Technical specifications

CadnaR is the powerful software tool for all professionals who deal with the acoustical planning of rooms and noise mitigation at workplaces. Dependent on area of application and budget the CadnaR Base-Module can be combined with one or several CadnaR Options to extend the functionality. Details about the features of the Base-Module and the different options are listed in this document.

CadnaR **Base-Module** and CadnaR **options** overview

CadnaR Base-Module

Precondition for the usage of all CadnaR options. Image source and particle calculation method (not in combination). Source types limited to point sources. Any type of obstacle allowed (barrier, box-type-obstacle, polymesh). Calculation of sound pressure levels at single receiver points. Import of textfiles (ASCII – format) for geometries, spectra and directivities, CLF-Import, Import from Trimble SketchUp.

Option VIS (Visualization)

Visualization of the calculation (calculation rays in 3D, particle animation etc.) for checking the model, to get a deeper understanding of the results and for presentation purposes. Usage of high-resolution bitmaps (e.g. as layout plan). Import of textured 3D-Objects for presentation purposes.

Option CAL (Calculation & handling)

Enormously increased performance. Additional calculation methods. Batch calculation. Further source types (e.g. line source, area source). Calculation and visualization of the voxel grid. Usage of Receiver Chains. Plot designer.

Option ORG (Project organization)

Massive improvements in organization and handling of projects of any size. Grouping of objects (ObjectTree). Usage of variants. Efficient handling and comparison of up to 16 scenarios in a single file. Calculation of partial levels. CUDA calculation. Import of DWG and DXF file formats.

Option AUDIO

Auralization and calculation of room acoustic and psychoacoustic parameters. Calculation of energetic impulse responses, echograms, reverberation time (T10, T20, T30), Speech Transmission Index (STI). Calculation of further parameters like e.g. Alcons, C80, D50, CIS and EDT.

CadnaR **Base-Module** and CadnaR **options** overview (II)

Option OFFICE

Selected features from both options CAL and ORG for the handling, evaluation and optimization of offices and open plan offices. Usually to be combined with option T (or option AUDIO).

Option T

Selected features from option AUDIO for the calculation and graphic representation of the reverberation time (T20, T30).

Option SET (Sound emission & transmission)

Expert option allowing for example the calculation of frequency spectra of radiated sound power determined from the technical parameters of a sound source. Modeling of complex devices with multiple sound sources and radiating areas, reproducing their inner sound flux and transmission to connected parts.

Calculation technology

☑ Feature included in Base-Module or software option
☐ The software option marked with this icon is needed as pre-requisite (Base-Module is always a pre-requisite)
☐x One of the software options marked with this icon and the same number is needed as pre-requisite

Feature name	CadnaR **Base-Module**	Options						
		CAL	**VIS**	**ORG**	**AUDIO**	**OFFICE**	**T**	**SET**
Image source model	☑							
Particle model	☑							
Combined image source and particle model (Hybrid method)		☑				☑		
Diffuse field statistical method		☑						
Calculation according to VDI 3760		☑						
Maximum order of reflection (Image source method)	20							
Horizontal and vertical diffraction (Image source method)	☑							
Maximum order of reflection (Particle method)	500							
Sigma criterium to avoid unreasonably low particle numbers (Particle method)	☑							
Estimation of maximum runtime for particles (Particle method)	☑							
Acoustical properties of obstacles: absorption Available with all calculation methods	☑							
Acoustical properties of obstacles: transmission Available with particle calculation method only	☑							
Acoustical properties of obstacles: scattering Available with particle calculation method only	☑							
Edge scattering Available with particle calculation method only	☑							
Scattering through roughness Available with particle calculation method only	☑							
Diffraction of particles Available with particle calculation method only	☑							
Calculation with CUDA Requires NVIDIA graphics card with at least compute capability 3.0 (Available with particle calculation method only)				☑				
Batch calculation		☑						

Noise **sources**

☑ Feature included in Base-Module or software option
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☐x One of the software options marked with this icon and the same number is needed as pre-requisite

Feature name	CadnaR **Base-Module**	Options						
		CAL	**VIS**	**ORG**	**AUDIO**	**OFFICE**	**T**	**SET**
Point source	☑							
Line source		☑						
Horizontal area source		☑						
Vertical area source		☑						
Box-type source		☑						
3D directivity (Point sources only)	☑							
Simplified directivity (Point sources only)	☑							
Consideration of the emission sound pressure level at a workplace (for single sources)	☑							
Emission sound pressure level SPL for source groups				☑				
Free field simulation for source groups				☑				
Calculation of sound power from the technical parameters of a sound source								☑
Database of source modules based on technical parameters (306 source modules included)								☑
User-defined sound source modules based on technical parameters								☑
Calculation of sound power level of complex interconnected source systems, considering radiation and transmission								☑

Further **object types**

☑ Feature included in Base-Module or software option
☐ The software option marked with this icon is needed as pre-requisite (Base-Module is always a pre-requisite)
☐x One of the software options marked with this icon and the same number is needed as pre-requisite

Feature name	CadnaR **Base-Module**	Options						
		CAL	**VIS**	**ORG**	**AUDIO**	**OFFICE**	**T**	**SET**
Barrier	☑							
Box-type obstacle	☑							
Polymesh and vertical polymesh	☑							
Height point (Inner point of the polymesh)	☑							
Contour line (Inner line of the polymesh)	☑							
Receiver	☑							
Receiver Chain		☑				☑		
High resolution bitmap			☑					
Section	☑							
Text box	☑							
Auxiliary polygon	☑							
Symbol	☑							
3D Symbol			☑					
Calculation area		☑						
Vertical grid		☐	☑					
3D grid		☐	☑					

Calculation results and postprocessing

☑ Feature included in Base-Module or software option
☐ The software option marked with this icon is needed as pre-requisite (Base-Module is always a pre-requisite)
☐$_x$ One of the software options marked with this icon and the same number is needed as pre-requisite

Feature name	CadnaR **Base-Module**	Options						
		CAL	**VIS**	**ORG**	**AUDIO**	**OFFICE**	**T**	**SET**
Calculation of sound pressure levels at receiver points	☑							
Diagram sound pressure level spectra (Receivers)	☑							
Diagram of spatially averaged sound pressure level spectra (Receivers)	☑							
NC (Noise Criteria) and NR (Noise rating) for receiver points	☑							
Partial sound pressure levels at receiver points				☑				
Calculation protocol (image source model only)				☑				
Calculation of Receiver Chains		☑				☑		
Horizontal Grid calculation (2D)		☑				☑		
Voxel Grid calculation (3D)		☑						
Arithmetic of Grids (up to 7 grids)		☑						
Generation and evaluation of an enveloping surface consisting of a mesh of Receivers		☑						
Level evaluation of Receiver Chains (Diagram, L_p,A,S,4m, D_2,S)		☑				☑		
STI evaluation of Receiver Chains (Diagram, r_D, r_P) ☐$_1$ Option CAL **or** OFFICE is pre-requisite		☐$_1$			☑	☐$_1$		
Diagram of reverberation times (Receiver)					☑		☑	
Calculation of the energy-based room impulse response at receivers					☑		☑	
Diagram echogram (Receivers)					☑		☑	
Diagram of reverberation times (Receiver Chains) ☐$_1$ Option CAL **or** OFFICE is pre-requisite		☐$_1$			☑	☐$_1$	☑	
Diagram of spatially averaged reverberation times (Receivers)					☑		☑	
Diagram of spatially averaged reverberation times (Grid) ☐$_1$ Option CAL **or** OFFICE is pre-requisite		☐$_1$			☑	☐$_1$		
Requirements for reverberation times (VDI 2569, DIN 18041)					☑		☑	
Early decay time (EDT), **Reverberation time T10**					☑			
Reverberation time T20 and T30					☑		☑	
Definition / Clarity (D50 and C50), **Clarity index for music** (C80), **Center time** (TS)					☑			
Articulation loss (Alcons%), **Common intelligibility scale** (CIS)					☑			
Speech transmission index - male / female According to IEC 60268-16:2011 (STI_male | STI_female)					☑			
STI for public address systems (STIPA_IR)					☑			
Grid calculation for quality criteria (with option T, only T20 and T30)		☐			☑		☑	
Estimate mean absorption coefficient from T20					☑		☑	

Import and **export**

☑ Feature included in Base-Module or software option
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☐x One of the software options marked with this icon and the same number is needed as pre-requisite

Feature name	CadnaR **Base-Module**	Options						
		CAL	**VIS**	**ORG**	**AUDIO**	**OFFICE**	**T**	**SET**
Import from Trimble SketchUp (.skp)	☑							
Import of bitmap files			☑					
Import of .dwg files (AutoCAD, pCon planner)				☑		☑		
Import of .dxf files (AutoCAD, pCon planner)				☑				
Import of ASCII Object geometry files	☑							
Import of ASCII Spectra files (e.g. spectral absorption and sound power level data)	☑							
ODBC interface				☑				
Direct import from MS Excel files (.xlsx)				☑				
Import of directivity files (ASCII)	☑							
Import of CLF directivity files (.cf1 / .cf2)	☑							
Library manager				☑				☑
Export of full reports to MS Office (MS Word (.docx) | MS Excel (.xlsx))				☑		☑		
Export to AutoCAD (.dxf)	☑							
Export of 2D ASCII - Grids (.rst)		☑						
Export of 2D ASCII Grids (.txt, .csv, .dat)		☑						
Export of 3D voxel grids (.cnivg)		☑						

Object handling and project organization

☑ Feature included in Base-Module or software option
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☐$_x$ One of the software options marked with this icon and the same number is needed as pre-requisite

Feature name	CadnaR **Base-Module**	Options						
		CAL	**VIS**	**ORG**	**AUDIO**	**OFFICE**	**T**	**SET**
Single object actions Duplicate, Convert to, Transform, Label, Parallel Object	☑							
Single object actions Break Lines, Break Areas, Create Poly with n-Edges, Simplify Geo, Spline, Modify Order of Points, Break into Pieces, Connect Lines, Set Length, Normalize rotation angles	☑							
Multiple object actions Delete, Convert, Transform, Delete Duplicates, Activation, Normalize rotation angles	☑							
Multiple object actions Simplify Geometry, Spline, Modify Order of Points, Break into Pieces, Connect Lines				☑		☑		
Multiple object actions Modify Attributes, Duplicate, Label, Parallel Object				☑		☑		
Creation of up to 16 scenarios or variants				☑				
Object Tree Group objects for interactive group editing with mouse and keyboard				☑		☑		
Object Tree (full functionality) Including partial levels and sound power levels for groups				☑				
Assignment of groups to variants				☑				
Comparison of variants in diagram of reverberation times (Receiver, Receiver Chains) ☐$_1$ Option CAL **or** OFFICE is pre-requisite to be able to use Receiver Chains ☐$_2$ Option AUDIO **or** T is pre-requisite to be able to calculate reverberation time		☐$_1$		☑	☐$_2$	☐$_1$	☐$_2$	
Comparison of variants in diagram of spatially averaged reverberation times (Receiver) ☐ Option AUDIO **or** T is pre-requisite to be able to calculate reverberation time				☑	☐		☐	
Comparison of variants in tables of spatially averaged reverberation times (Receivers, Receiver Chains) ☐$_1$ Option CAL **or** OFFICE is pre-requisite to be able to use Receiver Chains ☐$_2$ Option AUDIO **or** T is pre-requisite to be able to calculate reverberation time		☐$_1$		☑	☐$_2$	☐$_1$	☐$_2$	

Visual and **aural** presentation

☑ Feature included in Base-Module or software option
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☐x One of the software options marked with this icon and the same number is needed as pre-requisite

Feature name	CadnaR **Base-Module**	Options						
		CAL	**VIS**	**ORG**	**AUDIO**	**OFFICE**	**T**	**SET**
Open-GL based 3D Visualization	☑							
Selection and editing of objects in 3D view	☑							
Free movement and save up to 4 predefined views in 3D view	☑							
Appearance of objects in 3D view depending on attributes	☑							
Further appearance and functionality options for objects in the 3D View Transparency, selectable, direct color	☑							
Display of calculated sound rays in 3D View			☑					
Display of 3D Iso—Faces within the 3D view		☐	☑					
Display of 3D Iso— Lines within the 3D view		☐	☑					
Display of 3D Iso— Lines (Height is level) within the 3D view		☐	☑					
Vertical grid in 2D and 3D view		☐	☑					
3D grid in 2D and 3D view		☐	☑					
Particle animation (particle ping—pong) within the 3D view			☑					
Interactive video capturing for Open GL based 3D View (.avi fomat)			☑					
Import and visualization of 3D—Symbols (.obj format)			☑					
Stereoscopic 3D view *3D TV required			☑					
Plot Designer		☑				☑		
Print reports	☑							
Projection of bitmap background images in 3D View			☑					
Auralisation - One source for each receiver - Multiple sources for each receiver					☑			

* The information refers to **CadnaR 2021 MR1** (March 2021) and is subject to changes without notice.