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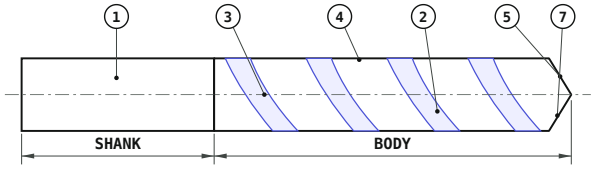
Aircraft Drill Bits: Which Bit, Which Size, Which Speed

Bit by material · drill by fastener · large holes · speed · faults

REFERENCE DRAWING — NOT APPROVED DATA · THE SRM ALWAYS GOVERNS

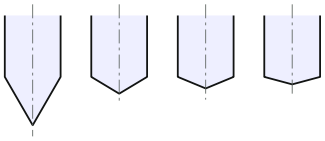
A · ELEVATION

TWO-FLUTE TWIST DRILL · NOT TO SCALE



B · POINT ANGLE

INCLUDED ANGLE · BY JOB

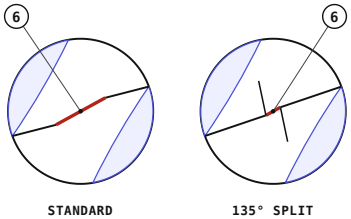


60°	118°	135°	150°
WOOD	GENERAL	ALUMINIUM	ACRYLIC

150° AC 43.13-1B; 140° H-8083-31 p. 7-56

C · END VIEW

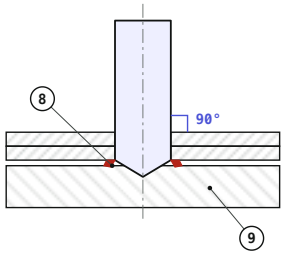
WHY THE POINT IS SPLIT



The chisel edge does not cut: it squeezes or extrudes the metal. It is why a drill walks and why a pilot hole is worth drilling.

D · SECTION

THROUGH THE WORK · 90° TO IT



Tilt the drill: the hole goes oval.

PARTS LIST

#	ITEM	JOB
1	Shank	Held by the chuck
2	Body	Core of the drill
3	Flute	Clears the chips
4	Land	Rides in the hole
5	Cutting lip	Does the cutting
6	Chisel edge	Extrudes, not cuts
7	Heel	12°-15° behind the lip
8	Burr	Remove, every hole
9	Backup block	Supports the exit

Lip angle 59° from the axis on a 118° point. Both lips the same length and angle.

NOTES

1. Dimensions in inches. Do not scale: the SRM sets the values.
2. For reference. The applicable manual always governs.
3. Based on H-8083-31 4-17, 30B 11-13.

REVISIONS

REV	DESCRIPTION	DATE
A	First issue	2026-10-30

The Aviation Point. Structural repair reference

TITLE			
Aircraft drill bits			
DRAWING NO.	REV	SCALE	SHEET
TAP-DWG-012	A	NTS	1 OF 1
APPLIES TO			
Twist drills			

DO NOT SCALE DRAWING

After FAA-H-8083-31 Vol. 1 pp. 4-17, 4-18, 4-20, 6-19, 7-56; FAA-H-8083-30B pp. 11-12, 11-13; AC 43.13-1B par. 3-23. Not to scale.

Which bit for which material

Material	Bit	Rule that matters
Aluminium alloy	HSS, 135° split point	Sheet needs no lubricant. Pilot 3/16 in and over
Mild steel	HSS, 118° point	Sulfurized mineral cutting oil
Stainless (CRES)	Cobalt; or HSS ground to 135°	Half the mild steel speed, 750 rpm at most. Uniform pressure, on before the power. Backing plate as hard as cast iron
Titanium	Carbide or 8% cobalt, short and sharp	0.1563 in is the largest single step by hand. Never let a bit ride in the hole: the surface work hardens
Inconel 625, 718	135° cobalt	Hand drill: push hard at a constant chip rate, about 50 lb on a No. 30. Autofeed preferred. No fluid when hand drilling
Wood	Brad point, or twist sharpened to 60°	Sharp bits, slow steady pressure, drill press where possible, backing piece. Seal the hole
Fibreglass	Solid carbide or diamond-coated	Same drills as carbon. Never a standard twist drill
Carbon/epoxy	Solid carbide or diamond-coated; flat flute or four-flute	High speed, low feed. Metal plate behind to stop breakout. HSS only for a hand pilot such as No. 40; it may last one hole
Aramid (Kevlar)	Klenk; HSS cuts but leaves poor holes	Plastic backup plate, cut through with the part. Between two metal parts, a standard twist drill will do
Composite on metal	As the composite, slowed for the metal	The metal may govern the speed. Titanium under carbon: chips enlarge the hole, so finish with a ream
Acrylic	Blunt point, zero rake; or Unibit	Water-soluble cutting oil for deep holes: acrylic holds heat

Educational reference only, not approved data. Always consult the applicable SRM, AMM, or AC 43.13-1B and your certifying authority.

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Which drill for which fastener

Fastener	Dash	Pilot	Final	Final Ø	mm (converted)
Solid rivet 3/32 in	-3	3/32 in	**#40**	0.098 in	2.49
Solid rivet 1/8 in	-4	1/8 in	**#30**	0.1285 in	3.26
Solid rivet 5/32 in	-5	5/32 in	**#21**	0.159 in	4.04
Solid rivet 3/16 in	-6	3/16 in	**#11**	0.191 in	4.85
Solid rivet 1/4 in	-8	1/4 in	**F**	0.257 in	6.53
AN4 bolt, 1/4 in	-4	Note 1	**F**	0.257 in	6.53
AN5 bolt, 5/16 in	-5	Note 1	**O**	0.316 in	8.03
AN6 bolt, 3/8 in	-6	Note 1	**V**	0.377 in	9.58

Speed

Material	Speed	Source
Aluminium alloy	200 to 300 sfm	H-31 p. 4-16
Mild steel	30 to 50 sfm (100 ft/min on a machine, H-30B)	H-31 p. 4-16; H-30B fig. 11-30
Soft metals · plastics	300 · 200 ft/min	H-30B fig. 11-30
Tool or hard steel · alloy or cast steel	60 · 40 ft/min	H-30B fig. 11-30
Stainless	Half of mild steel, 750 rpm at most	H-31 p. 4-83
Titanium, by hole size	0.0625 in: 920-1,830 rpm · 0.125 in: 460-920 · 0.1875 in: 230-460	H-31 fig. 4-167
Inconel, by drill, maximum	80-30: 500 rpm · 29-U: 300 · 3/8: 150	H-31 fig. 4-166
Composites	2,000 to 20,000 rpm, low feed. Reaming about half the drilling speed	H-31 p. 7-51

What goes wrong

Symptom	Cause	Fix
Oval, egg-shaped hole	Drill tilted going in or coming out	Stay at 90°; use a bushing or guide
Oversize hole	Bent or wobbling bit, or whip on a long one	Spin it free first; shortest bit, tube guard under 1/4 in
Walking off the mark	Punch mark smaller than the chisel edge	Size the mark; walk the hole back by tilting, carefully
Dent or local hardening	Punch mark too heavy, no support	Bucking bar behind while punching
Heavy burr	Slow hand drill, too much pressure	Remove every burr before riveting
Chips between sheets	A gap between the sheets	Clamp up; chip chaser. In carbon, metal chips erode the hole edge
Chatter, stalled motor, burned lips	Pilot too large	Pilot about the chisel edge width
Scarred reamed hole	Reamer turned backwards	Cutting direction only, also on the way out
Titanium will not restart	Blunt bit, or bit left rubbing	Sharp bit, keep cutting
Delamination, breakout	No backing; drill surges at the exit	Metal plate behind, feed-controlled motor
Drill hits what is behind	No stop	Spring drill stop

Key points

- **Inches are official:** mm are converted; a metric drill is an alternative, not the official drill.
- **Aluminium:** HSS 135° split point. Cobalt does not give a quality hole.
- **Rivet holes:** about 0.003 in over the shank tolerance.
- **Other fasteners:** hole size from the SRM, drawing or maker.
- **Hi-Lok:** interference in aluminium, 0.002 in at most; clearance elsewhere.
- **Every hole:** round, straight, no cracks, deburred, chips out.

Step by step

1. Mark, spot with 1/16 in, and support.
2. Pilot through a bushing: 1/8, 3/16 or 1/4 in.
3. Step drill to about 1/64 in under final.
4. Step ream to size, cutting direction only.
5. Deburr by hand; chip chaser between sheets.
6. Inspect: size and fit per the SRM or drawing.

SOURCES · FAA-H-8083-31, AMT Handbook — Airframe, Volume 1 · FAA AC 43.13-1B CHG 1, Acceptable Methods, Techniques and Practices · FAA-H-8083-30B, AMT General Handbook, Chapter 11 · Cherry Aerospace, CA-1011 CherryMAX installation catalogue · Cherry Aerospace CA-1015 Rev. C, CherryMAX process manual · Cherry Aerospace CA-1011 Rev. A, CherryMAX manual · Cherry Aerospace CA-1005 Rev. A, CherryLOCK catalog · MIL-R-47196A, 6 Sep 1977, Rivets, Buck Type, Preparation for and Installation of · Cessna Single Engine Structural Repair Manual, 51-40-00, par. 4.A and 4.D · NASA PRC-9007C, Sept 2020, Installation of Threaded and Collared Fasteners · Hi-Shear drawings HL18 Rev. 28, HL62 Rev. 18, HL218 Rev. 11 · TM 1-1500-204-23-6, General Aircraft Maintenance, Vol. 6

SCAN · OPEN THIS GUIDE
theaviationpoint.com/sheet-metal/drills/

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