

Every child  
deserves the best  
- at school too!



**Premium speech recognition**  
in classroom listening situations



# Understanding the challenge

## Every child deserves an equal chance

The modern school environment presents major challenges for a child with hearing loss. The level of noise and disruption that children routinely have to cope with is far greater than that typically faced by adults.

Compared to their normal-hearing peers, children with hearing loss experience increased fatigue from the effort of listening in noisy situations<sup>1</sup>. At the same time, they can't afford to miss anything.

The information they need to receive and process is crucial to their future success and fulfilment; school is literally a life-defining experience.

## Learning from their teachers, learning from their peers

As well as trying to understand what the teacher is saying, kids need to be able to hear and join in with what their peers are saying: much valuable learning can come from this source. Research has shown that children with hearing loss who are happy with their level of classroom participation have higher

scores for quality of life in school, social contact with peers and better mental health<sup>2</sup>.

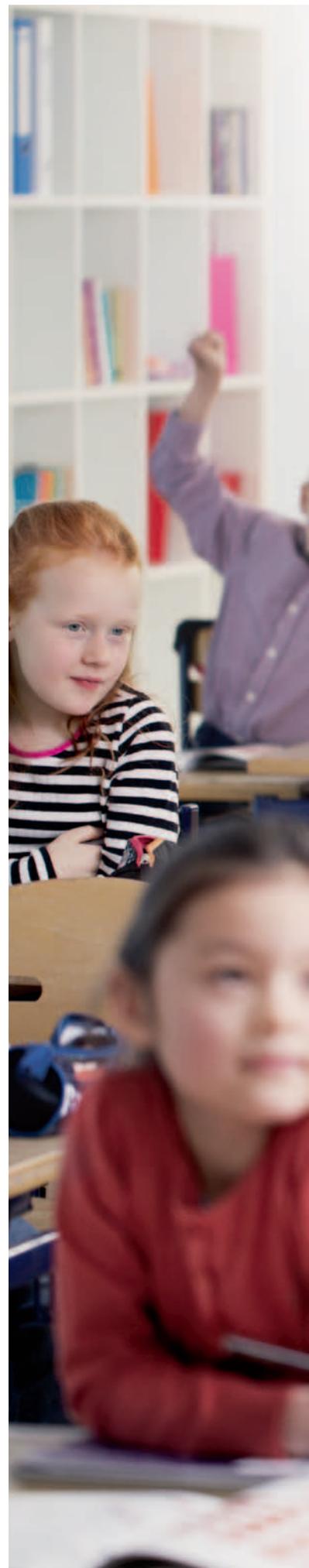
The challenge is how to effectively manage these different needs to ensure that hearing-impaired children enjoy the same access to learning as their peers.

## Advanced adaptive FM is the key

The ideal solution is an advanced adaptive FM amplification strategy that automatically adjusts the gain of the FM signal to optimize the signal-to-noise ratio (SNR) at the child's ear in challenging listening situations. This is precisely what Oticon Sensei's VoicePriority *i*™ system offers.

VoicePriority *i*™ has been integrated within the entire Oticon Sensei hearing instrument family, making it the perfect companion to Amigo FM. The result is a significant increase in speech recognition in complex listening environments, as evidenced in a recent study by Erin Schafer, PhD, a leading expert in educational audiology and FM research<sup>3</sup>.

1. Hick CB & Tharpe AM (2002) Listening effort and fatigue in school-age children with and without hearing loss. *Journal of Speech, Language, and Hearing Research* 45: 573-84.
2. Hintermair M (2011) Health-related quality of life and classroom participation of deaf and hard-of-hearing students in general schools. *Journal of Deaf Studies and Deaf Education* 16: 254-71.
3. Schafer EC, Sanders K, Bryant D, Keeney K & Baldus N (2013) Effects of Voice Priority in FM Systems for Children with Hearing Aids. *Journal of Educational Audiology* 19: 12-24.
4. Crukley J, Scollie SD & Parsa V (2011) An exploration of non-quiet listening at school. *Journal of Educational Audiology* 17: 23-35.
5. ASHA (2005) Acoustics in educational settings: Position statement.
6. Tharpe AM (2008) Unilateral and mild bilateral hearing loss in children: past and current perspectives. *Trends Amplification* 12: 7-15.





### Did you know...

Recent research, including the 2011 Crukley et al study<sup>4</sup>, shows just how noisy school life can be for hearing-impaired students. Moreover, the noise level varies frequently throughout the school day (Figure 1).

The SNR often falls below the recommended minimum of +15 dB for educational settings<sup>5</sup>. The use of FM systems can ease listening for hearing impaired children by reducing the adverse effects of distance, noise and reverberation in classroom settings<sup>6</sup>. Adaptive FM features like VoicePriority *i*™ allow this to be done even more effectively.

The benefits of VoicePriority *i*™ have been fully investigated by Erin Schafer, Ph.D., and her team at the University of North Texas. Pairing a traditional FM system with Oticon Sensei's VoicePriority *i*™ adaptive FM strategy proved to provide superior performance and subjective ratings relative to a traditional, fixed gain FM system or hearing instruments alone. Further findings from the study can be found later in this brochure.

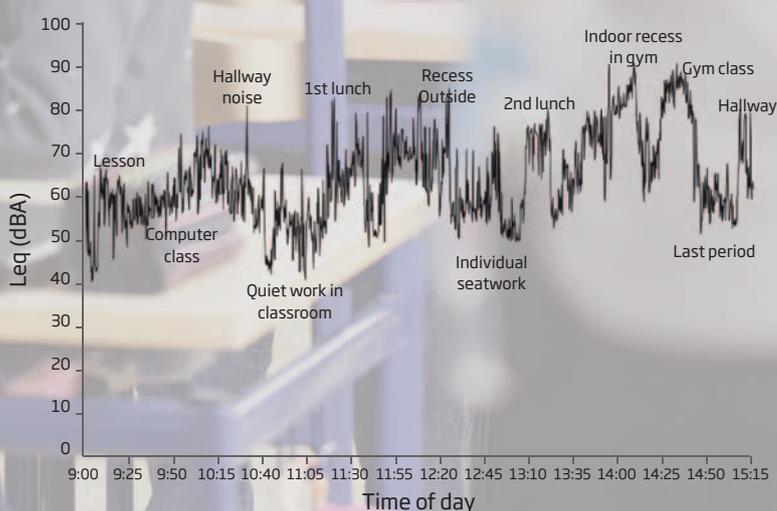


Figure 1: Frequent variation in sound levels and listening situations over the course of a school day at an elementary school (Crukley et al. study<sup>4</sup>).

# Focusing on the needs of the individual child

Designed to complement the use of FM, VoicePriority *i*<sup>TM</sup> has been specifically developed to help the individual child with hearing loss understand speech better in demanding classroom situations. All models in the Oticon Sensei hearing instrument family have integrated VoicePriority *i*<sup>TM</sup> making Oticon Sensei the ideal partner to Amigo FM.

With a traditional fixed gain FM system the teacher's voice is amplified to help the child keep up in class, but general classroom noise can still make it difficult for the student to hear the teacher.

## Putting the individual child first

VoicePriority *i*<sup>TM</sup> provides improved speech recognition by detecting noise levels at the child's ear, and adding extra gain to the FM signal to increase the SNR when needed. This strategy is different from existing adaptive FM solutions.

With other adaptive FM systems the noise detector is in the FM transmitter - monitoring only the teacher's immediate environment. This means that the system provides the same FM gain change to all students in the classroom, regardless of the localized noise levels each child may be experiencing. In contrast, by placing the noise detector at the child's ear, VoicePriority *i*<sup>TM</sup> works individually for each child, improving the SNR in any given listening situation.

Thus, rather than providing a single gain level for the entire class, VoicePriority *i*<sup>TM</sup> automatically adjusts FM gain based on external factors around each child, such as proximity to an air conditioner, the chatter of friends, or noise near computers or windows.

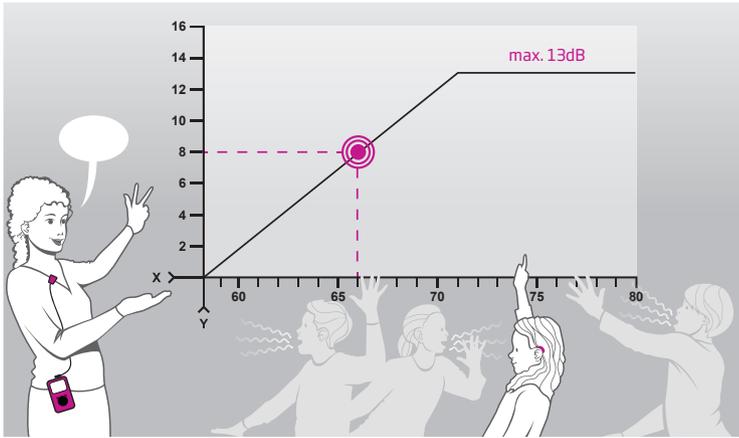
## Extremely rapid response

To make sure that students avoid missing out on any words when shifting attention between the teacher's question and a fellow student's response, VoicePriority *i*<sup>TM</sup> activates and deactivates almost instantaneously, depending on the noise level at the child's ear. Attack and release times as fast as 30 and 600 msec respectively ensure that the child can hear both teacher and classmates. This is important because children acquire significant learning from each other during class - both from direct conversations and from incidental learning. With VoicePriority *i*<sup>TM</sup> the teacher's voice is amplified without compromising relevant information from the child's surroundings.

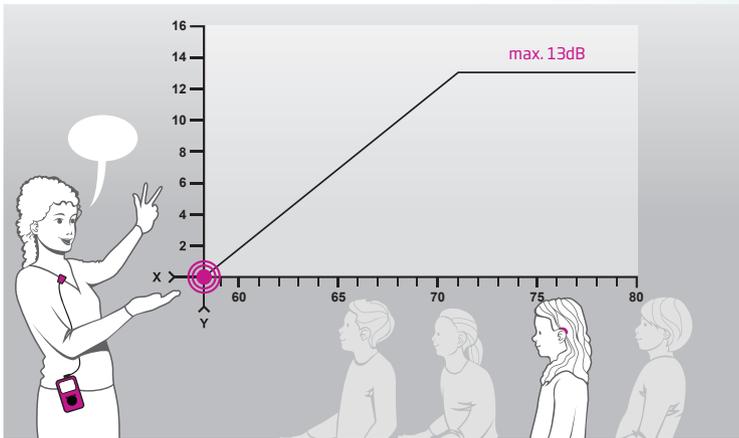


*“As a result, this system [VoicePriority *i*<sup>TM</sup>] will provide the most favorable FM input for each child in a classroom and should account for any variation in acoustics at the location of a particular child relative to his or her peers.”<sup>1</sup>*

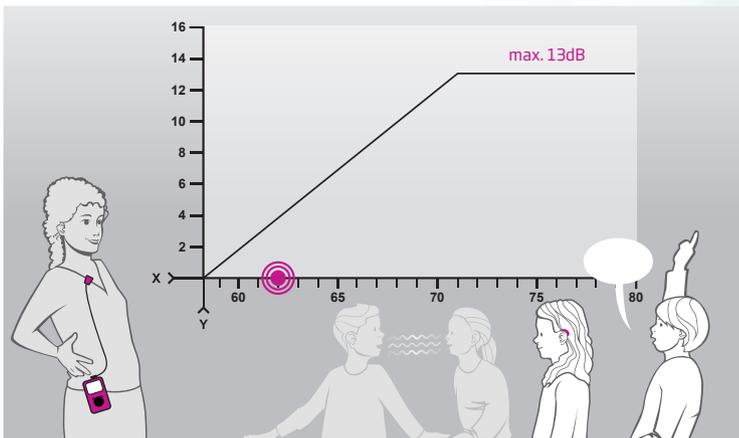
1. Schafer EC, Sanders K, Bryant D, Keeney K & Baldus N (2013) Effects of Voice Priority in FM Systems for Children with Hearing Aids. Journal of Educational Audiology 19: 12-24.



VoicePriority i™ is adding gain to the FM signal coming from the teacher when the noise around the hearing impaired child exceeds 58 dBA. Gain is added in a linear manner (as shown in the graph) up until 71 dBA. Above 71 dBA no more than 13 dB gain is added, since it can be uncomfortable to listen to, and sound quality may be degraded. In the situation above, VoicePriority i™ adds 8 dB gain, since the noise level is 66 dBA around the child (displayed by a pink dot in graph) and the teacher is speaking.



In the situation above, VoicePriority i™ is not activated since the noise level around the hearing impaired child is below 58 dBA (displayed by a pink dot in graph). As it is important to hear the teacher in this situation, only traditional FM gain is needed to maintain a recommended signal-to-noise ratio.



In the situation above, the teacher has just asked a question and the class is listening to an answer from the hearing impaired child's classmate. Although the classroom noise is measured to 62 dBA, VoicePriority i™ is not activated as the teacher is not speaking (displayed by the pink dot). Since VoicePriority i™ is activated/deactivated almost immediately, it reduces the risk of missing out on valuable classroom participation in the attention shift between teacher and peers.



“The FM systems with VPi provided superior performance and subjective ratings relative to traditional, fixed-gain FM systems or hearing aids alone.”<sup>1</sup>



# Leading expert puts VoicePriority *i*<sup>TM</sup> to the test

A recent independent study carried out at the University of North Texas by Erin Schafer, Ph.D., a well-known researcher of FM technology, has proven the efficacy of Oticon's advanced adaptive FM strategy, VoicePriority *i*<sup>TM</sup>.

Dr. Schafer's aim was to see how VoicePriority *i*<sup>TM</sup> performed against traditional FM systems or a hearing instrument alone. Was the VoicePriority *i*<sup>TM</sup> strategy actually more effective and beneficial in practice?

## How the study was composed

Depending on the style of instrument they were currently using, 20 children with moderate to severe hearing loss were fitted with Oticon Sensei Pro BTE or RITE hearing instruments on both ears. The Sensei instruments were paired with Oticon R12 FM receivers and Amigo T30 transmitters using omnidirectional lapel microphones.

The children were advised to use the Sensei instruments and FM equipment for a four-week field trial. During this period, they were asked to use FM for a minimum of two hours per day. For the remaining time, they were asked to use the Sensei instruments alone. Since many aspects are included in real world benefit, both behavioral performance and subjective ratings were investigated.

## Conclusive results prove significant benefits

Children were tested in six speech-recognition conditions in noise using FM and Sensei with VoicePriority *i*<sup>TM</sup> compared to traditional fixed gain FM. VoicePriority *i*<sup>TM</sup> significantly improved the children's speech recognition, particularly in localized noise (Figure 2).

An acceptable noise level test (ANL) also showed that children could tolerate significantly more noise with VoicePriority *i*<sup>TM</sup> compared to traditional FM or a hearing instrument alone. Children also experienced that they could hear more words with Amigo FM compared to using a hearing instrument alone.

On two questionnaires, children and parents reported a preference for the Amigo FM with VoicePriority *i*<sup>TM</sup> compared to using a hearing instrument alone during the trial period. On one questionnaire, Ninety-four percent of children reported that they would recommend Amigo FM with VoicePriority *i*<sup>TM</sup> to others (of 18 out of the 20 children who responded to this item). It was noteworthy that only 2 out of the 20 children used Oticon instruments before the study trial period.

## Taking a closer look

The speech recognition results of the study prove the increased efficacy offered by VoicePriority *i*<sup>TM</sup> in a range of different listening conditions.

The graph shows comparative speech recognition between traditional FM and FM with VoicePriority *i*<sup>TM</sup> in three SNR conditions: 65/55, 70/63 and 74/70 dBA. The first number describes the speech level; the second number describes the noise level calibrated at the participant's head. The noise speakers were placed so that the sound field was either localized (Loc) or diffuse (Dif).

Performance with VoicePriority *i*<sup>TM</sup> (pink bars) was significantly better ( $p < 0.05$ ) than performance with Amigo FM alone (grey bars) across all conditions, with the 70/74 SNR condition showing the most significant difference. As predicted, the benefit with VoicePriority *i*<sup>TM</sup> was most significant when the noise was localized around the student.



Figure 2: Average speech recognition performance in noise. Numbers represent speech/noise intensities. Loc=localized noise; Dif=diffuse noise.

*“Most children indicated that the FM receiver was comfortable, easy to use, reliable, clear, cosmetically appealing, and helped them hear.”<sup>1</sup>*

## Basics

Why you can always rely on Amigo FM:

- Amigo FM ear-level receivers offer the **lowest power consumption of any available FM system** and function even with hearing instruments running on a 312 battery.
- Amigo FM is compatible with virtually all current **BTE hearing instruments**.
- With **7.5 kHz bandwidth** the Amigo FM system provides excellent sound quality.
- To maintain a clear FM signal, **Super Silencer** reduces background noise when the teacher is not talking.
- The **LED indicator light** on both transmitter and receiver instantly shows that the system is turned on and on the same channel.
- **Rugged construction** effortlessly takes the rough and tumble of school life.



# Seamless compatibility and ease of use

Amigo FM has been designed to increase understanding, improve learning and build confidence.

## Easy to use

Amigo FM can be easily programmed and fitted without a complicated setup. A simple intuitive on the T30/T31 transmitter guides you through each step sequentially, making it simple to find and select desired features or options.

You can synchronize Amigo FM at the press of a single button, maximizing uptime and minimizing troubleshooting.

Additionally, the new Activity Analyser in Oticon's fitting software gives you a unique insight into the child's personal listening environment by keeping track of FM use. This provides reliable data for proactive and engaging counseling as the basis for achieving optimum system performance.

## Wide FM Compatibility

Amigo FM's ear-level receivers have the lowest power consumption of any available FM system. In contrast to other solutions, Amigo FM receivers are the only receivers on the market that can function attached to hearing instruments running on a 312 battery.

With Oticon Sensei's compatibility filter, Amigo FM receivers work with virtually all currently available FM transmitters. This gives you complete freedom of choice when selecting the optimal hearing instruments for the child.

## Inspiring confidence

Amigo FM is discreet, portable and highly flexible, helping students to understand speech at a distance, even from different rooms, without losing transmission or sound quality. To ensure long-term reliability, Amigo FM's robust design withstands the toughest challenges school life can throw at it.

The transmitter's single rechargeable AA NiMH battery offers more operating life than those from other manufacturers making sure that the transmitter makes it

through the entire school day. Whenever necessary, the battery can be quickly exchanged with a standard disposable alkaline battery.

The clearly visible LED indicator light on both the Amigo transmitter and receiver instantly shows you that the system is turned on. This is not only reassuring, but also helps to make the school day more efficient and productive for both teacher and student - removing uncertainty and increasing confidence.



## Streamer Pro with FM: the bridge to easier learning

FM used in conjunction with Oticon's Streamer Pro unlocks a world of learning and unhindered participation, both inside and outside the classroom.

### Getting the most out of learning

Many older children do not want to have attention drawn to their hearing loss by having FM receivers attached to their hearing instruments, making them larger and more visible.

Solving this problem, Oticon's Streamer Pro provides for any universal FM receiver to be plugged in, allowing children and teens to experience the benefit of discreet instruments and FM at the same time.

### Enjoying all the latest lifestyle devices

As the gateway to Oticon ConnectLine, Streamer Pro can link the child's hearing instruments to virtually any audio source,



transforming hearing instruments into headphones for music and TV, a wireless headset for mobile phone calls, or personal speakers for use with a tablet or computer. Streamer Pro also functions as a remote control for the hearing instruments themselves.

The Streamer Pro 1.2 App and the new ConnectLine App for iPhone® also allow children and teens to use their iPhone as a personalized, discreet and easy-to-use remote control for communication devices. Using devices that children and teens are already familiar with can be a valuable tool for empowering children to feel in control of their hearing situation - every day.

Streamer Pro 1.2 App supports iPhone 5s, iPhone 5c, iPhone 5, iPhone 4s and iPhone 4.

"Made for iPhone" means that an electronic accessory has been designed to connect specifically to iPhone, and has been certified by the developer to meet Apple performance standards. Apple is not responsible for the operation of this device or its compliance with safety and regulatory standards. Please note that the use of this accessory with iPhone may affect wireless performance. Apple, the Apple logo and iPhone are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.



## The Amigo FM system

Amigo FM has been designed to be simple to operate and to enable children to hear more speech, even in the most demanding classroom situations. This not only

increases their confidence but also enables more effective learning, increased social interaction and - ultimately - richer and more fulfilling lives.



**Oticon Amigo T30:** Body worn transmitter for use in educational settings. The transmitter also serves as a programming and fitting unit.



**Oticon Amigo T31:** Same functions as T30 but also features built-in Team Teaching.



**Oticon Amigo Arc:** Universal Neckloop receiver for virtually all instruments with telecoils including cochlear implants. Comes in five case colors.

**Oticon Amigo R2:** Universal receiver for virtually all BTE instruments. Also attaches to the Streamer Pro for wearing convenience. Features a unique push button for channel seek.

**Oticon Amigo R12:** Dedicated receiver for Oticon's BTE and RITE styles including all Oticon Sensei models. Push button for channel seek. Comes in 13 colors to complement Oticon hearing instruments.

## Empower children at every stage of childhood



**By giving them what they need to advocate for themselves**

Every child deserves the best future possible and children with hearing loss are no exception. Indeed, that is why we have defined an Audiological Mission that has guided the development of Oticon Sensei: A better future for every child with hearing loss.

### ▲ Individualization

To empower you to adapt solutions to meet each developmental stage of every child according to their individual physiological, educational and lifestyle needs.



### ▲ Performance

To deliver technology that will optimize auditory and cognitive habilitation, giving children the best possible speech understanding in every situation while minimizing their cognitive load.

### ▲ Living

To acknowledge the very real and challenging everyday complexities of growing up with hearing loss and accordingly develop support to assist children, parents and audiologists.

## People First

People First is our promise to empower people to communicate freely, interact naturally and participate actively

child  
friendly  
hearing  
care

Our pediatric audiological mission is to ensure a better future for every child with hearing loss. We will deliver solutions, tools and techniques that optimize auditory and cognitive habilitation, embrace the complexities of growing up with hearing loss and empower you to adapt solutions to each child's developmental stage on their journey towards adulthood.

