



**Pressure
Sentinel®
Intramedullary
Reaming System**



Minimizes heat and guards against excessive pressure




zimmer | trauma
Confidence in your hands®

Pressure Sentinel Intramedullary Reaming System

As a surgeon, pressure and heat buildup have been your concern with reaming. Fortunately, the *Zimmer® Pressure Sentinel®* Intramedullary Reaming System was designed specifically to address potential local and systematic complications that can occur.

The sharp cutting edges minimize temperature buildup and the narrow shaft diameter provides more relief space for medullary contents. Additionally, deep flutes help reduce hydraulic pressure and minimize the potential for clogging and chippers help decrease the size of particulate debris.

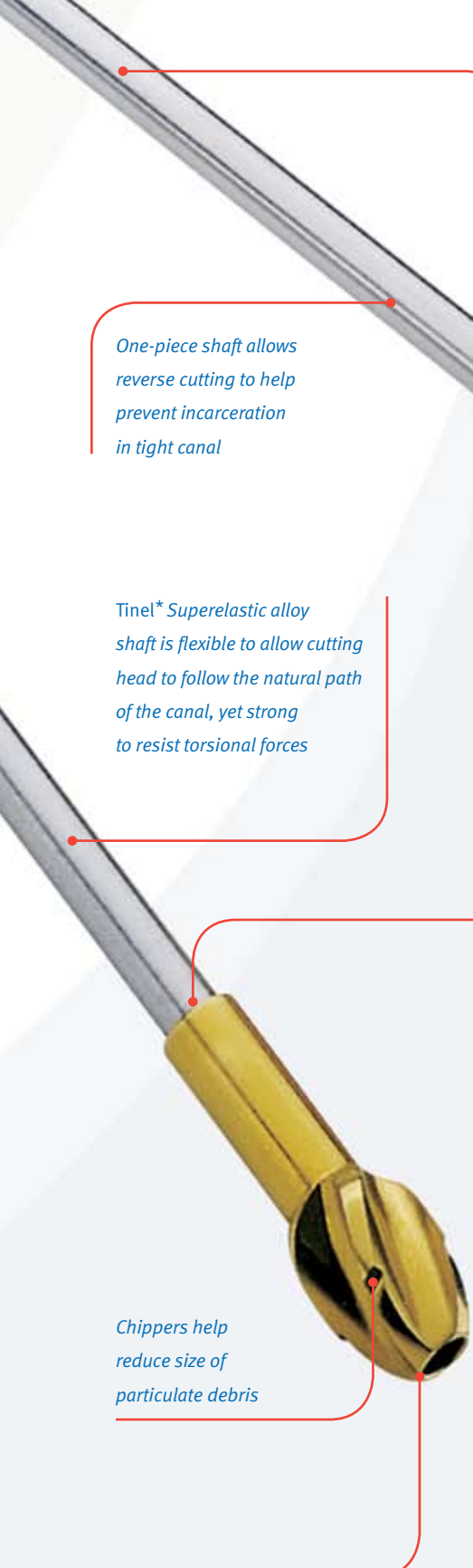


Large cannulation allows easy clearance of guide wire and an additional pressure release



Echocardiograms compare mobilization of medullary contents while reaming with the Pressure Sentinel Reamer (top) and a competitive reamer (bottom) in individual clinical situations





Now available in longer length shafts (minimum 58cm) to accommodate MIS nailing procedures

Narrow shaft diameter provides large relief space for medullary contents even in small diameter reamers

Ti-Nidium® Coating sustains edge sharpness longer

One-piece shaft allows reverse cutting to help prevent incarceration in tight canal

Tinel* Superelastic alloy shaft is flexible to allow cutting head to follow the natural path of the canal, yet strong to resist torsional forces

Rounded shape at back aids in removal

Deep flutes with high rake angle channel medullary contents past the reamer head to reduce hydraulic pressure and minimize the potential for clogging

Sharp cutting edges minimize temperature buildup during reaming

One-piece design eliminates multiple component assembly, simplifies cleaning, and facilitates complete sterilization

Chippers help reduce size of particulate debris

Tapered tip follows IM canal

Convenient, Organized Access

The *Pressure Sentinel* Reamer system is available in six sets – Full, Trauma, Basic Hip, Expanded Hip, *ZMR*® Hip, and Long *Pressure Sentinel* Reamer. The complete range of reamer sizes, in 0.5mm increments from 5mm to 27mm in diameter, is also available for individual purchase. Standard instrumentation with each set includes a T-Handle Extractor to aid in extraction of impacted reamers and an adapter for rapid coupling to power equipment with Jacob's style chucks.

Optional instrumentation for addition to the smaller sets includes a soak pan, a diameter gauge for quick verification of reamer size, and an additional adapter.



* Tinel® is a registered trademark of Raychem Corp.

Compared with competitive reamer designs, the Pressure Sentinel Reamer has a narrower shaft and deeper cutting flutes



The Science of Fluid Dynamics

The geometries of the *Pressure Sentinel* cutting head and shaft are based on the science of fluid dynamics.

The gap equation¹ predicts the change in intramedullary pressure during reaming. From this equation, it has been determined that less intramedullary pressure is created when the reamer head is short, minimizing contact area, and the cutting flutes are deep, maximizing fluid flow. Furthermore, the gap equation suggests that the shaft diameter should be small, so it will not restrict the flow of the medullary contents through the reamed canal.

Product Performance Patient Safety

Although the benefits of reaming are well known,² the passage of a reamer down the medullary canal produces pressure and heat that can cause local and systematic complications.^{3,4,5} Typically, in deciding whether to ream or not, surgeons have had to weigh the benefits against the potential complications.

Through applied research and extensive testing, the *Pressure Sentinel* Reamer was designed to maximize the efficiency of the cutting head, and facilitate the flow and dispersion of the medullary contents. The resulting intramedullary pressure levels are substantially below competitive reamer systems, and temperature levels are at or below competitive systems.⁶

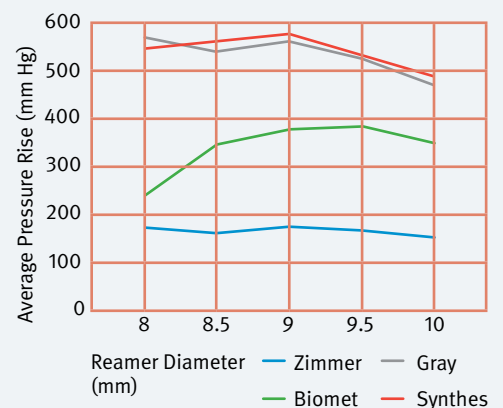
Low Pressure Design

Validation of this design was accomplished through extensive animal studies. They show lower pressure when using the *Pressure Sentinel* Reamer compared to those generated by using competitive reamers.⁶

The *Pressure Sentinel* Reamer features a short cutting head with deep flutes and sharp edges to cut quickly and efficiently through the medullary canal. In addition, the shape of the flutes is optimal for channeling the medullary contents past the reamer head and into the wide annulus made possible by the narrow shaft of the reamer.

So, with all the technology and innovation behind the *Pressure Sentinel* Reamer, the question is no longer “Should I ream?” But “How much should I ream?”

IM Canal Pressure During Reaming in a Canine Model⁶



Pressure Sentinel Intramedullary Reaming System

Order Information

Prod. No.	Description
00-2218-000-00	Long Pressure Sentinel Reamers Tray/Case/Lid Set
Includes the following instruments & case:	
00-2218-008-00	8.0mm Long Flexible PS Reamer
00-2218-008-05	8.5mm Long Flexible PS Reamer
00-2218-009-00	9.0mm Long Flexible PS Reamer
00-2218-009-05	9.5mm Long Flexible PS Reamer
00-2218-010-00	10.0mm Long Flexible PS Reamer
00-2218-010-05	10.5mm Long Flexible PS Reamer
00-2218-011-00	11.0mm Long Flexible PS Reamer
00-2218-011-05	11.5mm Long Flexible PS Reamer
00-2218-012-00	12.0mm Long Flexible PS Reamer
00-2218-012-05	12.5mm Long Flexible PS Reamer
00-2218-013-00	13.0mm Long Flexible PS Reamer
00-2218-013-05	13.5mm Long Flexible PS Reamer
00-2218-014-00	14.0mm Long Flexible PS Reamer
00-2218-014-05	14.5mm Long Flexible PS Reamer
00-2218-015-00	15.0mm Long Flexible PS Reamer
00-2218-015-05	15.5mm Long Flexible PS Reamer
00-2218-016-00	16.0mm Long Flexible PS Reamer
00-2218-016-05	16.5mm Long Flexible PS Reamer
00-2218-017-00	17.0mm Long Flexible PS Reamer
00-2218-017-05	17.5mm Long Flexible PS Reamer
00-2218-018-00	18.0mm Long Flexible PS Reamer
00-2228-030-00	T-Handle Extractor
00-2228-097-00	Diameter Gauge
00-5044-012-00	Adaptor 3 Jaw Chuck
00-2228-098-10	Soak Tray
00-2218-025-00	Long Cleaning Brush*
00-2218-030-00	Torque Limiter
00-2237-075-00	Long Reamer/ Instrument Case Assembly
00-2237-076-00	Long Reamer/ Instrument Case Base
00-2237-077-00	Long Reamer/ Instrument Case Lid
00-2237-078-00	Long Reamer/ Instrument Top Tray (8.0mm-13.5mm)
00-2237-079-00	Long Reamer/Instrument Middle Tray

* Non-sterile

Prod. No.	Description
00-2228-000-00	Pressure Sentinel Reamer Full Set (Standard Length)
Includes the following instruments & case:	
00-2228-005-00	5.0mm Flexible Reamer
00-2228-005-05	5.5mm Flexible Reamer
00-2228-006-00	6.0mm Flexible Reamer
00-2228-006-05	6.5mm Flexible Reamer
00-2228-007-00	7.0mm Flexible Reamer
00-2228-007-05	7.5mm Flexible Reamer
00-2228-008-00	8.0mm Flexible Reamer

00-2228-008-05	8.5mm Flexible Reamer
00-2228-009-00	9.0mm Flexible Reamer
00-2228-009-05	9.5mm Flexible Reamer
00-2228-010-00	10.0mm Flexible Reamer
00-2228-010-05	10.5mm Flexible Reamer
00-2228-011-00	11.0mm Flexible Reamer
00-2228-011-05	11.5mm Flexible Reamer
00-2228-012-00	12.0mm Flexible Reamer
00-2228-012-05	12.5mm Flexible Reamer
00-2228-013-00	13.0mm Flexible Reamer
00-2228-013-05	13.5mm Flexible Reamer
00-2228-014-00	14.0mm Flexible Reamer
00-2228-014-05	14.5mm Flexible Reamer
00-2228-015-00	15.0mm Flexible Reamer
00-2228-015-05	15.5mm Flexible Reamer
00-2228-016-00	16.0mm Flexible Reamer
00-2228-016-05	16.5mm Flexible Reamer
00-2228-017-00	17.0mm Flexible Reamer
00-2228-017-05	17.5mm Flexible Reamer
00-2228-018-00	18.0mm Flexible Reamer
00-2228-018-05	18.5mm Flexible Reamer
00-2228-019-00	19.0mm Flexible Reamer
00-2228-019-05	19.5mm Flexible Reamer
00-2228-020-00	20.0mm Flexible Reamer
00-2228-020-05	20.5mm Flexible Reamer
00-2228-021-00	21.0mm Flexible Reamer
00-2228-021-05	21.5mm Flexible Reamer
00-2228-022-00	22.0mm Flexible Reamer
00-2228-030-00	T-Handle Extractor
00-2228-097-00	Diameter Gauge
00-2228-098-00	Soak Tray
00-5044-012-00	1/4 in. Jacob's Chuck to Zimmer Adapter, Qty=2
00-2228-090-00	Sterilization Case

Optional Reamer Sizes (Standard Length)

Prod. No.	Description
00-2228-022-05	22.5mm Flexible Reamer
00-2228-023-00	23.0mm Flexible Reamer
00-2228-023-05	23.5mm Flexible Reamer
00-2228-024-01	24.0mm Flexible Reamer
00-2228-024-05	24.5mm Flexible Reamer
00-2228-025-01	25.0mm Flexible Reamer
00-2228-025-05	25.5mm Flexible Reamer
00-2228-026-01	26.0mm Flexible Reamer
00-2228-026-05	26.5mm Flexible Reamer
00-2228-027-01	27.0mm Flexible Reamer

Pressure Sentinel Reamer Sets

Prod. No.	Description
00-2228-000-01	Pressure Sentinel Reamer Trauma Set Includes the following instruments & case
	5.0mm, 6.0mm, 7.0mm & 8.00mm-17.5mm Flexible Reamers in 0.5mm increments (1ea.)
00-2228-030-00	T-Handle Extractor
00-5044-012-00	1/4 in. Jacob's Chuck to Zimmer Adapter, Qty=2
00-2228-090-00	Sterilization Case

Prod. No.	Description
00-2228-000-02	Pressure Sentinel Reamer Hip Set Includes the following instruments & case:
	8.0mm-18.0mm Flexible Reamers in 1.0mm increments (1ea.)
00-2228-030-00	T-Handle Extractor
00-5044-012-00	1/4 in. Jacob's Chuck to Zimmer Adapter, Qty=1
00-2228-090-00	Sterilization Case

Prod. No.	Description
00-2228-000-03	Pressure Sentinel Reamer Expanded Hip Set Includes the following instruments & case:
	8.0mm-18.0mm Flexible Reamers in 0.5mm increments (1ea.)
00-2228-030-00	T-Handle Extractor
00-5044-012-00	1/4 in. Jacob's Chuck to Zimmer Adapter, Qty=1
00-2228-090-00	Sterilization case

Prod. No.	Description
00-2228-90-00	Sterilization Case Includes the following components:
00-2228-091-00	Base
00-2228-092-00	18.0mm to 22.0mm Reamer Tray
00-2228-093-00	12.0mm to 17.5mm Reamer Tray
00-2228-094-00	5.0mm to 11.5mm Reamer Tray
00-2228-096-00	Case Lid

00-9975-011-00 Pressure Sentinel Reamer ZMR Hip Set
Includes the following components:

8.0mm-27.0mm Flexible reamers in 0.5mm increments (1ea.)	
00-9965-081-10	ZMR Flexible Reamer Diameter Gauge
00-9975-099-00	Case Lid
00-2228-040-00	ZMR Flexible Reamer Metal Case
*Set includes case and contents without the 00-9975-099-00 Case Lid. The Case Lid must be ordered separately.	

Optional Instruments

Prod. No.	Description
00-2255-008-00	Guide Wire 2.4mm, Ball-tipped, 70cm box (required for 5.0mm-7.5mm Pressure Sentinel Reamers)
47-2255-008-01	Guide Wire 3.0mm, Ball-tipped, 100cm Sterile/box (required for 8.0mm and larger Pressure Sentinel Reamers)
00-2255-008-01	Guide Wire 3.0mm, Ball-tipped, 100cm Non-Sterile/box (required for 8.0mm and larger Pressure Sentinel Reamers)

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2. Fairbank, AC, Thomas D, Cunningham B, Curtis M, Jinnah H. Stability of reamed and unreamed intramedullary tibial nails: a biomechanical study. *Injury*. 1995;26;7:483-485.
3. Pape NC, Dwenger A, Grotz M, Kaefer V, Negatsch R, Kleemann W, Regel G, Sturm JA, Tscherne H. Does the reamer type influence the degree of lung dysfunction after femoral nailing following severe trauma? An animal study. *J Orthop Trauma*. 1994;8;4:300-309.
4. Manning JB, Bach AB, Herman CM, Carrico J. Fat release after femur nailing in the dog. *J Trauma*. 1983;23:322.
5. Matthews LS, Hirsch C. Temperatures measured in human cortical bone when drilling. *J Bone Joint Surg*. 1972;54A:297-308.
6. Agnew SG, Stewart CL, Skinner R, Winquist RA, Kyle R. Design influences on pressure and temperature generation from intramedullary reamers; invitro and invivo models. Presented at the Orthopaedic Trauma Association Annual Meeting; September 30, 1995; Tampa, FL.

Contact your Zimmer representative or visit us at www.zimmer.com

