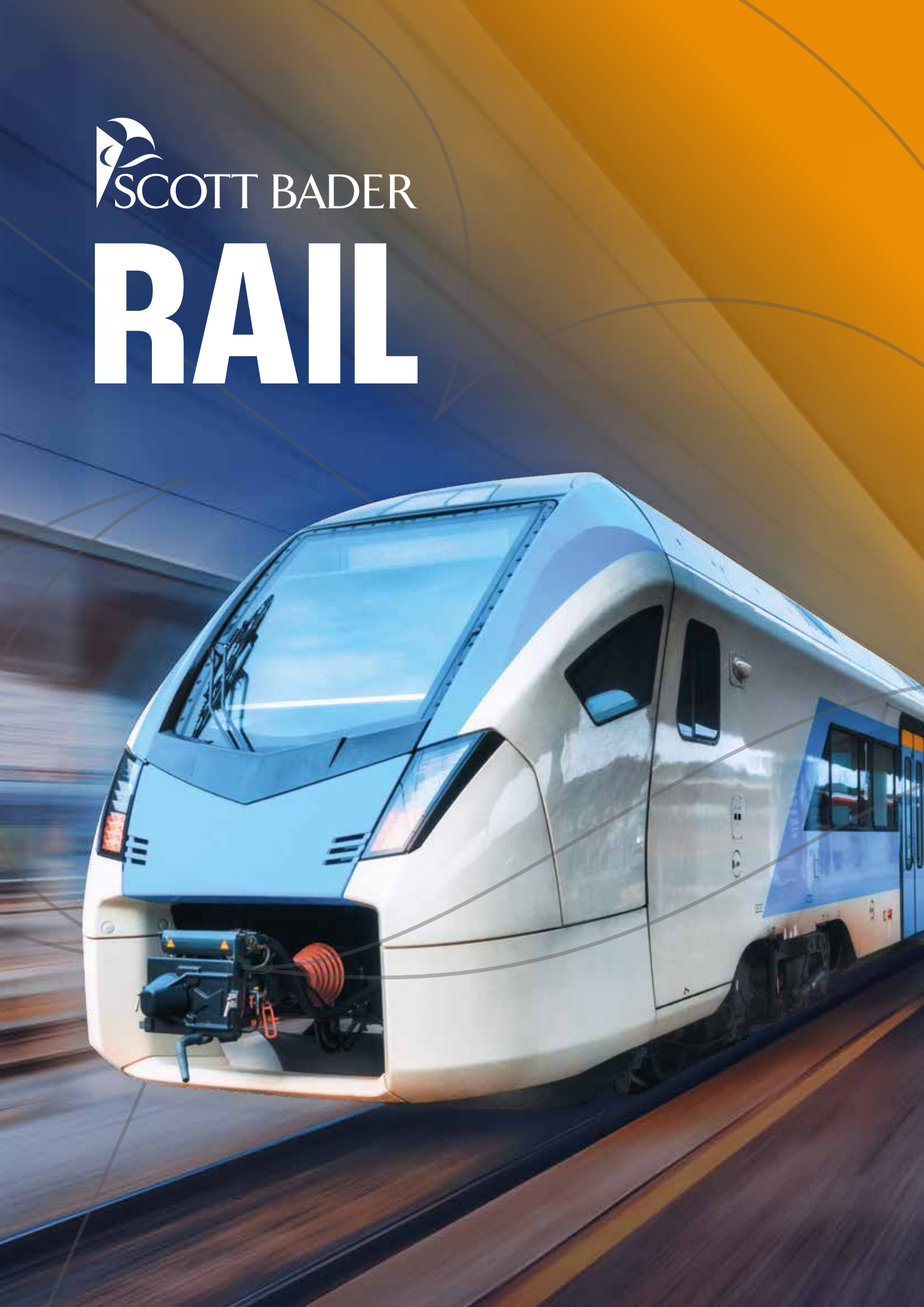
SCOTT BADER

RAIL



WELCOME TO SCOTT BADER

Established
1921

800+
colleagues

8
worldwide
manufacturing
sites

19
global
offices

WHY SCOTT BADER?

1 **LIGHTWEIGHT STRUCTURAL PERFORMANCE**

High performance HL2/HL3 systems

2 **GLOBAL TECHNICAL SUPPORT**

With the talent, experience and knowledge to develop the technical solutions you need.

3 **SUSTAINABLE SYSTEMS**

Bio-based systems that combine high performance with environmental benefits.

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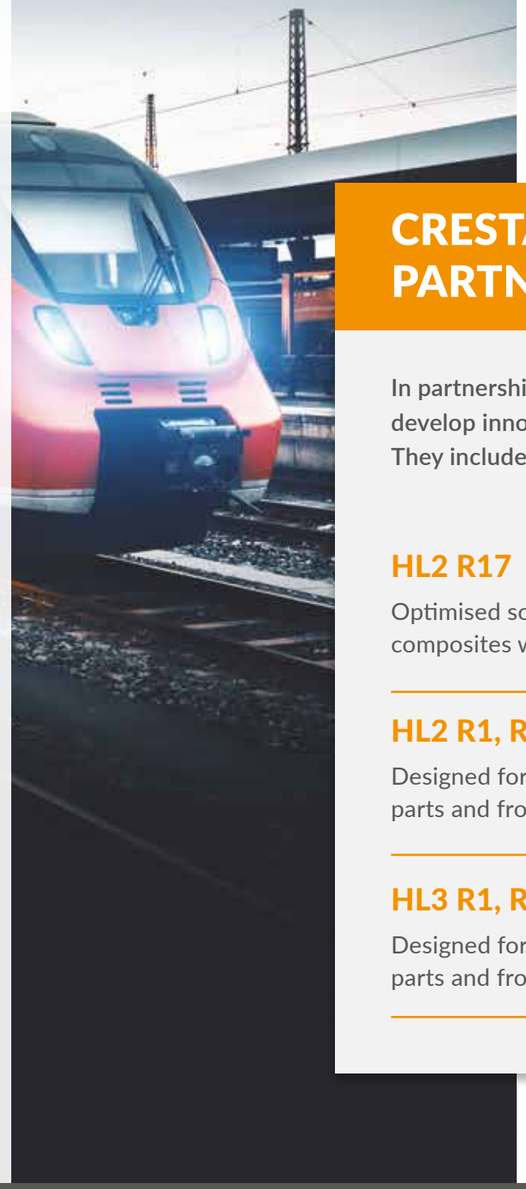
Scan for our rail page



SUSTAINABLE HIGH PERFORMANCE SYSTEMS

A range of high-performance fire, smoke and toxicity resistant systems for EN45545-2 AND NFPA130, with the added benefit of bio-based content.

- 100% bio-based resin
- Global technical support
- Achieves HL3
- Sustainable systems
- Lightweight structure
- Global availability

CRESTAFIRE LEO SYSTEMS IN PARTNERSHIP WITH SAERTEX

In partnership with Saertex we've combined our expertise to develop innovative composite systems called Crestafire LEO. They include various EN45545-2 systems:

HL2 R17

Optimised solution for infusion of structural composites with FST properties

Crestafire LEO GCS1001EPA (Post painted) + LEO Crestafire 1261 + SAERTEX LEO NCF (Glass & Carbon)

HL2 R1, R7 AND R17

Designed for EN45545-2 HL2 interior, exterior rail parts and front ends

Crestafire LEO GCS1001EPA (Post painted) + Crystic VE679-03PA + SAERTEX LEO NCF (Glass & Carbon)

HL3 R1, R7 AND R17

Designed for EN45545-2 HL3 interior, exterior rail parts and front ends

Crestafire LEO GCS1005EPA (Post painted) + LEO Crestafire P2-2001 + SAERTEX LEO NCF (Glass & Carbon)

APPLICATION OVERVIEW

R1

Toilet cabins and other inside parts (RTM/VI/HL)

R1

Window and door frames (RTM/HL)

R10

Interior flooring (RTM/VI)

R6

Interior seats (RTM/HL)

R8

Exterior roof (RTM/VI/HL)

R7

Exterior walls (RTM/VI)

R17

Front mask (HL/VI)

REQUIREMENT SET			R1			R6			R7			R8			R10			R17		
Test method	Parameter & unit	Maximum or minimum	HL1	HL2	HL3	HL1	HL2	HL3	HL1	HL2	HL3	HL1	HL2	HL3	HL1	HL2	HL3	HL1	HL2	HL3
T 02 ISO 5658-2	CFE kWm^2	Minimum	20	20	20				20	20	20							13	13	13
T 04 EN ISO 9239-1	CHF kWm^2	Minimum										4,5	6	8	4,5	6	8			
Irradiance of the following tests:			50 kWm^2			50 kWm^2			50 kWm^2			25 kWm^2			25 kWm^2			25 kWm^2		
T 03.01 ISO 5660-1	MARHE kWm^2	Maximum	-	90	60	90	90	60	-	90	60	-	50	50	-	-	-	-	90	60
T 10.01 EN ISO 5659-2	$D_5(4)$ dimensionless	Maximum	600	300	150	600	300	150	-	-	-	-	-	-	-	-	-	-	-	-
T 10.01 EN ISO 5659-2	D_5max. dimensionless	Maximum	-	-	-	-	-	-	-	600	300	-	600	300	600	300	150	-	600	300
T 10.01 EN ISO 5659-2	VOF_4 min	Maximum	1200	600	300	1200	600	300	-	-	-	-	-	-	-	-	-	-	-	-
T 10.01 EN ISO 5659-2	CIT_G dimensionless	Maximum	1,2	0.9	0.75	1,2	0,9	0.75	-	1,8	1,5	-	1,8	1,5	1,2	0.9	0.75	-	1,8	1,5

FST RAIL SYSTEMS AND CERTIFICATES

FIRE RETARDANT SYSTEMS	APPLICATION	ACHIEVE	PAINTED SOLUTION
Crestafire GCS 1001EPA + Crestafire P1-3001PA **LEO SYSTEM**	Spray, Hand Lay, RTM, Vacuum Infusion	EN45545-2 HL2 R1 / R7 / R17	✓
Crestafire GCS 1001EPA + Crystic VE679-03PA **LEO SYSTEM**	Spray, Vacuum Infusion	EN45545-2 HL2 / R17	✓
Crestafire GCS 1001EPA + Crestapol 1261 **LEO SYSTEM**	Vacuum Infusion	EN45545-2 HL2 R17	✓
Crestafire GCS 1005EPA + Crestafire P2-2001 **LEO SYSTEM**	Spray, Vacuum Infusion	EN45545-2 HL3 R1 / R7 / R17	✓
Crestafire GCS 1005EPA + Crestapol 1211A **LEO SYSTEM**	Spray, RTM, Vacuum Infusion	EN45545-2 HL3 R7	✓
Crestafire GCS 1005EPA + Crestapol 1212/ATH	Spray, Hand Lay, RTM, Vacuum Infusion	EN45545-2 HL3 R1 / R7 / R17	✓
Crestafire GCS 1005EPA + Crestapol 1213A	Spray, RTM, Vacuum Infusion	EN45545-2 HL3 R1 / R7 / R17	✓
Fireguard GC76PA + Crestafire GCS1001EPA + Crestafire P1-3001PA	Spray, Hand Lay, RTM, Vacuum Infusion	EN45545-2 HL2 R1 / R7 / R17	✗
Fireguard GC76PA / AG + Crestapol 1212/ATH	Spray, Hand Lay, RTM, Vacuum Infusion	EN45545-2 HL3 R1, R7, R17 / NFPA 130 ASTM E162 / ASTM E662	✗
Fireguard GC70PA / AG + Crestapol 1212/ATH	Spray, Hand Lay, RTM, Vacuum Infusion	NFPA 130 ASTM E162 / ASTM E662	✗
Crestapol 1212/ATH	Hand Lay, RTM, Vacuum Infusion, Pultrusion	NFPA 130 ASTM E162 / ASTM E662	✓

Crestafire®
FST Performance Products

PRODUCT	APPLICATION METHOD	PRODUCT DEFINITION	COLOUR
Gelcoat			
GCS1001EPA	Spray	Polyester based gelcoat, intumescent technology, formulated to EN45545-2 standard to meet HL2	Grey
GCS1005EPA	Spray	Polyester based gelcoat, intumescent technology, formulated to EN45545-2 standard to meet HL3	White
GC 70PA / AG	Spray	Polyester based gelcoat, standard fire-retardant technology for low smoke and surface spread of flames, colorable and with anti graffiti properties	Various
GC76PA FR / AG	Brush and Spray	Polyester based gelcoat, superior FST properties, colorable and with anti graffiti properties	Various
TCS1201PA	Brush and Spray	Polyester-based fire-retardant topcoat based on intumescent technology. Excellent fire, smoke and toxicity properties. Good weathering performance	Grey
Resin			
P1-3001PA	Closed Mould and Hand Lay	Polyester based, filled resin	White
P2-2001	Closed Mould	Vinyl ester and DCPD base, lightly filled resin	Light yellow
Bio P1-8001	Pultrusion	Bio sourced resin, capable of HL3, hot cure process	Dark brown
Bio P1-8003	Closed Mould	Bio sourced resin, capable of HL3, hot cure process	Dark brown
Crestapol 1211A	Closed Mould	Urethane acrylate technology, filled resin	-
Crestapol 1212	Closed Mould and Pultrusion	Urethane acrylate technology, to be filled with ATH	Clear
Crestapol 1212 Ready Fill	Hand Layup	Urethane acrylate technology, to be filled with ATH	-
Crestapol 1213A	Closed Mould	Urethane acrylate technology, highly filled with ATH	-
Crestapol 1261	Closed Mould	Urethane acrylate technology	-

STRUCTURAL ADHESIVES THAT MEET EN45545-2

Toughened, two component primerless MMA adhesives designed for bonding composites, thermoplastics and metals, perfectly suited to the rail industry.

Key information

CRESTABOND FEATURES	CUSTOMER BENEFITS
Primerless adhesives	Dramatically enhances production efficiency and reduces consumable costs
Minimal surface preparation	Reduces dust emissions and preparation time
Excellent fatigue and impact resistance	Confidence in the longevity of the finished product
Range of working and fixture times	Optimises production cycles to reduce manufacturing costs
Good gap filling capability	Adhesive can be used in multiple applications
Bonds dissimilar substrates	Provides flexibility in structural designs

Crestabond dispensing equipment

- The Crestabond cartridges can be used with a manual or pneumatic gun. Suitable dispense guns and static mixers are available from Scott Bader
- Crestabond adhesives can be dispensed directly from pails and drums using an automated 1:1 or 10:1 dispensing machine
- Scott Bader technical support can provide advice on appropriate dispensing equipment

Crestabond pack sizes

Cartridges

M1 (10:1) range
- 50ml side-by-side
- 400ml coaxial
- 825ml side-by-side

M7 and PP (1:1) Range
- 50ml side-by-side
- 400ml side-by-side

Bulk
- 20 Litre/ 18kg pails
- 200 Litre/ 180kg drums

CRESTABOND®
Primerless MMA Structural Adhesives

Crestabond adhesive selection guide

Choose the appropriate Crestabond adhesive product with optimal working and fixture times that will ensure long-term adhesion and durability.

PRODUCT	DESCRIPTION	COLOUR	MIX RATIO BY VOLUME	VISCOSITY (cP)	WORKING TIME (mins)	FIXTURE TIME (mins)*	TENSILE STRENGTH (MPa)	TENSILE MODULUS (MPa)	ELONGATION AT BREAK (%)	GAP FILL (mm)
M1-02	Universal bonder	Dark grey	10:1	100,000 - 140,000	1 - 2	2 - 3	12 - 16	600 - 1000	80 - 100	1 - 15
M1-04	Universal bonder	Dark grey	10:1	100,000 - 140,000	3 - 5	8 - 10	16 - 20	600 - 1000	80 - 100	1 - 15
M1-04 SL	Universal Bonder	Dark Grey	10:1	10,000 - 30,000	4 - 7	10 - 12	16 - 20	600 - 1000	80 - 100	1 - 5
M1-05 EN 45545-2 CERTIFIED	Universal bonder	Dark grey	10:1	100,000 - 140,000	4 - 7	12 - 18	16 - 20	600 - 1000	80 - 100	1 - 15
M1-10	Universal bonder	Dark grey	10:1	100,000 - 140,000	8 - 12	16 - 23	16 - 20	600 - 1000	80 - 100	1 - 15
M1-20 EN 45545-2 CERTIFIED	Universal bonder	Dark grey	10:1	100,000 - 140,000	16 - 22	25 - 35	16 - 20	600 - 1000	80 - 100	1 - 25
M1-30 EN 45545-2 CERTIFIED	Universal bonder	Dark grey	10:1	200,000 - 240,000	25 - 35	60 - 80	18 - 22	600 - 1000	100 - 130	1 - 50
M1-60HV	Universal bonder	Green	10:1	340,000 - 380,000	50 - 70	150 - 180	22 - 26	1200 - 1600	50 - 70	1 - 50
M1-90HV	Universal bonder	Green	10:1	340,000 - 380,000	80 - 100	210 - 220	22 - 26	1200 - 1600	50 - 70	1 - 50
M7-04	Universal bonder	Off white	1:1	30,000 - 70,000	3 - 5	12 - 15	22 - 25	1200 - 1700	6 - 10	1 - 5
M7-05 EN 45545-2 CERTIFIED	Universal bonder	Off white	1:1	30,000 - 70,000	4 - 7	18 - 22	22 - 25	1200 - 1700	25 - 30	1 - 5
M7-15 EN 45545-2 CERTIFIED	Universal bonder	Off white	1:1	30,000 - 70,000	10 - 20	30 - 45	22 - 25	1200 - 1700	25 - 30	1 - 5
PP-04	Low surface energy bonder	Off white	1:1	70,000 - 140,000	3 - 5	165 - 180	12 - 17	800 - 1200	2 - 5	0.5 - 5

Based on laboratory results

*Time taken at 23˚C to achieve 1.4MPA strength in lap shear tests according to BS ISO 4587

FST PERFORMANCE IN PULTRUSION

Crestapol® Urethane Acrylate Technology

Crestapol intelligent resin technology is a series of low viscosity urethane acrylate-based resins, designed for pultrusion.

Crestapol 1212 and 1214 are designed for pultrusion so they can be processed on standard pultrusion equipment without modification.

Features:

- Significantly enhanced line speed
- High reactivity
- Excellent mechanical performance
- Pigmentable
- EN45545-2 compliant

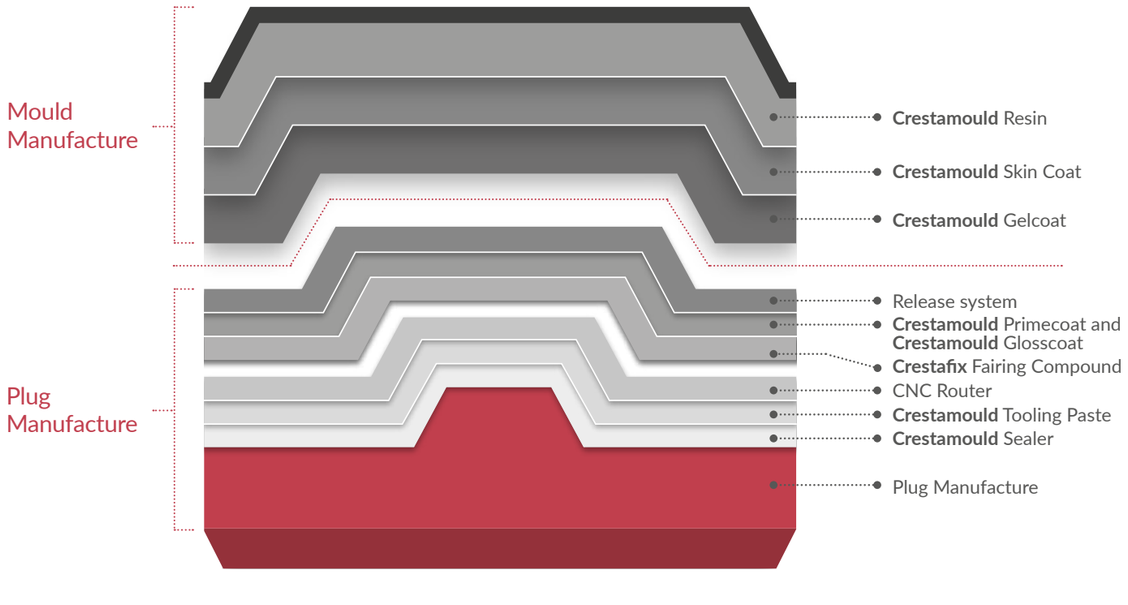
FIRE REQUIREMENT	MINIMUM ATH LOADING (parts per thousand)	CRESTAPOL 1212 RESULTS
French NFP 92-501	170	M1
French NFP 16-101	170	F0
UNE 23721 : 1990 UNE 23727 : 1990	170	M1
DIN 5510	100	S4/SR2/ST2
ASTM 162	100	Is = 10 (limit <35) Meets Federal Railroad Admin for surface flammability
ASTM 662	100	Ds (max) = 119 Dm (1.5) = 1 Dm (4) = 4
ASTM E84	165	Smoke index 110, Flame index 15
ISO 5658	170	HL2
ISO 5659-2	170	HL2
ISO 5660-1&2	170	HL2

PULTRUSION GUIDELINES TYPICAL FORMULATION	
Crestapol 1212 and 1214	100 pbw
ATH	100 - 200 pbw
BYK W996#	3 - 6 pbw
TBPB*	1 pbw
TBP**	0.5 pbw
(Dispersed in solvent)	1.0 pbw
PAT 654 (internal release agent)†	1 - 3 pbw
Pigment (if required)	2 - 5 pbw
Die temperature: (First section unheated to prevent gellation at die entrance)	140°
Start up approx	0.2 metre/minute

Registered trademark of BYK-Chemie GmbH
* Tert-Butyl peroxybenzoate
** Di (4-tert-butylcyclohexyl) peroxydicarbonate
† PAT 654 is produced by CRC Limited

CRESTAMOULD®
Matched Tooling Systems

Our **Crestamould** matched tooling systems offer a fast and effective way to produce moulds for the manufacture of rail components. Our low-profile laminating and infusion resins minimise shrinkage to improve the dimensional accuracy of moulds combined with gelcoat and skincoat products to deliver a high quality and robust mould surface.



MOULD MANUFACTURE

Crestamould Resin

Crestamould Rapid Tooling Resin (RTR) 4010PA is a rapid tooling resin which incorporates outstanding handling properties, lower viscosity, improved shrinkage control and is catalysed with standard MEKP catalyst. It enables faster mould making and eliminates surface distortion.

Crestamould Skin Coat

Crestamould Skin Coats VE679PA and VE690PA are pre-accelerated thixotropic DCPD modified vinylester resins that have been developed as a skin coat in tooling applications. They have excellent blister resistance and reduced print through.

Crestamould Gelcoat

Crestamould Gelcoat 15PA is a superior performance vinylester tooling gelcoat for making moulds designed to have a long service lifetime and retain high gloss levels after multiple pulls. It is easy to apply and achieves good coverage. There is no gassing of the gelcoat ensuring a very low porosity surface and it cures with a standard MEKP catalyst. Available in both spray and brush.

PLUG MANUFACTURE

Crystic Primecoat

Crystic Primecoat is a high build, polyester coating material which allows the rapid surfacing of patterns constructed from materials such as wood, MDF and GRP. It can be applied wet-on-wet up to a thickness of 1.5mm in one operation without sagging or draining from vertical surfaces.

Crystic Glosscoat

Crystic Glosscoat is a polyester coating designed to be applied over prepared Crestamould Primecoat to give a glossier and more durable surface. The material hardens rapidly and can be easily sanded to a smooth surface which can be polished to high gloss.

Crestafix Fairing Compound

A water resistant, low-density polyester-based fairing compound, Crestafix F26 has excellent adhesion to cured fibre-reinforced polyester and vinylester laminates. The material sands easily, gives a hard finish after a full cure, yet is not brittle and has good impact strength. Crestafix F26 is a suitable base for all marine finishes such as polyester, urethane and epoxy paints.

Crestamould Tooling Paste

Designed for milling of large plugs or direct limited production moulds with CNC multiple axis machines, Crestamould T29 is a modified polyester compound, available in sprayable or extrudable versions.

Crestamould Sealer

Laminating with polyester resin on top of polystyrene foams has never been possible despite various impractical methods of protection from preventing the styrene foam from dissolving when in contact with polyester resin. Crestamould B21 sealing resin solves this problem – just one coat applied by brush will seal the surface and laminating with polyester resins can begin two hours after application.

Find your local Scott Bader office

SCOTT BADER
*Making a **positive** difference*

INVESTORS IN PEOPLE®
We invest in people Gold

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