Polyols

Product Range

HARKE
Coatings &
Polymers

Coatings, Plastics & Polymers

YOUR BENEFITS

- Useable for several applications
- Different molecular weights
- Steady quality
- Diols, triols etc.

Bulk
IBCs
Drums

YOUR PARTNER FOR COATINGS, PLASTICS & POLYMERS

HARKE Chemicals GmbH stands for certified quality and constant engagement for a sustainable protection of the environment.

POLYETHER POLYOLS – PETOL

CHIMCOMPLEX

Poly (Propylene Oxide) Homopolymers (PPG)

Type	Name	Hydroxyl Value [mg KOH/g]	Acid Value (BBT), max. [mg KOH/g]	Viscosity at 25 °C [cP]	Water (Karl-Fischer) max. [%]	Typical Density at 25 °C [g/cm³]	Average Molecular Weight [g/mol]
56-2 A	PETOL	53 - 59	0.05	280 - 380	0.05	1.002	2000
56-2 LM	PETOL	53 - 59	0.05	300 - 450	0.05	1.002	2000
120-2	PETOL	110 - 130	0.05	100 - 180	0.05	1.003	935
120-2 A	PETOL	108 - 116	0.05	140 - 180	0.05	1.003	1000
250-2	PETOL	240 - 260	0.05	60 - 100	0.08	1.002	450
28-2 LM	PETOL	26 - 30	0.05	900 - 1200	0.05	1.001	4000
Application:	• coatings • adhesives • elastomers • sealants • defoamers • viscosity reducer in • flexibleness agent for epoxy resins • lubricants						

Triols (Based On Glycerine) for Flexible Foams

Type	Name	Hydroxyl Value [mg KOH/g]	Acid Value (BBT), max. [mg KOH/g]	Viscosity at 25 °C [cP]	Water (Karl-Fischer) max. [%]	Typical Density at 25 °C [g/cm³]	Average Molecular Weight [g/mol]
46-3 MB	PETOL	43 - 49	0.05	500 - 700	0.1	1.015	3600
48-3 MB	PETOL	46 - 50	0.05	530 - 630	0.1	1.015	3500
56-3	PETOL	53 - 59	0.05	400 - 600	0.1	1.005	3000
36-3 BR	PETOL	33 - 39	0.05	700 - 1000	0.1	1.017	4800
28-3 B	PETOL	26 - 30	0.05	1050 - 1300	0.1	1.015	6000
S 38-3 B	PETOL	36 - 40	0.1	1050 - 1250	0.1	1.08	4400
56-3 LM	PETOL	53 - 59	0.05	500 - 700	0.1	1.005	3000
48-3 S	PETOL	46 - 50	0.05	630 - 830	0.1	1.015	3500
Application:	• flexible slabstock foams (standard, soft or super soft) • high resilience flexible slabstock foams • high resilience molded polyurethane foams • semi-rigid and integral skin foams						

Triols (Based On Glycerine) for Special Applications

Type	Name	Hydroxyl Value [mg KOH/g]	Acid Value (BBT), max. [mg KOH/g]	Viscosity at 25 °C [cP]	Water (Karl-Fischer) max. [%]	Typical Density at 25 °C [g/cm³]	Average Molecular Weight [g/mol]
160-3	PETOL	150 - 170	0.05	240 - 300	0.08	1.018	1000
250-3	PETOL	240 - 260	0.05	240 - 300	0.08	1.027	670
400-3	PETOL	360 - 400	0.1	330 - 430	0.08	1.05	440
Application:	• base polyols for OCF • rigid foams formulations • CASE applications • flexibleness agent for epoxy resins • hydraulic fluids						

SAN Polymer Polyols*

Type	Name	Hydroxyl Value [mg KOH/g]	Solid Content [%]	Viscosity at 25 °C [cP]	Water (Karl-Fischer) max. [%]	Typical Density at 25 °C [g/cm³]	Average Molecular Weight [g/mol]
PP 451	PETOL	28 - 34	44 - 47	3800 - 4600	0.1	1.033	3500
PP 251	PETOL	36 - 40	24 - 27	1000 - 1700	0.1	1.028	3500
PP 151	PETOL	37 - 41	14 - 16	1100 - 1300	0.08	1.025	3500
PP 101	PETOL	41 - 45	9 - 11	700 - 1000	0.08	1.025	3500
PP 2725	PETOL	25 - 29	23 - 25	2500 - 3500	0.1	1.035	4800
Application:	• slabstock flexible polyurethane foams						

*Styrene-Acrylonitrile Copolymer Grafted On The Polyether Chains

Sucrose/Sorbitol based Polyols

Type	Name	Hydroxyl value [mg KOH/g]	Average Molecular Weight [g/mol]	Viscosity at 25 °C [cP]	Water (Karl-Fischer) max. [%]	Typical Density at 25 °C [g/cm³]	Functionality
PZ 360-4G	PETOL	345 - 375	700	2700 - 3700	0.1	1.1	4.6
PZ 400-4G	PETOL	400 - 450	630	4000 - 6000	0.1	1.1	4.5
PZ 480-4G	PETOL	460 - 490	530	6500 - 9000	0.1	1.1	4.5
PZ 400-5G	PETOL	400 - 450	700	5000 - 11000	0.1	1.1	5
PS 460-5P	PETOL	440 - 480	650	12500 - 15500	0.1	1.09	5.4
PS 500-5G	PETOL	480 - 520	550	7500 - 10500	0.1	1.09	4.8
PS 500-4G	PETOL	480 - 520	450	2000 - 4000	0.1	1.08	4
PS 400-4G	PETOL	400 - 450	630	3000 - 5000	0.1	1.1	4.5
PS 480-6	PETOL	460 - 500	700	30000 - 40000	0.2	1.12	6
Application:	• polyol blends for rigid polyurethane foams						

Aliphatic Amines & Mannich Polyols

Type	Name	Hydroxyl Value [mg KOH/g]	Average Molecular Weight [g/mol]	Viscosity at 25 °C [cP]	Water (Karl-Fischer) max. [%]	Typical Density at 25 °C [g/cm³]	Functionality
PA 450-4E	PETOL	430 - 470	500	3000 - 5000	0.1	1.05	4
PA 640-4E	PETOL	615 - 665	350	14500 - 19500	0.2	1.07	4
PA 450-3T	PETOL	400 - 500	375	300 - 400	0.1	1.06	3
PM 410-4N	PETOL	400 - 440	530	8000 - 15000	0.1	1.06	4
Application:	• rigid polyurethane foams • semirigid polyurethane foams • crosslinker agent						

POLYESTER POLYOLS

BCI Polyurethane Europe S.r.l.

PUROL® Aromatic Polyester Polyols

Type	Performance features	Base Aromatic Acid	Viscosity at 25 °C [cP]	OH Value [mg KOH/g]	Acid no. [mg KOH/g]	Functionality
PUROL RT-03	Good solubility in n-pentane, isopentane and cyclopentane Rigid PIR-PUR formulations.	PET/TPA	5500 - 9500	300	2 max	2.5
PUROL R-04	Lower viscosity and higher Acid No. than PUROL R-08. Improve fire resistance properties. PUR and PIR foam.	Phthalic Anhydride	2000 - 3000	315	2.2 - 3	2
PUROL R-06	For formulation of adhesives, sealants, elastomers and urethane coatings. Rigid PUR-PIR formulations.	Phthalic Anhydride	7500 - 10000	240	2 max	2
PUROL R-08	Increases insulation ability and improves flammability resistance. Rigid PUR-PIR formulations.	Phthalic Anhydride	3000 - 4000	310	2 max	2
PUROL R-09	Promotes good flow. For formulation of Rigid PUR-PIR, adhesives, sealants, elastomers and urethane coatings.	Phthalic Anhydride	2000 - 4000	240	1 max	2.04
PUROL R-10	Good solubility in hydrocarbon blowing agent. Promotes good flow. For formulation of Rigid PUR-PIR, adhesives, sealants, elastomers and urethane coatings.	Phthalic Anhydride	2000-3500	245	1 max	2.1
PUROL R-20	Production of PUR/PIR panel. It can be used as sole polyol for PIR panel. Contains Flame-retardant.	Phthalic Anhydride	2000 - 4500	240	1.5 - 2.5	2
PUROL R-21	Production of PUR/PIR panel. It can be used as sole polyol for PIR panel. Contains Flame-retardant.	Phthalic Anhydride	2500 - 4000	200	1 max	2.04
PUROL R-22	Production of PUR/PIR panel. It can be used as sole polyol for PIR panel. Contains Flame-retardant.	Phthalic Anhydride	3700 - 5500	190	1 - 2	2
PUROL R-40	Relatively low OH value for economical usage of isocyanate. The high aromatic content improves the fire resistance.	Phthalic Anhydride	6000 - 7000	195	2 max	2
PUROL R-43	Relatively low OH value for economical usage of isocyanate.Good compatibility with HC. Contains Flame-retardant.	Phthalic Anhydride + Terephthalic acid	4000 - 5700	195	0.6 - 2	2
PUROL R-44	Polyester for PIR panel HC blown with high acidity. Improve fire resistance properties. Contains Flame-retardant.	Phthalic Anhydride + Terephthalic acid	2500 - 4500	240	1.3 - 2.6	2
PUROL R-01	Promotes flammability resistance. PUR	Aromatic-Brominated	5500 - 8500	165	2 max	3.5
PUROL R-02	Promotes flammability resistance. PUR	Aromatic-Brominated	5000 - 8000	295	3.5 max	3
Application:	• for PUR and PIR rigid polyurethane foams with enhanced flame properties					

BASIS® Aliphatic Polyester Polyols

Type	Performance features	Base Aromatic Acid	Viscosity [cP]	Average Molecular Weight	OH Value [mg KOH/g]	Acid no. [mg KOH/g]	Functionality
BASIS F15	Branched polyester polyol for the synthesis of quasi-isoprepolymer. Base polyol for PU shoe soles.	Adipic Acid	9500 - 10500 (at 35 °C)	2715	62	1.6 max	3
BASIS F31	Linear polyester polyol. Base polyol for PU shoe soles (flexible grade).	Adipic Acid	4200 - 4700 (at 35 °C)	2000	56	1 max	2
BASIS F39	Linear Polyester polyol. Base polyol for PU shore soles (flexible grade).	Adipic Acid	3000 - 5000 (at 35 °C)	2000	57	1 max	2
BASIS F41	Slightly branched Polyester Polyol. Base Polyol for PU shoe soles (as sole polyol or blended with filled polyol).	Mixed Dicarboxylic Acid	4500 - 5800 (at 35 °C)	2057	60	1 max	2.2
BASIS C11	Linear Polyester Polyol for Thermoplastic Polyurethane.	Adipic Acid	1200 -1900 (at 60 °C)	2500	45	0.5 max	2
BASIS C45	Linear Polyester Polyol for Thermoplastic Polyurethane.	Adipic Acid	2100 - 2700 (at 60 °C)	2500	45	0.5 max	2
Application:	• hardeners or tensile/water absorption enhancers in the production of continuous slab-stock and discontinuous flexible foam • base polyols for footwear polyurethane systems and various grades of TPU						

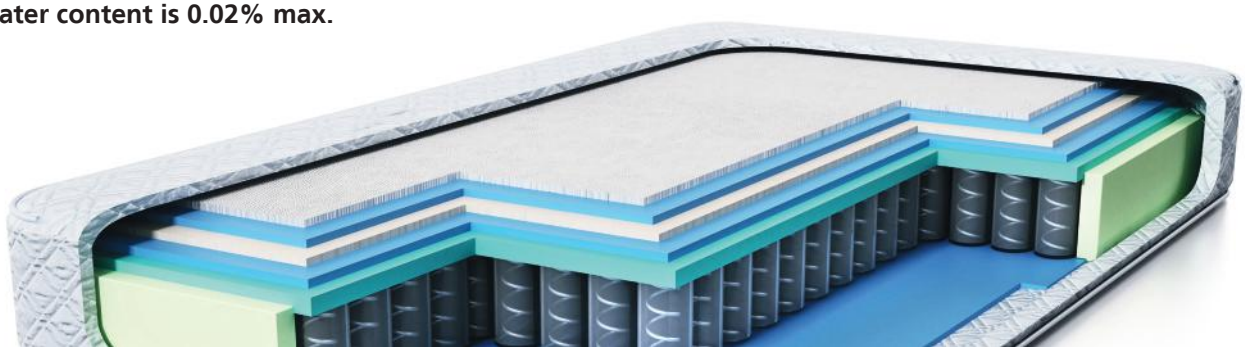
Technical features

Basis C11 is an adipate ester where 1,6-HD is used. **Basis C45** is an adipate ester where 1,4-BDO is used. **C11** is more flexible than **C45**. The flexibility is attributed to the use of 1,6-HD in **C11** (having a longer carbon chain length than 1,4-BD). If in the synthesis of TPU, both are using the same chain extender and the same molar ratio of polyester/chain-extender, then it is apparent that **C11** gives higher flexibility. But if formulated differently, a TPU using C45 can be more flexible than a TPU using **C11**. This depends on the molar ratio of the chain extender/polyester. The higher the amount of chain extender (relative to the polyester), the stiffer is the polymer backbone.

1. In its molten state, the color of the ester is almost water-white

2. Using the APHA standard, the specification is 50 APHA max.

3. Water content is 0.02% max.

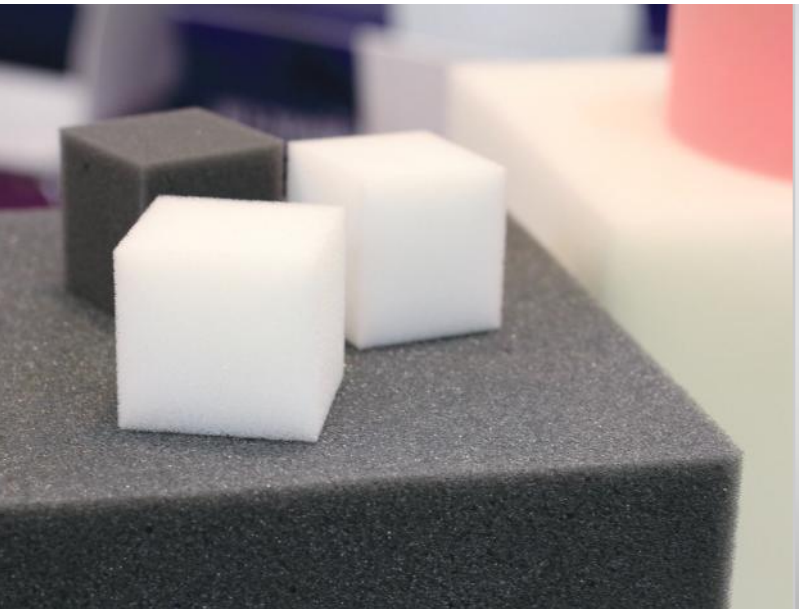


POLYCARBONATE POLYOLS

Available Types

Type	Name	OH number [mg KOH/g]	Average Molecular Weight [g/mol]	Viscosity at 50 °C [cps]	Melting Range [°C]	Appearance	Functionality
102	Ravecarb Homopolymer from Hexanediol	106 - 118	1000	1000	33 - 43	white, solid	2
103	Ravecarb Copolymer from Hexanediol and Pentanediol	106 - 118	1000	1000	-	liquid	2
106	Ravecarb Homopolymer from Hexanediol	53 - 59	2000	10000	36 - 50	white, solid	2
107	Ravecarb Copolymer from Hexanediol and Pentanediol	58 - 64	2000	8000	-	liquid	2
111	Ravecarb Copolymer from Polycaprolactonediol and Hexanediol	56	2000	3500	-	liquid	2
291	Ravecarb 3-Methyl-1,5-Pentanediol	112	1000	1800	-	liquid	2
292	Ravecarb 3-Methyl-1,5-Pentanediol	56	2000	4600	-	liquid	2

Application: Aliphatic polycarbonate polyols have a very good weathering resistance, excellent hydrolytic stability and low viscosity. Formally polycarbonate esterification are out of carbonic acid and at least difunctional alcohols. Our polycarbonate polyols are suitable for direct use in high-quality coatings. They also can be used to the further development of polyurethane binders. Especially noteworthy were polyurethane dispersions.



Types under Development

Technology	Type	Name	Average Molecular Weight [g/mol]	Functionality
Traditional Technology	101	Ravecarb Homopolymer from Hexanediole	500	2
	109	Ravecarb Copolymer from 1.6-Hexanediole & 1.4-Cyclohexane Dimethanol	900	2
Ravecarb 2 Series	251	Copolymer from Methylpentanediol & Hexanediol	3000	2
	252	Copolymer from Methylpentanediol & Hexanediol	4000	2
	253	Copolymer from Methylpentanediol & Hexanediol	5000	2
	293	Ravecarb 3-Methyl-1,5-Pentanediol	3000	2
Ravecarb 3 Series	351	Ravecarb Copolymer from Butanediol & Hexanediol	1000	2
	352	Ravecarb Copolymer from Butanediol & Hexanediol	2000	2
	353	Ravecarb Copolymer from Butanediol & Hexanediol	3000	2
	3505	Ravecarb Copolymer from Butanediol & Hexanediol	500	2
Application:	Several new developments are characterized by a very low glass transition temperature of - 50 °C. Additionally they have a very good weathering resistance and excellent hydrolytic stability. Caffaro Industry can also provide: • OH – stablility and reliablility on all batches • possibility of a tailor made reaction time to be +/- 30% of the typical value* • inserting reaction time into customer spec*			

*Only for FCL size business

PTMG

MITSUBISHI CHEMICAL

PTMG – Poly(tetramethylene ether) Glycol is manufactured by tetrahydrofuran (THF). It is a linear polyether glycol with primary hydroxyl groups at both ends. It easily reacts with isocyanates compounds (e.g. MDI, TDI), and generates polymers with the superior characteristic described below.

- High impact resilience
- Flexibility at low temperature
- Tear resistance
- Hydrolysis resistance
- Abrasion resistance
- Fungus resistance

PTMG has superior characteristics for use in the soft segment of polyurethane and polyester resins. The polymer obtained is used in a wide range of applications, from clothing and other ordinary consumables to various industrial materials (e.g. mechanical parts). Its applications are expected to increase in the future.

Feature of PTMG process:

1. Stable and high product quality (uncolored and low impurity), which is highly valued from leading manufacturer of spandex fibers
2. Using original catalysts
3. Cost competitive process
4. Green process/low waste and low environmental load

Grade	Molecular Weight	Hydroxyl Value (mgKOH/g)	Acid Value (mgKOH/g)	Moisture (%)	Volatile Content (%)	Color (Hazen)	Viscosity (mPA*s)
PTMG 250	210 ± 25	477.5 ~ 606.5	max. 0.10	max. 0.05	max. 0.1	max. 50	50 (20 °C) 40 (40 °C)
PTMG 650**	650 ± 50	160 ~ 187	max. 0.05	max. 0.03	max. 0.1	max. 50	160 (40 °C)
PTMG 850*	850 ± 50	125 ~ 140	max. 0.05	max. 0.03	max. 0.1	max. 50	
PTMG 1000**	1,000 ± 50	107 ~ 118	max. 0.05	max. 0.03	max. 0.1	max. 50	320 (40 °C)
PTMG 1300*	1,300 ± 65	82 ~ 91	max. 0.05	max. 0.03	max. 0.1	max. 50	
PTMG 1500*	1,500 ± 75	71 ~ 79	max. 0.05	max. 0.03	max. 0.1	max. 50	
PTMG 1800*	1,800 ± 100	59 ~ 66	max. 0.05	max. 0.03	max. 0.1	max. 50	
PTMG 2000**	2,000 ± 100	53 ~ 59	max. 0.05	max. 0.03	max. 0.1	max. 50	1,400 (40 °C)
PTMG 3000**	3,000 ± 200	35 ~ 40	max. 0.05	max. 0.03	max. 0.1	max. 50	3,450 (40 °C)
PTMG 4000*	4,000 ± 250	26 ~ 30	max. 0.05	max. 0.03	max. 0.1	max. 50	4,510 (40 °C)
Polyurethane Applications:	• Elastic polyurethane fiber (Spandex) • Polyurethane elastomers Thermoset elastomer (TSU) Thermoplastic elastomer (TPU) • Paint and Coating materials • Adhesives/Sealants • Synthetic leather/ Artificial leather • Flexible urethane foam						
Polyester Applications:	• Polyester elastomer (TPEE)						
Polyamide Applications:	• Polyetheramide elastomer						

* On request
**Also available as Bio-PTMG

POLYURETHANE ADDITIVES

Antistatic-Additives

These additives are highly effective in the production of safety-footwear as example, when it´s needed for the usage in hospitals or production industry. In the flexible PU foam it´s used in packaging materials for electronic devices or chips.

- High impact resilience
- Flexibility at low temperature
- Tear resistance
- Hydrolysis resistance
- Abrasion resistance
- Fungus resistance

Finishing Lacquers

These are the products to finish the moulded soles, our range includes dipping and spray types. These are used with specific machines and the soles are dipped directly into the bath containing the lacquer. The consumption of lacquer is only about 15 - 25 gr/pair.

- Transparent finish
- Brush-Off finish (age effects)
- Special effects such as cork imitation, metallic, velvet imitation or rubber-like touch

Flame Retardants

These additives can influence the flammability, the propagation of the flame and/or the fire load. For each application the most suitable flame retardant solution should be used to assure a high fire retardant effect of the material.

- Halogenated/halogen-free
- Solid/liquid
- Reduces flammability
- Prevent negative effects (toxic gases, smoke or odors)

Pigment Paste

They have been developed for colouring both Polyether and Polyester Polyurethane compounds, used in the production of shoe soles, integral skin, rigid and slab-stock foams, RIM and elastomers. They are a concentrated pigment dispersion in plasticizer or in polyol.

- Viscosity range from 500 - 10.000 cps
- Usage level between 0.5 - 5 %
- OH number from 0 - 32
- Concentrated pigment paste with plasticizer or polyol as carrier

Release-Agents

Water or solvent based (high or low concentration) Release-Agents for the production of shoe soles, flexible hot & cold foam, RIM, RRIM and SRIM as well for elastomers. Additionally we are providing our customers cleaners for their moulds and mixing heads.

- Solvent or water based
- Ready to use products manually or by air gun
- Available for all PU applications

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