



3M™ Scotchcal™ Graphic Film Series VHR3650

Product Description

Part of the 3M Rail Graphic Plus range, 3M Scotchcal Graphic Marking Film Series VHR3650 is a durable, dimensionally stable, glossy vinyl film, intended for use on flat surfaces with and without rivets. Will withstand severe weather and handling conditions as well as occasional spills of petroleum products.

Key Features

- Suitable for screen printing and piezo ink jet printing
- Pigmented pressure sensitive adhesive on white film
- Resistant to occasional petrol spillage
- Up to 6 years warranty
- Custom Colour Matching
- Conformance to BS6853:1999 fire regulations
- Conformance to GM/RT 2120 Issue 2 (April 2004)

Applications and Uses

Film series VHR3650 is intended for making durable graphics for rail rolling stock. When used with the listed **Compatible Products** the graphics are covered by the Scotchprint® Graphic Rail Warranty.

Limitations of End Uses

Specifically, we do not warrant this film for the following:

- Application to corrugated surfaces or compound contours
- Graphics applied to stainless steel substrates
- Non rail rolling stock applications

Product Line

Please contact the 3M Sales Office for stock availability and lead times.

Product No.	Colour	Stock Availability
VHR3650B	White	Stock item
VHR3655B	Black	Non-stock item

Custom colour matching is available on this product. Refer to the 3M Commercial Graphics Price List for stock availability and lead times.

Compatible Products

- 3M™ Screen Printing Ink Series 1900 (line colour and 4-colour)
- 3M™ Screen Printing Ink Series 9700UV (line colour and 4-colour)
- 3M™ Piezo Ink Jet Ink Series 1500
- 3M™ Piezo Ink Jet Series 4600
- 3M™ Scotchcal™ Graffiti Resistant Film 639
- 3M™ Screen Print Clear Coats
- Selected 3M application tapes

Main Characteristics

Property	Description
Film Type	0.05 mm opaque vinyl
Adhesive type	Permanent pressure sensitive
Adhesive colour	3650 – grey pigmented 3655 – grey pigmented
Thickness (film plus adhesive)	0.08 to 0.10 mm
Liner	Premium Performance Liner 150g/m ²
Suitable application surface	Flat with and without rivets, simple curves.
Suitable application substrates	ABS resins, aluminum, chrome, glass fiberglass-reinforced plastic, paint (check adhesion to powder or water-base paints)
Minimum application temperature *	16°C

**For applications nearing the minimum temperature range, please contact your local technical service representative to confirm suitability of application*

Chemical and Physical Properties

Values given are typical and are not for use in specifications. If a custom specification is desired, a request should be submitted through your sales representative. The data given below is for unprinted film

Physical Properties

Property	Metric Units
Thickness (ISO 4593)	0.08 to 0.10 mm
Tensile Strength (ISO 1184-1983)	22 N/25mm min at 23°C
Elongation (ISO 1184-1983)	50% at 23°C
Dimensional Stability (FTM 14)	0.4mm
Temperature Range	-60°C to +107°C
Reverse impact Resistance at 23°C	No effect

Adhesion (FTM1)

Substrate	Metric Units (N/25mm)
Etched Aluminium	27
Anodised Aluminium	27
Chrome	22
Acrylic Enamel	18
ABS	18
Fruehauf Prepainted Panels	18

These adhesion values are 24 hours after application.

Note: ISO refers to standards of the International Standards Organisation. FTM (Fimat Test Methods) refers to test methods listed by Fimat, the Association of European Tape Manufacturers.

Flammability

3M™ Scotchcal™ Graphic Film Series VHR3650 conforms to:

- BS6853:1999 fire regulations, category II
- GM/RT 2120 Issue 2 (April 2004)

Warranty

Only a Scotchprint® Graphics Authorised Manufacturer can produce Scotchprint® Graphic Rail Warranted Graphics. The warranty period is based on field experience and exposure tests. When the graphics are processed and used according to the 3M recommendations, they should have the performance life shown in the table below. The actual performance depends on the:

- Correct combination of film and ink
- Ink formulation
- Drying methods
- Selection and preparation of the substrate
- Application methods
- Exposure conditions
- Cleaning methods

Warranted Durability for Rail Rolling Stock in the UK

The following tables show the warranties, in years, for exposure where the face of the graphic is vertical at $90^\circ \pm 10^\circ$.

Graphic Orientation



face of graphic

Vertical Exposure

Face of graphic is $\pm 10^\circ$ from vertical

Colour	Ink Series ⁽¹⁾	Protective Clears/Laminates ⁽²⁾	Exterior	Interior
VHR3650 White/Colours	Unprinted		6	6
	Unprinted	Scotchcal 639	6	6
VHR3650 White	Screen Printing			
	1900/9700 Line/Halftone	Scotchcal 639	6	6
	1900/9700 Line/Halftone	1920, 9720, 1955abc	6	6
VHR3650 White	Digital Printing			
	1500/4600	Scotchcal 639	6	6
	1500/4600	1920, 9720, 1955abc	6	6

⁽¹⁾ Metallic inks have a maximum warranty of 5 years.

⁽²⁾ A clear coat protective layer will provide less abrasion resistance than a laminate. Therefore some degradation of a printed image may occur if the graphics are subjected to abrasive washing conditions.

Refer to the 3M™ MCS™ Warranty Document for details.

Drying

Caution

Always build enough time into your process to ensure adequate drying of the graphic. Poorly dried film may become soft and stretchy, and the adhesive may become too aggressive. This can cause difficulty when applying an overlamine, rolling the graphic, and applying the film. See the ink's Instruction Bulletin for more details.

Fabrication

This bulletin does not contain detailed printing, processing or application procedures for the subject products. The appropriate Instruction Bulletin(s) may be obtained by contacting your 3M sales representative or 3M Technical Service.

Cutting

The following are common cutting methods for this film. See Instruction Bulletin 4.1 for details.

- Bandsawing
- Hot kiss cutting
- Drum-type electronic cutting
- Flat-bed electronic cutting
- Guillotine
- Hand cut
- Cold and hot steel-rule die cutting

The following minimum values for cutting text from film series VHR3650 are based on upper case Helvetica medium type. Weeding is much more difficult with smaller text.

Minimum stroke width:	6.35 mm
Minimum height:	76.20 mm
Minimum radius for end of stripe:	3.18 mm

Application Tapes

The type of application tape to use depends on the type of graphic produced and the ink or overprint clear that was applied last. See Instruction Bulletin 4.3 for details.

- Use a prespacing tape if the graphic has large amounts of the liner exposed.
- Use a premasking tape if very little of the liner is exposed.

Overprint Clear	Prespacing Tape	Premasking Tape
Unprinted	SCPS-100	SCPM-19
1920 1955abc	SCPS-100 SCPS-2	SCPS-100
9720UV	SCPS-44X	SCPM-44X

Application

Refer to the Instruction Bulletin 5.4 and 5.5 for application details.

The following application details are for film series VHR3650.

Temperature

The minimum application temperature for film series 3650 is 16°C* for flat and riveted surfaces.

* For applications nearing the minimum temperature range, please contact your local technical service representative to confirm suitability of application.

Positioning

This film has a pressure sensitive adhesive. Do not use detergent and water or a commercial application liquid to position the graphic onto rail rolling stock.

Finishing

If an application requires edge sealing, use edge sealer 3950.

Maintenance and Cleaning

Use a cleaner designed for high-quality painted surfaces. The cleaner must be wet, non-abrasive, without strong solvents, and have a pH value between 3 and 11 (neither strongly acidic nor strongly alkaline).

Removal

3M™ Scotchcal™ Graphic Film Series VHR3650 can be removed using procedures recommended in Instruction Bulletin 6.5.

Shelf Life

The shelf life of the film is 2 years and should be applied within 2 years of the receipt of film if unprocessed. Processed film should be applied within 1 year of processing and within 2 years of receipt of the film.

Glossary of Terms

Matched Component System or MCS™

The system pursuant to which Finished Graphics are produced by a Graphic Manufacturer using only 3M Products and components and manufactured in accordance with 3M's Product or Instruction Bulletins, 3M Specification Document and using 3M Approved Technologies.

Permanent Adhesive

Films with a permanent adhesive can be difficult to remove and will often require heat and/or chemicals for effective removal.

Related 3M Literature

Listed below is related 3M Technical Literature which may be of interest:

Product Bulletins	Bulletin No.
3M™ Piezo Ink Jet Ink Series 1500	1500
3M™ Piezo Ink Jet Ink Series 4600	4600
3M™ Screen Printing Ink Series 1900	1900
3M™ Screen Printing Ink Series 9700UV	9700
3M™ Overprint Clear & Edge Sealer 1955ABC	1955
3M™ Scotchcal™ High Gloss Overlamine 639	639
Instruction Bulletins	Bulletin No.
Design of graphics	2.1
Printing with piezo ink jet ink series 1500	4.45
Printing with piezo ink jet ink series 2300	4.45
3M™ Piezo Ink Jet Ink Series 4600	4.43
Screen printing with ink series 1900 Line	3.12
Screen printing with ink series 1900 4-colour	3.11
Screen printing with 3M™ Overprint Clear & Edge Sealer 1955ABC	3.12.2
Screen printing with ink series 9700 UV	3.4
Screen printing with ink series 9700 UV	3.13
Cold roll lamination	4.22
Scoring and cutting	4.1
Using 3M application tapes; premasking and prespacing for films	4.3
Application, substrate selection, preparation and substrate-specific application techniques for rail applications	5.1.1
Application, special applications and vehicles	5.4
Application, general procedures for interior and exterior dry applications	5.5
Storage, handling, maintenance, removal	6.5

Health & Safety

Refer to the package label and the Material Safety Data Sheet for health, safety, and handling information on the products referenced in this bulletin. For 3M products, if necessary, you may contact our Toxicology/Product Responsibility Department on 01344 858000.

Important Notice to Purchaser

The 3M products described in this publication are covered by a 3M warranty and limitation of liability.

3M's warranty provides that if 3M finds that goods are defective in material or workmanship they will be replaced or the price refunded at 3M's option but note that 3M does not accept liability for other direct losses (except for personal injury or death) or consequential losses relating to defective products or from information supplied by 3M.

Purchasers and users of 3M products, and not 3M supplying companies, are always solely responsible for deciding on the suitability of the 3M product for their required or intended use.

Technical Assistance

For help on specific questions relating to 3M Commercial Graphics Division Products, contact your local Technical Service Representative.

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