

# LAMPIRAN

**Penghitungan manual pengujian tarik ( Teg.Max ) Logam Induk**

$$Pu = 113.56 \text{ Kn} = 1.135.600 \text{ N}$$

$$Ao = W \times T = 20.15 \text{ mm} \times 8.85 \text{ mm} = 178.3275 \text{ mm}^2$$

$$\text{Pers R.M : } \sigma_u = \frac{Pu}{Ao} = \frac{1.135.60}{178.3275} = \underline{636.81} \text{ Mpa}$$

**Penghitungan manual pengujian tarik ( Teg.Max ) arus 80 ampere**

$$Pu = 72,64 \text{ Kn} = 726.400 \text{ N}$$

$$Ao = W \times T = 15.57 \text{ mm} \times 8.85 \text{ mm} = 137.7945 \text{ mm}^2$$

$$\text{Pers 80.1 : } \sigma_u = \frac{Pu}{Ao} = \frac{726.400}{137.7945} = \underline{527.16} \text{ Mpa}$$

$$Pu = 74.59 \text{ Kn} = 745.900 \text{ N}$$

$$Ao = W \times T = 13.90 \text{ mm} \times 8.85 \text{ mm} = 123.015 \text{ mm}^2$$

$$\text{Pers 80.2 : } \sigma_u = \frac{Pu}{Ao} = \frac{745.900}{123.015} = \underline{606.35} \text{ Mpa}$$

$$Pu = 70.30 \text{ Kn} = 703.000 \text{ N}$$

$$Ao = W \times T = 16.88 \text{ mm} \times 8.85 \text{ mm} = 149.388 \text{ mm}^2$$

$$\text{Pers 80.3 : } \sigma_u = \frac{Pu}{Ao} = \frac{703.000}{149.388} = \underline{470.59} \text{ Mpa}$$

**Penghitungan manual pengujian tarik ( Teg.Max ) arus 90 ampere**

$$Pu = 83.51 \text{ Kn} = 835.100 \text{ N}$$

$$Ao = W \times T = 15.31 \text{ mm} \times 8.85 \text{ mm} = 135.4935 \text{ mm}^2$$

$$\text{Pers 90.1 : } \sigma_u = \frac{Pu}{Ao} = \frac{835.100}{135.4935} = \underline{616.34} \text{ Mpa}$$

$$Pu = 77.26 \text{ Kn} = 772.600 \text{ N}$$

$$Ao = W \times T = 14.40 \text{ mm} \times 8.85 \text{ mm} = 127.44 \text{ mm}^2$$

$$\text{Pers 90.2 : } \sigma_u = \frac{Pu}{Ao} = \frac{772.600}{127.44} = \underline{606.25} \text{ Mpa}$$

$$Pu = 70.99 \text{ Kn} = 709.900 \text{ N}$$

$$Ao = W \times T = 12.95 \text{ mm} \times 8.85 \text{ mm} = 114.6075 \text{ mm}^2$$

$$\text{Pers 90.3 : } \sigma_u = \frac{Pu}{Ao} = \frac{709.900}{114.6075} = \underline{619.42} \text{ Mpa}$$

**Perhitungan manual pengujian tarik ( Teg.Max ) arus 100 ampere**

$$Pu = 72.45 \text{ Kn} = 724.500 \text{ N}$$

$$Ao = W \times T = 13.27 \text{ mm} \times 8.85 \text{ mm} = 117.4395 \text{ mm}^2$$

$$\text{Pers 100.1 : } \sigma_u = \frac{Pu}{Ao} = \frac{724.500}{117.4395} = \underline{616.91} \text{ Mpa}$$

$$Pu = 77.47 \text{ Kn} = 774.700 \text{ N}$$

$$Ao = W \times T = 14.17 \text{ mm} \times 8.85 \text{ mm} = 125.4045 \text{ mm}^2$$

$$\text{Pers 100.2 : } \sigma_u = \frac{Pu}{Ao} = \frac{774.700}{125.4045} = \underline{617.76} \text{ Mpa}$$

$$Pu = 58.60 \text{ Kn} = 586.000 \text{ N}$$

$$Ao = W \times T = 14.16 \text{ mm} \times 8.85 \text{ mm} = 125.316 \text{ mm}^2$$

$$\text{Pers 100.3 : } \sigma_u = \frac{Pu}{Ao} = \frac{586.000}{125.316} = \underline{467.62} \text{ Mpa}$$

**Perhitungan manual pengujian tarik ( Regangan ) Logam Induk**

$$\begin{aligned} \text{Pers R.M : } \quad \varepsilon &= \frac{L-L_0}{L_0} \times 100\% \\ \varepsilon &= \frac{106.39 - 91.59}{91.59} \times 100 \% \\ \varepsilon &= \frac{1480}{91.59} = 16.15 = \underline{16.2} \% \end{aligned}$$

**Perhitungan manual pengujian tarik ( Regangan ) arus 80 ampere**

$$\begin{aligned} \text{Pers 80.1 : } \quad \varepsilon &= \frac{L-L_0}{L_0} \times 100\% \\ \varepsilon &= \frac{97.59 - 91.92}{91.92} \times 100 \% \\ \varepsilon &= \frac{567}{91.92} = 6.16 = \underline{6.2} \% \end{aligned}$$

$$\begin{aligned} \text{Pers 80.2 : } \quad \varepsilon &= \frac{L-L_0}{L_0} \times 100\% \\ \varepsilon &= \frac{99.26 - 91.67}{91.67} \times 100 \% \\ \varepsilon &= \frac{759}{91.67} = 8.27 = \underline{8.3} \% \end{aligned}$$

$$\begin{aligned} \text{Pers 80.2 : } \quad \varepsilon &= \frac{L-L_0}{L_0} \times 100\% \\ \varepsilon &= \frac{95.73 - 92.07}{92.07} \times 100 \% \\ \varepsilon &= \frac{366}{92.07} = 3.97 = \underline{4.0} \% \end{aligned}$$

**Penghitungan manual pengujian tarik ( Regangan ) arus 90 ampere**

$$\begin{aligned} \text{Pers 90.1 : } \quad \varepsilon &= \frac{L-L_0}{L_0} \times 100\% \\ \varepsilon &= \frac{101.21 - 92.13}{92.13} \times 100 \% \\ \varepsilon &= \frac{908}{92.13} = 9.85 = \underline{9.9} \% \end{aligned}$$

$$\begin{aligned} \text{Pers 90.2 : } \quad \varepsilon &= \frac{L-L_0}{L_0} \times 100\% \\ \varepsilon &= \frac{101.12 - 92.00}{92.00} \times 100 \% \\ \varepsilon &= \frac{912}{92.00} = 9.91 = \underline{9.9} \% \end{aligned}$$

$$\begin{aligned} \text{Pers 90.2 : } \quad \varepsilon &= \frac{L-L_0}{L_0} \times 100\% \\ \varepsilon &= \frac{102.62 - 92.07}{92.07} \times 100 \% \\ \varepsilon &= \frac{1055}{92.07} = 11.45 = \underline{11.5} \% \end{aligned}$$

**Perhitungan manual pengujian tarik ( Regangan ) arus 100 ampere**

$$\begin{aligned} \text{Pers 100.1 : } \quad \varepsilon &= \frac{L-L_0}{L_0} \times 100\% \\ \varepsilon &= \frac{100.35 - 91.98}{91.98} \times 100 \% \\ \varepsilon &= \frac{837}{91.98} = 9.09 = \underline{9.1} \% \end{aligned}$$

$$\begin{aligned} \text{Pers 100.2 : } \quad \varepsilon &= \frac{L-L_0}{L_0} \times 100\% \\ \varepsilon &= \frac{102.79 - 92.50}{92.50} \times 100 \% \\ \varepsilon &= \frac{1029}{92.50} = 11.12 = \underline{11.1} \% \end{aligned}$$

Pers 100.2 :  $\epsilon = \frac{L-L_0}{L_0} \times 100\%$

$$\epsilon = \frac{95.02 - 91.59}{91.59} \times 100 \%$$
$$\epsilon = \frac{343}{91.59} = 3.74 = \underline{3.7} \%$$

**Pembuatan spesimen dengan melakukan proses pembuatan kumpuh  
V dan pengelasan dengan arus 80, 90 dan 100 A**







Proses pengujian tarik dengan 9 spesimen arus 80, 90, 100 ampere dan 1 logam induk *raw material* kemudian dilakukan proses pemolesan benda kerja untuk dilakukan pengujian struktur mikro.









**Pengujian struktur mikro dengan perbesaran 100x untuk melihat struktur kandungan daerah las,HAZ dan logam induk pada benda kerja.**





