11/66

# Your guide to...




## TOP-QUALITY
# PLASTICIZERS

**Here are plasticizers and resin modifiers for any and every resin system!**

No matter what the application or performance specification, one or a combination of the plasticizers offered here will do the job. As shown here, you can select from the widest choice of plasticizers available from any single source. They are recommended for use in compounding:

| | |
|---|---|
| Flexible Film and Sheeting | Casting Compounds |
| Adhesives | Extrusions |
| Lacquers | Plastisols |
| Sealing Compounds | Fabric & Paper Coatings |
| Paints | |

**YOU CAN DEPEND UPON THESE PRODUCTS' QUALITY AND PERFORMANCE**

open once for "Compatibility" guide • open fully for a listing of products and properties

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TOWOLDMON0035079
WATER_PCB-00019548

PHTHALATES

| | | Dibutyl | Dicyclohexyl | Diethyl | Diisodecyl | Diisooctyl | Dimethyl | Di(n-octyl,-n-decyl) | Dioctyl | Diphenyl | Ditridecyl | Santicizer® 160 | Santicizer 165 | Santicizer 213 | Santicizer 214 | Santicizer 215 | Santicizer 262 | Santicizer 602 | Santicizer 603 | Santicizer 630 | Santicizer 631 | Santicizer 632 | Santicizer 636 | Santicizer 681 | Santicizer 683 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VINYL TYPE | Polyvinyl Chloride | 100 | 30 | I | 100 | 100 | I | 100 | 100 | 80 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 90 | 100 |
| | Polyvinyl Acetate | 100 | 50 | 100 | I | I | 100 | I | I | 70 | I | 100 | I | 10 | I | I | 40 | I | I | I | I | I | I | I | I |
| | Polyvinyl Butyral | 100 | 50 | 50 | 25 | 15 | 50 | 15 | 15 | 50 | 25 | 100 | 10 | 50 | 20 | 30 | 20 | 25 | 25 | 25 | 25 | 20 | 25 | 5 | 20 |
| | Polyvinylidene Chloride | 75 | 20 | 75 | 10 | 25 | 50 | 25 | 25 | 20 | 10 | 75 | 50 | 25 | 10 | 15 | 25 | 15 | 20 | 25 | 25 | 10 | 25 | 20 | 10 |
| | Polystyrene | 100 | 20 | 100 | 100 | 100 | 100 | 100 | 50 | 70 | 100 | 100 | 100 | 75 | 75 | 100 | 50 | 100 | 100 | 100 | 100 | 75 | 100 | 60 | 75 |
| CELLULOSIC | Nitrocellulose | 100 | 50 | 100 | 100 | 100 | 60 | 100 | 100 | 80 | 100 | 100 | 100 | 40 | 40 | 40 | 100 | 100 | 100 | 50 | 60 | 40 | 100 | 70 | 40 |
| | Ethyl Cellulose | 100 | 50 | 100 | 100 | 100 | 100 | 100 | 100 | 30 | 100 | 100 | 100 | 75 | 75 | 100 | 100 | 100 | 100 | 100 | 100 | 75 | 100 | 80 | 75 |
| | Cellulose Acetate | 25 | I | 85 | I | I | 80 | I | I | I | I | 10 | I | I | I | I | I | I | I | I | I | I | I | I | I |
| | Cellulose Acetate Butyrate | 100 | 20 | 100 | 50 | 50 | 100 | 50 | 50 | 20 | 50 | 100 | 50 | 40 | 20 | 40 | 50 | 50 | 40 | 25 | 30 | 20 | 50 | 35 | 20 |
| | Cellulose Acetate Propionate | 30 | 10 | 100 | 15 | 20 | 100 | 20 | 20 | 10 | 15 | 80 | 50 | 20 | 5 | I | 25 | 20 | 40 | 5 | 10 | 5 | 20 | 5 | 5 |
| MISCELLANEOUS THERMOPLASTIC | Chlorinated Rubber | 100 | 20 | 25 | 100 | 100 | 25 | 50 | 33 | 20 | 100 | 80 | 100 | 25 | 25 | 100 | 30 | 100 | 50 | 100 | 100 | 25 | 100 | 100 | 25 |
| | High Styrene-Butadiene | 50 | 20 | 25 | 50 | 50 | 20 | 50 | 50 | 20 | 50 | 50 | 50 | 40 | 40 | 40 | 50 | 50 | 50 | 40 | 40 | 40 | 50 | 35 | 40 |
| | Protein Compounds | 20 | I | 20 | I | I | 20 | I | I | I | I | 10 | I | I | I | I | I | I | I | I | I | I | I | I | I |
| | Shellac | I | I | 5 | I | I | 5 | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I |
| | Acrylic Type Resins | 70 | 25 | 100 | 25 | 25 | 100 | 25 | 25 | 25 | 25 | 70 | 25 | 15 | I | 20 | 70 | 25 | 25 | 10 | 10 | I | 25 | I | I |
| | Polyamides | 25 | 10 | I | 20 | 25 | I | 25 | 25 | 10 | 20 | 25 | 25 | I | I | 5 | 20 | 20 | 20 | I | I | I | 20 | 25 | I |
| THERMOSETTING | Polyester | 20 | 20 | 10 | 15 | 20 | 5 | 20 | 20 | 20 | 15 | 20 | 20 | 5 | 5 | 5 | 15 | 10 | 15 | 5 | 5 | 5 | 10 | 5 | 5 |
| | Epoxy | 25 | 10 | 10 | I | I | I | I | I | 10 | I | 25 | 10 | I | I | I | 15 | I | 10 | I | I | I | I | I | I |
| | Phenolic | 50 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 30 | 25 | 50 | 50 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| | Alkyd | 70 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 50 | 50 | 25 | 25 | 20 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| | Melamine | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I |
| | Polyurethane | 25 | 10 | 15 | 25 | 25 | 15 | 25 | 25 | 10 | 25 | 25 | 25 | 20 | 20 | 20 | 25 | 25 | 25 | 20 | 20 | 20 | 25 | 20 | 20 |
| | Nitrile & Neoprene Rubbers | 100 | 50 | 100 | 33 | 100 | 100 | 100 | 50 | 50 | 33 | 100 | 50 | 50 | 50 | 40 | 70 | 50 | 50 | 50 | 50 | 50 | 50 | 65 | 50 |

I = Incompatible  Figures = Compatibility, PHR

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WATER_PCB-00019549

# Compatibility Guide

| | ADIPATES | | | PHOSPHATES | | | | | SULFONAMIDES | | | | | PHTHALYL GLYCOLLATES | | PERMANENT | | | | | | | MISCELLANEOUS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Diisodecyl | Dioctyl | Di(n-octyl, n-decyl) | Santicizer 140 | Santicizer 141 | Tributoxyethyl | Tricresyl | Triphenyl | Santicizer 1-H | Santicizer 3 | Santicizer 8 | Santicizer 9 | Santolite® MHP | Santolite MS-80% | Santicizer E-15 | Santicizer B-16 | Santicizer M-17 | Santicizer 405 | Santicizer 409 | Santicizer 411 | Santicizer 480 | Santicizer 481 | Santicizer 482 | Santicizer 483 | Aroclor® | HB-40® | Mod-Epox® | Monter® | Triphenyl Phosphite |
| | 50 | 75 | 75 | 100 | 100 | 60 | 100 | 20 | 1 | 1 | 1 | 1 | 15 | 15 | 25 | 100 | 20 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 35 | 40 | 10 | 10 | 10 |
| | 1 | 1 | 1 | 40 | 50 | 40 | 40 | 80 | 50 | 50 | 100 | 50 | 50 | 50 | 100 | 100 | 100 | 75 | 100 | 75 | 20 | 50 | 100 | 1 | 50 | 1 | 1 | 10 | 1 |
| | 1 | 25 | 1 | 100 | 100 | 50 | 100 | 50 | 50 | 50 | 100 | 50 | 50 | 50 | 100 | 100 | 100 | 40 | 75 | 40 | 30 | 30 | 50 | 15 | 50 | 50 | 1 | 10 | 1 |
| | 10 | 15 | 15 | 75 | 75 | 50 | 75 | 20 | 20 | 25 | 50 | 20 | 25 | 25 | 75 | 75 | 75 | 10 | 25 | 10 | 10 | 10 | 15 | 25 | 50 | 20 | 1 | 10 | 1 |
| | 25 | 100 | 20 | 15 | 50 | 100 | 15 | 20 | 10 | 10 | 20 | 10 | 10 | 10 | 30 | 30 | 30 | 1 | 50 | 1 | 40 | 20 | 1 | 50 | 100 | 100 | 1 | 10 | 1 |
| | 35 | 35 | 35 | 100 | 100 | 100 | 100 | 75 | 75 | 80 | 80 | 50 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 10 | 1 | 10 | 1 |
| | 100 | 100 | 50 | 70 | 100 | 50 | 70 | 30 | 80 | 60 | 60 | 75 | 75 | 75 | 75 | 75 | 75 | 10 | 33 | 10 | 50 | 75 | 25 | 100 | 75 | 100 | 5 | 15 | 5 |
| | 1 | 1 | 1 | 35 | 20 | 10 | 15 | 35 | 20 | 45 | 90 | 30 | 25 | 25 | 100 | 50 | 100 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 50 | 25 | 25 | 30 | 80 | 25 | 30 | 50 | 40 | 40 | 50 | 25 | 50 | 50 | 100 | 50 | 100 | 100 | 100 | 100 | 70 | 80 | 80 | 50 | 50 | 30 | 5 | 10 | 5 |
| | 1 | 1 | 1 | 40 | 100 | 40 | 40 | 50 | 50 | 50 | 100 | 50 | 50 | 50 | 100 | 50 | 100 | 50 | 10 | 50 | 40 | 40 | 50 | 20 | 10 | 1 | 1 | 1 | 1 |
| | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 50 | 25 | 25 | 50 | 25 | 50 | 50 | 80 | 80 | 100 | 50 | 50 | 50 | 70 | 50 | 50 | 50 | 100 | 100 | 5 | 10 | 5 |
| | 20 | 20 | 20 | 50 | 50 | 50 | 50 | 20 | 25 | 25 | 25 | 25 | 25 | 25 | 50 | 50 | 50 | 15 | 25 | 10 | 30 | 20 | 20 | 40 | 50 | 25 | 1 | 20 | 1 |
| | 1 | 1 | 1 | 20 | 25 | 10 | 30 | 10 | 30 | 30 | 50 | 40 | 25 | 25 | 25 | 40 | 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 25 | 25 | 40 | 60 | 25 | 25 | 10 | 30 | 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 1 | 1 | 25 | 100 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 50 | 70 | 60 | 1 | 1 | 1 | 10 | 10 | 10 | 50 | 10 | 20 | 1 | 1 | 1 |
| | 25 | 25 | 25 | 25 | 25 | 15 | 25 | 10 | 50 | 50 | 50 | 25 | 50 | 50 | 1 | 20 | 1 | 1 | 1 | 1 | 20 | 15 | 1 | 25 | 25 | 1 | 1 | 10 | 1 |
| | 1 | 1 | 1 | 20 | 20 | 20 | 20 | 10 | 5 | 5 | 10 | 5 | 20 | 20 | 5 | 20 | 5 | 5 | 10 | 5 | 15 | 20 | 10 | 20 | 25 | 1 | 5 | 10 | 1 |
| | 1 | 1 | 1 | 25 | 25 | 25 | 25 | 10 | 20 | 20 | 50 | 50 | 25 | 25 | 25 | 25 | 25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 50 | 1 | 100 | 25 | 100 |
| | 25 | 25 | 25 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 15 | 25 | 15 | 25 | 15 | 15 | 25 | 25 | 25 | 25 | 25 | 25 |
| | 25 | 50 | 25 | 70 | 70 | 50 | 70 | 50 | 40 | 30 | 25 | 25 | 25 | 25 | 70 | 70 | 70 | 20 | 25 | 20 | 20 | 25 | 20 | 25 | 25 | 15 | 5 | 25 | 0.5 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 25 | 25 | 50 | 80 | 25 | 25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 15 | 15 | 15 | 25 | 25 | 25 | 25 | 10 | 10 | 10 | 20 | 10 | 25 | 25 | 25 | 25 | 25 | 10 | 15 | 10 | 25 | 15 | 10 | 25 | 25 | 15 | 1 | 10 | 1 |
| | 33 | 20 | 33 | 33 | 40 | 50 | 55 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 25 | 50 | 25 | 25 | 25 | 30 | 50 | 50 | 50 | 25 | 50 | 25 |

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# Specifications and Typical Properties

| Pour Point (°C) | Boiling Point (at 760 mm. Hg) (°C) | Vapor Pressure (mm Hg) at 150°C | at 200°C | at 300°C | Viscosity (centistokes) at 0°C | at 25°C | at 98.9°C | Surface Tension at 20°C (dynes/cm.) | Thermal-Expansion Coefficient (at 10° to 40°C) (cc/cc/°C) | * Specification Flash-Point (C.O.C.) (°F) | Fire Point (C.O.C.) (°F) | Assay (Ester Content) (%) | Sulfur (Copper-strip test) | Solubility in water (at 25°C) (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ) | 340 9 | 1 | 9 | 300 | 55.0 | 15.6 | 2.4 | 35 | 0.00078 | 340 | 395 | 99 min. | — | 0.001 (30°C) |
| ) | 270 to 278 (4 mm. Hg) | 0.09 | 1.1 | — | — | — | — | 36.4 (75°C±1°) | — | 405 | 465 | ° 99.0 min. | — | <0.01 |
| supercools readily | 298 | 8 | 50 | — | 31.0 | 9.8 | 1.8 | 35.3 (20.5°C) | — | 305 | 335 | 99 min. | Negative | 0.1 (32°C) |
| | 250 to 257 (4 mm. Hg) | 0.015 | 0.35 | — | 642.0 | 91.0 | 5.6 | 29 | 0.00074 | 450 | 520 | — | — | <0.005 |
| | 228 to 237 (4 mm. Hg) | < 0.05 | 1.0 | — | 322.0 | 55.0 | 4.3 | — | 0.00073 | 430 | 480 | 99 min. to 101 | Negative | <0.01 |
| resupercools) | 282 | 13 | 76 | — | 54 | 11.4 | 1.6 | 32 | 0.00092 (0° to 30°C) | 300 | 315 | 99.0 min. | Negative | 0.4 (32°C) |
| | 237 to 267 (4mm. Hg) | 0.01 | 0.25 | -- | — | 138 | 34 | 31 | 0.00071 | 435 | — | — | -- | |
| | 386 | 0.05 | 1.2 | — | 348.0 | 58.0 | 4.3 | 33 (25°C) | 0.00074 | 425 | 480 | 99 to 101 | Negative | <0.005 |
| | 405 | 0.15 | 1.7 | 55 | — | — | — | — | — | 435 | — | — | — | <0.01 |
| | 285 (35mm. Hg) | — | — | — | 1500 | 160 | 8 | — | — | 450 | — | — | — | -- |
| | 370 | 0.16 | 2 | 90 | — | 41.5 | — | 39.9 (25°C) | 0.00080 | 390 | — | — | — | 0.0003 (30°C) |
| | - | 0.14 | 1.8 | — | 250.0 | 45.0 | 3.9 | — | — | 390 | — | — | Negative | <0.005 |
| | — | 19.6 | 70.4 | — | — | 17.0 | — | 33.6 (24°C) | — | 315 | 335 | — | — | Practically insoluble |
| | - | 15.0 | 53.1 | — | — | 29.6 (37.8°C) | 4.5 | 31.0 (24°C) | 0.00051 | 325 | 355 | — | — | Practically insoluble |
| | - - | — | — | — | — | 75 | 4.5 | — | — | 495 | — | — | — | Practically insoluble |
| | | -- | 0.33 | 34 | 900 | 92 | 5.2 | 34.3 (25°C) | 0.00051 | 420 | 515 | — | — | |
| | | — | — | — | — | 34.5 (37.8°C) | 5.0 | — | — | 412 | — | — | — | |
| | | — | — | — | 400.0 | 60.0 | 4.6 | — | 0.00076 | 395 | — | — | — | -- |
| | — | — | — | — | 450.0 | 61.0 | 4.3 | — | 0.00074 | 370 | — | — | — | — |
| | — | — | — | — | 250.0 | 50.0 | 4.8 | — | 0.00074 | 385 | — | — | — | — |
| | -- | — | — | — | — | — | — | — | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| | 240 (4 mm. Hg) | 0.02 | 0.58 | — | — | 14.5 (37.8°C) | 3.6 | 30 | 0.00077 | — | — | — | — | <0.01 |
| | -- | 0.04 | 0.80 | — | — | 9.5 (37.8°C) | 2.8 | 29 | 0.00076 | 401 | 480 | — | Negative | <0.01 |
| | 214 (5 mm. Hg) | < 0.15 | 2.5 | — | — | 8.2 (37.8°C) | 2.4 | 29 | 0.00078 | 377 | 450 | — | — | <0.01 |
| | 420 | — | 0.5 | 29 | 1256.0 | 89.0 | 4.0 | 44.5 | 0.00057 | 470 | 595 | — | — | <0.002 gm/100 ml |
| | 370 | 0.15 | 1.9 | — | — | 7.8 (55°C) | 2.9 | — | — | 437 | — | — | — | 0.001 (34°C) |
| | 390 | 0.08 | 1 | 760 (390°C) | 208.0 | 33.0 | 2.8 | 42 | 0.00067 | 450 | none at 625 | — | — | <0.005 |
| | 375 | 0.095 | 1.3 | — | 61.0 | 16.4 | 2.5 | 36.7 (23°C) | — | 435 | 460 | — | — | 0.003 |
| | 215-228 | < 0.10 | 1.6 | — | — | 12.0 (20°C) | — | 30 | 0.00081 | 435 | 485 | — | — | 0.11 |
| | 137-145 | 7.3 | > 500 | — | — | 3.8 (20°C) | — | 29 | 0.00085 | 380 | 400 | — | -- | 0.1 |
| | 370 | 0.47 | 7 | 480 | 616.0 | 58.0 | 2.9 | — | — | 386 | -- | — | Negative | 0.0175 (30°C) |
| | 345 | 0.1 | 1.8 | 190 | 279.0 | 46.0 | 3.6 | — | — | 390 | — | — | Negative | 0.0012 (30°C) |
| | 310 | 0.5 | 8 | 600 | 1476.0 | 82.0 | 2.8 | 43.6 (25°C) | — | 380 | — | — | Negative | 0.09 (30°C) |
| | 350 | — | — | — | — | — | — | — | — | — | — | — | — | 0.00045 (30°C) |
| | | 0.8 | — | — | — | — | — | — | — | 371 | — | — | — | Slight |

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| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 (approx.) | 0.25 | 3.2 | — | — | — | — | — | — | 420 | — | — | — | 1 (34°C) |
| — | — | — | — | — | — | — | — | — | — | — | — | — | Practically insoluble |
| — | — | — | — | — | — | — | — | — | — | — | — | — | Nil |
| — | — | — | — | — | 10,500 to 13,500 | — | — | — | 555 | — | — | — | Practically insoluble |
| — | — | — | — | — | 2,900 to 3,500 | — | — | 0.00071 | 530 | 570 | — | — | Practically insoluble |
| — | — | — | — | — | 9,000 to 9,800 | — | — | — | 540 | — | — | — | Practically insoluble |
| — | — | — | — | — | 556 | — | — | — | 475 | 535 | — | — | Practically insoluble |
| — | — | — | — | — | 3,878 | — | — | — | 485 | 535 | — | — | Practically insoluble |
| — | — | — | — | — | 6,822 | — | — | — | 525 | 580 | — | — | Practically insoluble |
| — | — | — | — | — | 156 | — | — | — | 485 | 525 | — | — | Practically insoluble |
| 345 to 396 | 2 | 15 | 230 | 70.0 | 29.0 (37.8°C) | 3.8 | 40.1 (25°C) | — | 345 | 385 | — | — | — |
| 360 | — | 11 (220°C) | — | — | — | — | — | — | 375 | 525 | — | — | Hygroscopic |
| 360 | — | 11 (220°C) | — | — | 17.5 | — | — | — | 375 | 525 | — | — | Hygroscopic |

## FLAME-RETARDANT PLASTICIZERS

If you want products that resist burning, build your formulations with one or a combination of flame-retardant plasticizers. Monsanto's liquid and solid flame-retardant plasticizers offer a wide range of compatibilities. Other beneficial properties include permanence, chemical resistance, extraction resistance, flexibility and weatherability.

**Santicizer® 140**
**Santicizer 141**
**Tricresyl Phosphate**
**Triphenyl Phosphate**
**11 Arbclor® Plasticizers**
**6 Montar® Compounds**

## FDA REGULATED PLASTICIZERS

Monsanto offers more FDA regulated plasticizers than any supplier for use in compositions related to food packaging and handling, and for articles that come into close contact with the human body. The following list of plasticizers offer you high specification standards of purity, low odor, minimum taste, flexibility, clearness and water resistance for applications such as: food-wrapping paper coatings, packaging films, label adhesives and inks, beverage and blood tubing:

**Dioctyl Phthalate**
(high-water-content foods only)
**Diisooctyl Phthalate**
(high-water-content foods only)
**Diethyl Phthalate**
**Dioctyl (2-ethylhexyl) Adipate**
**Santicizer® 141**
**Santicizer E-15**
**Santicizer B-16**
**Santicizer 160**

## SOLID PLASTICIZERS

Choose from a variety of plasticizers for use in adhesives, coatings and lacquers, foams, rigid compositions and films. Solid plasticizers decrease your hot processing time at reduced cost. During solvent processing, they require fewer surface-building coats and at less cost. For use such as delayed-tack and heat-seal adhesives and coatings for non-blocking films, easier processing of rigid plastics products, toughness of rigid foams, for even flow and uniform filling of resinous impregnants, choose from the following:

| | Melting Point (°C) | Softening Range (°C) |
|---|---|---|
| Aroclor® 5442 | — | 46-52 |
| Triphenyl Phosphate | 48.5 | — |
| Montar® 1 | — | 54-160 |
| Santicizer® 3 | 58 | — |
| Aroclor 4465 | — | 60-66 |
| Santolite® MHP | 62 | — |
| Dicyclohexyl Phthalate | 63 | — |
| Diphenyl Phthalate | 69 | — |
| Montar 2 | — | 70-170 |
| Santicizer 1-H | 82.5 | — |
| Montar 3 | — | 86-168 |
| Montar 4 | — | 92-206 |
| Aroclor 5460 | — | 98-105 |
| Santicizer 9 | 105 | — |
| Montar 9 | — | 130-175 |
| Aroclor 1268 | — | 150-170 |
| Montar 5 | — | 155-195 |

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# MONSANTO PLASTICIZERS: Summary

| Plasticizer | Molecular Weight | Acidity (meq./100 gm max) | Appearance | Color (APHA) (maximum) | Moisture (KF in methanol) (% maximum) | Odor | Refractive Index (at 25°C) | Specific Gravity (25°/25°C) | Density (at 25°C) (lb./gal.) | Crystallizing Point (°C) |
|---|---|---|---|---|---|---|---|---|---|---|
| **PHTHALATES** | | | | | | | | | | |
| Dibutyl | 278.34 | * 0.12 | * Clear, oily liquid | * 20 | * 0.15 | * Slight, characteristic | 1.4895 to 1.4915 | * 1.044 to 1.048 | 8.72 | <—35 |
| Dicyclohexyl | 330.41 | * 0.12 | * White lumps or granules | * 100 (molten) | * 0.1 | * Moderate, aromatic; slight phthalic, characteristic | — | 1.29 | — | — |
| Diethyl | 222.11 | * 0.12 | * Clear, oily liquid | * 10 | * 0.15 | * Slight, aromatic, max. | 1.4990 to 1.5010 | * 1.115 to 1.119 | 9.35 | <—0.3 |
| Didodecyl | 446.65 | * 0.12 | * Clear, oily liquid | * 50 | * 0.10 | * Slight, characteristic | 1.4794 to 1.4864 | * 0.963 to 0.969 | 8.05 | —53 (still, clear gel) |
| Dioctyl | 390.53 | * 0.12 | * Clear, oily liquid | * 35 | * 0.10 | * Slight, characteristic, max. | 1.4810 to 1.4880 | * 0.980 to 0.985 | 8.21 | —45 |
| Dimethyl | 194.18 | * 0.12 | * Clear, oily liquid | * 10 | * 0.25 | * Slight, aromatic, max. | 1.5123 to 1.5143 | * 1.188 to 1.192 | 9.92 | 0.0 (in —2°C bath) |
| Di(*n*-octyl,*n*-decyl) | 418 (average) | * 0.01 | * Clear, oily liquid | * 50 | * 0.10 | * Slight, characteristic | * 1.4810 to 1.4840 | * 0.9680 to 0.9770 | 8.1 | —30 |
| Dioctyl | 390.53 | * 0.12 | * Clear, oily liquid | * 25 | * 0.10 | * Slight, characteristic, max. | 1.4845 to 1.4858 | * 0.980 to 0.985 | 8.21 | —55 (very stiff gel) |
| Diphenyl | 318.31 | * 1.20 | * Essentially white, fused solid with a slightly yellow or brown cast | * 160 (20ml: 50ml acetone) | 0.25 | — | 1.572 (@ 74°C) | 1.28 | — | — |
| Ditridecyl | 530 | * 0.12 | * Clear liquid | * 100 | * 0.1 | * Clear, characteristic | * 1.4813 to 1.4850 | * 0.948 to 0.955 | 7.93 | — |
| Santicizer® 160 | 312.35 | * 0.37 | * Clear, oily liquid | * 40 | * 0.15 | * Slight, characteristic, max. | * 1.535 to 1.540 | * 1.115 to 1.123 | 9.3 | <—35 |
| Santicizer 165 | — | * 0.12 | * Clear, oily liquid | * 40 | * 0.12 | * Slight (similar to DOP) | * 1.484 to 1.487 | * 0.990 to 0.996 | 8.28 | — |
| Santicizer 213 | — | * 0.25 | * Clear, oily liquid | * 75 | * 0.15 | Characteristic, very low | * 1.521 to 1.524 | * 1.040 to 1.045 | 8.68 | — |
| Santicizer 214 | — | * 0.15 | * Clear, oily liquid | * 100 | * 0.15 | Characteristic, very low | * 1.481 to 1.486 | * 0.948 to 0.956 | 7.9 | — |
| Santicizer 215 | — | * 0.12 | * Clear, oily liquid | * 100 | * 0.10 | Characteristic | * 1.508 to 1.516 | * 0.974 to 0.980 | 8.14 | — |
| Santicizer 262 | 396.5 | * 0.37 | * Clear, oily liquid | * 100 | * 0.15 | — | * 1.519 to 1.523 | * 1.045 to 1.057 | 8.7 | —27.8 |
| Santicizer 602 | — | * 0.18 | * Clear, oily liquid | * 50 | * 0.10 | * Characteristic, mild | * 1.482 to 1.486 | 0.971 to 0.977 | 8.1 | — |
| Santicizer 603 | — | * 0.12 | * Clear, oily liquid | * 100 | * 0.10 | Characteristic | * 1.4825 to 1.4895 | * 0.977 to 0.987 | 8.18 | — |
| Santicizer 630 | — | * 0.12 | * Clear, oily liquid | * 70 | * 0.10 | — | * 1.5095 to 1.5160 | * 0.987 to 0.994 | 8.25 | — |
| Santicizer 631 | — | * 0.12 | * Clear, oily liquid | * 40 | * 0.10 | — | * 1.4990 to 1.5045 | * 0.984 to 0.990 | 8.22 | — |
| Santicizer 632 | — | * 0.12 | * Clean, oily liquid | * 100 | * 0.15 | — | * 1.484 to 1.487 | * 0.976 to 0.982 | 8.15 | — |
| Santicizer 636 | — | * 0.12 | * Clear, oily liquid | * 75 | * 0.10 | — | * 1.478 to 1.488 | * 0.969 to 0.977 | 8.11 | — |
| Santicizer 681 | — | * 0.20 | * Clear, oily liquid | * 40 | * 0.10 | — | * 1.472 to 1.479 | * 0.963 to 0.970 | 8.05 | — |
| Santicizer 683 | — | * 0.12 | * Clear, oily liquid | * 40 | * 0.10 | — | * 1.488 to 1.489 | * 0.975 to 0.981 | 8.09 | — |
| **ADIPATES** | | | | | | | | | | |
| Dinodecyl | 446.0 | * 0.50 | * Clear, oily liquid | * 50 | * 0.10 | * Mild | 1.4485 to 1.4525 | * 0.962 to 0.973 | 7.65 | <—50 |
| Di(*n*-octyl,*n*-decyl) | 398 (average) | * 0.35 | * Clear, oily liquid | * 50 | * 0.10 | Characteristic | * 1.444 to 1.458 | * 0.914 to 0.922 | 7.63 | —5 |
| Dioctyl | 370.56 | * 0.25 | * Clear, oily liquid | * 25 | * 0.10 | * Mild | 1.444 to 1.448 | * 0.921 to 0.927 | 7.72 | <—70 |
| **PHOSPHATES** | | | | | | | | | | |
| Tricresyl | 368.18 | * 0.20 | * Clear, oily liquid | * 75 | * 0.15 | * No foreign odor | 1.556 | * 1.157 to 1.173 | 9.7 | <—35 |
| Triphenyl | 326.31 | * 0.05 | * White flakes | 20 (molten) | — | * Very faint, aromatic, max | 1.550 (@ 60°C) | 1.268 (60°/20°C) | 10.5 | 49 |
| Santicizer 140 | 340.2 | * 0.20 | * Clear, oily liquid | * 40 | * 0.15 | * Essentially odorless | 1.550 to 1.570 | * 1.203 to 1.213 | 10 | <—35 |
| Santicizer 141 | 362.40 | * 0.20 | * Clear, oily liquid | * 60 | * 0.10 | * Slight, sweet | 1.507 to 1.510 | * 1.089 to 1.093 | 9.1 | — |
| Tributoxyethyl | — | * 1.0 | * Clear, oily liquid | * 75 | * 0.20 | * Characteristic, mild | * 1.434 to 1.438 | * 1.017 to 1.023 | 8.50 | <—70 |
| Tributyl | 266.32 | * 0.61 | * Clear, oily liquid | * 25 | * 0.20 | * Characteristic | * 1.422 to 1.424 | * 0.973 to 0.978 | 8.14 | < 80 |
| **GLYCOLATES** | | | | | | | | | | |
| Santicizer E-15 | 280.27 | * 0.17 | * Clear, oily liquid | * 20 | * 0.15 | * Slight, max. | 1.496 to 1.500 | * 1.180 to 1.185 | 9.85 | (supercools 20 readily) |
| Santicizer B-16 | 336.37 | * 0.33 | * Clear, oily liquid | * 45 | * 0.15 | * Slight, characteristic | 1.488 to 1.492 | * 1.095 to 1.105 | 9.15 | <—35 |
| Santicizer M-17 | 266.24 | * 0.33 | * Clear, oily liquid | * 20 | * 0.15 | * Slight, characteristic, max. | 1.504 | * 1.217 to 1.227 | 10.20 | <—35 |
| **SULFONAMIDES** | | | | | | | | | | |
| Santicizer 1-H | 253.36 | — | * Yellow-brown fused mass | * 300 (molten) | * 0.15 | — | — | 1.125 | — | (in vacuum jacket) * 82.5 min. |
| Santicizer 3 | 199.23 | * 1.60 | * Practically white solid | * 60 (molten) | * 0.25 | — | 1.512 to 1.532 (65°C) | 1.166 to 1.176 (65°/65°C) | — | * 58.0 min. |
| Santicizer 4 | [illegible] | * 0.90 | * Light yellow, viscous liquid free of turbidity or | | | | | | | |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | * Fine, white to light-cream, granular particles | * 85 (33% wt. % in acetone) | * 1.0 | Essentially none | — | [illegible] | | |
| [illegible] | [illegible] | mg KOH/g | * Hard, practically colorless resin | * 50 (25g: 75g butyl acetate) | — | Faint formaldehyde | 1.4275 to 1.4325 (25g:75g butyl acetate) | 1.35 | | 62 |
| [illegible] | [illegible] | [illegible] | * Light-colored, viscous liquid. Free flowing above 20°C | * 80 (25g: 35g butyl acetate) | — | — | — | 1.256 | 10.5 | — |

**PERMANENT**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Santicizer 405 | — | * 1.0 | * Clear, viscous liquid | * 250 (50ml: 50ml 95% ethanol) | * 0.15 | * Characteristic | 1.476 | * 1.128 to 1.132 | 9.41 | — |
| Santicizer 409 | — | * 1.5 | * Clear, liquid | * 150 (50ml: 50ml 95% ethanol) | * 0.15 | Very faint ester | 1.4654 | * 1.080 to 1.084 | 9.01 | — |
| Santicizer 411 | — | * 1.0 | * Slightly yellow, viscous liquid; some solids on standing | * 175 (50ml: 50ml 95% ethanol) | * 0.15 | * Slight, characteristic | 1.4772 | * 1.104 to 1.110 | 9.29 | — |
| Santicizer 480 | — | * 0.50 | * Clear, oily liquid | * 200 | * 0.15 | Slight, characteristic | 1.4943 | * 1.039 to 1.046 | 8.72 | — |
| Santicizer 481 | — | * 0.85 | * Clear, oily liquid | * 300 | * 0.15 | Slight, characteristic | 1.4795 | * 1.072 to 1.078 | 8.96 | — |
| Santicizer 482 | — | * 1.1 | * Clear, liquid | * 325 | * 0.15 | Slight, characteristic | 1.4751 | * 1.097 to 1.103 | 9.16 | — |
| Santicizer 483 | — | * 0.24 | * Clear, oily liquid | * 125 | * 0.15 | Slight, characteristic | * 1.5015 to 1.5050 | * 1.045 to 1.052 | 8.74 | — |

**OTHER**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| HB-40® | — | — | Practically colorless, oily liquid | * 150 | * 125 ppm | Faint, characteristic | 1.5600 to 1.5750 | * 1.001 to 1.007 (25°/15.5° C) | 8.37 | — |
| Mod-Epox® | — | * 0.08 (mg KOH/g) | * Oily liquid or light-yellow solid | * 50 | — | — | * 1.587 to 1.590 | * 1.176 to 1.182 (30°/15.5°C) | 9.83 | 25 |
| Triphenyl Phosphite | 310.28 | * 0.18 (mg KOH/g) | * Oily liquid or light-yellow solid | * 50 | — | — | * 1.587 to 1.590 | * 1.176 to 1.182 (30°/15.5°C) | 9.83 | 25 |

## GENERAL PROPERTIES OF REPRESENTATIVE AROCLOR® PLASTICIZERS AND RESINS (*MONSANTO SPECIFICATIONS)

0509618

| PROPERTY | AROCLOR 1221 | AROCLOR 1232 | AROCLOR 1242 | AROCLOR 1248 | AROCLOR 1254 | AROCLOR 1260 | AROCLOR 1262 | AROCLOR 5442 | AROCLOR 4465 | AROCLOR 5460 | AROCLOR 1268 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Appearance | Clear, mobil oil | Clear, mobil oil | *Clear, mobil oil | *Clear, mobil oil | Light-yellow viscous oil | *Light-yellow, soft, sticky resin | *Light-yellow sticky viscous resin | *Yellow, clear, sticky resin | *Light-yellow, clear, *brittle resin* | *Clear, yellow-to-amber, *brittle resin* or flakes | *White to off-white powder |
| Color, maximum | *50 APHA | *100 APHA | *100 APHA | *100 APHA | *100 APHA | *150 APHA | *150 APHA | *2 NPA (molten) | *2 NPA (molten) | *2 NPA (molten) | 1.5 NPA (molten) |
| Chlorine, per cent | 20.5-21.5 | 31.5-32.5 | 42 | 48 | 54 | 60 | 61.5-62.5 | 42 | 65 | 58.5-60.6 | 68 |
| Acidity, mg KOH/g, maximum | *0.014 | *0.014 | *0.015 | *0.010 | *0.10 | *0.014 | *0.014 | 0.05 | 0.5 | 0.5 | 0.05 |
| Moisture, ppm, maximum | — | — | *50 | *50 | *50 | *50 | — | — | — | — | — |
| Avg. Coefficient of Expansion, cc/cc/°C | 0.00071 (15°-40°C) | 0.00073 (25°-100°C) | 0.00068 (25°-65°C) | 0.00070 (25°-65°C) | 0.00066 (25°-65°C) | 0.00067 (20°-100°C) | 0.00064 (25°-65°C) | 0.00123 (25°-99°C) | 0.00061 (25°-65°C) | 0.00179 (25°-124°C) | 0.00067 (20°-100°C) |
| Specific Gravity | *1.182-1.192 (25°/25°C) | *1.270-1.280 (25°/15.5°C) | *1.381-1.392 (25°/15.5°C) | *1.405-1.415 (65°/15.5°C) | *1.495-1.505 (65°/15.5°C) | *1.555-1.566 (90°/15.5°C) | *1.572-1.583 (90°/15.5°C) | 1.470 (25°/25°C) | 1.670 (25°/25°C) | 1.670 (25°/25°C) | 1.804-1.807 (25°/25°C) |
| Density, pounds per gallon, 25°C | 9.85 | 10.55 | 11.50 | 12.04 | 12.82 | 13.50 | 13.72 | 12.24 | 13.91 | 13.91 | 15.09 |
| Distillation Range, °C, corrected (ASTM D-20, modified) | 275-320 | 290-325 | 325-366 | 340-375 | 365-390 | 385-420 | 390-425 | 215-300 (4 mm. Hg) | 230-320 (4 mm. Hg) | 280-335 (5 mm. Hg) | 435-450 |
| Evaporation Loss, %, 100°C, 6 hours (ASTM D-6, mod.) 163°C, 5 hours | 1.0-1.5 — | 1.0-1.5 — | 0-0.4 3.0-3.6 | 0-0.3 3.0-4.0 | 0-0.2 1.1-1.3 | 0-0.1 0.5-0.8 | 0-0.1 0.5-0.6 | 0.01 0.2 | 0-0.02 0.2-0.3 | 0.03 | 0-0.05 0.1-0.2 |
| Flash Point (Cleveland Open Cup), °C / °F | 141-150 286-302 | 152-154 305-310 | 176-180 348-356 | 193-196 379-384 | NONE | NONE | NONE | 247 477 | NONE | NONE | NONE |
| Fire Point (Cleveland Open Cup), °C / °F | 176 349 | 238 460 | NONE** | NONE | NONE | NONE | NONE | 350 662 | NONE | NONE | NONE |
| Pour Point (ASTM D-97), °C / °F | 1 (crystals) 34 (crystals) | —35.5 —32 | —19 2 | —7 19.4 | 10 50 | 31 88 | 35-38 99 | 46 115 | — — | — — | — — |
| Softening Point (ASTM E-28), °C / °F | — — | — — | — — | — — | — — | — — | — — | *46-52 115-126 | *60-66 140-151 | *98-105.5 208-222 | *150-170 (hold point 302-338 |
| Refractive Index, $n_D^{70}$ or 20°C | 1.617-1.618 | 1.620-1.622 | 1.627-1.629 | 1.630-1.631 | 1.639-1.641 | 1.647-1.649 | 1.6501-1.6517 | — | 1.664-1.667 | 1.660-1.665 | — |
| Viscosity, Seconds Saybolt Universal (ASTM D-88) 100°F (37.8°C) | *38-41 | *44-51 | *82-92 | 185-240 | 1800-2500 | — | 600-850 | — | — | — | — |
| 130°F (54.4°C) | 35-37 | 39-41 | 49-56 | *73-80 | 260-340 | 3200-4500 | (160°F; 71°C) | — | 90-150 | — | — |
| 210°F (98.9°C) | 30-31 | 31-32 | 34-35 | 36-37 | *44-48 | *72-78 | *86-100 | 300-400 | (266°F; 130°C) | — | — |

*Monsanto Company specifications.
**NONE indicates no flash or fire up to boiling point.

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