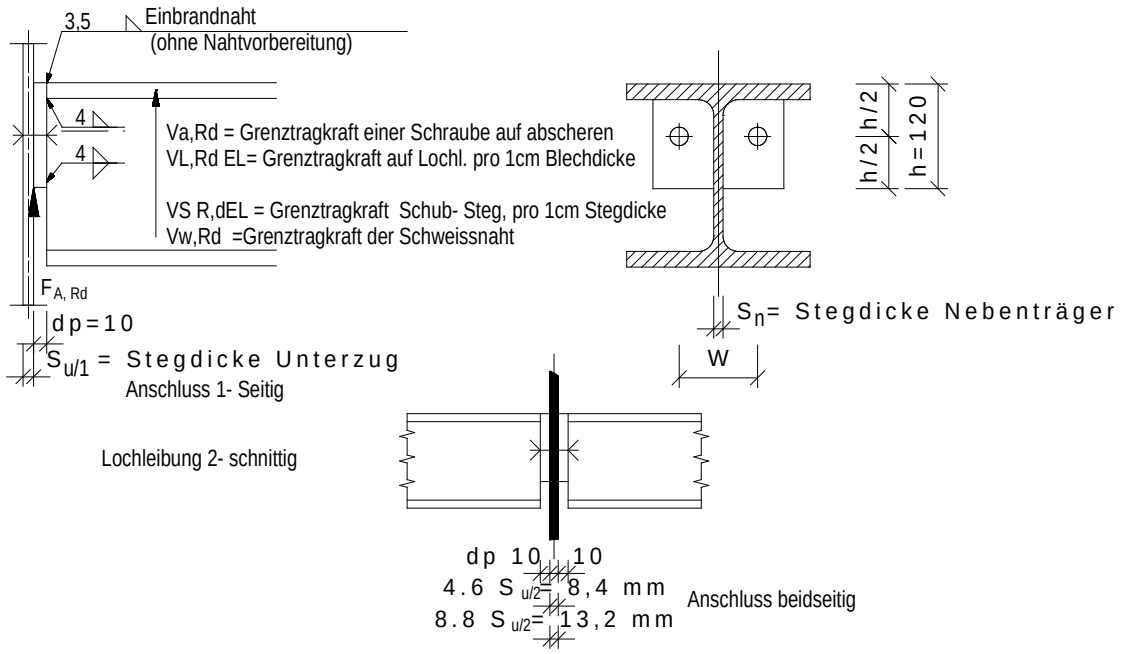
Typisierung, Tragfähigkeiten, Flanschstreichmasse für IPE-, HEA- u. HEB-Profile Schraubengrösse: M 16; Festigkeitsklassen: 4.6 u. 8.8; Bauteil aus S 235 JRG2 (St 37)

Maschinenschrauben 8.8 kleinste Abmessung M16 x 55, Klemmlänge (KL) = 12 – 32



Abscheren: $V_{a,R,d} = A \bullet \alpha_a \bullet f_{u,b,d}$

4.6 $V_{a,Rd}$ = 2,01cm² • 0,6 • 36,3 kN/cm² = **43 kN** ⇒4.6, 2xM16= **86 kN =$F_{A,Rd}$**

8.8 $V_{a,Rd}$= 1,57cm² • 0,6 • 72,7 kN/cm² = **68 kN** ⇒8.8, 2xM16= **136 kN =$F_{A,Rd}$**

Lochleibung: $V_{L,R,d_{EL}} = S_{EL} \bullet d_{sch} \bullet \alpha_L \bullet f_{y,d}$ **S_{EL} = 1cm = Einheitsstegdicke**

(Einheitsblechdicke S_{EL}=1cm) $V_{L,Rd,EL}$ S235 =1cm •1,6cm •3 •21,8 kN/cm² =**104 kN/$_{1cm}$** ⇒ 2 x M16= **208kN / 1cm= $V_{L,RdEL}$ = $F_{A,Rd,EL}$**

Lochleibung: (Stegdicke Unterzug S_u)

$V_{L,Rd}$ = $V_{a,Rd}$, **S_u erf.** = $\frac{F_{A,Rd}}{V_{L,Rd,EL}}$,4.6 S_u erf. = $\frac{86}{208}$ = 0,413cm,Su/1 **= 4,2 mm**

8.8 S_u erf. = $\frac{136}{208}$ = 0,653cm, Su/1 **= 6,6 mm**

Schub: $V_{sn,RdEL}$= $A_{s\,n}$ •1,1•$\tau_{R,d}$ = 1,0• h•1,1• **τ_{Rd}**,h=12cm,**τ_{Rd}**=21,8/√3 =12,60 kN/$_{cm²}$

(Einheitsstegdicke Nebenträger S_{nEL}=1cm)

$V_{Sn,Rd,EL}$ = 1 cm • 12 cm • 1,1 • 12,6 = **166 kN /$_{1cm}$ =$V_{s,n,Rd,EL}$ =$F_{A,Rd,S,EL}$**

Stegdicke $V_{Sn\ zugeh.}$ = $V_{Sn,Rd}$ / h • 1,1• **$\tau_{R,d}$** mit $V_{Sn,Rd}$ = $V_{a,Rd}$

S 235 (St 37) 4.6 = 86 kN / 12cm • 1,1 • 12,6 kN/cm² = 0,517 cm Sn **= 5,2 mm**

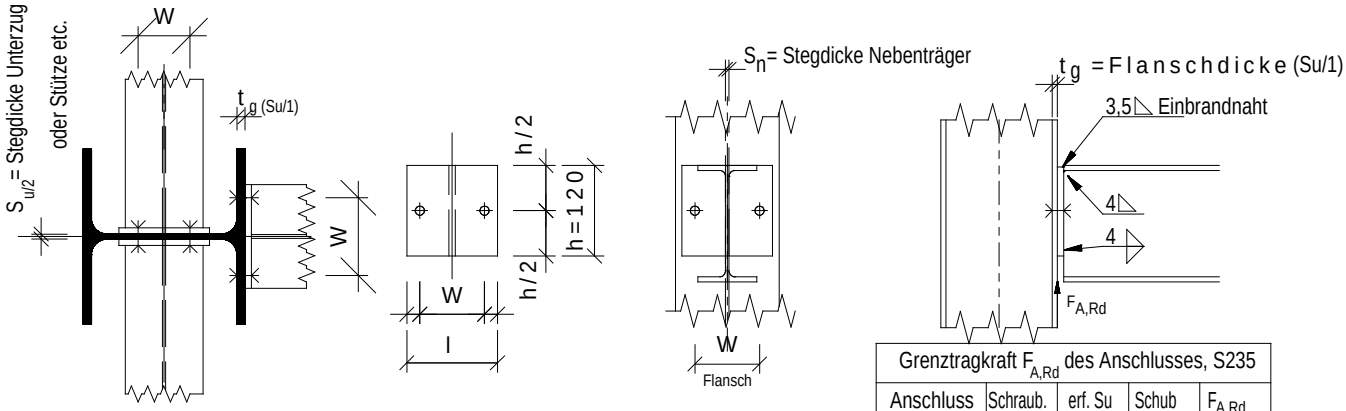
8.8 = 136 kN / 12cm • 1,1 • 12,6 kN/cm² = 0,817 cm Sn **= 8,2 mm**

Schweissnaht: $V_{w,Rd} = \alpha_w \bullet A_w \bullet f_{y,d}$ = α_w • 2 • a x h • $f_{y,d}$, α_W = 0,95 (S235=St37)

→ $V_{w,Rd}$ = 0,95 • 2 • 0,4cm • 12cm • 21,8 kN/cm² **= 198 kN =$V_{w,Rd}$ =$F_{A,Rd,W}$**

Hinweis: Für Bauteile aus S 355 (St 52) gelten für $F_{A,Rd}$, die 1,5 fachen Werte

Maschinenschrauben 8.8, kleinste Abmessung M 16 x 55 Klemmlänge (KL) = 12 – 32
Bei Flanschanschlüssen: $S_{u/1}=t_g$ setzen

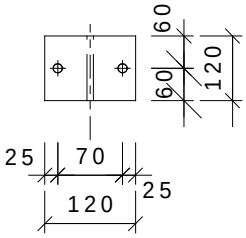


Grenztragkraft $F_{A,Rd}$ des Anschlusses, S235

Anschluss	Schraub. Güte	erf. Su mm	Schub grenz S_n mm	$F_{A,Rd}$ kN
1- seitig Su/1	4.6	4,2	5,2	86
	8.8	6,6	8,2	136
2-seitig Su/2	4.6	8,4	5,2	172
	8.8	13,2	8,2	272

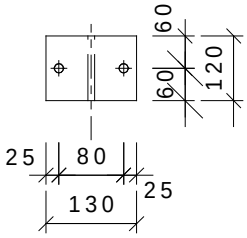
Lochleibung: $V_{L,Rd,EL}$=208 kN/1cm
$F_{A,Rd}$= $V_{L,Rd,EL}$ • vorh. Su für
vorh. Su < erf. Su und vorh. Sn ≥ grenz Sn

M 16 - 4.6 u. 8.8 Loch Ø17
120x10 - 120
Typ: 3.2.16.11
a= 4



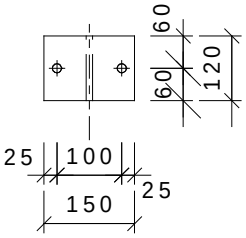
IPE 240 - 270
HEA 120 - 180
HEB 120 - 180

M 16 - 4.6 u. 8.8 Loch Ø17
120x10 - 130
Typ: 3.2.16.12
a= 4



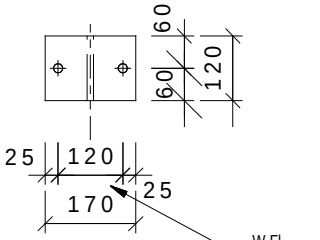
IPE 270 - 360
HEA 140 - 220
HEB 140 - 220

M 16 - 4.6 u. 8.8 Loch Ø17
120x10 - 150
Typ: 3.2.16.13
a= 4



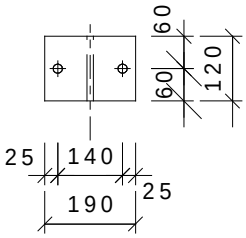
IPE 300 - 600
HEA 160 - 600
HEB 160 - 600

M 16 - 4.6 u. 8.8 Loch Ø17
120x10 - 170
Typ: 3.2.16.14
a= 4



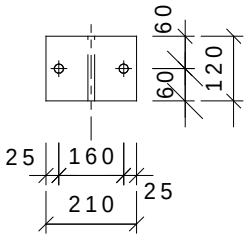
IPE 360 - 600
HEA 180 - 1000
HEB 180 - 1000

M 16 - 4.6 u. 8.8 Loch Ø17
120x10 - 190
Typ: 3.2.16.15
a= 4



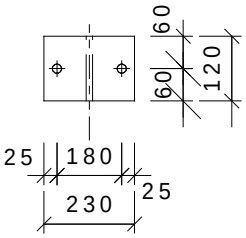
IPE 450 - 600
HEA 200 - 1000
HEB 200 - 1000

M 16 - 4.6 u. 8.8 Loch Ø17
120x10 - 210
Typ: 3.2.16.16
a= 4



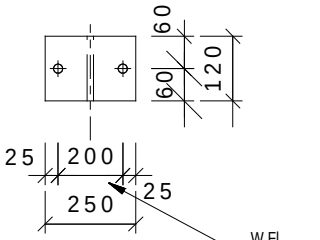
IPE 550 - 600
HEA 220 - 1000
HEB 220 - 1000

M 16 - 4.6 u. 8.8 Loch Ø17
120x10 - 230
Typ: 3.2.16.17
a= 4



HEA 240 - 1000
HEB 240 - 1000

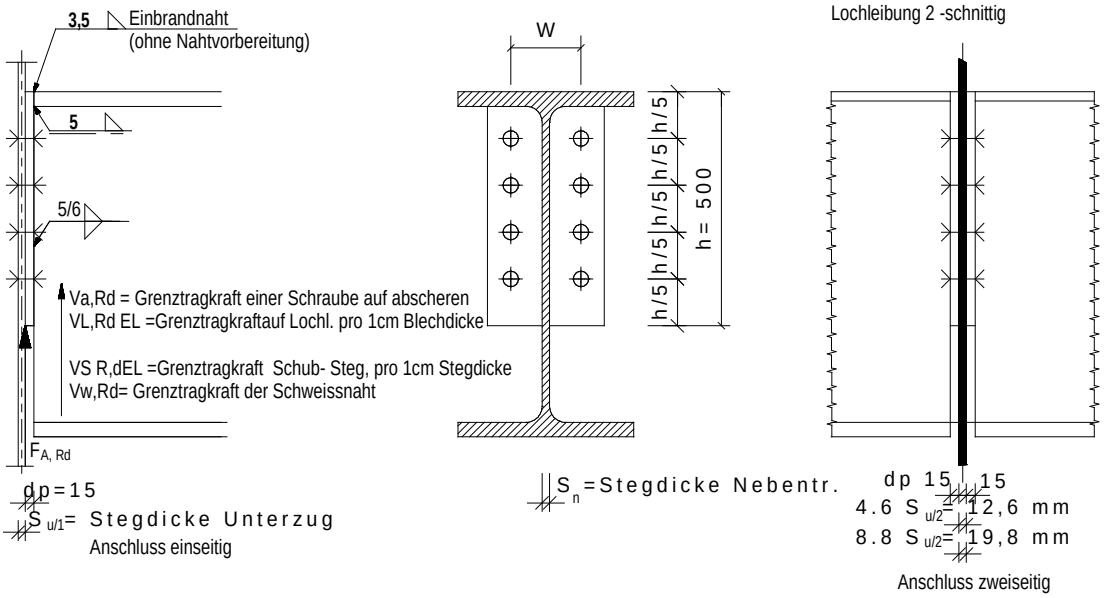
M 16 - 4.6 u. 8.8 Loch Ø17
120x10 - 250
Typ: 3.2.16.18
a= 4



HEA 260 - 1000
HEB 260 - 1000

Typisierung, Tragfähigkeiten, Flanschstreichmasse für IPE-, HEA- u. HEB-Profile
Schraubengröße: M 24; Festigkeitskl.: 4.6 u. 8.8; Bauteil aus S 235 JRG2 (St 37)

Maschinenschrauben 8.8, kleinste Abmessung M 24 x 70 Klemmlänge (KL) = 12 –37



Abscheren: $V_{a,R,d} = A \bullet \alpha_a \bullet f_{u,b,d}$

4.6 $V_{a,Rd}$ = 4,52 cm² • 0,6 • 36,3 kN/cm² = **98 kN** ⇒4.6, 8xM24= **784 kN =$F_{A,Rd}$**

8.8 $V_{a,Rd}$= 3,53 cm² • 0,6 • 72,7 kN/cm² = **154 kN** ⇒8.8, 8xM24= **1232 kN =$F_{A,Rd}$**

Lochleibung: $V_{L,R,d_{EL}} = S_{EL} \bullet d_{sch} \bullet \alpha_L \bullet f_{y,d}$ **S_{EL} = 1cm = Einheitsstegdicke**

(Einheitsblech-dicke S_{EL}=1cm)

$V_{L,Rd,EL,S235}$=1cm•2,4cm •3 •21,8 kN/cm² = **157 kN/$_{1cm}$** ⇒ 8 x M24= **1256 kN/1cm =$V_{L,RdEL}$ =$F_{A,Rd,EL}$**

Lochleibung: **(Stegdicke Unterzug S_u)**

$V_{L,Rd}$ = $V_{a,Rd}$, S_u erf. = $\frac{F_{A,Rd}}{V_{L,Rd,EL}}$,4.6 S_u erf. = $\frac{784}{1256}$ = 0,624cm,Su/1 **= 6,3 mm**

8.8 S_u erf. = $\frac{1232}{1256}$ = 0,981cm, Su/1 **= 9,9 mm**

Schub: $V_{sn,RdEL}=A_{s\,n}\bullet 1,1\bullet\tau_{R,d}=1,0\bullet h\bullet 1,1\bullet\tau_{R,d}$,h=40cm,τ_{Rd}=21,8/√3 =12,60 kN/$_{cm²}$

(Einheitssteg-dicke Neben-träger S_{nEL}=1cm)

$V_{Sn,Rd,EL}$ = 1 cm • 50 cm • 1,1 • 12,6 = **693 kN /$_{1cm}$ =$V_{s,n,Rd,EL}$ = $F_{A,Rd,S,EL}$**

Stegdicke $V_{Sn\ zugeh.}$ = $V_{Sn,Rd}$ / h • 1,1• $\tau_{R,d}$ mit $V_{Sn,Rd}$ = $V_{a,Rd}$

S 235 (St 37) 4.6 = 784 kN / 50cm • 1,1 • 12,6 kN/cm² = 1,131 cm Sn **= 11,3 mm**

8.8 = 1232kN / 50cm • 1,1 • 12,6 kN/cm² = 1,777 cm Sn **= 17,8 mm**

Schweissnaht: $V_{w,Rd} = \alpha_w \bullet A_w \bullet f_{y,d}$ = α_w • 2 • a x h • $f_{y,d}$, α_W = 0,95 (S235=St37)

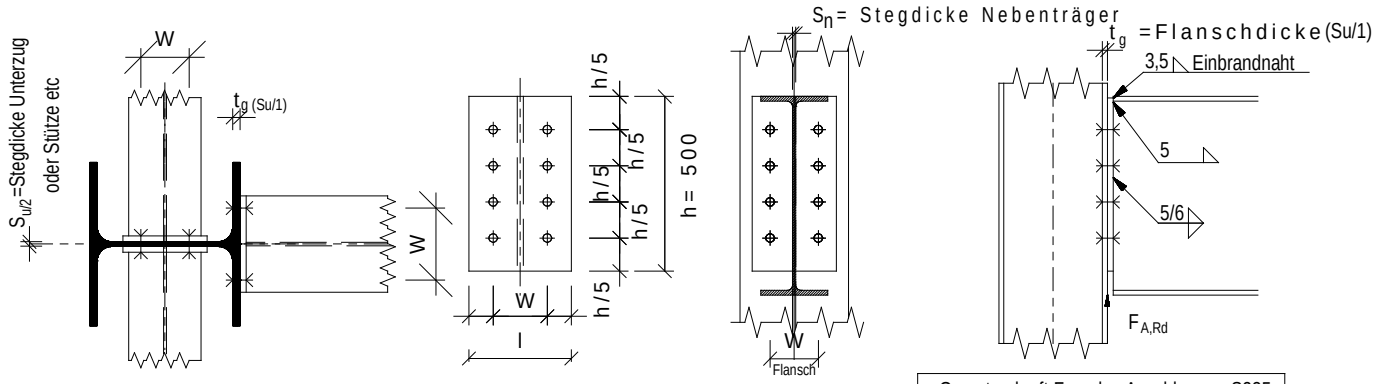
→ $V_{w,Rd}$ =a=5 0,95 • 2 • 0,5cm • 50cm • 21,8 kN/cm² **= 1036 kN =$V_{w,Rd}$ = $F_{A,Rd,W}$**

→ $V_{w,Rd}$ =a=6 0,95 • 2 • 0,6cm • 50cm • 21,8 kN/cm² **= 1242 kN =$V_{w,Rd}$ = $F_{A,Rd,W}$**

Grenz-Tragfähigkeiten

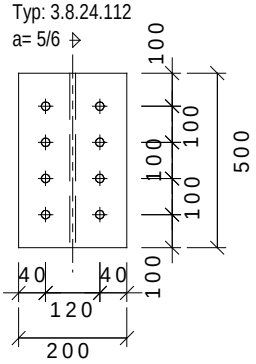
Hinweis: **Für Bauteile aus S 355 (St 52) gelten für $F_{A,Rd}$ die 1,5 fachen Werte**

Maschinenschrauben 8.8, kleinste Abmessung M 24 x 70 Klemmlänge (KL) = 12 –37
Bei Flanschanschlüssen: $S_{u/1}=t_g$ setzen



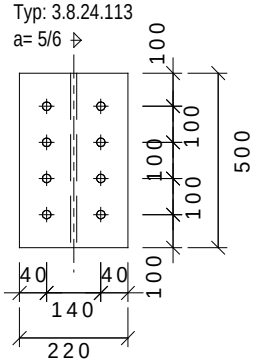
Grenztragkraft $F_{A,Rd}$ des Anschlusses, S235				
Anschluss	Schraub. Güte	erf. Su mm	Schub grenz S_n mm	$F_{A,Rd}$ kN
1- seitig Su/1	4.6	6,3	11,4	784
	8.8	9,9	17,8	1232
2-seitig Su/2	4.6	12,6	11,4	1568
	8.8	19,8	17,8	2464
Lochleibung: $V_{L,Rd,EL}$=1256 kN/1cm $F_{A,Rd}$= $V_{L,Rd,EL}$ • vorh. Su für vorh. Su < erf. Su und vorh. Sn ≥ grenz Sn				

M 24 - 4.6 u. 8.8 Loch Ø25
500x15 - 200
Typ: 3.8.24.112
a= 5/6



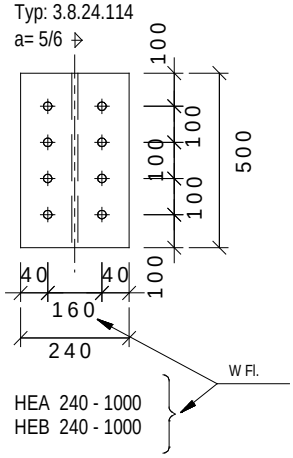
IPE 500 - 600
HEA 200 - 1000
HEB 200 - 1000

M 24 - 4.6 u. 8.8 Loch Ø25
500x15 - 220
Typ: 3.8.24.113
a= 5/6



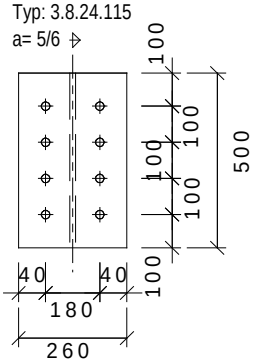
IPE 600
HEA 220 - 1000
HEB 220 - 1000

M 24 - 4.6 u. 8.8 Loch Ø25
500x15 - 240
Typ: 3.8.24.114
a= 5/6



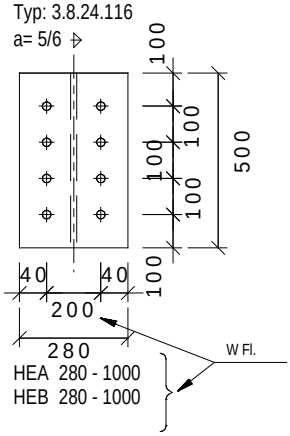
HEA 240 - 1000
HEB 240 - 1000

M 24 - 4.6 u. 8.8 Loch Ø25
500x15 - 260
Typ: 3.8.24.115
a= 5/6



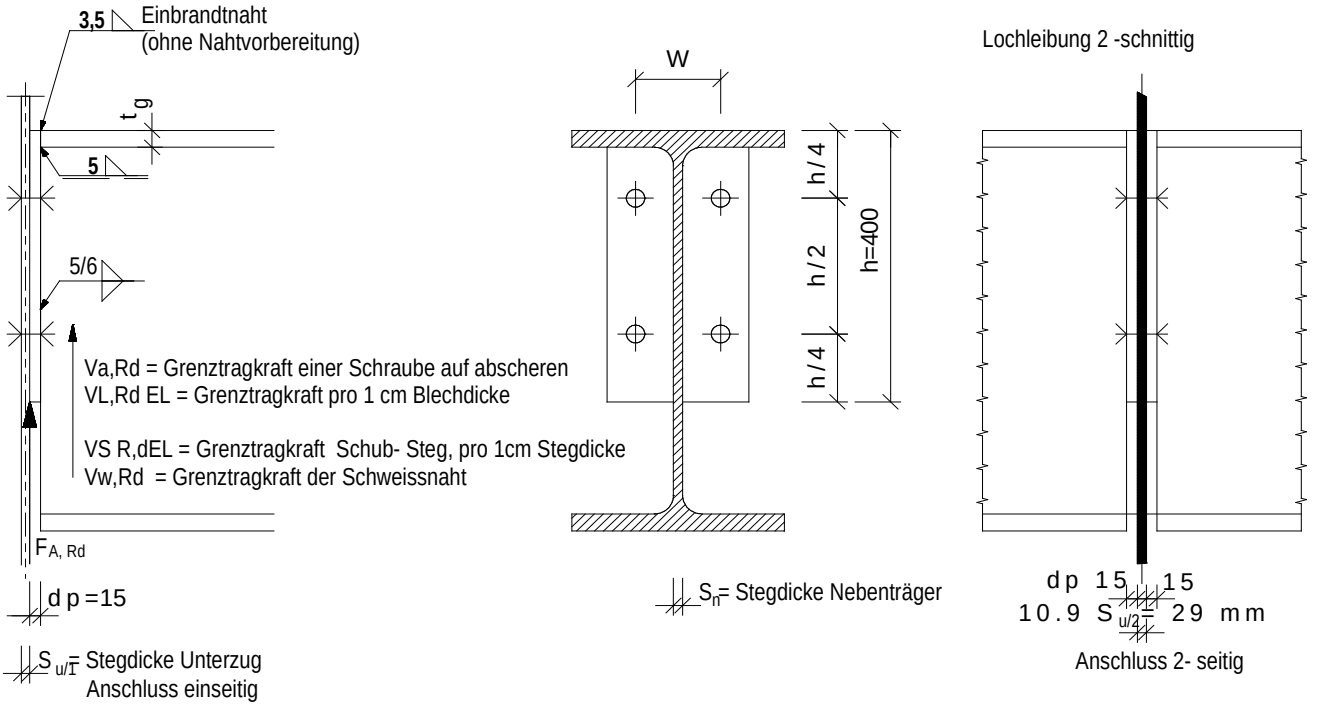
HEA 260 - 1000
HEB 260 - 1000

M 24 - 4.6 u. 8.8 Loch Ø25
500x15 - 280
Typ: 3.8.24.116
a= 5/6



HEA 280 - 1000
HEB 280 - 1000

Typisierung, Tragfähigkeiten, Flanschstreichmasse für IPE-, HEA- u. HEB-Profile
Schraubengröße: HV M 24; Festigkeitsklasse: 10.9; Bauteil aus S 235 JRG2 (St 37)



Abscheren: $V_{a,R,d} = A \bullet \alpha_a \bullet f_{u,b,d}$

10.9 $V_{a,Rd}$ = 4,52 cm² • 0,55 • 90,9 kN/cm² = **226 kN** ⇒10.9, 4xHVM24= **904 kN =$F_{A,Rd}$**

Lochleibung: $V_{L,R,d_{EL}} = S_{EL} \bullet d_{sch} \bullet \alpha_L \bullet f_{y,d}$ **S_{EL} = 1cm = Einheitsstegdicke**

(Einheitsblech-dicke S_{EL}=1cm)

$V_{L,Rd,EL}$,S235 =1cm •2,4 cm •3 •21,8 kN/cm² = **157kN/$_{1cm}$** ⇒ 4 x HVM24= **628kN / 1cm =$V_{L,RdEL}$=$F_{A,Rd,EL}$**

Lochleibung: **(Stegdicke Unterzug S_u)**

$V_{L,Rd}$ = $V_{a,Rd}$, S_u erf. = $\frac{F_{A,Rd}}{V_{L,Rd,EL}}$,10.9 S_u erf. = $\frac{904}{628}$ = **1,44cm,Su/1** **= 14,5 mm**

Schub:

(Einheitssteg-dicke Neben-träger S_{nEL}=1cm)

$V_{sn,RdEL} = A_{s\,n} \bullet 1{,}1 \bullet \tau_{R,d} = 1{,}0 \bullet h \bullet 1{,}1 \bullet \tau_{Rd}$, h=40 cm, τ_{Rd}=21,8/√3 =12,60 kN/$_{cm²}$

$V_{Sn,Rd,EL}$ = 1 cm • 40 cm • 1,1 • 12,6 = **554 kN /$_{1cm}$ =$V_{s,n,Rd,EL}$ =$F_{A,Rd,S,EL}$**

Schweissnaht:

Stegdicke $V_{Sn\ zugeh.}$ = $V_{Sn,Rd}$ / h • 1,1• $\tau_{R,d}$ mit $V_{Sn,Rd}$ = $V_{a,Rd}$

S 235 (St 37) 10.9 = 904 kN / 40cm • 1,1 • 12,6 kN/cm² = 1,64 cm Sn **= 16,4 mm**

$V_{w,Rd} = \alpha_w \bullet A_w \bullet f_{y,d}$ = α_w • 2 • a x h • $f_{y,d}$, α_W = 0,95 (S235=St37)

→ $V_{w,Rd}$ =a=5 0,95 • 2 • 0,5cm • 40cm • 21,8 kN/cm² **= 828 kN =$V_{w,Rd}$ =$F_{A,Rd,W}$**

→ $V_{w,Rd}$ =a=6 0,95 • 2 • 0,6cm • 40cm • 21,8 kN/cm² **= 994 kN = $V_{w,Rd}$ =$F_{A,Rd,W}$**

Grenz-Tragfähigkeiten

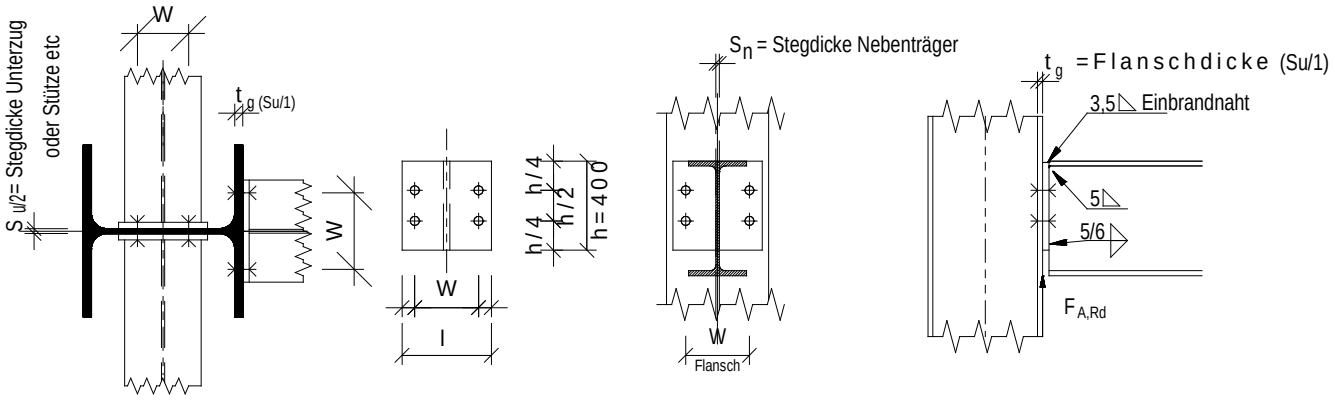
Hinweis: **Für Bauteile aus S 355 (St 52) gelten die 1,5-fachen Werte von S 235 (St 37)**

einschnittig für die Schraubengrösse HV M 24 - 10.9, α_L=3

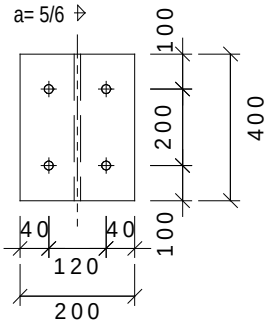
HV M24,Ø25 Typ 24.122-24.126

A 3.19

Bei Flanschanschlüssen: $S_{u/1}=t_g$ setzen

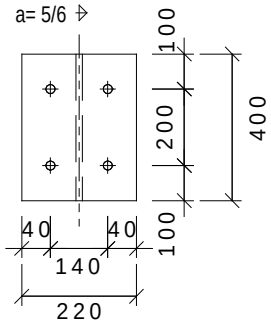


HV M 24 - 10.9 Loch Ø25
400x15 - 200
Typ: 3.4.24.122
a= 5/6



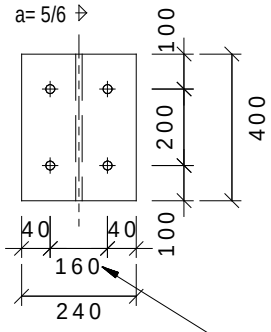
HEA 240 - 1000
HEB 240 - 1000

HV M 24 - 10.9 Loch Ø25
400x15 - 220
Typ: 3.4.24.123
a= 5/6



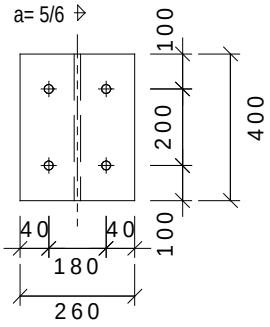
HEA 240 - 1000
HEB 240 - 1000

HV M 24 - 10.9 Loch Ø25
400x15 - 240
Typ: 3.4.24.124
a= 5/6



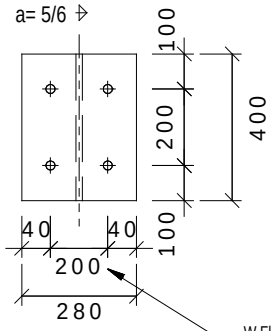
HEA 240 - 1000
HEB 240 - 1000

HV M 24 - 10.9 Loch Ø25
400x15 - 260
Typ: 3.4.24.125
a= 5/6



HEA 260 - 1000
HEB 260 - 1000

HV M 24 - 10.9 Loch Ø25
400x15 - 280
Typ: 3.4.24.126
a= 5/6



HEA 280 - 1000
HEB 280 - 1000

Grenztragkraft $F_{A,Rd}$ des Anschlusses, S235				
Anschluss	Schraub. Güte	erf. Su mm	Schub grenz S_n mm	$F_{A,Rd}$ kN
1- seitig Su/1	10.9	14,5	16,4	904
2-seitig Su/2	10.9	--	--	--
Lochleibung: $V_{L,Rd,EL}$=628 kN/1cm $F_{A,Rd}$= $V_{L,Rd,EL}$ • vorh. Su für vorh. Su < erf. Su und vorh. Sn ≥ grenz Sn				