Material Testing Report

SN7636

ISOGLASS H3V 6009D

Prepared for:

SIRMAX SPA

VIA DELL'ARTIGIANATO 42

CITTADELLA 35013

ITALY

Prepared by:

Autodesk Moldflow Plastics Labs

2353 N. Triphammer Rd.

Ithaca, NY 14850

USA

Prepared on:

16 October, 2015

Report Authorized By:

Stephen Wright

Material Technician

16 October, 2015

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ACCREDITED

Testing Cert. 2399.01

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Summary

Description

Family name	POLYPROPYLENES (PP)
Trade name	ISOGLASS H3V 6009D
Manufacturer	Sirmax SpA
Family abbreviation	PP
Material structure	Crystalline
Data source	Autodesk Moldflow Plastics Labs : pvT-Measured : mech-Measured
Date last modified	16-OCT-15
Date tested	06-OCT-15
Data status	Non-Confidential
Material ID	31941
Grade code	SN7636
Supplier code	SIRMAX
Fibers/fillers	15% Glass Fiber, 15% Talc Filled

Recommended Processing

Mold surface temperature	40	°C
Melt temperature	228	°C

Mold temperature range (recommended)		
Minimum	20	°C
Maximum	60	°C

Melt temperature range (recommended)		
Minimum	210	°C
Maximum	245	°C

Absolute maximum melt temperature	285	°C

Ejection temperature	116	°C

Maximum shear stress	0.25	MPa
Maximum shear rate	100000	1/s

Maximum shear stress and maximum shear rate values have been supplemented with generic estimates.

Rheological Properties

Cross WLF Viscosity Model		
n	0.23791	
Tau	45874.4	Pa
D1	6.31658e+013	Pa-s
D2	263.15	K
D3	0	K/Pa
A1	30.362	
A2	51.600	K

Juncture loss method coefficients		
C1	3.091e-005	Pa^(1-c2)
C2	2.084	

Transition temperature		
Ttrans	126	°C

Moldflow Viscosity Index	VI(240)79	

Melt mass-flow rate (MFR)		
Temperature	230	°C
Load	2.16	Kg
Measured MFR	17.0	g/10min

Thermal Properties

Specific heat data		
Temperature (T) °C	Specific heat (Cp) J/Kg-°C	Heating/Cooling rate °C/s
239	2229.0	-0.33
208	2208.0	-0.33
165	2124.0	-0.33
133	2042.0	-0.33
128	2140.0	-0.33
126	2802.0	-0.33
122	12708.0	-0.33
116	3672.0	-0.33
113	2419.0	-0.33
94	1886.0	-0.33
69	1654.0	-0.33
57	1533.0	-0.33

Thermal conductivity data		
Temperature (T) °C	Thermal conductivity (k) W/m-°C	Heating/Cooling rate °C/s
252.1	0.234	0.0
230.2	0.228	0.0
209.7	0.224	0.0
189.1	0.227	0.0
168.7	0.226	0.0
148.7	0.224	0.0
129.3	0.314	0.0
108.3	0.309	0.0
87.8	0.313	0.0
67.2	0.308	0.0
46.5	0.321	0.0
25.8	0.323	0.0

PVT Properties

Melt density	0.9555	g/cm^3
Solid density	1.1502	g/cm^3

2-domain Tait PVT model coefficients		
b5	423.15	K
b6	1.205e-007	K/Pa
b1m	0.000997	m^3/Kg
b2m	6.330e-007	m^3/Kg-K
b3m	9.85153e+007	Pa
b4m	0.004598	1/K
b1s	0.00091	m^3/Kg
b2s	3.271e-007	m^3/Kg-K
b3s	2.45511e+008	Pa
b4s	0.003901	1/K
b7	0.000087	m^3/Kg
b8	0.342583	1/K
b9	4.758e-008	1/Pa

Mechanical Properties

Mechanical properties data		
Elastic modulus, 1st principal direction [E1]	4414	MPa
Elastic modulus, 2nd principal direction [E2]	3255	MPa
Poisson's ratio [v12]	0.4190	
Poisson's ratio [v23]	0.4190	
Shear modulus [G12]	1255	MPa

Transversely isotropic coefficient of thermal expansion [CTE] data		
Alpha1	4.230e-005	1/°C
Alpha2	7.010e-005	1/°C

Shrinkage Properties

Corrected residual in-mold stress (CRIMS) model coefficients	
A1	0.825345
A2	-0.048658
A3	0.001592
A4	1.885822
A5	-0.332978
A6	0.004135

Residual strain model coefficients		
	Parallel	Perpendicular
A1	0.013118	0.071794
A2	0.000465	0.001002
A3	-0.000075	-0.000127
A4	3.2893e-008	2.5579e-007
A5	0.00207	0.00736

The shrinkage models shown above are valid for Autodesk Simulation Moldflow Insight 2016. Shrinkage models for previous software versions are included in the 21000.udb file.

Filler Properties

Filler data	
Description	Weight %
Glass Fiber	15
Talc	15

Viscosity

Method:
MPL Test Method
(Method falls outside the scope of A2LA accreditation)

Instrument:
Arburg Allrounder 270S Injection Molding Machine

Test Specifications:

Sample Form:		Pellets
Pre-Processing:		Dried at 70°C for 1 hours in a hopper dryer
Moisture Level:		Not measured
Capillary A:	Length:	32.3889 mm
	L/D:	16.19445
	Die Entry Angle:	90 degrees
Capillary B:	Length:	8.0249 mm
	L/D:	4.01245
	Die Entry Angle:	90 degrees
Barrel Diameter:		30 mm
Plastication Time:		20 sec
Dwell Time:		20 sec
Corrections:		Bagley, Rabinowitsch and shear heating
Date Received:		03-SEP-15
Date Tested:		29-SEP-15

Operator's Notes:
Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.

Apparent Viscosity Data

Temperature (°C)	Apparent Shear Rate (sec^{-1})	Apparent Viscosity (Pa-s)	Die Diameter (mm)	Die L/D
198.7	196	367.58	2	16.19
198.7	317	271.07	2	16.19
198.7	770	153.11	2	16.19
198.7	1344	107.46	2	16.19
198.7	25539	13.65	2	16.19
198.7	64669	7.73	2	16.19
198.8	12751	21.71	2	16.19
199	2589	68.16	2	16.19
199.7	6464	35.3	2	16.19
218.7	196	312.57	2	16.19
218.7	315	232.12	2	16.19
218.7	769	131.75	2	16.19
218.7	25536	11.64	2	16.19
218.7	64564	6.39	2	16.19
219	12725	19.04	2	16.19
219.6	2587	58.7	2	16.19
219.7	1345	91.25	2	16.19
220.1	6467	30.91	2	16.19
238.7	25551	10.39	2	16.19
238.7	64443	5.57	2	16.19
238.8	197	266.56	2	16.19
238.8	315	199.92	2	16.19
239.7	768	114.91	2	16.19
239.7	1347	80.02	2	16.19
239.9	2590	51.88	2	16.19
240.2	12744	17	2	16.19
240.6	6477	27.5	2	16.19
258.7	25542	9.52	2	16.19
258.8	64366	5.06	2	16.19
259	197	232.63	2	16.19
259.7	317	174.36	2	16.19
259.7	768	101.76	2	16.19
259.7	1345	71.51	2	16.19
259.7	2592	46.7	2	16.19
260.6	6472	24.93	2	16.19
260.7	12749	15.5	2	16.19
200.9	317	345.56	2	4.01
200.9	1344	155.79	2	4.01
201	196	434.48	2	4.01
201	770	215.34	2	4.01
201	12751	36.39	2	4.01
201.9	2589	103.33	2	4.01
201.9	25539	23.47	2	4.01
202	64669	13.95	2	4.01
203.2	6464	56.69	2	4.01
221.9	769	175.31	2	4.01
221.9	12725	31.15	2	4.01
222.1	25536	19.96	2	4.01
222.3	1345	128.1	2	4.01
222.7	6467	48.12	2	4.01
222.9	196	339.53	2	4.01

Temperature (°C)	Apparent Shear Rate (sec^{-1})	Apparent Viscosity (Pa-s)	Die Diameter (mm)	Die L/D
222.9	315	274.84	2	4.01
222.9	2587	86.35	2	4.01
223	64564	11.51	2	4.01
242.9	768	148.03	2	4.01
242.9	1347	108.86	2	4.01
243.8	25551	17.62	2	4.01
243.9	197	274.55	2	4.01
243.9	315	224.43	2	4.01
243.9	2590	74.28	2	4.01
243.9	6477	42.17	2	4.01
243.9	12744	27.43	2	4.01
244	64443	10.02	2	4.01
263.9	768	124.86	2	4.01
263.9	1345	93.94	2	4.01
263.9	2592	64.86	2	4.01
263.9	6472	37.33	2	4.01
264	12749	24.44	2	4.01
264.9	197	222.03	2	4.01
264.9	25542	15.72	2	4.01
265	317	183.84	2	4.01
265	64366	8.9	2	4.01

Calculated Viscosity Data

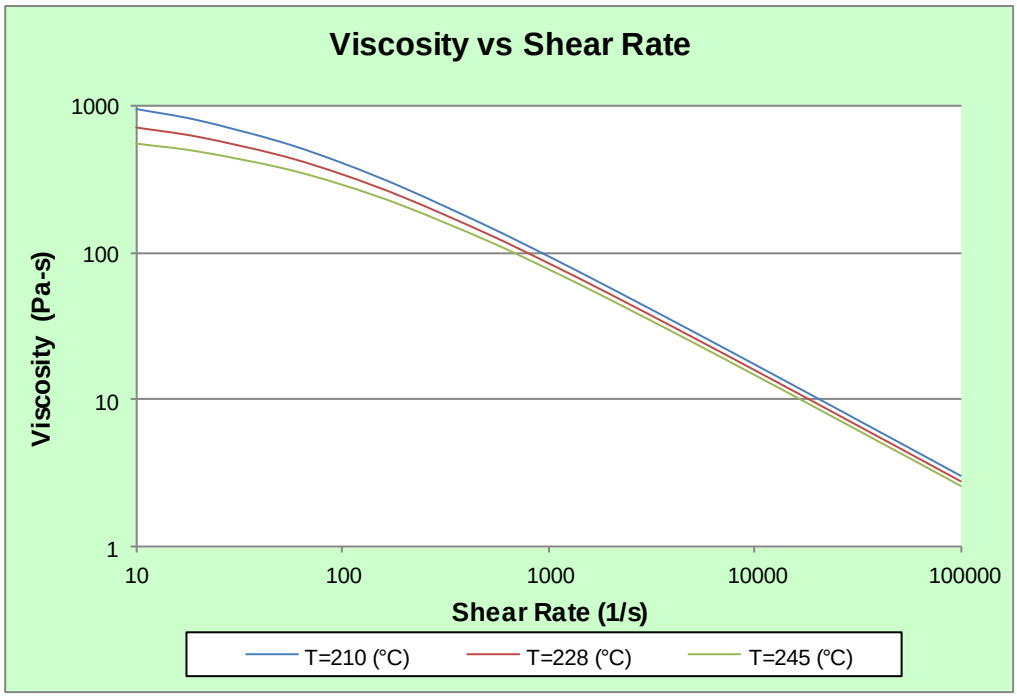
Temperature (°C)	Shear Rate (sec^{-1})	Calculated Viscosity (Pa-s)
198.7	317	225.18
198.7	770	122.51
198.7	196	306.76
198.7	1344	82.19
198.7	25539	9.11
198.7	64669	4.5
198.8	12751	15.4
199	2589	50.75
199.7	6464	25.56
200.9	317	221.34
200.9	1344	81.06
201	770	120.63
201	196	300.7
201	12751	15.21
201.9	2589	49.88
201.9	25539	8.95
202	64669	4.42
203.2	6464	25.05
218.7	315	194.11
218.7	196	258.8
218.7	64564	4.06
218.7	769	107.69
218.7	25536	8.21
219	12725	13.87
219.6	2587	45.18
219.7	1345	72.39
220.1	6467	22.9
221.9	769	105.58
221.9	12725	13.67
222.1	25536	8.08
222.3	1345	71.32
222.7	6467	22.61
222.9	315	188.19
222.9	2587	44.4
222.9	196	249.95
223	64564	3.98
238.7	25551	7.49
238.7	64443	3.72
238.8	315	167.83
238.8	197	219.13
239.7	1347	64.81
239.7	768	95.03
239.9	2590	40.73
240.2	12744	12.56
240.6	6477	20.76
242.9	1347	63.74
242.9	768	93.3
243.8	25551	7.33
243.9	2590	39.96
243.9	6477	20.46
243.9	197	210.46

Temperature (°C)	Shear Rate (sec^{-1})	Calculated Viscosity (Pa-s)
243.9	315	161.93
243.9	12744	12.36
244	64443	3.64
258.7	25542	6.92
258.8	64366	3.44
259	197	187.24
259.7	2592	37.16
259.7	768	84.96
259.7	1345	58.64
259.7	317	144.81
260.6	6472	19.09
260.7	12749	11.55
263.9	2592	36.48
263.9	768	83.06
263.9	1345	57.46
263.9	6472	18.85
264	12749	11.41
264.9	25542	6.76
264.9	197	179.07
265	317	139.78
265	64366	3.36

Rheological Data

Cross WLF Viscosity Model		
n	0.23791	
Tau	45874.4	Pa
D1	6.31658e+013	Pa-s
D2	263.15	K
D3	0	K/Pa
A1	30.362	
A2	51.600	K

Juncture loss method coefficients		
C1	3.091e-005	Pa^(1-c2)
C2	2.084	



Thermal conductivity

Method:

ASTM D 5930, Standard Test Method for Thermal Conductivity of Plastics by Means of a Transient Line-Source Technique.
(Method falls outside the scope of A2LA accreditation)

Instrument:

Moldflow K-System II

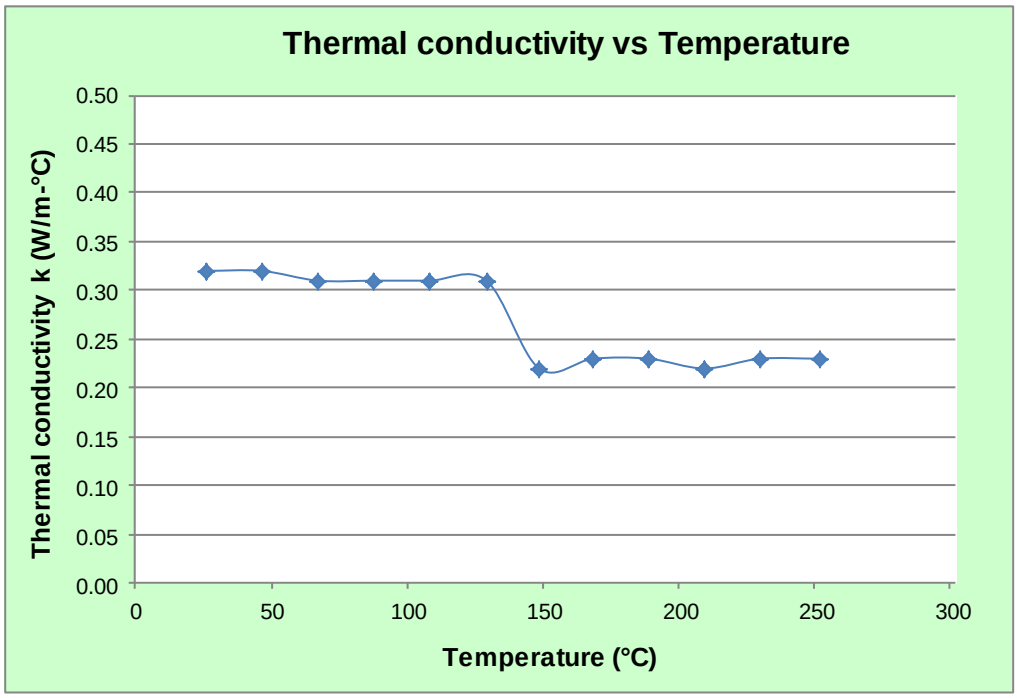
Test Specifications:

Sample Form:	Pellets
Pre-Processing:	Dried at 70°C for 1 hours in a hopper dryer
Moisture Level:	0.24 %
Probe Constant:	0.657
Probe Length:	50 mm
Data acquisition time:	45 sec
Probe Voltage:	4.0 V
Date Received:	03-SEP-15
Date Tested:	14-OCT-15

Operator's Notes:

Testing was performed at our Kilsyth facility per standard testing procedures.
No anomalies were noted during the course of testing.

Thermal conductivity data		
Temperature (T) °C	Thermal conductivity (k) W/m-°C	Heating/Cooling rate °C/s
252.1	0.234	0.0
230.2	0.228	0.0
209.7	0.224	0.0
189.1	0.227	0.0
168.7	0.226	0.0
148.7	0.224	0.0
129.3	0.314	0.0
108.3	0.309	0.0
87.8	0.313	0.0
67.2	0.308	0.0
46.5	0.321	0.0
25.8	0.323	0.0



Specific heat

Method:

ASTM E 1269, Standard Test Method for Determining Specific Heat Capacity by Differential Scanning Calorimetry
ASTM D 3418, Standard Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry

Instrument:

Perkin Elmer Pyris Diamond Differential Scanning Calorimeter

Test Specifications:

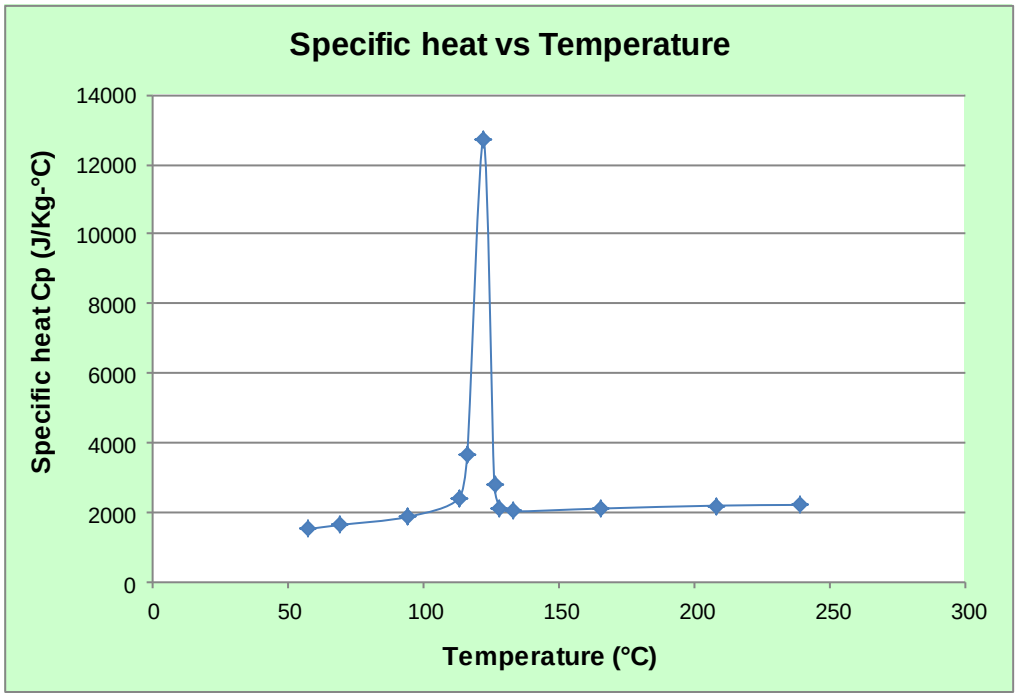
Sample Form:	Pellets
Pre-Processing:	Dried at 70°C for 1 hours in a hopper dryer
Moisture Level:	Not measured
Initial Temperature:	245°C
Final Temperature:	40°C
Cooling Rate:	20°C/min
Equilibrium Time:	3 min
Sample holder material:	Aluminum
Sample holder dimensions:	6.7 mm diameter, 1.6 mm tall
Sample holder mass:	25 mg (pan + lid)
Purge gas:	99.99% pure nitrogen
Purge gas flow rate:	30 cm^3/sec
Date Received:	03-SEP-15
Date Tested:	29-SEP-15

Operator's Notes:

Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.

Specific heat data		
Temperature (T) °C	Specific heat (Cp) J/Kg-°C	Heating/Cooling rate °C/s
239	2229.0	-0.33
208	2208.0	-0.33
165	2124.0	-0.33
133	2042.0	-0.33
128	2140.0	-0.33
126	2802.0	-0.33
122	12708.0	-0.33
116	3672.0	-0.33
113	2419.0	-0.33
94	1886.0	-0.33
69	1654.0	-0.33
57	1533.0	-0.33

Ttrans	126	°C
Ejection temperature	116	°C



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Pressure-Volume-Temperature

Method:
High Pressure Indirect Dilatometry

Instrument:
Gnomix pvT Apparatus

Test Specifications:

Sample Form**:**	Molded Plaque
Pre-Processing**:**	Not required
Scan type**:**	Isothermal Cooling
Date Received:	03-SEP-15
Date Tested**:**	01-OCT-15

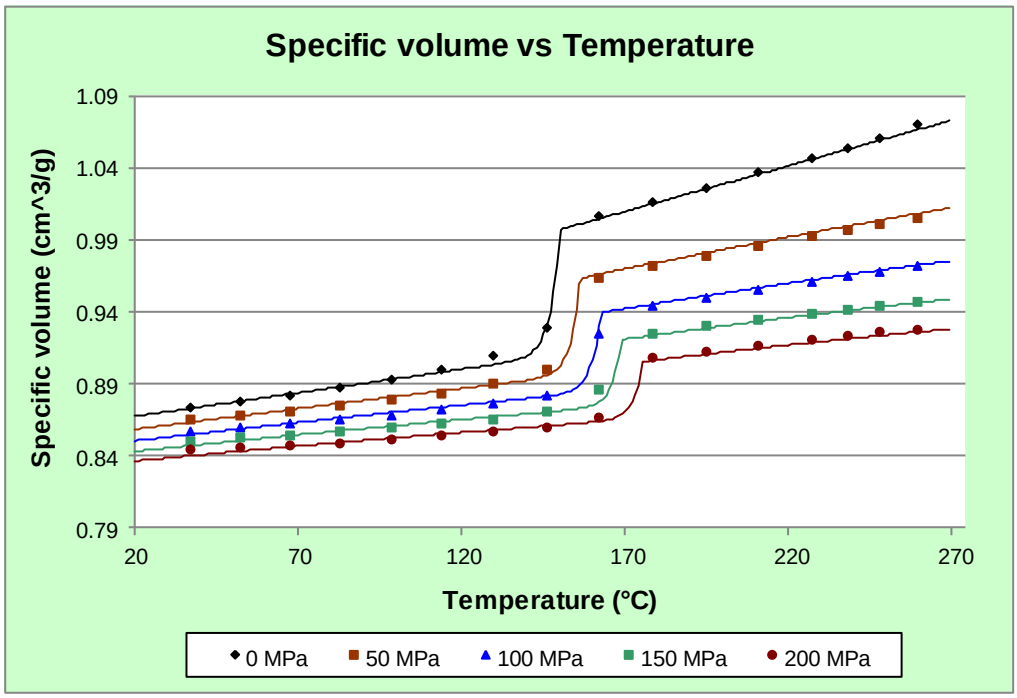
Operator's Notes:
Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.

pvT Experimental Data

Temperature (°C)	Pressure (MPa)				
	0MPa	50MPa	100MPa	150MPa	200MPa
37.03	0.8740	0.8649	0.8569	0.8502	0.8438
52.17	0.8780	0.8680	0.8594	0.8521	0.8452
67.32	0.8824	0.8713	0.8621	0.8543	0.8472
82.5	0.8873	0.8748	0.8650	0.8567	0.8491
98.2	0.8929	0.8788	0.8681	0.8593	0.8514
113.7	0.9000	0.8836	0.8717	0.8622	0.8537
129.5	0.9098	0.8899	0.8762	0.8657	0.8565
146.2	0.9291	0.9004	0.8825	0.8701	0.8599
161.7	1.0060	0.9640	0.9247	0.8860	0.8671
178.1	1.0160	0.9712	0.9445	0.9247	0.9083
194.6	1.0260	0.9784	0.9502	0.9296	0.9126
210.6	1.0370	0.9852	0.9554	0.9341	0.9166
227	1.0470	0.9919	0.9605	0.9383	0.9203
237.8	1.0540	0.9965	0.9642	0.9416	0.9232
247.9	1.0610	1.0010	0.9680	0.9446	0.9260
259.4	1.0700	1.0050	0.9711	0.9471	0.9280

Melt density	0.9555	g/cm^3
Solid density	1.1502	g/cm^3

2-domain Tait PVT model coefficients		
b5	423.15	K
b6	1.205e-007	K/Pa
b1m	0.000997	m^3/Kg
b2m	6.330e-007	m^3/Kg-K
b3m	9.85153e+007	Pa
b4m	0.004598	1/K
b1s	0.00091	m^3/Kg
b2s	3.271e-007	m^3/Kg-K
b3s	2.45511e+008	Pa
b4s	0.003901	1/K
b7	0.000087	m^3/Kg
b8	0.342583	1/K
b9	4.758e-008	1/Pa



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Shrinkage

Method:

AMPL Shrinkage Test Method (QOP-17-M)
(Method falls outside the scope of A2LA accreditation)

Instrument:

Krauss Maffei KM160-750CX Injection molding machine
Test mold inscribed with a fine grid pattern
Temperature and Humidity Controlled Room
OGP Smartscope Flash 400 metrology system

Test Specifications:

Sample Form**:**	Pellets
Pre-Processing**:**	Dried at 70°C for 1 hours in a hopper dryer
Moisture Level**:**	Not measured
Date Molded**:**	29-SEP-15
Post-Processing**:**	Conditioned at 23°C / 50% relative humidity for 7 days
Date Measured**:**	06-OCT-15
Shrinkage Data Correlated With**:**	Autodesk Simulation Moldflow Insight 2016
Default Model**:**	Residual Stress (CRIMS)
Date Received:	03-SEP-15

Operator's Notes:

Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.
Shrinkage measurements have been corrected to account for mold thermal expansion.
Data for some process conditions may have been removed in the determination of the favored model.

Shrinkage Experimental Data

Process Condition	Melt Temperature (°C)	Mold Temperature (°C)	Flow Rate (cc/sec)	Part Thickness (mm)	Packing Pressure (MPa)	Packing Time (sec)	Cooling Time (sec)
1	229.6	44.9	36.3	2	18.5	10	10
2	229.8	45.8	36.3	2	47.1	10	10
3	230.1	38.4	36.3	2	75.8	10	10
4	230.0	39.3	17.9	2	46.8	10	10
5	230.1	45.9	55.2	2	47.1	10	10
6	214.2	43.4	38.5	2	18.6	10	10
7	214.3	38.2	37.4	2	47.2	10	10
8	214.2	38.4	36.3	2	76.0	10	10
9	214.2	45.2	17.9	2	46.9	10	10
10	214.4	44.7	55.2	2	47.3	10	10
11	246.5	45.1	37.4	2	18.6	10	10
12	246.0	39.6	34.3	2	47.2	10	10
13	245.6	38.1	36.3	2	76.1	10	10
14	244.5	45.1	17.9	2	46.9	10	10
15	244.6	47.4	57.7	2	47.3	10	10
16	230.3	40.4	19.7	1	19.3	4	10
17	230.4	45.5	19.1	1	47.5	4	10
18	230.3	41.1	18.6	1	76.0	4	10
19	230.5	36.0	9.7	1	47.5	4	10
20	230.4	41.6	32.5	1	47.6	4	10
21	230.0	43.1	40.9	3	18.5	21	10
22	230.3	44.3	40.9	3	47.2	21	10
23	230.2	36.5	40.0	3	75.9	21	10
24	230.1	42.4	22.9	3	47.0	21	10
25	230.2	45.3	66.3	3	47.2	21	10

Part Shrinkage

Process Condition	Average Measured Parallel	Average Measured Perpendicular	Average Predicted Volumetric
1	0.321%	1.403%	6.552%
2	0.289%	1.119%	3.713%
3	0.198%	0.823%	2.023%
4	0.274%	1.123%	3.564%
5	0.277%	0.999%	3.641%
6	0.327%	1.352%	6.773%
7	0.301%	1.065%	3.749%
8	0.230%	0.794%	2.058%
9	0.309%	1.181%	3.679%
10	0.298%	1.054%	3.878%
11	0.328%	1.430%	6.272%
12	0.247%	1.009%	3.533%
13	0.227%	0.776%	1.853%
14	0.278%	1.079%	3.426%
15	0.291%	1.072%	3.595%
16	0.330%	1.167%	9.712%
17	0.317%	1.163%	7.149%
18	0.253%	0.886%	4.965%
19	0.346%	1.261%	6.578%
20	0.277%	1.037%	7.407%
21	0.342%	1.397%	4.863%
22	0.284%	1.037%	2.421%
23	0.212%	0.822%	1.094%
24	0.284%	1.076%	2.486%
25	0.283%	1.029%	2.355%

Residual Stress Coefficients

Corrected residual in-mold stress (CRIMS) model coefficients	
A1	0.825345
A2	-0.048658
A3	0.001592
A4	1.885822
A5	-0.332978
A6	0.004135

Residual Strain Coefficients

Parallel				
	Coefficient	Lower Limit	Upper Limit	Centroid
1	0.013118	0.008603	0.097261	0.042176
2	0.000465	0.022352	0.81358	0.38649
3	-0.000075	3.1506	30.642	11.459
4	3.2893e-008	8207.10	66827.00	26926.00
5	0.00207	0	0	0

Perpendicular				
	Coefficient	Lower Limit	Upper Limit	Centroid
1	0.071794	0.008603	0.097261	0.042781
2	0.001002	0.022352	0.81358	0.38217
3	-0.000127	3.1506	30.642	11.557
4	2.5579e-007	2904.70	10181.00	5788.80
5	0.00736	0	0	0

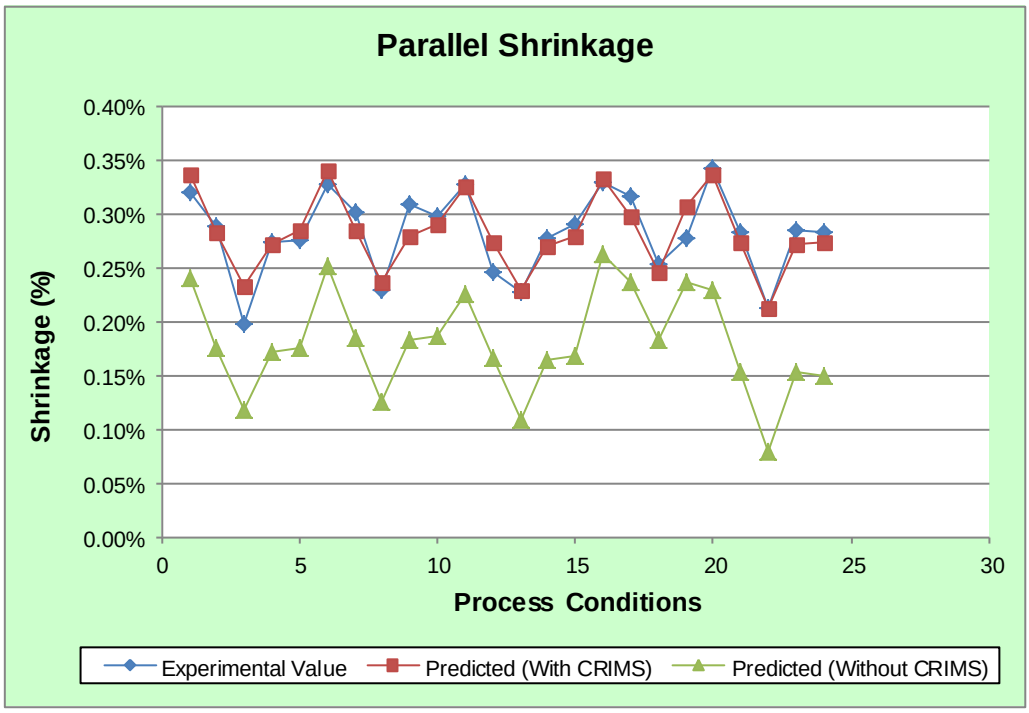
The shrinkage models shown above are valid for Autodesk Simulation Moldflow Insight 2016. Shrinkage models for previous software versions are included in the .21000.udb file.

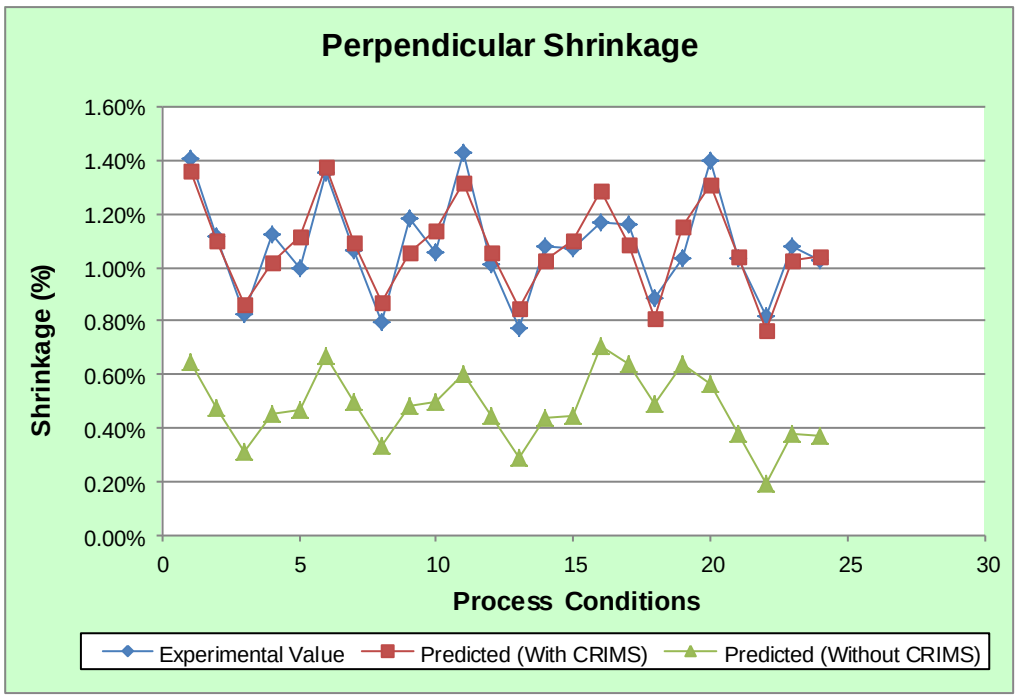
Observed Shrinkage

Observed nominal shrinkage	
Parallel	0.285%
Perpendicular	1.086%

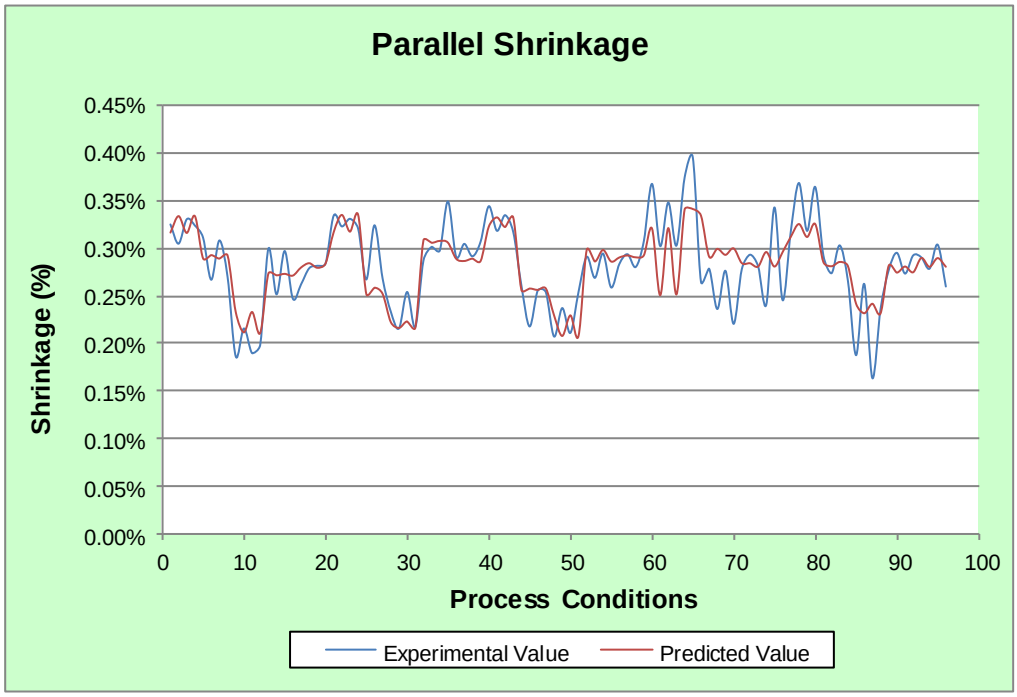
Observed shrinkage	
Minimum Parallel	0.198%
Maximum Parallel	0.346%
Minimum Perpendicular	0.776%
Maximum Perpendicular	1.430%

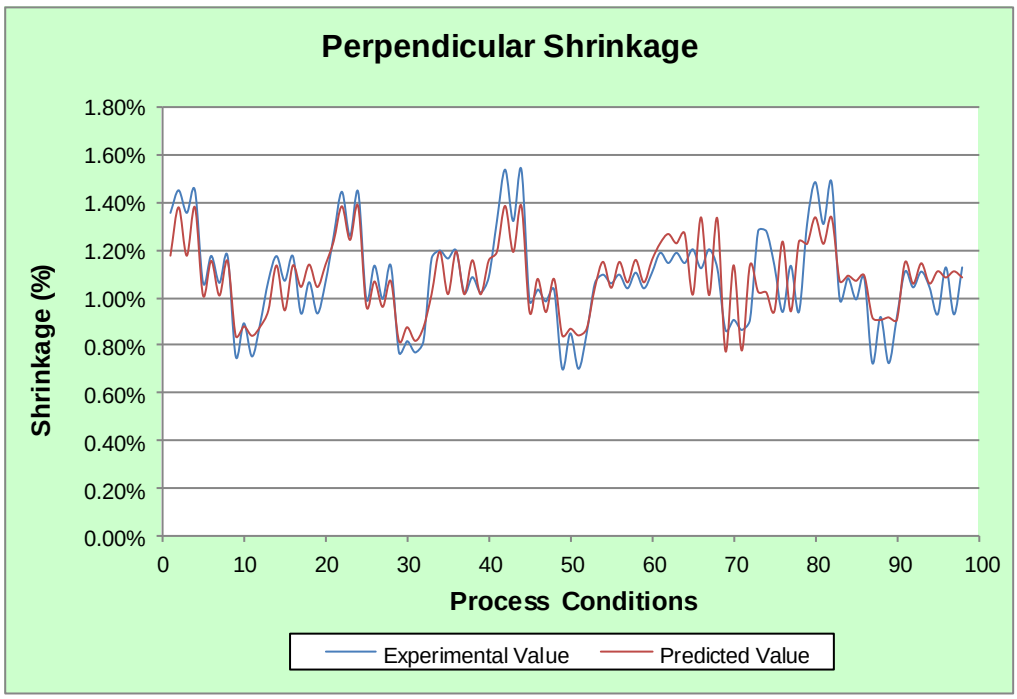
Residual Stress Plots





Residual Strain Plots





Mechanical

Elastic modulus and Poisson's ratio

Method:
ASTM D 638, Standard Test Method for Tensile Properties of Plastics
ASTM E 132, Standard Test Method for Poisson's Ratio at Room Temperature

Instrument:
MTS Sintech 5/G Universal Testing Machine

Test Specifications:

Specimens Tested:	8
Pre-Processing:	23°C +/-2°C at 50% +/-5% relative humidity for a minimum of 40 hours
Sample Form:	Machined from molded plaques
Test Speed:	5 mm/min
Date Received:	03-SEP-15
Date Tested:	06-OCT-15

Operator's Notes:
Testing was performed per standard testing procedures.
**NOTE: measured values for v23 were higher than expected; based on other data v23 was set equal to v12.

Elastic modulus		
Elastic modulus, 1st principal direction [E1]	4414	MPa
Elastic modulus, 2nd principal direction [E2]	3255	MPa

Poisson's ratio		
Poisson's ratio [v12]	0.4190	
Poisson's ratio [v23]	0.4190	

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Testing Cert. 2399.01

Shear modulus

Method:
ASTM D 638, Standard Test Method for Tensile Properties of Plastics

Instrument:
MTS Sintech 5/G Universal Testing Machine

Test Specifications:

Specimens Tested:	8
Pre-Processing:	23°C +/-2°C at 50% +/-5% relative humidity for a minimum of 40 hours
Sample Form:	Machined from molded plaques
Test Speed:	5 mm/min
Date Received:	03-SEP-15
Date Tested:	06-OCT-15

Operator's Notes:
Shear modulus is calculated using orthotropic elasticity from the tensile modulus measured on a sample cut at an angle of 45° with the flow direction.
Testing was performed per standard testing procedures.
No anomalies were noted during testing.

Shear modulus		
Shear modulus [G12]	1255	MPa

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Coefficient of linear thermal expansion

Method:
QOP-11, Coefficient of Linear Thermal Expansion of Plastics

Instrument:
Quartz tube dilatometer per ASTM

Test Specifications:

Specimens Tested:	2 (per direction): test repeated 2 times per specimen
Pre-Processing:	23°C +/-2°C at 50% +/-5% relative humidity for a minimum of 40 hours
Sample Form:	Machined from molded plaques
Specimen Geometry:	Rectangular, 8mm x 50mm, full thickness
Temperature Range:	0°C to 60°C
Date Received:	03-SEP-15
Date Tested:	06-OCT-15

Operator's Notes:
Testing was performed per standard testing procedures.
No anomalies were noted during testing.

Transversely isotropic coefficient of thermal expansion [CTE] data		
Alpha 1	4.230e-005	1/°C
Alpha 2	7.010e-005	1/°C

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Mold verification

Method:
AMPL Mold Verification Test Method (QOP-16-M)
(Method falls outside the scope of A2LA accreditation)

Instrument:
Krauss Maffei KM160-750CX Injection molding machine

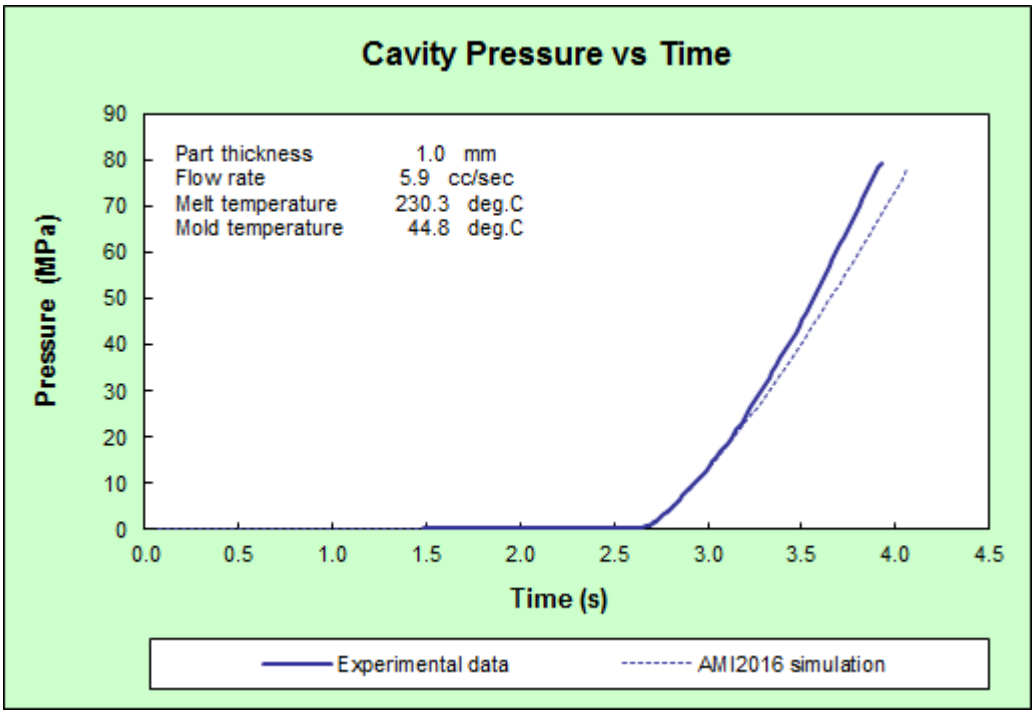
Test Specifications:

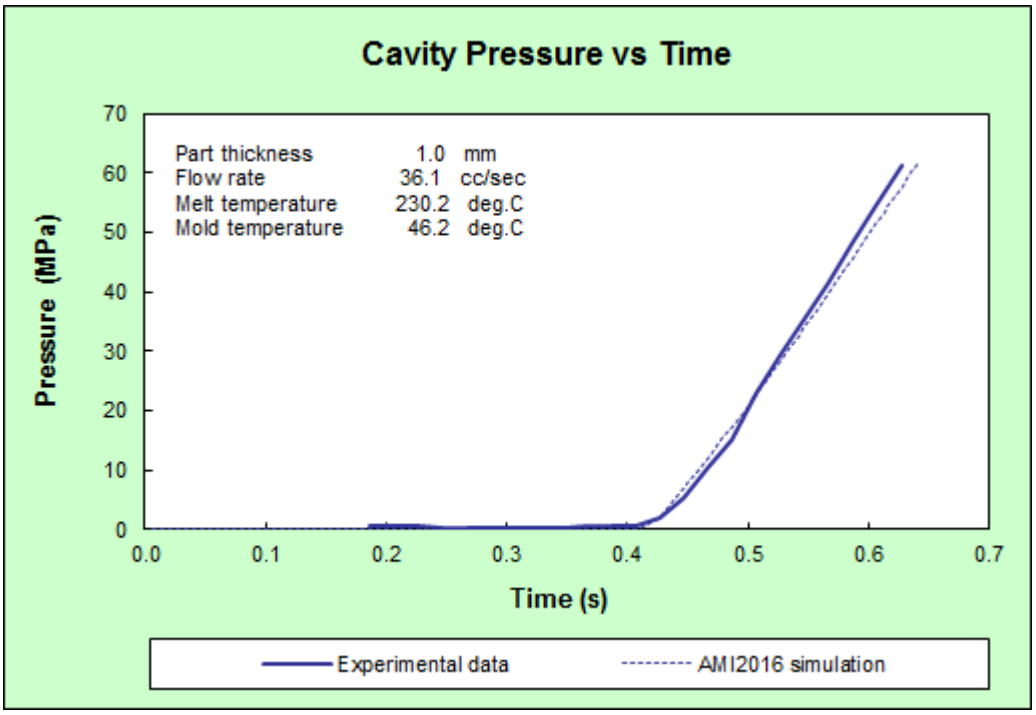
Sample Form:	Pellets
Pre-Processing:	Dried at 70°C for 1 hours in a hopper dryer
Moisture Level:	Not measured
Date Received:	03-SEP-15
Date Tested:	29-SEP-15

Operator's Notes:
Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.

1mm tag die

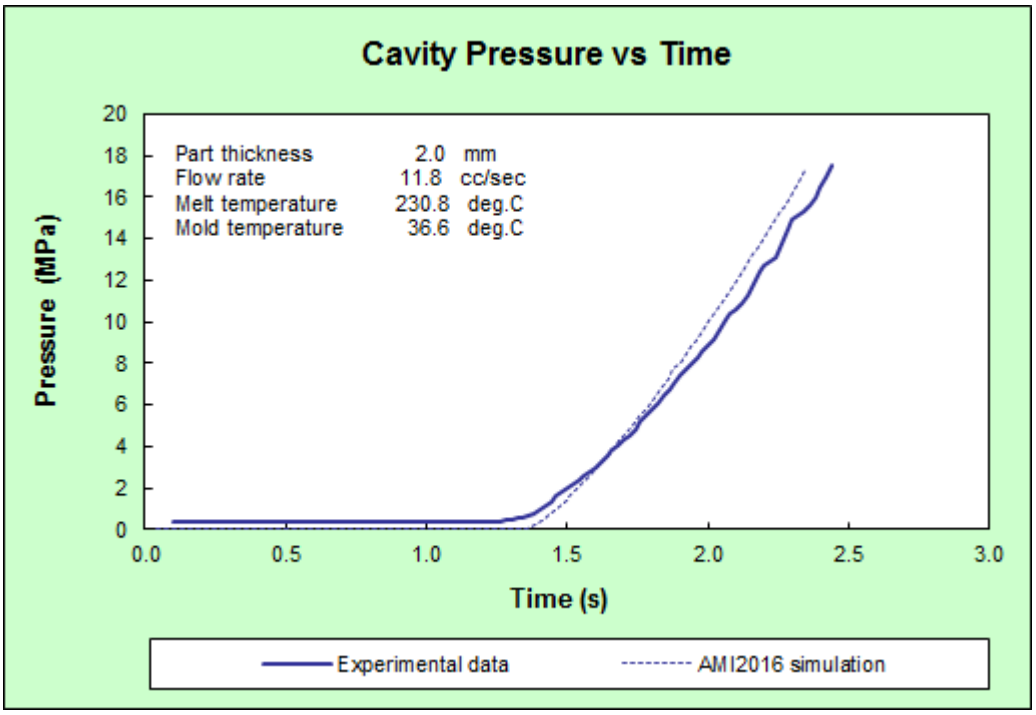
Experiment Number	Flow Rate (cc/sec)	Melt Temperature	Mold Temperature
Cyc0102	5.9	230.3	44.8
Cyc0114	36.1	230.2	46.2

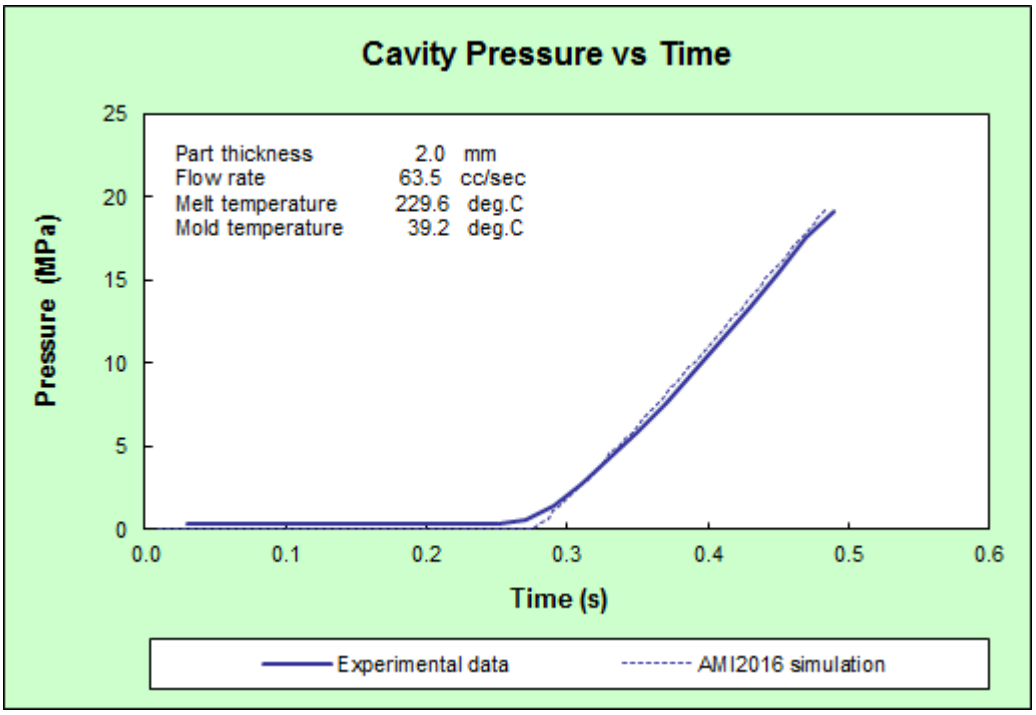




2mm tag die

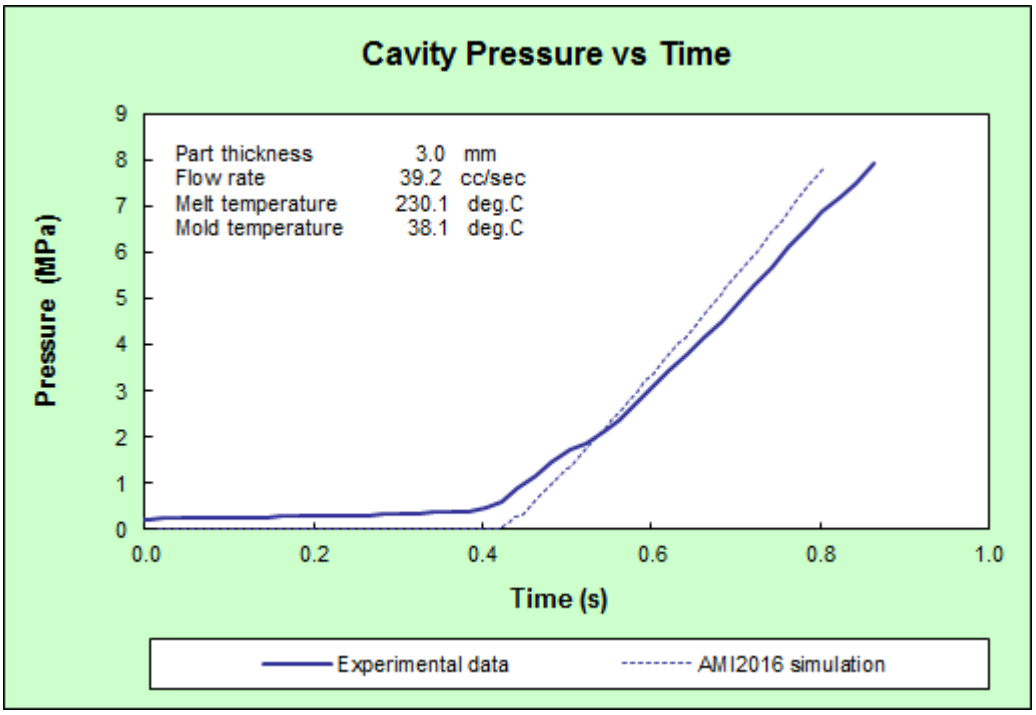
Experiment Number	Flow Rate (cc/sec)	Melt Temperature	Mold Temperature
Cyc0009	11.8	230.8	36.6
Cyc0021	63.5	229.6	39.2

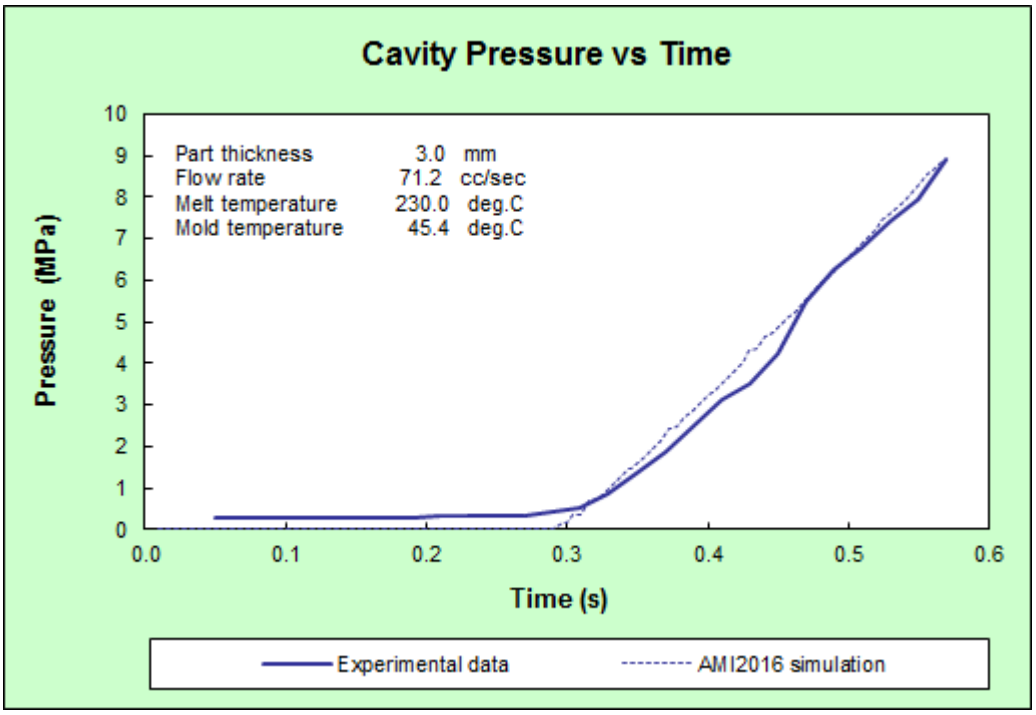




3mm tag die

Experiment Number	Flow Rate (cc/sec)	Melt Temperature	Mold Temperature
Cyc0146	39.2	230.1	38.1
Cyc0152	71.2	230	45.4

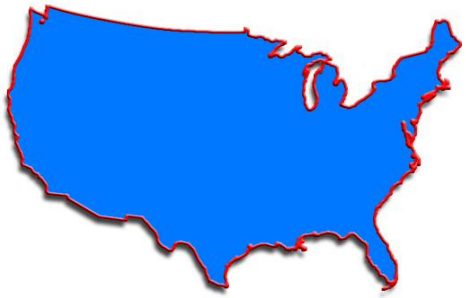




Contact details

United States of America

Autodesk Inc.
2353 North Triphammer Road
Ithaca, NY 14850
USA
Phone: +1-607- 266-7247
Fax: +1-607- 266-7100
Email: mplmoldflow@autodesk.com



Australia

Autodesk Australia Pty. Ltd.
259-261 Colchester Road
Kilsyth, Victoria, 3137
Australia
Phone: +61-3-9720-2088
Fax: +61-3-9729-0433
Email: mplmoldflow@autodesk.com

For testing enquiries please email: mplmoldflow@autodesk.com

For data fitting and database enquiries please email: datafittingmoldflow@autodesk.com

Autodesk's corporate website: www.autodesk.com