Tabelle 5a. Biegelinien von statisch bestimmten Trägern mit konstantem Querschnitt

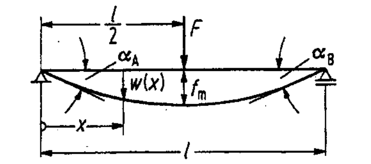
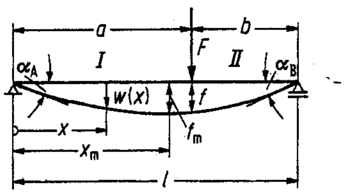
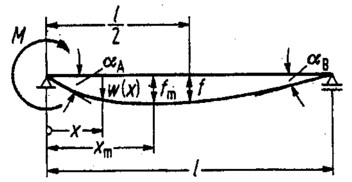
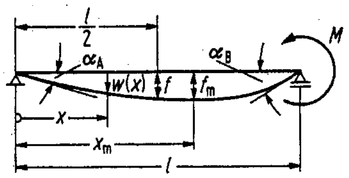
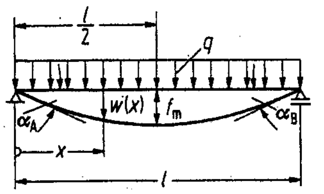
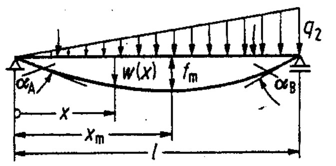
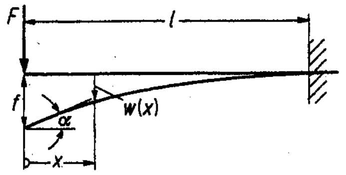
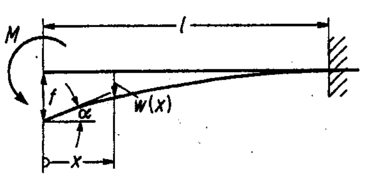
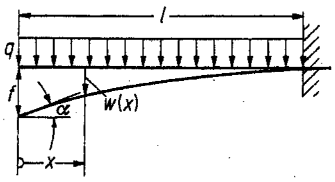
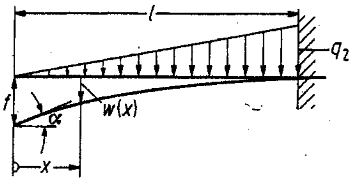
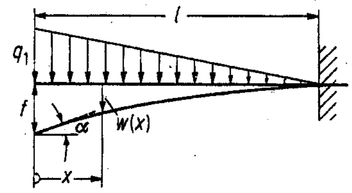
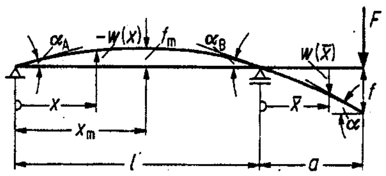
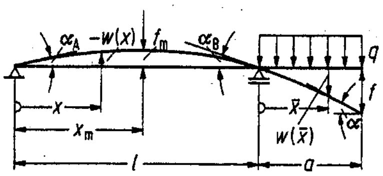
	Belastungsfall	Gleichung der Biegelinie	Durchbiegung	Neigungswinkel
1		$0 \le x \le l/2$: $w(x) = \frac{Fl^3}{48EI_y}\left[3\frac{x}{l} - 4\left(\frac{x}{l}\right)^3\right]$	$f_m = \frac{Fl^3}{48EI_y}$	$\alpha_A = \alpha_B = \frac{Fl^2}{16EI_y}$
2		$0 \le x \le a$: $w_I(x) = \frac{Fab^2}{6EI_y}\left[\left(1+\frac{l}{b}\right)\frac{x}{l} - \frac{x^3}{abl}\right]$ $a \le x \le l$: $w_{II}(x) = \frac{Fa^2b}{6EI_y}\left[\left(1+\frac{l}{a}\right)\frac{l-x}{l} - \frac{(l-x)^3}{abl}\right]$	$f = \frac{Fa^2b^2}{3EI_y l}$ $a>b$: $f_m = \frac{Fb\sqrt{(l^2-b^2)^3}}{9\sqrt{3}\,EI_y l}$ in $x_m = \sqrt{(l^2-b^2)/3}$ $a<b$: $f_m = \frac{Fa\sqrt{(l^2-a^2)^3}}{9\sqrt{3}\,EI_y l}$ in $x_m = l - \sqrt{(l^2-a^2)/3}$	$\alpha_A = \frac{Fab(l+b)}{6EI_y l}$ $\alpha_B = \frac{Fab(l+a)}{6EI_y l}$
3a		$w(x) = \frac{Ml^2}{6EI_y}\left[2\frac{x}{l} - 3\left(\frac{x}{l}\right)^2 + \left(\frac{x}{l}\right)^3\right]$	$f = \frac{Ml^2}{16EI_y}$ in $x = \frac{l}{2}$ $f_m = \frac{Ml^2}{9\sqrt{3}EI_y}$ in $x_m = l - \frac{l}{\sqrt{3}}$	$\alpha_A = \frac{Ml}{3EI_y}$ $\alpha_B = \frac{Ml}{6EI_y}$
3b		$w(x) = \frac{Ml^2}{6EI_y}\left[\frac{x}{l} - \left(\frac{x}{l}\right)^3\right]$	$f = \frac{Ml^2}{16EI_y}$ in $x = \frac{l}{2}$ $f_m = \frac{Ml^2}{9\sqrt{3}EI_y}$ in $x_m = \frac{l}{\sqrt{3}}$	$\alpha_A = \frac{Ml}{6EI_y}$ $\alpha_B = \frac{Ml}{3EI_y}$
4		$w(x) = \frac{ql^4}{24EI_y}\left[\frac{x}{l} - 2\left(\frac{x}{l}\right)^3 + \left(\frac{x}{l}\right)^4\right]$	$f_m = \frac{5}{384}\frac{ql^4}{EI_y}$	$\alpha_A = \alpha_B = \frac{ql^3}{24EI_y}$
5		$w(x) = \frac{q_2 l^4}{360EI_y}\left[7\frac{x}{l} - 10\left(\frac{x}{l}\right)^3 + 3\left(\frac{x}{l}\right)^5\right]$	$f_m = \frac{q_2 l^4}{153{,}3EI_y}$ in $x_m = 0{,}519\,l$	$\alpha_A = \frac{7}{360}\frac{q_2 l^3}{EI_y}$ $\alpha_B = \frac{8}{360}\frac{q_2 l^3}{EI_y}$
6		$w(x) = \frac{Fl^3}{6EI_y}\left[2 - 3\frac{x}{l} + \left(\frac{x}{l}\right)^3\right]$	$f = \frac{Fl^3}{3EI_y}$	$\alpha = \frac{Fl^2}{2EI_y}$
7		$w(x) = \frac{Ml^2}{2EI_y}\left[1 - 2\frac{x}{l} + \left(\frac{x}{l}\right)^2\right]$	$f = \frac{Ml^2}{2EI_y}$	$\alpha = \frac{Ml}{EI_y}$

Tabelle 5a (Fortsetzung)

	Belastungsfall	Gleichung der Biegelinie	Durchbiegung	Neigungswinkel
8		$w(x) = \frac{ql^4}{24EI_y}\left[3 - 4\frac{x}{l} + \left(\frac{x}{l}\right)^4\right]$	$f = \frac{ql^4}{8EI_y}$	$\alpha = \frac{ql^3}{6EI_y}$
9		$w(x) = \frac{q_2 l^4}{120EI_y}\left[4 - 5\frac{x}{l} + \left(\frac{x}{l}\right)^5\right]$	$f = \frac{q_2 l^4}{30EI_y}$	$\alpha = \frac{q_2 l^3}{24EI_y}$
10		$w(x) = \frac{q_1 l^4}{120EI_y}\left[11 - 15\frac{x}{l} + 5\left(\frac{x}{l}\right)^4 - \left(\frac{x}{l}\right)^5\right]$	$f = \frac{11}{120}\frac{q_1 l^4}{EI_y}$	$\alpha = \frac{q_1 l^3}{8EI_y}$
11		$0 \leq x \leq l$: $w(x) = -\frac{Fal^2}{6EI_y}\left[\frac{x}{l} - \left(\frac{x}{l}\right)^3\right]$ $0 \leq \bar{x} \leq a$: $w(\bar{x}) = \frac{Fa^3}{6EI_y}\left[2\frac{l}{a}\frac{\bar{x}}{a} + 3\left(\frac{\bar{x}}{a}\right)^2 - \left(\frac{\bar{x}}{a}\right)^3\right]$	$f = \frac{Fa^2(l+a)}{3EI_y}$ $f_m = \frac{Fal^2}{9\sqrt{3}\,EI_y}$ in $x_m = \frac{l}{\sqrt{3}}$	$\alpha = \frac{Fa(2l+3a)}{6EI_y}$ $\alpha_A = \frac{Fal}{6EI_y}$ $\alpha_B = \frac{Fal}{3EI_y}$
12		$0 \leq x \leq l$: $w(x) = -\frac{qa^2l^2}{12EI_y}\left[\frac{x}{l} - \left(\frac{x}{l}\right)^3\right]$ $0 \leq \bar{x} \leq a$: $w(\bar{x}) = \frac{qa^4}{24EI_y}\left[4\frac{l}{a}\frac{\bar{x}}{a} + 6\left(\frac{\bar{x}}{a}\right)^2 - 4\left(\frac{\bar{x}}{a}\right)^3 + \left(\frac{\bar{x}}{a}\right)^4\right]$	$f = \frac{qa^3(4l+3a)}{24EI_y}$ $f_m = \frac{qa^2l^2}{18\sqrt{3}\,EI_y}$ in $x_m = \frac{l}{\sqrt{3}}$	$\alpha = \frac{qa^2(l+a)}{6EI_y}$ $\alpha_A = \frac{qa^2l}{12EI_y}$ $\alpha_B = \frac{qa^2l}{6EI_y}$

Quelle: Dubbel - Taschenbuch für den Maschinenbau