Gurit PREPREG

PRODUCT DATASHEET

Gurit

SE 75

HIGH PERFORMANCE PREPREG SYSTEM

SE 75 is an extremely versatile hot melt epoxy prepreg system. It builds on the established good handling and performance of SE 84LV but has more versatile cure possibilities from 12 hours at 70ºC (158ºF) to 45 minutes at 120ºC (248ºF), whilst maintaining an 8 week shelf life at 18-20°C.

This flexibility combined with its exceptional mechanical and thermal performance makes it suitable for a wide range of marine and industrial applications.

SE 75 can be used for any high-performance structure. Its long shelf life at 18-20°C (64-68°F) means it is particularly suited to large components that need to remain in mold for long durations prior to curing.

- New generation, hot melt, epoxy prepreg
- Builds on the established heritage and performance of SE84LV, with more versatile cure possibilities
- 12 hours at 70ºC (158ºF)
  6 hours at 80ºC (176ºF)
  35 minutes at 120ºC (248ºF)
- Exceptional mechanical and thermal performance
- Eight weeks shelf life at 18-20°C (64-68°F)
- Optimized for vacuum bag processing
- Suitable for a wide range of Marine and Industrial applications
- Lloyds Register & DNV certified in certain formats

DNV

Lloyd's Register

INSTRUCTIONS FOR USE

PREPARATION

When preparing the lay-up the prepreg should be removed from the freezer and allowed to thaw to room temperature in a sealed bag. This may take 6 to 24 hours depending on roll size. This prevents atmospheric moisture from condensing on the prepreg which may cause voiding on cure. The mould surface should be release coated and must have been tested for vacuum integrity prior to lay-up.

LAMINATION

The recommend temperature for prepreg lay-up is between 18-21°C. At this temperature the correct level of resin tack is obtained to minimize air entrapment and allow the prepreg to be repositioned with minimal distortion. A lower level of prepreg tack will reduce the air entrapment during lamination and result in a lower finished laminate void content.

Different supporting backer configuration are offered, with the common formats being 2DPE and POPA. The 2DPE format is two polyethene plastic backers, one either side of the prepreg and POPA format is one polyethene plastic backer with silicon paper on the other side. The 2DPE format gives the prepreg a lower level of tack and enables easier positioning of the product when laminating long lengths of prepreg.

When applying prepreg it can be beneficial to spike the prepreg with a perforation roller, this action allows the air to escape as the prepreg is applied and reduces the amount of inter ply air bubbles / bumpers which can form. Spiking is typically done on unidirectional prepreg where it is impossible for the air to escape through the prepreg thickness.

Laminate debulking by vacuum pressure is required to ensure the laminate is sufficiently compacted prior to cure. The user needs to define at what intervals these debulks are needed during the lamination process. Typically it is done every 3 layers, but this can vary depending on the application and in some cases it is every layer. Debulking is needed to ensure the prepreg fully conforms to the mould shape and helps to reduce bumps/wrinkles appearing in the laminate.

THIN LAMINATES

When using very thin laminates (e.g. with a total laminate fibre weight of less than 300-400gm^2), care needs to be taken to avoid extracting excessive amounts of resin during the cure process. To avoid this, low bleed release film should be used and if required a prepreg peel ply should be used to avoid further resin bleed.

CORE BONDING

When using Nomex™, aluminium honeycombs or foam core materials the SA75-90 adhesive film is recommended and full details of use are provided on the product data sheet. This adhesive film can be supplied with or without lightweight glass carrier, or in some cases it can be supplied directly coated onto one face of the SE 75 prepreg.

PRODUCT INFORMATION

AVAILABILITY

SE75 is available in unidirectional carbon formats ranging in weight from 120 to 600g/m^2, also woven or multiaxial reinforcements in carbon or glass from 100-1200g/m^2. Gurit uses a number of qualified fabric and fiber suppliers to enable flexibility within the supply chain and maintain product availability for our customers, which may be adjusted at Gurit's discretion. Our approved fibers are shown in the Table below.

FIBER TYPE	DESCRIPTION	APPROVED FIBER TYPES	STRENGTH (MPa)	MODULUS (GPa)
HEC	High Elongation Carbon	T700, 34-700, H2250, TR50S, TC35, TC36, STS40, HTS40, HTS45	> 4000	227 to 257
IMC	Intermediate Modulus Carbon	T800, IM2C, IM7	> 4400	275 to 310
HMC	High Modulus Carbon	HR40, M40J	> 4300	365 to 405
UHMC	Ultra-High Modulus Carbon	M46J	> 4000	420 to 455

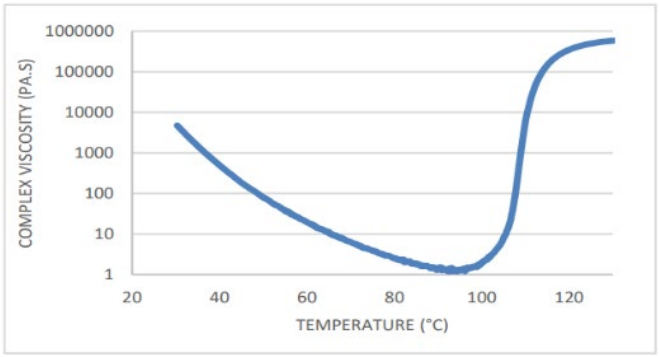
The table above provides indicative values and does not constitute a specification

T700, 34-700, H2250, TR50S, TC35, TC36, STS40, HTS40, HTS45

PREPREG PROPERTIES

RHEOLOGY DATA

SE75 resin viscosity profile conducted at 1°C (1.8°F) /minute.



PROPERTY	UNITS	VALUE
Minimum viscosity	Pa.s (P)	1.2 (12)
Temperature at minimum viscosity	°C (°F)	94 (101)

TRANSPORT AND STORAGE

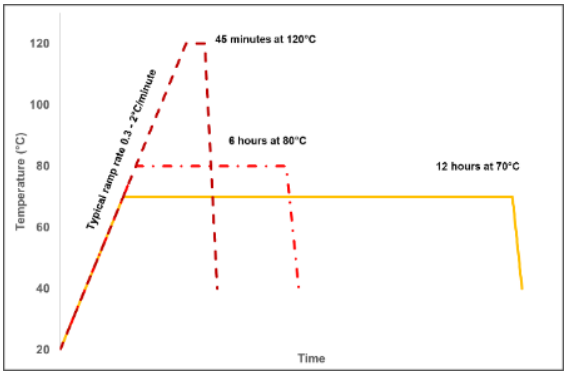
STORAGE TEMPERATURE	UNITS	VALUE
-18°C (0°F)	months	24
+18-20°C (64-68°F)	weeks	8
25°C (77°F)	weeks	4
30°C (86°F)	weeks	3

To maximise the de-frosted shelf life of the material it is beneficial to maintain a cool working environment. When not in use SE75 products should be maintained at -18°C (0°F).

TYPICAL CURE TIME AND TEMPERATURES

All temperatures measured by thermocouple installed on the laminate surface. Vacuum should be maintained as high as possible throughout the cure cycle. 70°C (158°F) should be treated as the minimum cure temperature; 65-70°C (149-158°F) will not generate adequate mechanical properties. It is not recommended to cure SE 75 under vacuum pressures of less than 85%.

PROPERTY	70°C CURE (158°C)	80°C CURE (176°C)	120°C CURE (248°C)	TEST METHOD
Processing method	Vacuum bag/autoclave	Vacuum bag/autoclave	Vacuum bag/autoclave	
Typical ramp rate	0.3 – 2°C/minute	0.3 – 2°C/minute	0.3 – 2°C/minute	
Cure time	12 hrs	6hrs	45 minutes	
Cure pressure	-1 Bar / +6 Bar	-1 Bar / +6 Bar	-1 Bar / +6 Bar	
Tg (DMA)	85°C (185°F)	98°C (208°F)	125°C (257°F)	ASTM D7028



MECHANICAL PROPERTIES

CURED RESIN PROPERTIES

Resin cast oven cured, mean values.

PROPERTY	SYMBOL	UNITS		12 HOURS 70°C (158°F)		6 HOURS 80°C (176°F)		45 MINS. 120°C (248°F)		TEST METHOD
Cured resin density	ρ_{cured}	g/cm²		1.19		1.19		1.19		Archimedean principle
Tensile strength	σ_T	MPa	(ksi)	68	(9.86)	82	(11.9)	83	(12.0)	ISO 527-2
Tensile modulus	E_T	GPa	(Msi)	3.8	(0.55)	3.4	(0.49)	3.0	(0.43)	ISO 527-2
Flexural strength	σ_F	MPa	(ksi)	117	(16.9)	123	(17.8)	117	(19.9)	ISO 178
Flexural modulus	E_F	GPa	(Msi)	3.8	(0.55)	3.5	(0.50)	2.9	(0.42)	ISO 178
Compressive yield strength	σ_C	MPa	(ksi)	147	(21.3)	140	(20.3)	117	(16.9)	ISO 604

UNIDIRECTIONAL LAMINATE PROPERTIES

Mean values derived from data from a single batch, cured 6 hours at 80°C (176°F). Customers with specific requirements must carry out tests to prove conformity.

PROPERTY	SYMBOL	UNITS		HEC 150g/m²		HEC 300g/m²		HEC 600g/m²		TEST METHOD
Typical fiber density	ρ_{fiber}	g/cm²		1.8		1.8		1.8		
Fiber modulus	E_{fiber}	GPa		227-257		227-257		227-257		
Resin content		%		32-37		32-37		32-37		ASTM D3171 Method II
Fiber volume fraction	V_f	%		55		56		55		ASTM D3171 Method II
0° tensile strength*	X_T	MPa	(ksi)	2775	(402)	2494	(361)	2188	(317)	ISO527-5
0° tensile modulus*	E_T	GPa	(Msi)	138	(20)	141	(20.4)	144	(20.9)	ISO527-5
0° compressive strength*	X_C	MPa	(ksi)	1356	(197)	1390	(201)	1410	(205)	SACMA SRM1-94
0° compressive modulus*	E_{C11}	GPa	(Msi)	120	(17.4)	126	(18.3)	130	(18.8)	SACMA SRM1-94
90° tensile strength	Y_T	MPa	(ksi)	49	(7.1)	38	(5.5)	21	(3.0)	ISO527-5
90° tensile modulus	E_{T22}	GPa	(Msi)	8.7	(1.26)	8.7	(1.26)	8.6	(1.24)	ISO527-5
0° flexural strength	X_F	MPa	(ksi)	1490	(216)	1538	(223)	1450	(210)	ISO14125
0° flexural modulus	E_{F11}	GPa	(Msi)	107	(15.5)	109	(15.8)	122	(17.7)	ISO14125
0° ILSS	X_{ILSS}	MPa	(ksi)	86	(12.5)	85	(12.3)	86	(12.5)	ISO14130

* Normalized to 60% V_f

PROPERTY	SYMBOL	UNITS		IMC 150g/m²		IMC 300g/m²		IMC 450g/m²		TEST METHOD
Typical fiber density	ρ_{fiber}	g/cm²		1.79		1.79		1.79		
Fiber modulus	E_{fiber}	GPa		275-310		275-310		275-310		
Resin content		%		32-37		32-37		32-37		ASTM D3171 - II
Fiber volume fraction	V_f	%		58		59		58		ASTM D3171 - II
0° tensile strength*	X_T	MPa	(ksi)	2765	(401)	2722	(395)	2511	(364)	ISO527-5
0° tensile modulus*	E_T	GPa	(Msi)	172	(24.9)	177	(25.7)	172	(24.9)	ISO527-5
0° compressive strength*	X_C	MPa	(ksi)	1450	(210)	1422	(206)	1458	(211)	SACMA SRM1-94
0° compressive modulus*	E_{C11}	GPa	(Msi)	157	(22.8)	143	(20.7)	152	(22.0)	SACMA SRM1-94
90° tensile strength	Y_T	MPa	(ksi)	33	(4.78)	39	(5.65)	36	(5.22)	ISO527-5
90° tensile modulus	E_{T22}	GPa	(Msi)	8.3	(1.20)	7.9	(1.15)	8.3	(1.20)	ISO527-5
0° flexural strength	X_F	MPa	(ksi)	1387	(201)	1474	(213)	1359	(197)	ISO14125
0° flexural modulus	E_{F11}	GPa	(Msi)	134	(19.4)	134	(19.4)	137	(19.9)	ISO14125
0° ILSS	X_{ILSS}	MPa	(ksi)	86	(12.5)	88	(12.7)	81	(11.7)	ISO14130

* Normalized to 60% V_f

PROPERTY	SYMBOL	UNITS		HMC FIBER 150g/m²		HMC FIBER 300g/m²		HMC FIBER 600g/m²		TEST METHOD
Typical fiber density	ρ_{fiber}	g/cm²		1.8		1.8		1.8		
Fiber modulus	E_{fiber}	GPa		365-405		365-405		365-405		
Resin content		%		32-37		32-37		32-37		ASTM D3171 - II
Fiber volume fraction	V_f	%		58		57		61		ASTM D3171 - II
0° tensile strength*	X_T	MPa	(ksi)	2515	(365)	2318	(336)	2226	(323)	ISO527-5
0° tensile modulus*	E_T	GPa	(Msi)	223	(32.3)	208	(30.1)	221	(30.6)	ISO527-5
0° compressive strength*	X_C	MPa	(ksi)	1322	(192)	1122	(163)	1115	(162)	SACMA SRM1-94
0° compressive modulus*	E_{C11}	GPa	(Msi)	194	(28.1)	187	(27.1)	186	(27.0)	SACMA SRM1-94
90° tensile strength	Y_T	MPa	(ksi)	37	(5.36)	26	(3.77)	21.8	(3.16)	ISO527-5
90° tensile modulus	E_{T22}	GPa	(Msi)	7.2	(1.04)	7	(1.02)	7.2	(1.04)	ISO527-5
0° flexural strength	X_F	MPa	(ksi)	1319	(191)	1397	(203)	1349	(196)	ISO14125
0° flexural modulus	E_{F11}	GPa	(Msi)	178	(25.8)	200	(29.0)	163	(23.6)	ISO14125
0° ILSS	X_{ILSS}	MPa	(ksi)	81	(11.74)	86	(12.5)	82	(11.9)	ISO14130

* Normalized to 60% V_f

CARBON WOVEN LAMINATE PROPERTIES

Mean values derived from data from a single batch, cured 6 hours at 80°C (176°F). Customers with specific requirements must carry out tests to prove conformity. Where test directions are given, they are with respect to the warp direction of the roll. Fabrics contained in these prepregs are 2X2 twill woven with High Elongation Carbon (HEC).

PROPERTY	SYMBOL	UNITS		RC200T		RC416T		RC660T		TEST METHOD
Uncured resin content		%		39-45		39-45		39-45		ASTM D3171- II
Cured ply thickness		mm		0.22		0.43		0.65		ASTM D792
Fiber volume fraction	V_f	%		49		48		58		ASTM D3171 - II
0° tensile strength*	X_T	MPa	(ksi)	751	(109)	909	(132)	963	(140)	ISO527-4
0° tensile modulus*	E_T	GPa	(Msi)	71	(10.3)	63	(9.14)	59	(8.56)	ISO527-4
0° compressive strength*	X_C	MPa	(ksi)	743	(108)	681	(98.6)	496	(71.9)	SACMA SRM1-94
0° compressive modulus*	E_{C11}	GPa	(Msi)	62	(8.99)	54	(7.83)	54	(7.83)	SACMA SRM1-94
90° tensile strength	Y_T	MPa	(ksi)	711	(103)	1055	(153)	854	(124)	ISO527-4
90° tensile modulus	E_{T22}	GPa	(Msi)	61	(8.85)	76	(11.0)	60	(8.70)	ISO527-4
90° compressive strength*	X_C	MPa	(ksi)	648	(89.6)	700	(101)	500	(72.5)	SACMA SRM1-94
90° compressive modulus*	E_{C11}	GPa	(Msi)	53.5	(7.76)	59	(8.56)	54	(7.83)	SACMA SRM1-94
0° Flexural strength	X_F	MPa	(ksi)	853	(124)	832	(124)	521	(75.6)	ISO14125
0° Flexural modulus	E_{F11}	GPa	(Msi)	53	(7.69)	51	(7.39)	57	(8.27)	ISO14125
0° ILSS	X_{ILSS}	MPa	(ksi)	63	(9.57)	53	(7.69)	50	(7.25)	ISO14130

*Normalized to 55% fiber volume fraction

BIAXIAL (+/-45°) CARBON LAMINATE PROPERTIES

Mean values derived from data from a single batch, cured 6 hours at 80°C (176°F). Where test directions are given, they are with respect to the warp direction of the roll. Fabrics contained in these products are 2 layers of unidirectional High Elongation Carbon (HEC) fibers stitched together at +/-45° to each other. HEC fibers are characterised by having a tensile modulus between 227-257GPa.

PROPERTY	SYMBOL	UNITS		XC150		XC411		XC611		TEST METHOD
Uncured resin content		%		42		42		42		ASTM D3171 Method II
Cured ply thickness		mm		0.16		0.43		0.61		ASTM D792
Fiber volume fraction	V_f	%		53		52		56		ASTM D3171 Method II
+45° tensile strength*	X_T	MPa	(ksi)	1128	(163)	992	(144)	726	(105)	ISO527-4
+45° tensile modulus*	E_T	GPa	(Msi)	62	(8.99)	67	(9.72)	66	(9.57)	ISO527-4
-45° tensile strength*	X_T	MPa	(ksi)	1193	(173)	857	(124)	723	(105)	ISO527-4
-45° tensile modulus*	E_T	GPa	(Msi)	59	(8.56)	67	(9.72)	66	(9.57)	ISO527-4
+45° compressive strength*	X_C	MPa	(ksi)	694	(101)	739	(107)	432	(63.0)	SACMA SRM1-94
+45° compressive modulus*	E_{C11}	GPa	(Msi)	56	(8.12)	58	(8.41)	59	(8.56)	SACMA SRM1-94
-45° compressive strength*	X_C	MPa	(ksi)	690	(100)	702	(102)	553	(80.0)	SACMA SRM1-94
-45° compressive modulus*	E_{C11}	GPa	(Msi)	56	(8.12)	60	(8.70)	61	(8.85)	SACMA SRM1-94
+45° Flexural strength	X_F	MPa	(ksi)	930	(135)	1013	(147)	738	(107)	ISO14125
+45° Flexural modulus	E_{F11}	GPa	(Msi)	54	(7.83)	56	(8.12)	50	(7.25)	ISO14125
-45° Flexural strength	X_F	MPa	(ksi)	987	(143)	903	(131)	850	(123)	ISO14125
-45° Flexural modulus	E_{F11}	GPa	(Msi)	56	(8.12)	58	(8.41)	52	(7.54)	ISO14125
0° ILSS	X_{ILSS}	MPa	(Ksi)	65	(9.43)	56	(8.12)	34	(4.93)	ISO14130

*Normalized to 55% fiber volume fraction

GLASS UNIDIRECTIONAL LAMINATE PROPERTIES

Mean values derived from data from a single batch cured using standard processing techniques and standard cure of 12 hours at 70°C (176°F). Where test directions are given, they are with respect to the warp direction of the roll. Fabrics contained in these prepregs standard e-glass.

PROPERTY	SYMBOL	UNITS		EGL 300 g/m²		TEST METHOD
Uncured resin content				36		
Typical fiber density	ρ_{fiber}	g/cm³		2.6		
Fiber modulus	E_{fiber}	GPa		69		
Cured ply thickness	-	mm		0.25		
Fiber volume fraction	V_f	%		47.3		ASTM D3171 Method II
0° tensile strength*	X_T	MPa	(ksi)	1499	(217)	ISO527-5
0° tensile modulus*	E_T	GPa	(Msi)	51	(7.4)	ISO527-5
0° compressive strength*	X_C	MPa	(ksi)	1207	(175)	SACMA SRM1-94
0° compressive modulus*	E_{C11}	GPa	(Msi)	43.8	(3.4)	SACMA SRM1-94
90° tensile strength	Y_T	MPa	(ksi)	45.6	(6.6)	ISO527-5
90° tensile modulus	E_{T22}	GPa	(Msi)	10.7	(1.55)	ISO527-5
0° flexural strength	X_F	MPa	(ksi)	1472	(213.5)	ISO14125
0° flexural modulus	E_{F11}	GPa	(Msi)	32.3	(4.68)	ISO14125
0° ILSS	X_{ILSS}	MPa	(ksi)	91.5	(13.3)	ISO14130

*normalized to 55% fiber volume fraction

GLASS WOVEN LAMINATE PROPERTIES

Mean values derived from data from a single batch cured using standard processing techniques and standard cure of 12 hours at 70°C (176°F). Where test directions are given, they are with respect to the warp direction of the roll. Fabrics contained in these prepregs standard e-glass.

PROPERTY	SYMBOL	UNITS		RE295 H4		RE301 H8		TEST METHOD
Uncured resin content		%		40		37		ASTM D3171- II
Cured ply thickness		mm		0.225		0.237		ASTM D792
Fiber volume fraction	V_f	%		51.2		48.1		ASTM D3171 - II
0° tensile strength*	X_T	MPa	(ksi)	550	(79.8)	639	(92.7)	ISO527-4
0° tensile modulus*	E_T	GPa	(Msi)	32	(4.64)	37	(5.37)	ISO527-4
0° Compressive strength*	X_C	MPa	(ksi)	643	(93.3)	572	(83.0)	SACMA SRM1-94
0° Compressive modulus*	E_{C11}	GPa	(Msi)	29	(4.20)	32	(4.64)	SACMA SRM1-94
90° tensile strength*	Y_T	MPa	(ksi)	526	(76.3)	549	(79.6)	ISO527-4
90° tensile modulus*	E_{T22}	GPa	(Msi)	32	(4.64)	33	(4.79)	ISO527-4
90° Compressive strength*	X_C	MPa	(ksi)	558	(80.9)	519	(75.3)	SACMA SRM1-94
90° Compressive modulus*	E_{C11}	GPa	(Msi)	29	(4.21)	31	(4.50)	SACMA SRM1-94
0° Flexural strength	X_F	MPa	(ksi)	813	(118)	672	(97.5)	ISO14125
0° Flexural modulus	E_{F11}	GPa	(Msi)	29	(4.21)	23	(3.34)	ISO14125
0° ILSS	X_{ILSS}	MPa	(ksi)	66	(9.57)	58	(8.41)	ISO14130

* normalized to 55% fiber volume fraction

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

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

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