Dual Lock™ Reclosable Fasteners

SJ3697FR (Type 170)
SJ3698FR (Type 250)
SJ3699FR (Type 400)
Flame Resistant

Product Information **October, 2012**

Product Description

3M™ Dual Lock™ Reclosable Fasteners SJ3697/98/99FR are flame resistant fasteners designed to meet many of the flammability requirements of the aerospace, rail, marine and specialty vehicle markets. These fasteners consist of a continuous polyolefin film backing with mushroom shaped stems protruding up from the backing and when pressed together, these mushroom shaped stems interlock to provide a strong reliable attachment. There are three different stem densities offered, type 170, type 250 and type 400 which refer to the approximate number of stems per square inch. The higher the number of stems, the stronger the closure strength.

3M™ Dual Lock™ Reclosable Fasteners can be mated in the following combinations of increasing closure strength: type 170 to type 250, type 250 to type 250, type 170 to type 400 and type 250 to type 400.

Product Construction

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

Product Number	**SJ3697FR**	**SJ3698FR**	**SJ3699FR**
Type: Approx. Stems/in² (Stems/cm²)	170 (26)	250 (39)	400 (62)
Material of Construction **Fastener** **Adhesive**	Black Polyolefin Clear Acrylic Foam Tape		
Thickness without liner **Unmated ± 10%** **Engaged ± 10%** **Liner**	0.125 inch (3.2 mm) 0.175 inch (4.4 mm) Clear 3 mil (0.08 mm) silicone treated polyolefin liner printed with 3M Dual Lock™ in red.		
Weight: grams/in² **Unmated, without liner**	0.81	0.88	0.98
Shelf Life	24 months from date of manufacture when stored at 72°F (22°C) with 50% RH.		

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System Performance **Note: The following technical information and data is intended as a guideline to assist customers for further evaluation. This technical information should be considered "typical" and the values are not product release specifications or standards.**

3M™ Dual Lock™ Reclosable Fastener Combination:	**SJ3697FR/SJ3698FR** Type 170 / 250	**SJ3697FR/SJ3699FR** Type 170 / 400	**SJ3698FR/SJ3698FR** Type 250 / 250	**SJ3698FR/SJ3699FR** Type 250 / 400
INITIAL TENSILE (Rigid to Rigid Substrates)	**Pounds/in² (Newtons/cm²)**			
Dynamic Tensile Engagement Force	15 (10)	30 (21)	30 (21)	50 (34)
Dynamic Tensile Disengagement Force	30 (21)	55 (38)	60 (41)	110 (76)
Static Tensile Holding Power	**Holds minimum 1000 grams/in² for indicated time and temperature**			
72°F (22°C)	10,000 minutes	10,000 minutes	10,000 minutes	10,000 minutes
100°F (38°C)/100% RH	10,000 minutes	10,000 minutes	10,000 minutes	10,000 minutes
220°F (104°C)	10,000 minutes	10,000 minutes	10,000 minutes	10,000 minutes
INITIAL SHEAR (Rigid to Rigid Substrates)	**Pounds/in² (Newtons/cm²)**			
Dynamic Shear (1" x 1" overlap)	15	35	25	110
Static Shear Holding Power	**Holds minimum 750 grams/in² for indicated time and temperature**			
72°F (22°C)	10,000 minutes	10,000 minutes	10,000 minutes	10,000 minutes
100°F (38°C)/100% RH	10,000 minutes	10,000 minutes	10,000 minutes	10,000 minutes
220°F (104°C)	10,000 minutes	10,000 minutes	10,000 minutes	10,000 minutes
PEEL AND CLEAVAGE	**Pounds/inch width**			
Cleavage Strength (Rigid to Rigid) 2.25" long	7	15	20	35
Peel Strength ("T" Peel, Flexible to Flexible)	0.5	1.0	1.0	1.5
Peel Strength (90° Peel, Flexible to Rigid)	1.5	2.5	3.5	4.0

Note: Unless noted otherwise, rigid panels were either stainless steel or aluminum and 3M™ Dual Lock™ was allowed to dwell on panel for 72 hours at 72°F (22°C) and 50% ± 10% relative humidity prior to testing.

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Typical Adhesive Performance

90 degree peel adhesion run at 12 inches per minute

4.5 lb rolled twice

Pounds per inch width	Stainless Steel	Aluminum	ABS
Initial (15 minutes)	9	4	8
72 hour dwell at 72°F (22°C)	11	9	10
72 hour dwell at 158°F (70°C)	13	13	10

Typical values, not specifications.

Note: Unless noted otherwise, the typical system performance and product properties were obtained using specific test methods under controlled laboratory conditions of 72°F ± 5°F and 50% ± 10% relative humidity. The user is responsible for evaluating 3M™ Dual Lock™ Reclosable Fasteners under expected use conditions to ensure suitable performance for the intended application.

Flammability Performance

***In all flammability tests, SJ3698FR was tested unmated and was directly exposed to the flame (unless noted otherwise).**

FAR 25.853 Appendix F, Part I (a) (ii) 12 Second Vertical Burn

	Spec. Max	SJ3698FR (Free Standing)	SJ3698FR (on 1/2" thick FR Honeycomb Panel)
Burn Length	8 Inches	0.6 Inch	0.9 Inch
Extinguish Time	15 Seconds	0 Second	0 Second
Drip Extinguish Time	5 Seconds	0 Second	0 Second

FAR 25.853 Appendix F, Part I (a) (i) 60 Second Vertical Burn

	Spec. Max	SJ3698FR (Free Standing)
Burn Length	6 Inches	2.5 Inches
Extinguish Time	15 Seconds	0 Second
Drip Extinguish Time	3 Seconds	0 Second

FAR 25.853 Appendix F, Part V FAA Smoke Density (Flaming Mode)

Avg. Ds @ 1.5 minutes	Avg. Ds @ 4.0 minutes	Avg. Ds Max	Avg. Ds Max Time (Minutes)
106	141	141	3.55

Flammability Performance *(continued)*

ASTM E 162 – Surface Flammability of Materials Using a Radiant Heat Energy Source

Specified Max Flame Spread Index (Is)	Avg. Flame Spread Index (Is)	Observations
35	15	- Flame front progression to a maximum distance of 9 inches - No flaming running or flaming dripping observed (No flaming running or flaming dripping permitted)

ASTM E 662 – Specific Optical Density of Smoke Generated by Solid Materials (Flaming Mode, Test Duration = 20 minutes)

	Specified Max	Avg. Specific Optical Density
Specific Optical Density @ 1.5 minutes	100	31
Specific Optical Density @ 4.0 minutes	200	85
Maximum Corrected Optical Density	–	205

ASTM E 662 – Specific Optical Density of Smoke Generated by Solid Materials (Non-Flaming Mode, Test Duration = 20 minutes)

	Specified Max	Avg. Specific Optical Density
Specific Optical Density @ 1.5 minutes	100	2
Specific Optical Density @ 4.0 minutes	200	43
Maximum Corrected Optical Density	–	197

Bombardier SMP 800-C (Rev. 6 2009-08-31) – Toxic Gas Generation from Material Combustion

Gas	Flaming Mode	Non-Flaming Mode	Specified Max
Carbon Monoxide (CO ppm)			
@ 1.5 minutes	20	<10	–
@ 4.0 minutes	348	<10	–
@ maximum	1198	185	3500
Carbon Dioxide (CO_2 ppm)			
@ 1.5 minutes	200	50	–
@ 4.0 minutes	3400	50	–
@ maximum	19650	650	90000
Nitrogen Oxides (NO_2 ppm)	2	<1	100
Sulfur Dioxide (SO_2 ppm)	<1	<1	100
Hydrogen Chloride (HCl ppm)	<2	11	500
Hydrogen Fluoride (HF ppm)	<2	<2	100
Hydrogen Bromide (HBr ppm)	<1	1	100
Hydrogen Cyanide (HCN ppm)	<1	<1	100

Flammability Performance *(continued)*

Boeing BSS 7239 (Rev. A 1-18-88) – Toxic Gas Generation

Gas	Flaming Mode	Non-Flaming Mode	M-7 Technical Specified Max
Carbon Monoxide (CO ppm)			
@ 1.5 minutes	13	<10	–
@ 4.0 minutes	345	<10	–
@ maximum	1095	203	3500
Nitrogen Oxides (NO_2 ppm)	<1	<1	100
Sulfur Dioxide (SO_2 ppm)	<6	<6	100
Hydrogen Chloride (HCl ppm)	<12	<12	500
Hydrogen Fluoride (HF ppm)	<12	<12	200
Hydrogen Bromide (HBr ppm)	<3	<3	–
Hydrogen Cyanide (HCN ppm)	<1	<1	150

ASTM E 1354 – Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter

	Average
Total Mass Loss (kg/m^2)	2.39
Peak Specific Mass Loss Rate ($g/s*m^2$)	24.93
Mass Loss Rate ($g/s*m^2$)	5.02
Time to Ignition (sec)	16
Time to Flame-out (sec)	861
Time of Peak Rate of Heat Release (sec)	78
Peak Rate of Heat Release (kW/m^2)	289.6
Rate of Heat Release (kW/m^2)	64.0
Total Heat Released (MJ/m^2)	53.11
Effective Heat of Combustion (MJ/kg)	19.72
Effective Heat of Combustion (BTU/lb)	8491
Caloric Content (MJ/kg)	4.93
Caloric Content (BTU/lb)	2122
Peak Extinction Area (m^2/kg)	3057.2
Extinction Area (m^2/kg)	343.4

NF F 16-101 (I & F Ratings) & EN 45545-2 Testing (R23 requirement)

BS EN 60695-2-11: 2001: Glow-Wire Flammability Test for End-Products

	850°C	960°C
Duration of Glow Wire Application (sec)	30	30
Avg. Time to Ignition (sec)	N/A	2
Avg. Time to Extinguishment (sec)	N/A	20
Avg. Duration of Flaming After Removal of the Glow-Wire (sec)	N/A	0
Avg. Duration of Flaming (sec)	N/A	18
Avg. Max Height of Flaming (mm)	N/A	23
Ignition of Tissue Paper	No	No

Ignition did not occur at a temperature of 850°C.
Ignition did occur at a temperature of 960°C.

Flammability Performance *(continued)*

BS EN ISO 4589-2: 1999: Plastics - Determination of Burning Behavior by Oxygen Index (Specimen Form III)

- Average Oxygen Index = 23.9%

NF X 10-702: Determination of the Opacity of Smoke in a Non-Renewed Atmosphere (Flaming Mode, 25 kW/m^2 in the presence of a pilot flame)

	Average
Smoke Value within first 4 minutes (VOS_4)	475.3
Maximum Specific Optical Density (Dmax)	220

EN ISO 5659-2: 2006: Plastics – Smoke Generation. Part 2 Determination of Optical Density by a Single Chamber Method (Flaming Mode, 25 kW/m^2 in the presence of a pilot flame)

The average maximum specific optical density (Ds(max)) obtained during the 20 minute test was 518.

NF X 70-100-1 & -2: 2006: Analysis of Gaseous Effluents (600°C)

Gases	Concentration (mg/g)	NF F 16-101 ref. values, cc_i (mg/m^3)	BS 6853 ref. values, FX (mg/g)	CEN TS 45545-2 ref. values, Ci (mg/m^3)	CIT per 100 gram	R value (BS 6853 Annex B.1)	CIT_{NLP} (CEN TS 45545-2 Annex C)
Carbon Monoxide	120.60	1750	280	1380	6.89	0.43	0.09
Carbon Dioxide	625.37	90000	14000	72000	0.69	0.04	0.01
Hydrogen Chloride	0.78	150	15	75	0.52	0.05	0.01
Hydrogen Bromide	5.31	170	20	99	3.12	0.27	0.05
Hydrogen Cyanide	ND	55	11	55	N/A	0.00	0.00
Hydrogen Fluoride	ND	17	4.9	25	N/A	0.00	0.00
Sulphur Dioxide	0.12	260	53	262	0.05	0.00	0.00
Nitrous Oxides	N/A	N/A	7.6	38	N/A	0.03	0.01

C.I.T. (Conventional Index of Toxicity) = 11.28

R (Weighted Summation of Toxicity) = 0.83

$C.I.T._{NLP}$ = 0.17

ND - non-detected

N/A - not applicable

Taking all of these tests into account, 3M™ Dual Lock™ SJ3698FR achieves an I4, F2 rating when tested directly exposed to the flame. The calculated Smoke Index (S.I.) is 24.

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Design Considerations

The following information is intended to assist the designer who is considering the use of 3M™ Dual Lock™ Reclosable Fasteners with pressure sensitive adhesive. Product performance depends upon a number of factors, including the Dual Lock fastener selected, the conditions in which the Dual Lock fastener is applied and the time and environment in which it is expected to perform. Because many of these factors are uniquely within the user's knowledge and control, it is required that the user evaluates 3M products to determine whether it is fit for a particular purpose and suitable for the users substrates, method of application and desired end use. It is suggested that four square inches of Dual Lock fastener per 1 pound of static load be used as a starting point when determining how much Dual Lock fastener to use on any particular application. The amounts may be adjusted up or down depending on the needs of the specific applications.

Surface Preparation

The amount and type of surface preparation required will depend upon the surfaces to which 3M™ Dual Lock™ Reclosable Fasteners SJ3697FR, SJ3698FR and SJ3699FR are attached and expected product use exposure conditions. SJ3697/98/99FR utilize a clear acrylic adhesive which will bond to a variety of high surface and medium surface energy plastics and metals. The acrylic adhesive is well suited for high temperature and/or high humidity applications. Product performance will depend on actual conditions within any specific application; it is essential that the user evaluate the 3M product to determine whether it is fit for a particular material purpose and suitable for the user's method of application.

Resistance to Chemicals

The polyolefin backing stems and mushroom top should resist attack by most common solvents and alkaline solutions. The adhesive on Dual Lock fasteners SJ3697FR, SJ3698FR and SJ3699FR may be affected by some common laboratory solvents and transportation fluids (gasoline, motor oil,etc.). Tests should be conducted by the user to evaluate the solvents and exposure time expected for the actual application.

Resistance to Environmental Exposure

Temperatures between -20°F (-29°C) and 180°F (82°C) should have minimal affect on closure strength. To maintain performance when exposed for extended periods to sunlight or ultraviolet radiation these products should be placed between two opaque or UV resistant surfaces. Specific testing under the expected environmental conditions is recommended.

Resistance to Water or Humidity

Closure strength should not be affected by prolonged exposure to water or humidity. Once bonded to the substrate, the adhesive has high resistance to moisture under typical use conditions. Exposure to elevated heat and chlorine or bromine may compromise the adhesive performance to the Dual Lock fasteners.

Washing and Dry Cleaning

The adhesive present on these Dual Lock fastener products typically make them unsuitable to washing or dry cleaning processes. The adhesive may soften during the cleaning process, potentially leaving adhesive residues on other material. The mushroom topped stems may also be easily entangled with loop or fabric present, potentially damaging these materials when they are separated.

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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.

Product Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

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ISO 9001:2000 - ISO/TS 16949:2002

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