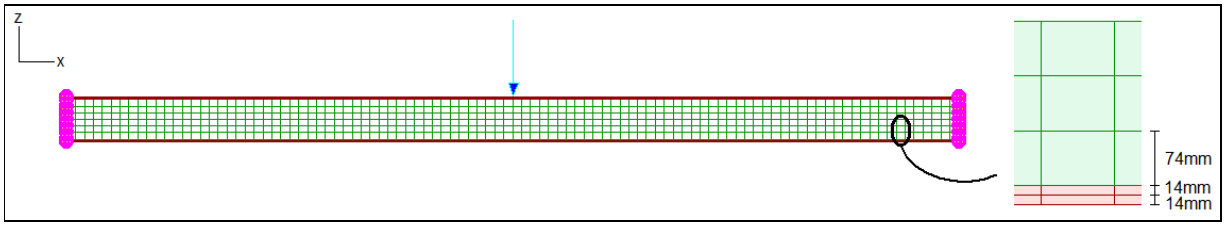
Validation of Sargon Nonlinear solver (CURAN, version 9.60)			
TEST MB018	**VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK**	**Marco Croci**	**26/11/2010**

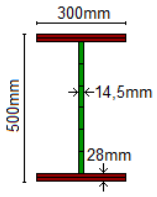


Test description
Constitutive law of membranes material: linear elastic. Solution should coincide with a linear elastic solution.
Theoretical check and cross-check with Sargon linear solver (CLEVER)
Test model: **curanMB_018.WSR** Target model: **C018MB_CLEVER.WSR**

Material properties		
Name	ν	E
S235LE	0,3	210000N/mm^2

Model data

Beam		**Constraints**		**Load (z direction)**	
LENGTH	SHAPE SIZES	LEFT	RIGHT	APPLICATION P.	FORCE
10000mm	See image	Fixed	Fixed	Middle point	-100000N
Membrane elements		Type		Thicknesses	d.o.f.
1000(10x100)		QUAD4		See image	2178



CROSS CHECK

Displacement in the middle of the beam is $\delta=FL^3/192EI+L\chi T/2GA$ where χ is shear factor and T is internal shear force

Load case	**Value**	**Unit**	**CURAN**	**TARGET**	**KIND**	**% diff.**
1	Node 127 displacement (z)	mm	-2,758E+00	-2,806E+00	theoretical	-1,71
1	σ_{VM} element 778, node 796	N/mm^2	1,189E+01	1,189E+01	cross-check	0,00
1	σ_z element 976, node 994	N/mm^2	1,851E-01	1,851E-01	cross-check	0,00

% difference = (CURAN - TARGET) / TARGET * 100

Precision of limit multiplier for the analysis: 0.005
QUAD4: bilinear isoparametric element