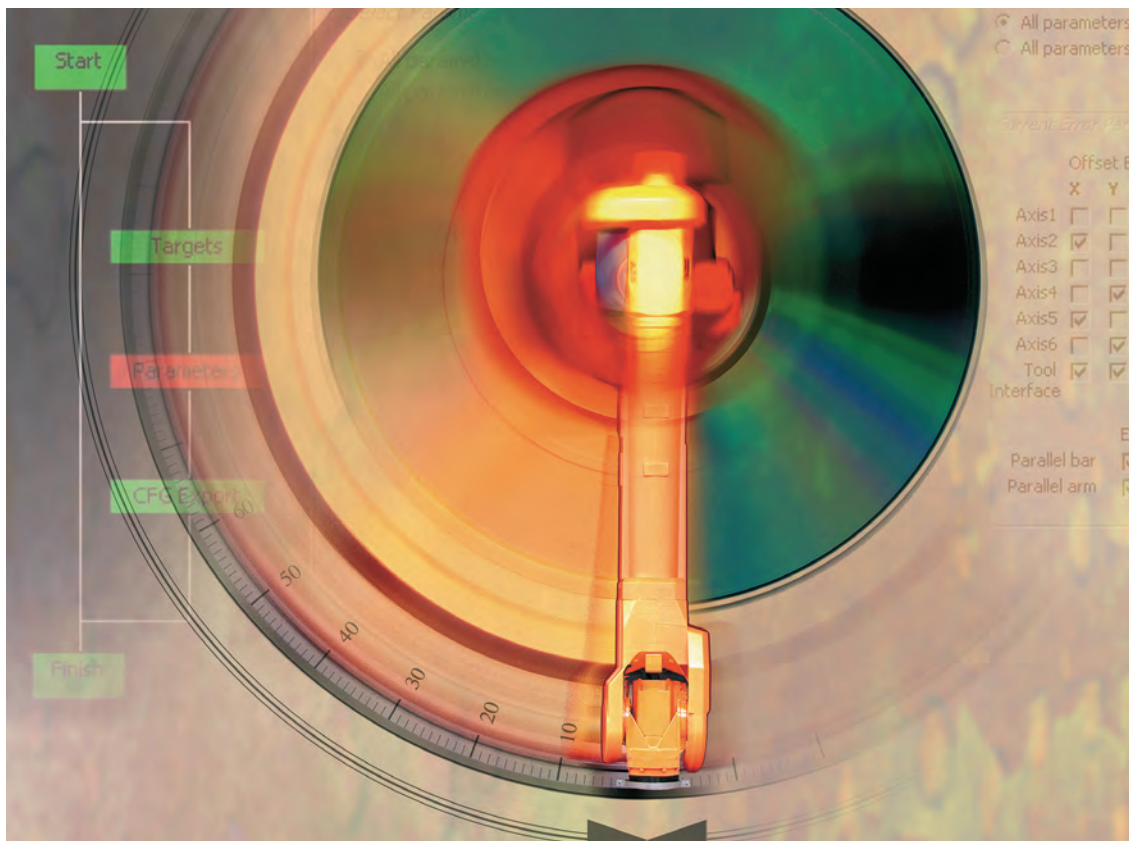# Absolute Accuracy

Industrial Robot Option

Make a real robot an ideal robot

Maintain the accuracy of your robot cells from installation, through motor exchange, fixture realignment and other activities, during the entire robot lifetime. Absolute Accuracy bridges the gap between robots on the factory floor and the virtual robots in your CAD environment. Absolute Accuracy comprises compensation of mechanical properties as well as deflection due to load (adopts to tool data).

Production downtime is minimized because Absolute Accuracy makes your robots exchangeable. Consistency between robots means you can simply replace one robot with another without sacrificing accuracy.

Absolute Accuracy means you install and run a perfectly accurate robot. The same toolkit is used from calibration and verification at the ABB production center, through installation and maintenance. CalibWare, Calibration Pendulum and Controller Software algorithms are consistent between ABB and your site, thus preventing incompatibilities. A clear "Calibration Guideline" helps you through installation and maintenance activities to ensure an optimal result. The accuracy of your robot (even "bending backward" robots) is guaranteed in its entire working envelope.

Shorter turnaround times

Removing errors and difficulties between real and virtual robots shortens your turnaround time for new product models. You save the time and expense of building robot cells as well as loading and running programs for each and every one of them.

ABB

Absolute Accuracy

Product concept

The difference between a virtual robot and a real robot can be typically 8-15 mm, resulting from mechanical tolerances and deflection in the robot structure. The introduction of the ABB Absolute Accuracy concept bridges this gap with a complete accuracy concept for the entire robot lifetime, ensuring a maintainable accuracy of approx 0.5 mm in the entire working range. The Product concept comprises three interconnected aspects.

Controller algorithms

Inherent mechanical tolerances and deflection due to load in the robot structure decrease the robot's absolute accuracy. Practical compensation of such errors is a complex and highly non-linear problem. The ABB solution is to compensate positions internally in the controller, resulting in a defined and measurable robot TCP (Tool Center Point) accuracy. A generic robot model is used for each robot family and robot individuals are described by a set of compensation parameters, determined at ABB Robotics. Accuracy of each robot will be ascertained and verified through the "Birth Certificate" which statistically describes the robot accuracy in a large sample of robot positions.

CalibWare

The CalibWare PC based software tool, together with the Calibration Pendulum, represents the key tools in the Absolute Accuracy Maintenance Toolkit. It enables the user to install, verify and maintain the accuracy of Absolute Accuracy robots throughout the entire robot lifetime. Resident within the RobotStudio environment, CalibWare uses the existing cell layouts developed using the RobotStudio functionality. Features such as automatic pose set generation are easily and efficiently performed using the advanced graphical display of the RobotStudio environment combined with the intelligent calibration software of CalibWare.
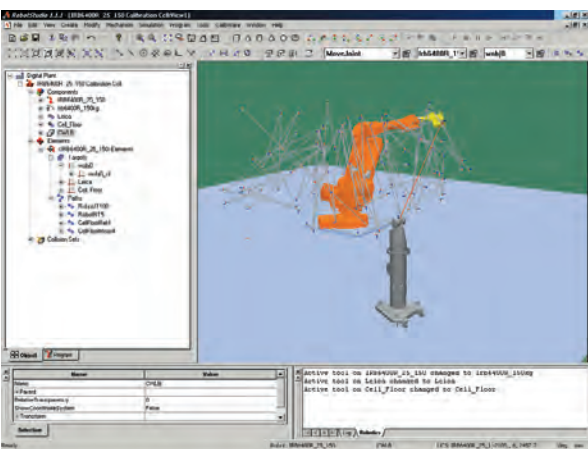
Offline screen of a calibration cell environment inside the CalibWare.

The five major facets of CalibWare are detailed as follows:
- Automatic Pose Set Generation. Simply draw the cell in Robot-Studio, add a robot tool and an appropriate measurement system from the CalibWare Library and generate optimized collision free calibration poses.

- Import of Measurements. Import text file measurements from any 3D measurement system using the proprietary CalibWare import format.

- Calibration. Determine the robot's compensation parameters from a set of robot poses. The parameters are saved in an ABB configuration file for loading into the controller.
- Cell Alignment. Determine coordinate-system relationships between components in the robot cell, including robot base, fixture frames and the World Coordinate System.
- Automated Measurement Capability. Currently supported for systems containing WebWare automation and the Leica LTD500 or automatically measure any calibration poses shown in the RobotStudio environment.

Specials:
- Single Model Approach – Same models in the Industrial robot controller as in CalibWare. Ensures consistency between ABB and Customer site.
- Calibration Checklist – Simple step-by-step guides through calibration activities.
- Accuracy Menu – Cater your maintenance activities to your desired accuracy level.

Calibration Pendulum

The Calibration Pendulum represents the future of level based calibration systems. The pendulum offers complete process semiautomation and security. Advanced automation software in the controller interfaces with a highly accurate measurement pendulum, to offer repeatable calibrations of resolver offsets following maintenance activities such as motor exchange.

Product offer

The ABB Absolute Accuracy function makes a real robot an ideal robot with software compensation of errors caused by load, kinematics and dynamics.

The ABB Absolute Accuracy offer consist of:
1. Robot with Absolute Accuracy Runtime software as optional part of Operating System, including compensation parameters and birth certificate (option 544).
2. The Calibration Pendulum resolver offset calibration tool (3HAC15716-1).
3. CalibWare tool for determination of compensation parameters (applicable parts of RobotStudio included) (3HAC 16090-1).
4. Complementory Absolute Accuracy calibration after delivery (contact Customer Service).

Supported robot types	Position accuracy (Typical production data)		
Robot type	Average (mm)	% within 1 mm	Maximum (mm)
IRB 140	0.35	100%	0.80
IRB1400	0.45	100%	0.95
IRB 2400L	0.45	95%	1.15
IRB 2400/10 and 16	0.30	100%	0.70
IRB 4400	0.30	100%	0.70
IRB 6600-175/2.55; 225/2.55; 200/2.75	0.55	90%	1.20
IRB 6600-175/2.80; 125/3.20	0.75	80%	1.45
IRB 6650S-200/3.00; 125/3.50			
IRB 7600-400/2.55; -150/3.50	0.65	85%	1.40
IRB 7600-500/2.30	0.55	90%	1.20
IRB 7600-340/2.80			

The new resolver offset calibration tool, the Calibration Pendulum, is valid for IRBs 140, 1400 (not H), 2400, 4400 (not S), 6600, 6650 and 7600.

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