

## HGS-005 Metal working fluid tapping torque simulation evaluation testing machine

### 1、 Product Introduction:

This machine mainly uses a standard sample tap to tap the standard sample nut blank filled with cutting fluid at a certain speed and record the torque. Evaluate the lubrication performance of the cutting fluid using the torque ratio of the reference fluid to the test fluid. This machine can also use a standard sample tap to tap the nut blanks of different metal materials filled with standard cutting fluid at a certain speed, record the torque, and evaluate the cutting performance of different metal materials using the torque ratio of the reference metal material and the metal material to be tested. In addition, the machine can also perform life tests on taps using standard cutting fluid and standard nut blanks.

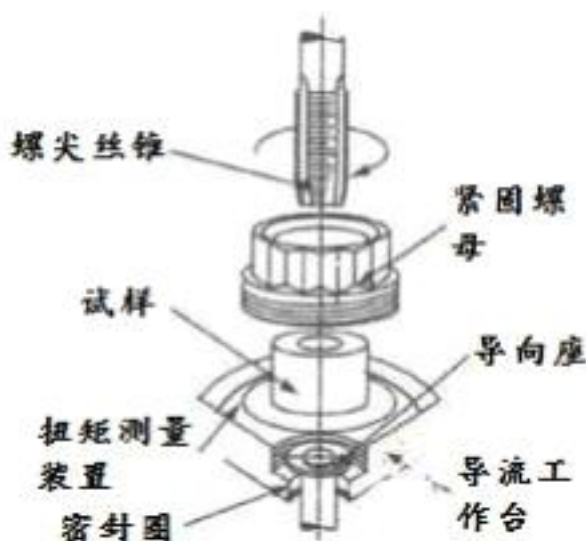
This machine can also evaluate the extrusion lubrication performance of cutting fluid, stamping oil, and rolling oil through standard extrusion taps and standard extrusion nut blanks.

### 2、 Main technical specifications:

NO	The project name	Technical indicators
1	Spindle output torque range	0-10N.M, 0-25N.M
2	Maximum limit torque of the testing machine (non cutting extrusion state)	50N.M
3	Relative accuracy of torque measurement indication	$\pm 1\%$
4	Verify torque accuracy	$\pm 0.3\%$
5	Spindle stepless speed regulation range	5-1000r/min
6	Spindle stepless speed regulation accuracy	$\pm 1r/min$
7	Torque sampling interval setting range	1-9999

8	Standard screw tips, extruded tap specifications	M10×1.5
9	Standard cutting nut blank bottom hole size	Ø8.538±0.004mm
10	Standard extrusion nut blank bottom hole size	Ø9.337±0.004mm
11	Overall dimensions of the host/control cabinet (L×W× H)	700x450x800/560x520x1500

### 3、 Introduction to Structural Principles



#### 3.1 Working principle of the testing machine

This machine adopts an AC servo motor and an AC servo speed control system to achieve stepless speed regulation and constant torque output of the main shaft. Special sensors are used to measure the tapping torque at high speed, protect the tap and motor, extend the service life, adjust the closed-loop speed to calculate the number of revolutions, use starting torque to control the start of the revolution counter, set the sampling interval based on the number of revolutions, and use a torque calculator to calculate the average torque within the sampling interval, Control the commutation of



the motor and the clutch of the electromagnetic clutch with a travel switch, while the computer records the torque curve in real-time and marks the start and end of the sampling interval.

### 3.2 Mechanical transmission system

The rotation and movement of the sample tap of this machine are driven by an electric motor, and its transmission process is as follows:

The servo motor drives the driving wheel to rotate, and the driving wheel drives the driven wheel to rotate through an arc toothed synchronous belt. The driven wheel drives the transmission shaft to rotate, and the transmission shaft drives the main shaft to rotate through the transmission pin. The screw rod rotates and moves downwards (or upwards) through the transmission nut, causing the sample tap installed on it to rotate and move downwards (or upwards).

### 3.3. Torque transmission system

The tapping torque of the sample tap on the sample nut blank of this machine is measured by a sensor. The sample tap taps the sample nut blank to generate torque, which is transmitted from the sample nut blank to the circular workbench through the locking nut and stop pin. The circular workbench and the inner ring of the torque sensor are connected together through threads, and the outer ring of the torque sensor is fixed to measure the change in torque.

### 3.4 Torque measurement control system

The control system of the testing machine adopts an upper and lower computer structure, which includes torque measurement control



Speed and revolution measurement control, full duplex communication with the upper computer, which mainly includes real-time display of various parameters, curve display processing of torque time, and calculation of average torque.

Torque measurement and control are the core of the measurement and control system of the machine. The average torque is the main measurement parameter, and its accuracy directly affects the accuracy of the testing machine. The machine uses a microcontroller for data processing and control. Due to the wide range of tapping speed and the large torque fluctuations during the tapping process, in order to ensure accurate testing data, a twelve bit high-speed AD converter is used for A/D conversion, and the measurement of average torque adopts an integral average method, During the measurement process, the torque sampling frequency changes with the speed, ensuring that the number of samples per revolution is the same at different speeds.

### 3.5 Speed and revolution measurement and control system

Revolution measurement and torque measurement are mutually controlled. The start and end of revolution counting are controlled by the starting torque, while the selection of the average torque range is set by the number of revolutions. The speed sensor uses a photoelectric encoder.

### 3.6 AC servo speed control system

The system adopts an AC speed regulation control system, which has outstanding advantages such as bidirectional working mode, high efficiency, good symmetry, and a wide speed regulation range, superior performance, smooth and noise free operation. The system has functions such as forward and reverse control, motor overcurrent



protection, limit protection, and overspeed protection.

3.7 The computer software measurement and control system, a torque testing machine dedicated control system independently developed by Hengxu, has the following functions

- ① Easy to operate, user-friendly interface, integrated display of parameters such as speed, revolutions, torque, friction coefficient, and data processing and analysis.
- ② Real time display of various curves, curve comparison display.
- ③ Complete protection function, with multi parameter data protection set according to working conditions.
- ④ Export and store the original experimental curves and data.

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