GRISWOLD
ADVANCING PERFORMANCE

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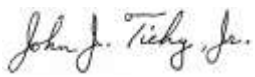
Customer:	General Motors
Specification No:	GMW 14196 (May 2016)
Product Description & Uses:	High density, cellular, polyurethane with low compression set For gaskets in vibration damping, vibration and shock isolation

GM Grade: Type 4/Type 5 **Product: U7Y20XXX0426**

Property	Test Method	Units	Specification	Result
Mass	GMW 3182	g/m^2	Per Engineering Drawing	1015
Thickness	ISO 2589	mm	Per Engineering Drawing	3.28
Odor	GMW 3205	rating	6 min.	10 wet, 9.5 dry
Flammability (as rec'd) (machine direction)	FMVSS 302	mm/min	102 max.	14, 20, 22, 17, 19
	GMW 3232	mm/min	100 max.	Bstat – 28 (conforming) Bmax – 22 (conforming)
Flammability (as rec'd) (cross-machine direction)	FMVSS 302	mm/min	102 max.	19, 30, 32, 24, 17
	GMW 3232	mm/min	100 max.	Bstat – 45 (conforming) Bmax – 32 (conforming)
Flammability (cycle aged) (machine direction)	FMVSS 302	mm/min	102 max.	41, 39, 17, 16, 36
	GMW 3232	mm/min	100 max.	Bstat – 67 (conforming) Bmax – 41 (conforming)
Flammability (cycle aged) (cross-machine direction)	FMVSS 302	mm/min	102 max.	21, 36, 38, 35, 33
	GMW 3232	mm/min	100 max.	Bstat – 53 (conforming) Bmax – 38 (conforming)
Fogging	GMW 3235	visual inspect	No oily film, droplets or crystals and ≤2 mg condensate	0.3 mg Dry uniform fog conforming
Compression Set - 50%	ISO 1856 Method A	%	10% max.	1.6
CFD at 40% Compression	ISO 3386-1	kPa	100 – 175 Type 4 175 – 450 Type 5	214
Emission Report	GMW 15634			Attached

Results compiled from testing performed by Intertek, Report No. 102970798GRR-001 Dated May 4, 2017

GRISWOLD LLC



John J. Tichy, Jr.
Technical Director

NOTE: Information of a technical nature is based on laboratory tests which either GRISWOLD LLC conducts or sends to an independent laboratory for testing for determination of uses as requested in writing by customer. GRISWOLD LLC believes these to be reliable. However, GRISWOLD LLC has no control over the application of the material to, or part of, the final **product** and **therefore**, GRISWOLD LLC makes **no express or implied warranty of result, fitness or merchantability.** The customer should determine reliability for the end use or particular application.

Test Report for:

Griswold LLC

GMW15634 (November 2014)
GMW15635 (August 2012)

Emissions Testing:

VOC/SVOC Analysis
Carbonyl Analysis

Materials:

Microcellular Polyurethane Foam Rolls

Part Numbers:

U7E211250426201
U7E171250426204
U7H200930427201
U7H151250427204
U7S151250426201
U7Y201250426201

KYLE TANIS
Project Engineer

TAYLOR GEBBEN
Reviewer

DESCRIPTION OF SAMPLES:

Product Name	Microcellular Polyurethane Foam
Product Category	Automotive Interior
Product Numbers	U7E211250426201 U7E171250426204 U7H200930427201 U7H151250427204 U7S151250426201 U7Y201250426201
Date of Manufacture	Not Specified
Date of Shipment	03/09/17
Date Received by Lab	03/13/17
Dates Tested	03/15/17 - 03/18/17
As Received Sample Condition	Good condition
Sample Condition	Production
Material Specification	GMW14196 (2016)
Lab Sample ID	GRR1703131303-006
Samples Submitted	(6x) Polyurethane foam rolls

WORK REQUESTED / APPLICABLE DOCUMENTS:

VOC/SVOC Analysis:	GMW15634 (November 2014)
Carbonyl Analysis:	GMW15635 (August 2012)

CONCLUSIONS:

VOC/SVOC Analysis:	Results Reported
Carbonyl Analysis:	Conforming

VOC / SVOC ANALYSIS

Description of Samples:

Product Name	Microcellular Polyurethane Foam
Product Category	Automotive Interior
Product Number	U7E211250426201, U7E171250426204, U7H200930427201, U7H151250427204, U7S151250426201, U7Y201250426201
Date of Manufacture	Not Specified
Date of Shipment	03/09/17
Date Received by Lab	03/13/17
As Received Sample Condition	Good condition
Sample Condition	Production
Material Specification	GMW14196 (2016)

Test Conditions:

Dates Test Performed	03/15/17 – 03/18/17
Test Method	GMW15634 (November 2014)
Sample Conditioning	24 hour preconditioning followed by 16+ hours uncovered at 23°C / 50%RH
Sample Size	15 ± 2 mg
Desorption Temperature	VOC – 90°C and SVOC – 120°C
Desorption Time	VOC – 30 minutes and SVOC – 60 minutes
Constant Flow Rate	42 mL/min
Number of Samples	Two (2) samples per material; twelve (12) total
Acceptance Criteria	Referencing GMW16853 (July 2013), Table 4, F7: Results Reported Referencing GMW3059 Appendix C (October 2015), Supplement CG4110 (October 2015) Individual VOC - See Appendix B of this report

Facilities and Equipment:

Instrumentation Used:	Markes TD-100 Thermal Desorption Agilent 7890A GC Agilent 5975C MS
Column Used:	Agilent HP-Ultra 2 (GC)

Test Summary:

The emissions testing were performed according to GMW15634, "*Determination of Volatile and Semi-Volatile Organic Compounds from Vehicle Interior Materials*". After conditioning, samples were prepared to the specifications outlined by Appendix C in the test method and placed in a glass thermal desorption tube. Samples were then subjected to thermal desorption as outlined in the test method and VOC/SVOC emissions were trapped on a sorbent cold trap held at -30°C. These emissions were separated and characterized using gas chromatography with mass selective detection. Total and individual emissions were calculated as equivalent to toluene and n-hexadecane standard calibrations that were run concurrently with the samples. Substance determinations are made using a library match of >90% to the mass fragmentation pattern observed. The prefixed "?" with substance names is included following Appendix E, Table E1 of GMW15634 since a confirmation by retention time was not obtained as these compounds were not included in the calibration mix defined in GMW15634. All single substances measuring in excess of 1.0 ppm (based on calibration compound equivalency) were identified.

Client / Sample Information			
Test Lab:	Intertek - GRR	Technician:	Kyle Tanis
Client Name:	Griswold LLC	Signature:	
Sample ID:	**U7Y201250426201**	Date of Analysis:	03/24/17
Date of Manufacture:	Not Specified		
Date of Sampling:	Not Specified		
Overall Weight in Vehicle (g):	Not Specified		
Overall Dimensions of Part (mm):	Not Specified		
	Sample 1	*Sample 2*	
Dimensions (mm):	6.2 x 3.3 x 2.4	6.5 x 3.2 x 2.5	
Mass (g):	0.01527	0.01586	

Total VOC / SVOC Emissions Results				
	Limits (µg/g)	Calculated Results (µg/g)		Disposition
VOC	Report Values	Sample 1:	**535.2**	N/A
		Sample 2:	**491.7**	N/A
SVOC	Report Values	Sample 2:	**162.0**	N/A

Individual VOC Emissions Results (as toluene equivalent)				
Retention Time (min)	Substance Name (with Observed Mass Fragmentation)	CAS No.	Substance Area	Concentration (ppm)
9.659	? Acetylacetone 100 85 72 **43** 41	123-54-6	133748	12.30
19.511	? Unknown compound 102 87 57 **43** 39	-	175686	16.16
21.657	? Unknown compound **69** 68 54 41 39	-	86454	7.95
21.848	? Butanedioic acid, dimethyl ester **115** 101 87 59 55	106-65-0	43179	3.97
26.127	? Pentanedioic acid, dimethyl ester 129 101 100 **59** 42	1119-40-0	342080	31.47
26.342	? 2-Oxepanone 114 84 70 **55** 42	502-44-3	94022	8.65
26.644	? Unknown compound 128 110 83 **69** 55	-	35673	3.28
26.834	? Unknown ester 128 83 **69** 67 55	-	11229	1.03
29.806	? Hexanedioic acid, dimethyl ester 143 114 101 **59** 55	627-93-0	109078	10.03
30.338	? Unknown compound 135 107 83 **68** 55	-	19526	1.80
32.363	? Cyclohexasiloxane, dodecamethyl-	540-97-6	26353	2.42
34.363	Tetradecane 99 85 71 57 **43**	629-59-4	11965	1.10
34.583	? Unknown siloxane 355 281 221 147 **73**	-	30833	2.84
34.954	? Unknown aromatic 157 130 **115** 103 91	-	59430	5.47
36.412	? Unknown siloxane 415 327 281 147 **73**	-	23326	2.15
36.876	? Butylated Hydroxytoluene 220 **205** 189 145 115	128-37-0	3873610	356.35
37.686	? Unknown siloxane 355 281 221 147 **73**	-	65086	5.99
38.281	? Diphenyl sulfide **186** 185 171 152 109 77	139-66-2	186472	17.15
38.872	? Decanedioic acid, dimethyl ester 199 133 125 97 74 **55**	106-79-6	94497	8.69
39.140	? Unknown siloxane 401 355 281 147 **73**	-	19789	1.82
39.950	? Unknown siloxane 415 327 281 147 **73**	-	78189	7.19
40.677	? Unknown compound 115 97 69 **55** 41	-	17846	1.64
41.175	? Unknown siloxane 429 255 281 221 **73**	-	13427	1.24
41.785	? Unknown siloxane 415 327 281 147 **73**	-	56241	5.17
42.829	? Dibutyl phthalate 223 205 149 121 104	84-74-2	15504	1.43
43.385	? Unknown silane 369 295 221 147 **73**	-	23067	2.12

*No VOCs were detected to be above 1 ppm in the volatility range defined in GMW15634.

Individual SVOC Emissions Results (as n-hexadecane equivalent)				
Retention Time (min)	Substance Name (with Observed Mass Fragmentation)	CAS No.	Substance Area	Concentration (ppm)
11.191	? Unknown Aromatic 157 142 117 **115** 91	-	61944	2.66
12.079	? Butylated Hydroxytoluene 220 **205** 189 145 115	128-37-0	376067	16.17
13.055	? Diphenyl sulfide **186** 185 171 152 51	139-66-2	189298	8.14
13.231	? Decanedioic acid, dimethyl ester 199 133 125 97 74 **55**	106-79-6	282127	12.13
14.753	? Unknown ester 128 **115** 97 69 55	-	55191	2.37
14.978	? Unknown compound **220** 184 152 108 51	-	33217	1.43
15.393	? Unknown amine 179 **144** 117 104 91	-	55164	2.37
15.612	? Unknown compound 281 207 144 **115** 91	-	27765	1.19
15.734	? Unknown compound 226 172 144 104 **91**		57353	2.47
16.334	? Unknown compound 111 93 **81** 67 55	-	174618	7.51
16.500	? Dibutyl phthalate 223 205 **149** 121 104	84-74-2	36958	1.59
16.642	? Benzaldehyde, 4-(ethylphenylamino)-225 **210** 196 180 167	-	60948	2.62
16.915	? Unknown siloxane 369 295 221 147 **73**	-	35912	1.54
18.125	? 7-Oxabicyclo[4.1.0]heptane-3-carboxylic acid, 7-oxabicyclo[4.1.0]hept-3-ylmethyl ester 143 127 110 81 **41**	2386-87-0	737963	31.73
18.340	? Unknown compound 127 110 93 **81** 67	-	373914	16.08
19.720	? Unknown compound 281 **210** 194 182 167	-	42978	1.85
20.282	? Unknown compound 140 **124** 107 98 58	-	68734	2.96
22.243	? Unknown compound 154 **138** 72 56 41	-	719645	30.94

The most abundant mass fragmentation is identified by a bolded value.

CARBONYL ANALYSIS

Description of Samples:

Product Name	Microcellular Polyurethane Foam
Product Category	Automotive Interior
Product Number	U7E211250426201, U7E171250426204, U7H200930427201, U7H151250427204, U7S151250426201, U7Y201250426201
Date of Manufacture	Not Specified
Date of Shipment	03/09/17
Date Received by Lab	03/13/17
As Received Sample Condition	Good condition
Sample Condition	Production
Material Specification	GMW14196 (2016)

Test Conditions:

Dates Test Performed	03/15/17
Test Method	GMW15635 (August 2012)
Sample Conditioning	24 hour preconditioning at 23°C / 50%RH
Sample Size	100mm x 40mm x part thickness
Bottle Size	1 Liter
Exposure Temperature	60°C ± 3°C
Exposure Duration	180 ± 15 minutes
Rest Duration	60 ± 10 minutes
Number of Samples	Two (2) samples per material; twelve (12) total
Acceptance Criteria	Referencing GMW16853 (July 2013), Table 4, F7: Formaldehyde ≤ 8 µg/g Acetaldehyde ≤ 8 µg/g Acrolein ≤ 8 µg/g Acetone: Report Value Sum of C2 to C6 Carbonyls ≤ 20 µg/g

Facilities and Equipment:

Instrumentation Used:	Agilent 1260 Infinity Series
Column Used:	Poroshell 120 EC-C18, 3x100 mm, 2.7 µm

Test Summary:

The emissions testing were performed according to GMW15635, "*Determination of Aldehyde and Ketone Emissions from Interior Materials*". The samples were prepared to the specifications outlined by Section 3.3.3 in the test method and suspended from a hook in a 1 liter polyethylene bottle. 50 mL of HPLC grade water was then measured into the bottles. The samples were then placed in an environmental chamber held at 60°C for a period of 180 minutes. A blank bottle was run concurrently with no sample. After the exposure and a 1 hour rest period, the sample water was combined in equal amounts with a 2,4-di-nitrophenylhydrazine (DNPH) derivatization solution and 100 µL of phosphoric acid. These samples were then analyzed using high performance liquid chromatography and aldehyde / ketone emissions were determined using calibration curves prepared from pure standards. The moisture content of the samples was determined separately according to Section 4.1.1 of the test method.

Determination of Carbonyl Compounds from Vehicle Interior Materials - GMW15635

Client Name:	Griswold LLC	Technician:	Kyle Tanis
Project Number:	G102970798	Date(s) Tested:	3/15/2017
Samples Tested:	U7Y201250426201	Technician Signoff:	Kyle Tanis

Laboratory:	Intertek - GRR
Sample Name:	**U7Y201250426201**
Part No.:	416121493
Supplier:	N/A

Sample/Order No. (Internal)	N/A
Date of Production:	N/A
Date of Sample Received:	3/13/2017
Weight of the Component in the Vehicle:	N/A
Overall Dimensions of Component:	N/A

Chromatogram No.:	N/A
Data Path:	Available upon request
Manager:	Jesse Ondersma
Date of Analysis:	3/27/2017
Method:	PMD V12B_5

	Sample 1	Sample 2
Weight of Sample Analyzed (g):	4.11259	4.08615
Dimensions of Sample Analyzed (mm):	98.3x40.4x3.2	98.3x40.1x3.2
Water Content (%):	0.43	0.43

Substance	CAS No.	µg/g Sample 1	µg/g Sample 2	µg/g Ave.
Formaldehyde	500-00-0	1.05	0.72	0.88
Acetaldehyde	75-07-0	0.49	0.56	0.52
Acetone	67-64-1	0.25	0.31	0.28
Acrolein	107-02-8	BDL	BDL	-
Propionaldehyde	123-38-6	BDL	BDL	-
Crotonaldehyde	123-73-9	BDL	BDL	-
2-Butanone	78-93-3	BDL	BDL	-
Methacrolein	78-85-3	BDL	BDL	-
n-Butyraldehyde	123-72-8	BDL	BDL	-
Benzaldehyde	100-52-7	BDL	BDL	-
Valeraldehyde	110-62-3	BDL	BDL	-
m-Tolualdehyde	620-23-5	BDL	BDL	-
Hexaldehyde	66-25-1	BDL	BDL	-
Total Carbonyls		**1.80**	**1.58**	**1.69**
Sum of C2to C6 Carbonyls		**0.74**	**0.86**	**0.80**

Comments or Specific Remarks:

BDL* - Below Detection Limits

The results are conforming to the acceptance criteria outlined in GMW16853.

HPLC Instrument Model	Agilent 1260 Infinity Series
Column Used:	Poroshell 120 EC-C18