Material Testing Report

SN 7332

ISOFIL HK 40 3SH1 NA

Lot# Z337152

Prepared for:

SIRMAX SPA

Via Dell'Artigianato 42

Cittadella (PD) 35013

Italy

Prepared by:

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Prepared on:

16 December, 2014

Report Authorized By:

Andrew Kostuk

Laboratory Operations Supervisor

16 December, 2014

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Testing Cert. 2399.01

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Contents

Summary

Description

Family name	POLYPROPYLENES (PP)
Trade name	ISOFIL HK 40 3SH1 NA
Manufacturer	Sirmax SpA
Family abbreviation	PP
Material structure	Crystalline
Data source	Autodesk Moldflow Plastics Labs : pvT-Measured : mech-Measured
Date last modified	16-DEC-14
Date tested	12-DEC-14
Data status	Non-Confidential
Material ID	31637
Grade code	SN7332
Supplier code	SIRMAX
Fibers/fillers	20% Calcium Carbonate, 20% Talc Filled

Recommended Processing

Mold surface temperature	45	°C
Melt temperature	230	°C

Mold temperature range (recommended)		
Minimum	20	°C
Maximum	70	°C

Melt temperature range (recommended)		
Minimum	210	°C
Maximum	250	°C

Absolute maximum melt temperature	290	°C

Ejection temperature	121	°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	0.25517	
Tau	95420.3	Pa
D1	1.98969e+015	Pa-s
D2	263.15	K
D3	0	K/Pa
A1	34.320	
A2	51.600	K

Juncture loss method coefficients		
C1	8.354e-005	Pa^(1-c2)
C2	1.945	

Transition temperature		
Ttrans	128	°C

Moldflow Viscosity Index	VI(240)141	

Melt mass-flow rate (MFR)		
Temperature	230	°C
Load	2.16	Kg
Measured MFR	3.5	g/10min

Thermal Properties

Specific heat data		
Temperature (T) °C	Specific heat (Cp) J/Kg-°C	Heating/Cooling rate °C/s
239	2024.0	-0.33
204	1929.0	-0.33
164	1839.0	-0.33
134	1776.0	-0.33
130	1872.0	-0.33
128	3160.0	-0.33
125	12360.0	-0.33
121	3184.0	-0.33
119	2163.0	-0.33
99	1734.0	-0.33
74	1541.0	-0.33
57	1418.0	-0.33

Thermal conductivity data		
Temperature (T) °C	Thermal conductivity (k) W/m-°C	Heating/Cooling rate °C/s
247.1	0.281	0.0
225.6	0.273	0.0
204.8	0.266	0.0
184.4	0.270	0.0
164.6	0.275	0.0
144.7	0.278	0.0
125.1	0.369	0.0
105.1	0.386	0.0
85.1	0.384	0.0
65.2	0.395	0.0
45.3	0.402	0.0
27.1	0.434	0.0

PVT Properties

Melt density	1.0668	g/cm^3
Solid density	1.2712	g/cm^3

2-domain Tait PVT model coefficients		
b5	434.15	K
b6	1.030e-007	K/Pa
b1m	0.000895	m^3/Kg
b2m	6.219e-007	m^3/Kg-K
b3m	1.07874e+008	Pa
b4m	0.005505	1/K
b1s	0.000828	m^3/Kg
b2s	3.011e-007	m^3/Kg-K
b3s	2.23270e+008	Pa
b4s	0.003841	1/K
b7	0.000067	m^3/Kg
b8	0.138073	1/K
b9	1.907e-008	1/Pa

Mechanical Properties

Mechanical properties data		
Elastic modulus, 1st principal direction [E1]	3697	MPa
Elastic modulus, 2nd principal direction [E2]	3590	MPa
Poisson's ratio [v12]	0.3500	
Poisson's ratio [v23]	0.3500	
Shear modulus [G12]	1289	MPa

Transversely isotropic coefficient of thermal expansion [CTE] data		
Alpha1	6.450e-005	1/°C
Alpha2	6.800e-005	1/°C

Shrinkage Properties

Corrected residual in-mold stress (CRIMS) model coefficients	
A1	0.522587
A2	0.00082
A3	0.00586
A4	1.159383
A5	-0.374114
A6	0.004906

Residual strain model coefficients		
	Parallel	Perpendicular
A1	0.049584	0.10471
A2	0.002617	0.004175
A3	-0.000212	-0.000108
A4	9.6369e-008	1.9492e-007
A5	0.005254	0.004948

The shrinkage models shown above are valid for Autodesk Simulation Moldflow Insight 2015. Shrinkage models for previous software versions are included in the 21000.udb file.

Filler Properties

Filler data	
Description	Weight %
Calcium Carbonate	20
Talc	20

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:		0.0136 %
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:		06-OCT-14
Date Tested:		24-NOV-14

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
210.4	12811	42.16	2	16.19
210.7	770	242.58	2	16.19
210.8	1347	166.26	2	16.19
210.8	25600	32.99	2	16.19
210.8	64913	17.82	2	16.19
211	2600	106	2	16.19
211.8	314	437.21	2	16.19
212.3	6499	59.8	2	16.19
214.8	194	581.2	2	16.19
220.7	771	225.4	2	16.19
220.8	194	557.87	2	16.19
220.8	314	412.17	2	16.19
220.8	25644	25.16	2	16.19
220.9	1348	152.91	2	16.19
220.9	12795	34.77	2	16.19
221.1	2598	96.44	2	16.19
221.8	64848	15.71	2	16.19
222.2	6498	52.02	2	16.19
230.4	194	510.61	2	16.19
230.6	314	375.62	2	16.19
230.7	769	207.63	2	16.19
230.7	1347	140.98	2	16.19
230.7	64325	13.95	2	16.19
230.8	25644	20.83	2	16.19
231.3	2599	84.04	2	16.19
232	6498	46.99	2	16.19
232.9	12792	30.59	2	16.19
240.7	314	361.77	2	16.19
240.7	770	197.88	2	16.19
240.7	25637	18.58	2	16.19
240.7	64710	12.15	2	16.19
240.8	194	497.97	2	16.19
240.8	2594	84.61	2	16.19
240.9	1348	134.26	2	16.19
241.9	12806	28.21	2	16.19
242.6	6494	44.27	2	16.19
209.3	12811	67.25	2	4.01
209.5	314	517.43	2	4.01
210.1	194	658.56	2	4.01
210.3	770	313.06	2	4.01
210.4	1347	226.9	2	4.01
211	2600	153.56	2	4.01
211	25600	42.73	2	4.01
211.8	6499	93.58	2	4.01
212	64913	25.86	2	4.01
219.7	314	489.47	2	4.01
220	25644	41.26	2	4.01
220.2	12795	58.77	2	4.01
220.4	771	291.14	2	4.01
220.5	1348	208.57	2	4.01
220.6	194	623.67	2	4.01

Temperature (°C)	Apparent Shear Rate (sec^{-1})	Apparent Viscosity (Pa-s)	Die Diameter (mm)	Die L/D
221.6	2598	140.48	2	4.01
222.3	6498	83.4	2	4.01
223	64848	23.18	2	4.01
230	25644	36.9	2	4.01
230.1	12792	52.57	2	4.01
230.3	314	434.44	2	4.01
230.4	769	263.71	2	4.01
230.9	64325	23.08	2	4.01
231	1347	190.13	2	4.01
231.4	194	549.96	2	4.01
231.7	2599	119.13	2	4.01
232.3	6498	74.87	2	4.01
240.2	25637	33.33	2	4.01
240.4	314	412.71	2	4.01
240.4	770	249.32	2	4.01
240.8	194	534.17	2	4.01
240.8	1348	179.05	2	4.01
241	2594	120.25	2	4.01
241	64710	20.89	2	4.01
241.4	12806	48.07	2	4.01
242.5	6494	69.51	2	4.01

Calculated Viscosity Data

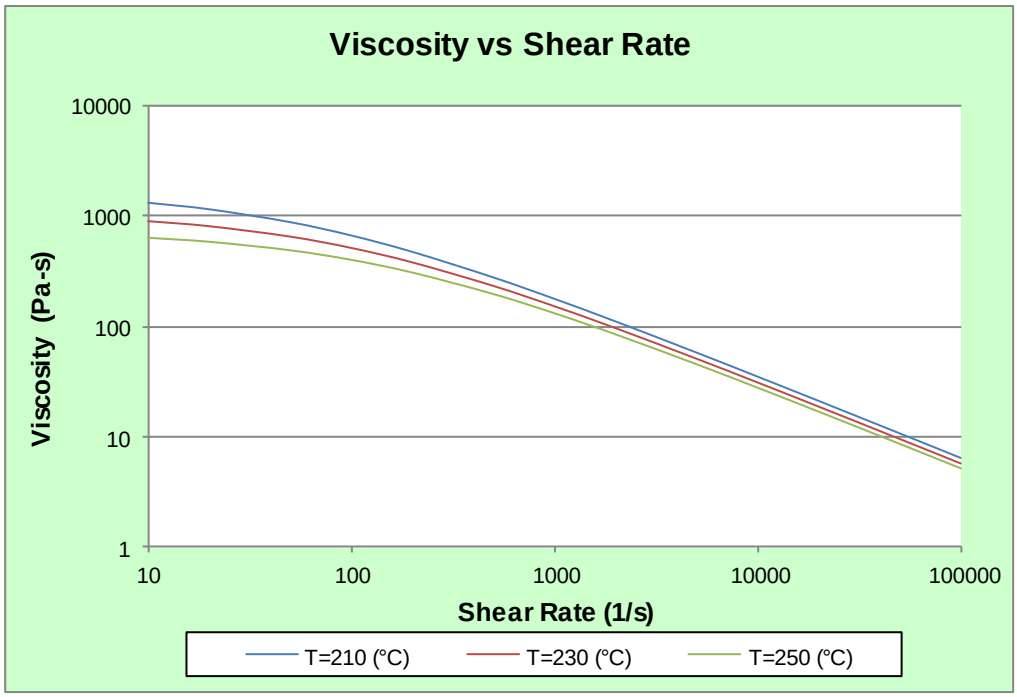
Temperature (°C)	Shear Rate (sec^{-1})	Calculated Viscosity (Pa-s)
209.3	12811	29.31
209.5	314	369.25
210.1	194	480.04
210.3	770	210.28
210.4	1347	144.75
210.4	12811	29.1
210.7	770	209.58
210.8	1347	144.31
210.8	64913	8.77
210.8	25600	17.45
211	2600	91.4
211	25600	17.43
211	2600	91.4
211.8	314	360.83
211.8	6499	47.25
212	64913	8.71
212.3	6499	47.1
214.8	194	455.44
219.7	314	333.62
220	25644	16.48
220.2	12795	27.4
220.4	771	193.35
220.5	1348	134.12
220.6	194	427.03
220.7	771	192.88
220.8	194	426.09
220.8	314	330.03
220.8	25644	16.41
220.9	1348	133.72
220.9	12795	27.29
221.1	2598	85.29
221.6	2598	85
221.8	64848	8.22
222.2	6498	44.23
222.3	6498	44.2
223	64848	8.17
230	25644	15.57
230.1	12792	25.86
230.3	314	300.84
230.4	194	383.55
230.4	769	178.77
230.6	314	299.97
230.7	64325	7.87
230.7	769	178.35
230.7	1347	124.64
230.8	25644	15.5
230.9	64325	7.87
231	1347	124.37
231.3	2599	79.73
231.4	194	379.41
231.7	2599	79.52

Temperature (°C)	Shear Rate (sec^{-1})	Calculated Viscosity (Pa-s)
232	6498	41.7
232.3	6498	41.62
232.9	12792	25.46
240.2	25637	14.74
240.4	770	165.24
240.4	314	273.11
240.7	64710	7.44
240.7	25637	14.7
240.7	314	272.33
240.7	770	164.86
240.8	194	342.93
240.8	2594	75.19
240.8	1348	116.09
240.8	194	342.93
240.9	1348	116.01
241	64710	7.43
241	2594	75.09
241.4	12806	24.28
241.9	12806	24.22
242.5	6494	39.29
242.6	6494	39.27

Rheological Data

Cross WLF Viscosity Model		
n	0.25517	
Tau	95420.3	Pa
D1	1.98969e+015	Pa-s
D2	263.15	K
D3	0	K/Pa
A1	34.320	
A2	51.600	K

Juncture loss method coefficients		
C1	8.354e-005	Pa^(1-c2)
C2	1.945	



Thermal conductivity

Method:

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

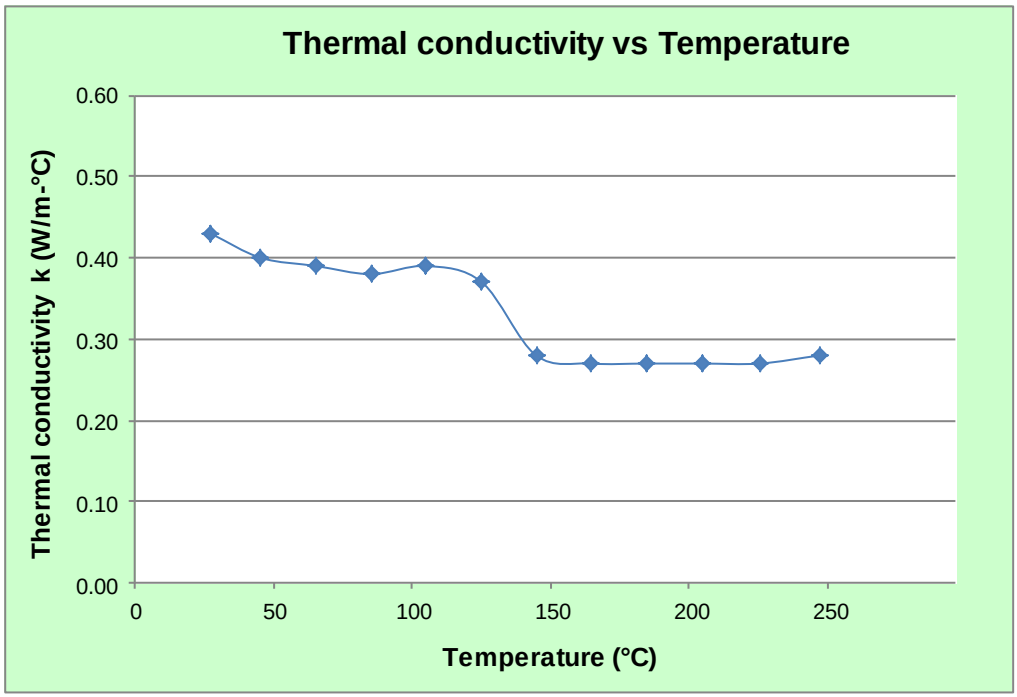
Test Specifications:

Sample Form:	Pellets
Pre-Processing:	Dried at 70°C for 1 hours in a hopper dryer
Moisture Level:	0.0136 %
Probe Constant:	0.709
Probe Length:	50 mm
Data acquisition time:	45 sec
Probe Voltage:	4.0 V
Date Received:	06-OCT-14
Date Tested:	09-DEC-14

Operator's Notes:

Testing was performed 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
247.1	0.281	0.0
225.6	0.273	0.0
204.8	0.266	0.0
184.4	0.270	0.0
164.6	0.275	0.0
144.7	0.278	0.0
125.1	0.369	0.0
105.1	0.386	0.0
85.1	0.384	0.0
65.2	0.395	0.0
45.3	0.402	0.0
27.1	0.434	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:

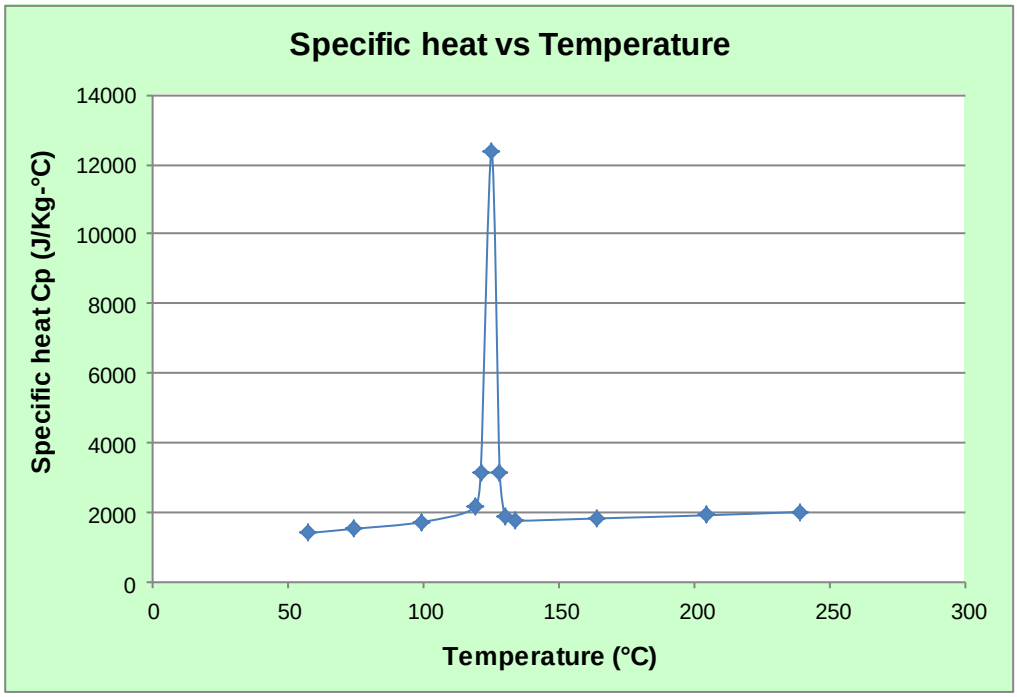
Sample Form:	Pellets
Pre-Processing:	Dried at 70°C for 1 hours in a hopper dryer
Moisture Level:	0.0136 %
Initial Temperature:	250°C
Final Temperature:	40°C
Cooling Rate:	20°C/min
Equilibrium Time:	3 min
Sample holder material:	Aluminum
Sample holder dimensions:	6.7 mm diameter, 1.6 mm tall
Sample holder mass:	25 mg (pan + lid)
Purge gas:	99.99% pure nitrogen
Purge gas flow rate:	30 cm^3/sec
Date Received:	06-OCT-14
Date Tested:	26-NOV-14

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	2024.0	-0.33
204	1929.0	-0.33
164	1839.0	-0.33
134	1776.0	-0.33
130	1872.0	-0.33
128	3160.0	-0.33
125	12360.0	-0.33
121	3184.0	-0.33
119	2163.0	-0.33
99	1734.0	-0.33
74	1541.0	-0.33
57	1418.0	-0.33

Ttrans	128	°C
Ejection temperature	121	°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:	06-OCT-14
Date Tested**:**	25-NOV-14

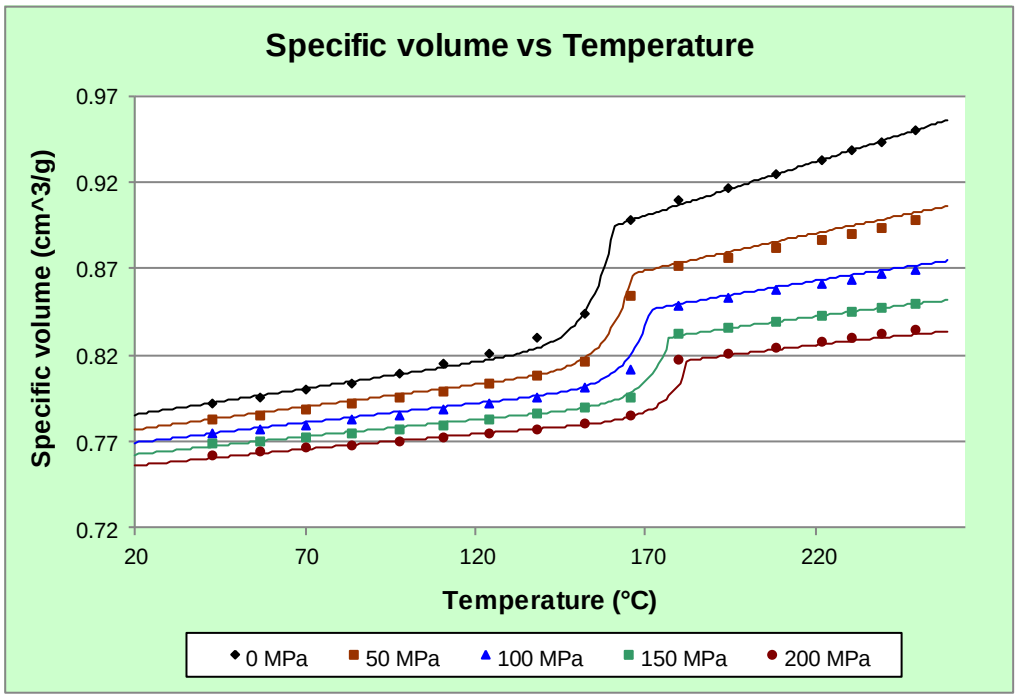
Operator's Notes:
Testing was performed per standard testing procedures.
No anomalies were noted during the course of testing.

pvT Experimental Data

Temperature (°C)	Pressure (MPa)				
	0MPa	50MPa	100MPa	150MPa	200MPa
42.53	0.7917	0.7826	0.7749	0.7683	0.7625
56.49	0.7955	0.7854	0.7774	0.7705	0.7641
70.21	0.7996	0.7884	0.7797	0.7725	0.7660
83.32	0.8040	0.7916	0.7823	0.7748	0.7679
97.63	0.8092	0.7952	0.7853	0.7772	0.7700
110.7	0.8144	0.7988	0.7881	0.7797	0.7722
124.2	0.8212	0.8034	0.7917	0.7826	0.7746
138.3	0.8294	0.8086	0.7957	0.7858	0.7772
152.0	0.8442	0.8164	0.8006	0.7896	0.7803
165.8	0.8977	0.8538	0.8116	0.7953	0.7846
179.7	0.9097	0.8712	0.8486	0.8317	0.8171
194.3	0.9170	0.8762	0.8526	0.8352	0.8208
208.1	0.9250	0.8817	0.8571	0.8390	0.8243
221.6	0.9328	0.8870	0.8611	0.8426	0.8275
230.8	0.9379	0.8904	0.8639	0.8450	0.8296
239.5	0.9434	0.8938	0.8667	0.8477	0.8320
249.3	0.9499	0.8977	0.8696	0.8499	0.8341

Melt density	1.0668	g/cm^3
Solid density	1.2712	g/cm^3

2-domain Tait PVT model coefficients		
b5	434.15	K
b6	1.030e-007	K/Pa
b1m	0.000895	m^3/Kg
b2m	6.219e-007	m^3/Kg-K
b3m	1.07874e+008	Pa
b4m	0.005505	1/K
b1s	0.000828	m^3/Kg
b2s	3.011e-007	m^3/Kg-K
b3s	2.23270e+008	Pa
b4s	0.003841	1/K
b7	0.000067	m^3/Kg
b8	0.138073	1/K
b9	1.907e-008	1/Pa



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Shrinkage

Method:
MPL 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**:**	0.0136 %
Date Molded**:**	24-NOV-14
Post-Processing**:**	Conditioned at 23°C / 50% relative humidity for 7 days
Date Measured**:**	01-DEC-14
Shrinkage Data Correlated With**:**	Autodesk Simulation Moldflow Insight 2015
Default Model**:**	Residual Stress (CRIMS)
Date Received:	06-OCT-14

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	227.8	50.9	41.8	3	18.4	17	10
2	228.2	46.5	40.9	3	46.8	17	10
3	228.2	52.4	40.0	3	75.4	17	10
4	227.9	47.7	20.0	3	46.6	17	10
5	227.9	50.9	66.3	3	46.9	17	10
6	229.0	49.9	27.2	1.5	18.5	5	10
7	228.9	50.6	26.4	1.5	47.0	5	10
8	229.0	46.8	26.4	1.5	75.8	5	10
9	229.1	45.5	13.6	1.5	47.0	5	10
10	229.2	51.8	41.4	1.5	47.2	5	10
11	229.3	51.1	36.3	2	18.6	9	10
12	229.5	54.0	35.3	2	47.1	9	10
13	229.4	52.7	36.3	2	75.6	9	10
14	229.5	53.7	15.5	2	46.9	9	10
15	229.5	56.3	55.2	2	47.2	9	10
16	210.6	47.0	33.4	2	18.6	9	10
17	209.6	52.9	33.4	2	47.1	9	10
18	208.7	45.9	32.6	2	75.7	9	10
19	208.6	52.2	15.9	2	47.1	9	10
20	208.7	50.4	50.8	2	47.1	9	10
21	251.8	51.5	37.4	2	18.6	9	10
22	250.6	54.7	36.3	2	47.2	9	10
23	249.7	50.2	35.3	2	75.9	9	10
24	249.2	46.7	17.2	2	47.0	9	10
25	249.1	54.4	52.9	2	47.2	9	10

Part Shrinkage

Process Condition	Average Measured Parallel	Average Measured Perpendicular	Average Predicted Volumetric
1	1.103%	1.581%	5.754%
2	0.911%	1.090%	3.270%
3	0.796%	0.968%	1.835%
4	0.959%	1.191%	3.289%
5	0.959%	1.092%	3.201%
6	1.066%	1.267%	9.346%
7	1.008%	1.047%	6.040%
8	0.921%	0.967%	4.213%
9	1.132%	1.148%	5.847%
10	0.973%	1.135%	6.095%
11	1.103%	1.559%	7.794%
12	1.057%	1.220%	4.553%
13	0.872%	0.975%	2.786%
14	1.094%	1.147%	4.401%
15	1.015%	1.194%	4.523%
16	1.133%	1.551%	8.216%
17	1.072%	1.213%	4.708%
18	0.924%	0.951%	3.039%
19	1.170%	1.231%	4.646%
20	1.041%	1.152%	4.831%
21	1.094%	1.577%	7.475%
22	0.976%	1.216%	4.390%
23	0.820%	0.896%	2.700%
24	1.027%	1.159%	4.366%
25	0.975%	1.202%	4.445%

Residual Stress Coefficients

Corrected residual in-mold stress (CRIMS) model coefficients	
A1	0.522587
A2	0.00082
A3	0.00586
A4	1.159383
A5	-0.374114
A6	0.004906

Residual Strain Coefficients

Parallel				
	Coefficient	Lower Limit	Upper Limit	Centroid
1	0.049584	0.014812	0.10381	0.049313
2	0.002617	0.058551	0.67527	0.30791
3	-0.000212	2.2776	15.557	7.2391
4	9.6369e-008	10672.00	71714.00	32269.00
5	0.005254	0	0	0

Perpendicular				
	Coefficient	Lower Limit	Upper Limit	Centroid
1	0.10471	0.014812	0.10381	0.048705
2	0.004175	0.058551	0.67536	0.31068
3	-0.000108	2.2776	15.557	7.2061
4	1.9492e-007	2595.40	10823.00	6798.90
5	0.004948	0	0	0

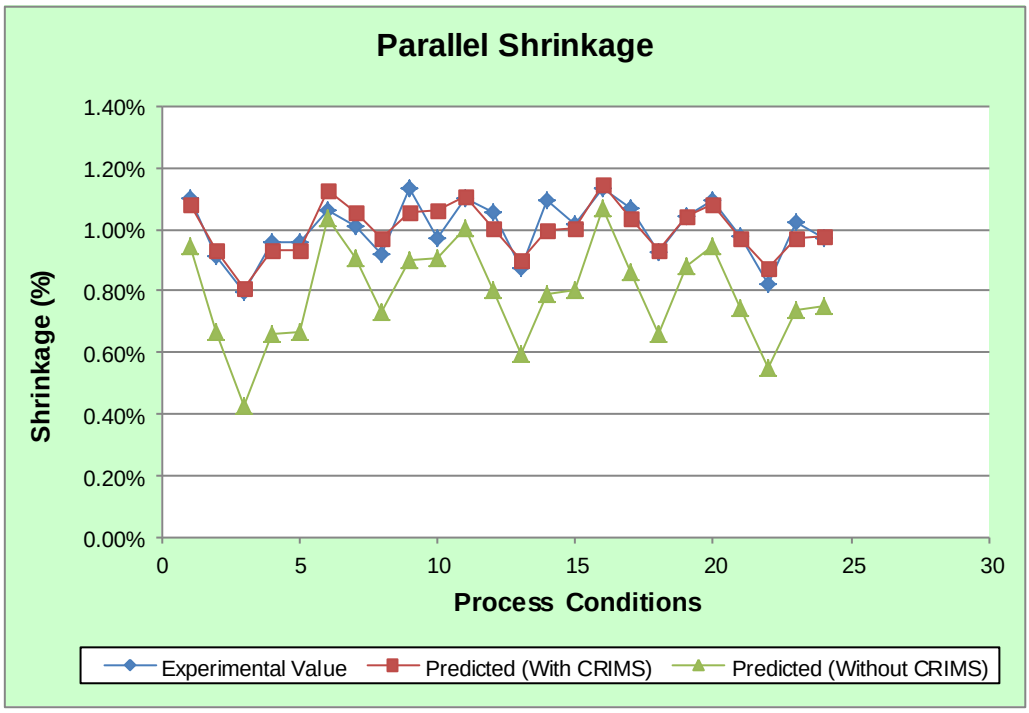
The shrinkage models shown above are valid for Autodesk Simulation Moldflow Insight 2015. Shrinkage models for previous software versions are included in the 21000.udb file.

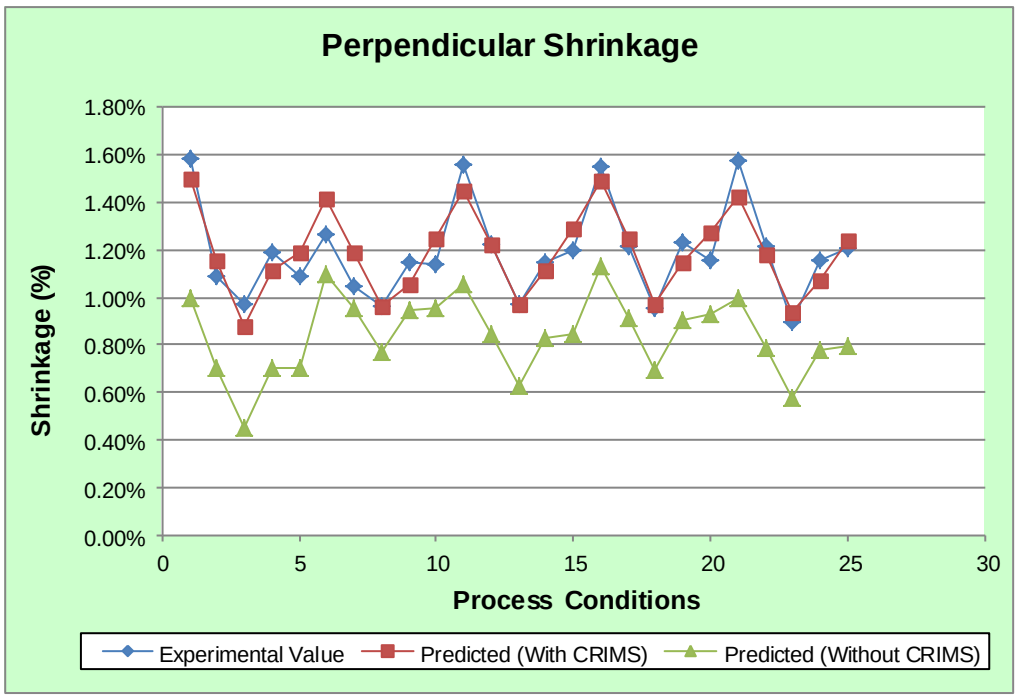
Observed Shrinkage

Observed nominal shrinkage	
Parallel	1.008%
Perpendicular	1.189%

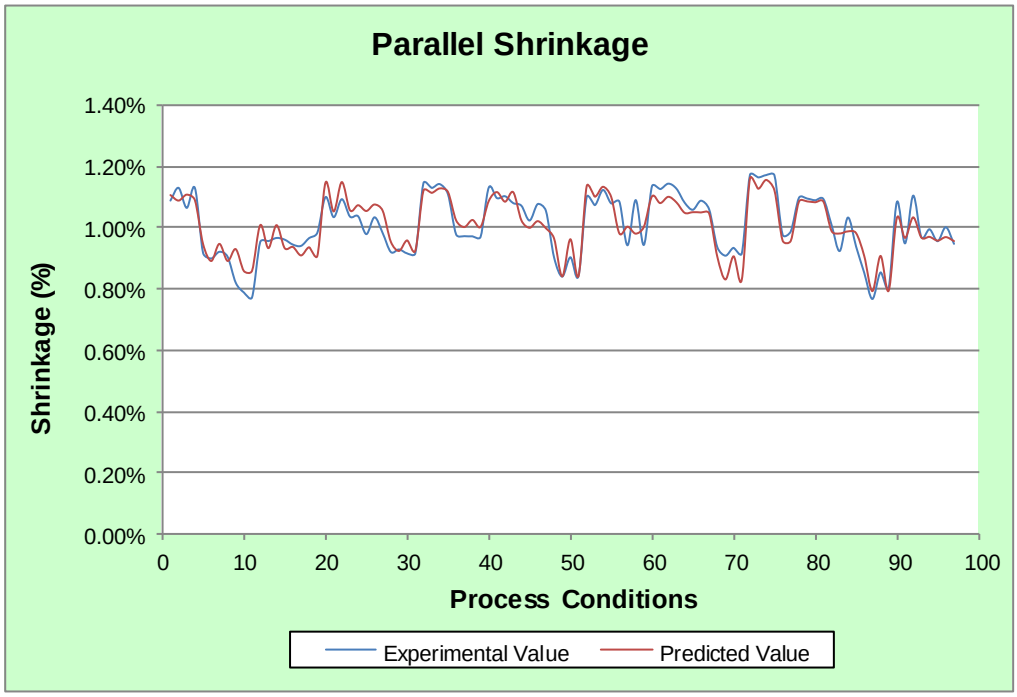
Observed shrinkage	
Minimum Parallel	0.796%
Maximum Parallel	1.170%
Minimum Perpendicular	0.896%
Maximum Perpendicular	1.581%

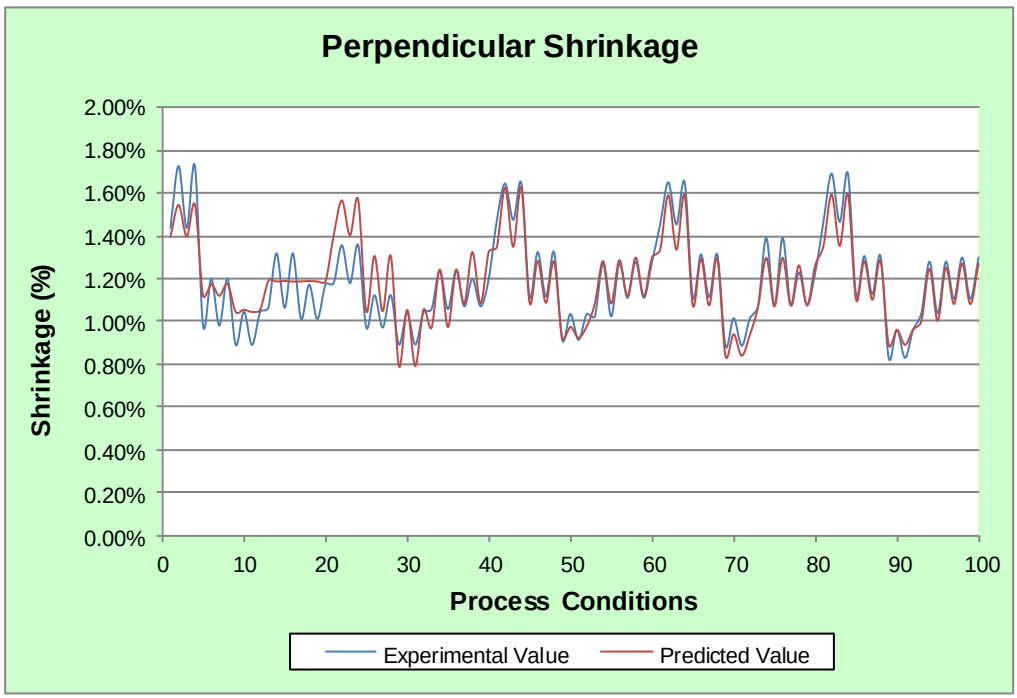
Residual Stress Plots





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:	06-OCT-14
Date Tested:	02-DEC-14

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]	3697	MPa
Elastic modulus, 2nd principal direction [E2]	3590	MPa

Poisson's ratio		
Poisson's ratio [v12]	0.3500	
Poisson's ratio [v23]**	0.3500	

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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:	06-OCT-14
Date Tested:	02-DEC-14

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]	1289	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:	06-OCT-14
Date Tested:	01-DEC-14

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	6.450e-005	1/°C
Alpha 2	6.800e-005	1/°C

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Mold verification

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

Instrument:
Krauss Maffei KM160-750CX Injection Molding Machine

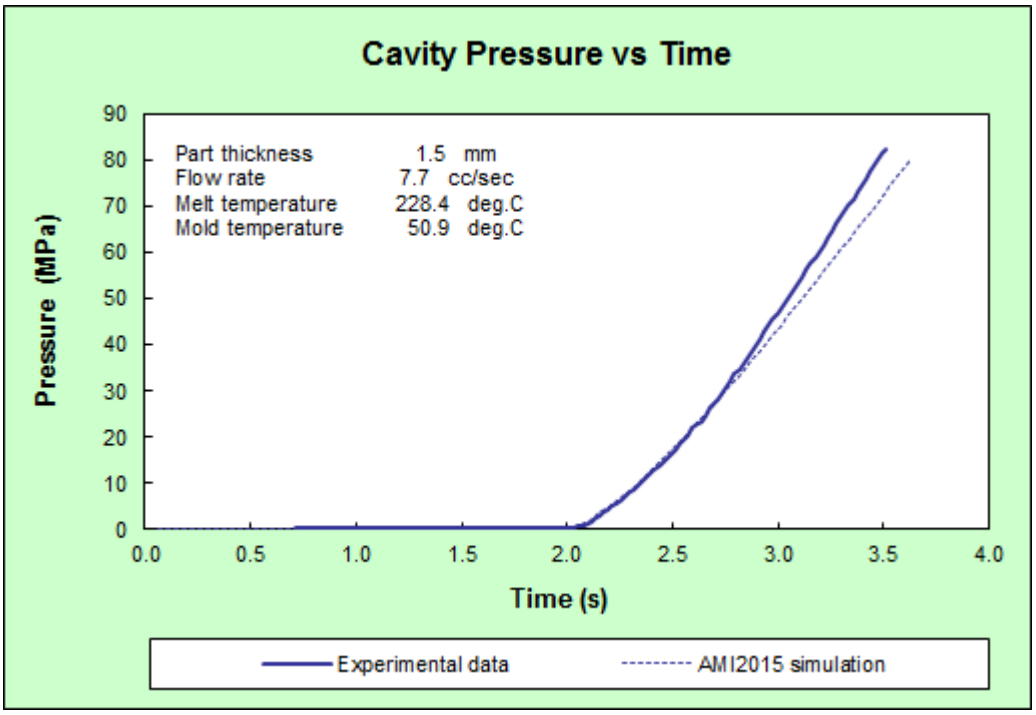
Test Specifications:

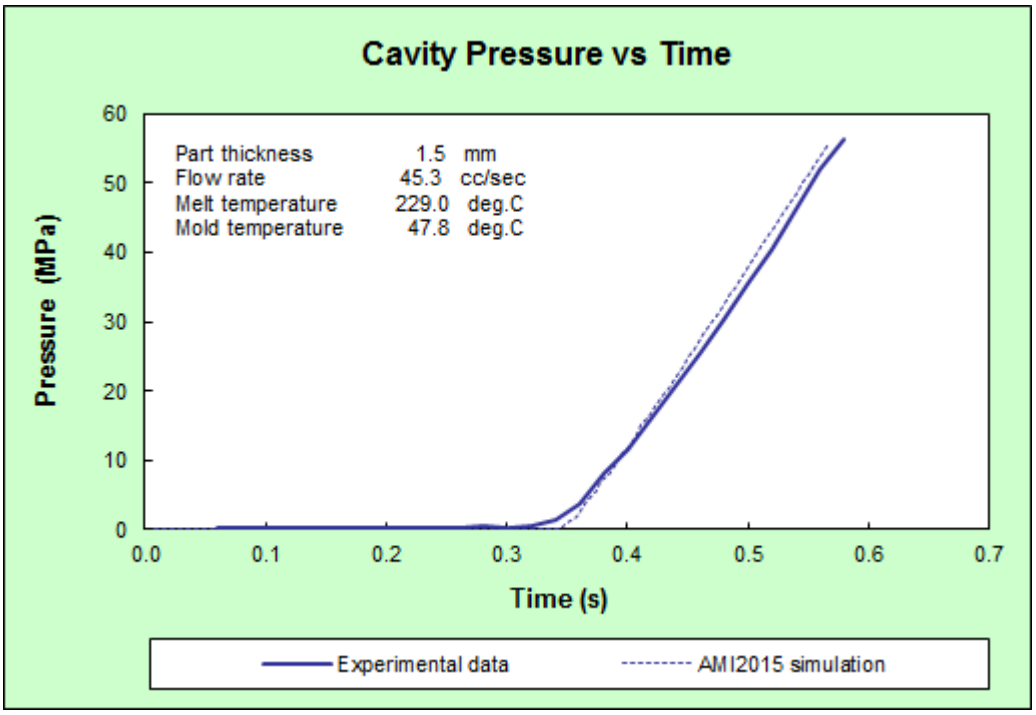
Sample Form:	Pellets
Pre-Processing:	Dried at 70°C for 1 hours in a hopper dryer
Moisture Level:	0.0136 %
Date Received:	06-OCT-14
Date Tested:	24-NOV-14

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

1.5mm tag die

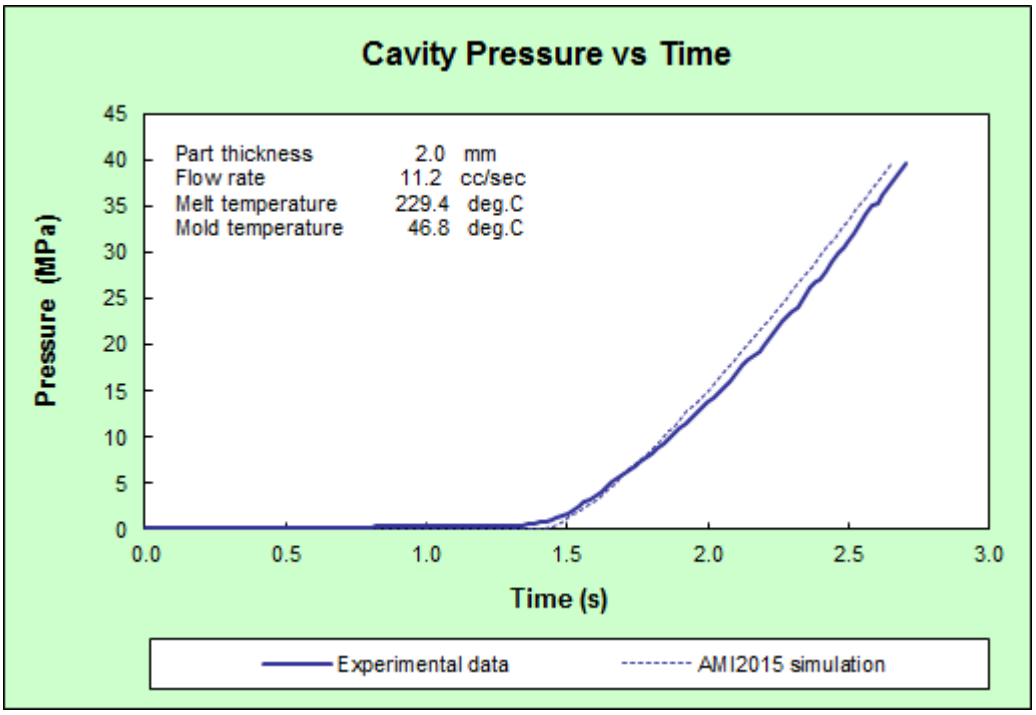
Experiment Number	Flow Rate (cc/sec)	Melt Temperature	Mold Temperature
Cyc0045	7.7	228.4	50.9
Cyc0057	45.3	229	47.8

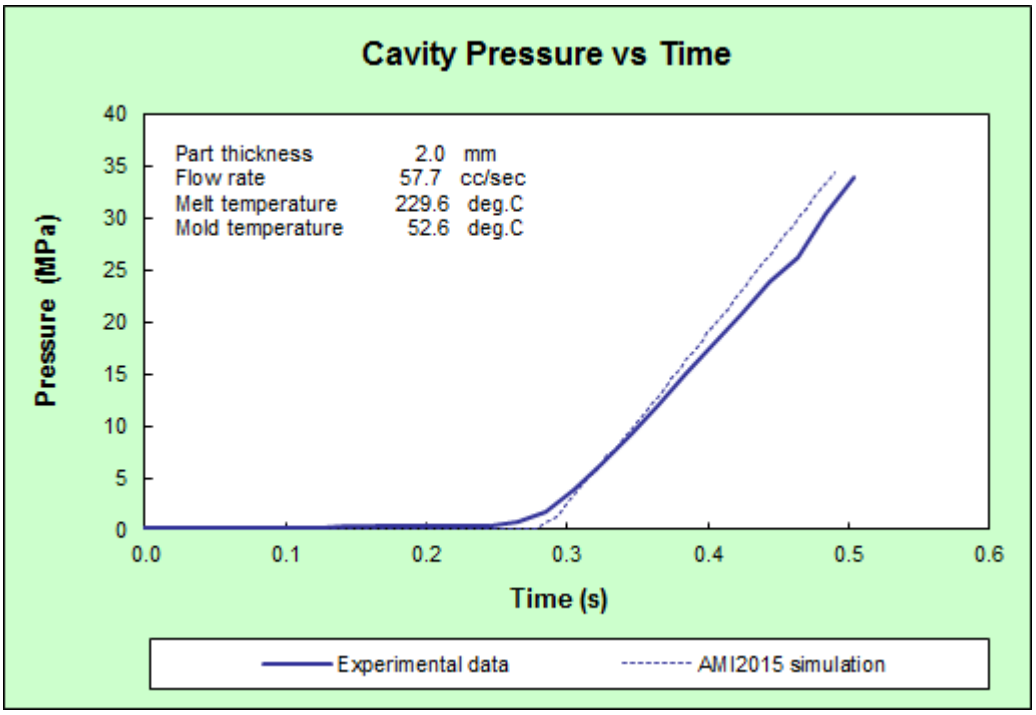




2mm tag die

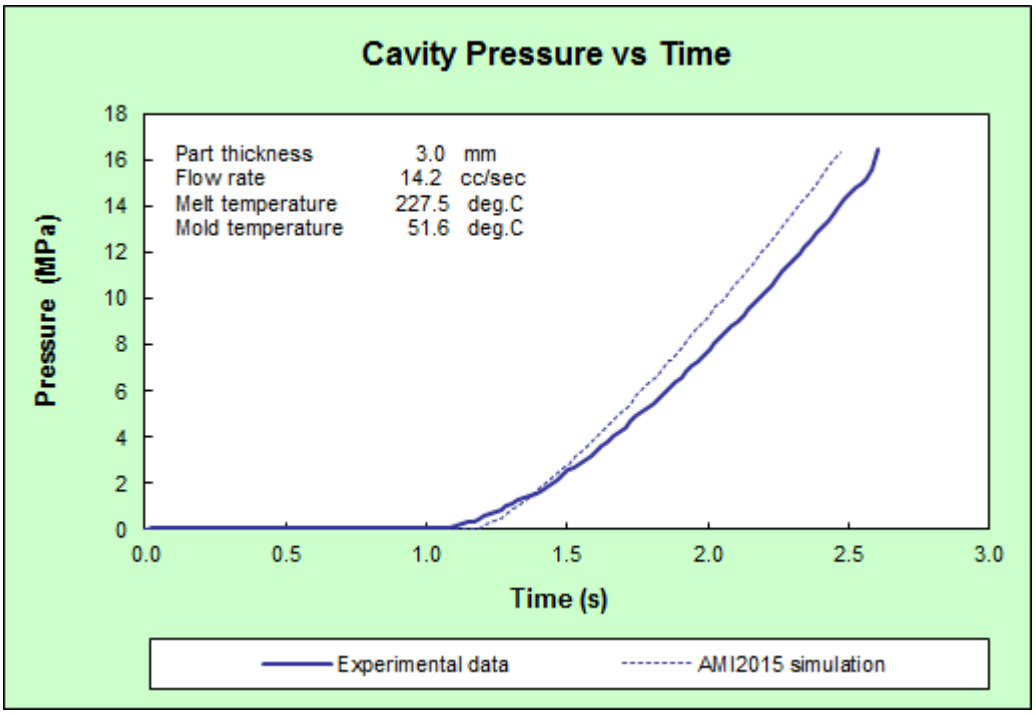
Experiment Number	Flow Rate (cc/sec)	Melt Temperature	Mold Temperature
Cyc0084	11.2	229.4	46.8
Cyc0096	57.7	229.6	52.6

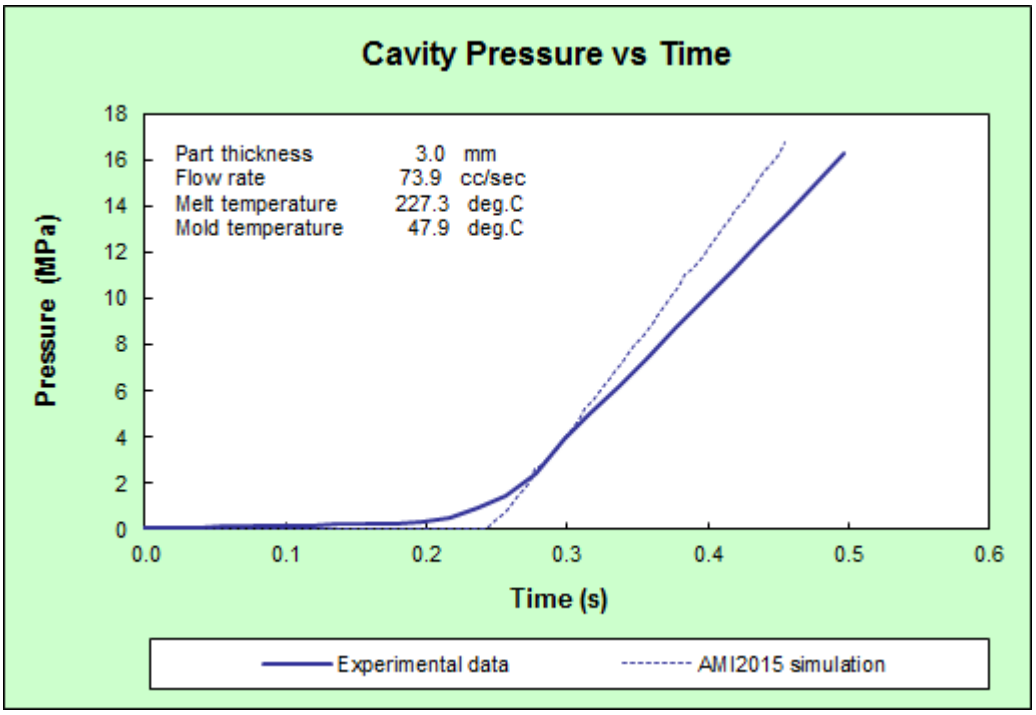




3mm tag die

Experiment Number	Flow Rate (cc/sec)	Melt Temperature	Mold Temperature
Cyc0007	14.2	227.5	51.6
Cyc0020	73.9	227.3	47.9





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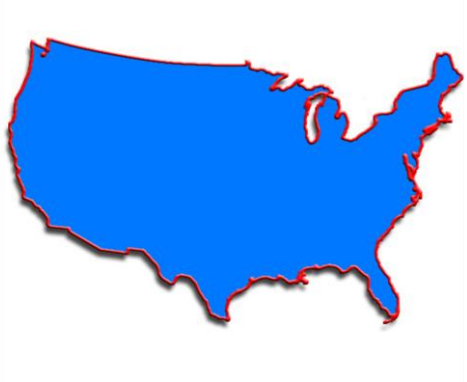

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