Timber Column HO1+

Contents

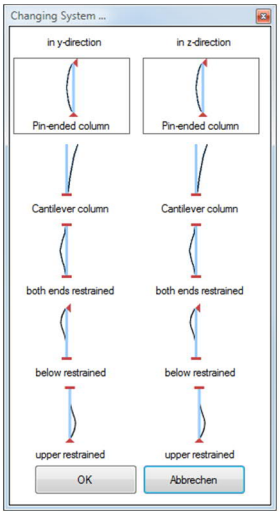
Basic Documentation – Overview

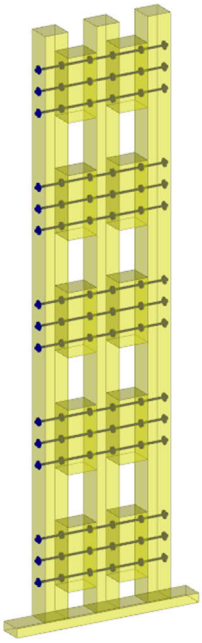
In addition to the individual program manuals, you will find basic explanations on the operation of the programs on our homepage www.frilo.com in the Campus-download-section.

Application options

The HO1+ application is suitable for the design of timber columns.

Available are single-piece (circular, rectangular) and multi-piece cross sections that are connected to each other in a yielding manner. All partial cross sections of columns and spacers are the same and have the same moduli of elasticity.





Available standards

- EN 1995
- DIN EN 1995
- ÖNORM EN 1995
- NTC EN 1995
- BS EN 1995

Available structural systems:

- Cantilever columns
- Hinged columns with and without cantilever

Loads

Vertical loads: concentrated loads with eccentricities in the directions of both main axes.

Horizontal loads: distributed loads, block loads, trapezoidal loads, concentrated loads; all loads can apply in the direction of the main axes and with eccentricities.

Hot design

For one-part / composite cross-sections, verifications under fire exposure are available.

Calculation

Internal forces are determined according to theory 1st order. The design is carried out according to EN 1995 chapter 6. The stability verifications are carried out according to the equivalent bar method.

For the calculation of composite cross sections with yielding connections, the cross sectional properties are calculated for an ideal individual member. Subsequently, internal forces and deformations (with and without creep) are determined on the ideal member. In addition, the internal forces in the individual cross sections are determined.

The verifications are carried out on the ideal member and on the end cross sections. Verifications of the connecting components between the individual cross section parts (wood spacers, diagonal struts, fasteners) are performed in the connection.

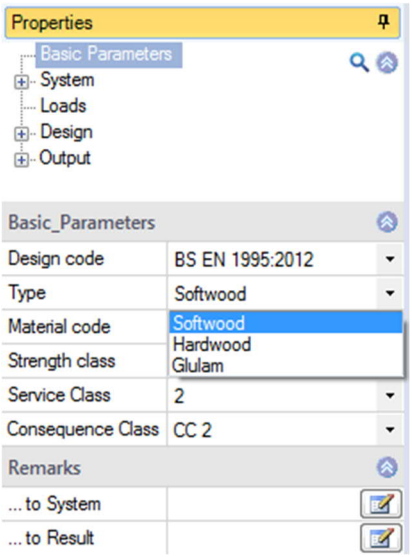
Note: *The calculation of composite, flexibly connected cross-sections (EN 1995 Annexes B and C) is approximation, mainly for hinged columns with predominantly axial force and small transverse loads from wind. Complex systems may in certain circumstances not sufficiently accurately recorded and in individual cases require expert control.*

Fasteners

- Round nails
- Bolts
- Glue
- Dowel pins
- Fit bolts
- Special dowels

Data entry

The definition of properties and control parameters is done in the menu of the left screen section. You can check the effect of the entered values in the graphical representation on the right screen section.
Fundamental information on the data-entry area and the data-entry options in the 3d graphical user interface is available in the document "Basic Operating Instructions-PLUS".



Definition wizard

The wizard is automatically launched when you start the software. It supports the user in defining the most important parameters for a new item. With the help of the wizard, you can quickly define a structural system and gain a first impression of the results. Subsequently, you can customize secondary parameters in a second step.

Note: You can disable the automatic start of the wizard via the corresponding option on the bottom of the window.

Basic parameters

Select the desired standard, the material (Softwood, Hardwood, Glulam or STEICO laminated veneer lumber), the usage class and the consequence class.

Structural system

Column type and supports

Column type see ill.

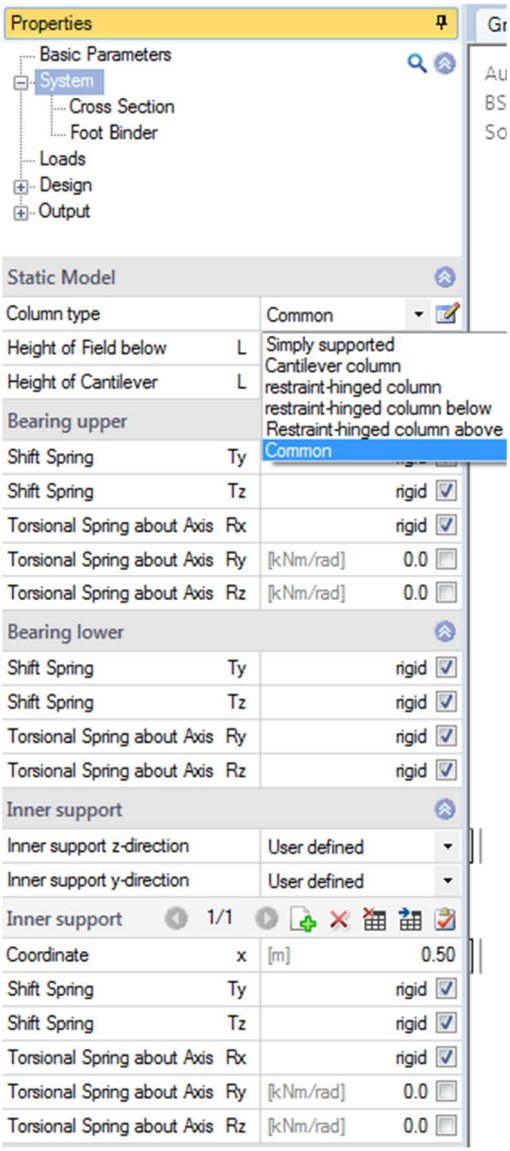
L Height of span on bottom and projection on top.

Supports

Here you specify the translational and torsional springs in the direction of and around the x and y axis for the upper and lower bearings. For a rigid support mark the appropriate option.

Furthermore, additional intermediate supports can be defined in the center of the column, the third and quarter points or at a user-defined position (coordinate x).

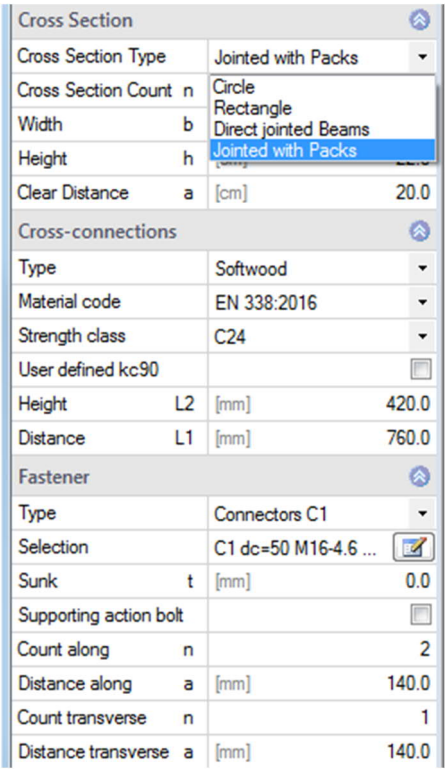
See also table toolbar.



Cross section

Type of cross section
- Circular
- Rectangular
- Multi-piece, direct connection
- Multi-piece with wood spacers

Tip: After having selected the type of cross section, the corresponding data-entry fields are displayed in the dialog area on bottom.



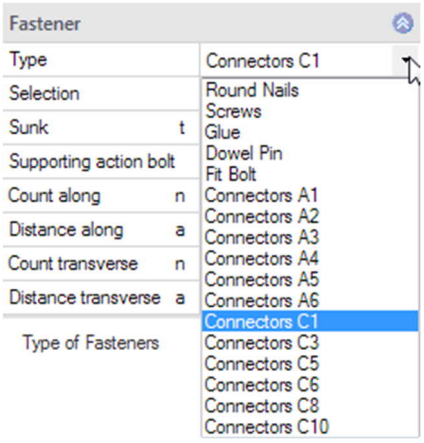
n	number of cross sections (2, 3 and/or 4)
d	diameter with circular cross sections
b/h	cross sectional dimensions of a rectangular column
a	clear distance of the column parts

Cross connections

Type/Material	a selection list is displayed.
Strength class	Strengths and stiffnesses can be customized if necessary. The dialog for changing the values can be called up by pressing the F5 key in the input field of the strength class. Basis of the design is the material derived from the standard.
... kc90	Optional entry of a value that better suits the situation.
L1	distance of the connecting components (in the z-direction, see also the graphical representation)
L2	height of the individual connecting components

Fasteners

The corresponding data-entry fields are displayed when you select a multi-piece cross section.



Type	first select the type of fasteners (nails, bolts, etc.). The corresponding data-entry fields are displayed after the selection of the type: - Round nails - Bolts - Glue - Dowel pins - Fit bolts - Special dowels The corresponding data-entry fields are displayed after the selection of the type.
Selection	click on the  button to access the fastener selection dialog. After having selected the type, the corresponding parameters displayed with defaults.

You can edit and customize the parameter setting if required. Click on the individual data-entry fields, options or selection lists to display a brief description in the information area (below the data-entry fields).

Foot binder (sleeper)

Tick this option to define a foot binder

Direction select the direction of the foot binder.

Specify the width, height, projections and the material of the foot binder.

Foot Binder			
Foot Binder			☑
Preselection			Timber
Type			Softwood
Material code			EN 338:2016
Strength class			C24
Direction			Y
Width	b	[cm]	16.0
Height	h	[cm]	6.0
Edge distance left	a	[cm]	20.0
Edge distance right	a	[cm]	20.0
Capacity transverse Pressure			User defined kc90
Coefficient	kc90		1.00
Load distribution plate			☐

Load-bearing capacity under transverse compression

Threshold pressure kc,90 automatically:

- HO1+ determines kc,90.

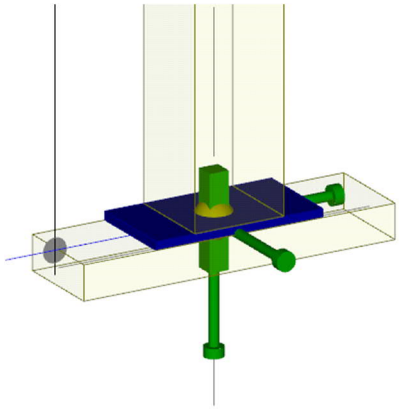
User defined kc90:

- The user can enter a value which suits better to the situation.

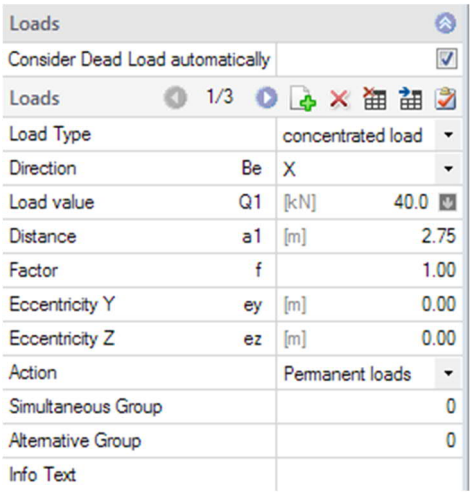
Load distribution plate

Component for load balancing, for example, a steel plate to reduce the compression.

Without design, without consideration of eccentric load position during compression.



Loads



Self-weight ... If you tick this option, the self-weight of the components is automatically taken into account.

Plump line offset h/ specify the plump line offset/inclination. Example: for h/200 enter the value "200". Enter "0", if there is no plump line offset.

Load cases

Define the first load case directly in the data-entry mask.

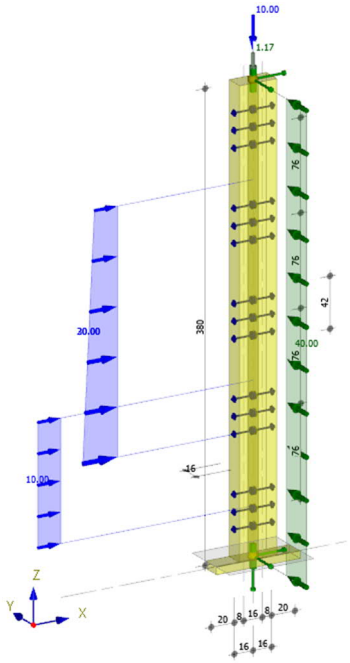
Add additional load cases with the help of the load case toolbar:

- see Data entry via tables (basic operating instructions)

To add a load case always set up a new load case via the  button (an empty load case mask is displayed each time).

Alternatively, add additional load cases via the load case table, which is accessible on the „Loads“ tab (below the graphic screen).

Tip: A description is displayed in the status line each time you click into a particular input field.



Type of load concentrated, uniformly distributed, block or trapezoidal load. *Note: The corresponding data-entry fields are displayed for each of the selected load types on the bottom of the screen.*

Direction the direction of action of the load: X/Y/Z – the load is shown in the 3d GUI and you can check your specifications - *tip: use the different view options*.

Ordinate Q1 load value Q1 (lower load value with trapezoidal loads).

By clicking on the arrow icon  you can access a load value summary - see the description of the LOAD+ application.

Distance a1 distance of the load or the lower load value to the base point

Load value Q2 upper load value with trapezoidal loads

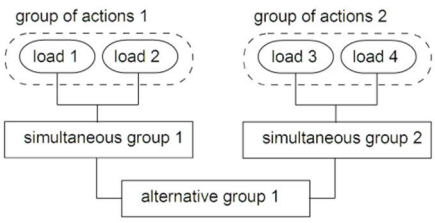
Length L2 with block and trapezoidal loads: length of the load

Factor f specification of a factor that multiplies the load value. Useful e.g. for entering a line load = area load [kN/m²] * factor influence width [m] = kN/m.

Action group select an action group from a list

Concurrent group loads of a particular action group can be defined as "always acting simultaneously"

Alternative group different variable load cases with similar actions can be assigned to an alternative load case group via the allocation of an alternative group number. Only the decisive load case of this alternative load case group is invoked in the superposition.



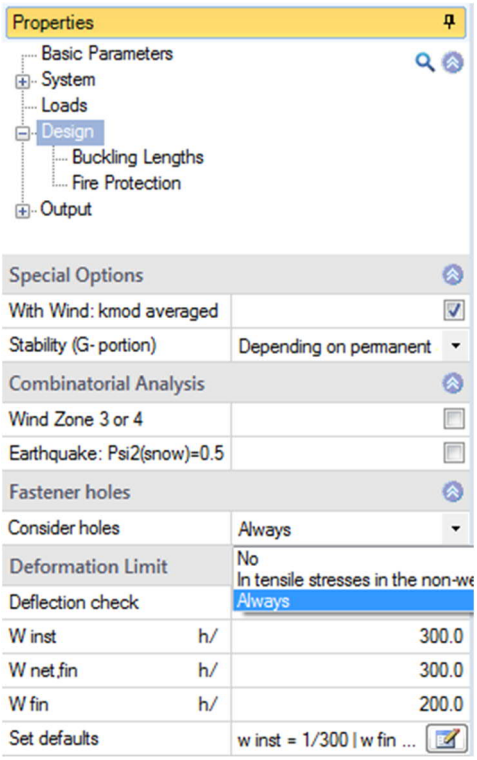
Info text you can add a comment to each load case.

Design

Special options

Win: kmod — for wind (EN 1995), kmod(short) is used. According to some NA´s averaged kmod(short/very short) can be taken into account. Tick the option to calculate the averaged value according to NA.

G-portion — determines how the portion of permanent loads for the stability are calculated in each combination:
- no G-portion
- permanent loads
- permanent and quasi-permanent loads



Combinatorics

Wind zone 3 or 4 — in the wind zones 3 and 4, snow must not be taken into account as accompanying action when wind is the leading action.

Earthquake: Psi2 — in some countries, Psi2 for snow must be set to 0.5 in earthquake combinations.

Fastener holes

For shear- and stress analysis of the end sections of the composite cross sections fastener holes can be taken into account.

no: Not taken into account

always: Holes will be taken into account

in tensile stresses...: Only with tensile stresses in the weakened crosssection the fastener holes will be taken into account. We assume that the steel in compression closes the hole positively.
Areas without steel generally will be taken into account.

Deformation limits

Deformation check — checking this option triggers the verification and output of the deformation resistance.

W inst — limitation of deformation, elastic portion, for serviceability verifications.

W fin — limitation of deformation, elastic portion including creep, for serviceability verifications.

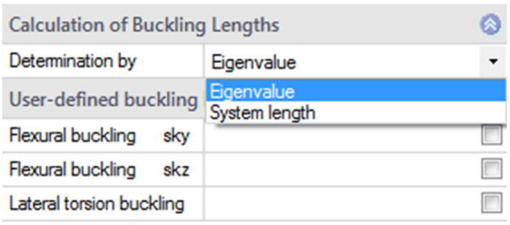
Wx net fin — limitation of deformation, elastic portion including creep and minus overhang (= 0), for serviceability verifications.

W (net)fin (STR) — limitation of deformation, elastic portion including creep, for load bearing capacity verifications.

Only the options required for the selected NA are visible.
In the output of the proofs, all four proofs always appear. proofs which are not required are issued only with deformation, but without utilization and permissible limit value.
The button "Set defaults" fills the input fields with useful default values within the limits of the standard/NA.

Note: EN 1995 and the associated NA may allow some bandwidth for the deflection limits.

Buckling lengths



Determination

Eigenvalue:
Calculation with bifurcation loads factor from framework application for each direction and every member section (recommended).
System length:
Calculation on rigid supports conditions and their distances for each direction and each member section (clearly, simplified)

The effective length sb is always be determined on the supports conditions.

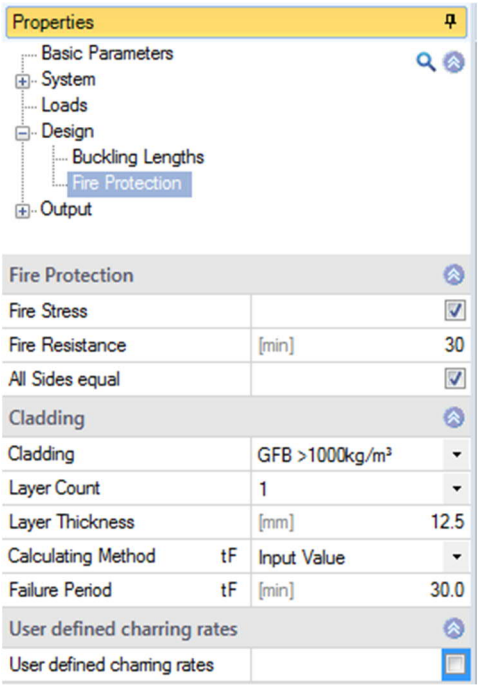
User defined buckling lengths

Tick the options to show up the entry fields for sky/skz/sb. This allows you to overwrite each value from the automatic settings set above.
Each entry is valid for the whole column length.

Fire protection

For single-piece cross sections: tick the fire action option to display the corresponding data-entry fields and enable the calculation.

Fire resistance	burn-off period in minutes.
Same on all sides	disable this option to define fire action individually for each side.
Lining	none, GK A,B... , GK F, GK F > 1,000 kg/m³
Number of plies	up to 3 plies
Ply thickness	specification in [mm]
Calculation method	entry of the tf-value for the failure time or HFA = Holzforschung Austria
Failure time	specify the tf-value in [min]



User defined charring rates

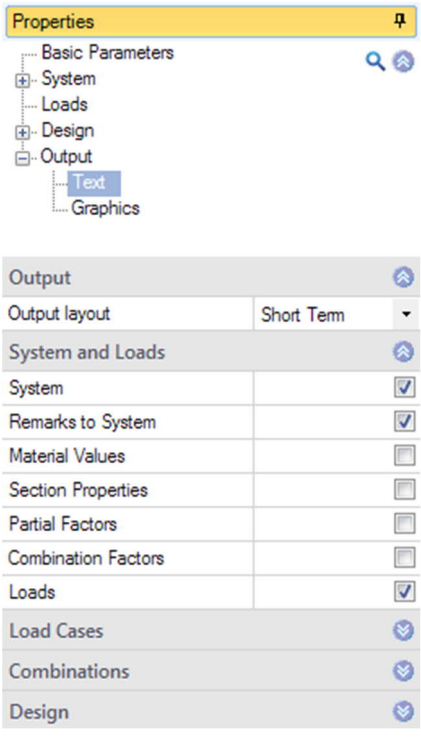
User defined charring rates override the charring rates of the standard. They are used for all materials (woods). A value of 0 means no fire stress.

For proofs where the assignment of the charring rate to the sides is not possible, the largest value is used.

Output

The scope of output for text and graphics can be defined via the output profile.

Tick the output options you want.



Output as a PDF document

Via the Document tab, you can display the document in PDF and print it.

See also Output and printing.pdf

Reference literature

/1/ EN 01/01/1995:2004, EN 02/01/1995:2004, EN 1991-1-4:2006/AC:2008