



LUVOCOM[®]

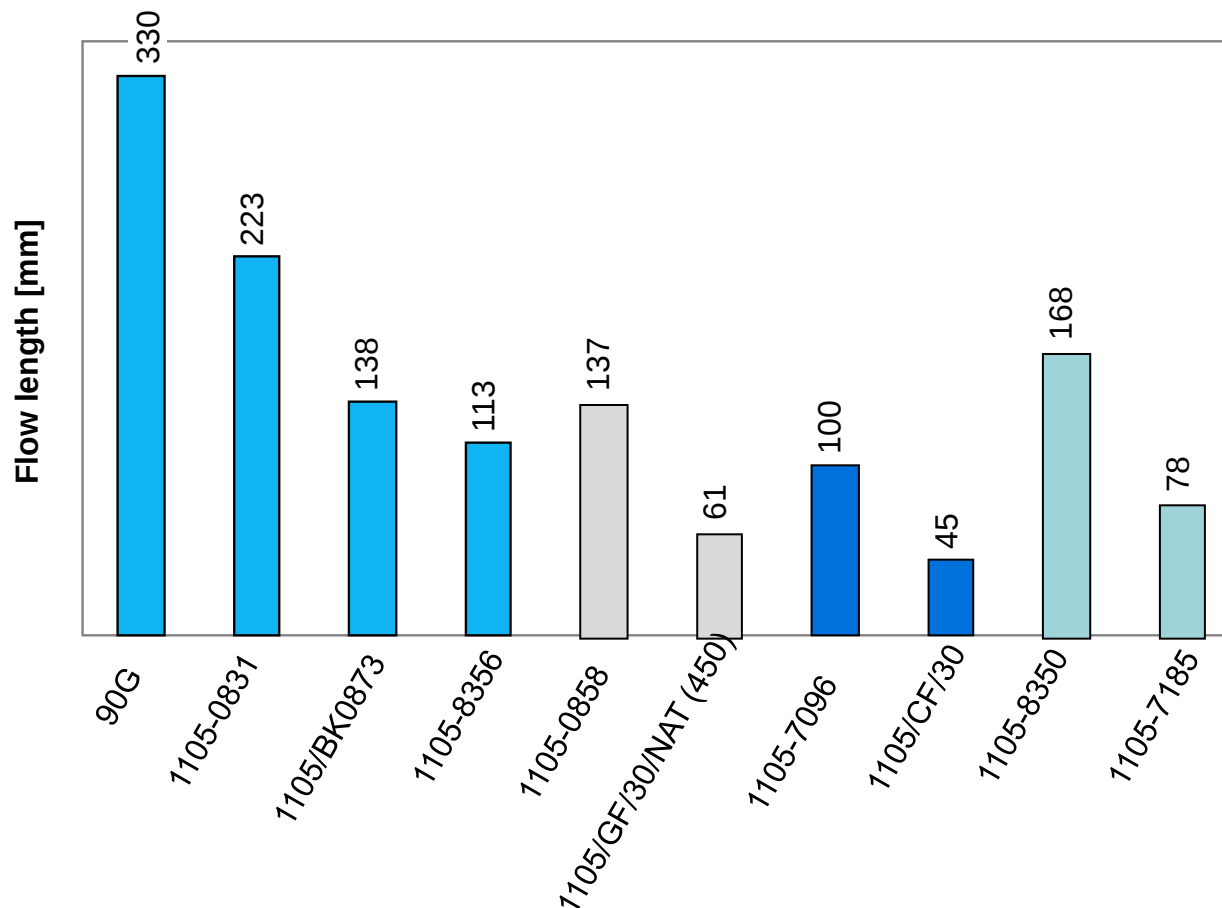
High-performance compounds

Processing of LUVOCOM High-Performance Compounds based on PEEK

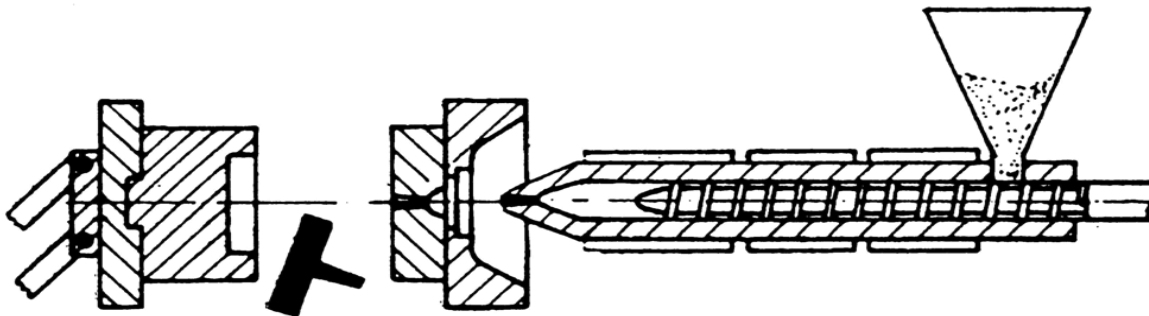


Flow Length of Various Materials Based on PEEK

Flow length in mm @ 1mm wall thickness and recommended processing conditions



Injection Moulding Parameters



- Typical injection pressure 1400 to 2000 bar
- Screw revolution 50 to 100 rpm
- Melt cushion 2 to 5 times of injected volume (part + runner)



Recommendations for Injection Moulding Tools for PEEK

- Wear protection if required (Titanium-Nitride)
- Surface brush- / fine-polished
- Tribological coatings for easy demoulding
- General: hardness ≥ 56 HRC also for $T > 400^{\circ}\text{C}$



Steels for Injection Moulding Tools

LUVOCOM with low fiber contents:

- 1.4112
- 1.4125

LUVOCOM with PTFE-modification:

- 1.2083 X 42CrMo13
- 1.2316 X 36CrMo17

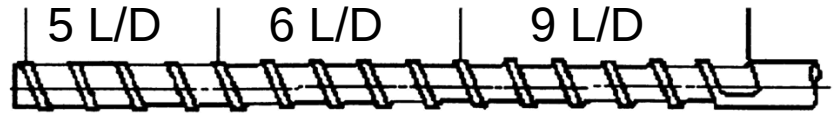
LUVOCOM with high fiber content:

- 1.2379 X 155CrVMo 12 1
- Böhler "M340"
- Zapp CPM 3 V

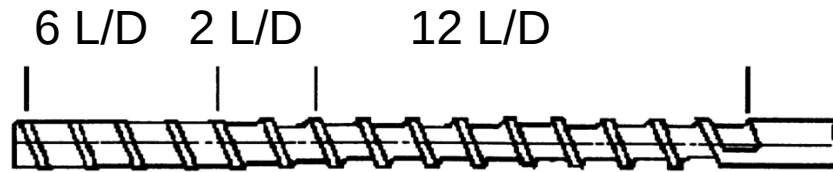
For high requirements:

- Ferro-Titanit S or WST "G25"
- Coating of inserts with PM-HIP-materials like
RP 15 C2 or RP 50 H

Screw Designs



Universal screw



Nylon screw

- Universal or nylon screw
- $20:1 < L/D < 25:1$
- $2.5:1 < \text{compression ratio} < 3:1$
- Distinctive feed- and metering zone
- Through hardened
- Surface hardened, highly wear resistant recommended
- Bi-metal screw according to machine manufacturer



Design Recommendations for Gating

- Big cross-section area
- Gates as short as possible
- Gate diameter at least 1 - 1.5 of biggest wall thickness
- Balanced gating system for multiple cavity tools
- Big gatings allow effective holding-pressure (strength, shrinkage, sink marks)
- Avoid tunnel/submarine gates



Hot Runners

- Use of hot runners is possible
- We recommend:
 - Systems heated from outside are preferred (Günther, PGT, Männer, Mouldmaster, Synventive, Xintech,...)
 - Hot nozzle - cold sub-runners
 - Multiple hot runner gating with small parts or compounds not recommended
 - No needle shut-off nozzles (compounds)



Shrinkage

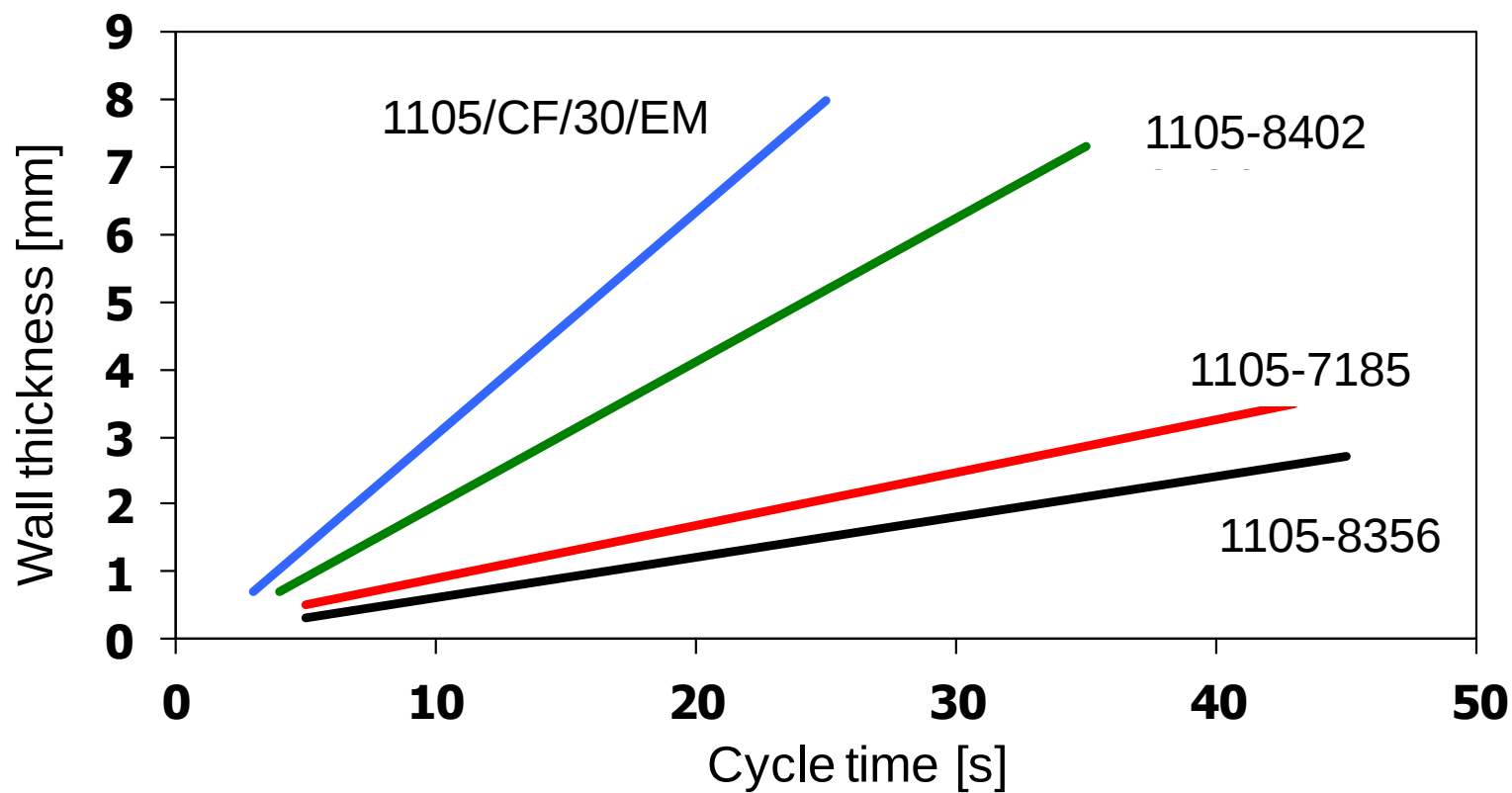
Typical values in % for plaque (150x150x3 mm) with film gate and recommended processing parameters

LUVOCOM	after moulding		heat treatment	
	parallel	perpendicular	parallel	perpendicular
1105-8356	0.74	1.18	0.88	1.32
1105/GF/30	0.23	1.06	0.27	1.18
1105-7185	0.26	0.85	0.30	0.97
1105-8417	0.03	0.31	0.04	1.09

Anisotropic behaviour, especially with compounds



Cycle time





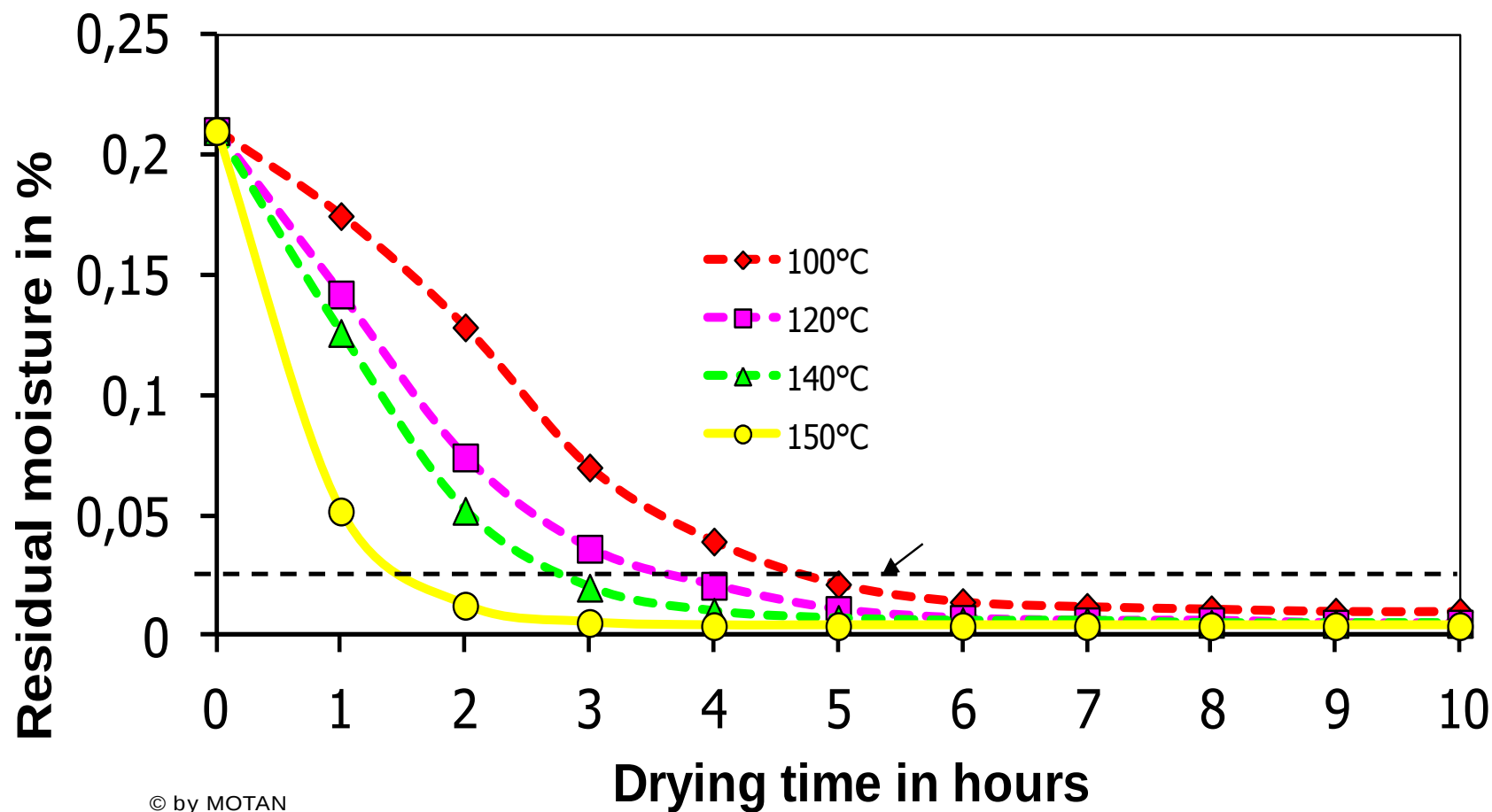
PEEK Melt Stability

PEEK shows good thermal stability

- TGA @ 400° C in air shows < 1% weight loss after 30 minutes
- Degradation products: phenol, diphenyl ether, benzophenon and benzoquinon
- No significant degradation after machine downtime of 1h / 360° C
- For longer downtime reduce barrel heating to 340° C



Drying of PEEK





Cleaning of Machine

- Cleaning resins for HT-polymers (Asaclean UX, Klüberclean G410, Schlicht Rapid Purge PM5540, Ultrapurge HT)
- Appropriate are also polymers with high melt viscosity like
 - PES
 - High molecular PE, PC
- Filled resins improve result
- Regard safety measures because of possible degradation products (gases)
- Complete cleaning by blasting or pyrolysis



Tempering

- Increase crystallinity:
@ 200° C
- Reduction of internal stress:
@ 250° C
- Dimension stability for high application temperatures:
tempering above application temperatures
- Heating rate approx. 40 K/h, cooling rate approx. 10 K/h
- Tempering time ≈ 1 h/mm
- Removal of parts not above glass transition temperature



Important

For the processing of PEEK the following should be considered:

- Sufficient gating to avoid freezing of melt and sufficient holding pressure
- Sufficient runner dimensions
- Adequate pressure reserves
- Effective venting
- Sufficient tool temperature for high crystallinity and good material performance



LUVOCOM®
High-performance compounds

LUVOCOM® P
Powder-coating solutions

LUVOSINT®
Additive manufacturing solutions

LUVOTECH®
Thermoplastic compounds

PERFORMANCE
Compounding

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