Shear connector HCC-K with HIT-RE 500 V4 and HIT-HY 200-A/R V3 Injection mortar

Product Technical Datasheet
Concrete-to-concrete
Update: July 25

Shear connector HCC-K with HIT-RE 500 V4 and HIT-HY 200-A/R V3 injection mortar

for Shear-friction applications and Concrete Overlay design (EOTA TR 066)

Injection mortar system	Benefits

HIT-RE 500 V4
(330, 500 and 1400 ml foil pack)

- Fast work progress: Setting and height levelling are carried out in a single work step
- Reliable design: Structure appears monolithic after use of HCC-K

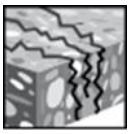
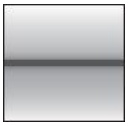
Hilti HIT-HY 200-A V3
(330 / 500 ml foil pack)

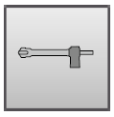
Hilti HIT-HY 200-R V3
(330 / 500 ml foil pack)

Shear connector
HCC-K

Application

- Renovation: reinforcement and repair of bridges, tunnels and high-rise buildings
- Concrete-concrete composite
- Repair of bridges, concrete roadways and underground car parks
- Increasing the payloads of bridges

Base material	Load conditions
 Concrete (uncracked)  Concrete (cracked)	 Static/ quasi-static

Drilling, cleaning, setting	Other information
 Hammer drilled holes  Diamond drilled holes  Hollow Drill Bit drilled holes  Water-filled boreholes	 PROFIS Engineering Software  Concrete-to-Concrete connections Handbook

Linked Approvals/Certificates and Instructions for use.

Approval no	Application / loading condition	Authority / Laboratory	Date of issue
ETA-20/0475	Static and quasi-static	DIBt, Berlin	28-08-2023

The instructions for use can be viewed using the link in the instructions for use table or the QR code/link in the Hilti webpage table.

Instructions for use(IFU)

Material				
Injection mortar	IFU Hilti HIT-RE 500 V4 (330/500 ml)			IFU Hilti HIT-RE 500 V4 (1400 ml)
	IFU Hilti HIT-HY 200 A V3	IFU Hilti HIT-HY 200-R V3		-
Dispenser	IFU HDM	IFU HDE-500 22	IFU HDE 500-A12	IFU HIT-P8000D
Shear connector	IFU HCC-K			

Link to Hilti Webpage

Injection mortars / Shear connector			
Hilti HIT-RE 500 V4	HIT-HY 200-A V3	HIT-HY 200-R V3	HCC-K
Dispenser			
HDE 500-22	HDE 500-A12	HDM 500	Hilti HIT-P8000D

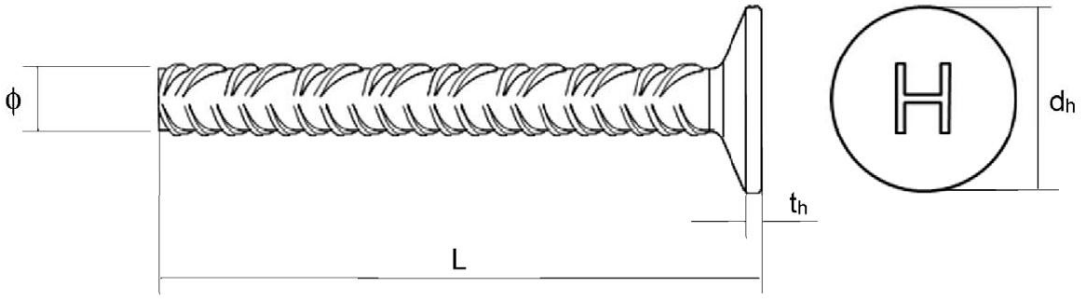
Fastener special dimensions

Mechanical properties

Mechanical properties of the HCC-K are standardized and can be taken from the ETA listed in the table Approvals / Certificates.

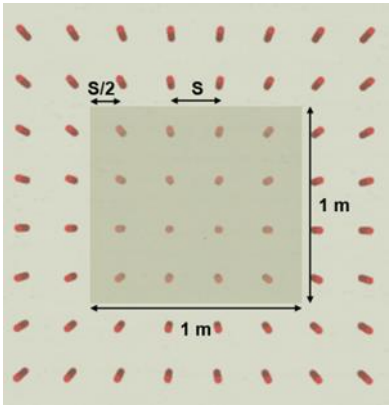
Dimensions for HCC-K

Connector size			10	12	14	16
Effective embedment depth	ϕ	[mm]	10	12	14	16
Overall embedment depth	L	[mm]	100 to 650	140 to 650	200 to 650	230 to 650
Diameter of the head	d_h	[mm]	36	36	42	48
Thickness of the head	t_h	[mm]	2	2	2	2



Hilti HIT-RE 500 V4 with HCC-K: Static and quasi-static design according to EOTA TR 066

All data in this section applies to:



- Correct setting (see Instructions for use (IFU))
- Hammer drilled holes, hammer drilled holes with Hilti hollow drill bit (TE-CD, TE-YD)
- Below calculated values based on 1 m^2 grid pattern of connectors given in the table below, No edge influence is consider in design
- Minimum base material thickness (see setting details)
- Cracked concrete
- Design values of the bond strength for a working life of 50 Years
- The following data are valid for a ψ_{sus} = 1,0
- The new concrete / overlay must exhibit a higher strength
- Roughness levels as defined in EOTA TR 066
- The design with shear connectors follows equation (2.11) of EOTA TR 066
- No design shear stress given in cases where minimum reinforcement ratio is not met
- The concrete strength class given in the following tables refer to the existing concrete member.
- In-service temperature range I (min. base mat. temp. -40°C, max. long/short term base mat. temp.: +24°C/40°C)
- The design with “no connectors” follows equation (2.9) of EOTA TR 066 (Note: Provide minimum reinforcement)

For specific design cases refer to PROFIS Engineering.

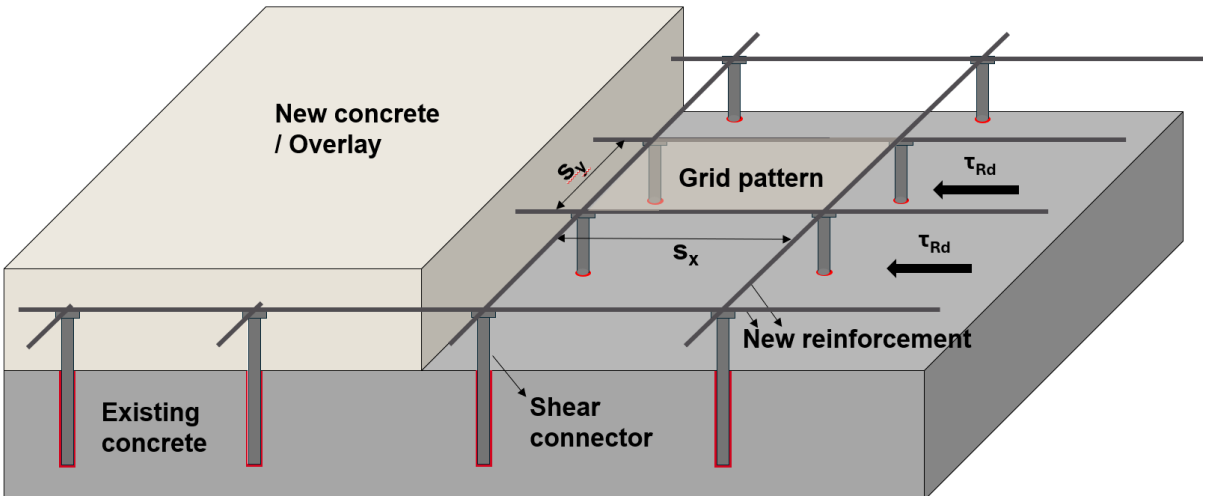


Figure showing grid pattern and shear stress in overlay application with HCC-K

Connector HCC-K 10

Effective embedment depth in existing concrete, $h_{ef,ex}$ = 60 mm

Effective embedment depth in overlay concrete $h_{ef,ov}$ = 40 mm

Grid pattern of connectors, s_x x s_y [mm]		**no connectors**	**350 x 350**	**300 x 300**	**200 x 200**	**100 x 100**
No. of connectors per 1 m^2		**0**	**9**	**16**	**25**	**100**
Reinforcement ratio		**0,0%**	**0,07%**	**0,13%**	**0,20%**	**0,79%**
Design resistance for very rough interface (R_t ≥ 3,0 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm^2]	0,43	0,61	0,67	0,74	1,17
Existing concrete: C30/37 New concrete: C40/50		0,57	-	0,78	0,87	1,39
Existing concrete: C45/55 New concrete: C50/60		0,77	-	0,92	1,03	1,70

Design resistance for rough interface ($R_t \geq 1,5$ mm)							
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd}	[N/mm²]	0,34	0,34	0,39	0,46	0,88
Existing concrete: C30/37 New concrete: C40/50	τ_{Rd}	[N/mm²]	0,45	-	0,46	0,55	1,06
Existing concrete: C45/55 New concrete: C50/60	τ_{Rd}	[N/mm²]	0,61	-	0,53	0,63	1,27
Design resistance for smooth interface ($R_t < 1,5$ mm)							
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd}	[N/mm²]	0,17	0,07	0,13	0,21	0,70
Existing concrete: C30/37 New concrete: C40/50	τ_{Rd}	[N/mm²]	0,23	-	0,16	0,26	0,86
Existing concrete: C45/55 New concrete: C50/60	τ_{Rd}	[N/mm²]	0,31	-	0,20	0,31	1,06

Connector HCC-K 12

Effective embedment depth in existing concrete, $h_{ef,ex}$ = 70 mm

Effective embedment depth in overlay concrete $h_{ef,ov}$ = 40 mm

Grid pattern of connectors, s_x x s_y [mm]			**no connectors**	**350 x 350**	**300 x 300**	**200 x 200**	**100 x 100**
No. of connectors per 1 m² **Reinforcement ratio**			**0 0,0%**	**9 0,10%**	**16 0,18%**	**25 0,28%**	**100 1,13%**
Design resistance for very rough interface ($R_t \geq 3,0$ mm)							
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd}	[N/mm²]	0,43	0,63	0,71	0,80	1,38
Existing concrete: C30/37 New concrete: C40/50	τ_{Rd}	[N/mm²]	0,57	0,73	0,82	0,93	1,65
Existing concrete: C45/55 New concrete: C50/60	τ_{Rd}	[N/mm²]	0,77	0,86	0,97	1,11	2,01
Design resistance for rough interface ($R_t \geq 1,5$ mm)							
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd}	[N/mm²]	0,34	0,36	0,43	0,52	1,09
Existing concrete: C30/37 New concrete: C40/50	τ_{Rd}	[N/mm²]	0,45	0,42	0,50	0,61	1,32
Existing concrete: C45/55 New concrete: C50/60	τ_{Rd}	[N/mm²]	0,61	0,49	0,59	0,72	1,59
Design resistance for smooth interface ($R_t < 1,5$ mm)							
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd}	[N/mm²]	0,17	0,10	0,18	0,27	0,96
Existing concrete: C30/37 New concrete: C40/50	τ_{Rd}	[N/mm²]	0.23	0,12	0,22	0,34	1,18
Existing concrete: C45/55 New concrete: C50/60	τ_{Rd}	[N/mm²]	0,31	0,15	0.26	0,41	1,45

Connector HCC-K 14

Effective embedment depth in existing concrete, $h_{ef,ex}$ = 75 mm

Effective embedment depth in overlay concrete $h_{ef,ov}$ = 40 mm

Grid pattern of connectors, s_x x s_y [mm]		**no connectors**	**350 x 350**	**300 x 300**	**200 x 200**	**100 x 100**
No. of connectors per 1 m²		**0**	**9**	**16**	**25**	**100**
Reinforcement ratio		**0,0%**	**0,14%**	**0,25%**	**0,39%**	**1,54%**
Design resistance for very rough interface (R_t ≥ 3,0 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,43	0,66	0,75	0,86	1,63
Existing concrete: C30/37 New concrete: C40/50		0,57	0,76	0,87	1,01	1,96
Existing concrete: C45/55 New concrete: C50/60		0.77	0,89	1,03	1,21	2,39
Design resistance for rough interface (R_t ≥ 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,34	0,38	0,47	0,58	1,35
Existing concrete: C30/37 New concrete: C40/50		0,45	0,45	0,55	0,69	1,63
Existing concrete: C45/55 New concrete: C50/60		0,61	0,52	0,65	0,81	1,97
Design resistance for smooth interface (R_t < 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,17	0,13	0,23	0,35	1,28
Existing concrete: C30/37 New concrete: C40/50		0,23	0,16	0,28	0,44	1,56
Existing concrete: C45/55 New concrete: C50/60		0,31	0,19	0,34	0,53	1,92

Connector HCC-K 16

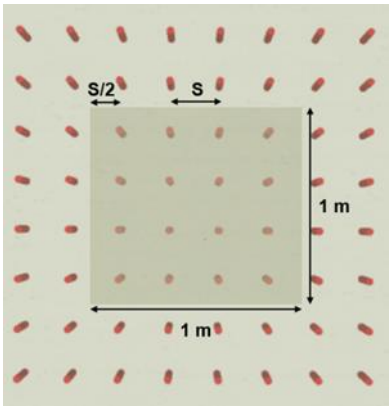
Effective embedment depth in existing concrete, $h_{ef,ex}$ = 80 mm

Effective embedment depth in overlay concrete $h_{ef,ov}$ = 40 mm

Grid pattern of connectors, s_x x s_y [mm]		**no connectors**	**350 x 350**	**300 x 300**	**200 x 200**	**100 x 100**
No. of connectors per 1 m²		**0**	**9**	**16**	**25**	**100**
Reinforcement ratio		**0,0%**	**0,18%**	**0,32%**	**0,50%**	**2,01%**
Design resistance for very rough interface (R_t ≥ 3,0 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,43	0,68	0,79	0,94	1,93
Existing concrete: C30/37 New concrete: C40/50		0,57	0,80	0,93	1,11	2,32
Existing concrete: C45/55 New concrete: C50/60		0,77	0,93	1,10	1,32	2,83
Design resistance for rough interface (R_t ≥ 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,34	0,41	0,52	0,65	1,64
Existing concrete: C30/37 New concrete: C40/50		0,45	0,48	0,61	0,78	1,99
Existing concrete: C45/55 New concrete: C50/60		0,61	0,56	0,72	0,92	2,41
Design resistance for smooth interface (R_t < 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,17	0,16	0,28	0,44	1,64
Existing concrete: C30/37 New concrete: C40/50		0,23	0,20	0,35	0,55	2,01
Existing concrete: C45/55 New concrete: C50/60		0,31	0,24	0,42	0,66	2,46

Hilti HIT-HY 200 A/R V3 with HCC-K: Static and quasi-static design according to EOTA TR 066

All data in this section applies to:



- Correct setting (see Instructions for use (IFU))
- Hammer drilled holes, hammer drilled holes with Hilti hollow drill bit (TE-CD, TE-YD)
- Below calculated values based on 1 m^2 grid pattern of connectors given in the table below, No edge influence is consider in design
- Minimum base material thickness (see setting details)
- Cracked concrete
- Design values of the bond strength for a working life of 50 Years
- The following data are valid for a ψ_{sus} = 1,0
- The new concrete / overlay must exhibit a higher strength
- Roughness levels as defined in EOTA TR 066
- The design with shear connectors follows equation (2.11) of EOTA TR 066
- No design shear stress given in cases where minimum reinforcement ratio is not met
- The concrete strength class given in the following tables refer to the existing concrete member.
- In-service temperature range I (min. base mat. temp. -40°C, max. long/short term base mat. temp.: +24°C/40°C)
- The design with “no connectors” follows equation (2.9) of EOTA TR 066 (Note: Provide minimum reinforcement)

For specific design cases refer to PROFIS Engineering.

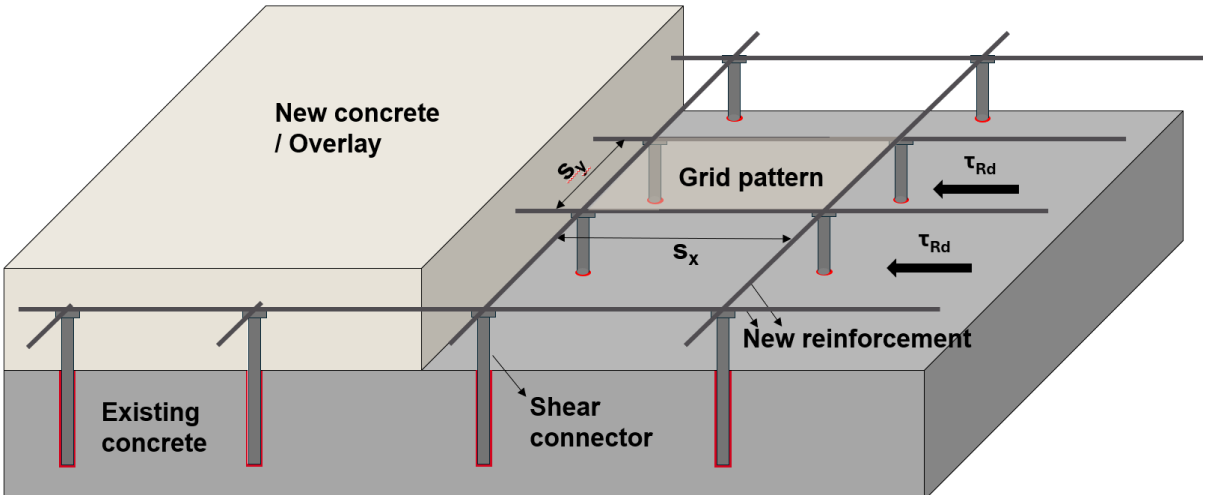


Figure showing grid pattern and shear stress in overlay application with HCC-K

Connector HCC-K 10
Effective embedment depth in existing concrete, $h_{ef,ex}$ =60 mm
Effective embedment depth in overlay concrete $h_{ef,ov}$ = 40 mm

Grid pattern of connectors, s_x x s_y [mm]		**no connectors**	**350 x 350**	**300 x 300**	**200 x 200**	**100 x 100**
No. of connectors per 1 m² **Reinforcement ratio**		**0** **0,0%**	**9** **0,07%**	**16** **0,13%**	**25** **0,20%**	**100** **0,79%**
Design resistance for very rough interface (R_t ≥ 3,0 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,43	0,61	0,66	0,73	1,17
Existing concrete: C30/37 New concrete: C40/50		0,57	-	0,76	0,84	1,39
Existing concrete: C45/55 New concrete: C50/60		0,77	-	0,88	0,98	1,70
Design resistance for rough interface (R_t ≥ 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,34	0,34	0,39	0,45	0,88
Existing concrete: C30/37 New concrete: C40/50		0,45	-	0,44	0,52	1,06
Existing concrete: C45/55 New concrete: C50/60		0,61	-	0,51	0,60	1,27
Design resistance for smooth interface (R_t < 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,17	0,07	0,13	0,20	0,70
Existing concrete: C30/37 New concrete: C40/50		0,23	-	0,15	0,23	0,86
Existing concrete: C45/55 New concrete: C50/60		0,31	-	0,18	0,28	1,06

Connector HCC-K 12
Effective embedment depth in existing concrete, $h_{ef,ex}$ = 70 mm
Effective embedment depth in overlay concrete $h_{ef,ov}$ = 40 mm

Grid pattern of connectors, s_x x s_y [mm]		**no connectors**	**350 x 350**	**300 x 300**	**200 x 200**	**100 x 100**
No. of connectors per 1 m² **Reinforcement ratio**		**0** **0%**	**9** **0,`0%**	**16** **0,18%**	**25** **0,28%**	**100** **1,13%**
Design resistance for very rough interface (R_t ≥ 3,0 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,43	0,63	0,71	0,80	1,38
Existing concrete: C30/37 New concrete: C40/50		0,57	0,73	0,82	0,93	1,65
Existing concrete: C45/55 New concrete: C50/60		0,77	0,86	0,97	1,11	2,01
Design resistance for rough interface (R_t ≥ 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,34	0,36	0,43	0,52	1,09
Existing concrete: C30/37 New concrete: C40/50		0,45	0,42	0,50	0,61	1,32
Existing concrete: C45/55 New concrete: C50/60		0,61	0,49	0,59	0,72	1,59
Design resistance for smooth interface (R_t < 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,17	0,10	0,18	0,27	0,96
Existing concrete: C30/37 New concrete: C40/50		0,23	0,12	0,22	0,34	1,18
Existing concrete: C45/55 New concrete: C50/60		0,31	0,15	0,26	0,41	1,45

Connector HCC-K 14

Effective embedment depth in existing concrete, $h_{ef,ex}$ = 75 mm

Effective embedment depth in overlay concrete $h_{ef,ov}$ = 40 mm

Grid pattern of connectors, s_x x s_y [mm]		**no connectors**	**350 x 350**	**300 x 300**	**200 x 200**	**100 x 100**
No. of connectors per 1 m²		**0**	**9**	**16**	**25**	**100**
Reinforcement ratio		**0,0%**	**0,10%**	**0,18%**	**0,28%**	**1,13%**
Design resistance for very rough interface (R_t ≥ 3,0 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,43	0,66	0,75	0,86	1,63
Existing concrete: C30/37 New concrete: C40/50		0,57	0,76	0,87	1,01	1,96
Existing concrete: C45/55 New concrete: C50/60		0,77	0,89	1,03	1,21	2,39
Design resistance for rough interface (R_t ≥ 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,34	0,38	0,47	0,58	1,35
Existing concrete: C30/37 New concrete: C40/50		0,45	0,45	0,55	0,69	1,63
Existing concrete: C45/55 New concrete: C50/60		0,61	0,52	0,65	0,81	1,97
Design resistance for smooth interface (R_t < 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,17	0,13	0,23	0,35	1,28
Existing concrete: C30/37 New concrete: C40/50		0,23	0,16	0,28	0,44	1,56
Existing concrete: C45/55 New concrete: C50/60		0,31	0,19	0.34	0,53	1,92

Connector HCC-K 16

Effective embedment depth in existing concrete, $h_{ef,ex}$ = 80 mm

Effective embedment depth in overlay concrete $h_{ef,ov}$ = 40 mm

Grid pattern of connectors, s_x x s_y [mm]		**no connectors**	**350 x 350**	**300 x 300**	**200 x 200**	**100 x 100**
No. of connectors per 1 m²		**0**	**9**	**16**	**25**	**100**
Reinforcement ratio		**0,0%**	**0,14%**	**0,25%**	**0,39%**	**1,54%**
Design resistance for very rough interface (R_t ≥ 3,0 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,43	0,68	0,79	0,94	1,93
Existing concrete: C30/37 New concrete: C40/50		0,57	0,80	0,93	1,11	2,32
Existing concrete: C45/55 New concrete: C50/60		0,77	0,93	1,10	1,32	2,83
Design resistance for rough interface (R_t ≥ 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,34	0,41	0,52	0,65	1,64
Existing concrete: C30/37 New concrete: C40/50		0,45	0,48	0,61	0,78	1,99
Existing concrete: C45/55 New concrete: C50/60		0,61	0,56	0,72	0,92	2,41
Design resistance for smooth interface (R_t < 1,5 mm)						
Existing concrete: C20/25 New concrete: C25/30	τ_{Rd} [N/mm²]	0,17	0,16	0,28	0,44	1,64
Existing concrete: C30/37 New concrete: C40/50		0,23	0,20	0,35	0,55	2,01
Existing concrete: C45/55 New concrete: C50/60		0,31	0,24	0,42	0,66	2,46

Setting information

Installation temperature range
-5°C to +40°C

Service temperature range
Hilti HIT-RE 500 V4 / HY 200 A/R V3 injection mortar with HCC-K may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

For use with HIT-RE 500 V4

Temperature range	Base material temperature	Maximum long-term base material temperature	Maximum short-term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +55 °C	+43 °C	+55 °C
Temperature range III	-40 °C to +75 °C	+55 °C	+75 °C

For use with HIT-HY A/R 200 V3

Temperature range	Base material temperature	Maximum long-term base material temperature	Maximum short-term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +80 °C	+50 °C	+80 °C
Temperature range III	-40 °C to +120 °C	+72 °C	+120 °C

Maximum short term base material temperature
Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Maximum long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Working time and curing time

Temperature of the base material at installation	RE 500 V4	
	Maximum working time	Minimum curing time
T [1)]	t_{work}	t_{cure} [2)]
-5°C to -1°C	2 h	168 h
0 °C to 4 °C	2 h	48 h
> 4 °C to 9 °C	2 h	24 h
> 9 °C to 14 °C	1,5 h	16 h
> 14 °C to 19 °C	1 h	12 h
> 19 °C to 24 °C	30 min	7 h
> 24 °C to 29 °C	20 min	6 h
> 29 °C to 34 °C	15 min	5 h
> 34 °C to 39 °C	12 min	4,5 h
> 39 °C to 40 °C	`10 min	4 h

1) The minimum temperature of the foil pack is +5° C.
2) The curing time data are valid for dry base material only. In wet base material, the curing times must be doubled.

Working time and curing time

Temperature of the base material [a]	HIT-HY 200-A V3		HIT-HY 200-R V3	
	Maximum working time	Minimum curing time	Maximum working time	Minimum curing time
T	t_{work}	t_{cure}	t_{work}	t_{cure}
- 10°C to - 5°C	1,5 h	7 h	3 h	20 h
> 5°C to 0°C	50 min	4 h	1,5 h	8 h
> 0°C to 5°C	25 min	2 h	45 min	4 h
> 5°C to 10°C	15 min	75 min	30 min	2,5 h
> 10°C to 20°C	7 min	45 min	15 min	1,5 h
> 20°C to 30°C	4 min	30 min	9 min	1 h
> 30°C to 40°C	3 min	30 min	6 min	1 h

[a] The Minimum Foil pack temperature is 0°C

Setting details for Hilti HCC-K in existing concrete

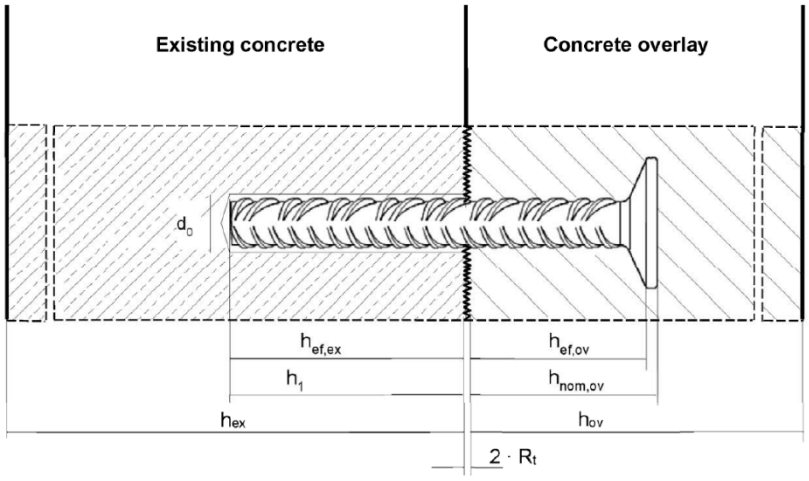
Connector Hilti HCC-K			10	12	14	16
Effective embedment depth And drill hole depth	min $h_{ef,ex}$ = h_1	[mm]	60	70	75	80
			200	240	280	320
Nominal diameter of drill bit	d_0	[mm]	12 (14) [1]	14 (16) [1]	18	20
Minimum thickness of existing concrete	$h_{min,ex} \geq$	[mm]	Max (100, h_{ef} + 30, h_{ef} + 2 · d_o)			
Minimum spacing	$s_{min,ex} \geq$	[mm]	50	60	70	80
Minimum edge distance	$c_{min,ex} \geq$	[mm]	45	45	50	50

[1] Each of the two given values can be used

Setting details for Hilti HCC-K in new concrete / overlay

Connector Hilti HCC-K			10	12	14	16
Effective embedment depth	min $h_{ef,ov}$	[mm]	40			
	max $h_{ef,ov}$		L - $h_{nom,ex}$ - t_h - 2 · R_t [1]			
Overall embedment depth	$h_{nom,ov}$	[mm]	$h_{ef,ov}$ + t_h			
Minimum thickness of concrete overlay	$h_{min,ov} \geq$	[mm]	$h_{nom,ov}$ + c_{nom} [2]			
Minimum spacing	$s_{min,ov} \geq$	[mm]	60	75	85	100
Minimum edge distance	$c_{min,ov} \geq$	[mm]	15 + c_{nom} [2]	20 + c_{nom} [2]	25 + c_{nom} [2]	25 + c_{nom} [2]

[1] R_t: Roughness according to EOTA TR 066
[2] c_{nom}: Minimum concrete cover according to EN 1992-1-1



Drilling and Installation equipment
For detailed setting information on installation see instructions for use (IFU) given with the product.

Rotary Hammers (Corded and Cordless)		TE 2 - TE 70
Diamond Coring Machines		DD EC-1, DD 100 … DD 160
Dispenser		HDE HDM PE-8000D
Other tools		Blow out pump, Compressed air gun Set of cleaning brushes
		Hammer drill bit TE-CX, TE-C,TE Y, TE YX
		Hollow drill bit TE-CD, TE-YD
		Diamond core bits Roughening tool