



NOVASONAR

NOVASONAR™

INVISIBLE SOUND SYSTEM



THE INVISIBLE LOUDSPEAKER

WITH THE INTELLIGENT INTEGRATION CONCEPT
FOR A PERFECT INSTALLATION

 Technology

 Materials

 Concept

 Solutions

 References

Do loudspeakers have to be seen?

Novasonar is invisible.



Novasonar loudspeakers transform walls, ceilings and furniture into sound reproducing surfaces that become invisible within the interior decoration.



Our flat-panel technology

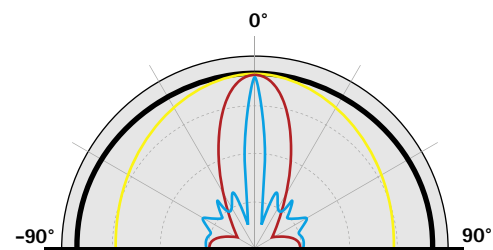


Our flat-panel technology

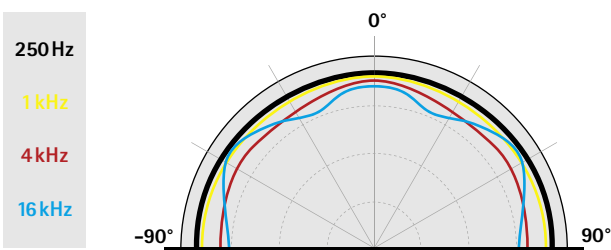
Optimal sound for everywhere in the room

The sound-wave emission of the Novasonar flat-panel loudspeakers equals the way acoustical musical instruments radiate their soundwaves, instruments like, for example, violins and guitars. The soundbody of such musical instruments vibrate and thus emits soundwaves in all directions. The Novasonar flat-panel loudspeaker is also a soundbody, which is brought to vibration by electrical exciters.

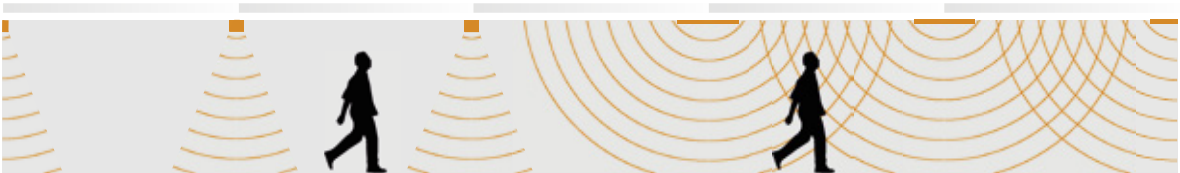
The dispersion angle of Novasonar flat-panel loudspeakers is for all frequencies equal to that of musical instruments, and with a 180° radiation pattern considerably broader than the dispersion angle of conventional loudspeakers. Dynamically, space-filling sound waves, offering optimum sound – anywhere you are in the room, no square meter hot spot – you'll be amazed at how good it sounds!



Polar plot of a conventional loudspeaker



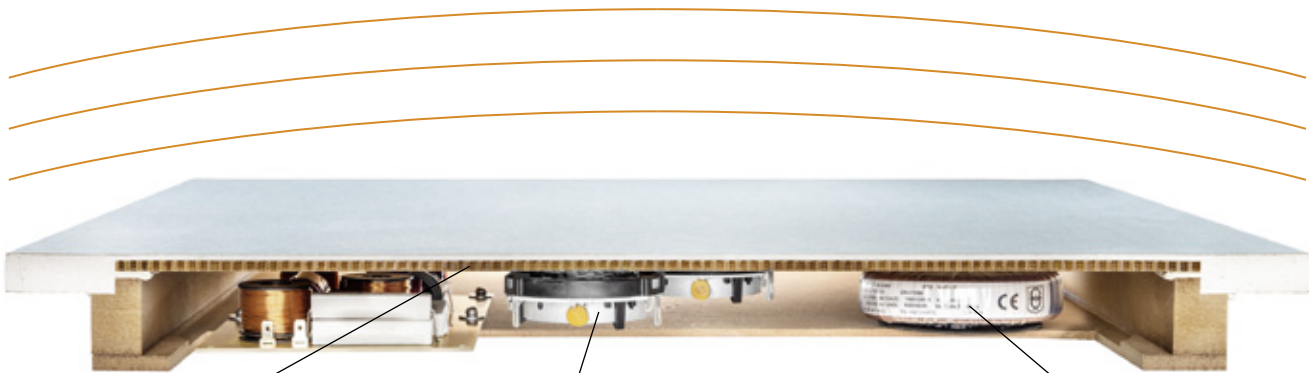
Polar plot of a Novasonar flat-panel loudspeaker



Conventional loudspeakers, showing the typically inadequate coverage of the room with the same number of loudspeakers.

Novasonar flatpanels provide a full coverage of the room in combination with high speech intelligibility, even when ceiling heights are relative low.

Novasonar flat-panel speakers are factory build into several kinds of construction materials



Sandwich membrane: The extremely sturdy and light sandwich membrane is the carrier of building material layers and enabling reproduction with high pulse fidelity. The building material layer is milled down to a minimum thickness and thus will behave sound-neutral.

Exciters: High-grade, powerful exciters with overload protection ensure operational reliability and perfect surround sound.

70 / 100 V transformers: High-grade, sound-neutral and extremely flat toroidal transformer for hooking up to public address systems.

Typical applications for Novasonar sound systems

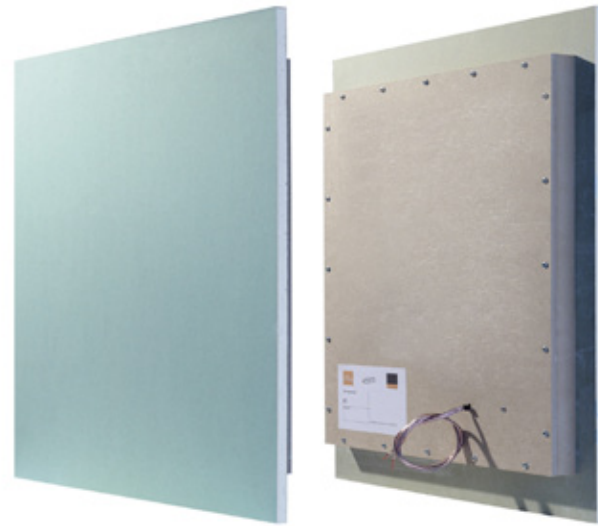
- Multi-room
- Presentation
- Home cinemas / HiFi systems
- Background music
- Public address systems
- Sound masking (open-plan offices / discrete areas)
- Multimedia
- Clean rooms / Operating theatres
- Conference rooms
- Auditoriums / Lecture halls
- Electronic acoustic systems for adjusting the reverberation time to various requirements

Novasonar worry-free-concept: Building material and the sound system come from a single production source

The **Novasonar worry-free-concept**



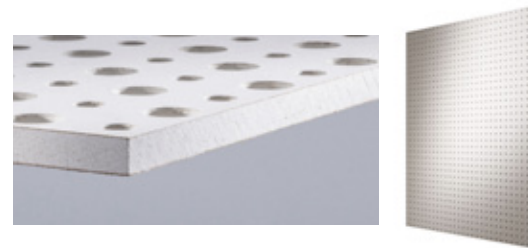
Novasonar flat-panel speakers are factory build into several kinds of construction materials, making installation very easy. Materials and assembly do not differ from other construction materials used and as a result, there are no „alien bodies“ in the drywall. This means the contractor deals with construction materials he already is acquainted with. For him, installation is simple and logical right from the start. Errors, encurring during installation of the speakers will not happen, because the loudspeakers are already incorporated in the construction materials at the ML factory, and the contractor only has to deal with his building materials as usual. This ensures stress free co-operation of all concerned, with perfect results.



The **Novasonar worry-free-concept** comes in the following kind of materials



■ Gypsum plaster boards in all existing versions
■ **Novasonar** GK, Dynamic GK



■ Perforated Gypsum plaster boards in all existing versions
■ **Novasonar** GL



■ Cement boards
■ **Novasonar** ZB



■ Gypsum fibre boards in all existing versions
■ **Novasonar** GF

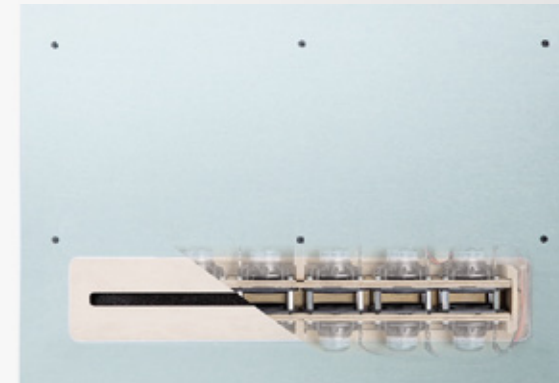


■ Grid ceiling boards in all existing versions and designs
■ **Novasonar** RA



■ Acoustic boards made of expanded glass granulate, mineral wool, glass wool, wood wool, chipped wood, etc. in all existing versions
■ **Novasonar** AK

Vibration-free subwoofer – **Novasonar** Boxer technology



The opposite positioning of the loudspeaker frames and their metal bracing cause mechanical vibrational forces to be cancelled out. Meaning vibrations in the housing cannot develop at all. Acoustic decoupling from drywall construction or furniture is therefore not necessary, making seamless integration simple.

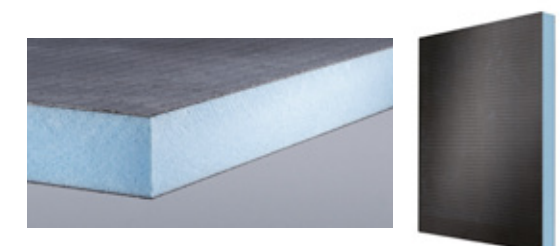


The vibrational forces of frames, act exactly in an opposite direction to each other, thus cancelling out each other.

Two channels separated from each other enable a stereo amplifier to be connected. By way of example, two satellite loudspeakers and a Boxer are run jointly (in parallel) on two amplifier channels.



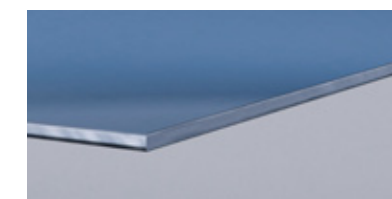
■ Acoustic canopy panels for ceilings in all existing versions and designs
■ **Novasonar** DS



■ Construction boards made of hard foam in all existing versions
■ **Novasonar** KW



■ Wooden boards such as chip boards, MDF, etc. in all existing versions und surface designs
■ **Novasonar** KIT, High Gain, also available, on request, as loudspeaker module for self-assembly. We will be glad to offer advise.



■ Glass, thin-stone, plexiglass, sandwich boards, advertising billboards, etc.
■ **Novasonar** KIT, High Gain, also available, on request, as loudspeaker module for self-assembly. We will be glad to offer advise.

▮ Trouble-free installation of the **Novasonar** sound system

for example, drywall installation with gypsum plaster boards



- ▮ Connect the pre-installed Novasonar loudspeakers.
- ▮ Insert the dry wall board with a pre-installed Novasonar loudspeaker into the opening provided.
- ▮ Screw the dry wall board to the conventional substructure.
- ▮ Fill the joint all around.
- ▮ Design the surface as desired.

▮ The following finishes are possible

- | | | | |
|----------------------|--------------|-------------------------------|-------------------|
| • Paint coatings | • Wallpapers | • Laminated plastic materials | • Wooden boards |
| • Plaster techniques | • Tiles | • Veneer | • Plastic sheets |
| • Plasters | • Glass | | • Metallic plates |
| | • Stoneware | | |

The exemplary Novasonar installation concept provides a reliable way for planning and assembling.

As planner and advisor the first thing to choose for is of course the sound quality in combination with the way a sound system performs and influences the interior decoration optically. In case of applying invisible loudspeakers the mounting of these loudspeakers brings additional costs to the buyer, costs which should not be underestimated. Over the last decades my company applied many of these systems in a range of national- and inter-

national projects. Which brought us the experience and insight how to deal with the "dry-wallers" and project planners/integrators. This exchange of information with them will consume time, thus money. The ML-Audio design creating the way to carry out the installation much easier, proves mounting can be done significantly more affordable.



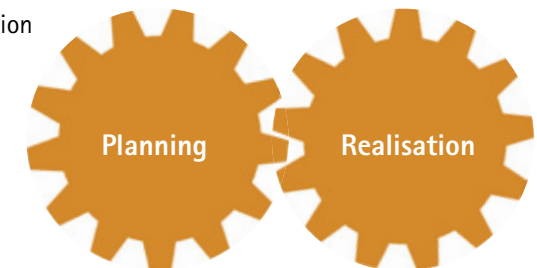
Norbert Hönig, NH consult, CTS
Expert Office for Audiovisual Technology

▮ Everything on the building site runs smoothly...

Twenty solid arguments, which distinguish us and make things easy for you

▮ Factory-integration of Novasonar sound systems into original construction materials providing clarity and reliability in planning and on the building site

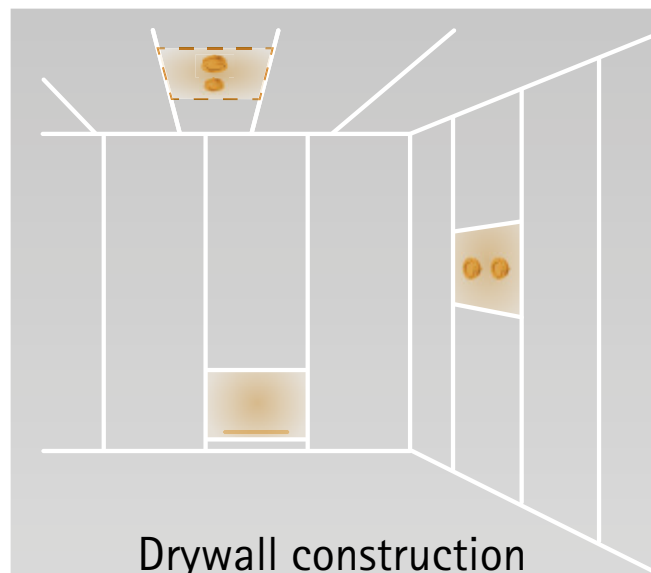
- A high degree of acceptance by architects, planners and contractors, since the loudspeaker's materials do not introduce alien material in the overall finish
- No changes in the material applied, continuously assemble and processing technology
- No mechanical installation errors, because the loudspeakers are already integrated in the factory
- Ensuring smooth co-operation between the specialists in interior finish and media technology
- The basis for perfect and durable creation of the surfaces by machine pre-fabrication
- No delays in building due to additional co-ordination between the specialists from different disciplines
- Simplification on costs calculations
- Cost savings through the most simple installation
- Predictable results with a constant high quality
- Milling down the material to its minimum thickness ensures neutrality to the sound color



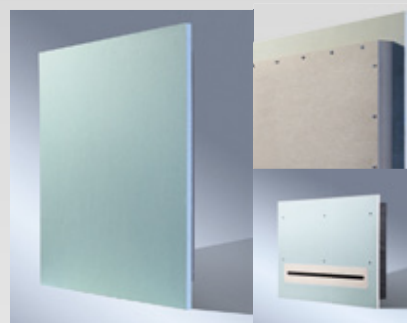
▮ **Novasonar** Boxer technology – acoustic decoupled and vibration-free subwoofer systems

- No need for acoustic decoupling from drywall construction or furniture
- No noise interference through rattling drywall substructure
- No risk of cracking in drywall constructions
- No noise interference, for example, through noise from rattling doors or shelves in furniture installation
- No wobbling image on the projection surface in media furniture installation
- Two channels separated from each other for connection to a stereo amplifier
- The ultra-flat housing makes installation possible, for example, in furniture plinths or slim stud walls

▮ In a nutshell: The **Novasonar worry-free**-concept combines the various specialisations involved, the pre-fabrication guarantees that after being installed Novasonar loudspeakers really remain invisible, sounding as they should.



Drywall construction



- Flat-panel loudspeakers, integrated into conventional building materials
- No different assembly when standard building materials are used
- Trouble-free installation in drywall construction
- No additional assembly costs
- Low installation depth

▣ Novasonar GK, Dynamic GK

- ▣ Gypsum plaster boards smooth

▣ Novasonar GL

- ▣ Gypsum plaster boards perforated

▣ Novasonar GF

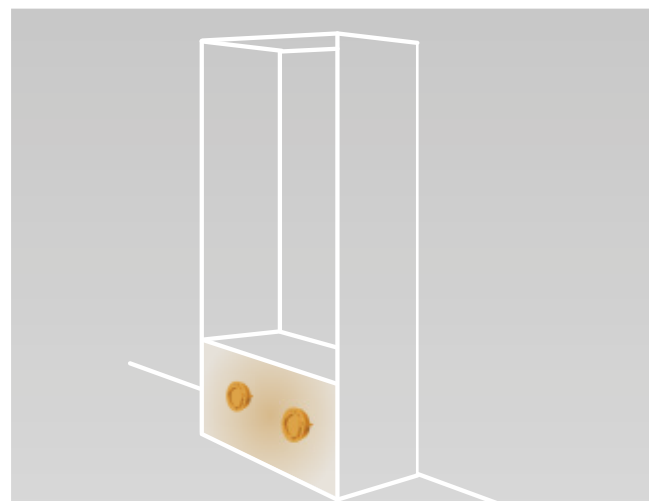
- ▣ Gypsum fibre boards

▣ Novasonar ZB

- ▣ Cement boards

▣ Novasonar Boxer GK

- ▣ Vibration-free subwoofer with drywall front panel



Furniture- and wood panelling



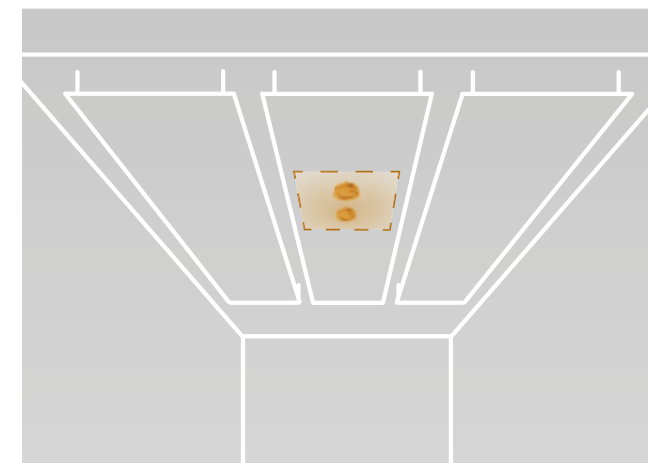
- Flat-panel loudspeakers, integrated into wooden boards
- Seamless installation in furniture or wood panelling
- Low installation depth

▣ Novasonar KIT, High Gain

- ▣ Chip boards
- ▣ MDF panels
- ▣ Solid wooden boards
painted, veneered, coated...
- ▣ Glass
- ▣ Thin-stone boards
- ▣ Plexiglass
- ▣ Sandwich boards

▣ Novasonar Boxer KIT

- ▣ Vibration-free subwoofer with wooden front panel



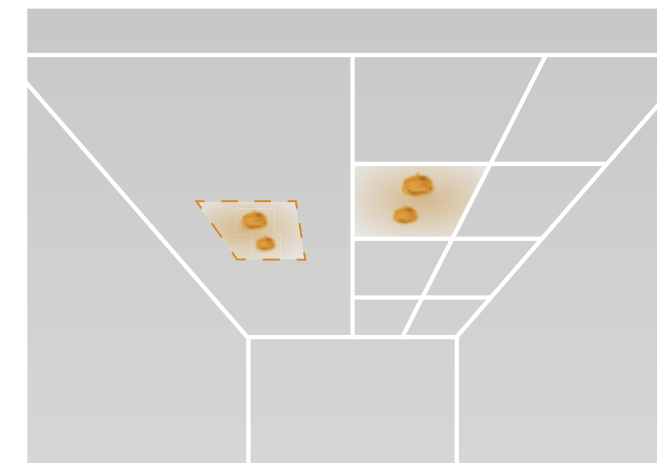
Ceiling panels



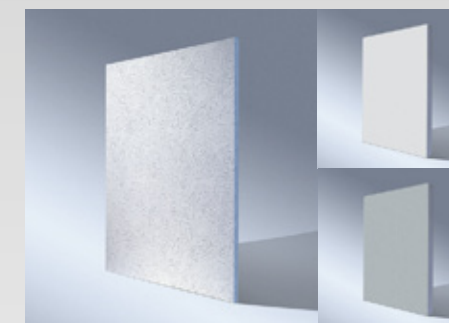
- Flat-panel loudspeakers, integrated into conventional ceiling panels

▣ Novasonar DS

Ceiling panels in almost all original surface designs



Sound-absorbing grid ceilings and surfaces



- Flat-panel loudspeakers, integrated into conventional acoustic boards
- Flat-panel loudspeakers, integrated into conventional grid ceilings
- Available in almost all original surface designs of conventional grid ceilings
- We also install Novasonar flat-panel loudspeakers in your existing ceiling tiles

▣ Novasonar AK

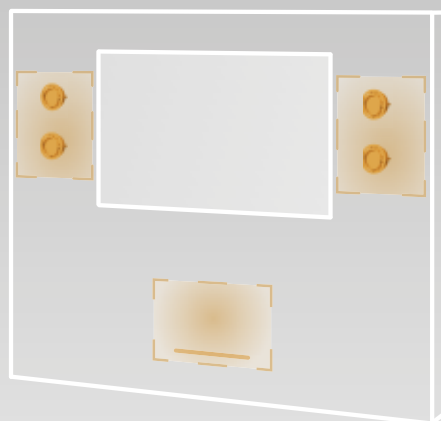
Acoustic boards, for example, made of

- ▣ expanded glass graulate
- ▣ mineral wool
- ▣ glass wool
- ▣ wood wool
- ▣ particle wood

▣ Novasonar RA

Ceiling tiles for all conventional grid ceilings made of mineral materials in almost all original surface designs.

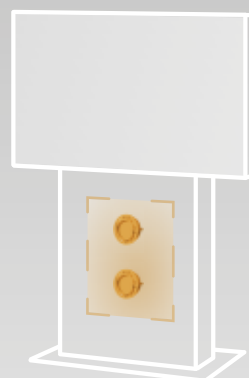
Other materials, such as, for example, metal, on request. We'll be pleased to advice.



Media furniture, conference rooms, shop interior decoration, exhibition stand construction

- Equipment in media furniture
 - Seamless installation
 - Small installation depth
 - Perfect combination of sound and image
 - Compatible with almost all amplifiers
 - Compatible with all conventional conference and presentation systems

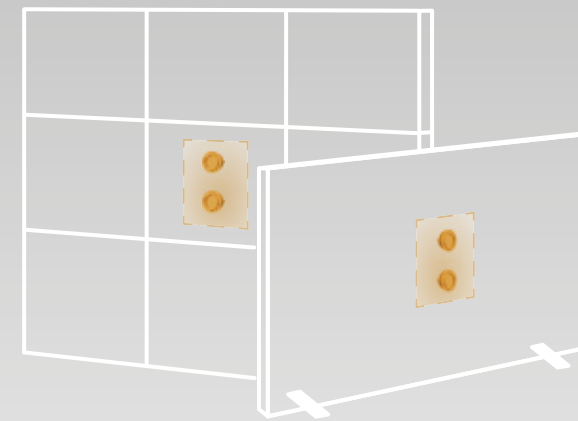
- Novasonar KIT, High Gain
- Novasonar Boxer KIT



Presentation elements

- Integration in steel- and advertising surfaces
 - Seamless installation
 - Low installation depth
 - The front of the presentation surface itself turns into a loudspeaker
 - Perfectly combining sound and image
 - Compatible with all conventional presentation systems

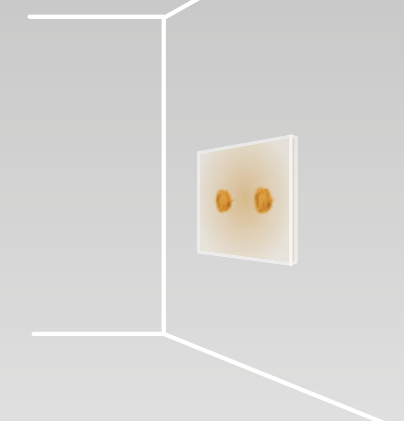
- Novasonar KIT, High Gain



Mobile exhibition wall systems Mobile partitions

- Integration of the equipment in exhibition wall systems and partitioning walls
 - Seamless installation
 - Low installation depth

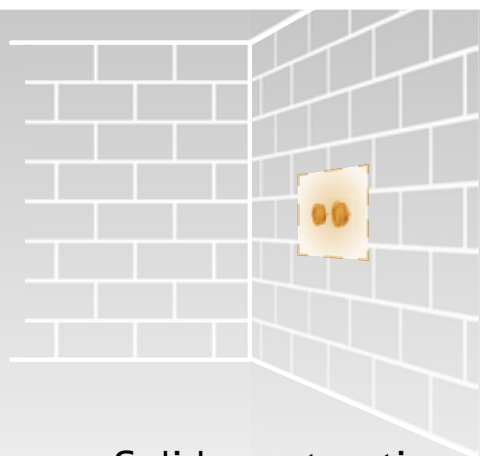
- Novasonar KIT, High Gain



Custom made configurable elements

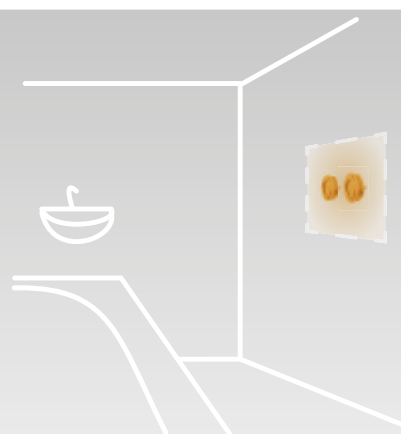
- Elements with digital printing
- Elements with surface coating
- Elements for self-coating
- Round, oval, angular...

- Novasonar Kreativ
- Custom-made design as you require.
- We would like to advice.



Solid construction

- We offer special prepared loudspeaker systems for invisible installation in solid walls and ceilings, such as, masonry and concrete. We'll be pleased to provide advice.



Damp rooms

- We offer especially prepared loudspeaker systems for installation in damp rooms. We'll be pleased to provide advice.

■ Our **service** – we will find just the right customised solution for your project

- No matter what your expectations are - we'll be only too pleased to provide advice and find for you the ideal solution
- Electro-acoustic simulations
- Individual consultation in all stages of planning and realisation
- Special design and sample construction in the material you require
- Individualised development
- More than 20 years experience in loudspeaker manufacturing
- Made in Germany
- We'll be happy to act as intermediary in order to select a partner from our extensive network nationally and abroad

CONFERENCE Conference Centre – Herzogenaurach



The approximately 6000 square meter of the decentralised audio ceiling system for conference use and voice alarm was realised with invisible Novasonar flat-panel loudspeakers mounted in the smooth and perforated gypsum plaster ceilings. In order to ensure correct functioning of the voice alarm systems, the flatpanels are

equipped per se with two separate loudspeaker circuits ensuring speech intelligibility at all times, should one loudspeaker circuit fail. The presentation sound also comes from Novasonar flat-panel loudspeakers.

TRAFFIC North-South City Subway Cologne, underground stations



In the underground stations of the North-South City Subway in Cologne, focus was on the architecture. The invisible public address system for paging ensuring full area coverage and intelligible speech alarm in case of emergencies has been realised utilising Novasonar flat-panel loudspeakers, the loudspeakers are

integrated into the ceiling and wall panelling. The architecture remains untouched. Each loudspeaker is equipped with two separate loudspeaker circuits offering redundancy ensuring speech intelligibility at all times should one loudspeaker circuit fail.

HOME Exclusive home in North-Rhine-Westphalia



In this exclusive home a multi-room sound reproduction system has been realized, with full room coverage in the sectors: living, sleeping, kitchen, bathroom, wellness and swimming pool. To this end, Novasonar flat-panel loudspeakers have been

integrated into the acoustic ceilings, smooth gypsum plaster ceilings and walls, furniture and special moist room boards applied for swimming pools.

CLINIC / CLEAN ROOM Operating theatres



The strict standards and requirements in force to meet hygiene regulations were easily met when applying Novasonar flat-panel loudspeakers.

for example, in the Cadolto Fertiggebäude GmbH & Co. KG buildings

SCHAEFFLER



References

NOVASONAR™
INVISIBLE SOUND SYSTEM



Hotel

In World-renowned luxury hotels in London, Paris, Milan
Invisible Novasonar flat-panel loudspeakers ensure discreet background music in the lobbies.

Culture / Theatre

Llanelli Theatre / Wales **State Theatre Brunswick** **Music Theatre / Gelsenkirchen**
State Theatre Darmstadt

Invisible Novasonar flat-panel loudspeakers, installed in walls and (balcony) ceilings. They are perfectly suitable for generation and projection of simulated reflections by the electronic acoustical enhancement systems. Whereby room acoustics are adapted to different acoustical requirements at the press of a button. Acoustically the hall gets adjusted to optimize the performance of for instance a chamber orchestra, a symphony orchestra and drama (speech). In the Llanelli Theatre in the city of Llanelli / Wales, Novasonar flat-panel loudspeakers are additionally used to create sound effects as well.

Shop

Flagship stores of well-known fashion brands in Hong-Kong, Shanghai, London, Paris, Milan
A good many examples of invisible sound systems integrated in premium stores have been realised with Novasonar flat-panel loudspeakers and subwoofers throughout the world.

Clinic / Clean Room

Surgery Centre of Ludwig-Maximilians University (LMU) Munich
In here, 32 operating theatres have been equipped with Novasonar flat-panel loudspeakers because strict hygiene regulations had to be observed. They are implemented, for example, for live surgery communication.

Fairs / Exhibitions

Fair stands Mercedes-Benz, BMW, Porsche
Invisible Novasonar flat-panel loudspeakers have been integrated into complex exhibition stands of prestigious car manufacturers, for example, the IAA Frankfurt, Automobilsalon Geneva and Detroit Motor Show (NAIAS).

Education / University

Friedrich-Alexander-University Erlangen-Nuremberg
In the new building for mathematics and informatics, the invisible public address system was realised with Novasonar flat-panel loudspeakers in three lecture halls, various seminar and computer rooms and in the dean's offices. Novasonar flat-panel loudspeakers offer outstanding speech intelligibility at any listening position.

Monument protection

New City Hall Hanover – Hodlersaal
In the Hodlersaal, part of the new City Hall of Hanover, invisible Novasonar flat-panel loudspeakers have been integrated into the front panel of individual seats, which are arranged in a circle. The loudspeakers transmit speech to the opposite seats.

Skyline

The Shard London
In luxury apartments in The Shard in London, invisibly integrated Novasonar Dynamic 60 GK and Boxer 100-2 GK Subwoofers make for perfect surround sound in exceptional architecture.
Green Towers Frankfurt am Main
Novasonar flat-panel loudspeakers have been integrated into the metal ceilings in the boarding rooms and in the cafeteria of the Deutsche Bank in Frankfurt. In the conference rooms, installation has been accomplished in the acoustic cooling ceilings and drywalls.
Taunusturm Frankfurt am Main
In the entrance hall of the Taunusturm, the voice alarm system has been equipped with Novasonar flat-panel loudspeakers in the 12 metre high ceiling. The loudspeakers for the voice alarm system in the escalator area have been invisibly integrated into diverse light-weight thin-stone boards from the GRAMA BLEND GmbH. There is no visual difference between the thin-stone boards and the rest of the frontage.

This brochure is intended to provide advice to the best of our knowledge. However, its content is not legally binding. We reserve the right to make technical alterations at any time without advance notice.

NOVASONARTM
INVISIBLE SOUNDSYSTEM

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