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for Industrial Robots and Robot Systems – Hand-Held Robot Control Pendants – Human Engineering Design Criteria



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ANSI/RIA R15.02/1-1990

American National Standard for Industrial Robots and Robot Systems –

Hand-Held Robot Control Pendants – Human Engineering Design Criteria

Secretariat
Robotic Industries Association

Approved December 28, 1990 American National Standards Institute, Inc.

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Foreword (This foreword is not part of American National Standard ANSI/RIA R15.02/1-1990)

This is a technical standard that specifies human factors characteristics for hand-held control devices that accompany industrial robots and industrial robot systems. The R15.02 Subcommittee of the Robotic Industries Association (RIA) initiated the development of this standard after a questionnaire of RIA member standardization preferences revealed a greater need for emphasizing ergonomic aspects in the design of industrial robots. A survey of the more heavily used robot pendants conducted by RIA revealed a lack of uniformity, and conflict in pendant designs. Additional research conducted by the Essex Corporation on behalf of the U.S. Army Human Engineering Laboratory also came to the conclusion that standardization in the area of pendant design is needed. In an effort to develop this American National Standard, the U.S. Army Human Engineering Laboratory has authorized RIA to reproduce a substantial portion of Mil Std 1472C into the text of this document. The R15.02 Subcommittee has made a diligent effort to present in this document practical and reasonable principles to improve pendant design. This standard, however, is not presented as a paragon, and the users of this standard should use it to supplement their good judgment.

The verb "shall" is used in this document to indicate criteria that must be implemented. However, industry standards, including this one, are voluntary. The Robotic Industries Association makes no determination with respect to whether any robot manufacturer or user is in compliance with this standard.

This standard contains three annexes, all of which are informative and are not considered part of the standard.

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

Suggestions for improvement of this standard are welcome. Such suggestions should be based on empirical human factors performance data, or accepted human factors engineering principles and practices as they impact industrial robot technology. Comments and suggestions should be sent to Subcommittee R15.02 on Human Interface, Robotic Industries Association, 900 Victors Way, P.O. Box 3724, Ann Arbor, MI 48106.

The following organizations, recognized as having an interest in human engineering design criteria for hand-held robot control pendants, were contacted prior to the approval of this standard. Inclusion in this list does not necessarily imply that the organization concurred with the submittal of the standard to ANSI. Adept Technology Alliance of American Insurers Aluminum Company of America William Anderson, P.E., Consultant A. O. Smith Automotive Products Corporation Automatix, Inc. Babcock & Wilcox -Naval Nuclear Fuels Division **DeVilbiss Corporation** E. I. DuPont de Nemours & Company -Engineering Development Laboratory Eastman Kodak Company -Kodak Park Division **Essex** Corporation **GMF** Robotics **General Motors Corporation** -Saginaw Division -Technical Center Humantech, Inc. John Deere Company -Dubuque Works Motor Vehicle Manufacturers Association National Institute of Occupational Safety and Health (NIOSH)

-Division of Safety Research

National Machine Tool Builders Association Prab Robots, Inc. **Rockwell International** -Rocketdyne Division Society of Automotive Engineers State University of New York Department of Industrial Engineering Triodyne, Inc. U.S. Naval Sea Systems Command University of Cincinnati -Mechanical & Industrial Engineering Department University of Louisville -Center for Industrial Ergonomics University of Southern California -Department of Safety Science Van Dorn Plastics Machinery West Virginia University -Industrial Engineering Department

Technical Subcommittee R15.02 on Human Interfaces, which developed this standard, had the following members:

Steven A. Cousins, Chair (Coca-Cola Company)	Romeo Bruce (Chrysler Corporation) James W. Collins (NIOSH Division of Safety Re- search, a nonvoting technical advisor) Ralph C. Daehn (Materials Engineering, Inc.) James K. Gilkey (DeVilbiss Company) Suzanne A. Glowiak (Triodyne, Inc.)	David Hodge (U.S. Army Human Engineering Laboratory) Theodore Marton (Dynamics Research Corporation) John E. Mason (Termiflex Corporation) Peter Strubhar (Babcock and Wilcox) Rick Tenneson (Unico, Inc.) Steve Wollenberg (Adept Technology, Inc.)
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Administrative services were provided by James A. Peyton and Sharon A. Myers of the Robotic Industries Association.

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ANSI/RIA R15.02/1-1990

American National Standard for Industrial Robots and Robot Systems –

Hand-Held Robot Control Pendants – Human Engineering Design Criteria

1 Scope, purpose, and exclusions

1.1 Scope

This standard applies to the design of the hand-held operator control pendants and teach pendants for industrial robots and industrial robot systems. Sentences containing the verb "shall" are considered mandatory. All other text is considered advisory.

1.2 Purpose

The purpose of this standard is to present human engineering guidelines for the design of operator control pendants for industrial robots and industrial robot systems; to promote speed, accuracy, simplicity, efficiency, reliability, and safety of robot operations, programming, training, and maintenance.

1.3 Exclusions

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

- personal robots;
- automatic guided vehicle systems;
- undersea and space robots;
- automated storage and retrieval systems;
- automatic conveyor and shuttle systems;
- teleoperated devices;

prosthetics or medical and other aids for the handicapped;

- numerically controlled machine tools;
- controller and terminal consoles;
- controls on a teaching arm.

This list is not intended to be all-inclusive.

2 Normative references

The following standards contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards and publications are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards and publications listed below.

ANSI/NFPA 79-1987, Electrical standard for industrial machinery

ANSI/RIA R15.05-1-1990, Industrial robots and robot systems – Point-to-point and static performance characteristics – Evaluation

ANSI/RIA R15.06-1986, Industrial robots and robot systems – Safety requirements

MIL STD 1472C, Human engineering design criteria for military systems, equipment, and facilities¹⁾

¹⁾ Available from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402.