Applied Robotics™
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EPSILON E50

TOOL CHANGE SYSTEM

95620, Rev 01

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REVISION

Revision	Date	Author	Description
00	03/31/2016	SC	Initial Release
01	05/25/2021	DS	Description updates

CONTENTS

1 LIFETIME GUARANTEE

APPLIED ROBOTICS extends a lifetime guarantee to the components that make up the operating cam locking mechanism of the Epsilon Tool Changer. The following components are covered under APPLIED ROBOTICS Lifetime Guarantee.

PART NUMBER	DESCRIPTION
96504-P1018	NUT, NYLON LOCK M5
96503-B1040	PISTON, BOLT ROBOT
96503-C1071	CAM, ROBOT
96503-B1039	PIVOT PIN, ROBOT
96503-B1054	LOCK RING, TOOLING

APPLIED ROBOTICS warrants the Epsilon Tool Changer cam locking mechanism for the lifetime of the product against manufacturer's defects in materials and workmanship. Additionally, APPLIED ROBOTICS warrants the cam locking mechanism against wear that results in the Epsilon Tool Changer to lose repeatability and precision during the docking sequence of operation (Section 8.1.3). For the purposes of this warranty, APPLIED ROBOTICS defines the lifetime as 8 years or 8,000,000 total cycles completed with regularly scheduled maintenance as per Section 8 of this manual.

CONDITIONS OF THE WARRANTY:
Products shall have been subject to only normal use and service as instructed in this manual and shall not have been misused, neglected, altered, improperly set up or otherwise damaged; and, there shall be no evidence of tampering or deliberate misuse or destruction.

Defects to APPLIED ROBOTICS products will be determined solely by APPLIED ROBOTICS and not by any representative or distributor of or for APPLIED ROBOTICS. Upon determination of a defect, APPLIED ROBOTICS sole obligation will be to provide replacement material for the defective part(s). APPLIED ROBOTICS is not liable or responsible for costs borne from lost production or labor related costs for repairing the defective part(s).

Any claim against APPLIED ROBOTICS for defects in material or workmanship must be in writing. APPLIED ROBOTICS must authorize the return of any allegedly defective part before it is returned. The party making the claim must prepay all shipping and transportation costs. APPLIED ROBOTICS will not accept charges for parts purchased unless the conditions of the warranty have been satisfied.

No APPLIED ROBOTICS representative or distributor is authorized to assume for APPLIED ROBOTICS any other obligations or liabilities in connection with the product, or alter the terms of this warranty in any way.

APPLIED ROBOTICS shall not be liable for damages, including special, incidental or consequential damages arising out of or in connection with the performance of an APPLIED ROBOTICS product or its use by the owner.

2 PRECAUTIONS

READ MANUAL
Do not start, operate or service machine until you read and understand operator's manual. Failure to do so could result in serious injury.

HAND CRUSH NOTICE
Indicates the possibility for a crush force between components during coupling of the Robot and Tool Side.

⚠ DANGER — Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING — Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION — Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE — Indicates a situation which, if not avoided, could result in equipment damage and voiding the manufacturer's equipment warranty.

IGNORING INFORMATION ABOUT POTENTIAL HAZARDS CAN LEAD TO SERIOUS HARM TO PERSONNEL AND/OR DAMAGE TO THE EQUIPMENT, AND MAY RESULT IN THE NULLIFICATION OF THE MANUFACTURER'S EQUIPMENT WARRANTY.

HEED ALL PRECAUTION NOTICES

3 SYSTEM DESCRIPTION

The Epsilon E50 Tool Changer provides a strong and reliable method for a manipulator to quickly change between different tools/end-effectors. With Applied Robotics, Inc. modular design, the E50 Tool Changer offers the maximum flexibility for any application.

The E50 Tool Changer contains two major components:

Robot Side (ER50) – Mounts directly to a robot flange utilizing a 50mm ISO 9409-1 pattern without the need for adaptor plates (Figure 3-1).

Tool Side (ET63) – Mounts directly to a tooling plate utilizing a 63mm ISO 9409-1 pattern (Figure 3-2).

The Robot Side and Tool Side lock together by means of a double-acting, pneumatically-driven cam locking mechanism. The three (3) cam self-centering locking mechanism allows for reliable and repeatable operation throughout the life of the tool changer with a unique wear compensating design. As the locking mechanism actuates, the Tool Side is physically connected and disconnected along with any utilities contained in the attached modules.

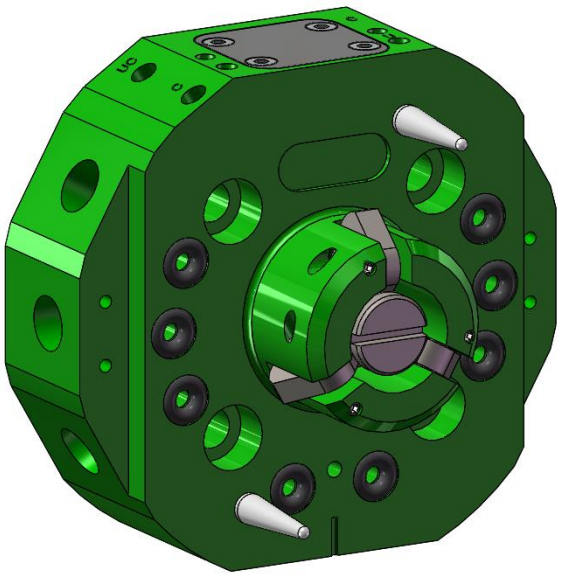


Figure 3-1. ER50 Robot Side

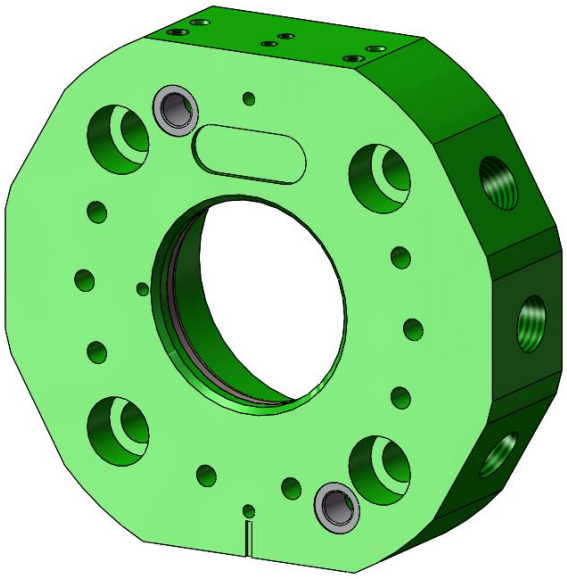
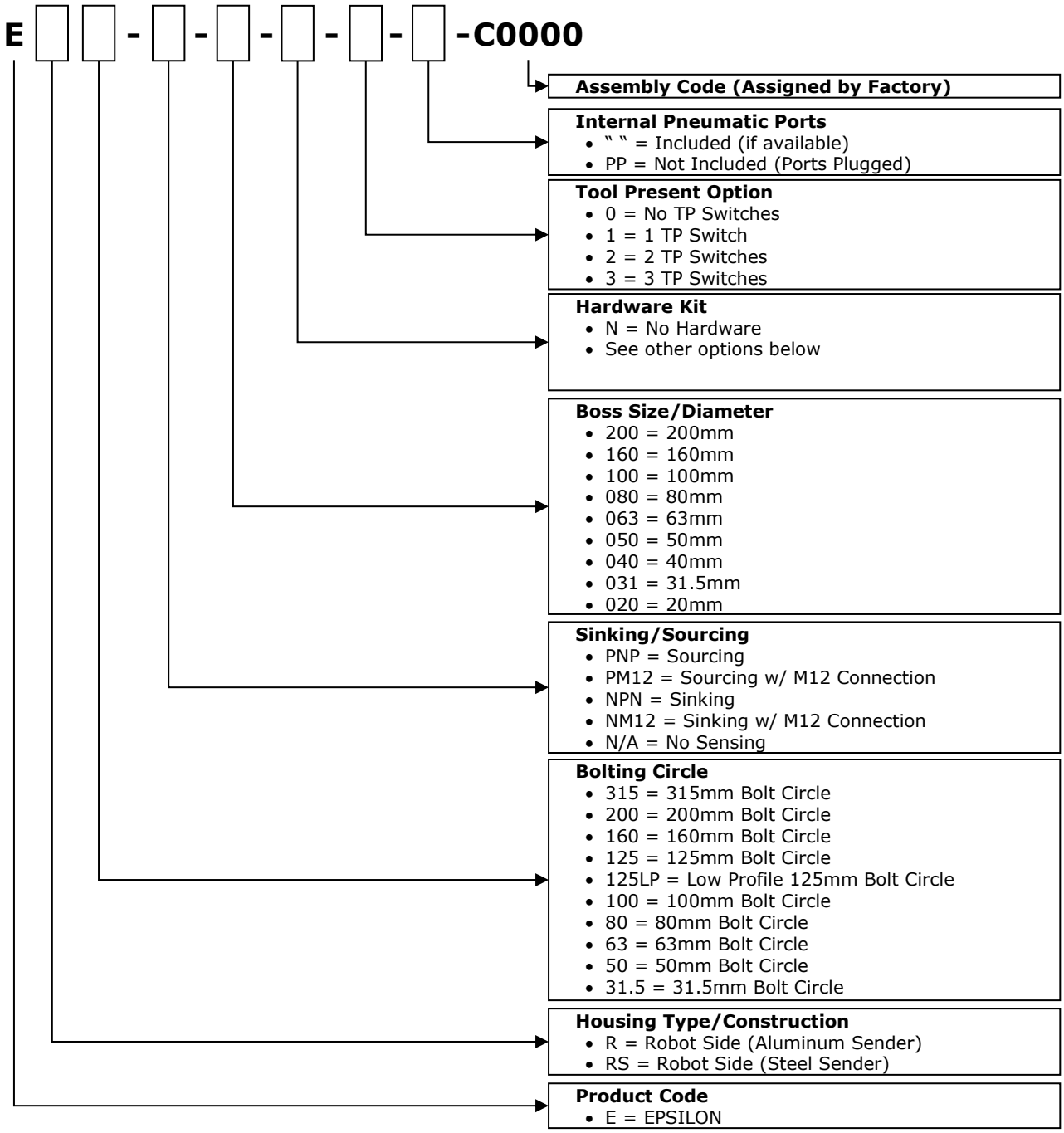


Figure 3-2. ET63 Tool Side

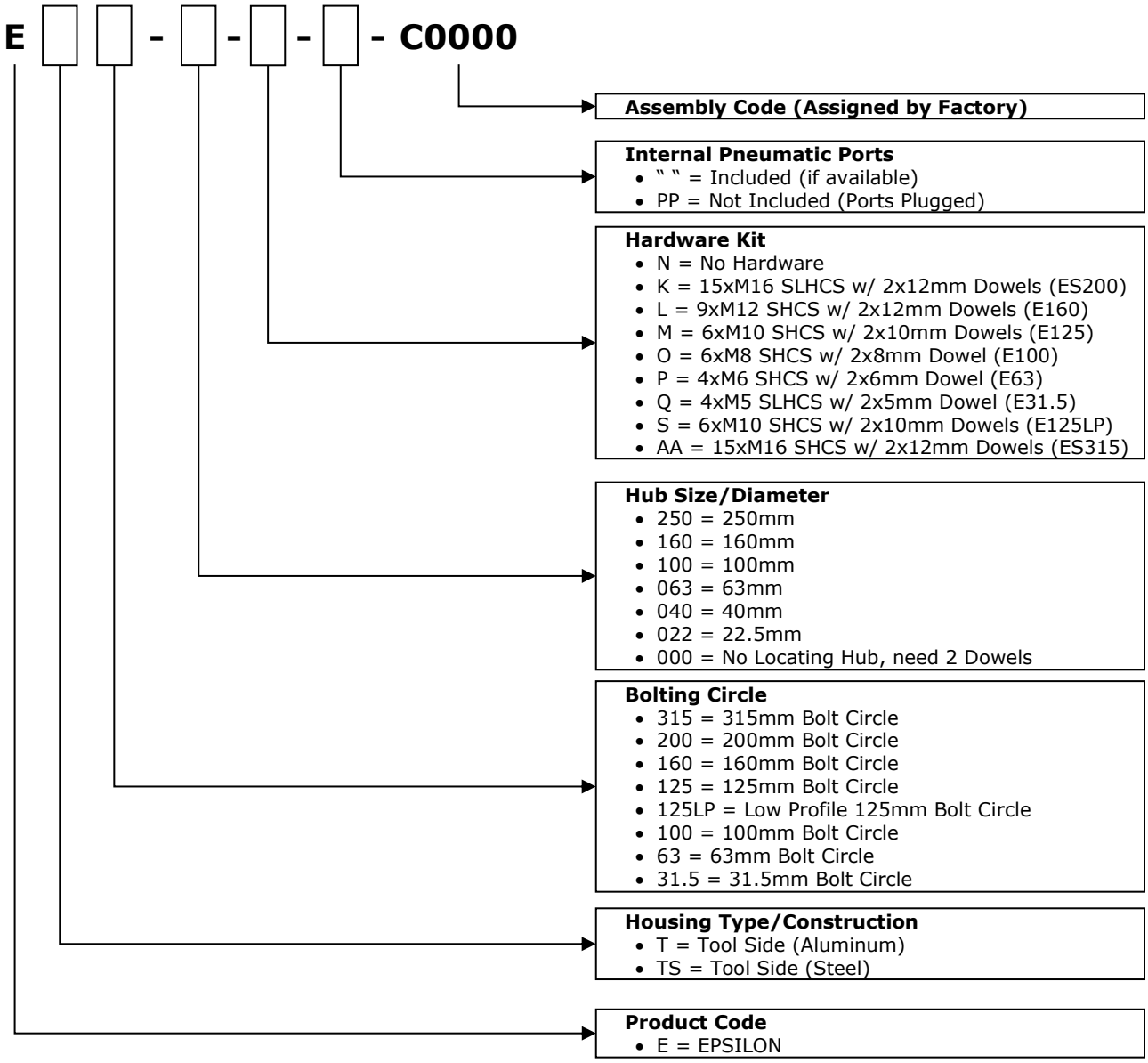
3.1 ROBOT SIDE



Hardware Kit

- N = No Hardware
- A = 16xM16 SHCS w/ 1x12mm Dowel (ES200)
- A2 = 6xM12 SHCS w/ 1x12mm Dowel (ES200)
- B = 11xM12 SHCS w/ 1x12mm Dowel (E160)
- B2 = 10xM12 SHCS w/ 2x12mm Dowels (E160)
- C = 6xM12 SHCS w/ 1x12mm Dowel (E160)
- D = 11xM10 SHCS w/ 1x10mm Dowel (E125)
- D2 = 10xM10 SHCS w/ 2x10mm Dowels (E125)
- E = 11xM10 SHCS w/ 1x10mm Dowel and 11x10.5mm ID washers (E160)
- E2 = 12xM10 SHCS w/ 2x10mm Dowels and 10x10.5mm ID washers (E160)
- F = 6xM10 SHCS w/ 1x10mm Dowel (E125)
- G = 6xM10 SHCS w/ 1x10mm Dowel and 6x10.5mm ID washers (E160)
- H = 6xM8 SHCS w/ 1x8mm Dowel (E80 & E100)
- I = 4xM6 SHCS w/ 1x6mm Dowel (E50 & E63)
- J = 4xM5 SLHCS w/ 1x5mm Dowel (E31.5)
- R = 6xM10 SHCS w/ 1x10mm Dowel (E125LP)
- Z = 15xM16 SHCS w/ 1x12mm Dowel (ES315)

3.2 TOOL SIDE



ET50-031-N-T-C0000 is a specific tool side, which has a thread-in 50mm Bolt Circle pattern.

Note: If " " (blank) is chosen, remove "-" (dash) if that is the only input between dashes.

4 TECHNICAL SPECIFICATIONS

Table 4-1. E50 Technical Specifications

Specification		Metric	English
Payload		25 kg	55 lb
Maximum Operating Moment (Mx, My)		88 Nm	780 in-lb
Maximum E-Stop Moment (Mx, My)		168 Nm	1,485 in-lb
Maximum Operating Torque (Mz)		120 Nm	1,060 in-lb
Maximum E-Stop Torque (Mz)		375 Nm	3,320 in-lb
Maximum Tensile Force (F_T)		3,336 N	750 lb
Maximum Compressive Force (F_C)		17,837 N	4,010 lb
Diameter		85 mm	3.35 in
Height (Robot and Tool Coupled)		48 mm	1.89 in
Mass / Weight *	Robot	0.38 kg	0.84 lb
	Tool	0.21 kg	0.46 lb
Rotational Repeatability		± .02°	
Operating Temperature		5 °C to 60 °C	40 °F to 140 °F
Supply Pressure		5 bar to 7 bar	72 psi to 101 psi
Couple/Uncouple Voltage (Optional)		10 VDC to 30 VDC	
Noise Emission		≤ 70 dB(A) in any direction	
Transportation and Storage Humidity		Up to 50%, Maximum Temperature 70 °C (158 °F)	
Transportation and Storage Temperature		-25 °C to 70 °C	-13 °F to 158 °F
User Pneumatic Pressure Range		0 bar to 7 bar	0 psi to 101 psi
User Pneumatic Flow (Cv)		0.27	

* Weight may vary depending on specific configuration.

5 INSTALLATION

5.1 ROBOT SIDE INSTALLATION

The E50 Robot Side is designed to mount directly to interfaces utilizing an ISO 50mm bolt pattern (ISO 9409-1). The E50 Robot Side can mount to manipulator interfaces utilizing M6 hardware. For size, locations, and tolerance information on the E50 Robot Side mounting patterns, see Informational Documents (Section 11).

NOTICE

TOOL CHANGER PAYLOAD & MOMENT RATINGS BASED ON USING A MINIMUM OF 4xM6 SCREWS TO MOUNT THE ROBOT SIDE TO THE MANIPULATOR INTERFACE.

5.1.1 M6 Hardware

NOTICE

ENSURE THAT THE MATING SURFACES OF THE ROBOT SIDE AND ROBOT FLANGE ARE FLUSH (PLANAR) WHEN FASTENING THE SCREWS.

1. Locate the Robot Side to the manipulator mounting flange utilizing the locating boss and one (1) M6 locating dowel (Figure 5.1-1).
2. Insert and tighten the M6 socket head cap screws (minimum Property Class 10.9) provided with the Robot Side Assembly. Torque the screws to the robot manufacturer's specification.

NOTICE

TIGHTEN FACEPLATE MOUNTING SCREWS TO ROBOT MANUFACTURER'S SPECIFICATIONS. IF USING LOCTITE, USE LOCTITE 242 OR EQUIVALENT.

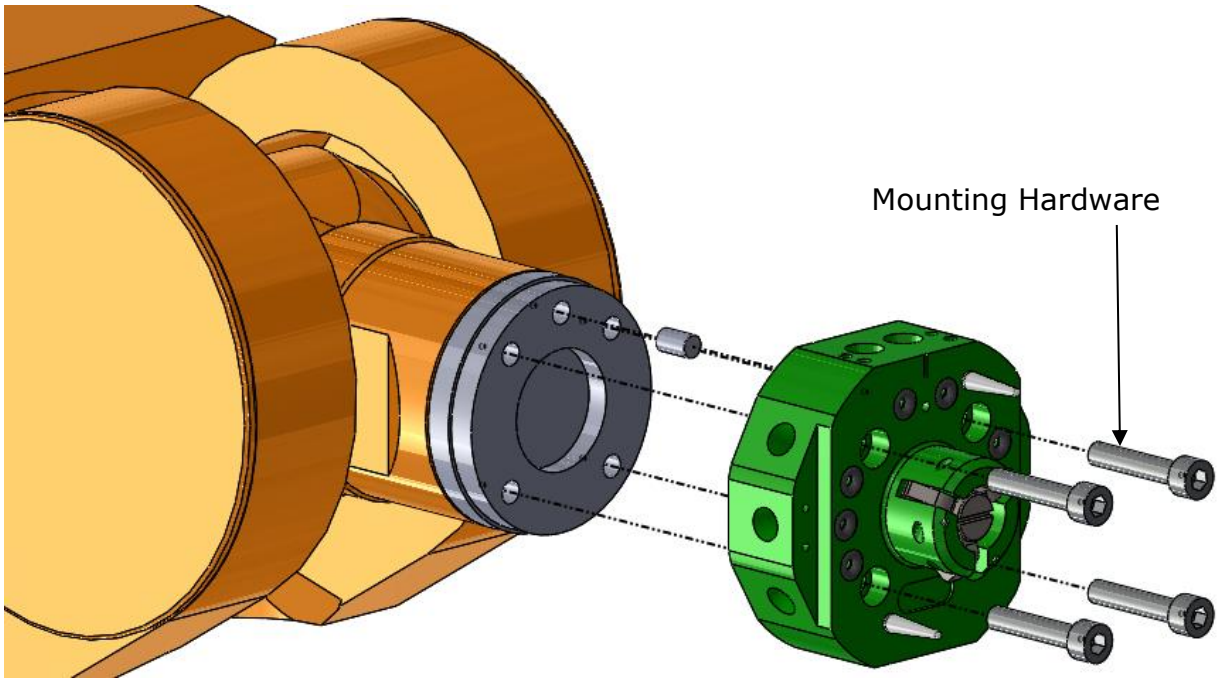


Figure 5.1-1. E50 Robot Side Installation w/ M6 Hardware

⚠ WARNING

DO NOT EXCEED THE MAXIMUM OPERATING OR E-STOP MOMENT OF THE TOOL CHANGER WHEN USING A ROBOT SIDE PLATE TO ADAPT TO OTHER BOLTING PATTERNS.

5.2 TOOL SIDE INSTALLATION

5.2.1 ET63

The E50 utilizes the same Tool Side as the E63 (ET63) and is designed to mount directly to customer tooling utilizing an ISO 9409-1 bolt pattern. The Tool Side can be mounted from the top down using M6 hardware on the ISO 63mm bolt circle. For size, locations, and tolerance information on the E50 Tool Side mounting patterns, see Informational Documents (Section 11).

NOTICE

TOOL CHANGER PAYLOAD & MOMENT RATINGS BASED ON USING 4xM6 SCREWS TO MOUNT THE TOOL SIDE TO THE TOOLING INTERFACE.

If a locating boss/pilot is used on the tool plate to locate the tool to the Tool Side, then the boss cannot protrude into the tool changer greater than 4mm and a 32mm diameter counter-bore with a minimum depth of 2mm below the Tool Side and Tool Plate interface must be made into the boss to allow for clearance of the latching mechanism (Figure 5.2.1-1).

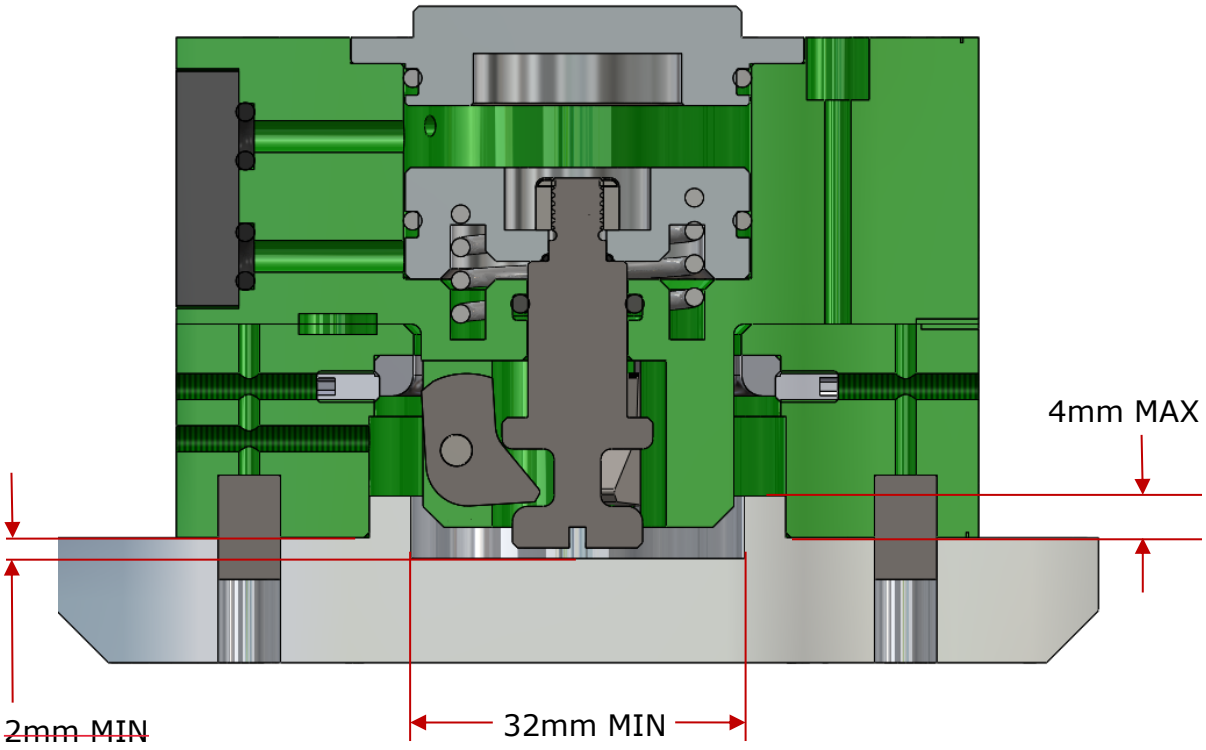


Figure 5.2.1-1. ET63 Tool Side and Tool Plate Installation (w/ Pilot)

Alternatively, if a locating boss/pilot is not used to locate the tool plate to the Tool Side and two (2) locating dowels are used instead, then a 15mm diameter counter-bore with a minimum depth of 2mm must be made into the tool plate to allow for clearance of the latching mechanism (Figure 5.2.1-2).

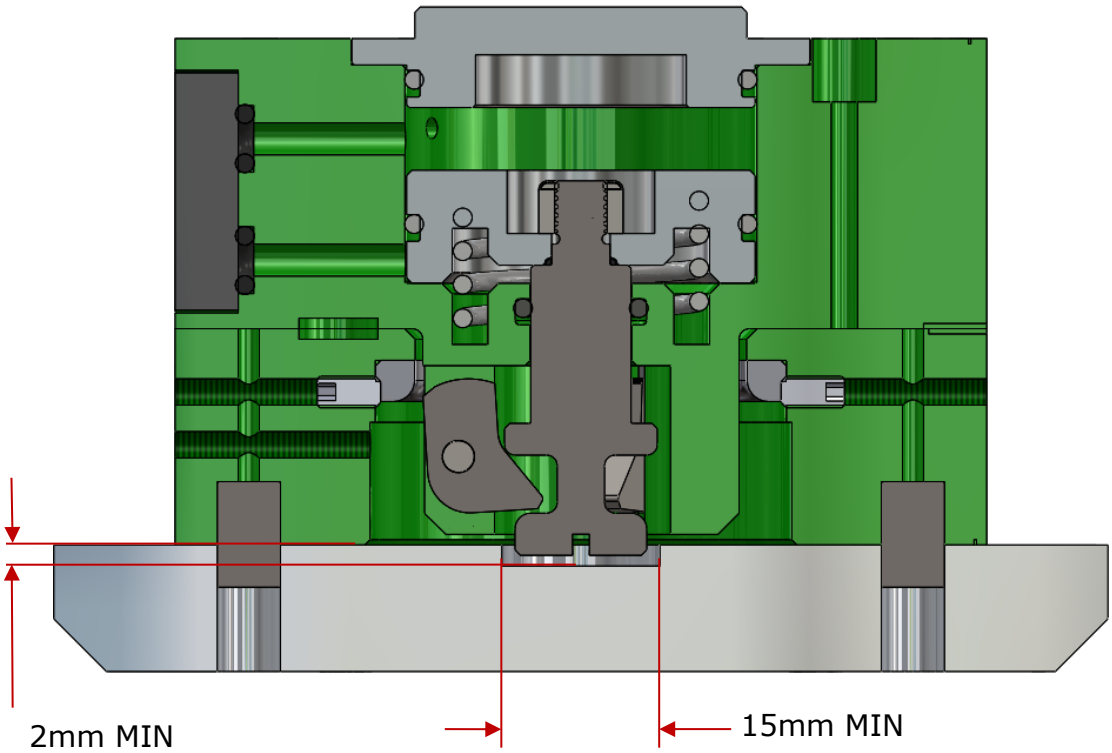


Figure 5.2.1-2. ET63 Tool Side and Tool Plate Installation (No Pilot)

Installing the ET63 Tool Side from the Top Down:

NOTICE

ENSURE THAT THE MATING SURFACES OF THE TOOL SIDE AND TOOL PLATE ARE FLUSH (PLANAR) WHEN FASTENING THE SCREWS.

1. Locate the Tool Side to the tool plate utilizing either the locating hub and one (1) M6 locating dowel, or two (2) M6 locating dowels (Figure 5.2.1-3).
2. Insert and tighten M6 socket head cap screws (minimum Property Class 10.9) through the Tool Side 63mm bolt circle. Applied Robotics recommends the use of steel threads in the tool plate and appropriate thread engagement and torque values.

NOTICE

TIGHTEN MOUNTING SCREWS TO THE APPROPRIATE SPECIFICATION DEPENDING ON THE END EFFECTOR USED. IF USING LOCTITE, USE LOCTITE 242 OR EQUIVALENT.

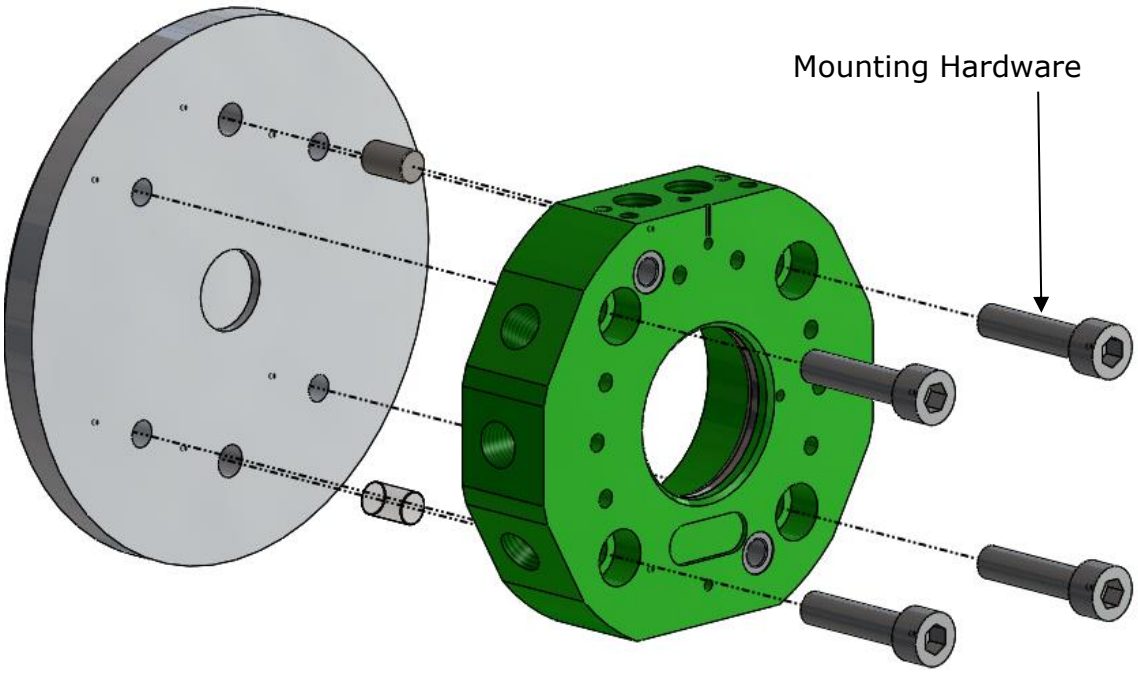


Figure 5.2.1-3. ET63 Tool Side Installation (Bolt Top Down)

⚠ WARNING

DO NOT EXCEED THE MAXIMUM OPERATING OR E-STOP MOMENT OF THE TOOL CHANGER WHEN USING AN ADAPTOR PLATE TO ADAPT TO OTHER BOLTING PATTERNS.

5.2.2 ET50

ET50-031-N-T-C0000 is a specific Tool Side which has an adaptor plate already assembled onto it. The adaptor plate has a 50mm ISO 9409-1 thread-in pattern. Therefore, the tool is mounted to the Tool Side using four (4) M6 screws and either two (2) 6mm dowels or one (1) 6mm dowel and a Ø31.5mm boss (Figure 5.2.2-1. Interfacing to an ET50). See Informational Documents (Section 11) for detailed mounting information. The end effector's boss should be no more than 6mm beyond the Tool Side and end effector interface to allow for clearance of the latching mechanism (Figure 5.2.2-2).

Installing the ET50 Tool Side from the Bottom Up:

NOTICE

ENSURE THAT THE MATING SURFACES OF THE TOOL SIDE AND TOOL PLATE ARE FLUSH (PLANAR) WHEN FASTENING THE SCREWS.

1. Locate the Tool Side to the tool utilizing either the locating hub and one (1) M6 locating dowel, or two (2) M6 locating dowels (Figure 5.2.2-1. Interfacing to an ET50).
2. Insert and tighten M6 socket head cap screws (minimum Property Class 10.9) through the end effector into the ET50 50mm bolt circle. Applied Robotics recommends the use of steel threads in the Tool Side adaptor plate with appropriate thread engagement and torque values.

NOTICE

M6 SOCKET HEAD CAP SCREWS HAVE A RECOMMENDED TORQUE OF 1.13 Nm (10 IN-LB). IF USING LOCTITE, USE LOCTITE 242 OR EQUIVALENT.

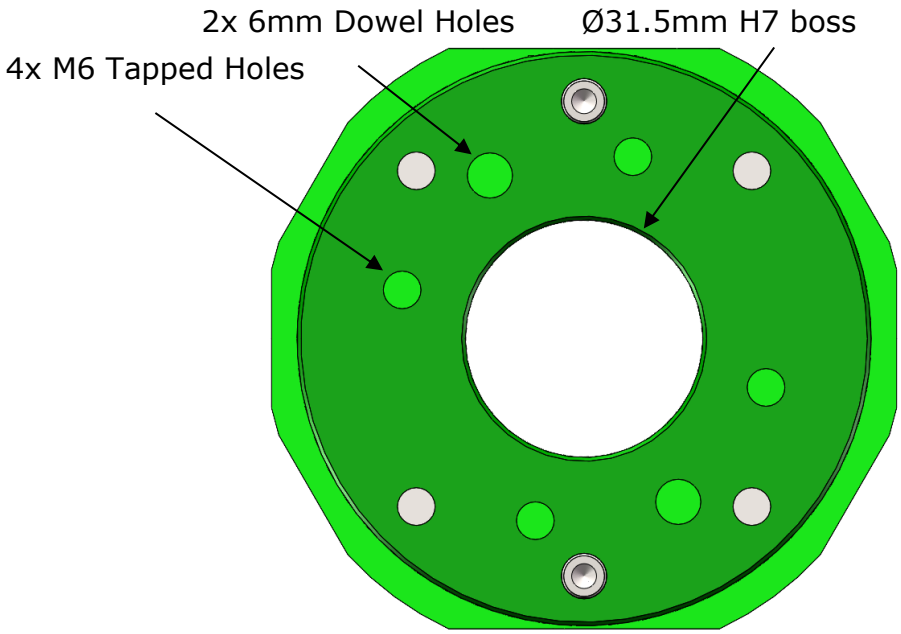


Figure 5.2.2-1. Interfacing to an ET50

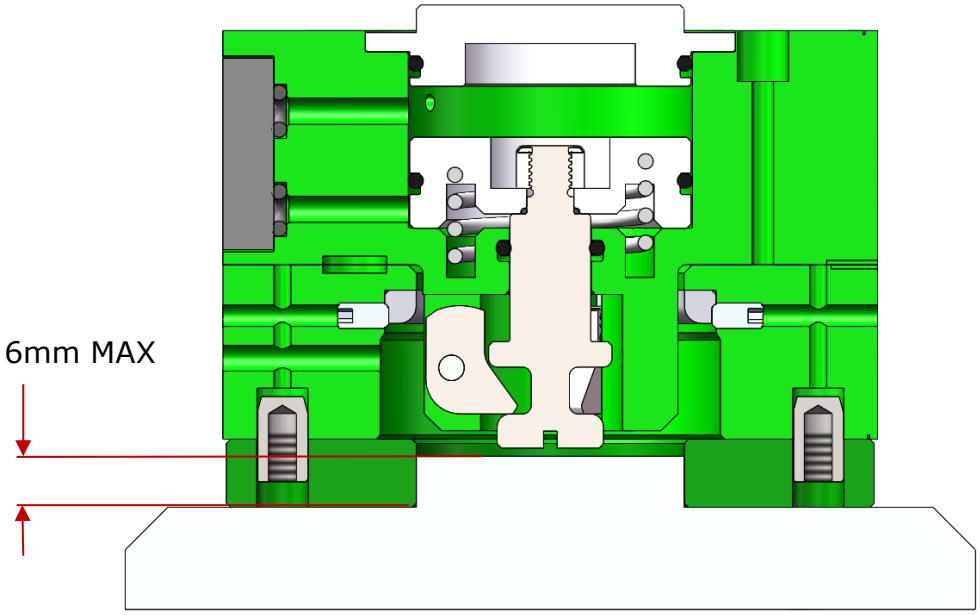


Figure 5.2.2-2. End Effector Boss Thickness to an ET50

5.3 CONNECTING THE AIR SUPPLY

The pneumatic supply for the Epsilon Tool Changer can be supplied via directly ported air fittings supplied by the customer (Figure 5.3-1).

⚠ WARNING

PNEUMATIC PRESSURE SHOULD NEVER BE SUPPLIED TO THE EPSILON TOOL CHANGE SYSTEM UNLESS THE POSITION OF THE VALVE SUPPLYING THE AIR IS KNOWN AND HAS BEEN CONFIRMED. FAILURE TO DO SO CAN RESULT IN SERIOUS INJURY OR DEATH FROM A DROPPED TOOL.

⚠ WARNING

THE ROBOT SHOULD NEVER BE RUN WITHOUT AIR PRESSURE BEING SUPPLIED TO THE TOOL CHANGER. PRESSURE TO THE TOOL CHANGER MUST BE AT LEAST 5 BAR (72 PSIG) FOR PROPER OPERATION.

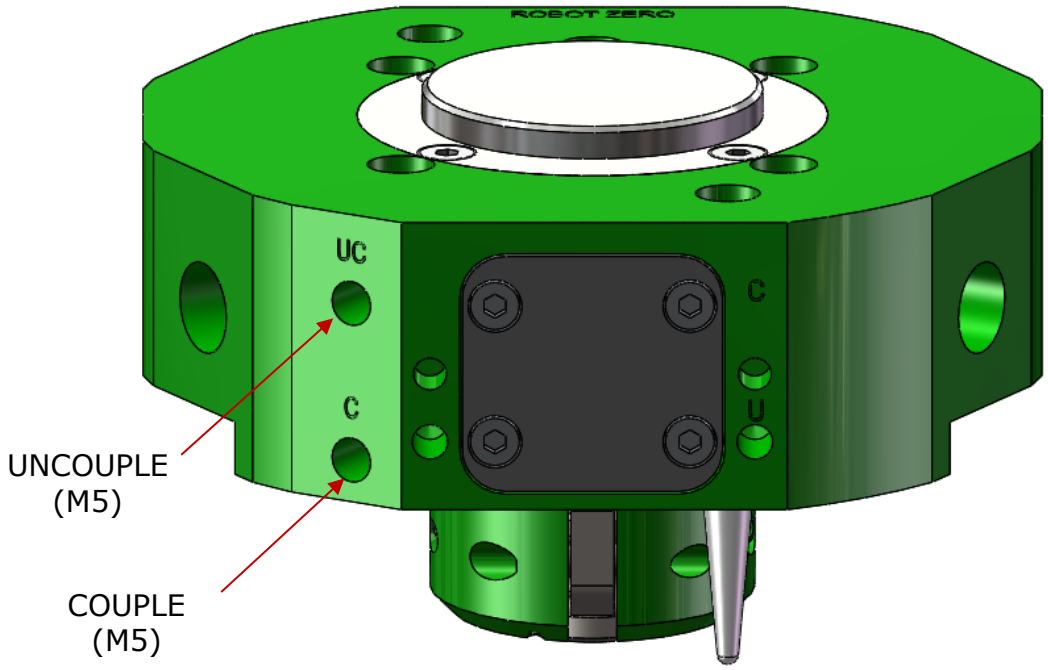


Figure 5.3-1. E50 Robot Side Air Supply Ports

Both the couple and uncouple actuation port lines must be installed in order for the Epsilon Tool Change System to function properly. To control air to the different ports, a single solenoid, spring-return, 4-way valve or a double solenoid, 4-way valve can be used.

⚠ WARNING

IF A SINGLE SOLENOID, SPRING-RETURN, 4-WAY PNEUMATIC VALVE IS USED, THE FOLLOWING MUST BE UNDERSTOOD AND ADHERED TO:

- IN THE DE-ENERGIZED STATE, THE VALVE MUST PROVIDE AIR TO THE COUPLE PORT ONLY.

⚠ WARNING

IF A DOUBLE SOLENOID, 4-WAY PNEUMATIC VALVE IS USED, THE FOLLOWING MUST BE UNDERSTOOD AND ADHERED TO:

- THE VALVE WILL REMAIN IN ITS PRESENT POSITION UNTIL EITHER THE ALTERNATE SOLENOID IS ENERGIZED OR BY MANUALLY PRESSING THE ALTERNATE SOLENOID OVERRIDE BUTTON (IF APPLICABLE).
- TO CHANGE THE STATE OF THE VALVE, ONE SIDE OF THE SOLENOID MUST BE ENERGIZED AND THE OTHER SIDE DE-ENERGIZED. IF BOTH SIDES ARE ENERGIZED (OR DE-ENERGIZED), THE VALVE WILL NOT CHANGE STATES.
- THE VALVE MUST BE PILOT ACTUATED SO THAT THE POSITION OF THE VALVE WILL NOT CHANGE UNLESS THERE IS AIR SUPPLIED TO THE VALVE.

5.4 COUPLE AND UNCOUPLE SIGNALS (OPTIONAL)

Couple and uncouple signals are optional on the E50 Robot Side and are provided via an M12 connection (Figure 5.4-1). APPLIED ROBOTICS utilizes proximity switches to provide indication of piston limit positions (couple and uncouple). Switches are preset at the factory and do not require any adjustment for the lifetime of the tool changer.

⚠ CAUTION

COUPLE AND UNCOUPLE SENSOR SIGNALS SHOULD BE CONTINUALLY MONITORED TO VERIFY THAT THE TOOL CHANGER IS IN THE PROPER STATE BEFORE COMMANDING THE ROBOT TO MOVE.

Should the switches need to be replaced, see Section 10.1.2.

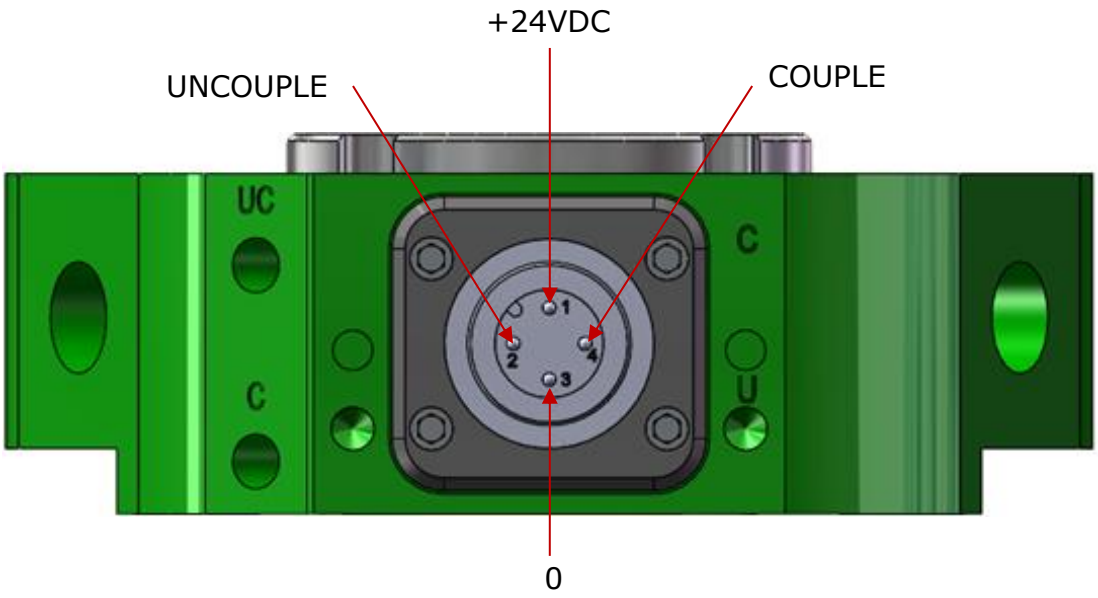


Figure 5.4-1. Couple/Uncouple Signal Interface (Optional)

NOTICE

MAKING CONNECTIONS WHILE UNDER POWER COULD RESULT IN DAMAGE TO THE EQUIPMENT. TO AVOID DAMAGING EQUIPMENT, ENSURE THAT ALL CABLES ARE CONNECTED BEFORE SUPPLYING POWER TO THE EQUIPMENT.

5.5 TOOL PRESENT SIGNAL (OPTIONAL)

The E50 Tool Changer contains a built-in feature for Tool Present detection via a proximity sensor(s) (Figure 5.5-1). This option provides direct detection of the Tool Side and the signal can be directly monitored by the robot controller.

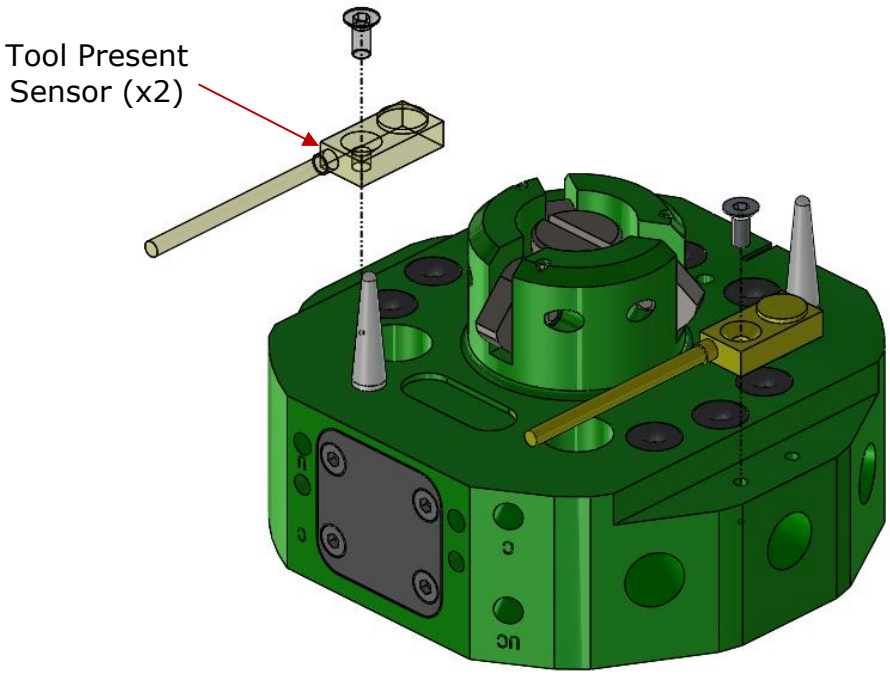


Figure 5.5-1. Tool Present Option

When the Tool Present sensors are installed, ensure that the tip of the sensor (highlighted blue) does not protrude past the Robot Side interface (Figure 5.5-2).

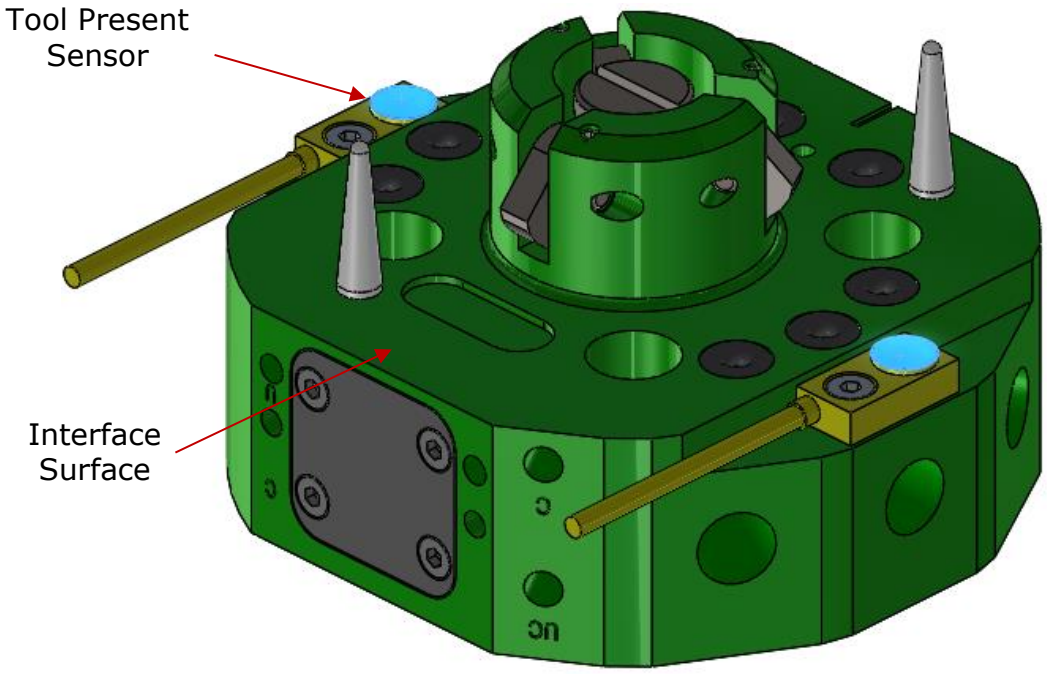


Figure 5.5-2. Tool Present Sensor Installation

5.6 CONNECTING USER PNEUMATIC PORTS

The E50 Tool Changer has 8 available user pneumatic ports to supply air through the tool changer to the specific tool being used. The tool changer must be coupled and be fitted with an O-ring seal for these ports to be operational. Air can be supplied via directly ported air fittings supplied by the customer (Figure 5.6-1).

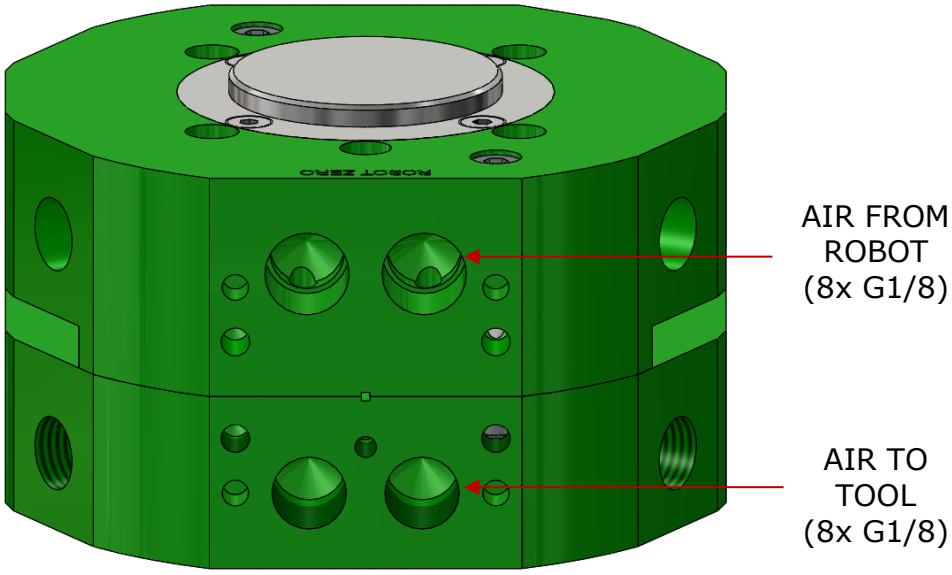


Figure 5.6-1. E50 User Pneumatic Ports

6 GUIDE TO OPERATION

6.1 INITIAL TEST

Once the air supply has been plumbed to the couple and uncouple ports, control power is connected to the air supply valve, and the couple and uncouple position sensors are in communication with the robot controller/PLC, perform the following steps to verify the proper operation of the Epsilon Tool Changer.

⚠ CAUTION

DURING TESTING, KEEP YOUR FINGERS CLEAR OF THE MECHANICAL COUPLING MECHANISM AND THE COUPLING INTERFACE SURFACES. KEEP OUT OF THE ROBOT WORK ENVELOPE WHEN DRIVE POWER IS ON.

1. Verify that the Robot Side is clear of any obstruction and not coupled to the Tool Side.
2. Turn on supply air to the control valve and verify that the cams move to the extended position (Figure 6.1-1). If using a single solenoid, spring return, 4-way valve, this will verify that it is plumbed correctly.
3. Supply control power to the solenoid valve and supply the signal from the controller/PLC to move the valve to the uncoupled (solenoid energized) position. The cams should retract to the uncoupled position (Figure 6.1-2) and the input from the uncoupled sensor (optional) should be received by the robot controller/PLC.
4. Change the state of the solenoid valve by turning off the uncouple signal (solenoid de-energized). The cams should extend back to the couple position and the uncouple sensor (optional) signal should turn OFF (LOW) and the couple sensor signal should turn ON (HIGH) at the robot controller/PLC.
5. Repeat Steps 3 and 4 several times. The cam action should be smooth and quick.

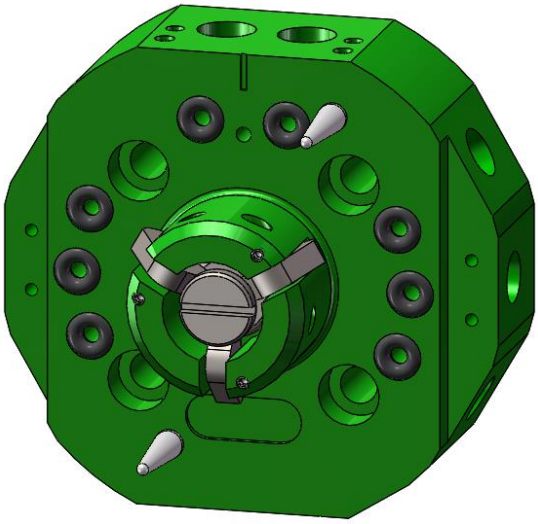


Figure 6.1-1. Robot Side Coupled (Cams Extended)

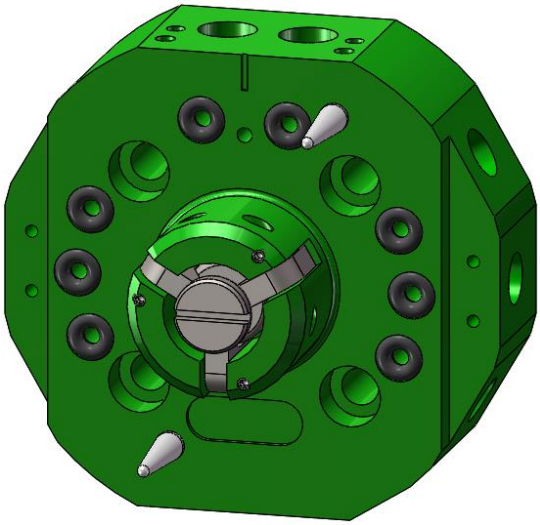


Figure 6.1-2. Robot Side Uncoupled (Cams Retracted)

6.2 PROGRAMMING THE COUPLE AND UNCOUPLE POINTS

⚠ WARNING

THE ROBOT SHOULD NEVER BE RUN WITHOUT A MINIMUM AIR PRESSURE OF 5 BAR (72 PSIG) BEING SUPPLIED TO THE ROBOT SIDE.

When programming the "dock" and "undock" points of each tooling, the following steps should be taken:

1. Orient the Robot Side and Tool Side so that the centerline axes are aligned and the interface surfaces are parallel. Maintain approximately 25mm minimum separation between the Robot Side and Tool Side interface surfaces (Figure 6.2-1).

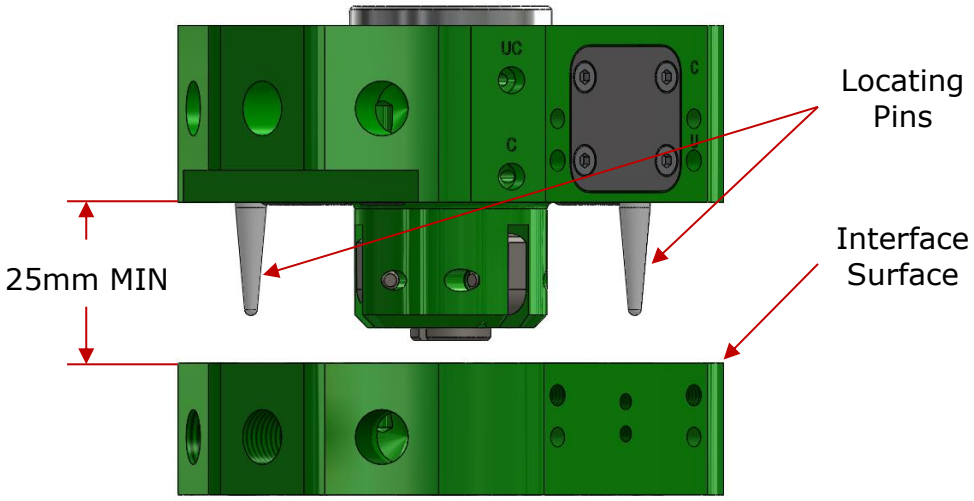


Figure 6.2-1. E50 Tool Changer – Docking Orientation

2. Energize the solenoid, resulting in an uncoupled (cams retracted) state.
3. Rotate the Robot Side so that the locating pins are centered on the bushings in the Tool Side.
4. Start to bring the Robot and Tool Sides together while visually checking the alignment of the locating pins and bushings. Make lateral adjustments as necessary to center the locating pins to the bushings. Exact alignment is not required; however, limit the amount of interference between the locating pins and bushings while docking. Interference between the locating pins and bushings while docking increases wear and decreases the life of the locating pins.
5. Stop the motion when the distance between the Robot Side interface surface and Tool Side interface surface are touching or as close as can reasonably be achieved. At this time, any electrical or fluid connections will be made through the use of available side modules. Note that when the interface surfaces of the Robot Side and Tool Side are in contact, the outer edge of the Sides should be touching (Figure 6.2-2).

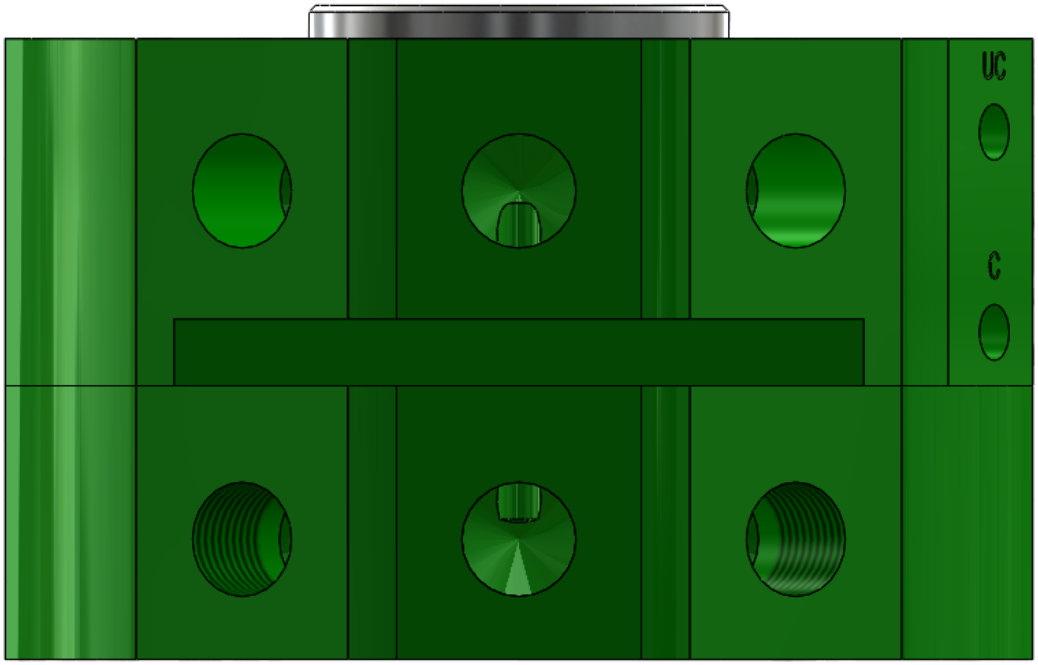


Figure 6.2-2. E50 Tool Changer – Docked Position

NOTICE

MINIMIZING THE DISTANCE BETWEEN THE ROBOT SIDE AND TOOL SIDE INTERFACE SURFACES WHEN PROGRAMMING THE DOCK AND UNDOCK POINTS WILL ENSURE OPTIMUM PERFORMANCE OF THE TOOL CHANGER OVER ITS OPERATIONAL LIFE SPAN.

SEPARATION BETWEEN THE ROBOT SIDE AND TOOL SIDE INTERFACE SURFACES, GREATER THAN 1mm DURING DOCKING OR UNDOCKING WILL RESULT IN ADDITIONAL WEAR TO THE TOOL CHANGER AND REDUCE THE OVERALL LIFE EXPECTANCY.

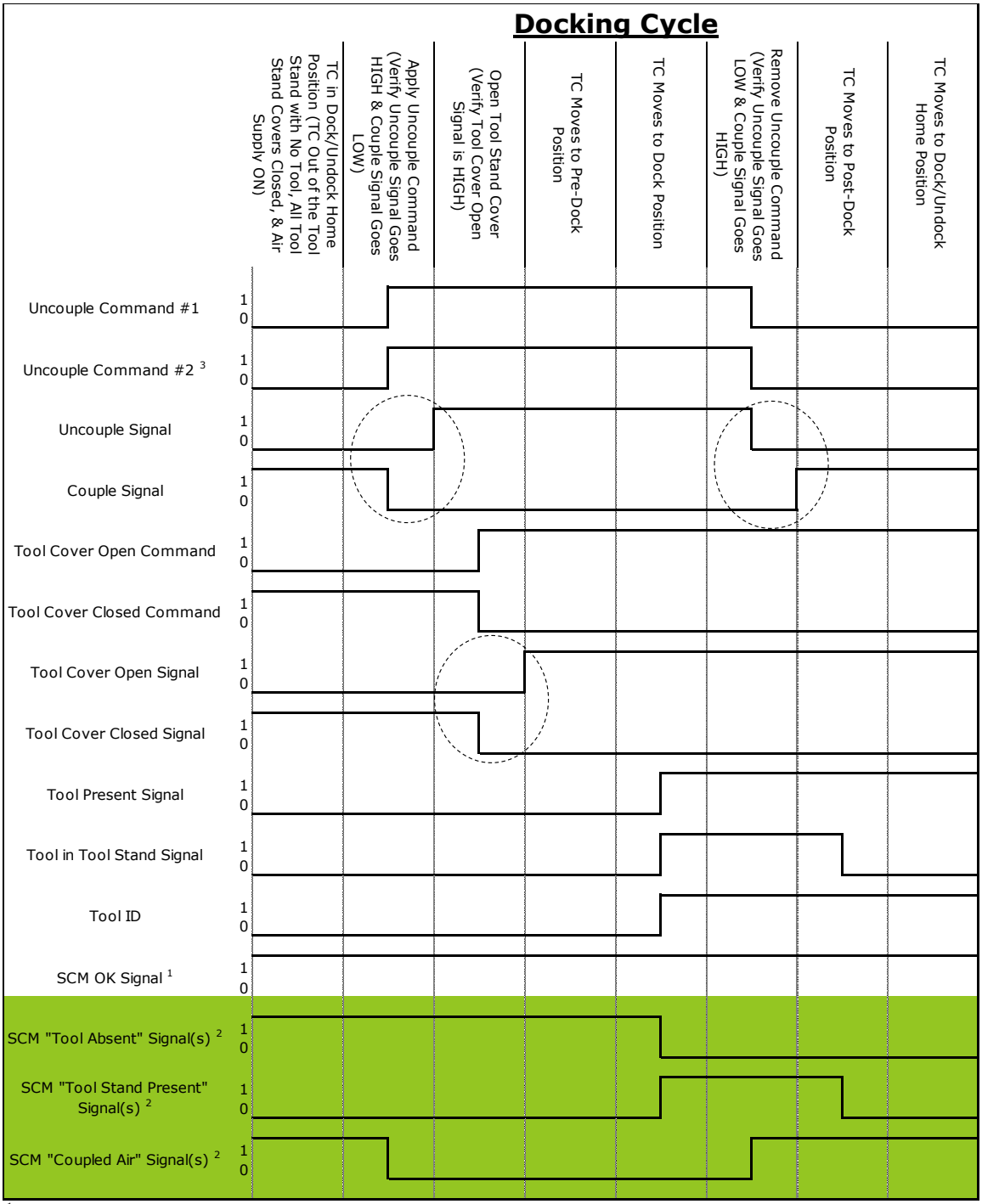
6. De-energize the solenoid that controls the air pressure to the couple port. This will couple the Robot Side with the Tool Side.
7. Cycle the cams by energizing and de-energizing the solenoid several times to verify that the Tool Side is properly connected and released from the Robot Side. If properly programmed, the Robot Side and Tool Side should not move when the cams are coupled (extended) and uncoupled (retracted).
8. Record the position from Step 5 as the "dock" and "undock" coordinates for the Tool Side. Depending on the docking station used, separate dock and undock positions may be required.
9. Repeat procedure for each Tool Side used in conjunction with the corresponding Robot Side.

6.3 RECOMMENDED SEQUENCE OF OPERATION

NOTICE

THE EPSILON TOOL CHANGER SYSTEM SHOULD NEVER BE UNCOUPLED UNLESS THE ATTACHED TOOL IS FULLY SUPPORTED IN A DOCKING STATION/TOOL STAND.

The following is a standard sequence of operation for a Robot, Tool Changer, and Tool combination. See Figure 5.2.2-1 and Figure 5.2.2-2 for a graphical representation of this sequence.



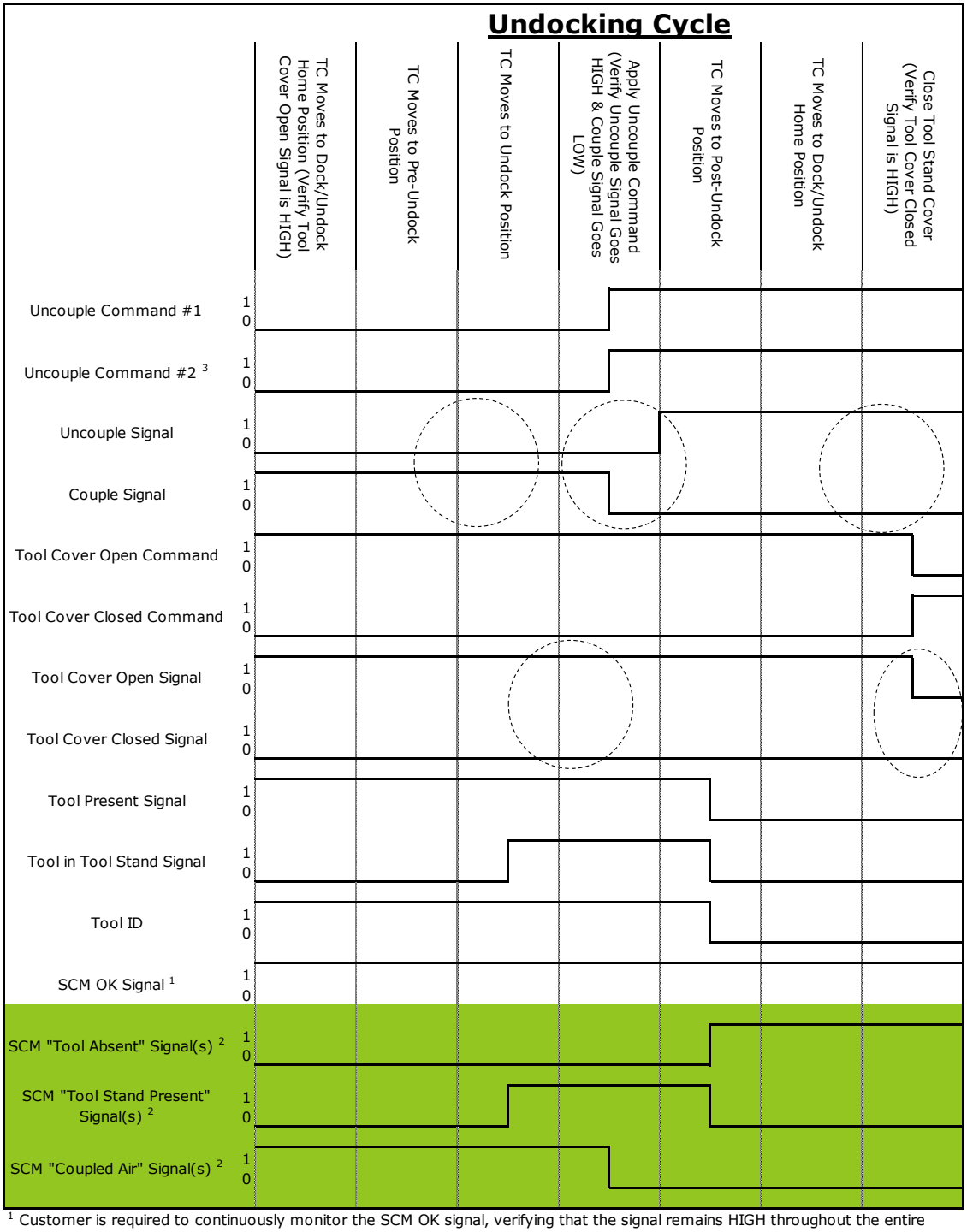
[1] Customer is required to continuously monitor the SCM OK signal, verifying that the signal remains HIGH throughout the entire operation. If SCM OK signal goes LOW, stop the robot, remove the Uncouple Commands and refer to the Troubleshooting section of the SCM User Guide.

[2] Signals (dual channel) are only available via LED's on ARI's Safety Control Module (SCM). Not available for monitoring by the robot controller.

[3] Second Uncouple Command is required when using ARI's Safety Control Module (SCM) and should be applied simultaneously with the first Uncouple Command.

- Verify the status of all signals before proceeding to the next step.
- Input/Output HIGH = 1, LOW = 0
- Dotted circles indicate a intermediate state of an actuating cyclinder when neither "Open" or "Close" signal is present.

Figure 5.2.2-1. Sequence of Operations Diagram – Docking Cycle



[1] Customer is required to continuously monitor the SCM OK signal, verifying that the signal remains HIGH throughout the entire operation. If SCM OK signal goes LOW, stop the robot, remove the Uncouple Commands and refer to the Troubleshooting section of the SCM User Guide.

[2] Signals (dual channel) are only available via LED's on ARI's Safety Control Module (SCM). Not available for monitoring by the robot controller.

[3] Second Uncouple Command is required when using ARI's Safety Control Module (SCM) and should be applied simultaneously with the first Uncouple Command.

- Verify the status of all signals before proceeding to the next step.
- Input/Output HIGH = 1, LOW = 0
- Dotted circles indicate a intermediate state of an actuating cyclinder when neither "Open" or "Close" signal is present.

Figure 5.2.2-2. Sequence of Operations Diagram – Undocking Cycle

7 TROUBLESHOOTING

7.1 TROUBLESHOOTING GUIDE

Table 7.1-1. Troubleshooting Guide

Symptom	Possible Cause	Resolution
Tool Changer Will Not Couple	Tool Changer not within required distance for coupling (<1mm)	Adjust Robot program to move within the required distance (<1mm)
	Electrical connection to the actuation valve has been lost (only if using double-acting solenoid)	Verify all connections are in place and that valve is not damaged and operating correctly
Tool Changer Will Not Uncouple	Air supply to the Tool Changer has been lost	Verify all air connections are in place and air is being supplied to the Robot cell
	Electrical connection to the actuation valve has been lost	Verify all connections are in place and that valve is not damaged and operating correctly
	Tool is not in Tool Stand	Verify the tool is supported in the tool stand and that the Tool Stand Present signal is activated
	Spring Failure	Replace piston spring
Tool Changer Couples, But No Coupled Signal is Being Received	Coupled sensing (optional) has failed	Replace sensor puck (See Section 10.1.2)
	Cable/Connections supplying signal failed	Inspect cables/connections and replace if necessary
	Air supply to the Tool Changer has been lost (Coupled via the sender spring)	Verify all air connections are in place and air is being supplied to the Robot cell
Tool Changer Uncouples, But No Uncoupled Signal is Being Received	Uncoupled sensing (optional) has failed	Replace sensor puck (See Section 10.1.2)
	Cable/Connections supplying signal failed	Inspect cables/connections and replace if necessary

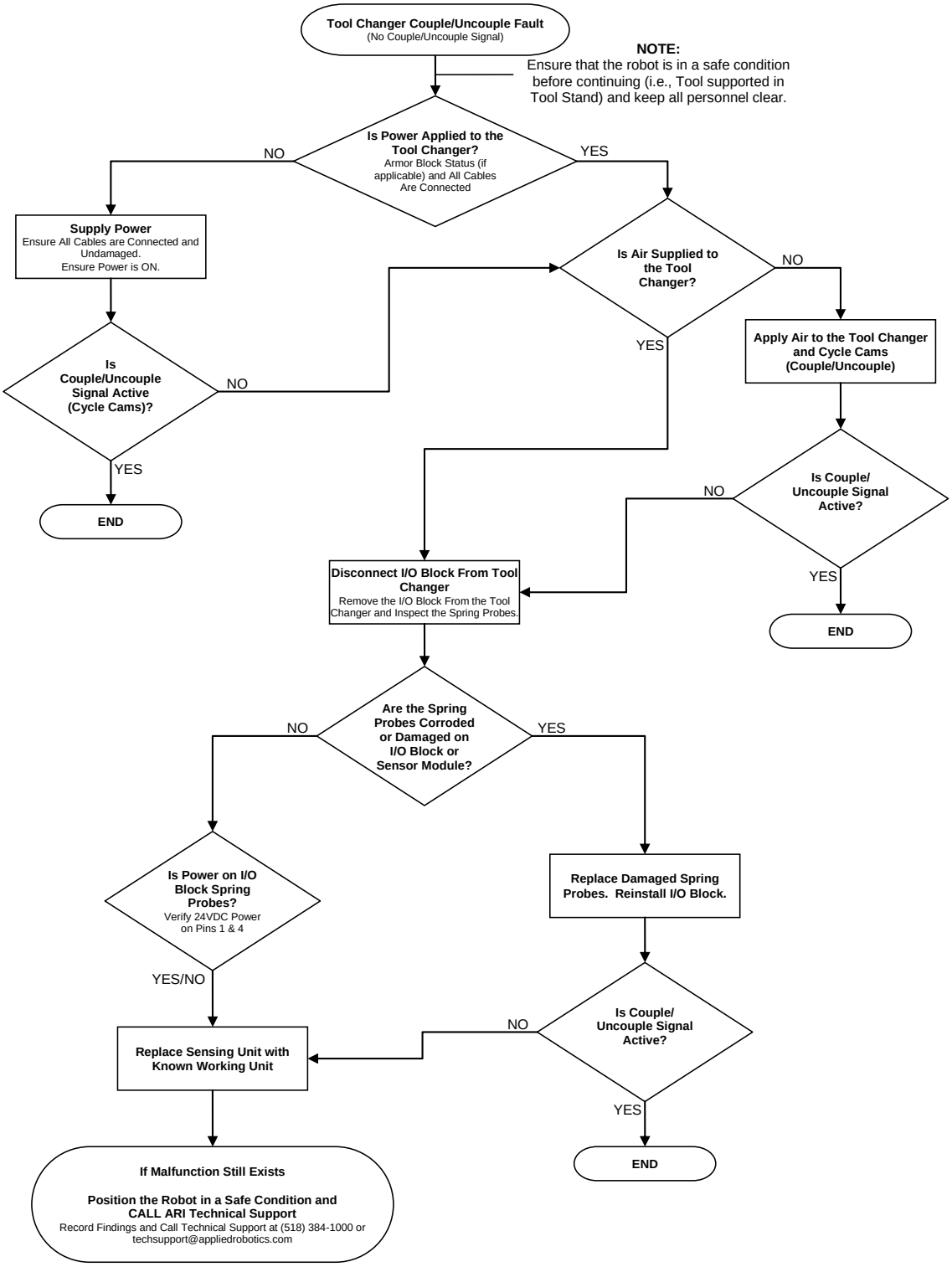
7.2 TECHNICAL SUPPORT

If you require assistance, contact APPLIED ROBOTICS Technical Support Department at:

Phone: +1 518 384 1000
E-mail: techsupport@appliedrobotics.com

7.3 TROUBLESHOOTING FAULT TREE

The fault tree provides guidance for troubleshooting a Tool Changer Couple/Uncouple signal fault (Optional).



7.4 MANUAL UNCOUPLE

A feature has been designed into the E50 Tool Changer that allows the system to be manually uncoupled in the event that damage occurs that prevents the system from uncoupling under normal means.

⚠ WARNING

ENSURE THAT THE ATTACHED TOOLING IS SAFELY SUPPORTED, PREFERABLY IN ITS TOOL STAND.

The following steps must be followed to ensure that the E50 Tool Changer is manually uncoupled in a safe manner:

1. Ensure that the attached tooling is safely supported, preferably in its tool stand, so that no damage or personal injury occurs when the tool is released.
1. Ensure that all unnecessary personnel are clear of the tooling before going further in this procedure.
2. Shut off the air supply to the actuating cylinder. The cylinder must not be pressurized for this operation to be performed successfully.
3. Insert a M3x25mm long socket head cap screw in the hole located in the middle of the Tool Side Housing as shown in Figure 7.4-1. This requires any tool side modules to be removed.
4. Drive the M3 screw in until the cams are fully retracted. This action will allow the tool changer to uncouple.

NOTICE

WHEN AIR SUPPLY IS OFF, THE COUPLE/UNCOUPLE SIGNALS WILL BE LOST DUE TO THE LACK OF AIR. ONLY MOVE THE ROBOT AFTER THE CAMS HAVE BEEN FULLY RETRACTED.

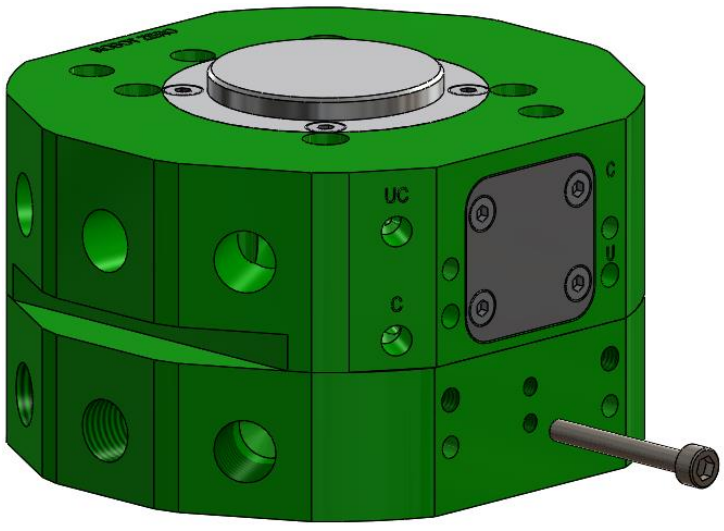


Figure 7.4-1. Manual Uncouple Feature

8 MAINTENANCE

NOTICE

FAILURE TO FOLLOW THE MAINTENANCE SCHEDULE DESCRIBED IN THIS SECTION COULD ALTER OR VOID THE WARRANTY PROVIDED BY APPLIED ROBOTICS, INC.

The following table provides a schedule for preventive maintenance to be performed for the Epsilon Tool Changer.

Table 8-1. Preventive Maintenance Schedule

	Frequency of Maintenance				
	Every 2 Weeks	250,000 Cycles	500,000 Cycles	750,000 Cycles	1,000,000 Cycles
Robot Side	Visual Checks (Section 8.1.2.1)	Lubrication (Section 8.1.1.1) & Visual Checks (Section 8.1.2.1)			Lubrication (Section 8.1.1.1) & Visual Checks (Section 8.1.2.1) & Replace Locating Pins if Worn or Damaged & Inspect Piston Spring Functionality and Replace if Necessary[1]
Tool Side	Visual Checks (Section 8.1.2.2)	Lubrication (Section 8.1.1.2) & Visual Checks (Section 8.1.2.2)			Lubrication (Section 8.1.1.2) & Visual Checks (Section 8.1.2.2) & Replace Locating Bushings if Worn or Damaged

	Frequency of Maintenance				
	Every 2 Weeks	1,250,000 Cycles	1,500,000 Cycles	1,750,000 Cycles	2,000,000 Cycles[2]
Robot Side	Visual Checks (Section 8.1.2.1)	Lubrication (Section 8.1.1.1) & Visual Checks (Section 8.1.2.1)			Lubrication (Section 8.1.1.1) & Visual Checks (Section 8.1.2.1) & Inspect Piston Spring Functionality and Replace if Necessary & Inspect Dock and Undock Positions to Ensure Proper Alignment with Each Tool Side
Tool Side	Visual Checks (Section 8.1.2.2)	Lubrication (Section 8.1.1.2) & Visual Checks (Section 8.1.2.2)			Lubrication (Section 8.1.1.2) & Visual Checks (Section 8.1.2.2) & Replace Locating Bushings if Worn or Damaged

[1] To test Piston Spring functionality, retract the cams (Figure 6.1-2) using air pressure, then completely vent off all air and ensure that the cams return to the extended position (Figure 6.1-1).
[2] Continue Lubrication and Visual Checks every 250,000 Cycles. Continue inspecting for wear or damaged components every 500,000 cycles.

8.1 PREVENTIVE MAINTENANCE

8.1.1 Lubrication

Proper lubrication of wear components is essential to maintaining the performance and prolonging the operational life of the E50 Tool Changer. Failure to apply proper lubrication could result in increased wear and shorten the life expectancy of the Tool Changer. The following lubricants are approved for use on the E50 Tool Change System.

Table 8.1.1-1. Approved Lubricants

Lubricant	ARI Part #	Manufacturer	Manufacturer's Part #
Lube-A-Cyl	51120	Parker	0766130000
White Lithium Grease	91504-P1037	Century Lubricants	ST-80
Staburags NBU 30 Grease	0903-P11N	Klüber	NBU 30
White EP Bearing Grease	96503-P1018	Dow Corning	White EP Bearing Grease

8.1.1.1 Robot Side

1. Clean the latching cams, locating/alignment pins, and driver/washer to ensure all existing grease, dirt, and debris is removed.
2. Apply a liberal coating of white lithium grease to the contact surfaces between the three (3) latching cams and driver, as shown in Figure 8.1.1.1-1 with the surfaces highlighted blue.

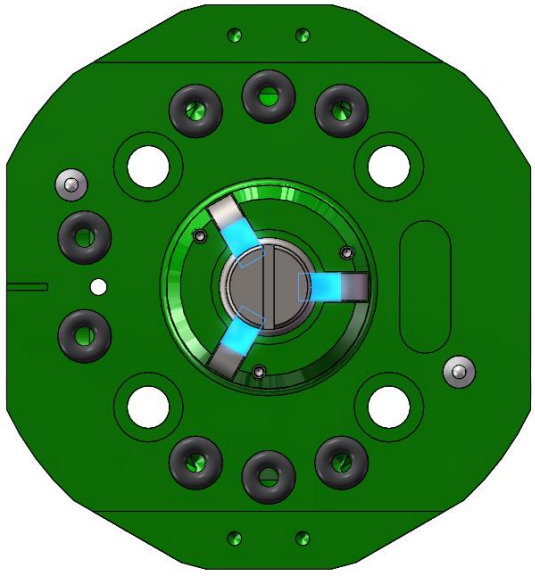


Figure 8.1.1.1-1. E50 Robot Side Lubrication – Cams & Driver

8.1.1.2 Tool Side

1. Clean the inner surface of the tool ring, the locating/alignment bushings, and the latching surfaces to ensure all existing grease, dirt, and debris is removed.
2. Apply a liberal coating of white lithium grease to the latching surfaces and to the inner surface of the locating/alignment bushings, as shown in Figure 8.1.1.2-1 with the surfaces highlighted blue.

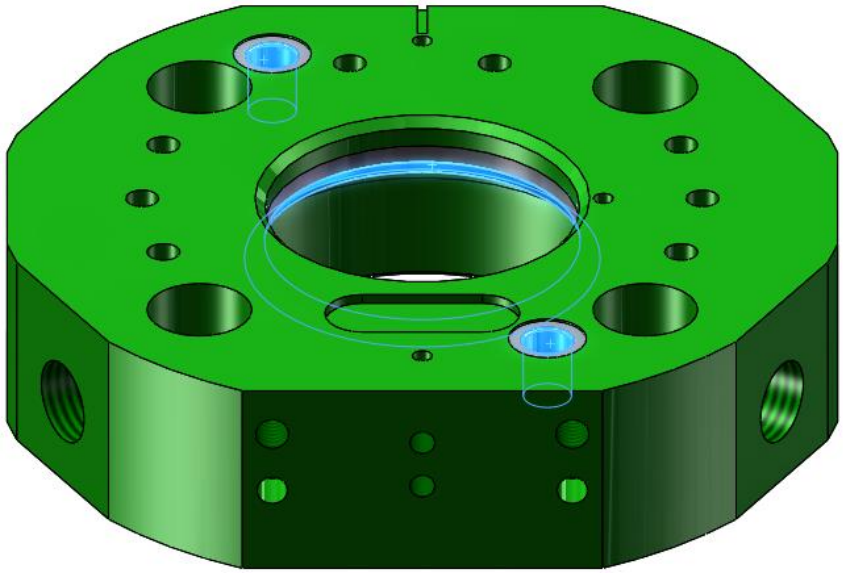


Figure 8.1.1.2-1. ET63 Tool Side Lubrication

8.1.2 Visual Checks

Periodic visual checks of the E50 Tool Changer provide early detection of breakage or wearing components.

8.1.2.1 Robot Side

1. The latching cams and locating/alignment pins should be inspected for proper lubrication as defined in Section 8.1.1.1.
2. Inspect the latching cams and locating/alignment pins for rust, breakage, or wear[3].
3. Inspect the Robot Side mating surface for raised material[4] or dings that could prevent proper mating to the Tool Side.
4. Uncouple the Robot Side from the Tool Side and cycle the coupling mechanism several times to verify the latching cams are operating smoothly. The cycling of the coupling mechanism will also ensure that the operating cylinder remains properly lubricated.

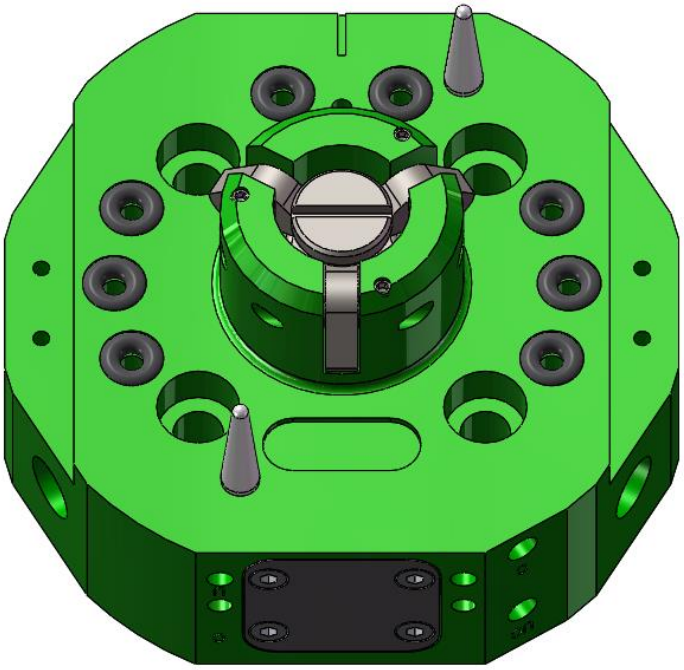


Figure 8.1.2.1-1. E50 Robot Side Visual Inspection

[3] If excessive wear is found on the locating/alignment pins, latching cams, or Robot Side mating surface, review the docking and undocking sequence of the robot program and adjust if necessary.
[4] All raised material should be filed smooth.

8.1.2.2 Tool Side

1. The locating/alignment bushings and the latching surfaces should be inspected for proper lubrication as defined in Section 8.1.1.2.
2. Inspect the latching surfaces and locating/alignment bushings for rust, breakage, or wear[5].
3. Inspect the Tool Side mating surface for raised material[6] or dings that could prevent proper mating to the Robot Side.

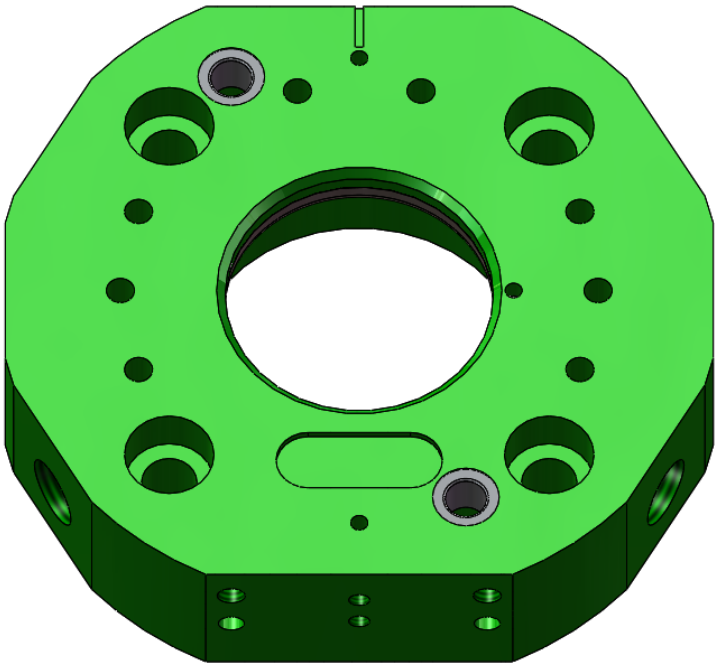


Figure 8.1.2.2-1. ET63 Tool Side Visual Inspection

8.1.3 Checking Wear of the Cam Locking Mechanism

In the unlikely event that the Epsilon Tool Changer begins to demonstrate signs of wear in the cam locking mechanism, causing the connection between the Robot Side and Tool Side to lose repeatability and precision, the following can be used to check the wear of the locking mechanism.

1. Remove the Robot Side from the Robot/Manipulator.
2. Remove the Tool Side from the Tool.
3. Remove the face seals from the Robot Side.
4. With the Sides positioned on a workbench, inspect the mating surfaces of the Robot (Figure 8.1.3-1) and Tool (Figure 8.1.3-2) Sides for any raised material. If any raised material is found, file it smooth before proceeding.

[5] If excessive wear is found on the locating/alignment bushings, latching surfaces, or Tool Side mating surface, review the docking and undocking sequence of the robot program and adjust if necessary.
[6] All raised material should be filed smooth.

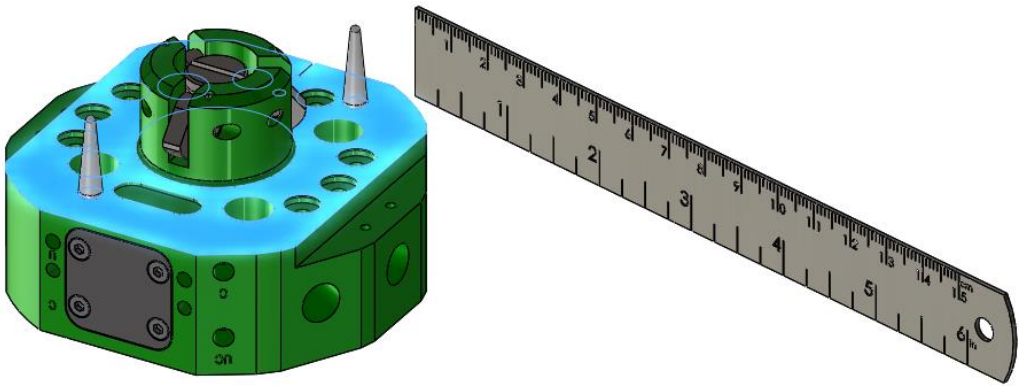


Figure 8.1.3-1. Robot Side – Raised Material Inspection

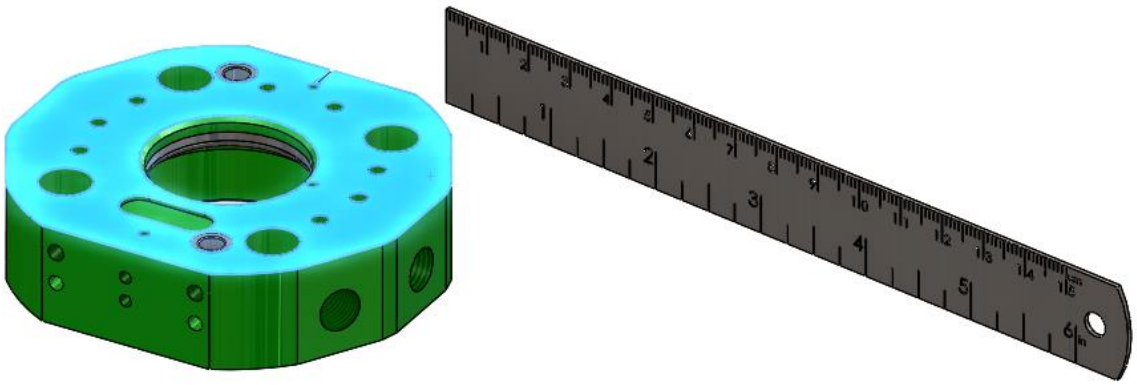


Figure 8.1.3-2. Tool Side – Raised Material Inspection

5. Connect the couple and uncouple actuation port lines (Figure 5.3-1) so that the locking mechanism can be manually actuated.
6. With the cams retracted (Figure 6.1-2), position the Robot Side and Tool Side so that they can be coupled together.
7. Place a 0.05mm piece of shim stock at the locations shown in Figure 8.1.3-3, one location at a time.
8. Actuate the cams to couple the Robot Side to the Tool Side (Figure 6.1-1).
9. With a slight tug, check if the piece of shim stock is securely clamped between the Robot Side and Tool Side interface surfaces.
10. Uncouple the Robot Side from the Tool Side.
11. Repeat Steps 6 through 9 for each location shown in Figure 8.1.3-3.

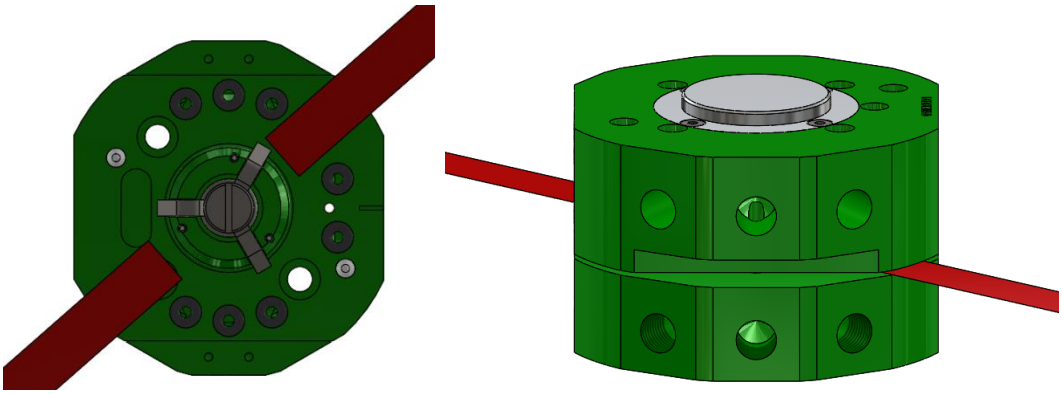


Figure 8.1.3-3. Shim Test of the Cam Locking Mechanism

If the piece of shim stock is able to be pulled free from the coupling interface while the cams are actuated (Figure 6.1-1), record the serial number of the Robot Side and Tool Side and contact APPLIED ROBOTICS Technical Support Department at +1 518 384 1000 or techsupport@appliedrobotics.com.

9 SPARE PARTS

The spare parts listed below are recommended to be maintained in stock for the life of the Tool Changer. These quantities are based on a single unit. If higher quantities are purchased, please contact the Technical Support Department at +1 518 384 1000 or techsupport@appliedrobotics.com to determine the quantity of spares recommended for the size of your installation.

Table 9-1. Robot Side Spare Parts

ROBOT SIDE		
Description	**Part Number**	**Quantity**
PIN, LOCATING XC5/CXC10	90507-B1028	2
SUBASSY, PNP M12 5PIN MOD. ER50/63 (Optional)	1507-D54A	1
O-RING, .112 ID X .103 BUNA	0202-P05N	8

Table 9-2. Tool Side Spare Parts

TOOL SIDE		
Description	**Part Number**	**Quantity**
LOCK RING, XC10 TOOLING	96503-B1054	1
BUSHING, (SS) XC5	90507-B1029	2

10 SPARE PARTS REPLACEMENT

The following procedures explain the correct method for removing and replacing the recommended spare parts listed in Section 9 of this manual.

10.1 ROBOT SIDE

10.1.1 Locating/Alignment Pins

1. Remove the Robot Side from the Robot/Manipulator.
2. Remove the M3 socket head cap screw (48030) using a 2.5mm Allen wrench.
3. Remove round Locating Pin(s) (90507-B1028). Locating/Alignment Pins may need to be punched out.
4. Place new Locating Pin into the appropriate mounting hole (Figure 10.1.1-1).
5. Apply Loctite 242, or equivalent, to M3 socket head cap screw removed in Step 2 (Clean threads before applying thread locker) and thread it into the Locating Pin from the top side of the Robot Side Housing. Tighten until Locating Pins are no longer pulled into holes and do not rotate.
6. Lubricate Locating Pin per Section 8.1.1.1.

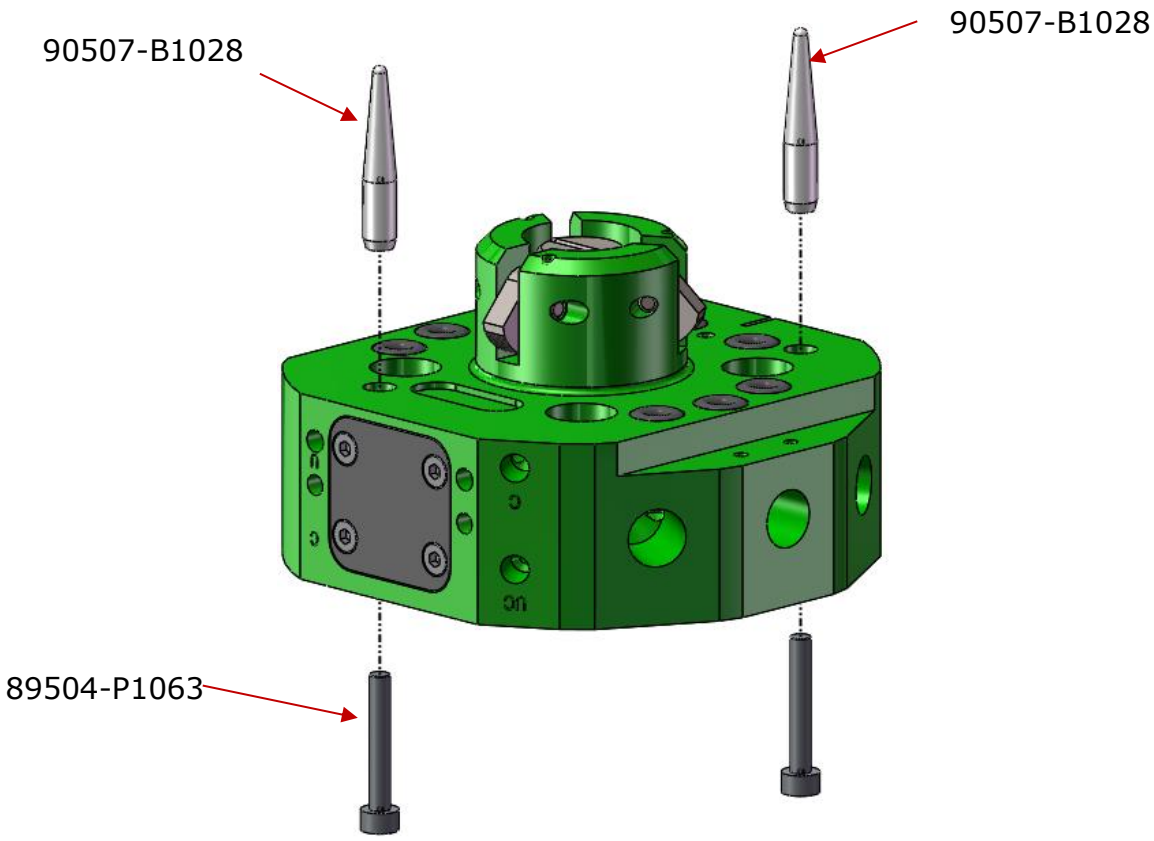


Figure 10.1.1-1. Locating/Alignment Pin Replacement

10.1.2 Couple/Uncouple Sensing Module (Optional Feature)

1. Remove the module from Side 2.
2. Loosen the captivated socket head cap screws holding the Sensing Module using a 2mm Allen wrench.
3. Remove the Sensing Module (1507-D54A) and either discard or send to APPLIED ROBOTICS for repair.
4. Replace unit with another Sensing Module.
5. Ensure that the cavity in the Robot Side Housing holding the Sensing Module is free of all foreign objects.
6. Ensure that the two (2) O-rings (97501-P1084) for the proximity sensors, supplied with the Sensing Module, are properly positioned.
7. Apply Loctite 242, or equivalent, to the threads of the captivated socket head cap screws before installing.
8. Install the new Sensing Module using the captivated socket head cap screws.
9. Reinstall module removed from Side 2 in Step 1.
10. Prior to coupling the Tool Changer, cycle the actuating cylinder for the Robot Side several times to ensure that the sensors are working properly and the correct inputs are being received by the robot controller.

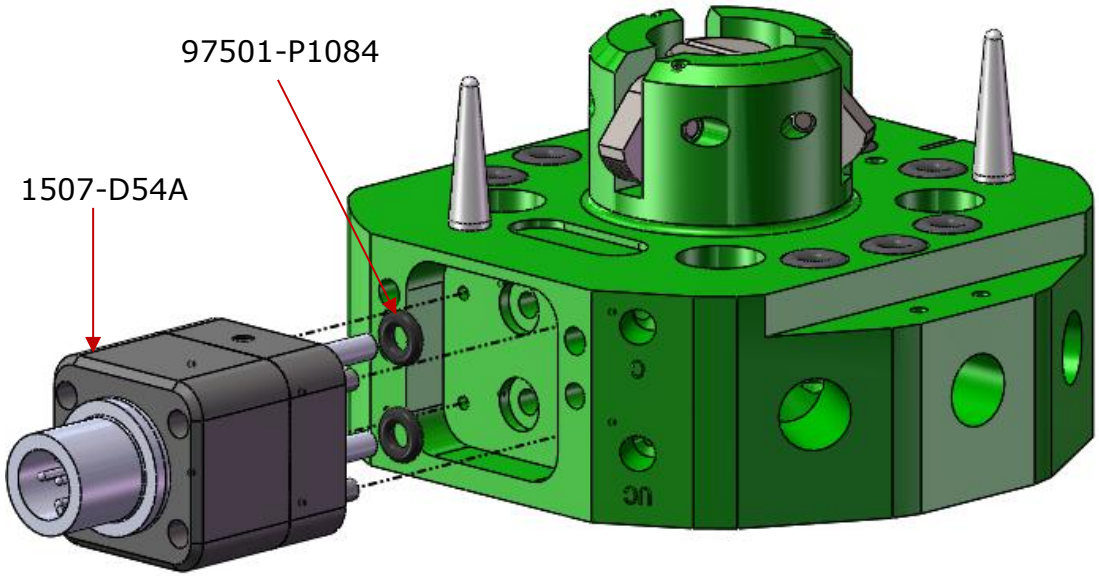


Figure 10.1.2-1. Couple/Uncouple Sensing (Optional) Module Replacement

NOTICE

MAKING CONNECTIONS WHILE UNDER POWER COULD RESULT IN DAMAGE TO THE EQUIPMENT. TO AVOID DAMAGING EQUIPMENT, ENSURE THAT ALL CABLES ARE CONNECTED BEFORE SUPPLYING POWER TO THE EQUIPMENT.

10.2 TOOL SIDE

10.2.1 Locking Ring

1. Remove the Tool Side from the Tool.
2. Remove the M3 socket head set screws (48417) using a 1.5mm Allen wrench.
3. Remove the Locking Ring (96503-B1054) from the Tool Side. Note that an access hole is available if a punch is needed to remove the Locking Ring.
4. Place new Locking Ring into the Tool Side.
5. Apply Loctite 222, or equivalent, to M3 socket head set screws removed in Step 2 (clean threads before applying thread locker) and screw into the Tool Side Housing.
6. Lubricate Latching Dowels per Section 8.1.1.2.

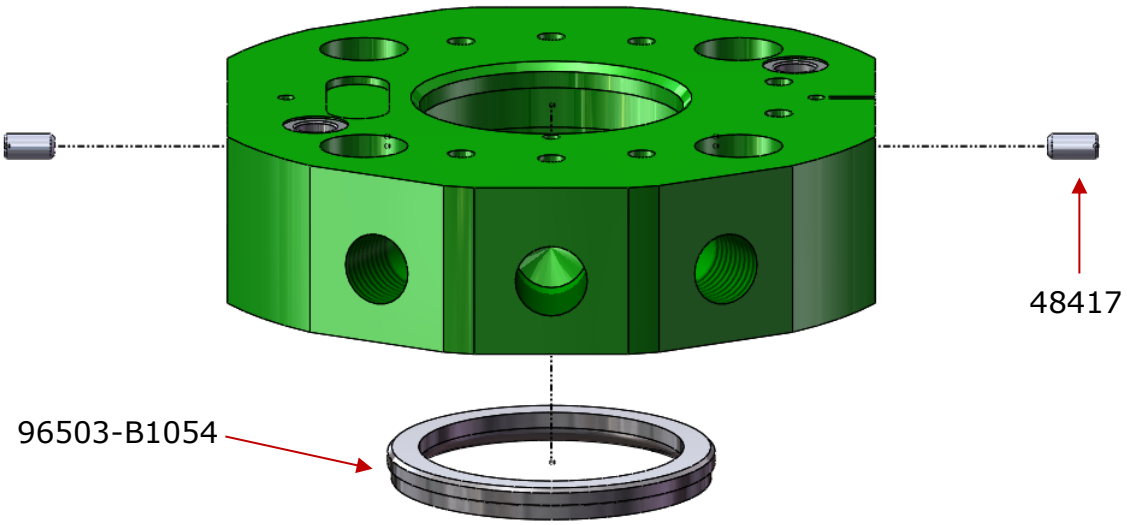


Figure 10.2.1-1. Locking Ring

10.2.2 Locating Bushing

1. Remove the Tool Side from the Tool.
2. Press out the Locating Bushings (90507-B1029) from the bottom of the Tool Side Housing.
3. Press in new Locating Bushings from the top of the Tool Side Housing until it is just below the Tool Side Housing surface. Ensure that the rounded edge of the Locating Bushing faces the top surface of the Tool Side Housing.
4. Lubricate the Locating Bushing per Section 8.1.1.2.

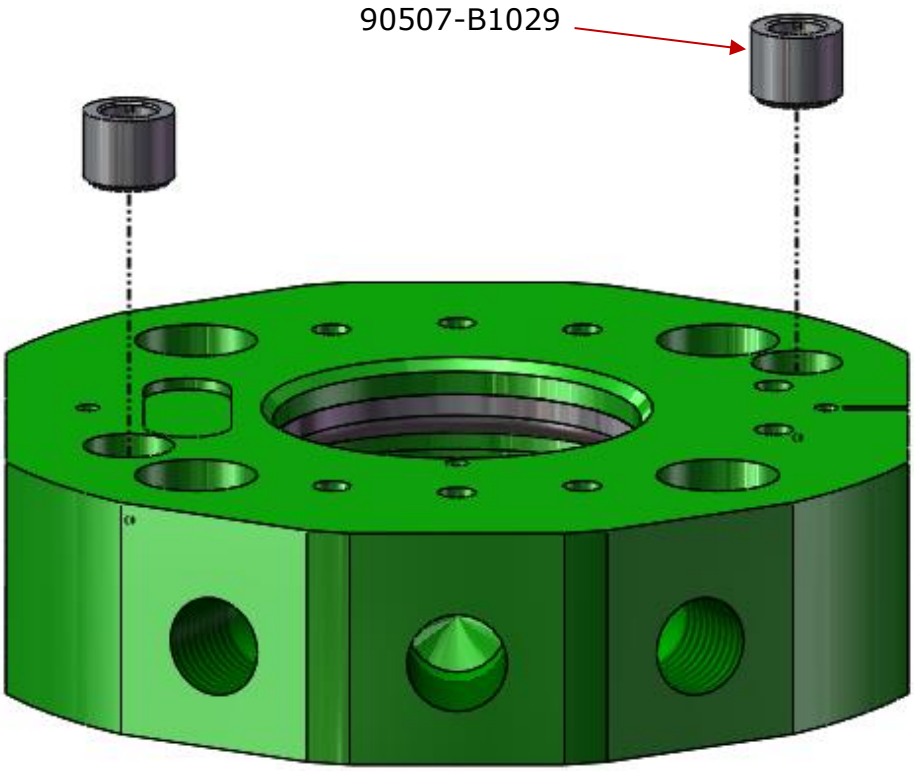


Figure 10.2.2-1. Locating Bushing Replacement

11 INFORMATIONAL DOCUMENTS

The drawings in this section can assist with installation, use, and identification of replacement parts for the Epsilon Tool Changer. Please contact **APPLIED ROBOTICS Technical Support** if you have any questions.

DECLARATIONS
• Declaration of Incorporation for Partly Completed Machinery

DRAWINGS	
DRAWING NUMBER	**DESCRIPTION**
1507-D40A	ER50-N/A-031-N-0-C0000
1606-D03A	ER50-PM12-031-N-0-C0000
1507-D49A	ET63-040-N-C0000
1900785A	ET50-031-N-T-C0000

Declaration of Incorporation of Partly Completed Machinery (Annex II 1 B of EC Machinery Directive 2006/42/EC)

Description and identification of the partly completed machinery:

XChange – EPSILON Series Tool Changers & Utility Modules

Fulfills the following function:

Allows industrial robots (and other automated equipment) to automatically change their end of arm tooling under programmed control without the need of human intervention. These products are intended to be incorporated into machinery supplied by others.

The following essential requirements of EC Machinery Directive 2006/42/EC (Annex I) have been applied and fulfilled:

Section 1.1.2.	Principles of safety integration
Section 1.1.3.	Materials and products
Section 1.1.5.	Design of machinery to facilitate its handling
Section 1.2.1.	Safety and reliability of control systems
Section 1.2.6.	Failure of the power supply
Section 1.3.2	Risk of break-up during operation
Section 1.3.3.	Risks due to falling or ejected objects
Section 1.3.4.	Risks due to surfaces, edges or angles
Section 1.3.7.	Risks related to moving parts
Section 1.3.9.	Risks of uncontrolled movements
Section 1.5.1.	Risks due to electricity supply
Section 1.5.3.	Risks due to energy supply other than electricity (air pressure)
Section 1.5.8.	Risks due to noise
Section 1.5.10.	Risks due to non-ionizing radiation
Section 1.6.4.	Operator intervention
Section 1.7.1.	Information and warnings on the machinery
Section 1.7.2.	Warning of residual risks
Section 1.7.3.	Marking of machinery
Section 1.7.4.	Instructions.

The partly completed machinery has been designed and manufactured according to the following harmonized standards:

EN ISO 12100-1	Safety of machinery - Basic concepts, general principles for design Part 1: Basic terminology, methodology
EN ISO 12100-2	Safety of machinery - Basic concepts, general principles for design Part 2: technical principles

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EN ISO 10218-2	Robots and robotic devices — Safety requirements for industrial robots — Part 2: Robot systems and integration
EN ISO 60204-1	Safety of machinery. Electrical equipment of machines. General requirements
EN 61000-6-2	Electromagnetic compatibility (EMC) - Generic standards. Immunity for industrial environments
EN 61000-6-4	Electromagnetic compatibility (EMC) - Generic standards. Emission standard for industrial environments
EN 61000-4-2	Electromagnetic compatibility (EMC). Testing and measurement techniques. Electrostatic discharge immunity test
EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use -- Part 1: General requirements

The relevant technical documentation has been compiled in accordance with Annex VII, Part B of EC Machinery Directive 2006/42/EC. We undertake, in response to a reasoned request, to supply it in electronic form to the market surveillance authorities within a reasonable period.

The party authorized to compile the technical documentation is:

Giovanni Patrini, at Effecto Group SpA

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machinery Directive.

Stefan Casey
Vice President, Engineering

APRIL 20, 2018
Date

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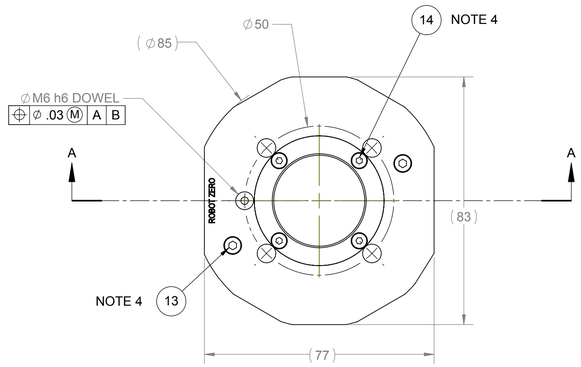
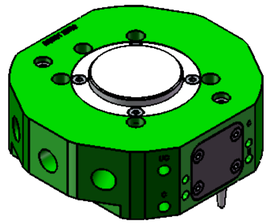
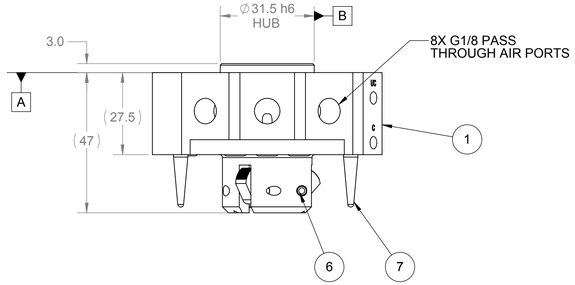
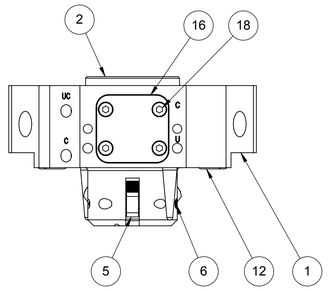
SIZE	DRAWING NUMBER	REV
D	1507-D40A	00

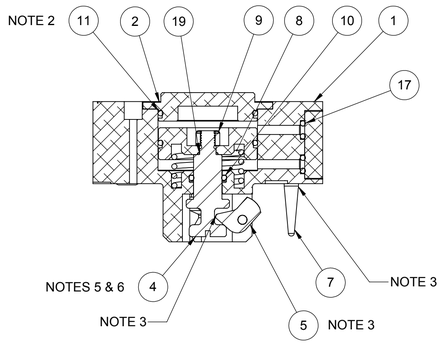
REVISIONS						
ZONE	REV	DESCRIPTION	DR	CHK	DATE	ECR/ESR NO.
	00	RELEASE FOR MANUFACTURE.	JV	SA	3/30/2016	EMIN-87JKUZ



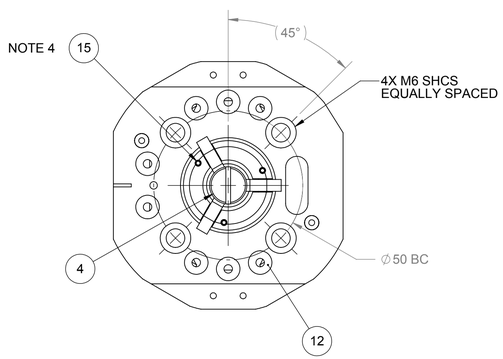








SECTION A-A
SCALE 1 : 1



NOTES:

1. ALL PARTS TO RECEIVE LOCTITE ARE TO BE THOROUGHLY CLEANED FROM GREASE AND OIL.
2. ALL SURFACES OR O-RINGS THAT RECEIVE LUBE-A-CYL (51120) APPLY ONLY A THIN FILM. ITEMS 14 - 18.
3. APPLY LITHIUM GREASE, ARI #91504-P1037.
4. APPLY LOCTITE 222, ARI #86005-P1020.
5. APPLY LOCTITE 271, ARI #86005-P1304.
6. TORQUE TO 18 IN/LBS.

ITEM NO.	QTY	PART NO.	DESCRIPTION
19	1	1602-P21N	O-RING, .216 X .028
18	4	48008	SCR, SOC HD CAP M2.5 X 8 (SS)
17	2	0601-P65N	O-RING, .101 ID X .070 BUNA (P)
16	1	1601-C38N	COVER, SENSING ER50/63
15	3	48410	SCR, SOC SET M2.5 X 6 (SS) CUP PNT
14	4	48162	SCR, FLAT HD SOC CAP M2.5 X 8 (SS)
13	2	89504-P1063	SCR, SOC HD CAP M3 X 20 (SS)
12	8	0202-P05N	O-RING, .112 ID X .103 BUNA (P)
11	2	90511-P1029	O-RING, 1.176 ID X .07 (VITON) (P)
10	1	83908-P1134	O-RING, .364 ID X .07 75 VITON
9	1	96504-P1018	NUT, NYLON LOCK M5
8	1	96504-P1020	SPRING, .921 O.D. X 1 IN LNG
7	2	90507-B1028	PIN, LOCATING
6	3	96503-B1039	PIVOT PIN, CXC10 ROBOT
5	3	96503-C1071	CAM, XC10 ROBOT
4	1	96503-B1040	PISTON, BOLT XC10 ROBOT
3	1	1507-C43N	PISTON, ROBOT ER50/63
2	1	1507-C42N	CAP, ROBOT ER50 31.5mm
1	1	1507-D41N	HOUSING, ROBOT ER50

THIRD ANGLE PROJECTION

DIM. AND TOLERANCING IN ACCORDANCE WITH ANSI Y14.5M-1994

METRIC

UNLESS OTHERWISE SPECIFIED:

UNTOLERANCED DIMS ARE BASIC

⌓ .25 A B C

⌖ ∅ .25Ⓜ A B C

ALL HOLE DIAMETERS +/- 0.25

INTERNAL RADII & BROKEN EDGES TO BE .13-.38.
ALL SURFACE FINISHES 1.6Ra

MAT'L:
-

SURFACE TREATMENT:
-

DR:	J. VALLELUNGA
CHK:	S. ATKINS
ENG:	J. DELMONACO
MFG:	C. BEST
QC:	M. DUDNATH

3D MODEL NUMBER:
1507-D40A

SCALE: 1:1
DO NOT SCALE DRAWING

ISO 9001
REGISTERED

PRINT DATE
7/11/2016

Applied Robotics™
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648 Saratoga Rd. Glenville, NY 12302
www.appliedrobotics.com

TITLE:

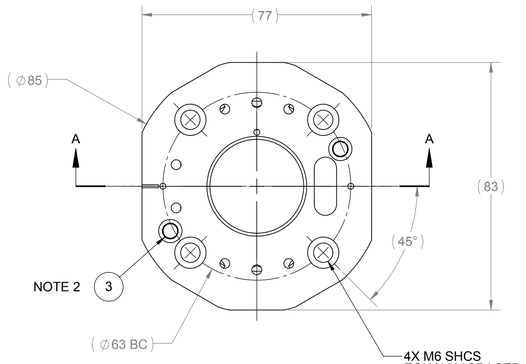
ER50-N/A-031-N-0-C0000

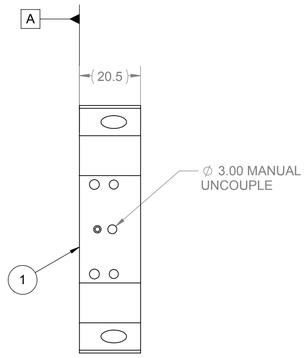
SIZE	DRAWING NUMBER	REV
D	1507-D40A	00

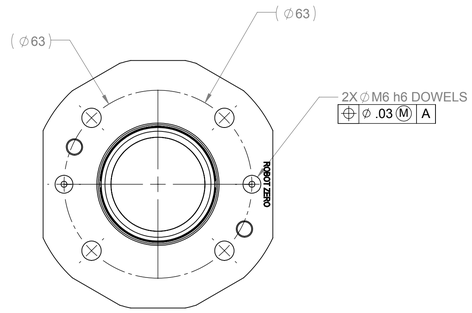
WEIGHT: 0.38 kg | RoHs COMPLIANT: - | SHT. 1 OF 1

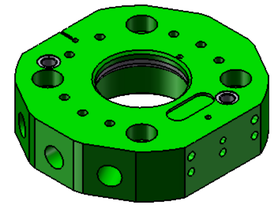
SIZE	DRAWING NUMBER	REV
D	1507-D49A	00

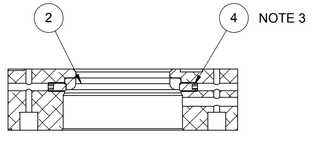
REVISIONS						
ZONE	REV	DESCRIPTION	DR	CHK	DATE	ECR/ESR NO.
	00	RELEASE FOR MANUFACTURE.	JV	SA	3/30/2016	EMIN-87JKUZ











SECTION A-A
SCALE 1 : 1

NOTES:

1. ALL PARTS TO RECEIVE LOCTITE ARE TO BE THOROUGHLY CLEANED FROM GREASE AND OIL.
2. APPLY LITHIUM GREASE, ARI #91504-P1037.
3. APPLY LOCTITE 222, ARI #86005-P1020.

ITEM NO.	QTY	PART NO.	DESCRIPTION
4	2	48417	SCR, SOC SET M3 X 6 (SS)
3	2	90507-B1029	BUSHING, (SS) XC5
2	1	96503-B1054	LOCK RING, XC10 TOOLING
1	1	1507-D50N	HOUSING, TOOL ET63

THIRD ANGLE PROJECTION

PRINT DATE
3/31/2016

METRIC

UNLESS OTHERWISE SPECIFIED:

UNTOLERANCED DIMS ARE BASIC

⌓ .25 A B C

⌖ ∅ .25 M A B C

ALL HOLE DIAMETERS +/- 0.25

INTERNAL RADII & BROKEN EDGES TO BE .13-.38
ALL SURFACE FINISHES 1.6Ra

DIM. AND TOLERANCING IN ACCORDANCE WITH ANSI Y14.5M-1994

MAT'L:
-

SURFACE TREATMENT:
-

DR:	J. VALLELUNGA
CHK:	S. ATKINS
ENG:	J. DELMONACO
MFG:	C. BEST
QC:	M. DUDNATH

3D MODEL NUMBER:
1507-D49A

SCALE: 1:1
DO NOT SCALE DRAWING

ISO 9001
REGISTERED

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648 Saratoga Rd. Glenville, NY 12302
www.appliedrobotics.com

TITLE:

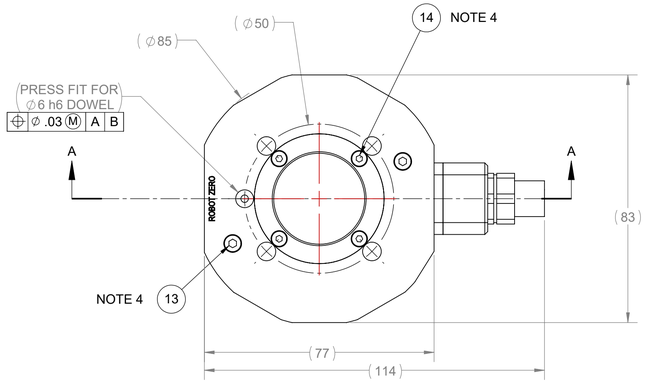
ET63-040-N-C0000

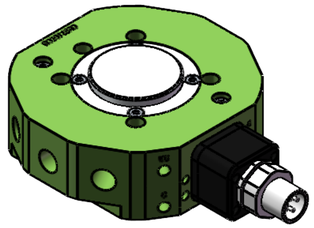
SIZE	DRAWING NUMBER	REV
D	1507-D49A	00

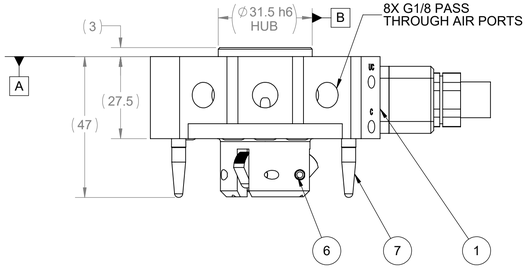
WEIGHT: 0.21 kg | RoHs COMPLIANT: - | SHT. 1 OF 1

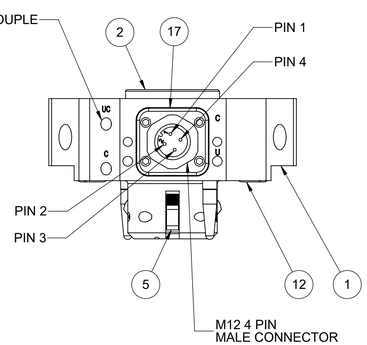
SIZE	DRAWING NUMBER	REV
D	1606-D03A	02

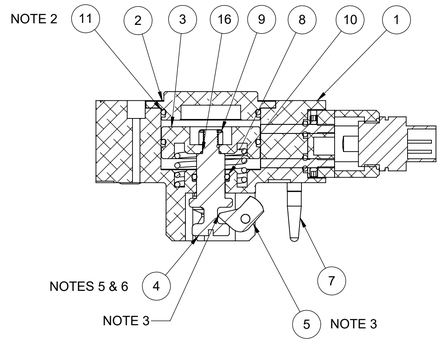
REVISIONS						
ZONE	REV	DESCRIPTION	DR	CHK	DATE	ECR/ESR NO.
	00	RELEASE FOR MANUFACTURE.	TM	JV	8-22-16	WJON-ACVR3N
	01	CHANGED MOD. # FROM ER50-PNP-031-N-0-C000	JV	PS	1/18/2017	WZEH-AHQ4CY
	02	0007-B20N WAS 90507-B1028, 2100280P WAS 0202-P05N	PS	TM	04/02/2021	SCAY-BZMLD9



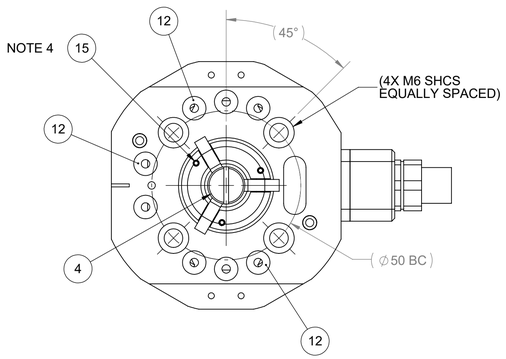








SECTION A-A
SCALE 1 : 1



NOTES:

1. ALL PARTS TO RECEIVE LOCTITE ARE TO BE THOROUGHLY CLEANED FROM GREASE AND OIL USING ISOPROPYL ALCOHOL.
2. ALL SURFACES OR O-RINGS THAT RECEIVE LUBE-A-CYL (51120) APPLY ONLY A THIN FILM.
3. APPLY LITHIUM GREASE, ARI #91504-P1037.
4. APPLY LOCTITE 222, ARI #86005-P1020.
5. APPLY LOCTITE 271, ARI #86005-P1304.
6. TORQUE TO 18 IN/LBS.

ITEM NO.	QTY	PART NO.	DESCRIPTION
17	1	1507-D54A	SUBASSY, PNP M12 4 PIN MOD. ER50/63
16	1	1602-P21N	O-RING, .216 X .028
15	3	48410	SCR, SOC SET M2.5 X 6 (SS) CUP PNT
14	4	48162	SCR, FLAT HD SOC CAP M2.5 X 8 (SS)
13	2	89504-P1063	SCR, SOC HD CAP M3 X 20 (SS)
12	8	2100280P	O-RING, .112 ID X .103 BUNA 50A
11	2	90511-P1029	O-RING, 1.176 ID X .07
10	1	83908-P1134	O-RING, .364 ID X .07 75 VITON
9	1	96504-P1018	NUT, NYLON LOCK M5
8	1	96504-P1020	SPRING, .921 O.D. X 1 IN LNG
7	2	0007-B20N	LOCATING PIN, MXC20
6	3	96503-B1039	PIVOT PIN, CXC10 ROBOT
5	3	96503-C1071	CAM, XC10 ROBOT
4	1	96503-B1040	PISTON, BOLT XC10 ROBOT
3	1	1507-C43N	PISTON, ROBOT ER50/63
2	1	1507-C42N	CAP, ROBOT ER50 31.5mm
1	1	1507-D41N	HOUSING, ROBOT ER50

THIRD ANGLE PROJECTION

METRIC

UNLESS OTHERWISE SPECIFIED:

UNTOLERANCED DIMS ARE BASIC

.25 A B C

⌖ ⌀ .25 Ⓜ A B C

ALL HOLE DIAMETERS +/- 0.25

INTERNAL RADII & BROKEN EDGES TO BE .13-.38
ALL SURFACE FINISHES 1.6Ra

MAT'L:
Material <not specified>

SURFACE TREATMENT:
-

DIM. AND TOLERANCING IN ACCORDANCE WITH ANSI Y14.5M-1994

ISO 9001 REGISTERED

DR:	T. MARCELLA
CHK:	J. VALLELUNGA
ENG:	T. MARCELLA
MFG:	C. BEST
QC:	M. DUDNATH

3D MODEL NUMBER:
1606-D03A

SCALE: 1:1
DO NOT SCALE DRAWING

PRINT DATE
4/27/2021

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TITLE:

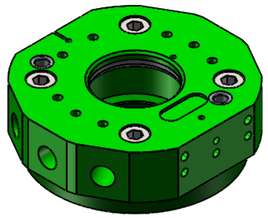
ER50-PM12-031-N-0-C0000

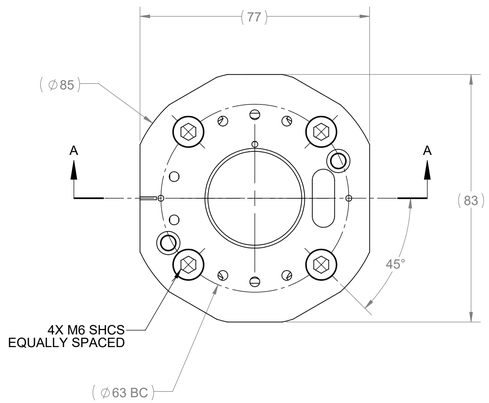
SIZE	DRAWING NUMBER	REV
D	1606-D03A	02

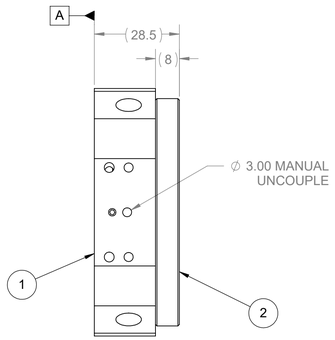
WEIGHT: 0.40 kg | RoHs COMPLIANT: - | SHT. 1 OF 1

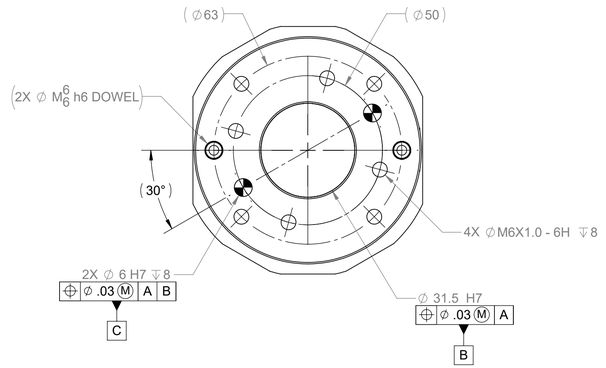
SIZE	DRAWING NUMBER	REV
D	1900785A	00

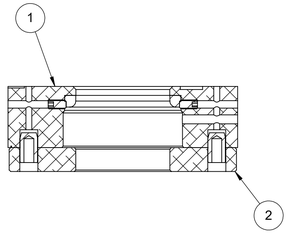
REVISIONS						
ZONE	REV	DESCRIPTION	DR	CHK	DATE	ECR/ESR NO.
	00	RELEASE FOR MANUFACTURE.	JV	TM	11/26/2019	DSCZ-BFXQ2N











SECTION A-A
SCALE 1 : 1

NOTES:

1. ALL PARTS TO RECEIVE LOCTITE ARE TO BE THOROUGHLY CLEANED FROM GREASE AND OIL.
2. APPLY LITHIUM GREASE, ARI #91504-P1037.
3. APPLY LOCTITE 222, ARI #86005-P1020.

ITEM NO.	QTY	PART NO.	DESCRIPTION
2	1	1900784A	E63-TAP-4XM6X50X031-T
1	1	1507-D49A	ET63-040-N-C0000

THIRD ANGLE PROJECTION

PRINT DATE
11/27/2019

METRIC

UNLESS OTHERWISE SPECIFIED:

UNTOLERANCED DIMS ARE BASIC

⌓ .25 A B C

⌖ ∅ .25Ⓜ A B C

ALL HOLE DIAMETERS +/- 0.25

INTERNAL RADII & BROKEN EDGES TO BE .13-.38
ALL SURFACE FINISHES 1.6Ra

MAT'L:
Material <not specified>

SURFACE TREATMENT:
-

DIM. AND TOLERANCING IN ACCORDANCE WITH ANSI Y14.5M-1994

ISO 9001 REGISTERED

DR:	J. VALLELUNGA
CHK:	T. MARCELLA
ENG:	J. VALLELUNGA
MFG:	M. DUDNATH
QC:	M. DUDNATH

3D MODEL NUMBER:
1900785A

SCALE: 1:1
DO NOT SCALE DRAWING

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TITLE:

ET50-031-N-T-C0000

SIZE	DRAWING NUMBER	REV
D	1900785A	00

WEIGHT: 0.32 kg | RoHs COMPLIANT: - | SHT. 1 OF 1