

modeX school system

- a better school for hard of hearing students



All voices need amplification



School should be a stimulating and developing environment also for hard of hearing students. Educational situations are today to a large extent based on a dialogue between teachers and students, which involve difficulties for a hard of hearing student. In order to create the right conditions, appropriate technique is required, and that is why GN ReSound has developed the school system modeX.

A short microphone distance is the best solution

A student who only use hearing instruments or a CI (cochlear implant) in the education becomes very strained, since the speech is very difficult to distinguish in the sound environment that is prevalent in a classroom. Suspended microphones or a table microphone can seem like an easy solution, but these pick up all sounds, not only the speech. For hard of hearing persons, there is not enough difference between speech and the surrounding noise (see facts box). The result is an incomprehensible cocktail of sounds. ModeX has therefore been designed as a communication system with individual wireless microphones. Our long experience has shown that this is the best way to compensate for a hearing impairment.

A microphone which entices you to use it

The wireless technique is based on well-established standards in wireless sound transmission to hearing instruments and CI. All parts of modeX are designed to meet the tough requirements of the environment in a classroom. The material are robust and durable, but the design is stylish, simple and ergonomical to be easy to hold. The surface finish is smooth to minimise scratching noises and make it easy to clean. The student microphone has a functionally positioned push-to-talk button and is easily operated with one hand. The teacher's microphone has an on/off button, and the teacher does not need to think about any more settings. The microphones are neat, comfortable and easy to handle.

Loudspeakers give many advantages

To the modeX system you can well connect our loudspeakers, which improves the turn-taking and makes the system appreciated by the whole class since also students and the teacher hear better. The system then becomes a concern for everyone, and the load on the hard of hearing student decreases (read more about loudspeaker systems on page 7).



Highly flexible modular system

Since modeX is a modular system, it can be adapted when the conditions in the classroom change, e.g. in case of a changed number of students. Moreover, modeX is fully compatible with GN ReSound's earlier systems and with other listening devices from other suppliers, e.g. built-in FM receivers in the hearing instrument.

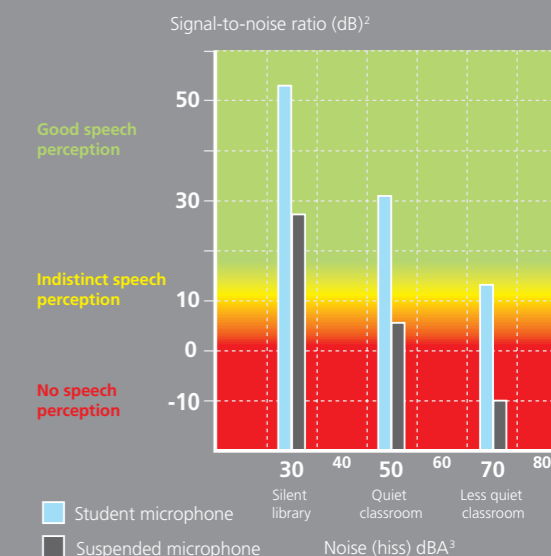
Young people's futures begin in the classroom. GN ReSound has developed modeX so that everyone will have the same chance to succeed at school.

The benefits of close-range speech

A person with perfect hearing can focus on a specific sound and filter out other auditory inputs. But this capacity is reduced in someone with a hearing impairment. In a classroom, the teacher's voice is drowned out by the surrounding noise. The worse the hearing impairment, the greater the signal-to-noise ratio (difference in level between speech and noise) that is required to retain speech perception.

Therefore the most important task for an assistive listening device is to improve the signal-to-noise ratio and in so doing improve speech perception. General amplification of the sound is not enough. The most effective solution is to place a microphone close to the person talking.

Speech perception at different noise levels:¹



The diagram shows the speech perception of a person with a 60 decibel hearing impairment (a fairly common level of hearing damage) at different noise levels and with different aids.

A suspended or table microphone works quite well in a quiet environment (see the two bars on the far left of the diagram). But since this solution amplifies all sounds, speech perception is reduced when the noise level is higher. It is only close-range speech into the microphone which can retain speech perception and provide adequate compensation for a hearing impairment when the general noise level increases (see the two bars on the right).

¹ The relationship between speech perception and the signal to noise ratio with different hearing impairments is taken from Mead C Killion's article in the British Journal of Audiology (1997, 31, 141-148).

² The signal-to-noise ratio for different microphone distances comes from Arne Vik, NTD No 2/3-04. We have used a microphone distance of 10 cm for the student microphone and 2 m for the suspended microphone.

³ Noise levels in Swedish classrooms are taken from Pär Lundqvist's thesis, Classroom noise, 2003.

Check for yourself on the web!

Go to www.resoundmodex.com and hear the difference between the student and suspended microphones at different noise levels.

Name: Katarina Forsberg
Occupation: Hearing instructor
Workplace: Örebro municipality, Sweden



“Hard of hearing students get the possibility to perceive a whole conversation”

Katarina Forsberg has worked as a hearing instructor for almost eight years and has worked both for the county and municipality. She is herself hard of hearing from childhood, and got her first hearing instruments when she was four years old. During her schooling she went in a regular class (the classroom was equipped with two teacher microphones), and received support from a hearing instructor.

To what extent do you see a need for student microphones for hard of hearing students?

I think that the system with student microphones is very good, I have thought many times that it was a pity that I did not have access to that when I went to school. It would have made my hearing situation easier. I remember that I thought it was very boring and hard to always have to turn around and “see” the one that got to answer. The problem for me was that once I had “found” the one that was speaking, I had missed half the sentence, and it was difficult to get a whole of the context. Most of the time I stopped listening to the dialogue and started to draw flowers instead, I don’t know how many flowers and stars that I have drawn during my schooling, probably quite a lot... By stopping to try to perceive what was said in the dialogue I probably saved some energy but missed other important things. I heard many questions, but few answers. So I think it should be a matter of course to have access to student microphones if you want to use this.

What influence do student microphones have on the hard of hearing student?

The hard of hearing student gets the possibility to perceive a whole conversation in the classroom with the aid of student microphones. But it is not simply to provide the students with a number of microphones and think that everything will be perfect. You have to teach teachers and classmates in

how to use the system. One example is to work on keeping the microphone on the right distance from your mouth so that the sound does not become too strong or too weak.

What do the students think of using microphones?

The student who is hard of hearing feels more equal to his/her classmates since he/she easier can follow what is said in the classroom. We have also received positive response from the classmates that they think the turn-taking is improved. It has surely happened that I have met a student who find it hard to speak in a microphone, but then you have to work with that and try to get it to function better together with the whole class and the teachers.

What importance do loudspeakers have in the classroom?

Loudspeakers are of benefit to all, the teachers who can save their voices, students who speak with a low voice are heard, the technique becomes a concern for all in the class, students and teachers can hear any interference. You get an understanding what it can sound like in the hearing instrument, as a hard of hearing student you don’t get perceived as “demanding” in the same way as when a hard of hearing student tells if there is a problem with the technique. There is a better understanding in the classroom.

What else is important to support hard of hearing students at school?

It is important that there is a supportive person close to the student who understands the student’s situation with knowledge, experience and competence. I also think it is important to increase the student’s awareness of his/her hearing impairment, different strategies they use and what the future could look like with studies and work. I have an idea to see everything in a life perspective, how it works now and later in life. It is vital to listen to the student’s own experience!



Name: Annika Sundström
Occupation: Teacher for young children
Workplace: Vistaskolan in Stockholm

”The use has strengthened all the students’ self-confidence”

Annika Sundström has worked as a teacher for four years, and has during this time had a class with one hard of hearing student.

How does the modeX system function in your class?

From the start we had only two student microphones and then it was difficult for the students to wait for their turn. It created a certain frustration to pass around the microphones and I felt that it was hard to get a flow in the lessons. For two years we have had ten student microphones in the class, and then the students always have a microphone available which works really well. To use the microphones is natural for them, they use them all the time, instinctively grasping them.

Do you think that student microphones inhibit the education in any way?

No, I don’t feel that the microphones inhibit the students, rather I see it as a tool that strengthens the students and the education. As in all classes, there are shy students, and with this system they get a better chance to be heard. Surely I saw that they were nervous about it at start, but it quickly changed when we together created a nice atmosphere and good respect between the students.

How has the class as a whole taken on the modeX system?

The class seem very satisfied with the system and they really want to use it. I sometimes forget to put on my teacher microphone or to turn it on, and then they tell me. I always make sure to thank the one who tells me, since it is important that it is working. If someone does not have a microphone available there is always someone who hands one over to that person.

Do the microphones function equally well on all lessons?

Yes, I see no difference in the lessons that take place in the classroom, we move around the microphones. When we are doing group projects the group with the hard of hearing student goes to the small room next to the classroom, where they can work undisturbed. When the class goes on lessons like handicraft, music or sports, or when we make excursions we bring the portable system (a microphone and a neck loop receiver).

How does the turn-taking work in the class?

Most of the time this is no problem, the students are careful to let everyone speak. Surely they talk at the same time sometimes when they become eager, but children are children, and I don’t want to damp their spontaneity. However, I see that the students have learnt to respect one another in a good way.

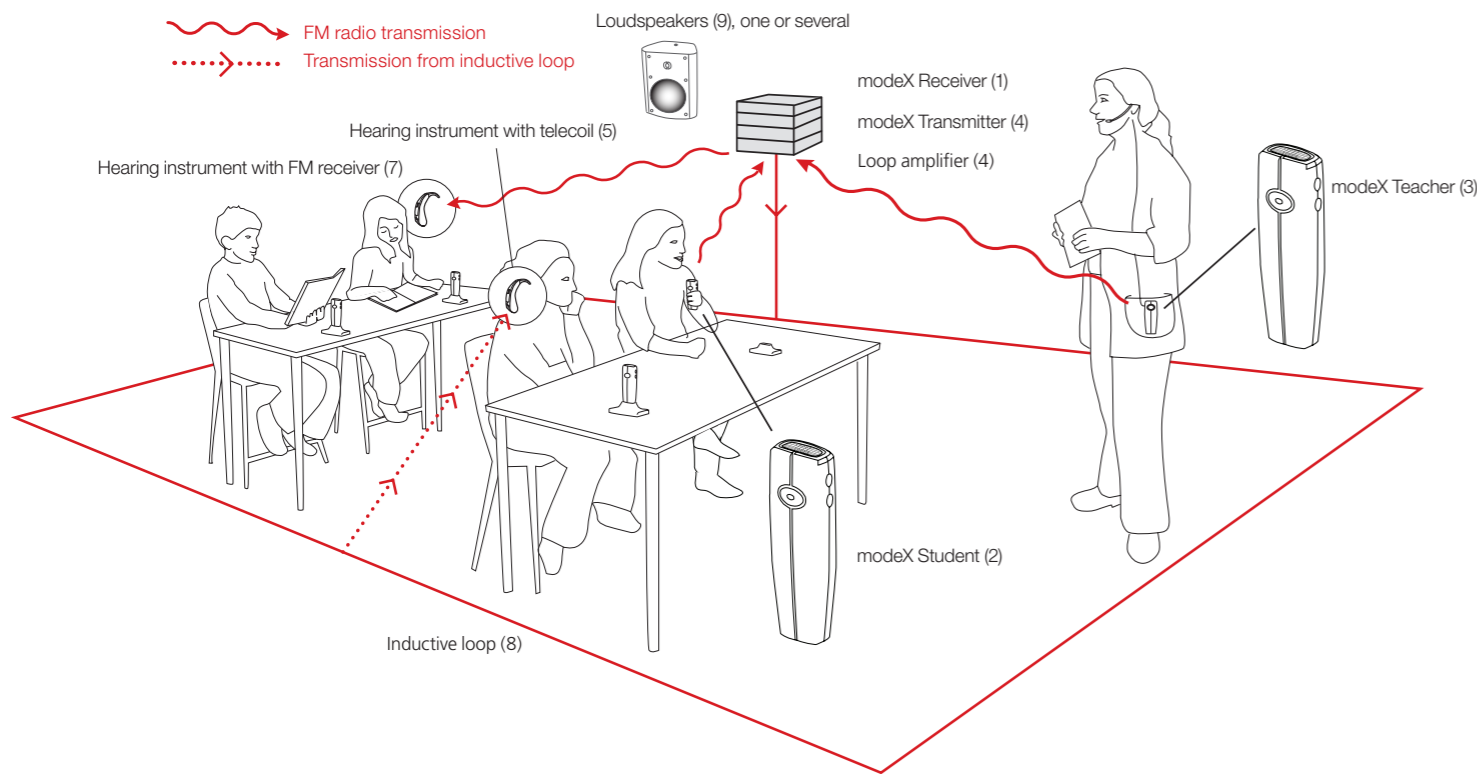
Who in the class is responsible for the technique?

Everyone makes sure that the microphones get charged. One student per table brings the microphones in the beginning of the day and the other puts it in the charger in the end of the day. I make sure that the system works and that the loudspeakers are on. If there is something that I cannot solve, I call the hearing technicians or my contact person at GN ReSound, and they are very quick to come out and help.

What do you think of the use of loudspeakers?

At start, it was a bit tough for all of us to hear our voices in the loudspeakers, but we quickly got used to it, and now it actually feels strange not having this sound amplification. I would allege that the use has strengthened all the students’ self-confidence. The hard of hearing student has become more self-confident, and herself chose to read a poem for the whole school, something which I find is a big and important step.

Facts and figures



modeX system overview

Modules in the system

- ▶ modeX Teacher – teacher's microphone
- ▶ modeX Student – student microphone
- ▶ modeX Receiver – FM receiver
- ▶ modeX Transmitter – FM transmitter
- ▶ modeX Pedagog – all-in-one solution where receivers, transmitter, loop amplifier and two chargers are installed in a unit
- ▶ Loudspeaker, AU-M x 2 – active loudspeakers in pairs
- ▶ Transsett 32 – loop amplifier. For premises of more than 300 m² there is a loop amplifier called PLS-300.

Some of the advantages of the system

- ▶ The version with student microphones gives the highest quality sound for the hard of hearing student.
- ▶ The system is compatible with GN ReSound's earlier products and school systems from other manufacturers. Frequency range 168–218 MHz.
- ▶ The system consists of modules – only buy what you need.
- ▶ Simple programming with the aid of a display.

Operation of the system

- ▶ The receiver (1) picks up the sound from the microphones (2 & 3).
- ▶ If you have several receivers, the sound is automatically mixed.
- ▶ The sound is then connected to an inductive loop (8) via a loop amplifier (4) for hearing instruments with a telecoil (5).
- ▶ It is of course also possible to connect modeX Transmitter (4) to the system, that transmits the sound to hearing instruments with a FM receiver (7), e.g. miniature receivers or neck loop receivers.
- ▶ By connecting loudspeakers (9) to the modeX system, the others in the classroom also benefit from the system. When using several loudspeakers there is a sound equalisation effect that improves the hearing further.



Teacher microphone

Student microphone

Microphone - modeX Teacher / modeX Student

- ▶ **Push-to-talk button** (student microphone) Ergonomically positioned for easy handling.
On/off button (teacher's microphone)
- ▶ **Read-aloud button** (student microphone) Also used when programming.
- ▶ **External sound/antenna input** - 3.5 mm connector for MP3, video, headset etc.
- ▶ **Display with menu system** Easily programmed without connection to external units.
- ▶ **Rechargeable battery**
- ▶ **Clip/external microphone** (teacher) Easily attached to clothes, and a lapel/headset microphone can be connected.
- ▶ **Extra smooth surface** to minimise scratching noises and simplify cleaning.
- ▶ **Charger/table stand** The microphone can be turned in the charger. Several chargers can be connected and can be powered by one power supply unit. The charging units can stand on a table or be wall-mounted.



Receiver - modeX Receiver

- ▶ **Diversity** Activated: One channel with extremely good reception.
- ▶ **Two channels** Deactivating diversity gives two channels in one receiver (e.g. teacher's and student microphones).
- ▶ **Built-in mixer** – connect up to 3 receivers in series. The sound from these is automatically mixed, and minimises the number of cables for antenna and sound.
- ▶ **Adjustable output level** allows for adjustment to transmitters with different deviation.
- ▶ **Double squelch** – Managing the radio signal from signal quality.
- ▶ **125 channels** – 20 are freely programmable. Possibility for automatic scanning in order to find a proper channel.
- ▶ **Space-saving mounting**



Transmitter - modeX Transmitter

- ▶ **Improved signal transmission** For increased quality in the signal transmission to the hearing device receiver.
- ▶ **Optimised signal transmission** Possibility to use dipole antenna on coaxial cable which gives minimal interference in the hearing device.
- ▶ **Power (output power)** Select between Low or Normal mode.
- ▶ **Space-saving mounting** Can be mounted on modeX Receiver.

Simple programming

The following parameters can be set by using the menu system on the display (A) and the programming buttons (B & C):

Microphone

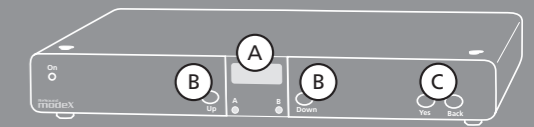
Channel, deviation, microphone sensitivity, read-aloud function (Student), on/off button (Teacher).

Receiver

Channel selection, squelch level, audio output level, selection of line/MIC level, diversity and channel scanning.

Transmitter

Channel, deviation, line level, on/off, power (output power).



Why loudspeakers in the classroom?

Using loudspeakers in the classroom as something that is of benefit for all. The teacher can save his/her voice, and all students will get a more comfortable sound experience.

- The teacher's voice is heard better and more clearly:
- If the teacher has his/her head turned "in the wrong direction", i.e. not towards the class.
 - If the teacher is situated e.g. in the far back of the classroom.
 - The upper intermediate range is amplified more than other frequencies, which makes it easier to hear.
 - One is not disturbed by noise as much (the signal/noise ratio is improved).
 - The sound volume is more even, especially far back in the classroom.

Positive effects:

- ▶ The teacher's voice is relieved
- ▶ It becomes more calm in the class
- ▶ Everyone benefits from the system, not only the hard of hearing student(s)
- ▶ AV equipment can be connected
- ▶ You hear that the equipment works

Reference: "Sound field systems in the classroom", Arne Vik (ongoing study).

Technical data

MODEX RECEIVER, ORDER NO. 412 08 50


Type of receiver	PLL-controlled diversity receiver (FM), 168–218 MHz
Audio connectors	6.3 mm out (balanced) and 3.5 mm jack in/out (unbalanced)
Interface	Display on the front provides all the information
Functions (lockable)	Programmed directly on the receiver: Channel selection, Squelch level, Audio output level, Selection of line/MIC level, Diversity (on/off), Channel scanning
Frequency range.....	90 Hz–11 kHz, (-3 dB relative to 1 kHz)
Dynamic range.....	>60 dB
Distortion	<1% THD
Breadth x depth x height.....	217 x 100 x 30 mm

MICROPHONE, MODEX TEACHER, ORDER NO. 412 08 51 - MODEX STUDENT, ORDER NO. 412 08 52

Type of transmitter.....	PLL-controlled transmitter (FM), 168–218 MHz
Audio connectors	3.5 mm jack for: MIC, antenna and line in (MP3, etc)
Interface.....	Display on rear provides all the information
Functions (lockable)	Programmed directly on the microphone: Channel selection, Deviation (5 or 15 kHz), Microphone sensitivity (+/-15 dB), Read-aloud position (on/off)
Frequency range.....	90 Hz–18 kHz (-3 dB relative to 1 kHz)
Dynamic range.....	>60 dB
Distortion	<1% THD
Battery	Rechargeable (Duracell, NiMH, 1.2 V, AAA)
Weight	50 g (incl. battery)
Talking time.....	Approx. 8 hours with antenna/headset, approx. 3 hours with built-in antenna
Breadth x depth x height.....	35 x 20 x 105 mm

MODEX TRANSMITTER, ORDER NO. 412 08 53

Type of transmitter.....	PLL-controlled transmitter (FM), 168–218 MHz
Audio connectors	3.5 mm out (unbalanced) and 3.5 mm jack out (unbalanced)
Interface	Display on the front provides all the information
Functions (lockable)	Programmed directly on the transmitter: Channel, Deviation, Line Level, On/off, Power (output power)
Frequency range.....	250–20 000 Hz (-3 dB)
Dynamic range.....	>50 dBA at 5 kHz deviation
Distortion	<1.5% THD
Breadth x depth x height.....	217 x 100 x 30 mm

 Questions concerning the EU's medical devices directive 93/42/EEC are referred to GN ReSound A/S.

ReSound has a long experience in developing assistive listening devices that really helps you to hear better, so that you fully can enjoy a rich and active life. We offer innovative solutions in the hearing field and develop and provide hearing instruments and different assistive listening devices.

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