

01 Final Drilling Sequence by Fixture Size

UD (Underdrilling) = Fixture Actual Diameter - Drill Diameter

Fixture [Actual Ø]	Drilling Sequence	UD	Step Note
F3.0 [Actual Ø3.2]	Guide 2.0 → Twist 2.2 → Twist 2.8	0.4	No Taper Drill. Narrow anterior ridge — prioritize axial precision.
F3.5 [Actual Ø3.75]	Guide 2.0 → Twist 2.2 → Twist 2.8 → F3.5 / Ø3.2	0.55	Versatile anterior size — note the resistance change entering the Taper Drill.
F4.0 [Actual Ø4.25]	... → F3.5 / Ø3.2 → F4.0 / Ø3.6	0.65	Premolar/molar transition — re-confirm root apex & sinus floor on radiograph. Largest UD in the lineup — expect comparatively higher insertion resistance than neighboring sizes.
F4.5 [Actual Ø4.6]	... → F4.0 / Ø3.6 → F4.5 / Ø4.0	0.6	Outer step narrower than 4.0 (4.25→4.6) — expect smooth progression, no spike.
F5.0 [Actual Ø5.05]	... → F4.5 / Ø4.0 → F5.0 / Ø4.5	0.55	True wide-body: dedicated final drill required, no cortical-only shortcut.

02 RPM by Bone Quality

Bone	Drill	Fixture
D1 Dense	500–800	15–20
D2 / D3 Normal	800–1200	20–30
D4 Soft	800–1200 ↓ lower	15–20

All values rpm. In D4, lean toward the lower end of the range to avoid overcompression.

03 Insertion Torque

Ncm

≥ 55	DANGER — reported risk of bone necrosis / fixture fracture
> 40	WARNING — re-check the torque limiter
≥ 35	Minimum for immediate loading
≥ 30	Primary stability target in D4 soft bone
20–40	General recommended working range
< 20	Survival rate decreases when insertion torque falls below this level

IF EXCESSIVE INSERTION RESISTANCE IS DETECTED

1 Pause and back off **counterclockwise**, then retry.

2 Use the **optional Tap** (hand ratchet preferred).

3 If needed, re-drill **one size larger**.

Preventing bone damage and fixture fracture takes priority over holding the underdrilling target.

TYPE S — Technique, Instruments & Instrument Life

04 Clinical Tips by Drill Type

DRILL	ROLE	CLINICAL TIP
Guide Ø2.0	Axial direction	Start at the center of the alveolar ridge; re-confirm direction against adjacent roots and the nerve canal before proceeding.
Twist Ø2.2 / Ø2.8	Pilot widening	Re-verify axis with a direction indicator; confirm radiographically if there is any doubt.
Taper F3.5-Ø3.2 / F4.0-Ø3.6 F4.5-Ø4.0 / F5.0-Ø4.5	Shaping to fixture form	Lateral pressure rises with diameter — pump whenever bone contact is sustained; re-confirm final depth against the drill's graduation marks.
Tap optional, D1	Pre-cutting thread path	Hand ratchet preferred (keep motor speed low if used). Only when insertion resistance is noticeably high immediately after the final drill.

05 General Drilling Principles

IRRIG

Irrigation is mandatory. The commonly cited literature threshold for bone necrosis is **47 °C for ≥ 1 min**. Maintain continuous external/internal saline irrigation at every step.

PUMP

Never press continuously. Withdraw the drill every **2–3 s** to clear debris and allow cooling.

WEAR

A dull drill generates more heat, not less, through reduced cutting efficiency. Track usage counts and replace on schedule.

AXIS

Re-verify axis and depth at every step using the direction indicator and drill graduation marks, cross-checked against pre-operative radiographic length — particularly before entering the F-series stage. This is a freehand kit; no mechanical depth stop is used.

06 Drill Reuse Limit

25–30 uses max

Recommended reuse count for cutting instruments.

DISCARD IMMEDIATELY – ANY COUNT

Dulled cutting edge (perceptible heat increase) · discoloration · corrosion · bending

Documented visual/magnified inspection after every use is recommended; a usage-tracking tray log is standard practice.

TERMINOLOGY UD (Underdrilling) = Fixture Actual Diameter – Drill Diameter

Reference values only. Final drilling protocol is at the operator's clinical discretion, based on bone quality, site anatomy and radiographic assessment. For professional use only.

01 Final Drilling Sequence by Fixture Size

UD (Underdrilling) = Fixture Actual Diameter - Drill Diameter

Fixture [Actual Ø]	Drilling Sequence	UD	Step Note
F3.5 [Actual Ø3.75]	Guide 2.0 → Twist 2.2 → Twist 2.8 → F3.5 / Ø3.2	0.55	Smallest size in the Type X line (no Ø3.0 option). Anterior-use size.
F4.0 [Actual Ø4.0]	... → F3.5 / Ø3.2 → F4.0 / Ø3.6	0.4	Premolar/molar transition — re-confirm root apex & sinus floor on radiograph. Tightest fit in this size range — expect slightly firmer insertion resistance than neighboring sizes.
F4.5 [Actual Ø4.5]	... → F4.0 / Ø3.6 → F4.5 / Ø4.0	0.5	Wider prosthetic platform & connection begin at the next size (Ø5.0) — no change to this drilling step.
F5.0 [Actual Ø5.0]	... → F4.5 / Ø4.0 → F5.0 / Ø4.5	0.5	True wide-body — dedicated final drill required. Wider prosthetic platform & connection at this size only.

Note: Type X shares the same F-series drills as Type S — no separate drill kit required.

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20–40	General recommended working range
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IF EXCESSIVE INSERTION RESISTANCE IS DETECTED

1 Pause and back off counterclockwise, then retry.

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TYPE X — Technique, Instruments & Instrument Life

04 Clinical Tips by Drill Type

DRILL	ROLE	CLINICAL TIP
Guide Ø2.0	Axial direction	Start at the center of the alveolar ridge; re-confirm direction against adjacent roots and the nerve canal before proceeding.
Twist Ø2.2 / Ø2.8	Pilot widening	Re-verify axis with a direction indicator; confirm radiographically if there is any doubt.
Taper F3.5-Ø3.2 / F4.0-Ø3.6 F4.5-Ø4.0 / F5.0-Ø4.5	Shaping to fixture form	Lateral pressure rises with diameter — pump whenever bone contact is sustained; re-confirm final depth against the drill's graduation marks.
Tap optional, D1	Pre-cutting thread path	Hand ratchet preferred (keep motor speed low if used). Only when insertion resistance is noticeably high immediately after the final drill. Use the Type X-specific Tap only — do not substitute a Type S Tap.

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