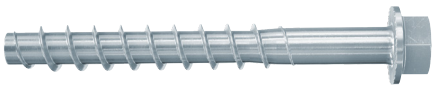
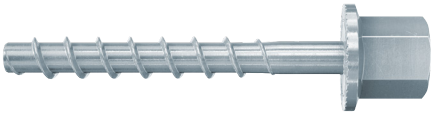
Concrete screw FBS IN. General product information



FBS IN HW (Ø3/8", Ø1/2"; Ø5/8"; Ø3/4")



FBS IN I (Ø1/4")

Features and advantages

- ICC-ES Evaluation Report for cracked and uncracked concrete including
  - Seismic Design Categories A through F
  - 2021, 2018, 2015 and 2012 IBC
  - 2021, 2018, 2015 and 2012 IRC
  - LABC and LARC Supplement
  - CBC and CRC Supplement
  - CBC and CRC Supplement
- Various anchorage depths for all sizes
- The expansion-free anchorage (undercut) ensures narrow edge distances and spacings

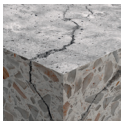
Anchor materials

Screw:

- Carbon steel, zinc plated (0.0002 in) and passivated (zp)

Base materials

- Cracked concrete, 2,500 psi to 8,500 psi



- Uncracked concrete, 2,500 psi to 8,500 psi

- Cracked and uncracked lightweight concrete, 2,500 psi to 8,500 psi

Certificates

- ESR-5456 (2024-03)

Design features

- FiXperience Design Software

- Static and quasi-static design

- Seismic design

Installation features

- Hammer drilling

Technical product information

1. Ultimate strength of single anchors with large spacing and large edge distance

Mean values[1]														
FBS IN HW (zp) (carbon steel, zinc-plated)					Ø3/8"		Ø1/2"			Ø5/8"	Ø3/4"		
Nominal embedment depth		h_{nom}	[in]		1 5/8"	2 1/2"	2 1/4"	3"	4 1/4"	3 1/4"	4"	5 1/2"	6 1/4"
Effective embedment depth		h_{ef}	[in]		1.21	1.98	1.66	2.30	3.37	2.54	3.14	4.41	5.05
Uncracked concrete													
Tension	2,500 psi	$\bar{N}_u$	[lb]		1,594	3,417	3,411	4,703	8,554	6,457	8,875	14,771	18,101
	8,000 psi	$\bar{N}_u$	[lb]		2,852	6,113	6,102	8,413	15,302	11,550	15,876	26,424	32,380
Shear	≥ 2,500 psi	$\bar{V}_u$	[lb]		2,123	*3,150*	3,411	5,564	*6,745*	*10,115*	*15,060*	*15,060*	*15,060*
Cracked concrete													
Tension	2,500 psi	$\bar{N}_u$	[lb]		823	2,006	1,543	3,189	5,937	3,571	5,034	8,377	10,046
	8,000 psi	$\bar{N}_u$	[lb]		1,472	3,588	2,760	5,704	10,621	5,687	9,006	14,985	17,970
Shear	≥ 2,500 psi	$\bar{V}_u$	[lb]		1,531	*3,150*	2,460	4,011	*6,745*	9,311	13,354	*15,060*	*15,060*

Mean values[1][2]						
FBS IN I (zp) (carbon steel, zinc-plated)				Ø1/4"		
Nominal embedment depth		h_{nom}	[in]	1 5/8"	2 1/2"	
Effective embedment depth		h_{ef}	[in]	1.24	2.01	
Uncracked concrete						
Tension	2,500 psi	$\bar{N}_u$	[lb]	2,202	4,545	
	8,000 psi	$\bar{N}_u$	[lb]	3,940	*4,585*	
Shear	≥ 2,500 psi	$\bar{V}_u$	[lb]	*1,350*	*1,350*	
Cracked concrete						
Tension	2,500 psi	$\bar{N}_u$	[lb]	691	1,234	
	8,000 psi	$\bar{N}_u$	[lb]	1,101	1,966	
Shear	≥ 2,500 psi	$\bar{V}_u$	[lb]	*1,350*	*1,350*	

[1] **Above values base on fischer ENSO specification and apply for following requirements:**
- Concrete strength based on ACI 318-19.
- Steel failure decisive = *Figures in blue italics*.

[2] **Above values for FBS IN I (Hex coupler) do not consider the steel insert element used and resulting values might be lower depending on the steel grade of the used steel insert element.**

Technical product information

2. Static and quasi-static strength of single anchors with large spacing and large edge distance

2.1 Nominal strength

Nominal values[1]														
FBS IN HW (zp) (carbon steel, zinc-plated)					**Ø3/8"**		**Ø1/2"**			**Ø5/8"**	**Ø3/4"**		
Nominal embedment depth		h_{nom}	[in]		**1 5/8"**	**2 1/2"**	**2 1/4"**	**3"**	**4 1/4"**	**3 1/4"**	**4"**	**5 1/2"**	**6 1/4"**
Effective embedment depth		h_{ef}	[in]		**1.21**	**1.98**	**1.66**	**2.30**	**3.37**	**2.54**	**3.14**	**4.41**	**5.05**
Uncracked concrete													
Tension	2,500 psi	N_n	[lb]		1,395	2,990	2,567	4,115	7,424	4,858	7,512	11,113	13,618
	8,000 psi	N_n	[lb]		2,495	5,349	4,591	7,361	13,280	8,690	13,437	19,880	24,361
Shear	≥ 2,500 psi	V_n	[lb]		1,597	*3,150*	2,567	4,186	*6,745*	9,715	15,023	*15,060*	*15,060*
Cracked concrete													
Tension	2,500 psi	N_n	[lb]		720	1,755	1,350	2,790	5,195	3,125	4,405	7,330	8,790
	8,000 psi	N_n	[lb]		1,288	3,139	2,415	4,991	9,293	4,976	7,880	13,112	15,724
Shear	≥ 2,500 psi	V_n	[lb]		1,131	2,368	1,818	2,965	*6,745*	6,882	13,354	*15,060*	*15,060*

Nominal values[1][2]						
FBS IN I (zp) (carbon steel, zinc-plated)					**Ø1/4"**	
Nominal embedment depth		h_{nom}	[in]		**1 5/8"**	**2 1/2"**
Effective embedment depth		h_{ef}	[in]		**1.24**	**2.01**
Uncracked concrete						
Tension	2,500 psi	N_n	[lb]		1,657	3,420
	8,000 psi	N_n	[lb]		2,964	*4,585*
Shear	≥ 2,500 psi	V_n	[lb]		*1,350*	*1,350*
Cracked concrete						
Tension	2,500 psi	N_n	[lb]		605	1,080
	8,000 psi	N_n	[lb]		963	1,720
Shear	≥ 2,500 psi	V_n	[lb]		1,174	*1,350*

2.2 Design strength

Design values[1]														
FBS IN HW (zp) (carbon steel, zinc-plated)					**Ø3/8"**		**Ø1/2"**			**Ø5/8"**	**Ø3/4"**		
Nominal embedment depth		h_{nom}	[in]		**1 5/8"**	**2 1/2"**	**2 1/4"**	**3"**	**4 1/4"**	**3 1/4"**	**4"**	**5 1/2"**	**6 1/4"**
Effective embedment depth		h_{ef}	[in]		**1.21**	**1.98**	**1.66**	**2.30**	**3.37**	**2.54**	**3.14**	**4.41**	**5.05**
Uncracked concrete													
Tension	2,500 psi	ϕN_n	[lb]		907	1,944	1,412	2,263	4,083	3,158	4,131	6,112	7,490
	8,000 psi	ϕN_n	[lb]		1,622	3,477	2,525	4,049	7,304	5,648	7,390	10,934	13,398
Shear	≥ 2,500 psi	ϕV_n	[lb]		1,118	1,890	1,797	2,930	4,047	6,069	9,036	9,036	9,036
Cracked concrete													
Tension	2,500 psi	ϕN_n	[lb]		468	1,141	743	1,535	2,857	2,031	2,423	4,032	4,835
	8,000 psi	ϕN_n	[lb]		837	2,041	1,328	2,745	5,111	3,235	4,334	7,212	8,648
Shear	≥ 2,500 psi	ϕV_n	[lb]		792	1,658	1,273	2,075	4,047	4,817	9,036	9,036	9,036

[1] **Above values base on ESR-5456 and ACI 318-19 and apply for following requirements:**
- Steel failure decisive = *Figures in blue italics*.

[2] **Above values for FBS IN I (Hex coupler) do not consider the steel insert element used and resulting values might be lower depending on the steel grade of the used steel insert element.**

Technical product information

2. Static and quasi-static strength of single anchors with large spacing and large edge distance

2.2 Design strength

Design values[1)2)]					
FBS IN I (zp) (carbon steel, zinc-plated)				Ø1/4"	
Nominal embedment depth		h_{nom}	[in]	1 5/8"	2 1/2"
Effective embedment depth		h_{ef}	[in]	1.24	2.01
Uncracked concrete					
Tension	2,500 psi	ϕN_n	[lb]	746	1,881
	8,000 psi	ϕN_n	[lb]	1,334	2,980
Shear	≥ 2,500 psi	ϕV_n	[lb]	810	810
Cracked concrete					
Tension	2,500 psi	ϕN_n	[lb]	272	594
	8,000 psi	ϕN_n	[lb]	434	946
Shear	≥ 2,500 psi	ϕV_n	[lb]	810	810

2.3 Allowable loads

Allowable values[1)]													
FBS IN HW (zp) (carbon steel, zinc-plated)					Ø3/8"		Ø1/2"			Ø5/8"	Ø3/4"		
Nominal embedment depth		h_{nom}	[in]		1 5/8"	2 1/2"	2 1/4"	3"	4 1/4"	3 1/4"	4"	5 1/2"	6 1/4"
Effective embedment depth		h_{ef}	[in]		1.21	1.98	1.66	2.30	3.37	2.54	3.14	4.41	5.05
Uncracked concrete													
Tension	2,500 psi	N_{allow}	[lb]		613	1,313	954	1,529	2,759	2,133	2,791	4,130	5,061
	8,000 psi	N_{allow}	[lb]		1,096	2,349	1,706	2,736	4,935	3,816	4,993	7,388	9,053
Shear	≥ 2,500 psi	V_{allow}	[lb]		755	1,277	1,214	1,980	2,734	4,101	6,105	6,105	6,105
Cracked concrete													
Tension	2,500 psi	N_{allow}	[lb]		316	771	502	1,037	1,931	1,372	1,637	2,724	3,267
	8,000 psi	N_{allow}	[lb]		566	1,379	897	1,855	3,454	2,186	2,928	4,873	5,843
Shear	≥ 2,500 psi	V_{allow}	[lb]		535	1,120	860	1,402	2,734	3,255	6,105	6,105	6,105

Allowable values[1)2)]					
FBS IN I (zp) (carbon steel, zinc-plated)				Ø1/4"	
Nominal embedment depth		h_{nom}	[in]	1 5/8"	2 1/2"
Effective embedment depth		h_{ef}	[in]	1.24	2.01
Uncracked concrete					
Tension	2,500 psi	N_{allow}	[lb]	504	1,271
	8,000 psi	N_{allow}	[lb]	901	2,014
Shear	≥ 2,500 psi	V_{allow}	[lb]	547	547
Cracked concrete					
Tension	2,500 psi	N_{allow}	[lb]	184	401
	8,000 psi	N_{allow}	[lb]	293	639
Shear	≥ 2,500 psi	V_{allow}	[lb]	547	547

1) **Above values base on ESR-5456 and ACI 318-19 and apply for following requirements:**
- Allowable loads consider a partial safety factor for action load of α = (1.2) D +(1.6) L = (1.2) (0.30) + (1.6) (0.70) = 1.48.

2) **Above values for FBS IN I (Hex coupler) do not consider the steel insert element used and resulting values might be lower depending on the steel grade of the used steel insert element.**

Technical product information

3. Seismic strength of single anchors with large spacing and large edge distance

3.1 Nominal strength for SDC C, D, E or F ($N_{n,eq} = \min\{N_{sa}; N_{p,cr,eq}; N_{cb,cr,eq}\}$; $V_{n,eq} = \min\{V_{sa,eq}; V_{cp,cr,eq}\}$)

Nominal values[1]														
FBS IN HW (zp) (carbon steel, zinc-plated)					Ø3/8"		Ø1/2"			Ø5/8"	Ø3/4"		
Nominal embedment depth		h_{nom}	[in]		1 5/8"	2 1/2"	2 1/4"	3"	4 1/4"	3 1/4"	4"	5 1/2"	6 1/4"
Effective embedment depth		h_{ef}	[in]		1.21	1.98	1.66	2.30	3.37	2.54	3.14	4.41	5.05
Cracked concrete, seismic design categories C through F														
Tension	≥ 2,500 psi	$N_{n,eq}$	[lb]		540	1,316	1,013	2,093	3,540	2,190	3,304	5,498	6,593
Shear	≥ 2,500 psi	$V_{n,eq}$	[lb]		1,131	*1,800*	1,818	2,965	*3,730*	*6,880*	*13,240*	*13,240*	*13,240*

Nominal values[1][2]						
FBS IN I (zp) (carbon steel, zinc-plated)					Ø1/4"	
Nominal embedment depth		h_{nom}	[in]		1 5/8"	2 1/2"
Effective embedment depth		h_{ef}	[in]		1.24	2.01
Cracked concrete, seismic design categories C through F						
Tension	≥ 2,500 psi	$N_{n,eq}$	[lb]		454	810
Shear	≥ 2,500 psi	$V_{n,eq}$	[lb]		*1,125*	*1,125*

3.2 Design strength for SDC C, D, E or F ($\phi N_{n,eq} = \min\{\phi N_{sa}; \phi N_{p,cr,eq}; \phi N_{cb,cr,eq}\}$; $\phi V_{n,eq} = \min\{\phi V_{sa,eq}; \phi V_{cp,cr,eq}\}$)

Design values[1]														
FBS IN HW (zp) (carbon steel, zinc-plated)					Ø3/8"		Ø1/2"			Ø5/8"	Ø3/4"		
Nominal embedment depth		h_{nom}	[in]		1 5/8"	2 1/2"	2 1/4"	3"	4 1/4"	3 1/4"	4"	5 1/2"	6 1/4"
Effective embedment depth		h_{ef}	[in]		1.21	1.98	1.66	2.30	3.37	2.54	3.14	4.41	5.05
Cracked concrete, seismic design categories C through F														
Tension	≥ 2,500 psi	$\phi N_{n,eq}$	[lb]		351	856	557	1,151	1,947	1,424	1,817	3,024	3,626
Shear	≥ 2,500 psi	$\phi V_{n,eq}$	[lb]		792	1,080	1,273	2,075	2,238	4,128	7,944	7,944	7,944

Design values[1][2]						
FBS IN I (zp) (carbon steel, zinc-plated)					Ø1/4"	
Nominal embedment depth		h_{nom}	[in]		1 5/8"	2 1/2"
Effective embedment depth		h_{ef}	[in]		1.24	2.01
Cracked concrete, seismic design categories C through F						
Tension	≥ 2,500 psi	$\phi N_{n,eq}$	[lb]		204	446
Shear	≥ 2,500 psi	$\phi V_{n,eq}$	[lb]		675	675

4. Resistance to fire exposure

The Concrete screw FBS IN has not been tested for applications under fire exposure.

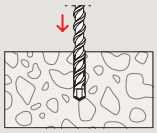
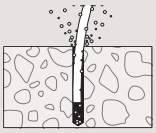
[1] **Above values base on ESR-5456 and ACI 318-19 and apply for following requirements:**
- Steel failure decisive = *Figures in blue italics*.

[2] **Above values for FBS IN I (Hex coupler) do not consider the steel insert element used and resulting values might be lower depending on the steel grade of the used steel insert element.**

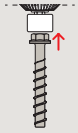
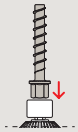
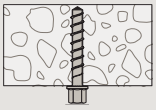
Technical product information

5. Installation data

5.1 Installation instructions – Bore hole drilling and cleaning

Drill method	Bore hole drilling	Cleaning procedure
Hammer drilling	 Drill bore hole.	 Remove drill dust.

5.2 Installation instructions – Anchor installation

Application condition	Anchor installation procedure		
FBS IN HW: Push-through installation – Static and quasi-static or seismic application	 Set anchor with torque impact screw driver or manually.	 Installation is finished, when screw head touches anchor plate.	 Installed anchor.
FBS IN I: Pre-positioned installation – Static and quasi-static or seismic application	 Set anchor with torque impact screw driver or manually.	 Installation is finished, when screw head touches concrete surface.	 Installed anchor. After anchor installation a threaded rod or screw can be screwed into the anchor.

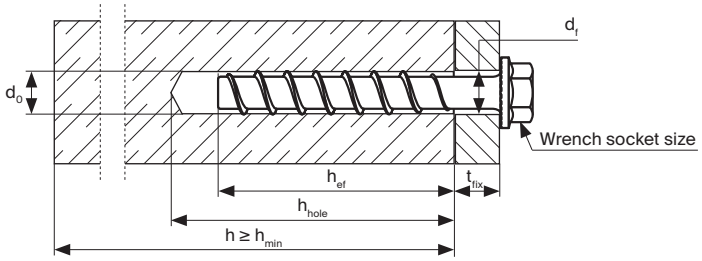
Technical product information

5. Installation data

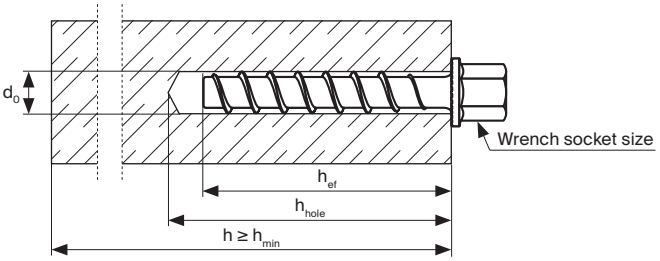
5.3 Installation parameters

Parameters for anchor installation														
			FBS IN HW									FBS IN I		
			Ø3/8"		Ø1/2"			Ø5/8"	Ø3/4"			Ø1/4"		
Nominal embedment depth	h_{nom}	[in]	1 5/8	2 1/2	2 1/4	3	4 1/4	3 1/4	4	5 1/2	6 1/4	1 5/8	2 1/2	
Minimum effective anchorage depth	h_{ef}	[in]	1.21	1.98	1.66	2.30	3.37	2.54	3.14	4.41	5.05	1.24	2.01	
Drill hole depth in concrete	h_{hole}	[in]	2	2 7/8	2 5/8	3 3/8	4 5/8	3 5/8	4 1/2	6	6 3/4	2	2 7/8	
Drill hole depth for through fixing	t_d	[in]	$h_{hole} + t_{fix}$									n/a	n/a	
Nominal drill hole diameter	d_0	[in]	3/8	3/8	1/2	1/2	1/2	5/8	3/4	3/4	3/4	1/4	1/4	
Maximum cutting diameter of drill bit	$d_{cut,max}$	[in]	0.398	0.398	0.530	0.530	0.530	0.660	0.787	0.787	0.787	0.268	0.268	
Diameter of clearance hole in fixture	d_f	[in]	1/2	1/2	5/8	5/8	5/8	3/4	7/8	7/8	7/8	n/a	n/a	
Wrench socket size		[in]	9/16	9/16	3/4	3/4	3/4	15/16	1 1/8	1 1/8	1 1/8	1/2	1/2	
Manual installation torque	$T_{inst,max}$	[ft lb]	n/a	n/a	n/a	n/a	n/a	n/a	103	103	103	21	21	
Torque impact screw driver	$T_{imp,max}$	[ft lb]	135	135	260	260	260	260	440	440	440	135	135	
Internal thread size (UNC coarse)		[in]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1/4-20	3/8-16	1/4-20	3/8-16
Minimum screw-in depth		[in]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5/16	13/32	5/16	13/32
Maximum screw-in depth		[in]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	13/32	13/32	13/32	13/32

FBS IN HW:



FBS IN I:



Legend:

h_{ef} = Effective anchorage depth
t_{fix} = Thickness of the fixture
h_{hole} = Drill hole depth to the deepest point
d_0 = Nominal drill hole diameter
d_f = Diameter of clearance hole in fixture
h_{min} = Minimum thickness of the concrete member
h = Thickness of the concrete member

5.4 Minimum spacings, minimum edge distances and minimum concrete member thicknesses

Parameters of the installed anchor in the concrete													
			FBS IN HW									FBS IN I	
			Ø3/8"		Ø1/2"			Ø5/8"	Ø3/4"			Ø1/4"	
Nominal embedment depth	h_{nom}	[in]	1 5/8	2 1/2	2 1/4	3	4 1/4	3 1/4	4	5 1/2	6 1/4	1 5/8	2 1/2
Minimum effective anchorage depth	h_{ef}	[in]	1.21	1.98	1.66	2.30	3.37	2.54	3.14	4.41	5.05	1.24	2.01
Minimum thickness of concrete member	h_{min}	[in]	3 5/8	4 1/2	4 1/4	5	6 1/4	5 1/4	6	7 1/2	8 1/4	4	4 3/8
Minimum edge distance	c_{min}	[in]	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Minimum spacing	s_{min}	[in]	3	3	3	3	3	3	3	3	3	3	3

Technical product information

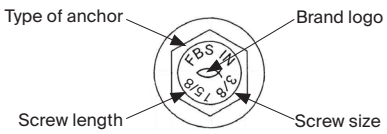
6. Materials

6.1 Approved materials of the anchor components

Overview about the materials used in the anchor system		
Anchor component	**General material definition**	**Common used material**
FBS IN HW (carbon steel, zinc plated)		
Screw	Hardened carbon steel (zinc plated)	Carbon steel, zinc plated (0.0002 in) and passivated
FBS IN I (carbon steel, zinc plated)		
Screw	Hardened carbon steel (zinc plated)	Carbon steel, zinc plated (0.0002 in) and passivated

6.2 Product marking

Marking of FBS IN		
Type of anchor	**Description of the marking**	**Example**
FBS IN HW	Type of anchor, screw size, screw length, brand logo	FBS IN 3/8 1 5/8
FBS IN I	n/a	n/a



6.3 Mechanical properties

Characteristics of the anchor													
			FBS IN HW									FBS IN I	
			Ø3/8"		Ø1/2"		Ø5/8"	Ø3/4"				Ø1/4"	
Nominal embedment depth	h_{nom}	**[in]**	1 5/8	2 1/2	2 1/4	3	4 1/4	3 1/4	4	5 1/2	6 1/4	1 5/8	2 1/2
Minimum effective anchorage depth	h_{ef}	**[in]**	1.21	1.98	1.66	2.30	3.37	2.54	3.14	4.41	5.05	1.24	2.01
Stressed cross sectional area	A_{se}	**[in²]**	0.1020	0.1020	0.1827	0.1827	0.1827	0.2888	0.4145	0.4145	0.4145	0.0453	0.0453
Yield strength	f_y	**[psi]**	90,505	90,505	90,505	90,505	90,505	90,505	90,505	90,505	90,505	81,220	81,220
Tensile strength	f_{uta}	**[psi]**	113,130	113,130	113,130	113,130	113,130	113,130	113,130	113,130	113,130	101,525	101,525