Fatigue assessment – Akulon K224-G6 (PA6) at 8°C

Parameter	Value / Assumption
Material	Akulon K224-G6 (PA6)
Temperature	8°C
Humidity	50% RH
Load	25 kg (~245 N)
Area	2 cm²
Calculated stress	~1.2 MPa
Fatigue level (10^6 cycles)	~100–115 MPa (temperature-dependent)
Fatigue safety margin	>80 times lower stress
Service life	Up to ~10^6 cycles (depending on use)
Creep	Reduced at lower temperatures
Environmental impact	Moisture absorption reduced at lower temperatures

Conclusion: At 8°C, the safety margin for fatigue is further improved compared to 23°C. The stress level remains very low relative to the material's fatigue properties, and there is assessed to be no risk of fatigue failure over a 100-year period under the given conditions.

Service life assessment – Akulon (PA6) at 23°C

Input data
Material: Akulon K224-G6 (PA6)
Temperature: 23°C
Humidity: 50% RH
Load: 25 kg
Area: 2 cm²

Calculated stress
Force: 245 N
Stress: approx. 1.2 MPa

Fatigue assessment
At 10^6 cycles: approx. 100 MPa
Current stress: 1.2 MPa
→ >80 times lower than critical level

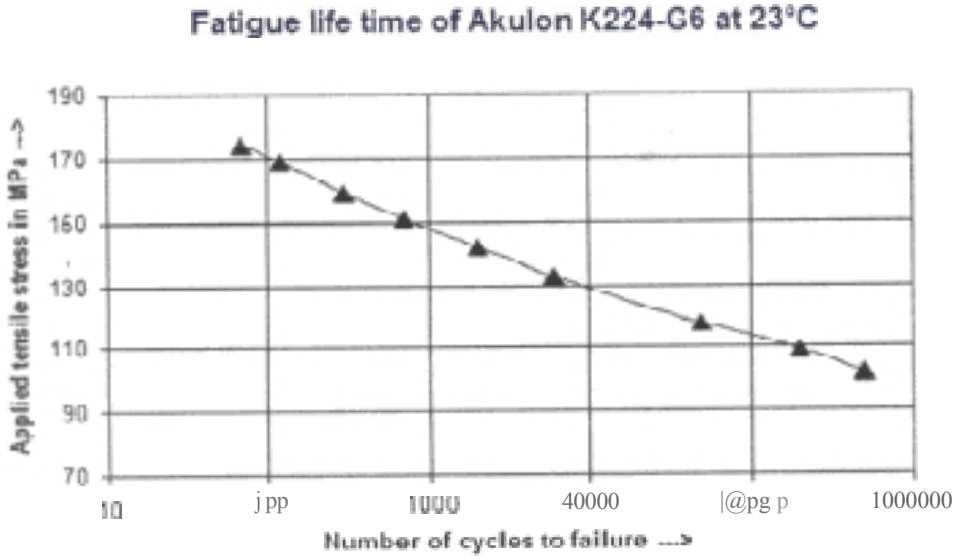
Service life (100 years)
Up to ~10^6 cycles depending on use
→ No fatigue risk

Environmental impact
50% RH improves fatigue properties

Conclusion
No risk of fatigue failure over 100 years.
The design has a high safety margin.

Recommendation
Assess creep, temperature and local stresses.

Fatigue curve (reference)


Fatigue life time of Akulon K224-G6 at 23°C
190
170
150
130
110
90
70
Applied tensile stress in MPa -->
10
j pp
1000
40000
|@pg p
1000000
Number of cycles to failure ...>

Service life assessment – Akulon (PA6) at 23°C

Input data
Material: Akulon F223-D (PA6)
Temperature: 23°C
Humidity: 50% RH
Load: 25 kg
Area: 2 cm²

Calculated stress
Force: 245 N
Stress: approx. 1.2 MPa

Fatigue assessment
At 10^6 cycles: approx. 40 MPa
Current stress: 1.2 MPa
® ~30–35 times lower than critical level

Service life (100 years)
Up to ~10^6 cycles depending on use
® No fatigue risk

Environmental impact
50% RH improves fatigue properties but increases creep

Conclusion
No risk of fatigue failure over 100 years.
The design still has a good safety margin, but this is lower than for glass-reinforced materials. Creep may be a limiting factor for long-term performance.

Recommendation
Assess creep, temperature and local stresses.

Service life assessment – Akulon (PA6) at 8°C

Input data
Material: Akulon F223-D (PA6)
Temperature: 8°C
Humidity: 50% RH
Load: 25 kg
Area: 2 cm²

Calculated stress
Force: 245 N
Stress: approx. 1.2 MPa

Fatigue assessment
At 10^6 cycles: approx. 40 MPa
Current stress: 1.2 MPa
® ~30–35 times lower than critical level

Service life (100 years)
Up to ~10^6 cycles depending on use
® No fatigue risk

Environmental impact
50% RH improves fatigue properties but increases creep

Conclusion
No risk of fatigue failure over 100 years.
The design still has a good safety margin, but it is lower than that of glass-reinforced material. Creep is reduced at lower temperatures and is less critical than at 23°C.

Recommendation
Continue to assess creep, temperature and local stresses.