Designation: E527 – 16

Standard Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)[1]

This standard is issued under the fixed designation E527; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This practice (Note 1) covers a unified numbering system (UNS) for metals and alloys that have a "commercial standing" (see Note 2), and covers the procedure by which such numbers are assigned. Section 2 describes the system of alphanumeric designations or "numbers" established for each family of metals and alloys. Section 3 outlines the organization established for administering the system. Section 5 describes the procedure for requesting number assignment to metals and alloys for which UNS numbers have not previously been assigned.

NOTE 1—UNS designations are not to be used for metals and alloys that are not registered under the system described herein, or for any metal or alloy whose composition differs from those registered.

NOTE 2—The terms "commercial standing," "production usage," and other similar terms are intended to apply to metals and alloys in active commercial production and use, although the actual amount of such use will depend, among other things, upon the type of metals and alloys involved and their application.

The various standardizing organizations involved with the individual industries apply their own established criteria to define the status of a metal or alloy in terms of when a UNS designation number will be assigned. For instance, ASTM Committee A01 requires details of heat analysis, mechanical properties, and processing requirements for addition of a new grade or alloy to its specifications. The Copper Development Association requires that the material be "in commercial use (without tonnage limits);" the Aluminum Association requires that the alloy be "offered for sale (not necessarily in commercial use);" the SAE Aerospace Materials Division calls for "repetitive procurement by at least two users."

Thus, while no universal definition for usage criteria is established, the UNS numbers are intended to identify metals and alloys that are generally in regular production and use. A UNS number will not ordinarily be issued for a material that has just been conceived or that is still in only experimental trial.

2. Description of Numbers (or Codes) Established for Metals and Alloys

2.1 The UNS establishes 19 series of numbers for metals and alloys, as shown in Table 1. Each UNS number consists of a single letter-prefix followed by five digits. In most cases the letter is suggestive of the family of metals identified; for example, A for aluminum, P for precious metals, and S for stainless steels.

2.2 Whereas some of the digits in certain UNS number groups have special assigned meaning, each series is independent of the others in such significance; this practice permits greater flexibility and avoids complicated and lengthy UNS numbers.

NOTE 3—This arrangement of alphanumeric six-character numbers is a compromise between the thinking that identification numbers should indicate many characteristics of the material, and the belief that numbers should be short and uncomplicated to define only the chemical composition and leaving the other properties to the specifications involved.

2.3 Wherever feasible, identification "numbers" from previous systems are incorporated into the UNS numbers. For example: carbon steel, originally identified by "American Iron and Steel Institute (AISI) 1020," is covered by "UNS G10200," and free cutting brass, presently identified by "Copper Development Association (CDA) C36000," is covered by "UNS C36000." Table 2 shows the secondary division of some primary series of numbers.

[1] This practice is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.91 on Editorial.

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***A Summary of Changes section appears at the end of this standard**

TABLE 1 Primary Series of Numbers

Nonferrous Metals and Alloys	
A00001–A99999	aluminum and aluminum alloys
B00001–B99999	aluminum and aluminum alloys
C00001–C99999	copper and copper alloys
E00001–E99999	rare earth and rare earth-like metals and alloys (18 items; see Table 2)
L00001–L99999	low melting metals and alloys (15 items; see Table 2)
M00001–M99999	miscellaneous nonferrous metals and alloys (12 items; see Table 2)
N00001–N99999	nickel and nickel alloys
P00001–P99999	precious metals and alloys (8 items; see Table 2)
R00001–R99999	reactive and refractory metals and alloys (14 items; see Table 2)
Z00001–Z99999	zinc and zinc alloys
Ferrous Metals and Alloys	
D00001–D99999	specified mechanical properties steels
F00001–F99999	cast irons
G00001–G99999	carbon and alloy steels
H00001–H99999	H-steels
J00001–J99999	cast steels (except tool steels)
K00001–K99999	miscellaneous steels and ferrous alloys
S00001–S99999	heat and corrosion resistant (stainless) steels
T00001–T99999	tool steels
W00001–W99999	welding filler metals, covered and tubular electrodes, classified by weld deposit composition (see Table 2)

TABLE 2 Secondary Division of Some Series of Numbers

E00001–E99999 Rare Earth and Rare Earth-Like Metals and Alloys	
E00000–E00999	actinium
E01000–E20999	cerium
E21000–E45999	mixed rare earths[A]
E46000–E47999	dysprosium
E48000–E49999	erbium
E50000–E51999	europium
E52000–E55999	gadolinium
E56000–E57999	holmium
E58000–E67999	lanthanum
E68000–E68999	lutetium
E69000–E73999	neodymium
E74000–E77999	praseodymium
E78000–E78999	promethium
E79000–E82999	samarium
E83000–E84999	scandium
E85000–E86999	terbium
E87000–E87999	thulium
E88000–E89999	ytterbium
E90000–E99999	yttrium
L00001–L99999 Low-Melting Metals and Alloys	
L00001–L00999	bismuth
L01001–L01999	cadmium
L02001–L02999	cesium
L03001–L03999	gallium
L04001–L04999	indium
L06001–L06999	lithium
L07001–L07999	mercury
L08001–L08999	potassium
L09001–L09999	rubidium
L10001–L10999	selenium
L11001–L11999	sodium
L12001–L12999	thallium
L13001–L13999	tin
L50001–L59999	lead
M00001–M99999 Miscellaneous Nonferrous Metals and Alloys	
M00001–M00999	antimony
M01001–M01999	arsenic
M02001–M02999	barium
M03001–M03999	calcium
M04001–M04999	germanium
M05001–M05999	plutonium
M06001–M06999	strontium
M07001–M07999	tellurium

TABLE 2 *Continued*

M08001–M08999	uranium
M10001–M19999	magnesium
M20001–M29999	manganese
M30001–M39999	silicon
P00001–P99999 Precious Metals and Alloys	
P00001–P00999	gold
P01001–P01999	iridium
P02001–P02999	osmium
P03001–P03999	palladium
P04001–P04999	platinum
P05001–P05999	rhodium
P06001–P06999	ruthenium
P07001–P07999	silver
R00001–R99999 Reactive and Refractory Metals and Alloys	
R01001–R01999	boron
R02001–R02999	hafnium
R03001–R03999	molybdenum
R04001–R04999	niobium (columbium)
R05001–R05999	tantalum
R06001–R06999	thorium
R07001–R07999	tungsten
R08001–R08999	vanadium
R10001–R19999	beryllium
R20001–R29999	chromium
R30001–R39999	cobalt
R40001–R49999	rhenium
R50001–R59999	titanium
R60001–R69999	zirconium
W00001–W99999 Welding Filler Metals Classified by Weld Deposit Composition	
W00001–W09999	carbon steel with no significant alloying elements
W10000–W19999	manganese-molybdenum low alloy steels
W20000–W29999	nickel low alloy steels
W30000–W39999	austenitic stainless steels
W40000–W49999	ferritic stainless steels
W50000–W59999	chromiun low alloy steels
W60000–W69999	copper base alloys
W70000–W79999	surfacing alloys
W80000–W89999	nickel base alloys

[A] Alloys in which the rare earths are used in the ratio of their natural occurrence (that is, unseparated rare earths). In this mixture, cerium is the most abundant of the rare earth elements.

2.4 Welding filler metals fall into two general categories: those whose compositions are determined by the filler metal analysis (e.g. solid bare wire or rods and cast rods) and those whose composition is determined by the weld deposit analysis (e.g. covered electrodes, flux-cored and other composite wire electrodes). The latter are assigned to a primary series with the letter W as shown in Table 1. The solid bare wire and rods continue to be assigned in the established number series according to their composition.

NOTE 4—The assignment of UNS designations rests solely with the industry organizations listed herin. Readers are *not* to make their own assignments of numbers from such listings, as this may create a risk of duplication and conflict.

2.5 ASTM and SAE periodically publish up-to-date listings of all UNS numbers assigned to specific metals and alloys, with appropriate reference information on each.[2] Many trade associations also publish similar listings related to materials of primary interest to their organizations.

3. Organization for Administering the UNS for Metals and Alloys

3.1 The organization for administering the UNS consists of the following:

3.1.1 *Advisory Board*—The Advisory Board has approximately 20 volunteer members who are affiliated with major producing and using industries, trade associations, government agencies, and standards societies, and who have extensive experience with identification, classification, and specification of materials. The Board is the administrative arm of SAE and ASTM on all matters pertaining to the UNS. It coordinates thinking on the format of each series of numbers and the administration of each by selected experts. It sets up ground rules for determining eligibility of any material for a UNS number, for requesting such numbers, and for appealing unfavorable rulings. It is the final referee on matters of disagreement between requesters and assigners.

3.1.2 *Several Number-Assigning Offices*—UNS number assigners for certain materials are set up at trade associations which have successfully administered their own numbering systems; for other materials, assigners are located at offices of SAE. Each of these assigners has the responsibility for administering a specific series of numbers, as shown in Table 3. Each

[2] Request the most recent version of ASTM DS 56 and SAE HS 1086, *Unified Numbering System for Metals and Alloys*, (a joint ASTM–SAE publication), PCN 05-056001-01.

TABLE 3 Number Assigners and Areas of Responsibility

The Aluminum Association, Inc. 1425 Wilson Boulevard, Suite 600 Arlington, VA 22209 Attention: Office for Unified Numbering System for Metals Telephone: (703) 358-2960 www.aluminum.org	Aluminum and Aluminum Alloys UNS Number Series: A00001–A99999 and B00001–B99999
American Welding Society 550 N. W. LeJeune Road P.O. Box 351040 Miami, FL 33126 Attention: Office for Unified Numbering System for Metals Telephone: (305) 443-9353 www.aws.org	Welding Filler Metals UNS Number Series: W00001–W99999
Copper Development Association 260 Madison Avenue, 16th Floor New York, NY 10016 Attention: Office for Unified Numbering System for Metals Telephone: (212) 251-7200 www.copper.org	Copper and Copper Alloys UNS Number Series: C00001–C99999
Society of Automotive Engineers 400 Commonwealth Drive Warrendale, PA 15096 Attention: Office for Unified Numbering System for Metals Telephone: (724) 776-4841 www.sae.org	Carbon and Alloy Steels UNS Number Series: G00001–G99999 H-Steels UNS Number Series: H00001–H99999 Tool Steels UNS Number Series: T00001–T99999 Miscellaneous Nonferrous Metals and Alloys UNS Number Series: M00001–M99999 Cast Steels UNS Number Series: J00001–J99999 Heat and Corrosion Resistant (Stainless) Steels UNS Number Series: S00001–S99999 Zinc and Zinc Alloys UNS Number Series: Z00001–Z99999 Precious Metals and Alloys UNS Number Series: P00001–P99999 Cast Irons UNS Number Series: F00001–F99999 Nickel and Nickel Alloys UNS Number Series: N00001–N99999 Steels Specified by Mechanical Properties UNS Number Series: D00001–D99999 Reactive and Refractory Metals and Alloys UNS Number Series: R00001–R99999

considers requests for assignment of new UNS numbers, and informs applicants of the action taken. Trade association UNS number assigners report immediately to SAE details of each number assignment. Assigners collaborate with designated consultants when considering requests for assignment of new numbers.

3.1.3 *Corps of Volunteer Consultants*—Consultants are selected by the Advisory Board to provide expert knowledge of a specific field of materials. Since they are utilized primarily by the Board and the SAE number assigners, they are not listed in this recommended practice. At the request of the SAE number assigner, a consultant considers a request for a new number in the light of the ground rules established for the material involved, decides whether a new number is justified, and informs the SAE number assigner accordingly. This utilization of experts (consultants and number assigners) is intended to ensure prompt and fair consideration of all requests. It permits each decision to be based on current knowledge of the needs of a specific industry of producers and users.

3.1.4 *Staff at SAE*—Staff members at SAE maintain master listings of all UNS numbers assigned.

3.1.5 In addition, established SAE and ASTM committees which normally deal with standards and specifications for the materials covered by the UNS, and other knowledgeable persons, are called upon by the Advisory Board for advice when considering appeals of unfavorable rulings in the matter of UNS number assignments.

4. Significance and Use

4.1 The UNS provides a means of correlating many nationally used numbering systems currently administered by societies, trade associations, and individual users and producers of metals and alloys, thereby avoiding confusion caused by use of more than one identification number for the same

material; and by the opposite situation of having the same number assigned to two or more entirely different materials. It also provides the uniformity necessary for efficient indexing, record keeping, data storage and retrieval, and cross referencing.

4.2 A UNS number is not in itself a specification, since it establishes no requirements for form, condition, quality, etc. It is a unified identification of metals and alloys for which controlling limits have been established in specifications published elsewhere.

NOTE 5—Organizations that issue specifications should report to appropriate UNS number-assigning offices (3.1.2) any specification changes that affect descriptions shown in published UNS listings.

5. Procedure for Requesting Number Assignment to Metals and Alloys Not Already Covered by UNS Numbers (or Codes)

5.1 UNS numbers are assigned only to metals and alloys that have a commercial standing (as defined in Note 2).

5.2 The need for a new number should always be verified by determining from the latest complete listing of already assigned UNS numbers that a usable number is or is not available.

NOTE 6—In assigning UNS numbers, and consequently in searching complete listings of numbers, the predominant element of the metal or alloy usually determines the prefix letter of the series to which it is assigned. In certain instances where no one element predominates, arbitrary decisions are made as to what prefix letter to use, depending on the producing industry and other factors.

5.3 For a new UNS number to be assigned, the composition (or other properties, as applicable) must be significantly different from that of any metal or alloy which has already been assigned a UNS number.

5.3.1 In the case of metals or alloys that are normally identified or specified by chemical composition, the chemical composition limits must be reported.

5.3.2 In the case of metals or alloys that are normally identified or specified by mechanical (or other) properties, such properties and limits thereof must be reported. Only those chemical elements and limits, if any, which are significant in defining such materials need be reported.

5.4 Requests for new numbers shall be submitted on "Application for UNS Number Assignment" forms (see Fig. 1 and Fig. 2). Copies of these are available from any UNS number-assigning office (see Table 3) or facsimiles may be made of the one herein.

5.5 All instructions on the printed application form should be read carefully and all information provided as indicated.

NOTE 7—The application form is designed to serve also as a data input sheet to facilitate processing each request through to final print-out of the data on electronic data-processing equipment and to minimize transcription errors at number-assigning offices and data-processing centers.

5.6 To further assist in assigning UNS numbers, the requester is encouraged to suggest a possible UNS number in each request, giving appropriate consideration to any existing number presently used by a trade association, standards society, producer, or user.

5.7 Each completed application form shall be sent to the UNS number-assigning office having responsibility for the series of numbers that appears to most closely relate to the material described on the form (see Table 3).

6. Keywords

6.1 aluminum alloy numbering system; aluminum alloy UNS numbering; cast iron numbering system; cast iron UNS numbering; copper alloy numbering system; copper alloy UNS numbering; ferrous alloys numbering system; ferrous alloys UNS numbering; nickel alloy numbering system; nickel alloy UNS numbering; reactive metals and alloys numbering system; reactive metals and alloys UNS numbering; refractory metals and alloys numbering system; refractory metals and alloys UNS numbering; steel alloy numbering system; steel alloy UNS numbering; stainless steel alloy numbering system; stainless steel alloy UNS numbering; unified numbering system; UNS metal and alloy numbering system; weld filler metal numbering system; weld filler metal numbering; welding electrode numbering system; welding electrode UNS numbering

APPLICATION FOR UNS NUMBER ASSIGNMENT
and
Data Input Sheet for Entering a Specific Material in the
SAE-ASTM Unified Numbering System for Metals and Alloys
(See Reverse Side for Instructions for Completing This Form)

Material Description _____

Suggested UNS No. _____

* UNS Assigned Description _____

*UNS Assigned No. _____

* Chemical Composition

Aluminum	Al		Indium	In		Selenium	Se	
Antimony	Sb		Iridium	Ir		Silicon	Si	
Arsenic	As		Iron	Fe		Silver	Ag	
Beryllium	Be		Lead	Pb		Sulfur	S	
Bismuth	Bi		Lithium	Li		Tantalum	Ta	
Boron	B		Magnesium	Mg		Tellurium	Te	
Cadmium	Cd		Manganese	Mn		Thorium	Th	
Carbon	C		Mercury	Hg		Tin	Sn	
Chromium	Cr		Molybdenum	Mo		Titanium	Ti	
Cobalt	Co		Nickel	Ni		Tungsten	W	
Columbium	Cb		Nitrogen	N		Uranium	U	
Copper	Cu		Oxygen	O		Vanadium	V	
Germanium	Ge		Phosphorus	P		Zinc	Zn	
Gold	Au		Platinum	Pt		Zirconium	Zr	
Hafnium	Hf		Rhenium	Re		Other		
Hydrogen	H		Rhodium	Rh				

* Cross References

AA _____
ACI _____
AISI _____
ANSI _____
AMS _____
ASME _____
ASTM _____
AWS _____
CDA _____
EN _____
FED _____
ISO _____
MIL SPEC _____
SAE _____
OTHERS _____

Requesting Person and Organization (full address) _____

Date of Request _____

* Assigning Org _____ *Date of UNS Assignment _____

Assigner's Name and Office _____

Applicant do not write in shaded areas. * These items for Computer Operator.

NOTE 1—Reverse side of Fig. 1 is located on the next page.

FIG. 1 Sample Application Form.

General:
Before attempting to complete this form, the applicant should be thoroughly familiar with the objectives of the UNS and the "ground rules" for assigning numbers, as stated in SAE J 1086 and ASTM E527, Section 5.

Material Description:
Identify the base element; the single alloying element that constitutes 50 % or more of the total alloy content; other distinguishing predominant characteristics (such as "casting"); and common or generic names if any (such as "ounce metal" or "Waspalloy"). When no single element makes up 50 % or more of the total alloy content, list in decreasing order of abundance the two alloying elements that together constitute the largest portion of the total alloy contents; except that if no two elements make up at least 50 % of the total alloy content, list the three most abundant, and so on. Instead of "iron," use "steel" to identify the base element of those iron-low-carbon alloys commonly known as steels.
When mechanical properties or physical characteristics are the primary defining criteria and chemical composition is secondary or nonsignificant, enter such properties and characteristics with the appropriate values or limits for each.

Suggested UNS No.:
While applicant's suggestion may or may not be the one finally assigned, it will assist proper identification of the material by the UNS Number Assigner.

Chemical Composition:
Enter limits such as 0.13–0.18 (*not* .13–.18 or 0.13 to 0.18) 1.5 max, 0.040 min, and balance. In space designated "other," enter information such as "Each 0.05 max, Total 0.15 max," and "Sn plus Pb 2.0 min."

Cross References:
Letter-symbols listed indicated widely known trade associations and standards-issuing organizations. Enter after appropriate symbols any known specification numbers or identification numbers issued by such groups to cover material equivalent to, similar to, or closely resembling the subject material.
Examples: SAE J 404 (50B44), AISI 415, ASTM A638 (660)
In space designated "other," enter any pertinent numbers issued by groups not listed above. In these instances, the full name and address of the issuing group shall be included.

SUBMIT COMPLETED FORM TO APPROPRIATE UNS NUMBER ASSIGNER, AS LISTED IN SAE J 1086 AND ASTM E527

FIG. 2 Sample Application Form (Reverse Side).

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this practice since the last issue (E527 – 12) that may impact the use of this practice. (Approved September 1, 2016.)

(1) Revised 2.1 adding one to the number of primary series.
(2) Revised Table 1 and Table 3 adding the B00001–B99999 series for additional aluminum and aluminum alloys.