

**AWS D16.1M/D16.1:2004**  
**An American National Standard**



# **Specification for Robotic Arc Welding Safety**



**American Welding Society**

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**Key Words**—Robot, robotic arc welding, robot welding systems, robotic welding operator, qualified robot technician, safety, risk assessment

**AWS D16.1M/D16.1:2004**  
**An American National Standard**

**Approved by**  
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## **Specification for**

# **Robotic Arc Welding Safety**

Prepared by  
AWS D16 Committee on Robotic and Automatic Welding

Under the Direction of  
AWS Technical Activities Committee

Approved by  
AWS Board of Directors

### **Abstract**

This standard establishes safety requirements with respect to the design, manufacture, maintenance, and operation of arc welding robot systems and ancillary equipment. It also helps to identify and minimize hazards involved in maintaining, operating, integrating, and setting up of arc welding robot systems.



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# Specification for Robotic Arc Welding Safety

## 1. Scope

**1.1 Scope and Objectives.** The requirements of this standard apply to industrial robots that are used to perform the gas metal arc welding (GMAW) and flux cored arc welding (FCAW) processes. The purpose of this standard is to establish minimum safety requirements with respect to the design, manufacture, maintenance, and operation of arc welding robot systems and ancillary equipment. It is also designed to help identify and minimize hazards involved in maintaining, operating, and setting up of arc welding robot systems.

A robotic arc welding system consists of a manipulator, power source, arc welding torch and accessories; electrode feed system, dereeling system, welding circuit, shielding and communication control, and grounding system. There may be other accessories that are outside the scope of this document. A typical system is illustrated in Figure 1.

This specification makes use of both U.S. Customary Units and the International System of Units (SI). These measurements may not be exact equivalents; therefore each system must be used independently of the other without combining in any way. The specification D16.1M uses SI units. The specification with the designation D16.1 uses U.S. Customary Units. The latter are shown in appropriate columns in tables or within parentheses ( ) when used in the text.

### 1.2 Applications

**1.2.1 New or Remanufactured Installations.** The requirements of this standard pertaining to design and manufacture shall apply to all new or remanufactured arc welding robot systems, fixtures, and ancillary equipment manufactured for installation or installed after the compliance date subsequent to the ANSI approval date of this standard. Compliance to the standard shall be 12 months after the ANSI approval date.

**1.2.2 Existing or Rebuilt Installations.** Existing installations or the repair or rebuilding thereof shall be compliant with the standards in effect at the time of their original installation. Modifications to fixtures, end-of-

arm devices, or ancillary equipment shall be reviewed for the creation of new hazards. Such new hazards shall be safeguarded in accordance with the applicable sections of this standard.

**1.2.3 All Installations.** The requirements of Sections 7 and 8 of this standard pertaining to the use and maintenance of arc welding robot systems shall apply to all users subsequent to the approval of this standard.

**1.3 Exclusions.** This standard applies to arc welding robot systems and is not intended to apply to the following machines:

- (1) Robots with a payload capacity greater than 20 kg (45 lbs)
- (2) Automated guided vehicle systems
- (3) Undersea and space robotics
- (4) Automatic conveyor and shuttle systems
- (5) Teleoperators
- (6) Mobile robots
- (7) Resistance welding robots

This list is not intended to be all-inclusive.

**1.4 Responsibilities.** The responsibility for the application of this standard is defined by this standard.

**1.4.1 Manufacturer or Remanufacturer.** It shall be the responsibility of the arc welding robot machine manufacturer or remanufacturer to design and construct the arc welding robot system in accordance with Section 4 of this standard.

**1.4.2 Rebuilder or Modifier.** It shall be the responsibility of any person rebuilding or modifying arc welding robot systems to do so in accordance with portions of Section 4 of this standard applicable to components being rebuilt or modified.

**1.4.3 System Integrator.** The system integrator shall ensure that the system complies with Section 6 of this standard. The System Integrator has the responsibility to ensure that any modifications made to the arc welding robot systems shall conform to Section 4. The employer shall be the system integrator unless another party contractually accepts responsibility as the system integrator.