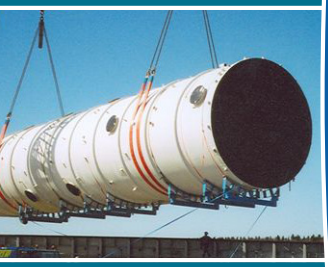
DION® IMPACT 9133

Premium Bisphenol A Vinyl Ester

PRELIMINARY EDITION



REICHHOLD

DION® IMPACT 9133

DION® IMPACT 9133 is a premium bisphenol A epoxy-based vinyl ester resin which has been designed to give additional benefits in comparison to standard bisphenol A epoxy-based vinyl ester resin:

- Very low-foaming system curable with standard MEK peroxide
- Improved heat deflection temperature (HDT)
- Lower styrene content

Belonging to the Impact family, DION® IMPACT 9133 is characterized by lighter colour, as well as an improved shelf-life, well-balanced/high reactivity with good final cure and shorter de-moulding times. It is a very low foaming vinyl ester resin that also can be cured using standard methyl ether ketone peroxide (MEKP) such as Butanox M50, NORPOL® Peroxide 1 or similar products.

Its heat deflection temperature (HDT) of 112ºC is up to 10-12°C higher than that of standard vinyl ester resins extending the possibilities to use the DION® IMPACT 9133 resin at higher temperatures. Compared to the standard vinyl ester resin, its styrene content is lower, which reduces styrene emissions during the fabrication process.

DION® IMPACT 9133 exhibits excellent chemical resistance to a wide variety of corrosive environments including acids, alkalis and oxidizing agents. It assures good mechanical properties with high toughness and good crack resistance as well as excellent thermal properties. It shows excellent wetting of glass fibre reinforcement and good compatibility to carbon and aramide fibres. The outstanding adhesive properties, toughness and fatigue properties in combination with its chemical resistance make this resin a very good choice for many applications and mostly for production of tanks, pipes and process equipment to be used in challenging working conditions.

DION® IMPACT 9133 has been tested based on many norms and it is classified as belonging to:

- EN 13121/1 - Group 7A
- DIN 16946/2 - Type 1310
- DIN 18820/1 - Group 5

The chemical composition of DION® IMPACT 9133 has been classified to be in accordance with the positive lists of

- “Guideline for the Hygienic Assessment of Organic Material in contact with drinking water (KTW Guideline)” Umweltbundesamt (UBA) by Technologiezentrum Wasser (TZW)

AVAILABLE GRADES AND APPLICATIONS

To better handle different demands in curing profile and rheology more grades are available on shelf while specific tailor-made grades could be developed on demand. Please discuss this opportunity with our commercial personnel.

DION® IMPACT 9133-00 is non-promoted and non-thixotropic specifically suggested for anticorrosion. Our technical staff will help you in determining the best curing system based on your requirements adapting its use to major technologies like e.g. Filament Winding, Centrifugal Casting, Lamination.

DION® IMPACT 9133-800 is thixotropic and pre-accelerated. The incorporated accelerator system minimizes the foaming normally occurring when using MEKP and gives relative short gel time and rapid curing. The use of this grade with other catalyst such as NORPOL® PEROXIDE 11 or Butanox LPT is also possible. The resin is especially formulated for hand lay-up and spray-up processes and impregnates both glass, carbon and aramide fibres rapidly. It is easily worked and will minimize drain off, making it ideal for large, vertical applications like boat and swimming pool walls. The recommended laminate thickness applied wet-on-wet should be between 2 and 6 mm.

DION® IMPACT 9133-200 is thixotropic and non-accelerated showing the same thixotropic properties as DION® IMPACT 9133-800 but giving the manufacturer the possibility to adjust the curing system to its specific needs. It is formulated for hand lay-up and spray-up requirements with minimized drain off.

PHYSICAL DATA IN LIQUID STATE AT 23°C

	Unit	DION® IMPACT 9133-00	DION® IMPACT 9133-200	DION® IMPACT 9133-800	Test Method
Description	-	Non-promoted resin	Thixotropic resin	Promoted and thixotropic resin	
Viscosity at 23°C, - Brookfield LVF sp. 2/12 rpm - ICI Cone & Plate	mPa.s (cP)	400-600	1100-1300 300-3320	1100-1300 300-330	ASTM D 2196
Density at 23°C	g/cm^3	1.02-1.06	1.02-1.06	1.02-1.06	ISO 2811-2001
Acid number	mgKOH/g	10-30	10-30	10-30	ISO 2114-1996
Styrene content	% weight	36-39	41-45	41-45	B070
Flash point	^{0}C	32	32	32	ASTM D 3278-95
Storage stability	Months	6	3	3	G180
Geltime at 23°C	Min	0.6 phr 1% Co + 2 phr Butanox M50 25-35 min	0.6 phr 1% Co + 2 phr Butanox M50 25-35 min	2 phr Butanox LPT or M50 18-30 min	G020

TYPICAL PROPERTIES OF POST-CURED CLEAR CASTING MEASURED AT 23°C

Properties	Unit	DION® IMPACT 9133-00	DION® IMPACT 9133-800	Test Method
Tensile Strength	MPa	80	80	ISO 527-1993
Tensile Modulus	MPa	3350	3350	ISO 527-1993
Tensile Elongation	%	4-5	3-5	ISO 527-1993
Flexural Strength	MPa	135	135	ISO 178-2001
Flexural Modulus	MPa	3400	3400	ISO 178-2001
Heat Distortion Temperature	^{0}C	112	112	ISO 75-1993
Hardness, Barcol 934-1, min.	-	40	40	ASTM D 2583-99
Curing system	-	0.6 phr 1% Co + 2 phr NORPOL® PEROXIDE 11 or Butanox M50	2 phr NORPOL® PEROXIDE 11 or Butanox M50	
Curing schedule		24hr at 23°C, 24hr at 65°C, 1hr at 90°C, 3hr at 120°C	24hr at 23°C, 24hr at 65°C, 1hr at 90°C, 3hr at 120°C	

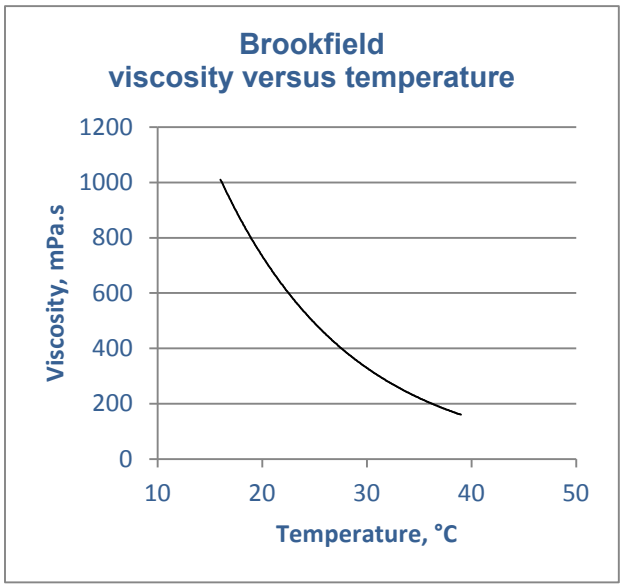
TYPICAL GELTIMES

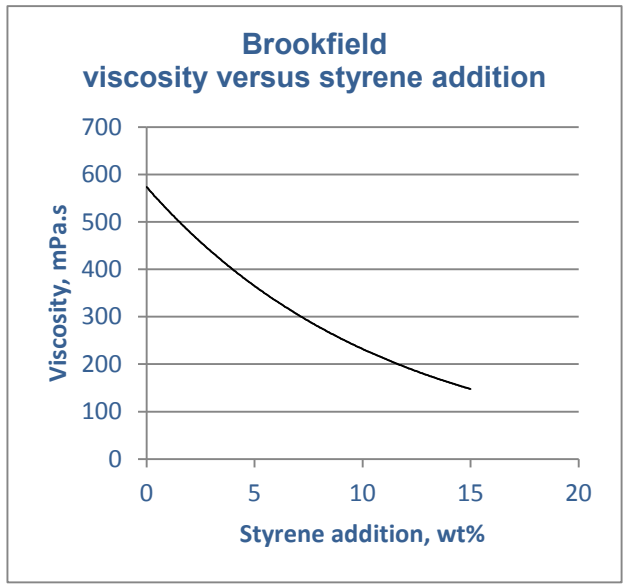
DION® IMPACT 9133 is a high reactivity resin requiring in general only low levels of Cobalt for promotion. Mechanical properties and HDT may depend on the curing system chosen. The following curing systems are proposed for curing of DION® IMPACT 9133 when using MEK peroxides of type Butanox M50/Norpol® Peroxide 1 (M50/K1) and Butanox LPT/Norpol® Peroxide 11 (LPT/K11) and moderate laminate thicknesses. Post-curing is recommended. If post-curing may not be possible or thinner laminates need to be cured the cobalt and DMA content can be increased, to about 1.5% of 1% Co and about 1 % of DMA 10%, respectively.

Temperature	Curing time	Co 1%	M50/K1	DMA 10%	TBC 10%
18ºC	15-20 min	0.6	2	1.0	
	30 ± 10 min	0.6	2	0.3	
	50 ± 10 min	0.6	2	-	
23ºC	15-20 min	0.6	2	0.5	
	30 ± 10 min	0.6	2	-	
	50 ± 10 min	0.6	1.5	-	
28ºC	15-20 min	0.6	2	-	
	30 ± 10 min	0.6	1.5	-	
	50 ± 10 min	0.6	1.5	-	0.05
33ºC	15-20 min	0.6	1.75	-	
	30 ± 10 min	0.6	2	-	0.3
	50 ± 10 min	0.6	2	-	

Temperature	Curing time	Co 1%	LPT/K11	DMA 10%	TBC 10%
18ºC	15-20 min	1.0	2	1.0	
	30 ± 10 min	0.6	2	1.0	
	50 ± 10 min	0.6	2	0.4	
23ºC	15-20 min	0.6	2	1.0	
	30 ± 10 min	0.6	2	0.5	
	50 ± 10 min	0.6	2	-	
28ºC	15-20 min	0.6	2	0.25	
	30 ± 10 min	0.6	2	-	
	50 ± 10 min	0.6	1.5	-	
33ºC	15-20 min	0.6	2	0.3	-
	30 ± 10 min	0.6	1.5	-	-
	50 ± 10 min	0.6	1.5	-	0.05

DION® IMPACT 9133 can also be cured using alternative promoters and or catalyst so as at higher or lower temperature than indicated in the above tables. If interested please contact technical service for details.

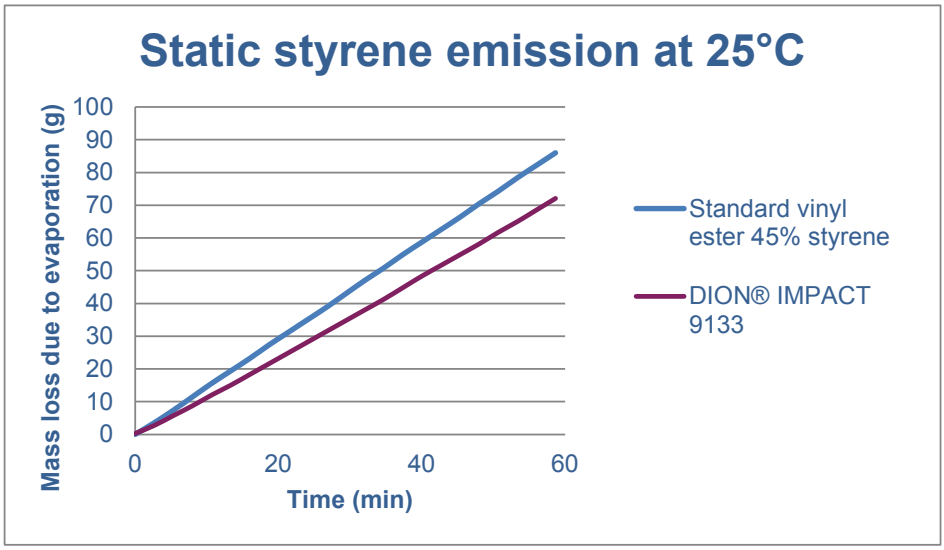




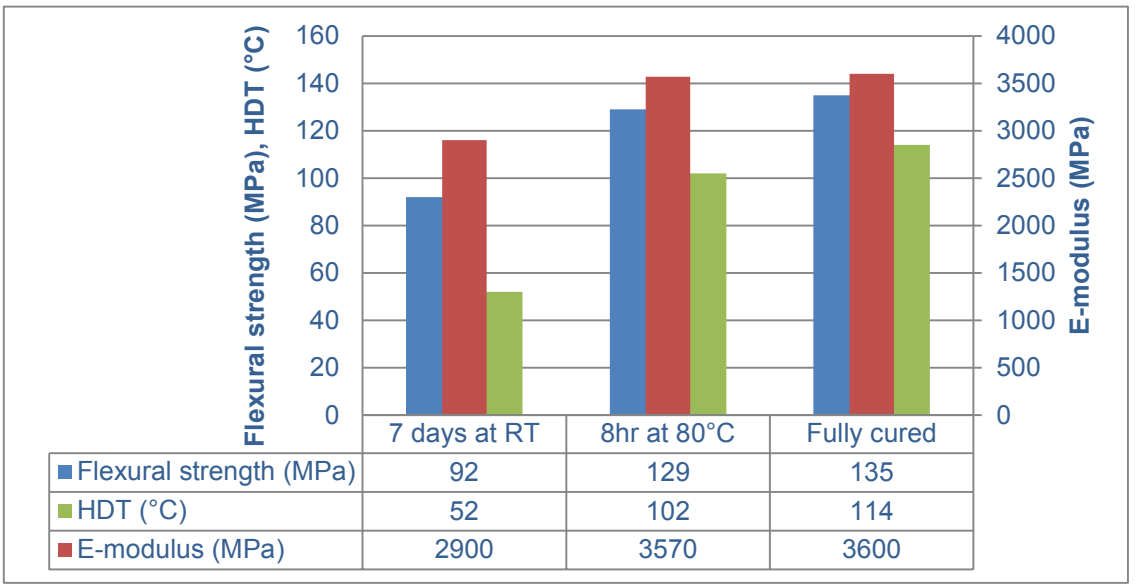
Brookfield viscosity versus temperature for DION® IMPACT 9133. (Measurement Brookfield viscometer type LV, spindle 2, 12 rpm)

Brookfield viscosity at 23ºC versus styrene addition for DION® IMPACT 9133. A styrene addition up to 5% is considered to leave mechanical and chemical resistance properties in general unchanged. (Measurement Brookfield viscometer type LV, spindle 2, 12 rpm)

Compared to a standard vinyl ester with 45 % of styrene, the static styrene emission is reduced by about 18-20 % when using DION® IMPACT 9133.

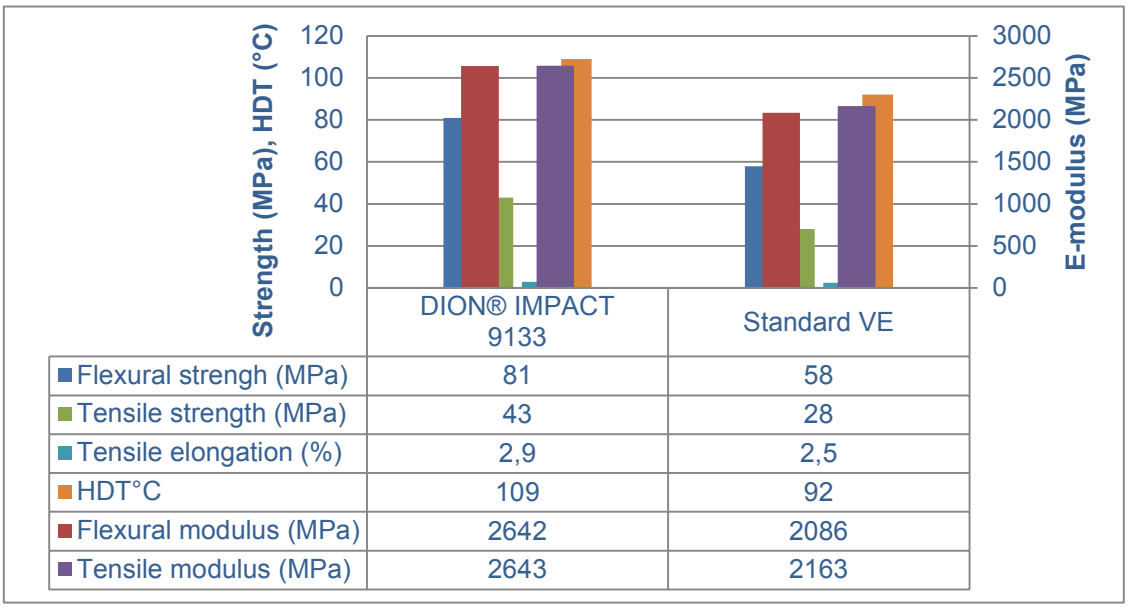


Moderate post-curing procedures, 8 h at 80°C, already give very good effects on the degree of cure and the mechanical performance of the DION® IMPACT 9133 resin and its laminates. The HDT reaches values of around 100°C, ie about 10 degrees higher than for standard vinyl ester resins, The retention of the mechanical properties of both resin and laminate made with DION® IMPACT 9133 at 80°C is significantly better than for standard vinyl ester resins. This allows the use of FRP structures made with DION® IMPACT 9133 at about 10 to 15°C higher design and operation temperatures than those made of standard vinyl ester resins.



	7 days at RT	8hr at 80°C	Fully cured
Flexural strength (MPa)	92	129	135
HDT (°C)	52	102	114
E-modulus (MPa)	2900	3570	3600

Mechanical properties and HDT of DION® IMPACT clear casts cured at different conditions.



	DION® IMPACT 9133	Standard VE
Flexural strengh (MPa)	81	58
Tensile strength (MPa)	43	28
Tensile elongation (%)	2,9	2,5
HDT°C	109	92
Flexural modulus (MPa)	2642	2086
Tensile modulus (MPa)	2643	2163

Comparison of the mechanical properties of 4 mm thick CSM laminates having a glass content of about 30 wt% and made with DION® IMPACT 9133 and standard vinyl ester when tested (post-cured at 80ºC for 24hr), HDT value for corresponding casting.

STORAGE

To ensure maximum stability and maintain optimum resin properties, resins should be stored in closed containers at temperatures below 24°C/75°F and away from heat ignition sources and sunlight. Resin should be warmed to at least 18°C/65°F prior to use in order to assure proper curing and handling. All storage areas and containers should conform to local fire and building codes. Copper or copper containing alloys should be avoided as containers. Store separate from oxidizing materials, peroxides and metal salts. Keep containers closed when not in use. Inventory levels should be kept to a reasonable minimum with first-in, first-out stock rotation. Additional information on handling and storing unsaturated polyesters is available in Reichhold's application bulletin "Bulk Storage and Handling of Unsaturated Polyester Resins." For information on other Reichhold resins or initiators, contact your sales representative or authorized Reichhold distributor.

SAFETY

READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET BEFORE WORKING WITH THIS PRODUCT

Obtain a copy of the material safety data sheet on this product prior to use. Material safety data sheets are available from your Reichhold sales representative. Such information should be requested from suppliers of all products and understood prior to working with their materials.

DIRECTLY MIXING ANY ORGANIC PEROXIDE WITH A METAL SOAP, AMINE, OR OTHER POLYMERIZATION ACCELERATOR OR PROMOTER WILL RESULT IN VIOLENT DECOMPOSITION

The information, recommendations and/or opinions contained herein are designed to assist customers in determining whether our products are suitable for their applications or to provide general assistance in the application of our products. Our products are intended for sale to industrial and commercial customers. We require customers to inspect and test our products before use and to satisfy themselves as to contents and suitability for their applications. We warrant that our products will meet our written specifications. Nothing herein shall constitute and other warranty, express or implied, including any warrant of merchantability or fitness for a particular purpose, nor is any protection from any law or patent to be inferred. All patent rights are reserved. The exclusive remedy for all proven claims is replacement of our material and in no event shall we be liable for incidental or consequential damages.

REICHHOLD is one of the world's largest suppler of unsaturated polyester resins for composites and a leading supplier of coating resins for a wide variety of markets and applications.

With its world headquarters in Durham, North Carolina, USA, and 20 manufacturing sites (17 operated by Reichhold) and 5 technology centres spread around the world, Reichhold has the widest global reach of any resin supplier today.

For contact information to our sales offices and distributors in Europe please see under Composites on our website www.Reichhold.com.

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