

CompoSIDE Report

Basic Laminate Report

| | |
|------------------------|---|
| Project | CS-IN-011-Open Academy Webinar - Design for FEA |
| Report name | Demo Report |
| Reported laminate name | Panel Laminate/Additional Plies |
| Description | |

Issues & Amendments

| Issue | Issue Log | Issued by | Approved by | Issue Date |
|-------|-----------|-----------|-------------|------------|
|-------|-----------|-----------|-------------|------------|

1.1 Laminate Stack-Up

| | | Theta [°] | 0 |
|--------|---------------------|---------------|-----------|
| | | Sequence Type | Total |
| # | Material Name | Alpha [°] | Gamma [°] |
| TOP | | | |
| 1 | 1 x UC-SM200-EP-VIN | 0 | 0 |
| 2 | 1 x UC-SM200-EP-VIN | -30 | -30 |
| 3 | 1 x UC-SM200-EP-VIN | 30 | 30 |
| 4 | 1 x UC-SM200-EP-VIN | 60 | 60 |
| 5 | 1 x UC-SM200-EP-VIN | -60 | -60 |
| 6 | 1 x UC-SM200-EP-VIN | 45 | 45 |
| 7 | 1 x UC-SM200-EP-VIN | -45 | -45 |
| 8 | 1 x 10mm T10.100 | 90 | 90 |
| 9 | 1 x UC-SM200-EP-VIN | -45 | -45 |
| 10 | 1 x UC-SM200-EP-VIN | 45 | 45 |
| 11 | 1 x UC-SM200-EP-VIN | -60 | -60 |
| 12 | 1 x UC-SM200-EP-VIN | 60 | 60 |
| 13 | 1 x UC-SM200-EP-VIN | 30 | 30 |
| 14 | 1 x UC-SM200-EP-VIN | -30 | -30 |
| 15 | 1 x UC-SM200-EP-VIN | 0 | 0 |
| BOTTOM | | | |

* Orange layer marks core

1.2 Generic Data

| Name | Units | Total | Top Skin | Bottom Skin | Core |
|----------------------|----------------------|----------|----------|-------------|------|
| Number of Plies | [-] | 15 | 7 | 7 | 1 |
| Thickness | [mm] | 12.778 | 1.389 | 1.389 | 10 |
| Weight* | [g/m ²] | 5293.056 | 2146.528 | 2146.528 | 1000 |
| Reinforcement Weight | [g/m ²] | 2800 | 1400 | 1400 | N/A |
| Density | [kg/m ³] | 414.239 | - | - | 100 |
| Unit Price | [€/m ²] | - | - | - | - |

*Given weight does not include any usage factors (eg. core resin consumption)

2 Engineering Constants

In-Plane Constant

| Property Name | Unit | Panel | Zero Curvature | Upper Skin | Lower Skin |
|---------------|-------|--------|----------------|------------|------------|
| E_x | [MPa] | 9414.6 | 9414.6 | 42830.6 | 42830.6 |
| E_y | [MPa] | 6646.4 | 6646.4 | 30114.4 | 30114.4 |
| G_{xy} | [MPa] | 5332 | 5332 | 24451.5 | 24451.5 |
| ν_{xy} | [-] | 0.578 | 0.578 | 0.581 | 0.581 |
| ν_{yx} | [-] | 0.408 | 0.408 | 0.408 | 0.408 |
| G_{xz} | [MPa] | 23.7 | - | - | - |
| G_{yz} | [MPa] | 32.9 | - | - | - |

Flexural Constant

| Property Name | Unit | Panel | Zero Curvature | Upper Skin | Lower Skin |
|---------------|-------|---------|----------------|------------|------------|
| E_x^f | [MPa] | 24663.3 | - | - | - |
| E_y^f | [MPa] | 15408.8 | - | - | - |
| G_{xy}^f | [MPa] | 12224.8 | - | - | - |
| ν_{xy}^f | [-] | 0.585 | - | - | - |
| ν_{yx}^f | [-] | 0.365 | - | - | - |

In-Plane Stiffnesses

| Property Name | Unit | Panel | Zero Curvature | Upper Skin | Lower Skin |
|---------------|--------|----------|----------------|------------|------------|
| E_x^{*t} | [N/mm] | 120297.7 | 120297.7 | 59486.9 | 59486.9 |
| E_y^{*t} | [N/mm] | 84926.2 | 84926.2 | 41825.6 | 41825.6 |
| G_{xy}^{*t} | [N/mm] | 68130.7 | 68130.7 | 33960.4 | 33960.4 |

Out of Plane Stiffnesses

| Property Name | Unit | Panel | Zero Curvature | Upper Skin | Lower Skin |
|---------------|------------------------|-----------|----------------|------------|------------|
| EI_x | [Nmm ² /mm] | 4287816.5 | - | 130245.7 | 35510.7 |
| EI_y | [Nmm ² /mm] | 2678882.6 | - | 38107 | 46521.9 |
| GI_0 | [Nmm ² /mm] | 2125337 | - | 31515.2 | 52285.2 |
| G_{xz}^{*t} | [N/mm] | 303.3 | - | - | - |
| G_{yz}^{*t} | [N/mm] | 420.5 | - | - | - |

Neutral Axis (in relation to midplane*)

| Property Name | Unit | Panel | Zero Curvature | Upper Skin | Lower Skin |
|---------------------|------|-------|----------------|------------|------------|
| X Direction Bending | [mm] | 0 | - | - | - |
| Y Direction Bending | [mm] | 0 | - | - | - |

Thermal Expansion Coefficients

| Property Name | Unit | Panel | Zero Curvature | Upper Skin | Lower Skin |
|---------------|------------|-------|----------------|------------|------------|
| α_x | [E-6/K] | - | - | - | - |
| α_y | [E-6/K] | - | - | - | - |
| α_{xy} | [E-6/K] | - | - | - | - |
| δ_x | [1/(mm*K)] | - | - | - | - |
| δ_y | [1/(mm*K)] | - | - | - | - |
| δ_{xy} | [1/(mm*K)] | - | - | - | - |

* Shown according to the orientation of the laminate (see the z-axis direction on the Laminate definition page). Positive value: NA is between mid-plane and the bottom layer of the laminate. Negative value: NA is between mid-plane and the top layer of the laminate.

3 Laminate ABD

3.1 Stiffness Matrix (ABD)

A_{ij} [N/mm]

| | | |
|-----------|-----------|-----------|
| 1.575e+05 | 6.43e+04 | 0 |
| 6.43e+04 | 1.112e+05 | 0 |
| 0 | 0 | 6.813e+04 |

B_{ij} [N]

| | | |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 0 | 0 |
| 0 | 0 | 0 |

D_{ij} [Nmm]

| | | |
|-----------|-----------|-----------|
| 5.452e+06 | 1.992e+06 | 1.615e+02 |
| 1.992e+06 | 3.407e+06 | 4.444e+04 |
| 1.615e+02 | 4.444e+04 | 2.126e+06 |

3.2 Compliance Matrix (abd)

a_{ij} [N/mm]⁻¹

| | | |
|------------|------------|-----------|
| 8.313e-06 | -4.808e-06 | 1.138e-21 |
| -4.808e-06 | 1.177e-05 | 7.387e-21 |
| -2.431e-23 | 8.779e-21 | 1.468e-05 |

b_{ij} [N]⁻¹

| | | |
|-----------|------------|-----------|
| 8.733e-22 | -4.519e-22 | 2.181e-22 |
| -4.23e-22 | 9.547e-22 | -1.01e-21 |
| 1.643e-22 | -9.861e-22 | 1.559e-21 |

d_{ij} [Nmm]⁻¹

| | | |
|------------|------------|------------|
| 2.332e-07 | -1.364e-07 | 2.833e-09 |
| -1.364e-07 | 3.733e-07 | -7.793e-09 |
| 2.833e-09 | -7.793e-09 | 4.705e-07 |

4 Allowable Ultimate Strains (Fibre Failure)

4.1 Top Skin Allowable Strains

| Name | Value | Description |
|--------------------|---------|---|
| ϵ_{uc_x} | -0.62 % | Allowable longitudinal compressive strain |
| ϵ_{uc_y} | -0.93 % | Allowable transverse compressive strain |
| ϵ_{ut_x} | 1.04 % | Allowable longitudinal tensile strain |
| ϵ_{ut_y} | 1.55 % | Allowable transverse tensile strain |

4.2 Bottom Skin Allowable Strains

| Name | Value | Description |
|--------------------|---------|---|
| ϵ_{uc_x} | -0.62 % | Allowable longitudinal compressive strain |
| ϵ_{uc_y} | -0.93 % | Allowable transverse compressive strain |
| ϵ_{ut_x} | 1.04 % | Allowable longitudinal tensile strain |
| ϵ_{ut_y} | 1.2 % | Allowable transverse tensile strain |

5 Allowable Cylindrical Bending Moments Summary

5.1 Summary

(Based on Max Strain Failure Criteria)

| Compressive: | X DIRECTION MOMENT | | | | Y DIRECTION MOMENT | | | |
|----------------------------------|-----------------------------|----------|--------------------------------|----------|-----------------------------|----------|--------------------------------|----------|
| | Top Skin (+M _x) | | Bottom Skin (-M _x) | | Top Skin (+M _y) | | Bottom skin (-M _y) | |
| | Allowable Moment [Nmm/mm] | Ply Seq. | Allowable Moment [Nmm/mm] | Ply Seq. | Allowable Moment [Nmm/mm] | Ply Seq. | Allowable Moment [Nmm/mm] | Ply Seq. |
| LONGITUDINAL (1) | | | | | | | | |
| Fibre Failure (FF) | 5319.54 | 1 | 5319.54 | 15 | 4946.26 | 4 | 4946.26 | 12 |
| Resin/Microcracking Failure (RF) | 7107.17 | 15 | 7107.17 | 1 | 6608.45 | 12 | 6608.45 | 4 |
| TRANSVERSE (2) | | | | | | | | |
| Fibre Failure (FF) | 10263.42 | 8 | 10263.42 | 8 | - | - | - | - |
| Resin/Microcracking Failure (RF) | 5646.18 | 12 | 5646.18 | 4 | 2399.27 | 15 | 2399.27 | 1 |
| SHEAR (12) | | | | | | | | |
| Resin Shear (RSF) | 12123.21 | 10 | 12123.21 | 10 | 7533.71 | 14 | 7533.71 | 14 |
| STABILITY | | | | | | | | |
| Skin Wrinkling | 6527.71 | | 6527.71 | | 4971.56 | | 4971.56 | |

5.2 Allowable Cylindrical Bending Moments - Detail Results

5.2.1 -M_x (Downwards-bottom skin in compression)

| Failure Sequence Id | Critical Ply Seq Number | Failure Moment [Nmm/mm] | Critical Strain Layer | Critical Strain Laminate | FailureMode |
|---------------------|-------------------------|-------------------------|-----------------------|--------------------------|-------------|
| 1 | 15 | 5319.54 | -0.623 | -0.623 | 11CF |
| 2 | 4 | 5646.18 | 0.45 | 0.6 | 22TR |
| 3 | 5 | 5846.91 | 0.45 | 0.6 | 22TR |
| 4 | 1 | 7107.17 | 0.833 | 0.833 | 11TR |
| 5 | 14 | 7319.73 | -0.623 | -0.831 | 11CF |
| 6 | 13 | 7562.77 | -0.623 | -0.831 | 11CF |
| 7 | 1 | 8883.97 | 1.041 | 1.041 | 11TF |
| 8 | 6 | 9091.72 | 0.45 | 0.9 | 22TR |
| 9 | 7 | 9440.17 | 0.45 | 0.9 | 22TR |
| 10 | 2 | 9779.53 | 0.833 | 1.11 | 11TR |
| 11 | 3 | 10104.24 | 0.833 | 1.11 | 11TR |
| 12 | 8 | 10263.42 | -0.941 | -0.941 | 22CF |
| 13 | 10 | 12123.21 | 1.2 | -1.2 | 12SR |
| 14 | 6 | 12123.21 | 1.2 | 1.2 | 12SR |
| 15 | 14 | 12204.51 | 1.2 | -1.386 | 12SR |
| 16 | 2 | 12204.51 | 1.2 | 1.386 | 12SR |
| 17 | 2 | 12224.41 | 1.041 | 1.388 | 11TF |
| 18 | 9 | 12585.93 | 1.2 | -1.2 | 12SR |
| 19 | 7 | 12585.93 | 1.2 | 1.2 | 12SR |
| 20 | 10 | 12595.75 | -0.623 | -1.247 | 11CF |
| 21 | 13 | 12607.53 | 1.2 | -1.386 | 12SR |
| 22 | 3 | 12607.53 | 1.2 | 1.386 | 12SR |
| 23 | 3 | 12630.3 | 1.041 | 1.388 | 11TF |
| 24 | 12 | 13040.44 | 1.2 | -1.386 | 12SR |
| 25 | 4 | 13040.44 | 1.2 | 1.386 | 12SR |
| 26 | 9 | 13074.52 | -0.623 | -1.247 | 11CF |
| 27 | 11 | 13501.68 | 1.2 | -1.386 | 12SR |
| 28 | 5 | 13501.68 | 1.2 | 1.386 | 12SR |
| 29 | 2 | 15855.52 | 0.45 | 1.8 | 22TR |
| 30 | 3 | 16376.23 | 0.45 | 1.8 | 22TR |

5.2.2 -My (Downwards-bottom skin in compression)

| Failure Sequence Id | Critical Ply Seq Number | Failure Moment [Nmm/mm] | Critical Strain Layer | Critical Strain Laminate | FailureMode |
|---------------------|-------------------------|-------------------------|-----------------------|--------------------------|-------------|
| 1 | 1 | 2399.27 | 0.45 | 0.45 | 22TR |
| 2 | 2 | 3341.9 | 0.45 | 0.607 | 22TR |
| 3 | 3 | 3370.21 | 0.45 | 0.593 | 22TR |
| 4 | 12 | 4946.26 | -0.623 | -0.841 | 11CF |
| 5 | 11 | 4999.51 | -0.623 | -0.821 | 11CF |
| 6 | 6 | 5564.32 | 0.45 | 0.882 | 22TR |
| 7 | 7 | 6023.36 | 0.45 | 0.919 | 22TR |
| 8 | 8 | 6412.24 | -0.941 | -0.941 | 11CF |
| 9 | 4 | 6608.45 | 0.833 | 1.124 | 11TR |
| 10 | 5 | 6679.59 | 0.833 | 1.097 | 11TR |
| 11 | 14 | 7533.71 | 1.2 | -1.369 | 12SR |
| 12 | 2 | 7533.71 | 1.2 | 1.369 | 12SR |
| 13 | 10 | 7574.17 | 1.2 | -1.2 | 12SR |
| 14 | 6 | 7574.17 | 1.2 | 1.2 | 12SR |
| 15 | 9 | 7863.26 | 1.2 | -1.2 | 12SR |
| 16 | 7 | 7863.26 | 1.2 | 1.2 | 12SR |
| 17 | 13 | 7973.33 | 1.2 | -1.403 | 12SR |
| 18 | 3 | 7973.33 | 1.2 | 1.403 | 12SR |
| 19 | 15 | 7997.57 | -1.5 | -1.5 | 22TR |
| 20 | 9 | 8001.87 | -0.623 | -1.221 | 11CF |
| 21 | 10 | 8036.8 | -0.623 | -1.273 | 11CF |
| 22 | 12 | 8049.72 | 1.2 | -1.369 | 12SR |
| 23 | 4 | 8049.72 | 1.2 | 1.369 | 12SR |
| 24 | 4 | 8260.56 | 1.041 | 1.405 | 11TF |
| 25 | 5 | 8349.49 | 1.041 | 1.371 | 11TF |
| 26 | 11 | 8538.82 | 1.2 | -1.403 | 12SR |
| 27 | 5 | 8538.82 | 1.2 | 1.403 | 12SR |
| 28 | 4 | 10213.31 | 0.45 | 1.737 | 22TR |
| 29 | 7 | 10690.9 | 0.833 | 1.632 | 11TR |
| 30 | 6 | 10737.57 | 0.833 | 1.701 | 11TR |

5.2.3 +Mx (Upwards-top skin in compression)

| Failure Sequence Id | Critical Ply Seq Number | Failure Moment [Nmm/mm] | Critical Strain Layer | Critical Strain Laminate | FailureMode |
|---------------------|-------------------------|-------------------------|-----------------------|--------------------------|-------------|
| 1 | 1 | 5319.54 | -0.623 | -0.623 | 11CF |
| 2 | 12 | 5646.18 | 0.45 | 0.6 | 22TR |
| 3 | 11 | 5846.91 | 0.45 | 0.6 | 22TR |
| 4 | 15 | 7107.17 | 0.833 | 0.833 | 11TR |
| 5 | 2 | 7319.73 | -0.623 | -0.831 | 11CF |
| 6 | 3 | 7562.77 | -0.623 | -0.831 | 11CF |
| 7 | 15 | 8883.97 | 1.041 | 1.041 | 11TF |
| 8 | 10 | 9091.72 | 0.45 | 0.9 | 22TR |
| 9 | 9 | 9440.17 | 0.45 | 0.9 | 22TR |
| 10 | 14 | 9779.53 | 0.833 | 1.11 | 11TR |
| 11 | 13 | 10104.24 | 0.833 | 1.11 | 11TR |
| 12 | 8 | 10263.42 | 0.941 | 0.941 | 22TF |
| 13 | 10 | 12123.21 | 1.2 | 1.2 | 12SR |
| 14 | 6 | 12123.21 | 1.2 | -1.2 | 12SR |
| 15 | 14 | 12204.51 | 1.2 | 1.386 | 12SR |
| 16 | 2 | 12204.51 | 1.2 | -1.386 | 12SR |

| Failure Sequence Id | Critical Ply Seq Number | Failure Moment [Nmm/mm] | Critical Strain Layer | Critical Strain Laminate | FailureMode |
|---------------------|-------------------------|-------------------------|-----------------------|--------------------------|-------------|
| 17 | 14 | 12224.41 | 1.041 | 1.388 | 11TF |
| 18 | 9 | 12585.93 | 1.2 | 1.2 | 12SR |
| 19 | 7 | 12585.93 | 1.2 | -1.2 | 12SR |
| 20 | 6 | 12595.75 | -0.623 | -1.247 | 11CF |
| 21 | 13 | 12607.53 | 1.2 | 1.386 | 12SR |
| 22 | 3 | 12607.53 | 1.2 | -1.386 | 12SR |
| 23 | 13 | 12630.3 | 1.041 | 1.388 | 11TF |
| 24 | 12 | 13040.44 | 1.2 | 1.386 | 12SR |
| 25 | 4 | 13040.44 | 1.2 | -1.386 | 12SR |
| 26 | 7 | 13074.52 | -0.623 | -1.247 | 11CF |
| 27 | 11 | 13501.68 | 1.2 | 1.386 | 12SR |
| 28 | 5 | 13501.68 | 1.2 | -1.386 | 12SR |
| 29 | 14 | 15855.52 | 0.45 | 1.8 | 22TR |
| 30 | 13 | 16376.23 | 0.45 | 1.8 | 22TR |

5.2.4 +My (Upwards-top skin in compression)

| Failure Sequence Id | Critical Ply Seq Number | Failure Moment [Nmm/mm] | Critical Strain Layer | Critical Strain Laminate | FailureMode |
|---------------------|-------------------------|-------------------------|-----------------------|--------------------------|-------------|
| 1 | 15 | 2399.27 | 0.45 | 0.45 | 22TR |
| 2 | 14 | 3341.9 | 0.45 | 0.607 | 22TR |
| 3 | 13 | 3370.21 | 0.45 | 0.593 | 22TR |
| 4 | 4 | 4946.26 | -0.623 | -0.841 | 11CF |
| 5 | 5 | 4999.51 | -0.623 | -0.821 | 11CF |
| 6 | 10 | 5564.32 | 0.45 | 0.882 | 22TR |
| 7 | 9 | 6023.36 | 0.45 | 0.919 | 22TR |
| 8 | 8 | 6412.24 | 0.941 | 0.941 | 11TF |
| 9 | 12 | 6608.45 | 0.833 | 1.124 | 11TR |
| 10 | 11 | 6679.59 | 0.833 | 1.097 | 11TR |
| 11 | 14 | 7533.71 | 1.2 | 1.369 | 12SR |
| 12 | 2 | 7533.71 | 1.2 | -1.369 | 12SR |
| 13 | 10 | 7574.17 | 1.2 | 1.2 | 12SR |
| 14 | 6 | 7574.17 | 1.2 | -1.2 | 12SR |
| 15 | 9 | 7863.26 | 1.2 | 1.2 | 12SR |
| 16 | 7 | 7863.26 | 1.2 | -1.2 | 12SR |
| 17 | 13 | 7973.33 | 1.2 | 1.403 | 12SR |
| 18 | 3 | 7973.33 | 1.2 | -1.403 | 12SR |
| 19 | 1 | 7997.57 | -1.5 | -1.5 | 22TR |
| 20 | 7 | 8001.87 | -0.623 | -1.221 | 11CF |
| 21 | 6 | 8036.8 | -0.623 | -1.273 | 11CF |
| 22 | 12 | 8049.72 | 1.2 | 1.369 | 12SR |
| 23 | 4 | 8049.72 | 1.2 | -1.369 | 12SR |
| 24 | 12 | 8260.56 | 1.041 | 1.405 | 11TF |
| 25 | 11 | 8349.49 | 1.041 | 1.371 | 11TF |
| 26 | 11 | 8538.82 | 1.2 | 1.403 | 12SR |
| 27 | 5 | 8538.82 | 1.2 | -1.403 | 12SR |
| 28 | 12 | 10213.31 | 0.45 | 1.737 | 22TR |
| 29 | 9 | 10690.9 | 0.833 | 1.632 | 11TR |
| 30 | 10 | 10737.57 | 0.833 | 1.701 | 11TR |




6 Skin Wrinkling

6.1 Sandwich Panel Skin Wrinkling under Compression




| | Units | Longitudinal (X) | Transverse (Y) |
|---------------------------|--------|---------------------|---------------------|
| Critical Compressive Load | [N/mm] | 1039.722 | 884.314 |
| Panel wrinkling mode | - | Symmetric wrinkling | Symmetric wrinkling |

6.2 Skin Wrinkling

6.2.1 Top Skin Compression


| | Type of wrinkling | Value Type | Units | Longitudinal (X) | Transverse (Y) |
|---|---------------------|---|------------------------|-----------------------------|-----------------------------|
|  | Case 1 - Rigid Base | Critical Stress Critical Load Critical Compressive Strain | [N/mm] [MPa] [%] | 405.563 292.006 0.682 | 347.516 250.211 0.831 |
|  | Case 2 - Asymmetric | Critical Stress Critical Load Critical Compressive Strain | [N/mm] [MPa] [%] | No Asymmetric wrinkling | No Asymmetric wrinkling |
|  | Case 3 - Symmetric | Critical Stress Critical Load Critical Compressive Strain | [N/mm] [MPa] [%] | 519.861 374.3 0.874 | 442.157 318.353 1.057 |

6.2.2 Bottom Skin Compression

| | Type of wrinkling | Value Type | Units | Longitudinal (X) | Transverse (Y) |
|---|---------------------|---|------------------------|-----------------------------|-----------------------------|
|  | Case 1 - Rigid Base | Critical Stress Critical Load Critical Compressive Strain | [N/mm] [MPa] [%] | 405.563 292.006 0.682 | 347.516 250.211 0.831 |
|  | Case 2 - Asymmetric | Critical Stress Critical Load Critical Compressive Strain | [N/mm] [MPa] [%] | No Asymmetric wrinkling | No Asymmetric wrinkling |
|  | Case 3 - Symmetric | Critical Stress Critical Load Critical Compressive Strain | [N/mm] [MPa] [%] | 519.861 374.3 0.874 | 442.157 318.353 1.057 |

6.2.3 Shear Crimping Calculation

Skin bending stiffness not included in shear crimping calculations.
No safety factor included in crimping critical load.

| | Shear Crimping | Value Type | Units | Longitudinal (X) | Transverse (Y) |
|---|---------------------------|---------------|--------|------------------|----------------|
|  | Both skins in compression | Critical Load | [N/mm] | 272.38 | 441 |

7 Materials Properties

7.1 Ply Properties

7.1.1 Physical Properties

| Name | t_{pp} [mm] | A_m [g/m ²] | ρ [kg/m ³] | FVF | α_{11} [E-6/K] | α_{22} [E-6/K] | Nominal Price per m ² [€] |
|-----------------|------------------|------------------------------|--------------------------------|------|--------------------------|--------------------------|---|
| UC-SM200-EP-VIN | 0.2 | 307 | 1545.5 | 0.56 | 0.25 | 42.02 | |

7.1.2 Stiffness

| Name | E_{11t} [MPa] | E_{11c} [MPa] | E_{22t} [MPa] | E_{22c} [MPa] | G_{12} [MPa] | ν_{12} | ν_{21} |
|-----------------|--------------------|--------------------|--------------------|--------------------|-------------------|------------|------------|
| UC-SM200-EP-VIN | 130417.9 | 120141 | 9416.5 | 9416.5 | 4435.5 | 0.31 | 0.02 |

7.1.3 Allowable Strains

| Name | ϵ_{11t} [%] | ϵ_{11c} [%] | ϵ_{22t} [%] | ϵ_{22c} [%] | ν_{12} [%] | $\epsilon_{11 \text{ m.crack}}$ [%] | $\epsilon_{22 \text{ r.crack}}$ [%] |
|-----------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------|--|--|
| UC-SM200-EP-VIN | 1 | -0.65 | 0.45 | -1.5 | 1.2 | 0.8 | 0.45 |

7.1.4 Allowable Strengths

| Name | σ_{11t} [MPa] | σ_{11c} [MPa] | σ_{22t} [MPa] | σ_{22c} [MPa] | τ_{12} [MPa] | $\sigma_{11 \text{ m.crack}}$ [MPa] | $\sigma_{22 \text{ r.crack}}$ [MPa] |
|-----------------|-------------------------|-------------------------|-------------------------|-------------------------|----------------------|--|--|
| UC-SM200-EP-VIN | 1304.2 | -780.9 | 42.4 | -141.2 | 53.2 | 1043.3 | 42.4 |

*All bi-axials properties are given at @0/90°

7.2 Core Properties

7.2.1 Physical Properties

| Name | t_{pp} [mm] | A_m [g/m ²] | ρ [kg/m ³] | Core Type | α_{11} [E-6/K] | α_{22} [E-6/K] | Nominal Price per m ² [€] |
|---------|------------------|------------------------------|--------------------------------|-----------|--------------------------|--------------------------|---|
| T10.100 | 10 | 1000 | 100 | pet | | | |

7.2.2 Stiffness, Strength and Allowable Strains

| Name | E_{11t} [MPa] | G_{13} [MPa] | ν_{13} [%] | τ_{13} [MPa] | G_{23} [MPa] | ν_{23} [%] | τ_{23} [MPa] |
|---------|--------------------|-------------------|-------------------|----------------------|-------------------|-------------------|----------------------|
| T10.100 | 150 | 34 | 2.5 | 0.9 | 21 | 3.476 | 0.7 |