Quick-change System (SWS)

Sales Manual

2016

Table of contents

1 Situation distribution rights SCHUNK-ATI

The contract signed in June 2015 between SCHUNK and ATI includes a clear regulation as to what extent SCHUNK and ATI are allowed to distribute their products from the robot accessories area on the global market.

Countries in which SCHUNK has sole distribution rights:

All countries in Europe (applies for all products except FT sensors; SCHUNK only has exclusive rights for these in Germany)

Countries in which ATI directly supplies SCHUNK Intecs and SCHUNK may potentially compete with ATI:

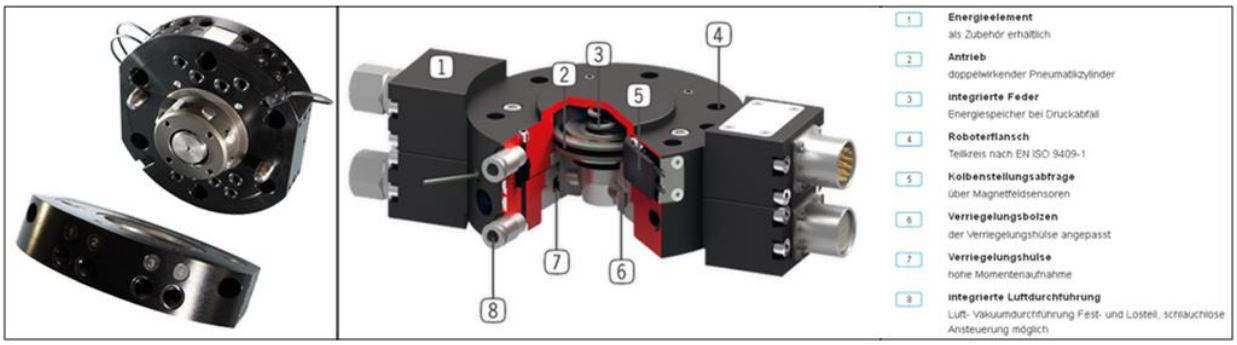
USA, Canada, Mexico, China, Korea, India, Turkey

2 Quick-change system competitive situation

2.1 Competing products

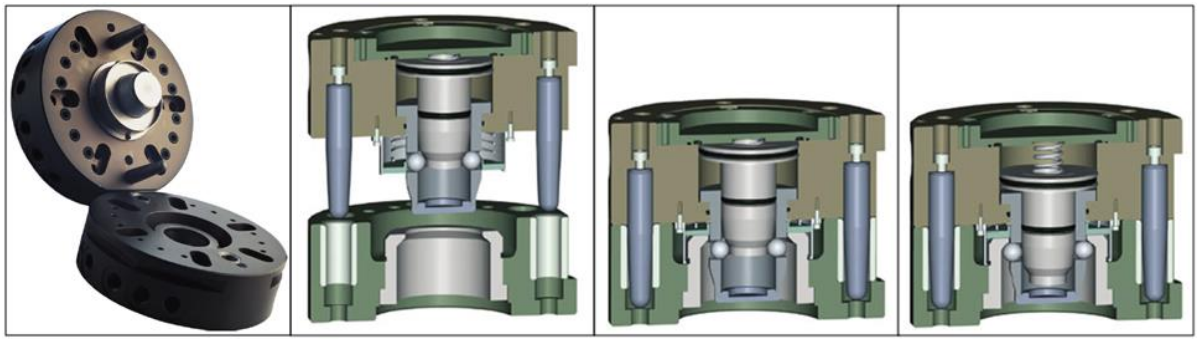
2.1.1 Zimmer Group GmbH

The German company Zimmer (formerly Sommer Automation) competes with SCHUNK in several product areas including robot accessories. For changing, the company offers its WWR range. This system has lock bolts (item 6 in the following illustration), which are inserted via a conical piston in the robot-side half precisely into the mounts of the tool-side half (item 7), in order to lock the system.



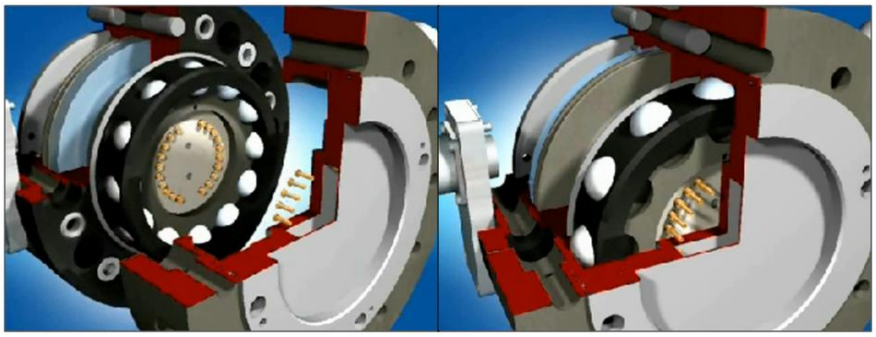
2.1.2 IPR Intelligent Peripherien für Roboter GmbH

IPR, which is located near SCHUNK, offers its TK range for automatic changing. Like most providers, for locking this is based on a bearing mechanism (see illustration below). What is unique about the system is a spring surrounding the piston which together with a covering ring leads the balls back into their basic setting when the piston is driven up. Both also serve as a dirt cover. The locking functions similar to the SCHUNK system. The balls are pressed with the aid of the piston under the tool-side locking connector in the adapter when the system is pressurized.



2.1.3 Robot System Products GmbH

With its TC range, the Swedish company Robot System Products (RSP) provides a change system whose special feature is the electrical feed-through in the piston (see following illustration). All other providers offer modules for this.

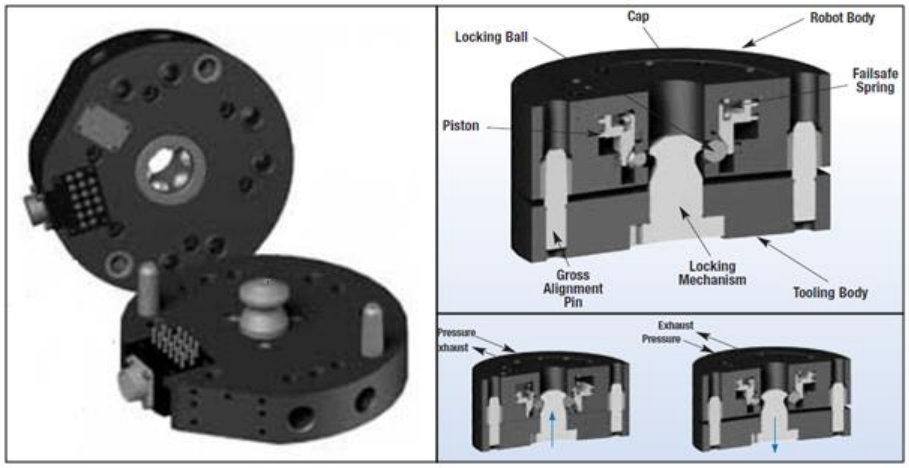


The locking mechanism works using balls similar to the SCHUNK system. However, these are pressed over two-stage, concave-shaped ball bearings in the piston of the head when locking (see illustration below) into the mounting of the adapter.

Here, the first stage serves as a guide for the balls and can at the least offset a twisting between head and adapter to a certain degree, as the system does not have any centering pins for this function. The balls are then pressed into the second stage with the further progress of the piston. The second stage functions as the locking surface.

2.1.4 DeStaCo

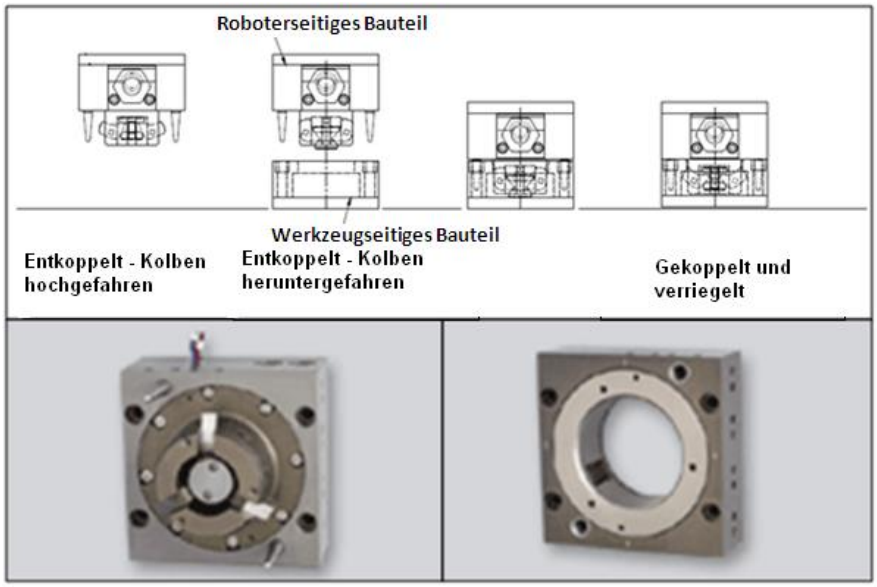
The American provider distributes their tool changer in two different ranges, the QC range and the RQC range. Both have different mechanisms for locking. To compare with the quick-change system, the QC range must be considered. This again works with the aid of the familiar ball mechanism (see figure below). The main difference to other systems, however, is that the balls are not pressed outwards under a locking ring, but inwards under the angled section of a bolt attached in the middle. The piston therefore encloses the balls from the outside and then presses them through its contour in the middle, which locks half of them.



The RQC range corresponds more to heavy load changers and thus to the SWS-L from SCHUNK. Here, oblong rolls lock the system, which as usual are pressed through the piston outwards under a mounting.

2.1.5 Applied Robotics Inc.

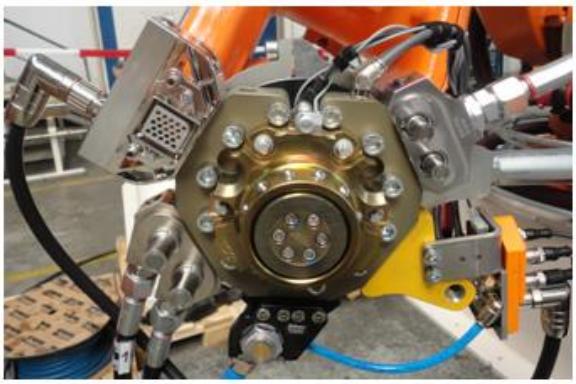
The second American company among the competitors also has tool changers in the medium (MXC/CXC range) and larger segment (Omega/Sigma range). The Applied Robotics system works differently from the other providers. Here, the locking is achieved using wedge hooks. In addition, the piston movement of the locking and unlocking process is opposed to the processes of other manufacturers (see following illustration).

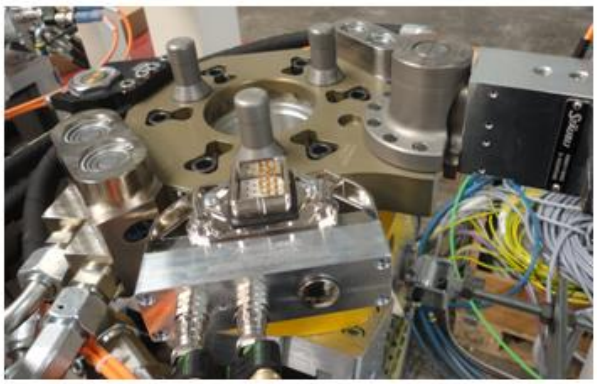


With this system, the piston is pushed down by compressed air (on the surface of the piston) and the wedge hook is driven in. Only then can head and adapter be coupled. As soon as this has taken place, the piston is pushed back up again with compressed air (on the piston ring surface) and wedge hooks go into the mountings in the adapter. The system is hereby locked, if the piston ring surface is pressurized with compressed air, which is where the special feature of the concept compared to its competitors lies.

2.1.6 Stäubli

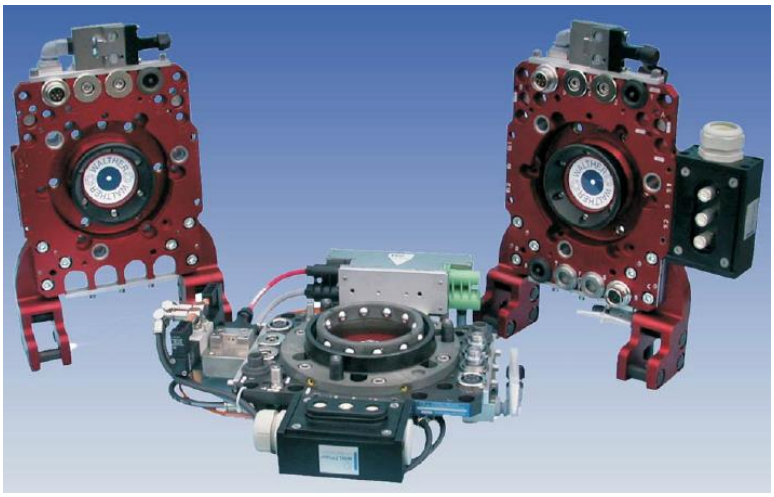
Stäubli from Switzerland, which is known for its robots, offers three model sizes in its MPS range. The mechanism works by clamping the robot-side balls, which is standard, in the "scalloped" design of smaller sizes and which is meanwhile also produced by ATI, are pressed into suitable mountings on the adapter side to lock. The Stäubli changers are fitted with several springs for self-locking.





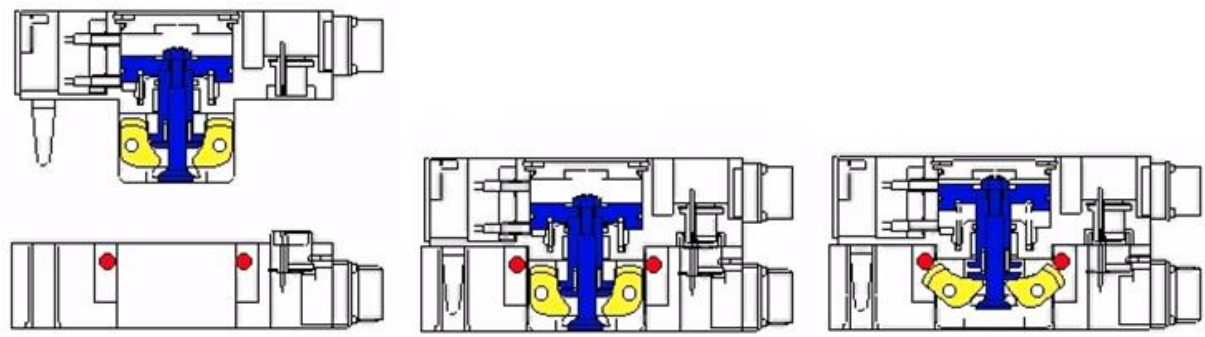
2.1.7 Walther Präzision

The changer range TOOLmaster from the German company Walther Präzision comes in two sizes. The locking works similar to the DeStaCo using locking balls, which are pressed under an angle. With Walther as well, this involves the balls being moved inwards unlike most other manufacturers. However, Walther does not only use centrally attached bolts, but also a significantly larger locking ring, under which the balls are pushed. Walther also uses springs for self-locking.



2.1.8 Nitta

The Japanese company Nitta Corporation offers a similar system to Applied Robotics. Here, the wedge hooks are first pushed in as well, in order to join the two halves. After this, the piston ring surface is pressurized with compressed air, which pushes the wedge hooks out and the system is locked.



2.2 Competitor comparison according to diverse criteria

Wettbewerber	Zimmer Group	IPR	RSP
Wettbewerb für:	SWS	SWS	SWS
Anzahl Baugrößen	9	9	11
Handlinggewicht (kg)	20-1000	3-800	5-1000
Verriegelungsmechanik	Bolzen	Kugeln	Kugeln
Manuelle Notentriegelung möglich?	Nein	Nein	Nein
Fügekraft notwendig?	Ja	Ja	Keine Angabe
ISO-Anschraubbild	Ja	Ja	Ja
Gehäuse	Hochfeste, hartbeschichtete Aluminiumlegierung	Hochfeste, hartbeschichtete Aluminiumlegierung	Kopf aus Aluminium mit Kupplungsfläche aus Stahl, Adapter komplett aus Stahl
Kolbenhubkontrolle	Induktive Näherungsschalter (2x)	Keine	Induktive Näherungsschalter (2x)
Anbauflächen Module	2 (bei kleinen), 6 (bei großen)	1 (bei kleinen)	2 bzw. 4
Anzahl Module	ca. 40	ca. 30	ca. 20
- Elektromodule	Stifte/Buchse	Federnde Flachkontakte	Federnde Flachkontakte

Wettbewerber	SCHUNK	DeStaCo	Applied Robotics
Wettbewerb für:	-	SWS	SWS-L
Anzahl Baugrößen	18	7	11
Handlinggewicht (kg)	1,4-1350	14-550	5-800
Verriegelungsmechanik	Kugeln	Kugeln/Rollen	Keilhaken
Manuelle Notentriegelung möglich?	Ja	Nein	Funktion nicht bekannt
Fügekraft notwendig?	Nein	Keine Angabe	Keine Angabe
ISO-Anschraubbild	Nur teilweise	Ja	Ja
Gehäuse	Hochfeste, hartbeschichtete Aluminiumlegierung	Aluminium	Aluminium
Kolbenhubkontrolle	Induktive Näherungsschalter (2x)	Induktive Näherungsschalter (1x)	Mechanische Schalter im Kolbenraum
Anbauflächen Module	2 (bei kleinen), 4 (bei großen)	0-1 (bei kleinen) --> integrierter I/O Block	1-4 (bei kleinen), 6 (bei großen)
Anzahl Module	ca. 1000	ca. 20	ca. 30
- Elektromodule	Federnde Flachkontakte	Federnde Flachkontakte	Federnde Flachkontakte

Wettbewerber	Stäubli	Walther	Nitta
Wettbewerb für:	SWS-L	SWS-L	SWS-L
Anzahl Baugrößen	3	2	7
Handlinggewicht (kg)	125-1530	Tragkraft 25-60 kN	10-400
Verriegelungsmechanik	Kugeln	Kugeln	Keilhaken
Manuelle Notentriegelung möglich?	Ja	Ja (aber begrenzt und kompliziert)	Ja
Fügekraft notwendig?	Keine Angabe	Keine Angabe	Keine Angabe
ISO-Anschraubbild	Ja	Ja	Nein
Gehäuse	Adapter aus Aluminium, komplett aus Stahl möglich, aber nur mit Aufpreis und mehr Gewicht	Aluminium	Aluminiumlegierung
Kolbenhubkontrolle	Induktive Näherungsschalter (2x)	Induktive Näherungsschalter (2x)	Induktive Näherungsschalter (2x)
Anbauflächen Module	5	4	3
Anzahl Module	ca. 30 (auch für Arbeit bei großem Spalt ausgelegt	ca. 10	ca. 10
- Elektromodule	Stifte/Buchse	Stifte/Buchse	Federnde Flachkontakte

3 Unique selling points/USPs of the SWS/SWS-L

Unique selling point	Benefits for the customer
Unique diversity of model sizes	Maximum capacity of the load capacity
Covers the biggest load range	Right size for every application
Optimal weight/load capacity ratio	Best possible use of the robot loading
Locking with highest precision and strength with few components	Reduced set-up times thanks to process reliability and quick service for repairs
Patented, innovative self-locking in case of a drop in pressure without spring	High service friendliness and work security without the disadvantages of springs
Contactless coupling of the halves	Tolerance compensation in the depositing station, gentle changing and low programming work
Unification of high-quality materials for the functional components with weight-optimized materials for the housing	Work and process reliability and economy thanks to weight and cost savings
All three main areas of monitoring are available (most of the time integrated piston stroke control, presence monitoring, tool coding)	Process reliability and prevention of erroneous changes
Modular concept for attachment	Easy exchangeability of the modules and attachment of several modules with optimal use of the space
Diverse adapter plates for mounting on robot	Compatibility of the quick-change system with every robot
Most extensive range of modules and fast implementation of any new developments into the standard program	Always provides the right option for each customer application and the products are always at the technological state-of-the-art
Multitude of storage racks for all model sizes	The right storage rack for each application and all from a single source
The longest warranty period with 24 months	Reliability, planning security of the costs

Guide in the range of the product-accompanying services or planning/realization/usage	Planning security with quality, time and costs/effective start-up (purpose) and with that faster production start/more economical through quick support and our own trained employees
Arc Prevention for several modules for the SWS-L	Wear reduction on the contacts of the electronic modules increases its life span

4 Optional modules

SWS	SWS-L
Electrical signals (K19, R19, G19, ...)	**The same modules as with the quick-change system using different adapter plates**
Servo-electric signals (MT8, MT14, ...)	**Locking/unlocking and signal** (JB2, JD2, JU2, SA2, VA2, ...)
Pneumatics/fluid (P186, P05, FG2, FH6, ...)	**Welding current** (PA2, PB2, ...)
Vacuum (V112A, V300, ...)	**Control and signal** (DA2, DR2, DK4, ...)
BUS signals (TE, TB, RP5, ...)	**Hydraulics** (HB2, HB3, ...)
	Other modules for pneumatics/fluid (AH2, AM2, FC2, ...)

5 Accessories and service

Options	Sensor system	Miscellaneous
Dust cover	Piston stroke control	Depositing station
High-temperature	Presence monitoring	Adapter plates
	Tool coding	Service
		Warranty
		CAD data

6 Price positioning

Performance-sensitive customers can usually be convinced most with the USPs from chapter 3. This chapter is primarily relevant for price-sensitive customers.

If a suitable changer from SCHUNK is selected for a competitor's product which has the same or a higher payload, there are sometimes significant differences in price. SCHUNK appears more expensive at first glance.

Reason for poor price situation of SCHUNK according to catalog specifications:

There is a lot of room to artificially increase the load capacity/moment figures. In this way, two systems that are actually weaker are on the same level as products with realistic figures. The first are correspondingly cheaper, which is the reason for the previously named price situation and why it appears to have cost disadvantages here with a SCHUNK system. It is possible to increase the figures, if:

- the operating pressure is increased. However, this means that the O-ring on the piston cover plate is pressed out in the direction of the robot more frequently and the quick-change head blows off. This is how downtimes and repair outlay (costs) occur. This excess pressure is usually not necessary and is therefore not recommended.
- reduced safety is accepted. This also increases the safety risk for people and damage to the system is also possible, which consequently leads to costs and delays in production. SCHUNK changers have quadrupled safety included in the catalog figures. However, this should not be passed on in writing. For the layout with the customer, the catalog figures always apply first and foremost.
- a higher deflection is permitted. Here, wear and inaccuracies are increased and thus the process reliability is decreased, which results in high expenditure for replacement parts and production errors.
- only a small acceleration of the robot is included. So for higher acceleration, this may result in a safety risk. SCHUNK changers have a robot acceleration of 30 m/s^2 included in the catalog figures.
- a lower or even no distance to the center of gravity of a tool is included. So for larger distances, there is again a risk posed to personal safety and process reliability.

As the load capacity figures or moment loads when comparing tool changers are among the most important figures for the customer, the most precise examinations are required here. If the customer wishes to compare the competitors using the catalog data, it is important to show how big the leeway is for these values using the possibilities listed above. SCHUNK as a company therefore tends to be more conservative in providing the catalog figures. Using different tests and comparisons with ATI, it becomes clear that other companies take a more optimistic approach when providing their catalog figures.

7 FAQs

Questions/statements against change systems

Statement: "We would like to mount all tools on one plate so that there are fewer interfaces."

Response: "Here it is a case of observing the interfering contours with such a solution. In addition, a larger robot may be necessary, as the robot must carry several tools at the same time or the same robot is unable to move as fast or can only carry a reduced workpiece weight.

Statement: "We would prefer to have a second robot in order to do without a tool changing system."

Response: "Here you should consider that a second robot requires more space and is also more expensive. Added to this you have the increased programming work in order to have the two robots work with each other precisely."

Questions/statements to quick-change system from SCHUNK

Statement: "What happens in case of a drop in pressure?"

Answer: "In the case of a loss of pressure, the quick-change adapter (SWA) drops slightly from the quick-change system due to its weight. This results in a gap of up to a few millimeters (depending on the model size). Technically, it is because the balls of the locking mechanism slide to the cylindrical part of the locking piston. Here, they are held in position by their patented contour and the frictional forces. Separating the quick-change system and quick-change adapter is only possible by re-actuating the piston with compressed air. However, for a high accuracy during operation, compressed air is always required!"

Statement: "What lifespan does the quick-change system have?"

Response: "This depends on many aspects. These include the number of locking and unlocking cycles, the application (mass, acceleration, etc.) and how frequently or properly maintenance work is carried out."

Statement: "What happens if I exceed the dynamic moment figures"?

Response: "SCHUNK provides these figures in comparison to the competition with a quadrupled safety factor. Only above this value are several parts mechanically destroyed during testing."

Statement: "Are the US and EU versions of the changer compatible?"

Response: "With the small changers (SWS-001 to SWS-300) the versions are largely not compatible, as the air connections are in different positions. With the changers for heavy load (SWS-L), the US and EU versions are however compatible. A corresponding list can be requested from the sales assistant."

Statement: "Which types of piston stroke control are there and how do they work?"

Response: "We first differentiate the integrated piston stroke control and the SIP setup on the quick-change head (SWK). For the former, two proximity switches which are attached on the side query the position of the piston directly in the piston chamber. With the SIP variant, a monitoring pin is screwed onto the piston, which drives the tower in the SIP cover plate up and down. Here, its position is also queried by two proximity switches which are attached on the side of the tower."

Statement: "Is it possible to retrofit the piston stroke control?"

Response: "This is possible throughout. With the model sizes with integrated piston stroke control, (SWS-040Q/-76/-110/-160 and all SWS-L), only two proximity switches incl. bracket must be reordered. For all other model sizes, the cover plate can be replaced with the SIP setup and this can also be fitted with two proximity switches. Please note here that a new adapter plate to the robot is required."

Statement: "What is the difference between the R19R and R19W electronic modules?"

Response: "With both modules, two cables exit, which can be inserted directly onto the two sensors of the piston stroke control. With the R19R, the connections have a 90° angle at the end, and with the R19W they are straight. Depending on the model size of the quick-change system, there are differences in terms of which model should be used. This depends on the space for the connections with the sensors of the piston stroke control, which is different for each changer."