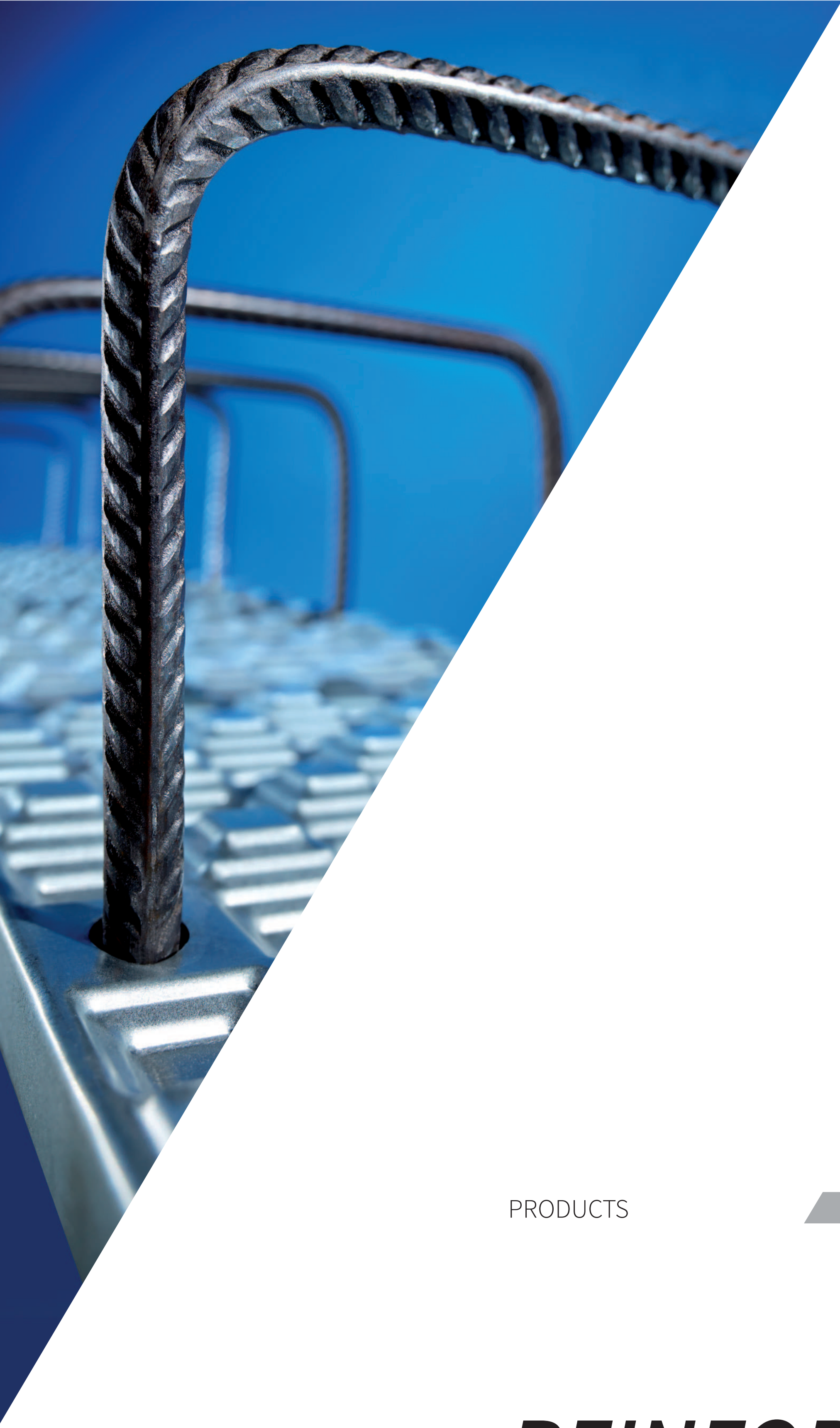


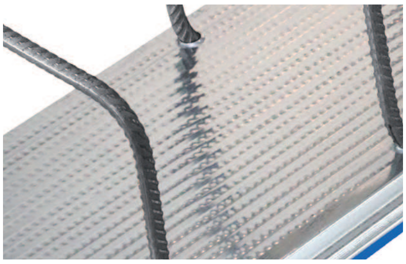
PRODUCTS

NEW
for high
shearing
forces

REINFORCEMENT SYSTEMS

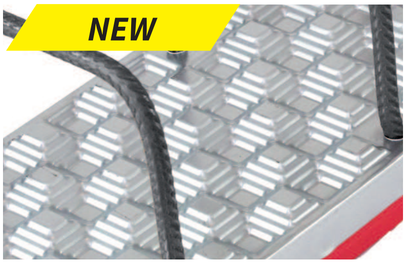
PRODUCT VIDEO WWW.NEVOGA.COM

REINFORCEMENT SYSTEM PLEXUS®, PYRAPLEX®, FTW



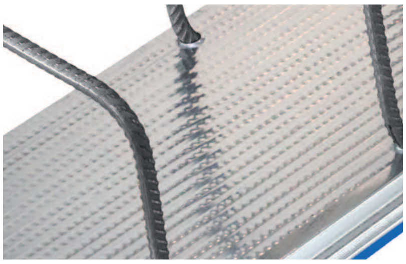
PLEXUS®

PLEXUS® is a prefabricated rebar continuity system for reinforced concrete construction. PLEXUS® provides a simple and cost effective method of reinforcement continuity across concrete joints. The surface texture of the box are classified in the category “smooth” according to DBV (German Society for Concrete and Construction Technology) leaflet “Bending back concrete steel and requirements for protective boxes”.



PYRAPLEX®

PYRAPLEX® is the advanced development of the PLEXUS® box with indentations for high shearing forces. With the new and unique special pyramid design of the box it is the PYRAPLEX® which is the first product that ensures a biaxial transfer of the shearing forces across the length of the construction joint. The surface texture of the box are classified in the category “geared” according to DBV (German Society for Concrete and Construction Technology) leaflet “Bending back concrete steel and requirements for protective boxes”.



PLEXUS® FTW

PLEXUS® FTW for the use in the precast industry or applications where an extra low box height of 20 or 30mm is required. The surface texture of the box are classified in the category “smooth” according to DBV (German Society for Concrete and Construction Technology) leaflet “Bending back concrete steel and requirements for protective boxes”.

REINFORCEMENT SYSTEMS

The reinforcement system PLEXUS®, PYRAPLEX® and PLEXUS® FTW are certified to the requirements of DIN EN 1992-1-1 with NA(D) and DBV (German Society for Concrete and Construction Technology) leaflet “Bending back concrete steel and requirements for protective boxes”, according to the Eurocode 2, January 2011. The pull out bar lengths are in accordance to DIN 1045-1:2008-08, section 12.3.2. or other local regulations in Europe.

- Diameter of bending roller: 6ds as per Standard
- Bent section of metal connectors within casing
- Transverse hooks on individual strips to simplify insertion of reinforcement
- Galvanised casing can remain inside concrete
- Ends closed with wood, thereby extremely stable
- Plastic cover for lower weight, easier and reduced risk of injury
- No plastic remains in the concrete

Due to plastic cover, no risk of injury!

Bendable structural steel BST550 with Austrian and BST500 with German approval. Types with special steel for other European countries possible.

Pull out length lü:	acc. to DIN 1045:	acc. to ÖNORM B4200:
Ø 8mm:	32cm	29cm
Ø 10mm:	39cm	36cm
Ø 12mm:	46cm	42cm

Tested according to Eurocode2

Due to the manufacture and installation, stirrup height tolerance of 10 to 20mm.

Following steel Ø are available: Ø 6, 8, 10, 12, 14 und 16mm

NEVOGA S.R.O.
KOTKOVA 22
66902 ZNOJMO
DIN488-3:2009-08;
DIN488-6:2010-01;
DIN 488-1:2009-08
TÜVRheinland® LGA Bautechnik

External controlling of TÜV Rheinland LGA Bautechnik GmbH

NEW
for high shearing forces

REINFORCEMENT SYSTEM PYRAPLEX®

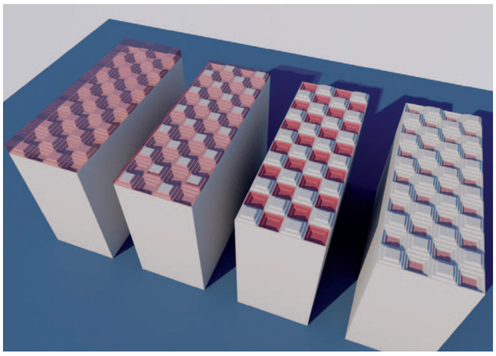
PYRAPLEX®

PYRAPLEX® is the advanced development of the PLEXUS® box with indentations for high shearing forces. With the new and unique special pyramid design of the box it is the PYRAPLEX® which is the first product that ensures a biaxial transfer of the shearing forces across the length of the construction joint.

ADVANTAGES:

- The surface character of PYRAPLEX® has been classified in the category "denticulate" in accordance with DBV. Excerpt from the DBV statement of 24.02.2015: "The surface character of the PYRAPLEX® reinforcement system in accordance with the DBV data sheet "Rebending reinforcing steel and requirements on protective boxes pursuant to Eurocode 2" [1] in a linear and transverse direction can be classified in the category "denticulate"."
- In addition to the main load-bearing direction, forces can be safely transferred in a secondary direction. For example, from an earthquake, wind or earth movement.
- Construction joints do not have to be roughened.
- No additional spines or different box forms to transfer shearing forces transverse and linear to the joint, but uniform rebar connections.

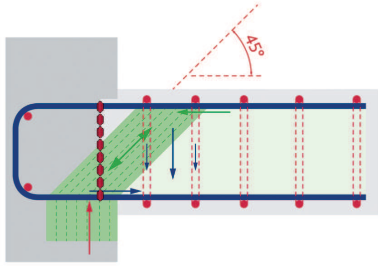
PYRAPLEX®-TECHNOLOGY:



- The checkered, truncated pyramids guarantee a maximum shear transfer independent of the direction.
- Excerpt from the DBV statement: "The unfavourable ratio of the base dimensions of the pyramidal denticulations in the standard range in the linear and transverse direction is
  $h_1/h_2 = 40/38 = 1{,}05 < 1{,}25$."
- Excerpt from the DBV statement: "The corresponding area ratio of the pyramidal denticulations (two-dimensional) is thus $A_1/A_2 = (40x38)/(38x40) = 1{,}0 < 1{,}25$ respectively $> 0{,}8$.
- The angle of the steps is less than 30° and thus corresponds to Eurocode 2 Figure 6.9.
- The effect of the high shear area share of the concrete at the metal flashing was confirmed in tests.

REINFORCEMENT SYSTEM PYRAPLEX®

IMPORTANT NOTICES:



- The planner must ensure that the flow of forces on both sides of the rebar connection is guaranteed in the neighbouring structural component(s).
- The tabular resistances assume the normal binder anchorage for good bond conditions. Better bond conditions permit higher resistances depending on the utilisation factor of the starter bars.
- The resistances are tabulated for the concrete strength C20/25, C25/30 and C30/37. If the reinforcement resistances are not fully exploited for the tabulated values, better concrete qualities allow higher resistances.
- Wall connections: (shear linear to joint)
  - The tabulated values apply for connections without a transverse bending stress.
- Slab connections: (shear transverse to joint)
  - The box width is decisive when determining the effective static height d.
  - The tensile force as a result of any restraining torque MEd in the starter bars must be proven. (EC2 6.2.3 (7)).
  - Without shear reinforcement: only one reinforcement layer may be included in the calculation to determine the reinforcement content ρl.
  - With shear reinforcement: the angle of inclination Θ d of the strut results from the ratio of the influence VEd to the concrete resistance VRd,cc and may be between Θ=18.5° and Θ=45.0°. The resistance of the starter bars should be checked with this angle of inclination: FRd ≥ FEd = 0,5·VEd·cotΘ ± MEd/z. The angle of inclination of the struts and the design resistance may have to be adjusted.

TENDER TEXT

Producer information

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Reinforcement systems

Reinforcement system, shear meshed

Nevoga reinforcement system PYRAPLEX® with pyramidal sheet profile for denticulate joint of galvanised steel sheet. With type testing and type statics pursuant to DIN EN 1992-1-1 with NA(D) and DBV data sheet "Reinforcement system steel and requirements on protective boxes pursuant to Eurocode 2", January 2011.

PYRAPLEX® reinforcement system with biaxial shear transfer

Type: _____
Steel-Ø: _____mm
Partition: _____cm
Box width : ____mm
Length of elemet: 1,25m

Possibilities of choice:
Type: double layer Typ B, single layer Typ A
Steel-Ø: 8, 10, 12mm
Partition: 10, 15, 20cm
Box width: 112, 142, 172, 202, 222mm

REINFORCEMENT SYSTEM PYRAPLEX®

NORMATIVE REFERENCES / DESIGN:

Normative references and design model

The PYRAPLEX® reinforcement systems are designed in accordance with the regulations of the data sheet of the DBV 'Rebending reinforcing steel and requirements on protective boxes pursuant to Eurocode 2' from January 2011 [1]. A differentiation is made in the force according to the shearing force linear to the joint (A. wall connection) and the shearing force transverse to the joint (B. ceiling connection), whereby case B. is considered separately for slabs with and without transverse force reinforcement. The key formulas are summarised in [1] Figure 8.

The determination of the maximum resistance to shearing force in the construction joint is based on a friction model. The shearing force capacity therefore depends on the roughness of the joint face, which is classified into four categories: 'very smooth, 'smooth', 'rough' and 'denticulate', whereby the latter displays the highest resistance parameters. The PYRAPLEX® sheet with its omnidirectional pyramidal structure satisfies the geometric requirements of the denticulate joint pursuant to Eurocode 2 Figure 6.9, as has been confirmed by the DBV. The following thus applies for the three joint parameters

$c = 0{,}5 \quad \mu = 0{,}9 \quad v = 0{,}7$

A. Design resistances linear to the construction joint

The design resistance results from the shares of the concrete and steel to

$v_{Rdl} = c \cdot f_{ctd} + \mu \cdot \sigma_n + v_{Rdl,s} \leq v_{Rdl,max}$

The concrete resistance $c \cdot f_{ctd}$ is determined with $c=0{,}5$ and $f_{ctd}=0{,}85 \cdot f_{ctk,0.05}/1{,}5$. The factor c=0 must be set for tension perpendicular to the joint and with a dynamic stress. The share $\mu \cdot \sigma_n$ (σ_n positive for pressure) can also be taken into account for pressure perpendicular to the joint. The steel resistance is calculated for the angle between the joint and reinforcement of $\alpha=90°$ as

$v_{Rdl,s} = \rho \cdot f_{yd,red}$ $1{,}2 \cdot \mu \cdot \sin(90°)$ with $\rho=A_s / A_c$ and $f_{yd,red} = 0{,}8 \cdot 500 N/mm^2/1{,}15 = 348 N/mm^2$.

The compression diagonal slope pursuant to EC2 NA is determined with $\cot\Theta = 1{,}2$. The box width is used to determine A_c. The maximum force in the steel inlays is limited by the bond force of the anchoring section. The design is according to EC2 8.4.4. $\alpha_1=0{,}7$ applies for the binder anchorage. Any transverse reinforcement can be taken into account with the factor α_3.

The maximum possible shearing resistance is calculated on the basis of the concrete resistance and the efficiency of the joint denticulation v=0,7 at

$v_{Rdl,max} = 0{,}5 \cdot v \cdot f_{cd}$.

The shearing resistances v_{Rdl}[N/mm²] shown here are to be interpreted as design shear stresses. In order to determine the design resistance V_{Rd} [kN/m] of the PYRAPLEX® reinforcement system, the box width is assumed as the effective width of the joint.

B. Design resistances transverse to the construction joint

Transverse force resistance without transverse force reinforcement

The transverse forces that can be transferred in the joint are determined from the design resistance of the connected slab pursuant to EC2 6.2.2 and the efficiency of the joint denticulation as

$V_{Rd,c} = (c/0{,}5) \cdot [0{,}15/\gamma_c \cdot k \cdot (100 \rho_l \cdot f_{ck})^{1/3} + 0{,}12 \sigma_{cp}] \cdot b_w \cdot d$ where $k=1+(200/d)^{1/2}$

ρ_l is the linear reinforcement content of a reinforcement layer, σ_{cp} a possible central compressive stress from normal force. There is no reduction for the PYRAPLEX® rebar connections with c=0.5 compared to the design resistance of the slab.
The anchorage of the reinforcement is to be checked in accordance with the specifications of EC2.

Transverse force resistance with transverse force reinforcement

The design resistance is determined pursuant to EC2 6.2.3 from the chosen binders by equating $V_{Rd,s} = V_{Ed}$ and with $\cot\Theta = 1{,}2 / (1-V_{Rd,cc}/V_{Ed})$ from equation 6.8 as

$V_{Rd,s} = V_{Rd,cc} + (A_{Sw} / s) \cdot f_{ywd} \cdot z \cdot 1{,}2$ where $V_{Rd,cc} = 0{,}48 \cdot c \cdot f_{ck}^{1/3} \cdot 1{,}0 \cdot z$

The following applies for the units, for example: A_{Sw}[mm²/mm/mm], s[mm], z[mm], f[N/mm²], VRd[N/mm] respectively [kN/m].

REINFORCEMENT SYSTEM PYRAPLEX®

The lever arm of the internal forces z=0.9d is determined from the geometry of the connections based on a clamping situation with an upper reinforcement. The strut inclination in the area of the joint is to be limited to

$1{,}0 \leq \cot\Theta \leq 3{,}0$

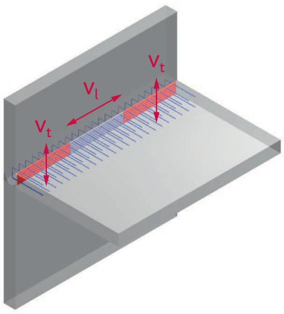
and results from the ratio $V_{Rd,cc}/V_{Ed}$ in the aforementioned equation. The design rules pursuant to EC2 NA apply for the binders.

The maximum transverse force that can be absorbed in the joint area is limited to

$V_{Ed} \leq 0{,}30 \cdot V_{Rd,max} = 0{,}30 \cdot (c/0{,}5) \cdot 1{,}0 \cdot z \cdot v_1 \cdot f_{cd}/(\cot\Theta + \tan\Theta)$ with $v_1 = 0{,}75$

Shear transfer in two directions

The structure of the joint denticulation of the PYRAPLEX® reinforcement system is omnidirectional. This is why the same connections can be used for shearing forces that are both linear and transverse to the joint.



If combined forces occur transverse and linear to the joint, these can be transferred together in the same connections. In a simple model it is assumed that independent subsections are effective to transfer the force linear and transverse to the joint.
It thus follows that

$$\frac{\Sigma_i V_{li}}{\Sigma_i L_{li}} \leq V_{Rd,l} \quad \text{and} \quad \frac{\Sigma_i V_{ti}}{\Sigma_i L_{ti}} \leq V_{Rd,t}$$

$V_{Rd,l}$ and $V_{Rd,t}$ are determined according to the data in A. and B.