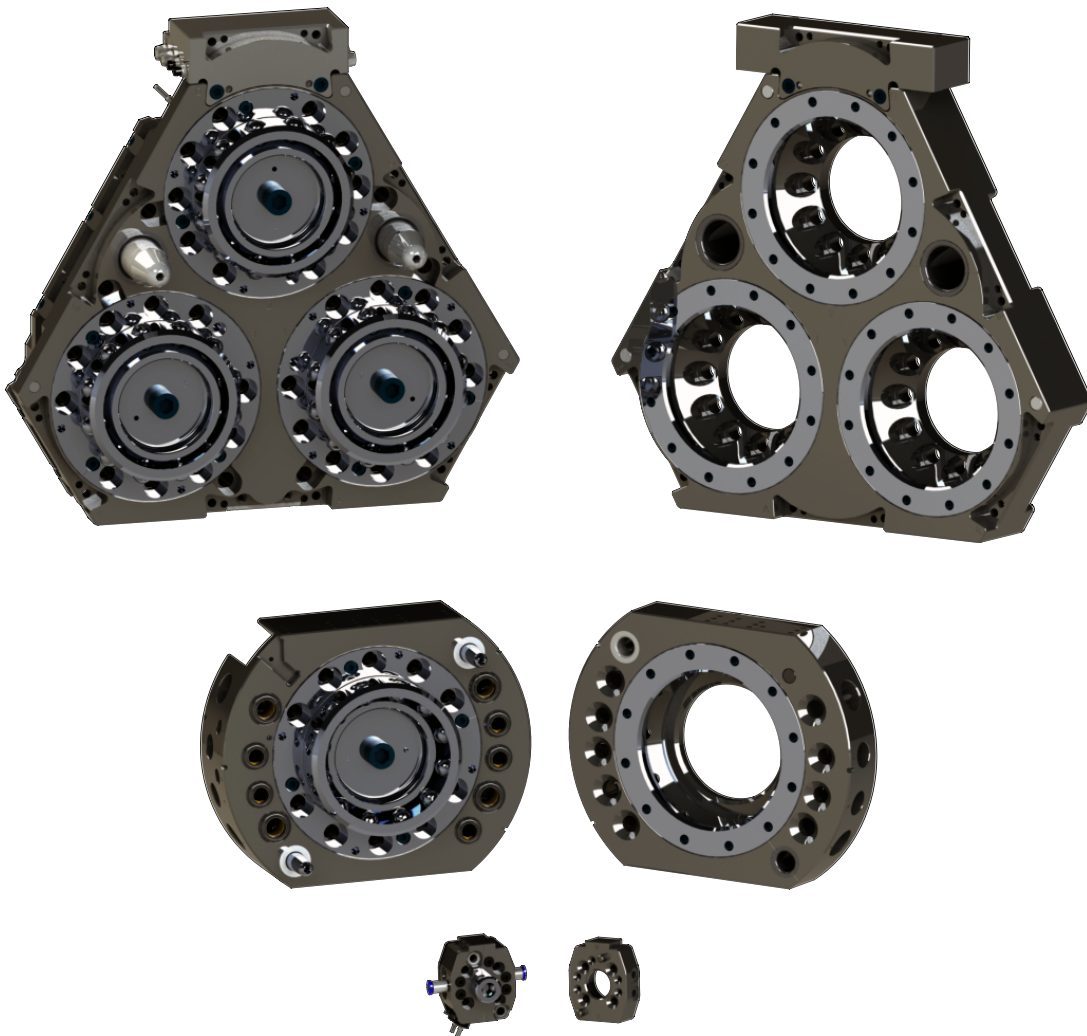




Instruction Manual

Tool Changer Product Line



Document #: 9610-20-4451

Engineered Products for Robotic Productivity

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Foreword

Please contact ATI Industrial Automation with any questions concerning a particular model.



WARNING: Only use ATI products for applications approved by the manufacturer. Using ATI products in applications other than what was intended by the manufacturer could result in damage to equipment and injury to personnel.



CAUTION: This manual describes the function, application, and safety considerations of this product. This manual must be read and understood before any attempt is made to install or operate the product, otherwise damage to the product or unsafe conditions may occur.

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1. Safety

The safety section describes general safety guidelines to be followed with this product, explanations of the notifications found in this manual, and safety precautions that apply to the product.

1.1 Explanation of Notifications

These notifications are used in all ATI manuals and are not specific to this product. The user should heed all notifications from the robot manufacturer and/or the manufacturers of other components used in the installation.



DANGER: Notification of information or instructions that if not followed will result in death or serious injury. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.



WARNING: Notification of information or instructions that if not followed could result in death or serious injury. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.



CAUTION: Notification of information or instructions that if not followed could result in moderate injury or will cause damage to equipment. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.

NOTICE: Notification of specific information or instructions about maintaining, operating, installing, or setting up the product that if not followed could result in damage to equipment. The notification can emphasize, but is not limited to: specific grease types, best operating practices, and maintenance tips.

1.2 General Safety Guidelines

Prior to purchase and installation, the customer should verify that the Tool Changer selected is rated for the maximum loads and moments expected during operation. Give particular attention to dynamic loads caused by robot acceleration and deceleration. These forces can be exponentially greater than the static forces in high acceleration or deceleration situations. To verify an ATI product is rated for a particular application, refer to the product specifications section in this manual or contact ATI for assistance.

The customer is responsible for ensuring that the area between the Master and Tool sides is clear of debris and/or foreign objects during mating and subsequent coupling. Failure to do so will result in serious injury to personnel and equipment damage.



DANGER: The gap between the Master and Tool sides is a pinch point. All personnel should abstain from placing any body part or clothing in the gap, especially during actuation of the locking mechanism.

The customer is responsible for understanding the function of the Tool Changer or Utility Coupler and installing the proper fasteners and/or software to operate products safely. Control the Tool Changer or Utility Coupler so there is no chance of coupling or uncoupling in a position that endangers personnel and/or equipment. If locked/unlocked (L/U) and Ready-to-Lock (RTL) sensing capability are used, monitor the status and apply interlocks to prevent injury or damage to personnel and equipment.



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.



2. Introduction

ATI Tool Changers play a critical role for any robotic application, enabling versatility and automation for tasks that require different tools. The use of an ATI Tool Changer allows the user to automatically change tools within an application without human intervention.

NOTICE: ATI's robotic Tool Changers are one essential component to the overall robotic system. Additionally, ATI offers a vast catalog of **Tool Changer modules** for passing utilities to multiple tools seamlessly, as well as a line of **Tool Stand products** for safe tool storage.

ATI Utility Module Operating Manual: [9610-20-4452](#)

ATI Tool Stand Operating Manual: [9610-20-4453](#)

2.1 System Overview

Robotic applications can vary greatly in size and complexity. However, any robotic solution that requires multiple tools will likely consist of at least these components:

Figure 2.1—Robotic System Overview

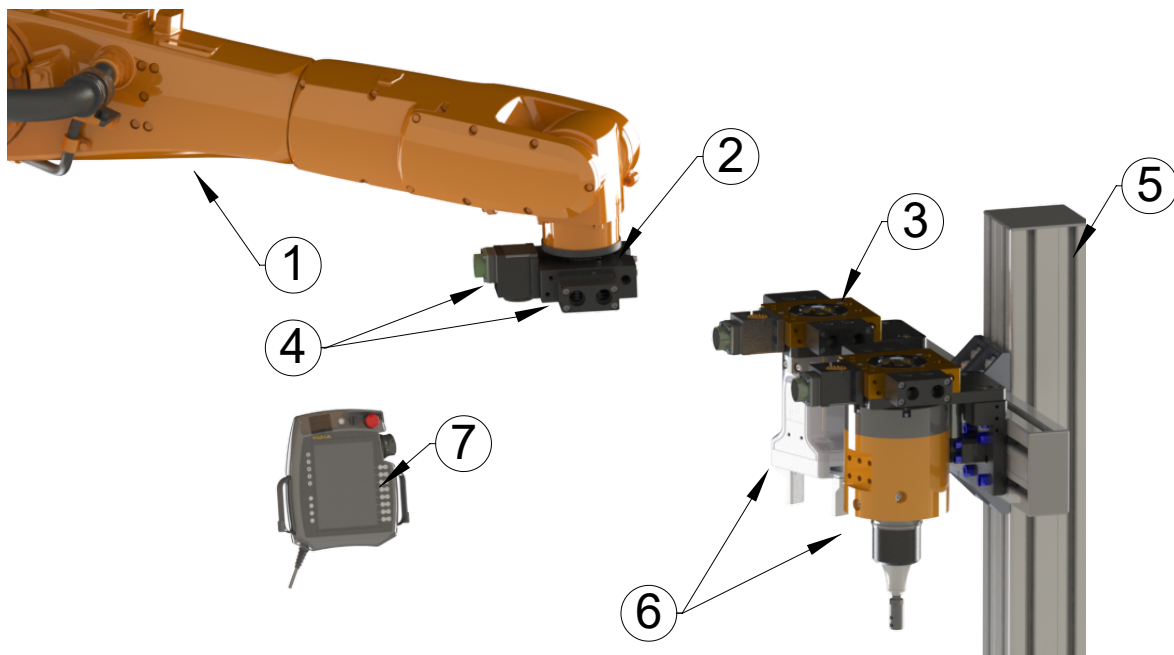


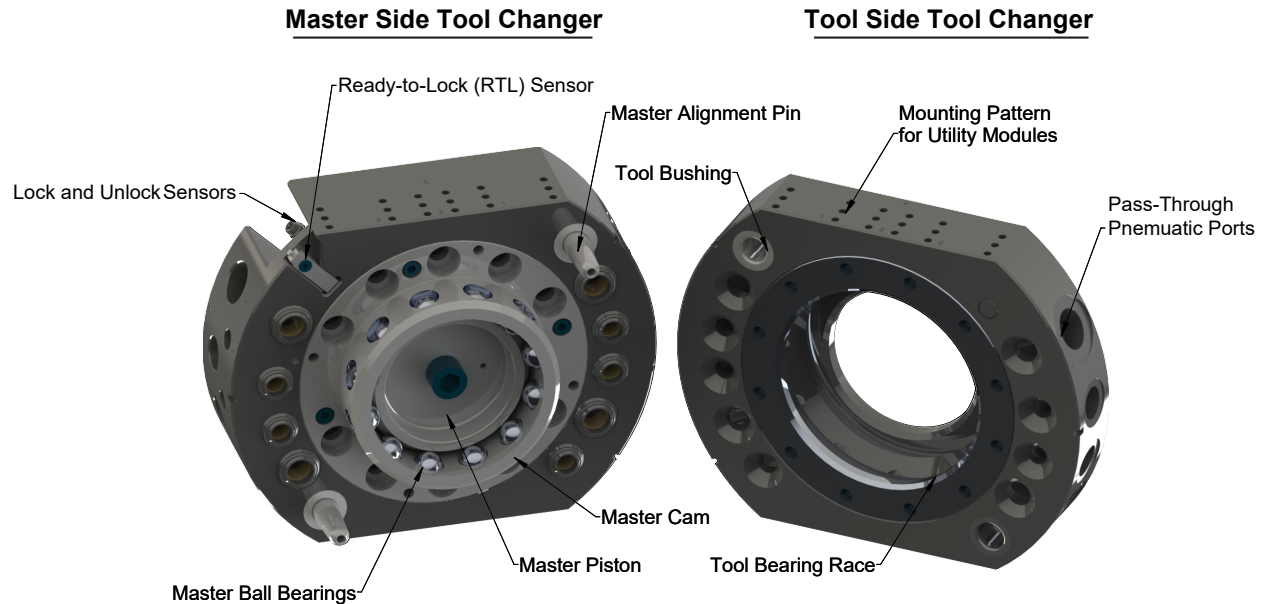
Table 2.1—Robotic System Overview Components	
No.	Description
1	<u>Robot</u> handles all movement within the cell.
2	<u>Tool Changer Master side</u> allows use of multiple tools in a single application.
3	<u>Tool Changer Tool side</u> attaches to customer tooling.
4	<u>Tool Changer modules</u> pass customer utilities through Tool Changer.
5	<u>Tool Stand</u> safely supports tooling.
6	<u>Tooling/end effector</u> performs different tasks within the cell.
7	<u>Robotic controller</u> manages robot movement and programming.
Additional required components not shown:	
1.	<u>Pneumatic Valve</u> enables Tool Changer coupling mechanism to latch and unlatch. See Section 4.5—Pneumatic Connections and Valve Requirements
2.	<u>Power and Pneumatic supply</u> are requirements for operation. See Section 7—Specifications .

2.2 Tool Changer Overview

ATI Tool Changers consist of a:

1. Master side: attaches to the robot arm.
2. Tool side: attaches to customer tooling.

Figure 2.2—Tool Changer Overview



CAUTION: Operation of the Tool Changer is dependent on maintaining an air pressure of 4.1 to 7 bar (60-100 psi). Damage to the locking mechanism could occur. Robot motion must be halted if the air supply pressure drops below 4.1 bar (60 psi).

ATI's Tool Changers use a pneumatic locking mechanism, which operates in the following manner:

1. Air supplied to Master side Tool Changer extends piston.
2. Piston drives cam toward locking mechanism.
3. Cam forces ball bearings outward.
4. Ball bearings engage with Tool side bearing race, locking into place.

Air pressure of at least 4.1 bar (60 psi) must be maintained while the Master and Tool are coupled. However, the patented, fail-safe locking mechanism utilizes a multi-tapered cam with ball-locking technology will prevent uncoupling if air pressure falls below 4.1 bar during operation.

Refer to [Section 4—Operation](#) for detailed information on Tool Changer operation requirements and procedures.

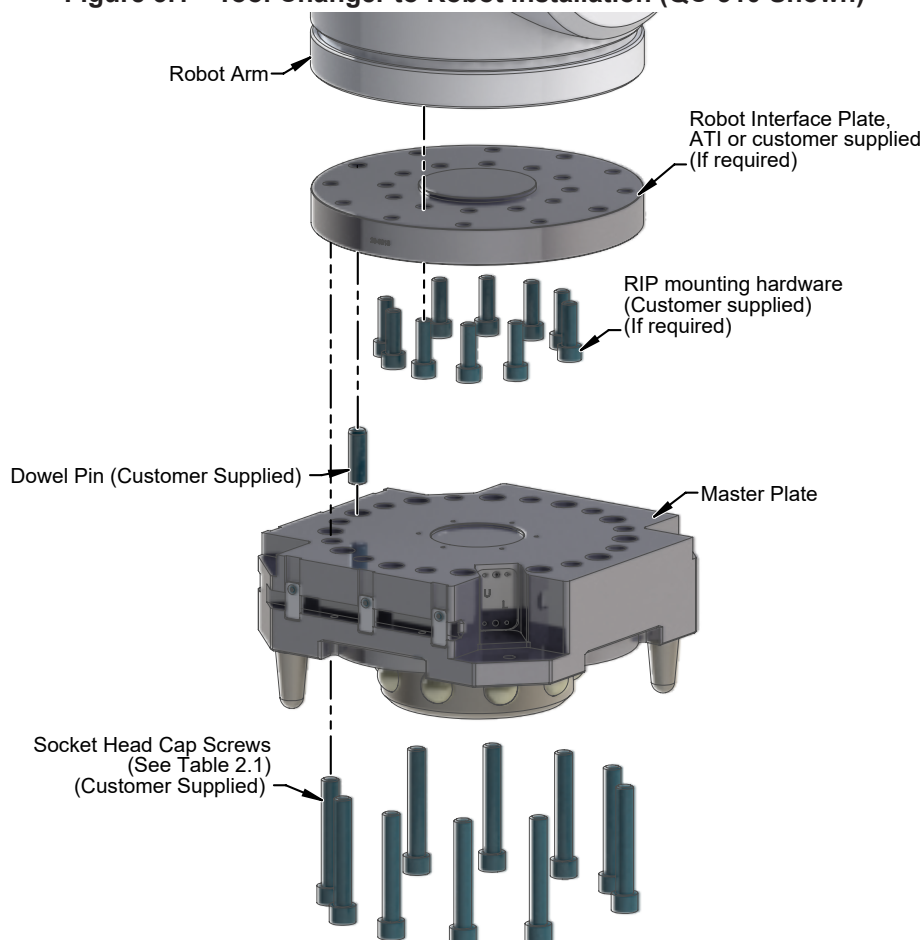
3. Installation

3.1 Tool Changer to Robot Installation

Mounting hardware and specifications may differ between each ATI Tool Changer. However, most are installed to the robot in the same manner, which is outlined below.

[Table 3.2](#) provides specifications for mounting the Master side Tool Changer to a robot.

Figure 3.1—Tool Changer to Robot Installation (QC-310 Shown)



Master Side Tool Changer Installation:

1. Wipe down mounting surfaces with a clean rag.
2. Align Master side to robot arm or RIP.
3. Install Master side:
 - a. Add threadlocker to fasteners. Refer to [Table 3.2](#) for threadlocker and fastener requirements.
 - b. Use hex tool to secure the Master side with the fasteners.
 - c. Torque fasteners. Refer to [Table 3.2](#).
4. If applicable, connect the lock and unlock sensor connections. Refer to [Section 4.5—Pneumatic Connections and Valve Requirements](#) and customer drawings.
5. Connect required utilities to modules and Master side.
6. Continue to [Section 3.2—Tool Changer to Customer Tooling Installation](#).

Table 3.1—Fastener Size, Class, and Torque Specifications: Master Side

QC Model	Fastener Size ^{1,3,5}	Torque (Nm)
QC-1	M3x14 ^{2,4}	1.02
QC-7	M5x30	8.81
QC-11	M3x25 ⁴	1.92
QC-20	M4x35 ^{2,4}	1.92
QC-21	M4x35 ^{2,4}	1.92
QC-29	M6x35	14.69
QC-40Q	M5x45 ⁴	8.81
QC-41	M5x35 ⁴	8.81
QC-46	M8x40 ⁶	37.28
	M10x40	72.31
QC-60	M6x40 ^{2,4}	8.81
QC-71	M6x40 ^{2,4}	14.69
QC-76	M10x35	72.31
QC-110	M10x50	72.31
QC-160	M10x55	72.31
QC-210	M10x60	72.31
QC-310	M12x65	124.28
	M16x70	305.06
QC-510	M12x80	124.28
	M16x85	305.06
QC-835	M10x60	72.31
	M12x50	124.28
QC-850	M12x50	124.28
	M16x55	305.06
QC-1210	M10x70	72.31
QC-1310	M10x80	72.31
QC-1510	M16x90	305.06

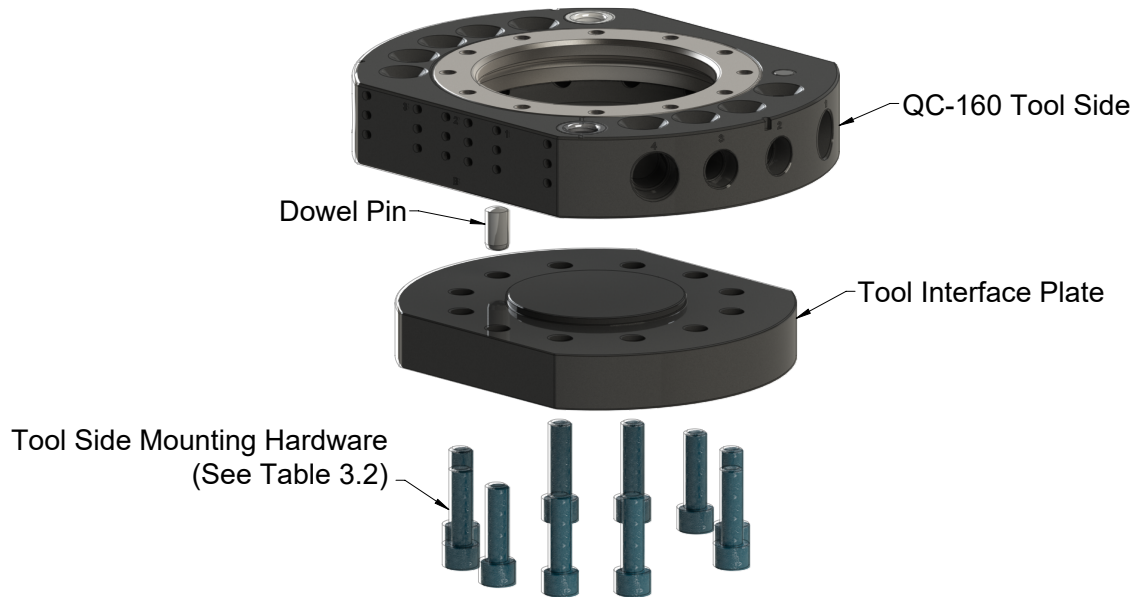
Notes:

1. Unless marked otherwise, all fasteners adhere to ISO 4762 standard, coarse thread, and Class 12.9.
2. Fasteners adhere to ISO 10642 standard, coarse thread, and Class 10.9.
3. Lengths shown represent minimum thread engagement.
4. Mounting fasteners are included.
5. For material over 90 KSI (USS), attempt 1D of engagement. For anything less than 90 KSI (USS), attempt 1.5D of engagement.
6. Special washers are required (included in fastener kits).

3.2 Tool Changer to Customer Tooling Installation

[Table 3.2](#) provides specifications for mounting the Tool side Tool Changer to customer tooling.

Figure 3.2—Tool Changer to Robot Installation (QC-160 Shown)



Tool Side Tool Changer Installation:

1. Wipe down mounting surfaces with a clean rag.
2. Align Tool side to customer tooling.
3. Install Tool side Tool Changer:
 - a. Add threadlocker to fasteners. Refer to [Table 3.2](#) for threadlocker and fastener requirements.
 - b. Use hex tool to secure the Tool side with the fasteners.
 - c. Torque fasteners. Refer to [Table 3.2](#).
4. Connect required utilities to modules and Tool side.

Table 3.2—Fastener Size, Class, and Torque Specifications: Tool Side		
QC Model	Fastener Size ^{1,3,5}	Torque (Nm)
QC-1	M3-0.5	1.92
QC-7	Bolt Down: M4x22 ²	1.92
	M5-0.8	8.81
QC-11	M5-0.8	8.81
QC-20	M6-1.0	14.69
QC-21	M6-1.0	14.69
QC-29	M6-1.0	14.69
QC-40	M8-1.25	37.28
QC-41	M8-1.25	37.28
QC-46	Bolt Down: M6x30	14.69
	M8-1.25	37.28
	M10-1.5	72.31
QC-60	M8-1.25	37.28
QC-71	M8-1.25	37.28
QC-76	M10-1.5	72.31
QC-110	M10-1.5	72.31
QC-160	M10-1.5	72.31
QC-210	M10-1.5	72.31
	M12-1.75	124.28
QC-310	Bolt Down: M10x45	72.31
	M10-1.5	72.31
	M12-1.75	124.28
	M16-2.0	305.06
QC-510	M12-1.75	124.28
	M16-2.0	305.06
QC-835	Bolt down: M10x40	72.31
	M10-1.5 ⁶	72.31
	M12-1.75	124.28
QC-850	Bolt Down: M12	124.28
	M12-1.75 ⁶	124.28
	M16-2.0	305.06
QC-1210	Bolt Down: M10x25	72.31
QC-1310	Bolt Down: M10x60 ⁴	72.31
	M12-1.75	124.28
QC-1510	Bolt Down: M16x60	305.06

1. Unless marked otherwise, all fasteners adhere to ISO 4762 standard, coarse thread, and Class 12.9.
 2. Fasteners adhere to ISO 10642 standard, coarse thread, and Class 10.9.
 3. Lengths shown represent minimum thread engagement.
 4. Mounting fasteners are included.
 5. For material over 90 KSI (USS), attempt 1D of engagement. For anything less than 90 KSI (USS), attempt 1.5D of engagement.
 6. Nuts are required (included in fastener kits).

3.3 Module to Tool Changer Installation

ATI offers a wide variety of optional modules to pass air, water, power, electrical signals, and more.

These optional modules are typically installed on the Tool Changer by ATI prior to shipment. The following section outlines field installation and removal.

There are multiple module mounting patterns across ATI's Tool Changer catalog. These mounting patterns can generally be categorized into one of five categories:

- M7 Mount
- K Mount
- J Mount
- L Mount
- M8 Mount

Refer to [Table 3.3](#) to identify the specific module mounting style for each ATI Tool Changer.

Installation Instructions:

1. Place Tool in a secure location.
2. Uncouple Master and Tool.
3. Turn off and de-energize all circuits.
4. Clean the mounting surfaces.
5. Align module to mounting position on the Master or Tool side.
6. Add threadlocker to the mounting fasteners. Refer to [Table 3.3](#) for threadlocker and fasteners information.
7. Torque according to specification outlined in [Table 3.3](#).

Figure 3.3—ATI Module Mounting Styles

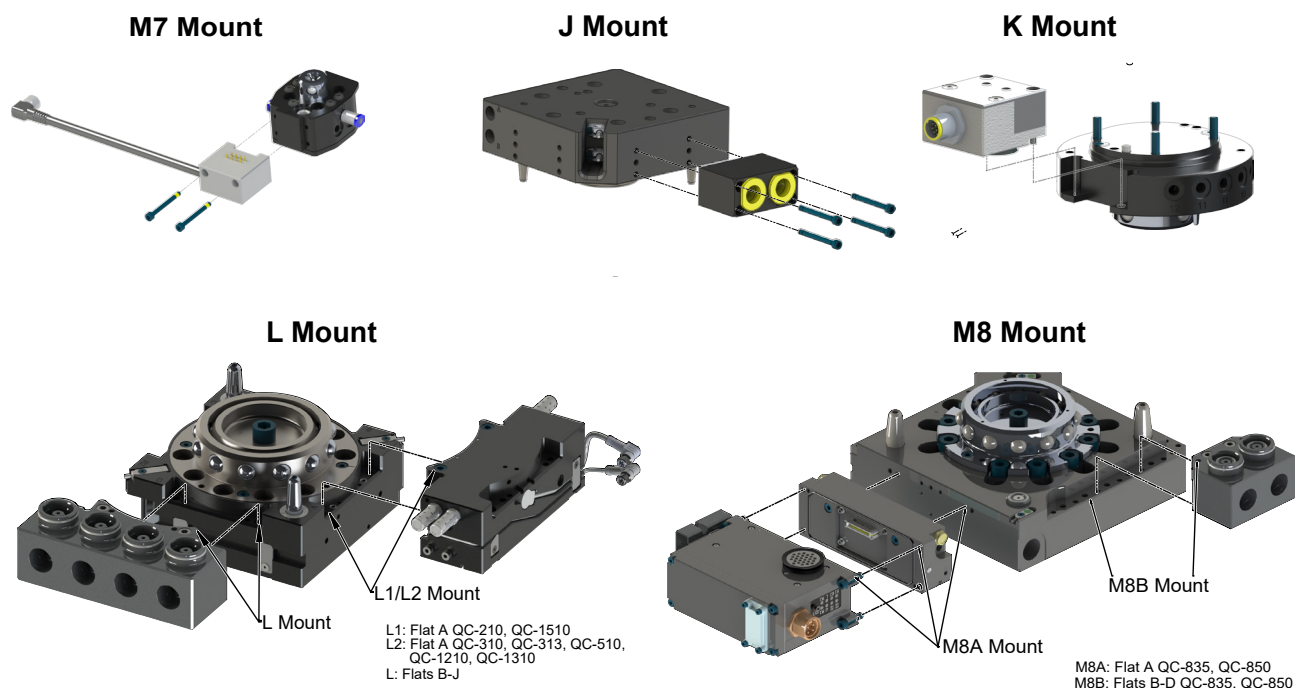


Table 3.3—Module Mounting Fastener Size and Torque Specifications

QC Model	Mounting Style ¹	Fastener Size ²	Torque	Hex Tool
QC-1	M1	(2) M2 SHCS	0.25 Nm	1.5 mm
QC-7	M7 / M7+	(2) M3 SHCS	1.13 Nm	2.5 mm
QC-11	M7	(2) M3 SHCS	1.13 Nm	2.5 mm
QC-20	K	(2) M3 SHCS	1.13 Nm	2.5 mm
QC-21 Flat A	K	(2) M3 SHCS	1.13 Nm	2.5 mm
QC-21 Flat B	J with adapter	(4) M4 SHCS	1.7 Nm	3 mm
QC-29	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-40Q	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-41	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-46	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-60 Flat A	K	(2) M3 SHCS	1.13 Nm	2.5 mm
QC-60 Flat B	J with adapter	(4) M4 SHCS	1.7 Nm	3 mm
QC-71	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-76	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-110	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-160	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-210 ³	L1 / L	(2) M6 SHCS	10.1 Nm	5 mm
QC-310 ³	L2 / L	(2) M6 SHCS	10.1 Nm	5 mm
QC-510 ³	L2 / L	(2) M6 SHCS	10.1 Nm	5 mm
	J	(4) M4 SHCS	1.7 Nm	3 mm
QC-835 ^{3,4}	M8	(2) M6 SHCS	10.1 Nm	5 mm
QC-850 ^{3,4}	M8	(2) M6 SHCS	10.1 Nm	5 mm
QC-1210 ³	L2 / L	(2) M6 SHCS	10.1 Nm	5 mm
QC-1310 ³	L2 / L	(2) M6 SHCS	10.1 Nm	5 mm
QC-1510 ³	L1 / L	(2) M6 SHCS	10.1 Nm	5 mm

1. Detailed mounting style information found in [ATI catalog](#).
2. Loctite 222 should be applied to all fasteners without pre-applied adhesive.
3. Some modules may require Loctite 242 when used with ATI's heavy duty product line. Refer to module customer drawing.
4. Series 8 Tool Changers (QC-835 and QC-850) support one standard heavy-duty ledge-mount module position.

4. Operation

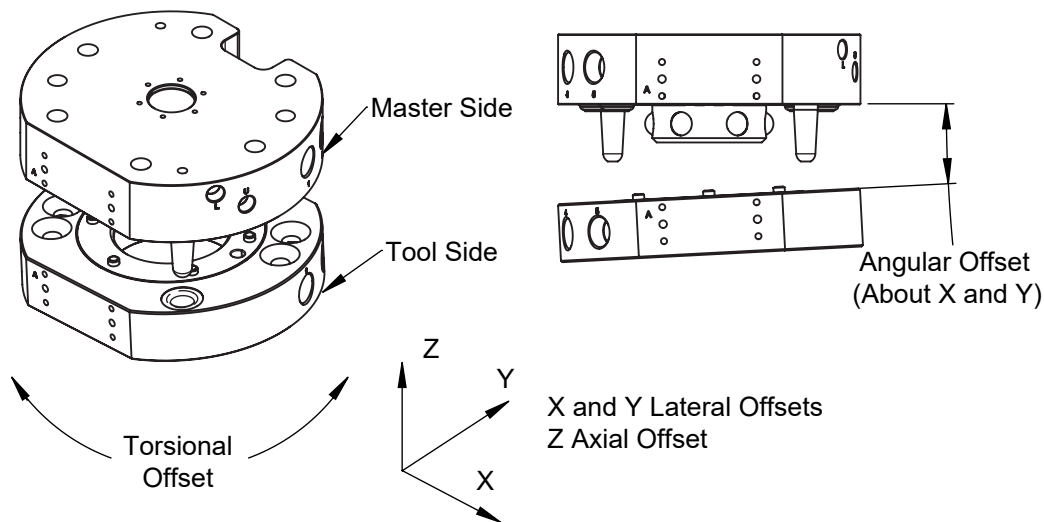


CAUTION: Operation of the Tool Changer is dependent on maintaining an air pressure of 4.1 to 7 bar (60-100 psi). Damage to the locking mechanism could occur. Robot motion must be halted if the air supply pressure drops below 4.1 bar (60 psi).

NOTICE: All Tool Changers are lubricated prior to shipment. The customer must apply additional lubricant to the locking mechanism components and alignment pins prior to operation. Tubes of lubricant for this purpose are shipped with every Tool Changer.

NOTICE: Standard Tool Changers require MobilGrease XHP222 Special (a NLGI #2 lithium complex grease with molybdenum disulfide). For custom applications, such as food grade or surgical applications, specialized lubricants might be required.

Figure 4.1— Offset Definitions (QC-76 Shown)



"No-Touch" locking technology simplifies robot point teaching and reduces wear during locking and unlocking. To enable, follow guidelines in [Table 4.1](#) for maximum permissible offsets between Master and Tool.

Table 4.1—Maximum Permissible Offsets Between Master and Tool When Locking

QC Model	Max Axial Offset Z	Max Lateral Offset XY	Max Angular Offset XY	Max Torsional Offset Z
QC-1	1 mm	2 mm	±0.7°	±1°
QC-7	1.5 mm	1 mm	±0.8°	±2°
QC-11	1.5 mm	1 mm	±0.8°	±2°
QC-20	2 mm	1 mm	±0.8°	±2°
QC-21	2 mm	1 mm	±0.8°	±2°
QC-29	1.5 mm	1 mm	±0.8°	±1°
QC-40Q	3 mm	2 mm	±1.0°	±2°
QC-41	3 mm	2 mm	±1.0°	±2°
QC-46	2.5 mm	1.5 mm	±1.0°	±2°
QC-60	3 mm	2 mm	±0.6°	±1°
QC-71	3 mm	2 mm	±0.6°	±1°
QC-76	2 mm	1 mm	±0.7°	±1°
QC-110	3 mm	1 mm	±0.7°	±1°
QC-160	2 mm	2 mm	±0.7°	±1°
QC-210	2 mm	2 mm	±0.7°	±1°
QC-310	2.5 mm	2 mm	±0.7°	±1°
QC-510	2.5 mm	2 mm	±0.7°	±1°
QC-835	1.5 mm	2 mm	±0.7°	±1°
QC-850	1.5 mm	2 mm	±0.7°	±1°
QC-1210	1 mm	2 mm	±0.7°	±1°
QC-1310	1.65 mm	2 mm	±0.7°	±1°
QC-1510	1 mm	2 mm	±0.7°	±1°

Notes:

1. Maximum values shown. Decreasing the actual values minimizes wear during coupling and uncoupling.

4.1 Coupling Process

1. Ensure locking mechanism is unlocked. Failure to do so may damage equipment.
2. Position Master above Tool with air supplied to unlock port.
 - If equipped, unlock sensor indicates Tool Changer is unlocked.
3. Align Master and Tool axially and parallel to each other.
4. Lower Master toward Tool until Max Axial Offset Z distance is achieved. See [Table 4.1](#).
 - If applicable, the ready-to-lock (RTL) sensor will illuminate for verification.
 - Note: Better alignment minimizes wear of equipment.
5. Release pressure from unlock port and supply air to the lock port.
 - Tool side is pulled into Master side to couple.
 - If equipped, lock sensor indicates Tool Changer is in locked position.
6. Program a slight delay to ensure locking process is complete prior to moving robot.



CAUTION: If air pressure is lost during operation, ATI's patented fail-safe design prevents the Tool side from being released. Do not use the Tool Changer in a fail-safe condition. Re-establish air pressure and ensure the Tool Changer is in a secure lock position before returning to normal operation. Refer to [Section 4.4—Fail-Safe Operation](#).

4.2 Uncoupling Process

1. Position Tool in Tool Stand so there is little or no contact force between Tool and Tool Stand.
2. Release air from the lock port and supply air to the unlock port.
 - If equipped, unlock sensor will indicate the Tool Changer is in the unlocked position.
 - Tool weight will assist in uncoupling if Tool is released in vertical position.
3. Program a sufficient delay to ensure Tool is fully released before moving the robot.
4. Carefully lift Master away from Tool, avoiding interference with Tool Stand.
 - It is recommended a Tool presence sensor be used in the Tool Stand to verify the Tool is present in Tool Stand.

4.3 Missed Tool Condition

A missed tool condition occurs when the Master side Tool Changer has locked without a Tool. The missed tool condition is specific to ATI's Heavy Duty Tool Changer line.

Mechanically, the locking mechanism piston has fully extended, beyond the range of both the unlock and lock sensors. In this case, an error is generated and the robot program should be halted. Inspect the situation to determine the cause of the issue.

In some cases, a manual valve override may be required. Refer to the user module manual for instructions.

4.4 Fail-Safe Operation



CAUTION: Do not use the Tool Changer in a fail-safe condition. Damage to the locking mechanism could occur. Re-establish air pressure and ensure the Tool Changer is in a secure lock position before returning to normal operation.

A fail-safe occurs when lock air pressure to the Master side is unintentionally lost. This may cause slight separation between the Master and Tool sides, and the lock sensor may show the unit as unlocked.

ATI's patented fail safe feature uses a multi-tapered cam to trap the ball bearings and prevent an unintended release. Positional accuracy is not maintained during this state.

If air is lost, halt movement until pressure is restored. Once air is re-established, the locking mechanism re-engages to secure the Tool Changer. If the load is significantly off-center, reposition it beneath the Tool Changer or return it to the Tool Stand to ensure a secure couple.

Before resuming operation, confirm the lock sensor indicates a locked state.

4.5 Pneumatic Connections and Valve Requirements

Proper operation of the locking mechanism requires a constant supply of clean, dry, non-lubricated air. Specific pneumatic conditions will vary depending on the Tool Changer model. Refer to [Table 7.1](#).

4.5.1 Valve Requirements and Connections for the Locking Mechanism

NOTICE: ATI's Heavy Duty and Series 8 Tool Changer line typically operate with a valve adapter and control module to manage the locking mechanism. Therefore, no external valve is required within those applications.

NOTICE: A valve adapter module has an integrated solenoid valve and only requires the customer to supply a single air source to the valve adapter.

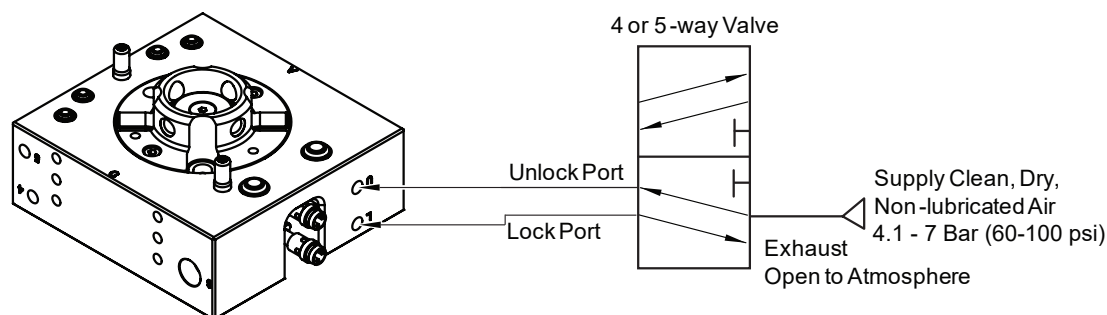


CAUTION: The locking mechanism will not function properly when connected to a 3-way valve as this type of valve is incapable of venting trapped air or vacuum from within the Tool Changer. This could result in damage to the product, attached tooling, or injury to personnel. Connect the lock and unlock supply air to a 2-position, 4-way or 5-way valve with either 4-port or 5-port configuration.

The customer must supply a 2-position, 4-way or 5-way valve with either a 4-port or 5-port configuration for any Tool Changer not equipped with a valve adapter. See [Figure 4.2](#).

When air is supplied to the lock port, the unlock port must be vented to atmosphere. And vice versa, when air is supplied to the unlock port, the lock port must be vented to atmosphere. Failure to vent trapped air may prevent coupling or uncoupling.

Figure 4.2— Lock and Unlock Pneumatic Connections



QC-29 Master shown. Refer to Tool Changer customer drawing to confirm location of lock and unlock ports.

4.6 Optional Sensing

Nearly every ATI Tool Changer is available with lock and unlock sensors in some capacity, and many have ready-to-lock (RTL) sensing, as well. [Table 4.2](#) outlines specific Tool Changer sensor options.

For each sensing option, two sensor types are available:

- PNP Sensing
- NPN Sensing

[Figure 4.3](#) and [Figure 4.4](#) outline PNP and NPN sensing circuitry. However, both types adhere to the following specifications:

- Voltage Supply Range: 10-30 VDC
- Output Circuit: Make Function (NO)

Figure 4.3—PNP Type Lock, Unlock and RTL Sensors

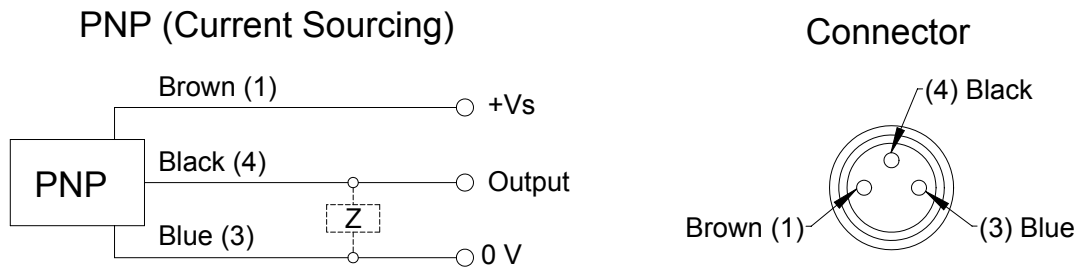


Figure 4.4—NPN Type Lock, Unlock and RTL Sensors

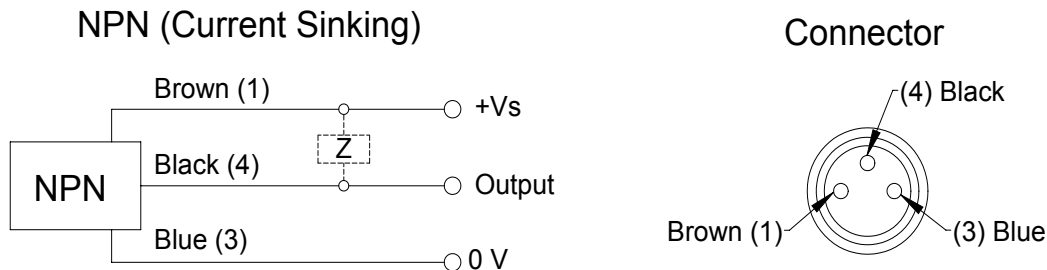


Table 4.2—Tool Changer Sensing Options				
QC Model	Lock and Unlock Sensing		Ready to Lock Sensing	Missed Tool Sensing
	Integrated Sensing	External Sensing		
QC-1				
QC-7	✓			
QC-11		✓		
QC-20 ¹		✓		✓
QC-21 ¹		✓		✓
QC-29	✓			
QC-40Q	✓			
QC-41		✓		
QC-46	✓			
QC-60		✓		
QC-71		✓		
QC-76	✓		✓	
QC-110	✓		✓	✓
QC-160	✓		✓	
QC-210	✓		✓	✓
QC-310	✓		✓	✓
QC-313	✓		✓	✓
QC-510	✓		✓	✓
QC-835	✓		✓	
QC-850	✓		✓	
QC-1210	✓		✓	✓
QC-1310	✓		✓	✓
QC-1510	✓		✓	✓
Notes: 1. QC-20 and QC-21 include Missed Tool sensing if a Sensor Interface Plate (SIP) is present. 2. If sensors are not used, plugs are provided to seal the locking mechanism.				

5. Maintenance

A visual inspection and preventive maintenance schedule for the Tool Changer is provided in the following table. Refer to individual module documentation for detailed preventive maintenance steps for all utility modules.

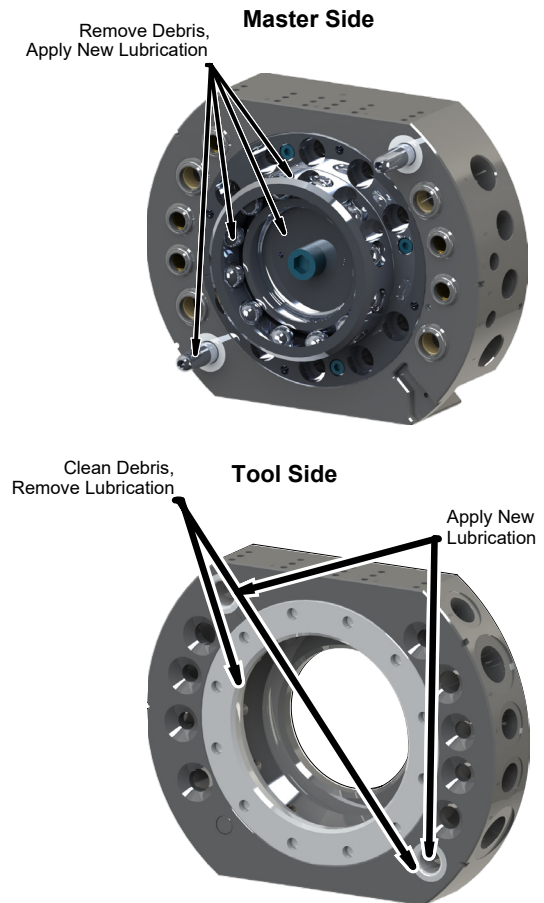
Table 5.1—Preventive Maintenance Check List		
Application(s)	Tool Change Frequency	Inspection Schedule
General Usage Material Handling Docking Station	> 1 per minute	Weekly
	< 1 per minute	Monthly
Welding/Servo/Deburring, Foundry Operations (Dirty Environments)	All	Weekly
Checklist		
Mounting Fasteners/Interface Connections		
☐ Inspect fasteners for proper torque, interference, or wear. Tighten and correct as required. Refer to Section 3—Installation		
Balls/Alignment Pins/Holes/Bearing Race		
☐ Inspect for lubrication and wear. 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. See Section 5.1—Cleaning and Lubrication of the Locking Mechanism and Alignment Pins .		
☐ Inspect pin and bushing for excessive wear, which 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. Replace worn alignment pins, refer to Section 6.2.3—Alignment Pin Replacement		
☐ Inspect for wear on the balls/bearing race, which could be an indication of excessive loading.		
Sensors and Cables		
☐ Inspect sensor cable connectors for tightness, and if loose, tighten connections.		
☐ Inspect sensor cables for any damage, cuts, and abrasion. Replace as necessary.		
Hoses		
☐ Inspect hose connections for tightness and leaks. If leaking or loose, secure hose connection.		
☐ Inspect hoses for interferences, abrasions, cuts, and leaks. Replace as required.		
Seals (Pass-Through Air)		
☐ Inspect for wear, abrasion, and cuts. Replace damaged rubber bushings as needed. Refer to Section 6.2.2—Rubber Bushing Inspection and Replacement .		

5.1 Cleaning and Lubrication of the Locking Mechanism and Alignment Pins

Supplies required: Clean rag, MobilGrease® XHP222 Special Grease

Figure 5.1—Tool Changer Cleaning Locations

1. Place Tool in a secure location.
2. Uncouple Master and Tool.
3. Turn off and de-energize all circuits.
4. Use clean rag to thoroughly remove any lubricant and debris from:
 - Master side ball bearings
 - Master side male coupling
 - Master side cam
 - Master side pins
 - Tool side bearing race
 - Tool side alignment bushings
5. Check each ball bearing to ensure it moves freely in male coupling.
6. Apply a liberal coating of lubricant to:
 - Master side ball bearings
 - Master side male coupling
 - Tool side alignment bushings



6. Troubleshooting and Service Procedures

Troubleshooting and service information is provided in the following section to help diagnose conditions and repair the Tool Changer.



WARNING: Do not perform maintenance or repair(s) on the Tool Changer or modules unless the Tool is safely supported or placed in the Tool Stand, all energized circuits (for example: electrical, air, water, etc.) are turned off, pressurized connections are purged and power is discharged from circuits in accordance with the customer specific safety practices and policies. Injury or equipment damage can occur with the Tool not placed and energized circuits on. Place the Tool in the Tool Stand, turn off and discharge all energized circuits, purge all pressurized connections, and verify all circuits are de-energized before performing maintenance or repair(s) on the Tool Changer or modules.



CAUTION: Thread locker applied to fasteners must not be used more than once. Fasteners might become loose and cause equipment damage. Always apply new thread locker when reusing fasteners.

6.1 Troubleshooting

Check these conditions for all symptoms prior to troubleshooting:

- Proper pneumatic and electrical connections to the Tool Changer.
- Air supplied per specification listed in [Table 7.1](#).
- No air or vacuum can be trapped in a de-energized lock or unlock port. Pressure must be vented to atmosphere.

Table 6.1—Tool Changer Troubleshooting

Symptom	Cause	Resolution
Tool Changer cannot lock and/or unlock (or the lock sensor does not indicate Tool Changer is locked).	Debris caught between the Master and Tool sides.	Clean debris from between the Master and Tool sides. Verify mounting fasteners are secure and does not protrude above the mating surfaces.
	Insufficient air pressure supply	Verify proper air pressure and pneumatic valve is supplied. Refer to Section 4.5—Pneumatic Connections and Valve Requirements .
	Air pressure trapped in de-energized lock or unlock ports.	Air pressure must be vented to the atmosphere properly, refer to Section 4.5—Pneumatic Connections and Valve Requirements
	Pneumatic connections loose or damaged.	Inspect hose connection for tightness and leaks. If leaking or loose secure hose connection. Inspect hoses for interferences, abrasions, cuts, and leaks. Replace as required.
	The ball bearings and/or cam are not moving freely in the male coupling.	Clean and lubricate as needed to restore smooth operation (see Section 5.1—Cleaning and Lubrication of the Locking Mechanism and Alignment Pins).
	The Master and Tool sides are not within the specified No-Touch™ zone when attempting to lock.	Check that Tool is properly seated in the Tool Stand. Re-teach the robot to bring the Master and Tool side closer together prior to attempting to lock.
	The male coupling in the Master side was struck and became dislodged, during coupling.	Contact ATI for assistance.
Insufficient air supply to tooling or an air leak.	The rubber bushings are damaged.	Inspect the rubber bushings for damage. Replace the damaged bushings. Refer to Section 6.2.2—Rubber Bushing Inspection and Replacement .
Unit is locked but the lock signal does not read ON.	Lock sensor/cable is damaged.	Replace the lock sensor subassembly as necessary. Refer to Section 6.2.1—Proximity Sensor Replacement .
Unit is unlocked but the unlock signal does not read ON.	Unlock sensor/cable is damaged.	Replace the unlock sensor subassembly as necessary. Refer to Section 6.2.1—Proximity Sensor Replacement .

6.2 Service Procedures



CAUTION: Pay special attention to ensure the proper procedure is used for user's specific Tool Changer. Attempting to perform a non-compatible procedure on the Tool Changer can result in damage to the equipment.

NOTICE: Each ATI Tool Changer includes unique serviceable parts. Refer to individual customer drawings to verify which individual components can be replaced in the field by the customer.

6.2.1 Proximity Sensor Replacement

NOTICE: The following procedures serve as a general overview for replacing ATI's Tool Changer proximity sensors. There may be slight differences between each Tool Changer. For additional support, it is recommended to contact ATI.

Proximity sensors are extremely reliable and should not require frequent replacement. Should malfunctions occur, evaluate all other possible solutions before testing or replacing the sensor. Check continuity, air supply, lubrication, and pneumatic components.

Refer to [Table 4.2](#) to determine the correct sensor replacement procedure.

6.2.1.1 Standard In-Body Sensor Replacement

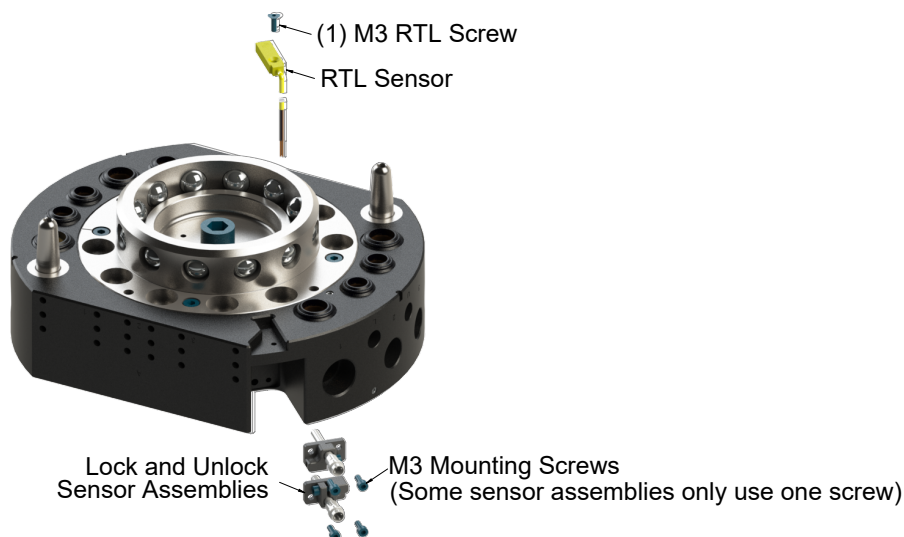
Parts required: Refer to Tool Changer Customer Drawing

Tools required: 2 mm hex tool, 2.5 mm hex tool, torque wrench

NOTICE: Some PNP and NPN sensors have hard-wired cables. However, some sensors have a quick disconnect end that connects to a connector on a customer supplied cable.

NOTICE: Not every Tool Changer is equipped with Ready-to-Lock (RTL) sensors. Refer to Tool Changer customer drawing to verify if RTL sensors are present.

Figure 6.1—Lock, Unlock, RTL Sensor Assembly Replacement



1. Use hex tool to remove the screw(s) that secure lock and unlock sensors to the Master.
2. Pull sensor assembly straight out of Master. If present, retain sensor O-rings for reuse. Discard and replace O-ring if damaged.



CAUTION: The lock and unlock sensor assemblies are precision aligned and permanently assembled at the factory. Do not attempt to disassemble and rebuild.

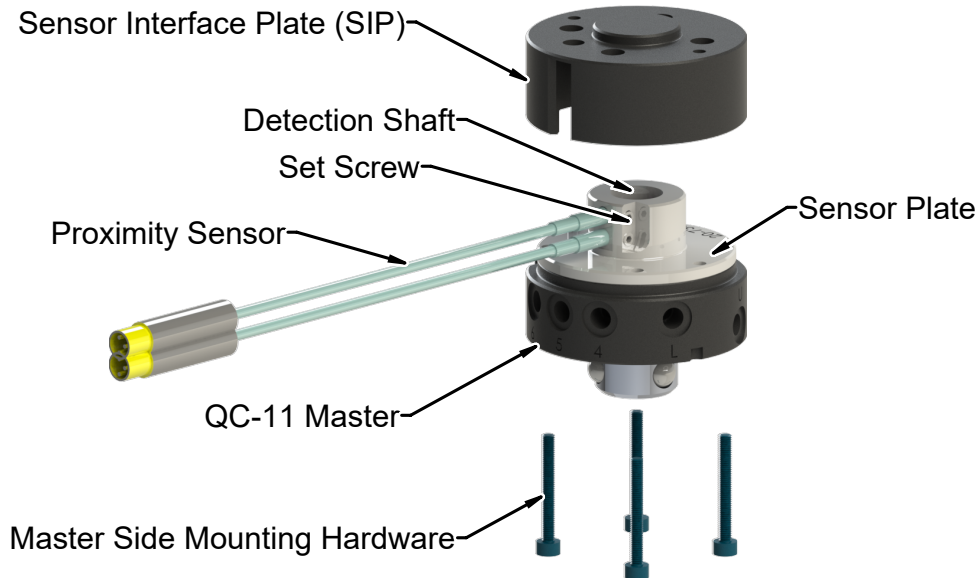
3. Discard removed sensor.
4. Insert new sensor into Master.
5. Apply Loctite 222 to the M3 socket head cap screw(s).
6. Use hex tool to secure sensor assembly to Master.
7. Tighten to 1.4 Nm.
8. Disconnect RTL sensor cable.
9. Use hex tool to remove screw that secures RTL sensor to Tool Changer body.
10. Remove and discard RTL sensor.
11. Install new RTL sensor to Tool Changer body.
12. Apply Loctite 222 to RTL sensor screws.
13. Secure sensor to Tool Changer body
14. Tighten to 0.4 Nm.
15. Connect RTL sensor cable.
16. Confirm operation of RTL sensor by bringing a metallic object into close proximity to the face of the sensor. LED within the body of sensor should light up.

6.2.1.2 Sensor Interface Plate (SIP) Style Replacement

Parts required: Refer to Tool Changer Customer Drawing

Tools required: 1.5 mm hex tool, 2 mm, 2.5 mm or 3 mm hex tool, torque wrench

Figure 6.2— SIP Sensor Replacement



1. Remove Master from SIP. Support Master side while loosening screws.
2. Unscrew proximity sensor from the sensor plate. Discard old sensor.
 - Some proximity sensors include a hex nut. Loosen this hex nut to remove the sensor.
3. If equipped, back the sensor hex nut onto the cable end of the sensor.
4. Thread new proximity sensor into the sensor plate until it touches detection shaft. Then back the sensor out by a half-turn.
5. From an overhead view of the sensor plate, verify detection shaft does not touch lock and unlock sensors. If the sensors touch the shaft, adjust the sensor position.
6. Connect sensor cable. With power turned on sensor LED should illuminate.



CAUTION: Do not operate locking mechanism with sensor touching the detection shaft. Operating locking mechanism with sensor touching detection shaft will damage sensor. Back off the sensor a half-turn and secure with the set screw before operating the locking mechanism.

7. Secure the sensor:
 - QC-11: Turn set screw until it contacts sensor. Then tighten 1/4 turn.
 - All other QCs: Apply Loctite 222 to sensor threads. Tighten hex nut. Torque to 0.90 Nm.



CAUTION: Be careful not to over tighten. Over tightening can cause damage to the proximity sensor.

8. Attach the Master to the interface plate.
 - Use hex tool to secure Master to interface plate with Master mounting screws.
 - Tighten to torque values according to [Table 3.1](#).
9. Connect utilities to the optional modules on the Master side.
10. Provide lock or unlock air to Tool Changer, and verify corresponding sensor signal is ON and sensor LED is illuminated.

6.2.1.3 Heavy Duty and Series 8 Sensor Replacement

Parts required: Refer to Tool Changer Customer Drawing

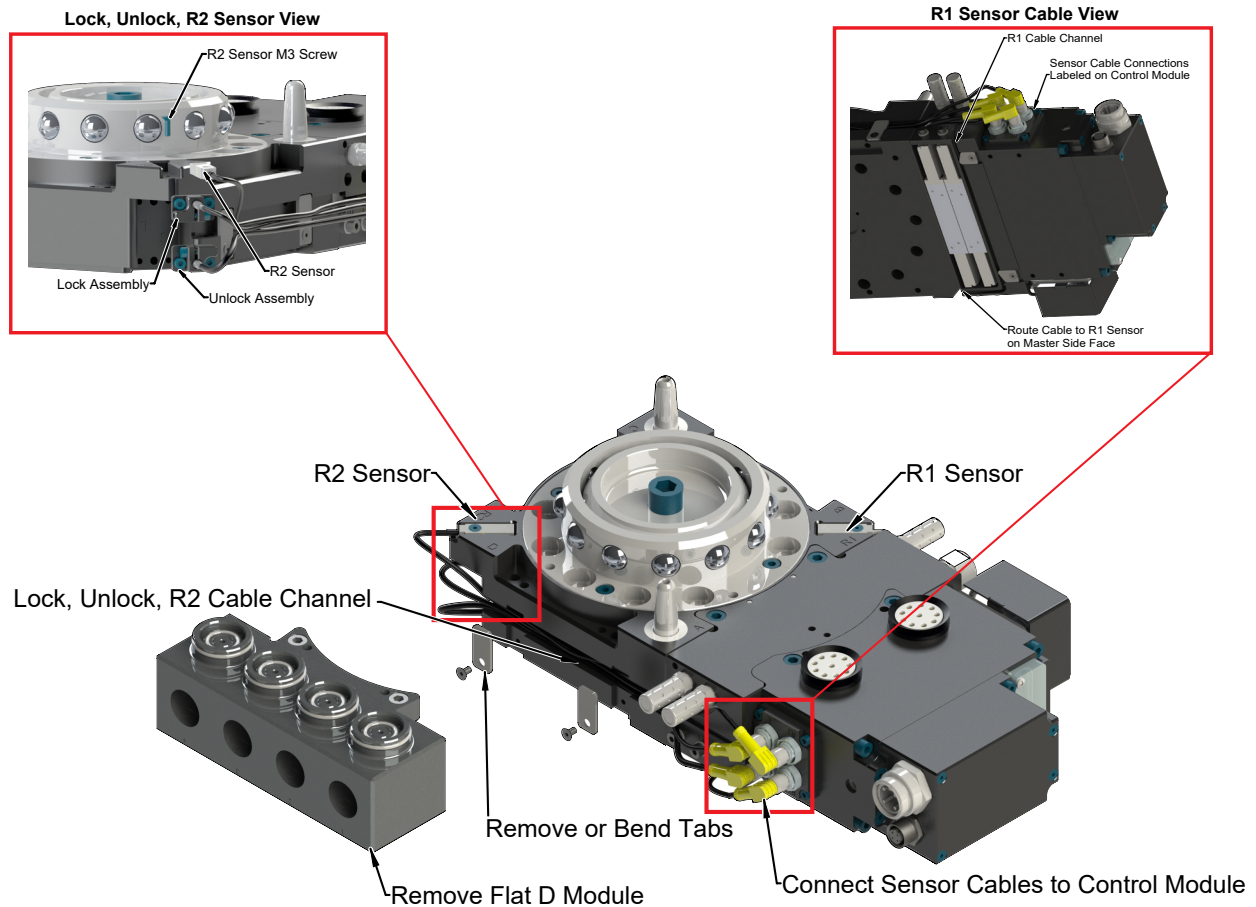
Tools required: 2.0 mm hex tool, 2.5 mm hex tool, 5 mm hex tool, 13mm wrench, torque wrench

Table 6.2—Heavy Duty Tool Changer Sensor Replacement Torque Values

QC Model	Lock/Unlock Sensor Assembly	RTL 1 (R1)	RTL 2 (R2)
QC-210	1.4 Nm	0.4 Nm	0.4 Nm
QC-310 ¹	1.4 Nm	Jam Nut: 2.3 Nm	Jam Nut: 2.3 Nm
QC-510 ¹	1.4 Nm	Jam Nut: 2.3 Nm	Jam Nut: 2.3 Nm
QC-835	1.4 Nm	0.7 Nm	0.7 Nm
QC-850	1.4 Nm	0.7 Nm	0.7 Nm
QC-1210 ¹	1.4 Nm	Jam Nut: 2.3 Nm	Jam Nut: 2.3 Nm
QC-1310 ¹	1.4 Nm	Jam Nut: 2.3 Nm	Jam Nut: 2.3 Nm
QC-1510 ¹	1.4 Nm	Jam Nut: 2.3 Nm	Jam Nut: 2.3 Nm

1. RTL sensors are threaded and secured with a jam nut.

Figure 6.3—Lock, Unlock, and RTL Sensor Assembly Replacement



All Heavy Duty and Series 8 Lock and Unlock Sensor Replacement

1. If installed, remove modules on Flats C and D with 5 mm hex tool.
2. Use 2 mm hex tool to remove cable retaining tabs on Flat D of Master side.
 - If tabs are metallic, they can be bent instead of removed.
3. Unscrew the lock and unlock sensor cable connectors from control module on Flat A.
4. Use 2.5 mm hex tool to remove M3 screw(s) that secure the lock and unlock sensors to Master.
5. Pull sensor assemblies straight out from Master.
6. Install new lock and unlock sensors, routing cables through cable channel on the Master.
7. Attach lock and unlock sensor cable connectors to proper connector on the control module.
8. Secure sensors using the M3 screw(s).
9. Torque according to specification outlined in [Table 6.2](#).
10. Reinstall Flat D cable retaining tabs with M3 screws, or bend back into position.
11. Tighten cable retaining tab screws to 1 Nm using a 2 mm hex tool.
12. If optional modules were installed on Flats C and D, reinstall the modules.
13. Confirm operation of the unlock sensor by unlocking the Master side and then checking to see if unlock sensor cable LED is on.

QC-210 and Series 8 RTL Sensor Replacement

RTL 1:

1. Remove RTL 1 sensor connector from control module.
2. If equipped, remove tabs from sensor channel.
 - If tabs are metallic, they can be bent instead of removed.
3. Replace RTL 1 sensor:
 - i. Use 2 mm hex tool to remove M3 screw.
 - ii. Remove sensor.
 - iii. Apply Loctite 222 to threads of new M3 screw.



CAUTION: Thread locker applied to fasteners must not be used more than once. Fasteners might become loose and cause equipment damage. Always apply new thread locker when reusing fasteners.

- iv. Secure new sensor to Master with M3 screw and applied threadlocker.
 - v. Torque according to specification outlined in [Table 6.2](#).
4. Reroute RTL 1 cable through the channel along the valve module.
5. Attach the cable connector to the RTL 1 connection on the control module.
6. Verify the sensor operates correctly:
 - i. Move a metal object close to the RTL 1 sensor. Verify sensor LED is on.
7. Reinstall (or bend) the sensor channel tabs to secure cable.

RTL 2:

1. If installed, remove modules on Flats C and D with 5 mm hex tool.
2. Use 2 mm hex tool to remove the cable retaining tabs on Flat D of Master side.
 - If tabs are metallic, they can be bent instead of removed.
3. Unscrew the RTL 2 sensor cable connector from control module on Flat A.
4. Use 2.5 mm hex tool to remove M3 screw that secures the RTL 2 sensor to Master.
5. Pull sensor straight out from Master.
6. Install new RTL 2 sensor, routing cable through cable channel on the Master.
7. Attach RTL 2 sensor cable connectors to proper connector on control module.
8. Secure sensor using the M3 screw.
9. Torque according to specification outlined in [Table 6.2](#).
10. Reinstall Flat D cable retaining tabs or bend back into position.
11. Tighten cable retaining tab screws to 1 Nm using a 2 mm hex tool.
12. If optional modules were installed on Flats C and D, reinstall the modules.

QC-310, QC-510, QC-1210, QC-1310, QC-1510 RTL Sensor Replacement

RTL 1:

1. Remove all sensor connectors from control module.
2. Remove valve and control module from Tool Changer with 5 mm hex key.
3. Remove the cable retaining tabs from sensor channel with 2 mm hex key.
 - If tabs are metallic, they can be bent instead of removed.
4. Remove RTL 1 sensor cable from sensor by pulling back on locking sleeve.
5. Remove RTL 1 sensor:
 - i. Loosen jam nut that secures sensor with 13 mm socket wrench.
 - ii. Unscrew RTL 1 sensor from Tool Changer and discard
6. Install RTL 1 sensor:
 - i. Apply Loctite 222 to new RTL 1 sensor.
 - ii. Screw RTL 1 sensor into Tool Changer until face of sensor is flush with Master.
 - iii. Tighten jam nut with 13 mm socket wrench. Torque to 2.3 Nm.
7. Install sensor cable:
 - i. Insert cable onto RTL 1 sensor.
 - ii. Route sensor cable through channel on Tool Changer.
 - iii. Secure cable by re-installing cable retaining tabs.
 - iv. Install valve and control module using 5 mm hex tool. Torque according to [Table 6.2](#).
 - v. Connect RTL 1 sensor cable connector to control module.
8. Confirm operation of RTL 1 sensor by bringing metallic object in close proximity of sensor face and ensure LED illuminates.

RTL 2:

1. If installed, remove modules on Flats C and D with 5 mm hex tool.
2. Use 2 mm hex tool to remove cable retaining tabs on Flat D of Master side.
 - If tabs are metallic, they can be bent instead of removed.
3. Unscrew RTL 2 sensor cable connector from control module on Flat A.
4. Remove RTL 2 sensor cable from sensor by pulling back on locking sleeve.
5. Remove RTL 2 sensor:
 - i. Loosen jam nut that secures sensor with 13 mm socket wrench.
 - ii. Unscrew RTL 2 sensor from Tool Changer and discard.
6. Install RTL 2 sensor:
 - i. Apply Loctite 222 to new RTL 2 sensor.
 - ii. Screw RTL 2 sensor into Tool Changer until face of sensor is flush with Master.
 - iii. Tighten jam nut with 13 mm socket wrench. Torque to 2.3 Nm.
7. Install sensor cable:
 - i. Insert cable onto RTL 2 sensor.
 - ii. Route sensor cable through channel on Tool Changer.
 - iii. Secure cable by re-installing cable retaining tabs.
 - iv. Connect RTL 2 sensor cable connector to control module.
8. Confirm operation of RTL 2 sensor by bringing metallic object in close proximity of sensor face and ensure LED illuminates.
9. If optional modules were installed on Flats C and D, reinstall the modules.

6.2.2 Rubber Bushing Inspection and Replacement

The Tool Changer rubber bushings seal the air passage from the Master side to the Tool side. If the bushings become cut or damaged, they should be replaced.

Refer to [Table 6.3](#) to verify the correct procedure.

Figure 6.4 —Rubber Bushing Replacement Styles

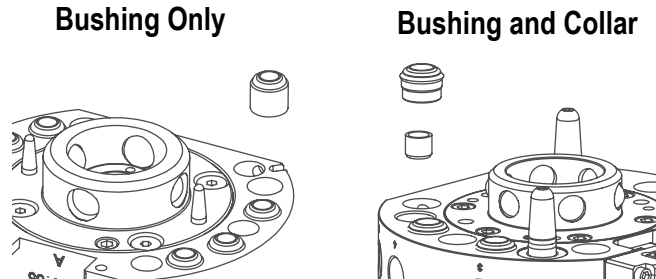


Table 6.3—Tool Changer Bushing Replacement

QC Model	Bushing Replacement Style
QC-1	O Rings Only (Follow bushing replacement instructions)
QC-7	Bushing Only
QC-11	Bushing Only
QC-20	Bushing Only
QC-21	Bushing Only
QC-29	Bushing Only
QC-40Q	Bushing Only
QC-41	Bushing Only (1/8 Ports), Bushing and Collar (3/8 Ports)
QC-46	N/A
QC-60	Bushing Only
QC-71	Bushing Only
QC-76	Bushing and Collar
QC-110	Bushing and Collar
QC-160	Bushing and Collar
QC-210	N/A
QC-310	N/A
QC-510	N/A
QC-835	N/A
QC-850	N/A
QC-1210	N/A
QC-1310	N/A
QC-1510	N/A

6.2.2.1 Rubber Bushing Replacement: Bushing Only

Parts required: Refer to Tool Changer customer drawing

Figure 6.5 —Rubber Bushing Replacement



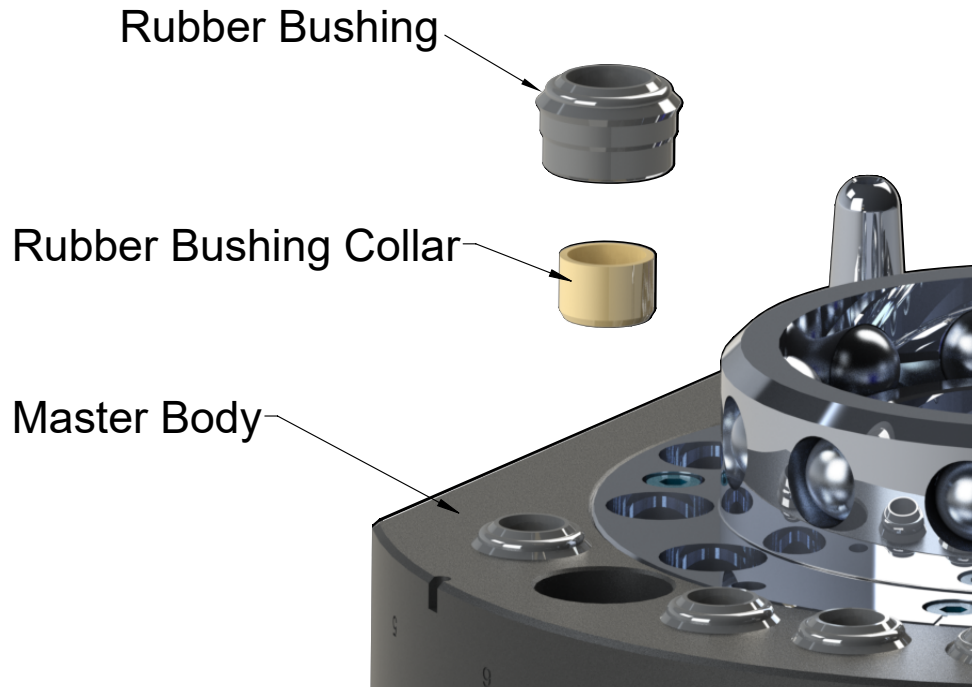
1. Place Tool in secure location.
2. Uncouple Master and Tool.
3. De-energize all energized circuits.
4. Remove damaged rubber bushing by grasping with your fingers and pulling the bushing out of the body.
5. Dip new bushing into water so bushing installs smoothly into the bore.
6. Insert beveled (chamfered) end of the rubber bushing into the bore, leaving ribbed end of the bushing facing outward.
7. Press bushing in by hand until it is seated completely in the bore.
 - If necessary, use a plastic or rubber soft-faced mallet to tap the bushings into place.

6.2.2.2 Rubber Bushing Replacement: Bushing and Collar

Parts required: Refer to Tool Changer customer drawing

Tools required: Needle nose pliers

Figure 6.6—Rubber Bushing Replacement



1. Place Tool in a secure location.
2. Uncouple Master and Tool.
3. De-energize all circuits.
4. Remove damaged rubber bushing by grasping with your fingers and pulling bushing out of the body.
5. Remove the collar if it remains in the Master body.
6. Dip new bushing into water so bushing installs smoothly into the bore.
7. Insert beveled (chamfered) end of the rubber bushing into the bore, leaving ribbed end of bushing facing outward.
8. Press bushing in by hand until it is seated completely in bore.
 - If necessary, use a plastic or rubber soft-faced mallet to tap the bushings into place.
9. Insert new collar into rubber bushing, ensuring bushing is pressed in completely.

6.2.3 Alignment Pin Replacement

Excessive alignment pin/bushing wear could indicate poor robot positioning during pickup/drop-off. Adjust the robot position as needed. Check the Tool Stand for wear and alignment problems. If necessary, replace the alignment pins.

There are two methods that can be used to remove and install a new alignment pin:

- [Option A: Option A: Removal of Alignment Pin](#)
- [Option B: Option B: Removal of Alignment Pin Screw](#)

It is generally preferred to use the first method, but some Tool Changers are designed to where Option B is the only method available. Refer to [Table 6.4](#) to determine the correct method.

Table 6.4—Tool Changer Alignment Pin Replacement			
QC Model	Alignment Pin Replacement Method	Hey Key(s)	Torque
QC-1	N/A	N/A	N/A
QC-7	N/A	N/A	N/A
QC-11	N/A	N/A	N/A
QC-20	N/A	N/A	N/A
QC-21	N/A	N/A	N/A
QC-29	Option B	2.5 mm	1.4 Nm
QC-40Q	N/A	N/A	N/A
QC-41	N/A	N/A	N/A
QC-46	Option A	2.5 mm	2.0 Nm
QC-60	N/A	N/A	N/A
QC-71	N/A	N/A	N/A
QC-76	Option A	4 mm	6.8 Nm
QC-110	Option A	4 mm	6.8 Nm
QC-160	Option A	4 mm	6.8 Nm
QC-210	Option A	4 mm	6.8 Nm
QC-310	Option A	4 mm	6.8 Nm
QC-510	Option A	4 mm	6.8 Nm
QC-835	Option B	6 mm	14.1 Nm
QC-850	Option B	6 mm	14.1 Nm
QC-1210	Option A	5 mm	6.8 Nm
QC-1310	Option A	5 mm	6.8 Nm
QC-1510	Option A	5 mm	6.8 Nm

6.2.3.1 Option A: Removal of Alignment Pin

Parts required: Refer to Tool Changer Customer Drawing

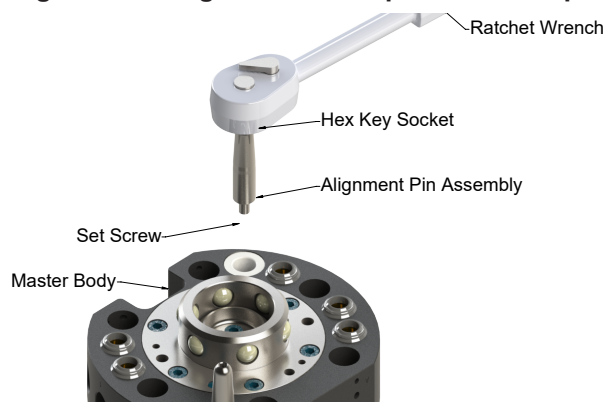
Tools required: Refer to [Table 6.4](#)

Supplies required: MobilGrease XHP222 Special is a NLGL #2 lithium complex grease with molybdenum disulfide.

NOTICE: If for any reason the pin cannot be removed using the hex tool in the tip or from the back side it may be necessary to remove it by other means, such as locking pliers.

1. Place Tool in a secure location.
2. Uncouple Master and Tool.
3. Turn off and de-energize all energized circuits.
4. Unscrew the alignment pin sub-assembly from the Master using a hex tool. Refer to [Table 6.4](#).

Figure 6.7—Alignment Pin Replacement: Top



5. After alignment pin is removed, verify assembly (pin and set screw) is intact. If set screw was not removed from Master, remove it separately using the access hole in the back of the Master.
6. Apply Loctite 242 to the threads.
7. Install new alignment pin assembly into the bushing using a hex tool.
8. Tighten to specification listed in [Table 6.4](#)
9. Apply MobilGrease XHP222 Special grease to the alignment pin.

6.2.3.2 Option B: Removal of Alignment Pin Screw

Parts required: Refer to Tool Changer Customer Drawing

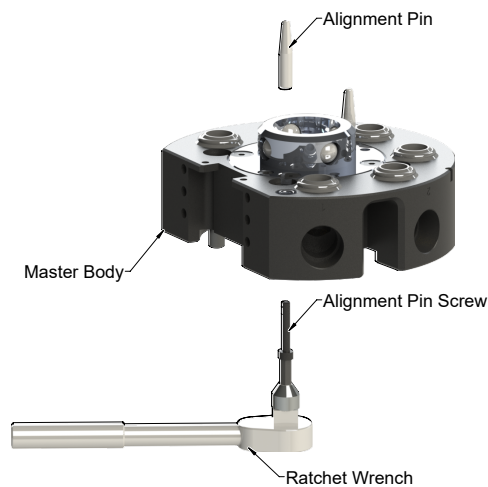
Tools required: Refer to [Table 6.4](#)

Supplies required: MobilGrease XHP222 Special is a NLGL #2 lithium complex grease with molybdenum disulfide.

NOTICE: If for any reason the pin cannot be removed using the hex tool in the tip or from the back side it may be necessary to remove it by other means, such as locking pliers.

1. Place Tool in a secure location.
2. Uncouple Master and Tool.
3. Turn off and de-energize all energized circuits.

Figure 6.8—Alignment Pin Replacement: Screw



4. On back side of the Master, remove the alignment pin screw.
 - a. Use hex tool to remove alignment pin screw.
 - b. Remove alignment pin from Master.
5. After alignment pin is removed, verify the assembly (pin and set screw) is intact. If set screw was not removed from the Master, remove it.
6. Apply Loctite 242 to threads of screw.
7. Install new alignment pin assembly into the bushing using a hex tool.
8. Tighten to specification listed in [Table 6.4](#)
9. Apply MobilGrease XHP222 Special grease to the alignment pin.

7. Specifications

Table 7.1—Tool Changer Operating Conditions

Operating Temperature Range	Operating Pressure Range	Additional Air Requirements
5-60° C	4.1-7 bar ¹	Proper operation of the locking mechanism requires a constant supply of clean, dry, non-lubricated air with the following conditions: • Filter minimum: 40 microns • Flow maximum: 1/3 CFM at 4.8 bar (70 psi), when cycled continuously
1. QC-835 and QC-850 operating pressure range of 4.1 to 8.3 bar, filtered to ISO 8573-1:2010 {7:4:4}.		

Table 7.2—Tool Changer Physical and Payload Specifications

QC Model	Weight (kg)	Locking Force @ 5.5 Bar (N)	Suggested Payload Limit (kg)	Static Moment (Nm)		Dynamic Moment (Nm)		Max Moment (Nm)	
				Mxy	Mz	Mxy	Mz	Mxy	Mz
QC-1	0.05	170	1.5	1	1	2	6	2	6
QC-7	0.3	980	16	20	12	40	90	50	150
QC-11	0.25	1100	16	20	12	40	105	50	150
QC-20	0.85	2300	25	57	35	100	300	80	240
QC-21	0.85	2300	25	57	35	100	300	80	240
QC-29	1.7	2865	35	57	78	170	360	150	450
QC-40Q	1.7	5600	60	226	226	375	1050	350	1050
QC-41	2.2	4500	60	157	216	375	1050	350	1050
QC-46	3	5800	70	226	150	375	1050	400	1200
QC-60	2	7400	100	197	294	500	1500	400	1200
QC-71	2.8	8100	100	395	395	750	1800	600	1800
QC-76	3.7	12000	120	542	701	1000	2400	1800	5400
QC-110	6.8	12000	180	784	784	1500	3000	2000	5400
QC-160	9.4	31000	300	2710	920	5000	10500	2300	5400
QC-210	7.9	31000	300	2710	920	5000	10500	2300	5400
QC-310	19.5	38000	500	3290	3160	7000	15000	6300	13500
QC-510	28.1	62000	1000	4860	3500	10000	30000	7000	13500
QC-835	12.3	21000	300	2000	1200	5000	10500	3600	5400
QC-850	18	48000	700	3510	2110	7000	15000	6300	13500
QC-1210	27.8	93000	1500	5240	5240	12500	12500	37500	25000
QC-1310	64	110000	2300	11000	12600	25000	25000	75000	50000
QC-1510	90.7	190000	4000	16300	13900	35000	30000	87500	50000

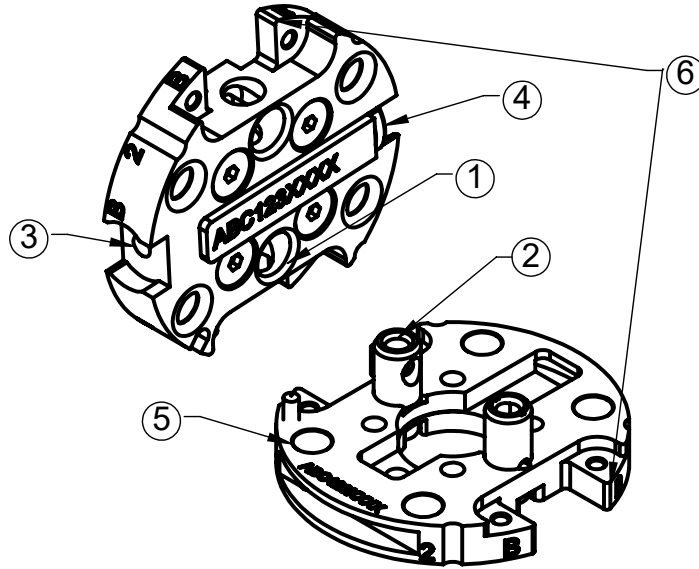
Table 7.3—Tool Changer Pneumatic Specifications					
QC Model	Pneumatic Pass-Through		Lock and Unlock Air Connections		Version
	Number	Size / Type	Number	Size / Type	
QC-1	4	M5	2	M3	Orange
					Black
QC-7	5	M5	2	M5	Orange
					Black
QC-11	6	M5	2	M5	Orange
					Black
QC-20	12	M5	2	M5	Orange
					Black
QC-21	8	1/8 NPT	2	M5	Orange
		G1/8			Black
QC-29	2 4	1/8 NPT M5	2	M5	Orange
	2 4	G1/8 M5			Black
QC-40Q	8	1/8 NPT	2	1/8 NPT	Orange
		G1/8		G1/8	Black
QC-41	4 6	1/8 NPT 3/8 NPT	2	1/8 NPT	Orange
	4 6	G1/8 G3/8		G1/8	Black
QC-46	N/A		2	1/8 NPT	Orange
				G1/8	Black
QC-60	8	1/8 NPT	2	1/8 NPT	Orange
		G1/8		G1/8	Black
QC-71	8	1/4 NPT	2	1/8 NPT	Orange
		G1/4		G1/8	Black
QC-76	5	3/8 NPT	2	1/8 NPT	Orange
		G3/8		G1/8	Black
QC-110	8	3/8 NPT	2	1/8 NPT	Orange
		G3/8		G1/8	Black
QC-160	5 4	3/8 NPT 1/2 NPT	2	1/8 NPT	Orange
	5 4	G3/8 G1/2		G1/8	Black
QC-835	1	G1/2	N/A²		
QC-850	1	G1/2	N/A²		
1. ATI's Heavy Duty Tool Changer line does not have pass-through ports built into the body. Instead, an ATI pneumatic module can be used. 2. ATI's Heavy Duty and Series 8 Tool Changer lines do not have lock and unlock ports built into the body. Instead, a valve adapter with control module attached to the Tool Changer will control all locking, unlocking, and sensing.					

8. Product Drawings

Customer drawings for individual ATI Tool Changers can be found on the [ATI website](#) or by contacting an ATI representative.

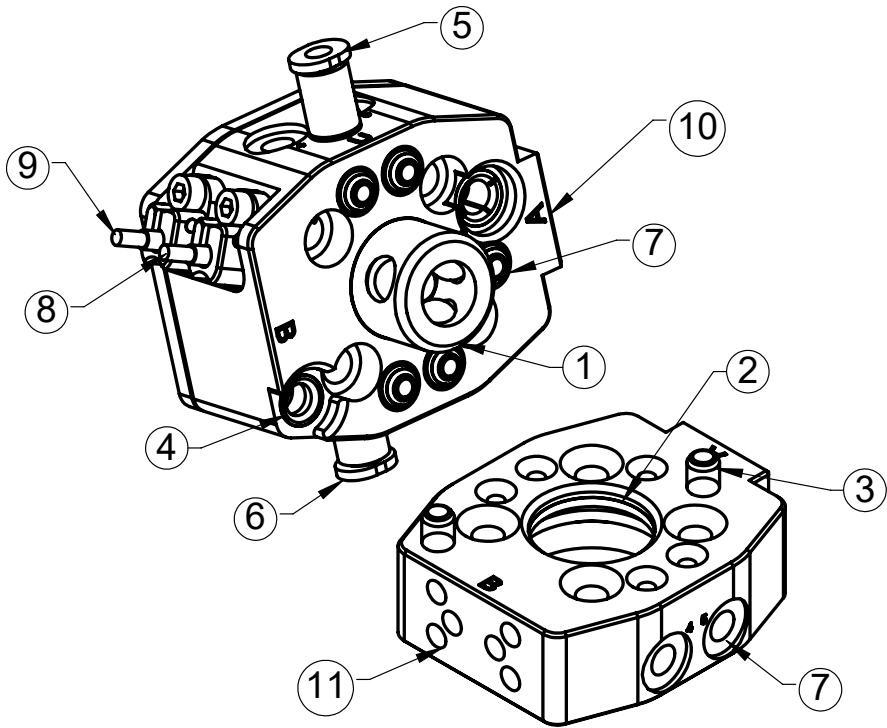
A series of simple drawings highlighting individual Tool Changer model features is found below.

8.1 QC-1 Tool Changer Product Overview



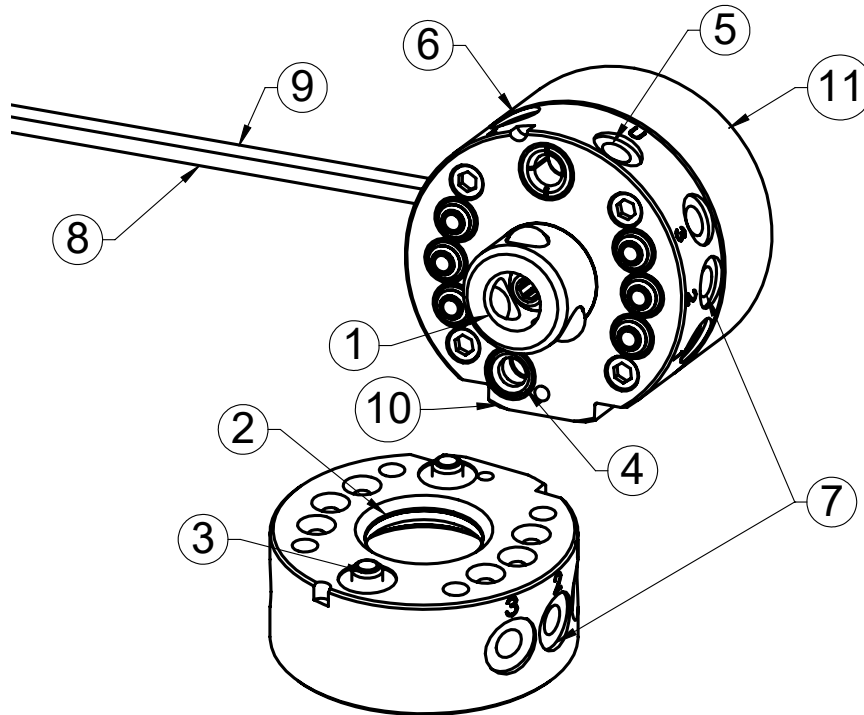
Callout No.	Feature Description
1	Master Alignment Bushing
2	Tool Alignment Pin
3	Unlock Port
4	Lock Port
5	(4) M5 Pass-Through Pneumatic Ports
6	Utility Module Mounting Pattern

8.2 QC-7 Tool Changer Product Overview



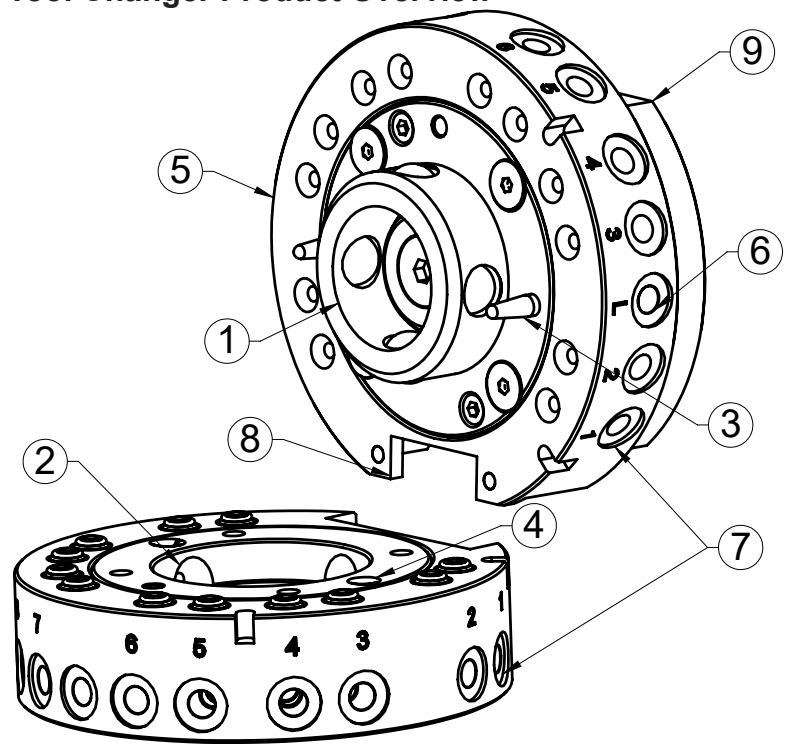
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Tool Alignment Pin
4	Master Alignment Bushing
5	Unlock Port
6	Lock Port
7	(5) M5 Pneumatic Pass-Through Ports
8	Lock Sensor
9	Unlock Sensor
10	Flat A: Utility Module Mounting Pattern
11	Mounting Flat for Optional Tool Stand Hook

8.3 QC-11 Tool Changer Product Overview



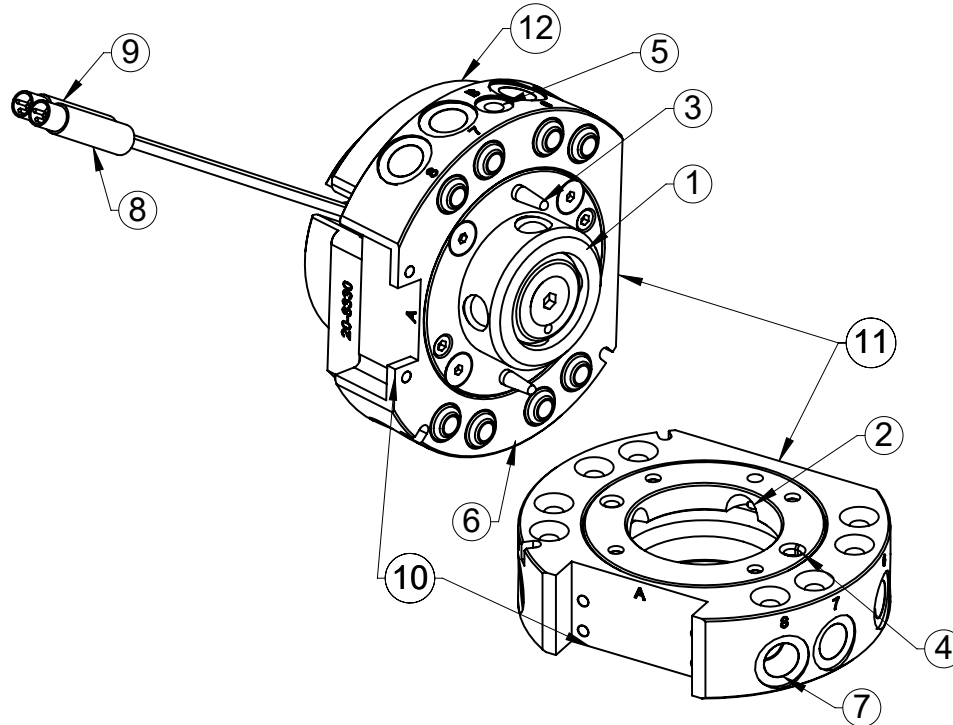
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Tool Alignment Pin
4	Master Alignment Bushing
5	Unlock Port
6	Lock Port
7	(6) M5 Pneumatic Pass-Through Ports
8	Lock Sensor Cable
9	Unlock Sensor Cable
10	Flat A: Utility Module Mounting Pattern
11	Sensor Interface Plate

8.4 QC-20 Tool Changer Product Overview



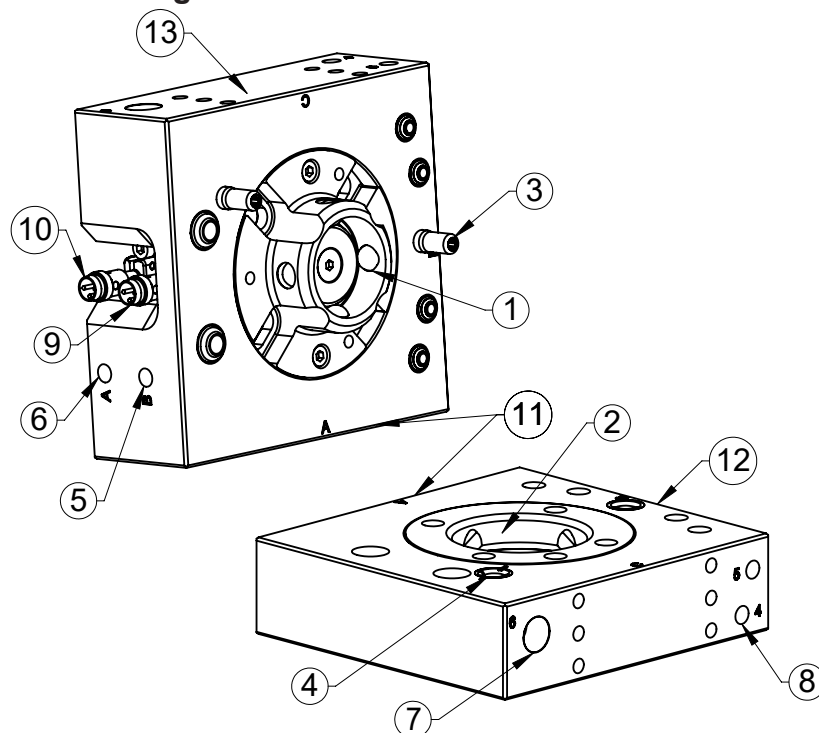
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port (Hidden in Drawing)
6	Lock Port
7	(12) M5 Pneumatic Pass-Through Ports (Depending on Model)
8	Flat A: Utility Module Mounting Pattern
9	Robot Interface Plate

8.5 QC-21 Tool Changer Product Overview



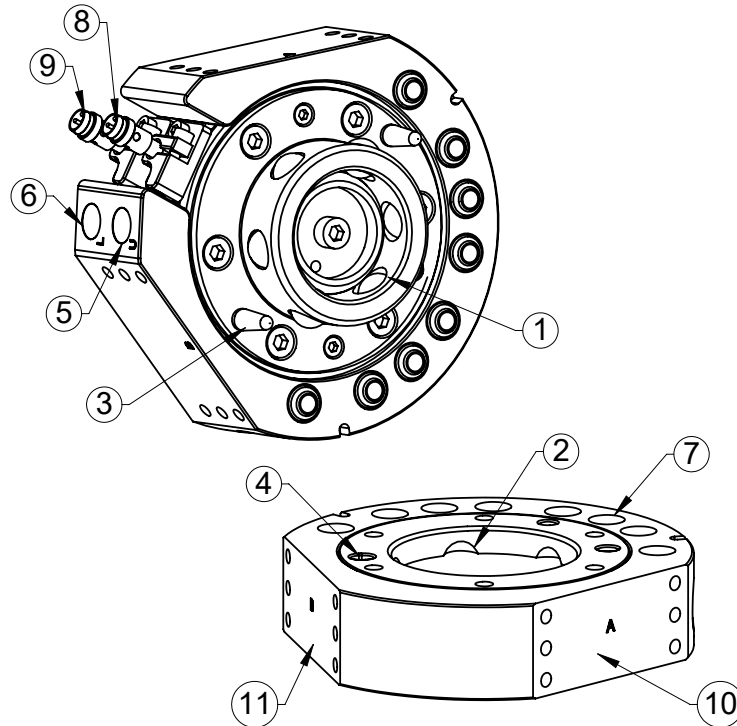
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port (Labeled as 'B')
6	Lock Port (Labeled as 'A', Hidden in Drawing)
7	(8) G1/8 Pneumatic Pass-Through Ports
8	Lock Sensor Cable
9	Unlock Sensor Cable
10	Flat A: Utility Module Mounting Pattern
11	Flat B: Utility Module Mounting Pattern
12	Sensor Interface Plate

8.6 QC-29 Tool Changer Product Overview



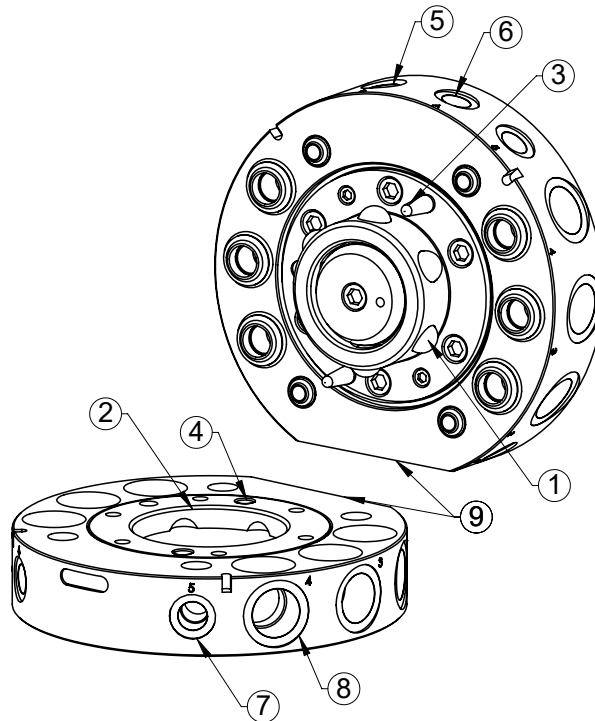
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port (Labeled as 'B')
6	Lock Port (Labeled as 'A')
7	(2) G1/8 Pneumatic Pass-Through Ports
8	(4) M5 Pneumatic Pass-Through Ports
9	Lock Sensor
10	Unlock Sensor
11	Flat A: Utility Module Mounting Pattern
12	Flat B: Utility Module Mounting Pattern
13	Flat C: Utility Module Mounting Pattern

8.7 QC-40Q Tool Changer Product Overview



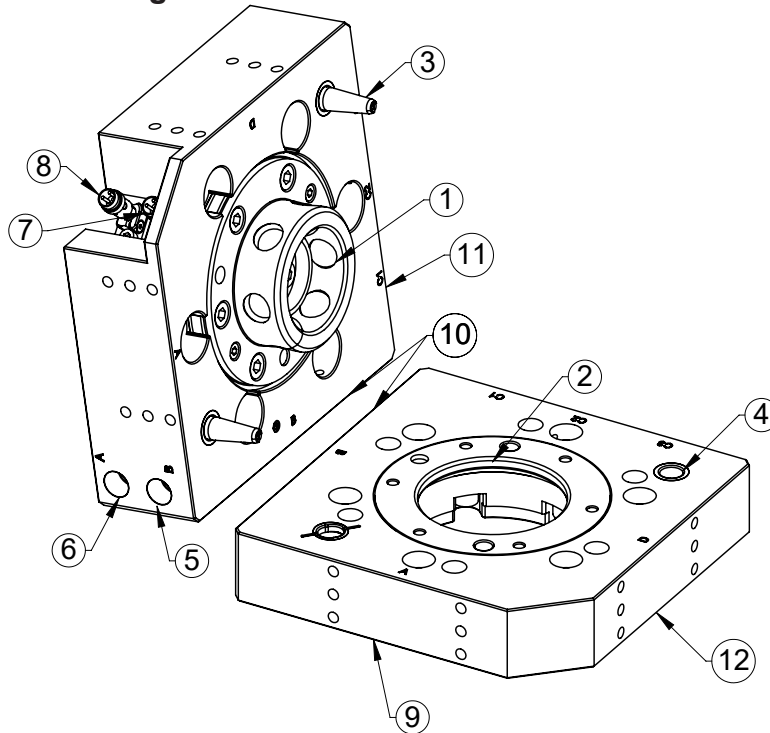
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port
6	Lock Port
7	(8) G1/8 Pneumatic Pass-Through Ports
8	Lock Sensor
9	Unlock Sensor
10	Flat A: Utility Module Mounting Pattern
11	Flat B: Utility Module Mounting Pattern

8.8 QC-41 Tool Changer Product Overview



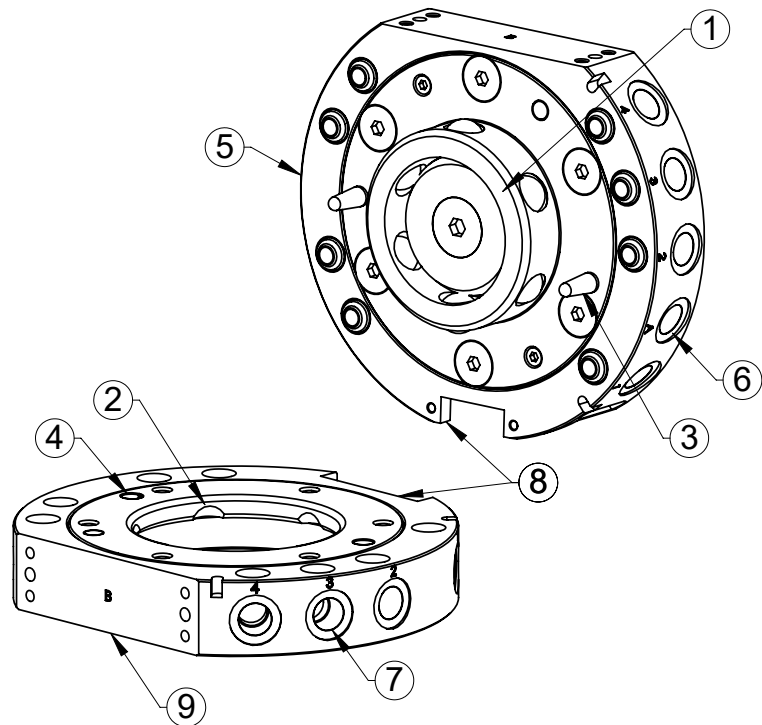
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port (Labeled as 'B')
6	Lock Port (Labeled as 'A')
7	(4) G1/8 Pneumatic Pass-Through Ports
8	(6) G3/8 Pneumatic Pass-Through Ports
9	Flat A: Utility Module Mounting Pattern

8.9 QC-46 Tool Changer Product Overview



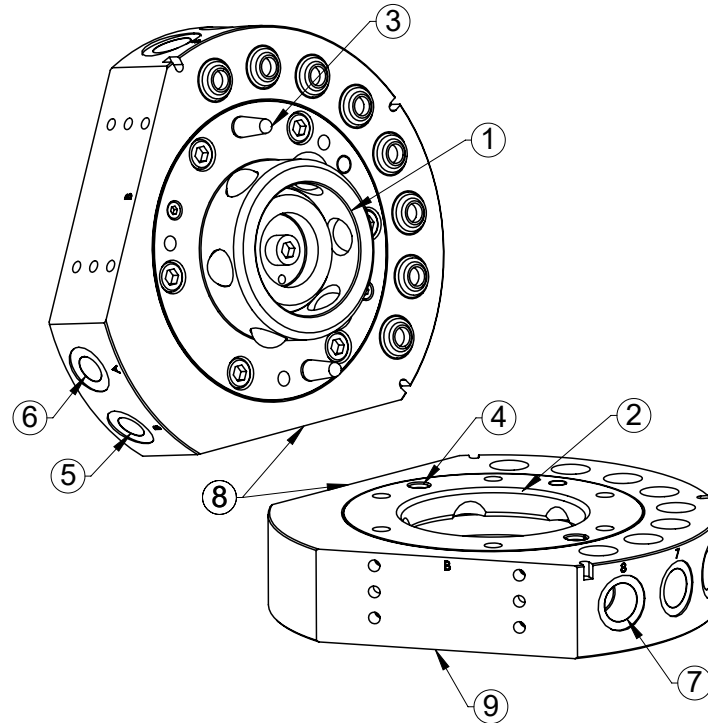
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port
6	Lock Port
7	Lock Sensor
8	Unlock Sensor
9	Flat A: Utility Module Single Mounting Pattern
10	Flat B: Utility Module Single Mounting Pattern
11	Flat C: Utility Module (3) Position Mounting Pattern
12	Flat D: Utility Module Single Mounting Pattern

8.10 QC-60 Tool Changer Product Overview



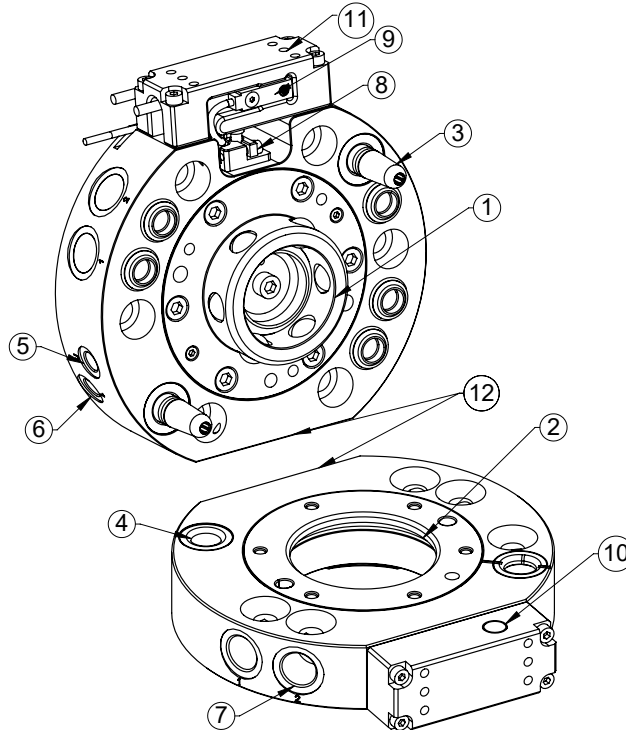
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port (Labeled 'B', Hidden in Drawing)
6	Lock Port (Labeled 'A')
7	(8) G1/8 Pneumatic Pass-Through Ports
8	Flat A: Utility Module Mounting Pattern
9	Flat B: Utility Module Mounting Pattern

8.11 QC-71 Tool Changer Product Overview



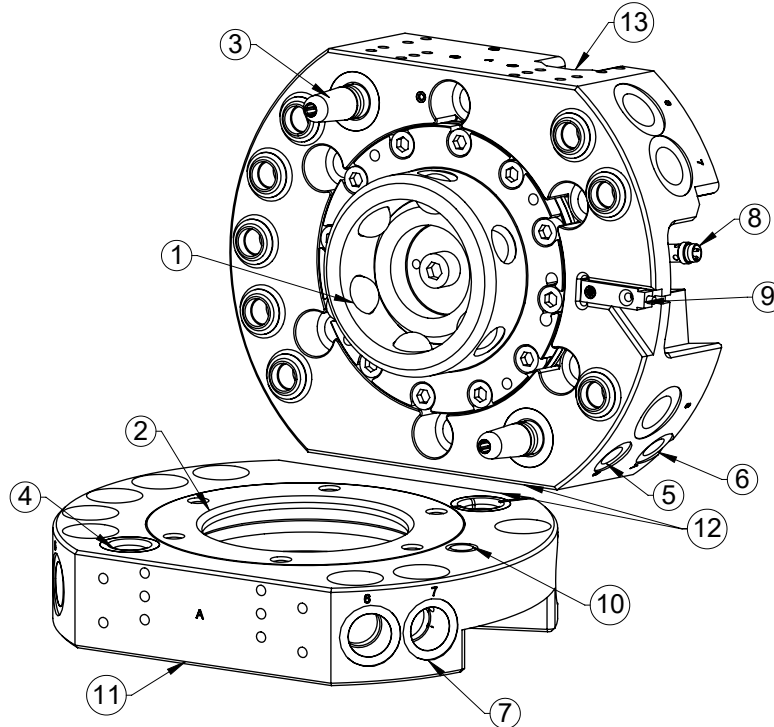
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port (Labeled 'B')
6	Lock Port (Labeled 'A')
7	(8) G1/4 Pneumatic Pass-Through Ports
8	Flat A: Utility Module Mounting Pattern
9	Flat B: Utility Module Mounting Pattern

8.12 QC-76 Tool Changer Product Overview



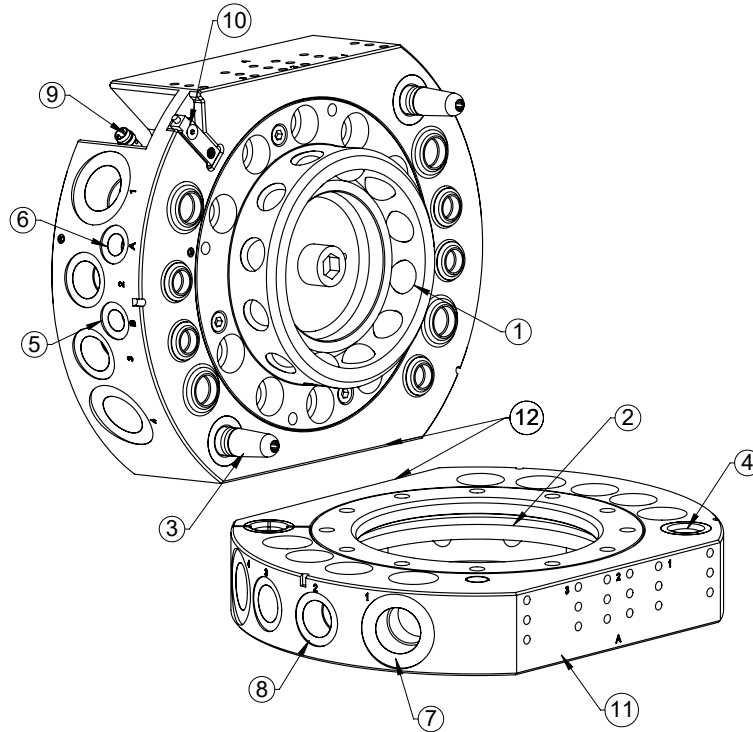
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port (Labeled 'U')
6	Lock Port (Labeled 'L')
7	(5) G3/8 Pneumatic Pass-Through Ports
8	Lock and Unlock Sensors
9	RTL Sensor
10	RTL Sensor Target
11	Flat A: Utility Module Mounting Pattern
12	Flat B: Utility Module Mounting Pattern

8.13 QC-110 Tool Changer Product Overview



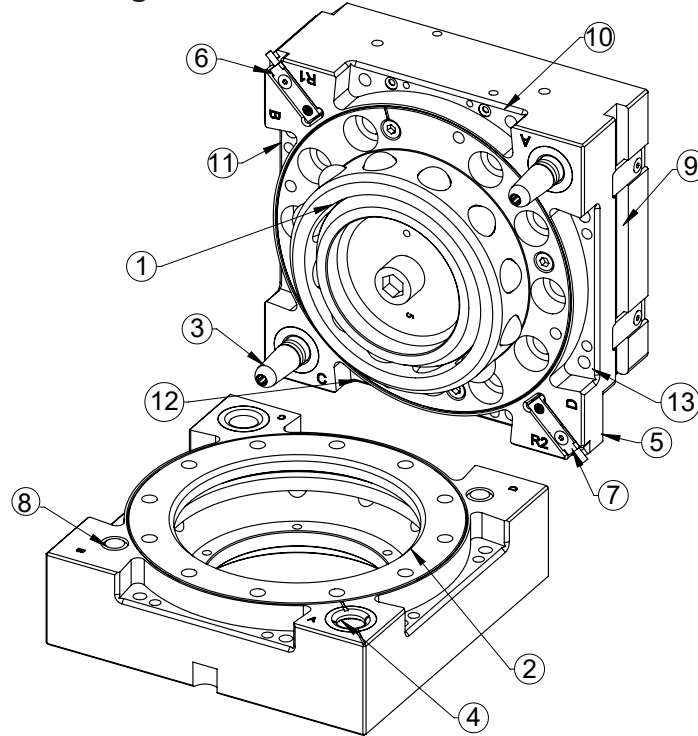
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port (Labeled as 'B')
6	Lock Port (Labeled as 'A')
7	(8) G3/8 Pneumatic Pass-Through Ports
8	Lock and Unlock Sensors
9	RTL Sensor
10	RTL Sensor Target
11	Flat A: Utility Module Mounting Pattern
12	Flat B: Utility Module Mounting Pattern
13	Channel for Wired Module Cables (Hidden)

8.14 QC-160 Tool Changer Product Overview



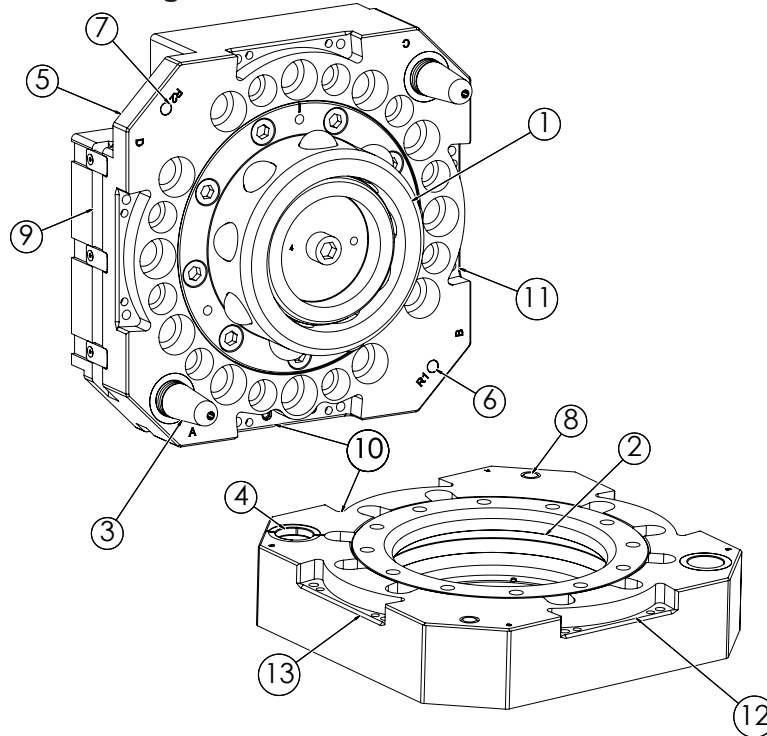
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Unlock Port (Labeled as 'B')
6	Lock Port (Labeled as 'A')
7	(4) G1/2 Pneumatic Pass-Through Ports
8	(5) G3/8 Pneumatic Pass-Through Ports
9	Lock and Unlock Sensors
10	RTL Sensor
11	Flat A: Utility Module 3-Position Mounting Pattern
12	Flat B: Utility Module 3-Position Mounting Pattern

8.15 QC-210 Tool Changer Product Overview



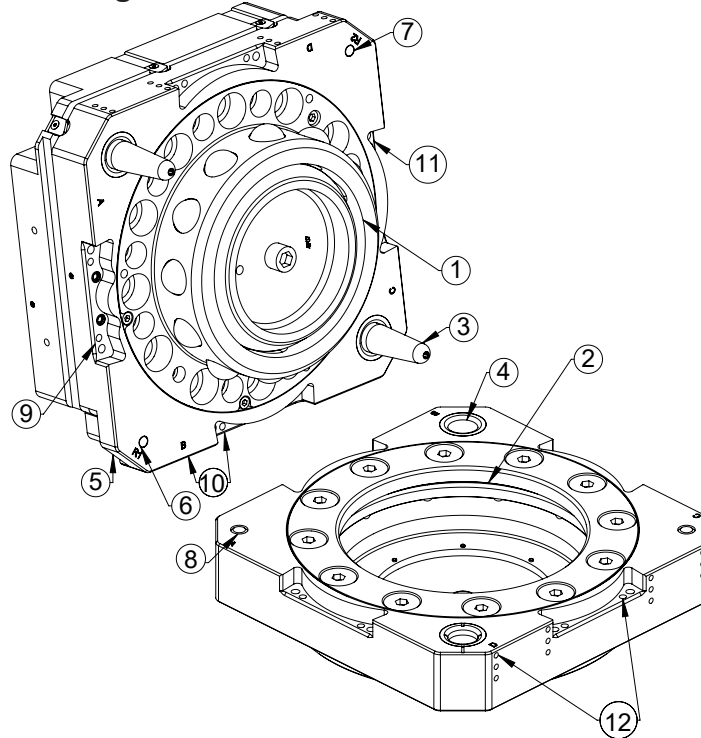
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Lock and Unlock Sensors (Hidden)
6	RTL1 Sensor
7	RTL2 Sensor
8	RTL 1 Sensor Target
9	Sensor Cable Channel
10	Flat A: Valve and Control Module Use
11	Flat B: Utility Module Mounting Pattern
12	Flat C: Utility Module Mounting Pattern
13	Flat D: Utility Module Mounting Pattern

8.16 QC-310 Tool Changer Product Overview



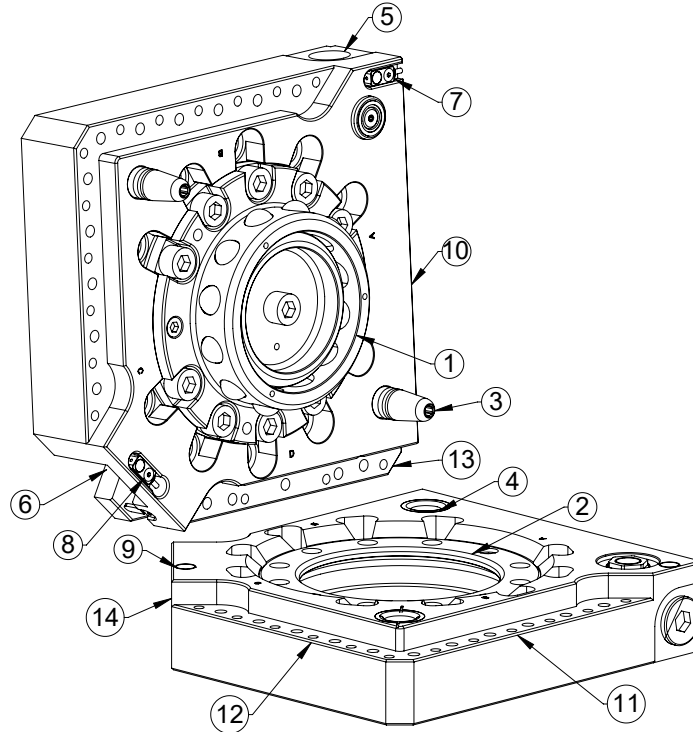
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Lock and Unlock Sensors (Hidden Beneath QC)
6	RTL 1 Sensor (Hidden Beneath QC)
7	RTL 2 Sensor (Hidden Beneath QC)
8	RTL 1 Sensor Target
9	Sensor Cable Channel
10	Flat A: Valve and Control Module Use
11	Flat B: Utility Module Mounting Pattern
12	Flat C: Utility Module Mounting Pattern
13	Flat D: Utility Module Mounting Pattern

8.17 QC-510 Tool Changer Product Overview



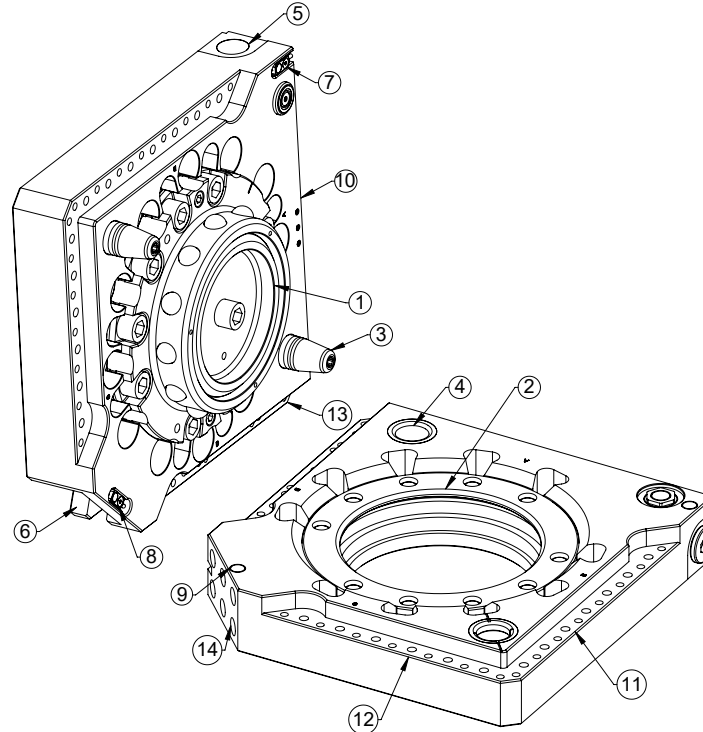
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Lock and Unlock Sensors (Hidden Beneath QC)
6	RTL 1 Sensor (Hidden Beneath QC)
7	RTL 2 Sensor (Hidden Beneath QC)
8	RTL 1 Sensor Target
9	Flat A: Valve and Control Module Use
10	Flat B: Utility Module Dual-Mounting Pattern
11	Flat C: Utility Module Mounting Pattern
12	Flat D: Utility Module Dual-Mounting Pattern

8.18 QC-835 Tool Changer Product Overview



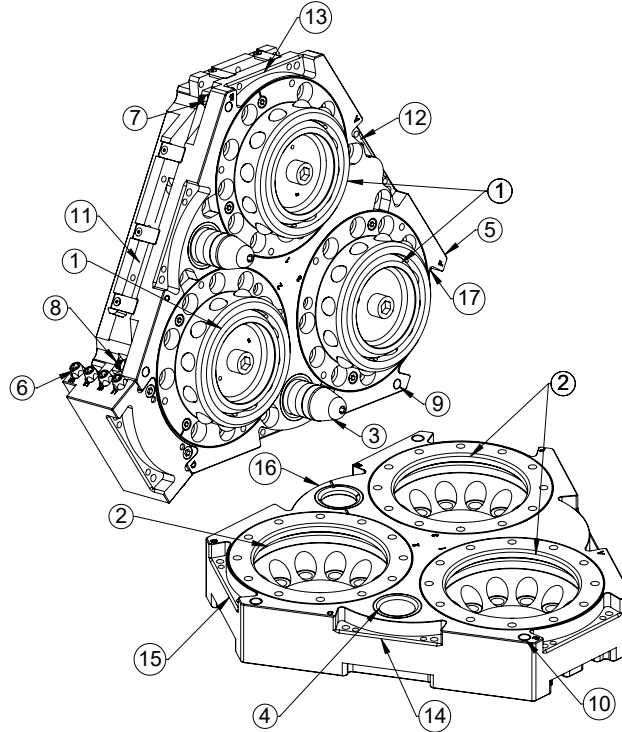
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	(1) G1/2 Pneumatic Pass-Through Port
6	Lock and Unlock Sensors (Hidden Beneath QC)
7	RTL 1 Sensor
8	RTL 2 Sensor
9	RTL 2 Sensor Target
10	Flat A: Valve and Control Module Use
11	Flat B: Utility Module Mounting Pattern
12	Flat C: Utility Module Mounting Pattern
13	Flat D: Utility Module Mounting Pattern
14	Tool Stand Mounting Pattern

8.19 QC-850 Tool Changer Product Overview



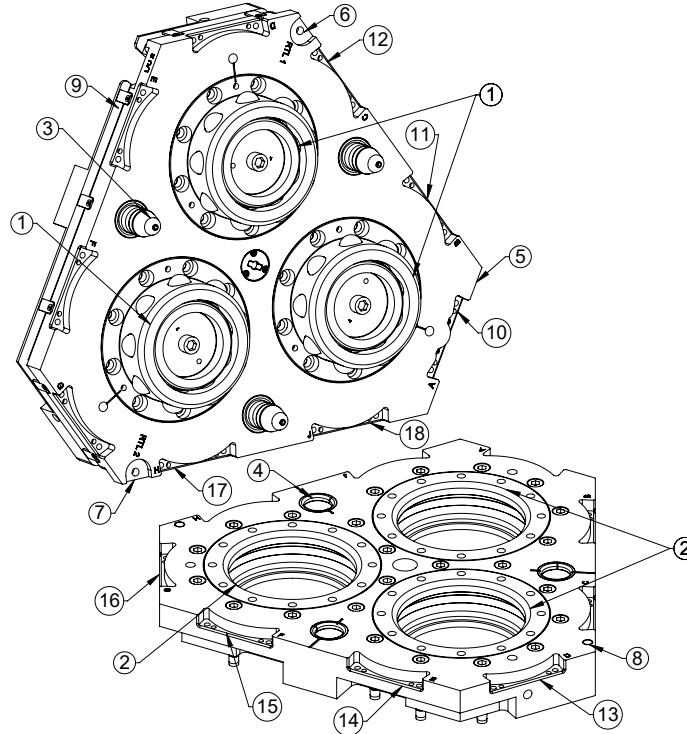
Callout No.	Feature Description
1	Master Locking Mechanism
2	Tool Bearing Race
3	Master Alignment Pin
4	Tool Alignment Bushing
5	(1) G1/2 Pneumatic Pass-Through Port
6	Lock and Unlock Sensors (Hidden Beneath QC)
7	RTL 1 Sensor
8	RTL 2 Sensor
9	RTL 2 Sensor Target
10	Flat A: Valve and Control Module Use
11	Flat B: Utility Module Mounting Pattern
12	Flat C: Utility Module Mounting Pattern
13	Flat D: Utility Module Mounting Pattern
14	Tool Stand Mounting Pattern

8.20 QC-1210 Tool Changer Product Overview



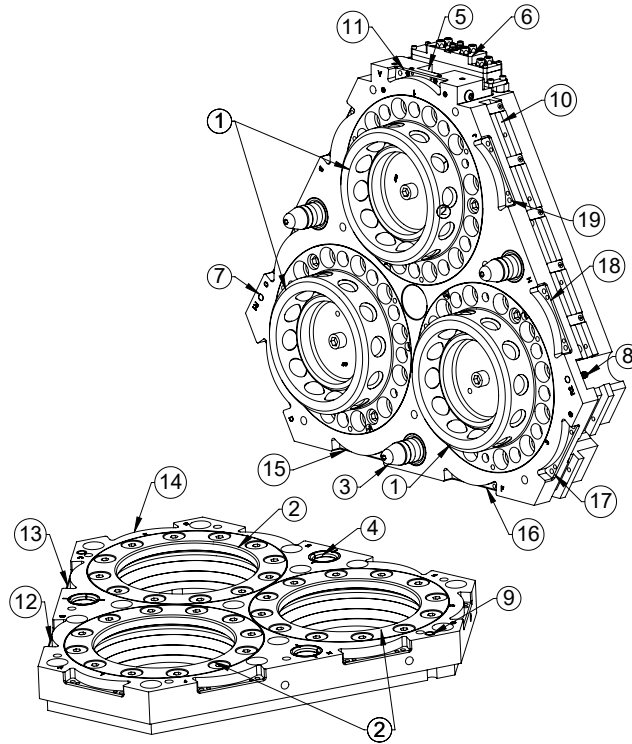
Callout No.	Feature Description
1	Master Locking Mechanisms
2	Tool Bearing Races
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Lock and Unlock Sensors (Hidden Beneath QC)
6	Lock and Unlock Sensor Junction
7	RTL 1 Sensor (Hidden Beneath QC)
8	RTL 2 Sensor (Hidden Beneath QC)
9	RTL 3 Sensor (Hidden Beneath QC)
10	RTL 1 Sensor Target
11	Sensor Cable Channel
12	Flat A: Valve and Control Module Use
13	Flat B: Utility Module Mounting Pattern
14	Flat C: Utility Module Mounting Pattern
15	Flat D: Tool Junction Module / Utility Module Mounting Pattern
16	Flat E: Utility Module Mounting Pattern
17	Flat F: Utility Module Mounting Pattern

8.21 QC-1310 Tool Changer Product Overview



Callout No.	Feature Description
1	Master Locking Mechanisms
2	Tool Bearing Races
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Lock and Unlock Sensors (Hidden Beneath QC)
6	RTL 1 Sensor (Hidden Beneath QC)
7	RTL 2 Sensor (Hidden Beneath QC)
8	RTL 1 Sensor Target
9	Sensor Cable Channel
10	Flat A: Valve and Control Module Use
11	Flat B: Utility Module Mounting Pattern
12	Flat C: Utility Module Mounting Pattern
13	Flat D: Utility Module Mounting Pattern
14	Flat E: Utility Module Mounting Pattern
15	Flat F: Utility Module Mounting Pattern
16	Flat G: Utility Module Mounting Pattern
17	Flat H: Utility Module Mounting Pattern
18	Flat J: Utility Module Mounting Pattern

8.22 QC-1510 Tool Changer Product Overview



Callout No.	Feature Description
1	Master Locking Mechanisms
2	Tool Bearing Races
3	Master Alignment Pin
4	Tool Alignment Bushing
5	Lock and Unlock Sensors (Hidden Beneath QC)
6	Lock and Unlock Sensor Junction Box
7	RTL 1 Sensor
8	RTL 2 Sensor
9	RTL 2 Sensor Target
10	Sensor Cable Channel
11	Flat A: Valve and Control Module Use
12	Flat B: Utility Module Mounting Pattern
13	Flat C: Utility Module Mounting Pattern
14	Flat D: Utility Module Mounting Pattern
15	Flat E: Utility Module Mounting Pattern
16	Flat F: Utility Module Mounting Pattern
17	Flat G: Utility Module Mounting Pattern
18	Flat H: Utility Module Mounting Pattern
19	Flat J: Utility Module Mounting Pattern