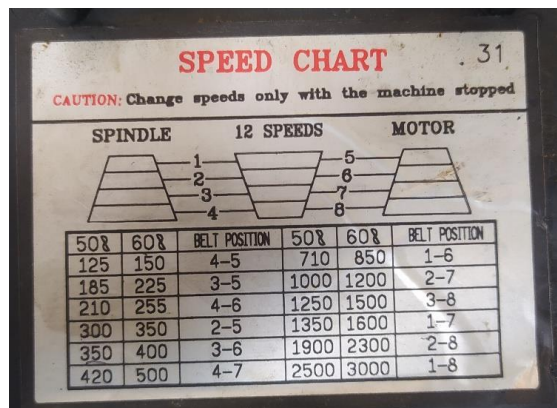


## LAMPIRAN 1

### TABEL DATA MATERIAL, *CUTTING SPEED*, DAN SPESIFIKASI KECEPATAN PUTARAN *SPINDLE* MESIN GURDI

| MATERIAL                              | CUTTING SPEEDS 1. |               | POINT ANGLE   | LIP CLEARANCE | COOLANTS                                    |
|---------------------------------------|-------------------|---------------|---------------|---------------|---|
|                                       | (METERS/MINUTE)   | (FEET/MINUTE) |               |               |   |
| Aluminum And Alloys                   | 61.00 - 91.50     | 200 - 300     | 90 - 130 deg  | 12 - 15 deg   | Kerosene/Kerosene & Lard Oil/ Soluble Oil   |
| Armor Plate                           | 12.20 - 18.25     | 40 - 50       | 135 - 140 deg | 6 - 9 deg     | Light Machine Oil                           |
| Brass                                 | 61.00 - 91.50     | 200 - 300     | 118 - 118 deg | 12 - 15 deg   | Dry/ Soluble Oil/Kerosene/Lard Oil          |
| Bronze                                | 61.00 - 91.50     | 200 - 300     | 110 - 118 deg | 12 - 15 deg   | Dry/ Soluble Oil/Mineral Oil/Lard Oil       |
| Bronze, High Tensile                  | 21.35 - 45.75     | 70 - 150      | 100 - 110 deg | 12 - 15 deg   | Dry/ Soluble Oil/Mineral Oil/Lard Oil       |
| Cast Iron, Soft                       | 30.50 - 45.75     | 100 - 150     | 90 - 100 deg  | 12 - 15 deg   | Air Jet Dry/ Soluble Oil                    |
| Cast Iron, Medium                     | 21.35 - 30.50     | 70 - 100      | 100 - 110 deg | 12 - 15 deg   | Air Jet Dry/ Soluble Oil                    |
| Cast Iron, Hard                       | 21.35 - 30.50     | 70 - 100      | 100 - 118 deg | 8 - 12 deg    | Air Jet Dry/ Soluble Oil                    |
| Cast Iron, Chilled                    | 9.15 - 12.20      | 30 - 40       | 118 - 135 deg | 5 - 9 deg     | Air Jet Dry/ Soluble Oil                    |
| Copper                                | 61.00 - 91.50     | 200 - 300     | 100 - 118 deg | 12 - 15 deg   | Air Jet Dry/ Soluble Oil                    |
| Copper Graphite Alloy (Carbon Drills) | 18.30 - 21.35     | 60 - 70       | **_**         | **_**         | Soluble Oil/Dry/Mineral Oil/Kerosene        |
| Glass (Carbon Drills)                 | 6.10 - 9.15       | 20 - 30       | **_**         | **_**         | Soluble Oil/Dry/Mineral Oil/Kerosene        |
| Iron, Malleable                       | 15.25 - 27.45     | 50 - 90       | 90 - 100 deg  | 12 - 15 deg   | Light Machine Oil                           |
| Magnesium And Alloys                  | 76.25 - 122.0     | 250 - 400     | 70 - 118 deg  | 12 - 15 deg   | Soluble Oil                                 |
| Monel Nickel                          | 4.15 - 15.28      | 30 - 50       | 118 - 125 deg | 10 - 12 deg   | Compressed Air/Mineral Oil                  |
| Nickel Alloys                         | 12.20 - 18.30     | 40 - 60       | 135 - 140 deg | 5 - 7 deg     | Lard Oil/Soluble Oil                        |
| Plastic, Hot Set                      | 30.50 - 91.50     | 100 - 300     | 60 - 90 deg   | 10 - 12 deg   | Lard Oil/Soluble Oil                        |
| Plastic, Cold Set                     | 30.50 - 91.50     | 100 - 300     | 118 - 135 deg | 12 - 20 deg   | Soap Solution                               |
| Steel, Low Carbon, 0.2-0.3ct          | 24.40 - 33.55     | 80 - 110      | 110 - 118 deg | 7 - 9 deg     | Soap Solution                               |
| Steel, Medium Carbon 0.4-0.5c         | 21.35 - 24.40     | 70 - 80       | 118 - 125 deg | 7 - 9 deg     | Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil |
| Steel (High Carbon 1.2c)              | 15.25 - 18.30     | 50 - 60       | 118 - 145 deg | 7 - 9 deg     | Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil |
| Steel, Forged                         | 15.25 - 18.30     | 50 - 60       | 118 - 145 deg | 7 - 12 deg    | Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil |
| Steel, Alloy                          | 15.25 - 21.35     | 50 - 70       | 118 - 125 deg | 10 - 12 deg   | Mineral Lard Oil                            |
| Steel, Alloy 300 To 400 Brinell       | 6.10 - 9.15       | 20 - 30       | 130 - 140 deg | 7 - 10 deg    | Soluble Oil                                 |
| Steel, Stainless, Free Machining      | 9.15 - 24.40      | 30 - 80       | 110 - 118 deg | 8 - 12 deg    | Soluble Oil                                 |
| Steel, Stainless, Hard                | 4.57 - 15.25      | 15 - 50       | 118 - 135 deg | 6 - 8 deg     | Soluble Oil                                 |
| Steel, Manganese                      | 3.66 - 4.57       | 12 - 15       | 140 - 150 deg | 7 - 10 deg    | Soluble Oil                                 |
| Stone (Carbide Drills)                | 7.63 - 9.15       | 25 - 30       | **_**         | **_**         | Water Solution                              |
| Wood                                  | 91.50 - 122.2     | 300 - 400     | 60 - 70 deg   | 10 - 15 deg   | Dry   |

Gambar 1A Data material dan *cutting speed* proses gurdi (Widarto, 2008)



Gambar 1B Variasi kecepatan *spindle* mesin gurdi

- Untuk baja

$$f = 0,084\sqrt[3]{d}; mm / put \dots \dots \dots (8.2)$$

- Untuk besi tuang

$$f = 0,1\sqrt[3]{d}; mm / put \dots \dots \dots (8.3)$$

Gambar 1C Rumus empiris gerak makan gurdi (Widarto, 2008)

## LAMPIRAN 2

### TABEL DATA MATERIAL, *CUTTING SPEED*, DAN SPESIFIKASI KECEPATAN PUTARAN *SPINDLE* MESIN FRAIS

| MATERIAL                              | CUTTING SPEEDS 1.      |                      | POINT<br>ANGLE | LIP<br>CLEARANCE | COOLANTS                                    |
|---------------------------------------|------------------------|----------------------|----------------|------------------|---|
|                                       | (METERS/MINUTE)<br>MPM | (FEET/MINUTE)<br>FPM |                |                  |   |
| Aluminum And Alloys                   | 61.00 - 91.50          | 200 - 300            | 90 - 130 deg   | 12 - 15 deg      | Kerosene/Kerosene & Lard Oil/ Soluble Oil   |
| Armor Plate                           | 12.20 - 18.25          | 40 - 50              | 135 - 140 deg  | 6 - 9 deg        | Light Machine Oil                           |
| Brass                                 | 61.00 - 91.50          | 200 - 300            | 118 - 118 deg  | 12 - 15 deg      | Dry/ Soluble Oil/Kerosene/Lard Oil          |
| Bronze                                | 61.00 - 91.50          | 200 - 300            | 110 - 118 deg  | 12 - 15 deg      | Dry/ Soluble Oil/Mineral Oil/Lard Oil       |
| Bronze, High Tensile                  | 21.35 - 45.75          | 70 - 150             | 100 - 110 deg  | 12 - 15 deg      | Dry/ Soluble Oil/Mineral Oil/Lard Oil       |
| Cast Iron, Soft                       | 30.50 - 45.75          | 100 - 150            | 90 - 100 deg   | 12 - 15 deg      | Air Jet Dry/ Soluble Oil                    |
| Cast Iron, Medium                     | 21.35 - 30.50          | 70 - 100             | 100 - 110 deg  | 12 - 15 deg      | Air Jet Dry/ Soluble Oil                    |
| Cast Iron, Hard                       | 21.35 - 30.50          | 70 - 100             | 100 - 118 deg  | 8 - 12 deg       | Air Jet Dry/ Soluble Oil                    |
| Cast Iron, Chilled                    | 9.15 - 12.20           | 30 - 40              | 118 - 135 deg  | 5 - 9 deg        | Air Jet Dry/ Soluble Oil                    |
| Copper                                | 61.00 - 91.50          | 200 - 300            | 100 - 118 deg  | 12 - 15 deg      | Air Jet Dry/ Soluble Oil                    |
| Copper Graphite Alloy (Carbon Drills) | 18.30 - 21.35          | 60 - 70              | **_**          | **_**            | Soluble Oil/Dry/Mineral Oil/Kerosene        |
| Glass (Carbon Drills)                 | 6.10 - 9.15            | 20 - 30              | **_**          | **_**            | Soluble Oil/Dry/Mineral Oil/Kerosene        |
| Iron, Malleable                       | 15.25 - 27.45          | 50 - 90              | 90 - 100 deg   | 12 - 15 deg      | Light Machine Oil                           |
| Magnesium And Alloys                  | 76.25 - 122.0          | 250 - 400            | 70 - 118 deg   | 12 - 15 deg      | Soluble Oil                                 |
| Monel Nickel                          | 4.15 - 15.28           | 30 - 50              | 118 - 125 deg  | 10 - 12 deg      | Compressed Air/Mineral Oil                  |
| Nickel Alloys                         | 12.20 - 18.30          | 40 - 60              | 135 - 140 deg  | 5 - 7 deg        | Lard Oil/Soluble Oil                        |
| Plastic, Hot Set                      | 30.50 - 91.50          | 100 - 300            | 60 - 90 deg    | 10 - 12 deg      | Lard Oil/Soluble Oil                        |
| Plastic, Cold Set                     | 30.50 - 91.50          | 100 - 300            | 118 - 135 deg  | 12 - 20 deg      | Soap Solution                               |
| Steel, Low Carbon, 0.2-0.3ct          | 24.40 - 33.55          | 80 - 110             | 110 - 118 deg  | 7 - 9 deg        | Soap Solution                               |
| Steel, Medium Carbon 0.4-0.5c         | 21.35 - 24.40          | 70 - 80              | 118 - 125 deg  | 7 - 9 deg        | Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil |
| Steel (High Carbon 1.2c)              | 15.25 - 18.30          | 50 - 60              | 118 - 145 deg  | 7 - 9 deg        | Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil |
| Steel, Forged                         | 15.25 - 18.30          | 50 - 60              | 118 - 145 deg  | 7 - 12 deg       | Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil |
| Steel, Alloy                          | 15.25 - 21.35          | 50 - 70              | 118 - 125 deg  | 10 - 12 deg      | Mineral Lard Oil                            |
| Steel, Alloy 300 To 400 Brinell       | 6.10 - 9.15            | 20 - 30              | 130 - 140 deg  | 7 - 10 deg       | Soluble Oil                                 |
| Steel, Stainless, Free Machining      | 9.15 - 24.40           | 30 - 80              | 110 - 118 deg  | 8 - 12 deg       | Soluble Oil                                 |
| Steel, Stainless, Hard                | 4.57 - 15.25           | 15 - 50              | 118 - 135 deg  | 6 - 8 deg        | Soluble Oil                                 |
| Steel, Manganese                      | 3.66 - 4.57            | 12 - 15              | 140 - 150 deg  | 7 - 10 deg       | Soluble Oil                                 |
| Stone (Carbide Drills)                | 7.63 - 9.15            | 25 - 30              | **_**          | **_**            | Water Solution                              |
| Wood                                  | 91.50 - 122.2          | 300 - 400            | 60 - 70 deg    | 10 - 15 deg      | Dry   |

Gambar 2A Data material dan *cutting speed* proses frais (Widarto, 2008)

| HORIZONTAL SPINDLE R.P.M. |     |     |      |
|---------------------------|-----|-----|------|
| 60% 50%<br>POLE 4         | A   | B   | C    |
| HIGH 60%                  | 360 | 610 | 1470 |
| HIGH 50%                  | 300 | 512 | 1225 |
| LOW 60%                   | 108 | 180 | 430  |
| LOW 50%                   | 90  | 151 | 358  |

Gambar 2B Variasi kecepatan *spindle* mesin frais

### LAMPIRAN 3



#### TABEL DATA MATERIAL, *CUTTING SPEED*, DAN SPESIFIKASI KECEPATAN PUTARAN *SPINDLE* MESIN BUBUT

| Bahan                            | Pahat Bubut HSS |           | Pahat Bubut Karbida |            |
|----------------------------------|-----------------|-----------|---------------------|------------|
|                                  | m/men           | Ft/min    | M/men               | Ft/min     |
| Baja lunak ( <i>Mild Steel</i> ) | 18 – 21         | 60 – 70   | 30 – 250            | 100 – 800  |
| Besi Tuang ( <i>Cast Iron</i> )  | 14 – 17         | 45 – 55   | 45 - 150            | 150 – 500  |
| Perunggu                         | 21 – 24         | 70 – 80   | 90 – 200            | 300 – 700  |
| Tembaga                          | 45 – 90         | 150 – 300 | 150 – 450           | 500 – 1500 |
| Kuningan                         | 30 – 120        | 100 – 400 | 120 – 300           | 400 – 1000 |
| Aluminium                        | 90 - 150        | 300 - 500 | 90 - 180            | b. – 600   |

Gambar 3A Data material dan *cutting speed* proses bubut

|   | 1   | 2   | 3    |
|---|-----|-----|------|
| A | 60  | 220 | 860  |
| B | 92  | 360 | 1400 |
| C | 140 | 530 | 2000 |

Gambar 3B Variasi kecepatan *spindle* mesin bubut

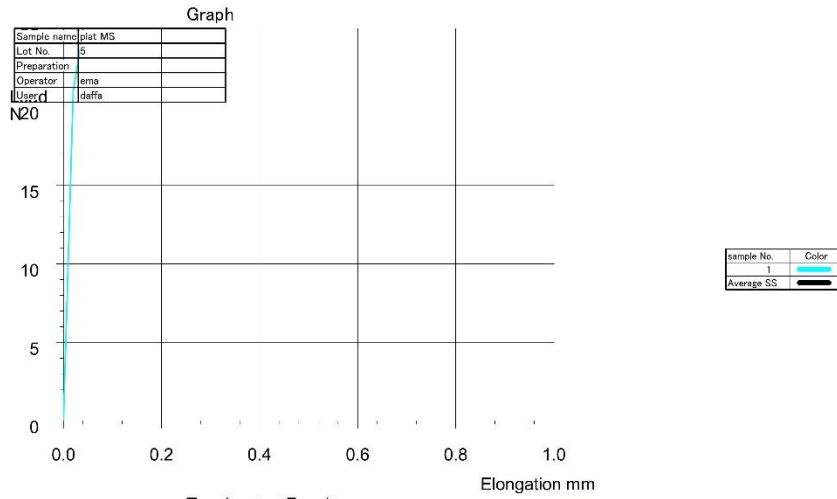
| LONGITUDINAL FEED  |       |       |       |       | TRANSVERSE FEED   |       |       |       |       |
|--|-------|-------|-------|-------|---|-------|-------|-------|-------|
|  [mm/rev] |       |       |       |       |  [mm/rev] |       |       |       |       |
| M  | M     |       |       |       | M   | M     |       |       |       |
|  | D     | E     | F     | G     |   | D     | E     | F     | G     |
| 1  | 0.044 | 0.088 | 0.176 | 0.352 | 1   | 0.020 | 0.039 | 0.079 | 0.158 |
| 2  | 0.050 | 0.099 | 0.198 | 0.396 | 2   | 0.022 | 0.044 | 0.089 | 0.178 |
| 3  | 0.052 | 0.105 | 0.210 | 0.420 | 3   | 0.023 | 0.047 | 0.094 | 0.188 |
| 4  | 0.055 | 0.110 | 0.220 | 0.440 | 4   | 0.024 | 0.049 | 0.098 | 0.196 |
| 5  | 0.060 | 0.121 | 0.242 | 0.484 | 5   | 0.027 | 0.054 | 0.109 | 0.218 |
| 6  | 0.063 | 0.127 | 0.254 | 0.508 | 6   | 0.028 | 0.057 | 0.114 | 0.228 |
| 7  | 0.066 | 0.132 | 0.264 | 0.528 | 7   | 0.029 | 0.059 | 0.118 | 0.236 |
| 8  | 0.072 | 0.144 | 0.287 | 0.574 | 8   | 0.032 | 0.064 | 0.128 | 0.256 |
| 9  | 0.075 | 0.149 | 0.298 | 0.596 | 9   | 0.033 | 0.067 | 0.134 | 0.268 |
| 10   | 0.077 | 0.154 | 0.308 | 0.616 | 10  | 0.034 | 0.069 | 0.138 | 0.276 |
| 11   | 0.083 | 0.166 | 0.331 | 0.662 | 11  | 0.037 | 0.074 | 0.148 | 0.296 |

Gambar 3C Variasi *feeding* mesin bubut

**LAMPIRAN 4**  
**DOKUMENTASI PROSES PRODUKSI**



**LAMPIRAN 5**  
**HASIL UJI TARIK *SPESIMEN* UJI**  
**MESIN *SPOT WELDING PORTABLE***



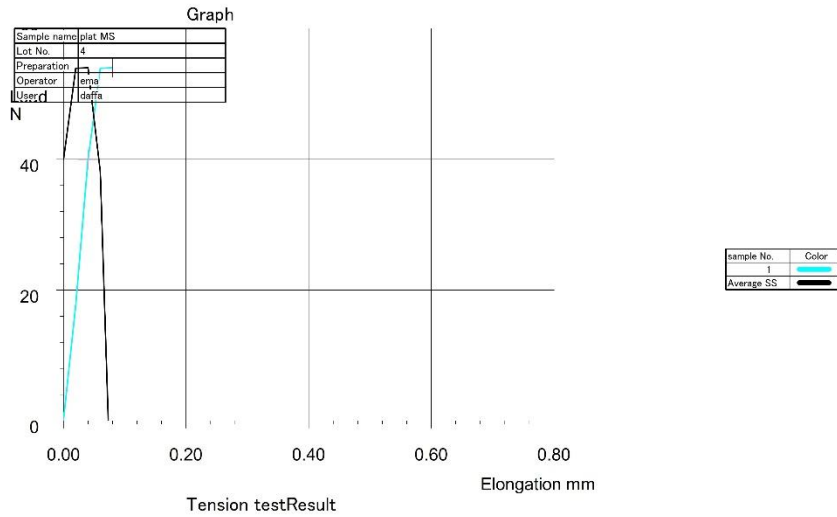
Tension testResult

|                       |            |                       |             |
|-----------------------|------------|-----------------------|-------------|
| Machine name          | RT1 series | Test type             | Tension     |
| Strain input 1        | Not used   | Test speed            | 10.0 mm/min |
| Chart speed           | OFF        | Machine rigidity      | 0 mm/kgf    |
| Point data(Load)      | N          | Point data(Elong)     | mm          |
| Elastic modulus anal. | Interval   | Initial sample length | Distance    |
| Load                  | Pitch      | Origin of elongation  | Init. load  |
| Elong adjust          | No         | Break point measurerr | 0.5 N       |
| Save SS curve         | Yes        |                       |             |

|           |            |             |         |
|-----------|------------|-------------|---------|
| Test date | 2024/07/16 | Temperature | 25 C    |
| Humidity  | 60 %RH     | Sample name | plat MS |
| Lot No.   | 5          | Preparation |         |
| Operator  | ema        | User        | daffa   |
| Comment 1 |            | Comment 2   |         |

| TestID=57 | Thickness | Maximum point | Maximum point | Maximum point |
|-----------|-----------|---------------|---------------|---------------|
| Test No   | mm        | Load N        | Load kN       | Stress MPa    |
| 1         | 0.8000    | 24.853        | 0.0249        | 1.0355        |

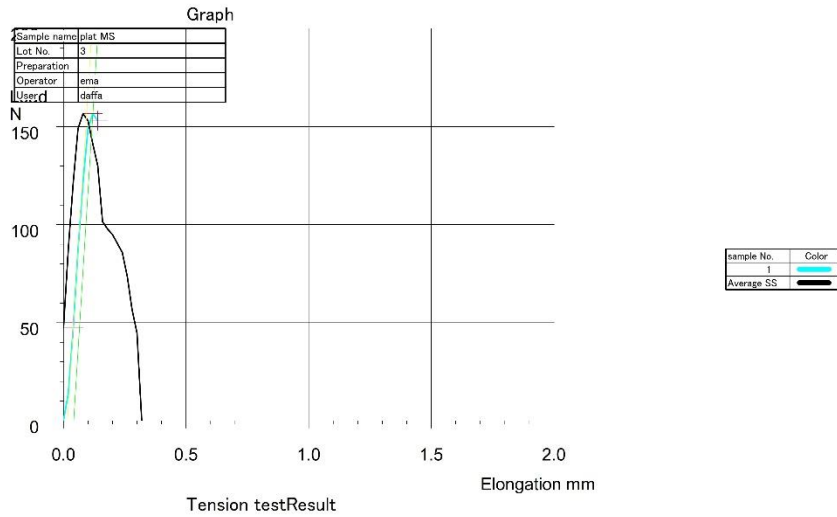




|                       |            |                       |             |
|-----------------------|------------|-----------------------|-------------|
| Machine name          | RT1 series | Test type             | Tension     |
| Strain input 1        | Not used   | Test speed            | 10.0 mm/min |
| Chart speed           | OFF        | Machine rigidity      | 0 mm/kgf    |
| Point data(Load)      | N          | Point data(Elong)     | mm          |
| Elastic modulus anal. | Interval   | 1                     | 100         |
| Load                  | Pitch      | 5 N                   |             |
| Elong adjust          | No         | Break point measurerr | 0.5 N       |
| Save SS curve         | Yes        |                       |             |

|           |            |             |         |
|-----------|------------|-------------|---------|
| Test date | 2024/07/16 | Temperature | 25 C    |
| Humidity  | 60 %RH     | Sample name | plat MS |
| Lot No.   | 4          | Preparation |         |
| Operator  | ema        | User        | daffa   |
| Comment 1 |            | Comment 2   |         |

| TestID=57 | Thickness | Maximum point Load | Maximum point Load | Maximum point Stress |
|-----------|-----------|--------------------|--------------------|----------------------|
| Test No   | mm        | N                  | kN                 | MPa                  |
| 1         | 0.8000    | 53.988             | 0.0540             | 2.2495               |

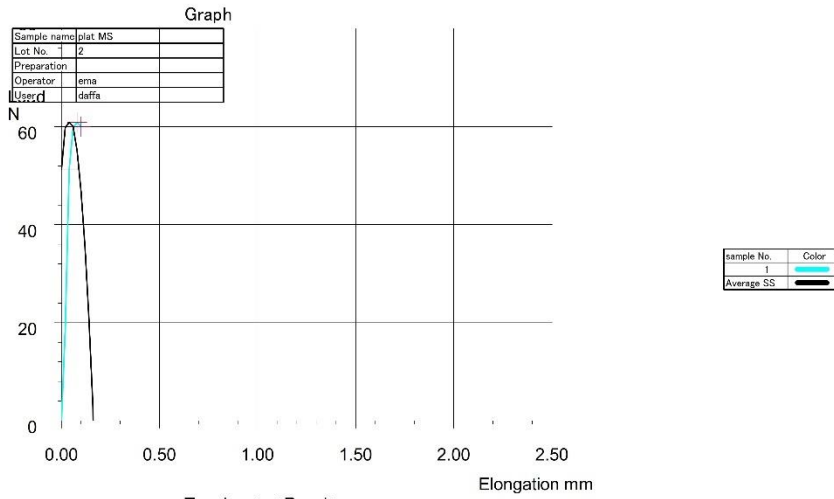


|                       |            |                       |             |
|-----------------------|------------|-----------------------|-------------|
| Machine name          | RT1 series | Test type             | Tension     |
| Strain input 1        | Not used   | Test speed            | 10.0 mm/min |
| Chart speed           | OFF        | Machine rigidity      | 0 mm/kgf    |
| Point data(Load)      | N          | Point data(Elong)     | mm          |
| Elastic modulus anal. | Interval   | 1                     | 100         |
| Load                  | Pitch      | 5 N                   |             |
| Elong adjust          | No         | Break point measurerr | 0.5 N       |
| Save SS curve         | Yes        |                       |             |

|           |            |             |         |
|-----------|------------|-------------|---------|
| Test date | 2024/07/16 | Temperature | 25 C    |
| Humidity  | 60 %RH     | Sample name | plat MS |
| Lot No.   | 3          | Preparation |         |
| Operator  | ema        | User        | daffa   |
| Comment 1 |            | Comment 2   |         |

| TestID=57 | Thickness | Maximum poin | Maximum poin | Maximum poin |
|-----------|-----------|--------------|--------------|--------------|
| Test No   | mm        | Load N       | Load kN      | Stress MPa   |
| 1         | 0.4000    | 156.56       | 0.1566       | 13.047       |

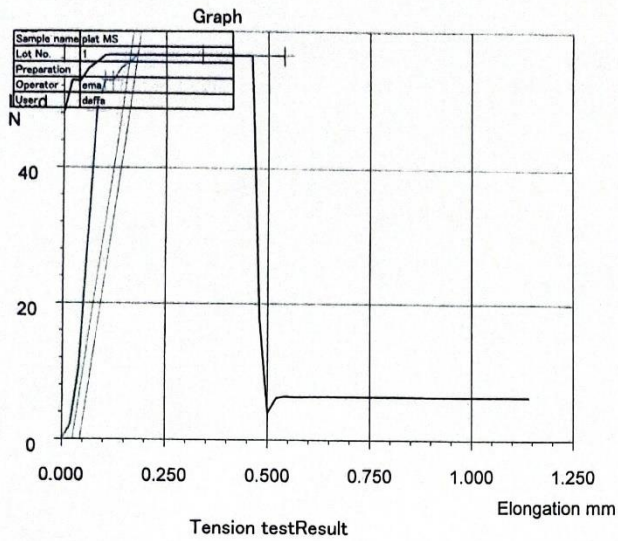




|                       |            |                       |             |
|-----------------------|------------|-----------------------|-------------|
| Machine name          | RT1 series | Test type             | Tension     |
| Strain input 1        | Not used   | Test speed            | 10.0 mm/min |
| Chart speed           | OFF        | Machine rigidity      | 0 mm/kgf    |
| Point data(Load)      | N          | Point data(Elong)     | mm          |
| Elastic modulus anal. | Interval   | 1                     | 100         |
| Load                  | Pitch      | 5 N                   |             |
| Elong adjust          | No         | Break point measurerr | 0.5 N       |
| Save SS curve         | Yes        |                       |             |

|           |            |             |         |
|-----------|------------|-------------|---------|
| Test date | 2024/07/16 | Temperature | 25 C    |
| Humidity  | 60 %RH     | Sample name | plat MS |
| Lot No.   | 2          | Preparation |         |
| Operator  | ema        | User        | daffa   |
| Comment 1 |            | Comment 2   |         |

| TestID=57 | Thickness | Maximum poin | Maximum poin | Maximum poin |
|-----------|-----------|--------------|--------------|--------------|
| Test No   | mm        | Load N       | Load kN      | Stress MPa   |
| 1         | 0.4000    | 60.836       | 0.0608       | 5.0697       |

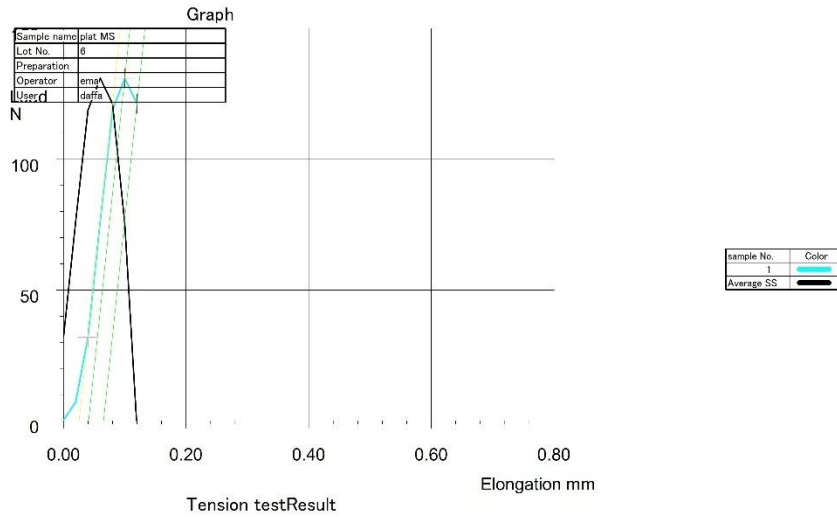


| sample No. | Color |
|------------|-------|
| 1          |       |
| Average SS |       |

|                       |            |                      |                       |
|-----------------------|------------|----------------------|-----------------------|
| Machine name          | RTI series | Test type            | Tension               |
| Strain input 1        | Not used   | Test speed           | 10.0 mm/min           |
| Chart speed           | OFF        | Machine rigidity     | 0 mm/kgf              |
| Point data(Load)      | 0          | Point data(Elong)    | 0                     |
|                       | 0          |                      | 0                     |
| Elastic modulus anal. | Interval   | 1                    | 100                   |
|                       | Pitch      | 5 N                  | Initial sample length |
|                       |            |                      | Distance              |
|                       |            |                      | 10 mm                 |
| Elong adjust          | No         | Origin of elongation | Init. load            |
| Save SS curve         | Yes        | Break point measurem | 0.3 %RO               |
|                       |            |                      | 0.5 N                 |

|           |            |             |         |
|-----------|------------|-------------|---------|
| Test date | 2024/07/16 | Temperature | 25 C    |
| Humidity  | 60 %RH     | Sample name | plat MS |
| Lot No.   | 1          | Preparation |         |
| Operator  | ema        | User        | daffa   |
| Comment 1 |            | Comment 2   |         |

| TestID=56 | Thickness | Maximum poin<br>Load | Maximum poin<br>Load | Maximum poin<br>Stress |
|-----------|-----------|----------------------|----------------------|------------------------|
| Test No   | mm        | N                    | kN                   | MPa                    |
| 1         | 0.4000    | 56.548               | 0.0565               | 4.7123                 |



|                       |            |                       |                    |
|-----------------------|------------|-----------------------|--------------------|
| Machine name          | RT1 series | Test type             | Tension            |
| Strain input 1        | Not used   | Test speed            | 10.0 mm/min        |
| Chart speed           | OFF        | Machine rigidity      | 0 mm/kgf           |
| Point data(Load)      | N          | Point data(Elong)     | mm                 |
| Elastic modulus anal. | Interval   | 1                     | 100                |
| Load                  | Pitch      | 5 N                   |                    |
| Elong adjust          | No         | Initial sample length | Distance 11.5 mm   |
| Save SS curve         | Yes        | Origin of elongation  | Init. load 0.3 %RO |
|                       |            | Break point measurerr | 0.5 N              |

|           |            |             |         |
|-----------|------------|-------------|---------|
| Test date | 2024/07/16 | Temperature | 25 C    |
| Humidity  | 60 %RH     | Sample name | plat MS |
| Lot No.   | 6          | Preparation |         |
| Operator  | ema        | User        | daffa   |
| Comment 1 |            | Comment 2   |         |

| TestID=58 | Thickness | Maximum point Load | Maximum point Load | Maximum point Stress |
|-----------|-----------|--------------------|--------------------|----------------------|
| Test No   | mm        | N                  | kN                 | MPa                  |
| 1         | 0.8000    | 130.86             | 0.1309             | 5.4527               |

**LAMPIRAN 6**  
**BIODATA PENULIS**



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Banyumas  
Telephone/HP : 085692294672  
Hobi : Jalan-jalan  
Moto : ITB (*Ikhlas, Teteg, Berhasil*)  
Pendidikan :  

1. SD Negeri 4 Kedungwuluh
2. SMP Negeri 1 Purwokerto
3. SMA Negeri 5 Purwokerto