



Surgical technique

Hip prosthesis

Linea Anatomic



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TORNIER 
SURGICAL IMPLANTS

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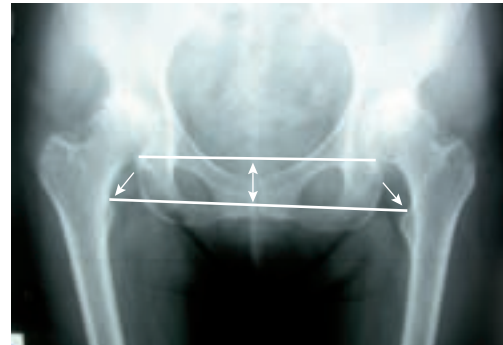
MAIN STAGES

1. THE 4 MAIN STAGES OF PREOPERATIVE PLANNING

Evaluate, anticipate, allows **selection** of the appropriate implants and preparation of the operation.

● 1. Assess the pathological hip

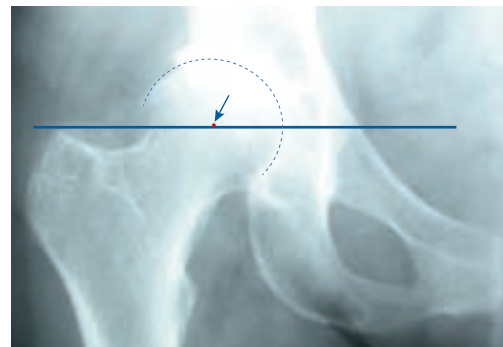
Measure the difference in length, drawing a line connecting the teardrops and a line connecting the upper or lower edges of the lesser trochanters. **(1)**



(1)

Mark the center of the arthritic femoral head and check its location in relation to the greater trochanter (coxa valga, coxa vara) stem. **(2)**

At this stage, this assessment should lead the surgeon's choice toward the 135 or 125 (coxa vara) stem.



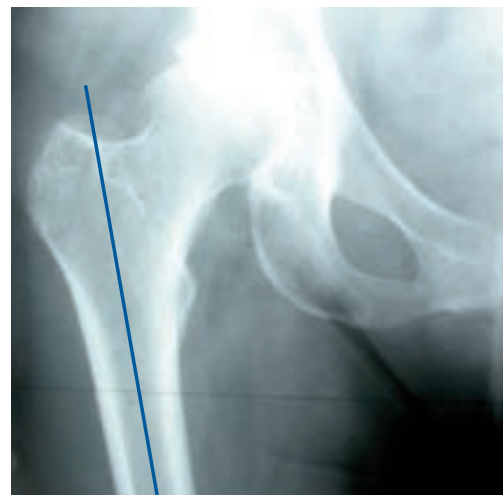
(2)

Draw the diaphyseal axis to identify any conflict with the summit of the greater trochanter (risk of stem varus rotation). **(3)**

Assess the quality of the bone support (Singh):

- evaluate epiphyseal trabeculae
- evaluate the morphology of the cortexes (cortical index, flare index); this information is valuable in assessing bone support quality
- the lateral x-ray of the pathological hip provides information on anteversion of the femur neck as well as the femur's bi-curved shape.

The first preoperative stage allows the surgeon to screen for possibly problematic hips based on both the hip's particularities and its bone support.



(3)

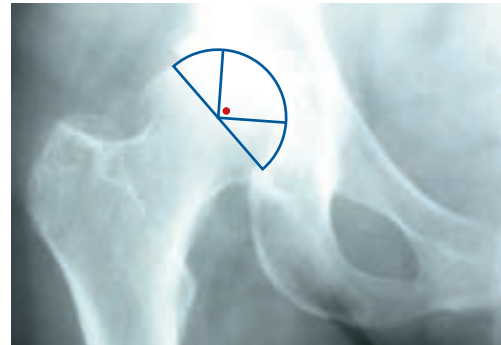
MAIN STAGES

1. THE 4 MAIN STAGES OF PREOPERATIVE PLANNING

● 2. Reconstruct the acetabulum

Choose the size of the acetabulum by positioning its medial edge against the teardrop, inclining it from 40° to 45° .

Mark the center of the acetabulum, which becomes the new center of rotation for the hip. Moderate subchondral bone reaming is preferred, to spare the bone stock. **(4)**



(4)

● 3. Choose the femoral implant

Position the implant on the diaphyseal axis while maintaining its lateral support in the trochanteric fossa. The diaphyseal stem should be adjusted to the isthmus, while remaining very slightly away from the cortical bones. During this stage, the need for complementary femur reaming can be detected (in case of narrow femoral isthmus). **(5)**

Choosing the size and position

of the femoral component is a crucial step in the planning stage. Using the perforations on the templates, the positioned implant determines where the neck should be cut in relation to the upper edge of the lesser trochanter. **(6)**

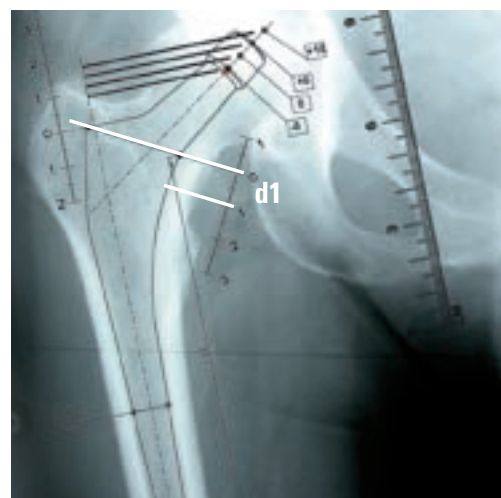
Distance d1 is a vital operative landmark.

At this stage the length and lateralization corrections can be adjusted:

- the vertical projection from the center of the head, parallel to the diaphyseal axis, provides the best assessment of lateralization **(5)**
- a lengthening effect can occur as a result of femur neck valgus. If this effect is limited, equalization can be obtained by placing the implant in the lowest position possible (distal reaming can be necessary). If there is a large gap, a 125 stem can be chosen at this stage.



(5)



(6)

MAIN STAGES

1. THE 4 MAIN STAGES OF PREOPERATIVE PLANNING

● 4. Adjust the reconstruction

Choose the most suitable neck length (short, medium, long) depending on the length correction and lateralization desired. (7)



(7)

Assess the situation of the new center of rotation in relation to the summit of the greater trochanter.

This distance d2 is another vital operative landmark. (8)

Transfer the drawing of the implants and the femur neck onto the pathological hip:

- superimpose the center of the acetabulum and draw the contours of the iliac bone
- superimpose the level of the femur neck cut and draw the contours of the femur.



(8)

SURGICAL TECHNIQUE

2. THE IMPORTANT TECHNICAL POINTS

Linea Anatomic

● 1. Approach

Using the same instrumentation and following the same sequence, the surgeon chooses **how the prosthesis will be anchored** (cemented or cementless).

The Linea Anatomic prosthesis can be implanted using all approaches, according to the surgeon's experience and preference.

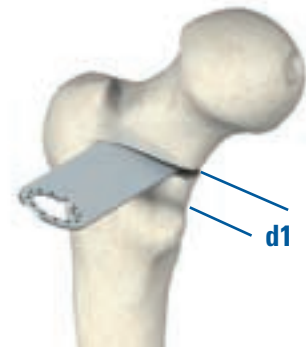
● 2. Femoral neck cut

The **femur neck** is cut with the oscillating saw (stop externally at the trochanteric fossa) **(9)**, guided by the preoperative landmark.

Prepare the summit of the greater trochanter with the chisel or the gouge forceps to provide centered access to the medullary canal. **(10)**



(9)



(10)



SURGICAL TECHNIQUE

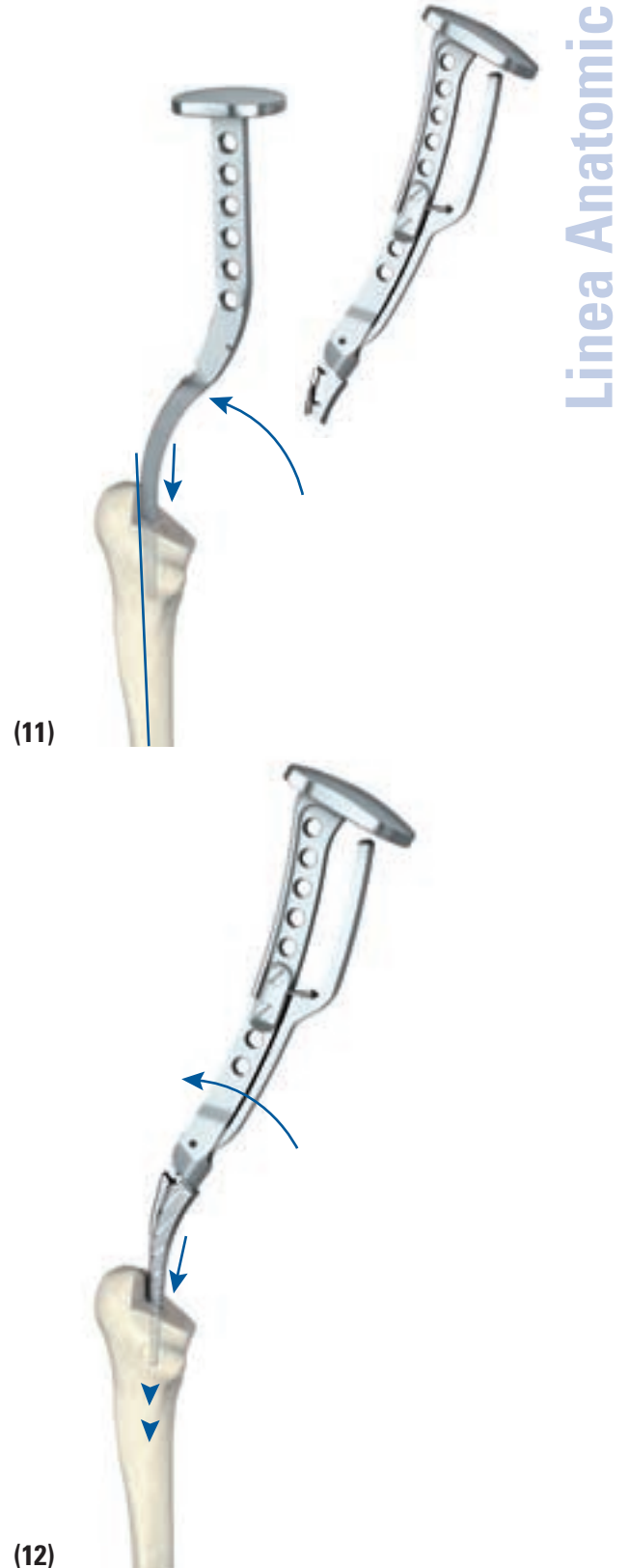
2. THE IMPORTANT TECHNICAL POINTS

● 3. Femur preparation

The medullary canal is opened with a first thin rasp or a punch. **(11)**

The **rasping** always begins with the smallest rasp. At this point, a handle mounted on one of the holes of the rasp holder can be used for anteversion assessment.

Each rasp is progressively incremented: with each strike of the hammer, the instrument moves further down. The surgeon guides the rasp in valgus with no rotational movement. **(12)**



SURGICAL TECHNIQUE

2. THE IMPORTANT TECHNICAL POINTS

The proximal teeth of the rasp should be flush with the cut, the lateral ridge of the instrument in the trochanteric fossa. **(13)**

The medullary canal should be carefully cleaned after each rasp is introduced.

The preoperative planning gives a precise indication of the size of the trial rasp.

A triangle of cancellous material is often preserved in the metaphysis.

Filling should be optimal and not maximal. Support comes both from cortical bone and dense cancellous bone. **(14)**

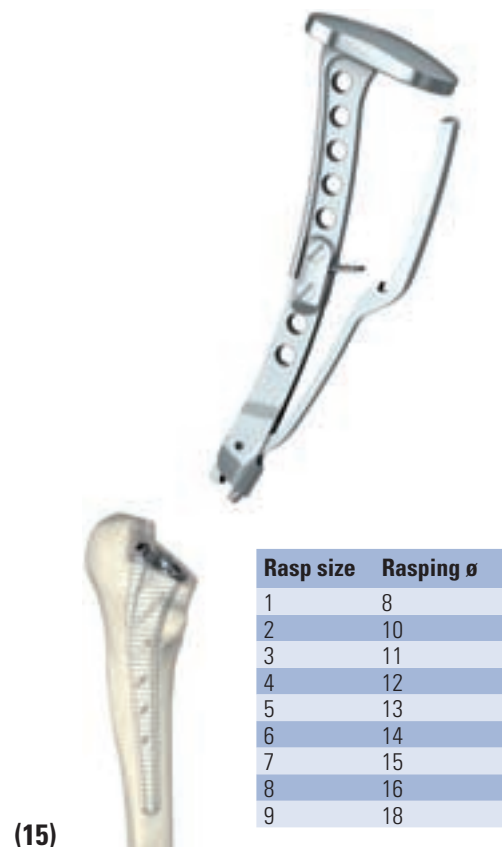
Generally, the planned rasp is positioned easily. One must not force on the rasps because these movements can create micro-fractures that are often invisible but that may induce complications.

Reaming is seldom required necessary during this medullary canal preparation, but it can be planned when templating in case of thick cortexes. It may be indispensable during preparation if the rasp is blocked at the planned cut: do not force if this occurs. Therefore, cautious reaming is called for, using rigid reamers. The reaming diameter, slightly larger than the last rasp, provides the implant with the necessary diaphyseal under-fit (**see reaming table**).

The metaphysis should not be oversized and the rasp should not be worked in varus. Obvious blocking despite reaming at the proper diameter requires an intraoperative x-ray for verification, with the rasp in place.

The intraoperative x-ray is an effective means of verification if doubt persists.

The surgeon should **perform stability tests** on the rasp. The last trial rasp remains in place. The rasp holder is removed. The surgeon can work on the acetabulum without the rasp interfering. **(15)**



SURGICAL TECHNIQUE

2. THE IMPORTANT TECHNICAL POINTS

● 4. Neck length selection

A tip adapted to the femur neck is mounted on the rasp to test the neck length. The tips are different colors depending on the size of the rasp (4 colors for 4 neck lengths). **(16)**

At this stage, the surgeon confirms the choice of the standard or lateralized version by testing with both tips.

Reduction tests should be performed with the trial implants (knee flexed at 90° and hip completely extended).

The height of the center of the head in relation to the summit of the greater trochanter can be measured and compared to the measurement taken during the preoperative planning stage:

- the height measurement instrument is positioned in the orifice designed for this purpose on the tip **(17)**
- The height of the center of the head corresponds to a medium femur neck.

After these tests and measurements, the rasp handle is remounted on the rasp in place so that it can be extracted.



(16)



(17)

SURGICAL TECHNIQUE

2. THE IMPORTANT TECHNICAL POINTS

● 5. Final implantation

The size of the final implant corresponds to the size of the last rasp.

The stem must be inserted carefully into the medullary canal without forcing it, until the HAP disappears under the neck cut.

The prosthesis is implanted in one of two ways:

- either manually on the first few centimeters, then with the impactor positioned in the notch located on the back of the implant **(18)**
- or directly using the holder-impactor screwed to the threaded hole on the back of the implant.

The surgeon takes new length measurements as necessary.

With cemented prostheses,

an obturator is inserted into the medullary canal which is then carefully cleaned by lavage, pulsed, and then dried. Cementing is done by retrograde filling for homogeneous sealing.

The same precautions should be taken for inserting the implant. One should be careful of varus during sealing and it is important to seal the implant while respecting the same anteversion as during the tests with the rasp.

This technique guarantees even cement distribution throughout.

After careful cleaning and drying of the prosthesis taper, the final head is put in place, using the clamp for this purpose, and impacted. **(19)**

The metallic head is impacted with a femoral head impactor.

The ceramic head is put in place with a rotational movement, then impacted in the neck's axis with a head impactor.



(18)

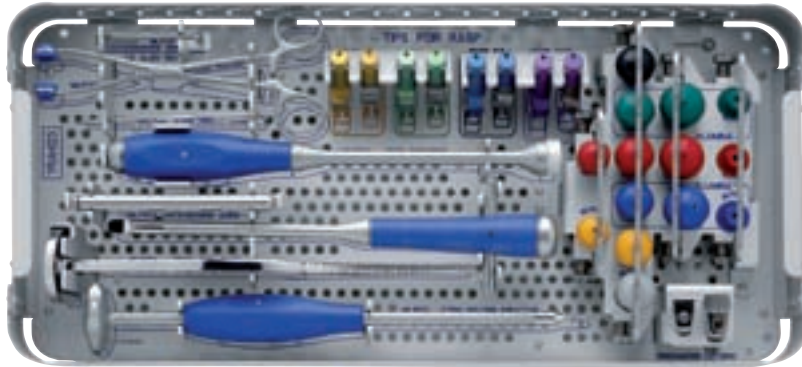


(19)

INSTRUMENTATION

3. LINEA STEM INSTRUMENTATION

1. YKAH123 kit, common box



Linea Anatomic

Stem impactor
MLP500



Stem holder / impactor
MLP501



Head impactor
MLP302



Head holder
MLP305



Anteversión guide
MLP502



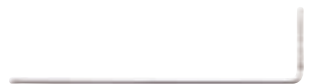
3.5-mm allen wrench
MLP311



First thin rasp
MLP312



Height gauge
MLP332



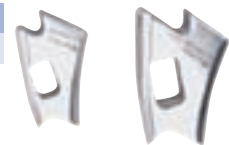
Trial head



Ø 22.2 metal	+0	MLP542
	+5	MLP543
Ø 28 metal	-5	MLP561
	+0	MLP562
	+5	MLP563
	+10	MLP564
Ø 28 ceramics	-3.5	MLP566
	+0	MLP562
	+3.5	MLP567
Ø 32 ceramics	-4	MLP576
	+0	MLP572
	+4	MLP578
Ø 36 ceramics	-4	MLP580
	+0	MLP581
	+4	MLP582

Chisel for large trochanter

small	MLP503
large	MLP504



Tip 125

For rasps 1-2	MLP515
For rasps 3-4	MLP516
For rasps 5-6	MLP517
For rasps 7-8-9	MLP518



Tip 135

For rasps 1-2	MLP510
For rasps 3-4	MLP511
For rasps 5-6	MLP512
For rasps 7-8-9	MLP513



INSTRUMENTATION

3. LINEA STEM INSTRUMENTATION

Linea Anatomic

2. YKAH124 kit, posterior approach



Trial rasp

n°1 right	MLP521	n°1 left	MLP531
n°2 right	MLP522	n°2 left	MLP532
n°3 right	MLP523	n°3 left	MLP533
n°4 right	MLP524	n°4 left	MLP534
n°5 right	MLP525	n°5 left	MLP535
n°6 right	MLP526	n°6 left	MLP536
n°7 right	MLP527	n°7 left	MLP537
n°8 right	MLP528	n°8 left	MLP538
n°9 right *	MLP529	n°9 left *	MLP539

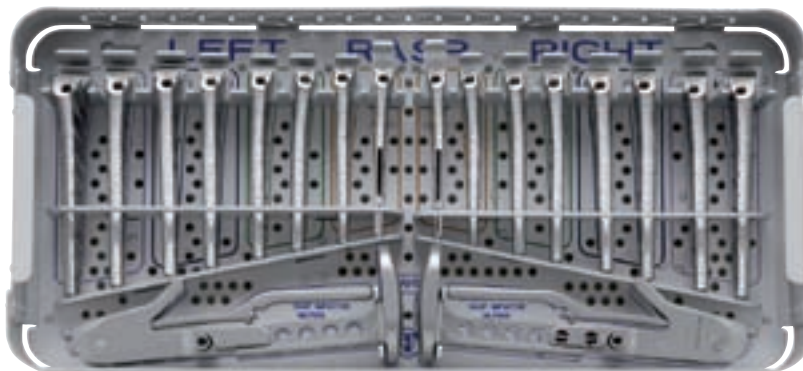
* Option to specify. Available on request and delivered separately.

Rasp holder/impactor

MLP505 (x 2)



3. YKAH125 kit, anterior approach



Trial rasp

n°1 right	MLP521	n°1 left	MLP531
n°2 right	MLP522	n°2 left	MLP532
n°3 right	MLP523	n°3 left	MLP533
n°4 right	MLP524	n°4 left	MLP534
n°5 right	MLP525	n°5 left	MLP535
n°6 right	MLP526	n°6 left	MLP536
n°7 right	MLP527	n°7 left	MLP537
n°8 right	MLP528	n°8 left	MLP538
n°9 right *	MLP529	n°9 left *	MLP539

* Option to specify. Available on request and delivered separately.

Rasp holder/impactor

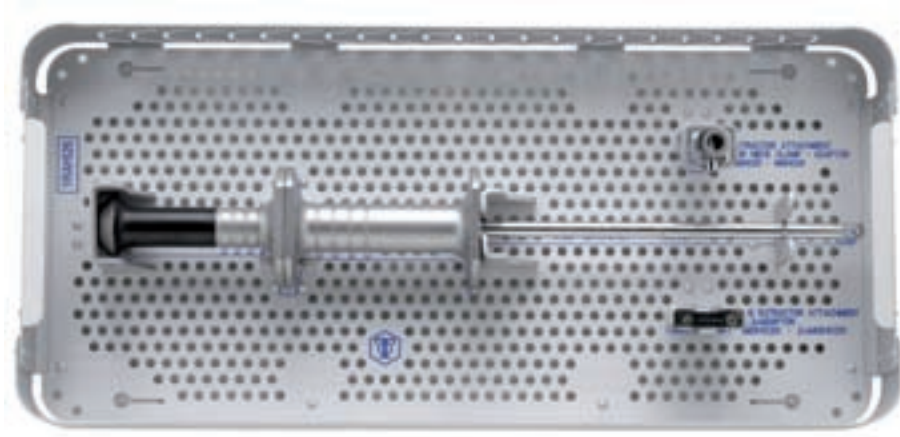
MLP506 (x 2)



INSTRUMENTATION

3. LINEA STEM INSTRUMENTATION

● 4. YKAH105 kit, extraction kit



Linea Anatomic

Stem extractor

MGH024



Extractor adaptor: on taper

MGH025



Assembly axis of extractor adaptor x 3

MGH028

(2 mounted on MGH025
and 1 mounted on MGH026)



Extractor adaptor: on M6

MGH026



REFERENCES

135 cementless

Right side		Left side	
Reference	Size	Reference	Size
HLI571	N°1	HLI581	N°1
HLI572	N°2	HLI582	N°2
HLI573	N°3	HLI583	N°3
HLI574	N°4	HLI584	N°4
HLI575	N°5	HLI585	N°5
HLI576	N°6	HLI586	N°6
HLI577	N°7	HLI587	N°7
HLI578	N°8	HLI588	N°8
HLI579	N°9 (on request)	HLI589	N°9 (on request)



125 cementless

Right side		Left side	
Reference	Size	Reference	Size
HLI551	N°1	HLI561	N°1
HLI552	N°2	HLI562	N°2
HLI553	N°3	HLI563	N°3
HLI554	N°4	HLI564	N°4
HLI555	N°5	HLI565	N°5
HLI556	N°6	HLI566	N°6
HLI557	N°7	HLI567	N°7
HLI558	N°8	HLI568	N°8
HLI559	N°9 (on request)	HLI569	N°9 (on request)



135 cemented

Right side		Left side	
Reference	Size	Reference	Size
HLI531	N°1	HLI541	N°1
HLI532	N°2	HLI542	N°2
HLI533	N°3	HLI543	N°3
HLI534	N°4	HLI544	N°4
HLI535	N°5	HLI545	N°5
HLI536	N°6	HLI546	N°6
HLI537	N°7	HLI547	N°7
HLI538	N°8	HLI548	N°8
HLI539	N°9 (on request)	HLI549	N°9 (on request)



HEADS

		Short		Medium		Long		Extra-long	
COCR metal	22.2	-		0	HZC232	+5	HZC233	-	
	28	-5	HZC281	0	HZC282	+5	HZC283	+10	HZC284
	32	-5	HZC321	0	HZC322	+5	HZC323		
Alumina	28	-3.5	HZL081	0	HZL082	+3.5	HZL083	-	
	32	-4	HZL091	0	HZL092	+4	HZL093	-	
	36	-4	HZL094	0	HZL095	+4	HZL096	-	
BioloX Delta ceramics	28	-3.5	HZL020	0	HZL021	+3.5	HZL022	-	
	32	-4	HZL023	0	HZL024	+4	HZL025	-	
	36	-4	HZL026	0	HZL027	+4	HZL028	-	

