RBC ROBOTICS

AUTOMATION FOR TOMORROW'S MANUFACTURING

More Efficiency with Modular, Camera-based Robot Automation

RBC-ROBOTICS.DE
DVS-TECHNOLOGY.COM
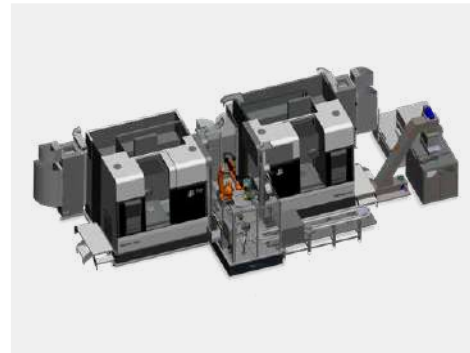
04

The company

We are successfully creating the future of robot automation together with our customers. Discover our range of products and services for component feeding, machine loading, and component packaging.
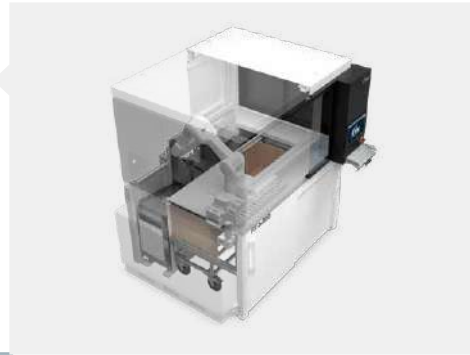

18

FX SMART FLEX

FX SMART FLEX enables individual solutions: From robot automation of machine tools to the chaining of multiple machines and systems.

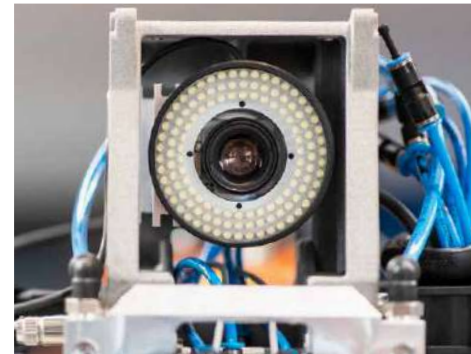# Contents

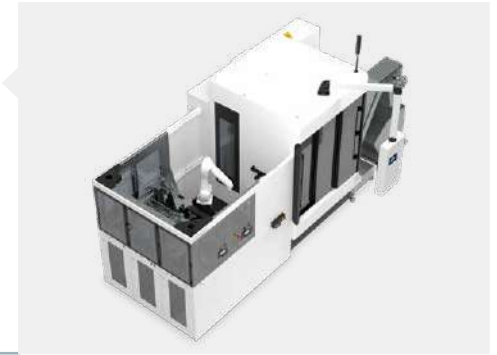## 06
FX SMART PICK & PACK

Reliable unloading of workpieces from piles or bulk material and orderly discharge.

12
FX SMART LOAD

Compact cells for direct loading of machines and systems.

21
Component detection

Our technologies turn the FX series modules into intelligent, reliable systems.

RBC ROBOTICS

We are changing the future of robot automation together with our customers.

Get an overview of the products and services for component feeding, machine loading, and the packaging of components. Discover modular solutions for your high-end manufacturing requirements with rbc robotics. The Vision system in combination with the industrial robot is at the heart of economic production and makes the entire process more intelligent and viable. Thanks to innovative image capturing, the FX module series from rbc robotics fulfills all requirements in terms of functionality, design, and cost-effectiveness.

We use the modularization principle in order to be able to offer our customers individual solutions as efficiently as possible.

A DVS TECHNOLOGY GROUP COMPANY

The DVS TECHNOLOGY GROUP is a group of experienced companies engaged in the machining technologies of turning, gear cutting, and grinding.
The DVS TECHNOLOGY GROUP employs more than 1400 staff worldwide and is considered a leading system provider of machines, tools, and manufacturing solutions for the soft and hard-fine machining of components.

The DVS TECHNOLOGY GROUP includes the following divisions:

DVS Machine Tools & Automation:
Manufacture and sale of high-precision machine tools and automation systems and related services.

DVS Tools & Components:
Customer-specific development, manufacturing, and sale of machine components, tools, and abrasives.

DVS Production:
Series production of car and truck components on DVS machine tools.

DVS International Sales & Service:
Local DVS partners for sales and service in international markets.

FOCUS ON COMPONENT DETECTION

2D TECHNOLOGY

2.5D TECHNOLOGY

3D TECHNOLOGY, CARTESIAN

3D TECHNOLOGY, RANDOM BIN PICKING

Good accessibility
through rear inspection hatch via
double wing doors

Movable 3D sensor
for scanning of multiple
bin positions

**Noise reduction and protection against
extraneous light** through modern glass
front and cell roof

**User-friendly
operating terminal**
with a 15-inch HMI panel,
which is integrated into the
modular cabin

FX-b-800

**Flexible connection to
the production line**
thanks to variable placement
position

Short pick & place times
thanks to optimal robot
positioning above the bin

**Space-saving
sliding door concept**
for changing the workpiece
bin in production

Space-saving integration
The control cabinet and robot control are
integrated in the modular cabin

Larger working area through
the use of an additional linear axis

FX SMART PICK & PACK Series
## Bin Emptying, Component Packaging

FX Smart Pick is a standard solution for the reliable unloading of randomly arranged components. The 3D scanner recognizes the parts, enables collision-free removal, and uses different gripping systems.

FX Smart Pack enables the orderly loading of different workpieces on intermediate piles in different bin sizes.

EFFICIENT UNLOADING AND ORDERLY PACKING
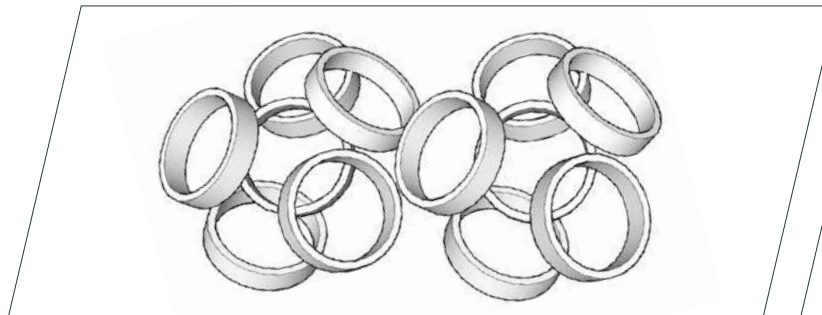
FX SMART PICK: efficient unloading, smart production, and maximum reliability!

The bin picking cell is a standard solution for the reliable and efficient unloading of workpieces from defined piles or randomly arranged bulk goods. It is designed for bins with a size of 600 x 800 mm and a height of up to 600 mm. An integrated 3D scanner recognizes the components and the edge of the bins, enables a safe cycle time from approx. 8 seconds, and uses magnetic or finger grippers.

The bin picking cell has a two-chamber system that allows bins to be changed during the cycle, which means the robot does not have to wait. As a result, the process becomes more efficient. For larger bins, the XL bin picking cell with dimensions of up to 1000 x 1200 mm and a height of up to 1000 mm offers a solution.

Compact and agile robots from ABB or KUKA are used, sometimes with an additional robot axis in order to take up as little space as possible. The cells are mainly made of sheet metal construction with a safety glass front, thus creating closed modules that reduce noise emissions and meet the cleanliness requirements.

The bin picking solutions from rbc robotics intelligently combine robotics, gripping technology, and component detection. The cell is compact, easy to operate, and has data interfaces for field and higher-level systems. The modular cabin can be transported by forklift or crane.

The cell is highly standardized and has been in continuous industrial operation (ring pickers) for years. A turning station with fine detection of the smallest geometric characteristics is available.

A user-friendly, shopfloor-based interface is available for teaching in new components. It does not require any special operator know-how. Various gripping modules such as pneumatic finger grippers or magnetic grippers are available. FX PICK offers automatic TCP measuring and correction for maximum reliability in continuous operation.

The bin picking solutions are ideal for flexible manufacturing processes with many different workpieces. They facilitate reliable production and support smart manufacturing to make companies more efficient, safer, and more competitive.

FX-b-800

Mögliche Richtungen zum Ausschleusen der Bauteile

1,75 m

2,45 m
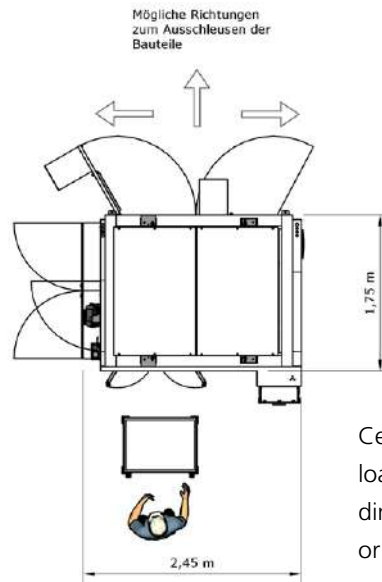
Cell expansion for loading and unloading using a forklift or AGV.
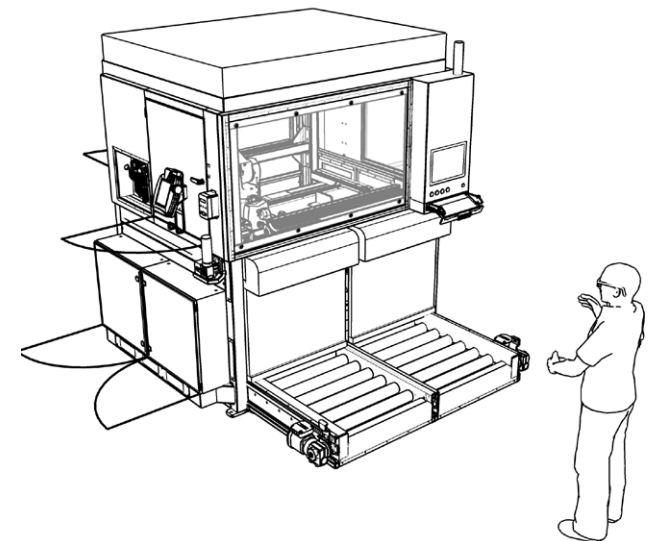
FX SMART PACK: efficient palletizing in variable bin sizes!

The cells enable the discharge of a wide range of workpieces in defined and orderly positions. The series' are differentiated based on the bin size.

Bins or wire baskets can be loaded on floor trolleys with a basic size of 400 x 600 mm, as well as pallets with stacking frames, boxes with 600 x 800 mm or Euro pallets and mesh baskets with 800 x 1200 mm in size.

The smart loading software automatically calculates the position of the components in the bin. Numerical entries in the operator dialog define, for example, the distance between the components and the edge of the bin as well as the gaps between the components. The palletizing pattern is then generated automatically, which means that teaching in the robot is not necessary. Singularities are avoided with the additional robot axis.

An additional module can optionally be fitted on the side of the cell to insert intermediate piles. 3D recognition can also be used if necessary, depending on the design and component geometry.

Compact and agile robots from ABB or KUKA are used. For an even more compact design and to keep the footprint of the cells to a minimum, we sometimes use seven robot axes in our modules.

The cells are largely constructed from sheet metal with safety glass on the front. The resulting encapsulated modules reduce

noise emissions and meet the requirements for product cleanliness. In addition, we effectively reduce the impact of external light in order to create optimal conditions for image recognition systems.

FX PACK 600 basket stacking cell
Our FX PACK 600 basket stacking cell enables workpieces to be packed reliably and flexibly in defined layers. It is suitable for bins/baskets with a size of 400 x 600 mm and a stacking height of up to 1100 mm. The integrated basket stacker (2 servo axes) moves the baskets.

FX PACK 800 bin packing cell
The FX PACK 800 bin packing cell enables workpieces to be packed in defined and orderly layers in bins measuring 600 x 800 mm and up to 600 mm in height. The loading software automatically calculates the placement points of the components in the bin. The palletizing pattern for simple geometries is generated without teaching in the robot.
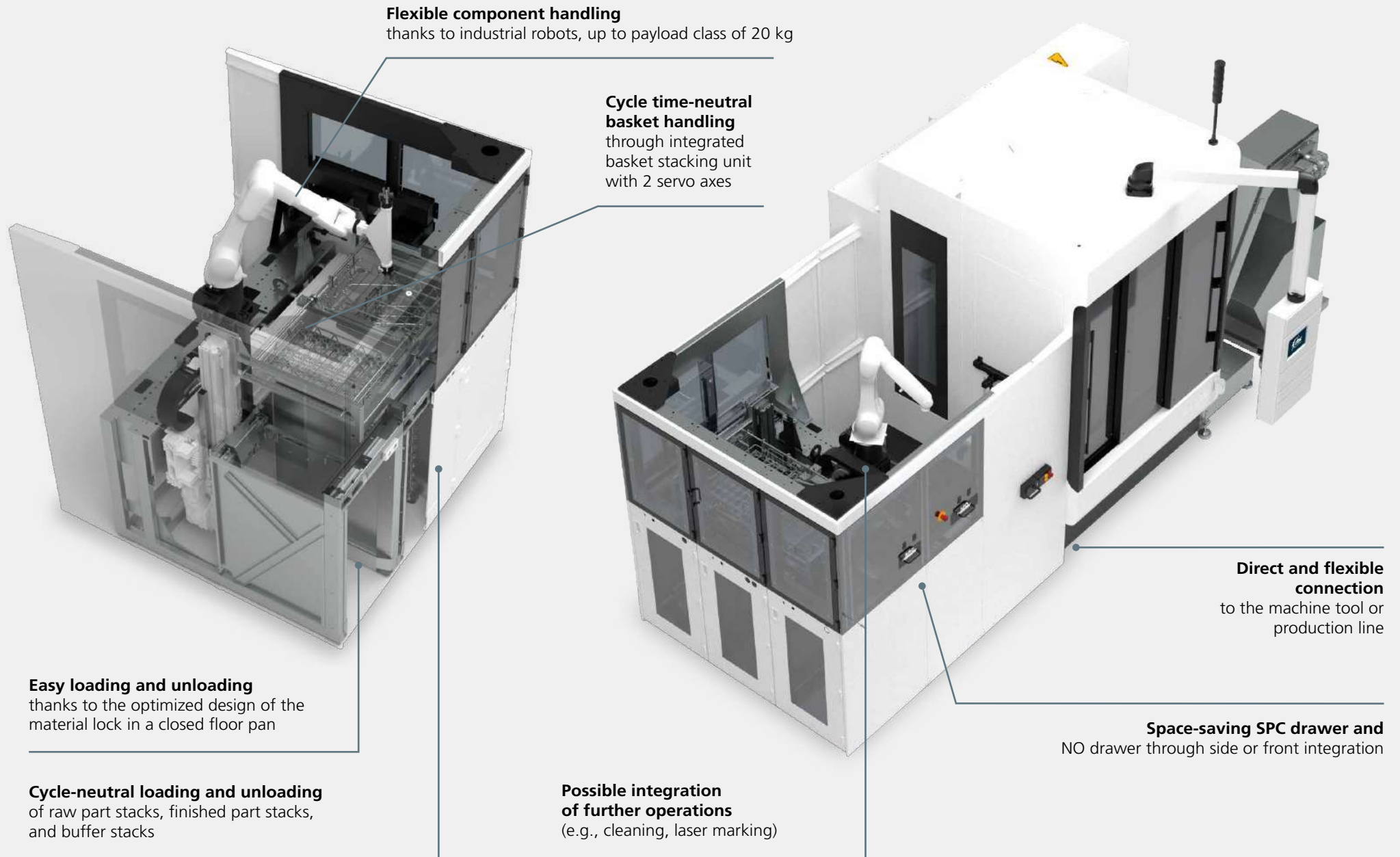
FX PACK 1200 XL bin packing cell
The FX PACK 1200 XL bin packing cell enables the quick and reliable packing of workpieces in bins with a size of up to 1000 x 1200 mm and a height of up to 1000 mm. With straight-forward geometries, the loading software automatically calculates the placement points of the components in the bin. Optionally, integrated 3D scanners can be used.

Technical Data

	FX PICK 800	FX PICK 1200	FX PACK 600 Basket stacking cell	FX PACK 800 Bin packing cell	FX PACK 1200 XL **bin packing cell**
Width x length x height (mm)	1750 x 2450 x 2150		2000 x 2000 x 2100		4000 x 3200 x 2200
Model	Modular cabin, powder-coated according to RAL specification				
Cell weight (kg)	1700		1900	1700	1900
Max. bin weight (kg)	650 (loaded)			-	-
Max. component weight (kg)	4		3	4	15
Bin storage spaces	for two identical bins		3–6	2	4
Bin dimensions (mm)	600 x 800 x 600 or 800 x 800 x 500		400 x 600 Height 80–150	600 x 800 x 600 or 800 x 800 x 500	800 x 1200 x 1000
Loading	Floor trolley or forklift/AGV				
Model	Pallets with stacking frame or smooth bin wall		Small load carrier or wire baskets	Smooth-walled bin	Euro pallet/GiBo
Safety	Front sliding doors and internal sliding protection				
Robotics	ABB, KUKA, FANUC				
Infeed cycle	from 8 seconds				
Component quality	The components should not entangle		Process-specific		
Component surfaces	Advance identification test required		-	-	-
Gripping technology	Component-specific, tried and tested standard gripper available		Component-specific		

|	FX PICK 800	FX PICK 1200	FX PACK 600 **Basket stacking cell**	FX PACK 800 **Bin packing cell**	FX PACK 1200 XL **bin packing cell**
Control			S7 1500		
HMI			15 Touch		
Operation/teaching in			Shopfloor wizard		
Component detection			3D point cloud/matching or alternative methods		
Turning station			Optional, integrated into the module (also PICK!)		
Additional processes			Laser marking, deburring, brushing, etc. according to requirements and testing		

Flexible component handling
thanks to industrial robots, up to payload class of 20 kg

**Cycle time-neutral
basket handling**
through integrated
basket stacking unit
with 2 servo axes

**Direct and flexible
connection**
to the machine tool or
production line

Easy loading and unloading
thanks to the optimized design of the
material lock in a closed floor pan

Space-saving SPC drawer and
NO drawer through side or front integration

Cycle-neutral loading and unloading
of raw part stacks, finished part stacks,
and buffer stacks

**Possible integration
of further operations**
(e.g., cleaning, laser marking)

FX SMART LOAD Series
Compact and Flexible

The FX SMART LOAD series is primarily designed for direct loading of machines or systems. The components are fed in and discharged again after processing or placed in a bin. Component detection is also possible with this variant. This makes the system highly flexible with set-up times that are close to zero.

EFFICIENT AUTOMATION SOLUTIONS FOR FLEXIBLE & EFFICIENT MACHINE LOADING
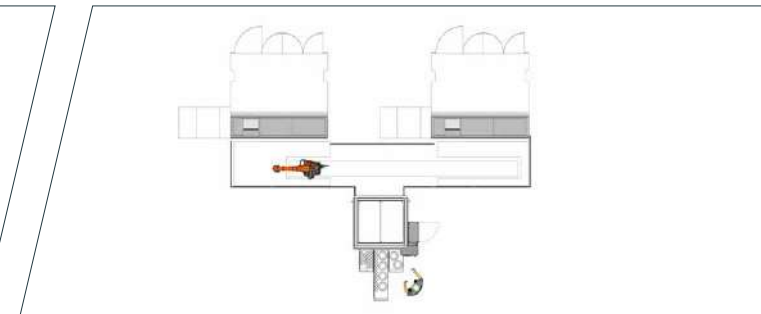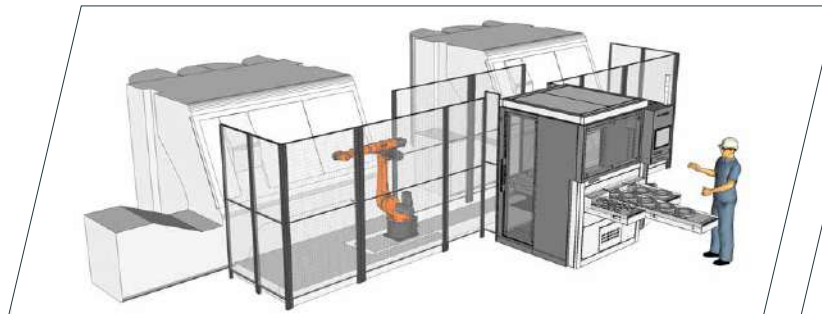
FX LOAD 600
Our basket stacking cell

The module series for the FX LOAD 600 basket stacking module offers many options for separating your products and reliably and flexibly unloading workpieces in defined positions. In particular, it serves as a basket stacking module for plastic bins, blister packs, and wire baskets measuring 400 x 600 mm.

Fast cycle times, simple changeovers, and user-friendly programming save you valuable time and money with the FX LOAD 600 basket stacking cell.

With our many years of experience in the field of automation with basket stacking modules, we meet the highest quality standards with the latest technologies and developments for optimal cycle times and easy machine conversions. Clear and user-friendly operation makes it easier to deal with automation in production and increases acceptance among your employees and customers.

Application

The internal handling of the basket stacking module always removes the top basket or bin from the stack of raw parts and makes it available at a designated staging area. The integrated robot can then remove individual workpieces in a targeted manner and feed them for further use. The robot can be equipped with a single or double gripper.

The basket stacking module always processes the bins in a defined order. Thanks to the integrated sliding protection, the respective stack of finished parts can be removed by the employee without affecting the cycle time and replaced with a stack of raw parts.

Workpiece feeding

Workpieces are fed in via stacks of bins on floor trolleys. This enables the FX LOAD 600 basket stacking module to easily transport workpieces from station to station during operation. Flexible extensions to a higher number of chambers enable extended autonomous operation. Of course, flexible access to all chambers is possible via secured doors.

Restacking

The internal handling is the centerpiece of the FX LOAD 600 basket stacking module. Two linear axes for baskets or bins as well as a precise and robust guide system enable the safe handling of baskets or bins weighing up to 50 kg. Loading and unloading of the basket staging areas is also carried out by the stacking module. The basket gripper can be adapted to the different bins or baskets.
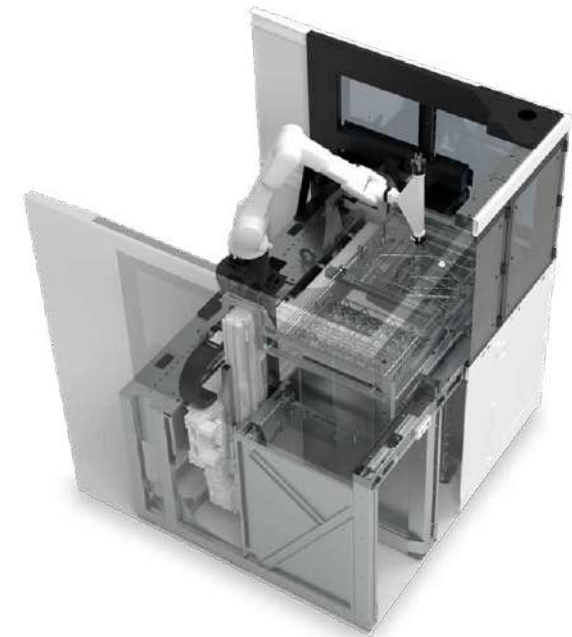
FX LOAD-A
The feeder cell

Different workpieces are added to one of the two material buffers as bulk material. The cell is suitable for light workpieces and, in the version with two springs, can achieve feed times from around 3.5 seconds.

The integrated material buffer is extremely compact and can be adapted to the conveyed material. The components are conveyed to an illuminated camera field where they are separated and flipped over by means of a shaker. Using 2D image recognition, the robot precisely picks up the components in their preferred position. Additional processes such as, for example, deburring or laser marking can be integrated. Agile 6-axis units or Scaras are used.

FX LOAD-T
The FeedLine cell

The different workpieces are fed in by manually placing them on one or more conveyor belts. The integrated conveyor belts convey randomly arranged workpieces into the cell in a single layer. They are detected using 2D camera technology and can then be removed in a targeted manner in short cycle times and, e.g., fed to the machine. Compact and agile robots are used. The FX LOAD-T can also be fed one- or multi-layer flat plastic blisters with workpieces.

Using 2.5D image recognition, both the component positions and the height at which the components are located are recognized. The empty blisters can be ejected via one of the conveyor belts or a chute.
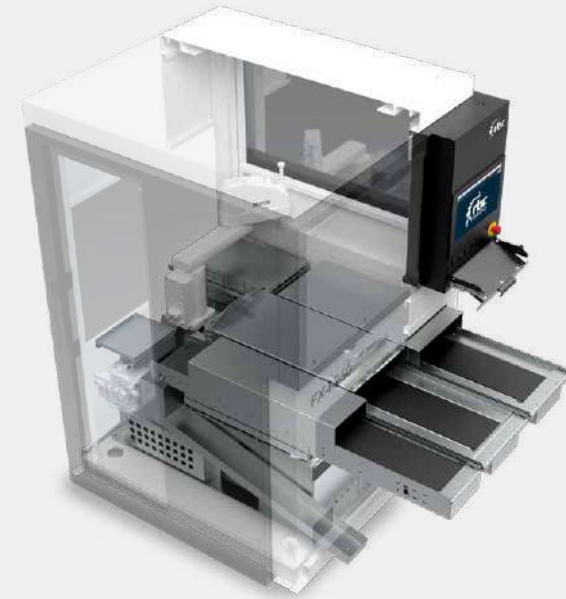
FX LOAD-F
The FeedLine

Feeding a wide variety of workpieces via a simple belt convey-or in combination with 2D camera detection has been used successfully thousands of times.

When the workpieces are manually placed on one or more conveyor belts, the system is able to operate autonomously for a certain time, depending on the belt length and process-ing time.
A signal emitted by the system indicates to the operator when further workpieces are required for continuous processing.

The conveyor belt length and width are selectable in the basic version, which means that a wide variety of workpieces can be fed in and removed, regardless of whether they are small and light or large and heavy. The industrial robot depends on the cell design and the required work area. The FeedLine is the most flexible way of feeding components in connection with an industrial robot and a camera. Our customers are really pleased with how easy it is to set up the system.

FX LOAD-S
The workpiece buffer

With a storage area of 5 m², the workpiece buffer offers maxi-mum space on a very small footprint.

The buffer is served from two sides. The robot has access from the side and the operator from the rear. The number of drawers ranges from 3 to 5, depending on the height of the component. The FX LOAD-S is tried and tested and is used successfully by many customers. The design is robust and can handle 24/7 operation. In connection with the FX Control buffer management, the operator always has an overview of the buffer volume and occupancy.

FX LOAD-M
The MaxiFlex

Components cannot always be automatically removed directly from the bin. The FX LOAD-M, which has been in use for years, was designed for this type of situation.

The system is equipped with a lifter and a tipper. It conveys the components pre-separated to the camera field via vibrat-ing conveyors and vibrating feeders.

The camera field can be equipped with a backlight and can find the components using 2D image recognition. But it is also possible to localize the component using 3D sensors. The maximum component weights are around 6 kg. The design of the system is very robust. It has demonstrated its toughness in difficult conditions.

Technical Data

	FX LOAD 600		
Width x length x height	2000 x 2000 x 2100 mm	2650 x 2000 x 2100 mm	3300 x 2000 x 2100 mm
Number of chambers	3	4	5
Bin size	400 x 600 mm, basket height 80 to 150 mm, basket weight up to 50 kg		
Model	Wire baskets, small load carriers (plastic), blisters		
Max. stacking height	1100 mm		
Sliding protection	integrated		
Drive	2 NC axes for internal basket handling		
Integrated automation	Robots from KUKA, ABB, FANUC, Epson, or loading portal		
Floor pan	Sealed throughout, barrier-free basket stack loading		
Cell control	SIEMENS S7 1500		
Basket delivery	max. 2 spaces	max. 3 spaces	max. 4 spaces
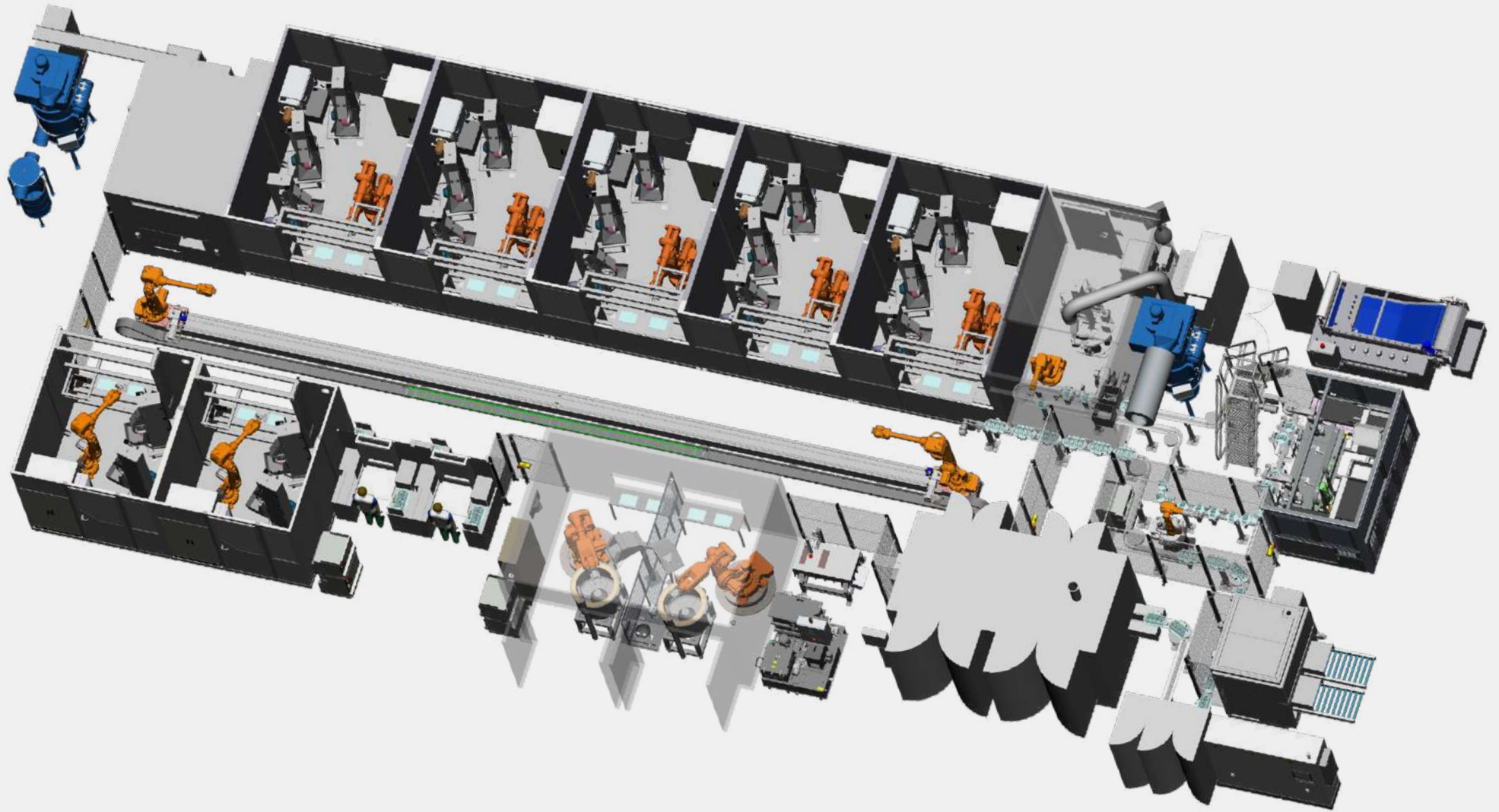
FX SMART FLEX
Individual Automation Solutions

We realize customized solutions for robot automation, machine chaining, complex gripping technology, a large number of variants, and more. The key to flexible automation is almost always a suitable detection system, which makes the system significantly more intelligent and event-based. Our customers also frequently ask for part tracking, visualization, and operation of the existing interfaces via the higher-level production control. Using clever solutions, we always try to be ahead of our competitors. Our team designs, plans, manufactures, assembles, installs, and commissions the finished system – all from a single source.

AUTOMATION SOLUTION BENEFITS FROM OUR EXPERIENCE FROM OVER 500 IMPLEMENTED SYSTEMS
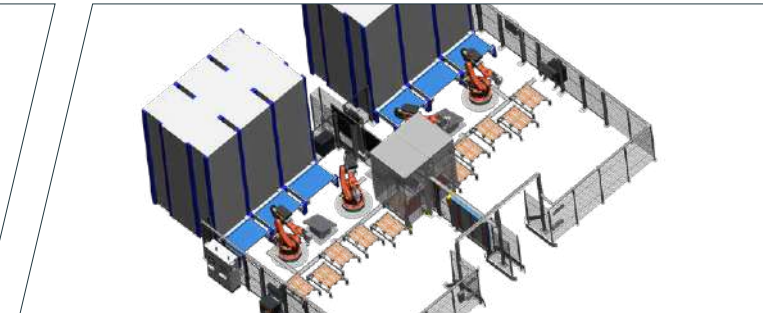
# FX SMART FLEX Your tailor-made robot solution, without compromise!

Discover tailor-made applications the way you like! Welcome to FX SMART FLEX

Smart Flex includes all applications that are not included in our modular system, i.e., our tailor-made, customer-specific solutions. From the robot automation of your machine tools to the chaining of several machines and systems through to complex automation with several robots and linear axes – FX SMART FLEX makes all of this possible and enables us to develop new modules. With the right control and safety concept, your system will always stay productive. Moreover, you can always keep an eye on your system with all the key figures you want via our dashboard.
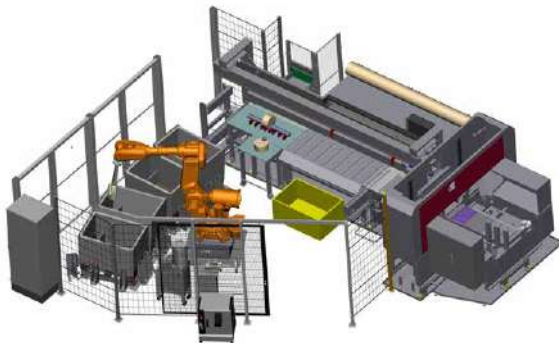
Highly flexible automation solution for a band saw: The saw sections have a very large variance. From the very small to the extremely heavy section, everything is handled fully automatically by the robot. Special interchangeable grippers have been developed to enable the removal and palletizing of the sections into the bins. In addition, the sharp edges are automatically rounded off by the robot with a brush. There are no set-up times. The system is able to handle batch sizes as small as 1.
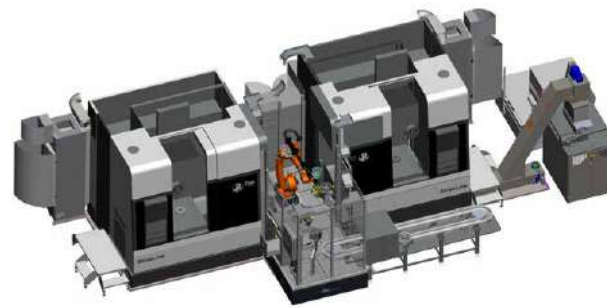
Classic loading and unloading solution using industrial robots and a powerful pallet loop. The robot cell requires very little space, chains the two PITTLER SkiveLine machines (PV320), feeds them raw parts, and removes the finished (turned and geared) components. The components in the cell are also labeled.
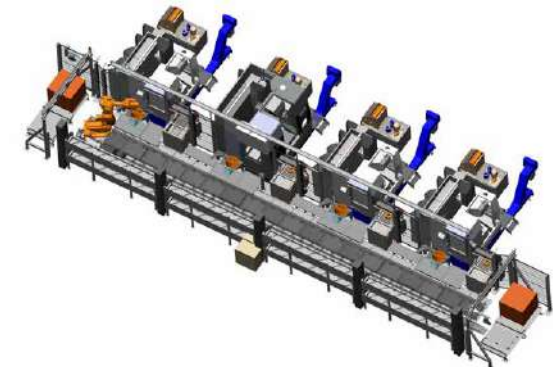
Chaining and automation of four PITTLER PV machines. The robot can move components that weigh up to 250 kg. The raw parts are automatically recognized by a 3D scanner and removed by the robot. The line can perform soft and hard machining and is designed for maximum flexibility. In addition, up to 50 components can be buffered in order to maximize the duration of autonomous working. A higher-level control system coordinates the production orders.

COMPONENT DETECTION
Our Robots see the World through their Own Eyes

The positioning of components is critical for robot applications. In reality, the parameters are shifting constantly due to different sizes, geometries, manufacturing tolerances, and surface characteristics. The robot system must be capable of autonomously adapting to these variables. Only then can the system be considered intelligent and reliable. The technologies that we are presenting here make our FX series modules exactly the intelligent systems that you need for your requirements.
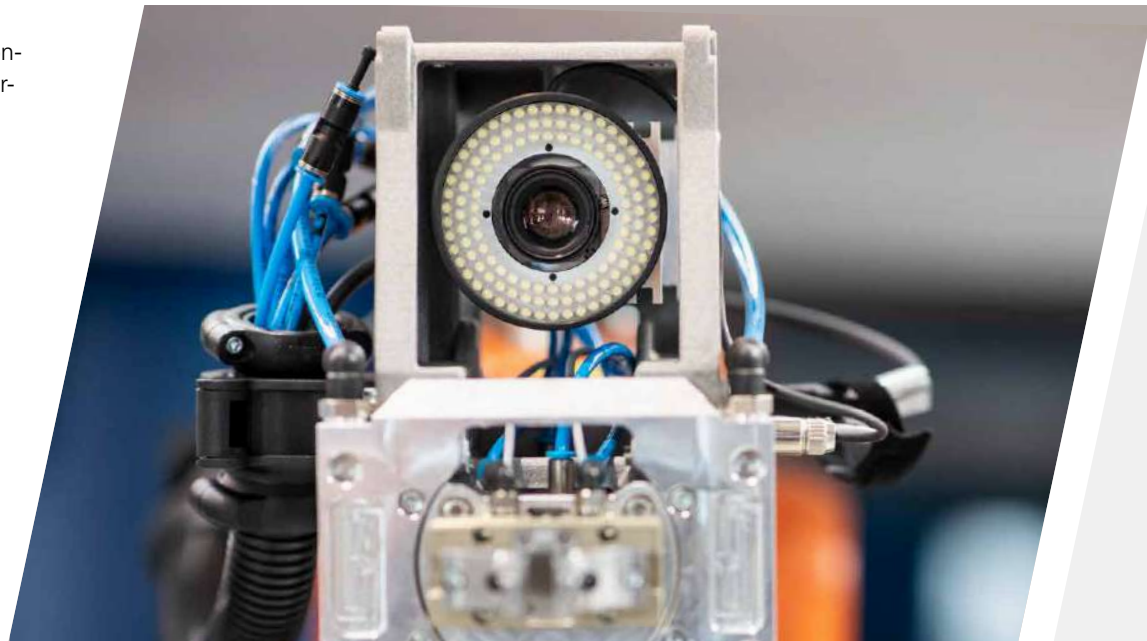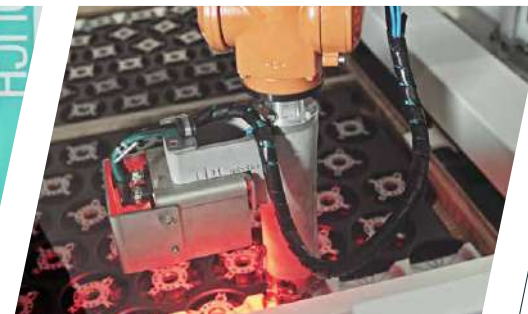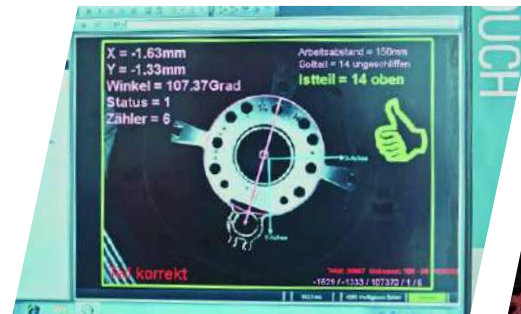
Vision technology – 2D
2D recognition x, y, and rotation around Rz

For rbc robotics, the recognition of objects by means of camera-based 2D image acquisition is one of the basic applications. Intelligent and reliable pick-and-place applications are only possible if the position and rotation of the components is recognized and automatically processed by the program.

The challenge: Picking up of components from a flat surface and placing them in a defined position. Processing of components with a fixed height. A 2D camera detects the position of the components before they are picked up from a conveyor belt or another flat surface. This makes the applications more reliable and safe. In addition to tracking displacement and rotation, other characteristics such as the type numbers or other numerical component information can be read out and processed if provided on top of the components. It is almost irrelevant how the data was marked, because the AI-based camera algorithms are getting smarter and smarter.

The cameras can be installed stationary above the component or on the robot hand, depending on the application requirements. Tried and tested components from leading manufacturers are used. With smart cameras, the analysis takes place directly in the camera or in a separate PC. Depending on the use case, we can plan the optimal application for you. This 2D technology has already been used in more than 300 projects for a wide range of tasks. The analysis is carried out according to pre-defined parameters. This enables the robot to precisely grip the components and set them down.
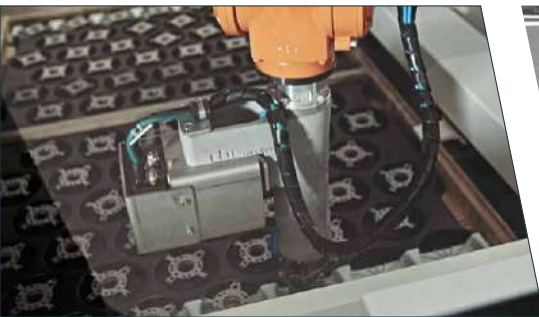
Vision technology – 2.5D
2.5D recognition x, y, z, and rotation around Rz

Compared to the 2D standard application, the system also recognizes the component height in this case, so this application offers additional flexibility.

The challenge: Grab components from a flat surface with a variable height. This enables the robot to precisely grip the components and set them down. The 2.5D camera technology from rbc robotics is able to safely and reliably detect the position of components, whether they are removed directly from a conveyor belt or from a tray. Similar to the 2D application, in addition to the evaluation of displacement and rotation, properties such as type numbers or other numerical component information can be read out and processed.

Here, too, the cameras are installed stationary above the components or on the hand of the robot, depending on the requirements of the application. Tried and tested components from leading manufacturers are used. With smart cameras,

the analysis takes place directly in the camera or in a separate PC. Depending on the use case, we can plan the optimal application for you. This 2.5D technology has already been used in more than 300 projects for a wide range of tasks. The analysis is carried out according to pre-defined parameters. This enables the robot to precisely grip the components and set them down.

Vision technology – 3D, cartesian
3D recognition x, y, z, and rotation around Rz

The 3D-based technology is best suited to the detection of objects that are present at different heights and mostly layered.
The components can be used in bins with dimensions of 400 x 600 mm, 600 x 800 mm, and up to 1000 x 1200 mm.

Whether wire baskets, plastic boxes with or without trays, pallets with stacking frames or mesh boxes: We have the right solution for you for every type of bin.

The challenge: Grab components from different levels from a bin from a relatively orderly position or slightly tilted.

A technology that records a cloud of dots by means of a sensor system is used to provide the necessary positional information of the components.

All room dimensions are always taken into account thanks to complete 3D information. Small features of the surface can be evaluated using high-resolution sensors.
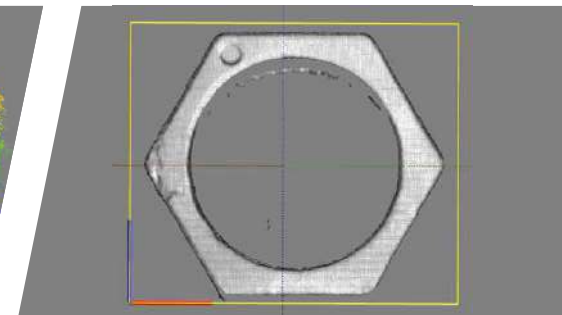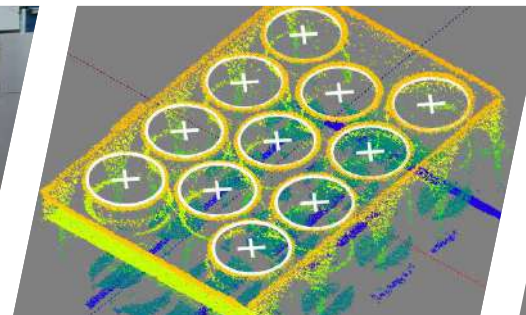
Vision technology – 3D, random
3D recognition x, y, z and rotation Rx, Ry, Rz

This technology is used to recognize randomly arranged components in bins or on conveyor belts by means of 3D-based sensor systems. This is essentially a classic bin picking or belt picking system.

The interaction between robot path planning, gripper technology, collision control, and sensor system is of paramount importance here. Near 100% bin emptying levels are only possible with an optimally coordinated overall system. Not every component is suitable for automatic removal from the bin.

In most cases, the sensor is mounted in a fixed position and only needs a brief unobstructed view of the bin. If there are several bins, a pneumatic or electric displacement axis is used. Components can then be detected in several bins.

After scanning, the point cloud is evaluated using the "Best Shape" method. This process uses tried-and-tested systems that specialize in the respective component shapes. The FX series modules can be used universally. Standardized solutions are available especially for rings, rollers, or gear parts and are already widely used on the market. For this purpose, a shopfloor-based input software has been developed by rbc robotics. This enables the operator to teach in new components simply by entering the geometric data.

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Camera-guided robot automation systems

DVS Service GmbH | dvs-technology.com/dvs-service
Maintenance – Complete overhauls – Repairs

Werkzeugmaschinenbau Ziegenhain GmbH | dvs-technology.com/wmz
Turning & Combined machining of shafts – Motor spindles

DVS TOOLS & COMPONENTS

DVS TOOLING GmbH | dvs-technology.com/dvs-tooling
Tool solutions and technology support for PRÄWEMA gear honing

NAXOS-DISKUS Schleifmittelwerke GmbH | dvs-technology.com/naxos-diskus
Conventional grinding tools – CBN and diamond tools

DVS Production

DVS Production GmbH | dvs-technology.com/production
DVS Technologies in mass production for passenger car components

DVS Production South GmbH | dvs-technology.com/dvs-production-south
DVS Technologies in mass production for commercial vehicle components

DVS Precision Components (Taicang) Co. Ltd.
Precision powertrain components in series production for passenger cars and trucks on DVS machines

DVS INTERNATIONAL SALES & SERVICE

DVS Technology America, Inc. | dvs-technology.com
DVS Sales & Service in USA, Canada & Mexico

DVS Technology (Taicang) Co., Ltd. | dvs-technology.com
DVS Sales & Service in China

DVS Technology Europe GmbH | dvs-technology.com
DVS Sales & Service in South Europe