

## PARAPLEX® RESINS FOR INDUSTRIAL COATINGS

### PARAPLEX® RESINS

- Unique alkyd-type polymeric materials.
- Commonly known as polyester resins.
- Soft, flexible resins widely used as plasticizers for more brittle film-forming materials such as nitrocellulose, ethylcellulose, polyvinyl chloride and polyvinyl butyral.
- Impart unusual flexibility, toughness,
- Retain these physical properties under severe conditions of exposure.
- They should be considered in all applications where toughness, flexibility, durability, resistance to abrasion, resistance to water and permanence are of prime importance.

## SUMMARY OF CHARACTERISTICS

### Product

### Principle Characteristics and Uses

**PARAPLEX RGA-2**  
**50% and 80% in n-butyl acetate**

Compatible with nitrocellulose, ethyl cellulose, and polyvinyl butyral. Excellent retention of flexibility on aging.

**PARAPLEX RGA-7**  
**60% in toluene**

Excellent flexibility, adhesion and color retention. Used with nitrocellulose for tough, durable metal lacquers.

**PARAPLEX RGA-8**

Compatible with nitrocellulose, ethyl cellulose, polyvinyl butyral; softer than PARAPLEX RGA-2; outstanding non-solvent resin for pigment wetting and grinding characteristics

**PARAPLEX GA-20**  
**80% in MAK or xylene**

Compatible with nitrocellulose; yields tough and rubbery compositions; high viscosity resins; very resistant to gasoline and aliphatics.

**PARAPLEX 5-B**  
**80% in toluene**

Very compatible with nitrocellulose and all types of lacquer resins and plasticizers, good solvent release and alcohol tolerance; excellent fullness and gloss.

## PRODUCT INFORMATION

### PARAPLEX® RGA-2

#### **DESCRIPTION**

PARAPLEX RGA-2 is an oil-modified azelaic acid-type plasticizing resin that imparts excellent toughness and high tensile strength to nitrocellulose films.

PARAPLEX 2 is supplied in either 50% solids or 80% solids in n-butyl acetate.

#### **COMPATIBILITY**

Nitrocellulose, ethyl cellulose, polyvinyl butyral, melamine formaldehyde

#### **ATTRIBUTES**

- ◆ Provides excellent flexibility.
- ◆ Outstanding durability on outdoor exposure.
- ◆ Shows little color change on aging or exposure to sunlight therefore, can be used in clear or light-colored coatings.
- ◆ Imparts adhesion to many nitrocellulose finishes used on rubber and other substrates.
- ◆ Helps improve adhesion on aging.

#### **RECOMMENDED USAGE LEVELS**

Ratio 75 - 150% RGA-2 (based on solids) on the nitrocellulose dry weight.

## PRODUCT INFORMATION

### PARAPLEX® RGA-7 60%

#### **DESCRIPTION**

PARAPLEX RGA-7 60% is an oil-modified azelaic acid-type plasticizing resin, cut with toluene to a 60% solids level. PARAPLEX RGA-7 60% provides excellent flexibility, durability and adhesion in nitrocellulose lacquers.

#### **COMPATIBILITY**

Lacquers, shellac, dewaxed damar, ester gum, oil, nitrocellulose

#### **ATTRIBUTES**

- ◆ Excellent for nitrocellulose lacquers.
- ◆ Provides excellent flexibility.
- ◆ Imparts excellent durability.
- ◆ Offers excellent adhesion to metal substrates.
- ◆ Exhibits light color for clear and pale or light-colored lacquers.

#### **RECOMMENDED USAGE LEVELS**

Ratio 75 - 150% RGA-7 60% (based on solids) on the nitrocellulose dry weight.

## PRODUCT INFORMATION

### PARAPLEX® RGA-8

#### **DESCRIPTION**

PARAPLEX RGA-8 is a flexible, oil-modified azelaic acid plasticizing resin developed specifically as an all-purpose grinding medium for nitrocellulose lacquers.

PARAPLEX RGA-8 is supplied as 100% solids.

#### **COMPATIBILITY**

Nitrocellulose, castor oils, esters, ethyl cellulose, polyvinyl butyral, melamine formaldehyde, chlorinated rubbers

#### **ATTRIBUTES**

- ◆ Developed specifically as an all-purpose grinding medium for nitrocellulose lacquers
- ◆ Low in acid value.
- ◆ Excellent pigment wetting and stability characteristics.
- ◆ Offers durability, scuff resistance, good flexibility and freedom from spewing in nitrocellulose
- ◆ Imparts good toughness, clarity and flexibility in ethyl cellulose.
- ◆ Has a pronounced plasticizing action in polyvinyl butyral.

#### **RECOMMENDED USAGE LEVELS**

Ratio 100 - 200% RGA-8 (150 typical) (based on solids) on the nitrocellulose dry weight. For other resins 50 - 150%.

## PRODUCT INFORMATION

### PARAPLEX® GA-20

#### **DESCRIPTION**

PARAPLEX GA-20 is an azelaic acid-type polyester containing no modifying oil and is a true solvent for nitrocellulose.

PARAPLEX GA-20 is supplied as either 80% solids in MAK or 80% solids in xylene.

#### **COMPATIBILITY**

Nitrocellulose, urea formaldehyde, cellulose acetate propionate, polyvinyl chloride acetate, polyvinyl butyral

#### **ATTRIBUTES**

- ◆ Exhibits high plasticizing efficiency at average temperatures.
- ◆ Very tough resin without much flexibility at low temperatures.
- ◆ Non-volatile with excellent heat resistance.
- ◆ An excellent compromise between the low temperature flexibility characteristics of an ester-type plasticizer and the high tensile strength obtainable with resin-type plasticizers.
- ◆ High resistance to aromatic solvents and gasoline.

#### **RECOMMENDED USAGE LEVELS**

Ratio 50 - 150% GA-20 (based on solids) on the nitrocellulose dry weight.

## PRODUCT INFORMATION

### PARAPLEX® 5-B 80%

#### **DESCRIPTION**

PARAPLEX 5-B 80% is a special maleic alkyd polyester. PARAPLEX 5-B 80% imparts flexibility and high abrasion resistance to nitrocellulose lacquer films.

#### **COMPATIBILITY**

Nitrocellulose, ethyl cellulose, chlorinated rubber, urea, melamine, castor oil

#### **ATTRIBUTES**

- ◆ A pale, tough viscous material.
- ◆ Imparts an unusual degree of fullness and build to clear nitrocellulose lacquer films.
- ◆ Enhances the fullness and gloss of pigmented lacquer films.
- ◆ Can be used in large proportions in a lacquer without detracting from hardness and resistance to water and alcohol
- ◆ Contributes flexibility and elongation while minimizing shrinkage of nitrocellulose
- ◆ Produces lacquers with good resistance to marring or printing and to solvents

#### **RECOMMENDED USAGE LEVELS**

Ratio 50 - 150% 5B 80% (based on solids) on the nitrocellulose dry weight.

**TABLE I**  
**FILM PROPERTIES OF PARAPLEX® RGA-2**  
**WITH NITROCELLULOSE**

Property	PARAPLEX RGA-2 <sup>1</sup>	100% 1/2" Nitrocellulose (no plasticizer)
<b><u>Tensile strength</u></b> (psi)		
Initial	8,420	12,100
After 32 hours ultraviolet exposure	10,100	2,080
Percent change	20.0	-84.4
<b><u>Ultimate elongation</u></b> (%)		
Initial	5.8	5.8
After 32 hours ultraviolet exposure	4.2	0.4
Percent change	-28.8	93.0
<b><u>Gurley stiffness</u></b>		
25°C.	152.6	273
-12°C.	342.0	365
Percent gain at -12°C.	+124.0	+33.8

<sup>1</sup> Films contain 35% PARAPLEX resin; 65% 1/2" nitrocellulose



**TABLE II  
SPEW AND COLOR CHARACTERISTICS  
OF NITROCELLULOSE FILMS<sup>1</sup>**

	Spew Test			Color Test <sup>2</sup> Relative Lack of Color		
	30 min. at 150° F	30 min. at 200° F.	30 min. at 225° F.	30 min. at 250° F.	30 min. at 275° F.	30 min. at 300° F.
<b><u>Plasticizer</u></b>						
<b>PARAPLEX® RGA-2</b>	OK	OK	OK	V.Slight Spewing	2	3
<b>Raw Castor Oil</b>	OK	Slight	Spewed	Spewing	1 Discolored	2 Discolored
<b>Heavy Body Castor Oil</b>	OK	OK	Spewed	Spewed	3	4

<sup>1</sup> Films contain 50% plasticizer; 50% 1/2" nitrocellulose.

<sup>2</sup> Small numbers better.

**TABLE III  
PARAPLEX® PLASTICIZERS IN POLYVINYL BUTYRAL**

Stock Composition (Parts by Weight)	PARAPLEX RGA-2	PARAPLEX RGA-8	RAW CASTOR OIL
Polyvinyl butyral	100	100	100
Plasticizer	75	70	50
<b>Characteristics</b>			
Tensile (psi)	2652	3216	3324
Elongation, %	320	320	246
Permanent set, %	3.5	2.0	3.2
Shore Durometer	60	63	65

TABLE IV RESIN COMPATIBILITY															
	% PARAPLEX RGA-2			% PARAPLEX RGA-7			% PARAPLEX RGA-8			% PARAPLEX GA-20			% PARAPLEX 5-B		
	25	50	75	25	50	75	25	50	75	25	50	75	25	50	75
<b>Other Components</b>															
Cellulose Nitrate (RS-½")	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Cellulose Acetate	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Cellulose Acetate Propionate	I	I	I	I	I	I	I	I	I	C	C	C	I	I	I
Cellulose Acetate Butyrate	I	I	I	I	I	I	I	I	I	C	I	I	I	I	I
Ethyl Cellulose (10 cps.)	C	C	C	C	C	I	C	C	C	I	I	I	C	C	C
Polyvinyl Acetate	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Polyvinyl Chloride Acetate	I	I	I	I	I	I	I	I	I	C	C	C	I	I	I
Polyvinyl Butyral	C	C	C	I	C	I	C	C	C	C	C	C	I	I	I
Chlorinated Rubber (20 cps.)	I	I	I	I	I	I	C	C	C	I	I	I	I	C	C
Uformite® 27-803	C	C	C	C	C	C	C	C	C	I	I	I	C	C	C
Dewaxed Damar	C	I	I	C	C	C	C	I	I	I	I	I	C	C	C
Refined Shellac	I	I	I	C	C	C	I	I	I	I	I	I	I	I	I
Lacquer Linseed Oil	C	C	-	C	C	C	C	C	-	I	I	-	I	I	-
Heavy Body Castor Oil	C	C	-	C	C	C	C	C	-	I	I	-	C	C	-
<b>PARAPLEX® is a registered trademark of The HallStar Innovations Corporation, a subsidiary of the HallStar Company</b>															
<b>Uformite® is a registered trademark of Reichhold Chemicals Ltd.</b>															

**TABLE V  
TOLERANCE AND NITROCELLULOSE SOLVENCY**

<b>Grade</b>	<b>Alcohol Tolerance<sup>1</sup></b>	<b>Mineral Thinner Tolerance<sup>2</sup></b>	<b>Solvency for Nitrocellulose<sup>3</sup></b>
PARAPLEX® RGA-2	52	4	Partial
PARAPLEX RGA-7	46	3	Partial
PARAPLEX RGA-8	52	13	True
PARAPLEX GA-20	50	4	Slight
PARAPLEX 5-B <sup>1</sup>	12	20	Partial

**This data indicates the approximate values and are supplied for comparison purposes.**

<sup>1</sup> **Alcohol Tolerance:** Number of cc. of 2-B alcohol required to cause permanent turbidity in 10 grams of a 50% solution of the resin in toluene (PARAPLEX 5-B<sup>1</sup> 80% in toluene).

<sup>2</sup> **Mineral Thinner Tolerance:** Number of cc. of mineral thinner required to cause permanent turbidity in 10 grams of a 50% solution of the resin in toluene.

<sup>3</sup> **Solvency for Nitrocellulose:** Determined by making 5% solution of dry nitrocellulose in the resin and allowing to come to equilibrium to determine solubility.

**TABLE VI  
SOLVENT STUDY**

**PARAPLEX® RGA SAMPLES CUT 70% IN BUTYL ACETATE  
COMPARED TO CURRENT PRODUCT**

	RGA-2 Exp	RGA-2 Current	5B Exp	5B Current	RGA-7 Exp	RGA-7 Current	RGA-8 Exp	RGA-8 Current	GA-20 Exp	GA-20 Current
<b>% NVM</b>	71.4	60.0	68.0	80.0	70.5	60.0	70.2	100	70.7	100
<b>Solvent</b>	Butyl Acetate	Toluene	Butyl Acetate	Toluene	Butyl Acetate	Toluene	Butyl Acetate	None	Butyl Acetate	None
<b>Viscosity</b>										
CPS	1820		520		1980		126		4040	
TBR	16		5		16.5		N/A		33.8	
(G-H) Est	Y	U	T	Z1	Y	U	E	Z1-Z3	Z-2	Z10+
<b>Color (Gardner)</b>	4.5	4-7	1.9	3-6	4.0	4-7	2.7	4-7	4.7	6-10
<b>Acid Value</b>	21.7	22-35	39.5	47-60	27.4	35-48	3.7	0-3.5	6.7	10-20
<b>Specific Gravity</b>	0.997		0.965		1.029		0.962		1.045	
<b>Weight-Gallon</b>	8.3	8.0	8.0	8.2	8.6	8.0	8.0	8.3	8.7	9.2

## FORMULATIONS

◆	<b>PARAPLEX RGA-2</b>	
	<b>RUBBER LACQUER</b>	<b>Parts by Weight (Solids Basis)</b>
	Titanium dioxide	30.0
	1/2" RS Nitrocellulose	24.5
	PARAPLEX RGA-2	<u>45.5</u>
		100.0

◆	<b>PARAPLEX RGA-8</b>	
	<b>UPHOLSTERY FABRIC COATING ROLLER MILL GRIND</b>	<b>Parts by Weight (Solids Basis)</b>
	Pigment	16.7
	PARAPLEX RGA-8	8.3
	<b>MIX WITH</b>	
	15" TO 20" RS Nitrocellulose	33.3
	PARAPLEX RGA-8	<u>41.7</u>
		100.0

Ratio of PARAPLEX RGA-8 to nitrocellulose 1.5/1.  
Reduce to 50% solids with the following thinner:

Ethyl alcohol-50%; Ethyl acetate-33%; Butyl alcohol-17%

◆	<b>PARAPLEX GA-20</b>	
	<b>RUBBER LACQUER</b>	<b>Parts by Weight (Solids Basis)</b>
	Titanium dioxide	23.5
	1/2" RS Nitrocellulose	34.5
	PARAPLEX GA-20	<u>42.0</u>
		100.0

## FORMULATIONS

### ◆ PARAPLEX 5-B 80%

#### BOOK CLOTH COATING ROLLER MILL GRIND

**Parts by Weight  
(Solids Basis)**

Chrome Green	33.3
PARAPLEX 5-B 80%	22.2

#### MIX WITH

5" TO 6" RS Nitrocellulose	26.6
PARAPLEX 5-B 80%	<u>17.9</u>
	100.0

Ratio of PARAPLEX 5-B 80% to nitrocellulose 1.5/1.  
Reduce with the following thinner:

Ethyl acetate	33%
Ethyl alcohol	33%
Toluene	32%
Acetone	5%

#### FURNITURE LACQUER

**Parts by Weight  
(Solids Basis)**

1/2" RS Nitrocellulose	33.4
A-801 Light (Union Camp)	33.3
PARAPLEX 5-B 80%	<u>33.3</u>
	100.0

The technical information and suggestions for use contained herein are believed to be reliable, but they are not to be construed as warranties and no patent liability can be assumed.