

# DI-PAK™

Dielectric Potting Compounds



  
by hapco

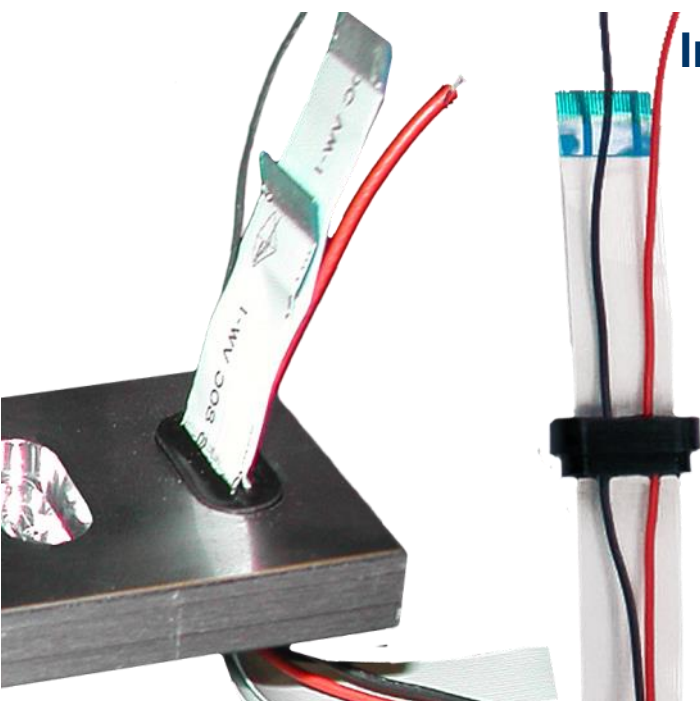
# Urethanes and Epoxies for ALL of Your Potting and Encapsulating Needs!

Contact us for a  
Recommendation!

Phone: (781) 826-8801  
Toll Free: (877) 729-4272  
Email: [info@hapcoweb.com](mailto:info@hapcoweb.com)

## The Di-Pak™ Advantage:

- Flexible or Rigid
- Low Viscosity
- Multiple Speeds
- Mercury Free



## Improve Your Process and Your Product

- Eliminate Rejects
- Fast Cure & Fast Turnover
- Increase Performance
- Hand Mix or Dispense



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# Hapco Dielectric Materials

## - elastomeric -

### DI-PAK™ ELASTOMERIC SERIES

#### **DI-PAK™ E-4500 SERIES**

Flexible, 45, 65 and, 95 shore A hardness, potting and encapsulating systems. Accelerated gel times, and black or unpigmented versions are available.

#### **DI-PAK™ E-4600 SERIES**

Flexible, high strength, 50 to 71 shore D hardness potting and encapsulating systems. Accelerated gel times, and black or unpigmented versions are available.

#### **DI-PAK E-4500 & E-4600 SERIES**

These products have all been formulated to be flame retardant. Please contact a Hapco representative for more information on our FR and UL approved materials.

### DI-PAK™ ELASTOMERIC PRODUCTS

#### **DI-PAK™ E-4888 & E-4889**

High performance, flexible potting systems designed to be in **constant water immersion** while maintaining electrical and physical properties. **DI-PAK™ E-4888 & E-4889** were designed to meet Naval underwater applications.

#### **DI-PAK™ E-4701 and E-4501**

Easily pourable, **thermally conductive**, shock resistant potting compounds that are ideally suited for low and high production applications. This series of **DI-PAK™** products reduce rejects by exhibiting extremely low stress on potted components. All three of the above **DI-PAK™ E** products are flame retardant and pass the 94V test with a rating of 0.

#### **DI-PAK™ E-4568**

A tough, **REPAIRABLE**, shock resistant potting compound for short and long run productions. **DI-PAK™ E-4568** has excellent insulating properties, a very low moisture vapor transmission rate, can be operated from -60°C to +100°C, and performs in both wet and dry environments. It can be easily trimmed with a knife, making repairs quick and easy.

#### **DI-PAK™ E-4901-2, E-4901-10, & E-4901-30**

Low cost, easy to use, potting compounds with **fast cycle times**. Available in 3 speeds.



# DI-PAK™ E-4500 SERIES

- elastomeric -

	PHYSICAL PROPERTIES	TEST METHOD	E-4540 E-4540-3	E-4541 E-4541-3	E-4565 E-4565-3	E-4566 E-4566-3	E-4595 E-4595-3	E-4596 E-4596-3
<b>PHYSICAL PROPERTIES</b>	Mix Ratio by volume A:B	Calculation	100:50	100:50	100:85	100:85	100:50	100:50
	by weight A:B		100:50	100:50	100:100	100:100	100:50	100:50
	Gel time 100 grams @ 25°C	ASTM D-2971	22min. 3min.	20 min. 3 min.	25 min. 3 min.	25 min. 3 min.	45 min. 3 min.	45 min. 3 min.
	Color (cured)	Visual	Black	Clear Amber	Black	Clear Amber	Black	Clear Amber
	Hardness Shore	ASTM D-2240	45 A	45 A	80 A	80 A	95 A	95 A
	Viscosity mixed @ 25°C cps	ASTM D-4878	2,600	2,600	2,100	2,100	2,700	2,700
	Specific Gravity mixed @ 25°C	ASTM D-4669	1.04	1.04	1.1	1.1	1.06	1.06
	Shrinkage inch/inch See shrinkage paragraph	ASTM D-2566	.002-.003	.002-.003	.002-.003	.002-.003	.002-.003	.002-.003
	Demold time @ 70°F 1/8" thick	HAPCO TEST	18-24 hrs. 1-2 hrs.(-3)	18-24 hrs. 1-2 hrs.(-3)	4-6 hrs. 30-60 min.(-3)	4-6 hrs. 30-60 min.(-3)	5-8 hrs. 20-40 min.(-3)	5-8 hrs. 20-40 min.(-3)
	Weight per cubic inch (lbs.)	Calculation	0.0365	0.0365	0.0379	0.0379	0.0383	0.0383
<b>PRODUCT PROPERTIES</b>	Tensile Strength (psi)	ASTM D-638	630	630	1,118	1,118	2,048	2,048
	Elongation %	ASTM D-638	449	449	240	240	227	227
	Tear Strength (pli)	ASTM 624 Die-C	103	103	192	192	418	418
	Modulus of Elasticity (ksi)	ASTM D-638	0.16	0.16	3.87	3.87	12.1	12.1
	Izod Impact (ft.lbs/in.)	ASTM D-256	No Break	No Break	No Break	No Break	No Break	No Break
	Flexural Strength (psi)	ASTM D-790	NA	NA	NA	NA	NA	NA
	Flexural Modulus (ksi)	ASTM D-790	NA	NA	NA	NA	NA	NA
	Service Temperature		60°C	60°C	80°C	80°C	90°C	90°C
	Thermal Conductivity (BTU)(in)/(hr)(ft²)(°F)		1.4	1.4	1.6	1.6	1.5	1.5
	Thermal Expansion (in/in °C)		NA	NA	NA	NA	NA	NA
	Thermal shock test		Pass	Pass	Pass	Pass	Pass	Pass
	Dielectric Constant 1 KHz 100 KHz	ASTM D-150	2.8 2.7	2.8 2.7	2.5 2.4	2.5 2.4	2.7 2.6	2.7 2.6
	Dielectric Strength (volts/mil.)	ASTM D-149	370	370	≥ 350	≥ 350	≥ 350	≥ 350
	Volume Resistivity (ohm-cm)	ASTM D-270	7.1 x 10 <sup>15</sup>	7.1 x 10 <sup>15</sup>	8.9 x 10 <sup>16</sup>	8.9 x 10 <sup>16</sup>	6.6 x 10 <sup>16</sup>	6.6 x 10 <sup>16</sup>
Dissipation Factor 100 KHz @25°C	ASTM D-150	0.22	0.22	.023	.023	.025	.025	

**NOTE: Before use, reference material handling, processing, and safety notes located at the end of this brochure.**





# DI-PAK™ E-4600 SERIES

- elastomeric -

PHYSICAL PROPERTIES		TEST METHOD	E-4650 E-4650-3	E-4651 E-4651-3	E-4665 E-4665-3	E-4666 E-4666-3	E-4670 E-4670-3	E-4671 E-4671-3
Mix Ratio by volume A:B by weight A:B	Calculation		100:75	100:75	100:50	100:50	100:65	100:65
			100:85	100:85	100:50	100:50	100:65	100:65
Gel time 100 grams @ 25°C	ASTM D-2971	25 min. 3 min.	25 min. 3 min.	25 min. 3 min.	25 min. 3 min.	25 min. 3 min.	18 min. 3 min.	18 min. 3 min.
Color (cured)	Visual	Black	Clear Amber	Black	Clear Amber	Black	Clear Amber	Clear Amber
Hardness Shore	ASTM D-2240	47-50 D	47-50 D	65 D	65 D	71±2 D	71±2 D	71±2 D
Viscosity mixed @ 25°C cps	ASTM D-4878	3,400	3,400	4,000	4,000	3,100	3,100	3,100
Specific Gravity mixed @ 25°C	ASTM D-4669	1.08	1.08	1.04	1.04	1.05	1.05	1.05
Shrinkage inch/inch See shrinkage paragraph	ASTM D-2566	.001-.003 .003-.005	.001-.003 .003-.005	.001-.003 .003-.005	.001-.003 .003-.005	.001-.003 .003-.005	.001-.003 .003-.005	.001-.003 .003-.005
Demold time @ 70°F 1/8" thick	HAPCO TEST	2-5 hrs. 20-35 min(-3)	2-5 hrs. 20-35 min(-3)	1-2 hrs. 10-20 min.(-3)	1-2 hrs. 10-20 min.(-3)	1-2 hrs. 10-20 min.(-3)	1-2 hrs. 10-20 min.(-3)	1-2 hrs. 10-20 min.(-3)
Weight per cubic inch (lbs.)	Calculation	0.0372	0.0372	0.0368	0.0368	0.0383	0.0383	0.0383
Tensile Strength (psi)	ASTM D-638	2,594	2,594	4,506	4,506	4,512	4,512	4,512
Elongation %	ASTM D-638	157	157	237	237	87	87	87
Tear Strength (pli)	ASTM 624 Die-C	457	457	863	863	660	660	660
Modulus of Elasticity (ksi)	ASTM D-638	53.1	53.1	52	52	55	55	55
Izod Impact (ft.lbs/in.) notched unnotched	ASTM D-256	1.4 4.4	1.4 4.4	11.8 No Break	11.8 No Break	6.4 No Break	6.4 No Break	6.4 No Break
Flexural Strength (psi)	ASTM D-790	840	840	2,770	2,770	3,710	3,710	3,710
Flexural Modulus (ksi)	ASTM D-790	11.7	11.7	58.14	58.14	57.0	57.0	57.0
Service Temperature		125°C	125°C	135°C	135°C	150°C	150°C	150°C
Thermal Conductivity (BTU)(in)/(hr)(ft <sup>2</sup> )(°F)		1.5	1.5	1.5	1.5	1.5	1.5	1.5
Thermal Expansion (in/in °C)		NA	NA	NA	NA	NA	NA	NA
Thermal shock test		Pass	Pass	Pass	Pass	Pass	Pass	Pass
Dielectric Constant 1 KHz 100 KHz	ASTM D-150	3.1 2.9	3.1 2.9	3.3 3.0	3.3 3.0	1.9 2.3	1.9 2.3	1.9 2.3
Dielectric Strength (volts/mil.)	ASTM D-149	≥ 350	≥ 350	≥ 350	≥ 350	≥ 350	≥ 350	≥ 350
Volume Resistivity (ohm-cm)	ASTM D-270	7.4 x 10 <sup>15</sup>	7.4 x 10 <sup>15</sup>	5.1 x 10 <sup>15</sup>	5.1 x 10 <sup>15</sup>	4.2 x 10 <sup>13</sup>	4.2 x 10 <sup>13</sup>	4.2 x 10 <sup>13</sup>
Dissipation Factor 100 KHz @25°C	ASTM D-150	.031	.031	.037	.037	.038	.038	.038

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# DI-PAK™ E-PRODUCTS

- elastomeric -

		TEST METHOD	E-4888	E-4889	E-4701	E-4568
<b>PHYSICAL PROPERTIES</b>	Mix Ratio	Calculation	100:25	100:25	100:150	100:100
	by volume A:B					
	by weight A:B		100:25	100:25	100:250	100:88
	Gel time 100 grams @ 25°C	ASTM D-2971	25 min.	25 min.	30 min.	5 min.
	Color (cured)	Visual	Clear/ Translucent	Clear/ Translucent	Black	Blue
	Hardness Shore	ASTM D-2240	85 A	87 A	65 A	65 A ±5
	Viscosity mixed @ 25°C cps	ASTM D-4878	1,060	6,000	9,200	950
	Specific Gravity mixed @ 25°C	ASTM D-4669	1.05	0.99	1.50	0.93
	Shrinkage inch/inch See shrinkage paragraph	ASTM D-2566	0.0005- 0.0020	0.0005- 0.0020	0.0005- 0.0015	0.0005- 0.0015
	Demold time @ 70°F 1/8" thick	HAPCO TEST	8-12 hrs.	8-12 hrs.	3-5 hrs.	20-40 min.
Weight per cubic inch (lbs.)	Calculation	0.0379	0.0357	0.0542	0.0336	
<b>PRODUCT PROPERTIES</b>	Tensile Strength (psi)	ASTM D-638	3,500	1,900	1,000	125
	Elongation %	ASTM D-638	650	300	145	25
	Tear Strength (pli)	ASTM 624 Die-C	370	380		
	Modulus of Elasticity (ksi)	ASTM D-638	1	3.1	NA	NA
	Izod Impact (ft.lbs/in.) notched unnotched	ASTM D-256	No Break	No Break	No Break	No Break
	Flexural Strength (psi)	ASTM D-790	NA	NA	NA	NA
	Flexural Modulus (ksi)	ASTM D-790	NA	NA	NA	NA
	Available in Flame Retardant (FR)	94V	No	No	FR only	No
	Service Temperature		95°C	110°C	125°C	70°C
	Thermal Conductivity (BTU)(in)/(hr)(ft <sup>2</sup> )(°F)		1.7	1.7	2.9	1.5
	Thermal Expansion (in/in °C)		NA	NA	35 x 10 <sup>-5</sup>	NA
	Thermal shock test		Pass	Pass	Pass	Pass
	Dielectric Constant 1 KHZ 100 KHZ	ASTM D-150	2.6 2.4	2.7 2.5	4.4 4.1	1.3 1.3
	Dielectric Strength (volts/mil.)	ASTM D-149	358	645	≥ 400	710
	Volume Resistivity (ohm-cm)	ASTM D-270	7.2 x 10 <sup>14</sup>	1.3 x 10 <sup>16</sup>	1.36 x 10 <sup>12</sup>	3.5 x 10 <sup>15</sup>
Dissipation Factor 100 KHz @25°C	ASTM D-150	.104	.036	.073	.001	

**NOTE: Before use, reference material handling, processing, and safety notes located at the end of this brochure.**



# DI-PAK™ E-4901

- elastomeric -

	PHYSICAL PROPERTIES	TEST METHOD	E-4901-2	E-4901-10	E-4901-30
<b>PHYSICAL PROPERTIES</b>	Mix Ratio by volume A:B	Calculation	100:100	100:100	100:100
	by weight A:B		100:84	100:84	100:84
	Gel time 100 grams @ 25°C	ASTM D-2971	2 min.	10 min.	30 min.
	Color (cured)	Visual	Black	Black	Black
	Hardness Shore	ASTM D-2240	73 A	73 A	73 A
	Viscosity mixed @ 25°C cps	ASTM D-4878	3,500	3,500	3,500
	Specific Gravity mixed @ 25°C	ASTM D-4669	1.02	1.02	1.02
	Shrinkage inch/inch See shrinkage paragraph	ASTM D-2566	0.0025 0.005	0.0015 0.003	0.005 0.0015
	Demold time @ 70°F 1/8" thick	HAPCO TEST	10-20 min.	30-60 min.	4-8 hrs.
	Weight per cubic inch (lbs.)	Calculation	0.0368	0.0368	0.0368
<b>PRODUCT PROPERTIES</b>	Tensile Strength (psi)	ASTM D-638	460	460	460
	Elongation %	ASTM D-638	41	41	41
	Tear Strength (pli)	ASTM 624 Die-C	53	53	53
	Modulus of Elasticity (ksi)	ASTM D-638	947	947	947
	Izod Impact (ft.lbs/in.) notched unnotched	ASTM D-256	No break	No break	No break
	Flexural Strength (psi)	ASTM D-790	NA	NA	NA
	Flexural Modulus (ksi)	ASTM D-790	NA	NA	NA
	Available in Flame Retardant (FR)	94V	N/A	N/A	N/A
	Service Temperature		80°C	80°C	80°C
	Thermal Conductivity (BTU)(in) / (hr)(ft²)(°F)		1.5	1.5	1.5
	Thermal Expansion (in/in °C)		NA	NA	NA
	Thermal shock test		Pass	Pass	Pass
	Dielectric Constant 1 KHz 100 KHz	ASTM D-150	1.73 1.67	1.73 1.67	1.73 1.67
	Dielectric Strength (volts/mil.)	ASTM D-149	390	390	390
	Volume Resistivity (ohm-cm)	ASTM D-270	1.8x10 <sup>14</sup>	1.8x10 <sup>14</sup>	1.8x10 <sup>14</sup>
Dissipation Factor 100 KHz @25°C	ASTM D-150	.009 .012	.009 .012	.009 .012	

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## DI-COAT™ E-Series

### Hapco's Dielectric Coating Systems

#### DI-COAT™ E-4599

Shore 90-95 A, elastomeric coatings that have been specifically designed to reproduce exact surface details. **DI-COAT™ E-4599** is excellent for electrical insulation applications requiring non or low sag materials. **DI-COAT™ E-4599** is semi-rigid and formulated to withstand repeated abuse.

#### DI-COAT™ E-4669

Shore 60-65 D, elastomeric coatings that have been specifically designed to reproduce exact surface details. **DI-COAT™ E-4669** is highly abrasion resistant and formulated to withstand repeated abuse.

DI-COAT™	E-4599	E-4669
Mix Ratio by Volume A:B	100:10	100:10
By Weight A:B	100:75	100:75
Gel Time - @ 25°C	35-45 min.	15-20 min.
Tack-up Time	45-60 min.	20-30 min.
Color (cured)	Grey	Grey
Hardness Shore	90 A	65 D
Viscosity Mixed @ 25°C cps	thixotropic	thixotropic
Specific Gravity mixed @ 25°C	1.2	1.2
Shrinkage inch/inch	none	none
Demold time @ 70°F 1/8" thick	24 hrs.	16-24 hrs.
Weight per cubic inch (lbs.)	0.0433	0.0433
Tensile Strength (psi)	2,500	3,000
Tensile Elongation %	325	150
Service Temperature	90°C	135°C
Dielectric Constant		
1 Khz	2.7	3.3
100 Khz	2.6	3.0
Dielectric Strength (volts/mil.)	350	350
Volume Resistivity (ohm-cm)	$6.6 \times 10^{16}$	$5.1 \times 10^{15}$
Dissipation Factor (100khz)	0.025	0.037



# Hapco Dielectric Materials

## - rigid -

### DI-PAK™ RIGID SERIES

#### DI-PAK™ R-4525 Series

A **general purpose** series of low viscosity, strong, potting and encapsulating compounds. **DI-PAK™ R-4525** has excellent electrical insulating properties and bonds well to many substrates. By varying the curing agents, the desired cure and working life can be obtained.

#### DI-PAK™ R-4528 Series

A black, flame retardant, **thermally conductive**, high performance series that can be used in all types of electrical components. Combined with its ability to dissipate heat, **DI-PAK™ R-4528** also provides low linear thermal expansion, low shrinkage, and low exothermic heat while curing. Meets UL requirements.

#### DI-PAK™ R-4545 Series

A very **low viscosity** potting and encapsulating system with excellent flow and penetration into the most intricate electronic components, without voids or porosity. The **R-4545 Series** cure to a hard, shiny, high gloss, plastic finish that is free from "blushing" under all humidity conditions. The **R-4545 Series** is ideal for electrical applications where surface finish and appearance are critical.

### DI-PAK™ RIGID PRODUCTS

#### DI-PAK™ R-4307

A high performance, **long working life** potting compound for potting/encapsulating units requiring high physical strength and excellent electricals. **DI-PAK™ R-4307** holds its mechanical and electrical properties while under the most severe conditions. This is due to its low water absorption, thermal shock resistance, and retention of strength at elevated temperatures.

#### DI-PAK™ R-4200

A **low viscosity, long working life** compound designed for potting/encapsulating units requiring high physical strength, and excellent penetration & adhesion to components. **DI-PAK™ R-4200** holds its mechanical & electrical properties while under the most severe conditions, due to its low water absorption, and retention of strength at elevated temperatures.

#### DI-PAK™ R-4354

A 100% solids, **room temperature cure**, dielectric insulating material used for sealing, coating, bonding and potting. **R-4354** is a medium viscosity, slightly thixotropic system.

#### DI-PAK™ R-4806 & R-4807 A/B

**Low viscosity, fast cure**, high performance, potting and encapsulating compounds with excellent properties and FAST TURNOVER. Both are two part systems with 1:1 mix ratios by volume.

#### DI-PAK™ R-4242/4243

**Low cost**, fast set potting compounds with excellent properties and FAST TURNOVER. **R-4242/4243** are 1:1 by weight or volume, making them ideal for hand pour or automatic metering systems.

#### DI-PAK™ R-4912 & R-4260 A/B

**Low viscosity, fast cure**, high performance, high HDT potting and encapsulating compounds with excellent properties and FAST TURNOVER. Both are two part systems with 1:1 mix ratios by volume.



# DI-PAK™ R-4525 & R-4528

- rigid -

PHYSICAL PROPERTIES	TEST METHOD	DI-PAK™ R-4525/7	DI-PAK™ R-4525/17	DI-PAK™ R-4525/30	DI-PAK™ R-4525/40	DI-PAK™ R-4528/7	DI-PAK™ R-4528/17	DI-PAK™ R-4528/30	DI-PAK™ R-4528/40
Mix Ratio by volume A:B by weight A:B	Calculation	100:20	100:40	100:25	100:33	100:10	100:30	100:20	100:25
		100:12.5	100:24	100:15	100:20	100:6	100:16	100:11	100:14
Gel time 100 grams @ 25°C	ASTM D-2971	50 min.	40-60 min.	60-90 min.	35-45 min.	50 min.	40-60 min.	60-90 min.	35-45 min.
Color (cured)	Visual	Black	Black	Black	Glossy Black	Black	Black	Black	Glossy Black
Hardness Shore	ASTM D-2240	95 D	90 D	92 D	88 D	95 D	88 D	90 D	90 D
Viscosity mixed @ 25°C cps	ASTM D-4878	12, 500	1,800	11,500	3,000	24,000	4,050	5,050	4,250
Specific Gravity mixed @ 25°C	ASTM D-4669	1.51	1.43	1.45	1.50	1.69	1.59	1.48	1.59
Shrinkage inch/inch <b>See shrinkage paragraph</b>	ASTM D-2566	0.0005-0.002	0.0005-0.001	0.0005-0.0025	0.0005-0.003	0.0005-0.001	0.0005-0.001	0.0005-0.0025	0.0005-0.0025
Demold time @ 70°F 1/8" thick	HAPCO TEST	16-24 hrs. or 2-4@150°F	24 hrs.	2-4@135°F and 2-4@200°F	24 hrs.	16-24 hrs. or 2-4@150°F	24 hrs.	2-4@135°F and 2-4 200°F	2-4 hrs.
Weight per cubic inch (lbs.)	Calculation	0.0545	0.0516	0.0524	0.0542	0.0610	0.0575	0.0534	0.0575
Tensile Strength (psi)	ASTM D-638	9,050	8,250	7,700	6,200	7,000	6,500	7,250	5,300
Elongation %	ASTM D-638	1.1	3.8	0.8	1.5	0.60	1.70	0.15	0.14
Modulus of Elasticity (ksi)	ASTM D-638	397	360	410	320	350	310	420	430
Izod Impact (ft.lbs/in.) notched unnotched	ASTM D-256	0.45 0.65	0.63 0.76	0.43 0.64	0.50 0.72	0.41 0.62	0.58 0.78	0.52 0.61	0.54 0.70
Flexural Strength (psi)	ASTM D-790	10,100	9,450	8,600	7,300	7,800	7,350	8,000	6,100
Flexural Modulus (ksi)	ASTM D-790	402	387	436	344	386	327	457	444
Available in Flame Retardant (FR)	94V	No	No	No	No	FR only	FR only	FR only	FR only
Service Temperature		155°C	75°C	175°C	110°C	163°C	85°C	195°C	120°C
Thermal Conductivity (BTU)(in)/(hr)(ft²)(°F)		3.0	2.8	2.9	2.8	2.9	2.7	2.8	2.7
Dielectric Constant 1 KHz 100 KHz	ASTM D-150	4.3	3.4	4.4	4.3	4.6	3.6	4.6	4.6
		4.2	3.3	4.2	4.2	4.4	3.3	4.4	4.3
Dielectric Strength (volts/mil.)	ASTM D-149	666	579	630	520	421	633	654	585
Volume Resistivity (ohm-cm)	ASTM D-270	2.6 x 10 <sup>13</sup>	2.9 x 10 <sup>12</sup>	1.2 x 10 <sup>14</sup>	1.1 x 10 <sup>14</sup>	7.5 x 10 <sup>13</sup>	7.3 x 10 <sup>13</sup>	7.2 x 10 <sup>13</sup>	7.2 x 10 <sup>13</sup>
Dissipation Factor 100 KHz @25°C	ASTM D-150	.007	.023	.0038	.0011	.009	.022	.031	.015

**NOTE: Before use, reference material handling, processing, and safety notes located at the end of this brochure.**



# DI-PAK™ R-4545

- rigid -

	PHYSICAL PROPERTIES	TEST METHOD	DI-PAK™ R-4545/7	DI-PAK™ R-4545/17	DI-PAK™ R-4545/30	DI-PAK™ R-4545/40	DI-PAK™ R-4545/44
<b>PHYSICAL PROPERTIES</b>	Mix Ratio by volume A:B by weight A:B	Calculation	100:20	100:50	100:33	100:50	100:25
			100:20	100:42	100:27	100:43	100:25
	Gel time 100 grams @ 25°C	ASTM D-2971	45 minutes	60 minutes	40 minutes	30 minutes	12.5 minutes
	Color (cured)	Visual	Black	Black	Black	Glossy Black	Black
	Hardness Shore	ASTM D-2240	90 D	80 D	90 D	85 D	90D
	Viscosity mixed @ 25°C cps	ASTM D-4878	2,000	550	3,600	1,100	3,000
	Specific Gravity mixed @ 25°C	ASTM D-4669	1.09	1.07	1.10	1.09	1.13
	Shrinkage inch/inch See shrinkage paragraph	ASTM D-2566	0.001-0.003	0.0005-0.0025	0.0015-0.003	0.001-0.003	0.002-0.005
	Demold time @ 70°F 1/8" thick	HAPCO TEST	24 hrs.	24 hrs.	2-4 hrs.@ 135°F and 2-4 hrs.@ 200°F	24 hrs.	20-30 min.
	Weight per cubic inch (lbs.)	Calculation	0.0394	0.0386	0.0397	0.0394	0.0408
<b>PRODUCT PROPERTIES</b>	Tensile Strength (psi)	ASTM D-638	11,000	8,100	10,000	6,250	10,500
	Elongation %	ASTM D-638	4.5	15.0	3.0	13.0	5 %
	Modulus of Elasticity (ksi)	ASTM D-638	420	367	463	361	415
	Izod Impact (ft.lbs/in.) notched unnotched	ASTM D-256	0.58	0.55	0.53	0.59	0.55
			0.88	0.86	0.81	0.91	0.90
	Flexural Strength (psi)	ASTM D-790	12,700	9,700	11,650	7,850	12,500
	Flexural Modulus (ksi)	ASTM D-790	451	392	497	421	440
	Available in Flame Retardant (FR)	94V	No	No	No	No	No
	Service Temperature		137°C	63°C	168°C	80°C	133°C
	Thermal Conductivity (BTU)(in)/(hr)(ft²)(°F)		1.5	1.5	1.5	1.5	1.5
	Dielectric Constant 1 KHZ 100 KHZ	ASTM D-150	4.5	4.1	4.5	4.7	4.4
			4.2	3.8	4.2	4.4	4.1
	Dielectric Strength (volts/mil.)	ASTM D-149	550	521	565	631	545
Volume Resistivity (ohm-cm)	ASTM D-270	8.0 x 10 <sup>13</sup>	7.3 x 10 <sup>13</sup>	8.2 x 10 <sup>13</sup>	7.3 x 10 <sup>13</sup>	7.9 x 10 <sup>13</sup>	
Dissipation Factor 100 KHZ @25°C	ASTM D-150	.008	.0123	.015	.011	.009	

**NOTE: Before use, reference material handling, processing, and safety notes located at the end of this brochure.**



# DI-PAK™ R-PRODUCTS

- rigid -

	PHYSICAL PROPERTIES	TEST METHOD	DI-PAK™ R-4307	DI-PAK™ R-4307FR	DI-PAK™ R-4200	DI-PAK™ R-4806	DI-PAK™ R-4807
<b>PHYSICAL PROPERTIES</b>	Mix Ratio by volume A:B	Calculation	100:100	100:100	100:85	100:100	100:100
	by weight A:B		100:100	100:100	100:90	100:96	100:93
	Gel time 100 grams @ 25°C	ASTM D-2971	24 hrs.	24 hrs.	8-24 hrs.	90-120 seconds	4 min. ± .5
	Color (cured)	Visual	Blue	Blue	Clear amber	Opaque tan/yellow	Black
	Hardness Shore	ASTM D-2240	86 D	86 D	88 D	79 D	84 D
	Viscosity mixed @ 25°C cps	ASTM D-4878	18,000	18,000	1,200	500	240
	Specific Gravity mixed @ 25°C	ASTM D-4669	1.62	1.62	1.12	1.10	1.10
	Shrinkage inch/inch See shrinkage paragraph	ASTM D-2566	0.001 -0.0035	0.001 -0.0035	0.0015-0.0035	.002-.004	.0015-.003
	Demold time @ 70°F 1/8" thick	HAPCO TEST	2 hrs. @ 250°F	2 hrs. @ 250°F	2 hrs. @ 250°F Or 12 hrs. @ 175°F	15-30 min.	60 min.
	Weight per cubic inch (lbs.)	Calculation	0.0585	0.0585	0.0404	0.0397	0.0395
<b>PRODUCT PROPERTIES</b>	Tensile Strength (psi)	ASTM D-638	14,375	14,375	11,000	6,370	6,200
	Elongation %	ASTM D-638	3.0	3.0	5.0	9.5	11.0
	Modulus of Elasticity (ksi)	ASTM D-638	501	501	478	158	340
	Izod Impact (ft.lbs/in.) notched unnotched	ASTM D-256	0.46 0.72	0.46 0.72	0.61 0.77	0.70 1.60	0.23 1.30
	Flexural Strength (psi)	ASTM D-790	17,100	17,100	13,640	7,000	8,700
	Flexural Modulus (ksi)	ASTM D-790	560	560	501	172	361
	Available in Flame Retardant (FR)	94V	No	Yes (94VO @ 3mm)	No	No	No
	Service Temperature		170°C	170°C	148°C	120°C	70°C
	Thermal Conductivity (BTU)(in)(hr)(ft²)(°F)	ASTM D-150	2.7	2.7	1.5	1.5	1.5
	Dielectric Constant 1 KHz 100 KHz	ASTM D-149	3.9 3.7	3.9 3.7	3.5 3.1	3.7 3.6	3.77 3.63
	Dielectric Strength (volts/mil.)	ASTM D-270	432	432	400	460	465
	Volume Resistivity (ohm-cm)	ASTM D-150	5.3 x 10 <sup>15</sup>	5.3 x 10 <sup>15</sup>	3.5 x 10 <sup>15</sup>	1.7 x 10 <sup>14</sup>	1.5 X 10 <sup>14</sup>
	Dissipation Factor 100 KHz @25°C		.021	.021	.019	.020	0.22

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# DI-PAK™ R-PRODUCTS

## - rigid -

	PHYSICAL PROPERTIES	TEST METHOD	DI-PAK™ R-4912	DI-PAK™ R-4260
<b>PHYSICAL PROPERTIES</b>	Mix Ratio by volume A:B	Calculation	100:100	100:100
	Mix Ratio by weight A:B		100:90	100:86
	Gel time 100 grams @ 25°C	ASTM D-2971	60 sec.	60 sec.
	Color (cured)	Visual	Transparent	Black
	Hardness Shore	ASTM D-2240	82 D	80 D
	Viscosity mixed @ 25°C cps	ASTM D-4878	500	600
	Specific Gravity mixed @ 25°C	ASTM D-4669	1.2	1.12
	Shrinkage inch/inch See shrinkage paragraph	ASTM D-2566	.002 - .007	.004 - .008
	Demold time @ 70°F 1/8" thick	HAPCO TEST	10 - 15 min.	5 - 12 min.
<b>PRODUCT PROPERTIES</b>	Weight per cubic inch (lbs.)	Calculation	0.0433	0.0405
	Tensile Strength (psi)	ASTM D-638	6,400	7,700
	Elongation %	ASTM D-638	7.1	14.7
	Modulus of Elasticity psi (000)	ASTM D-638		95
	Izod Impact (ft.lbs/in.) notched unnotched	ASTM D-256	0.73 1.70	0.18 1.04
	Flexural Strength (psi)	ASTM D-790	9,100	10,600
	Flexural Modulus (ksi)	ASTM D-790	300	264
	Available in Flame Retardant (FR)	94V	Yes	No
	Service Temperature		140°C	146°C
	Thermal Conductivity (BTU)(in) / (hr)(ft²)(°F)		1.4	1.5
	Dielectric Constant 1 KHz 100 KHz		3.6 3.3	3.73 3.5
	Dielectric Strength (volts/mil.)	ASTM D-150	470	480
	Volume Resistivity (ohm-cm)	ASTM D-149	3.1 x 10 <sup>12</sup>	4.7x 10 <sup>13</sup>
	Dissipation Factor 100 KHz @25°C	ASTM D-270	0.23	0.22

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# DI-COAT™ R-Series

## Hapco's Dielectric Coating Systems

### DI-COAT™ R-4721 / DI-COAT™ R-4721 LV (lower viscosity)

Shore 90 D, room temperature curing, medium to high thixotropic coating for dielectric insulating applications.

**DI-COAT™ R-4721** is ideal for use on vertical or sloping surfaces where flow or drain-off cannot be tolerated. **DI-COAT™ R-4721** is easy to use, and should be used on insulating applications where conformal coating is required.

**DI-COAT R-4721 LV** exhibits similar characteristics to **DI-COAT R-4721**, but has a lower viscosity.

DI-COAT™	R-4721/7	R-4721/30	R-4721LV/7	R-4721LV/30
Mix Ratio Part A to Part B by Weight	100A:12B	100A:13B	100A:12B	100A:13B
Mixed Viscosity @ 25°C cps	Medium to high thixotropic	thixotropic	Medium thixotropic	thixotropic
Gel Time @ 25°C	65 ±10 minutes	120 ±20 minutes	65 ±10 minutes	120 ±20 minutes
Cure Schedule	Overnight @ room temp.	4-6 hrs @ 120°F Plus 6-12 hours @ 200°F	Overnight @ room temp.	4-6 hrs @ 120°F Plus 6-12 hours @ 200°F
Specific Gravity (mixed)	1.5	1.5	1.5	1.5
Hardness Shore	90 D	90 D	90 D	90 D
Color	White	White	White	White
Tensile Strength psi	7,340	8,700	7,340	8,700
Service Temperature	157°C	175°C **	140°C	167°C **
Dielectric Constant 1 Khz 100 Khz	3.1 3.0	3.1 3.0	3.1 3.0	3.1 3.0
Dielectric Strength (volts/mil.)	625	600	625	600
Volume Resistivity (ohm-cm)	1.85 x 10 <sup>12</sup>	1.96 x 10 <sup>12</sup>	1.85 x 10 <sup>12</sup>	1.96 x 10 <sup>12</sup>
Dissipation Factor 100khz	.03	.024	.03	.024

**NOTE: Before use, reference material handling, processing, and safety notes located at the end of this brochure.**



**Di-Pak™ SERIES**  
**MATERIAL HANDLING & SAFETY NOTES**

**POSTCURE:**

Postcure Heat: 100-175°F (38-79°C) for a *minimum* of 6-12 hours.

Properties increase with heat acceleration. Izod impact and heat distortion properties increase with postcure heat. The lower the temperature the longer the post-cure (8-24 hrs). **Heat cured products do not require a post cure.**

**DEMOLD & CURE TIMES:**

Demold and final cure time can be accelerated with the addition of postcure heat 100-175°F (38-79°C) .

To retain working life, heat the mold not the material for best results. Increasing the mold temperature to 80-100°F (26-38°C) will accelerate demold and cure times by up to 50%. For full cure polymers require at least 7-10 days.

Final cure for faster gel materials (3-6 minute gel) is 3-7 days. Please be aware that size and mass effect demold and cure times. The customer and geometry will ultimately determine demold time.

**HARDNESS NOTE:**

The hardness progresses more slowly in the longer working life systems. The hardness progression can be accelerated by using the faster version or by curing with mild heat. Hardness and cure progress will be retarded, slowed down, when the temperature falls below 70°F.

**SILICONE MOLDS:**

Silicone molds should be post cured overnight, 16-24 hours, in an oven at 120°F (48°C). When using a tin based silicone mold, make sure the mold is open when it is in the oven during postcure. Improperly cured silicone can cause a sticky surface on molded parts. This process extends mold life.

**SURFACE PREPARATION TO PREVENT ADHESION:**

To prevent adhesion to the mold, use a GREASE-IT release agent. The following are recommended:

GREASE-IT II, GREASE-IT IV, GREASE-IT V, GREASE-IT WAX P, or GREASE-IT WAX LT, use GREASE-IT FDG when a Food & Drug grade release is required. For best results, apply in a few thin coats, drying between coats.

Porous surfaces, i.e. wood, plaster, etc, must be sealed thoroughly before release is applied. Use multiple coats of a good coating, such as: a high grade lacquer or urethane lacquer.

**SURFACE PREPARATION FOR ADHESION:**

For applications where adhesion is desired, the surface must be cleaned, abraded and dried. Sandblasting and mechanical roughing are the preferred ways of abrading surfaces to be bonded. For added adhesion to metals, use Primer 200 and for added adhesion to plastic, use Primer 810. Make sure all surfaces are clean, dry, and free from moisture.

**COLD TEMPERATURES:**

**CAUTION** - Part A may freeze or crystallize in cold temperatures. Part A may appear to be striated or solidify.

This situation can easily be corrected. Place the cover on the Part A loosely (do not seal) and place in an oven set at 125-150°F (51-65°C) for 3-8 hours or 8-12 hours for drums. Reseal, allow to cool, and then mix thoroughly.

**CAUTION** - Part B may freeze or crystallize in cold temperatures. Part B may turn thicker, appear to be striated, thicken, or solidify. **To prevent this see storage.**

This situation can be easily corrected. To reverse crystallization, loosen the cover on Part B and heat to 170-180°F (77-82°C) for 3-6 hours, drums, 6-12 hours. Allow to cool before using. If contents are pigmented, mix thoroughly.

**MIXING:**

**IMPORTANT!**

**E-SERIES** - Before each use, mix Part B thoroughly before proportioning out the required amount.

**R-SERIES** - Before each use, mix Part A thoroughly before proportioning out the required amount.

Components may separate and should be mixed before each use. Mix, only when ready to use, by adding the curing agent to the resin portion and blending together thoroughly. Be sure to scrape and stir in all material sticking to the sides and bottom of the mixing container. Do not use paper containers or wooden mixing sticks. They may contain moisture. For best results, use plastic or coated containers, and metal or plastic sticks.



**Di-Pak™ SERIES**  
**MATERIAL HANDLING & SAFETY NOTES**

**MACHINE MIXING AND DISPENSING:**

Use Hapco's **RAPIDFIL**, **MINIFIL**, and/or **RAPIDSHOT** dispensing machines for fast, reliable, and efficient mixing without the air entrapment, measuring, or mess associated with hand processing.

**CASTING:**

Pour in a thin unbroken stream into the lowest point in the cavity or mold. This will help break up some of the air entrapped during mixing. For best results, Hapco recommends meter mix dispensing, vacuum degassing and/or pressure casting at 70-80 PSI.

**SHRINKAGE:**

Shrinkage or dimensional variation is largely influenced by 5 factors:

1. Mass (total volume and thickness)
2. The temperature of the material
3. Maximum temperature reached during the exotherm (reaction).  
The faster the gel time, the higher the exotherm, the greater the shrinkage.
4. The temperature of the mold
5. The stability of the mold

Geometry, part thickness, and total volume vary in each design, therefore, the customer is responsible to test and determine the shrinkage factor to be used. The values in the brochures are for comparative reference only, using ASTM testing procedures.

**AIR RELEASE:**

Use HAPCO'S ANTI-AIR to aid in air release (see Technical Bulletin). In some products, ANTI-AIR can cause a slight haze to cloudiness. This has no effect on properties.

**CLEAN UP:**

Cured polymers are difficult to remove. It is best to clean tools and equipment immediately after use.

For best results use Hapco's A-TAK.

**STORAGE:**

Store both components in an area with a temperature range of 68-90°F (20-32°C). Store in a dry place off of cement floors and on shelving if possible. Containers should be kept tightly closed.

**SHELF LIFE:**

The shelf life on Hapco products begins from the date of invoice for that product shipment. Hapco's shelf life only pertains to containers that are unopened and in their original condition. Once the container is opened Hapco has no control or responsibility for the shelf life.

**RESEALING:**

Many polymers are moisture sensitive, reseal, using one of the following two (2) methods: blanket with nitrogen or use a hair dryer for 30 seconds to cover with dry air.

**PRECAUTIONS:**

**CAUTION:** The MSDS should be read thoroughly before using this product.

Skin or eye contact with polymers should be avoided. The use of gloves, eye protection, and face masks are strongly recommended. All polymers, as a general practice, should be used in well-ventilated areas. Spot ventilation is most effective. Contaminated clothing should be removed immediately and the skin washed with soap and water or waterless skin cleaner. Should accidental eye contact occur, wash thoroughly with water and consult a physician.

The information presented here is based on carefully conducted laboratory tests and is believed to be accurate. However, results cannot be guaranteed and it is suggested that customers confirm results under their conditions and in their applications before production use.

**Important:** Hapco Inc. makes no warranty, whether expressed or implied, including warranties of merchantability or of fitness for a particular purpose. Under no circumstances shall Hapco Inc. be liable for incidental, consequential, or other damages from alleged negligence, breach of warranty, strict liability, tort contract, or any other legal theory, arising out of the use of handling of this product. The sole remedy of purchaser and sole liability of Hapco Inc. shall be for the purchase price of the product which is the subject of the claim.

