USER MANUAL FOR MICRO LINEAR SERVO ACTUATOR (MECHANICAL)

(Applicable to LA, LAS, LAF and LASF Series)

Beijing Inspire-Robots Technology Co., Ltd. | January 2024

ID: PRJ-01-MTS-U-006 | 15 pages | Version: V1.2.0

Table of Contents

User Manual for Micro Linear Servo Actuator

(Applicable to LA, LAS, LAF and LASF Series)

1 Product Overview

1.1 Product Introduction

The Micro Linear Servo Actuator (hereinafter referred to as the "Actuator") is a micro servo electric push rod, which is integrated with a micro motor, a reducer, a screw structure, a sensor and a drive control system. It can realize the precise servo control of any position within the stroke range. Because of the built-in absolute position sensor, the position information will not be lost after power failure and there is no need to return to zero position.

Technical Features:

- Integrated design of drive and control.
- Small size, high power density and high repeatability of positioning.
- Diversified interfaces:
- Electrical interfaces: Serial Port LVTTL3.3V (Type-D) and Serial Port PWM (Type-P) are available. The actuator with Type-D interface has a configurable ID and multiple actuators with different ID can be controlled via serial buses. The actuator with Type-P interface is compatible with the standard actuator interface and supports PWM control signals of 50 Hz and 333 Hz.
- Mechanical interfaces: There are abundant optional mechanical interface modes, which is convenient for users to install.
- Wide power supply range: DC 7 V to 9 V power supply is available, and 8 V is recommended.
- Overheating and overcurrent protection

1.2 Product Series

LA Series: The center of rotation for the motor and the screw structure is in a straight line. It is featured by the slender overall configuration and a small cross-sectional area.

LAS Series: The center of rotation for the motor and the screw structure is not in a straight line, and is arranged in parallel by gear transmission. It is featured by a shorter overall length and a slightly larger cross-sectional area.

LAF Series: On the basis of LA series, a force sensor and corresponding signal acquisition and filtering algorithm are added to detect the force applied to the actuator.

LASF Series: On the basis of LAS series, a force sensor and corresponding signal acquisition and filtering algorithm are added to detect the force applied to the actuator.

Figure 1: Four Series of Micro Linear Servo Actuator

2 Mechanical Interface

The Micro Linear Servo Actuator has a total of four mechanical interface types: 1) standard interface; 2) ear interface; 3) octagonal interface; and 4) male screw.

2.1 Standard Interface

The housing is locked by a profiling clip. This interface is suitable for LA and LAS series and operating conditions with small load.

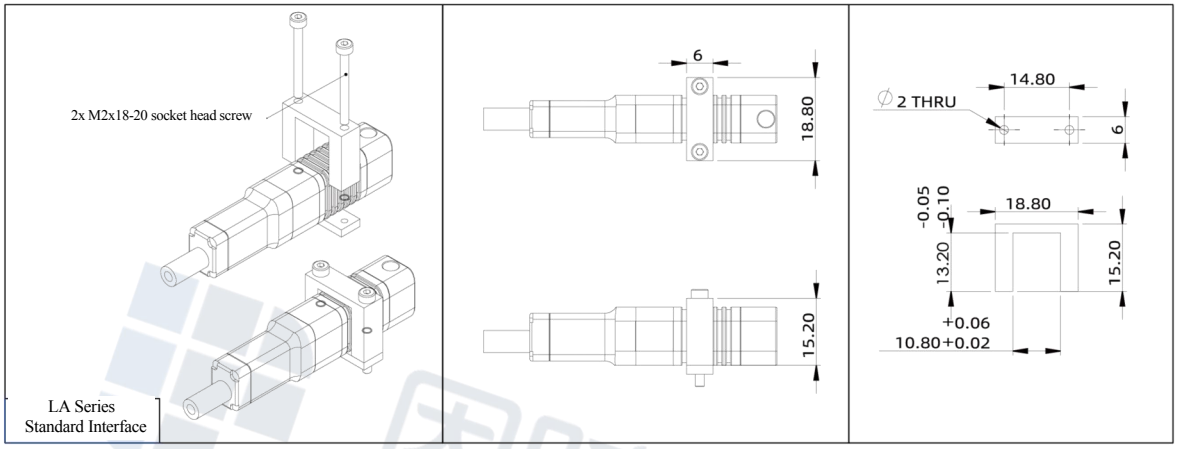

Figure 2: Installation Diagram of LA Series Standard Interface

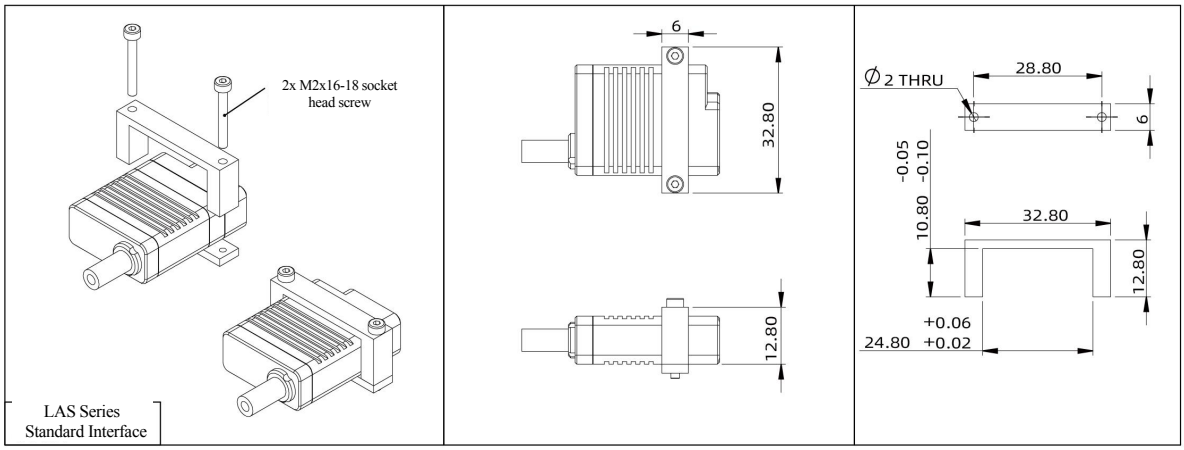

Figure 3: Installation Diagram of LAS Series Standard Interface

2.2 Ear Interface

Two cylinders (3 mm in diameter and 2.5 mm in height) are protruding from both sides of the rear end of the actuator. There are M1.6 threaded holes in the center of them with a threaded hole depth of 2.5 mm. Two cylinders are available for LA series actuators. After they are attached to bearings or mounting holes, such actuator can swing around both cylinders within a certain range.

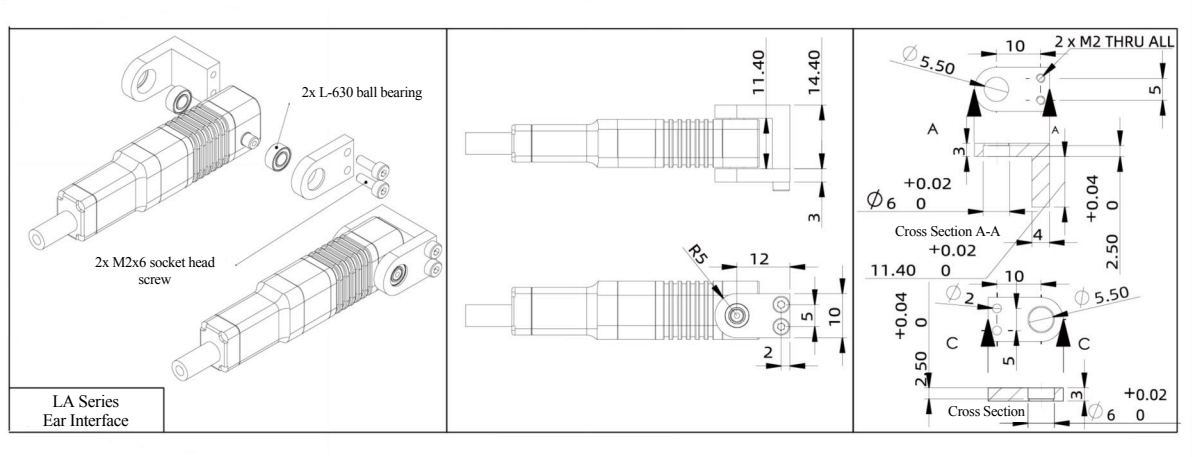

Figure 4: Installation Diagram of LA Series Ear Interface

2.3 Octagonal Interface

The rear end of the actuator is an octagonal base, which is equipped with AMI-LA-ACBO-S30 octagonal joint by default. This interface is suitable for LA and LAS series.

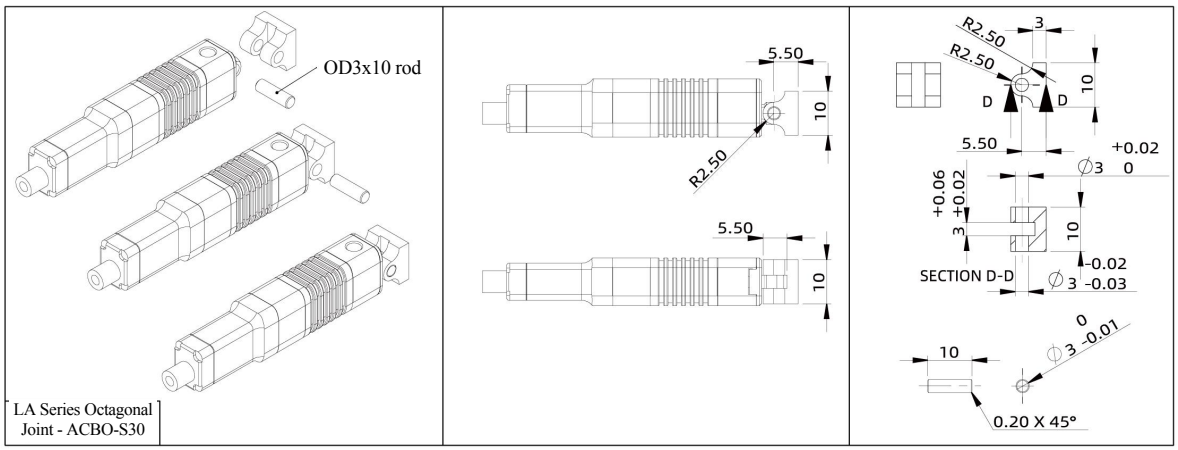

Figure 5: Installation Diagram of LA Series Octagonal Interface

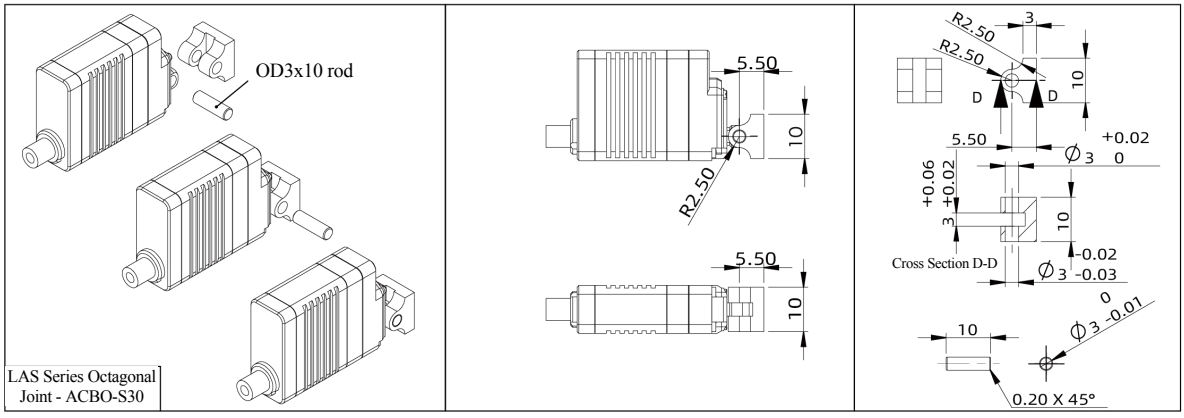

Figure 6: Installation Diagram of LAS Series Octagonal Interface

The installation angle of the octagonal joint can be adjusted as needed.

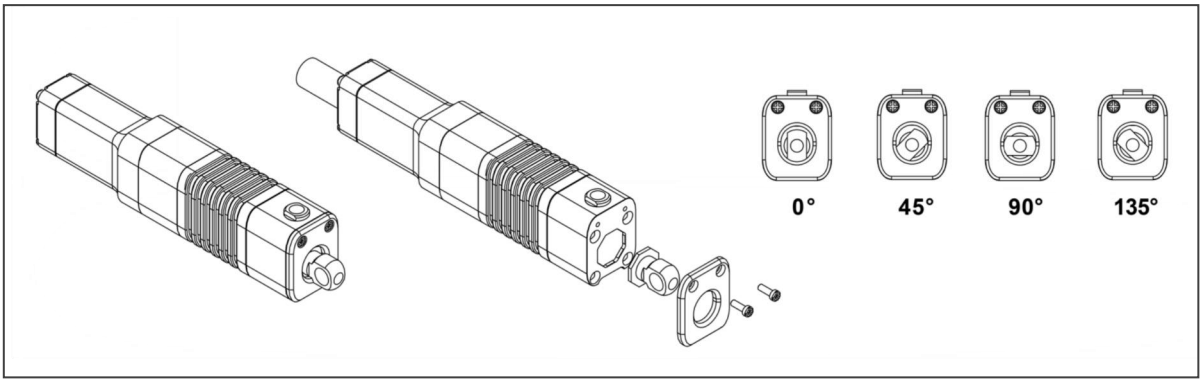

Figure 7: Installation Angle Diagram of Octagonal Joint

In addition to AMI-LA-ACBO-S30, the following types of octagonal joints can also be selected:

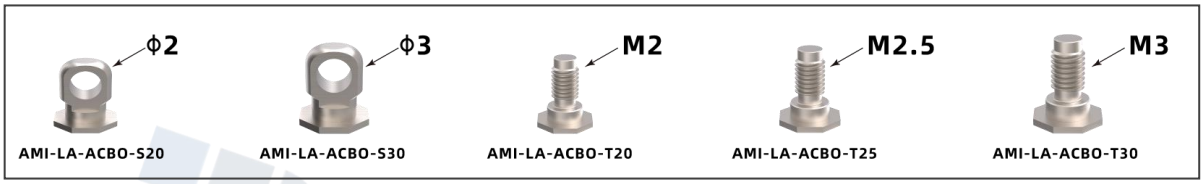

Figure 8: Various Octagonal Joint Models

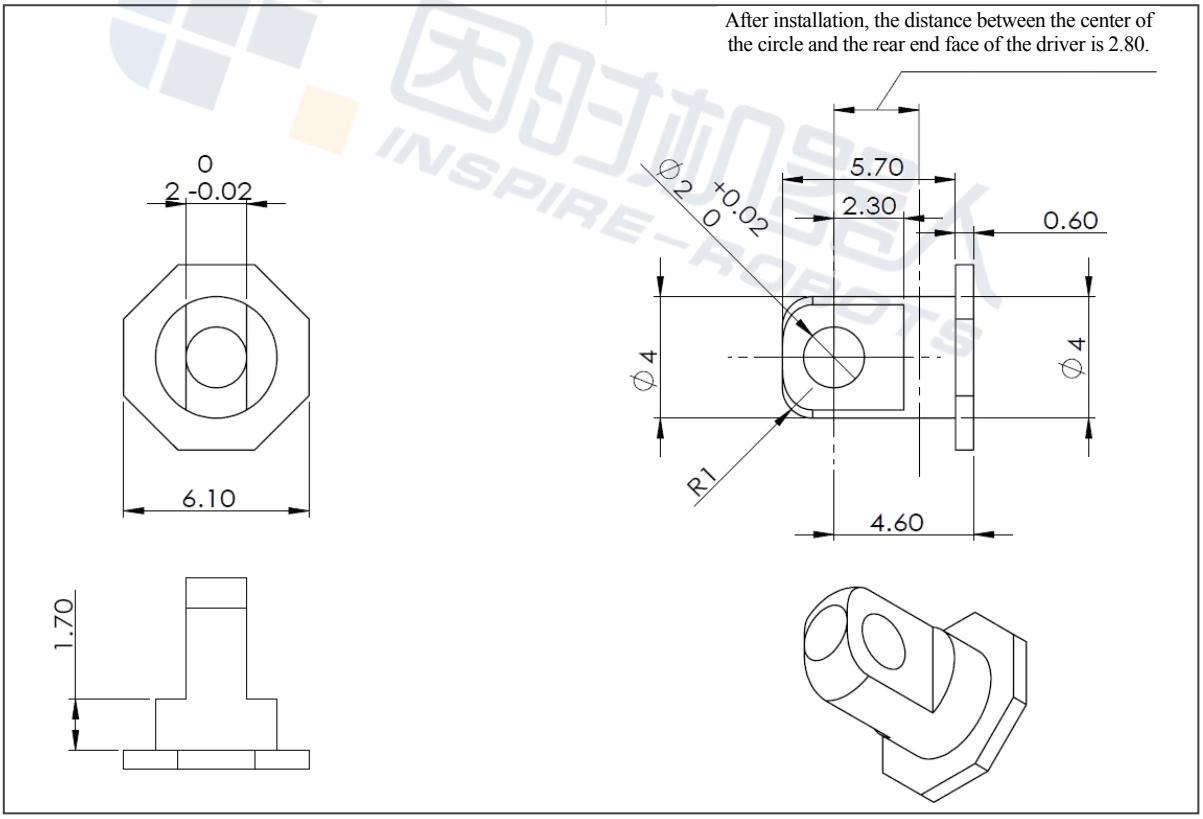

Figure 9: Dimensions of AMI-LA-ACBO-S20

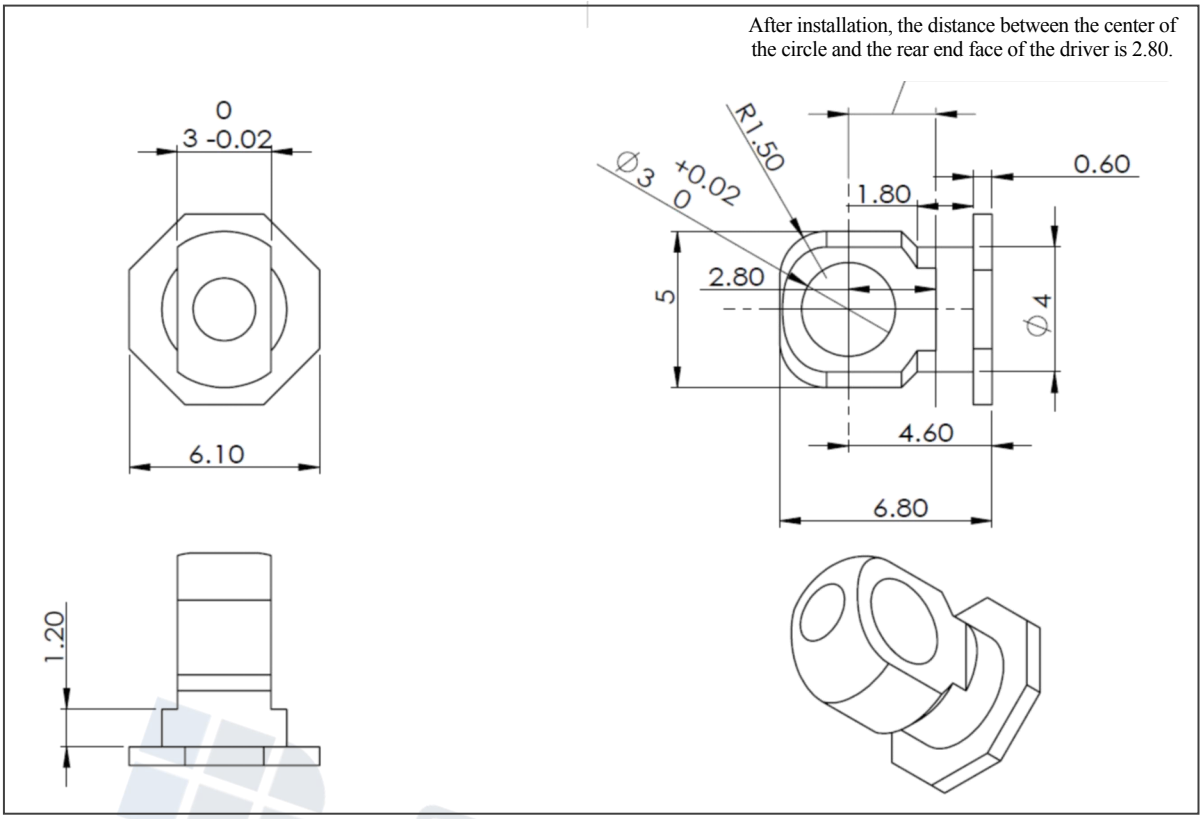

Figure 10: Dimensions of AMI-LA-ACBO-S30

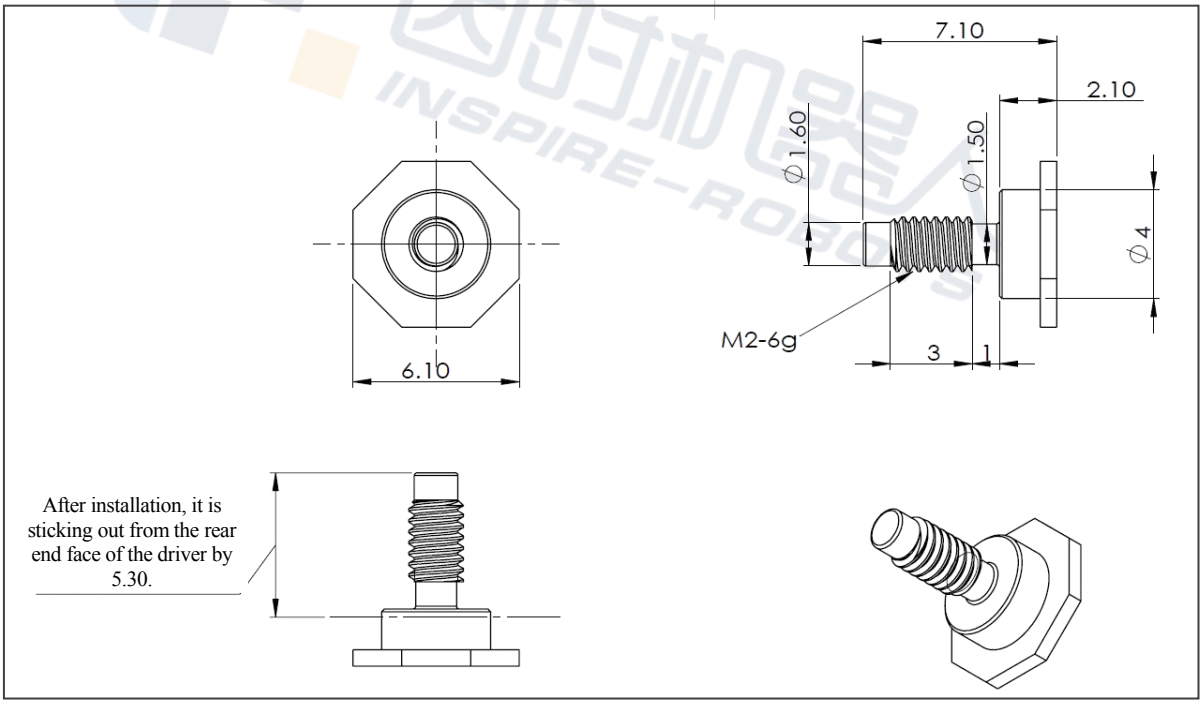

Figure 11: Dimensions of AMI-LA-ACBO-T20

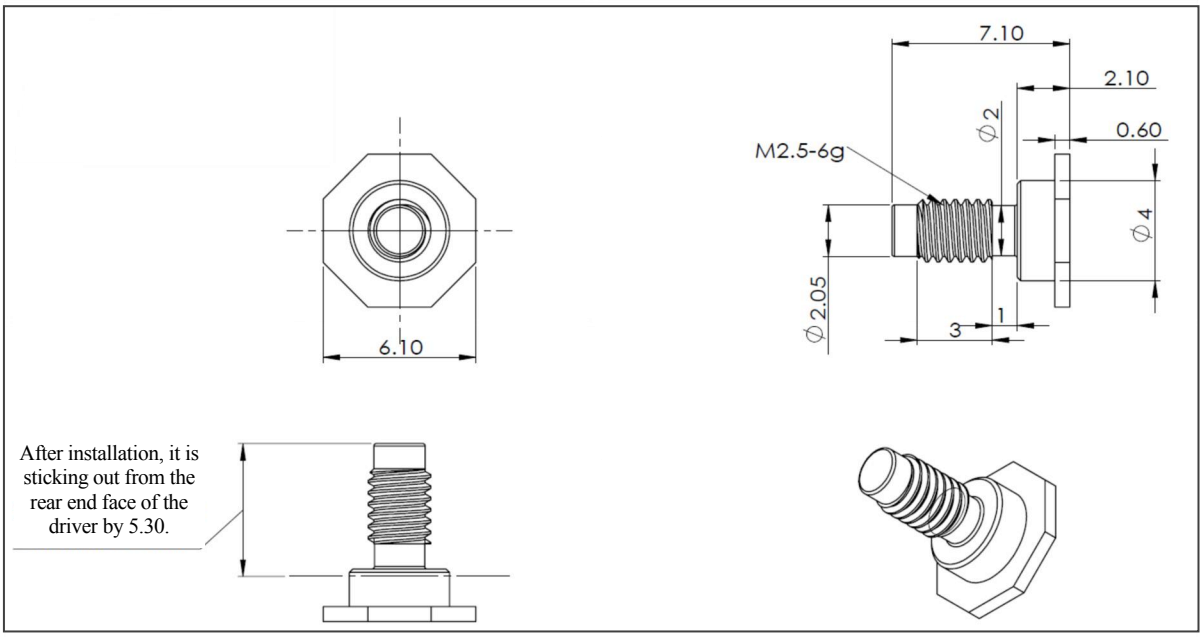

Figure 12: Dimensions of AMI-LA-ACBO-T25

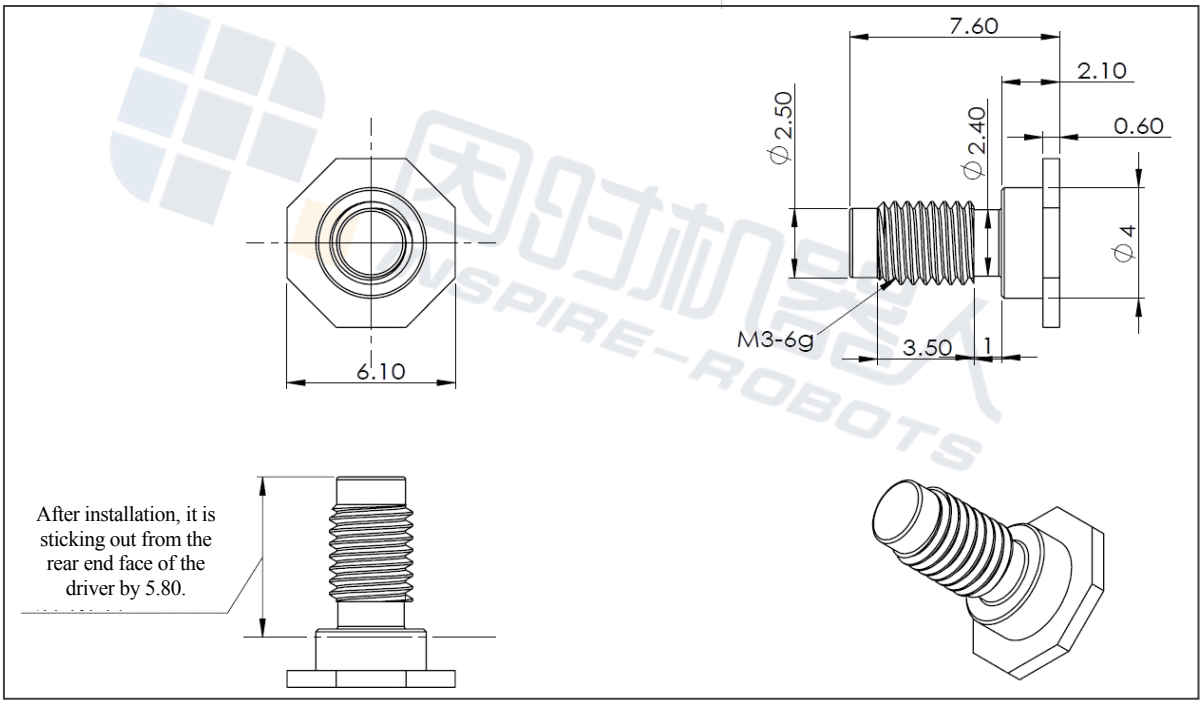

Figure 13: Dimensions of AMI-LA-ACBO-T30

2.4 Male Screw

There is a screw on the rear end of the actuator and the ball bearing has been mounted in the factory. This interface is suitable for LAF and LASF series. The ball bearing is designed to allow the actuator to rotate around the center of the ball bearing within a certain range of angles to reduce the effect of the lateral load on the measurement accuracy of the force sensor.

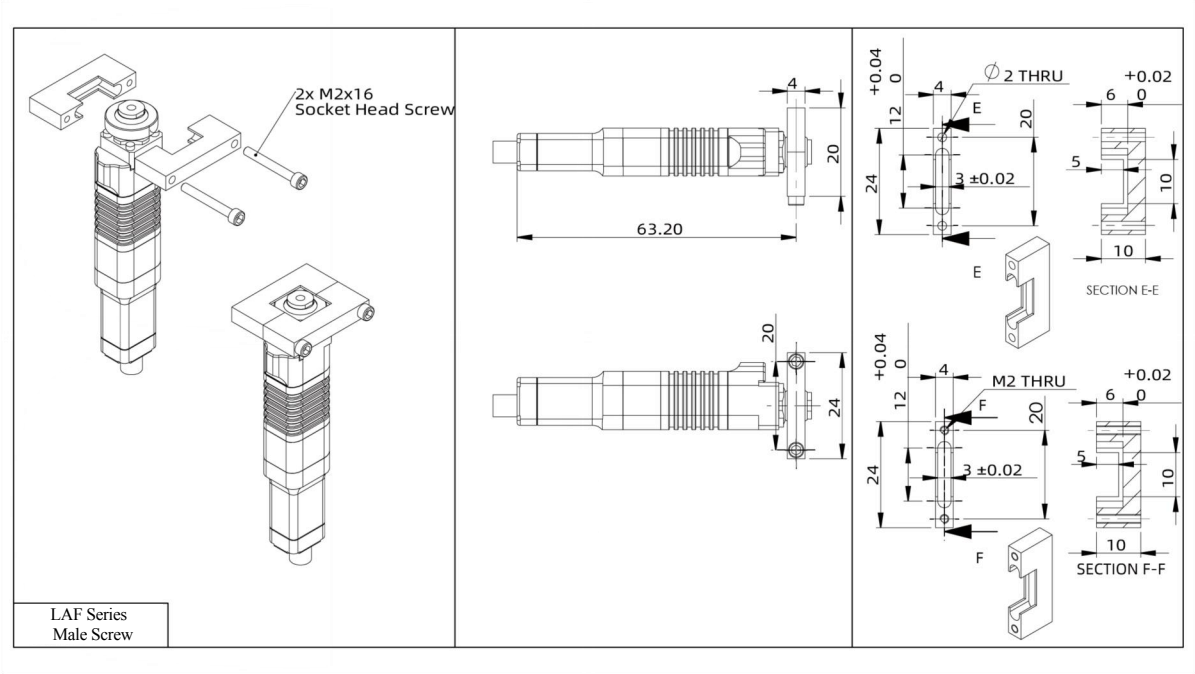

Figure 14: Installation Diagram of LAF Series Male Screw

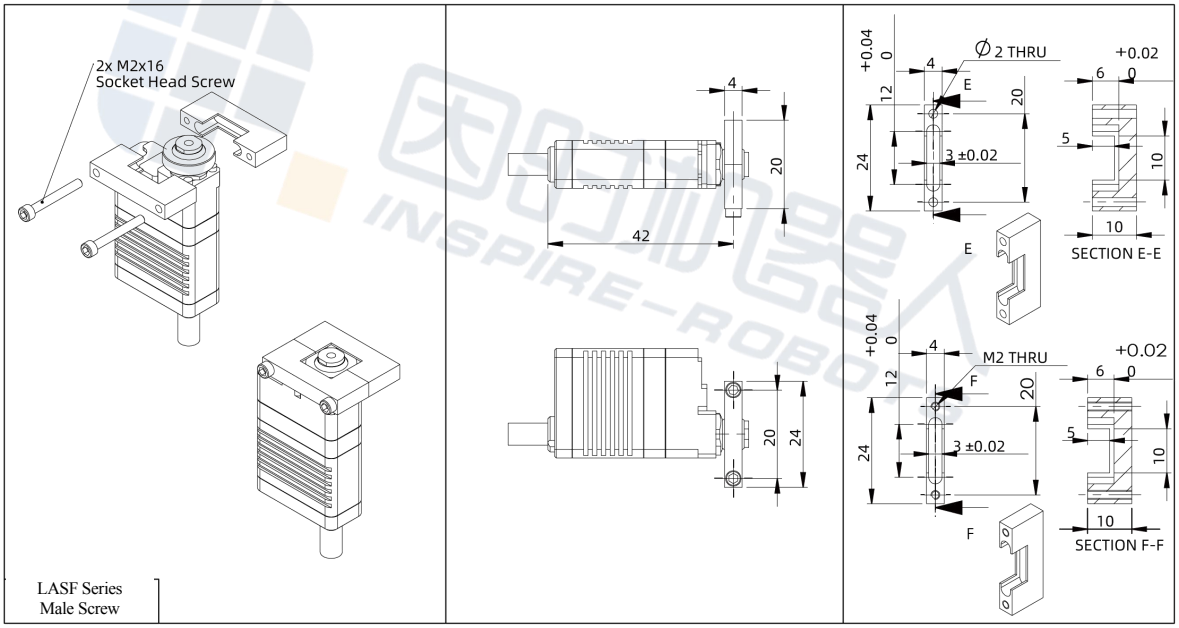

Figure 15: Installation Diagram of LASF Series Male Screw

Where there is an appropriate installation space, it is recommended to add a linear guide in the front of the push rod to remove the lateral load and eliminate the effect of the lateral load on the measurement accuracy of the sensor.

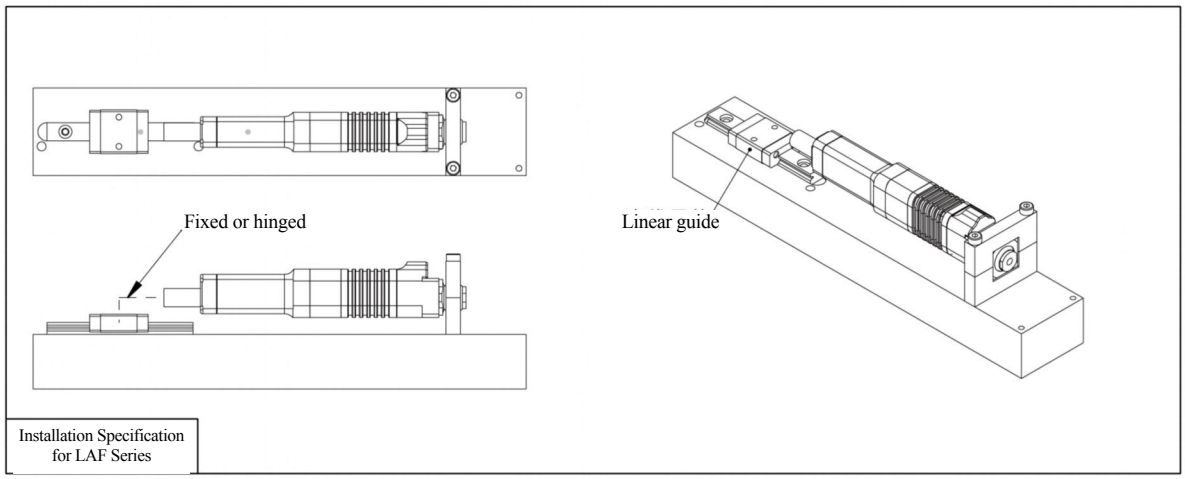

Figure 16: Diagram of Adding a Linear Guide to LAF Series Male Screw

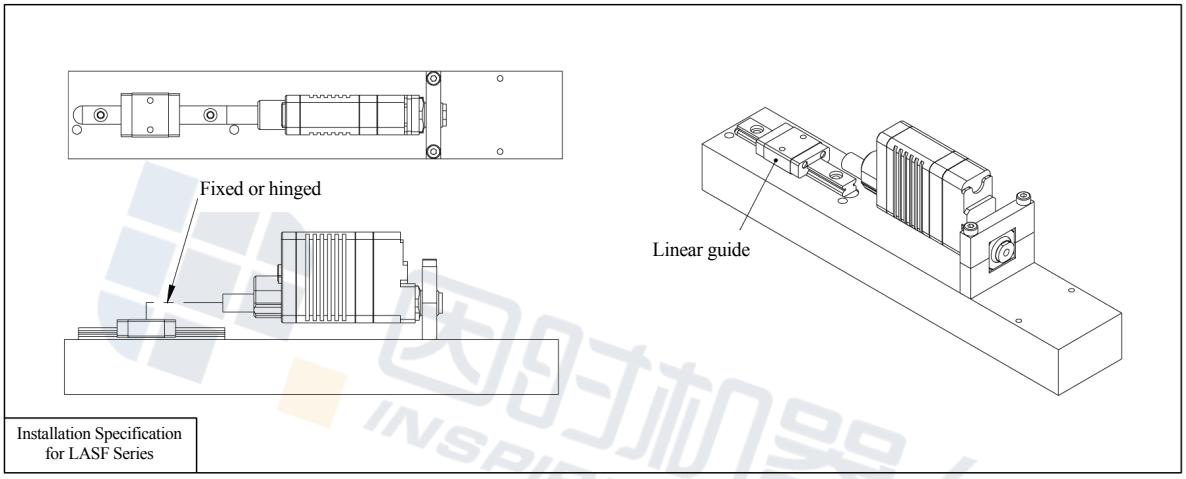

Figure 17: Diagram of Adding a Linear Guide to LASF Series Male Screw

3 Push Rod Joint

For all actuator models, on the front end of the push rod is a M3 standard female thread with a depth of 3 mm. The push rod joint can be selected as needed.

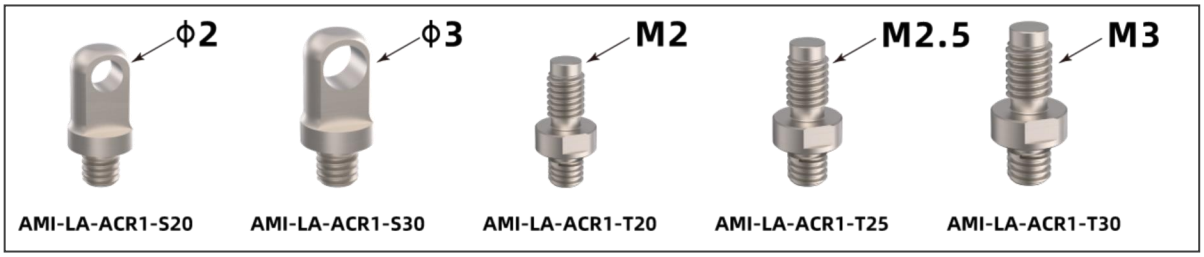

Figure 18: Various Push Rod Joint Models

Push Rod Joint	Model	Description	Assembly diagram
	AMI-LA-ACR1-S20	φ2 through-hole	
	AMI-LA-ACR1-S30	φ3 through-hole	
	AMI-LA-ACR1-T20	M2 screw	
	AMI-LA-ACR1-T25	M2.5 screw	
	AMI-LA-ACR1-T30	M3 screw	

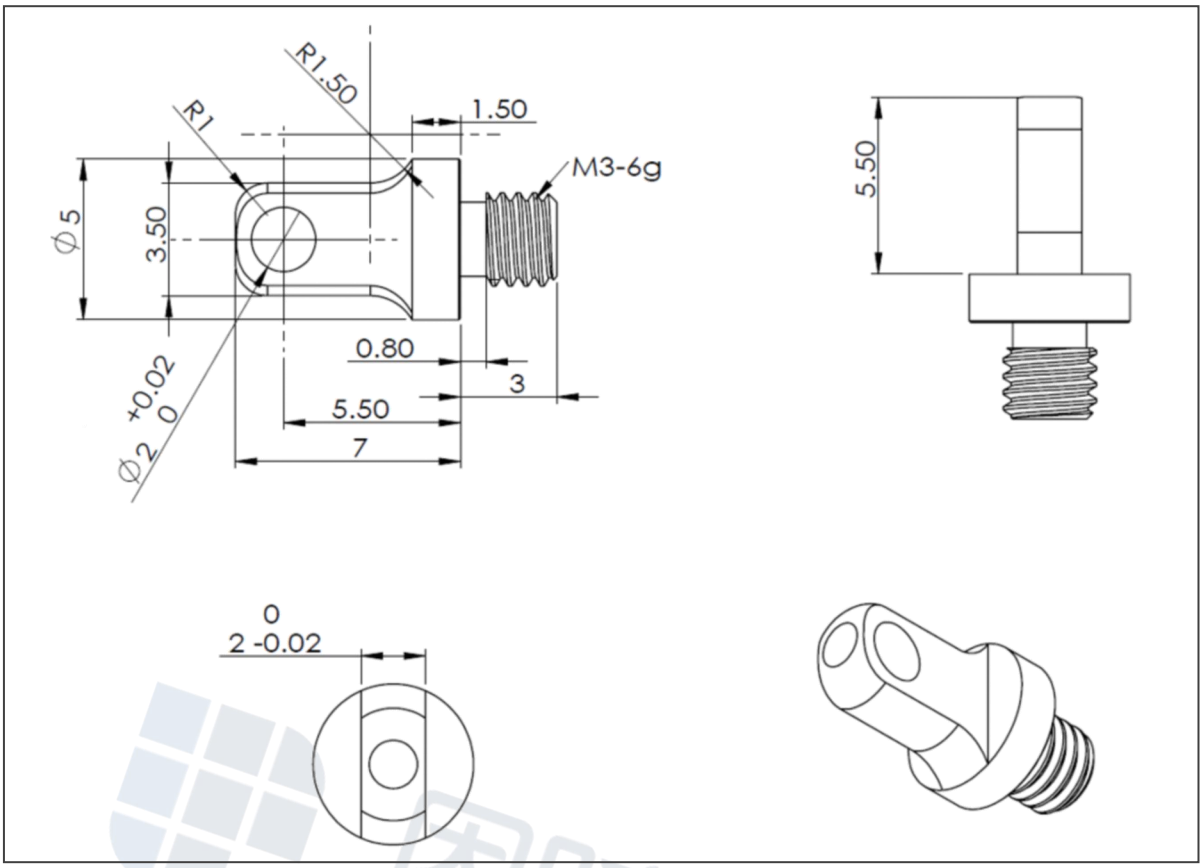

Figure 19: Dimensions of AMI-LA-ACR1-S20

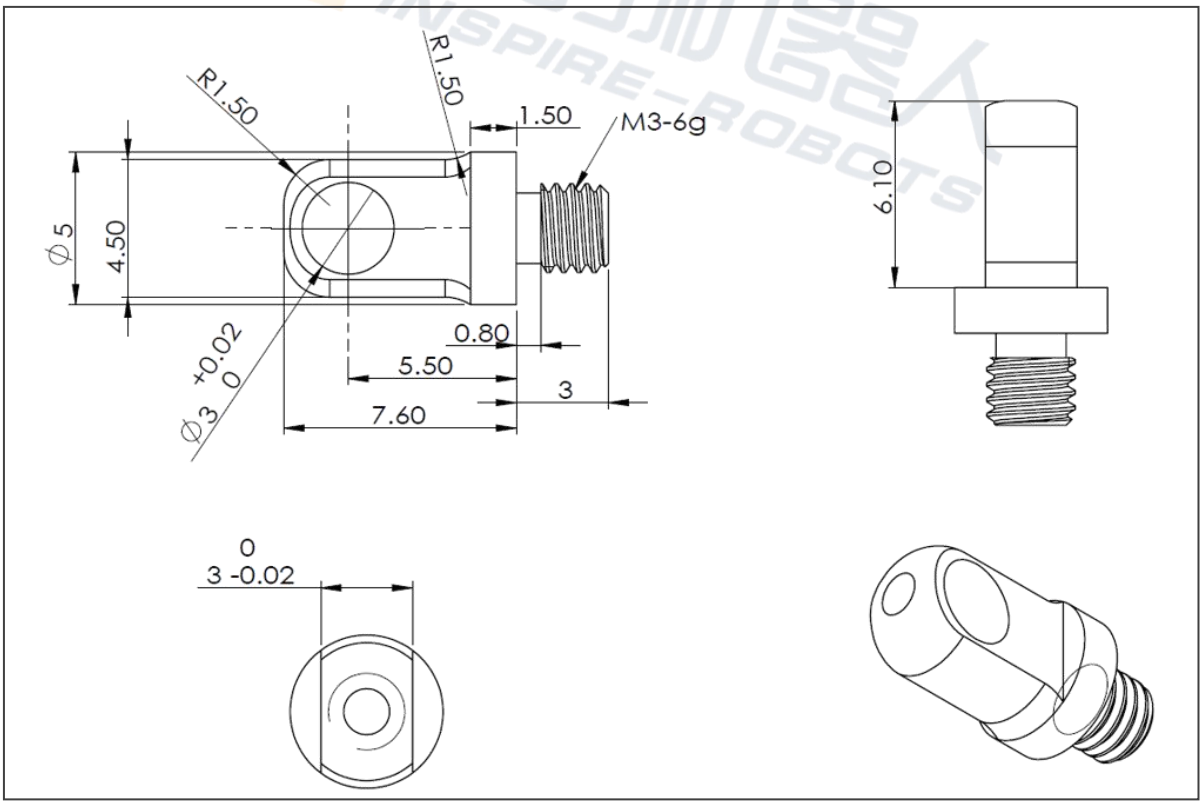

Figure 20: Dimensions of AMI-LA-ACR1-S30

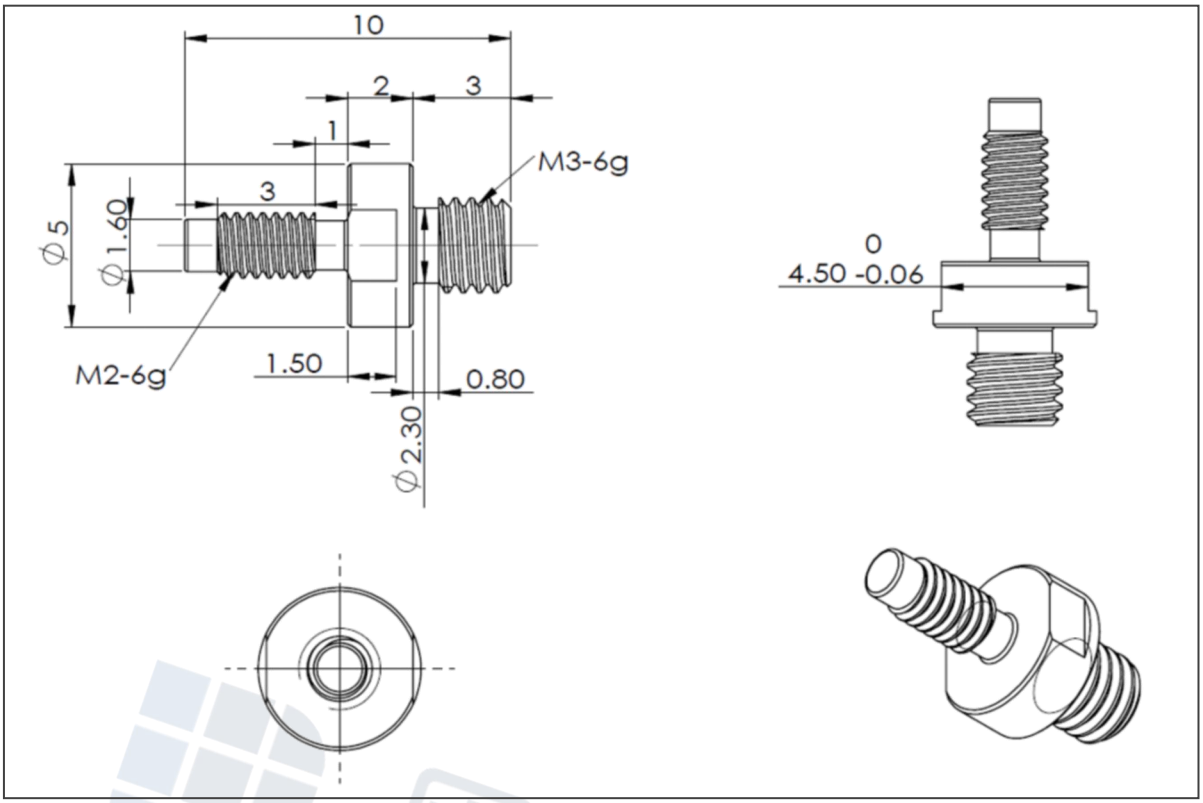

Figure 21: Dimensions of AMI-LA-ACR1-T20

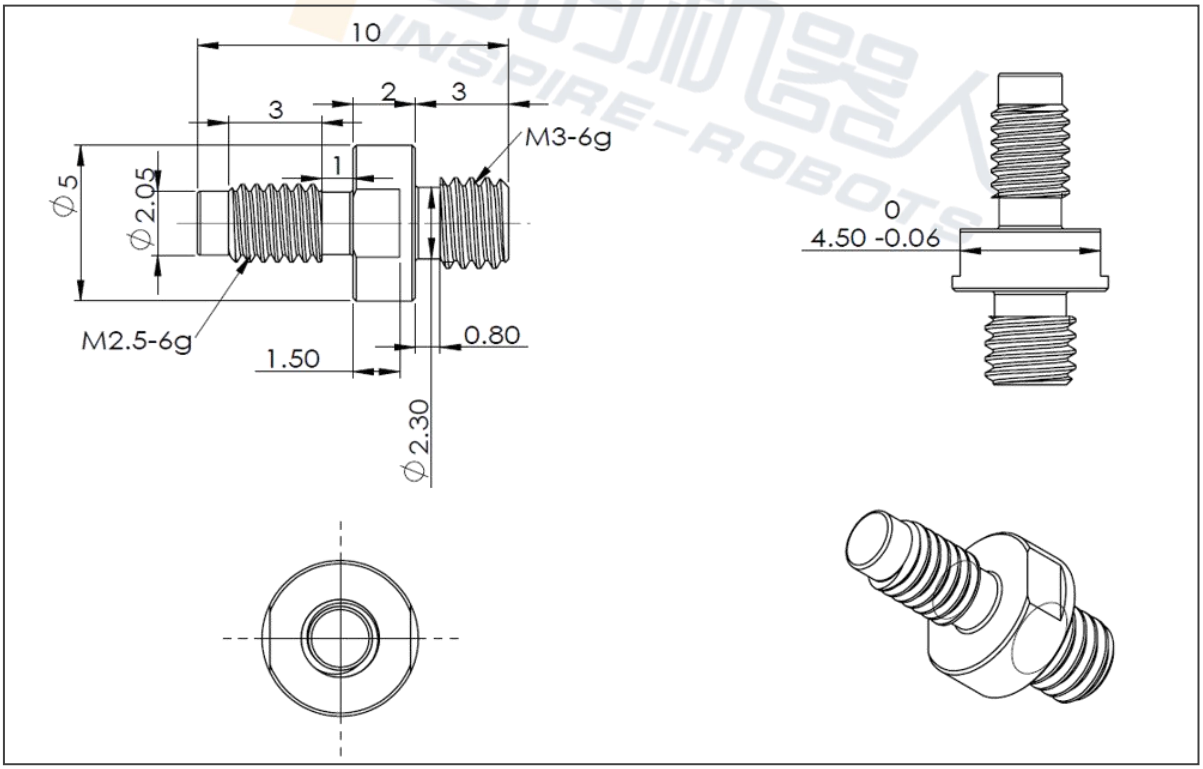

Figure 22: Dimensions of AMI-LA-ACR1-T25

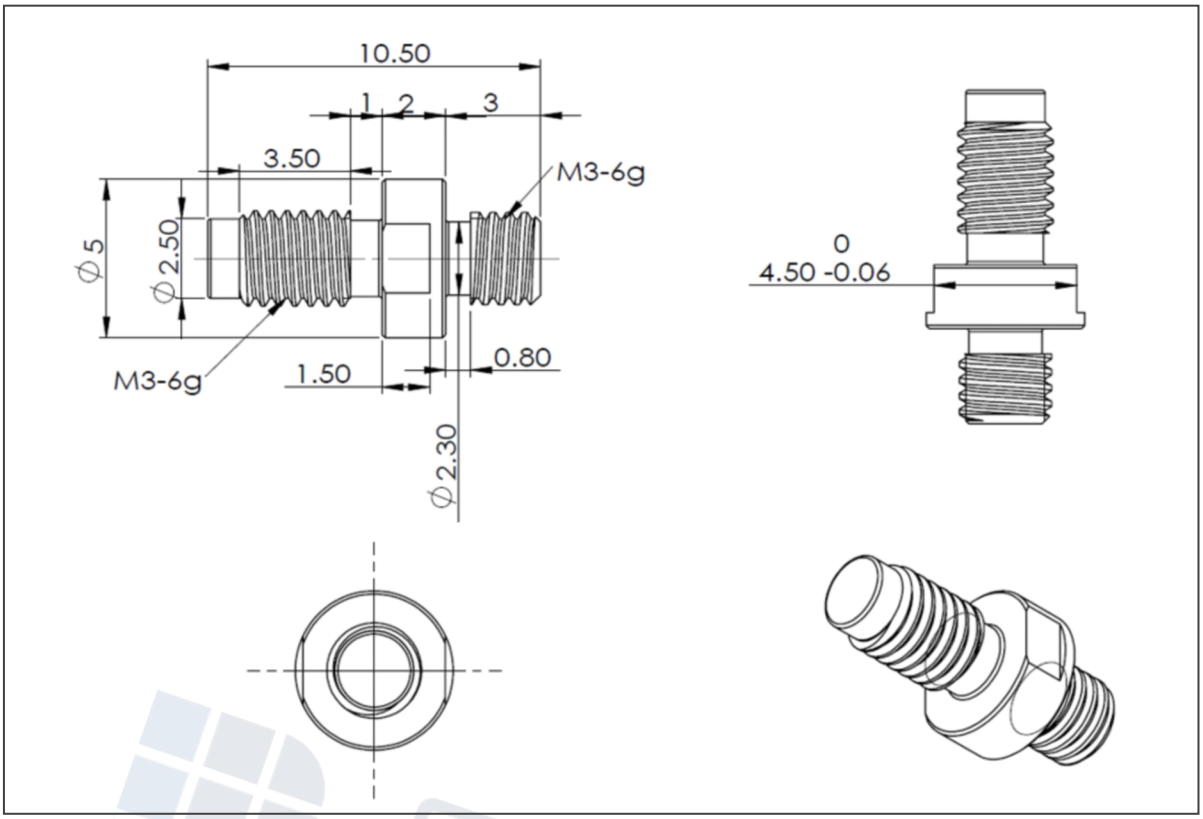

Figure 23: Dimensions of AMI-LA-ACR1-T30

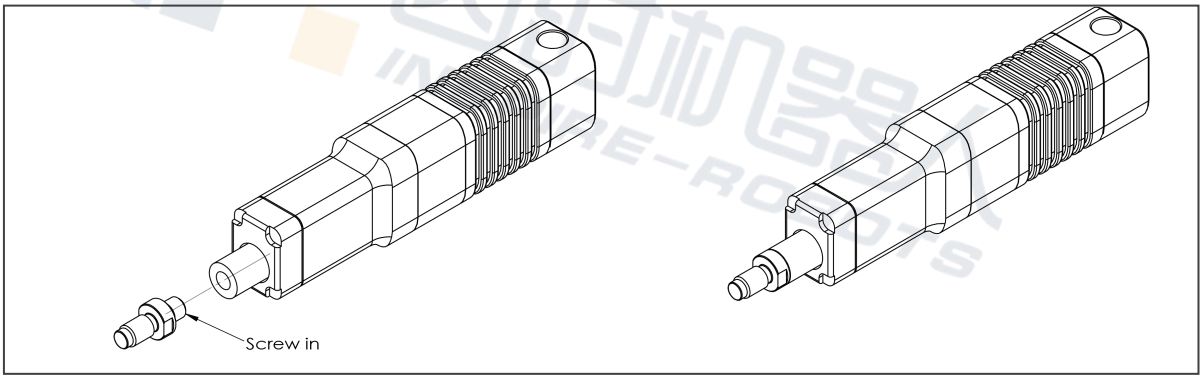

Figure 24: Installation Diagram of Push Rod Joint

4 Ball Joint

A ball joint can also be mounted on the front end of the push rod joint as needed. The ball joint must be used with AMI-LA-ACR1-T30 push rod joint.

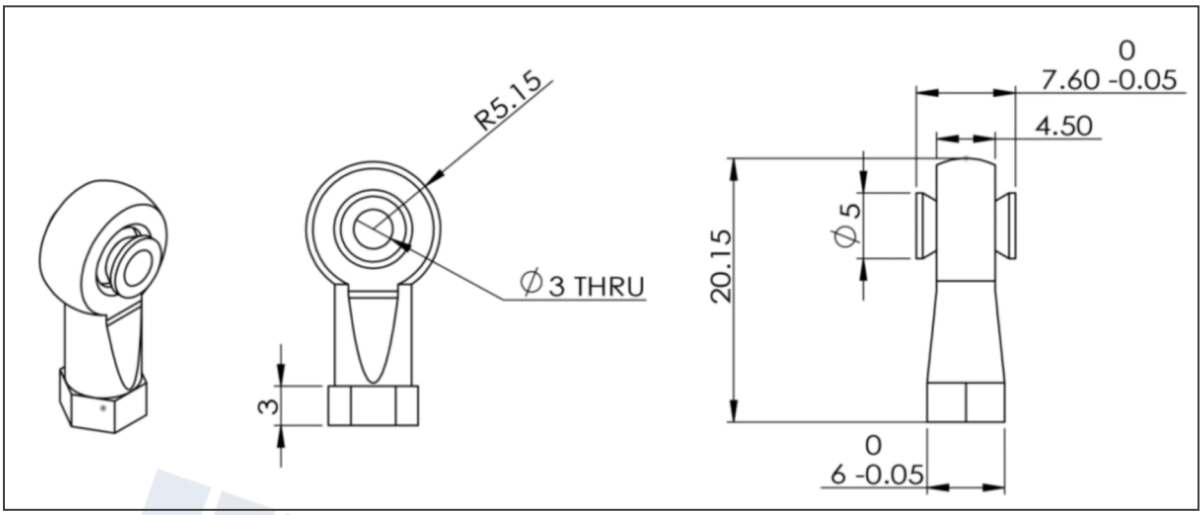

Figure 25: Dimensions of AMI-LA-BR-P30 Ball Joint

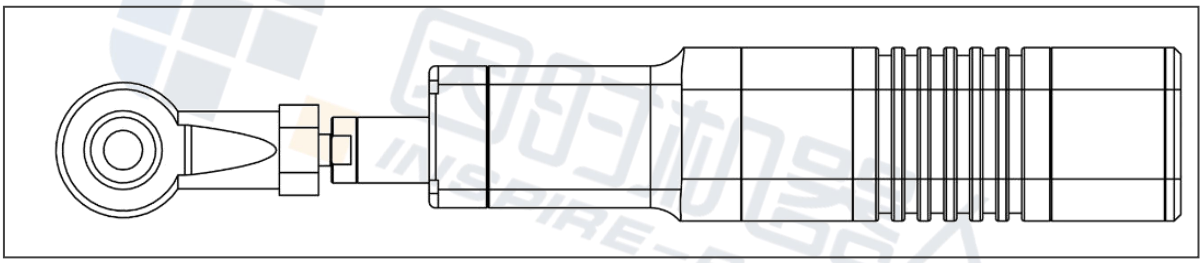

Figure 26: Installation Diagram of Ball Joint

5 Cautions

5.1 Tightening Force of Push Rod Thread

There is a M3 female thread on the front end of the push rod. Before tightening, a small amount of low-strength thread glue may be applied to the M3 screw, with the tightening force not greater than 4 kgf.cm. A torque wrench is recommended for the tightening purpose.

5.2 Maximum Lateral Load of Push Rod

An excessive lateral load will affect the working efficiency and life of the push rod, or even result in its breaking in a serious case. The maximum safe lateral load for the farthest end of the push rod with different stroke is shown in the table below. Please note that lateral load will affect the sticking-out positioning accuracy of the push rod to different extent. Therefore, it is recommended to avoid or reduce the effect of lateral load except for what is specifically needed.

Stroke	Maximum Lateral Load
10 mm	30 N
16 mm	30 N
30 mm	25 N
50 mm	30 N