OPERACE
by PB Swiss Tools

PROCEDURE 1
Screw sheet overview
Removal of intact screws that can be loosened by hand

Table 1
Compatibility matrix based on screw diameter

(■ = most commonly used screw recess, ▒ = other possible screw recesses)

Hex

∅	HEX 1.3	HEX 1.5	HEX 1.8	HEX 2.0	HEX 2.5	HEX 3.0	HEX 3.5	HEX 4.0	HEX 3/16"	HEX 5.0
Operace Ref	80196	80046	80051	80054	80048	80197	80050	80052	80053	80168
0.9										
1.0										
1.2										
1.3										
1.4										
1.5		■								
1.6										
1.7	▒									
1.8		▒								
1.9										
2.0		■			▒					
2.1										
2.3		▒		▒	▒					
2.4		▒			▒					
2.5	▒	▒	▒	▒	▒					
2.6			▒							
2.7				▒	■		▒			
2.8					▒					
3.0		▒	▒	▒	▒	▒				
3.2		▒								
3.3		▒								
3.4		▒			▒		▒			
3.5		▒		▒	■		▒			
3.7					▒					
3.8				▒	▒	▒				
3.9				▒	▒		■			
4.0				▒	■	▒	■			▒
4.2				▒	▒		▒			
4.3				▒						
4.5				▒	▒	▒	■			▒
4.6				▒			▒			
4.7						▒	▒			
4.8							▒			
4.9							■			
5.0					▒	▒	■	■		▒
5.3							▒			
5.5						▒	▒			
5.7							▒			
6.0					▒	▒	■			▒
6.4							▒			▒
6.5						▒	■	■		▒
6.8										
7.0							■		▒	▒
7.3								■		▒
7.5								▒		▒
8.0							▒			▒

Torx

∅	T4	T5	T6	T7	T8	T9	T10	T15	T20	T25	T30	T40
Operace Ref	80069	80070	80071	80178	80073	80198	80078	80075	80077	80079	80081	80083
0.9												
1.0												
1.2												
1.3												
1.4												
1.5	■	▒	▒									
1.6	▒											
1.7			▒									
1.8	▒		▒		▒							
1.9					▒							
2.0			■	▒	▒							
2.1												
2.3			▒		▒							
2.4				▒	■	▒						
2.5			▒	▒	▒							
2.6			▒									
2.7			▒	▒	■	▒	▒	■				
2.8				▒								
3.0			▒		■	▒	▒	▒				
3.2			▒									
3.3					▒							
3.4												
3.5					▒	▒	▒	■	▒			
3.7								■	▒			
3.8												
3.9					▒							
4.0					▒	▒	▒	▒	▒	■		
4.2												
4.3								▒				
4.5						▒	▒	■	▒	▒		
4.6												
4.7												
4.8					▒							
4.9												
5.0									▒	■	▒	
5.3												
5.5										▒		
5.7												
6.0										■		
6.4												
6.5										▒	▒	
6.8												
7.0								▒		▒		
7.3										▒		
7.5										▒	▒	
8.0								▒				■

Square

∅	SQR 0.7	SQR 1.0	SQR 1.2	SQR 1.5	SQR 1.8	SQR 2.2	SQR 2.3
Operace Ref	80036	80037	80044	80194	80039	80195	80041
0.9	▒						
1.0	▒						
1.2							
1.3	▒						
1.4	▒	▒	▒				
1.5		▒					
1.6		▒					
1.7		▒					
1.8		▒					
1.9		▒					
2.0		▒	▒		▒		
2.1							
2.3			▒				
2.4							
2.5			▒	▒			
2.6							
2.7			▒		▒		
2.8							
3.0			▒		▒		
3.2							
3.3							
3.4							
3.5						▒	▒
3.7							
3.8							
3.9							
4.0							
4.2							
4.3							
4.5							
4.6							
4.7							
4.8							
4.9							
5.0							
5.3							
5.5							
5.7							
6.0							
6.4							
6.5							
6.8							
7.0							
7.3							
7.5							
8.0							

Cruciform

∅	CR 0.3	CR 0.4	CR 0.5	CR 0.6	CR 08	CR 1.0
Operace Ref	80055	80056	80060	80057	80058	80059
0.9	▒					
1.0	■					
1.2	▒	▒				
1.3		■				
1.4	▒	▒				
1.5		▒	■			
1.6			▒			
1.7		▒	▒			
1.8		▒	▒			
1.9			▒			
2.0			■			
2.1				▒		
2.3			▒	▒		
2.4				■		
2.5				▒		
2.6						
2.7				▒		
2.8				▒		
3.0				■	▒	
3.2						
3.3						
3.4						
3.5					▒	
3.7						
3.8						
3.9						
4.0						▒
4.2						
4.3						
4.5						
4.6						
4.7						
4.8						
4.9						
5.0						
5.3						
5.5						
5.7						
6.0						
6.4						
6.5						
6.8						
7.0						
7.3						
7.5						
8.0						

Slotted

∅	SL 0.3	SL 0.4	SL 0.5	SL 0.6	SL 0.8	SL 1.0
Operace Ref	80061	80062	80065	80063	80064	80066
0.9	▒					
1.0	■					
1.2	▒	▒				
1.3		■				
1.4	▒	▒				
1.5		▒	■			
1.6			▒			
1.7		▒	▒			
1.8		▒	▒			
1.9			▒			
2.0			■			
2.1				▒		
2.3			▒	▒		
2.4				■		
2.5				▒		
2.6						
2.7				▒	▒	
2.8				▒		
3.0				■	▒	
3.2						
3.3						
3.4						
3.5					▒	
3.7						
3.8						
3.9						
4.0						▒
4.2						
4.3						
4.5						
4.6						
4.7						
4.8						
4.9						
5.0						▒
5.3						
5.5						
5.7						
6.0						
6.4						▒
6.5						▒
6.8						
7.0						▒
7.3						
7.5						
8.0						

Phillips

∅	PH 1
Operace Ref	80086
0.9	
1.0	
1.2	
1.3	
1.4	
1.5	
1.6	
1.7	
1.8	
1.9	
2.0	▒
2.1	
2.3	
2.4	
2.5	
2.6	
2.7	▒
2.8	
3.0	
3.2	
3.3	
3.4	
3.5	
3.7	
3.8	
3.9	
4.0	
4.2	
4.3	
4.5	
4.6	
4.7	
4.8	
4.9	
5.0	
5.3	
5.5	
5.7	
6.0	
6.4	
6.5	
6.8	
7.0	
7.3	
7.5	
8.0	

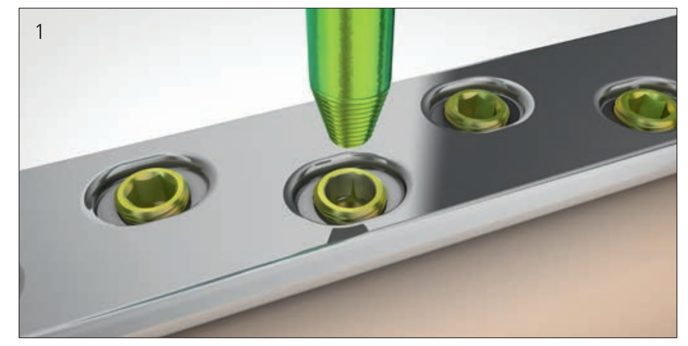
Hex	HEX 1.3, HEX 1.5, HEX 1.8, HEX 2.0, HEX 2.5, HEX 3.0, HEX 3.5, HEX 4.0, HEX 3/16" (4.7), HEX 5.0
Torx	T4, T5, T6, T7, T8, T9, T10, T15, T20, T25, T30, T40
Square	SQR 0.7, SQR 1.0, SQR 1.2, SQR 1.5, SQR 1.8, SQR 2.2, SQR 2.3
Cruciform	CR 0.3, CR 0.4, CR 0.5, CR 0.6, CR 0.8, CR 1.0
Slotted	SL 0.3, SL 0.4, SL 0.5, SL 0.6, SL 0.8, SL 1.0
Phillips	PH1

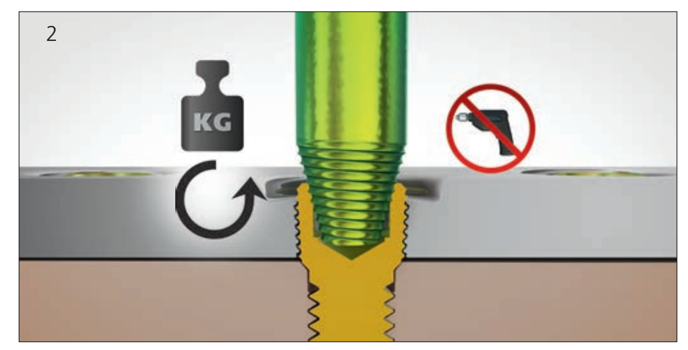
■ Most commonly used screw recess
▒ Other possible screw recesses

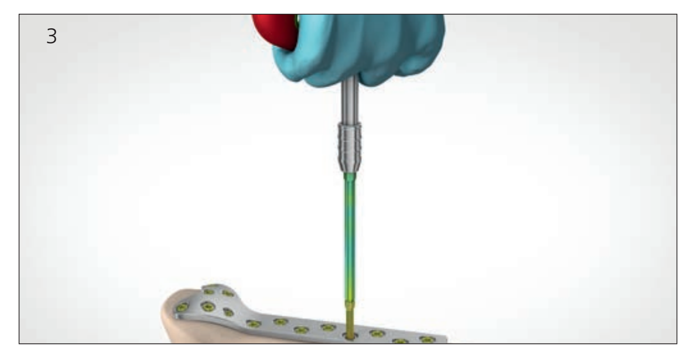
Important
– Blows and bending loads should be avoided since they can lead to instrument breakage.
– The use of incorrect sizes leads to improper functioning and an increased risk of instrument breakage.

PROCEDURE 2
Removal of screws with a damaged screw recess

Handle · Cross-handle · Extraction screw







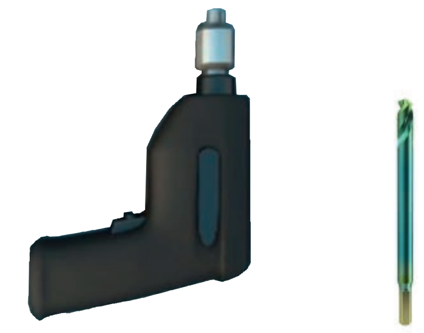
Procedure
1. Select extraction screw of the appropriate size matched to the screw drive according to Table 2.
2. Lock extraction screw in the handle coupling.
3. Start **turning** the extraction screw **to the left, counterclockwise,** in the same axis as the screw to be removed.
4. Continue turning, applying constant pressure, until the conical left-handed thread is securely seated in the damaged recess and until sufficient torque is applied to unscrew the screw.
5. Then unscrew the screw, turning to the left.

Animation

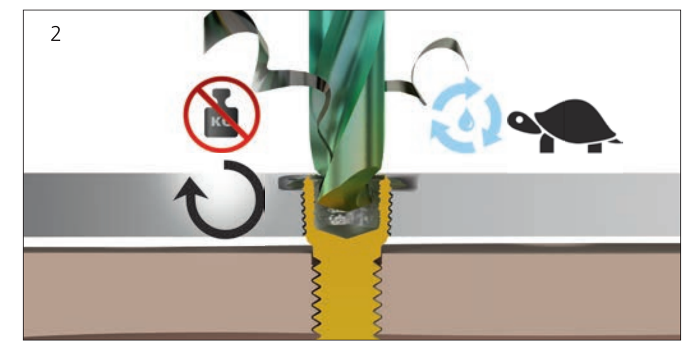
Table 2 — **Screw drive size**

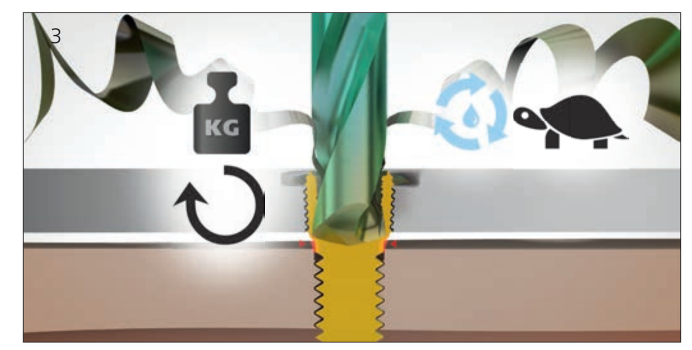
∅ mm	Hex	Torx	Square	OPERACE REF	Extraction screw
1.5–3.2	Hex 1.5	T6, T7	SQR 1.0, 1.2, 1.5	80018	1.6
2.0–4.3	Hex 1.8, 2.0	T8, T9	SQR 1.8	80170	2.0
2.3–6.0	Hex 2.5, 3.0	T10, T15	SQR 1.8, 2.2	80020	2.6
3.5–8.0	Hex 3.5, 4.0	T20, T25	SQR 2.3	80022	3.5

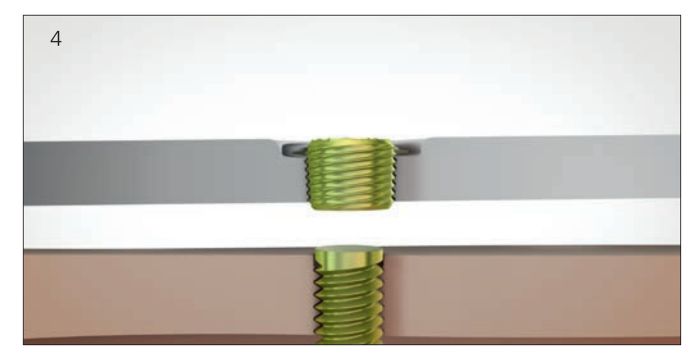
PROCEDURE 3
Removal of locking head screws stuck in the plate which cannot be removed by any of the above procedures



Power tool · Extraction drill bit





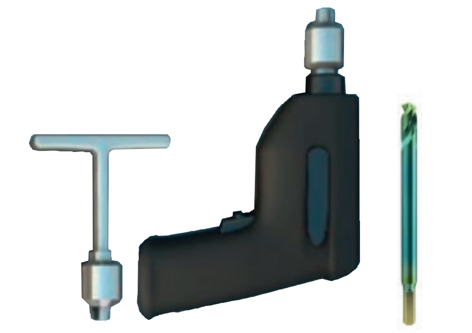


Procedure
1. Select extraction drill bit of the appropriate size according to the Table 3.
2. Position the drill bit in the screw recess and start **turning** the drill bit matching the screw diameter **to the right, clockwise,** in the same axis as the screw to be removed and applying **very little pressure.**
3. Only drill down until the underside of the implant plate is reached. This either loosens the screw head from the shaft or else weakens it sufficiently to cause it to break off when the plate is lifted.
4. Remove the plate.
5. Remove the screws according to procedure 4.

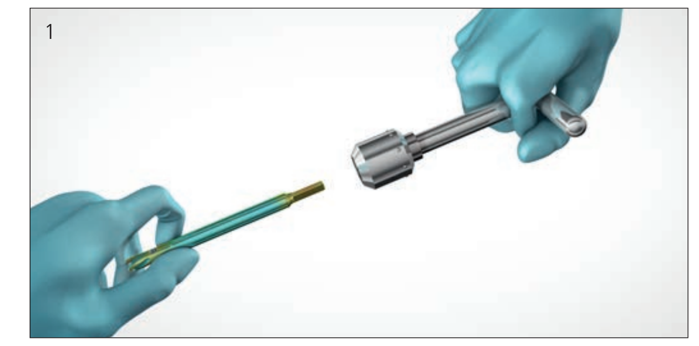
Table 3
Screw diameter in mm

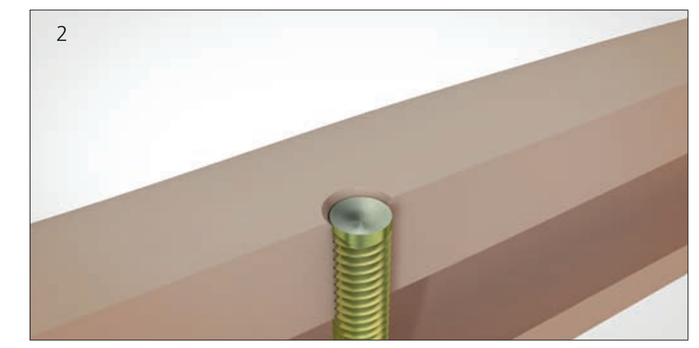
∅	OPERACE REF	Extraction drill bit
1.0–1.5	80023	1.5
1.6–2.0	80123	2.0
2.1–2.5	80024	2.5
2.6–3.2	80025	3.2
3.3–4.0	80019	4.0
4.1–5.0	80026	5.0
5.1–6.5	80027	6.5
6.6–7.5	80021	7.5

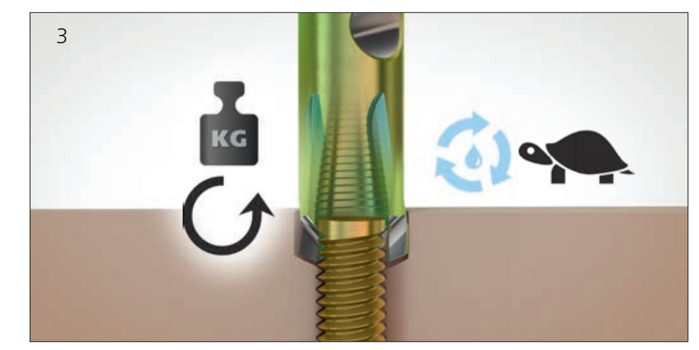
PROCEDURE 4A
Removal of broken, projecting screws or screws processed according to procedure 3

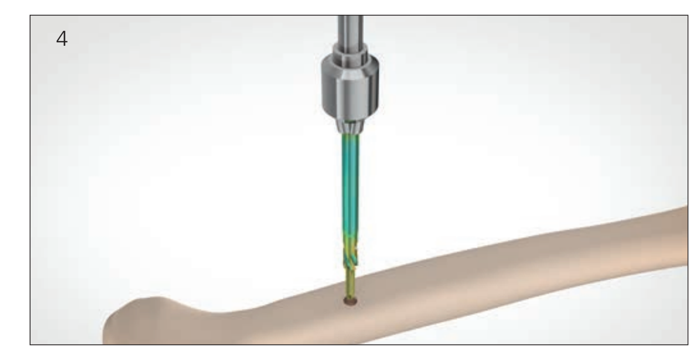


T-handle · Power tool · Extraction reamer







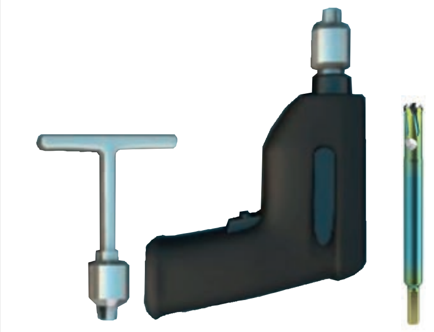


Procedure
1. Select extraction reamer of the appropriate size matched to the screw recess according to the Table 4.
2. Locate the stationary extraction reamer and turn in the direction of the screw axis to ream over the screw shaft remaining in the bone. Apply **slight pressure** initially, **turning to the left, counterclockwise.**
3. As soon as the reamer grips the screw shaft, continue reaming with increased pressure until the conical left-handed thread is securely seated on the screw shaft.
4. **When unscrewing the reamer do not relieve the pressure, but maintain the constant axial pressure and direction of rotation.**

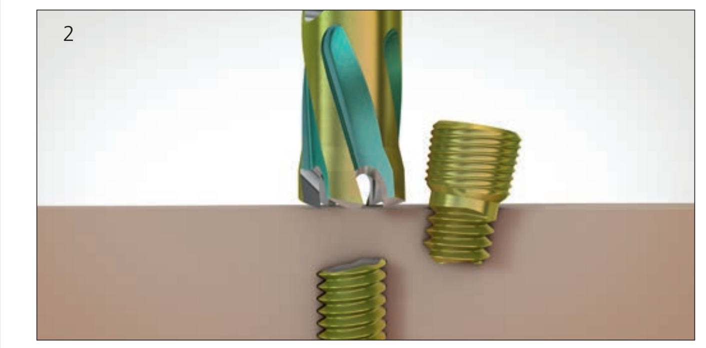
Table 4
Screw diameter in mm

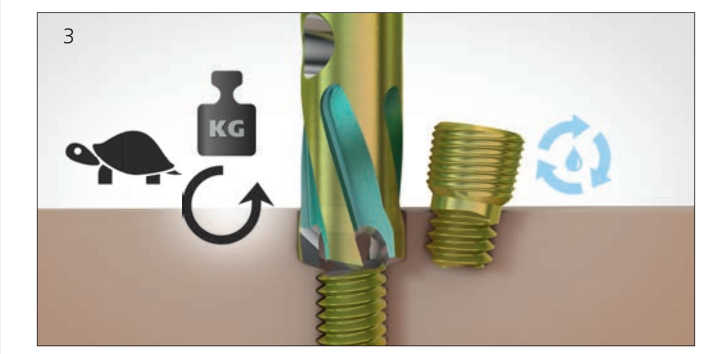
∅	OPERACE REF	Extraction reamer
1.4–2.0	80009	2.0
2.1–2.5	80028	2.5
2.6–3.2	80029	3.2
3.3–4.0	80030	4.0
4.1–4.5	80033	4.5
4.6–5.8	80035	5.8
5.9–7.5	80015	7.5

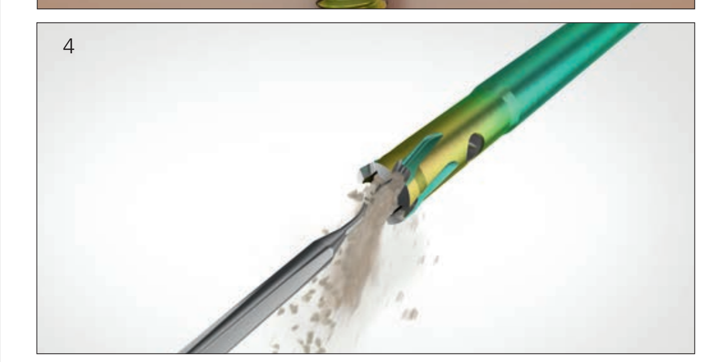
PROCEDURE 4B
Removal of buried broken screw shafts

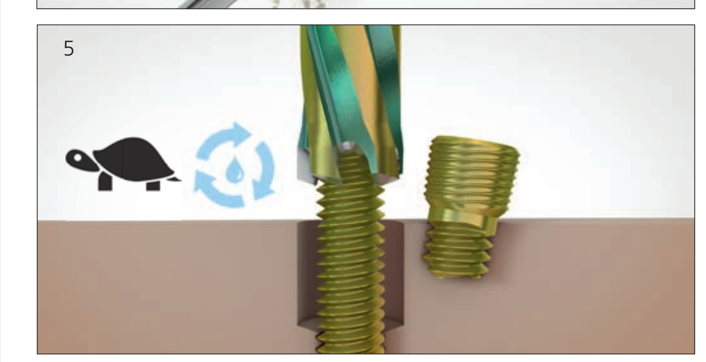


T-handle · Power tool · Extraction reamer









Procedure
1. Select extraction reamer of the appropriate size matched to the screw recess according to Table 4.
2. Locate the stationary extraction reamer perpendicular to the bone so that the teeth rest on the bone as evenly as possible. Apply **slight pressure** initially, **turning to the left, counterclockwise.**
3. As soon as the reamer grips, ream in the direction of the screw axis under image intensifier control until it can be guided through the screw shaft.
4. **Remove the reamer from the bone at regular intervals and free it of accumulated bone material.**
5. Continue reaming with increased pressure until the conical left-handed thread is securely seated on the screw shaft.
6. **When unscrewing the reamer do not relieve the pressure, but maintain the constant axial pressure and direction of rotation.**

Surgical Instruments by PB Swiss Tools

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