
densurf
PRODUCT CATALOGUE

densurf

Densurf, as a subsidiary establishment of Denge Kimya, navigates the Paints and Coatings Industry with the aim of delivering innovative and distinctive solutions for our clients. The Densurf product portfolio includes dispersion agents, surface modifiers, defoamers, and silicone resins. In addition to the paint and coating industry, Densurf also designs products for other industries such as the cosmetics, detergency and agriculture.

OUR AIM

Make a positive impact on the world with our innovative solutions tailored for our clients need.

OUR MISSION

Be a solution partner in the sectors we serve as a learning and teaching organization.

OUR VISION

Be a name brand in the industries we serve with our innovative solutions.

OUR VALUES

Being a team
Prioritizing our customers need
Creativity
Social Awareness

CONTENTS

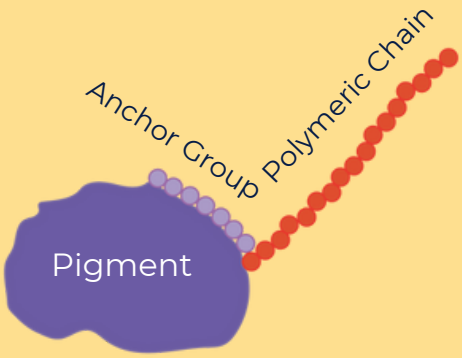
DISPERSING AGENTS

DENSURF DA products help the wetting of pigments/extenders and their dispersion to the primary particle size. They avoid flocculation of the dispersed particles by means of sterical and electrostatic effects and ensure their stabilization.

densurf *DISPERSING AGENTS*

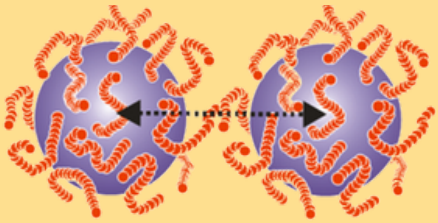
Dispersing agents are composed of two parts: polymeric chain and anchor group.

Anchor groups may be acids, amines, and cyclic, and they interact with the surface of the pigments to ensure adsorption of the dispersing agent. On the other hand, polymeric chains should be compatible with the medium, and move freely.



Dispersing agents prevent pigment particles to regather by avoiding interaction among the pigment particles by means of the basic methods stated below:

Polymeric chains of the dispersing agents entangle with each other as pigment particles close up, and lose their degree of freedom. This state results in a lower entropy level (repulsion potential), and constitutes an energy barrier between the pigment particles. (1st Effect)

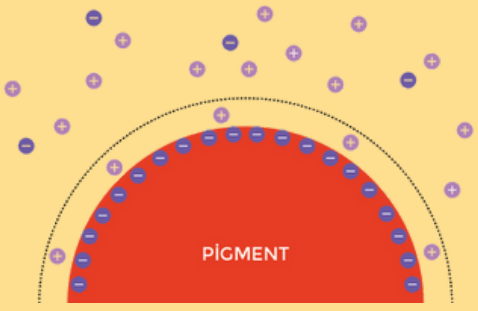


Steric Hindrance

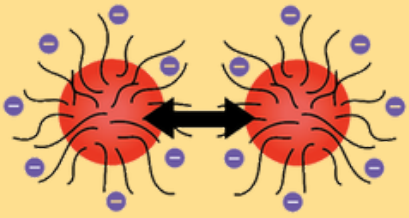
Besides, when polymeric chains get compressed, local solvent concentration decreases. Solvent moves to dense polymer region due to the pressure build-up caused by difference in osmotic pressure, and creates repulsive force.
(2nd Effect)

Electrostatic Repulsion

Dissociated ionic structures form a double layer charge cloud (electric double layer) on the pigment surface. Interaction of the pigment particles loaded with the same charge is inhibited due to repulsive forces. These forces are effective in mediums with high dielectric constant (for example: water-based systems). Combination of steric and electrostatic stabilization (electro-steric repulsion) is another method used for preventing interaction of pigments.



Electrical Double Layer



Electro-steric Repulsion

DA

DENSURF DA 202 is developed for solvent-based, short oil alkyd systems. Effectively disperses inorganic pigments and fillers, and ensures their stability.

DENSURF DA 405 is a hydroxy functional carboxylic acid ester. Recommended for solvent-based alkyd paints.

DENSURF DA 412 is a copolymer with acidic anchor groups. Recommended for the dispersion of inorganic pigments, especially titanium dioxide.

DENSURF DA 413 is developed for the dispersion of inorganic pigments and fillers in solvent-based systems. Recommended for primers and extender pastes.

DENSURF DA 4010 is a polyether modified copolymer with pigment affinic groups. Used for dispersion of organic pigments, especially carbon blacks.

	Chemical Structure	Solid Content %	Solvent	Amine Value mg KOH/g	Acid Value mg KOH/g	Pigment	System
DENSURF DA 202	Combination of Surface Active Agents	57 ±2	Propylene Glycol: Water (5:1)	-	34 ±3	Inorganic Filler	Short Oil Alkyd
DENSURF DA 405	Carboxylic Acid Ester	98.5 ±1.5	-	69 ±3	-	Inorganic Organic Carbon Black Filler	Medium-Long Oil Alkyd Filler
DENSURF DA 412	Copolymer with acidic anchor groups	99 ±1	-	-	100 ±10	Inorganic Filler	Acrylic Epoxy Polyester
DENSURF DA 413	Copolymer solution with acidic anchor groups	50 ±1	Xylene: n-Butyl Acetate (3:1)	-	55 ±5	Inorganic Filler	Acrylic Epoxy Polyester
DENSURF DA 4010	Polyether modified copolymer	98.5 ±1.0	-	15 ±2	6 ±2	Carbon Black Organic Inorganic	Acrylic Epoxy Polyester

SURFACE MODIFIERS

Surface defects can be frequently observed due to differences in surface tension during and after the application of paints and coatings. Besides appearance, surface defects also impair protective function of coatings.

DENSURF SM series enhances wetting of the substrate by reducing surface tension of the coating, and prevents formation of surface defects. Products enhance distinctness of the image and offers resistance against scratch.

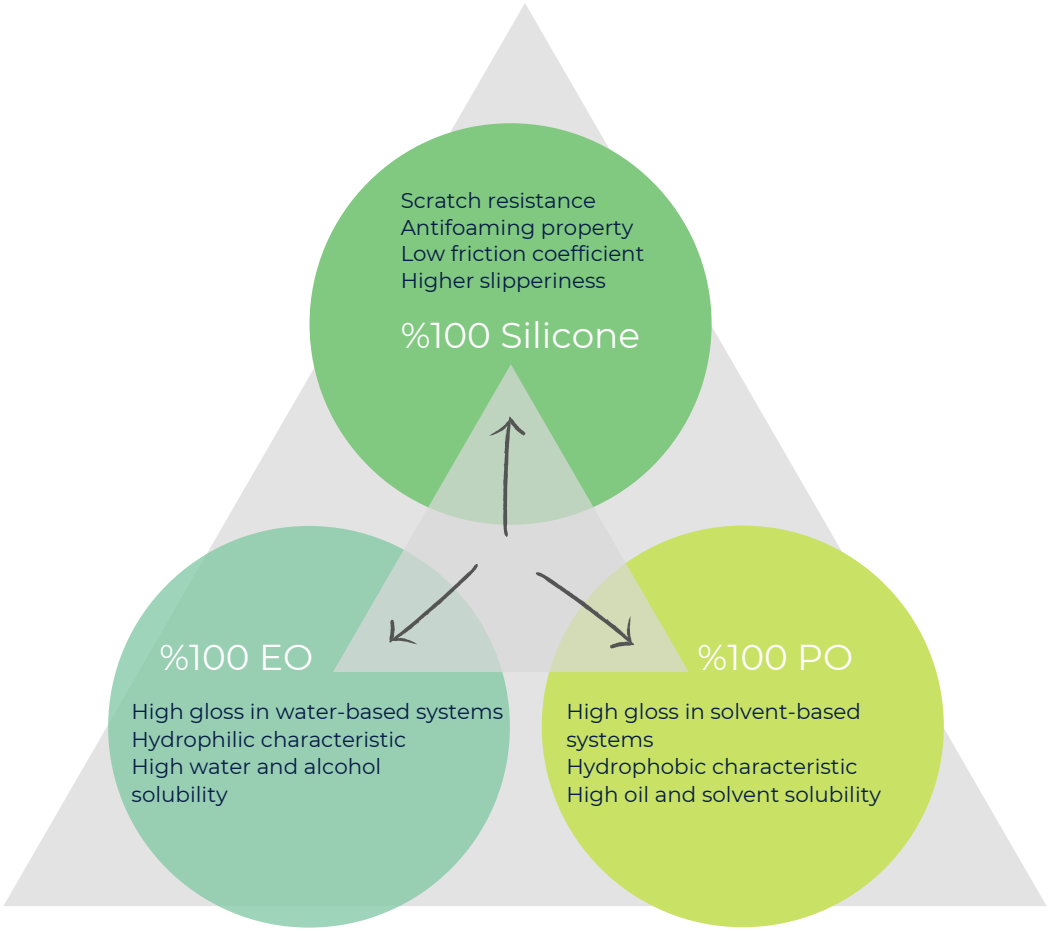
densurf *SURFACE MODIFIERS*

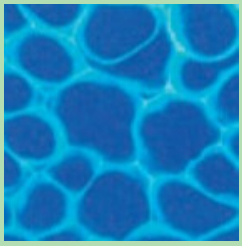
Surface defects such as crater, Benard cell, orange peel can be observed due to differences in surface tension during and after the application of paints and coatings.

Ordinarily polysiloxanes and polyacrylates are utilized to prevent formation of surface defects by changing the surface tension of the coatings.

Effects of polyacrylates on changing surface tension of coatings is relatively low. On the other hand, polysiloxanes can reduce the surface tension radically depending on their chemical structures and modifications. Due to this effect, they enhance surface wetting properties of the coatings, and they also prevent formation of surface defects. Polysiloxanes have also another effect that increases slippery of the coating film. Thus, they positively contribute to the scratch resistance of the coating.

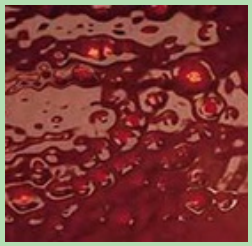
Organo modified polysiloxanes gain different properties as their silicone, ethylene oxide (EO) and propylene oxide (PO) ratios change. For example, EO modification ensures compatibility with the water-based systems, whereas PO modification provides hydrophobicity for the structure.



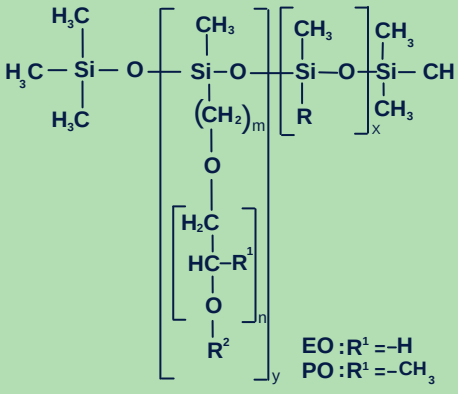


Benard cell

Orange peel effect



Crater



Organo-modified polysiloxane

SM

	Chemical Structure	Active Content (%)	Solvent	System	Application
DENSURF SM 101	Polyether modified polysiloxane	98 ± 2	-	WB SF	Paints and Coatings Printing Inks
DENSURF SM 102	Polyether modified polysiloxane solution	52 ± 2	Dipropylene glycol mono n-butyl ether	WB	Paints and Coatings Printing Inks
DENSURF SM 103	Polyether modified polysiloxane	98 ± 2	-	WB SB SF	Paints and Coatings Printing Inks
DENSURF SM 105	Polyether modified siloxane	95 ± 5	-	WB	Concrete Primers Architectural Coatings
DENSURF SM 114	Polyether modified polysiloxane	98 ± 2	-	SB SF	Paints and Coatings Printing Inks
DENSURF SM 124	Polyether modified polysiloxane	98 ± 2	-	SB SF	Paints and Coatings Printing Inks
DENSURF SM 127	Polyether modified polysiloxane	98 ± 2	-	WB SB SF	Paints and Coatings Printing Inks
DENSURF SM 135	Polyether modified polysiloxane	15 ± 2	Xylene	SB	Paints and Coatings
DENSURF SM 220	Functional Ester	100	-	WB	Architectural Coatings

WB: Water-based
SB: Solvent-based
SF: Solvent-free

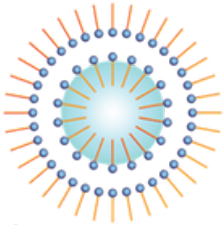
DEFOAMERS AND AIR RELEASE AGENTS

Air that is trapped in the pigments and fillers, adsorbed by the surface to which application is realized; and gases such as carbon dioxide released as a result of the reaction cause formation of foam in the paint.

Foam formation can be reduced by optimizing formulation, production and application processes.

If foam continues to form, **DENSURF AF** series offers an efficient defoaming.

Foam can be defined as gaseous phase dispersed in the liquid. Surface active agents in the paint settle into foam lamella and cause the foam to become stable.



Surface Active Agent

Properties of an Ideal Defoamer

Defoamer should have a controlled incompatibility in the system. If it is compatible with the system, it cannot enter into the foam lamella, as it is dispersed homogenously in the medium. It can even cause stable foam formation. On the other hand, too much incompatibility may cause surface defects in the paint film such as haziness, craters.

Types of Defoamers

We can arrange defoamers under three groups according to their compositions

- Mineral oil
- Silicone-based
- Silicone-free

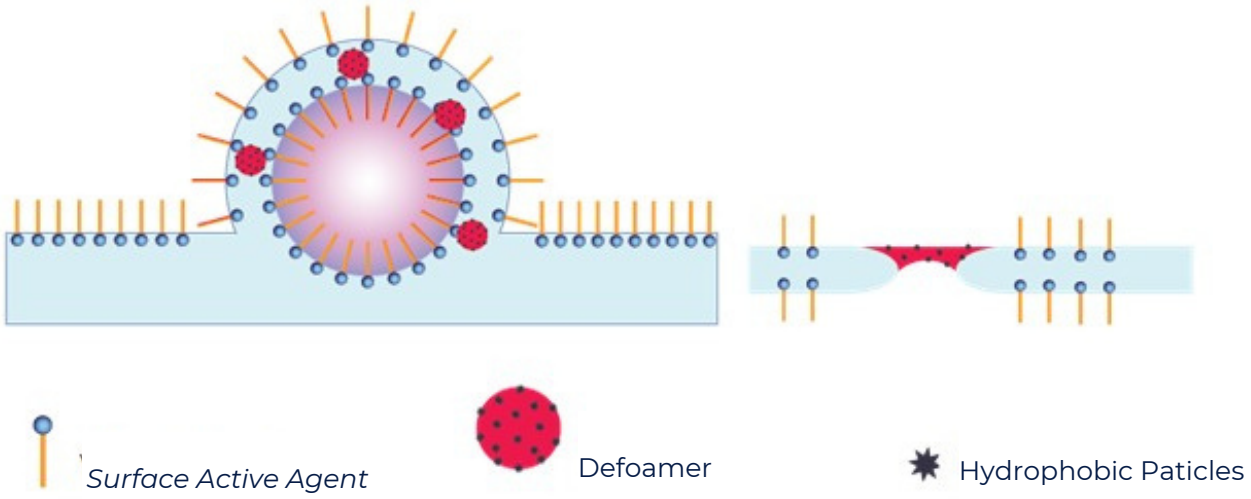
Silicone-based defoamers generally consist of modified polydimethylsiloxane (PDMS) and their solutions. PDMS chains are modified with different polyether groups, thus their compatibility and defoaming effect are optimized.

Effect of chain length of PDMS on the compatibility

Hydrophobic particles (silicas, waxes, etc.) are added extensively to improve efficiency of defoamers. These particles impair stability of the foam by entering into the foam lamella.

Stages of Defoaming

- Defoamer drops enter into the foam lamella, and settle to the liquid/gas intermediate phase by their surface active property.
- Drops spread to the foam lamella, and push surface active agents to sides. Thus, surface active agent ratio reduces and inelastic points are created.
- Stability of the foam is impaired, and lamella ruptures and foam bursts.



Defoaming Mechanism

AF

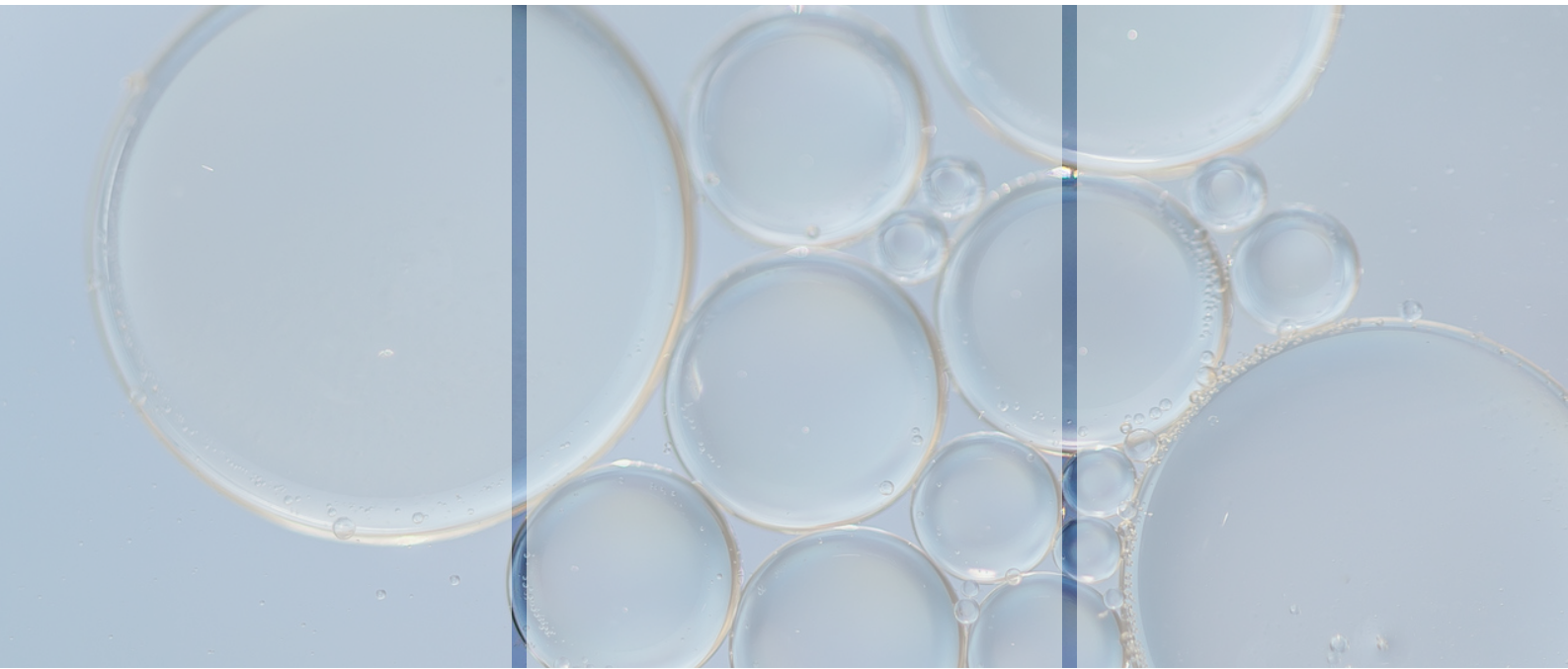
DENSURF AF 126 is a mineral oil and organo-modified silicone emulsion. Contains hydrophobic particles. Developed for water-based applications. It is effective in the medium to high pigment-volume concentration (PVC) range.

DENSURF AF 200 is an organo-modified polysiloxane-based air release agent with hydrophobic particles. Effective against micro and macro foams especially in solvent-free epoxy systems.

DENSURF AF 206 is an organo-modified silicone oil-based defoamer with hydrophobic particles. Recommended for artificial leather formulations.

	Chemical Structure	Active Content (%)	Solvent	System	Appllication
DENSURF AF 126	Organo-modified silicone and mineral oil emulsion	17.5 ± 1.0	Water	WB	Architectural Coatings
DENSURF AF 200	Organo-modified polysiloxane	100	-	SF	Floor Coatings Protective Coatings Wood Coatings Printing Inks
DENSURF AF 206	Organo-modified silicone oil	100	-	WB SB SF	Printing Inks Artificial Leather Systems

WB: Water-based
SB: Solvent-based
SF: Solvent-free

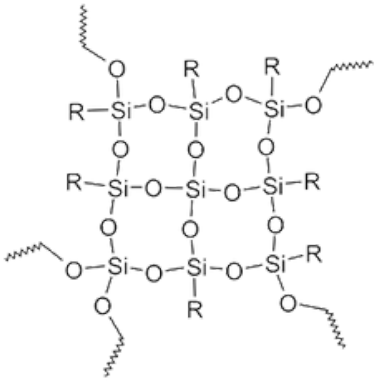


SILICONE RESINS

DENSURF HR series is special silicone resins that are used to formulate solvent-based coatings resistant to 600-650°C with the proper pigment/filler combination.

densurf SILICONE RESINS

Silicone resins consist of siloxane (Si O) lattice structure and Silicate SiO2 or Silsesquioxane (R*-SiO3/2) structures. R groups are generally alkyl or aryl (methyl, phenyl) structures.
Silicone resins are resistant to heat and radiation. They are transparent in UV and visible light spectrum.

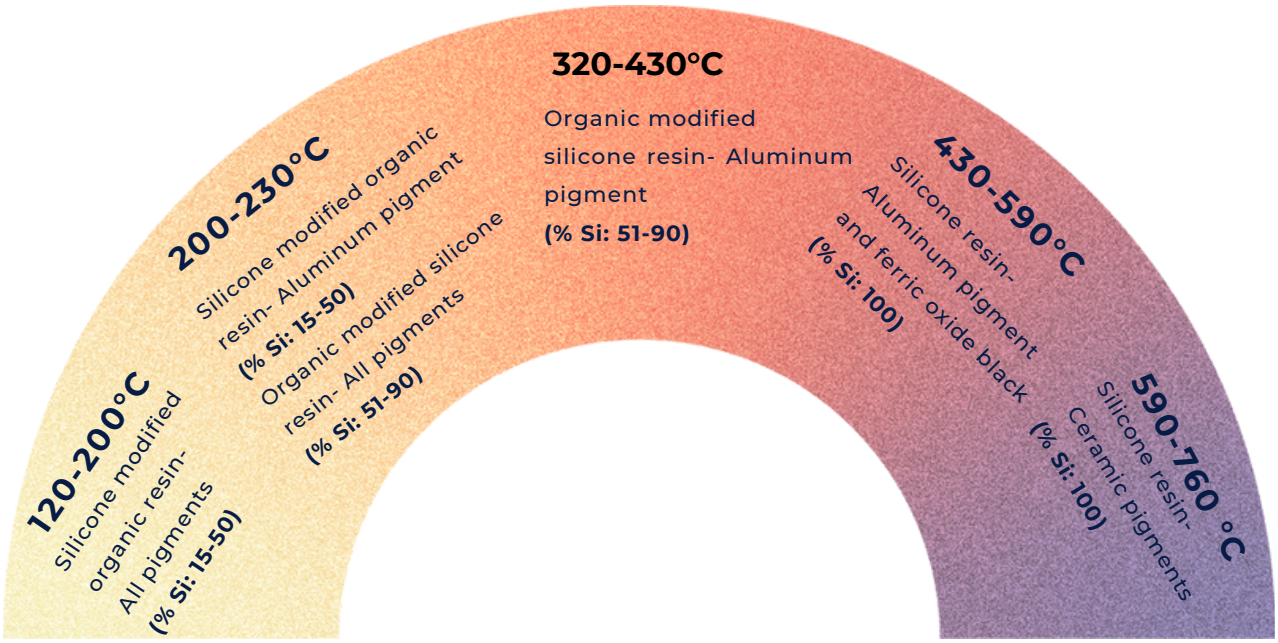


PHENYL	METHYL
Compatibility with organic resins	Fast curing
High thermal resistance	Thermal shock resistance
Toughness	Hardness
Thermal stability	Water repellency
High resistance to oxidation	Chemical resistance
Thermoplasticity	Elasticity at low temperature
Better storage stability	Gloss resistance
High mass loss during curing	Low mass loss during curing

Silicone resins have two different types of curing, thermal and ambient curing:

- For full curing of thermal-cured resins (with silanol function), they should be cured at 250°C for 30 minutes. If curing is not completed, paint film may remain soft and exhibit poor adhesion.
- For curing of ambient-cured resins (with Silalkoxy function), addition of catalyzer (for example: tetrabutyltitanate) is required before the application. These resins is cured by using humidity of the air.

Thermal resistance of systems with silicone resins is directly associated with pigment/filler composition. Silicone resins can also be mixed with organic resins.

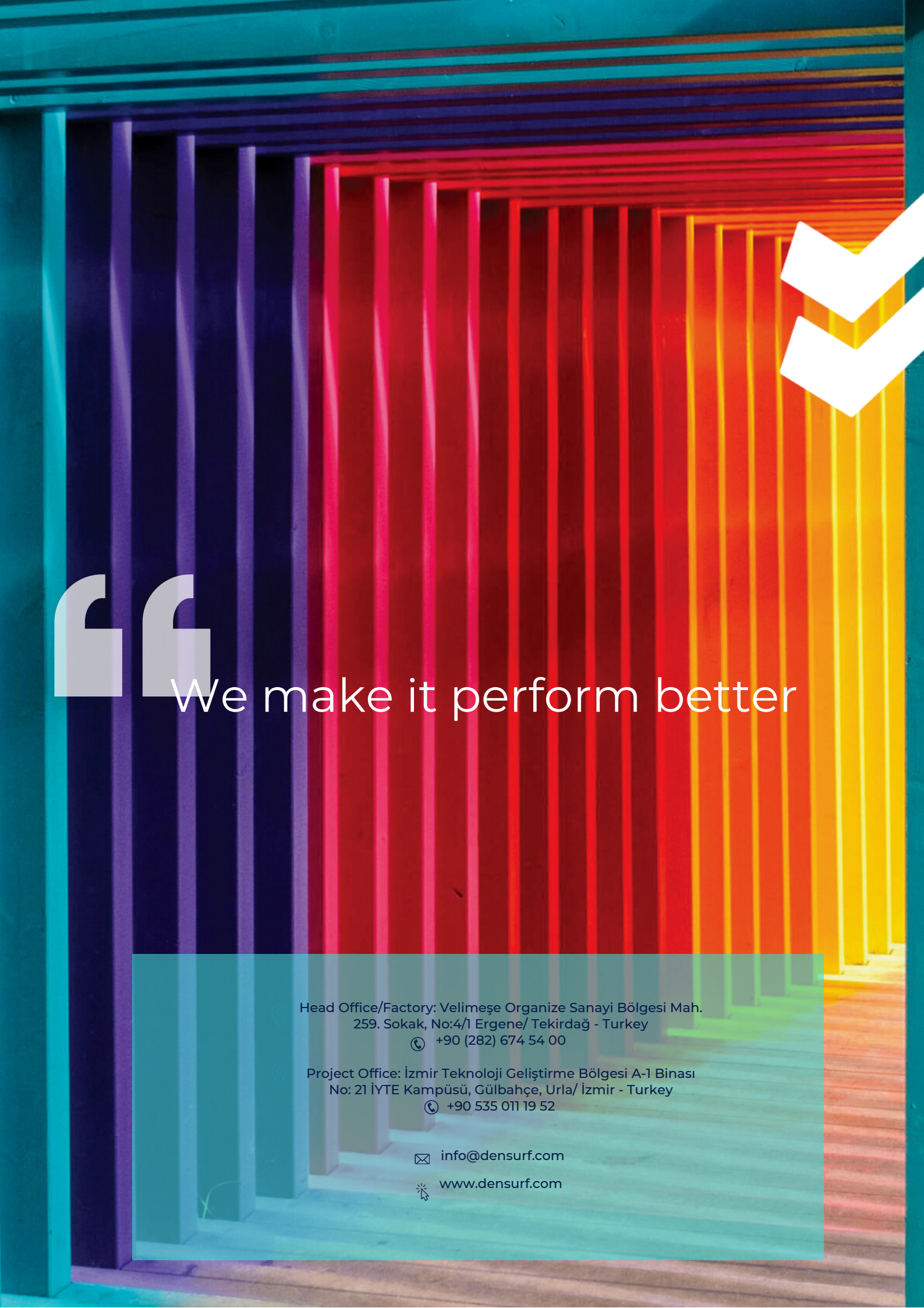


HR

	DENSURF HR 700A	DENSURF HR 800	DENSURF HR 900
Chemical Structure	Methyl polysiloxane	Methyl-phenyl polysiloxane	Phenyl polysiloxane
Curing Mechanism	Ambient Curing	Thermal curing	Thermal curing
Phenyl/Methyl Ratio	%100 Methyl	1.1	%100 Phenyl
Molecular Weight (x1000)	2-7	200-300	200-300
Pendulum Hardness (persoz)	278	279	187
Active Content (%)	100	50 ± 2	50 ± 2
Touch-free Drying Time (min)	45	45	40
Viscosity (cps)	<100	30-100	30-100
Solvent	-	Xylene:Isobutanol (15:1)	Xylene

	Epoxy Resin	Acrylic Resin	Thermoplastic Acrylic Resin	Alkyd Resin
DENSURF HR 700A	○	○	○	●
DENSURF HR 800	●	●	●	●
DENSURF HR 900	●	●	●	●

● *Very Suitable* ● *Suitable* ○ *Not suitable*



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