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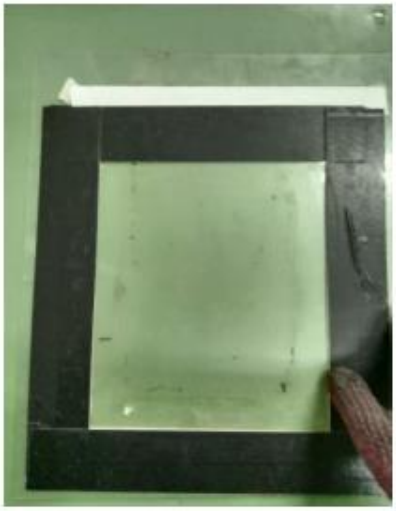
LAMPIRAN

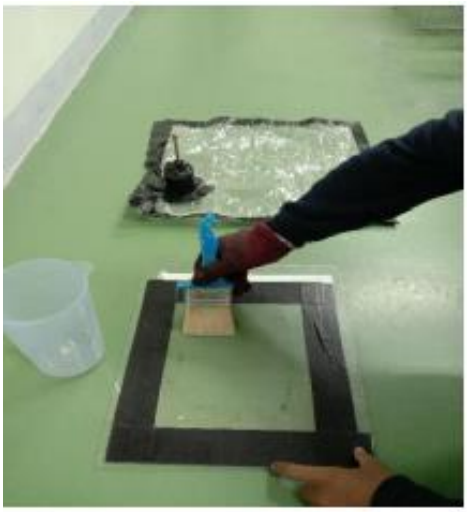
LAMPIRAN I

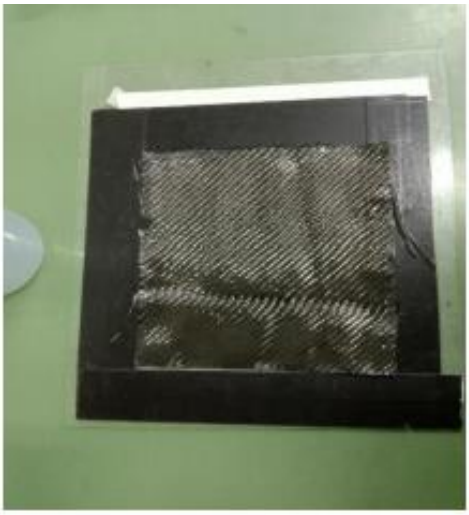
Proses Pembuatan Spesimen CFRP & Pengujian



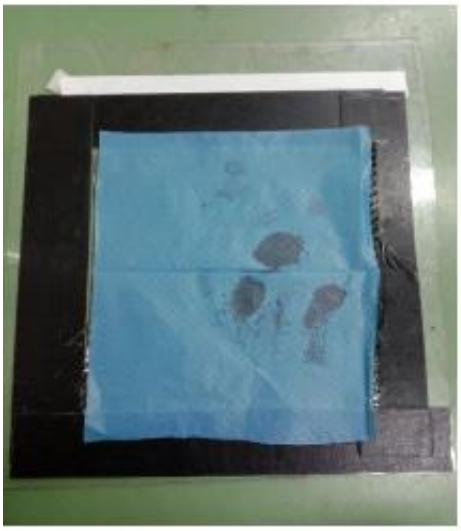
Persiapan Alat

Pengukuran dan Pencampuran Resin





Pengolesan resin dan peletakan serat karbon ke media pencetakan

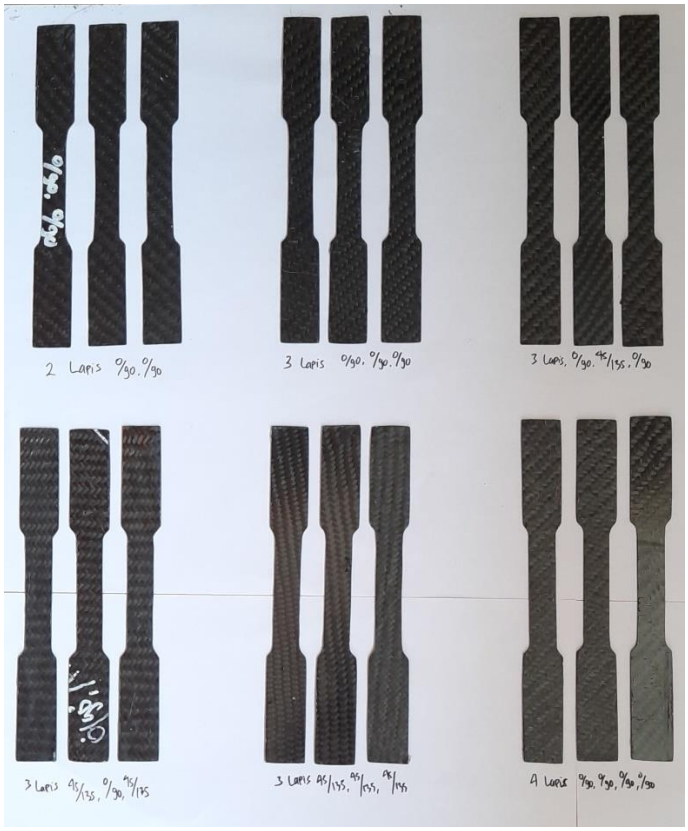


Peletakan *Perforated Release* dan *Film Carbon Breather*

Proses *Vacuum bagging*

Hasil pembuatan CFRP

Foto Spesimen Tarik dan Bending Sebelum Pengujian



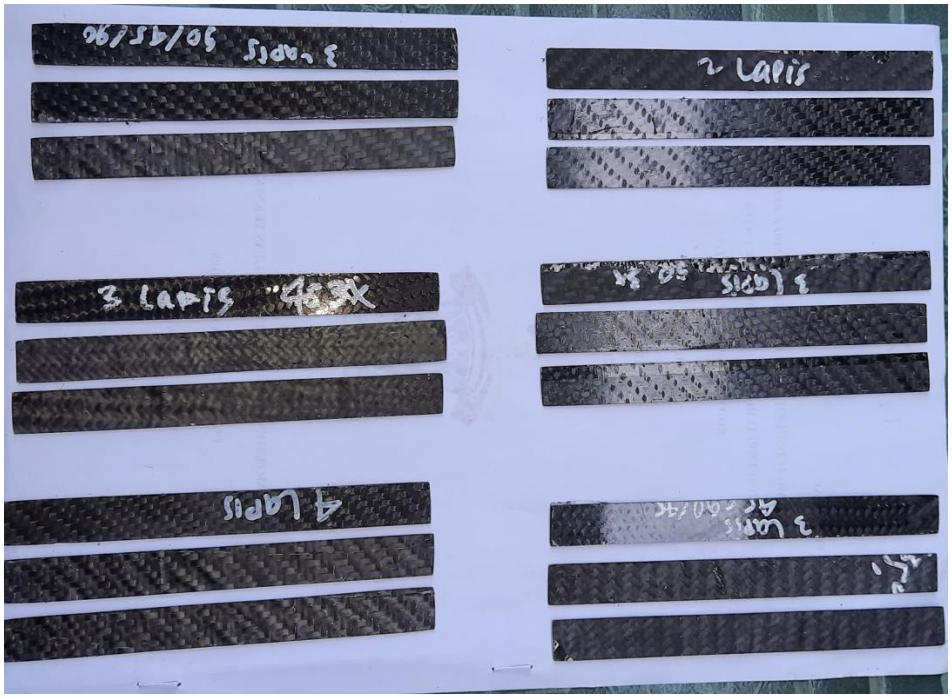


Foto Pengujian Tarik

Foto Pengujian Bending

Foto Final Pengerjaan Body Pesawat

(a)

(b)

LAMPIRAN II

Tabel Pengujian dan Data Pengujian

Pengujian Tarik

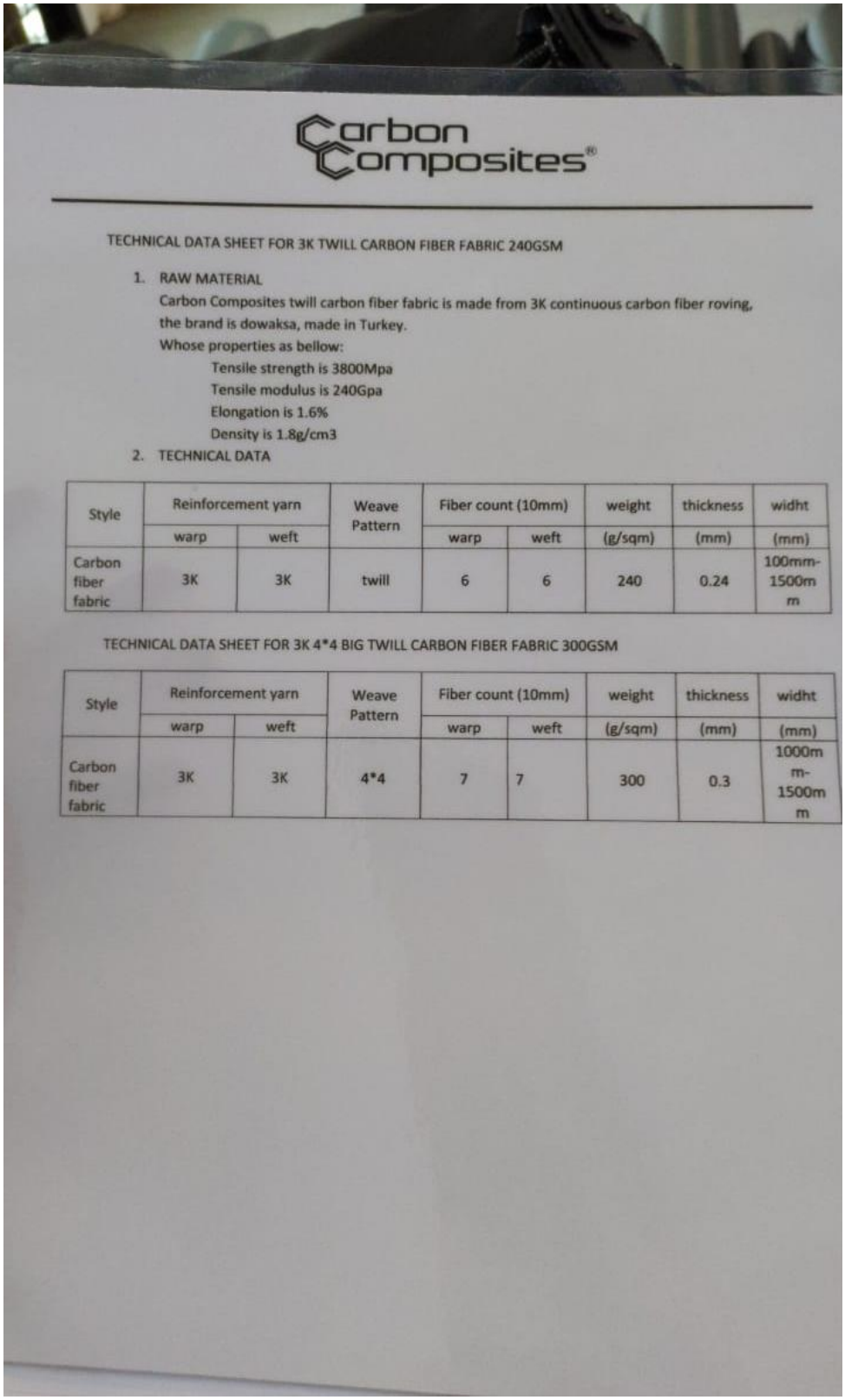
No	Nama	Ao	AL Max	F (kN)	F (N)	F*elastis*	AL Proporsional	Kekuatan Tarik Max(Mpa)	Regangan (%)	Tegangan Proporsional (Mpa)	Modulus Elastitas (Mpa)
1	CFRP 2 Lapis (1)	8.75	1.869	1.8	1800	1550	1.588	205.714	3.279%	177.143	6358.402
2	CFRP 2 Lapis (2)	8.75	3.208	1.45	1450	1400	2.695	165.714	5.628%	160	3384.045
3	CFRP 2 Lapis (3)	8.75	2.887	1.55	1550	1350	2.342	177.143	5.065%	154.286	3755.032
4	CFRP 3 Lapis (1)	11.25	2.719	2.5	2500	2300	2.446	222.222	4.770%	204.444	4764.241
5	CFRP 3 Lapis (2)	11.25	2.27	2.4	2400	2200	2.013	213.333	3.982%	195.556	5537.341
6	CFRP 3 Lapis (3)	10.625	2.462	1.8	1800	1650	1.949	169.412	4.319%	155.294	4541.696
7	CFRP 4 Lapis (1)	25	2.944	2.45	2450	2350	2.695	98.000	5.165%	94	1988.126
8	CFRP 4 Lapis (2)	17.5	2.069	2.25	2250	2200	1.781	128.571	3.630%	125.714	4023.422
9	CFRP 4 Lapis (3)	15	1.797	2.6	2600	1900	1.548	173.333	3.153%	126.667	4664.083
10	(0/90,45/135,0/90) (1)	13.75	1.901	1.45	1450	1150	1.42	105.455	3.335%	83.636	3357.234
11	(0/90,45/135,0/90) (2)	15	1.989	2.15	2150	1950	1.516	143.333	3.489%	130	4887.863
12	(0/90,45/135,0/90) (3)	12.5	2.077	2.25	2250	1900	1.845	180.000	3.644%	152	4695.935
13	(45/135,0/90,45/135) (1)	12.5	2.246	1.75	1750	1400	1.724	140.000	3.940%	112	3703.016
14	(45/135,0/90,45/135) (2)	15	2.591	1.3	1300	1250	2.109	86.667	4.546%	83.333	2252.252
15	(45/135,0/90,45/135) (3)	13.75	2.944	1.45	1450	1400	2.711	105.455	5.165%	101.818	2140.773
16	(45/135,45/135,45/135) (1)	11.25	6.288	0.95	950	900	4.459	84.444	8.288%	80	1022.651
17	(45/135,45/135,45/135) (2)	12.5	9.352	0.7	700	650	5.302	56.000	9.649%	52	559.034
18	(45/135,45/135,45/135) (3)	11.25	8.63	0.75	750	700	6.649	66.667	12.102%	62.222	533.414

No	Nama	Nilai Rata-Rata		
		Kekuatan Tarik (Mpa)	Regangan (%)	Modulus Elastisitas (Mpa)
1	CFRP 2 Lapis (1)	182.857	4.657%	4499.160
2	CFRP 2 Lapis (2)			
3	CFRP 2 Lapis (3)			
4	CFRP 3 Lapis (1)	201.656	4.357%	4947.759
5	CFRP 3 Lapis (2)			
6	CFRP 3 Lapis (3)			
7	CFRP 4 Lapis (1)	133.302	3.982%	3558.544
8	CFRP 4 Lapis (2)			
9	CFRP 4 Lapis (3)			
10	(0/90,45/135,0/90) (1)	142.929	3.489%	4313.677
11	(0/90,45/135,0/90) (2)			
12	(0/90,45/135,0/90) (3)			
13	(45/135,0/90,45/135) (1)	110.707	4.550%	2698.681
14	(45/135,0/90,45/135) (2)			
15	(45/135,0/90,45/135) (3)			
16	(45/135,45/135,45/135) (1)	69.037	10.013%	705.033
17	(45/135,45/135,45/135) (2)			
18	(45/135,45/135,45/135) (3)			

Pengujian Bending

No	Nama	P (N)	L (mm)	b (mm)	d (mm)	m (mm)	Bending (Mpa)	Modulus Bending	Nilai Rata-Rata	
									Bending (Mpa)	Modulus Bending
1	CFRP 2 Lapis (1)	5.8	40	12.5	0.7	1.33	56.816	4963.27	72.490	5990.251
2	CFRP 2 Lapis (2)	6.5	40	12.5	0.7	0.927	63.673	3459.36		
3	CFRP 2 Lapis (3)	9.9	40	12.5	0.7	2.5586	96.980	9548.13		
4	CFRP 3 Lapis (1)	18.4	40	12.5	1	10.046	88.320	12858.88	96.32	8633.173
5	CFRP 3 Lapis (2)	21.5	40	12.5	1	4.5358	103.200	5805.82		
6	CFRP 3 Lapis (3)	20.3	40	12.5	1	5.6522	97.440	7234.82		
7	CFRP 4 Lapis (1)	48.4	40	12.5	1.2	26.527	161.333	19649.63	144.33	19489.63
8	CFRP 4 Lapis (2)	46.7	40	12.5	1.2	35.08	155.667	25985.19		
9	CFRP 4 Lapis (3)	34.8	40	12.5	1.2	18.784	116.000	13914.07		
10	(0/90,45/135,0/90) (1)	12.9	40	12.5	1	2.5958	61.920	3322.62	62.954	3681.96
11	(0/90,45/135,0/90) (2)	17.5	40	12.5	1.1	2.4737	69.421	2378.92		
12	(0/90,45/135,0/90) (3)	14.5	40	12.5	1.1	5.5573	57.521	5344.36		
13	(45/135,0/90,45/135) (1)	18.6	40	12.5	1.2	3.5281	62.000	2613.41	58.33	2118.568
14	(45/135,0/90,45/135) (2)	15.5	40	12.5	1.2	2.5257	51.667	1870.89		
15	(45/135,0/90,45/135) (3)	18.4	40	12.5	1.2	2.5264	61.333	1871.41		
16	(45/135,45/135,45/135) (1)	14.6	40	12.5	1.1	2.4787	57.917	2383.72	56.682	1985.897
17	(45/135,45/135,45/135) (2)	10.6	40	12.5	1.1	1.5109	42.050	1453.01		
18	(45/135,45/135,45/135) (3)	14.6	40	12.5	1	1.657	70.080	2120.96		

Mechanical Properties Carbon Fiber



Carbon Composites®

TECHNICAL DATA SHEET FOR 3K TWILL CARBON FIBER FABRIC 240GSM

1. RAW MATERIAL
   Carbon Composites twill carbon fiber fabric is made from 3K continuous carbon fiber roving, the brand is dowaksa, made in Turkey.
   Whose properties as bellow:
   - Tensile strength is 3800Mpa
   - Tensile modulus is 240Gpa
   - Elongation is 1.6%
   - Density is 1.8g/cm3
2. TECHNICAL DATA

Style	Reinforcement yarn		Weave Pattern	Fiber count (10mm)		weight	thickness	widht
	warp	weft		warp	weft	(g/sqm)	(mm)	(mm)
Carbon fiber fabric	3K	3K	twill	6	6	240	0.24	100mm-1500mm

TECHNICAL DATA SHEET FOR 3K 4*4 BIG TWILL CARBON FIBER FABRIC 300GSM

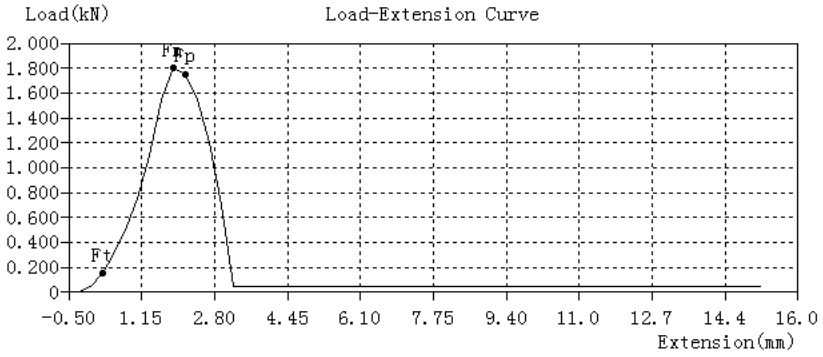
Style	Reinforcement yarn		Weave Pattern	Fiber count (10mm)		weight	thickness	widht
	warp	weft		warp	weft	(g/sqm)	(mm)	(mm)
Carbon fiber fabric	3K	3K	4*4	7	7	300	0.3	1000mm-1500mm

Uji Tarik

2 Lapis (1)

CFRP 2 Lapis 1

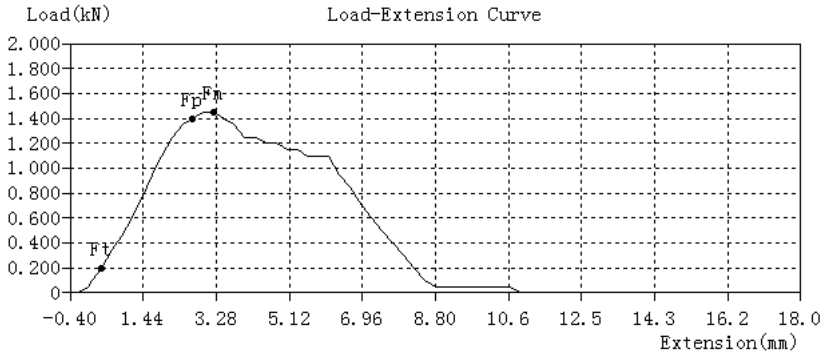
SampleID	CFRP 2 Lapis 1	TestDate	11/10/2020
Operator		Type	Flat
Size(mm)	12.5*0.7	Ao(mm²)	8.75
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm²)	
Z(%)	/	Fm(kN)	1.80
Rm(MPa)	205	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	1.75
Rp(MPa)	200	Ft(kN)	/
Rt(MPa)	/	E(GPa)	5.37



2 Lapis (2)

CFRP 2 Lapis 1

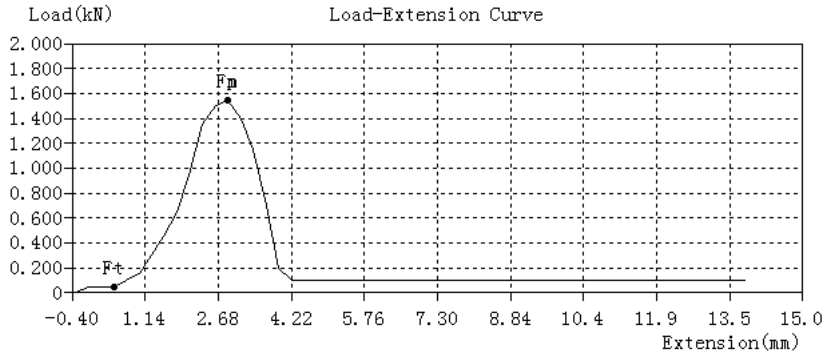
SampleID	CFRP 2 Lapis 1	TestDate	17/10/2020
Operator		Type	Flat
Size(mm)	12.5*0.7	Ao(mm^2)	8.75
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm^2)	
Z(%)	/	Fm(kN)	1.45
Rm(MPa)	165	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	1.40
Rp(MPa)	160	Ft(kN)	/
Rt(MPa)	/	E(GPa)	3.31



2 Lapis (3)

CFRP 2 Lapis 4

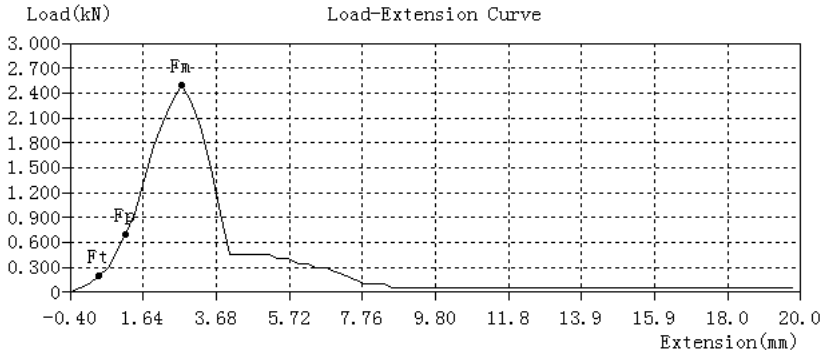
SampleID	CFRP 2 Lapis 4	TestDate	11/10/2020
Operator		Type	Flat
Size(mm)	12.5*0.7	Ao(mm^2)	8.75
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm^2)	
Z(%)	/	Fm(kN)	1.55
Rm(MPa)	175	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	1.55
Rp(MPa)	175	Ft(kN)	/
Rt(MPa)	/	E(GPa)	4.29



3 Lapis (1)

CFRP 3 Lapis 1

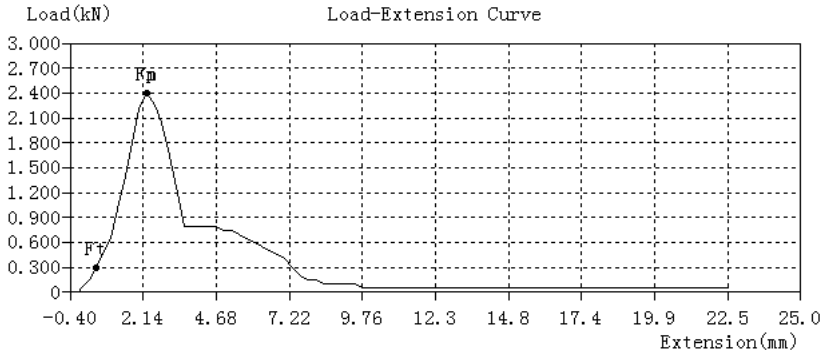
SampleID	CFRP 3 Lapis 1	TestDate	11/10/2020
Operator		Type	Flat
Size(mm)	12.5*1.0	Ao(mm^2)	12.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm^2)	
Z(%)	/	Fm(kN)	2.50
Rm(MPa)	200	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	/
Rp(MPa)	/	Ft(kN)	/
Rt(MPa)	/	E(GPa)	/



3 Lapis (2)

CFRP 3 Lapis 2

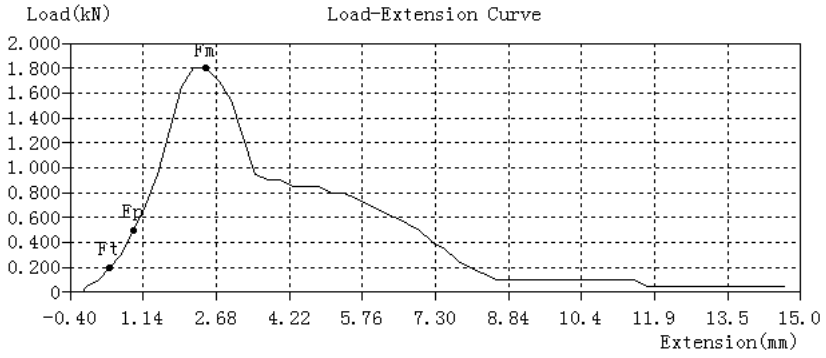
SampleID	CFRP 3 Lapis 2	TestDate	11/10/2020
Operator		Type	Flat
Size(mm)	12.5*1.0	Ao(mm²)	12.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm²)	
Z(%)	/	Fm(kN)	2.40
Rm(MPa)	190	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	2.40
Rp(MPa)	190	Ft(kN)	/
Rt(MPa)	/	E(GPa)	5.64



3 Lapis (3)

CFRP 3 Lapis 3

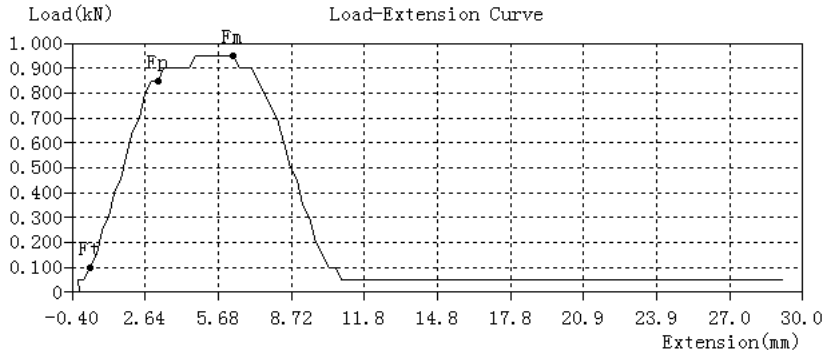
SampleID	CFRP 3 Lapis 3	TestDate	11/10/2020
Operator		Type	Flat
Size(mm)	12.5*1.0	Ao(mm^2)	12.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm^2)	
Z(%)	/	Fm(kN)	1.80
Rm(MPa)	145	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	/
Rp(MPa)	/	Ft(kN)	/
Rt(MPa)	/	E(GPa)	/



45˚/135˚; 45˚/135˚; 45˚/135˚ (1)

CFRP 3 Lapis sudut 45 1

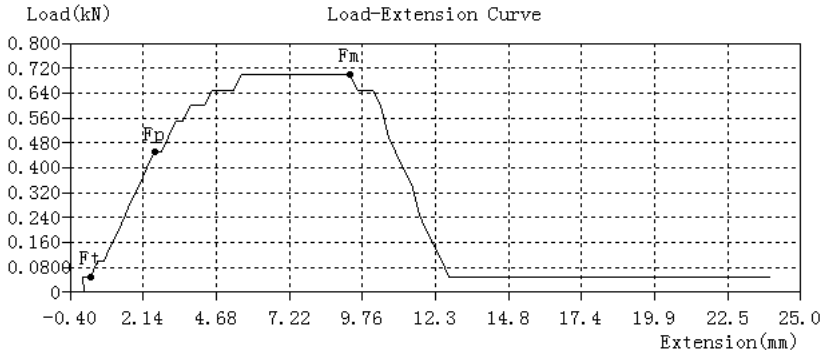
SampleID	CFRP 3 Lapis sudu	TestDate	11/10/2020
Operator	t 45 1	Type	Flat
Size(mm)	12.5*1.0	Ao(mm²)	12.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm²)	
Z(%)	/	Fm(kN)	/
Rm(MPa)	/	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	/
Rp(MPa)	/	Ft(kN)	/
Rt(MPa)	/	E(GPa)	1.16



45˚/135˚; 45˚/135˚; 45˚/135˚ (2)

CFRP 3 Lapis sudut 45 2

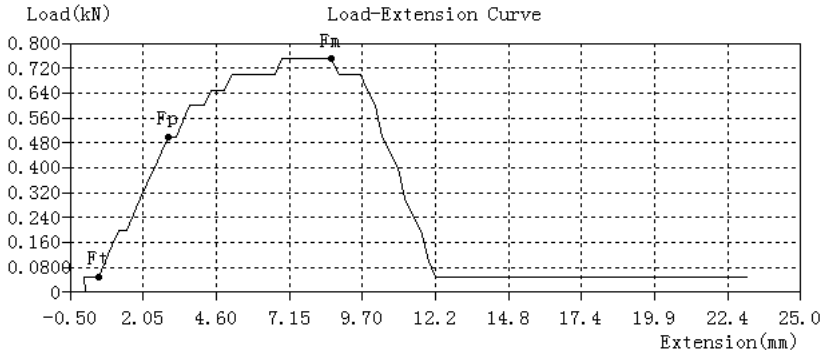
SampleID	CFRP 3 Lapis sudu	TestDate	11/10/2020
Operator	t 45 2	Type	Flat
Size(mm)	12.5*1.0	Ao(mm²)	12.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm²)	
Z(%)	/	Fm(kN)	/
Rm(MPa)	/	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	/
Rp(MPa)	/	Ft(kN)	/
Rt(MPa)	/	E(GPa)	0.80



45˚/135˚; 45˚/135˚; 45˚/135˚ (3)

CFRP 3 Lapis sudut 45 3

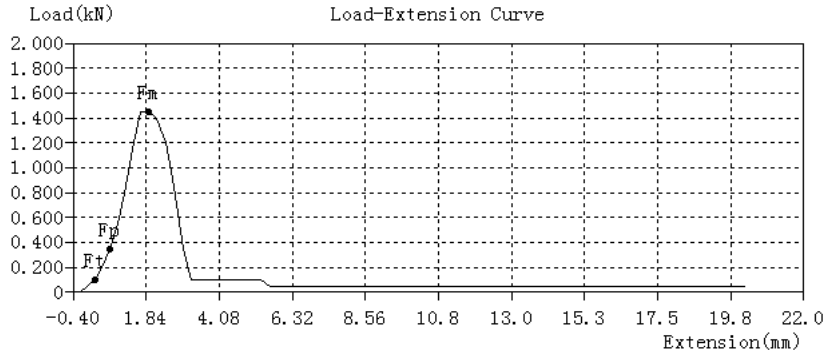
SampleID	CFRP 3 Lapis sudu	TestDate	11/10/2020
Operator	t 45 3	Type	Flat
Size(mm)	12.5*1.0	Ao(mm²)	12.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm²)	
Z(%)	/	Fm(kN)	/
Rm(MPa)	/	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	/
Rp(MPa)	/	Ft(kN)	/
Rt(MPa)	/	E(GPa)	0.80



0˚/90˚; 45˚/135˚; 0˚/90˚ (1)

CFRP 3 Lapis sudut 90 45 90 1

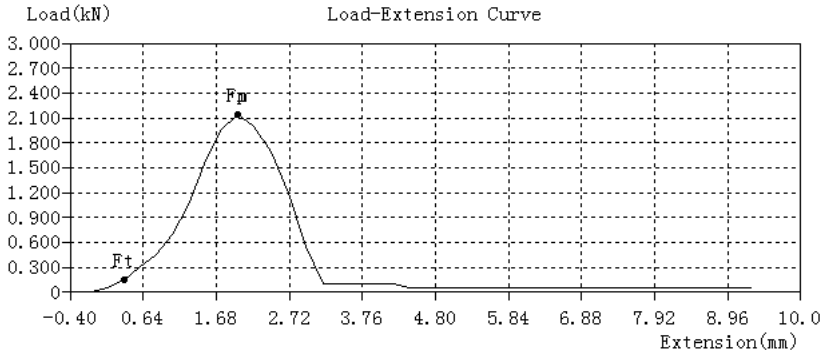
SampleID	CFRP 3 Lapis sudu	TestDate	11/10/2020
Operator	t 90 45 90 1	Type	Flat
Size(mm)	12.5*1.0	Ao(mm^2)	12.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm^2)	
Z(%)	/	Fm(kN)	1.45
Rm(MPa)	115	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	/
Rp(MPa)	/	Ft(kN)	/
Rt(MPa)	/	E(GPa)	/



0˚/90˚; 45˚/135˚; 0˚/90˚ (2)

CFRP 3 Lapis sudut 90 45 90 2

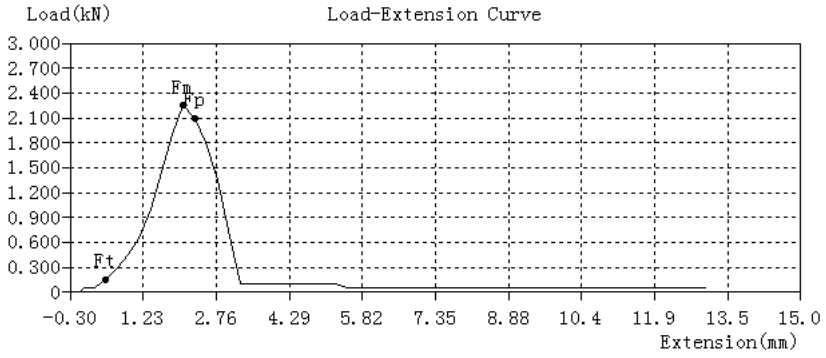
SampleID	CFRP 3 Lapis sudu	TestDate	11/10/2020
Operator	t 90 45 90 2	Type	Flat
Size(mm)	12.5*1.0	Ao(mm²)	12.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm²)	
Z(%)	/	Fm(kN)	2.15
Rm(MPa)	170	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	2.15
Rp(MPa)	170	Ft(kN)	/
Rt(MPa)	/	E(GPa)	6.04



0˚/90˚; 45˚/135˚; 0˚/90˚ (3)

CFRP 3 Lapis sudut 90 45 90 3

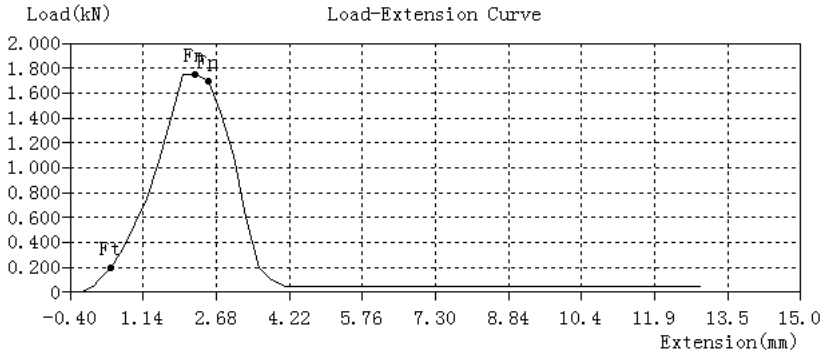
SampleID	CFRP 3 Lapis sudu	TestDate	11/10/2020
Operator	t 90 45 90 3	Type	Flat
Size(mm)	12.5*1.0	Ao(mm²)	12.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm²)	
Z(%)	/	Fm(kN)	2.25
Rm(MPa)	180	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	2.10
Rp(MPa)	170	Ft(kN)	/
Rt(MPa)	/	E(GPa)	6.00



45˚/135˚; 0˚/90˚; 45˚/135 ˚ (1)

CFRP 3 Lapis sudut 45 90 45 1

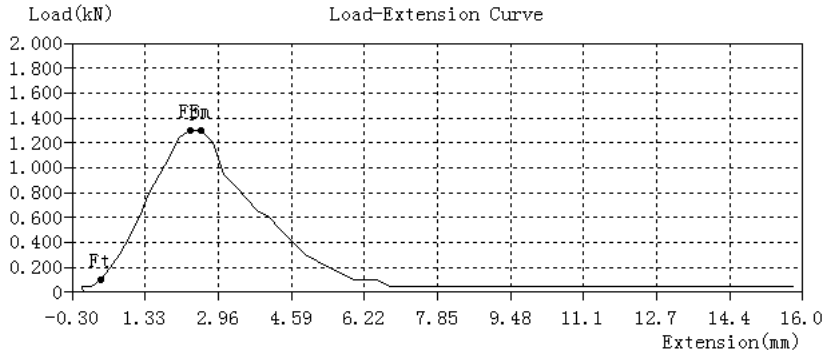
SampleID	CFRP 3 Lapis sudu	TestDate	17/10/2020
Operator	t 45 90 45 1	Type	Flat
Size(mm)	12.5*1	Ao(mm^2)	12.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm^2)	
Z(%)	/	Fm(kN)	1.75
Rm(MPa)	140	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	1.70
Rp(MPa)	135	Ft(kN)	/
Rt(MPa)	/	E(GPa)	3.12



45˚/135˚; 0˚/90˚; 45˚/135 ˚ (2)

CFRP 3 Lapis sudut 45 90 45 2

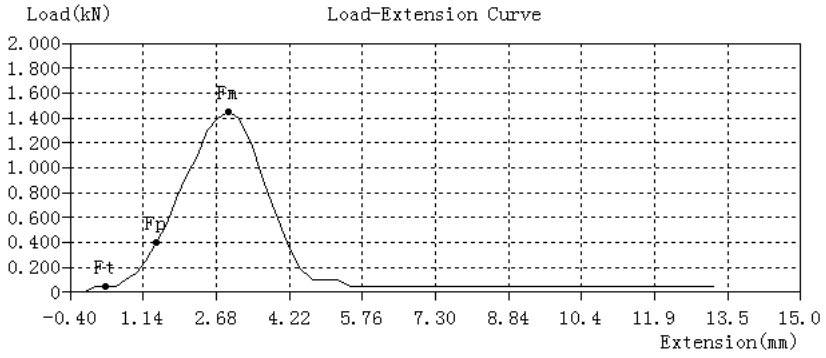
SampleID	CFRP 3 Lapis sudu	TestDate	11/10/2020
Operator	t 45 90 45 2	Type	Flat
Size(mm)	12.5*1.2	Ao(mm^2)	15.00
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm^2)	
Z(%)	/	Fm(kN)	1.30
Rm(MPa)	85	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	1.30
Rp(MPa)	85	Ft(kN)	/
Rt(MPa)	/	E(GPa)	2.30



45˚/135˚; 0˚/90˚; 45˚/135 ˚ (3)

CFRP 3 Lapis sudut 45 90 45 3

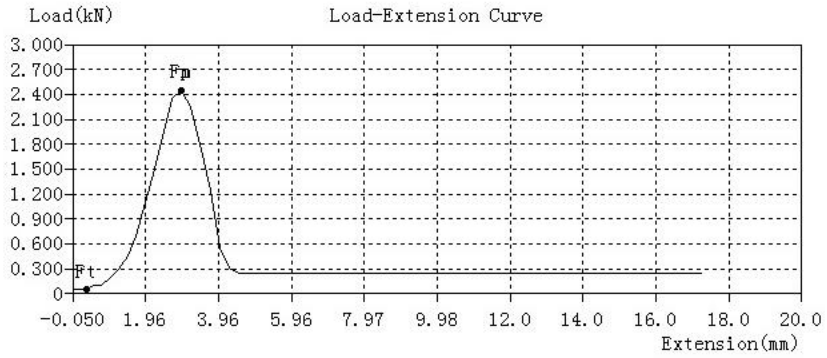
SampleID	CFRP 3 Lapis sudu	TestDate	11/10/2020
Operator	t 45 90 45 3	Type	Flat
Size(mm)	12.5*1.2	Ao(mm²)	15.00
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm²)	
Z(%)	/	Fm(kN)	1.45
Rm(MPa)	95	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	/
Rp(MPa)	/	Ft(kN)	/
Rt(MPa)	/	E(GPa)	/



4 Lapis (1)

CFRP 4 Lapis 1

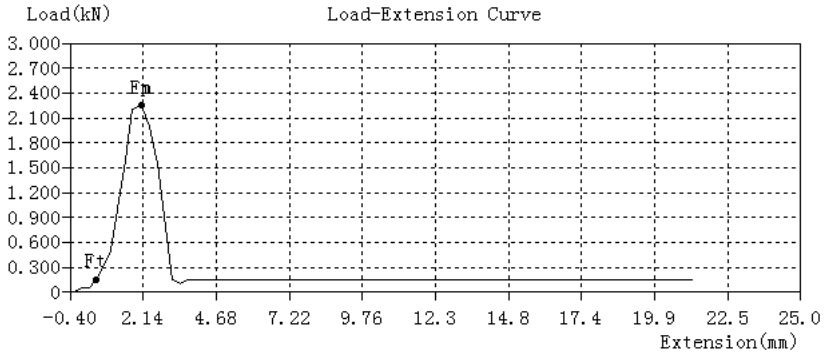
SampleID	CFRP 4 Lapis 1	TestDate	17/10/2020
Operator		Type	Flat
Size(mm)	12.5*2	Ao(mm²)	25.00
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm²)	
Z(%)	/	Fm(kN)	2.45
Rm(MPa)	100	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	2.45
Rp(MPa)	100	Ft(kN)	/
Rt(MPa)	/	E(GPa)	3.22



4 Lapis (2)

CFRP 4 Lapis 2

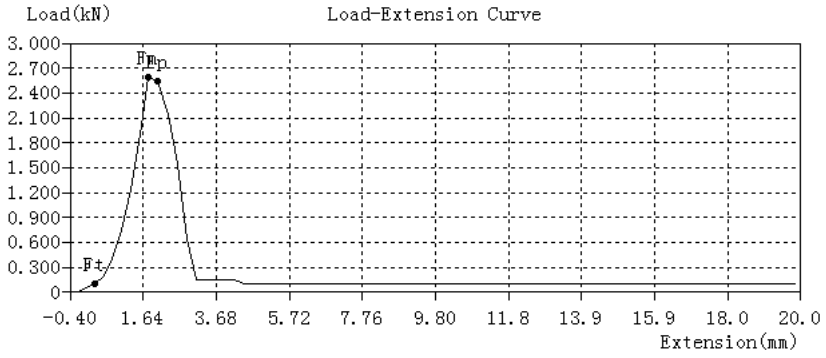
SampleID	CFRP 4 Lapis 2	TestDate	17/10/2020
Operator		Type	Flat
Size(mm)	12.5*1.4	Ao(mm^2)	17.50
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm^2)	
Z(%)	/	Fm(kN)	2.25
Rm(MPa)	130	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	2.25
Rp(MPa)	130	Ft(kN)	/
Rt(MPa)	/	E(GPa)	5.57



4 Lapis (3)

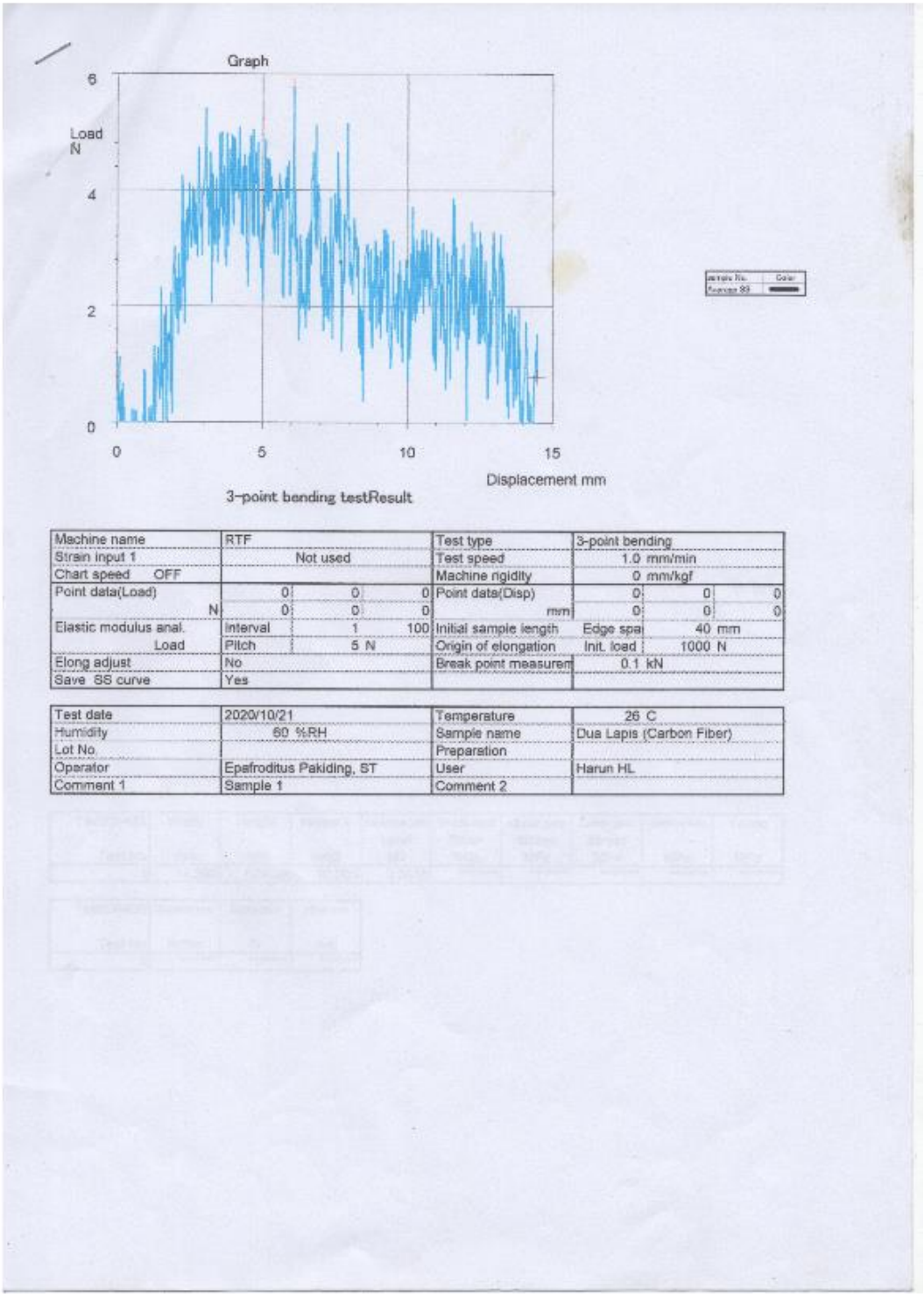
CFRP 4 Lapis 3

SampleID	CFRP 4 Lapis 3	TestDate	11/10/2020
Operator		Type	Flat
Size(mm)	12.5*1.2	Ao(mm^2)	15.00
Lo(mm)	57	Lu(mm)	
A(%)	/	Au(mm^2)	
Z(%)	/	Fm(kN)	2.60
Rm(MPa)	175	FeH(kN)	/
UYS(MPa)	/	FeL(kN)	/
LYS(MPa)	/	Fp(kN)	2.55
Rp(MPa)	170	Ft(kN)	/
Rt(MPa)	/	E(GPa)	6.73



1. Ujian Bending

2 Lapis (1)

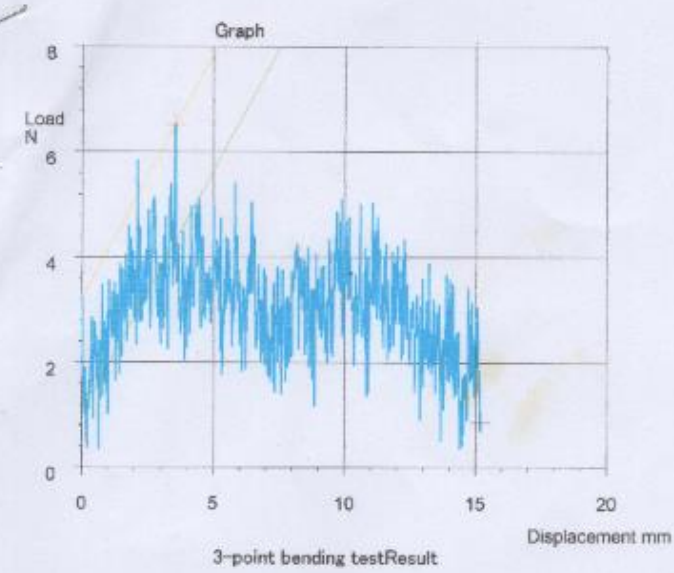


3-point bending testResult

Machine name	RTF			Test type	3-point bending			
Strain input 1	Not used			Test speed	1.0 mm/min			
Chart speed OFF				Machine rigidity	0 mm/kgf			
Point data(Load)	0	0	0	Point data(Disp)	0	0	0	
N	0	0	0	mm	0	0	0	
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm		
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N		
Elong adjust	No			Break point measurem	0.1 kN			
Save SS curve	Yes							

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Dua Lapis (Carbon Fiber)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 1	Comment 2	

2 Lapis (2)

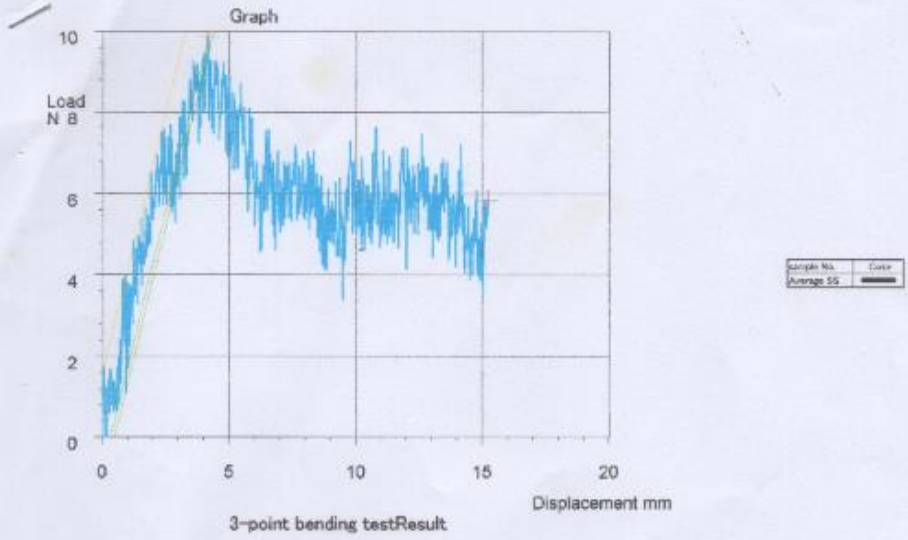


3-point bending testResult

Machine name	RTF			Test type	3-point bending			
Strain input 1	Not used			Test speed	1.0 mm/min			
Chart speed OFF				Machine rigidity	0 mm/kgf			
Point data(Load)	0	0	0	Point data(Disp)	0	0	0	
N	0	0	0	mm	0	0	0	
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm		
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N		
Elong adjust	No			Break point measuren	0.1 kN			
Save SS curve	Yes							

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Dua Lapis (Carbon Fiber)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 2	Comment 2	

2 Lapis (3)

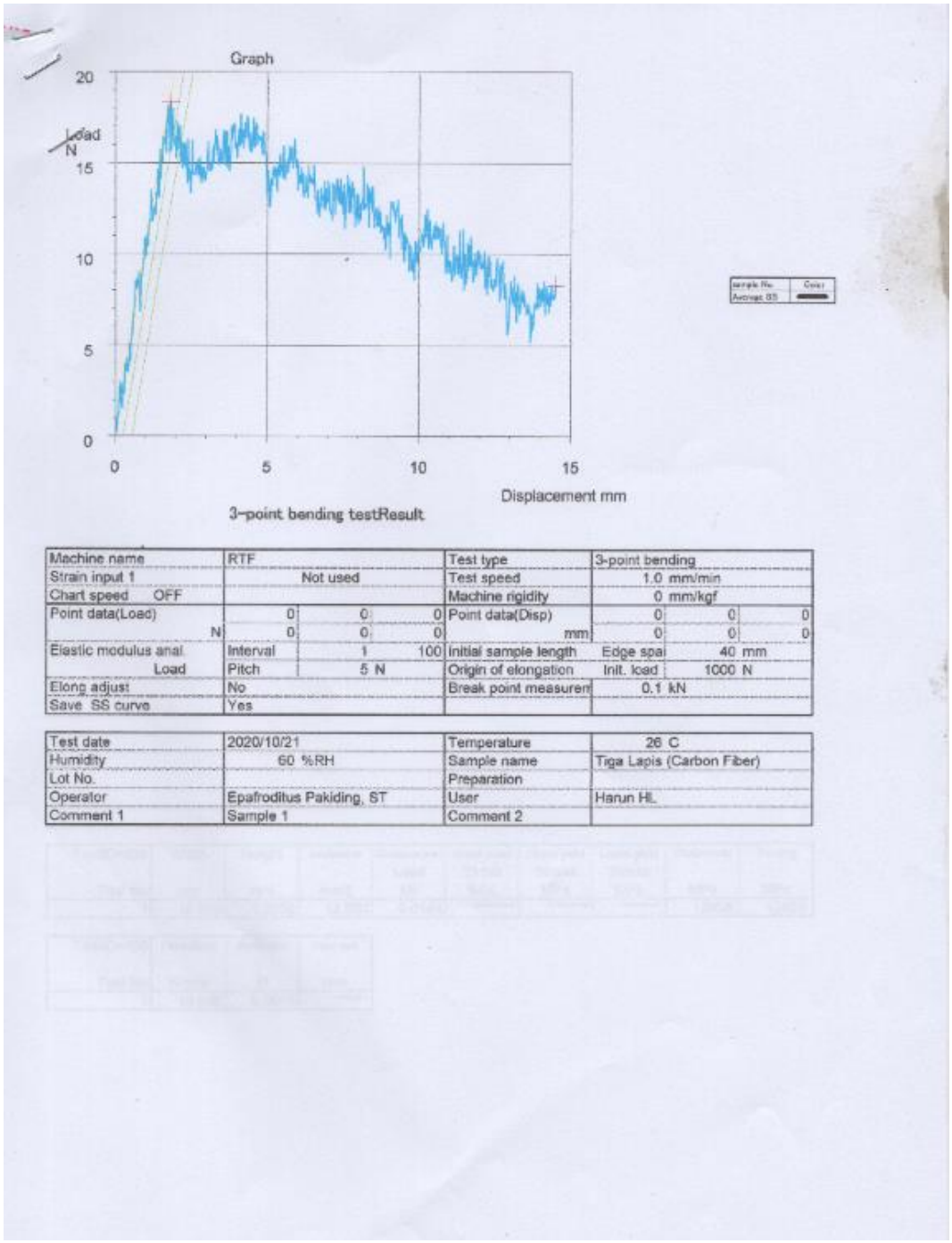


3-point bending testResult

Machine name	RTF			Test type	3-point bending		
Strain input 1	Not used			Test speed	1.0 mm/min		
Chart speed OFF				Machine rigidity	0 mm/kgf		
Point data(Load)	0	0	0	Point data(Disp)	0	0	0
N	0	0	0	mm	0	0	0
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm	
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N	
Elong adjust	No			Break point measurem	0.1 kN		
Save SS curve	Yes						

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Dua Lapis (Carbon Fiber)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 3	Comment 2	

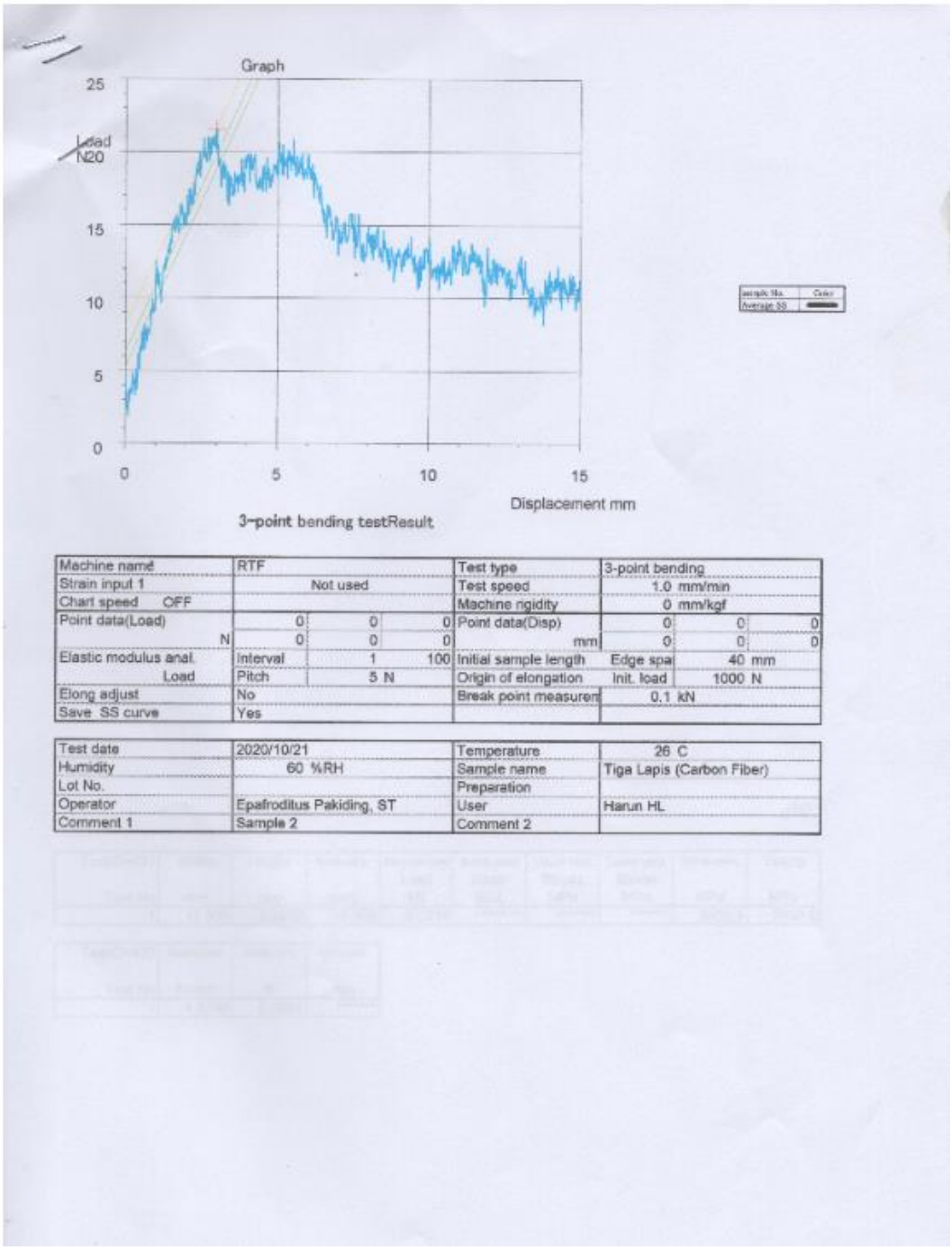
3 Lapis (1)



Machine name	RTF			Test type	3-point bending		
Strain input 1	Not used			Test speed	1.0 mm/min		
Chart speed OFF				Machine rigidity	0 mm/kgf		
Point data(Load)	0	0	0	Point data(Disp)	0	0	0
N	0	0	0	mm	0	0	0
Elastic modulus anal	Interval	1	100	Initial sample length	Edge spa	40 mm	
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N	
Elong adjust	No			Break point measuren	0.1 kN		
Save SS curve	Yes						

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (Carbon Fiber)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 1	Comment 2	

3 Lapis (2)

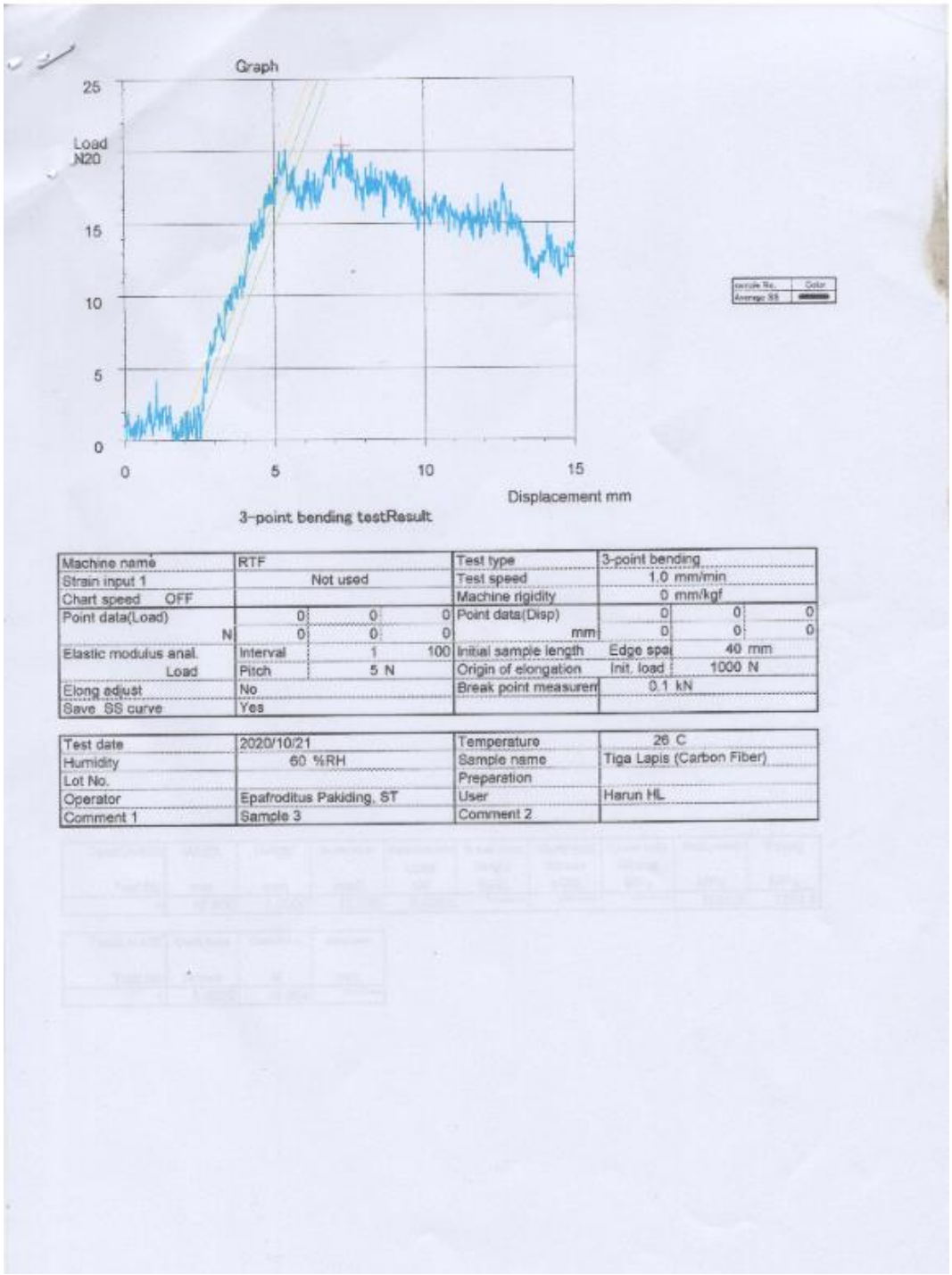


3-point bending testResult

Machine name	RTF			Test type	3-point bending		
Strain input 1	Not used			Test speed	1.0 mm/min		
Chart speed OFF				Machine rigidity	0 mm/kgf		
Point data(Load)	0	0	0	Point data(Disp)	0	0	0
N	0	0	0	mm	0	0	0
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm	
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N	
Elong adjust	No			Break point measuren	0.1 kN		
Save SS curve	Yes						

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (Carbon Fiber)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 2	Comment 2	

3 Lapis (3)

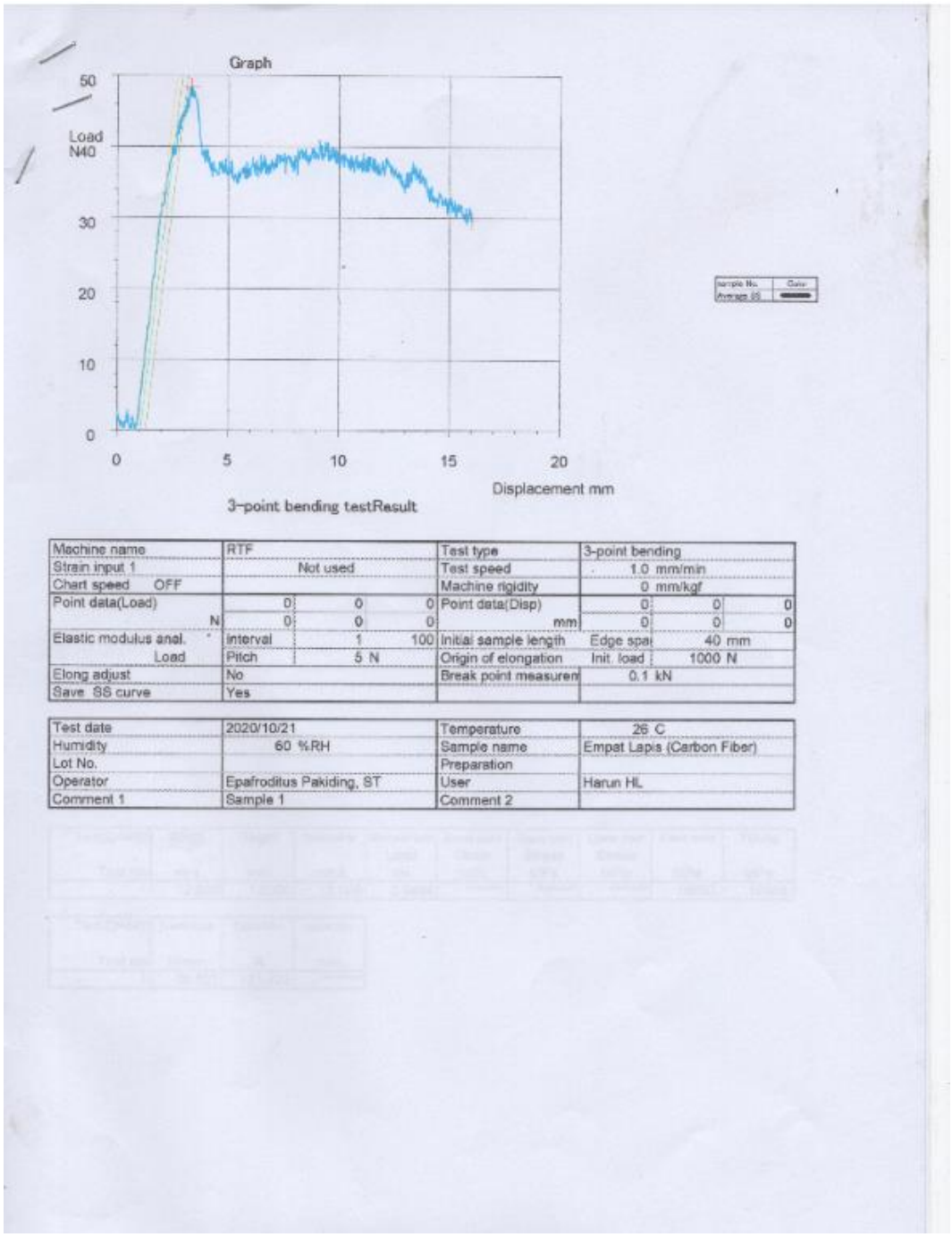


3-point bending testResult

Machine name	RTF			Test type	3-point bending		
Strain input 1	Not used			Test speed	1.0 mm/min		
Chart speed OFF				Machine rigidity	0 mm/kgf		
Point data(Load)	0	0	0	Point data(Disp)	0	0	0
N	0	0	0	mm	0	0	0
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm	
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N	
Elong adjust	No			Break point measurem	0.1 kN		
Save SS curve	Yes						

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (Carbon Fiber)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 3	Comment 2	

4 Lapis (1)

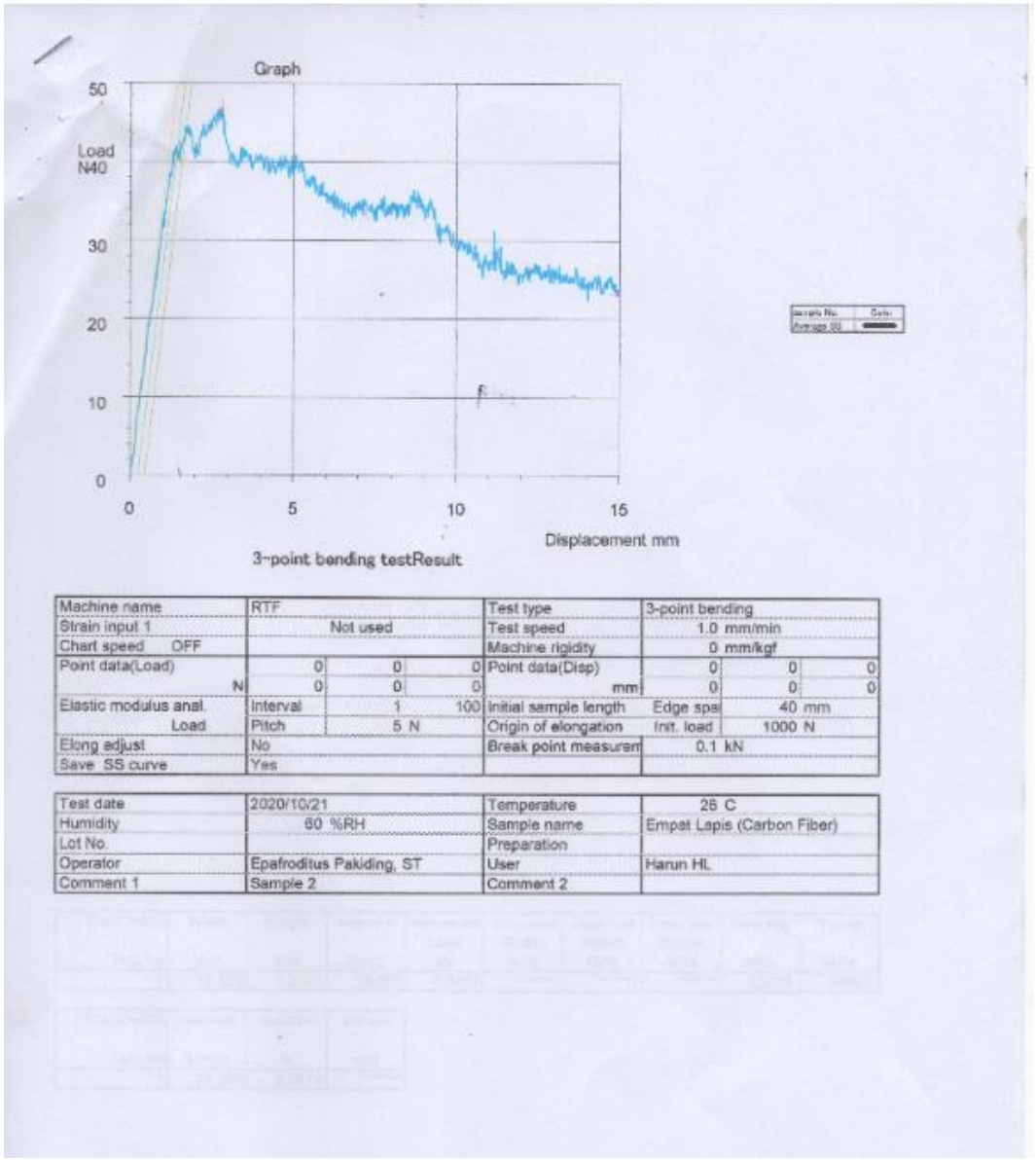


3-point bending testResult

Machine name	RTF			Test type	3-point bending			
Strain input 1	Not used			Test speed	1.0 mm/min			
Chart speed OFF				Machine rigidity	0 mm/kgf			
Point data(Load)	0	0	0	Point data(Disp)	0	0	0	
N	0	0	0	mm	0	0	0	
Elastic modulus anal.	interval	1	100	Initial sample length	Edge spa	40 mm		
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N		
Elong adjust	No			Break point measuren	0.1 kN			
Save SS curve	Yes							

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Empat Lapis (Carbon Fiber)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 1	Comment 2	

4 Lapis (2)

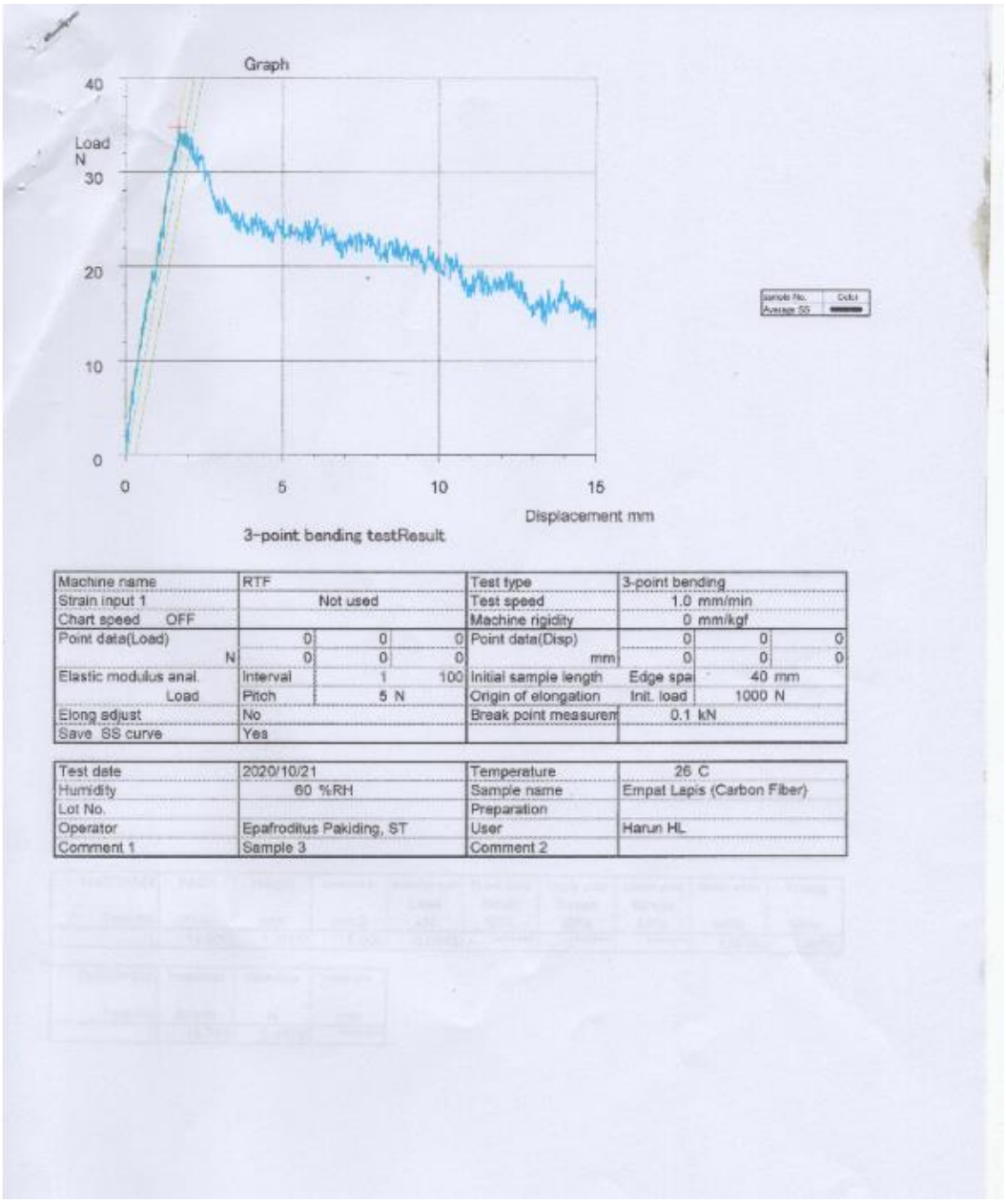


3-point bending testResult

Machine name	RTF			Test type	3-point bending			
Strain input 1	Not used			Test speed	1.0 mm/min			
Chart speed OFF				Machine rigidity	0 mm/kgf			
Point data(Load)	0	0	0	Point data(Disp)	0	0	0	
N	0	0	0	mm	0	0	0	
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm		
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N		
Elong adjust	No			Break point measurem	0.1 kN			
Save SS curve	Yes							

Test date	2020/10/21	Temperature	25 C
Humidity	60 %RH	Sample name	Empat Lapis (Carbon Fiber)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 2	Comment 2	

4 Lapis (3)

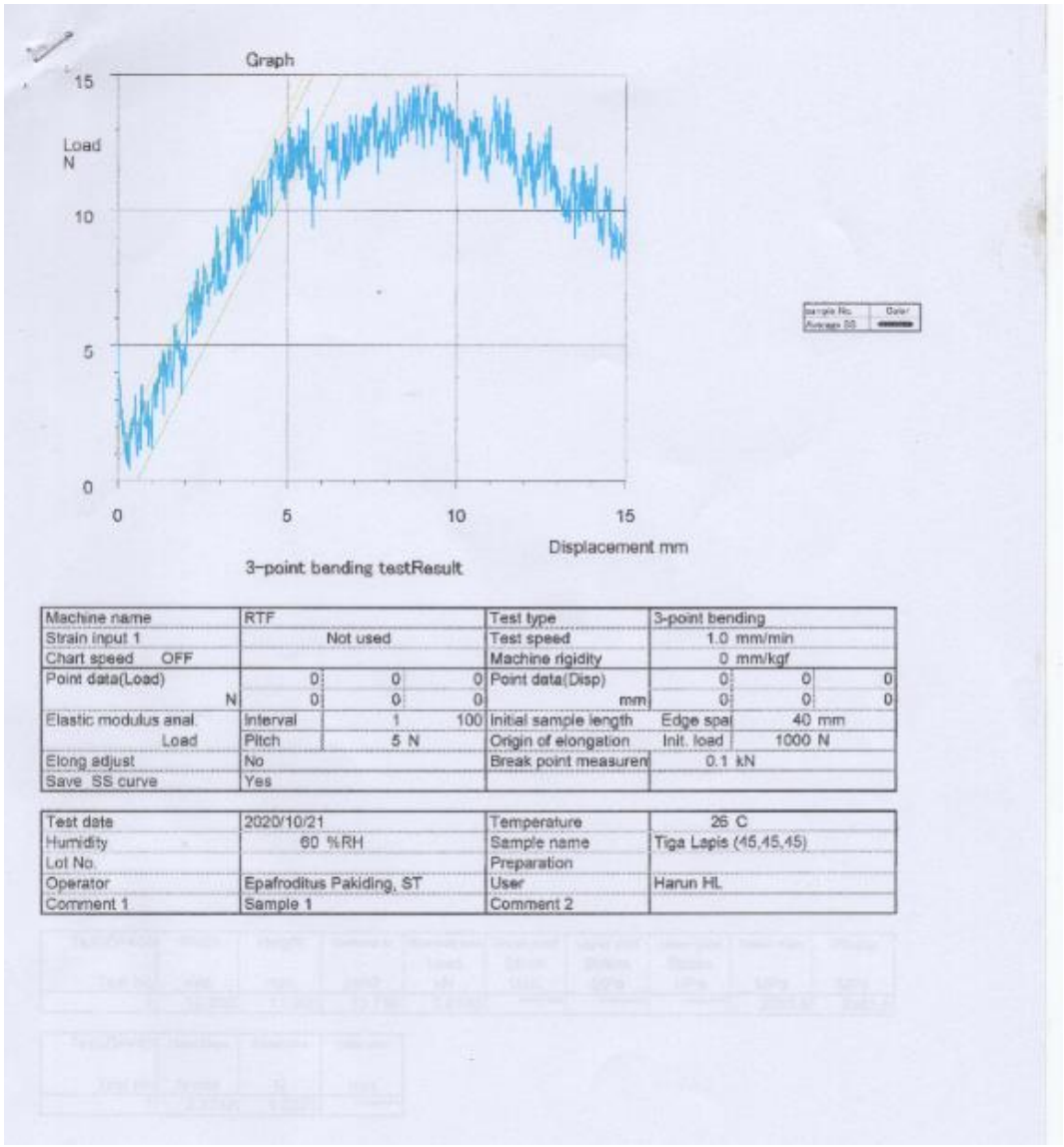


3-point bending testResult

Machine name	RTF			Test type	3-point bending		
Strain input 1	Not used			Test speed	1.0 mm/min		
Chart speed OFF				Machine rigidity	0 mm/kgf		
Point data(Load)	0	0	0	Point data(Disp)	0	0	0
N	0	0	0	mm	0	0	0
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm	
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N	
Elong adjust	No			Break point measurem	0.1 kN		
Save SS curve	Yes						

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Empat Lapis (Carbon Fiber)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 3	Comment 2	

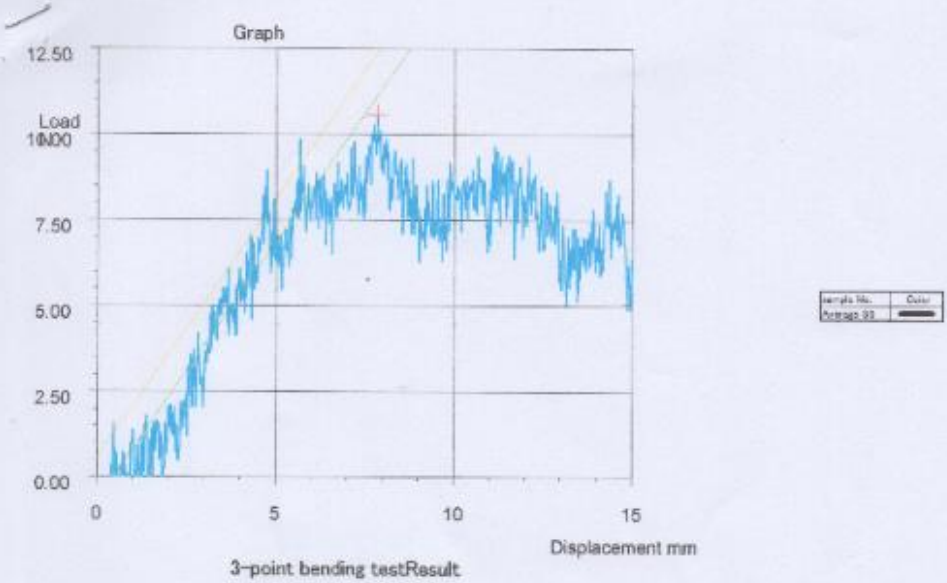
45˚/135˚; 45˚/135 ˚; 45˚/135˚ (1)



Machine name	RTF			Test type	3-point bending			
Strain input 1	Not used			Test speed	1.0 mm/min			
Chart speed OFF				Machine rigidity	0 mm/kgf			
Point data(Load)	0	0	0	Point data(Disp)	0	0	0	
N	0	0	0	mm	0	0	0	
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spac	40 mm		
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N		
Elong adjust	No			Break point measuren	0.1 kN			
Save SS curve	Yes							

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (45,45,45)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 1	Comment 2	

45˚/135˚; 45˚/135 ˚; 45˚/135˚ (2)

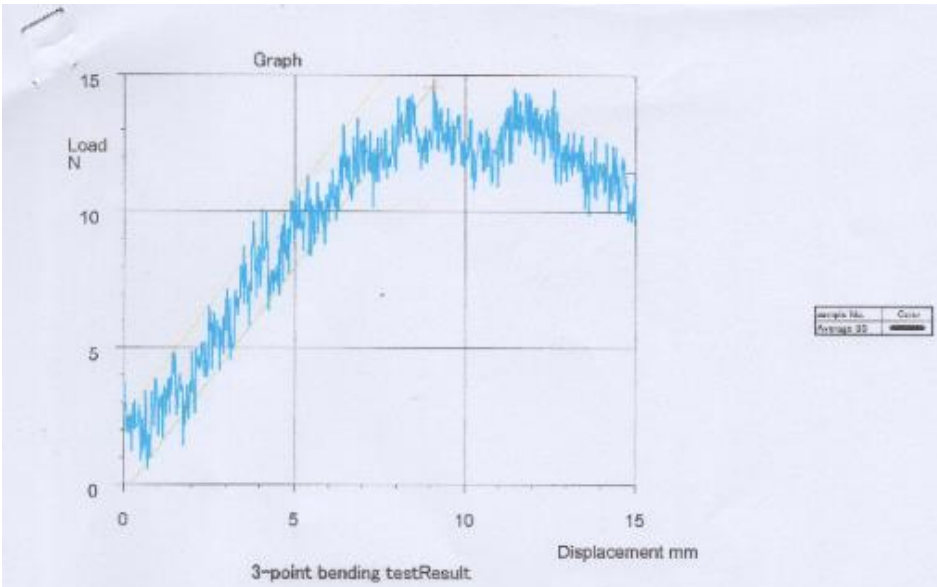


3-point bending testResult

Machine name	RTF			Test type	3-point bending		
Strain input 1	Not used			Test speed	1.0 mm/min		
Chart speed OFF				Machine rigidity	0 mm/kgf		
Point data(Load)	0	0	0	Point data(Disp)	0	0	0
N	0	0	0	mm	0	0	0
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm	
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N	
Elong adjust	No			Break point measurem	0.1 kN		
Save SS curve	Yes						

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (45,45,45)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 2	Comment 2	

45˚/135˚; 45˚/135 ˚; 45˚/135˚ (3)

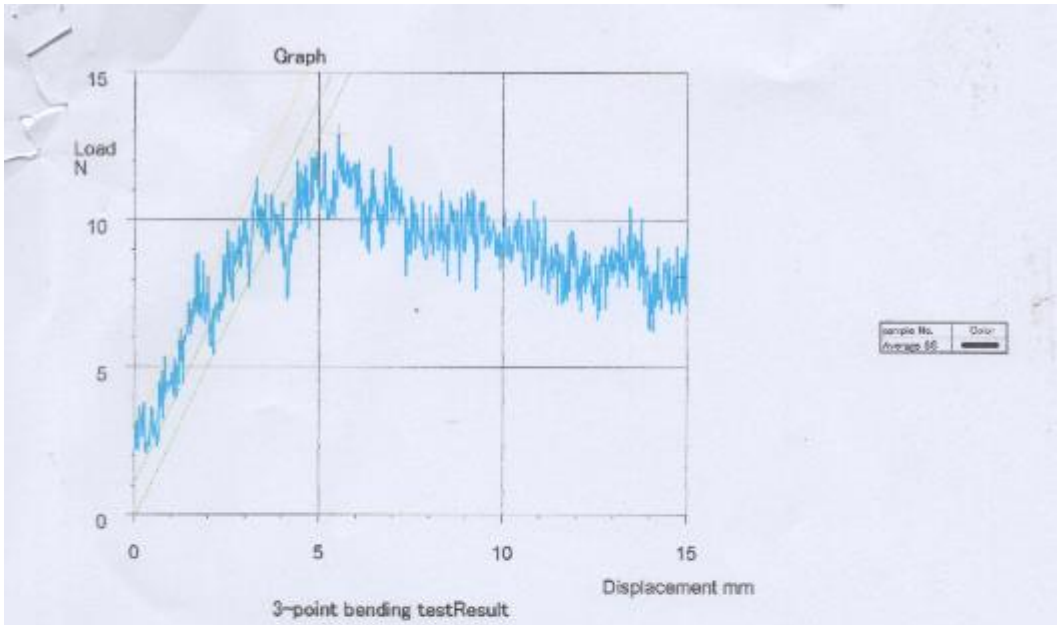


3-point bending testResult

Machine name	RTF			Test type	3-point bending			
Strain input 1	Not used			Test speed	1.0 mm/min			
Chart speed OFF				Machine rigidity	0 mm/kgf			
Point data(Load)	0	0	0	Point data(Disp)	0	0	0	
N	0	0	0	mm	0	0	0	
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm		
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N		
Elong adjust	No			Break point measuren	0.1 kN			
Save SS curve	Yes							

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (45,45,45)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 3	Comment 2	

0˚/90˚; 45˚/135 ˚; 0˚/90˚ (1)

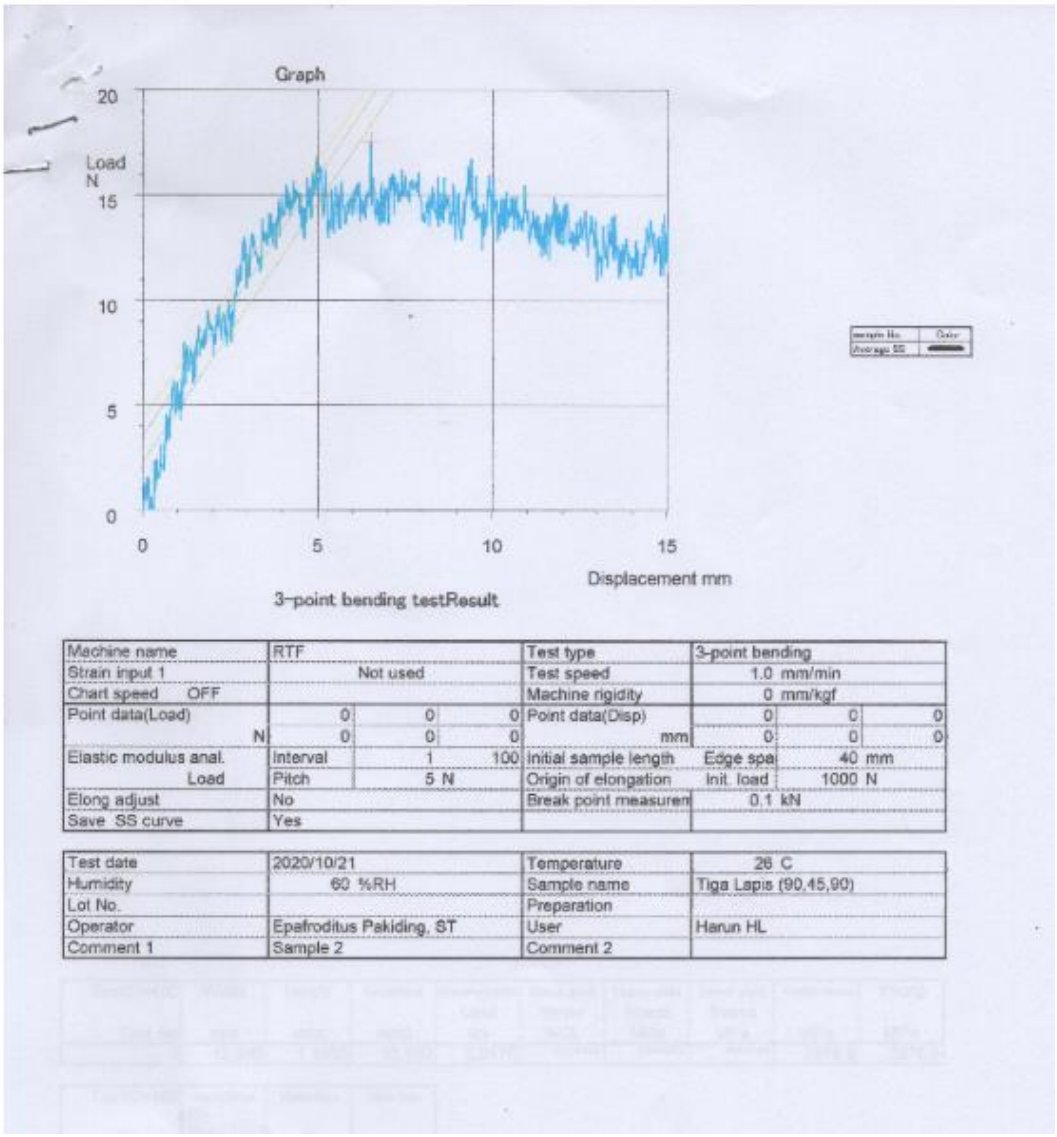


3-point bending testResult

Machine name	RTF			Test type	3-point bending		
Strain input 1	Not used			Test speed	1.0 mm/min		
Chart speed OFF				Machine rigidity	0 mm/kgf		
Point data(Load)	0	0	0	Point data(Disp)	0	0	0
N	0	0	0	mm	0	0	0
Elastic modulus anal.	interval	1	100	Initial sample length	Edge spa	40 mm	
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N	
Elong adjust	No			Break point measurem	0.1 kN		
Save SS curve	Yes						

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (90,45,90)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 1	Comment 2	

0˚/90˚; 45˚/135 ˚; 0˚/90˚ (2)

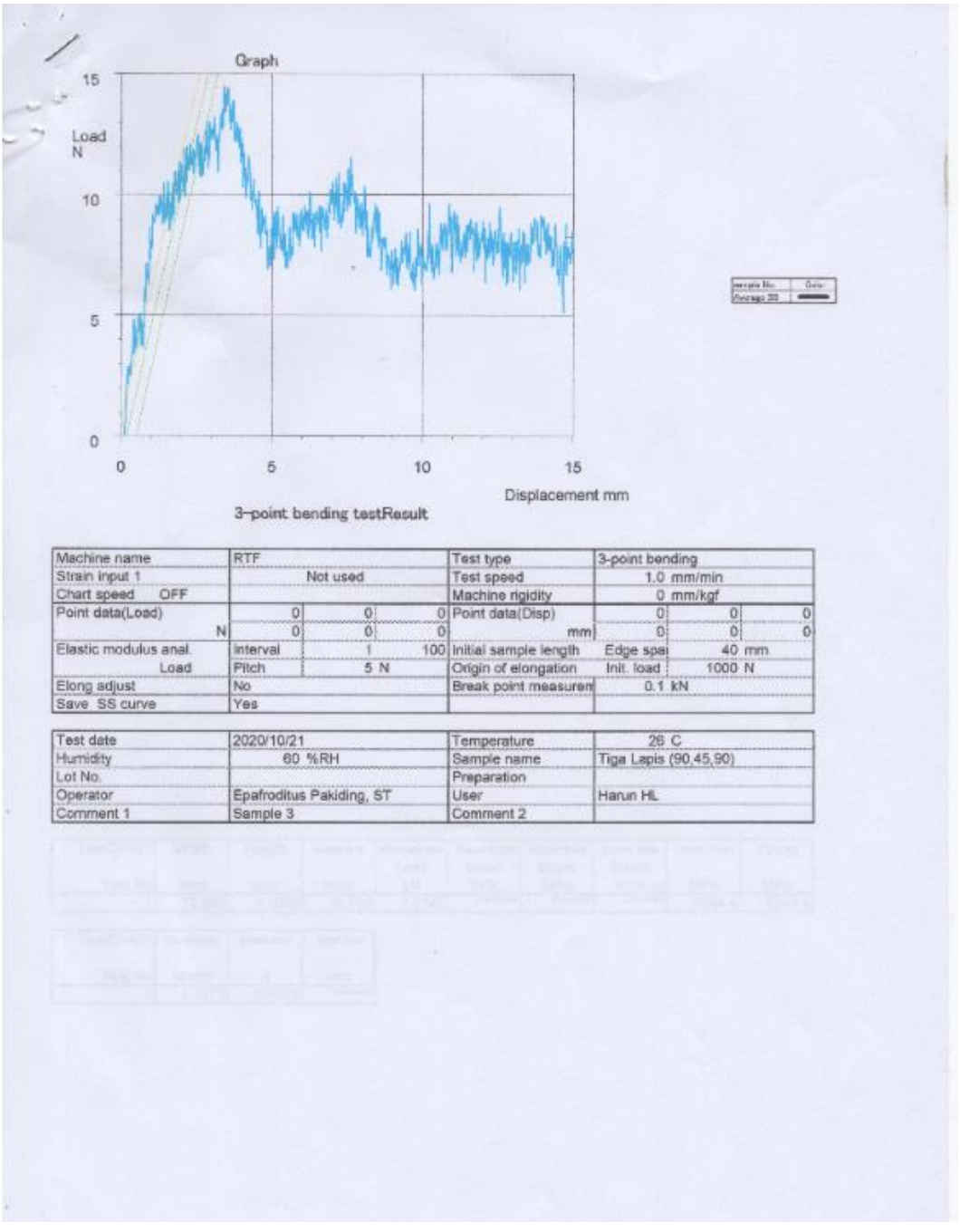


3-point bending testResult

Machine name	RTF			Test type	3-point bending			
Strain input 1	Not used			Test speed	1.0 mm/min			
Chart speed OFF				Machine rigidity	0 mm/kgf			
Point data(Load)	0	0	0	Point data(Disp)	0	0	0	
N	0	0	0	mm	0	0	0	
Elastic modulus anal.	Interval	1	100	initial sample length	Edge spa	40 mm		
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N		
Elong adjust	No			Break point measuren	0.1 kN			
Save SS curve	Yes							

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (90,45,90)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 2	Comment 2	

0˚/90˚; 45˚/135 ˚; 0˚/90˚ (3)

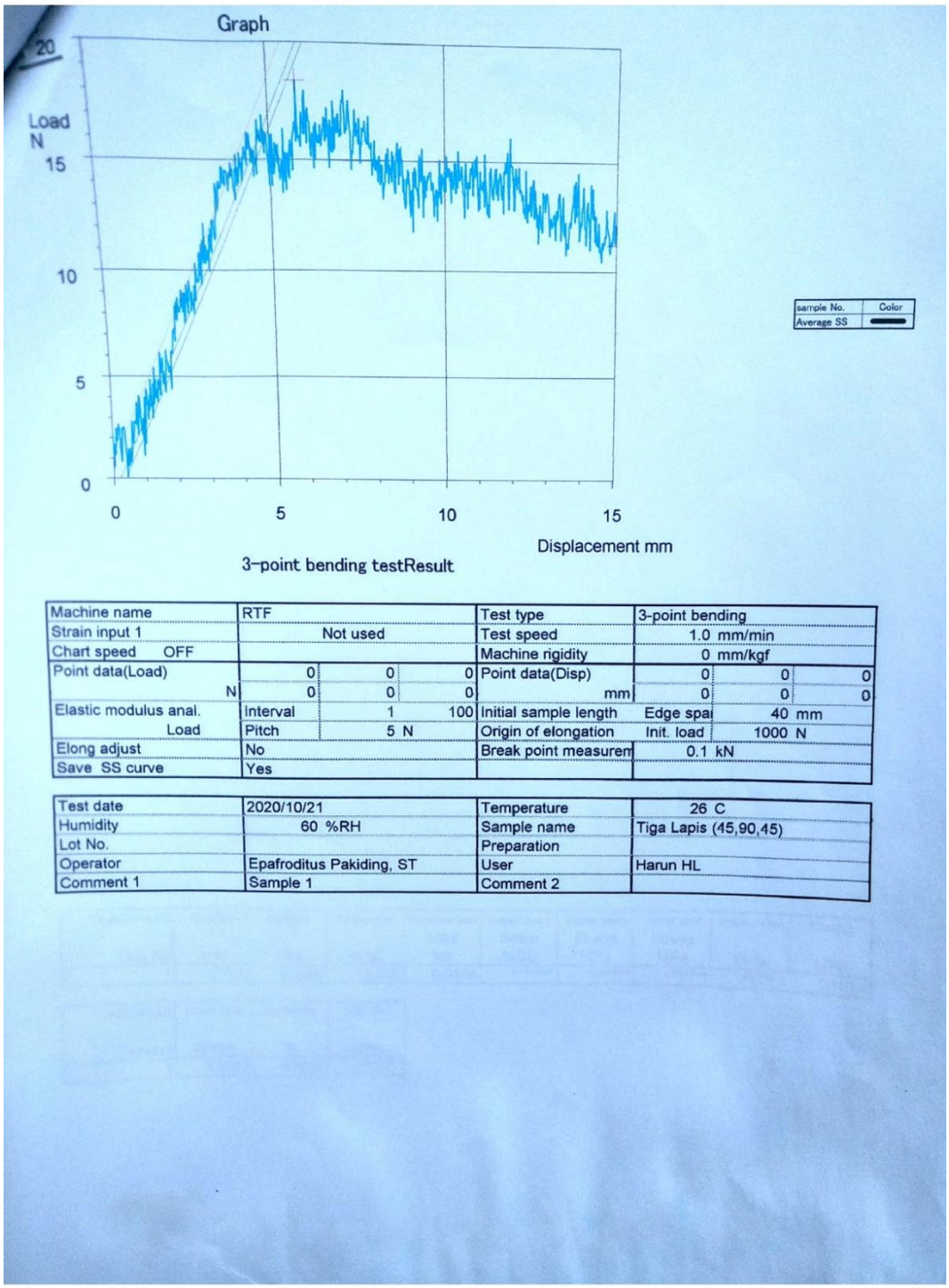


3-point bending testResult

Machine name	RTF			Test type	3-point bending		
Strain input 1	Not used			Test speed	1.0 mm/min		
Chart speed OFF				Machine rigidity	0 mm/kgf		
Point data(Load)	0	0	0	Point data(Disp)	0	0	0
N	0	0	0	mm	0	0	0
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm	
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N	
Elong adjust	No			Break point measurem	0.1 kN		
Save SS curve	Yes						

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (90,45,90)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 3	Comment 2	

45˚/135˚; 0˚/90˚; 45˚/135˚ (1)

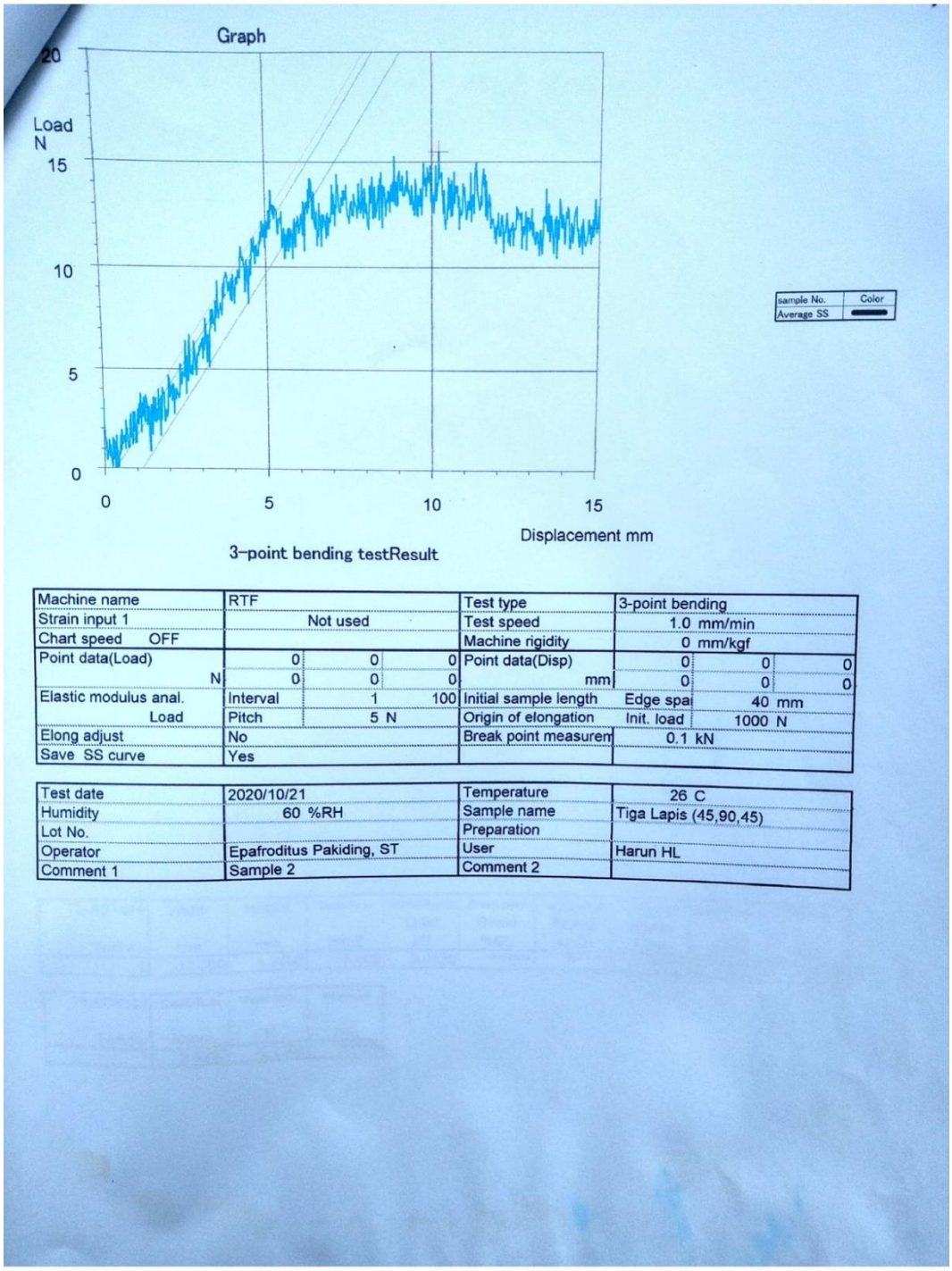


3–point bending testResult

Machine name	RTF			Test type	3-point bending		
Strain input 1	Not used			Test speed	1.0 mm/min		
Chart speed OFF				Machine rigidity	0 mm/kgf		
Point data(Load)	0	0	0	Point data(Disp)	0	0	0
N	0	0	0	mm	0	0	0
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm	
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N	
Elong adjust	No			Break point measurem	0.1 kN		
Save SS curve	Yes						

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (45,90,45)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 1	Comment 2	

45˚/135˚; 0˚/90˚; 45˚/135˚ (2)

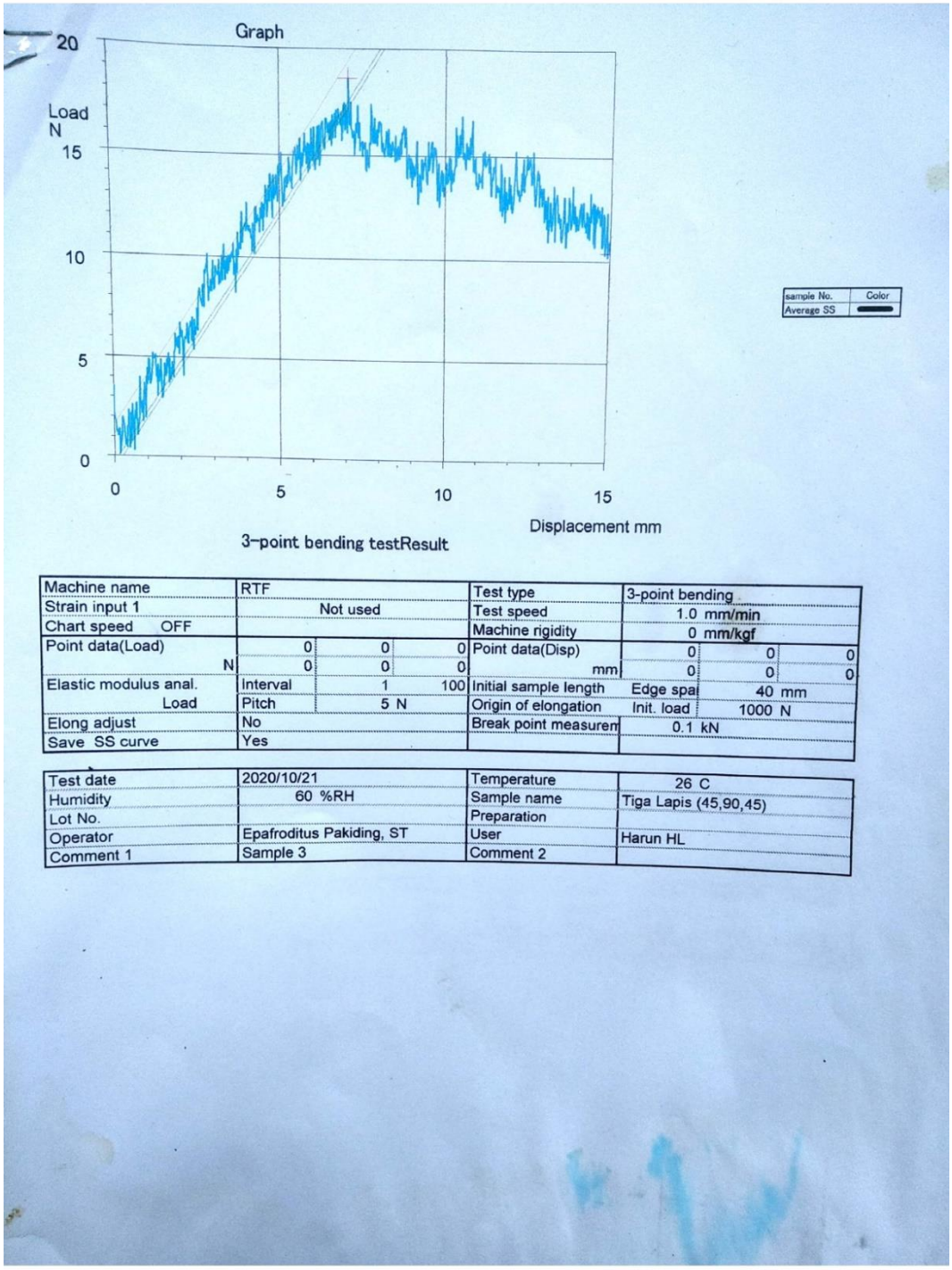


3-point bending testResult

Machine name	RTF			Test type	3-point bending			
Strain input 1	Not used			Test speed	1.0 mm/min			
Chart speed OFF				Machine rigidity	0 mm/kgf			
Point data(Load)	0	0	0	Point data(Disp)	0	0	0	
N	0	0	0	mm	0	0	0	
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm		
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N		
Elong adjust	No			Break point measuren	0.1 kN			
Save SS curve	Yes							

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (45,90,45)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 2	Comment 2	

45˚/135˚; 0˚/90˚; 45˚/135˚ (3)



3-point bending testResult

Machine name	RTF			Test type	3-point bending		
Strain input 1	Not used			Test speed	1.0 mm/min		
Chart speed OFF				Machine rigidity	0 mm/kgf		
Point data(Load)	0	0	0	Point data(Disp)	0	0	0
N	0	0	0	mm	0	0	0
Elastic modulus anal.	Interval	1	100	Initial sample length	Edge spa	40 mm	
Load	Pitch	5 N		Origin of elongation	Init. load	1000 N	
Elong adjust	No			Break point measurem	0.1 kN		
Save SS curve	Yes						

Test date	2020/10/21	Temperature	26 C
Humidity	60 %RH	Sample name	Tiga Lapis (45,90,45)
Lot No.		Preparation	
Operator	Epafroditus Pakiding, ST	User	Harun HL
Comment 1	Sample 3	Comment 2	