Reamer/Irrigator/Aspirator (RIA).

For intramedullary reaming and bone harvesting.

Technique Guide

SYNTHES®

Instruments and implants
approved by the AO Foundation

Table of Contents

Image intensifier control

Reamer/Irrigator/Aspirator (RIA)

Reaming with reduced risk of systemic complication
– Reduces intramedullary pressure
– Reduces potential for fat embolization
– Reduces heat generated
– Removal of infected tissue

Fast, efficient reaming
– Time-saving, single-pass procedure
– Easier handling
– Sharp reamer heads for optimized cutting

Reamer head

Tube assembly

Flow of irrigating fluid

Bone marrow, morselized bone

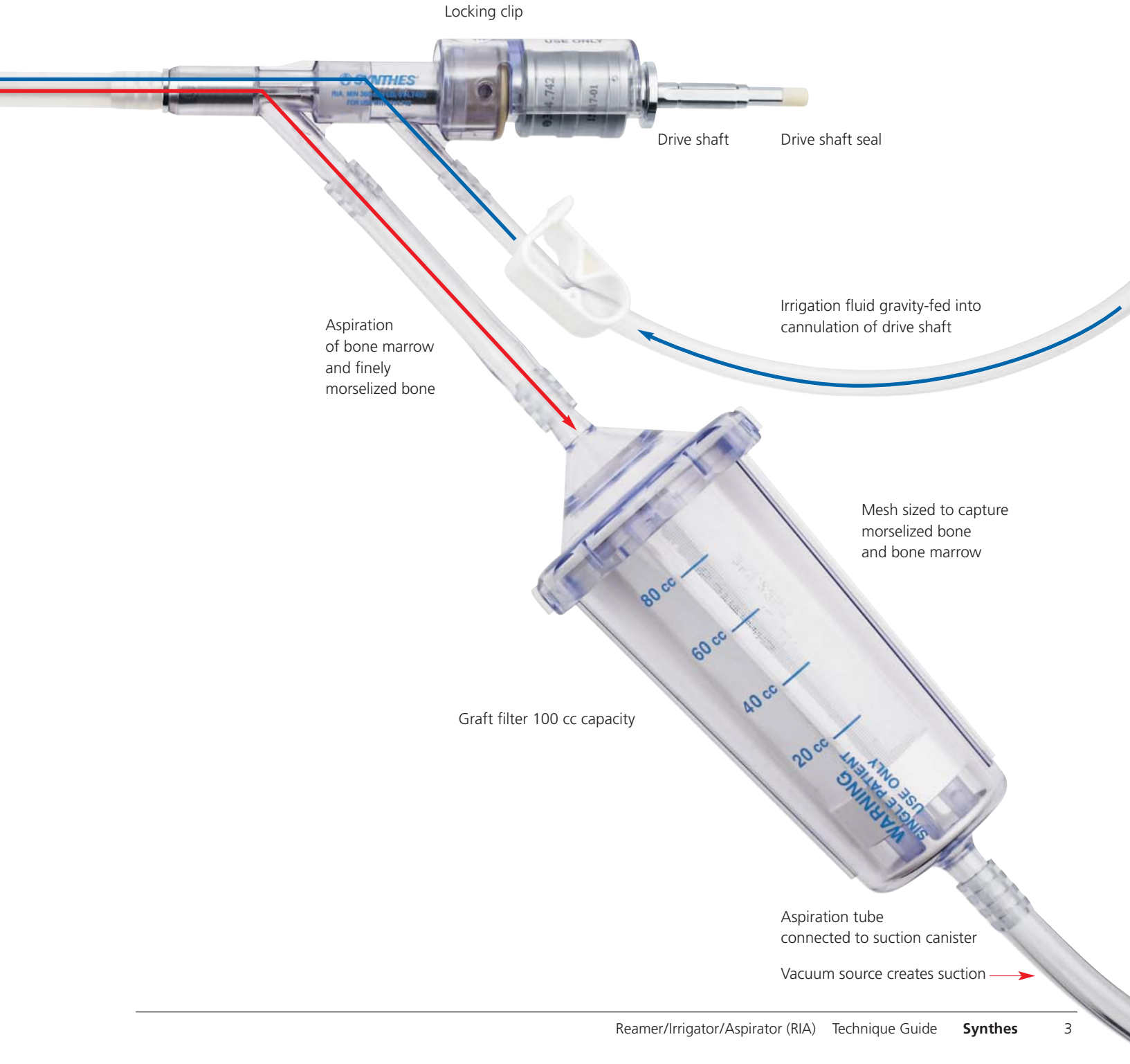
Autograft harvesting
– Familiar technique

Irrigation fluid constantly cools reamer head and emulsifies marrow for easy evacuation

Removal of marrow and bone through aspiration holes creates negative intramedullary pressure

Sharp edges for efficient cutting

Deep flutes to minimize clogging

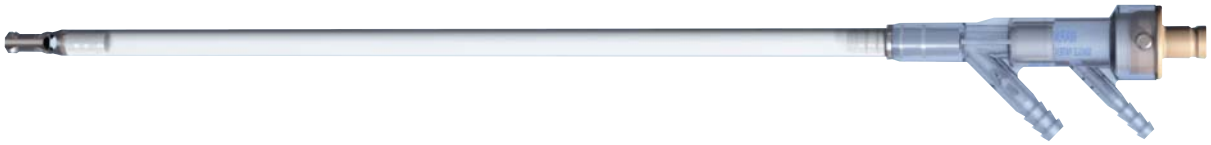

Locking clip
Drive shaft
Drive shaft seal
Irrigation fluid gravity-fed into cannulation of drive shaft
Aspiration of bone marrow and finely morselized bone
Mesh sized to capture morselized bone and bone marrow
80 cc
60 cc
40 cc
20 cc
WARNING
SINGLE PATIENT USE ONLY
Graft filter 100 cc capacity
Aspiration tube connected to suction canister
Vacuum source creates suction

Indications

– To clear the medullary canal of bone marrow and debris
– To effectively size the medullary canal for the acceptance of an intramedullary implant or prosthesis
– To harvest finely morselized autogenous bone and bone marrow for any surgical procedures that require bone graft to facilitate fusion and/or fill bone defects. These procedures include spinal fusion, joint arthrodesis, total joint replacement, fracture repair, nonunion, maxillofacial reconstruction, and tumor removal

1
Select appropriate length of tube assembly

Instruments	
314.745S	RIA Tube Assembly, minimum 360 mm length, sterile
314.746S	RIA Tube Assembly, minimum 520 mm length, sterile



Select the appropriate length RIA tube assembly based on the length of the canal.

Length of the canal	Tube assembly
Less than 350 mm	360 mm
Greater than 350 mm	520 mm

2
Confirm reaming diameter

Instrument

351.717	Depth Gauge

To estimate the canal diameter, position the image intensifier for an AP view of the limb at the level of the isthmus. Hold the radiographic depth gauge perpendicular to the limb and overlay the diameter tabs over the isthmus. Read the diameter on the tab that fills the canal. Repeat with an LM view.

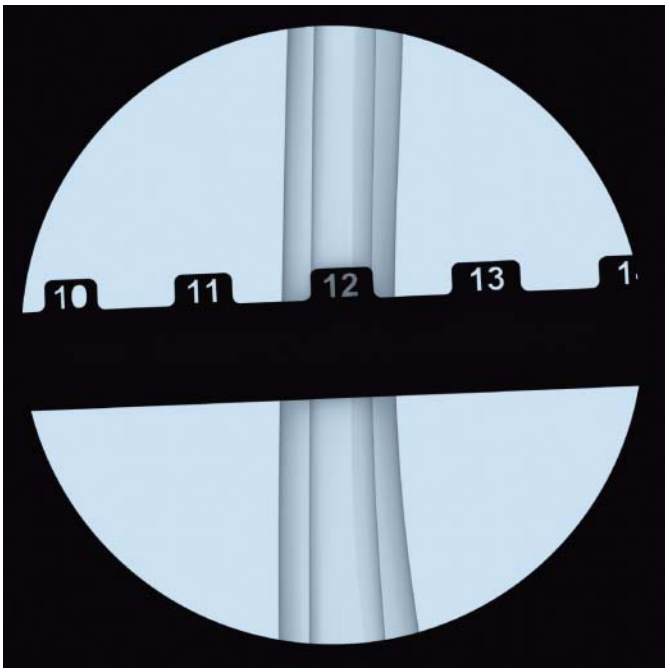
a. For reaming only, choose the implant diameter. Select a reamer head 1.0 mm to 1.5 mm larger than the chosen implant diameter.
b. For bone harvesting, select a reamer head 1.0 mm to 1.5 mm larger than the canal diameter at the isthmus.

Note: Measure in both AP and LM view.

Caution: The distance of the depth gauge from the bone and the position of the receiver affect the diameter measurement

Always place the depth gauge on the side of the limb closest to the receiver. Estimate the width as follows:

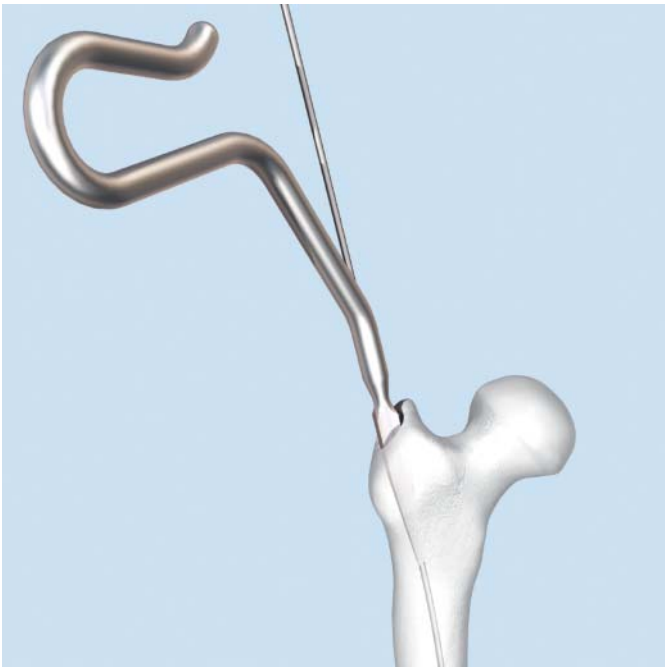
Distance between depth gauge and bone
a. 25 mm = 1 mm larger reading
b. 50 mm = 2 mm larger reading
c. 100 mm = 3 mm larger reading

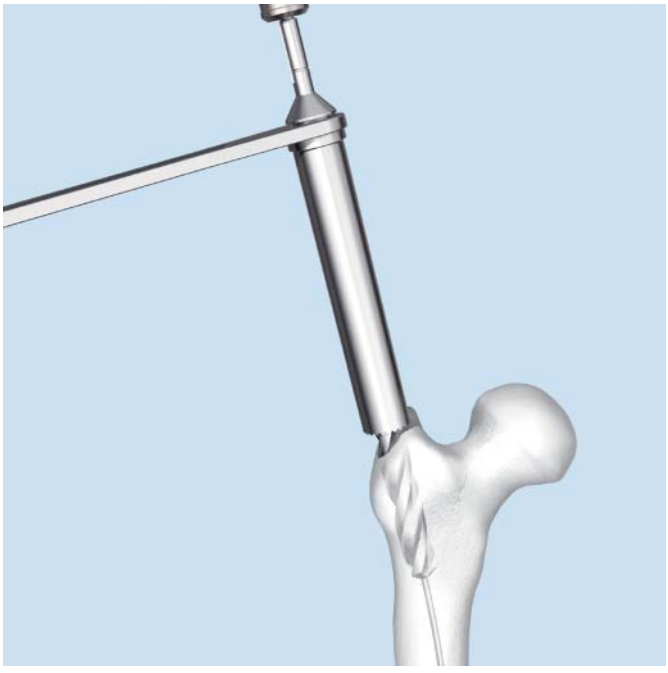


3
Access canal and place reaming rod

Instruments	
351.706S or 351.707S	2.5 mm Reaming Rod with ball tip, 950 mm 2.5 mm Reaming Rod with ball tip and extension, 950 mm
393.10	Universal Chuck with T-Handle

- Gain access to the intramedullary canal using standard opening procedures and instrumentation for the chosen implant or entry point. Reduce the fracture, if present.
- Attach the universal chuck with T-handle to the reaming rod. Insert the reaming rod into the canal to the physeal scar. Verify its position with the image intensifier.
- **Note:** Ensure the reaming rod is centered in the canal in both AP and LM views.





4
Confirm nail length (for reaming only)

Instruments	
351.717	Depth Gauge
351.719	Depth Gauge Extension Tube

Assemble the extension tube to the depth gauge.

Place the depth gauge assembly over the reaming rod.

Note: The tip of the depth gauge assembly should be positioned at the desired location of the implant end.

Caution: Use the depth gauge extension tube only with the 950 mm reaming rod.

Determine the length of the canal. Choose implant length accordingly.

Note: Consider dynamization when choosing implant length.

Assembly

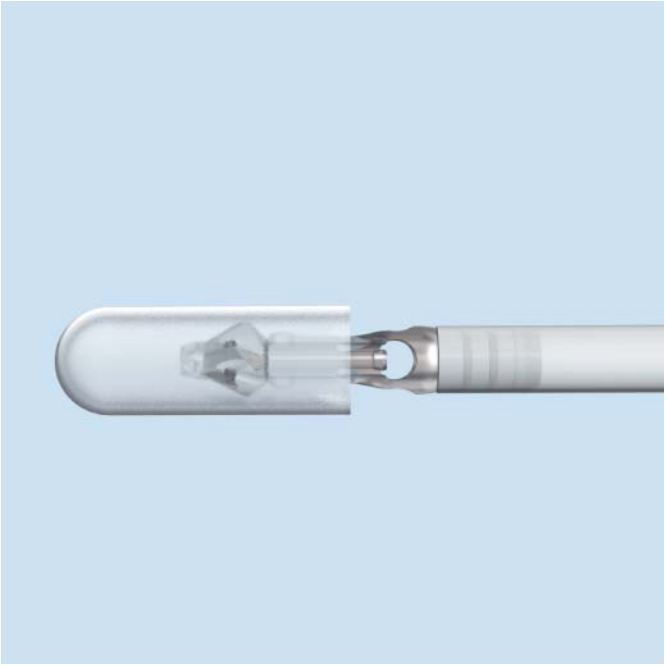
1
Attach reamer head

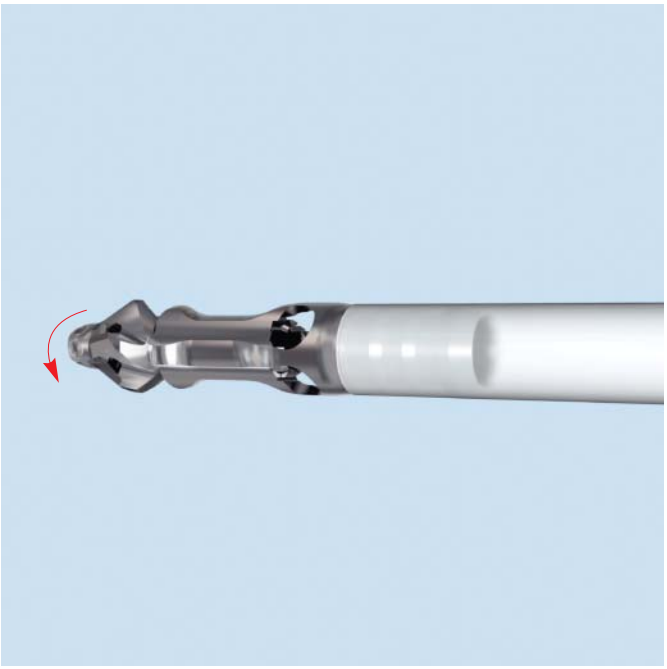
Instruments	
314.745S	RIA Tube Assembly, minimum 360 mm length, sterile
314.746S	RIA Tube Assembly, minimum 520 mm length, sterile
352.250S – 352.259S	Reamer Heads, for RIA 12.0 mm – 16.5 mm, sterile
352.261S – 352.265S	Reamer Heads, for RIA 17.0 mm – 19.0 mm, sterile

Select the appropriate reamer head. Insert it into the tube assembly.

Caution: Reamer heads are sharp. Use the provided tip protector when attaching the reamer head to the tube assembly.

Note: The reamer head is attached correctly when it can spin freely and is retained by the tube assembly.

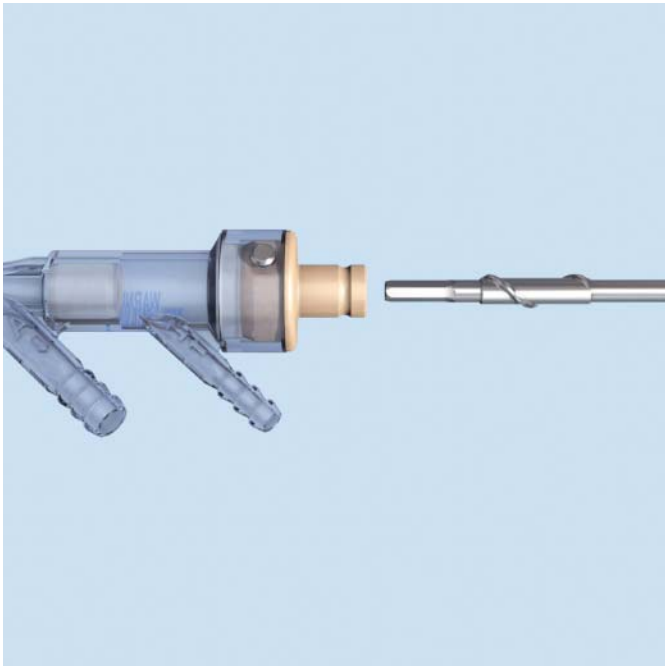




2
Attach drive shaft to tube assembly and reamer head

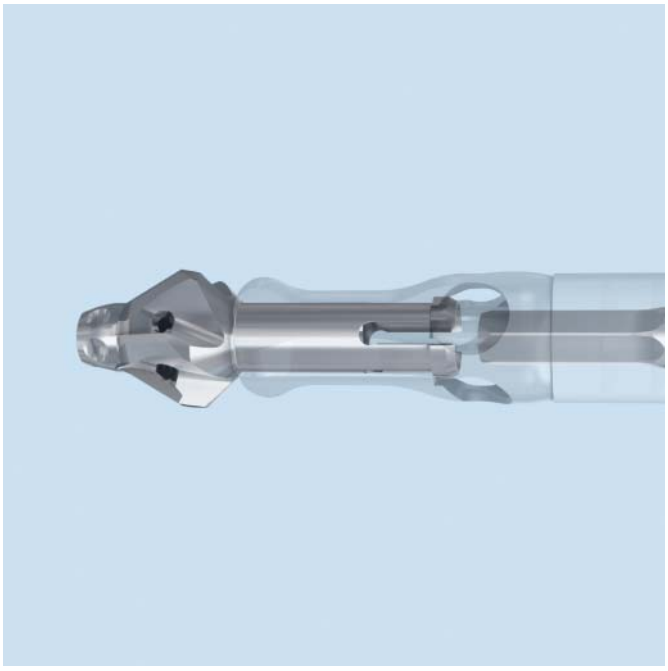
Instruments	
314.742	Drive Shaft, minimum 360 mm length
314.743	Drive Shaft, minimum 520 mm length

Select the appropriate length drive shaft. Guide the tip of the drive shaft through the RIA tube assembly.

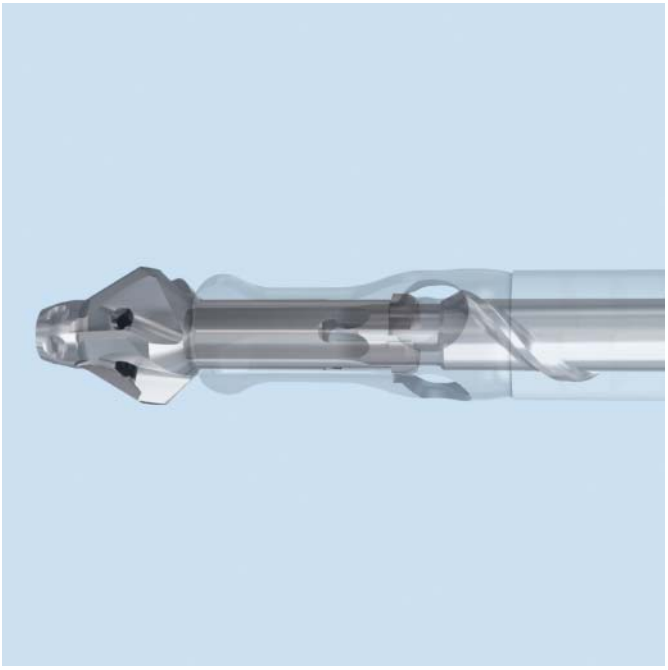


Mate the hexagonal end of the RIA drive shaft with the hexagonal recess in the reamer head.

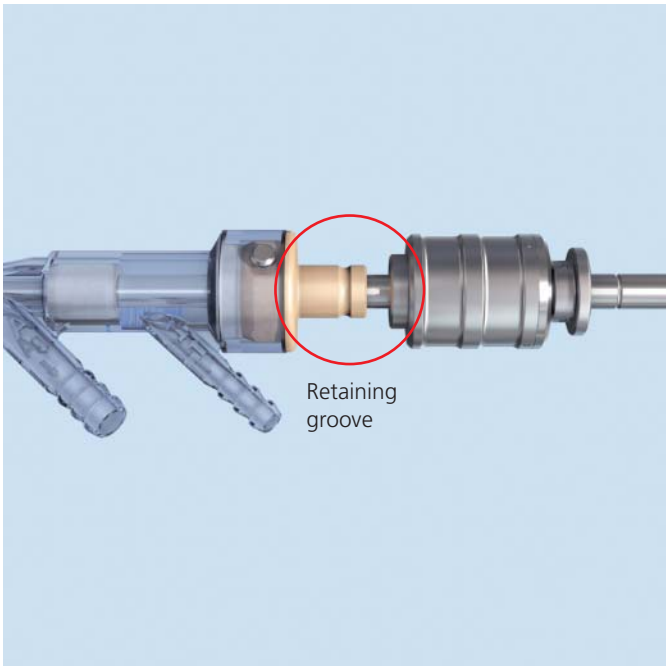
Note: Visually check mating through the aspiration holes.



Note: The drive shaft is properly attached when the hex flats are not visible. The helix is also visible when properly attached.



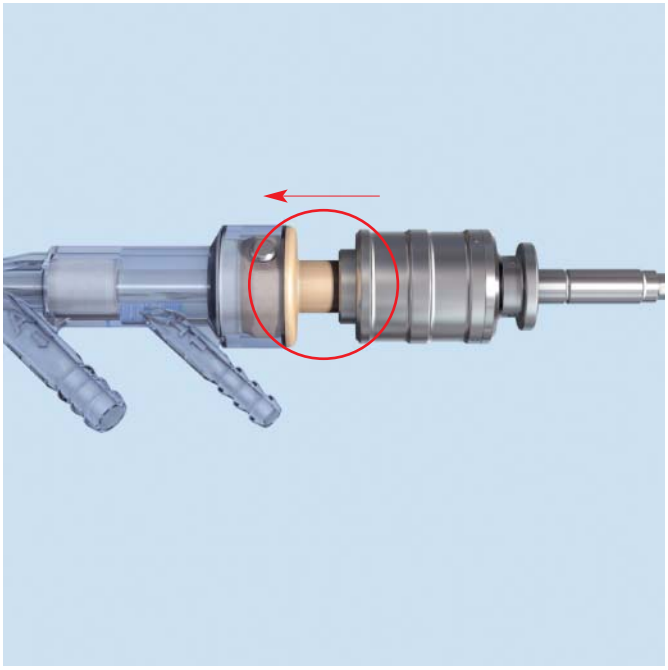
Note: The drive shaft hex is properly engaged in the reamer head when the retaining groove is hidden.



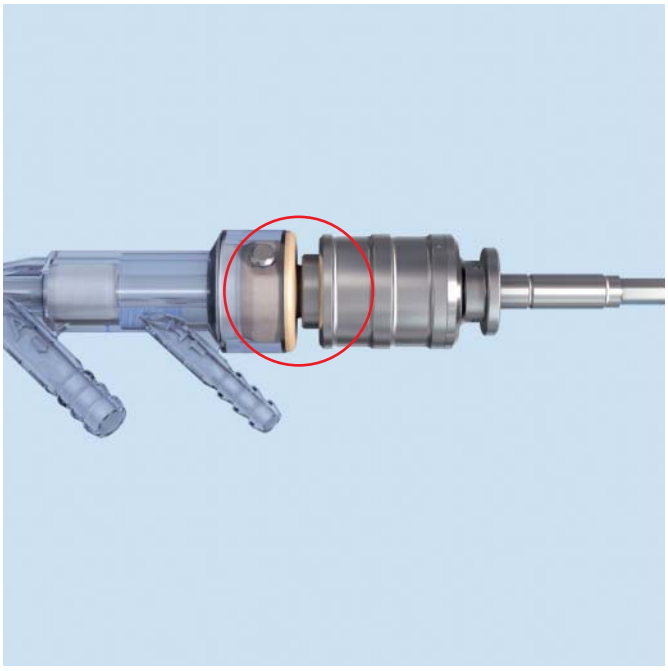
2

Attach drive shaft to tube assembly and reamer head continued

Push the outer sleeve of the RIA drive shaft forward to engage the body of the RIA tube assembly.



Note: The drive shaft is properly attached when the tan plastic coupling shaft is no longer visible.

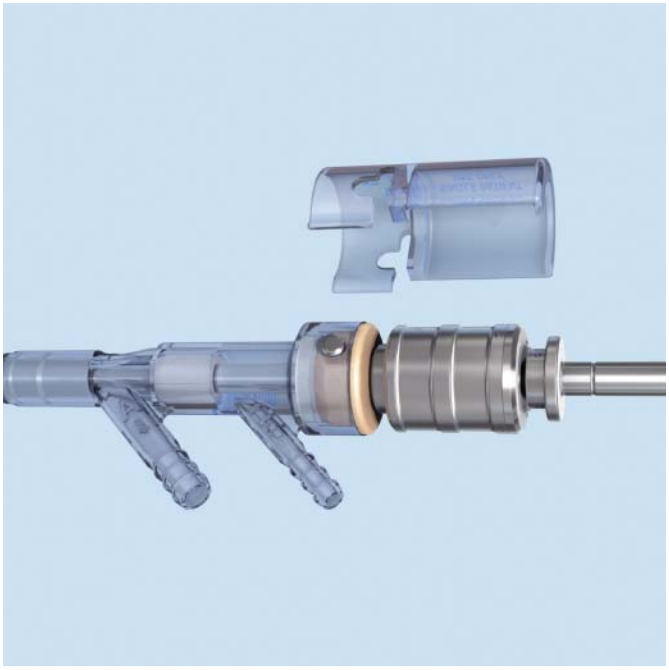


3
Attach locking clip

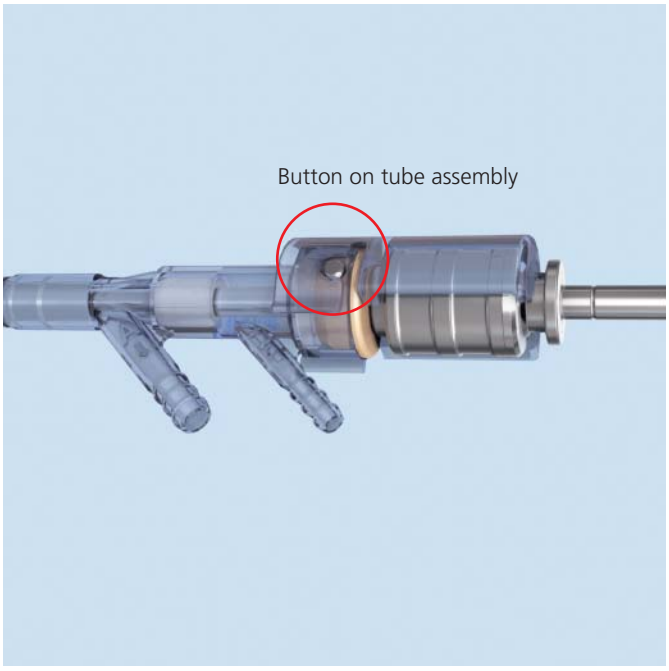
Instrument	
352.260S	Locking Clip, for RIA, sterile

Slide the locking clip onto the assembled RIA drive shaft and tube assembly.

Note: The small ridge on the inner surface of the locking clip matches the groove between the drive shaft and the tube assembly.



Rotate the locking clip until the circular notches on the locking clip align with the corresponding buttons on the tube assembly.



4
Attach drive shaft seal

Instrument	
351.718S	Drive Shaft Seal, for RIA, sterile

Attach the drive shaft seal to the proximal end of the drive shaft.

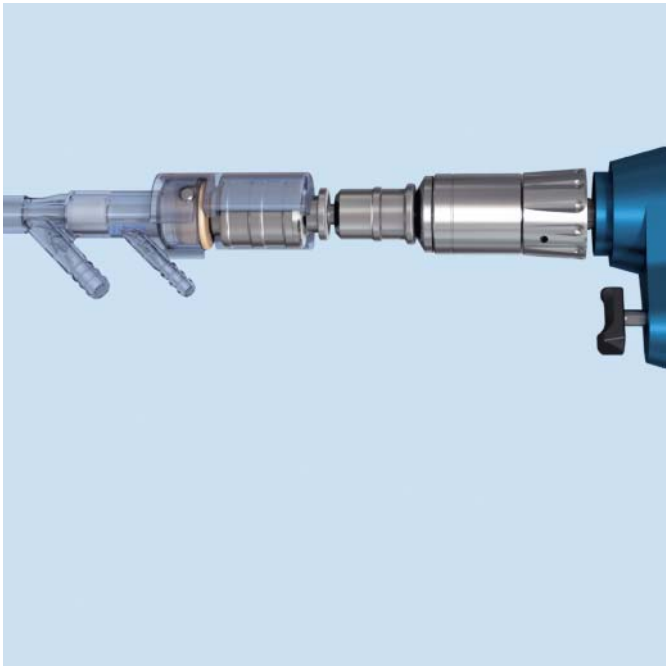
Note: The drive shaft seal is important to retain irrigation fluid in the cannulation of the drive shaft.

5
Attach drive unit to large quick coupling

Instruments	
530.605	Battery Reamer/Drill
530.760	Large Quick Coupling, for Battery Power Line

Select a cannulated drive unit that will deliver 3.5 Nm to 4.5 Nm of torque and 700 rpm to 900 rpm (standard drill speed). Use the cannulated quick coupling to attach the drive shaft to the drive unit.

Caution: Do not use a reduction drive. Drills with a torque greater than 6 Nm must not be used. Power equipment designed for reaming must not be used.



Alternative with Jacobs chuck with key

Alternative instrument	
530.730	Jacobs Chuck with key

Use the Jacobs chuck to attach the drive shaft to the drive unit.

Note: Insert the key into one hole of the chuck and tighten. Move the key to all subsequent holes on the chuck and tighten again.

6
Connect irrigation

Additional materials

1–2 liter container of irrigation fluid (e.g. isotonic 0.9% NaCl)

Irrigation tubing set ("TURP", cysto-bladder, cystoscopy)

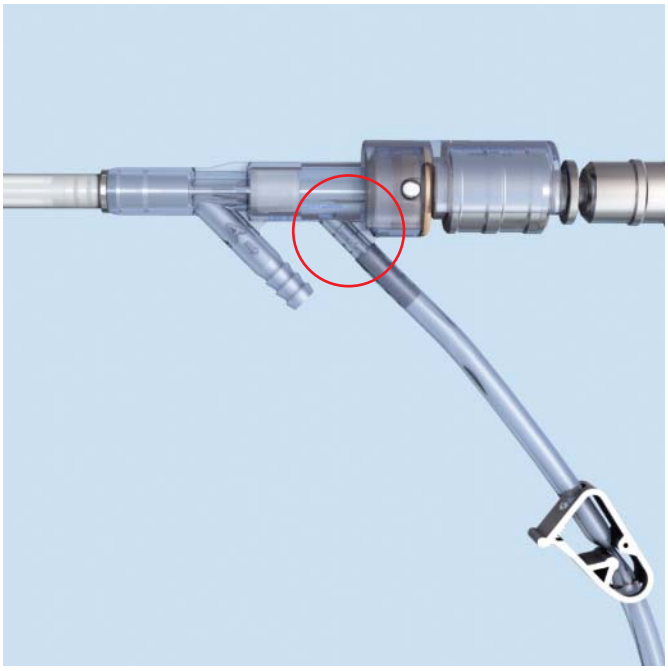
Suspend a 1 or 2 liter container of irrigation fluid approximately one meter above the level of the RIA assembly.

Attach spike end of tubing set to the irrigation container.

Note: The clamp on the irrigation tubing set should be closed until reaming begins.

Connect the opposite end of the irrigation tube to the irrigation port on the tube assembly.

Note: The irrigation port is the smaller of the two ports and is indicated by an "I".

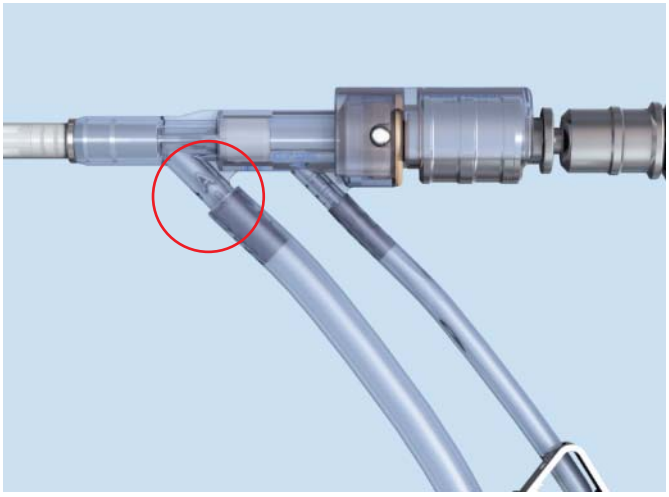


7
Connect aspiration

Additional materials
Aspiration/suction tubing (minimum diameter = ¼" or 6 mm)
2–5 liter suction canister
Vacuum source

Connect the aspiration tube to the aspiration port on the tube assembly.

Note: The aspiration port is the larger of the two ports and is indicated by an "A".



Alternative for bone harvesting

Instrument	
352.229S	Graft Filter for RIA, sterile

Connect the graft filter to the aspiration port on the tube assembly.

Connect the distal end of the graft filter to the aspiration tube.

Note: Before use, ensure filter cap is tightened.

Connect the other end of the aspiration tube to the suction canister. Connect the suction canister directly to the vacuum source.

Note: Connect the aspiration tube directly to the suction canister to avoid a reduction in suction. Never connect several suction canisters in series.

Start the vacuum source, if necessary.

Note: Adjust to maximum level.

1

Introduce RIA assembly into medullary canal

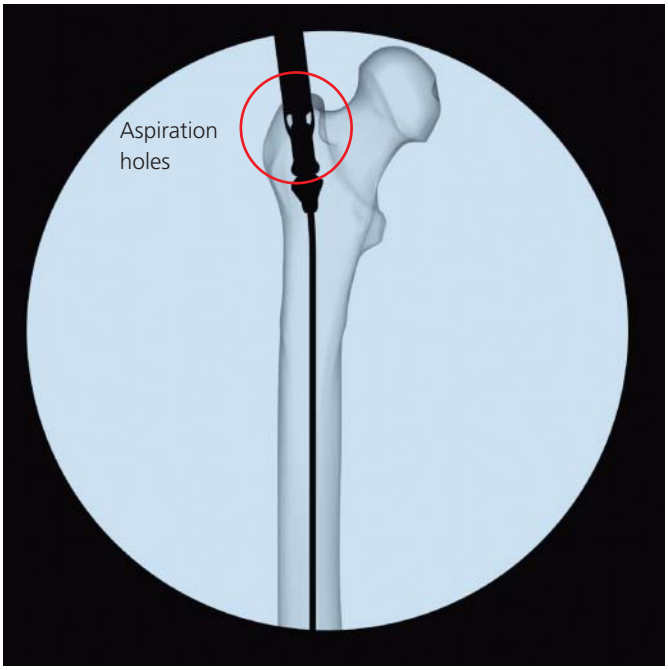
Guide the reamer head over the reaming rod. Open the irrigation clamp to start liquid flow and ensure vacuum is operational.

Note: Prior to insertion into patient's limb, visually verify flow of irrigation fluid at the tip of the reamer head.

Advance the RIA assembly over the reaming rod until the aspiration holes are fully immersed into the bone. Check position on the image intensifier. A flow of blood and bone marrow becomes visible in the aspiration tube.

Note: Flow of aspiration begins when aspiration holes are fully immersed in the bone.

Caution: Never ream when there is no irrigation/aspiration. The irrigation/aspiration cools the reamer heads and removes bone marrow and morselized bone from the medullary canal. Liquid flow is crucial for proper system performance.



2
Ream

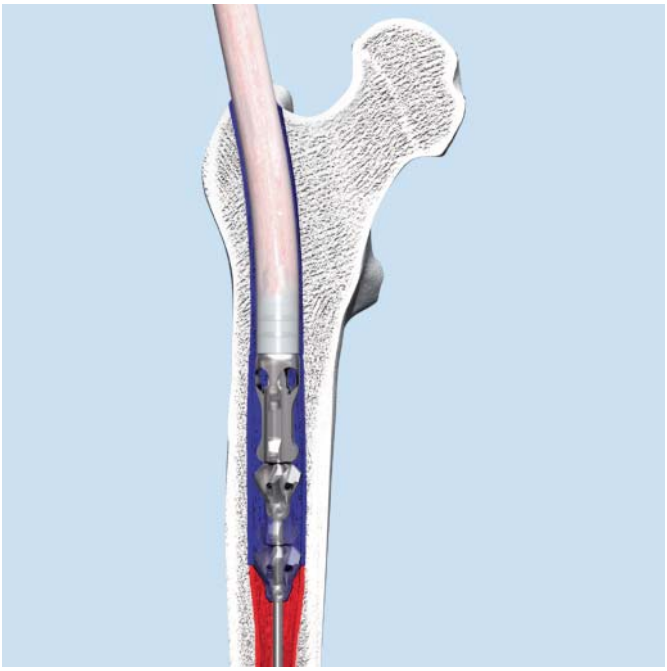
Begin reaming, using a gradual advance/retract technique. Slowly advance 20–30 mm and then retract 50–80 mm allowing the irrigation fluid to flow in front of the reamer head. Advance the assembly until resistance is felt, then repeat.

Note: An insufficient irrigation volume may lead to clogging. To prevent clogging, avoid rapid advancement of the assembly.

Caution: Periodically check that the reaming aspirate is flowing through the tube and into the suction canister. Stop reaming if there is no flow.

After the reamer head reaches the desired depth, withdraw the RIA assembly while maintaining rotation of the drill.

Note: Reverse the drill if advancement of the reamer becomes difficult.



Note: When deciding to harvest autogenous graft, the patient's history, bone quality, physiological condition and compliance must be taken into account.

1

Turn off irrigation and aspiration

Instrument	
352.229S	Graft Filter, for RIA, sterile

Stop irrigation after withdrawing the RIA assembly from the canal. Turn off suction, or clamp the suction tubing. Disconnect the filter canister from the lid and move it to the back table.

2

Prepare graft

Hold the graft filter vertically. Compress the bone graft by gently pushing down on the plunger. Estimate the volume of bone graft with the scale on the outer canister.

3

Remove graft from filter

With the plunger inserted, invert the filter. Remove the inner filter from the canister.

Caution: When handling, do not hold the opening downward as there is a risk of dropping the graft material.

Hold the inner filter over an appropriate container.

Position the inner filter vertically. Push the bone graft out of the filter with the plunger.

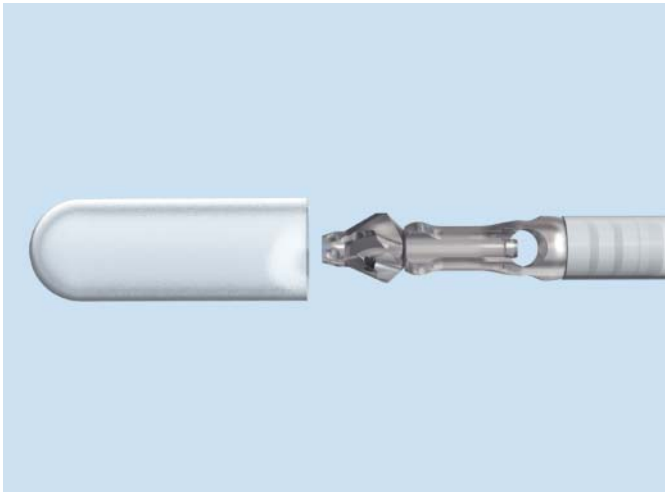
Reamer Head Exchange

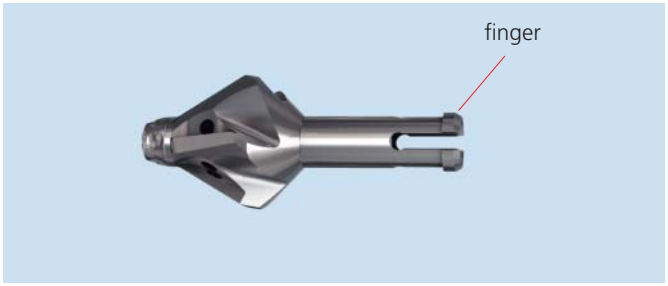
1
Disengage drive shaft

Intraoperative RIA reamer head exchange is determined by surgeon preference.

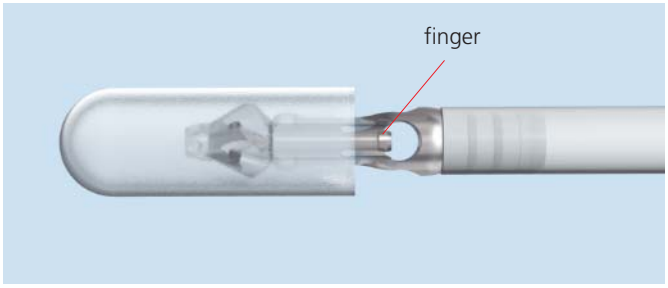
Place reamer head tip protector over reamer head and disengage drive shaft. The tip protector is provided with each RIA reamer head.

Caution: Reamer heads are sharp.

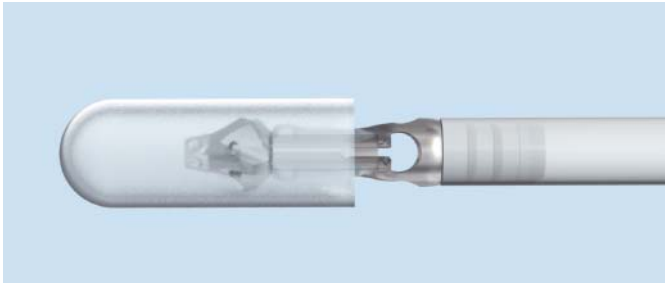




Align reamer head in aspiration hole. The reamer head is correctly positioned when one reamer head finger is visible in the aspiration hole.



Correct alignment

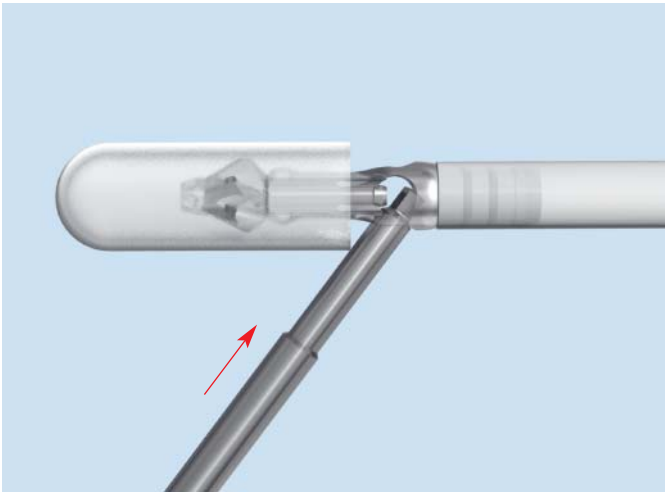


Incorrect alignment

2

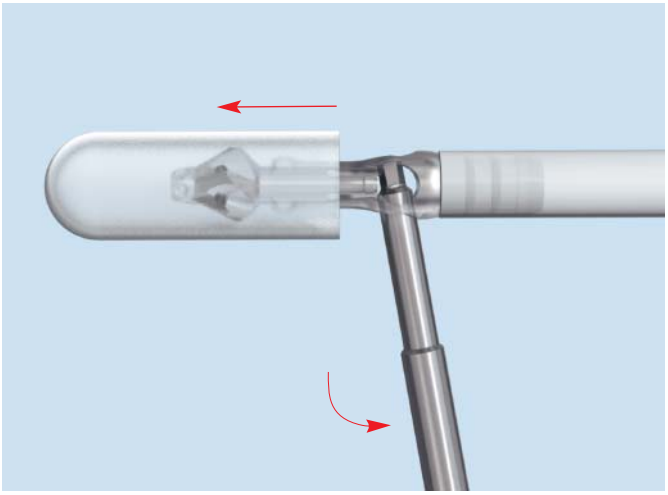
Remove reamer head

Insert a 3.5 mm or 4.0 mm hex screwdriver into the aspiration hole at a 30° – 45° angle to collapse the reamer head finger.



Rotate screwdriver away from reamer head to release head. Replace with sterile reamer head.

Note: Dispose of reamer head.

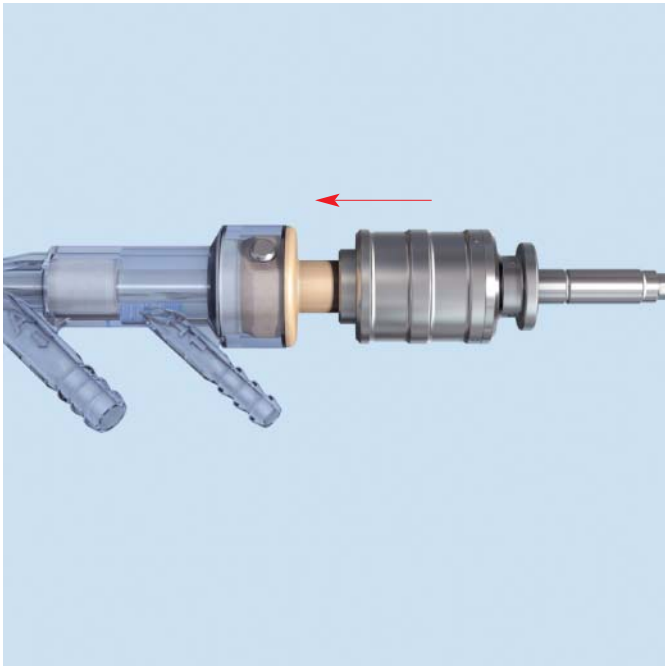


Disassembly

1

Remove drive shaft

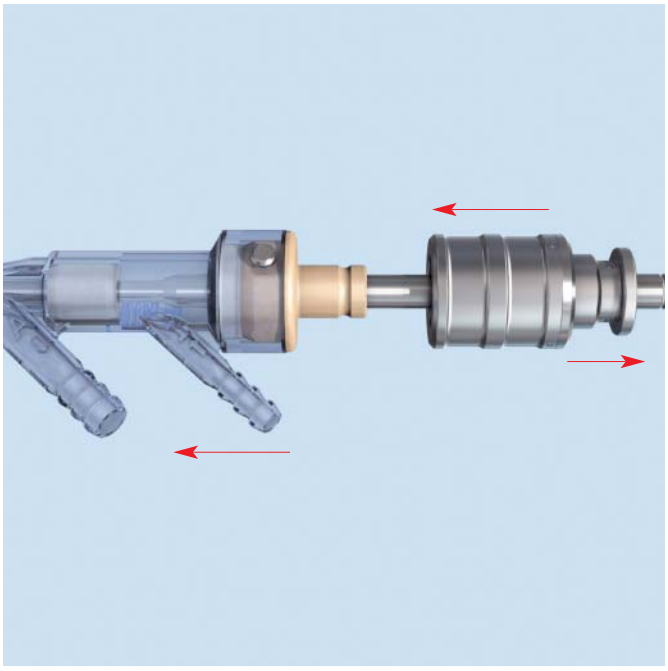
Remove and dispose of the irrigation/aspiration tubing and locking clip. Push the outer sleeve of the drive shaft toward the body of the RIA tube assembly.



Keep the outer sleeve in a forward position while withdrawing the drive shaft from the body of the tube assembly.

Remove the drive shaft from the RIA tube assembly.

Note: Dispose of the tube assembly and reamer head. Remove and dispose of the drive shaft seal.



Single-use Instruments

Reamer Heads

- Conical tip helps centralize reamer
- Deep flutes minimize clogging
- Sharp edges for cutting efficiency
- Diameters: 12 mm – 19 mm in 0.5 mm increments
- Stainless steel
- Sterile packed
- Attaches to RIA tube assemblies

	Diameter (mm)		Diameter (mm)
352.250S	12.0	352.258S	16.0
352.251S	12.5	352.259S	16.5
352.252S	13.0	352.261S	17.0
352.253S	13.5	352.262S	17.5
352.254S	14.0	352.263S	18.0
352.255S	14.5	352.264S	18.5
352.256S	15.0	352.265S	19.0
352.257S	15.5		

RIA Tube Assemblies

- Two lengths available (attach to corresponding drive shafts)
- Sterile packed

	Length (mm)
314.745S	360
314.746S	520

2.5 mm Reaming Rods with ball tip

	Length (mm)
351.706S	950
351.707S	950, with extension
351.708S	1150

351.718S Drive Shaft Seal, for RIA (2/pkg.)
- Elastomeric seal
- Minimizes flow of irrigation fluid into drive unit
- Sterile packed

352.229S Graft Filter, for RIA
- Collects finely morselized bone chips and marrow
- Capacity: 100 cc
- Graduations for estimating volume
- Plunger for easy removal of graft
- Sterile packed

352.260S Locking Clip, for RIA
- Secures attachment between drive shaft and tube assembly
- Sterile packed

Additional Materials

Irrigation Fluid Bag
– 1–2 liters for reaming
– 3 liters minimum for harvesting

Suction Canister
– 2 liters minimum for reaming
– 3 liters minimum for harvesting

Irrigation Tubing
– Clip to control liquid flow
– Spike to connect irrigation fluid bag
("TURP", cysto-bladder, cystoscopy)

Aspiration/Suction Tubing
– Minimum diameter: ¼", or 6 mm, allowing tight seal around port

Vacuum Source
– Wall suction or portable suction

Instruments

314.742	Drive Shaft, minimum 360 mm length	
314.743	Drive Shaft, minimum 520 mm length	
351.05	Tissue Protector	
351.717	Depth Gauge	
351.719	Depth Gauge Extension Tube	
355.006	Medullary Tube **Note**: Single sterilization only.	
393.10	Universal Chuck with T-Handle	

Optional Instruments

03.010.036	12.0 mm Cannulated Drill Bit, large quick coupling, 190 mm	
03.010.040	12.0 mm Cannulated Awl	
03.010.115	3.2 mm Guide Wire, 290 mm	
351.02	Small Awl, 210 mm length	
351.782	Holding Forceps	
	Hand Reamers, 450 mm length	
351.92	6.0 mm	
351.93	7.0 mm	
351.94	8.0 mm	
357.403	6.0 mm/10.0 mm Stepped Cannulated Drill Bit, large quick coupling, 435 mm	

Power Equipment

530.605 Battery Reamer/Drill

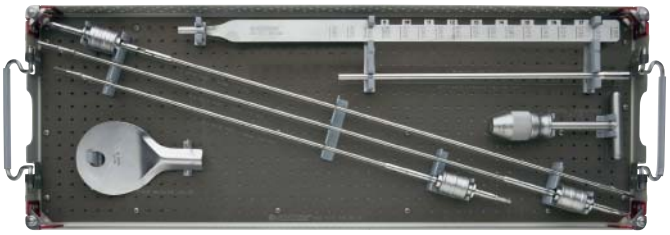
530.730 Jacobs Chuck with Key, for Battery Power Line

530.760 Large Quick Coupling, for Battery Power Line

Reamer/Irrigator/Aspirator Instrument Set (105.309)

Graphic Case

690.308	Reamer/Irrigator/Aspirator Instrument Set Graphic Case



Instruments

314.742	Drive Shaft, minimum 360 mm length, for use with Reamer/Irrigator/Aspirator (RIA)
314.743	Drive Shaft, minimum 520 mm length, for use with Reamer/Irrigator/Aspirator (RIA), 2 ea.
351.05	Tissue Protector
351.717	Depth Gauge
351.719	Depth Gauge Extension Tube
393.10	Universal Chuck with T-Handle

Note: For additional information, please refer to package insert.
For detailed cleaning and sterilization instructions, please refer to
http://us.synthes.com/Medical+Community/Cleaning+and+Sterilization.htm
or to the below listed inserts, which will be included in the shipping container:

- Processing Synthes Reusable Medical Devices—Instruments, Instrument Trays and Graphic Cases—DJ1305
- Processing Non-sterile Synthes Implants—DJ1304

Also Available

Single-use Items

314.745S	Reamer/Irrigator/Aspirator Tube Assembly, minimum 360 mm length, sterile, for use with RIA drive shaft (314.742)
314.746S	Reamer/Irrigator/Aspirator Tube Assembly, minimum 520 mm length, sterile, for use with RIA drive shaft (314.743)
351.706S	2.5 mm Reaming Rod with ball tip, 950 mm, sterile
351.707S	2.5 mm Reaming Rod with ball tip and extension, 950 mm, sterile
351.708S	2.5 mm Reaming Rod with ball tip, 1150 mm, sterile
351.718S	Drive Shaft Seal, for Reamer/Irrigator/Aspirator, sterile (2/pkg.)
352.229S	Graft Filter, for Reamer/Irrigator/Aspirator, sterile
352.260S	Locking Clip, for Reamer/Irrigator/Aspirator, sterile

Reamer Heads, for Reamer/Irrigator/Aspirator, sterile

	Diameter (mm)		Diameter (mm)
352.250S	12.0	352.258S	16.0
352.251S	12.5	352.259S	16.5
352.252S	13.0	352.261S	17.0
352.253S	13.5	352.262S	17.5
352.254S	14.0	352.263S	18.0
352.255S	14.5	352.264S	18.5
352.256S	15.0	352.265S	19.0
352.257S	15.5		

Instruments

03.010.036	12.0 mm Cannulated Drill Bit, large quick coupling, 190 mm
03.010.040	12.0 mm Cannulated Awl
03.010.115	3.2 mm Guide Wire, 290 mm
351.02	Small Awl, 210 mm length
351.15	Flexible Shaft Handle, quick coupling, cannulated
351.782	Holding Forceps
351.92	6.0 mm Hand Reamer, 450 mm length
351.93	7.0 mm Hand Reamer, 450 mm length
351.94	8.0 mm Hand Reamer, 450 mm length
352.040	5.0 mm Flexible Shaft, 470 mm
352.050	7.0 mm Reduction Head, straight
352.055	7.0 mm Reduction Head, angled
357.403	6.0 mm/10.0 mm Stepped Cannulated Drill Bit, large quick coupling, 435 mm
360.243	Handle, for 12.0 mm Tapered Intramedullary Reduction Tool
360.244	Shaft, for 12.0 mm Tapered Intramedullary Reduction Tool

Power Equipment

511.73	Jacobs Chuck with Key
511.761	Large Quick Coupling
530.100	Power Drive
530.605	Battery Reamer/Drill
530.730	Jacobs Chuck with key, for Battery Power Line
530.760	Large Quick Coupling, for Battery Power Line

Recommended Additional Sets

115.545	Accessory Instrument Set for IM Nail Insertion
150.060	Flexible Reamer Set for IM Nails
150.16	ComPact Air Drive II Set
150.119	Battery Power Line Set
105.957	Power Drive Set
105.955	Small Battery Drive Set

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