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Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

MEMBER OF EOTA

European Technical Assessment ETA-19/0020 of 2020/07/06

General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:	Eurotec Hold Downs
Product family to which the above construction product belongs:	Three-dimensional nailing plate (hold-downs for timber-to-timber or timber-to-concrete or steel connections)
Manufacturer:	E.u.r.o. Tec GmbH Unter dem Hofe 5 D-58099 Hagen Tel. +49 2331 / 6245 - 0 Fax +49 2331 / 6245 - 200 Internet www.e-u-r-o-tec.de
Manufacturing plant:	HSW 34, HSW 43, HSW 44
This European Technical Assessment contains:	27 pages including 2 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	Guideline for European Technical Approval (ETAG) No. 015 Three Dimensional Nailing Plates, April 2013, used as European Assessment Document (EAD).
This version replaces:	With the same number issued on 2020-04-14

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product

E.u.r.o. Tec hold-downs are one-piece welded or similarly joined face-fixed nailing plates to be used in timber to concrete or to steel or in timber to timber connections.

E.u.r.o. Tec angle brackets, shear angles, shear plates, tensile strips and lifting anchors are one-piece non-welded, face-fixed nailing plates to be used in timber to timber or in timber to concrete or to steel connections. They are connected to construction members made of timber or wood-based products with profiled (ringed shank) nails according to EN 14592 or ETA or screws according to ETA-11/0024 and to concrete or steel members with bolts or metal anchors.

The angle brackets with a steel plate thickness of 3 mm are made from the following materials:

- Hold downs from pre-galvanized steel S355 Fe Zn 12c according to EN 10025:2004
- Shear angles H-H and H-B from pre-galvanized steel S235 Fe Zn 12c according to EN 10025-2:2004
- Angle brackets, shear plates and tensile strips from pre-galvanized steel S250GD / Z275 according to EN 10346:2015
- Base plates from pre-galvanized steel S235 Fe Zn 12c according to EN 10025:2004
- Lifting anchors from steel S235JR according to EN 10025-2:2004

Dimensions, hole positions and typical installations are shown in Annex B. E.u.r.o. Tec hold-downs, angle brackets, shear plates and tensile strips are made from steel with tolerances according to EN 10143.

2 Specification of the intended use in accordance with the applicable EAD

The hold-downs, angle brackets, shear angles, shear plates, tensile strips and lifting anchors are intended for use in making connections in load bearing timber structures, as a connection between a beam and a purlin, where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Works Requirements 1 and 4 of Regulation (EU) 305/2011 shall be fulfilled.

The connection may be with a single nailing plate or with nailing plates on one or both sides of the fastened timber member (see Annex B).

The static and kinematical behaviour of the timber members or the supports shall be as described in Annex A and B.

The wood members may be of solid timber, glued laminated timber and similar glued members, or wood-based structural members with a characteristic density from 290 kg/m^3 to 460 kg/m^3. This requirement to the material of the wood members can be fulfilled by using the following materials:

- Structural solid timber according to EN 14081,
- Glulam according to EN 14080,
- Glued solid timber according to EN 14080,
- LVL according to EN 14374,
- Cross laminated timber according to ETA.

Annex B states the load-carrying capacities of the connections for a characteristic density of 350 kg/m3. For timber or wood based material with a lower or higher characteristic density than 350 kg/m3 the load-carrying capacities shall be reduced or may be increased by the factor k_{dens}:

$$k_{dens} = \left(\frac{\rho_k}{350}\right)^{0.5}$$

where ρk is the characteristic density of the timber in kg/m^3.

If a wood-based panel interlayer with a thickness of not more than 26 mm is placed between the connector plate and the timber member, the lateral load-carrying capacity of the nail or screw, respectively, has to take into account the effect of the interlayer.

The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code. The wood members shall have a thickness which is larger than the penetration depth of the nails or screws into the members.

The nailing plates are primarily for use in timber structures subject to the dry, internal conditions defined by service classes 1 and 2 of Eurocode 5 and for connections subject to static or quasi-static loading.

The nailing plates can also be used in outdoor timber structures, service class 3, when a corrosion protection in accordance with Eurocode 5 is applied, or when stainless steel with similar or better characteristic yield strength and ultimate strength is employed.

The scope of the connectors regarding resistance to corrosion shall be defined according to national provisions that apply at the installation site considering environmental conditions and in conjunction with the admissible service conditions according to EN 1995-1-1

and the admissible corrosivity category as described and defined in EN ISO 12944-2.

The hold-downs, angle brackets, shear angles, shear plates, tensile strips and lifting anchors may also be used for connections between a timber member and a member of concrete or steel.

Assumed working life

The assumed intended working life of the connectors for the intended use is 50 years, provided that they are subject to appropriate use and maintenance.

The information on the working life should not be regarded as a guarantee provided by the manufacturer or ETA Danmark. An "assumed intended working life" means that it is expected that, when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the essential requirements.

3 Performance of the product and references to the methods used for its assessment

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability (BWR 1)*)	
Characteristic load-carrying capacity	See Annex B
Stiffness	See Annex B
Ductility in cyclic testing	No performance assessed
3.2 Safety in case of fire (BWR 2)	
Reaction to fire	The connectors are made from steel classified as **Euroclass A1** in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
3.3 Hygiene, health and the environment (BWR 3)	No performance assessed
3.7 Sustainable use of natural resources (BWR 7)	No performance assessed
3.8 General aspects related to the performance of the product	The hold downs have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the conditions defined by service classes 1 and 2

*) See additional information in section 3.9 – 3.12.

3.9 Methods of verification

Safety principles and partial factors

The characteristic load-carrying capacities are based on the characteristic values of the nailed or screwed connections and the steel plates. To obtain design values the capacities have to be divided by different partial factors for the material properties, the nailed or screwed connection in addition multiplied with the coefficient k_{mod}.

According to EN 1990 (Eurocode – Basis of design) paragraph 6.3.5 the design value of load-carrying capacity may be determined by reducing the characteristic values of the load-carrying capacity with different partial factors.

Thus, the characteristic values of the load–carrying capacity are determined also for timber failure $F_{Rk,H}$ (obtaining the embedment strength of fasteners subjected to shear or the withdrawal capacity of the most loaded fastener, respectively) as well as for steel plate failure $F_{Rk,S}$. The design value of the load–carrying capacity is the smaller value of both load–carrying capacities.:

$$F_{Rd} = \min\left\{\frac{k_{mod} \cdot F_{Rk,T}}{\gamma_{M,T}}; \frac{F_{Rk,S}}{\gamma_{Mi,S}}\right\}$$

Therefore, for timber failure or failure of the metal fasteners the load duration class and the service class are included. The different partial factors γ_M for steel or timber failure, respectively, are also correctly taken into account.

3.10 Mechanical resistance and stability

See annex B for the characteristic load-carrying capacity in the different directions F_1, F_2, F_3 and F_4

The characteristic capacities of the connectors are determined by calculation assisted by testing as described in the EOTA Guideline 015 clause 2.4.1. They should be used for designs in accordance with Eurocode 5 or a similar national Timber Code.

No performance has been determined in relation to ductility of a joint under cyclic testing. The contribution to the performance of structures in seismic zones, therefore, has not been assessed.

No performance has been determined in relation to the joint's stiffness properties - to be used for the analysis of the serviceability limit state.

3.11 Aspects related to the performance of the product

In accordance with ETAG 015 the hold downs are produced from the following materials:

- Hold downs from pre-galvanized steel S355 Fe Zn 12c according to EN 10025:2004
- Angle brackets, shear plates and tensile strips from pre-galvanized steel S250GD / Z275 according to EN 10346:2015
- Base plates from pre-galvanized steel S235 Fe Zn 12c according to EN 10025:2004

3.12 General aspects related to the use of the product

The performance given in this ETA are based on the following:

- The structural members – the components 1 and 2 shown in the figure on page 12 – to which the brackets are fixed shall be:
  - Restrained against rotation.
  - Strength class C14 or better, see section 3 of this evaluation report
  - Free from wane under the bracket.

- The actual end bearing capacity of the timber member to be used in conjunction with the bracket is checked by the designer of the structure to ensure it is not less than the bracket capacity and, if necessary, the bracket capacity reduced accordingly.

- The gap between the timber members does not exceed 3 mm.
- There are no specific requirements relating to preparation of the timber members.

4 Assessment and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 97/638/EC of the European Commission1, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 2+.

5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

Issued in Copenhagen on 2020-07-06 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A
Product details definitions

Table A.1 Materials specification

Nailing plate type	Thickness (mm)	Steel specification	Coating specification
Hold-down 340 or 440	3,0	S355	FeZn12c
Hold-down HighLoad	3,0	S355	FeZn12c
Shear angle 230x120	3,0	S250GD	Z 275
Shear angle 230x100	2,5	S235	FeZn12c
Shear plate 240x230	3,0	S250GD	Z 275
Tensile strip HH60	3,0	S250GD	Z 275
Tensile strip HH70	3,0	S250GD	Z 275
Tensile strip HB60	3,0	S250GD	Z 275
Tensile strip HB70	3,0	S250GD	Z 275
Base plate 60	10,0	S235	FeZn12c
Base plate 230	12,0	S235	FeZn12c
Base plate HL	40,0	S235	FeZn12c
Lifting anchor 40x80	40	S235JR	-

Table A.2 Range of sizes

Angle Bracket type	Height (mm) vertical		Height (mm) horizontal		Width (mm)	
Hold-down 340 or 440	339	341	62	64	59	61
Hold-down HighLoad	749	751	84	86	139	141
Shear angle 230x120	119	121	119	121	229	231
Shear angle 230x100	99	101	99	101	229	231
Shear plate 240x230	7,5	8,5	239	241	229	231
Tensile strip HH60	7,5	8,5	659	661	59	61
Tensile strip HH70	7,5	8,5	739	741	69	71
Tensile strip HB60	7,5	8,5	505	507	59	61
Tensile strip HB70	7,5	8,5	505	507	69	71
Base plate 60	9,5	10,5	49	51	57	59
Base plate 230	11,5	12,5	67	69	229	231
Base plate HL	39,0	41,0	81	83	129	131
Lifting anchor 40x80	79,5	80,5	-	-	39,5	40,5

Table A.3 Fastener specification

Fastener	Length	Profiled Length	Fastener type
Nail 4.0 mm	40 mm	25 mm	Ringed shank nails according to EN 14592
	50 mm	35 mm	
	60 mm	45 mm	
E.u.r.o. Tec WBS screw 5.0 mm	25 mm	16 mm	Self-tapping screws according to ETA-11/0024
	40 mm	31 mm	
	50 mm	41 mm	
	60 mm	51 mm	
E.u.r.o. Tec Paneltwistec screw 5.0 mm	120 mm	70 mm	
E.u.r.o. Tec KonstruX screw 10.0 mm	125 mm	116 mm	Self-tapping screws according to ETA-11/0024
E.u.r.o. Tec VSS screw 6.0 mm	60 mm	50 mm	Self-tapping screws according to ETA-11/0024

In the load-carrying-capacities of the nailed or screwed connection in Annex B the capacities calculated from the formulas of Eurocode 5 are used assuming a thick steel plate when calculating the lateral fastener load-carrying-capacity. The characteristic withdrawal capacity of the nails or screws is determined by calculation in accordance with EN 1995-1-1:2010, paragraph 8.3.2 (head pull-through is not relevant):

$F_{ax,Rk} = f_{ax,k} \cdot d \cdot t_{pen}$ for the nails 4.0 mm

$F_{ax,Rk} = k_{ax} \cdot f_{ax,k} \cdot d \cdot \ell_{ef} \left(\frac{\rho_k}{\rho_a} \right)^{0,8}$ for the screws 5.0 mm

where:

k_{ax} Factor taking into account the angle between screw axis and grain direction; $k_{ax} = 1$ for $\alpha \leq 45°$
$f_{ax,k}$ Characteristic value of the withdrawal parameter in N/mm^2
d Nail or screw diameter in mm
t_{pen} Penetration depth of the profiled shank in mm
ρ_k Characteristic density of the timber in kg/m^3
ρ_a Characteristic density of the timber in kg/m^3 according to $f_{ax,k}$

Based on tests by Versuchsanstalt für Stahl, Holz und Steine, Karlsruhe Institute of Technology, the characteristic value of the withdrawal resistance for the threaded nails used may be assumed as:
$f_{ax,k}$ = 6,125 N/mm² for ρ_k = 350 kg/m³

Based on ETA-11/0024 the characteristic value of the withdrawal resistance and the characteristic value of fastener's yield moment for E.u.r.o. Tec screws d = 5.0 mm is:
$f_{ax,k}$ = 12,1 N/mm²
$M_{y,k}$ = 5910 Nmm

The shape of the nail or screw directly under the head shall be in the form of a truncated cone with a diameter under the head which fits or exceeds the hole diameter.

Bolt diameter	Correspondent hole diameter	Bolts type
12.0 to 28.0 mm	Max. 2 mm larger than the bolt diameter	See specification of the manufacturer

Metal Anchor diameter	Correspondent Hole diameter	Anchors type
12.0 to 28.0 mm	Max. 2 mm larger than the anchor diameter	See specification of the manufacturer

Annex B
Characteristic load-carrying capacities

Table 1: $F_{1,Rk}$ per nailing plate with washer or base plate / connection timber to timber or timber to concrete or steel

Type	Timber ρ_k = 350 kg/m³						steel	bolt	concrete
	capacity per fastener in the vertical flange $F_{v,Rk}$ [kN]						$F_{t,Rk}$ [kN]	$k_{t,II}$	ℓ_D [mm]
	Nails			Screws					
	4x40	4x50	4x60	5x40	5x50	5x60			
Hold-down 340 or 440 + washer 30x3 or base plate	1,56	1,84	1,90	2,14	2,28	2,43	57,1	1,4	10
Hold-down HighLoad + base plate HL	1,56	1,84	1,90	2,14	2,28	2,43	See equation (B.1)	1,4	10
Shear angle 230x120 + base plate 230	1,56	1,84	1,90	2,14	2,28	2,43	116	1,7	10
	capacity per shear angle $F_{1,Rk}$ [kN]						$F_{t,Rk}$ [kN]	$k_{t,II}$	ℓ_D [mm]
Shear angle 230x100* + base plate 230 + 2 bolts M12 close to bend line	30,0						120	2,0	10
* 6 screws 5x120 and 3 screws 5x25 per flap									

Characteristic load-carrying capacity $F_{t,Rk}$ for Hold-down HighLoad:

$$F_{t,Rk} = \min\left\{A \cdot f_{y,k}; 0{,}9 \cdot A_{net} \cdot f_{u,k}\right\} \quad \text{(B.1)}$$

Where:

A	Cross-section area of the vertical flap in mm²
	$A = 210 \cdot (1+h_f/600)$ in mm²
h_f	Distance of the lowermost nail or screw from the upper end of the vertical flap in mm
$f_{y,k}$	Characteristic yield strength of vertical flap in N/mm², $f_{y,k}$ = 355 MPa
$f_{u,k}$	Characteristic ultimate strength of vertical flap in N/mm², $f_{u,k}$ = 510 MPa
A_{net}	Net cross-section area of the vertical flap in mm²
	$A_{net} = 210 \cdot (1+h_f/600) - n_h \cdot 15$ in mm²
n_h	Number of nail or screw holes in the cross-section at the lowermost fastener

Table 2: $F_{1,Rk}$ per nailing plate / timber to timber connection

Type	Timber ρ_k = 350 kg/m³	steel
	capacity per inclined screw 5x120 $F_{v,Rk}$ [kN]	$F_{t,Rk}$ [kN]
Tension strap HH60 or HB60	3,74	28,5
Tension strap HH70 or HB70	3,74	37,4
Shear angle 230x100*	capacity per shear angle $F_{1,Rk}$ [kN]	120
	30,0	
* 6 screws 5x120 and 3 screws 5x25 per flap and 5 screws 10x125 per angle		

Table 3: $F_{23,Rk}$ per nailing plate / timber-timber connection, ρ_k = 350 kg/m³

Type	Fastener pattern	Number of nails or screws per flap n_{na}	Number of inclined screws 5x120 per flap n_{Sc}	F_{23Rk} [kN] with n_{na} nails			F_{23Rk} [kN] with n_{na} screws		
				4x40	4x50	4x60	5x40	5x50	5x60
Shear angle 230x120	Full	41	6	30,5	36,0	37,2	41,9	44,6	47,6
	Partial 1	34	6	23,9	28,1	29,1	32,7	34,9	37,2
	Partial 2	29	4	19,3	22,8	23,6	26,5	28,3	30,1
Shear plate 240x230	Full	41	6	30,5	36,0	37,2	41,9	44,6	47,6
	Partial 1	34	6	23,9	28,1	29,1	32,7	34,9	37,2
	Partial 2	29	4	19,3	22,8	23,6	26,5	28,3	30,1

$F_{23,Rk}$ per shear angle 230x100 with full screw pattern / timber-timber connection, ρ_k = 350 kg/m³ (6 screws 5x120 and 3 screws 5x25 per flap and 5 screws 10x125 per angle):

$F_{23,Rk}$ = 40 kN

$F_{23,Rk}$ per shear angle 230x100 with full screw pattern* / timber-to-concrete or steel connection, ρ_k = 350 kg/m³ (6 screws 5x120 and 3 screws 5x25 per vertical flap):

$F_{23,Rk} = \min \{40\ kN; n_{ef} \cdot F_{v,bolt,Rk}\}$

Where n_{ef} = 1,89 for two bolts close to bend line, n_{ef} = 1,48 for two bolts away from bend line

$F_{4,Rk}$ per shear angle 230x100 with full screw pattern / timber-timber connection, ρ_k = 350 kg/m³ (6 screws 5x120 and 3 screws 5x25 per flap and 5 screws 10x125 per angle):

$F_{4,Rk}$ = 40 kN

$F_{4,Rk}$ per shear angle 230x100 with full screw pattern* / timber-to-concrete or steel connection, ρ_k = 350 kg/m³ (6 screws 5x120 and 3 screws 5x25 per vertical flap):

$F_{4,Rk} = \min \{40\ kN; n_B \cdot F_{v,bolt,Rk}\}$

$F_{ax,Rk}$ per lifting anchor 40x80 parallel to anchor axis with full screw pattern, (8 VSS screws 6x60):

$F_{ax,Rk} = 0,218 \cdot \rho_k^{0,8}$ kN

for CLT members and glulam members loaded perpendicular to member plane or parallel to grain,

$$F_{ax,Rk} = \min\left\{0,218 \cdot \rho_k^{0,8}; \frac{0,5 \cdot h}{h-60}\left(0,0065 + \frac{64,8}{h^2}\right) \cdot (100 \cdot h)^{0,8}\right\} \text{ kN}$$

for glulam members loaded in plane perpendicular to grain,

$F_{v,Rk}$ per lifting anchor 40x80 perpendicular to anchor axis with full screw pattern, load eccentricity e = 38 mm to member surface, (8 VSS screws 6x60):

$$F_{v,Rk} = \frac{0,057 \cdot \rho_k}{\max\left\{1,95 \cdot \sin^2\alpha + \cos^2\alpha; 2,5 \cdot \cos^2\varepsilon + \sin^2\varepsilon\right\}} \text{ kN}$$

Where

α Angle between load and grain direction;
for anchors in wide surface of CLT: α = angle between load and grain direction of outer layer,
for anchors in edge or end grain surface of CLT loaded in plane: α = 0°,
for anchors in edge or end grain surface of CLT loaded perpendicular to member plane: α = 90°,

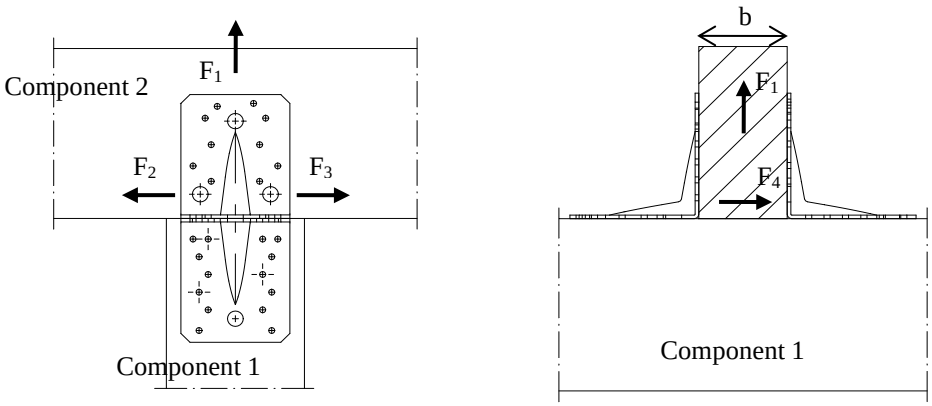
ε	Angle between anchor axis and grain direction; for anchors in CLT: ε = 90°,
h	Glulam member depth in mm.

Slip moduli

The slip modulus per shear angle 230x100 may be assumed as:

$K_{1,ser} = 5$ kN/mm
$K_{23,ser} = 15$ kN/mm
$K_{4,ser} = 10$ kN/mm

Definitions of forces, their directions and eccentricity
Forces - Beam to beam connection



Fastener specification
Holes are marked referring to the fastener pattern.

Double angle brackets per connection
The angle brackets must be placed at each side opposite to each other, symmetrically to the component axis.
Acting forces

F_1	Lifting force acting along the central axis of the joint.
F_2 and F_3	Lateral force acting in the joint between the component 2 and component 1 in the component 2 direction

Single angle bracket per connection
Acting forces

F_1	Lifting force acting in the central axis of the angle bracket. The component 2 shall be prevented from rotation.
F_2 and F_3	Lateral force acting in the joint between the component 2 and the component 1 in the component 2 direction. The component 2 shall be prevented from rotation.
F_4	Lateral force acting perpendicular to the central axis of the joint towards a shear angle.

Wane
Wane is not allowed; the timber has to be sharp-edged in the area of the angle brackets.

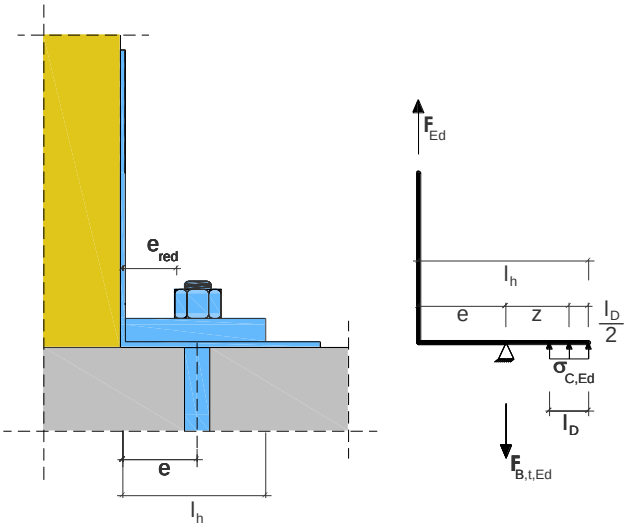
Timber splitting
For the lifting force F_1 it must be checked in accordance with Eurocode 5 or a similar national Timber Code that splitting will not occur.

Connection of timber to concrete or steel with bolts or metal anchors

The load $F_{B,Ed}$ for the design of the maximally loaded bolt or metal anchor is calculated as:

$$F_{B,t,Ed} = k_{t,\square} \cdot F_{1,Ed}$$

$$\sigma_{C,Ed} = \frac{F_{1,Ed} \cdot \left(k_{t,\square} - 1\right)}{b \cdot \ell_D}$$



where:

$F_{B,t,Ed}$	Resulting tensile load on the maximally loaded bolt in the group in N
$k_{t,II}$	Coefficient taking into account the resulting axial bolt force
$F_{1,Ed}$	Tensile load F_1 on vertical flap of the angle bracket in N
b	Width of the washer in mm
$\sigma_{C,Ed}$	compressive stress on the support in N/mm^2

E.u.r.o. Tec Nailing Plates

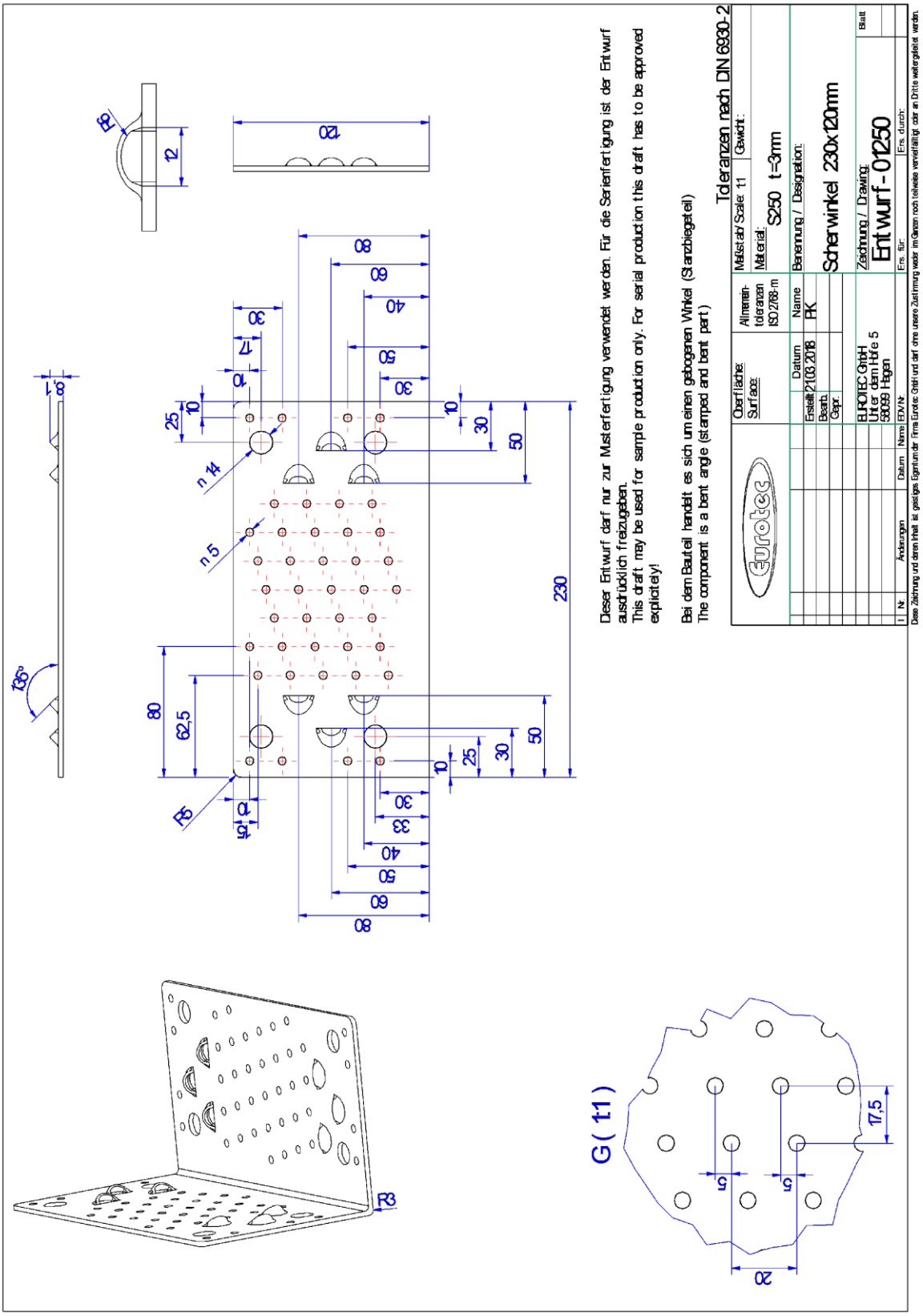


Figure B. 1 Dimensions of Shear Angle 240x230

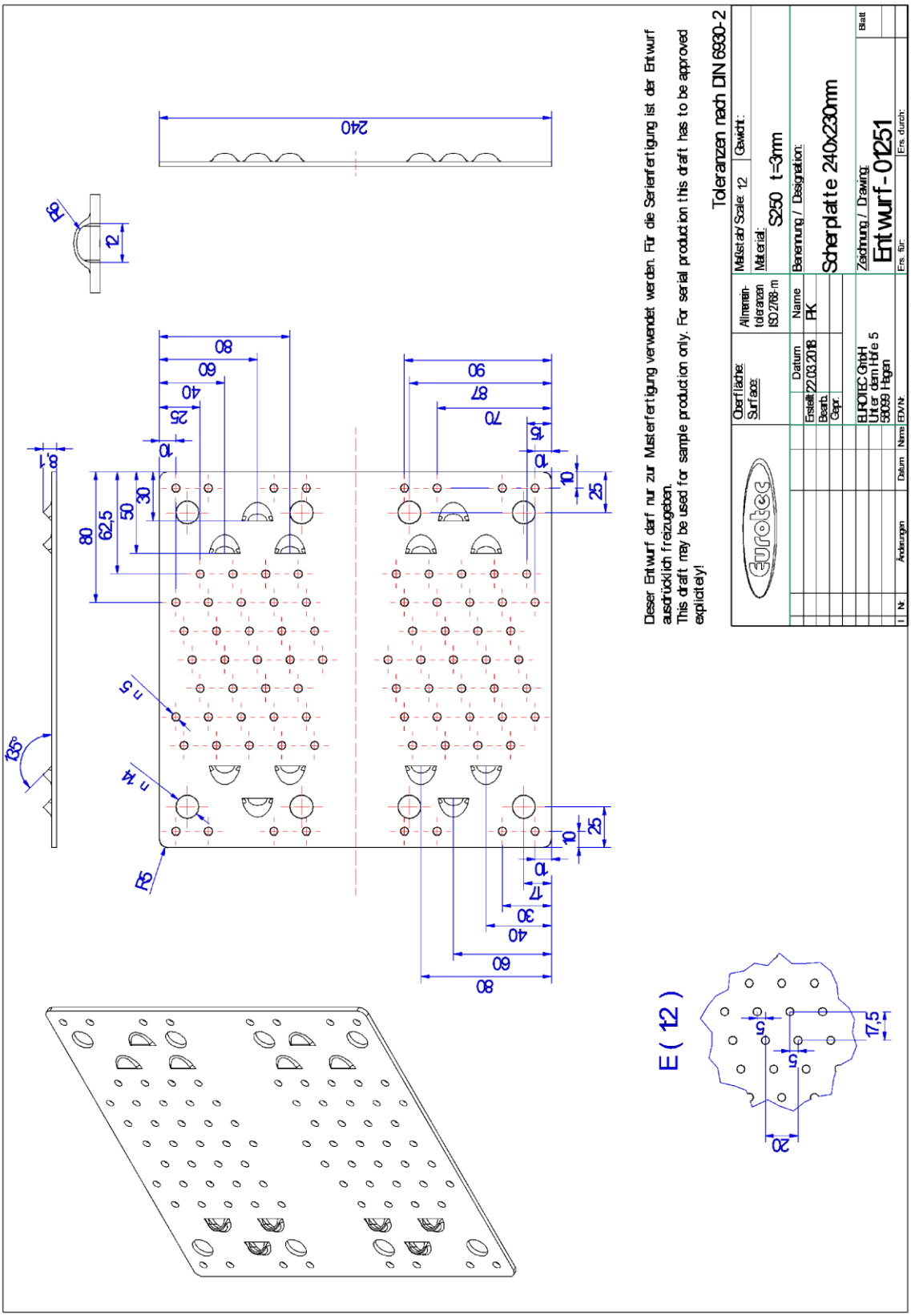
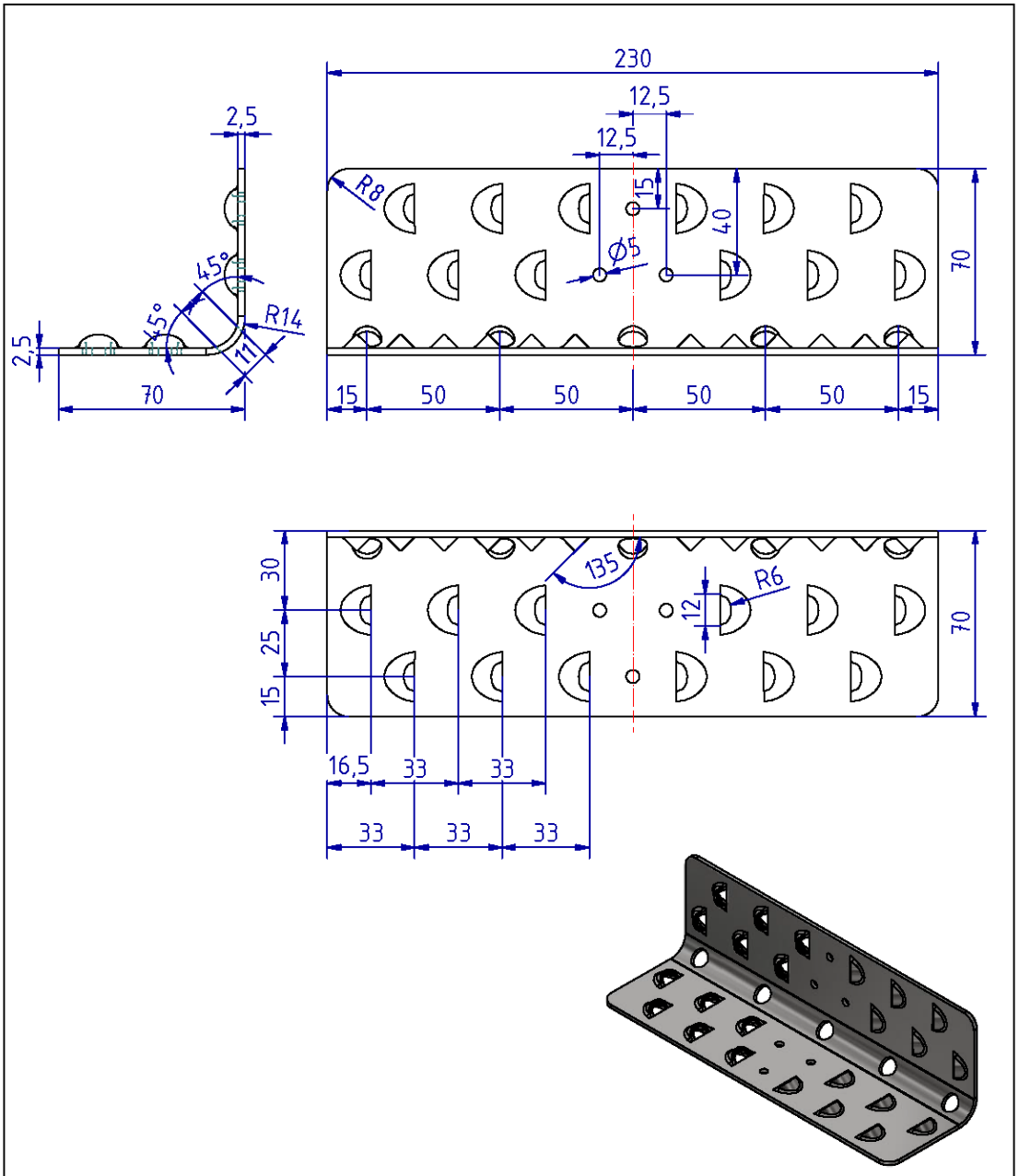


Figure B. 2 Dimensions of Shear Plate 230x120



Eurotec					Oberfläche: Surface:		Allmeinen-toleranzen ISO 2768-m	Maßstab/Scale: 1:2 Gewicht:
								Material: S235 GD Z275
						Datum	Name	Benennung / Designation:
					Erstellt	24.06.2019	YT	Scherwinkel flach H-H
					Bearb.			
					Gepr.			
					EUROTEC GmbH Unter dem Hofe 5 58099 Hagen			Zeichnung / Drawing: Entwurf - 01431 Blatt 1/1
	2	Material von S250 auf Q235	15.07.2019	YT				
	1	Biegeradien angepasst	10.07.2019	YT				
I	Nr.	Änderungen	Datum	Name	EDV Nr.			Ers. für: Ers. durch:

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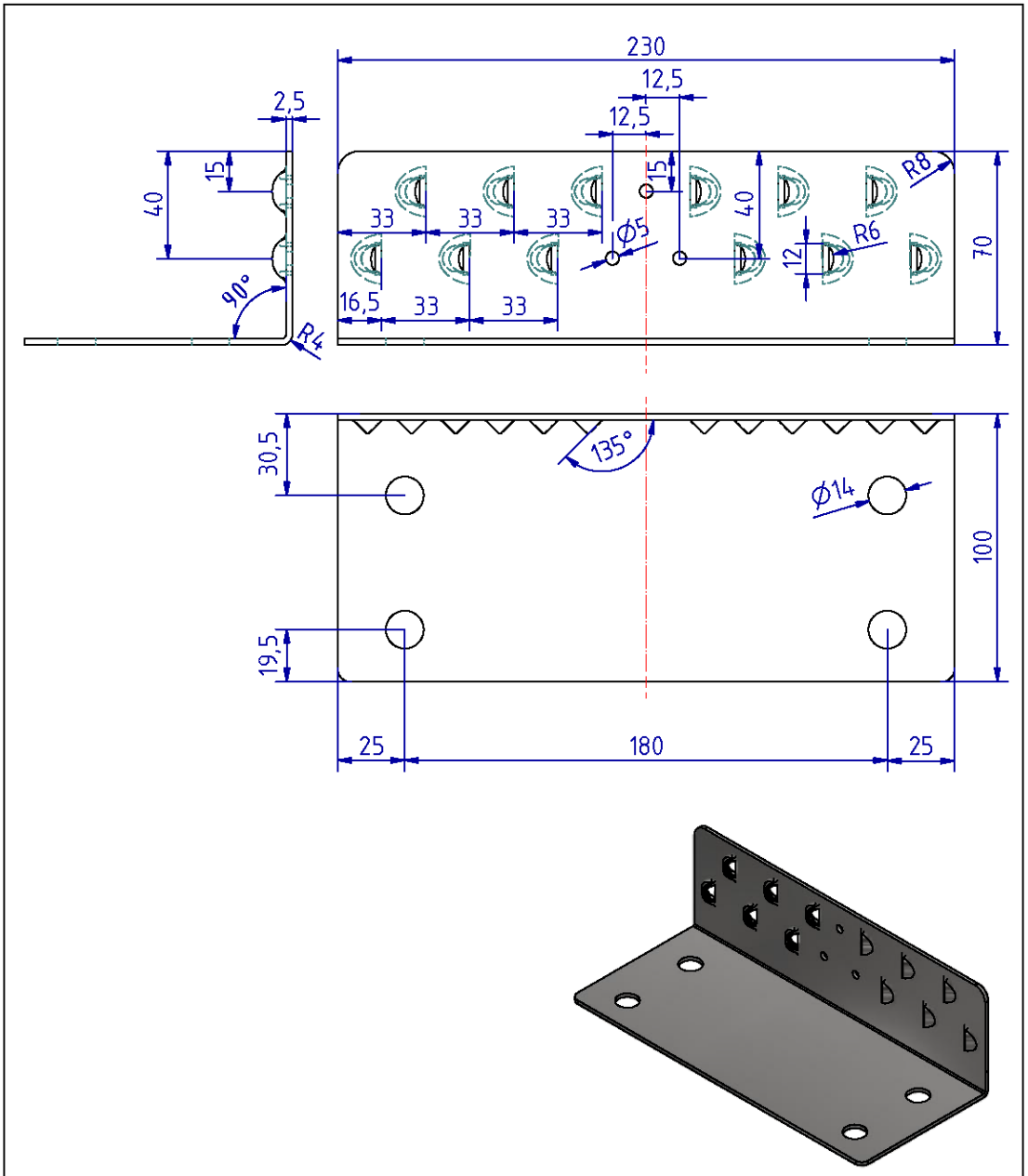
Figure B. 3 Dimensions of Shear Angle 230x100 H-H



Eurotec					Oberfläche: Surface:		Allmeinen-toleranzen ISO 2768-m	Maßstab/Scale: 1:2 Gewicht:
								Material: S235 GD Z275
						Datum	Name	Benennung / Designation:
					Erstellt	24.06.2019	YT	Scherwinkel flach H-B
					Bearb.			
					Gepr.			
					EUROTEC GmbH Unter dem Hofe 5 58099 Hagen			Zeichnung / Drawing: Entwurf - 01432 Blatt 1/1
	2	Material von S250 auf Q235	15.07.2019	YT				
	1	Biegeradien angepasst	10.07.2019	YT				
I	Nr.	Änderungen	Datum	Name	EDV Nr.			Ers. für: Ers. durch:

Diese Zeichnung und deren Inhalt ist geistiges Eigentum der Firma Eurotec GmbH und darf ohne unsere Zustimmung weder im Ganzen noch teilweise vervielfältigt oder an Dritte weitergeleitet werden.

Figure B. 4 Dimensions of Shear Angle 230x100 H-B

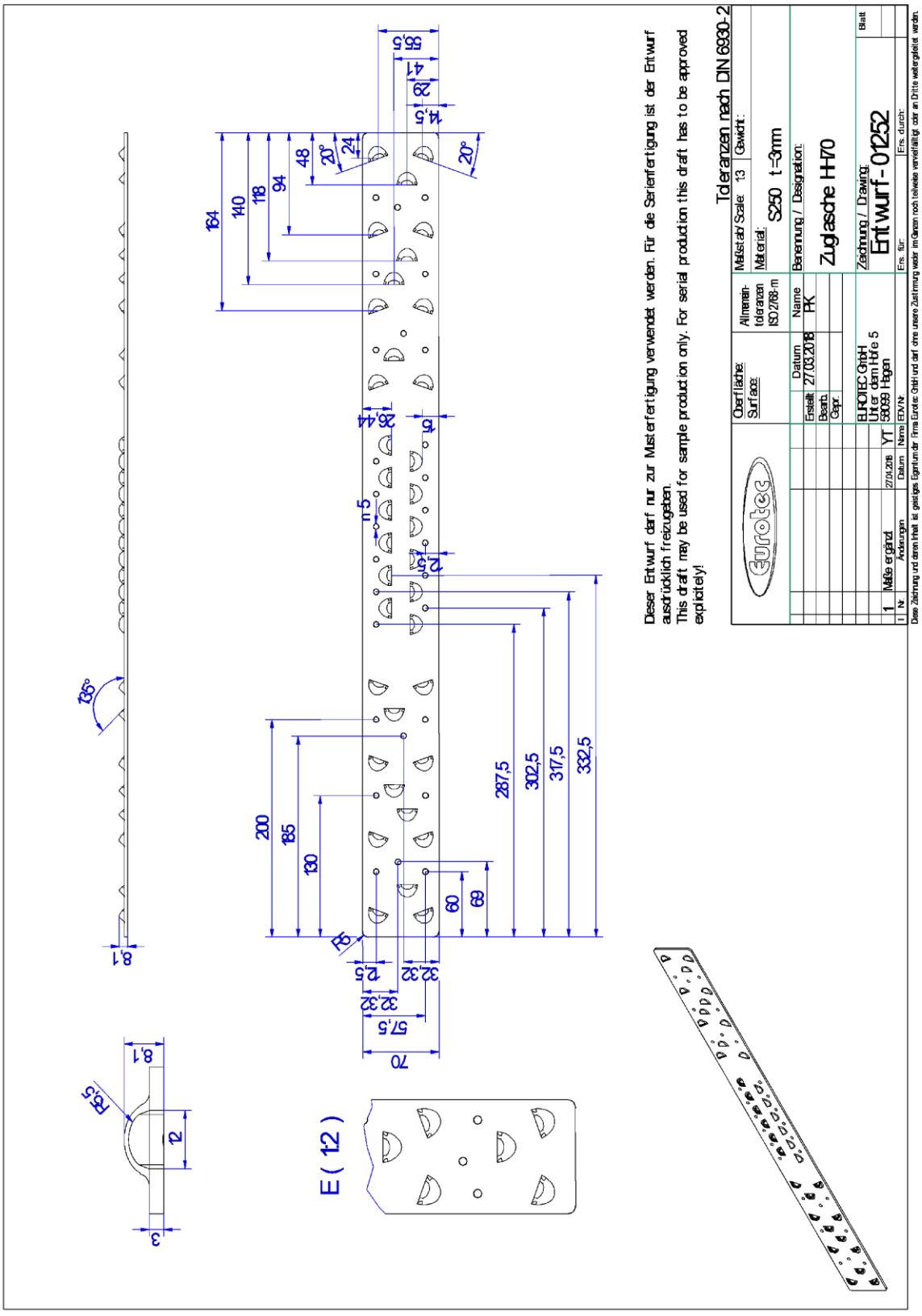


Figure B. 5 Dimensions of Tension Strap HH70

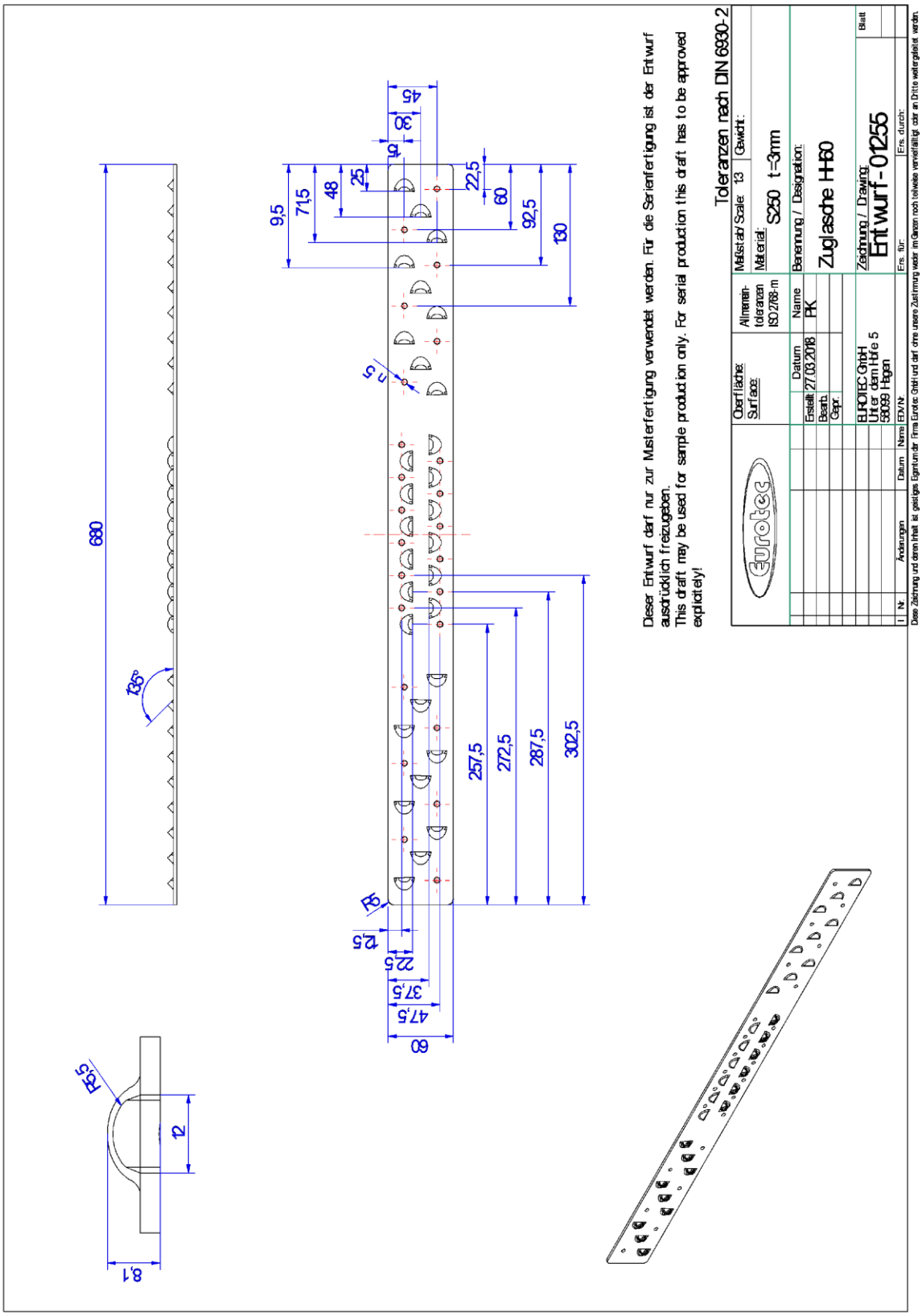


Figure B. 6 Dimensions of Tension Strap HH60

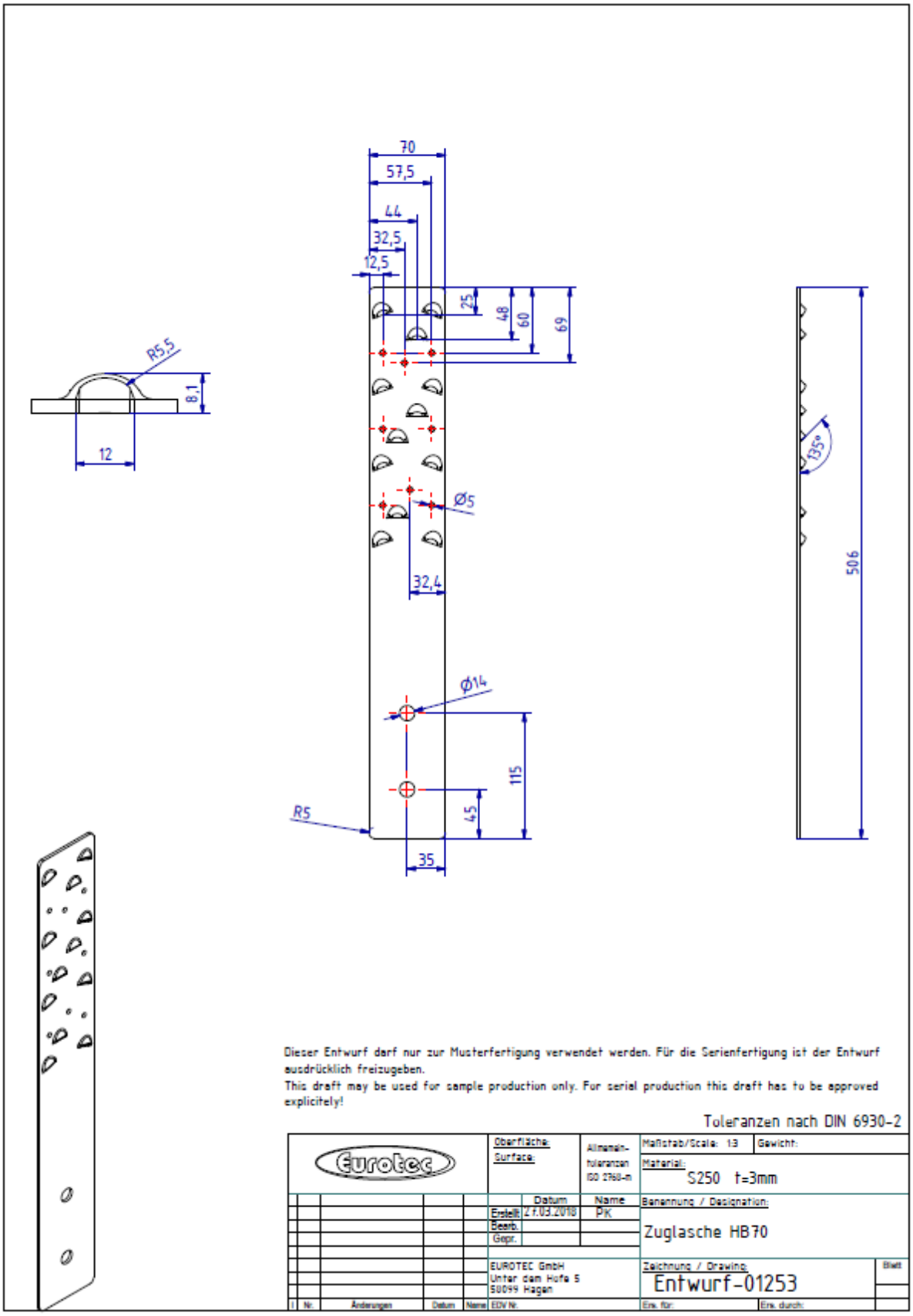


Figure B. 7 Dimensions of Tension Strap HB70

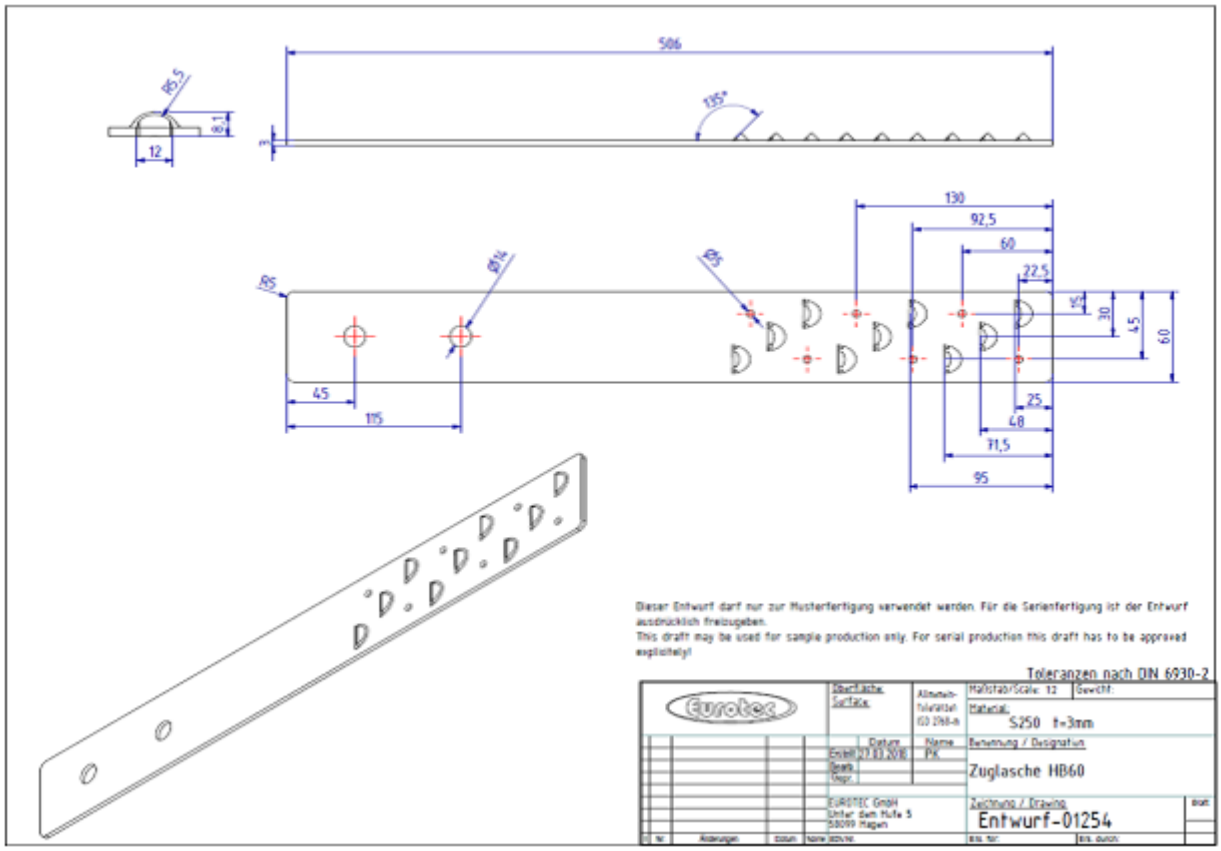


Figure B. 8 Dimensions of Tension Strap HB60

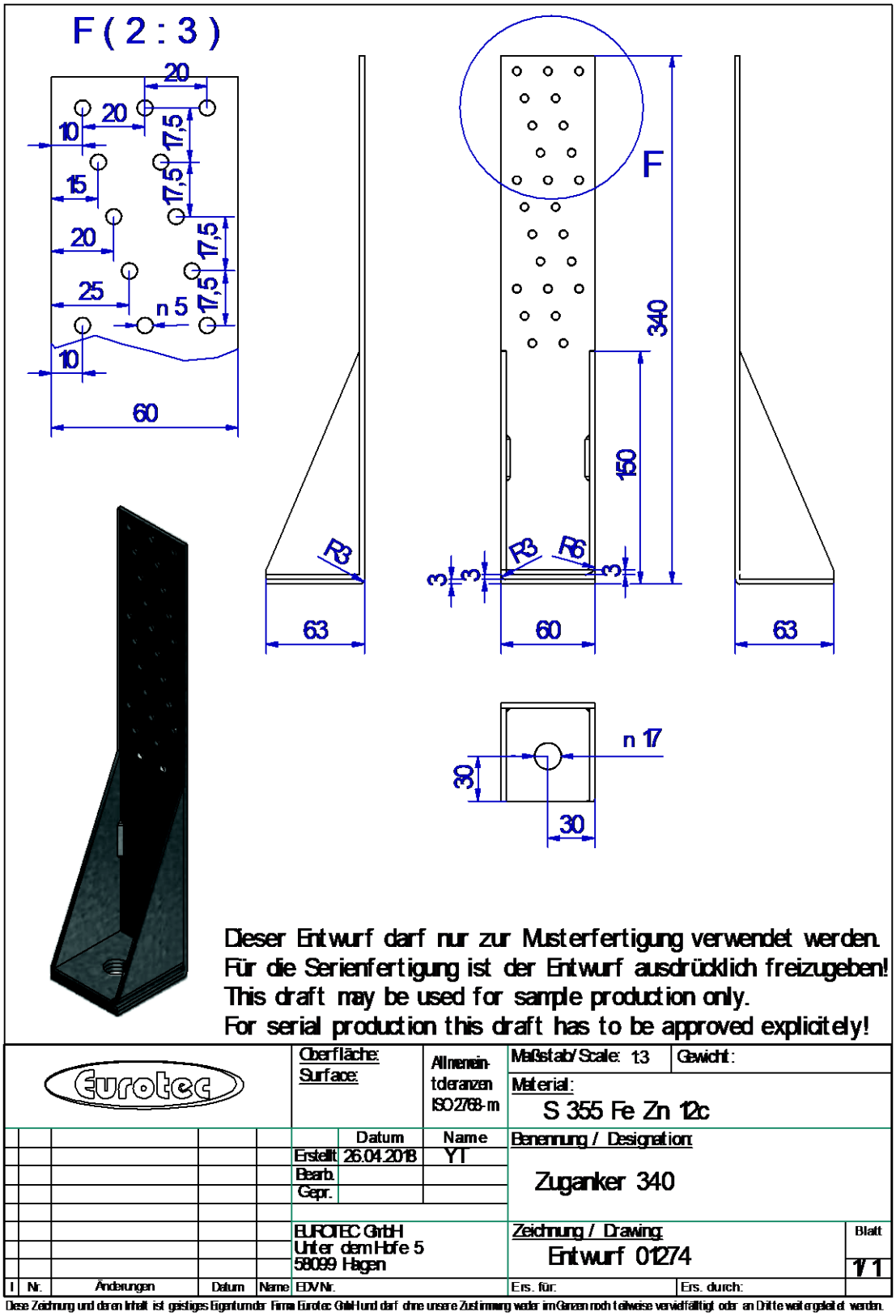


Figure B. 9 Dimensions of Hold-down 340

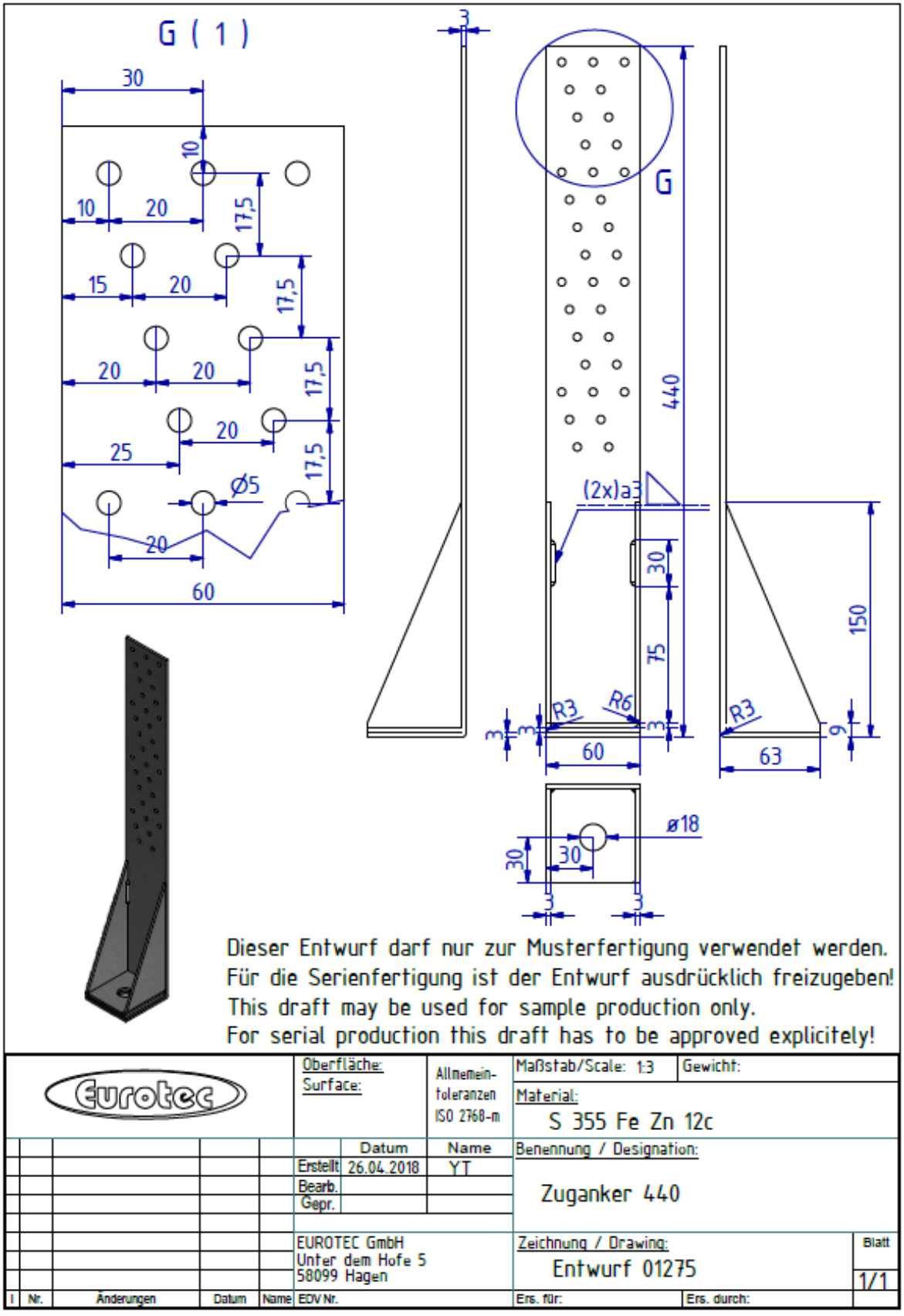


Figure B. 10 Dimensions of Hold-down 440

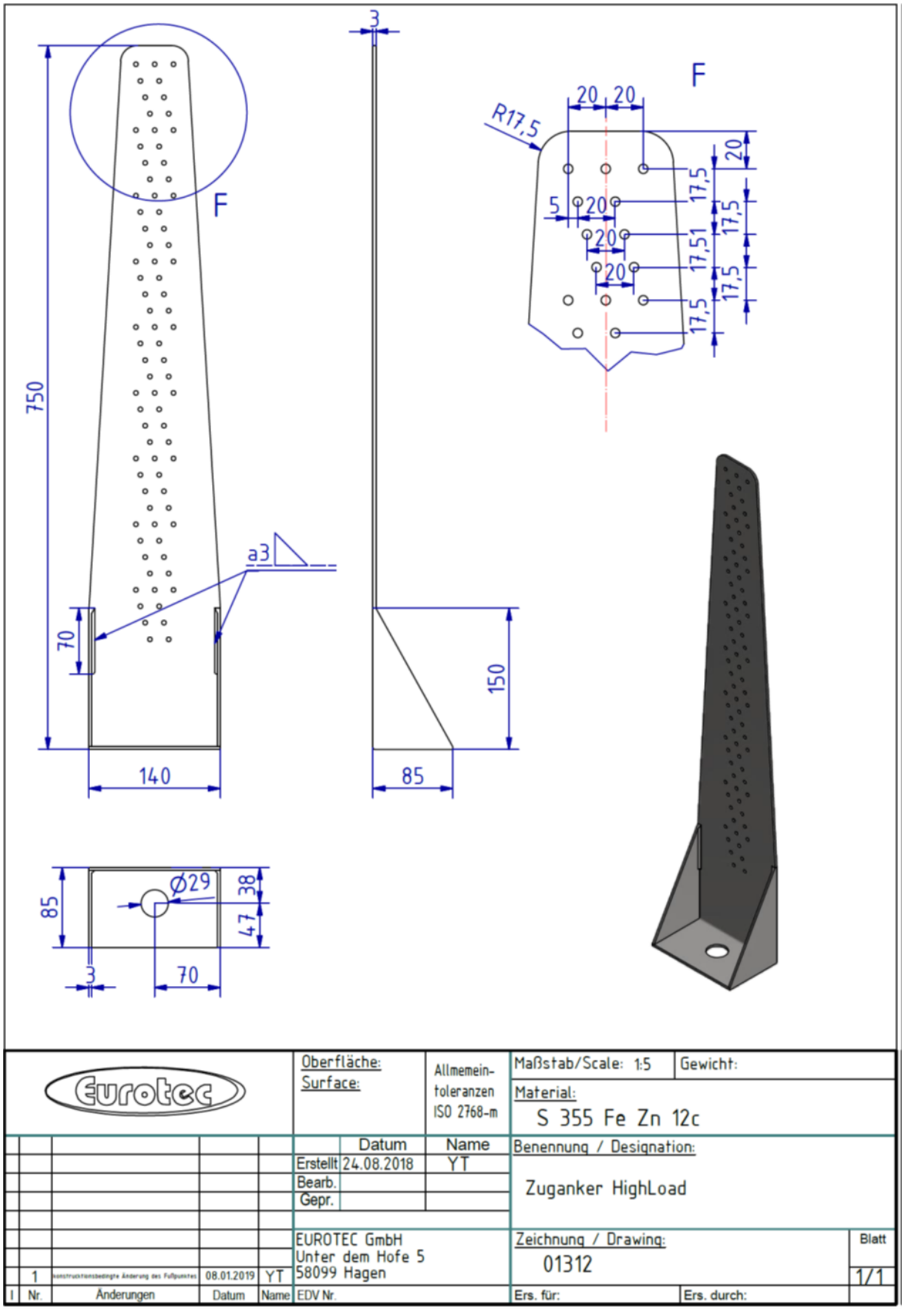


Figure B. 11 Dimensions of Hold-down HighLoad

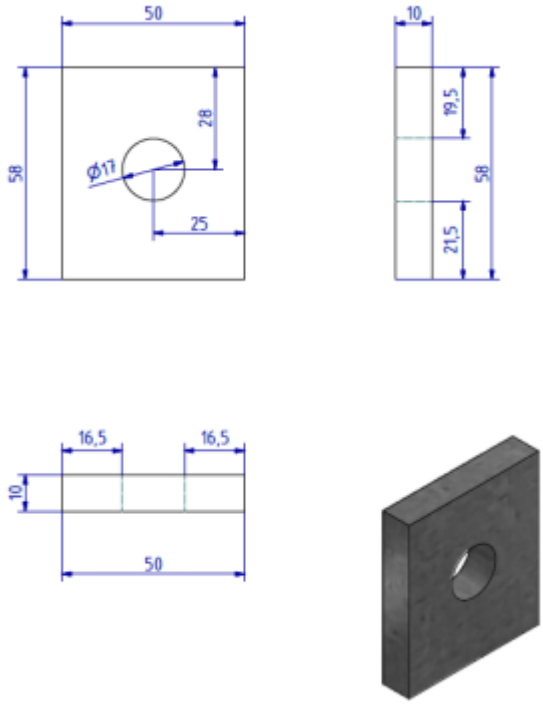


Figure B. 12 Dimensions of Base Plate 60

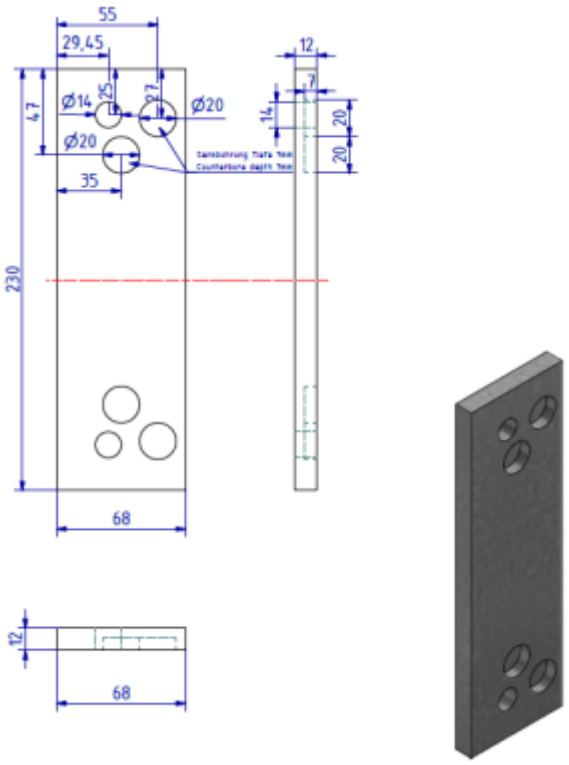


Figure B. 13 Dimensions of Base Plate 230

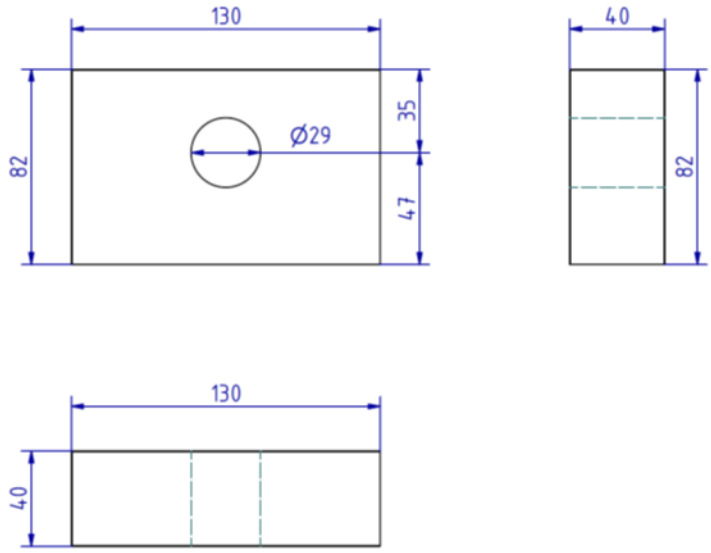


Figure B. 14 Dimensions of Base Plate HL

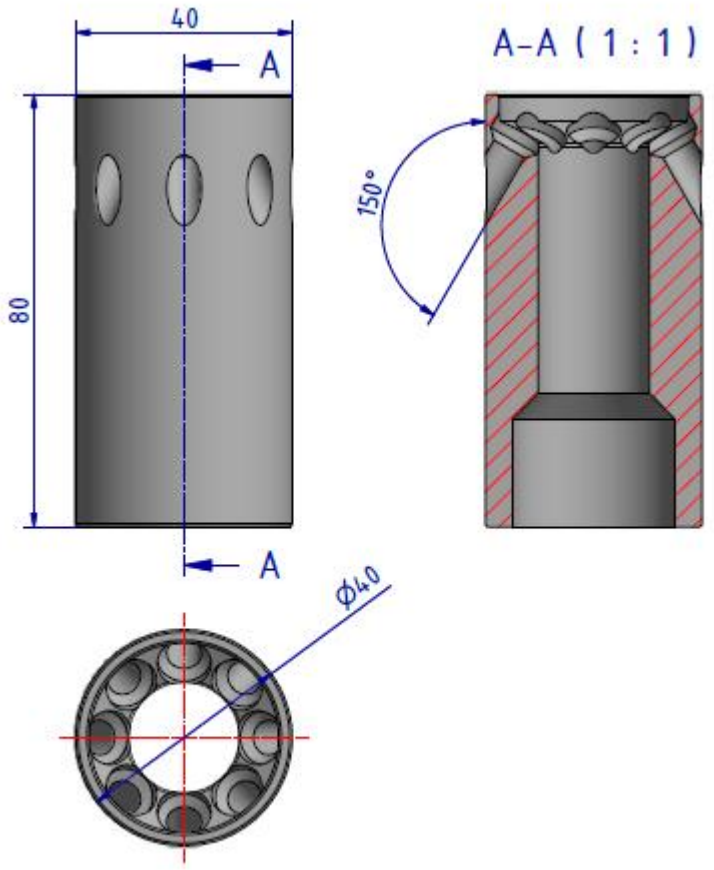


Figure B.15 Lifting anchor 40x80, insertion perpendicular to and flush with member surface

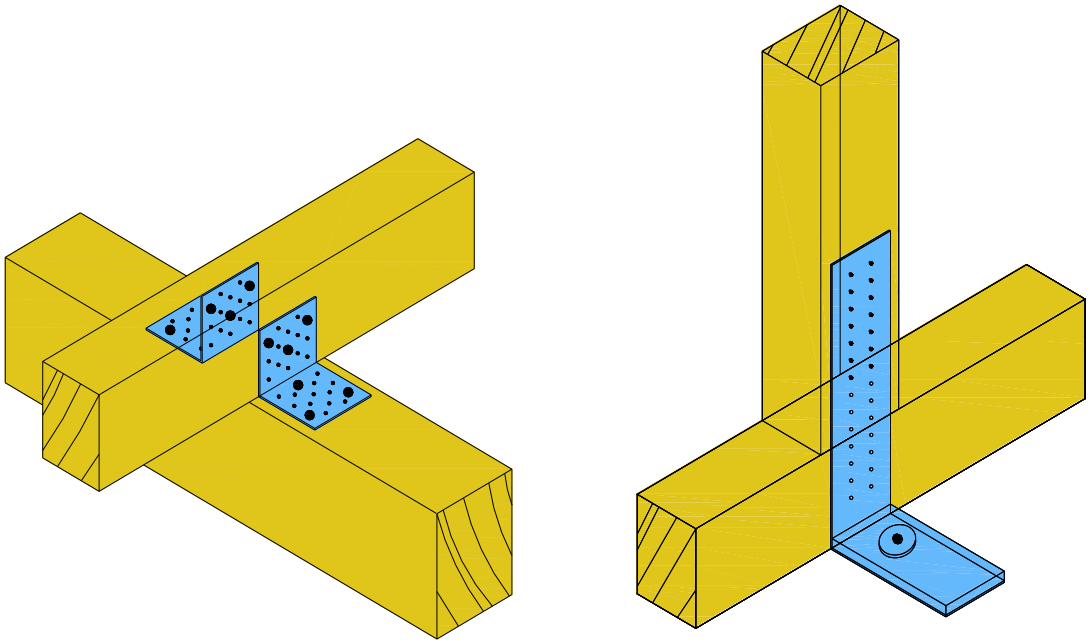


Figure B. 16 Typical installation

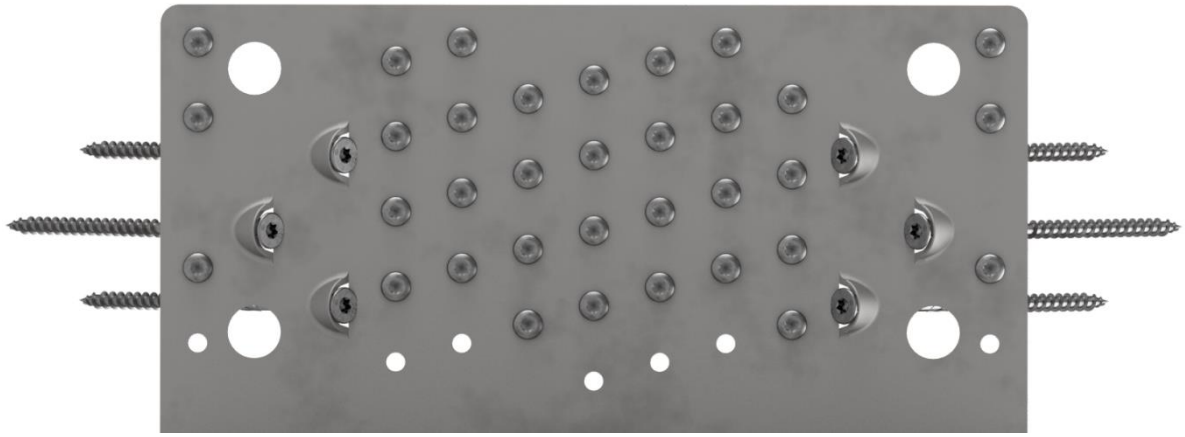


Figure B.17 Fastener Pattern Partial 1 for Shear Angle 240x230 and Shear Plate 230x120 in timber to timber connections
(Symmetrical hole-pattern for both flanges)

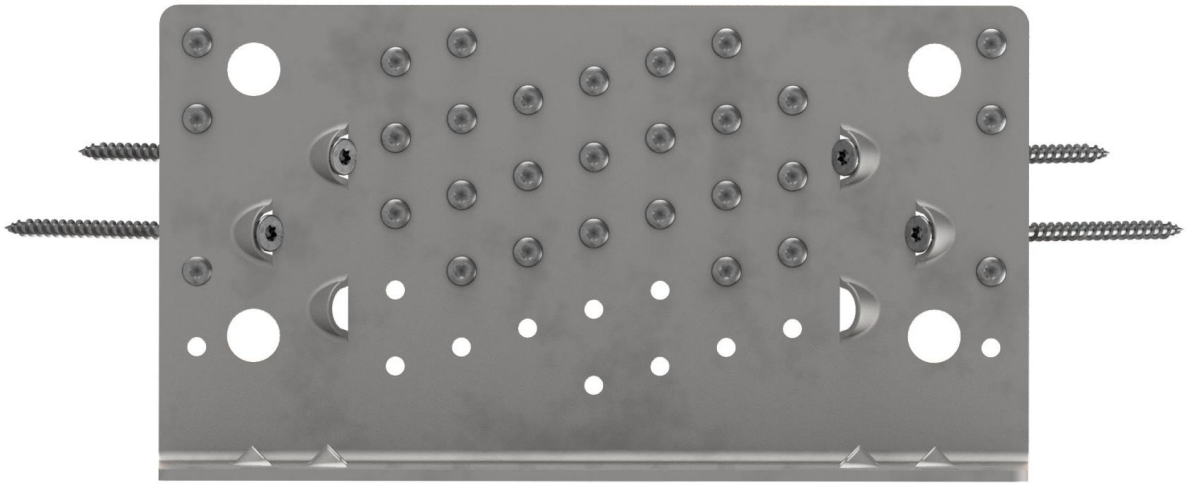


Figure B.18 Fastener Pattern Partial 2 for Shear Angle 240x230 and Shear Plate 230x120 in timber to timber connections
(Symmetrical hole-pattern for both flanges)