

Standard Procedures for Determination of Moisture Content of Welding Fluxes and Welding Electrode Flux Coverings



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AWS A4.4M:2001 (R2016)
An American National Standard

Approved by the
American National Standards Institute
October 21, 2016

Standard Procedures for Determination of Moisture Content of Welding Fluxes and Welding Electrode Flux Coverings

1st Edition

Prepared by the
American Welding Society (AWS) A5 Committee on Filler Metals and Allied Materials

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This document establishes standard procedures for determination of moisture content of welding fluxes and welding electrode coverings. The test involves combustion of a sample in an oxygen carrier gas at elevated temperature. Any water evolved from the sample or formed by the combustion process is measured by means of either Karl Fischer titration or infrared detection. The key differences between these methods and traditional thermo gravimetric techniques are the inclusion of instrument calibration procedures, system verification checks and use of more accurate analytical techniques for water detection.



ISBN: 978-0-87171-899-0
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Foreword

This foreword is not part of [AWS A4.4M:2001 \(R2016\)](#), *Standard Procedures for Determination of Moisture Content of Welding Fluxes and Welding Electrode Flux Coverings*, but is included for informational purposes only.

Historically, electrode covering and flux moisture levels have been determined by thermogravimetric means, after Gayley and Wooding, August 1950, *Welding Journal*, 29(8): 629–635. Samples were combusted in an oxygen carrier to ensure that any hydrogen present formed water in the carrier gas. That water was collected downstream in an absorption U-tube and the water content determined by weight difference of the U-tube, taking into account the requisite blank value. At the time this test method was developed, typical moisture levels were on the order of 0.5%–1.0% by weight. As welding consumable improvements reduced moisture levels to less than 0.10% by weight in many cases, corresponding improvements in the test method were not made to ensure reliability and accuracy at such low levels.

Two AWS task groups under the A5A Subcommittee on Carbon and Low-Alloy Steel Electrodes and Rods for Shielded Metal Arc and Oxyfuel Gas Welding investigated the suitability of the standard thermogravimetric method and possible improvements. Although the procedure and equipment refinements were successful in reducing the variability in test results, the variability could not be reduced sufficiently to permit reliable use of the thermogravimetric method for contemporary welding consumables.

Accordingly, the methods set forth in this standard offer significant improvement in the reliability of moisture test measurements for contemporary welding consumables. The sample is still combusted in an oxygen carrier gas to ensure oxidation of any hydrogen present to water. Thus, the tests still provide a measure of the hydrogen potential of the welding consumables measured as water. However, they differ from the thermogravimetric method in that the detection systems employed, Karl Fischer Titration and Infrared Detection, are much more accurate at low levels of water.

This is the first issue of [AWS A4.4M](#), *Standard Procedures for Determination of Moisture Content of Welding Fluxes and Welding Electrode Flux Coverings*. Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS A5 Committee on Filler Metals and Allied Materials, American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166. Official interpretations of any of the technical requirements of this standard may only be obtained by sending a request, in writing, to the Managing Director, Standards Development, American Welding Society. A formal reply will be issued after it has been reviewed by the appropriate personnel following established procedures.

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Table of Contents

	Page No.
Personnel (Reaffirmation)	v
Personnel (Original)	vii
Foreword.....	ix
List of Tables	xii
List of Figures.....	xii
1. Scope	1
2. Normative Reference	1
3. Units of Measure	1
4. Sample Preparation, Handling, and Storage	2
4.1 Electrode Coverings	2
4.2 Welding Fluxes	2
5. Equipment/Instrumentation Requirements	2
5.1 Karl Fischer Titration	2
5.2 Infrared (IR) Detection	6
5.3 Fluoride Inhibitor	6
5.4 Test Sequence	6
5.5 Blank Determination Prior to Calibration/Verification	7
5.6 Calibration/Verification	7
5.7 Blank Determination Prior to Sample Analysis	8
5.8 Sample Analysis	8
5.9 Reporting of Results	9
5.10 Safety Considerations	9
Annex A (Informative)—Guide to AWS Standard Procedures for Determination of Moisture Content of Welding Fluxes and Welding Electrode Flux Coverings	11
Annex B (Informative)—Standard Test Method for Water in Gases Using Karl Fischer Reagent.....	17
Annex C (Informative)—Guidelines for the Preparation of Technical Inquiries	23
AWS Filler Metal Specifications by Material and Welding Process	25
AWS Filler Metal Specifications and Related Documents	27

List of Tables

Table	Page No.
1 Recommended Sample Size Based on Anticipated Water Content	8
A1 Variability in Moisture Determination Results.....	13
A2 Correlation Between Infrared and Thermogravimetric Methods.....	15

List of Figures

Figure	Page No.
1 Schematic Illustration, Typical Moisture Test Apparatus	3
2 Inlet Breech Fitting with Cap (Section)	4
3 Outlet Fitting with Cap (Section).....	4
A1 Approximate Effect of As-Manufactured Coating Moisture and Rehydration of a Very Dry Covered Electrode on Diffusible Hydrogen	14