HILTI COMPOSITE METAL DECK FLOOR SEISMIC FIXING SOLUTION

Hilti HUS3, HUS4 and HST3 ultimate performance mechanical anchor system

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HUS4 Screw Anchor

Ultimate-performance screw anchor for seismic actions into ComFlor® 60, 80 and SR

Setting Information	Sym.	Units	Nominal anchor diameter (mm)			
			8		10	
Nominal bit diameter	d_o	mm	8		10	
Effective min. embedment	h_{ef}	mm	46.4	54.9	58.6	67.1
Nominal embedment	h_{nom}	mm	60	70	75	85
Min. hole depth	h_o	mm	70	80	85	95
Setting tool[1]	-	-	Hilti SIW T-A			
Loads according to Figure 1 and 2						
Minimum concrete thickness over upper flute	$h_{min,deck}$	mm	70			
Minimum distance to edge of lower flute	$c_{min,deck}$	mm	45	45	47	47
Characteristic pullout resistance in non-cracked concrete	$N_{Rk,p,deck,uncr}$	kN	15.9	17.5	19.2	19.9
Characteristic pullout resistance in cracked concrete	$N_{Rk,p,deck,cr}$	kN	11.1	12.3	13.5	14.0
Characteristic pullout resistance, seismic C1	$N_{Rk,p,deck,C1}$	kN	11.1	12.3	13.5	14.0
Partial safety factor for pullout resistance	γ_c	-	1.5			
Robustness factor for pullout resistance	γ_{inst}	-	1.00			
Characteristic steel resistance for shear	$V_{Rk,s,deck}$	kN	17.3	17.3	20.6	20.6
Characteristic steel resistance for shear, seismic C1	$V_{Rk,s,deck,C1}$	kN	14.7	14.7	17.2	17.2
Partial safety factor for steel resistance for shear	$\gamma_{Ms,V}$	-	1.5			

[1] – Installation with other impact screw driver of equivalent power is possible. See ETA-20/0987 for full setting details.

Table 1 - Hilti HUS4-H, -HF, -C, -A, -AF anchors tension and shear design data for installation in the soffit of f'_c = 30 MPa, normal weight concrete-filled profile deck assemblies for hammer drilled installations

All data in Table 1 applies to:

- Correct installation. See anchor box or Hilti.co.nz for details including hole cleaning and installation torque
- No edge distance and spacing influence. Only one anchor can be used in the lower flute at a time with the min. spacing between anchors along the length of the flute to be at least 3 x h_{ef}. This datasheet does not give information for the design of fasteners in a group.
- f'_c = 30 MPa concrete. For higher compressive strengths, the tension loads may be increased by $(f'_c/30)^{0.5}$
- α_{gap} = 1.0 (no hole clearance between anchor and fixture) was used to in the formula $V_{Rd,s,deck,C1} = \alpha_{gap} \times \alpha_{eq} \times V_{Rk,s,deck,C1} / \gamma_{Ms,V}$ In case of connections with hole clearance according to EN 1992-4 Table 6.1, α_{gap} = 0.5 should be used.
- Testing in accordance with ACI 355.2 and AC 193. Evaluated in accordance with AC 193 and EAD 330232 and EOTA TR 049

For anchoring into the upper flute, either use Table 1 data below conservatively or refer to ETA-20/0867. Additionally, C2 seismic performance category is not included in ACI 355.2 and AC 193. C2 seismic performance category may be designed in the upper flute using all guidelines and parameters provided in ETA-20/0867.

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HUS3 Screw Anchor

Ultimate-performance screw anchor for seismic actions into ComFlor® 60 and 80

Setting Information	Sym.	Units	Nominal anchor diameter (mm)
			6
Nominal bit diameter	d_o	mm	6
Effective min. embedment	h_{ef}	mm	30
Nominal embedment	h_{nom}	mm	40
Min. hole depth	h_o	mm	43
Setting tool[1]	-	-	SIW 22A
Loads according to Figure 1			
Minimum concrete thickness over upper flute	$h_{min,deck}$	mm	70
Minimum distance to edge of lower flute	$c_{min,deck}$	mm	45
Characteristic pullout resistance in non-cracked concrete	$N_{Rk,p,deck,uncr}$	kN	7.1
Characteristic pullout resistance in cracked concrete	$N_{Rk,p,deck,cr}$	kN	2.5
Characteristic pullout resistance, seismic C1	$N_{Rk,p,deck,C1}$	kN	2.5
Design pullout resistance, seismic C1	$N_{Rd,p,deck,C1}$	kN	1.4
Partial safety factor for pullout resistance	γ_c	-	1.5
Robustness factor for pullout resistance	γ_{inst}	-	1.2
Characteristic steel resistance for shear HUS3-H, -P, -PS, -C	$V_{Rk,s,deck}$	kN	10.8
Characteristic steel resistance for shear, seismic C1, HUS3-H, -P, -PS, -C	$V_{Rk,s,deck,C1}$	kN	4.3
Design steel resistance for shear, seismic C1, HUS3-H, -P, -PS, -C	$V_{Rd,s,deck,C1}$	kN	2.9
Partial safety factor for steel resistance for shear	$\gamma_{Ms,V}$	-	1.5

[1] – Installation with other impact screw driver of equivalent power is possible. See ETA-13/1038 for full setting details.

Table 2 - Hilti HUS3 anchors tension and shear design data for installation in the soffit of f'_c = 30 MPa, normal weight concrete-filled profile deck assemblies for hammer drilled installations

All data in Table 2 applies to:

- Correct installation. See anchor box or Hilti.co.nz for details including hole cleaning and installation torque
- No edge distance and spacing influence. Only one anchor can be used in the lower flute at a time with the min. spacing between anchors along the length of the flute to be at least 3 x h_{ef}. This datasheet does not give information for the design of fasteners in a group.
- f'_c = 30 MPa concrete. For higher compressive strengths, the tension loads may be increased by $(f'_c/30)^{0.5}$
- α_{gap} = 1.0 (no hole clearance between anchor and fixture) was used to in the formula $V_{Rd,s,deck,C1} = \alpha_{gap} \times \alpha_{eq} \times V_{Rk,s,deck,C1} / \gamma_{Ms,V}$ In case of connections with hole clearance according to EN 1992-4 Table 6.1, α_{gap} = 0.5 should be used.
- Testing in accordance with ACI 355.2 and AC 193. Evaluated in accordance with AC 193 and EAD 330232 and EOTA TR 049

For anchoring into the upper flute, either use Table 1 data below conservatively or refer to ETA-13/1038. Additionally, C2 seismic performance category is not included in ACI 355.2 and AC 193. C2 seismic performance category may be designed in the upper flute using all guidelines and parameters provided in ETA-13/1038.

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HST3 Expansion Anchor

Ultimate-performance expansion anchor for seismic actions into ComFlor® 60 and 80

Setting Information	Sym.	Units	Nominal anchor diameter (mm)			
			8	10	12	16
Nominal bit diameter	d_o	mm	8	10	12	16
Effective min. embedment	h_{ef}	mm	47	60	70	85
Nominal embedment	h_{nom}	mm	54	68	80	98
Min. hole depth	h_o	mm	59	73	88	106
Installation torque	T_{inst}	Nm	20	45	60	110
Methods for application of torque moment	-	-	Machine torquing using a Hilti SIW 6AT-A22 impact wrench with SI-AT-A22 adaptive torque module or manual torquing using a torque wrench			
Loads according to Figure 3						
Minimum concrete thickness over upper flute	$h_{min,deck}$	mm	70			
Minimum distance to edge of lower flute	$c_{min,deck}$	mm	43	45	47	50
Characteristic pullout resistance in non-cracked concrete	$N_{Rk,p,deck,uncr}$	kN	11.9	18.6	20.6	29.2
Characteristic pullout resistance in cracked concrete	$N_{Rk,p,deck,cr}$	kN	8.0	12.7	16.5	20.4
Chacteristic pullout resistance, seismic C1	$N_{Rk,p,deck,C1}$	kN	8.0	12.7	16.5	20.4
Partial safety factor for pullout resistance	γ_c	-	1.5			
Robustness factor for pullout resistance	γ_{inst}	-	1.0			
Characteristic steel resistance for shear	$V_{Rk,s,deck}$	kN	15.0	24.2	21.4	26.0
Characteristic steel resistance for shear, seismic C1	$V_{Rk,s,deck,C1}$	kN	13.6	21.9	19.4	22.9
Design steel resistance for shear, seismic C1	$V_{Rd,s,deck,C1}$	kN	9.0	14.6	13.0	15.3
Partial safety factor for steel resistance for shear	$\gamma_{Ms,V}$	-	1.25			

Table 3 - Hilti HST3 anchors tension and shear design data for installation in the soffit of f'_c = 30 MPa, normal weight concrete-filled profile deck assemblies for hammer drilled installations

All data in Table 3 applies to:

- Correct installation. See anchor box or Hilti.co.nz for details including hole cleaning and installation torque
- No edge distance and spacing influence. Only one anchor can be used in the lower flute at a time with the min. spacing between anchors along the length of the flute to be at least 3 x h_{ef}. This datasheet does not give information for the design of fasteners in a group.
- f'_c = 30 MPa concrete. For higher compressive strengths, the tension loads may be increased by $(f'_c/30)^{0.5}$
- α_{gap} = 1.0 (no hole clearance between anchor and fixture) was used to in the formula $V_{Rd,s,deck,C1} = \alpha_{gap} \times \alpha_{eq} \times V_{Rk,s,deck,C1} / \gamma_{Ms,V}$ In case of connections with hole clearance according to EN 1992-4 Table 6.1, α_{gap} = 0.5 should be used
- Testing in accordance with ACI 355.2 and AC 193. Evaluated in accordance with AC 193 and EAD 330232 and EOTA TR 049

For anchoring into the upper flute, either use Table 2 data below conservatively or refer to ETA-98/0001. Additionally, C2 seismic performance category is not included in ACI 355.2 and AC 193. C2 seismic performance category may be designed in the upper flute using all guidelines and parameters provided in ETA-98/0001.

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Figures for performance data

HUS3 and HUS4 Ultimate screw anchors

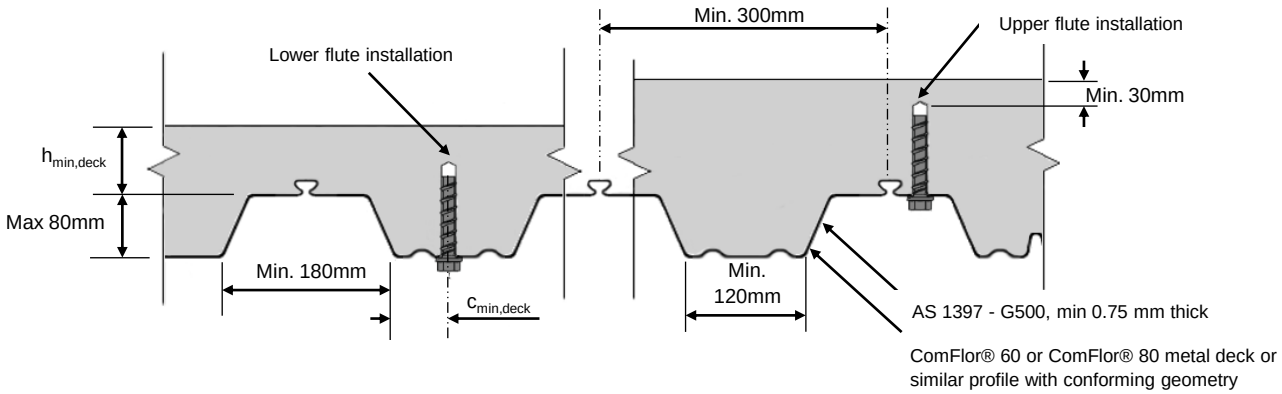

Figure 1 - Hilti HUS4/HUS3 in the soffit of concrete filled open trough profile steel deck assemblies

HUS4 Ultimate screw anchor

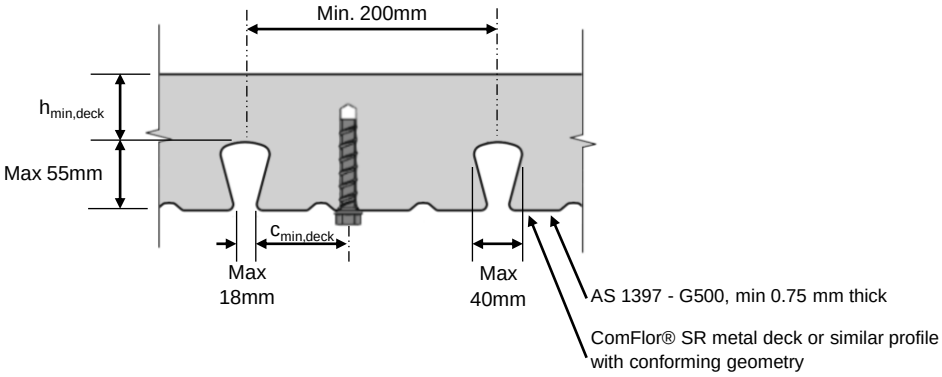

Figure 2 - Hilti HUS4 in the soffit of concrete filled re-entrant profile steel deck assemblies

HST3 Ultimate expansion anchor

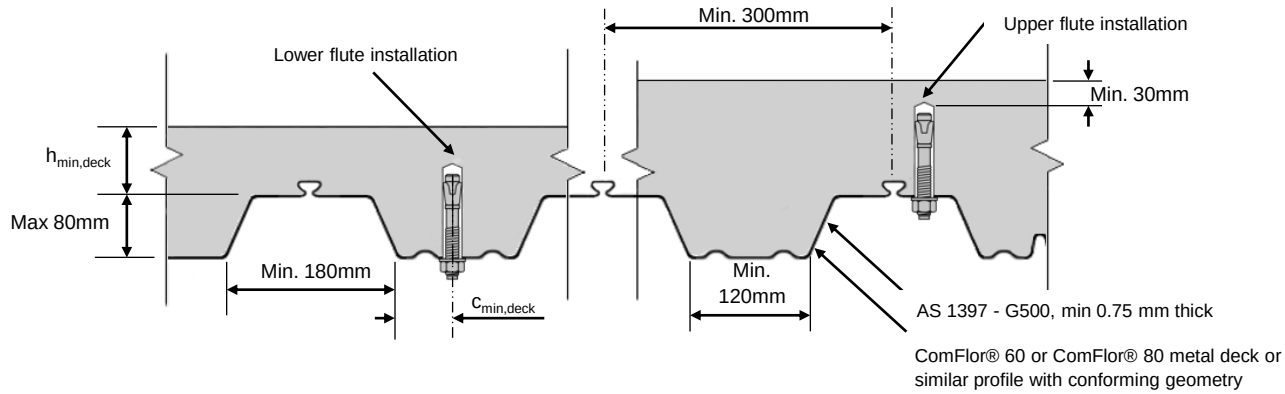

Figure 3 - Hilti HST3 in the soffit of concrete filled open trough profile steel deck assemblies