



INTERNAL CORRESPONDENCE

RECEIVED

DEC 6 1968

R. N. Wheeler

CHEMICALS AND PLASTICS

SOUTH CHARLESTON PLANT P. O. BOX 8004, SOUTH CHARLESTON W. VA. 25304

To (Name)

Mr. W. A. McClain

Date

December 3, 1968

Company

Location

SOUTH CHARLESTON PLANT Originating Dept.

Answering letter date

Copy to

Mr. H. V. Hooper, Jr.
Mr. W. O. Rodgers

Subject

New Resin Solution Products

*These accounts have been opened
as requested*

Dear Mr. McClain:

Please issue the following 885 account numbers:

1. To cover the cost of initial production of resin solution MA-34-18 (Product Code 77166). This is a new hydrolyzed polyvinyl acetate resin solution in methyl acetate.

Initial production was undertaken in November for market development. When this product becomes established in about three months, we will issue an estimated standard cost and close this account.

2. To cover the cost of initial production of new resin solution product AU-42 (Product Code 76422). This solution is 42 percent solids in acetone and ethanol.

Initial production was undertaken in November for market development. When this product becomes established in about three months, we will issue an estimated standard cost and close this account.

Very truly yours,

R. N. Wheeler
R. N. Wheeler, Jr.

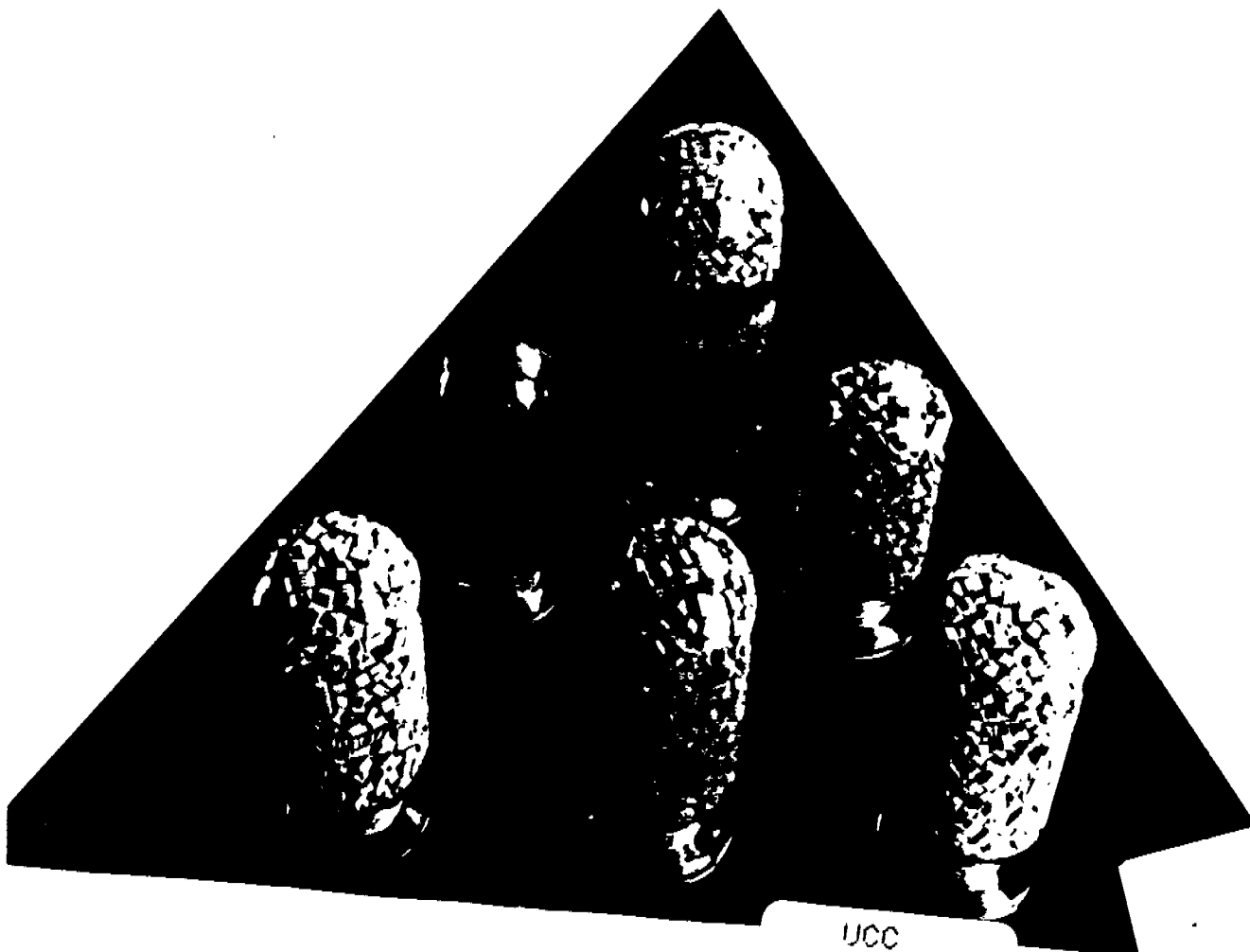
RNWJr/ra

UCC
040010

BFGoodrich

PM-2

Thermoplastic Materials



UCC
040011

BF Goodrich

Thermoplastic Materials

	Page
Geon® Vinyl Resins	
General Purpose Type	2
Dispersion Resins	2
Super EP Type	3
Blending Resins	3
Powder Coating Resins	3
Rigid Geon® Vinyl Compounds	
Building Products-Exterior	4
Building Products-Interior	5
For Coextrusion Capstock	6
Pipe, Pipe Fitting Compounds	7
Cellular Rigid Extrusion Compounds	7
Wire and Cable Insulation	8, 9
Wire and Cable Sheath	10, 11
Geon® Vinyl Flexible Molding and Extruding Compounds	12
Rigid Geon® Vinyls — Injection Molding Compounds	13
Telcar® Thermoplastic Elastomers	13
Estane® Thermoplastic Polyurethane Polymers	14
Compounds	14
Properties of Geon® CPVC Compounds	15
Carboset® Acrylic Resins	15
Metric Terminology	16

GEON® VINYL RESINS—GENERAL PURPOSE TYPE

	Inherent Viscosity ¹	Porosity ² (cm ³ /gm)	Heat Loss % Max.	Particle size		ASTM Classification
				% thru 40 mesh (425 μ m)	Max % thru 140 mesh 106 μ m)	
Geon® 102EP F-5	1.13	0.30	0.30	100	20	GP-6-15443
Geon® 103EP	1.02	0.25	0.30	100	20	GP-5-15543
Geon® 103EP F-76	0.92	0.20	0.30	100	20	GP-4-16043
Geon® 110X334	0.68	0.12	0.30	100	35	GP-1-16100

¹ASTM D 1243-66

²ASTM D 2873-70

GEON® VINYL DISPERSION RESINS

			General Purpose		Foam				Low Fusion	Specialty Resins		
			Geon® 121	Geon® 128	Geon® 124	Geon® 124F-1	Geon® 120X261	Geon® 120X241	Geon® 135	Geon® 120X271	Geon® 130X17*	
Inherent viscosity, ASTM D 1243-66			1.20	1.20	0.89	0.92	1.00	0.73	1.12	1.40	1.40	
Specific gravity (approx.)			1.40	1.40	1.40	1.40	1.40	1.40	1.39	1.40	1.39	
FDA-acceptable			Yes	Yes	Yes	Yes	Yes	Yes	Ltd.	Yes	Yes	
Flow Properties												
Brookfield RVF	1 hour	2 RPM	7 000	4 900	4 400	32 000	4 800	4 000	8 000	9 400	17 500	
		20 RPM	4 500	3 500	3 800	13 000	3 600	3 000	6 500	3 800	11 000	
	1 day	2 RPM	10 500	8 800	5 800	40 000	8 800	5 000	12 000	11 200	25 000	
		20 RPM	8 000	6 700	5 000	19 500	6 500	4 400	10 000	4 700	19 000	
	1 week	2 RPM	13 500	13 000	7 500	47 500	10 000	5 500	16 000	13 100	25 000	
		20 RPM	10 000	9 500	6 800	23 500	7 500	5 000	12 000	5 800	20 000	
	1 month	2 RPM	17 000	20 000	10 000	52 500	16 000	7 000	25 000	15 600	—	
		20 RPM	13 000	14 000	7 200	20 500	12 000	5 500	20 000	7 200	—	
	Severs efflux¹	1 day		16.0	30.0	21.0	22.0	20.0	35.0	12.0	35.0	8.0
		1 week		14.0	25.0	20.0	20.0	19.0	34.0	10.0	32.0	7.0
1 month			12.0	20.0	19.0	16.0	18.0	33.0	8.0	28.0	6.0	
Gelation temperature												
Hot plate gel, °C (°F)			75 (168)	76 (170)	71 (160)	71 (160)	74 (165)	68 (155)	65 (150)	92 (198)	65 (150)	
Film properties², tensile strength at												
135°C (275°F)												
MPa			6.9	6.9	6.5	5.4	6.9	5.2	11.0	5.2	—	
(psi)			(1,000)	(1,000)	(950)	(780)	(1,000)	(750)	(1,600)	(750)	—	
149°C (300°F)												
MPa			11.0	10.3	11.0	8.1	11.0	9.0	16.5	10.3	8.0	
(psi)			(1,600)	(1,500)	(1,600)	(1,170)	(1,600)	(1,300)	(2,400)	(1,500)	(1,150)	
163°C (325°F)												
MPa			15.8	16.5	15.8	13.8	15.8	12.4	17.2	16.5	—	
(psi)			(2,300)	(2,400)	(2,300)	(2,000)	(2,300)	(1,800)	(2,500)	(2,400)	—	
178°C (350°F)												
MPa			19.3	20.0	18.3	15.5	18.6	13.1	19.3	19.6	14.5	
(psi)			(2,800)	(2,850)	(2,650)	(2,250)	(2,700)	(1,900)	(2,800)	(2,850)	(2,100)	
190°C (375°F)												
MPa			20.0	20.0	18.3	16.5	19.3	13.8	19.3	20.0	—	
(psi)			(2,900)	(2,850)	(2,650)	(2,400)	(2,800)	(2,000)	(2,800)	(2,900)	—	
204°C (400°F)												
MPa			19.3	18.6	17.9	17.6	19.3	13.8	17.9	18.6	14.5	
(psi)			(2,800)	(2,700)	(2,600)	(2,550)	(2,800)	(2,000)	(2,600)	(2,700)	(2,100)	
Elongation, %, at												
135°C (275°F)			100	80	100	90	100	80	200	80	—	
149°C (300°F)			200	150	200	170	200	200	300	150	190	
163°C (325°F)			350	300	375	325	375	300	350	320	—	
178°C (350°F)			425	400	400	380	400	350	400	425	380	
190°C (375°F)			425	400	400	380	400	350	400	450	—	
204°C (400°F)			400	375	400	380	400	325	380	425	380	
Test recipe: Geon® dispersion resin			100 parts	¹At 0.7 MPa (95 psi) with 1.56 mm diameter orifice						²Recipe: Geon® 130X17 100 parts		
Plasticizer			60	0.51-mm (20-mil) films fused 5 minutes at indicated temperatures, ASTM Die "C", 500 mm/min (20 IPM) ASTM D 638						Plasticizer 80		
Stabilizer			2									

UCC
040013

GEON® VINYL RESINS—SUPER EP TYPE

	Inherent Viscosity ¹	Porosity ² (cm ³ /gm)	Heat Loss % Max.	Particle size		ASTM Classification
				% thru 30 mesh (600 μm)	Max. % thru 100 mesh (160 μm)	
Geon® 99	1.37	0.60	0.30	100	<5	GP-8-14440
Geon® 92	1.02	0.45	0.30	100	<1	GP-5-15443

¹ASTM D 1243-66

²ASTM D 2873-70

GEON® VINYL BLENDING RESINS

	Test Method	Geon® 100X122	Geon® 101F-4	Geon® 140X30	Geon® 140X31	Geon® 140X32
Inherent viscosity	ASTM D 1243-66	0.85	1.10	.74	.84	.76
Specific gravity (approx.)		1.40	1.40	1.40	1.40	1.40
FDA acceptable		yes	yes	yes	yes	yes
Flow Properties						
Brookfield LVF viscosity	SPI-VD-T1					
Initial		2800	3500	4800	5800	5500
12 RPM		2600	3500	4400	5300	5000
1-Day		3200	4200	6000	7500	7000
12 RPM		3000	4200	5800	6700	6500
1-Wk		3500	5000	8000	8000	8000
12 RPM		3400	5000	7400	7800	7700
1-Month		4500	6000	9000	10000	10000
12 RPM		4300	6000	8600	9600	93000
Severs Efflux ¹	SPI-VD-T2					
(gm/100 sec)		75.9	56.7	43.2	37.5	38.8
Fineness of grind, vinyl dispersion gauge	SPI-VD-T10	170-200	110-140	90-130	100-140	100-140
Gloss, Gardner reflectance at 60° angle ²		38	27	36	19	24
Gel temperature °C (°F)	SPI-VD-T18	89 (192)	96 (205)	84 (189)	79 (175)	79 (175)
Clarity, percent of light transmitted through 20 mil film		58	50	63	38	50
Film Properties³						
Tensile strength, MPa (psi)	ASTM D 822-56T					
at 149°C (300°F)		8.4 (1220)	8.3 (1200)	10.0 (1450)	11.7 (1700)	11.4 (1650)
163°C (325°F)		11.2 (1625)	9.9 (1440)	12.4 (1800)	13.9 (2020)	13.4 (1950)
177°C (350°F)		12.3 (1785)	12.4 (1800)	19.6 (2115)	15.8 (2300)	15.8 (2375)
191°C (375°F)		13.4 (1950)	14.9 (2166)	15.5 (2250)	16.5 (2400)	16.4 (2385)
204°C (400°F)		15.2 (2200)	16.9 (2450)	14.1 (2050)	16.5 (2400)	16.1 (2333)
Elongation, % at						
149°C (300°F)		183	137	220	223	215
163°C (325°F)		230	196	287	300	295
177°C (350°F)		280	240	325	353	360
191°C (375°F)		310	303	390	380	356
204°C (400°F)		320	325	373	340	343

Test Recipe:

Geon® 121	60 Parts
Geon® blending resin	40
plasticizer	60
stabilizer	2

¹At 0.7 MPa (95 psi) with .1560 cm diameter orifice

²Samples fused 5 minutes at 177°C (350°F)

³20 mil films fused 5 minutes at indicated temperature, ASTM Die "C", 500 mm/min (20 IPM)

GEON® POWDER COATING RESINS

Geon® powder coating resins are fine particle size resins with a narrow particle size distribution. They dry blend well in high intensity mixers and are well accepted in the electrostatic spray and fluidized bed coating market. Vinyl powder compounds made with Geon® powder coating resins readily melt and flow into durable, continuous coatings when heated to 204-232°C (400-450°F).

	Inherent Viscosity	Plasticizer Sorption, phr	Porosity, cc/gm	Heat Loss, % maximum
Test Method	ASTM D 792	BFG 838	BFG 511-A	BFG 793-C
Geon® 140X31	84	>90	0.20	0.30
Geon® 140X32	76	>80	0.15	0.30
	% thru 40 mesh	Particle Size % thru 100 mesh	% thru 200 mesh	ASTM Classification
Test Method		BFG 812-F		ASTM D 1756
Geon® 140X31	100	>95	>25	GP3-46343
Geon® 140X32	100	>95	>25	GP2-46243

RIGID GEON[®] VINYL COMPOUNDS— BUILDING PRODUCTS—EXTERIOR

Extrusion Compounds

NOTE: All tests were run at room temperature except where indicated	ASTM Test Method	Profile Normal Impact		Sheet and Profile Impact Modified	
		7082	7084	85862	85857
Cell classification	D 1784-69	13454-C	12454-C	14354-C	13344-C
Form of compound		cube	cube	powder	cube
Specific gravity, ± 0.02	D 792	1.46	1.46	1.46	1.46
Hardness, Durometer D ± 3	D 785	78	80	78	82
Compression strength	D 695				
MPa		70	66	—	—
(psi)		(10,100)	(9,600)	—	—
Flexural strength	D 790				
MPa		112	100	81	78
(psi)		(16,200)	(14,500)	(11,800)	(11,300)
Tensile strength at	D 638				
26°C (78°F)					
MPa		49	50	44	43
(psi)		(7,100)	(7,300)	(6,400)	(6,200)
0°C (32°F)					
MPa		—	62	—	—
(psi)		—	(9,000)	—	—
-40°C (-40°F)					
MPa		—	83	—	—
(psi)		—	(12,000)	—	—
Flexural modulus	D 790				
MPa		—	—	3 284	2 825
(psi)		—	—	(476,000)	(410,000)
Tensile modulus	D 638				
MPa		2 829	2 898	3 105	2 446
(psi)		(410,000)	(420,000)	(450,000)	(355,000)
Tensile impact strength	D 1822				
joules/cm (ft•lbs/inch)		38 (71.2)	—	40 (75.7)	—
Heat deflection temperature	D 648				
at 1.82 MPa (264 psi)		72°C (161°F)	71°C (160°F)	73°C (163°F)	73°C (163°F)
Izod impact strength, notched	D 256				
joules/cm (ft•lbs/inch) at 23°C (72°F)		0.95 (1.8)	0.74 (1.4)	4.24 (8.0)	2.01 (3.8)
0°C (32°F)		0.53 (1.0)	0.37 (0.7)	—	0.95 (1.8)
-27°C (-18°F)		0.42 (0.8)	0.26 (0.5)	—	—
High current arc resistance, UL 746		no ignition			
Hot wire ignition, UL 746		no ignition			
Arc resistance	D 495	6/6			
seconds to track/seconds to ignite					
High voltage arc resistance, UL 746		3/no ignition			
seconds to track/seconds to ignite					
Arc tracking rate, UL 746					
cm/min		30-38			
in/min		(12-15)			
Dielectric strength	D 149				
volts/mm, normal		28 920			
moist		31 008			
(volts/mil), normal		(734)			
moist		(787)			
Volume resistivity, megohm-cm	D 257				
normal		7.55 x 10 ⁸			
moist		6.10 x 10 ⁸			
Coefficient of linear expansion	D 696				
10 ⁻⁵ cm/cm, °C (10 ⁻⁵ in/in, °F)		6.3 (3.5)	5.2 (2.9)	6.3 (3.5)	5.9 (3.3)
Coefficient of thermal conductivity	C 177				
W/m•K, °C (BTU, in/ft ² , h, °F)		0.19 (1.3)	0.14 (1.0)	—	—

UCC
040015

RIGID GEON* VINYL COMPOUNDS*— BUILDING PRODUCTS—INTERIOR

Extrusion Compounds

NOTE: All tests were run at room temperature except where indicated	ASTM Test Method	Profile						Sheet and Profile
		8700A ^{1,2}	8702	82862	87262	87255	87256	
Cell classification	D 1784-69	16344	16234	13364	16344	12453	15354	12464
Form of compound		cubes	cubes	cubes	cubes	cubes	cubes	cubes
Specific gravity ±0.02	D 792	1.39	1.39	1.37	1.39	1.34	1.41	1.42
Hardness Rockwell R	D 785	111	107	117	111	112	113	118
Durometer D=3	D 2240	82	81	80	82	78	78	81
Compression strength	D 695							
MPa		56	50	66	56	—	—	66
(psi)		(8,100)	(7,200)	(9,600)	(8,100)	—	—	(9,500)
Flexural strength	D 790							
MPa		76	96	90	78	90	88	90
(psi)		(11,000)	(14,000)	(13,000)	(11,300)	(13,000)	(12,700)	(13,000)
Tensile strength	D 638							
MPa		43	37	47	42	50	45	52
(psi)		(6,200)	(5,400)	(6,800)	(6,150)	(7,200)	(6,600)	(7,500)
Flexural modulus	D 790							
MPa		2,415	3,101	3,307	2,598	2,963	3,231	3,243
(psi)		(350,000)	(450,000)	(480,000)	(377,000)	(430,000)	(469,000)	(470,000)
Tensile modulus	D 638							
MPa		2,691	2,412	3,514	2,308	2,898	2,756	3,714
(psi)		(390,000)	(350,000)	(510,000)	(355,000)	(420,000)	(400,000)	(460,000)
Heat distortion temperature at 1.82 MPa (264 psi), °C (°F)	D 648							
		73 (163)	73.5 (164)	73.5 (164)	77 (171)	66 (151)	73.5 (164)	74 (165)
Izod impact strength, notched	D 256							
joules/cm (ft-lb/inch) at								
23°C (73°F)		9.0 (17)	11 (21)	1.0 (2.0)	7.3 (13.8)	0.7 (1.3)	5.3 (10.0)	0.5 (1.0)
0°C (32°F)		0.9 (1.6)	1.5 (2.8)	0.5 (1.0)	—	0.3 (0.6)	—	0.4 (0.8)
-18°C (0°F)		0.5 (1.0)	0.8 (1.4)	0.4 (0.8)	—	0.3 (0.6)	—	0.3 (0.6)
Modified Izod, unnotched at	D 256							
23°C (73°F)		35+ (64+)	35+ (64+)	35+ (64+)	—	—	—	35+ (64+)
0°C (32°F)		35+ (64+)	35+ (64+)	35+ (64+)	—	—	—	35+ (64+)
-18°C (0°F)		23+ (42+)	12 (23)	13 (24)	—	—	—	6 (12)
Dielectric constant	D 150							
60 Hz at 30°C (86°F)		3.9	3.9	3.7	—	—	—	3.7
1000 Hz at 30°C (86°F)		3.3	3.3	3.6	—	—	—	3.6
Power factor	D 150							
60 Hz at 30°C (86°F)		2.9	2.9	1.2	—	—	—	1.2
1000 Hz at 30°C (86°F)		4.0	3.3	2.8	—	—	—	2.8
High current arc resistance, UL 746		no ignition	—	—	—	—	—	—
Hot wire ignition, UL 746		no ignition	—	—	—	—	—	—
Arc resistance	D 495							
seconds to track/seconds to ignite		6/7	—	—	—	—	—	—
High voltage arc resistance, UL 746		2-3/no ignition	—	—	—	—	—	—
seconds to track/seconds to ignite		—	—	—	—	—	—	—
Arc tracking rate, UL 746								
cm/min		38-45	—	—	—	—	—	—
(in./min)		(15-18)	—	—	—	—	—	—
Dielectric strength	D 149							
volts/mm, normal		27,186	27,186	55,160	—	—	—	55,160
moist		27,580	27,580	—	—	—	—	—
(volts/mil) normal		(690)	(690)	(1,400)	—	—	—	(1,400)
moist		(700)	(700)	—	—	—	—	—
Volume resistivity, megohm-cm	D 257							
normal		5.1 x 10 ⁹	—	—	—	—	—	—
moist		5.1 x 10 ⁹	—	—	—	—	—	—
Coefficient of linear expansion	D 696							
10 ⁻⁵ cm/cm, °C (10 ⁻⁵ in./in., °F)		6.6 (3.7)	5.8 (3.3)	5.7 (3.1)	6.6 (3.7)	6.8 (3.8)	6.0 (3.3)	5.7 (3.1)
Coefficient of thermal conductivity	D 177							
W/m °C		0.16 (1.1)	0.16 (1.1)	0.16 (1.1)	0.16 (1.1)	—	—	0.16 (1.1)
(BTU, in./ft ² , h., °F)		—	—	—	—	—	—	—
Drop impact resistance	D 3029							
1.5 mm (0.060 inch) thick		19 (14)	19 (14)	23 (17)	—	—	—	19 (14)
joules (ft./lbs)		—	—	—	—	—	—	—

¹Flammability class UL 94V-0

²Underwriters Laboratories yellow card listing

*These compounds are not recommended for exterior applications

All data are based on natural color

UCC
040016

References to flammability (flame spread, fuel contribution) and products of combustion (smoke density, combustion gases), as well as descriptive terms relating to combustion characteristics such as flame-retardant or flame-retarded, describe material response to heat and flame under controlled laboratory conditions and do not reflect performance in actual fire conditions.

GEON® VINYL COMPOUNDS FOR COEXTRUSION CAPSTOCK

Form of compound	ASTM Test Method	86100 ¹ cube	Geon 86101 ² cube	86103 ² cube
Specific gravity, ± 0.02	D 792-60T		1.43	
Tensile strength, MPa (psi)	D 882-75			
with grain, yield			20.7 (3,000)	
with grain, rupture			30.0 (4,350)	
across grain, yield			20.3 (2,950)	
across grain, rupture			32.4 (4,700)	
Tensile elongation, %	D 882-61T			
with grain, yield			2-3	
with grain, rupture			220	
across grain, yield			2-3	
across grain, rupture			220	
Tear resistance	D 1004-61			
kN/m (lbs./mil), with grain			89.25 (0.51)	
kN/m (lbs./mil), across grain			87.50 (0.50)	
Dimensional stability, %				
shrinkage, 4" disc in air oven				
10 minutes at 80°C (176°F)			2-4	
10 minutes at 130°C (266°F)			5	
10 minutes at 200°C (392°F)			30	
Water absorption				
24 hours at 23°C (73°F),	D 570-63			
% volume change			0.91	
WVTR, gms/100 sq.m/24 hrs	E 96-65T		20.2	
(gms/100 sq.in/24 hrs)			(1.2)	
Dielectric strength, volts/mm (volts/mil)	D 149-64T		99,446 (2,524)	
Dielectric constant, 100 cps	D 150-65T		3.4	
Volume resistivity, ohm/cm ² x 10 ⁶	D 257-61		2.91	

¹High gloss, sample thickness .08mm (3 mil) film, ASTM 523-67

²Low gloss, sample thickness .08mm (3 mil) film, ASTM 523-67

Weatherable Capstock Colors of Geon® Vinyl

The capstock approach involves the marriage of two materials, each providing its own best characteristics. Capstocks (3-5 mil) of Geon® vinyl coextruded or laminated over a substrate provide a range of colors, some of which can only be attained by the capstock approach. It provides toughness by way of scratch, mar, abrasion, and stain resistance. Economics often favor the composite approach because the most efficient use is made of each material. Thirteen capstock colors are currently available.

RIGID GEON® VINYL—PIPE, PIPE FITTING COMPOUNDS

ASTM Test Method	Pipe Fitting Compounds Cubes		Pipe Extrusion Compounds Powder			Pipe Extrusion Compounds Cubes					
	Geac® 85798	Geac® 85690	Geac® 85483	Geac® 85781	Geac® 85707	Geac® 8714	Geac® 85781	Geac® 8781	Geac® 85555	Geac® 85672	
Classification, type-grade	I-1	II-1	I-1	I-1	I-1	II-1	I-1	I-1	I-1	II-1	
Specific gravity, ±0.02	D 792	1.41	1.35	1.38	1.40	1.40	1.35	1.40	1.38	1.38	1.35
Hardness, Durometer D, ±3	D 2240	74	83	83	81	82	78	81	80	83	80
Hardness, Rockwell R	D 785	112	111	113	115	117	107	115	113	113	113
Tensile strength, MPa (psi)	D 638	49 (7,075)	47 (6,725)	50 (7,120)	51 (7,300)	52 (7,450)	43 (6,100)	51 (7,300)	51 (7,300)	50 (7,120)	48 (6,850)
Tensile modulus, MPa (psi)	D 638	3 180 (455,500)	2 736 (392,000)	2 792 (400,000)	2 932 (420,000)	3 211 (460,000)	2 373 (340,000)	2 932 (420,000)	2 862 (410,000)	2 792 (400,000)	2 827 (405,000)
Flexural strength, MPa (psi)	D 790	90 (12,930)	94 (13,420)	93 (13,300)	91 (13,100)	101 (14,480)	80 (11,500)	91 (13,100)	105 (15,000)	93 (13,300)	85 (12,200)
Flexural modulus, MPa (psi)	D 790	— —	— —	2 932 (420,000)	3 135 (455,000)	3 204 (465,000)	2 653 (385,000)	3 135 (455,000)	2 860 (415,000)	2 932 (420,000)	2 771 (397,000)
Izod impact strength notched 23°C (73°F), joules/cm (ft-lb/in)	D 256	0.71 (1.34)	7.36 (13.90)	1.16 (2.20)	0.46 (0.88)	0.39 (0.75)	7.95 (15.00)	0.46 (0.88)	0.42 (0.80)	1.16 (2.20)	9.01 (17.00)
Heat deflection temp. at 1.8 MPa (264 psi) °C (°F)	D 648	73 (164)	75 (168)	72 (162)	74.9 (167)	16.6 (170)	72.6 (161)	74.9 (167)	70 (158)	72 (162)	72.7 (163)
Shear	—	—	High Single Screw	High Single Screw	Multi- screw	Low	High	Low	High	High	High
NSF approval	T I-G1 for potable water, DWV	T II-G1 for potable water	1120 for potable water; T I-G1 for DWV	1120 for potable water; T I-G1 for DWV	1120 for potable water; T I-G1 for DWV	2110 for potable water	1120 for potable water; T I-G1 for DWV	1120 for potable water; T I-G1 for DWV	1120 for potable water; T I-G1 for DWV	2116 for potable water	2116 for potable water

CELLULAR RIGID GEON® PVC EXTRUSION COMPOUNDS

	ASTM Test Method	Interior		Exterior
		Geac® 85721	Geac® 87081	Geac® 85858
Specific gravity, expanded, gms/cc	D 792	.50-.80	.70-.80	.70-.80
Tensile strength, MPa (psi)	D 638	10-12 (1,400-1,700)	14-17 (2,000-2,500)	17-21 (2,500-3,000)
Flexural modulus, MPa (psi)	D 790	1,035-1,380 (150M-200M)	1,380-1,725 (200M-250M)	1,378-1,723 (200M-250M)
Flexural strength, MPa (psi)	D 790	23-32 (3,300-4,600)	31-35 (4,500-5,000)	36-38 (5,200-5,700)
Elongation, %	D 638	38-40	40-45	40-65
Stiffness, MPa (psi)	D 747	317-442 (46M-64M)	414-449 (60M-65M)	379-413 (55M-60M)
Heat distortion, °C at 1.8 MPa (264 psi)	D 648	57-68	65	66
Hardness, Durometer D	D 2240	40-50	55	55
Coefficient of linear thermal expansion 10° cm/cm, (10° in/in, °F)	D 696	6.3 (3.5)	5.6 (3.1)	5.6 (3.1)
Izod impact strength, notched joules/cm (ft-lbs/inch)		0.6 (1.2)	0.6-0.7 (1.2-1.4)	0.7 (1.4)

M indicates thousands

For application ideas and design information about our products, see our companion publication, *Designing With Thermoplastics, PM-1*.

UCC
040018

GEON® VINYL FOR WIRE AND CABLE INSULATION

	Test Method	Test Condition	Geon® 2042	Geon® 8610	Geon® 8730	Geon® 8800	Geon® 8801-021	Geon® 8801-025	Geon® 8803
Specific gravity ($\pm .02$)	ASTM D 792	40 mil molded sheets	1.31	1.39	1.37	1.35	1.37	1.37	1.32
Instantaneous hardness (± 3)	ASTM D 2240		87A	86A	74C	79C	90A	90A	86A
Tensile strength, MPa (psi)	ASTM D 412		17.23 (2500)	13.78 (2000)	16.54 (2400)	20.67 (3000)	17.23 (2500)	17.23 (2500)	19.29 (2800)
Elongation, %	ASTM D 412	75 mil sheets	300	270	275	250	300	300	300
Modulus at 100% elongation, MPa (psi)	ASTM D 412		10.34 (1500)	8.96 (1300)	10.68 (1550)	20.40 (1800)	11.71 (1700)	11.71 (1700)	10.34 (1500)
Brittleness temperature, °C (°F)	ASTM D 746	75 mil sheets	-30 (-22)	-25 (-13)	-20 (-4)	-10 (14)	-30 (-22)	-	-30 (-22)
Low temperature flexibility, °C (°F)	UL 83	14 AWG 2/64" wall	-40 (-40)	-30 (-22)	-40 (-40)	-30 (-22)	-40 (-40)	-	-40 (-40)
Retention of elongation, %	UL 83	14 AWG 2/64" wall	90	75	-	-	95	-	70
Over aging		7 days at 100°C	65	-	80	-	70	-	-
		7 days at 113°C	-	-	75	95	-	75	-
		7 days at 121°C	-	-	-	80	-	-	-
		7 days at 136°C	-	-	-	-	-	-	-
Oil aging — ASTM Oil No. 2		4 hours at 70°C	-	-	-	-	-	-	85
		4 hours at 100°C	90	70	75	70	90	-	75
		4 days at 100°C	-	-	-	85	-	-	-
		60 days at 60°C	80	70	85	-	85	-	-
		60 days at 80°C	-	-	-	-	-	-	-
Moisture absorption, mg/cm² (mg/m²)	UL 83	14 AWG 2/64" wall	1.2 (7.9)	2.3 (15.0)	-	-	-	-	1.9 (12.0)
		7 days at 70°C	-	-	1.2 (8.0)	0.7 (4.2)	1.2 (8.0)	-	-
		7 days at 82°C	-	-	-	-	-	-	-
Deformation at 121°C, %	UL 83	14 AWG 2/64" wall	29	35	25	25	33	-	40
		1 hr. 500 gram load	-	-	-	-	-	-	-
Volume resistivity at 95°C ohm-cm $\times 10^{-12}$	ASTM D 257	75 mil slab	2.5	2.2	1.4	1.8	2.1	-	0.2
Insulation resistance, megohms/km (megohms/1000 ft)	UL 83	14 AWG 2/64" wall	763 (2500)	305 (1000)	610 (2000)	1220 (4000)	305 (1000)	-	305 (1000)
		1 hour at 15.6°C	27 (90)	38 (125)	-	-	0.5 (1.8)	-	-
		12 weeks at 60°C	26 (84)	25 (83)	-	-	0.5 (1.8)	-	-
		24 weeks at 60°C	-	-	5 (17)	0.3 (0.9)	-	-	-
		12 weeks at 75°C	-	-	4 (12)	0.2 (0.8)	-	-	-
		24 weeks at 75°C	-	-	-	-	-	-	-
Dielectric strength volts/mm (volts/mil)	ASTM D 149	14 AWG 2/64" wall	27 580 (700)	29 550 (750)	29 550 (750)	27 580 (700)	33 490 (850)	-	19 700 (500)
		short time test in air	-	-	-	-	-	-	-
Dielectric constant at 1000 hz	UL 83	14 AWG 2/64" wall	6.5	6.8	6.2	4.8	4.8	-	6.0
		1 day at 30°C	-	-	5.0	2.1	2.0	-	1.5
		1-14 days change, %	-	-	3.0	1.1	1.0	-	0.9
		7-14 days change, %	-	-	-	6.9	-	5.0	-
		1 day at 75°C	-	-	-	1.6	-	1.5	-
		1-14 days change, %	-	-	-	0.9	-	0.6	-
		7-14 days change, %	-	-	-	-	-	-	-
Stock extrusion temperature, °C (°F)			177-182 (350-360)	177-182 (350-360)	188-193 (370-380)	199-204 (390-400)	188-193 (370-380)	188-193 (370-380)	182-188 (360-370)
Maximum continuous operation, °C (°F)			75 (167)	80 (140)	80 (176)	105 (223)	80 (176)	80 (176)	60 (140)
Suggested applications			T, TW, TW 60°C oil, Type UA flexible conduit	T, TW, TW 60°C oil	T, TW, TW 60°C oil, THW 60°C oil, 90°C MTW with 3/64" wall	THHN-THWN, 105°C AWM, MIL-W-16878, 80°C AWM with MIL-W-76	T, TW, TW 60°C oil, NM jacket, 80°C AWM with 2/64" wall	T, TW, TW 60°C oil, NM jacket, 80°C AWM, 75° THW	telephone cable insulation & jacket
Colors*			Ivory 030 B. Gray 247 B. Gray 249	Nat 021	Nat 021 Black 288	Trans 001 FrNat 020 Nat 021 FrNat 022	Nat 021 Black 288 Beige 326	Nat 025 FrNat 023 Black 291	Nat 021 Ivory 033 White 132 Black 288 Beige 325

*Geon® 8830, 8841, and 84203 wire data run on 20 AWG 1/64" wall

HYCAR® POLYBLEND 503-H

Preblended 55/45 Geon® vinyl/Hycar® nitrile rubber. Non-migratory. Non-volatile. Eliminates mill mixing rubber and resin. Bands immediately on a cold mill. Excellent oil, chemical, aging resistance. Excellent dielectric strength. Some uses: plastics modification, packaging, wire and cable jacketing, straps, belting, shoe welting and uppers. Crumb version (503F-1) available on a special order basis.

HYCAR® 1422 POWDER RUBBER

Plastics modification. Improves resistance to ultraviolet light and thermal degradation. Can improve plastic compound resistance to impact, oils and fuels and provide better low-temperature flexibility. A non-extractable polymeric plasticizer. Disperses quickly, uniformly. For conventional equipment. Average particle size is 0.5mm.

HYCAR® 1422X8 POWDER RUBBER

Similar to Hycar® 1422 except for improved moisture resistance. Used to modify PVC where excellent thermal and color stability are essential. Can be used in stringent interior automotive applications where a PVC compound with low fogging characteristics is essential. Average particle size is 1.2 mm.

Geon [®] 8818	Geon [®] 8825	Geon [®] 8830	Geon [®] 8841	Geon [®] 8843	Geon [®] 8852	Geon [®] 8884	Geon [®] 8891	Geon [®] 8896	Geon [®] 8898	Geon [®] 82461	Geon [®] 82718	Geon [®] 82882	Geon [®] 84203	Geon [®] 84370
1.26 66A 10.34 (1500) 400 4.13 (600) -45 (-49) -50 (-58)	1.37 86A 15.85 (2300) 275 11.02 (1600) -25 (-13) -30 (-22)	1.34 68D 23.08 (3350) 250 20.67 (3000) -15 (5) -30 (-22)	1.36 80C 20.67 (3000) 280 15.16 (2200) -20 (-4) -55 (-67)	1.35 92A 18.95 (2750) 275 13.78 (2000) -15 (5) -25 (-13)	1.37 83C 22.05 (3200) 275 13.78 (2000) -15 (5) -30 (-22)	1.30 80C 17.91 (2600) 300 13.09 (1900) -25 (-13) -40 (-40)	1.32 81C 17.23 (2500) 250 13.78 (2000) -25 (-13) -50 (-58)	1.37 82A 14.47 (2100) 275 6.89 (1000) -33 (-27) -34 (-30)	1.35 81C 19.29 (2800) 275 15.85 (2300) -13 (9) -25 (-13)	1.31 72A 11.37 (1650) 375 4.96 (720) -34 (-29) -25 (-22)	1.29 80A 12.40 (1800) 350 - (0) -18 (-22)	1.31 83C 21.70 (3150) 300 15.85 (2300) -18 (0) -30 (-22)	1.21 91A 18.60 (2700) 325 11.02 (1600) - (0) -30 (-22)	1.35 92A 22.74 (3300) 310 13.09 (1900) -25 (-13) -40 (-40)
80 - - 80 - - -	90 75 - - 70 -	- 90 - 90 -	70 - - 90 -	- 90 90 90 90	85 - - 90 65	- 75 - 70 -	- 90 - - -	90 - 95 80 -	- 80 75 100 80	- - 87 - -	- 80 - - -	70 - 66 -	- 80 -	- 89 75 -
- - -	1.5 (9.7) -	0.9 (5.8) -	2.0 (13.0) -	- 1.2 (7.8) -	2.0 (12.9) -	0.8 (5.1) -	- - -	2.0 (12.8) -	- 1.5 (9.9) -	- - -	- - -	1.2 (7.9) -	- -	- 2.4 (15.5) -
55 1.8	30 1.5	20 0.08	30 0.02	20 0.14	25 0.9	20 1.5	- 1.5	35 0.5	26 1.5	- 0.1	- 0.04	23 -	- -	50 -
238 (780) - - - - -	610 (2000) - - - -	1068 (3500) - - -	854 (2800) - - -	153 (500) 6 (20) 1.5 (5) 0.6 (1.9) 0.5 (1.7)	1068 (3500) 244 (800) 198 (650) -	1068 (3500) 244 (800) 198 (650) -	366 (1200) -	153 (500) -	747 (2450) -	- -	- -	1220 (4000) -	- -	427 (1400) -
17.730 (450) 8.5 3.0 3.0 - - -	19.700 (500) - 6.6 2.0 1.2	25.610 (650) - 4.7 1.1 1.2	25.610 (650) - - - -	23.640 (600) - 5.9 2.0 1.5	27.580 (700) 4.9 3.2 1.4	31.520 (800) - 6.5 1.0 0.5	- - -	31.520 (800) 7.1 2.3 1.5	17.730 (450) 5.02 ^a -	- -	- -	35.460 (900) 4.3	- -	- -
177-182 (350-360) 60 (140) retractile cords	188-193 (370-380) 80 (176) 80°C AWM	199-204 (390-400) 80 (176) 80°C AWM	193-199 (380-390) 60 (140) automotive primary	193-199 (380-390) 105 (223) low odor 105°C AWM	182-188 (360-370) 60 (140) NM & UF primary	188-193 (370-380) 90 (194) 75°C THW 90°C AWM	177-193 (370-380) 105 (223) 105°C AWM	177-182 (350-360) 60 (140) SPT cord MIL-W-16878	188-199 (370-390) 105 (223) TW, THW THHN, THWN molding 105°C AWM	188-193 (370-380) 105 (223) 105°C plug molding	177-182 (350-360) 90 (194) 90°C insu- lation low odor 90°C plug molding	182-188 (360-370) 60 (140) 60°C insu- lation, REA PE 220 switchboard insulation	182-188 (360-370) 90 (194) UL 224 90°C non- heat shrink- able tubing	188-193 (370-380) 105 (223) 105°C AWM, MIL-W-76 80°C insu- lation
Nat 021 White 133 Black 288	Nat 021 White 132 White 135 Black 288	Nat 021 Nat 025 Black 288	Nat 021	Trans 001 Nat 021 FrNat 022 White 128 Black 288	Nat 021 Black 288	Nat 021 FrNat 022 Black 288	Nat 021 FrNat 022 FrBlack 289 Red 750	Nat 021 White 132 Gray 250	FrNat 021 FrBlack 288	Black 288	Black 289	Nat 021	Trans 002	FrNat 022 FrBlack 289

^aGeon[®] 8898 wire data run on 14 AWG 15 mil wall

^bRun at 60 Hz

^cReferences to Fr indicate flame-retarded compounds

HYCAR[®] CTBN LIQUID RUBBER

Reduces epoxy resin crack density 400% and lessens micro-cracking from cyclic stressing. Little or no loss in structural properties, heat distortion temperature. For epoxy resins used in composites, adhesives, tooling, molding, encapsulation coatings.

GOOD-RITE[®] 3114 ANTIOXIDANT

Non-discoloring, high molecular weight, tri-functional hindered phenolic antioxidant. Non-volatile in processing. Exceptional light stability. Acceptable for use in polypropylene, polyethylene, and EPDM food contact articles and in adhesives.

GOOD-RITE[®] 3125 ANTIOXIDANT

High molecular weight, tri-functional, hindered phenolic antioxidant. Stabilizes polypropylene and polyethylene against long-term, high temperature degradation. Acceptable for use in polypropylene and polyethylene food contact articles especially where severe use-conditions are encountered.

GEON® VINYL FOR WIRE AND CABLE SHEATH

	Test Method	Test Condition	Geon® 8720	Geon® 8737	Geon® 8745	Geon® 8801-021	Geon® 8804	Geon® 8806
Specific gravity ($\pm .02$)	ASTM D 792		1.20	1.40	1.37	1.37	1.35	1.25
Instantaneous hardness (± 3)	ASTM D 2240	40 mil	84A	82A	85A	90A	83A	78A
Tensile strength, MPa	ASTM D 412	molded sheets	11.71 (1700)	13.78 (2000)	13.78 (2000)	17.23 (2500)	13.78 (2000)	15.16 (2200)
(psi)			380	300	340	300	300	375
Elongation, %	ASTM D 412		6.23 (900)	7.58 (1100)	8.96 (1300)	11.71 (1700)	11.71 (1100)	6.58 (950)
Modulus at 100% elongation, MPa	ASTM D 412		(900)	(1100)	(1300)	(1700)	(1100)	(950)
(psi)			—40	—40	—14	—22	—31	—40
Brittleness temperature, °C	ASTM D 746	75 mil sheets	(—40)	(—40)	(+10)	(—30)	(—35)	(—40)
(°F)			—60	—40	—30	—40	—62	—40
Low temperature flexibility, °C	UL 83	14 AWG 2/64" wall	(—76)	(—40)	(—20)	(—40)	(—55)	(—40)
(°F)								
Retention of elongation, %	UL 83							
Oven aging		7 days at 100°C	95	90	—	95	95	85
		7 days at 113°C	90	80	—	70	75	70
		7 days at 121°C	75	75	95	—	—	—
		7 days at 136°C	—	—	90	—	—	—
Oil aging—ASTM Oil No. 2		4 hours at 70°C	90	90	100	—	—	—
		4 hours at 100°C	—	75	—	90	—	75
		4 days at 100°C	—	—	—	—	—	—
		7 days at 60°C	—	—	85	—	90	—
		60 days at 60°C	—	—	80	85	—	—
		60 days at 80°C	—	—	—	—	—	—
Moisture absorption, mg/cm ²	UL 83	7 days at 70°C	0.9	1.9	—	—	1.6	—
(mg/in ²)			(5.8)	(12.5)	—	—	(10.2)	—
Deformation at 121°C, %	UL 83	1 hr, 500 gm load	55	30	40	35	30	80
Dielectric strength, volts/mm	ASTM D 149		23 640	23 640	31 520	33 490	23 640	19 700
(volts/mil)			(600)	(600)	(800)	(850)	(600)	(500)
Dielectric constant at 1000 Hz	UL 83	1 day at 30°C	11.2	7.1	7.2	4.8	8.0	9.5
Volume resistivity, ohm-cm x 10 ¹¹	ASTM D 257		0.004	5.2	0.136	21.0	3.7	0.008
Insulation resistance, megohms/km	UL 83	1 hour at 15.6°C	2.4	12.2	4.9	306.0	33.6	16.5
(megohms/1000 ft)			(8)	(40)	(16)	(1000)	(110)	(54)
Stock extrusion temperature, °C			160-166	182-188	182-188	188-193	182-188	182-188
(°F)			(320-330)	(360-370)	(360-370)	(370-380)	(360-370)	(360-370)
Maximum continuous operation, °C			60	80	105	80	80	60
(°F)			(140)	(176)	(221)	(176)	(176)	(140)
Suggested applications			coaxial cable, non-contaminating jacket	REA PE 7, PE 73 MIL-C-915E (black 289) 80°C jacket	105°C jacket SPT 1, 2, 3, class 12, oil resistant and oil proof cord	general purpose jacket, 60°C oil, NM jacket	general purpose jacket, CB, CATV coaxial cable	coil cords, telephone handset cords
Colors ³			Nat 021 Gray 250 Black 288	Nat 021 FrBlack 289	Nat 021	Nat 021 Gray 243 Black 288	Nat 021 FrNat 022 Gray 248 Black 288 FrBlack 290 Red 786	Nat 021 Black 288 Beige 320

¹Geon® 8806 wire data run on 20 AWG 1/64" wall

²Geon® 84350 oven aging data run on 75 mil slabs

³References to Fr indicate flame-retarded compounds

Geon® 8863	Geon® 8870	Geon® 8880	Geon® 84059	Geon® 84295	Geon® 84319	Geon® 84343	Geon® 84350	Geon® 84360
1.22 82A 14.47 (2100) 325 8.96 (1300) -76 (-60) -112 (-80)	1.26 78A 13.78 (2000) 300 6.89 (1000) -49 (-45) -40 (-40)	1.32 68C 15.16 (2200) 300 9.65 (1400) -13 (-25) -40 (-40)	1.37 85A 15.16 (2200) 300 — — -20 (-28) — —	1.55 88A 11.02 (1600) 275 7.23 (1050) -22 (-30) -40 (-40)	1.29 83A 17.23 (2500) 350 8.96 (1300) -40 (-40) — —	1.25 76A 13.78 (2000) 350 5.86 (850) -76 (-60) — —	1.23 80A 13.78 (2000) 325 6.89 (1000) -22 (-30) — —	1.41 83A 12.92 (1875) 290 7.23 (1050) -22 (-30) — —
80 — — — 80 — — — —	90 — 80 70 80 — — — —	— — 85 — — 95 — — —	70 — — — — — — —	85 — — — 85 — — — —	95 — — — — — — — —	— — — — — — — —	80 — — — — — — — —	— — — — — — — —
3.0 (19.5)	1.1 (6.9)	1.2 (7.9)	— —	2.9 (18.8)	— —	— —	— —	— —
25	35	25	—	30	—	—	—	—
23.640 (600)	27.580 (700)	31.520 (800)	— —	27.580 (700)	— —	— —	— —	— —
10.5	7.0	7.1	—	6.8	—	—	—	—
0.002 10.7 (35)	0.015 27.5 (90)	0.05 11.6 (38)	— — —	2.6 42.7 (140)	— — —	— — —	— — —	— — —
177-182 (350-360)	177-182 (350-360)	193-204 (380-400)	182-188 (360-370)	177-182 (350-360)	182-188 (360-370)	177-182 (350-360)	182-188 (360-370)	177-182 (350-360)
60 (140)	105 (221)	90 (194)	60 (140)	60 (140)	60 (140)	60 (140)	60 (140)	60 (140)
low tempera- ture, oil resistant jacket, missile cable	-40°C to 105°C jacket	non-contami- nating to polyethylene power cable jacket, MIL-C-915E special pur- pose jacket	switchboard cable jacket, REA PE 220 for indoor use	applications requiring low chlorine content jacket	REA PE 20 station wire jacket, REA PE 220 for outdoor jacket	MIL-C-915 repeated flex jacket, low temperature jacket	telephone modular cord jacket	low cost coaxial cable, CATV, and general purpose jacket
FrGray 249 Black 288 FrBlack 289	Nat 021 Gray 256 Black 288	FrBlack 288	Nat 021 Gray 243	FrBlack 290	FrNat 021 FrGray 243 FrBlack 289 FrBeige 320	FrNat 022 FrGray 243 FrBlack 289	FrTrans 001	Black 288

UCC
040022

GEON® VINYL FLEXIBLE MOLDING AND EXTRUDING COMPOUNDS

	ASTM Test Method	Geon® 8812	Geon® 8813	Geon® 8814	Geon® 8815	Geon® 8883	Geon® 83403	Geon® 83457	Geon® 83741	Geon® 83718	Geon® 83794	Geon® 8857
Specific gravity ±0.02	D 792	1.24	1.27	1.32	1.34	1.26	1.19	1.22	1.37	1.38	1.42	1.42
Hardness, Durometer A ±3¹	D 2240	65A-58A	75A-69A	85A-80A	95A-90A	90A-85A	65A-59A	78A	72A	80A	90A	70A
Tensile strength, MPa (psi)	D 412	11.3 (1,650)	13.1 (1,900)	16.5 (2,400)	19.3 (2,800)	19.3 (2,800)	11.0 (1,600)	17.3 (2,700)	10.7 (1,550)	12.1 (1,750)	15.2 (2,200)	10.4 (1,350)
Elongation, %	D 412	400	380	310	290	300	425	300	310	275	280	270
Modulus at 100% elongation, MPa (psi)	D 412	3.4 (600)	5.5 (800)	9.0 (1,300)	12.4 (1,800)	14.8 (2,150)	4.5 (650)	8.2 (1,200)	4.7 (675)	6.2 (900)	8.3 (1,200)	4.5 (650)
Brittle temperature, °C (°F)	D 746	-43 (-49)	-40 (-45)	-32 (-37)	-25 (-19)	-23 (-10)	-48 (-50)	-35 (-30)	—	—	-26 (-15)	-22 (-9)
Graves tear, kN/cm (lbf/in)	D 1004	31.5 (180)	43.8 (250)	70.0 (400)	80.5 (460)	87.0 (450)	24.5 (140)	43.8 (250)	—	—	61.3 (350)	—
Clash-Berg stiffness	D 1043	—	—	—	—	—	—	—	—	—	—	—
Modulus of rigidity at 35°C, MPa (psi)		32.4 (4,700)	144.7 (21,000)	318.3 (46,200)	463.7 (67,300)	—	—	—	—	—	—	—
TF, °C		-40	< -40	-35	-30	—	—	—	—	—	—	—
Emery 24 hrs at 70°C, % loss	D 1203	—	—	—	—	—	0.49	—	—	—	—	—
Volatility 24 hrs at 100°C, % loss	D 1203	-0.39	-0.28	0.28	—	—	—	—	—	—	—	—
Dielectric strength, volts/mm (volts/mil)	D 149	27,600 (700)	30,000 (800)	34,000 (720)	35,600 (720)	—	—	—	—	—	—	—
Stock extrusion, molding temp, °C (°F)		168-176 (335-350)	173-182 (345-360)	179-187 (355-370)	182-190 (360-375)	182-187 (360-370)	176-182 (350-360)	168-176 (335-350)	168-176 (335-350)	170-179 (340-355)	173-182 (345-360)	176-182 (350-360)
Accelerated Aging Data												
Atlas Weather-Ometer 1000 hours	D 42-57 Type "E"	—	—	—	—	—	—	—	—	—	—	—
Tensile strength, MPa (psi)	Equipment	6.9 (1,000)	11.7 (1,700)	13.8 (2,000)	15.2 (2,200)	—	—	—	10.3 (1,500)	11.9 (1,725)	14.5 (2,100)	—
Elongation, %		250	300	200	200	—	—	—	360	350	300	—
Modulus at 100% elongation, MPa (psi)		4.8 (700)	8.6 (1,250)	11.7 (1,700)	14.5 (2,100)	—	—	—	5.2 (750)	7.2 (1,050)	11.0 (1,580)	—
Hardness, Durometer A ±3		65A	77A	86A	90A	—	—	—	77A	87A	95A	—
Atlas Weather-Ometer 2000 hours												
Tensile strength, MPa (psi)		5.5 (800)	11.0 (1,600)	12.8 (1,850)	14.5 (2,100)	—	—	—	9.6 (1,400)	11.2 (1,625)	14.5 (2,100)	—
Elongation, %		280	240	220	200	—	—	—	330	320	300	—
Modulus at 100% elongation, MPa (psi)		5.1 (750)	7.6 (1,100)	11.4 (1,650)	14.5 (2,000)	—	—	—	5.2 (750)	6.5 (950)	10.8 (1,565)	—
Hardness, Durometer A ±3		73A	85A	90A	91A	—	—	—	81A	84A	95A	—
Air-oven Aging — 7 days at 100°C												
Tensile strength, MPa (psi)	D 573	13.8 (2,000)	14.5 (2,100)	17.6 (2,550)	19.3 (2,800)	—	—	—	—	—	—	—
Elongation, %		280	260	240	230	—	—	—	—	—	—	—
Modulus at 300% elongation, MPa (psi)		13.4 (1,950)	7.2 (1,050)	17.2 (2,500)	18.6 (2,700)	—	—	—	—	—	—	—
Weight change, %		-10.4	-10.5	-10.8	-10.1	—	—	—	—	—	—	—
Suggested Uses		General Molding, Extrusion				High-gloss extrusion molding	General molding, extrusion. FDA acceptable. Transparent	General molding, extrusion. Transparent	Weather-strip	Weather-strip	Weather-strip	Non-migrating

¹Figure after dash is value after 15-second delay

UCC
040023

RIGID GEON[®] VINYL—INJECTION MOLDING COMPOUNDS

	ASTM Test Method	Geon [®] 87237	Geon [®] 87238*	Geon [®] 87239	Geon [®] 87241*	Geon [®] 87242	Geon [®] 85856
Specific gravity ± 0.02	D 792	1.40	1.35	1.38	1.35	1.35	1.45
Hardness Durometer D pts	D 2240	78	77	78	80	81	80
Tensile strength, MPa (psi)	D 638	41.4 (6,000)	40.7 (5,900)	46.2 (6,700)	42.7 (6,200)	52.7 (7,650)	44.4 (6,450)
Tensile modulus, MPa (psi)	D 638	2530 (367,000)	2241 (325,000)	2827 (410,000)	2517 (365,000)	2859 (415,000)	3169 (460,000)
Elongation %	D 638	125	125	125	100	145	125
Flexural strength, MPa (psi)	D 790	79.3 (11,500)	75.8 (11,000)	89.0 (12,900)	79.3 (11,500)	92.5 (13,420)	69.0 (10,000)
Flexural modulus, MPa (psi)	D 790	2792 (405,000)	2565 (372,000)	3227 (468,000)	2737 (397,000)	3204 (465,000)	2997 (435,000)
Izod impact strength, notched at 23°C (72°F) joules/cm (ft·lb/in)	D 256	0.58 (1.1)	8.0 (15.0)	0.4 (0.7)	6.4 (12.0)	1.2 (2.3)	6.9 (13.0)
Heat deflection temp. at 1.8 MPa (264 psi) °C (°F)	D 648	68 (154)	67 (153)	68 (154)	68 (154)	67 (152)	71 (160)
0.46 MPa (66 psi) °C (°F)		74 (165)	74 (165)	71 (160)	72 (161)	70 (158)	74 (165)
Coefficient of linear expansion 10 ⁻³ cm/cm °C (10 ⁻³ in./in. °F)	D 696	— Lead Stabilized	— Lead Stabilized	— Tin Stabilized	— Tin Stabilized	— Trans- parent	11.7 (6.5) Exterior

TELCAR[®] THERMOPLASTIC ELASTOMERS

Original Physical Properties*	ASTM Method	Telcar [®] TR 101	Telcar [®] TR 102	Telcar [®] TR 150	Telcar [®] TR 301	Telcar [®] TR 302	Telcar [®] TR 340	Telcar [®] TR 355	Telcar [®] TR 413
Specific Gravity, ± 0.02	D792	0.92	0.92	1.02	0.88	0.88	0.89	0.94	1.08
Hardness, Durometer A Durometer D	D2240	95 55	— 61	— 59	80 —	75 —	91 —	94 —	78 —
Flexural Modulus, MPa (psi)	D790	380 (55,000)	550 (80,000)	620 (90,000)	53.7 (7800)	42.7 (6200)	172.3 (25,000)	241.2 (35,000)	59.3 (8600)
Tensile strength, MPa (psi)	D412	18,600 (2700)	18,000 (2610)	14,000 (2030)	11.7 (1700)	8.3 (1200)	10.0 (1450)	20.0 (2900)	9.6 (1400)
Elongation %		700	700	550	750	900	700	800	800
100% Modulus, MPa (psi)		10.34 (1500)	11.71 (1700)	11.02 (1600)	4.1 (600)	3.1 (450)	5.2 (750)	9.0 (1500)	3.4 (500)
300% Modulus, MPa (psi)		10.34 (1500)	12.06 (1750)	11.37 (1650)	5.2 (750)	3.8 (550)	5.9 (850)	9.6 (1400)	4.8 (700)
Tear Strength, Die C, kN/m (lb/in)	D624	128 (730)	127 (725)	96 (550)	54.3 (310)	38.5 (220)	70.0 (400)	98.0 (560)	40.3 (280)
Compression set, Method B, % 22 hours at 23°C (72°F)	D395	45.0	45.0	40.0	34.0	32.0	38.0	49.0	20.0
Melt Index, g/10 minutes condition L: 2.16 kg at 230°C (446°F)	D1238	2.0	4.5	2.0	1.6	3.4	6.0	5.4	0.9

*Data based on injection molded slabs, 8x15x.3 cm (3x6 x .125") and tested at 5 cm/min. (2"/min)

ESTANE® THERMOPLASTIC POLYURETHANE POLYMERS

Estane® Polymer Number	Viscosity Range ¹ cP or MPa-s	Shore Hardness	Characteristics (Pale amber polyester-urethane, granular, calcium stearate-dusted unless otherwise noted)	Suggested Uses
5701 F1	300-700	88A	Excellent flexibility, resistant to chemicals and abrasion. Compatible with many additives and other resins.	Binders, coated fabrics, adhesive blending resins.
5702 5702 F1 5702 F2	300-500 500-800 800-1200	70A 70A 70A	Readily soluble, easy processing. Broadly compatible with adhesives and other resins.	Fabric coating, "tie coat" for transfer coating process, blending resin for coating and adhesives.
5703 5703 F1 5703 F2	300-500 500-800 800-1200	70A 70A 70A	Readily soluble, high adhesion, compatible with additives and resins, talc dusted.	Shoe construction adhesives, commercial adhesives systems, fabric lamination, tape and sheet adhesives, binders.
5707 F1	670-1290 ²	50D	Most resistant to chemicals, abrasion, tearing. Highest tensile strength.	Binders, outerwear, leather finishes by direct coating. Gloss, matte and leather finish outer wear by transfer coating for coats, boots, purses and luggage. Free film casting.
5708 F1	420-780 ²	87A	Best low-temperature flexibility.	Fabric coating.
5710 F1	400-800	78A	Soft, tough, makes very flexible film with exceptional "hand." Blend with other resins to improve low-temperature flexibility. Good chemical resistance.	Fabric coating by direct and transfer methods, binders, commercial coating systems.
5711 5712 5713 5716	1800-3000 ² 2100-3800 ² 800-1300 2200-4000 ²	42D 42D 42D 30D	"Open tack" series. High crystalline. Dries to non-tacky film. Tack is easily restored by heat or solvent treatment. High strength, flexible bonds. Resistant to plasticizers and other chemicals. Talc dusted. 5711 activates at approximately 49°C (120°F), 5712 at approximately 57°C (135°F) and 5713 at 80°C (175°F) or higher.	High speed assembly of footwear multi-material laminates, hot-melt sealing, heat activated "open tack" adhesives in sheet and tape form.
5714 F1	600-1200	80A	Polyether-based polyurethane. Excellent resistance to hydrolysis and fungus, exceptional low-temperature flexibility, good resistance to chemicals and abrasion. Limited compatibility with other Estane® polymers.	Fabric coating, lifejackets, tarpaulins.
5715	100-200 ²	63D	Readily soluble in MEK, produces hard, flexible, abrasion-resistant coating.	Binders, leather dressing, commercial coatings, paper and foil coatings.

¹ Brookfield RVF viscosities at 25°C. Solutions contained 15% total solids in THF (tetrahydrofuran) except as noted.

² 15% total solids in DMF (dimethyl formamide).

³ 20% total solids in MEK (methyl ethyl ketone).

ESTANE® THERMOPLASTIC POLYURETHANE COMPOUNDS

Estane® Compound Number	Shore Hardness	Specific Gravity	Characteristics (Polyester-urethane unless otherwise noted)	Suggested Uses
58013	86A	1.21	Medium hardness, excellent resistance to cuts, tears, abrasion. Easy processing by extrusion.	Extrusion—tubing, shapes, sheet.
58091	70D	1.15	High hardness, semi-rigid. Excellent oil and grease resistance.	Injection molding, automotive parts, appliance gears.
58092	45D	1.22	Firm, flexible, most resistant to chemicals and abrasion, highest properties, low-blocking.	Injection molding, extrusion—film, sheet, tubing and shapes.
58109	90A	1.22	Exceptional low-temperature resilience and flexibility, melt strength, abrasion resistance, compression set. Fast molding and release.	Injection molding, "O" rings, seals.
58121	75A	1.21	The softest Estane® compound. Excellent abrasion resistance and flow. Used for shoe soles and heels and in applications similar to 58109 where softer material is desired.	Injection molding.
58130	50D	1.21	A medium hard compound with excellent low temperature impact strength and good heat resistance.	Injection molding, automotive parts.
58133	55D	1.21	A high modulus material with excellent heat resistance and fast molding cycles. Used where some structural strength is required.	Injection molding, ice skates, automotive parts.
58134	45D	1.21	Medium-soft compound with excellent molding characteristics, fast cycle time. For applications requiring good abrasion and cut resistance.	Injection molding. All purpose material.
58136	45D	1.21	Excellent outdoor weathering properties. Otherwise very similar to Estane® 58134. For cattle tags, other high-performance applications.	Injection molding.
58137	65D	1.21	A very high modulus material with excellent heat resistance and fast molding cycles. Used where good structural strength required.	Injection molding, automotive parts, ski boots.
58271 58277	87A 93A	1.21 1.21	Both Estane® 58271 and 58277 have acceptability under FDA regulations 121.2520, 121.2522 and 121.2562. These materials are also acceptable by the USDA, for use in processing or storage areas for direct contact with meat or poultry food products prepared under Federal inspection.	Extrusion.
58300	80A	1.13	Polyether base. Excellent resistance to hydrolysis, improved fungus resistance. Exceptional low-temperature flexibility.	Extrusion, injection molding—hose and wire jacketing, molded junctions.
58309	85A	1.14	Polyether base. Excellent hydrolysis resistance. Good anti-block characteristics, low temperature properties, tear properties.	Extrusion, injection molding—hose, film and sheet.
58311	85A	1.14	Polyether base. Excellent resistance to hydrolysis, improved fungus resistance. Good low temperature properties. Good abrasion, high tear properties.	Extrusion, injection molding—hose, wire jacketing, film and sheet.
58360	93A	1.28	Polyester based polyurethane. Characteristics similar to 58600. Oxygen index 25.4% (ASTM D 69). Used in film/sheet and wire and cable jacketing.	Flame-retarded extrusions.
58370	86A	1.18	Polyether-based polyurethane. Characteristics similar to 58300. Oxygen index 26.5% (ASTM D 69). Used for wire and cable jacketing.	Flame-retarded extrusions.
58630	82A	1.14	Low hardness, polyether-based compound with hydrolytic and fungus resistance, good low-temperature flexibility. Low softening point.	Calenders, Zimmers, and Bema coaters. Industrial coated fabrics and films. Good adhesion.

*021 and 022 Natural (Pale Amber), 288 and 289 Black. Other colors made by mixing 021 natural with color masterbatch or by special order.

PROPERTIES OF GEON® CPVC COMPOUNDS

(Typical values on compression molded samples)	ASTM Test Method	Extrusion Pipe Geon® 3007	Extrusion Pipe & Profile Geon® 88934	Molding Fittings Geon® 3010	Molding and Custom Extrusion Geon® 88933
Form of compound		cube	cube	cube	cube
Specific gravity, ± 0.02	D 792	1.55	1.57	1.52	1.52
Hardness, Rockwell R, Method A	D 785	120	119	118	119
Tensile strength, MPa (psi) at	D 638				
0°C (32°F)		68 (9,900)	10,500	—	—
23°C (73°F)		58 (8,400)	8,400	57 (8,200)	—
60°C (140°F)		40 (5,800)	—	—	8,200
82°C (180°F)		28 (4,100)	4,300	—	—
93°C (200°F)		23 (3,400)	—	—	—
110°C (230°F)		17 (2,400)	—	—	—
Modulus of elasticity in tension, MPa (psi) at	D 638				
0°C (32°F)		3 436 (489M)	(550M)	—	—
23°C (73°F)		2 919 (423M)	(405M)	3 312 (480M)	(405M)
60°C (140°F)		2 229 (323M)	—	—	—
82°C (180°F)		1 856 (269M)	(314M)	—	—
93°C (200°F)		1 566 (227M)	—	—	—
110°C (230°F)		1 297 (188M)	—	—	—
Flexural strength, MPa (psi) at 23°C (73°F)	D 790	108 (15,600)	(15,000)	110 (16,000)	(14,500)
Flexural modulus MPa (psi) at 23°C (73°F)	D 790	2 939 (426M)	(395M)	2 760 (400M)	(387M)
Heat deflection temperature, annealed samples at 1.8 MPa (264 psi), °C (°F)	D 648	105 (221)	(216)	100 (212)	(212)
at 0.5 MPa (66 psi), °C (°F)		—	—	104 (220)	(220)
Izod impact strength, notched (joules/cm (ft·lbs/inch) at	D 256				
23°C (73°F)		1.6 (3.0)	(2.0)	1.1 (2.0)	(2.3)
0°C (32°F)		1.0 (1.8)	1.0	—	—
-18°C (0°F)		0.5 (1.0)	0.6	—	—
-40°C (-40°F)		0.3 (0.6)	0.7	—	—
Dielectric strength, volts/mm (volts/mil)*	D 149	51 220 (1,300)	—	51 220 (1,300)	—
Dielectric constant*	D 150				
10 ³ Hz		3.4	—	3.4	—
10 ⁶ Hz		3.3	—	3.3	—
Power factor*	D 150				
60 Hz		0.19	—	.019	—
1000 Hz		0.15	—	.015	—
Coefficient of thermal conductivity* W/m·K (BTU·in/ft ² ·h·°F)	C 177	0.137 (0.95)	—	—	—
Coefficient of thermal expansion* 10 ⁶ cm/cm, °C (10 ⁶ in/in, °F)	D 696	6.8 (3.8)	(3.6)	6.8 (3.8)	(3.9)
Water absorption, % weight gain, 24 hours*	D 570	.05	—	.05	—

*Room temperature

CARBOSET³ ACRYLIC RESINS

Resin Number	XL-11	XL-19	514H	514A	515	525	531
Appearance as supplied	Milky white dispersion	Milky white dispersion	Milky white dispersion	Clear colorless solution	Clear colorless liquid	Granular white solid	Translucent white solution
Resin concentration and solvent	30% in ammonia water	40% in ammonia water	40% in ammonia water	70% isopropyl alcohol	100% liquid resin	100% solid resin	25% in ammonia water
Viscosity, cp or MPa·s	50	35	350	10 000-15 000	2 000 000	—	2 000
Density, kg/m ³ (lbs/gal)	1 040 (8.7)	1 062 (8.8)	1 052 (8.8)	1 030 (8.6)	1 100 (9.2)	—	1 040 (8.7)
pH as supplied	6.4-7.0	7.2-7.8	6.7-7.3	—	—	—	7.4-8.2
Acid number	70-80	29-35	60-70	60-70	60-65	76-85	60-70
Type	Thermoplastic	Thermoplastic	Thermoplastic	Thermoplastic	Thermoplastic	Thermoplastic	Thermoset
Molecular weight	40,000	30,000	30,000	30,000	7,000	260,000	1,000,000+ (cured)
Hardness (Sward)	35	21	24	24	Liquid	24	32
Tensile strength, MPa (psi)	—	—	11.0 (1,600)	11.0 (1,600)	Liquid Liquid	28.2 (4,100)	—
Elongation, %	—	—	50	50	—	165	—

UCC
040026

METRIC UNIT STYLE GUIDE

PM-2 data were originally expressed in "customary units" regularly used in United States science and technology.

The BFGoodrich Company has adopted the standards of the SI metric system. SI abbreviation of the French phrase Le Systeme International d'Unites is the system of units established from seven Base Units for the measurement of length, mass, time, electric current, temperature, luminous intensity, amount of substance, and two supplementary units for plane angle and solid angle. Other units such as force, power, work, energy, electrical potential, area, volume, pressure, etc are derived from these seven base units.

Multiple and divisions of Base Units are simply related by powers of 10 and expressed by adding a prefix to the name of the Base Unit. For example: millimeter for one-thousandth of a meter. Kilogram for one thousand grams, etc

MULTIPLES		DIVISIONS	
Prefix	Means	Prefix	Means
tera (10 ¹²)	One trillion times	deci (10 ⁻¹)	One tenth of
giga (10 ⁹)	One billion times	centi (10 ⁻²)	One hundredth of
mega (10 ⁶)	One million times	milli (10 ⁻³)	One thousandth of
kilo (10 ³)	One thousand times	micro (10 ⁻⁶)	One millionth of
hecto (10 ²)	One hundred times	nano (10 ⁻⁹)	One billionth of
deca (10 ¹)	Ten times	pico (10 ⁻¹²)	One trillionth of

*Some discretion, however, has been exercised on grounds of "reasonableness". All units and symbols have been expressed according to "pure" SI principles as far as possible.

*ASTM E 380-76 Standard Metric Practice Guide

DEFINITIONS OF BASIC SYMBOLS

Unit Name	Symbol	Quantity
ampere	A	electric current
candela	cd	luminous intensity
hertz	Hz	frequency
joule	J	energy
kelvin	K	thermodynamic temperature*
kilogram	kg	mass
metre	m	length
mole	mol	amount of substance
newton	N	force or weight
ohm	Ω	electrical resistance
pascal	Pa	pressure or stress
poise	P	unit of viscosity
second	s	time
volt	V	electrical potential
watt	W	power

*Degree Celsius (°C)

U.S./METRIC EQUIVALENTS

multiply	by:	to get:
BTU·in/h·ft ² ·°F	0.144	W/m·K
ft	0.305	m
ft·lb	1.356	joules
ft·lb/inch	0.534	joules/cm
gms/100 sq in/24 hrs	15.5	gms/100 sq m/24 hrs
in	25.4	mm
in/in, °F	1.8	cm/cm, °C
in/min	2.54	cm/min
lb/gal	119.8	kg/m ³
lb/in	0.175	kN/m
lb/mil	175.0	kN/m
megohms/1000 ft	0.305	megohms/km
mg/in ²	0.155	mg/cm ²
mil	0.0254	mm
psi	0.00689	MPa
volts/mil	39.4	volts/mm

°C = (°F - 32)/1.8

Because of the possible confusion between European and United States practices, the use of a comma (,) as a thousands separator, should be avoided. A gap between groups of three figures, counted from left or right of the decimal point is to be used. A period (.) is to be used as a decimal marker.

Example: 63 093.969 12

When there are only four figures either side of the decimal point, a gap between groups of three figures is optional, however, for uniformity, a gap will be used.

Example: 4 512.577 2

Where the figure is less than one, a zero is inserted before the decimal place.

Example: 0.4 0.027 61

Data within PM-2 are indicated in both metric and U.S. units.

NON WARRANTY

The information contained herein is believed to be reliable, but no representations, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications or the results to be obtained therefrom. The information is based on laboratory work with small-scale equipment and does not necessarily indicate end product performance. Because of variations in methods, conditions and equipment used commercially in processing these materials, no warranties or guarantees are made as to the suitability of the products for the applications disclosed. Full-scale testing and end product performance are the responsibility of the user. BFGoodrich shall not be liable for and the customer assumes all risk and liability of any use or handling of any material beyond BFGoodrich's direct control. THE SELLER MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Nothing contained herein is to be considered as permission, recommendation, nor as an inducement to practice any patented invention without permission of the patent owner.

Printed in U.S.A.

BFGoodrich Chemical Group

The BFGoodrich Company
Chemical Group

6100 Oak Tree Boulevard
Cleveland, Ohio 44131
216-524-0200

Sales Offices

CLEVELAND AREA

Suite 300
7550 Lucerne Dr.
MIDDLEBURG HGTS., OH 44130
216-524-0200

ATLANTA AREA

Suite 370
2625 Cumberland Parkway N.W.
ATLANTA, GA 30339
404-434-7761

BOSTON AREA

36 Washington Street
WELLESLEY HILLS, MA 02181
617-235-8700

CHICAGO AREA

715 Oak Brook Executive Plaza
1301 West 22nd Street
OAK BROOK, IL 60521
312-654-4700

DETROIT AREA

Suite 500
26211 Central Park Blvd.
SOUTHFIELD, MI 48037
313-357-3939

KANSAS CITY AREA

1000 Blue Ridge Tower
4240 Blue Ridge Boulevard
KANSAS CITY, MO 64133
816-353-6440

LOS ANGELES AREA

Suite 980 Wilshire Centre
3055 Wilshire Boulevard
LOS ANGELES, CA 90010
213-386-7436

NEW YORK AREA

299 Market Street
SADDLE BROOK, NJ 07662
201-368-9400

PHILADELPHIA AREA

200 Office Center
275 Commerce Drive
FORT WASHINGTON, PA 19034
215-643-6805

CANADA

409 Weber Street, West
KITCHENER, ONT., Canada
519-742-3641

INTERNATIONAL DEPARTMENT

6100 Oak Tree Boulevard
CLEVELAND, OH 44131
Cable Address:
GOODRICHCHEM