

ANSI/RIA R15.05-1-1990

American National Standard

*for Industrial Robots and Robot Systems –
Point-to-Point and Static
Performance Characteristics –
Evaluation*



American National Standards Institute

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10018

American National Standard

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Sponsor

Robotic Industries Association

Approved September 13, 1989

American National Standards Institute, Inc

Foreword (This Foreword is not part of American National Standard ANSI/RIA R15.05-1-1990.)

The objective of this standard is to provide meaningful technical information to help robot users select the best robot for their specific applications. It defines the most important static performance criteria and a method for evaluating them. These criteria are accuracy, cycle time, repeatability, overshoot, settling time, and compliance. These six criteria, selected from a list of nearly thirty, are felt to represent the best indication of the overall static performance of industrial robots.

In order to achieve this means of relative comparison of robots, standard test paths and conditions are used. The results do have limitations and should be supplemented with additional engineering information when considering detailed systems specifications and designs.

The concept of performance classes is also introduced. These classes are used to determine robot performance when used at rated capacity, to optimize maximum cyclic rate, to optimize repeatability or optimize other specific criteria important for certain applications.

A list of recommended specifications is also included. These specifications cover much of the information needed by robot users, such as service requirements, environmental effects, and tolerances.

This standard is not a safety standard and therefore does not directly address the safety issues related to robot performance and operation. It is the responsibility of whomever uses this standard to consult and utilize appropriate safety standards and health practices.

Care should be exercised in the interpretation of the results determined by this standard. Many of the parameters measured using the guidelines described in this standard may change during the life of the robot. The manufacturer should be consulted regarding performance warranties covering the life of the robot.

Use of industry standards, including this standard, is voluntary. The Robotic Industries Association makes no determination with respect to whether any robot, manufacturer, or user is in compliance with this standard.

Suggestions for improvement of this standard will be welcome. They should be sent to Subcommittee R15.05 on Performance, Robotic Industries Association, P.O. Box 3724, Ann Arbor, MI 48106.

Consensus for approval of this standard as an American National Standard was achieved by the use of the Canvass Method.

The following organizations recognized as having an interest in an industrial robot point-to-point and static performance test methodology were contacted prior to the approval of the standard.

Inclusion in this list does not necessarily imply that the organization concurred with the submittal of the standard to ANSI:

ABB Robotics	Hewlett Packard
Adept Technology	IBM Corporation
Advanced Automation	John Deere & Company
Alliance of American Insurers	Kuka Welding Systems
Automated Manufacturing Systems	Lehigh University, Institute for Robotics
Chrysler Corporation	Procter & Gamble
Cimcorp, Inc	Society of Automotive Engineers
Cincinnati Milacron, Industrial Robot Division	United Technology
DeVilbiss Company	University of Tennessee
GMF Robotics	
General Motors Corporation	
• CPC Division	
• Saginaw Division	

Subcommittee R15.05 had the following members at the time it processed and submitted this standard to ANSI for approval as an American National Standard.

Thomas H. Helzerman, Co-Chairman
Steve Walsh, Co-Chairman

D. Scott Ackerson
Hadi Akeel
John Bloodgood
Romeo Bruce
Walt Cwycyshyn
Joseph J. Czerak
Robert Gorman
John W. Hill
B. Sung Kim
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Tom Mize
Joseph Ray
Eugene Rivin
Thomas A. Saari
Robert J. Schlesinger
Mike Sklar
Albert Sturm
Jim Wells
Carl Witham
Michael Wodzinski

Administrative services were provided by James M. Prange and James A. Payton of the Robotic Industries Association.

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1. Scope, Purpose, and Exclusions

1.1 Scope. This standard is intended to facilitate understanding between manufacturers and users of industrial robots and industrial robot systems. It defines the most important performance criteria and a method for evaluating these criteria. Included in this method are performance classes, standard test paths, and standard test loads. Means of measuring these performance criteria are not described in this standard.

No attempt has been made to address orientation errors directly. The effects of such errors are indirectly measured through the use of axial and radial offsets. Orientation errors will result in deviations in the position of the measurement point.

This standard is not a safety standard and therefore does not directly address the safety issues related to robot performance and operation. It is the responsibility of whomever uses this standard to consult and utilize appropriate safety standards and health practices.

NOTE: For the purpose of the remaining sections of this standard, the term "robot" will mean industrial robot or industrial robot system.

1.2 Purpose. The purpose of this standard is to provide meaningful technical information that robot users can utilize for the selection of the proper robot for their specific applications.

1.3 Exclusions. This standard applies to robots and robot systems only and is not intended to apply to the following:

- (1) Automatic guided vehicles and systems
- (2) Automatic conveyors and shuttle systems
- (3) Mobile robots
- (4) Tele-operators
- (5) Prosthetic and other aids for the handicapped
- (6) Automated storage and retrieval systems

- (7) Numerically controlled machine tools
- (8) Personal robots
- (9) Undersea and space robots

This list is not intended to be all-inclusive.

2. Related Standards

The following standards contain additional information but are not essential to completing the requirements of this standard.

ANSI Z244.1-1982, Lockout/Tagout of Energy Sources — Safety Requirements

ANSI/ASQC B1, B2, B3-1985, Guide for Quality Control Charts; Control Chart Method of Analyzing Data; and Control Chart Method of Controlling Quality During Production

ANSI/RIA R15.06-1986, Industrial Robots and Robot Systems — Safety Requirements

ASTM E-122-72, Recommended Practice for Choice of Sample Size to Estimate the Average Quality of a Lot or Process¹

ASTM-STP 15D, ISO Presentation of Data and Control Chart Analysis¹

ISO/DIS 9283: 1988, Manipulating Industrial Robots — Performance Criteria and Related Test Methods²

ISO/DIS 9787: 1988, Manipulating Industrial Robots — Coordinate Systems and Motions²

ISO/TR 8373: 1988, Manipulating Industrial Robots — Vocabulary²

¹Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

²Available from the American National Standards Institute, 1430 Broadway, New York, NY 10018.