



Design of Keys Formulas

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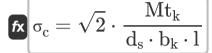


List of 32 Design of Keys Formulas

Design of Keys 🗗

Design of Kennedy Key 🗗

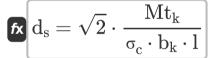
1) Compressive Stress in Kennedy Key



Open Calculator 🗗

$$ext{ex} 128.0285 ext{N/mm}^2 = \sqrt{2} \cdot rac{712763.6 ext{N*mm}}{44.98998 ext{mm} \cdot 5 ext{mm} \cdot 35 ext{mm}}$$

2) Diameter of Shaft given Compressive Stress in Kennedy Key



Open Calculator 🗗

$$45 \mathrm{mm} = \sqrt{2} \cdot \frac{712763.6 \mathrm{N^*mm}}{128 \mathrm{N/mm^2 \cdot 5mm \cdot 35mm}}$$

3) Diameter of Shaft given Shear Stress in Kennedy Key

$$\mathbf{f}_{\mathbf{k}} d_{s} = rac{\mathrm{Mt_k}}{\sqrt{2} \cdot au \cdot b_k \cdot 1}$$

Open Calculator 🗗

$$=$$
 $\frac{712763.6 \mathrm{N^*mm}}{\sqrt{2} \cdot 63.9 \mathrm{N/mm^2} \cdot 5 \mathrm{mm} \cdot 35 \mathrm{mm}}$



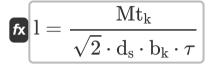
4) Length of Kennedy Key given Compressive Stress in Key



Open Calculator 2

$$l = \sqrt{2} \cdot rac{\mathrm{Mt_k}}{\mathrm{d_s \cdot b_k \cdot \sigma_c}}$$

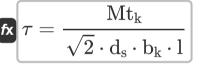
5) Length of Kennedy Key given Shear Stress in Key



Open Calculator

$$= \frac{712763.6\text{N*mm}}{\sqrt{2} \cdot 44.98998\text{mm} \cdot 5\text{mm} \cdot 63.9\text{N/mm}^2}$$

6) Shear Stress in Kennedy Key



Open Calculator

$$\mathbf{ex} = \frac{64.01425 \mathrm{N/mm^2}}{\sqrt{2} \cdot 44.98998 \mathrm{mm} \cdot 5 \mathrm{mm} \cdot 35 \mathrm{mm}}$$



7) Torque Transmitted by Kennedy Key given Compressive Stress in Key

 $\mathbf{M} t_k = \sigma_c \cdot d_s \cdot b_k \cdot rac{1}{\sqrt{2}}$

Open Calculator

 $ext{ex} 712604.9 ext{N*mm} = 128 ext{N/mm}^2 \cdot 44.98998 ext{mm} \cdot 5 ext{mm} \cdot rac{35 ext{mm}}{\sqrt{2}}$

8) Torque Transmitted by Kennedy Key given Shear Stress in Key

 $\mathbf{M} t_k = au \cdot \sqrt{2} \cdot d_s \cdot b_k \cdot l$

Open Calculator

 $= 711491.5 \text{N*mm} = 63.9 \text{N/mm}^2 \cdot \sqrt{2} \cdot 44.98998 \text{mm} \cdot 5 \text{mm} \cdot 35 \text{mm}$

9) Width of Key given Compressive Stress in Key

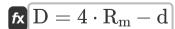
 $\left|\mathbf{b}_{\mathrm{k}}=\sqrt{2}\cdotrac{\mathrm{Mt_{k}}}{\mathrm{d_{s}\cdot\sigma_{c}\cdot l}}
ight|$

Open Calculator

 $ext{ex} egin{aligned} 5.001113 ext{mm} & \sqrt{2} \cdot rac{712763.6 ext{N*mm}}{44.98998 ext{mm} \cdot 128 ext{N/mm}^2 \cdot 35 ext{mm}} \end{aligned}$

Design of Splines &

10) Major Diameter of Spline given Mean Radius



Open Calculator

 $\texttt{ex} \ 60 \text{mm} = 4 \cdot 28 \text{mm} - 52 \text{mm}$







11) Mean Radius of Splines

 $m R_m = rac{D+d}{4}$

Open Calculator

 $28 \text{mm} = \frac{60 \text{mm} + 52 \text{mm}}{4}$

12) Mean Radius of Splines given Torque Transmitting Capacity

 $\left| {{
m{R}}_{
m{m}}}
ight| {
m{R}}_{
m{m}} \cdot {
m{A}}
ight|$

Open Calculator

 $\mathbf{ex} = \frac{224500 \mathrm{N^*mm}}{5.139652 \mathrm{N/mm^2 \cdot 1560 mm^2}}$

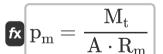
13) Minor Diameter of Spline given Mean Radius 🗹

fx $d=4\cdot R_{
m m}-D$

Open Calculator 🗗

 $2mm = 4 \cdot 28mm - 60mm$

14) Permissible Pressure on Splines given Torque Transmitting Capacity



Open Calculator 🗗

 $ext{ex} \ 5.139652 ext{N/mm}^2 = rac{224500 ext{N*mm}}{1560 ext{mm}^2 \cdot 28 ext{mm}}$





15) Torque Transmitting Capacity of Splines

fx $M_t = p_m \cdot A \cdot R_m$

Open Calculator 🚰

Open Calculator

 $\mathbf{ex} \ 224500 \mathrm{N*mm} = 5.139652 \mathrm{N/mm^2 \cdot 1560 mm^2 \cdot 28 mm}$

16) Torque Transmitting Capacity of Splines given Diameter of Splines

 $\mathbf{M}_{\mathrm{t}} = rac{\mathrm{p}_{\mathrm{m}} \cdot \mathrm{l}_{\mathrm{h}} \cdot \mathrm{n} \cdot \left(\mathrm{D}^2 - \mathrm{d}^2
ight)}{8}$

ex

 $224500 ext{N*mm} = rac{5.139652 ext{N/mm}^2 \cdot 65 ext{mm} \cdot 6 \cdot \left((60 ext{mm})^2 - (52 ext{mm})^2
ight)}{8}$

17) Total Area of Splines

 $m{\kappa} = 0.5 \cdot (\mathbf{l_h} \cdot \mathbf{n}) \cdot (\mathbf{D} - \mathbf{d})$

Open Calculator

 $\mathbf{ex} \ 1560 \mathrm{mm}^2 = 0.5 \cdot (65 \mathrm{mm} \cdot 6) \cdot (60 \mathrm{mm} - 52 \mathrm{mm})$

18) Total Area of Splines given Torque Transmitting Capacity

 $\mathbf{K} = \frac{\overline{M_t}}{p_m \cdot R_m}$

Open Calculator 🗗

 $ext{ex} 1560 ext{mm}^2 = rac{224500 ext{N*mm}}{5.139652 ext{N/mm}^2 \cdot 28 ext{mm}}$





Design of Square and Flat Keys

19) Compressive Stress in Key

 $\sigma_{
m c} = 4 \cdot rac{
m M_t}{
m d_s \cdot l \cdot h}$

Open Calculator 2

ex $126.7302 \text{N/mm}^2 = 4 \cdot \frac{2245001 \text{N}}{44.98998 \text{mm} \cdot 35 \text{mm} \cdot 4.5 \text{mm}}$

20) Compressive Stress in Square Key due to Transmitted Torque 🖸

fx $\sigma_{
m c} = 2 \cdot au$

Open Calculator

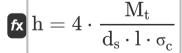
ex $127.8 \text{N/mm}^2 = 2 \cdot 63.9 \text{N/mm}^2$

21) Force on Key

 $\left| \mathbf{F} = 2 \cdot rac{\mathrm{M_t}}{\mathrm{d_s}}
ight|$

Open Calculator

22) Height of Key given Compressive Stress in Key



Open Calculator

 $= 4 \cdot \frac{224500 \mathrm{N*mm}}{44.98998 \mathrm{mm} \cdot 35 \mathrm{mm} \cdot 128 \mathrm{N/mm^2}}$







00) 1 41 515 1 0



 $l=4\cdotrac{
m M_t}{
m d_s\cdot\sigma_c\cdot h}$

Open Calculator

24 65 27 2

24) Length of Key given Shear Stress

 $l = \frac{F}{b_{lr} \cdot au}$

Open Calculator

= $31.23631 \mathrm{mm} = rac{9980 \mathrm{N}}{5 \mathrm{mm} \cdot 63.9 \mathrm{N/mm^2}}$

25) Shaft Diameter given Compressive Stress in Key

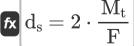
= $44.54365 ext{mm} = 4 \cdot rac{224500 ext{N*mm}}{128 ext{N/mm}^2 \cdot 35 ext{mm} \cdot 4.5 ext{mm}}$

 $\left| \mathbf{f}_{\mathbf{s}}
ight| \mathrm{d}_{\mathrm{s}} = 4 \cdot rac{\mathrm{M}_{\mathrm{t}}}{\mathrm{\sigma}_{\mathrm{c}} \cdot \mathbf{l} \cdot \mathbf{h}}$

Open Calculator

26) Shaft Diameter given Force on Key

26) Shaft Diameter given Force on Key



Open Calculator







27) Shear Stress in given Force on Key

 $au_{
m flat\ key} = rac{
m F}{
m b_k \cdot l}$

Open Calculator 🗗

 $ext{ex} \left[57.02857 ext{N/mm}^2 = rac{9980 ext{N}}{5 ext{mm} \cdot 35 ext{mm}}
ight]$

28) Shear Stress in Key given Torque Transmitted

 $au_{
m flat\ key} = 2 \cdot rac{
m M_t}{
m b_k \cdot l \cdot d_s}$

Open Calculator

 $ext{ex} \left[57.02857 ext{N/mm}^2 = 2 \cdot rac{224500 ext{N*mm}}{5 ext{mm} \cdot 35 ext{mm} \cdot 44.98998 ext{mm}}
ight]$

29) Shear Stress on Flat Key 🗹

 $au_{
m flat\ key} = \overline{rac{2 \cdot {
m T}}{{
m b}_{
m k} \cdot {
m d}_{
m s} \cdot {
m l}}}$

Open Calculator 🗗

30) Torque Transmitted by Keyed Shaft given Force on Keys

 $\left| \mathbf{f}_{\mathbf{k}}
ight| \mathrm{M_{t}} = \mathrm{F} \cdot rac{\mathrm{d_{s}}}{2} \,
ight|$

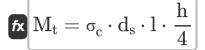
Open Calculator 🗗

= 224500N*mm = 9980N $\cdot \frac{44.98998$ mm





31) Torque Transmitted by Keyed Shaft given Stress in Key



Open Calculator 🗗

32) Width of Key given Shear Stress in Key

$$b_{k} = rac{F}{ au_{
m flat\ key} \cdot l}$$

Open Calculator

$$ext{ex} = rac{9980 ext{N}}{57.02857 ext{N/mm}^2 \cdot 35 ext{mm}}$$



Variables Used

- A Total Area of Splines (Square Millimeter)
- **b**_k Width of Key (Millimeter)
- d Minor Diameter of Spline Key Shaft (Millimeter)
- **D** Major Diameter of Spline Key Shaft (Millimeter)
- **d**_S Diameter of Shaft using Key (Millimeter)
- **F** Force on Key (Newton)
- h Height of Key (Millimeter)
- Length of Key (Millimeter)
- In Length of Hub on Keyed Shaft (Millimeter)
- M_t Transmitted Torque by Keyed Shaft (Newton Millimeter)
- Mt_k Transmitted Torque by Kennedy Key (Newton Millimeter)
- n Number of Splines
- pm Permissible Pressure on Splines (Newton per Square Millimeter)
- R_m Mean Radius of Spline of Shaft (Millimeter)
- T Torque Transmitted by Shaft (Newton Millimeter)
- σ_c Compressive Stress in Key (Newton per Square Millimeter)
- τ Shear Stress in Key (Newton per Square Millimeter)
- τ_{flat kev} Shear Stress (Newton per Square Millimeter)





Constants, Functions, Measurements used

- Function: sqrt, sqrt(Number)

 A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: Length in Millimeter (mm)
 Length Unit Conversion
- Measurement: Area in Square Millimeter (mm²)
 Area Unit Conversion
- Measurement: Pressure in Newton per Square Millimeter (N/mm²)
 Pressure Unit Conversion
- Measurement: Force in Newton (N)
 Force Unit Conversion
- Measurement: Torque in Newton Millimeter (N*mm)
 Torque Unit Conversion
- Measurement: Stress in Newton per Square Millimeter (N/mm²)
 Stress Unit Conversion





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