



COMPASS[◇] Universal Hinge

by

Jimmy Tucker, M.D.

Orthopaedic Surgeon

Director, Arkansas Sports Medicine, P.A.

Little Rock, Arkansas

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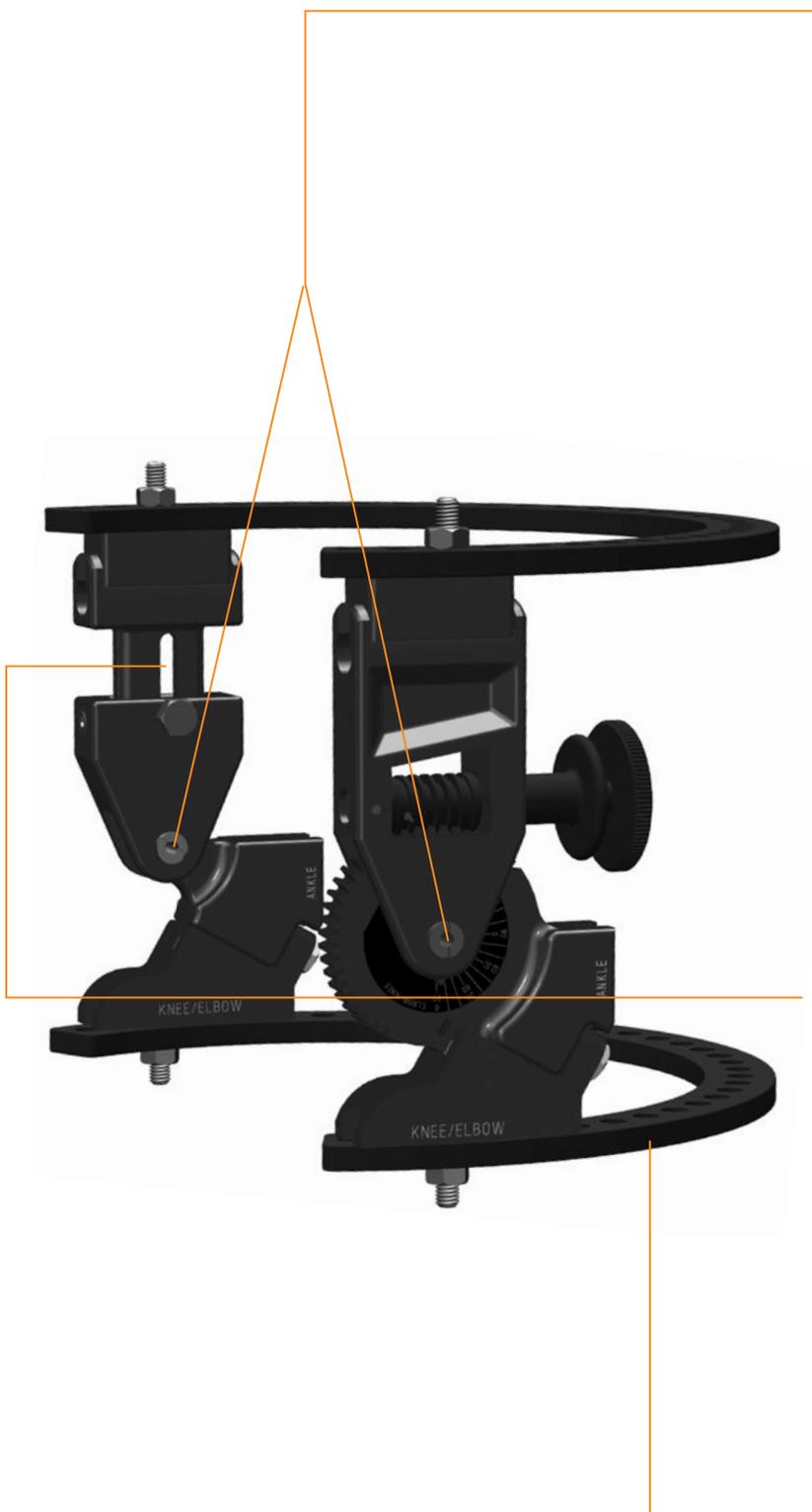
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The following technique guide was prepared under the guidance of Jimmy Tucker, MD under close collaboration with the physician. It contains a summary of medical techniques and opinions based upon his training and expertise in the field, along with his knowledge of Smith & Nephew products. It is provided for educational and informational purposes only. Smith & Nephew does not provide medical advice and it is not intended to serve as such.

It is the responsibility of the treating physician to determine and utilize the appropriate products and techniques according to their own clinical judgment for each of their patients. For more information on the products in this surgical technique, including indications for use, contraindications, effects, precautions and warnings, please consult the products' Instructions for Use (IFU).

Nota Bene: The technique description herein is made available to the healthcare professional to illustrate the author's suggested treatment for the uncomplicated procedure. In the final analysis, the preferred treatment is that which addresses the needs of the specific patient.

Design features



Matching axes of rotation

The COMPASS° Universal Hinge is designed to align its mechanical axis with the anatomic axis of the joint –elbow, knee or ankle. This allows the hinge to work with the joint, gently moving it through a biomechanically normal range of motion. A choice of passive or active modes are designed to ensure the greatest therapeutic value for each individual patient. As with the original design, radiolucent construction assists with the alignment of the axes during hinge application. Once the hinge is placed, the axis reference pin is removed to reduce the likelihood of infection in the joint capsule.

Versatility

The COMPASS Universal Hinge offers great versatility for use on the elbow, the knee or the ankle and requires only a few simple adjustments for any application.

Precision worm gear

The COMPASS Universal Hinge incorporates a precision worm gear that is designed to provide controlled displacement throughout the extremes of flexion and extension.

Range of valgus

The self-telescoping design of the COMPASS Universal Hinge allows a full range of 10° varus to 10° of valgus, allowing quick, easy and anatomically appropriate application to the elbow, knee, or ankle.

Lower profile

The COMPASS Universal Hinge is lighter in weight and lower in profile than the original design. This improves patient comfort with the device and patient compliance throughout the healing process.

Radiolucent arcs

The COMPASS Universal Hinge is fully compatible with the ILIZAROV™ system to provide a wide variety of fixation options.

Indications

The COMPASS[®] Universal Hinge Construct is indicated to treat post traumatic joint contracture which has resulted in the loss of range of motion, and fractures and disease which generally may result in joint contractures or loss of range of motion.

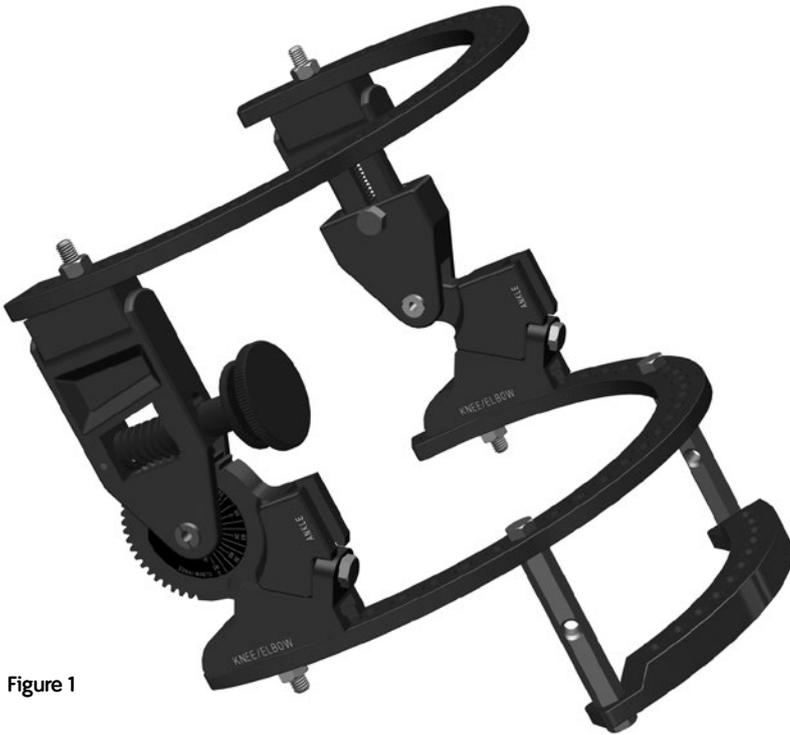


Figure 1

Preoperative planning and frame assembly

Consideration should be given to patient size, preoperative stability of the joint, extent of reconstruction and angulation of the knee.

In most circumstances, 5/8 rings of appropriate diameter will attach directly to the hinge mechanism. The ring size selected should allow at least 2cm of clearance around the circumference of the thigh and/or upper leg to accommodate any postoperative swelling.

To ensure proper fit, the fixator should be assembled prior to surgery. The threaded posts on the extensions labeled “knee/elbow” will be fixed to the distal ring. The posts on each hinge side generally can be inserted into the third or fourth hole from the posterior of the 5/8 ring. The geared side of the hinge, or master, is normally placed on the medial side with the large black knob anterior (*Figure 1*).



Figure 2

Prior to tightening the hinge to the 5/8 rings, pass a 9/16" Steinman pin through the central axis holes on each side of the hinge. This will align the hinges to parallel. The hinges may now be tightened to the rings, applying counter-torque to keep the hinges aligned. Once tightened, the Steinman pin should slide through the axis holes without impingement if the hinge components are still parallel (*Figure 2*).

A 90° pin arc of corresponding diameter may now be attached to the anterior of the tibial ring (generally with 60mm threaded sockets).

If extra stability is desired, attach another pin arc directly lateral on the femoral ring (*Figure 3*).



Figure 3

Surgical Technique

Frame assembly

Attach a 200mm threaded rod to the central hole of the femoral ring and another to the tibial ring, extending well proximally and distally. Under C-arm, center these rods on the femoral and tibial shafts in the A-P plane to obtain optimal alignment. An adjustment can be made on the lateral, or slave, hinge from neutral varus to 10° valgus. The hinges may be switched to achieve varus alignment of up to 10°. Loosen the set screw, and then adjust by turning the 10mm hex nut until the desired angulation is achieved. Retighten the set screw (*Figure 4*).

Ligament reconstruction and/or fracture reduction and fixation may now be performed.



Figure 4

Patient positioning for application of fixator

The patient is positioned supine on the table. The foot of the bed is then flexed to 25-30°. The unaffected leg is positioned in an Allen stirrup, removing it from the field and allowing lateral visualization of the operative leg with the C-arm.

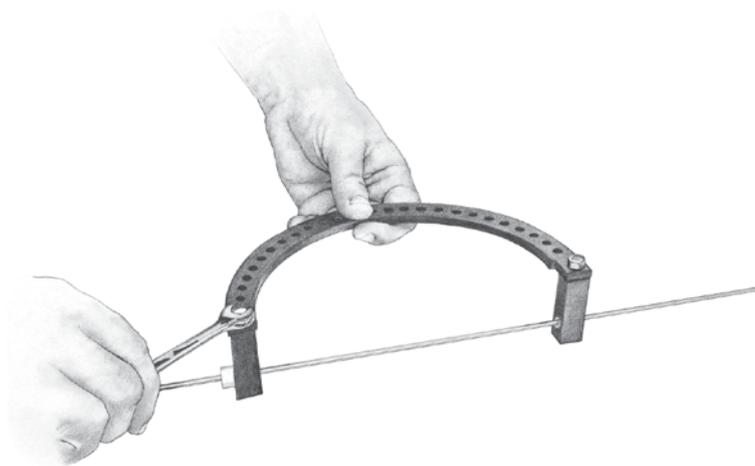


Figure 5

The COMPASS[®] Centering Pin Guide

To assemble the COMPASS Centering Pin Guide, select a half ring the same diameter as the fixator. Attach each of the guide posts into the end holes of the half ring with 10mm bolts. Pass a long Steinman pin through the holes in the guide posts (available upon request as a special product) to align them parallel, then tighten the 10mm bolts securely to the ring (Figure 5). Remove the Steinman pin, and insert a 1/8" x 3" trocar pin (7121-0002) through the guide posts on each side. Rotate the locking sleeve with a 10mm wrench to secure trocar pin in place. Do not overtighten – trocar pins should still slide within the sleeves when forced. Two balancing supports (socket with bolt) are then attached near the middle of the half ring (Figure 6).



Figure 6

Identifying the center of rotation

To locate the center of rotation of the knee, first align the posterior and distal aspects of the femoral condyles using lateral C-arm visualization. The axis of the center of rotation is defined by the femoral insertion of the medial collateral ligament and the femoral insertion of the lateral collateral ligament. It is at an equal distance from the most distal point of the femoral condyle and the most posterior point of the femoral condyle. This usually falls along the posterior portion of the femoral shaft and Blumenstadt's line (Figure 7).

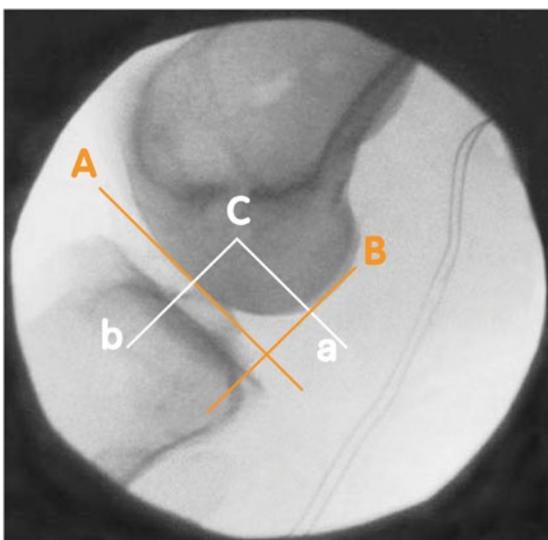


Figure 7

- A = Distal femoral line
 - B = Posterior femoral line
 - a = Line parallel to A, bisecting B
at most posterior point of condyles
 - b = Line parallel to B, bisecting A
at most distal point of condyles
 - C = Center of rotation
- C is the point where a and b intersect and are an equal distance from A and B.

Surgical Technique

Place the pin guide on the knee. Position the pin guide on the distal femur (Figure 8) until the trocar pins align under the C-arm and appear as a spot located at the center of rotation (Figure 9). Tap or drill the trocar pin wires into the femur approximately 2 to 3cm (Figure 10). Loosen and remove the pin guide assembly and center the fixation over the trocar pins. One side of the hinge may need to be loosened to accomplish this; abut an alignment buckle to the hinge where it meets the ring before loosening or removing the hinge. The properly positioned fixator should move easily medial to lateral. Now that the fixator is properly aligned with the femoral and tibial shafts and the hinge axis positioned over the center of rotation, attachment of the fixator may proceed.

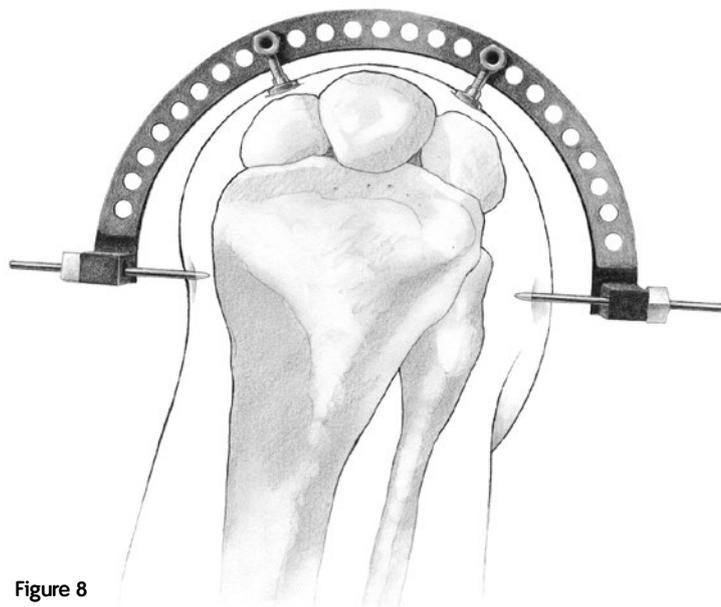


Figure 8

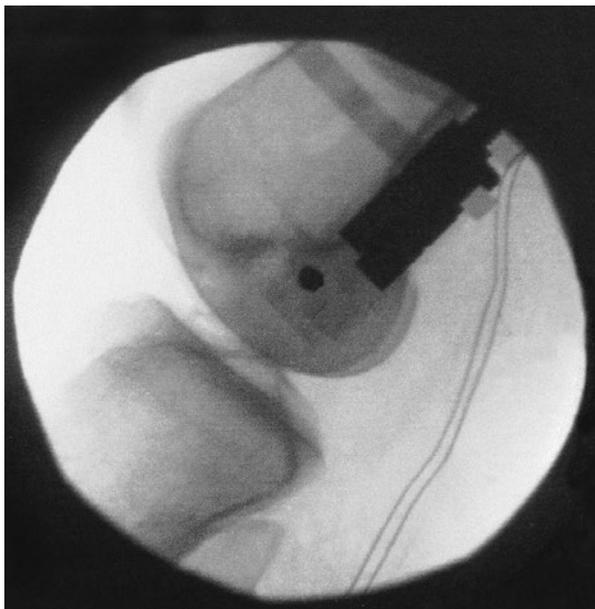


Figure 9

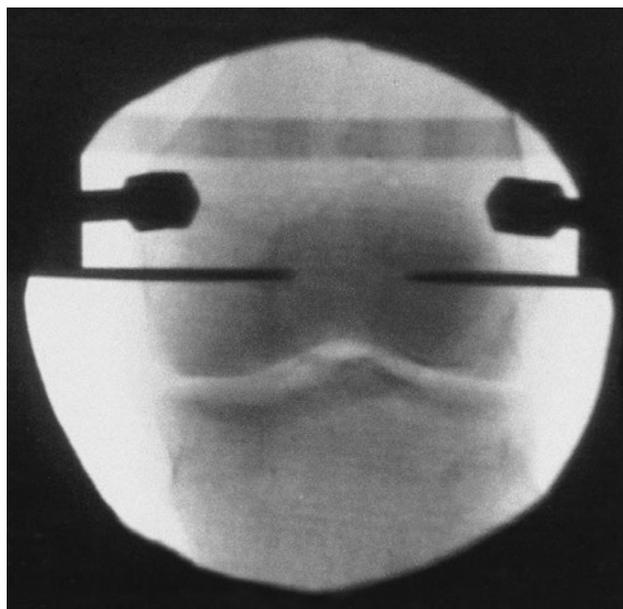


Figure 10

Half-Pin placement – Femoral

Choose either a one- or two-hole Rancho Cube and place it lateral on the femoral ring. Insert and secure Half-Pin (see Half-Pin insertion technique below). The second pin is placed anteromedially away from the quadriceps tendon using a cube longer (normally a 4-hole) than the one placed laterally. If a pin arc has been incorporated laterally, place a final cube and Half-Pin off of this arc.

Half-Pin placement – Tibial

The first tibial pin may be placed either medially or laterally. After this pin is secured, the knee should be placed through a range of motion to ensure there is no binding. Place an additional pin into the tibia from the 5/8 ring. Finally, place a pin in the anteromedial tibial cortex from the distal pin arc and secure.

Half-Pin insertion technique

Skin and other soft tissues must be handled with care. Skin should be incised sharply with short longitudinal incisions along safe zones. Bone is reached with gentle blunt dissection when not using the subcutaneous border of the tibia. Drill sheaths should be used when drilling. Hand-drilling or low-speed power drilling (with a new drill bit), with frequent pauses to cool the drill bit in cold saline, is recommended. Thermal necrosis well may be the initiating event in pin loosening and infection.

Make a short longitudinal incision. Insert the drill sleeve with trocar into the pin clamp and advance to the cortex. Remove the trocar from the drill sleeve. Drill both cortices, using the 3.8mm drill bit for 5.0mm pins in the tibia, or the 4.8mm drill bit for 6.0mm pins in the femur. Pass the depth gauge through the drill sleeve and engage the far cortex. The measurement visible at the top of the drill sleeve indicates the length of thread needed. Insert a 5.0mm or 6.0mm pin through the sleeve until the driver/extractor touches the rim of the drill sleeve. The pin should disengage at this point.

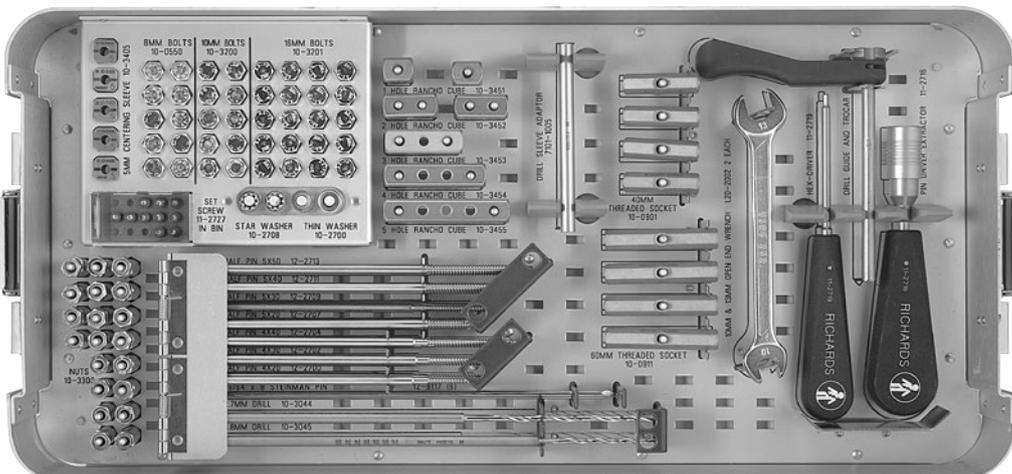
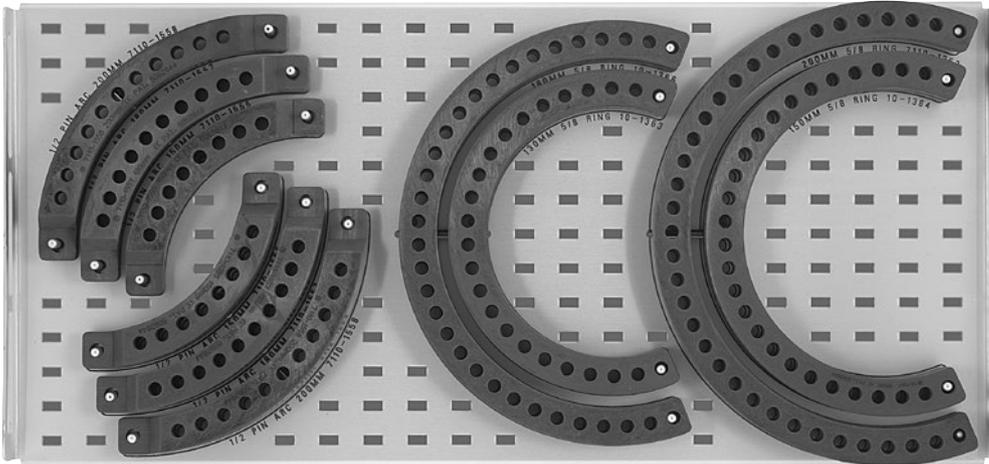
Catalog

COMPASS® Universal Set

Cat. No. 7106-0000

Tray Accepts:

Description	Cat. No.	Qty.	Description	Cat. No.	Qty.
1 Hole Rancho Cube	10-3451	2	40mm Threaded Socket	10-0901	4
2 Hole Rancho Cube	10-3452	2	60mm Threaded Socket	10-0911	4
3 Hole Rancho Cube	10-3453	1	Nut	10-3300	40
4 Hole Rancho Cube	10-3454	1	Thin Washer	10-2700	20
5 Hole Rancho Cube	10-3455	1	Star Washer	10-2708	5
5mm Centering Sleeve	10-3405	5	Half Pin 4 x 20	12-2700	3
Set Screw	11-2727	10	Half Pin 4 x 30	12-2702	3
Hex-Driver	11-2719	1	Half Pin 4 x 40	12-2704	3
2.7mm Drill	10-3044	1	Half Pin 5 x 20	12-2707	4
3.8mm Drill	10-3045	1	Half Pin 5 x 30	12-2709	4
Pin Driver Extractor	11-2716	1	Half Pin 5 x 40	12-2711	4
Drill Guide and Trocar	7103-1040	1	Half Pin 5 x 50	12-2713	4
Drill Sleeve Adapter	7101-1005	1	130mm 5/8 Ring	10-1363	2
Composite 1/2 Pin Arc 200mm	7110-1558	2	150mm 5/8 Ring	10-1364	2
8mm Bolt	10-0550	20	180mm 5/8 Ring	10-1366	2
10mm Bolt	10-3200	20	200mm 5/8 Ring	7110-1362	2
16mm Bolt	10-3201	20	13mm /10mm Wrench	L20-2002	2
20mm Bolt	10-3203	10	9/64 x 9 (3.5mm) Steinman Pin	12-8117	6
			COMPASS Universal Hinge	71060001	1
			COMPASS Univ. Hinge Ster. Case	71060004	1



Notes

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Smith & Nephew, Inc.
1450 Brooks Road
Memphis, TN 38116
USA

www.smith-nephew.com

Telephone: 1-901-396-2121
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