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CSA W48-23 Filler Metals and Allied Materials for Metal Arc Welding

Changes Summary

Introduction

The fifth edition of CSA W48 was published in March 2023. In the previous editions of CSA W48, published in 2018, 2014, 2006 and 2001, technical changes were introduced with the intent of harmonizing with international standards and AWS A5 specifications. Harmonization has continued in the fifth edition with the adoption of additional AWS A5 specifications to cover all consumable types specified in other CSA welding standards, such as CSA W47.1, W59, W186, W47.2 and W59.2.

In the new edition, the testing requirements and classifications have been removed from the standard. All welding consumables now refers to AWS A5 specifications or ISO standard for testing and classification. The following requirements have been maintained in the standard:

I. The use of a quality system during the manufacture of welding consumables and for distributors repacking welding consumables.

II. Marking of the welding consumable packages and labels

III. Certification of the welding consumables

IV. Renewals of certification of welding consumables

Below are the major changes to CSA W48:2023:

a) All specifications and classifications related to carbon and low-alloy steel SMAW electrodes have been replaced by references to AWS A5.1/A5.1M and A5.5/A5.5M.
    a. For initial tests, the diameters tested are 3.2*, 4.0 and 6.0mm, if the 6.0mm diameter is not manufactured, the 5.0mm is to be tested. That is a change from the previous edition where the 4.0, 5.0 and 6.0mm were required for the initial test.
    *: The same tests as those of the 4.0mm diameter.

b) All specifications and classifications related to SAW carbon steel electrodes/fluxes have been replaced by references to AWS A5.17/A5.17M.

c) For diffusible hydrogen testing, if ISO 3690 is used, only specimen type A (80mm long) is acceptable and sets of four specimens are mandatory.

d) Annexes have been updated and consolidated, consequently the certification annex has been moved from annex K to annex G.

e) Specifications and classifications related to SAW low-alloy electrodes/fluxes have been introduced in the standard and refers to AWS A5.23/A5.23M.

f) Check-testing requirements for SAW low-alloy electrode/fluxes have been established in annex G.

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g) Specifications and classifications related to aluminum GTAW and GMAW electrodes have been introduced in the standard and references to AWS A5.10/A5.10M.

h) Check-testing requirements for aluminum GTAW and GMAW electrodes have been established in annex G.

i) As the standard now refers to AWS A5.1/A5.1M and AWS A5.5/A5.5M for SMAW, a new test will be required for electrode manufacturers. Both AWS specifications for SMAW require a mandatory coating moisture test to be performed on low-hydrogen electrodes. The diffusible hydrogen is now an optional test in AWS A5.1/A5.1M and A5.5/A5.5M, but as CSA W59 requires an H8 or lower designator to weld grades other than those found in column 2 of table 5.2, electrode manufacturers will still have to conduct diffusible hydrogen test to maintain their diffusible hydrogen designator (e.g.: H8).

j) One new subclause was added, clause 10.2 requires electrode manufacturers and distributors to prepare and maintain up-to-date product technical data sheets (TDS). Technical Data Sheets (TDS) shall provide all technical information about the certified products (CSA W48 product classification, typical chemistry, and mechanical properties, recommended operating ranges, storage conditions, reconditioning when needed, etc.…)

k) In annex G (certification), a new clause was added requiring CWB to publish/maintain a list of de-certified products.

To summarize how welding consumables are classified and certified in CSA W48:23, you will find below for each welding consumable type, the references to AWS A5 specifications or ISO standard.

SMAW - Carbon and low-alloy steel electrodes

All classifications related to carbon steel and low-alloy steel electrodes for shielded metal arc welding (SMAW) are classified and certified using the designations and classification requirements specified in AWS A5.1/A5.1M and A5.5/A5.5M respectively.

GMAW - Carbon and low-alloy steel electrodes

Wire electrodes and deposits for GMAW of non-alloy and fine-grain steels are classified and approved using the designations and classification requirements specified in CAN/CSA-ISO 14341 for strength levels up to 550 MPa. For strength levels above 620 MPa, AWS A5.28/A5.28M is used for classification requirements and testing.

FCAW/MCAW - Carbon and low-alloy steel electrodes

All classifications related to carbon steel and low-alloy steel electrodes for flux-cored arc welding and metal-cored arc welding are classified and approved using the designations and classification requirements specified in AWS A5.36/A5.36M. Although AWS A5.36/A5.36M has been officially withdrawn AWS, CSA W48 technical committee has made the decision to maintain the use of that AWS specification for carbon and low-alloy steel FCAW and MCAW

products. The CSA W48 technical committee has recognized that AWS A5.36/A5.36M open classification system is well tailored for Canada.In addition to the requirements of AWS A5.36/A5.36M, FCAW wire electrodes are subject to fillet weld test for initial certification.

SAW - Carbon and low-alloy steel electrodes and fluxes

All classifications related to carbon steel and low-alloy steel electrodes and flux for submerged arc welding (SAW) are classified and certified using the designations and classification requirements specified in AWS A5.17/A5.17M and A5.23/A5.23M respectively. Two-run SAW, either carbon steel or low-alloy steel, are now tested and certified to AWS A5.23/A5.23M (refer to clause 1.1 of AWS A5.17/A5.17M).

SMAW – Chromium and chromium-nickel steel electrodes

All classifications related to chromium and chromium-nickel steel electrodes for shielded metal arc welding (SMAW) have been replaced by references to AWS A5.4/A5.4M.

GMAW/GTAW/SAW – Chromium and chromium-nickel steel electrodes and rods

All classifications related to chromium and chromium-nickel steel electrodes for gas-shielded metal arc welding (GMAW), gas tungsten arc welding (GTAW), and submerged arc welding (SAW) have been added by including references to AWS A5.9/A5.9M.

FCAW/MCAW - Chromium and chromium-nickel steel electrodes

All classifications related to chromium and chromium-nickel steel electrodes for FCAW and MCAW have been added by including references to AWS A5.22/A5.22M and A5.9/A5.9M as appropriate. When a product meets AWS A5.22/A5.22M requirements for classification, it will be listed as FCAW/MCAW Stainless Steel along with the shielding gas used for approval. When a product meets AWS A5.9/A5.9M requirements for classification, it will be listed as GMAW/GTAW Stainless Steel without a shielding gas as only the chemical analysis is required for approval.

GTAW/PAW - Carbon steel rods

All classifications related to carbon steel rods and deposits specifically for GTAW/PAW have been added by including references to AWS A5.18/5.18M.

GTAW/PAW – Low-alloy steel rods

All classifications related to low alloy steel rods and deposits specifically for GTAW and PAW have been added by including references to AWS A5.28/A5.28M.

GMAW/GTAW – Aluminum and aluminum-alloy electrodes and rods

All classifications related to aluminum and aluminum-alloy electrodes, rods, and deposits specifically for GMAW and GTAW have been added by including references to AWS A5.10/A5.10M.

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Summary by product types:

Material Type	Welding Process	Specification/Standard
Carbon Steel	Shielded Metal Arc Welding (SMAW)	AWS A5.1/A5.1M
	Gas Metal Arc Welding (GMAW)	CAN/ISO 14341 (B side classifications)
	Submerged Arc Welding (SAW)	AWS A5.17/A517M
	Flux-Cored Arc Welding (FCAW)	AWS A5.36/A5.36M
	Metal-Cored Arc Welding (MCAW)	AWS A5.36/A5.36M
	Gas Tungsten Arc Welding (GTAW)	AWS A5.18/A5.18M
Low-Alloy Steel	Shielded Metal Arc Welding (SMAW)	AWS A5.5/A5.5M
	Gas Metal Arc Welding (GMAW)	CAN/ISO 14341 (B side) or AWS A5.28/A5.28M when UTS > 550MPa
	Submerged Arc Welding (SAW)	AWS A5.23/A5.23M
	Flux-Cored Arc Welding (FCAW)	AWS A5.36/A5.36M
	Metal-Cored Arc Welding (MCAW)	AWS A5.36/A5.36M
	Gas Tungsten Arc Welding (GTAW)	AWS A5.28/A5.28M
Stainless Steel	Shielded Metal Arc Welding (SMAW)	AWS A5.4/A5.4M
	Gas Metal Arc Welding (GMAW)	AWS A5.9/A5.9M
	Submerged Arc Welding (SAW)	AWS A5.9/A5.9M for the electrode
	Flux-Cored Arc Welding (FCAW)	AWS A5.22/A5.22M
	Metal-Cored Arc Welding (MCAW)	AWS A5.22/A5.22M
	Gas Tungsten Arc Welding (GTAW)	AWS A5.9/A5.9M
Aluminum	Gas Metal Arc Welding (GMAW)	AWS A5.10/A5.10M
	Gas Tungsten Arc Welding (GTAW)	AWS A5.10/A5.10M

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Implementation Plan

1. The new standard can be ordered through CWB website at www.cwbgroup.org/store or CSA Group website at https://www.csagroup.org/store/product/CSA%20W48%3A23/
2. Starting April 1, 2024, all consumables will be tested to the requirements of CSA W48:23.
3. As of April 1, 2024, all electrode manufacturers, distributors, wholesaler, or re-packager will be required to prepare and maintain up-to-date product technical data sheets (TDS). Refer to clause 10.2 of CSA W48:23.
4. As of April 1, 2024, CWB will maintain a current list of decertified welding consumables. The list will be available on the CWB website.
5. CWB will be using the open classification system of AWS A5.36/A5.36M, but electrode manufacturers can request the use of the retained classification of AWS A5.36M (refer to clause A1 of AWS A5.36 Annex A). If manufacturers want to dual classify with both retained and open classification, additional charges will apply.
6. SMAW carbon steel electrode will now be classified and tested to the requirements of AWS A5.1M, the classification system of AWS A5.1M is identical to the classification system of the previous W48, and as such the transition to AWS A5.1M will not affect the classification of the electrodes.
7. SMAW low-alloy steel electrode will now be classified and tested to the requirements of AWS A5.5M, the classification system of AWS A5.5M is identical to the classification system of the previous W48, and as such the transition to AWS A5.5M will not affect the classification of the electrodes.
8. SAW carbon steel electrode/flux combination will now be classified and tested to the requirements of AWS A5.17M, the classification system of AWS A5.17M is identical to the classification system of the previous W48, and as such the transition to AWS A5.17M will not affect the classification of the electrodes.
9. SAW low-alloy steel electrode/flux combination will now be classified and tested to the requirements of AWS A5.23M, the classification system of AWS A5.23M is identical to the classification system of the previous W48, and as such the transition to AWS A5.23M will not affect the classification of the electrodes.
10. Since aluminum GMAW/GTAW/PAW wire electrodes and rods were already tested and certified by CWB using AWS A5.10/A5.10M, the addition of these products in the new standard will not affect the manufacturers and fabricators.

FCAW/MCAW - Carbon and low-alloy steel wire electrode classifications

Since 2018, CSA W48 adopted AWS A5.36M method for classifying FCAW and MCAW wire electrodes. AWS A5.36M specification utilizes a new, “open classification system” which is introduced for the classification of carbon and low-alloy steel flux cored and metal cored.

electrodes. The open classification system uses designators to indicate electrode type (Usability Designator), welding position capability, tensile strength, impact strength, shielding gas (with more options and new designations), condition of heat treatment, if any, and weld deposit composition. The change to an open classification system has been made to allow for the classification of flux cored and metal cored electrodes with classification options which (1) better define the performance capabilities of the advanced electrode designs that have been developed, and (2) reflect the application requirements of today's marketplace.

Because CSA W48-23 maintained AWS A5.36M method for classifying FCAW and MCAW electrodes, it is recognized that it might cause problems vis-à-vis acceptance of existing procedure qualification records (PQR), weld procedure data sheets (WPDS), and weld procedure specifications (WPS), you will find below tables showing equivalency between the new open classification system in AWS A5.36M, which has been adopted in CSA W48-23, and the old system in CSA W48-06, AWS A5.29 and A5.28. For an equivalency of classifications between the retained classification of AWS A5.36M and the old system of CSA W48-06, please refer to annex I of CSA W48-23.

The following AWS A5.36M open classifications shall be considered equivalent to the corresponding classifications for the purpose of using existing procedure qualification records (PQR), weld procedure data sheets (WPDS), and weld procedure specifications (WPS).

Equivalency of classifications for FCAW and MCAW electrode classifications with open classification system

Carbon steel electrodes for FCAW*

CSA W48-23 (AWS A5.36M)	Shielding gas	CSA W48-06
E490T1-C1A2-CS1	C1	E492T-1
E491T1-C1A2-CS1	C1	E491T-1
E490T1-MXXA2-CS1	MXX (M21, M20, …)	E492T-1M
E491T1-MXXA2-CS1	MXX (M21, M20, …)	E491T-1M
E490T4-AZ-CS3	None (self-shielded)	E492T-4
E490T5-C1A3-CS1	C1	E492T-5
E491T5-C1A3-CS1	C1	E491T-5
E490T5-MXXA3-CS1	MXX (M21, M20, …)	E492T-5M
E490T6-A3-CS3	None (self-shielded)	E492T-6
E490T7-AZ-CS3	None (self-shielded)	E492T-7
E490T8-A3-CS3	None (self-shielded)	E492T-8
E490T8-A4-CS3	None (self-shielded)	E492T-8J
E491T8-A3-CS3	None (self-shielded)	E491T-8
E491T8-A4-CS3	None (self-shielded)	E491T-8J
E490T1-C1A3-CS1	C1	E492T-9
E491T1-C1A3-CS1	C1	E491T-9
E490T1-C1A4-CS1	C1	E492T-9J
E491T1-C1A4-CS1	C1	E491T-9J
E490T1-MXXA3-CS1	MXX (M21, M20, …)	E492T-9M
E491T1-MXXA3-CS1	MXX (M21, M20, …)	E491T-9M

E490T1-MXXA4-CS1	MXX (M21, M20, …)	E492T-9MJ
E491T1-MXXA4-CS1	MXX (M21, M20, …)	E491T-9MJ
E490T11-AZ-CS3	None (Self-shielded)	E492T-11
E491T11-AZ-CS3	None (Self-shielded)	E491T-11
E490T1-C1A3-CS2	C1	E492T-12
E491T1-C1A3-CS2	C1	E491T-12
E490T1-C1A4-CS2	C1	E492T-12J
E491T1-C1A4-CS2	C1	E491T-12J
E490T1-MXXA3-CS2	MXX (M21, M20, …)	E492T-12M
E491T1-MXXA3-CS2	MXX (M21, M20, …)	E491T-12M
E490T1-MXXA4-CS2	MXX (M21, M20, …)	E492T-12MJ
E491T1-MXXA4-CS2	MXX (M21, M20, …)	E491T-12MJ
E490T14S	None (Self-shielded)	E492T-14

*: AWS A5.36M open classifications above will include in the body of each classification the hydrogen designator, as required. For instance, if the electrode classification on the existing PQR is E491T-9M-H8 a newly developed WPDS based on that PQR will show E491T1-MXXA3-CS1-H8.

Carbon steel electrodes for MCAW*

CSA W48-23 (AWS A5.36M)	Shielding gas	CSA W48-06
E490T15-C1A3-CS1	C1	E492C-6
E491T15-C1A3-CS1	C1	E491C-6
E490T15-MXXA3-CS1	MXX (M21, M20, …)	E492C-6M
E491T15-MXXA3-CS1	MXX (M21, M20, …)	E491C-6M
E490T15-C1A4-CS1	C1	E492C-6J
E491T15-C1A4-CS1	C1	E491C-6J
E490T15-MXXA4-CS1	MXX (M21, M20, …)	E492C-6MJ
E491T15-MXXA4-CS1	MXX (M21, M20, …)	E491C-6MJ

*: AWS A5.36M open classifications above will include in the body of each classification the hydrogen designator, as required. For instance, if the electrode classification on the existing PQR is **E491C-6M-H8** a newly developed WPDS based on that PQR will show **E491T15-MXXA3-CS1-H8.**

Low-alloy steel electrodes for FCAW*

CSA W48-23 (AWS A5.36M)	Shielding gas	AWS A5.29
E551T1-C1A3-K2	C1	E551T1-K2C
E551T1-MXXA3-K2	MXX (M21, M20, …)	E551T1-K2M
E551T1-C1A4-K2	C1	E551T1-K2C-J
E551T1-MXXA4-K2	MXX (M21, M20, …)	E551T1-K2M-J
E551T1-C1A3-Ni1	C1	E551T1-Ni1C
E551T1-MXXA3-Ni1	MXX (M21, M20, …)	E551T1-Ni1M
E551T1-C1A4-Ni1	C1	E551T1-Ni1C-J
E551T1-MXXA4-Ni1	MXX (M21, M20, …)	E551T1-Ni1M-J
E551T1-C1A4-Ni2	C1	E551T1-Ni2C
E551T1-MXXA4-Ni2	MXX (M21, M20, …)	E551T1-Ni2M
E621T1-C1A2-K2	C1	E621T1-K2C
E621T1-MXXA2-K2	MXX (M21, M20, …)	E621T1-K2M

E760T5-C1A5-K4	C1	E760T5-K4C
E760T5-MXXA5-K4	MXX (M21, M20, …)	E760T5-K4M

*: AWS A5.36M open classifications above will include in the body of each classification the hydrogen designator, as required. For instance, if the electrode classification on the existing PQR is E551T1-K2C-H4 a newly developed WPDS based on that PQR will show **E551T1-C1A3-K2-H4.**

Low-alloy steel electrodes for MCAW*		
CSA W48-23 (AWS A5.36M)	**Shielding gas**	**AWS A5.28**
(See note a)	M22 or M13	E55C-Ni1
E550T15-MXXP6-Ni2	MXX (M13 or M22)	E55C-Ni2
E620T15-MXXA5-K3	MXX (M21 or M20)	E62C-K3
E760T15-MXXA5-K4	MXX (M21 or M20)	E76C-K4

a) As the impact are done at -45ºC, there is no specific classification under the metric system for the E55C-Ni1

AWS A5.36M open classifications above will include in the body of each classification the hydrogen designator, as required. For instance, if the electrode classification on the existing PQR is **E55C-Ni2-H4** a newly developed WPDS based on that PQR will show **E550T15-MXXP6-Ni2-H4.**