# POS. 12: TYPED IK-CONNECTION

## standard IK-connection

**hinged IK-connection acc. to EC 3-1-8 (12.10), NA: Deutschland**

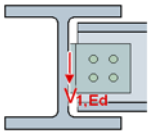
the connection type, dimensions of beam, bolts, end-plate resp. angle
and material are taken of the following literature:
'Typisierte Anschlüsse im Stahlhochbau nach DIN EN 1993-1-8, Stahlbau Verlags- und Service GmbH, Ausgabe 2013'
the current number and associated parameters are recorded.
verification method is 'elastic-elastic'.

code IK, steel grade S 235

181: beam section IPE330, connection type 2
notch: a = 80 mm, e = 35 mm, $h_a$ = 260 mm, d = 17 mm

$V_{j,Ed}$: internal forces and moments at hinge

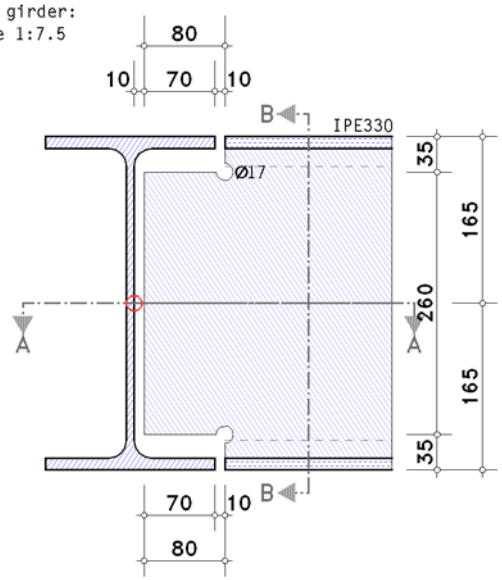
| Lk | $V_{j,Ed}$ kN | | Lk | $V_{j,Ed}$ kN | | Lk | $V_{j,Ed}$ kN | |
|---|---|---|---|---|---|---|---|---|
| 1 | -68.00 | min N | 5 | -4.22 | max Vζ | 9 | -7.76 | max Vη |
| 2 | -23.21 | max N | 6 | -95.92 | min N | 10 | -116.87 | min Vζ |
| 3 | -22.74 | min Vη | 7 | -33.27 | max N | 11 | -111.22 | min T |
| 4 | -79.40 | min Vζ | 8 | -87.48 | min Vη | 12 | -42.68 | max T |



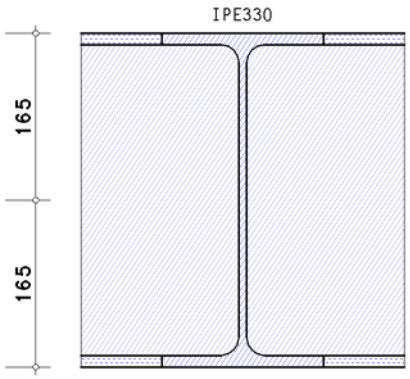

## Simple Joint of Beams

**EC 3-1-8 (12.10), NA: Deutschland**

main girder:
scale 1:7.5



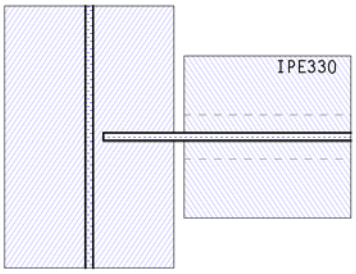

section B-B:




steel grade S 235
bolts M5-4.6

○ hinge

section A-A:



**partial safety factors for material**
resistance of cross sections $\gamma_{M0}$ = 1.00
resistance of bolts, welds, plates in bearing $\gamma_{M2}$ = 1.25
resistance with tension loads $\gamma_{Mu}$ = 1.10

## Final Result

**maximum utilization [Lk 10]:** design resistance max U = 0.709 < 1 ok.

**verification succeeded**

## Decisive load case combination

note
design resistance of the main girder is not verified.

Lk 10: min Vζ

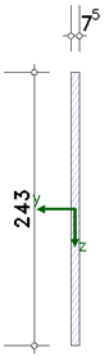
## design values

transformation of member forces to the reference point (intersection point of beam axis')

$M_{1,Ed} = V_{j1,Ed} \cdot e_1$ = 0.44 kNm, $e_1$ = -3.8 mm
$V_{1,Ed} = V_{j1,Ed}$ = -116.87 kN

## cross-sectional check of supported beam

verification at Δx = 93.8 mm (ref. to mg-axis) with 2 notchs




plastic cross-sectional check is not possible ⇒ elastic cross-sectional check
elastic cross-sectional check for $M_y$ = -10.52 kNm, $V_z$ = -116.87 kN
max $\sigma_v$ bei y = -1.9 mm, z = -0.0 mm: $\sigma_x$ = 0.00 kN/cm², $\tau$ = 9.62 kN/cm², $\sigma_v$ = 16.66 kN/cm²
verification: $\sigma_v$ = 16.66 kN/cm < zul $\sigma_v$ = 23.50 kN/cm ⇒ U = 0.709 < 1 ok.
utilizations: design resistance $U_\sigma$ = 0.709 < 1 ok.

**verification result**

maximum utilization: max U = 0.709 < 1 ok.

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## Regulations

DIN EN 1990, Eurocode 0: Grundlagen der Tragwerksplanung;
Deutsche Fassung EN 1990:2002 + A1:2005 + A1:2005/AC:2010, Ausgabe Dezember 2010
DIN EN 1990/NA, Nationaler Anhang zur DIN EN 1990, Ausgabe Dezember 2010

DIN EN 1993-1-1, Eurocode 3: Bemessung und Konstruktion von Stahlbauten -
Teil 1-1: Allgemeine Bemessungsregeln und Regeln für den Hochbau;
Deutsche Fassung EN 1993-1-1:2005 + AC:2009, Ausgabe Dezember 2010
DIN EN 1993-1-1/NA, Nationaler Anhang zur DIN EN 1993-1-1, Ausgabe Dezember 2010

DIN EN 1993-1-8, Eurocode 3: Bemessung und Konstruktion von Stahlbauten -
Teil 1-8: Bemessung von Anschlüssen;

Deutsche Fassung EN 1993-1-8:2005 + AC:2009, Ausgabe Dezember 2010
DIN EN 1993-1-8/NA, Nationaler Anhang zur DIN EN 1993-1-8, Ausgabe Dezember 2010

ECCS Document No. 126: European Recommendations for the Design of Simple Joints in Steel Structures.
ECCS TC10 - Structural Connections, 2009. J.P. Jaspart, J.F. Demonceau, S. Renkin, M.L. Guillaume

Klaus Weynand, Ralf Oerder: Typisierte Anschlüsse im Stahlhochbau nach DIN EN 1993-1-8,
IS - Gelenkige Stirnplattenanschlüsse, IW - Gelenkige Winkelanschlüsse
IG - Gelenkige Winkelanschlüsse mit großem Spalt, IK - Ausklinkungen,
Stahlbau Verlags- und Service GmbH, Ausgabe 2013