

IMMI



Noise mapping and noise prediction



Table of content

Base modules	4	Documentation and presentation	12
IMMI Basic	4	Lists of input data and results	12
IMMI Standard	4	Report manager	12
IMMI Plus	4	3D viewer	12
IMMI Premium	4		
Special configuration IMMI air pollution	5		
Element libraries ... modular expandability	6	Current applications	13
Road traffic noise	6	Air pollutants	13
Industrial noise	6	Noise impact of wind turbines	13
EU interim directives	7	Noise at workplaces module	13
Railway noise	7		
Noise at workplaces	7	Technical data	14
Shipping noise	7	Hardware requirements	14
Aircraft noise	7	Interfaces/compatibility	14
Air pollutants	7	Online help/documentation	14
		Technical support /maintenance contract	14
Project work and data management	8	Support pages on our website/ customer log-in	14
Data input	8	Performance scope	14
Editing and visualizing objects	8	Training courses and seminars	15
Special functions for industrial noise	9	Fields of application and target groups	15
Special noise mapping functions	9		
Checking and testing functions	9	Summary	15
		Our office sites at a glance	15
Calculation	10		
Calculation Control Center (CCC) for performing the calculation	10		
MultiCore – ACC – AUDINOM	10		
Single point calculation	11		
Grid calculation	11		
Façade calculation /exposure analysis	11		

Base modules

IMMI is available in four base module versions. Every base module features the DIN 18005 element library and the Gaussian plume model for calculating the dispersion of air pollutants and dust (TA Luft 1986). Element libraries for noise and air pollutants can be added optionally.

IMMI Basic

... is the cost-effective solution for all those who are satisfied with single-point verification. Calculation precision and documentation completeness are the same as those of the following basic modules.



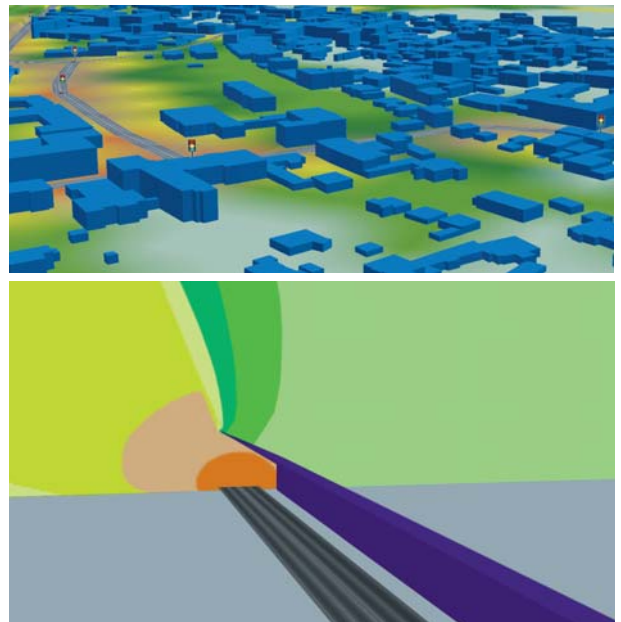
Getting started in noise calculation

IMMI Standard

... gets you started in the world of noise mapping. The optimized performance scope allows the user to process noise projects with high efficiency and at low cost. In this version, the number of obstacles is limited to 200. Every one of these obstacles may contain up to 200 diffracting edges.

IMMI Plus

... is the universal program package which enables the user to calculate, evaluate and present almost all projects. To achieve this, IMMI Plus features a plurality of options which optimally support users in their work. The number of elements is only limited by the available main memory. With its up to 64 million grid points and up to 1000 obstacles, this version allows processing even large-size projects.



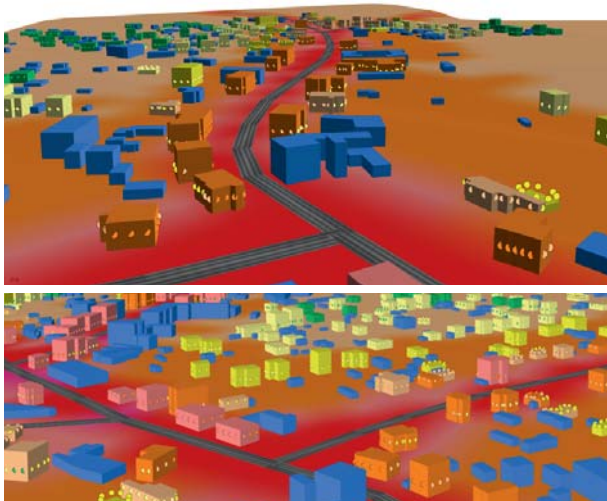
Noise abatement at a glance: bent noise barrier and 3D noise calculation

IMMI Premium

... is the professional tool for creating large-scale noise maps with an excellent price-performance ratio. The scope of this version leaves nothing to be desired and is especially configured for the management of large data volumes. In this package, there is no limit to the number of elements or obstacles. In addition, it features options for distributed (ACC) and segmented (AUDINOM) calculation in the network.

All expansion versions provide the following performance features:

- 3D viewer
- Data import/export (DXF, ASCII, etc.)
- Macros (transformations, constructing noise-emitting buildings, designing openings)
- Calculation of Lden/Lnight according to the Environmental Noise Directive 2002/49/EC
- Support of coordinate systems and coordinate transformation
- Optimization of noise barriers
- Sound transmission of noise barriers
- Noise allocation
- QSI data interface according to DIN 45687



Grid and façade levels in 3D view

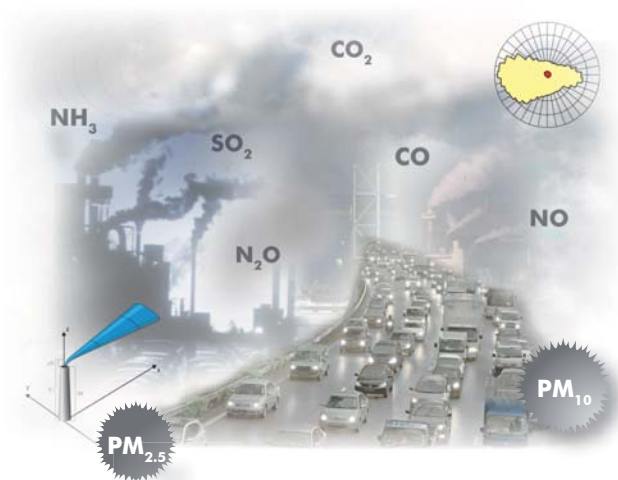
The following performance features can be added depending on the base modules:

- Calculation of multiple higher order reflections
- Databases (emission, attenuation, absorption)
- Expanded grid functions for linking and evaluating grid results
- Calculation of vertical grids
- Calculation of façade levels and exposure analysis according to Directive 2002/49/EC
- Hot spot analysis for action plans
- AUDINOM for segmented calculation in the network
- ACC (automatic cluster calculation) for calculation in the network
- ArcGIS and MapInfo data interface

A detailed description of individual performance features can be found in the data sheets.

Special configuration IMMI air pollution

... is the cost-effective solution for all those who are engaged in calculating the dispersion of air pollutants according to TA Luft 2002 (AUSTAL2000). For more information, please refer to our data sheets.

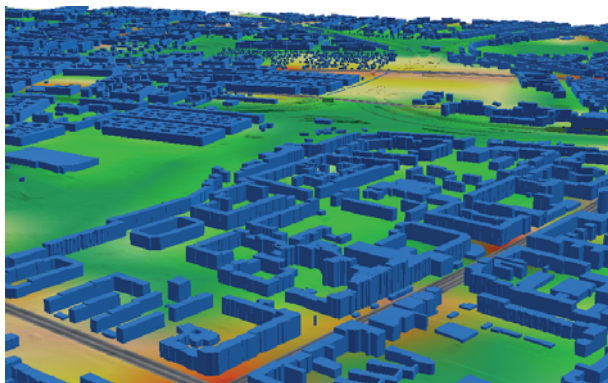


Noise and air pollutants often occur at the same time

Element libraries ... modular expandability

The emission and noise impact calculations in IMMI are based on pertinent rules and standards. All rules, algorithms, tables and nomograms of a specific standard are comprised in an “element library”. Along with the base module, one or more selected element libraries form the customized tool for calculating noise and the dispersion of air pollutants.

All relevant calculation methods for national and international use have been implemented. Not forgetting the European Environmental Noise Directive 2002/49/EC and its implementation for application in the countries of the EU.



Noise calculation in 3D view

Road traffic noise

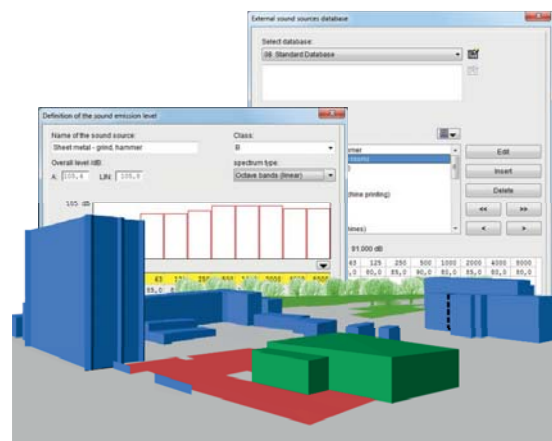
- RLS 90 – Richtlinie für den Lärmschutz an Straßen (DE) (guideline for road traffic abatement)
- PLS (Parkplatzlärmstudie) 07 – Examination of noise impact from parking places, rest stops and bus terminals as well as from indoor parking lots and underground car parks (conducted by the Bayrisches Landesamt für Umweltschutz (LfU, Administrative Office of Bavaria for Environmental Protection) (DE)
- RVS 04.02.11 – Berechnung von Straßenverkehrs-lärm (AT) (calculation of road traffic noise)
- StL 86 – Schweizer Vorschrift zur Berechnung von Straßenlärm (CH) (Swiss standard for the calculation of road traffic noise)
- SonRoad – Road traffic noise calculation model (BUWAL) (CH)
- XP S 31-133 (NMPB) – Bruit des infrastructures de transports terrestres – Calcul de l’atténuation du son lors de sa propagation en milieu extérieur, incluant les effets météorologiques

(avec modèle d’émission du Guide du bruit 1980) (FR) (French calculation method)

- NTF S 31-133 (NMPB 2008) – Noise of earth-bound transport – Calculation of the attenuation of sound during propagation outdoors including meteorological effects (with French emission model Guide du Bruit 2008) (FR)
- CRTN – Calculation of Road Traffic Noise (UK)
- RMW – Reken- en Meetvoorschriften Wegverkeerslawaaai (NL)
- TemaNord 1996:525 – Road-Traffic Noise – Nordic Prediction Method (Scandinavia)

Industrial noise

- DIN 18005 – Schallschutz im Städtebau (DE) (noise protection in city planning)
 - Part 1 – Calculation methods
 - Part 2 – Noise maps; graphical representation of noise pollution
- VDI 2571 – Schallabstrahlung von Industriebauten (DE) (sound radiation from industrial buildings)
- VDI 2714 – Schallausbreitung im Freien (DE) (sound propagation outdoors)
- VDI 2720, Part 1 – Schallschutz durch Abschirmung im Freien (DE) (sound control by barriers outdoors)
- ISO 9613 – Attenuation of sound during propagation outdoors (EU)
 - Part 1: Calculation of the absorption of sound by the atmosphere
 - Part 2: General method of calculation
- ÖAL Directive No. 28 – Schallabstrahlung und Schallausbreitung (AT) (sound radiation and sound propagation)



Calculation of industrial noise / rating in IMMI

- BS5228 – Part 1 - British Standard - Noise and vibration control on construction and open sites Part 1: Code of practice for basic information and procedures for noise and vibration control (UK)
- Handleiding Industrie – Handleiding meten en rekenen industrielawaai (NL)
- Noise from Industrial Plants – Nordic Prediction Method (Scandinavia)

EU interim directives

Road traffic:	XP S 31-133/NMPB + Guide du Bruit
Railway traffic:	RMR-SRM II
Industrial noise:	ISO 9613-2
Airport traffic:	ECAC.CEAC Doc. 29 2 nd edition

Railway noise

- Schall03 – Richtlinie zur Berechnung der Schallimmissionen von Schienenwegen (DE) (directive on the calculation of railway traffic noise)
- Schall Transrapid – Magnetschwebbahnverordnung (DE) (magnetic levitation system decree)
- ON Rule S 305011 – Berechnung der Schallimmission durch Schienenverkehr (Zugverkehr, Vershub- und Umschlagbetrieb) (AT) (calculation of sound immission caused by railway traffic (train traffic, shunting and cargo handling operations))
- Semibel – Schweizerisches Emissions- und Immissionsmodell für die Berechnung von Eisenbahnlärm (CH) (Swiss emission and noise impact model for the calculation of railway traffic noise)
- CRN – Calculation of Railway Noise with supplement 1: Procedure for the Calculation of Noise from Eurostar Trains Class 373 (UK)
- TemaNord 1996:524, Railway Noise – Nordic Prediction Method (Scandinavia)

Noise at workplaces

- VDI 3760 - Berechnung und Messung der Schallausbreitung in Arbeitsräumen (DE) (computation and measurement of sound propagation in workrooms)

Shipping noise

- ABSAW – Anleitung zur Berechnung der Luftschallausbreitung an Bundeswasserstraßen (BfG) (DE) (guideline for the calculation of propagation of airborne sound at Federal Waterways)

Rating methods

16. BImSchV • 18. BImSchV (incl. 4 h rule) TA Lärm • DIN 18005 • Lden • Recreational noise directives

Aircraft noise

- AzB 2008 – Anleitung zur Berechnung von Fluglärmschutzbereichen an zivilen und militärischen Flugplätzen nach dem Gesetz zum Schutz gegen Fluglärm in Kombination mit Datenerfassungssystem (DES) für die Ermittlung von Lärmschutzbereichen an zivilen Flughäfen (DE) (guideline for the calculation of noise protection areas at civil and military airports according to the German act on aircraft noise ("Gesetz zum Schutz gegen Fluglärm"), in combination with the data acquisition system DES ("Datenerfassungssystem") for the determination of noise protection areas at civil airports)
- DIN 45684-1 – Akustik – Ermittlung von Fluggeräuschemissionen an Landeplätzen (DE) (Acoustics – Determination of aircraft noise exposure at airfields) Part 1: Calculation method
- ECAC.CEAC Doc. 29 2nd edition – Report on Standard Method of Computing Noise Contours around Civil Airports (EU)
- ÖAL-Richtlinie No. 24, Sheet 1 – Lärmschutzzonen in der Umgebung von Flughäfen – Planungs- und Berechnungsgrundlagen (AT) (noise abatement zones in the environment of airports; planning and calculation specifications)

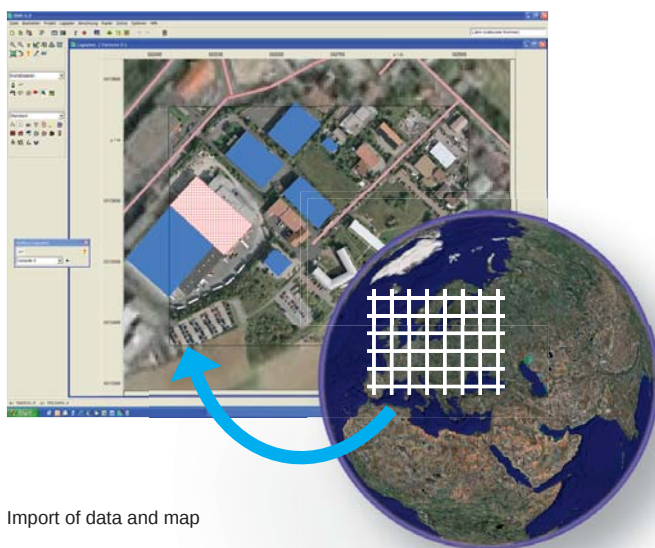
Air pollutants

- ÖNORM M 9440 (Gaussian plume model) (AT)
- VDI 3945 Part 3 (TA Luft 2002 – AUSTAL2000 Partikelmodell) (DE) (particle model)

Project work and data management

Data input

- Input of geometry data through keyboard and mouse or on the screen using (georeferenced) background bit maps (more than 30 different graphic formats)
- Import of geometry and technical data through different data interfaces Formats: DXF, ASCII, TXT, ArcGIS (shape), MapInfo
- Connection to Google™ Earth and Maps
- Support of all European coordinate systems (UTM, Gauss-Krüger, etc.) for georeferencing and coordinate transformation
- Project-based work on a graphical user interface with GIS functionality
- User-friendly management of project data, results and grids
- Standard elements: buildings, walls, reflecting element, land use zones, ground effect, attenuation by vegetation and housing, traffic light, receiver point, compass, bridge, cantilevered barrier
- Emission sources subdivided into point, line and area sound sources, as well as traffic routes (roads, railways, air, and water), tunnels and parking lots
- Measurement of distances and angles
- Auxiliary functions for geometry editing, such as copying, moving, parallel curves, adjustment to terrain profile
- Cartographic elements (scale, legend, text boxes)



Import of data and map

- Multiple zoom function using the mouse wheel
- Determination of the terrain with triangular decomposition based on altitude and/or altitude lines, or digital terrain model based on grid data

Variants

- Definition of variants for calculating case studies, scenarios, planning versions

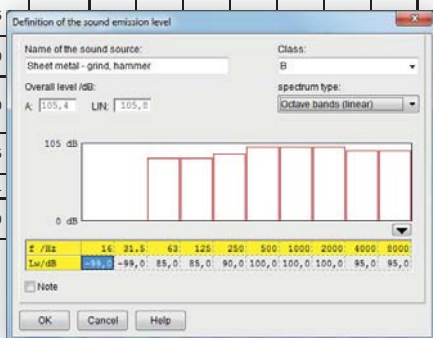
Editing and visualizing objects

- Element database with display of technical data: tabular output, sorting by input data (e.g. number of inhabitants or vehicles), block functions for editing multiple elements at the same time
- Edit, delete, change, copy, join, split and move single or multiple elements using the mouse
- Adjust elements to the terrain and vice versa, with display of the terrain level profile
- Control the visibility of elements in the map
- Design tools and macros: build dams or cuts, generate reception points automatically, transform elements, draw free body diagrams of altitude lines, count kilometers, generate circular buildings and parallel elements
- Insert nodes into polygons, delete nodes from polygons, attach nodes to polygons, check nodes, generate equidistant sections
- Constant or linear z-values in ascending or descending order, relative or absolute height
- Differentiate inhabitants in buildings from land use zones
- Thematic maps for graphical representation and monitoring of input data, e.g. display of building heights, inhabitants per building, display of the terrain model, rating of the land use zones, etc.

Special functions for industrial noise

- Databases for sound emission values, transmission and absorption losses, meteorological annual statistics and time series
- Macro for generating 3D structures, e.g. buildings with noise-emitting walls for calculating industrial noise
- Multiple reflections up to the 50th order
- Sound transmission of walls
- Input and calculation of linear or A-weighted cumulative, octave band and third octave band levels
- Room conditions according to EN 12354-4
- Display of noise producers
- Evaluation according to TA Lärm or individual methods
- Import of spectra from the clipboard
- Calculation of indoor levels according to Sabine or VDI 3760

Emission spectra (Internal Database)										
Name	Sum	Unit	63	125	250	500	1000	2000	4000	8000
Sheet metal - grind, hammer	105,4	dB	85,0	85,0	90,0	100,0	100,0	100,0	95,0	95,0
Sheet metal (Fabrication room)	91,0	dB	80,0	80,0	85,0	90,0	80,0	85,0	80,0	80,0
Wire rolling mill (big hall)	85,2	dB	75,0	75,0	80,0	85,0	80,0	75,0	70,0	70,0
Wire drawing mill	90,5									
Wire straightener	98,0									
Printing plant (rotary machine printing)	95,0									
Printing office (small)	83,5									
Extruder plant	88,1									
Getränkeabfüllanlage	94,9									



Databases in IMMI: easy application of data

Special noise mapping functions

- Support of large-size terrain models and simplification functions (VIP)
- Input of the building use (resid. building, school, kindergarten, hospital, uninhabited), number of storeys, dwellings, inhabitants
- Calculation of noise maps and façade levels according to EU Directive 2002/49/EC
- Pre-defined rating method L_{den}
- Fast calculation with AUDINOM and ACC functions for segmented and distributed calculation in networks
- Hot spot analysis at traffic routes

Checking and testing functions

Plausibility and geometry checks, clearly arranged lists of the data entered and graphical functions are available for checking the input data.

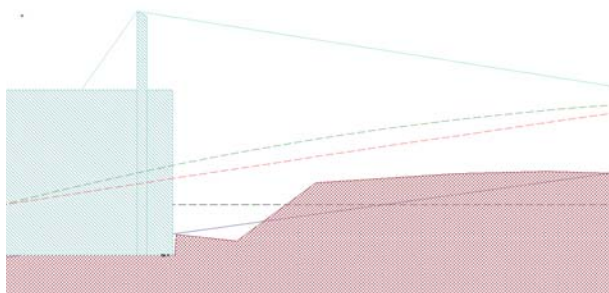
- Check and edit geometry conflicts; intersection of altitude lines, intersection of buildings and roads, self-intersection of elements
- Find identical and similar elements
- Detect reception points inside buildings
- Adjust sound sources on bridges
- Calculate the terrain model (triangulation)
- Conformity with DIN 45687 – fulfilling test tasks
- Estimate the inaccuracy of results in case of optimized calculation models
- Check test tasks using the QS Manager
- Display sound beams

Calculation

Single points, reception grids and façade levels can be easily calculated, while sophisticated algorithms provide for short calculating times.

Calculation model

- Calculation according to reference (strictly as per directive) and optimized calculation model
- Automatic segmentation of line and area sound sources
- Compliance with standard-specific distance criteria
- Projection techniques help prevent discontinuities caused by obstacles and reflecting surfaces
- Multiple reflections up to the 50th order
- Free field in front of reflecting surfaces



Profile section

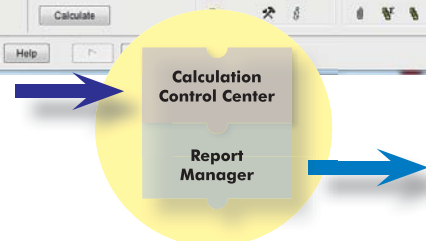
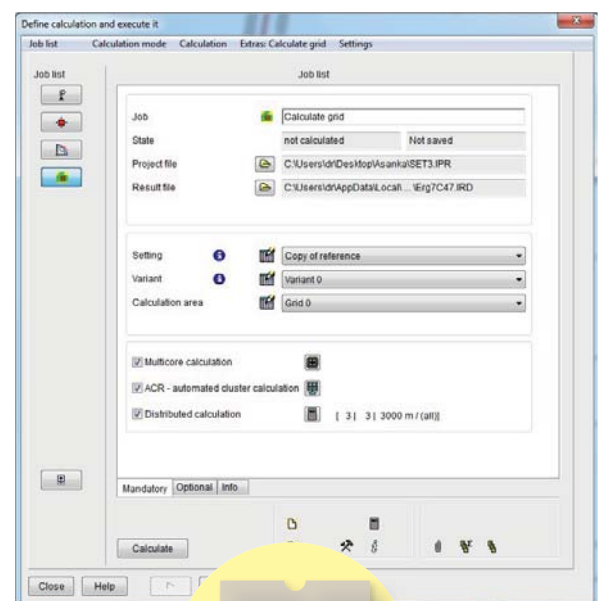
Calculation Control Center (CCC) for performing the calculation

- Central management of all calculations at single points, in the grid or on façade points
- Automatic calculation jobs by means of batch job control; calculation of single points, grid and façade levels as well as of all project variants in one go
- Integrated management and registration of the results calculated
- Powerful variant management to allow studying planning scenarios

- Results lists with extended functionality
- Calculation of horizontal and vertical grids in sections of the map or in user-definable land use zones
- Color scale according to DIN 18005, ISO 1996-2, ÖAL 36, and many more
- Support of multicore computers
- AUDINOM and ACC for segmented and distributed calculation in the network
- Linking of results
- Estimation of calculating times
- Linking and editing of calculation results with numerous mathematical functions

MultiCore – ACC – AUDINOM

These three functions considerably reduce calculating times.



Single point calculation

Results are saved in lists with varying itemization degree. User-definable layouts are used for representation.

- Short lists: Overview of reception point and/or rating levels for all rating periods. Comparison of results with guidance values.
- Mid-size lists: Contribution of each single sound source to the total noise impact level, identification of main sound sources and frequency contents.



Noise action plan

- Long lists: Detailed and testable summary of all influencing variables, intermediate and final results
- Display of sound beams
- Comparison of the calculation results of variants

IMMI helps you view the lists on the screen, print complete or selected areas, copy and paste such areas to MS WORD or MS EXCEL or to TXT, RTF and HTML format via the clipboard. Additional functions facilitate comparing different variants.



Display of façade levels

Grid calculation

The PREMIUM version features functions enabling the calculation of up to a billion points in a reception point grid and their output in many forms. Powerful functions for post-editing, combining and evaluating reception point grids facilitate working with the project.

- Simultaneously calculate all rating periods (day, evening, night, resting, etc.)
- Display defined color scales according to DIN18005, ISO 1996-2, planning guideline ASFINAG
- Display isolines
- Use mathematical operations
- Link grid results
- Join partial grids
- Generate differential grids (logarithmic and energetic)
- Create conflict maps and population equivalent values
- Export noise maps as contour areas to ArcGIS, ASCII or binary ArcGIS files, DXF

Façade calculation / exposure analysis

Test points along façades are calculated at a defined height and at a defined distance from the wall.

- Exposure analysis according to Directive 2002/49/EC: Statistical evaluation of all inhabitants or proportionate evaluation (34th BImSchV), output of the apartments, schools, kindergartens and hospitals affected
- Evaluation of the area examined, either as a whole or in parts as well as element by element
- Allocation to noise bands (Lden and Lnight)
- Import and export of the results via ArcGIS data interface
- Additional statistical evaluations: min. and max. levels on buildings, all levels on buildings

Documentation and presentation

Lists of input data and results

- Input data, intermediate results and final results are documented in the form of clearly arranged tables which can be printed and applied to MS WORD, MS EXCEL, RTF, TXT, HTML.

Report manager

The report manager function provides a powerful tool enabling users to design printouts and reports according to their individual needs and in many versatile forms.



Use of different design elements

- Predefined paper formats and page layouts from size A4 to size A0 in portrait and landscape formats
- Various layout components for structuring the printout as desired: plan/grid, text, graphic, color legend, element legend, header and footer
- Use of text boxes and plan clippings that can be designed as desired, support of a whole variety of fonts allowing different font colors, font sizes and font presentations

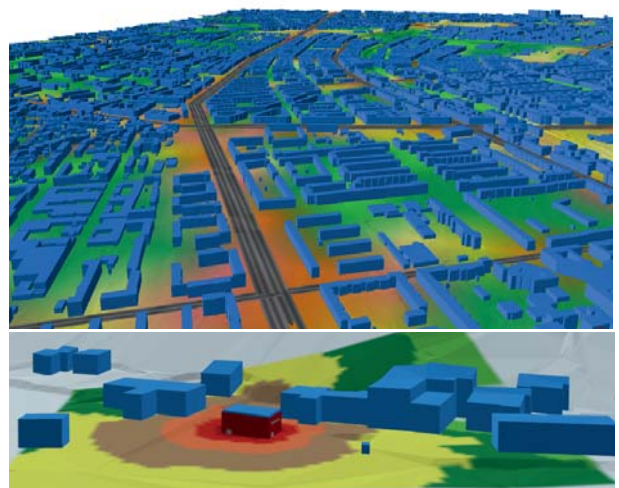
- Numerous options of labeling the axes and contour lines and displaying the scale
- Parallel output of all point, façade and grid results
- Output of layouts and thematic maps
- Printout of graphic files in more than 30 image formats, e.g. BMP, JPG, etc.

The complete testable documentation and the impressive presentation of the calculation results rank among the strong points of the IMMI programming system.

3D viewer

The powerful 3D Viewer allows moving through the 3D model in three different settings.

- Profile sections, screenshots and video recordings
- Automatic flight along line elements
- Graphic symbols for roads, vegetation, traffic light, vehicles

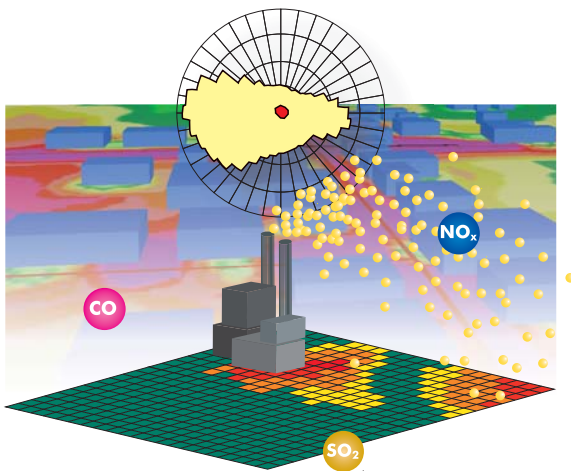


Results convince both the client and the user

Current applications

Air pollutants

The pollutants module in IMMI features the calculation of dispersion of gas, dust and odor both according to the particle model (TA Luft 2002 / AUSTAL2000) and to the Gaussian model (TA Luft 1986). For this purpose, IMMI has been provided with a convenient user interface. It is similarly easy to combine the calculation of air pollutants with the forecast of noise, two environmental impacts which often originate from the same producers.



Calculation of air pollutants according to the Gaussian or particle model

Noise impact of wind turbines

IMMI can also be used for calculating the noise impact of wind turbines. The program is subject to quality assurance and performs calculations based on the following standards:



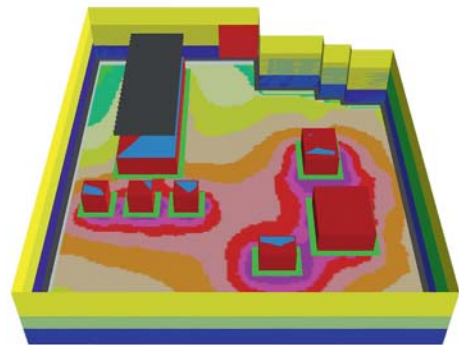
Calculation of the noise impact from a wind farm

- Calculation of sound propagation according to ISO 9613
- Evaluation according to TA Lärm
- Quality-assured software according to DIN 45687

Noise at workplaces module

The noise at workplaces module in IMMI is ideally suited for analyzing the noise situation on factory floors and for determining the sound decay curves (SDC) according to VDI 3760. IMMI now enables you to calculate and evaluate your noise reduction measures on factory floors and at workplaces for industrial and commercial companies.

- Implementation of VDI 3760 (computation and measurement of sound propagation in workrooms, 1996)
- Sound decay curves (SDC) with statistical theory (Sabine) and mirror source methods with raytracing (description depth 4)
- Determination of characteristic values for evaluating the acoustic quality of workrooms
- Application-related design macros
- "Baffle ceiling" macro
- Consideration of multiple reflections
- Calculation of the sound power according to the enveloping surface method of EN ISO 3744 on machines



Propagation of noise on a factory floor

Technical data

Hardware requirements

- Operating system: Windows 98, 2000, XP, VISTA, Windows 7, Windows 8
- 32-bit processor – calculation accelerated by multiprocessor systems (at least 1 GB RAM)
- 64-bit processor – calculation accelerated by multiprocessor systems (at least 1 GB RAM per kernel)
- 400 MB unassigned hard disk storage capacity for program installation
- Monitor resolution: 1042 x 768
- Graphics card with 3D acceleration and MS DirectX
- Mouse and keyboard

IMMI can be run on tabletop computers and notebooks and in networks.

Interfaces/compatibility

IMMI supports data exchange with the following programs/formats:

- DXF (z. B. von AutoCAD)
- ASCII, TXT
- ArcGIS (.dbf, .shp, .shx) / ArcGIS Grid (binary and ASCII)
- MapInfo (.mif, .mid)
- QSI (.qsi, .dbf, .shp, .shx) according to DIN 45687
- AUSTAL2000
- More than 30 different graphic formats
- Google™ Maps/Earth

Online help/documentation

- Detailed online help for each function, accompanied by pictures and explanatory texts
- Examples and tutorials for getting started in IMMI easily and quickly

Technical support / maintenance contract

- Technical support by phone and e-mail to answer your questions about handling the software through our hotline
- Automatic acquisition of all software updates
- Program configuration supplemented at lower prices
- Special conditions for participating in our comprehensive range of workshops and seminars
- 12-month maintenance included in the initial purchase; thereafter, a software maintenance contract must be concluded

Support pages on our website/ customer log-in

As a customer, you have access to the internal pages of our website where you can find out about novelties, download updates and obtain exclusive product information.

- News on IMMI
- Download of updates, manuals, documentations and tutorials
- News ticker about workarounds, suggestions and tips
- Offers on the program

Performance scope

- Installation CD
- Hard key (USB) for program backup as single user or network license
- Tutorial for noise and air pollutants
- 12-month warranty, incl. update and hotline service



Summary

Training courses and seminars

Our range of training courses and seminars always is as up-to-date as our software and measurement systems. For us, optimal service means the following: whether beginners or advanced users, we offer the appropriate further training in our modern training classrooms at Höchberg.

- Training courses
- Workshops /special seminars
- Company seminars

Our website keeps you informed about current events and dates: www.woelfel.de/en/training

Fields of application and target groups

IMMI is a tool for calculating noise and air pollutants and is suitable for all those who

- are in charge of issues concerning immission control and air pollution prevention at authorities,
- prepare expert opinions for engineering consultants,
- perform noise calculations for approval procedures in industry,
- wish to efficiently forecast noise and air pollutants using one tool,
- are employed in the following fields of application: EIA, approval procedures, immission control, air pollution prevention,
- are engaged with environmental simulations in research and teaching.

Our office sites at a glance:

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**Demo-Version
available:**

www.woelfel.de/immi



**Software and measurement technology for
immission control from Höchstberg**

YOUR tool for noise and air pollution mapping
