Smartfuse™

EPOXY INDUSTRIAL ADHESIVE

- Range of hardener speeds to suit most application requirements
- Bonds multiple substrates
- Cross-market applications – Automotive, Transportation, Industrial, Construction
- Range of gap filling – Low (0.2mm) to High (20mm)
- Easy to apply – Manual or Pneumatic Dispense Guns, Bulk Dispensing Unit

INTRODUCTION

Gurit has established itself as a developer and innovator in the composites industry and positioned itself as the leading global supplier of composite materials, engineering services, tooling equipment, select parts and systems.

With over 30 years experience in the the formulation of advanced epoxy resins and practical application of composites across various market sectors, Gurit has now further enhanced its trusted adhesives range with the launch of Smartfuse™.

Smartfuse™ is a two component Epoxy Industrial Adhesive offering outstanding performance in numerous composite and non-composite bonding applications

PRODUCT INFORMATION

AVAILABILITY

The product is available in a number of formats please contact your local customer support or download the latest product catalogue available on www.gurit.com.

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).

RESIN & HARDENER SHELF-LIFE	UNITS	10 – 25°C
Smartfuse™ E1009	months	12
Smarfuse™ E2025, E2090 & E2350	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. 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)

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/Plastics – ideal surface treatments can vary significantly, contact Gurit Technical Support for further advice.
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

Gurit recommends mixing machine dispense. If 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.

CARTRIDGE USE

If dispensing product from twin cartridges with a mixing / dispensing head, please discard the first mix head length of resin and hardener components, prior to applying adhesive to the job, in order to ensure thorough mixing of the system.

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.

SMARTFUSE™ E1009

This one page product summary is intended for use in conjunction with further advice provided under the Instructions for Use section and contains data generated from single batch testing and does not constitute a specification.

MIXING AND HANDLING

PROPERTY	UNITS	E1009 RESIN	E1009 HARDENER	MIXED SYSTEM	TEST METHOD
Appearance - Colour	Description	Black	Dark Blue	Black	-
Appearance - Form	Description	Thixotropic Paste			-
Mix Ratio by Weight	Parts by weight	100	100	-	-
Mix Ratio by Volume	Parts by volume	100	100	-	-
Density at 21°C	g/cm^3	1.13	1.13	1.13	ISO 1183-1B

PROCESSING PROPERTIES

PROPERTY	UNITS	AMBIENT TEMPERATURE: 21 – 23°C	TEST STANDARD
Working Time (pot-life 100 g, mixed in air)	minutes	6	-
Gel Time (10mm bead, mixed in air)	minutes	9	-
Time to Green Strength (1 MPa Lap Shear)	hours	1	ISO 4587
Time to Strength (10 MPa Lap Shear)	hours	6	ISO 4587

ADHESIVE PERFORMANCE

METAL SUBSTRATES	SYMBOL	UNITS	ROLLED STEEL	STAINLESS-STEEL	ALUMINIUM	GLASS FRP	CARBON FRP	TEST STANDARD
Lap Shear Strength**	τ_{steel}	MPa	24*	13	8	10	14	ISO 4587
Cleavage Strength**	$F_{cleavage}$	kN	4.8	-	-	-	-	BS 5350 Part C1

PLASTIC SUBSTRATES	SYMBOL	UNITS	POLYAMIDE	POLYCARBONATE	ACRYLIC	ABS	PVC	TEST STANDARD
Lap Shear Strength***	$\tau_{lapshear}$	MPa	2.2	2.7	3.8	2.9	3.1 (2 / 5 substrate failures)	ISO 4587

DISSIMILAR SUBSTRATES	SYMBOL	UNITS	CFRP TO MILD STEEL	CFRP TO STAINLESS-STEEL	CFRP TO ALUMINIUM	TEST STANDARD
Lap Shear Strength**	$\tau_{lapshear}$	MPa	13	13	10	ISO 4587

CONDITIONED STEEL LAPSHEAR ADHESIVE PERFORMANCE

CONDITIONING MEDIUM	SYMBOL	UNITS	30 DAYS @ 23°C	60 DAYS @ 23°C	90 DAYS @ 23°C	90 DAYS @ 60°C	60 DAYS @ 80°C	90 DAYS @ 90°C	TEST STANDARD
Distilled Water	$\tau_{lapshear}$	MPa	11***	10***	12***	2.0**	-	2.0**	ISO 4587
Petrol***	$\tau_{lapshear}$	MPa	16	20	-	-	-	-	ISO 4587
Diesel***	$\tau_{lapshear}$	MPa	21	21	-	-	-	-	ISO 4587
Acetic Acid, 10%***	$\tau_{lapshear}$	MPa	8.5	9.8	12	-	-	-	ISO 4587
Lubricating Oil***	$\tau_{lapshear}$	MPa	17	15	-	-	-	-	ISO 4587
Paraffin***	$\tau_{lapshear}$	MPa	15	16	15	-	-	-	ISO 4587
Anti-freeze***	$\tau_{lapshear}$	MPa	16	18	-	-	-	-	ISO 4587
Hot-air**	$\tau_{lapshear}$	MPa	-	-	-	-	7.2	-	ISO 4587

CONDITIONING TEMPERATURE	SYMBOL	UNITS	-40°C	-20°	0°C	23°C	40°C	60°C	80°C	TEST STANDARD
Strength Steel to Steel**	τ_{steel}	MPa	7.7	12	14	16	22	9.3	1.3	ISO 4587

CURED MECHANICAL AND THERMAL PROPERTIES

PROPERTY	SYMBOL	UNITS	POST-CURED 16HRS at 40°C**	POST-CURED 16HRS at 50°C***	TEST STANDARD
Glass Transition Temperature	Tg_1	°C	49	-	ISO 6721 (DMA)
Tensile Strength	σ_T	MPa	40	47	ISO 527-2
Tensile Modulus	E_T	GPa	2.2	2.7	ISO 527-2
3-point Flexural Strength	σ_F	MPa	76	73	ISO 178
3-point Flexural Modulus	E_F	GPa	2.3	2.4	ISO 178

*BS5350 part C5 **initial cure: 24 hrs at 21°C + post-cure: 16 hrs at 40°C ***initial cure: 24 hrs at 21°C + post-cure: 16 hrs at 50°C

SMARTFUSE™ E2025

This one page product summary is intended for use in conjunction with further advice provided under the Instructions for Use section and contains data generated from single batch testing and does not constitute a specification.

MIXING AND HANDLING

PROPERTY	UNITS	E2025 RESIN	E2025 HARDENER	MIXED SYSTEM	TEST METHOD
Appearance - Colour	Description	Black	Pink	Black	-
Appearance - Form	Description	Thixotropic Paste			
Mix Ratio by Weight	Parts by weight	100	47	-	-
Mix Ratio by Volume	Parts by volume	100	50	-	-
Density at 21°C	g/cm^3	1.17	1.10	1.14	ISO 1183-1B

PROCESSING PROPERTIES

PROPERTY	UNITS	AMBIENT TEMPERATURE: 21 – 23°C	TEST STANDARD
Working Time (pot-life 100 g, mixed in air)	minutes	26	-
Gel Time (10mm bead, mixed in air)	minutes	89	-
Time to Green Strength (1 MPa Lap Shear)	hours	5	ISO 4587
Time to Strength (10 MPa Lap Shear)	hours	9	ISO 4587

ADHESIVE PERFORMANCE

METAL SUBSTRATES	SYMBOL	UNITS	ROLLED STEEL	STAINLESS-STEEL	ALUMINIUM	GLASS FRP	CARBON FRP	TEST STANDARD
Lap Shear Strength**	τ_{steel}	MPa	29*	20	11	29	28	ISO 4587
Cleavage Strength**	$F_{cleavage}$	kN	9.9	-	-	-	-	BS 5350 Part C1

PLASTIC SUBSTRATES	SYMBOL	UNITS	POLYAMIDE	POLYCARBONATE	ACRYLIC	ABS	PVC	TEST STANDARD
Lap Shear Strength***	$\tau_{lapshear}$	MPa	2.6	4.6 (3 / 5 substrate failures)	4.4 (4 / 5 substrate failures)	3.7	3.5 (4 / 5 substrate failures)	ISO 4587

DISSIMILAR SUBSTRATES	SYMBOL	UNITS	CFRP TO MILD STEEL	CFRP TO STAINLESS-STEEL	CFRP TO ALUMINIUM	TEST STANDARD
Lap Shear Strength**	$\tau_{lapshear}$	MPa	29	25	26	ISO 4587

CONDITIONED STEEL LAPSHEAR ADHESIVE PERFORMANCE

CONDITIONING MEDIUM	SYMBOL	UNITS	30 DAYS @ 23°C	60 DAYS @ 23°C	90 DAYS @ 23°C	90 DAYS @ 60°C	60 DAYS @ 80°C	90 DAYS @ 90°C	TEST STANDARD
Distilled Water	$\tau_{lapshear}$	MPa	15***	15***	12***	18**	-	12**	ISO 4587
Petrol***	$\tau_{lapshear}$	MPa	25	27	-	-	-	-	ISO 4587
Diesel***	$\tau_{lapshear}$	MPa	26	25	-	-	-	-	ISO 4587
Acetic Acid, 10%***	$\tau_{lapshear}$	MPa	12	11	12	-	-	-	ISO 4587
Lubricating Oil***	$\tau_{lapshear}$	MPa	28	22	-	-	-	-	ISO 4587
Paraffin***	$\tau_{lapshear}$	MPa	26	26	25	-	-	-	ISO 4587
Anti-freeze***	$\tau_{lapshear}$	MPa	23	19	-	-	-	-	ISO 4587
Hot-air**	$\tau_{lapshear}$	MPa	-	-	-	-	36	-	ISO 4587

CONDITIONING TEMPERATURE	SYMBOL	UNITS	-40°C	-20°	0°C	23°C	40°C	60°C	80°C	TEST STANDARD
Strength Steel to Steel**	τ_{steel}	MPa	14	16	29	29	22	7.0	2.7	ISO 4587

CURED MECHANICAL AND THERMAL PROPERTIES

PROPERTY	SYMBOL	UNITS	POST-CURED 16HRS at 40°C**	POST-CURED 16HRS at 50°C***	TEST STANDARD
Glass Transition Temperature	Tg_1	°C	61	-	ISO 6721 (DMA)
Tensile Strength	σ_T	MPa	41	47	ISO 527-2
Tensile Modulus	E_T	GPa	2.8	2.9	ISO 527-2
3-point Flexural Strength	σ_F	MPa	83	83	ISO 178
3-point Flexural Modulus	E_F	GPa	2.8	2.7	ISO 178

*BS5350 part C5 **initial cure: 24 hrs at 21°C + post-cure: 16 hrs at 40°C ***initial cure: 24 hrs at 21°C + post-cure: 16 hrs at 50°C

SMARTFUSE™ E2090

This one page product summary is intended for use in conjunction with further advice provided under the Instructions for Use section and contains data generated from single batch testing and does not constitute a specification.

MIXING AND HANDLING

PROPERTY	UNITS	E2090 RESIN	E2090 HARDENER	MIXED SYSTEM	TEST METHOD
Appearance - Colour	Description	Black	Grey	Black	-
Appearance - Form	Description	Thixotropic Paste			
Mix Ratio by Weight	Parts by weight	100	46	-	-
Mix Ratio by Volume	Parts by volume	100	50	-	-
Density at 21°C	g/cm^3	1.17	1.10	1.14	ISO 1183-1B

PROCESSING PROPERTIES

PROPERTY	UNITS	AMBIENT TEMPERATURE: 21 – 23°C	TEST STANDARD
Working Time (pot-life 100 g, mixed in air)	minutes	88	-
Gel Time (10mm bead, mixed in air)	minutes	140	-
Time to Green Strength (1 MPa Lap Shear)	hours	10	ISO 4587
Time to Strength (10 MPa Lap Shear)	hours	16	ISO 4587

ADHESIVE PERFORMANCE

METAL SUBSTRATES	SYMBOL	UNITS	ROLLED STEEL	STAINLESS-STEEL	ALUMINIUM	GLASS FRP	CARBON FRP	TEST STANDARD
Lap Shear Strength**	τ_{steel}	MPa	27*	20	11	29	30	ISO 4587
Cleavage Strength**	$F_{cleavage}$	kN	10.5	-	-	-	-	BS 5350 Part C1

PLASTIC SUBSTRATES	SYMBOL	UNITS	POLYAMIDE	POLYCARBONATE	ACRYLIC	ABS	PVC	TEST STANDARD
Lap Shear Strength***	$\tau_{lapshear}$	MPa	2.4	8.0 (5 / 5 substrate failures)	4.4 (4 / 5 substrate failures)	5.9 (4 / 5 substrate failures)	4.1 (3 / 5 substrate failures)	ISO 4587

DISSIMILAR SUBSTRATES	SYMBOL	UNITS	CFRP TO MILD STEEL	CFRP TO STAINLESS-STEEL	CFRP TO ALUMINIUM	TEST STANDARD
Lap Shear Strength**	$\tau_{lapshear}$	MPa	29	29	29	ISO 4587

CONDITIONED STEEL LAPSHEAR ADHESIVE PERFORMANCE

CONDITIONING MEDIUM	SYMBOL	UNITS	30 DAYS @ 23°C	60 DAYS @ 23°C	90 DAYS @ 23°C	90 DAYS @ 60°C	60 DAYS @ 80°C	90 DAYS @ 90°C	TEST STANDARD
Distilled Water**	$\tau_{lapshear}$	MPa	18***	17***	15***	28**	-	20**	ISO 4587
Petrol***	$\tau_{lapshear}$	MPa	28	25	-	-	-	-	ISO 4587
Diesel***	$\tau_{lapshear}$	MPa	25	26	-	-	-	-	ISO 4587
Acetic Acid, 10%***	$\tau_{lapshear}$	MPa	14	11	13	-	-	-	ISO 4587
Lubricating Oil***	$\tau_{lapshear}$	MPa	27	28	-	-	-	-	ISO 4587
Paraffin***	$\tau_{lapshear}$	MPa	27	27	26	-	-	-	ISO 4587
Anti-freeze***	$\tau_{lapshear}$	MPa	23	21	-	-	-	-	ISO 4587
Hot-air**	$\tau_{lapshear}$	MPa	-	-	-	-	36	-	ISO 4587

CONDITIONING TEMPERATURE	SYMBOL	UNITS	-40°C	-20°	0°C	23°C	40°C	60°C	80°C	TEST STANDARD
Strength Steel to Steel**	τ_{steel}	MPa	21	24	22	27	24	8.9	1.7	ISO 4587

CURED MECHANICAL AND THERMAL PROPERTIES

PROPERTY	SYMBOL	UNITS	POST-CURED 16HRS at 40°C**	POST-CURED 16HRS at 50°C***	TEST STANDARD
Glass Transition Temperature	Tg_1	°C	61	-	ISO 6721 (DMA)
Tensile Strength	σ_T	MPa	40	47	ISO 527-2
Tensile Modulus	E_T	GPa	3.1	3.2	ISO 527-2
3-point Flexural Strength	σ_F	MPa	79	85	ISO 178
3-point Flexural Modulus	E_F	GPa	2.9	3.0	ISO 178

*BS5350 part C5 **initial cure: 24 hrs at 21°C + post-cure: 16 hrs at 40°C ***initial cure: 24 hrs at 21°C + post-cure: 16 hrs at 50°C

SMARTFUSE™ E2350

This one page product summary is intended for use in conjunction with further advice provided under the Instructions for Use section and contains data generated from single batch testing and does not constitute a specification.

MIXING AND HANDLING

PROPERTY	UNITS	E2350 RESIN	E2350 HARDENER	MIXED SYSTEM	TEST METHOD
Appearance - Colour	Description	Black	Blue	Black	-
Appearance - Form	Description	Thixotropic Paste			
Mix Ratio by Weight	Parts by weight	100	44	-	-
Mix Ratio by Volume	Parts by volume	100	50	-	-
Density at 21°C	g/cm^3	1.17	1.05	1.13	ISO 1183-1B

PROCESSING PROPERTIES

PROPERTY	UNITS	AMBIENT TEMPERATURE: 21 – 23°C	TEST STANDARD
Working Time (pot-life 100 g, mixed in air)	minutes	360	-
Gel Time (10mm bead, mixed in air)	minutes	360	-
Time to Green Strength (1 MPa Lap Shear)	hours	13	ISO 4587
Time to Strength (10 MPa Lap Shear)	hours	18	ISO 4587

ADHESIVE PERFORMANCE

METAL SUBSTRATES	SYMBOL	UNITS	ROLLED STEEL	STAINLESS-STEEL	ALUMINIUM	GLASS FRP	CARBON FRP	TEST STANDARD
Lap Shear Strength**	τ_{steel}	MPa	35*	24	12	TBD	TBD	ISO 4587
Cleavage Strength**	$F_{cleavage}$	kN	10.6	-	-	-	-	BS 5350 Part C1

PLASTIC SUBSTRATES	SYMBOL	UNITS	POLYAMIDE	POLYCARBONATE	ACRYLIC	ABS	PVC	TEST STANDARD
Lap Shear Strength***	$\tau_{lapshear}$	MPa	2.3	7.3 (4 / 5 substrate failures)	6.3 (5 / 5 substrate failures)	5.1	4.2 (4 / 5 substrate failures)	ISO 4587

DISSIMILAR SUBSTRATES	SYMBOL	UNITS	CFRP TO MILD STEEL	CFRP TO STAINLESS-STEEL	CFRP TO ALUMINIUM	TEST STANDARD
Lap Shear Strength**	$\tau_{lapshear}$	MPa	29	24	22	ISO 4587

CONDITIONED STEEL LAPSHEAR ADHESIVE PERFORMANCE

CONDITIONING MEDIUM	SYMBOL	UNITS	30 DAYS @ 23°C	60 DAYS @ 23°C	90 DAYS @ 23°C	90 DAYS @ 60°C	60 DAYS @ 80°C	90 DAYS @ 90°C	TEST STANDARD
Distilled Water**	$\tau_{lapshear}$	MPa	14***	16***	14***	15**	-	22**	ISO 4587
Petrol***	$\tau_{lapshear}$	MPa	21	21	-	-	-	-	ISO 4587
Diesel***	$\tau_{lapshear}$	MPa	24	23	-	-	-	-	ISO 4587
Acetic Acid, 10%***	$\tau_{lapshear}$	MPa	12	14	14	-	-	-	ISO 4587
Lubricating Oil***	$\tau_{lapshear}$	MPa	23	25	-	-	-	-	ISO 4587
Paraffin***	$\tau_{lapshear}$	MPa	26	25	25	-	-	-	ISO 4587
Anti-freeze***	$\tau_{lapshear}$	MPa	21	19	-	-	-	-	ISO 4587
Hot-air**	$\tau_{lapshear}$	MPa	-	-	-	-	33	-	ISO 4587

CONDITIONING TEMPERATURE	SYMBOL	UNITS	-40°C	-20°	0°C	23°C	40°C	60°C	80°C	TEST STANDARD
Strength Steel to Steel**	τ_{steel}	MPa	20	17	20	35	28	12	1.6	ISO 4587

CURED MECHANICAL AND THERMAL PROPERTIES

PROPERTY	SYMBOL	UNITS	POST-CURED 16HRS at 40°C**	POST-CURED 16HRS at 50°C***	TEST STANDARD
Glass Transition Temperature	Tg_1	°C	58	-	ISO 6721 (DMA)
Tensile Strength	σ_T	MPa	44	45	ISO 527-2
Tensile Modulus	E_T	GPa	3.1	3.1	ISO 527-2
3-point Flexural Strength	σ_F	MPa	86	84	ISO 178
3-point Flexural Modulus	E_F	GPa	2.9	2.9	ISO 178

*BS5350 part C5 **initial cure: 24 hrs at 21°C + post-cure: 16 hrs at 40°C ***initial cure: 24 hrs at 21°C + post-cure: 16 hrs at 50°C

NOTICE

All advice, instruction or recommendation is given in good faith but 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 the Company's Website: www.gurit.com/terms-and-conditions.aspx.

The Company strongly recommends that Customers make test panels and conduct appropriate testing of any goods or materials supplied by the Company 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. 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 are continuously reviewing and updating literature. Please ensure that you have the current version, by contacting Gurit Marketing Communications or your sales contact and quoting the revision number in the bottom left-hand corner of this page.

E gurit@gurit.com

W www.gurit.com