XPE440 injection mortar

VJ Technology

Technical Data Sheet

Description

XPE440 is VJT's ultimate performance, pure epoxy injection mortar with approvals for anchoring and rebar connections. This product is used in conjunction with a hand, battery or pneumatic tool and static mixer nozzle.

XPE440 consists of 2 components, resin and hardener, which are stored in separate compartments. These are mixed when extruded through the mixer nozzle and allow the mortar to set. Cartridges may be reused up to end of shelf life by replacing the static mixer nozzle or resealing the cap.

CCPI verified product information: Verification Number 002400004/0925

Usage/Purpose

XPE440 is suitable for anchoring of façades, roofs, wood construction, metal profiles, columns, beams, consoles, railings, sanitary devices, cable trays, piping, post-installed rebar connections and more. Especially suitable for applications with deeper embedment depths due to high flow properties.

Key Benefits

- ETA for cracked and non-cracked concrete, C20/25 to C50/60
- ETA for post-installed rebar connections
- Approved for seismic performance categories C1 and C2
- Anchors designed according to EN 1992-4 standard (Eurocode 2 Part 4) for maximum safety and efficiency
- Additional provisions within in the ETA for 100 year working life
- Compatible with hammer or diamond drilled holes
- Very high load capacity in cracked and non-cracked concrete
- Suitable for dry and wet concrete including flooded holes (bonded anchors)
- Suitable for overhead application
- Fire rating resistance ~ R120
- EPD Declaration number: EPD-VJT-20240220-CBA1-EN
- NSF approval for potable water
- High chemical resistance
- Low odour
- Small allowable edge distance and anchor spacing
- Superior performance in heavy-duty anchoring applications
- Design check can be performed using free VJT DesignFiX software - alternatively contact technical@vjtechnology.com to model applications

Applications

XPE440 injection mortar is used in conjunction with the following:

- Threaded rods eg. VJT Chemical Anchor Studs (zinc, HDG, A2, A4, HCR)
- VJT Internally Threaded Sockets
- Rebar - designed either as anchors (EN1992-4) or post-installed rebars (EN1992-1)

Handling & Storage

- Storage and transportation: store in a cool dry place from +5°C to +35°C. Keep out of direct sunlight
- Shelf life: 18 months for cartridges when stored as recommended in original, unopened condition

Certificates

BBA UKCA 0836		UK 0836-CPR-M 532-10-CA	UK 0836-CPR-M 532-11-CA	
		UKTA-22/6262	UKTA-22/6261	
		25	25	
		UKAD 330499-01-0601	UKAD 33087-00-0601	
ETA CE 2873		1343-CPR-M 532-10-CE	1343-CPR-M 532-11-CE	1343-CPR-M 532-12-CE
		ETA-20/0202	ETA-20/0230	ETA-24/0077
		25	25	25
		EAD 330499-01-0601	EAD 33087-00-0601	EAD 332402-00-0601
BWR 1	Mechanical resistance and stability	Option 1 M8 - M36 / IT-M6 - IT-M20 / rebar ø8 - ø32 For cracked and non-cracked concrete see DoP Annex C1 to C23	ø8 - ø40 for post-installed rebar connection see DoP Annex C1	ø8 - ø40 for post-installed rebar connection with improved bond-splitting behaviour see DoP Annex C1 to C3
BWR 2	Safety in case of fire	-	Class A1 see DoP Annex C2 to C3	NPA
BWR 3	Hygiene, health and the environment	NPA	NPA	NPA

CCPI 002400004/0925 VJT Resin Injection Mortar

ECO PLATFORM EPD VERIFIED

NSF

ÉMISSIONS DANS L'AIR INTÉRIEUR A+ A+ A B C

LEED tested

Fire Resistance Class R 120

Approvals & Certificates

Description	Authority / Laboratory	Guideline for Assessment	Number / Issue Date
ETA “Bonded fastener for use in concrete”	DiBt, Berlin	EAD 330499-01-0601	ETA-20/0202: April-2020
ETA “Post-installed rebar connection”	DiBt, Berlin	EAD 330087-00-0601	ETA-20/0230: April-2020
Fire resistance	TU Kaiserslautern	DIN EN 1363-1:2012	17061MR15557 Assessment Report 22021
VOC Emissions test report	Eurofins	DEVL 1101903D, DEVL 1104875A	392-2019-00290201_E_EN_06
Test report LEED	Eurofins	Leed 2009 EQ c4.1	392-2019-00290201_HA_EN_06
NSF International	NSF International	NSF/ANSI Standard	C0109090 - 061
Environmental Product Declaration (EPD)	Institut Bauen und Umwelt e.V. (IBU)	ISO 14025 and EN 1580+A2	EPD-VJT-20240220-CBA1-EN

Loads - Threaded Rod

Static/Quasi-static Loads

Data in this section is based on the following criteria:

- VJ Technology Injection System XPE440: XPE440 injection mortar with threaded rod (zinc plated steel grade 5.8 / zinc plated steel grade 8.8 / stainless steel A4-70 and A4-50)
- Correct anchor setting according to installation instructions
- Static and quasi-static loading
- Single anchor with edge distance, $c \geq 2{,}4 \times h_{ef}$ and spacing, $s \geq 4{,}8 \times h_{ef}$
- A single “typical” effective embedment depth as detailed in the table below
- Minimum thickness of base material as per typical effective embedment depth
- Temperature range I: -40°C to +40°C (max long term temperature +24°C and max short term temperature +40°C)
- $\psi_{sus} = 1{,}0$ ($\alpha_{sus} \leq 0{,}8$)
- Hammer drilled holes
- **Bold** figures denote steel failure

Note that for full design with combinations of tensile/shear loads and edge distance/spacing influence, or for 100 year working life, the complete assessment ETA-20/0202 must be considered. Contact VJT Technical for further advice.

Embedment

Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
Typical effective embedment depth[1], h_{ef}	[mm]	80	90	110	125	170	210	240	270
Min. base material thickness for typical effective embedment, h_{min}	[mm]	110	120	140	165	215	270	300	340

1) Full embedment depth range is shown in the Installation Parameters table (page 6)

Characteristic Resistance

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked normal concrete class C20/25										
Tension N_{Rk}	5.8	[kN]	**18,0**	**29,0**	**42,0**	68,8	109,0	149,7	182,9	218,2
	8.8	[kN]	**29,0**	42,0	56,8	68,8	109,0	149,7	182,9	218,2
	A4-50	[kN]	-	-	-	-	-	-	182,9	218,2
	A4-70	[kN]	**26,0**	**41,0**	56,8	68,8	109,0	149,7	-	-
Shear V_{Rk}	5.8	[kN]	**11,0**	**17,0**	**25,0**	**47,0**	**74,0**	**106,0**	**138,0**	**168,0**
	8.8	[kN]	**15,0**	**23,0**	**34,0**	**63,0**	**98,0**	**141,0**	**184,0**	**224,0**
	A4-50	[kN]	-	-	-	-	-	-	**115,0**	**140,0**
	A4-70	[kN]	**13,0**	**20,0**	**30,0**	**55,0**	**86,0**	**124,0**	-	-
Cracked normal concrete class C20/25										
Tension N_{Rk}	5.8	[kN]	14,1	19,8	35,2	48,1	76,3	104,8	128,0	152,8
	8.8	[kN]	14,1	19,8	35,2	48,1	76,3	104,8	128,0	152,8
	A4-50	[kN]	-	-	-	-	-	-	128,0	152,8
	A4-70	[kN]	14,1	19,8	35,2	48,1	76,3	104,8	-	-
Shear V_{Rk}	5.8	[kN]	**11,0**	**17,0**	**25,0**	**47,0**	**74,0**	**106,0**	**138,0**	**168,0**
	8.8	[kN]	**15,0**	**23,0**	**34,0**	**63,0**	**98,0**	**141,0**	**184,0**	**224,0**
	A4-50	[kN]	-	-	-	-	-	-	**115,0**	**140,0**
	A4-70	[kN]	**13,0**	**20,0**	**30,0**	**55,0**	**86,0**	**124,0**	-	-

Design Resistance

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked normal concrete class C20/25										
Tension N_{Rd}	5.8	[kN]	12,0	19,3	28,0	45,8	72,7	99,8	121,9	145,5
	8.8	[kN]	19,3	28,0	37,8	45,8	72,7	99,8	121,9	145,5
	A4-50	[kN]	-	-	-	-	-	-	80,4	98,3
	A4-70	[kN]	13,9	21,9	31,6	45,8	72,7	99,8	-	-
Shear V_{Rd}	5.8	[kN]	8,8	13,6	20,0	37,6	59,2	84,8	110,4	134,4
	8.8	[kN]	12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2
	A4-50	[kN]	-	-	-	-	-	-	48,3	58,8
	A4-70	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	-	-
Cracked normal concrete class C20/25										
Tension N_{Rd}	5.8	[kN]	9,4	13,2	23,5	32,1	50,9	69,9	85,4	101,8
	8.8	[kN]	9,4	13,2	23,5	32,1	50,9	69,9	85,4	101,8
	A4-50	[kN]	-	-	-	-	-	-	80,4	98,3
	A4-70	[kN]	9,4	13,2	23,5	32,1	50,9	69,9	-	-
Shear V_{Rd}	5.8	[kN]	8,8	13,6	20,0	37,6	59,2	84,8	110,4	134,4
	8.8	[kN]	12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2
	A4-50	[kN]	-	-	-	-	-	-	48,3	58,8
	A4-70	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	-	-

Recommended Load[1)]

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked normal concrete class C20/25										
Tension N_{Rec}	5.8	[kN]	8,6	13,8	20,0	32,7	51,9	71,3	87,1	103,9
	8.8	[kN]	13,8	20,0	27,0	32,7	51,9	71,3	87,1	103,9
	A4-50	[kN]	-	-	-	-	-	-	57,4	70,2
	A4-70	[kN]	9,9	15,7	22,5	32,7	51,9	71,3	-	-
Shear V_{Rec}	5.8	[kN]	6,3	9,7	14,3	26,9	42,3	60,6	78,9	96,0
	8.8	[kN]	8,6	13,1	19,4	36,0	56,0	80,6	105,1	128,0
	A4-50	[kN]	-	-	-	-	-	-	34,5	42,0
	A4-70	[kN]	6,0	9,2	13,7	25,2	39,4	56,8	-	-
Cracked normal concrete class C20/25										
Tension N_{Rec}	5.8	[kN]	6,7	9,4	16,8	22,9	36,3	49,9	61,0	72,7
	8.8	[kN]	6,7	9,4	16,8	22,9	36,3	49,9	61,0	72,7
	A4-50	[kN]	-	-	-	-	-	-	57,4	70,2
	A4-70	[kN]	6,7	9,4	16,8	22,9	36,3	49,9	-	-
Shear V_{Rec}	5.8	[kN]	6,3	9,7	14,3	26,9	42,3	60,6	78,9	96,0
	8.8	[kN]	8,6	13,1	19,4	36,0	56,0	80,6	105,1	128,0
	A4-50	[kN]	-	-	-	-	-	-	34,5	42,0
	A4-70	[kN]	6,0	9,2	13,7	25,2	39,4	56,8	-	-

1) Partial safety factor γ = 1.4 for load actions is considered

Fire Resistance

This section represents the fire resistance of anchors in wall and soffit applications. The evaluation is based on tests according to DIN EN 1363-1:2012 and TR020. Data is based on the following:

- Normal non-cracked and cracked concrete minimum C20/25
- Typical embedment depths as defined above
- Fire attack from one side only
- $c \geq 2{,}0 \times h_{ef}$ and $s \geq 4{,}0 \times h_{ef}$

Values are valid for the use of carbon steel (minimum grade 5.8 acc. to ISO 898-1), stainless steel (1.4401 / 1.4404 / 1.4571 acc. to EN 10088, minimum grade 70 acc. to ISO 3506) or high corrosion resistance steel (HCR 1.4529 / 1.4565 acc. to EN 10088, minimum grade 70 acc. to ISO 3506) threaded rods.

Recommended Load

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Normal concrete class C20/25										
R30	non-cracked	[kN]	1,10	1,74	3,03	5,65	8,82	12,71	16,52	20,20
	cracked	[kN]	1,10	1,74	3,03	5,65	8,82	12,71	16,52	20,20
R60	non-cracked	[kN]	0,88	1,39	2,28	4,24	6,62	9,53	12,39	15,15
	cracked	[kN]	0,88	1,39	2,28	4,24	6,62	9,53	12,39	15,15
R90	non-cracked	[kN]	0,44	0,87	1,60	2,98	4,66	6,71	8,72	10,66
	cracked	[kN]	0,33	0,65	1,60	2,77	4,66	6,71	8,72	10,66
R120	non-cracked	[kN]	0,00	0,00	1,17	2,06	3,43	4,94	6,43	7,85
	cracked	[kN]	0,00	0,00	0,88	1,54	3,43	4,94	6,43	7,85

Seismic Loads

Data in this section is based on the following criteria:

- VJ Technology Injection System XPE440: XPE440 injection mortar with threaded rod (zinc plated steel grade 8.8)
- Correct anchor setting according to installation instructions
- Single anchor with edge distance, $c \geq 2,4 \times h_{ef}$ and spacing, $s \geq 4,8 \times h_{ef}$
- A single "typical" effective embedment depth as detailed in the table below
- Minimum thickness of base material as per typical effective embedment depth
- Temperature range I: -40°C to +40°C (max long term temperature +24°C and max short term temperature +40°C)
- $\psi_{sus} = 1,0$ ($\alpha_{sus} \leq 0,8$)
- Hammer drilled holes
- **Bold** figures denote steel failure
- $\alpha_{gap} = 1,0$ (annular gap between anchor and plate filled)

Note that for full design with combinations of tensile/shear loads and edge distance/spacing influence, the complete assessment ETA-20/0202 or UKTA-22/6262 must be considered. Contact VJT Technical for further advice.

Embedment

Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
Typical effective embedment depth, h_{ef}	[mm]	80	90	110	125	170	210	240	270
Min base material thickness for typical effective embedment, h_{min}	[mm]	110	120	140	165	215	270	300	340

1) Full embedment depth range is shown in the Installation Parameters table (page 6)

Characteristic Resistance - Seismic Performance Category C1

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Tension N_{Rk}	8.8	[kN]	14,1	19,8	35,2	48,1	76,3	104,8	188,0	152,8
Shear V_{Rk}	8.8	[kN]	**10,5**	**16,1**	**23,8**	**44,1**	**68,6**	**98,7**	**128,8**	**156,8**

Design Resistance - Seismic Performance Category C1

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Tension N_{Rd}	8.8	[kN]	9,4	13,2	22,5	27,3	43,3	59,4	72,6	86,6
Shear V_{Rd}	8.8	[kN]	8,4	12,9	19,0	35,3	54,9	79,0	103,0	125,4

Characteristic Resistance - Seismic Performance Category C2

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Tension N_{Rk}	8.8	[kN]	-	-	24,1	30,2	53,4	80,8	-	-
Shear V_{Rk}	8.8	[kN]	-	-	**23,8**	**44,1**	**68,6**	**98,7**	-	-

Design Resistance - Seismic Performance Category C2

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Tension N_{Rd}	8.8	[kN]	-	-	16,0	20,1	35,6	53,8	-	-
Shear V_{Rd}	8.8	[kN]	-	-	19,0	34,2	54,9	79,0	-	-

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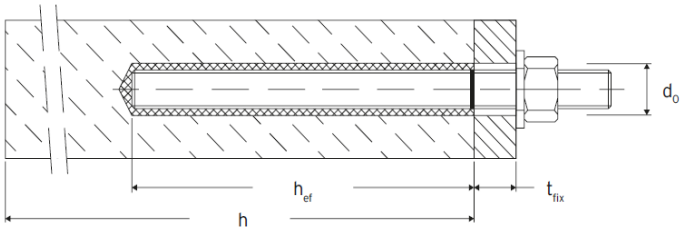
Setting and Installation - Threaded Rod



Installation Parameters

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Nominal drill hole diameter	d_0	[mm]	10	12	14	18	22	28	30	35
Effective embedment depth	$h_{ef,min}$	[mm]	60	60	70	80	90	96	108	120
	$h_{ef,max}$	[mm]	160	200	240	320	400	480	540	600
Maximum torque moment	$T_{inst} \leq$	[Nm]	10	20	40[1)]	60	100	170	250	300
Minimum base material thickness	h_{min}	[mm]	h_{ef} + 30mm ≥ 100mm			$h_{ef} + 2d_0$				
Minimum spacing	s_{min}	[mm]	40	50	60	75	95	115	125	140
Minimum edge distance	c_{min}	[mm]	35	40	45	50	60	65	75	80
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$							
Critical edge distance for splitting failure	$c_{cr,sp}$	[mm]	$1{,}0\ h_{ef}$					for $h/h_{ef} \geq 2{,}0$		
			$2\ h_{ef}(2{,}5 - h/h_{ef})$					for $2{,}0 > h/h_{ef} > 1{,}3$		
			$2{,}4\ h_{ef}$					for $h/h_{ef} \leq 1{,}3$		
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	$2\ c_{cr,N}$							
Critical edge distance for concrete cone failure	$c_{cr,N}$	[mm]	$1{,}5\ h_{ef}$							

1) Maximum torque moment for M12 with steel grade 4.6 is 35 Nm

Working and Curing Time

Concrete temperature	Gelling working time	Minimum curing time in dry concrete	Minimum curing time in wet concrete
0°C to +4°C	80 mins	122 hours	244 hours
+5°C to +9°C	80 mins	48 hours	96 hours
+10°C to +14°C	60 mins	28 hours	56 hours
+15°C to +19°C	40 mins	18 hours	36 hours
+20°C to +24°C	30 mins	12 hours	24 hours
+25°C to +34°C	12 mins	9 hours	18 hours
+35°C to +39°C	8 mins	6 hours	12 hours
+40°C	8 mins	4 hours	8 hours
Cartridge temperature	+5°C to +40°C		

Cleaning and Setting Tools

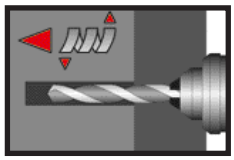
Threaded rod size	Drill bit diameter, d_0 (HD, HDB, CD, DD) [mm][1)]	Brush diameter (min-max)[mm]	Piston plug diameter (mm)	Installation direction and use of piston plug	
				vertical/horizontal	overhead
M8	10	10,5 - 11,5	No plug required		
M10	12	12,5 - 13,5			
M12	14	14,5 - 15,5			
M16	18	18,5 - 20,0	18	h_{ef} > 250mm	all
M20	22	22,5 - 24,0	22		
M24	28	28,5 - 30,0	28		
M27	30	30,5 - 31,8	30		
M30	35	35,5 - 37,0	35		

1) HD = hammer drill, HDB = hollow drill bit system, CD = compressed air drilling, DD = diamond drilling

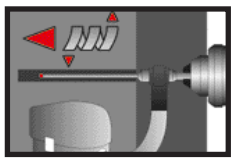
Installation Instructions

Refer to the Material Safety Data Sheet (MSDS) for guidance on safe and proper handling.

Drilling of the bore hole (HD, HDB, CD)



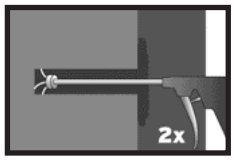
1a. Hammer (HD) or compressed air drilling (CD)
Drill a hole into the base material to the size and embedment depth required by the selected anchor (page 6). Proceed with Step 2. In cases of aborted drill holes, the drill hole must be filled with mortar.



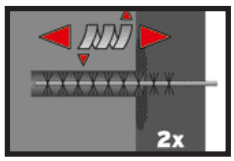
1b. Hollow drill bit system (HDB)
Drill a hole into the base material to the size and embedment depth required by the selected anchor (page 6). This drilling system removes the dust and cleans the bore hole during drilling (all conditions). Proceed with Step 3. In cases of aborted drill holes, the drill hole must be filled with mortar.

Attention! Standing water in the bore hole must be removed before cleaning.

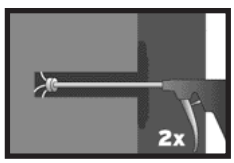
CAC: Cleaning for dry, wet and water-filled bore holes with all diameter in non-cracked and cracked concrete



2a. Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (oil free, min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used.

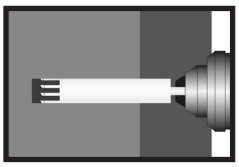
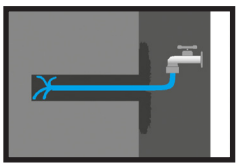
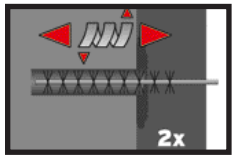
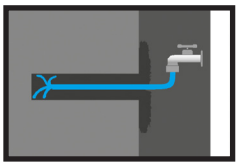
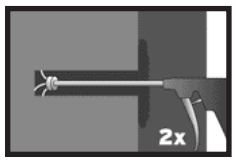
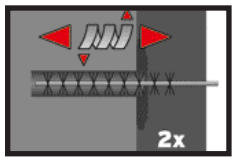
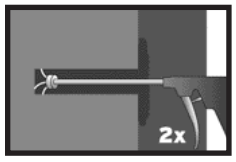


2b. Check brush diameter (table above). Brush the hole with an appropriate sized wire brush a minimum of two times in a twisting motion. If the brush does not reach the bottom of the bore hole a brush extension must be used.



2c. Finally blow the hole clean again with compressed air (min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used.

After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning has to be repeated directly before dispensing the mortar. Inflowing water must not contaminate the bore hole again.

Drilling of the bore hole (DD) in non-cracked concrete		
	**1a.**	Diamond drilling (DD) Drill with diamond drill a hole into the base material to the size and embedment depth required by the selected anchor (page 6). Proceed with Step 2. In cases of aborted drill holes, the drill hole must be filled with mortar.
SPCAC: Cleaning for dry, wet and water-filled bore holes with all diameter in non-cracked concrete		
Attention! Standing water in the bore hole must be removed before cleaning.		
	**2a.**	Rinse with water until clear water emerges from bore hole.
	**2b.**	Check brush diameter (page 7). Brush the hole with an appropriate sized wire brush a minimum of two times in a twisting motion. If the brush does not reach the bottom of the bore hole a brush extension must be used.
	**2c.**	Rinse again with water until clear water emerges from bore hole.
	**2d.**	Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used.
	**2e.**	Check brush diameter (page 7). Brush the hole with an appropriate sized wire brush a minimum of two times in a twisting motion. If the brush does not reach the bottom of the bore a brush extension must be used.
	**2f.**	Finally blow the hole clean again with compressed air (min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used.
After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning has to be repeated directly before dispensing the mortar. Inflowing water must not contaminate the bore hole again.		

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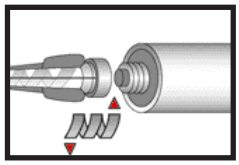
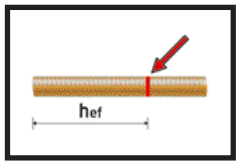
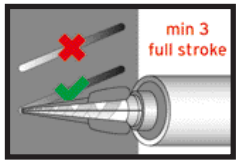
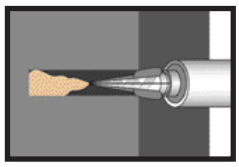
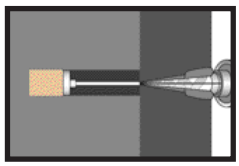
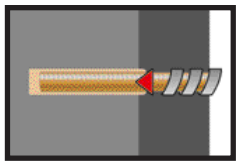
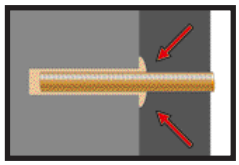
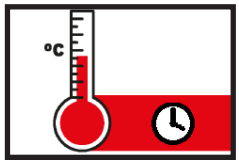
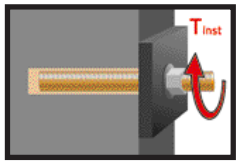
Installation Instructions (Continued)		
	**3.**	Attach the supplied static mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. For every working interruption longer than the recommended working time (page 6) as well as for new cartridges, a new static mixer nozzle shall be used.
	**4.**	Prior to inserting the anchor rod into the filled bore hole, the position of the embedment depth shall be marked on the anchor rods.
	**5.**	Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour.
	**6.**	Starting from the bottom or back of the cleaned anchor hole, fill the hole up to approximately two-thirds with mortar. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. If the bottom or back of the anchor hole is not reached, an appropriate extension nozzle must be used. Observe the gel/working times given on page 6.
	**7.**	Piston plugs and mixer nozzle extensions shall be used according to page 7 for the following applications: • Horizontal assembly (horizontal direction) and ground erection (vertical downwards direction): Drill bit diameter $d_0 \geq 18$mm and embedment depth $h_{ef} > 250$mm • Overhead assembly (vertical upwards direction): Drill bit diameter $d_0 > 18$mm
	**8.**	Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. The anchor shall be free of dirt, grease, oil or other foreign material.
	**9.**	After inserting the anchor, the annular gap between anchor rod and concrete must be completely filled with mortar (in case of a push through installation this includes the fixture). If excess mortar is not visible at the top of the hole, the requirement is not fulfilled and the application has to be renewed. For overhead application the anchor rod shall be fixed (eg. using wedges).
	**10.**	Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (refer to page 6).
	**11.**	After full curing, the fixture can be installed up to the max. torque (page 6) by using a calibrated torque wrench. In case of prepositioned installation the annular gap between anchor and fixture may be optionally filled with mortar. In this case substitute the washer with a filling washer and connect the mixer reduction nozzle to the tip of the mixer nozzle. The annular gap is filled when mortar oozes out of the washer.

Loads - Rebar

Criteria

Data in this section is based on the following criteria:

- VJ Technology Injection System XPE440: XPE440 injection mortar with rebar (grade B500B)
- Correct anchor setting according to installation instructions
- Static and quasi-static loading
- Single anchor with edge distance, $c \geq 2{,}4 \times h_{ef}$ and spacing, $s \geq 4{,}8 \times h_{ef}$
- A single "typical" effective embedment depth as detailed in the table below
- Minimum thickness of base material as per typical effective embedment depth
- Temperature range I: -40°C to +40°C (max long term temperature +24°C and max short term temperature +40°C)
- $\psi_{sus} = 1{,}0$ ($\alpha_{sus} \leq 0{,}8$)
- Hammer drilled holes
- **Bold** figures denote steel failure

Note that for full design with combinations of tensile/shear loads and edge distance/spacing influence, or for 100 year working life, the complete assessment ETA-20/0202 or UKTA-22/6262 must be considered. Contact VJT Technical for further advice.

Embedment

Anchor size		ø8	ø10	ø12	ø14	ø16	ø20	ø24	ø25	ø28	ø32
Typical effective embedment depth[1], h_{ef}	[mm]	80	90	110	125	145	170	205	210	270	300
Min base material thickness for typical effective embedment, h_{min}	[mm]	110	120	145	165	185	220	270	275	340	380

1) Full embedment depth range is shown in the Installation Parameters table (page 12)

Characteristic Resistance

Anchor size			ø8	ø10	ø12	ø14	ø16	ø20	ø24	ø25	ø28	ø32
Non-cracked normal concrete class C20/25												
Tension N_{Rk}	B500B	[kN]	**27,5**	42,0	56,8	68,8	85,9	109,0	144,4	149,7	218,2	255,6
Shear V_{Rk}	B500B	[kN]	**13,8**	**21,7**	**31,1**	**42,4**	**55,3**	**86,4**	**124,3**	**135,0**	**169,4**	**221,1**
Cracked normal concrete class C20/25												
Tension N_{Rk}	B500B	[kN]	14,1	19,8	35,2	46,7	60,1	76,3	101,1	104,8	152,8	178,9
Shear V_{Rk}	B500B	[kN]	**13,8**	**21,7**	**31,1**	**42,4**	**55,3**	**86,4**	**124,3**	**135,0**	**169,4**	**221,1**

Design Resistance

Anchor size			ø8	ø10	ø12	ø14	ø16	ø20	ø24	ø25	ø28	ø32
Non-cracked normal concrete class C20/25												
Tension N_{Rd}	B500B	[kN]	19,6	28,0	37,8	45,8	57,3	72,7	96,3	99,8	145,5	170,4
Shear V_{Rd}	B500B	[kN]	9,2	14,5	20,7	28,2	36,9	57,6	82,9	90,0	112,9	147,4
Cracked normal concrete class C20/25												
Tension N_{Rd}	B500B	[kN]	9,4	13,2	23,5	31,2	40,1	50,9	67,4	69,9	101,8	119,3
Shear V_{Rd}	B500B	[kN]	9,2	14,5	20,7	28,2	36,9	57,6	82,9	90,0	112,9	147,4

Recommended Load[1)]

Anchor size			ø8	ø10	ø12	ø14	ø16	ø20	ø24	ø25	ø28	ø32
Non-cracked normal concrete class C20/25												
Tension N_{Rec}	B500B	[kN]	14,0	20,0	27,0	32,7	40,9	51,9	68,8	71,3	103,9	121,7
Shear V_{Rec}	B500B	[kN]	6,5	10,3	14,8	20,2	26,3	41,1	59,2	64,3	80,7	105,3
Cracked normal concrete class C20/25												
Tension N_{Rec}	B500B	[kN]	6,7	9,4	16,8	22,3	28,6	36,3	48,1	49,9	72,7	85,2
Shear V_{Rec}	B500B	[kN]	6,5	10,3	14,8	20,2	26,3	41,1	59,2	64,3	80,7	105,3

1) Partial safety factor γ = 1.4 for load actions is considered

Seismic Loads

Data in this section is based on the following criteria:

- VJ Technology Injection System XPE440: XPE440 injection mortar with rebar (grade B500B)
- Correct anchor setting according to installation instructions
- Single anchor with edge distance, $c \geq 2,4 \times h_{ef}$ and spacing, $s \geq 4,8 \times h_{ef}$
- A single “typical” effective embedment depth as detailed in the table below
- Minimum thickness of base material as per typical effective embedment depth
- Temperature range I: -40°C to +40°C (max long term temperature +24°C and max short term temperature +40°C)
- $\psi_{sus} = 1,0$ ($\alpha_{sus} \leq 0,8$)
- Hammer drilled holes
- **Bold** figures denote steel failure
- $\alpha_{gap} = 1,0$ (annular gap between anchor and plate filled)

Note that for full design with combinations of tensile/shear loads and edge distance/spacing influence, the complete assessment ETA-20/0202 or UKTA-22/6262 must be considered. Contact VJT Technical for further advice.

Embedment

Anchor size		ø8	ø10	ø12	ø14	ø16	ø20	ø24	ø25	ø28	ø32
Typical effective embedment depth[1)], h_{ef}	[mm]	80	90	110	125	145	170	205	210	270	300
Min base material thickness for typical effective embedment, h_{min}	[mm]	110	120	145	165	185	220	270	275	340	380

1) Full embedment depth range is shown in the Installation Parameters table (page 12)

Characteristic Resistance - Seismic Performance Category C1

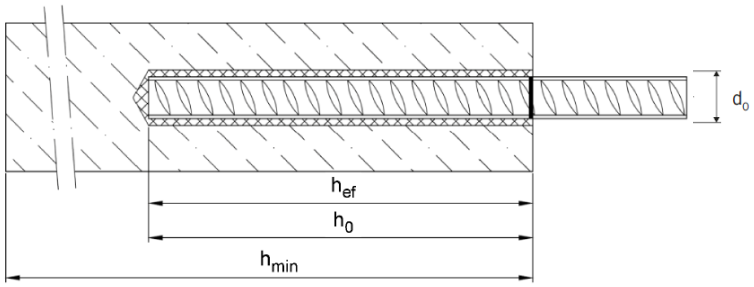
Anchor size			ø8	ø10	ø12	ø14	ø16	ø20	ø24	ø25	ø28	ø32
Tension N_{Rk}	B500B	[kN]	14,1	19,8	35,2	46,7	60,1	76,3	101,1	104,8	152,8	178,9
Shear V_{Rk}	B500B	[kN]	**9,6**	**15,2**	**21,8**	**29,6**	**38,7**	**60,4**	**87,0**	**94,5**	**118,6**	**154,8**

Design Resistance - Seismic Performance Category C1

Anchor size			ø8	ø10	ø12	ø14	ø16	ø20	ø24	ø25	ø28	ø32
Tension N_{Rd}	B500B	[kN]	9,4	13,2	22,5	27,3	34,1	43,3	57,3	59,4	86,6	101,4
Shear V_{Rd}	B500B	[kN]	6,4	10,1	14,5	19,8	25,8	40,3	58,0	63,0	79,1	103,2

VJ Technology

Setting and Installation - Rebar



Installation Parameters

Anchor size			ø8[1)]		ø10[1)]		ø12[1)]		ø14	ø16	ø20	ø24	ø25	ø28	ø32
Nominal drill hole diameter	d_0	[mm]	10	12	12	14	14	16	18	20	25	32	32	35	40
Effective embedment depth	$h_{ef,min}$	[mm]	60		60		70		75	80	90	96	100	112	128
	$h_{ef,max}$	[mm]	160		200		240		280	320	400	480	500	560	640
Minimum base material thickness	h_{min}	[mm]	h_{ef} + 30mm ≥ 100mm						h_{ef} + $2d_0$						
Minimum spacing	s_{min}	[mm]	40		50		60		70	75	95	120	120	130	150
Minimum edge distance	c_{min}	[mm]	35		40		45		50	50	60	70	70	75	85

1) Both nominal drill hole diameters can be used

Working and Curing Time

Concrete temperature	Gelling working time	Minimum curing time in dry concrete	Minimum curing time in wet concrete
0°C to +4°C	80 mins	122 hours	244 hours
+5°C to +9°C	80 mins	48 hours	96 hours
+10°C to +14°C	60 mins	28 hours	56 hours
+15°C to +19°C	40 mins	18 hours	36 hours
+20°C to +24°C	30 mins	12 hours	24 hours
+25°C to +34°C	12 mins	9 hours	18 hours
+35°C to +39°C	8 mins	6 hours	12 hours
+40°C	8 mins	4 hours	8 hours
Cartridge temperature	+5°C to +40°C		

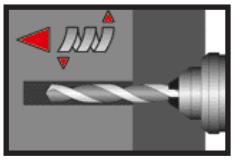
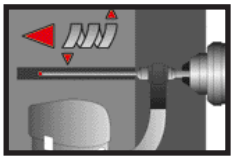
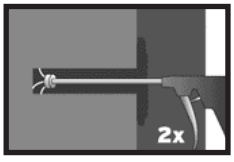
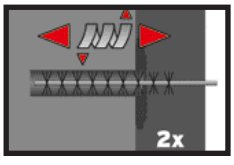
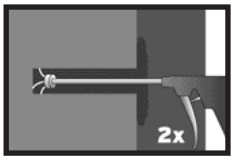
Cleaning and Setting Tools

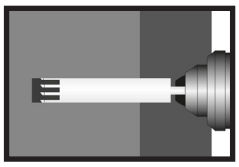
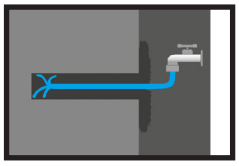
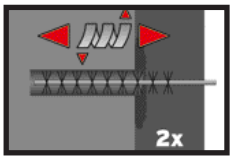
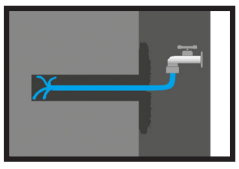
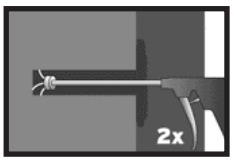
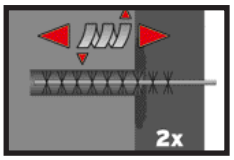
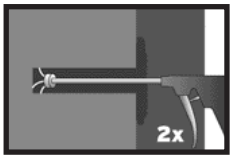
Rebar size	Drill bit diameter, d_0 (HD, HDB, CD, DD) [mm][1)]	Brush diameter (min-max)[mm]	Piston plug diameter (mm)	Installation direction and use of piston plug	
				vertical/horizontal	overhead
ø8	10/12	10,5 - 11,5/12,5 - 13,5	No plug required		
ø10	12/14	12,5 - 13,5/14,5 - 15,5			
ø12	16	16,5 - 17,5			
ø14	18	18,5 - 20,0	18	h_{ef} > 250mm	all
ø16	20	20,5 - 22,0	20		
ø20	25	25,5 - 27,0	25		
ø24	32	32,5 - 34,0	32		
ø25	32	32,5 - 34,0	32		
ø28	35	35,5 - 37,0	35		
ø32	40	40,5 - 43,5	40		

1) HD = hammer drill, HDB = hollow drill bit system, CD = compressed air drilling, DD = diamond drilling

Installation Instructions

Refer to the Material Safety Data Sheet (MSDS) for guidance on safe and proper handling.

Drilling of the bore hole (HD, HDB, CD)		
	**1a.**	Hammer (HD) or compressed air drilling (CD) Drill a hole into the base material to the size and embedment depth required by the selected anchor (page 12). Proceed with Step 2. In cases of aborted drill holes, the drill hole must be filled with mortar.
	**1b.**	Hollow drill bit system (HDB) Drill a hole into the base material to the size and embedment depth required by the selected anchor (page 12). This drilling system removes the dust and cleans the bore hole during drilling (all conditions). Proceed with Step 3. In cases of aborted drill holes, the drill hole must be filled with mortar.
Attention! Standing water in the bore hole must be removed before cleaning.		
CAC: Cleaning for dry, wet and water-filled bore holes with all diameter in non-cracked and cracked concrete		
	**2a.**	Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (oil free, min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used.
	**2b.**	Check brush diameter (page 13). Brush the hole with an appropriate sized wire brush a minimum of two times in a twisting motion. If the brush does not reach the bottom of the bore hole a brush extension must be used.
	**2c.**	Finally blow the hole clean again with compressed air (oil free, min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used.
After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning has to be repeated directly before dispensing the mortar. Inflowing water must not contaminate the bore hole again.		

Drilling of the bore hole (DD) in non-cracked concrete		
	**1a.**	Diamond drilling (DD) Drill with diamond drill a hole into the base material to the size and embedment depth required by the selected anchor (page 12). Proceed with Step 2. In cases of aborted drill holes, the drill hole must be filled with mortar.
SPCAC: Cleaning for dry, wet and water-filled bore holes with all diameter in non-cracked concrete		
Attention! Standing water in the bore hole must be removed before cleaning.		
	**2a.**	Rinse with water until clear water emerges from bore hole.
	**2b.**	Check brush diameter (page 13). Brush the hole with an appropriate sized wire brush a minimum of two times in a twisting motion. If the brush does not reach the bottom of the bore hole a brush extension must be used.
	**2c.**	Rinse again with water until clear water emerges from bore hole.
	**2d.**	Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (oil free, min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the tool does not reach the bottom of the bore hole an extension must be used.
	**2e.**	Check brush diameter (page 13). Brush the hole with an appropriate sized wire brush a minimum of two times in a twisting motion. If the brush does not reach the bottom of the bore hole a brush extension must be used.
	**2f.**	Finally blow the hole clean again with compressed air (min. 6 bar) a minimum of two times until return air stream is free of noticeable dust. If the bottom of the bore hole is not reached an extension must be used.
After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning has to be repeated directly before dispensing the mortar. Inflowing water must not contaminate the bore hole again.		

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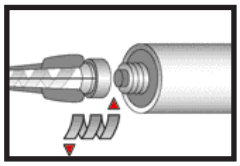
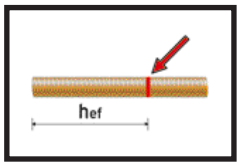
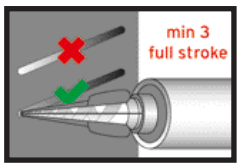
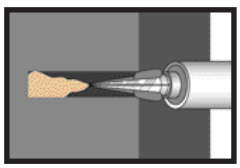
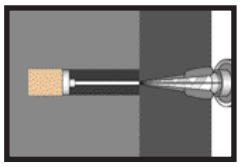
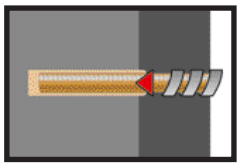
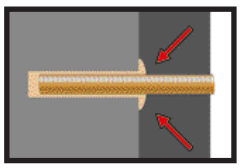
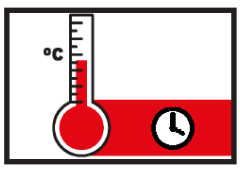
Installation instructions (continued)		
	**3.**	Attach the supplied static mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. For every working interruption longer than the recommended working time (page 12) as well as for new cartridges, a new static mixer nozzle shall be used.
	**4.**	Prior to inserting the reinforcing bar into the filled bore hole, the position of the embedment depth shall be marked on the anchor rods.
	**5.**	Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour.
	**6.**	Starting from the bottom or back of the cleaned anchor hole, fill the hole up to approximately two-thirds with adhesive. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. If the bottom or back of the anchor hole is not reached, an appropriate extension nozzle must be used. Observe the gel/working times given on page 12.
	**7.**	Piston plugs and mixer nozzle extensions shall be used according to page 13 for the following applications: • Horizontal assembly (horizontal direction) and ground erection (vertical downwards direction): Drill bit diameter $d_0 \geq 18$mm and embedment depth $h_{ef} > 250$mm • Overhead assembly (vertical upwards direction): Drill bit diameter $d_0 > 18$mm
	**8.**	Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. The anchor shall be free of dirt, grease, oil or other foreign material.
	**9.**	After inserting the anchor, the annular gap between anchor rod and concrete must be completely filled with mortar (in case of a push through installation this includes the fixture). If excess mortar is not visible at the top of the hole, the requirement is not fulfilled and the application has to be renewed. For overhead application the anchor rod shall be fixed (eg. using wedges).
	**10.**	Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (refer to page 12).

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Material Properties

Mechanical Properties (Mortar)

Properties	Test Method	Result
UV resistance	-	pass
watertightness	DIN EN 12390-8	0 mm
compressive strength	EN 196-1	122 N/mm^2
flexural strength	EN 196-1	66 N/mm^2
axial tensile strength	DIN EN ISO 527-2	44 N/mm^2
E modulus	DIN EN ISO 527-2	6300 N/mm^2
shrinkage	DIN 52450	< 1,4 %
shore A hardness	DIN EN ISO 868	99,4
shore D hardness	DIN EN ISO 868	86,1
density		1,5 kg/dm^3
thermal conductivity	DIN EN 993-15	0,5 W/m K
spec. heat capacity	DIN EN 993-15	1350 J/kg ·K
electrical resistance	DIN IEC 93	8,0 x 10^{12} Ω

Chemical Resistance

Chemical	Concentration	Resistant
accumulator acid		X
acetic acid	10%	X
acetic acid	40%	X
acetone	5%	X
acetone	10%	X
acetone	100%	X
ammonia, aqueous solution	5%	O
ammonia, aqueous solution	32%	X
aniline	100	X
beer	100	O
chlorine	all	O
benzol	100%	X
boric acid, aqueous solution		O
calcium carbonate, suspended in water	all	O
calcium chloride, suspended in water		O
calcium hydroxide, suspended in water		O
chlorinated lime (calcium hypochlorite)	10%	X
carbon tetrachloride	100%	O
caustic soda solution	10%	O

Chemical	Concentration	Resistant
caustic soda solution	40%	O
citric acid	10%	X
citric acid	50%	X
citric acid	all	O
chlorine water, swimming pool	all	X
demineralized water	all	X
diesel oil	100%	O
ethyl alcohol, aqueous solution	100%	X
ethyl alcohol, aqueous solution	50%	X
formic acid	10%	O
formic acid	30%	X
formic acid	100%	X
formaldehyde, aqueous solution	20%	O
formaldehyde, aqueous solution	30%	O
freon		O
fuel oil		O
gasoline (premium grade)	100%	O
glycol (ethylene glycol)		O
hydraulic fluid	conc.	X

Chemical Resistance Cont.

Chemical	Concentration	Resistant
hydrochloric acid (muriatic acid)	conc.	X
hydrogen peroxide	10%	X
hydrogen peroxide	30%	X
isopropyl alcohol	100%	X
lactic acid	10%	X
lactic acid	all	X
linseed oil	100%	O
lubricating oil	100%	O
magnesium chloride, aqueous solution	all	O
methanol	100%	X
standard benzine		X
motor oil (SAE 20 W-50)	100%	O
nitric acid	10%	X
oleic acid	100%	O
perchloroethylene	100%	O
petroleum	100%	O
phenol, aqueous solution	8%	X
benzyl alcohol	100%	X
phosphoric acid	85%	O
phosphoric acid	10%	O
potash lye (potassium hydroxide)	10%	O

Chemical	Concentration	Resistant
potash lye (potassium hydroxide)	40%	O
potassium carbonate, aqueous solution	all	O
potassium chlorite, aqueous solution	all	O
potassium nitrate, aqueous solution	all	O
sea water, salty	all	O
sodium carbonate	all	O
sodium chloride, aqueous solution	all	O
sodium phosphate, aqueous solution	all	O
sodium silicate	all	O
sulfuric acid	10%	X
sulfiruc acid	30%	X
sulfuric acid	70%	X
tartaric acid	all	O
tetrachloroethylene	100%	O
toluene		X
turpentine	100%	O
trichloroethylene	100%	X

O Resistant when subject to brief periods of chemical contact with a fully cured product
X Not resistant

For further advice please contact VJT Technical dept.
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