REAMER/IRRIGATOR/ASPIRATOR (RIA)

For Intramedullary Reaming and Bone Harvesting

Instruments and implants approved by the AO Foundation.
This publication is not intended for distribution in the USA.
Warning
This description alone does not provide sufficient background for direct use of DePuy Synthes products. Instruction by a surgeon experienced in handling these products is highly recommended.

Processing, Reprocessing, Care and Maintenance
For general guidelines, function control and dismantling of multi-part instruments, as well as processing guidelines for implants, please contact your local sales representative or refer to:
http://emea.depuy.synthes.com/hcp/reprocessing-care-maintenance
For general information about reprocessing, care and maintenance of Synthes reusable devices, instrument trays and cases, as well as processing of Synthes non-sterile implants, please consult the Important Information leaflet (SE_023827) or refer to:
http://emea.depuy.synthes.com/hcp/reprocessing-care-maintenance
# TABLE OF CONTENTS

## INTRODUCTION
- Overview 2
- Indications 4

## SURGICAL TECHNIQUE
- Preparation 5
- Assembly 9
- Reaming 18
- Bone Harvesting 20
- Disassembly 22

## PRODUCT INFORMATION
- Single-Patient-Use Instruments 23
- Other Material 25
- General Instruments 26
- Optional Instruments 28
- Power Equipment 30
- Cleaning Instruments 31
- RIA-Instruments Set (105.309) 31

## BIBLIOGRAPHY
32
OVERVIEW

REAMING WITH LOWERED RISK OF SYSTEMIC COMPLICATION

- Designed for:
  - Lower intramedullary pressure\textsuperscript{1, 4, 5}
  - Lower fat embolisation\textsuperscript{2, 3, 14}
  - Lower heat generated\textsuperscript{11}
  - Removal of infected tissue\textsuperscript{6, 7, 8, 13, 14}

FAST, EFFICIENT REAMING

- Time saving one-step procedure\textsuperscript{10}
- Sharp reamer heads for facilitated cutting

**Tube assembly**

Flow of irrigating fluid

Bone marrow, morselized bone

AUTOGRAFT HARVESTING

- Low morbidity\textsuperscript{7, 18}
- Possible range: 30 to 80 cc per procedure
- Well-known technique
- Osteoinductive and osteogenic\textsuperscript{12, 16, 17}

Constant cooling with irrigation fluid, also emulsifies reamings for evacuation

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

Sharp edges for efficient cutting

Deep flutes to prevent clogging
Aspiration of bone marrow and finely morselized bone

Mesh sized to capture morselized bone and bone marrow

Aspiration tube connected to vacuum source

Graft filter 100 cc capacity

Gravity fed irrigation into cannulation of drive shaft
INDICATIONS

Intended use

• To clear the medullary canal of bone marrow and reaming debris
• To clear the medullary canal of infected bone tissue
• 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 in order 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

Note: When deciding on bone harvesting, the patient's history, bone quality, physiological condition and compliance must be taken into account.
PREPARATION

1
Select appropriate length of tube assembly

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>314.745S</td>
<td>RIA Tube Assembly, for RIA Drive Shaft minimum length 360 mm, for No. 314.742, sterile</td>
</tr>
<tr>
<td>314.746S</td>
<td>RIA Tube Assembly, for RIA Drive Shaft minimum length 520 mm, for No. 314.743, sterile</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Length of the canal</th>
<th>Tube assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 350 mm</td>
<td>360 mm</td>
</tr>
<tr>
<td>Greater than 350 mm</td>
<td>520 mm</td>
</tr>
</tbody>
</table>
2
Confirm reaming diameter

Instrument

351.717 Depth Gauge for Medullary Nails

To estimate the canal diameter, position 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 a 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 only, select a reamer head 1.0 mm to 1.5 mm larger than the canal diameter at the isthmus.

Notes:
Measure both in AP and LM view.

Precaution:
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 real width as follows:

Distance between depth gauge and bone
- 25 mm = 1 mm larger reading
- 50 mm = 2 mm larger reading
- 100 mm = 3 mm larger reading
Access canal and place reaming rod

Instruments

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>393.100</td>
<td>Universal Chuck with T-Handle</td>
</tr>
<tr>
<td>352.032</td>
<td>SynReam Reaming Rod Ø 2.5 mm, short, length 950 mm</td>
</tr>
</tbody>
</table>

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 view.
4
Confirm nail length (for reaming only)

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>351.717</td>
<td>Depth Gauge for Medullary Nails</td>
</tr>
<tr>
<td>351.719</td>
<td>Elongation Tube for Reaming Rods, for Depth Gauge for Medullary Nails, for Nos. 351.717 and 03.019.001</td>
</tr>
</tbody>
</table>

Assemble the extension tube to the depth gauge.

Place the depth gauge assembly over the reaming rod.

**Notes:** The tip of the depth gauge assembly should be located at the entry site.

**Precaution:**
Use the depth gauge only with the 950 mm reaming rod.

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

**Note:** Consider dynamization when choosing the length of the implant.
1

Attach reamer head

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

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

**Precaution:** Reamer heads are sharp. Use care when attaching the reamer head to the tube assembly.

### Instruments

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Length Range</th>
<th>Sterility</th>
</tr>
</thead>
<tbody>
<tr>
<td>352.250S–352.259S</td>
<td>RIA Medullary Reamer Heads</td>
<td>12.0 mm–16.5 mm</td>
<td>sterile</td>
</tr>
<tr>
<td>352.261S–352.265S</td>
<td>RIA Medullary Reamer Heads</td>
<td>17.0 mm–19.0 mm</td>
<td>sterile</td>
</tr>
<tr>
<td>314.745S</td>
<td>RIA Tube Assembly, for RIA Drive Shaft</td>
<td>minimum length 360 mm, for No. 314.742, sterile</td>
<td></td>
</tr>
<tr>
<td>314.746S</td>
<td>RIA Tube Assembly, for RIA Drive Shaft</td>
<td>minimum length 520 mm, for No. 314.743, sterile</td>
<td></td>
</tr>
</tbody>
</table>
2
Attach drive shaft to tube assembly and reamer head

Instruments

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>314.742</td>
<td>RIA Drive Shaft, length 360 mm</td>
</tr>
<tr>
<td>314.743</td>
<td>RIA Drive Shaft, length 520 mm</td>
</tr>
</tbody>
</table>

Select the respective length of the 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.

**Precaution:** Improper assembly can result in product breakage, which may lead to surgical delay, bone damage, and/or adverse tissue damage.
**Note:** The drive shaft is properly attached when the hex flats are not visible. The helix is also visible when properly attached.

**Precaution:** Improper assembly can result in product breakage, which may lead to surgical delay, bone damage, and/or adverse tissue damage.

---

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

**Precaution:** Improper assembly can result in product breakage, which may lead to surgical delay, bone damage, and/or adverse tissue damage.
Push the outer sleeve of the RIA drive shaft forward to engage the body of the RIA tube assembly.

**Precaution:** Improper assembly can result in product breakage, which may lead to surgical delay, bone damage, and/or adverse tissue damage.

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

**Precaution:** Improper assembly can result in product breakage, which may lead to surgical delay, bone damage, and/or adverse tissue damage.
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

351.718.025  Seal for RIA Drive Shaft, sterile, pack of 2 units

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

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

5
Attach drive unit with large quick coupling

Instruments

530.605  Battery Reamer/Drill
530.760  Quick Coupling for DHS/DCS Triple Reamers, for Battery Power Line

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

Note: 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.
6 Connect irrigation

Instrument

Irrigation Tube

Other material

1–2 liter container of saline solution (eg, isotonic 0.9 % NaCl)

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

Attach the end with spike on the irrigation tube to the irrigation container.

Note: The clamp on the irrigation 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**

<table>
<thead>
<tr>
<th>Instrument</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspiration Tube</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other material</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2-5 liter suction canister</td>
<td></td>
</tr>
<tr>
<td>Vacuum source</td>
<td></td>
</tr>
</tbody>
</table>

Connect the aspiration tube (non-flared end) 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

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>352.229S Graft Filter for RIA, sterile</td>
<td></td>
</tr>
</tbody>
</table>

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

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

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

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

Start vacuum source, if necessary.

**Note:** Set adjustment to maximum vacuum.
1

**Introduce RIA assembly into medullary canal**

Guide the reamer head over the reaming rod. The system should only be used with SynReam reaming rod (352.032), as described on p. 7.

Open the irrigation clamp to start flow. Turn on the vacuum source.

**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.

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

The irrigation/aspiration cools the reamer heads and removes bone marrow and morselized bone from the medullary cavity. It is crucial for the properties of the system.

**Precautions:**
- Never ream when there is no irrigation/aspiration.
- While not reaming, always turn off irrigation flow and vacuum (aspiration).
Ream

Commence reaming using a gradual advancing/retracting technique. Slowly advance 20–30 mm and then retract 50–80 mm allowing the irrigation to flow in front of reamer head. Then advance until resistance is felt and repeat.

**Notes:** An insufficient irrigation volume may lead to clogging. Never advance too fast to avoid clogging.

**Precaution:**
Periodically check that the reaming aspirate is flowing back via the aspiration port and tube 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 with the drill.

**Note:** Reverse the drill if advancement of the reamer becomes difficult.
1
**Turn off irrigation and aspiration**

**Instrument**

| 352.229S | Graft Filter for RIA, sterile |

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

2
**Prepare graft**

Hold 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

Invert filter vertically with the plunger in a downward position. Remove the inner filter from the canister.

**Precaution:** When handling, do not hold the opening downwards as there is a risk of dropping the graft.

Hold the inner filter over an appropriate container.

Invert the inner filter vertically. Push the bone graft out of the filter with the plunger.
1

**Remove drive shaft**

Remove and dispose of the irrigation/aspiration tube 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.
PRODUCT INFORMATION
SINGLE-PATIENT-USE INSTRUMENTS

Reamer Heads
- Conical tip helps centralize reamer
- Deep flutes prevent clogging
- Sharp cutting edges for every case
- Diameters: 12 mm–19 mm in 0.5 mm increments
- Stainless steel
- Sterile packed
- Attaches to RIA Tube Assemblies

<table>
<thead>
<tr>
<th>Article No.</th>
<th>Diameter (mm)</th>
<th>Article No.</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>352.250S</td>
<td>12.0</td>
<td>352.258S</td>
<td>16.0</td>
</tr>
<tr>
<td>352.251S</td>
<td>12.5</td>
<td>352.259S</td>
<td>16.5</td>
</tr>
<tr>
<td>352.252S</td>
<td>13.0</td>
<td>352.261S</td>
<td>17.0</td>
</tr>
<tr>
<td>352.253S</td>
<td>13.5</td>
<td>352.262S</td>
<td>17.5</td>
</tr>
<tr>
<td>352.254S</td>
<td>14.0</td>
<td>352.263S</td>
<td>18.0</td>
</tr>
<tr>
<td>352.255S</td>
<td>14.5</td>
<td>352.264S</td>
<td>18.5</td>
</tr>
<tr>
<td>352.256S</td>
<td>15.0</td>
<td>352.265S</td>
<td>19.0</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Article No.</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>314.745S</td>
<td>360</td>
</tr>
<tr>
<td>314.746S</td>
<td>520</td>
</tr>
</tbody>
</table>
351.718.025  Seal for RIA Drive Shaft, sterile, pack of 2 units
• Elastomeric seal
• Prevents flow of irrigation fluid into drive unit
• Sterile packed

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

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

Irrigation/Aspiration Tubes
• Spike on irrigation tube to connect with irrigation source
• Clamp on irrigation tube to control flow of irrigation fluid
• Aspiration tube to connect to suction canister
Product Information

OTHER MATERIAL

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

Vacuum Source
- Wall suction or portable suction
### Product Information

#### GENERAL INSTRUMENTS

<table>
<thead>
<tr>
<th>Article No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>314.742</td>
<td>RIA Drive Shaft, length 360 mm</td>
</tr>
<tr>
<td>314.743</td>
<td>RIA Drive Shaft, length 520 mm</td>
</tr>
</tbody>
</table>

- Made of superelastic Nitinol, an alloy of nickel and titanium
- Two lengths available
- Attaches to RIA tube assemblies

<table>
<thead>
<tr>
<th>Article No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>351.050</td>
<td>Tissue Protector</td>
</tr>
<tr>
<td>351.717</td>
<td>Depth Gauge for Medullary Nails</td>
</tr>
<tr>
<td>351.719</td>
<td>Elongation Tube for Reaming Rods, for Depth Gauge for Medullary Nails, for Nos. 351.717 and 03.019.001</td>
</tr>
</tbody>
</table>
393.100  Universal Chuck with T-Handle

352.032*  SynReam Reaming Rod ᴅ 2.5 mm, short, length 950 mm

*Available non-sterile or sterile packed. Add "S" to the catalogue number to order sterile products.
Opening Instruments

351.020 Reverse Awl, small

03.010.040 Awl Ø 12.0 mm, cannulated

03.010.115 Guide Wire Ø 3.2 mm, 290 mm

03.010.036 Drill Bit Ø 12.0 mm, cannulated, length 190 mm, 3-flute, for Quick Coupling for DHS/DCS

351.240 Cutter for UTN/CTN and Universal Medullary Nail, Ø 11.0 mm, length 350 mm
Other Accessory Instruments

351.782  Holding Forceps for SynReam Reaming Rod Ø 2.5 mm

03.010.093  Rod Pusher for Reaming Rod with Hexagonal Screwdriver Ø 8.0 mm
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>530.705</td>
<td>Battery Reamer/Drill II</td>
</tr>
<tr>
<td>530.730</td>
<td>Drill Chuck (930 1/min), with Key</td>
</tr>
<tr>
<td>530.731</td>
<td>Drill Chuck, keyless</td>
</tr>
<tr>
<td>530.760</td>
<td>Quick Coupling for DHS/DCS Triple Reamers</td>
</tr>
</tbody>
</table>
Product Information

CLEANING INSTRUMENTS

Cleaning Instruments

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>352.041</td>
<td>Cleaning Brush Ø 3.6 mm, length 600 mm, for flexible shafts</td>
</tr>
<tr>
<td>351.800</td>
<td>Air Jet, for Cleaning the Instruments with Compressed Air</td>
</tr>
<tr>
<td>351.810</td>
<td>Air Tube Ø 2.0 mm, for No. 351.800</td>
</tr>
</tbody>
</table>

RIA-INSTRUMENTS SET (105.309)

Instruments

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>314.742</td>
<td>RIA Drive Shaft, length 360 mm</td>
</tr>
<tr>
<td>314.743</td>
<td>RIA Drive Shaft, length 520 mm</td>
</tr>
<tr>
<td>351.050</td>
<td>Tissue Protector</td>
</tr>
<tr>
<td>351.717</td>
<td>Depth Gauge for Medullary Nails</td>
</tr>
<tr>
<td>351.719</td>
<td>Elongation Tube for Reaming Rods, for Depth Gauge for Medullary Nails, for Nos. 351.717 and 03.019.001</td>
</tr>
<tr>
<td>393.100</td>
<td>Universal Chuck with T-Handle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>690.308</td>
<td>Graphic Case for RIA Instrument Set, without Contents</td>
</tr>
</tbody>
</table>
Fat Embolism and Reamed/Unreamed Nailing


References

Osteomyelitis


Bone Harvesting


