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## TECAMAX SRP – Extreme strength without fibre reinforcement



Extruded and moulded semi-finished goods made of TECAMAX SRP are used in many different fields of application.

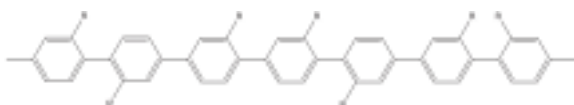
**TECAMAX SRP** is an exceptional ultra-high performance thermoplastic and the most outstanding new product in the ENSINGER product portfolio. In exclusive collaboration with Mississippi Polymer Technologies, Inc., ENSINGER develops and produces moulded and extruded semi-finished goods made of Parmax®, a polyparaphenylene copolymer material.

As the polymer chains in **TECAMAX SRP** are rigid and strong, the addition of strengthening additives is not necessary. Nevertheless, it is possible to achieve properties, which cannot be obtained with conventional, non-reinforced plastics.

Self-reinforcing **TECAMAX SRP** is thus considered to be the strongest, hardest and most rigid non-reinforced polymer which is commercially available in the world.

### The structure

**TECAMAX SRP** is based on a substituted poly (1,4-phenylene) structure, whereby each phenyl ring possesses a substituent which can originate from a wide range of organic groups. This structure determines the unique properties of this material. The rigid backbone produces strength and stiffness, whereby the substituents influence processing ability.



### Properties, which differ distinctly from those of other polymers

- | Considerably stiffer and harder than other non-reinforced thermoplastics
- | Excellent mechanical properties, even at very low temperatures (E-modulus 8,300 MPa at 295 K compared to 9,600 MPa at 4 K, thermal shrinkage at 4 K only 0.557% and yield stress 210 MPa)
- | Remarkably high pressure resistance
- | Higher scratch and abrasion resistance than other thermoplastics
- | Outstanding chemical resistance
- | Outstanding dimensional stability before and after processing; machined parts with tolerances < 25 µm.

### Application examples

TECAMAX SRP is suitable for parts where low weight is just as important as high stability, compressive strength and precision. Examples are bearings, gear-wheels, flanges and pipes, valve seats, high pressure seals, thermal and electrical insulators and sample holders.

### Areas of use

TECAMAX SRP is used preferentially in the aeronautics and space industry, in the semi-conductor and electronics field, in the automotive sector, in medical technology, in nuclear and cryogenic engineering, in instrument technology, construction of scientific apparatus and mechanical engineering.



TECAMAX SRP can be machined to the tightest tolerances with standard equipment using hardened metal or diamond tools and can be superbly polished.

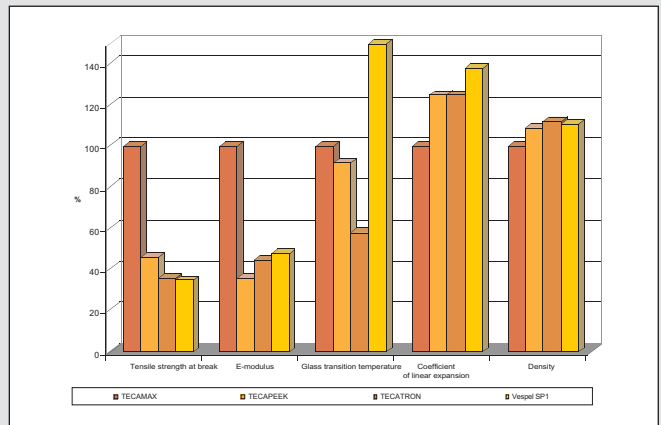
**Technical Properties**

	Units	TECAMAX SRP
DIN designation		PPP
Density (ASTM D 792, DIN 53 479)	$\rho$ g/cm <sup>3</sup>	1,21
Tensile strength at break (ASTM D 638, DIN EN ISO 527)	$\sigma_S$ MPa	207
Elongation at yield (ASTM D 638, DIN EN ISO 527, ASTM D 1708 (a))	$\epsilon_R$ %	
Modulus of elasticity in tension (ASTM D 638, DIN EN ISO 527)	$E_Z$ MPa	8300
Modulus of elasticity after flexural test (ASTM D 790, DIN EN ISO 178)	$E_B$ MPa	8300
Compressive strength (ASTM D 695)	$\sigma_D$ MPa	>620
Hardness (Ball-pressure: ISO 2039/1, Shore D: ASTM D 2240, DIN 53 505 (d), Rockwell: ASTM D 785 , ISO 2039/2 (r), Other: ASTM D 785 (a), DIN 43 456 (s))	$H_K$ MPa	80 B (r)
Impact strength (DIN EN ISO 179, Izod: ASTM D 256, DIN EN ISO 180 (i), Charpy: DIN EN ISO 179 21, Notched impact: DIN 53 456 (k))	$a_n$ kJ/m <sup>2</sup>	1200
Glass transition temperature (DIN 53 736)	$T_g$ °C	155
Heat distortion temperature (DIN 53 461 acc. to ISO R 75 process B, ASTM 648)	HDT/B °C	163
Service temperature short-term	°C	150**
Service temperature permanent	°C	140**
Thermal conductivity (23 °C)	$\lambda$ W/(K.m)	
Coefficient of linear expansion (23 °C, ASTM D 696, DIN 53 752, ASTM E 831)	$\alpha$ 10 <sup>-5</sup> 1/K	3,5-4,5
Dielectric constant (ASTM D 150)	$\epsilon_R$ -	3,1
Specific volume resistance (ASTM D 257, EC 93, DIN IEC 60093)	$R_D$ $\Omega \cdot \text{cm}$	> 10 <sup>15</sup>
Surface resistance (DIN IEC 93 / DIN 54 345 T1)	$R_O$ $\Omega$	10 <sup>14</sup>
Moisture absorption in standard climate 23 °C / 50% rel. humidity (DIN EN ISO 62)	W(H <sub>2</sub> O) %	0,5
Oxygen limit index (ASTM D 2863)	LOI %	42
Flammability acc. to UL standard 94		V0

\*\* expected values

Thermal, chemical and mechanical properties of TECAMAX SRP, TECAPEEK, TECATRON and Vespel® SP1.

Properties	TECAMAX	TECAPEEK	TECATRON	Vespel SP1
Mechanical properties at high temperatures	Tg 155°C; HDT/A 150°C; long-term use 130°C; short-term use 160°C	Tg 143°C; HDT/A 140°C; long-term use 260°C; short-term use 300°C	Tg 90°C; HDT/A 110°C; long-term use 230°C; short-term use 260°C	Tg 360-375°C; HDT/A 360°C; long-term use 300°C; short-term use 360-400°C
Cryogenic properties	Stable to approx. -270°C	Stable to approx. -50°C	Stable to approx. 0°C	Stable to approx. -270°C
Flame resistance (UL94)	V-0 (3.2 mm)	V-0 (1.45 mm)	V-0 (3.0 mm)	V-0 (0.75 mm)
Acid resistance	↑↑	↑	↑	↑
Base resistance	↑↑	↑↑	↑↑	→
Solvent resistance	↑	↑↑	↑↑	↑↑
Hot steam resistance	↑	↑↑	↑↑	↓
Stress fracture resistance	↑	↑↑	↑↑	↑
Radiopacity	↑	↑↑	↑↑	↑↑



A look at the future: Transparent TECAMAX SRP. Future, modified for optimum tribological performance for interesting frictional applications.

Information concerning the exclusion of liability and Terms and Conditions of Delivery can be found in our Semi-finished products catalogue or under [www.ensinger-online.com](http://www.ensinger-online.com).

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