

***Lubrizol***

# Compendial Specifications

Applicable to Pharmaceutical Polymers



Lubrizol LifeScience Polymers

**Links Science to Life™**



# Compendial Specifications Applicable to Carbopol® and Pemulen™ Pharmaceutical-Grade Polymers Based on Individual Monographs

| Test                             | USP 36-NF 31  |                 |                                     |                 |                 |                 | Ph. Eur. 7.0 |                      |    |    | JPE (2004)*          |                                   |    |    |
|----------------------------------|---|-----------------|-------------------------------------|-----------------|-----------------|-----------------|--------------|----------------------|----|----|----------------------|-----------------------------------|----|----|
| Monograph Name(s)                | Carbomer Copolymer<br>Carbomer Homopolymer<br>Carbomer Interpolymer<br>Carbomer 934, 934P, 940, 941, 1342 |                 |                                     |                 |                 |                 | Carbomers    |                      |    |    | Carboxyvinyl Polymer |                                   |    |    |
| Identification                   | IR <sup>1</sup>   | GF <sup>2</sup> | CT <sup>3</sup>                     | PT <sup>4</sup> | FD <sup>5</sup> | W0 <sup>6</sup> | IR           | GF                   | CT | PT | IR                   | GF                                | CT | PT |
| Carbomer Copolymer               | +   | –               | –                                   | –               | +               | –               |              |                      |    |    |                      |                                   |    |    |
| Carbomer Homopolymer             | +   | +               | +                                   | +               | –               | –               |              |                      |    |    |                      |                                   |    |    |
| Carbomer Interpolymer            | +   | +               | –                                   | –               | –               | +               |              |                      |    |    |                      |                                   |    |    |
| Carbomer 934                     | –   | +               | +                                   | –               | –               | –               |              |                      |    |    |                      |                                   |    |    |
| Carbomer 934P                    | –   | +               | +                                   | –               | –               | –               |              |                      |    |    |                      |                                   |    |    |
| Carbomer 940                     | –   | +               | +                                   | –               | –               | –               |              |                      |    |    |                      |                                   |    |    |
| Carbomer 941                     | –   | +               | +                                   | –               | –               | –               |              |                      |    |    |                      |                                   |    |    |
| Carbomer 1342                    | –   | +               | +                                   | –               | –               | –               |              |                      |    |    |                      |                                   |    |    |
| Carbomers                        |   |                 | –                                   |                 |                 |                 | +            | +                    | +  | +  |                      |                                   |    |    |
| Carboxyvinyl Polymer             |   |                 | –                                   |                 |                 |                 |              |                      |    |    | +                    | +                                 | +  | +  |
| <b>Definition</b>                |   |                 | –                                   |                 |                 |                 |              |                      |    |    |                      |                                   |    | –  |
| <b>Description</b>               |   |                 | –                                   |                 |                 |                 |              |                      |    |    |                      |                                   |    | +  |
| <b>Aqueous Viscosity (mPa-s)</b> |   |                 |                                     |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| Carbomer Copolymer (1%)          |   |                 |                                     |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| <i>Type A</i>                    |   |                 | 4,500–13,500                        |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| <i>Type B</i>                    |   |                 | 10,000–29,000                       |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| <i>Type C</i>                    |   |                 | 25,000–45,000                       |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| Carbomer Homopolymer (0.5%)      |   |                 |                                     |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| <i>Type A</i>                    |   |                 | 4,000–11,000                        |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| <i>Type B</i>                    |   |                 | 25,000–45,000                       |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| <i>Type C</i>                    |   |                 | 40,000–60,000                       |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| Carbomer Interpolymer            |   |                 |                                     |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| <i>Type A (0.5%)</i>             |   |                 | 45,000–65,000                       |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| <i>Type B (1%)</i>               |   |                 | 47,000–77,000                       |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| <i>Type C (0.5%)</i>             |   |                 | 8,500–16,500                        |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| Carbomer 934 (0.5%)              |   |                 | 30,500–39,400                       |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| Carbomer 934P (0.5%)             |   |                 | 29,400–39,400                       |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| Carbomer 940 (0.5%)              |   |                 | 40,000–60,000                       |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| Carbomer 941 (0.5%)              |   |                 | 4,000–11,000                        |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| Carbomer 1342 (1.0%)             |   |                 | 9,500–26,500                        |                 |                 |                 |              |                      |    |    |                      |                                   |    |    |
| <b>Loss on Drying, %</b>         |   |                 | NMT 2.0                             |                 |                 |                 |              | NMT 3.0              |    |    |                      | NMT 7.0                           |    |    |
| <b>Residue on Ignition, %</b>    |   |                 | NMT 4.0 (Carbomer Homopolymer Only) |                 |                 |                 |              | NMT 4.0              |    |    |                      | NMT 2.5                           |    |    |
| <b>Heavy Metals, %</b>           |   |                 | NMT 0.002                           |                 |                 |                 |              | NMT 0.002            |    |    |                      | Lead NMT 0.001<br>Arsenic NMT 0.0 |    |    |
| <b>Ethyl Acetate, %</b>          |   |                 |                                     |                 |                 |                 |              | NMT 0.5 <sup>7</sup> |    |    |                      | –                                 |    |    |
| Carbomer Copolymer               |   |                 | NMT 0.5                             |                 |                 |                 |              | –                    |    |    |                      | –                                 |    |    |
| Carbomer Homopolymer             |   |                 | NMT 0.5                             |                 |                 |                 |              | –                    |    |    |                      | –                                 |    |    |
| Carbomer Interpolymer            |   |                 | NMT 0.35                            |                 |                 |                 |              | –                    |    |    |                      | –                                 |    |    |

| Test  | USP 36-NF 31  | Ph. Eur. 7.0     | JPE (2004)**                    |
|---|---|------------------|---------------------------------|
| <b>Monograph Name(s)</b>                      | <b>Carbomer Copolymer<br/>Carbomer Homopolymer<br/>Carbomer Interpolymer<br/>Carbomer 934, 934P, 940, 941, 1342</b> | <b>Carbomers</b> | <b>Carboxyvinyl<br/>Polymer</b> |
| <b>Cyclohexane, %</b>                         |   | NMT 0.3887       | —                               |
| Carbomer Copolymer                            | NMT 0.3   | —                | —                               |
| Carbomer Homopolymer                          | NMT 0.3   | —                | —                               |
| Carbomer Interpolymer                         | NMT 0.15  | —                | —                               |
| <b>Benzene, %</b>                             |   | NMT 0.0002       | NMT 0.0002                      |
| Carbomer Copolymer, Homopolymer, Interpolymer | NMT 0.0002  | —                | —                               |
| Carbomer 934, 940, 941                        | NMT 0.5   | —                | —                               |
| Carbomer 934P                                 | NMT 0.01  | —                | —                               |
| Carbomer 1342                                 | NMT 0.2   | —                | —                               |
| <b>Free Acrylic Acid, %</b>                   |   | NMT 0.25         | NMT 1.0                         |
| Carbomer Copolymer, Homopolymer, Interpolymer | NMT 0.25  | —                | —                               |
| <b>Carboxylic Acid Content Assay, %</b>       |   | 56.0 – 68.0      | 58.0 – 63.0                     |
| Carbomer Copolymer                            | 52.0 – 62.0   | —                | —                               |
| Carbomer Homopolymer                          | 56.0 – 68.0   | —                | —                               |
| Carbomer Interpolymer                         | 52.0 – 62.0   | —                | —                               |
| Carbomer 934, 934P, 940, 941                  | 56.0 – 68.0   | —                | —                               |
| Carbomer 1342                                 | 52.0 – 62.0   | —                | —                               |
| <b>pH 0.2% Dispersion</b>                     | —   | —                | 2.5 – 4.0                       |



— Designates "Not Applicable"

\*Based on customer request, Lubrizol certified select lots of product against the JPE Carboxyvinyl Polymer monograph. <sup>1</sup>Infrared spectrum, <sup>2</sup>Gel formation test, <sup>3</sup>Colorimetric test, <sup>4</sup>Precipitate test, <sup>5</sup>Foam on dispersion test, <sup>6</sup>Wet-out test, <sup>7</sup>Limits cited in Ph. Eur. 7.0, General Texts: Chapter 5.4 Residual Solvents.

NLT: Not less than. NMT: Not more than. Method and testing frequency are indicated in the product specification sheet for each product ([www.lubrizol.com/Pharmaceutical/Literature/ProductSpecifications.html](http://www.lubrizol.com/Pharmaceutical/Literature/ProductSpecifications.html)). When considering multiple polymers for pharmaceutical development, please refer to product specifications for method details and evaluate key performance properties of the final products.

## Associated Compendial Names for Lubrizol Products

| Lubrizol Product Trade Name   | USP/NF Compendial Name   | Europe (Ph. Eur. 7.0) Compendial Name | Japan (JPE - 2004) Compendial Name  |
|---|--|---------------------------------------|---|
| <b>Carbopol 71G NF Polymer</b><br><b>Carbopol 971P NF Polymer</b><br><b>Carbopol 981 NF Polymer</b>                                   | Carbomer Homopolymer Type A  | Carbomers                             | Carboxyvinyl Polymer  |
| <b>Carbopol 974P NF Polymer</b><br><b>Carbopol 5984 EP Polymer</b>  | Carbomer Homopolymer Type B  | Carbomers                             | Carboxyvinyl Polymer  |
| <b>Carbopol 980 NF Polymer</b>  | Carbomer Homopolymer Type C  | Carbomers                             | Carboxyvinyl Polymer  |
| <b>Carbopol Ultrez 10 NF Polymer</b><br><b>Carbopol ETD 2020 NF Polymer</b><br><i>No commercial product currently offered</i>         | Carbomer Interpolymer Type A<br>Carbomer Interpolymer Type B<br>Carbomer Interpolymer Type C | —<br>—<br>—                           | —<br>—<br>—   |
| <b>Pemulen TR-2 NF Polymer</b><br><b>Pemulen TR-1 NF Polymer</b><br><i>No commercial product currently offered</i>                    | Carbomer Copolymer Type A<br>Carbomer Copolymer Type B<br>Carbomer Copolymer Type C          | —<br>—<br>—                           | —<br>—<br>—   |
| Carbopol 934 NF Polymer<br>Carbopol 934P NF Polymer<br>Carbopol 940 NF Polymer<br>Carbopol 941 NF Polymer<br>Carbopol 1342 NF Polymer | Carbomer 934<br>Carbomer 934P<br>Carbomer 940<br>Carbomer 941<br>Carbomer 1342               | —<br>—<br>—<br>—<br>—                 | Carboxyvinyl Polymer<br>Carboxyvinyl Polymer<br>Carboxyvinyl Polymer<br>Carboxyvinyl Polymer<br>— |
| <b>Noveon AA-1 Polycarbophil, USP</b>   | Polycarbophil  | —                                     | —   |

## Compendial Specifications Applicable to Noveon® Polycarbophil

| Test                            | USP 36-NF 31*                                 | Ph. Eur. 7.0 | JPE (2004) |
|---------------------------------|---|--------------|------------|
| <b>Monograph Name</b>           | <b>Polycarbophil</b>                          | —            | —          |
| <b>Identification</b>           | <b>CT<sup>3</sup></b>   <b>GF<sup>1</sup></b> | —            | —          |
| <b>pH, 1% Dispersion</b>        | NMT 4   | —            | —          |
| <b>Loss on Drying, %</b>        | NMT 1.5                                       | —            | —          |
| <b>Residue on Ignition, %</b>   | NMT 4.0                                       | —            | —          |
| <b>Absorbing Power, g/g</b>     | NLT 62.0                                      | —            | —          |
| <b>Limit of Acrylic Acid, %</b> | NMT 0.3                                       | —            | —          |
| <b>Ethyl Acetate, %</b>         | NMT 0.45                                      | —            | —          |

— Designates "Not Applicable"

\*Based on customer request, Lubrizol certified select lots of product against the JPE Carboxyvinyl Polymer monograph. <sup>1</sup>Gel formation test.

NLT: Not less than. NMT: Not more than. Method and testing frequency are indicated in the product specification sheet for each product ([www.lubrizol.com/Pharmaceutical/Literature/ProductSpecifications.html](http://www.lubrizol.com/Pharmaceutical/Literature/ProductSpecifications.html)). When considering multiple polymers for pharmaceutical development, please refer to product specifications for method details and evaluate key performance properties of the final products.

# U.S. FDA Inactive Ingredient Database (IID) Reference Information – Lubrizol Polymers



| Product Trade Name           | Residual Solvent       | Current USP Monograph <sup>1</sup> | Previous USP Monograph       | U.S. FDA Inactive Ingredient Database (IID) References  |
|------------------------------|------------------------|------------------------------------|------------------------------|---|
| <b>Carbopol Polymers</b>     |                        |                                    |                              |   |
| 71G NF                       | Ethyl Acetate          | Carbomer Homopolymer Type A        | Carbomer 941                 | Carboxypolymethylene <sup>2</sup><br>Carbomer Homopolymer Type A<br>Carbomer 941                  |
| 971P NF                      | Ethyl Acetate          | Carbomer Homopolymer Type A        | Carbomer 941                 | Carboxypolymethylene <sup>2</sup><br>Carbomer Homopolymer Type A<br>Carbomer 941                  |
| 974P NF                      | Ethyl Acetate          | Carbomer Homopolymer Type B        | Carbomer 934P                | Carboxypolymethylene <sup>2</sup><br>Carbomer Homopolymer Type B<br>Carbomer 934P<br>Carbomer 974 |
| 980 NF                       | Cosolvent <sup>3</sup> | Carbomer Homopolymer Type C        | Carbomer 940                 | Carbomer Homopolymer Type C<br>Carbomer 980<br>Carbomer 940                                       |
| 981 NF                       | Cosolvent <sup>3</sup> | Carbomer Homopolymer Type A        | Carbomer 941                 | Carbomer Homopolymer Type A<br>Carbomer 981<br>Carbomer 941                                       |
| 5984 EP                      | Cosolvent <sup>3</sup> | Carbomer Homopolymer Type B        | Carbomer 934                 | Carbomer Homopolymer Type B<br>Carbomer 934   |
| ETD 2020 NF                  | Cosolvent <sup>3</sup> | Carbomer Interpolymer Type B       | Carbomer Interpolymer Type B |   |
| Ultrez 10 NF                 | Cosolvent <sup>3</sup> | Carbomer Interpolymer Type A       | Carbomer Interpolymer Type A |   |
| 934 NF                       | Benzene                | Carbomer 934                       | Carbomer 934                 | Carbomer 934  |
| 934P NF                      | Benzene                | Carbomer 934P                      | Carbomer 934P                | Carboxypolymethylene <sup>2</sup><br>Carbomer 934P  |
| 940 NF                       | Benzene                | Carbomer 940                       | Carbomer 940                 | Carbomer 940  |
| 941 NF                       | Benzene                | Carbomer 941                       | Carbomer 941                 | Carbomer 941  |
| 1342 NF                      | Benzene                | Carbomer 1342                      | Carbomer 1342                | Carbomer 1342   |
| <b>Pemulen Polymers</b>      |                        |                                    |                              |   |
| TR-1 NF                      | Cosolvent <sup>3</sup> | Carbomer Copolymer Type B          | Carbomer 1342                | Carbomer 1342   |
| TR-2 NF                      | Cosolvent <sup>3</sup> | Carbomer Copolymer Type A          | Carbomer 1342                | Carbomer 1342   |
| <b>Noveon® Polycarbophil</b> |                        |                                    |                              |   |
| AA-1 USP                     | Ethyl Acetate          | Polycarbophil                      | Polycarbophil                | Polycarbophil   |

<sup>1</sup>In April 2002, the Carbomer Copolymer and Interpolymer monographs became effective in USP 25-NF 20. Subsequently, on January 1, 2006, the Carbomer Homopolymer monograph became effective in USP 29-NF 24 with a delayed implementation date of January 1, 2011. Prior to January 1, 2011, the practice of labeling products as Carbomer 941, Carbomer 934P, Carbomer 934 or Carbomer 940 was allowed for products made in both benzene or nonbenzene solvents. The added monographs each include three categories of carbomers (Type A, Type B and Type C) that differ by viscosity range.

<sup>2</sup>Title of The Merck Index monograph applicable to Carbomer Homopolymers (Monograph #1830).

<sup>3</sup>Mixture of ethyl acetate and cyclohexane.

# USP/NF Monograph Timeline for Carbopol Polymers, Pemulen™ Polymers and Noveon Polycarbophil

| Prior to April 2002  |   | April 2002 through January 2006   |   |
|--|---|---|---|
| Monograph  | Lubrizol Polymer  | Monograph   | Lubrizol Polymer  |
| Carbomer 941   | Carbopol 941 NF<br>Carbopol 71G NF<br>Carbopol 971P NF<br>Carbopol 981 NF | Carbomer 941  | Carbopol® 941 NF<br>Carbopol® 71G NF<br>Carbopol® 971P NF<br>Carbopol® 981 NF |
| Carbomer 934P  | Carbopol 934P NF<br>Carbopol 974P NF                                      | Carbomer 934P   | Carbopol® 934P NF<br>Carbopol® 974P NF  |
| Carbomer 934   | Carbopol 934 NF<br>Carbopol 5984 EP                                       | Carbomer 934  | Carbopol® 934 NF<br>Carbopol® 5984 EP   |
| Carbomer 940   | Carbopol 940 NF<br>Carbopol 980 NF  | Carbomer 940  | Carbopol® 940 NF<br>Carbopol® 980 NF  |
| Carbomer 1342  | Carbopol 1342 NF<br>Pemulen TR-2 NF<br>Pemulen TR-1 NF                    | Carbomer 1342   | Carbopol® 1342 NF   |
|  |   | Carbomer Copolymer<br>Type A<br>Type B  | Pemulen™ TR-2 NF<br>Pemulen™ TR-1 NF  |
|  |   | Carbomer Interpolymer<br>Type A<br>Type B   | Carbopol® Ultrez 10 NF<br>Carbopol® ETF 2020 NF                               |
| Polycarbophil  | Noveon® AA-1 Polycarbophil USP  | Polycarbophil   | Noveon® AA-1 Polycarbophil USP  |
| <p>Initially, all Carbopol polymers were polymerized in benzene. When toxicologically preferred (nonbenzene) solvents were introduced, USP agreed that polymers produced without the use of benzene could be classified according to the same generic compendial name as long as the viscosity and residual solvent level requirements were met.</p> <p>During this time, the Carbomer XXX (where XXX is numerical designation) monographs were used as the designated USP/NF monographs for all Lubrizol Carbopol and Pemulen polymers.</p> |   | <p>In April 2002, the Carbomer Copolymer monograph became effective in USP 25-NF 20. It is one of the umbrella monographs that separates the carbomer products based on polymer structure and applies to copolymer products that are not polymerized in benzene. The Carbomer Copolymer monograph includes three categories of carbomers (Type A, Type B and Type C) which differ by viscosity ranges that are specific to this class of polymers. The Type A and Type B viscosity ranges apply to Lubrizol's Pemulen™ polymer products.</p> <p>The Carbomer Interpolymer monograph also became effective at this time, and Lubrizol introduced Carbopol® Ultrez 10 NF and Carbopol® ETD 2020 NF polymers for use in pharmaceutical formulations. Both of these products are covered by the Carbomer Interpolymer monograph. The three categories of carbomer interpolymers (Type A, Type B and Type C) differ by viscosity ranges that are specific to this class of polymers.</p> |   |





| January 2006 through January 2011  |   | Post-January 2011  |   |
|--|---|--|---|
| Monograph  | Lubrizol Polymer  | Monograph  | Lubrizol Polymer  |
| Carbomer 941   | Carbopol 941 NF<br>(Carbopol 71G NF)<br>(Carbopol 971P NF)<br>(Carbopol 981 NF)                                   | Carbomer 941   | Carbopol 941 NF   |
| Carbomer 934P  | Carbopol 934P NF<br>(Carbopol 974P NF)  | Carbomer 934P  | Carbopol 934P NF  |
| Carbomer 934   | Carbopol 934 NF<br>(Carbopol 5984 EP)   | Carbomer 934   | Carbopol 934 NF   |
| Carbomer 940   | Carbopol 940 NF<br>(Carbopol 980 NF)  | Carbomer 940   | Carbopol 940 NF   |
| Carbomer 1342  | Carbopol 1342 NF  | Carbomer 1342  | Carbopol 1342 NF  |
| Carbomer Copolymer<br>Type A<br>Type B   | Pemulen TR-2 NF<br>Pemulen TR-1 NF  | Carbomer Copolymer<br>Type A<br>Type B   | Pemulen TR-2 NF<br>Pemulen TR-1 NF  |
| Carbomer Interpolymer<br>Type A<br>Type B  | Carbopol Ultrez 10 NF<br>Carbopol ETF 2020 NF   | Carbomer Interpolymer<br>Type A<br>Type B  | Carbopol Ultrez 10 NF<br>Carbopol ETF 2020 NF   |
| Carbomer Homopolymer<br>Type A<br>Type A<br>Type A<br>Type B<br>Type B<br>Type C   | Carbopol 71G NF<br>Carbopol 971P NF<br>Carbopol 981 NF<br>Carbopol 974P NF<br>Carbopol 5984 EP<br>Carbopol 980 NF | Carbomer Homopolymer<br>Type A<br>Type A<br>Type A<br>Type B<br>Type B<br>Type C   | Carbopol 71G NF<br>Carbopol 971P NF<br>Carbopol 981 NF<br>Carbopol 974P NF<br>Carbopol 5984 EP<br>Carbopol 980 NF |
| Polycarbophil  | Noveon AA-1 Polycarbophil USP   | Polycarbophil  | Noveon AA-1 Polycarbophil USP   |
| <p>On January 1, 2006, the Carbomer Homopolymer monograph became effective in USP 29-NF 24. It is an additional umbrella monograph that separates the carbomer products based on polymer structure and applies specifically to homopolymer products that are not polymerized in benzene. The Carbomer Homopolymer monograph includes three categories of carbomers (Type A, Type B, Type C), which differ by viscosity ranges that are specific to this class of polymers.</p> <p>As noted in USP 29-NF 24, the monograph includes a delayed implementation date up to January 1, 2011. Prior to January 1, 2011, the practice of labeling nonbenzene homopolymer products as Carbomer 941, Carbomer 934P, Carbomer 934 or Carbomer 940 was allowed.</p> |   | <p>Per USP 29-NF 24, the practice of using the Carbomer XXX monographs to describe nonbenzene homopolymer products beyond January 1, 2001, shall be discontinued. Subsequently, the Carbomer Homopolymer monograph should be used to describe these materials.</p> <p>The Carbomer XXX monographs are specifically assigned to Lubrizol products manufactured with the use of benzene. Carbomer XXX refers to the Carbopol polymer product number designation. For example, Carbopol 940 NF polymer is currently covered by the USP/NF Carbomer 940 monograph.</p> |   |



LifeScience Polymers | Medical Solutions | Pharmaceutical Solutions | Oral Care and Dental Solutions

**Lubrizol**

Lubrizol Advanced Materials, Inc.  
Global Headquarters | 9911 Brecksville Road | Cleveland, OH 44141-3201 USA

For more information, visit [Lubrizol.com/LifeSciencePolymers](http://Lubrizol.com/LifeSciencePolymers) or call us at 216-447-5000 / 888-234-2436 (toll-free)

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. The information often is based on laboratory work with small-scale equipment and does not necessarily indicate end-product performance or reproducibility. Formulations presented may not have been tested for stability and should be used only as a suggested starting point. Because of the 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. Lubrizol Advanced Materials, Inc., shall not be liable for and the customer assumes all risk and liability for any use or handling of any material beyond Lubrizol Advanced Materials, Inc.'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.

Lubrizol Advanced Materials, Inc., is a wholly owned subsidiary of The Lubrizol Corporation.

© 2013 The Lubrizol Corporation, all rights reserved. All marks are the property of The Lubrizol Corporation.  
The Lubrizol Corporation is a Berkshire Hathaway company.

LSP-PS-COMPSPC-BRC  
GC 131273  
OCT 2013