

The BASF logo, consisting of a white square with a smaller white square inside, followed by the letters "BASF" in a bold, white, sans-serif font.

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# Ultramid<sup>®</sup> Flex

A sustainable polyamide choice



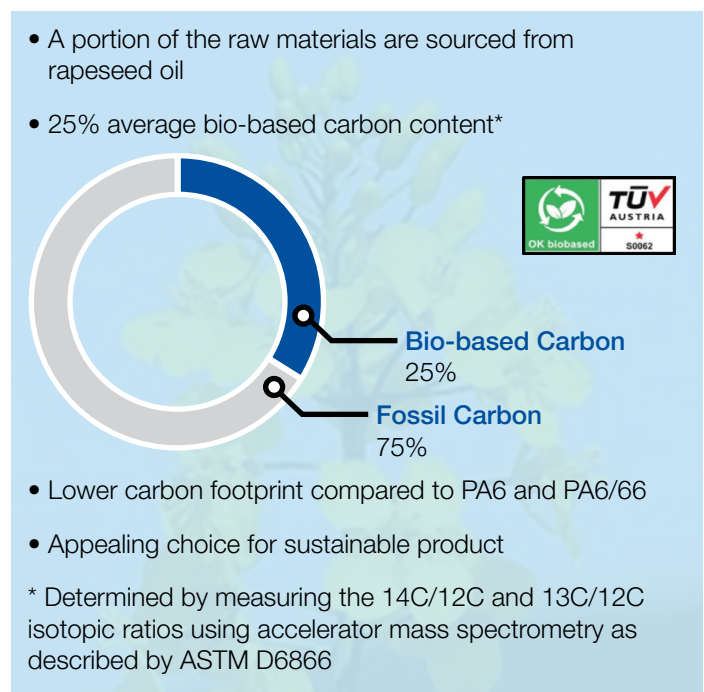
# Ultramid® Flex:

## A sustainable polyamide choice

The Ultramid® Flex F40L product family is a copolymer blend of polyamides made partially bio-based content. These long-chain polyamides are ideal as PA12 replacements and are suitable for:

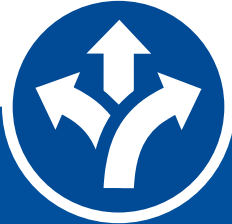
- extrusion applications
- mono-wall hose, outer hose jacketing and core tubes for multilayer air brake hose
- industrial hydraulic, pneumatic and exhaust hose

Ultramid® Flex F40L copolymers have the mechanical properties and chemical resistance needed for demanding hose applications, as well as provide superior adhesion to core layers which can eliminate the cost and complexities of tie layers.



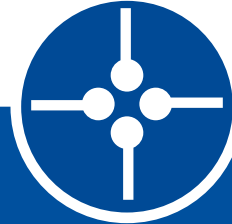
Properties	Ultramid® Flex F40L1	Ultramid® Flex F40L	Ultramid® Flex F40L2
Tensile modulus, 23°C, MPa	820	496	345
Stress at break, 23°C, MPa	40	34	37
Strain at break, 23°C, %	189	162	228
Tensile modulus, 130°C, MPa	132	118	105
Stress at 20% strain, 130°C, MPa	6.7	6.3	5.2
Izod notched impact strength, 23°C, KJ/m <sup>2</sup>	73	104	112
Izod notched impact strength, -40°C, KJ/m <sup>2</sup>	7	4.5	4.6

# Expanding the Ultramid® portfolio for demanding applications



## Lower Stiffness / Higher Flexibility

Less hydrogen bonding /  
Lower degree of crystallinity



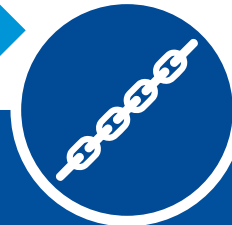
## Apolar Character

Chemical resistance: e.g., Zinc Chloride  
Lower water uptake compared to PA6  
and PA66 → better dimensional stability



## Sustainability

Partial bio-based content



## Towards Long-chain Aliphatic Polyamides

e.g., PA6.10 / PA6.12 / PA11 / PA6.12



## Key advantages

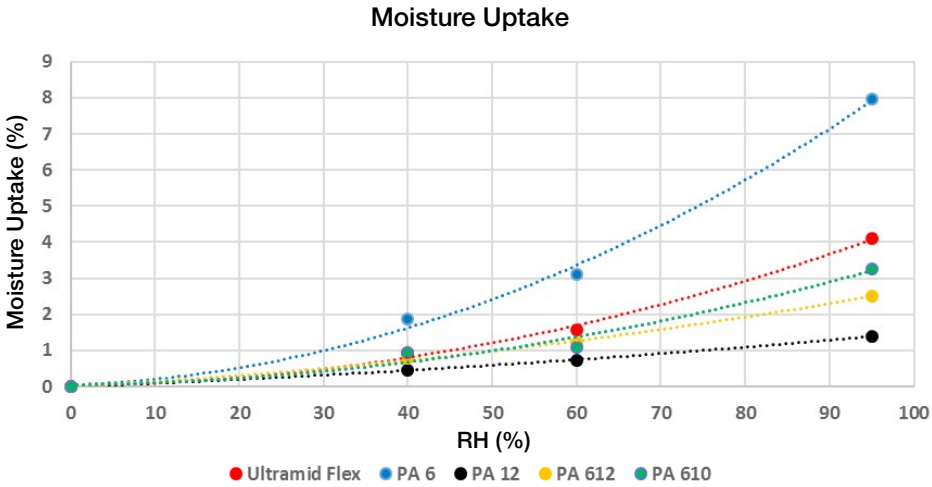
- Low moisture absorption
- Inherent flexibility
- Resistance to road salt environmental stress cracking (50% aqueous  $ZnCl_2$ )
- Methanol resistance per SAE J844
- Excellent adhesion to TPU, PA6, and PA12
- Partial bio-based content (25%)



# ▶ Ultramid® Flex: Key features

- Soft long-chain polyamide with low water uptake
- Excellent toughness
- Good chemical resistance

## Reduced moisture absorption

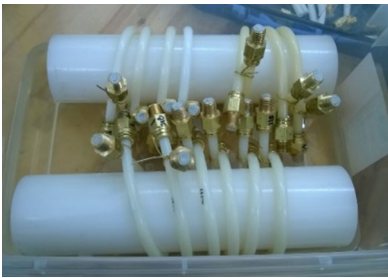


## Strong layer adhesion



## Chemical resistance

### SAE J844 – ZnCl<sub>2</sub> resistance



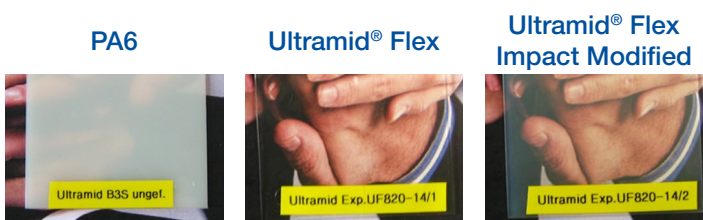
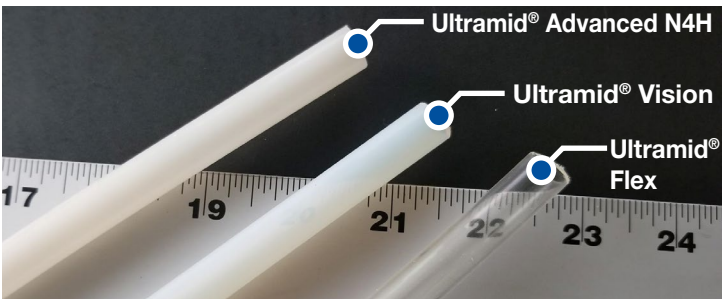
- 50% aqueous zinc chloride solution
- Immersion of stressed tube for 200 hrs at 23°C
- Ultramid® Flex XA3532 and PA12 tubes show no evidence of cracking
- Ultramid® PA6 tubes failed within minutes of immersion into zinc chloride solution

### Methanol chemical resistance (SAE J844)



- Tube samples were immersed in 95% methyl alcohol for 200 hrs at 24°C
- Tubing did not show any evidence of cracking

## Material with high transparency





# Ultramid® Flex:

## Chemical resistance<sup>1</sup>

	Function	Conditions	Ultramid® Flex	Ultramid® B40L (PA6)	Ultramid® C40L (PA6/66)	PA12
Zinc chloride	salt resistance	20°C	+	-	na	+
Nitric acid (30%)*	strong acid	RT, 1 days	+	-	--	na
Na-hypochlorite	disinfection, bleach, oxidizing agents	70°C	O	-	na	+
Acetic acid (10%)	weak acid, cleansing supplies	70°C	+	+	na	+
Methanol (98%)	alcohol	RT, 60°C, 70°C	+	+	na	+
n-Octanol**	fatty alcohol	1 hr at 40°C plus 24 hrs at 25°C	+	+	na	na
n-Heptane**	alkane	1 hr at 40°C plus 24 hrs at 25°C	+	+	na	na
NaOH (50%)	alkaline stability	20°C	+	+	na	+
Fuel E10	nonpolar, aliphatic	60°C	O	+	na	O
HCL (2%)	strong acid	70°C	-	-	na	+
Phosphoric acid (30%)	strong acid	70°C	-	-	na	+

### KEY:

- + resistance
- no resistance
- O limited resistance
- na not available

<sup>1</sup> unless otherwise noted, viscosity measurements, mechanical properties and dimensional changes were used to determine chemical resistance

\* 50 µm films were fixed in slide mounts (Diarahmen) and stored in 20 & 40 % aq. HNO<sub>3</sub> at room temperature

\*\* 2 g/L solutions were prepared; %Weight change was used to determine chemical resistance, by comparing the initial and final weight of granules





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