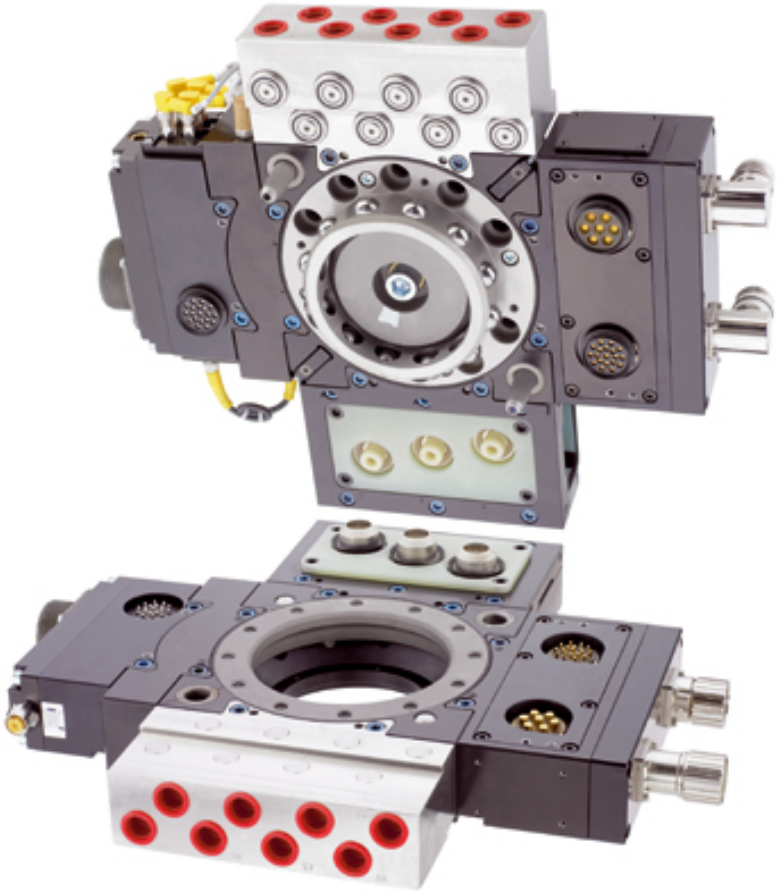
Assembly and operating manual

SWS-L

Heavy Load Change System



Superior Clamping and Gripping

SCHUNK®

Imprint

Technical changes:

We reserve the right to make alterations for the purpose of technical improvement.

Document number: 389037

Version: 03.00 | 03/05/2019 | en

Dear Customer,

thank you for trusting our products and our family-owned company, the leading technology supplier of robots and production machines.

Our team is always available to answer any questions on this product and other solutions. Ask us questions and challenge us. We will find a solution!

Best regards,

Your SCHUNK team

SCHUNK GmbH & Co. KG
Spann- und Greiftechnik

Bahnhofstr. 106 – 134
D-74348 Lauffen/Neckar

Tel. +49-7133-103-0
Fax +49-7133-103-2399

info@de.schunk.com
schunk.com

Table of contents

1 General

1.1 About this manual

This manual contains important information for a safe and appropriate use of the product.

This manual is an integral part of the product and must be kept accessible for the personnel at all times.

Before starting work, the personnel must have read and understood this operating manual. Prerequisite for safe working is the observance of all safety instructions in this manual.

Illustrations in this manual are provided for basic understanding and may differ from the actual product design.

In addition to these instructions, the documents listed under Applicable documents [▶ 6] are applicable.

1.1.1 Presentation of Warning Labels

To make risks clear, the following signal words and symbols are used for safety notes.

⚠ DANGER

Danger for persons!

Non-observance will inevitably cause irreversible injury or death.

⚠ WARNING

Dangers for persons!

Non-observance can lead to irreversible injury and even death.

⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

NOTICE

Material damage!

Information about avoiding material damage.

1.1.2 Applicable documents

- General terms of business*
- Catalog data sheet of the purchased product *
- Assembly and operating manuals of the accessories *

The documents marked with an asterisk (*) can be downloaded on our homepage **schunk.com**

1.2 Warranty

If the product is used as intended, the warranty is valid for 24 months from the ex-works delivery date under the following conditions:

- Observe the specified maintenance and lubrication intervals
- Observe the ambient conditions and operating conditions

Parts touching the workpiece and wear parts are not included in the warranty.

1.3 Accessories

A wide range of accessories are available for this product

For information regarding which accessory articles can be used with the corresponding product variants, see catalog data sheet.

2 Basic safety notes

2.1 Intended use

The product (quick-change system SWS-L, consisting of quick-change head SWK-L and quick-change-adapter SWA-L) was designed for quickly changing parts and automation components at a robot in context of the technical data.

- The product is intended for installation in a machine/system or for mounting to a robot. The applicable guidelines must be observed and complied with.
- When implementing and operating components in safety-related parts of the control systems, the basic safety principles in accordance with DIN EN ISO 13849-2 apply. The proven safety principles in accordance with DIN EN ISO 13849-2 also apply to categories 1, 2, 3 and 4.
- Make sure that the product is only used within its defined application parameters.
- The product is intended for industrial use.

2.2 Not intended use

It is not intended use if the product is used, for example, as a pressing tool, stamping tool, lifting gear, guide for tools, cutting tool, clamping device or a drilling tool.

- Any utilization that exceeds or differs from the appropriate use is regarded as misuse.

2.3 Ambient conditions and operating conditions

Required ambient conditions and operating conditions

Incorrect ambient and operating conditions can make the product unsafe, leading to the risk of serious injuries, considerable material damage and/or a significant reduction to the product's life span.

- Make sure that the product is used only in the context of its defined application parameters, Technical Data [▶ 12].
- Make sure that the product is a sufficient size for the application.
- Make sure that the environment is free from splash water and vapors as well as from abrasion or processing dust. Exceptions are products that are designed especially for contaminated environments.

2.4 Personnel qualification

Inadequate qualifications of the personnel

If the personnel working with the product is not sufficiently qualified, the result may be serious injuries and significant property damage.

- All work may only be performed by qualified personnel.
- Before working with the product, the personnel must have read and understood the complete assembly and operating manual.
- Observe the national safety regulations and rules and general safety instructions.

The following personal qualifications are necessary for the various activities related to the product:

Trained electrician	Due to their technical training, knowledge and experience, trained electricians are able to work on electrical systems, recognize and avoid possible dangers and know the relevant standards and regulations.
Qualified personnel	Due to its technical training, knowledge and experience, qualified personnel is able to perform the delegated tasks, recognize and avoid possible dangers and knows the relevant standards and regulations.
Instructed person	Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.
Service personnel of the manufacturer	Due to its technical training, knowledge and experience, service personnel of the manufacturer is able to perform the delegated tasks and to recognize and avoid possible dangers.

2.5 Personal protective equipment

Use of personal protective equipment

Personal protective equipment serves to protect staff against danger which may interfere with their health or safety at work.

- When working on and with the product, observe the occupational health and safety regulations and wear the required personal protective equipment.
- Observe the valid safety and accident prevention regulations.
- Wear protective gloves to guard against sharp edges and corners or rough surfaces.
- Wear heat-resistant protective gloves when handling hot surfaces.
- Wear protective gloves and safety goggles when handling hazardous substances.
- Wear close-fitting protective clothing and also wear long hair in a hairnet when dealing with moving components.

2.6 Notes on particular risks

⚠ WARNING

Risk of injury from objects falling and being ejected!

Falling and ejected objects during operation can lead to serious injury or death.

- Take appropriate protective measures to secure the danger zone.

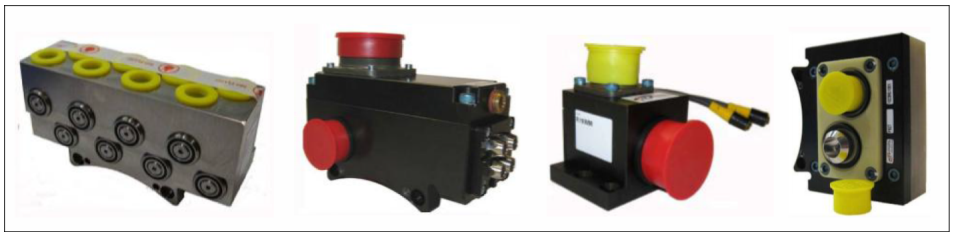
⚠ WARNING

Risk of injury due to unexpected movement of the machine/ system!

- Switch off the energy supply.

⚠ WARNING

Remove all temporary protective materials (caps, plugs, tape, etc.) on locking face of Tool Changer and modules prior to operation. Failure to do so will result in damage to Tool Changers, modules, and end-of-arm tooling and could cause injury to personnel.



⚠ WARNING

Injury or equipment damage can occur with power or air on.

- Do not perform maintenance or repair on Tool Changer or modules with power or air on.
- Turn off power and air before performing maintenance or repair on Tool Changer or modules.

⚠ WARNING

During operation, the area between the Quick-Chance-Head SWK and Quick Change Adapter SWA must be kept clear.

Failure to keep area clear will result in damage to Tool Changer, modules , or end-of-arm tooling and could cause injury to personnel.

⚠ WARNING

Using the Tool Changer in applications other than intended will result in damage to Tool Changer, modules, or end-of-arm tooling and could cause injury to personnel.

- The Tool Changer is only to be used for intended applications and applications approved by the manufacturer.

⚠ CAUTION

The SWK locking mechanism must not be actuated without being mounted to the robot interface plate.

Damage to the Cover Plate and O-ring may result.

- Always attach the SWK to the Robot interface plate prior to attempting any operations.

3 Technical Data

Designation		Description	SWS-L			
			210	310	510	1210
Suggested Payload [kg]		The mass attached to the Tool Changer.	300	510	700	1350
Operating temperature [°C]			5 – 60	5 – 60	5 – 60	5 – 60
Operating pressure [bar]		Locking mechanism supply pressure operating range. Supply to be clean, dry, and filtered to 50 micron or better.	5 – 6.9	5 – 6.9	5 – 6.9	5 – 6.9
Coupling Force @ 5,5 bar [N]		Axial holding force.	31,000	38,000	62,000	93,000
Max. Moment Load [Nm]	(X, Y)	Maximum recommended working load for optimum performance of the Tool Changer.	8,100	9,900	14,700	16,200
	(Z)	Torsion	6,900	9,600	10,500	16,200
Positional Repeatability [mm]		Repeatability tested at rated load at one million cycles.	0.015			
Weight [kg] (coupled, no modules)		Total	8.2	20.4	28	28
		SWK-L	5.4	12.7	19.3	18
		SWK-A	2.7	7.7	8.7	10
Max. **Recommended** distance between SWK-L and SWA-L [mm]		No-Touch™ locking technology allows the SWK-L and SWA-L to lock with separation when coupling.	2.5	2.5	2.5	1

Designation	Description	SWS-L			
		210	310	510	1210
Mounting/ Customer Interface	SWK-L	Meets ISO 9409-1-A125	Meets ISO 9409-1-A200 Also Supports ABB ISO Pattern	Meets ISO 9409-1-200-6-M12 (Position 11)	Assembly drawings [▶ 56]
	SWA-L	Meets ISO 9409-1-A125 Also supports (8) Fasteners on 160 mm BC Pattern	Meets ISO 9409-1-A200 Also Supports (6) Fasteners on ABB ISO Pattern	ISO 9409-1-200-12-M16 (Position 12)	Assembly drawings [▶ 56]

Designation	Description	210 - 510	1210
Sensor Information, signal name	L/U (Lock/Unlock)	Internal proximity sensors (2) with cable and connector for direct wiring to the control/ signal module to indicate locking mechanism position.	Internal proximity sensors (6) with cable and connector to indicate locking mechanism position.
	RTL (Ready-To-Lock)	Flat Pack proximity sensor with cable and connector for direct wiring to control/signal module to indicate SWK-L and SWA-L mating surfaces within close proximity of each other.	Proximity sensors (3) with cable and connector for direct wiring to control/signal module to indicate SWK-L and SWA-L mating surfaces within close proximity of each other.

4 Product description

4.1 Quick-change head (SWK-L)

The Quick-change head (SWK-L) includes an anodized aluminum body, a hardened stainless-steel locking mechanism, and hardened steel alignment pins (see Figure).

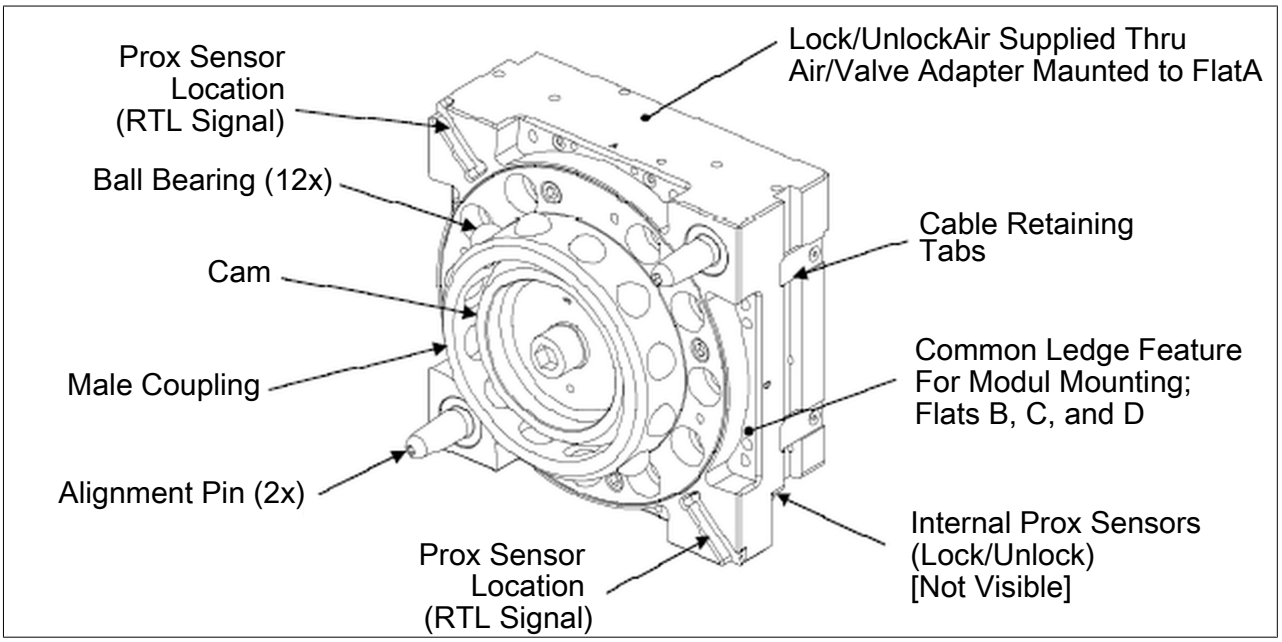
The SWK-L plate has 4 (SWK-L-1210 Series: 6) flat sides for mounting of optional modules. Flat ‘A’ is dedicated for mounting of the control/signal module along with SWK-L supply air that is provided through an air or valve adapter. Flats ‘B’, ‘C’, and ‘D’ (SWS-L-1210 Series and ‘F’) are fully interchangeable and optional modules can be arranged to suit the application or robot dress as required.

The locking mechanism consists of a cylindrical housing with holes that retain hardened chrome-steel balls. Tapered pins located on the SWK-L mate with holes in the SWA-L to ensure repeatable alignment during the coupling process. An extreme pressure grease is applied to the cam, male coupling, ball bearings and alignment pins to enhance performance and maximize life of the components.

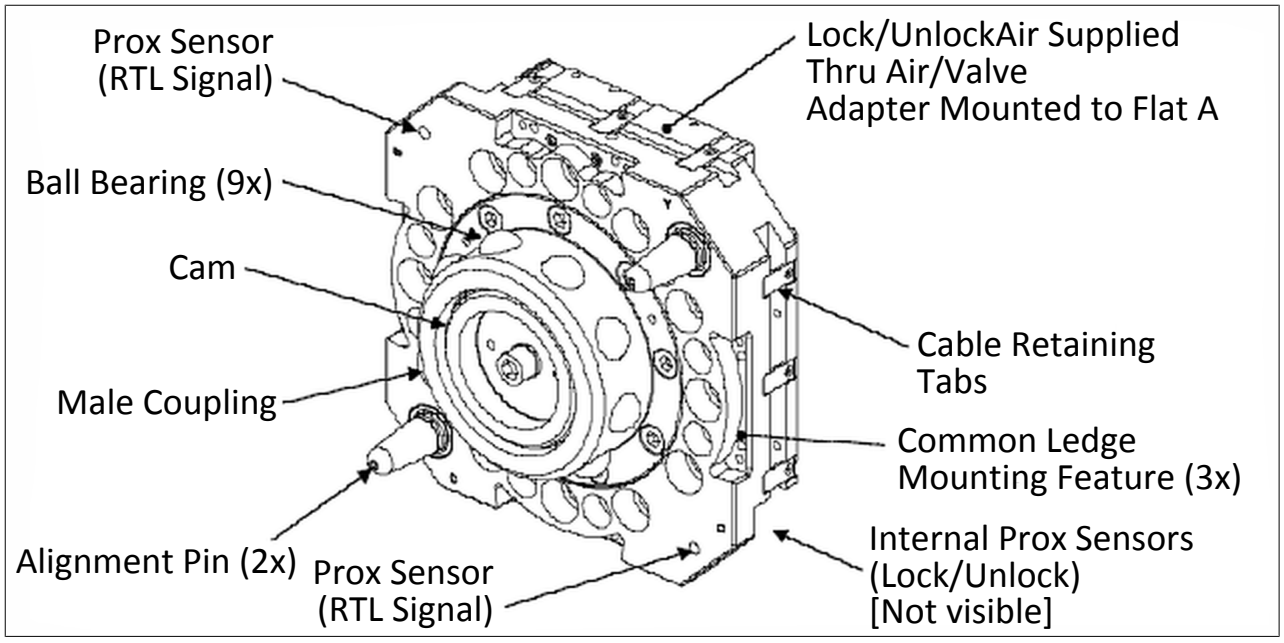
SWK-L-210: A dual-sensor assembly is mounted into the body of the SWK-L to verify the lock/unlock position of the piston and cam. The sensors provide the lock and unlock (L/U) signals through the control/signal module.

SWK-L-310 and 510: Proximity sensors are designed into the body of the SWK-L to verify the lock/unlock position of the piston and cam. The sensors provide the lock and unlock (L/U) signals through the control/signal module.

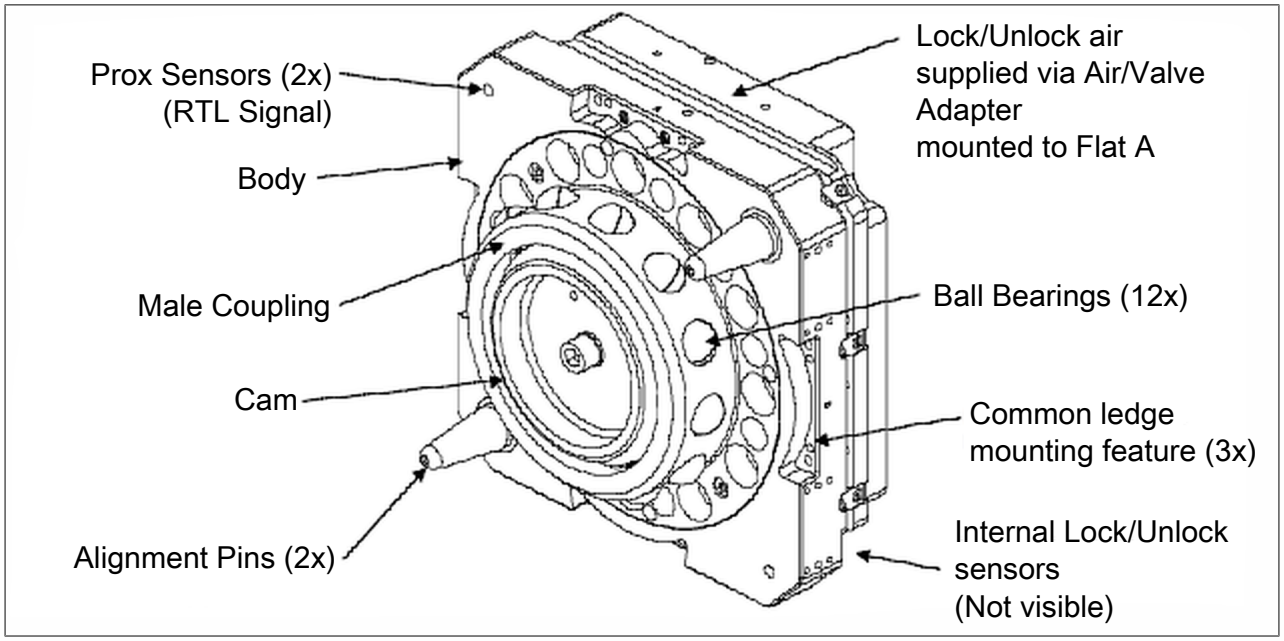
SWK-L-1210: The SWK-L is comprised of 3 locking mechanisms. Each locking mechanism consists of a cam, male coupling, and chrome-steel balls. Tapered pins located on the SWK-L mate with holes in the SWA-L to ensure repeatable alignment during the coupling process. Extreme pressure grease is applied to the cams, male couplings, ball bearings, and pins to enhance performance and maximize the life of the SWK-L.
Proximity sensors (6 total) are designed into the body of the SWK-L to verify the locked/unlocked position of each locking mechanism. Due to the multiple locking mechanism design, the proximity sensors are grouped such that 3 sensors are for Lock and 3 are for Unlock. The Lock/Unlock signal at each locking mechanism is routed to the signal junction module. The junction module provides the control/signal module with the Lock/Unlock state of the SWK-L. See the cable routing illustrations in chapter "Installation" to understand the relationship between the sensors, junction module and control module.)



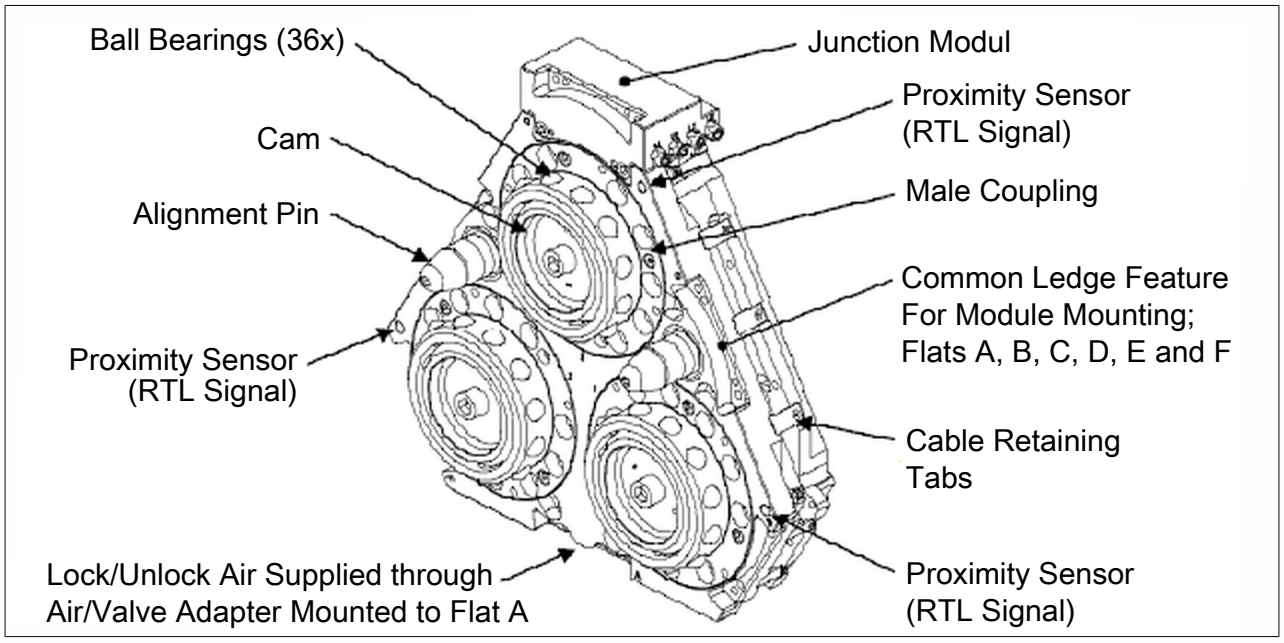
SWK-L 210



SWK-L 310



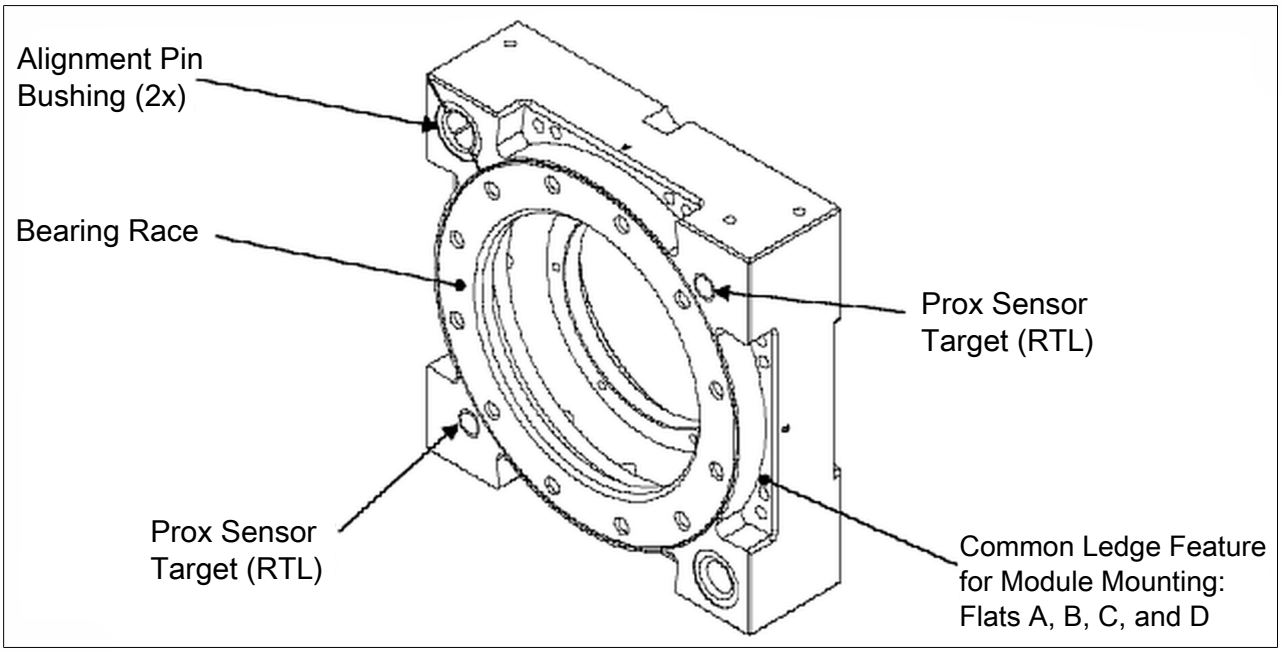
SWK-L 510



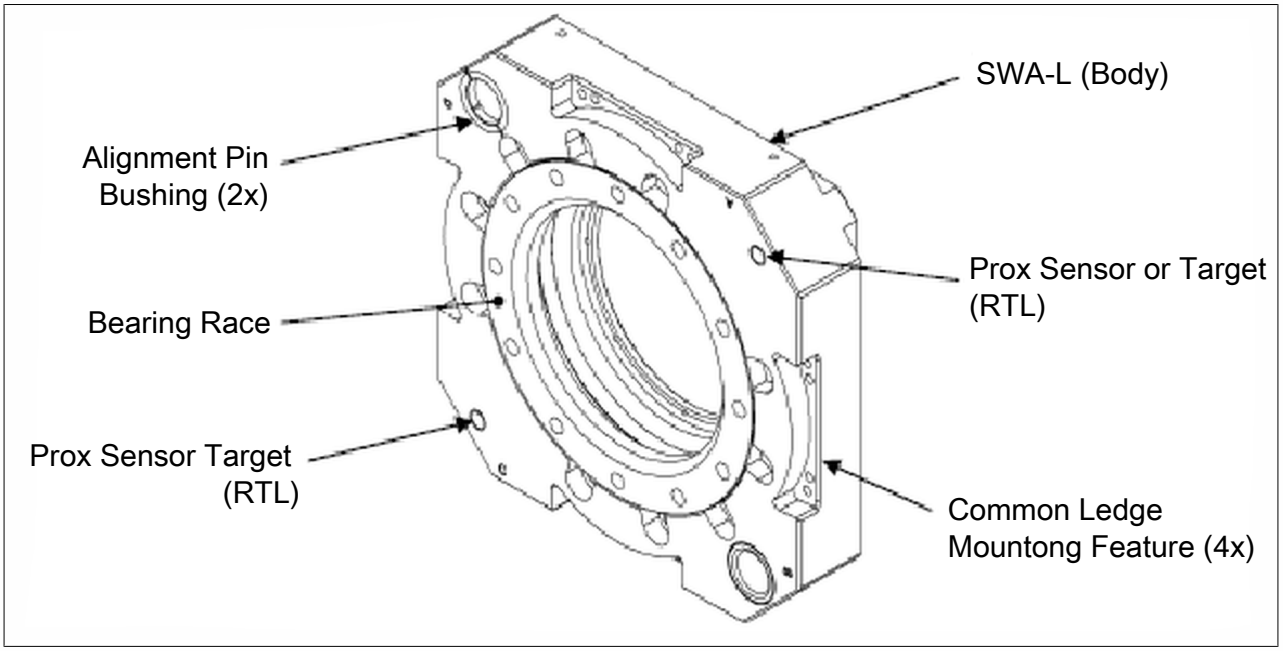
SWK-L 1210

4.2 Quick Change Adapter (SWA-L)

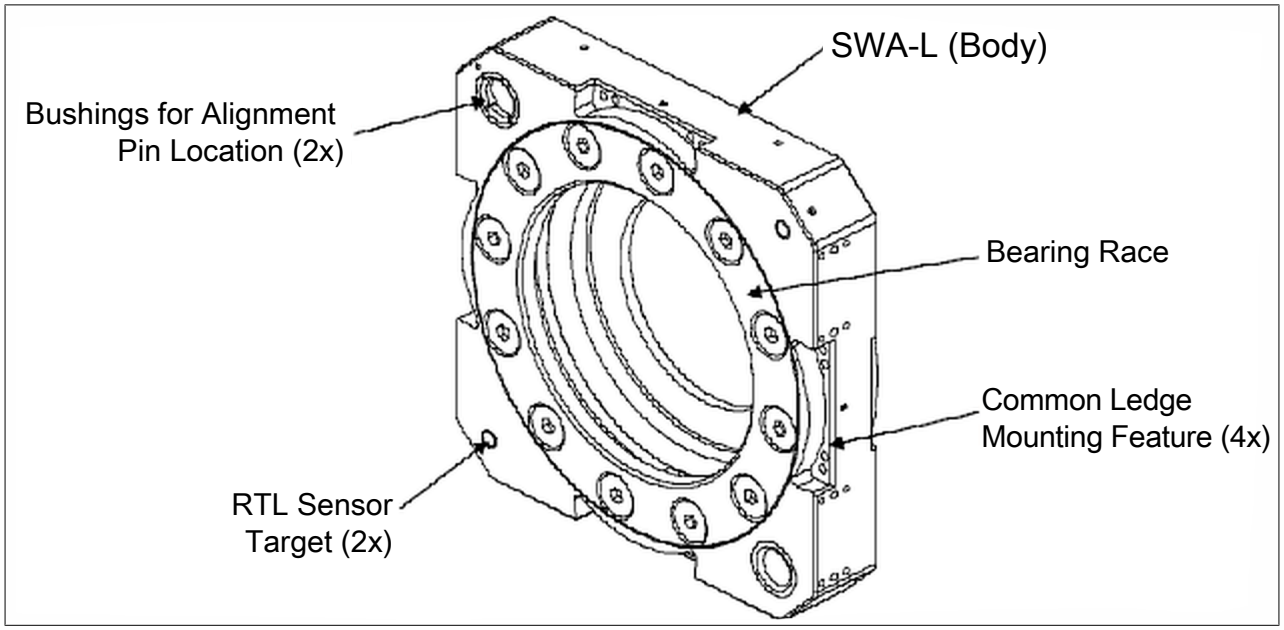
The Quick Change Adapter (SWA-L) includes an anodized aluminum body and a hardened stainless-steel bearing race (SWS-L-1210: 3 hardened stainless-steel bearing races). The SWA-L has 4 (SWS-L-1210: 6) flat sides for mounting of optional modules.



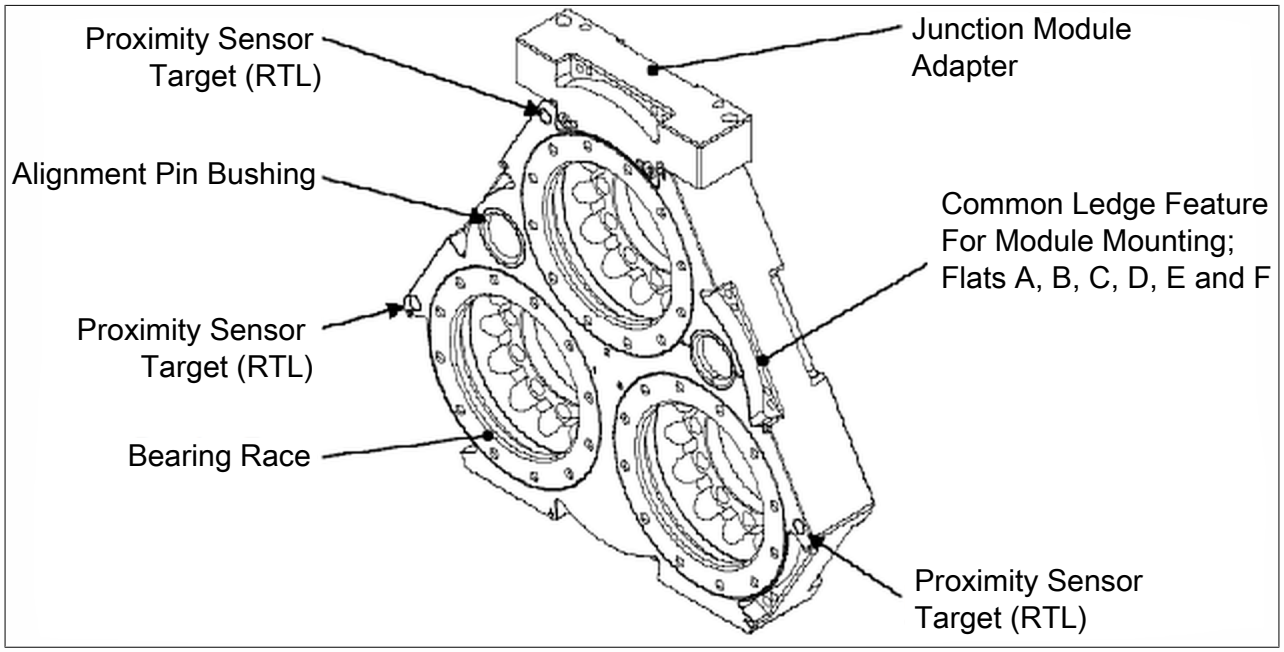
SWA-L 210



SWA-L-310



SWAS-L-510



SWA-L-1210

4.3 Optional Modules

There are 4 (SWS-1210: 6) flats available for mounting of the optional modules for support of various utility pass-through, such as signal, fluid/air, and power.

For assistance in choosing the right modules for your particular application, visit our website to see what is available or contact an SCHUNK Sales Representative directly.

In general, flat ‘A’ is reserved for an air/valve adapter module and a control/signal module.

Modules for flats ‘B’, ‘Modules for flats ‘B’, ‘C’, or ‘D’ (SWS-1210: or ’F’) are interchangeable to suit the application or the dress-out required.

The optional modules are mounted to the SWK-L or SWA-L using a common ledge mounting feature. Only 2 M6 SHCS fasteners need to be unscrewed in order to remove the module from the SWK-L/ SWA-L. A secondary mounting support, called a “cleat”, is factory-installed to the SWK-L and SWA-L on each flat that is occupied with a module. The cleats provide additional module support for those situations when hoses or cables may inadvertently be snagged or pulled and may otherwise result in damage to the module.

If modules are added to a SWS-L in the field, then the SWK-L and SKA-L may have to be uninstalled to facilitate the cleat installation.

5 Installation

⚠ WARNING

Risk of injury due to falling tool!

The tool can fall off during assembly, adjustment and maintenance work.

- Only carry out assembly, adjustment and maintenance work when the tool is placed in the storage rack or secured against falling.

All fasteners used to mount the SWS-L to the robot and to user Tools should be tightened to a torque value as indicated below. Furthermore, removable (blue) Loctite 242 must be used on these fasteners.

NOTE

Care should be taken to select fasteners for mounting that are not too long, such that a gap is formed at the interface.

SWS-210

Mounting conditions	Fastener Size and Property Class	Recommended Torque
SWK-L to RIP (6061-T6 aluminum) Minimum thread engagement of 15 mm (1.5 x fastener Ø)	M10–1.5 Class 12.9	75 Nm
SWK-L to Robot (steel; USS ≥ 90KSI) Minimum thread engagement of 10 mm (1.0 x fastener Ø)	M10–1.5 Class 12.9	75 Nm
End-effector Interface Plate (aluminum) to SWA-L (7075-T6 aluminum) Minimum thread engagement of 15 mm (1.5 x fastener Ø)	M10–1.5 Class 12.9	52 Nm
End-effector Interface Plate (aluminum) to SWA-L (7075-T6 aluminum) Minimum thread engagement of 18 mm (1.5 x fastener Ø)	M12–1.75 Class 12.9	94 Nm

SWS-310

Mounting conditions	Fastener Size and Property Class	Recommended Torque
SWK-L to Robot Interface Plate (6061-T6 aluminum) Minimum thread engagement of 24 mm (1.5 x fastener Ø)	M16-2.0 Class 12.9	225 Nm
SWK-L to Robot Interface Plate (6061-T6 aluminum) Minimum thread engagement of 18 mm (1.5 x fastener Ø)	M12-1.75 Class 12.9	95 Nm
SWK-L to Robot (steel; USS ≥ 90KSI) Minimum thread engagement of 16 mm (1.0 x fastener Ø)	M16-2.0 Class 12.9	225 Nm
SWK-L to Robot (steel; USS ≥ 90KSI) Minimum thread engagement of 12 mm (1.0 x fastener Ø)	M12-1.75 Class 12.9	95 Nm
End-effector Interface Plate (aluminum) to SWA-L (7075-T6 aluminum) Thread engagement of 21 mm (1.3 x fastener Ø)	M16-2.0 Class 12.9	225 Nm
End-effector Interface Plate (aluminum) to SWA-L (7075-T6 aluminum) Minimum thread engagement of 18 mm (1.5 x fastener Ø)	M12-1.75 Class 12.9	94 Nm
End-effector Interface Plate (aluminum) to SWA-L (7075-T6 aluminum) Minimum thread engagement of 15 mm (1.5 x fastener Ø)	M10-1.5 Class 12.9	52 Nm
SWA-L to End-effector Interface Plate (6061-T6 aluminum) Minimum thread engagement of 15 mm (1.5 x fastener Ø)	M10-1.5 Class 12.9	52 Nm

SWS-510

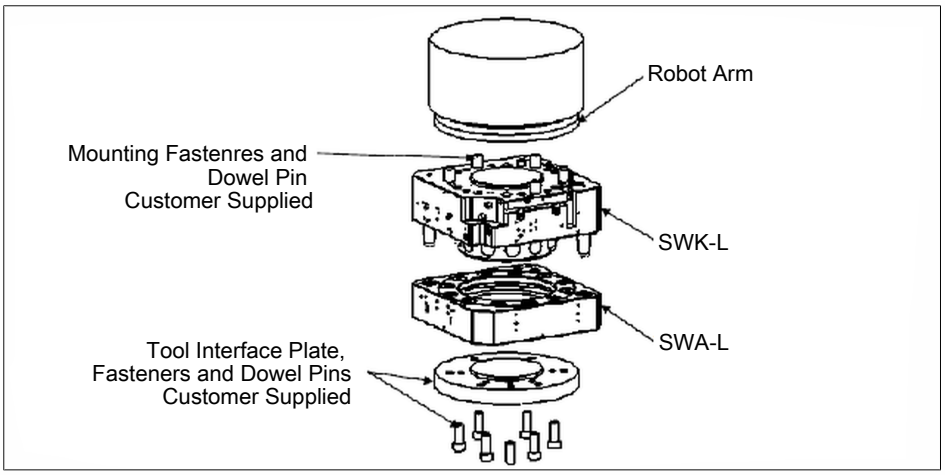
Mounting conditions	Fastener Size and Property Class	Recommended Torque
SWK-L to Robot Interface Plate (6061-T6 aluminum) Minimum thread engagement of 24 mm (1.5 x fastener Ø)	M16-2.0 Class 12.9	325 Nm
SWK-L to Robot Interface Plate (6061-T6 aluminum) Minimum thread engagement of 18 mm (1.5 x fastener Ø)	M12-1.75 Class 12.9	135 Nm
SWK-L to Robot Interface Plate (steel; USS ≥ 40KSI) Minimum thread engagement of 24 mm (1.5 x fastener Ø)	M16-2.0 Class 12.9	325 Nm
SWK-L to Robot Interface Plate (steel; USS ≥ 40KSI) Minimum thread engagement of 18 mm (1.5 x fastener Ø)	M12-1.75 Class 12.9	135 Nm
SWK-L to Robot (steel; USS ≥ 90KSI) Minimum thread engagement of 16 mm (1.0 x fastener Ø)	M16-2.0 Class 12.9	325 Nm
SWK-L to Robot (steel; USS ≥ 90KSI) Minimum thread engagement of 12 mm (1.0 x fastener Ø)	M12-1.75 Class 12.9	135 Nm
End-effector Interface Plate (steel or aluminum) to SWA-L (7075-T6 aluminum) Minimum thread engagement of 24 mm (1.5 x fastener Ø)	M16-2.0 Class 12.9	225 Nm
End-effector Interface Plate (steel or aluminum) to SWA-L (7075-T6 aluminum) Minimum thread engagement of 18 mm (1.5 x fastener Ø)	M12-1.75 Class 12.9	94 Nm

SWS-1210

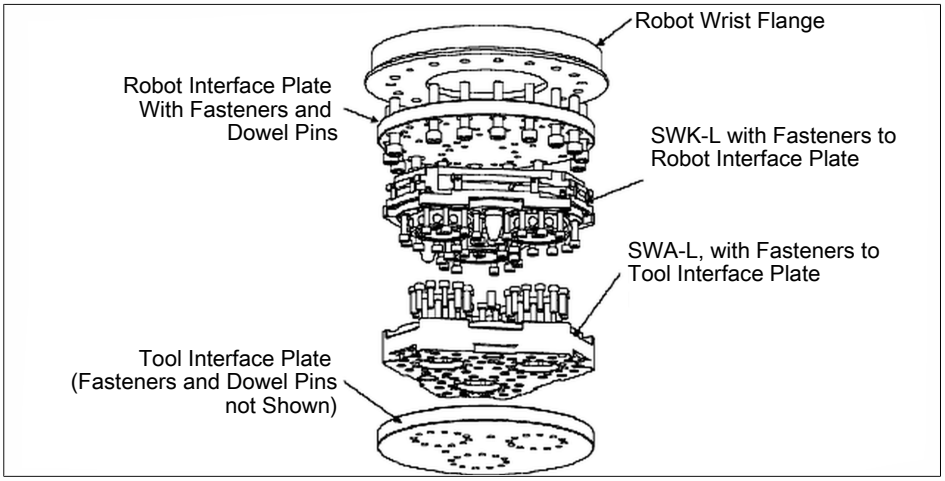
Mounting conditions	Fastener Size and Property Class	Recommended Torque
SWK-L to RIP (6061-T6 aluminum) Minimum thread engagement of 15 mm (1.5 x fastener Ø)	M10–1.5 Class 12.9	75 Nm
SWK-L to RIP (Steel; USS ≥ 90KSI) Minimum thread engagement of 15 mm (1.5 x fastener Ø)	M10–1.5 Class 12.9	75 Nm
SWA-L (aluminum) to End-Effector Interface Plate (6061-T6 aluminum) Minimum thread engagement of 15 mm (1.5 x fastener Ø)	M10–1.5 Class 12.9	52 Nm
SWA-L (aluminum) to End-Effector Interface Plate (7075-T6 aluminum) Minimum thread engagement of 15 mm (1.5 x fastener Ø)	M10–1.5 Class 12.9	52 Nm

5.1 SWK-L

The SWK-L is attached to the robot arm. (SWS-L-1210: The SWK-L is attached to the robot interface plate (RIP), and both are bolted to the robot arm. The RIP is designed with mounting features such as a boss and/or bolt and dowel holes.)
The SWK-L is designed with mounting features such as a boss and/or bolt and dowel holes. These features are used to accurately position and secure the SWK-L to the robot. A robot interface plate (RIP) is utilized to adapt the SWK-L to a specific robot flange that is not compatible with the SWK-L mounting features. Custom RIPs are available upon request.



Typical Installation SWS-L-210, 310, 510



Typical Installation SWS-L-1210

If the customer chooses to design and build a robot interface plate, the following should be considered:

- The interface plate should be designed to include bolt holes for mounting, dowel pins and a boss for accurate positioning on the robot and SWK-L
- The thickness of the interface plate must be great enough to provide the necessary thread engagement for the mounting bolts.

- The interface plate must be properly designed to provide rigid mounting to the SWK-L boss area.
- The plate design should take into account clearances required for tool changer module attachments and accessories.

5.2 SWA-L

The SWA-L is attached to customer-supplied tooling. The SWA-L is designed with mounting features such as a bolt and dowel holes. These features are used to accurately position and secure the end-effector. Most often an End- effector Interface Plate (EIP) is utilized to adapt the SWA-L to an end-effector that is not compatible with the SWA-L mounting features. Custom End-effector Interface Plates can be supplied by SCHUNK to meet customer requirements (refer to the drawings "Typical Installation" in the section above).

When the customer chooses to design and build an End- effector Interface Plate, the following should be considered:

- The interface plate should be designed to include bolt holes for mounting, dowel pins, and a boss that mates with SWA-L body recess for accurate positioning.
- **SWS-L-310:** When using a locating boss, the race cover must be removed.
- **SWS-L-210:** The locating boss height should not exceed 6.3mm. If necessary, the race cover can be removed to allow for additional boss height.
- The thickness of the interface plate must be great enough to provide the necessary thread engagement for the mounting bolts.
- The plate design should take into account clearances required for SWS-L attachments and accessories.
- The End- effector Interface Plate should be designed with a hole in its center to allow for manually returning the locking mechanism to the unlocked position under adverse conditions (i.e. unintended loss of power and/or air pressure). The center access hole should be kept small (minimum recommended hole diameter: 25.4 mm) to prevent debris from contaminating the locking mechanism while operating in dirty environments. Even greater protection will result if the standard race cover with removable access plug is used. **Note**: Thru hole diameter in plate: 14.3 mm. Grommet outside diameter: 22.5 mm.

- **SWS-L-1210:** The End- effector Interface Plate should be designed with a set of holes in the center of each of the three locking mechanisms to allow for manually returning the locking mechanisms to the unlocked position under adverse conditions (i.e., unintended loss of power and/or air pressure). The center access holes should be kept small (recommended hole diameter: 25.4mm) to prevent debris from contaminating the locking mechanism while operating in dirty environments.

5.3 Tool Stand Design

NOTICE

Tool stand design is critical to proper operation of the SWS-L. Improperly designed tool stands can cause misalignments that will cause jamming and/or excessive wear of SWS-L components.

SWS-L-1210: Z-Compliance is required for the Tool Stand, in order to ensure that the SWK-L remains fully contacted with the SWA-L prior to issuing the Unlock command.

NOTICE

During coupling and lock-up the tool stand must allow for movement (float) in a plane parallel to the mating surfaces of the SWK-L and SWA-L, and in a direction perpendicular to this plane, towards the SWK-L.

In most cases, the SWA-L are stored in a Tool Stand when not being used by the robot. During coupling and lock-up, the Tool Stand must allow for movement (float) in a plane parallel with the mating surfaces of the SWK-L and SWA-L (X and Y directions). Even slight misalignment between the SWK-L and SWA-L can generate high forces during lockup if the SWA-L is not allowed to float into place during lock-up. These high forces can cause excessive wear and even jamming of the end-effector and robot. The degree of float required depends on the accuracy of the robot's positioning and the repeatability of the SWA-L location in the Tool Stand during lock-up. See following Figure and Table for recommended maximum allowable float (offsets) prior to coupling. The Tool Stand should be designed to minimize misalignment during coupling and uncoupling. In some cases, greater offsets than shown in the Table can be accommodated by the SWK-L and SWA-L, but will increase wear.

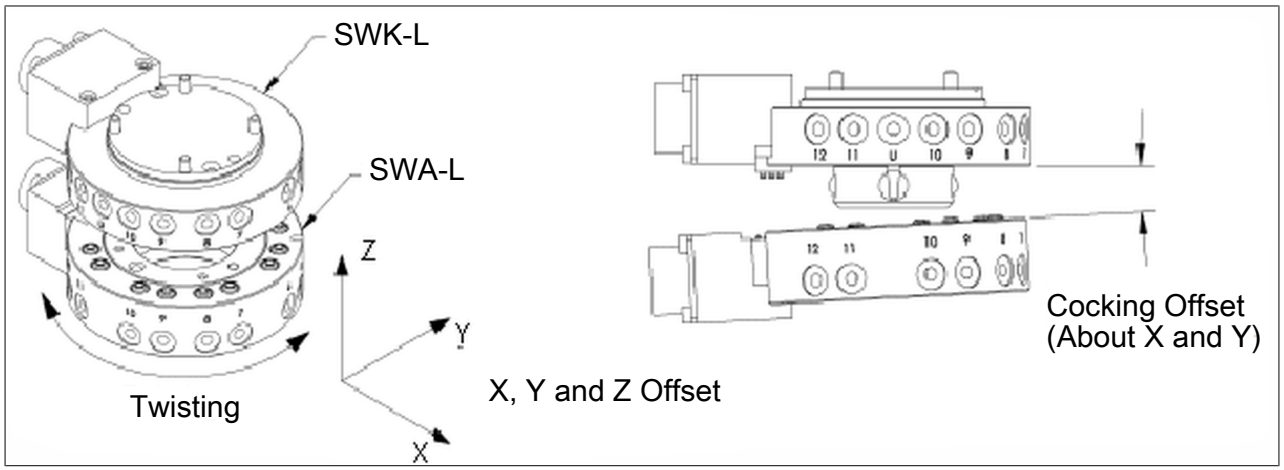
Ideally, the SWA-L should be hanging vertically in the tool stand so that gravity acts to uncouple the SWA-L from the SWK-L during unlocking.

SWS-L-1210:, the Tool stand should have compliance in the Z direction. The robot should be programmed to fully seat the SWA-L in the Tool Stand before issuing the Unlock command. The Unlock sensors need to be active before pulling the SWK-L away.

It is possible to design Tool Stands that hold SWA-L in the horizontal position, but care must be taken that the necessary compliance is provided during coupling and uncoupling. In general, “horizontalposition” Tool Stands cause more wear on the locking mechanism and locating features of the SWA-L and Tool Stand.

Lock-up should occur with the SWK-L in the No-Touch™ locking zone (see following table), but not touching the SWK-L. As locking occurs, theSWK-L should draw the SWA-L into the locked position.

Tool Stands may also need to incorporate means for covering tools and electrical modules to protect them in dirty environments, such as grinding or welding. Alternatively, locating Tool Stands in areas shielded from weld spatter, fluids, adhesives, or other debris would eliminate the need for tool covers.



Offset Definitions

Maximum Recommended Offsets Prior to Coupling

Model	No-Touch™ Zone Z Offset (Max)* (mm)	X and Y Offset (Max)** (mm)	Cocking Offset (Max) (degrees)
SWS-L-210	2.5	±2	±1
SWS-L-310	2.5	±2	±1
SWS-L-510	2.5	±2	±1
SWS-L-1210	1	±2	±1

* Maximum values shown. Decreasing actual values will minimize wear during coupling/ uncoupling.

** Actual allowable values may be higher in some cases but higher offsets will increase wear during coupling.

6 Operation

⚠ WARNING

Risk of injury due to falling tool!

The tool can fall off during assembly, adjustment and maintenance work.

- Only carry out assembly, adjustment and maintenance work when the tool is placed in the storage rack or secured against falling.

The SWK-L locking mechanism is pneumatically driven to couple and uncouple with the bearing race on the SWA-L. The SWK-L utilizes air ports from a signal control module or air supply block to provide lock and unlock pressure to the locking mechanism.

⚠ CAUTION

Safe, reliable operation of the Tool Changer is dependent on a continuous supply of compressed air at a pressure of 4,1 bar to 7 bar [SWS-L-1210: 4,9 bar to 6,9 bar]

Robot motion should be halted if the air supply pressure drops below 4,1 bar [SWS-L-1210: 4,9 bar] for any reason.

NOTICE

All SWS-L are initially lubricated using MobilGrease® XHP222 Special grease.

- The end user must apply additional lubricant to the locking mechanism components and alignment pins prior to start of service Cleaning, Lubrication, Adjustment and Replacement. Tubes of lubricant for this purpose are shipped with every SWS-L.
- Note: MobilGrease® XHP222 Special is a NLGI #2 lithium complex grease with molybdenum disulfide.

6.1 Coupling Sequence

NOTICE

Possible damage to the unit and/or the robot, if the locking mechanism is not in unlock position when attemting to couple the SWS-L.

- The locking mechanism must be in the unlock position when attempting to couple the SWS-L.

Position the SWK-L above the Tool and move the SWK-L into locking position. When using electrical feed-through-modules the voltages from 24 V have to be switched off prior to coupling. Contacts could be damaged due to sparking. Coupling without power shutdown may shorten the life extremely. The mating surfaces of the SWK-L and Tool should be parallel and not touching. Make sure that the tapered alignment pins from the SWK-L enter the alignment holes on the Tool. The alignment pins should be relatively concentric with the alignment holes such that they do not rub against the edge.

The locking mechanism allows the SWK-L to “pull up” the Tool with relatively large gaps between the two sides. It is recommended that the mating faces of the SWK-L and Tool not be touching, but be within 1 mm of each other when coupling to minimize stress and wear on the locking mechanism.

RTL (Ready-To-Lock) sensing is built into the tool changer, providing the ability to sense Tool proximity to the SWK-L prior to locking. The mating faces of the SWK-L and Tool must be positioned within approximately 1.40–1.65 mm [SWS-L-510: 0.50–0.75 mm] of each other for the sensors to detect Tool presence. RTL signals are not required to couple the tool changer, but are recommended as a further confirmation of coupling prior to removing the Tool from the tool stand.

NOTICE

No-TouchTM locking technology allows the unit to couple with a separation distance between the SWK-L and Tool. Direct contact of the SWK-L and SWA-L mating surfaces is not suggested or required just prior to coupling. (SWS-L-1210: ONLY if Z compliance is built in to the Tool Stand.) Contact may result in damage to the unit and/or the robot.

Verify that the RTL signals are read as “on” (true).

Turn the Lock command on. Air is supplied to the locking mechanism to couple the SWS-L.

SWS-L-1210: Turn the Unlatch output off. Turn the Latch output on. Air is supplied to the locking mechanism to couple the SWS-L.

A sufficient delay must be programmed between the Lock command being activated and reading the state of the Locked/ Unlocked signals, so that the locking process is completed before checking the locked state.

Read the Locked and Unlocked signals.

The Locked signal should read “on” (true) and the Unlocked signal should read “off” (false).

If the locking mechanism has been actuated and both the Locked and Unlocked signals are read as “off” (false), then a “missed tool” condition has occurred (for example, the SWA-L is not in the stand or is not positioned properly). In this case, an error should be generated and the robot program halted. The situation requires manual inspection to determine the cause of the problem.

The locking mechanism must be in the unlocked state before another attempt is made to couple or damage could occur to the robot and/or the SWS-L.

6.2 Fail-Safe Operation

In the event of air supply loss to the locking mechanism the SWS-L **will not uncouple.**
A slight separation between the SWK-L and SWA-L occurs just after air loss, but at this point the locking balls become trapped and cannot move without air pressure being applied to the unlock port. This feature provides the SWS-L with a fail-safe mechanism.

The patented fail-safe design prevents the SWA-L from being released in the event of air-pressure loss to the Lock port, thereby increasing safety and reliability. Positional accuracy may not be maintained during air loss but will be regained once air pressure is reestablished to the Lock port.

NOTICE

Possible damage to the locking mechanism

- Do not use the SWS-L in the fail-safe condition for extended periods of time. Do not transport the SWS-L in the fail-safe condition.

6.3 Uncoupling

The SWS-L should be positioned in the Tool Stand in the same location as when coupling took place. When using electrical feed-through-modules the voltages from 24 V have to be switched off prior to uncoupling. Contacts could be damaged due to sparking. Uncoupling without power shutdown may shorten the life extremely.

SWK-L-1210: Verify that the Tool is FULLY secured and seated in the Tool Stand. Z-compliance is required for the Tool Stand in order to ensure reliable Unlocking sequence. Once you have verified that the SWA-L is FULLY secured in the Tool Stand, turn the Latch output off.

NOTICE

This SWS-L may be equipped with a Tool Stand Interlock (TSI) feature that physically breaks the unlock solenoid circuit. Use of the TSI will prevent any unwanted unlock software commands from being recognized until the circuit is made.

- See user manual of the respective control module for details and troubleshooting.

SWS-L-210-510: Turn the Lock output off (for double solenoid valve versions).

SWS-L-210: Issue the Unlock output. **/ SWS-L-310, 510:** Issue the Unlock command. **/ SWS-L-1210:** Issue the Unlatch output. Air is supplied to the locking mechanism to uncouple the SWS-L.

A sufficient delay must be programmed between the Unlock output being activated and reading the state of the Lock/Unlock signals, so that the coupling process is completed before checking the Locked state.

Read the Locked and Unlocked signals.

The Unlock signal should read “on” (true) and the Lock signal should read “off” (false). Any other condition indicates a problem and the robot program should be halted.

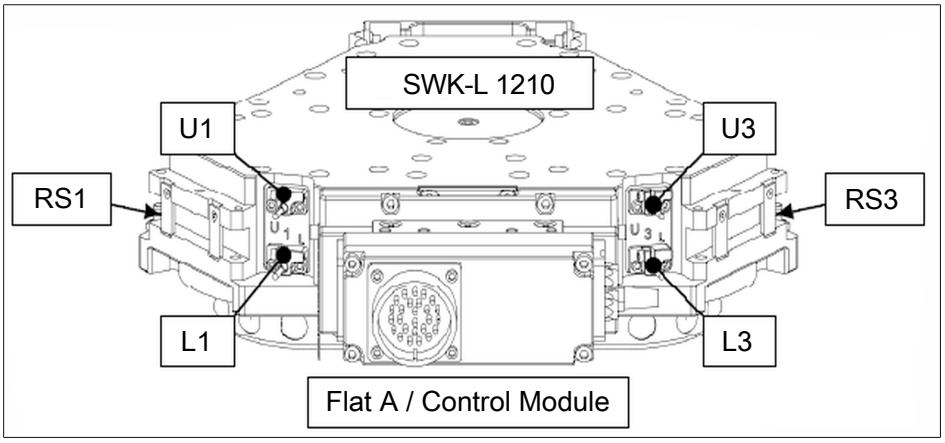
Once the Lock and Unlock signals are verified to be in the proper state the SWK-L may be moved away from the SWA-L in the axial direction.

SWS-L-1210: Check to verify that the RTLs are all “off” (false) after the SWK-L moves away from the SWA-L.

The robot and SWK-L can now proceed to another SWA-Lfor coupling and subsequent operations.

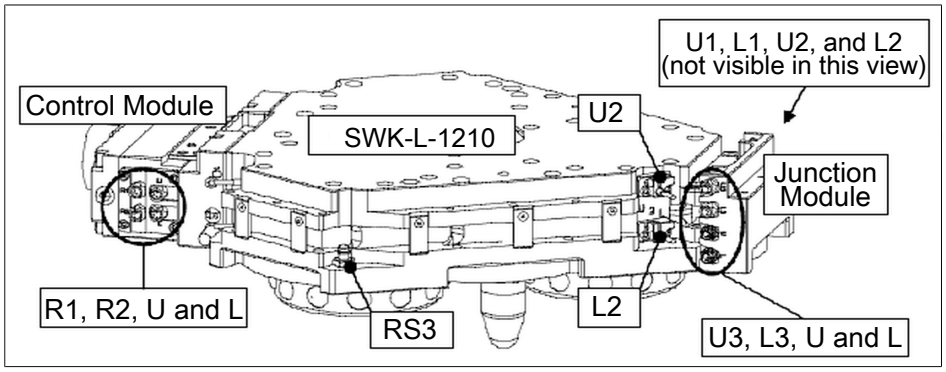
6.4 Integrated Sensors (SWS-L-1210)

The SWK-L-1210 has a total of 6 proximity sensors for detecting the Lock and Unlock state of the SWS-L. For each locking mechanism there is one Lock sensor and one Unlock sensor. Each sensor pair is distinguished by the corresponding locking mechanism. For example, locking mechanism #1 has “L1” (Lock sensor #1) and “U1” (Unlock sensor #1). Also, to eliminate confusion, the SWK-L body, sensor cables, and junction module connectors are labeled the same way (L1, U1, L2, U2, L3, and U3).



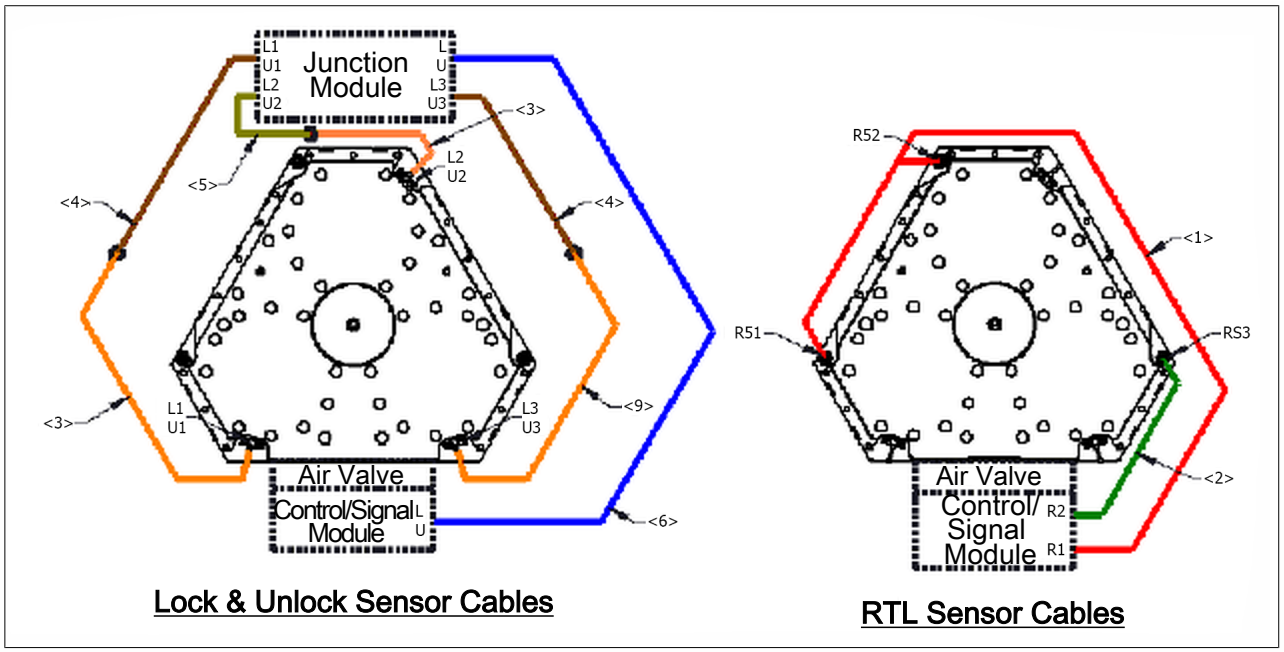
Lock and Unlock sensors. "L2" and "U2" not visible in this view

Inside the junction module, all 3 Lock sensors are wired in series which provides for one Locked signal via the connector labeled “L”. The 3 Unlocked sensors are also wired in series within the junction module which provides for one Unlocked signal via the connector labeled “U”. Cables connect the “L” and “U” connectors of the junction module to the “L” and “U” connectors of the control module.

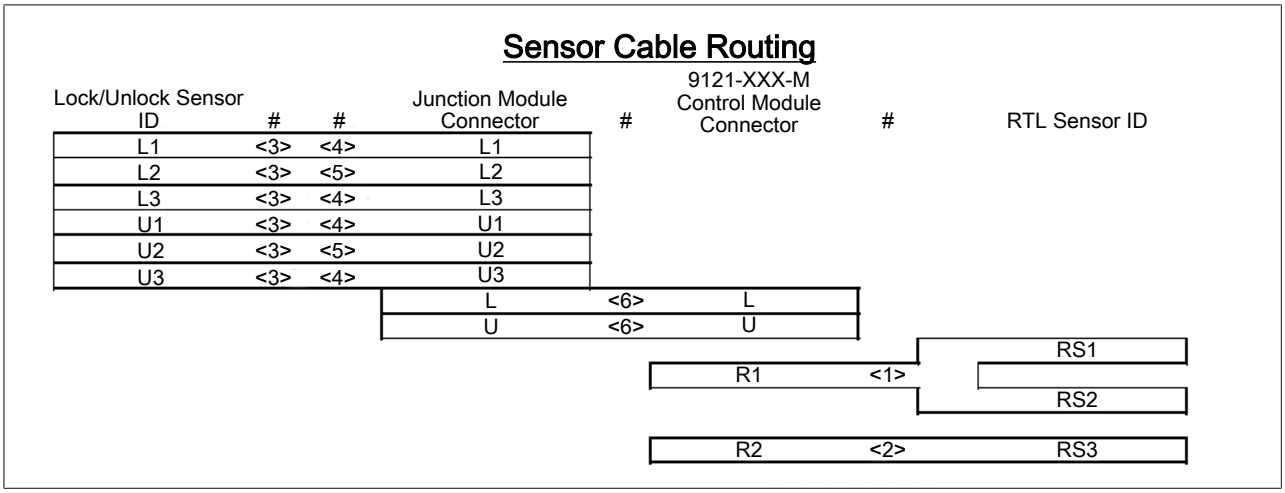


Connector view

The following figure and table show the cables pertaining to the Lock and Unlock sensors. From the factory, the cables will be labeled to match where they are connected.



Sensor Cable Routing



Sensor Cable Routing

Lock/Unlock Sensor ID	#	#	Junction Module Connector	#	9121-XXX-M Control Module Connector	#	RTL Sensor ID
L1	<3>	<4>	L1				
L2	<3>	<5>	L2				
L3	<3>	<4>	L3				
U1	<3>	<4>	U1				
U2	<3>	<5>	U2				
U3	<3>	<4>	U3				
			L	<6>	L		
			U	<6>	U		
					R1	<1>	RS1
							RS2
					R2	<2>	RS3

The SWK-L-1210 has 3 RTL sensors.
They are designated as “RS1”, “RS2”, and “RS3”. Sensors “RS1” and “RS2” are wired in series (by means of a splitter cable) and in this way provide the control module with a single “R1” signal.
Only when “RS1” and “RS2” are both triggered will a Tool presence signal occur at “R1”.

The third RTL sensor, “RS3”, is connected directly to the control module at “R2” to give a second Tool presence signal. show the cables pertaining to the RTL sensors. The labels on the cables indicate which sensors the cables are connected to.

7 Troubleshooting

Check these conditions for all symptoms prior to troubleshooting:

- Proper pneumatic and electrical connections have been made to the SWS-L.
- Air is supplied at a minimum of 5 and a maximum of 6,9 bar.
- No air or vacuum can be trapped in a de-energized Lock or Unlock port (pressure must be vented to atmosphere).

SWS-L-210, 310, 510

Symptom	Cause	Resolution
Unit will not lock or unlock	The ball bearings and/or cam are not moving freely in the male coupling.	Clean and lubricate as needed to restore smooth operation Maintenance.
	The control module is not operating correctly.	Check the troubleshooting section of the manual for the specific module.
	The SWK-L and SWA-L are not within the specified No-Touch zone when attempting to lock.	Check that the Tool is properly seated in the Tool Stand. Re-teach the robot to bring the SWK-L and SWA-L closer together prior to attempting to lock.
	Ready-To-Lock (RTL) sensors not activated indicating Tool is not positioned properly	Check that the SWA-L is properly seated in the tool stand. Re-teach the robot to bring the SWK-L and SWA-L closer together prior to attempting to lock. Check that both RTL sensors are not damaged. Replace damaged RTL sensors as necessary. Check all cables for damage and that they are connected properly to the signal control module. Replace damaged cables as necessary.

SWS-L-310 and 510

Symptom	Cause	Resolution
Unit is locked but Lock signal does not read “on” (true).	Lock sensor is damaged.	Replace Lock sensor or Sensor Assembly as necessary Maintenance.
	Lock sensor is out of position.	Replace the Lock sensor or Sensor Assembly as necessary.
Unit is unlocked but Unlock signal does not read “on” (true).	Unlock sensor is damaged	Replace Unlock sensor Or Sensor Assembly as necessary Maintenance.
	Unlock sensor is out of position	Replace Unlock sensor or Sensor Assembly as necessary.

SWS-L-210

Symptom	Cause	Resolution
Unit is locked but Lock signal does not read “on” (true).	Lock sensor/cable is damaged.	**Units using individual Sensors:** Replace Lock sensor/cable as necessary Maintenance. **Units using Sensor Assemblies:** Replace the lock sensor sub-assembly as necessary.
	Lock sensor is out of position.	**Units using individual Sensors:** Adjust Lock sensor using procedure in Maintenance. **Units using Sensor Assemblies**: Replace the lock sensor sub-assembly as necessary.
Unit is unlocked but Unlock signal does not read “on” (true).	Unlock sensor/cable is damaged.	**Units using individual Sensors:** Replace Unlock sensor/cable as necessary Maintenance. **Units using Sensor Assemblies:** Replace the unlock sensor sub-assembly as necessary.
	Unlock sensor is out of position	**Units using individual Sensors:** Adjust Unlock sensor using procedure in Maintenance **Units using Sensor Assemblies:** Replace the unlock sensor sub-assembly as necessary.

SWS-L-1210

Symptom	Cause	Resolution
Unit will not Lock or Unlock or the locking mechanisms are jammed.	The ball bearings and/or cam are not moving freely in the male coupling.	Clean and lubricate as needed to restore smooth operation Maintenance.
	The SWK-L and SWA-L are not within the specified No-Touch zone when attempting to Lock.	Check that the SWA-L is properly seated in the Tool Stand. Reteach the robot to bring the SWK-L and SWA-L closer together before attempting to Lock.
	SWK-L and SWA-L are not parallel (all three RTL sensors are not on when trying to lock).	Check that the SWA-L is properly seated in the Tool Stand. Reteach the robot to bring the SWK-L and SWA-L closer together and parallel prior to attempting to Lock. Verify RTLs (RS1, RS2, and RS3) are all on.
	SWA-L Drop-off Distance is too large.	Check that the SWA-L is properly positioned in the Tool Stand and the SWA-L is fully seated. Check that the UNLATCH command is not being issued with the SWA-L sitting above the Tool Stand and the robot is not trying to “drop” the SWA-L into the nest.

Symptom	Cause	Resolution
Unit is fully locked but Locked input to control module is not ON	Individual Lock sensor/ cable damage.	Check LED light on each of the three Lock sensors. If OFF check for cable damage and a secure connection to the junction module. Replace sensor and/or cable as needed.
	Main Lock sensor/cable damage.	are on, check the main Lock cable connecting the junction module and control module. NOTE: Individual sensors are wired in series in the junction module. All sensors must be “on” to get the main Lock input “on”. Check for cable damage and a secure connec-tion to control module. Replace as needed.
	Junction Module failure.	If individual Lock sensors/cables and main Lock cable are found to be good, replace junction module.
Unit is fully unlocked but Unlock input to control module is not ON.	Individual Unlock sensor/ cable damage.	Check LED light on each of the three Unlock sensors. If OFF check for cable damage and a secure connection to the junction module. Replace sensor and/or cable as needed.
	Main Unlock sensor cable damage.	If all individual Unlock sensor LEDs are on, check the main Unlock cable connecting the junction module and control module. NOTE: Individual sensors are in series in the junction module. All sensors must be “on” to get the main Unlock input “on”. Check for cable damage and a secure connection to control module. Replace as needed.
	Junction Module failure.	If individual Unlock sensor/cables and main Unlock cable are found to be good, replace control module.

Symptom	Cause	Resolution
R1 input (RS1 and RS2 sensors) not on.	SWK-L not in position.	Reprogram pick-up point so SWK-L and SWA-L are parallel and within 1 mm of each other.
	Sensor/cable damage.	Check the RS1 and RS2 sensor faces and cables for damage. Replace if necessary. NOTE: These sensors are wired in series in the cable harness. Both sensors must be “on” to get the R1 (RTL1) input “on”. Check splitter cable from R1 connector at the control module to RS1 and RS2 sensors. Replace as needed.
R2 input (RS3 sensor) not on.	SWK-L not in position at Pickup.	Reprogram pick-up point so SWK-L and SWA-L are parallel and within 1 mm of each other.
	Sensor/cable damage.	Check the RS3 sensor face for damage. Replace if necessary. Check cable between RS3 sensor and the R2 connector at control module for damage and replace as needed.

8 Maintenance and Care

⚠ WARNING

Risk of injury due to falling tool!

The tool can fall off during assembly, adjustment and maintenance work.

- Only carry out assembly, adjustment and maintenance work when the tool is placed in the storage rack or secured against falling.

NOTE

The cleanliness of the work environment strongly influences the error-free operation of the change system. If the work environment is prone to heavy contamination, it is very important that the entire unit is protected from contamination with appropriate measures.

Protective measures:

- Locate toolholders at a distance from sources of dust
- Include protective equipment in the storage rack (install deflectors, air curtains or similar equipment on the unit Requirements of the storage magazine)

8.1 Preventive Maintenance

The Tool Changer and optional modules are designed to provide a long life with regular maintenance.

A visual inspection and preventive maintenance schedule is provided in the table below depending upon the application.

Detailed assembly drawings, Assembly drawings [▶ 56].

NOTE

All Tool Changers are initially lubricated using MobilGrease® XHP222 Special grease. The end-user must apply additional lubricant to the locking mechanism components and alignment pins prior to start of service Link Schmierstoffe/Schmierstellen.

For this purpose, tubes of lubricant are shipped with every Tool Changer.

NOTE:

MobiGrease® XHP222 Special is a NLGI#2 lithium complex grease with molybdenum disulfide.

Schedule

Application(s)	Tool Change Frequency	Inspection Schedule
General Usage Material Handling Docking Station	> 1 per minute	Weekly
General Usage Material Handling Docking Station	< 1 per minute	Monthly
Welding/Servo/Deburring Foundry Operations (Dirty Environments)	All	Weekly

Checklist

Balls/Alignment Pins/Holes/Bearing Race	Inspect for lubrication and wear. A NLGI #2, lithium-based grease with molybdenum disulfide additive is suggested for locking mechanism and alignment pin lubrication. Over time, lubricants can become contaminated with process debris. Therefore, it is recommended to thoroughly clean the existing grease and replace with new as needed. Link Schmierstoffe/Schmierstellen. Excessive alignment pin/bushing wear may be an indication of poor robot position during pickup/drop-off. Adjust robot position as needed. Check Tool Stand for wear and alignment problems. Wear on the balls/bearing race could be an indication of excessive loading.
Mounting Hardware / /Interface Connections	Inspect for proper torque and interference or wear, abrasions, cuts of hoses, and electrical cables. Tighten and correct as required.
Seals	Inspect for wear, abrasion, and cuts. Exposed O-rings and rubber bushings may be subject to damage during normal operation. Replace damaged o-rings and rubber bushings as needed.
Sensors and Cables	Inspect sensor cables and connectors for any damage, cuts, and abrasion.
Electrical Contacts/ Pin Block (Modules)	Inspect for wear and abrasion. Exposed contacts may be subject to damage during normal operation. Clear debris from the area of the contacts using compressed air. Do not directly clean contacts as abrasion may occur and the performance of the contact may be compromised.

8.2 Cleaning, Lubrication, Adjustment and Replacement

⚠ WARNING

Risk of injury in the event of unexpected unlocking!

For SWK with integrated locking queries, the bore holes for mounting the proximity switch are pneumatically connected directly with the piston chamber. When the proximity switch is removed, compressed air can operate the locking mechanism and loosen the tool.

- When the proximity switch is removed, do not use compressed air to clean the machine/system.

8.2.1 Cleaning and Lubrication of the Locking Mechanism

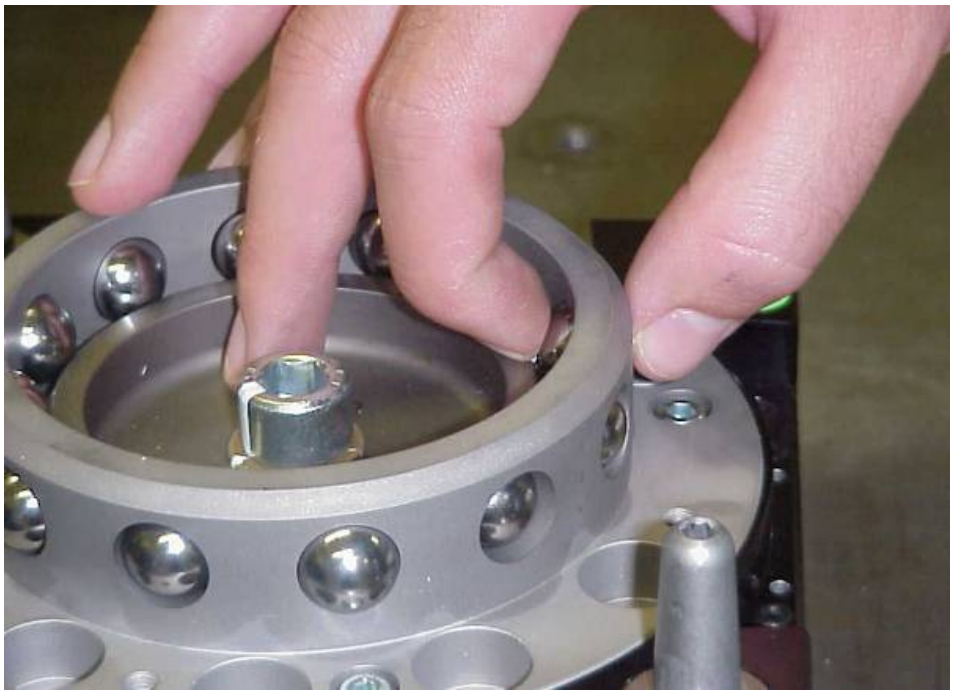
8.2.1.1 Cleaning and Lubrication of the Locking Mechanism and Alignment Pins

Cleaning balls and outer surfaces of male coupling

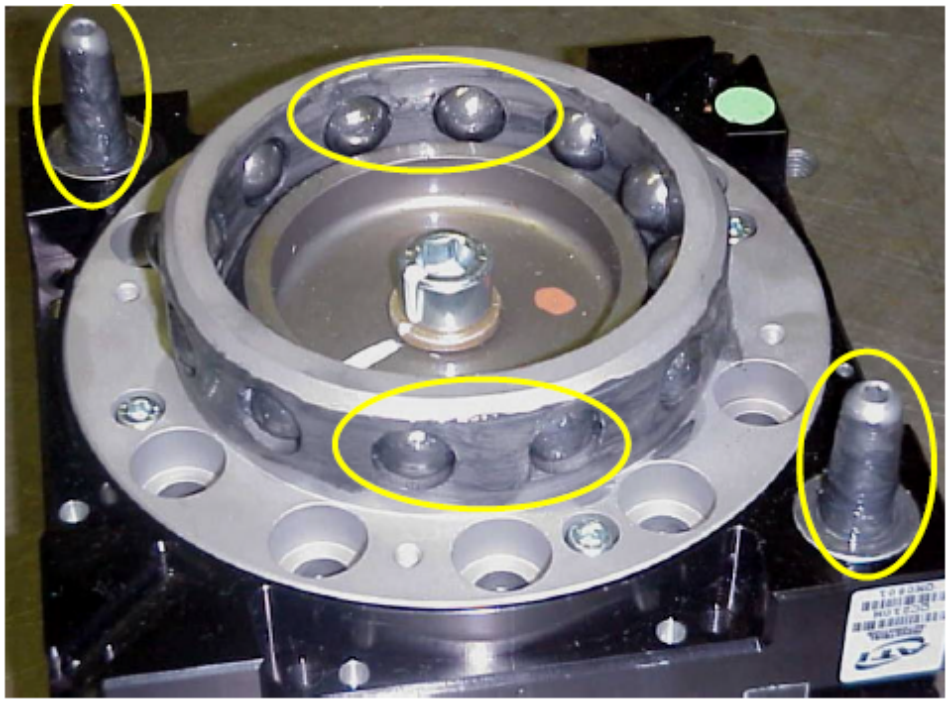
Cleaning balls, cam an inner surfaces of male coupling

➢ The locking mechanism must be in the unlock state before cleaning.

➢ Use a clean rag to thoroughly remove the existing lubricant and debris from the balls, the male coupling, the cam and the alignment pins.



- Check each ball to make sure it moves freely in the male coupling. Additional cleaning may be necessary to free up any balls that are sticking in place.



- Apply a liberal coating of lubricant to the balls, the male coupling (inside and out), and the alignment pins.

8.2.1.2 Cleaning the Bearing Race and Alignment Pin Bushings (SWA)

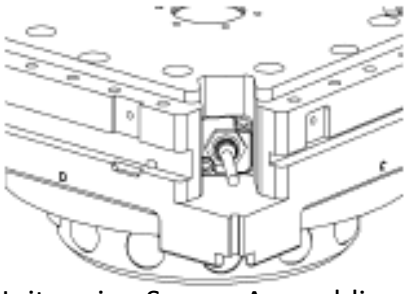
1. Use a clean rag to thoroughly remove any lubricant and debris from the bearing race and the bushings.
2. No re-lubrication is necessary on the SWA components.

8.2.2 Lock and Unlock Sensor Assembly Replacement

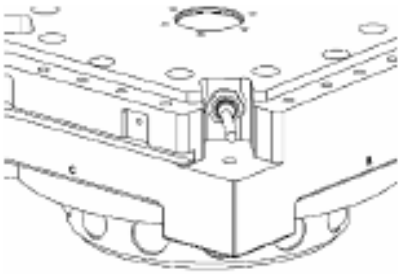
8.2.2.1 SWS-L-210

Sensor types

Determine what type of sensors the SWS-L uses:



Units using Sensor Assemblies

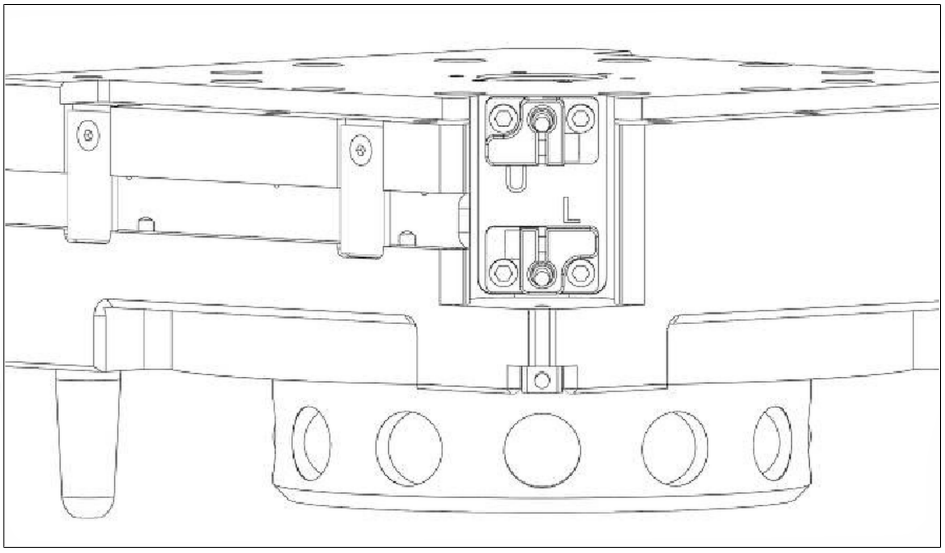


Units using Individual Sensors

NOTE

Turn air off before servicing sensors.

Units using Sensor assemblies

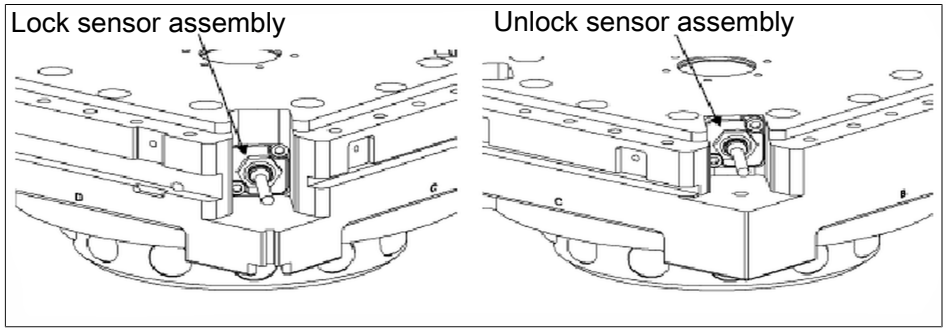


Lock and Unlock Sensor Assembly Replacement

- Unscrew the sensor cable connector from the control/signal module.
- If present, remove the module(s) on the flat D.
- Remove the two M3 socket head cap screws that secure the assembly to the SWK-L body.
- Slide the sensor assembly out and discard. Visually check that o-ring around sensor was removed with assembly.
  CAUTION The Lock and Unlock sensor assemblies are precision aligned and permanently assembled at the factory. Do not attempt to disassembled and re-build.
- Apply Loctite 222MS to the new M3 socket head cap screws supplied with the new sensor assembly.
- Attach the new assembly to the SWK-L body by tightening the M3 screws to 1.36 Nm of torque.

- Re-attach cables and modules.
- Confirm operation of the Unlock sensor by issuing the Unlock command and then checking to see that the LED in the Unlock sensor body is on.
- Confirm operation of the Lock sensor by issuing the Lock command to lock a Tool to the SWK-L and then checking to see that the LED in the Lock sensor body is on.

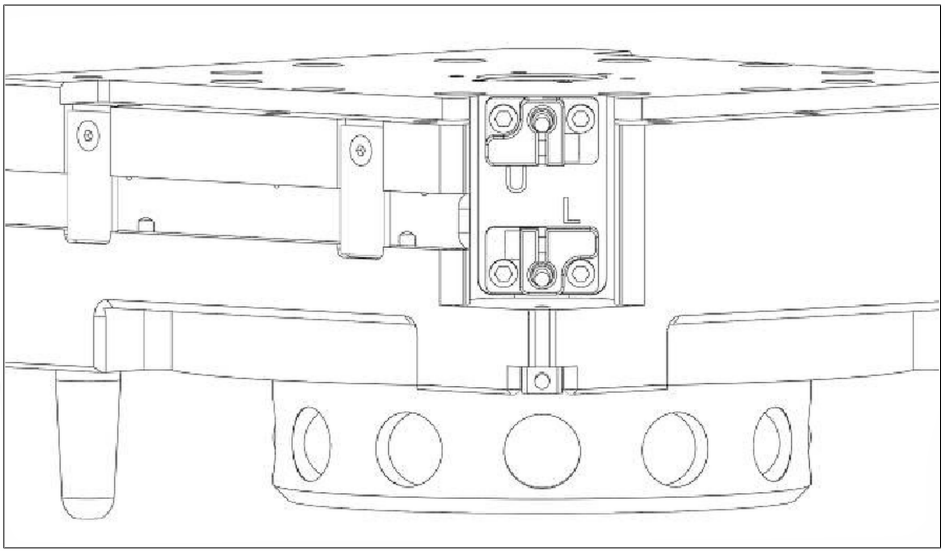
Units using indidivual sensors



Lock and Unlock sensor assemblies SWS-L-210

- Unscrew the sensor cable connector from the control/signal module.
- For Lock sensor assembly replacement, remove any modules mounted on Flat D. For Unlock sensor assembly replacement, remove any modules mounted on both Flats C and D.
- Remove the two M4 socket head cap screws that secure the assembly to the SWK-L Body.
  CAUTION The Lock and Unlock sensor assemblies are precision aligned and permanently assembled at the factory. Do not attempt to disassemble and rebuild. Over-tightening the proximity sensor on the jam nut will cause severe damage to the SWK-L.
- Slide the sensor assembly out and discard.
- Apply Loctite 222MS to the new M4 socket head cap screws supplied with the new sensor assembly.
- Attach the new assembly to the SWK-L body by tightening the M4 screws to 3.39 Nm of torque.
- Re-attach cables and modules.
- Confirm operation of the Unlock sensor by issuing the Unlock command and then checking to see that the LED in the Unlock sensor body is on.
- Confirm operation of the Lock sensor by issuing the Lock command to lock a SWA-L to the SWK-L and then checking to see that the LED in the Lock sensor body is on.

8.2.2.2 SWS-L-310 (Model Designator: SWK-L-310DM-...SM)



Lock and Unlock Sensor Assembly Replacement

1. Unscrew the sensor cable connector from the control/signal module.
2. If present, remove the module(s) on the flat D.
3. Remove the two (2) M3 socket head cap screws that secure the assembly to the SWK-L body.
4. Slide the sensor assembly out and discard. Visually check that o-ring around sensor was removed with assembly.

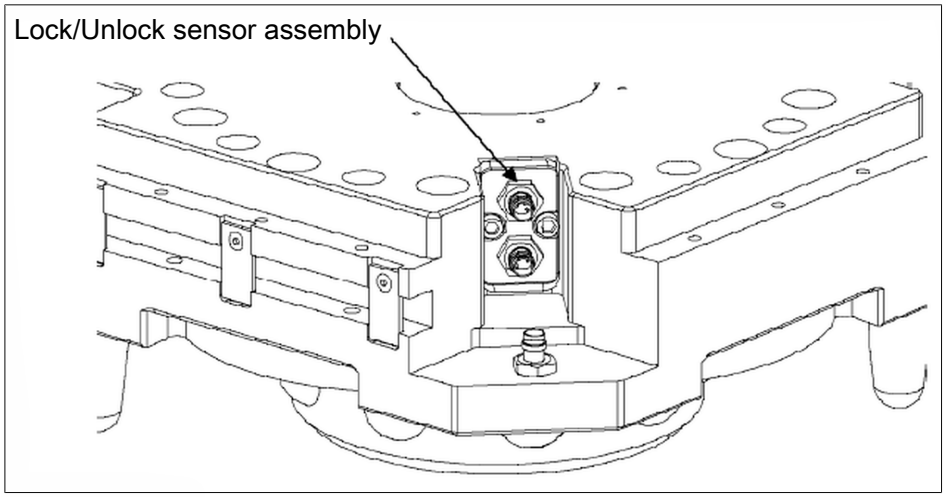
NOTICE

The Lock and Unlock sensor assemblies are precision aligned and permanently assembled at the factory. Do not attempt to disassembled and re-build.

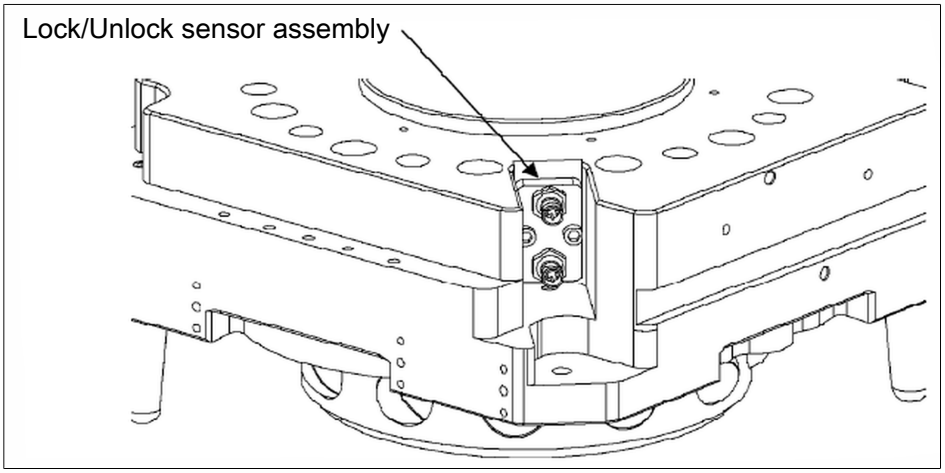
5. Apply Loctite 222MS to the new M3 socket head cap screws supplied with the new sensor assembly.
6. Attach the new assembly to the SWK-L body by tightening the M3 screws to 1.36 Nm of torque.
7. Re-attach cables and modules.
8. Confirm operation of the Unlock sensor by issuing the Unlock command and then checking to see that the LED in the Unlock sensor body is on.
9. Confirm operation of the Lock sensor by issuing the Lock command to lock a SWA-L to the SWK-L and then checking to see that the LED in the Lock sensor body is on.

8.2.2.3 SWS-L-310 and 510

- SWS-L-310: Units using a dual-sensor assembly P/N: 9951094 Set for INB 310 U/L incl. plate for preadjusting
- SWS-L-510: Units using Lock/Unlock sensor assembly P/N: 9005-20-1339 (PNP)



Lock/Unlock sensor assembly SWS-L-310



Lock/Unlock sensor assembly SWS-L-510

NOTICE

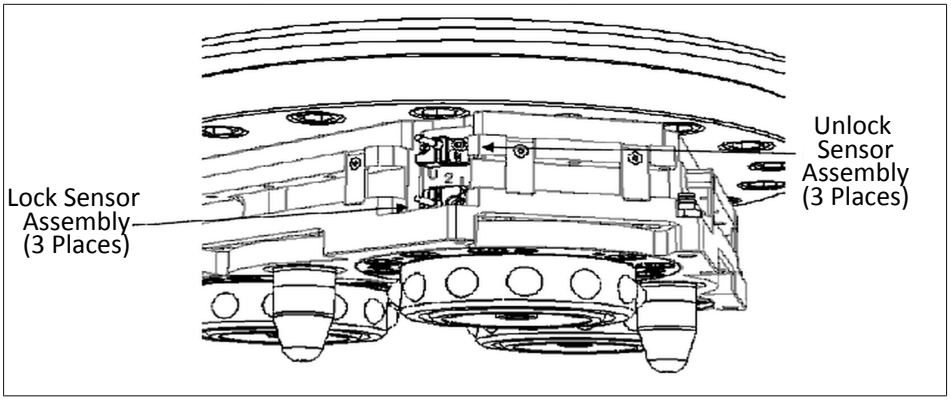
The Lock/Unlock sensor assembly is precision aligned and permanently assembled at the factory. Do not attempt to disassemble and re-build.

SWS-L-310: Over tightening the proximity sensor or the jam nut will cause severe damage to the SWK-L.

- ➢ Unplug the sensor cable connectors from lock and unlock sensors.
- ➢ Remove the two M4 socket head cap screws that secure the assembly to the SWK-L body.
- ➢ Slide the sensor assembly out and discard.

- Apply Loctite 222MS to the M4 socket head cap screws supplied with the new sensor assembly.
- Slide the assembly into position and secure it to the SWK-L body by tightening the M4 screws to 3.39 Nm of torque.
- Re-attach cables.
- Confirm operation of the Unlock sensor by issuing the Unlock command and verifying that the LED in the Unlock sensor body is on.
- Confirm operation of the Lock sensor by issuing the Lock command to lock a Tool to the SWK-L and verifying that the LED in the Lock sensor body is on.

8.2.2.4 SWS-L-1210



Lock and Unlock Sensor Assemblies SWS-L-1210

NOTICE

The Lock and Unlock sensor assemblies are precision aligned and permanently assembled at the factory. Do not attempt to adjust the position of the sensor or severe damage to the SWK-L may occur.

- Unscrew the sensor cable connector from the extension cable.
- Remove the two M3 socket head cap screws that secure the assembly to the SWK-L body.
- Slide the sensor assembly out and discard.
- Apply Loctite 222MS to the new M3 socket head cap screws supplied with the new sensor assembly.
- Check that the new sensor assembly has the o-ring present and that the old oring came off of the SWK-L with the old sensor assembly. Attach the new assembly to the SWK-L by tightening the M3 screws to 1.36 Nm.
- Re-attach cables and modules.
- Confirm operation of the Unlock sensor by issuing the Unlatch command and then checking to see that the LED in the Unlock sensor body is on.
- Confirm operation of the Lock sensor by issuing the Latch command to lock a Tool to the SWK-L and then checking to see that the LED in the Lock sensor body is on.

8.2.3 Lock/Unlock Sensor Adjustment and Replacement (Units using individual sensors)

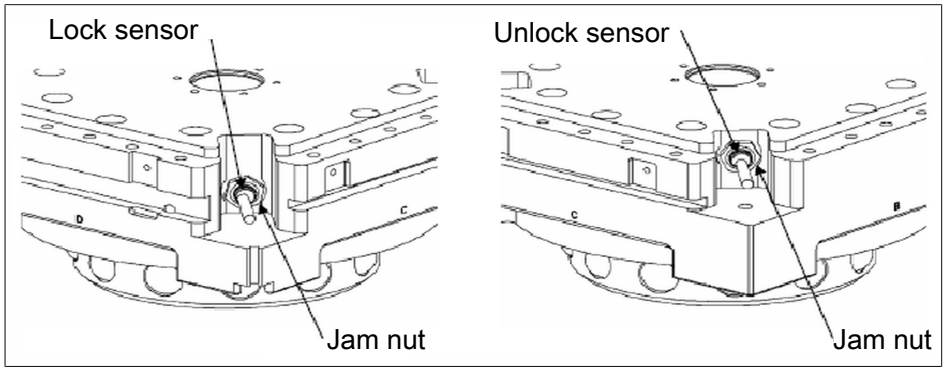
8.2.3.1 SWS-L-210

NOTICE

Over tightening the proximity sensor or the jam nut will cause severe damage ! to the SWK-L.

NOTE

When adjusting the lock sensor the SWK-L must be locked to the Tool. When adjusting the unlock sensor the SWK-L must be separated from the Tool and in the unlocked condition.



Individual Lock and Unlock sensors SWS-L-210

- Loosen jam nut with slotted 13mm socket or standard pliers.
- Turn proximity sensor clockwise until the LED in the sensor body comes on.
- Turn the proximity sensor clockwise another 1/4 turn (90°).
- Tighten jam nut to 2.26 Nm of torque.

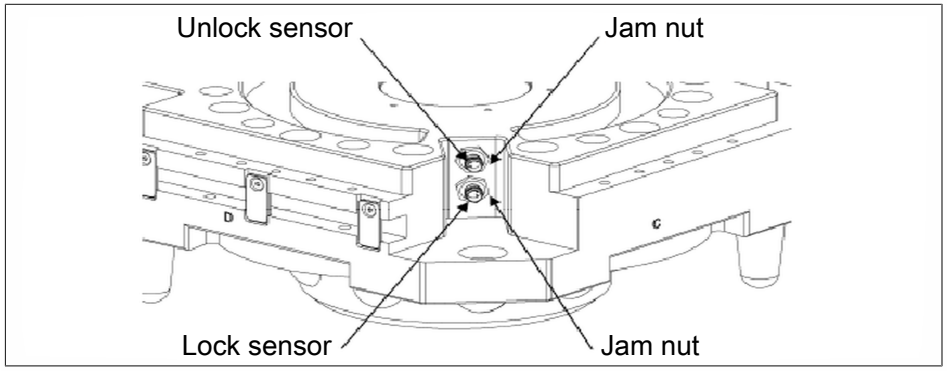
8.2.3.2 SWS-L-310 and 510

NOTICE

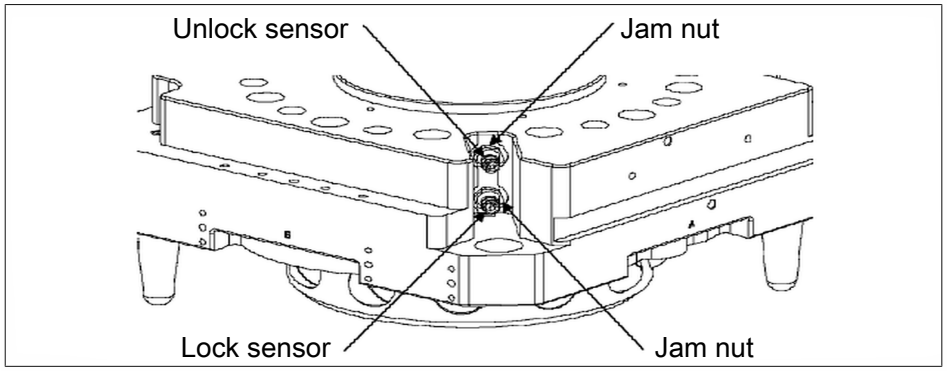
Over tightening the proximity sensor or the jam nut will cause severe damage ! to the SWK-L.

NOTE

- Do not undertake this adjustment until proper operation of the sensor has been confirmed. This requires removing the sensor from the SWK-L and testing it separately from the EOAT.
- When adjusting the lock sensor the SWK-L must be locked to the Tool.
- When adjusting the unlock sensor the SWK-L must be separated from the Tool and in the unlocked condition.



Lock and Unlock sensors in body - SWS-L-310



Lock and Unlock sensors in body - SWS-L-510

- Loosen jam nut with 13mm socket or standard pliers.
- Turn proximity sensor clockwise until the LED in the sensor body comes on.
- Turn the proximity sensor clockwise another 1/4 turn (90°).
- Tighten jam nut to 2.26 Nm of torque.

8.2.4 RTL Sensor Replacement

8.2.4.1 SWS-L-210

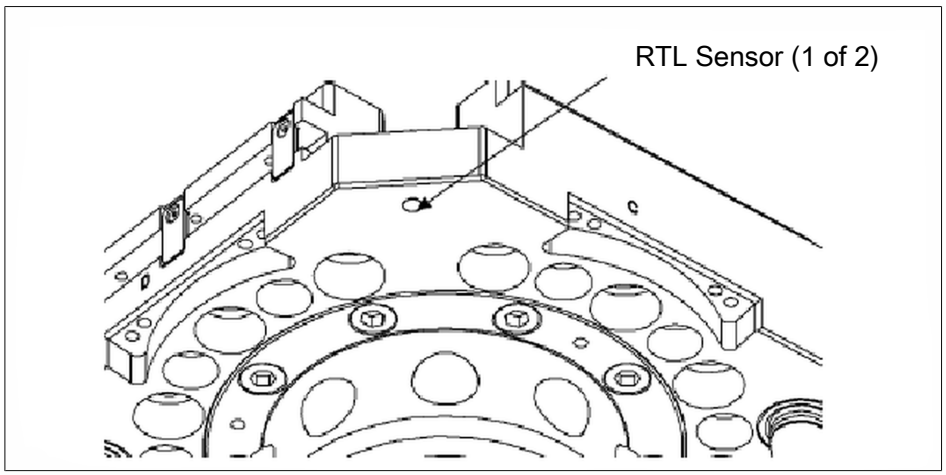
RTL Sensor Replacement (Flat Pack style)

- Unscrew the sensor cable connector from the control/signal module.
- Unscrew the M3 socket flat head cap screw that fastens the sensor to the SWK-L body.
- For replacement of the RTL sensor between flats A and B remove the cleat assembly on flat A (This may require that the SWK-L be removed from the robot.). For replacement of the RTL sensor between flats A and B remove the module and cable retaining tabs mounted on flat D.
- Remove the sensor/cable assembly from the SWK-L and discard.
- Install the new sensor/cable assembly. Use Loctite 222MS on the screws securing the sensors and the cable retaining tabs.
- Re-attach cables and modules.
- Confirm operation of the new sensor by bringing a metallic object into close proximity to the face of the sensor and watching for the LED in the body of the sensor to come on.

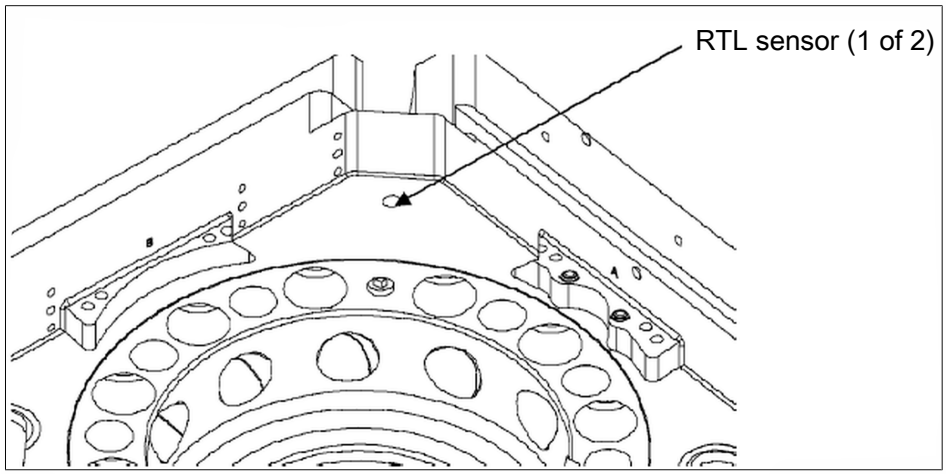
RTL Sensor Replacement (8mm Threaded Barrel Style)

- Unscrew the sensor cable connector from the control/signal module.
- Remove the cleat assembly on flat A (This may require that the SWK-L be removed from the robot.).
- Loosen the jam nut securing the sensor to the SWK-L body
- Remove the sensor/cable assembly from the SWK-L and discard.
- Screw the new sensor/cable assembly into the SWK-L body until the face of the sensor is flush with the surrounding face of the SWK-L body. Use a slotted socket and a torque wrench to tighten the jam nut to 20 in-lbs of torque.
- Re-install the cleat on flat A. Use Loctite 222MS on the screws.
- Re-attach the cable connector to the control/signal module.
- Confirm operation of the new sensor by bringing a metallic object into close proximity to the face of the sensor and watching for the LED in the body of the sensor to come on.

8.2.4.2 SWS-L-310 and 510



RTL sensor - SWS-L-310

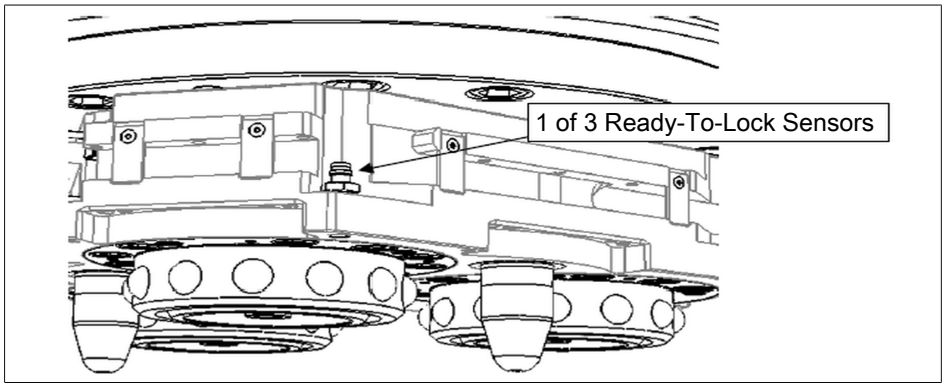


RTL sensor - SWS-L-510

1. Unplug the cable from the RTL sensor.
2. Loosen the jam nut securing the sensor to the SWK-L body.
3. Remove the sensor from the SWK-L and discard.
4. Screw the new sensor into the SWK-L body until the face of the sensor is flush with the surrounding face of the SWK-L body. Use a socket and a torque wrench to tighten the jam nut to 2.26 Nm of torque.
5. Attach the cable to the new RTL sensor.
6. Confirm operation of the new sensor by bringing a metallic object into close proximity to the face of the sensor and watching for the LED in the body of the sensor to come on.

8.2.4.3 SWS-L-1210

RTL Sensor Replacement (8mm Threaded Barrel Style)



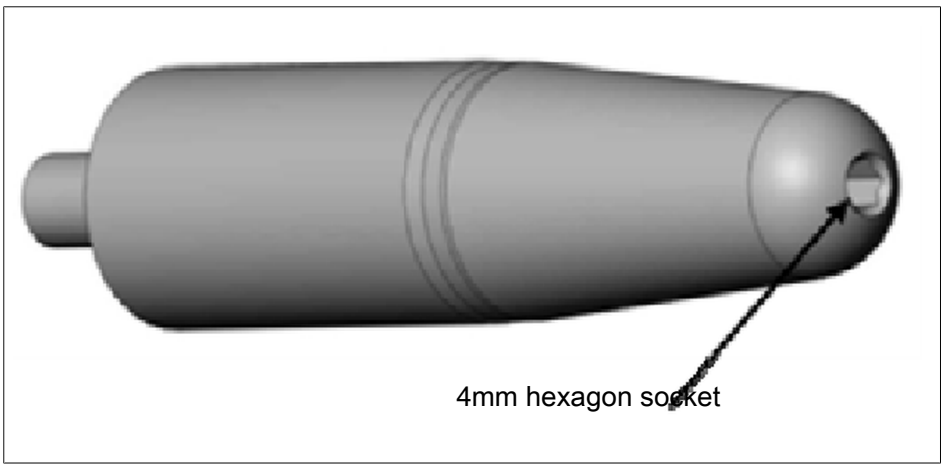
Barrel-style RTL sensor - SWS-L-1210

- Remove the sensor cable connector from the sensor.
- Loosen the jam nut securing the sensor to the SWK-L body.
- Unscrew/remove the sensor from the SWK-L and discard.
- Screw the new sensor/cable assembly into the SWK-L body until the face of the sensor is flush with the surrounding face of the SWK-L body. Turn the sensor back ¼ turn. Use a crowfoot and a torque wrench to tighten the jam nut to 2.26 Nm of torque.
- Replace the sensor cable if needed.
- Re-attach the cable connector to the control/signal module.
- Confirm operation of the new sensor by bringing a metallic object into close proximity to the face of the sensor and watching for the LED in the body of the sensor to come on. **NOTICE**: “R1” consists of sensors “RS1” and “RS2” wired in series. Therefore, a metallic object has to be used at both locations in order to view the LED indicator of either sensor SWS-1210: Integrated Sensors .

8.2.5 Alignment Pin Replacement

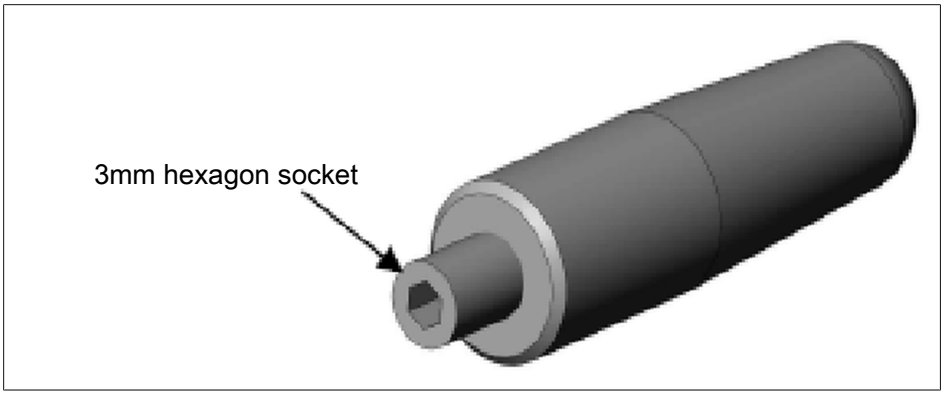
8.2.5.1 SWS-L-210 - 510

Removing the Alignment Pin

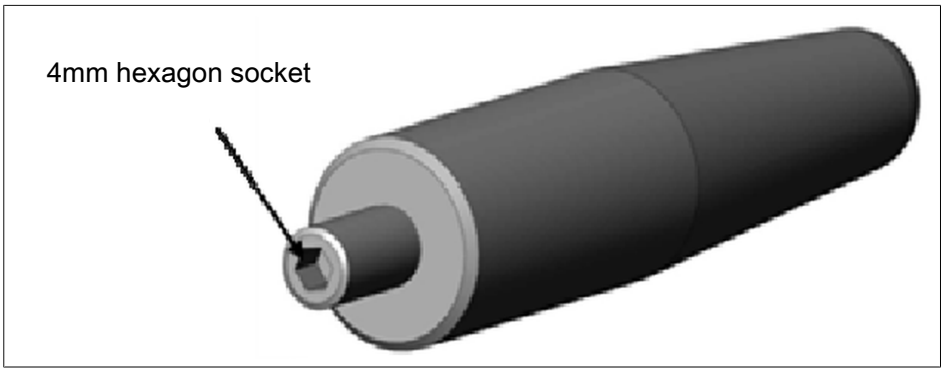


4mm Hex Key - SWS-L-210 - 510

- Unscrew the alignment pin sub-assembly from the SWK-L using a 4mm hex key (see Figure above).
  Note: If for any reason the pin cannot be removed using the hex socket in the tip, it may be necessary to remove it by other means, such as Vise Grip pliers.



3mm Hex Key - SWS-L-210



4mm Hex Key - SWS-L-310, 510

✓ Another approach would be to use the access hole in the back side of the SWK-L. In this case, a hex key will be needed (3 mm for SWS-210 / 4mm for SWS-310 and 510) (see Figures above).

➢ Once the alignment pin has been removed, verify that the sub-assembly (pin and set screw) are intact. If the set screw portion of the subassembly did not come out, it will be necessary to remove it separately using the access hole in the back plate of the SWK-L.

Installing the Alignment Pin Assembly into the SWS-L

➢ Apply Loctite 242 and install the Alignment Pin Assembly into the Bushing on the SWS-L. Tighten to 6.78 Nm.

➢ Apply MobilGrease® XHP222 Special grease to the Alignment Pin Cleaning and Lubrication of the Locking Mechanism

8.2.5.2 SWS-L-1210 (1-1/8” Two Piece Pin Sub-Assembly)

- Unscrew the alignment pin sub-assembly from the SWK-L using a 5mm hex key. Note: If for any reason the pin cannot be removed using the hex socket in the tip, it may be necessary to remove it by other means such as Vise Grip pliers. Another approach is to use the access hole in the back side of the SWK-L. In this case, a 4 mm hex key will be needed.
- Once the alignment pin has been removed verify that the sub-assembly (pin and set screw) is intact. If the set screw portion of the sub-assembly did not come out it will be necessary to remove it separately using the access hole in the back side of the SWK-L.
- Apply Loctite® 242 (or similar thread locking compound) to the M8 set screw in the new alignment pin.
- Install the alignment pin into the bushing and screw it into place. Apply 60 in-lb of torque to fully tighten it.

8.3 Recommended Spare Parts

8.3.1 SWS-L-210

Assembly	Description	
SWK-L	Complete SWK-L-210, No Options	
SWA-L	Complete SWA-L-210, No Options	
Other	Sensors	2x Lock and Unlock sensors
		1x RTL1
		1x RTL2
	Alignment Pin	2x Alignment Pin

8.3.2 SWS-L-310

Assembly	Description	
SWK-L	Complete SWK-L-310, No Options	
SWA-L	Complete SWA-L-310, No Options	
Other	Sensors	1x Set
		2x RTL
		3x Cables with connectors 0,33m
		1x Cable with connector 0,4m
	Alignment Pin	2x Alignment Pin

8.3.3 SWS-L-510

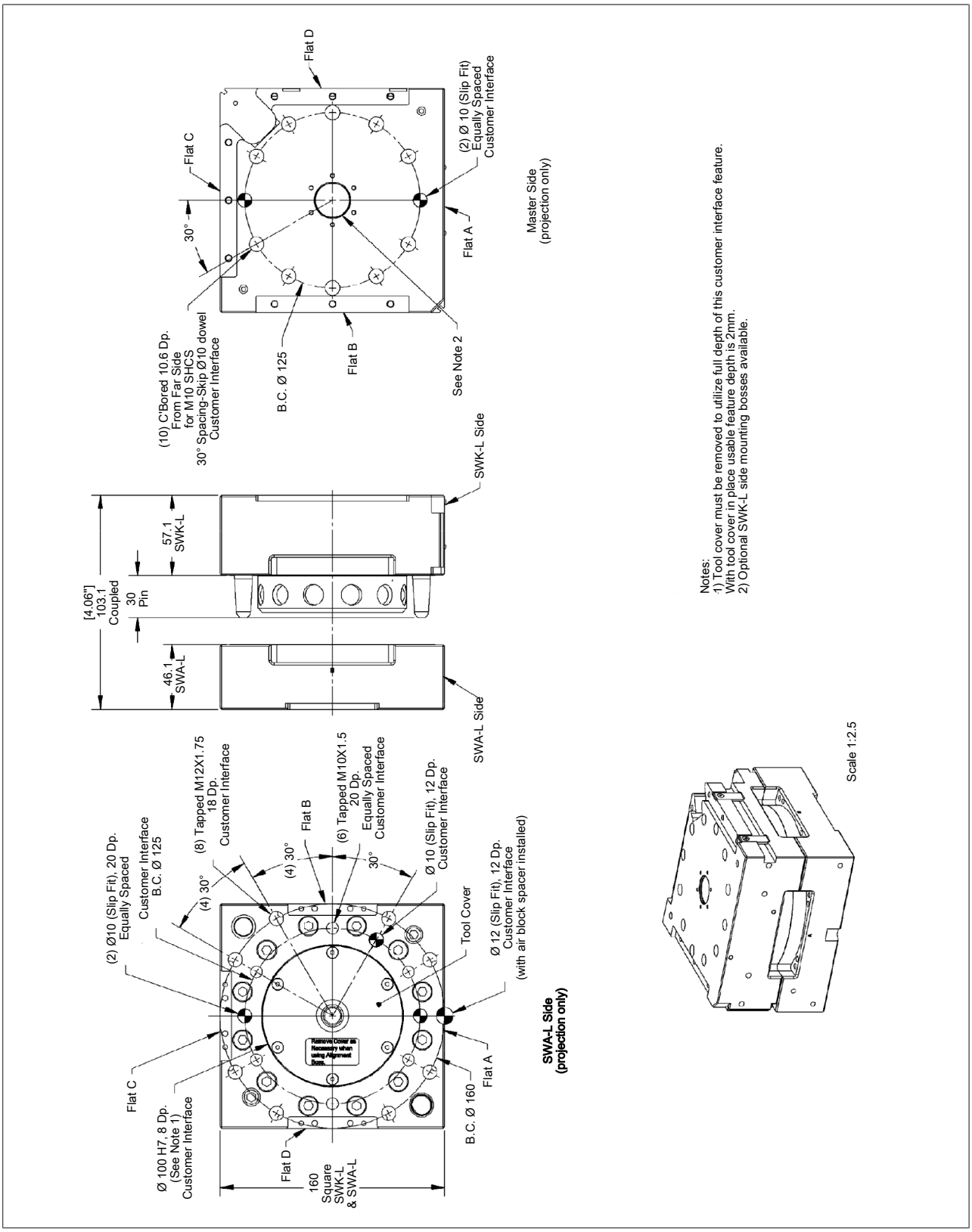
Assembly	Description	
SWK-L	Complete SWK-L-510, No Options	
SWA-L	Complete SWA-L-510, No Options	
Other	Sensors	Sensors complete
	Alignment Pin	Alignment Pin

8.3.4 SWS-L-1210

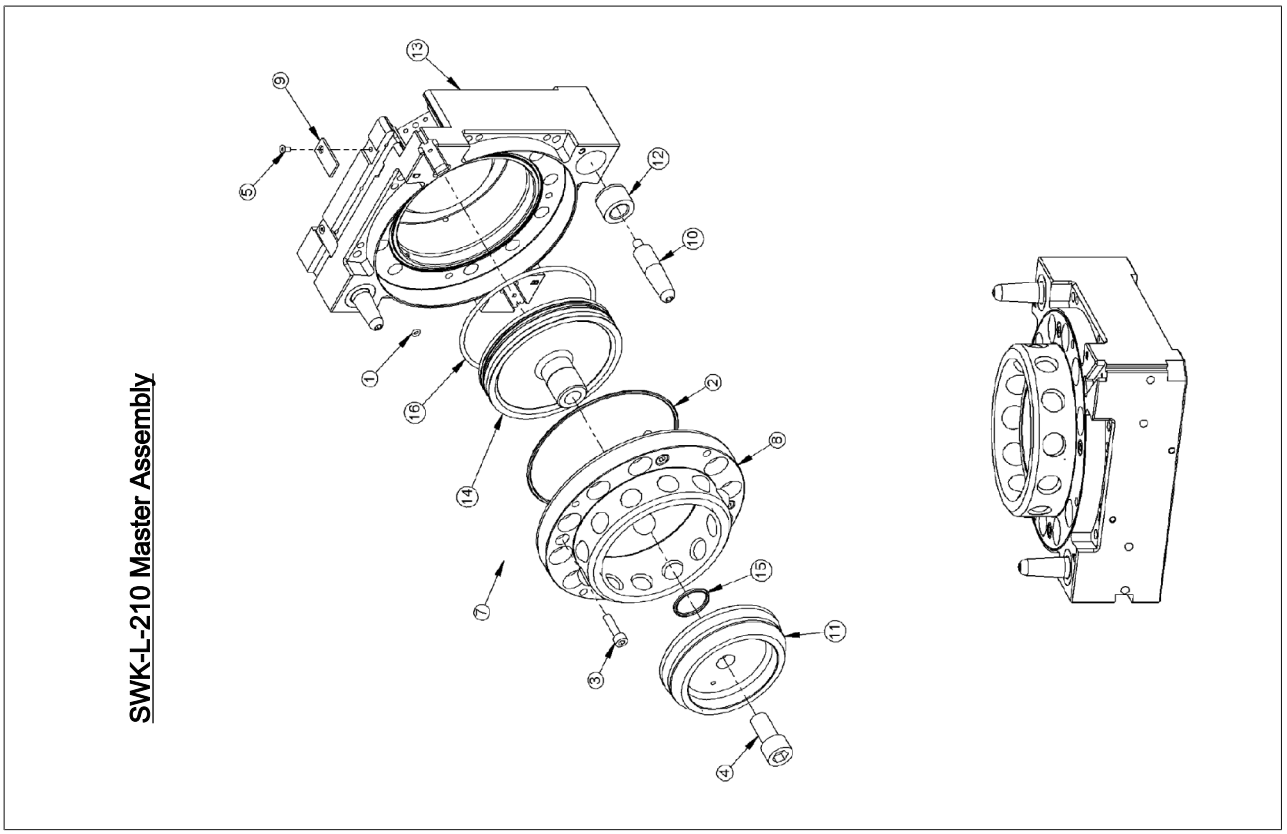
Assembly	Description	
SWK-L	Complete SWK-L-1210, No Options	
SWA-L	Complete SWA-L-1210, No Options	
Other	Sensors	Sensors complete
	Alignment Pin	Alignment Pin

8.4 Assembly drawings

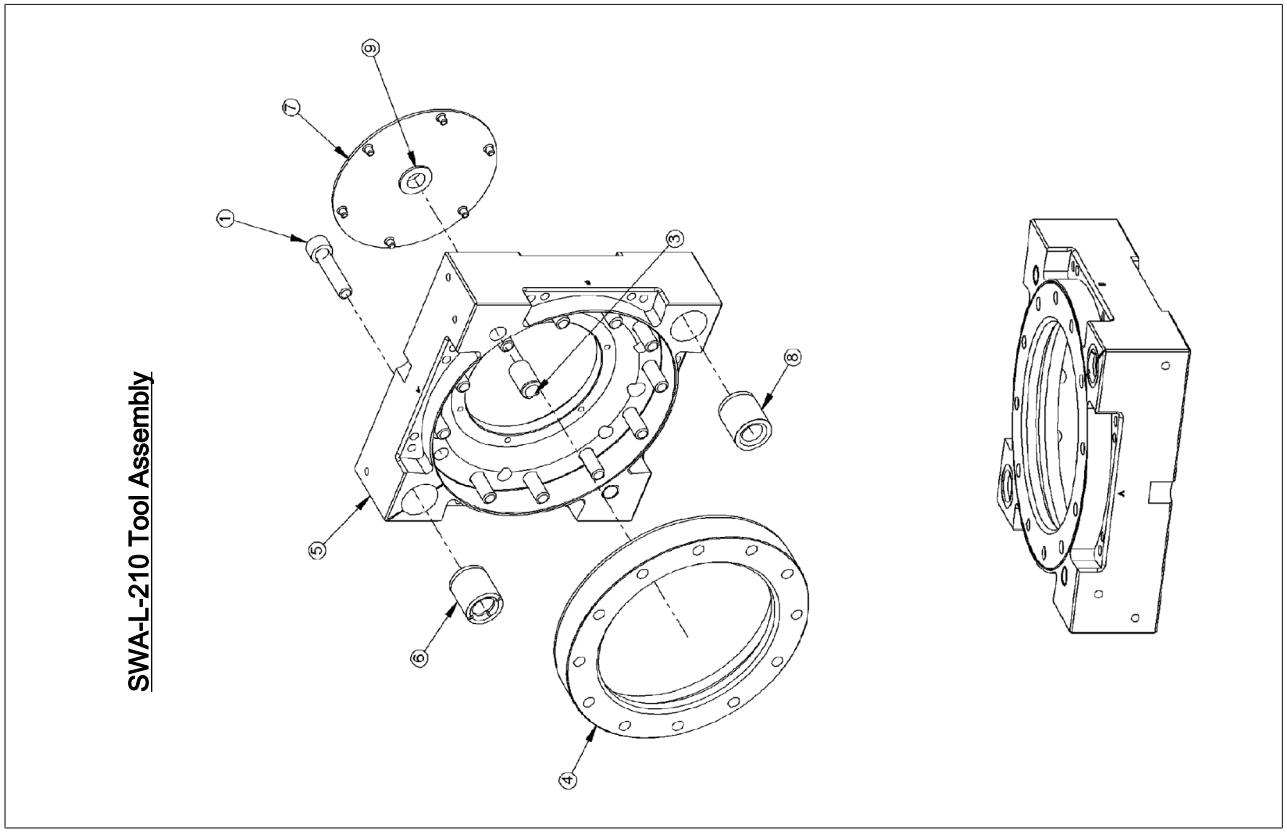
8.4.1 SWS-L-210



SWS-L 210

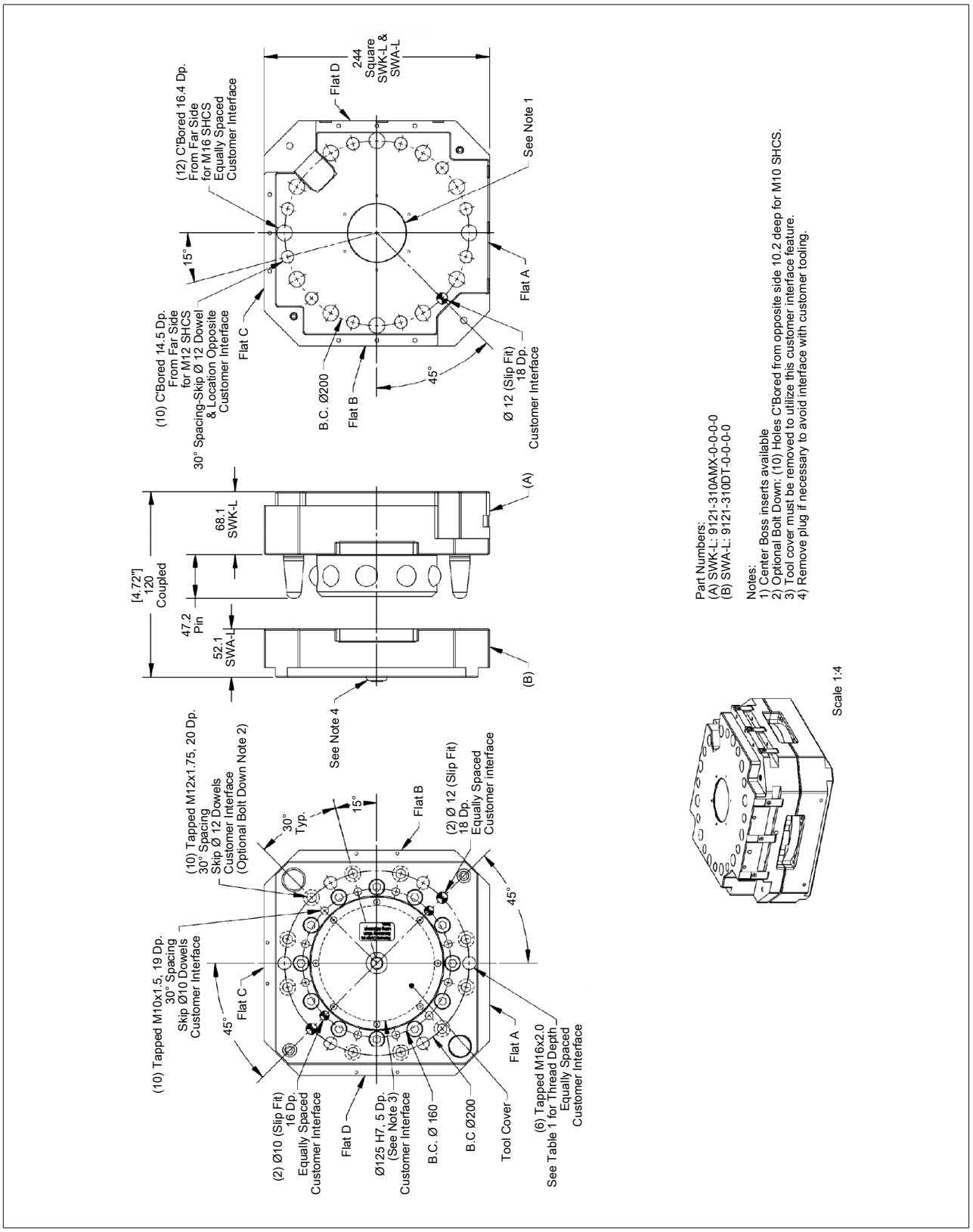


SWK-L-310

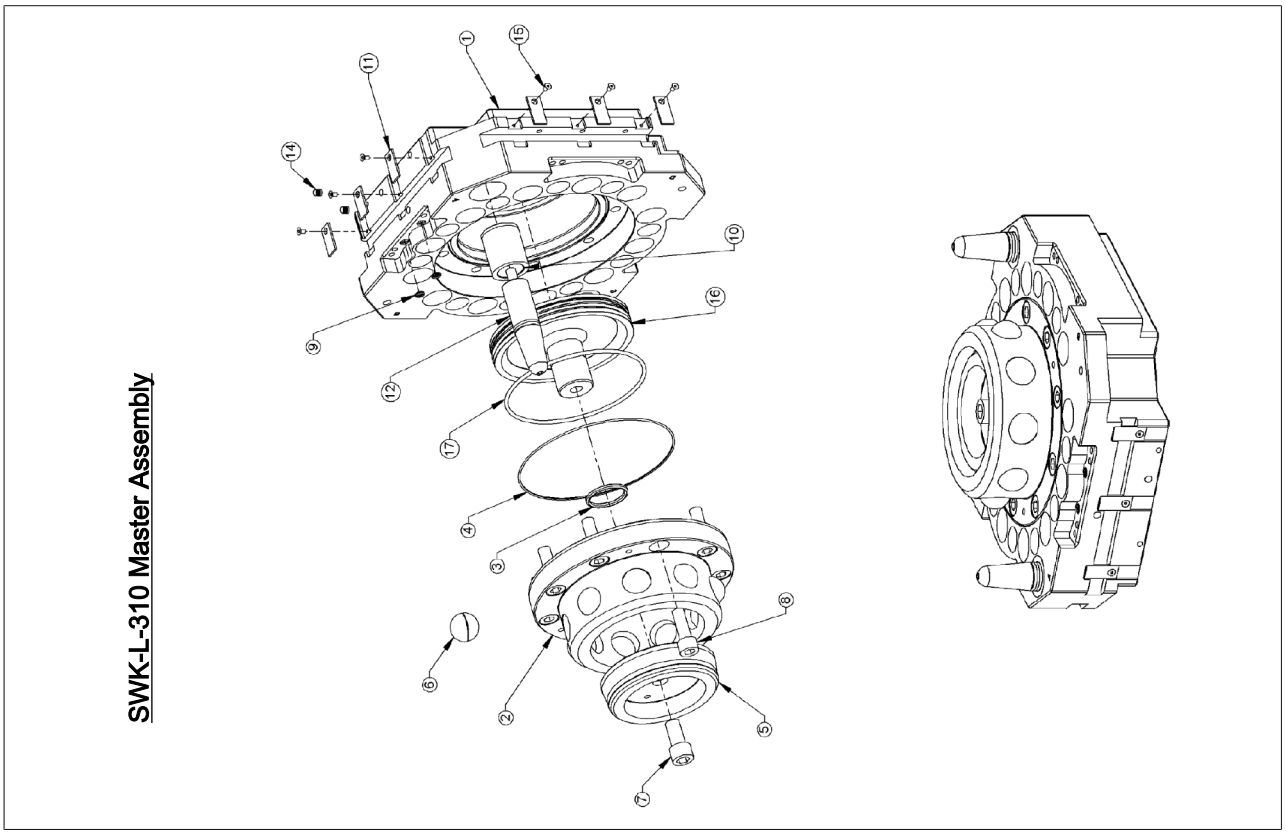


SWA-L-210

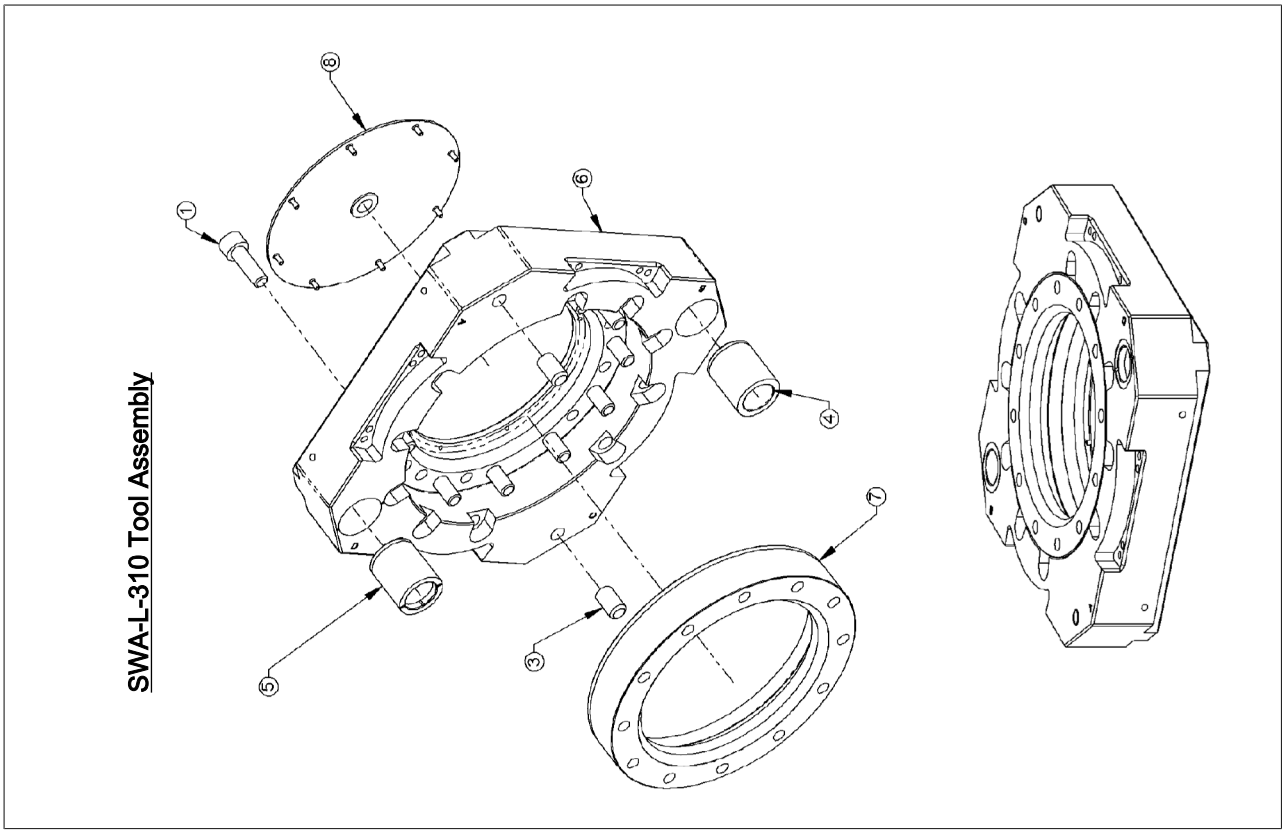
8.4.2 SWS-L-310



Assembly drawing SWS-L 310

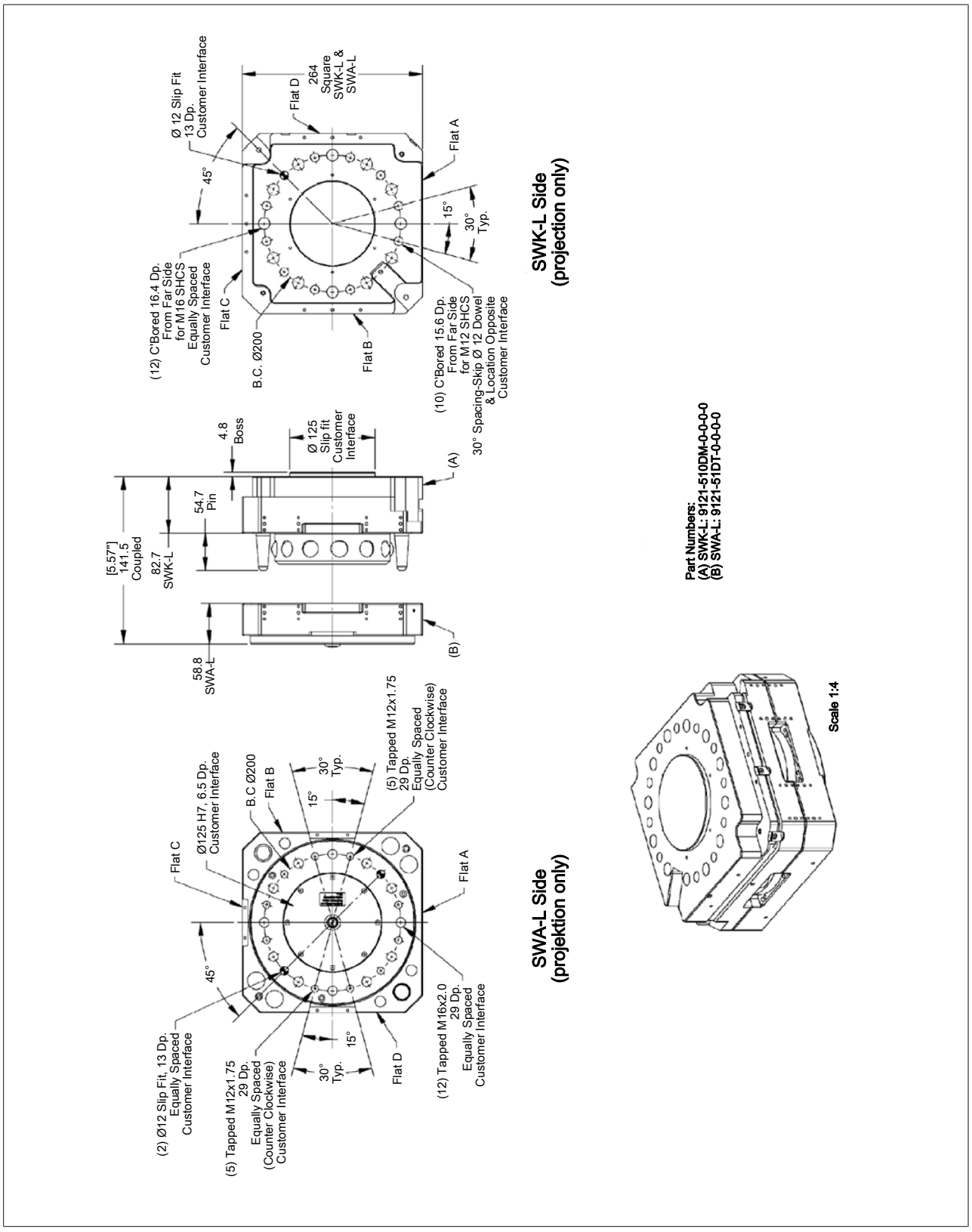


SWK-L-310

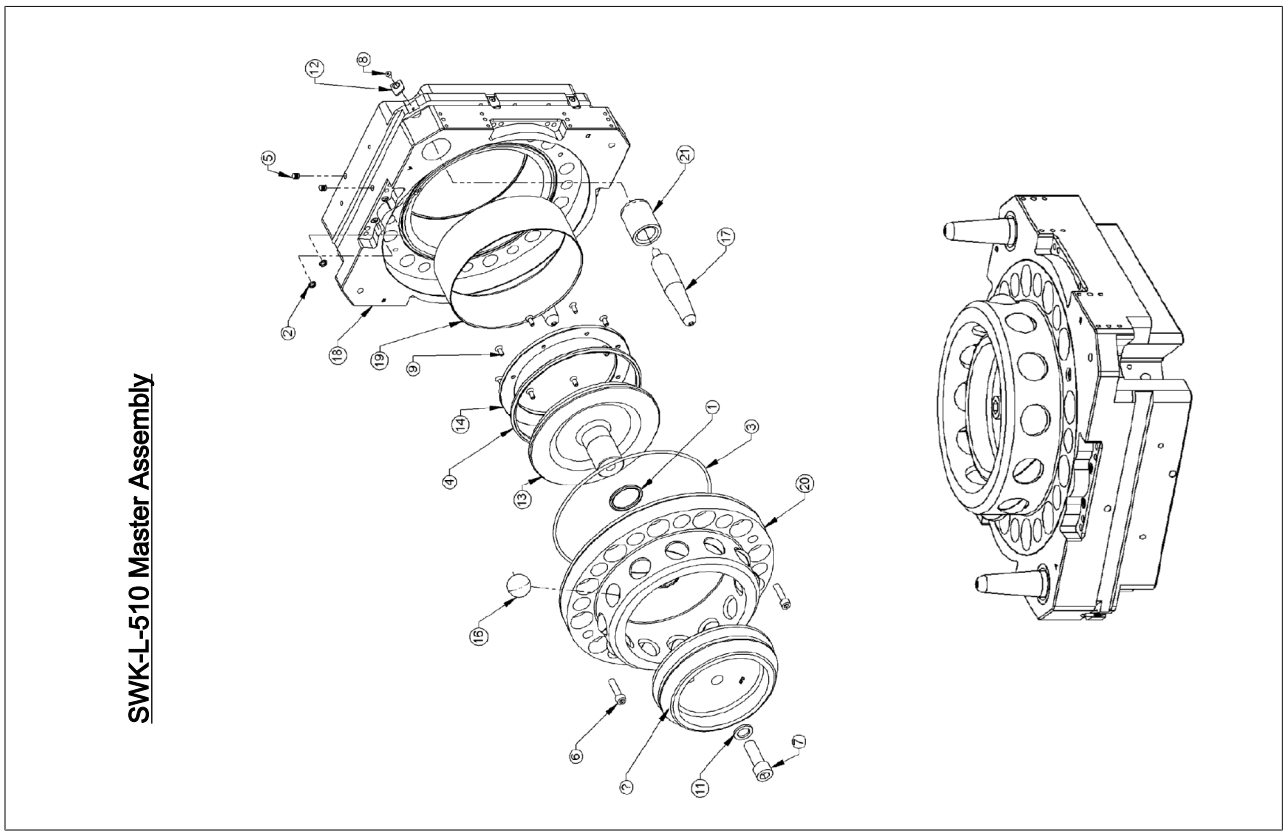


SWA-L-310

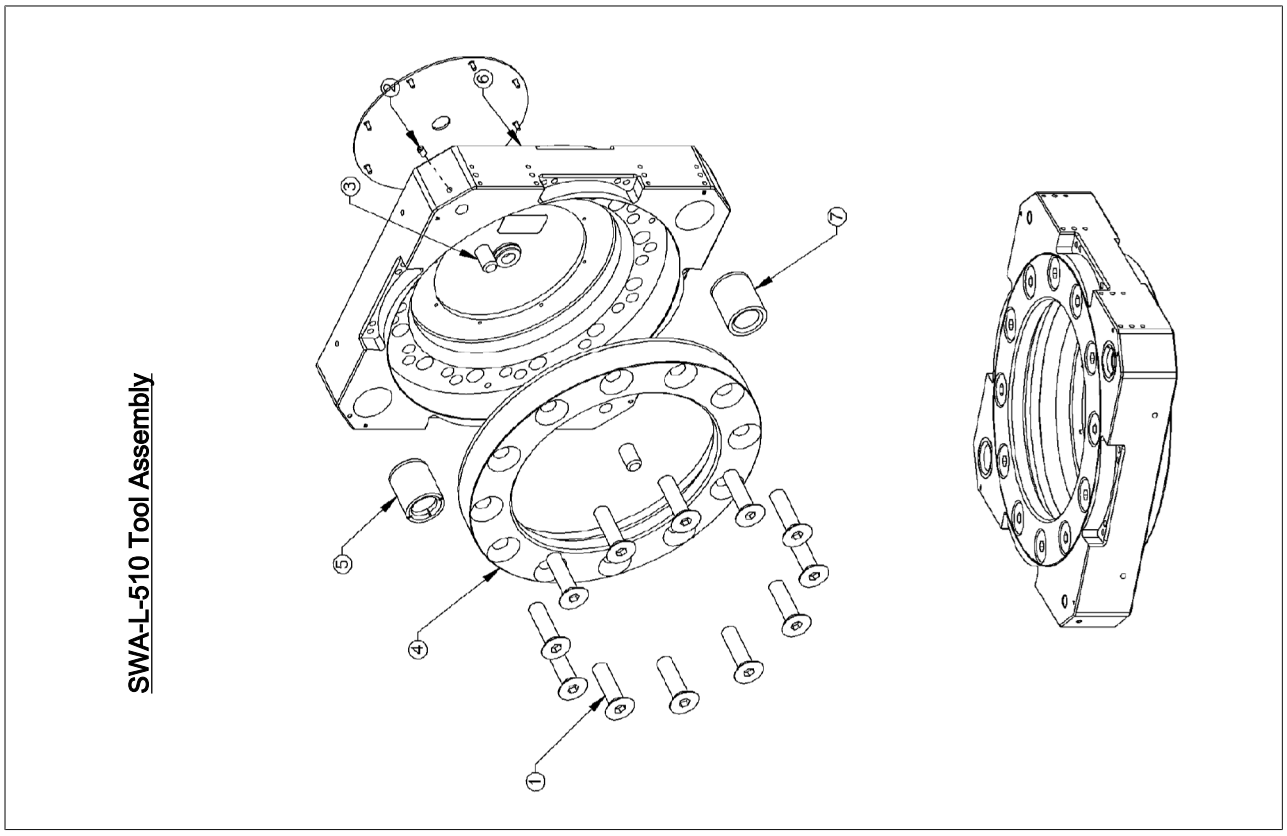
8.4.3 SWS-L-510



SWS-L 510

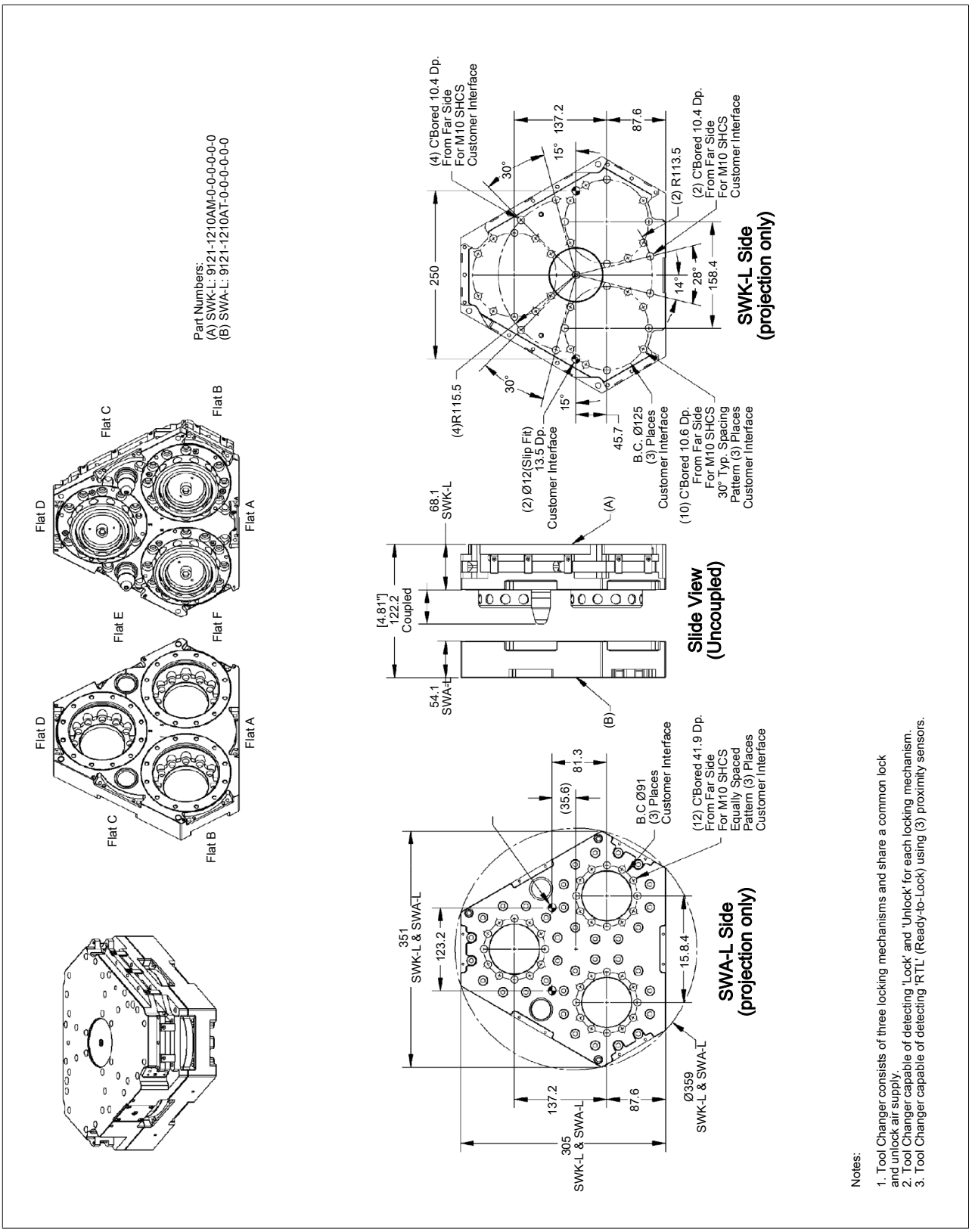


SWK-L 510

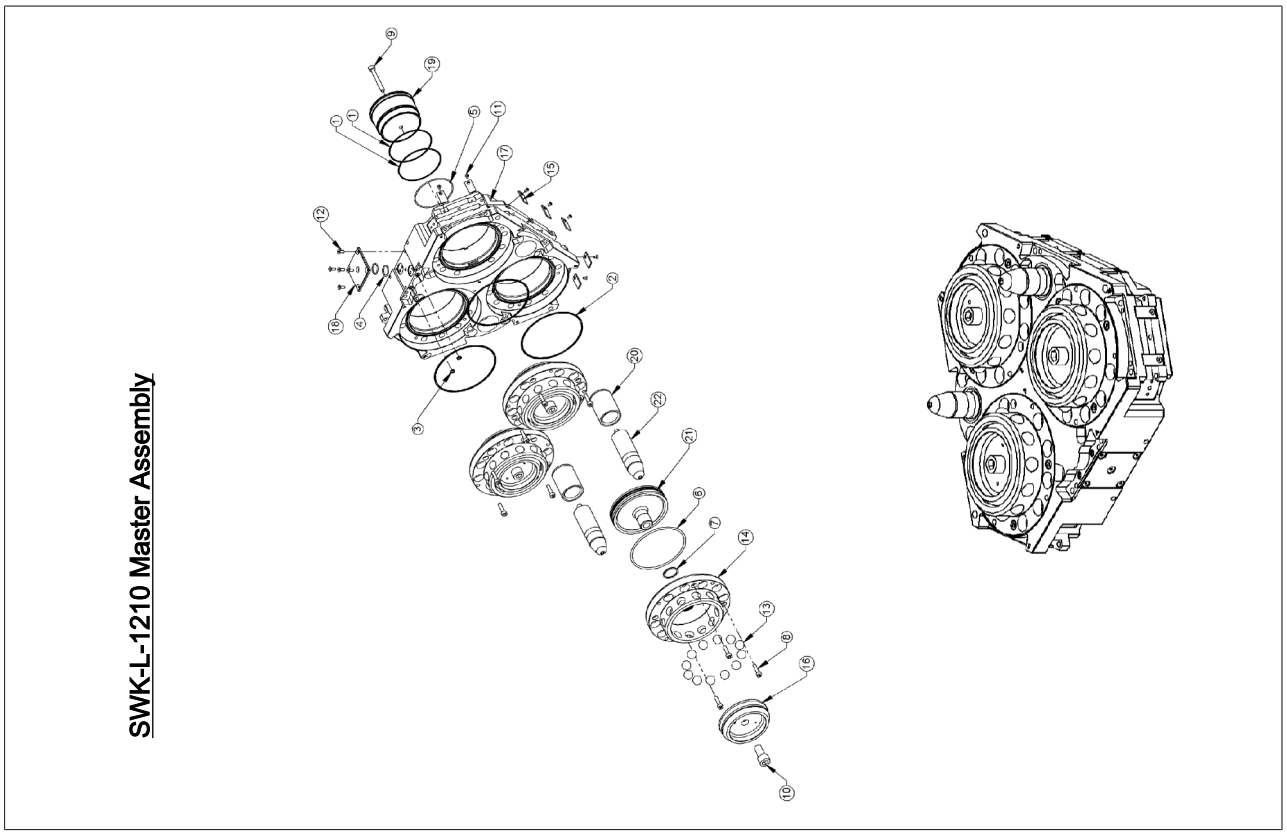


SWA-L 510

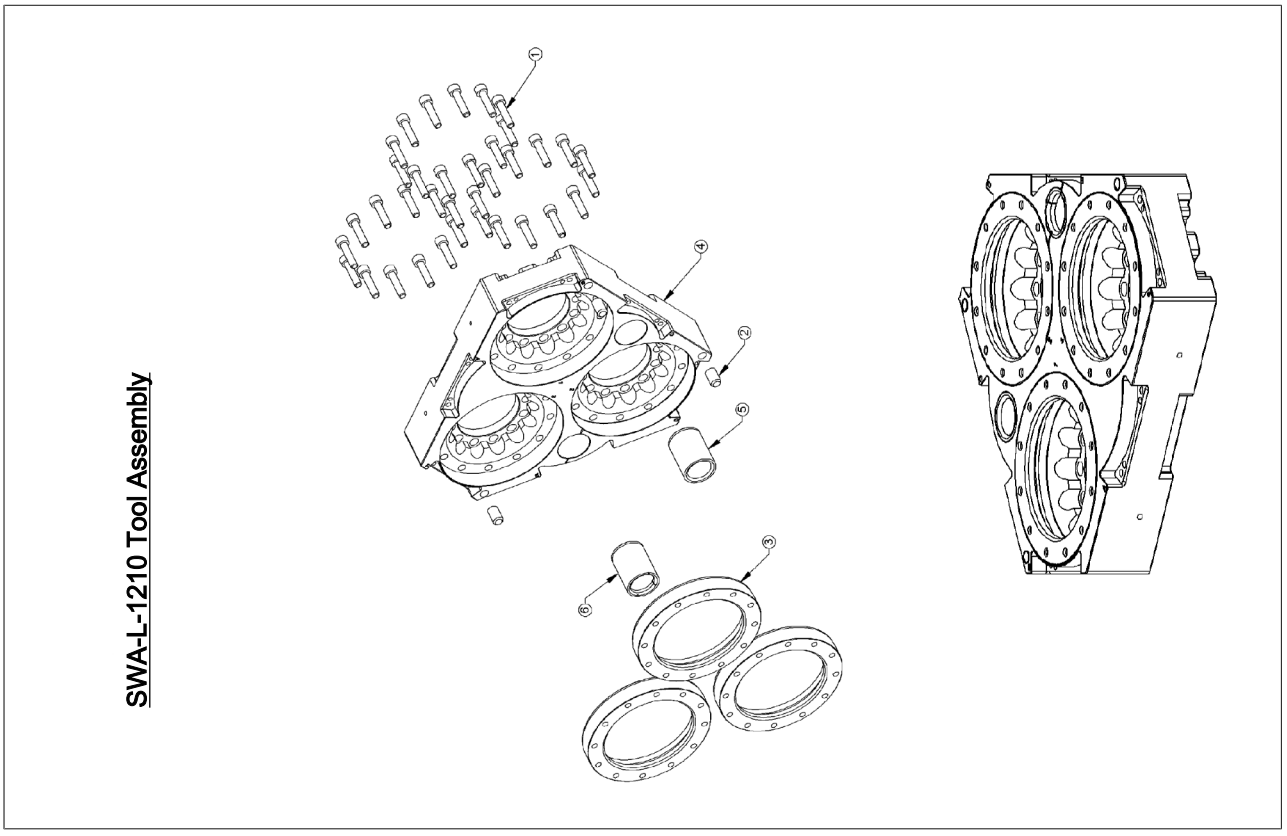
8.4.4 SWS-L-1210



SWS-L 1210



SWK-L 1210



SWA-L 1210

9 Translation of original declaration of incorporation

in terms of the Directive 2006/42/EG, Annex II, Part 1.B of the European Parliament and of the Council on machinery.

Manufacturer/
Distributor

SCHUNK GmbH & Co. KG Spann- und Greiftechnik
Bahnhofstr. 106 – 134
D-74348 Lauffen/Neckar

We hereby declare that on the date of the declaration the following partly completed machine complied with all basic safety and health regulations found in the directive 2006/42/EC of the European Parliament and of the Council on machinery. The declaration is rendered invalid if modifications are made to the product.

Product designation: Heavy Load Change System / SWS-L /

The partly completed machine may not be put into operation until conformity of the machine into which the partly completed machine is to be installed with the provisions of the Machinery Directive (2006/42/EC) is confirmed.

The manufacturer agrees to forward on demand the relevant technical documentation for the partly completed machinery in electronic form to national authorities.

The relevant technical documentation according to Annex VII, Part B, belonging to the partly completed machinery, has been created.

Person authorized to compile the technical documentation:
Robert Leuthner, Address: see manufacturer's address

Signature: see original declaration

Lauffen/Neckar, May 2019

p.p. Ralf Winkler,
Manager for development
of gripping system components

10 Annex to Declaration of Incorporation

according 2006/42/EG, Annex II, No. 1 B

1.Description of the essential health and safety requirements pursuant to 2006/42/EC, Annex I that are applicable and that have been fulfilled with:

Product designation	Heavy Load Change System
Type designation	SWS-L

To be provided by the System Integrator for the overall machine		⇓
Fulfilled for the scope of the partly completed machine	⇓	
Not relevant	⇓	

1.1	**Essential Requirements**			
1.1.1	Definitions		X	
1.1.2	Principles of safety integration		X	
1.1.3	Materials and products		X	
1.1.4	Lighting		X	
1.1.5	Design of machinery to facilitate its handling		X	
1.1.6	Ergonomics		X	
1.1.7	Operating positions			X
1.1.8	Seating			X

1.2	**Control Systems**			
1.2.1	Safety and reliability of control systems		X	
1.2.2	Control devices		X	
1.2.3	Starting		X	
1.2.4	Stopping		X	
1.2.4.1	Normal stop		X	
1.2.4.2	Operational stop		X	
1.2.4.3	Emergency stop		X	
1.2.4.4	Assembly of machinery		X	
1.2.5	Selection of control or operating modes		X	
1.2.6	Failure of the power supply			X

1.3	Protection against mechanical hazards			
1.3.1	Risk of loss of stability			X
1.3.2	Risk of break-up during operation			X
1.3.3	Risks due to falling or ejected objects			X
1.3.4	Risks due to surfaces, edges or angles		X	
1.3.5	Risks related to combined machinery			X
1.3.6	Risks related to variations in operating conditions			X
1.3.7	Risks related to moving parts		X	
1.3.8	Choice of protection against risks arising from moving parts			X
1.3.8.1	Moving transmission parts		X	
1.3.8.2	Moving parts involved in the process			X
1.3.9	Risks of uncontrolled movements			X

1.4	Required characteristics of guards and protective devices			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.1	Fixed guards			X
1.4.2.2	Interlocking movable guards			X
1.4.2.3	Adjustable guards restricting access			X
1.4.3	Special requirements for protective devices			X

1.5	Risks due to other hazards			
1.5.1	Electricity supply		X	
1.5.2	Static electricity		X	
1.5.3	Energy supply other than electricity		X	
1.5.4	Errors of fitting		X	
1.5.5	Extreme temperatures			X
1.5.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise			X
1.5.9	Vibrations			X
1.5.10	Radiation	X		
1.5.11	External radiation	X		
1.5.12	Laser radiation	X		
1.5.13	Emissions of hazardous materials and substances			X
1.5.14	Risk of being trapped in a machine	X		
1.5.15	Risk of slipping, tripping or falling	X		
1.5.16	Lightning			X

1.6	Maintenance			
1.6.1	Machinery maintenance		X	
1.6.2	Access to operating positions and servicing points		X	
1.6.3	Isolation of energy sources		X	
1.6.4	Operator intervention		X	
1.6.5	Cleaning of internal parts		X	

1.7	Information			
1.7.1	Information and warnings on the machinery		X	
1.7.1.1	Information and information devices		X	
1.7.1.2	Warning devices		X	
1.7.2	Warning of residual risks		X	
1.7.3	Marking of machinery	X		
1.7.4	Instructions	X		
1.7.4.1	General principles for the drafting of instructions	X		
1.7.4.2	Contents of the instructions	X		
1.7.4.3	Sales literature	X		

	The classification from Annex 1 is to be supplemented from here forward.			
2	Supplementary essential health and safety requirements for certain categories of machinery			X
2.1	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products			X
2.2	Portable hand-held and/or guided machinery			X
2.2.1	Portable fixing and other impact machinery			X
2.3	Machinery for working wood and material with similar physical characteristics			X
3	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery		X	
4	Supplementary essential health and safety requirements to offset hazards due to lifting operations		X	
5	Supplementary essential health and safety requirements for machinery intended for underground work			X
6	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons		X	