

**LAMPIRAN A**  
**CONTOH PERHITUNGAN**

### A.1 Perhitungan Konsentrasi NaOH 5%

Untuk menyiapkan 1000 mL larutan NaOH dengan konsentrasi 5% maka,

$$\% \text{Larutan} = \frac{\text{massa zat terlarut (gr)}}{\text{massa zat pelarut (mL)}} \times 100$$

$$5\% = \frac{\text{massa zat terlarut (gr)}}{1000 \text{ mL}} \times 100$$

$$\text{massa zat terlarut (gr)} = \frac{5 \times 1000 \text{ mL}}{100}$$

$$\text{Massa zat terlarut} = 50 \text{ gr}$$

### A.2 Perhitungan Komposisi Komposit

Diketahui :

$$\text{Berat sampel} = 25 \text{ cm} \times 2,5 \text{ cm} \times 0,3 \text{ cm} = 18,75 \text{ cm}^3$$

$$\rho \text{ ijuk} = 1,4 \text{ gr/cm}^3$$

$$\rho \text{ polyester} = 1,1 \text{ gr/cm}^3$$

$$\rho \text{ epoksi} = 1,2 \text{ gr/cm}^3$$

$$\rho \text{ vinyl ester} = 1,1 \text{ gr/cm}^3$$

1. Mencari berat serat (pada fraksi berat 5%)

$$\text{Berat serat (gr)} = \text{Berat ijuk} \times \rho \text{ ijuk}$$

$$\text{Berat serat (gr)} = (\text{Berat sampel} \times \% \text{Berat serat}) \times \rho \text{ ijuk}$$

$$\text{Berat serat (gr)} = (18,75 \times 5\%) \times 1,4 \text{ gr/cm}^3$$

$$\text{Berat serat (gr)} = 3,937 \text{ gr}$$

2. Mencari berat resin (pada fraksi berat 5%)

$$\text{Berat serat (gr)} = \text{Berat resin} \times \rho \text{ polyester}$$

$$\text{Berat serat (gr)} = (\text{Berat sampel} \times \% \text{Berat resin}) \times \rho \text{ polyester}$$

$$\text{Berat serat (gr)} = (18,75 \times 95\%) \times 1,1 \text{ gr/cm}^3$$

$$\text{Berat serat (gr)} = 17,531 \text{ gr}$$

### A.3 Perhitungan Nilai Densitas

Diketahui sampel *polyester* 5%

$$SG = \frac{a}{a+w-b}$$

$$SG = \frac{25,784}{25,784+27,509-25,509}$$

$$SG = \frac{25,784}{27,784}$$

$$SG = 0,928$$

$$\text{Densitas sampel} = SG \times \rho \text{ air}$$

$$\text{Densitas sampel} = 0,928 \times 0,997$$

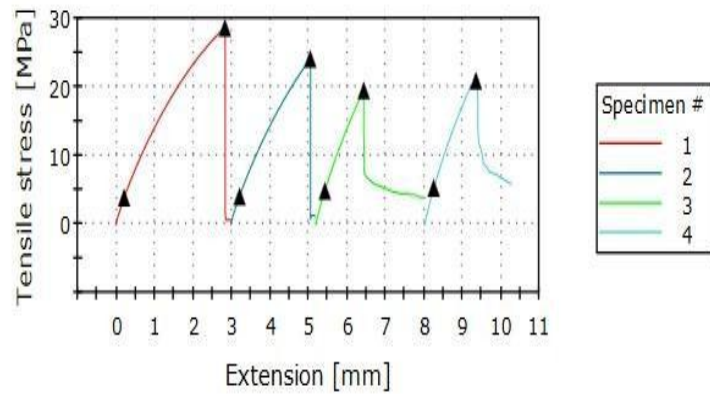
$$\text{Densitas sampel} = 0,925 \text{ gr/cm}^3$$

**LAMPIRAN B**  
**DATA HASIL PENELITIAN**

**B.1 Data Hasil Uji Tarik****Tabel B.1** Hasil Pengujian Tarik

Resin	Fraksi Berat	Kuat Tarik (Mpa)
<i>Unsaturated Polyester</i>	0%	19,48
	5%	20,87
	10%	24,04
	15%	28,58
Epoksi	0%	21,72
	5%	22,55
	10%	28,14
	15%	35,24
<i>Vinyl ester</i>	0%	24,32
	5%	29,63
	10%	34,53
	15%	41,22

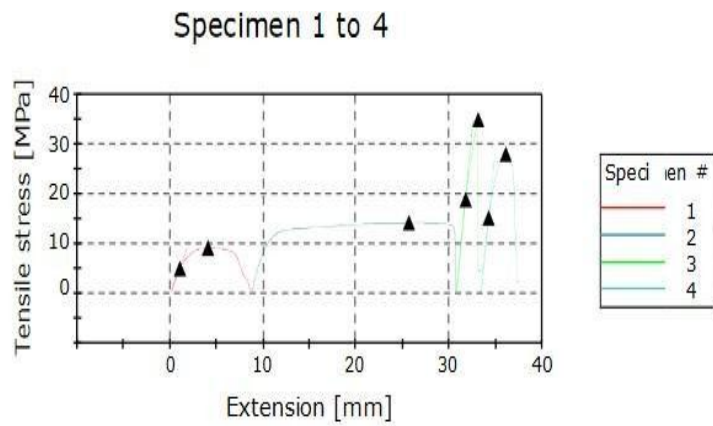
Specimen 1 to 4



Results table 1

	Width [mm]	Thickness [mm]	Max Load [N]	Tensile stress [MPa]	Tensile stress at Yield [MPa]	Tensile strain (Extension) at Maximum Load [%]	Modulus 1 (Gpa)	Code
1	25.66	3.78	2768.85	28.58	3.94	5.665	0.505	Polyester 15%
2	25.81	3.34	2075.67	24.04	4.13	4.132	0.582	Polyester 10%
3	24.99	3.18	1549.12	19.48	4.95	2.499	0.780	Polyester 0
4	24.74	3.25	1676.56	20.87	5.32	2.667	0.782	Polyester 5%
Mean	25.30	3.39	2017.55	23.24	4.58	3.741	0.662	
Maximum	25.81	3.78	2768.85	28.58	5.32	5.665	0.782	
Minimum	24.74	3.18	1549.12	19.48	3.94	2.499	0.505	

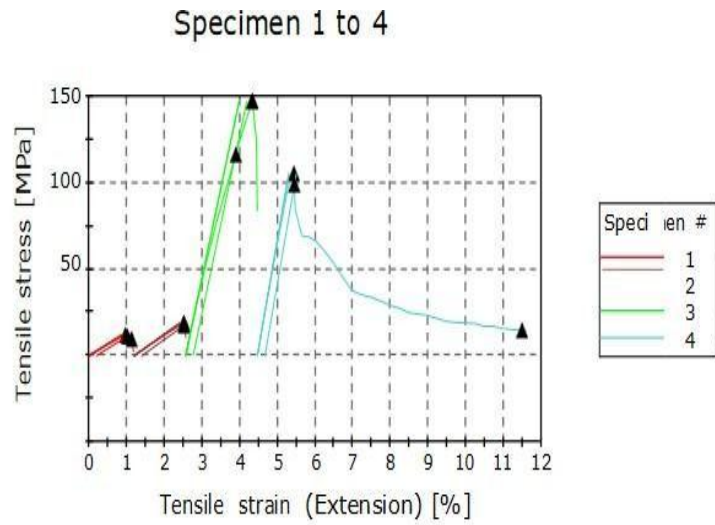
Gambar B.1 Hasil Uji Tarik Polyester



Results table 1

	Width [mm]	Thickness [mm]	Max Load [N]	Tensile stress [MPa]	Tensile stress at Yield [MPa]	Tensile strain (Extension) at Maximum Load [%]	Modulus 1 (Gpa)	Code
1	27.40	3.06	752.98	21.72	4.82	7.970	0.113	Epoxy 0
2	27.27	3.14	1210.96	22.55	12.42	33.932	0.042	Epoxy 5%
3	26.75	3.25	3063.90	35.24	18.94	4.766	0.739	Epoxy 15%
4	27.98	3.16	2487.84	28.14	15.13	5.415	0.520	Epoxy 10%
Mean	27.35	3.15	1878.92	26.92	12.96	13.021	0.353	
Maximum	27.98	3.25	3063.90	35.24	18.94	33.932	0.739	
Minimum	26.75	3.06	752.98	21.72	4.82	4.766	0.042	

**Gambar B.2 Hasil Uji Tarik Epoksi**



	Width [mm]	Thickness [mm]	Maximum Load [N]	Tensile stress at Maximum Load [MPa]	Tensile stress at Yield (Offset 0.2 %) [MPa]	Tensile strain (Extension) at Maximum Load [%]	Modulus-1 [Gpa]	Specimen label
1	25.10	3.07	956.92	24.32	24.32	0.97	1.276	Vinylester 0%
2	25.20	3.19	1535.78	29.63	29.63	1.33	1.437	Vinylester 5%
3	12.38	1.02	1865.09	41.22	41.53	1.76	8.356	Vinylester 15%
4	12.38	1.02	1338.85	34.53	34.53	0.97	10.909	Vinylester 10%
Mean	18.76	2.08	1424.16	32.42	32.50	1.26	5.495	
Maximum	25.20	3.19	1865.09	41.22	41.53	1.76	10.909	
Minimum	12.38	1.02	956.92	24.32	24.32	0.97	1.276	

**Gambar B.3** Hasil Uji Tarik *Vinyl ester*



## B.2 Data Hasil Uji Densitas

**Tabel B.2** Hasil Uji Densitas

Resin	Fraksi Berat	Densitas (gr/cm <sup>3</sup> )
<i>Unsaturated Polyester</i>	0%	0,925
	5%	0,915
	10%	0,913
	15%	0,908
	0%	0,974
	5%	0,95
	10%	0,937
	15%	0,922
	0%	0,906
	5%	0,911
	10%	0,911
	15%	0,919

**Tabel B.3** Hasil Uji Normalitas Variabel Fraksi Berat dengan Metode Shapiro-Wilk

	Fraksi Berat	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		<i>Statistic</i>	<i>df</i>	<i>Sig.</i>	<i>Statistic</i>	<i>df</i>	<i>Sig.</i>
Densitas	0,00%	,279	3	.	,939	3	,524
	5,00%	,352	3	.	,826	3	,178
	10,00%	,361	3	.	,807	3	,132
	15,00%	,308	3	.	,902	3	,391

**Tabel B.4 Homogeneity of Variances**

		<i>Levene</i>			
		<i>Statistic</i>	<i>df1</i>	<i>df2</i>	<i>Sig.</i>
Densitas	<i>Based on Mean</i>	2,991	3	8	,096
	<i>Based on Median</i>	,605	3	8	,630
	<i>Based on Median and with adjusted df</i>	,605	3	5,221	,639
	<i>Based on trimmed mean</i>	2,685	3	8	,117

**Tabel B.5 Analysis of Variances**

Densitas	<i>Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
<i>Between Groups</i>	,001	3	,000	,398	,758
<i>Within Groups</i>	,004	8	,000		
<i>Total</i>	,004	11			

**Tabel 4.6 Hasil Uji Korelasi Pearson**

		Resin	Fraksi Berat	Kuat Tarik (Mpa)	Densitas
Resin	<i>Pearson Correlation</i>	1	,000	,585	-,074
	<i>Sig. (2-tailed)</i>		1,000	,045	,820
	N	12	12	12	12
Fraksi Berat	<i>Pearson Correlation</i>	,000	1	,770	-,352
	<i>Sig. (2-tailed)</i>	1,000		,003	,261
	N	12	12	12	12
Kuat Tarik (Mpa)	<i>Pearson Correlation</i>	,585	,770	1	-,325
	<i>Sig. (2-tailed)</i>	,045	,003		,303
	N	12	12	12	12
Densitas	<i>Pearson Correlation</i>	-,074	-,352	-,325	1
	<i>Sig. (2-tailed)</i>	,820	,261	,303	
	N	12	12	12	12

### Notes

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	Cases Used	Statistics for each pair of variables are based on all the cases with valid data for that pair.
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	Elapsed Time	00:00:00,07

### Descriptive Statistics

	Mean	Std. Deviation	N
Fraksi Volume	7,5000%	5,83874%	12
Kuat Tarik (Mpa)	27,5267	6,68746	12
Densitas	,92425	,020213	12

### Correlations

		Fraksi Volume	Kuat Tarik (Mpa)	Densitas
Fraksi Volume	Pearson Correlation	1	,770**	-,352
	Sig. (2-tailed)		,003	,261
	Sum of Squares and Cross-products	375,000	330,550	-,457
	Covariance	34,091	30,050	-,042
	N	12	12	12
Kuat Tarik (Mpa)	Pearson Correlation	,770**	1	-,325
	Sig. (2-tailed)	,003		,303
	Sum of Squares and Cross-products	330,550	491,943	-,483
	Covariance	30,050	44,722	-,044
	N	12	12	12
Densitas	Pearson Correlation	-,352	-,325	1
	Sig. (2-tailed)	,261	,303	
	Sum of Squares and Cross-products	-,457	-,483	,004
	Covariance	-,042	-,044	,000
	N	12	12	12

\*\* . Correlation is significant at the 0.01 level (2-tailed).

## Resin

### Case Processing Summary

	Resin	Valid		Cases Missing		Total	
		N	Percent	N	Percent	N	Percent
Densitas	epoxy	4	100,0%	0	0,0%	4	100,0%
	polyeste	4	100,0%	0	0,0%	4	100,0%
	vinyl es	4	100,0%	0	0,0%	4	100,0%

### Descriptives

Resin		Statistic	Std. Error	
Densitas	epoxy	Mean	,94575	,011018
		95% Confidence Interval for Mean	Lower Bound	,91069
	Upper Bound		,98081	
	5% Trimmed Mean		,94550	
	Median		,94350	
	Variance		,000	
	Std. Deviation		,022036	
	Minimum		,922	
	Maximum		,974	
	Range		,052	
	Interquartile Range		,042	
	Skewness		,533	1,014
	Kurtosis		,089	2,619
	polyeste	Mean		,91525
95% Confidence Interval for Mean		Lower Bound	,90390	
		Upper Bound	,92660	
5% Trimmed Mean		,91511		
Median		,91400		
Variance		,000		
Std. Deviation		,007136		
Minimum		,908		

	Maximum		,925	
	Range		,017	
	Interquartile Range		,013	
	Skewness		,981	1,014
	Kurtosis		1,704	2,619
vinyl es	Mean		,91175	,002689
	95% Confidence Interval for Lower Bound Mean		,90319	
		Upper Bound	,92031	
	5% Trimmed Mean		,91167	
	Median		,91100	
	Variance		,000	
	Std. Deviation		,005377	
	Minimum		,906	
	Maximum		,919	
	Range		,013	
	Interquartile Range		,010	
	Skewness		,815	1,014
	Kurtosis		1,874	2,619

### M-Estimators

	Resin	Huber's M-Estimator <sup>a</sup>	Tukey's Biweight <sup>b</sup>	Hampel's M-Estimator <sup>c</sup>	Andrews' Wave <sup>d</sup>
Densitas	epoxy	,94350	,94398	,94411	,94399
	polyeste	,91400	,91361	,91400	,91362
	vinyl es	,91100	,91064	,91100	,91065

- The weighting constant is 1,339.
- The weighting constant is 4,685.
- The weighting constants are 1,700, 3,400, and 8,500
- The weighting constant is  $1,340 \cdot \pi$ .

### Percentiles

		Resin	Percentiles			
			5	10	25	50
Weighted Average(Definition 1)	Densitas	epoxy	,92200	,92200	,92575	,94350
		polyeste	,90800	,90800	,90925	,91400
		vinyl es	,90600	,90600	,90725	,91100
Tukey's Hinges	Densitas	epoxy			,92950	,94350
		polyeste			,91050	,91400
		vinyl es			,90850	,91100

### Percentiles

		Resin	Percentiles		
			75	90	95
Weighted Average(Definition 1)	Densitas	epoxy	,96800	.	.
		polyeste	,92250	.	.
		vinyl es	,91700	.	.
Tukey's Hinges	Densitas	epoxy	,96200		
		polyeste	,92000		
		vinyl es	,91500		

### Extreme Values<sup>a</sup>

Resin				Case Number	Value
Densitas	epoxy	Highest	1	5	,974
			2	6	,950
	Lowest	1	8	,922	
		2	7	,937	
	polyeste	Highest	1	1	,925
			2	2	,915
Lowest		1	4	,908	

		2	3	,913
vinyl es	Highest	1	12	,919
		2	10	,911 <sup>b</sup>
	Lowest	1	9	,906
		2	11	,911 <sup>c</sup>

- a. The requested number of extreme values exceeds the number of data points. A smaller number of extremes is displayed.
- b. Only a partial list of cases with the value ,911 are shown in the table of upper extremes.
- c. Only a partial list of cases with the value ,911 are shown in the table of lower extremes.

### Tests of Normality

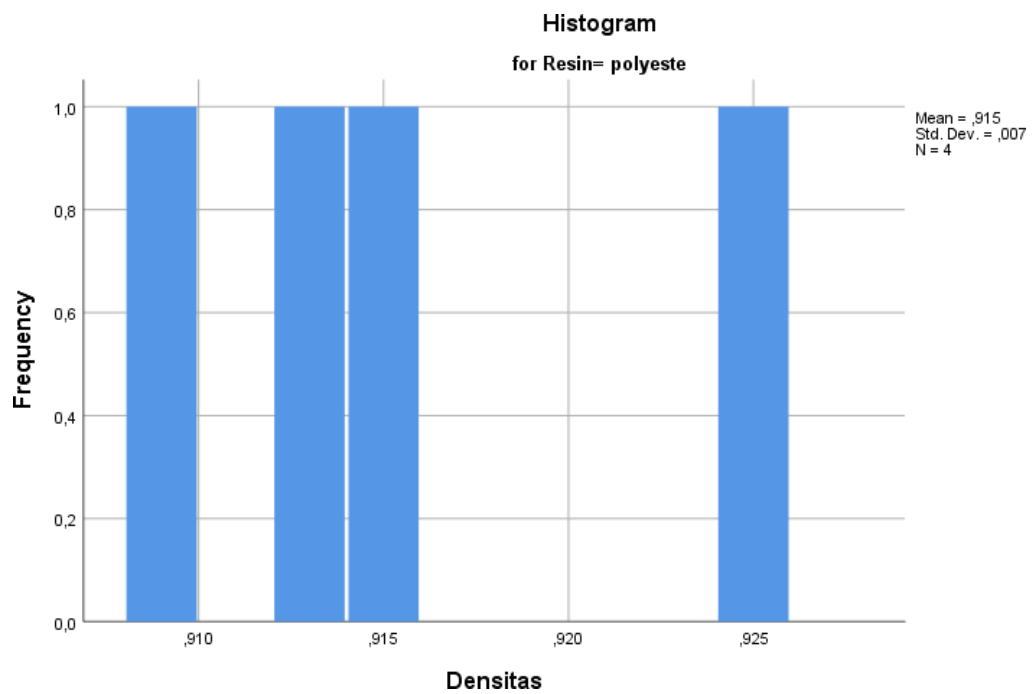
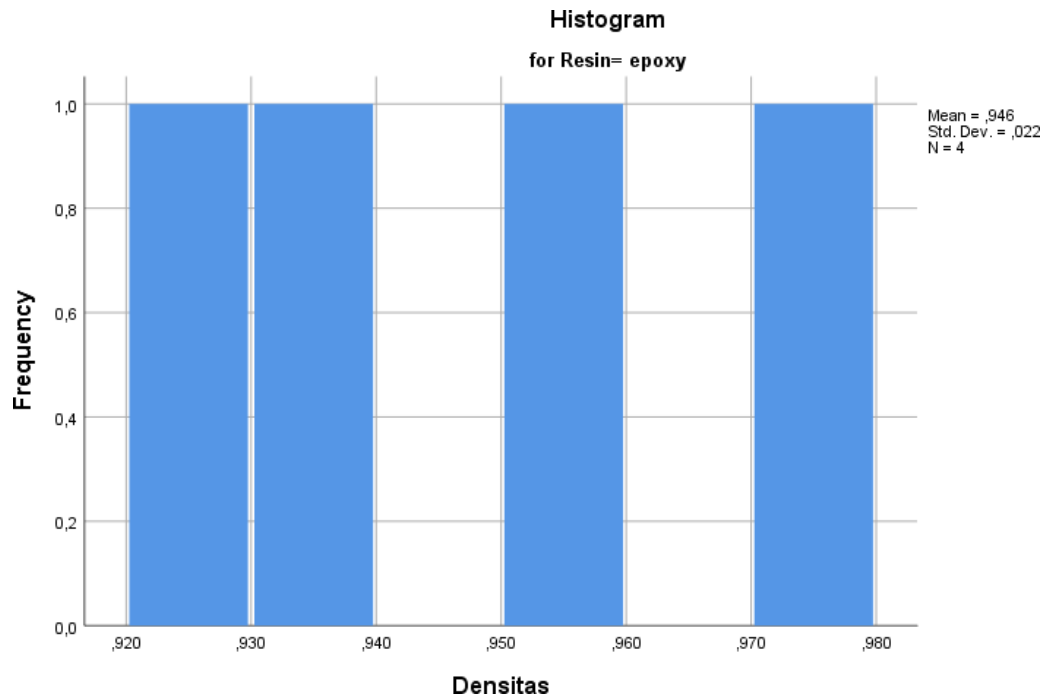
Resin	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Densitas epoxy	,174	4	.	,986	4	,936
polyeste	,264	4	.	,945	4	,687
vinyl es	,305	4	.	,920	4	,538

- a. Lilliefors Significance Correction

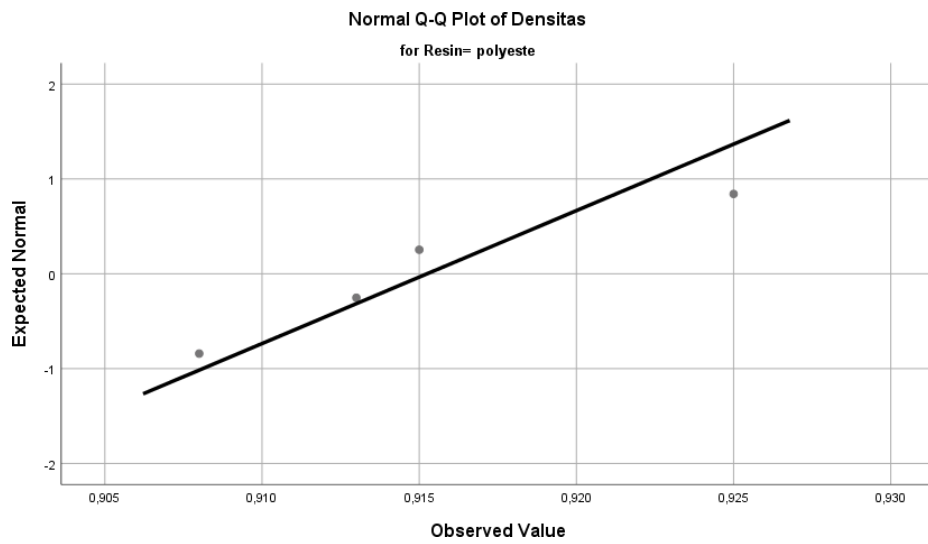
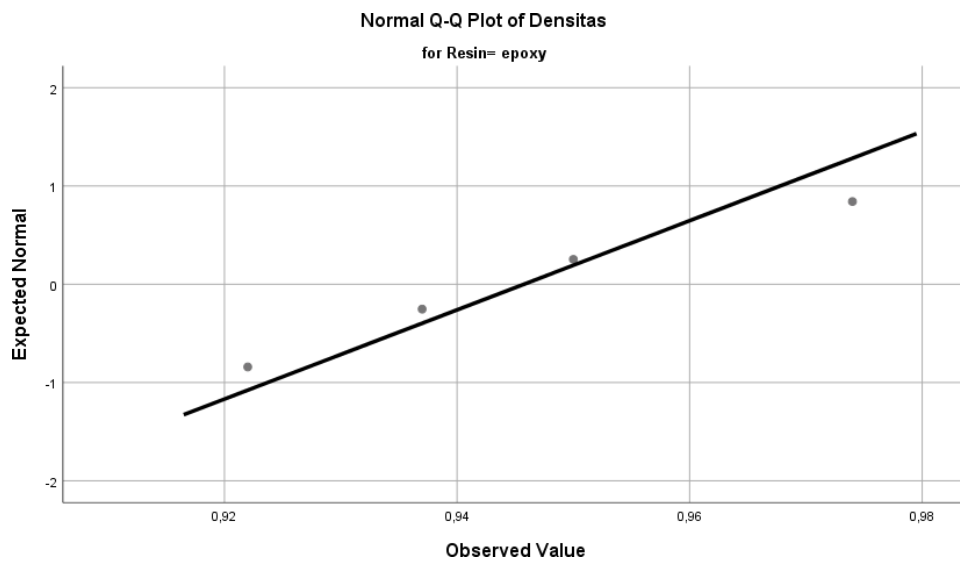
## Densitas

## Histograms

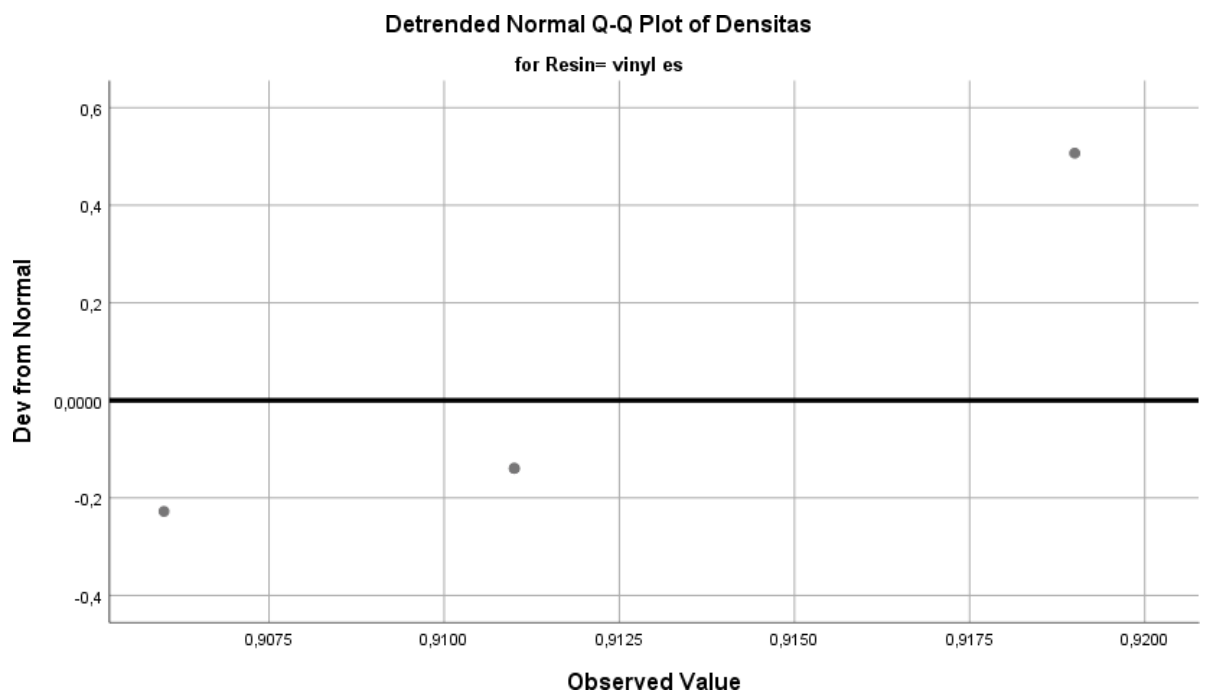
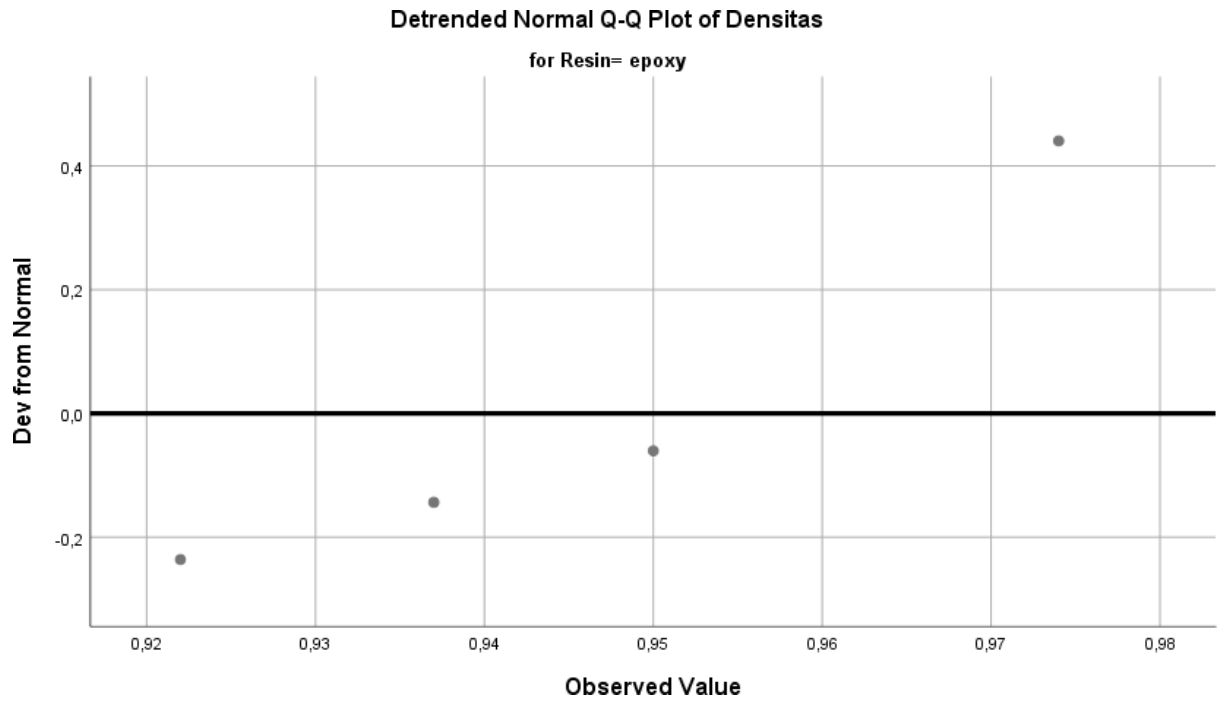


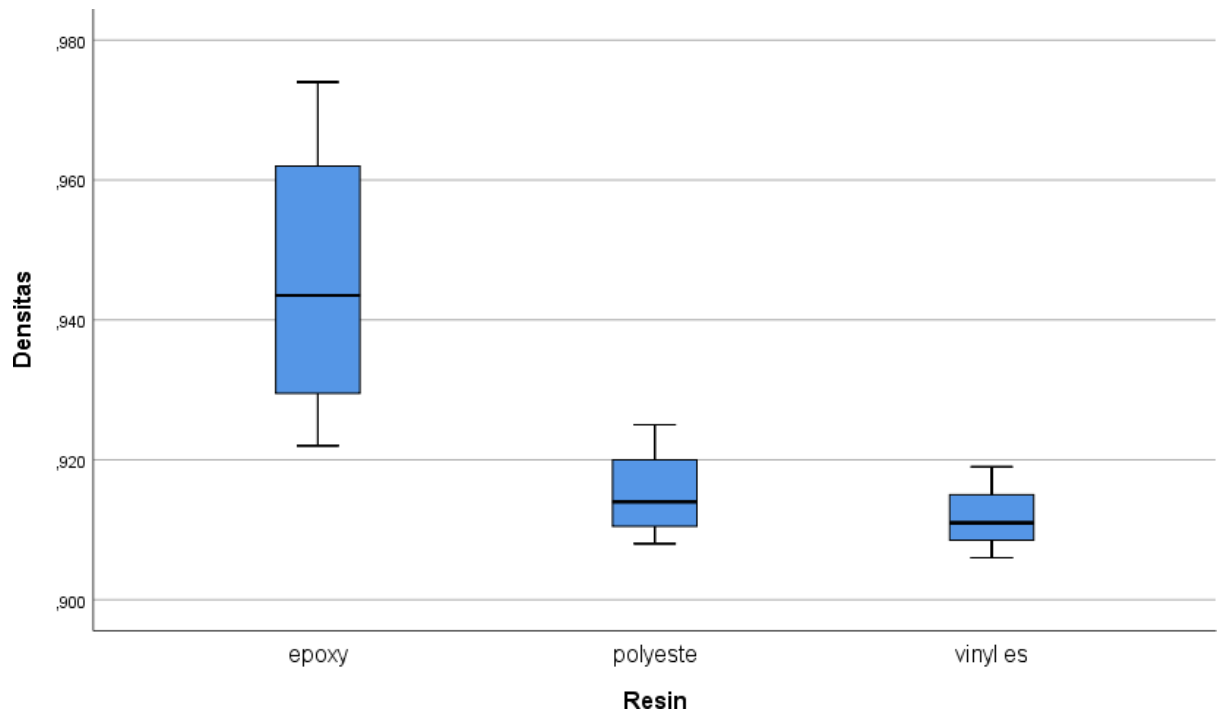


## Normal Q-Q Plots



## Detrended Normal Q-Q Plots





## Fraksi Volume

### Case Processing Summary

	Fraksi Volume	Valid		Cases Missing		Total	
		N	Percent	N	Percent	N	Percent
Densitas	0,00%	3	100,0%	0	0,0%	3	100,0%
	5,00%	3	100,0%	0	0,0%	3	100,0%
	10,00%	3	100,0%	0	0,0%	3	100,0%
	15,00%	3	100,0%	0	0,0%	3	100,0%

### Descriptives

Fraksi Volume		Statistic	Std. Error
Densitas	0,00%	Mean	,93500
		95% Confidence Interval for Lower Bound	,84784
	Mean	Upper Bound	1,02216

	5% Trimmed Mean	.	
	Median	,92500	
	Variance	,001	
	Std. Deviation	,035086	
	Minimum	,906	
	Maximum	,974	
	Range	,068	
	Interquartile Range	.	
	Skewness	1,178	1,225
	Kurtosis	.	.
5,00%	Mean	,92533	,012387
	95% Confidence Interval for Mean	Lower Bound Upper Bound	,87204 ,97863
	5% Trimmed Mean	.	
	Median	,91500	
	Variance	,000	
	Std. Deviation	,021455	
	Minimum	,911	
	Maximum	,950	
	Range	,039	
	Interquartile Range	.	
	Skewness	1,665	1,225
	Kurtosis	.	.
10,00%	Mean	,92033	,008353

	95% Confidence Interval for Mean	Lower Bound	,88439	
		Upper Bound	,95627	
	5% Trimmed Mean		.	
	Median		,91300	
	Variance		,000	
	Std. Deviation		,014468	
	Minimum		,911	
	Maximum		,937	
	Range		,026	
	Interquartile Range		.	
	Skewness		1,695	1,225
	Kurtosis		.	.
15,00%	Mean		,91633	,004256
	95% Confidence Interval for Mean	Lower Bound	,89802	
		Upper Bound	,93464	
	5% Trimmed Mean		.	
	Median		,91900	
	Variance		,000	
	Std. Deviation		,007371	
	Minimum		,908	
	Maximum		,922	
	Range		,014	
	Interquartile Range		.	
	Skewness		-1,415	1,225

Kurtosis	.	.
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### M-Estimators

	Fraksi Volume	Huber's M- Estimator <sup>a</sup>	Tukey's Biweight <sup>b</sup>	Hampel's M- Estimator <sup>c</sup>	Andrews' Wave <sup>d</sup>
Densitas	0,00%	,92756	,92771	,93121	,92775
	5,00%	,91563	,91309	,91300	,91309
	10,00%	,91332	,91205	,91200	,91205
	15,00%	,91857	,91952	,91825	,91956

- The weighting constant is 1,339.
- The weighting constant is 4,685.
- The weighting constants are 1,700, 3,400, and 8,500
- The weighting constant is  $1,340 \cdot \pi$ .

### Percentiles

		Fraksi Volume	Percentiles			
			5	10	25	50
Weighted Average(Definition 1)	Densitas	0,00%	,90600	,90600	,90600	,92500
		5,00%	,91100	,91100	,91100	,91500
		10,00%	,91100	,91100	,91100	,91300
		15,00%	,90800	,90800	,90800	,91900
Tukey's Hinges	Densitas	0,00%			,91550	,92500
		5,00%			,91300	,91500
		10,00%			,91200	,91300
		15,00%			,91350	,91900

### Percentiles

		Fraksi Volume	Percentiles		
			75	90	95
Weighted Average(Definition 1)	Densitas	0,00%	.	.	.
		5,00%	.	.	.

		10,00%	.	.	.
		15,00%	.	.	.
Tukey's Hinges	Densitas	0,00%	,94950		
		5,00%	,93250		
		10,00%	,92500		
		15,00%	,92050		

### Extreme Values<sup>a</sup>

	Fraksi Volume		Case Number	Value	
Densitas	0,00%	Highest	1	5	,974
		Lowest	1	9	,906
	5,00%	Highest	1	6	,950
		Lowest	1	10	,911
	10,00%	Highest	1	7	,937
		Lowest	1	11	,911
	15,00%	Highest	1	8	,922
		Lowest	1	4	,908

a. The requested number of extreme values exceeds the number of data points. A smaller number of extremes is displayed.

### Tests of Normality

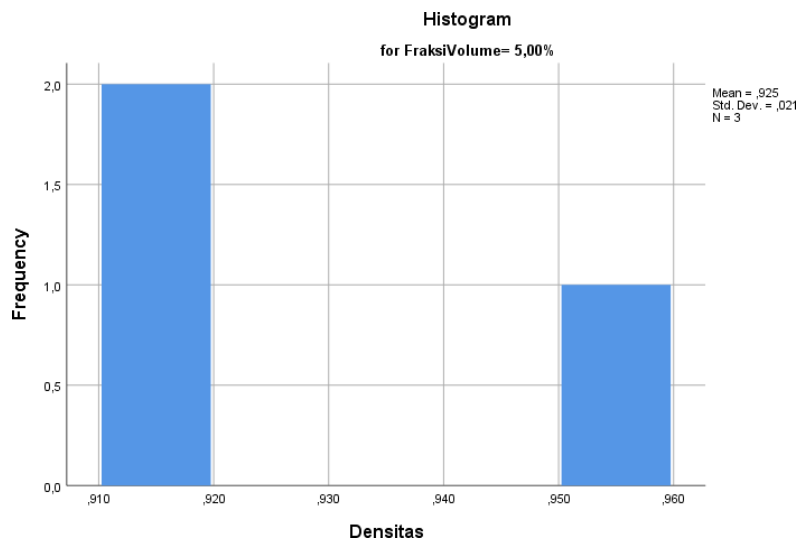
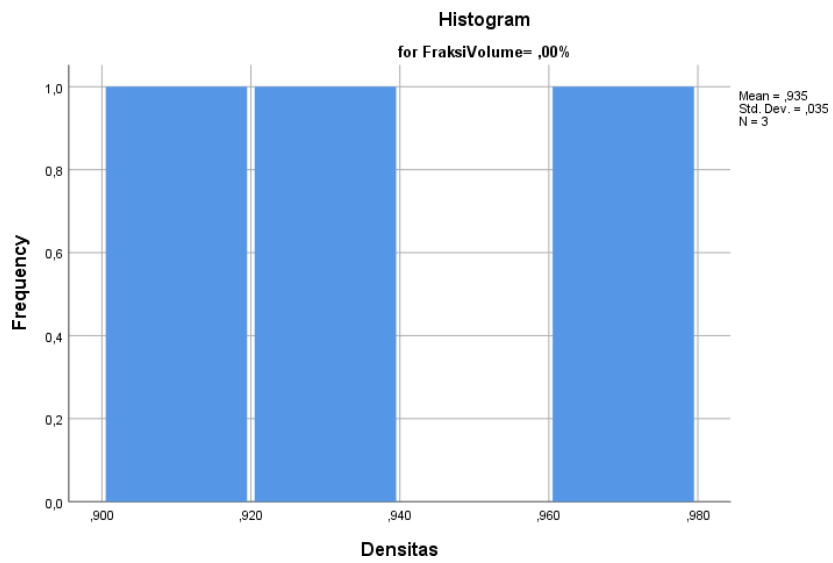
	Fraksi Volume	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Densitas	0,00%	,279	3	.	,939	3	,524
	5,00%	,352	3	.	,826	3	,178
	10,00%	,361	3	.	,807	3	,132
	15,00%	,308	3	.	,902	3	,391

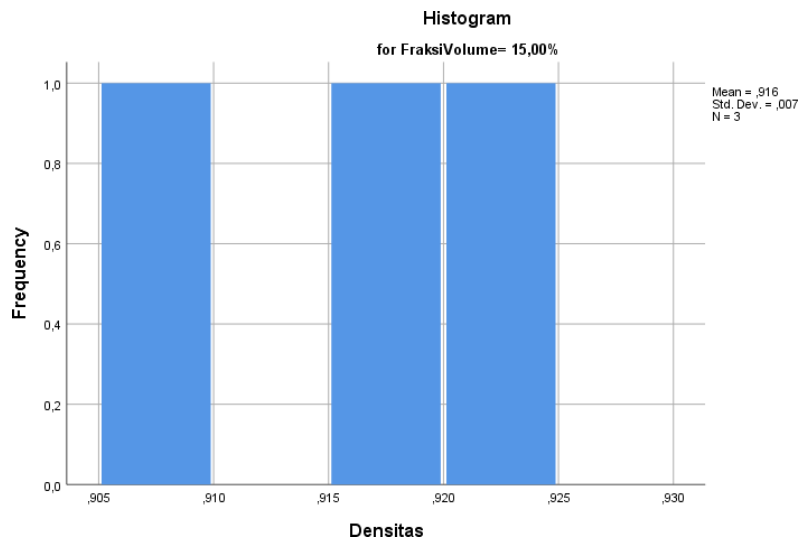
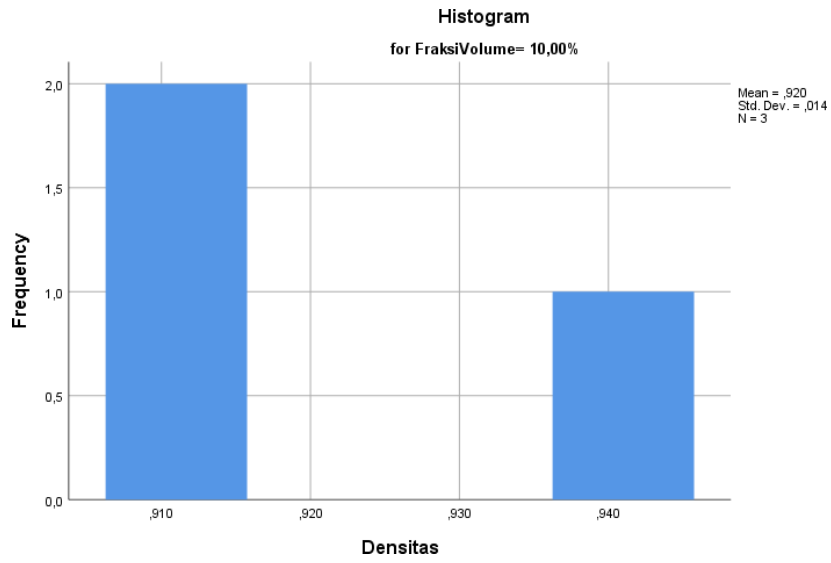
a. Lilliefors Significance Correction



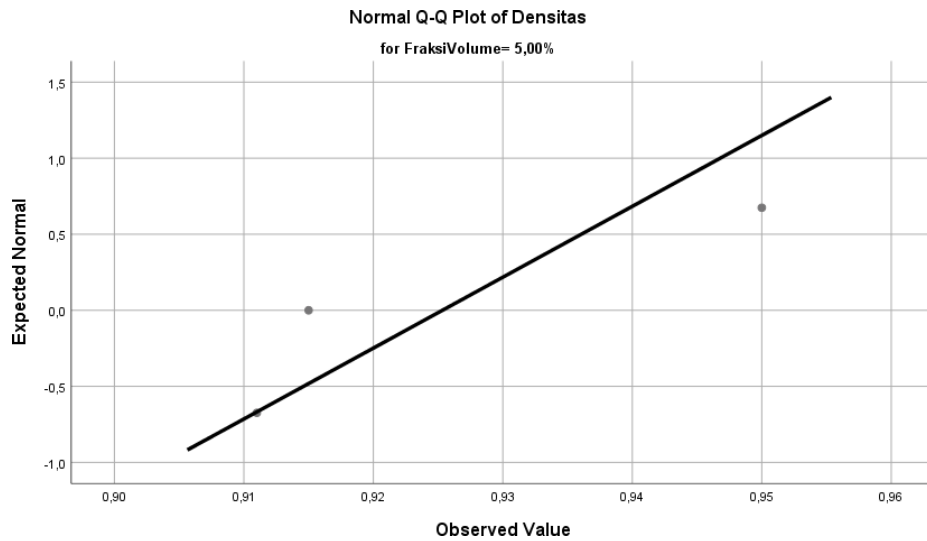
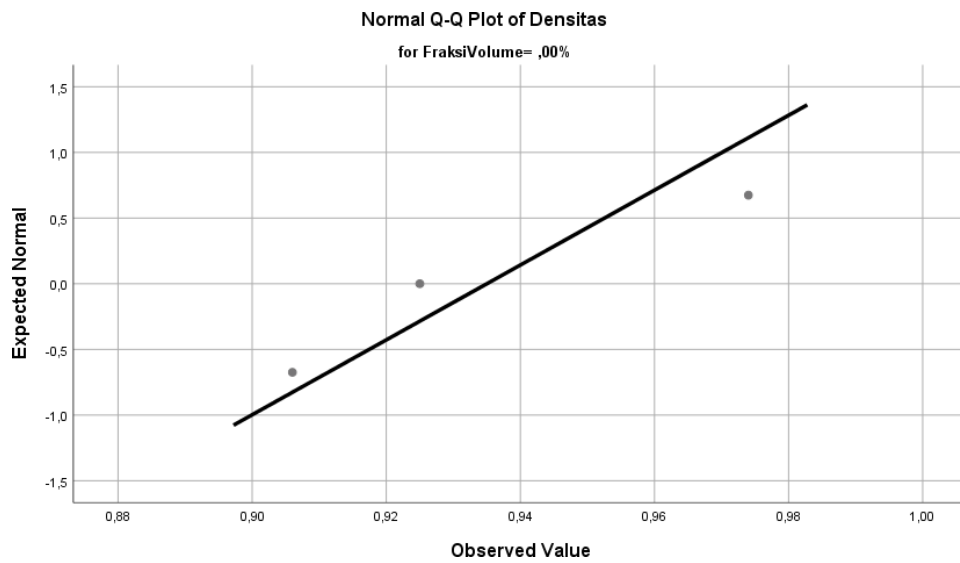
## Densitas

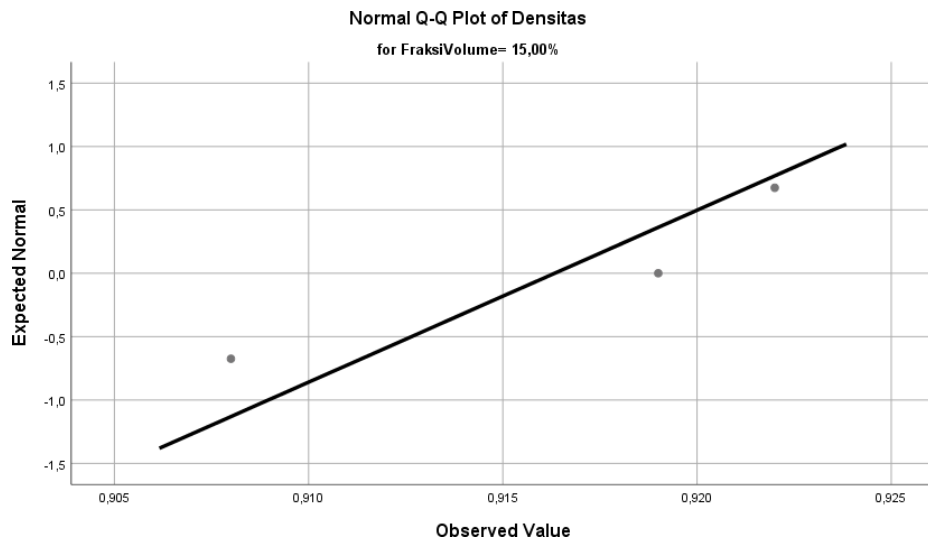
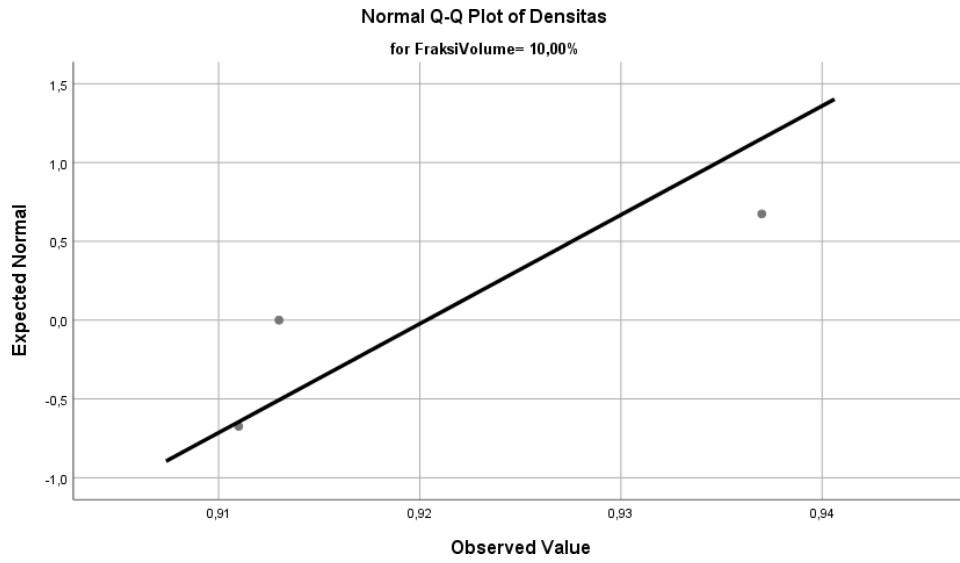
### Histograms



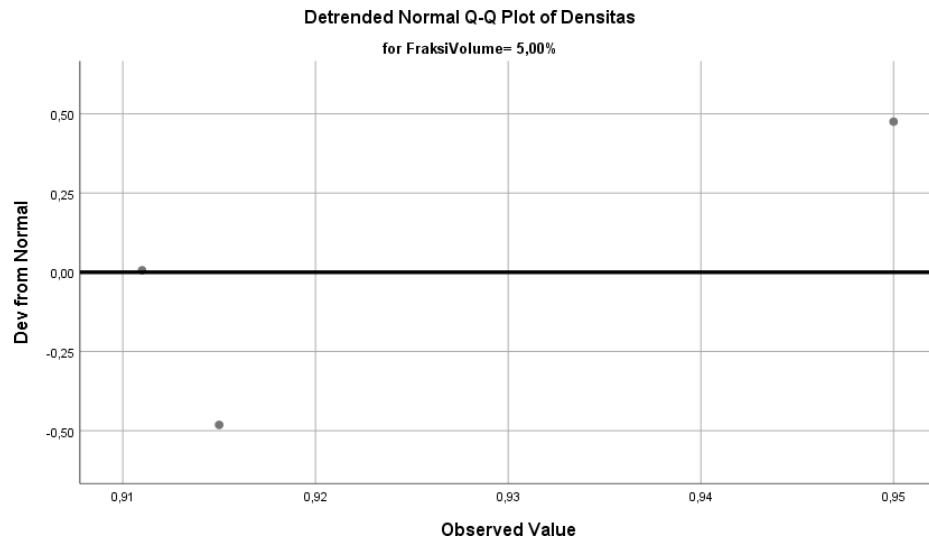
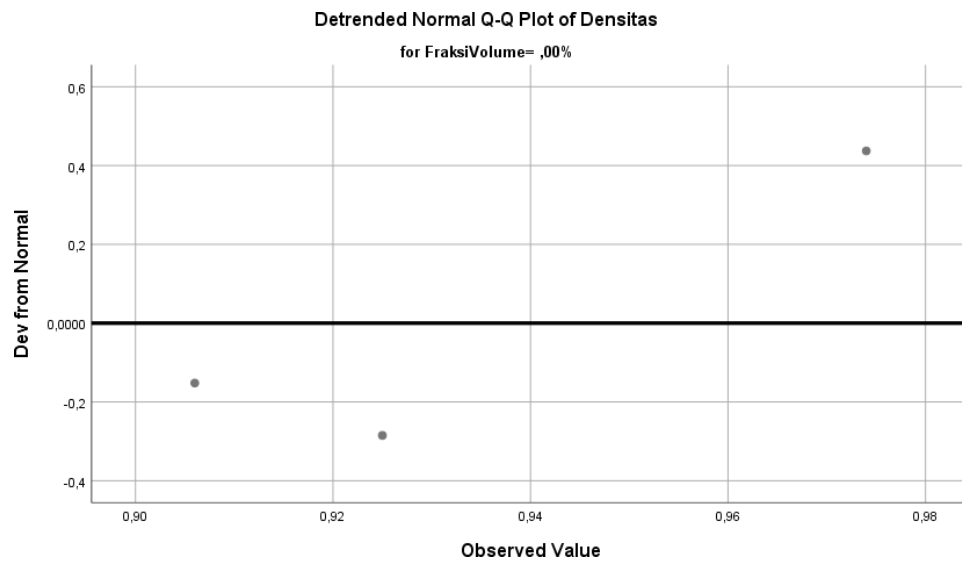


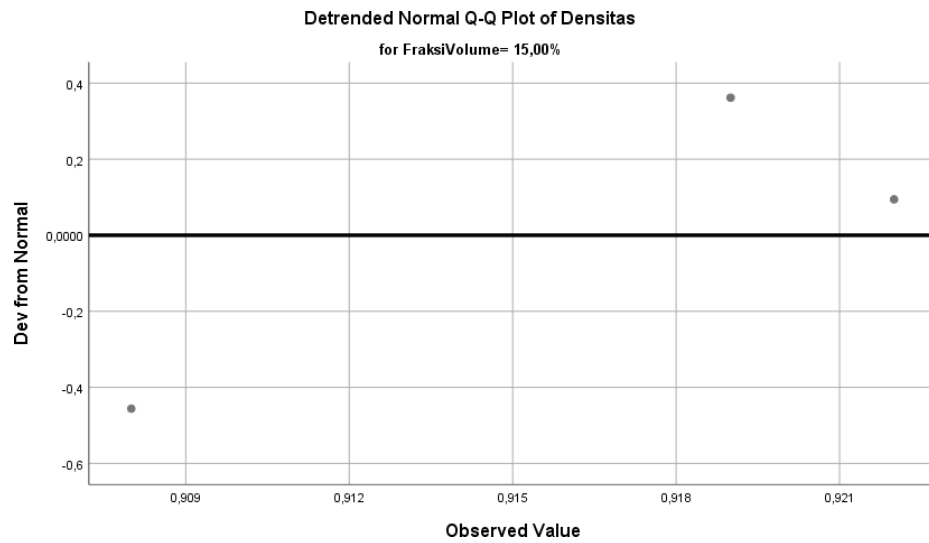
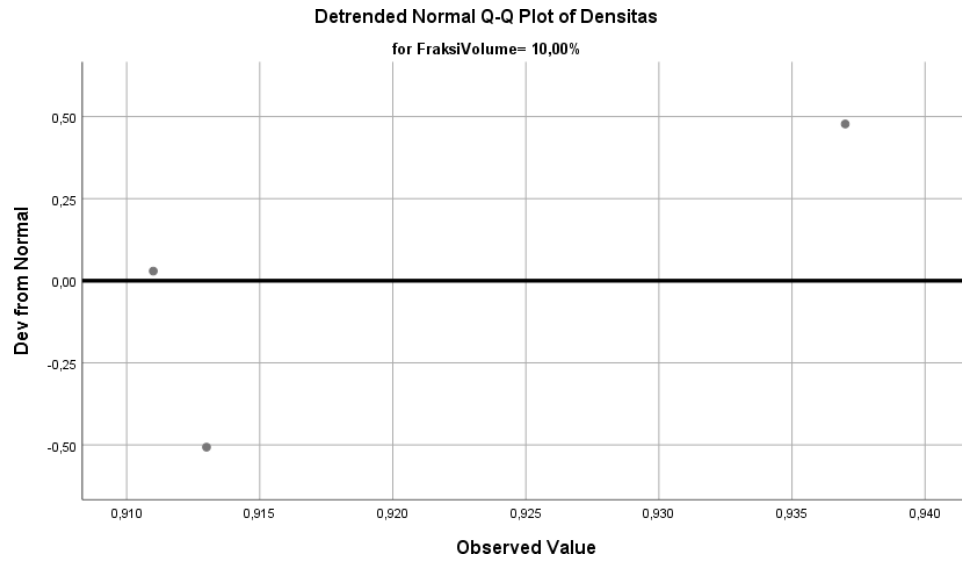
## Normal Q-Q Plots



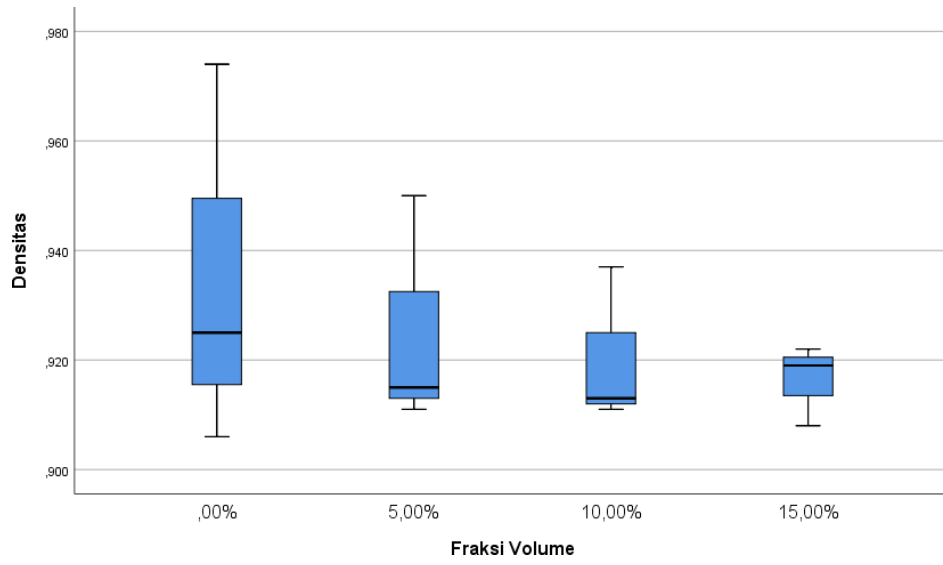


## Detrended Normal Q-Q Plots





## Boxplots



**LAMPIRAN C**  
**ALAT DAN BAHAN**





**Gambar C.1** Neraca Digital



**Gambar C.2** Gelas Beker



**Gambar C.3** Sarung tangan



**Gambar C.4** Akuades



**Gambar C.5** Polyester



**Gambar C.6** Epoksi



**Gambar C.7** NaOH



**Gambar C.8** Vinyl ester



**Gambar C.9** Cetakan Komposit



**Gambar C.10** Wax



**Gambar C.11** Serat Ijuk



**Gambar C.12** Alkohol 70%



**Gambar C.13** Penampang



**Gambar C.14** Kain majun



**Gambar C.15** Penggaris



**Gambar C.16** Gelas Plastik