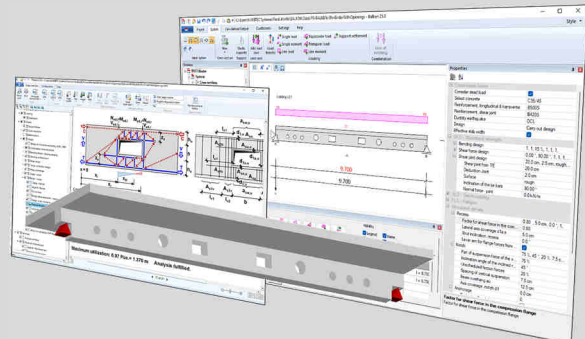


BALKEN

BALKEN Basic Module	Continuous RC beam basic module
BALKEN Reinforcement	Reinforcement selection from design
BALKEN Prestressing	Prestressing with subsequent bonding
BALKEN Steel beam	Verifications continuous steel beams
BALKEN Timber beam	Verifications continuous timber beams

Analysis and design of continuous beams: Reinforced / Prestressed Concrete, Steel- & Timber

- Design according to DIN and EN (2010-12) with NAs for DE, AT, SK/CZ & UK
- Clear, configurable working environment
- Material change between reinforced concrete, prestressed concrete, structural steel and timber
- Efficient and fast input for simple systems
- Load transfer from and to other positions
- Different language settings for input and output
- Output as short list, long list and detail list with integrated graphics and diagrams
- Verification overview with all information



BALKEN can be used to calculate and dimension continuous beams in structural engineering made of reinforced and prestressed concrete, structural steel and timber. The program has a configurable graphic-interactive working environment for the input and output. With BALKEN, straight continuous beams including single span beams as well as cantilever beams with or without elastic bedding can be calculated. The design of openings and notches, the verification of serviceability and fatigue or proofs for refurbishment of existing structures are included. A prestressing bed or subsequent prestressing can be defined with an additional option.

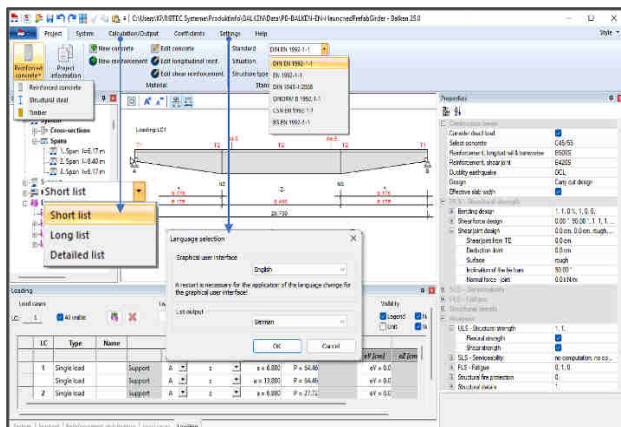


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For simple and complex engineering tasks

The current edition of the BALKEN program is a versatile and powerful application for complex calculation and design tasks involving straight continuous beams in building construction made of reinforced and prestressed concrete, as well as steel or timber. The calculation and design of any static systems is based on finite element technology. BALKEN features a modern, graphically interactive working environment for the input and output.

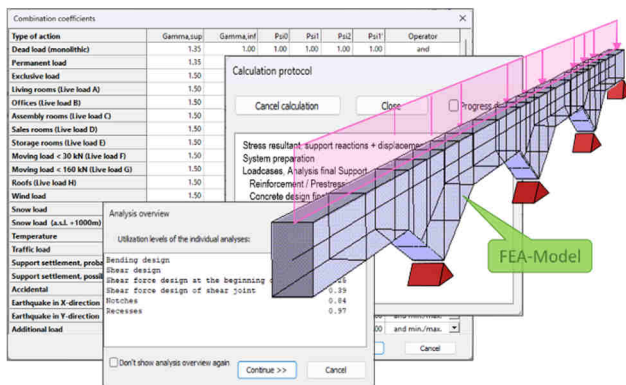


The current version of BALKEN has been further improved and optimised and offers the following advantages with various options:

- Modern interface with ribbon menu, quick access bar, object tree and property tables, as well as 2D/3D view
- Graphics with sensitive elements and dimension chains, as well as immediate display of all changes
- Consistent material change for reinforced concrete, prestressed concrete, structural steel or timber
- Verifications for DIN & EN, NAs for DE, AT, SK/CZ & UK
- Efficient input via quick entry, from templates or via user-defined data sets
- Load transfer and transfer from other positions
- Combination formation for non-linear calculations
- Clear program control, configuration and independent language settings for DE, UK and CZ
- Modern table-oriented and repeatable results list with integrated graphics and diagrams
- Results output with configuration and filter options as short list, long list and detailed list
- Compact output of verifications as a summary

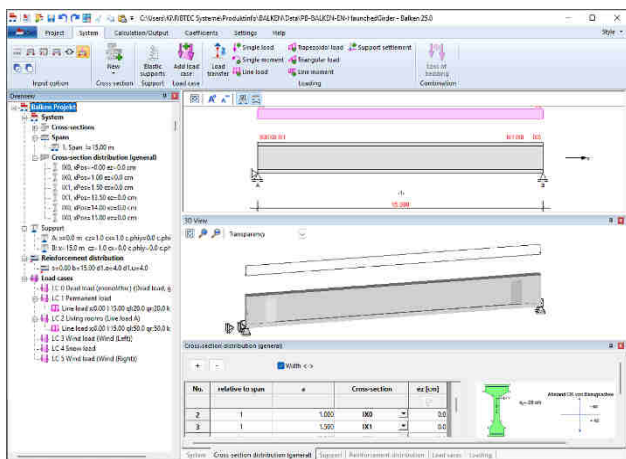
Product information

With BALKEN, you are using a structural analysis program that has repeatedly proven itself both in day-to-day business and in solving complex tasks.



User-defined program configuration

The BALKEN working environment is delivered in a preconfigured version and can be fully tailored to the user's needs. The visibility and arrangement of the program windows can be freely adjusted and also adapted to a workstation with two screens. In addition, the object properties, calculation options, partial safety factors and combination coefficients can be individually adjusted.



Versatile system input and load functions

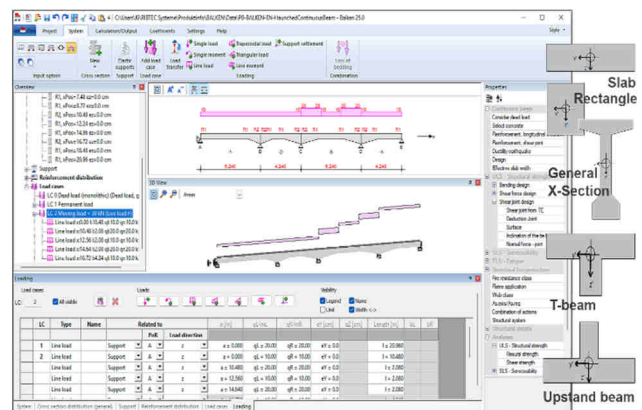
Any continuous beam systems, including single-span and cantilever beams, can be specified for all beam types. In the case of steel and prestressed concrete beams, it is also possible to specify any haunched systems. Rigid or elastic bearings with automatically determined spring characteristics can be defined.

The determination of internal forces and deformations is performed for specified load cases. For superposition and design, the structural self-weight or build-out, traffic, wind and snow loads as well as temperature stress or support settlement can be used as load attributes. The loads can be generated across fields and load case-related. Load cases can also be generated by copying field by field or copying with spacing. The following load types are available:

- Uniform, triangular and trapezoidal loads
- Variable loads within or across fields
- Single loads and arbitrary torsional loads

The loads can be transferred to other positions or taken over from other positions. The loads can be arranged either centrally or eccentrically.

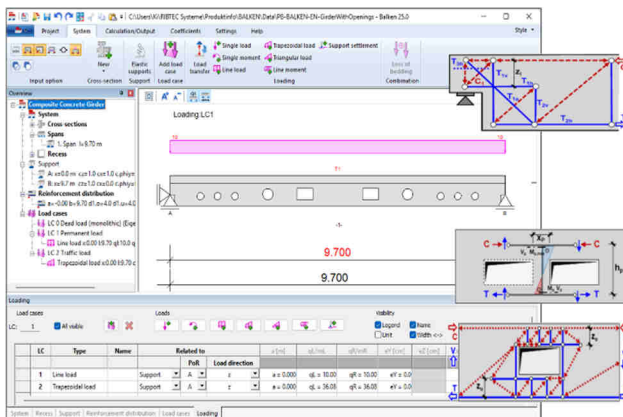
The extreme design combinations are created automatically and taken into account for permanent and temporary or even exceptional design situations.



Continuous RC-beam (BALKEN basic module)

Reinforced concrete design for building construction with uniaxial loading is possible in accordance with DIN 1045-1, EN 1992-1-1:2010-12 and corresponding NAs for DE, AT, SK/CZ and UK. Specifically, the following tasks can be solved with BALKEN:

- Homogeneous rectangular, plate beam, plate and double-T cross-sections with variable flange and web thicknesses as well as upstand beam-sections
- Input of standardised haunches with arbitrarily variable progression including cross-section jumps
- Simple symmetrical and, in special cases, asymmetrical cross-section shapes are possible, but these are designed uniaxially
- Static systems with an unlimited number of fields, automatically taking into account the contributing slab widths for the determination of internal forces
- Consideration of normal-strength concrete (up to C50/60), high-strength concrete (C55/67 to C100/115), ultra-high-strength concrete (UHPC140)
- Concrete steel reinforcement (up to B550), high-strength concrete steel reinforcement (SAS670) or glass fibre reinforcement (ComBAR)
- Linear internal force determination with automatic formation of all design combinations
- Linear internal force determination with moment redistribution, taking into account the redistribution limits
- Moment rounding and automatic consideration of minimum clamping and loads near supports
- Complete reinforced concrete design in ULS
- Minimum and ductility reinforcement
- Bending capacity due to NM interaction
- Shear capacity due to V-T-VT interaction
- Design of the web connection and the composite joint
- Tabular fire protection

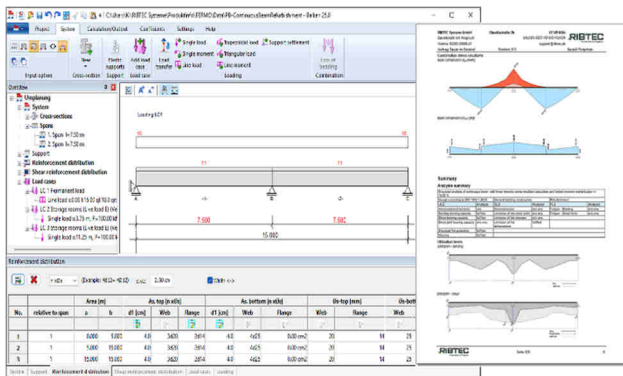


Detail verification (BALKEN basic module)

For reinforced and prestressed concrete components, it is possible to dimension various discontinuity areas:

- Small and large openings (recesses) in accordance with DAfStb Heft 399/599 and DAfStb Heft 459
- Post design for closely spaced openings < 0.8 h
- Design of geometric discontinuity areas for offset supports (notches)

These details are dimensioned in accordance with the specifications in the technical literature using the truss and analysis models specified therein. For example, small, large and closely spaced recesses are recognised by the program and dimensioned accordingly. The output describes the arrangement of the required reinforcement using reinforcement sketches, so that the structural design of individual discontinuity areas can be carried out directly.



SLS-, FLS design and refurbishment (basic module)

For reinforced concrete and prestressed concrete beams, additional verifications for serviceability and fatigue can be provided. The following verifications can be provided on request:

- Minimum reinforcement of crack width for thin and thick components
- Minimum reinforcement due to dissipation of hydration heat in slabs
- Limitation of crack width
- Limitation of concrete and steel stresses in cracked state
- Limitation of deformations in uncracked state
- Limitation of effective deformations in cracked state for $l_{eff}/250$ and $l_{eff}/500$

- Deformations optionally for quasi-permanent, frequent or rare combinations of actions
- Verification against fatigue of longitudinal reinforcement and concrete pressure stage 2
- Verification against fatigue of transverse or stirrup reinforcement
- Determination of fatigue strength by specifying the number of load cycles
- Load-bearing capacity verifications for existing structures with utilisation rates for specified longitudinal and shear reinforcement, taking into account a possible corrosion damage

For all verifications in the limit states of load-bearing capacity, serviceability and fatigue, a genuine design is carried out, i.e. a hierarchical, iterative increase in reinforcement from verification to verification. The deformation in the cracked state is limited by the required reinforcement, which has been determined for the sequence of all verifications. In building renovation, the bending and shear reinforcement can be specified and the utilisation rates determined.

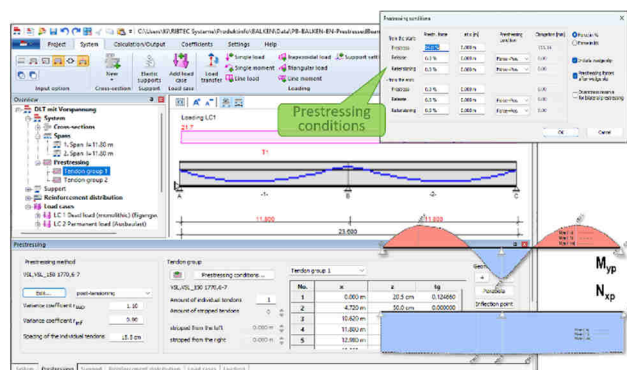
Prestressed beams (BALKEN Prestressing)

The processing and dimensioning of prestressed building systems is available as an option. In addition to bed prestressing, post-tensioning with subsequent bonding or prestressing without bonding is also possible. The graphical interactive working environment allows the prestressing tendon geometry to be edited as a straight line or any parabola with the geometry specified by support points in the dialogue. In the case of post-tensioning, a standard geometry can be generated automatically.

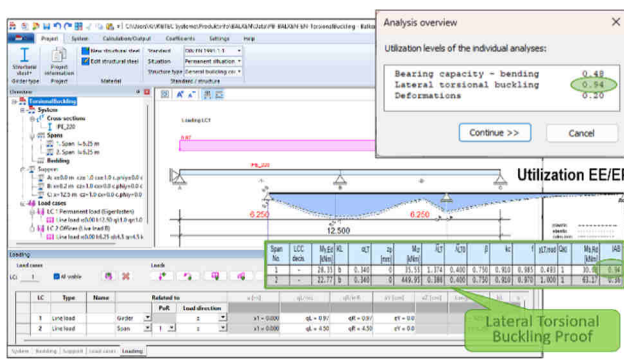
The following processing options are available for prestressed beams:

- Single-stage prestressing with immediate or delayed bonding
- Database with all common prestressing methods
- Prestressing with up to 4 tensioning conditions per side, including wedge slip
- Prestressed concrete design taking into account creep, shrinkage and relaxation ($t = 7d, 28d, 36500d$)
- Gap reinforcement for tendons in immediate bond

The prestressing option is a powerful add-on module that allows complex tendon geometries to be entered quickly with direct graphical control.



Product information



Continuous steel beams (BALKEN steel beams)

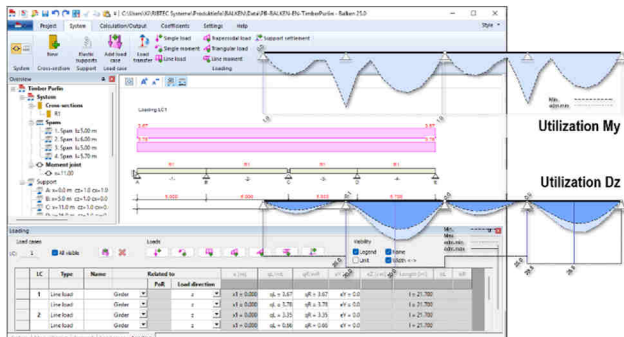
Steel design for building construction is available in biaxial form, optionally in accordance with DIN 18800, EN 1993-1-1:2010-12 and corresponding NAs for DE, AT, SK/CZ & UK. Specifically, BALKEN can be used to solve the following tasks:

- I, T, U, O and rectangular hollow sections from the profile database and welded, symmetrical profiles
- Constant cross-section profile across the field
- Cross-section classification and elastic stress calculation EE due to NM-V-T interaction
- Automatic plastic verification EP if elastic stress verification is exceeded
- Bending-torsional buckling for I-profiles
- Deformations optionally for quasi-permanent, frequent and rare load combinations

Continuous timber beams (BALKEN timber beams)

Wood design for building construction is available in biaxial form, optionally in accordance with EN 1995-1 and corresponding NA for DE, AT, SK/CZ and UK. The following tasks can be solved for timber components using BALKEN:

- Rectangular profiles made of softwood, hardwood and glued laminated timber
- Constant cross-section across the entire field
- Stress and bending torsion buckling checks taking torsional stress into account
- Determination of bearing pressure
- Fire protection in tabular form (EN 1995-1-2:2010-12)
- Limitation of deformations for initial (w_{inst}) and final deformations (w_{fins})

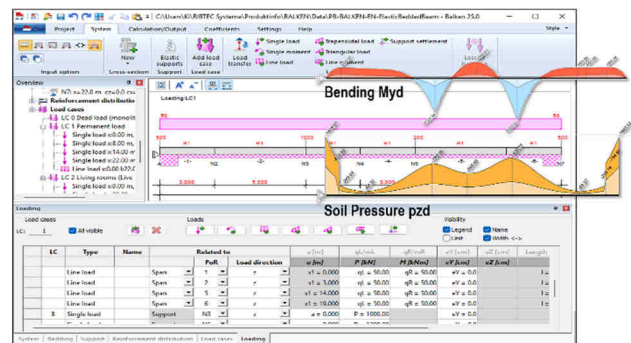


Elastically bedded beam (BALKEN basic module)

An elastic bedding can be included in the system as an option for all material variants.

- Elastic bedding according to the bedding module method with or without tensile failure for reinforced concrete DLT
- Consideration of a subsidence, longitudinal and rotational bedding

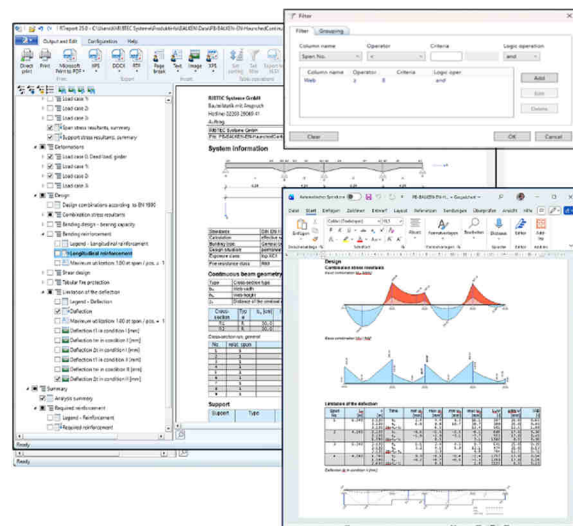
- Definition of any foundation sections
- Conversion of the bedding into stiffness modulus
- Determination of base pressure forces
- Nonlinear internal force determination in case of foundation failure
- Automatic combination formation for temporary (BS-T/GEO-2) and permanent situations (BS-P/GEO-2/GzT)
- Automatic combination formation for deformations (GzG)
- Component design with 1.0-fold non-linear internal forces



Configurable result list (BALKEN basic module)

The result list, including graphics, can be configured and printed out specifically for each office. This ensures that only the information that is important and desired is printed. Output control is multi-level. The output of input values, stress resultants, deformations, etc. can be controlled globally. Short, long and detailed outputs are available with individual specifications.

A preview function allows you to view the entire document. The list output with the included graphics can be finalised by making the appropriate selections in the table of contents. Filters can be used for tables to reduce the content to the essentials. This configuration is maintained even after the data are saved and can be also used as a template if desired.



The list layout can be customised in many ways in terms of format and header and footer design, and saved as a company or user template. Project information can also be integrated using field functions. Documents can be further edited digitally by exporting them to MS Word/Excel, PDF, XPS and VCmaster.