Short Introduction
Version 5.0

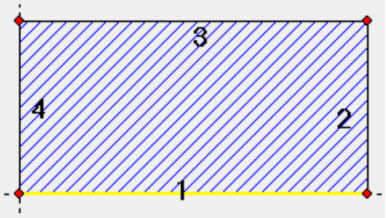
Januar 2020

Geometry

Rectangle

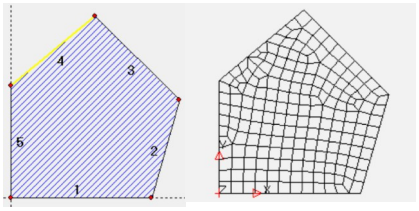
2000x1000mm

Edge	X [mm]	Y [mm]	X_m	Y_m	Rotation
	0	0			
1	0	0			
2	2000	0			
3	2000	1000			
4	0	1000			



Pentagon

Edge	X [mm]	Y [mm]	X_m	Y_m	Rotation
	600	1300			
1	0	0			
2	1000	0			
3	1200	700			
4	600	1300			
5	0	800			



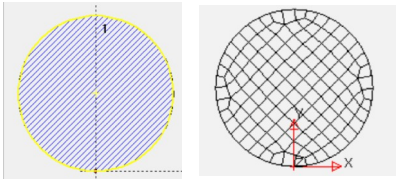
Disk

D1000mm

Edge	X [mm]	Y [mm]	X_m	Y_m	Rotation
	0	0	0	500	1
1	0	0	0	500	1

or

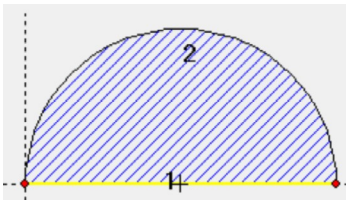
Edge	X [mm]	Y [mm]	X_m	Y_m	Rotation
	500	0	0	0	1
1	500	0	0	0	1



Halfmoon

R500

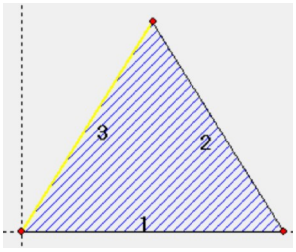
Edge	X [mm]	Y [mm]	X_m	Y_m	Rotation
	0	0			
1	0	0			
2	1000	0	500	0	1



Triangle

B = 1000
H = 800

Edge	X [mm]	Y [mm]	X_m	Y_m	Rotation
	500	800			
1	0	0			
2	1000	0			
3	500	800			



Ellipse

R1 = 650
R2 = 400

Edge	X [mm]	Y [mm]	X_m	Y_m	Rotation
	650	0	377.3	0	1
1	650	0	377.3	0	1
2	627.6	104.1	356.3	-8.7	1
3	560.5	202.5	122.1	-250.9	1
4	337.3	343.4	0	-598.6	1
5	0	400			
6	0	0			

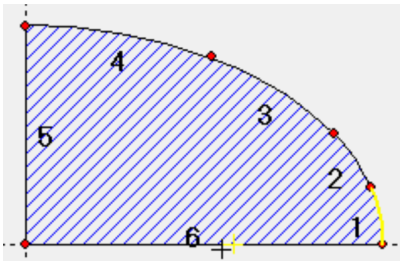
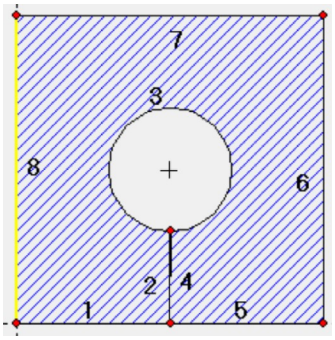


Plate with Hole

1000x 1000mm
Hole D400

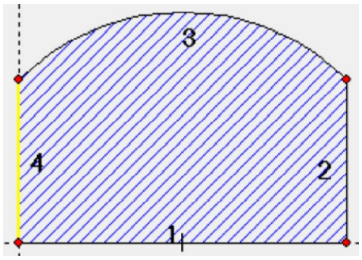
Edge	X [mm]	Y [mm]	X_m	Y_m	Rotation
	0	1000			
1	0	0			
2	500	0			
3	500	300	500	500	-1
4	500	300			
5	500	0			
6	1000	0			
7	1000	1000			
8	0	1000			



Rectangle with arc

2000x1000m
R 1428mm

Edge	X [mm]	Y [mm]	X_m	Y_m	Rotation
	0	1000			
1	0	0			
2	2000	0			
3	2000	1000	1000	0	1
4	0	1000			

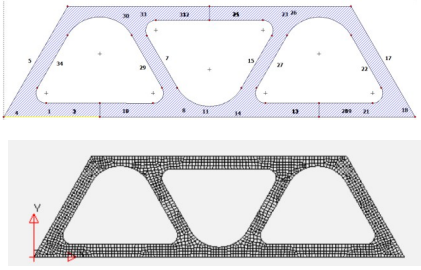


Framework

very complex
structures

Edge	X [mm]	Y [mm]	X_m	Y_m	Rotation
	0	0			
1	0	0			
2	606	0			
3	606	87			
4	268	87	268	152	-1
5	212	184			
6	403	516	606	399	-1
7	808	516			
8	1000	184	943	152	-1

...



Layers

Single glass

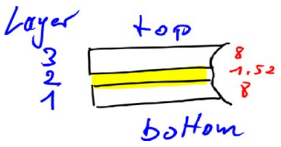
1 x 10mm

Layer	Material	E	ν	t	ρ	α_T	ΔT
	Float glass	70000.	0.23	10	2.55e-9	1.e-5	0
1	Float glass	70000.	0.23	10	2.55e-9	1.e-5	0

Laminated glass

8/1.52/8

Layer	Material	E	ν	t	ρ	α_T	ΔT
	Float glass	70000.	0.23	8	2.55e-9	1.e-5	0
3	Float glass	70000.	0.23	8	2.55e-9	1.e-5	0
2	PVB long time loading	0.03	0.5	1.52	1.07e-9	8.e-5	0
1	Float glass	70000.	0.23	8	2.55e-9	1.e-5	0



Insulated glass

8 / gap 16 / 8

Glass package 1

Package: 1 from 2 | New item | Delete item

Layer	Material	E	ν	t	ρ	α_T	ΔT
	Float glass	70000.	0.23	8	2.55e-9	1.e-5	0
1	Float glass	70000.	0.23	8	2.55e-9	1.e-5	0

Glass package 2

Package: 2 from 2 | New item | Delete item

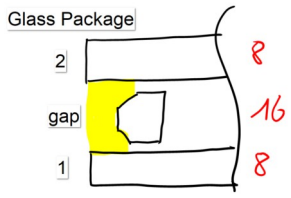
Layer	Material	E	ν	t	ρ	α_T	ΔT
	Float glass	70000.	0.23	8	2.55e-9	1.e-5	0
1	Float glass	70000.	0.23	8	2.55e-9	1.e-5	0

Gap 1

Intermediate space:

Package (from-to)	Gas	t	γ	ΔT	p_i
1 - 2	Ideal Gas 20°C (Standard)	16	0.003411	0	0.101
2 - 3				0	0.101
3 - 4				0	0.101

Each glass package can also be any kind of laminated glass!
IGU up to 3 gaps!



Supports

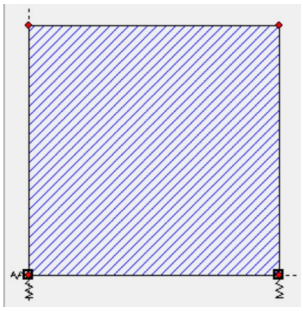
Local Springs

Spring Supports

X [mm]	Y [mm]	C_x	C_y	C_z	C_φ	C_θ
0	0	1	1	0	0	0
0	0	1	1	0	0	0
1000	0	0	1	0	0	0

Default springs:
Corner 1: C_x = C_y = 1.0 N/mm
Corner 2: C_y = 1.0 N/mm

Simply to first generate a statically determined system inplane direction using very weak springs!

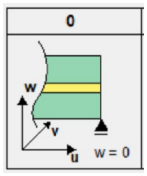


Simply supported

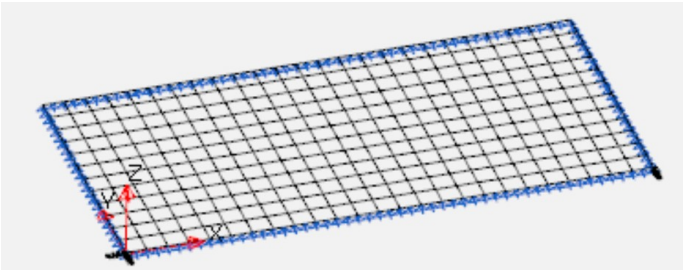
at all edges, nodes fixed to w = 0 mm

Edge Support

Edge	Type
	0
1	0
2	0
3	0
4	0



simply supported



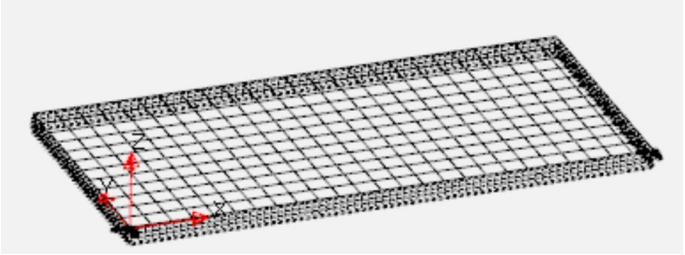
Elastically supported

edges supported on elastic material

Elast. Edge Support

Edge	Contact	E	G	b	h
	☐	10	0	20	5
1		10	0	20	5
2		10	0	20	5
3		10	0	20	5
4		10	0	20	5

slight deflections possible – more real support for glass!

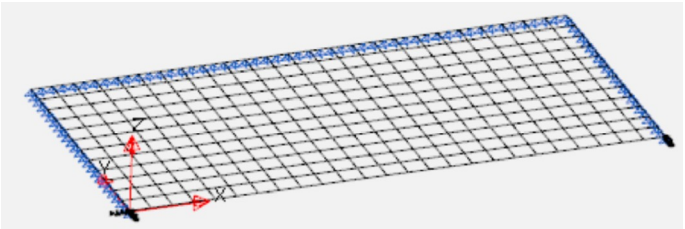


3 side supported

edge 1 free

Edge Support

Edge	Type
1	
2	0
3	0
4	0

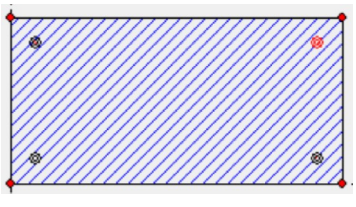


Point supported

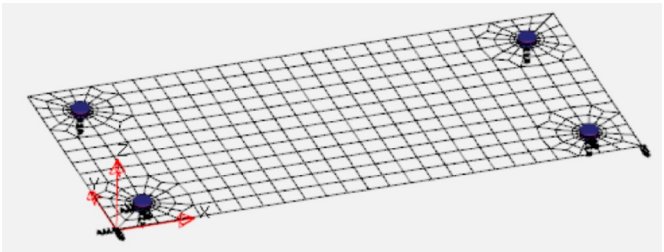
Glass Fixings

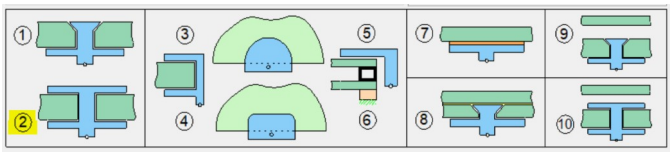
Manufacturer - product*	Type	r_i	r_a	E_s	E_h	t_s	t_h
DiskFixing	2	18	35	60	500	3	2
DiskFixing	2	18	35	60	500	3	2

*Reference	X [mm]	Y [mm]	Z_h	C_x	C_y	C_z	C_φ	C_θ	Type
DiskFixing	1850	850	-10	0	0	1000	0	0	0
DiskFixing	1850	850	-10	0	0	1000	0	0	0
DiskFixing	1850	150	-10	0	1000	1000	0	0	0
DiskFixing	150	850	-10	0	0	1000	0	0	0
DiskFixing	150	150	-10	1000	1000	1000	0	0	0



Holes are build automatically
10 different types possible
All fixings also for IGUs usable



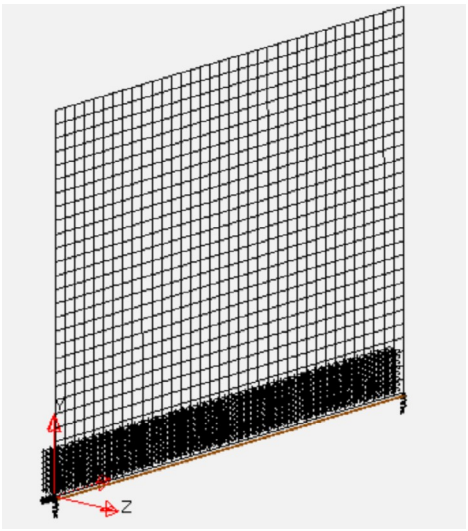


Clamped balustrade

Clamped elastically in a glass shoe

Elast. Line Support

Contact	X_1	Y_1	X_2	Y_2	E	b	h
	0	150	1840	150	20	20	5
☐	0	130	1840	130	20	20	5
☐	0	110	1840	110	20	20	5
☐	0	90	1840	90	20	20	5
☐	0	70	1840	70	20	20	5
☐	0	50	1840	50	20	20	5
☐	0	30	1840	30	20	20	5
☐	0	10	1840	10	20	20	5

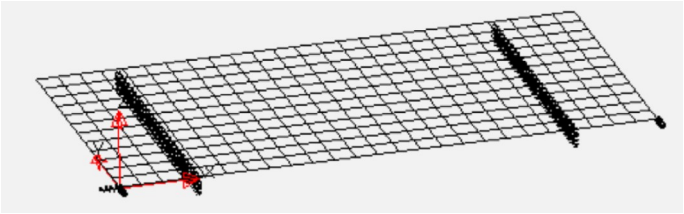


Internally supported

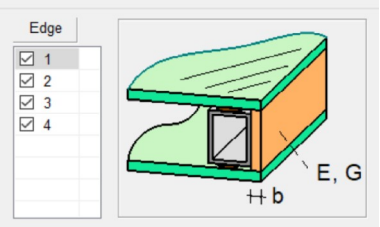
Elastic supports within the glass area

Elast. Line Support

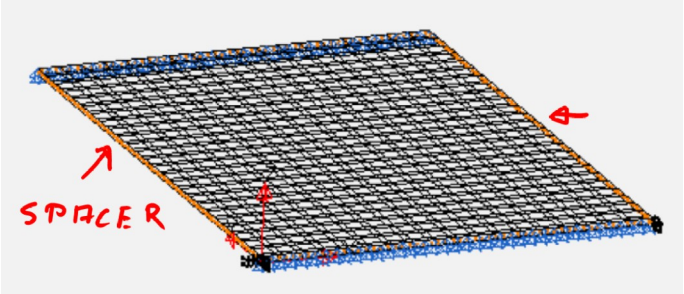
Contact	X_1	Y_1	X_2	Y_2	E	b	h
	1700	0	1700	1000	20	20	5
☐	1700	0	1700	1000	20	20	5
☐	300	0	300	1000	20	20	5



Spacer



needed to combine glass edges in IGUs to keep edges closed, specially free edges, where no other condition keeps the distance constant



Loads

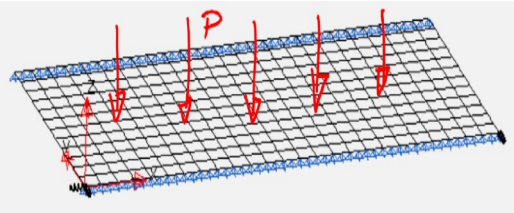
Face Load

p = -1.0 kN/m²
= -0.001 N/mm²
= -1.e-3 N/mm²

constant:

Package	p [N/mm²]
1	-0.001

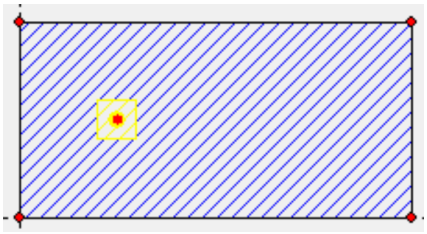
pressure against the z-axis: negative!
Suction loads in direction of z: positive!

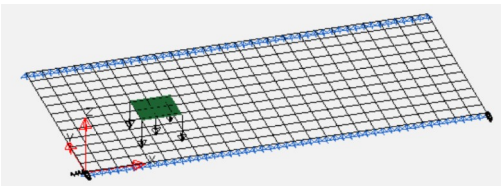


Conc. Load

Center Position, Load and Area

X [mm]	Y [mm]	F_x [N]	F_y [N]	F_z [N]	L_x [mm]	L_y [mm]
500	500	0	0	-1000	200	200
500	500	0	0	-1000	200	200



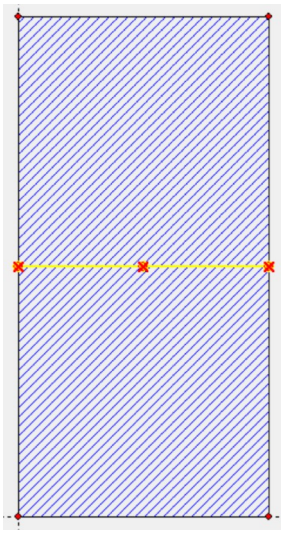


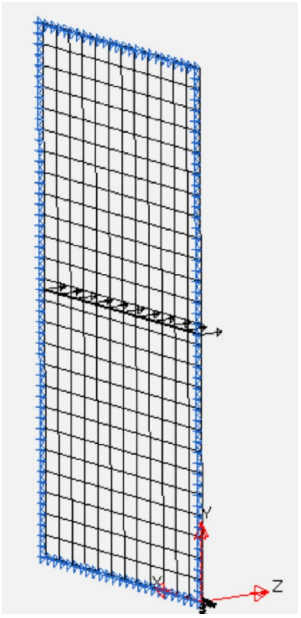
here:
F = - 1000 N (in negative z-direction)

Line Load

q_z =1 N/mm
= 1 kN/m

X_1	Y_1	X_2	Y_2	q_x	q_y	q_z
0	1000	1000	1000	0	0	1
0	1000	1000	1000	0	0	1

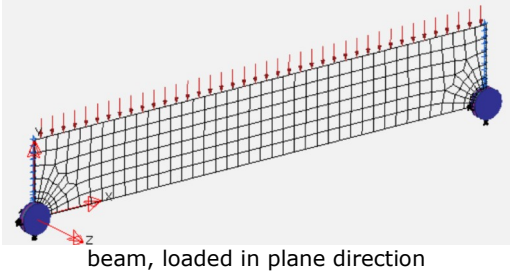




Border loads

inplane or out of plane edge loads
q_n = -1 N/mm
= -1 kN/m

Edge	q_z	q_n
	0	-1
1		
2		
3	0	-1
4		



beam, loaded in plane direction

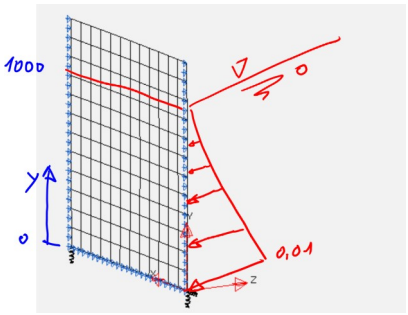
Water Loads

Linear increasing loads

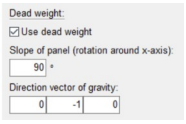
linear:

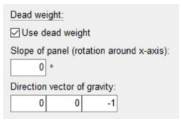
Package	p_0	p_1	y_0	y_1
1	0.01	0	0	1000
2				

Water pressure
1m = 0.01 N/mm²
10m = 1 bar = 0.1 N/mm²



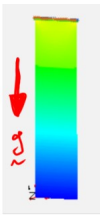
Dead load

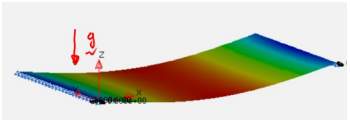




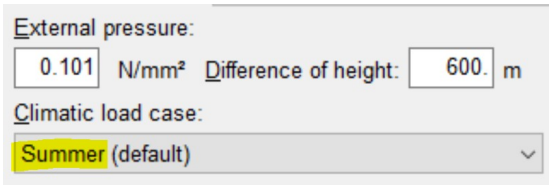
vertically horizontally

Volume load in the direction of the gravity vector!
(any direction possible)

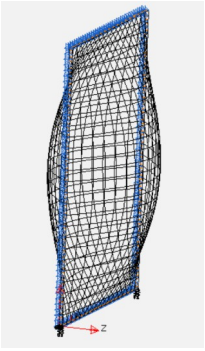




Climate loads



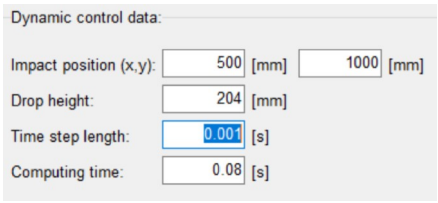
- Predefined climate load cases Summer/Winter or any other condition
- Seperately or using LoadCases
- Using real Boyle's gas pressure law
see also here

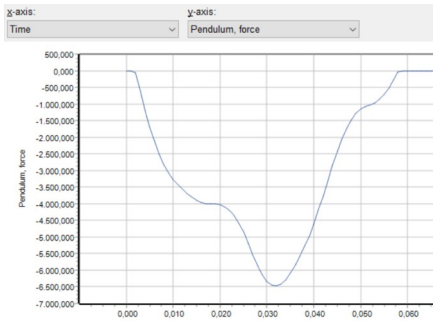


Soft body impact

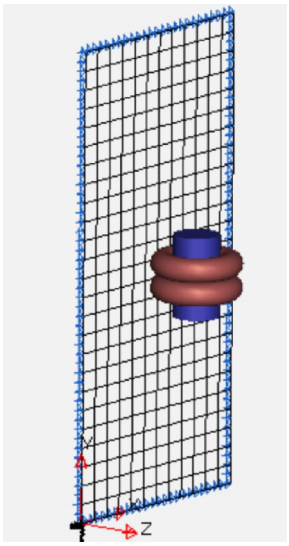
dyn. Analysis

Pendulm Body, Wind blast or enhanced Impact model



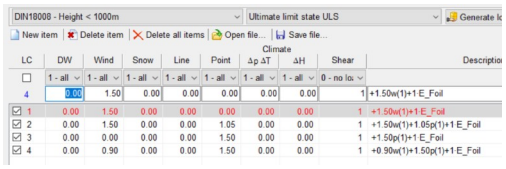


Results over time

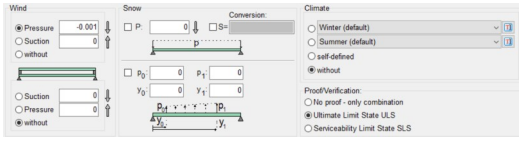


Load Cases

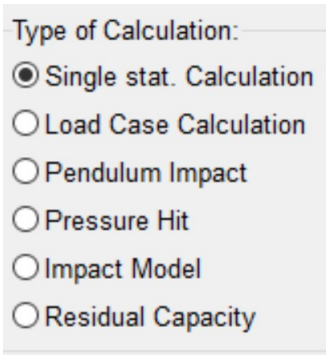
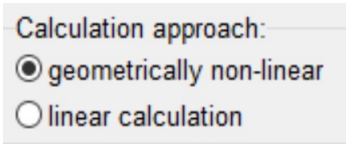
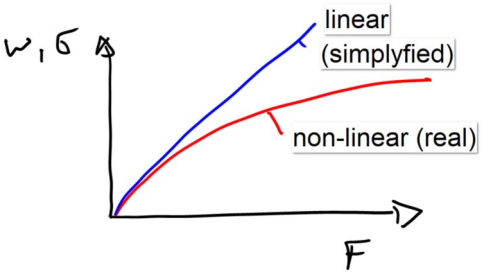
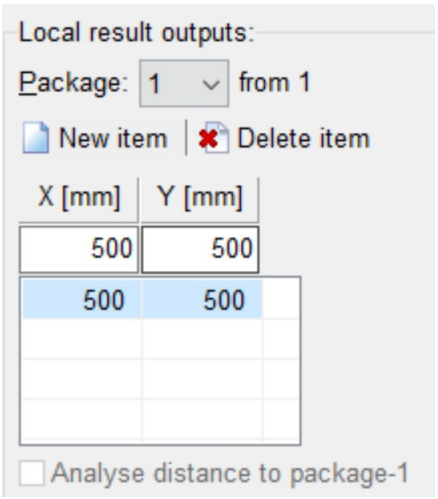
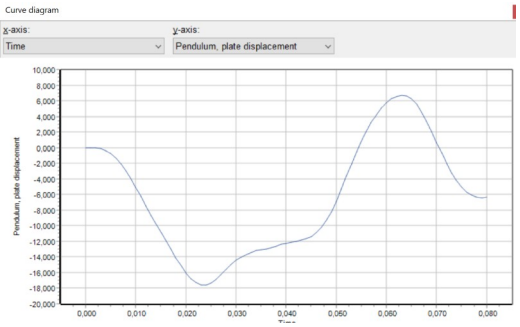
Combination of loads according to selected Norms, automated design proof

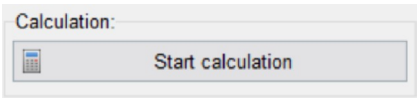
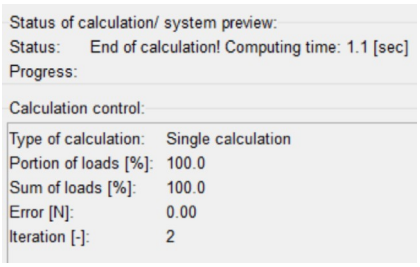


Load cases set up automatically



Loads to be combined automatically incl. line-, point- and climate loads

Options		
Type of Calculation		Which type of calculation shall be started? One single static calculation, running all loads cases and doing design check or dynamic calculations including mass, time and acceleration effects?
Calculation method		
Additional output points	 written in *Protocol* and *Diagram* output	 **Local displacements and stresses:** Package x y max min mm mm mm mm Layer σ_xx σ_yy σ_xy σ_p+ σ_p- N/mm² N/mm² N/mm² N/mm² N/mm² 1 500.00 500.00 4.834 -9.536 (w) 0.000 0.000 (u) 0.000 0.000 (v) Maximum 1 18.75 9.68 0.00 18.75 9.68 (top) 1 36.07 10.79 0.01 36.07 10.79 (bottom) Minimum 1 -36.07 -10.79 -0.01 -10.79 -36.07 (top) 1 -18.75 -9.68 -0.00 -9.68 -18.75 (bottom)

Results		
Start Calculation or cancel a running calculation		
Calculation results Graphics Protocols, Design Proof Diagram