INTERNATIONAL STANDARD

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Welding consumables — Procurement of filler materials and fluxes

Produits consommables pour le soudage — Approvisionnement en matériaux d'apport et flux

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14344 was jointly prepared by the International Institute of Welding, Commission II, *Arc welding and filler metals*, and Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 3, *Welding consumables*. IIW has been approved as an international standardizing body in the field of welding by the ISO Council.

This second edition cancels and replaces the first edition (ISO 14344:2002). Compared to the previous edition, normative reference to ISO 9001 has been deleted and some lot definitions have been revised.

Requests for official interpretations of any aspect of this International Standard should be directed to the Secretariat of ISO/TC 44/SC 3 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

Welding consumables — Procurement of filler materials and fluxes

1 Scope

This International Standard specifies tools for communication between a purchaser and a supplier of welding consumables within quality systems, such as those based upon ISO 9001[1].

In production, the components of welding consumables are divided into discrete, predetermined quantities so that satisfactory tests with a sample from that quantity will establish that the entire quantity meets specification requirements. These quantities, known by such terms as heats, lots, blends, batches and mixes, vary in size according to the manufacturer. For identification purposes, each manufacturer assigns a unique designation to each quantity. This designation usually consists of a series of numbers or letters, or combinations thereof, which will enable the manufacturer to determine the date and time (or shift) of manufacture, the type and source of the raw materials used, and the details of the procedures used in producing the welding consumable. This designation stays with the welding consumable and can be used to identify the material later, in those cases in which identification is necessary.

This International Standard, together with an applicable International Standard or other standard for welding consumables, provides a method for preparing those specific details needed for welding consumable procurement which consist of:

a) the welding consumable classification (selected from the applicable International Standard or other standard for welding consumables);

b) the lot classification (selected from Clause 4);

c) the testing schedule (selected from Clause 5).

Selection of the specific welding consumable classification, lot classification, and testing schedule depends upon the requirements of the application for which the welding consumable is being procured.

This International Standard does not apply to non-consumable electrodes or shielding gases.

2 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

2.1
dry batch
quantity of dry ingredients mixed at one time in one mixing vessel

NOTE Liquid binder, when added to a dry batch, produces a wet mix. A dry batch can be divided into smaller quantities, in which case addition of the liquid binder produces as many wet mixes as there are smaller quantities.

2.2
dry blend
〈welding consumables〉 two or more dry batches from which quantities of each are combined proportionately, then mixed in a mixing vessel to produce a larger quantity in which the ingredients are as uniformly dispersed as they would have been had the entire quantity been mixed together at one time in one large mixer

NOTE A dry blend, as in the case of a dry batch, can be used singly or divided into smaller quantities which, when the liquid binder is added, produce one or more wet mixes.

2.3
wet mix
combination of liquid binder and a dry batch or dry blend, or a portion thereof, mixed at one time in one mixing vessel

2.4 Heat

2.4.1
heat
〈open hearth, electric arc, basic oxygen, argon-oxygen processes〉 for consumable inserts, solid wires, rods and strip, core wire for covered electrodes, and the sheath (strip or tubing of tubular cored electrode wire and rod), material obtained from one furnace melt, where slag-metal or gas-metal reactions occur in producing the metal

2.4.2
heat
〈induction melting in a controlled atmosphere or in a vacuum〉 for consumable inserts, solid wires, rods and strip, core wire for covered electrodes, and the sheath (strip or tubing of tubular cored electrode wire and rod), an uninterrupted series of melts from one controlled batch of metals and alloying ingredients in one melting furnace under the same melting conditions, each melt conforming to the chemical composition range approved by the purchaser of the material (i.e. the producer of the welding consumable) where significant chemical reactions do not occur in producing the metal

2.4.3
heat
〈consumable electrode remelt〉 for consumable inserts, solid wires, rods and strip, core wire for covered electrodes, and the sheath (strip or tubing of tubular cored electrode wire and rod), an uninterrupted series of remelts in one furnace under the same remelting conditions using one or more consumable electrodes produced from a heat, as defined, each remelt conforming to the chemical composition range approved by the purchaser of the material (i.e. the producer of the welding consumable) in processes involving continuous melting and casting

3 Identification

3.1 General

Identification of consumable inserts, solid wires, rods and strip, core wire for covered electrodes, and the sheath (strip or tubing) for tubular cored electrodes and rods shall be applied as listed in 3.2 to 3.3.1.

Identification of covering mix of covered electrodes, core ingredients of tubular cored electrode wire or rod, and fluxes for submerged arc welding shall be applied as listed in 3.3.2 to 3.6.

3.2 Heat number

Consumable inserts, solid wires, rods and strip, core wire for covered electrodes, and the sheath (strip or tubing) for tubular cored electrodes and rods, identified by heat number, shall consist of material from a single heat of metal.

3.3 Controlled chemical composition

3.3.1 Consumable inserts, solid wires, rods and strip, core wire for covered electrodes, and the sheath (strip or tubing) for tubular cored electrodes and rods identified by controlled chemical composition, rather than by heat number, shall consist of mill coils of one or more heats from which samples have been taken for chemical analysis. The results of the analysis of each sample shall be within the manufacturer's composition limits for that material. Coils from mills that do not permit spliced-coil practice need be sampled on only one end. Coils from mills that permit spliced-coil practice shall be sampled on both ends and shall have no more than a single splice per coil.

3.3.2 Covering or fluxes identified by controlled chemical composition rather than by wet mix shall consist of one or more wet mixes and shall be subjected to sufficient tests to ensure that all wet mixes within the lot are equivalent. These tests shall include chemical analysis, the results of which shall fall within the manufacturer's acceptance limits. The identification of the test procedure and the results of the tests shall be recorded. Alternatively, when the chemical composition of wet mixes is controlled by raw material analysis and computerized weighing, it can be assumed that all wet mixes within the lot are equivalent.

3.3.3 Core ingredients or fluxes identified by controlled composition rather than by dry blend shall consist of one or more dry blends and be subjected to sufficient tests to ensure that all dry blends within the lot are equivalent. These tests shall include chemical analysis, the results of which shall fall within the manufacturer's acceptance limits. The identification of the test procedure and the results of the tests shall be recorded. Alternatively, when the chemical composition of dry blends is controlled by raw material analysis and computerized weighing, it can be assumed that all dry blends within the lot are equivalent.

3.4 Covering mix

In the production of covered electrodes, the covering mix shall be identified either by wet mix (see 2.3) or by controlled chemical composition (see 3.3.2). A covering identified by wet mix shall consist of a single wet mix for each lot of electrodes.

3.5 Core ingredients

In the production of tubular cored electrode wire or rod (flux cored or metal cored welding consumables), the core ingredients shall be identified either by dry blend (see 2.2) or by controlled chemical composition (see 3.3.3). Core ingredients identified by dry blend shall consist of a single dry batch or blend.

3.6 Fluxes for submerged arc welding

In the production of fused and mixed fluxes for electro-slag and submerged arc welding, the flux ingredients shall be identified either by dry blend (see 2.2) or by controlled chemical composition (see 3.3.3).

In the production of agglomerated fluxes for electro-slag and submerged arc welding, the flux ingredients shall be identified either by wet mix (see 2.3) or by controlled chemical composition (see 3.3.2).

Fluxes identified by dry blend shall consist of a single dry batch or blend. Fluxes identified by wet mix shall consist of a single wet mix.

4 Lot classification

4.1 Bare solid electrode wires and strips, rods and consumable inserts

4.1.1 Class S1

A class S1 lot of bare solid electrodes and rods or consumable inserts is the manufacturer's standard lot, as defined in the manufacturer's quality assurance programme.

4.1.2 Class S2

A class S2 lot of bare solid electrodes and rods or consumable inserts is the quantity, not exceeding 45 000 kg, of one classification, size, form, and temper produced in 24 h of consecutively scheduled production (i.e. consecutive normal work shifts). Class S2 solid electrodes and rods or consumable inserts shall be produced from material identified by one heat number (see 3.2) or from material identified by controlled chemical composition (see 3.3.1).

4.1.3 Class S3

A class S3 lot of bare solid electrodes and rods or consumable inserts is the quantity of one size produced in one production schedule from material identified by one heat number (see 3.2).

4.1.4 Class S4

A class S4 lot of bare solid electrodes and rods or consumable inserts is the quantity, not exceeding 45 000 kg, of one classification, size, form, and temper produced under one production schedule. Class S4 solid electrodes and rods or consumable inserts shall be produced from material identified by one heat number (see 3.2) or from material identified by controlled chemical composition (see 3.3.1).

4.2 Tubular cored electrodes and rods

4.2.1 Class T1

A class T1 lot of tubular cored electrodes and rods is the manufacturer's standard lot, as defined in the manufacturer's quality assurance programme.

4.2.2 Class T2

A class T2 lot of tubular cored electrodes and rods is the quantity, not exceeding 45 000 kg, of one classification and size produced in 24 h of consecutively scheduled production (i.e. consecutive normal work shifts). Class T2 tubular cored electrodes and rods shall be produced from tube or strip identified by heat number (see 3.2) or by controlled chemical composition (see 3.3.1). Identification of the core ingredients shall be as specified in 3.5.

4.2.3 Class T3

A class T3 lot of tubular cored electrodes and rods is the quantity produced from material identified by one heat number (see 3.2) and one dry batch (see 2.1) or one dry blend (see 2.2) of core materials. Identification of the core ingredients shall be as specified in 3.5.

4.2.4 Class T4

A class T4 lot of tubular cored electrodes and rods is the quantity, not exceeding 45 000 kg, of one classification and size produced under one production schedule from tube or strip identified by heat number (see 3.2) or controlled chemical composition (see 3.3.1). Identification of the core ingredients shall be as specified in 3.5.

4.3 Covered electrodes

4.3.1 Class C1

A class C1 lot of covered electrodes is the manufacturer's standard lot, as defined in the manufacturer's quality assurance programme.

4.3.2 Class C2

A class C2 lot of covered electrodes is the quantity, not exceeding 45 000 kg, of any one size and classification produced in 24 h of consecutively scheduled production (i.e. consecutive normal work shifts).

4.3.3 Class C3

A class C3 lot of covered electrodes is the quantity, not exceeding 45 000 kg, of any one size and classification produced in 24 h of consecutively scheduled production (i.e. consecutive normal work shifts). Class C3 electrodes shall be produced from covering identified by wet mix (see 2.3) or controlled chemical composition (see 3.3.2) and core wire identified by heat number (see 3.2) or controlled chemical composition (see 3.3.1).

4.3.4 Class C4

A class C4 lot of covered electrodes is the quantity of any one size and classification produced from one wet mix (see 2.3) and core wire identified by one heat number (see 3.2).

4.3.5 Class C5

A class C5 lot of covered electrodes is the quantity of one size and classification produced from one dry blend (see 2.2) of covering mixture and core wire identified by one heat number (see 3.2).

4.4 Fluxes for submerged arc welding

4.4.1 Class F1

A class F1 lot of flux is the manufacturer's standard lot, as defined in the manufacturer's quality assurance programme.

4.4.2 Class F2

A class F2 lot of flux is the quantity produced from the same combination of raw materials under one production schedule.

5 Testing schedule

5.1 General

The level of the testing schedule shall be selected by the purchaser from those listed in Table 1. If no level of testing schedule is specified, the level shall be schedule 1.

5.2 Schedule 1

The level of testing shall be the manufacturer's standard. A statement, “the product supplied meets the requirements of the applicable International Standard or other standard for welding consumables, when tested in accordance with that standard”, and a summary of the typical properties of the material, when tested in that manner, shall be supplied upon written request. The class of each lot is the manufacturer's standard.

5.3 Schedule 2

Test results shall be supplied from any production run of the product made within the 12 months preceding the date of the purchase order. These shall include the results of all tests prescribed for that classification in the applicable International Standard or other standard for welding consumables. The class of each lot is the manufacturer's standard.

Table 1 — Testing schedules

Schedule	Requirements	Reference
1	Manufacturer's standard testing schedule	5.2
2	Tests from production runs of the product within 12 months preceding the date of the purchase order	5.3
3	Chemical analysis only, for each lot shipped	5.4
4	Tests called for by Table 2, for each lot shipped	5.5
5	All tests which the classification called for in the applicable International Standard or other standard for welding consumables, for each lot shipped	5.6
6	All tests specified by the purchaser for each lot shipped	5.7

5.4 Schedule 3

Chemical analysis of each lot shipped shall be supplied by the manufacturer. The analysis shall include those elements prescribed for that classification in the applicable International Standard or other standard for welding consumables. The class of each lot shall be specified by the purchaser from those listed in Clause 4.

5.5 Schedule 4

Results of the tests called for in Table 2 shall be supplied by the manufacturer for each lot shipped. These tests represent a consensus of those frequently requested for consumables certification; however, they do not necessarily include all tests required for schedule 5. The tests shall be performed as prescribed for that classification in the applicable International Standard or other standard for welding consumables. The class of each lot shall be specified by the purchaser from those listed in Clause 4.

5.6 Schedule 5

Results of all of the tests prescribed for that classification in the applicable International Standard or other standard for welding consumables shall be supplied by the manufacturer for each lot shipped. The class of each lot shall be specified by the purchaser from those listed in Clause 4.

5.7 Schedule 6

In addition to, or in place of, any of the tests called for in the applicable International Standard or other standard for welding consumables, the purchaser may require other tests (such as testing after a specified heat treatment). In all such cases, the purchaser shall identify on the purchase order the specific tests that are to be conducted, the procedures to be followed, the requirements that shall be met and the results to be reported by the manufacturer. The class of each lot shall be specified by the purchaser from those listed in Clause 4.

6 Certification

6.1 General

When required, certification that the product meets the applicable International Standard or other standard for welding consumables can be done by the manufacturer, by an intermediate provider in the supply chain from manufacturer to purchaser, or by an organization not in the supply chain (third party). The organization issuing the certificate should be certified to ISO 9001 or other applicable standard.

Table 2 — Required tests for schedule 4 in Table 1

Product type	Alloy group[ab]						
	Non-alloy and fine grain steel	High tensile and creep resisting steel	Stainless and heat resisting steel	Nickel and Ni-alloy	Aluminium and Al-alloy	Copper and Cu-alloy	Titanium and Ti-alloy
Bare solid electrodes and rods for gas-shielded metal arc welding, gas-shielded tungsten arc welding, plasma arc welding, and electro-gas welding	1, 2, 3, 4[c]	1, 2, 3, 4[c]	1[c]	1[c]	1, 4	1	1
Bare solid and metal cored electrodes (wires and strips) for submerged arc welding	1	1	1	1	—	—	—
Electrode-flux combinations for submerged arc welding and electro-slag welding	1, 2, 3, 4, 5[d]	1, 2, 3, 4, 5[d]	1, 6	—	—	—	—
Tubular cored electrodes for metal arc welding with or without gas shielding, and for electro-gas welding	1, 2, 3, 4, 5[d]	1, 2, 3, 4, 5[d]	1, 6	1, 2, 4	—	—	—
Covered solid and metal cored electrodes for manual metal arc welding	1, 2, 3, 4, 5	1, 2, 3, 4, 5	1, 6	1, 2, 4	1, 4	1, 4	—

[a] Tests called for in this table shall be performed only when required by the applicable International Standard or other standard for welding consumables for the particular classification involved. Tests shall be performed in the manner prescribed by the applicable standard. Testing to one current and polarity is sufficient.

[b] Test designations are:

(1) Chemical analysis

(2) Tensile

(3) Impact toughness

(4) Soundness (X-ray) (not required in International Standards for consumables, but required in some national standards)

(5) Diffusible hydrogen

(6) Ferrite Number (not required in International Standards for consumables, but required in some national standards)

[c] Includes consumable inserts.

[d] The diffusible hydrogen test is not applicable to electro-slag or electro-gas welding.

6.2 Certification by the manufacturer

By placing a label on the product in conformance with the applicable International Standard or other standard for welding consumables, the manufacturer certifies that the shipped product meets the requirements of that standard. This certification is accomplished through a quality assurance programme by which the manufacturer verifies that the product meets those requirements. Such a programme includes planning, documentation, surveillance, inspection, testing, and certification of the test results. It also includes control of the inspection and measuring equipment, as well as control of any nonconforming material. It involves auditing of the activities and provides for developing and implementing any corrective action that may be necessary.

6.3 Certification by an intermediate provider

When another organization, not fully integrated into the production of the product, labels the product, and hence provides certification, that organization's quality assurance system shall provide that traceability of all data required from the original manufacturer is maintained and available. Such a programme includes planning, documentation, testing and certification of the test results. It also includes control of the inspection and measuring equipment, as well as control of any nonconforming material. It involves auditing of the activities and provides for developing and implementing any corrective action that may be necessary.

6.4 Certification by a third party

Certification may be performed by a third party in one of two ways. The third party may actually conduct the testing required and may provide the results of the tests. Or the third party may witness the conducting of the tests while they are being carried out by the manufacturer or by an intermediate provider. In either case, the third party is responsible for auditing the quality assurance system of the manufacturer or intermediate provider.

Bibliography

[1] ISO 9001, *Quality management systems — Requirements*

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