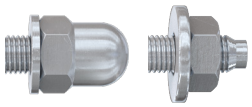
Bolt anchor FAZ II.
General product information

FAZ II gvz (M6 – M24)



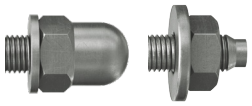
FAZ II H gvz (M10 – M12)

FAZ II GS gvz (M8 – M16)

FAZ II HBS gvz (M12 – M16)

FAZ II K gvz (M8 – M12)

FAZ II R (M6 – M24)



FAZ II H R (M10 – M12)

FAZ II GS R (M8 – M16)

FAZ II HCR (M8 – M16)

Features and advantages

- European Technical Assessment *) for cracked and non-cracked concrete and Seismic Categories C1 and C2 and including Fire Resistance R30 – R120
- ICC-ES Evaluation Report *) for cracked and non-cracked concrete and Seismic Categories A-F
- Variable anchorage depths for the sizes M8 to M16
- Expert report for use in low strength concrete C12/15 and high strength concrete C55/67 up to C80/95
- Various drilling methods – Hammer-, Diamond-, Hollow drill bit drilling

*) The conditions of use (e.g. design resistances, characteristic distance, ...) in the European Technical Assessment or in the ICC-ES Evaluation Report may vary from those of the Technical Handbook.

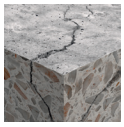
Anchor materials

Bolt anchor:

- Carbon steel, zinc plated (5 µm) and passivated (gvz)
- Stainless steel (R) of corrosion resistance class (CRC) III, e.g. 1.4401 optional 1.4571 and according to ASTM/AISI steel grade 316
- Highly corrosion-resistant steel (HCR) of the corrosion resistance class (CRC) V, e.g. 1.4529

Base materials

- Cracked concrete, C20/25 – C50/60



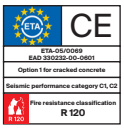
- Non-cracked concrete, C20/25 – C50/60

- Low strength concrete, C12/15

- High strength concrete, C55/67 – C80/95

Certificates

- ETA-05/0069 (2020-04-24)



- ESR-2948 (2021-05)

- Expert report IEA No. 16-064 (2016-12-27)
- BBK, Germany (2007-12-31)
- Expert report University Stuttgart (2013-01-31)

- VdS CEA 4001:2008-11(03) (Internet listing)

- FM ID: 0003023222 (2015-02-12)

Design features

- FiXperience Design Software

- Static and quasi-static design

- Seismic design

- Design under fire exposure

Installation features

- Hammer drilling

- Hollow drill bit drilling

- Diamond drilling

Technical product information

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

Mean values[1]													
FAZ II gvz (carbon steel, zinc-plated)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	[mm]	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	$N_{Ru,m}$	[kN]	11.7	14.7	*16.6*	17.1	26.7	23.9	38.3	35.4	54.7	61.6	87.9
	C 50/60	$N_{Ru,m}$	[kN]	*13.6*	*16.6*	*16.6*	26.5	*28.6*	37.0	*43.6*	54.8	*69.5*	97.4	139.0
Shear	≥ C 20/25	$V_{Ru,m}$	[kN]	*6.5*	*15.2*	*15.2*	*23.9*	*23.9*	*33.2*	*33.2*	*62.5*	*62.5*	*97.0*	*147.0*
Cracked concrete														
Tension	C 20/25	$N_{Ru,m}$	[kN]	8.0	12.8	12.8	12.1	20.0	17.0	27.4	25.2	45.7	55.8	75.6
	C 50/60	$N_{Ru,m}$	[kN]	11.1	*16.6*	*16.6*	18.8	*28.6*	26.3	*43.4*	39.0	*69.5*	88.2	119.5
Shear	≥ C 20/25	$V_{Ru,m}$	[kN]	*6.5*	*15.2*	*15.2*	*23.9*	*23.9*	*33.2*	*33.2*	*62.5*	*62.5*	*97.0*	*147.0*

Mean values[1]													
FAZ II R (stainless steel, CRC III)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	[mm]	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	$N_{Ru,m}$	[kN]	11.4	14.7	16.6	17.1	26.7	23.9	38.3	35.4	54.7	61.6	87.9
	C 50/60	$N_{Ru,m}$	[kN]	*12.2*	*17.0*	*17.0*	26.5	*28.6*	37.0	43.6	54.8	*69.5*	97.4	139.0
Shear	≥ C 20/25	$V_{Ru,m}$	[kN]	*9.1*	*19.5*	*19.5*	*28.4*	*28.4*	*41.6*	*41.6*	*76.7*	*76.7*	*119.0*	*170.0*
Cracked concrete														
Tension	C 20/25	$N_{Ru,m}$	[kN]	8.0	12.8	12.8	12.1	22.0	17.0	26.5	25.2	39.8	64.2	75.6
	C 50/60	$N_{Ru,m}$	[kN]	11.1	*17.0*	*17.0*	18.8	*28.6*	26.3	43.4	39.0	*69.5*	88.2	119.5
Shear	≥ C 20/25	$V_{Ru,m}$	[kN]	*9.1*	*19.5*	*19.5*	*28.4*	*28.4*	*41.6*	*41.6*	*76.7*	*76.7*	*119.0*	*170.0*

Mean values[1]													
FAZ II HCR (high corrosion-resistant steel, CRC V)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	[mm]	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	$N_{Ru,m}$	[kN]	11.4	14.7	16.6	17.1	26.7	23.9	38.3	35.4	54.7	61.6	87.9
	C 50/60	$N_{Ru,m}$	[kN]	*12.2*	*17.0*	*17.0*	26.5	*28.6*	37.0	43.6	54.8	*69.5*	97.4	139.0
Shear	≥ C 20/25	$V_{Ru,m}$	[kN]	*9.1*	*19.5*	*19.5*	*28.4*	*28.4*	*41.6*	*41.6*	*76.7*	*76.7*	*119.0*	*170.0*
Cracked concrete														
Tension	C 20/25	$N_{Ru,m}$	[kN]	8.0	12.8	12.8	12.1	20.0	17.0	27.4	25.2	45.7	64.2	75.6
	C 50/60	$N_{Ru,m}$	[kN]	11.1	*17.0*	*17.0*	18.8	*28.6*	26.3	43.4	39.0	*69.5*	88.2	119.5
Shear	≥ C 20/25	$V_{Ru,m}$	[kN]	*9.1*	*19.5*	*19.5*	*28.4*	*28.4*	*41.6*	*41.6*	*76.7*	*76.7*	*119.0*	*170.0*

[1] **Above values base on fischer ENSO specification and apply for following requirements:**
- Concrete strength based on $f_{ck,cube}$.
- Steel failure decisive = *Figures in blue italics*.

Technical product information

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

2.1 Characteristic resistance

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Characteristic values[1]													
FAZ II gvz (carbon steel, zinc-plated)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	[mm]	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	N_{Rk}	[kN]	*7.6*	10.5	14.0	12.8	20.0	17.9	22.0	26.5	38.6	49.2	68.8
	C 50/60	N_{Rk}	[kN]	*7.6*	16.2	*16.6*	19.8	*28.3*	27.7	34.1	41.0	59.8	76.3	106.6
Shear	≥ C 20/25	V_{Rk}	[kN]	*5.9*	*13.6*	*13.6*	*21.4*	*21.4*	*30.6*	*30.6*	*55.0*	*55.0*	*81.4*	*110.1*
Cracked concrete														
Tension	C 20/25	N_{Rk}	[kN]	1.5	5.5	8.0	9.1	13.0	12.7	20.0	18.9	27.0	34.4	48.1
	C 50/60	N_{Rk}	[kN]	2.3	8.5	12.4	14.1	20.2	19.7	31.0	29.2	41.9	53.3	74.6
Shear	≥ C 20/25	V_{Rk}	[kN]	*5.9*	*13.6*	*13.6*	*21.4*	*21.4*	*30.6*	*30.6*	*55.0*	*55.0*	*81.4*	*110.1*

Characteristic values[1]													
FAZ II R (stainless steel, CRC III)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	[mm]	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	N_{Rk}	[kN]	10.5	10.5	14.0	12.8	20.0	17.9	22.0	26.5	38.6	49.2	68.8
	C 50/60	N_{Rk}	[kN]	*11.4*	16.2	*17.0*	19.8	*29.0*	27.7	34.1	41.0	59.8	76.3	106.6
Shear	≥ C 20/25	V_{Rk}	[kN]	*8.8*	*16.8*	*16.8*	*26.5*	*26.5*	*38.3*	*38.3*	*69.8*	*69.8*	*106.3*	*148.5*
Cracked concrete														
Tension	C 20/25	N_{Rk}	[kN]	1.5	5.5	8.0	9.1	13.0	12.7	20.0	18.9	27.0	34.4	48.1
	C 50/60	N_{Rk}	[kN]	2.3	8.5	12.4	14.1	20.2	19.7	31.0	29.2	41.9	53.3	74.6
Shear	≥ C 20/25	V_{Rk}	[kN]	*8.8*	*16.8*	*16.8*	23.7	*26.5*	*38.3*	*38.3*	60.4	*69.8*	93.6	120.7

Characteristic values[1]													
FAZ II HCR (high corrosion-resistant steel, CRC V)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	[mm]	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	N_{Rk}	[kN]	10.5	10.5	14.0	12.8	20.0	17.9	22.0	26.5	38.6	49.2	68.8
	C 50/60	N_{Rk}	[kN]	*11.4*	16.2	*17.0*	19.8	*29.0*	27.7	34.1	41.0	59.8	76.3	106.6
Shear	≥ C 20/25	V_{Rk}	[kN]	*8.8*	*16.8*	*16.8*	*26.5*	*26.5*	*38.3*	*38.3*	*69.8*	*69.8*	*106.3*	*148.5*
Cracked concrete														
Tension	C 20/25	N_{Rk}	[kN]	1.5	5.5	8.0	9.1	13.0	12.7	20.0	18.9	27.0	34.4	48.1
	C 50/60	N_{Rk}	[kN]	2.3	8.5	12.4	14.1	20.2	19.7	31.0	29.2	41.9	53.3	74.6
Shear	≥ C 20/25	V_{Rk}	[kN]	*8.8*	*16.8*	*16.8*	23.7	*26.5*	*38.3*	*38.3*	60.4	*69.8*	93.6	120.7

[1] **Above values base on fischer ENSO specification and apply for following requirements:**
- Concrete strength based on $f_{ck,cube}$.
- Working life ≤ 50 years.
- Steel failure decisive = *Figures in blue italics*.

Technical product information

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

2.2 Design resistance

Design values[1]														
FAZ II gvz (carbon steel, zinc-plated)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	**[mm]**	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	N_{Rd}	**[kN]**	5.1	7.0	9.3	8.5	13.3	11.9	14.7	17.6	25.7	32.8	45.9
	C 50/60	N_{Rd}	**[kN]**	5.1	10.8	11.1	13.2	18.9	18.4	22.7	27.3	39.9	50.8	71.1
Shear	≥ C 20/25	V_{Rd}	**[kN]**	4.7	10.9	10.9	17.1	17.1	24.5	24.5	44.0	44.0	65.1	88.1
Cracked concrete														
Tension	C 20/25	N_{Rd}	**[kN]**	1.0	3.7	5.3	6.1	8.7	8.5	13.3	12.6	18.0	22.9	32.1
	C 50/60	N_{Rd}	**[kN]**	1.6	5.7	8.3	9.4	13.4	13.1	20.7	19.5	27.9	35.5	49.7
Shear	≥ C 20/25	V_{Rd}	**[kN]**	4.7	10.9	10.9	15.8	17.1	24.5	24.5	40.2	44.0	62.4	80.5

Design values[1]														
FAZ II R (stainless steel, CRC III)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	**[mm]**	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	N_{Rd}	**[kN]**	7.0	7.0	9.3	8.5	13.3	11.9	14.7	17.6	25.7	32.8	45.9
	C 50/60	N_{Rd}	**[kN]**	7.6	10.8	11.3	13.2	19.3	18.4	22.7	27.3	39.9	50.8	71.1
Shear	≥ C 20/25	V_{Rd}	**[kN]**	7.0	13.4	13.4	21.2	21.2	30.6	30.6	55.8	55.8	85.0	112.9
Cracked concrete														
Tension	C 20/25	N_{Rd}	**[kN]**	1.0	3.7	5.3	6.1	8.7	8.5	13.3	12.6	18.0	22.9	32.1
	C 50/60	N_{Rd}	**[kN]**	1.6	5.7	8.3	9.4	13.4	13.1	20.7	19.5	27.9	35.5	49.7
Shear	≥ C 20/25	V_{Rd}	**[kN]**	7.0	12.4	13.4	15.8	21.2	26.3	30.6	40.2	55.8	62.4	80.5

Design values[1]														
FAZ II HCR (high corrosion-resistant steel, CRC V)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	**[mm]**	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	N_{Rd}	**[kN]**	7.0	7.0	9.3	8.5	13.3	11.9	14.7	17.6	25.7	32.8	45.9
	C 50/60	N_{Rd}	**[kN]**	7.6	10.8	11.3	13.2	19.3	18.4	22.7	27.3	39.9	50.8	71.1
Shear	≥ C 20/25	V_{Rd}	**[kN]**	7.0	13.4	13.4	21.2	21.2	30.6	30.6	55.8	55.8	85.0	112.9
Cracked concrete														
Tension	C 20/25	N_{Rd}	**[kN]**	1.0	3.7	5.3	6.1	8.7	8.5	13.3	12.6	18.0	22.9	32.1
	C 50/60	N_{Rd}	**[kN]**	1.6	5.7	8.3	9.4	13.4	13.1	20.7	19.5	27.9	35.5	49.7
Shear	≥ C 20/25	V_{Rd}	**[kN]**	7.0	12.4	13.4	15.8	21.2	26.3	30.6	40.2	55.8	62.4	80.5

[1] **Above values base on fischer ENSO specification and apply for following requirements:**
- Concrete strength based on $f_{ck,cube}$.
- Working life ≤ 50 years.

Technical product information

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

2.3 Recommended loads

Recommended values[1]													
FAZ II gvz (carbon steel, zinc-plated)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	[mm]	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	N_{rec}	[kN]	3.6	5.0	6.7	6.1	9.5	8.5	10.5	12.6	18.4	23.4	32.8
	C 50/60	N_{rec}	[kN]	3.6	7.7	7.9	9.4	13.5	13.2	16.2	19.5	28.5	36.3	50.8
Shear	≥ C 20/25	V_{rec}	[kN]	3.4	7.8	7.8	12.2	12.2	17.5	17.5	31.4	31.4	46.5	62.9
Cracked concrete														
Tension	C 20/25	N_{rec}	[kN]	0.7	2.6	3.8	4.3	6.2	6.1	9.5	9.0	12.9	16.4	22.9
	C 50/60	N_{rec}	[kN]	1.1	4.1	5.9	6.7	9.6	9.4	14.8	13.9	19.9	25.4	35.5
Shear	≥ C 20/25	V_{rec}	[kN]	3.4	7.8	7.8	11.3	12.2	17.5	17.5	28.7	31.4	44.6	57.5

Recommended values[1]													
FAZ II R (stainless steel, CRC III)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	[mm]	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	N_{rec}	[kN]	5.0	5.0	6.7	6.1	9.5	8.5	10.5	12.6	18.4	23.4	32.8
	C 50/60	N_{rec}	[kN]	5.4	7.7	8.1	9.4	13.8	13.2	16.2	19.5	28.5	36.3	50.8
Shear	≥ C 20/25	V_{rec}	[kN]	5.0	9.6	9.6	15.1	15.1	21.9	21.9	39.9	39.9	60.7	80.7
Cracked concrete														
Tension	C 20/25	N_{rec}	[kN]	0.7	2.6	3.8	4.3	6.2	6.1	9.5	9.0	12.9	16.4	22.9
	C 50/60	N_{rec}	[kN]	1.1	4.1	5.9	6.7	9.6	9.4	14.8	13.9	19.9	25.4	35.5
Shear	≥ C 20/25	V_{rec}	[kN]	5.0	8.9	9.6	11.3	15.1	18.8	21.9	28.7	39.9	44.6	57.5

Recommended values[1]													
FAZ II HCR (high corrosion-resistant steel, CRC V)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	[mm]	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Non-cracked concrete														
Tension	C 20/25	N_{rec}	[kN]	5.0	5.0	6.7	6.1	9.5	8.5	10.5	12.6	18.4	23.4	32.8
	C 50/60	N_{rec}	[kN]	5.4	7.7	8.1	9.4	13.8	13.2	16.2	19.5	28.5	36.3	50.8
Shear	≥ C 20/25	V_{rec}	[kN]	5.0	9.6	9.6	15.1	15.1	21.9	21.9	39.9	39.9	60.7	80.7
Cracked concrete														
Tension	C 20/25	N_{rec}	[kN]	0.7	2.6	3.8	4.3	6.2	6.1	9.5	9.0	12.9	16.4	22.9
	C 50/60	N_{rec}	[kN]	1.1	4.1	5.9	6.7	9.6	9.4	14.8	13.9	19.9	25.4	35.5
Shear	≥ C 20/25	V_{rec}	[kN]	5.0	8.9	9.6	11.3	15.1	18.8	21.9	28.7	39.9	44.6	57.5

[1] **Above values base on fischer ENSO specification and apply for following requirements:**

- Concrete strength based on $f_{ck,cube}$.
- Working life ≤ 50 years.
- Recommended loads consider a partial safety factor for action load of $\gamma_L = 1.4$.

Technical product information

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

3.1 Characteristic resistance ($N_{Rk,C1/C2}$ = min{$N_{Rk,s,C1/C2}$; $N_{Rk,p,C1/C2}$; $N_{Rk,c,C1/C2}$}; $V_{Rk,C1/C2}$ = min{$V_{Rk,s,C1/C2}$; $V_{Rk,cp,C1/C2}$})

Characteristic values[1]																
FAZ II gvz (carbon steel, zinc-plated)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	**[mm]**	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Cracked concrete, seismic performance category C1														
Tension	≥ C 20/25	$N_{Rk,C1}$	**[kN]**	–	–	4.6	7.7	8.0	10.8	16.0	16.0	24.0	30.6	42.8
Shear	≥ C 20/25	$V_{Rk,C1}$	**[kN]**	–	–	*11.0*	*17.0*	*17.0*	*27.0*	*27.0*	*47.0*	*47.0*	*56.0*	*69.0*
Cracked concrete, seismic performance category C2														
Tension	≥ C 20/25	$N_{Rk,C2}$	**[kN]**	–	–	–	2.7	5.1	4.4	7.4	16.0	21.5	30.6	–
Shear	≥ C 20/25	$V_{Rk,C2}$	**[kN]**	–	–	–	*7.0*	*10.0*	*12.7*	*17.4*	*22.0*	*27.5*	*39.9*	–

Characteristic values[1]																
FAZ II R (stainless steel, CRC III)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	**[mm]**	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Cracked concrete, seismic performance category C1														
Tension	≥ C 20/25	$N_{Rk,C1}$	**[kN]**	–	–	4.6	7.7	8.0	10.8	16.0	16.0	24.0	30.6	42.8
Shear	≥ C 20/25	$V_{Rk,C1}$	**[kN]**	–	–	*11.0*	*17.0*	*17.0*	*27.0*	*27.0*	*47.0*	*47.0*	*56.0*	*69.0*
Cracked concrete, seismic performance category C2														
Tension	≥ C 20/25	$N_{Rk,C2}$	**[kN]**	–	–	–	2.7	5.1	4.4	7.4	16.0	21.5	30.6	–
Shear	≥ C 20/25	$V_{Rk,C2}$	**[kN]**	–	–	–	*7.0*	*10.0*	*12.7*	*17.4*	*22.0*	*27.5*	*39.9*	–

Characteristic values[1]																
FAZ II HCR (high corrosion-resistant steel, CRC V)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	**[mm]**	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Cracked concrete, seismic performance category C1														
Tension	≥ C 20/25	$N_{Rk,C1}$	**[kN]**	–	–	4.6	7.7	8.0	10.8	16.0	16.0	24.0	30.6	42.8
Shear	≥ C 20/25	$V_{Rk,C1}$	**[kN]**	–	–	*11.0*	*17.0*	*17.0*	*27.0*	*27.0*	*47.0*	*47.0*	*56.0*	*69.0*
Cracked concrete, seismic performance category C2														
Tension	≥ C 20/25	$N_{Rk,C2}$	**[kN]**	–	–	–	–	–	–	–	–	–	–	–
Shear	≥ C 20/25	$V_{Rk,C2}$	**[kN]**	–	–	–	–	–	–	–	–	–	–	–

[1] **Above values base on fischer ENSO specification and apply for following requirements:**
- Concrete strength based on $f_{ck,cube}$; Hammer or hollow drill bit drilling.
- Working life ≤ 50 years.
- Reduction factor considering gap between anchor and fixture is α_{gap} = 1.0 (= no gap → use fischer Filling disc FFD).
- Steel failure decisive = *Figures in blue italics*.

Technical product information

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

3.2 Design resistance ($N_{Rd,C1/C2} = \min\{N_{Rd,s,C1/C2}; N_{Rd,p,C1/C2}; N_{Rd,c,C1/C2}\}$; $V_{Rd,C1/C2} = \min\{V_{Rd,s,C1/C2}; V_{Rd,cp,C1/C2}\}$)

Design values[1]														
FAZ II gvz (carbon steel, zinc-plated)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	**[mm]**	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Cracked concrete, seismic performance category C1														
Tension	≥ C 20/25	$N_{Rd,C1}$	**[kN]**	–	–	3.1	5.2	5.3	7.2	10.7	10.7	16.0	20.4	28.5
Shear	≥ C 20/25	$V_{Rd,C1}$	**[kN]**	–	–	8.8	13.4	13.6	21.6	21.6	34.2	37.6	44.8	55.2
Cracked concrete, seismic performance category C2														
Tension	≥ C 20/25	$N_{Rd,C2}$	**[kN]**	–	–	–	1.8	3.4	2.9	4.9	10.7	14.3	20.4	–
Shear	≥ C 20/25	$V_{Rd,C2}$	**[kN]**	–	–	–	5.6	8.0	10.2	13.9	17.6	22.0	31.9	–

Design values[1]														
FAZ II R (stainless steel, CRC III)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	**[mm]**	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Cracked concrete, seismic performance category C1														
Tension	≥ C 20/25	$N_{Rd,C1}$	**[kN]**	–	–	3.1	5.2	5.3	7.2	10.7	10.7	16.0	20.4	28.5
Shear	≥ C 20/25	$V_{Rd,C1}$	**[kN]**	–	–	8.8	13.4	13.6	21.6	21.6	34.2	37.6	44.8	55.2
Cracked concrete, seismic performance category C2														
Tension	≥ C 20/25	$N_{Rd,C2}$	**[kN]**	–	–	–	1.8	3.4	2.9	4.9	10.7	14.3	20.4	–
Shear	≥ C 20/25	$V_{Rd,C2}$	**[kN]**	–	–	–	5.6	8.0	10.2	13.9	17.6	22.0	31.9	–

Design values[1]														
FAZ II HCR (high corrosion-resistant steel, CRC V)				**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth		h_{ef}	**[mm]**	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Cracked concrete, seismic performance category C1														
Tension	≥ C 20/25	$N_{Rd,C1}$	**[kN]**	–	–	3.1	5.2	5.3	7.2	10.7	10.7	16.0	20.4	28.5
Shear	≥ C 20/25	$V_{Rd,C1}$	**[kN]**	–	–	8.8	13.4	13.6	21.6	21.6	34.2	37.6	44.8	55.2
Cracked concrete, seismic performance category C2														
Tension	≥ C 20/25	$N_{Rd,C2}$	**[kN]**	–	–	–	–	–	–	–	–	–	–	–
Shear	≥ C 20/25	$V_{Rd,C2}$	**[kN]**	–	–	–	–	–	–	–	–	–	–	–

[1] **Above values base on fischer ENSO specification and apply for following requirements:**
- Concrete strength based on $f_{ck,cube}$; Hammer or hollow drill bit drilling.
- Working life ≤ 50 years.
- Reduction factor considering gap between anchor and fixture is α_{gap} = 1.0 (= no gap → use fischer Filling disc FFD).

Technical product information

4. Fire resistance of single anchors with large spacing and large edge distance

Design values[1] for fire resistance classes R30, R60, R90 and R120													
FAZ II gvz (carbon steel, zinc-plated) **FAZ II R** (stainless steel, CRC III) **FAZ II HCR** (high corrosion-resistant steel, CRC V)				M6	M8		M10		M12		M16		M20	M24
Embedment depth		h_{ef}	[mm]	40	35	45	40	60	50	70	65	85	100	125
Cracked concrete, fire resistance class R30														
Tension	≥ C 20/25	$N_{Rd,fi,30}$	[kN]	0.4	0.9	1.4	1.8	2.8	3.0	5.0	4.5	6.8	8.6	12.0
Shear	≥ C 20/25	$V_{Rd,fi,30}$	[kN]	0.9	1.8	1.8	3.6	3.6	6.3	6.3	11.7	11.7	18.2	26.3
Cracked concrete, fire resistance class R60														
Tension	≥ C 20/25	$N_{Rd,fi,60}$	[kN]	0.4	0.8	1.2	1.8	2.3	3.0	4.1	4.5	6.8	8.6	12.0
Shear	≥ C 20/25	$V_{Rd,fi,60}$	[kN]	0.9	1.6	1.6	2.9	2.9	4.9	4.9	9.1	9.1	14.2	20.5
Cracked concrete, fire resistance class R90														
Tension	≥ C 20/25	$N_{Rd,fi,90}$	[kN]	0.4	0.5	0.9	1.8	1.9	3.0	3.2	4.5	6.0	8.6	12.0
Shear	≥ C 20/25	$V_{Rd,fi,90}$	[kN]	0.9	1.3	1.3	2.2	2.2	3.5	3.5	6.6	6.6	10.3	14.8
Cracked concrete, fire resistance class R120														
Tension	≥ C 20/25	$N_{Rd,fi,120}$	[kN]	0.3	0.3	0.8	1.5	1.6	2.4	2.8	3.6	5.2	6.9	9.6
Shear	≥ C 20/25	$V_{Rd,fi,120}$	[kN]	0.7	1.2	1.2	1.9	1.9	2.8	2.8	5.3	5.3	8.3	11.9

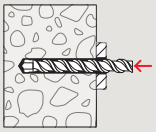
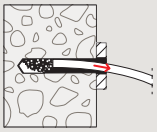
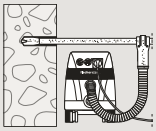
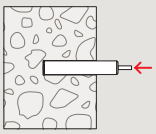
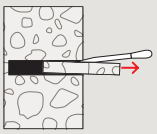
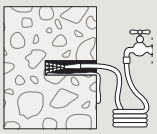
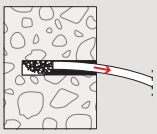
[1] **Above values base on fischer ENSO specification and apply for following requirements:**

- Concrete strength based on $f_{ck,cube}$.
- Working life ≤ 50 years.
- Partial safety factor for resistance under fire exposure in accordance with EN 1992-4:2018 for steel failure and all shear failure modes $\gamma_{M,fi} = 1.0$ is considered. For concrete failure modes for tension the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1.0 \times \gamma_{inst}$ is considered.

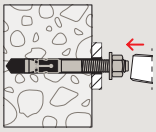
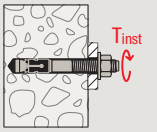
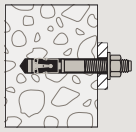
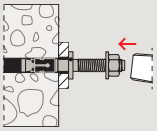
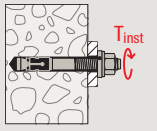
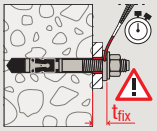
Technical product information

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.
Hollow drill bit drilling	 Drill bore hole.	 Cleaning obsolete.
Diamond drilling	 Drill bore hole.	 Remove drill core.  Rinse bore hole with water.  Remove drill dust.

5.2 Installation instructions – Anchor installation

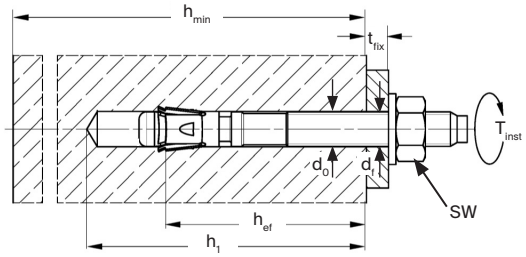
Application condition	Anchor installation procedure
Push-through installation – Static and quasi-static application in all types of bore holes (see 5.1)	 Set anchor.  Apply torque.  Installed anchor.
Seismic application (in hammer or hollow drilled holes only).	 Add filling disc FFD to the anchor. The concave side of the disc has to face the anchor plate.  Set anchor.  Apply torque.  Fill annular gap with injection mortar (e.g. FIS SB) and elapse curing time. Note, that the filling disc FFD reduces the useable length.

Technical product information

5. Installation data

5.3 Installation parameters

Parameters for anchor installation													
FAZ II			**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Minimum effective anchorage depth	h_{ef}	[mm]	40	35	45	40	60	50	70	65	85	100	125
Drill hole depth in concrete	h_1	[mm]	51.5	49.5	59.5	57.0	77.0	68.5	88.5	87.5	107.5	130.0	158.5
Drill hole depth for through fixing	t_d	[mm]	$h_1 + t_{fix}$										
Nominal drill hole diameter	d_0	[mm]	6	8	8	10	10	12	12	16	16	20	24
Maximum cutting diameter of drill bit for hammer and hollow drilling	$d_{cut,max}$	[mm]	6.40	8.45	8.45	10.45	10.45	12.50	12.50	16.50	16.50	20.55	24.55
Maximum cutting diameter of drill bit for diamond drilling	$d_{cut,max}$	[mm]	–	8.15	8.15	10.45	10.45	12.25	12.25	16.45	16.45	20.50	24.40
Diameter of clearance hole in fixture (push-through)	d_f	[mm]	≤ 7	≤ 9	≤ 9	≤ 12	≤ 12	≤ 14	≤ 14	≤ 18	≤ 18	≤ 22	≤ 26
Width across nut	SW	[mm]	10	13	13	17	17	19	19	24	24	30	36
Required installation torque moment	T_{inst}	[Nm]	8	20	20	45	45	60	60	110	110	200	270
fischer Filling disc FFD (e.g. as alignment washer or for seismic applications)													
Item No. of filling disc FFD		gvz	–	538458	538458	538458	538458	538459	538459	538460	538460	538461	538462
		R	–	541986	541986	541986	541986	541987	541987	541988	541988	541989	541930
Thickness of filling disc FFD	t_{FFD}	[mm]	–	6	6	6	6	6	6	7	7	8	10
Outer diameter of filling disc FFD	d_{FFD}	[mm]	–	26	26	26	26	30	30	38	38	46	54



Legend:

h_{ef}	=	Effective anchorage depth
t_{fix}	=	Thickness of the fixture
h_1	=	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
SW	=	Width across nut
T_{inst}	=	Required installation torque moment

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

Parameters of the installed anchor in the concrete													
FAZ II			**M6**	**M8**		**M10**		**M12**		**M16**		**M20**	**M24**
Embedment depth	h_{ef}	[mm]	**40**	**35**	**45**	**40**	**60**	**50**	**70**	**65**	**85**	**100**	**125**
Minimum thickness of concrete member	h_{min}	[mm]	81.5	80	89.5	87	107	100	118.5	140	140	170	206.5
Non-cracked concrete													
Minimum edge distance	c_{min}	[mm]	45	40	40	45	45	55	55	65	65	95	135
for spacing	s	[mm]	35	40	40	40	40	50	50	65	65	95	100
Minimum spacing	s_{min}	[mm]	35	40	40	40	40	50	50	65	65	95	100
for edge distance	c	[mm]	45	40	40	45	45	55	55	65	65	95	135
Cracked concrete													
Minimum edge distance	c_{min}	[mm]	45	40	40	45	45	55	55	65	65	85	100
for spacing	s	[mm]	35	35	35	40	40	50	50	65	65	95	100
Minimum spacing	s_{min}	[mm]	35	35	35	40	40	50	50	65	65	95	100
for edge distance	c	[mm]	45	40	40	45	45	55	55	65	65	85	100

Technical product information

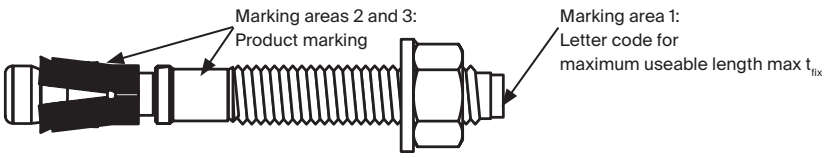
6. Materials

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**
FAZ II gvz (carbon steel, zinc plated)		
Cone bolt	Cold form steel or free cutting steel (zinc plated) Nominal steel tensile strength: $f_{uk} \leq 1{,}000$ N/mm² (thread)	Carbon steel, zinc plated (5µm) and passivated
Expansion clip	Cold strip, EN 10139:2016 (zinc plated) Optional: Stainless steel EN 10088:2014	
Hexagon nut	Steel, minimum property class 8, EN ISO 898-2:2012 (zinc plated)	
Washer	Cold strip, EN 10139:2016 (zinc plated)	
FAZ II R (stainless steel R)		
Cone bolt	Stainless steel EN 10088:2014 Nominal steel tensile strength: $f_{uk} \leq 1{,}000$ N/mm² (thread)	Stainless steel of corrosion resistance class III, e.g. Mat.-No. 1.4401, 1.4571 or 1.4362
Expansion sleeve	Stainless steel EN 10088:2014	
Hexagon nut	Stainless steel EN 10088:2014, minimum property class 70, ISO 3506-2:2018	
Washer	Stainless steel EN 10088:2014	
FAZ II HCR (high corrosion resistant steel)		
Cone bolt	High corrosion resistant steel EN 10088:2014 Nominal steel tensile strength: $f_{uk} \leq 1{,}000$ N/mm² (thread)	High corrosion resistant steel of corrosion resistance class IV, e.g. Mat.-No. 1.4529
Expansion sleeve	Stainless steel EN 10088-1:2014	
Hexagon nut	High corrosion resistant steel EN 10088:2014 minimum property class 70, ISO 3506-2:2018	
Washer	High corrosion resistant steel EN 10088:2014	

6.2 Product marking

Marking of FAZ II		
Type of steel	**Descrition of the marking**	**Example**
Carbon steel, zinc plated	Brand logo, type of anchor, thread diameter / maximum thickness of fixture (t_{fix})	FAZ II 12/30
Stainless steel, CRC III	Brand logo, type of anchor, thread diameter / maximum thickness of fixture (t_{fix}), "R" for stainless steel	FAZ II 12/30 R
High corrosion-resistant steel, CRC V	Brand logo, type of anchor, thread diameter / maximum thickness of fixture (t_{fix}), "HCR" for high corrosion-resistant steel	FAZ II 12/30 HCR



Technical product information

6. Materials

6.3 Mechanical properties

Characteristics of the anchor												
FAZ II gvz (carbon steel, zinc-plated)			M6	M8		M10		M12		M16		M20	M24
Embedment depth	h_{ef}	[mm]	40	35 to 44	45	40 to 59	60	50 to69	70	65 to 84	85	100	125
Stressed cross sectional area cone bolt	A_s	[mm²]	13.9	21.1	21.1	36.3	36.3	55.4	55.4	88.3	88.3	156.1	230.0
Section modules cone bolt	W	[mm³]	7.3	13.8	13.8	30.9	30.9	58.2	58.2	116.9	116.9	175.2	490.9
Design value of bending moment	$M^0_{Rd,s}$	[Nm]	9.1	16.0	20.8	35.2	41.6	73.6	73.6	147.2	186.4	410.4	692.0
Yield strength cone bolt	f_{yk}	[N/mm²]	640	600	600	600	600	600	600	600	600	560	544
Tensile strength cone bolt	f_{uk}	[N/mm²]	800	750	750	750	750	750	750	750	750	700	680
Stressed cross sectional area threaded part	A_s	[mm²]	20.1	36.6	36.6	58.0	58.0	84.3	84.3	157.0	157.0	245.0	353.0
Section modules threaded part	W	[mm³]	12.7	31.2	31.2	62.3	62.3	109.2	109.2	277.5	277.5	540.9	935.5
Yield strength threaded part	f_{yk}	[N/mm²]	600	560	560	560	560	560	560	560	560	632	616
Tensile strength threaded part	f_{uk}	[N/mm²]	750	700	700	700	700	700	700	700	700	790	770

Characteristics of the anchor												
FAZ II R (stainless steel, CRC III) **FAZ II HCR** (high corrosion-resistant steel, CRC V)			M6	M8		M10		M12		M16		M20	M24
Embedment depth	h_{ef}	[mm]	40	35 to 44	45	40 to 59	60	50 to 69	70	65 to 84	85	100	125
Stressed cross sectional area cone bolt	A_s	[mm²]	13.9	21.1	21.1	36.3	36.3	55.4	55.4	88.3	88.3	156.1	230.0
Section modules cone bolt	W	[mm³]	7.3	13.8	13.8	30.9	30.9	58.2	58.2	116.9	116.9	175.2	490.9
Design value of bending moment	$M^0_{Rd,s}$	[Nm]	8.6	16.8	23.2	36.0	47.2	80.0	80.0	154.4	204.8	415.2	718.4
Yield strength cone bolt	f_{yk}	[N/mm²]	680	600	600	600	600	600	600	600	600	560	544
Tensile strength cone bolt	f_{uk}	[N/mm²]	850	750	750	750	750	750	750	750	750	700	680
Stressed cross sectional area threaded part	A_s	[mm²]	20.1	36.6	36.6	58.0	58.0	84.3	84.3	157.0	157.0	245.0	353.0
Section modules threaded part	W	[mm³]	12.7	31.2	31.2	62.3	62.3	109.2	109.2	277.5	277.5	540.9	935.5
Yield strength threaded part	f_{yk}	[N/mm²]	560	624	624	632	632	608	608	616	616	640	640
Tensile strength threaded part	f_{uk}	[N/mm²]	700	780	780	790	790	760	760	770	770	800	800