DHS®/DCS® Dynamic Hip and Condylar Screw System

TECHNIQUE GUIDE

SYNTHES®

Original Instruments and Implants of the Association for the Study of Internal Fixation—AO ASIF

Contents

Introduction to the Dynamic Hip Screw—DHS

The Dynamic Hip Screw is designed to provide strong and stable internal fixation of a variety of inter-trochanteric, subtrochanteric and basilar neck fractures, with minimal soft tissue irritation.

Strong

- The DHS Plates are made of 316L stainless steel and are cold-worked for strength.

Stable

- The number of screw holes per plate length is maximized, without compromising plate strength. This allows an increased number of fixation points with a smaller incision.

- DCP® (Dynamic Compression Plate) holes in the DHS side plate:
  — allow angulation of 4.5 mm Cortex Screws, for lag screw fixation of medial fragments, and
  — allow axial compression and multiple-screw fixation of the main fragment in subtrochanteric fractures with shaft extension.

- Two flats within the DHS Plate barrel correspond to the two-flat design of the DHS/DCS Lag Screw, preventing rotation of the lag screw within the barrel. The two-flat design also eases insertion of the plate over the DHS/DCS Lag Screw.

Minimal Soft Tissue Irritation

- The DHS Plates have a low-profile design, reducing the risk of trochanteric bursitis.

The DHS Plates are available in a wide range of sizes and barrel angles, with standard or short barrels, for varied clinical situations.

The DHS/DCS Lag Screw, available from 50 mm to 145 mm lengths, easily glides within the DHS Plate barrel for controlled collapse and impaction of fragments. When the fracture requires additional intraoperative compression, the DHS/DCS Compression Screw can be used; only one size compression screw is needed.

The DHS instruments provide direct measurements throughout the DHS procedure, allowing proper reaming, tapping and lag screw insertion depth. The built-in stop and locking nut on the DHS Triple Reamers prevent over-reaming.

DHS TECHNIQUE

Indications

The DHS is indicated for the following fractures of the proximal femur:

- Intertrochanteric fractures
- Subtrochanteric fractures*
- Basilar neck fractures

The DHS is indicated for stable fractures, and unstable fractures in which a stable medial buttress can be reconstructed. The DHS provides controlled collapse and compression of fracture fragments. This results in stable fixation and prevents undue stress concentration on the implant.

*For certain subtrochanteric fractures, a 95° device is the implant of choice. (See "Using the DCS for Subtrochanteric Fractures," page 13.)

38 mm barrel 25 mm barrel

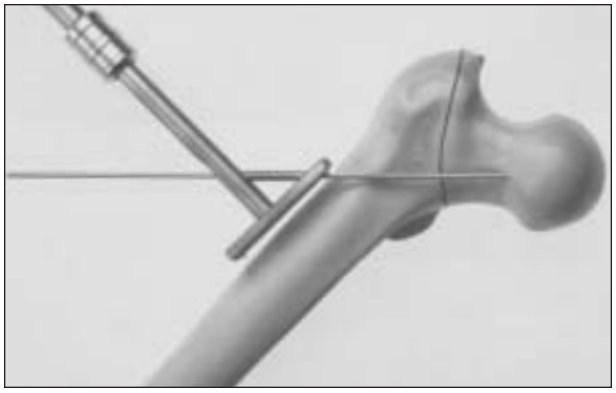
Plate Selection

- *Barrel length*. The standard 38 mm barrel length is most commonly indicated.
  The 25 mm short barrel is indicated for specific clinical situations, including:
  —Cases in which the standard barrel may not provide sufficient glide for the lag screw; i.e., a long impaction distance is expected.
  —A medial displacement osteotomy.
  —Unusually small femurs.

- *Barrel angle.* An evaluation of the angle subtended between the femoral neck and shaft axes (C.C.D., or collum-center-diaphysis, angle) of the uninjured femur will aid in the selection of the most appropriate barrel angle. The 135° barrel angle is most commonly indicated.

Note: Greater barrel angles may produce biomechanical advantages in unstable cases; i.e., better gliding characteristics and reduced bending stresses on the plate/barrel junction, although correct placement of the implant becomes technically more difficult as barrel angles increase.[1]

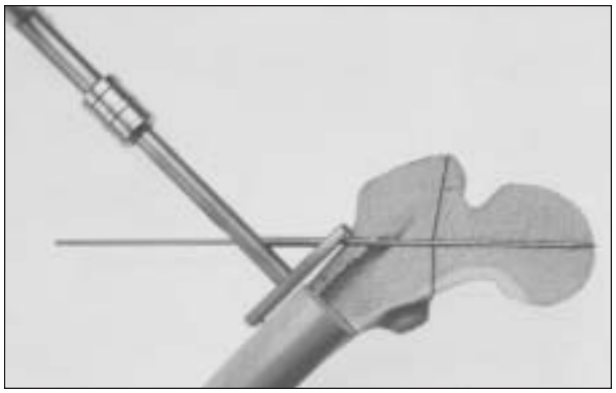
[1] P. Regazzoni, Th. Rüedi, R. Winquist, and M. Allgöwer, *The Dynamic Hip Screw Implant System* (Berlin: Springer-Verlag, 1985) 5.



Note: This procedure requires image intensification.

Surgical Technique

1 Reduce the fracture. Determine anteversion by placing a DHS/DCS Guide Pin anteriorly along the femoral neck, using the appropriate DHS Angle Guide. Gently hammer the pin into the femoral head. This anteversion pin will later allow correct placement of the central guide pin in the center of the femoral head.

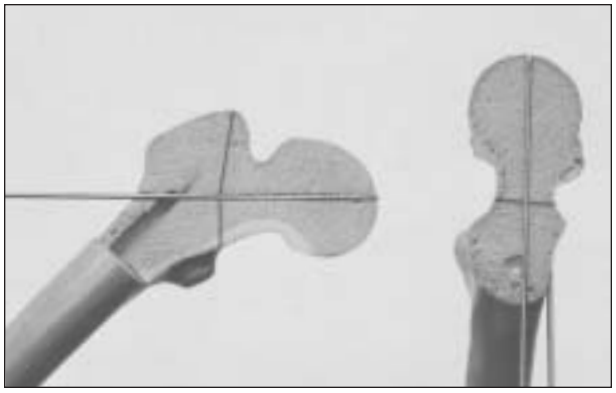


2 Align the appropriate DHS Angle Guide along the axis of the femoral shaft, and place it on the femur. Point the guide tube toward the center of the femoral head. Predrilling of the lateral cortex with the 2.0 mm Drill Bit is recommended in dense bone. Insert a DHS/DCS Guide Pin through the appropriate DHS Angle Guide, parallel to the anteversion pin and directed toward the center of the femoral head. This point of introduction varies with barrel angle. When a 135° barrel angle is used, the guide pin enters the proximal femur approximately 2.5 cm distal to the vastus ridge.

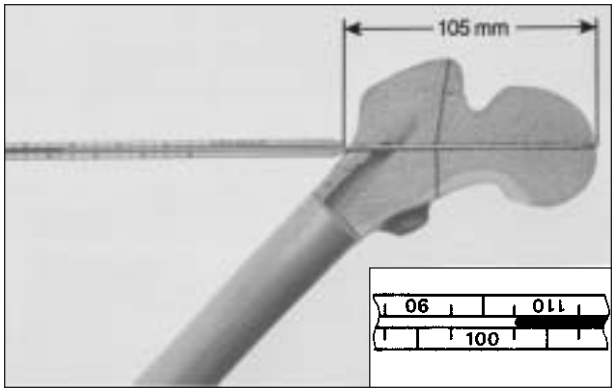
Notes:

Because it is designed for use with the DHS/DCS instruments and implants, the DHS/DCS Guide Pin, and not an alternate pin, must be used.

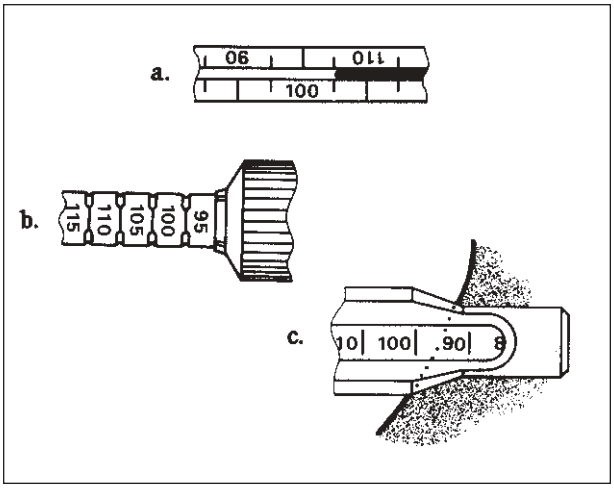
This guide pin remains in place throughout the procedure. If it is inadvertently withdrawn, reinsert it immediately. (See "Reinserting the DHS/DCS Guide Pin," page 21.)



3 Confirm placement of the DHS/DCS Guide Pin under image intensification. It must lie along the axis of the femoral neck in both the A-P and lateral views, and parallel to the anteversion pin. If its position is incorrect, insert a new DHS/DCS Guide Pin. Remove and discard the anteversion pin.

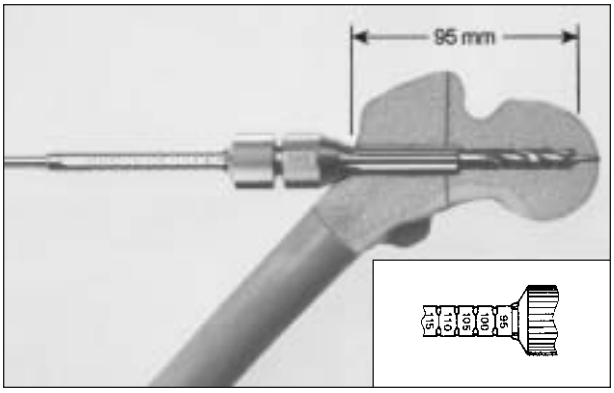


4 Slide the Direct Measuring Device over the guide pin to determine guide pin insertion depth. Calibration on the measuring device provides a direct reading.

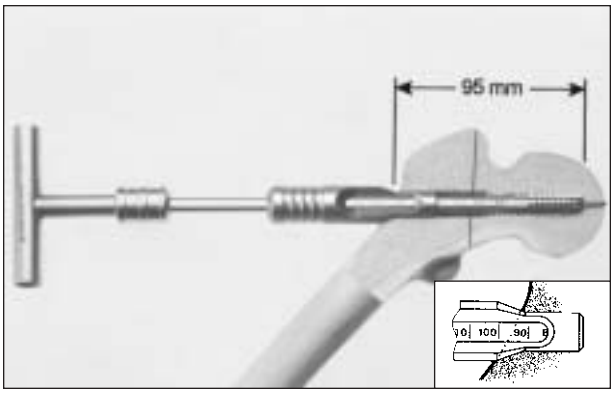


5 To calculate reaming depth, tapping depth and lag screw length, subtract 10 mm from the reading. For example:

- **a.** Direct reading . . . . . 105 mm
- **b.** Reamer setting . . . . . 95 mm
- **c.** Tapping depth (optional) . . . . . 95 mm
  Lag screw length . . . . . 95 mm

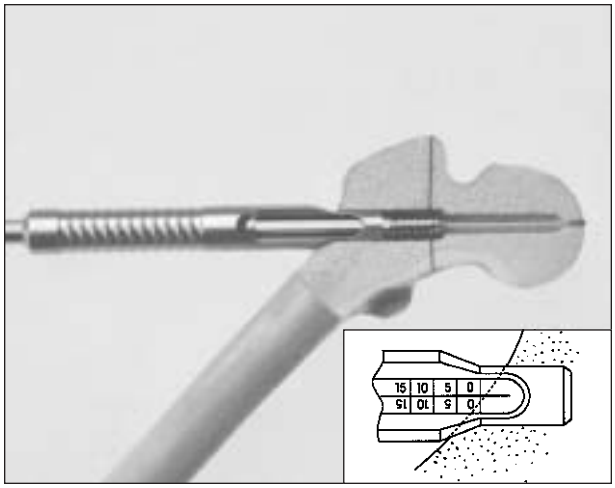


6 Assemble the appropriate DHS Triple Reamer (for either the standard or short barrel DHS Plate). (See "Assembling the Instrumentation," page 18.) Set the reamer to the correct depth. Insert the DHS Triple Reamer into the Power Drive using the Large Quick Coupling attachment. Slide the reamer over the guide pin to simultaneously drill for the lag screw, ream for the plate barrel, and countersink for the plate/barrel junction to the preset depth. When reaming in dense bone, continuously irrigate the DHS Triple Reamer to prevent thermal necrosis.



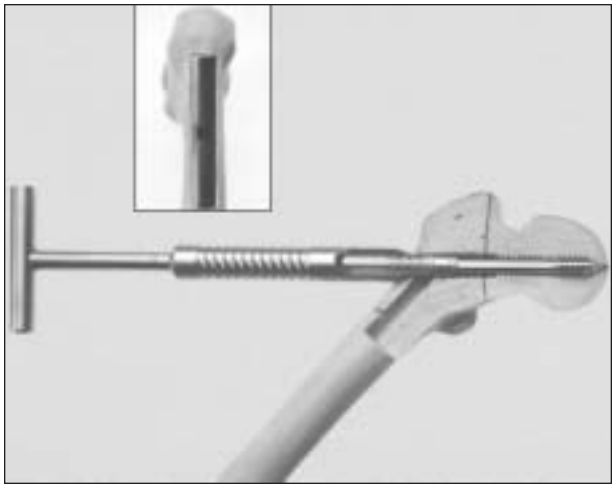
7 If necessary, tap to the predetermined depth using the Tap Assembly. (See "Assembling the Instrumentation," page 19.) Tapping depth can be seen through the window in the Short Centering Sleeve.

DHS Technique (Continued)

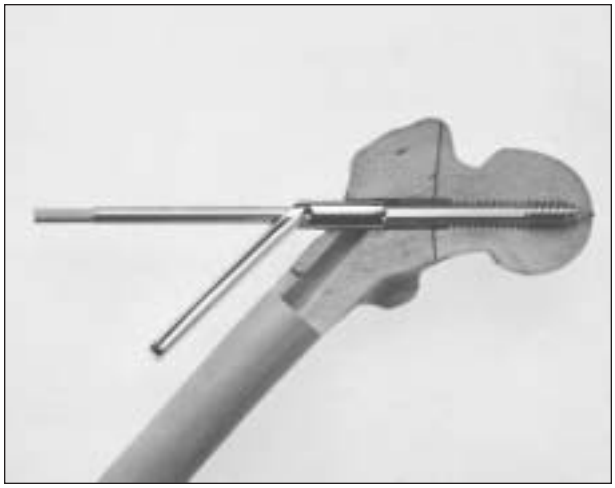


8 Select the DHS/DCS Lag Screw and assemble the Lag Screw Insertion Assembly. (See "Assembling the Instrumentation," page 20.) Slide the assembly over the guide pin and into the reamed hole. Seat the Long Centering Sleeve in the hole to center and stabilize the assembly. Insert the lag screw by turning the handle clockwise, until the zero mark on the assembly aligns with the lateral cortex. The threaded tip of the lag screw now lies 10 mm from the joint surface. The lag screw may be inserted an additional 5 mm in porotic bone, for increased holding power and additional controlled collapse.

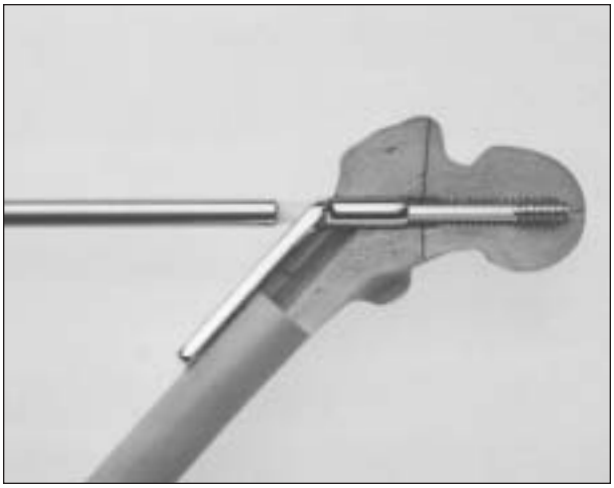
Note: Keep continuous forward pressure on the DHS/DCS Wrench while advancing the lag screw.



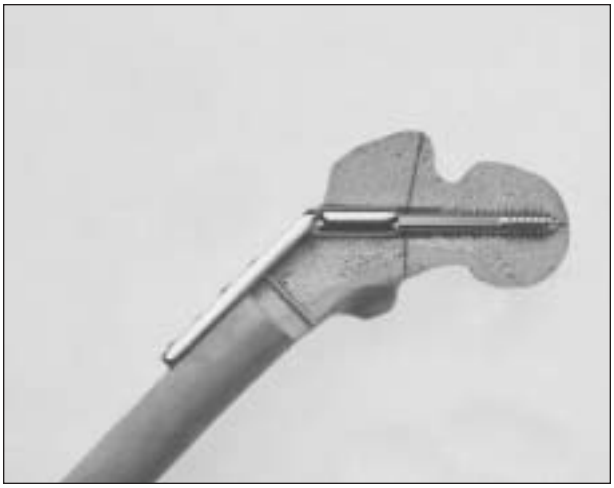
9 Before removing the assembly, align the handle so it is in the same plane as the femoral shaft (parallel to the femoral shaft axis when viewed laterally). This allows proper placement of the DHS Plate onto the lag screw.



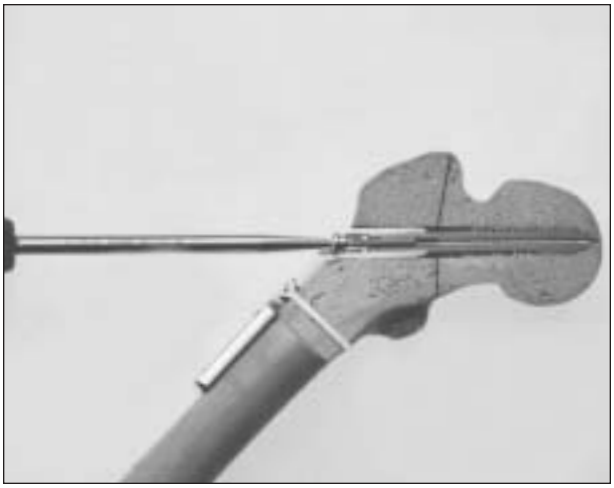
10 Remove the DHS/DCS Wrench and Long Centering Sleeve. Slide the appropriate DHS Plate onto the guide shaft/lag screw assembly until it contacts the lateral cortex. Loosen and remove the Coupling Screw and Guide Shaft. Use the Power Drive in reverse, with the Jacobs Chuck attachment, to withdraw the DHS/DCS Guide Pin.



11 Gently seat the plate with the DHS/DCS Impactor. The vastus ridge may be chiseled to further seat the plate on bone.



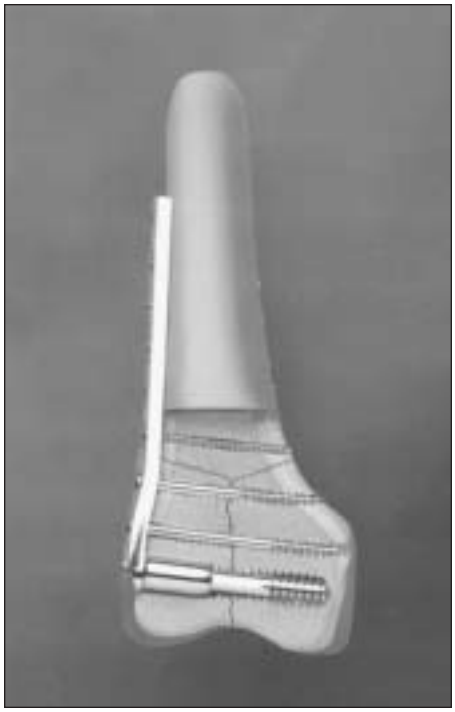
12 Using AO ASIF standard screw insertion technique, fix the DHS Plate to the femur with 4.5 mm Cortex Screws.



13 For further, intraoperation compression of the trochanteric fracture, the DHS/DCS Compression Screw may be inserted into the lag screw. The DHS/DCS Compression Screw may be used in unstable fractures to prevent disengagement of the lag screw from the plate barrel in non-weightbearing patients.

Note: Use of the Compression Screw may cause stripping of the lag screw thread in porotic bone.

Introduction to the Dynamic Condylar Screw—DCS



The Dynamic Condylar Screw is designed to provide strong and stable internal fixation of certain distal femoral and subtrochanteric fractures, with minimal soft tissue irritation.

Strong

- The DCS Plates are made of 316L stainless steel and are cold-worked for strength.

Stable

- The two holes closest to the barrel accept 6.5 mm Cancellous Bone Screws. This enhances stability by allowing:
  - — fixation of the most distal condylar fracture fragments with two or more screws, or
  - — fixation of the most proximal subtrochanteric fracture fragment with two or more screws.

- DCP holes in the DCS side plate allow angulation of 4.5 mm Cortex Screws and axial compression across a shaft fracture.

- The number of screw holes per plate length is maximized, without compromising plate strength. This allows an increased number of fixation points with a smaller incision.

- Two flats within the DCS Plate barrel correspond to the two-flat design of the lag screw, preventing rotation of the DHS/DCS Lag Screw within the barrel. The two-flat design also eases insertion of the plate over the DHS/DCS Lag Screw.

Minimal Soft Tissue Irritation

- Low-profile design reduces risk of iliotibial band irritation (distal femoral fractures) and trochanteric bursitis (subtrochanteric fractures).

The DCS Plates are available with 6 to 16 holes, for varied clinical situations. The DHS/DCS Lag Screw is available in 50 mm to 145 mm lengths. The DHS/DCS Compression Screw can be used for additional compression; only one size compression screw is needed.

The DCS instruments also provide direct measurements throughout the DCS procedure, allowing proper reaming, tapping, and lag screw insertion depth. The built-in stop and locking nut on the DCS Triple Reamer prevent over-reaming.

DCS TECHNIQUE

Indications

The DCS is indicated for the following fractures of the distal femur:

- Intercondylar fractures*
- Supracondylar fractures*
- Unicondylar fractures*

*The following anatomic conditions should exist:

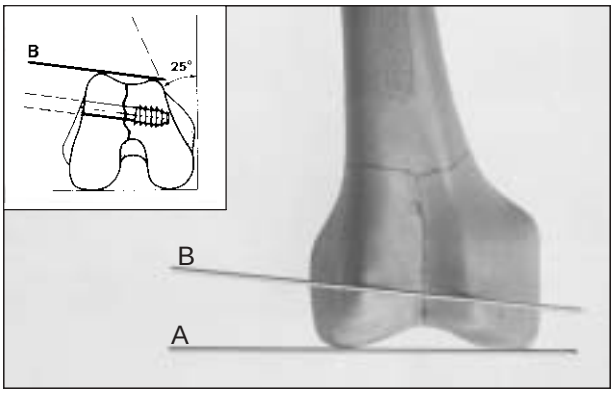
- 4cm of distal femur should remain intact to provide support for the implant.
- A distal portion of the medial condyle should be intact for the DHS/DCS Lag Screw to gain good purchase.

If these conditions do not exist, a SYNTHES 95° Condylar Plate or Condylar Buttress Plate should be considered.

Note: This procedure requires image intensification.

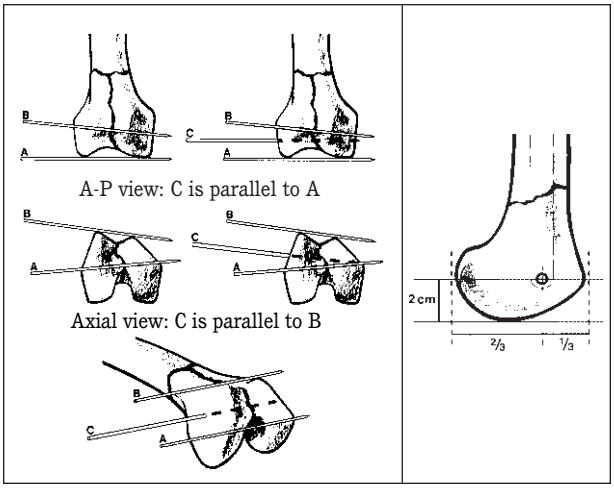
Surgical Technique

1 Reduce the fracture. The fracture can be temporarily stabilized with DHS/DCS Guide Pins or Steinmann pins. Place these pins so they do not interfere with subsequent positioning of the DCS implant assembly. (See illustrations accompanying step 3 for proper implant positioning.) In intercondylar fractures, the pins should be replaced with independent 6.5 mm Cancellous Bone Screws with washers.



2 To determine direction of the central guide pin, flex the knee to 90°, and mark the axis of the knee joint by placing a K-wire distally over the condyles (A). Place a second K-wire anteriorly over the condyles (B).

Note: Placement of the DHS/DCS Guide Pin determines placement of the DCS implant assembly. Misplacement of the guide pin can result in varus/valgus or rotational malalignment of the fracture fragments.



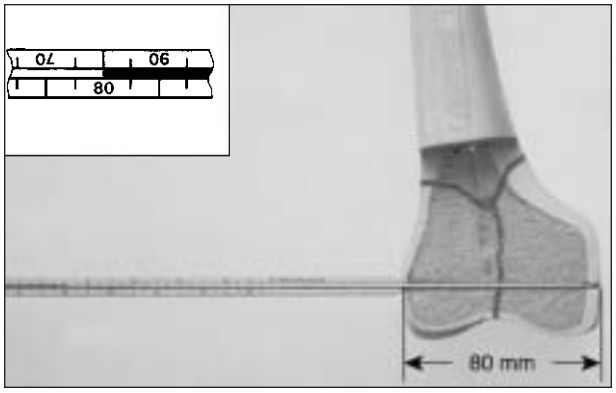
3 Using the DCS Drill Guide, insert the central guide pin (C) parallel to the distal K-wire (A) in the A-P view, and parallel to the anterior K-wire (B) in the axial view. Do not insert the guide pin too far medially; consider the inclination of the medial wall of the distal femur. In the sagittal plane, the central guide pin enters the distal femur at a point anterior to the midline between the condyles, and in line with the shaft axis, approximately 2 cm from the knee joint. Confirm placement of the central guide pin under image intensification. If it is not parallel to the knee joint axis, insert a new DHS/DCS Guide Pin.

Notes:

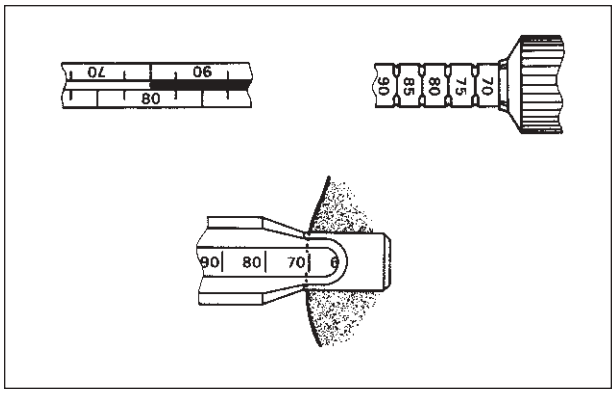
Because it is designed for use with the DHS/DCS instruments and implants, the DHS/DCS Guide Pin, and not an alternate pin, must be used.

This guide pin remains in place throughout the procedure. If it is inadvertently withdrawn, reinsert it immediately. (See "Reinserting the DHS/DCS Guide Pin," page 21.)

DCS Technique (Continued)



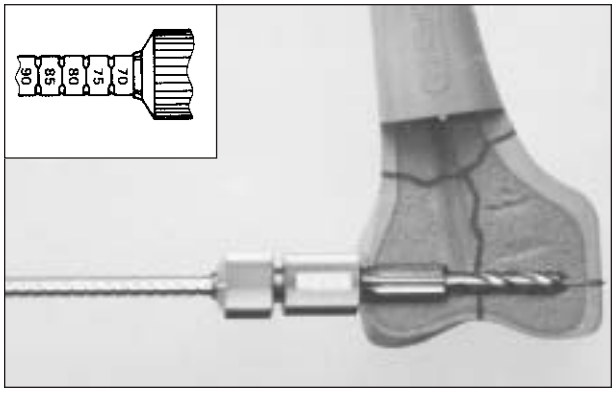
4 Slide the Direct Measuring Device over the guide pin, and determine guide pin insertion depth. Calibration on the measuring device provides a direct reading.



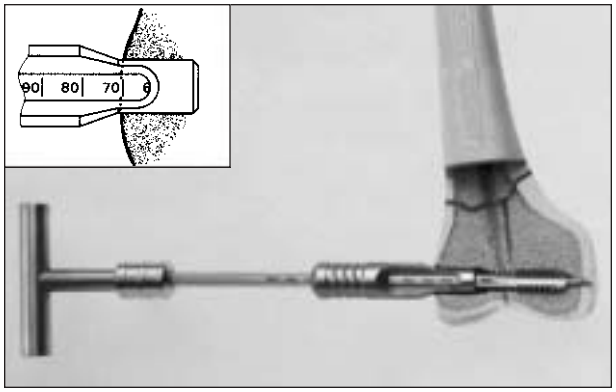
5 To calculate reaming depth, tapping depth and lag screw length, subtract 10 mm from the reading. For example:

a. Direct reading . . . . . 80 mm
b. Reamer setting . . . . . 70 mm
c. Tapping depth (optional) . . . . . 70 mm
Lag screw length . . . . . 70 mm*

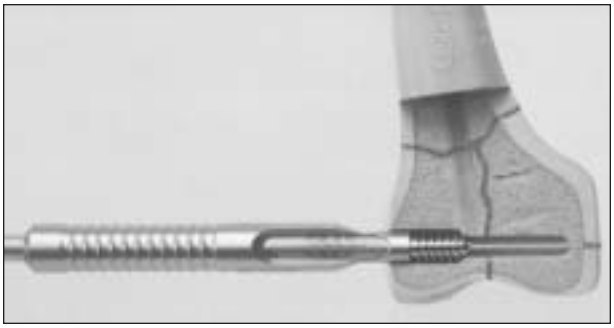
*If the Compression Screw will be used, allow for additional compression of the fracture by selecting a lag screw 5 mm shorter (in this case, 65 mm) and inserting it an additional 5 mm.



6 Assemble the DCS Triple Reamer. (See "Assembling the Instrumentation," page 18.) Set the reamer to the correct depth. Insert the DCS Triple Reamer into the Power Drive using the Large Quick Coupling attachment. Slide the reamer over the guide pin to simultaneously drill for the lag screw, ream for the plate barrel, and countersink for the plate/barrel junction to the preset depth. When reaming in dense bone, continuously irrigate the DCS Triple Reamer to prevent thermal necrosis.

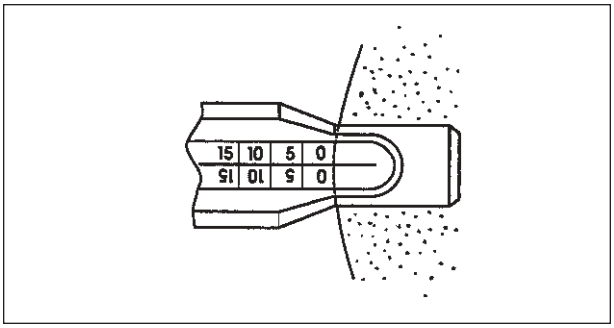


7 If necessary, use the Tap Assembly to tap to the predetermined depth, which can be seen through the window in the Short Centering Sleeve. (See "Assembling the Instrumentation," page 19.)



8 Select the correct length DHS/DCS Lag Screw and assemble the Lag Screw Insertion Assembly. (See "Assembling the Instrumentation," page 20.) Slide the assembly over the guide pin and into the reamed hole. Seat the Long Centering Sleeve in the hole to center and stabilize the assembly.

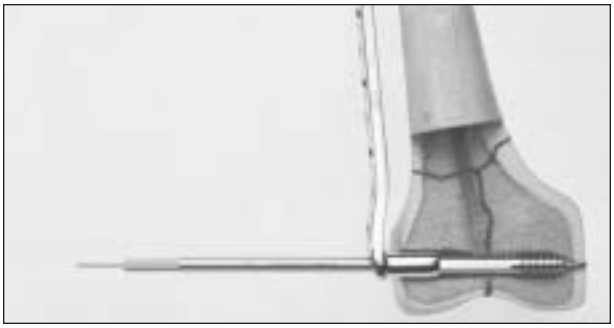
Note: Keep continuous forward pressure on the DHS/DCS Wrench while advancing the lag screw.



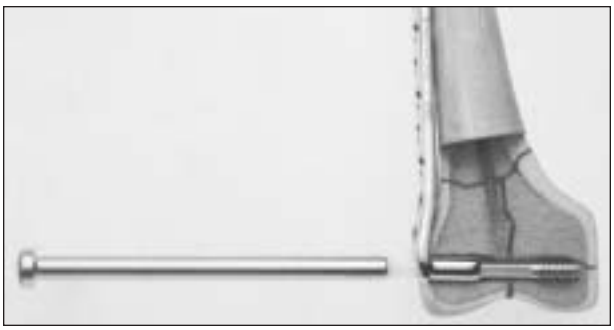
9 Insert the lag screw by turning the handle clockwise until the 0 mark on the assembly aligns with the lateral cortex. The threaded tip of the lag screw now lies 10 mm from the medial cortex. The lag screw may be inserted an additional 5 mm in porotic bone, for increased holding power.

Note: If a lag screw 5 mm shorter than reaming and tapping depth is used (in this case, 65 mm), insert it an additional 5 mm, until the 5 mark on the assembly aligns with the lateral cortex.

10 Before removing the assembly, align the handle so it is parallel with the femoral shaft axis when viewed laterally. This allows proper placement of the DCS Plate onto the lag screw.

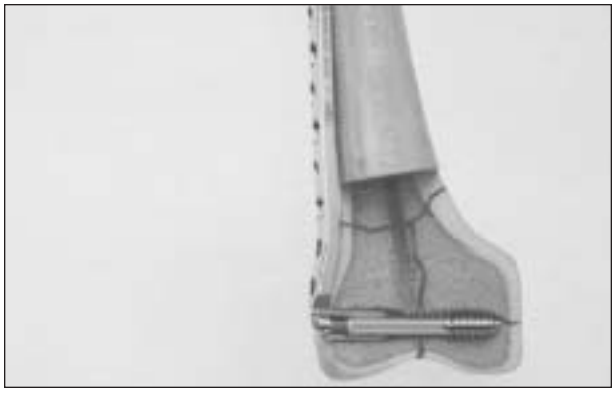


11 Remove the DHS/DCS Wrench and Long Centering Sleeve. Slide the appropriate DCS Plate onto the guide shaft/lag screw assembly. Loosen and remove the Coupling Screw and Guide Shaft. Use the Power Drive in reverse, with the Jacobs Chuck attachment, to withdraw the guide pin.

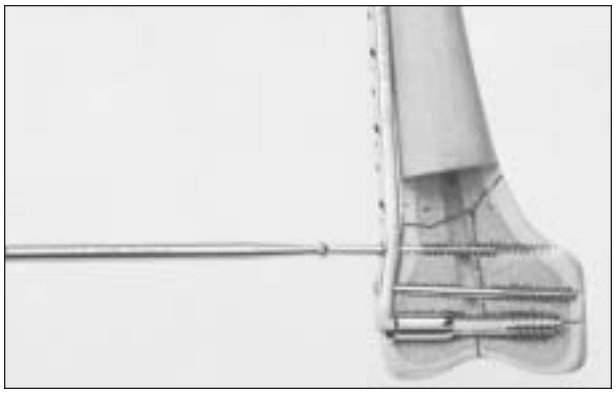


12 Gently seat the plate with the DHS/DCS Impactor. The lateral condylar cortex may be chiseled to further seat the plate on bone.

DCS Technique (Continued)

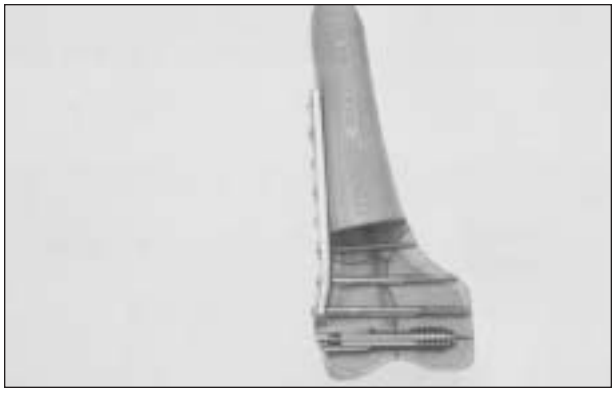


13 If the joint fragments were not previously reduced with independent 6.5 mm Cancellous Bone Screws, the DHS/DCS Compressing Screw may be inserted into the lag screw. In porotic bone, insert the screw very carefully to avoid stripping the lag screw thread.



14 Further interfragmentary compression can be achieved by using two 6.5 mm Cancellous Bone Screws through the distal round holes of the DCS Plate.

15 Once an approximate anatomic reduction is achieved, use the Articulated Tension Device to produce final compression between the femoral shaft and distal fragments. To facilitate reduction of the diaphyseal fragment, particularly in cases of medial comminution with shortening, the tension device can also be used as a distractor.



16 Using AO ASIF standard screw insertion technique, fix the DCS Plate to the femur with 4.5 mm Cortex Screws.

Using the DCS for Subtrochanteric Fractures

Indications

The DCS is indicated for the following fractures of the proximal femur:

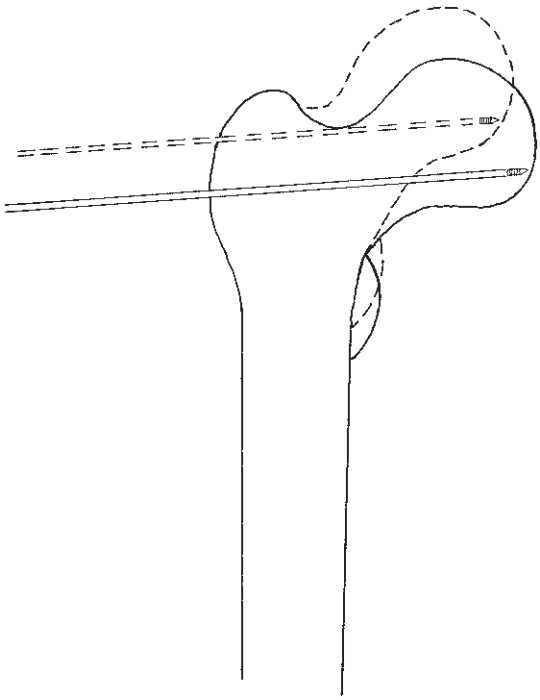
- Transverse subtrochanteric fractures*
- Short oblique subtrochanteric fractures*
- Long oblique subtrochanteric fractures*

The design of the DCS Plate can enhance fixation of selected, stable subtrochanteric fractures because it permits stable fixation in the proximal fragment.[3] The DCS Plate has a 95° barrel angle, allowing it to enter the femur more proximally than the DHS Plate and allowing insertion of two or more screws into the calcar. Further, its two round proximal plate holes permit insertion of 6.5 mm Cancellous Bone Screws, for stable proximal fixation.

- *Stable transverse and short oblique subtrochanteric fractures.* When using the DCS Plate for these fractures, the plate can act as a tension band against normal medial compressive forces.[4]
- *Long oblique subtrochanteric fractures.* When using the 135° DHS Plate to treat long oblique subtrochanteric fractures, use of the proximal plate screws can prohibit compression. With the 95° DCS Plate, however, stable fixation can be achieved by lagging the fracture through the plate, since controlled collapse is not anticipated.

Note: When used in the proximal femur, the DCS Plate can only be used to treat stable fractures; i.e., fractures that can be directly reduced and anatomically reassembled to allow restoration of the bony medial buttress. Because the DCS Plate has a 95° barrel angle, it does not allow for controlled collapse and compression.

*With the lesser trochanter avulsed or on the distal fragment (femoral shaft).[2]



The insertion point of the guide pin will vary with CCD angle (angle subtended between the femoral neck and shaft axes), as depicted by this valgus femur (dotted lines). Example is exaggerated for clarity.

Preoperative Considerations

Plate Selection

Select the DCS Plate so there are four screws (eight cortices) distal to the fracture in hard diaphyseal bone, or five screws (ten cortices) in porotic bone.

Insertion of the DHS/DCS Guide Pin

Though the general insertion area of the guide pin is known, the precise insertion point varies with the CCD angle, or the angle subtended between the femoral neck and shaft axes. Assessment of the CCD angle will allow subsequent placement of the lag screw in its optimal position—in the center of the femoral neck and in the inferior half of the femoral head. (See illustration.) This insertion point should be determined preoperatively with the aid of planning templates.

[2] Roy Sanders and P. Regazzoni, "Treatment of Subtrochanteric Femur Fractures Using the Dynamic Condylar Screw," *Journal of Orthopaedic Trauma* vol. 3, no. 3 (New York: Raven Press, 1989) 211.
[3] ibid 206–213.
[4] ibid 212.

Note: This procedure requires image intensification.

Surgical Technique

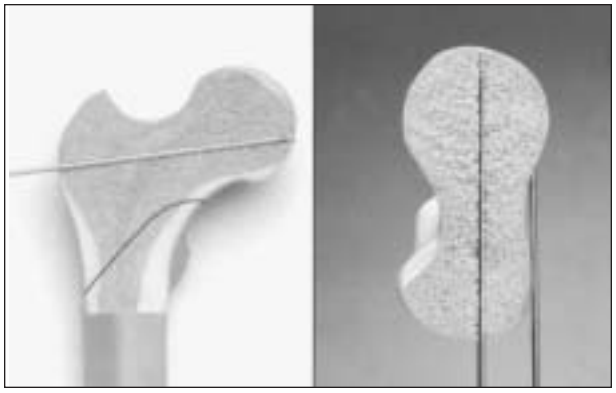
1 Reduce the fracture. Determine anteversion by placing a DHS/DCS Guide Pin anteriorly along the femoral neck, gently hammering it into the femoral head. This anteversion pin will ensure correct placement of the central guide pin.

2 Place the DCS Drill Guide along the axis of the femoral shaft so the central guide pin will enter the femur slightly anterior to the midpoint of the greater trochanter, near the vastus ridge. The precise level at which the guide pin enters the femur should be determined preoperatively. (See "Preoperative Considerations," page 13.) Insert the central guide pin parallel to the anteversion pin in the lateral view. Predrilling of the lateral cortex with the 2.0 mm Drill Bit is recommended in dense bone.

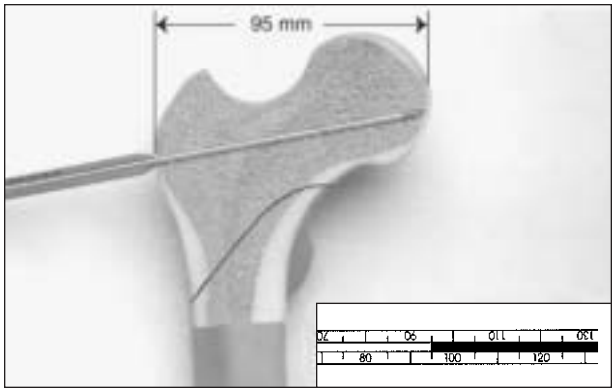
Notes:

Because it is designed for use with the DHS/DCS instruments and implants, the DHS/DCS Guide Pin, and not an alternate pin, must be used.

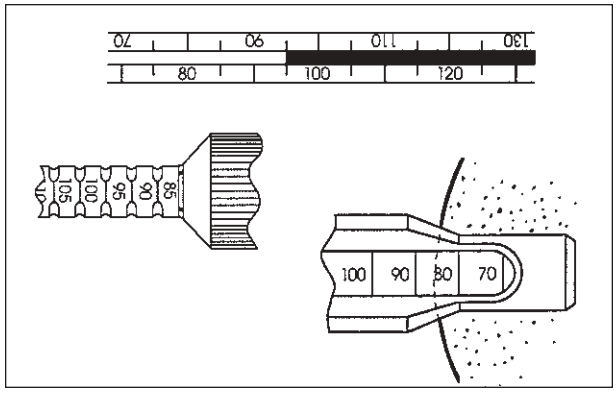
This guide pin remains in place throughout the procedure. If it is inadvertently withdrawn, reinsert it immediately. (See "Reinserting the DHS/DCS Guide Pin," page 21.)



3 Confirm placement of the central guide pin under image intensification, in two views. In the A-P view, the pin should lie in the center of the neck and in the inferior half of the femoral head. In the lateral view, it should lie in the middle of the femoral head. The tip of the guide pin should just engage the subchondral bone. If its position is incorrect, insert a new guide pin. Remove and discard the anteversion pin.

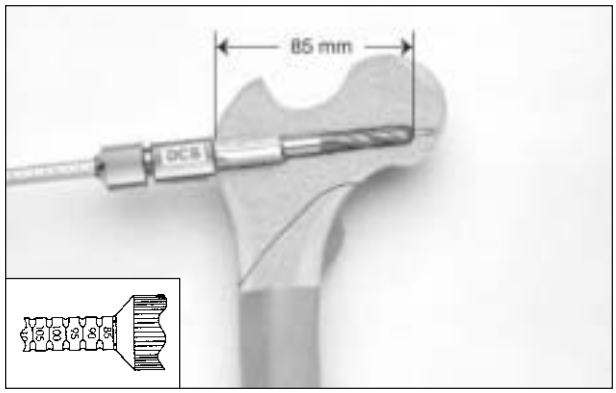


4 Slide the Direct Measuring Device over the guide pin to determine guide pin insertion depth. Calibration on the measuring device provides a direct reading.

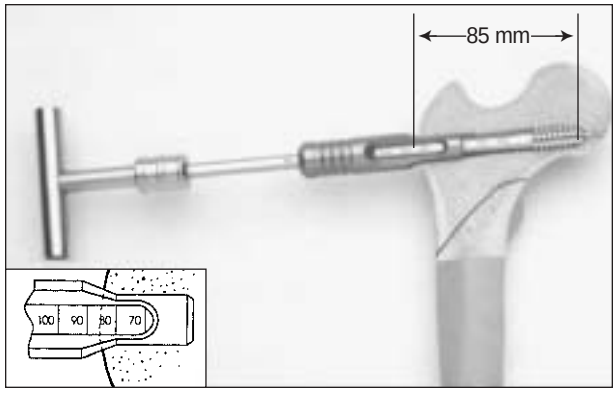


5 To calculate reaming depth, tapping depth and lag screw length, subtract 10 mm from the reading. For example:

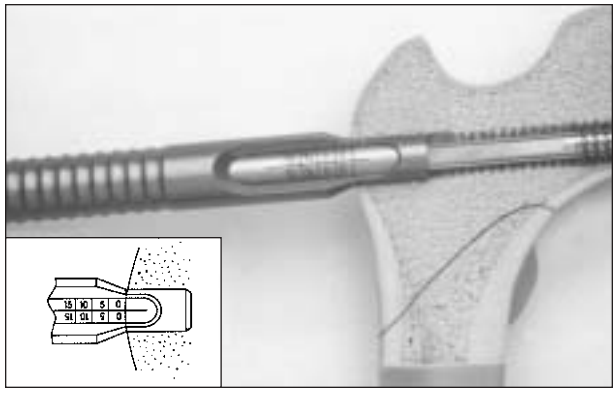
a. Direct reading . . . . . 95 mm
b. Reamer setting . . . . . 85 mm
c. Tapping depth (optional) . . . . . 85 mm
Lag screw length . . . . . 85 mm



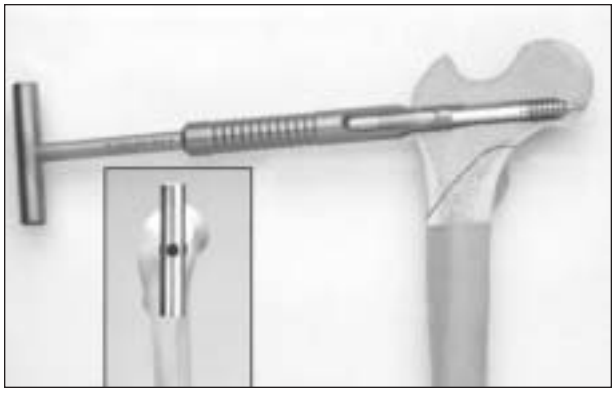
6 Assemble the DCS Triple Reamer. (See "Assembling the Instrumentation," page 18.) Set the reamer to the correct depth. Insert the DCS Triple Reamer into the Power Drive using the Large Quick Coupling attachment. Slide the reamer over the guide pin to simultaneously drill for the lag screw, ream for the plate barrel, and countersink for the plate/barrel junction to the preset depth. When reaming in dense bone, continuously irrigate the DCS Triple Reamer to prevent thermal necrosis.



7 Secure the proximal fragment with a bone forceps to prevent rotation in the sagittal plane. If necessary, tap to the predetermined depth using the Tap Assembly. (See "Assembling the Instrumentation," page 19.) Tapping depth can be seen through the window in the Short Centering Sleeve.

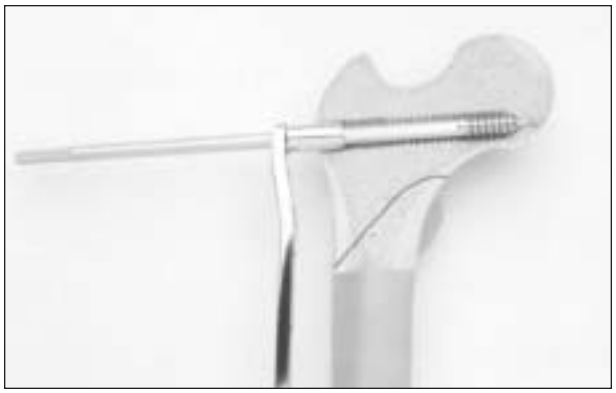


8 Select the lag screw and assemble the Lag Screw Insertion Assembly. (See "Assembling the Instrumentation," page 20.) Slide the assembly over the guide pin and into the reamed hole. Seat the centering sleeve in the hole to center and stabilize the assembly, and insert the lag screw by turning the handle clockwise until the 0 mark on the assembly aligns with the lateral cortex. The threaded tip of the lag screw now lies 10 mm from the medial cortex. The lag screw may be inserted an additional 5 mm in porotic bone, until the 5 mm mark aligns with the lateral cortex, for increased holding power.

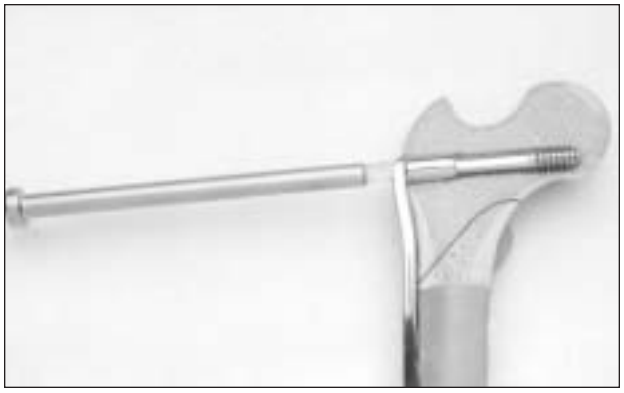


Surgical Technique (Continued)

9 Before removing the assembly, align the handle so it is in the same plane as the femoral shaft (parallel with the femoral shaft axis when viewed laterally). This allows correct placement of the DCS Plate onto the lag screw.

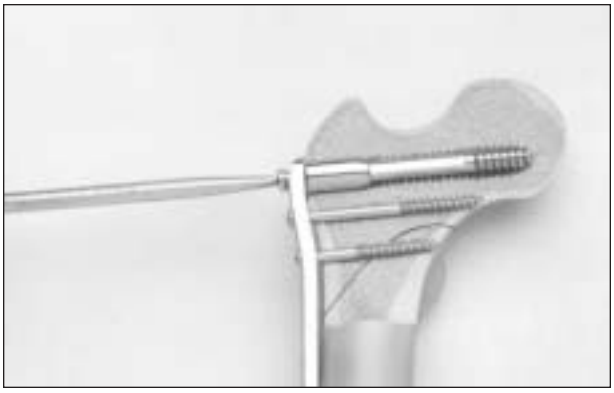


10 Remove the DHS/DCS Wrench and Long Centering Sleeve. Slide the appropriate DCS Plate onto the guide shaft/lag screw assembly.

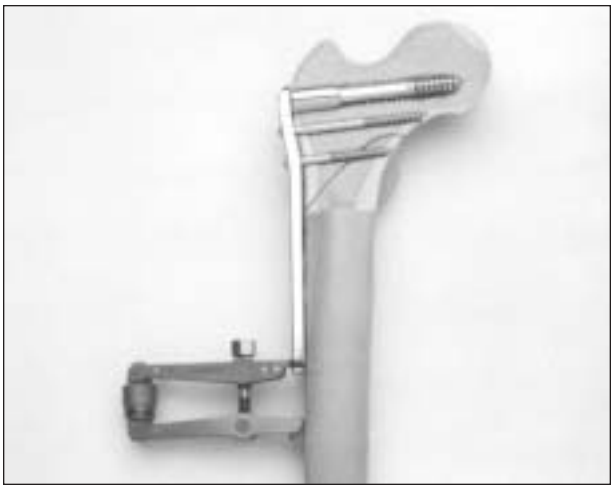


11 Loosen and remove the Coupling Screw and Guide Shaft. Use the Power Drive in reverse, with the Jacobs Chuck attachment, to withdraw the guide pin. Gently seat the plate with the DHS/DCS Impactor. The vastus ridge can be chiseled to further seat the plate on bone.

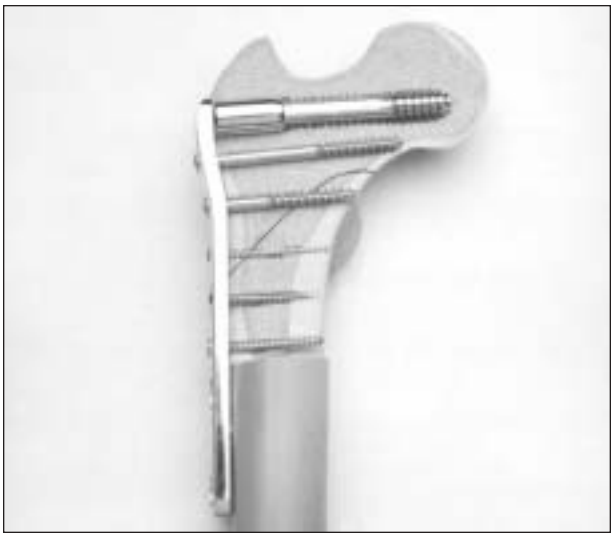
12 Insert two 6.5 mm Cancellous Bone Screws through the proximal round holes of the DCS Plate, using lag screw technique. To do so, drill a hole through the near cortex with the 4.5 mm Drill Bit. Fully seat the 4.5/3.2 mm Insert Drill Sleeve into the hole. Drill through the sleeve and penetrate the far cortex with the 3.2 mm Drill Bit. Measure, tap and insert the 6.5 mm Cancellous Bone Screw. This technique will prevent the drill bit from gliding along the calcar.



13 Insert the DHS/DCS Compression Screw into the lag screw. This will prevent disengagement of the lag screw from the plate barrel.



14 Once an approximate anatomic reduction is achieved, the Articulated Tension Device may be used to produce final compression of the fracture. Do not use the tension device if extensive comminution exists.



15 Using AO ASIF standard screw insertion technique, fix the DCS Plate to the femur with 4.5 mm Cortex Screws.

Assembling the Instrumentation

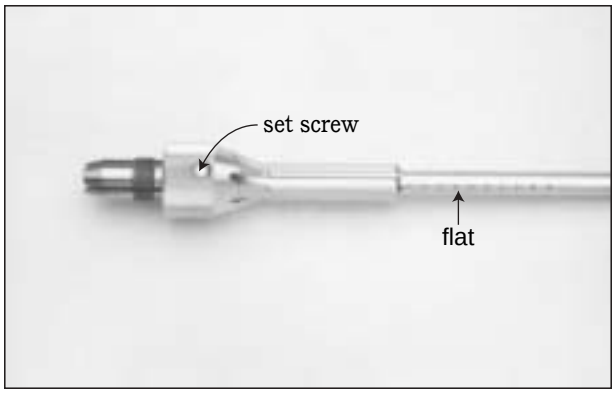
Triple Reamers

The components of the triple reamers are sharp and should be handled carefully.

The triple reamers can be assembled preoperatively. Reaming depth is set intraoperatively.

To assemble:

- Select the reaming head that corresponds to the chosen plate (DHS or DCS) and barrel length (DHS standard or DHS short).



- Align the set screw on the reaming head with the flat on the drill bit. Slide the cutting end of the reaming head over the coupling end of the drill bit.

- Hold the coupling end of the drill bit with one hand, and continue sliding the reaming head along the drill bit with the other hand. The proper setting is attained when the non-cutting end of the reaming head reaches the calculated depth setting. In this example, the depth setting is 95 mm. (See inset.)

- Secure the reaming head into the appropriate notch, and lock it in place with the locking nut.

Tap Assembly

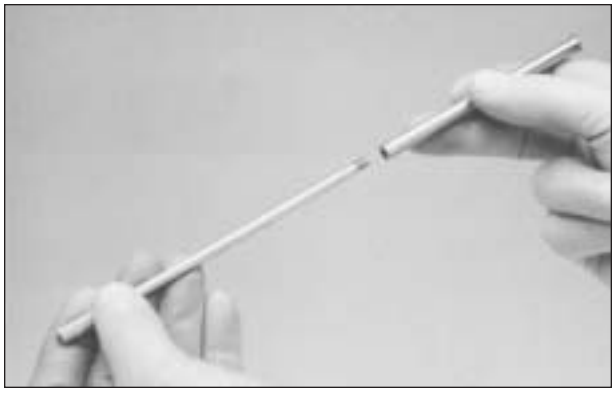
To assemble:

- Slide the Short Centering Sleeve over the tap.

- Simultaneously push the quick coupling fitting on the T-handle and insert the tap into the fitting.

- Release the collar, and check to be sure the tap is securely seated in the handle.

Assembling the Instrumentation (Continued)

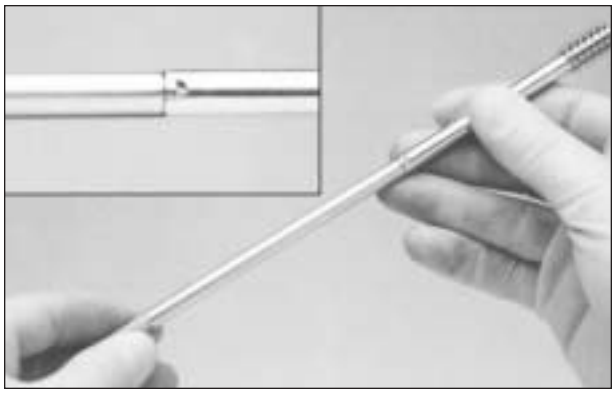


Lag Screw Insertion Assembly

The Lag Screw Insertion Assembly must be assembled intraoperatively after the proper length lag screw is chosen.

To assemble:

- Insert the Coupling Screw (1) into the DHS/DCS Guide Shaft (2).



- Screw the Coupling Screw into the end of the lag screw. The tabs of the Guide Shaft should seat into the slots of the lag screw.

- Slide the Long Centering Sleeve over the wrench.

- Firmly insert the guide shaft/lag screw assembly into the wrench until it stops.

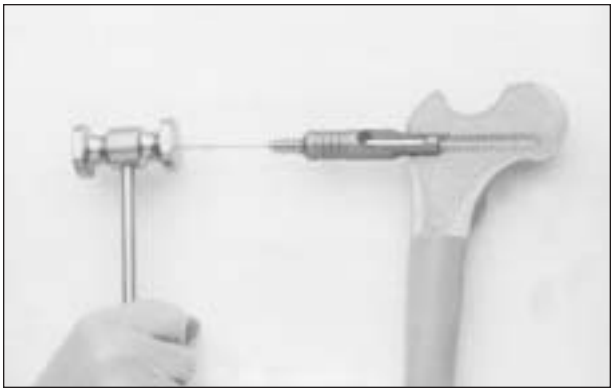
Reinserting the DHS/DCS Guide Pin

If the guide pin is inadvertently withdrawn at any time during the procedure, reinsert it immediately.

To reinsert the guide pin if withdrawn upon removal of the Triple Reamer:

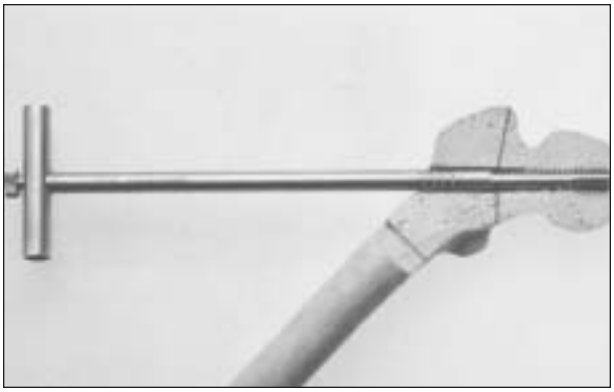
- Insert a lag screw backwards into the Short Centering Sleeve.

- Place this assembly into the bone, and use it as a guide for reinsertion of the guide pin. Cannulation in the DHS/DCS Lag Screw centers the guide pin in the hole.



- Use a hammer to gently reseat the guide pin.

Caution: Do not continue the procedure without the guide pin, as the risk of misdirecting the Triple Reamer, Tap Assembly, or DHS/DCS Lag Screw is too great.



Removing the Implants

- Remove the plate.
- Assemble the insertion wrench, using the long Coupling Screw. The long Coupling Screw allows the surgeon to exert traction while unscrewing the lag screw.
- Align the flats inside the wrench with the flats of the lag screw. Slide the wrench over the lag screw until it is well over the end of the screw.
- Pull on the wrench while turning it counterclockwise.

Recommended Reading

Benum, P. "The Use of Bone Cement as an Adjunct to Internal Fixation of Supracondylar Fractures of Osteoporotic Femurs." *Acta Orthopaedica Scandinavica* 48 (1977): 52–56.

Johnson, Eric E. "Combined Direct and Indirect Reduction of Comminuted Four-Part Intraarticular T-Type Fractures of the Distal Femur:" *Clinical Orthopaedics* 231 (1988): 154–162.

Mize, Roby D. "Surgical Management of Complex Fractures of the Distal Femur:" *Clinical Orthopaedics and Related Research* 240 (1989): 77–86.

Mize, Roby D., Robert W. Bucholz, and Dennis P. Grogan. "Surgical Treatment of Displaced, Comminuted Fractures of the Distal End of the Femur." *The Journal of Bone and Joint Surgery* 64-A.6 (1982): 871–879.

Müller M.E., M. Allgöwer, R. Schneider, and H. Willenegger. *Manual of Internal Fixation: Techniques Recommended by the AO-Group*. 3rd ed. Berlin: Springer-Verlag, 1990.

Regazzoni, P., Th. Rüedi, R. Winquist, and M. Allgöwer. *The Dynamic Hip Screw Implant System*. Berlin: Springer-Verlag, 1985.

Sanders, Roy and P. Regazzoni. "Treatment of Subtrochanteric Femur Fractures Using the Dynamic Condylar Screw." *Journal of Orthopaedic Trauma* 3.3 (1989): 206–213.

Sanders, Roy, P. Regazzoni, and Th. Rüedi. "Treatment of Supracondylar-Intracondylar Fractures of the Femur Using the Dynamic Condylar Screw." *Journal of Orthopaedic Trauma* 3.3 (1989): 214–222.

Schatzker, Joseph and Marvin Tile. *The Rationale of Operative Fracture Care*. Berlin: Springer-Verlag, 1987.

Schatzker, J., N. Mahomed, K. Schiffman, and J. Kellam. "Dynamic Condylar Screw: A New Device." *Journal of Orthopaedic Trauma* 3.2 (1989): 124–132.

Seinsheimer, Frank. "Subtrochanteric Fractures of the Femur." *The Journal of Bone and Joint Surgery* 60-A.3 (1978): 300–306.

Siliski, John M., Martin Mahring, and H. Peter Hofer. "Supracondylar-Intercondylar Fractures of the Femur." *The Journal of Bone and Joint Surgery* 71-A.1 (1989): 95–104.

Simpson, A.H.R.W., K. Varty, and C.A.F. Dodd. "Sliding Hip Screws: Modes of Failure." *Injury* 20 (1989): 227–231.

Singh, Manmohan, A.R. Nagrath, and P.S. Maini. "Changes in Trabecular Pattern of the Upper End of the Femur as an Index of Osteoporosis." *The Journal of Bone and Joint Surgery* 52-A.3 (1970): 457–467.

Vander Schilden, Jack, Brett Bolnhoffer, Roy Sanders, Donald Wiss, and Phillip Spiegel "Subtrochanteric Femur Fractures." *Evarts' Surgery of the Musculoskeletal System*. New York: Churchill Livingstone, 1990.

Waddell, J.P. "Subtrochanteric Fractures of the Femur: A Review of 130 Patients." *The Journal of Trauma* 19.8 (1979): 582–592.

The DHS Plates, DCS Plates, and DHS/DCS Lag Screws

DHS Standard Barrel Plates (38 mm barrel)

		Barrel Angle			
Holes	Shaft length (mm)	135°	140°	145°	150°
2	46	281.12	281.202	281.302	281.42
4	78	281.14	281.24	281.34	281.44
5	94	281.15	281.25	281.35	281.45
6	110	281.16	281.26	281.36	281.46
8	142	281.18	281.208	281.308	281.48
10	174	281.10	281.210	281.310	281.40
12	206	281.11	281.212	281.312	281.41
14	238	281.13	281.214	281.314	281.414
16	270	281.17	281.216	281.316	281.416
18	302	281.118			281.418
20	333	281.120			281.420

DHS Short Barrel Plates (25 mm barrel)

		Barrel Angle			
Holes	Shaft length (mm)	135°	140°	145°	150°
4	78	281.54	281.64	281.74	281.84
5	94	281.55	281.65	281.75	281.85
6	110	281.56	281.66	281.76	281.86

DCS Plates

		Barrel Angle
Holes	Shaft length (mm)	95°
6	114	281.96
8	146	281.98
10	178	281.90
12	210	281.92
14	242	281.93
16	274	281.94
18	306	281.95
20	338	281.97

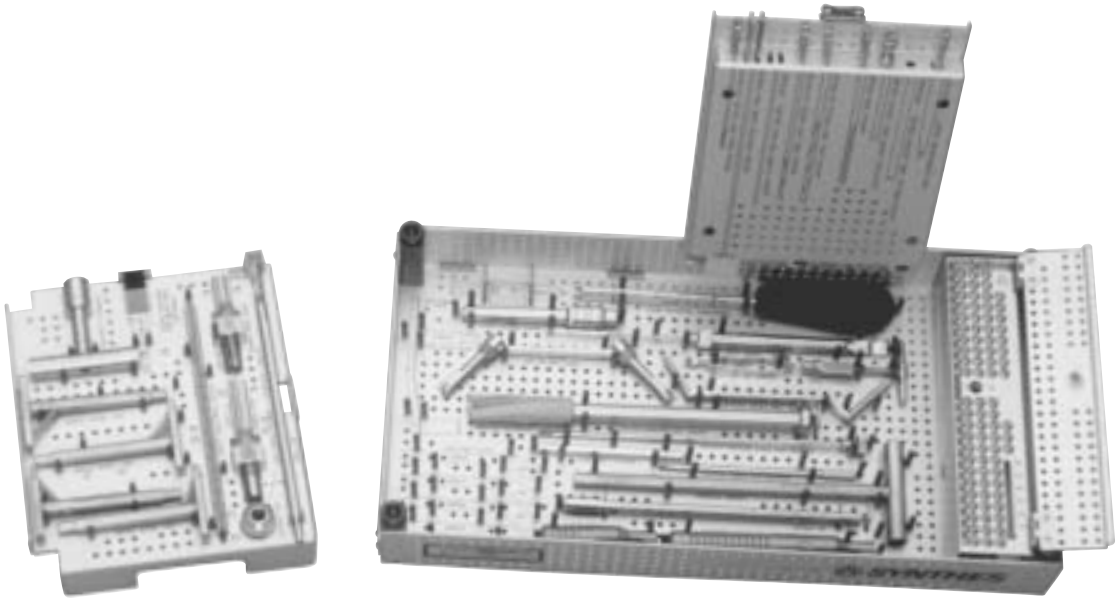
DHS/DCS Lag Screws

Thread diameter: 12.7 mm
Thread length: 22 mm
Shaft diameter: 8 mm
Pitch: 3.0 mm
Diameter of cannulation: 2.7 mm

Catalog No.	Length (mm)	Catalog No.	Length (mm)
280.50	50 mm	280.00	100 mm
280.55	55 mm	280.05	105 mm
280.60	60 mm	280.10	110 mm
280.65	65 mm	280.15	115 mm
280.70	70 mm	280.20	120 mm
280.75	75 mm	280.25	125 mm
280.80	80 mm	280.30	130 mm
280.85	85 mm	280.35	135 mm
280.90	90 mm	280.40	140 mm
280.95	95 mm	280.45	145 mm

DHS and DCS Plates and DHS/DCS Lag Screws are available nonsterile or sterile-packed.
To order sterile product, add S to the catalog number.

DHS Basic Set with self-tapping screws [105.837]
DHS Basic Set [105.37]



304.250 DHS/DCS Basic Set Graphic Case, for self-tapping screws, with cover (for Set 105.837)
304.257 DHS/DCS Basic Set Graphic Case, with cover (for Set 105.37)

Instruments

310.19	2.0 mm Drill Bit, 100 mm, quick coupling, 2 ea.
310.31	3.2 mm Drill Bit, 145 mm, quick coupling, 2 ea.
310.44	4.5 mm Drill Bit, 145 mm, quick coupling, 2 ea.
311.44	T-Handle, with quick coupling
311.46	Tap for 4.5 mm Cortex and 4.5 mm Shaft Screws, 2 ea.
312.46	4.5 mm/3.2 mm Double Drill Sleeve
312.48	4.5 mm/3.2 mm Insert Drill Sleeve
314.11	Holding Sleeve
314.15	Large Hexagonal Screwdriver Shaft
314.27	Large Hexagonal Screwdriver
319.10	Depth Gauge for large screws
319.97	Screw Forceps
322.43	4.5 mm DCP® Hip Drill Guide
338.00	2.5 mm Threaded Guide Wire, 230 mm, 10 ea.
338.01–	DHS Angle Guides
338.04	1 ea.: 135°, 140°, 145° and 150°
338.05	DHS/DCS Direct Measuring Device
338.06	DHS/DCS Wrench
338.08	DHS/DCS T-Handle
338.13	DHS Triple Reamer, complete
338.17	DHS/DCS Tap, 12.5 mm dia.
338.18	DHS/DCS Centering Sleeve, short
338.19	DHS/DCS Centering Sleeve, long
338.20	DHS/DCS Coupling Screw, short
338.21	DHS/DCS Guide Shaft
338.22	DHS/DCS Coupling Screw, long
338.28	DHS/DCS Impactor
338.44	DHS Reaming Head, short

Implants in Set 105.837

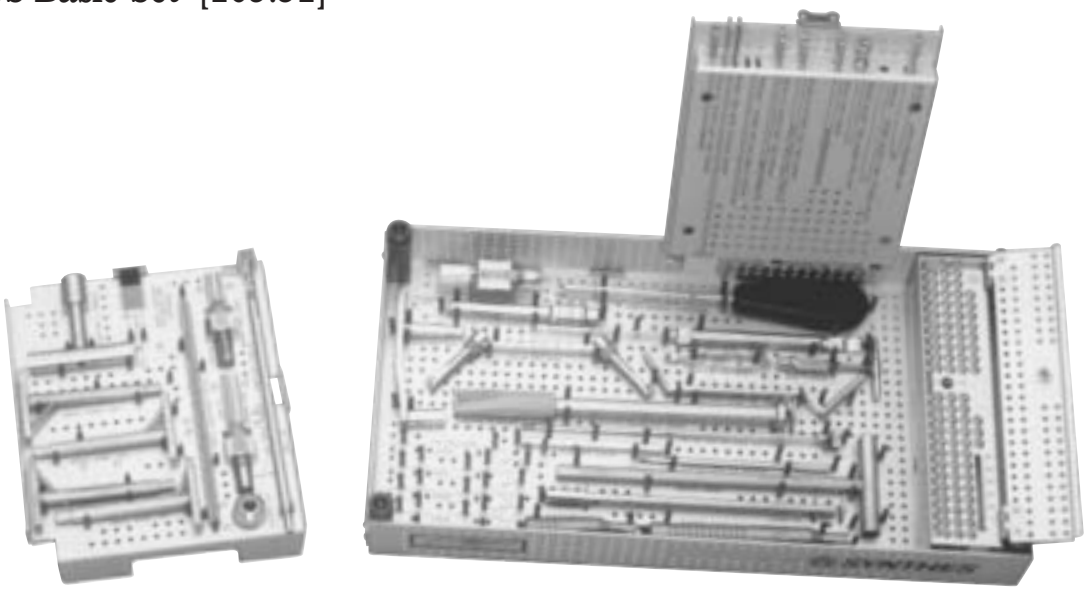
214.828– **214.854** 4.5 mm Cortex Screws, self-tapping
3 ea.: 28, 30, 48, 50, 52 and 54 mm
6 ea.: 44 and 46 mm
8 ea.: 32, 34, 36, 38 and 42 mm
10 ea.: 40 mm

Implants in Set 105.37

214.028– **214.054** 4.5 mm Cortex Screws
3 ea.: 28, 30, 48, 50, 52 and 54 mm
6 ea.: 44 and 46 mm
8 ea.: 32, 34, 36, 38 and 42 mm
10 ea.: 40 mm

Also available: DHS Basic Set with self-tapping screws (105.837J) and DHS Basic Set (105.37J)
With standard drill bits 310.20, 310.32 and 310.45 to fit Jacobs chuck.
DHS Basic Screw Rack with self-tapping screws (105.809)

DHS/DCS Basic Set with self-tapping screws [105.831]
DHS/DCS Basic Set [105.31]



304.250 DHS/DCS Basic Set Graphic Case, for self-tapping screws, with cover (for Set 105.831)
304.257 DHS/DCS Basic Set Graphic Case, with cover (for Set 105.31)

Instruments

310.19	2.0 mm Drill Bit, 100 mm, quick coupling, 2 ea.
310.31	3.2 mm Drill Bit, 145 mm, quick coupling, 2 ea.
310.44	4.5 mm Drill Bit, 145 mm, quick coupling, 2 ea.
311.44	T-Handle, with quick coupling
311.46	Tap for 4.5 mm Cortex and 4.5 mm Shaft Screws, 2 ea.
312.46	4.5 mm/3.2 mm Double Drill Sleeve
312.48	4.5 mm/3.2 mm Insert Drill Sleeve
314.11	Holding Sleeve
314.15	Large Hexagonal Screwdriver Shaft
314.27	Large Hexagonal Screwdriver
319.10	Depth Gauge for large screws
319.97	Screw Forceps
322.43	4.5 mm DCP® Hip Drill Guide
338.00	2.5 mm Threaded Guide Wire, 230 mm, 10 ea.
338.01–	DHS Angle Guides
338.04	1 ea.: 135°, 140°, 145° and 150°
338.05	DHS/DCS Direct Measuring Device
338.06	DHS/DCS Wrench
338.08	DHS/DCS T-Handle
338.13	DHS Triple Reamer, complete
338.17	DHS/DCS Tap, 12.5 mm dia.
338.18	DHS/DCS Centering Sleeve, short
338.19	DHS/DCS Centering Sleeve, long
338.20	DHS/DCS Coupling Screw, short
338.21	DHS/DCS Guide Shaft
338.22	DHS/DCS Coupling Screw, long
338.28	DHS/DCS Impactor
338.41	95° DCS Drill Guide
338.44	DHS Reaming Head, short
338.47	DCS Reaming Head

Implants in Set 105.831

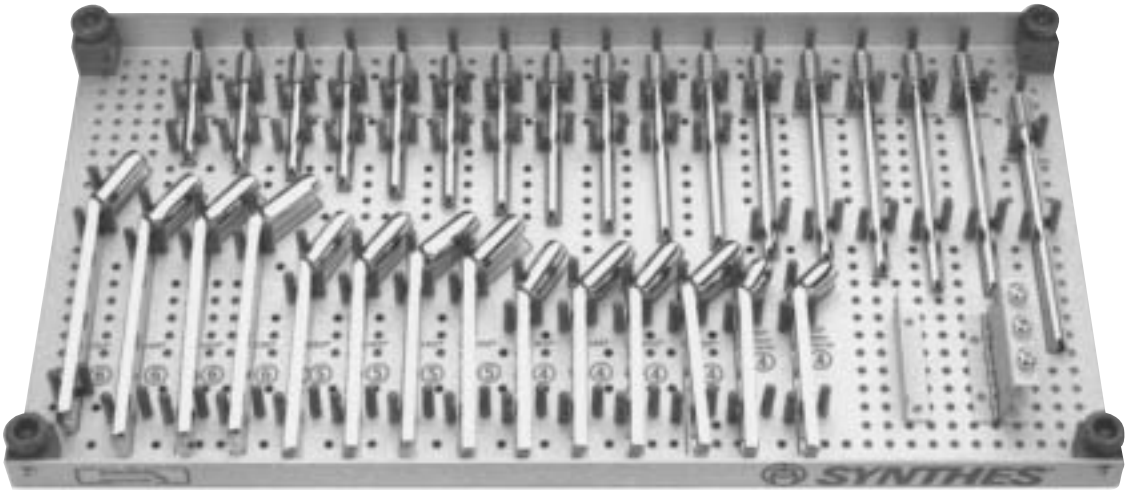
214.828– **214.854**	4.5 mm Cortex Screws, self-tapping 3 ea.: 28, 30, 48, 50, 52 and 54 mm 6 ea.: 44 and 46 mm 8 ea.: 32, 34, 36, 38 and 42 mm 10 ea.: 40 mm
292.20	2.0 mm Kirschner Wire, 150 mm 1 pkg. of 10

Implants in Set 105.31

214.028– **214.054**	4.5 mm Cortex Screws 3 ea.: 28, 30, 48, 50, 52 and 54 mm 6 ea.: 44 and 46 mm 8 ea.: 32, 34, 36, 38 and 42 mm 10 ea.: 40 mm
292.20	2.0 mm Kirschner Wire, 150 mm 1 pkg. of 10

Also available: DHS/DCS Basic Set with self-tapping screws (105.831J), and DHS/DCS Basic Set (105.31J)
With standard drill bits 310.20, 310.32 and 310.45 to fit Jacobs chuck
DHS/DCS Basic Screw Rack with self-tapping screws (105.812)
DHS/DCS Basic Screw Rack with screws (105.12) (not self-tapping)

DHS Universal Implant Set [105.35]



305.36 DHS Universal Implant Set Graphic Case, with cover

280.00–
280.95 DHS/DCS Lag Screws, 12.7 mm dia. thread
1 ea.: 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135, 140 and 145 mm

280.99 DHS/DCS Compression Screw, 36 mm, 3 ea.

281.14–
281.16 135° DHS Plates, Standard Barrel
1 ea.: 4, 5 and 6 holes

281.24–
281.26 140° DHS Plates, Standard Barrel
1 ea.: 4, 5 and 6 holes

281.34–
281.36 145° DHS Plates, Standard Barrel
1 ea.: 4, 5 and 6 holes

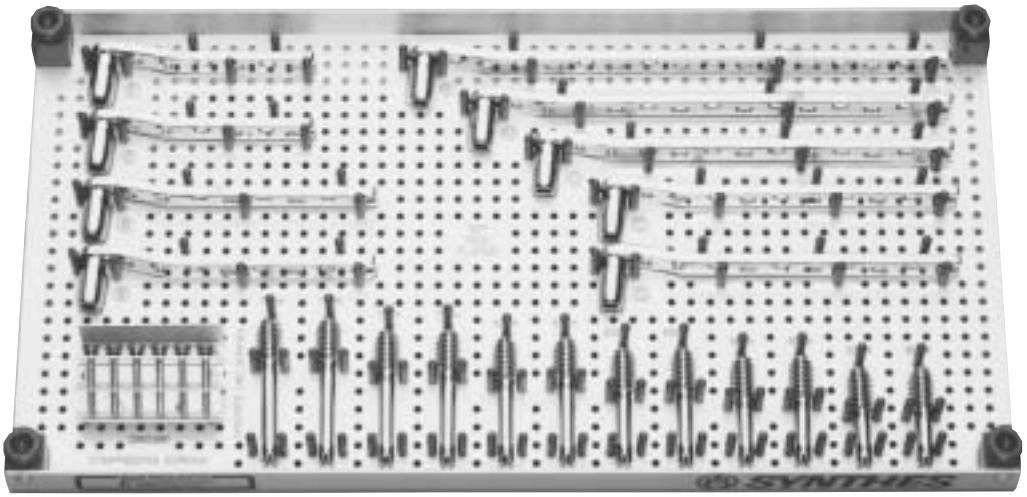
281.44–
281.46 150° DHS Plates, Standard Barrel
1 ea.: 4, 5 and 6 holes

281.54 135° DHS Plate, Short Barrel, 4 holes

281.84 150° DHS Plate, Short Barrel, 4 holes

Also available: DHS Universal Implant Set (105.35S), sterile, without graphic case

DCS Implant Set [105.32]



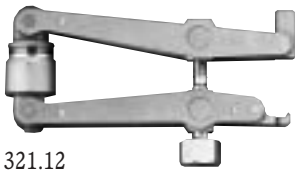
304.270 DCS Implant Set Graphic Case
With graphic outlines, autoclavable, perforated, complete with cover

280.50–
280.75 DHS/DCS Lag Screws, 12.7 mm dia. thread
2 ea.: 50, 55, 60, 65, 70 and 75 mm

280.99 DHS/DCS Compression Screw, 36 mm, 6 ea.

281.90–
281.98 95° DCS Plates
1 ea.: 12, 14 and 16 holes
2 ea.: 6, 8 and 10 holes

Instrument and Implant Sets (Continued)



321.12

530.100

530.100
Power Drive

530.280

511.731 Jacobs Chuck, keyless

511.76 Large Quick Coupling

Recommended Additions:

321.12 Articulated Tension Device, span 20 mm

105.957 Power Drive Set

Header Right Page

DHS Basic Set with self-tapping screws [105.837]
DHS Basic Set [105.37]

304.250 DHS/DCS Basic Set Graphic Case, for self-tapping screws, with cover (for Set 105.837)

304.257 DHS/DCS Basic Set Graphic Case, with cover (for Set 105.37)

Instruments

310.19	2.0 mm Drill Bit, 100 mm, quick coupling, 2 ea.
310.31	3.2 mm Drill Bit, 145 mm, quick coupling, 2 ea.
310.44	4.5 mm Drill Bit, 145 mm, quick coupling, 2 ea.
311.44	T-Handle, with quick coupling
311.46	Tap for 4.5 mm Cortex and 4.5 mm Shaft Screws, 2 ea.
312.46	4.5 mm/3.2 mm Double Drill Sleeve
312.48	4.5 mm/3.2 mm Insert Drill Sleeve
314.11	Holding Sleeve
314.15	Large Hexagonal Screwdriver Shaff
314.27	Large Hexagonal Screwdriver
319.10	Depth Gauge for large screws
319.97	Screw Forceps

Implants in Set 105.837

214.828–	4.5 mm Cortex Screws, self-tapping
214.854	3 ea.: 28, 30, 48, 50, 52 and 54 mm 6 ea.: 44 and 40 mm 8 ea.: 32, 34. 36, 38 and 42 mm 10 ea.: 40 mm
322.43	4.5mm DCP® Hip Drill Guide
338.00	2.5 mm Threaded Guide Wire, 230 mm. 10 ea.
338.01–	DHS Angle Guides
338.04	1 ea: 135°, 140°, 145° and 150°
338.05	DHS/DCS Direct Measuring Device
338.06	DHS/DCS Wrench
338.08	DHS/DCS T-Handle
338.13	DHS Triple Reamer, complete
338.17	DHS/DCS Tap, 12.5 mm dia.
338.18	DHS/DCS Centering Sleeve, short
338.19	DHS/DCS Centering Sleeve, long
338.20	DHS/DCS Coupling Screw, short
338.21	DHS/DCS Guide Shaft
338.22	DHS/DCS Coupling Screw, long
338.28	DHS/DCS Impactor
338.44	DHS Reaming Head, short

Header Right Page

Implants in Set 105.37

214.028–214.054 4.5 mm Cortex Screws
3 ea.: 28, 30, 48, 50, 52 and 54 mm
6 ea.: 44 and 46 mm
8 en.: 32, 34, 36, 38 and 42 mm
10 ea.: 40 mm

Also available: DHS Basic Set with self-tapping screws (105.837J) and DHS Basic Set (105.37J)
With standard drill bits 310.20. 310.32 and 310.45 to fit Jacobs chuck.
DHS Basic Screw Rack with self-tapping screws (105.809)

DHS/DCS Basic Set with self-tapping screws [105.831]

DHS/DCS Basic Set [105.31]

304.250 DHS/DCS Basic Set Graphic Case, for self-tapping screws, with cover (for Set 105.831)

304.257 DHS/DCS Basic Set Graphic Case, with cover (for Set 105.31)

Instruments

310.19 2.0 mm Drill Bit. 100 mm. quick coupling, 2 ea.

310.31 3.2 mm Drill Bit, 145 mm. quick coupling, 2 ea.

310.44 4.5 mm Drill Bit, 145 mm. quick coupling, 2 ea.

311.44 T-Handle, with quick coupling

311.46 Tap for 4.5 mm Cortex and 4.5 mm Shaft Screws, 2 ea.

312.46 4.5 mm/3.2 mm Double Drill Sleeve

312.48 4.5 mm/3.2 mm Insert Drill Sleeve

314.11 Holding Sleeve

314.15 Large Hexagonal Screwdriver Shaft

314.27 Large Hexagonal Screwdriver

319.10 Depth Gauge for large screws

319.97 Screw Forceps

322.43 4.5 mm DCP® Hip Drill Guide

Implants In Set 105.831

214.828–214.854 4.5 mm Cortex Screws, self-tapping
3 ea.: 28, 30, 48, 50, 52 and 54 mm
6 ea.: 44 and 46 mm
8 ea.: 32, 34, 36, 38 and 42 mm
10 ea.: 40 mm

292.20 2.0 mm Kirschner Wire, 150 mm 1 pkg. of 10

338.00 2.5 mm Threaded Guide Wire, 230 mm, 10 ea.
338.01– DHS Angle Guides
338.04 1 ea.: 135°, 140°, 145° and 150°
338.05 DHS/DCS Direct Measuring Device
338.06 DHS/DCS Wrench
338.08 DHS/DCS T-Handle
338.13 DHS Triple Reamer, complete
338.17 DHS/DCS Tap, 12.5 mm dia.
338.18 DHS/DCS Centering Sleeve, short
338.19 DHS/DCS Centering Sleeve, long
338.20 DHS/DCS Coupling Screw, short
338.21 DHS/DCS Guide Shaft
338.22 DHS/DCS Coupling Screw, long
338.28 DHS/DCS Impactor
338.41 95° DCS Drill Guide
338.44 DHS Reaming Head, short
338.47 DCS Reaming Head

Implants in Set 105.31

214.028– 4.5 mm Cortex Screws
214.054 3 ea.: 28, 30, 48, 50, 52 and 54 mm
6 ea.: 44 and 46 mm
8 ea.: 32, 34, 36, 38 and 42 mm
10 ea.: 40 mm
292.20 2.0 mm Kirschner Wire, 150 mm
1 pkg. of 10

Also available: DHS/DCS Basic Set with self-tapping screws (105.831J), and DHS/DCS Basic Set (105.31J)
With standard drill bits 310.20, 310.32 and 310.45 to fit Jacobs chuck
DHS/DCS Basic Screw Rack with self-tapping screws (105.812)
DHS/DCS Basic Screw Rack with screws (105.12) (not self-tapping)

DHS Universal Implant Set [105.35]

305.36 DHS Universal Implant Set Graphic Case, with cover
280.00– DHS/DCS Lag Screws, 12.7 mm dia. thread
280.95 1 ea.: 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135, 140 and 145 mm
280.99 DHS/DCS Compression Screw, 36 mm, 3 ea.
281.14– 135° DHS Plates, Standard Barrel
281.16 1 ea.: 4, 5 and 6 holes
281.24– 140° DHS Plates, Standard Barrel

SYNTHES (USA)
1690 Russell Road
Paoli, PA 19301-1262
Telephone: 610-647-9700
Fax: 610-251-9056
To order: 800-523-0322

SYNTHES (CANADA) LTD.
111 Brunel Road
Suite 110
Mississauga, Ontario L4Z 1X3
Telephone: 905-568-1711
Fax: 905-568-1662
To order: 800-668-1119

Printed in U.S.A.
(Rev. 6/01) J3045B