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Gemachtigd en aangemeld overeenkomstig artikel 10 van Richtlijn 89/106/EEG van de Raad van 21 december 1988 betreffende de onderlinge aanpassing van de wettelijke en bestuursrechtelijke bepalingen der lidstaten inzake voor de bouw bestemde producten

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Partner for progress

Lid van EOTA
Member of EOTA

European Technical Approval ETA-11/0347

(original version is in the English language)

Trade name	**Gebroeders Bodegraven 3-D nailing plates**
Holder of the approval	**Gebroeders Bodegraven B.V.** **Atoomweg 2,** **2421 LZ Nieuwkoop** **The Netherlands** **Telephone: +31 (0)172 52 01 10** **Mail : techniek@gb.nl** **Internet: www.gb.nl**
Generic type and use of construction product	**THREE-DIMENSIONAL NAILING PLATES**
Validity from **to**	**2011-12-07** **2016-12-07**
Manufacturing plant	**Gebroeders Bodegraven B.V.** **Atoomweg 2,** **2421 LZ Nieuwkoop** **The Netherlands**
Report number	**Kiwa K62484**
This European Technical Approval contains	**15 pages**

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I LEGAL BASES AND GENERAL CONDITIONS

1 This European Technical Approval is issued by Kiwa N.V., in accordance with:

Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by the Council Directive 93/68/EEC of 22 July 1993[2];

Besluit van 7 augustus 2001, houdende vaststelling van voorschriften met betrekking tot het bouwen van bouwwerken uit het oogpunt van veiligheid, gezondheid, bruikbaarheid, energiezuinigheid en milieu (Bouwbesluit)[3], gewijzigd door Besluit van 17 april 2002, houdende wijziging van het Bouwbesluit en enige andere maatregelen van bestuur (correcties en aanvullingen van het Bouwbesluit en aanpassing van andere besluiten aan het Bouwbesluit) en de Ministeriële regeling Bouwbesluit 2003[4] , gewijzigd door Besluit van 30 oktober 2007, houdende wijziging van Bouwbesluit 2003 (wijziging met betrekking tot de CE-markeringen en kwaliteitsverklaringen)[5] .

Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex of Commission Decision 94/23/EC[6].

EOTA Guideline ETAG 015 Three-dimensional Nailing Plates, September 2002 edition.

2 Kiwa N.V. is authorized to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.

3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1 of this European technical approval.

4 This European technical approval may be withdrawn by Kiwa N.V., in particular after information by the Commission on the basis of Article 5 (1) of Council Directive 89/106/EEC.

5 Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Kiwa N.V.. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

6 The European Technical Approval is issued by the approval body in its official language. This version corresponds to the English version which is circulated within EOTA. Translations into other languages have to be designated as such.

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[1] Official Journal of the European Communities N° L 40, 11.02.1989, p. 12
[2] Official Journal of the European Communities N° L 220, 30.08.1993, p. 1
[3] Staatsblad 2001: 410; Staatsblad 2002: 203,516,518 en 582
[4] Staatsblad 2002: 241; Staatsblad 2003: 101
[5] Staatsblad 2007: 439
[6] Official Journal of the European Communities N° L 17, 20.01.1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 DEFINITION OF PRODUCTS AND INTENDED USE

This European Technical Approval applies to the “Gebroeders Bodegraven 3-D nailing plates” joist hanger types RDZ(Heavy), RDM(Medium) and Anglebrackets with no Rill and with one Rill. These connectors are one-piece non-welded, face-fixed parts to be used in timber to timber connections, made of (hot dip) pre-galvanised steel DX51D +Z275.

The connectors are available in various sizes and are detailed in Annex 1.

The connectors are intended for use as a connection between timber elements, for joist hangers in end-grain to side grain and for angle brackets in side-grain to side-grain connections, where requirements for mechanical resistance and stability shall be fullfilled.

The calculation methods are only allowed for a characteristic wood density of up to 420 kg/m³. The design of the connections shall be in accordance with Eurocode 5 or an equivalent Timber Code.

It is a condition that the parts are fixed with nails in all holes (full nailing). Nails are considered to be equivalent to profiled nails 4 mm with sufficient length according the calculation rules. Prescribed are the following nails: “GB-gripankernagels” 4 x 32; Diameter = 4,0 mm.

The zinc-coated parts are for use in timber structures subject to dry, internal conditions defined by the service classes 1 and 2 of EN 1995-1-1:2004 (Eurocode 5).

The connectors are not intended for use in seismic areas.

The provisions made in this ETA are based on an assumed intended working life of 50 years for the connectors. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a mean for choosing the right product in relation the expected reasonable working life of the works.

2 CHARACTERISTICS OF THE PRODUCT AND METHODS OF VERIFICATION

The assessment of fitness for the intended use has been made in accordance with EOTA ETAG 015: 2002 (Section Two).
The Essential Requirements laid down in EOTA ETAG 015: 2002 are:

2.1 Mechanical resistance and stability

For practical applications the following conditions have to be met:
- Ensure the header of joists is restrained against rotation.
- Install specified nails in all available holes.
- Fitting of parts should be free of wane (all < 3mm).
- The actual maximum bearing capacity of the joist is checked in relation to the part-capacity by the designer of the structure.

To determine the strength and stiffness properties of the three-dimensional nailing plates defined in section 1, the method of combining a calculation method based on the principles of the EN 1995-1-1 “Eurocode 5 Design of timber structures: General – Common rules and rules for buildings” with a limited test program is used.

2.1.1 Strength

The characteristic strength values are given in Annex 2.

2.1.2 Stiffness

No performance has been determined in relation to the joint's stiffness properties, to be used for the analysis of the serviceability limit state.
According EN 26891, the deflections during testing are limited to 15 mm. The ultimate load on the specimen is also limited to the value at 15 mm deflexion over the connection.

2.1.3 Ductility in cyclic testing

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

2.2 Safety in case of fire

2.2.1 Reaction to fire

The connectors and associated nails are classified as non-combustible and meet the requirements of class A1 according to EN 13501-1-2002 and EC Decision 96/603/EC, amended by EC Decision 2000/605/EC.

2.2.2 Resistance to fire

Performance in relation to fire resistance would be determined for the complete structural element with any associated finishes, therefore there are no aspects of performance relevant to this aspect of this Essential Requirement for 3-D nailing plates.

2.3 Hygiene, health and the environment

2.3.1 Release of dangerous substances

The three-dimensional nailing plates do not present any known risk in relation to ER 3 of Council Directive 89/106/EEC during normal use.

2.4 Safety in use

There are no aspects of performance relevant to this Essential Requirement for three-dimensional nailing plates.

2.5 Protection against noise

There are no aspects of performance relevant to this Essential Requirement for three-dimensional nailing plates.

2.6 Energy economy and heat retention

There are no aspects of performance relevant to this Essential Requirement for three-dimensional nailing plates.

2.7 Aspects of durability, serviceability and identification

2.7.1 Durability and serviceability

The zinc-coated parts are for use in timber structures subject to dry, internal conditions defined by the service classes 1 and 2 of EN 1995-1-1:2004 (Eurocode 5).
Under these conditions and under appropriate use and maintenance the assumed intended working life is 50 years.

2.7.2 Identification of the product

The CE marking appears on the packaging as stated in section 3.3.

3 ATTESTATION AND EVALUATION OF CONFORMITY AND CE MARKING

3.1 System of attestation of conformity

The system of attestation of conformity for this product is System 2+ according to Commission Decision 97/638/EC.
This system is described in Council Directive (89/106/EEC), Annex III, 2(ii), *First possibility* and is detailed as follows:

(a) Tasks for the manufacturer

- Initial type-testing of the product (by notified testing lab)
- Factory production control
- Testing of samples taken at the factory (prescribed test plan)

(b) Tasks for the approved body

Certification of factory production control on the basis of:

- Initial inspection of factory and of factory production control
- Continuous surveillance, assessment and approval of factory production control.

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control (FPC)

The manufacturer shall continue to exercise their factory production control system. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures. This factory production control system shall ensure that the product is in conformity with the European Technical Approval (ETA).
The manufacturer may only use the raw materials listed in the technical documentation of this ETA. The raw materials shall be subject to controls by the manufacturer. The control shall include the test certificates presented by suppliers (comparison with nominal values), including verification of dimensions and determination of material properties, e.g. chemical composition, mechanical properties and thickness of the zinc coating.

The results of factory production control shall be recorded and evaluated. The records shall at least include the following:

- Designation of the product, basic material and components
- Type of control or testing
- Date of manufacture of the product and date of testing of the product or basic material and components
- Result of control and testing and, if appropriate, comparison with requirements
- Signature of person responsible for factory production control

The records shall be available to the inspection body conducting the continuous surveillance.

3.2.1.2 Testing of samples taken at the factory – Prescribed Test Plan

The final products are checked visually and for dimensions. The frequency of controls and tests conducted during production and on the finished connector is laid down in the prescribed test plan agreed with KIWA N.V..

3.2.2 Tasks for the Approved Body

The approved body shall perform the following tasks in accordance with the control plan:
- Initial inspection of factory and factory production control
- Continuous surveillance, assessment and approval of factory production control

The approved body shall retain and document the results in a written report.

3.2.2.1 Initial inspection of the factory and of factory production control

The approved body shall ascertain that, in accordance with the prescribed control plan, the factory, particularly the staff and equipment, and the factory production control, are suitable to ensure continuous and orderly manufacturing of the connectors in accordance with the specifications of this ETA.

3.2.2.2 Continuous surveillance

The approved body shall visit the factory twice a year for routine inspections. It shall be verified that the system of factory production control and the specified manufacturing processes are maintained in accordance with the control plan.
The certification body shall make the results of product certification and continuous surveillance available to KIWA N.V. upon demand.
The certification body appointed by the manufacturer shall issue an EC certificate of conformity confirming compliance of the factory production control with the provisions of this ETA.
In cases where the provisions of the ETA and its control plan are no longer fulfilled, the certification body shall withdraw the certificate of conformity and inform KIWA N.V. without delay.

3.3 CE marking

The CE marking shall be affixed to the packaging of the connectors. The CE symbol shall be accompanied by the following information:
- Identification number of the notified body
- Name/identification mark of the manufacturer
- Last two digits of the year in which the marking was affixed
- Identification of the product (by name and size)
- The number of the ETA
- The number of the EC certificate of conformity

The CE marking shall also be affixed on each connector. The CE symbol on the connector shall be accompanied by the following information:

The number of the ETA

4 ASSUMPTIONS AND RECOMMENDATIONS UNDER WHICH THE FITNESS OF THE PRODUCT FOR THE INTENDED USE WAS FAVOURABLY ASSESSED

4.1 Manufacturing

"Gebroeders Bodegraven 3-D nailing plates" joist hangers types RDZ(Heavy), RDM (Medium) and Anglebrackets with no Rill and with one Rill shall be manufactured in accordance with the provisions of this ETA using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation.
The ETA is issued for the product on the basis of the information provided by Gebroeders Bodegraven B.V. at the time of the assessment and judging of KIWA N.V. of the product. Changes to the product or the production process, which could affect the approval and consequently the validity of the CE marking on the basis of the approval, shall be notified to KIWA N.V. before the changes are introduced. KIWA N.V. will decide whether or not these changes affect the approval and consequently the validity of the CE marking on the basis of the approval, and if so whether further assessment or alterations to the ETA shall be necessary.

4.2 Installation

The ETA is issued under the assumption that the execution of the works shall be in accordance with the manufacturer's technical literature.
The "Gebroeders Bodegraven 3-D nailing plates" are deemed fit for its intended use provided:
- The joints are designed in accordance with Eurocode 5 and ETAG 015
- The connectors are fixed with nails in all holes (full nailing)
- The header is restrained against rotation
- Acting forces are without big eccentricities in relation to the centre of the connection
- Fitting of parts should be free of wane (all < 3 mm)
- The actual maximum bearing capacity of the connected timber members are checked in relation to the part-capacity by the designer of the structure
- The execution of the connection shall be in accordance with the approval holder's technical literature
- The angle brackets will be symmetrically applied to the timber members

4.3 Responsibility of the manufacturer

It is the responsibility of the manufacturer to ensure that the information on the specific conditions given in this ETA is given to those concerned.
The minimum information required is:
- Fastener specification
- Requirements for timber members
- Identification of the manufacturing batch

4.4 Recommendations

4.4.1 Recommendations on packaging, transport and storage

The connectors are packed in boxes bearing the information as stated in section 3.3.
For conventional metallic products no recommendations are necessary for transport and storage.

4.4.2 Use, maintenance and repair

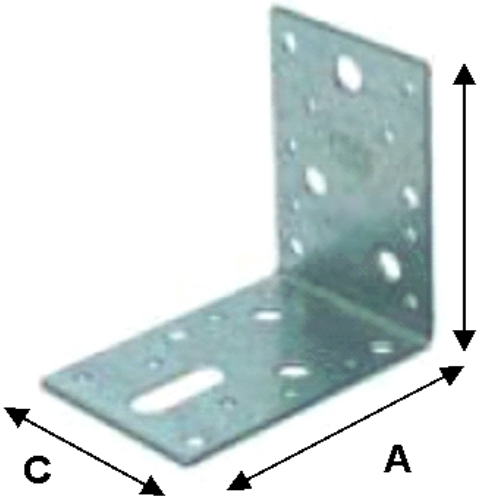
The assessment of the fitness for use is based on the assumption that no maintenance is required during the assumed intended working life.
Should repair prove necessary this is normally achieved by replacement.

ANNEX 1: PRODUCT DETAILS AND SPECIFICATION

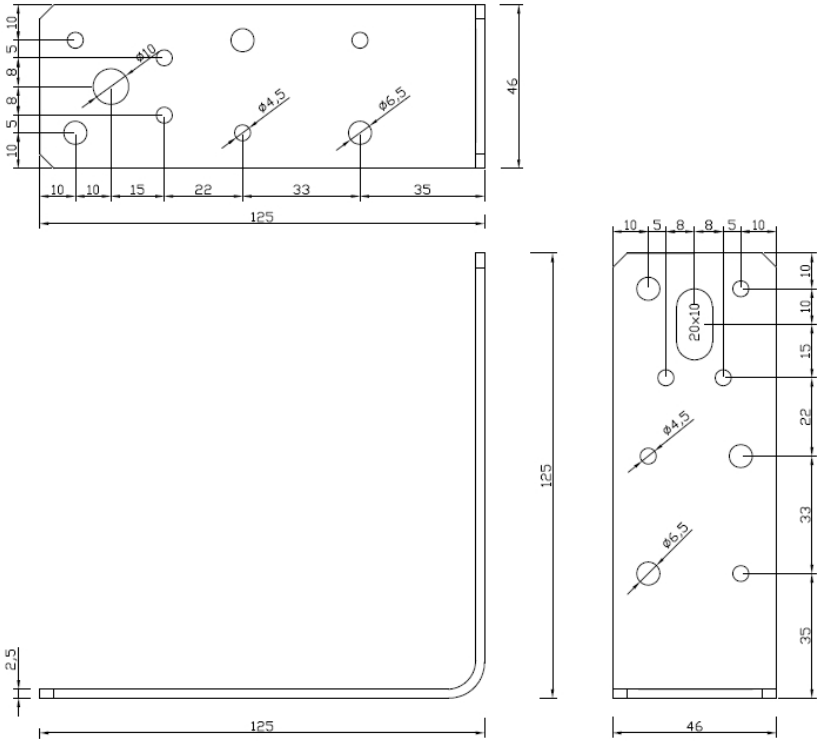
Angle brackets with no rill

Table 1 Angle brackets - no rill

Type	Dimensions [mm]			
	A	B	C	Thick
90x90x2	90	90	60	2,0
90x90x2,5	90	90	60	2,5
90x90-2AH	90	90	60	2,0
90x150	150	90	60	2,5
125x125	125	125	46	2,5
150x150	150	150	60	2,5



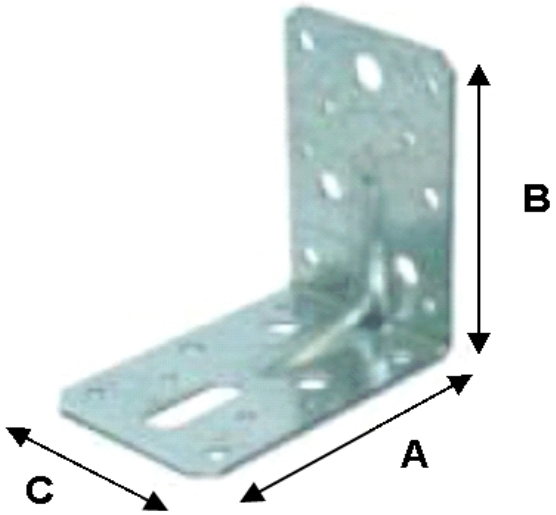
Geometric information for a typical Angle bracket with no rill



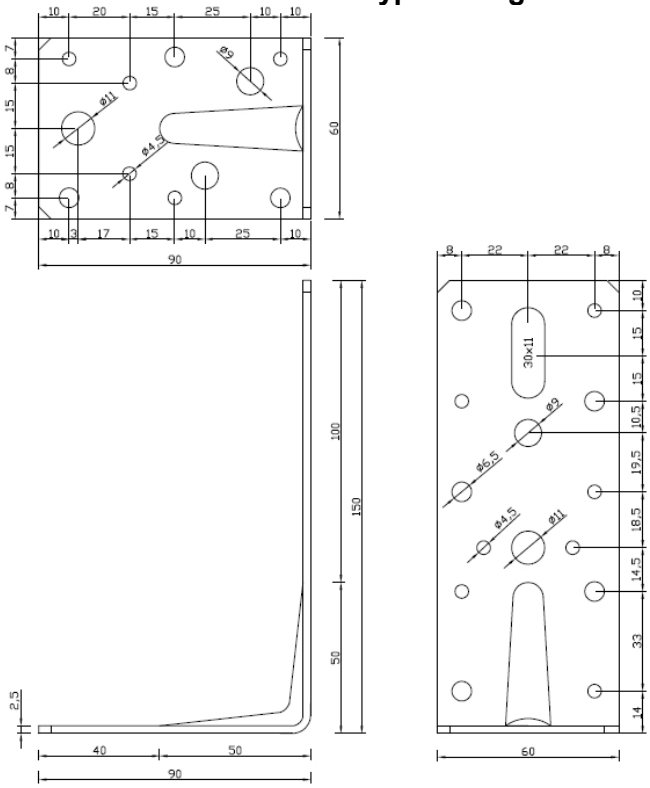
Angle brackets with one rill

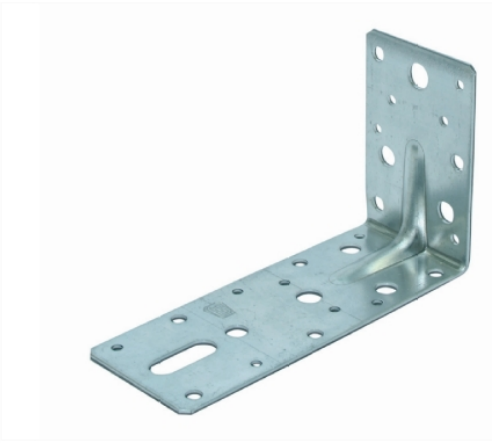
Table 2 Angle brackets - one rill

Type	Dimensions [mm]			
	A	B	C	Thick
90x90x2 rill	90	90	60	2,0
90x90x2,5 rill	90	90	60	2,5
90x90-2AH rill	90	90	60	2,0
90x150 rill	150	90	60	2,5
125x125 rill	125	125	46	2,5
150x150 rill	150	150	60	2,5



Geometric information for a typical Angle bracket with no rill

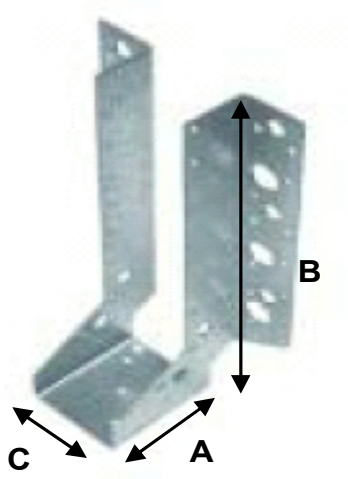




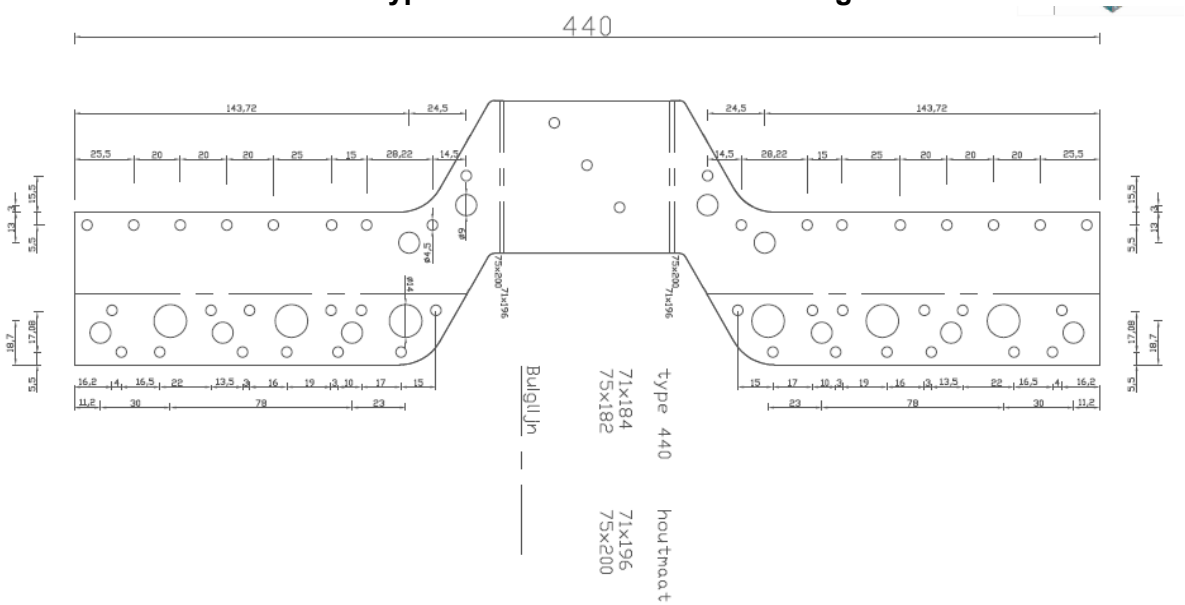
Joist Hanger: RDM (“Medium”)

Table 3 Joist hanger "Medium"

Type	Dimensions [mm]			
	A	B	C	Thick
RDM-180/46	71	180	46	1,5
RDM-180/50	75	180	75	1,5
RDM-230	87	230	46	1,5
RDM-280/38	121	280	38	1,5
RDM-280/46	117	280	46	1,5
RDM-280/50	115	280	50	1,5
RDM-280/59	110	280	59	1,5
RDM-280/63	108	280	63	1,5
RDM-335/46	144	335	46	1,5
RDM-335/50	143	335	50	1,5
RDM-335/59	138	335	59	1,5
RDM-335/63	136	335	63	1,5
RDM-335/71	132	335	71	1,5
RDM-335/75	130	335	75	1,5
RDM-380/59	160	380	59	1,5
RDM-380/63	158	380	63	1,5
RDM-380/71	154	380	71	1,5
RDM-380/75	152	380	75	1,5
RDM-440/71	184	440	71	1,5
RDM-440/75	182	440	75	1,5



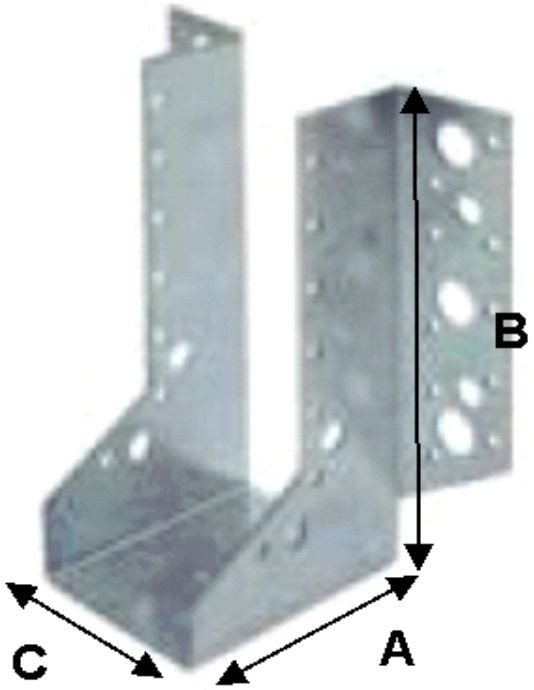
Geometric information for a typical RDM “Medium” Joist Hanger



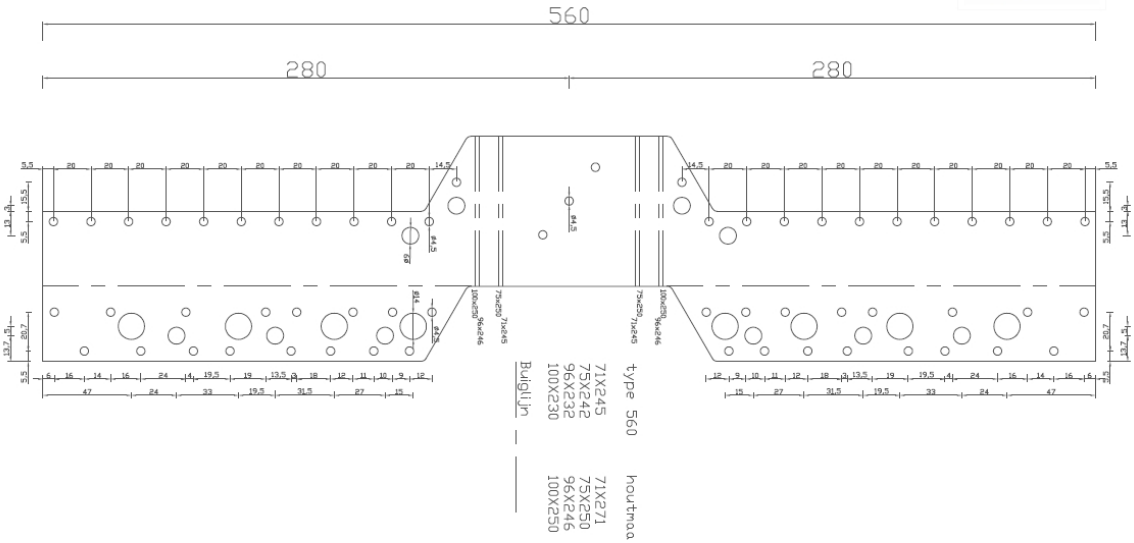
Joist Hanger: RDZ ("Heavy")

Table 4 Joist hanger "Heavy"

Type	Dimensions [mm]			
	A	B	C	Thick
RDZ-220/46	87	220	46	2,0
RDZ-220/50	85	220	50	2,0
RDZ-280/38	121	280	38	2,0
RDZ-280/46	117	280	46	2,0
RDZ-280/50	115	280	50	2,0
RDZ-280/59	110	280	59	2,0
RDZ-280/63	108	280	63	2,0
RDZ-335/46	144	335	46	2,0
RDZ-335/50	143	335	50	2,0
RDZ-335/59	138	335	59	2,0
RDZ-335/63	136	335	63	2,0
RDZ-335/71	132	335	71	2,0
RDZ-335/75	130	335	75	2,0
RDZ-380/46	167	380	46	2,0
RDZ-380/50	165	380	50	2,0
RDZ-380/59	160	380	59	2,0
RDZ-380/63	158	380	63	2,0
RDZ-380/71	154	380	71	2,0
RDZ-380/75	152	380	75	2,0
RDZ-440/50	195	440	50	2,0
RDZ-440/59	190	440	59	2,0
RDZ-440/63	188	440	63	2,0
RDZ-440/71	184	440	71	2,0
RDZ-440/75	182	440	75	2,0
RDZ-440/96	172	440	96	2,0
RDZ-440/100	170	440	100	2,0
RDZ-500/59	220	500	59	2,0
RDZ-500/63	218	500	63	2,0
RDZ-500/71	214	500	71	2,0
RDZ-500/75	212	500	75	2,0
RDZ-500/96	202	500	96	2,0
RDZ-500/100	200	500	100	2,0
RDZ-560/71	245	560	71	2,0
RDZ-560/75	242	560	75	2,0
RDZ-560/96	232	560	96	2,0
RDZ-560/100	230	560	100	2,0



Geometric information for a typical RDZ "Heavy" Joist Hanger



ANNEX 2: CHARACTERISTIC STRENGTH VALUES

Angle brackets: with “no rill” and “one rill”

Angle brackets (values for a single bracket)

Attention:
- Angle brackets should be used in a symmetrical way:
- No additional eccentricities may be introduced due to the static system
- All values should be corrected with the density-factor (ρ-factor) of the appropriate values.

Shearforces in the main direction (direction "Dr pull" resp. "Dr push" result in:
- a traction force
  or
- a pressure force

} of the same value on the other contact-area (in that cases, the minimum of the two values is the ultimate value).

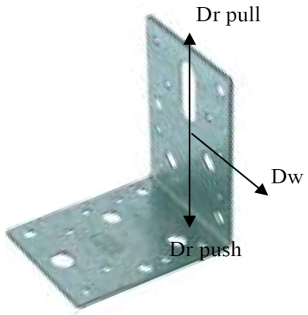


Table 5 Angle brackets - no rill

Type	Pull [kN]	Push [kN]	Lateral [kN]	Combination Push/Pull and Lateral*
ρ-factor type**	A	B	B	
90x90x2	0,78	5,66	2,86	See Fig. 1
90x90x2,5	0,78	7,08	2,86	See Fig. 1
90x90-2AH	0,78	5,66	2,86	See Fig. 1
90x150	0,78	7,08	2,86	See Fig. 1
125x125	0,78	5,43	2,86	See Fig. 1
150x150	0,78	7,08	2,86	See Fig. 1

Table 6 Angle brackets - one rill

Type	Pull [kN]	Push [kN]	Lateral [kN]	Combination Push/Pull and Lateral*
ρ-factor type**	A	B	B	
90x90x2 rill	1,16	6,79	2,86	See Fig. 1
90x90x2,5 rill	1,16	6,79	2,86	See Fig. 1
90x90-2AH rill	1,16	6,79	2,86	See Fig. 1
90x150 rill	1,16	6,79	2,86	See Fig. 1
125x125 rill	1,55	6,87	2,86	See Fig. 1
150x150 rill	2,33	9,63	2,86	See Fig. 1

*The ultimate characteristic capacity in the case of a combination of Push/Pull (Main) capacity and lateral capacity should be calculated as follows:

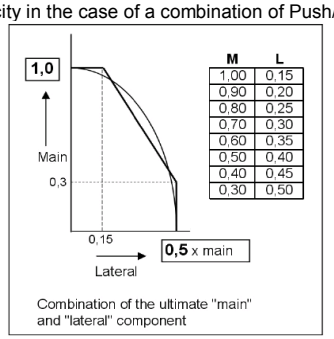


Figure 1

** The characteristic density ρ should be taken into account by correcting the table-values with the following ρ-factor:

e.g: C class	*C16*	*C18*	*C20*	*C22*	*C24*	*C27*	*C30*	*C35*	*Up to*
char. Density [kg/m³]	310	320	330	340	350	370	380	400	420

Additional factors									
Type A	Square ($c_w = 2$)	0,78	0,84	0,89	0,94	1,00	1,12	1,18	1,31	1,44
Type B	Root ($c_w = 0,5$)	0,94	0,96	0,97	0,99	1,00	1,03	1,04	1,07	1,10

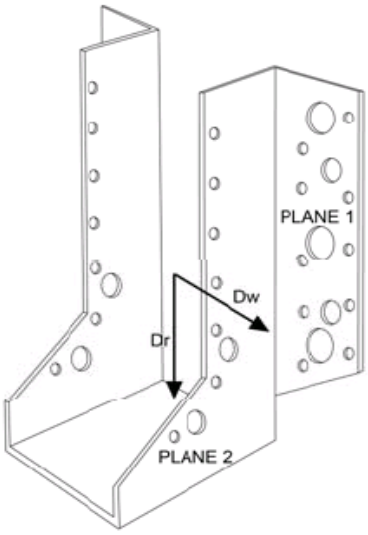
Joist Hangers: RDM ("Medium") and RDZ ("Heavy")

Table 7 Joist hanger "medium"

Type	Dr (Main) [kN]	Dw (Lateral) [kN]	Combination Dr and Dw*
ρ-factor type**	B	B	
RDM-180	3,76	1,88	See Fig. 2
RDM-230	10,15	5,08	See Fig. 2
RDM-280	12,93	6,47	See Fig. 2
RDM-335	19,91	9,96	See Fig. 2
RDM-380	22,33	11,17	See Fig. 2
RDM-440	27,01	13,51	See Fig. 2

Table 8 Joist hanger "Heavy"

Type	Dr (Main) [kN]	Dw (Lateral) [kN]	Combination Dr and Dw*
ρ-factor type**	B	B	
RDZ-220	5,85	2,93	See Fig. 2
RDZ-280	12,45	6,23	See Fig. 2
RDZ-385	19,96	9,98	See Fig. 2
RDZ-380	22,58	11,29	See Fig. 2
RDZ-440	27,61	13,81	See Fig. 2
RDZ-500	30,30	15,15	See Fig. 2
RDZ-560	35,29	17,65	See Fig. 2



*The ultimate characteristic capacity in the case of a combination of Push/Pull (Main) capacity and lateral capacity should be calculated as follows:

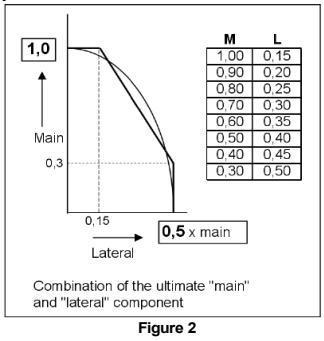


Figure 2

** The characteristic density ρ should be taken into account by correcting the table-values with the following ρ-factor:

	e.g: C class	*C16*	*C18*	*C20*	*C22*	*C24*	*C27*	*C30*	*C35*	*Up to*
	char. Density [kg/m^3]	310	320	330	340	350	370	380	400	420
	Additional factors									
Type A	Square (c_w = 2)	0,78	0,84	0,89	0,94	1,00	1,12	1,18	1,31	1,44
Type B	Root (c_w = 0,5)	0,94	0,96	0,97	0,99	1,00	1,03	1,04	1,07	1,10