

Flexible Packaging Inks

Quality you can see,
properties you can rely on

 **BASF**

We create chemistry

Flexible Packaging Inks

Quality you can see, properties you can rely on

Flexible packaging offers brand owners, retailers, and consumers many advantages including high graphic capability, light weight, and re-sealability along with moisture and aroma barrier properties that protect and extend the shelf life of food and other perishable items.

Flexible packaging inks enhance the graphic appearance and contribute to the performance of the package by preserving the quality of the images during the manufacturing, packaging, transportation, and use of the product.

Whether the inks are water-based or solvent-based, for surface print or lamination, BASF offers ink formulators a broad portfolio of high quality, high performance pigments, resins, resin solutions, and formulation additives for a wide range of flexible packaging inks.



For flexible packaging printing inks, excellent resolubility is crucial for clean, sharp images over long print runs, while good adhesion and resistance properties are essential for final product performance.

Lamination Inks

High Performance

Inks for retort packaging and other food packaging, such as boil-in-bag, sterilizable or microwavable packaging, printed on OPP, PET, and foil multilayer laminates must withstand stress from high temperature and high humidity environments. High performance lamination inks require destruct bonds (the film tears before delamination) and good adhesion to high barrier films such as SiOx and AlxOx coated polyester and nylon.

Medium Performance

Packaging that contains meat, cheese, coffee, and highly acidic products require high barrier properties. High bond strength, 300+ gram force/linear inch or higher, is required for medium performance lamination inks printed on polyester or polypropylene substrates.

Standard Performance

Standard lamination inks, such as those for snack food packaging and label applications, printed on polypropylene laminated to polyethylene require excellent high speed, long-run printability, and lamination bonds greater than 100 gram force/linear inch.

Surface Print Inks

High Performance

High resistance applications such as outdoor bags, medical packaging and label applications require inks with broad resistance properties. High heat resistance, alcohol and alkali resistance, deep-freeze resistance, abrasion resistance, fade and weather resistance and very good adhesion are necessary attributes for high performance surface printing inks.

Standard Performance

Inks printed on the surface (outside of the package) or reverse printed on a single layer of film require good adhesion, flexibility, and water and abrasion resistance properties. Typical standard surface ink applications include bread bags, dry food packaging, over-wraps, and utility bags.

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Solvent-based Lamination Inks

• **Versamid® PUR** polyurethane resin solutions offer excellent adhesion and lamination bond strength over a wide range of adhesives and film structures for medium and high performance food packaging applications.

• **Versamid 970 series** polyamide resins provide very good pigment dispersion properties, as well as adhesion, cohesion, and flexibility to inks for standard and medium performance laminations used on food packaging.

Product	Softening Point (°C)	Acid Value (mg KOH/g max)	Amine Value (mg KOH/g max)	Solution Viscosity (cps)	NC Compatible	Description
Versamid 963	110	3	6	170 @ 40% solids ²	yes	Intermediate viscosity co-solvent soluble resin with very good adhesion. Useful in cold-seal release lacquers and standard laminations.
Versamid 971	141	2	10	75 @ 20% solids ¹	no	Low solution viscosity lamination resin, excellent adhesion to multiple substrates, solvent resistance, and high gloss.
Versamid 973	138	2	10	140 @ 20% solids ¹	no	Industry standard laminating ink resin with excellent adhesion to various substrates, compatible with a broad range of adhesives.

Product	Urethane Type	Non Volatile (%)	Solvents	Viscosity (cps)	NC Compatible	Description
Versamid PUR 1010	aliphatic	35	21% 1-propanol 44% n-propyl acetate	850	no	Film forming polyurethane resin solution that provides excellent cohesion, flexibility, and adhesion to a variety of polyolefin, polyester, polymer coated, and metallized films. Has excellent solvent release and good pigment dispersion capability.
Versamid PUR 1011	aliphatic	35	45% 1-propanol 20% butyl acetate	1,075	no	Film forming polyurethane resin solution that provides excellent cohesion, flexibility, and adhesion to a variety of polyolefin, polyester, polymer coated, and metallized films. Has excellent solvent release and good pigment dispersion capability.
Versamid PUR 1120	aliphatic	42	48% 2-propanol 10% n-propyl acetate	575	yes	Film forming polyurethane resin solution that when used with nitrocellulose-based pigment dispersions exhibits good hardness and heat resistance, and excellent adhesive and cohesive strength in adhesive and extrusion laminates.
Versamid PUR 2011	aliphatic	35	45% 1-propanol 20% butyl acetate	1,000	no	Retort lamination ink resin solution. Excellent hydrolysis resistance, adhesion to various barrier films (e.g. SiO _x , Al _x O _x coated polyesters), nylon films, and foils. Excellent pigment dispersion capability.
Versamid PUR 7132	aromatic	76	22% ethanol 2% ethyl acetate	2,250	yes	Plasticizing-grade, non-migratory polyurethane resin solution used with nitrocellulose-based pigment dispersions for surface print and lamination inks.

Starting Point Formulations

High Performance Lamination Ink	White (%)	Color (%)
Versamid PUR 2011	24.0	36.0
TiO ₂	42.0	---
Organic Pigment	---	13.0
Solvent Blend	34.0	51.0
Total	100.0	100.0

Medium Performance Lamination Ink	White (%)	Color (%)
Versamid PUR 1011	23.9	39.8
TiO ₂	41.5	---
Organic Pigment	---	12.4
Solvent Blend	34.6	47.8
Total	100.0	100.0

Standard Performance Lamination Ink	White (%)	Color (%)
NC Pigment Concentrate	---	60.0
Versamid PUR 1120	---	16.7
Solvent Blend	---	23.3
Versamid 973	8.0	---
TiO ₂	40.0	---
Solvent Blend	52.0	---
Total	100.0	100.0

¹ Solubilized in 99.5% 1-propanol

² Solubilized in IPA/VM&P naphtha

Water-based Lamination Inks

- **Joncryl® FLX 5000-A** and **Joncryl FLX 5200** allow the formulation of water-based lamination inks for a wide range of substrates including polyethylene, polypropylene, and treated polyester using solvent, solvent-less, and water-based adhesives on bags, over-wraps, and food packaging applications.

Product	Appearance	Non Volatile (%)	Total VOC (% wt)	Viscosity @ 25°C (cps)	pH	Acid Number (NV)	Tg (°C)	MFFT (°C)	Description
Joncryl FLX 5000-A	translucent	42.0	< 0.5	1,000	8.8	90		< 5	Self-crosslinking acrylic emulsion that has excellent balance of resistance and resolubility in inks for bread bags, frozen food bags, and heavy duty bags.
Joncryl FLX 5200	opaque	40.0	< 1.0	70	8.0		- 47	< 5	Polyurethane dispersion that provides water-based lamination inks with high bond strength, very good resolubility, and enhanced print performance.

Starting Point Formulations

White Pigment Concentrate	White (%)
TiO ₂	75.0
FoamStar® SI 2210	0.3
Dispex® AA 4040 NS	1.5
Water	23.2
Total	100.0

Lamination Ink	White (%)	Color (%)
White Pigment Concentrate	40.0	-
Joncryl HPD 296-based Pigment Dispersion	-	40.0
Joncryl FLX 5200	41.5	42.1
Joncryl FLX 5000-A	13.1	13.5
Isopropanol	3.0	3.0
Joncryl Wax 4	0.2	0.2
FoamStar® SI 2280	0.3	0.3
Hydropalat® WE 3650	1.0	0.1
Rheovis® PE 1320 <i>(add as needed to adjust viscosity)</i>	0.9	0.8
Total	100.0	100.0



Solvent-based Surface Print Inks

• **Versamid® 700 series**, alcohol-soluble polyamide resins provide very good pigment dispersion properties as well as gloss, wetting, and adhesion on a wide range of flexible packaging substrates used for over-wraps, bakery bags, and snack food packaging.

• **Versamid 900 series**, co-solvent soluble polyamide resins improve durability of outdoor bag inks and offer cold-seal release properties to overprint varnishes used in confectionary packaging.

Product	Softening Point (°C)	Acid Value (mg KOH/g max)	Amine Value (mg KOH/g max)	Solution Viscosity @ 40% solids (cps)	NC Compatible	Description
Versamid 725	120	5	4	82 ¹	yes	Excellent heat and block resistance. Recommended for alcohol-soluble cold-seal release lacquers.
Versamid 728	110	2	10	220 ¹	yes	Excellent adhesion to treated films and foils. High viscosity for low cost inks.
Versamid 744	125	6	3	65 ¹	yes	Designed for high solids, all-purpose inks. One of the best resins for white inks. Excellent block resistance.
Versamid 750	116	3	6	140 ¹	yes	Industry standard surface printing resin. Excellent alcohol reducibility, gel resistance, adhesion, and gloss.
Versamid 754	116	6	3	105 ¹	yes	Acid-terminated version of Versamid 750 with excellent gel resistance, adhesion, and gloss.
Versamid 757	116	3	6	80 ¹	yes	General purpose polyamide resin with good balance of properties for high solids pigment dispersions and process printing.
Versamid 759	110	12	2	40 ¹	yes	Low solution-viscosity resin. Recommended for ultra high pigment concentrates, high solids whites with fast drying speed.
Versamid 795	125	3	4	280 ¹	yes	Polyamide resin for excellent solubility in alcohol solvents.

Product	Softening Point (°C)	Acid Value (mg KOH/g max)	Amine Value (mg KOH/g max)	Solution Viscosity @ 40% solids (cps)	NC Compatible	Description
Versamid 930	110	5	5	200 ²	yes	Industry standard co-solvent resin with excellent adhesion, water resistance, and gloss. Suitable for cold-seal release lacquers.
Versamid 940	110	4	5	130 ²	yes	Low viscosity version of Versamid 930 for use where higher solids are desired.

Starting Point Formulations

Co-solvent Outdoor Bag Surface Print Ink	White (%)	Color (%)
Versamid 930	24.0	27.0
Organic Pigment	---	14.0
TiO ₂	40.0	---
Alcohol, VM&P Naphtha Blend	36.0	59.0
Total	100.0	100.0

Alcohol Soluble Surface Print Ink	White (%)
Versamid 757	24.0
TiO ₂	40.0
Solvent Blend	36.0
Total	100.0

¹ Solubilized in 99.5% 1-propanol

² Solubilized in IPA/VM&P naphtha

Water-based Surface Print Inks

• **Joncryl®** water-based emulsions are the primary vehicle used in water-based flexible packaging inks. They provide substrate wetting, adhesion, and resistance properties along with good printability and resolubility for surface print inks on polyolefin substrates.

• **Joncryl FLX 5200** water-based polyurethane dispersion for both white and colored inks, has very good adhesion to a wide variety of films and exhibits bond strengths suitable for many packaging applications.

Product	Appearance	Non Volatile (%)	Total VOC (% wt)	Viscosity @ 25°C (cps)	pH	Acid Number (NV)	Density @ 23°C (g/cm³)	Tg (°C)	MFFT (°C)	Description
Joncryl DFC 3030	translucent	47.4	< 0.1	1,150	7.9	64	1.04	-27	< 5	Soft film forming acrylic emulsion that provides flexibility and water resistance in inks, overprint varnishes, and functional packaging coatings for indirect food contact applications.
Joncryl ECO 2124	translucent	47.3	0.1	1,000	7.9	65	1.04	- 35	< 0	Glycol-ether free ^(a) , low VOC, soft film forming acrylic emulsion with good adhesion and flexibility for food packaging applications.
Joncryl FLX 5000-A	translucent	42.0	< 0.5	1,000	8.8	90	1.05		< 5	Self-crosslinking acrylic emulsion that has a good balance of resistance and resolubility in inks for bread bags, frozen food bags, and heavy duty bags.
Joncryl FLX 5026-A	semi-translucent	44.0	< 0.5	175	9.0	7	1.03		11	Self-crosslinking acrylic emulsion with an improved balance of resistance and resolubility in inks for polyolefin substrates.
Joncryl FLX 5100	slightly yellow	40.0	< 1.0	100	8.2	12	1.05		< 5	Acrylic emulsion that, when used in combination with Joncryl FLX CL1, provides excellent resistance and resolubility in inks for labels, frozen food packaging, and outdoor bags.
Joncryl FLX CL1	slightly turbid liquid	60	40	400			1.05			Polymeric carbodiimide to be used with Joncryl FLX 5100 to formulate inks suitable for alkaline-resistant labels, frozen food bags, and outdoor bags.
Joncryl FLX 5200	opaque	40.0	< 1.0	70	8.0		1.05	- 47	< 5	Polyurethane dispersion that provides water-based lamination inks with high bond strength, very good resolubility, and enhanced print performance.
Joncryl LMV 7034	translucent	47.8	0.7	800	7.6	52	1.05	- 30	< 0	Film forming, low maintenance, pH-stable acrylic emulsion that provides adhesion and water-resistant characteristics in inks for utility bag and other surface print film and foil applications.

(a) The glycol ether level in this product averages less than 0.002 wt%.

Starting Point Formulations

High Performance Surface Print Ink	Color (%)
Joncryl FLX 5100	57.8
Joncryl HPD 296-based Pigment Dispersion	40.0
Joncryl Wax 4	2.0
FoamStar® ED 2522	0.2
Total	100.0
Add at press side, mix in a 50:50 blend of crosslinker and water	
Joncryl FLX CL1	10.0
Water	10.0
Total	120.0

Standard Performance Surface Print Ink	White (%)
Joncryl FLX 5000-A	68.2
Joncryl HPD 296-based Pigment Dispersion	30.0
Wax	0.5
Efka® SL 3299	0.2
Hydropalat® WE 3650	0.6
FoamStar® SI 2280	0.5
Total	100.0

Pigments & Pigment Dispersions

Brand owners rely on the appearance of the flexible package to sell the product and convey their marketing message. Bright, bold colors and crisp, clean graphics are needed to effectively communicate the value of the product to the consumer.

BASF offers a broad portfolio of pigments and pigment dispersions for the flexible packaging ink market. The portfolio includes a wide spectrum of colors to help increase the effectiveness of your packaging solutions and achieve your creative packaging goals. Contact a BASF representative for formulation assistance.

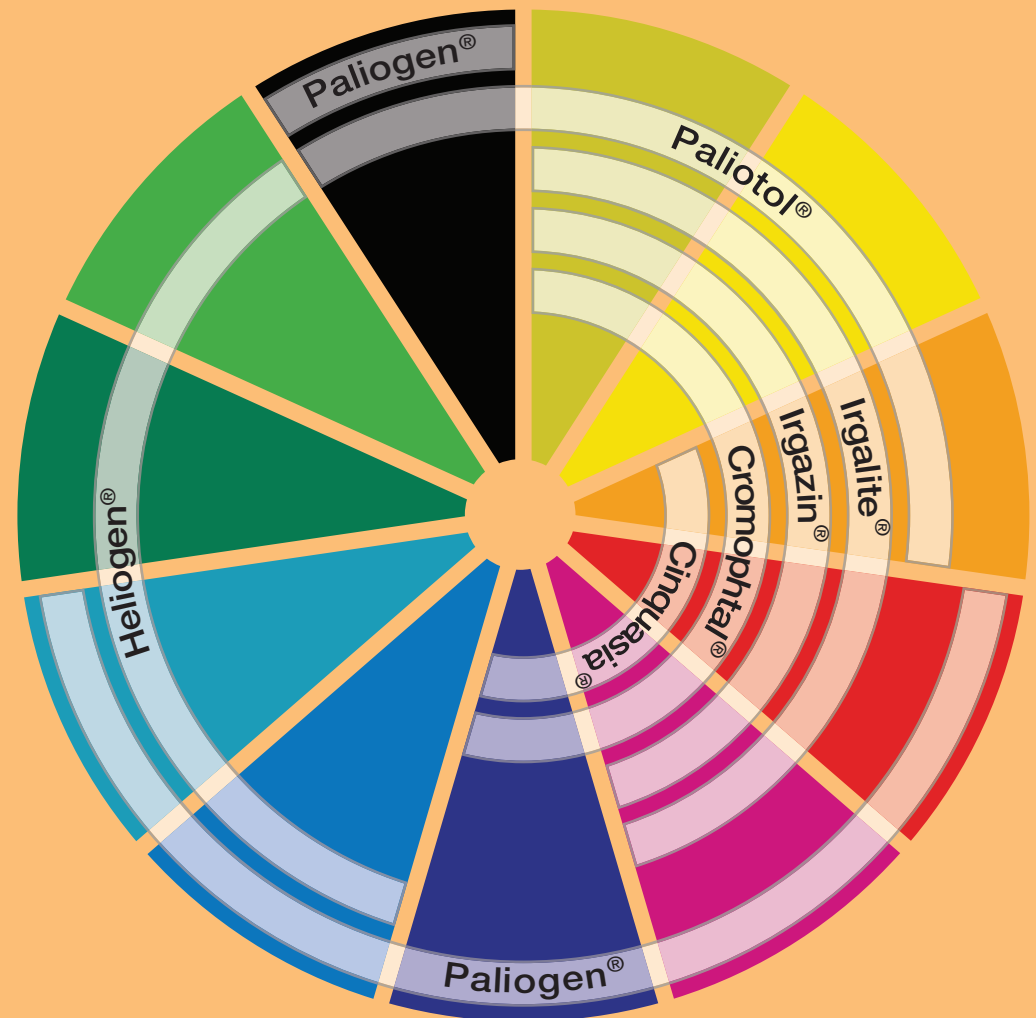
The BASF Color Wheel

The BASF color wheel is divided into ten sectors with consecutive numbers from 0 to 9, each representing a specific color space. The three to four digit numbers in the trade name indicate a position on the color wheel.

These numbers are derived from colorimetric data of the product in white reduction at 1/3 International Standard Depth (ISD) and indicate differences in hue between pigments according to the visual impression they make.

Effect Pigments

- **Firemist® Crystal Touch** coated glass-flake pigment provides a pleasing and refined texture for a unique tactile experience while offering a subtle sparkling effect.
- **Metasheen®** is a series of vacuum-metalized aluminum pigments that impart highly reflective effects from the exceptionally smooth, flat, mirror-like nature of the flakes. Shades range from white “liquid silver” to a darker, more chrome-like effect.



Pigments

The products shown here are an attractive selection of classical and high performance pigments for the formulation of water-based and solvent-based inks for packaging applications using all printing technologies.

Classical Pigments provide a range of colorful organic pigments that combine high impact shades with high chroma and aesthetic appeal.

High Performance Pigments combine excellent color strength, good transparency, and rheology with good fastness suitable for solvent- and water-based systems.

Product	Colour Index	Chemistry	Description
Cromophtal® YW L 0990	PY 128	Azo Condensation	Excellent lightfastness, transparency, and heat stability
Cromophtal YW D 1040	PY 93	Azo Condensation	High performance process yellow alternative; good transparency
Cromophtal YW L1061 HD	PY 151	Benzimidazolone	Green shade yellow with high opacity
Paliotol® YW D 1155	PY 185	Isoindoline	Higher chroma and light fastness vs PY180 and PY74.
Cromophtal YW K 1500 FP	PY 95	Azo Condensation	High strength, good transparency; high performance process yellow shade.
Paliotol YW D 1819	PY 139	Isoindoline	Reddish yellow with high heat stability and good transparency and gloss
Irgazin® YW D 1999	PY 110	Isoindolinone	Very transparent, high performance red shade yellow; Outstanding lightfastness.
Cromophtal Orange K 2960	PO 64	Benzimidazolone	High strength reddish orange with high opacity
Irgalite® Orange D 2980	PO 34	Diarylide pyrazolone	High transparency, good soap and solvent fastness
Cromophtal Scarlet D 3430	PR 166	Azo Condensation	High performance, red lake C shade; high strength, transparent
Cromophtal Scarlet D 3540	PR 166	Azo Condensation	High performance red lake C shade
Cromophtal Red D 3635	PR 144	Azo Condensation	High strength yellow shade red; good transparency
Irgalite Red D 3656 HD	PR 254	DPP	Opaque mid-shade red, high value in use.
Irgalite Red D 3707	PR 23	naphthol AS	Semi-transparent with good chemical resistance
Irgalite Red D 3785	PR 48:2	Ca 2B toner	All around bluish transparent red
Irgalite Rubine D 4240	PR 57:1	4B toner	Blue shade, transparent with good flow
Irgalite Rubine D 4242	PR 57:1	4B toner	Strong, transparent mid-shade rubine with good flow and gloss
Cinquasia® Magenta L 4540	Solid Solution	Quinacridone	High color strength, yellow shade magenta
Cinquasia Magenta D 4570	Mixture	Quinacridone / DPP	Very high strength, process magenta shade; high lightfastness
Heliogen® Blue D 7086	PB 15:3	Cu phthalocyanine	Process Cyan blue high strength and transparency
Heliogen Blue D 7110 F	PB 15:4	Cu phthalocyanine	Green shade blue, good rheology and color strength
Heliogen Blue D 7490	PB 16	Metal free phthalocyanine	Copper free blue, unique shade
Heliogen Green D 8730	PG 7	Cu phthalocyanine	Universal green for all ink types

Pigment Dispersions

High strength pigment dispersions allow the ink manufacturer the latitude to formulate inks that have the desired combination of good color development along with the ability to meet the stringent requirements of high performance flexible packaging. BASF offers the ink manufacturer a selection of resins, resin solutions, and dispersants that allow the formulation of these high performance inks.

Resins and Resin Solutions

- **Joncryl® HPD** is a special range of High Performance Dispersion resins and resin solutions designed to produce high quality aqueous pigment dispersions with superior pigment wetting characteristics, exceptional viscosity stability, and free-flowing viscosity at high pigment load.

Pigment Dispersants

Pigment dispersion is the most time-consuming and expensive stage of ink making, where pigments often represent a large proportion of the cost. BASF's Dispex® and Efka® dispersing agents ensure that maximum value is extracted from a pigment and help to improve the efficiency of the milling process.

- **Dispex® Ultra FA** low molecular weight, surfactant-like, dispersing agents mainly for water-based systems
- **Dispex Ultra PA and PX** high molecular weight dispersing agents mainly for water-based systems
- **Dispex AA** anionic dispersing agents based on polyacrylic acid mainly for water-based systems
- **Efka® FA** low molecular weight, conventional dispersing agents mainly for solvent-based systems
- **Efka PX** high molecular weight, acrylic block co-polymer dispersing agents for solvent-based systems

Dispersants	Waterborne	Solventborne	Colors / Comments	C	M	Y	K	W
Dispex® AA 4040 NS	✓		TiO ₂ + inorganics					W
Dispex AA 4144	✓		TiO ₂ + inorganics					W
Dispex Ultra FA 4431	✓	✓	Inorganic fillers, universal					W
Dispex Ultra PA 4530	✓	✓	Organics with NC bases	C	M	Y	K	
Dispex Ultra PX 4585	✓		Carbon black & organics	C	M	Y	K	
Efka® MI 6745		✓	Phthalo pigment synergist	C				
Efka PX 4310		✓	Organic yellow & red		M	Y	K	
Efka PX 4350		✓	Phthalo blue & green	C	M	Y	K	

Starting Point Formulations

Joncryl HPD 296 Pigment Dispersion	Amount (%)
Organic Pigment	42.0
Joncryl HPD 296	30.0
FoamStar® SI 2210	0.4
Water	27.6
Total	100.0

TiO ₂ Pigment Concentrate	Amount (%)
TiO ₂	75.0
FoamStar SI 2210	0.3
Dispex AA 4040 NS	1.5
Water	23.2
Total	100.0

✓ = Applies

Formulation Additives

Our formulation additives portfolio comprises a broad technology base of defoamers, wetting & surface modifiers, rheology modifiers, and film-forming agents.

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

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

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

Film-forming agents support the film-forming process of an ink or coating.

Defoamers

- **Foamaster® MO, FoamStar® ED, SI and ST** defoamers for water-based systems
- **Efka PB** silicone-free and **Efka SI** modified-silicone defoamers for solvent-based systems

Wetting Agents and Surface Modifiers

- **Hydropalat® WE** polymer-based surfactant, substrate- wetting agents for water-based systems
- **Hydropalat WE** fluorinated polyacrylate, flow and leveling agents for water-based systems
- **Efka FL** series of flow and leveling agents for solvent-based systems
- **Efka SL** slip and leveling agents for water- and solvent-based systems

Rheology Modifiers

- **Rheovis® AS, HS, PE and PU** rheology modifiers for water-based systems

Film Forming Agents

- **Loxanol® CA** high performance coalescing agent for water-based systems

Defoamers	Waterborne	Solventborne	Comments	In - process	Post add
Efka® PB 2010		✓	Non-silicone, transparent	✓	
Efka PB 2720		✓	Non-silicone		✓
Efka SI 2022		✓	Silicone, persistent	✓	
Efka SI 2023		✓	Silicone, compatible		✓
Efka SI 2035		✓	Silicone, balanced		✓
FoamStar® SI 2210	✓		> 99% active, also for UV	✓	
FoamStar ED 2522	✓		Emulsion, also post add	✓	✓
FoamStar SI 2280	✓		> 99% active, also for UV	✓	✓
FoamStar ST 2438	✓		Star polymer, persistent	✓	
FoamStar ST 2446	✓		Persistent, compatible	✓	

Surface Active Agents	Waterborne	Solventborne	Comments	Slip	Wetting	Over-coatability
Dispex® Ultra FA 4480 NU	✓		Improves color development	■	■■■	yes
Efka FL 3277	✓	✓	Also improves air release	■	■■■■	yes
Efka FL 3777		✓	Also improves air release	■	■■■■	yes
Efka SL 3033		✓	Also improves mar resistance	■■■■	■■■	limited
Efka SL 3035	✓	✓	Universal	■■■■	■■■	limited
Efka SL 3257	✓	✓	Universal, high slip	■■■■	■■■	no
Hydropalat® WE 3311	✓		Also for pigment dispersing	■	■■■	yes
Hydropalat WE 3322	✓		Star polymer based wetting agent	■	■■■■	yes
Hydropalat WE 3370	✓		For ink pH > 7.5	■	■■■■	yes
Hydropalat WE 3650	✓		Low dynamic surface tension	■	■■■■	yes
Efka SL 3031		✓	Also improves block resistance	■■■	■■■	limited
Efka SL 3299	✓	✓	Universal, highest slip	■■■■	■■■■	no

✓ = Applies
 ■ = minimal effect
 ■■ = moderate effect
 ■■■ = strong effect

About the Dispersions & Pigments Division

The Dispersions & Pigments Division in North America offers a comprehensive portfolio of resins, binders, latex, pigments and effect pigments, colorants, and systems to meet specific application needs for the coatings, construction, printing and packaging and plastics markets. Our innovative products also help manufacturers in the adhesives, nonwovens and fiber bonding industries meet functional and performance demands. Our formulation additives, rheology modifiers, light stabilizers, photoinitiators, and antioxidants significantly enhance the existing BASF product portfolio for these markets. For more information about BASF's Dispersions & Pigments Division, visit www.basf.us/dpsolutions.

About BASF

BASF Corporation, headquartered in Florham Park, New Jersey, is the North American affiliate of BASF SE, Ludwigshafen, Germany. BASF has nearly 17,000 employees in North America, and had sales of \$19.3 billion in 2013. For more information about BASF's North American operations, visit www.basf.us.

BASF is the world's leading chemical company: The Chemical Company. Its portfolio ranges from chemicals, plastics, performance products and crop protection products to oil and gas. We combine economic success with environmental protection and social responsibility. Through science and innovation, we enable our customers in nearly every industry to meet the current and future needs of society. Our products and solutions contribute to conserving resources, ensuring nutrition and improving quality of life. We have summed up this contribution in our corporate purpose: We create chemistry for a sustainable future. BASF had sales of about €74 billion in 2013 and over 112,000 employees as of the end of the year. Further information on BASF is available on the Internet at www.basf.com.

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