

APPENDIX G
Wear Resistance Test Results

Types of Test : Sliding Wear Test

Machine Model : -

Sliding Force (N) : 32.7

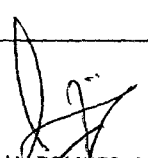
Sliding Distance (m) : 502.65

Sliding time (s) : 600

Specimen's material : Al-MMC

Counter face material : mild steel

No of Run	Combination Factor	First Replication			Second Replication		
		Weight before test (g)	Weight after test (g)	Weight loss (g)	Weight before test (g)	Weight after test(g)	Weight loss (g)
1	A ₀ B ₀ C ₀ D ₀	25.548	25.493	0.055	25.585	25.548	0.037
2	A ₀ B ₁ C ₁ D ₁	24.945	24.914	0.031	24.218	24.171	0.047
3	A ₀ B ₂ C ₂ D ₂	24.689	24.678	0.011	24.486	24.454	0.032
4	A ₁ B ₀ C ₁ D ₂	24.591	24.535	0.056	25.148	25.089	0.059
5	A ₁ B ₁ C ₂ D ₀	24.817	24.784	0.033	25.465	25.430	0.035
6	A ₁ B ₂ C ₀ D ₁	25.127	25.087	0.040	24.896	24.862	0.034
7	A ₂ B ₀ C ₂ D ₁	24.772	24.731	0.041	25.139	25.110	0.029
8	A ₂ B ₁ C ₀ D ₂	24.398	24.374	0.024	24.839	24.790	0.049
9	A ₂ B ₂ C ₁ D ₀	25.366	25.319	0.041	25.278	25.266	0.012

 2/2/05
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APPENDIX H
Vickers Hardness Test Results

Types Of Testing : Vickers Hardness Test
Types of Indenter : _____
Load : 30 kg
Load Time : 10 sec
Loading speed : 55 μ m/sec

No of Run	Combination Factor	First Replication (HV)						Second Replication (HV)					
		1	2	3	4	5	AVG	1	2	3	4	5	AVG
1	A ₀ B ₀ C ₀ D ₀	76.5	73.2	77.1	75.8	75.6	75.6	75.9	81.0	77.6	76.1	70.9	76.3
2	A ₀ B ₁ C ₁ D ₁	64.7	66.4	65.2	63.6	62.5	64.5	66.6	65.0	64.5	65.9	63.8	65.2
3	A ₀ B ₂ C ₂ D ₂	87.2	81.9	75.1	80.3	77.6	80.4	61.3	75.0	79.2	79.3	73.6	73.7
4	A ₁ B ₀ C ₁ D ₂	75.2	73.4	76.2	77.0	74.2	75.2	73.4	71.6	69.6	68.2	73.0	71.2
5	A ₁ B ₁ C ₂ D ₀	77.4	79.4	78.2	82.8	78.9	79.3	81.8	79.5	80.2	77.5	80.5	79.9
6	A ₁ B ₂ C ₀ D ₁	81.3	79.1	81.3	79.9	81.3	80.6	78.7	84.0	89.2	87.4	82.6	84.4
7	A ₂ B ₀ C ₂ D ₁	71.3	69.4	72.0	71.3	69.6	70.7	72.1	71.2	71.6	72.0	70.6	71.5
8	A ₂ B ₁ C ₀ D ₂	72.5	72.1	72.4	73.3	71.6	72.5	71.7	71.8	69.7	69.5	71.4	70.7
9	A ₂ B ₂ C ₁ D ₀	82.0	84.0	83.5	84.5	83.2	83.4	77.7	77.2	85.6	84.4	79.3	80.8
10	Al-LM6	65.1	68.2	61.7	68.3	68.6	66.4	65.2	67.3	66.8	69.0	64.3	66.5
11	Al+ Copper	37.0	42.3	39.8	39.4	38.8	39.5	37.1	40.4	39.9	39.6	38.1	39.0


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APPENDIX I
Density Test Results

Density Test

Equipment : Ultrapyrometer 1000

Cell : Medium

Replication 1

Replication 2

No	Combination Factor	Parameter	Run No. 1	Run No. 2	Run No. 3	Run No. 1	Run No. 2	Run No. 3
1	A ₀ B ₀ C ₀ D ₀	Temp. (°C)	27.7	27.7	27.7	28.0	28.1	28.2
		Vol. (cm ³)	9.1427	9.1497	9.1578	9.5070	9.5087	9.503
		Density (g/cm ³)	2.6891	2.6871	2.6847	2.6778	2.6773	2.679
		Mean Volume (cm ³)	9.1501			9.5062		
		Mean Density (g/cm ³)	2.6870			2.678		
		Std Deviation (%)	0.0062			0.0024		
		Sample weight (g)	24.586			25.458		
2	A ₀ B ₀ C ₀ D ₀	Temp. (°C)	28.4	28.5	28.6	28.8	28.9	29.0
		Vol. (cm ³)	9.2779	9.2769	9.2685	9.1748	9.1844	9.1604
		Density (g/cm ³)	2.6842	2.6845	2.6870	2.6328	2.630	2.6369
		Mean Volume (cm ³)	9.2744			9.1732		
		Mean Density (g/cm ³)	2.6852			2.6332		
		Std Deviation (%)	0.0042			0.0099		
		Sample weight (g)	24.904			24.155		
3	A ₀ B ₀ C ₀ D ₀	Temp. (°C)	29.2	29.2	29.3	29.4	29.5	29.5
		Vol. (cm ³)	8.9974	9.0044	9.0084	9.083	8.9467	9.8937
		Density (g/cm ³)	2.7161	2.714	2.7128	2.7162	2.7575	2.4937
		Mean Volume (cm ³)	9.0034			9.3077		
		Mean Density (g/cm ³)	2.7143			2.6506		
		Std Deviation (%)	0.0045			0.4178		
		Sample weight (g)	24.438			24.671		
4	A ₀ B ₀ C ₀ D ₀	Temp. (°C)	29.6	29.6	29.6	29.7	29.7	29.8
		Vol. (cm ³)	9.3063	9.318	9.3251	9.1050	9.111	9.1147
		Density (g/cm ³)	2.6959	2.6908	2.6888	2.6935	2.6917	2.6906
		Mean Volume (cm ³)	9.3145			9.1102		
		Mean Density (g/cm ³)	2.6918			2.6919		
		Std Deviation (%)	0.0104			0.0040		

		Sample weight (g)	25.073			24.524		
5	A ₁ B ₁ C ₂ D ₀	Temp. (°C)	29.9	29.9	29.9	29.9	29.9	29.9
		Vol. (cm ³)	9.1184	9.1256	9.1398	7.8436	7.8351	7.8438
		Density (g/cm ³)	2.7050	2.7028	2.6986	2.7102	2.7132	2.7102
		Mean Volume (cm ³)	9.1279			7.8408		
		Mean Density (g/cm ³)	2.7021			2.7112		
		Std Deviation (%)	0.0089			0.0040		
		Sample weight (g)	24.665			21.2580		
6	A ₁ B ₂ C ₀ D ₁	Temp. (°C)	30.0	30.1	30.1	30.2	30.2	30.2
		Vol. (cm ³)	9.2974	9.3048	9.3147	9.1939	9.2042	9.2128
		Density (g/cm ³)	2.6971	2.6950	2.6921	2.7024	2.6994	2.6969
		Mean Volume (cm ³)	9.3056			9.2037		
		Mean Density (g/cm ³)	2.6947			2.6996		
		Std Deviation (%)	0.0071			0.0077		
		Sample weight (g)	25.076			24.8460		
7	A ₂ B ₀ C ₂ D ₁	Temp. (°C)	30.3	30.4	30.4	30.4	30.5	30.5
		Vol. (cm ³)	9.2862	9.2971	9.3024	9.1226	9.1248	9.1356
		Density (g/cm ³)	2.7023	2.6991	2.6976	2.7092	2.7085	2.7054
		Mean Volume (cm ³)	9.2952			9.1277		
		Mean Density (g/cm ³)	2.6997			2.7077		
		Std Deviation (%)	0.0068			0.0057		
		Sample weight (g)	25.094			24.715		
8	A ₂ B ₁ C ₀ D ₂	Temp. (°C)	30.6	30.6	30.6	30.2	30.2	30.3
		Vol. (cm ³)	9.1852	9.1908	9.1958	9.046	9.0419	9.0368
		Density (g/cm ³)	2.6970	2.6955	2.6941	2.6927	2.6939	2.6954
		Mean Volume (cm ³)	9.1906			9.0416		
		Mean Density (g/cm ³)	2.6956			2.6940		
		Std Deviation (%)	0.0043			0.0038		
		Sample weight (g)	24.774			24.358		
9	A ₂ B ₂ C ₁ D ₀	Temp. (°C)	30.5	30.5	30.6	30.6	30.6	30.6
		Vol. (cm ³)	9.3393	9.3213	9.3111	8.2370	8.2305	8.2199
		Density (g/cm ³)	2.7037	2.709	2.7119	2.7113	2.7135	2.7169
		Mean Volume (cm ³)	9.3239			8.299		
		Mean Density (g/cm ³)	2.7082			2.7139		

		Std Deviation (%)	0.0117			0.0071		
		Sample weight (g)	25.251			22.3330		
10	LM6	Temp. (°C)	31.2	31.2	31.3	31.3	31.4	31.4
		Vol. (cm ³)	9.2732	9.2662	9.2680	9.2481	9.2510	9.2530
		Density (g/cm ³)	2.7054	2.7075	2.7069	2.7094	2.7086	2.708
		Mean Volume (cm ³)	9.2691			9.2507		
		Mean Density (g/cm ³)	2.7066			2.7087		
		Std Deviation (%)	0.003			0.002		
		Sample weight (g)	25.088			25.057		
11	Al + Cu	Temp. (°C)	30.7	30.8	30.9	31.0	31.0	31.0
		Vol. (cm ³)	9.5236	9.5104	9.5046	9.2351	9.242	9.246
		Density (g/cm ³)	2.7145	2.7183	2.7199	2.7018	2.6997	2.6986
		Mean Volume (cm ³)	9.5129			9.241		
		Mean Density (g/cm ³)	2.7176			2.70		
		Std Deviation (%)	0.008			0.0045		
		Sample weight (g)	25.852			24.951		

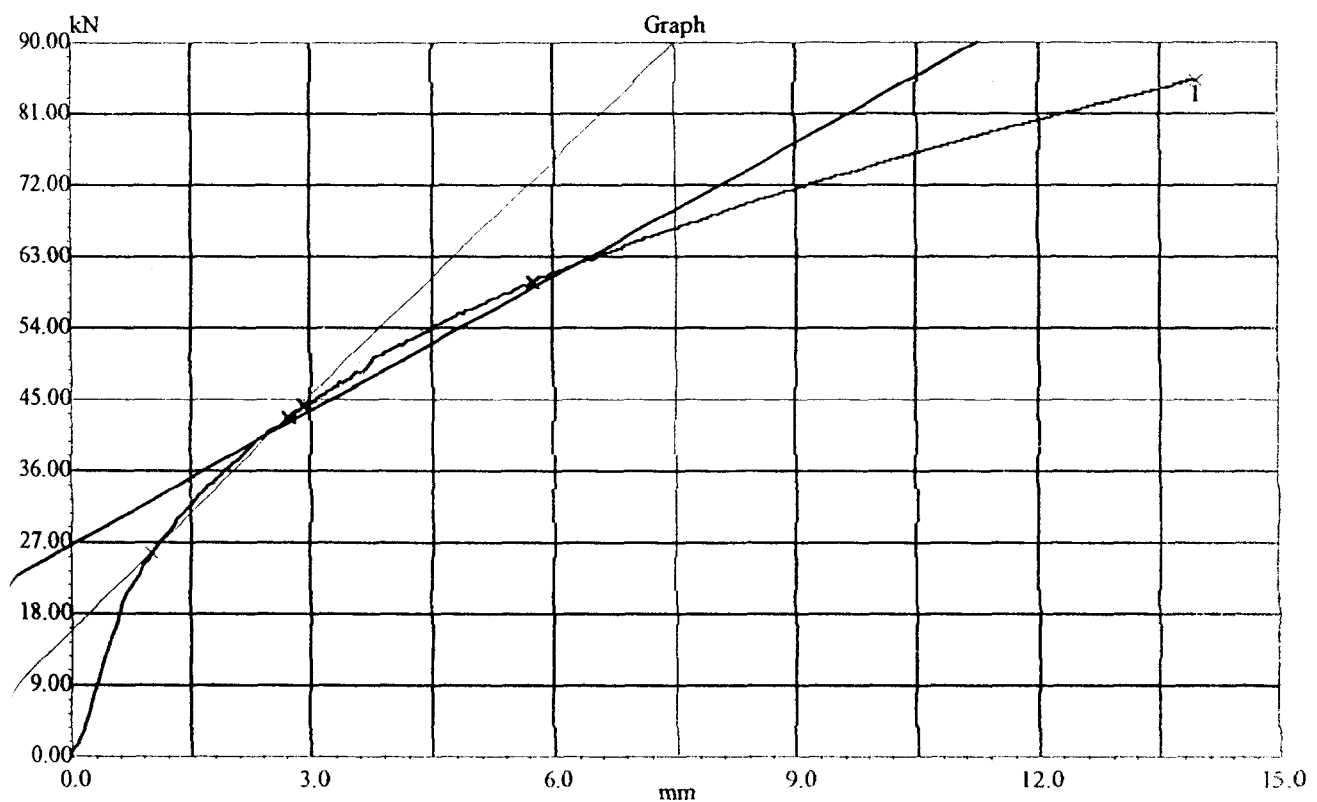
APPENDIX J
Compression Test Results

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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al+Cu	Max. load : 85.24kN
Area : 314.16mm ²	Elongation at break : 13.99mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 23.31%
	Young's Modulus : 1915.29MPa
	Yield Point : 0.14kN/mm ²
	Yield strength @0.2% : 0.20kN/mm ²

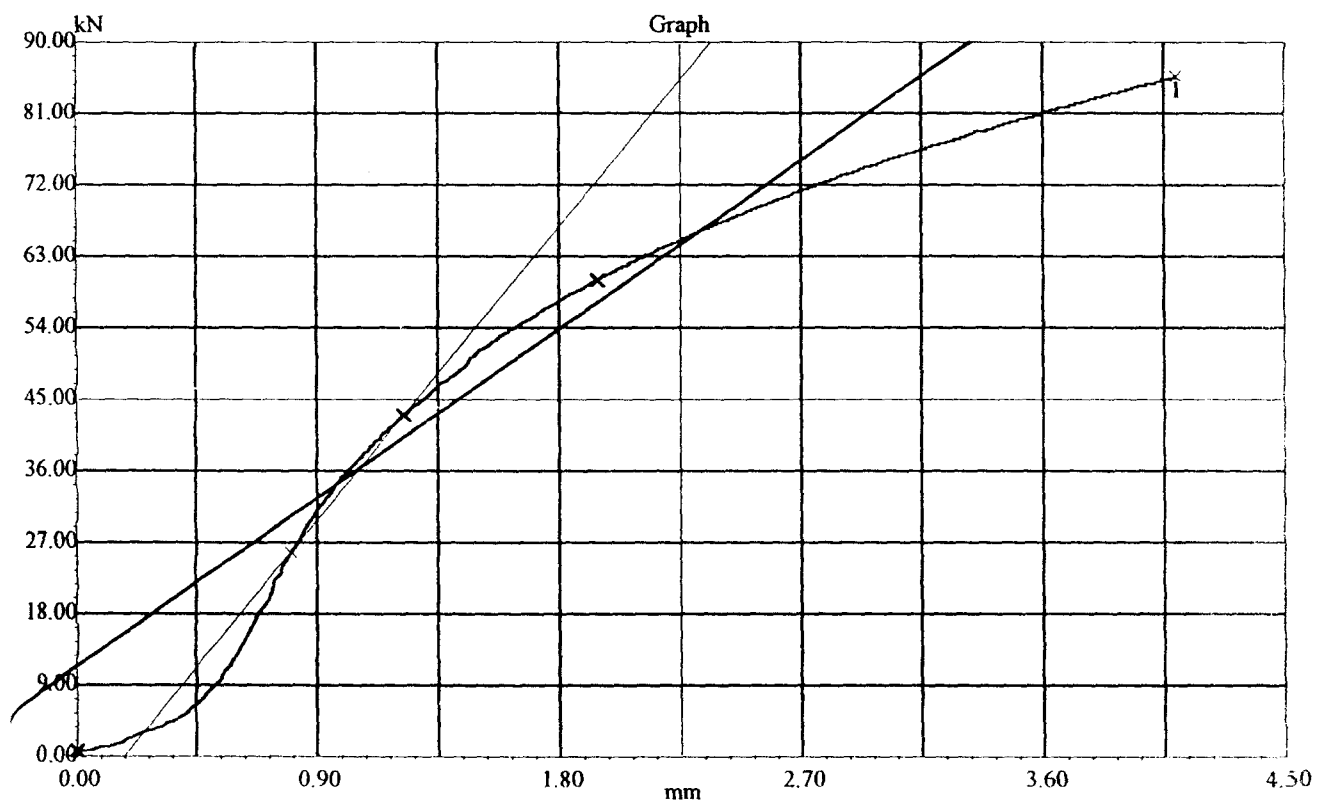


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al(LM6)	Max. load : 85.58kN
Area : 314.16mm ²	Elongation at break : 4.10mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 6.83%
	Young's Modulus : 7876.90MPa
	Yield Point : 0.00kN/mm ²
	Yield strength @0.2% : 0.21kN/mm ²

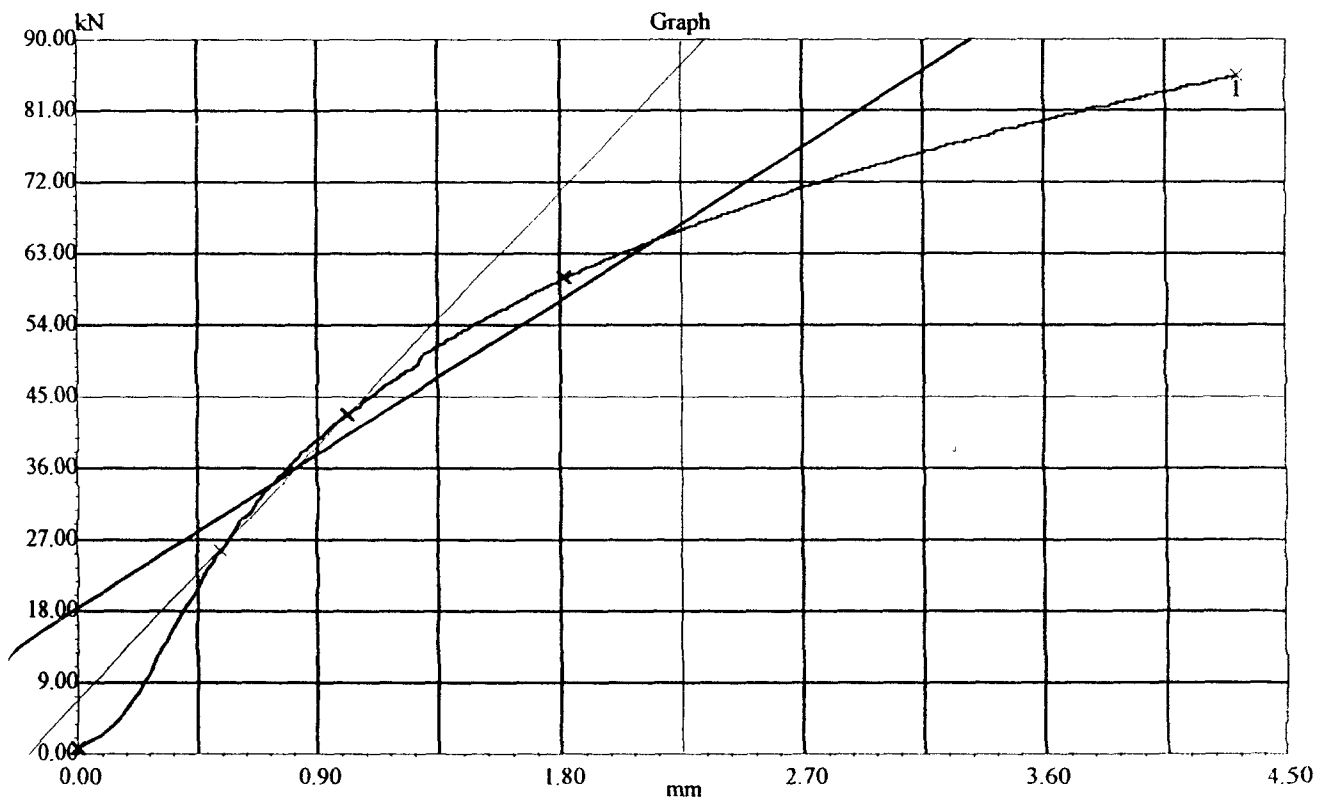


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al(LM6)B	Max. load : 85.37kN
Area : 314.16mm ²	Elongation at break : 4.33mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 7.21%
	Young's Modulus : 6824.27MPa
	Yield Point : 0.00kN/mm ²
	Yield strength @0.2% : 0.21kN/mm ²

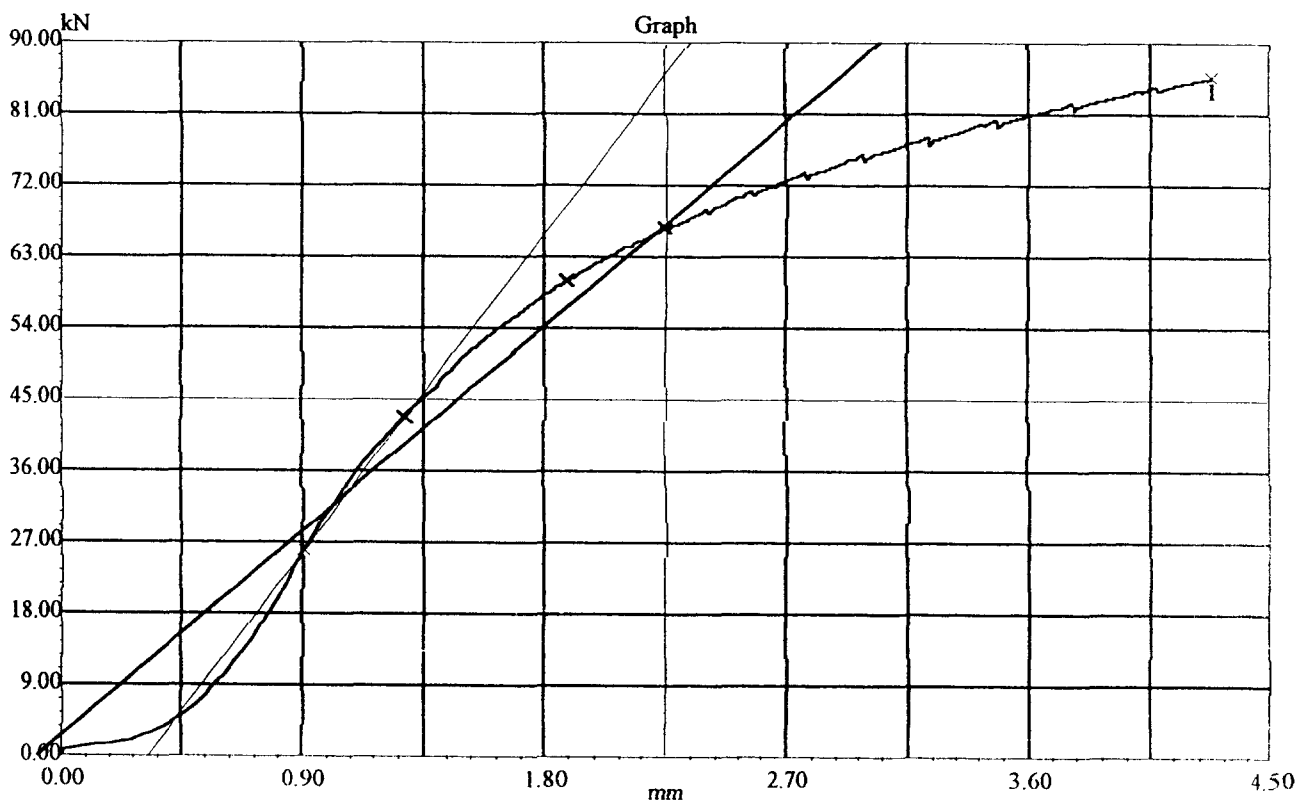


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC1A	Max. load : 85.53kN
Area : 314.16mm ²	Elongation at break : 4.28mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 7.13%
	Young's Modulus : 8712.03MPa
	Yield Point : 0.21kN/mm ²
	Yield strength @0.2% : 0.21kN/mm ²

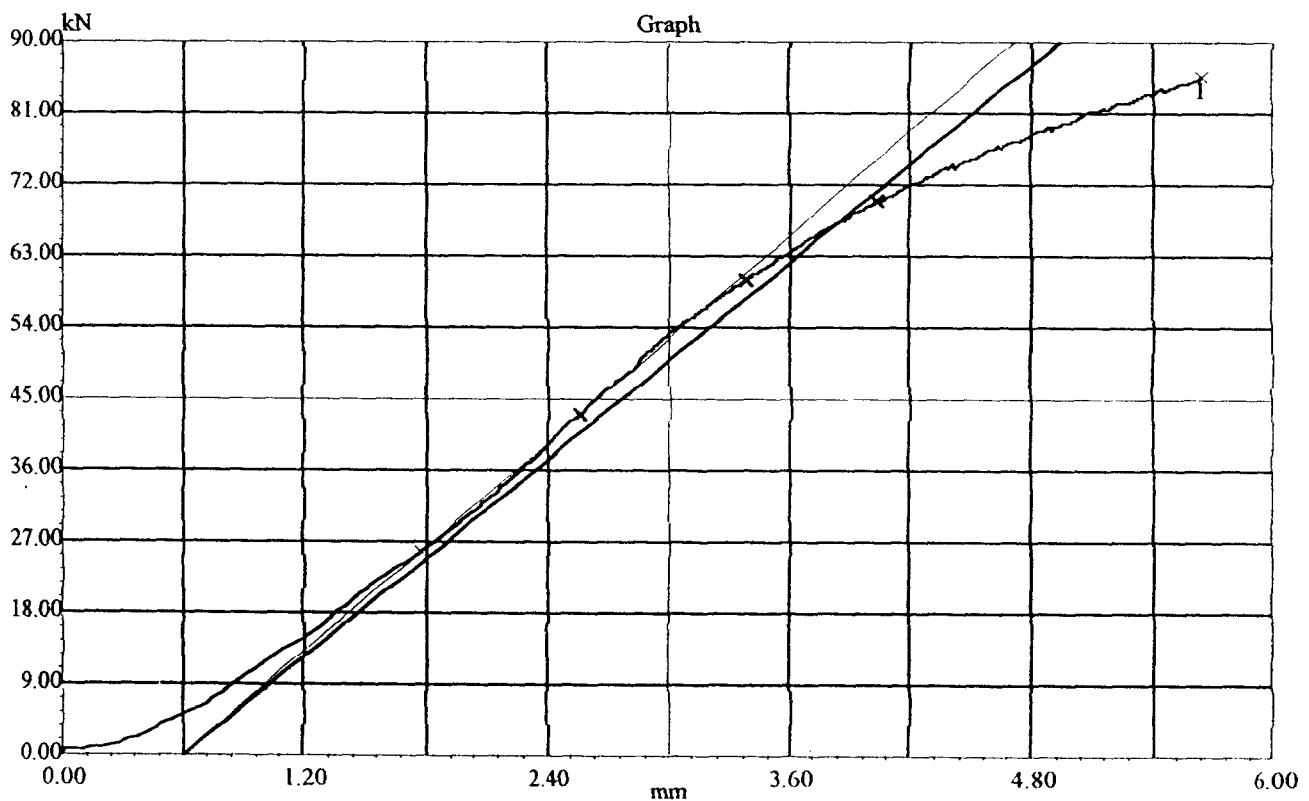


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC1B	Max. load : 85.58kN
Area : 314.16mm ²	Elongation at break : 5.65mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 9.42%
	Young's Modulus : 4161.86MPa
	Yield Point : 0.22kN/mm ²
	Yield strength @0.2% : 0.21kN/mm ²

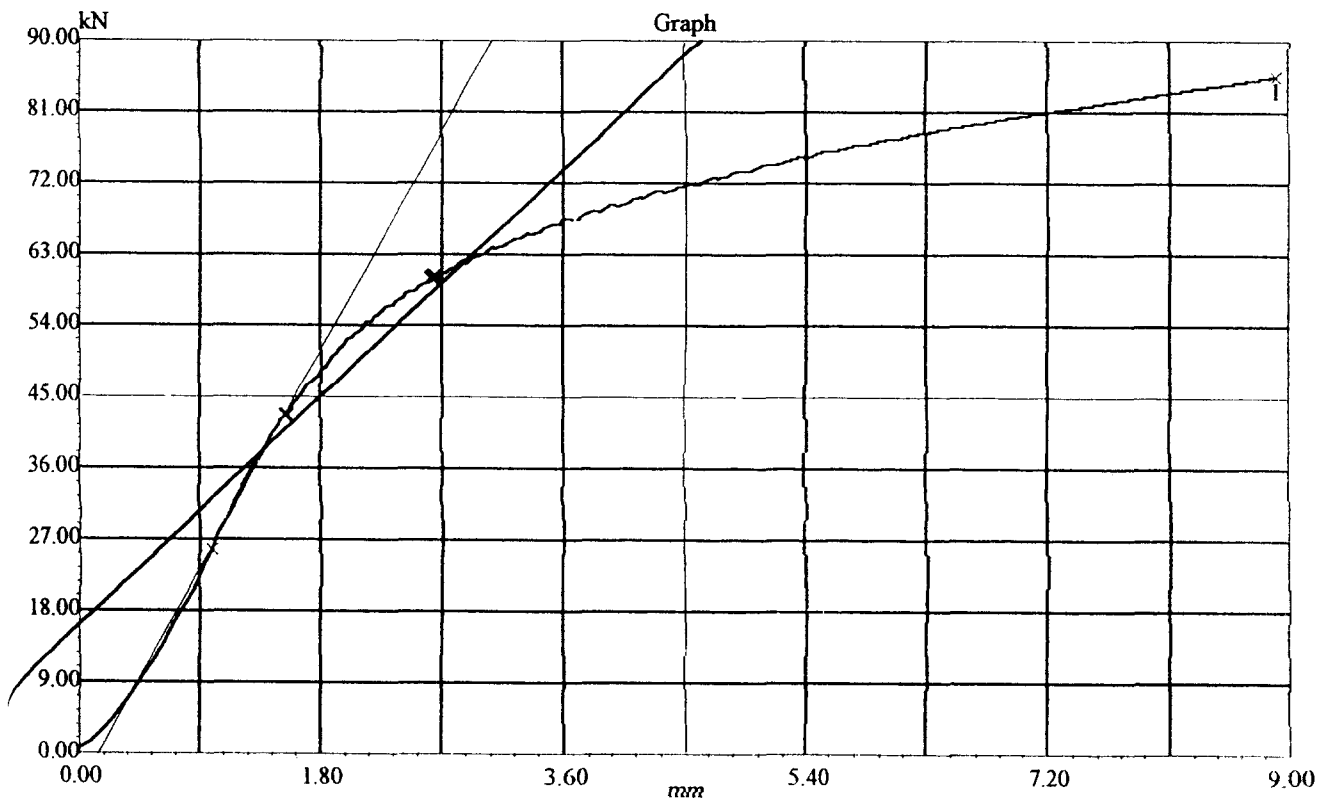


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC2B	Max. load : 85.38kN
Area : 314.16mm ²	Elongation at break : 8.91mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 14.85%
	Young's Modulus : 5862.93MPa
	Yield Point : 0.19kN/mm ²
	Yield strength @0.2% : 0.20kN/mm ²

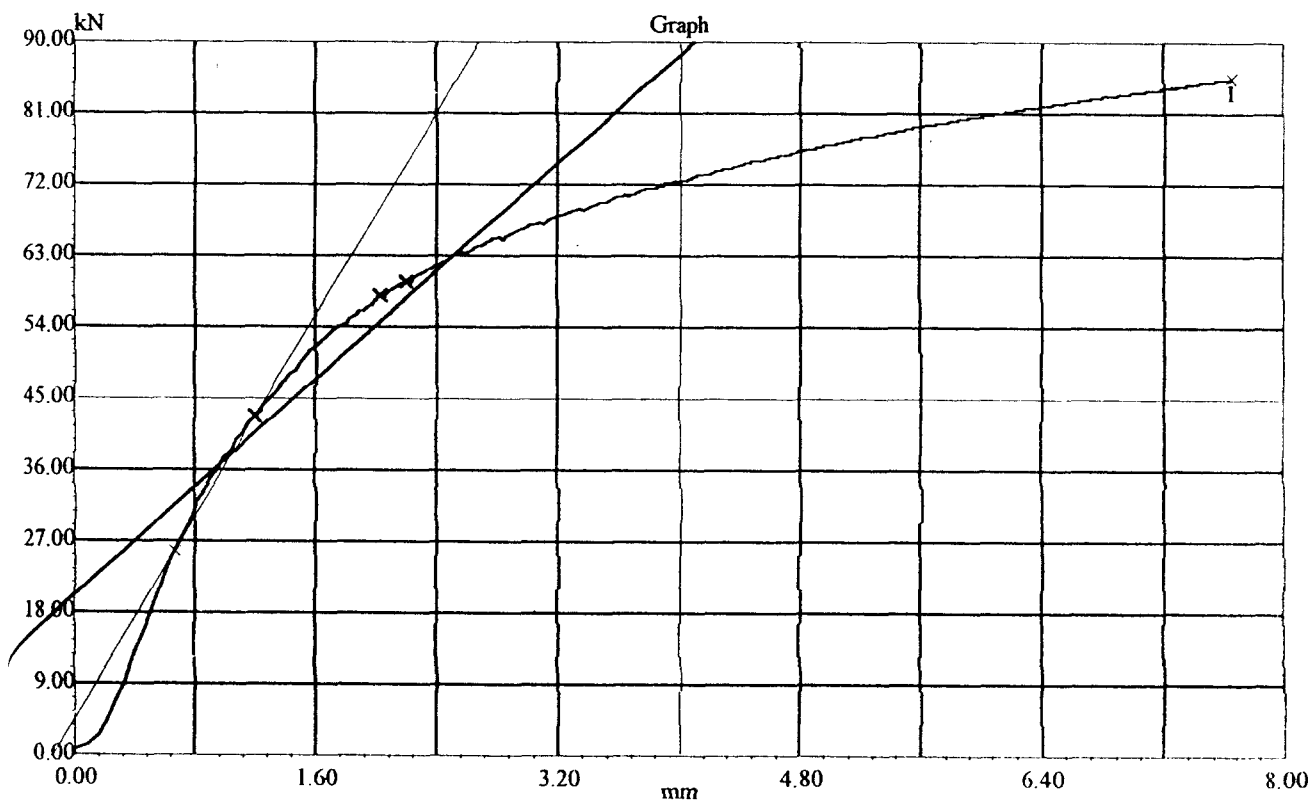


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC2A	Max. load : 85.32kN
Area : 314.16mm ²	Elongation at break : 7.65mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 12.75%
	Young's Modulus : 6134.20MPa
	Yield Point : 0.18kN/mm ²
	Yield strength @0.2% : 0.20kN/mm ²

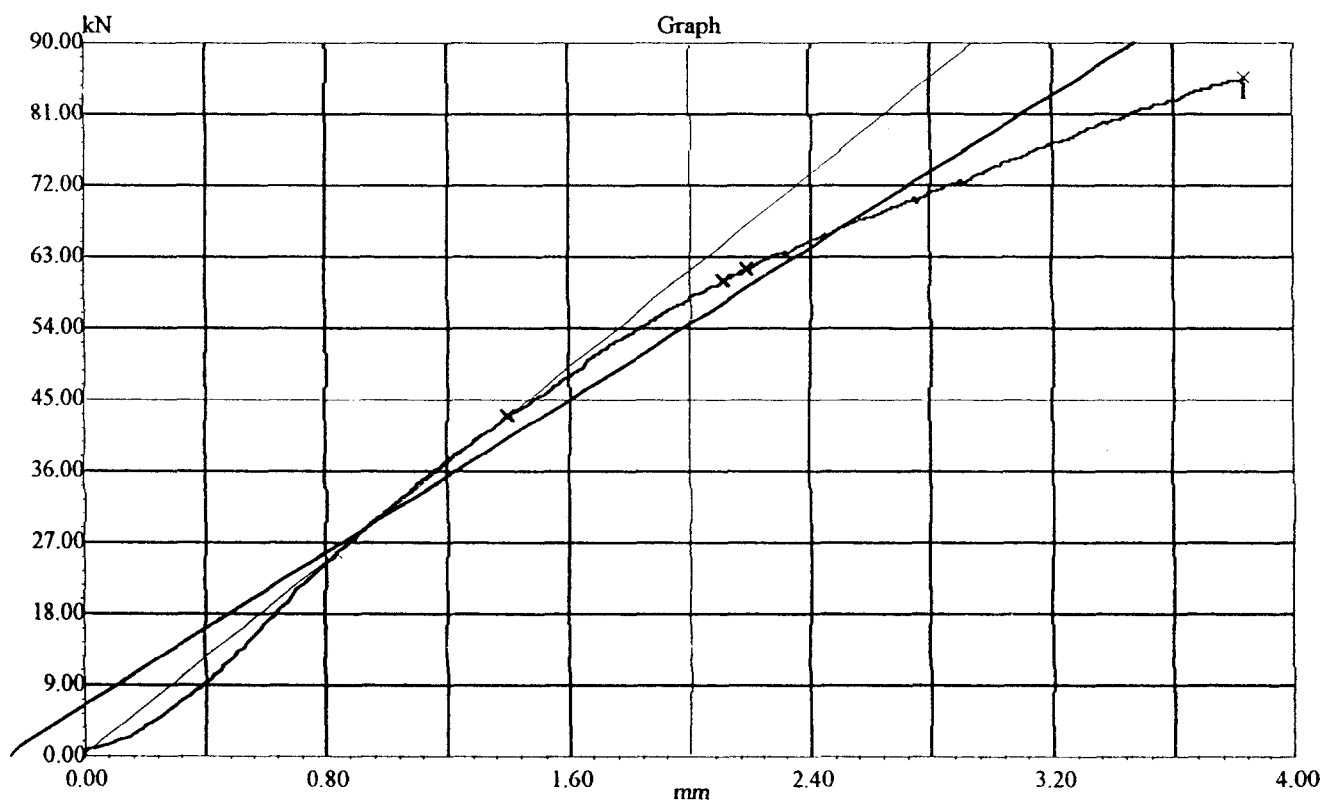


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC3B	Max. load : 85.52kN
Area : 314.16mm ²	Elongation at break : 3.84mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 6.40%
	Young's Modulus : 5777.51MPa
	Yield Point : 0.20kN/mm ²
	Yield strength @0.2% : 0.21kN/mm ²

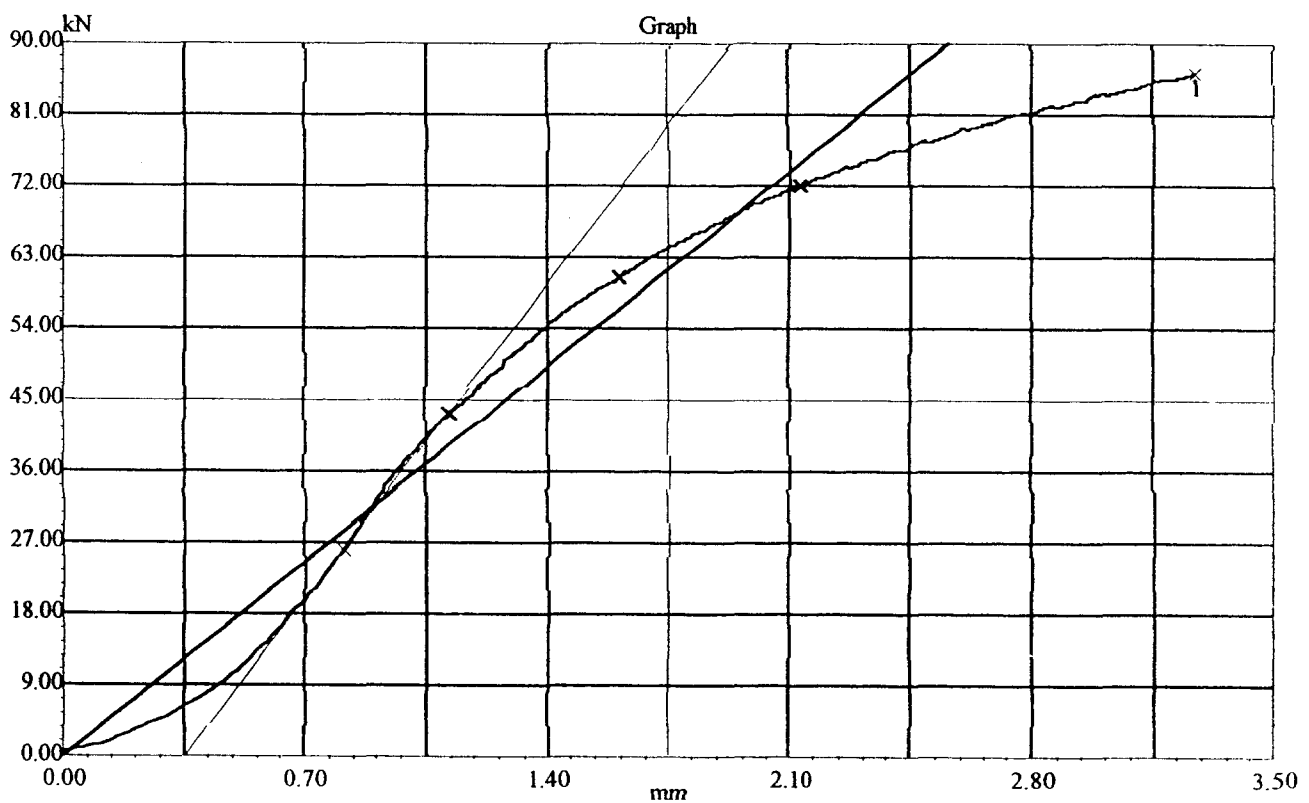


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC3A	Max. load : 86.19kN
Area : 314.16mm ²	Elongation at break : 3.28mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 5.46%
	Young's Modulus : 10695.37MPa
	Yield Point : 0.23kN/mm ²
	Yield strength @0.2% : 0.22kN/mm ²

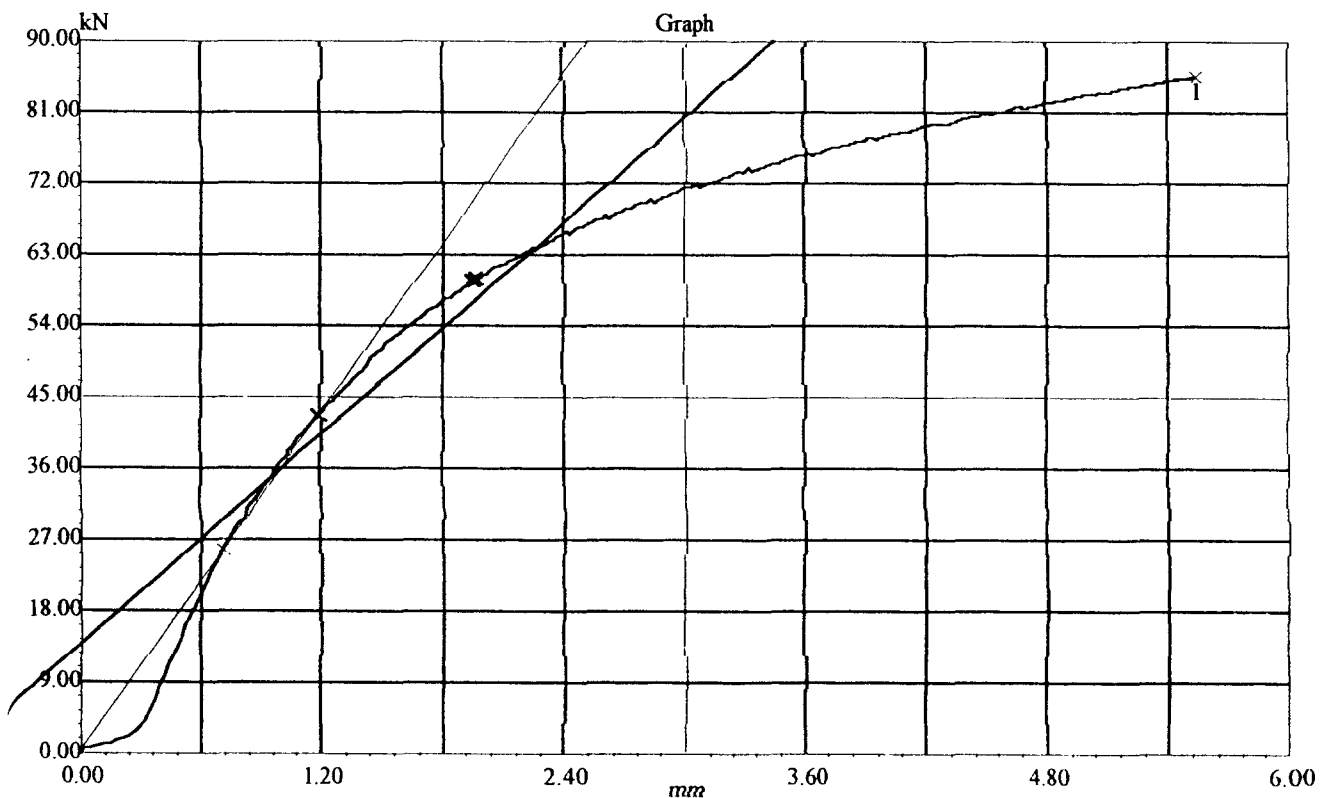


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC4A	Max. load : 85.39kN
Area : 314.16mm ²	Elongation at break : 5.55mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 9.25%
	Young's Modulus : 6768.55MPa
	Yield Point : 0.19kN/mm ²
	Yield strength @0.2% : 0.20kN/mm ²

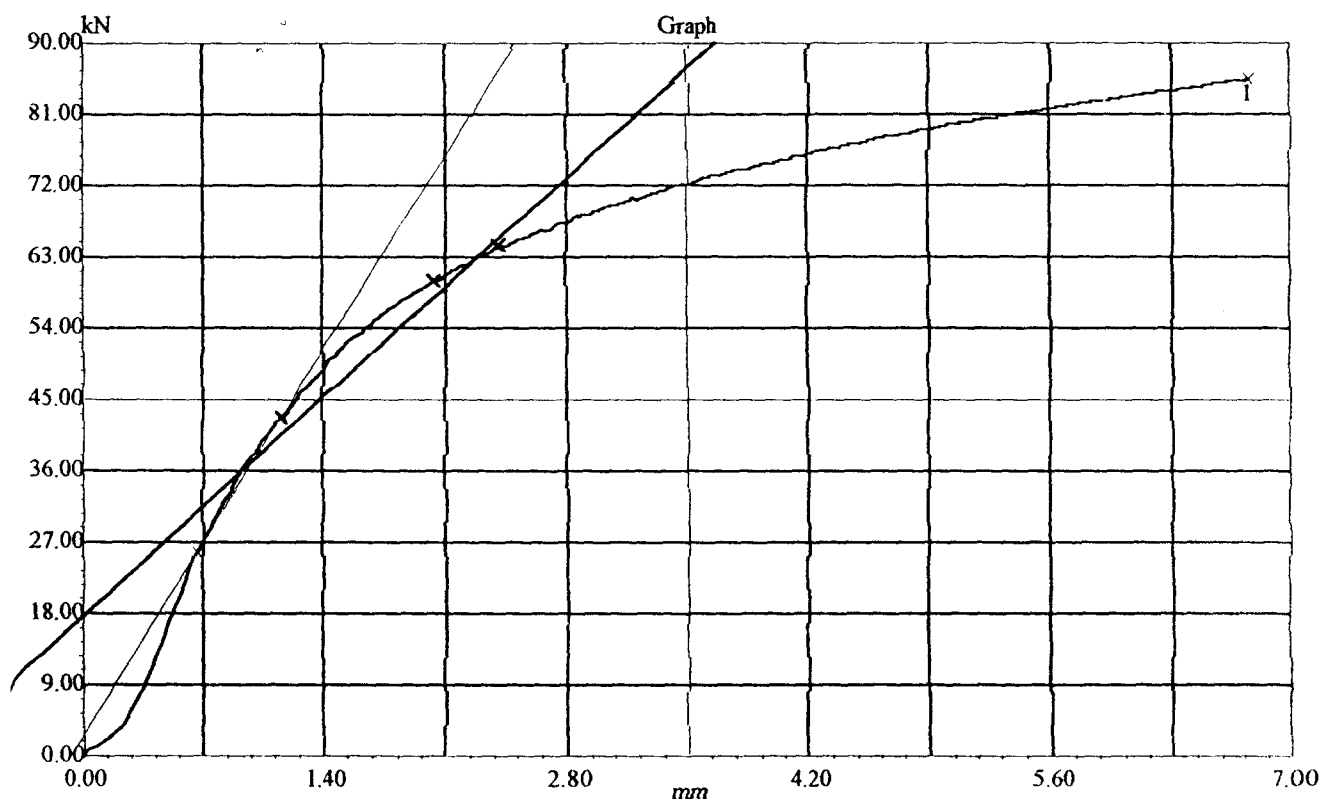


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC4B	Max. load : 85.37kN
Area : 314.16mm ²	Elongation at break : 6.75mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 11.25%
	Young's Modulus : 6746.33MPa
	Yield Point : 0.20kN/mm ²
	Yield strength @0.2% : 0.20kN/mm ²

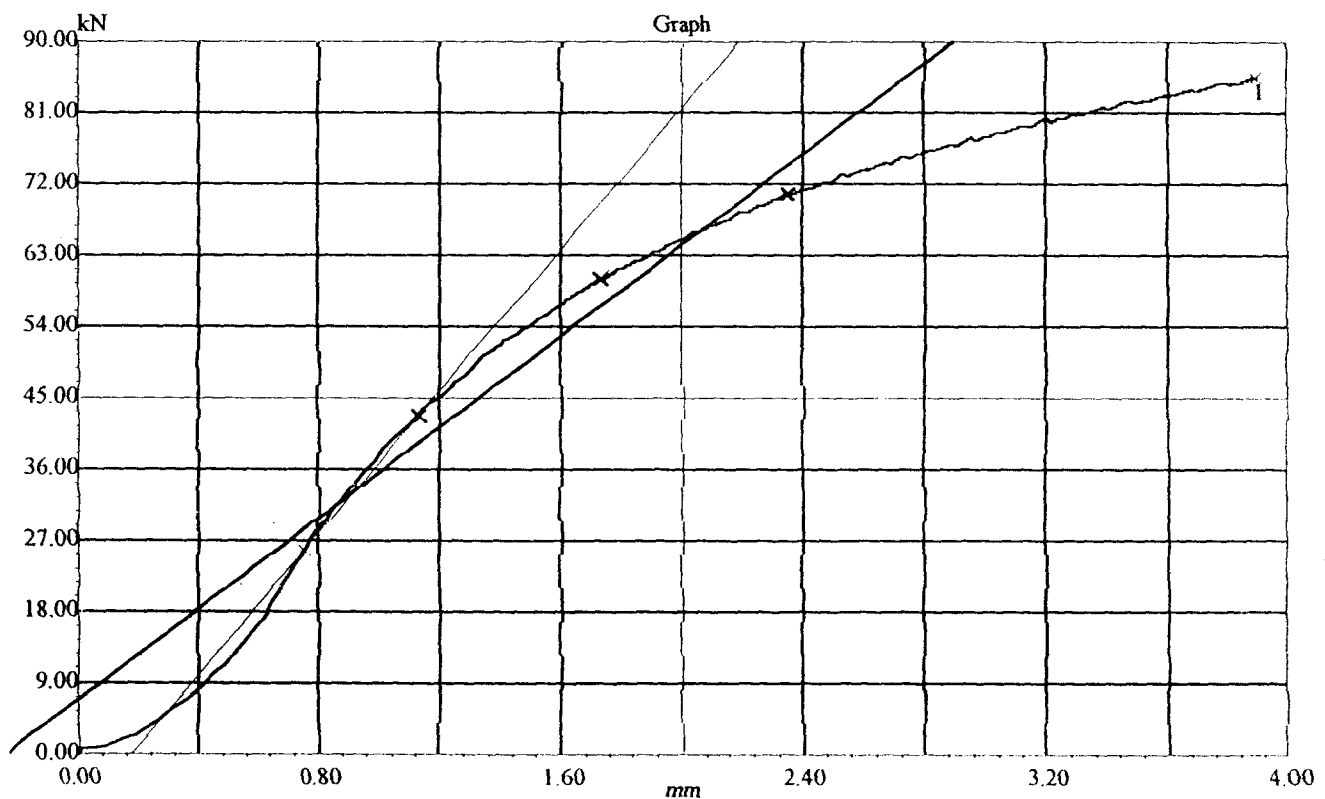


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC5A	Max. load : 85.35kN
Area : 314.16mm ²	Elongation at break : 3.90mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 6.50%
	Young's Modulus : 8608.06MPa
	Yield Point : 0.23kN/mm ²
	Yield strength @0.2% : 0.21kN/mm ²

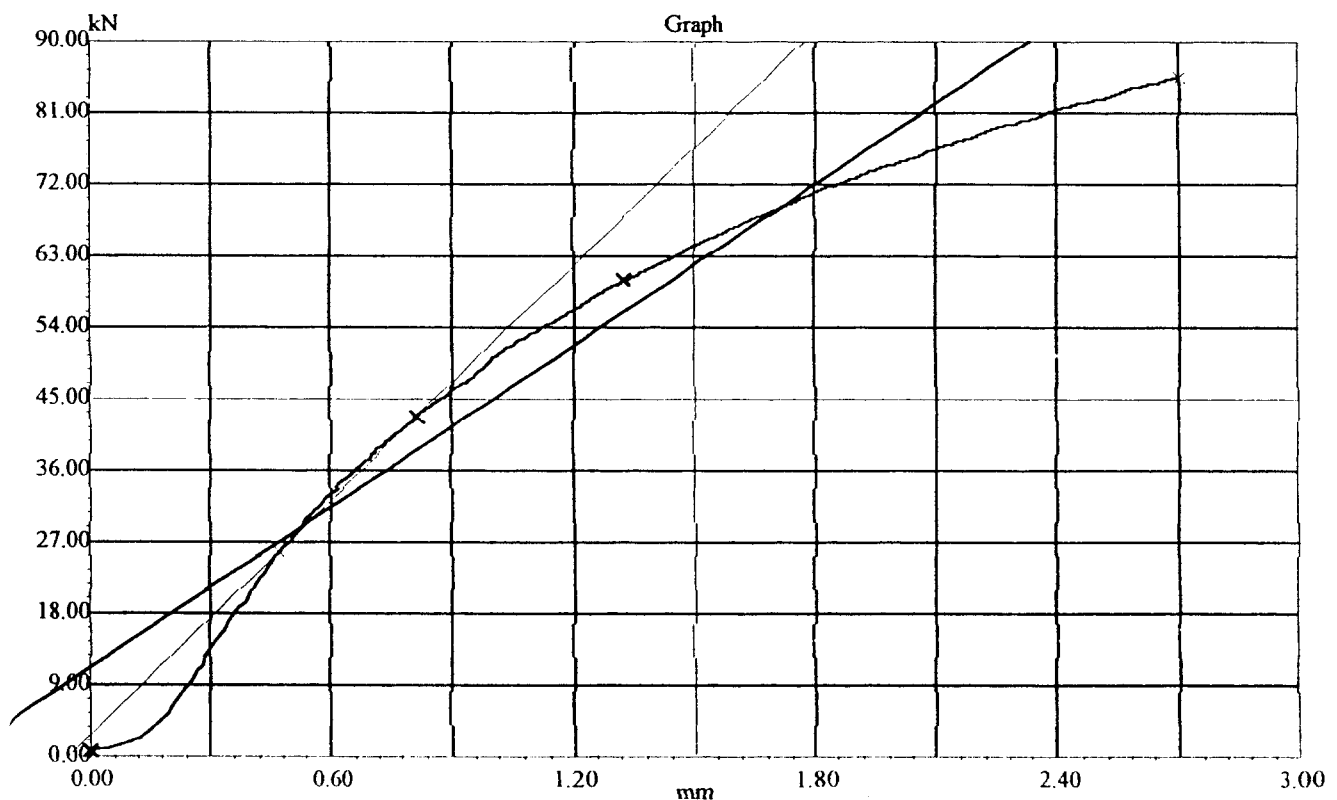


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC6A	Max. load : 85.38kN
Area : 314.16mm ²	Elongation at break : 2.70mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 4.50%
	Young's Modulus : 9410.06MPa
	Yield Point : 0.00kN/mm ²
	Yield strength @0.2% : 0.22kN/mm ²

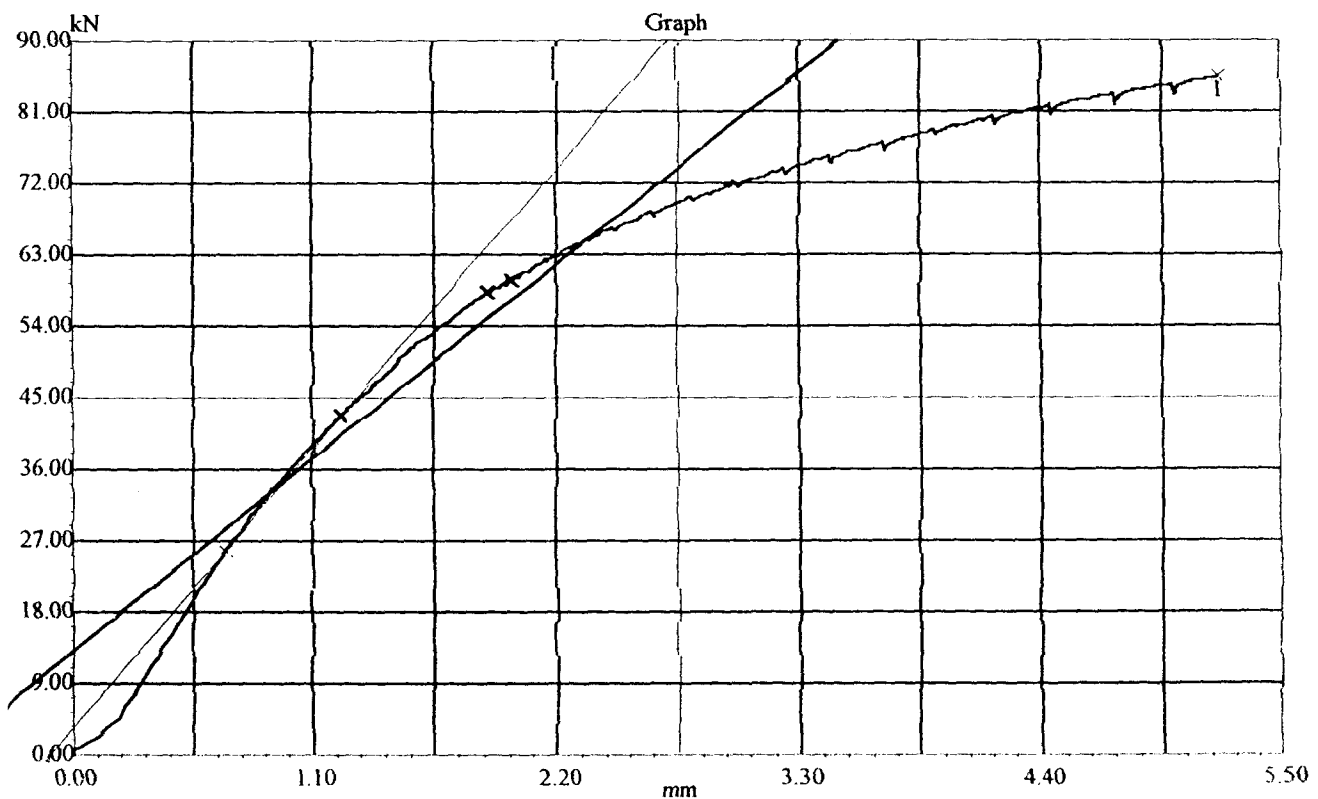


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC7A	Max. load : 85.32kN
Area : 314.16mm ²	Elongation at break : 5.21mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 8.69%
	Young's Modulus : 6156.43MPa
	Yield Point : 0.19kN/mm ²
	Yield strength @0.2% : 0.20kN/mm ²

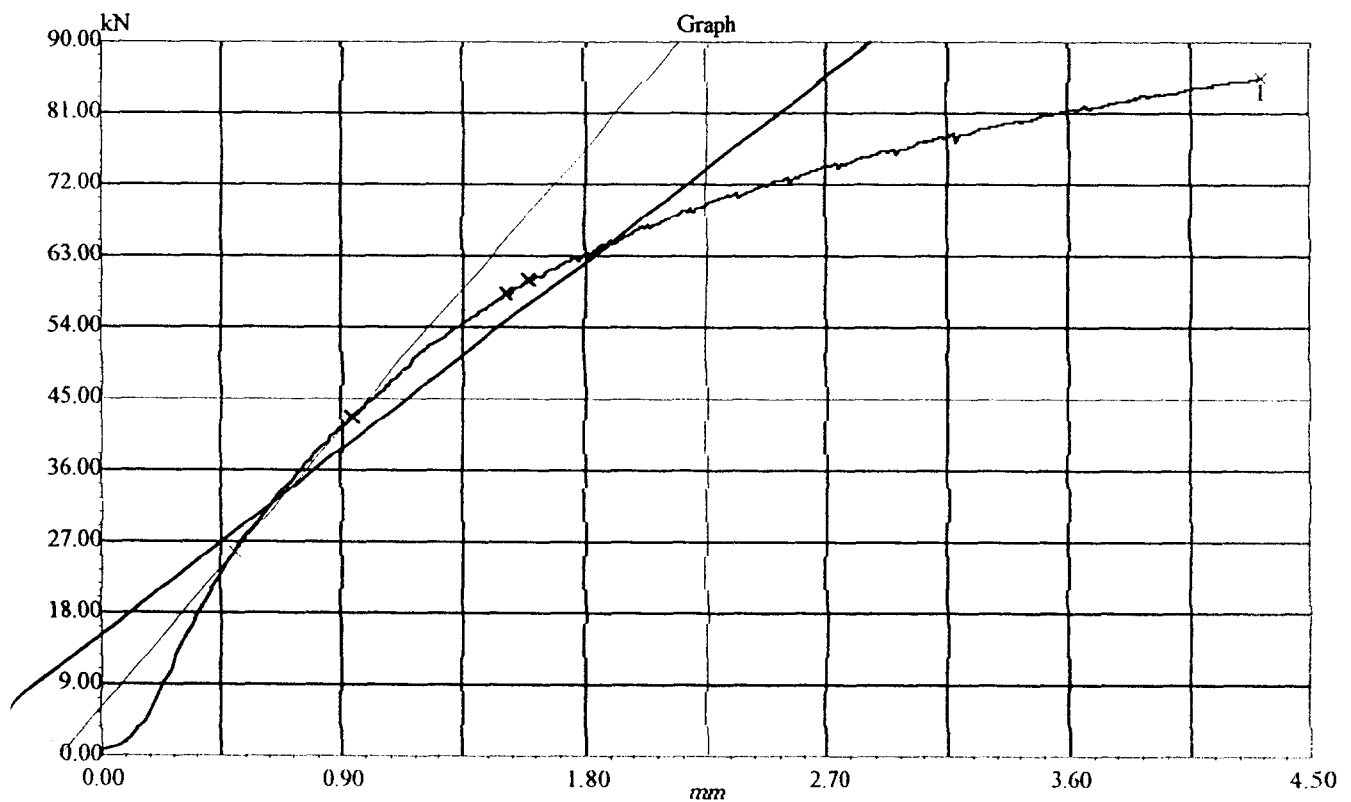


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC7B	Max. load : 85.36kN
Area : 314.16mm ²	Elongation at break : 4.31mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 7.19%
	Young's Modulus : 7431.14MPa
	Yield Point : 0.19kN/mm ²
	Yield strength @0.2% : 0.21kN/mm ²

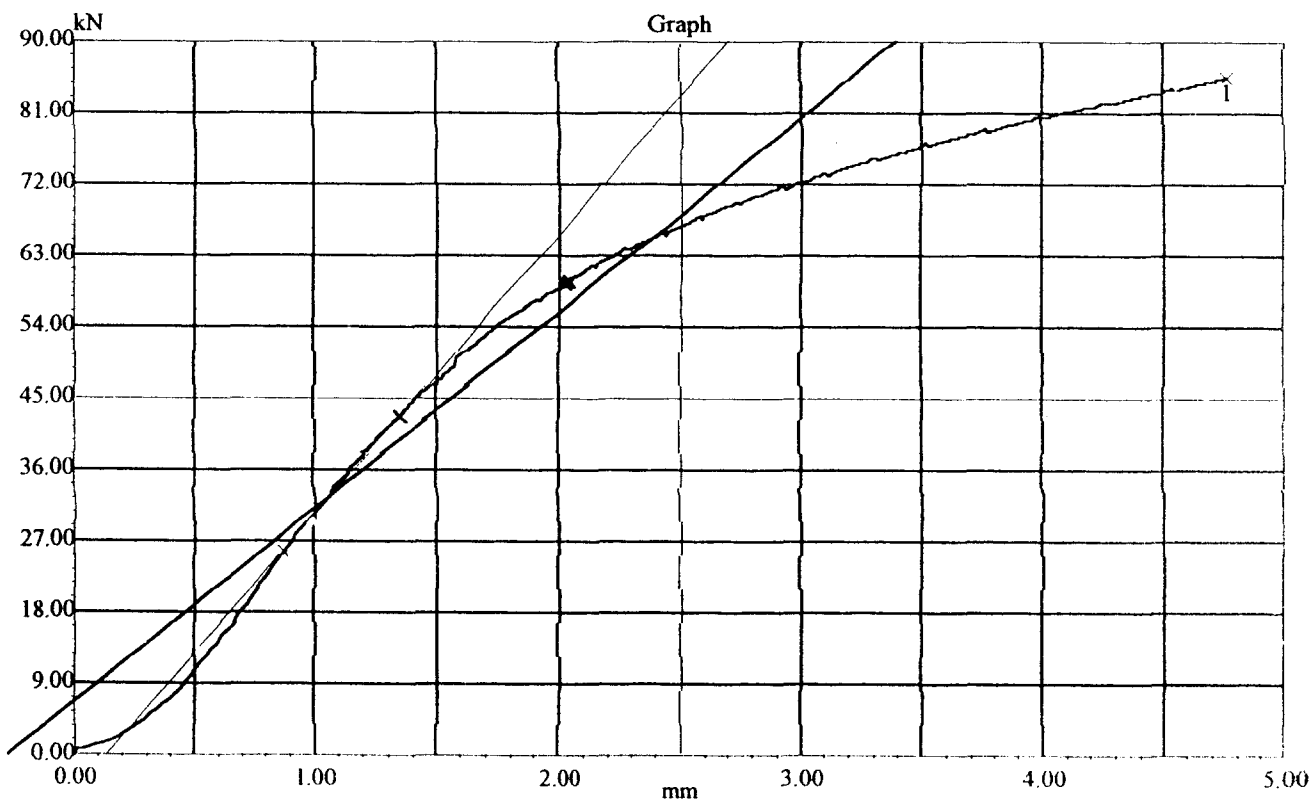


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC8A	Max. load : 85.35kN
Area : 314.16mm ²	Elongation at break : 4.76mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 7.94%
	Young's Modulus : 6863.60MPa
	Yield Point : 0.19kN/mm ²
	Yield strength @0.2% : 0.21kN/mm ²

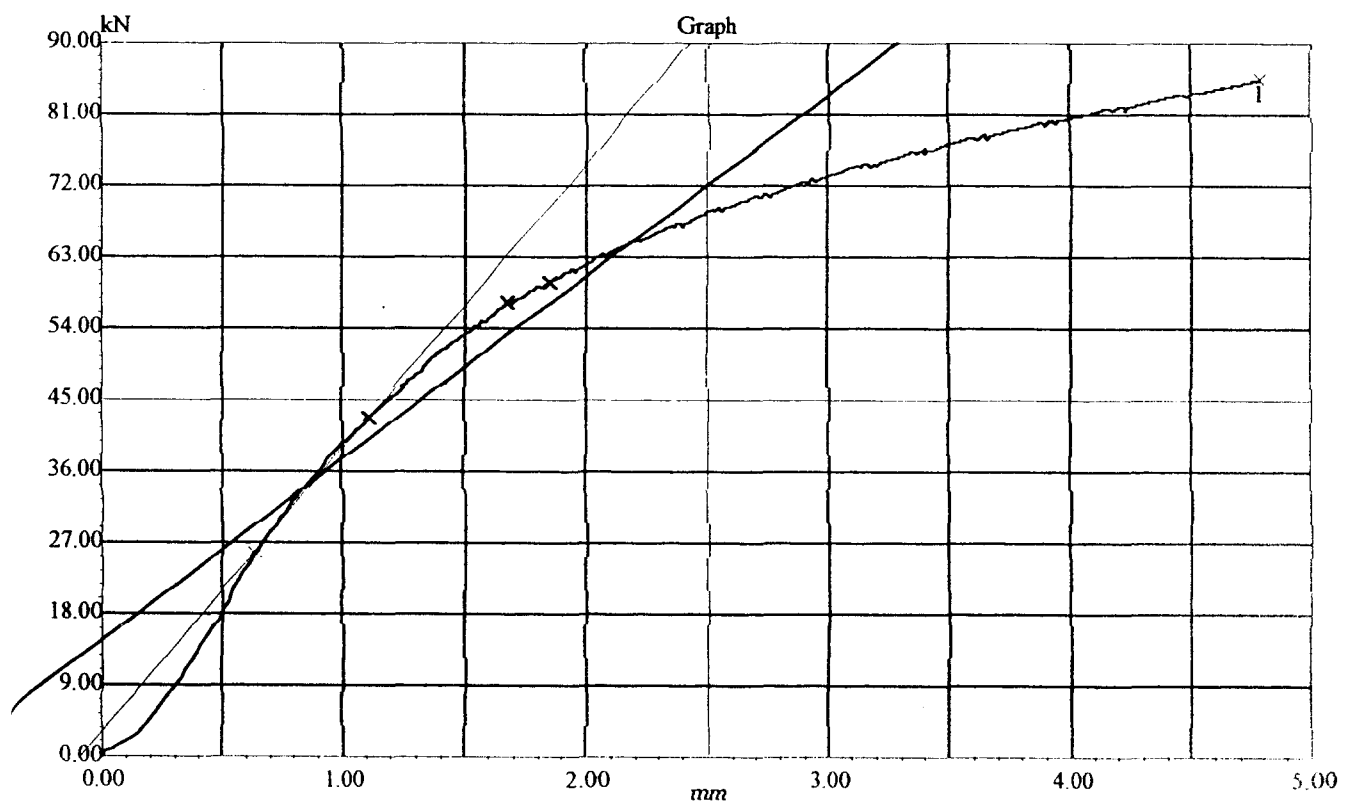


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC8B	Max. load : 85.27kN
Area : 314.16mm ²	Elongation at break : 4.79mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 7.98%
	Young's Modulus : 6948.66MPa
	Yield Point : 0.18kN/mm ²
	Yield strength @0.2% : 0.21kN/mm ²

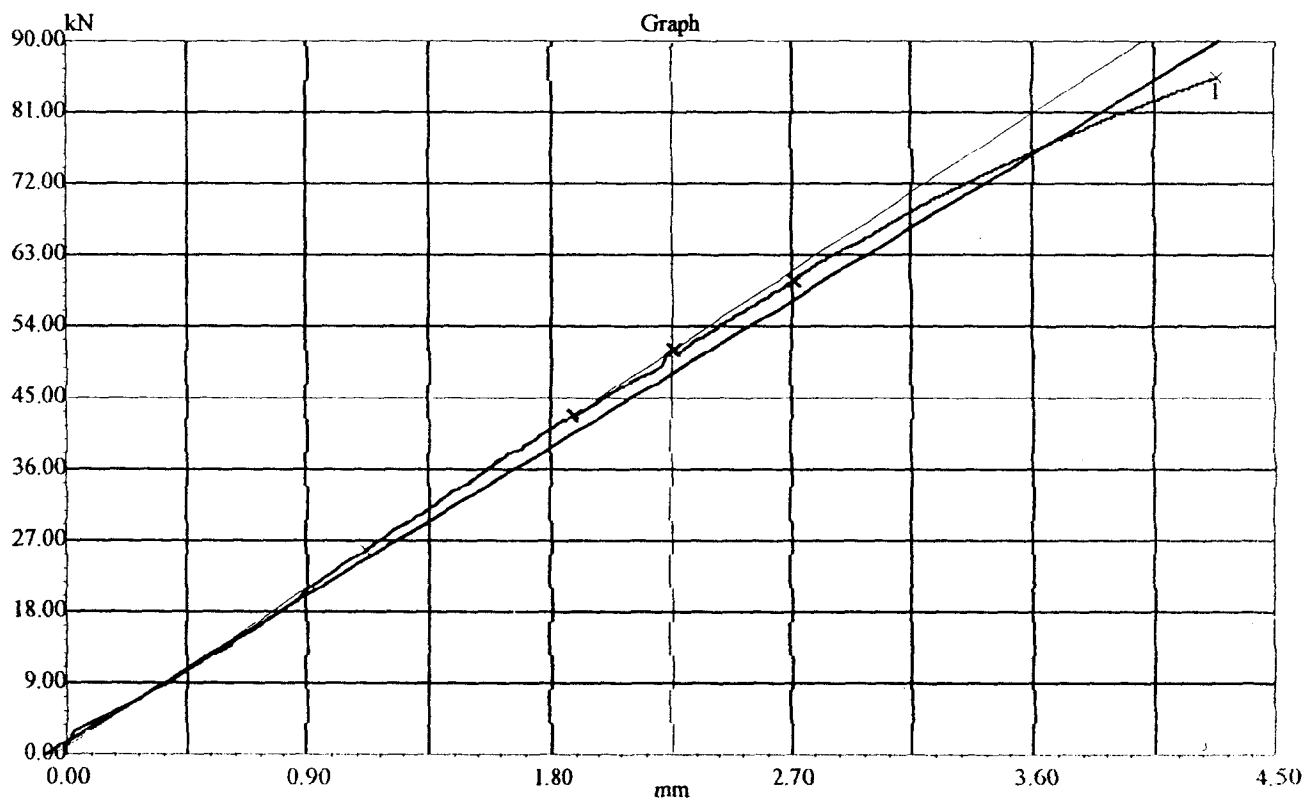


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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC9A	Max. load : 85.33kN
Area : 314.16mm ²	Elongation at break : 4.29mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 7.15%
	Young's Modulus : 4228.53MPa
	Yield Point : 0.16kN/mm ²
	Yield strength @0.2% : 0.24kN/mm ²



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Makmal Mekanik Pepejal

Compression Test Report

Project Name : Al-MMC9B	Max. load : 85.44kN
Area : 314.16mm ²	Elongation at break : 1.93mm
	Ultimate tensile strength : 0.27kN/mm ²
	Strain at break : 3.21%
	Young's Modulus : 28073.09MPa
	Yield Point : 0.00kN/mm ²
	Yield strength @0.2% : 0.22kN/mm ²

