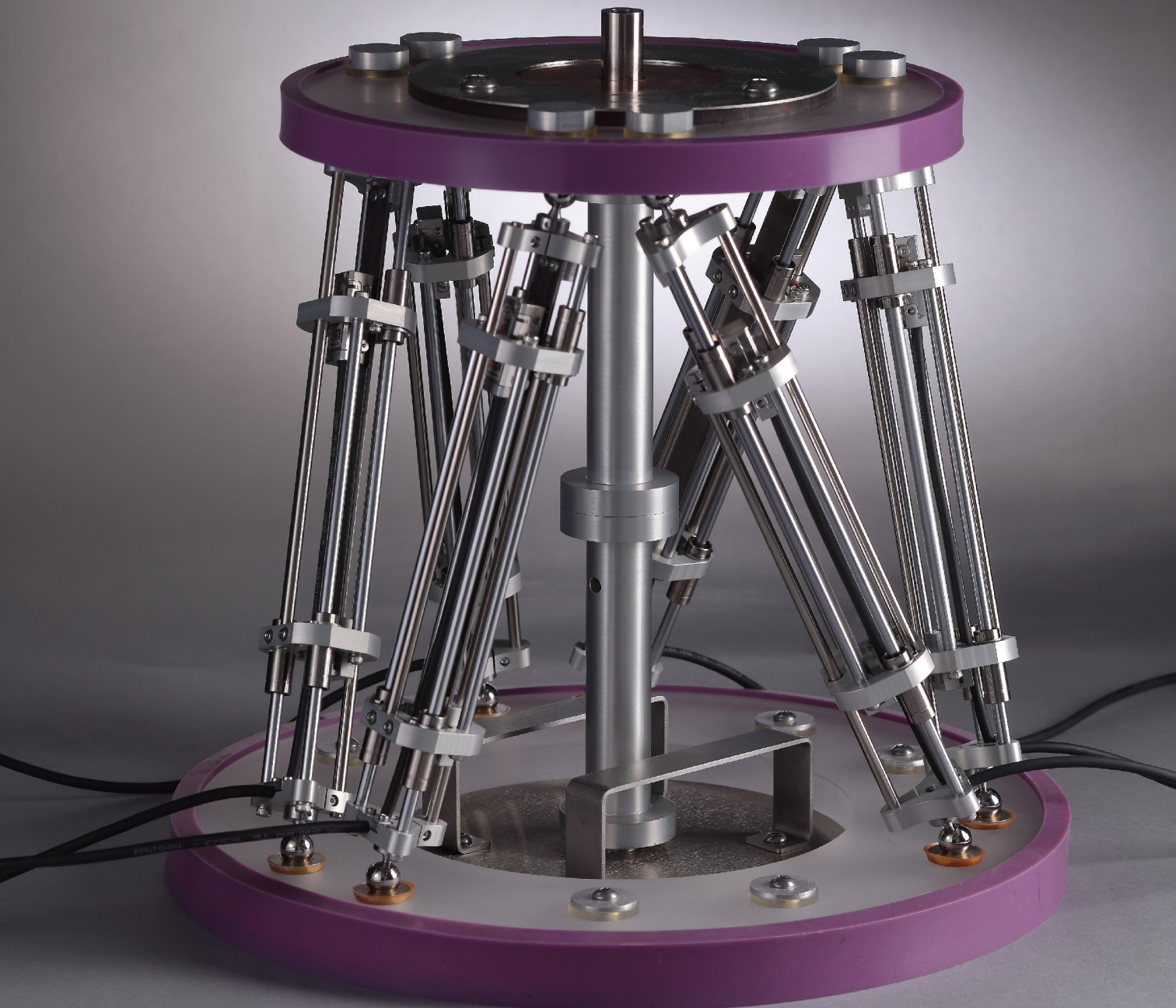


LEI & SO Co., Ltd.

MMD-200

Six-Dimensional Motion Measurement Device

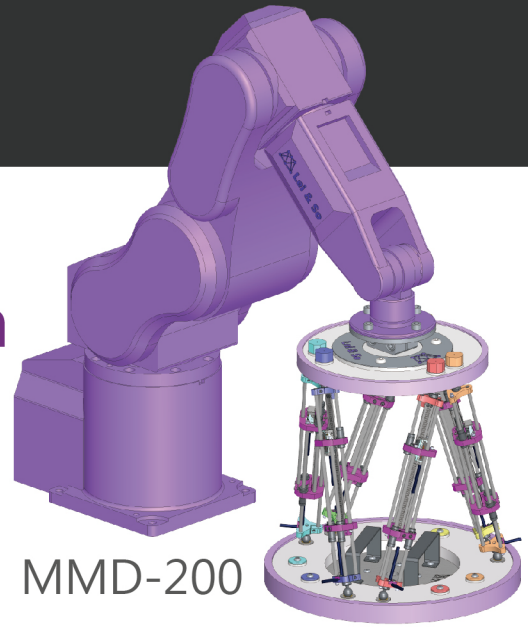


Installation and Measurements Once and for All



Introduction

The Six-Dimensional Motion Measurement Device (MMD) is an innovative product of the LEI & SO Co., Ltd. The MMD is designed to measure the motion of the tool relative to the workpiece on a machine in shop floor. The measured motion is six-dimensional, including three translations and three rotations. Once the MMD is installed on a machine, it can be used for all kinds of measurements and inspections such as the calibration of DH kinematic parameters of a industrial robot, the calibration of link parameters of the two rotary axes of a five-axis machine tool, the tracking of dynamic motion errors and the measurement of thermal errors of a main spindle.



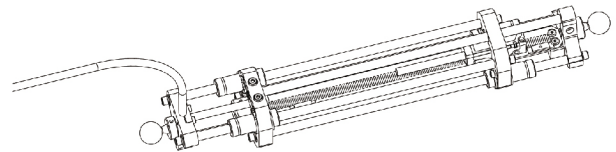
MMD-200

Six-Dimensional Motion Measurement Device

Features

High rigidity optical scale ball bar

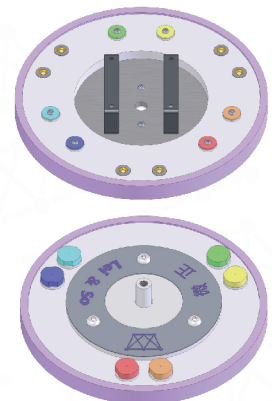
The three parallel rods of the optical scale ball bar form a spatial structure with excellent rigidity against bending. The parallel rod is made of material INVAR, which is well



known for its low CTE. The use of optical scale as displacement sensor for the ball bar has the advantages of high accuracy and large measuring stroke.

Thermally stable platforms

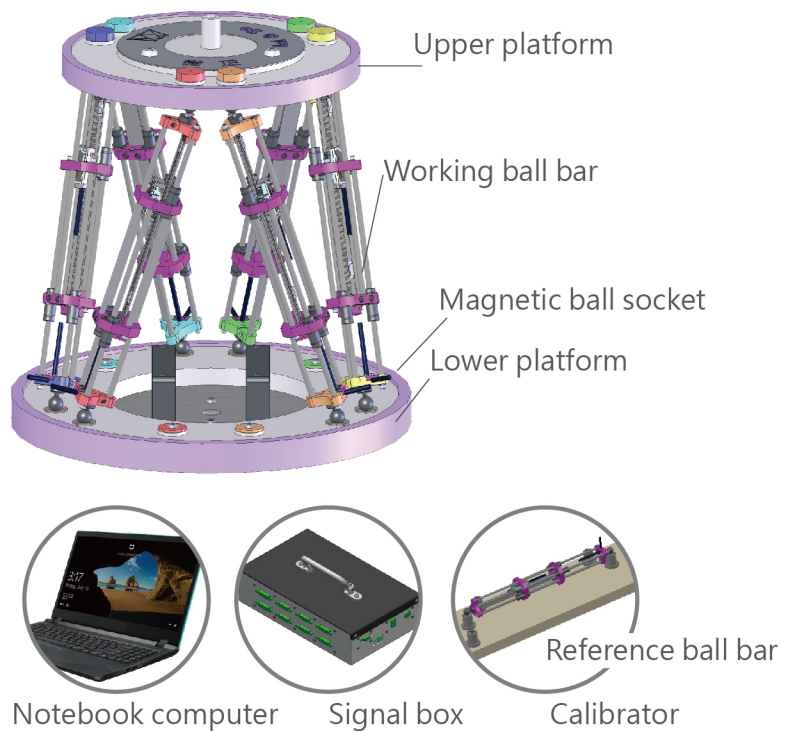
The upper platform and the lower platform have multi-layer design. The quartz glass layer provides thermally stable locations for the centers of the ball joints under changing ambient temperature. The quartz glass layer is supported by the INVAR metal layer, which bears loads resulting from transport and installation.



System description

The MMD has the parallel kinematics of a Stewart platform, consists of one upper platform and one lower platform. Each platform has six magnetic ball sockets on it. Six working ball bars connect the two platforms and form the parallel measuring kinematics. Each working ball bar is equipped with an optical scale of the highest accuracy. The near-zero CTE calibrator is used to initialize the lengths of the working ball bars. During the measurement, an extra reference ball bar is placed on the calibrator, which enables an accurate compensation of thermal errors of the working ball bars. The signal box gathers the displacement signals of all ball bars and communicates with a notebook computer via the USB interface. A powerful motion measurement system runs on the notebook computer and provides user with friendly interface.

Six-Dimensional Motion Measurement Device



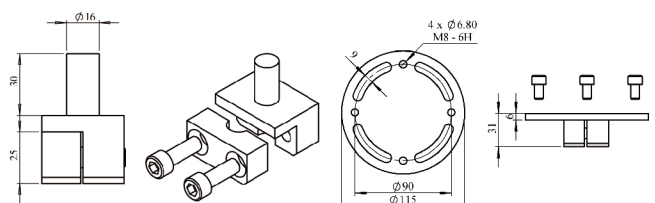
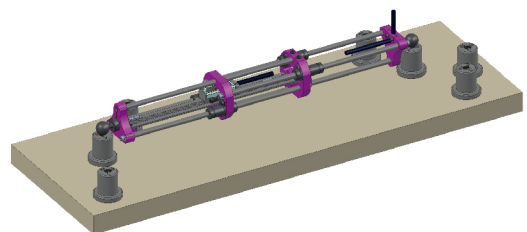
Thermal errors compensation

A challenge of MMD is to maintain its measuring accuracy under changing ambient temperature in shop floor. The patented method* uses a reference ball bar to measure and compensate dynamic thermal errors. The reference ball bar is placed on a calibrator having near zero CTE, so that its readings are the real thermal errors induced by the changing ambient temperature. Since the working and the reference ball bars have the same structure, their thermal errors are nearly equal. The compensation of thermal errors of all working ball bars is thus very efficient.

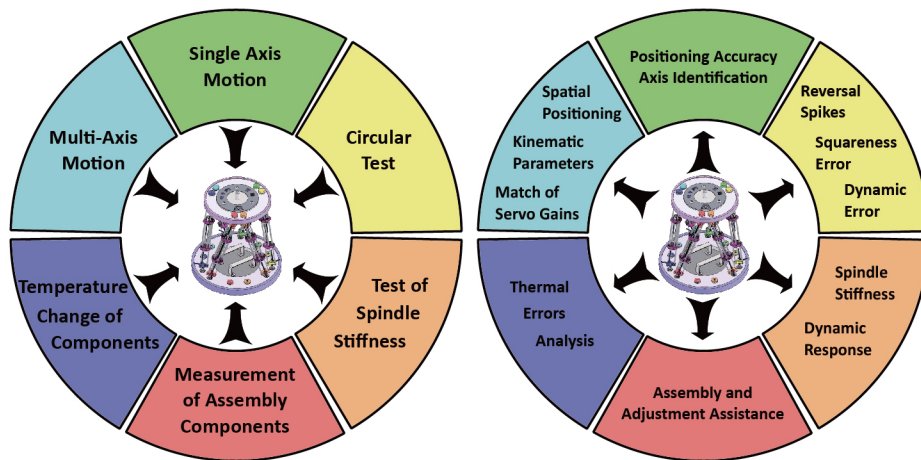
*US10209048B2, TWI585363, CN201611091440.8

Interfaces for installation

The MMD can be used for different kinds of machines, including machine tools and industrial robots. To make the mount of the upper platform on the target machine quickly and easily, two standard interfaces are provided, which include a cylindrical shaft and a circular plate.



Applications

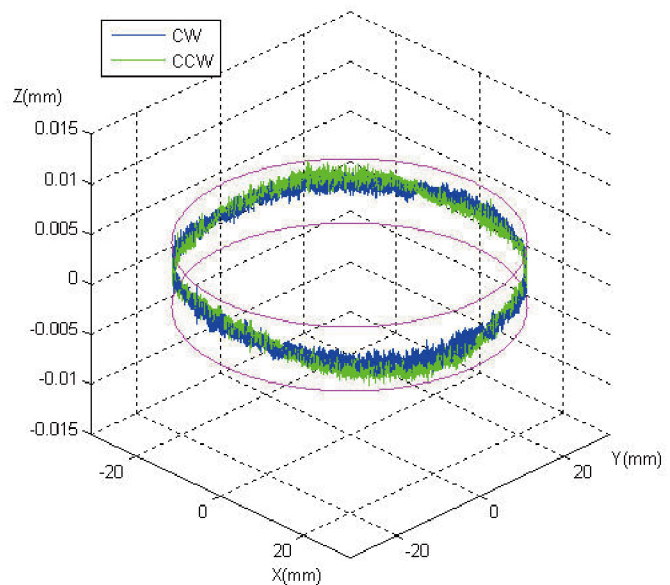
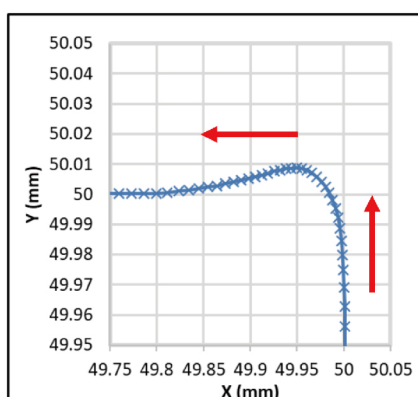
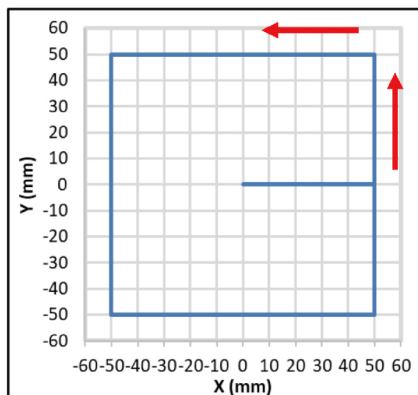


Measurement of dynamic motion

The MMD can measure dynamic motion errors of any continuous or non-continuous motion. The type of motion includes point-to-point, linear, circular, spline, NURBS and any combination of them.

6D Circular tracking

In case the MMD is used for a circular tracking, the measured results show not only the change of radius, but also the three translational and three rotational motion errors during the circular tracking.

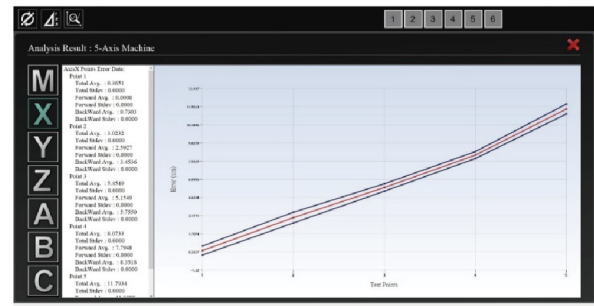
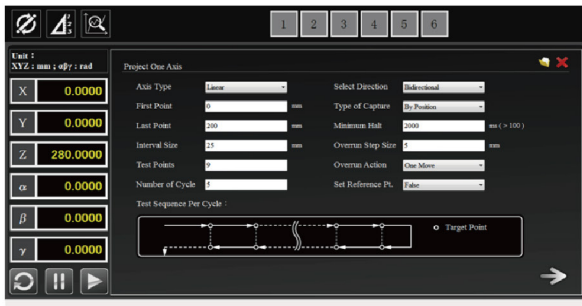




Motion Measurement System MMS

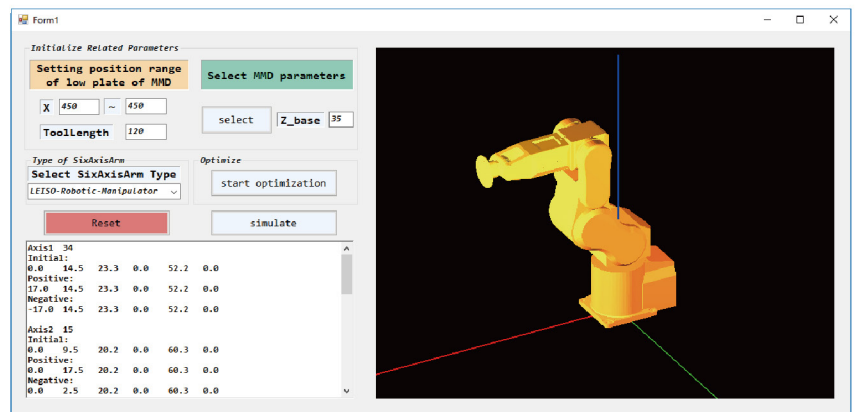
The powerful 6D motion measurement system MMS has very simple and friendly user interfaces. The MMS helps user installing the MMD, setting parameters for the measurement, performing measurement functions step by step, and finally outputs the results in desired formats.

Software system



Intelligent test paths generation

This APP helps user generating optimal test paths for the measurement of DH parameters of a robotic arm. User inputs the kinematic parameters and position of the lower plat-



form, the APP outputs optimal test paths. Before starting the test, a visual simulation helps reducing the risk of collision.

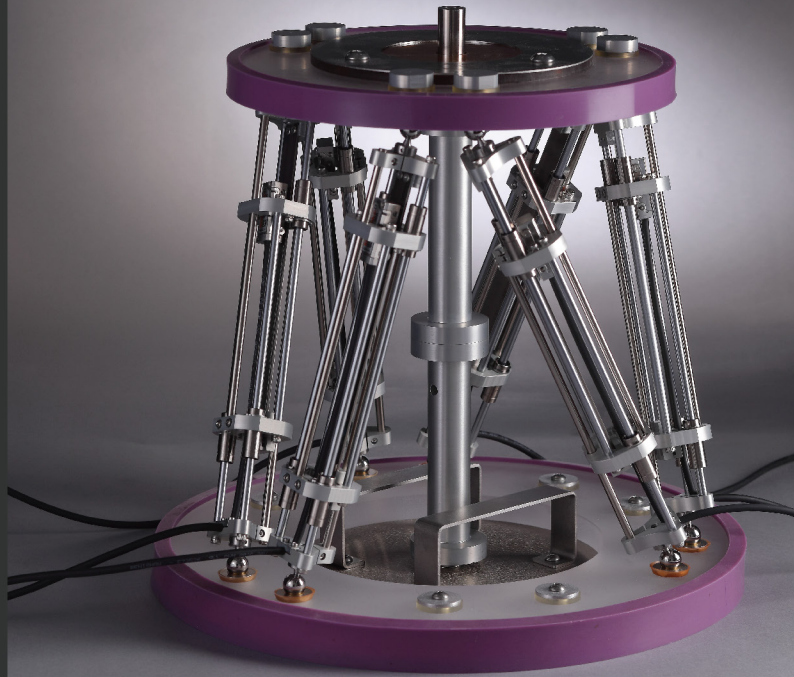
Specifications

Motion space	X	200 mm
	Y	200 mm
	Z	100 mm
Degree of measurement		6 (3 linear+3 rotational)
Accuracy	Linear	XY : 2 μ m, Z : 1 μ m
Sampling frequency		1 KHz
Operating temperature		0°C-40°C
EMG stop	voltage	12/24 VDC
	current	85 mA
Resolution of optical scale		50 nm
Notebook interface		USB 2.0 or above
System requirement		Windows 7 or above (includes .NET 4.0 Client)
Power		100~240 VAC
Max. speed of ball bar		100 mm/s



About LEI&SO

Lei & So Co., Ltd. is an innovation driving company. We deliver highly reliable, accurate optical scale ball bars and measurement devices based on it, such as 6D motion measurement device (MMD) and 2D ball bar box (BBB).



Contact

Lei & So Co., Ltd. (R&D)

No. 101, Sec. 2, Guangfu Rd. Incubation building R712
Hsinchu, TAIWAN, R.O.C.

TEL: +886 (0) 3 5615656

E-mail: services@leiso.com.tw

Website: www.leiso.com.tw

Gongin Precision Ind. Co., Ltd. (General Agent)

No. 168, Bade 2nd Rd., Renwu Dist., Kaohsiung City,
81453 TAIWAN, R.O.C.

TEL: +886 (0) 7 3597177

E-mail: service@mail.gongin.com.tw

Website: www.gongin.com.tw