

Recommended Practices for Shielding Gases for Welding and Cutting



American Welding Society



Key Words—Shielding gases, gas distribution, gas safety, plasma gas, purging gas, gas mixtures, arc characteristics, dew point, gas properties

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Recommended Practices for Shielding Gases for Welding and Cutting

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Abstract

This document is concerned with six industrial gases: argon (Ar), carbon dioxide (CO₂), helium (He), hydrogen (H), nitrogen (N), and oxygen (O). Properties, uses, safe handling, distribution, mixtures and effects on arc characteristics and welds are presented for flux cored arc welding (FCAW), gas tungsten arc welding (GTAW), gas metal arc welding (GMAW), electrogas welding (EGW), plasma arc welding (PAW), plasma arc cutting (PAC), laser welding (LW) and laser cutting (LC). Gas purging, gas distribution and safety practices are also covered.



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Recommended Practices for Shielding Gases for Welding and Cutting

1. Scope

This publication presents basic concepts relating to gas usage for each process and its variations. These concepts, combined with basic information about arc welding or cutting processes, will enable the reader to make an educated decision when selecting a gas.¹ In addition, safe practices and specific technical data are included as guides in an effort to establish optimum operation of the selected welding or cutting process.

The reader will learn the process and specific advantages and disadvantages for each. Standard welding and cutting equipment is normally designed to permit the use of several gases.

Note: The scope of this document does not include information for oxyfuel or heat treating processes.

This specification makes use of both U.S. Customary Units and the International System of Units (SI). The measurements may not be exact equivalents; therefore each system must be used independently of the other without combining in any way. The specification with the designation C5.10 uses U.S. Customary Units. The specification C5.10M uses SI units. The latter are shown in appropriate columns in tables or within brackets [] when used in the text.

Safety and health issues and concerns are beyond the scope of this standard and, therefore, are not fully addressed herein. Information on safe handling of gases and cylinders can be found in Section 6. Safety and health information is available from other sources, including, but not limited to, ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, applicable federal and state regulations, and local safety codes.

1. In this document, the use of the term *gas* also includes “gas mixture.”

2. Normative References

If a code or other standard is cited without a date of publication, it is understood that the latest edition of the document referred to applies. If a code or other standard is cited with the date of publication, the citation refers to that edition only, and it is understood that any future revisions or amendments to the code or standard are not included; however, as codes and other standards undergo frequent revision, the reader is encouraged to consult the most recent edition.

2.1 American Conference of Governmental Industrial Hygienists Standards²

(1) ACGIH, *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*

2.2 ASME Standards³

(1) ASME B31.3, *Process Piping*

2.3 AWS Standards⁴

(1) ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*

(2) AWS A1.1, *Metric Practice Guide for the Welding Industry*

(3) AWS. A3.0, *Standard Welding Terms and Definitions*

2. Available through: American Conference of Governmental Industrial Hygienists, 1330 Kemper Meadow Drive, Cincinnati, OH 45240-1634.

3. Available through: American Society of Mechanical Engineers, 3 Park Avenue, New York, NY 10017.

4. Available through: Global Engineering Documents, Handling Services Group, 15 Inverness Way East, Englewood, CO 80112-5776, (800) 854-7179 (303)397-7956, Fax (303)-397-2740, Internet: www.global.ihs.com.