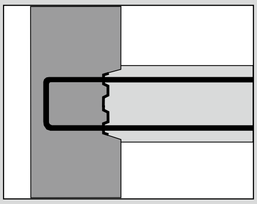
Recostal Permanent Formwork for Construction Joints

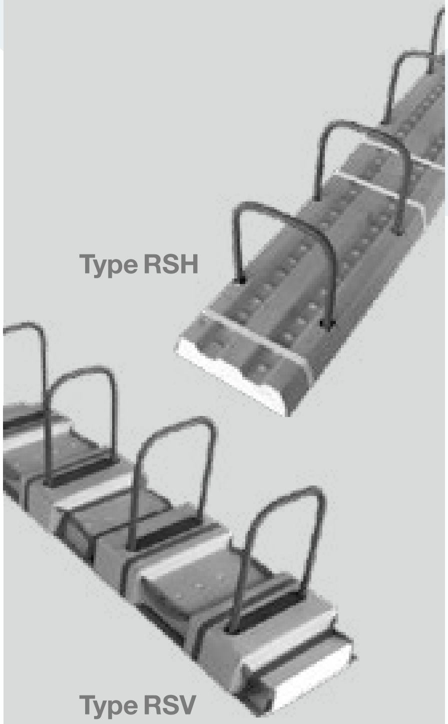
Contents

Structural Design

recostal® Starter Packs type RSH and type RSV

Joint category “key profiled” according to DIN EN 1992-1-1/NA





DIN EN 1992-1-1/NA § 2.8.2: Planning Principles

The type of joint must be specified in the starter pack drawings

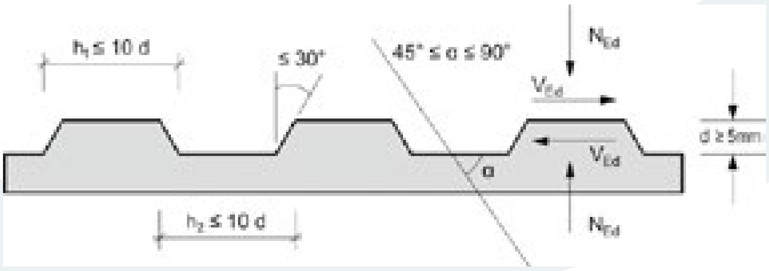
DIN EN 1992-1-1/NA § 6.2.5: Transfer of Shear Forces in Joints

EC 2 divides the type of joint surface into 4 categories. Trapezoidally profiled construction joints represent the highest category with regard to the transfer of shear forces.

Type of surface according to EC 2 § 6.2.5 (2)	Roughness coefficient c [1]	Friction coefficient μ	Strength reduction coefficient[3]
key profiled joint	0.5	0.9	0.7
rough joint	0.4 [2]	0.7	0.5
smooth joint	0.2 [2]	0.6	0.2
very smooth joint	0	0.5	0 [4]

[1] In case of dynamic or fatigue loading, concrete bond (adhesion) should not be taken into consideration (c = 0).
[2] Where tension occurs perpendicular to the joint due to strain, c = 0.
[3] For concrete classes ≥ C55/67 the stated values are to be multiplied by factor $(1.1 - f_{ck} / 500)$ with f_{ck} in [N/mm²] .
[4] The friction proportion in Expression 6.25 may be allowed up to the limit of $\mu \cdot \sigma_N \leq 0.1\ f_{cd}$ for very smooth joints.

Geometry of key profiled joints according to EC 2: recostal® Starter Packs meet the EC 2 requirements for the highest category “key profiled“.



Starter Pack Requirements according to DBV Bulletin

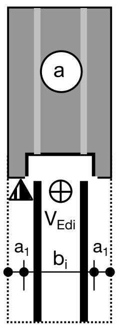
Starter packs without key profiled surfaces are to be classified as “rough“, “smooth“ or “very smooth“ by means of analysis. Starter packs that are not categorized should always be classified as joint category ”very smooth”.

Concrete Cover for Starter Packs according to DBV Bulletin

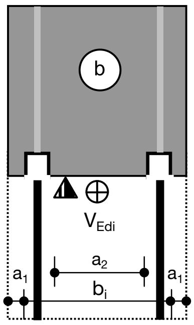
For sheet steel starter packs that remain inside the construction, the concrete cover should be determined referring to the most unfavorable section according to DIN EN 1992-1-1, Paragraph 4.4 with Table 4.4DE. The allowance for deviations Δc_{dev} for the sheet steel of the box may be reduced by 5mm.

Reduced Bar Tension

According to DIN EN 1992-1-1, 8.3 (NA.5), the reinforcement surrounding sections of rebending, while exposed to predominantly static loading close to the limit of the bearing capacity, has to be determined with no more than 80 % of the otherwise permissible values of the calculated stress-strain curve of the reinforcing steel according to DIN EN 1992-1-1, Fig. 3.8. The design value of the anchorage length $l_{b,rqd}$ for this type of starter pack may, according to DIN EN 1992-1-1, 8.4.3 GL (8.3), also be determined with the reduced rated value of the bar tension $f_{yd,red} = 0.8\ f_{yk} / \gamma_S$.



$a_1 < 50$ mm



$a_1 < 50$ mm
$a_2 \geq 50$ mm where surface finish is according to DIN EN 1992-1-1, 6.2.5

Like a_2 $a_1 \geq 50$ mm may be taken into account for b_i; however, in this case, only the slighter roughness of the starter pack box or the construction joint surface should be considered for b_i. Alternatively, the individual width of the construction joint surface area or the starter pack box with their respective surface roughness for b_i may be allowed for.

Shear Force Longitudinal to the Construction Joint

[R1] Exp. 6.25: Design value of the shear capacity
Total bearing capacity = bearing contact area [concrete] + [friction] + [reinforcement] ≤ max. bearing capacity

$V_{Rdi} = c \cdot f_{ctd} + \mu \cdot \sigma_N + V_{Rdi,s} \leq V_{Rdi,max}$ [N/mm²]

Where
$f_{ctd} = \alpha_{ct} \cdot f_{ctk;0,05} / \gamma_c$ (with $\alpha_{ct} = 0.85$ and $\gamma_c = 1.5$ according to 3.1.6 (2)P);
$\sigma_N < 0.6\, f_{cd}$ (positive for stress and negative for tension);
$V_{Rdi,s} = \rho \cdot f_{yd,red}\, (1.2\mu \cdot \sin\alpha + \cos\alpha)$ where $\rho = A_s / A_i$ and
$f_{yd,red} = 400$ [N/mm²] / γ_s (0.8 f_{yk} at bending);

$V_{Rdi,max} = 0.5 \cdot v \cdot f_{cd}$ (no reduction to 0.3 $V_{Rd\,i,max}$)

Table 1. Classification of joint surfaces according to [R1], 6.2.5

Type of surface according to EC 2 § 6.2.5 (2)	Roughness coefficient c [1]	Friction coefficient μ	Strength reduction coefficient v [3]
key profiled joint	0.5	0.9	0.7
rough joint	0.4 [2]	0.7	0.5
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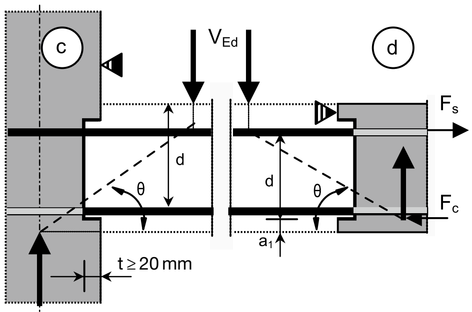
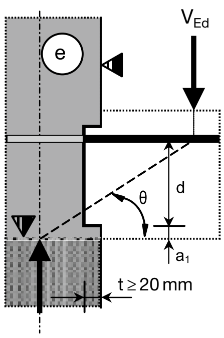
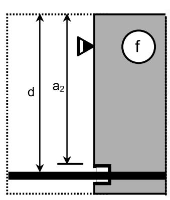
[1] In case of dynamic or fatigue loading, the concrete bond (adhesion) should not be taken into consideration (c = 0).
[2] Where tension occurs perpendicular to the joint due to impact, c = 0.
[3] For concrete classes ≥ C55/67, the stated values are to be multiplied by the factor $(1.1 - f_{ck} / 500)$ with f_{ck} in [N/mm²].
[4] The friction proportion in Expression 6.25 may be allowed for up to the limit of $\mu \cdot \sigma_N \leq 0.1\, f_{cd}$.



Wall to floor slab   Floor slab to floor slab





$a_2 \geq 50$ mm where surface roughness according to DIN EN 1992-1-1, 6.2.5 (see Table 1)

Edge of concrete pour area,
[R1] DIN EN 1992-1-1 with DIN EN 1992-1-1/NA

Shear Force Transverse to the Construction Joint

[R1] Exp. (6.2): Shear resistance without shear reinforcement, including reduction by applying roughness coefficient c
$V_{Rd,c} = (c / 0.5) \cdot [0.15 / \gamma_c \cdot k \cdot (100\rho_1 \cdot f_{ck})^{1/3} + 0.12\sigma_{cp}] \cdot b_w \cdot d$
where $k = 1 + \sqrt{(200/d\,[mm])} \leq 2.0$ and c according to Table 1

[R1] Exp. (6.8): Shear resistance with shear reinforcement
$V_{Rd,s} = (A_{sw} / s) \cdot f_{ywd} \cdot z \cdot \cot\theta$
where $z = 0.9$ d and/or $z \leq d - c_{v,i} - 30$ mm and $f_{ywd} = f_{yk} / \gamma_s$

Maximum acceptable shear with shear reinforcement (very smooth joint not permissible)**: [R1] Exp. (6.9) for 90° bar reinforcement, reduced to 30% in sections of rebending**
$V_{Ed} \leq 0.30 \cdot V_{Rd,max} = 0.30 \cdot b_w \cdot z \cdot v_1 \cdot f_{cd} / (\cot\theta + \tan\theta)$
with $v_1 = 0.75 \cdot (1.1 - f_{ck} / 500) \leq 0.75$

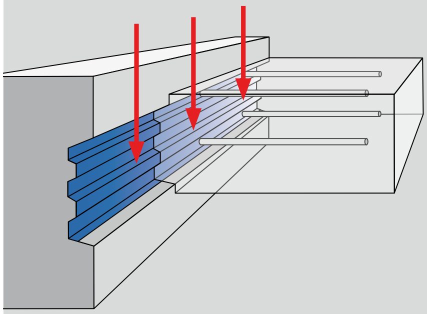
[R1] Exp. (6.7aDE): Reduction of the strut inclination, calculated with reduction to $\theta \leq 45°$ in the area $l_e = 0.5\, l_e \cdot \cot\theta \cdot d$ on either side of the joint
$1.0 \leq \cot\theta \leq [(1.2 + 1.4\sigma_{cd} / f_{cd})] / [(1 - V_{Rd,cc} / V_{ed})] < 3.0$

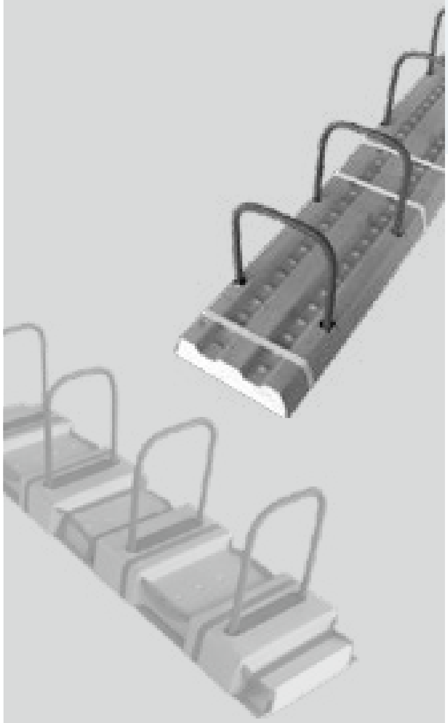
where [R1]] Exp. (6.7bDE): $V_{Rd,cc} = 0.48 \cdot c \cdot f_{ck}^{1/3} \cdot (1 - 1.2\sigma_{cd} / f_{cd}) \cdot b_w \cdot z$
with c according to Table; $\sigma_{cd} = N_{Ed} / Ac > 0$ as compressive strength!

Please note: The longitudinal reinforcement to be considered in Exp. (6.2) is, according to the structural design, the one that is exposed to tensile loads (e.g. c, d or e). Fig. d and e show the effective depth d to be reduced by a_1 due to the difficult concrete pour conditions of $a_1 < 50$ mm in the stress area.

Standard Type RSH

recostal® Starter Packs type RSH
with trapezoidal profile for transverse stresses.





RSH Starter Packs

recostal® Starter Packs type RSH meet the requirements of DIN EN 1992-1-1 for the highest surface category "key profiled" in the case of transverse loads.

Advantages

- Strong, robust galvanised sheet metal starter packs, dimensionally stable
- Cost and time effective installation, starter packs are simply nailed to the formwork
- Easy removal of the sheet metal covers due to their special design
- Trapezoidally profiled box for excellent bond
- Various possible combinations provide a solution for all common installation details

The Decisive Factor for the Designer

recostal® Starter Packs type RSH meet the requirements of the DBV Bulletin "Rückbiegen von Betonstahl und Anforderungen an Verwahrkästen nach Eurocode 2" ["Rebending of reinforcement steel and requirements for continuity strips according to Eurocode 2"] (issue January 2011) for the highest joint category "key profiled" in the case of transverse stresses.

▸ **No national approval required!**

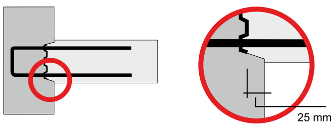
Technical Data – RSH Starter Packs

- Trapezoidally profiled starter packs, joint category "key profiled" according to DIN EN 1992-1-1, highest shear force bearing capacity
- Concrete reinforcement steel BSt 500 S or BSt 500 WR according to DIN 488, Ø = 8 mm – 14 mm (16 mm)
- Diameter of bending rolls dbr ≥ 6 Ds in the section of rebending
- 8 standard profiles, bar widths 10 cm – 22 cm, smaller or larger bar widths on request
- Standard unit length L= 1.25 m, fixed lengths up to 2.50 m on request

Application

recostal® Starter Packs ensure time-saving installation of secure connections between steel reinforced concrete construction parts that are created with different pour sequences. Therefore, floor slabs, walls or staircases can be installed subsequently with rigid connections corresponding to the highest joint category "key profiled". The large variety of shapes offers the perfect connection for many different design situations; special types for specific solutions are also available. The standard range includes starter packs with 8, 10 and 12 mm diameter and L=1.25 m unit lengths. Unit lengths exceeding 1.25 m, the production of special types and the combination with waterproofing systems as well as solutions for entire projects are possible on request.

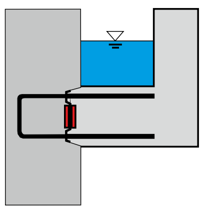
Increased Corrosion Protection

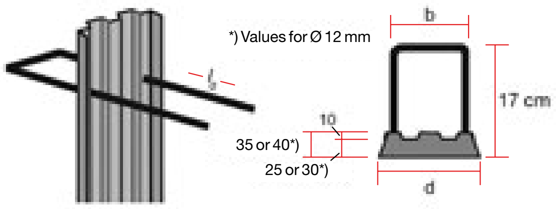


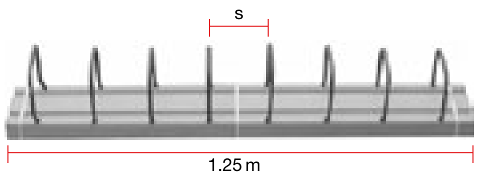
Type RSH is installed with a planned 25 mm recess

RSH active - Starter Pack with active Waterproofing

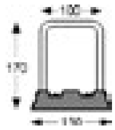
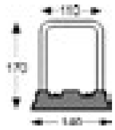
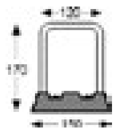
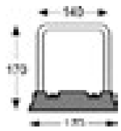
RSH Starter Packs can be manufactured with an active bentonite coating on both sides for the application in construction joints exposed to water.







Reinforcement steel: BSt 500 S or BSt 500 WR

Standard	Type	Ø (mm)/ s (cm)	Lap length l_0 (cm)	Bar height h (cm)	Bar width b (cm)	Effective depth d (cm)
	RSH 10	- 8/15	32	17	10	13
		- 8/20	32	17	10	13
		-10/15	39	17	10	13
		-10/20	39	17	10	13
		-12/15	46	17	10	13
		-12/20	46	17	10	13
	RSH 11	- 8/15	32	17	11	14
		- 8/20	32	17	11	14
		-10/15	39	17	11	14
		-10/20	39	17	11	14
		-12/15	46	17	11	14
		-12/20	46	17	11	14
	RSH 12	- 8/15	32	17	12	15
		- 8/20	32	17	12	15
		-10/15	39	17	12	15
		-10/20	39	17	12	15
		-12/15	46	17	12	15
		-12/20	46	17	12	15
	RSH 14	- 8/15	32	17	14	17
		- 8/20	32	17	14	17
		-10/15	39	17	14	17
		-10/20	39	17	14	17
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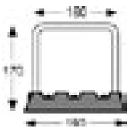
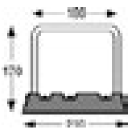
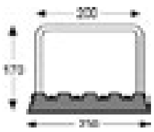
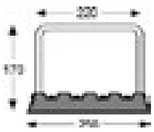
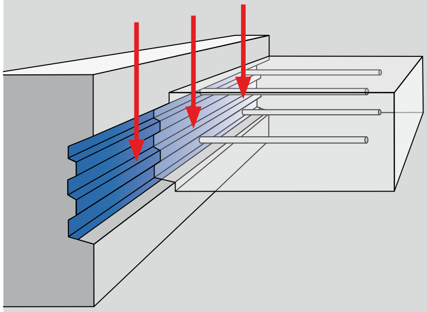
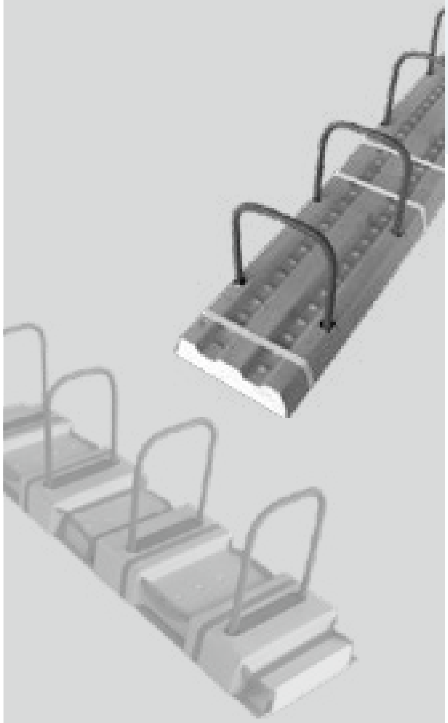
		-12/20	46	17	14	17
	RSH 16	- 8/15	32	17	16	19
		- 8/20	32	17	16	19
		-10/15	39	17	16	19
		-10/20	39	17	16	19
		-12/15	46	17	16	19
		-12/20	46	17	16	19
	RSH 18	- 8/15	32	17	18	21
		- 8/20	32	17	18	21
		-10/15	39	17	18	21
		-10/20	39	17	18	21
		-12/15	46	17	18	21
		-12/20	46	17	18	21
	RSH 20	- 8/15	32	17	20	23
		- 8/20	32	17	20	23
		-10/15	39	17	20	23
		-10/20	39	17	20	23
		-12/15	46	17	20	23
		-12/20	46	17	20	23
	RSH 22	- 8/15	32	17	22	25
		- 8/20	32	17	22	25
		-10/15	39	17	22	25
		-10/20	39	17	22	25
		-12/15	46	17	22	25
		-12/20	46	17	22	25

Other shapes on request

Standard Type RSH

recostal® Starter Packs type RSH
with trapezoidal profile for transverse stresses.





Shear Force Transverse to the Construction Joint

- Highest joint category "key profiled"

Determination according to:
- DIN EN 1992-1-1/NA
- DBV-Bulletin "Rückbiegen…nach Eurocode 2"
  ["Rebending… according to Eurocode 2"], January 2011

Determination Example - Acceptable Shear Force

Acceptable shear force without shear reinforcement, including reduction by applying roughness coefficient c:

$V_{Rd,c} = (c/0.5) \cdot [C_{Rd,c} \cdot k \cdot (100\rho_1 \cdot f_{ck})^{1/3} + k_1 \cdot \sigma_{cp}] \cdot b_w \cdot d$ (6.2.a)

Values	Definition
$h = 20$ cm	Height of the construction part
$d = 17$ cm	Effective depth
$b_w = 1.0$ m	1m width of section
C20/25	Tab. 3.1 ▶ $f_{ck} = 20$ N/mm²
$c = 0.5$	6.2.5 (2) ▶ key profiled metal base
$C_{Rd,c} = 0.15/\gamma_c = 0.10$	(NA, 6.2.2(1)), $\Upsilon_c = 1.5$
$k = 1 + \sqrt{(200/170)} = 2.08$	$k = 1 + \sqrt{(200/d\,[mm])} \leq 2.0$
$\rho_1 = 7.54/(100 \times 17)$ $= 4.435 \cdot 10^{-3}$	$(A\,sl/b_w \cdot d) \leq 0.02$ determined with Ø 12/15 cm = 7.54 cm²/m, single
K1 = 0.12	NA, 6.2.2 (1)
$\sigma_{cp} = 0$	No compressive stress in the concrete from axial loading or prestressing

$V_{Rd,ct} = (0.5/0.5) \cdot [0.10 \cdot 2.0 \cdot (100 \cdot 4.435 \cdot 10^{-3} \cdot 20)^{1/3} + 0] \cdot 1.0 \cdot 0.17 \cdot 10^3$
$= \mathbf{70.4\ kN/m}$

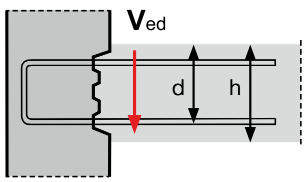
Please note:
If anchorage and lap lengths are reduced, the bearing values have to be reduced accordingly.

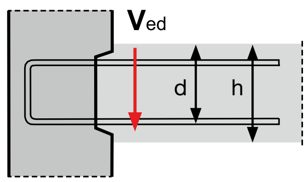
Shear Force Bearing Capacity (kN/m)

Shear force bearing capacity (kN/m) of slab to steel reinforced concrete wall connections without shear reinforcement depending on the joint category and the steel cross section, if starter packs are used.

The values given in the table are subject to the application of the entire anchorage and lap lengths required according to EC 2.

- Tabular values $V_{Rd,c}$ in kN/m
- All values have been determined for $\sigma_{cp} = 0$



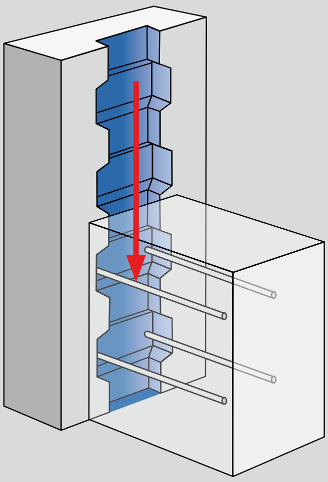


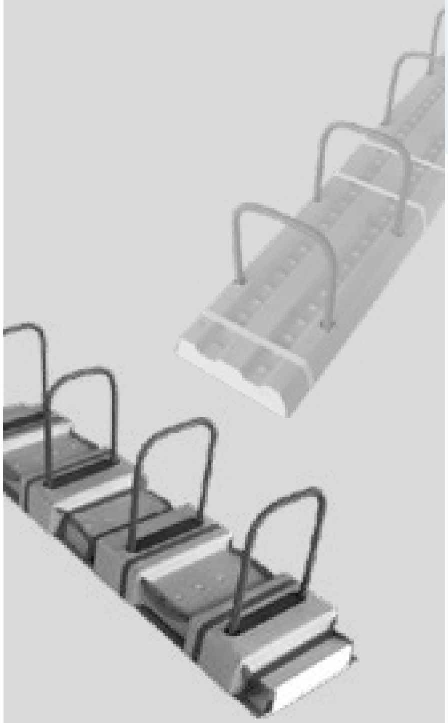
Effective depth d (cm)	Type	Bar diameter/ centers	Joint category key profiled $V_{Rd,c,kp}$			Joint category smooth $V_{Rd,c,smooth}$		
			C 20/25	C 25/30	C 30/37	C 20/25	C 25/30	C 30/37
11	RSH 10	Ø 8/15	40.18	43.28	45.99	16.07	17.31	18.40
		Ø 10/15	46.64	50.24	53.39	18.66	20.10	21.36
		Ø 12/15	52.65	56.72	60.27	21.06	22.69	24.11
12	RSH 11	Ø 8/15	42.58	45.86	48.74	17.03	18.35	19.50
		Ø 10/15	49.42	53.24	56.57	19.77	21.29	22.63
		Ø 12/15	55.79	60.11	63.87	22.32	24.04	25.55
13	RSH 12	Ø 8/15	44.91	48.38	51.41	17.96	19.35	20.56
		Ø 10/15	52.13	56.16	59.68	20.85	22.46	23.87
		Ø 12/15	58.86	63.40	67.37	23.54	25.36	26.95
15	RSH 14	Ø 8/15	49.41	53.22	56.56	19.76	21.29	22.62
		Ø 10/15	57.35	61.78	65.65	22.94	24.71	26.26
		Ø 12/15	64.75	69.75	74.12	25.90	27.90	29.65
17	RSH 16	Ø 8/15	53.71	57.85	70.40	21.48	23.14	28.16
		Ø 10/15	62.34	67.16	71.36	24.94	26.86	28.55
		Ø 12/15	70.38	75.82	80.57	28.15	30.33	32.23
19	RSH 18	Ø 8/15	57.84	62.31	66.21	23.14	24.92	26.48
		Ø 10/15	67.14	72.33	76.86	26.86	28.93	30.74
		Ø 12/15	75.80	81.65	86.77	30.32	32.66	34.71
21	RSH 20	Ø 8/15	61.09	65.8	69.93	24.43	26.32	27.97
		Ø 10/15	70.91	76.38	81.17	28.36	30.55	32.47
		Ø 12/15	80.05	86.23	91.64	32.02	34.49	36.66
23	RSH 22	Ø 8/15	63.48	68.38	72.67	25.39	27.35	29.07
		Ø 10/15	73.69	79.38	84.35	29.47	31.75	33.74
		Ø 12/15	83.19	89.61	95.23	33.28	35.85	38.09

Please note:
If anchorage and lap lengths are reduced, the bearing values have to be reduced accordingly.

Standard Type RSV

recostal® Starter Packs type RSV
with trapezoidal profile for longitudinal stresses.





Shear Force Longitudinal to the Construction Joint

- Highest joint category "key profiled"

Determination Example - Shear Capacity

Total bearing capacity =
bearing contact area [concrete] + [friction] + [reinforcement] ≤ max. bearing capacity

Example: concrete C 20/25

Values	Definition
b = 17 cm	Shear force area
$\sigma_N = 0$	Nominal compressive stress vertical to the joint N_{Ed} = design value of the applied axial force or prestressing which can act together with the shear force.
c = 0.5	c according to DIN EN 1992-1-1, 6.2.5(2) (key profiled)
$\mu = 0.9$	μ according to DIN EN 1992-1-1, 6.2.5(2) (key profiled)
$f_{ctd} = \alpha_{ct} \cdot f_{ctk;0.05} / \gamma_c$ $= 0.85 \cdot 1.5/1.5$ $= 0.85$	Design value of the axial tensile strength of concrete with $f_{ctk;0.05}$ = 1.5 N/mm² according to DIN EN 1992-1-1, Table 3.1 and γ_c = 1.5 for concrete according to DIN EN 1992-1-1, Table 2.1
	α_{ct} = 0.85 according to DIN EN 1992-1-1 / NA 3.1.6 (2)P
Asl = Ø10/15 double = 5.24 x 2 = 10.48 cm²/m	Cross section of the reinforcement transverse to the joint, double
$f_{yd,red} = 0.8 \cdot 500/1.15$ $= 348$ N/mm²	Design value of the reinforcement steel yield strength with f_{yk} = 500 N/mm² according to DIN EN 1992-1-1 / NA 3.2.2(3P) γ_c = 1.15; reduced steel tension 80 % f_{yd} according to DIN EN 1992-1-1 / NA 8.3 (5)P
$\alpha = 90°$	Angle of the reinforcement transverse to the joint
v = 0.7	v according to DIN EN 1992-1-1 / NA 6.2.2(6)
$f_{cd} = \alpha_{cc} \cdot f_{ck} / \gamma_c$ $= 0.85 \cdot 20/1.5$ $= 11.33$ N/mm²	Design value of the characteristic cylinder strength with f_{ck} = 20 N/mm² according to DIN EN 1992-1-1, Tab.3.1 and α_{cc} = 0.85 according to DIN EN 1992-1-1, NA 3.1.6(1)P and γ_c = 1.5 according to DIN EN 1992-1-1 Tab.2.1N

Bearing Contact Area - Concrete

$V_{Rdi,c} = (c \cdot f_{ctd}) = (0.5 \cdot 0.85)$
= 0.425 N/mm²

Bearing Contact Area - Friction

$V_{Rd,\mu} = (\mu \cdot \sigma_N) = (0.9 \times 0)$
= 0

Bearing Contact Area - Reinforcement

$V_{Rd,sy} = \rho \cdot f_{yd} \cdot (1.2\mu \cdot \sin\alpha + \cos\alpha) = 10.48/(17 \cdot 100) \cdot 348 \cdot (1.2 \cdot 0.9 \cdot \sin 90° + \cos 90°)$
= 2.32 N/mm²

Factor 1.2 according to DIN EN 1992-1-1, NA 6.2.5

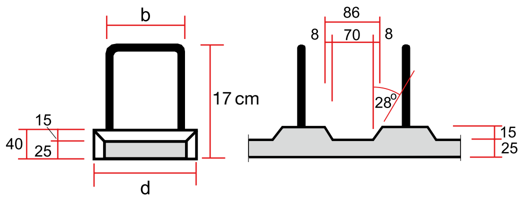
Total Bearing Capacity

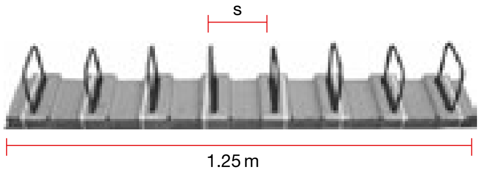
$V_{Rdi} = V_{Rdi,c} + V_{Rd,sy} < V_{Rdi,max}$
$> V_{Ed}$

The values stated apply to full length anchorage and lap lengths; if the lengths are reduced, the bearing values have to be reduced accordingly.

$V_{Rdi,max} = 0.5 \cdot v \cdot f_{cd}$
$= 0.5 \cdot 0.7 \cdot 11.33 = 3.97$ N/mm²
$\hat{=} 3.97 \cdot 10^3 \cdot 0.17 = 674.9$ kN/m

V_{Rdi} $= (0.425 + 2.32) \cdot 10^3 \cdot 0.17$
= 466.65 kN/m = applicable
$< V_{Rdi,max} = 674.9$ kN/m





Reinforcement steel: BSt 500 S or BSt 500 WR

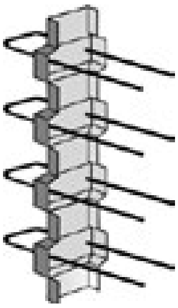
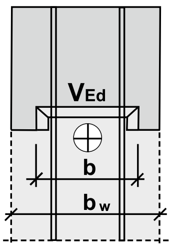
Standard	Type	Ø (mm)/ s (cm)	Lap length l_0 (cm)	Bar height h (cm)	Bar width b (cm)	Effective depth d (cm)
	**RSV 8**	**- 8/15**	32	17	8	11
		-10/15	39	17	8	11
	RSV 11	**- 8/15**	32	17	11	14
		-10/15	39	17	11	14
		-12/15	46	17	11	14
	RSV 14	**- 8/15**	32	17	14	17
		-10/15	39	17	14	17
		-12/15	46	17	14	17
	RSV 18	**- 8/15**	32	17	18	21
		-10/15	39	17	18	21
		-12/15	46	17	18	21

Table of the Bearing Capacity Applicable for the Shear Force Stress Longitudinal to the Starter Pack



The values given in the table are subject to the anchorage and lap lengths required according to DIN EN 1992-1-1.

- Tabular values in kN/m
- All values have been determined for $\sigma_{Nd} = 0$

Determination according to:

- DIN EN 1992-1-1 § 6.2.5 (6.25)
- DBV Bulletin "Rückbiegen von ..." [Rebending...] (Issue 2011)
- Type of surface "key profiled"

Taken as:

- $\sigma_N = 0$; $45° \leq \alpha \leq 90°$

Applicable:

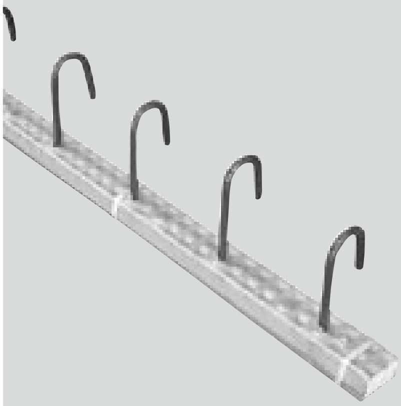
- max. $V_{ed} < V_{Rd,i} < V_{Rd,i\,max}$
- e. G. RSV 8 - 8/15 cm, max. V_{ed} = 298.56 kN/m = applicable

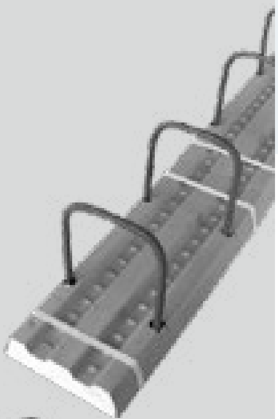
Shear force area b (mm)	Type	Ø (mm)/ s (cm)	C 20/25		C 25/30		C 30/37	
			$V_{Rd,i\,galv}$	$V_{Rd,i\,galv\,max}$	$V_{Rd,i\,galv}$	$V_{Rd,i\,galv\,max}$	$V_{Rd,i\,galv}$	$V_{Rd,i\,galv\,max}$
110	**RSV 8**	**- 8/15**	298.56	436.21	307.91	545.55	314.13	654.5
		-10/15	440.63	436.21	449.98	545.55	456.20	654.5
140	**RSV 11**	**- 8/15**	311.31	555.17	323.21	694.33	331.12	833.00
		-10/15	453.38	555.17	465.28	694.33	473.19	833.00
		-12/15	626.27	555.17	638.17	694.33	646.08	833.00
170	**RSV 14**	**- 8/15**	324.06	674.90	338.51	843.12	348.12	1011.50
		-10/15	466.65	674.90	480.58	843.12	490.19	1011.50
		-12/15	639.02	674.90	653.47	843.12	663.07	1011.50
210	**RSV 18**	**- 8/15**	341.06	832.76	358.91	1041.50	370.78	1249.50
		-10/15	483.13	832.76	500.98	1041.50	512.85	1249.50
		-12/15	656.02	832.76	673.87	1041.50	685.73	1249.50

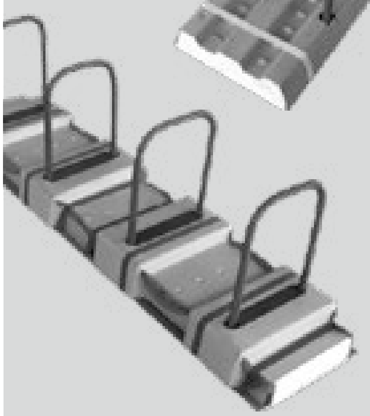
Please note:
If anchorage and lap lengths are reduced, the bearing values have to be reduced accordingly.

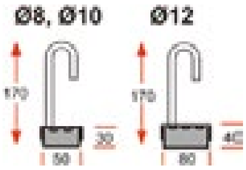
Standard Type V

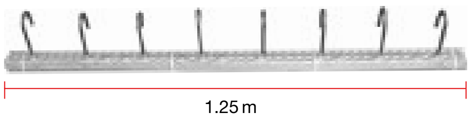
recostal®
Single Bar Starter Packs type VHQ



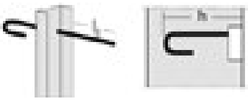




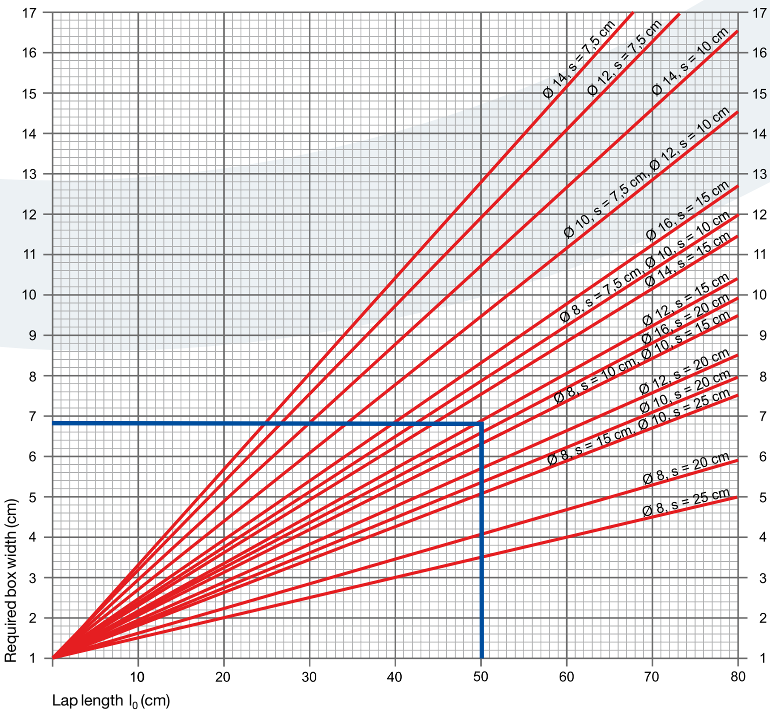




Reinforcement steel: BSt 500 S or BSt 500 WR

Standard	Type	Ø (mm)/ s (cm)	Lap length l_0 (cm)	Centers- s (cm)
	VHQ	- 8/15	32	15
		- 8/20	32	20
		- 8/25	32	25
		- 10/15	39	15
		- 10/20	39	20
		- 10/25	39	25
		- 12/15	46	15
		- 12/20	46	20
		- 12/25	46	25

Graph for the Determination of the Production-Related required Box Widths and Max. Producible l_0-Lengths



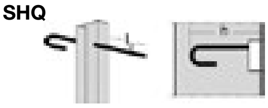
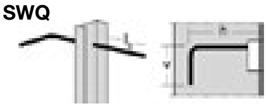
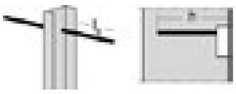
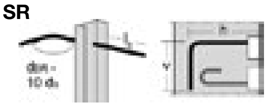
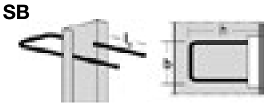
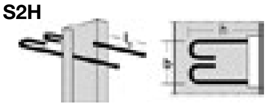
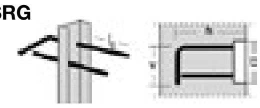
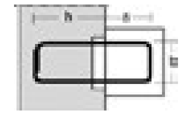
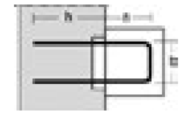
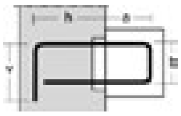
Notes:
b: Production-related required box width for single bars. In case of double bar starter packs, the respective value has to be doubled.

Example:
Type SB (double bar starter pack)
Ø 12, s = 15 cm, l_0 = 50 cm ▸ required box width: 2 x 6.8 = 14 cm

Special Types

recostal® Special Types are made to specification and are available in many different shapes.

▸ Production-related options can be derived from the graph on page 12.

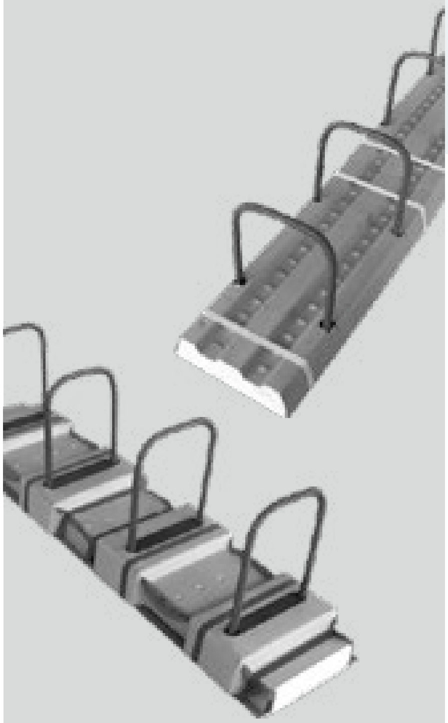
Special types	Qty. (m)	Diameter Ø (mm)	Centers s (cm)	Size b (cm)	Height h (cm)	Lap length l_0 (cm)	Size v (cm)	Size a (cm)	Unit length L (cm)
SHQ 									
SWQ 									
SG 									
SR 									
SB 									
S2H 									
SRG 									
SKB 									
SKG 									
SKR 									

Special solutions and solutions for special projects on request

Jobsite Application

recostal® Starter Packs type RSH and type RSV

Joint category “key profiled”



Specification Example

Starter packs with trapezoidal profile for shear forces, “key profiled joint“ according to Eurocode 2

Project: ____

1.0	Starter Packs		
Position	**Quantity/unit**	**Price per unit**	**Total**
1.0001	Starter packs made from galvanised sheet steel with trapezoidal profile longitudinal to the unit according to EC 2 joint category “key profiled““, to be supplied for the horizontal connection of construction parts.		
	Bar diameter: Ø = _______ mm		
	Centers: s = _______ cm		
	Bar width: b = _______ cm		
	Bar height: h = _______ cm		
	Make: recostal® type RSH ________		
	m _________	____________ €	____________ €

RECOSTAL PERMANENT FORMWORK FOR CONSTRUCTION JOINTS