

# Modular. Robust. Flexible.

## SWS Quick-change system

Pneumatic tool changing system with patented locking system.

### Field of Application

Can be used wherever short changeover times between a handling device and a tool (pallets, gripper) are required

### Advantages – Your benefit

**Many sizes for almost every robot size:** there is always the matching unit for your application

**Patented fail-safe locking mechanism** for safe connection between quick-change master and quick-change adapter

**Manual emergency unlocking possible** no counter-forces from springs

**All functional components made from hardened steel** for a greater change system load bearing capacity

**Wide range of electric, pneumatic, and fluid modules for manifold** energy transmission possibilities

**Integrated pneumatic feed-through** for safe energy supply of the handling modules and tools

**Possibility of transmission of fluid systems** with self-sealing couplings possible

**Adapter coding** via electric module possible

**Suitable storage racks for all sizes** of standardized storage modules

**ISO flange pattern** for easy assembly with most types of robots without needing additional adapter plates



Sizes  
Quantity: 15



Handling weight  
1.4 .. 450 kg



Moment load  $M_x$   
2.8 .. 9870 Nm



Moment load  $M_z$   
3.45 .. 8460 Nm

## Functional Description

Due to the automatic change of the robot tool (e.g. gripper, pallets, suction cups, pneumatic or electrically driven tools, welding guns ...) the flexibility of your robot increases. The SWS quick-change system consists of a SWK quick-change master and a SWA quick-change adapter. The SWK, mounted onto the robot, couples with the SWA

mounted onto the tool. A pneumatically driven locking piston, with its patented design, ensures that the connection is secure. After coupling, pneumatic and electric feed-throughs automatically supply your robot tool.



① **Sensor monitoring of the locking device**

Optional, for process reliable monitoring of the locking condition

② **Housing**

Weight-optimized through application of high-strength aluminum alloy

③ **Drive**

Pneumatic, efficient, and easy to handle

④ **Locking mechanism**

Force-free locking and unlocking, self-locking in locked position

⑤ **Air feed-through**

No interfering contours due to the integration into the housing. Also suitable for vacuum.

CAD data, operating manuals and other current product documents are available at [www.schunk.com](http://www.schunk.com)

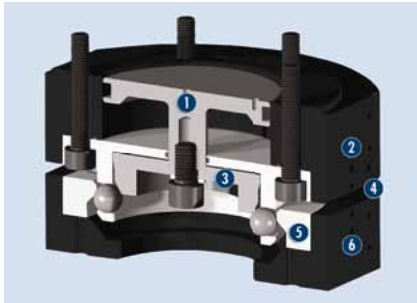
## Detailed Functional Description

### Quick-change system in unlocked position



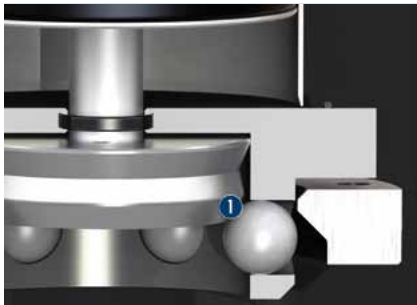
- ❶ Adapter plate
- ❷ Quick-change master SWK
- ❸ Electrical module, robot-side
- ❹ Locking mechanism
- ❺ Locking ring
- ❻ SWA quick-change adapter
- ❼ Electrical module, tool-side

### Section view in Ready-to-Lock position



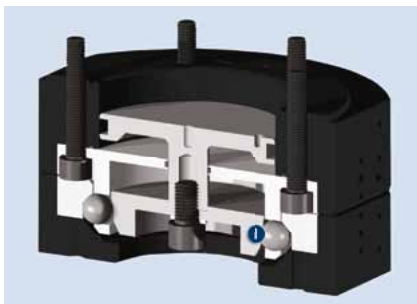
- ❶ Piston
- ❷ Quick-change master SWK
- ❸ Locking piston
- ❹ No-Touch-Locking™
- ❺ Locking ring
- ❻ SWA quick-change adapter

### Detailed view of the locking ball position in Ready-to-Lock position



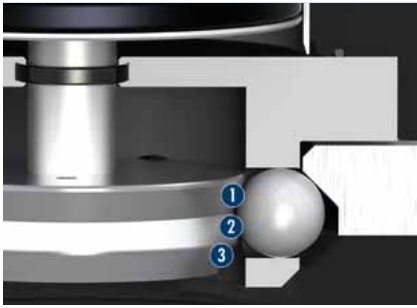
- ❶ Locking balls are on the 1<sup>st</sup> taper of the cam. The master and adapter do not need to be touching to lock.

### Section view of the quick-change system in locked position



- ❶ Actuation of the piston forces the balls out and into the hardened steel ring, pulling the adapter to the master.

### Close-up of locking ball in locked position



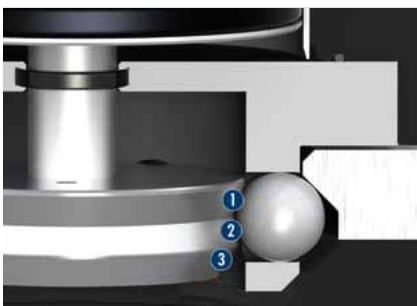
- ❶ Locking balls on the 2<sup>nd</sup> taper of the cam create extremely high locking forces.
- ❷ Fail-Safe reverse taper
- ❸ 1<sup>st</sup> taper

### Section view of the quick-change system in fail-safe position



- ❶ The tool plate will not release from the master plate unless unlock air pressure is applied. Separation of master and adapter in fail-safe position is only possible by pneumatic actuation of the piston.

### Close-up of locking ball while in fail-safe position



- ❶ In the case of pressure loss the locking balls are held in place via the cylindrical part of the locking piston. The piston seal friction prevents the piston from moving due to its own weight or vibrations. The master and adapter can only be separated by pneumatic actuation of the piston.
- ❷ Fail-Safe reverse taper
- ❸ 1<sup>st</sup> taper

### Sectional diagram SWS-001



- ❶ Drive  
Pneumatic, efficient, and easy to handle
- ❷ Locking mechanism  
Force-free locking and unlocking, self-locking in locked position
- ❸ Housing  
Weight-optimized through application of high-strength aluminum alloy
- ❹ Centering and mounting possibilities by using a standardized ISO 9409 interface for robots
- ❺ Electric feed-throughs  
No interfering contours, due to the integration into the housing.
- ❻ Air feed-through  
No interfering contours due to the integration into the housing. Also suitable for vacuum.

## General Notes to the Series

**Actuation:** pneumatic, with filtered compressed air as per DIN ISO 8573-1: 7 4 4

**Operating principle:** Locking balls actuated by pistons

**Energy feed-through:** Variable via attachment modules, depending on the type

**Housing:** The housing is made of high-tensile, hard-coated aluminum alloy. The functional parts are made of hardened steel.

**Scope of delivery:** Operating and maintenance instructions, manufacturer's declaration

**Warranty:** 24 months (details, general terms and conditions and operation manuals can be downloaded at [www.schunk.com](http://www.schunk.com))

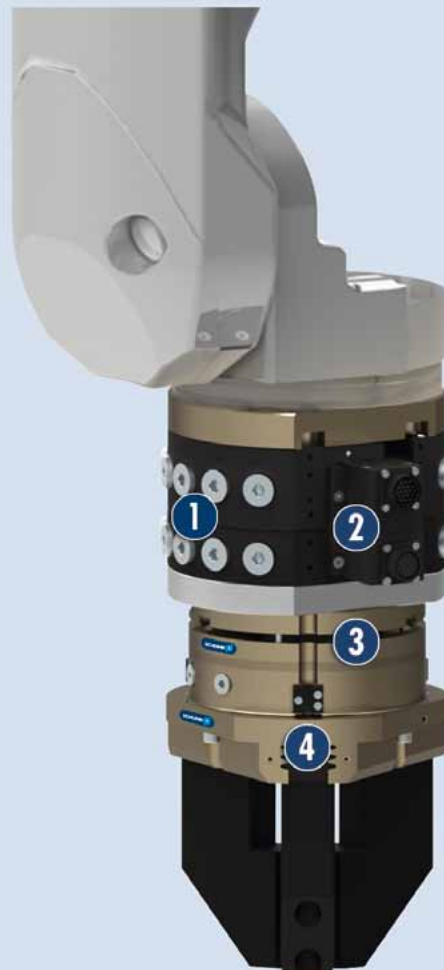
**Harsh environmental conditions:** Please note that use in harsh environmental conditions (e.g. in the coolant area, cast and grinding dust) can considerably reduce the service lifetime of the units, and may void the warranty. However, in many cases we can find a solution. Please contact us.

**Handling weight:** the weight of the total load attached to the flange. The design must take into account the permissible forces and moments. Please note that the life span will be reduced if the maximum handling weight is exceeded.

## Application example

Insertion tool for assembly of small to medium-sized workpieces. The tool can be used in both, clean and dirty environments. Due to its quick-change system, many tools can alternatively be fixed to the robot flange.

- 1 SWS quick-change system
- 2 Electric feed-through
- 3 TCU-Z tolerance compensation unit
- 4 PZN-plus 3-finger centric gripper





## SCHUNK offers more ...

The following components make the SWS even more productive – the perfect complement for highest functionality, flexibility, and process reliability.



Optional Electrical Module



Cable Connector



Pneumatic Optional Modules



SWM Storage Rack



Extension Cable



Adapter Plates



Inductive Proximity Switches



Dust Cover



PGN-plus Universal Gripper



OPR Collision and Overload Sensor



FDB-AC Deburring Spindles



AGE Compensation Unit

① Further information regarding the products can be found on the following products pages or at [www.schunk.com](http://www.schunk.com). Please contact us for further information: SCHUNK technical hotline +49-7133-103-2696

## Options and special Information

**No-Touch-Locking™:** Locking without touching. Ensures that the SWS is securely locked even when the SWK and SWA do not contact.

**Patented fail-safe locking mechanism:** Large piston diameter and outward ball travel increase moment load. All locking parts are made of Rc 58 stainless steel.

## Selection of a SWS Quick-change System

### 1. Determining the Size

#### Quick Method:

When low or medium forces and moments act upon the SCHUNK quick-change system, you should choose a quick-change system with a payload that is comparable to that of your robot.

If high moments and forces act upon the SCHUNK quick-change system, please use the following method, which is more precise.

#### More Precise Method:

The forces and moments are a critical factor in choosing a suitable quick-change system. Proceed as follows to estimate the most unfavorable moment:

- Calculate for the approximate center of gravity (COG) of the heaviest end effector that will be used. Calculate the distance (D) from the COG to the bottom of the tool plate.
- Calculate the mass (m) of the heaviest end effector.
- Multiply m, D and gravity (9,81 m/s<sup>2</sup>) to determine the approximate static moment (M) (or a moment based on 1 g acceleration).
- Choose a quick-change system with a moment load that is equal to or greater than M.

Due to their potentially high accelerations, robots can generate moments that are two to three times higher than M. The quick-change systems are designed for absorbing dynamic moments that are three times higher than their static moments.

### 2. Pneumatic and electrical System

Determine the number of required pneumatic connections and electrical contacts. Larger quick-change systems feature a higher number of pneumatic connections and electrical contacts.

### 3. Temperature and Chemicals

SCHUNK quick-change systems use nitrile seals for the pneumatic supply to the tool plate. O-rings seal the pneumatic locking mechanism. These O-rings are resistant to most chemical influences and also withstand temperatures ranging from -25 to 65 °C. Please contact your SCHUNK representative if you need information on temperatures or chemical influences in particular environments.

### 4. Precision Applications

Always comply with the specifications if you work with applications that require high repeat accuracy.

## SWS Sizes

Designation	Recommended handling weight [kg]	Dynamic moment [Nm]		Static moment [Nm]		Pneumatic feed-throughs	Air connections locked and unlocked
		M <sub>x</sub> and M <sub>y</sub>	M <sub>z</sub>	M <sub>x</sub> and M <sub>y</sub>	M <sub>z</sub>		
SWS-001	1.4	2.8	3.45	0.983	1.15	4 x M5	M5
SWS-005	8	37.2	50.7	12.4	16.9	6 x M5	M5
SWS-011	16	74.7	101.7	24.9	33.9	6 x M5	M5
SWS-020	25	169.5	234	56.5	78	12 x M5	M5
SWS-021	25	169.5	234	56.5	78	8 x G1/8"	M5
SWS-027	38	254.1	298.2	84.7	99.4	8 x G1/8"	G1/8"
SWS-040Q	50	678	678	226	226	8 x G1/8"	G1/8"
SWS-041	50	471	648	157	216	6 x G3/8"; 4 x G1/8"	G1/8"
SWS-060	75	591	882	197	294	8 x G1/8"	G1/8"
SWS-071	79	1185	1185	395	395	8 x G1/4"	G1/8"
SWS-076	100	1626	2103	542	701	5 x G3/8"	G1/8"
SWS-110	150	2352	2352	784	784	8 x G3/8"	G1/8"
SWS-160	300	7170	3800	2390	1267	5 x G3/8"; 4 x G1/2"	G1/8"
SWS-210	300	8130	6780	2710	2260		
SWS-300	450	9870	8460	3290	2820	10 x G3/8"w	G1/4"
SWS-310	510	9870	9480	3290	3160		
SWS-510	700	14580	10500	4860	3500		
SWS-1210	1350	16260	16260	5420	5420		

## Sample Order SWS 001/005/011/020/.../300

SW K - 040 - R19 - G19

### Designation

SW

### Page

K = Master (robot side)

A = Adapter (tool side)

### Size

001/005/011/020/.../300

### Optional modules

Rxx, Sxx, Gxx, Kxx = Electro modules

Pxx = Pneumatic module (anodized aluminum housing, not suitable for liquids)

Vxx = Vacuum module

Fxx = Fluid modules (stainless steel, self-sealing)

000 = Option not used

## Sample Order SWS 011H/020H/021H/040Q/076/110/160

SW K - 110 - R19 - G19 - SM

### Designation

SW

### Page

K = Master (robot side)

A = Adapter (tool side)

### Size

011H/020H/021H/040Q/110/160

### Optional modules

Rxx, Sxx, Gxx, Kxx = Electro modules

Pxx = Pneumatic module (anodized aluminum housing, not suitable for liquids)

Vxx = Vacuum module

Fxx = Fluid modules (stainless steel, self-sealing)

000 = Option not used

### Proximity switch monitoring

SM = Inductive proximity switch PNP (SWK-110, SWK-160)

SG = Inductive proximity switch PNP (for SWK-040Q, SWK-076)

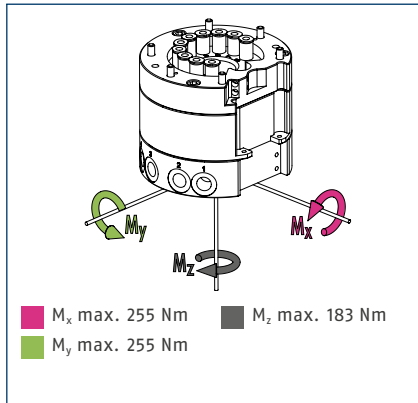
SQ = Inductive proximity switch PNP (for SWK-011H, SWK-020H, SWK-021H)

0 = No proximity switch

Additional variants available on request



## Forces and moments

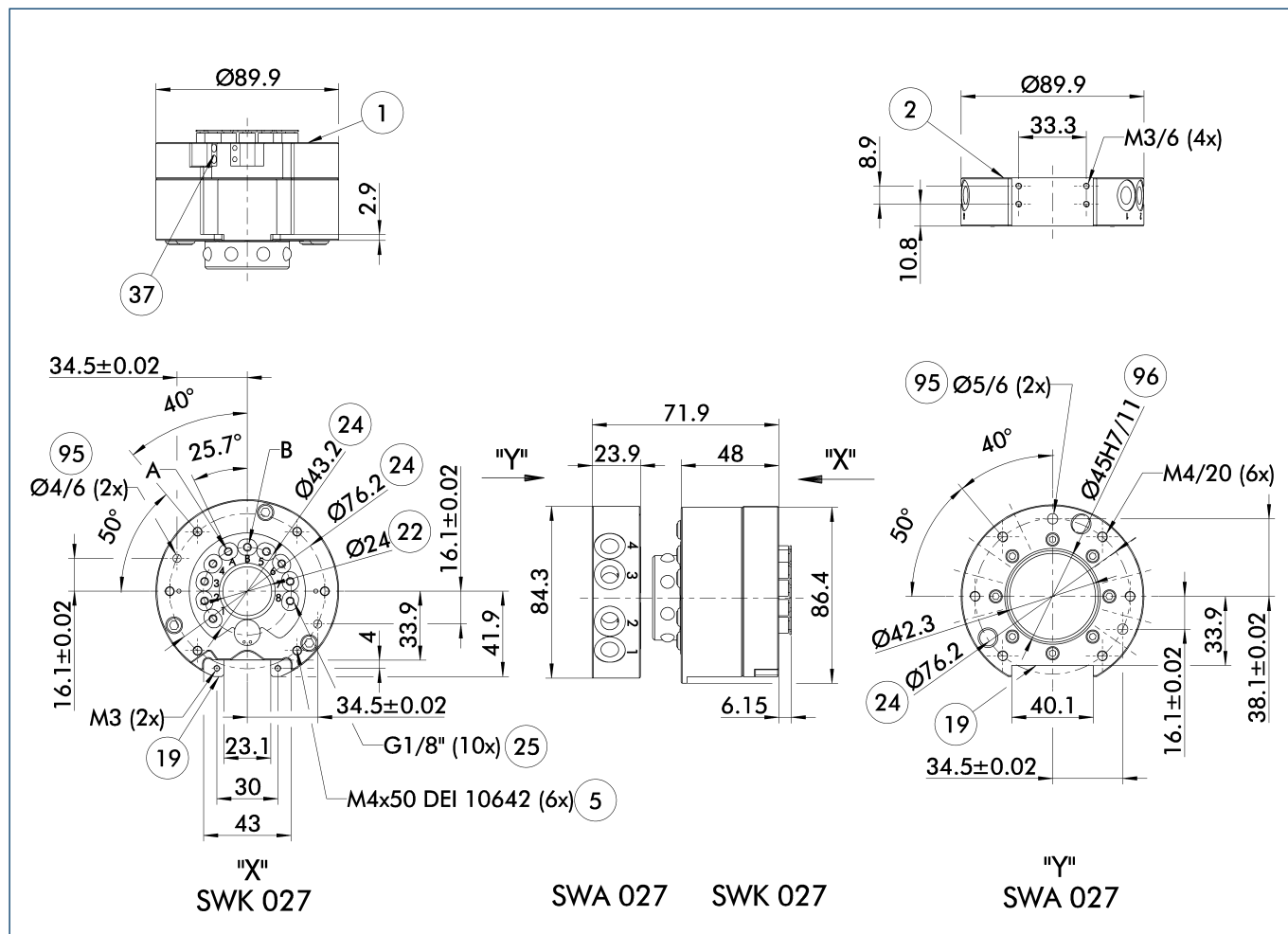


ⓘ This is the max. sum of all forces and moments (from acceleration or deceleration, process forces or moments, emergency stop situations, etc.) which are permitted to act on the tool change system while still ensuring proper functioning.

## Technical data

Description		SWK-027-000-000-SIP	SWA-027-000-000
		Quick-change master for hollow wrist robots	Quick-change adapter
Recommended handling weight	[kg]	38	38
Piston stroke monitoring		integrated	
Locking force	[N]	3500	
Repeat accuracy	[mm]	0.01	0.01
Mass	[kg]	1.1	0.29
max. locking distance	[mm]	2	2
Air connection thread		8x G1/8"	8x G1/8"
Pneumatic feed-through			
Main connection lock / unlock		M5	
max. permissible XY offset	[mm]	±1	±1
max. permissible angular offset	[°]	±2	±2
min. / max. ambient temperature	[°C]	5/60	5/60
min. / max. operating pressure	[bar]	4.5/6.9	4.5/6.9

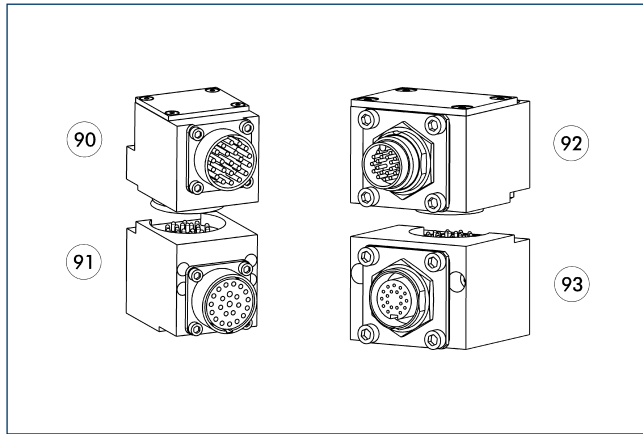
Main view



The drawing shows the basic design of the quick-change system and does not take into consideration the dimensions of any options described below.

- A, a Air connection locked
- B, b Air connection unlocked
- ① Robot side connection
- ② Tool side connection
- ⑤ Through-hole for connection with screws
- ⑬ Mounting surface for options
- ⑲ Center bore
- ⑳ Bolt circle
- ㉕ Pneumatic feed-through
- ㉟ Sensor connection
- ㉞ Fit for a centering pin
- ㉟ Fitting for centering

## Optional electrical modules



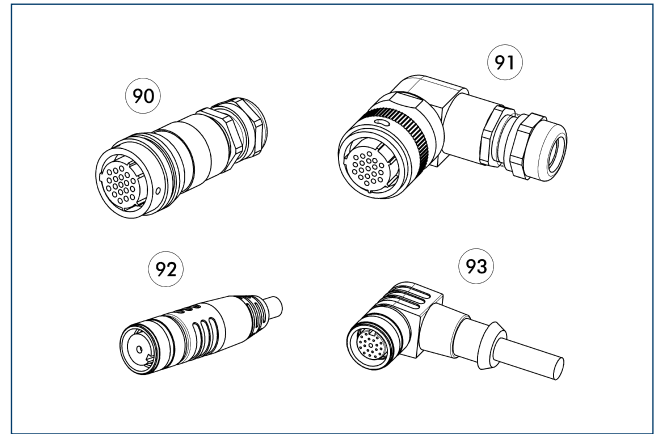
- 90 E-module with bayonet fitting, robot-side
- 91 E-module with bayonet fitting, tool-side
- 92 E-module with metric threads, robot-side
- 93 E-module with mil-spec. threads, tool-side

Modules for transmission of electrical signals from the robot through the tool changer to the tools.

Description	ID	No. Pins	Elec. Rating
<b>Robot-side</b>			
SWO-KF19-K	9959886	19	50 V DC/3 A
<b>Tool-side</b>			
SWO-KF10-A	9961308	10	50 V DC/3 A
SWO-KF14-A	9961307	14	50 V DC/3 A
SWO-KF19-A	9959887	19	50 V DC/3 A

① The modules listed above show only a small selection of the many electrical option possibilities. SCHUNK offers a wide range of electrical feed modules for every application. For further options and technical data, please see chapter "SWO-E Electrical Option" or contact us at any time.

## Cable connector / cable extension



- 90 Connection plug / socket straight
- 91 Connection plug / socket at an angle
- 92 Connection plug / socket straight with extension cable
- 93 Connection plug / socket at an angle with extension cable

Other cable lengths on request.

Cable connector for SWO-R19 / G19 / S19 / K19 / KG19 / R14 / G14 / S14 / R10 / G10 / S10

Description	ID	Cable outlet	Length
<b>Robot-side</b>			
<b>Cable connector without cable</b>			
KAS-19B-K-0-C	0301283	0°	-
KAS-19B-K-90-C	0301294	90°	-
<b>Cable connector with cable</b>			
KV-3-SWK-19B-0	0302176	0°	3 m
KV-5-SWK-19B-0	0302177	0°	5 m
KV-3-SWK-19B-90	0302179	90°	3 m
KV-5-SWK-19B-90	0302190	90°	5 m
<b>Tool-side</b>			
<b>Cable connector without cable</b>			
KAS-19B-A-0-C	0301284	0°	-
KAS-19B-A-90-C	0301295	90°	-
<b>Cable connector with cable</b>			
KV-3-SWA-19B-0	0302178	0°	3 m
KV-3-SWA-19B-90	0302191	90°	3 m

Cable connector for SWO-R26 / G26 / S26 / K26 / R17 / R21 / S21 / K21

Description	ID	Cable outlet	Length
<b>Robot-side</b>			
<b>Cable connector without cable</b>			
KAS-26B-K-0-C	0301290	0°	-
KAS-26B-K-90-C	0301296	90°	-
<b>Cable connector with cable</b>			
KV-3-SWK-26B-0	0302192	0°	3 m
KV-5-SWK-26B-0	0302193	0°	5 m
KV-3-SWK-26B-90	0302185	90°	3 m
KV-5-SWK-26B-90	0302186	90°	5 m
<b>Tool-side</b>			
<b>Cable connector without cable</b>			
KAS-26B-A-0-C	0301291	0°	-
KAS-26B-A-90-C	0301297	90°	-
<b>Cable connector with cable</b>			
KV-3-SWA-26B-0	0302184	0°	3 m
KV-3-SWA-26B-90	0302187	90°	3 m

Cable connector for SWO-KM14

Description	ID	Cable outlet	Length
Robot-side			
Cable connector without cable			
KAS-14B-K-0	0301276	0°	-
KAS-14B-K-90	0301278	90°	-
Tool-side			
Cable connector without cable			
KAS-14B-A-0	0301277	0°	-
KAS-14B-A-90	0301279	90°	-

Cable connector for SWO-RF19 / GF19 / SF19 / KF19/ RF14 / GF14 / KF14 / RF10 / KF10

Description	ID	Cable outlet	Length
Robot-side			
Cable connector with cable			
KV-5-SWK-19F-0	0302170	0°	5 m
KV-10-SWK-19F-0	0302171	0°	10 m
KV-5-SWK-19F-90	0302172	90°	5 m
KV-10-SWK-19F-90	0302173	90°	10 m
Tool-side			
Cable connector with cable			
KV-3-SWA-19F-0	0302174	0°	3 m
KV-3-SWA-19F-90	0302175	90°	3 m

① For other cable connections / extensions, see chapter "Options" or visit [www.schunk.com](http://www.schunk.com)

