

SPABOND™ 400

STRUCTURAL TOUGHENED EPOXY ADHESIVE SYSTEM

- Excellent surface wetting for high adhesion strength and toughness
- Easy manual mixing performance
- High temperature performance with 80-90 °C cured Tg
- 3 resins for up to 10, 20 and 30mm gap filling applications
- Lloyds Register & DNV certification pending
- Low Toxicity Hardener Formulations

INTRODUCTION

Spabond™ 400 is a new generation, toughened, structural epoxy adhesive for high dynamic load applications, comprising of 3 systems:

SYSTEM PROPERTIES AT 20°C	GAP FILLING*	HARDENER	WORKING TIME*	LAPSHEAR STRENGTH	CURED COLOUR	PAGE
Spabond™ 435 Ideal for thin bondlines such as core bonding, large surface areas and detailed work.	Up to 10 mm	Fast	½ hour	35 MPa		3
		Slow	3 ½ hrs	35 MPa		
Spabond™ 440 Optimised for rapid dispense from cartridges or automated mixing machines.	Up to 20 mm	Fast	½ hour	39 MPa		4
		Slow	3 ½ hrs	37 MPa		
Spabond™ 445 For large gap filling & filleting applications and high performance projects, with a black resin option available.	Up to 30 mm	Fast	½ hour	37 MPa		5
		Slow	3 ½ hrs	36 MPa		

*application and working time properties are highly subjective to ambient conditions and should be used as an approximate guideline for all Spabond™ systems



PRODUCT INFORMATION

The product is available in a number of formats including DNV and Lloyd's Register certifications (see table) please contact your local customer support representative for more information.

PRODUCT DESCRIPTION	STATUS	CERTIFICATION
Spabond™ 435, Spabond™ 440 & Spabond™ 445	Pending	DNV
Spabond™ 435, Spabond™ 440 & Spabond™ 445	Pending	Lloyd's Register

TRANSPORT & STORAGE

The resin and hardeners 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 of 2 years for both the resin and hardeners. Storage should be in a warm dry place out of direct sunlight and protected from frost. The storage temperature should be kept constant between 15°C and 25°C, cyclic fluctuations in temperature can cause crystallization. Containers should be firmly closed. Hardeners, in particular, will suffer serious degradation if left exposed to air. For more information on crystallization please refer to the Adhesives section on the Gurit website. (www.gurit.com)

COMPONENT	UNITS	15 – 25°C
Resins	months	24
Hardeners	months	24

INSTRUCTIONS FOR USE

The product is optimised 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.

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 colour. Use from pot quickly to maximise resin working life. It is not advised to use Spabond 440 or Spabond 445 resins with Spabond 400 Fast hardener in thicknesses above 20mm and should not be left in mixing pots in quantities greater than 100g due to the risk of exotherm.

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.

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 moisturising cream should be used after washing.
2. Overalls or other 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 vapours 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
- ↪ 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.

APPLICABLE RISK & SAFETY PHRASES

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.

SPABOND™ 435

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MIXING AND HANDLING

PROPERTY	UNITS	RESIN	FAST	SLOW	TEST METHOD
Component Colour	-	Yellow	Red Gel	Blue Gel	Visual Appearance
Mixed Colour	-	-	Pink	Green	Visual Appearance
Mix Ratio by Weight	Parts	100	31	30	-
Mix Ratio by Volume	Parts	100	33	33	-
Component Density at 21 °C	g/cm ³	1.11	1.08	1.04	Archimedes
Mixed Density at 21 °C	g/cm ³	-	1.10	1.09	Archimedes

APPLICATION PROPERTIES (AT AMBIENT 25°C)

PROPERTY	UNITS	FAST	SLOW	TEST METHOD
Initial Mixed System Viscosity	P	40 - 60	20 - 40	-
Working Time*	hrs:min	00:35	03:31	-
Clamp Time*	hrs:min	03:30 – 04:30	< 16:00	BS 5350 Part C1 (time to 2kN cleavage strength)
Sag resistance*	mm	Up to 10	Up to 10	-

ADHESIVE PERFORMANCE (5 HOUR AT 70°C** POST-CURE)

LAP SHEAR STRENGTH	UNITS	FAST	SLOW	TEST STANDARD
Steel to Steel	MPa	35.1	35.3	BS 5350 Part C5
GFRP to GFRP	MPa	38.0	37.3	BS 5350 Part C5
Stainless Steel to Stainless Steel	MPa	28.8	-	BS 5350 Part C5
Aluminium to Aluminium	MPa	25.7	-	BS 5350 Part C5
Steel to CFRP	MPa	15.8	-	BS 5350 Part C5
Stainless Steel to CFRP	MPa	15.9	-	BS 5350 Part C5
Aluminium to CFRP	MPa	28.0	-	BS 5350 Part C5

MECHANICAL & THERMAL PERFORMANCE (5 HOURS AT 70°C** POST-CURE)

PROPERTY	UNITS	FAST	SLOW	TEST STANDARD
Glass Transition Temperature (T _g)	°C	81	71	ISO 11357 (DSC)
Ultimate Glass Transition Temperature (UT _g)	°C	90	88	ISO 11357 (DSC)
Cured Density	g/cm ³	1.15	1.13	Archimedes
Linear Shrinkage	%	1.31	1.03	Archimedes
Tensile Strength	MPa	61.7	49.2	ISO 527-2
Tensile Modulus	GPa	3.16	2.68	ISO 527-2
Tensile Strain	%	5.72	9.28	ISO 527-2
3-point Flexural Strength	N/mm ²	101	90.8	ISO 178
3-point Flexural Modulus	GPa	3.02	2.98	ISO 178
Charpy Impact Strength	kJ/m ²	3.86	4.06	ISO 179-1 (notched)
Fracture Toughness	MPa.m ^{0.5}	1.47	1.61	ASTM D5045
28 Day Water Uptake***	%	0.57	0.63	-

All adhesive and mechanical properties quoted are average values tested on a single batch of resin and hardener.

*working time properties are highly subjective to ambient conditions and should be used as an approximate guideline for all Spabond™ systems

initial cure of 24 hours at 21°C *post-cure of 16 hours at 50°C

SPABOND™ 440

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MIXING AND HANDLING

PROPERTY	UNITS	RESIN	FAST	SLOW	TEST METHOD
Component Colour	-	Yellow	Red Gel	Blue Gel	Visual Appearance
Mixed Colour	-	-	Pink	Green	Visual Appearance
Mix Ratio by Weight	Parts	100	31	30	-
Mix Ratio by Volume	Parts	100	33	33	-
Component Density at 21 °C	g/cm ³	1.17	1.08	1.04	Archimedes
Mixed Density at 21 °C	g/cm ³	-	1.15	1.14	Archimedes

APPLICATION PROPERTIES (AT AMBIENT 25°C)

PROPERTY	UNITS	FAST	SLOW	TEST METHOD
Initial Mixed System Viscosity	P	105 - 125	70 - 90	-
Working Time*	hrs:min	00:27	03:17	-
Clamp Time*	hrs:min	03:30 – 04:30	< 16:00	BS 5350 Part C1 (time to 2kN cleavage strength)
Sag resistance*	mm	Up to 20	Up to 20	-

ADHESIVE PERFORMANCE (5 HOUR AT 70°C** POST-CURE)

LAP SHEAR STRENGTH	UNITS	FAST	SLOW	TEST STANDARD
Steel to Steel	MPa	39.4	36.5	BS 5350 Part C5
GFRP to GFRP	MPa	39.0	37.6	BS 5350 Part C5
Stainless Steel to Stainless Steel	MPa	32.8	-	BS 5350 Part C5
Aluminium to Aluminium	MPa	31.3	-	BS 5350 Part C5
Steel to CFRP	MPa	20.5	-	BS 5350 Part C5
Stainless Steel to CFRP	MPa	10.6	-	BS 5350 Part C5
Aluminium to CFRP	MPa	24.7	-	BS 5350 Part C5

MECHANICAL & THERMAL PERFORMANCE (5 HOURS AT 70°C** POST-CURE)

PROPERTY	UNITS	FAST	SLOW	TEST STANDARD
Glass Transition Temperature (T _g)	°C	84	74	ISO 11357 (DSC)
Ultimate Glass Transition Temperature (UT _g)	°C	97	90	ISO 11357 (DSC)
Cured Density	g/cm ³	1.18	1.17	Archimedes
Linear Shrinkage	%	1.42	1.39	Archimedes
Tensile Strength	MPa	61.8	53.4	ISO 527-2
Tensile Modulus	GPa	3.17	2.81	ISO 527-2
Tensile Strain	%	5.74	11.04	ISO 527-2
3-point Flexural Strength	N/mm ²	101.0	95.1	ISO 178
3-point Flexural Modulus	GPa	3.32	3.13	ISO 178
Charpy Impact Strength	kJ/m ²	3.72	5.29	ISO 179-1 (notched)
Fracture Toughness	MPa.m ^{0.5}	1.75	1.70	ASTM D5045
28 Day Water Uptake***	%	0.61	0.72	-

All adhesive and mechanical properties quoted are average values tested on a single batch of resin and hardener.

*working time properties are highly subjective to ambient conditions and should be used as an approximate guideline for all Spabond™ systems

initial cure of 24 hours at 21°C *post-cure of 16 hours at 50°C

SPABOND™ 445

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MIXING AND HANDLING

PROPERTY	UNITS	RESIN	FAST	SLOW	TEST METHOD
Component Colour	-	Black or Yellow	Red Gel	Blue Gel	Visual Appearance
Mixed Colour	-	-	Dark Grey or Pink	Dark Grey or Green	Visual Appearance
Mix Ratio by Weight	Parts	100	31	30	-
Mix Ratio by Volume	Parts	100	33	33	-
Component Density at 21 °C	g/cm ³	1.17	1.08	1.04	Archimedes
Mixed Density at 21 °C	g/cm ³	-	1.15	1.14	Archimedes

APPLICATION PROPERTIES (AT AMBIENT 25°C)

PROPERTY	UNITS	FAST	SLOW	TEST METHOD
Initial Mixed System Viscosity	P	110 - 130	90 - 110	-
Working Time*	hrs:min	00:28	03:31	-
Clamp Time*	hrs:min	03:30 – 04:30	< 16:00	BS 5350 Part C1 (time to 2kN cleavage strength)
Sag resistance*	mm	Up to 30	Up to 30	-

ADHESIVE PERFORMANCE (5 HOUR AT 70°C** POST-CURE)

LAP SHEAR STRENGTH	UNITS	FAST	SLOW	TEST STANDARD
Steel to Steel	MPa	37.4	36.2	BS 5350 Part C5
GFRP to GFRP	MPa	40.0	33.3	BS 5350 Part C5
Stainless Steel to Stainless Steel	MPa	28.5	-	BS 5350 Part C5
Aluminium to Aluminium	MPa	28.9	-	BS 5350 Part C5
Steel to CFRP	MPa	28.7	-	BS 5350 Part C5
Stainless Steel to CFRP	MPa	13.9	-	BS 5350 Part C5
Stainless Steel to Stainless Steel	MPa	28.5	-	BS 5350 Part C5

MECHANICAL & THERMAL PERFORMANCE (5 HOURS AT 70°C** POST-CURE)

PROPERTY	UNITS	FAST	SLOW	TEST STANDARD
Glass Transition Temperature (T _g)	°C	87	79	ISO 11357 (DSC)
Ultimate Glass Transition Temperature (UT _g)	°C	97	94	ISO 11357 (DSC)
Cured Density	g/cm ³	1.18	1.17	Archimedes
Linear Shrinkage	%	1.73	1.73	Archimedes
Tensile Strength	MPa	59.0	52.4	ISO 527-2
Tensile Modulus	GPa	3.14	2.86	ISO 527-2
Tensile Strain	%	5.68	7.92	ISO 527-2
3-point Flexural Strength	N/mm ²	96.9	90.2	ISO 178
3-point Flexural Modulus	GPa	2.98	2.95	ISO 178
Charpy Impact Strength	kJ/m ²	3.78	4.68	ISO 179-1 (notched)
Fracture Toughness	MPa.m ^{0.5}	1.86	2.02	ASTM D5045
28 Day Water Uptake***	%	0.62	0.78	-

All adhesive and mechanical properties quoted are average values tested on a single batch of resin and hardener.

*working time properties are highly subjective to ambient conditions and should be used as an approximate guideline for all Spabond™ systems

initial cure of 24 hours at 21°C *post-cure of 16 hours at 50°C

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.

TECHNICAL CONTACT INFORMATION

For all other enquiries such as technical queries:

Telephone + 44 1983 828000 (08:30 – 17:00 GMT)
Email technical.support@gurit.com

24-HOUR CHEMICAL EMERGENCY NUMBER

For advice on chemical emergencies, spillages, fires or exposures:

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