

Assembly and Operating Manual

FUS

Coaxial Joining (6-axis)



Imprint

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Dear Customer,

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

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

Best regards,

Your SCHUNK team

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1 General

1.1 About this manual

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

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

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

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

In addition to these instructions, the documents listed under [Applicable documents](#) [► 6] are applicable.

1.1.1 Presentation of Warning Labels

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



⚠ DANGER

Danger for persons!

Non-observance will inevitably cause irreversible injury or death.



⚠ WARNING

Dangers for persons!

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



⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

NOTICE

Material damage!

Information about avoiding material damage.

1.1.2 Applicable documents

- General terms of business*
- Catalog data sheet of the purchased product *

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

1.2 Warranty

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

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

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

1.3 Scope of delivery

The scope of delivery includes

- Coaxial Joining (6-axis) FUS in the version ordered
- Assembly and Operating Manual
- Accessory pack

2 Basic safety notes

2.1 Intended use

- The product is intended for installation in a machine/system. The applicable guidelines must be observed and complied with.
- The product may only be used within the scope of its technical data, [Technical data](#) [▶ 14].
- The product is intended for industrial and industry-oriented use.
- Appropriate use of the product includes compliance with all instructions in this manual.

2.2 Not intended use

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

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

2.3 Constructional changes

Implementation of structural changes

By conversions, changes, and reworking, e.g. additional threads, holes, or safety devices can impair the functioning or safety of the product or damage it.

- Structural changes should only be made with the written approval of SCHUNK.

2.4 Spare parts

Use of unauthorized spare parts

Using unauthorized spare parts can endanger personnel and damage the product or cause it to malfunction.

- Use only original spare parts or spares authorized by SCHUNK.

2.5 Ambient conditions and operating conditions

Required ambient conditions and operating conditions

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

- Make sure that the product is used only in the context of its defined application parameters, [Technical data](#) [► 14].
- Make sure that the product is a sufficient size for the application.
- Make sure that the environment is free from splash water and vapors as well as from abrasion or processing dust. Exceptions are products that are designed especially for contaminated environments.

2.6 Personnel qualification

Inadequate qualifications of the personnel

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

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

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

Trained electrician

Due to their technical training, knowledge and experience, trained electricians are able to work on electrical systems, recognize and avoid possible dangers and know the relevant standards and regulations.

Qualified personnel

Due to its technical training, knowledge and experience, qualified personnel is able to perform the delegated tasks, recognize and avoid possible dangers and knows the relevant standards and regulations.

Instructed person

Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.

Service personnel of the manufacturer

Due to its technical training, knowledge and experience, service personnel of the manufacturer is able to perform the delegated tasks and to recognize and avoid possible dangers.

2.7 Personal protective equipment

Use of personal protective equipment

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

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

2.8 Notes on safe operation

Incorrect handling of the personnel

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Avoid any manner of working that may interfere with the function and operational safety of the product.
- Use the product as intended.
- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media. This does not apply to products that are designed for special environments.
- Eliminate any malfunction immediately.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention and environmental protection regulations regarding the product's application field.

2.9 Transport

Handling during transport

Incorrect handling during transport may impair the product's safety and cause serious injuries and considerable material damage.

- When handling heavy weights, use lifting equipment to lift the product and transport it by appropriate means.
- Secure the product against falling during transportation and handling.
- Stand clear of suspended loads.

2.10 Malfunctions

Behavior in case of malfunctions

- Immediately remove the product from operation and report the malfunction to the responsible departments/persons.
- Order appropriately trained personnel to rectify the malfunction.
- Do not recommission the product until the malfunction has been rectified.
- Test the product after a malfunction to establish whether it still functions properly and no increased risks have arisen.

2.11 Disposal

Handling of disposal

The incorrect handling of disposal may impair the product's safety and cause serious injuries as well as considerable material and environmental harm.

- Follow local regulations on dispatching product components for recycling or proper disposal.

2.12 Fundamental dangers

General

- Observe safety distances.
- Never deactivate safety devices.
- Before commissioning the product, take appropriate protective measures to secure the danger zone.
- Disconnect power sources before installation, modification, maintenance, or calibration. Ensure that no residual energy remains in the system.
- If the energy supply is connected, do not move any parts by hand.
- Do not reach into the open mechanism or movement area of the product during operation.

2.12.1 Protection during handling and assembly

Incorrect handling and assembly

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Have all work carried out by appropriately qualified personnel.
- For all work, secure the product against accidental operation.
- Observe the relevant accident prevention rules.
- Use suitable assembly and transport equipment and take precautions to prevent jamming and crushing.

Incorrect lifting of loads

Falling loads may cause serious injuries and even death.

- Stand clear of suspended loads and do not step into their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.

2.12.2 Protection during commissioning and operation

Falling or violently ejected components

Falling and violently ejected components can cause serious injuries and even death.

- Take appropriate protective measures to secure the danger zone.
- Never step into the danger zone during operation.

2.12.3 Protection against dangerous movements

Unexpected movements

Residual energy in the system may cause serious injuries while working with the product.

- Switch off the energy supply, ensure that no residual energy remains and secure against inadvertent reactivation.
- Never rely solely on the response of the monitoring function to avert danger. Until the installed monitors become effective, it must be assumed that the drive movement is faulty, with its action being dependent on the control unit and the current operating condition of the drive. Perform maintenance work, modifications, and attachments outside the danger zone defined by the movement range.
- To avoid accidents and/or material damage, human access to the movement range of the machine must be restricted. Limit/prevent accidental access for people in this area due through technical safety measures. The protective cover and protective fence must be rigid enough to withstand the maximum possible movement energy. EMERGENCY STOP switches must be easily and quickly accessible. Before starting up the machine or automated system, check that the EMERGENCY STOP system is working. Prevent operation of the machine if this protective equipment does not function correctly.

2.13 Notes on particular risks



⚠ WARNING

Risk of injury due to unexpected movements!

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.



⚠ WARNING

Risk of injury from objects falling and being ejected!

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

- Take appropriate protective measures to secure the danger zone.

3 Technical data

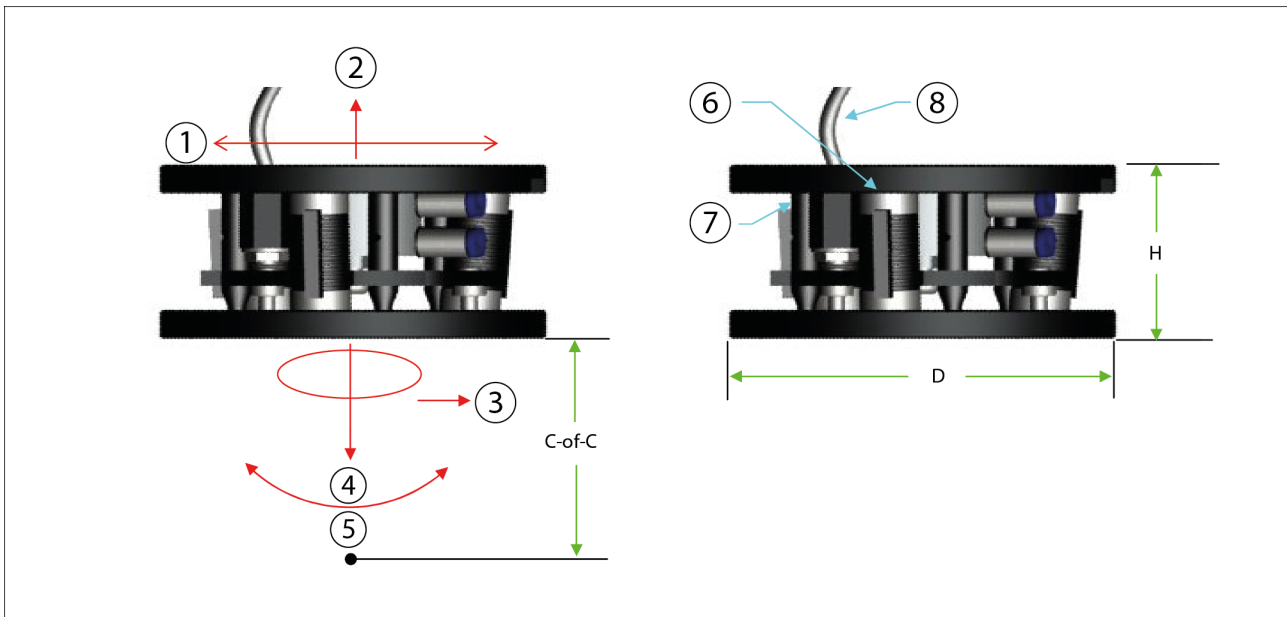
Size	C of C [mm]	Maximum Load Capacities				Stiffness	
		Vertical (N)*	Horizontal (N)*	Compression (N)	Cocking [N-m]	Lateral [N/mm]	Cocking [N-m/rad]
FUS-001	23	22	6.7	360	3.4	1.7	180.4
FUS-111B	120	45	8.9	1300	5.1	11	372.2
FUS-112B	69	45	8.9	530	5.1	7	180.4
FUS-113B	61	80	27	1300	7.9	27	631.5
FUS-211A	140	53	8.9	1300	6.8	11	473.7
FUS-211B	150	53	8.9	1400	7.3	11	552.6
FUS-211C	150	107	18	2700	14	23	1026.3
FUS-212A	81	62	8.9	620	6.8	7	225.6
FUS-212B	91	62	8.9	710	7.3	7	270.7
FUS-212C	86	125	18	1300	14	14	496.2
FUS-213A	74	98	27	1360	8.5	26	789.4
FUS-213B	82	98	27	1400	9	26	947.3
FUS-213C	79	196	54	2770	17.5	52	1736.8
FUS-413C	225	196	27	2750	22.6	60	9022.1
FUS-413D	225	391	54	5490	45.2	120	18044.2

* When used in the vertical position, use the Vertical maximum load capacities. When used in the horizontal position, use the Horizontal maximum load capacities.

–A and –B models use (3x) shear pads, –C uses (6x), –D uses (12x).
9116 Series 100 and 200 use three types of shear pads: HCL-11A, -12A and -13A.

9116 Series 000 uses two types of shear pads: HCL-01A2 and -02A.

9116 Series 400 uses one type of shear pad: HCL-13A.



Series Inserting Unit Assembly Shown

1	Lateral	5	Cocking
2	Compression	6	Shear pads (3x), (6x) or (12x)
3	Torsion	7	Overload Pins (3x)
4	Tension	8	Lock Sensor Cable

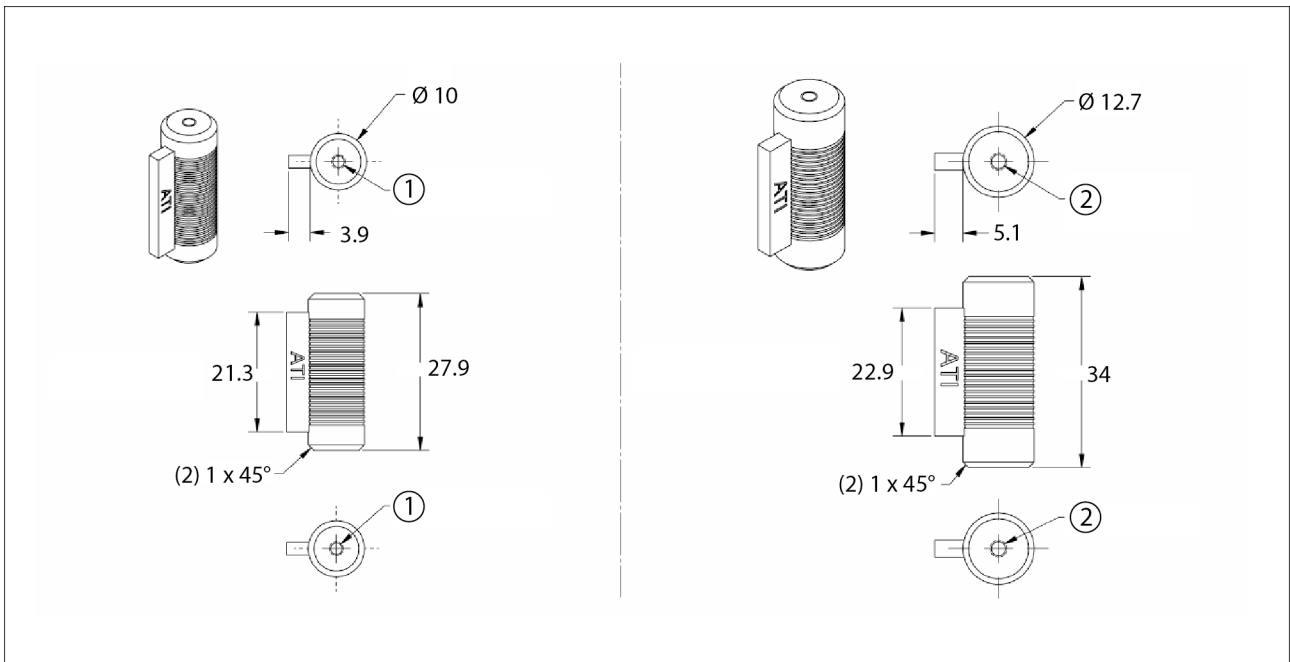
Lock Sensor

Type	M5x0.5 Threaded Barrel Proximity Sensor, NPN or PNP, Normally Open
Supply Voltage Range	10–30 VDC
Output Current	200mA
Rated Operating Distance (Sensing Range)	1.5mm

Air Cylinder

9116 Series 000 and 100 Force Factor	15 N / bar
9116 Series 200 and 400 Force Factor	28 N / bar

Shear Pad



1	Tapped M2.5x0.45, 2,2 deep, Mounting feature
2	Tapped M3x0.5, 3.0 deep, Mounting feature

Properties	Shear Pad Number				
	HCL-01A2	HCL-02A	HCL-11A	HCL-12A	HCL-13A
Compatible Inserting Unit Size	000	000	100, 200	100, 200	100, 200, 400
Elastomer	Neoprene	Nitrile	Neoprene	Neoprene	Nitrile
Operating Temperature, Celsius	-29 to 82				
Oil Resistance	Good	Excellent	Good	Good	Excellent
Ozone Resistance	Good	Good	Good	Good	Good
Lateral Stiffness (lbs/in)	8 (Very low)	28 (High)	20 (Low)	14 (Very Low)	34 (High)
Axial Stiffness (lbs/in)	2329	10498	24889	6075	8300

More technical data is included in the catalog data sheet. Whichever is the latest version.

4 Product Overview

4.1 Introduction

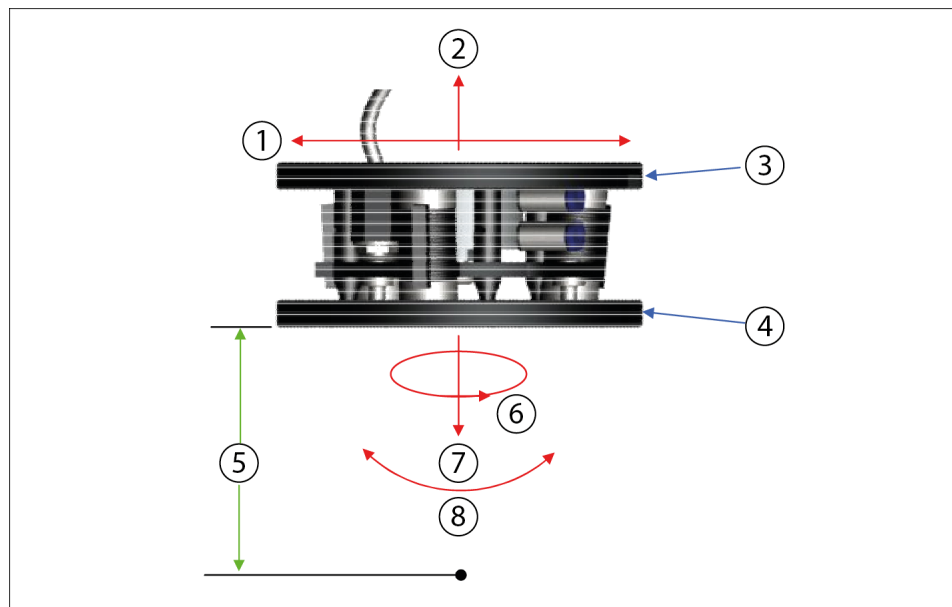
The Inserting Unit FUS is a compliance device that enhances the flexibility and reliability of a robot or assembly machine. Inserting Units are used in automated assembly applications to provide compliance for misalignment during assembly.

The sizes covered in this manual include 9116 Series 000, 100, 200, and 400.

The Inserting Unit is designed to provide compliance in the lateral, cocking, axial, and torsional directions. A key feature to the Inserting Unit is the projected (remote) compliance center.

The Center-of-Compliance (C-of-C) is the point in space at which a contact force will cause a translation with no rotation and a torque will cause a rotation with no translation. When the Center-of-Compliance is near the insertion contact point, the insertion part axis will align with the location axis during assembly.

The Inserting Unit consists of a single device with all components contained within the unit's outside diameter. The Inserting Unit is available in various sizes and configurations [Technical data](#) [▶ 14].



Product description

1	Lateral	5	Center-of-Compliance
2	Compression	6	Torsion
3	Robot Side (Top Plate)	7	Tension
4	Tool Side (Bottom Plate)	8	Cocking

5 Description

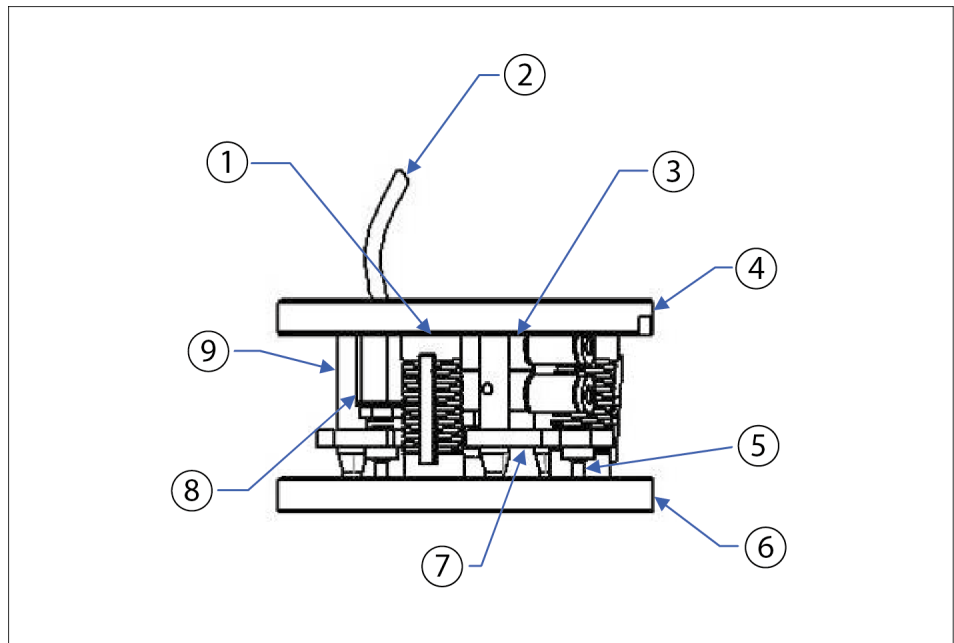
5.1 9116 Series 000, 100, 200, and 400 Inserting Unit Assemblies

The base 9116 Series Inserting Unit assembly includes anodized aluminum top and bottom plates, hardened steel overload pins, and shear pads.

- The 000 and 100 use 3 shear pads.
- The 200 uses either 3 or 6 shear pads.
- The 400 uses either 6 or 12 shear pads.

Units with lock-up include air cylinder(s), bearing plate, lock-up screws, and lock-up screw bushings. Units with lock sensing also require a sensor fitting and cabled proximity sensor.

Lock-up and lock sensing is optional. Lock-up is available on all sizes; lock sensing is only available on 100, 200, and 400 sizes.



9116 Series Inserting Unit Assembly (Lock-up Screw Bushing Not Shown)

1	Shear Pads (3, 6, or 12)	6	Tool Side (Bottom Plate)
2	Lock Sensor Cable	7	Bearing Plate
3	Air Cylinder	8	Sensor and Fitting
4	Robot Side (Top Plate)	9	Overload Pins (3)
5	Lock-up Screw (3)		

6 Application

6.1 Intended Use

The Inserting Unit is intended to be used in “peg-in-hole” type operations in the vertical orientation. The peg-in-hole example is an application involving the insertion of one part into another. There are a variety of peg-in-hole type applications that include: dowel pin insertion, mold alignment, washer insertion, bearings into housings, and shafts into bearings.

If the Inserting Unit is used in the horizontal orientation, over time the shear pads will develop sag. Rubber and most rubber-like materials have memorization characteristics. Over time the rubber material memorizes the repeated position and will return to this position. When this occurs, the shear pads have developed sag. Use of the Lock-up option is recommended to prevent shear pad sag.

6.2 FUS Selection

6.2.1 Compare possible assembly misalignment with Inserting Unit allowable misalignment

1: Perform a tolerance study of your worst case assembly misalignment

- Tolerance to which your assembly machine can position part A.
- Tolerance to which your feeder can position part B.
- Repeatability of tooling handling part A.
- Locational tolerance of part B’s feature (i.e.; hole)
- Repeatability of Inserting Unit is +/- 0.002” in the vertical position.

Assembly misalignment (worst case) = 1) + 2) + 3) + 4) + 5)

2: Find your total clearance

- Chamfer size on part A (a lead in is required on at least one part).
- Chamfer size on part B.
- Worst case part clearance, Y subtract X.

Total Clearance = 1) + 2) + 3)

- The Inserting Unit is needed when your assembly misalignment is greater than your part clearance.
- Your total clearance must be greater than your assembly misalignment or two parallel surfaces will contact. If your total clearance is less than your assembly misalignment, then increase the chamfer size on part A and / or part B.
- Select a Inserting Unit with allowable misalignment greater than your assembly misalignment [Technical data](#) [▶ 14].

When the insertion axis is not vertical, the initial offset of the Inserting Unit due to the weight of tooling and part must be taken into consideration as there is some lateral and cocking deflection of the flexing shear pads. This reduces the allowable misalignment in the downward direction, while increasing it in the upward direction.

6.2.2 Calculate the optimum Center-of-Compliance (C-of-C)

Calculate the total distance, L, from the tool side (bottom) plate of the Inserting Unit to the initial contact point of the part being inserted.

Take into account any interface plates.

Select the model with a C-of-C within 30% of the distance L.

It is better to have a C-of-C below the insertion point than above.

If the fit between the peg and hole is loose, a model with a C-of-C within 60% of distance L is allowable.

6.2.3 Determine the required load capacity:

Observe the following guidelines:

- The tension load capacity for a vertical application is the weight of the tool and part.
- Use HCL-13A shear pad for high-impact loads.
- Use lock-up device to reduce high inertia loads due to acceleration.
- A high compression load capacity will be needed for tight tolerance applications (i.e.; press fit).
- When needed, use six (6) shear pads on the 200 and twelve (12) on the 400 to double the load capacity [Technical data](#) [▶ 14].

6.2.4 Minimize insertion force

Calculate your maximum insertion force by multiplying your assembly misalignment by the lateral stiffness [Technical data](#) [▶ 14].

- Make sure your assembly device can overcome the insertion force.
- Minimize Inserting Unit stiffness when handling lightweight or delicate parts.
- Longer, heavier parts can usually tolerate a greater insertion force.

The 100 and 200 use three types of shear pads. The HCL-12A is the softest shear pad, while the HCL-11A is nearly as soft, but with a longer C-of-C. The HCL-13A is the stiffest shear pad with a C-of-C similar to the HCL-12A.

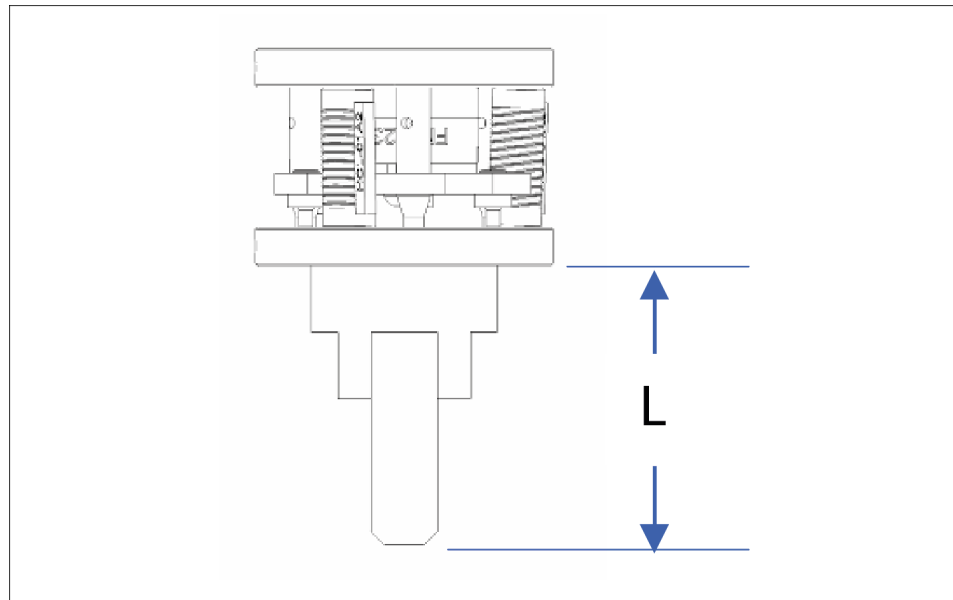
The 000 uses two types of shear pads, HCL-01A2 and HCL-02A. The HCL-01A2 is the softest shear pad. The HCL-02A is stiffer axially and laterally.

Find the lowest stiffness model that is within the applications load capacity and near the optimum C-of-C.

The 400 uses one type of shear pad, HCL-13A.

6.2.5 Environment

The shear pads performance can be affected by the environment, such as temperature and oil [Technical data](#) [► 14].

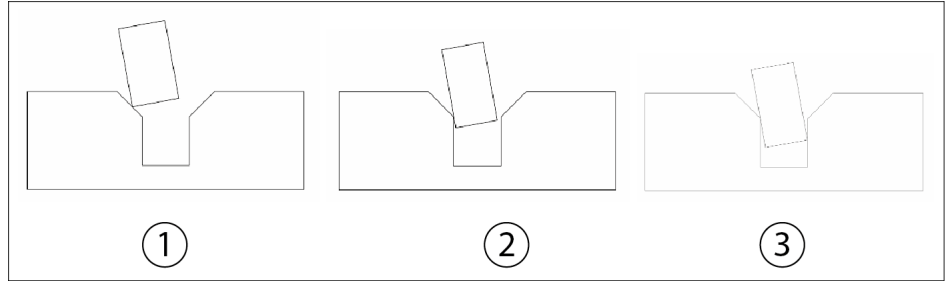


6.3 Contact Force

Excessive contact force is the main problem in many assembly applications. Excessive contact force causes galling, jamming, and broken parts. During a typical assembly process, there are three main contact forces: single-point, sliding, and two-point [Repeatability](#) [► 22]. The key to reducing single-point or sliding contact force is using a compliance device with a low lateral stiffness. Two-point contact force is reduced with a low cocking stiffness.

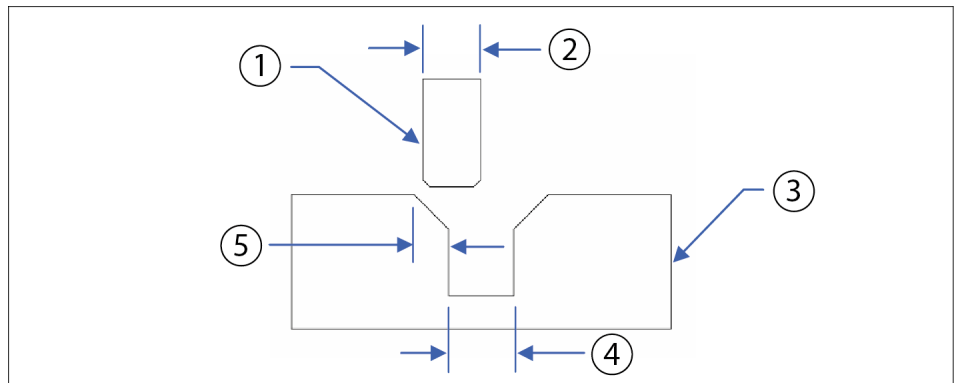
6.4 Repeatability

The Inserting Unit has a positional repeatability of +/- 0.026mm when in the locked position. When unit is unlocked, shear pads have a positional repeatability of +/- 0.051mm.



Contact Forces

1	Single-Point Contact Force
2	Sliding Contact Force
3	Two-point Contact Force



Assembly Inaccuracy

1	Part A
2	Maximum Dimension (X)
3	Part B
4	Minimum Dimension (Y)
5	Chamfer size of Part B

7 Installation

7.1 Robot Side Interface

The 000, 100, 200, and 400 have two options for interfacing to a robot or assembly machine.

Units can be mounted by using the tapped holes on the robot side (top) plate or by bolting through robot side (top) plate to robot or assembly machine.

All sizes have two dowel holes for location.

Robot or assembly machine interface must accommodate sensor cable if unit is equipped with lock sensing.

For size and location of mounting features and lock sensor cable exit, Assembly drawing. Mounting hardware not provided.

7.2 Tool Side Interface

The tool side (bottom) plate uses the same two methods for mounting tooling to unit as the robot side (top) plate. This plate also has two dowel holes for location Assembly drawing.

7.3 Units with Lock-up and Lock Sensing (optional)

Units equipped with lock-up require an air supply to operate lock-up. Air supply should be clean, dry, and non-lubricated. Air supply is connected to Inserting Unit by 5/32" or 4mm O.D. flexible, pneumatic tubing. "Air fitting identification" [Lock-up \(optional\)](#) [▶ 24].

Units equipped with lock sensing use a M5 x 0.5 x 25mm long threaded barrel proximity sensor. For power requirements and additional specifications, [Technical data](#) [▶ 14]. Customers that order units sensor-ready should use the same type proximity sensor as specified. Sensor gap should be set at 1.02mm on 100 and 200 with unit locked. Sensor gap should be set at 0.5mm on 400 with unit locked [Lubricants/Lubrication points](#) [▶ 29].

NOTICE

Failure of electrical or pneumatic lines to operate the unit properly may result in damage to equipment.

- The routing of electrical and pneumatic lines must minimize the possibility of stress pullout, kinking, etc.

8 Operation

8.1 Compliance

The Inserting Unit's compliance is limited by three overload pins. When the unit has reached maximum compliance, the overload pins support the load to prevent damage to shear pads.

"Compliant directions" [Introduction](#) [▶ 17].

8.2 Lock-up (optional)

Units equipped with lock-up are recommended to use an air supply from 60 to 120 psi (4.1 to 8.3 bar).

In severe locking conditions, air supply can be adjusted to a maximum of 120 psi (8.3 bar) [Technical data](#) [▶ 14].

Lock-up is operated by applying air to the desired fitting (lock or unlock).

Opposite fitting must be exhausted for cylinder to operate correctly.

Unit is recommended to be locked in the vertical position. This creates a normal locking condition.

Severe locking condition occurs when the unit is locked in the horizontal position under load. Load is being lifted by lock-up mechanism [Lock-up \(optional\)](#) [▶ 24].

Please note that severe locking conditions will create above normal wear on lock-up screw bushings.

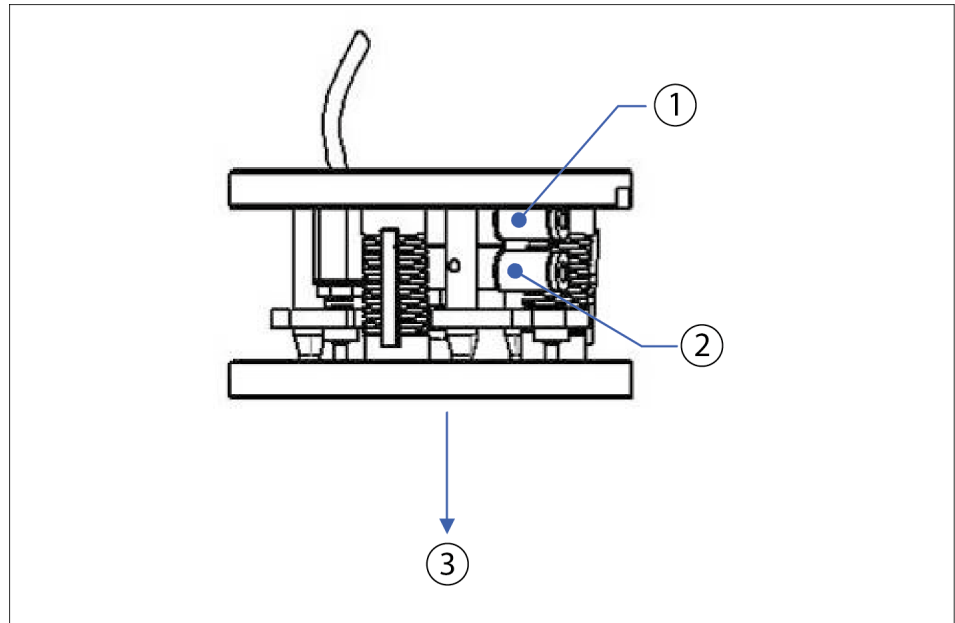
For recommended lubrication periods for normal and severe locking conditions, [Maintenance](#) [▶ 28].

Using a flow control valve to reduce acceleration of the lock-up screw into the tool side (bottom) plate will help reduce wear on lock-up screw bushings.

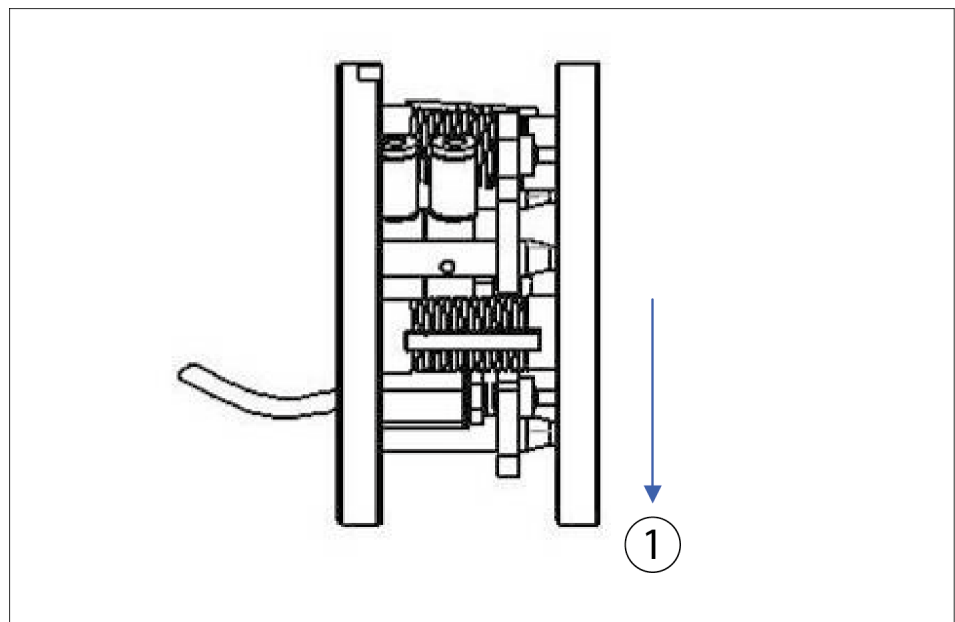


⚠ WARNING

Unit must be in the unlocked position for full compliance.



1	Unlock air fitting
2	Lock air fitting
3	Load



1	Load
---	------

8.3 Lock Sensing (optional)

Lock sensing is achieved by monitoring the position of the lock-up screw on the 100 and 200.

The bearing plate position is monitored on the 400 to achieve lock sensing.

When air pressure is applied to the air cylinder to lock unit, the lock-up screw is pulled into the tool side (bottom) plate.

The lock-up screw or bearing plate enters the sensing range of the proximity sensor sending a lock signal [Lubricants/Lubrication points](#) [▶ 29].



⚠ DANGER

Injury could result from moving parts.

- Stay clear of Inserting Unit when lock-up is being cycled.
-

9 Troubleshooting

Possible cause	Corrective action
Unit will not lock or unlock	<p>Check air supply. Pneumatic cylinder rod should be compressed during locked condition. Cylinder rod should be fully extended during unlock condition.</p> <p>Verify that when air is supplied to one port, the opposite port is being exhausted.</p> <p>Verify that air lines are connected to correct air fittings.</p> <p>Verify locking mechanism is operating freely and is lubricated properly.</p>
Lock sensor not operating properly	<p>Ensure sensing face of sensor and sensor target are clean.</p> <p>Verify sensor is wired correctly to power source.</p> <p>Verify that sensor gap is set at correct distance and jam nut and sensor fitting are tight.</p>
Unit is not compliant	Verify unit is unlocked.
Air leak at unit	Verify pneumatic tubing is fully inserted into air fittings.

10 Maintenance

10.1 Lock-up (optional)

The lock-up mechanism should be inspected periodically to ensure that it is operating freely and is free of debris. Overload pins should be lubricated with a light machine oil at their point of contact with bearing plate [Maintenance and lubrication intervals](#) [▶ 28].

Lock-up screws and bushings should be inspected for lubricant [Maintenance and lubrication intervals](#) [▶ 28].

Routine inspection of pneumatic and electrical lines is recommended to avoid possible failure.

10.2 Lock Sensing (optional)

The lock sensor should be inspected at lubrication periods [Maintenance and lubrication intervals](#) [▶ 28].

Ensure that sensing face of sensor and sensor target (bottom of lock-up screw or bearing plate) is clean, and jam nut and sensor fitting are tight [Lubricants/Lubrication points](#) [▶ 29].

10.3 Maintenance and lubrication intervals

NOTICE

Material damage due to hardening lubricants!

Lubricants harden more quickly at temperatures above 60°C, leading to possible product damage.

- Reduce the lubricant intervals accordingly.

Overload pins

Maintenance and lubrication intervals Overload pins

Condition	normal locking conditions	severe locking conditions
Interval [cycles]	25.000	50.000

Lock-up Screw

Maintenance and lubrication intervals Lock-up Screw

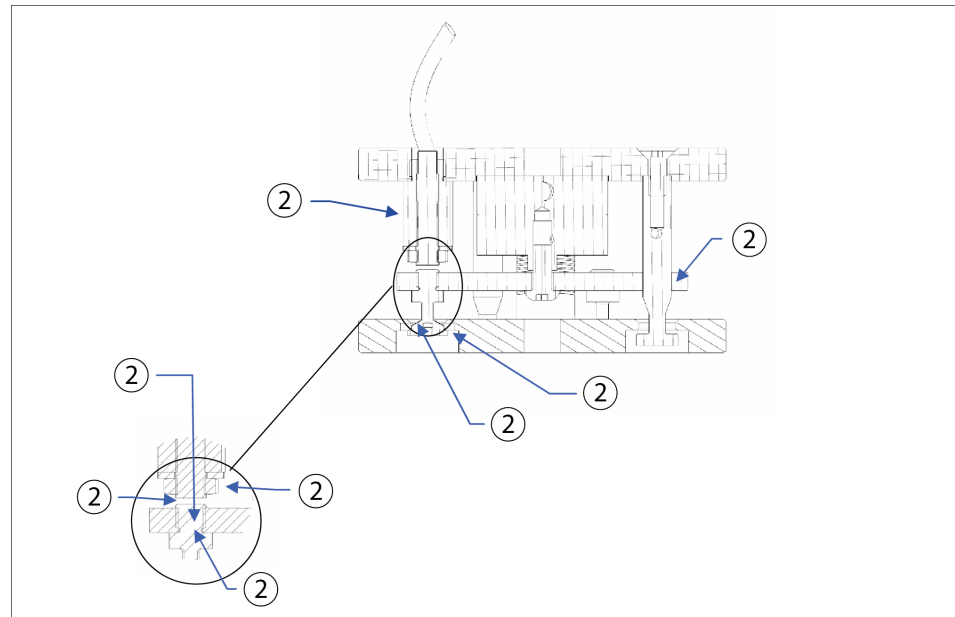
Condition	normal locking conditions	severe locking conditions
Interval [cycles]	250.000	100.000

10.4 Lubricants/Lubrication points

SCHUNK recommends the lubricants listed.

During maintenance, treat all greased areas with lubricant. Thinly apply lubricant with a lint-free cloth.

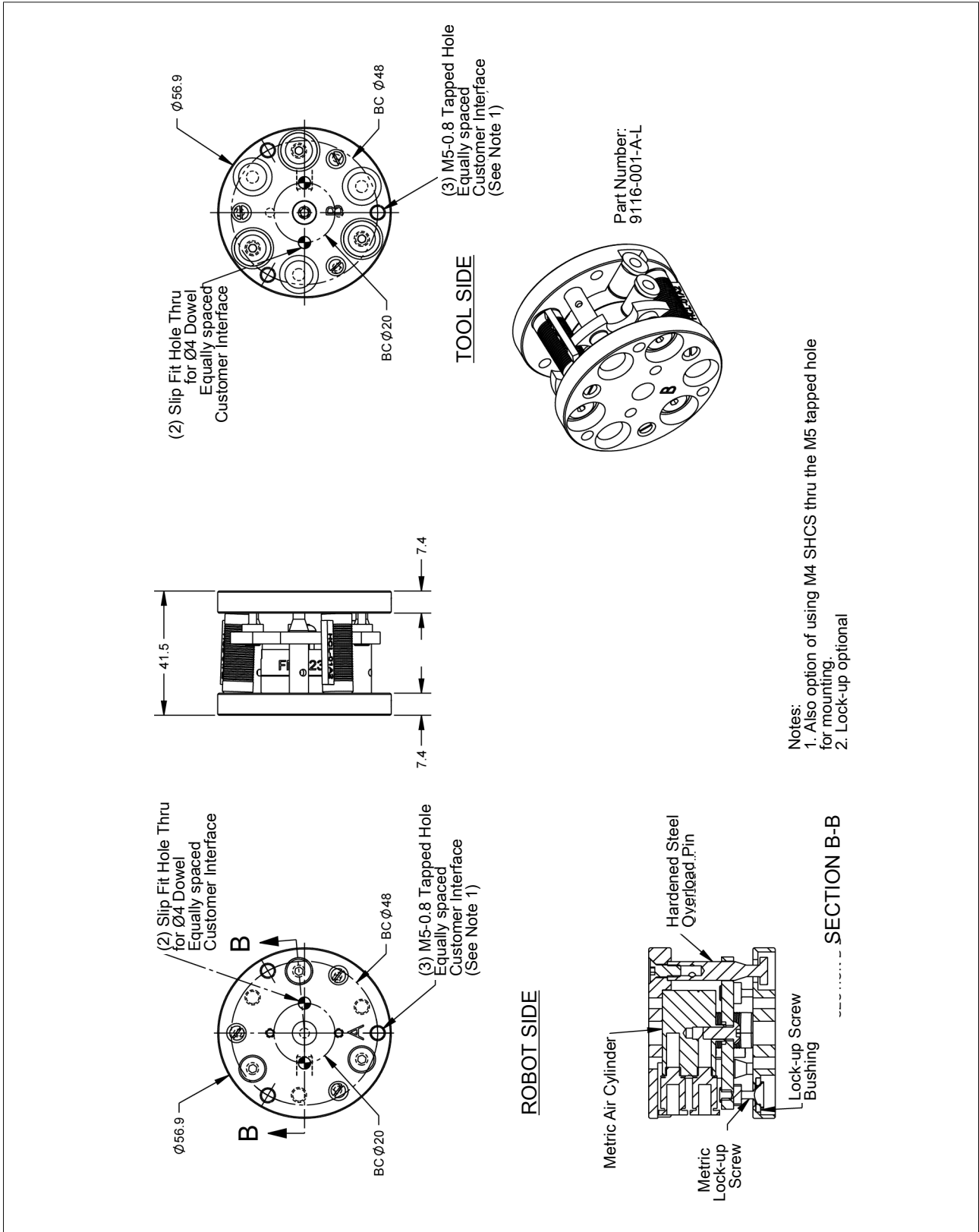
Lubricant point	Lubricant
Under head of lock-up screw between lock-up screw bushing	MIL-A-907E
Lock-up screw	



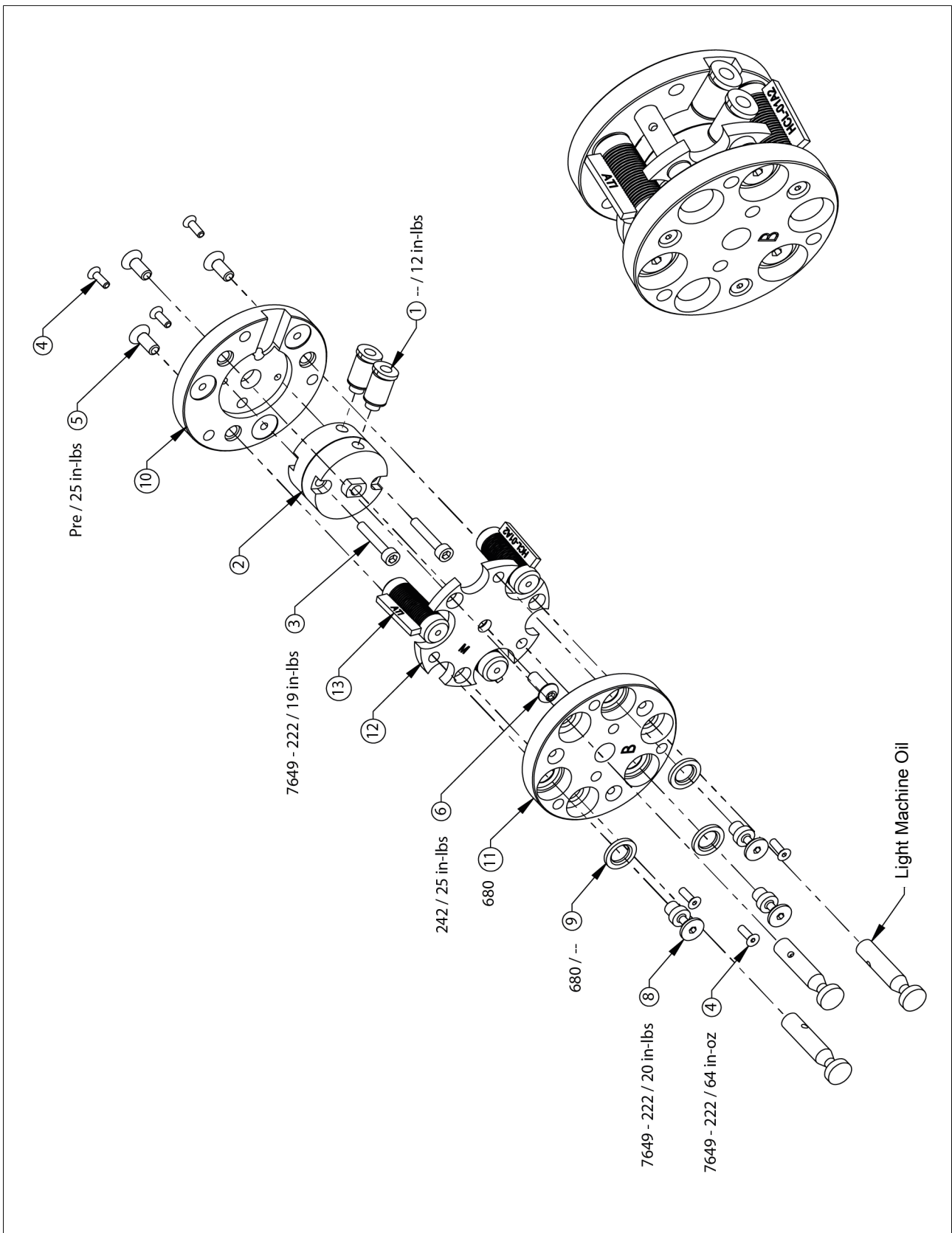
1	Sensor Fitting	5	Sensing Face of Sensor
2	Overload Pin and Bearing Plate Contact Point	6	Sensor Gap
3	Lock-up Screw Bushing	7	Sensor Target (Bottom of Lock-up Screw)
4	Lock-up Screw	8	Sensor Jam Nut

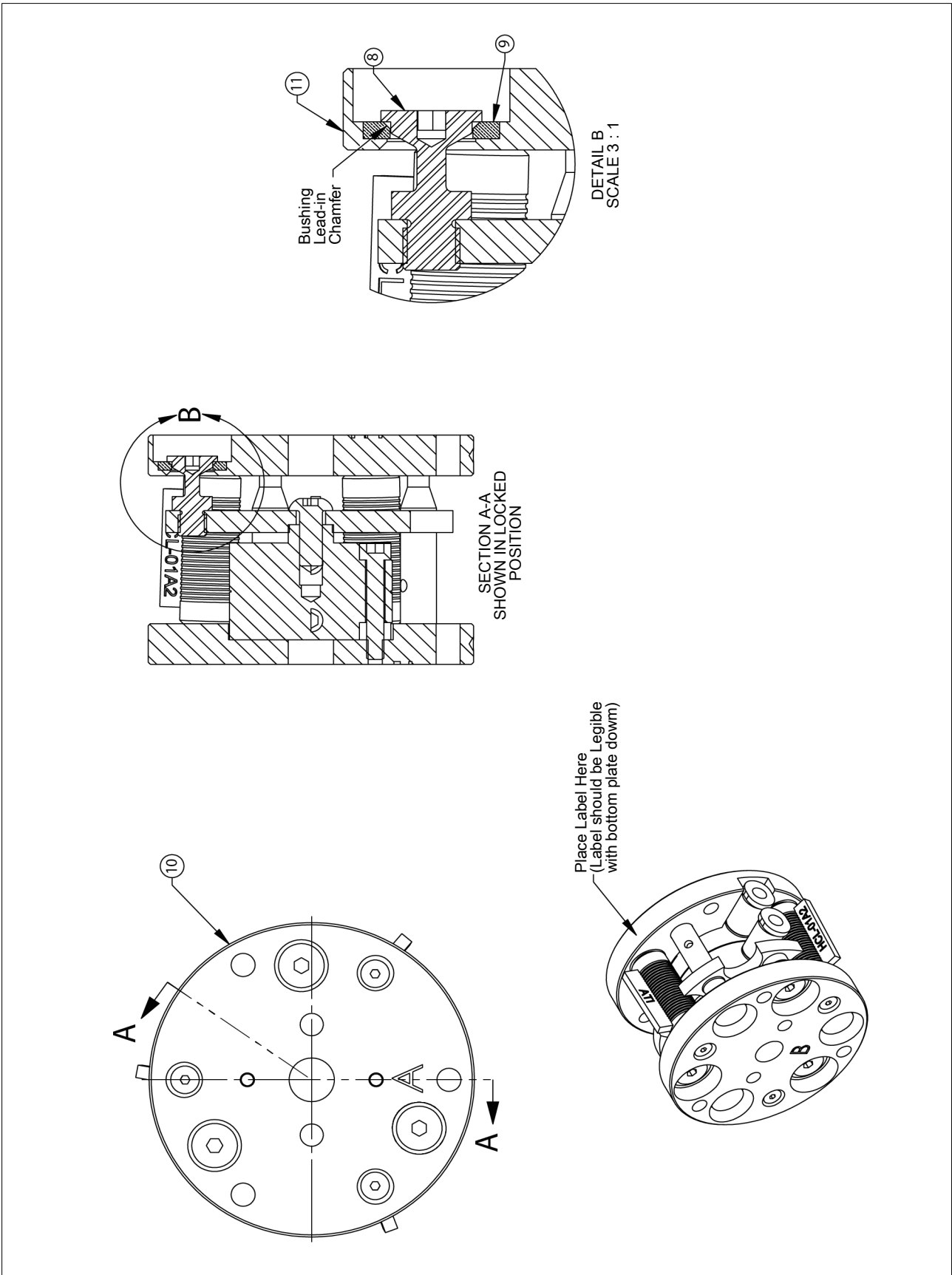
11 Assembly drawings

11.1 9116 Series 000 w/ Lock-up

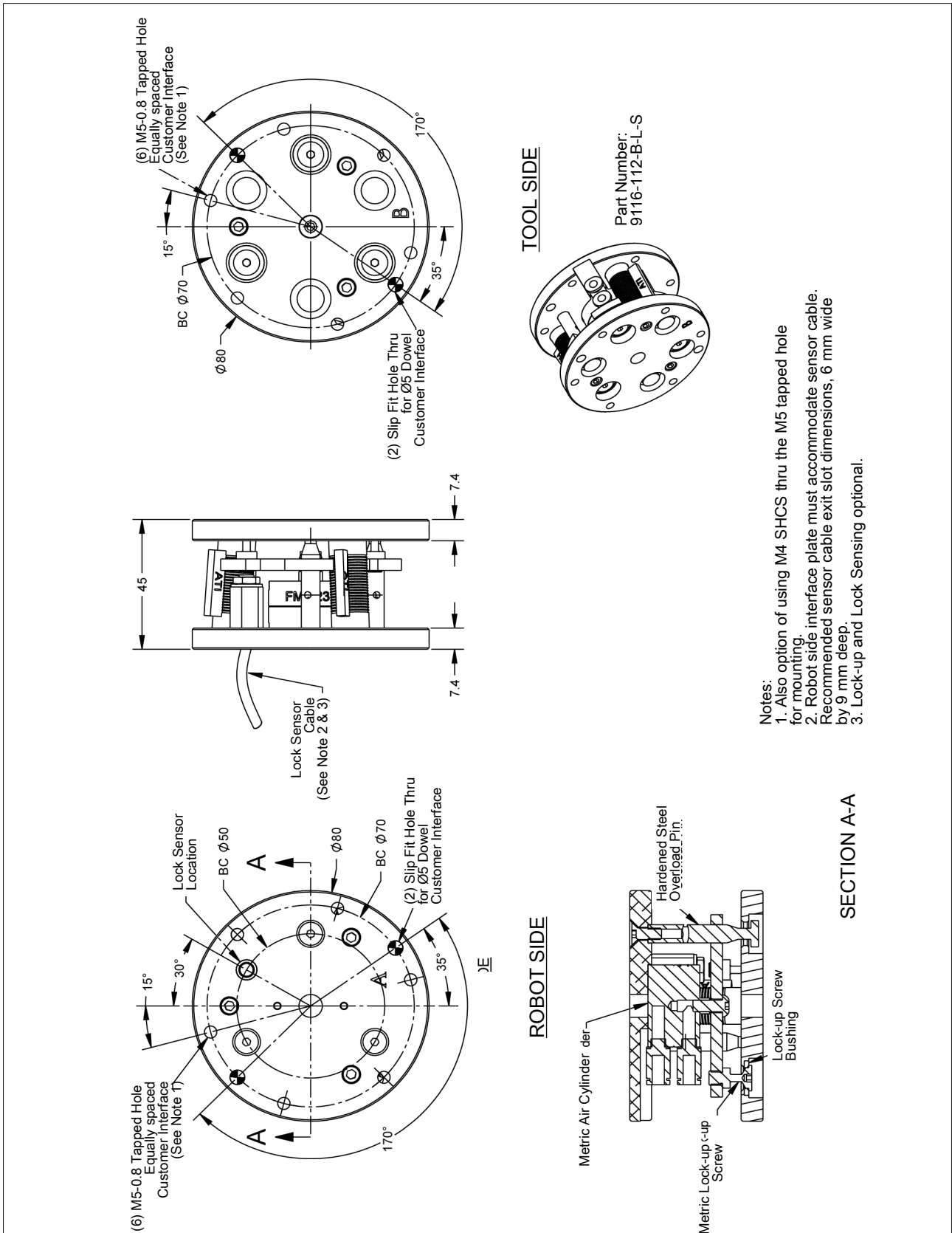


11.2 9116 Series 000 with Lock-up

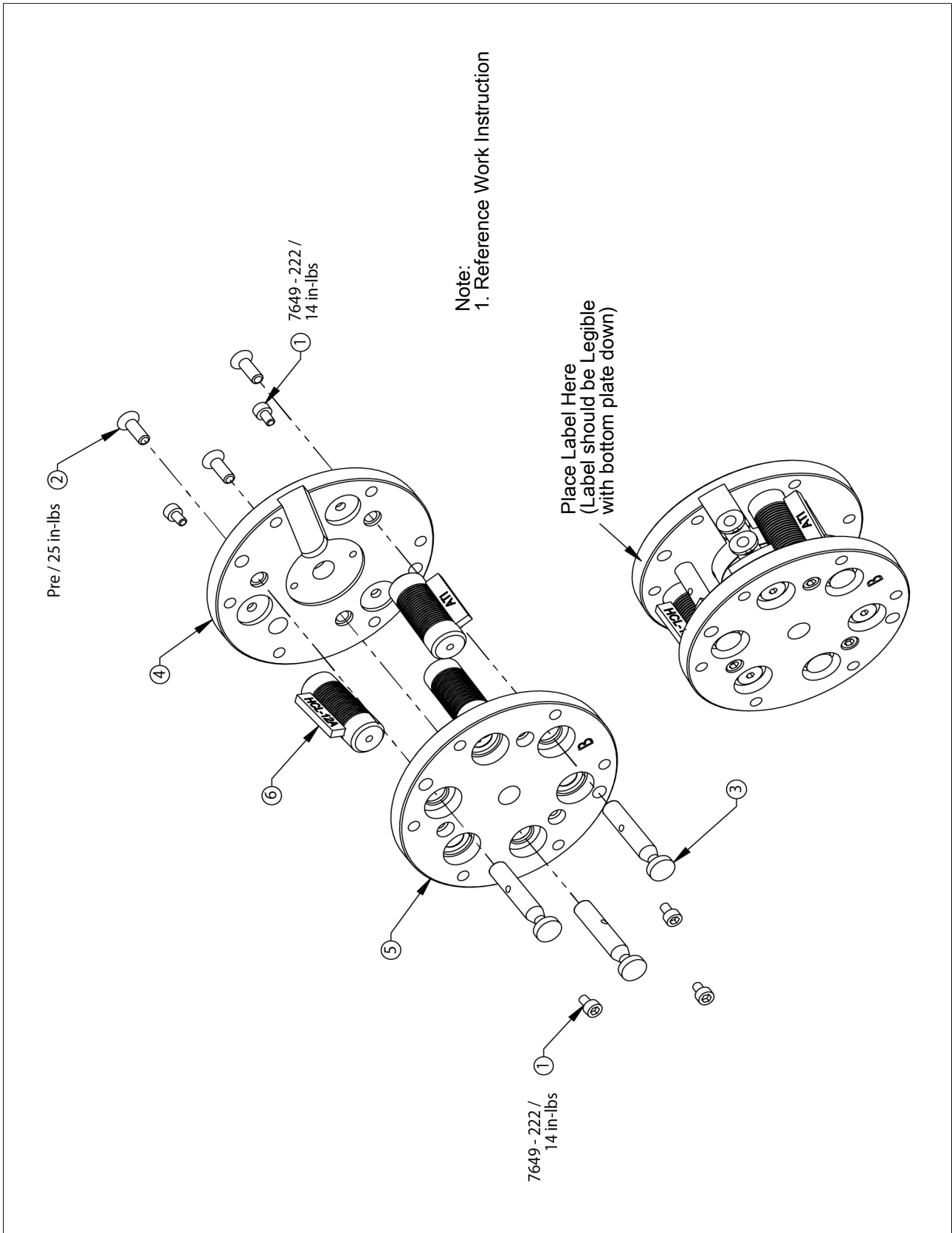


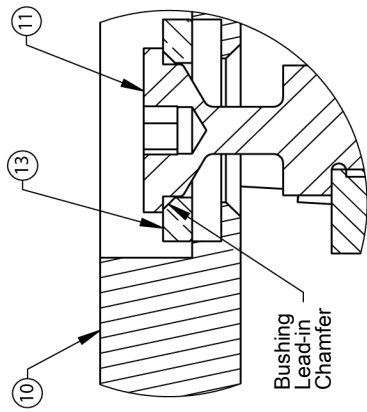


11.3 9116 Series 100 w/ Lock-up and Sensor

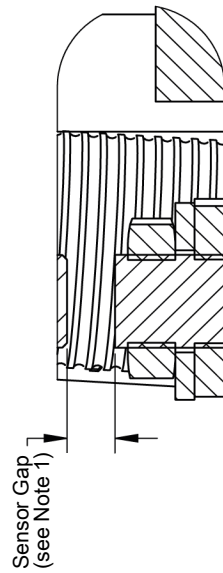


11.4 9116 Series 100 without Lock-up and Sensor

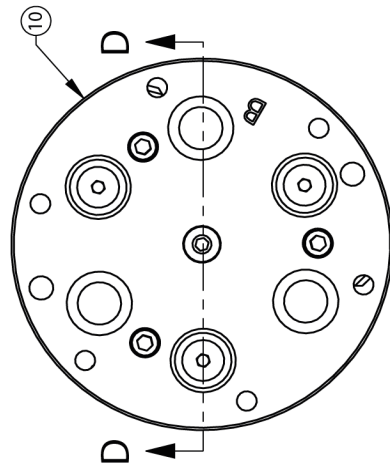




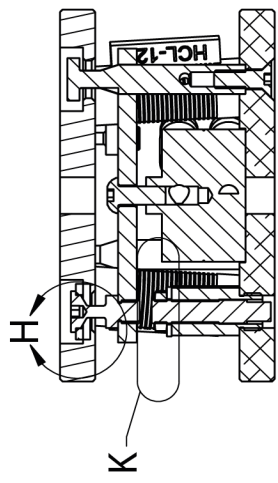
DETAIL H
SCALE 4 : 1
SHOWN IN LOCKED
POSITION



DETAIL K
SCALE 4 : 1

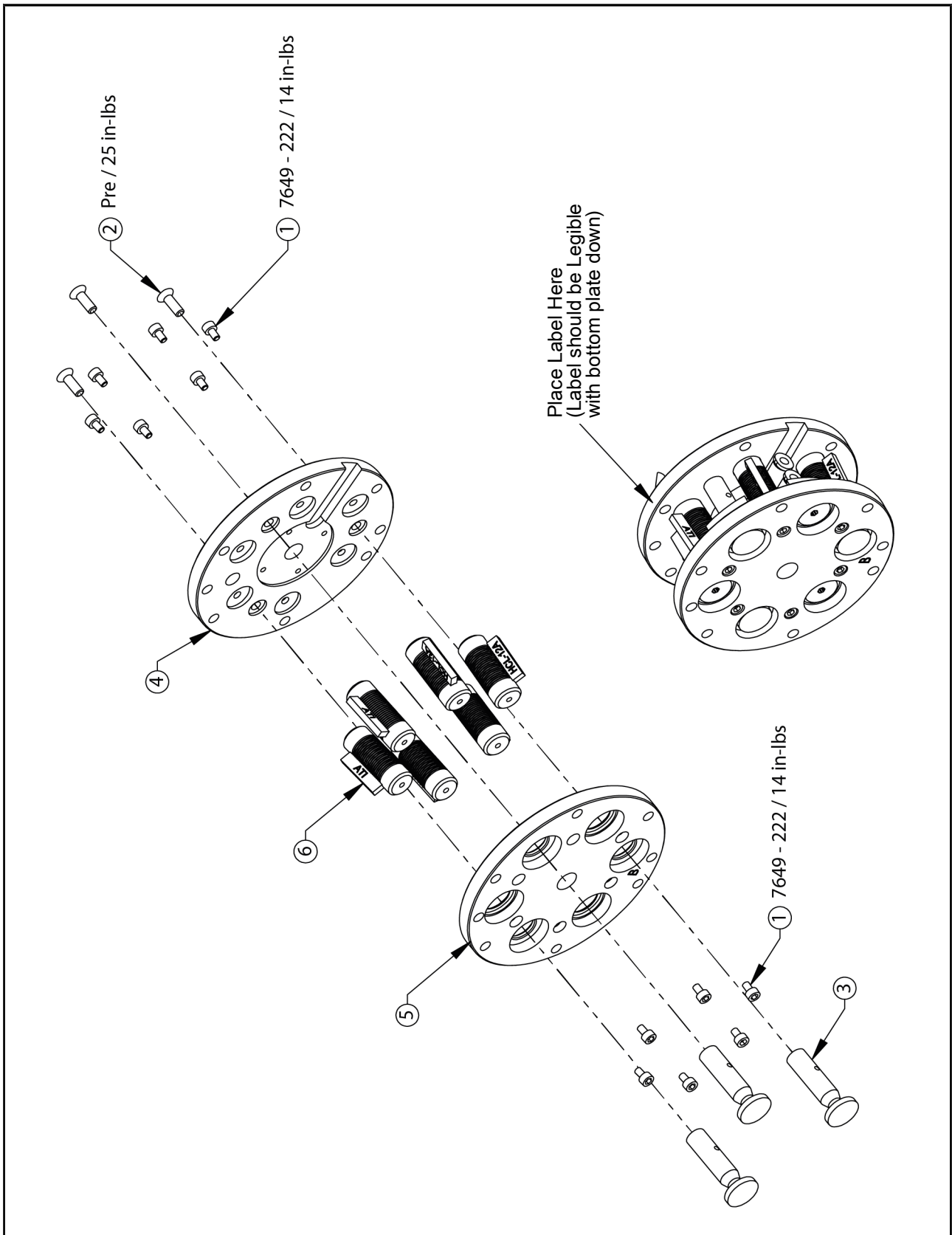


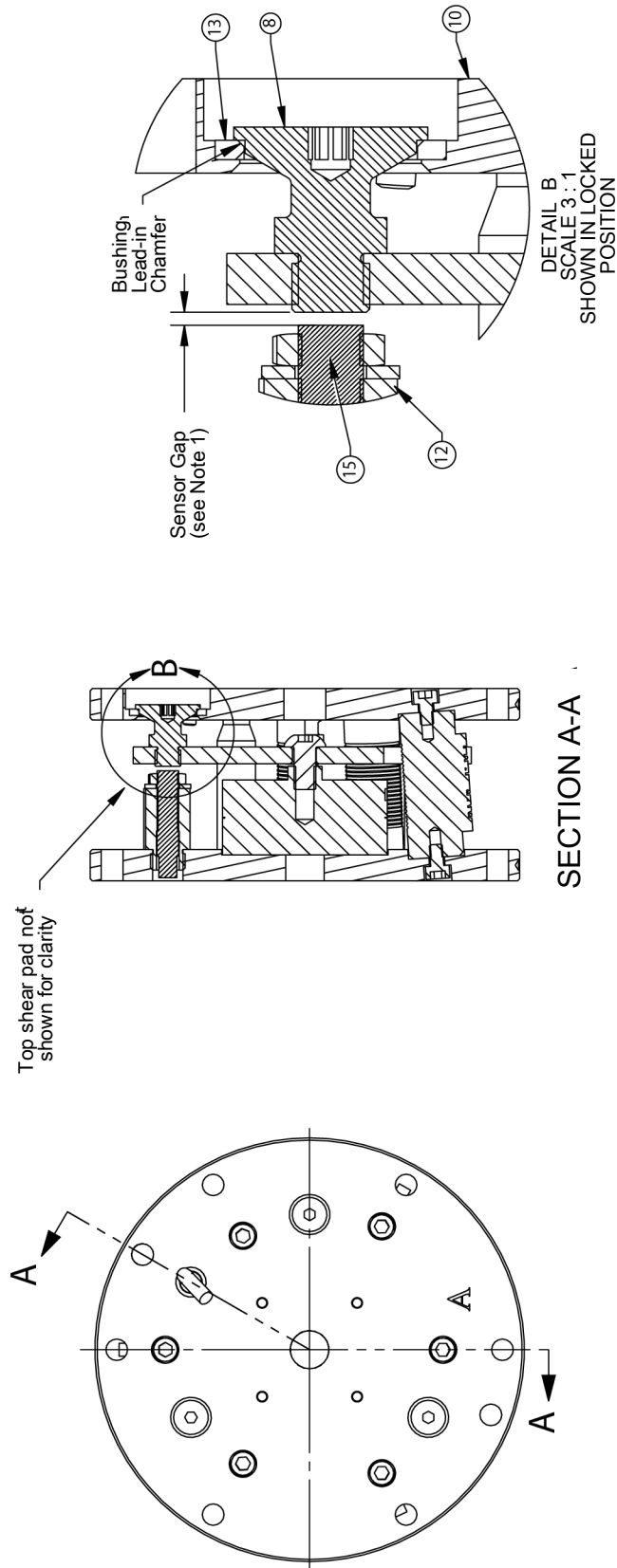
SECTION D-D
SCALE 1 : 1
SHOWN IN LOCKED
POSITION.



Note:
1. Secure M5 prox sensor into hex sensor fitting using nut and washer.
Set gap between lock-up screw and sensor to .040".
Unit should be in the lock position when set. (see DETAIL K).
Torque mark nut so visible after unit is assembled for final QA inspection.

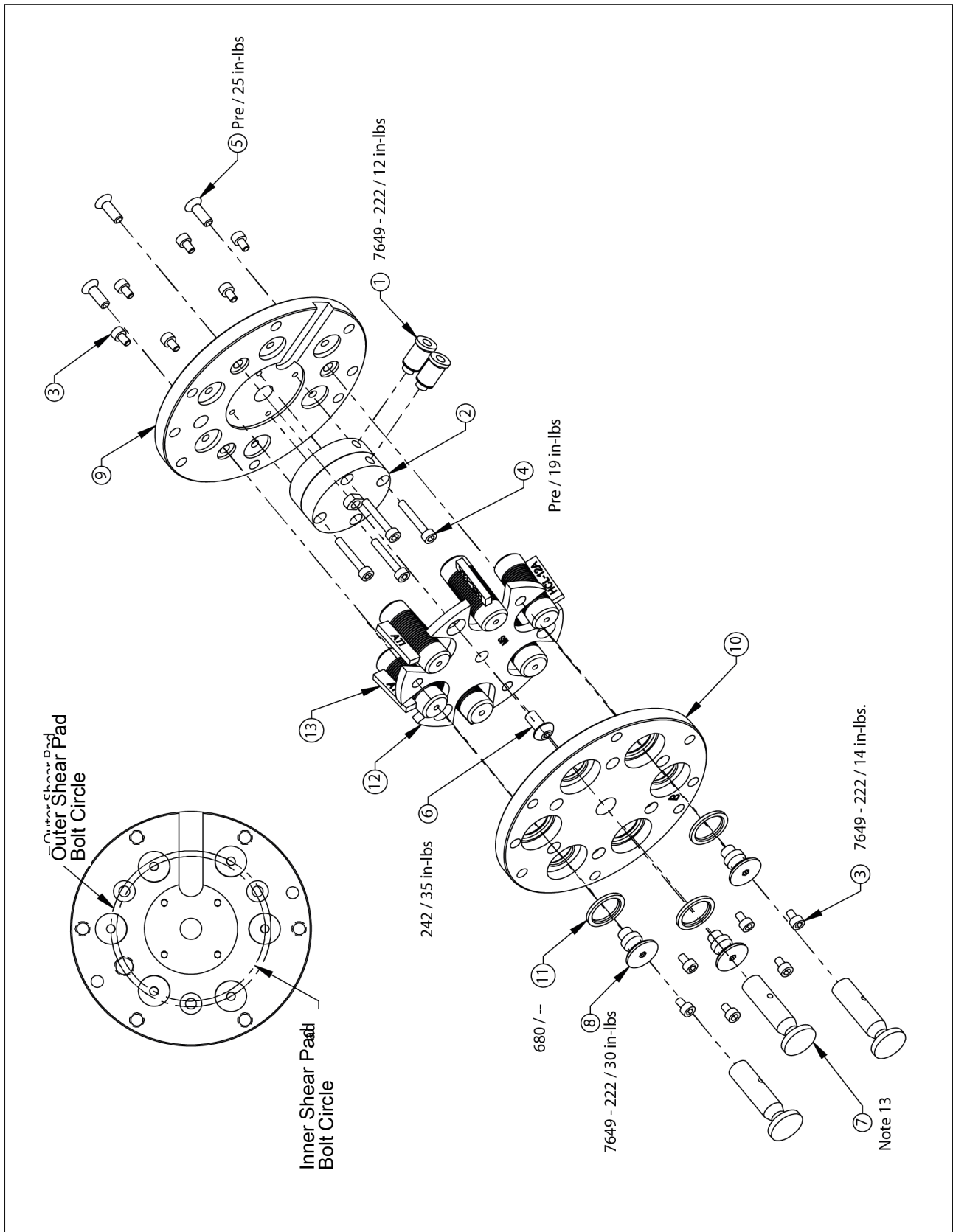
11.5 9116 Series 200 Shear Pad Location without Lock-up or Sensor

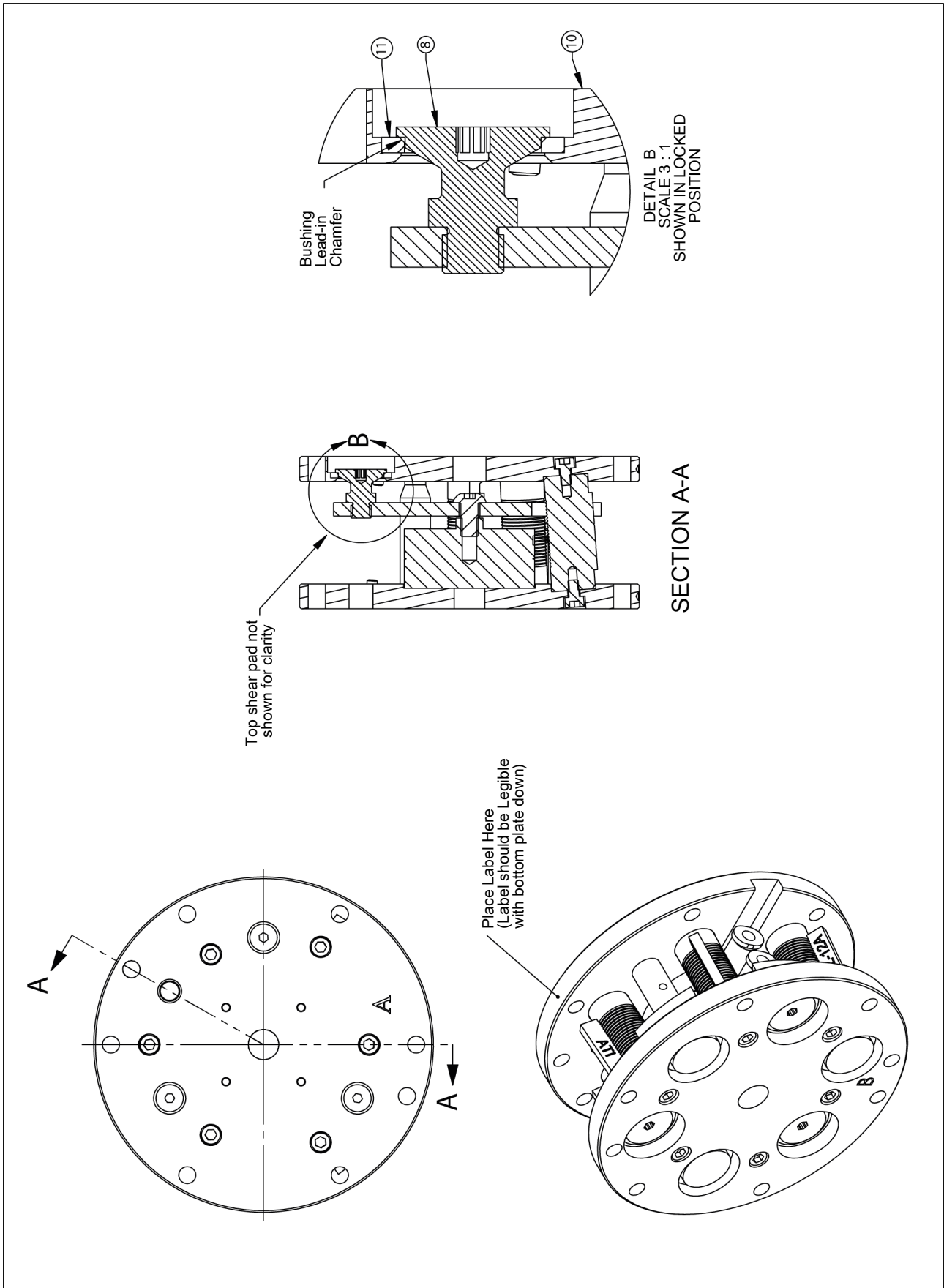




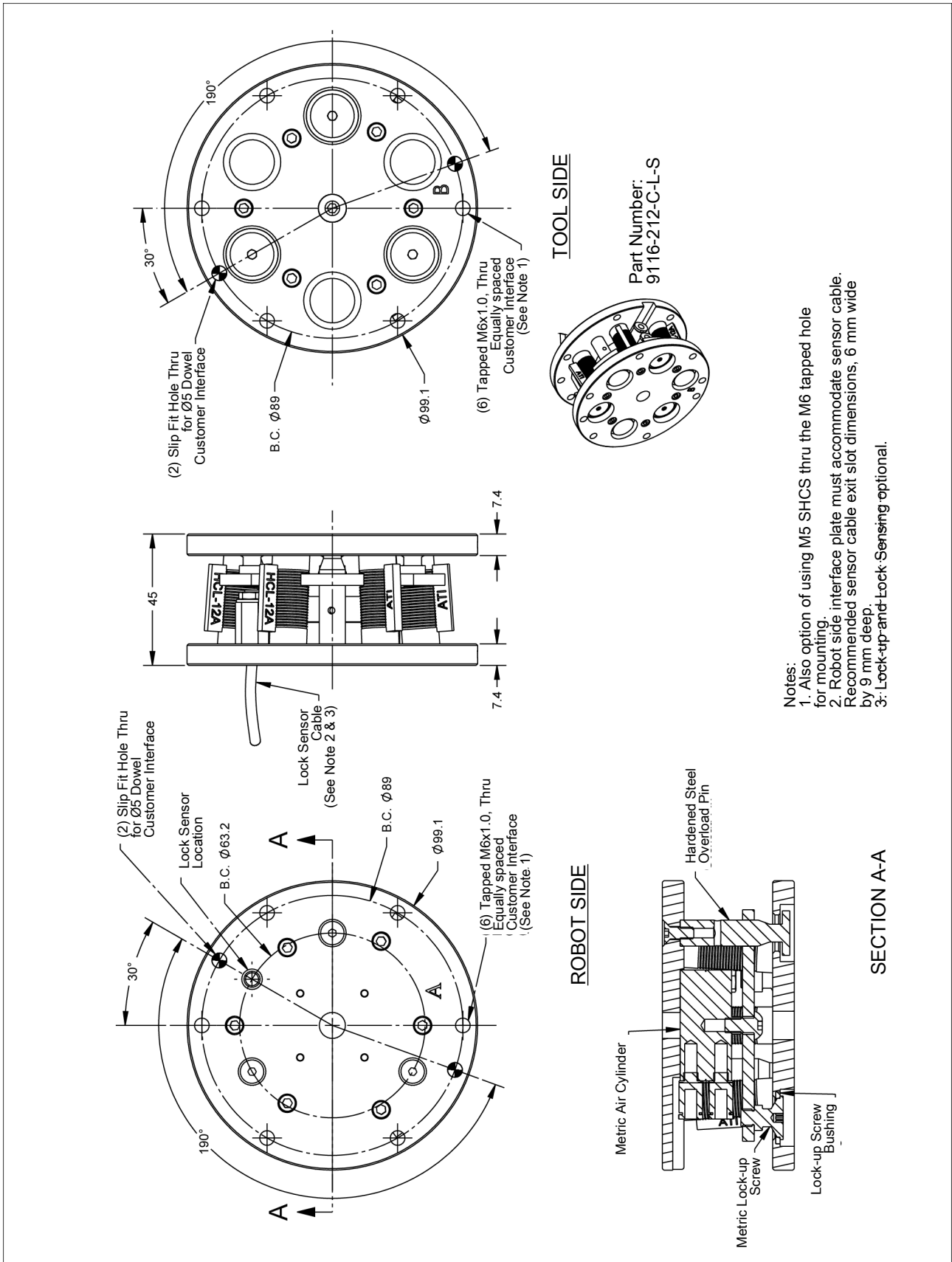
Note:
 1. Secure M5 prox sensor into hex sensor fitting using nut and washer.
 Set gap between lock-up screw and sensor to .040".
 Unit should be in the lock position when set. (see DETAIL B).
 Torque mark nut so visible after unit is assembled for final QA inspection.

11.6 9116 Series 200 w (6) HCL-12, Lock-up and Steel Bearing Plate





11.7 9116 Series 200 w Lock-up and Sensor



11.9 9116 Series 400 with Lock-up and Lock Sensing (PNP)

