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B. Base Utility Coupler

GLx Series—Utility Couplers with Integrated Compliance

1. Product Overview

The GLx Utility Coupler is designed for heavy-duty industrial applications. The Utility Coupler provides pass-through utilities, such as: air, fluids, and electrical signals from both integrated ports within the body and standard ATI add-on ledge mounted modules. Consult ATI for further details. For a brief description of utility couplers, refer to *Table 1.3*. Master and Tool assemblies are grouped into compatible modules, in the table.

The Utility Couplers are comprised of a compliant Master side and Tool side (refer to *Figure 1.1*). The Master side is equipped with a unique compliance mechanism that allows for large tooling misalignments. The Utility Coupler depends on brute force from the guided cylinder assembly to maintain constant coupling pressure. The recommended operating pressure for the guided cylinder is 80 psi (5.5 bar), between 60-100 psi (4.5-6.9 bar).

Previous versions of G2x, G5x utility couplers and drive cylinders are equivalent to current models, these are shown in *Table 1.1* and *Table 1.2*.

Table 1.1—Utility Coupler Previous Product Versions

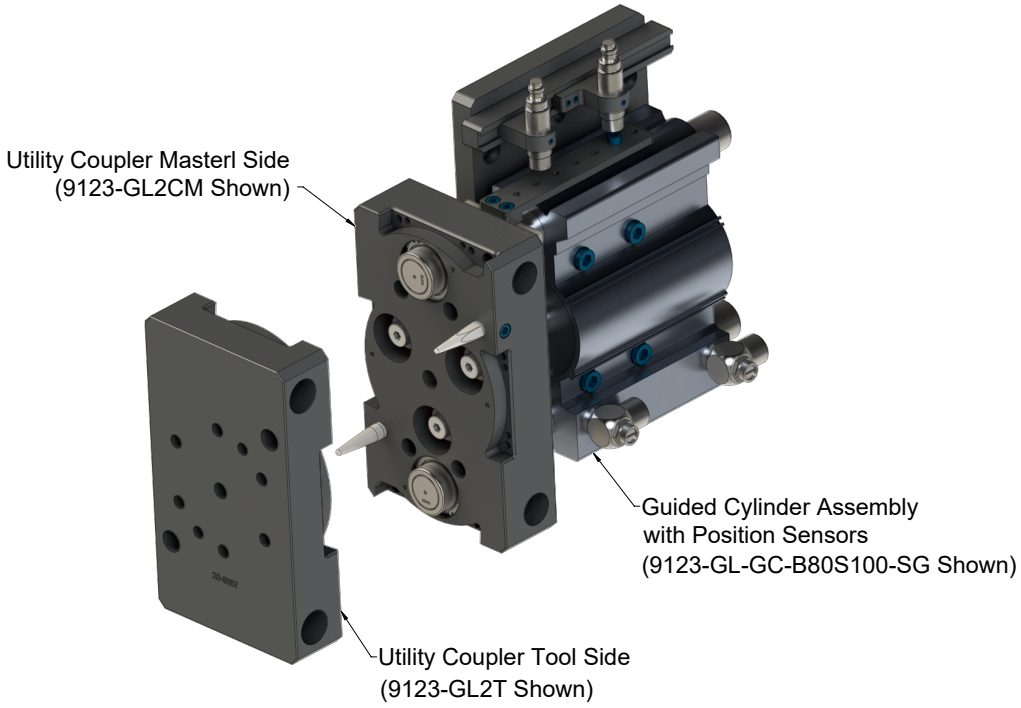
Old Model Number	Current Model Number Equivalent
G2B	GL1
G2	GL2
G2E	GL3
G5	GL5

Table 1.2—Drive Cylinder Previous Product Versions

Old Model Number	Current Model Number Equivalent
G2-GC-B80S100	GL-GC-B80S100

Table 1.3—GLx Utility Couplers	
Part Number	**Description**
9123-GL1CM-0-0-N	Compliant Utility Coupler Master, ± 4 mm X-Y, 3 Degrees Angular, with (10) ¼” NPT (National PipeThread) ports
9123-GL1T-0-0-N	Utility Coupler Tool, with (10) 1/4” NPT Ports
9123-GL1CM-0-0-E	Compliant Utility Coupler Master, ± 4 mm X-Y, 3 Degrees Angular, with (10) G ¼” BSPP (British Standard Pipe Parallel) ports
9123-GL1T-0-0-E	Utility Coupler Tool, with (10) G 1/4” BSPP Ports
9123-GL2CM-0-0-0-0-N	Compliant Utility Coupler Master +/-4 mm X-Y, 3 Degrees Angular, with (2) 3/4” NPT Checked Ports
9123-GL2ACM-0-0-0-0-N	Compliant Utility Coupler Master +/-4 mm X-Y, 3 Degrees Angular with (2) 3/4” NPT Checked Ports, short alignment pins
9123-GL2T-0-0-0-0-N	Utility Coupler Tool, with (2) 3/4” NPT Ports
9123-GL2CM-0-0-0-0-E	Compliant Utility Coupler Master +/-4 mm X-Y, 3 Degrees Angular, with (2) G 3/4” BSPP Checked Ports
9123-GL2T-0-0-0-0-E	Utility Coupler Tool, with (2) G 3/4” BSPP Ports
9123-GL2APCM-0-0-0-0-N	Compliant Utility Coupler Master +/-4 mm X-Y, 3 Degrees Angular, with (2) 3/4” NPT Pass-Through Ports, short alignment pins
9123-GL2PCM-0-0-0-0-N	Compliant Utility Coupler Master +/-4 mm X-Y, 3 Degrees Angular, with (2) 3/4” NPT Pass-Through Ports
9123-GL2PT-0-0-0-0-N	Utility Coupler Tool, with (2) 3/4” NPT Pass-Through Ports
9123-GL2PCM-0-0-0-0-E	Compliant Utility Coupler Master +/-4 mm X-Y, 3 Degrees Angular, with (2) G 3/4” BSPP Pass-Through Ports
9123-GL2PT-0-0-0-0-E	Utility Coupler Tool, with (2) G 3/4” BSPP Pass-Through Ports
9123-GL3CM-0-0-0-0-S0-N	Compliant Utility Coupler Master, ± 4 mm X-Y, 3 Degrees Angular, with (4) 3/4” NPT Checked Ports
9123-GL3CM-0-0-0-0-SG-N	Compliant Utility Coupler Master, ± 4 mm X-Y, 3 Degrees Angular, with (4) 3/4” NPT Checked Ports, (2) PNP Sensors
9123-GL3T-0-0-0-0-N	Utility Coupler Tool, with (4) 3/4 NPT Ports
9123-GL3CM-0-0-0-0-S0-E	Compliant Utility Coupler Master, ± 4 mm X-Y, 3 Degrees Angular, with (4) G 3/4” BSPP Checked Ports
9123-GL3CM-0-0-0-0-SG-E	Compliant Utility Coupler Master, ± 4 mm X-Y, 3 Degrees Angular, with (4) G 3/4” BSPP Checked Ports, (2) PNP Sensors
9123-GL3T-0-0-0-0-E	Utility Coupler Tool, with (4) G 3/4” BSPP Ports
9123-GL5CM-0-0-0-0-SE-R	Compliant Utility Coupler Master +/-4 mm X-Y, 3 Degrees Angular with (2) G 1/2” BSPT Checked Ports, short alignment pins, (2) PNP Sensors
9123-GL5T-0-0-0-0-R	Utility Coupler Tool with (2)1/2” BSPT Ports and Tool Presence Sensor Targets
9123-GL5CM-0-0-0-0-SD-E	Compliant Utility Coupler Master +/-4 mm X-Y, 3 Degrees Angular with (2) G 1/2” BSPP Checked Ports-SHORT PINS, (2) PNP Sensors with cables
9123-GL5CM-0-0-0-0-SG-E	Compliant Utility Coupler Master +/-4 mm X-Y, 3 Degrees Angular with (2) G 1/2” BSPP Checked Ports-SHORT PINS, (2) PNP Sensors
9123-GL5T-0-0-0-0-E	Utility Coupler Tool with (2) G 1/2” BSPP Ports and Tool Presence Sensor Targets
9123-GL8CM-0-0-E	GL8 Compliant Utility Coupler Master +/-4 mm X-Y, 3 Degrees Angular, (10) G 3/8” Ports
9123-GL8T-0-0-E	GL8 Utility Coupler Tool, (10) G 3/8” Ports

Figure 1.1—GLx Compliant Utility Coupler with Guided Cylinder Assembly

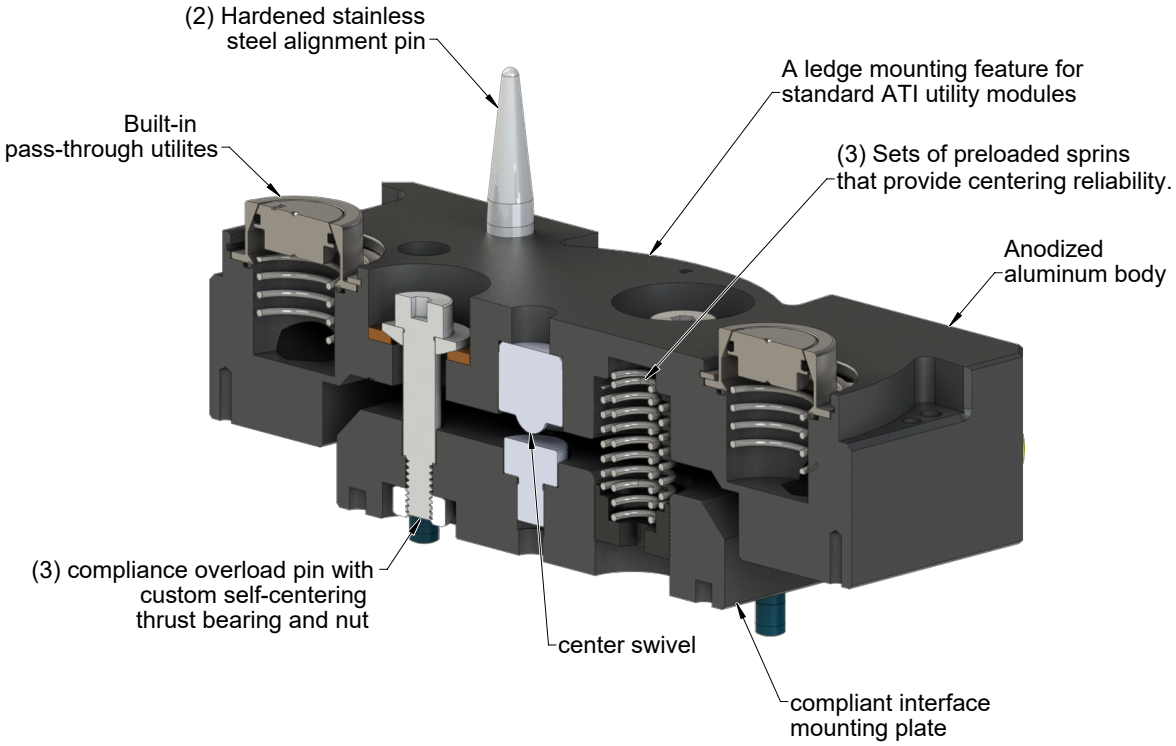


1.1 GLx Compliant Utility Coupler Master

The Master plate assembly includes an anodized aluminum body and hardened stainless steel alignment pins. The Utility Coupler Master has a center swivel that allows for ± 4 mm compliance in any direction of the coupling plane. Also it allows for ± 3 degrees angular compliance. There are three sets of preloaded springs internal to the plate that force the main body to self-center on custom chamfered thrust bearings. This system allows for a relatively large misalignment of the Master and Tool plates prior to coupling; (3) hardened-steel overload pins provide for the compliance limits.

The Master plate has built-in features to pass utilities on to the Tool side; additionally, the Master and Tool plates are equipped with up to (4) module ledge mount flats that provide support for additional Utility Coupler utility modules. Consult ATI for further details.

Figure 1.2—GLx Compliant Utility Coupler Master assembly (9123-GL2CM Shown)

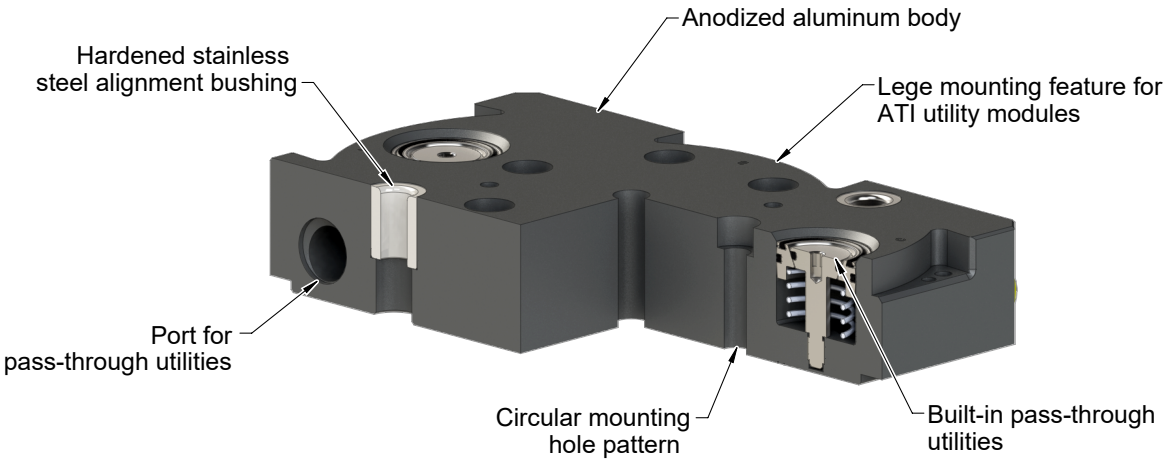


1.2 GLx Utility Coupler Tool

The Tool plate assembly includes an anodized aluminum body and hardened-steel alignment bushings. The Tool plate also includes a 100 mm BC mounting pattern for direct customer tool mounting.

The Tool plate has built in features to receive utilities from the Master side. The Tool plates are equipped with up to (4) module ledge mount flats that provide support for additional Utility Coupler utility modules. Consult ATI for further details.

Figure 1.3—GLx Utility Coupler Tool assembly (9123-GL2T Shown)



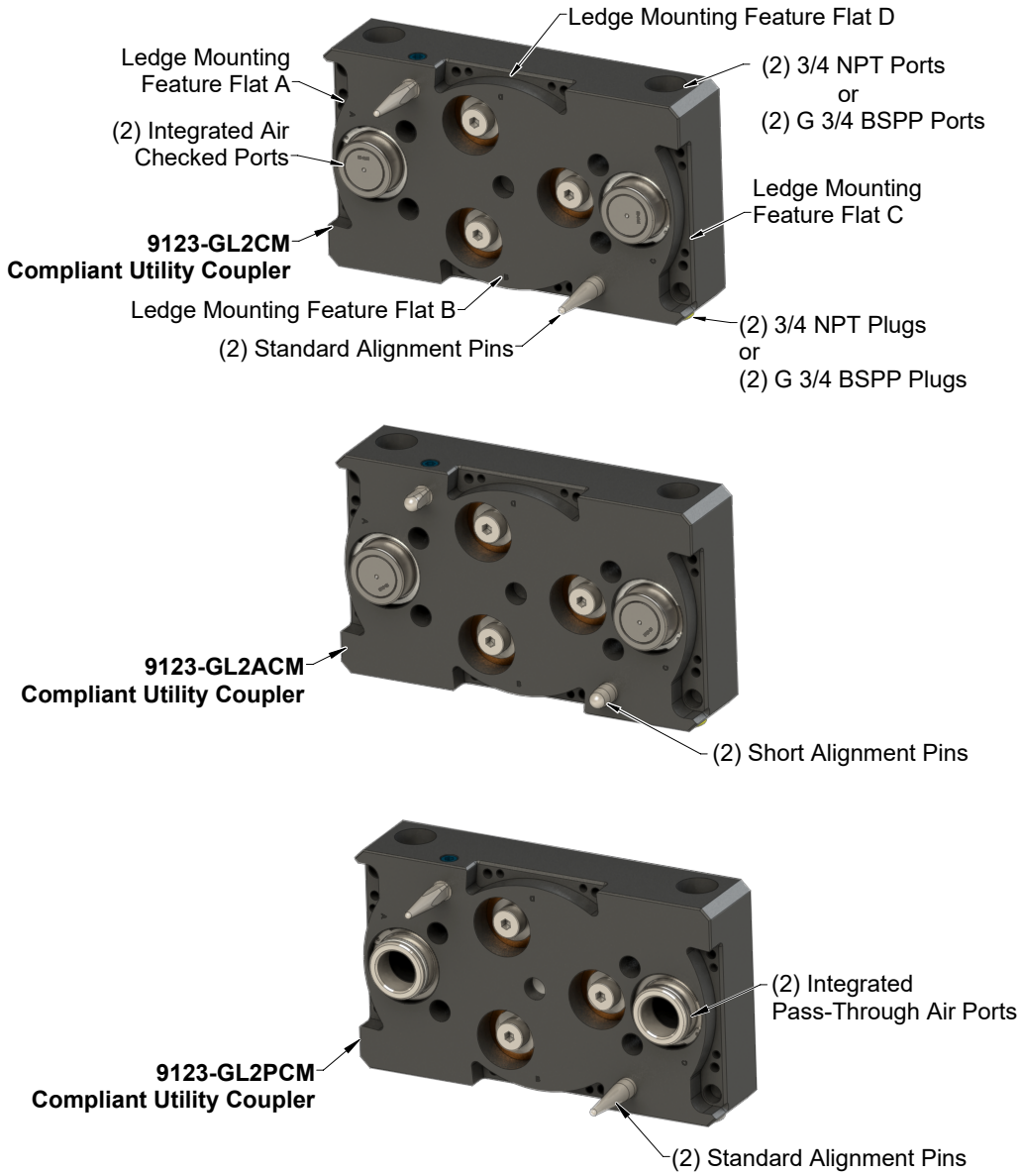
1.3 GL2 Utility Coupler

The Master and Tool bodies are equipped with (4) ledge mount flats that enable the coupler to accept up to (4) additional utility modules.

1.3.1 GL2CM/GL2ACM/GL2PCM/GL2APCM Utility Coupler Master

The GL2 series provides (4) ledge mounting flats. The GL2CM and GL2PCM Utility Couplers are equipped with standard hardened stainless steel alignment pins and either (2) 3/4 NPT or (2) G 3/4 BSPP integrated checked ports (GL2CM model) or pass-through ports (GL2PCM model). The GL2ACM and GL2APCM (not shown) Utility Coupler are equipped with short, hardened, stainless steel alignment pins and either (2) 3/4 NPT or (2) G 3/4 BSPP integrated checked ports (GL2ACM model) or pass-through ports (GL2APCM model) For specific model numbers and compatible Tool models, refer to *Table 1.3*.

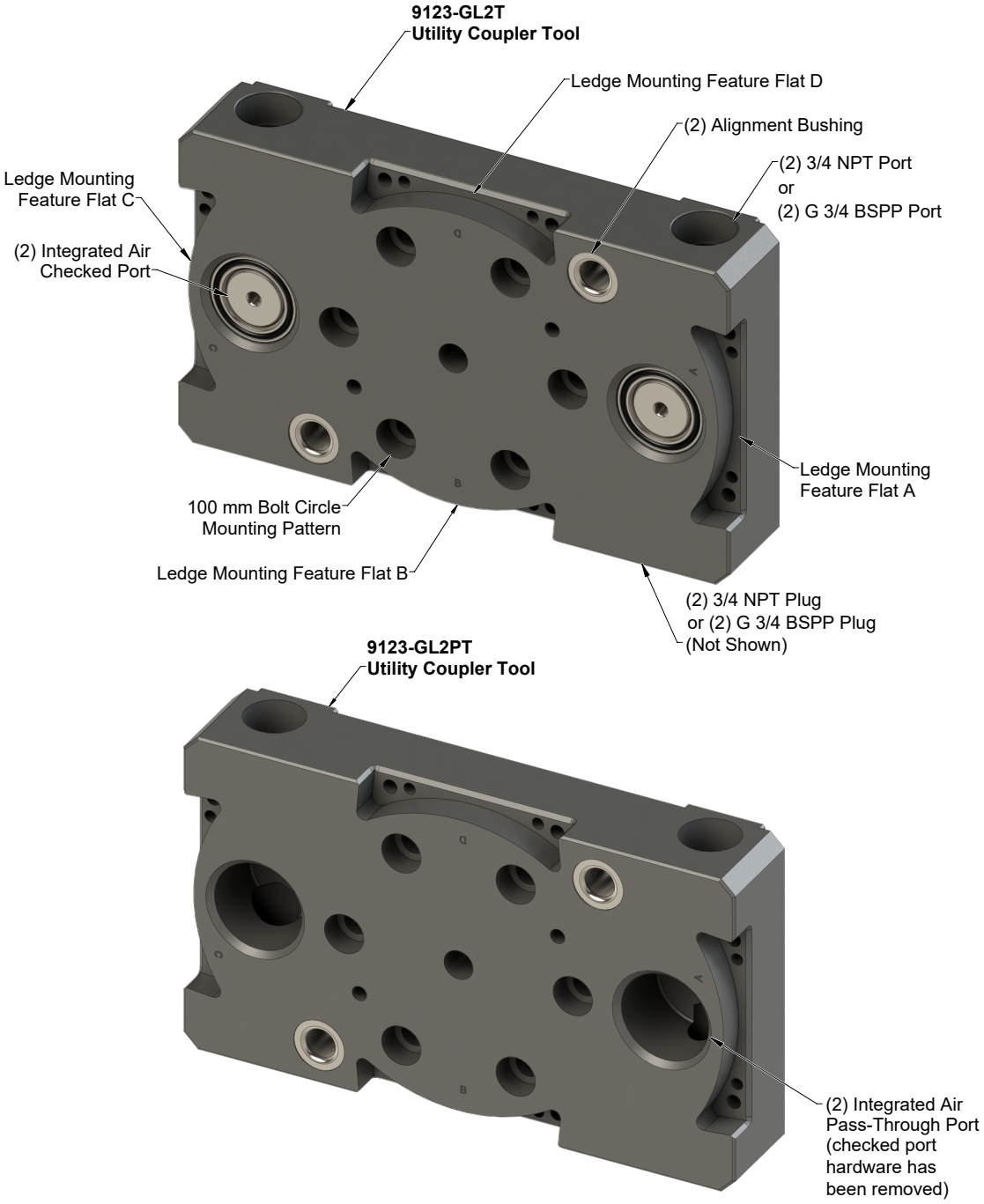
Figure 1.4—GL2 Utility Coupler Master



1.3.2 GL2T/GL2PT Utility Coupler Tool

The GL2T model provides (2) 3/4 NPT or (2) G 3/4 BSPP integrated checked ports checked ports and (4) ledge mounting flats. The GL2PT model provides (2) 3/4 NPT or (2) G 3/4 BSPP integrated pass-through ports and (4) ledge mounting flats. For specific model numbers and compatible Master models, refer to *Table 1.3*.

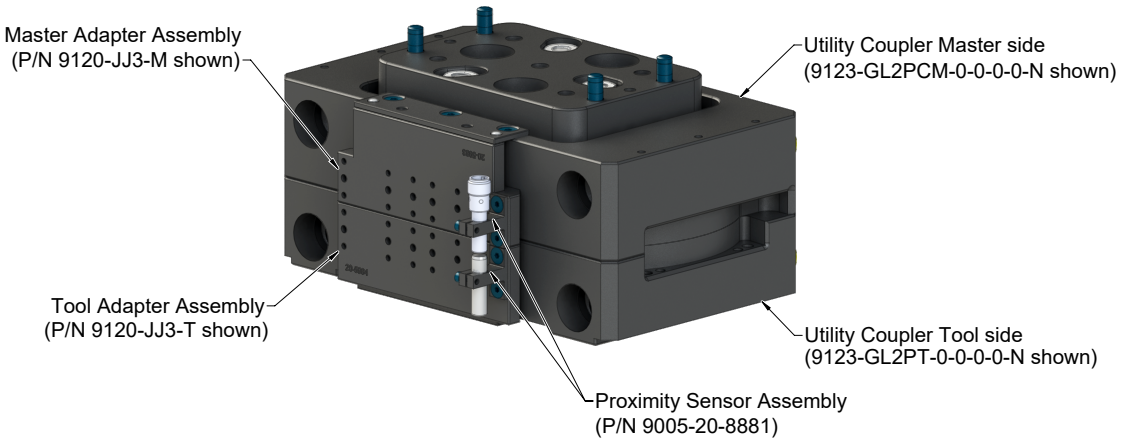
Figure 1.5—GL2 Utility Coupler Tool



1.3.2.1 (Optional) Proximity Sensor

For coupling and uncoupling status, the user can install an optional proximity sensor assembly on adapters (refer to the following image).

Figure 1.6—Coupling and Uncoupling Proximity Sensor



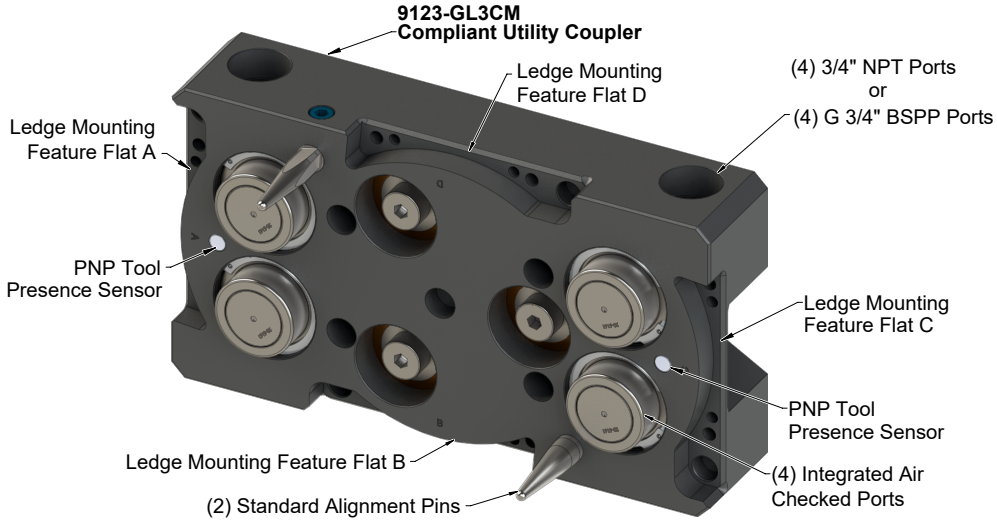
1.4 GL3 Utility Coupler

The Master and Tool bodies are equipped with (4) ledge mount flats that enable the coupler to accept up to (4) additional utility modules.

1.4.1 GL3CM Utility Coupler Master

The GL3CM model provides (4) 3/4″ NPT integrated checked ports or (4) G 3/4″ BSPP integrated checked ports and (4) ledge mounting flats. Refer to *Table 1.3* for specific model numbers and compatible Tool models. The Utility Coupler is equipped with standard hardened stainless steel alignment pins. The 9123-GL3CM-0-0-0-0-SG model has integrated PNP sensors to detect Tool presence.

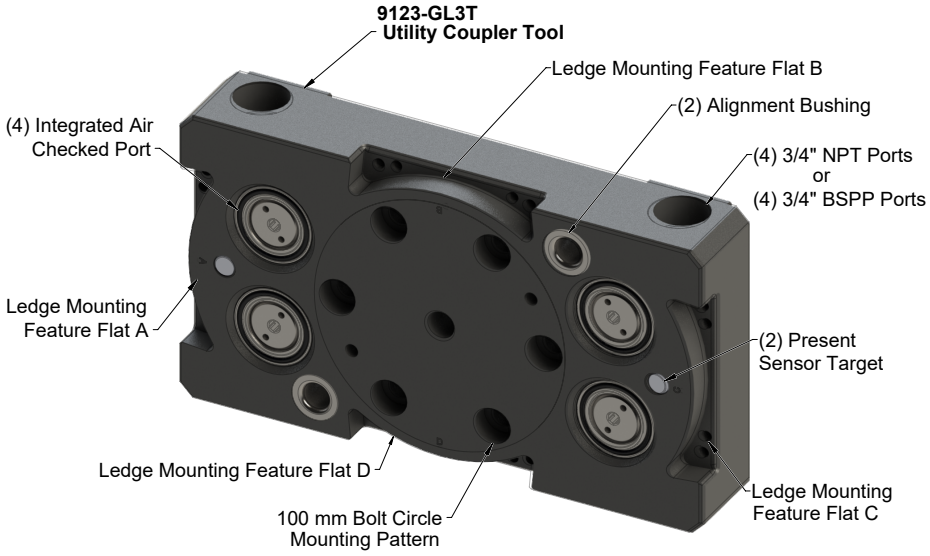
Figure 1.7—GL3 Utility Coupler Master



1.4.2 GL3T Utility Coupler Tool

The GL3T model provides (4) 3/4″ NPT integrated ports or (4) G 3/4″ BSPP integrated ports and (4) ledge mounting flats. Refer to *Table 1.3* for specific model numbers and compatible Master models. The Tool has integrated present sensor targets.

Figure 1.8—GL3T Utility Coupler Tool



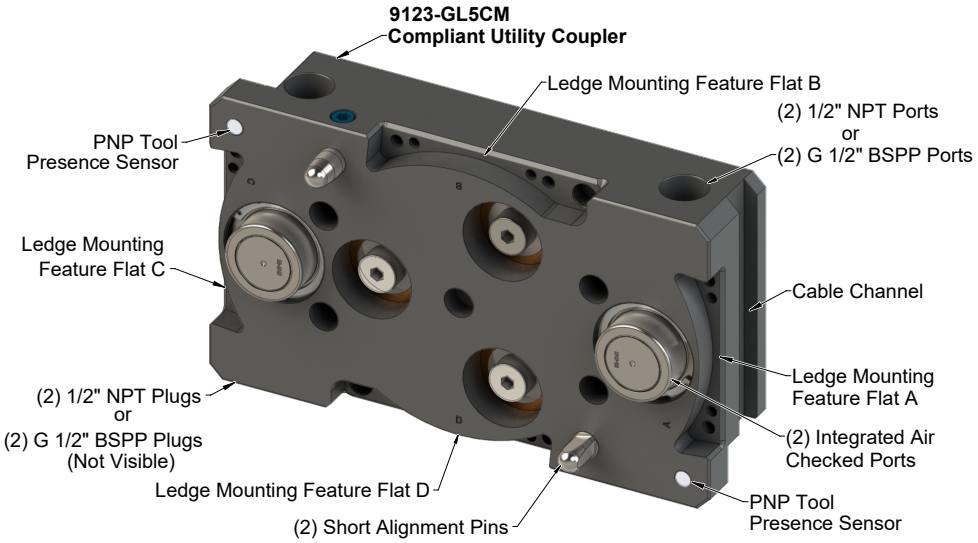
1.5 GL5 Utility Coupler

The Master and Tool bodies are equipped with (4) ledge mount flats that enable the coupler to accept up to (4) additional utility modules. Contact ATI for further details.

1.5.1 GL5CM Compliant Utility Coupler Master

The GL5 model provides (2) 1/2″ NPT integrated checked ports or (2) G 1/2″ BSPP integrated checked ports and (4) ledge mounting flats. Refer to *Table 1.3* for specific model numbers and compatible Tool models. The Utility Coupler is equipped with short hardened stainless steel alignment pins and integrated PNP sensors to detect Tool presence.

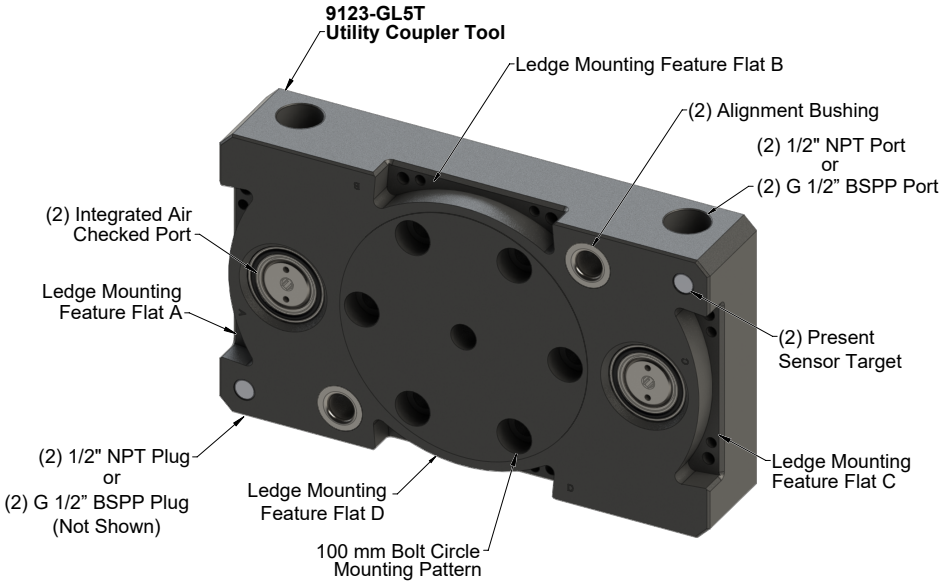
Figure 1.9—GL5 Utility Coupler Master



1.5.2 GL5T Utility Coupler Tool

The GL5T model provides (2) 1/2″ NPT integrated ports or (2) G 1/2″ BSPP integrated ports and (4) ledge mounting flats. Refer to *Table 1.3* for specific model numbers and compatible Master models. The Tool has integrated present sensor targets.

Figure 1.10—GL5 Utility Coupler Tool



1.6 Other Utility Coupler Models

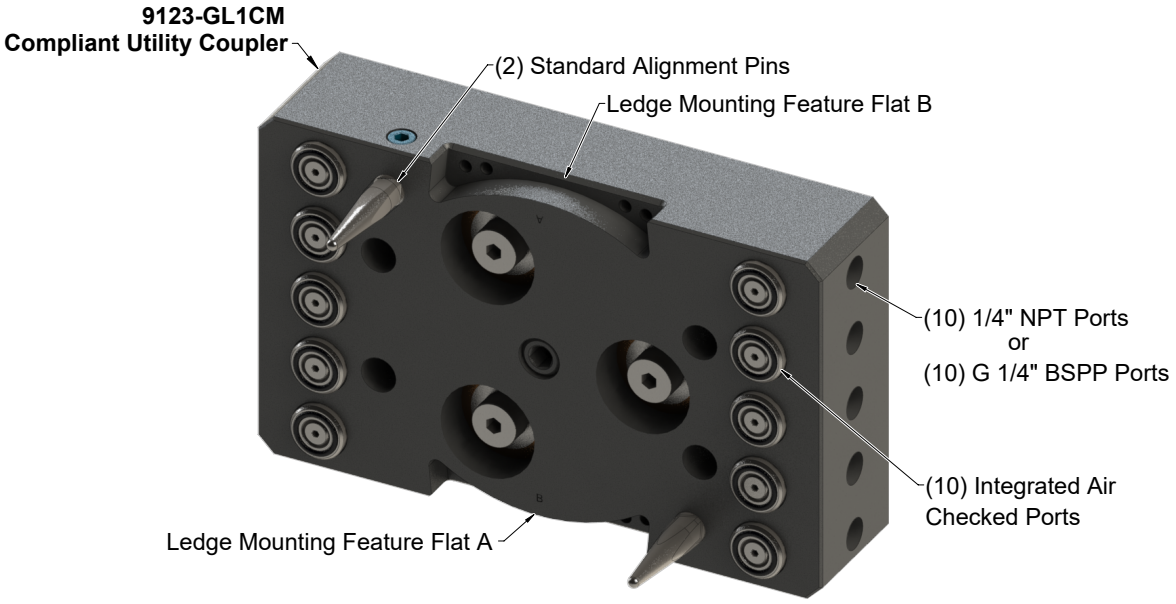
1.6.1 GL1 Utility Coupler

The Master and Tool bodies are equipped with (2) ledge mount flats that enable the coupler to accept up to (2) additional utility modules.

1.6.1.1 GL1CM Utility Coupler Master

The GL1CM model provides (10) 1/4″ NPT integrated checked ports or (10) G 1/4″ BSPP integrated checked ports. Refer to *Table 1.3* for specific model numbers and compatible Tool models. The Utility Coupler is equipped with standard hardened stainless steel alignment pins.

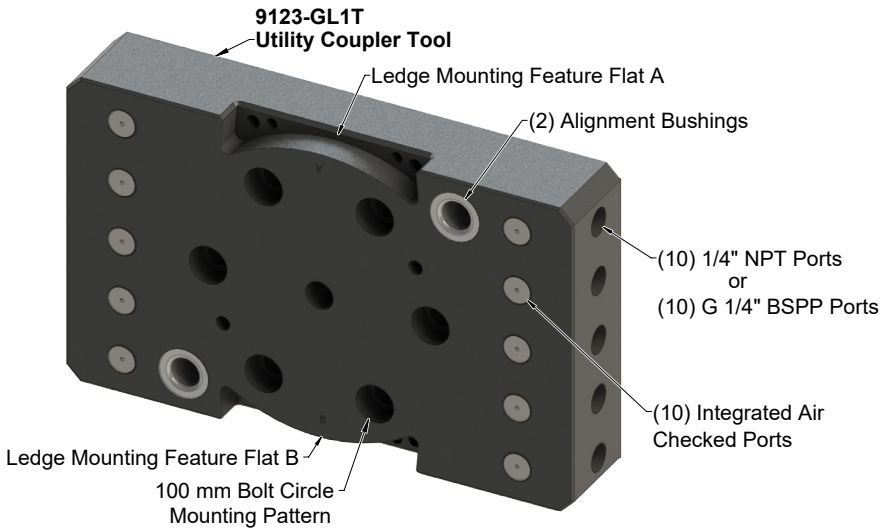
Figure 1.11—GL1 Utility Coupler Master



1.6.1.2 GL1T Utility Coupler Tool

The GL1T model provides (10) 1/4″ NPT integrated ports or (10) G 1/4″ BSPP integrated ports. Refer to *Table 1.3* for specific model numbers and compatible Master models.

Figure 1.12—GL1 Utility Coupler Tool



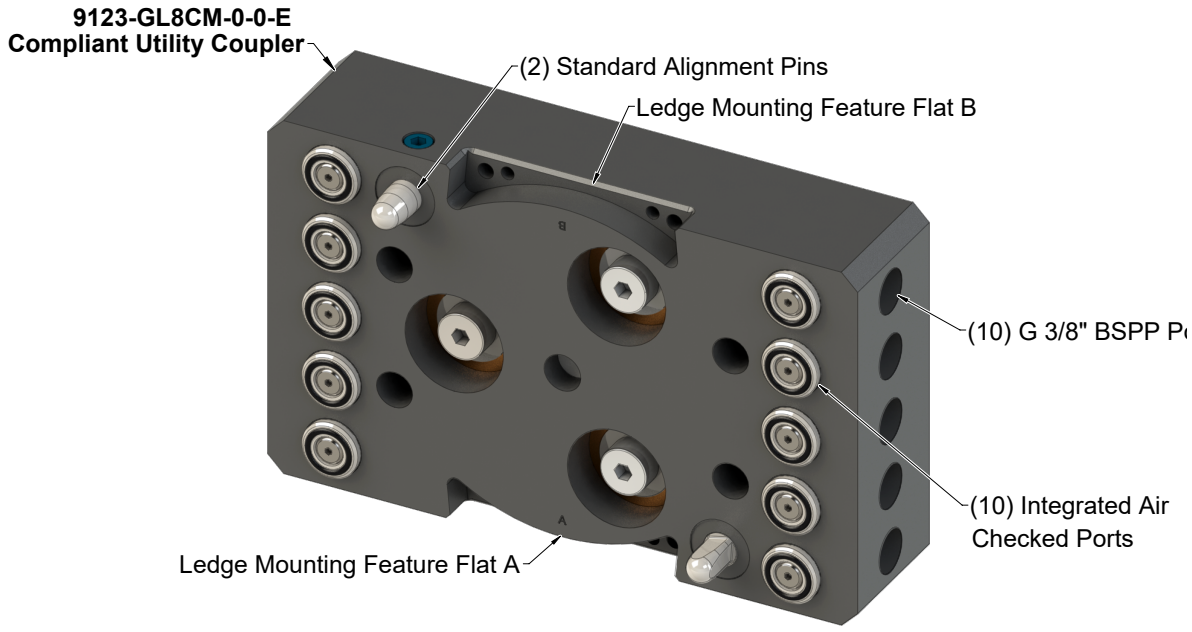
1.6.2 GL8 Utility Coupler

The Master and Tool bodies are equipped with (2) ledge mount flats that enable the coupler to accept up to (2) additional utility modules. Contact ATI for further details.

1.6.2.1 GL8CM Utility Coupler Master

The GL8CM model provides (10) G 3/8″ BSPP integrated checked ports. Refer to *Table 1.3* for specific model numbers and compatible Tool models. The Utility Coupler is equipped with standard hardened stainless steel alignment pins.

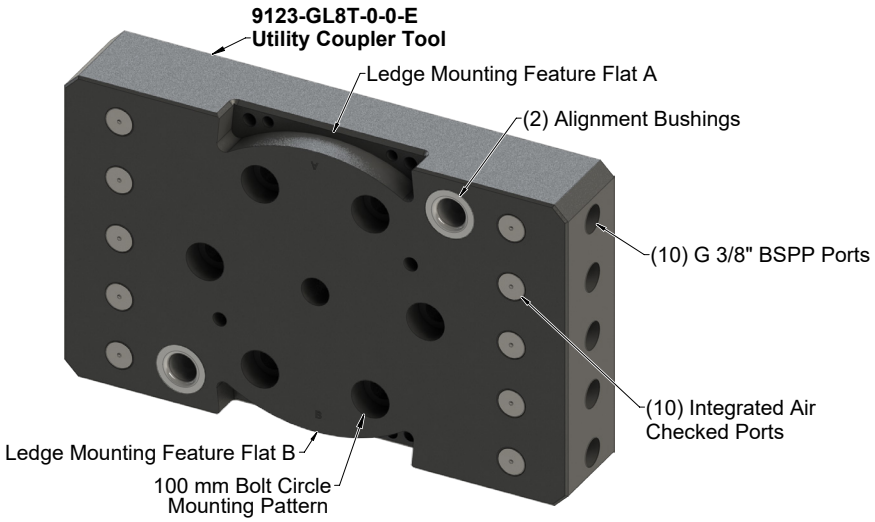
Figure 1.13—GL8 Utility Coupler Master



1.6.2.2 9123-GL8T-0-0-E Utility Coupler Tool

The GL8T-0-0-E model provides (10) G 3/8″ BSPP integrated ports. Refer to *Table 1.3* for specific model numbers and compatible Master models.

Figure 1.14—GL8 Utility Coupler Tool



1.7 GL-GC Drive Cylinders

Certain drive cylinders may not be compatible with all Utility Couplers; refer to *Table 1.4* for available drive cylinders and compatible Utility Couplers. The use of additional utility modules, utility supply line flexibility, and other factors will affect the selection of the drive cylinder. Consult ATI for proper drive cylinder selection.

Table 1.4—9123-GL-GC Drive Cylinder Models and Compatibility

Part Number	Description	Compatible with Utility Coupler Models[1]
9123-GL-GC-B80S100-S0-E	Guided cylinder assembly, 80 mm Bore, 100 mm Stroke, Sensor Holder for 18 mm Barrel Proximity Sensor	GL1 GL2 GL5 GL8
9123-GL-GC-B80S100-S0-N	Guided cylinder assembly, 80 mm Bore, 100 mm Stroke, Sensor Holder for 18 mm Barrel Proximity Sensor	GL1 GL2 GL5 GL8
9123-GL-GC-B80S100-SG-E	Guided cylinder assembly, 80 mm Bore, 100 mm Stroke, PNP Efector Proximity Sensors (18 mm Barrel, 12 mm range)	GL1 GL2 GL5 GL8
9123-GL-GC-B80S100-SG-N	Guided cylinder assembly, 80 mm Bore, 100 mm Stroke, PNP Efector Proximity Sensors (18 mm Barrel, 12 mm range)	GL1 GL2 GL5 GL8
9123-GL-GC-B80S100-SR-E	Guided cylinder assembly, 80 mm Bore, 100 mm Stroke, PNP Turck Proximity Sensors	GL1 GL2 GL5 GL8
9123-GL-GC-B80S100-SR-N	Guided cylinder assembly, 80 mm Bore, 100 mm Stroke, PNP Turck Proximity Sensors	GL1 GL2 GL5 GL8

Note:

1. GL3 requires a customer-sourced drive cylinder. Contact ATI for assistance.

2. Installation

The GLx Utility Coupler and add-on modules are typically installed by ATI prior to shipment. Field installation or removal of the Utility Coupler to the drive cylinder and customer tooling are covered in the following sections.

WARNING: Do not perform maintenance or repairs on Utility Coupler or modules unless all energized circuits (for example: electrical, air, water, etc.) are turned off, pressurized connections purged, and power discharged from circuits in accordance with the customer's safety practices and policies. Injury or equipment damage can occur with energized circuits on. Turn off and discharge all energized circuits, purge all pressurized connections, and verify all energized circuits are de-energized before performing maintenance or repair on Utility Coupler or modules.

CAUTION: Do not use fasteners that exceed the thread depth in the Utility Coupler. Refer to *Section 8—Drawings* for details on mounting hole thread depth. Secure the Utility Coupler with the proper length fasteners. This is true for both robot and tool interfaces.

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.

Table 2.1—Fastener Size, Class, and Torque Specifications

Mounting Conditions	Fastener Size and Property Class	Recommended Torque	Thread Locker
Master assembly plate to the drive cylinder assembly	M8 Class 12.9		Pre-applied Adhesive or Loctite 242
	Socket head cap	23 ft-lbs (31.64 Nm)	
Tool assembly plate to the customer tooling.	M10 x 1.5 Class 12.9		
	Socket head cap	38 ft-lbs (52 Nm)	
Utility Module or adapter plate to Master or Tool plate (Supplied Fasteners).[1]	M3 x 0.5 Class 12.9		Pre-applied Adhesive or Loctite 222
	Socket head cap	10 in-lbs (1.13 Nm)	
	Socket flat head cap	8 in-lbs (0.9 Nm)	
	M4 x 0.7 Class 12.9		
	Socket head cap	15 in-lbs (1.69 Nm)	
	Socket flat head cap	10 in-lbs (1.13 Nm)	
	M6 x 1.0 Class 12.9		Pre-applied Adhesive or Loctite 242
	Socket head cap	70 in-lbs (7.9 Nm)	

Notes:

1. These values for utility modules are usually covered in greater detail in the module manual. For convenience, these values are also listed here but are not a substitute for reading the module manual.

2.1 Utility Coupler Master Installation

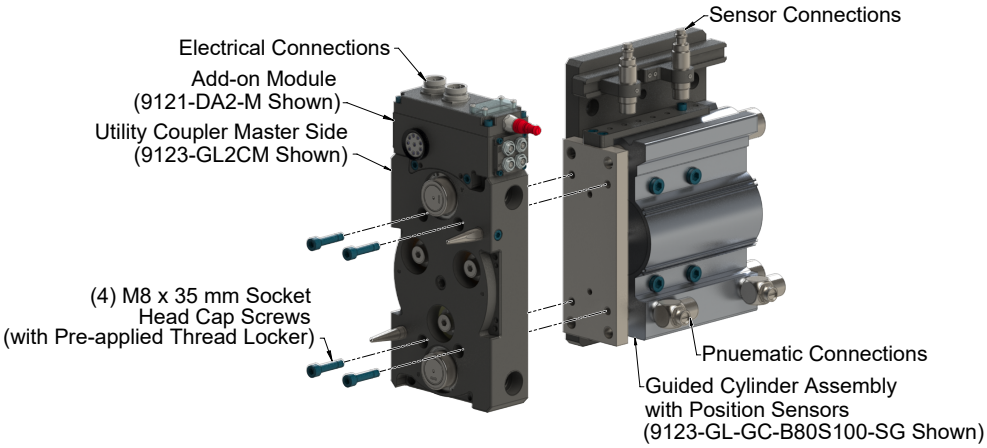
The compliant Utility Coupler Master assembly is normally attached to the guided drive cylinder. The Master plate is designed with a rectangular mounting pattern to accommodate (4) M8 socket head cap screws.

Tools required: *6 mm hex key, torque wrench*

Supplies required: *Clean rag, Loctite® 242™*

1. Attach the Utility Coupler Master assembly to the drive cylinder. Align the Master assembly using the M6 dowel pins in the drive cylinder mounting plate.
2. Secure the Master assembly using the (4) M8 x 35 mm socket head cap screws using a 6 mm hex key. Tighten to 33 ft-lbs (31.64 Nm). Note: If fasteners do not have pre-applied thread locker, apply Loctite 242.
3. If utility modules have not been installed, refer to *Table 2.1* and the module manual for installation instructions.
4. Attach the hoses to the Master body and drive cylinder as required.
5. Power, signal, and sensor cables can be connected to the module and drive cylinder after attaching the module to the Utility Coupler. Ensure that the connectors are cleaned prior to being secured as appropriate.
6. After installation is complete, Master assembly may be put into normal operation.

Figure 2.1—Utility Coupler Master Installation



2.2 Utility Coupler Master Removal

Tools required: *6 mm hex key*

1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
3. Depending upon the service or repair being done, the customer connections may or may not need to be disconnected. Remove customer connection as required.
4. Remove the (4) M8 x 35 mm socket head cap screws securing the Master assembly to the drive cylinder using a 6 mm hex key and remove the Master assembly.

2.3 Utility Coupler Tool Assembly Installation

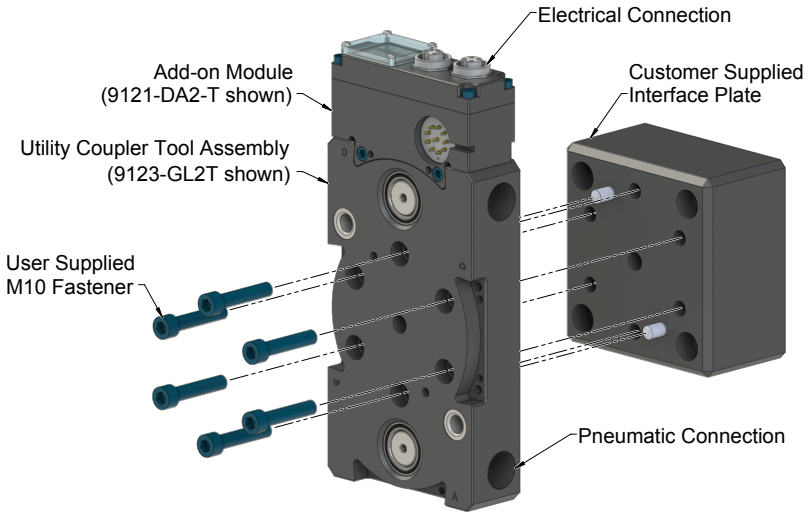
The Tool plate is attached to a customer-supplied fixture. The Tool plate is designed with a 100 mm mounting pattern for (6) M10 socket head cap screws and (2) M10 dowel holes. These features are used to accurately position and secure the Utility Coupler Tooling.

Tools required: *8 mm hex key, torque wrench*

Supplies required: *Clean rag, Loctite 242*

1. Attach the Utility Coupler Tool assembly to the customer supplied fixture using customer supplied fasteners. Note: Fasteners must be grade 12.9 with pre-applied adhesive, if not using pre-applied adhesive, apply Loctite 242 to fasteners. Tighten fasteners to the applicable value in *Table 2.1*.
2. If add-on modules have not been installed, refer to the module manual for installation instructions.
3. Attach the hoses to the Tool plate as required.
4. Power and signal cables can be connected to the modules after attaching the module to the Utility Coupler Tool. Ensure that the connectors are cleaned prior to being secured as appropriate.
5. After installation is complete, Tool assembly may be put into normal operation.

Figure 2.2—Utility Coupler Tool Installation



2.4 Utility Coupler Tool Assembly Removal

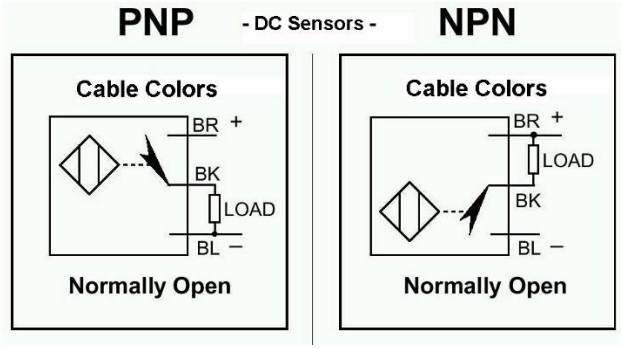
Tools Required: *8 mm hex key*

1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
3. Depending upon the service or repair being done, the customer connections may or may not need to be disconnected. Remove customer connection as required.
4. Remove the (6) M10 socket head cap screws securing the Tool assembly to the customer supplied fixture using a 8 mm hex key and remove Tool assembly.

2.5 Electrical Connections

The Utility Coupler Master utilizes proximity sensors to detect the extracted position. The type of sensor is specified by the customer at the time of order. Sensors should be selected to work with the controls used on the customer's equipment. Available sensors include DC PNP sourcing and NPN sinking. The DC sensors operate at a nominal 24 volts (check the labels attached to the installed sensors prior to connecting to any control circuit). Regardless of sensor type specified, ALL sensors must be installed in series with a resistive load to limit current flow. The connections for the DC sensors are shown in the following figures:

Figure 2.3—PNP and NPN Sensors



2.6 Pneumatic Connections

The air supply used for coupling and uncoupling the device should be clean, dry, and non-lubricated. The suggested supply pressure for operating the guided cylinder and Utility Coupler is 80 psi (5.5 bar), between 60-100 psi (4.5-6.9 bar). The air should be filtered 50 micron or better.

The air supply pressure for coupling and uncoupling varies based on air-line pressure for the ports. Pressure for the drive cylinder should be based on the guidelines in *Section 3.2—Pneumatic Dependency on the Drive Cylinder*. Pressure for air ports should not exceed 100 psi (6.9 bar).

2.6.1 Air Check Ports

Prior to pressurization, verify that the checked port pistons on the Master side are seated flush as in *Figure 2.5*. By design they are self-centering, and as a result have the ability to swivel inside their housings. If a piston is swiveled like in *Figure 2.4*, then pressure is supplied to the port and the port will leak until the unit is actually coupled. Once the unit is coupled the first time, the swivel is corrected and no leakage occurs.

Figure 2.4—Check Port Pistons Swiveled

Figure 2.5—Check Port Pistons Flush

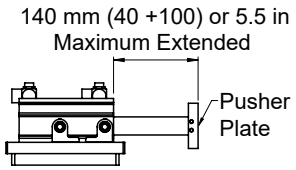
2.6.2 Air Pass-Through Ports

ATI offers a pass-through port option for applications that don't require checked ports. Benefits are reduced coupling force and increase flow. The GL2 model (refer to *Section 1.3—GL2 Utility Coupler*) uses the pass-through port option, but users may contact ATI to modify a GL3, or GL5 model to use the pass-through port option.

2.7 Drive Cylinder Position During Installation

When installing the Master plate to the drive cylinder, the drive cylinder should not be in its maximum extracted position; otherwise, the Master and Tool may not fully couple and properly operate. To ensure that the drive cylinder is in the proper position during installation, refer to the dimensions in the following table:

Table 2.2—Drive Cylinder Maximum Extension

Bore Size	Figure	Retracted	Maximum Extension (max stroke)	Recommended Coupling Position (25 mm short of max stroke)
80 mm		40 mm	140 mm	115 mm (40 + 75)

2.8 Guided Cylinder Sensor Adjustment Procedure

The sensors for the guided cylinder assembly are supplied pre-adjusted to detect the fully retracted and fully extended states. The sensor is adjusted to be 0.2″ to 0.25″ away from the top of the fastener. For wiring information refer to *Section 9—Guided Cylinder Proximity Sensor Information (Manufacturers' Literature)*.

To adjust the sensors height or position:

2.8.1 Adjust the Sensor Height

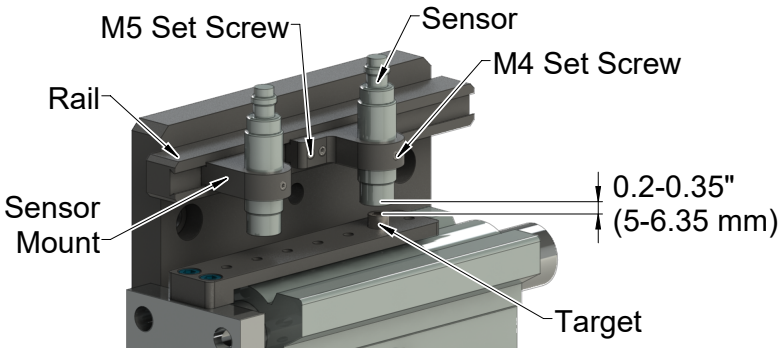
Tools required: *2 mm hex key, torque wrench*

Supplies required: *Loctite 222*

To adjust the sensor distance from the target on the guided cylinder assembly, complete the following procedure:

1. Loosen the M4 set screw using a 2 mm hex key.
2. Adjust the sensor distance by rotating it. The optimal distance from the sensor to the target is 0.2" to 0.25" (5 mm to 6.35 mm).
3. Apply Loctite 222 to the M4 set screws and tighten to 10 in-lbs (1.13 Nm) using a 2 mm hex key.

Figure 2.6—Guided Cylinder Sensor Adjustment



2.8.2 Adjust the Sensor Position

Tools required: *2.5 mm hex key, torque wrench*

Supplies required: *Loctite 222*

Adjust the sensors using a rail on the Guided Cylinder assembly. To adjust the sensor position, complete the following procedure:

1. Loosen the (2) M5 set screws on the sensor mounts using a 2.5 mm hex key.
2. Adjust the sensor position by sliding the sensor holder along the rail.
3. Apply Loctite 222 to the M5 set screws and tighten to 20 in-lbs (2.26 Nm) using a 2.5 mm hex key.

3. Operation

The Master coupling plate is pneumatically-driven to couple and uncouple with the Tool side plate. The Master plate is driven by a guided cylinder assembly.

WARNING: During operation, the area between the Master and Tool must be kept clear. Failure to keep area clear will result in damage to Utility Coupler, add-on modules, or end-of-arm tooling and could cause injury to personnel.

WARNING: During operation, the area between the driver cylinder mounting plate and body must be kept clear. Failure to keep area clear will result in damage to drive cylinder or could cause injury to personnel.

CAUTION: Never couple or uncouple the unit without first disconnecting and discharging the power that passes through the contacts. This is especially true if high voltage circuits are involved. Arcing and contact damage will occur if this is not observed. Always disconnect and discharge electrical power from both upstream and downstream modules.

CAUTION: Air lines and utilities connections should have sufficient service loop so they don't interfere with the Master plate compliance as the drive cylinder extends or retracts. Verify air lines and other utility module connections have sufficient length to permit movement and avoid equipment damage.

3.1 Conditions for Coupling

The Master and Tool plate must be positioned within the extendable reach of the drive cylinder assembly. ATI recommends placing Master and Tool plates at a distance 25 mm short of the drive cylinder maximum stroke (refer to *Section 2.7—Drive Cylinder Position During Installation*). The Master and compliance plates must be fully compressed together for the Master and Tool plates to fully couple.

Ensure the tapered alignment pins from the Master side enter the alignment bushings on the Tool side. The alignment pins should be relatively concentric with the alignment holes to improve alignment and reduce premature wear on alignment pins.

For some applications, cylinder stroke proximity sensing is included, providing the ability to sense cylinder retracted and extended states. For the distance the target for the cylinder and proximity sensors face on the Master housing must be positioned for the sensor to detect target refer to *Section 6—Serviceable Parts* and for guided cylinders refer to *Section 9—Guided Cylinder Proximity Sensor Information (Manufacturers' Literature)*. A signal is not required to couple the Master and Tool but is recommended as further confirmation of coupling.

3.2 Pneumatic Dependency on the Drive Cylinder

CAUTION: It is critical to the operation of the coupler that cylinder pressure is maintained at all times during operation; otherwise, the Utility Coupler uncouples and damage to equipment can occur.

CAUTION: Drive cylinders can exert thousands of pounds of coupling force. Take care to accommodate these coupling forces in the design of the mating customer fixture.

Because the Utility Coupler is designed to allow for added compliance and to not carry a payload, the device does not have a locking mechanism. Therefore, air pressure to the guided cylinder must be maintained during operation. If the air supply to the cylinder is lost during operation, the Utility Coupler uncouples.

Figure 3.1 shows the resistance force on the 3/4″ checked valve ports corresponding to line pressure. For example, for the 2-port Utility Coupler, such as GL2CM and GL2ACM, the resistance force of the ports, if they are pressurized to 60 psi, is 400 lbs. For the GL3CM 4-port coupler, the resistance force at 60 psi is 800 lbs. It is recommended that drive unit be sized with ample factor of safety to handle these resistance forces from the ports. Also, consider which additional utilities are being passed on optional modules and the pressure at which the drive cylinder will be operated.

Figure 3.1—Resistance Force on the ¾" Checked Valve Ports Corresponding to Line Pressure

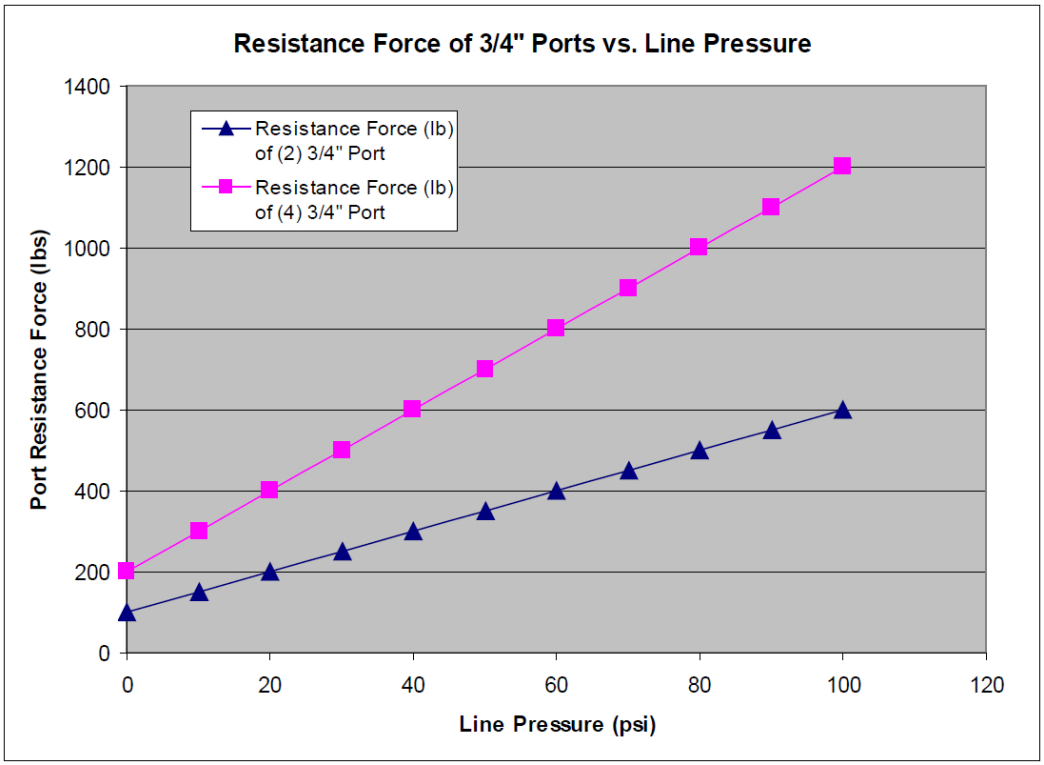


Figure 3.2 shows the separation force associated with 3/4” pass-through ports on a GL2 Utility Coupler and the corresponding line pressure. For example, a 2-pass-through port with a line pressure of 60 psi generates approximately a total of 210 lbs separation force.

It is recommended that drive unit be sized with ample factor of safety to handle these resistance forces from the ports. Also, consider which additional utilities are being passed on optional modules and the pressure at which the drive cylinder will be operated.

Figure 3.2—Separation Force on the ¾" Pass-Through Valve Ports Corresponding to Line Pressure

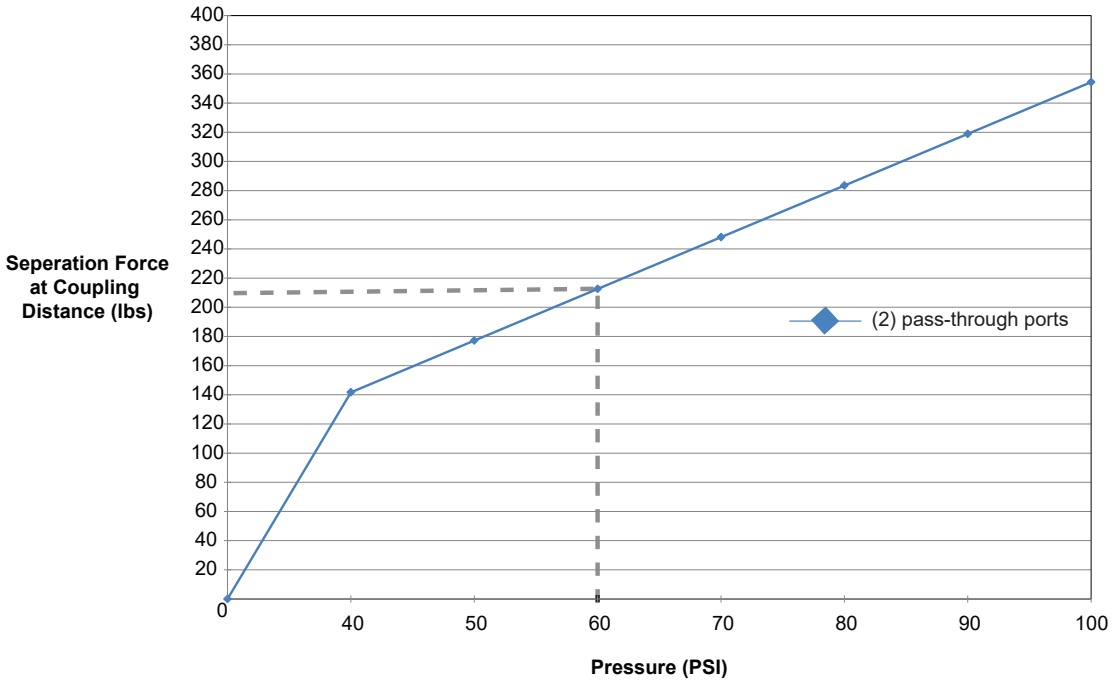
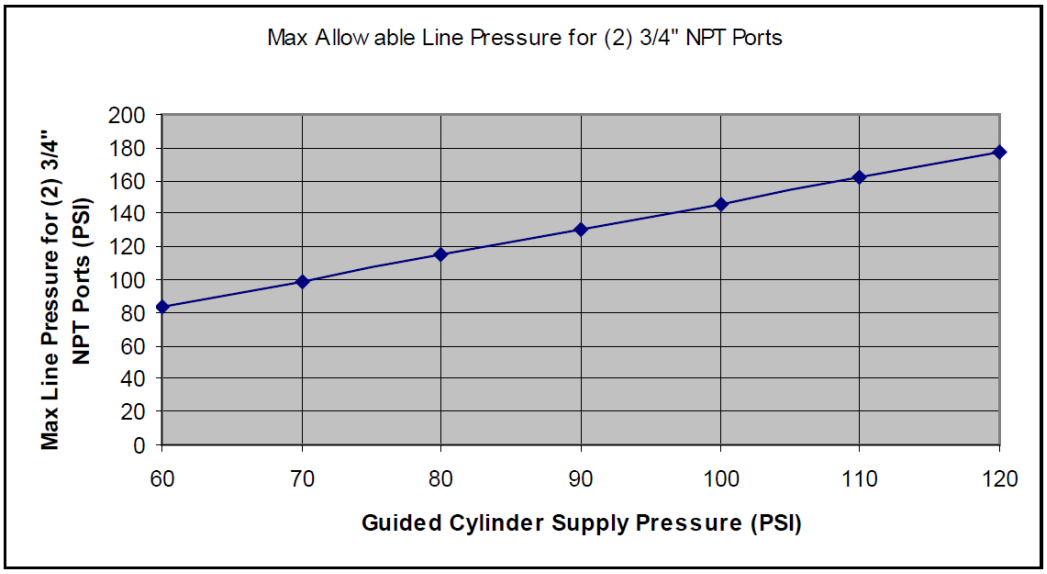


Figure 3.3 shows the maximum recommended line pressure for the (2) checked air lines when plotted against the cylinder line pressure. This is for applications that use the GL2 2-port coupler with the 9123-GL-GC-B80S100-SG-N drive cylinder. For example, if the cylinder is pressurized to 80 psi, the max line pressure is approximately 115 psi.

Figure 3.3—Maximum Line Pressure for Two Checked Air Line Against Cylinder Line Pressure



3.3 Conditions for Uncoupling

Supply air to the retract port on the drive cylinder. The Master and Tool plate uncouples.

4. Maintenance

The GLx Compliant Utility Coupler is designed to provide a long life with little maintenance required. A visual inspection and maintenance schedule is provided in *Section 4.1—Preventive Maintenance*. Assembly details are provided in *Section 8—Drawings* of this manual.

WARNING: Do not perform maintenance or repairs on Utility Coupler or modules unless all energized circuits (for example: electrical, air, water, etc.) are turned off, pressurized connections purged, and power discharged from circuits in accordance with the customer's safety practices and policies. Injury or equipment damage can occur with energized circuits on. Turn off and discharge all energized circuits, purge all pressurized connections, and verify all energized circuits are de-energized before performing maintenance or repair on Utility Coupler or modules.

4.1 Preventive Maintenance

The preventive maintenance schedule is based on the application. For infrequent operation, follow a maintenance inspection every six months, and for frequent operation (one or more uses per minute), follow an inspection schedule every 50,000 cycles. More repetitive applications or highly contaminated environments require a more frequent inspection schedule.

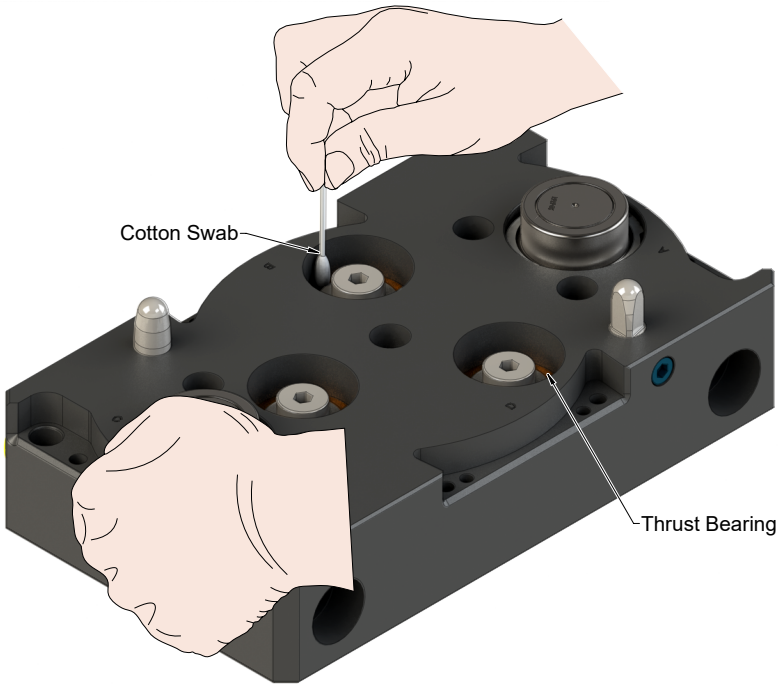
Table 4.1—Preventative Maintenance Checklist
Thrust Bearings, Compression Springs, Alignment Pins and Bushings, refer to: *Section 4.2—Clean, Inspect, and Lubricate Thrust Bearings for Utility Couplers.* ☐ Clean and lubricate bronze thrust bearing in Master body. ☐ Inspect /Test compliance springs in Master body. ☐ Inspect alignment pins for wear or damage and proper lubrication in Master body. ☐ Inspect alignment bushing in Tool body.
Pin Blocks, Electrical Contacts, and V-ring seals, refer to *Section 4.4—Pin Block Inspection and Cleaning for Utility Modules.* ☐ Clean, and inspect pin block and electrical contacts for wear or damage in Master and Tool bodies. ☐ Inspect V-ring seals on the Master add-on modules, if worn or damaged replace, refer to *Section 5.2.14.1—V-ring Seal Replacement.*
Mounting Fasteners and Interface Connections in the Master and Tool Modules ☐ Inspect mounting fasteners to verify they are tight and if loose, then tighten to the proper torque (refer to *Table 2.1*). ☐ Cable connections should be inspected during maintenance periods to ensure they are secure. Loose connections should be cleaned and tightened as appropriate. ☐ Inspect cable sheathing for damage, repair or replace damaged cabling. Loose connections or damaged cabling are not expected and may indicate improper routing and/or strain relieving.
Clean Compliance Springs in the Master ☐ Clean compliance spring area, refer to *Section 4.3—Clear Dust and Debris from Compliance Springs Area for Drive Cylinders*.
Check Ports and Pass Through ports ☐ Clean, Inspect and Lubricate Check Port seals and components in the Master and Tool bodies. Refer to *Section 5.2.1—Clean, Inspect, Lubricate, Replace Components for GL1/GL8 Master side Check Port, Section 5.2.2—Clean, Inspect, Lubricate, Replace Components for GL1/GL8 Tool side Check Port, Section 5.2.3—Clean, Inspect, Lubricate, Replace Components for GL2, GL3, and GL5 Master Side Check Port,* and *Section 5.2.4—Replacement of the GL2, GL3, and GL5 Tool Side Check Port*.

4.2 Clean, Inspect, and Lubricate Thrust Bearings for Utility Couplers

Supplies required: *Cotton swabs, clean rag, MobilGrease XHP222 Special Grease*

1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
3. Press on Utility Coupler Master to compress the springs and expose the bronze thrust bearing. Note: This also tests the compliance springs, if springs do not return the Master to the neutral position replace springs. Refer to *Section 5.2.9—Compliance Spring Replacement for Utility Coupler (Preferred Method)*.

Figure 4.1—Press on Utility Coupler Master



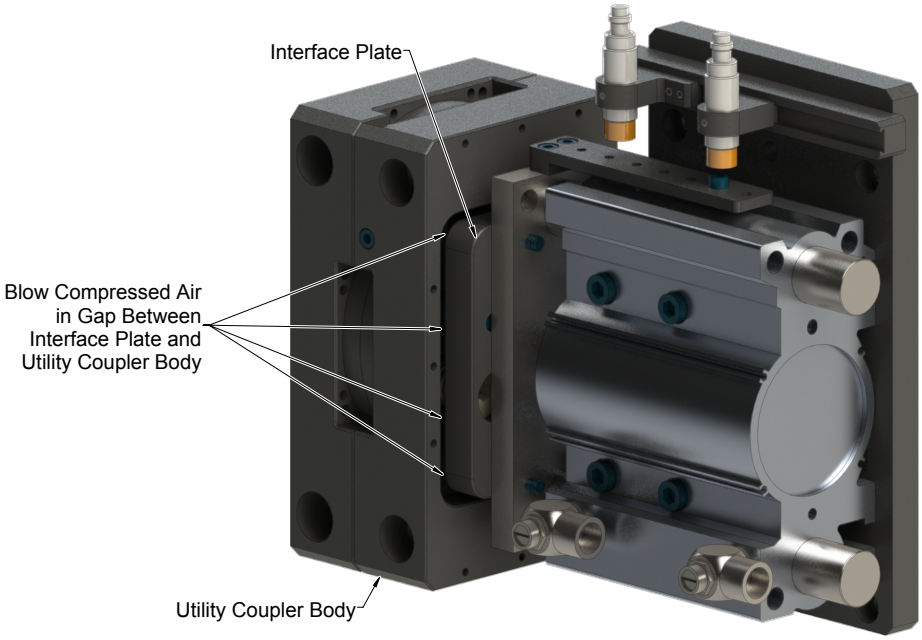
4. With the thrust bearing exposed from pressing on the Master plate, remove all the grease from the (3) thrust bearings with a cotton swab or clean rag.
5. Inspect the thrust bearings. If thrust bearing is not worn, apply MobilGrease XHP222 Special grease to thrust bearings chamfered edge. If thrust bearing or other components are worn, replace worn components. Refer to *Section 5.2.8—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler*.
6. Inspect the (2) alignment pins in the Master body for wear or damage. If pins are not worn, apply MobilGrease XHP222 Special grease to alignment pins. If pins are worn or damaged, replace. Refer to *Section 5.2.6—Alignment Pin Replacement*.
7. Safely resume normal operation.

4.3 Clear Dust and Debris from Compliance Springs Area for Drive Cylinders

Supplies required: *Compressed air, Clean rag*

1. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
2. Clear dust and debris out of spring compliance area by blowing with compressed air in the gap between the interface plate and the Utility Coupler body or the compliance assembly, as shown in *Figure 4.2*.
3. Wipe off unit with a clean rag.
4. Safely resume normal operation.

Figure 4.2—Clear Dust and Debris from Compliance Springs



4.4 Pin Block Inspection and Cleaning for Utility Modules

Tools required: *Nylon Brush (ATI part number 3690-0000064-60)*

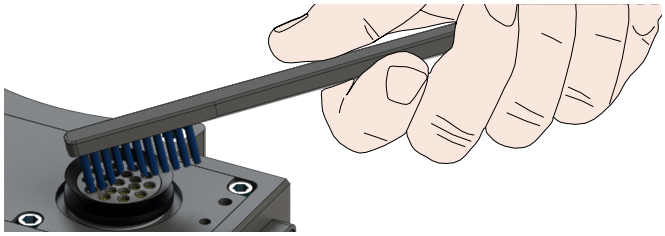
1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).
4. Inspect the Master and Tool pin blocks for debris or darkened pins.

Figure 4.3—Inspect Master and Tool Pin Blocks

5. If debris or darkened pins are present, use a vacuum to remove the debris, and clean using a nylon brush (ATI part number 3690-0000064-60).

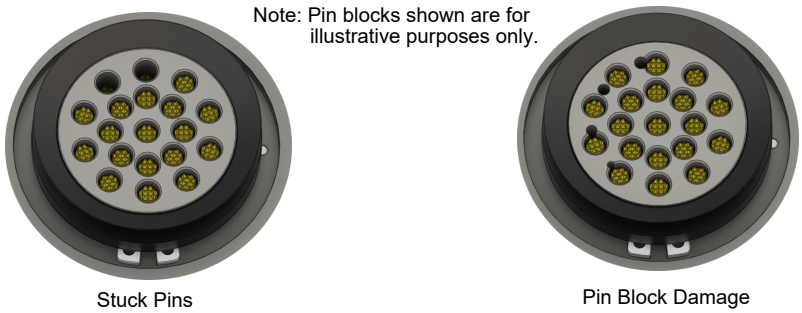
NOTICE: Do not use an abrasive media and/or cleaners or solvents to clean the contact pins. Using abrasive media and/or cleaners or solvents will cause damage to the contact surface or cause pins to stick. Clean contact surfaces with a vacuum or non-abrasive media such as a nylon brush (ATI part number 3690-0000064-60).

Figure 4.4—Clean Pin Blocks with a Nylon Brush



6. Inspect the Master and Tool pin blocks for stuck pins or pin block damage.

Figure 4.5—Stuck Pin and Pin Block Damage



7. If pins become stuck or if there is damage to the pin block, contact ATI for either a possible pin replacement procedure or module replacement.
8. Safely resume normal operation.

5. Troubleshooting and Service Procedures

The following section provides troubleshooting and service information to help diagnose conditions and repair the Utility Coupler or control/signal module.

WARNING: Do not perform maintenance or repairs on Utility Coupler or modules unless all energized circuits (for example: electrical, air, water, etc.) are turned off, pressurized connections purged, and power discharged from circuits in accordance with the customer's safety practices and policies. Injury or equipment damage can occur with energized circuits on. Turn off and discharge all energized circuits, purge all pressurized connections, and verify all energized circuits are de-energized before performing maintenance or repair on Utility Coupler or modules.

CAUTION: Do not use fasteners with pre-applied adhesive more than once. Fasteners might become loose and cause equipment damage. Always apply new thread locker when reusing fasteners.

5.1 Troubleshooting Procedures

The troubleshooting table is provided to assist in diagnosing issues that may cause the Utility Coupler not to function properly.

Table 5.1—Troubleshooting

Symptom	Cause	Resolution
Master and Tool Utility Coupler does not couple.	Object trapped between Master, Tool, utility modules, or drive cylinder body and mounting plate.	Clear object from between Master, Tool, add-on modules, or drive cylinder Body and mounting plate.
	Cables and/or air lines prevent the Utility Couple from fully coupling.	Adjust cables and air line length so that they do not interfere with coupling. If a cable or air line has too much or not enough slack, the Master plate compliance may be disrupted as the drive cylinder extracts and retracts.
	Drive cylinder has insufficient air supply.	Verify the air is supplied at a minimum of 60 psi (4.1 Bar). Refer to *Section 2.6—Pneumatic Connections*.
	Drive cylinder not functioning properly.	Ensure that the drive cylinder pneumatic connections are properly secured and not leaking, if leaking repair connection. Verify that cylinder guide rods are moving freely. Clean and lubricate as needed to restore smooth operation. Verify the drive cylinder is not leaking air from rod seals, if leaking repair or replace drive cylinder.
	Utility Coupler is misaligned beyond the intended specification	Check fixture alignment and make adjustments as necessary. For specifications, refer to *Section 7—Specifications*.
	The Master Utility Coupler center pivot components are not touching, loose, or damaged.	Verify the drive cylinder is not at its maximum stroke (refer to *Section 2.7—Drive Cylinder Position During Installation*). Inspect that the pivot components are not loose or damaged (refer to *Section 5.2.11.1—Center Swivel Replacement for Utility Coupler*).

Table 5.1—Troubleshooting		
Symptom	**Cause**	**Resolution**
Reduced air flow to Tool function	Object trapped between Master and Tool or between modules	Clear object from between Master and Tool or modules.
	Master or Tool side Check port O-ring seals worn or damaged	Inspect O-rings seals, if worn or damaged replace. Refer to *Section 5.2.1—Clean, Inspect, Lubricate, Replace Components for GL1/GL8 Master side Check Port, Section 5.2.2—Clean, Inspect, Lubricate, Replace Components for GL1/GL8 Tool side Check Port, Section 5.2.3—Clean, Inspect, Lubricate, Replace Components for GL2, GL3, and GL5 Master Side Check Port,* and *Section 5.2.4—Replacement of the GL2, GL3, and GL5 Tool Side Check Port*.
	Hose or connector leaking or damage	Inspect hoses and connectors, if damaged or leaking, repair or replace.
Utility Coupler is uncoupled but the proximity sensor does not read “on” (retracted).	Uncouple or retract proximity sensor/cable is damaged.	Inspect hoses and connectors, if damaged or leaking, repair or replace.
Communications to the Tool is intermittent or non existent.	The Master and Tool Utility Couplers are not properly coupled.	Refer to the symptom *Master and Tool Utility Couplers do not couple* in *Table 5.1*.
	Debris between the utility module contacts, worn or damaged contact pins	Inspect pin blocks, refer to *Section 4.4—Pin Block Inspection and Cleaning for Utility Modules*
	Cables or connector is loose or damaged.	Inspect cables and connectors, if connectors are loose, tighten. If cables are damaged, repair or replace.

5.2 Service Procedures

Component replacement procedures are provided in the following section:

Refer to *Section 6—Serviceable Parts* for seal kit part numbers for the specific Utility Coupler model being serviced. For legacy part numbers, contact ATI at *Applications.Engineers@novanta.com*.

5.2.1 Clean, Inspect, Lubricate, Replace Components for GL1/GL8 Master side Check Port

Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *2.5 mm hex key, torque wrench*

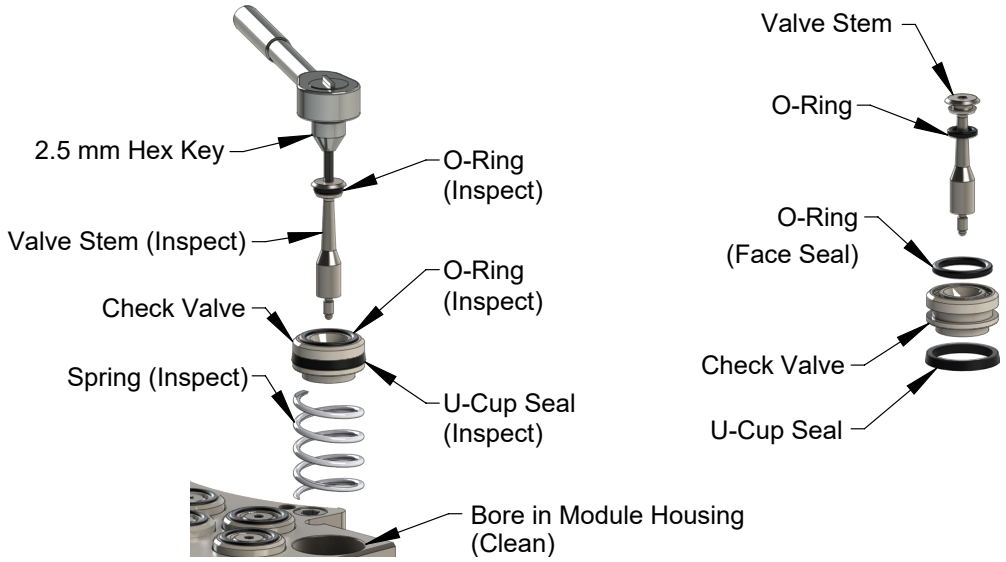
Supplies required: *Clean rag, Magnalube G lubricant*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).

NOTICE: Debris can be expelled at high velocity during the purge, take all required safety precautions.

4. Purge and disconnect all customer plumbing connections to the module.
   a. Turn the supply lines off.
   b. Cover the valves with a rag for safety.
   c. Manually actuate the module's self-sealing valves to purge the line pressure. Note: Debris can be expelled at high velocity during the purge, take all required safety precautions.
5. Depending on the type of service or repair, connections to the module might also need to be disconnected.
6. Remove the valve stem using a 2.5 mm hex key. Do not strip the hex on the valve stem during removal.
7. Remove the check valve piston and spring. Clean any lubrication from the check valve piston, valve stem, spring, and bore in the module housing using a clean rag.
8. Inspect the valve stem for straightness, and replace, if bent.
9. Inspect the o-rings and u-cup seal on the valve stem and check valve piston for wear and damage. Replace components that are damaged or worn.
10. Inspect the spring in the assembly and replace if damaged or worn.

Figure 5.1—Master Self-Sealing Valve

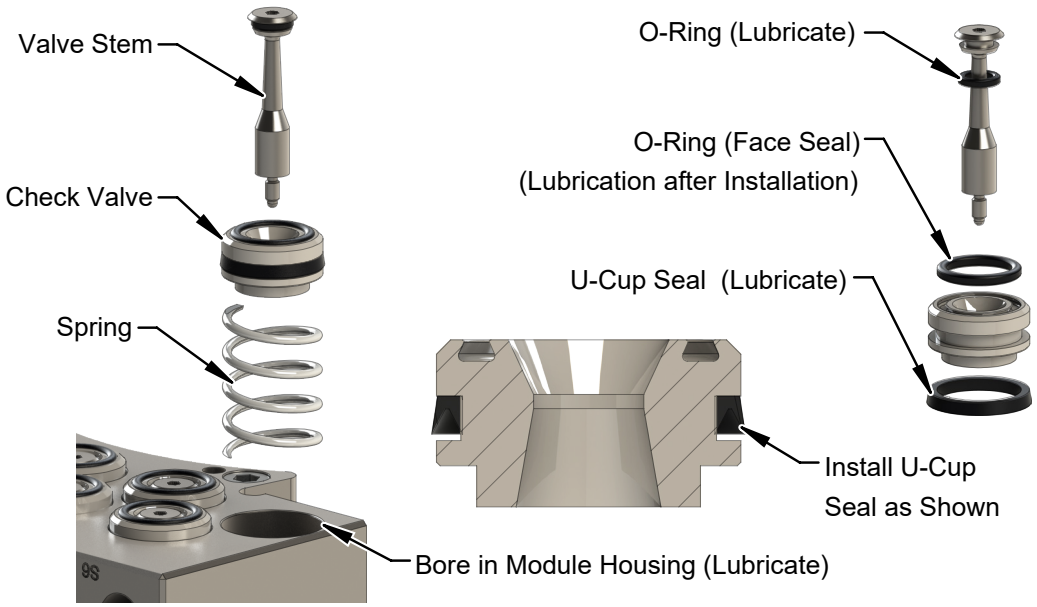


11. Lubricate the bore in the module housing with Magnalube G (Teflon/Petroleum based grease).

NOTICE: Do not lubricate the O-ring face seal until after installation. Lubricating the O-ring before installation can cause the O-ring to blow out during coupling and uncoupling.

12. If replacing seals, lubricate the valve stem O-ring and the check valve piston U-cup seal with Magnalube G (Teflon/Petroleum based grease).
13. Install the O-ring on the valve stem.
14. Install the U-cup seal on the check valve. Do not get lubrication in the face seal groove in the check valve.
15. Install the non-lubricated O-ring (face seal) into the check valve.
16. Install the spring into the bore in the module housing, seat the check valve on the spring.
17. If the threaded end of the valve stem does not have pre-applied adhesive, apply Loctite 7649 primer and then Loctite 222 or similar thread locker to the threaded end of the valve stem. If the module housing is stainless steel, also add Loctite 7649 primer to the housing threads.

Figure 5.2—Master Self-Sealing Valve Installation



18. Install the valve stem. The check valve piston must be pushed down flush with the mating surface of the Master housing in order to install the threaded end of the valve stem. Do not damage the U-cup seal around the check valve piston. A small, flat-head screwdriver can be used to ensure that the U-cup seal is fully located in the recess and not folded over itself prior to screwing in the valve stem. Tighten the stem to 10 in-lbs (1.1 Nm).
19. Lubricate the installed O-ring (face seal) with Magnalube G (Teflon/Petroleum based grease).
20. Safely resume normal operation.

5.2.2 Clean, Inspect, Lubricate, Replace Components for GL1/GL8 Tool side Check Port

Parts required: *Refer to Section 6—Serviceable Parts*
Tools required: *10 mm hex key, Torque wrench*
Supplies required: *Clean rag, Magnalube G lubricant*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).

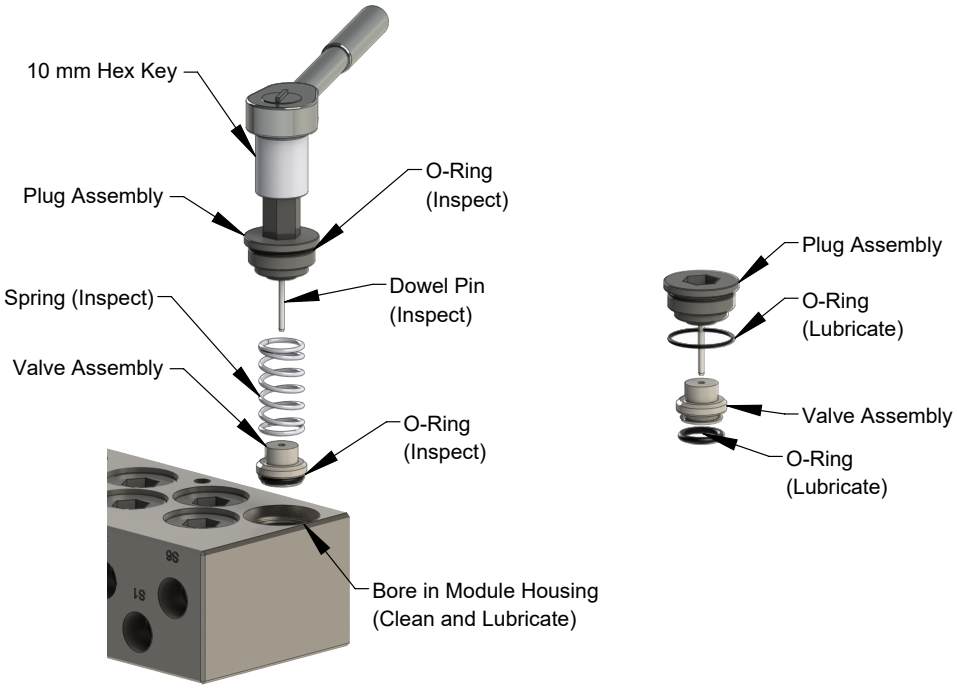
NOTICE: Debris can be expelled at high velocity during the purge, take all required safety precautions.

4. All customer plumbing connections to the module must be purged.
   a. Verify that the supply lines are turned off.
   b. Cover the valves with a rag for safety.
   c. Manually actuate the self-sealing valves to purge the line pressure.
5. If required disconnect connections to the module.

NOTICE: You might need to remove the Tool side module to access the plug.

6. Remove the plug assembly from the bottom of the air module using a 10 mm hex key.
7. Remove the spring and valve assembly from the housing.

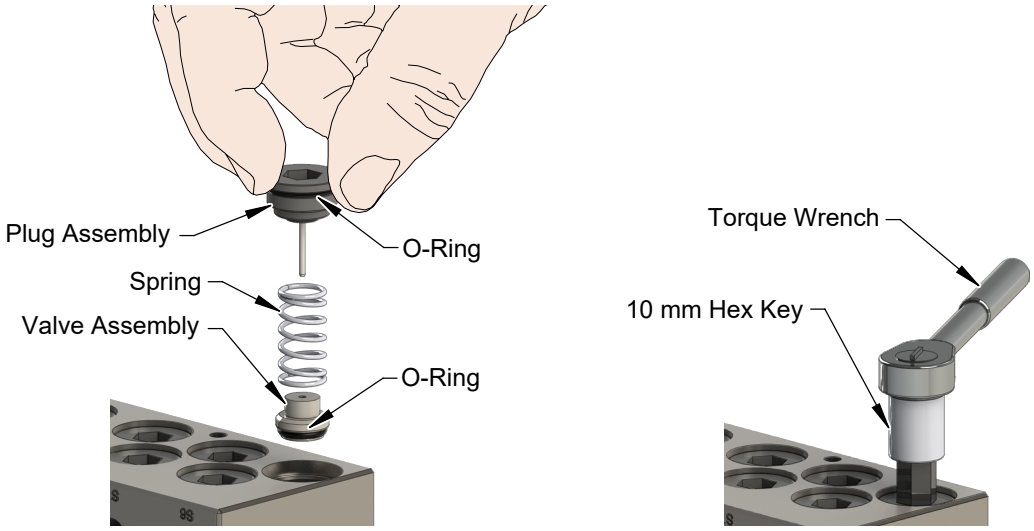
Figure 5.3—Tool Self-Sealing Valve (Disassembly)



8. Clean all lubrication from the plug assembly, valve assembly, spring, and bore in the housing using a clean rag.
9. Inspect the dowel pin that is contained in the plug assembly for straightness. Replace the plug assembly if the dowel pin is bent.
10. Inspect the O-rings on the plug and valve assemblies, replace if worn or damaged.
11. Inspect the spring in the assembly and replace if worn or damaged.

12. If replacing the O-rings, lubricate both new O-rings with Magnalube G (Teflon/ Petroleum based grease).
13. Install the O-rings on the plug assembly and the valve assembly.

Figure 5.4—Tool Self-Sealing Valve (Assembly)



14. Install the check valve piston, make sure it is seated properly in the housing.
15. Install the spring into the housing, make sure it is installed over the step on the check valve.

> **CAUTION:** Do not use excess force when installing the plug assembly into the housing. Using excessive force can damage the O-ring and strip the threads on the plug assembly. Thread the plug assembly into the Tool housing by hand, until several threads are engaged into the housing. Then use a 10 mm hex key to complete the installation. Torque the plug to 30 in-lbs (3.39 Nm).

16. Carefully install the plug assembly aligning the dowel pin into the check valve piston. Thread the plug assembly into the housing by hand until several threads are engaged in the housing.
17. Tighten the plug assembly using a 10 mm hex key to 30 in-lbs (3.39 Nm).
18. Verify the check valve piston is seated properly in the housing.
19. Safely resume normal operation.

5.2.3 Clean, Inspect, Lubricate, Replace Components for GL2, GL3, and GL5 Master Side Check Port

Parts required: *Refer to Section 6—Serviceable Parts*
Tools required: *Snap ring pliers*

Supplies required: *Clean rag, Magnalube*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).

NOTICE: Debris can be expelled at high velocity during the purge, take all required safety precautions.

4. Purge and disconnect all customer plumbing connections to the module.
   a. Turn the supply lines off.
   b. Cover the valves with a rag for safety.
   c. Manually actuate the module's self-sealing valves to purge the line pressure.
5. Remove the retaining ring using snap ring pliers.
6. Remove the valve stem, valve piston and spring, inspect for wear or damage. Replace any worn or damaged components. Refer to *Figure 5.5*.
7. Remove the O-rings form the valve piston and the valve bore in the housing.
8. Clean the valve bore and internal components with a clean dry rag.

Figure 5.5—Master Self-Sealing Valve

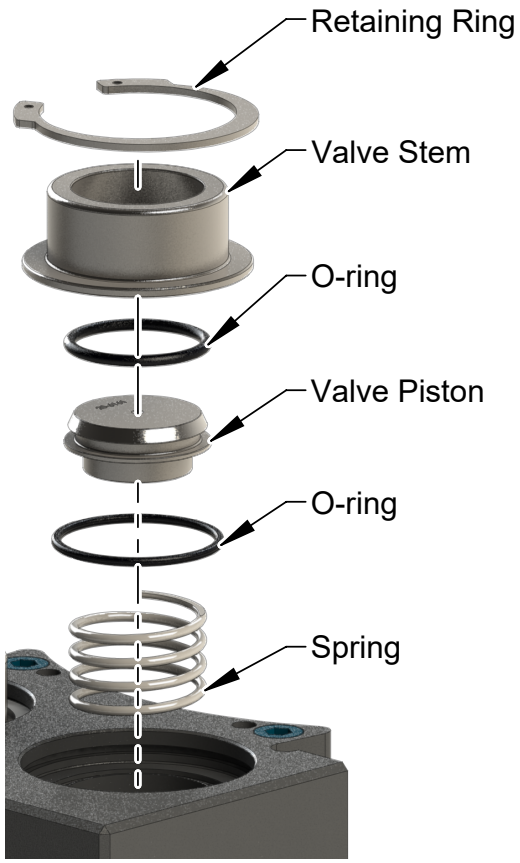
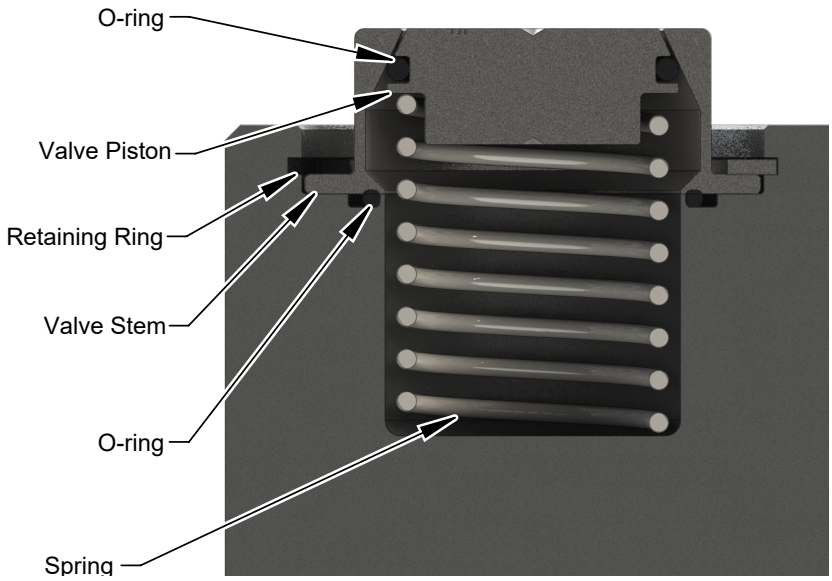


Figure 5.6—Master Self-Sealing Valve Cross Sectional View



9. Lubricate the replacement O-rings and valve piston with Magnalube.
10. Place the larger O-ring on the seat of the valve bore. Refer to *Figure 5.6*.
11. Place the smaller O-ring in the groove of the valve piston.
12. Place the spring to the bottom boss of the valve piston, and insert into the valve bore.
13. Place the valve stem in the bore of the housing so that the stem's flange rests on the seat of the housing. The valve piston should be flush with the top rim of the valve stem.
14. Using snap ring pliers, secure the self-sealing valve assembly by installing the retaining ring in the groove of the housing.
15. Safely resume normal operation.

5.2.4 Replacement of the GL2, GL3, and GL5 Tool Side Check Port

Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *Spanner wrench (legacy product) or 5 mm hex key (latest product revision)*

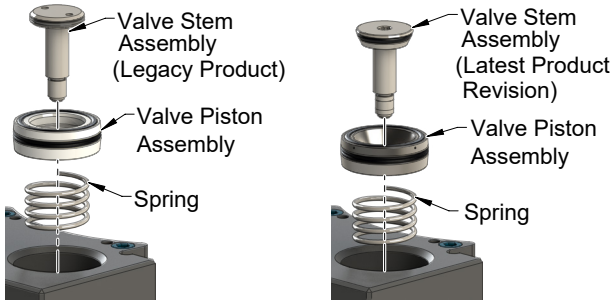
Supplies required: *Clean rag, Magnalube G lubricant, Loctite 242*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits, for example, electrical, air, and water.

NOTICE: Debris can be expelled at high velocity during the purge; take all required safety precautions.

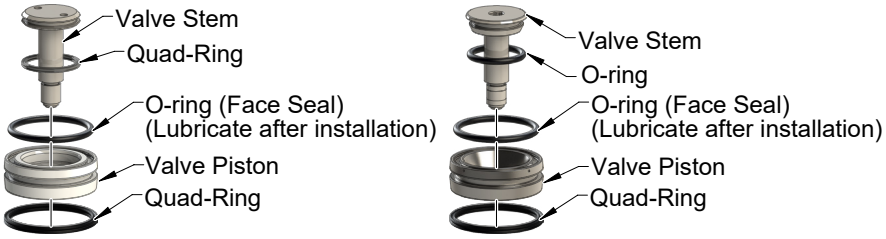
4. Purge and disconnect all customer plumbing connections to the module.
   a. Turn the supply lines off.
   b. Cover the valves with a rag for safety.
   c. Manually actuate the module's self-sealing valves to purge the line pressure.
5. Use a spanner wrench or 5 mm hex key to remove the valve stem assembly, the valve piston assembly, and spring from the housing.

Figure 5.7—Remove Valve Stem Assembly, Valve Piston Assembly, and Spring



6. Inspect the valve stem, valve piston, and the spring for wear or damage; replace all worn or damaged components.
7. Remove all O-ring and Quad-ring seals from the valve stem and piston assemblies.

Figure 5.8—Replace the O-rings and Quad-rings



NOTICE: Do not lubricate the O-ring face seal for the valve piston prior to installation.

8. Lubricate the replacement valve Piston Quad-ring and the valve stem Quad-ring or O-ring.
9. Install the O-ring face seal into the top groove in the valve piston. Then lubricate the O-ring.
10. Clean the check port with a clean dry rag. Assemble the components in the order shown.
11. Apply Loctite 242 on the valve stem's threads. Push down, compressing the spring, and thread the valve stem into the housing. Tighten to 110 in-lbs (12.4 Nm) using a spanner wrench or 5 mm hex key.
12. Safely resume normal operation.

5.2.5 Clean, Inspect, Lubricate, Replace Components for GL2PCM/ GL2APCM Pass-Through Port

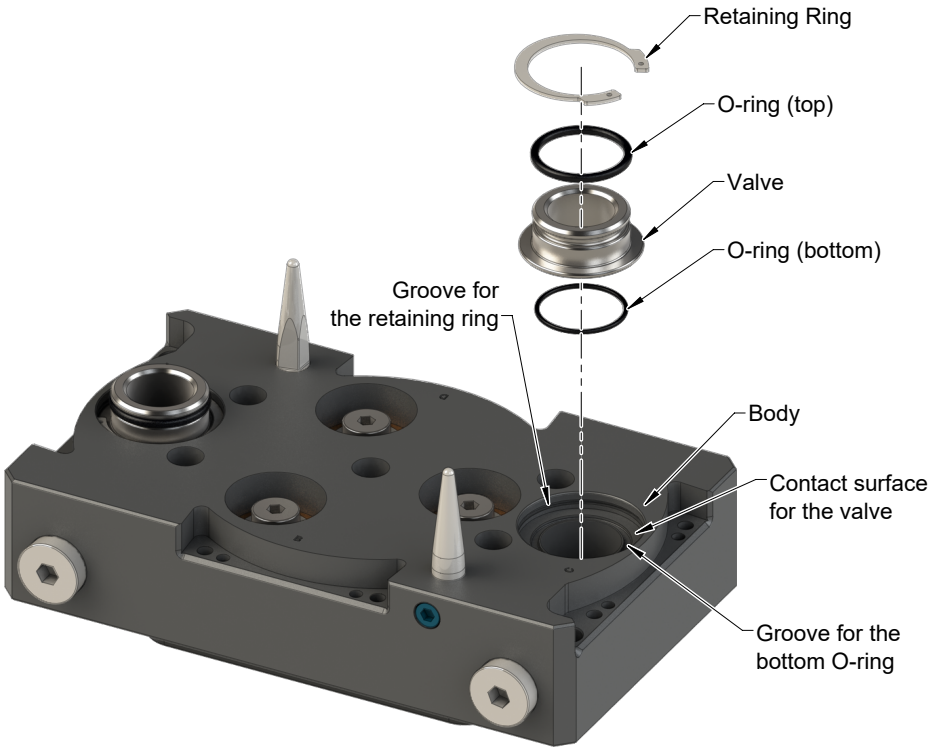
Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *Snap ring pliers*

Supplies required: *Clean rag, Magnalube, XHP 222 Special grease*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
4. Remove the retaining ring using snap ring pliers.
5. Remove the valve and O-rings. Replace the O-rings. If damaged, replace the valve.
6. Clean the valve bore, retaining ring, and valve with a clean, dry rag.
7. Install the bottom O-ring:
   a. Lubricate the bottom O-ring with Magnalube.
   b. Insert the bottom O-ring in the groove of the valve bore (refer to *Figure 5.9*).
8. Install the top O-ring:
   a. Lubricate the top O-ring with XHP 222 Special grease.
   b. Insert the O-ring in the groove of the valve.
9. Install the valve in the valve bore so that the valve's flange contacts the surface in the valve bore (refer to *Figure 5.9*).
10. Using snap ring pliers, install the retaining ring in the groove of the valve bore (refer to *Figure 5.9*) so that the valve is secure in the body of the utility coupler.
11. Safely resume normal operation.

Figure 5.9—GL2PCM Pass-Through Valve



5.2.6 Alignment Pin Replacement

> **CAUTION:** When replacing an alignment pin,verify that the Master has both round and diamond-shaped pins (refer to *Section 6—Serviceable Parts*). During coupling, the round-shaped pin maintains precision alignment, and the diamond-shaped pin permits incremental adjustments so that the Master and Tool plates do not bind. Failure to incorporate both shapes could result in improper operation and equipment damage.

Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *5 mm hex key, torque wrench*

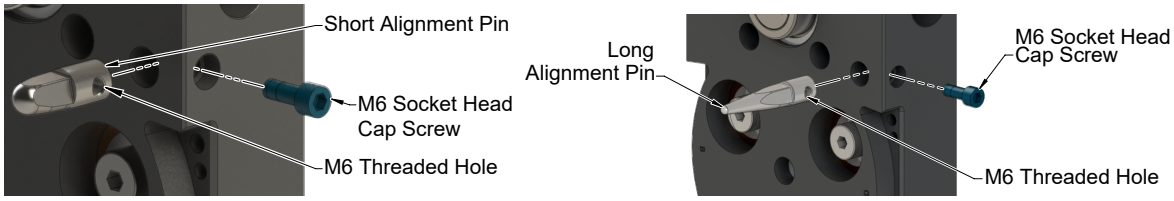
Supplies required: *Mobile XHP 222 Special grease*

1. Uncouple the Utility Coupler and space to allow clear access to the Master and Tool.
2. Turn off all energized circuits (e.g., electrical, air, water, etc.)
3. Remove the M6 socket head cap screw using a 5 mm hex key.
4. Remove the alignment pin from the housing.

> **NOTICE:** If the alignment pin is difficult to remove, it can be pressed out using a 0.1" diameter pin from the back side of the housing.

5. Insert the new alignment pin into the housing, align the tapped hole in the pin with the M6 screw hole in the housing.

Figure 5.10—Alignment Pin Replacement



6. Secure the alignment pin with the M6 socket head cap screw using a 5 mm hex key, and tighten to 140 in-lbs (15.82 Nm).
7. Apply Mobile Grease XHP 222 Special grease to the alignment pin.
8. Safely resume normal operation.

5.2.7 Tool Presence Sensor Replacement for GL3 and GL5 Models

Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *1/2" socket wrench, torque wrench*

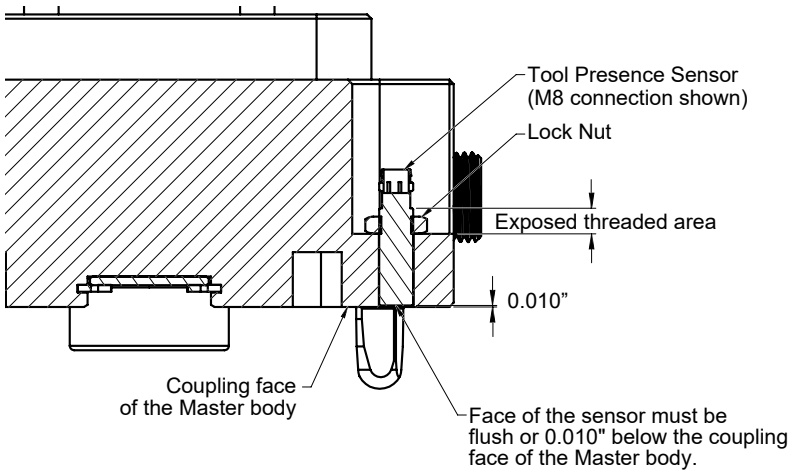
Supplies required: *Loctite 222*

1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
3. Disconnect the sensor cable, loosening the lock nut using a 1/2" socket wrench, and unscrewing the sensor from the body.
4. Check to be sure the female threads on the housing are free and clear of debris, then thread a new sensor into the tool presence mounting holes until the face of the sensor is flush or 0.010″ below flush with the coupling face of the Master assembly.

NOTICE: Do not apply Loctite 222 to the threaded portion of the sensor that contacts the Utility Coupler body; otherwise, the sensor is difficult to remove in the future.

5. Apply Loctite 222 to the exposed threaded area of the sensor where the lock nut will seat (only this area).
6. Screw the lock nut onto the sensor until it is snug to the Master body using a 1/2" socket wrench. Tighten to 20 in-lbs (2.26 Nm).
7. Connect the sensor cable.
8. Safely resume normal operation.

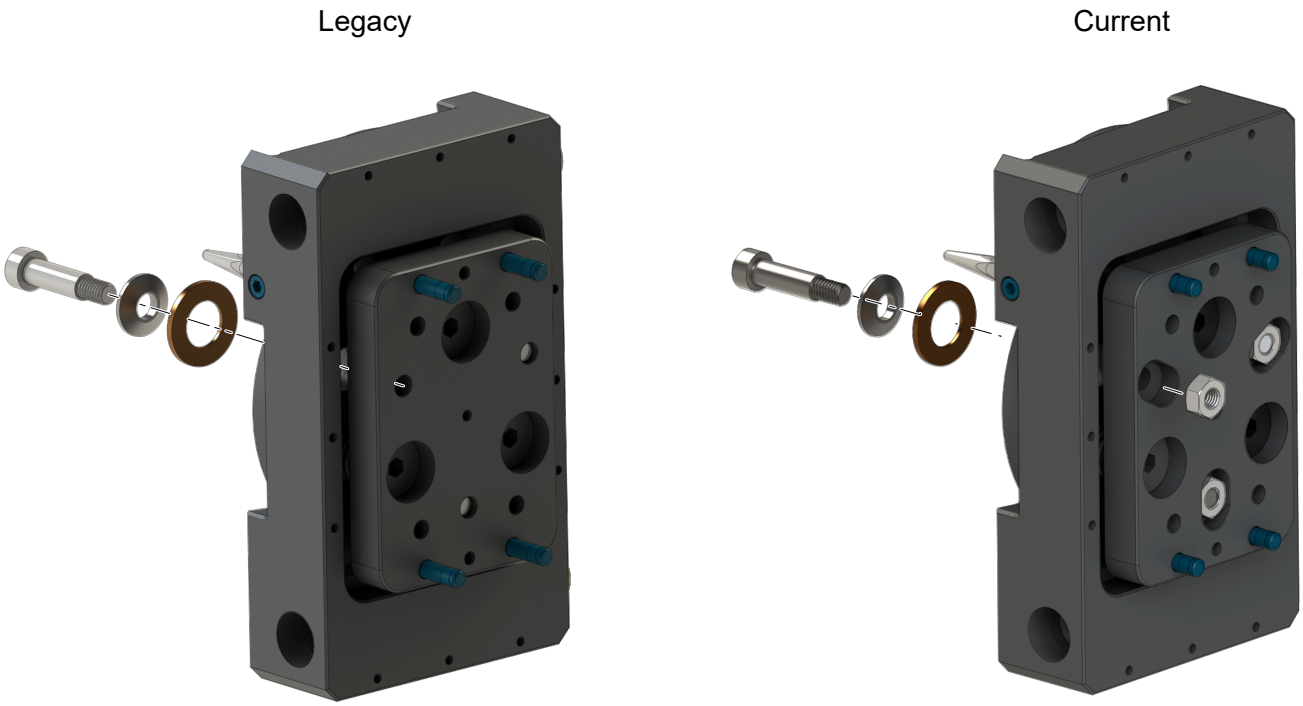
Figure 5.11—Tool Presence Sensor Replacement



5.2.8 Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler

The replacement procedure varies slightly between the current and legacy (previous) versions of the Utility Coupler. Both versions are shown in the following figure. Under each version a hyperlink cross-references to the applicable replacement procedure.

Figure 5.12—Legacy vs Current Versions



5.2.8.1 Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler

Parts required: *Refer to Section 6—Serviceable Parts*

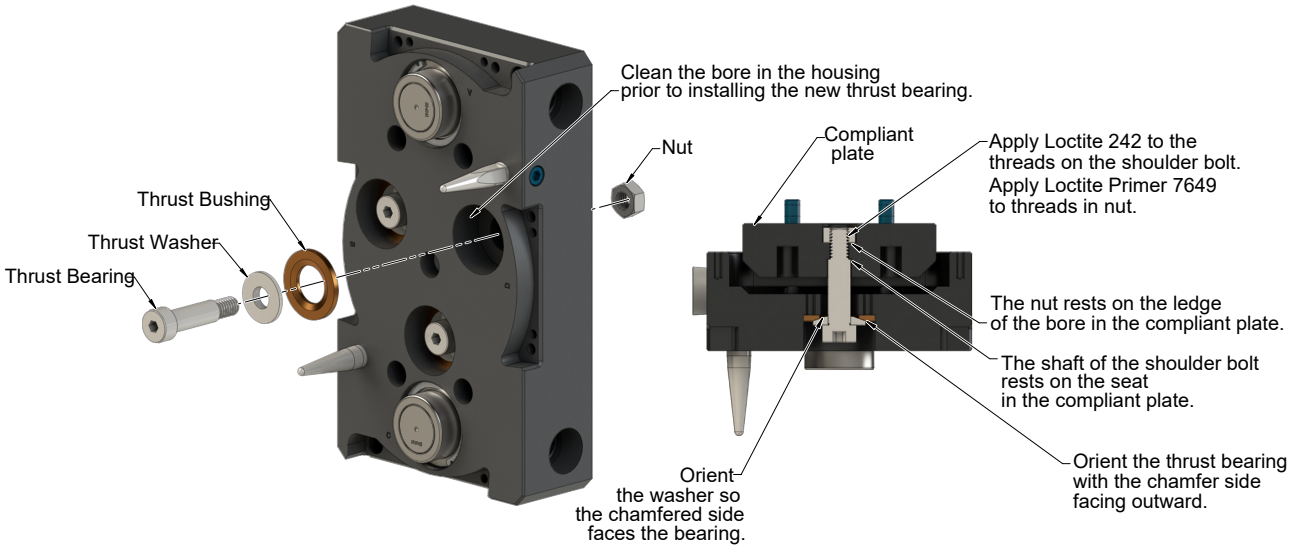
Tools required: *6 mm hex key, torque wrench, open-end wrench*

Supplies required: *Loctite® 7649™ and 242™, Magnalube G lubricant, Mobile XHP 222 Special, Clean rag*

1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits, for example: electrical, pneumatic, hydraulic.
3. Use an open-end wrench to hold the nut steady, and use a 6 mm hex key to remove the M12 shoulder bolt.
4. Remove the chamfered washer and thrust bearing. Note: To remove the thrust bearing may require the use of a flat head screw driver (or similar) to push bearing out from the back side.
5. Clean the housing with a rag to remove grease and debris.
6. Insert the new thrust bearing with the chamfered side facing outward.

7. Apply MobilGrease XHP222 Special grease the chamfered edges of the thrust bearing and the new chamfered washer.
8. Insert the new chamfered washer with the chamfer facing the bearing (refer *Figure 5.13*).
9. Apply Loctite 242 to the threads of the new shoulder bolt.
10. Apply Loctite® 7649™ primer to the threads in the nut.
11. Press on Utility Coupler Master to compress the springs so that the shoulder bolt will bottom out in the housing and leave the thrust bearing and chamfered washer loose.

Figure 5.13—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement



12. Insert the nut so that it rests on the ledge of the bore in the housing.
13. Insert the new shoulder bolt so that the shaft of the bolt rests on seat in the compliant plate. Tighten the new shoulder bolt to 20.83 ft-lbs (28.25 Nm).
14. Safely resume normal operation.

Section 5.2.8.2—Thrust Bearing, Chamfered Washer, and Shoulder Bolt Replacement for Utility Coupler (Legacy)

Section 5.2.8.1—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler

5.2.8.2 Thrust Bearing, Chamfered Washer, and Shoulder Bolt Replacement for Utility Coupler (Legacy)

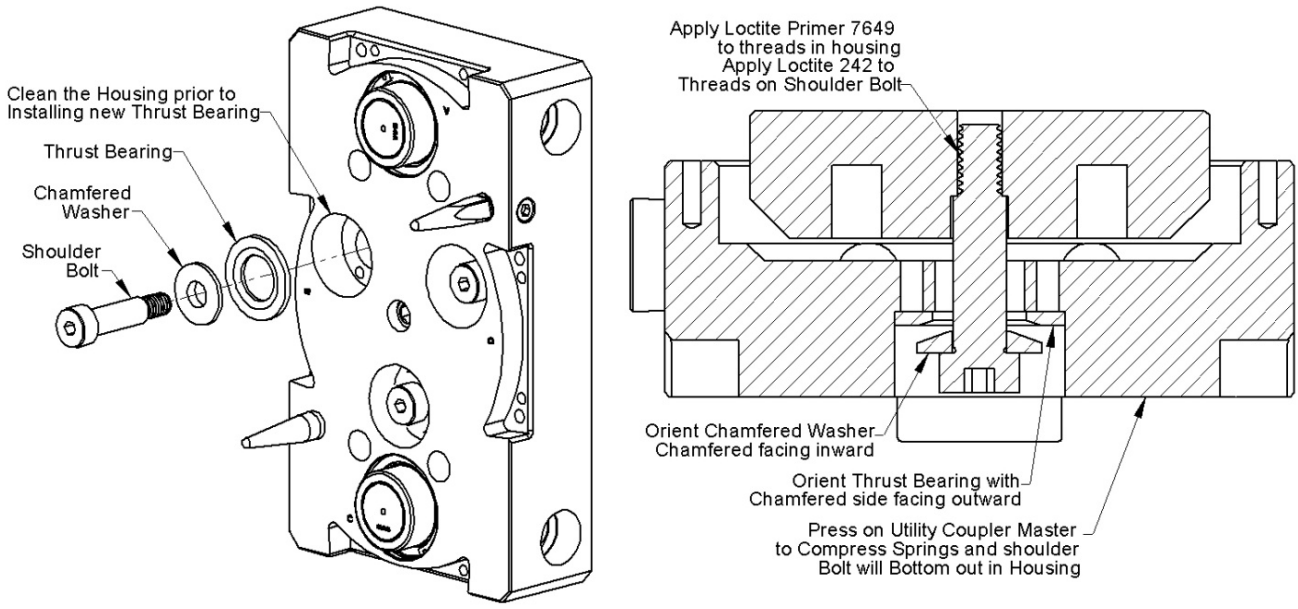
Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *6 mm hex key, torque wrench*

Supplies required: *Loctite® 7649™ and 242™, Magnalube G lubricant, MobilGrease XHP222 Special grease ,Clean rag*

1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
3. Press on Utility Coupler Master to compress the springs and release the pressure on the thrust bearing, chamfered washer and shoulder bolt.
4. Remove the M12 shoulder bolt using a 6 mm hex key.
5. Remove the chamfered washer and thrust bearing. Note: To remove the thrust bearing may require the use of a flat head screw driver (or similar) to push bearing out from the back side.
6. Clean the housing with a rag to remove grease and debris.
7. Apply Loctite® 7649™ primer to the threads in the Master body (housing).
8. Insert the new thrust bearing with the chamfered side facing outward.
9. Apply MobilGrease XHP222 Special grease the chamfered edges of the thrust bearing and the new chamfered washer.
10. Insert the new chamfered washer with the chamfer facing inward.
11. Apply Loctite 242 to the threads of the new shoulder bolt.
12. Press on Utility Coupler Master to compress the springs so that the shoulder bolt will bottom out in the housing and leave the thrust bearing and chamfered washer loose.

Figure 5.14—Thrust Bearing, Chamfered Washer, and Shoulder Bolt Replacement



13. Insert the new shoulder bolt and tighten the new shoulder bolt using 6 mm hex key to 20.83 ft-lbs (28.25 Nm).
14. Safely resume normal operation.

5.2.9 Compliance Spring Replacement for Utility Coupler (Preferred Method)

Note: If environment is dirty or gritty an alternative method may be preferable, refer to *Section 5.2.10—Compliance Spring Replacement for Utility Coupler (Alternative Method)*.

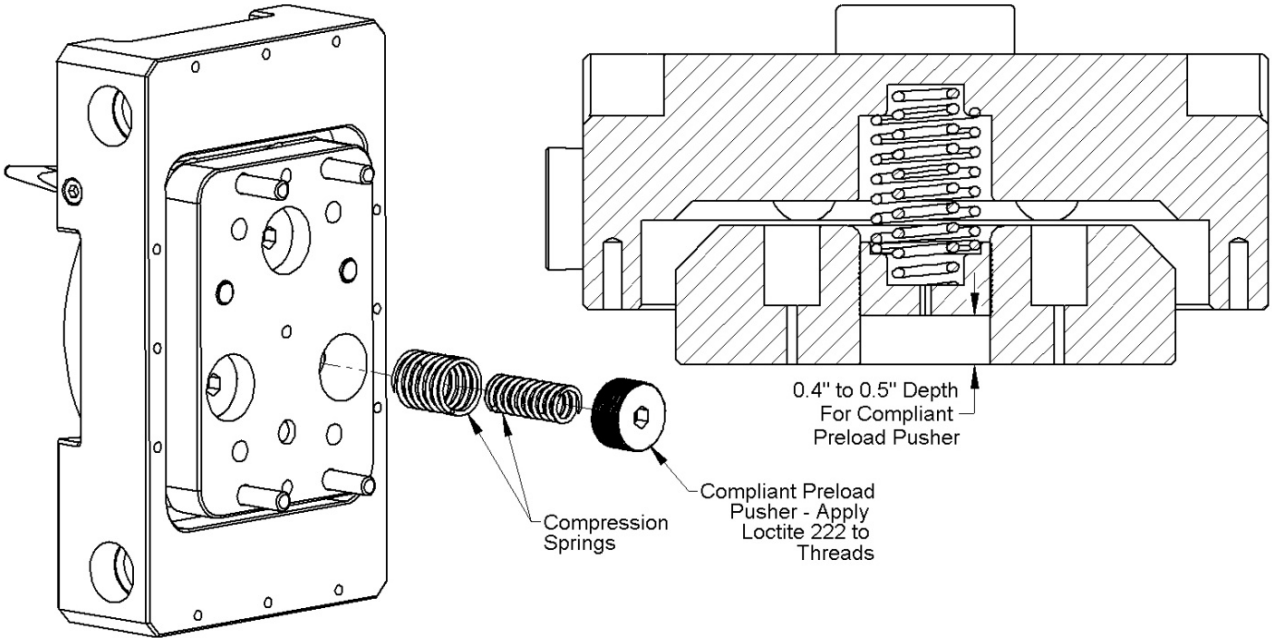
Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *5/16" hex key*

Supplies required: *Loctite®222, Compressed air, Clean rag*

1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
3. Remove Utility Coupler Master from drive cylinder refer to *Section 2.2—Utility Coupler Master Removal*.
4. Clear dust and debris out of spring compliance area by blowing with compressed air in the gap between the interface plate and the Utility Coupler body.

Figure 5.15—Compliance Springs Replacement



5. Using a 5/16″ hex key, remove the compliant preload pusher from the interface plate.
6. Remove the (2) compression springs.
7. Insert (2) new compression springs.
8. Apply Loctite 222 to the threads of the new compliant preload pusher.
9. Using a 5/16″ hex key, tighten the compliant preload pusher until it is 0.4″ to 0.5″ below the face of the interface plate.
10. Install the Utility Coupler Master to the drive cylinder refer to *Section 2.1—Utility Coupler Master Installation*.
11. Safely resume normal operation.

5.2.10 Compliance Spring Replacement for Utility Coupler (Alternative Method)

> **CAUTION:** Dust and debris not removed from the preload pusher holes can roll the aluminum thread in the plate and entrap the preload pusher components within the plate. When replacing the compliant springs, use compressed air to remove debris from the holes.

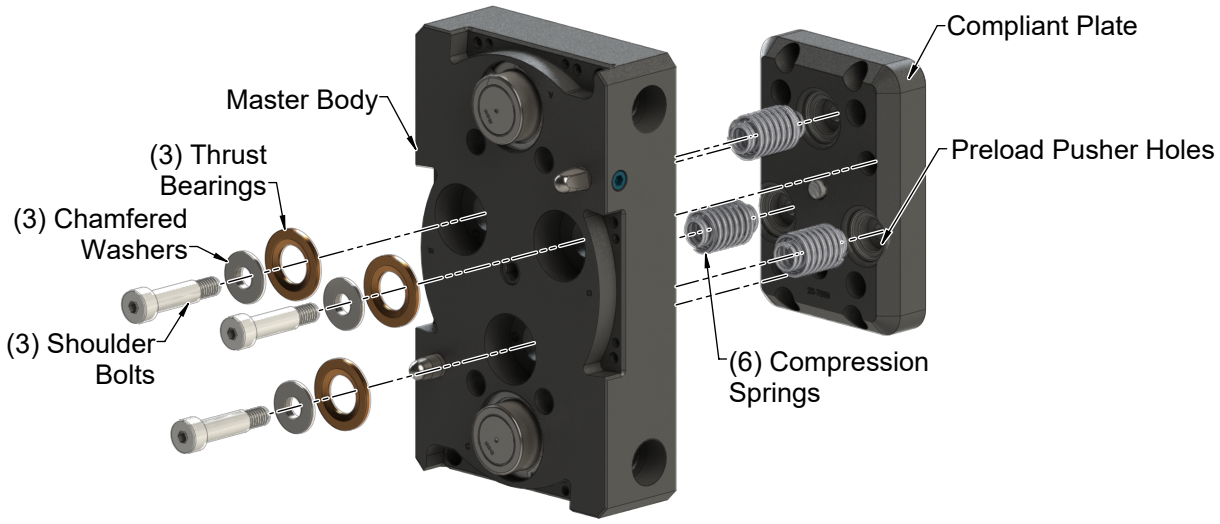
Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *6 mm hex key, torque wrench*

Supplies required: *Compressed air, Clean rag*

1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
3. Remove Utility Coupler Master from drive cylinder refer to *Section 2.2—Utility Coupler Master Removal*.
4. Use compressed air to clear dust and debris in the gap between the interface plate and the Utility Coupler body.
5. Use compressed air to clear dust and debris in the preload pusher holes.
6. Remove the (3) shoulder bolts, nuts, thrust bearings, and chamfered washers. Refer to *Section 5.2.8—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler*.
7. Lift off the Master body to expose the compression springs.

Figure 5.16—Compliance Springs Replacement (GL2ACM shown)



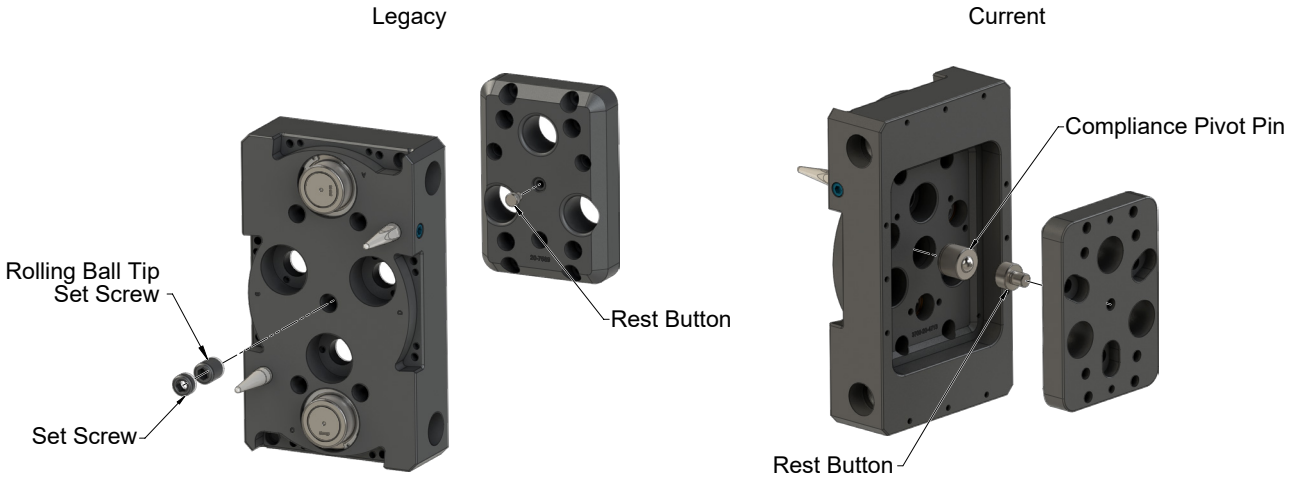
8. Replace compression springs as necessary. Note: If an individual compression spring is worn out or broken it is recommended that all compression spring be replaced.
9. Place the Master body on the compliance interface plate, making sure the compression springs are in the proper recesses in the back of the Master body.
10. Replace the (3) shoulder bolts, nuts, thrust bearings, and chamfer washers. Refer to *Section 5.2.8—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler* or *Section 5.2.8.2—Thrust Bearing, Chamfered Washer, and Shoulder Bolt Replacement for Utility Coupler (Legacy)* (Install).
11. Install the Utility Coupler Master to the drive cylinder refer to *Section 2.1—Utility Coupler Master Installation*.
12. Safely resume normal operation.

5.2.11 Center Swivel Replacement for Utility Coupler

The center swivel replacement procedure varies slightly between the current and legacy (previous) versions of the Utility Coupler. Both versions are shown in the following figure. Under each version a hyperlink cross-references to the applicable replacement procedure.

The rest button replacement procedure is identical for both versions (refer to *Section 5.2.12—Rest Button Replacement*).

Figure 5.17—Identify the Version of Utility Coupler



5.2.11.1 Center Swivel Replacement for Utility Coupler

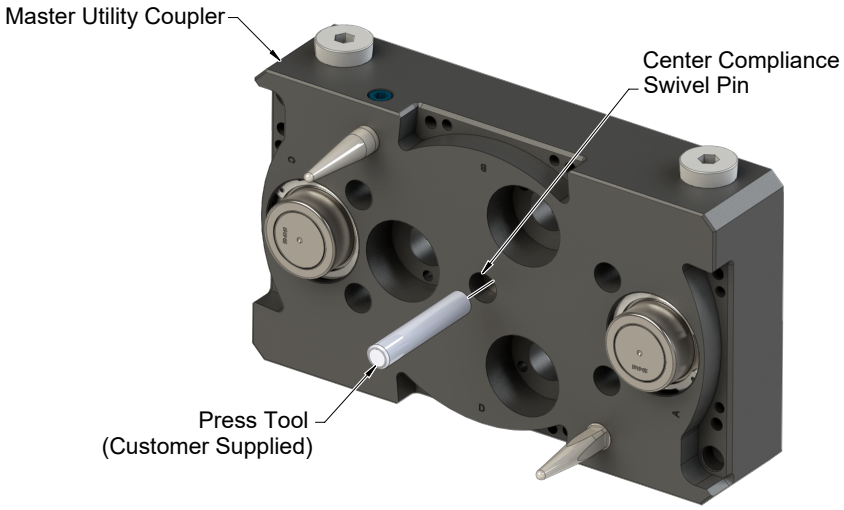
Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *Arbor press and press tools*

Supplies required: *Compressed air, Clean rag*

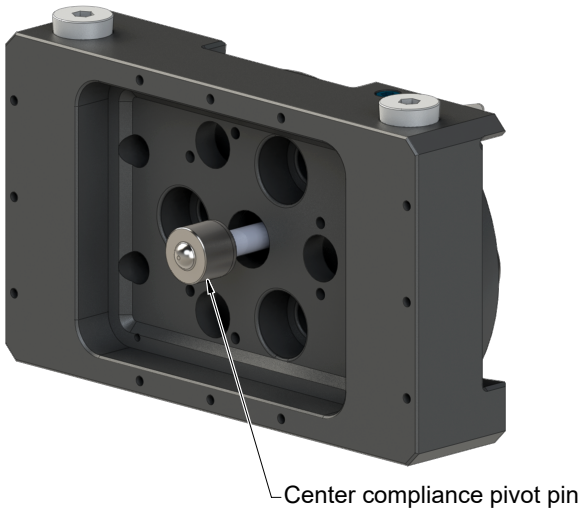
1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
3. Remove Utility Coupler Master from drive cylinder refer to *Section 2.2—Utility Coupler Master Removal*.
4. Clear dust and debris out of spring compliance area by blowing with compressed air in the gap between the interface plate and the Utility Coupler body, refer to *Section 4.3—Clear Dust and Debris from Compliance Springs Area for Drive Cylinders*.
5. Remove the (3) nuts, shoulder bolts, thrust washers, and chamfered washers, refer to *Section 5.2.8—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler* (Remove).
6. Lift off the Master body to expose the center pivot.
7. Insert a press tool, in the hole with the center compliance pivot pin.

Figure 5.18—Remove



8. Using an arbor press, remove the center compliance swivel pin.

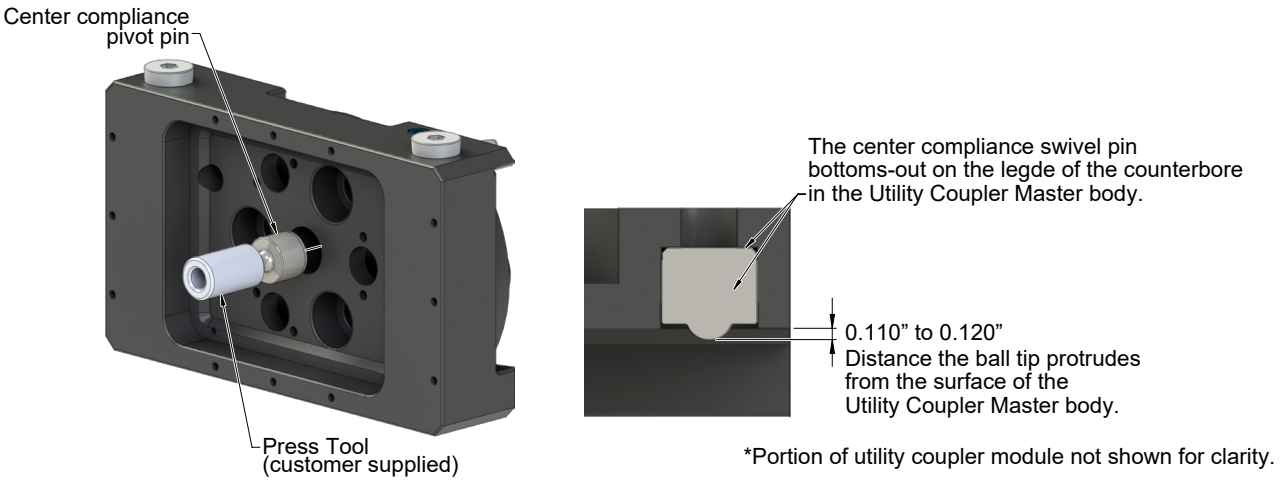
Figure 5.19—Press-out the Center Compliance Swivel Pin



9. Use a lint-free rag or compressed air to clean the hole.
10. Using an arbor press and press tool, insert the center compliance swivel pin until it bottoms-out on the seat in the Master body.

NOTICE: The ball tip on the center compliance swivel pin protrudes between 0.110” and 0.120” from the surface of the Utility Coupler Master body.

Figure 5.20—Install the Center Compliance Swivel Pin



11. To replace the rest button, refer to *Section 5.2.12—Rest Button Replacement*.
12. Place the Master body on the compliance interface plate, making sure the compression springs are in the proper recesses in the back of the Master body (refer to *Section 5.2.9—Compliance Spring Replacement for Utility Coupler (Preferred Method)*).
13. Replace the (3) shoulder bolts, thrust washers, chamfered washers, and nuts refer to *Section 5.2.8—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler*(Install).
14. Install the Utility Coupler Master to the drive cylinder refer to *Section 2.1—Utility Coupler Master Installation*.
15. Safely resume normal operation.

5.2.11.2 Center Swivel Replacement for Utility Coupler (Legacy)

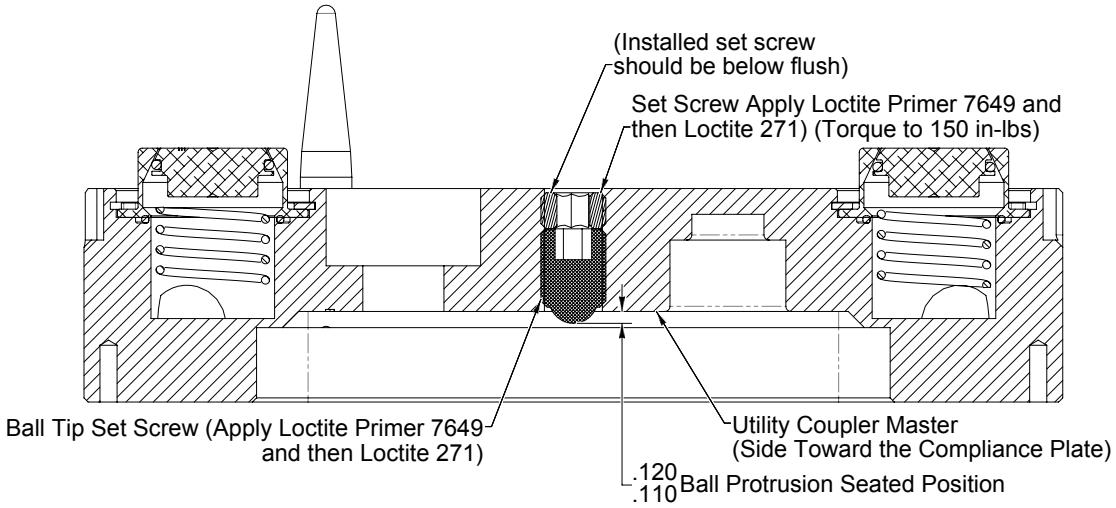
Parts required: *Contact an ATI representative*

Tools required: *6 mm hex key, 8 mm hex key, torque wrench*

Supplies required: *Loctite® 7649™, 242™, and 271™ , Magnalube G lubricant, Compressed air, Clean rag*

1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
3. Remove Utility Coupler Master from drive cylinder refer to *Section 2.2—Utility Coupler Master Removal*.
4. Clear dust and debris out of spring compliance area by blowing with compressed air in the gap between the interface plate and the Utility Coupler body, refer to *Section 4.3—Clear Dust and Debris from Compliance Springs Area for Drive Cylinders*.
5. Remove the (3) shoulder bolts, thrust washers, and chamfered washers, refer to *Section 5.2.8—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler*.
6. Lift off the Master body to expose the center pivot.
7. Using a 8 mm hex key, remove the set screw and ball tip set screw.

Figure 5.21—Position the Center Swivel



8. Apply Loctite® 7649™ primer and then Loctite® 271™ to the threads of the new ball tip set screw.
9. Using a 8 mm hex key, install the new ball tip set screw. Position the ball tip set screw so that the ball tip protrudes between .110” and .120” from the surface of the Utility Coupler body.
10. Allow 5 minutes for the Loctite to dry before proceeding to the next step.
11. Apply Loctite® 7649™ primer and then Loctite® 271™ to the threads of the set screw.
12. Using a 8 mm hex key, install the set screw. Tighten to 150 in-lbs (16.95 Nm).
13. To replace the rest button, refer to *Section 5.2.12—Rest Button Replacement*.
14. Place the Master body on the compliance interface plate, making sure the compression springs are in the proper recesses in the back of the Master body (refer to *Section 5.2.9—Compliance Spring Replacement for Utility Coupler (Preferred Method)*).
15. Replace the (3) shoulder bolts, thrust washers, and chamfered washers, refer to *Section 5.2.8—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler*.
16. Install the Utility Coupler Master to the drive cylinder refer to *Section 2.1—Utility Coupler Master Installation*.

17. Safely resume normal operation.

5.2.12 Rest Button Replacement

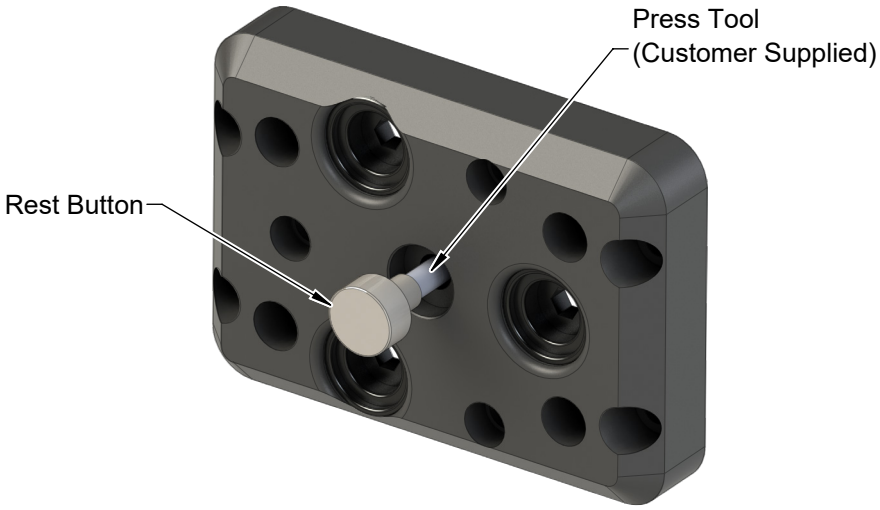
Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *6 mm hex key, 8 mm hex key, torque wrench*

Supplies required: *MobilGrease XHP222 Special grease, Compressed air, Clean rag*

1. Uncouple the Utility Coupler to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, hydraulic).
3. Remove Utility Coupler Master from drive cylinder refer to *Section 2.2—Utility Coupler Master Removal*.
4. Clear dust and debris out of spring compliance area by blowing with compressed air in the gap between the interface plate and the Utility Coupler body, refer to *Section 4.3—Clear Dust and Debris from Compliance Springs Area for Drive Cylinders*.
5. Remove the (3) nuts, shoulder bolts, thrust washers, and chamfered washers, refer to *Section 5.2.8—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler* (Remove).
6. Lift off the Master plate to expose the compliant plate.
7. Insert a press tool, in the hole with the rest button.
8. Using an arbor press, remove the rest button.

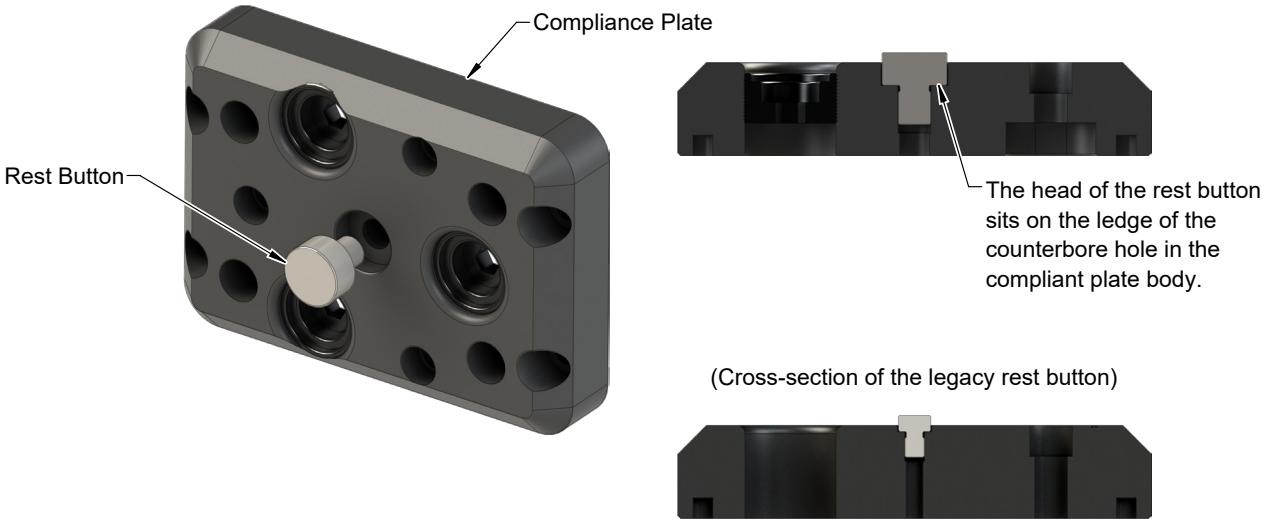
Figure 5.22—Remove Rest Button



9. Insert a press tool, in the hole with the rest button.
10. Using an arbor press, remove the rest button.
11. Use a clean towel, remove debris from the hole.

12. Insert the new rest button until the head stops on the ledge of the counterbore hole in the plate (refer to *Figure 5.23*).
13. Apply XHP 222 Special grease to the head of the rest button.

Figure 5.23—Insert Rest Button



14. Place the Master body on the compliance interface plate, making sure the compression springs are in the proper recesses in the back of the Master body (refer to *Section 5.2.9—Compliance Spring Replacement for Utility Coupler (Preferred Method)*).
15. Replace the (3) shoulder bolts, thrust washers, chamfered washers, and nuts refer to *Section 5.2.8—Thrust Bearing, Chamfered Washer, Shoulder Bolt, and Nut Replacement for Utility Coupler*(Install).
16. Install the Utility Coupler Master to the drive cylinder refer to *Section 2.1—Utility Coupler Master Installation*.
17. Safely resume normal operation.

5.2.13 Cylinder Bellow Replacement

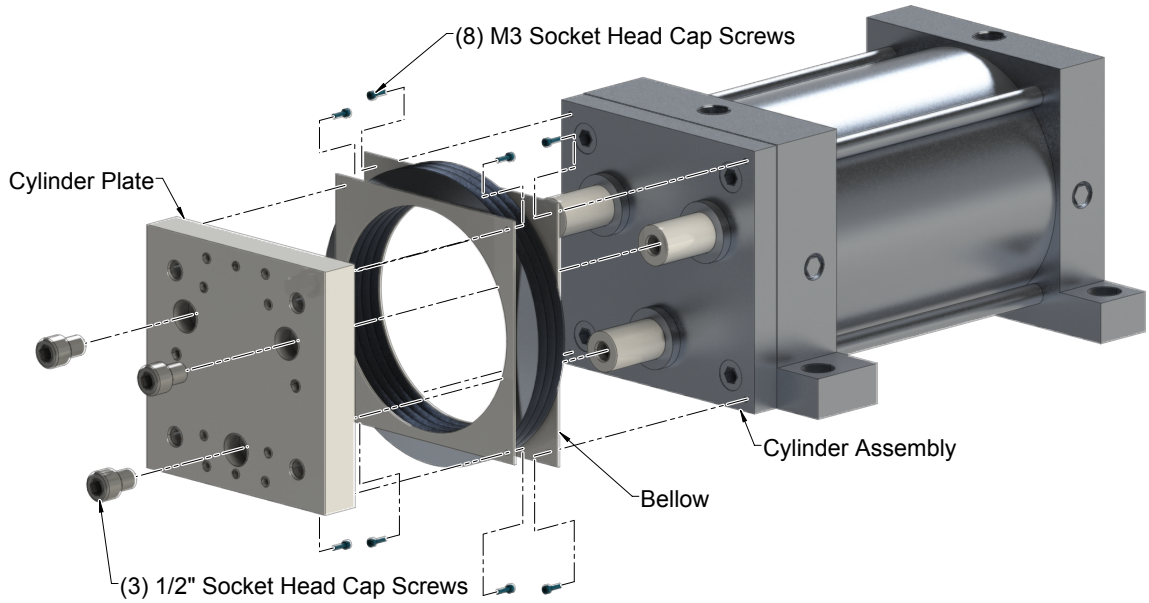
Parts required: *Refer to Section 6—Serviceable Parts*

Tools required: *5 mm hex key, torque wrench*

Supplies required: *Clean rag, Loctite®222 and 242™*

1. Uncouple the Utility Coupler and space to allow clear access to the Master and Tool.
2. Turn off all energized circuits (e.g., electrical, air, water, etc.)
3. Remove Utility Coupler Master from drive cylinder refer to *Section 2.2—Utility Coupler Master Removal*.
4. If replacing a bellow, remove the (8) M3 socket head cap screws securing the bellow to cylinder body and the cylinder plate.
5. Remove the (3) 1/2” socket head cap screws securing the cylinder plate to the cylinders and remove the cylinder plate.
6. If replacing a bellow, remove the bellow from the cylinder assembly.
7. It may be necessary to clean the mounting surfaces and cylinders of the assembly prior to installing a bellow in order to remove any debris that may be present.
8. Install the bellow into position over the cylinders.

Figure 5.24—Cylinder Bellow Installation



9. Apply Loctite®222 to the threads of the (8) M3 socket head cap screws.
10. Install the (4) M3 socket head cap screws securing the bellow to the cylinder body. Torque to 10 in-lbs (1.13 Nm).
11. Apply Loctite®242 to the threads of the (3) 1/2” socket head cap screws.
12. Install cylinder plate to the cylinders and secure with the (3) 1/2” socket head cap screws. Torque to 75 ft-lbs (101.69 Nm).
13. Install the (4) M3 socket head cap screws securing the bellow to the cylinder plate. Torque to 10 in-lbs (1.13 Nm).
14. Install the Utility Coupler Master to the drive cylinder refer to *Section 2.1—Utility Coupler Master Installation*.
15. Safely resume normal operation.

5.2.14 Utility Module Replacement Procedures

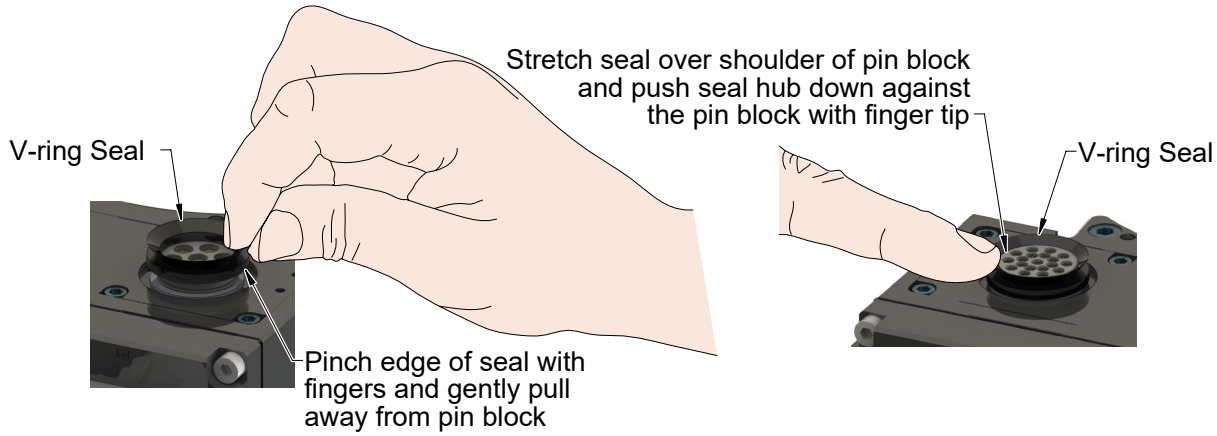
Common replacement procedures among all utility modules are located in this section.

5.2.14.1 V-ring Seal Replacement

The seal protects the electrical connection between the Master and Tool module. Replace the seal if it becomes worn or damaged.

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).
4. To remove the existing seal, pinch the edge of the seal and pull the seal away from the pin block on the Master module.
5. To install a new seal, stretch the new seal over the shoulder of the pin block.
6. Push the seal hub down against the pin block.
7. Safely resume normal operation.

Figure 5.25—V-ring Seal Replacement



6. Serviceable Parts

6.1 GL2 and GL5 Models

6.1.1 GL2CM and GL2ACM Master

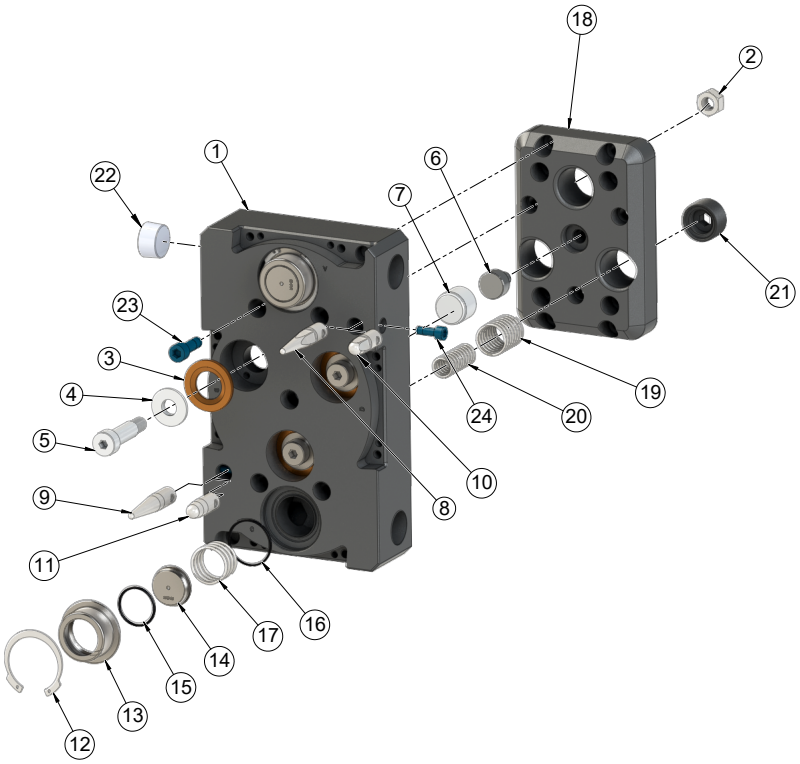


Figure 6.1—Master Plate			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL2CM-0-0-0-0-N	GL2 Utility Coupler Master, (2) 3/4” NPT Checked Ports, long alignment pins
	1	9123-GL2CM-0-0-0-0-E	GL2 Compliant Utility Coupler Master, (2) 3/4” BSPP Checked Ports, long alignment pins, Euro
	1	9123-GL2ACM-0-0-0-0-N	GL2 Compliant Utility Coupler Master, (2) 3/4” NPT Checked Ports, short alignment pins
2	3	3505-0870001-12	Hex Nut M10x1.5, 8mm Tall 17 mm Wide Zinc Plated Steel
3	3	3700-20-4676	Custom SAE 841 Bronze Thrust Bushing
4	3	3700-20-4675	Custom Chamfered Washer
5	3	3500-2070035-11	Socket Head Cap Screw Shoulder M12 x 35 Shoulder M10 Thread Alloy Steel
6	1	3700-20-10322	Center Compliance Pivot Pin
7	1	3700-20-10414	Rest Button, 10mm Dia Stem, .79 Dia Button S7 Steel
8	1	3700-20-4718	LONG ½" Dia. Alignment Pin 4 mm Taper Diamond (GL2CM)
9	1	3700-20-4732	LONG ½" Dia. Alignment Pin 4 mm Taper Round (GL2CM)
10	1	3700-20-4875	SHORT ½" Dia. Alignment Pin 4 mm Taper Diamond (GL2ACM, GL5CM)
11	1	3700-20-4876	SHORT ½" Dia. Alignment Pin 4 mm Taper Round (GL2ACM, GL5CM)
12	2	3690-8500001-11	Retaining Ring, Internal Inverted (Also See #13)
13	2	3700-20-4924	3/4" Valve Master Stem

Figure 6.1—Master Plate			
Item No.	**Qty**	**Part Number**	**Description**
14	2	3700-20-6161	3/4" Valve Piston
15	2	3410-001249-01	O-Ring AS568-119 Buna-N 90 Durometer
16	2	3410-0001015-01	O-Ring AS568-026 Buna-N D70
17	3	3610-2015100-20	Spring, 1.1 inch diameter, 2.5” long, 10.7 lb/in SS
18	1	3700-20-4713	Compliant Interface Plate Body
19	3	3610-1925001-20	Compression Spring .845” diameter, 2.5” Long, 43.4 Rate, MW
20	3	3610-1725001-10	Steel Compression Spring 2-1/2” L, 5/8” OD,.080” Wire
21	3	3700-20-4716	Compliant IP Preload Pusher
22	2	3490-0001036-01	¾" NPT Hex Socket Plug, SS (for N models)
	2	3490-0001056-01	¾" BSPP Hex Socket Plug, Brass (for E models)
23	4	3500-1068025-15A	M8x25 SHCS, 12.9, ISO4762/DIN912, Corrosion Protection Coating , YL M-spheres/IFI 525
24	2	3500-1066016-15A	M6x16 Socket Head Cap Screw, Class 12.9, Blue dyed Magni-565, ND Microspheres

6.2 GL2PCM and GL2APCM Master

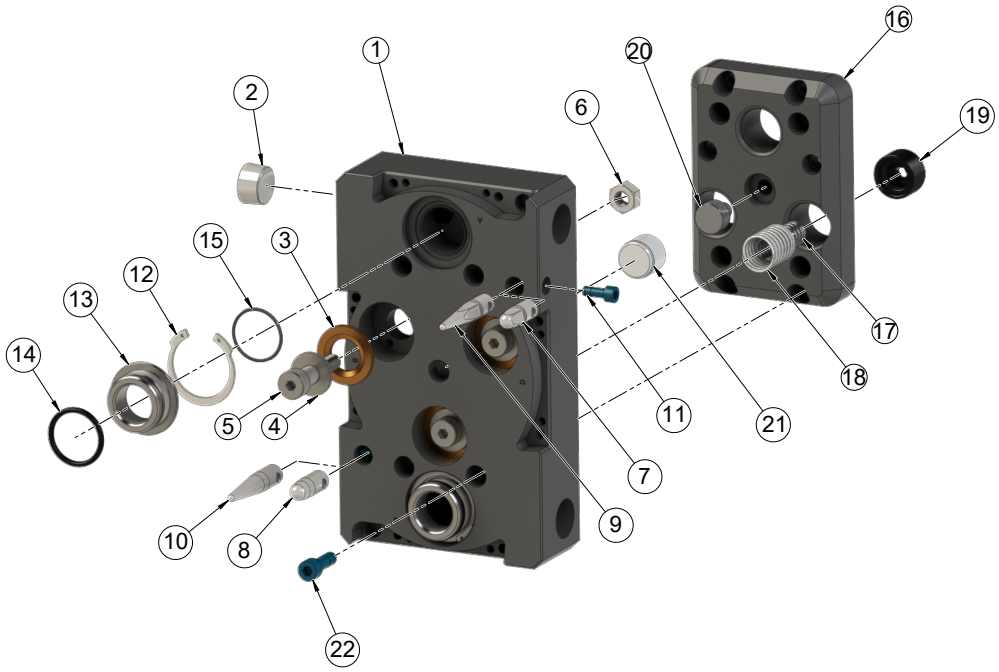


Figure 6.2—Master Plate			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL2PCM-0-0-0-0-N	GL2 Utility Coupler Master, (2) 3/4” NPT Checked Ports, long alignment pins
	1	9123-GL2PCM-0-0-0-0-E	GL2 Compliant Utility Coupler Master, (2) 3/4” BSPP Checked Ports, long alignment pis, Euro
	1	9123-GL2APCM-0-0-0-0-N	GL2 Compliant Utility Coupler Master with (2) 3/4 NPT Pass-Through Ports, Short Alignment Pins
2	2	3490-0001036-01	¾ NPT Hex Socket Plug, SS (for N models)
	2	3490-0001056-01	G ¾ BSPP Hex Socket Plug, Brass (for E models)

Figure 6.2—Master Plate			
Item No.	**Qty**	**Part Number**	**Description**
3	3	3700-20-4676	Custom SAE 841 Bronze Thrust Bearing
4	3	3700-20-4675	Custom Chamfered Washer
5	3	3500-2070035-11	Socket Head Cap Screw Shoulder M12 x 35 Shoulder M10 Thread
6	3	3505-0870001-12	Hex Nut M10x1.5, 8mm Tall 17mm Wide Zinc Plated Steel
7	1	3700-20-4875	SHORT ½" Dia. Alignment Pin 4 mm Taper Diamond (GL2APCM)
8	1	3700-20-4876	SHORT ½" Dia. Alignment Pin 4 mm Taper Round (GL2APCM)
9	1	3700-20-4718	LONG ½" Dia. Alignment Pin 4 mm Taper Diamond (GL2PCM)
10	1	3700-20-4732	LONG ½" Dia. Alignment Pin 4 mm Taper Round (GL2PCM)
11	2	3500-1066016-15A	M6x16 Socket Head Cap Screw, Class 12.9, Blue dyed Magni-565, ND Microspheres
12	2	3690-8500001-11	Retaining Ring, Internal Inverted
13	2	3700-20-8095	Air Pass-Through Valve
14	2	3410-0001392-01	O-Ring, AS568-218, Buna-N, D70
15	2	3410-0001015-01	O-Ring AS568-026 Buna-N D70
16	1	3700-20-10415	G Series Compliant Interface Plate Base Mount
17	3	3610-1725001-10	Steel Compression Spring 2-1/2” long, 5/8” outer diameter,.080 inch wire
18	3	3610-1925001-20	Compression Spring .845 Dia, 2.5 Inch Long, 43.4 Rate, MW
19	3	3700-20-4716	Compliant IP Preload Pusher
20	1	3700-20-10414	Rest Button, 10mm Dia Stem, .79 Dia Button S7 Steel
21	1	3700-20-10322	Center Compliance Pivot Pin
22	4	3500-1068025-15A	M8x25 SHCS, 12.9, ISO4762/DIN912, Corrosion Protection Coating , YL M-spheres/IFI 525

6.2.1 GL5 Master

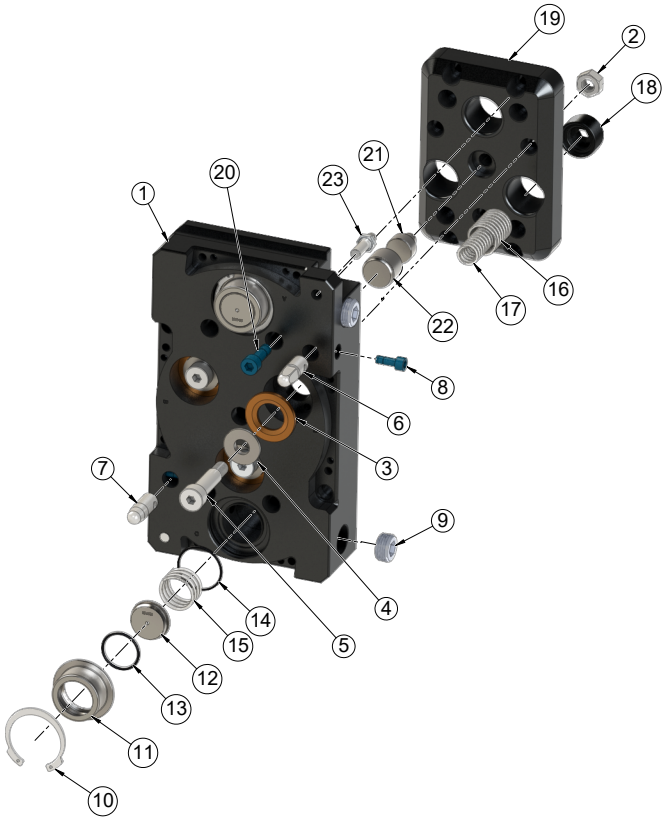


Figure 6.3—Master Plate			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL5CM-0-0-0-0-SE-R	GL5 Compliant Utility Coupler Master with (2) 1/2” BSPT Checked Ports, SHORT PINS, (2) NPN Tool Presence Sensors
	1	9123-GL5CM-0-0-0-0-SD-E	GL5 Compliant Utility Coupler Master with (2) 1/2” BSPP Checked Ports-SHORT PINS, (2) PNP Sensors with cables (Cable P/N 8590-9909999-07)
	1	9123-GL5CM-0-0-0-0-SG-E	GL5 Compliant Utility Coupler Master with (2) 1/2” BSPP Checked Ports-SHORT PINS, (2) PNP Sensors
2	3	3505-0870001-12	Hex Nut M10x1.5, 8 mm Tall 17 mm Wide Zinc Plated Steel
3	3	3700-20-4676	Custom SAE 841 Bronze Thrust Bushing
4	3	3700-20-4675	Custom Chamfered Washer
5	3	3500-2070035-11	Socket Head Cap Screw Shoulder M12 x 35 Shoulder M10 Thread
6	1	3700-20-4875	SHORT ½" Dia. Alignment Pin 4 mm Taper Diamond (GL2ACM, GL5CM)
7	1	3700-20-4876	SHORT ½" Dia. Alignment Pin 4 mm Taper Round (GL2ACM, GL5CM)
8	2	3500-1066016-15A	M6x16 Socket Head Cap Screw, Class 12.9, Blue dyed Magni-565, ND Microspheres
9	2	3490-0001045-01	1/2” BSPP Plug, Nickel Plated Brass (for GL5CM models)
10	2	3690-8500001-11	Retaining Ring, Internal Inverted (Also See #13)
11	2	3700-20-4924	3/4" Valve Master Stem
12	2	3700-20-6161	3/4" Valve Piston
13	2	3410-001249-01	O-Ring AS568-119 Buna-N 90 Durometer

Figure 6.3—Master Plate			
Item No.	**Qty**	**Part Number**	**Description**
14	2	3410-0001015-01	O-Ring AS568-026 Buna-N D70
15	2	3610-2015100-20	Spring, 1.1 inch diameter, 2.5” long, 10.8 lb/in SS
16	3	3610-1925001-20	Compression Spring .845 Dia, 2.5Inch Long, 43.4 Rate, MW
17	3	3610-1725001-10	Steel Compression Spring 2-1/2” L, 5/8” OD,.080” Wire
18	3	3700-20-4716	Compliant IP Preload Pusher
19	1	9700-20-10415	G Series Compliant Interface Plate Base Mount
20	4	3500-1068025-15A	M8x25 SHCS, 12.9, ISO4762/DIN912, Corrosion Protection Coating , YL M-spheres/IFI 525
20	1	9005-20-2230	Utility Coupler Compliance Kit (Includes item #6,7)
21	1	3700-20-10322	Center Compliance Pivot Pin
22	1	3700-20-10414	Rest Button, 10 mm Diameter Stem, .79 Diameter Button S7 Steel
23	2	8590-9909999-120	NPN Proximity sensor (True 2 mm), M8 with M8 connection. BI2-EGO8K-AN6X-V1131/S957 TURCK (for -R utility coupler versions)
	2	8590-9909999-34	Turck Proximity sensor (PNP True 2 mm Range, quick disconnect)
	2	8590-9909999-127	Proximity sensor (PNP, 4 mm sensing range, M8 barrel and M12 connection, quick disconnect) (legacy version)

6.2.2 GL2 and GL5 Tool

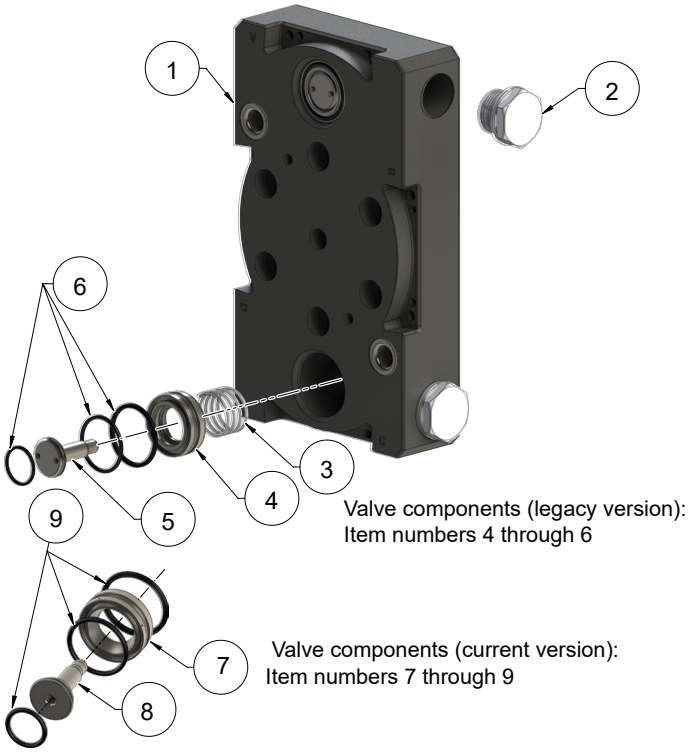


Figure 6.4—Tool plate			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL2T-0-0-0-0-N	GL2 Utility Coupler Tool with (2) 3/4” NPT Ports
	1	9123-GL2T-0-0-0-0-E	GL2 Utility Coupler Tool, (2) 3/4” BSPP Ports, Euro
	1	9123-GL5T-0-0-0-0-E	GL5 Utility Coupler Tool, (2) 3/4” BSPP Ports, Euro
	1	9123-GL5T-0-0-0-0-R	GL5 Utility Coupler Tool with (2) 1/2” BSPT Checked Ports, Tool Presence Targets
2	2	3490-0001036-01	3/4” NPT Socket Hex Plug, SS (GL2T-N Model)
	2	3490-0001056-01	3/4 BSPP Plug, Hex Head, Zinc-Plated Steel (GL2T-E Model)
	2	3490-0001045-01	1/2 BSPP Plug, Nickel Plated Brass (GL5T-E Model)
	2	3490-0001057-01	1/2 BSPT Plug, Nickel Plated Brass (GL5T-R Model)
3	2	3610-2015001-20	Spring
Valve Components (Legacy Version)			
4	2	3700-20-6807	(Legacy) 3/4" Valve Piston, Tool
5	2	3700-20-6808	(Legacy) 3/4" Valve Stem, Tool
6	1	9123-GL2T-SEAL	(Legacy) Seal Kit for Tool Assembly Check Valve (2 sets of seals)
Valve Components (Current Version)			
7	2	3700-20-9610	3/4" Valve Piston, Tool, Conical Seal
8	2	3700-20-9609	3/4" Valve Stem, Tool, Conical Seal
9	1	9005-20-8554	3/4” Valve Seal Kit, Tool, Hex Stem, Blind Thread Housing (2 sets of seals)

6.2.3 GL2P Tool

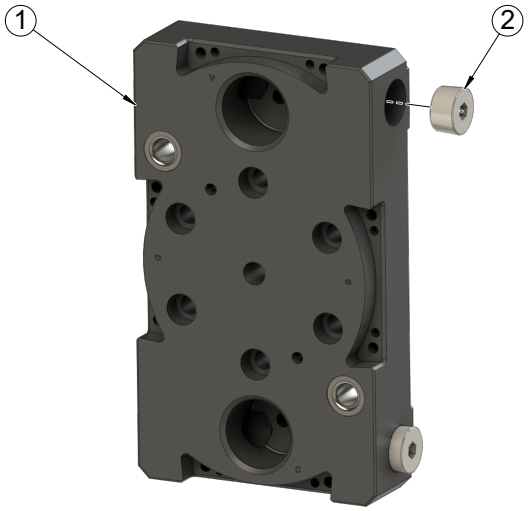


Figure 6.5—Tool plate			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL2PT-0-0-0-0-N	GL3 Utility Coupler Tool with (2) 3/4 NPT Pass-Through Ports
		9123-GL2P-0-0-0-0-E	GL3 Utility Coupler Tool, (2) G 3/4 BSPP Ports, Euro
2	2	3490-0001036-01	¾ NPT Hex Socket Plug, Stainless Steel (for N models)
		3490-0001056-01	G ¾ (BSPP) Hex Socket Plug, Zinc-Plated Steel (for E models)

6.3 GL3 Models

6.3.1 GL3 Master

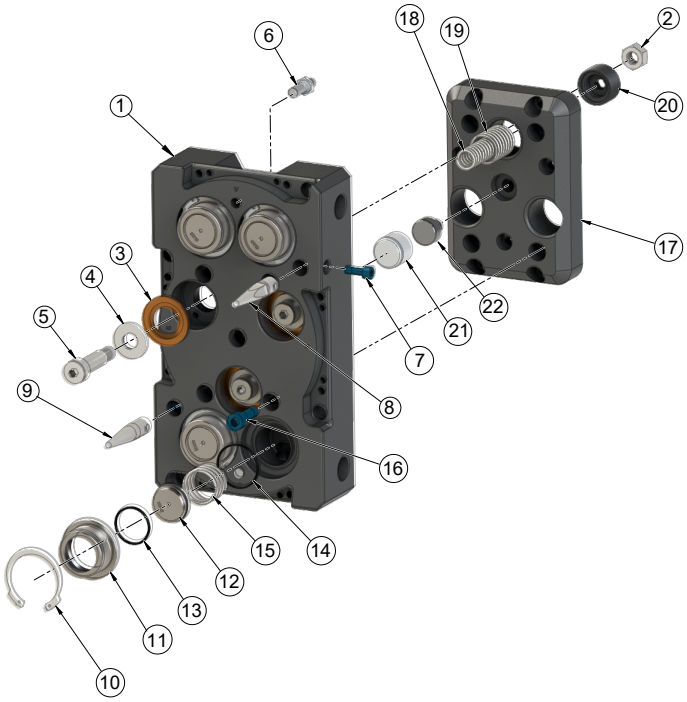


Figure 6.6—Master plate			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL3CM-0-0-0-0-S0-E	GL3 Compliant Utility Coupler Master with (4) G 3/4 BSPP Checked Ports
	1	9123-GL3CM-0-0-0-0-S0-N	GL3 Compliant Utility Coupler Master with (4) 3/4” NPT Checked Ports
	1	9123-GL3CM-0-0-0-0-SG-E	GL3 Compliant Utility Coupler Master with (4) G 3/4 BSPP Checked Ports, (2) PNP Tool Presence Sensors
	1	9123-GL3CM-0-0-0-0-SG-N	GL3 Compliant Utility Coupler Master with (4) 3/4” NPT Checked Ports, (2) PNP Sensors to Detect Tool
2	3	3505-0870001-12	Hex Nut M10x1.5, 8 mm Tall 17mm Wide Zinc Plated Steel
3	3	3700-20-4676	Custom SAE 841 Bronze Thrust Bushing
4	3	3700-20-4675	Custom Chamfered Washer
5	3	3500-2070035-11	Socket Head Cap Screw Shoulder M12 x 35 Shoulder M10 Thread
6	2	8590-9909999-34	Proximity Sensor (PNP True 2mm Range, Quick Disconect)
7	1	3500-1066016-15A	M6x16 SHCS, 12.9, ISO4762/DIN912, Corrosion Protection Coating, YL M-spheres/IFI 525
8	1	3700-20-4718	LONG ½" Dia. Alignment Pin 4 mm Taper Diamond
9	1	3700-20-4732	LONG ½" Dia. Alignment Pin 4 mm Taper Round
10	4	3690-8500001-11	Retaining Ring, Internal Inverted (Also See #13)
11	4	3700-20-4924	3/4" Valve Master Stem
12	4	3700-20-6161	3/4" Valve Piston
13	4	3410-0001015-01	O-Ring AS568-026 Buna-N D70
14	4	3410-0001249-01	O-Ring AS568-119 Buna-N 90 Durometer
15	4	3610-2015100-20	Spring, 1.1 inch dia, .586 long, 13 lb/in stainless steel

Figure 6.6—Master plate			
Item No.	**Qty**	**Part Number**	**Description**
16	4	3500-1068035-15A	M8x35 Socket Head Cap Screw, Class 12.9, Blue dyed Magni-565, ND Microspheres Epoxy
17	1	3700-20-10415	G Series Compliant Interface Plate Base Mount
18	3	3610-1725001-10	Steel Compression Spring 2-1/2" long, 5/8" outer diameter
19	3	3610-1925001-20	Steel Spring .845" outer diameter, 2.5" long 43.4 Rate
20	3	3700-20-4716	Compliant IP Preload Pusher
21	1	3700-20-10322	Center Compliance Pivot Pin
22	1	3700-20-10414	Rest Button, 10mm diameter stem, .79 diameter button S7 Steel

6.3.2 GL3 Tool

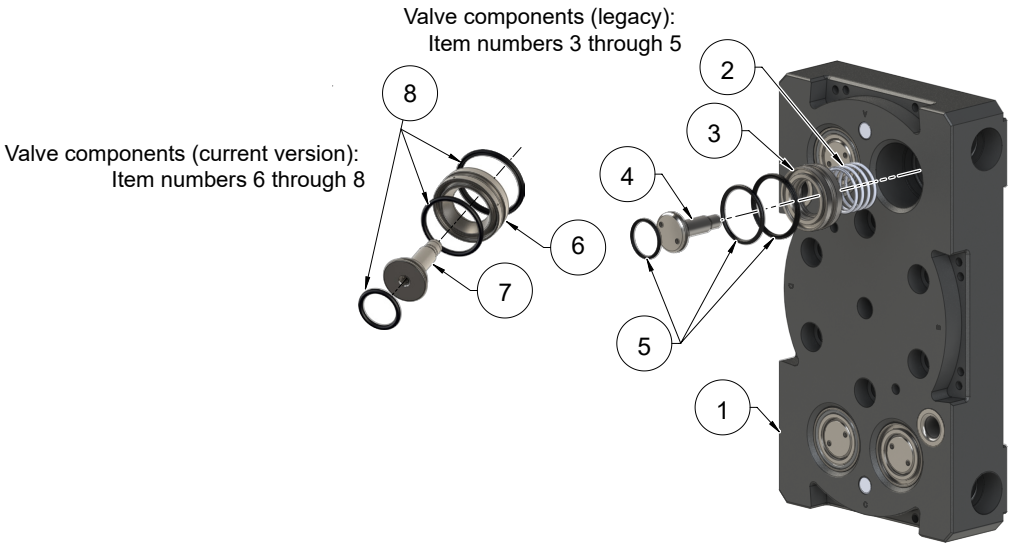


Figure 6.7—Tool plate			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL3T-0-0-0-0-N	GL3 Utility Coupler Tool with (2) 3/4” NPT Ports
	1	9123-GL3T-0-0-0-0-E	GL3 Utility Coupler Tool, (2) 3/4” BSPP Ports, Euro
2	4	3610-2015001-20	Spring
Valve Components (Legacy Version)			
3	4	3700-20-6807	(Legacy) 3/4" Valve Piston, Tool
4	4	3700-20-6808	(Legacy) 3/4" Valve Stem, Tool
5	2	9123-GL2T-SEAL	(Legacy) Seal Kit for Tool Assembly Check Valve (2 sets of seals)
Valve Components (Current Version)			
6	4	3700-20-9610	3/4" Valve Piston, Tool, Conical Seal
7	4	3700-20-9609	3/4" Valve Stem, Tool, Conical Seal
8	2	9005-20-8554	3/4” Valve Seal Kit, Tool, Hex Stem, Blind Thread Housing (2 sets of seals)

6.4 GL1 and GL8 Models

6.4.1 GL1 Master

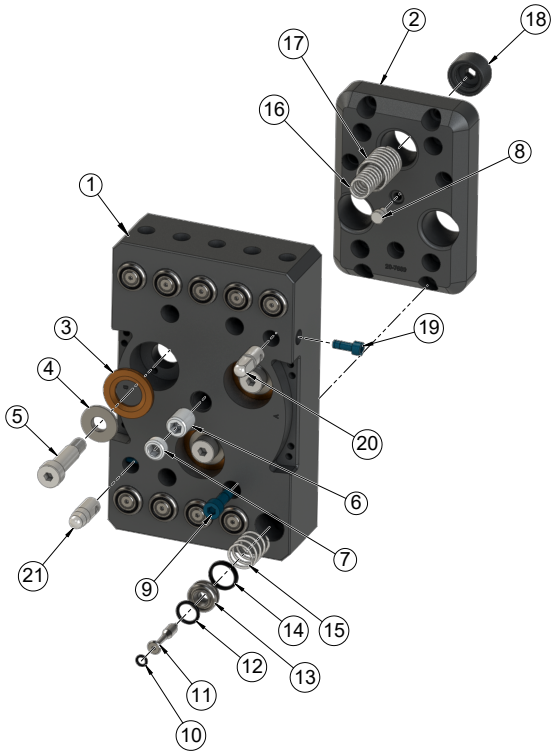


Figure 6.8—Master Plate			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL1CM-0-0-N	GL1 Compliant Utility Coupler Master, (10) 1/4” NPT Checked Ports
	1	9123-GL1CM-0-0-E	GL1 Compliant Utility Coupler Master, (10) 1/4” BSPP Checked Ports, Euro
2	1	3700-20-10415	G Series Compliant Interface Plate Base Mount
3	3	3700-20-4676	Custom SAE 841 Bronze Thrust Bushing
4	3	3700-20-4675	Custom Chamfered Washer
5	3	3500-2070035-11	Socket Head Cap Screw Shoulder M12 x 35 Shoulder M10 Thread
6	1	3690-6600900-10	Rolling Ball Tip Set Screw, Black Oxide Steel
7	1	3700-20-8254	M16-2.0 x 9 mm Set Screw, Hollow Hex
8	1	3700-20-9467	Rest Button, Hardened S7 Steel
9	4	3500-1068025-15A	M8x25 SHCS, 12.9, ISO4762/DIN912, Corrosion Protection Coating , YL M-spheres/IFI 525
10	10	3410-0001183-01	O-Ring 6 mm X 2 mm Buna D90
11	10	3700-20-2996	Valve Stem, High Strength
12	10	3410-0001065-01	O-Ring 14 mm X 2 mm Buna
13	10	3700-20-2994	Master Check Valve Piston, FA44
14	10	3410-0001068-01	Mini U-Cup Seal 18 mm ID x 22 mm Buna
15	10	3700-20-1459	SW-150A Master Fluid / Air Spring SS
16	3	3610-1725001-10	Steel Compression Spring 2-1/2" L, 5/8" OD
17	3	3610-1925001-20	Steel Spring .845" OD, 2.5" Long 43.4 Rate

Figure 6.8—Master Plate			
Item No.	**Qty**	**Part Number**	**Description**
18	3	3700-20-4716	Compliant IP Preload Pusher
19	2	3500-1066016-15A	M6x16 Socket Head Cap Screw, Class 12.9, Blue dyed Magni-565, ND Microspheres Epoxy
20	1	3700-20-4875	Alignment Pin, Utility Coupler, Diamond
21	1	3700-20-4876	Alignment Pin, Utility Coupler, Round

6.5.1 GL8 Master

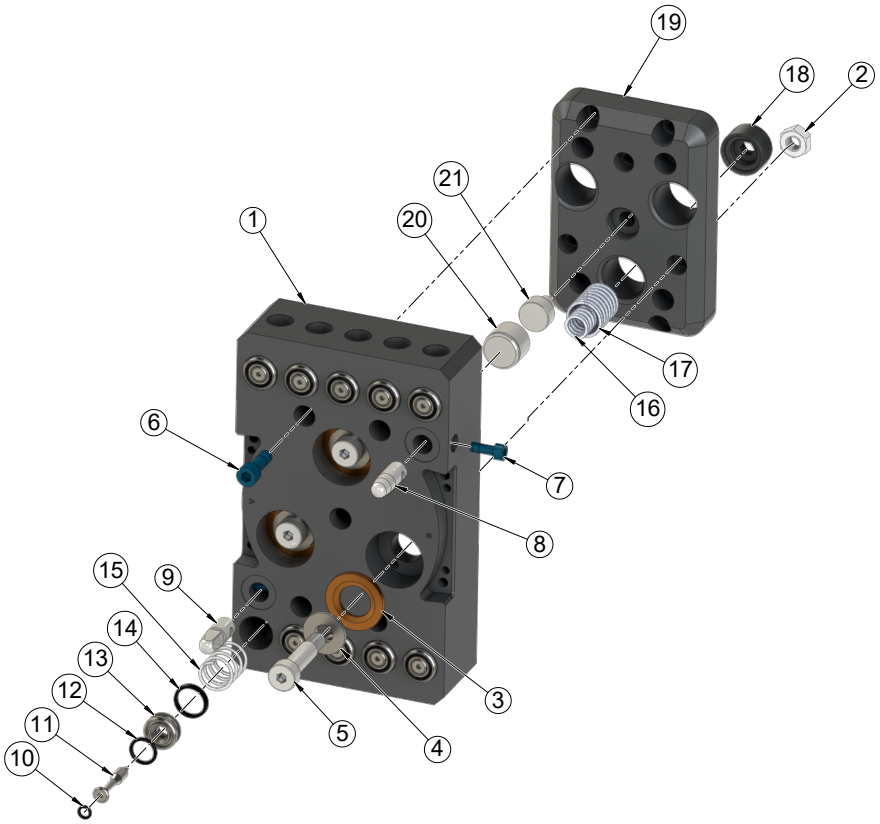


Figure 6.9—Master Plate			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL8CM-0-0-E	GL8 Compliant Utility Coupler Master, (10) 3/8” BSPP Checked Ports, Euro
2	3	3505-0870001-12	Hex Nut M10x1.5, 8mm Tall 17mm Wide Zinc Plated Steel
3	3	3700-20-4676	Custom SAE 841 Bronze Thrust Bushing
4	3	3700-20-4675	Custom Chamfered Washer
5	3	3500-2070035-11	Socket Head Cap Screw Shoulder M12 x 35 Shoulder M10 Thread
6	4	3500-1068025-15A	M8x25 SHCS, 12.9, ISO4762/DIN912, Corrosion Protection Coating , YL M-spheres/IFI 525
7	2	3500-1066016-15A	M6x16 Socket Head Cap Screw, Class 12.9, Blue dyed Magni-565, ND Microspheres Epoxy
8	1	3700-20-4875	Alignment Pin, Utility Coupler, Diamond
9	1	3700-20-4876	Alignment Pin, Utility Coupler, Round
10	10	3410-0001183-01	O-Ring 6 mm X 2 mm Buna D90
11	10	3700-20-2996	Valve Stem, High Strength

Figure 6.9—Master Plate			
Item No.	**Qty**	**Part Number**	**Description**
12	10	3410-0001065-01	O-Ring 14 mm X 2 mm Buna
13	10	3700-20-2994	Master Check Valve Piston, FA44
14	10	3410-0001068-01	Mini U-Cup Seal 18 mm ID x 22 mm Buna
15	10	3610-3312500-20	Spring, Fluid/Air Module, Master
16	3	3610-1725001-10	Steel Compression Spring 2-1/2” long, 5/8” outer diameter,.080” Wire
17	3	3610-1925001-20	Steel Spring .845" outer diameter, 2.5" long, 43.4 rate
18	3	3700-20-4716	Compliant IP Preload Pusher
19	1	3700-20-10415	G Series Compliant Interface Plate Base Mount
20	1	3700-20-10322	Center Compliance Pivot Pin
21	1	3700-20-10414	Rest Button, 10 mm diameter stem, .79 diameter Button S7 Steel

6.5.3 GL1 and GL8 Tool

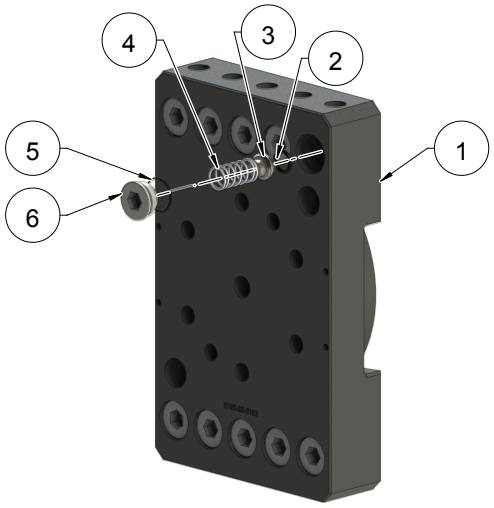


Figure 6.10—Tool plate			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL1T-0-0-N	GL1 Utility Coupler Tool with (10) 1/4” NPT Ports
	1	9123-GL8T-0-0-E	GL8 Utility Coupler Tool with (10) G 3/8” Ports, Euro
2	10	3410-0001067-01	O-ring, .669OD x .047 wall, 70D, Buna-N
3	10	3700-20-1457-02	QC-151 Tool Check Valve Piston
4	10	3700-20-1460-02	SW-150A tool Fluid/Air Spring
5	10	3410-0001284-01	O-ring, .669OD x .047 wall, 70D, Buna-N
6	10	3700-20-3288	Plug, F/A Tool (Includes Dowel Pin 1/16” x 3/4” 18-8 Stainless Steel)

6.6 Models 9123-GL-GC-B80S100 Guided Cylinder

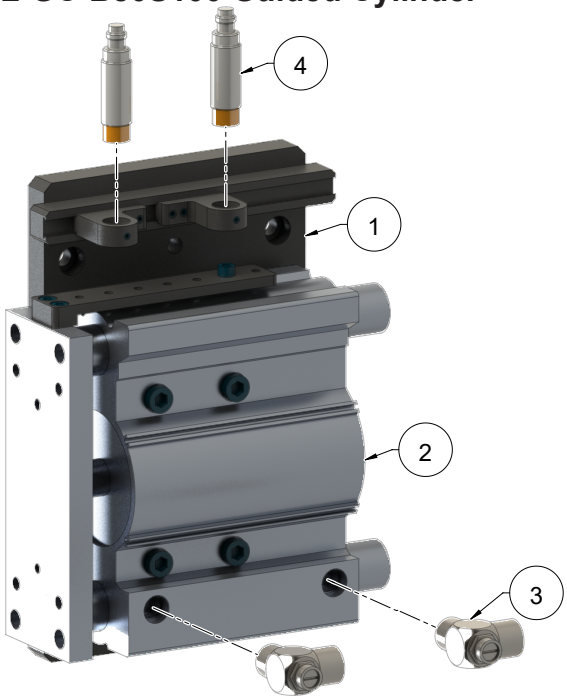


Figure 6.11—Guided Cylinder			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9123-GL-GC-B80S100-S0-N	Guided Cylinder Assembly, 80 mm Bore, 100 mm Stroke, Sensor Holder for 18 mm Barrel Proximity Sensor
	1	9123-GL-GC-B80S100-S0-E	Guided Cylinder Assembly, 80 mm Bore, 100 mm Stroke, Sensor Holder for 18 mm Barrel Proximity Sensor
	1	9123-GL-GC-B80S100-SG-N	GL Guided Cylinder Assembly with 80 mm Bore, 100 mm Stroke, and PNP Prox Sensors
	1	9123-GL-GC-B80S100-SG-E	GL Guided Cylinder Assembly with 80 mm Bore, 100 mm Stroke, and PNP Prox Sensors
	1	9123-GL-GC-B80S100-SR-N	GL Guided Cylinder Assembly, 80 mm Bore, 100 mm Stroke, PNP Turck Prox Sensors
	1	9123-GL-GC-B80S100-SR-E	GL Guided Cylinder Assembly, 80 mm Bore, 100 mm Stroke, PNP Turck Prox Sensors
2	1	3710-20-3460	Modified Guided Cylinder 80 mm Bore (Cylinder Only)
3	2	3405-2010004-01	3/8 NPT Flow Control
4	2	8590-9909999-45	Prox Sensor 12 mm Sensing Range, 18 mm Barrel 3-wire DC PNP; 2-wire DC PNP/NPN (SG Models)
4	2	8590-9909999-103	18 mm Barrel, PNP 3 wire DC Prox (SR Models)
5	2	9120-C-4EM-4EF-020	Prox Cable, 2 Meter Long, 4 pin Euro (Not Shown)

7. Specifications

Table 7.1—Master and Standard Tool Plates Specifications		
Recommended maximum payload	Not applicable	Total end-effector weight should be supported independently of the Utility Coupler
Maximum recommended distance between Master and Tool plate	Varies	Recommended Master to Tool plate spacing is 0.98 in (0.25 mm) short of the maximum drive cylinder stroke.
Operating Pressure	Varies	Refer to *Section 2.6—Pneumatic Connections* and *Section 3.2—Pneumatic Dependency on the Drive Cylinder*. Air supply must be clean, dry, and filtered to 50 micron or better.
Compliance	X and Y[1]	± 0.157 in (± 4 mm)
	Angular	3°
Weight[2]	GL1 Coupler	Master TBD lbs, (TBD kg) Tool TBD lbs, (TBD kg)
	GL2 Coupler	Master 10.2 lbs, (4.6 kg) Tool 8.3 lbs, (3.8 kg)
	GL3 Coupler	Master 10.2 lbs, (4.6 kg) Tool lbs, (TBD kg)
	GL5 Coupler	Master 9.9 lbs, (4.5 kg) Tool 8.56 lbs, (3.9 kg)
	GL8 Coupler	Master 9.8 lbs, (4.4 kg) Tool 7.2 lbs, (3.3 kg)
Port, (Qty) Size	GL1-N Coupler	(10) 1/4" NPT Ports
	GL1-E Coupler	(10) 1/4" BSPP Ports
	GL2-N Coupler	(2) 3/4" NPT Ports
	GL2-E Coupler	(2) 3/4" BSPP Ports
	GL2A-N Coupler	(2) 3/4" NPT Ports
	GL3-N Coupler	(4) 3/4" NPT Ports
	GL3-E Coupler	(4) 3/4" BSPP Ports
	GL5-E Coupler	(2) ½" BSPP Ports
	GL5-R Coupler	(2) ½" BSPT Ports
	GL8-E Coupler	(10) 3/8" BSPP Ports
Mounting Patterns	See *Section 8—Drawings*	
Table 7.2—GL Drive Cylinder Specifications		
Coupling Force at 80 psi (5.5 bar)	620 lbs (2314 N)	Axial holding force. 9123-GL-GC-B80

Notes:

1. No compliance in the Z-axis because the utility coupler plates must be fully compressed in the Z direction to operate properly.
2. Weights do not include utility modules. For weights of utility modules, refer to the applicable module manual.

8. Drawings

Drawings are available on the *ATI website* or by contacting an ATI representative.

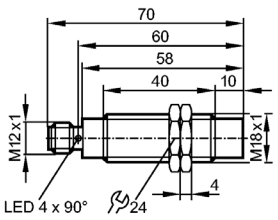
9. Guided Cylinder Proximity Sensor Information (Manufacturers' Literature)

9.1 9123-GL-GC-B80S100-SG Guided Cylinder Proximity Sensor

IGS209

IGKC012-ASKG/M/US
Inductive sensor
Metal thread M18 x 1
Connector
Operation as 3-wire or 2-wire possible
Increased sensing range
Optical setting aid (2 LED)
gold-plated contacts

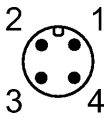
Sensing range 12 mm [nf]
non-flush mountable

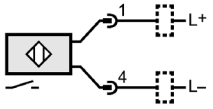


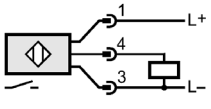
Made in Germany

Electrical design		**3-wire DC PNP; 2-wire DC PNP/NPN**
Output		**normally open**
Operating voltage	[V]	10...30 DC
Current rating	[mA]	100
Minimum load current	[mA]	2 *)
Short-circuit protection		pulsed
Reverse polarity protection		yes
Overload protection		yes
Overload protection		yes
Voltage drop	[V]	< 2.8
Leakage current	[mA]	< 0.5 *)
Current consumption	[mA]	< 12 (24 V)
Real sensing range	[mm]	12 ± 10 %
Operating distance	[mm]	0...9.7
Switch-point drift	[% of Sr]	-10...10
Hysteresis	[% of Sr]	3...15
Switching frequency	[Hz]	300
Correction factors		mild steel = 1 / stainless steel approx. 0.7 / brass approx. 0.5 / Al approx. 0.4 / Cu approx. 0.3
Ambient temperature	[°C]	-25...70
Protection		IP 67, II
EMC		EN 61000-4-2 ESD: 4 kV CD / 8 kV AD EN 61000-4-3 HF radiated: 10 V/m (80...1000 MHz) EN 61000-4-4 Burst: 2 kV EN 61000-4-6 HF conducted: 10 V (0.15...80 MHz) EN 55011: class B
Housing materials		brass white bronze coated; active face: PBT (Pocan)
Function display		
Switching status	LED	yellow (4 x 90°)
Setting aid	LED	red
Connection		M12 connector; gold-plated contacts
Weight	[kg]	0.054
Remarks		suitable for PLC type 1 according to IEC 61131-2 *) only in 2-wire operation
Accessories (included)		2 lock nuts

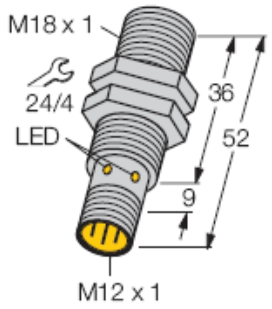
Wiring

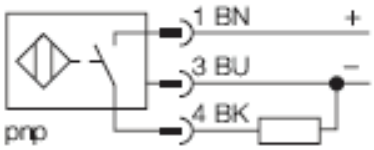


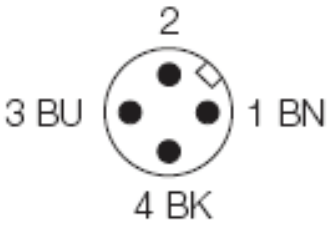




9.2 9123-GL-GC-B80S100-SR Guided Cylinder Proximity Sensor







Type	Bi5U-EM18-AP6X-H1141
Ident-No.	1635340
Rated operating distance Sn	5 mm
Mounting condition	flush
Assured sensing range	≤ (0,81 x Sn) mm
Repeatability	≤ 2 %
Temperature drift	≤ ± 10 % ≤ ± 15 %, ≤ -25 °C v ≥ +70 °C
Hysteresis	3... 15 %
Ambient temperature	-30...+ 85 °C
Operating voltage	10... 30VDC
Residual ripple	≤ 10 % U_{ss}
DC rated operational current	≤ 200 mA
No-load current I_0	≤ 15 mA
Residual current	≤ 0.1 mA
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes / cyclic
Voltage drop at I_e	≤ 1.8V
Wire breakage / Reverse polarity protection	yes / complete
Output function	3-wire, normally open, pnp
Insulation class	⧈
Switching frequency	≤ 2.5 kHz
Housing	threaded barrel, M18 x 1
Dimensions	52 mm
Housing material	metal, AISI 304
Material active face	plastic, PBT
Tightening torque of housing nut	25 Nm
Connection	connectors, M12 x 1
Vibration resistance	55 Hz (1 mm)
Shock resistance	30g (11 ms)
Degree of protection	IP68
Display switch state	LED yellow