PB 250, PB 400 / SD 560x

Resilient & ambient curing epoxy foam

PB products are 2 component epoxy foaming formulations developed for “in situ” low density epoxy foam production. Foam final density is depends only on the choice of the resin.
Associated with **SD 560x** hardeners **PB 250 and PB 400** respectively provide approximately 280 and 500 kg/m^3 foams. The mixing phase is eased by an easy and quite tolerant 1 for 1 volume ratio.
The mixes evolve in two separate steps:
1 Fast expansion of the casting, speed not depending on the choice of hardener
2 Slow hardening of the mass.

Performances

“in situ” low density foam manufacturing.
No hollow microspheres handling.
Good adhesion onto all type of materials.
PB can be cast onto prepregs and wet epoxy resins curing.
Homogeneous density.

Applications

Production of epoxy foam.
Casting “in situ” of epoxy core materials.
Floating volume.
Increase the density of foams and honey comb.
Thermal insulation.
Machinable blocks for models.

Foaming epoxy resin PB

		PB 250	PB 400
Aspect		Thixotropic liquid	Thixotropic liquid
Colour		White	White
Viscosity (mPa.s)	20 °C	22 000 ± 4 000	22 000 ± 4 000
Rheometer CP 50 mm	25 °C	12 000 ± 2 000	12 000 ± 2 000
Shear rate 10 s^{-1}	30 °C	7 500 ± 1 500	7 000 ± 1 400
	40 °C	3 800 ± 800	3 000 ± 600
Density Picnomètre NF EN ISO 2811-1	20 °C	1.10 ± 0.01	1.14 ± 0.01

Hardeners SD 560x

		SD 5604	SD 5602
Aspect / colour		**Yellow liquid**	**Yellow liquid**
Typical reactivity		**Standard**	**Slow**
Viscosity (mPa.s)	20 °C	4 500 ± 900	5 000 ± 1 000
Rheometer CP 50 mm	25 °C	2 800 ± 600	3 000 ± 600
Shear rate 10 s^{-1}	30 °C	1 800 ± 400	2 000 ± 400
	40 °C	900 ± 200	1 000 ± 200
Density	20 °C	0.99 ± 0.01	0.99 ± 0.01
Picnometer NF EN ISO 2811-1			

PB xx0 / SD 560x mix properties

PB	SD	Final density after 20°C expansion	Weight ratio	Volume ratio	Tg 1 max
PB 250	**SD 560x**	App. 300 kg/m^3	100 / 90 g	1 / 1	60 °C
PB 400		App. 500 kg/m^3	100 / 90 g	1 / 1	60 °C

Exothermic parameters

Thermal conductivity of substrate.
Open or closed moulding.
Temperature of components and ambient temperature.
Geometry, thickness, volume and mass of the casting.
When casting on a thick curing laminate, the heat produced by the resin can influence the reactivity of the foaming system.

Recommendations for use

In order to homogenise the PB resins, mix thoroughly with a helicoidal agitator before quantity determination (take a special care to the side and base of the container).
The quantity determination have to be done by weight, with a precise scale adapted to the quantity used
The expansion is much faster than the polymerisation: mixing and casting operations must be done as quick as possible, especially with the low density foaming systems. The maximum working time of mixes is 4 minutes.

While mixing PB resin and hardener, air is usually included. Most of these bubbles can be eliminated by simply passing the blend through a 1 to 2 mm stainless steel sieve.

Expansion ratios

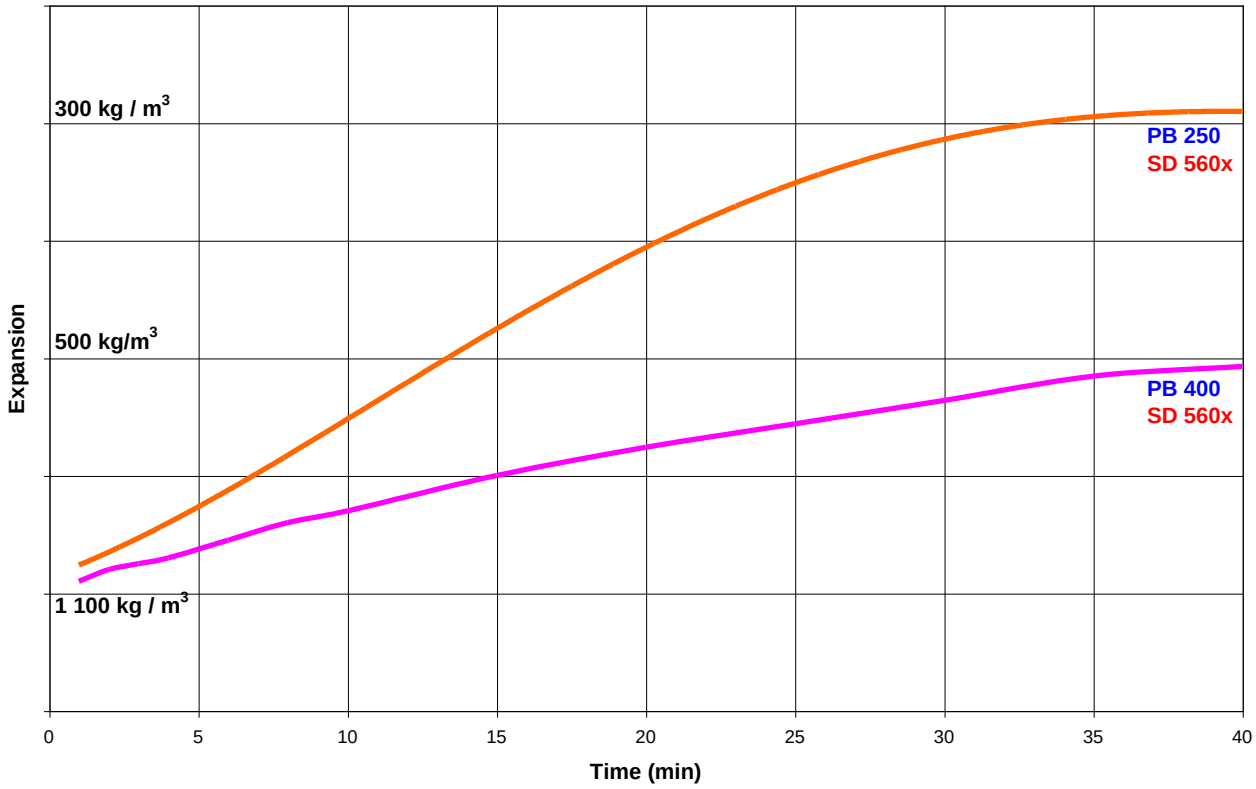
	Finale density after free expansion at 20°C	Expansion ratio at 20°C
PB 250	300 ± 30 kg / m^3	x 3.5 approximately
PB 400	520 ± 50 kg / m^3	x 2 approximately

For example, if the volume to fill up is 2 litres, you need :

2 / 3.5 = 0,57 kg ou 570 g **PB 250** / **SD 560x** mix
2 / 2 = 1 kg ou 1 000 g **PB 400** / **SD 560x** mix

Prepare 10 % more of mix for the waste and the approximation made.
Be aware of the problem of exothermal peak with large volume (see graph: Measure of the exothermal peak of the casting relative to the thickness @ 20°C, page 3 & 4.

Expansion speed at 20 °C



Material thermal conductivity

Materials	Density (kg / m^3)	Thermal Conductivity at 20 °C (W / m x °C)
Copper	8800	380
Composite Carbon / carbon	1700 – 2000	300
Aluminium (AU 4G)	2800	140
Steel	7800	20 to 100
Carbon fiber: HR or HM	1800	200
E glass fiber	2600	1
Aramid fiber	1450	0.03
Concrete	2000 to 2500	1 to 1.5
Plaster		0.37
Expanded PVC (Forex)	650	0.12
PB 400 epoxy foam	**400**	**0.130**
PB 250 epoxy foam	**250**	**0.065**
Extruded polyethylene foam	35 to 150	0.05
Herex C70.33 C70.75 C70.200	33, 80 and 200	0.030, 0.033 and 0.048
Airex R82.80 R 82.110	80 and 110	0.037 and 0.040
Airex R63.80 R63.140	90 and 140	0.034 and 0.039
Kapex C51	60	0.036
Non-filled thermoset resins Epoxy, polyester, phenolic	1100 to 1300	0.2
Polyethylene LD / HD	960	0.25 to 0.34
Laminate E glass / epoxy		0.3 to 0.8
Wood	400 to 700	0.12 to 0.2
Balsa	100 to 250	0.051 to 0.090
Expanded Polystyrene	20	0.035
Extruded Polystyrene	28 to 45	0.033 to 0.025
Air		0.021

Mechanical properties on cured foam

		PB 250 / SD 5604	PB 250 / SD 5602	PB 400 / SD 5604	PB 400 / SD 5602
Curing cycle		7 days at 23 °C	7 days at 23 °C	7 days at 23 °C	7 days at 23 °C
Compressive strength					
Modulus of elasticity	N/mm^2	68	97	131	135
Compressive yield strength	N/mm^2	3.3	3.5	6.7	6.5
Offset compressive yield	%	8.4	5.8	6.8	6.2
Flexion					
Modulus of elasticity	N/mm^2	125	120	335	310
Maximum resistance at break	N/mm^2	3.8	3.3	9.2	8.4
Elongation at maximum load	%	5.5	7.1	6.1	5.4
Shear strength					
Modulus of elasticity	N/mm^2	50	60	118	125
Shear load at break		2	2	3.2	3.5
Elongation at break		30	28	18	16
Glass transition					
Tg1		40	43	41	43
Tg1 max.		60	58	62	63

Tests carried out on samples of pure cast resin, without prior degassing, between steel plates.
Measures undertaken according to the following norms :

Flexion :	NF T 51-001
Compression:	NF T 51-101
Shear strength	ASTM 1041D
Glass transition DSC :	ISO 11357-2 : 1999 -5°C to 180°C under nitrogen gaz Tg1 or Onset : 1st point at 20 °C/mn Tg1 maximum or Onset : second passage