
```
**
**
**      Altair OptiStruct(TM) 2018.0.1      **
**
**      Advanced Engineering Analysis, Design and      **
**      Optimization Software from Altair Engineering, Inc.      **
**
**
**      Windows 10 (Build 9200) DESKTOP-TOM2U6M      **
**      8 CPU: Intel(R) Core(TM) i7-8550U CPU @ 1.80GHz      **
**      11247 MB RAM, 18469 MB swap      **
**
**
```

** Build tag: 0934289red33180_Ce64RBW8UH14M:149678-0 4000000004000 **

```
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```

*** OptiStruct defaults set from:
install config file: C:\Program Files\Altair\2018\hwsolvers/optistruct.cfg.

NOTE # 9199

MSGLMT=STRICT is active, all messages will be printed.

You can suppress some less important warning messages by use of

MSGLMT=BRIEF or UNREF (in config file or in the input data).

1 PARAM(s) were set:

CHECKEL,YES

*** WARNING 1932: PSHELL ID 9 is not referenced.

NOTE # 1852

AUTOMATIC SCREENING is activated.

Use DSCREEN,AUTO,OFF to disable automatic screening.

NOTE # 2715

Solver with 64 bit integer is activated.

The amount of memory allocated for the run is 3386 MB.

This run will use in-core processing in the solver.

OPTIMIZATION FILE AND PARAMETER INFORMATION :

FEM model file :

E:/solo telaio hypermesh/free size optimization solo telaio/ottimizzazione_solo telaio

Output files prefix :

E:/solo telaio hypermesh/free size optimization solo telaio/ottimizzazione_solo telaio

FINITE ELEMENT MODEL DATA INFORMATION :

Total # of Grids (Structural) : 117086

Total # of Elements : 39198

Total # of Rigid Elements : 8

Total # of Rigid Element Constraints : 2649

Total # of Degrees of Freedom : 702406

(Structural)

Total # of Non-zero Stiffness Terms : 33330261

Element Type Information

CQUAD8 Elements : 38795

CTRIA6 Elements : 403

Load and Boundary Information

FORCE Sets : 1

SPC Sets : 1

Material and Property Information

PSHELL Cards : 10

MAT1 Cards : 1

OPTIMIZATION PROBLEM PARAMETERS :

Objective Function : Minimize Compliance

Response Summary :

Number of volume fraction responses : 1

Number of compliance responses : 1

Static Subcase Summary :

Subcase ID SPC ID FORCE ID

1	1	2
---	---	---

Design Parameters Summary :

Total # of free-sizing design elements : 23926

Total # of free-sizing cards : 1

Total Volume of Design Material : 9.5605E+07

Total Mass of Design Material : 7.5050E-01

Volume of Non-Design Material : 2.7082E+07

Mass of Non-Design Material : 2.1259E-01

Shell Design Elements : PSHELL T0 T

1 0.00 10.

Optimization Parameters Summary :

Initial Material Fraction [0,1] : 0.3000

Maximum Number of Iterations : 30

Convergence Tolerance : 5.0000E-03

Step Size (Free Sizing) : 0.5000

Checkerboard Control : Off

Run Type : Free-Sizing Optimization

Free-Sizing Optimization Summary :

DSIZE ID Minimum Maximum Pattern Pattern Pattern
Member Size Member Size Repet. Symm. Group.

1 NONE NONE NONE

Restart from previous solution : No

Run at location : E:/solo telaio hypermesh/free size optimization solo telaio/

Scratch file directory : E:/solo telaio hypermesh/free size optimization solo telaio/

Free space: 495.415 GB

Number of CPU processors : 1

MEMORY ESTIMATION INFORMATION :

Solver Type is: Sparse-Matrix Solver

Direct Method

Current Memory (RAM) : 3386 MB

Estimated Minimum Memory (RAM) for Out of Core Solution : 812 MB

Recommended Memory (RAM) for Out of Core Solution : 917 MB

Recommended Memory (RAM) for In-Core Solution : 3386 MB

DISK SPACE ESTIMATION INFORMATION :

Estimated Disk Space for Output Data Files : 71 MB

Estimated Scratch Disk Space for In-Core Solution : 1000 MB

Estimated Scratch Disk Space for Out of Core Solution : 4390 MB

BEGINNING OPTIMIZATION SOLUTION

OPTIMIZATION HISTORY INFORMATION :

ITERATION 0

Element # 314647, element type QUAD8.

WARNING - Outside of recommended range: Hoe Normal Offset = 0.30502

upper limit = 0.30000

Element # 314648, element type QUAD8.

WARNING - Outside of recommended range: Hoe Normal Offset = 0.34317

upper limit = 0.30000

Element # 314649, element type QUAD8.

WARNING - Outside of recommended range: Hoe Normal Offset = 0.38141

upper limit = 0.30000

NOTE : other similar error/warning messages were suppressed,

use PARAM,CHECKEL,FULL to obtain full report

Element # 314655, element type QUAD8.

WARNING - Outside of recommended range: Hoe Tangent Offset = 0.23197

upper limit = 0.20000

Element # 316768, element type QUAD8.

WARNING - Outside of recommended range: Hoe Tangent Offset = 0.23197

upper limit = 0.20000

Element # 316785, element type QUAD8.

WARNING - Outside of recommended range: Hoe Tangent Offset = 0.22135

upper limit = 0.20000

Element # 332578, element type QUAD8.

WARNING - Outside of recommended range: Skew Angle = 65.195

upper limit = 60.000

Element # 332583, element type QUAD8.

WARNING - Outside of recommended range: Skew Angle = 65.230

upper limit = 60.000

Element # 331029, element type TRIA6.

WARNING - Outside of recommended range: Vertex Angle = 14.511

lower limit = 15.000

Element Quality Check Summary

Total # of elements that exceeded recommended range (warning) = 24

Note: Only element with the highest violation of each check is listed below.

Recommended range violations:

Element	Property	# of	Recommended Range	Max. Viol.	Elem.	
	Viol.	Lower	Upper	Value	type	No.

QUAD8	Skew Angle	2	--	60.00	65.23	U	332583
QUAD8	Hoe Normal Offset	9	--	0.30	0.57	U	314654
QUAD8	Hoe Tangent Offset	13	--	0.20	0.23	U	314655
TRIA6	Vertex Angle	1	15.00	165.00	14.51	L	331029

*** INFORMATION # 3454

MPC constraints for subcase 1 will be enforced
with elimination of dependent dofs.

List of Auto-SPC d.o.f.s for loadcase 1

Total number of Auto-SPC d.o.f.s = 100381

Grid No.	Component
----------	-----------

8741	6
8742	6
8743	6
8744	6
8745	6
8746	6
8747	6
8748	6
22712	5
22713	5
22714	5
22715	5
22716	5
22717	5
22718	5
22719	5
22720	5
22721	5
22722	5
22723	5
22724	5
22725	5
22726	5
22727	5
22728	5

22729	5
22730	5
22731	5
22732	5
22733	5
22734	5
22735	5
22736	5
22737	5
22738	5
22739	5
22740	5
23032	5
23033	5
23034	5
23035	5
23036	5
23037	5
23038	5
23039	5
23040	5
23041	5
23042	5
23043	5
23044	5

23045	5
23046	5
23047	5
23048	5
23049	5
23050	5
23051	5
23052	5
23053	5
23054	5
23055	5
23056	5
23057	5
23058	5
23059	5
23060	5
23062	4
23063	4
23064	4
23065	4
23066	4
23067	4
23068	4
23069	4
23070	4

23071	4
23072	4
23101	4
23102	4
23103	4
23104	4
23105	4
23106	4
23255	4
23256	4
23257	4
23258	4
23259	4
23260	4
23261	4
23262	4
23263	4
23264	4
23265	4
23456	6
23457	6
23458	6
23459	6
23460	6
23461	6

Because of PARAM, PRGPST, 100, Auto-SPC printing is limited to 100 dofs.

(Scratch disk space usage for starting iteration = 502 MB)

Subcase: 1

Label x-force y-force z-force x-moment y-moment z-moment

Sum-App. 0.000E+00 0.000E+00 0.000E+00 -2.021E+08 -9.775E+07 -1.191E+07

Sum-SPCF 1.546E-03 -9.986E-06 -7.287E-05 2.021E+08 9.775E+07 1.191E+07

Notes: 1. All applied and SPC forces are transferred to

the origin of the basic coordinate system,

so that the applied and SPC loads can match.

2. If spring elements and/or MPCs exist in the model,

total applied loads may not match total SPC loads.

3. If axisymmetric elements are present in the model,

the total x-force and y-force and all the total

moments are set to zero, according to principles

of axisymmetric analysis.

4. If periodic boundary conditions exist in the model,

total applied loads may not match total SPC loads.

(Running in-core solution)

Objective Function (Minimize COMPL) = 3.82374E+07

Maximum Constraint Violation % = 0.42744E-11

Design Volume Fraction = 3.00000E-01 Mass = 4.37740E-01

Subcase Compliance Epsilon

1 3.823742E+07 -1.076744E-12

Note : Epsilon = Residual Strain Energy Ratio.

RETAINED RESPONSES TABLE

Response Type	Response	Subcase	Grid/	DOF/	Response	Objective	Viol.
User-ID	Label	/RANDPS	Element/	Comp	Value	Reference/	%
	/Model	MID/PID/	/Reg		Constraint		
	+Frqncy	Mode No.			Bound		
	/Times						
2	COMPL comp	1	-- TOTL	3.824E+07	MIN		
1	VOLFR vfrac	--	-- TOTL	3.000E-01	< 3.000E-01	0.0 A	

ITERATION 1

*** WARNING # 1662

Constraint reduced AUTOSPC DOF(s) listed below usually are related to a modeling error. Please review the model.

GRID 1417172 DOF 6

GRID 1549910 DOF 4

Number of constraint reduced AUTOSPC DOFs = 2

Subcase: 1

Label x-force y-force z-force x-moment y-moment z-moment

Sum-App. 0.000E+00 0.000E+00 0.000E+00 -2.021E+08 -9.775E+07 -1.191E+07

Sum-SPCF 6.323E-04 -4.560E-05 -7.785E-05 2.021E+08 9.775E+07 1.191E+07

Objective Function (Minimize COMPL) = 1.81342E+07 % change = -52.57

Maximum Constraint Violation % = 0.12367E-05

Design Volume Fraction = 3.00000E-01 Mass = 4.37740E-01

Subcase Compliance Epsilon

1 1.813421E+07 4.770880E-12

Note : Epsilon = Residual Strain Energy Ratio.

RETAINED RESPONSES TABLE

Response Type Response Subcase Grid/ DOF/ Response Objective Viol.

User-ID Label /RANDPS Element/ Comp Value Reference/ %

/Model MID/PID/ /Reg Constraint

+Frqncy Mode No. Bound

/Times

2 COMPL comp 1 -- TOTL 1.813E+07 MIN

1 VOLFR vfrac -- -- TOTL 3.000E-01 < 3.000E-01 0.0 A

ITERATION 2

*** WARNING # 1662

Constraint reduced AUTOSPC DOF(s) listed below usually are related to a modeling error. Please review the model.

GRID 1417172 DOF 6

GRID 1549581 DOF 4

GRID 1549602 DOF 4

GRID 1549638 DOF 4

GRID 1552034 DOF 4

GRID 1552688 DOF 4

Number of constraint reduced AUTOSPC DOFs = 6

Subcase: 1

Label	x-force	y-force	z-force	x-moment	y-moment	z-moment
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Sum-App.	0.000E+00	0.000E+00	0.000E+00	-2.021E+08	-9.775E+07	-1.191E+07
----------	-----------	-----------	-----------	------------	------------	------------

Sum-SPCF	2.278E-04	-5.926E-05	-7.521E-05	2.021E+08	9.775E+07	1.191E+07
----------	-----------	------------	------------	-----------	-----------	-----------

Objective Function (Minimize COMPL) = 1.03094E+07 % change = -43.15

Maximum Constraint Violation % = 0.00000E+00

Design Volume Fraction = 3.00000E-01 Mass = 4.37740E-01

Subcase Compliance Epsilon

1	1.030942E+07	3.897501E-12
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Note : Epsilon = Residual Strain Energy Ratio.

RETAINED RESPONSES TABLE

Response Type	Response	Subcase	Grid/	DOF/	Response	Objective	Viol.
User-ID	Label	/RANDPS	Element/	Comp	Value	Reference/	%
	/Model	MID/PID/	/Reg		Constraint		
	+Frqncy	Mode No.			Bound		
	/Times						

2	COMPL comp	1	--	TOTL	1.031E+07	MIN	
1	VOLFR vfrac	--	--	TOTL	3.000E-01	< 3.000E-01	0.0 A

ITERATION 3

*** WARNING # 1662

Constraint reduced AUTOSPC DOF(s) listed below usually are related to a modeling error. Please review the model.

GRID 1417172 DOF 6

GRID 1549602 DOF 4

GRID 1549638 DOF 4

GRID 1552034 DOF 4

GRID 1552688 DOF 4

Number of constraint reduced AUTOSPC DOFs = 5

Subcase: 1

Label x-force y-force z-force x-moment y-moment z-moment

Sum-App. 0.000E+00 0.000E+00 0.000E+00 -2.021E+08 -9.775E+07 -1.191E+07

Sum-SPCF 7.578E-05 -6.296E-05 -8.148E-05 2.021E+08 9.775E+07 1.191E+07

Objective Function (Minimize COMPL) = 7.32310E+06 % change = -28.97

Maximum Constraint Violation % = 0.61434E-04

Design Volume Fraction = 3.00000E-01 Mass = 4.37740E-01

Subcase Compliance Epsilon

1 7.323100E+06 -4.946129E-12

Note : Epsilon = Residual Strain Energy Ratio.

RETAINED RESPONSES TABLE

Response Type Response Subcase Grid/ DOF/ Response Objective Viol.

User-ID Label /RANDPS Element/ Comp Value Reference/ %

/Model MID/PID/ /Reg Constraint

+Frqncy Mode No. Bound

/Times

2 COMPL comp 1 -- TOTL 7.323E+06 MIN

1 VOLFR vfrac -- -- TOTL 3.000E-01 < 3.000E-01 0.0 A

ITERATION 4

*** WARNING # 1662

Constraint reduced AUTOSPC DOF(s) listed below usually are related to a modeling error. Please review the model.

GRID 1417172 DOF 6

GRID 1549602 DOF 4

GRID 1549638 DOF 4

GRID 1552034 DOF 4

GRID 1552688 DOF 4

GRID 1552908 DOF 4

GRID 1553156 DOF 4

Number of constraint reduced AUTOSPC DOFs = 7

Subcase: 1

Label x-force y-force z-force x-moment y-moment z-moment

Sum-App. 0.000E+00 0.000E+00 0.000E+00 -2.021E+08 -9.775E+07 -1.191E+07

Sum-SPCF 6.035E-05 -6.363E-05 -8.063E-05 2.021E+08 9.775E+07 1.191E+07

Objective Function (Minimize COMPL) = 7.08170E+06 % change = -3.30

Maximum Constraint Violation % = 0.00000E+00

Design Volume Fraction = 3.00000E-01 Mass = 4.37740E-01

Subcase Compliance Epsilon

1 7.081704E+06 -1.940578E-12

Note : Epsilon = Residual Strain Energy Ratio.

RETAINED RESPONSES TABLE

Response Type	Response	Subcase	Grid/	DOF/	Response	Objective	Viol.
User-ID	Label	/RANDPS	Element/	Comp	Value	Reference/	%
	/Model	MID/PID/	/Reg		Constraint		
	+Frqncy	Mode No.			Bound		
	/Times						

2	COMPL comp	1	-- TOTL	7.082E+06	MIN		
1	VOLFR vfrac	--	-- TOTL	3.000E-01	< 3.000E-01	0.0	A

ITERATION 5

*** WARNING # 1662

Constraint reduced AUTOSPC DOF(s) listed below usually are related to a modeling error. Please review the model.

GRID 1417172 DOF 6

GRID 1549529 DOF 4

GRID 1549602 DOF 4

GRID 1549638 DOF 4

GRID 1549910 DOF 4

GRID 1550036 DOF 4

GRID 1552034 DOF 4

GRID 1552688 DOF 4

GRID 1552908 DOF 4

GRID 1553156 DOF 4

Number of constraint reduced AUTOSPC DOFs = 10

Subcase: 1

Label	x-force	y-force	z-force	x-moment	y-moment	z-moment
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Sum-App.	0.000E+00	0.000E+00	0.000E+00	-2.021E+08	-9.775E+07	-1.191E+07
----------	-----------	-----------	-----------	------------	------------	------------

Sum-SPCF	5.641E-05	-6.179E-05	-8.208E-05	2.021E+08	9.775E+07	1.191E+07
----------	-----------	------------	------------	-----------	-----------	-----------

Objective Function (Minimize COMPL) = 7.03055E+06 % change = -0.72

Maximum Constraint Violation % = 0.95137E-04

Design Volume Fraction = 3.00000E-01 Mass = 4.37740E-01

Subcase Compliance Epsilon

1 7.030555E+06 2.505762E-12

Note : Epsilon = Residual Strain Energy Ratio.

RETAINED RESPONSES TABLE

Response Type	Response	Subcase	Grid/	DOF/	Response	Objective	Viol.
---------------	----------	---------	-------	------	----------	-----------	-------

User-ID	Label	/RANDPS	Element/	Comp	Value	Reference/	%
---------	-------	---------	----------	------	-------	------------	---

	/Model	MID/PID/	/Reg		Constraint		
--	--------	----------	------	--	------------	--	--

	+Frqncy	Mode No.			Bound		
--	---------	----------	--	--	-------	--	--

	/Times						
--	--------	--	--	--	--	--	--

2	COMPL comp	1	-- TOTL	7.031E+06	MIN		
---	------------	---	---------	-----------	-----	--	--

1 VOLFR vfrac -- -- TOTL 3.000E-01 < 3.000E-01 0.0 A

ITERATION 6

*** WARNING # 1662

Constraint reduced AUTOSPC DOF(s) listed below usually are related to a modeling error. Please review the model.

GRID 1417172 DOF 6

GRID 1548470 DOF 4

GRID 1549382 DOF 4

GRID 1549529 DOF 4

GRID 1549602 DOF 4

GRID 1549910 DOF 4

GRID 1550036 DOF 4

GRID 1552034 DOF 4

GRID 1552137 DOF 4

GRID 1552688 DOF 4

GRID 1552908 DOF 4

GRID 1553130 DOF 4

GRID 1553156 DOF 4

GRID 1554856 DOF 4

Number of constraint reduced AUTOSPC DOFs = 14

Subcase: 1

Label x-force y-force z-force x-moment y-moment z-moment

Sum-App. 0.000E+00 0.000E+00 0.000E+00 -2.021E+08 -9.775E+07 -1.191E+07

Sum-SPCF 5.255E-05 -6.131E-05 -7.816E-05 2.021E+08 9.775E+07 1.191E+07

the 1st satisfied convergence ratio = 3.4651E-03

Objective Function (Minimize COMPL) = 7.00628E+06 % change = -0.35

Maximum Constraint Violation % = 0.45607E-04

Design Volume Fraction = 3.00000E-01 Mass = 4.37740E-01

Subcase Compliance Epsilon

1 7.006277E+06 1.575981E-12

Note : Epsilon = Residual Strain Energy Ratio.

RETAINED RESPONSES TABLE

Response Type Response Subcase Grid/ DOF/ Response Objective Viol.

User-ID Label /RANDPS Element/ Comp Value Reference/ %

/Model MID/PID/ /Reg Constraint

+Frqncy Mode No. Bound

/Times

2 COMPL comp 1 -- TOTL 7.006E+06 MIN

1 VOLFR vfrac -- -- TOTL 3.000E-01 < 3.000E-01 0.0 A

ITERATION 7

*** WARNING # 1662

Constraint reduced AUTOSPC DOF(s) listed below usually are related
to a modeling error. Please review the model.

GRID 1417172 DOF 6

GRID 1548470 DOF 4

GRID 1549314 DOF 4

GRID 1549343 DOF 4

GRID 1549382 DOF 4

GRID 1549456 DOF 4

GRID 1549529 DOF 4

GRID 1549602 DOF 4

GRID 1549910 DOF 4

GRID 1550036 DOF 4

GRID 1550470 DOF 4

GRID 1552034 DOF 4

GRID 1552639 DOF 4

GRID 1552688 DOF 4

GRID 1552908 DOF 4

GRID 1553130 DOF 4

GRID 1553156 DOF 4

GRID 1554856 DOF 4

Number of constraint reduced AUTOSPC DOFs = 18

Subcase: 1

Label x-force y-force z-force x-moment y-moment z-moment

Sum-App. 0.000E+00 0.000E+00 0.000E+00 -2.021E+08 -9.775E+07 -1.191E+07

Sum-SPCF 4.865E-05 -5.909E-05 -7.555E-05 2.021E+08 9.775E+07 1.191E+07

the 2nd satisfied convergence ratio = 1.8512E-03

Objective Function (Minimize COMPL) = 6.99333E+06 % change = -0.18

Maximum Constraint Violation % = 0.58056E-05

Design Volume Fraction = 3.00000E-01 Mass = 4.37740E-01

Subcase Compliance Epsilon

1 6.993331E+06 1.465968E-12

Note : Epsilon = Residual Strain Energy Ratio.

RETAINED RESPONSES TABLE

Response Type Response Subcase Grid/ DOF/ Response Objective Viol.

User-ID Label /RANDPS Element/ Comp Value Reference/ %

/Model MID/PID/ /Reg Constraint

+Frqncy Mode No. Bound

/Times

2 COMPL comp 1 -- TOTL 6.993E+06 MIN

1 VOLFR vfrac -- -- TOTL 3.000E-01 < 3.000E-01 0.0 A

OPTIMIZATION HAS CONVERGED.

FEASIBLE DESIGN (ALL CONSTRAINTS SATISFIED).

RESOURCE USAGE INFORMATION

MAXIMUM MEMORY USED 3386 MB

MAXIMUM DISK SPACE USED 943 MB

COMPUTE TIME INFORMATION

EXECUTION STARTED Tue Nov 26 11:58:42 2019

EXECUTION COMPLETED Tue Nov 26 12:06:53 2019

ELAPSED TIME 00:08:10

CPU TIME 00:07:57

***** END OF REPORT *****

For Useful OptiStruct Tips and Tricks, go to the URL:

<http://www.altairhyperworks.com/tips.aspx>

==== End of solver screen output ====

==== OptiStruct Job completed ====

Iteration	Subcase	Variable	Grid/Elem ID	Value
0	1	MaxDisp	632451_X	163.036
0	0	ObjFun:MinimizeCOMPL	0	3.82374e+07
0	0	MaxConstrViol(%)	0	4.27436e-12
1	1	MaxDisp	632451_X	64.5118
1	0	ObjFun:MinimizeCOMPL	0	1.81342e+07
1	0	MaxConstrViol(%)	0	1.23673e-06
2	1	MaxDisp	632451_X	27.5543
2	0	ObjFun:MinimizeCOMPL	0	1.03094e+07
2	0	MaxConstrViol(%)	0	0
3	1	MaxDisp	632353_X	14.322
3	0	ObjFun:MinimizeCOMPL	0	7.3231e+06
3	0	MaxConstrViol(%)	0	6.1434e-05
4	1	MaxDisp	632353_X	13.6205
4	0	ObjFun:MinimizeCOMPL	0	7.0817e+06
4	0	MaxConstrViol(%)	0	0
5	1	MaxDisp	632451_X	13.5554
5	0	ObjFun:MinimizeCOMPL	0	7.03055e+06
5	0	MaxConstrViol(%)	0	9.51373e-05

6	1	MaxDisp	632451_X	13.5222
6	0	ObjFun:MinimizeCOMPL	0	7.00628e+06
6	0	MaxConstrViol(%)	0	4.56073e-05
7	1	MaxDisp	632451_X	13.5097
7	0	ObjFun:MinimizeCOMPL	0	6.99333e+06
7	0	MaxConstrViol(%)	0	5.80557e-06