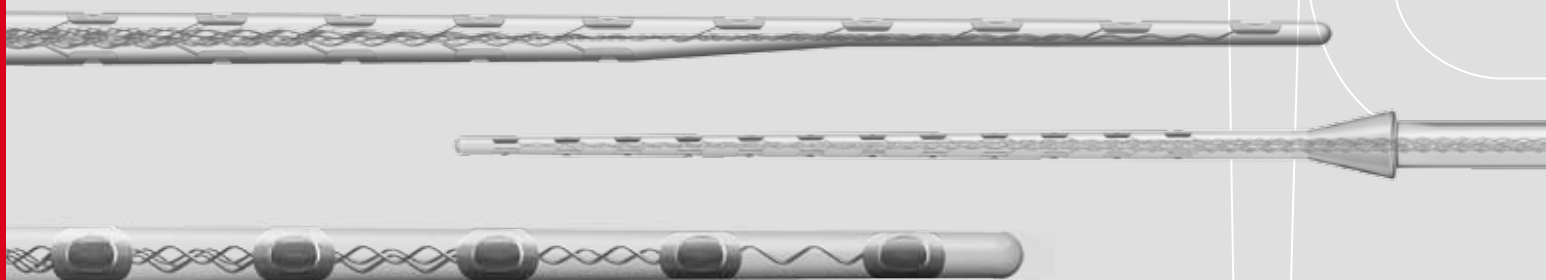


# Electrode Arrays

Designed for Atraumatic Implantation  
Providing Superior Hearing Performance



# Electrode Arrays

## Designed for Atraumatic Implantation Providing Superior Hearing Performance<sup>1,2,3,4</sup>

MED-EL is the leader in providing soft, flexible electrode arrays which ensure maximum protection of the delicate structures in the cochlea. Preserving residual hearing enables users to benefit from future technologies and therapies.

### Wave-Shaped Wires

The electrode arrays feature ultraflexible wave-shaped platinum-iridium wires. Wave-shaped wires significantly reduce rigidity in comparison to a straight-wire design. This unique design is the key to making a MED-EL electrode array the world's most flexible and atraumatic.

### Optimal Number of Contacts

MED-EL's electrode design philosophy dictates a careful balance between the maximum number of electrode contacts and minimised channel interaction. Channel interaction negatively impacts performance. Each electrode array contains the optimal number of contacts for stimulation of nerve fibres leading to best performance. Optimal number and spacing of electrode contacts also significantly reduce rigidity; allowing for gentle insertion without damaging the delicate cochlear structures.

### FLEX Series

The FLEX series feature unique FLEX-Tip Technology with single contacts at the leading end, ultra-flexible wave-shaped wires, and a tapered tip for increased mechanical flexibility.

### FORM Series

The FORM series are the first electrode arrays designed specifically for malformed cochleae. Each FORM array features the SEAL designed for better control of cerebrospinal fluid (CSF) leakage.

### CLASSIC Series

CLASSIC Series were the first MED-EL electrode arrays to feature wave-shaped wires. They reflect MED-EL's commitment to creating soft, flexible electrodes for over 20 years. Each CLASSIC array also features double electrode contacts throughout as well as optimal number of contacts.

### ABI Array

The ABI electrode array features 12 active contacts on a soft pre-shaped silicone paddle, with shaping arms fixed to a polyester mesh.

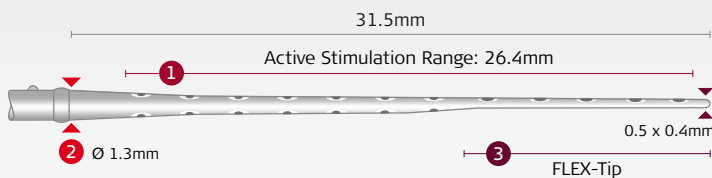
*"... thin and flexible free-fitting electrodes demonstrated to best fulfill all criteria for atraumatic CI surgery."<sup>5</sup>*

# FLEX Series

MED-EL's softest and most flexible electrode arrays designed for the majority of patients and optimised for Structure Preservation and the preservation of residual hearing.

## FLEXSOFT™

A 31.5mm electrode array featuring FLEX-Tip technology for increased mechanical flexibility and enabling CCC.

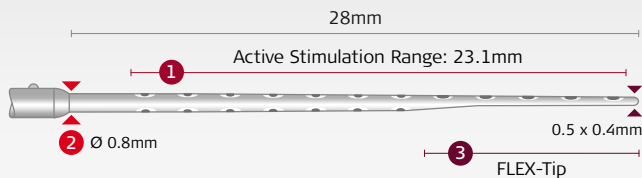


- 1 19 platinum electrode contacts  
Optimal spacing over a 26.4mm stimulation range
- 2 Diameter at basal end: 1.3mm
- 3 FLEX-Tip for minimal insertion trauma  
Dimensions at apical end: 0.5 x 0.4mm



## FLEX28™

A 28mm electrode array suitable for 96% of normal cochlear anatomies<sup>6,7</sup> featuring FLEX-Tip technology. Optimised for insertion into the apical region (CCC).

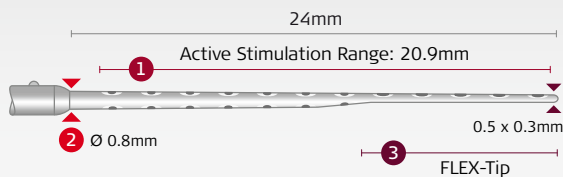


- 1 19 platinum electrode contacts  
Optimal spacing over a 23.1mm stimulation range
- 2 Diameter at basal end: 0.8mm
- 3 FLEX-Tip for minimal insertion trauma  
Dimensions at apical end: 0.5 x 0.4mm



## FLEX24™

A 24mm electrode array featuring FLEX-Tip technology and designed for combined Electric Acoustic Stimulation (EAS) with insertion less than 1.5 turns. FLEX24 is formerly known as the FLEXEAS.

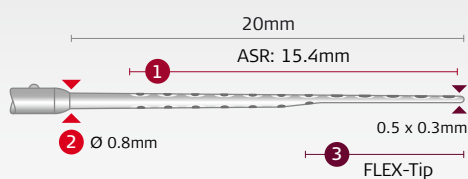


- 1 19 platinum electrode contacts  
Optimal spacing over a 20.9mm stimulation range
- 2 Diameter at basal end: 0.8mm
- 3 FLEX-Tip for minimal insertion trauma  
Dimensions at apical end: 0.5 x 0.3mm



## FLEX20

A 20mm electrode array featuring FLEX-Tip technology and designed to be used in cases of partial deafness or for other specific needs or surgical preferences. FLEX20 is under development.



- 1 19 platinum electrode contacts  
Optimal spacing over a 15.4mm stimulation range
- 2 Diameter at basal end: 0.8mm
- 3 FLEX-Tip for minimal insertion trauma  
Dimensions at apical end: 0.5 x 0.3mm



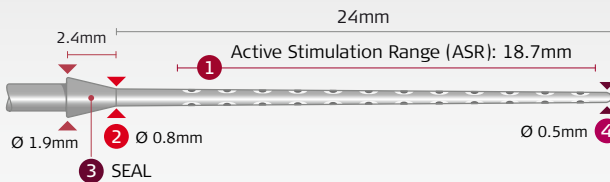
# FORM Series



Designed specifically for malformed cochleae and for instances where leakage of cerebrospinal fluid (CSF) is expected. Each FORM array features an integrated SEAL designed to close off the cochlear opening making it easier for surgeons to apply additional tissue for sealing the area once the electrode array has been inserted.

## FORM24™

A 24mm electrode array featuring a SEAL designed for open (no obliteration or ossification) or malformed cochleae. Also for cases where CSF leakage is expected.

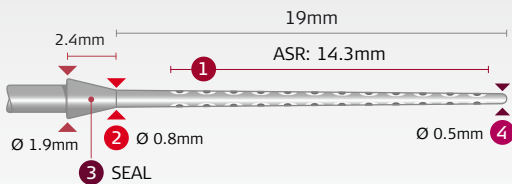


- 1 24 platinum electrode contacts  
Optimal spacing over a 18.7mm stimulation range
- 2 Diameter at basal end: 0.8mm
- 3 SEAL
- 4 Diameter at apical end: 0.5mm



## FORM19™

A 19mm electrode array featuring a SEAL designed to be used in cochleae with malformation, obliteration, or ossification. Also for cases where CSF leakage is expected.



- 1 24 platinum electrode contacts  
Optimal spacing over a 14.3mm stimulation range
- 2 Diameter at basal end: 0.8mm
- 3 SEAL
- 4 Diameter at apical end: 0.5mm

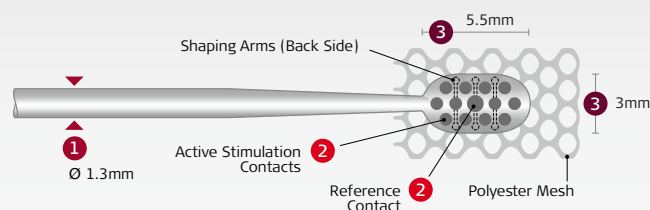


# Auditory Brainstem Implant (ABI)

ABI is a solution for individuals with hearing loss due to a non-functioning auditory nerve (Neurofibromatosis Type II). The MED-EL ABI stimulates the cochlear nucleus (CN) and provides users with a variety of hearing sensations to assist with sound awareness and communication.

## ABI Array

The ABI electrode array features 12 active contacts on a soft pre-shaped silicone paddle, with shaping arms fixed to a polyester mesh.



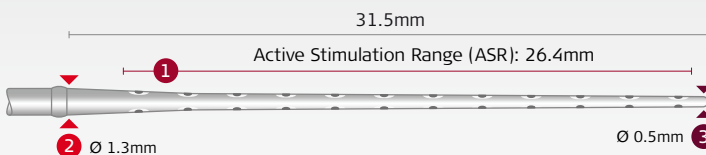
- 1 Diameter at basal end: 1.3mm
- 2 12 x 0.55mm active stimulation contacts  
1 x 0.75mm reference contact
- 3 Paddle size: 5.5mm x 3mm

# CLASSIC Series

For over 20 years, MED-EL has been the leader in providing a variety of soft, flexible electrode arrays. CLASSIC series were the first MED-EL's arrays designed with unique wave-shaped wires. Each CLASSIC array also features double electrode contacts throughout as well as optimal contact spacing.

## STANDARD

A 31.5mm electrode array designed for long cochlear duct lengths.

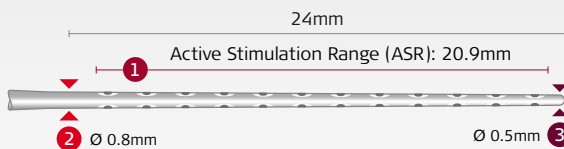


- 1 24 platinum electrode contacts  
Optimal spacing over a 26.4mm stimulation range
- 2 Diameter at basal end: 1.3mm
- 3 Diameter at apical end: 0.5mm



## MEDIUM

A 24mm electrode array designed for cases where deep insertion is not desired or is not possible due to anatomic restrictions.



- 1 24 platinum electrode contacts  
Optimal spacing over a 20.9mm stimulation range
- 2 Diameter at basal end: 0.8mm
- 3 Diameter at apical end: 0.5mm



## COMPRESSED

A 15mm electrode array designed for partial ossification or malformation of the cochlea.



- 1 24 platinum electrode contacts  
Optimal spacing over a 12.1mm stimulation range
- 2 Diameter at basal end: 0.7mm
- 3 Diameter at apical end: 0.5mm



1. Speech Perception with Cochlear Implants as Measured Using a Roving-Level Adaptive Test Method, Haumann S; Lenarz T; Buchner A, ORL J Otorhinolaryngol Relat Spec, 72(6), 2010 Sep 15, p. 312-318
2. Partial Deafness Cochlear Implantation at the University of Kansas: Techniques and Outcomes, Prentiss S; Sykes K; Staecker H, J Am Acad Audiol, 21(3), 2010 Mar, p. 197-203
3. Achievement of Hearing Preservation in the Presence of an Electrode Covering the Residual Hearing Region, Usami S; Moteki H; Suzuki N; Fukuoka H; Miyagawa M; Nishio SY; Takumi Y; Iwasaki S; Jolly C, Acta Otolaryngol, 2011 Jan 5
4. Atraumatic Round Window Deep Insertion of Cochlear electrodes, Skarzynski H; Lorens A; Zgoda M; Piotrowska A; Skarzynski, PH; Szkielkowska A, Acta Otolaryngol, 2011 Apr 15
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6. The Length of the Organ of Corti in Man, Hardy M, American Journal of Anatomy, 62(2), 1938, p. 179-311
7. Depth of Electrode Insertion and Postoperative Performance in Humans with Cochlear Implants: A Histopathologic Study, Lee J; Nadol JB; Eddington DK, Audiol Neurootol, 15(5), 2010 Mar 4, p. 323-331
8. Cochlear implantation in inner ear malformations, Sennaroglu L (2010), Cochlear Implants Int. 2010 Mar;11(1):4-41. doi: 10.1002/cii.416. Epub 2009 Apr 8.
9. Benefits of electrical stimulation over two cochlea turns in postlingually deafened CI users – a prospective long-term study. Poster session presented at the Conference on Implantable Auditory Prostheses, Tahoe City, CA., Haumann S, Buechner A, Joseph G, Lenarz T (2009).

# World's Largest Selection of Electrodes for a Variety of Cochlear Duct Lengths (CDLs)

Cochleae may differ significantly in size and shape from one another as can individual cochlear duct lengths.<sup>6,7</sup> MED-EL offers the largest selection of electrode arrays. Each implant recipient can be sure to receive the best possible electrode array for their unique cochlear anatomy.

## Selecting the Right Electrode Array for Each CDL

The graphs at right may assist in selecting the appropriate electrode array.

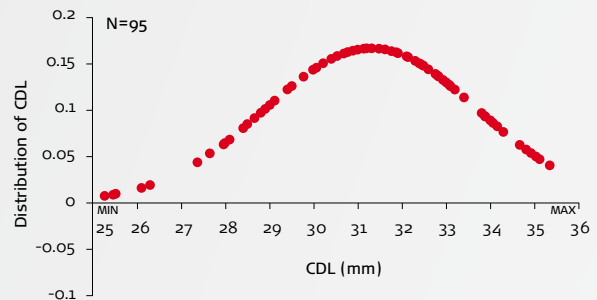
To choose the appropriate electrode array with the assistance of radiological imaging, the diameter of the basilar turn is used. This value, labeled "A", is measured from the Round Window to the opposite lateral wall, using the modiolus as the centre point (see Figure 1).

The "A" value may then be used for pre-operative assessment of the appropriate electrode variant by using the graphs at right (See Figure 2). Please use the appropriate graph depending on whether a Round Window or Cochleostomy approach is used.

The "A" value is only applicable for patients with normal cochlear anatomies.

## Complete Cochlear Coverage (CCC)<sup>9</sup>

Complete Cochlear Coverage means stimulating the cochlea from the base to the apical region in order to stimulate a maximum number of nerve fibres. Stimulation of the entire frequency range provides the implant user with the best possible outcomes in speech perception and sound quality.



Variation in Cochlear Duct Lengths  
Study by Hardy and Lee

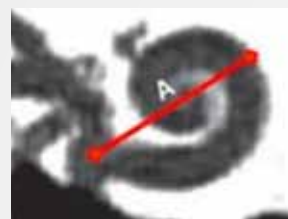


Figure 1  
The diameter of the basilar turn, labeled "A", may be used as a guide for selecting the appropriate array.

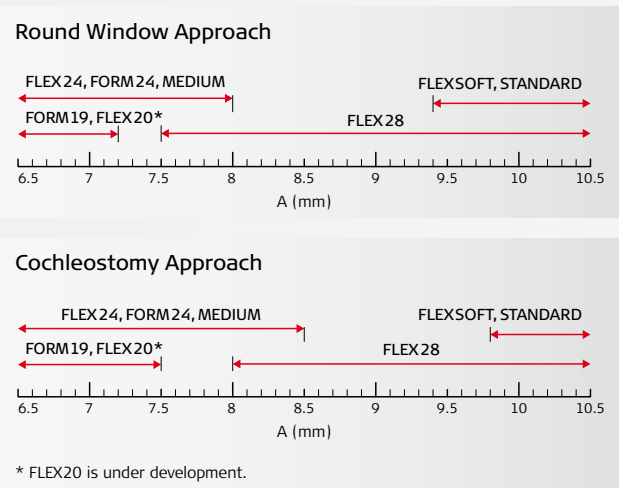


Figure 2  
Selection of electrode arrays for RW or Cochleostomy Approaches

