

<b>Project:</b> 1035-11 WIMO WIMO-Alumast 10,42m	<b>Position:</b> 2-q0,7-120kmh Alumast AI 6063 T5 (F18)	Page: 10
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**CONTENTS**

Contents .....	10
General Data .....	10
<b>Structural Data</b>	
Nodes .....	10
Materials .....	10
Sections .....	10
Elements .....	11
Supports .....	11
<b>Loads</b>	
General Data .....	12
LC 1 - Vollast 120 km/h 0,694 kN/qm .....	12
<b>LC, LG Results</b>	
<b>Load Groups</b> .....	12
2nd Order Analysis Data .....	12
Graphic - Loads .....	13
Internal Forces by Element .....	14
Support Forces and Support Moments .....	14
Global Node Deformations .....	14
Graphic - Results .....	15
STEEL .....	16
STEEL1 - Spannungsanalyse .....	16
General Data .....	16
Materials .....	16
Sections .....	16
Results .....	16
Max Stresses by Section .....	16
Max Stresses by Element .....	16
Governing Internal Forces - [Sigma eq] .....	17
Graphic - SPANNUNGSAUSNUTZUNG .....	18

**GENERAL DATA**

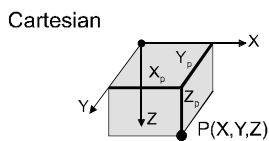
**COMPUTING METHOD**

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Structural Analysis | <input checked="" type="checkbox"/> 1st Order Analysis |
| <input type="checkbox"/> Stress Analysis                | <input checked="" type="checkbox"/> 2nd Order Analysis |
| <input type="checkbox"/> Dynamic Analysis               | <input type="checkbox"/> Cable Theory                  |
| <input checked="" type="checkbox"/> Load Cases          | <input checked="" type="checkbox"/> Design Cases       |
| <input checked="" type="checkbox"/> Load Groups         | <input type="checkbox"/> Dynamic Cases                 |
| <input type="checkbox"/> Load Combinations              | <input type="checkbox"/> Buckling Curves               |

**STRUCTURAL DATA PARAMETERS**

- |  |                      |                       |
|--|----------------------|-----------------------|
| <input type="checkbox"/> 1D Continuous Beam              | 7 Nodes              | 6 Elements            |
| <input type="checkbox"/> 2D Construction Type            | 1 Materials          | 0 Cables              |
| <input checked="" type="checkbox"/> 3D Construction Type | 5 Sections           | 0 Tapered Elements    |
| <input type="checkbox"/> Grid                            | 0 Element Hinges     | 0 Elastic Foundations |
|  | 0 Element Partitions | 0 Sets of Elements    |

**STRUCTURE**



**NODES**

Node No	Coordinates-System	Ref Nodes	Node Coordinates		
			X [m]	Y [m]	Z [m]
1	Cartesian	-	0.000	0.000	0.000
2	Gelagert	-	0.000	0.000	-2.575
3	Cartesian	-	0.000	0.000	-4.575
4	Cartesian	-	0.000	0.000	-6.550
5	Cartesian	-	0.000	0.000	-8.500
6	Cartesian	-	0.000	0.000	-10.420
7	Cartesian	-	0.000	0.000	-1.600
	Gelagert				

**MATERIALS**

Mat No	Material Description	E Modulus [kN/cm <sup>2</sup> ]	Shear Mod [kN/cm <sup>2</sup> ]	Spec Weight [kN/cm <sup>3</sup> ]	Coeff Therm [1/°C]
1	Aluminium	7.000E+03	2.700E+03	2.700E-05	2.400E-05

Rohr 160/5      Rohr 140/5



**SECTIONS**

Sec No	Mat No	Section Description	I <sub>T</sub> A	I <sub>2</sub> A <sub>2</sub>	I <sub>3</sub> [cm <sup>4</sup> ] A <sub>3</sub> [cm <sup>2</sup> ]
1	1	Rohr 160/5	1463.88 24.347	731.94	731.94
2	1	Rohr 140/5	967.51 21.206	483.76	483.76
3	1	Rohr 118/4	466.01 14.326	233.01	233.01
4	1	Rohr 98/4	261.41	130.70	130.70

<b>Project:</b> 1035-11 WIMO WIMO-Alumast 10,42m	<b>Position:</b> 2-q0,7-120kmh Alumast AI 6063 T5 (F18)	Page: 11
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Rohr 118/4



Rohr 98/4



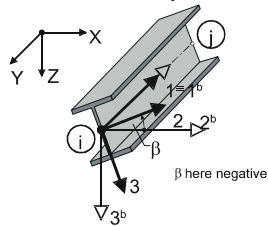
**SECTIONS**

Sec No	Mat No	Section Description	$I_T$ A	$I_2$ A <sub>2</sub>	$I_3$ [cm <sup>4</sup> ] A <sub>3</sub> [cm <sup>2</sup> ]
4			11.812	130.70	130.70
5	1	Rohr 82/4	149.48 9.802	74.74	74.74

Rohr 82/4



**Local Element Axis System**



**ELEMENTS**

Elem No	Elem Type	Nodes		Beta [°]	Section		Hinge		Part No	Length [m]	Elem Location
		Begin	End		Begin	End	Begin	End			
1	Beam	1	7	0.00	1	1	-	-	-	1.600	VERT
2	Beam	2	3	0.00	2	2	-	-	-	2.000	VERT
3	Beam	3	4	0.00	3	3	-	-	-	1.975	VERT
4	Beam	4	5	0.00	4	4	-	-	-	1.950	VERT
5	Beam	5	6	0.00	5	5	-	-	-	1.920	VERT
6	Beam	7	2	0.00	1	1	-	-	-	0.975	VERT

**SUPPORTS**

Support No	Supported Nodes	Rotation [°]		Fixed Support/Support Spring [kN/m] [kNm/rad]						
		Alpha	Beta	in X	in Y	in Z	ar X	ar Y	ar Z	
1	1	0.0	0.0	Yes	Yes	Yes	No	No	No	Yes
2	7	0.0	0.0	Yes	Yes	No	No	No	No	No

<b>Project:</b> 1035-11 WIMO WIMO-Alumast 10,42m	<b>Position:</b> 2-q0,7-120kmh Alumast AI 6063 T5 (F18)	Page: 12
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**LOADS**

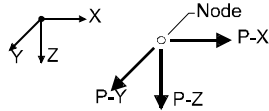
**GENERAL DATA**

LC No	LC Description	Factor	Combination Type	Dead Weight
1	Vollast 120 km/h 0,694 kN/qm	1.00	Variable	1.00

**NODAL FORCES**

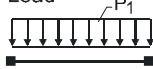
LC 1

Global Nodal Force

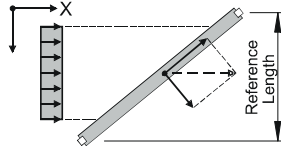


No	Loaded Nodes	P <sub>X</sub> [N]	Nodal Forces P <sub>Y</sub> [N]	P <sub>Z</sub> [N]
1	6	370.000	0.000	0.000

1- Linear Load



X - Global in X-direction



**ELEMENT LOADS**

LC 1

No	Loaded Elements	Load type	Load Direction	Parameters [N, Nm, m, °C, N/m, Nm/m]
1	2	1	X	109.000
2	5	1	X	64.000
3	4	1	X	76.000
4	3	1	X	92.000
5	1,6	1	X	124.000

**LOAD GROUPS**

LG No	LG Description	Factor	Coefficient γ <sub>M</sub>	Load Cases in LG
1	Vollast	1.00	1.10	1.50*LC1

**2ND ORDER ANALYSIS DATA**

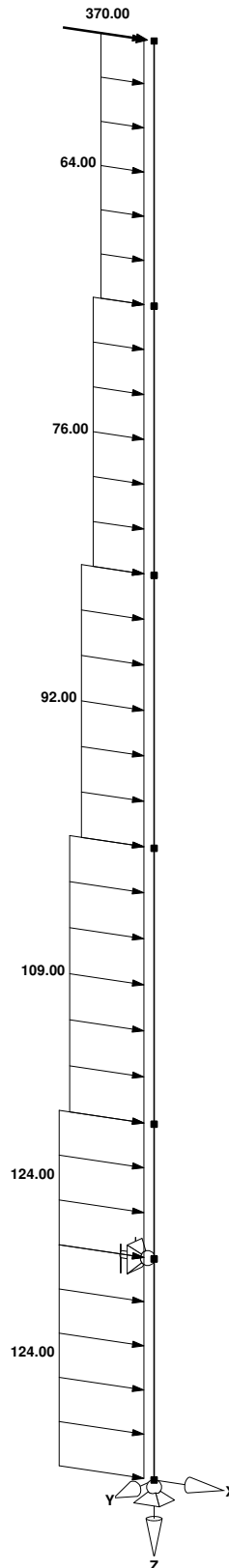
LG-No	Factor N <sub>y</sub>	Number Iterations	Eps-Convergence		Ny-fold Results	Tension Force Effect
			Existing	Wanted		
LG1	1.000	2	.00E+00	0.01	Yes	No

<b>Project:</b> 1035-11 WIMO WIMO-Alumast 10,42m	<b>Position:</b> 2-q0,7-120kmh Alumast AI 6063 T5 (F18)	Page: 13
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**LOADS**

LC 1 - Vollast 120 km/h 0,694 kN/qm  
 [N], [N/m]

Isometric



<b>Project:</b> 1035-11 WIMO WIMO-Alumast 10,42m	<b>Position:</b> 2-q0,7-120kmh Alumast AI 6063 T5 (F18)	Page: 14
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**INTERNAL FORCES BY ELEMENT**

Elem No	LC/LG No	Node No	x [m]	Forces [kN]			T	Moments [kNm]	
				N	V <sub>2</sub>	V <sub>3</sub>		M <sub>2</sub>	M <sub>3</sub>
1	LC1	1	.00	-47	.00	-3.85	.00	.00	.00
		7	1.60	-37	.00	-4.05	.00	-6.32	.00
	LG1	1	.00	-71	.00	-5.90	.00	.00	.00
		7	1.60	-55	.00	-6.19	.00	-9.67	.00
2	LC1	2	.00	-30	.00	1.04	.00	-5.24	.00
		3	2.00	-19	.00	.82	.00	-3.38	.00
	LG1	2	.00	-46	.00	1.57	.00	-8.05	.00
		3	2.00	-28	.00	1.25	.00	-5.21	.00
3	LC1	3	.00	-19	.00	.82	.00	-3.38	.00
		4	1.98	-11	.00	.64	.00	-1.93	.00
	LG1	3	.00	-28	.00	1.25	.00	-5.21	.00
		4	1.98	-17	.00	.98	.00	-2.98	.00
4	LC1	4	.00	-11	.00	.64	.00	-1.93	.00
		5	1.95	-05	.00	.49	.00	-.83	.00
	LG1	4	.00	-17	.00	.98	.00	-2.98	.00
		5	1.95	-08	.00	.75	.00	-1.27	.00
5	LC1	5	.00	-05	.00	.49	.00	-.83	.00
		6	1.92	.00	.00	.37	.00	.00	.00
	LG1	5	.00	-08	.00	.75	.00	-1.27	.00
		6	1.92	.00	.00	.56	.00	.00	.00
6	LC1	7	.00	-37	.00	1.16	.00	-6.32	.00
		2	.98	-30	.00	1.04	.00	-5.24	.00
	LG1	7	.00	-55	.00	1.75	.00	-9.67	.00
		2	.98	-46	.00	1.57	.00	-8.05	.00

**SUPPORT FORCES AND SUPPORT MOMENTS**

Node No	LC/LG No	P <sub>x</sub>	Support Forces [kN]			Support Moments [kNm]		
			P <sub>y</sub>	P <sub>z</sub>	M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>	
1	LC1	-3.849	.000	.473	.000	.000	.000	.000
	LG1	-5.895	.000	.710	.000	.000	.000	.000
7	LC1	5.209	.000	.000	.000	.000	.000	.000
	LG1	7.935	.000	.000	.000	.000	.000	.000
ΣForces	LC1	1.360	.000	.473				
ΣLoads	LC1	1.360	.000	.473				
ΣForces	LG1	2.040	.000	.710				
ΣLoads	LG1	2.040	.000	.710				

**GLOBAL NODE DEFORMATIONS**

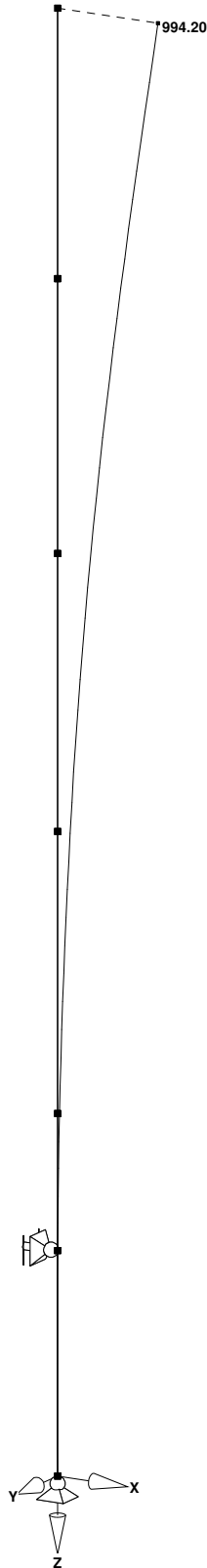
Node No	LC/LG No	Deformations [mm]			Rotations [mrad]		
		u <sub>x</sub>	u <sub>y</sub>	u <sub>z</sub>	φ <sub>x</sub>	φ <sub>y</sub>	φ <sub>z</sub>
1	LC1	.00000	.00000	.00000	.00000	3.24639	.00000
	LG1	.00000	.00000	.00000	.00000	5.47060	.00000
2	LC1	11.88964	.00000	.00587	.00000	-17.51440	.00000
	LG1	20.03422	.00000	.00969	.00000	-29.52285	.00000
3	LC1	74.00163	.00000	.00919	.00000	-42.76316	.00000
	LG1	1.249E+02	.00000	.01517	.00000	-72.24335	.00000
4	LC1	1.928E+02	.00000	.01217	.00000	-74.57112	.00000
	LG1	3.257E+02	.00000	.02008	.00000	-1.262E+02	.00000
5	LC1	3.702E+02	.00000	.01410	.00000	-1.035E+02	.00000
	LG1	6.261E+02	.00000	.02327	.00000	-1.752E+02	.00000
6	LC1	5.877E+02	.00000	.01481	.00000	-1.180E+02	.00000
	LG1	9.942E+02	.00000	.02444	.00000	-1.997E+02	.00000
7	LC1	.00000	.00000	.00395	.00000	-6.53408	.00000
	LG1	.00000	.00000	.00652	.00000	-11.00723	.00000
Maxi	LC1	5.877E+02	.00000	.01481	.00000	3.24639	.00000
Mini	LC1	.00000	.00000	.00000	.00000	-1.180E+02	.00000
Maxi	LG1	9.942E+02	.00000	.02444	.00000	5.47060	.00000
Mini	LG1	.00000	.00000	.00000	.00000	-1.997E+02	.00000

<b>Project:</b> 1035-11 WIMO WIMO-Alumast 10,42m	<b>Position:</b> 2-q0,7-120kmh Alumast AI 6063 T5 (F18)	Page: 15
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**RESULTS**

LG 1 - Vollast  
 Deformations

Isometric



Max u: 994.20 mm  
 Factor for Deformations: 0.8

<b>Project:</b> 1035-11 WIMO WIMO-Alumast 10,42m	<b>Position:</b> 2-q0,7-120kmh Alumast AI 6063 T5 (F18)	Page: 16
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**STEEL1 - SPANNUNGSANALYSE**

**GENERAL DATA**

**ELEMENTS TO DESIGN**

All

**LOAD CASES TO DESIGN**

LG1 - Vollast

**MATERIALS**

Mat No	Material Description	Material Code, Criterion	Allowable Stresses [N/mm <sup>2</sup> ]		
			Sigma	Tau	Sigma eq
1	Al 6063 T5 (F18)	DIN18800	132	76	132

**SECTIONS**

Sec No	Mat No	Section Description Section Rotation	I-T [cm <sup>4</sup> ] A [cm <sup>2</sup> ]	I-2 [cm <sup>4</sup> ] Alpha pl y	I-3 [cm <sup>4</sup> ] Alpha pl z
1	1	Rohr 160/5	1463.88 24.35	731.94 1.00	731.94 1.00
2	1	Rohr 140/5	967.51 21.21	483.76 1.00	483.76 1.00
3	1	Rohr 118/4	466.01 14.33	233.01 1.00	233.01 1.00
4	1	Rohr 98/4	261.41 11.81	130.70 1.00	130.70 1.00
5	1	Rohr 82/4	149.48 9.80	74.74 1.00	74.74 1.00

Rohr 160/5



Rohr 140/5



Rohr 118/4



Rohr 98/4



Rohr 82/4



**MAX STRESSES BY SECTION**

Stress Type	Elem No	x Loc [m]	S Point No	LC No	Stress [N/mm <sup>2</sup> ]		Stress Ratio
					existing	allowable	
<b>Section No 1 - Rohr 160/5</b>							
Sigma Total	1	1.600	10	LG1	-105.92	132.00	0.80
Tau Total	1	1.600	1	LG1	-5.07	76.00	0.07
Sigma eq	1	1.600	10	LG1	105.92	132.00	0.80
<b>Section No 2 - Rohr 140/5</b>							
Sigma Total	2	0.000	10	LG1	-116.70	132.00	0.88
Tau Total	2	0.000	1	LG1	1.48	76.00	0.02
Sigma eq	2	0.000	10	LG1	116.70	132.00	0.88
<b>Section No 3 - Rohr 118/4</b>							
Sigma Total	3	0.000	10	LG1	-132.12	132.00	1.00
Tau Total	3	0.000	1	LG1	1.74	76.00	0.02
Sigma eq	3	0.000	10	LG1	132.12	132.00	1.00
<b>Section No 4 - Rohr 98/4</b>							
Sigma Total	4	0.000	10	LG1	-111.86	132.00	0.85
Tau Total	4	0.000	1	LG1	1.65	76.00	0.02
Sigma eq	4	0.000	10	LG1	111.86	132.00	0.85
<b>Section No 5 - Rohr 82/4</b>							
Sigma Total	5	0.000	10	LG1	-69.75	132.00	0.53
Tau Total	5	0.000	1	LG1	1.52	76.00	0.02
Sigma eq	5	0.000	10	LG1	69.75	132.00	0.53

**MAX STRESSES BY ELEMENT**

Stress Type	x Location [m]	S Point No	LC No	Stress [N/mm <sup>2</sup> ]		Stress Ratio
				existing	allowable	
<b>Element No 1: Section No 1 - Rohr 160/5</b>						
Sigma Total	1.600	10	LG1	-105.92	132.00	0.80
Tau Total	1.600	1	LG1	-5.07	76.00	0.07
Sigma eq	1.600	10	LG1	105.92	132.00	0.80
<b>Element No 2: Section No 2 - Rohr 140/5</b>						
Sigma Total	0.000	10	LG1	-116.70	132.00	0.88
Tau Total	0.000	1	LG1	1.48	76.00	0.02
Sigma eq	0.000	10	LG1	116.70	132.00	0.88
<b>Element No 3: Section No 3 - Rohr 118/4</b>						
Sigma Total	0.000	10	LG1	-132.12	132.00	1.00
Tau Total	0.000	1	LG1	1.74	76.00	0.02
Sigma eq	0.000	10	LG1	132.12	132.00	1.00

<b>Project:</b> 1035-11 WIMO WIMO-Alumast 10,42m	<b>Position:</b> 2-q0,7-120kmh Alumast AI 6063 T5 (F18)	Page: 17
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**MAX STRESSES BY ELEMENT**

Stress Type	x Location [m]	S Point No	LC No	Stress [N/mm <sup>2</sup> ]		Stress Ratio
				existing	allowable	
<b>Element No 4: Section No 4 - Rohr 98/4</b>						
Sigma Total	0.000	10	LG1	-111.86	132.00	0.85
Tau Total	0.000	1	LG1	1.65	76.00	0.02
Sigma eq	0.000	10	LG1	111.86	132.00	0.85
<b>Element No 5: Section No 5 - Rohr 82/4</b>						
Sigma Total	0.000	10	LG1	-69.75	132.00	0.53
Tau Total	0.000	1	LG1	1.52	76.00	0.02
Sigma eq	0.000	10	LG1	69.75	132.00	0.53
<b>Element No 6: Section No 1 - Rohr 160/5</b>						
Sigma Total	0.000	10	LG1	-105.92	132.00	0.80
Tau Total	0.000	1	LG1	1.43	76.00	0.02
Sigma eq	0.000	10	LG1	105.92	132.00	0.80

**GOVERNING INTERNAL FORCES - [SIGMA EQ]**

Elem No	x Location [m]	LC No	Forces [kN]			Moments [kNm]		
			N	V-2	V-3	M-T	M-2	M-3
1	1.600	LG1	-0.55	0.00	-6.19	0.00	-9.67	0.00
2	0.000	LG1	-0.46	0.00	1.57	0.00	-8.05	0.00
3	0.000	LG1	-0.28	0.00	1.25	0.00	-5.21	0.00
4	0.000	LG1	-0.17	0.00	0.98	0.00	-2.98	0.00
5	0.000	LG1	-0.08	0.00	0.75	0.00	-1.27	0.00
6	0.000	LG1	-0.55	0.00	1.75	0.00	-9.67	0.00

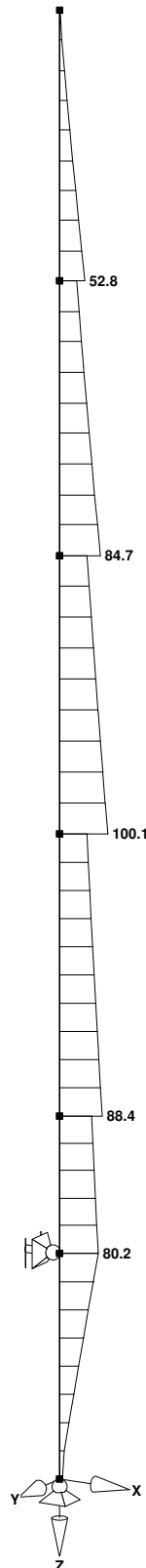


<b>Project:</b> 1035-11 WIMO WIMO-Alumast 10,42m	<b>Position:</b> 2-q0,7-120kmh Alumast AI 6063 T5 (F18)	Page: 18
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**SPANNUNGS AUSNUTZUNG**

STEEL1 - Spannungsanalyse  
 Sigma eq

Isometric



Max = 100.1%