MODERN CEMENTING TECHNIQUE - HIP

IMPLANT

CEMENT

BONE

ZIMMER BIOMET

Your progress. Our promise.®

Modern Cementing Technique Hip for improved clinical outcome[1,2,3]

Modern Cementing Technique Hip is a documented and clinically proven procedure.[1,2] The objective is to improve mechanical interlock between bone and cement in order to establish a durable interface. The use of distal plug, cement gun, pulsatile lavage and cement pressurizing devices have been shown to significantly improve long-term outcomes.[3] Modern Cementing Technique, compared to earlier techniques, has been linked to a 20% reduction for the risk of revision.[4]

Zimmer Biomet offers a comprehensive portfolio of products and educational courses to supporting the key elements of Modern Cementing Technique:

Bone Bed Preparation

Preparation of the bone bed with a high pressure pulse lavage system enhance the cement penetration and the interface strength.[5-7]
It also reduces the risk of fat embolism.[5]

Bone Cement

PMMA bone cements fill the space between prostheses and bone.
This helps to transmit and evenly distribute loads.

Mixing and Delivery

Mixing and collecting the cement under vacuum reduces both micro and macro pores to a minimum, thereby increasing fatigue life.[3,8-11]

Pressurization

Pressurization improves interface between bone and cement[10]

IMPLANT

CEMENT

BONE

Modern Cementing Technique Hip Key Surgical Steps
Acetabulum

Bone Bed Preparation

Transversal ligament

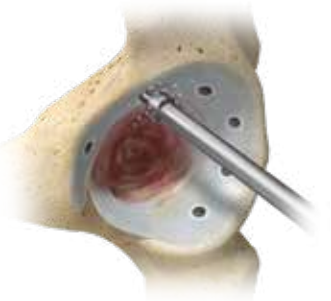
Remove central osteophytes and be sure to save the transversal ligament in order to obtain optimal pressurization when the cup is cemented.

Reaming

Ream the acetabulum at the anatomical site to the size determined at preoperative planning. Save the part of the subcondral bone. The reaming should be over-sized in order to obtain a 2-3 mm cement mantle.

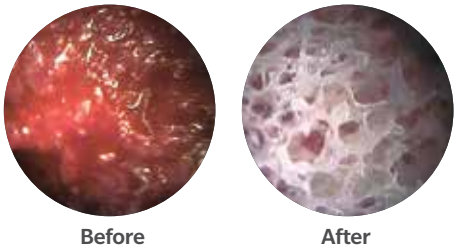
Anchorage Holes

In order to remove as little bone as possible, drill or impact five to eight holes, six mm deep, in the cranial and central parts of the acetabulum. Additional smaller diameter holes can be added in the most cranial parts. These anchorage holes increase the contact area between bone and cement, providing for better fixation.



Pulse Lavage

In order to obtain micro-interlock, use high-pressure pulse lavage and suction repeatedly. Always use a nozzle with front orifices and a splash shield. Clean repeatedly until clear fluid is received in the return line to reduce the amount of debris, blood, bacteria and fat.[5-7]



Before After

Vacuum Mixing of Bone Cement

The cement is mixed and collected in the cartridge under vacuum. The cartridge is then positioned in the cement gun.

Bone Cement Delivery

Break off the long nozzle at the circular mark.

Deliver the doughy bone cement into the acetabulum using the cement gun with short nozzle.

In order to minimize lamination of the blood, apply the vacuum mixed bone cement as a bolus. This requires high viscosity bone cement. Delivery time varies depending on type of cement used.

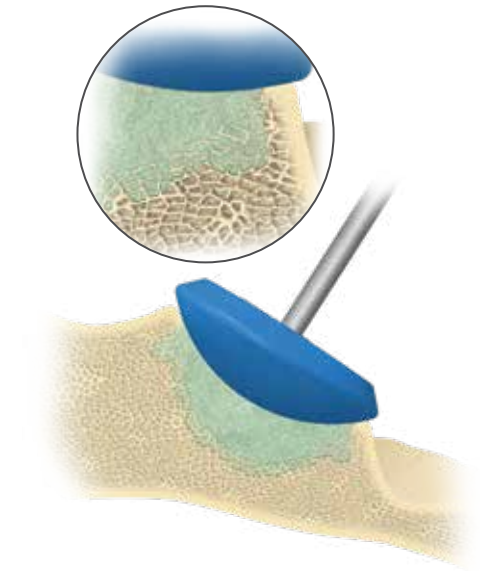
Note: Protect your hands and prevent contact allergy by using an extra pair of PE gloves. Latex gloves provide no protection from monomer penetration.

Pressurization

Pressurization

Pressure is applied immediately by using the acetabular pressurizer. Maintain pressure until the bone cement is sufficiently doughy.

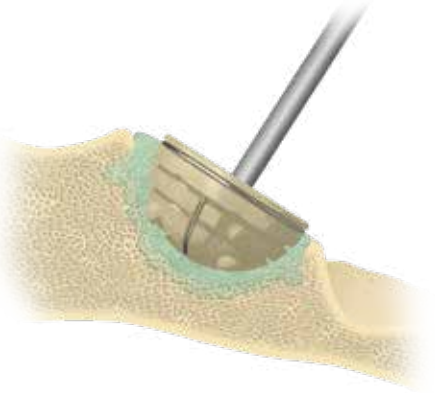
Collected data has shown that high pressurization is needed to achieve micro-interlock.[2] This reaffirms the necessity of working in a contained cavity and not removing the transversal ligament.



Even Cement Mantle

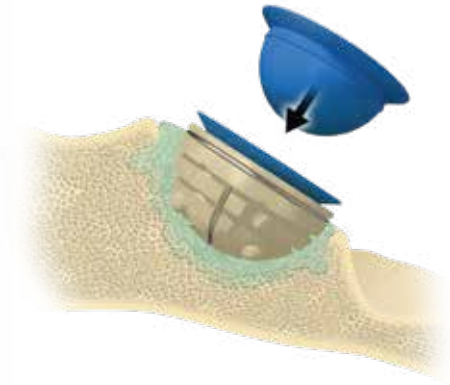
You should have a 2-3 mm cement mantle around the cup.

An even cement mantle means better stress distribution and reduces risk of cement mantle failure.



Protect the Cup

Use the cup protector in order to prevent cement contamination in the articulating surface.



Femur

Bone Bed Preparation

Reaming

Use a straight reamer to open up the femoral canal. Be sure to open both the posterior and the lateral walls sufficiently.

Insufficient reaming will make it impossible to align the femoral stem properly in both planes. Start with the smallest available rasp impactor and increase until the size determined at preoperative planning has been achieved. If necessary, be prepared to use a flexible reamer to enlarge the isthmus.

Distal Plug

Determine the plug size by using the special instrument or a flexible reamer. Insert the appropriate distal femoral plug. Place the plug 10 mm distal to the intended level of the tip of the stem. Resorbable biodegradable plugs make the removal during revision surgery unnecessary.

Pulse Lavage

Use a nozzle with side orifices, allowing the pulse lavage to act perpendicular to the bone surface.

Clean repeatedly until clear fluid is received in the return line to reduce the amount of debris, blood, bacteria and fat.[5-7]

Vacuum Mixing of Bone Cement

The bone cement is mixed and collected in the cartridge under vacuum.

The cartridge is then positioned in the cement gun.

Pulse Lavage

Make a final pulse lavage before injecting the cement.

Clean repeatedly until clear fluid is received in the return line to reduce the amount of debris, blood, bacteria and fat.[5-7]

Bone Cement Delivery

The doughy bone cement is delivered in retrograde fashion.

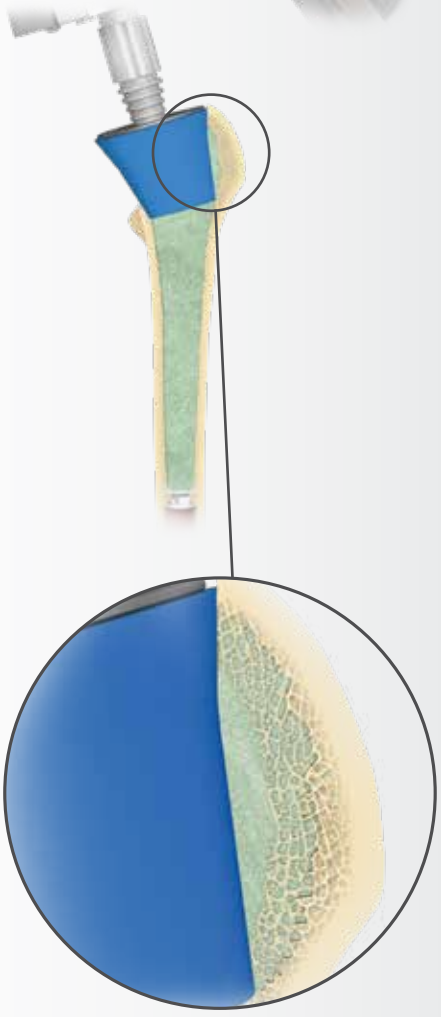
Pressurization

Break off the long nozzle at the circular mark.

Place the support plate and the femoral pressurizer on the short nozzle.

Apply the proximal seal and pressurize the bone cement. A positive sign of pressurization is marrow extrusion in the greater trochanter (the so-called sweating trochanter sign).

As with the acetabulum, maintain pressure until the bone cement is sufficiently doughy to withstand bleeding. The time varies depending on the type of cement used.



Bone cement penetration into cancellous bone insert.

Pressurization

Distal centralizer

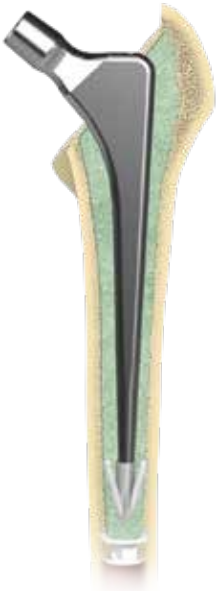
Apply the distal centralizer to the stem. The centralizer should be used to avoid varus or valgus malposition of the stem in both planes.

Introduction of the stem

Gently introduce the stem and hold it in place until the cement has polymerized.

Even cement mantle

With the stem in final position, you should have a 2–3 mm cement mantle around the stem and approximately 10 mm between the tip of the stem and the plug. This will yield optimal stress distribution. Finally, reduce the hip.



Modern Cementing Technique Hip
The method for improved clinical outcome.[1,2,3]

The modern total hip replacement has effectively helped to improve quality of life for patients with osteoarthrosis of the hip.[22] Modern and reproducible cementing technique has definite advantages for our patients as well as for the health care providers.[3]

Long Term Implant Survival

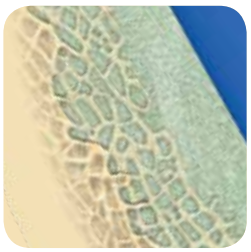
Good initial stability of the implant is one important factor to obtain good and long lasting results. Each step of Modern Cementing has been associated with approximately 20% reduction of revision for aseptic loosening.[7]

Good implant stability

Micro-interlock and a homogenous bone cement mantel around the implant are important factors in achieving good implant stability

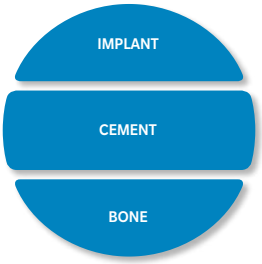
Micro-interlock

Micro-interlock is the mechanical interlock between bone and cement. It is important to have an optimal micro-interlock in order to achieve a durable interface.



Modern Cementing Technique Hip

The goal of Modern Cementing Technique in general is to improve both the long-term properties of the bone cement itself and the cement-bone interface.



National Hip Registers

Since 1979, the Swedish Total Hip Replacement Registry has documented cement techniques. More than 400 000 surgeries have been recorded and the data demonstrates significantly improved longevity of hip implants when Modern Cement Technique is utilized.[2] The significant variables are distal plug, pulsatile lavage, proximal seal and vacuum mixing of the bone cement. Each of these steps has been associated with approximately 20% reduction of revision for aseptic loosening.[7]

Cement-Bone Interface

Bone Bed Preparation

Preparation of the bone bed with a pulsative lavage system, like the Pulsavac® Plus Wound Debridement System, helps to ensure solid cement fixation.[1]

- To obtain proper cement penetration and fixation into the cancellous bone[14]
- Reduce the risk for revision due to aseptic loosening[1]
- Reduce the risk for fat embolism and significantly minimize circulatory changes.[5,16]

Bone Cement

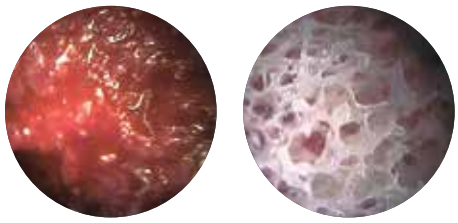
Polymethyl methacrylate (PMMA) bone cements fill the space between prostheses and bone, transmitting and evenly distributing loads. Antibiotic-loaded bone cement reduces the risk of infection in both primary and revision operations.[2,13]

High viscosity cements have been shown to offer a lower incidence of revision and aseptic loosening in total hip replacement.[2,13]

The handling properties of the bone cement are highly dependent on the temperatures of the cement and the operating room. Higher temperatures make for a shorter working phase and a faster setting time.

High viscosity bone cement like Refobacin® Bone Cement R can be pre-chilled if a longer working phase is required. The main considerations are:

- Good mechanical properties[21]
- Consistent handling properties[22]
- High antibiotic release

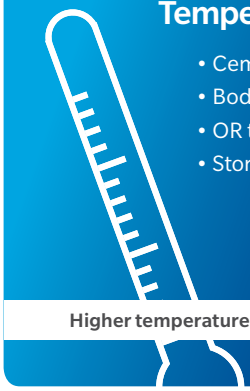


Before After

Factors Influencing Bone Cement Handling Characteristics

Temperature

- Cement temperature
- Body temperature
- OR temperature
- Storage temperature



Higher temperature = faster setting time

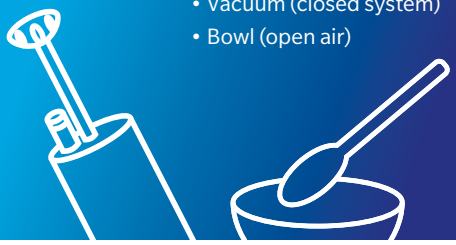
Time

- From storage to mixing
- From mixing to application
- Application time
- Setting time
- Start the clock immediately when the powder and liquid meet

Test – get to know your cement

Mixing Method

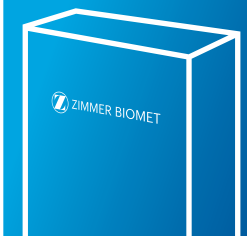
- Vacuum (closed system)
- Bowl (open air)



Read relevant information

Type of Cement

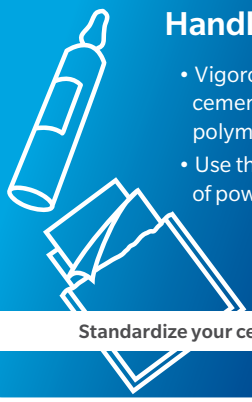
- Low viscosity
- Medium viscosity
- High viscosity



Read relevant information

Handling

- Vigorous kneading of the cement may speed up the polymerization process
- Use the right proportion of powder and liquid



Standardize your cement handling

Improved Working Environment

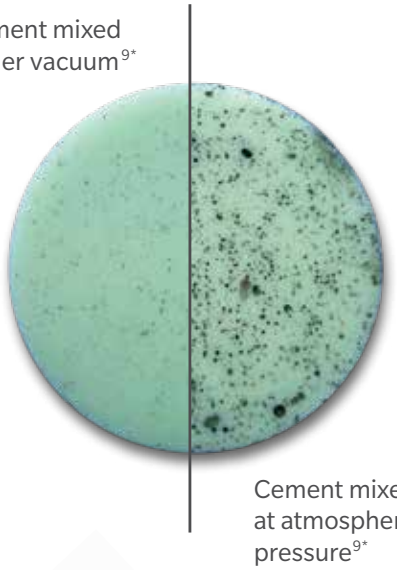
- Use an extra pair of PE gloves
- A closed system minimizes monomer fumes and skin contact
- Use a combined system for mixing and delivery

Rubber gloves do not protect against monomer

Mixing and Collection Under Vacuum

Mixing and collecting the bone cement under vacuum reduces both micro and macro pores.[3,8-11]

- Improved cement strength and fatigue life[3,17]
- Lower risk of aseptic loosening due to cracks[9-11,17]
- Delivery of reproducible results[21,22]
- Less exposure to monomer fumes[18*,19]



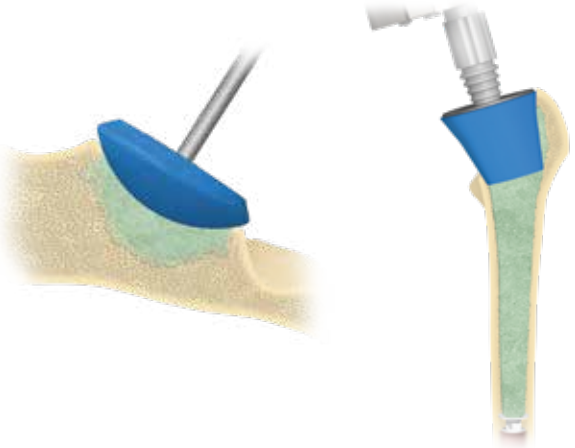
Delivery

- Acetabulum: Deliver the doughy bone cement into the acetabulum using the cement gun with the short nozzle. It is recommended to apply the cement as a bolus.
- Femur: Deliver the doughy bone cement into the femur using the cement gun with the long nozzle. The doughy cement should be delivered in a retrograde fashion. The Swedish Hip Register has shown that retrograde cement filling in the femur reduces the risk of revision.[2]

Pressurization

High pressure increases penetration into cancellous bone to achieve micro-interlock

- Reduces cement porosity and increase fatigue strength[3,12]
- Improved interface between bone and cement[3,14]
- Better stress distribution[3]



* Lab test results not necessarily indicative of clinical performance.

Solutions for Modern Cementing Technique Hip

Optipac® Vacuum Mixing System

A closed vacuum mixing system, pre-packed with bone cement

Proven*, Strong, Safety

- On the market since 2008 and based on Optivac® Technology since 1993
- Designed to improve cement fatigue life by mixing and collection under vacuum[1,8-10]
- Featuring SoftPac™ Technology ensures no breaking of glass ampoules.
- Standardized and reproducible method, improved bone cement quality[9]
- Minimizing exposure to monomer fumes[18*,19]
- No direct contact with bone cement during mixing and delivery
- No breaking of glass ampoules, no risk of glass injury

Optipac | SINCE 2008

Optivac® Vacuum Mixing System

Designed for mixing and collection under vacuum,
Optivac Vacuum Mixing System reduces both microporosity and macroporosity[8-11]

- Designed to improve cement strength and fatigue life[8-11]
- On the market since 1993
- Unmatched in documentation[8-11, 18**]

Refobacin® Bone Cement R

- High viscosity cement
- Green color of cement allows for easy recognition during surgery
- Reliable mechanical performance based on international standard laboratory testing[20,21*]

*Technology tried in practice of mixing and collecting bone cement in a system under vacuum.
**Laboratory testing is not necessarily indicative of clinical performance. In published articles and lab reports

Ordering Information

Optipac Refobacin® Bone Cement R

Product	Description	Part Number	Units/box
	Optipac Knee Refobacin® Bone Cement R	4709500392-3	8
	Optipac 40 Refobacin® Bone Cement R	4710500394-3	8
	Optipac 60 Refobacin® Bone Cement R	4711500396-3	8
	Optipac 80 Refobacin® Bone Cement R	4712500398-3	8
	Optipac Hip Set (40 + 80) Refobacin® Bone Cement R	4740500394-3	4

Optipac Refobacin® Plus Bone Cement

Product	Description	Part Number	Units/box
	Optipac Knee Refobacin® Plus Bone Cement	4719502082-3	8
	Optipac 40 Refobacin® Plus Bone Cement	4720502083-3	8
	Optipac 60 Refobacin® Plus Bone Cement	4721502084-3	8
	Optipac 80 Refobacin® Plus Bone Cement	4722502117-3	8

Optipac Refobacin® Revision

Product	Description	Part Number	Units/box
	Optipac 40 Refobacin® Revision	4730501163-3	8
	Optipac 80 Refobacin® Revision	4732501165-3	8

Refobacin® Bone Cement R

Product	Description	Part Number	Units/box
	Refobacin® Bone Cement R 1x20	3003920001-3	20
	Refobacin® Bone Cement R 2x20	3003920002-3	20
	Refobacin® Bone Cement R 1x40	3003940001-3	20
	Refobacin® Bone Cement R 2x40	3003940002-3	20
	Refobacin® Bone Cement R 1x60	3003960001-3	12

Refobacin® Plus Bone Cement

Product	Description	Part Number	Units/box
	Refobacin® Plus Bone Cement 1x20	3020820401-3	20
	Refobacin® Plus Bone Cement 2x20	3021180001-3	20
	Refobacin® Plus Bone Cement 1x40	3020830401-3	20
	Refobacin® Plus Bone Cement 2x40	3021170001-3	20
	Refobacin® Plus Bone Cement 1x60	3020840401-3	12

Refobacin® Revision

Product	Description	Part Number	Units/box
	Refobacin® Revision 1x40	3011630001-3	20

Mixing & Delivery and Bone Bed Preparation

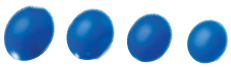
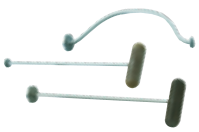
Product	Description	Part Number	Units/box
	**Optivac S**	4161	10
	Optivac M	4160	10
	Optivac L	4152	10
	Optivac Hip Set	4150	10
	**Optivac+ Hip Set**	4250	10
	**Optigun™**	4193	1
	**Optigun Ratchet**	4195	1
	**Pulsavac® Plus Hip Kit**	00-5150-482-00	10
	**Optivac+ Hip Set**	4250	10

Pressurizers

Femur Pressurizers

Product	Description	Part Number	Units/box
	**Pressurizer Femur II**	430900	5
	**Cement Press Support Plate II**	4197	1

Acetabular Pressurizers

Product	Description	Part Number	Units/box
	**Acetabular Pressurizer 50 mm**	4316	1
	Acetabular Pressurizer 57 mm	4317	1
	Acetabular Pressurizer 63 mm	4321	5
	Acetabular Pressurizer 71 mm	4322	1
	**Handle For Acetabular Pressurizer 4321, 4322**	4327	1
	Handle For Acetabular Pressurizer 4316, 4317	4318	1
	Angle Handle Acetabular Press, compatible with all acetabular pressurizers	4319	1

Ordering Information

Bone Bed Preparation

Quik-Use® Femoral Bone Prep Kits

Product	Description	Part Number	Units/box
	**Quik-Use Femoral Bone Cement Prep Kit**	00-5049-055-00	1
	Quik-Use Femoral Bone Cement Prep Kits	00-5049-055-10	10
	Femoral Bone Brushes	00-5059-013-00	10
	Ortho-Dri® Absorbent Packing	00-5059-080-00	5
	Quik-Use Curette	00-5049-053-00	10

Polyethylene Bone Plugs

Allen Bone Plugs

Product	Description	Part Number	Units/box
	**Allen Plug HDPE/BAS04 7C/12FL**	00-8011-020-12	1
	Allen Plug HDPE/BASO4 8C/16FL	00-8011-020-16	1
	Allen Plug HDPE/BASO4 10C/20FL	00-8011-020-20	1
	Allen Plug HDPE/BASO4 12C/24FL	00-8011-020-24	1
	Allen Plug HDPE/BASO4 14C/28FL	00-8011-020-28	1
	Allen Plug HDPE/BASO4,16C/32FL	00-8011-020-32	1
	**12 mm/16 mm Plugs with Disposable Inserter**	00-8011-010-01	1
	20 mm/24 mm Plugs with Disposable Inserter	00-8011-020-01	1
	28 mm/32 mm Plugs with Disposable Inserter	00-8011-030-01	1
	**Allen Plug Inserter Metal**	00-8011-210-00	1

Stühmer/Weber Bone Plugs

Product	Description	Part Number	Units/box
	**Stühmer/Weber Intramed Plug W/out Drain, Size 1**	0961	1
	Stühmer/Weber Intramed Plug w/out Drain, Size 2	3202	1
	Stühmer/Weber Intramed Plug w/out Drain, Size 2.5	3208	1
	Stühmer/Weber Intramed Plug w/out Drain, Size 3	3203	1
	Stühmer/Weber Intramed Plug w/out Drain,G Size 3.5	3209	1
	Stühmer/Weber Intramed Plug w/out Drain, Size 4	3204	1
	Stühmer/Weber Intramed Plug w/out Drain, Size 5	3205	1
	Stühmer/Weber Intramed Plug w/out Drain, Size 6	3206	1
	Stühmer/Weber Intramed Plug w/out Drain, Size 7	3207	1
	Stühmer/Weber Intramed Plug w/ Drain, Size 1	0981	1
	Stühmer/Weber Intramed Plug w/ Drain, Size 2	3222	1
	Stühmer/Weber Intramed Plug w/ Drain, Size 2.5	3228	1
	Stühmer/Weber Intramed Plug w/ Drain, Size 3	3223	1
	Stühmer/Weber Intramed Plug w/ Drain, Size 3.5	3229	1
	Stühmer/Weber Intramed Plug w/ Drain, Size 4	3224	1
	Stühmer/Weber Intramed Plug w/ Drain, Size 5	3225	1
	Stühmer/Weber Intramed Plug w/ Drain, Size 6	3226	1
	Stühmer/Weber Intramed Plug w/ Drain, Size 7	3227	1

Instrumentation

Product	Description	Part Number	Units/box
	Plug Inserter	5950	1
	Ø 7.1 mm Measuring Cone, Size 1.0	5951	1
	Ø 9.1 mm Measuring Cone, Size 2.0	5952	1
	Ø 9.8 mm Measuring Cone, Size 2.5	5958	1
	Ø 11.5 mm Measuring Cone, Size 3.0	5953	1
	Ø 12.7 mm Measuring Cone, Size 3.5	5959	1
	Ø 13.9 mm Measuring Cone, Size 4.0	5954	1
	Ø 16.4 mm Measuring Cone, Size 5.0	5955	1
	Ø 19 mm Measuring Cone, Size 6W	5961	1
	Ø 22 mm Measuring Cone, Size 7W	5962	1

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2. Malchau H, *et al.* The Swedish Total Hip Replacement Register. *The Journal of Bone and Joint Surgery.* 84A: 2-20, 2002.
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4. Swedish Hip Arthroplasty Register. Annual Report 1998.
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