

 **BASF**  
We create chemistry

**Solutions for  
Digital Printing**  
resins and additives  
selection guide



# Solutions for Digital Printing

## resins and additives selection guide

**Digital printing is a fast-growing industry with specific requirements for innovative products. BASF offers a complete range of high-quality raw materials for digital inks.**

At BASF, we are committed to helping you be more successful by delivering innovative solutions with minimal environmental impact. With our technical expertise, wide array of products, and global sourcing, we have your digital needs covered.

For specific formulation requirements or a complete list of products, please contact your BASF representative.

### **Broad technology portfolio**

BASF provides you with a full range of options for your formulation needs, including:

- Acrylic resins, resin solutions, RC emulsions, and colloids
- Energy-curing oligomers and reactive diluents
- UV absorbers and light stabilizers
- Dispersing agents, wetting agents and surface modifiers, defoamers, rheology modifiers and film-forming agents

### **Unique performance attributes**

BASF can work with you to develop innovative solutions for your customers that address a multitude of performance attributes, including:

- Consistent product quality
- Printability and resolubility
- Clarity and gloss
- Color strength and stability
- Low VOC and low HAPS
- Resistance and adhesion

### **Service capabilities**

Our expert teams, serving the needs of our customers in North America, offer expertise in chemistry, applications, and formulations. We can help you with:

- Formulation support
- Global research and development
- Regulatory support
- Product stewardship
- Global sourcing capabilities





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# Solutions for Digital Printing

Digital Applications	Narrow Web	Wide Format (Indoor)	Wide Format (Outdoor)	Continuous Inkjet
				

## Applications

Energy Cure	✓	✓	✓	
Waterborne	✓	✓	✓	
Solventborne				✓

## BASF Brand Solutions

<b>Resins</b> Joncryl®	✓	✓	✓	✓
<b>Oligomers &amp; Reactive Diluents</b> Laromer®	✓	✓	✓	
<b>Additives</b> Dispex®, Efka®, Hydropalat®, Irgastab®, Lignostab®, Rheovis®, Tinuvin®, and FoamStar®	✓	✓	✓	✓



# Resins

## Products at a glance

- Joncryl® Resins

To support the growth of the digital marketplace, innovative raw materials for ink design and production are needed for both digital printing in general and inkjet printing in particular. BASF's comprehensive resins and resin solutions meet the most stringent formulation requirements of ink, ink-receptive coating, and overprint varnish manufacturers.

Acrylic resins can be formulated to improve viscosity, enhance gloss and resolubility, and improve color development of pigment dispersions, inks, and overprint varnishes.

Resin solutions are a convenient and cost-effective alternative to solid resins. They produce high-quality, water-based pigment dispersions with superior pigment wetting characteristics, viscosity stability and free-flowing pigment dispersions.





# Joncryl Resins

Products	Physical Form	Viscosity @ 25°C (cps)	Acid Value (NV)	Typical VOC (% wt)	Applications Water-based	Description
<b>Joncryl HPD resins and resin solutions for high-performance pigment dispersion</b>						
Joncryl HPD 71	Liquid	4000	220	1.1	✓	Solution for heat-resistant, high-quality pigment dispersions with very good viscosity stability.
Joncryl HPD 671	Solid	-	214	0.4	✓	Resin for high-quality pigment dispersions with very good viscosity stability.
Joncryl HPD 96	Liquid	5000	220	0.6	✓	Solution of high molecular weight acrylic resin that improves color development and gloss without compromising ink stability.
Joncryl HPD 296	Liquid	600	141	0.4	✓	High-performance resin solution that improves the viscosity and shock stability of highly pigmented dispersions.
<b>Joncryl resins and resin solutions for resolubility, gloss, and holdout</b>						
Joncryl 50	Liquid	1,700	238	0.2	✓	Low VOC solution for high solids OPVs requiring high gloss and excellent holdout.
Joncryl 60	Liquid	8,500	215	0.5	✓	Low VOC solution for good gloss, holdout, and clarity in pigment dispersions, inks, and OPVs.
Joncryl 63	Liquid	13,000	213	0.5	✓	Low VOC solution for high-quality pigment dispersions and inks.
Joncryl 67	Solid	13,000	213	1.4	✓	High molecular weight acrylic resin for high-quality pigment dispersions used for maximum color development.
Joncryl 611	Solid	8,100	53	0.2		Solventborne continuous inkjet .Low acid flake for better water resistance.
Joncryl 683	Solid	8,000	165	2.0	✓	Low acid value resin for pigment dispersions and water resistance.
Joncryl 678	Solid	8,600	215	1.3	✓	Resin flake for pigment dispersions, gloss.
Joncryl LMV 7025	Liquid	12,500	235	0.4	✓	pH-stable, low VOC solution that modifies the resolubility and drying speed of inks.
<b>Joncryl RC Emulsions and Colloids</b>						
Joncryl 100	Liquid	2000	95	<0.1	✓	Colloid. Low VOC universal grind and letdown with excellent resolubility.
Joncryl 142	Liquid	25	130	<0.005	✓	Colloid. General purpose, for carbon black inks; recommended letdown vehicle for organic pigment dispersions.
Joncryl 2664	Liquid	550	170	13.8	✓	Film-forming acrylic emulsion for high-strength inks.
Joncryl 537	Liquid	150	40	0.8	✓	Acrylic emulsion that can be coalesced to provide alkali- and detergent-resistant film for inks, OPVs, and packaging applications; can resist plasticizer migration.
Joncryl 538-A	Liquid	200	53	1.0	✓	Acrylic emulsion that can be coalesced to provide alkali- and alcohol-resistant film for inks, OPVs, and packaging applications; can resist plasticizer migration.
Joncryl 585	Liquid	300	30	2.0	✓	Heat-resistant, film-forming acrylic emulsion that exhibits high gloss and adhesion to treated flexible films and foils in inks and OPVs.
Joncryl LMV 7034	Liquid	800	52	0.7	✓	Film-forming, pH-stable acrylic emulsion that provides adhesion and water-resistant characteristics in inks on plastic films and foils.
Joncryl LMV 7040	Liquid	750	115	0.3	✓	Hard-film-forming, pH-stable emulsion that provides film integrity, adhesions, and rub resistance in inks for paper and primed foil.

✓ = Applies



# Oligomers & Reactive Diluents

## Products at a glance

- Laromer® Oligomers
- Laromer Reactive Diluents

### Introduction

Depending on end-use requirements, specific formulations will vary greatly. For UV-curable systems, the majority of formulations will contain one or more of the following components: oligomers, monomers, pigments and other additives.

BASF offers a broad portfolio of high-quality, high-functionality oligomers and monomers for a wide range of formulation requirements. Laromer acrylate oligomers influence the physical properties of an application whereas the monomers dilute the acrylate oligomers to required formulation viscosities. This variety of oligomer and monomer types provides UV-curing formulators with a wide range of possibilities.

### Laromer oligomers

Oligomers are moderately low molecular weight polymers that determine the most basic properties (flexibility, hardness, gloss, adhesion, etc.) of any coating, ink, adhesive, or binder crosslinked by UV curing. Each Laromer oligomer family provides specific physical properties: epoxy acrylate (EA) oligomers are suitable for hardness and reactivity; polyester acrylates (PE) for all-around physical properties; urethane acrylates (UA) for flexibility, abrasion and exterior durability; and polyether acrylates (PO) for viscosity.

### Laromer monomers

Monomers, primarily used as diluents for the acrylate oligomer to achieve viscosities suitable for typical application equipment, can be mono-functional or multi-functional. Like oligomers, monomers within each functional group exhibit a considerable range of performance characteristics: mono-functional monomers contain one reactive group and extend flexibility, reduce shrinkage and improve adhesion; multi-functional monomers contain two or more reactive groups and impart a multitude of desired performances.





# Laromer Oligomers

Products*	Physical Form	Chemistry	Functionality	Viscosity @ 23°C (cps)	Hardness	Elasticity	Reactivity	Chemical Resistance	Applications Energy Cure	Description
Laromer PO 94 F	Liquid	Polyether acrylate, (amine-modified, monomer free)	3.5	300 - 600	■■	■■■■	■■■	■■■	✓	Very high reactivity and good pigment wetting.
Laromer PO 9103	Liquid	Amine Modified Polyether	2	2,500-4,000	■	■■■■	■■■■	■■■	✓	Highly reactive, good adhesion to plastics.
Laromer UA 8987	Liquid	Urethane acrylate	2.3	4,000-6,000	■■■■	■■■	■■■	■■■■	✓	Scratch and weather resistant for outdoor applications.

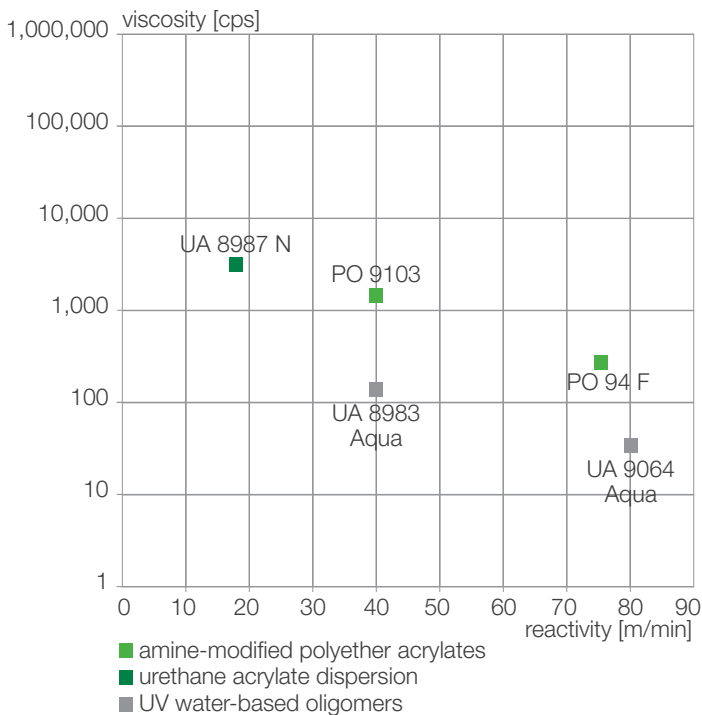
## UV Water-based Oligomers

Products	Type of Resin	Viscosity @ 23 cps	Initial pH	Filterability	Description
Laromer LR 8983	aromatic urethane acrylate dispersion	50 - 300	6.9	Best	Provide good adhesion over films and good physical drying properties
Laromer UA 9064	urethane acrylate dispersion	20 - 250	7.3	Good	Provides good chemical resistance over films and good physical drying properties

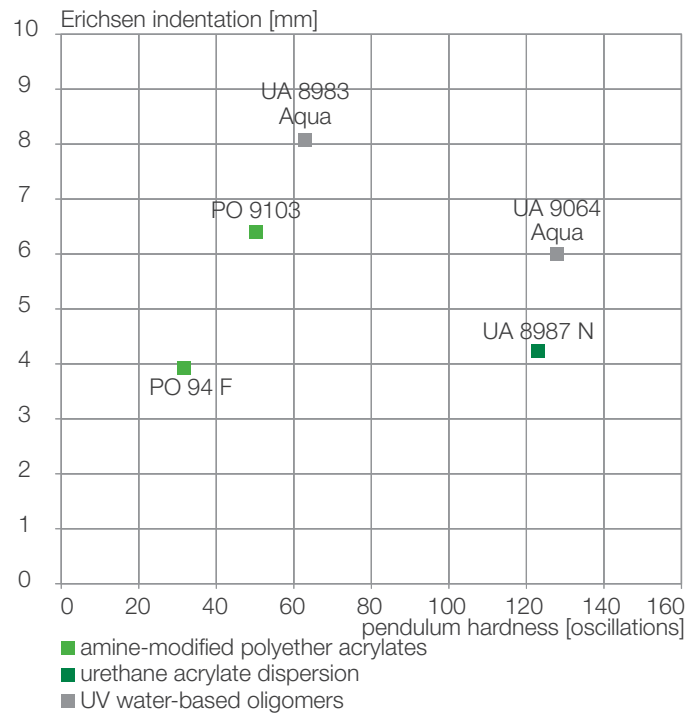
\* All products registered with REACH and TSCA. All other countries, please contact your BASF representative.  
 ✓ = Applies ■ = Good ■■ = Very Good ■■■ = Excellent ■■■■ = Superior

These relative comparisons provide a first indication in selecting the right oligomer for your requirements. Contact your BASF representative for formulation assistance.

**Viscosity – reactivity** / all products were cured with 1 UV lamp 120 W/cm, photoinitiator: 4% blend of benzophenone and α-hydroxy ketone



**Hardness – flexibility** / all products were cured 5 x 5 m/min. with 1 UV lamp 120 W/cm, photoinitiator: 4% blend of benzophenone and α-hydroxy ketone





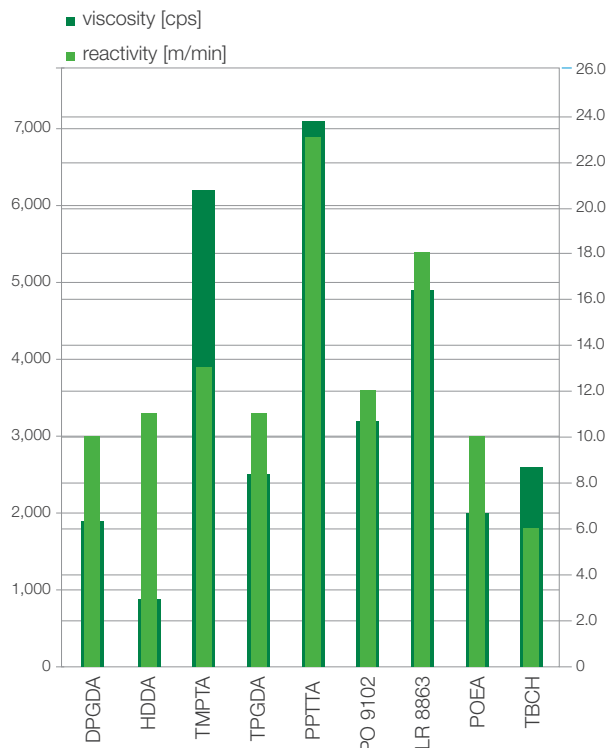
# Laromer Reactive Diluents

Products*	Physical Form	Chemistry	CAS Number	Molar Mass (approx. g/mol)	Density @ 25°C (g/cm <sup>3</sup> )	Viscosity @ 23°C (cps)	Level of Stabilizer (ppm MeHQ)	APHA Color (max)	Abrasion Resistance	Scratch Resistance	Adhesion	Pigment Dispersion
Laromer DPGDA	Liquid	Dipropylene glycol diacrylate	57472-68-1	240	1.05	8	350 ± 50	150	✓		✓	
Laromer HDDA	Liquid	Hexanediol diacrylate	13048-33-4	230	1.02	6	200 ± 50	150			✓	
Laromer TMPTA	Liquid	Trimethylolpropane triacrylate	15625-89-5	300	1.10	130	200 ± 50	70	✓	✓		
Laromer TPGDA	Liquid	Tripropylene glycol diacrylate	42978-66-5	300	1.04	11	350 ± 50	70				✓
Laromer PPTTA	Liquid	Ethoxylated pentaerythritol tetra-acrylate	51728-26-8	530	1.14	< 190	900 ± 100	100			✓	
Laromer PO 9102	Liquid	Propoxylated (2.0) neopentyl glycol diacrylate	84172-74-1	252	1.00	< 20	900 ± 100	200				✓
Laromer LR 8863	Liquid	Ethoxylated TMP-triacrylate	28961-43-5	450	1.10	50 - 100	< 1000 ± 150	100				✓
Laromer POEA	Liquid	Phenoxy ethyl acrylate	48145-04-6	190	1.10	8	200 ± 150	70			✓	✓
Laromer TBCH	Liquid	4-t-Butylcyclohexyl Acrylate	84100-23-2 282-104-8	210	0.94	9	200 ± 150	100			✓	

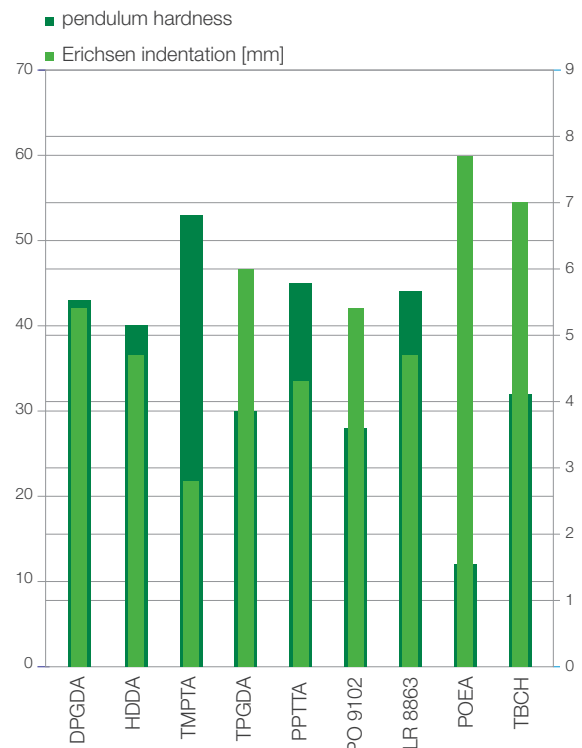
\* All products registered with REACH and TSCA. All other countries, please contact your BASF representative. ✓ = Applies

These relative comparisons provide a first indication in selecting the right reactive diluent for your requirements. Contact your BASF representative for formulation assistance.

**Viscosity – reactivity** / formulation: 70 parts Laromer PE 56 F, 30 parts monomer, photoinitiator: 4% blend of benzophenone and α-hydroxy ketone



**Hardness – flexibility** / formulation: 70 parts Laromer PE 56 F, 30 parts monomer, photoinitiator: 4% blend of benzophenone and α-hydroxy ketone









# Additives

## Products at a glance

- Dispex® and Efka® Dispersing Agents
- Efka and FoamStar® Defoamers
- Efka and Hydropalat® Wetting & Flow Control Agents
- Efka Slip and Rub Control Agents
- Rheovis® Rheology Modifiers
- Tinuvin® UV Absorbers and Hindered Amine Light Stabilizers
- Irgastab® In-can Stabilizer
- Lignostab® Antioxidant

As a world leader in the global chemical industry, BASF offers a wide array of high-performance additives that support a broad spectrum of applications across many different industry sectors. These unique raw materials help enable performance-driven products to meet the latest and most stringent application requirements.

Our portfolio comprises a broad technology base of dispersing agents, defoamers, wetting & flow control agents, rheology modifiers, film formation agents, UV absorbers and hindered amine light stabilizers, in-can stabilizers and antioxidants.

Dispersing agents wet and stabilize pigments and other particles within formulations. They represent an essential component as they provide color strength, gloss, viscosity stability and prevent sedimentation of particles.

Defoamers focus on establishing a perfect balance between excellent foam suppression, high compatibility, long-term efficiency and easy handling.

Wetting and flow control agents provide adequate wetting properties, enhance component compatibility and surface flow.

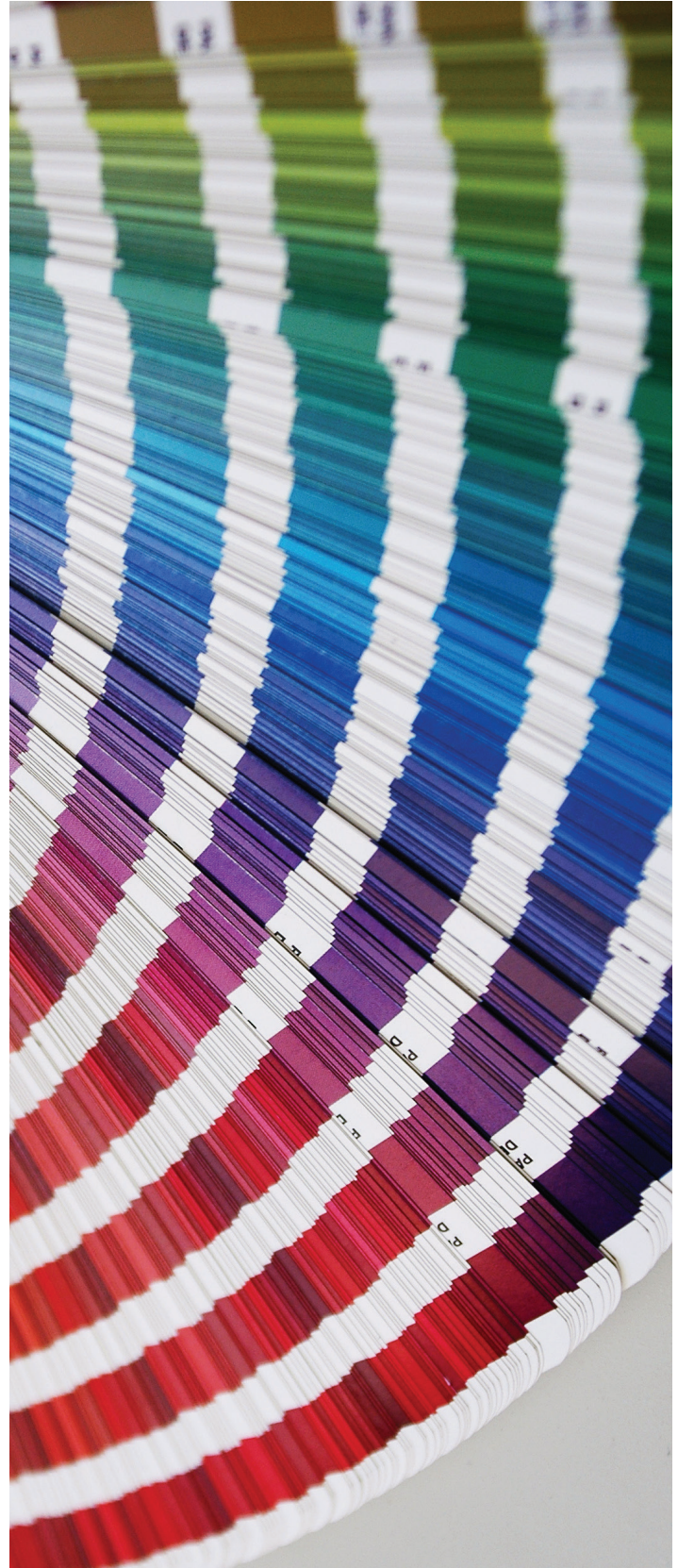
Slip and rub control agents provide a formulation with strong slip and surface smoothness effects.

Rheology modifiers make it possible to adjust the flow behavior of formulations.

UV absorbers provide excellent performance and photostability by filtering harmful UV light and protecting the underlying image against fading, and can easily be incorporated into the ink formula.

Hindered amine light stabilizers in the formulation are effective in retaining surface properties such as gloss and preventing cracking and chalking.

The addition of an in-can stabilizer and antioxidants in the formulation provides long-term thermal stability of the energy-curable formula during its life cycle.





# Formulation Additives

Products	Physical Form	Applications				Recommended Colors				
		LED	UV	Water-based	Solvent-based	Cyan	Magenta	Yellow	Black	White
<b>Dispersing Agents</b>										
Dispex AA 4040 NS	Liquid			✓						✓
Efka FA 4611	Liquid		✓		✓					✓
Dispex Ultra PX 4575	Liquid			✓						✓
Dispex Ultra PX 4585	Liquid			✓		✓	✓	✓	✓	
Efka PX 4350	Liquid				✓	✓	✓	✓	✓	
Efka PX 4701	Visc Liquid		✓		✓	✓	✓	✓	✓	
Efka PX 4733	Visc Liquid	✓	✓		✓	✓	✓	✓	✓	

Products	Physical Form	Applications				Timing to Add		
		LED	UV	Water-based	Solvent-based	In-Process	Application	Post Add
<b>Defoamers</b>								
Efka PB 2744	Liquid	✓	✓		✓		✓	✓
Efka SI 2723	Liquid	✓	✓		✓	✓	✓	
FoamStar SI 2280	Liquid			✓		✓	✓	✓
FoamStar SI 2240	Liquid			✓		✓	✓	

Products	Physical Form	Applications				Functionality		
		LED	UV	Water-based	Solvent-based	Slip	Substrate Wetting	Dry-Trapping
<b>Wetting &amp; Flow Control Agents</b>								
Efka FL 3277	Liquid	✓	✓	✓	✓	■	■■■	Yes
Hydropalat WE 3220	Liquid	✓	✓	✓	✓	■	■■	Yes
Hydropalat WE 3650	Liquid			✓		■	■■■	Yes
Hydropalat WE 3370	Liquid			✓		■	■■■	Yes
Efka SL 3257	Liquid	✓	✓	✓	✓	■■■	■■■	No

Products	Physical Form	Applications				Description
		LED	UV	Water-based	Solvent-based	
<b>Rheology Modifiers</b>						
Rheovis HS 1332	Liquid			✓		HASE, high shear
Rheovis PE 1331	Liquid			✓		Associative, high shear Newtonian

✓ = Applies   ■ = Minimal Effect   ■■ = Moderate Effect   ■■■ = Strong Effect

# Performance Additives

Products	Physical Form	Chemistry	Applications			Description
			Energy Cure	Water-based	Solvent-based	
<b>Light Stabilizers: Hindered Amine Light Stabilizers (HALS)</b>						
Tinuvin 123	Liquid	Hindered amine light stabilizer	✓		✓	Non-basic, non-interacting N-OR based HALS.
Tinuvin 123-DW (N)	Liquid	Hindered amine light stabilizer	✓	✓		Non-basic, non-interacting N-OR based HALS.
Tinuvin 152	Solid	Hindered amine light stabilizer	✓		✓	A high-performance, non-interacting HALS that significantly improves coating durability.
Tinuvin 249	Liquid	Hindered amine light stabilizer	✓		✓	New HALS. Low sensitivity toward acid catalysts. Low viscosity, exhibits low exudation in polar media.
Tinuvin 292	Liquid	Hindered amine light stabilizer	✓	✓	✓	Standard in the industry, N-Methyl based HALS.
<b>Light Stabilizers: UV Absorbers</b>						
Tinuvin 400	Liquid	Hydroxyphenyl triazene	✓		✓	UV-B blocking, ideal for UV-curable inks.
Tinuvin 400-DW (N)	Liquid	Novel Encapsulated Additive Technology (NEAT)	•	✓		Encapsulated Tinuvin 400, which is dispersed in water. 20 wt% active UVA.
Tinuvin 460	Solid	Hydroxyphenyl triazene	•		✓	Provides excellent coverage in the UV-A spectral range.
Tinuvin 477	Liquid	Hydroxyphenyl triazene	✓		✓	"Red-shifted HPT" providing UV blocking up to 400 nm. High photo-permanence.
Tinuvin 477-DW (N)	Liquid	Novel Encapsulated Additive Technology (NEAT)	✓	✓		Encapsulated Tinuvin 477, which is dispersed in water. 20 wt% active UVA.
Tinuvin 479	Solid	Hydroxyphenyl triazene	•		✓	High photo-permanence & very high extinction in the 310-340 nm range. Excellent choice for coatings/inks over poly-carbonate.
Tinuvin 928	Solid	2-(2-hydroxyphenyl)- Benzotriazole			✓	UV absorber that provides broad UV-A coverage, high thermal stability.
Tinuvin 9945-DW (N)	Liquid	Novel Encapsulated Additive Technology (NEAT)		✓		Encapsulated hydroxyphenyl benzotriazole, which is dispersed in water. 45 wt% active UVA.
<b>Light Stabilizers: Blends of UV Absorbers and HALS</b>						
Tinuvin 5151	Liquid	2-(2-hydroxyphenyl)- Benzotriazole / HALS blend	✓	✓	✓	UV-A blocking, ideal for UV-curable inks.
Tinuvin 5333-DW (N)	Liquid	Novel Encapsulated Additive Technology (NEAT)	✓	✓		Encapsulated UVA & HALS, designed for broad UV-A and UV-B blocking. The proprietary blend is dispersed in water. Approx 40 wt% active UVA/HALS.
<b>In-can stabilizers (for energy curable inks and coatings)</b>						
Irgastab UV 22	Liquid	Quinone derivative in GPTA monomer	✓			An in-can stabilizer that inhibits early polymerization of UV inks and coatings. Helps to maintain viscosity.
Lignostab 1198	Solid	HALS based	✓	✓	✓	Potent anaerobic stabilizer, which scavenges carbon-based free radicals. Helps to maintain viscosity.

✓ = Applies    • = Possible









Additives

Oligomers & Reactive Diluents

Resins & Resin Solutions

Solutions for Digital Printing



## About BASF

BASF Corporation, headquartered in Florham Park, New Jersey, is the North American affiliate of BASF SE, Ludwigshafen, Germany. BASF has more than 17,500 employees in North America, and had sales of \$16.2 billion in 2016. For more information about BASF's North American operations, visit [www.basf.us](http://www.basf.us).

At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. The approximately 114,000 employees in the BASF Group work on contributing to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio is organized into five segments: Chemicals, Performance Products, Functional Materials & Solutions, Agricultural Solutions and Oil & Gas. BASF generated sales of about €58 billion in 2016. BASF shares are traded on the stock exchanges in Frankfurt (BAS), London (BFA) and Zurich (BAS). Further information at [www.basf.com](http://www.basf.com).

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### For more information, visit [www.basf.us/dpsolutions](http://www.basf.us/dpsolutions)

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