



ROBODYN

INDUSTRIAL ROBOT CALIBRATION AND ISO PERFORMANCE TESTING





ROBODYN

Full Inspection and Calibration for Industrial Robotics

The RoboDyn robot calibration and inspection system delivers complete robotic control, making it simple to make the most of the precision, flexibility and intelligence automated systems have to offer.

With the ability to calculate robot base alignment and tool centre point offsets as well as directly correct and compensate for robot parameters, RoboDyn software is the perfect tool for improving absolute positioning and performance of robotics. Designed to meet the demands of the ISO 9283 standard, RoboDyn guarantees accuracy and reliability throughout automated operations.

Simple and easy to use, RoboDyn allows for on-the-spot modification of robot models, followed by fast recalibration. Coming alongside the full capability for offline simulation, RoboDyn has the potential to transform process productivity across manufacturing, installation, testing, maintenance and logistics areas.

For static and dynamic data acquisition, RoboDyn requires use in conjunction with a Leica Absolute Tracker featuring precision, speed, large measurement range, portability and the capacity for 6DoF measurement.





RoboDyn software makes robot calibration simple and straightforward as the straightforward straightforward, and has been very useful in evaluating the performance of industrial and cooperative robots."

Jinwon Lee, Korea Institute for Robot Industry Advancement, Daegu, Republic of Korea

ROBODYN

Performance testing according to ISO 9283, Calibration and Accuracy Improvement on **Virtually Any Industrial Robotic System**

The RoboDyn software suite provides the full range of functionality required to simulate, check and calibrate industrial robots.

Offering direct connectivity between Leica Absolute Tracker systems and a variety of robot technologies, RoboDyn delivers the flexibility needed to connect to virtually any system. Thanks to the open architecture of RoboDyn, any user can extend the software's core functionality by adding custom direct connections and postprocessors.

ROBODYN SIMULATION



The RoboDyn simulation module can represent and analyse line-of-sight issues and offline path creation before connecting to the physical system.

- Path accessibility feedback (joint limitation, inverse kinematics, etc.).
- Simulation of joint, line, circular and spline movements
- Robot movement analysis

ROBODYN CALIBRATION



The calibration module provides a fast and intuitive process for aligning the robot to the laser tracker and calibrating the robot's kinematic configuration in order to improve absolute positioning accuracy.

- Calculation of base alignment and TCP offset.
- Calibration of DH parameters with accuracy to standard or modified conventions.
- Automatic creation of calibration paths.
- Flexible workspace and temperature fluctuation specific calibrations. • Support of linear axes.
- Robot interfacing through direct communication, I/O or stable probing for highest level of flexibility and compatibility.

ROBODYN ISO PERFORMANCE TESTING



The ISO test module allows for accuracy and performance testing according to the ISO 9283 standard with any industrial robot.

- Compliance with ISO 9283 standard.
- Flexible definition of required tests and duration.
- Automatic creation of robotic inspection path.
- Flexible definition of working zones.
- Direct control of robot and laser tracker.
- Numerical and graphical inspection report production.

ISO 9283 Test Parameters

Inspection item	Cycle times	
Pose accuracy and pose repeatability	30	
Multi-directional pose accuracy variation	30	
Distance accuracy and distance repeatability	30	
Position stabilisation time	3	
Position overshoot	3	
Drift of pose characteristics	continuous cycle 8 hours	
Path accuracy and path repeatability	10	
Path accuracy on reorientation	10	
Cornering deviations	3	
Path velocity characteristic	10	
Minimum positioning time	3	
Weaving deviation	3	

Supported Calibration Parameters

- Robot base alignment
- TCP definition
- DH parameters

(according to standard and modified conventions)





Pose accuracy and repeatability



Path accuracy and repeatability of a certain instruction path

LEICA ABSOLUTE TRACKER

Leading Accuracy From a Leading Product

A long-term standard in industrial metrology, laser tracker systems from Hexagon Manufacturing Intelligence lead the field of portable measurement in terms of accuracy, reliability and durability.

In combination with the RoboDyn software suite, Leica Absolute Tracker systems offer unmatched flexibility and performance on robotic applications. This can greatly reduce the time and cost investment required for calibration and testing procedures.

The built-in mini variozoom technology of the Leica Absolute Tracker AT960 provides 6DoF measurement as standard. Pairing the system with a Leica T-Mac can provide immediate robot pose position and orientation information and therefore allows for the full utilisation of the RoboDyn software suite. RoboDyn also delivers 3D functionality when paired with a 3D laser tracker such as the Leica Absolute Tracker AT930 and reflectors.

Versatile quick-release mounting options, including inclined and inverted operation, ensure that the accuracy of a Leica Absolute Tracker can always be applied to the task at hand. With completely sealed units certified to the IP54 standard and integrated environmental monitoring, Leica Absolute Tracker systems deliver reliable results in even the harshest conditions.

Leica Absolute Tracker	AT403*	AT930	AT960
Maximum measuring range (Ø)	320 m	160 m	160 m /60 m
Position accuracy	±15 μm + 6 μm/m	±15 μm + 6 μm/m	±15 μm + 6 μm/m
6DoF support	No	No	Yes**

Typical results are half MPE. * As well as AT401 and AT402.

**Rotation accuracy = ± 0.01 degrees.





Automated Solutions

A machine control sensor for automated 6DoF applications, the Leica T-Mac can be customised for specific purposes including tactile and non-contact inspection, monitoring and correcting robotic systems or controlling automated production elements. Generating not just positional, but also the pitch, roll and yaw data of an object, the Leica T-Mac can deliver up to 1000 measurements every second.

Reflector Measurements

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With optical centring accuracy of $\pm 3 \mu$ m, Hexagon Manufacturing Intelligence reflectors offer a highly accurate solution for line-of-sight measurement. Automatically located and tracked by the PowerLock function of the Leica Absolute Tracker, reflectors allow high-speed dynamic measurement in volumes of up to 160 m (Ø). Available in a range of types and sizes for various applications, they are compatible with any Leica Absolute Tracker.





Hexagon Manufacturing Intelligence helps industrial manufacturers develop the disruptive technologies of today and the life-changing products of tomorrow. As a leading metrology and manufacturing solution specialist, our expertise in sensing, thinking and acting – the collection, analysis and active use of measurement data – gives our customers the confidence to increase production speed and accelerate productivity while enhancing product quality.

Through a network of local service centres, production facilities and commercial operations across five continents, we are shaping smart change in manufacturing to build a world where quality drives productivity. For more information, visit HexagonMI.com.

Hexagon Manufacturing Intelligence is part of Hexagon (Nasdaq Stockholm: HEXA B; **hexagon.com**), a leading global provider of information technologies that drive quality and productivity across geospatial and industrial enterprise applications.

İΠ. COORDINATE MEASURING MACHINES é. 3D LASER SCANNING Ŭ SENSORS 2. PORTABLE MEASURING ARMS **t**t SERVICES LASER TRACKERS & STATIONS MULTISENSOR & OPTICAL SYSTEMS WHITE LIGHT SCANNERS METROLOGY SOFTWARE SOLUTIONS 1 CAD / CAM STATISTICAL PROCESS CONTROL 41 AUTOMATED APPLICATIONS ٩ MICROMETERS, CALIPERS AND GAUGES DESIGN AND COSTING SOFTWARE T)

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