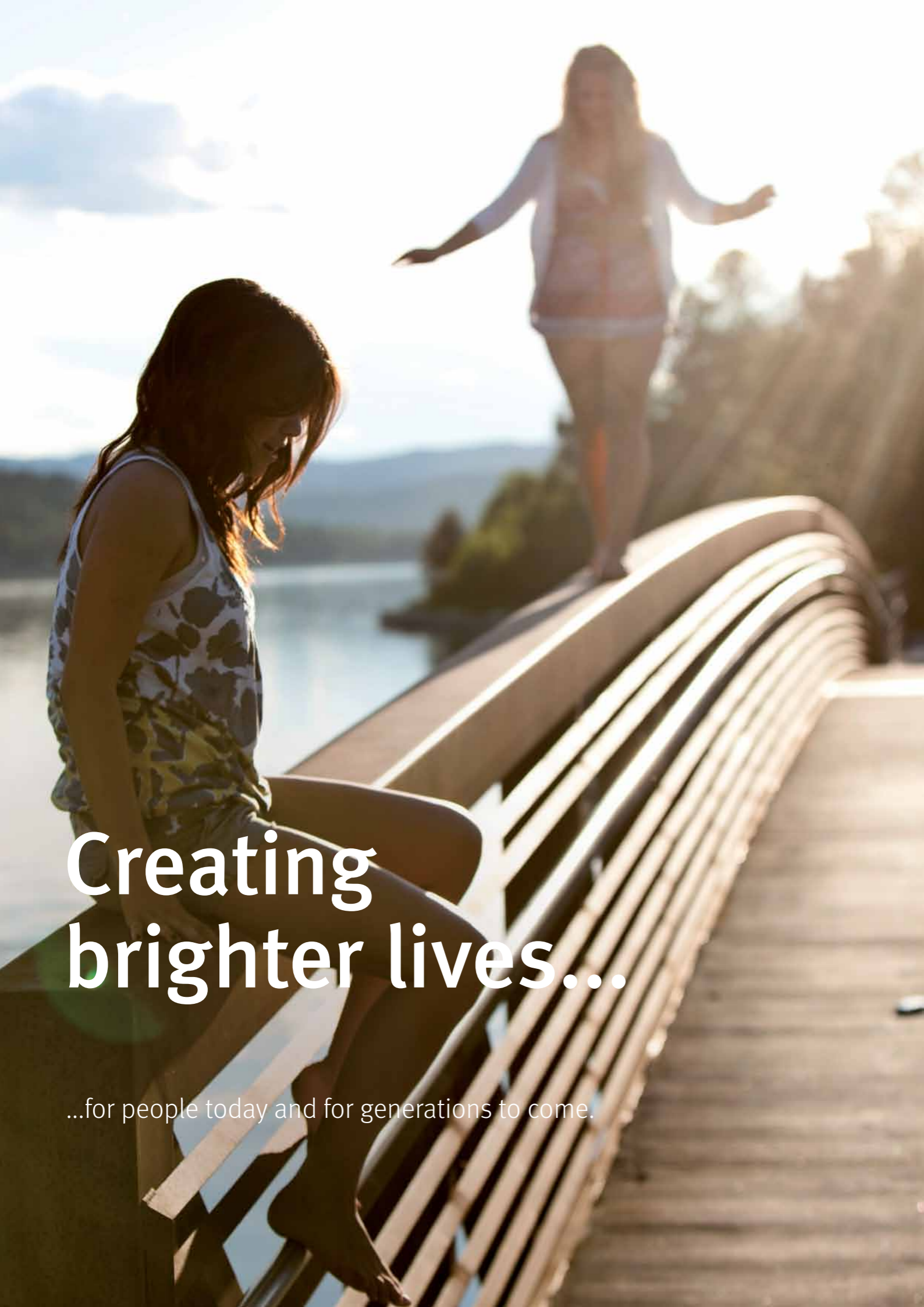




Energy curable resins for
Graphic Arts



Creating brighter lives...

...for people today and for generations to come.

Our business is all about improving people's lives. At DSM we want to make life brighter for people – today and in generations to come. We connect our unique skills in materials sciences to create solutions that nourish, protect, and improve performance. And contribute to a more sustainable world. This is reflected in how we approach the graphic arts and adhesive business.

Brighter future

Some companies see sustainability as a challenge, but at DSM we see it as an opportunity, with endless possibilities to work together for a brighter future. By exchanging ideas and collaborating openly, we are making a difference. Innovating to add value to people's lives, ensure a positive contribution to our business, and protect the planet.

Bright Science

Bright Science is at the heart of all we do in graphic arts and adhesives. Based on our intimate knowledge of our markets and our deep materials science expertise across a wide range of applications. Our global network of industry specialists travel around the world and talking to customers and other parties in the supply chains. Through these deep partnerships built on mutual trust, we create resins and technologies that enhance our customers' formulations and their customers' everyday experiences.

Brighter Living

This means Brighter Living for everyone. People around the world eat and drink food every day. This can be done safely using our resins to print, coat, label and seal the colorful packaging. Or travel abroad with their passport, which might be printed and laminated using our resins, in such a way that it is reliable, durable and of a quality that can not easily be imitated. Or receive a gift with a beautiful matt or soft touch finish, giving it that special look and feel. That's the real beauty of Bright Science, brightening lives wherever and whenever it touches them.

DSM for graphic arts and adhesives

DSM has a dedicated division that draws upon its broad know-how and understanding of the market and customer needs to develop innovative resin solutions that deliver the best performance in graphic arts and adhesives markets.

From our headquarters in the Netherlands, we provide resins for coatings and graphic arts markets around the globe. We support our customers with manufacturing sites in North America, Europe, and Asia. Our brand names are well known around the world, including NeoCryl™, NeoRez™, NeoPac™, NeoRad™, Hybrane™, Uralac™, Uracron™, Urathix™, and Uradil™.

Customers rely on us for a unique range of tailor-made, sustainable solutions based on water-borne, UV, powder, and solvent-borne technologies. We are the largest producer of polyester resins in the world and one of the largest producers of specialty emulsions and solventbased urethanes, ensuring a supply of products that fits our customers' individual requirements.

We design resin systems with tomorrow's environmental requirements in mind, guided by our Product Stewardship principles, by an awareness of the need for continuity, and by a strong sense of responsibility. We have an outstanding sustainability record in specialty resins that we continue to improve each day.



Energy curable technology

DSM has a broad range of resins based on energy curing technologies for the Graphic Arts Industry. This range includes acrylated oligomers, inert resins, water based polyurethane dispersions, and a host of other innovative chemistries which can be cured using ultra-violet light or electron beam. Our broad portfolio reflects our ongoing commitment to sustainability, innovation and quality.



Our innovation focus is the development of resins that have a low odour and contain a low level of residual monomers especially for low migration inks that can be used in indirect food contact applications. At the same time our aim is to work with renewable raw materials as much as is possible. We further intend to develop resins that show improved press behavior, and improved adhesion towards low quality non porous substrates.

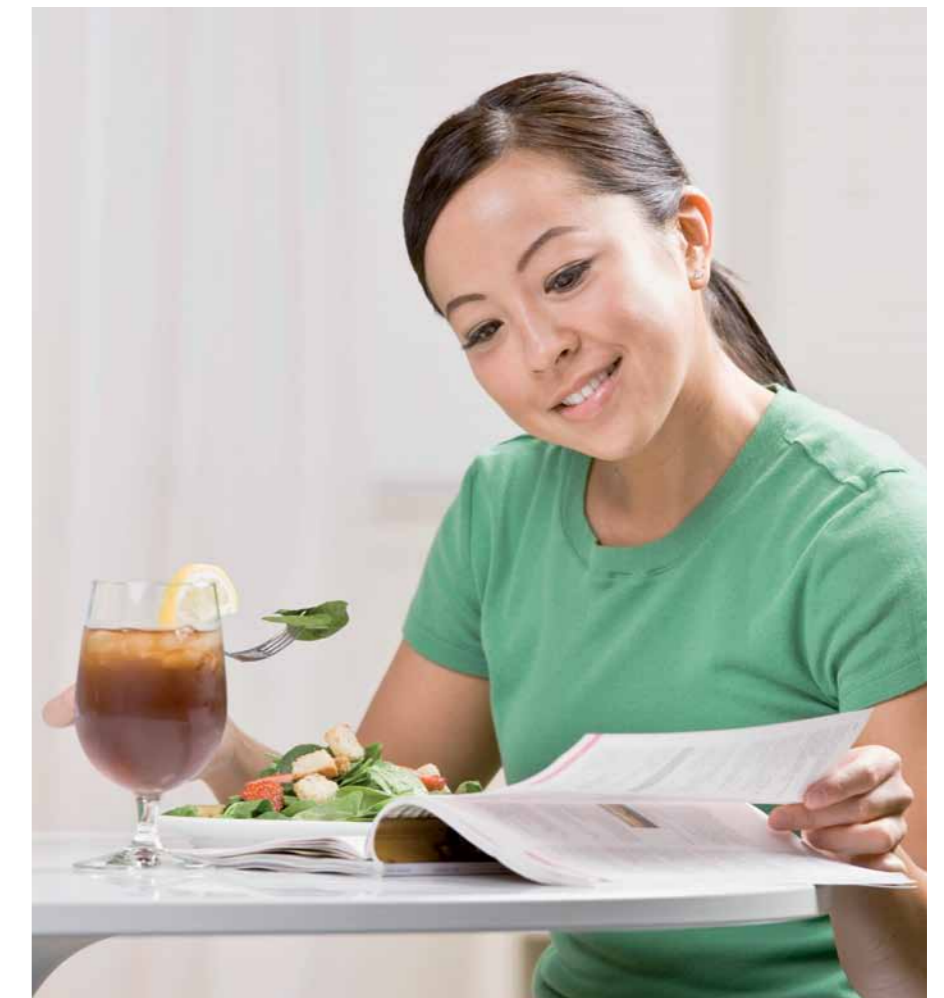
Innovations recently introduced:

- New inert resins that can replace low functional monomers to give enhanced adhesion properties to non-porous substrates of low quality. An excellent solution for low migration inks.
- Easy to Matt Resin, in combination with conventional matting agents a very low gloss finish can be obtained.
- Acrylated polyester resins that contain low levels of residual monomers and solvents.

A snapshot of innovative products which are currently in development:

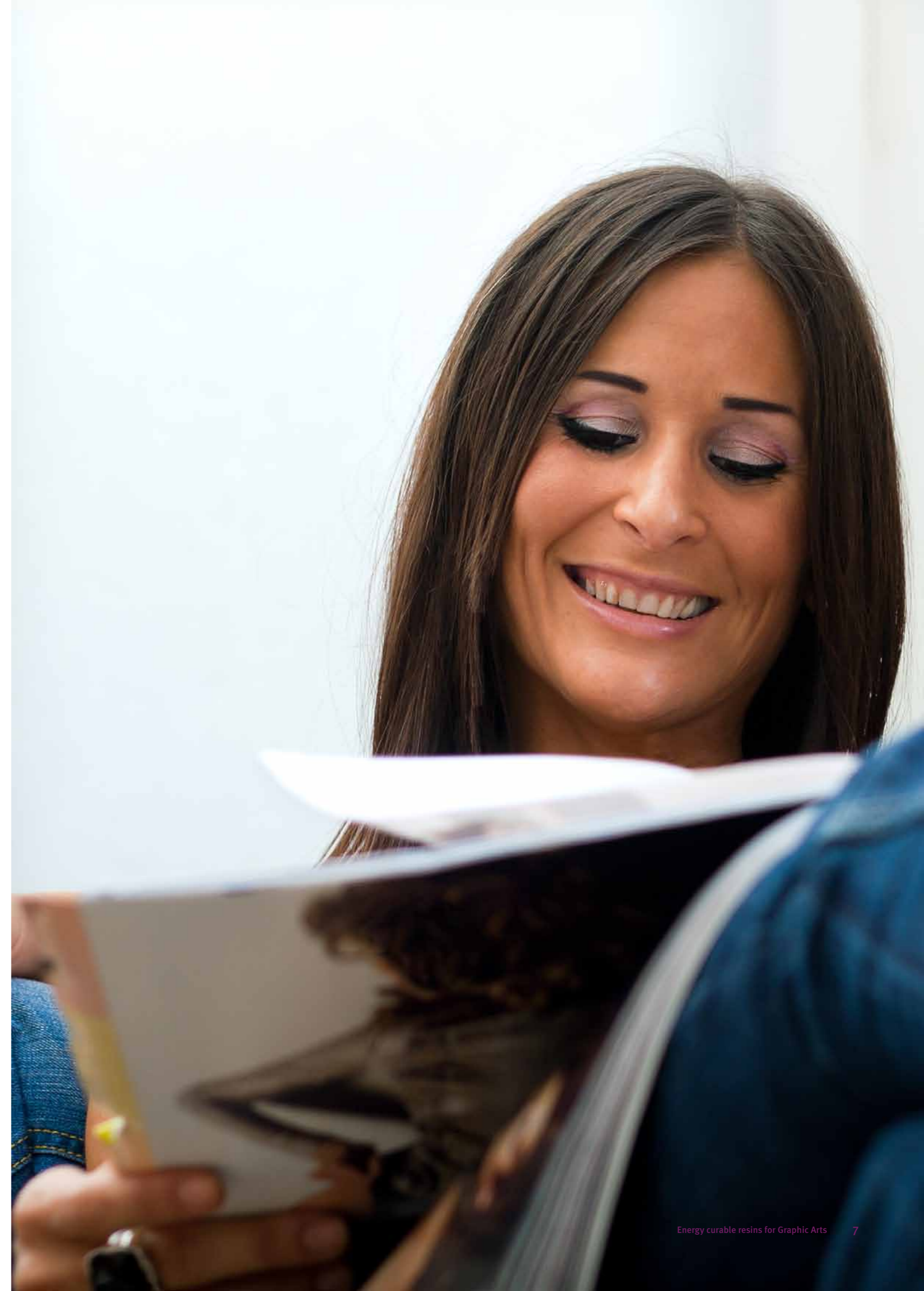
- Universal pigment grinding vehicles exhibiting a controlled rheology behavior, suitable for flexo, offset and screen.
- Low viscosity resins enabling the development of printing inks containing low or no acrylated monomers.
- Hyperbranched polyester acrylates. High molecular weight multifunctional oligomers, combining high reactive and very good adhesion to non-porous substrates.

To help our customers reach their performance goals we have a dedicated technical support and innovation team for energy curing as well as a globally organized product stewardship and regulatory support team. We have strong global logistics capabilities with strategic global warehousing locations to serve our customers in the best possible way all over the world.



Energy curable resins

	Application	Main resin technology	Key-grade for this application
Ink	Label printing ink (flexo)	Polyester acrylate	NeoRad™ P-60
	Offset ink	Polyester acrylate	NeoRad™ P-61
	Screen ink for plastic	Urethane acrylate	NeoRad™ U-25-20D
	Deep draw application	Acrylated acrylate	NeoRad™ A-20
	Adhesion promoting resin	Inert Solid Acrylate	NeoCryl™ B-300 NeoCryl™ B-302
Over print varnish	Standard over print varnish	Polyester acrylate	NeoRad™ P-90
	Specialty over print varnish	Urethane acrylate	NeoRad™ U-6288
	Adhesion promoting resin	Inert Solid Acrylate	NeoCryl™ B-300 NeoCryl™ B-302



100% Energy curable resins

	Functionality	Molecular weight	Viscosity (Pas @ 23°C)	Viscosity (Pas @ 60°C)	Colour (Gardner)	OH Value (mg KOH/g)	Acid Value (mg KOH/g)	Tg (°C)	Description	REACH (Europe)	TSCA (US)	DSL (Canada)	IECSC (China)	AICS (Australia)	ENCS (Japan)	PICCS (Philippines)	ECL (Korea)	Regulatory data sheet	Main feature	Flexo	Off set	Screen	Inkjet	OPV	Reactivity	Flexibility	Solvent resistance	Adhesion	Non yellowing	Pigment wetting	Shrink
Polyester Acrylates Key grades																															
NeoRad™ P-20	4	970	2-5	-	<3	60	<5	25	Tetra functional polyester acrylate with medium viscosity	●	●		●					●	Medium viscosity	●		●		●	0	+	+	0	+	-	0
NeoRad™ P-30	4	800	0.4 - 1	-	<1	70	<15	22	Tetra-functional polyester acrylate with low viscosity	●			●	●				●	Low viscosity	●		●		●	0	0	+	-	+	-	-
NeoRad™ P-40	4	940	-	2.5 - 5	<9	10	<20	8	Tetra-functional fatty acid modified polyester acrylate	●	●	●	●	●			●	●	Pigment grinding vehicle based on 35% renewable raw materials	●	●	●			+	+	++	0	-	++	0
NeoRad™ P-41	4	940	200 - 300	2.5 - 3.5	<10	10	<12	8	Tetra-functional fatty acid modified polyester acrylate	●	●	●	●	●			●	●	Low odour pigment grinding vehicle based on 35% renewable raw materials	●	●	●			+	+	++	0	-	++	0
NeoRad™ P-60	6	1200	7 - 10.5	-	<8	30	<20	15	Hexa-functional fatty acid modified polyester acrylate	●	●	●	●	●				●	Low viscose pigment grinding vehicle	●	●	●			+	0	++	--	0	++	-
NeoRad™ P-61	6	1700	60 - 75	-	<9	na	<20	25	Hexa-unctional fatty acid modified polyester acrylate	●			●					●	Low odour pigment grinding vehicle based on 25% renewable raw materials	●	●	●			+	0	++	-	0	++	-
NeoRad™ P-80	4	920	0.4 - 0.6	-	<2	50	<1	21	Tetra-functional amine modified polyether acrylate	●	●		●					●	Excellent solvent resistance	●	●	●	●	●	++	0	++	+	+	0	0
NeoRad™ P-81	2	570	0.05 - 0.2	-	<2	na	<1	6	Di-functional amine modified polyether acrylate	●	●	●	●	●				●	Low viscosity	●	●	●	●	●	-	0	0	0	+	+	0
NeoRad™ P-82	4	1300	3500	-	<1	na	<1	na	Amine modified polyether acrylate	●			●					●	High reactivity	●	●	●	●	●	++	-	++	+	0	0	0
NeoRad™ P-85	6	1400	0.3 - 0.7	-	<6	na	<10	24	Hexa-functional fatty acid based amine modified polyester acrylate	●								●	Ultra low viscose, good cure response	●	●	●	●		++	-	+	0	0	+	0
NeoRad™ P-90	2,5	1500	25 - 55	-	<4	40	<5	7	2,5-functional polyester acrylate	●	●	●	●	●	●	●	●	●	Low cost in combination with a fair combination of properties	●	●	●		●	+	+	+	-	0	+	+
Urethane Acrylates Key grades																															
NeoRad™ U-10-15H	3	2000	37.5 - 52.5	-	<1	<10	<1	12	Tri functional aliphatic polyester based urethane acrylate in HDDA	●	●	●	●	●			●	●	Good adhesion to difficult substrates	●		●		●	0	+	0	+	+	0	0
NeoRad™ U-10-15T	3	2000	115 - 150	-	<1	<10	<1	14	Tri-functional aliphatic polyester based urethane acrylate in TPGDA	●	●	●	●	●			●	●	Good adhesion to difficult substrates	●		●		●	+	+	0	+	++	0	0
NeoRad™ U-20-12H	2	1200	-	1.9 - 2.3	<1	<10	<1	20	Di functional aliphatic polyester based urethane acrylate in HDDA	●	●	●	●				●	●	Good adhesion to difficult substrates	●		●		●	+	+	+	+	+	0	0
NeoRad™ U-25-20D	2	1300	20 - 30	-	<2	<10	<1	18	Di-functional aliphatic urethane acrylate in DPGDA	●	●	●	●				●	●	Good adhesion to difficult substrates	●	●	●		●	+	+	++	++	+	+	0
NeoRad™ U-30W	6	4800	0.9 - 2.0	-	<1	80	<8	-6	Hexa-functional water dilutable aliphatic polyether based urethane acrylate	●			●					●	Water dilutable resin	●					+	0	-	0	++	0	0
NeoRad™ U-41	6	1100	80 - 120	-	<2	15	<1	60	Hexa-functional aliphatic urethane acrylate	●	●							●	excellent cure response, non yellowing	●	●	●	●	●	++	--	++	0	0	-	--
NeoRad™ U-50-25H	3	1900	12 - 22	-	<1	<10	<1	17	Tri-functional aromatic polyester based urethane acrylate in HDDA										Good flexibility	●		●			0	+	+	0	0	0	0
NeoRad™ U-60	2	1500	-	3.3 - 4.4	<1	<10	<1	-20	Di-functional aromatic polyester based urethane acrylate	●	●	●	●	●			●	●	Good flexibility	●		●			-	+	-	0	0	0	+

100% Energy curable resins

	Functionality	Molecular weight	Viscosity (Pas) @ 23°C	Viscosity (Pas) @ 60°C	Colour (Gardner)	OH Value (mg KOH/g)	Acid Value (mg KOH/g)	Tg (°C)	Description	REACH (Europe)	TSCA (US)	DSL (Canada)	IECSC (China)	AICS (Australia)	ENCS (Japan)	PICCS (Philippines)	ECL (Korea)	Regulatory data sheet	Main feature	Flexo	Off set	Screen	Inkjet	OPV	Reactivity	Flexibility	Solvent resistance	Adhesion	Non yellowing	Pigment wetting	Shrink	
NeoRad™ U-61	2	1000	1.25 - 1.65	-	< 3	160	< 1	25	Di-functional aromatic polyester based urethane acrylate	●	●	●	●	●	●	●	●	●	High elongation	●	●	●		●	0	++	0	+	-	-	+	
NeoRad™ U-70	6	1100	25 - 35	-	< 2	35 - 40	< 1	43	Hexa-functional aromatic urethane acrylate	●	●	●	●	●					excellent cure response	●	●	●		●	++	--	++	0	-	-	--	
NeoRad™ U-6288	2	520	70	-	< 3	30	< 3	19	Urethane acrylate	●	●	●	●	●			●		Easy mottable, suitable for matt and soft over print varnishes					●	0	0	+	+	0	-	++	
Epoxy Acrylates Key grades																																
NeoRad™ E-10	2	500	2000	-	< 1	240	< 2	55	Di-functional bisphenol A based epoxy acrylate	●	●	●	●	●		●	●	●		●	●	●		●	+	--	+	-	0	0	0	
NeoRad™ E-10-20T	2	500	20 - 50	-	< 1	200	< 2	65	Di-functional bisphenol A based epoxy acrylate diluted with TPGDA	●	●	●	●	●		●	●	●		●	●	●		●	+	--	+	-	0	0	0	
NeoRad™ E-10-30T	2	500	6.5 - 9.5	-	< 1	170	< 2	na	Di-functional bisphenol A based epoxy acrylate diluted with TPGDA	●	●	●	●	●		●	●	●		●	●	●		●	+	--	+	-	0	0	0	
NeoRad™ E-10-50T	2	500	0.3 - 0.8	-	< 1	120	< 2	na	Di-functional bisphenol A based epoxy acrylate diluted with TPGDA	●	●	●	●	●		●	●	●		●	●	●		●	+	--	+	-	0	0	0	
NeoRad™ E-10-20G	2	500	105	-	< 1	190	< 2	62	Di-functional bisphenol A based epoxy acrylate diluted with GPTA	●	●	●	●	●		●	●	●		●	●	●		●	+	--	+	-	0	0	0	
NeoRad™ E-20	1,7	860		2 - 4	< 3	230	< 3	43	Fatty acid modified bisphenol A based epoxy acrylate	●	●	●	●	●		●	●	●		Epoxy acrylate with improved flexibility	●	●	●		0	-	0	-	0	0	0	
NeoRad™ E-30	3	1240	20 - 30	-	< 10	180	< 10	11	tri-functional soy bean oil based epoxy acrylate	●	●	●	●	●		●		●		Pigment grinding vehicle based on 60% renewable raw materials	●	●	●	●	-	-		-	0	+	0	
Acrylated Acrylates Key grades																																
NeoRad™ A-20	high	28000	500 - 1000 ¹⁾	-	< 5	150 ²⁾	4 - 15	42	Medium Mw acrylated acrylate	●										Flexible vehicle for deep draw applications			●			+	++	+	+	0	0	0

1) 50% in butyl acetate
2) on solids

Solid acrylics

	Functionality	Molecular weight (kDalton)	Viscosity (mPas) @ 23°C	Viscosity (mPas) @ 60°C	Colour	OH Value (mg KOH/g)	Acid Value (mg KOH/g)	Tg (°C)	Description	REACH (Europe)	TSCA (US)	DSL (Canada)	IECSC (China)	AICS (Australia)	ENCS (Japan)	PICCS (Philippines)	ECL (Korea)	Regulatory Data Sheet	Main feature	Flexo	Off set	Screen	Inkjet	OPV	Reactivity	Flexibility	Solvent Resistance	Adhesion	Non Yellowing	Pigment wetting	Shrink
Inert Solid Acrylates Key grades																															
NeoCryl™ B-300	none	16	950 **)	na	Off white	0	<1	45	MMA/BMA copolymer	●	●	●	●	●	●	●	●	●	Excellent solubility in monomers Excellent adhesion properties	●	●	●		●	na	o	++	++	o	+	+
NeoCryl™ B-302	none	5	700 **)	na	Off white	0	4	70	Methacrylic copolymer	●	●	●		●		●	●	●	Excellent solubility in monomers Excellent pigment grinding	●	●	●		●	na	-	++	++	o	++	+
NeoCryl™ B-810	none	54	1900 *)	na	White	0	7	59	BMA/MMA copolymer	●	●	●	●	●	●	●	●	●	Improved outdoor durability	●	●	●			na	o	++	+	o	-	+
NeoCryl™ B-813	none	40	18000 *)	na	White	0	10	64	EMA copolymer	●	●	●		●	●	●	●	●	Plastisizer resistant, good adhesion		●	●			na	o	++	++	o	-	+
NeoCryl™ B-819	none	40	1200 *)	na	White	65	16	49	Acrylic/Styrene copolymer	●	●		●	●		●	●	●	Suitable for pigment grinding	●	●	●			na	o	++	+	-	o	+
NeoCryl™ B-890	none	12.5	1300 *) 16000 **)	na	Off white	25	75	85	Modified MMA/BMA	●	●		●	●		●	●	●	Excellent adhesion and scratch resistance	●		●			na	-	++	+	o	+	+
NeoCryl™ B-891	none	35	2500 *)	na	White	0	13	77	BMA/MMA copolymer	●	●	●	●	●	●	●	●	●	Excellent scratch resistance		●	●			na	-	++	+	o	-	+

Water-borne resins

	Functionality	Molecular weight (kDalton)	Viscosity (mPas) @ 23°C	Solids (%)	Appearance	OH Value (mg KOH/g)	Acid Value (mg KOH/g)	pH	Description	REACH (Europe)	TSCA (US)	DSL (Canada)	IECSC (China)	AICS (Australia)	ENCS (Japan)	PICCS (Philippines)	ECL (Korea)	Regulatory Data Sheet	Main feature	Flexo	Off set	Screen	Inkjet	OPV	Reactivity	Flexibility	Solvent resistance	Adhesion	Non yellowing	Tack free before cure	Printability
Urethane Acrylates Key grades																															
NeoRad™ R-441	medium	8	100 - 500	39	bluish	na	na	6.5 - 7.5	Aliphatic Acrylated Urethane Oligomer	●	●					●		●	Excelent surface holdout, amine free	●		●	●	●	+	-	++	++	+	--	++
NeoRad™ R-444	high	25	100 - 600	40	bluish	na	na	7.5 - 9	Aliphatic Acrylated Urethane	●	●	●						●	Good flexibility	●		●	●	●	+	++	++	+	++	++	-/0
NeoRad™ R-447	high	500	max 150	35	bluish	na	na	7.5 - 9	Aliphatic Acrylated Urethane/acrylate	●	●							●	Excellent adhesion to plastics	●		●	●	●	++	--	++	++	++	++	0
NeoRad™ R-448	high	40	60	40	white	na	na	7.5 - 9	Aliphatic Acrylated Urethane Oligomer	●								●	Excellent chemical resistances	●		●	●	●	++	--	++	++	++	---	-/0
NeoRad™ UV-14/40W	high	1100	30 - 160	40	white	na	na	7 - 8.5	Aliphatic Acrylated Urethane	●								●	Excellent printability	●		●	●	●	+	-	++	0	++	++	++
NeoRad™ UV-20/40W	high	1100	30 - 160	40	white	na	na	7 - 8.5	Aliphatic Acrylated Urethane	●	●	●						●	Adhesion to glass	●		●	●	●	+	+	-	0	++	++	++
NeoRad™ UV-65/40W	medium	125	30 - 200	40	bluish	na	na	7 - 8.5	Aliphatic Acrylated Urethane Oligomer	●								●	Good surface holdout	●		●	●	●	+	-	0	0	++	--	++
NeoRad™ UV-TN-6711	low	400	30 - 160	40	white	na	na	7 - 8.5	Aliphatic Acrylated Urethane/acrylate	●								●		●		●	●	0	0	-	0	++	++	+	
NeoRad™ R-1500	medium	25	200-1000	32	white	na	na	6.5 - 8.5	Aliphatic Acrylated Urethane	●	●								Matt & soft touch	●				●	0	-	0	+	++	++	+

Abbreviations

DPGDA	Diproglycol diacrylate
HDDA	Hexanediol diacrylate
TPGDA	Tripropylene glycol diacrylate
GPTA	Propoxylated glyceryl triacrylate

MMA	Methylmethacrylate
BMA	Butylmethacrylate
EMA	Ethylmethacrylate

OPV	Overprint varnish
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