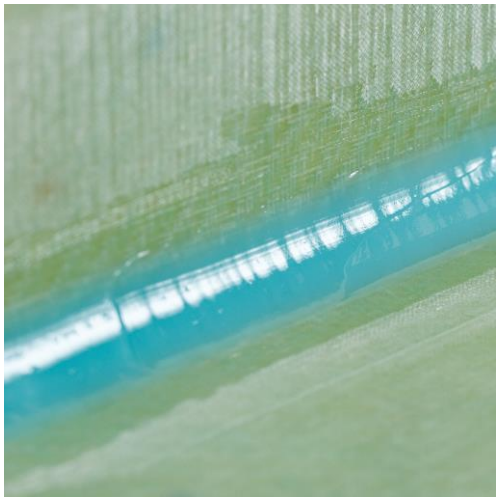
Gurit EPOXY

PRODUCT DATASHEET

Gurit



SPABOND™ 445

TOUGHENED GAP FILLING EPOXY ADHESIVE SYSTEM

Spabond 445 is a toughened, high performance adhesive system ideal for bonding large structures where substrate surfaces have uneven geometry. Developed from the proven performance of its predecessors, whilst sharing the same hardener components as Spabond 435 and 440 to deliver a complete adhesive system.

The product has a thick, paste-like consistency, and can be applied without sag in thicknesses of over 30mm at 15°C, making it ideal where large, uneven vertical gluelines are required. Available with a choice of two hardeners, improved cure progression chemistry.

The unique formulation offers improved health & safety through the careful selection of low toxicity raw materials.

The product has a 3:1 mix ratio by volume. To aid mixing, the hardener components are pigmented to give visual indication of mix quality.

Black resin option is also available, which is useful for improving the cosmetic appearance of bondlines involving exposed carbon composites.

Spabond 445 is available in cartridges and straight-sided pails & drums for machine mixing/dispense.

For further advice please contact your Gurit representative.

- High Tg, strength and toughness
- Excellent gap filling, low exotherm and low shrinkage properties
- Designed for cartridge and mixing machine dispense
- Two hardener speeds give a full range of working times / clamp times
- Hardeners compatible with Spabond 435 and Spabond 440 Resin
- Optional black cured colour option is ideal for cosmetic carbon applications
- Lloyds Register approved
- 445 / slow DNV-GL Approved
- Mix ratio by volume 3:1

DNV Lloyd's Register

INSTRUCTIONS FOR USE

APPLICATION

The product is optimized for use at 15 - 25°C. At lower temperatures the components thicken and may eventually become unworkable. To ensure accurate mixing and good workability pre-warm the resin & hardener as well as the surfaces to be bonded before use. Maximum relative humidity for use is 70%. It is not advised to use Spabond 445 resins with Spabond 400 Fast hardener in thicknesses above 20mm due to the risk of exotherm.

SURFACE PREPARATION

Before using the product ensure that surfaces to be bonded are clean, dry and dust-free. Prepare all surfaces by abrading with medium grit paper or other suitable abrasive, remove dust then wipe with acetone.

Metals - requires a chemical pre-treatment to create the best bond. Please contact Gurit for a Guide to Surface Preparation and Pre-treatments.

Polyester or vinylester - ensure laminates are fully cured before bonding, then prepare as above.

Epoxy laminates - it is recommended to use a suitable Peel Ply as the last stage in their manufacture, otherwise prepare as above. Trials may be required to test Peel Ply suitability.

Ferrocement - etch with 5% solution of hydrochloric acid, wash with fresh water, then dry.

Timber - sand with abrasive paper across grain. Degrease oily timber with a fast evaporating solvent (e.g. acetone). For resinous or gummy timber, etch with 2% caustic soda solution, wash off with fresh water and dry.

MIXING & HANDLING

When mixing by hand, mix thoroughly for at least one minute, paying particular attention to the sides and bottom of the mixing vessel, to ensure no streaks remain. Once fully mixed the adhesive should have a uniform color. Use from pot quickly to maximize resin working life.

CARTRIDGE USE

If dispensing product from a two component cartridge, first prime the cartridge by dispensing slowly until both resin and hardener are at the outlet of the cartridge. Secondly, clean the outlet and attach the mixing head. When starting a new cartridge, dispense and discard a small amount of adhesive (typically the length of a mix head) prior to applying adhesive to the substrate, in order to ensure thorough mixing of the system. If using a pneumatic gun, regulate supply air pressure to a maximum of 4 Bar. Relieve the pressure on the cartridge after use.

CURE SCHEDULE

Adequate properties are achieved from a ambient cure 18-21°C. A post cure is only recommended to generate optimum properties and a typical post cure schedule is either 5 hours at 70°C or 16 hours at 50°C. The cured properties are shown in the tables below for 21°C cure versus elevated post cured.

TRANSPORT & STORAGE

The resin and hardener should be kept in securely closed containers during transport and storage. Any accidental spillage should be soaked up with sand, sawdust, cotton waste or any other absorbent material. The area should then be washed clean (see appropriate Safety Data Sheet). Adequate long term storage conditions will result in a shelf life, as per table, from the date of manufacture for both the resin and hardeners, see product container label for expiry date.

COMPONENT	UNITS	10 – 25°C
Spabond 445 Resin	Months	24
Spabond 400 Fast and Slow Hardeners	Months	24

Storage should be in a warm dry place out of direct sunlight and protected from frost. The storage temperature should be kept constant between 10°C and 25°C, cyclic fluctuations in temperature can cause crystallization. Containers should be firmly closed. Hardener, in particular, will suffer serious degradation if left exposed to air. Hardeners may darken over time, however the physical properties are not affected.

SPABOND 445 & SPABOND 400 FAST HARDENER

This product summary is intended for use in conjunction with further advice provided under the Instructions for Use section. All data has been generated from typical production material and does not constitute a product specification.

PROPERTY	UNITS	SPABOND 445 RESIN	400 FAST HARDENER	MIXED SYSTEM	TEST METHOD
Appearance - color	Description	Black or Yellow	Red	Dark Grey or Pink	-
Appearance - form	Description		Thixotropic paste		-
Mix ratio by weight	Parts by weight	100	31	-	-
Mix ratio by volume	Parts by volume	100	33	-	-
Density at 21 °C	g/cm^3	1.17	1.08	1.15	Archimedes

COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	15°C	20°C	25°C	30°C	TEST METHOD
Spabond 445 Resin viscosity	P	455 - 475	200 – 220	120 – 150	75 – 95	-
Spabond 400 Fast Hardener viscosity	P	-	-	50 - 70	-	-
Initial mixed system viscosity	P	-	-	110 - 130	-	-
Pot-life (100 g, mixed in air)*	hrs:min	-	00:14	-	-	ISO 10364 (up to 40°C temp rise or peak exotherm)
Clamp time* (time to 2kN cleavage strength)	hrs:min	-	03:30 – 04:30	-	-	BS 5350 Part C1
Sag resistance*	mm	-	30	-	-	-

ADHESIVE PERFORMANCE

MECHANICAL PROPERTIES	SYMBOL	UNITS	28 DAYS AT 21°C	16 HOURS AT 50°C**	5 HOURS AT 70°C**	TEST STANDARD
Cleavage on steel (0.5mm bondline)	$F_{cleavage}$	kN	7.4	12.3	11.4	BS 5350 Part C1
Lap shear on steel (0.5mm bondline)	τ_{steel}	MPa	24.0	39.3	37.4	BS 5350 Part C5

CURED MECHANICAL AND THERMAL PROPERTIES

MECHANICAL PROPERTIES	SYMBOL	UNITS	28 DAYS AT 21°C	16 HOURS AT 50°C**	5 HOURS AT 70°C**	TEST STANDARD
Glass transition temperature	Tg_2	°C	52	74	87	ISO 11357 (DSC)
Ultimate glass transition temp.	UTg_2	°C	98	96	97	ISO 11357 (DSC)
Cured density	ρ_{ply}	g/cm^3	-	1.18	-	Archimedes
Linear shrinkage		%	-	1.73	-	Archimedes
Tensile strength	σ_T	MPa	45.8	55.1	59.0	ISO 527-2
Tensile modulus	E_T	GPa	3.03	3.18	3.14	ISO 527-2
Tensile strain	ε_T	%	2.35	5.39	5.68	ISO 527-2
3-point flexural strength	σ_F	N/mm^2	85.7	94.7	96.9	ISO 178
3-point flexural modulus	E_F	GPa	3.20	3.04	2.98	ISO 178
3-point flexural strain	ε_F	%	5.00	7.38	6.49	ISO 178
Charpy impact strength	KV	kJ/m^2	2.29	3.99	3.78	ISO 179-1 (notched)
Fracture toughness	K_{Ic}	$MPa.m^{0.5}$	1.72	1.83	1.86	ASTM D5045
28 day water uptake		%	-	0.62	-	-

**working time properties are highly subjective to ambient conditions and should be used as an approximate guideline*
***initial cure of 24 hours at 21°C*

SPABOND 445 & SPABOND 400 SLOW HARDENER

This product summary is intended for use in conjunction with further advice provided under the Instructions for Use section. All data has been generated from typical production material and does not constitute a product specification.

PROPERTY	UNITS	SPABOND 445 RESIN	400 SLOW HARDENER	MIXED SYSTEM	TEST METHOD
Appearance - color	Description	Black or Yellow	Blue	Dark Grey or Green	-
Appearance - form	Description		Thixotropic paste		
Mix ratio by weight	Parts by weight	100	30		-
Mix ratio by volume	Parts by volume	100	33	-	-
Density at 21 °C	g/cm^3	1.17	1.04	1.14	Archimedes

COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	15°C	20°C	25°C	30°C	TEST METHOD
Spabond 445 Resin viscosity	P	455 - 475	200 – 220	120 – 150	75 – 95	-
Spabond 400 Slow Hardener viscosity	P	-	-	75 - 95	-	-
Initial mixed system viscosity	P	-	-	100 - 130	-	-
Pot-life (100g, mixed in air)*	hrs:min	-	03:30	-	-	ISO 10364 (up to 40°C temp rise or peak exotherm)
Clamp time* (time to 2kN cleavage strength)	hrs:min	-	16:00	-	-	BS 5350 Part C1
Sag resistance*	mm	-	25 - 30	-	-	-

ADHESIVE PERFORMANCE

MECHANICAL PROPERTIES	SYMBOL	UNITS	28 DAYS AT 21°C	16 HOURS AT 50°C**	5 HOURS AT 70°C**	TEST STANDARD
Cleavage on steel (0.5mm bondline)	$F_{cleavage}$	kN	8.6	12.2	11.7	BS 5350 Part C1
Lap shear on steel (0.5mm bondline)	τ_{steel}	MPa	29.7	36.0	36.2	BS 5350 Part C5

CURED MECHANICAL AND THERMAL PROPERTIES

MECHANICAL PROPERTIES	SYMBOL	UNITS	28 DAYS AT 21°C	16 HOURS AT 50°C**	5 HOURS AT 70°C**	TEST STANDARD
Glass transition temperature	Tg_2	°C	51	68	79	ISO 11357 (DSC)
Ultimate glass transition temp.	UTg_2	°C	85	92	94	ISO 11357 (DSC)
Cured density	ρ_{ply}	g/cm^3	-	1.17	-	Archimedes
Linear shrinkage		%	-	1.73	-	Archimedes
Tensile strength	σ_T	MPa	37.9	49.3	52.4	ISO 527-2
Tensile modulus	E_T	GPa	2.77	3.02	2.86	ISO 527-2
Tensile strain	ε_T	%	3.29	8.33	7.92	ISO 527-2
3-point flexural strength	σ_F	N/mm^2	73.5	87.3	90.2	ISO 178
3-point flexural modulus	E_F	GPa	3.10	3.08	2.95	ISO 178
3-point flexural strain	ε_F	%	5.20	8.81	8.33	ISO 178
Charpy impact strength	KV	kJ/m^2	1.40	3.76	4.68	ISO 179-1 (notched)
Fracture toughness	K_{Ic}	MPa.m$^{0.5}$	1.56	1.88	2.02	ASTM D5045
28 day water uptake		%	-	0.78	-	-

**working time properties are highly subjective to ambient conditions and should be used as an approximate guideline*
***initial cure of 24 hours at 21°C*

HEALTH AND SAFETY

The following points must be considered:

1. Skin contact must be avoided by wearing protective gloves. Gurit recommends the use of disposable nitrile gloves for most applications. The use of barrier creams is not recommended, but to preserve skin condition a moisturizing cream should be used after washing.
2. Protective clothing should be worn when mixing, laminating or sanding. Contaminated work clothes should be thoroughly cleaned before re-use.
3. Eye protection should be worn if there is a risk of resin, hardener, solvent or dust entering the eyes. If this occurs flush the eye with water for 15 minutes, holding the eyelid open, and seek medical attention.
4. Ensure adequate ventilation in work areas. Respiratory protection should be worn if there is insufficient ventilation. Solvent vapors should not be inhaled as they can cause dizziness, headaches, loss of consciousness and can have long term health effects.
5. If the skin becomes contaminated, then the area must be immediately cleansed. The use of resin-removing cleansers is recommended. To finish, wash with soap and warm water. The use of solvents on the skin to remove resins etc must be avoided.

   Washing should be part of routine practice:
   - before eating or drinking
   - before smoking & vaping
   - before using the lavatory
   - after finishing work

6. The inhalation of sanding dust should be avoided and if it settles on the skin then it should be washed off. After more extensive sanding operations a shower/bath and hair wash is advised.

Gurit produces a separate full Safety Data Sheet for all hazardous products. Please ensure that you have the correct SDS to hand for the materials you are using before commencing work.

NOTICE

All advice, instruction or recommendation is given in good faith but the selling Gurit entity (the Company) only warrants that advice in writing is given with reasonable skill and care. No further duty or responsibility is accepted by the Company. All advice is given subject to the terms and conditions of sale (the Conditions) which are available on request from the Company or may be viewed at Gurit's Website: www.gurit.com/terms-and-conditions.aspx

The Company strongly recommends that Customers make test panels in the final process conditions and conduct appropriate testing of any goods or materials supplied by the Company prior to final use to ensure that they are suitable for the Customer's planned application. Such testing should include testing under conditions as close as possible to those to which the final component may be subjected. The Company specifically excludes any warranty of fitness for purpose of the goods other than as set out in writing by the Company. Due to the varied nature of end-use applications, the Company does, in particular, not warrant that the test panels in the final process conditions and/or the final component pass any fire standards.

The Company reserves the right to change specifications and prices without notice and Customers should satisfy themselves that information relied on by the Customer is that which is currently published by the Company on its website. Any queries may be addressed to the Technical Services Department.

Gurit is continuously reviewing and updating literature. Please ensure that you have the current version by contacting your sales contact and quoting the revision number in the bottom left-hand corner of this page.

CONTACT INFORMATION

Please see local contact information at www.gurit.com

24-HOUR CHEMICAL EMERGENCY NUMBER

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