

# Elasticizing and Matting with Renewable Raw Materials



**Deogrip<sup>®</sup>  
in Practice**

Epoxy-Systems

2020 Edition

# OUR PHILOSOPHY: YOU NEED IT. WE DO IT.

## Expertise in Additives Since 1902

Since being founded in December 1902, we have been a family-owned, medium-sized company specialized in the production of additives.

Although in the first few decades, the core business was producing rubber additives, later we expanded our range with additives for lubricants, **coatings**, adhesives, and sealants. Since we have continued to use our company name, DOG Deutsche Oelfabrik GmbH & Co. KG, although it no longer fully reflects the expanded range of our business activities, we decided to unite our product groups under the brand name: DO.ADDITIVES.

In addition to our company headquarters directly at the Hamburg harbor, in 2012 we also constructed a second production site in Marschacht, where we primarily manufacture our special products for the rubber and coating markets.

## Social Responsibility

We want to contribute to making modern processes even more effective with our additives: add efficiency. That's why at the center of our endeavor is the production of efficient products that are safe for the environment and the users. We use a wide range of **natural, renewable**

raw materials such as rapeseed oil and castor oil for our products and continually invest in the safety and environmental sustainability of our chemical processes.

In doing so, our highest goal is to pose no harm to people or the environment with our products while helping our customers advance their technology with our products.

For us, it also goes without saying that we adhere to the laws and regulations, and moreover, we view corruption and child labor as being completely unethical and indefensible.

## German Production Sites – Worldwide Sales

We can draw upon a distribution network that has been developed, modernized, and expanded over the course of more than 115 years. By combining our own technology with our local distribution partners who support our customers directly on-site, we have a local presence in over 80 countries. This dual strategy enables us to provide our customers both with fast reaction times and expert consulting for their application.

This strategy is supported by our own technical laboratory capacities that we maintain at our sites in Hamburg and Marschacht.





## Your Benefits at a Glance

- We supply you with highly effective additives worldwide, even in small units.
- We offer you a wide range of products that are safe for the environment and the users.
- With our own R&D capabilities, we also serve as development partners for our customers.
- As a medium-sized company, you benefit from our direct lines of communication – we don't make you wait long for an answer.
- Our quality management is certified in accordance with DIN EN ISO 9001:2015.

## TABLE OF CONTENTS

<b>1. Production: From Castor Oil to Deogrip®</b>	
The Raw Materials .....	4
The Production .....	4
The Deogrip® Product Range .....	4
<b>2. The Advantages of Using Deogrip®</b>	
Special Product Characteristics .....	5
Special Properties .....	5
Areas of Application .....	5
<b>3. Overview of Example Recipes</b> .....	6
<b>3.1</b> Recipe R1 – 2K Epoxy Clear Coating, Solvent-Based .....	7
<b>3.2</b> Recipe R2 – 2K Epoxy Clear Coating, Water-Based .....	10
<b>3.3</b> Recipe R3 – 2K Epoxy Clear Coating, Solvent-Free Recipe R4 – 2K Epoxy Clear Coating, Reactive Diluent .....	12
<b>4. Test Methods</b> .....	14
<b>5. Contact &amp; Imprint</b> .....	15

### Technical Datasheets

At [www.do-additives.de/en](http://www.do-additives.de/en) you have the opportunity to download "technical datasheets" for each of our products.

# 1. From Castor Oil to Deogrip®



### The Raw Materials

The cross-linking of cold-pressed oils has been one of the core competencies of the DOG Deutsche Oelfabrik over the course of its more than 115-year company history. Cross-linked native oils, also called factice, are often used as additives in the rubber industry. Taking this as a starting point, DOG developed a new product for the coating industry called Deogrip, which is based on cross-linked castor oil and provides numerous advantages.

### The Production

The product types offered in powder form, Deogrip WPF and Deogrip WPF-NT, are produced at our locations in Hamburg and Marschacht. The production of the liquid Deogrip Micro products takes place exclusively at our location in Marschacht. The renewable raw material, castor oil, is first modified chemically and subsequently cross-linked to a polymer. DOG's expertise in the polymerization process and wet milling is essential for the production of the fluid Deogrip Micro products. The process that is employed by DOG ensures that the products have a consistently high quality. In further refinement steps, individual adjustments to the particle size are subsequently made in order to meet the demands of the coating industry.

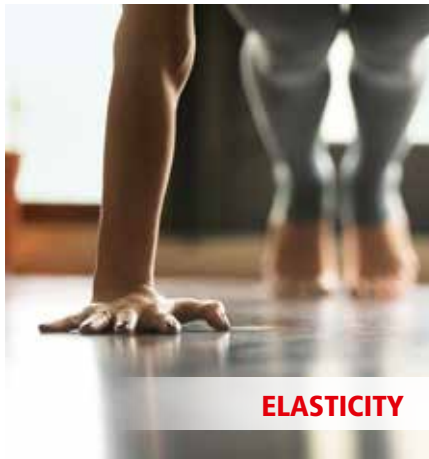
Appearance	Product	Active Substance [%]	Particle Size	
			d <sub>50</sub> [µm]	d <sub>90</sub> [µm]
<b>Deogrip in Powder Form</b>				
	<b>Deogrip WPF</b> Milled Powder	100	120	500
	<b>Deogrip WPF-NT</b> Milled Powder	100	35	80
<b>Deogrip for Water-Based Coatings</b>				
	<b>Deogrip Micro A 2010*</b> White suspension, low viscosity, water-based	45	10	28
	<b>Deogrip Micro A 2011*</b> White suspension, low viscosity, water-based	45	10	25
	<b>Deogrip Micro A 2020*</b> White suspension, low viscosity, water-based	45	20	60
<b>Deogrip for Solvent-Based Coatings</b>				
	<b>Deogrip Micro S 1005*</b> Creme white gel, in butyl acetate / DMM	30	7	15
	<b>Deogrip Micro S 1010*</b> White suspension, medium viscosity, in butyl acetate	30	10	25
	<b>Deogrip Micro S 1011*</b> Creme white gel, in butyl acetate / contains thixotropic additive	30	9	20
	<b>Deogrip Micro S 1020*</b> White suspension, medium viscosity, in DPM	30	12	25
	<b>Deogrip Micro S 1021*</b> Creme white suspension, medium viscosity, in DPM / contains thixotropic additive	30	12	25
	<b>Deogrip Micro S 1030*</b> White suspension, medium viscosity, in DMM	30	10	25
	<b>Deogrip Micro S 1040*</b> White suspension, medium viscosity, in ethyl acetate	30	10	25
<b>Deogrip in Reactive Diluent Solutions</b>				
	<b>Deogrip Micro R 1510*</b> White suspension, medium viscosity, in DPGDA	30	10	25

\*Please Note: Deogrip Micro products demonstrate different specific weights between polymers and solvents. This can lead to a temporary phase separation and is a product-specific characteristic. Therefore, before usage, all Deogrip Micro products should be agitated well.

## 2. The Advantages of Using Deogrip®



**MATTING**



**ELASTICITY**



**STRUCTURE**

The Deogrip product range is highly versatile. Even at relatively small concentrations, excellent matting effects can be achieved, e.g. in combination with conventional silicates. At a higher concentration, Deogrip can completely replace matting silicates and furthermore, it enhances the elasticity and flexibility of the coating. Deogrip also can make a wide range of coatings less prone to cracking, without reducing their resistance to solvents or other chemicals.

### Special Product Characteristics

- Matting, even when silicates should not be used
- Improved elasticity and flexibility in coatings
- Targeted structural effects can be generated by Deogrip
- No shrinkage necessary for matting
- Generally chemically resistant
- Good resistance to solvents
- Good thermal stability, up to 230°C for short periods without yellowing
- Hydrophobic properties, no water absorption
- Neutral in color
- High transparency – no clouding at higher dosages
- Retains the original depth of color even at higher dosages

### Special Properties

- Easy blending in coatings due to excellent dispersion properties, without an increase in viscosity
- After mixing, no sedimentation or depositing in coatings, (density 1.0 g/cm<sup>3</sup>)
- Troubleshooting: easy to make fine adjustments to the glossiness even after production completed
- Very good compatibility with most binding systems

### Areas of Application

- Industrial coatings
- Container linings
- Electrical devices (matting)
- Rock-chip protection/undercoatings (improved impact resistance)
- Floor coatings (improved elasticity)
- Structural coatings (texturing)

### 3. Overview of Example Recipes



The Deogrip products can be used in any coating system for a wide range of applications. We have generated example recipes in order to provide a representative overview of the versatility of these innovative additives. It goes without saying that the Deogrip additives can be used in further coating systems as well.

Binding Agent System	Recipe	Deogrip Products Used
2K Epoxy Clear Coating, Solvent-Based	R1	Deogrip Micro S 1010, 1011, 1020, 1030
2K Epoxy Clear Coating, Water-Based	R2	Deogrip Micro A 2010
2K Epoxy Clear Coating, Solvent-Free	R3	Deogrip WPF-NT
2K Epoxy Clear Coating, Reactive Diluent	R4	Deogrip WPF-NT

#### INFO

Further examples of Deogrip applications can be found in PU and acrylate systems.





### 3.1 Recipe R1 – 2K Epoxy Clear Coating, Solvent-Based

Pos.	Product	Initial Weight [g]	Function
<b>A-Components</b>			
1.	<b>Araldite GZ 7071X75</b>	100.0	Binding agent
2.	<b>AFCONA 5585</b>	0.5	Wetting agent
3.	<b>AFCONA 2270</b>	2.0	Anti-foaming agent
4.	<b>Butyl acetate</b>	20.0 (0.0 with Micro S)	Solvent
5.	<b>Polymer</b>	11.0 (see table)	Polymer matting agent
6.	<b>Silicate</b>	11.0 (see table)	Inorganic matting agent
7.	<b>Deogrip Micro S 1010</b>	33.0 (see table)	Polymer matting agent
8.	<b>Deogrip Micro S 1011</b>	33.0 (see table)	Polymer matting agent
	<b>Deogrip Micro S 1020</b>	33.0 (see table)	Polymer matting agent
	<b>Deogrip Micro S 1030</b>	33.0 (see table)	Polymer matting agent
<b>B-Components</b>			
9.	<b>D.E.H. 445</b>	16.4	Hardening agent

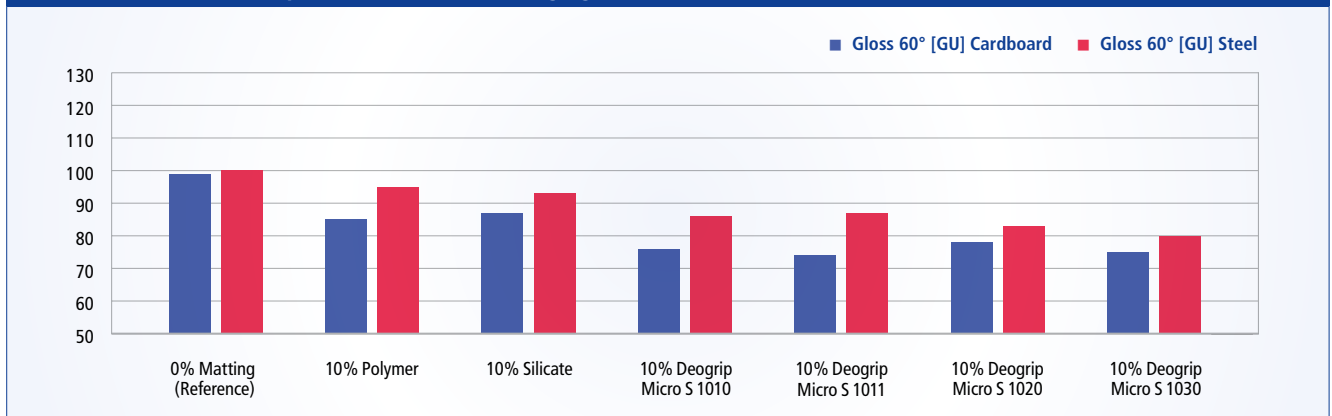
#### 3.1.1 Production:

- Except for the matting agents, all of the A-component substances are agitated together in a disperser at 500 rpm for 5 minutes.
- Subsequently, the matting agent is slowly added, then the suspension is agitated for another 10 minutes at 1000 rpm.
- Afterwards, the B-components are added then the mixture is agitated at 500 rpm for another 5 minutes.

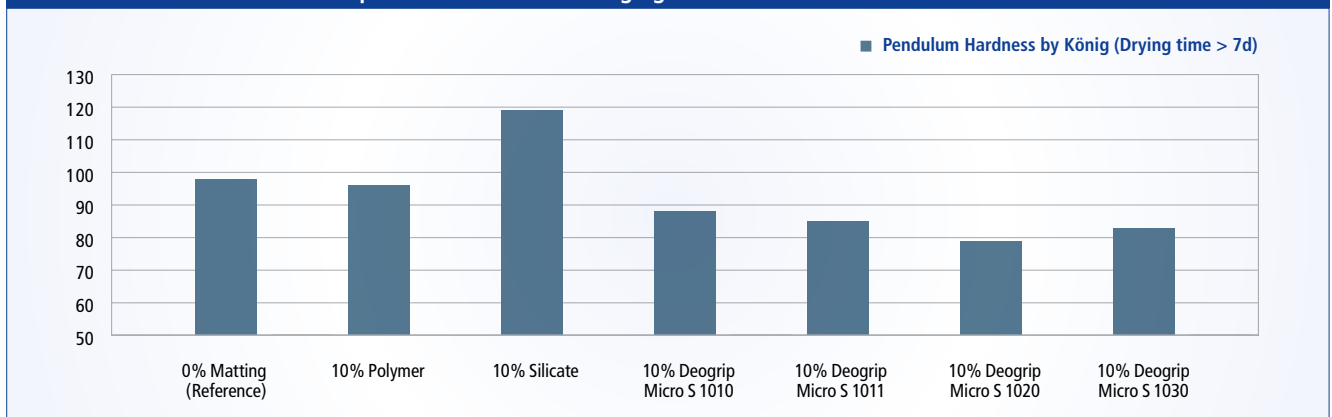
## 3.1.2 Comparison of Various Matting Agents

	0 % Matting (Reference)	10 % Polymer	10 % Silicate	10 % Deogrip Micro S 1010	10 % Deogrip Micro S 1011	10 % Deogrip Micro S 1020	10 % Deogrip Micro S 1030
<b>Substrate: Cardboard</b>							
Dry Coating Thickness [µm]	47	54	50	57	51	49	53
Gloss 60 [GU] Cardboard	99	85	87	76	74	78	75
<b>Substrate: Steel</b>							
Dry Coating Thickness [µm]	47	54	50	57	51	49	53
Gloss 60 [GU] Steel	100	95	93	86	87	83	80
Pendulum Hardness by König (Drying time > 7d)	98	96	119	88	85	79	83
Cross Cut		G0	G0	G0	G0	G0	G0

Gloss Values for Basic Recipe R1 with Various Matting Agents



Pendulum Hardness for Basic Recipe R1 with Various Matting Agents



## ADVANTAGES

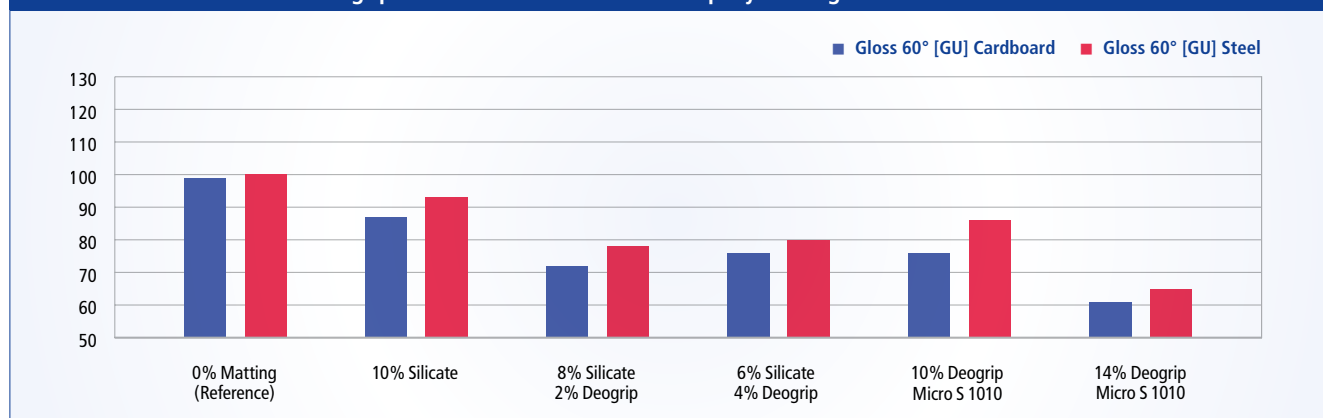
- At a concentration of 10 % by mass, all of the tested Deogrip Micro S products matt the 2K epoxy coating more strongly than matting silicates or a competing polymer product.
- Deogrip Micro S has an elasticizing effect on the coating, making it more flexible.



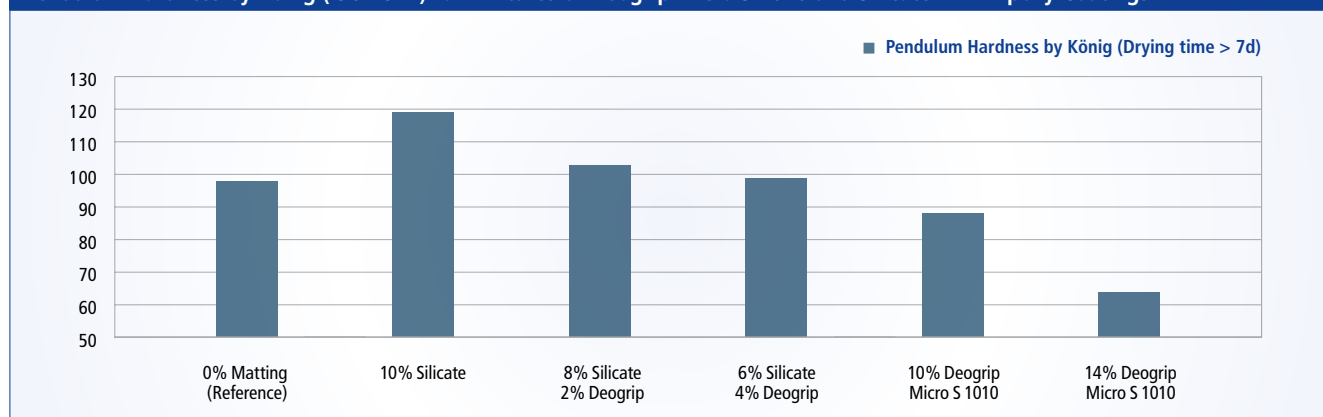
### 3.1.3 The Boost Effect of Deogrip in Solvent-Based Systems

	0 % Matting (Reference)	10 % Silicate	8 % Silicate 2 % Deogrip	6 % Silicate 2 % Deogrip	10 % Deogrip Micro S 1010	14 % Deogrip Micro S 1010
<b>Substrate: Cardboard</b>						
Gloss 60 [GU] Cardboard	99	85	87	76	74	75
<b>Substrate: Steel</b>						
Gloss 60 [GU] Steel	100	95	93	86	87	80
Pendulum Hardness by König (Drying time > 7d)	98	96	119	88	85	83
Dry Coating Thickness [µm]		40–60	40–60	40–60	40–60	40–60

Gloss Values for Mixtures of Deogrip Micro S 1010 and Silica in 2K Epoxy Coatings



Pendulum Hardness by König (ISO 1522) for Mixtures of Deogrip Micro S 1010 and Silicate in 2K Epoxy Coatings



## ADVANTAGES

- In the mixture with silicate, Deogrip Micro S enhances the matting effect while also elasticizing the 2K epoxy coating, making it more flexible.



## 3.2 Recipe R2 – 2K Epoxy Clear Coating, Water-Based

Pos.	Product	Initial Weight [g]	Function
<b>A-Components</b>			
1.	<b>D.E.H. 805</b>	90.0	Hardening agent
2.	<b>AFCONA 3585</b>	1.0	Wetting agent
3.	<b>AFCONA 2270</b>	1.0	Anti-foaming agent
4.	<b>Demineralized Water</b>	100.0*	Solvent
5.	<b>Silicate</b>	16.0 (see table)	Inorganic matting agent
6.	<b>Deogrip Micro A 2010</b>	20.0/36.0/72.0 (see table)	Polymer matting agent
<b>B-Components</b>			
7.	<b>D.E.R. 3581</b>	70.0	Binding agent

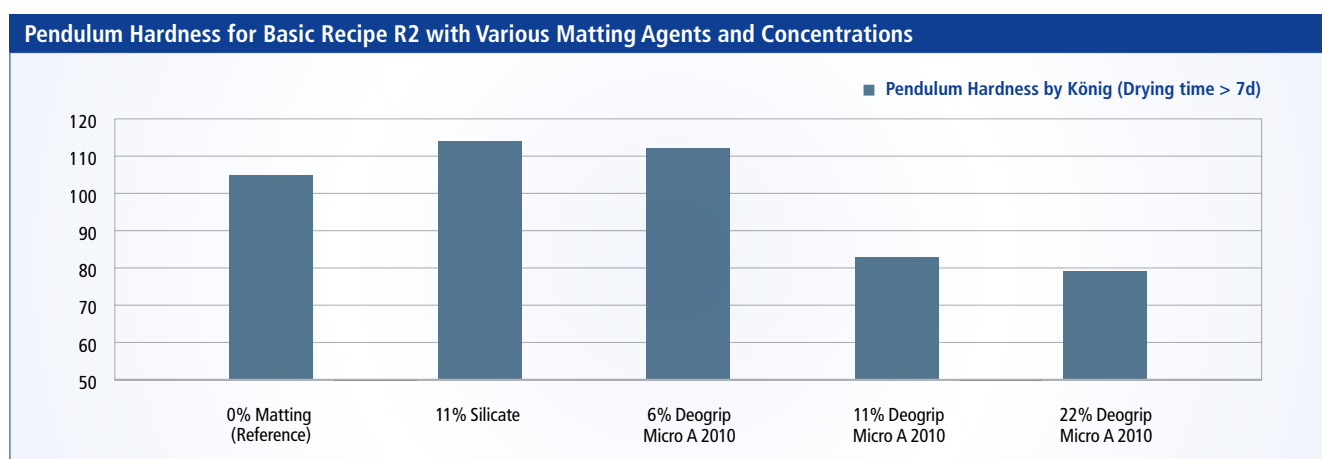
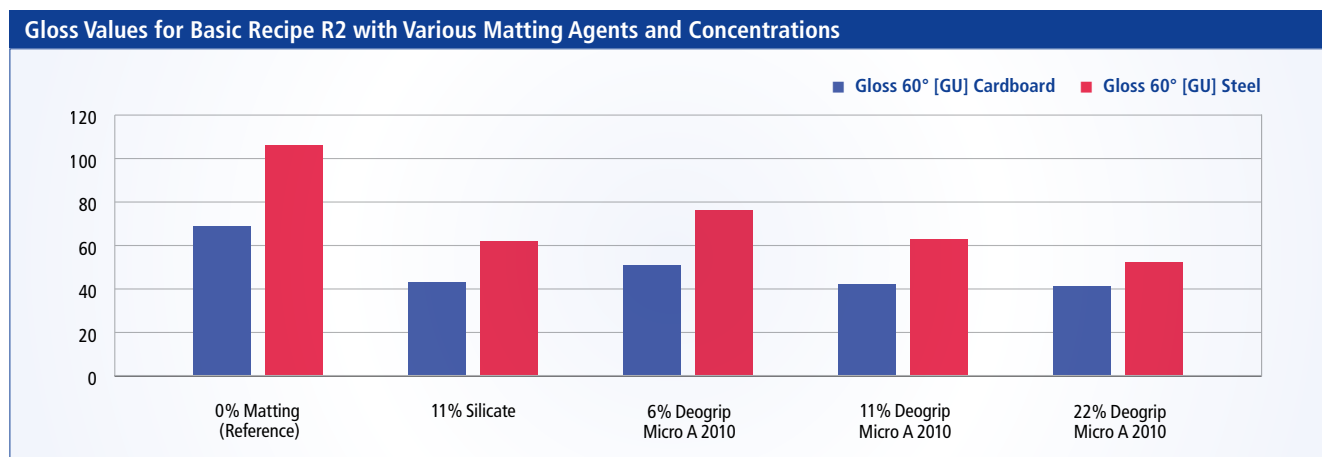
\*Water amount reduced by adding Deogrip Micro A

### 3.2.1 Production:

- Except for the matting agent, all of the A-component substances are agitated together in a disperser at 500 rpm for 5 minutes.
- Subsequently, the matting agent is slowly added, then the suspension is agitated for another 10 minutes at 1000 rpm.
- Afterwards, the B-components are added then the mixture is agitated at 500 rpm for another 5 minutes.

### 3.2.2 Test Results

	0 % Matting (Reference)	11 % Silicate	6 % Deogrip Micro A 2010	11 % Deogrip Micro A 2010	22 % Deogrip Micro A 2010
<b>Substrate: Cardboard</b>					
Gloss 60 [GU] Cardboard	69	43	51	42	41
<b>Substrate: Steel</b>					
Gloss 60 [GU] Steel	106	62	76	63	52
Pendulum Hardness by König (Drying time > 7d)	105	114	112	83	79
Dry Coating Thickness [µm]	40–50	G0	G0	G0	G0



## ADVANTAGES

- Compared with matting silicates, Deogrip Micro A has matting effects even at low concentrations.
- As opposed to matting silicates, when used in concentrations above 6 %, Deogrip Micro A has an elasticizing effect on the coating, making it more flexible.



## 3.3 Recipe R3 – 2K Epoxy Clear Coating, Solvent-Free Recipe R4 – 2K Epoxy Clear Coating, Reactive Diluent

Pos.	Product	Recipe R3 [g]	Recipe R4 [g]	Function
<b>A-Components</b>				
1.	<b>Araldite GY 783</b>	100.0	100.0	Binding agent
2.	<b>AFCONA 5585</b>	3.0	3.0	Wetting agent
3.	<b>AFCONA 7201</b>	1.0	1.0	Anti-foaming agent
4.	<b>Talcum</b>	100.0/60.0/20.0 (see table)		Filler
5.	<b>Deogrip WPF-NT</b>	0.0/40.0/80.0 (see table)	0.0/100.0	Polymer matting agent
6.	<b>Nikanol Y300</b>		60.0/60.0	Reactive diluent
<b>B-Components</b>				
7.	<b>D.E.H. 445</b>	54.0	64.0	Hardening agent

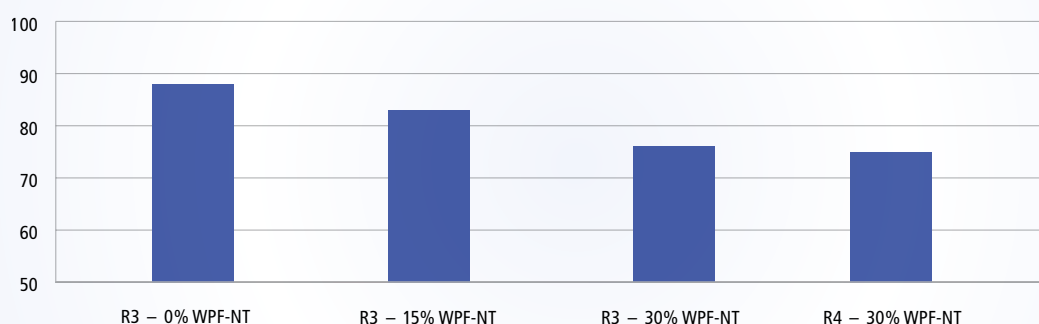
### 3.3.1 Production:

- Except for the matting agent, all of the A-component substances are put together.
- This mixture is agitated in a disperser at 500 rpm for 5 minutes.
- After 5 minutes of agitating, the matting agent is slowly added.
- Then the suspension is agitated for approximately another 10 minutes at 1000 rpm.
- Afterwards, the B-components are added then the mixture is agitated at 500 rpm for another 5 minutes.
- The preparation can be utilized immediately.

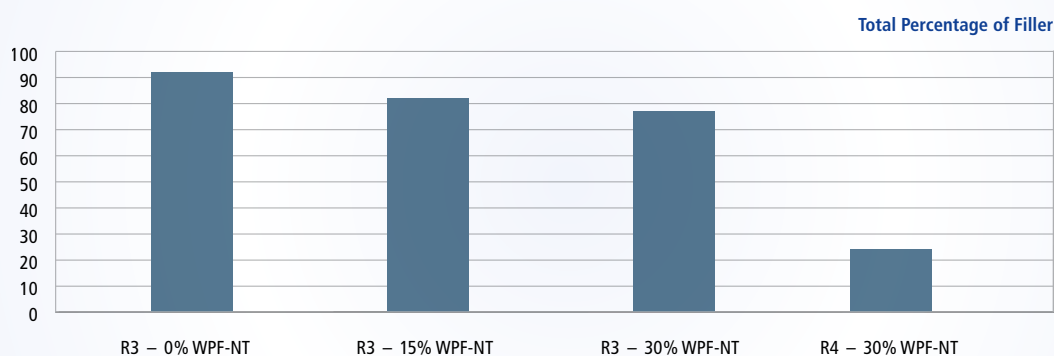
### 3.3.2 Test Results

	Recipe R3 – 2K Epoxy Clear Coating, Solvent-Free			Recipe R4 – 2K Epoxy Clear Coating, Reactive Diluent
	0 % WPF-NT	15 % WPF-NT	30 % WPF-NT	30 % WPF-NT
Amount of talcum in dry mass	38 %	23 %	8 %	
Amount of Nikanol Y 300 in dry mass				18 %
Amount of WPF-NT in dry mass	0 %	15 %	30 %	30 %
Dry coating thickness [µm]	220	230	215	575
Gloss 60° [GU] steel	88	83	76	75
Pendulum Hardness by König (Drying time > 7d)	92	82	77	24
Cross Cut	GT 0	GT 0	GT 0	GT 0

Gloss Values for Different 2K Epoxy High Solid Coatings with Deogrip WPF-NT



Pendulum Hardness for Different 2K Epoxy High Solid Coatings with Deogrip WPF-NT



## ADVANTAGES

- Deogrip WPF-NT has a matting and elasticizing effect in high solid coatings.
- Deogrip WPF-NT can be used together with reactive diluents in high solid coatings. This results in matt surfaces with high elasticity (low pendulum hardness).

## 4. Test Methods



### 4.1 Determining Pendulum Damping According to König

With the König method, two pendulum balls lying on a paint film are used to determine the pendulum damping. The number of oscillations that exceed a predefined amplitude are measured. The softer the film, the stronger the damping effect will be on the oscillations. According to DIN EN ISO 152, the number of oscillations provides evidence of the elasticity and the surface hardness of the coating.

### 4.2 Determining the Gloss Value Using DIN ISO 2813

The conventional definition of gloss refers to the light reflected on the surface of a coating. This light is reflected differently depending on the roughness of the surface, thus leading to a correspondingly good representation of the illuminated environment. The sensory impression of this phenomenon, as it is perceived by the eye, is recognized as gloss. In order to measure gloss, a reflectometer is utilized. This instrument contains a defined light source and measures the intensity of the reflection at predetermined angles.

### 4.3 Determining the Coating Thickness Using DIN EN ISO 2178

In order to determine the coating thickness, one could draw upon a variety of methods for measurement. One common, non-destructive method of measuring the coating thickness, DIN EN ISO 2178, makes use of magnetic induction. The magnetic-inductive method can be used on magnetizable substrates. The current in the primary coil of an electromagnet is used to generate a magnetic flux, which in turn results in an induction voltage. The coating thickness is determined by measuring the change in the magnetic flux and thus the induced voltage.

### 4.4 Static and Dynamic Friction

The test specified in DIN EN ISO 8295 is used to determine the coefficients of static and dynamic friction. With this test, one can define the coefficients of friction between two coatings or between a coating and a defined surface. A test specimen is placed on a test plate and is weighted with a defined mass. Then, at a constant velocity, the testing apparatus pulls the test specimen across the test plate, which is attached to a horizontal surface. The applied force is measured, which is then used to calculate the coefficients of static and dynamic friction.

### 4.5 Chemical Resistance

This test is based on several different standard methods for testing surfaces (e.g. DIN 68861, DIN EN 12720 (2009)) and serves to determine the resistance of coatings to liquid chemicals. It can be used to carry out both temporary and long-term tests. A test liquid is applied to the coated object and covered for a specified time period and at a defined temperature. It is subsequently examined for visible changes such as gloss, color, adhesion, or blistering.

### 4.6 Cross-Cut Test (DIN EN ISO 2409)

In this test, 6 parallel cuts are applied to the coating using a utility knife or a special cutting device. Then 6 more cuts are made at a right angle to the first set, thus creating 25 squares. The cuts go down to the substrate without damaging it much. An adhesive strip is placed on this field parallel to one set of cuts, then removed abruptly. The remaining grid is inspected and, depending on its condition, is rated with a cross-cut value from 0 (good) to 5 (very bad).

#### Imprint

**Publisher:** DOG Deutsche Oelfabrik Gesellschaft für chemische Erzeugnisse mbH & Co. KG, [www.dog-chemie.de](http://www.dog-chemie.de), [info@dog-chemie.de](mailto:info@dog-chemie.de)

**Authors:** Manfred Heide, Andre Rittmann, Christoph Weiss, Karl-Heinz Köll, Dr. Jens Molter

**Design/Production:** Ehrenberg 360° GmbH, [www.ehrenberg360.de](http://www.ehrenberg360.de), [info@ehrenberg.de](mailto:info@ehrenberg.de)

## 5. Contact & Imprint



Our D.O.COAT team is always by your side, ready to offer advice and assistance. Furthermore, our local DOG sales partners worldwide are of course available to consult you as well.

### Addresses

#### Hamburg Headquarters

DOG Deutsche Oelfabrik  
Ges.f.chem.Erz.mbH & Co.KG  
Postfach 11 19 29  
20419 Hamburg  
Ellerholzdamdamm 50  
20457 Hamburg / Deutschland  
Tel. +49(0)40/31 18 05 0  
Fax +49(0)40/31 18 05 88  
E-Mail: info@dog-chemie.de

#### Production Site in Marschacht

Gewerbepark Eichholz  
Brandhagen 2  
21436 Marschacht / Deutschland  
Tel. +49(0)4176/94 96 80 0  
Fax +49(0)4176/94 96 80 29

### Order Processing / Samples / Literature

**Gabriele Horlitzki** Order Processing  
**Stefanie Heerde** Order Processing  
**Pauline Czajka** Order Processing / Logistics  
**Stephan Deiter** Order Processing / Logistics  
**Benjamin Reimers** Order Processing / Logistics

### R&D / Head of Chemical Department

**Dr. Jens Molter** Head of R&D

### Technical Customer Service

**Andre Rittmann** Technical Customer Service  
**Matthias Kuhn** Technical Customer Service  
**Karl-Heinz Köll** Technical Customer Service

### Court of Registration and Managing Director

Amtsgericht Hamburg HRA 71809

**Manfred Heide** Managing Director

### Marketing and Sales

**Manfred Heide** Product Group Director: Coating Additives, Adhesives, and Sealants



### Further Literature: D.O.COAT Product Range

Applications, products, properties, and recommendations for adhesion-promoting additives (Deolink Silanes), organic matting and soft-touch additives (Deogrip), polymer matting/soft-touch additives (Deocoat), as well as tackifier resins (Deotack).



Any technical recommendation provided here merely constitutes a general suggestion that is non-binding – even with regards to the rights of any third party – and will not exempt the client from examining the products supplied by DOG. Processing, application, and usage of our products will be carried out exclusively under the responsibility of the client. We guarantee the faultless quality of our goods as defined in our General Terms of Sale and Delivery.

# ADD EFFICIENCY

...in more than 80 countries worldwide



Updated January 2020. Subject to modifications. Deogrip® is a registered trademark of DOG Deutsche Oelfabrik.

## Europe

- Albania
- Belgium
- Bosnia and Herzegovina
- Bulgaria
- Germany
- Denmark
- Estonia
- Finland
- France
- Greece
- Great Britain
- Ireland
- Italy
- Croatia
- Latvia
- Lithuania
- Luxembourg
- Malta
- Macedonia
- Moldova
- Montenegro
- Netherlands
- Norway
- Austria
- Poland
- Portugal
- Romania
- Sweden
- Switzerland
- Serbia
- Slovakia
- Slovenia
- Spain
- Czech Republic
- Turkey
- Hungary
- Belarus

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- India
- Indonesia
- Israel
- Japan
- Cambodia
- Kazakhstan
- Laos
- Lebanon
- Malaysia
- Myanmar
- Pakistan
- Philippines
- Singapore
- South Korea
- Sri Lanka
- Taiwan (ROC)
- Thailand
- United Arab Emirates
- Vietnam

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- Belize
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- Chile
- Columbia
- Costa Rica
- Ecuador
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- Guatemala
- Honduras
- Mexico
- Nicaragua
- Panama
- Paraguay
- Peru
- USA
- Uruguay
- Venezuela

## Africa

- Morocco
- South Africa
- Zimbabwe

## Australia

- Australia
- New Zealand

- Sales Partner for DOG Rubber Additives
- Sales Partner for DOG Lubricant Additives
- Sales Partner for DOG Coating Additives
- Sales Partner for DOG Adhesive/Sealant Additives



### DOG DEUTSCHE OELFABRIK

Gesellschaft für chemische Erzeugnisse mbH & Co. KG

#### Hamburg

Ellerholzdamm 50  
D-20457 Hamburg · Germany  
Tel +49(0)40/31 18 05 0  
Fax +49(0)40/31 18 05 88

#### Marschacht

Gewerbepark Eichholz  
Brandhagen 2 · 21436 Marschacht  
Tel +49(0)4176/94 96 80 0  
Fax +49(0)4176/94 96 80 29

E-Mail: info@dog-chemie.de · Internet: www.dog-chemie.de

