Smith+Nephew

CATALYSTEM◊

Primary Hip System

Surgical Technique

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Description

The CATALYSTEM◊ design is based on the heritage of clinically successful stems and is designed with enabling technology in mind.[1,2] CATALYSTEM is suitable for for all surgical approaches to the hip, featuring approach specific instrumentation based on the surgeon's preference.[3] CATALYSTEM is designed to deliver predictable and reproducible stem seating through utilization of ACCUBROACH◊ technology, demonstrated by proven reproducibility between broach and implant.[4]

Preoperative planning

The goal of preoperative planning is to determine the correct stem size, level of femoral neck cut, and proper head and stem offset combination.

Preoperative planning includes, but is not limited to:

- X-rays (AP of the pelvis and lateral of the affected hip)
- Templates for the acetabular component and the stem

Nota Bene

The following technique guide is intended for informational and educational purposes only. It is not intended to serve as medical advice. It is the responsibility of treating physicians to determine and utilize the appropriate products and techniques, according to their own clinical judgment, for each of their patients. For more information on any product referenced herein, including indications for use, contraindications, effects, precautions and warnings, please consult the product's Instructions for Use (IFU) prior to use.

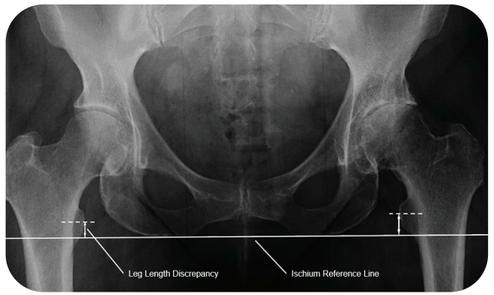


Figure 1

Determining leg length discrepancy

The height and angle of the neck resection determine the optimal leg length and offset.

Leg length discrepancy can be estimated by using the AP radiograph in addition to clinical assessment (Figure 1). Draw a reference line across the bottom of the ischium or use other landmarks like the teardrop or obturator foramen. Measure the difference between the chosen landmark and the greater or lesser trochanter. If leg lengthening is required, mark the required distance superior to the center of rotation which will be your new target while templating the femoral stem.

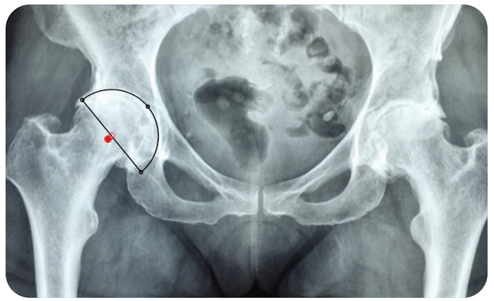


Figure 2

Determining acetabular cup size and position

Utilising A/P radiographs of the hip and R3◊ Acetabular cup templates, determine acetabular sizing and positioning. Ensure that the size fills between the tear drop and the superior rim, and the cup is centered in the acetabulum to determine the reaming required for restoration of the cups center of rotation. Once determined, mark the planned center of rotation (Figure 2).

For further guidance, refer to 15630 R3 Surgical Technique.

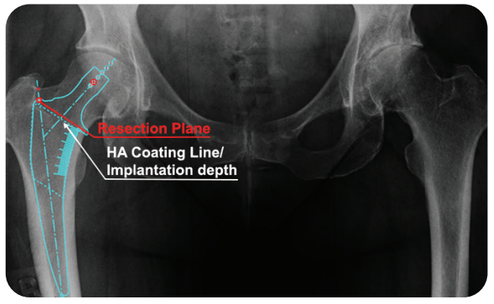


Figure 3

Selecting Femoral Stem

Standardized AP and lateral X-rays are recommended to ensure accurate planning. The femur must be positioned in neutral rotation to produce orientation that matches the templates. An adequate length of the femoral diaphysis should be included in the X-rays. The correct stem size is determined by laying the stem template over the X-ray and selecting the optimum fit of the stem by aiming for medial and lateral contact to the inner cortex. For the CATALYSTEM system, it is important to template for proximal fixation, not distal fixation. The CATALYSTEM is available in standard and high offset variants. Determine whilst templating (and trialing) the appropriate stem option and neck length to restore offset and centre of rotation corresponding to the cup placement. The level of resection is shown by the template (Figure 3).

Tips:

- While templating is an important part of the pre-operative planning, final decisions regarding sizing and fitting should be done intra-operatively to ensure proper leg length along with hip stability.
- Standing X-rays are recommended.
- A/P and lateral X-rays are recommended to evaluate stem size.
- To ensure the correct position of the final implants, consider any pelvic tilt.

Position of the patient and approach

For the purpose of this description a direct anterior approach is chosen. Surgery is performed with the patient in a supine position.

Whether an anterior, lateral, or posterior approach is used is at the surgeon's discretion. The skin incision and muscle interval detachment depend on the selected approach.

Femoral neck osteotomy

Having a fitting neck resection is essential for successful placing of the femoral stem. Laterally, the osteotomy commences at the trochanteric fossa (perpendicular to the neck axis), while medially it ends approximately a finger breadth above the lesser trochanter. The height of neck resection may be modified in the presence of abnormal anatomy as determined by preoperative templating and intraoperative measurements. The osteotomy can be performed before or after dislocation of the femoral head. The acetabulum is replaced in a routine manner, conventionally or with the aid of technology such as computer navigation and robotic assistance.

Tip:

- Following neck resection, if you consider a cemented stem is more suitable to the patient, please refer to 38638 POLARSTEM◊ Cementless and Cemented Stem System Surgical Technique for further information.

Figure 4

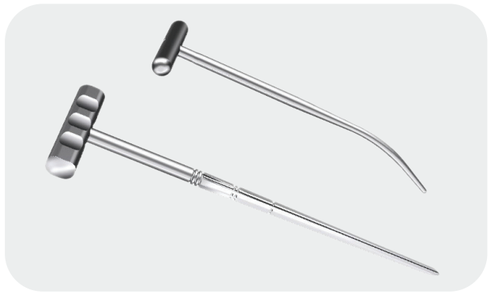


Figure 5

Figure 6

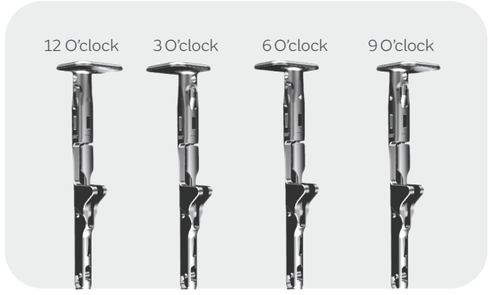


Figure 7

Preparation of the femoral canal

Use the modular box osteotome by attaching it to the preferred broach handle and strike plate. Access the canal laterally and posteriorly to establish a favorable stem orientation and establish version (Figure 4).

Utilize the appropriate canal finder for initial entry into the femoral canal (Figure 5).

Tips:

- Ensure to stay lateral with the box osteotome and the canal finder.
- Care should be taken to ensure that the initial reaming tract into the femur is in neutral alignment with the femoral axis.
- To decrease the risk of under sizing or a varus placement of the stem, remove the lateral cortical bone at the piriformis fossa.
- A lateralizing rasp can be attached to the preferred broach handle to assure proper lateral positioning for the femoral broach.

Broach assembly/disassembly

CATALYSTEM offers multiple broach handle options to accommodate the surgeon's surgical approach (Figure 6).

Place the desired broach handle into the broach strike plate. The strike plate can be positioned in the 12:00, 3:00, 6:00 or 9:00 o'clock position (Figure 7) to enable ease of impaction.

Unlock the broach handle by pulling the locking handle away from the body of the broach handle. Insert the post of the broach into the broach handle and re-lock the handle to secure the broach (Figure 8). Disassemble the broach from the broach handle by lifting the lever to release the handle from the broach post.

Figure 8

Figure 9

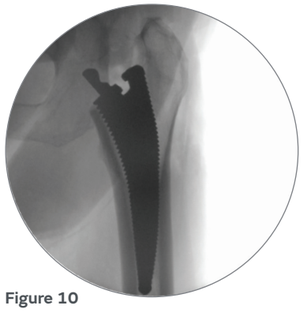


Figure 10

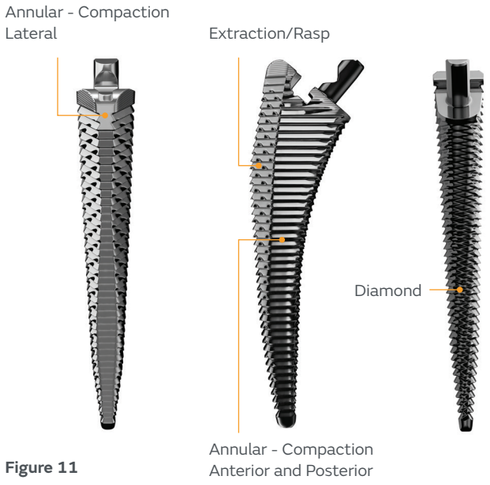


Figure 11

Femoral broaching

Initiate broaching with the starter broach, driving it until the first teeth are fully countersunk.

Sequential broaching should then be carried out, hugging the medial curve of the femur and maintaining version. Continue broaching until the broach has axial and rotational stability (Figure 9).

Tips:

- An audible pitch change should be noted when final broach is reached.
- Avoid under sizing from varus positioning by hugging the medial curve whilst broaching.
- The resection level of the stem is aligned with the top of the broach
- CATALYSTEM® has a distal lateral relief which allows for ideal proximal implant fit but makes the distal tip asymmetric. An example of a correctly seated broach (AP X-ray) is shown in Figure 10 as guidance.
- CATALYSTEM ACCUBROACH® technology features 3 types of teeth to optimize cutting efficiency and rotational stability.

  Annular Compaction: Compact bone in AP direction
  Extraction: Clears bone laterally
  Diamond: Cut bone medially and maintain rotational stability (Figure 11)

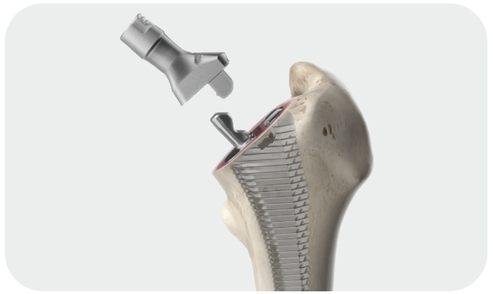


Figure 12

Figure 13

Trial reduction

Place the standard or high offset trial neck (as determined by templating) onto the broach post (Figure 12).

Select the trial femoral head of desired diameter and neck length and place onto the trial neck.

Reduce the hip, evaluate hip stability and re-measure leg length. Compare to previous measurements recorded from preoperative templating or leg length before dislocation. If required, adjustments in length and/or offset can be made at this time. For sizes 0-6, offset increases 6mm when changing from standard to high offset. For sizes 7-12, offset increases 8mm when changing from standard to high offset.

Tips:

- The trial necks do not include a collar to allow trialing to take place prior to calcar reaming.
- The trail necks accommodate multiple broaches (Sizes 0-6 & 7-12). The trial neck has a positive stop to provide tactile feedback that the neck is seated on the broach. To confirm seating, the trial neck will not detach unless the lever on the neck is depressed.

Calcar preparation

With the final broach fully seated, remove the broach handle. Attach the calcar reamer to the power tool and place over the post of the broach. Machine the femoral neck, ensuring axial alignment to avoid fracture (Figure 13).

Tips:

- Start the power before the reamer contacts the femur. While using continuous power, approach the broach slowly until it contacts the broach face and the bone is removed.
- If the calcar planer is not fully engaging with the broach face, remove the broach and either use a larger broach size or do a new neck resection at a lower level.
- When using the collared stem, ream the calcar down to the level of the final broach to ensure contact between the collar and the calcar
- There are two diameters of calcar planer available for suitable reaming to be achieved. It is recommended to use the small calcar reamer for stem sizes 0-6 and large calcar reamer for stem sizes 7-12.

Figure 14

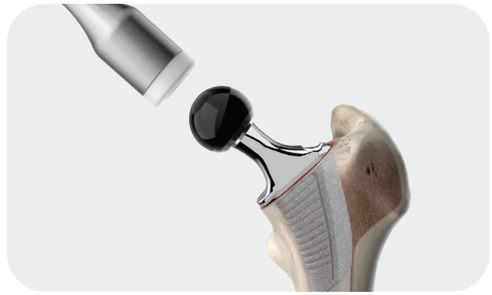


Figure 15

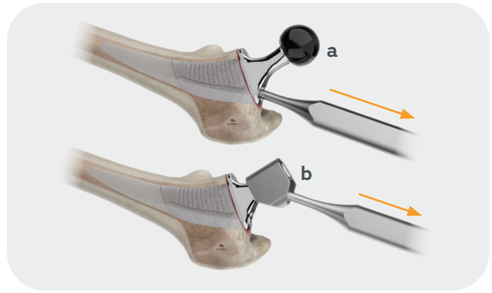


Figure 16a-b

Stem insertion

Insert the selected femoral stem into the canal by hand until you feel resistance. Attach the bullet tipped inserter to the strike plate. Apply hand pressure and rotate the stem into the correct position. Impact the stem into the femoral canal, following the central axis of the femur, until the coating or collar reaches the level of the calcar. The implant is considered fully seated when the coating or collar rests firmly against the calcar. Avoid applying excessive force while seating the stem, as this could risk femoral fracture.

Tips:

- Do not use excessive force to seat the stem.
- If the implant has stopped moving and is not completely seated, remove the stem, and repeat the same size broaching steps.
- An offset inserter can be available on request (71313136).

Final trial reduction

A final trial reduction may be performed using trial femoral heads.

Femoral head assembly

Clean and dry the neck taper with a clean, sterile cloth. Place the femoral head on the neck taper and firmly impact with the femoral head impactor and a mallet several times (Figure 15).

Relocate the femoral head into the acetabular cup.

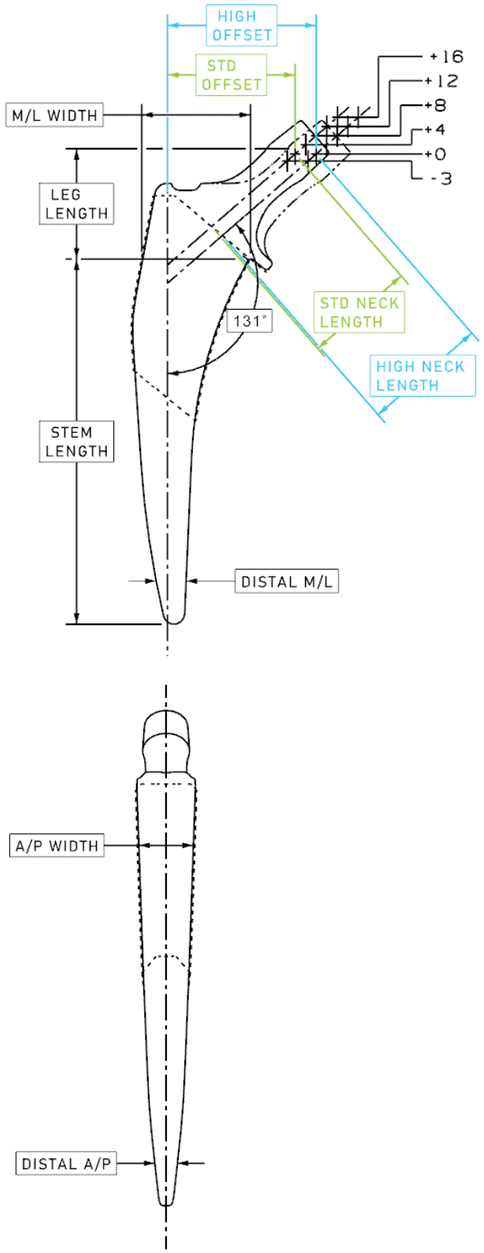
Stem extraction

If required, CATALYSTEM◊ can be explanted using the extraction screw M6 (75002165) in the threaded hole of the stem (Figure 16a).

If this is not possible, the user can also utilise the extractor block (75004678) (Figure 16b).

If the extractor block is used for extraction, the stem should be discarded as it may cause damage to the taper.

Technical Specifications



Stem Body Dimensions

Size	Length	ML @ Resection	ML Distal*	AP @ Resection	AP Distal*
0	93	25	7	13	7
1	95	25	8	14	7
2	97	26	8	14	7
3	99	27	9	15	8
4	101	28	10	16	9
5	103	29	11	17	9
6	105	31	12	18	10
7	107	32	12	19	10
8	109	33	13	20	11
9	111	35	14	21	11
10	113	36	15	22	11
11	115	37	16	23	12
12	117	39	17	23	12

* Taken from the centre point of the AP distal taper

Stem Neck Dimensions

Standard	Offset							Neck length							Leg length						
	-4	-3	0	+4	+8	+12	+16	-4	-3	0	+4	+8	+12	+16	-4	-3	0	+4	+8	+12	+16
0	28	29	32	35	38	41	44	24	25	28	32	26	40	43	24	24	26	29	31	34	37
1	28	29	32	35	38	41	44	24	25	28	32	36	40	44	24	24	26	29	31	34	37
2	29	30	33	36	39	42	45	25	26	29	33	37	41	45	24	25	27	29	32	35	37
3	30	31	33	37	40	43	46	26	27	30	34	38	42	46	25	26	28	30	33	35	38
4	31	32	34	38	41	44	47	26	27	30	34	38	42	46	26	26	28	31	33	36	39
5	32	33	35	39	42	45	48	27	28	31	35	39	43	47	26	27	29	31	34	37	39
6	33	34	36	40	43	46	49	27	28	31	35	39	43	47	27	28	29	32	35	37	40
7	35	36	38	41	44	47	50	28	29	32	36	40	44	48	27	28	30	33	35	38	41
8	36	37	39	42	45	48	51	29	30	33	37	41	45	49	28	29	31	33	36	39	41
9	37	38	41	44	47	50	53	30	31	34	38	42	46	50	29	29	31	34	37	39	42
10	39	40	42	45	48	51	54	31	32	35	39	43	47	51	29	30	32	35	37	40	43
11	40	41	43	46	49	52	55	32	33	36	40	44	48	52	30	31	33	35	38	41	43
12	41	42	44	47	50	53	56	32	33	36	40	44	48	52	31	32	34	36	39	41	44
High	**Offset**							**Neck length**							**Leg length**						
	-4	-3	0	+4	+8	+12	+16	-4	-3	0	+4	+8	+12	+16	-4	-3	0	+4	+8	+12	+16
0	34	35	38	41	44	47	50	28	29	32	36	40	44	47	24	24	26	29	31	34	37
1	34	35	38	41	44	47	50	28	29	32	36	40	44	48	24	24	26	29	31	34	37
2	35	36	39	42	45	48	51	29	30	33	37	41	45	49	24	25	27	29	32	35	37
3	36	37	40	43	46	49	52	30	31	34	38	42	46	50	25	26	28	30	33	35	38
4	37	38	40	44	47	50	53	30	31	34	38	42	46	50	26	26	28	31	33	36	39
5	38	39	41	45	48	51	54	31	32	35	39	43	47	51	26	27	29	31	34	37	39
6	39	40	42	46	49	52	55	31	32	35	39	43	47	51	27	28	29	32	35	37	40
7	43	44	46	49	52	55	58	33	34	37	41	45	49	53	27	28	30	33	35	38	41
8	44	45	47	50	53	56	59	34	35	38	42	46	50	54	28	29	31	33	36	39	41
9	45	46	49	52	55	58	61	35	36	39	43	47	51	55	29	29	31	34	37	39	42
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11	48	49	51	54	57	60	63	37	38	41	45	49	53	57	30	31	33	35	38	41	43
12	49	50	52	56	59	62	65	38	39	42	46	50	54	58	31	32	34	36	39	41	44

Catalog information

Collared Stem

Catalog #	Description
71314020	CATALYSTEM Collared Standard Offset Size 0
71314021	CATALYSTEM Collared Standard Offset Size 1
71314022	CATALYSTEM Collared Standard Offset Size 2
71314023	CATALYSTEM Collared Standard Offset Size 3
71314024	CATALYSTEM Collared Standard Offset Size 4
71314025	CATALYSTEM Collared Standard Offset Size 5
71314026	CATALYSTEM Collared Standard Offset Size 6
71314027	CATALYSTEM Collared Standard Offset Size 7
71314028	CATALYSTEM Collared Standard Offset Size 8
71314029	CATALYSTEM Collared Standard Offset Size 9
71314030	CATALYSTEM Collared Standard Offset Size 10
71314031	CATALYSTEM Collared Standard Offset Size 11
71314032	CATALYSTEM Collared Standard Offset Size 12
71314040	CATALYSTEM Collared High Offset Size 0
71314041	CATALYSTEM Collared High Offset Size 1
71314042	CATALYSTEM Collared High Offset Size 2
71314043	CATALYSTEM Collared High Offset Size 3
71314044	CATALYSTEM Collared High Offset Size 4
71314045	CATALYSTEM Collared High Offset Size 5
71314046	CATALYSTEM Collared High Offset Size 6
71314047	CATALYSTEM Collared High Offset Size 7
71314048	CATALYSTEM Collared High Offset Size 8
71314049	CATALYSTEM Collared High Offset Size 9
71314050	CATALYSTEM Collared High Offset Size 10
71314051	CATALYSTEM Collared High Offset Size 11
71314052	CATALYSTEM Collared High Offset Size 12

Collarless Stem

Catalog #	Description
71314060	CATALYSTEM® Collarless Standard Offset Size 0
71314061	CATALYSTEM Collarless Standard Offset Size 1
71314062	CATALYSTEM Collarless Standard Offset Size 2
71314063	CATALYSTEM Collarless Standard Offset Size 3
71314064	CATALYSTEM Collarless Standard Offset Size 4
71314065	CATALYSTEM Collarless Standard Offset Size 5
71314066	CATALYSTEM Collarless Standard Offset Size 6
71314067	CATALYSTEM Collarless Standard Offset Size 7
71314068	CATALYSTEM Collarless Standard Offset Size 8
71314069	CATALYSTEM Collarless Standard Offset Size 9
71314070	CATALYSTEM Collarless Standard Offset Size 10
71314071	CATALYSTEM Collarless Standard Offset Size 11
71314072	CATALYSTEM Collarless Standard Offset Size 12
71314080	CATALYSTEM Collarless High Offset Size 0
71314081	CATALYSTEM Collarless High Offset Size 1
71314082	CATALYSTEM Collarless High Offset Size 2
71314083	CATALYSTEM Collarless High Offset Size 3
71314084	CATALYSTEM Collarless High Offset Size 4
71314085	CATALYSTEM Collarless High Offset Size 5
71314086	CATALYSTEM Collarless High Offset Size 6
71314087	CATALYSTEM Collarless High Offset Size 7
71314088	CATALYSTEM Collarless High Offset Size 8
71314089	CATALYSTEM Collarless High Offset Size 9
71314090	CATALYSTEM Collarless High Offset Size 10
71314091	CATALYSTEM Collarless High Offset Size 11
71314092	CATALYSTEM Collarless High Offset Size 12

Catalog information *continued*

Femoral Heads

OXINIUM® Femoral Heads 12/14 Taper

Neck length	22mm	26mm	28mm	32mm	36mm
-3	—	—	71342803	71343203	71343603
+0	71342200	71342600	71342800	71343200	71343600
+4	71342204	71342604	71342804	71343204	71343604
+8	71342208	71342608	71342808	71343208	71343608
+12	71322212	71342612	71342812	71343212	71343612
+16	—	—	71342816	71343216	—

OXINIUM Modular Femoral Heads

Neck length	40mm		44mm
	71342340		71342344

Please refer to page 13, which shows the available trial heads in the CATALYSTEM Core instrument tray.

CoCr Femoral Heads 12/14 Taper – Cobalt Chromium – ASTM F 799

Neck length	22mm	26mm	28mm	32mm	36mm
-3	—	—	71302803	71303203	71303603
+0	71302200	71302600	71302800	71303200	71303600
+4	71302204	71302604	71302804	71303204	71303604
+8	71302208	71302608	71302808	71303208	71303608
+12	71302212	71302612	71302812	71303212	—
+16	—	—	71302816	71303216	—

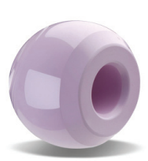
CoCr Modular Femoral Heads – Colbalt Chromium – ASTM F 799

Neck length	40mm	44mm
	71346340	71342644

Titanium Modular 12/14 Taper Sleeve*

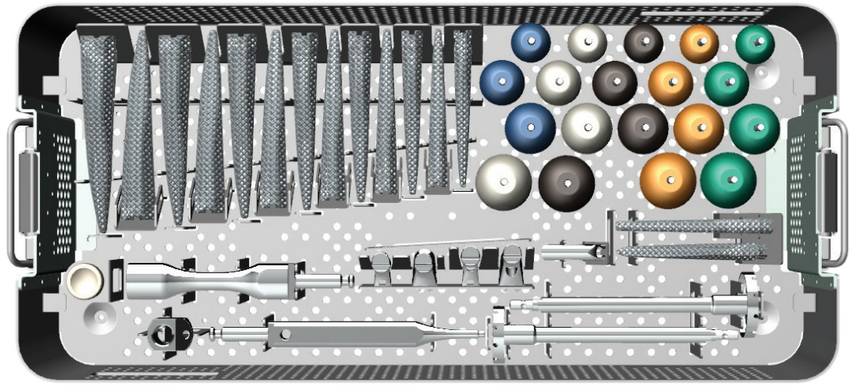
Neck length	
-4	71344245
+0	71344247
+4	71344248
+8	71344249

*Use with 40mm and 44mm OXINIUM and CoCr Modular Femoral Heads



BIOLOX® delta Ceramic Femoral Heads 12/14 Taper

Neck length	32mm	36mm	40mm
S/+0	76539160	76539165	71346004
M/+4	76539161	76539166	71346005
L/+8	76539162	76539167	71346006



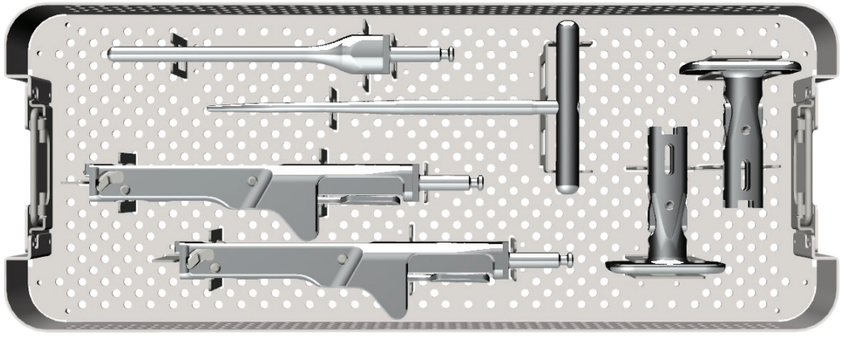
The CATALYSTEM® instruments are housed within a one tray system: a base layer of core instruments and a top layer which includes the relevant broach handles to cater to the surgical approach.

CATALYSTEM Core Instrument Tray

Catalog #	Description
71313151	CATALYSTEM Core Instrument Tray
71314199	CATALYSTEM Starter Broach
71314200	CATALYSTEM Broach Size 0
71314201	CATALYSTEM Broach Size 1
71314202	CATALYSTEM Broach Size 2
71314203	CATALYSTEM Broach Size 3
71314204	CATALYSTEM Broach Size 4
71314205	CATALYSTEM Broach Size 5
71314206	CATALYSTEM Broach Size 6
71314207	CATALYSTEM Broach Size 7
71314208	CATALYSTEM Broach Size 8
71314209	CATALYSTEM Broach Size 9
71314210	CATALYSTEM Broach Size 10
71314211	CATALYSTEM Broach Size 11
71314212	CATALYSTEM Broach Size 12
71313130	CATALYSTEM Trial Neck Size 0-6 Standard Offset
71313131	CATALYSTEM Trial Neck Size 7-12 Standard Offset
71313132	CATALYSTEM Trial Neck Size 0-6 High Offset
71313133	CATALYSTEM Trial Neck Size 7-12 High Offset
71313137	Calcar Planer Small
71313138	Calcar Planer Large
71365719	Modular Box Osteotome
71365723	Lateralizing Rasp
71369708	MI Trial FEM Head 28 -3

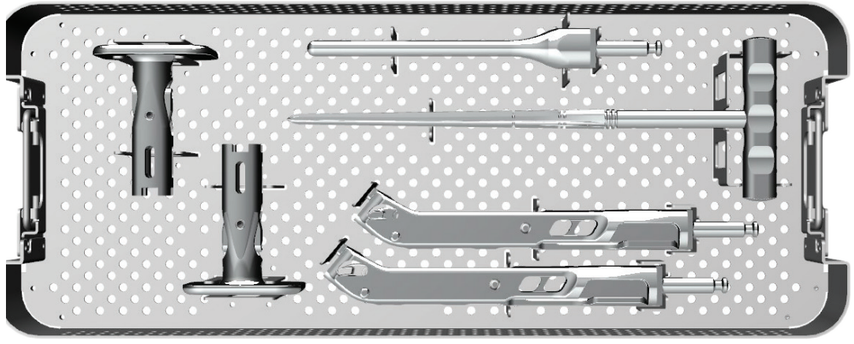
Catalog #	Description
71369709	MI Trial Fem Head 28 +0
71369710	MI Trial Fem Head 28 +4
71369711	MI Trial Fem Head 28 +8
71369712	MI Trial Fem Head 28 +12
71369714	MI Trial Fem Head 32 -3
71369715	MI Trial Fem Head 32 +0
71369716	MI Trial Fem Head 32 +4
71369717	MI Trial Fem Head 32 +8
71369718	MI Trial Fem Head 32 +12
71369720	MI Trial Fem Head 36 -3
71369721	MI Trial Fem Head 36 +0
71369722	MI Trial Fem Head 36 +4
71369723	MI Trial Fem Head 36 +8
71369724	MI Trial Fem Head 36 +12
71313139	Modular Head Impactor
71313141	Impactor Tip
71353355	Generic Full Tray Lid
71366516	Femoral Head Trial 12/14 40 -4
71366517	Femoral Head Trial 12/14 40 +0
71366518	Femoral Head Trial 12/14 40 +4
71366519	Femoral Head Trial 12/14 40 +8
75002165	Extractor Screw M6
75004678	Extractor Block

Catalog information *continued*



CATALYSTEM DA Broach Handle Tray

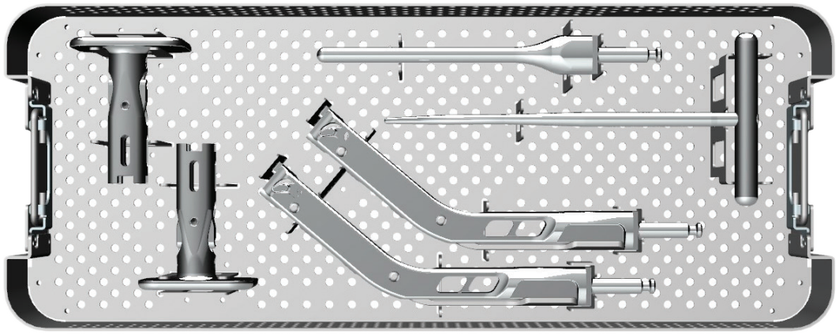
Catalog #	Description	Qty.
71313152	CATALYSTEM DA Instrument Tray	1
71313142	DA Broach Handle	2
71365722	Broach Handle Strike Plate	2
71313135	Bullet Tipped Inserter	1
71313143	Canal Finder	1



CATALYSTEM◊ Straight Broach Handle Tray

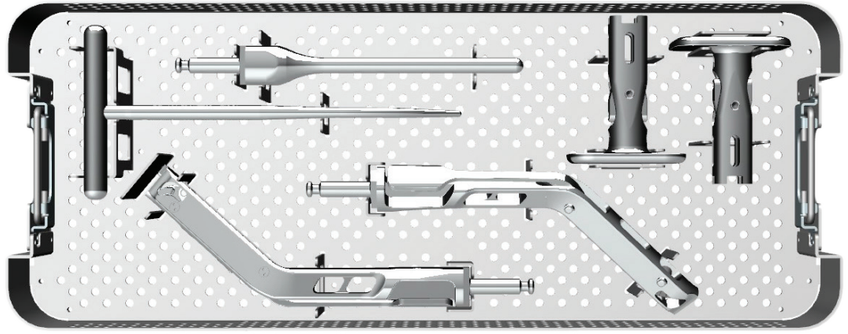
Catalog #	Description	Qty.
71313153	CATALYSTEM Straight Tray	1
71365727	Straight Broach Handle	2
71365722	Broach Handle Strike Plate	2
71313135	Bullet Tipped Inserter	1
119657	Blunt Medullary Reamer	1

Catalog information *continued*



CATALYSTEM Single Offset Broach Handle Tray

Catalog #	Description	Qty.
71313155	CATALYSTEM Single Offset Tray	1
71365728	Single Offset Broach Handle	2
71365722	Broach Handle Strike Plate	2
71313135	Bullet Tipped Inserter	1
71313143	Canal Finder	1



CATALYSTEM◊ Double Offset Broach Handle Tray

Catalog #	Description	Qty.
71313154	CATALYSTEM Dual Offset Tray	1
71365731	Dual Offset Broach Handle Left	1
71365729	Dual Offset Broach Handle Right	1
71313135	Bullet Tipped Inserter	1
71365722	Broach Handle Strike Plate	2
71313143	Canal Finder	1

Additional items on request	
71313136	CATALYSTEM Offset Inserter
71365731	Dual Offset Broach Handle Left
71365729	Dual Offset Broach Handle Right

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41911 V3 71381912 REVC 03/25

References
1. Smith+Nephew 2024. CATALYSTEM Comparison to legacy stem: Synergy. Internal Report. 10143364 REVA. **2.** Smith+Nephew 2024. CATALYSTEM Comparison to legacy stem: POLARSTEM. Internal Report. 10143423 REVA. **3.** Smith+Nephew 2024. Surgeon Feedback on the CATALYSTEM Total Hip System. Internal Report. CSD.REC.24.001. **4.** Smith+Nephew 2023. Orthopaedic Research Report OR-23-106.