Scotch-Weld™
Urethane Adhesive
DP605 NS Off-White • DP640 Brown

Technical Data **May, 2010**

Product Description

3M™ Scotch-Weld™ Urethane Adhesives DP605 NS Off-White and DP640 Brown are two-part, non-sag urethane adhesives. They feature tough, flexible bonds with good adhesion to a wide variety of substrates, especially wood and many properly abraded and cleaned plastics. Good adhesion can also be obtained on etched aluminum as well as primed aluminum, steel and glass. For maximum bond durability under moisture conditions, priming of glass and metal substrates is required.

Available in bulk containers as 3M™ Scotch-Weld™ Urethane Adhesive 605 NS Off-White B/A or 3M™ Scotch-Weld™ Urethane Adhesive 3549 B/A.

Features

- Tough, flexible bonds
- Non-Sag/Thixotropic
- 1:1 Mix Ratio
- 5 or 40 minute worklife
- Bonds wood and many plastics
- Low halogen content (3M™ Scotch-Weld™ Urethane Adhesive DP605 NS)

Typical Uncured Physical Properties

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Product		**Scotch-Weld Urethane Adhesive DP605 NS Off-White**	**Scotch-Weld Urethane Adhesive DP640 Brown**
Color		Off-White	Brown
Base Resin		Polyol/Isocyanate	Polyol/Isocyanate
Mix Ratio (B:A)	**Volume** **Weight**	1:1 1:1.08	1:1 1:1.09
Net Weight Lbs./Gal.	**Base** **Accelerator**	8.8-9.2 9.7-10.2	10.1-10.5 11.1-11.5
Viscosity[1a] (Approx.) time to deliver 20 gms @ 20 psi thru a .104" orifice @ 75°F (24°C) seconds.	**Base** **Accelerator**	11-20 11-20	– –
Viscosity[1b] Brookfield RVF @ 10 rpm	**Base (#6 Spindle)**	–	10,000-40,000
cps @ 75°F (24°C)	**Accelerator (#5 Spindle)**	–	15,000-55,000

1a. Viscosity determined using 3M test method C-1019. Procedure involves pressure flowmeter, .104 orifice sample cup, pressure of 20 psi and temperature of 75°F ± 2°F (24°C ± -16°C).

1b. Viscosity determined using C-1D. Procedure involves using a RVF Brookfield viscometer with either a #6 or #5 spindle at 10 rpm.

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Typical Cured Thermal Properties

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Product	3M™ Scotch-Weld™ Urethane Adhesive DP605 NS Off-White	3M™ Scotch-Weld™ Urethane Adhesive DP640 Brown
Physical:		
Color	Off-White	Brown
Shore A Hardness (ASTM D 2240)	75-85	70-80
Time to Handling Strength[2]	15-20 min. @ 23°C (73°F)	6-8 hrs. @ 23°C (73°F)
Cure Time[3]	48 hours @ 23°C (73°F)	7 days @ 23°C (73°F)
Elongation[4]	100%	100%

Electrical:	Scotch-Weld Urethane Adhesive DP605 NS Off-White	Scotch-Weld Urethane Adhesive DP640 Brown
Dielectric Constant (ASTM D 150)	3.1 @ 1 KHz @ 23°C	5.9 @ 1 KHz @ 23°C
Dissipation Factor (ASTM D 150)	.021 @ 1 KHz @ 23°C	.12 @ 1 KHz @ 23°C
Dielectric Strength (ASTM D 149)	640 volts/mil	470 volts/mil
Volume Resistivity (ASTM D 257)	1.0 x 10^{14} ohm-cm	2.6 x 10^{12} ohm-cm

Thermal:	Scotch-Weld Urethane Adhesive DP605 NS Off-White	Scotch-Weld Urethane Adhesive DP640 Brown
Wt. loss by Thermal[5] Gravimetric Analysis	5% @ 300°C	–
Coefficient of Thermal[6] Expansion (in./in./°C)	121 x 10^{-6} below 41°C 219 x 10^{-6} above 41°C	– –
Thermal Conductivity[7] (btu-ft./sq. ft.-hr. °F)	0.101 @ 45°C	–
Glass Transition Temp[8]	41°C	–

2. Handling strength determined per 3M test method C-3179. Time to handling strength taken to be that time required to achieve 50 psi OLS strength using aluminum substrates.
3. The cure time is defined as that time required for the adhesive to achieve a minimum of 80% of the ultimate strength as measured by aluminum - aluminum OLS.
4. Elongation is determined using 3M test method C-3094/ASTM D 882.
5. Weight loss by TGA reported as that temperature at which 5% weight loss occurs by TGA in air at 5°C rise per minute per ASTM 1131-86.
6. TCE determined with TMA Analyzer using a heating rate of 50°F (10°C) per minute. Second heat values given.
7. Thermal conductivity determined using ASTM C177 and C-matic Instrument with 2" diameter samples.
8. Glass transition temperature (Tg) determined using DSC Analyzer with a heating rate of 68°F (20°C) per minute. Second heat values given.

Typical Cured Thermal Properties *(continued)*

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Solvent Resistance:[9] Results for 3M™ Scotch-Weld™ Urethane Adhesive DP605 NS Off-White only.
(Visual check after immersion in specified solvent at 23°C [73°F])

	1 Hour	1 Month
Acetone	A	B
Isopropyl Alcohol	A	A
Freon® TF	A	A
Freon® TMC	B	C
1,1,1-Trichloroethane	A	B
RMA Flux	A	A

Key: A-Unaffected; B-Sight Attack; C-Moderate/Severe Attack

9. Solvent resistance was determined using cured (24 hrs RT + 2 hrs 160°F [71°C]) samples (1/2" x 4" x 1/8" thickness) immersed in the test solvent for 1 hour and 1 month. After the allotted period of time the sample was removed and visually examined for surface attack as compared to the control.

Key: A - Unaffected - no change to color or surface texture.
B - Slight attack - noticeable swelling of surface.
C - Moderate/severe attack - extreme swelling of surface.

3M™ Scotch-Weld™ Urethane Adhesive DP605 NS can be considered “low halogen”. Low halogen is defined by the Electrotechnical Commission (IEC) 61249-2-21 standard as having less than 900 ppm chlorine, 900 ppm bromine, and less than 1500 ppm total chlorine and bromine.

3M™ Scotch-Weld™ Urethane Adhesive DP605 NS Test Results
Halogens (determined by ion chromatography)

Total Chlorine (ppm)	Total Bromine (ppm)	Total Halogens (ppm)
670	< 10	< 800

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Typical Adhesive Performance Characteristics

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

The following product performance data were obtained in the 3M laboratory under the conditions specified. The following data shows typical results obtained with 3M™ Scotch-Weld™ Urethane Adhesives DP605 NS Off-White and DP640 Brown when applied to properly prepared substrates, cured for 7 days at 73°F (23°C) under 2 psi cure pressure, and tested according to the test methods indicated.

Overlap Shear

Overlap shear bonds were tested on 1" wide test specimens with a 1/2" overlap of the adhesive bonded area. Substrates were bonded after surfaces were prepared according to the surface preparation section. They were cured for 1 week at 73°F (23°C) prior to testing. Tests were run according to Test Method ASTM D1002-72.

				OLS (psi)	
Substrate	Substrate Thickness (in.)	Bondline Thickness (in.)	Test Temperature (°F)	3M™ Scotch-Weld™ Urethane Adhesive DP605 NS Off-White	3M™ Scotch-Weld™ Urethane Adhesive DP640 Brown
CRS/CRS	.035	.005	73 (23°C)	1350	2000
CRS/CRS	.035	.005	180 (82°C)	140	300
Al/Al	.063	.005	73 (23°C)	1460	2000
EPDM/Wood	.250/.125	.005	73 (23°C)	100	
SBR/Wood	.250/.125	.005	73 (23°C)	100 + SF*	
PC/PC	.125	.005	73 (23°C)	640	1850*
PVC/PVC	.125	.005	73 (23°C)	550	950*
FRP/FRP	.125	.005	73 (23°C)	1180	1150*

CRS - cold rolled steel
Al - aluminum
EPDM - ethylene propylene diene monomer
SBR - styrene butadiene rubber
PC - polycarbonate
PVC - polyvinyl chloride
FRP - fiberglass reinforced plastic

*Substrate Failure

Bondline Thickness Study (Tested according to ASTM D 1002-72)

				OLS (psi)
Substrate	Substrate Thickness (in.)	Bondline Thickness (in.)	Test Temperature (°F)	3M™ Scotch-Weld™ Urethane Adhesive DP605 NS Off-White
CRS/CRS	.035	.005	73 (23°C)	1350
CRS/CRS	.035	.010	73 (23°C)	1150
CRS/CRS	.035	.015	73 (23°C)	1050
CRS/CRS	.035	.020	73 (23°C)	850

Typical Adhesive Performance Characteristics *(continued)*

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Peel Strength

Peel strength tests were run on 1" wide specimens that were aged for 1 week at 73°F (21°C). The 180° peel testing was run according to Test Method ASTM D1876-61T. Substrates were prepared according to the surface preparation section.

Substrate	Substrate Thickness (in.)	Bondline Thickness (in.)	Test Temperature (°F)	Peel Strength (piw) 3M™ Scotch-Weld™ Urethane Adhesive DP605 NS Off-White
CRS/CRS	.022	.005	73 (23°C)	13
	.022	.015	73 (23°C)	18
CRS/CRS	.035	.005	73 (23°C)	36
	.035	.015	73 (23°C)	47
Al/Al	.022	.005	73 (23°C)	17

3M™ EPX™ Pneumatic Applicator Delivery Rates

50 ml Applicator – Maximum Pressure 50 psi

Adhesive*	1/4 in. Nozzle gms/minute
3M™ Scotch-Weld™ Urethane Adhesive DP605 NS Off-White	68.5
3M™ Scotch-Weld™ Urethane Adhesive DP640 Brown	44.7

*Tests were run at a temperature of 70°F ± 2°F (21°C ± 1°C) and at maximum applicator pressure.

Handling/Curing Information

Directions for Use

1. For optimum strength structural bonds, paint, oxide films, oils, dust, mold release agents and all other surface contaminants must be completely removed. However, the amount of surface preparation directly depends on the required bond strength and the environmental aging resistance desired by the user. For suggested surface preparations on common substrates, see the section on surface preparation.
2. These products consist of two parts.

   Mixing:

   For Duo-Pak Cartridges - 50 ml

   Remove the Scotch-Weld urethane adhesive DP605 NS Off-White or DP640 Brown duo-pak cartridge from its foil package and place it into the 3M™ EPX Applicator. Remove the cap and dispense a small amount of adhesive to equalize piston displacement and to assure that no material is blocking either the base or accelerator ports. Attach the mixing nozzle to the duo-pak cartridge and apply the adhesive to clean surfaces. To store a partially used duo-pak cartridge leave mixing nozzle in place and replace after storage. **Note:** Scotch-Weld urethane adhesive DP605 NS Off-White is sensitive to moisture. For best results, use the entire contents of the cartridge within a few weeks after removing the cartridge from the sealed foil pack. If extended storage is necessary, the duo-pak cartridge should be stored in a sealed plastic bag. For hand mixing, expel the desired amount of adhesives and mix thoroughly (10-15 seconds after uniform color is obtained).

Handling/Curing Information *(continued)*

For Duo-Pak Cartridges - 200/400 ml

Directions for Use: While holding cartridge in an upright position, remove insert from duo-pak cartridge by unscrewing plastic nut. Detach metal removal disc from insert to free plastic nut nozzle attachment. Clear orifices if necessary. Attach mixing nozzle and secure with plastic nut. Place cartridge into 3M™ EPX Applicator. Discard a small quantity of dispensed adhesive to assure both components are dispensing equally. Apply adhesive to clean surfaces, join parts, secure until set up (15 minutes @ 75°F (24°C) for 3M™ Scotch-Weld™ Urethane Adhesive DP605 NS Off-White, 6-8 hours for 3M™ Scotch-Weld™ Urethane Adhesive DP640 Brown @ 75°F (24°C). Leave nozzle attached to store. Replace nozzle after storage.

For Bulk Containers

Mix thoroughly by weight or volume in the ratios specified in the typical uncured properties section. Resulting color should be uniform. After opening, containers of adhesive should be used completely. If storage of partially used containers is necessary, flush each container with dry nitrogen just before sealing the containers.

4. Application to the substrates should be made within 5 minutes for Scotch-Weld urethane adhesive DP605 NS Off-White or 40 minutes for Scotch-Weld urethane adhesive DP640 Brown. Larger quantities and/or higher temperatures will reduce this working time.
5. Join the adhesive coated surfaces and allow to cure at 60°F (16°C) or above until firm. Heat up to 200°F (93°C) will speed curing.
6. Scotch-Weld urethane adhesive DP605 NS Off-White will fully cure in 48 hours @ 75°F (24°C). Scotch-Weld urethane adhesive DP640 Brown will fully cure in 7 days 75°F (24°C).
7. Keep parts from moving during cure. Contact pressure is necessary. Maximum shear strength is obtained with a 3-5 mil bond line.
8. Excess uncured adhesive can be cleaned up with ketone type solvents.*

***Note:** When using solvents, extinguish all ignition sources, including pilot lights, and follow the manufacturer's precautions and directions for use.

Adhesive coverage (typical): A 0.005 in. thick bondline will yield a coverage of 320 sq. ft./gallon.

Application Equipment Suggestions

For small or intermittent applications, the 3M EPX applicator is a convenient method of application.

For larger applications, these products may be applied by use of flow equipment.

Two-part mixing/proportioning/dispensing equipment is available for intermittent or production line use. These systems may be desirable because of their variable shot size and flow rate characteristics and are adaptable to many applications.

Surface Preparation

For optimum strength structural bonds, paint, oxide films, oils, dust, mold release agents and all other surface contaminants must be completely removed. However, the amount of surface preparation directly depends on the required bond strength and the environmental aging resistance desired by the user.

The following cleaning methods are suggested for common surfaces:

Steel:

1. Wipe free of dust with oil-free solvent such as acetone or isopropyl alcohol.*
2. Sandblast or abrade using clean fine grit abrasives (150 grit or finer).
3. Wipe again with solvent to remove loose particles.
4. If a primer is used, it should be applied within 4 hours after surface preparation.

Aluminum:

1. Alkaline Degrease: Oakite 164 solution (9-10 oz./gallon water) at 190°F ± 10°F (88°C ± -23°C) for 10-20 minutes. Rinse immediately in large quantities of cold running water.
2. Acid Etch: Place panels in the following solution for 10 minutes at 150°F ± 5°F (66°C ± -20°C).

Sodium Dichromate	4.1 - 4.9 oz./gallon
Sulfuric Acid, 66°Be	38.5 - 41.5 oz./gallon
2024-T3 aluminum (dissolved)	0.2 oz./gallon minimum
Tap Water as needed to balance	

3. Rinse: Rinse panels in clear running tap water.
4. Dry: Air dry 15 minutes; force dry 10 minutes at 150 ± 10°F (66°C ± -20°C).
5. If primer is to be used, it should be applied within 4 hours after surface preparation.

Plastics/Rubber:

1. Wipe with isopropyl alcohol.*
2. Abrade using fine grit abrasives (150 grit or finer).*
3. Wipe with isopropyl alcohol.*

Glass:

1. Solvent wipe surface using acetone or MEK.*
2. Apply a thin coating (0.0001 in. or less) of 3M™ Scotch-Weld™ Metal Primer EC3901 to the glass surfaces to be bonded and allow the primer to dry 60 minutes at room temperature before bonding.

***Note:** When using solvents, extinguish all ignition sources, including pilot lights, and follow the manufacturer's precautions and directions for use.

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Storage

Store products at 60-80°F (16-27°C) for maximum storage life. Rotate stock on a "first-in first-out" basis.

Shelf Life

When stored in the original, unopened container at the storage conditions suggested, these products have a shelf life of 12 months from date of shipment.

Precautionary Information

Refer to Product Label and Material Safety Data Sheet for health and safety information before using this product. For additional health and safety information, call 1-800-364-3577 or (651) 737-6501.

Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

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ISO 9001:2000

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001:2000 standards.

3M

Industrial Adhesives and Tapes Division
3M Center, Building 225-3S-06
St. Paul, MN 55144-1000
800-362-3550 • 877-369-2923 (Fax)
www.3M.com/industrial

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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург, Промышленная ул, дом № 19, литера Н, помещение 100-Н Офис 331