

SHEAR DOWEL HED

Expansion joint dowelling in concrete
structural elements





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Expansion joint dowelling in concrete structural elements

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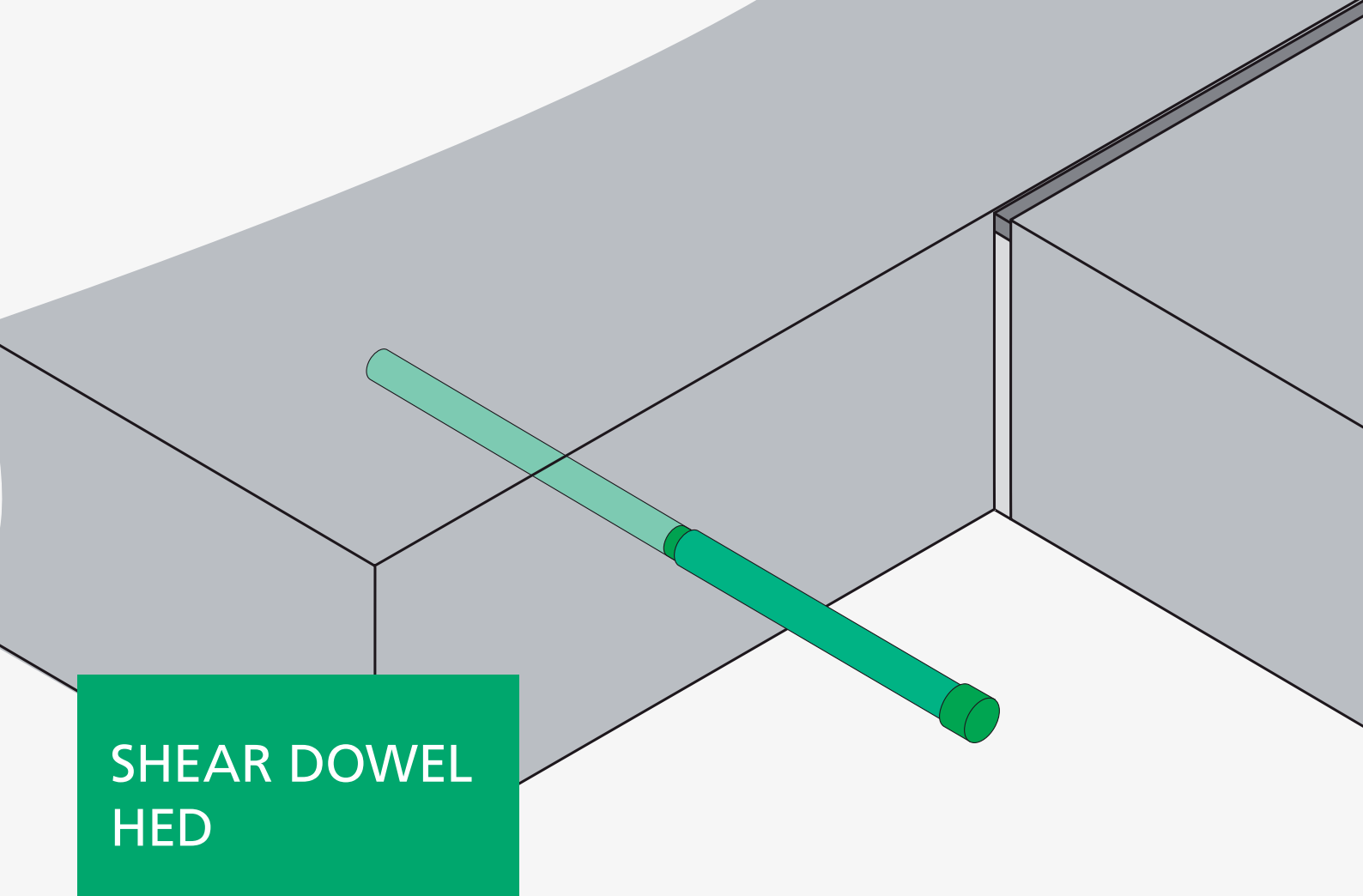
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SHEAR DOWEL HED

EXPANSION JOINT DOWELLING IN CONCRETE STRUCTURAL ELEMENTS

THE PRODUCT

Due to the use of these HED type shear dowels, dowelling applications on expansion joints can be solved simply and reliably even where there are varying shear forces.

It guarantees a displacement of the structural element in the longitudinal axis of the rod up to a joint width of 40 mm. The shear dowels are available in steel grade S 355 galvanized or in stainless steel with material number 1.4571 / 1.4362 (corrosion-protection class 3).

All types are available with a special fire protection sleeve for classification according to F90.

FEATURES

- Prevents component displacement in the area of the joint
- Simple, precise-fit assembly using shear dowel sleeves on the shuttering. A rip-proof film protects the sleeve from ingress of concrete
- There is no requirement to drill through the shuttering or supplementary drilling of the concrete

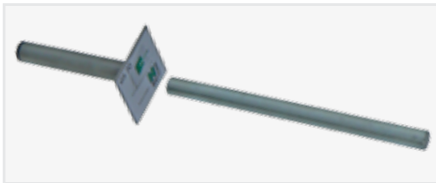
APPLICATION AREA

Single type HED shear dowels are used wherever shear forces are to be transferred through structural joints, e.g. expansion joints between concrete slabs, in floors and walls, for joints between supports and walls or between balconies and floors.



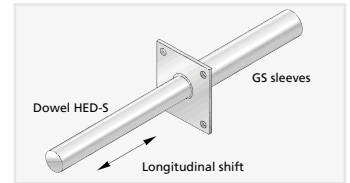
TYPES AND DIMENSIONS

TYPES



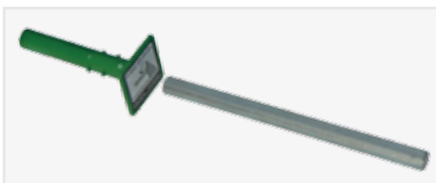
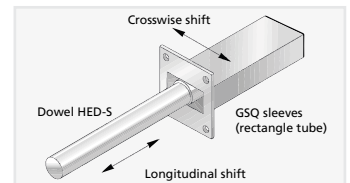
SHEAR DOWEL HED-S + GS SLEEVES

- Motion in the longitudinal direction
- Transmission of transverse forces vertically and parallel to the joint
- Sliding sleeve and dowel made of stainless steel



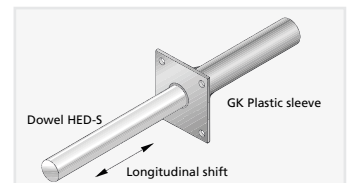
SHEAR DOWEL HED-S + GSQ SLEEVES

- Motion in the longitudinal and transverse direction
- Transmission of transverse forces vertically to the joint
- Sliding sleeve and dowel made of stainless steel



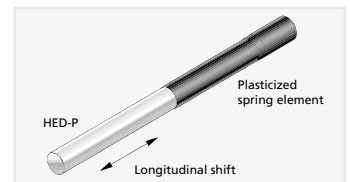
SHEAR DOWEL HED-S + GK SLEEVES

- Motion in the longitudinal direction
- Transmission of transverse forces vertically and parallel to the joint
- Sliding sleeve made of plastic, dowel made of S 355 galvanized or stainless steel



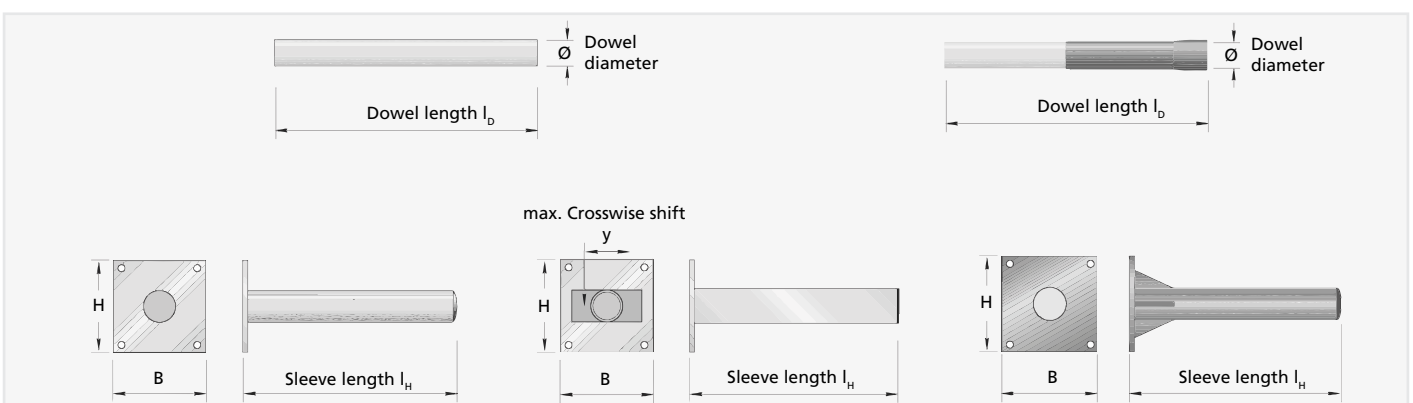
SHEAR DOWEL HED-P

- Motion in the longitudinal direction
- Transmission of transverse forces vertically and parallel to the joint
- With plasticized spring element
- Dowel made of S 355 galvanized or stainless steel



DIMENSIONS

Dowel type [mm] HED-S HED-P	Dowel element		Sleeves GS, GK		Sleeves GSQ		
	Dowel Ø [mm]	Dowel length l_b [mm]	Sleeve length l_H [mm]	Nail plate B/H [mm]	Sleeve length l_H [mm]	Nail plate B/H [mm]	Max transverse displacement y [mm]
20	20	300	160	70/70	180	80/80	± 11
22	22	300	160	70/70	180	80/80	± 10
25	25	300	160	70/70	180	80/80	± 14
30	30	350	185	80/80	205	100/80	± 21



MEASUREMENTS

REINFORCED CONCRETE

The decisive resistance for dimensioning is the lesser value of the steel bearing capacity and concrete bearing capacity:

$$V_{Rd} = \min(V_{Rd,S}; V_{Rd,C})$$

$V_{Rd,S}$ Dimensioning resistance of the steel bearing capacity taking into account the friction forces ($f_{\mu} = 0,9$)

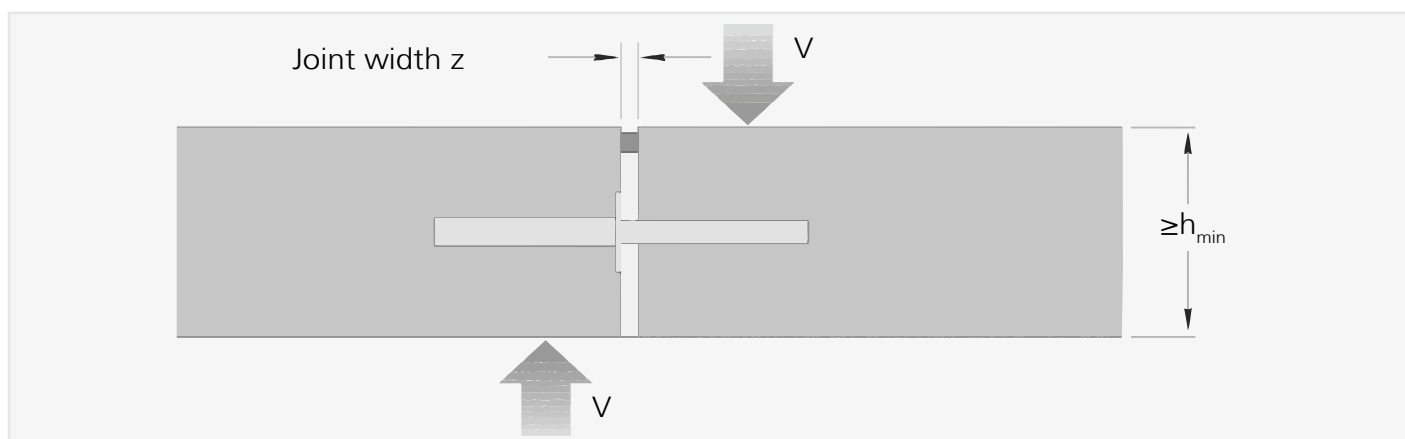
$V_{Rd,C}$ Dimensioning resistance of the concrete bearing capacity

$V_{Rd,ce}$ Dimensioning resistance of the concrete edge break according to the expert opinion of Prof. Eligehausen 2004

$V_{Rd,ct}$ Dimensioning resistance to punching shear in accordance with EC2

The decisive resistance for the concrete bearing capacity is the lesser value of the verifications of concrete edge break and punching shear:

$$V_{Rd,C} = \min(V_{Rd,ce}; V_{Rd,ct})$$



The determination of the dimensioning resistances for the steel bearing capacity according to Booklet 346, DafStb as follows:

$$V_{Rd,S} = f_{\mu} \times 1,25 \times (f_{yk} / \gamma_{MS}) \times W / (z + \emptyset/2)$$

with:

f_{μ} 0,9 reduction factor for friction

f_{yk} Yield point dowel [N/mm²]

z Joint width [mm]

\emptyset Dowel diameter [mm]

W Moment of resistance [mm³]

γ_{MS} Material safety factor for steel

MEASUREMENTS

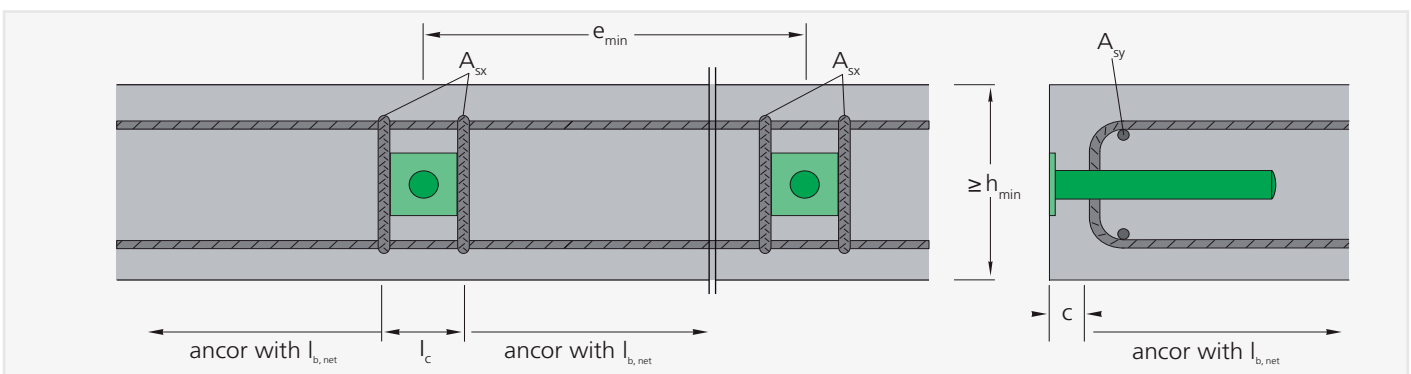
DIMENSIONING RESISTANCES FOR CONCRETE AND STEEL BEARING CAPACITY IN REINFORCED CONCRETE

Dowel type HED-S HED-P	Dimensioning resistances for steel bearing capacity $V_{Rd,S}$ [kN] taking the friction for the joint width into account				Component thickness h [mm]	Rated resistances concrete load capacity* $V_{Rd,C}$ [kN] for C20/25
	$z = 0-10$ mm	$z = 11-20$ mm	$z = 21-30$ mm	$z = 31-40$ mm		
20	14.3	9.5	7.1	5.7	≥ 160 ≥ 180	13.7 14.3**
22	18.1	12.2	9.3	7.4	≥ 160 ≥ 180 ≥ 200 ≥ 220 ≥ 240	14.2 15.8 17.2 18.0 18.1**
25	24.8	17.1	13.1	10.6	≥ 180 ≥ 200 ≥ 220 ≥ 240 ≥ 260	20.5 22.4 23.6 24.6 24.8**
30	38.5	27.5	21.4	17.5	≥ 220 ≥ 240 ≥ 260 ≥ 280 ≥ 300 ≥ 320	29.2 31.5 33.7 35.8 38.0 38.5**

* taking on-site reinforcement into account

** for these values the dimensioning resistance of the steel bearing capacity is reached taking the friction forces ($f_{\mu} = 0,9$) into account

ON-SITE REINFORCEMENT AND MINIMUM SPACINGS



Dowel type HED-S HED-P	Required dowel spacing e_{min} [mm]	Distance from edge a_r [mm]	Construction element thickness h_{min} [mm]	Stirrup spacing l_c [mm]	On-site reinforcement	
					A_{sx}	A_{sy}
20	310	155	160	60	2 \emptyset 10	2 \emptyset 10
22	350	175	160	60	2 \emptyset 10	2 \emptyset 10
25	410	205	180	70	2 \emptyset 12	2 \emptyset 12
30	560	280	220	90	2 \emptyset 14	2 \emptyset 14

e_{min} minimum spacing between axes of single dowels
 a_r minimum distance from edge
 h_{min} minimum construction element thickness
 l_c Spacing of the first splice stirrup on the dowel
 A_{sx} Splice stirrup
 A_{sy} longitudinal reinforcement

MEASUREMENTS

NON-REINFORCED CONCRETE

The determination of the dimensioning resistances V_{Rd} of the shear dowels HED for the steel and concrete bearing capacity according to Booklet 346, DafStb as follows:

STEEL BEARING CAPACITY

$$V_{Rd,S} = f_{\mu} \times 1,25 \times (f_{yk} / \gamma_{MS}) \times W / (z + \emptyset/2)$$

CONCRETE BEARING CAPACITY

$$V_{Rd,C} = 0,4 \times f_{ck} \times \emptyset^{2,1} / (333 + 12,2 \times z)$$

$$0,4 = (\alpha \times \gamma_{MW}) / 3$$

with:

- f_{μ} 0,9 reduction factor for friction
- f_{yk} Yield point Dowel [N/mm²]
- f_{ck} Characteristic cylinder compressive strength of the concrete [N/mm²]
- z Joint width [mm]
- \emptyset Dowel diameter [mm]
- W Moment of resistance [mm³]
- γ_{MS} Material safety factor for steel
- α 0,85 (in consideration with longterm effects on the compressive strength of concrete)
- γ_{MW} 1,425 (average between permanent, $\gamma_G = 1,35$ and varying, $\gamma_Q = 1,5$ impacts)

DIMENSIONING RESISTANCES IN NON-REINFORCED CONCRETE

Dowel type HED-S HED-P	Concrete quality	Dowel \emptyset [mm]	Min. construction element thickness h_{min} [mm]	Dimensioning resistances [kN] taking the resistance of the joint width into account			
				$z = 0-10$ mm	$z = 11-20$ mm	$z = 21-30$ mm	$z = 31-40$ mm
20	$\geq C 20/25$	20	320	9.5	7.1	5.7	4.8
22		22	350	1.6	9.0	7.3	6.1
25		25	400	15.2	12.0	9.9	8.4
30		30	480	22.2	17.5	14.5	12.3

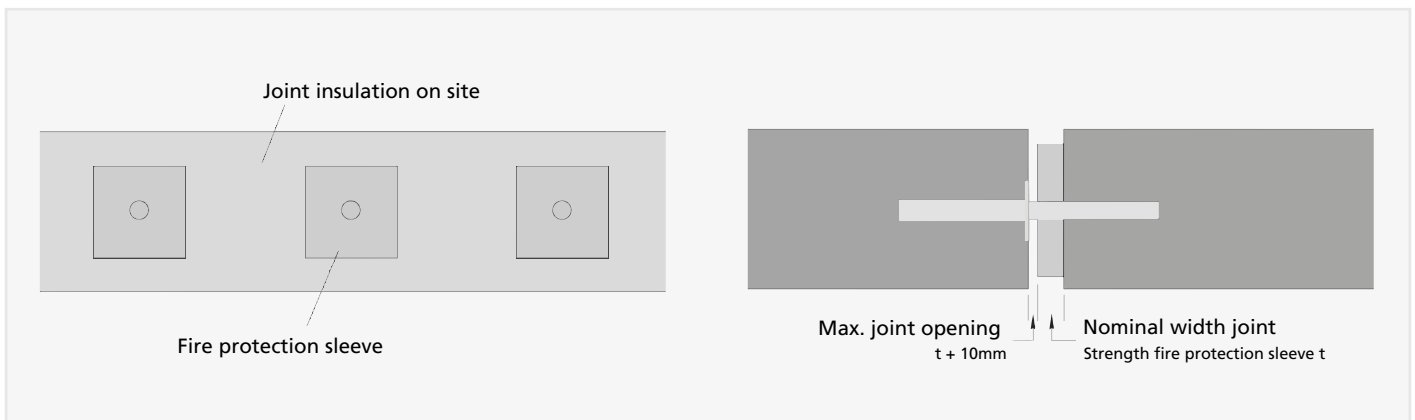
An edge spacing of $a_r \geq 8 \emptyset$ and a dowel spacing of $e \geq 16 \emptyset$ referred to the dowel axis must be maintained in all directions.

FIRE PROTECTION

FIRE PROTECTION SLEEVES BRM

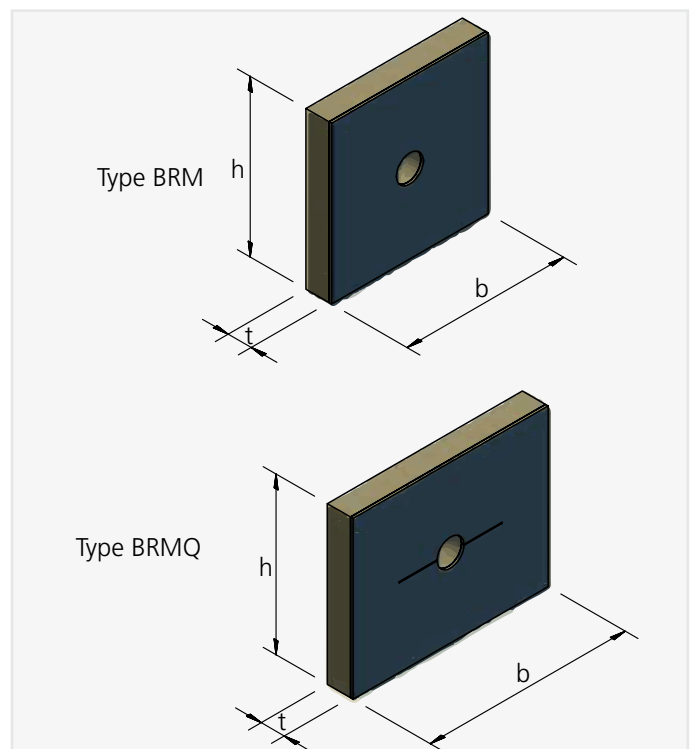
If there are technical fire protection requirements on the construction elements according to DIN 4102 Part 2, the shear dowels must be installed with fire protection sleeves. In order to meet the classification F90 the unprotected dowel must be fitted with a fire protection sleeve in the joint. In the event of a fire, the fire protection sleeve foams and completely fills the joint.

Nominal width joint [mm]	Fire protection sleeves t [mm]	Max. joint opening [mm]
20	20	30
30	30	40
40	40	50
50	20 + 30	60



DIMENSIONS OF THE FIRE PROTECTION SLEEVES TYPE BRM & BRMQ

Type	Dowel		Sleeve	
	Ø [mm]	b [mm]	h [mm]	t [mm]
BRM 20	20	122	122	20, 30, 40
BRM 22	22	122	122	20, 30, 40
BRM 25	25	122	122	20, 30, 40
BRM 30	30	122	122	20, 30, 40
<hr/>				
BRMQ 20	20	152	122	20, 30, 40
BRMQ 22	22	152	122	20, 30, 40
BRMQ 25	25	152	122	20, 30, 40
BRMQ 30	30	152	122	20, 30, 40

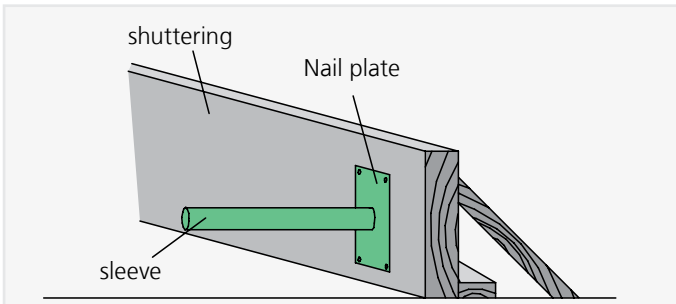


Ordering example:

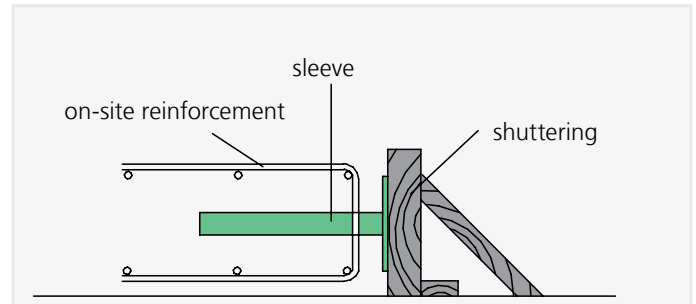
BRM-25-20
 for shear dowel HED 25 Nominal joint 20 mm

INSTALLATION INSTRUCTIONS

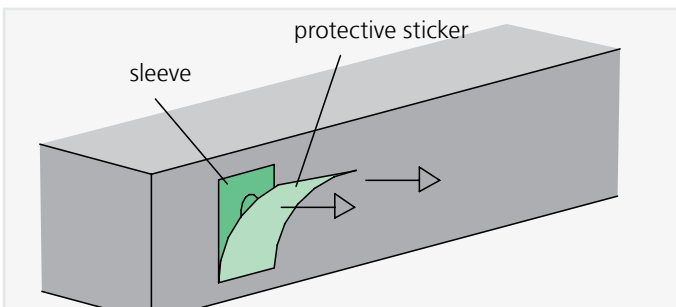
INSTALLATION INSTRUCTIONS SHEAR DOWEL HED-S + GK/GS SHEAR DOWEL SLEEVE*



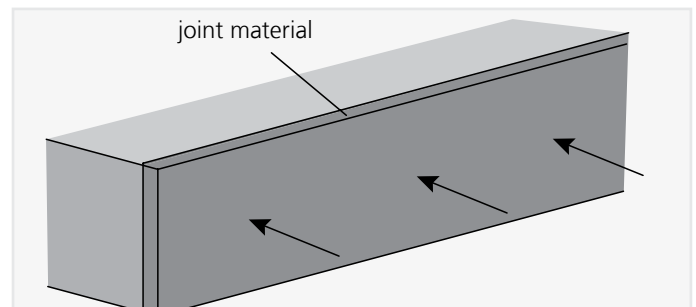
- Nail the sleeve on to the shuttering
- Do NOT remove protective sticker



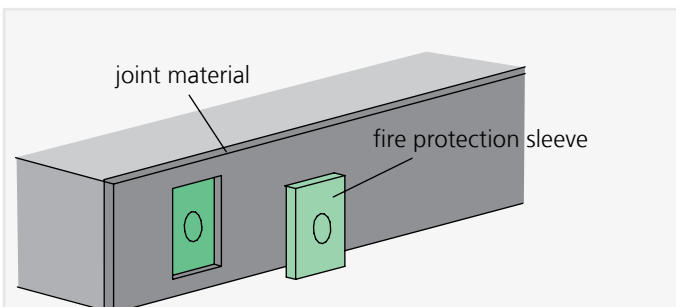
- Arrange the reinforcement in accordance with the reinforcement plan
- Concrete in the first section



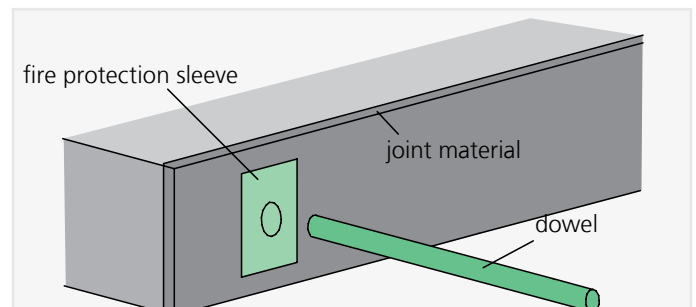
- Strip the shuttering
- Remove protective sticker



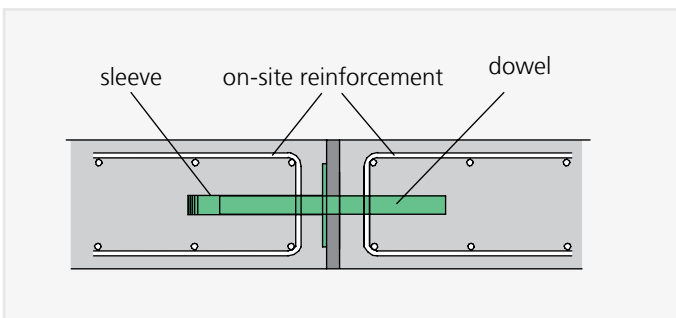
- Apply the joint material



- Cut an aperture in the joint material
- Attach the fire protection sleeve

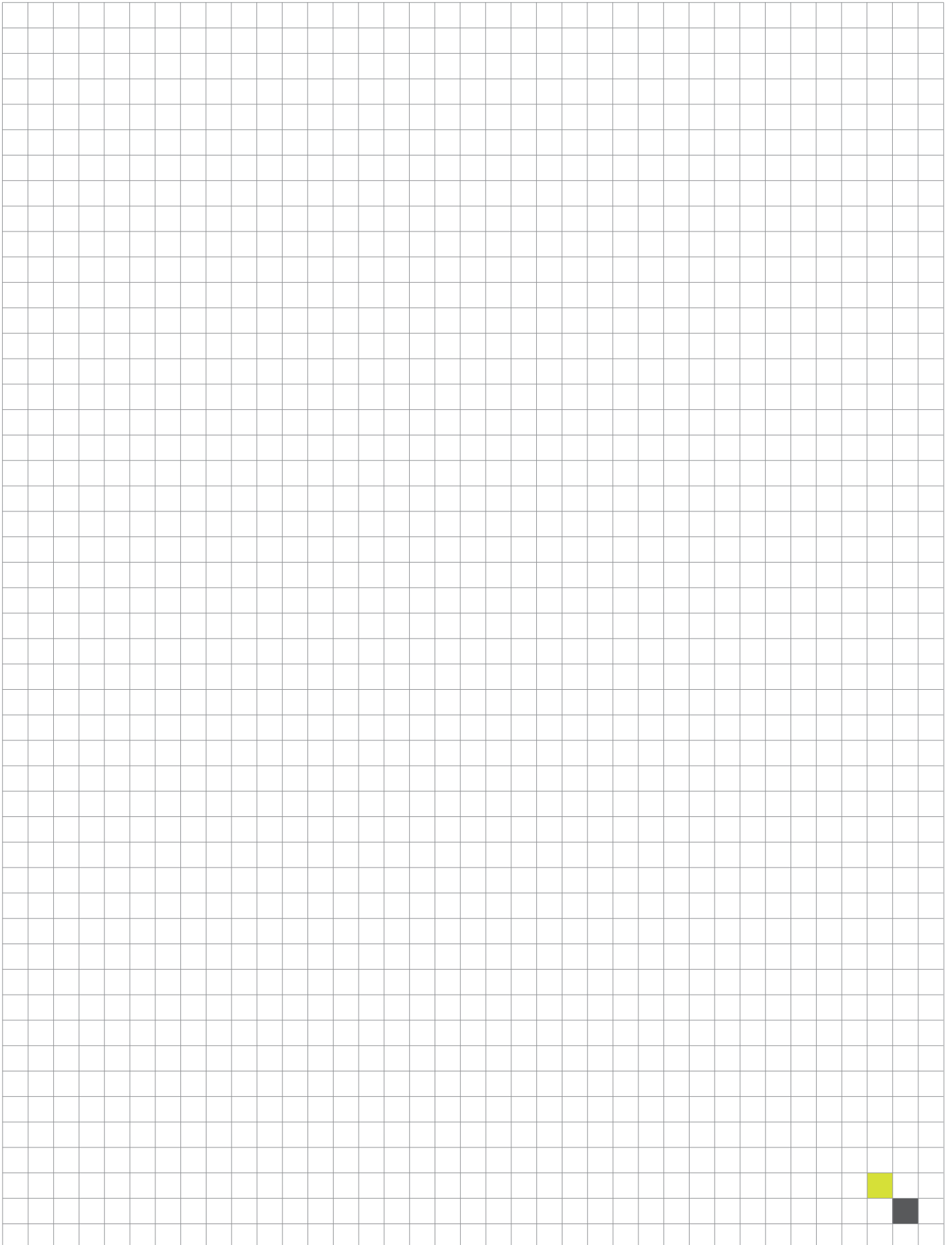


- Push the dowel into the sleeve



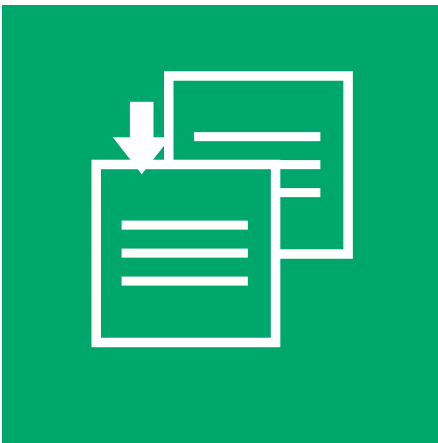
- Arrange the reinforcement in accordance with the reinforcement plan
- Concrete in the second section

* Fitting with GSQ sleeve has to be effected correspondingly. It should be ensured that the GSQ sleeve is fit horizontally.



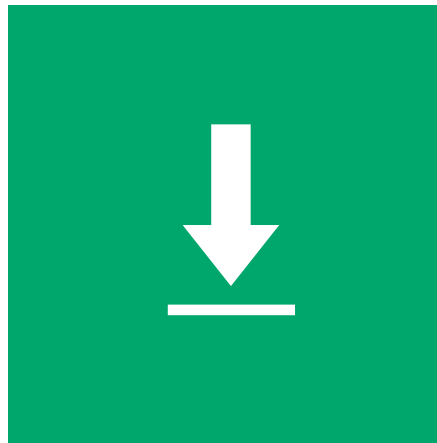
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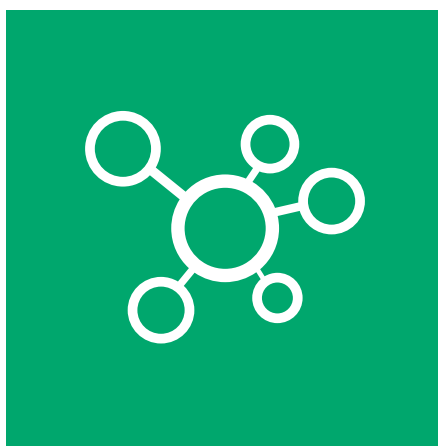
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