


Scope of Performance

CadnaR is the powerful software tool for all professionals who deal with the acoustic planning of rooms and noise mitigation at workplaces. This document contains details about the technical specification of CadnaR and it´s options.

1 CadnaR products overview 2
2 CadnaR options overview 2
3 Technical specification of CadnaR 3
3.1 Calculation methods 3
3.2 Source object types 4
3.3 Further object types 5
3.4 Calculation results and postprocessing 6
3.5 Import and export formats 7
3.6 Modelling tools and project organization 8
3.7 Visual and aural presentation of results 9
4 System requirements 10
5 Cloud licensing related additional requirements and information 10
5.1 DataKustik Cloud License Server availability 10
5.2 Cloud licensing management and company account on DataKustik website 10
6 Bibliography 10

The information presented in this document refers to **CadnaR 2025** (March 2025) and is subject to changes without notice.

1 CadnaR products overview

CadnaR

Calculation of sound pressure levels at single receiver points. 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). Import of textfiles (ASCII – format) for geometries, spectra and directivities, IFC-Import, CLF-Import, Import from SketchUp. For the time being also included: Import from CadnaR.scan App (*.eox).

2 CadnaR options overview

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. Virtual Acoustic Camera.

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. Automatic calibration of absorption and scattering coefficients to achieve user-defined target reverberation time. Dosimeter.

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. Automatic calibration of complex source structures as e.g. machines.

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.

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.

3 Technical specification of CadnaR

3.1 Calculation methods

Feature	CadnaR	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 5.0 (Available with particle calculation method only)				☑				
Batch calculation		☑						

☑ included (in product or option)

☐ needed as pre-requisite

3.2 Source object types

Feature	CadnaR	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)	☑							
Emission sound pressure level SPL for source groups				☑				
Free field simulation for source groups				☑				
Source group calibration				☑				
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								☑

☑ included (in product or option)

☐ needed as pre-requisite

3.3 Further object types

Feature	CadnaR	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		☐	☑					

☑ included (in product or option)

☐ needed as pre-requisite

3.4 Calculation results and postprocessing

Feature	CadnaR	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				☑				
Dosimeter		☑		☐				
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, ASR 3.7, UNI 11532-2)					☑		☑	
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					☑		☑	
Automatic calibration of absorption and scattering coefficients to achieve user-defined target reverberation time. ☐$_1$ Option AUDIO **or** T is pre-requisite		☑			☐$_1$		☐$_1$	

☑ included (in product or option)

☐ needed as pre-requisite

3.5 Import and export formats

Feature	CadnaR	Options						
		CAL	VIS	ORG	AUDIO	OFFICE	T	SET
Import from SketchUp (.skp)	☑							
Import from CadnaR.scan App (*.eox) Included in Base-Module for the time being	☑							
Import of bitmap files			☑					
Import of .dwg files (AutoCAD 2013, pCon planner)				☑		☑		
Import of .dxf files (AutoCAD, pCon planner)				☑				
Import of IFC4 STEP files (.ifc)	☑							
Import of ASCII Object geometry files	☑							
Import of ASCII Spectra files (e.g. spectral absorption and sound power level data)	☑							
Open *.spa files from the "SchallPrognoseApp(SPA) " of the German Federal Institute for Occupational Safety and Health (BAUA)	☑							
ODBC interface				☑				
Direct import from MS Excel files (.xlsx)				☑				
Import of directivity files (ASCII)	☑							
Import of CLF directivity files (.cf1 / .cf2)	☑							
Import of XHN directivity files	☑							
Library manager				☑				☑
Export of reports based on predefined MS Excel Templates (MS Excel (.xlsx)))				☑		☑		
Export of full customizable 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)		☑						

☑ included (in product or option)

☐ needed as pre-requisite

3.6 Modelling tools and project organization

Feature	CadnaR	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, Snap point to obstacle, Change ObjectTree assignment, Break into Pieces, Connect Lines, Set Length, Normalize rotation angles	☑							
Single object actions Deconstruct box-type source, Generate machine		☑						
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, Snap point to obstacle, Change ObjectTree assignment, 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				☑				
Copy group activation				☑				
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		☐$_1$		☑	☐$_2$	☐$_1$	☐$_2$	

☑ included (in product or option)

☐ needed as pre-requisite

3.7 Visual and aural presentation of results

Feature	CadnaR	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			☑					
Virtual Acoustic Camera			☑					
Plot Designer		☑				☑		
Print reports	☑							
Projection of bitmap background images in 3D View			☑					
Auralisation - One source for each receiver - Multiple sources for each receiver					☑			

☑ included (in product or option)

☐ needed as pre-requisite

4 System requirements

CadnaR can be installed on any system which fulfils the following requirements:

- Multi-core processor from Intel (Core i series, 6th generation, „Skylake“ architecture or newer) or from AMD (Ryzen series, starting from the 1st generation, „Zen“ architecture or newer) with at least 4 cores, instruction set extensions SSE 4.2 and AVX as well as 64-bit extensions (Intel 64 or AMD64). ARM-based processors (e.g. M1/2/3/4 chips from Apple or Snapdragon-SoC) are not supported.
- 8 GB RAM
- OpenGL 3.3 graphics card with minimum 2 GB real graphic memory to use the hardware accelerated 3D-view. Using processor graphics or graphics card with no dedicated graphics memory ("shared memory") may result in display errors. For the accelerated calculation of the particle model with CUDA on the GPU, a NVIDIA graphics card with at least Compute Capability 5.0 (Maxwell architecture) or newer is required.
- Windows 64-bit operating system
    - Microsoft Windows 10 (Version 22H2)
    - Microsoft Windows 11 (Version 23H2 or newer)

5 Cloud licensing related additional requirements and information

With licensing type cloud licensing, during the use of CadnaR:

- the DataKustik Cloud License Server must always be accessible from the customer location,
- a permanent and uninterrupted internet connection via port 1947 (UDP and TCP) is mandatory.

5.1 DataKustik Cloud License Server availability

DataKustik ensures that the Cloud License Server is available at least 99% of the time on average over the month. Each first Tuesday of the month at 0:00 UTC updates and patches will be installed on the Cloud License Server which may require restarting the Cloud License Server. Upon restarting the server, it will be temporarily not available and existing connections will be lost.

5.2 Cloud licensing management and company account on DataKustik website

On the DataKustik website, a company account will be created upon ordering the first cloud license. The initial administrator of the company account will be set by DataKustik according to information provided by the customer during the ordering process. After the initial setup of the company account and its initial administrator by DataKustik, the further administration of cloud licensing (e.g. adding further administrators, users, or requesting identities) via the company account is in the control and responsibility of the customer. Additionally, each user of cloud licenses must have a user account on the DataKustik website and install the application “DataKustik Launcher” for setting up cloud licenses. For more details, please see [1].

6 Bibliography

[1] www.datakustik.com. [Online] 11 2024. https://www.datakustik.com/e-learning-center/technical-notes-1. 2303 Software Licensing Types.