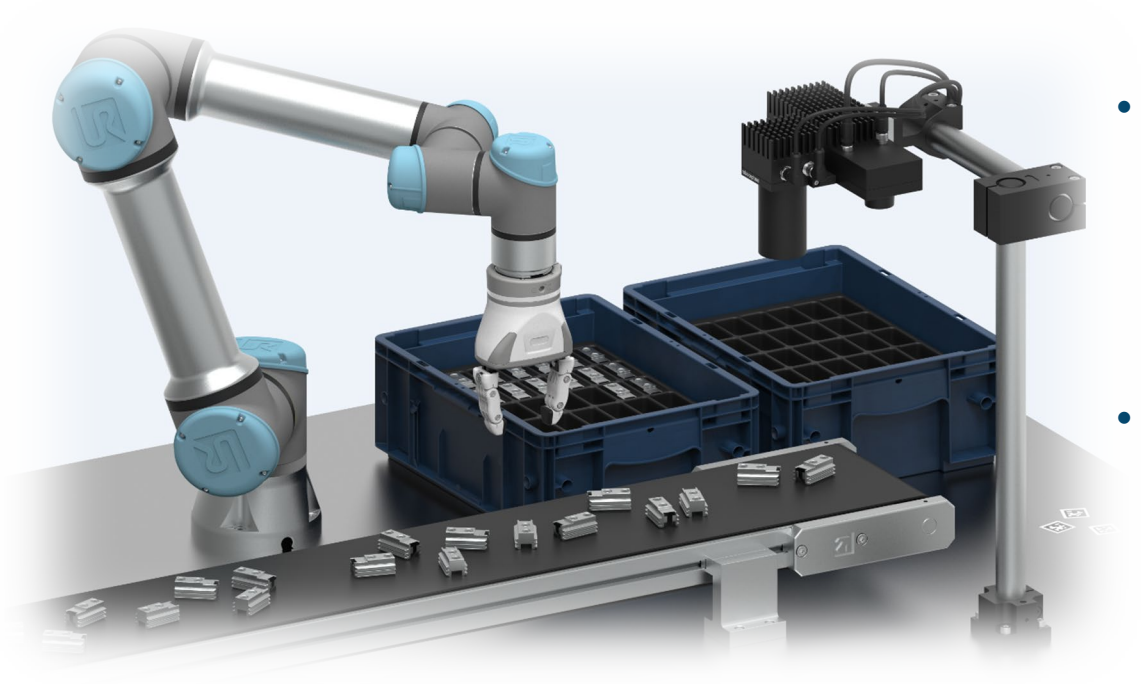


SGC

Application solution for gripping non-position-oriented workpieces consisting of camera system and gripper for easy automation with cobots.

The SGC application kit combines **intelligent object detection** and **flexible gripping** in **one intuitive set**. The camera system reliably detects workpieces on a defined surface even in poor lighting conditions and calculates possible grips **including collision checks**. During workpiece detection, the software function "**template matching**" searches for previously defined objects in a scene. If these are detected, collision-free grips and approach points are automatically calculated, transferred to the robot and the gripper is pre-positioned in the required position.

Smart Grasping – What do we offer?



- Camera-based pick-up and set-down of non-oriented workpieces with a 2-finger parallel gripper (EGH).
- **We do not offer single components. We a delivering a complete solution in a package.**

From Grippers to Grasping



Fields of applications for SCHUNK SGC

- **2D/2.5D**
- **Detecting of part geometries on a flat surface of non-oriented workpieces**
- **Collision detection between gripper, transport box and workpieces**
- Best results with flat workpieces on a flat surface (inclination less than 10%)



Not possible

- **<u>No</u> Bin picking applications**
- **Detection and picking of chaotically provided objects is not possible**
- 3D evaluation via ItemPick/BoxPick (complex and EXPENSIVE)

Overview SGC

HW
SW
Service
Basis
Optional

Adapter plates for roboter and SAS System

Calibration Kit

Camera

Manual

Application validation, teach-in support

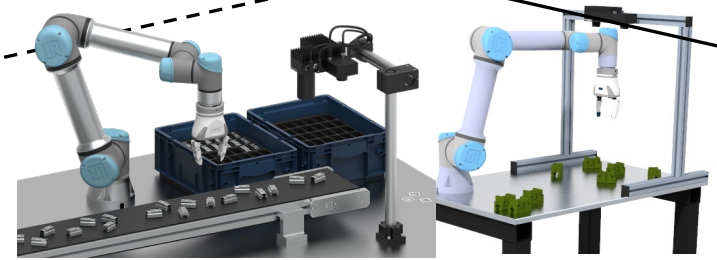
Vision-SW

UR Cap Kamera

EGH Kit

UR Cap EGH

LED Projector



Programm example

Where are the parts coming from?

roboception	
	rc_visard 160 monochrome
	rc_visard 65 monochrome
	rc_RandomDot
	rc_reason SilhouetteMatch (SW)
	CalibrationGrid (small)
	UR CAP rc_visard

accessories	
	Network cable
	Power supply and camera cable

„Products“ SCHUNK	
	EGH UR kit
	UR cap EGH
	Adapter dynamic
	Adapter static
	Beispielprogramm

Produkt kits | Static

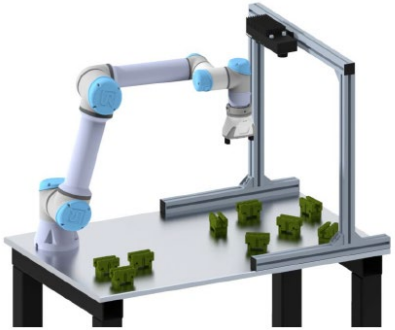


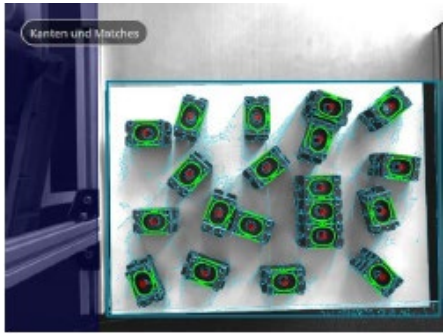




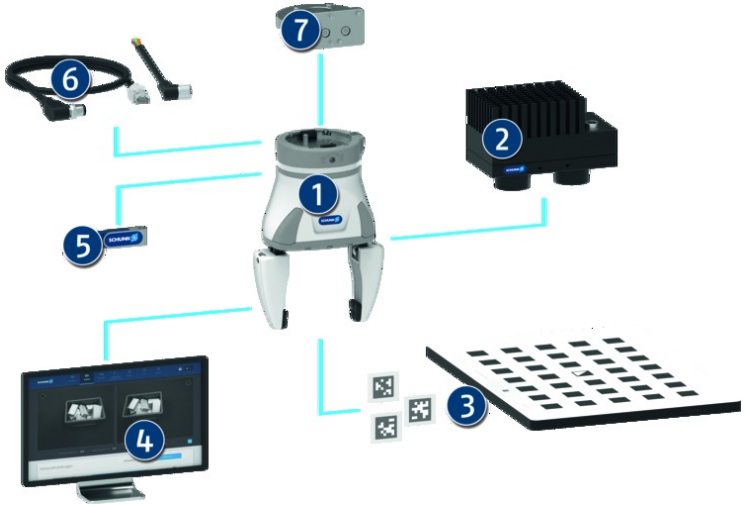
SGC 160-EGH-UR-S

Applications and Examples| How it works!





Produkt kits | Dynamic

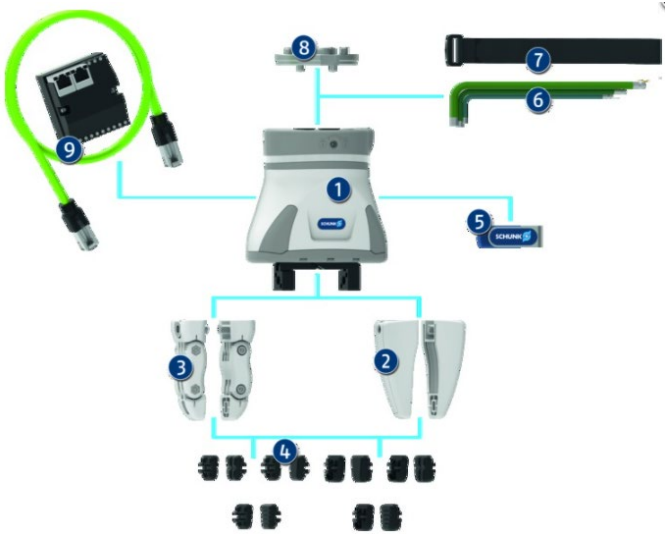




SGC 160-EGH-UR-D

Technical Details

SGC | EGH



Technical data

Description		SGC 160-EGH-UR-S	SGC 65-EGH-UR-D
ID		1465651	1465678
Version		static	dynamic
General operating data			
Compatible robot		UR 3/5/10/16	UR 3/5/10/16
Min./max. ambient temperature	[°C]	5/50	5/50
Nominal voltage	[V]	24	24
Operating data gripper			
Variant		EGH 80-IOL-N-UREK starter	EGH 80-IOL-N-UREK starter
Stroke per jaw	[mm]	40	40
Min./max. gripping force	[N]	0/100	0/100
Recommended workpiece weight	[kg]	0.5	0.5
Weight	[kg]	0.95	0.95
Cable connector/cable end		open wire strands	open wire strands
Cable length	[m]	4	4
Communication interface/ specification		IO-Link/V1.1	IO-Link/V1.1
Operating data camera			
Variant		rc_visard 160	rc_visard 65
Image resolution		1,280 x 960 pixels, monochrome	1,280 x 960 pixels, monochrome
Focal length	[mm]	4	4
Opening angle (horizontal/vertical)	[°]	61/48	61/48
Depth measuring range		0.5 m to infinity	0.2 m to infinity
lateral resolution (x/y direction)		0.5 mm - 2.8 mm (at 0.5 m - 3 m working distance)	0.2 mm - 2.8 mm (at 0.2 m - 3 m working distance)
Depth resolution (z-direction)		0.1 mm - 3.3 mm (at 0.5 m - 3 m working distance)	0.04 mm - 8.0 mm (at 0.2 m - 3 m working distance)
Weight	[kg]	0.84	0.68
Communication interface/ specification		GigE Vision	GigE Vision
Operating data adapter plate			
Weight	[kg]	0.101	0.209
Material		Aluminum	Aluminum

Produkt kits | Pricing



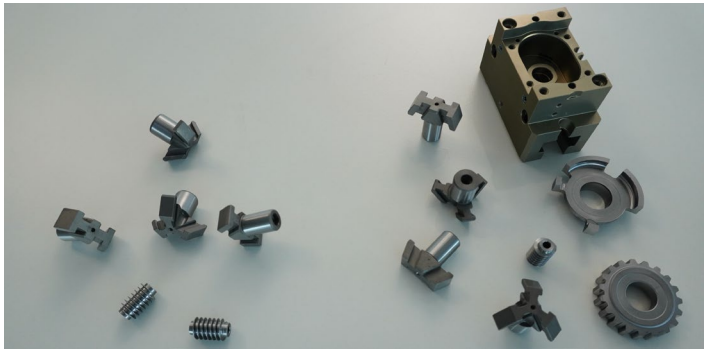
SGC 160-EGH-UR-S



SGC 65-EGH-UR-D

Price: 12.500 € / Set (without gripper 9.600 €)

Applications and Examples|What is possible?!



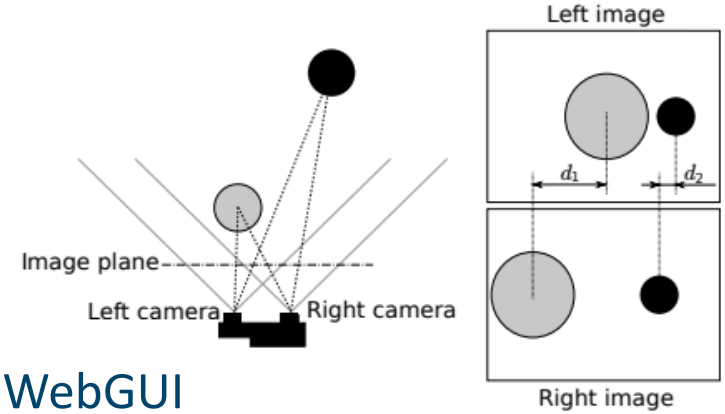
Vorteile – Ihr Nutzen

SGC

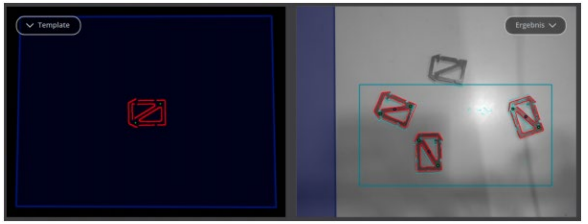
- **Vision and handling expertise from a single source** for a reliable complete solution across the entire application
- **Complete, perfectly attuned set of hardware, software, and service** for quick and easy commissioning
- **Intuitive user interface of the software** for easy configuration of the application
- **Integrated anti-collision device between gripper and transport box** for high process reliability and less downtimes
- **Plug & Work** with the interfaces suitable for all robots from Universal Robots
- **Long and freely programmable gripper stroke** for flexible handling of various workpieces

Function of the rc_visard

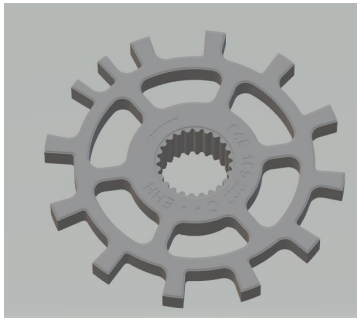
- 3D camera system with integrated controller
- Two stereo cameras use **semi-global matching method**
- Optional software modules run on the camera:
  - ItemPick (Bin picking applications)
  - BoxPick (Bin picking applications)
  - **SilhouetteMatch (in use)**
  - **CollisionCheck (in use, single gripper)**
  - CADMatch (Bin picking applications)
- Parameterization via web-based user interface WebGUI

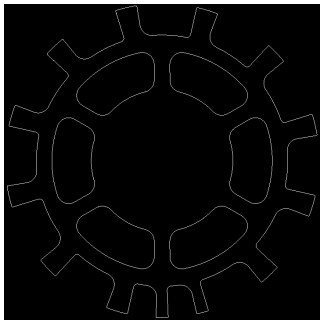


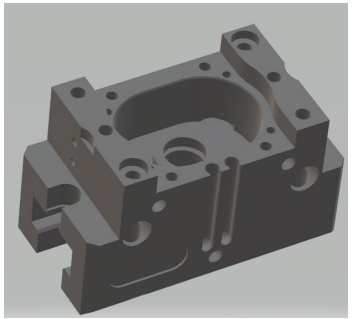
Software modul SilhouetteMatch

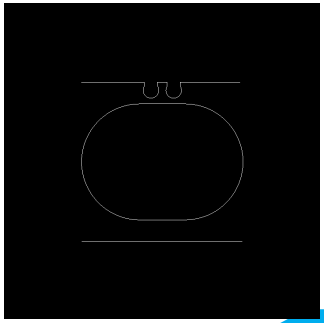


- License included with purchase
- Object recognition by **template matching - method**
- Edges detected in the image are compared with predefined silhouettes (templates)
- Objects are assigned if there is a match

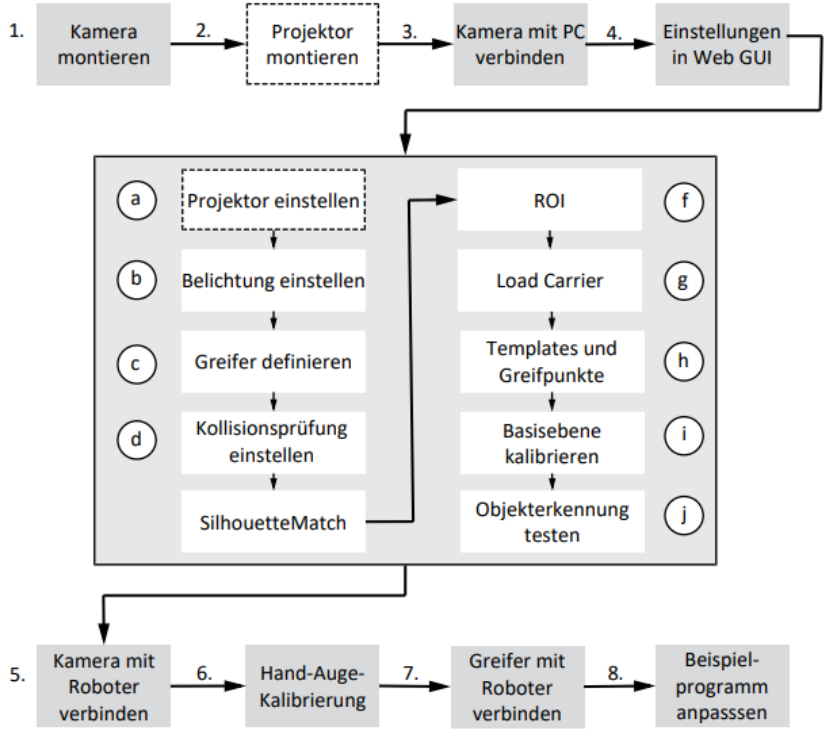








Assembly and Commissioning SGC



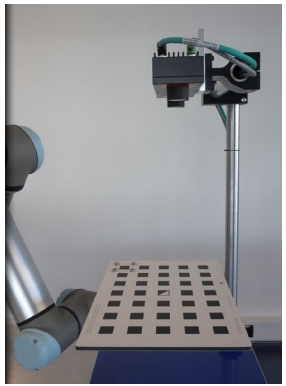
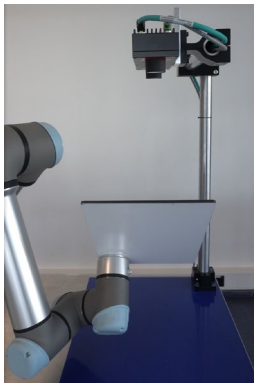
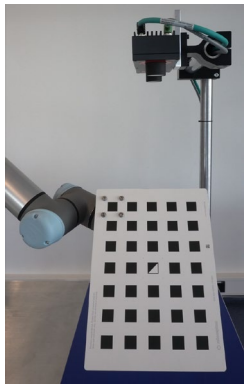
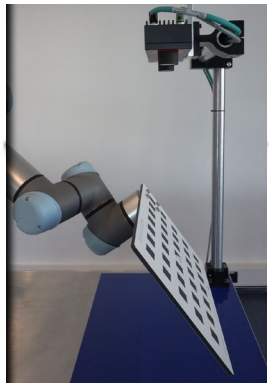
Work steps:

- Assembly and connection (1,2)
- Establish communication (3)
- Set up camera via Web GUI (4)
- Connect camera with UR (5)
- Calibrate robot coordinate system to camera system (6)
- Integrate gripper Install UrCap (7)
- Adapt UR - programm (8)

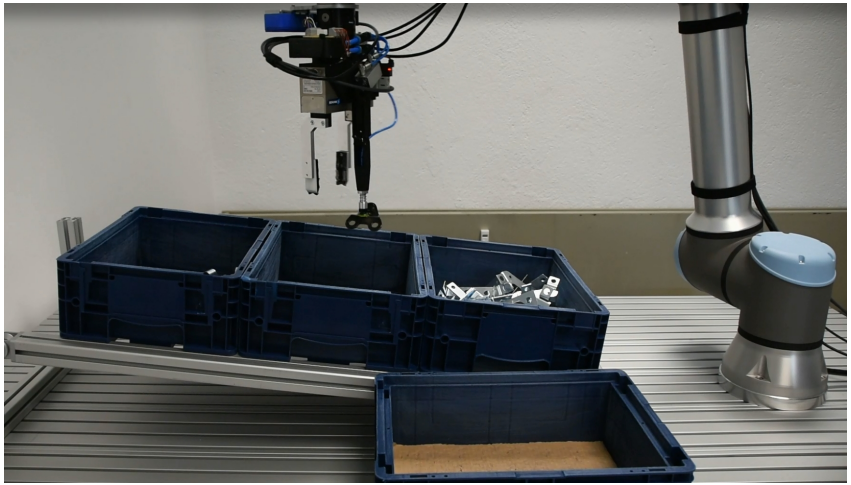
Commissioning at UR

Hand-eye calibration

- Place calibration plate in 4 positions under the camera
- Camera calculates offset to robot automatically
- Don´t move the camera afterwards

Smart Grasping | Fields of application



Machine load – and unloading

- 177k new robotic systems in 2018
- Annual growth of 18

Logistics

- 111k new robotic systems in 2018
- Annual growth of 57

Pick & Place

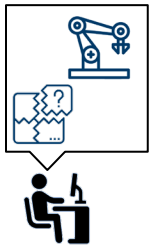
- 32k new robotic systems in 2018
- Annual growth of 20%

Further fields of application:

Assembly, pharmaceutical, etc.

Source [IFR Report 2019]

Validation in the



Customer with application request

Product

Roboter + Product

Product validation



- ADHESO
- Magnet gripper
- Plug&Work
- Smart Grasping
- Material Removal

CoLab

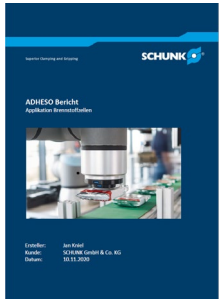
Application validation



- Doosan
- Kuka
- Universal Robots
- Techman
- Fanuc

Report:

Ideal use of components in the spec. application to Reduced customer risk.
Recommendation on process parameters
Faster commissioning for customer





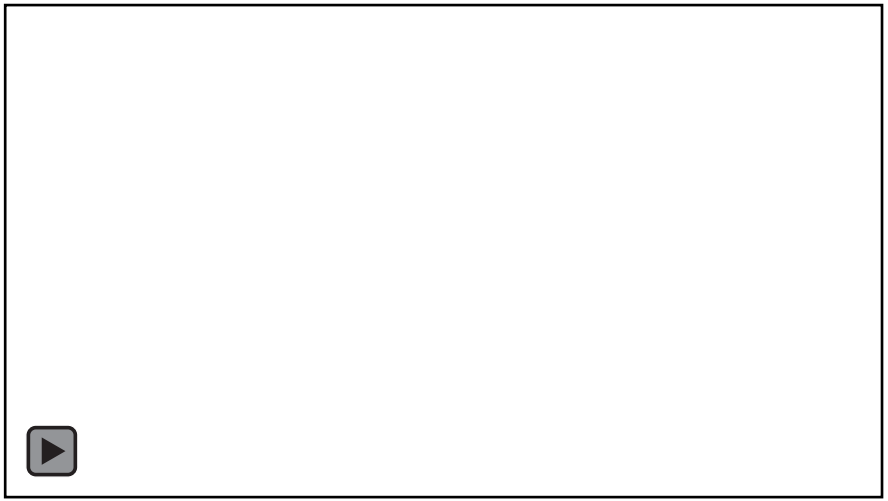
Exemplary CoLab hardware setup in the

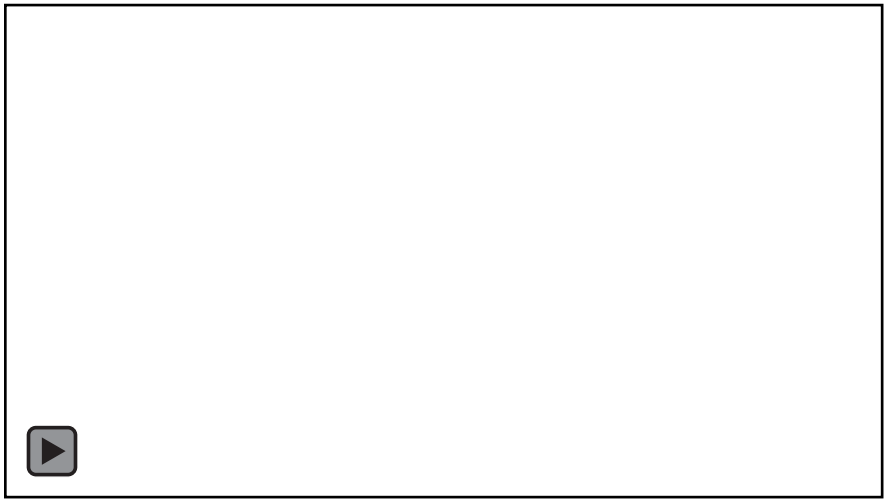
Description of the setup with list of components

Video documentation of the exemplary implementation

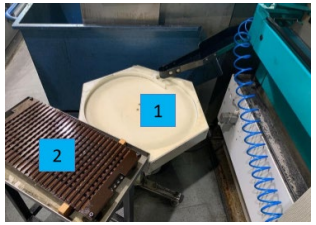
Customer training in CoLab

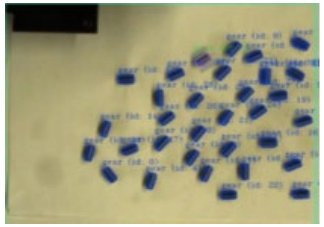
Commissiong of SGC

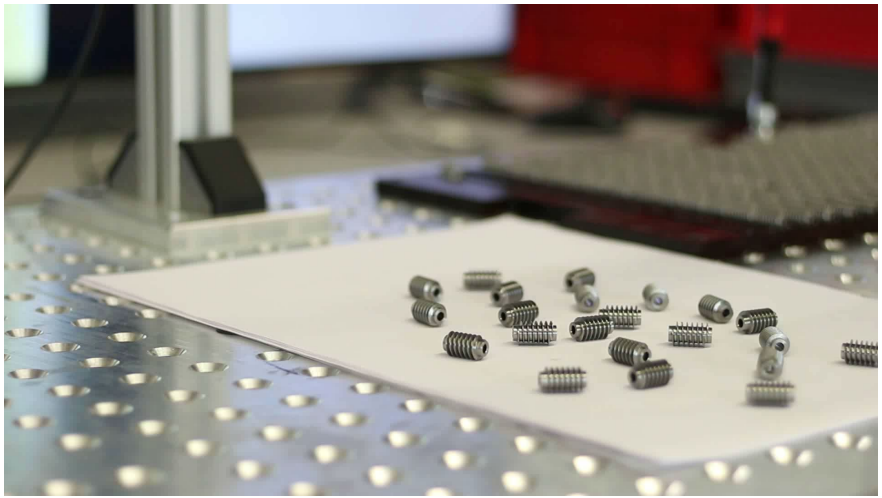


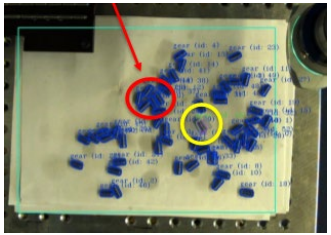


Applications and Examples | snails screws

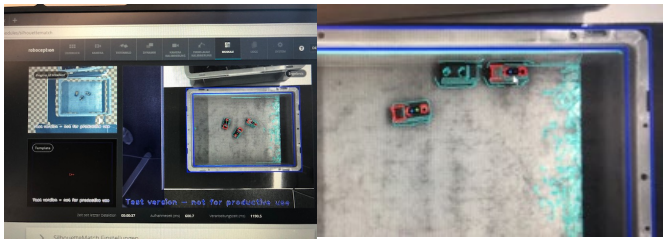






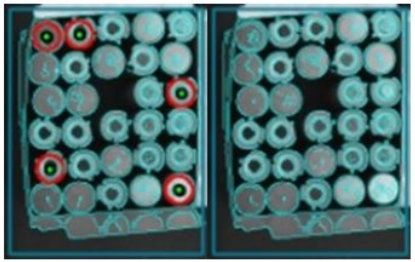


Applications and Examples | base jaws

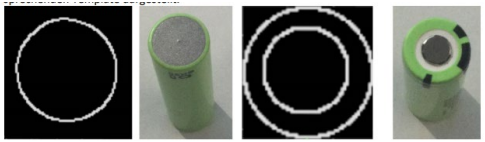


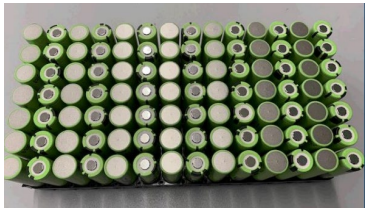


Applications and Examples | Batterie cells

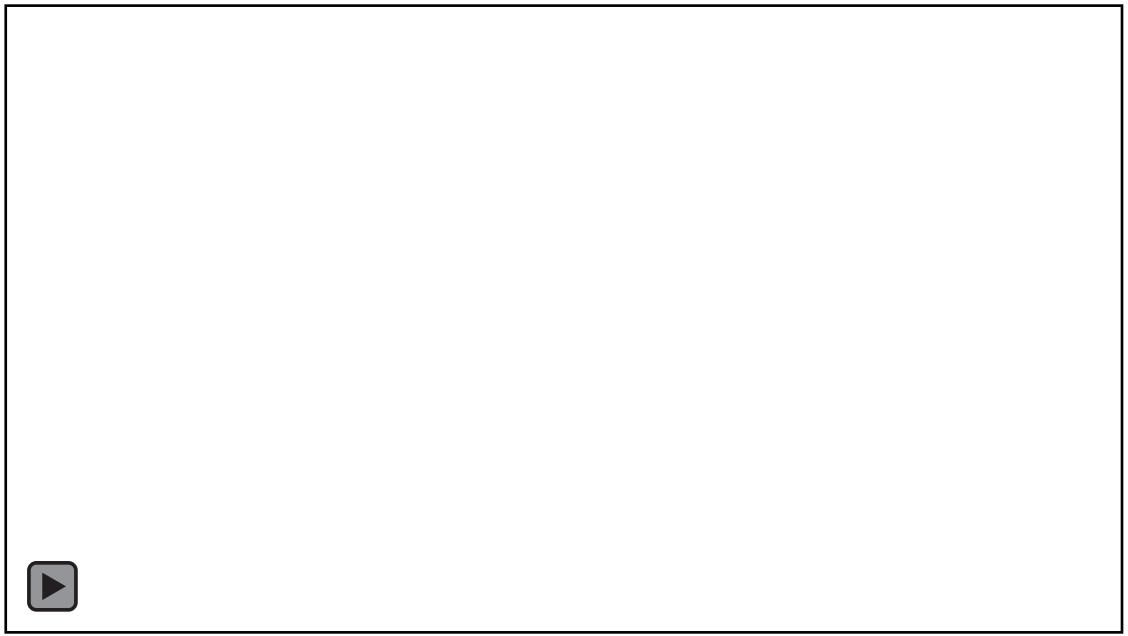


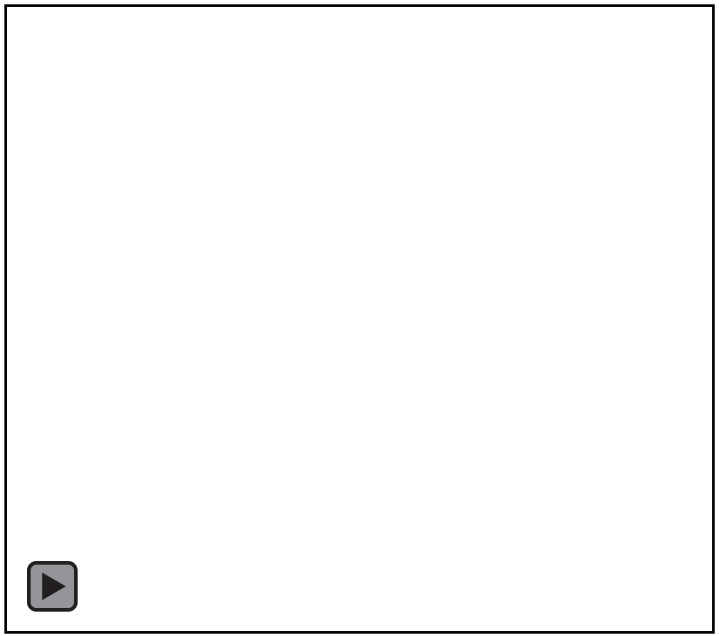




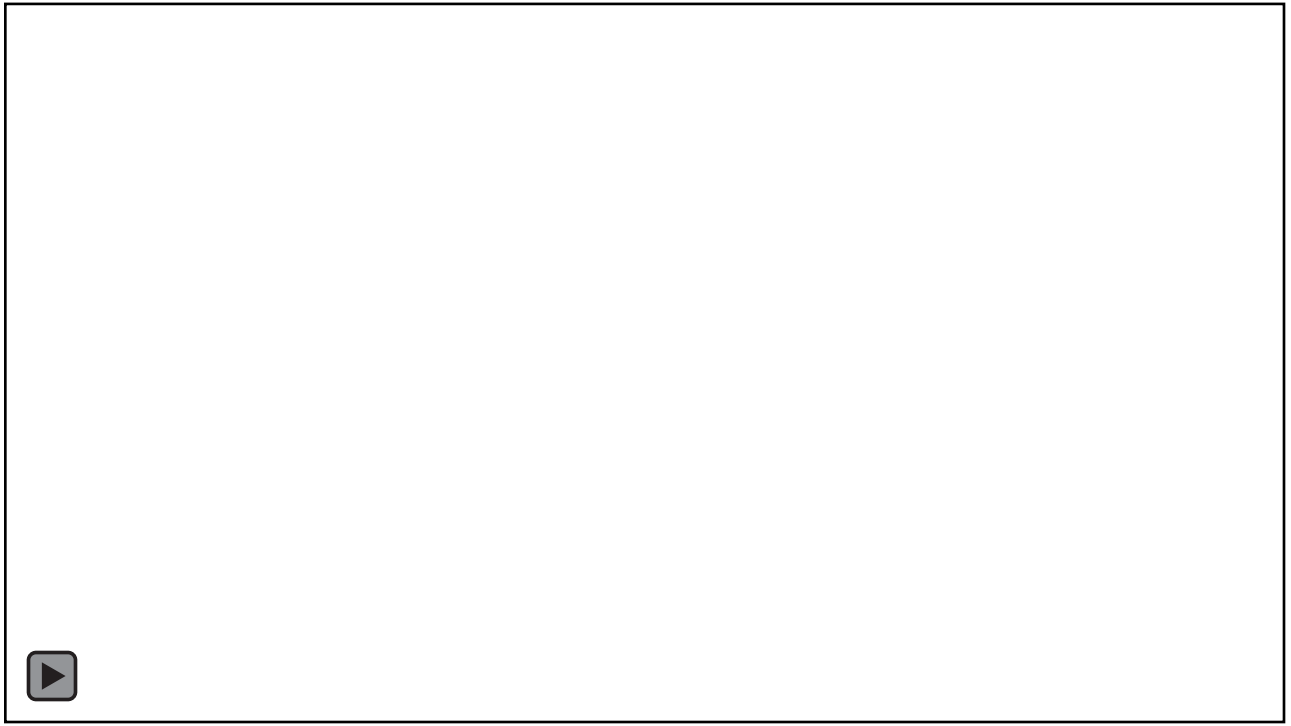


Applications and Examples | wheels etc.

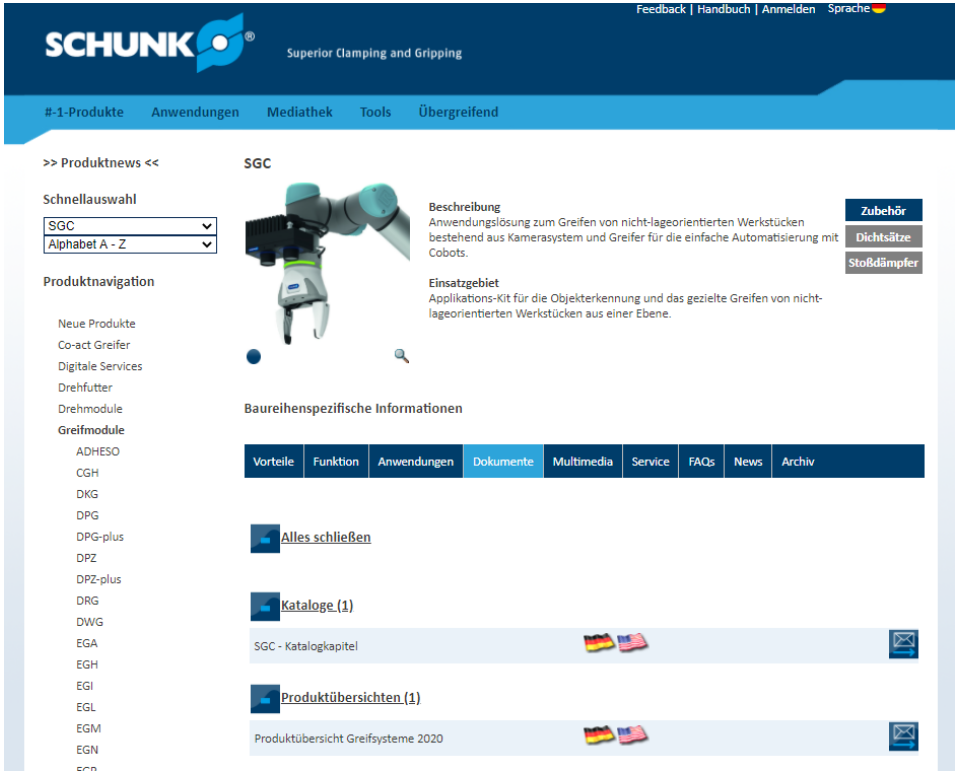




Applications and Examples | wheels etc.



SalesToolBox





Decision support - properties of the SGC

Categories	Number	Description	Selection (Yes; No)
Enviromental properties	**E1**	Objects lie on level (e.g. conveyor belt, table, ...)	Ja
	E2	Objects are partially defined in one or more layers in a plane (e.g. trays, crates, ...)	Nein
	E3	Objects lie completely undefined (e.g. bulk material box)	Nein
	E4	Environment is dynamic and collision obstacles are not prior known	Nein
Object properties	O1	Objects are only one type	Ja
	O2	Objects are separated so far that no collision between objects is possible	Ja
	O3	Objects are invariant in shape (all rigid bodies, e.g. no cables, ...)	Ja
	O4	Objects tend to have strong optical reflections (e.g. polished materials, oil, ...)	Nein
	O5	Objects have little to no texture and edges	Nein
	O6	A digital geometry image exists as CAD (e.g. .stl, .step, ...)	Ja
process properties	P1	Object must be gripped in a defined way	Ja
	P2	Object must be stored defined	Ja
	P3	Cycle times < 0.5 [s]	Nein
		SGC solution possible	**Ja**

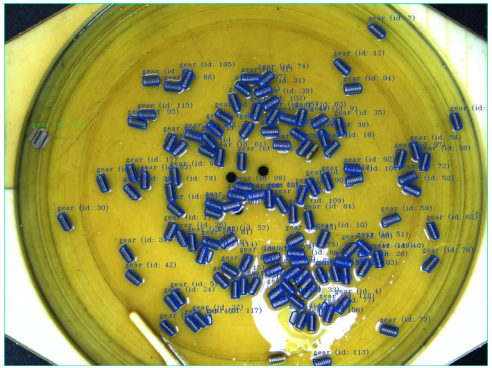
Ergebnisse	Empfehlung
Yes	Product can be sold without hesitation
Maybe	Technical expert needed (CoLab)
No	Product cannot be used for application

Will be updated in the STB

Smart Grasping

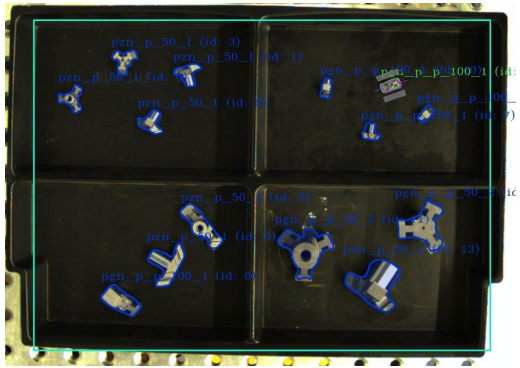
Application examples

NAME: Machine unloading



Area: Production engineering
Info: Automatic gripping of components from flat rotary table or conveyor belt in machine tool applications

NAME: Tray unloading



Area: Production engineering, intralogistics
Info: Automatic gripping of components which are positioned in single layers in trays.

NAME: Box unloading



Area: Production engineering, intralogistics
Info: Automatic gripping of components which are positioned in a single layer in a box.

FB 179 – Checklist Smart Grasping

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Hinweis: Bitte pro Werkstück eine Checkliste verwenden. (Note: Please use one checklist per workpiece.)

SCHUNK Kontakt (SCHUNK contact)			
Name Innendienst (Name inside sales)			
Name Außendienst (Name outside sales)			
Kundenkontakt (customer contact)			
Kundenname (customer name)		**Kunden-Nr.** (customer ID)	
Ansprechpartner (contact person)		**Projekt** (project)	
Telefon-Nr. (phone number)		**E-Mail**	

Anfrageübersicht (request overview)		
Gewünschter Angebotstermin (wanted offer date)		
Angebotsumfang (offer scope)	☐ Budget (budget)	☐ Detailliert (detailed)
	☐ CoLab-validierung (CoLab-validation)	☐ Erstellung Template (generation template)
Gewünschter Liefertermin (requested delivery date)		
NDA	☐ Ja (Yes)	☐ Nein (No)

CoLab-Validierung (CoLab-Validation)		
Validierungsumfang (validation scope)	☐ Video (Video)	☐ Bericht (Report)
Versuchsbauteil wird beigestellt (Test component provided)	☐ Ja (Yes)	☐ Nein (No)
Umgang mit Versuchsbauteilen nach Validierung (Dealing with test components after validation)	☐ Darf entsorgt werden (May be disposed)	☐ Bitte zurück an Auftraggeber nach Rücksprache (Please return to client after consultation)
Transportbox wird beigestellt (falls vorhanden) (Test component provided (if available))	☐ Ja (Yes)	☐ Nein (No)
Umgang mit Transportbox nach Validierung (Dealing with test components after validation)	☐ Darf entsorgt werden (May be disposed)	☐ Bitte zurück an Auftraggeber nach Rücksprache (Please return to client after consultation)

Aufgabenstellung/Bemerkungen/Skizze
(Definition of task and comments/sketch

Werkstückerkennung: Wie wird das Werkstück bereitgestellt? (Ebene, Förderband, Transportbox,...) Welche Seiten sollen von der Kamera erkannt werden? Wie viele Werkstücke liegen gleichzeitig im Kamerabild? Wie eng liegen die Bauteile zusammen?
(Workpiece detection: How is the workpiece provided? (level, conveyor, transport box,...) Which sides should be detected by the camera? How many workpieces are in the camera image at the same time? How close together are the workpieces?)

Werkstückaufnahme: Wie ist das Bauteil zu greifen? Gibt es definierte Greifpunkte?
(Workpiece gripping: How is the workpiece to be gripped? Are there defined grasp points?)

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Werkstück (workpiece)		
Gefahrstoff (Hazardous material)	☐ Ja (Yes)	☐ Nein (No)
Template (Template)	☐ bereits vorhanden (already existing)	☐ muss erstellt werden (has to be generated)
CAD Modell vorhanden (CAD-file available)	☐ Ja (Yes)	☐ Nein (No)
Werkstückgewicht (Workpiece weight) **[g]**		
Werkstückabmessungen (Workpiece dimensions)		
Maximale Greifkraft (maximum gripping force) **[N]**		
Gibt es vordefinierte Greifpunkte? (Are there pre-defined grasp points?)	☐ Ja (Yes)	☐ Nein (No)
Anzahl der möglichen Objektansichten (Number of possible object views)		

Einsatz und Prozess (application and process)				
Abstand zwischen Kamera und Detektionsebene (Distance between camera and detection plane)	mm		☐ Noch nicht definiert	
Griff aus/von (Gripping out of/from)	☐ Transportbox (load carrier)		☐ Ebene Fläche (flat surface)	
Sind die Teile Sortenrein? (Are all parts of one kind?)				
Berühren sich die Teile? (Do the workpieces touch each other?)				
Anzahl der Teile im Sichtfeld (Number of workpieces in the camera view)				
Taktzeit / Picks pro minute (cycle time / picks per minute)				
Vorhandene Lichtverhältnisse (Existing lighting conditions)	☐ Szene gleichmäßig ausgeleuchtet (Scene evenly lighted)		☐Reflexionen vorhanden (Reflections present)	☐ Beeinflusst durch Tageslicht (influenced by daylight)
Umgebungsbedingungen (enviromental conditions)	☐ Reinraum (clean room)	☐ Vakuum (vacuum)	☐ Sauber (clean)	☐ Industrielle Produktionsumgebung (industrial environment)

Will be updated in the STB

Competitors and our position

SENSOPART

KEYENCE



2D

Ab ca. 4.000€

ROBOTIQ 4.600€

Wrist Camera

potential Bundle mit with Gripper (2F-140) and accessories



ca. 9.000€ 2D



ohrobot Eyes

4.145€

potential Bundle with Gripper (RG2) and accessories

ca. 8.600€ 2,5D

SCHUNK

roboception

Bundle



Max. 12.500€ 2,5D

SCHMALZ

roboception

Bundle



ca. 18.000€ 3D

ca. 25 – 50k€ 3D

Photoneo focused on 3D

Pickit ROBOT VISION MADE EASY

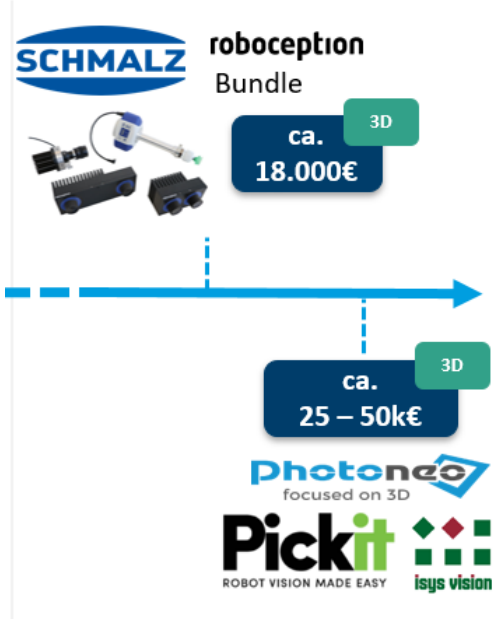
isys vision

SCHUNK

Comparison of direct competitors

Points	SCHUNK/roboception kit (12.500 €)	OnRobot (ca. 8.600 €)	Robotiq (ca.9000 €)
Template	Via CAD data service from SCHUNK, whereby functional test already available	Manually by customer, thus no function guarantee (template created via camera template fused m. depth info)	Manually by customer, no function guarantee (CAD or original image of the camera, different shapes could be teached in)
Collission Check	✓	No collision detection. Only isolated objects can be grasped.	Free space check of the same object models. Other objects are ignored. Complex parameterization of the clearances and gripper fingers via parameterizable control geometries.
Object detection	✓	Larger distance between objects necessary	Object recognition method is very focused on background and shape, does not work in general
Quality of the camera data	✓	Poor quality data (Intel consumer camera), lighting and background must fit	
Architecture	Processor inside the camera	implemented directly in UR controller, master is UR	Camera is separate. Processing / control in URcap = very limited functions, communication via USB.
Limitations / Features	We are delivering a kit with template service	- Objects must not be to flat - Offered as individual components	Objects must be well segmentable from background.

Competitor comparison



SCHMALZ Bundle

- SCHMALZ works together with Roboception
- Camera is identical to our version (3D camera)
- Higher price due to ItemPick/BoxPick function (3D)
- SCHMALZ can thereby realize Bin Picking
- Possible due to your vacuum gripper, because only a flat surface is needed to detect and no collision occurs

Pickit/isys vision/photoneo

- These systems are functional with only a few limitations
- Can process 3D images accordingly
- Are thereby however also with 25.000 € upward not comparable to our system.
- Investment very high -> therefore only targeted customer interest

Why a camera kit at SCHUNK?



The goal of the current approach is to ...

- to gain access to the market
- to understand the requirements of new applications and to learn from them
- to make SCHUNK visible as a company that can offer **solutions** in this new environment

We want to learn from target applications and then transfer this knowledge to our own research and development at the end. (GraspSensor)

Highly confidential

Project status:

- 31.03 - Official sales release
  - In the meantime some applications carried out in Co-Lab
- 29.04 - Communication start
  - **Soft launch -> limited marketing activities**
  - -> sales push will follow
- 10.5 - Delivery of the cameras (from stock)

Superior Clamping and Gripping

SCHUNK





Jens Lehmann, deutsche Torwartlegende,
seit 2012 SCHUNK-Markenbotschafter
für sicheres, präzises Greifen und Halten.
schunk.com/lehmann