Technical specifications

There are three different main configurations available: CadnaA **Standard,** CadnaA **Basic** and CadnaA **Modular.** They vary only in the number of noise types and number of implemented standards. Plenty of powerful features like grid noise maps (horizontal, vertical), building noise maps, grid arithmetic, distributed calculation (PCSP), multithreading, GIS integration, web export, Dynamic-3D, plot designer and numerous import and export interfaces such as AutoCAD DXF, ESRI Shape files, MapInfo, Open Street Map, ASCII, or QSI are already included in the main configuration. Further features can be added according to the user´s needs by selecting additional options.

CadnaA **versions**

CadnaA **Modular**

- ✓ One noise type
- ✓ One calculation standard for this noise type

CadnaA **Basic**

- ✓ All noise types (industry, road and railway)
- ✓ One calculation standard for each noise type

CadnaA **Standard**

- ✓ All noise types (industry, road and railway)
- ✓ All available calculation standards

Available **calculation standards**

Industry	**Road**	**Railway**	**Aircraft (Option FLG required)**
ISO 9613-2, VBUI CONCAWE VDI 2714, VDI 2720 DIN 18005 (1987) ÖAL Richtlinie Nr. 28 (1987) BS 5228 Nordic General Prediction Method (1996) Nord 2000 Ljud från vindkraftverk Harmonoise, P2P model NMPB08-Industry HJ2.4 (2009 & 2021) Schall 03 (2014) CNOSSOS 2015/996 EU CNOSSOS 2021/1226 EU	NMPB-Routes-96 RLS-90, VBUS RLS-19 DIN 18005 (1987) RVS 04.02.11 (2006) STL 86 SonRoad SonRoad 18 CRTN (1998) TemaNord 1996:525 Czech Method (1996) NMPB-Routes-08 TNM 2.5 (2004) HJ2.4 (2009 & 2021) CNOSSOS 2015/996 [1] CNOSSOS 2021/1226 EU CNOSSOS 2021/1226 DE (BUB 2021) CNOSSOS 2021/1226 AT (RVS 2021)	RMR, SRM II Schall 03 (1990), VBUSch Schall03 2014 DIN 18005 (1987) ONR 305011 Semibel NMPB-Fer CRN TemaNord 1996:524 FTA/FRA (2018) NMPB08-Fer HJ2.4 (2021) CNOSSOS 2015/996 [1] CNOSSOS 2021/1226 EU CNOSSOS 2021/1226 DE (BUB 2021) CNOSSOS 2021/1226 AT (RVE 2022) CNOSSOS 2021/1226 BE (Infrabel 2022) CNOSSOS 2021/1226 FR (SCNF 2022)	DIN 45684 AzB 2008 / ICAN ÖAL 24 ECAC Doc. 29 2nd Edition 1997 ECAC Doc. 29 3rd Edition ECAC Doc. 29 4th Edition Integrated Noise Model (INM 7.0d) AzB 1975, AzB-MIL, LAI-Landeplatzlinie VBUF CNOSSOS 2015/996 EU & DE (BUF 2018) CNOSSOS 2021/1226 EU & DE (BUF 2021)
	[1] containing: CNOSSOS 2015/996 EU CNOSSOS 2015/996 DE (BUB 2018) CNOSSOS 2015/996 AT (RVS 2019)	[1] containing: CNOSSOS 2015/996 EU CNOSSOS 2015/996 DE (BUB 2018) CNOSSOS 2015/996 AT (RVE 2019) CNOSSOS 2015/996 FR (SCNF 2021)	

CadnaA **options** overview

BMP (Bitmap and other interfaces)

- ✓ Bitmap handling (more than 40 different file formats).
- ✓ Google Maps interface.
- ✓ Connection with Web Mapping Services (WMS).
- ✓ Import and visualization of 3D symbols in the 3D special view.
- ✓ Export of results to Google Earth (.kmz).

PRO (Extended RAM usage and additional tools which enhance efficiency)

- ✓ Support of up to 2048 GB of RAM*. Importing and handling of large amount of data within one single project file.
- ✓ 64-Bit software version*. Multithreading up to 64 cores*.
- ✓ Additional tools to speed up and facilitate your work like e.g: Migration assistant, Transfer attributes, Find errors in DTM, Thin out height points, Automatic closing of polygon points.

*requires 64-bit operating system

BPL (Back-tracing of sound power levels)

- ✓ Manual or automatic optimization of noise emission.
- ✓ Calibration of area sources of which the sound power level is unknown.
- ✓ Automatic fixation of noise quota for urban development projects.

X (Extended analysis and postprocessing features)

- ✓ Extended features for analysis and postprocessing, especially valuable for e.g. noise mapping: Object-scan, population density estimation, monetary evaluation, conflict maps.
- ✓ LUA scripting language for automation of CadnaA tasks and many more user-definable customized functionalities.
- ✓ Additional features: automatic closing of polygons, thin out height points.

L (Large scale projects)

- ✓ Calculation with unlimited number of screening objects for large scale projects.

SET (Sound Emission & Transmission)

- ✓ 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.
- ✓ User-defined sound source models.

FLG (Aircraft noise)

- ✓ Calculation of noise contours around airports.
- ✓ Calculation of evaluation parameters such as the number of exceedances or flight statistics.

FLG-RAD (Radar Tracks)

- ✓ Aircraft noise calculation based on radar data.
- ✓ RADAR Import formats: Fanomos, Stanly, Topsonic, user-defined.
- ✓ Time period selection.
- ✓ Group classification according to ICAO-code.
- ✓ Automatic filtering of RADAR tracks.

APL (Air pollution)

- ✓ Calculation of air pollutants distribution for more than 50 pollutants.
- ✓ Exposure maps for air pollutants for industrial and road sources.
- ✓ Import of annual or multi-annual statistics of meteorological parameters.
- ✓ Standardized emission factors for road traffic.

CALC (Distributed calculation)

- ✓ Calculation of complex projects from 5 up to 20 computers simultaneously in a network (with a separate hardlock key installed on the server computer).
- ✓ Can be combined with **Option L** for unlimited number of screening objects.

Calculation technology

☑ Feature included in the software option
☐ The software option marked with this icon is needed as pre-requisite
× Not available due to CadnaA configuration

Feature name	Configuration		Options										
	Modular	**Basic Standard**	**BMP**	**BPL**	**PRO**	**X**	**L**	**FLG**	**RAD**	**SET**	**CALC**	**CALC XL**	**APL**
32-Bit version Use of 2Gb RAM Maximum	☑	☑											
64-Bit version (Use of up to 2048 GB* RAM, *64-Bit O.S. is prerequisite)* **Depends on the Operating System*					☑								
Multi-threaded calculation (up to 32 cores)	☑	☑											
Multi-threaded calculation (up to 64 cores)					☑								
Ray Tracing calculation method	☑	☑											
Angle Scanning calculation method	☑	☑											
Projection at line and area sources	☑	☑											
Maximum order of reflection	20	20											
Batch calculation	☑	☑											
Maximum number of obstacles per project	16 M.	16 M.											
Maximum number of buildings per calculation	1000	1000											
Maximum number of screening objects per calculation	1000	1000											
Unlimited number of buildings and obstacles per calculation							☑						
PCSP distributed calculation (Up to 1000 Buildings and Screening Objects)											☑		
PCSP distributed calculation (Unlimited Buildings and Screening Objects)							☐					☑	
DYNMAP Update of calculated noise maps based on measurements	☑	☑											
Air Pollution AUSTAL2000 Calculation Method													☑

Noise sources

☑ Feature included in the software option
☐ The software option marked with this icon is needed as pre-requisite
× Not available due to CadnaA configuration

Feature name	Configuration		Options										
	Modular	Basic Standard	BMP	BPL	PRO	X	L	FLG	RAD	SET	CALC	CALC XL	APL
Point source **Line source** **Horizontal area source** **Vertical area source** **Tennis point of serve**	☐ Module Industry	☑											
Optimizable area source	☐ Module Industry			☑									
Sound power level input modes: Direct PWL, PWL based on interior sources, PWL based on sound pressure level	☐ Module Industry	☑											
Sound power level based on moving machinery for line and area industrial sources	☐ Module Industry	☑											
Sound power level estimation based on transmission loss and interior level	☐ Module Industry	☑											
Estimation of sound power from the technical parameters of a sound source (32 modules) Fans and Blades (5) | Diesel Motors (4) | Electric Motors (6) | Pumps (13) | Trafo (4)	☐ Module Industry	☑											
Extended database of source modules based on technical parameters (306 source modules included)	☐ Module Industry									☑			
User-defined sound source modules based on technical parameters	☐ Module Industry									☑			
Calculation of sound power level of complex interconnected source systems, accounting for Radiation and Transmission	☐ Module Industry									☑			
Road source **Traffic light-controlled road crossing** **Parking lot**	☐ Module Road	☑											
Railway source	☐ Module Railway	☑											
Airport **Air route source**	×	☐						☑					
RADAR track	×	☐						☐	☑				

Further object types

☑ Feature included in the software option
☐ The software option marked with this icon is needed as pre-requisite
× Not available due to CadnaA configuration

Feature name	Configuration		Options										
	Modular	Basic Standard	BMP	BPL	PRO	X	L	FLG	RAD	SET	CALC	CALC XL	APL
Barrier **Barrier with cantilever** **Barrier with curved cantilever (3D)** **Floating barrier** **Roof edge (3D)**	☑	☑											
Building	☑	☑											
Enbankment	☑	☑											
Bridge plate	☑	☑											
3D-Reflector	☑	☑											
Area of ground absorption	☑	☑											
Foliage area	☑	☑											
Built—up area	☑	☑											
Cylinder	☑	☑											
Contour line	☑	☑											
Line of fault	☑	☑											
Height point	☑	☑											
Area of designated land use	☑	☑											
Bitmap Object			☑										
Section	☑	☑											
Text box	☑	☑											
Auxiliary polygon	☑	☑											
Symbol	☑	☑											
3D Symbol			☑										
Station	☑	☑											
Horizontal calculation area	☑	☑											
Vertical calculation area	☑	☑											
CadnaB building Sound source and obstacle object for the interoperability with CadnaB (requires CadnaB as additional separate software)	☑ Module Industry	☑											

Calculation results and postprocessing

☑ Feature included in the software option
☐ The software option marked with this icon is needed as pre-requisite
× Not available due to CadnaA configuration

Feature name	Configuration		Options										
	Modular	Basic Standard	BMP	BPL	PRO	X	L	FLG	RAD	SET	CALC	CALC XL	APL
Calculation at receiver points	☑	☑											
Partial levels at receiver points	☑	☑											
Calculation protocol for receiver points	☑	☑											
Building noise maps	☑	☑											
Horizontal grid calculations	☑	☑											
Vertical grid calculations	☑	☑											
Unlimited number of grid receivers	☑	☑											
Calculation of up to 4 evaluation parameters	☑	☑											
Arithmetic of grids Up to 7 grid collections (4 eval. parameters and terrain)	☑	☑											
Noise evaluation parameters L_{Day} | $L_{evening}$ | L_{night} | L_{dn} | L_{de} | L_{en} | L_{den} | L_{to} (CRTN)	☑	☑											
Calculation of the loudest hour level L1hMax for day, evening and night	☑	☑											
Calculation of L_{max} for industrial sources	☑	☑											
User defined noise evaluation parameters	☑	☑											
Partial noise-type related evaluation parameters e.g. Industry Noise Map in projects with other types of noise sources (such as roads)	☑ Need 2 modules	☑											
Multiple source effect Calculation according to VDI3722, Miedema and EU Directive 2020/367	☑	☑											
Frequency maps	☑	☑											
Uncertainty maps (combined uncertainty for source and propagation) SigmaD | SigmaE | SigmaN	☑	☑											
Calculation of terrain maps	☑	☑											
Automatic optimization of noise barriers	☑	☑											
Pass-By level calculations for traffic Sources time-based sound pressure levels based on passing sound sources like cars or trains.	☑	☑											
3D Pass-by level based auralization	☑	☑											
Aircraft related noise evaluation parameters DNL | CNEL | LAEQ | LAEQd | LAEQn | SEL | LAMAX | EPNL | PNLTM *relevant with INM/ECAC 3ᵈ/CNOSSOS Standards	×							☑					
Calculation of wake-up reactions during night period	×							☑					
Number of Aircraft Events Above Threshold NATd | NATe | NATn | SigmaNATd | | SigmaNATe | SigmaNATn	×							☑					

Feature name	Configuration		Options										
	Modular	**Basic Standard**	**BMP**	**BPL**	**PRO**	**X**	**L**	**FLG**	**RAD**	**SET**	**CALC**	**CALC XL**	**APL**
Evaluation of maximum Level statistics FlgStatD | FlgStatE | FlgStatN | SigFlgStatD | SigFlgStatE | SigFlgStatN	×							☑					
Automatic generation of noise protection zones	×							☑					
Automatic generation of conflict maps	×					☑							
Estimation of the population density	×					☑							
Monetary evaluation according to BUWAL method Evaluation of noise reduction measures with regards to the reduction in value of rented flats caused by high noise levels	×					☑							
Noise impact evaluation by single number ratings	×					☑							
Object Scan Statistical Evaluation of object attributes or calculated values by using expressions. Includes predefined settings for EU Directives 2015/996, 2020/367 and 2021/1226	×					☑							
3D animated noise maps Noise map video captured from the 3D view for moving sources	×					☑							
Air pollution maps for different components: Benzene, F, NH3, NO, NO2, NOx, SO2, Tetrachlorethylen, As, Cd, Hg, Ni, Pb, Tl, PM10 (fine particles), and odor													☑

Import formats

☑ Feature included in the software option
☐ The software option marked with this icon is needed as pre-requisite
× Not available due to CadnaA configuration

Feature name	Configuration		Options										
	Modular	Basic Standard	BMP	BPL	PRO	X	L	FLG	RAD	SET	CALC	CALC XL	APL
AutoCAD (.dxf)	☑	☑											
Trimble SketchUp 2015 (.skp)	☑	☑											
Trimble SketchUp 2019 (.skp)					☑								
GIS formats ESRI Shape files (.shp) | Atlas GIS (.bna) | GYpSiNOISE | MapInfo (.mif) | AED-Sicad	☑	☑											
ASCII formats ASCII-Objects | ASCII-Grid DTM (.asc) | ASCII-Spectra | Building Height Points | Winput-DGM | Numbers of Trains (.txt) | Height points (.xyz)	☑	☑											
Noise software formats CadnaA | SoundPLAN | LimA	☑	☑											
XML formats Open Street Map (.osm) | GML | CityGML | NMPB08-Trains (.xml)	☑	☑											
Other formats EDBS | T-Mobil | Slip | SOSI | NTF | STRATIS (.cst) | Noise Mapping England (.nme)	☑	☑											
QSI Interchange format according to DIN 45687	☑	☑											
Other CAD formats AutoCAD (.dwg) | Microstation (.dgn)			☑										
Google Maps interface			☑										
Import from Web Mapping Services (WMS)			☑										
Bitmap formats CALS Raster, DCX, DWF, ECW, IMG, GIF, ICA, JFIF, JPEG, JTIF, LEAD CMP, PCT, MAC, MSP, MPT, OS/2 Bitmap, PCD, PCX, PSD, PNG, PostScript Raster, RAS, TIFF, TIFF CCITT, LZW, TARGA, BMP, WMF), WinFax Group 3, WinFax Group 4, WPG WordPerfect raster files			☑										
Raster formats CadnaA Grids (.cnr) | ESRI-ASCII Grids (.asc, .hdr) | ASCII-Grids (.rst) | LimA Grids (.ert) | SoundPLAN Grids | IMMI Grids (.ird) | AUSTAL Grids (.dmna) | Miskam Grids (.zwk) | NMGF Grids (.grd)	☑	☑											
Aircraft INM import formats ANP Database | INM Study | INM Operations **Only with INM Calculation Standard*	×							☑					
Import of RADAR tracks FANOMOS | STANLY | Topsonic | User-Defined	×							☐	☑				
Import from MS Excel files	☑	☑											
ODBC— interface Import of external databases of object´s attributes and libraries (I.e. Sound Power Levels, Absorptions, Noise Reduction Indices, directivities and measurements from sound analyzers.	☑	☑											
Import of annual or multi-annual statistics of meteorological parameters (.akt, .akterm)													☑
Import of directivities of loudspeakers in CLF format (*.CF1 , *.CF2 and *.XHN)	☑	☑											

Modelling tools and project organization

☑ Feature included in the software option
☐ The software option marked with this icon is needed as pre-requisite
× Not available due to CadnaA configuration

Feature name	Configuration		Options										
	Modular	Basic Standard	BMP	BPL	PRO	X	L	FLG	RAD	SET	CALC	CALC XL	APL
Actions applied to single objects Edit, Delete, Import here, Duplicate, Force Rectangle, Orthogonalize, Convert to, Transformation, Generate Label, Parallel Object, Break Lines, Break Areas, Simplify Geo, Spline, Modify Order of Points, Break into Pieces, Connect Lines, Fit DTM to Object, Fit Object to DTM, Hyperlink, Generate Station, Edit Facades, Generate Radiating Building, Set Length, Generate Rails, Cross Section, Generate Floors, Snap Object to Façade	☑	☑											
Actions applied to multiple objects ("modify objects" command) Delete, Modify Attributes, Duplicate, Force Rectangle, Orthogonalize, Object Snap, Modify order of Points, Spline, Simplify Geo, Break into Pieces, Connect Lines, Transformation, Convert to, Generate Rails, Generate Station, Generate Building Evaluation, Generate Label, Generate Floors, Parallel Object, Activation, Swap Name/ID, Delete Duplicates, Fit DTM to Object, Fit Object to DTM	☑	☑											
Object Tree Project Organization in hierarchical structure	☑	☑											
Up to 16 variants/scenarios per CadnaA project file	☑	☑											
Assignment of groups to variants	☑	☑											
User-defined Global and Local libraries Sound Levels (Sound Power Levels and Sound Pressure Levels), Absorptions, Sound Reduction Indices, Directivities, 2D & 3D Symbols, Diurnal Patterns, Road Surfaces, Road Types and Vehicle Classes, Parking Lot Movements, Train Classes, Color Palettes	☑	☑											
Default Library Always includes latest datasets for many of the above-mentioned libraries including e.g. Road and Railway related Datasets for many national implementations of EU Directives 2015/996 and 2021/1226.	☑	☑											
Library Manager	☑	☑											
Lua scripting e.g. for task automation	×					☑							
Additional action for multiple objects ("modify objects" command) Lua command	×					☑							
Automatic closing of auxiliary polygons	×				☑	☑							
Thin out height points	×				☑	☑							
Find errors in DTM					☑								
Transfer attributes					☑								
Migration assistant RLS90->RLS19 data conversion for existing project file when switching calculation standard					☑								
Automatic filtering of RADAR—tracks	×							☐	☑				

Presentation of results and 3D visualization

☑ Feature included in the software option
☐ The software option marked with this icon is needed as pre-requisite
× Not available due to CadnaA configuration

Feature name	Configuration		Options										
	Modular	Basic Standard	BMP	BPL	PRO	X	L	FLG	RAD	SET	CALC	CALC XL	APL
Display of calculated rays in 2D view	☑	☑											
2D Horizontal noise maps Iso dB-Lines, noise contours, Raster Oversampling	☑	☑											
2D Vertical noise maps Iso dB-Lines, noise contours, Raster Oversampling	☑	☑											
Building noise maps in 2D view Ribbons, Spheres, Octagons, Level boxes	☑	☑											
Pass-by level graph for line sources	☑	☑											
Pass—by based 3D auralization of traffic sources	☑	☑											
2D animated noise maps for line moving sources	☑	☑											
Plot—Designer	☑	☑											
User defined table of results	☑	☑											
Open-GL based 3D visualization	☑	☑											
Selection and edition of objects in the 3D view	☑	☑											
Recalculation of DTM and objects directly in 3D view	☑	☑											
Free movement and save up to 10 predefined views	☑	☑											
Appearance of objects in 3D depending on attributes	☑	☑											
Display of calculated rays in the 3D view	☑	☑											
Display of 3D directivities in the 3D view	☑	☑											
Display of horizontal noise maps in 3D view Projected or at the real height	☑	☑											
Display of vertical noise maps in 3D view	☑	☑											
Noise map of buildings Color map, Spheres, Octagons, Level boxes	☑	☑											
Display of text labels in 3D view	☑	☑											
Display of ground maps in 3D view	☑	☑											
Import and visualization of 3D symbols (*.obj format)			☑										
Animation of 3D symbols (rotation)			☑										
Stereoscopic 3D display with passive 3D glasses *Compatible 3D TV required	☑	☑											
Interactive scene video recording (.avi) from 3D view	☑	☑											
Display of lightning sources (street lights)	☑	☑											
Import of skybox ambient images			☑										
Import of facade images to the buildings			☑										
Projection of background images i.e. Google Maps or aerial imagery			☑										

Export formats

☑ Feature included in the software option
☐ The software option marked with this icon is needed as pre-requisite
× Not available due to CadnaA configuration

Feature name	Configuration		Options										
	Modular	**Basic Standard**	**BMP**	**BPL**	**PRO**	**X**	**L**	**FLG**	**RAD**	**SET**	**CALC**	**CALC XL**	**APL**
AutoCAD— DXF	☑	☑											
GIS formats ESRI /ArcInfo (.shp) | ArcView Grid (.asc, .hdr) | GYpSiNOISE	☑	☑											
ASCII formats Text Files (.txt) |Building Height Points | Numbers of Trains (.txt) | Rich Text Format (.rtf) | Compact Protocol	☑	☑											
Export of full reports to Ms Office Ms Word (.docx) | Ms Excel (.xlsx)	☑	☑											
Noise software formats LimA (.bna, .bnx) | Immis-Luft (.dbf)	☑	☑											
QSI Interchange Format According to DIN 45687	☑	☑											
Google SketchUp Materials (.skm)	☑	☑											
Bitmap Files (.bmp)			☑										
Google Earth (.kml)			☑										
Web Bitmaps PNG files at different magnification levels			☑										
AzB related export formats **Az**B-QSI, AzB-DES, AzB-XML, AzB-Lmax, AzB-Segment, AzB-Zones	×							☑					
SET-T Graph (.gv)										☑			
Grid formats CadnaA Grids (.cnr) | ASCII-Grids (.rst) | LimA Grids (.ert) | NMGF Grids (.grd)	☑	☑											
QSI Statistical Analysis report DIN 45687	☑	☑											

CadnaA recommended packages

Software Package	Configuration		Options										
	Basic	**Standard**	**BMP**	**BPL**	**PRO**	**X**	**L**	**FLG**	**RAD**	**SET**	**CALC**	**CALC XL**	**APL**
CadnaA **BASIC BMP**	☑		☑										
CadnaA **STANDARD BMP**		☑	☑										
CadnaA **BASIC NOISE MAPPING**	☑		☑			☑	☑						
CadnaA **STANDARD NOISE MAPPING**		☑	☑			☑	☑						

The information presented in this document refers to **CadnaA 2022 MR2** (August 2022) and is subject to changes without notice.