



*E*astman Plasticizers

Selector Chart

Eastman TXIB Plasticizer
has been renamed
Eastman TXIB Formulation Additive
February 1, 2006

EASTMAN

TYPICAL PROPERTIES^a OF VARIOUS PLASTICIZERS

Plasticizers	Molecular Weight (Theoretical)	Specific Gravity, 20°C/20°C	Weight per Volume (Density) @ 20°C		Viscosity @ 25°C cP (MPa·s)	Typical Color, Pt-Co	Flash Point, COC °C (°F)	Boiling Point @ 760 mm °C (°F)
			lb/gal (U.S.)	kg/L				
Orthophthalates								
<i>Eastman</i> DMP ^b	194	1.192	9.93	1.19	11	10 max.	157 (315)	284 (543)
<i>Eastman</i> DEP ^b	222	1.120	9.32	1.12	9	10 max.	161 (322)	298 (568)
<i>Eastman</i> DBP ^b	278	1.048	8.72	1.04	15	20 max.	190 (375)	340 (644)
Butyl Benzyl Phthalate (BBP)	312	1.121	9.33	1.12	41	40	199 (390)	370 (698)
Dihexyl Phthalate (DHP)	334	1.008	8.39	1.01	25	25	193 (380)	210 (410) @ 5 mm
<i>Eastman</i> DOP ^b	391	0.985	8.20	0.98	56	25 max.	216 (420)	384 (723)
C ₆ –C ₁₀ Straight-Chain Phthalate	—	0.977	8.13	0.97	31	40	227 (440)	—
C ₇ –C ₁₁ 70% Straight-Chain Phthalate	414	0.973	8.10	0.97	41	25	227 (440)	385 (725)
Diisononyl Phthalate (DINP)	418	0.972	8.10	0.97	52	25	221 (430)	252 (486) @ 5 mm
Diisodecyl Phthalate (DIDP)	447	0.967	8.05	0.96	79	50	232 (450)	250 (482) @ 4 mm
Ditridecyl Phthalate (DTDP)	530	0.953	7.90	0.95	190	75	235 (455)	285 (545) @ 3.5 mm
<i>Eastman</i> DUP ^b	547	0.955	7.94	0.95	53	100 max.	252 (485)	523 (971)
Orthophthalate-Free Plasticizers								
<i>Eastman</i> TXIB ^b	286	0.945	7.86	0.94	9	30 max.	143 (290)	280 (536)
<i>Eastman</i> Triacetin (Glyceryl Triacetate) ^b	218	1.160	9.65	1.16	17	10 max.	153 (308)	258 (496)
<i>Eastman</i> DOA ^b	370	0.927	7.71	0.92	12	25 max.	206 (402)	417 (782)
Dioctyl Azelate (DOZ)	412	0.916	7.64	0.91	15	75	213 (415)	376 (709)
<i>Eastman</i> TEG-EH	403	0.967	8.07	0.96	16	100 max.	199 (380)	344 (651)
Epoxidized Tallate	420	0.931	7.60	0.91	45	1 Gardner	224 (435)	—
<i>Eastman</i> TOTM ^b	547	0.989	8.22	0.98	194	125 max.	263 (505)	414 (777)
<i>Eastman</i> 425	—	1.018	8.49	1.02	99	50 max.	194 (407)	>300 (>572)
Triisooctyl Trimellitate (TIOTM)	547	0.992	8.26	0.99	220	100	260 (500)	283 (541) @ 2.5 mm
Triisononyl Trimellitate (TINTM)	589	0.979	8.15	0.97	200	100	266 (510)	—
<i>Eastman</i> 168 ^b	391	0.984	8.18	0.98	63	50 max.	238 (460)	400 (752)
<i>Eastman</i> EPZ ^b	—	0.992	8.26	1.19	33 @ 10°C	Clear to Yellow	110 (230)	500 (930)
Epoxidized Soybean Oil	1,000	0.997	8.30	0.99	400	1 Gardner	310 (590)	—
<i>Eastman</i> PA-6 (Adhesion-Promoting Plasticizer) ^b	—	1.004	8.35	1.00	800	1 Gardner max.	201 (393)	404 (759)

^aProperties reported here are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform exactly to the listed values.

^bMarketed by Eastman Chemical Company.

FORMULATION RANGES FOR *EASTMAN* PLASTICIZERS IN PVC

When Your Business Is:		Typical Plasticizer Range, phr	Typical Maximum Concentration of Individual Plasticizers, phr								Special Requirements	
			DOP	168	<i>TXIB</i>		425	DUP	DOA	TOTM		Epoxy
Apparel	Baby Pants	60–75	25				25			75	5	Permanence, soapy water extraction
	Footwear	40–80	80		15		80		25		5	
	Outerwear	70–90	90	90	10		90		25		5	Hand and drape, low-temperature flexibility
Building and Construction	Flooring	35–70	70		20		70				5	Low staining
	Swimming Pool Liners	60–75	75	75			80	80		75		Water and sunlight resistance
	Water Stops	65–85	65	65	10		60	70	20			Low-temperature flexibility
	Weather Stripping	50–85	65	65	10		60		20			Permanence, low-temperature flexibility
Electrical	Wire and Cable	45–70	60	70				60		70	5	
Home Furnishings	Furniture Upholstery	60–90	90	90	15		65		25		5	Hand and drape
	Garden Hose	40–60	60	60	15		60		15		5	Low-temperature flexibility
	Shower Curtains	60–80	80	80	10		80		20	40		Flexibility, water extraction
	Tablecloths, Place Mats	40–80	80	80	10		80		20		5	Stain resistance, lacquer mar resistance
	Wall Coverings	40–60	60	60	15		60				5	Stain resistance
	Wood Surfacing Films	30–50	50	50	10		50	60			5	Stain resistance
Packaging	Film	40–80	80	80			80		40		5	
	Sheet	40–80	80	80			80		40		5	
Recreation	Sporting Goods	40–100+	100	100	30		100		25		5	
	Toys	30–100		100	30		100		25		5	
Transportation	Auto Mats	40–75	75	75	15		75	75	20		5	Stain resistance
	Auto Tops	35–60	15	60			60	70			5	Permanence
	Upholstery, Seat Covers	60–90	50	75			75	70			5	Permanence
Miscellaneous	Medical Tubing	50–65	65						65		5	
	Novelties	30–100	100	100	30		100				5	
	Tools and Hardware	40–100	100	100	20		100		50		5	
Vinyl Foams	Chemically Expanded	30–100+	100	100			100		40		5	Gel control
	Mechanically Frothed	65–100+	100	100	10		100		40		5	
Desired Features for PVC Applications			DOP	168	<i>TXIB</i>		425	DUP	DOA	TOTM	Epoxy	
Stain Resistance					X							
Permanence				X			X	X		X	X	
Fast Processing							X					
Low-Temperature Flexibility				X			X	X	X			
High Efficiency (Activity)									X			
Low Plastisol Viscosity				X	X				X			
Lacquer Mar Resistance				X			X	X		X		

 Preferred plasticizer

COMPARATIVE PROPERTIES OF EASTMAN PLASTICIZERS

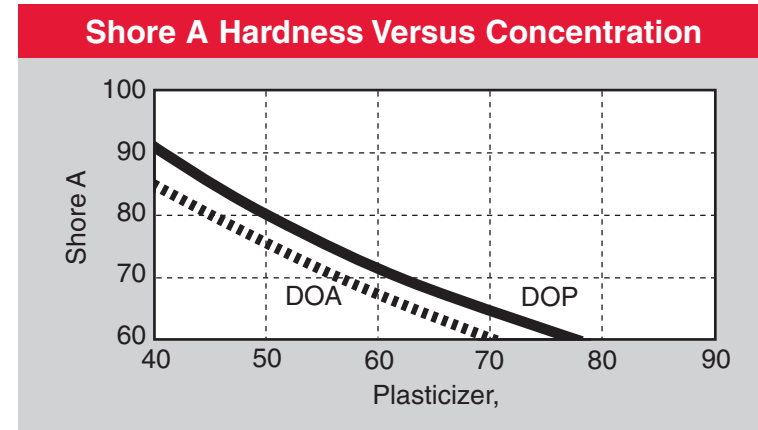
Plastisols contain 60 parts per hundred resin (phr) of plasticizer. Milled (and calendered) vinyl contains 50 phr.

100% Modulus psi (MPa) ^a			Low-Temperature Flexibility Temperature Where T = 35,000 psi (241 MPa), ^b °C			Activated Carbon Extraction (% wt loss) ^c		
Eastman Plasticizer	Plastisols	Milled	Eastman Plasticizer	Plastisols	Milled	Eastman Plasticizer	Plastisols	Milled
DOA	800 (5.5)	1,050 (7.2)	DOA	-57	-54	TOTM	0.8	0.5
TXIB ^f	1,000 (6.9)	1,600 (11.0)	168	-38	-26	168	1.2	1.0
DOP	1,050 (7.2)	1,550 (10.7)	DOP	-38	-26	DOP	2.5	1.5
168	1,250 (8.6)	1,600 (11.0)	TXIB ^f	-38	-24	DOA	3.7	2.8
TOTM	1,250 (8.6)	1,850 (12.8)	TOTM	-36	-20	TXIB ^f	7.0	6.0

Eastman Plasticizer	Solvating Characteristics of Plastisols		Plastisol Viscosity P (Pa·s) ^d		
	Gel Temperature, °C (°F) ^e		Eastman Plasticizer	1 Day	21 Days
	Soft	Hard			
TXIB ^f	65 (149)	80 (176)	DOA	45 (4.5)	90 (9.0)
DOP	66 (150)	81 (177)	168	75 (7.5)	110 (11.0)
DOA	68 (155)	79 (175)	TXIB ^f	95 (9.5)	180 (18.0)
168	69 (156)	93 (200)	DOP	120 (12.0)	220 (22.0)
TOTM	82 (180)	110 (230)	TOTM	190 (19.0)	265 (26.5)

PVC Hardness With Eastman Plasticizers

Shore A Hardness (ASTM D1706)		
Eastman Plasticizer	Plastisols	Milled
DOA	69	78
HS-4	70	79
TXIB ^f	70	80
DOP	70	80
168	72	81
TOTM	74	84



Relative Extraction Resistance in PVC (ASTM D1239)

Soapy Water Extraction (% wt loss)			Oil Extraction (% wt loss)			Hexane Extraction (% wt loss)		
Eastman Plasticizer	Plastisols	Milled	Eastman Plasticizer	Plastisols	Milled	Eastman Plasticizer	Plastisols	Milled
TOTM	0.2	0.1	TXIB ^f	14	6.3	TXIB ^f	31	24
168	0.5	0.4	DOP	15	8.3	168	31	26
DOP	1.1	0.3	168	16	10	DOP	34	26
TXIB ^f	1.7	1.2	TOTM	24	10	TOTM	35	26
DOA	1.9	0.9	DOA	31	18	DOA	35	29

^aStress required to elongate PVC 100%. Lower numbers indicate more efficient plasticizers. ASTM D638.

^bTemperature at which PVC has indicated stiffness (torsion). ASTM D1043.

^cIndication of volatility at elevated temperatures. ASTM D1203.

^dBrookfield viscosity, determined with a No. 4 spindle @ 6 rpm and @ 23°C.

^eAs determined on a temperature gradient bar: lower temperatures indicate faster processing or processing at a lower temperature in a vinyl system.

^fA TXIB/DOP (15/85) blend was used to illustrate the effectiveness of TXIB in PVC.

EASTMAN



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