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SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J2276

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Submitted for recognition as an American National Standard

NUMBERING SYSTEM FOR MULTIPLE DIAMETER CUTTING TOOLS

1. ***Scope***—This SAE Recommended Practice provides a systematic method for the identification of multiple diameter cutting tools. It is intended to assist in the cataloging and supplying of these tools.

NOTE—Caution must be taken when assigning codes for designators to prevent specifying cutting tools that cannot be physically or economically manufactured.

2. ***References***

2.1 Applicable Documents—The following publications (latest revision) form a part of this specification to the extent specified herein.

NOTE—Reference information not specified to be manufacturer's standard practices. Manufacturers to supply information for regrind upon request.

2.1.1 ANSI PUBLICATIONS—Available from American National Standards Institute, 11 West 42nd Street, New York, NY 10036-8002.

ANSI B5.10—Machine Tapers
ANSI B94.11—Twist Drills
ANSI B94.11M-1979—Nomenclature, Definitions, Sizes, and Tolerances of Twist Drills

2.1.2 ISO PUBLICATIONS—Available from International Organization for Standardization, 1 Rue DeVarembe, Case Postal 56, CH1211 Geneva 20 Switzerland. (The publications are also available through American National Standards Institute.)

ISO 235—Parallel Shank Jobbers, Stub Series Drills and Morse Taper Shank Drills
ISO 286/2—System of Limits and Fits
ISO 296—Machine Tools—Self Holding Tapers for Tool Shanks
ISO 494—Parallel Shank Twist Drills—Long Series
ISO 866—Center Drills for Center Holes Without Protecting Chamfers—Type A
ISO 2306—Drills for Use Prior to Tapping Screw Threads
ISO 2540—Centre Drills for Centre Holes With Protecting Chamfer—Type B
ISO 2541—Centre Drills for Centre Holes With Radius Form—Type R
ISO 3291—Extra Long Morse Taper Shank Twist Drills

2.1.3 DIN PUBLICATIONS—Available from Beuth Verlag GmbH, Burggrafenstrasse 6, D-1000 Berlin 30 Germany. (The publications are also available through American National Standards Institute.)

DIN 228 Part 1—Morse Taper Shanks
DIN 332—60 Degree Center Holes
DIN 333—60 Degree Center Drills
DIN 333R—Center Drills With Radius Step Angles
DIN 338—Parallel Shank Twist Drills—Jobbers Series
DIN 339—Parallel Shank Twist Drills for Use in Jig Bushings
DIN 340—Parallel Shank Twist Drills—Long Series
DIN 341—Morse Taper Shank Twist Drills—Long Series
DIN 345—Morse Taper Shank Twist Drills—for Use in Jig Bushings
DIN 346—Morse Taper Shank Twist Drill With Oversize Shank
DIN 1412—Twist Drill Definitions
DIN 1414—Twist Drills of High Speed Steel—Technical Conditions of Delivery
DIN 1809—Driving Tenons for Tools With Parallel Shanks
DIN 1861—Twist Drills for Jig Boring Machines
DIN 1869—Extra Length Drills Series 1, 2 and 3
DIN 1870—Extra Length Taper Shank Drills Series 1 & 2
DIN 1897—Stub Length Drills
DIN 1899—Cobalt Micro Precision Drills HSCO Form A
DIN 6539—Continuous Parallel Shank Solid Hardmetal Twist Drills
DIN 7168 Part 1—General Tolerances; Linear and Angular Dimensions
DIN 8037—Twist Drills With Parallel Shank With Carbide Tips for Drilling Metal
DIN 8038—Twist Drills With Parallel Shank With Carbide Tips for Drilling Plastics
DIN 8039—Parallel Shank Masonry Drills With Carbide Tips
DIN 8041—Twist Drills With Morse Taper Shanks With Carbide Tips for Drilling Steel
DIN 17350—Tools Steels—Technical Conditions of Delivery

2.1.4 USCTI PUBLICATIONS—Available from United States Cutting Tool Institute, 1300 Summer Avenue, Cleveland, OH 44115.

Standard Drills—Handbook of Specifications
USCTI—Handbook of Standard Drills

2.1.5 DATOM ENGINEERING SOFTWARE, INC.—Available from Datom Engineering Software, Inc., 561 Somerset, Suite 3, Crystal Lake, IL 60014, (815) 477-3380.

Datom Engrg. Software Inc. TMS III-Drills-Electronic Reference Manual—Nomenclature, Definitions, Sizes, and Tolerances of Twist Drills

3. Numbering System

3.1 Format—The basic numbering system utilizes 30 or 40 positions to fully describe the various dimensions, types, materials, and characteristics of two diameter (one step) cutting tools.

3.1.1 FORMAT—30 Position—Two diameter (one step) cutting tools which comply with the referenced Standards.

3.1.2 FORMAT—40 Position—Two diameter (one step) cutting tools with flute lengths and/or overall lengths which do not comply with the referenced Standards.

3.2 Content of Numbering System—The numbering system utilizes 30 or 40 positions to fully describe the various dimensions, types, materials, and characteristics of two diameter (one step) cutting tools.

Figure 1 illustrates the content and sequence of the 30 positions in the numbering system for two diameter (one step) cutting tools whose flute lengths and overall lengths comply with the referenced Standards.

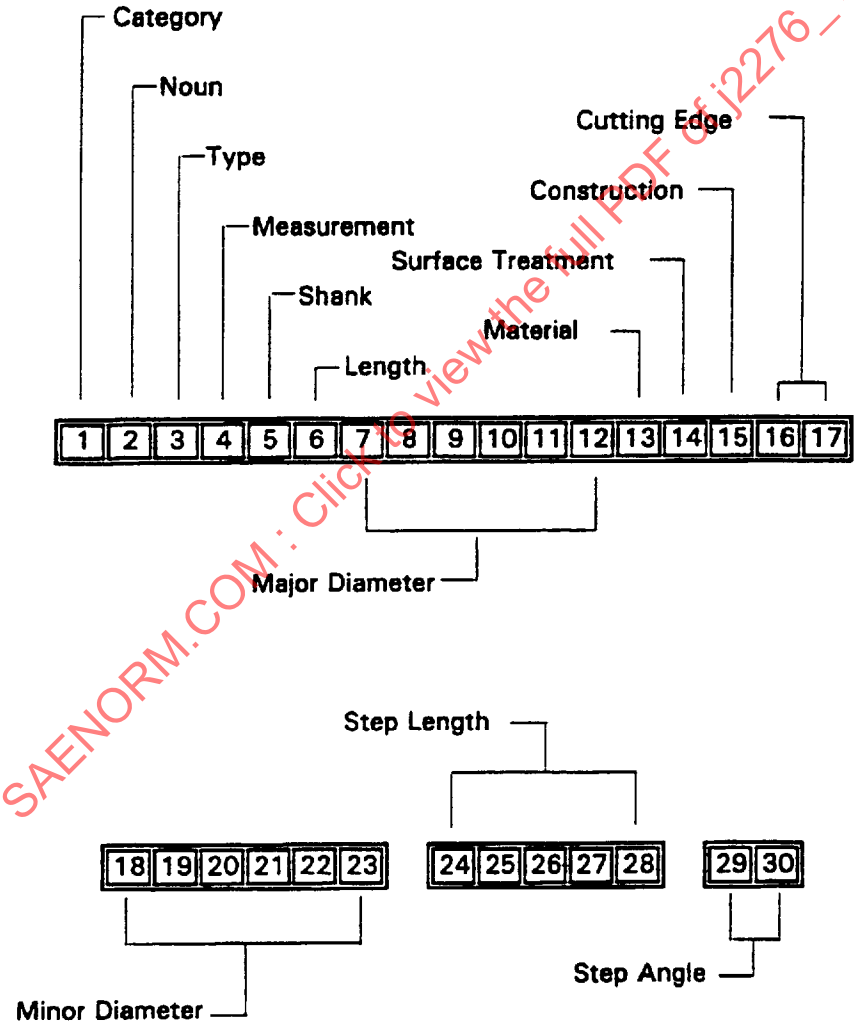

FIGURE 1—FORMAT—30 POSITION

Figure 2 illustrates the content and sequence of the 40 positions in the numbering system for two diameter (one step) cutting tools whose flute lengths and/or overall lengths do not comply with the referenced Standards.

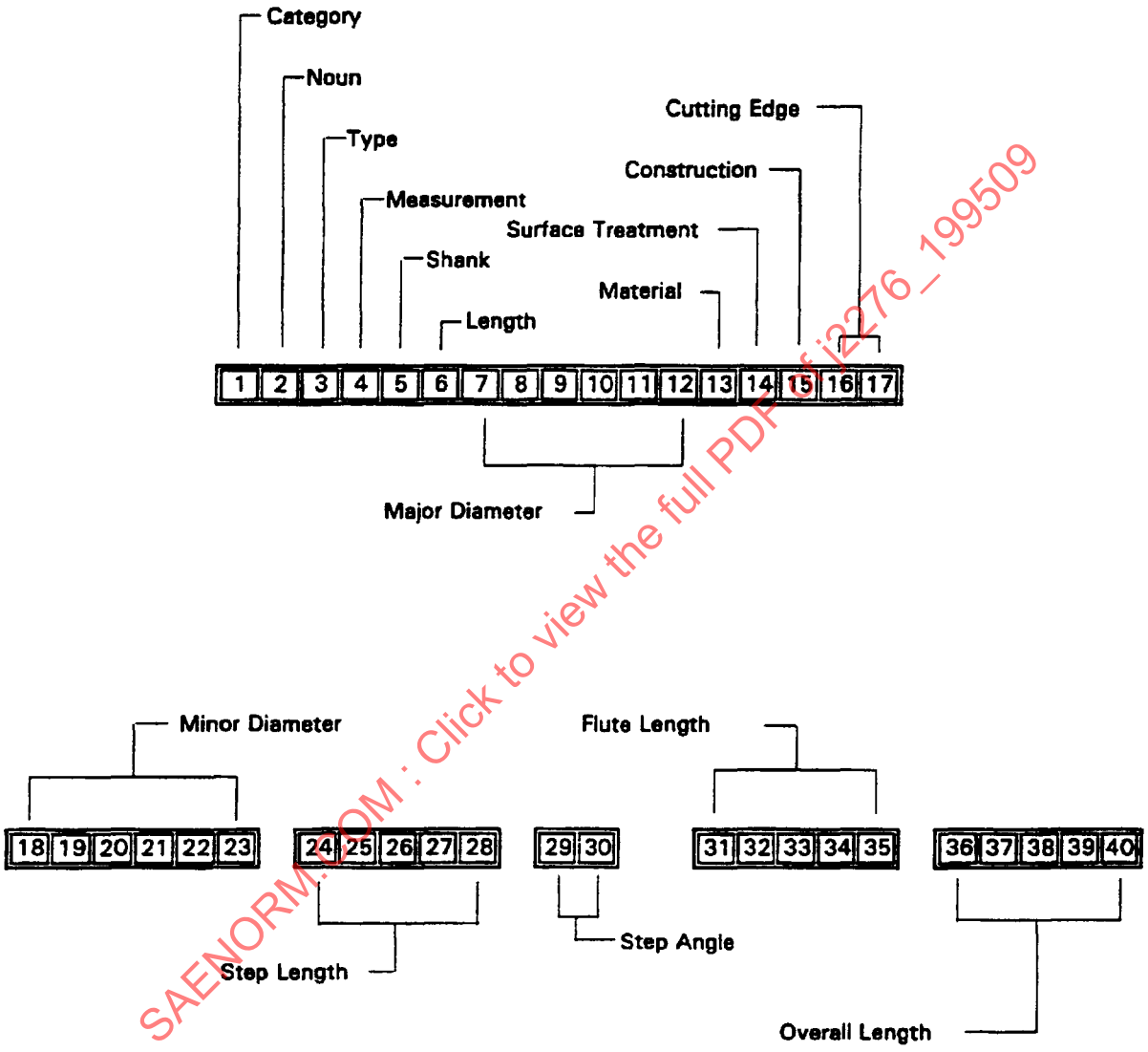

FIGURE 2—FORMAT—40 POSITION

3.3 Positions—The content of each position is explained in detail in the following sections:

3.3.1 POSITIONS 1 AND 2, CATEGORY AND NOUN—Positions 1 and 2 will always be alphabetic. The following designations have been assigned:

Position 1: T—designates TOOL
Position 2: M—designates MULTIPLE DIAMETER (See Figure 3.)

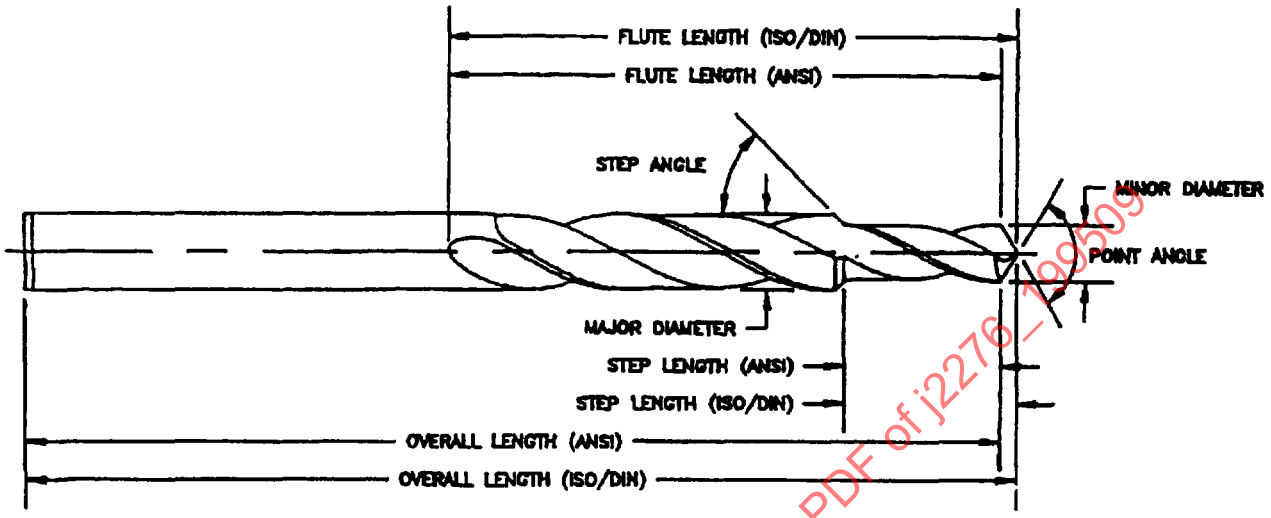

FIGURE 3—MULTI-DIAMETER CUTTING TOOL

3.3.2 POSITION 3, TYPE—Position 3 will always be numeric based on the type of tool. The following codes have been assigned for two diameter cutting tools:

A—2 Flute Step Drill
B—3 Flute Step Drill
C—Subland Drill 2 x 2
D—Subland Drill 3 x 3
E—3 Flute Step Core Drill
F—4 Flute Step Core Drill
G—Subland Core Drill 3 x 3
H—Subland Core Drill 4 x 4
J—4 Flute Step Reamer
K—6 Flute Step Reamer
L—8 Flute Step Reamer
M—Subland Reamer 4 x 4
N—Subland Reamer 6 x 6
P—Subland Reamer 8 x 8
Q—Combination Drill Reamer 2 x 4
R—Combination Drill Reamer 2 x 6
S—Combination Drill Reamer 2 x 8
T—Subland Drill Reamer 2 x 4
U—Subland Drill Reamer 2 x 6
V—Subland Drill Reamer 2 x 8

3.3.3 POSITION 4, MEASUREMENT—Position 4 will always be alphabetic. The following codes have been assigned:

C—Inch—ANSI Standards
M—Metric—ANSI Standards
U—Metric—DIN Standards
W—Metric—ISO Standards

3.3.4 POSITION 5, SHANK—Position 5 can be alpha or numeric.

0—No. 0 Morse Taper
1—No. 1 Morse Taper
2—No. 2 Morse Taper
3—No. 3 Morse Taper
4—No. 4 Morse Taper
5—No. 5 Morse Taper
6—No. 6 Morse Taper
S—Straight Shank (same as major diameter)
T—Straight Shank (same as major diameter)—Tanged

3.3.5 POSITION 6, LENGTH—Position 6 can be alpha or numeric. The following codes have been assigned:

NOTE—When Position 6 is an "X," then the 40 position format must be used.

1—Taper Length (ANSI)/Long Series (DIN/ISO)
2—Jobbers Length (ANSI)/Jobber Series (DIN/ISO)
4—For use in Jig Bushes (DIN)
7—Regular Length—Solid Carbide
8—Stub Length—Solid Carbide
9—Screw Machine Length (ANSI)/Stub Series (ISO)
X—Special Length

3.3.6 POSITIONS 7, 8, 9, 10, 11, AND 12, MAJOR TOOL DIAMETER (METRIC OR INCH)—These positions will always be numeric with a decimal point as an integral part of the number.

NOTE—Use zeros for all open positions.

3.3.6.1 Major Diameter (Metric)—Position 4 indicates "M," "U," or "W."

Major Diameter will be specified to the thousandth of a millimeter, with the decimal point located in Position 9.

Maximum diameter will be (99.999 mm).

Examples:

00.900 mm
03.250 mm
09.750 mm
15.000 mm
37.500 mm

3.3.6.2 Major Diameter-Drill (Inch)—Position 4 indicates "C."

Major Diameter will be specified to the ten thousandth of an inch, with the decimal point located in Position 8.

Maximum diameter will be (9.9999 in).

Examples:

0.1250 in (1/8 in)
0.2500 in (1/4 in)
0.8750 in (7/8 in)
1.0000 in (1 in)
1.2500 in (1-1/4 in)

3.3.7 POSITION 13, MATERIAL DESIGNATOR—Position 13 will always be alphabetic. The following codes have been assigned:

3.3.7.1 Manufacturer's Standard

H—High Speed Steel
C—Cobalt High Speed Steel
S—Solid Carbide
T—Carbide Tipped
A—Solid Carbide Head—Steel Body—Steel Shank
B—Solid Carbide Head—Steel Shank
Z—Solid Carbide—Micrograin
P—Poly Crystalline Diamond Tipped

3.3.7.2 Other

2—High Speed Steel—M3 Type 2
D—Cobalt High Speed Steel—M35
E—Cobalt High Speed Steel—M42
F—Cobalt High Speed Steel—M33
I—High Speed Steel—M1
J—High Speed Steel—M2
K—High Speed Steel—M7
L—High Speed Steel—M10
M—Cobalt High Speed Steel—T15
N—Solid Carbide—C3
Q—Solid Carbide—C2
R—Solid Carbide—C5
U—Carbide Tipped—C1
V—Carbide Tipped—C2
W—Carbide Tipped—C5
O—Carbide Tipped—C3
X—Carbide Tipped—C6
Y—Carbide Tipped—C7

3.3.8 POSITION 14, SURFACE TREATMENT—Position 14 can be alpha or numeric. The following codes have been assigned:

0—Standard Treated
1—Untreated (Bright)
2—Steam Oxide
3—Nitride Plus Steam Oxide
4—Nitride Only
6—Bronze Oxide (Straw Draw)
A—Titanium Nitride (TiN)
B—Titanium Carbo Nitride (TiCN)
C—Titanium Aluminum Nitride (TiAlN)
D—Chrome Nitride (CrN)
E—Chrome Carbide (CrC)
F—Boron Carbide (BC)
G—Zirconium Nitride (ZrN)

3.3.9 POSITION 15, FLUTE CONSTRUCTION (TYPE HELIX AND HAND OF CUT)—Position 15 can be alpha or numeric. The following codes have been assigned:

1—Straight, Right Hand Cut
2—Straight, Left Hand Cut
3—Right Hand Spiral, Right Hand Cut
4—Right Hand Spiral, Left Hand Cut
5—Left Hand Spiral, Right Hand Cut
6—Left Hand Spiral, Left Hand Cut
7—Right Hand High Helix, Right Hand Cut
8—Right Hand High Helix, Left Hand Cut
A—Left Hand High Helix, Right Hand Cut
B—Left Hand High Helix, Left Hand Cut
C—Right Hand Slow Spiral, Right Hand Cut
D—Right Hand Slow Spiral, Left Hand Cut
E—Left Hand Slow Spiral, Right Hand Cut
F—Left Hand Slow Spiral, Left Hand Cut

3.3.10 POSITIONS 16 AND 17, CUTTING EDGE—MINOR DIAMETER—Positions 16 and 17 will be alpha and/or numeric.

3.3.10.1 Point—When Position 3 indicates:

A—2 Flute Step Drill
B—3 Flute Step Drill
C—Subland Drill 2 x 2
D—Subland Drill 3 x 3
Q—Combination Drill Reamer 2 x 4
R—Combination Drill Reamer 2 x 6
S—Combination Drill Reamer 2 x 8
T—Subland Drill Reamer 2 x 4
U—Subland Drill Reamer 2 x 6
V—Subland Drill Reamer 2 x 8

The following codes have been assigned:

00—118 degree Split Point NAS P-5
01—135 degree Split Point NAS P-3
02—135 degree Split Point NAS P-9
15— 60 degree Point
20— 90 degree Point
23— 90 degree Notched Point (M.S.)
25— 90 degree Split Point
26— 90 degree x 60 degree Double Angle Point
28—100 degree Point
33—118 degree Point
35—118 degree Four Facet Point
36—118 degree Four Facet Split Point
37—118 degree Notched Point (M.S.)
39—118 degree Helical Point
40—118 degree Split Point
41—118 degree x 60 degree Double Angle Point
42—118 degree x 90 degree Double Angle Point
43—118 degree x 90 degree Double Angle Split Point
45—118 degree Flat Lip Web Thinning Point
47—120 degree Point
49—130 degree Point
50—130 degree Notched Point (M.S.)
51—130 degree Split Point
52—130 degree Bickford Point
53—130 degree Helical Point
56—135 degree Point
57—135 degree Chipbreaker Point (M.S.)
58—135 degree Notched Point
60—135 degree Split Point
62—140 degree Point
64—150 degree Point
69—180 degree Point (Flat Bottom)
85—Racon Point (M.S.)
86—Fishtail Point

3.3.10.2 Chamfer—When Position 3 indicates:

E—3 Flute Step Core Drill
F—4 Flute Step Core Drill
G—Subland Core Drill 3 x 3
H—Subland Core Drill 4 x 4
J—4 Flute Step Reamer
K—6 Flute Step Reamer
L—8 Flute Step Reamer
M—Subland Reamer 4 x 4
N—Subland Reamer 6 x 6
P—Subland Reamer 8 x 8

The following codes have been assigned:

A1— 90 degrees Included Angle Chamfer
B1—118 degrees Included Angle Chamfer
C1—180 degrees End Cut to Bottom of Flutes
D1—180 degrees Center Cutting
E1— 90 degrees Chamfer Followed by Entering Lead
F1—118 degrees Chamfer Followed by Entering Lead
R1—Radial Radius Form Relieved (Barber-Coleman)
T1—Taper

3.3.11 POSITIONS 18, 19, 20, 21, 22, AND 23, MINOR TOOL DIAMETER (METRIC OR INCH)—These positions will always be numeric with a decimal point as an integral part of the number.

NOTE—Use zeros for all open positions.

3.3.11.1 Minor Diameter (Metric)—Position 4 indicates "M," "U," or "W."

Minor Diameter will be specified to the thousandth of a millimeter, with the decimal point located in Position 20.

Maximum diameter will be (99.999 mm).

Examples:

00.900 mm
03.250 mm
09.750 mm
15.000 mm
17.500 mm
25.500 mm

3.3.11.2 Minor Diameter (Inch)—Position 4 indicates "C."

Minor Diameter will be specified to the ten thousandths of an inch, with the decimal point located in Position 19.

Maximum diameter will be (9.9999 in).

Examples:

0.1250 in (1/8 in)
0.1876 in (3/16 in)
0.2500 in (1/4 in)
0.8750 in (7/8 in)
1.0000 in (1 in)
1.2500 in (1-1/4 in)

3.3.12 POSITIONS 24, 25, 26, 27, AND 28, STEP LENGTH (METRIC OR INCH)—These positions will always be numeric, with a decimal point as an integral part of the number.

NOTE—Use zeros for all open positions.

3.3.12.1 Step Length (Metric)—Position 4 indicates "M," "U," or "W."

The step length will be specified to the nearest tenth of a millimeter, with the decimal point located in Position 27.

Maximum step length will be (999.9 mm).

Examples:

006.3 mm
012.7 mm
025.4 mm
100.0 mm
120.6 mm
158.7 mm

3.3.12.2 Step Length (Inch)—Position 4 indicates "C."

The step length will be specified to the nearest hundredth of an inch, with the decimal point located in Position 26.

Maximum step length will be (99.99 in).

Examples:

00.25 in
00.87 in
01.00 in
01.62 in
04.25 in
06.24 in

3.3.13 POSITIONS 29 AND 30, STEP ANGLE (METRIC OR INCH)—These positions will always be numeric and designate the step angle (1/2 the included angle). The designated step angle will be specified from 00 to 90.

Examples:

30—30 degree Step Angle (60 degree Included Angle)
45—45 degree Step Angle (90 degree Included Angle)
59—59 degree Step Angle (118 degree Included Angle)
60—60 degree Step Angle (120 degree Included Angle)
90—90 degree Step Angle (180 degree Included Angle)

3.3.14 POSITIONS 31, 32, 33, 34, AND 35, FLUTE LENGTH (METRIC OR INCH)—These positions will always be numeric with a decimal point as an integral part of the number.

NOTE—Use zeros for all open positions.

3.3.14.1 Flute Length (Metric)—Position 4 indicates "M," "U," or "W."

The flute length will be specified to the nearest tenth of a millimeter, with the decimal point located in Position 34.

Maximum flute length will be (999.9 mm).

Examples:

120.6 mm
158.7 mm
212.6 mm
260.3 mm
282.4 mm

3.3.14.2 Flute Length (Inch)—Position 4 indicates "C."

The flute length will be specified to the nearest hundredth of an inch, with the decimal point located in Position 33.

Maximum flute length will be (99.99 in).

Examples:

04.75 in
06.25 in
08.37 in
10.25 in
11.12 in

3.3.15 POSITIONS 36, 37, 38, 39, AND 40, OVERALL LENGTH (METRIC OR INCH)—These positions will always be numeric, with a decimal point as an integral part of the number.

NOTE—Use zeros for all open positions.

3.3.15.1 Overall Length (Metric)—Position 4 indicates "M," "U," or "W."

The overall length will be specified to the nearest tenth of a millimeter, with the decimal point located in Position 39.

Maximum overall length will be (999.9 mm).

Examples:

174.5 mm
244.3 mm
292.1 mm
349.2 mm
390.4 mm
460.2 mm