

# **FIXING APPLICATIONS IN TUNNELS**



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# INFLUENCES ON CONSTRUCTION FIXINGS IN TUNNELS

## Fire



A fire inside a tunnel represents an enormous challenge for the material used. The fire load may be very high due to traffic passing through the tunnel. Temperatures may also rise to very high levels due to tight spaces in the tunnel.

As fire fighting is extremely difficult, it is important for fastening material not to fail in case of a fire event before a certain time has passed. In general, the standard temperature curve according to DIN 4102 is not sufficient for the structural design of exposed fastening material.

The Würth anchors W-FAZ/HCR, W-FA/HCR M6, W-NA/HCR and W-VIZ/HCR have therefore been tested according to the time-temperature profile of the "Additional technical terms of contract and guidelines for civil engineering works (ZTV-ING), part 5 Tunnel Construction" and thus comply with all requirements of fire protection in tunnels. Our W-NA/HCR has also been tested according to the more stringent and demanding RWS (RijksWaterstaat) curve, which assumes the worst-case scenario of an oil tanker catching fire while carrying 50 m<sup>3</sup> of fuel and results in a fire load of 300 MW lasting up to 120 minutes.

## Fatigue loading



Trains and trucks passing through tunnels cause fatigue loading on construction fixings. In particular, this includes wind pressure and suction. Continuously repeating periodic loads on anchors may lead to the fatigue failure of the fastener. This may already occur after approx. 10,000 load changes (e.g., in the case of 10 load changes per day, there will be more than 10,000 load changes within 3 years).

Therefore, many of the applications in tunnels may be fixed with anchors approved for fatigue loading. Only this prevents the failure. This also applies to dynamically loaded operational structures, such as jet ventilators. The resin bonded anchor system W-VIZ dynamic is approved for fatigue loading and is generally used for such applications.

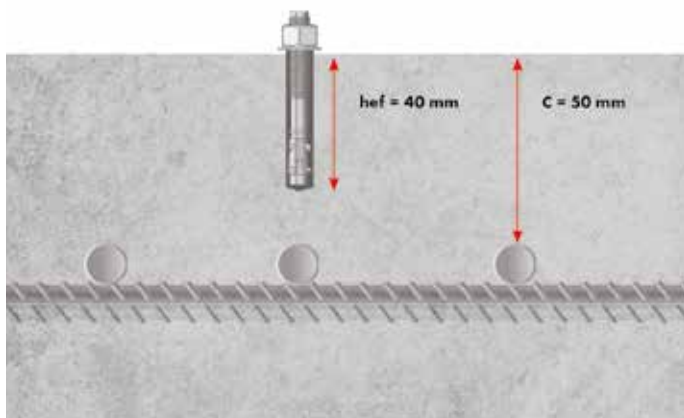
## Corrosion

Environmental conditions inside road tunnels regularly represent increased challenges for fasteners and their corrosion resistance. This includes humidity, de-icing salts and exhaust gases. According to the stainless steel approval Z-30.3-6, a steel quality in accordance with corrosion resistance class V is required in road tunnels due to the high pollution caused by sulfur dioxide (SO<sub>2</sub>). This class includes highly corrosion-resistant steel (HCR steel), which is also required according to "ZTV-ING, part 5 Tunnel Construction". A4 stainless steel must not be used in road tunnels since this material may fail due to stress corrosion cracking.

With its product range of anchors made of highly corrosion resistant (HCR) steel and all other popular steel qualities, Würth covers all applications in tunnels. On the following pages you will find a selection of fastening solutions made of HCR steel.



## Shallow Embedment Depth










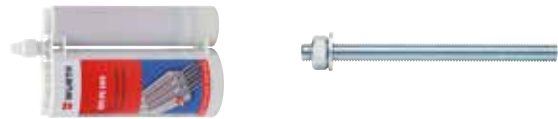








Concrete cover thickness is sometimes a restriction on the construction site when it comes to fixing solutions. Fixings with large embedment depths often come with the risk of drilling into rebar. Würth's anchor solutions include specifically designed products that ensure rebar is undamaged during the installation process. Our top-line mechanical anchor W-FAZ Pro/HCR is a high performance anchor which is designed to sustain large tension loads up to 5.8 kN for a metric thread diameter of 8 mm in cracked concrete and effective anchorage depths under 50 mm. As a chemical injection mortar alternative, our WIT-VIZ can achieve the same load in tension without exceeding the 50 mm marker for adequate concrete cover.

## De-installation



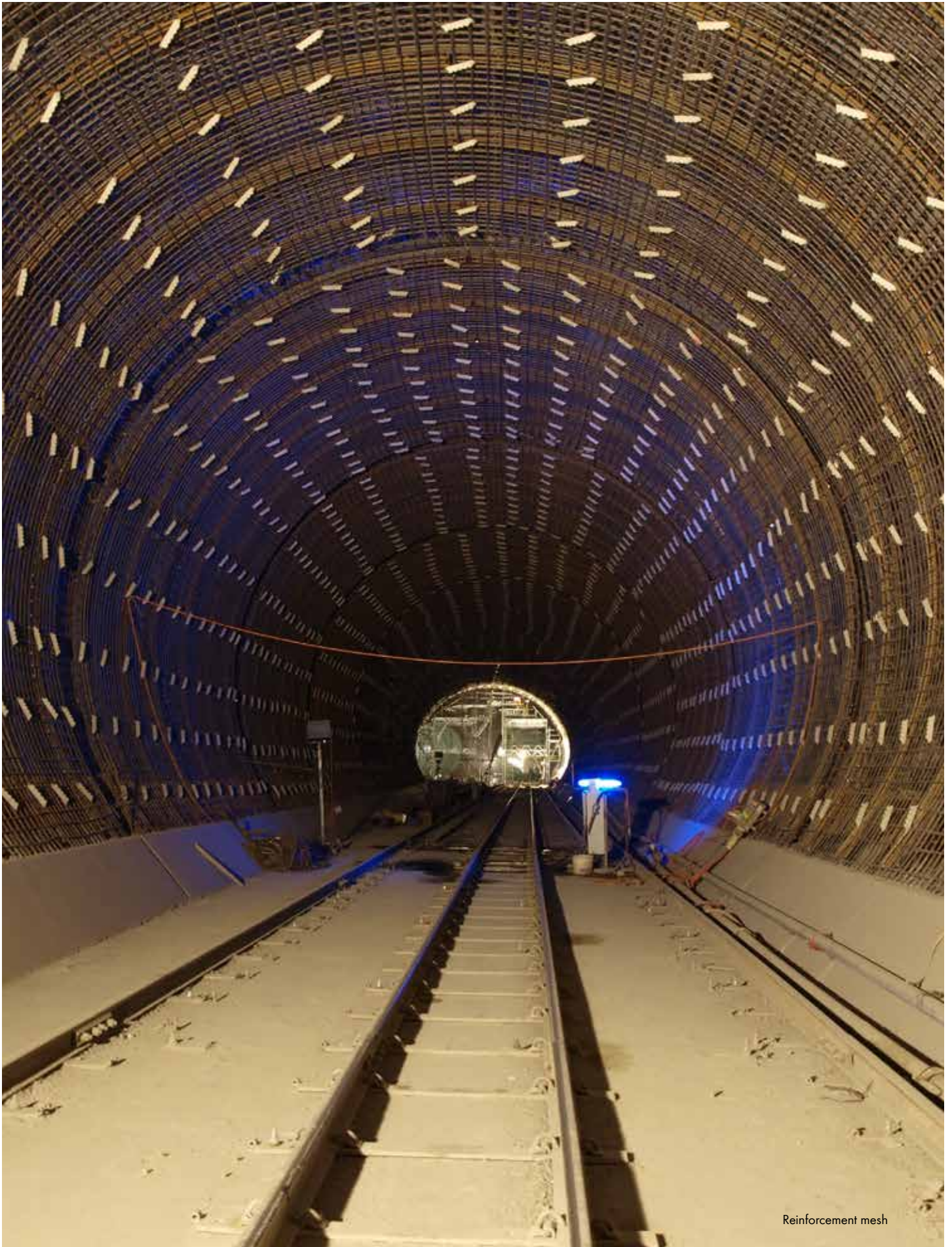
During the construction phase, equipment is installed for temporary use to aid in the construction process. Removing this equipment without damage to the substructure is necessary to be able to commission the project for final use. In addition, tunnel refurbishment often requires that old equipment is safely and easily de-installed and replaced with new equipment. Such equipment include ventilation pipes, temporary lighting and temporary rail-tracks. As a solution, Würth provides its heavy duty concrete screw W-BS as a high performance anchor in terms of load capacity which has a European Technical Approval for multiple reuse.

## Selection Matrix

Anchor/Screw	Load				Galvanized
	Static	Seismic C1	Seismic C2	Fatigue	
<b>WIT-VIZ Art. No. 0905 440..</b> 	✓	✓	✓	-	✓
<b>WIT-VIZ Dynamic Art. No. 0905 481..</b> 	✓	-	-	✓	✓
<b>WIT-BS Art. No. 0905 450..</b> 	✓	-	-	-	✓
<b>WIT-UH 300 Art. No. 5918 500..</b> 	✓	✓	✓	-	✓
<b>WIT-VM 250 Art. No. 0903 450..</b> 	✓	✓	-	-	✓
<b>WIT-PM 200 Art. No. 5918 24..</b> 	✓	-	-	-	✓
<b>WIT-PE 1000 Art. No. 5918 605..</b> 	✓	✓	✓	-	✓
<b>WIT-PE 500 Art. No. 0903 480..</b> 	✓	✓	✓	-	✓
<b>W-BS Art. No. 5929..</b> 	✓	✓	✓	-	✓
<b>W-FAZ Pro Art. No. 5930..</b> 	✓	✓	✓	✓	✓
<b>W-FAZ Art. No. 5928..</b> 	✓	✓	✓	-	✓
<b>W-HAZ Art. No. 0905 2..</b> 	✓	✓	✓	-	✓
<b>W-FA Art. No. 5932..</b> 	✓	-	-	-	✓
<b>W-ED Art. No. 0904..</b> 	✓	-	-	-	✓
<b>W-NA Art. No. 0905 361..</b> 	✓	-	-	-	✓
<b>Shark pro Art. No. 5906 2..</b> 	✓	-	-	-	✓

Corrosion Resistance			Fire Resistance			
Hot-dipped	A4	HCR	R 120	ZTV-ING		RWS
				A4	HCR	
✓	✓	✓	✓	-	✓	-
-	✓	✓	-	-	✓	-
-	✓	-	-	-	-	-
✓	✓	✓	✓	-	-	-
✓	✓	✓	✓	-	-	-
✓	✓	✓	-	-	-	-
✓	✓	✓	✓	-	-	-
✓	✓	✓	✓	-	-	-
-	✓	-	✓	-	-	-
-	✓	✓	✓	-	✓	-
-	✓	✓	✓	-	✓	-
-	✓	-	✓	-	-	-
✓	✓	✓	-	-	✓	-
-	✓	✓	✓	-	-	-
-	✓	✓	✓	✓	✓	✓
-	✓	-	-	-	-	-



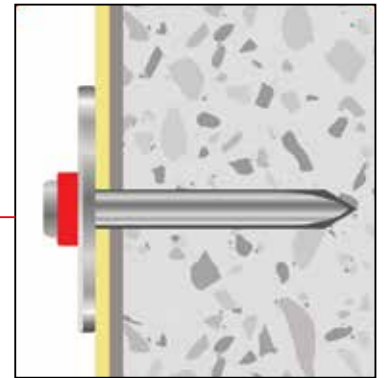
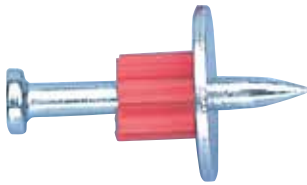


Reinforcement mesh



## SEALING MEMBRANE

**UNS Nail 104**  
Art. No. 0864 104 ...



### Type of installation

Pre-positioned	In-place	Stand-off
-	✓	-

Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>UNS Nail 104</b> 0864 104 ...	✓	-	-	-	✓	-	-	-	-	-	-	-
<b>WIT-VM 250</b> 0903 450..	✓	✓	-	-	✓	✓	✓	✓	✓	-	-	-

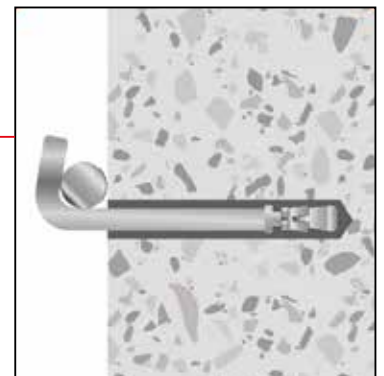
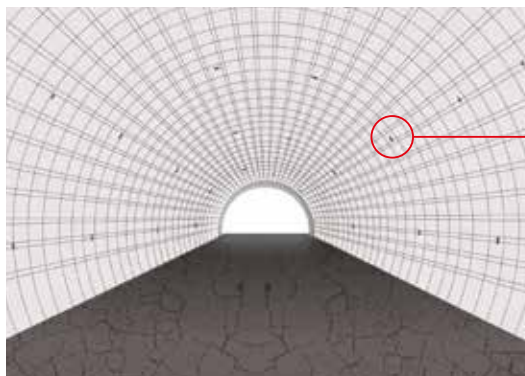
Also suitable:

**WIT VM 250**  
Art. No. 0903 450..



## REINFORCEMENT MESH

**Fixanchor B-W**  
Special Request



### Type of installation

Pre-positioned	In-place	Stand-off
✓	✓	-

Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>Fixanchor B-W</b> Special request	✓	-	-	-	✓	-	-	-	-	-	-	-
<b>WIT-PE 500</b> + Rebar 0903 480..	✓	✓	✓	-	✓	✓	✓	✓	✓	-	-	-

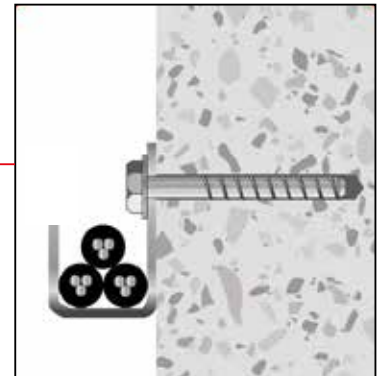
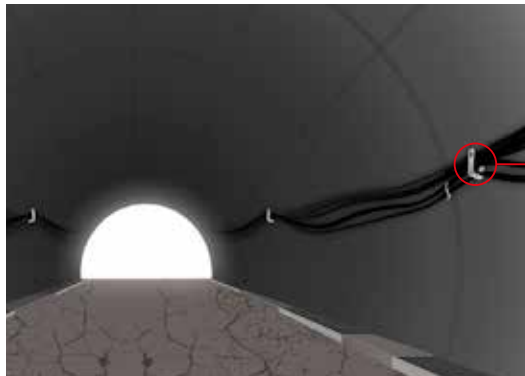
Also suitable:

**WIT-PE 500 + Rebar**  
Art. No. 0903 480..



## POWER SUPPLY CABLE

**Concrete Screw W-BS**  
Art. No. 5929..



### Type of installation

Pre-positioned	In-place	Stand-off
-	✓	-

### Approvals and certificates\*



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING A4	HCR	RWS
<b>W-BS 5929..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>W-FAZ 5928..</b>	✓	✓	✓	-	✓	-	✓	✓	✓	-	✓	-
<b>W-FA 5932..</b>	✓	-	-	-	✓	✓	✓	✓	-	-	✓	-

### Also suitable:

**W-FAZ**  
Art. No. 5928..

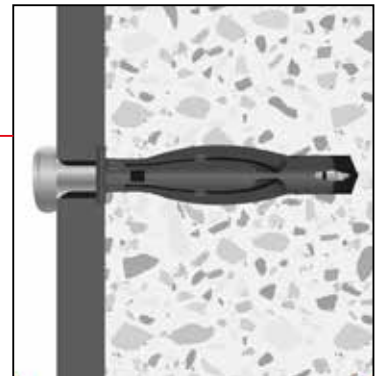
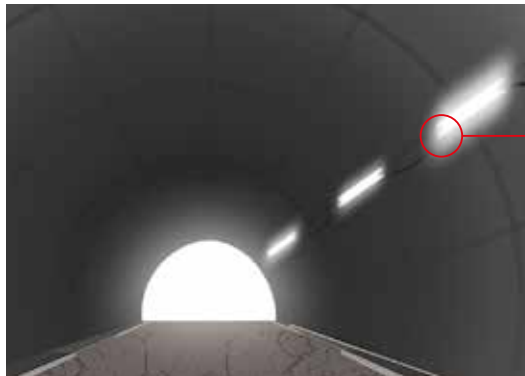


**W-FA**  
Art. No. 5932..



## TEMPORARY LIGHTING

**Shark Pro**  
Art. No. 5906 2..



### Type of installation

Pre-positioned	In-place	Stand-off
✓	✓	-

### Approvals and certificates\*



### Also suitable:

**W-BS**  
Art. No. 5929..



**W-FA**  
Art. No. 5932..



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>Shark Pro 5906 2..</b>	✓	-	-	-	✓	-	✓	-	-	-	-	-
<b>W-BS 5929..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>W-FA 5932..</b>	✓	-	-	-	✓	✓	✓	✓	-	-	✓	-

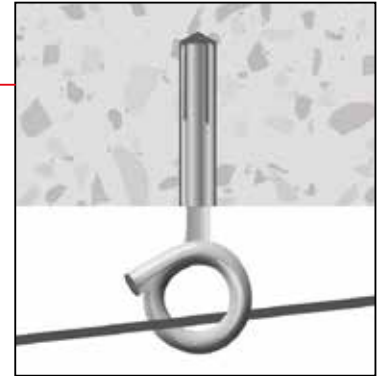
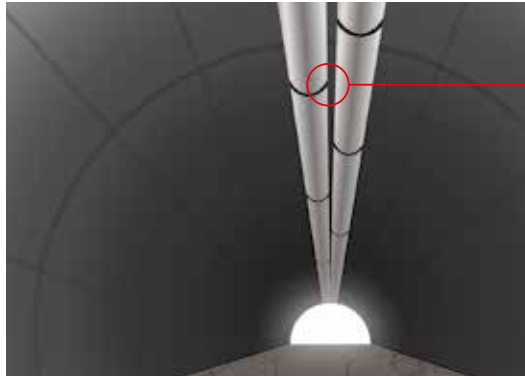


\* see page 26



## VENTILATION PIPES

**Drop-in Anchor W-ED**  
Art. No. 0904..



### Type of installation

Pre-positioned	In-place	Stand-off
✓	-	-

### Approvals and certificates\*



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>W-ED 0904..</b>	✓	-	-	-	✓	-	✓	✓	✓	-	-	-
<b>W-BS 5929..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>WIT-VM 250 + W-VI-IG 0903 450..</b>	✓	✓	-	-	✓	✓	✓	✓	✓	-	-	-

**Also suitable:**

**W-BS + internal thread**  
Art. No. 5929..

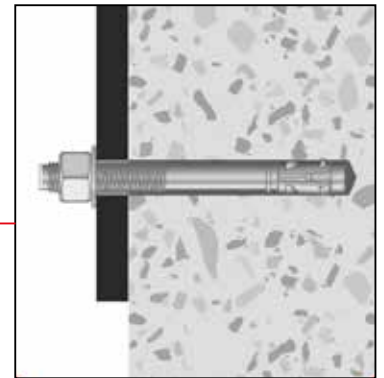
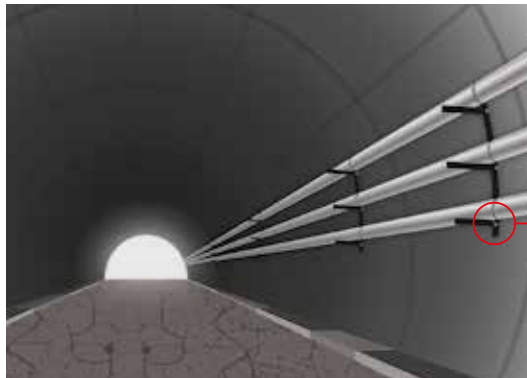


**WIT-VM 250 + W-VI-IG**  
Art. No. 0903 450..



## UTILITY PIPES

**Fixanchor W-FAZ**  
**Art. No. 5928..**



### Type of installation

Pre-positioned	In-place	Stand-off
-	✓	✓

### Approvals and certificates\*



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>W-FAZ 5928..</b>	✓	✓	✓	-	✓	-	✓	✓	✓	-	✓	-
<b>W-BS 5929..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>W-FA 5932..</b>	✓	-	-	-	✓	✓	✓	✓	-	-	✓	-

### Also suitable:

#### W-BS

**Art. No. 5929..**



#### W-FA

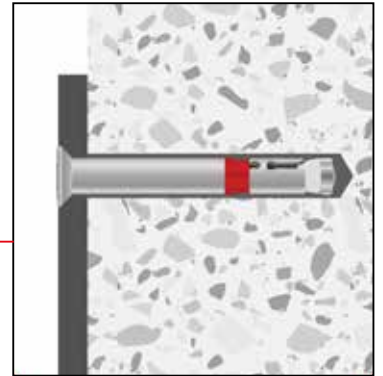
**Art. No. 5932..**



\* see page 26

## EXIT NICHE

**High-performance Anchor W-HAZ**  
Art. No. 0905 2..



### Type of installation

Pre-positioned	In-place	Stand-off
-	✓	-

### Approvals and certificates\*



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>W-HAZ 0905 2..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>W-BS 5929..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>W-NA 0905 362..</b>	✓	-	-	-	✓	-	✓	✓	✓	✓	✓	✓

### Also suitable:

**W-BS**  
Art. No. 5929..



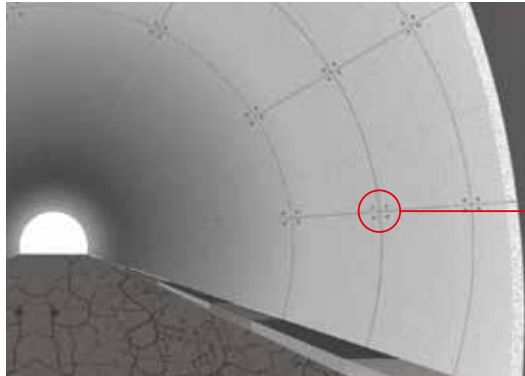
**W-NA**  
Art. No. 0905 361..





## FIRE PROTECTION BOARDS

**Hammer-in Anchor W-NA**  
Art. No. 0905 361..



### Type of installation

Pre-positioned	In-place	Stand-off
✓	✓	-

### Approvals and certificates\*



### Also suitable:

**W-BS**  
Art. No. 5929..



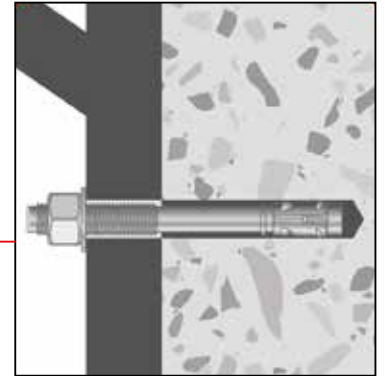
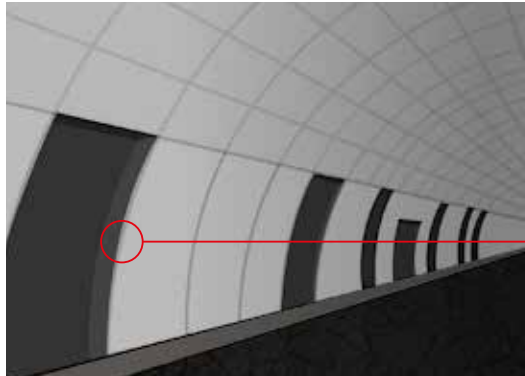
Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>W-NA</b> <b>0905 362..</b>	✓	-	-	-	✓	-	✓	✓	✓	✓	✓	✓
<b>W-BS</b> <b>5929..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-



\* see page 27

## WALL CLADDINGS

**Fixanchor W-FAZ**  
Art. No. 5928..



### Type of installation

Pre-positioned	In-place	Stand-off
-	✓	✓

### Approvals and certificates\*



### Also suitable:

**W-BS**  
Art. No. 5929..



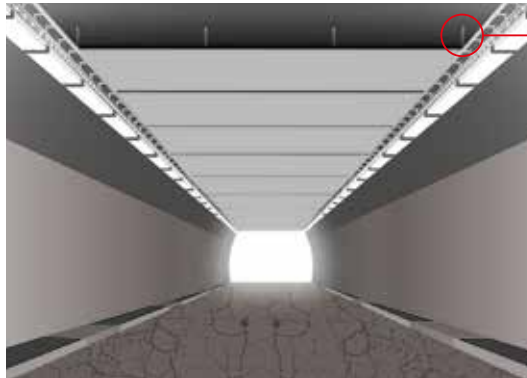
**W-FA**  
Art. No. 5932..



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>W-FAZ 5928..</b>	✓	✓	✓	-	✓	-	✓	✓	✓	-	✓	-
<b>W-BS 5929..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>W-FA 5932..</b>	✓	-	-	-	✓	✓	✓	✓	-	-	✓	-



# FALSE CEILING



### Type of installation

Pre-positioned	In-place	Stand-off
✓	✓	✓

### Approvals and certificates\*



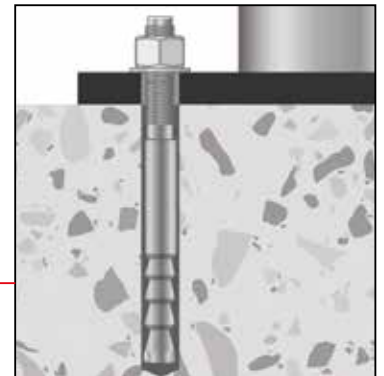
Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>WIT-VIZ</b> 0905 440..	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	-
<b>WIT-PE 1000</b> 5918 605..	✓	✓	✓	-	✓	✓	✓	✓	✓	-	-	-
<b>WIT-UH 300</b> 5918 500..	✓	✓	✓	-	✓	✓	✓	✓	✓	-	-	-



\* see page 26



# HANDRAILS



### Type of installation

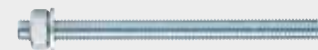
Pre-positioned	In-place	Stand-off
✓	✓	✓

### Approvals and certificates\*



Also suitable:

**WIT-UH 300**  
Art. No. 5918 500..



**W-BE**  
Art. No. 5929..

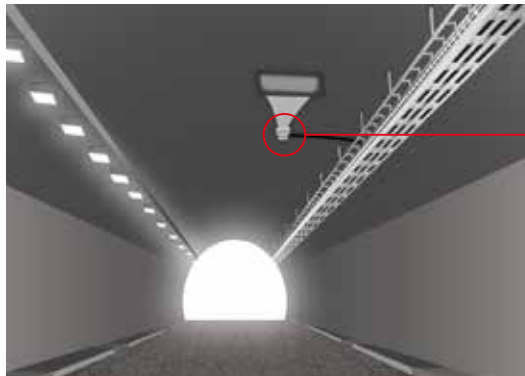


Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>WIT-VIZ</b> 0905 440..	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	-
<b>WIT-UH 300</b> 5929..	✓	✓	✓	-	✓	✓	✓	✓	✓	-	-	-
<b>W-BE</b> 5918 500..	✓	✓	✓	-	✓	✓	✓	✓	✓	-	-	-



## LIGHTING / CABLE TRAYS / LOUDSPEAKERS

**Fixanchor W-FAZ**  
Art. No. 5928..



### Type of installation

Pre-positioned	In-place	Stand-off
-	✓	✓

### Approvals and certificates\*



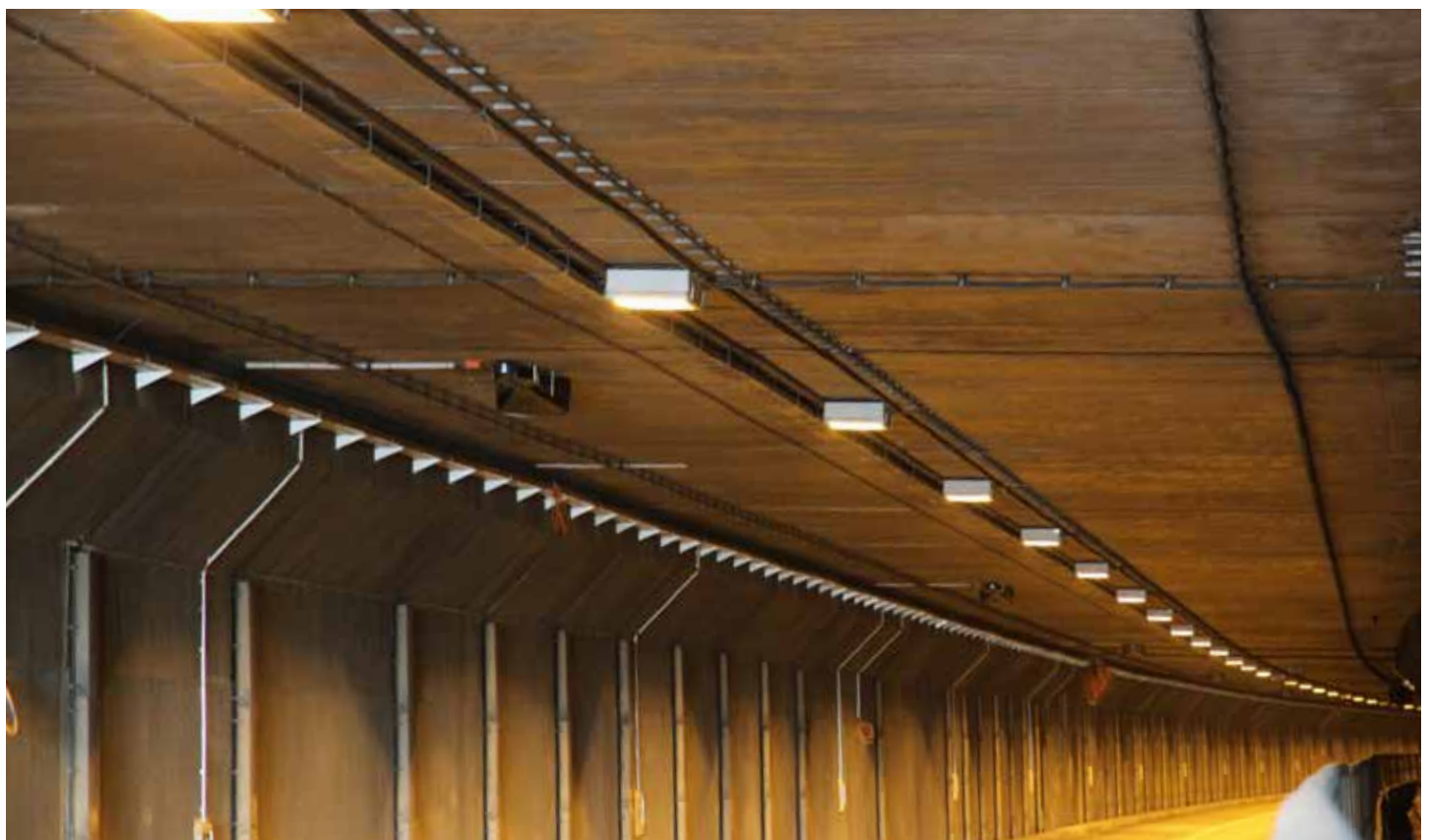
Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>W-FAZ 5928..</b>	✓	✓	✓	-	✓	-	✓	✓	✓	-	✓	-
<b>W-BS 5929..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>WIT-VIZ 0905 440..</b>	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	-

### Also suitable:

**W-BS**  
Art. No. 5929..



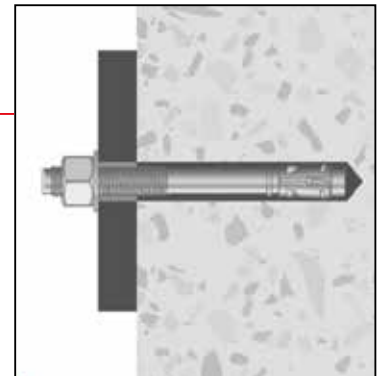
**WIT-VIZ**  
Art. No. 0905 440..



\* see page 26

## TRAFFIC SIGNS / EMERGENCY APPARATUS

**Fixanchor W-FAZ**  
Art. No. 5928..



### Type of installation

Pre-positioned	In-place	Stand-off
-	✓	✓

### Approvals and certificates\*

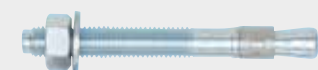


### Also suitable:

**W-BS**  
Art. No. 5929..



**W-FA**  
Art. No. 5932..



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>W-FAZ</b> 5928..	✓	✓	✓	-	✓	-	✓	✓	✓	-	✓	-
<b>W-BS</b> 5929..	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>W-FA</b> 5932..	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	-





# JET FANS



### Type of installation

Pre-positioned	In-place	Stand-off
✓	✓	✓

### Approvals and certificates\*



### Also suitable:

**W-FAZ Pro +  
Filling Washer WIT SHB**  
**Art. No. 5930..**



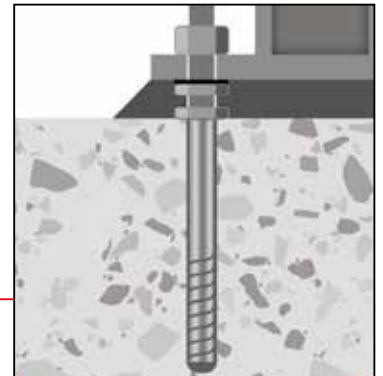
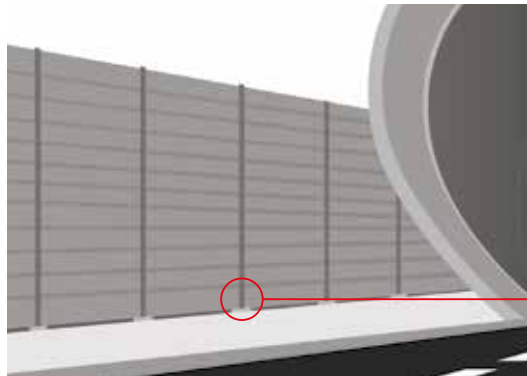
Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>WIT-VIZ Dynamic 0905 481..</b>	✓	-	-	✓	✓	-	✓	✓	-	-	✓	-
<b>W-FAZ Pro + Filling Washer WIT SHB 5930..</b>	✓	✓	✓	✓	✓	-	✓	✓	✓	-	✓	-



\* see page 26

## NOISE BARRIERS

**WIT-BS Stud Screw Type ST**  
Art. No. 0905 450..



### Type of installation

Pre-positioned	In-place	Stand-off
✓	✓	✓

### Approvals and certificates\*



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>WIT-BS 0905 450..</b>	✓	-	-	-	✓	-	✓	-	✓	-	-	-
<b>WIT-UH 300 5918 500..</b>	✓	✓	✓	-	✓	✓	✓	✓	✓	-	-	-
<b>WIT-VIZ 0905 440..</b>	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	-

### Also suitable:

**WIT-UH 300 Art. No. 5918 500..**

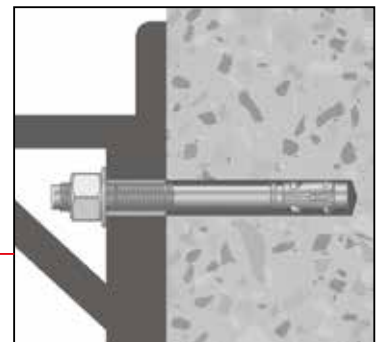


**WIT-VIZ Art. No. 0905 440..**



## CATWALK

**Fixanchor W-FAZ**  
Art. No. 5928..



### Type of installation

Pre-positioned	In-place	Stand-off
-	✓	✓

### Approvals and certificates\*



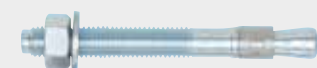
Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>W-FAZ 5928..</b>	✓	✓	✓	-	✓	-	✓	✓	✓	-	✓	-
<b>W-BS 5929..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>W-FA 5932..</b>	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	-

### Also suitable:

**W-BS  
Art. No. 5929..**

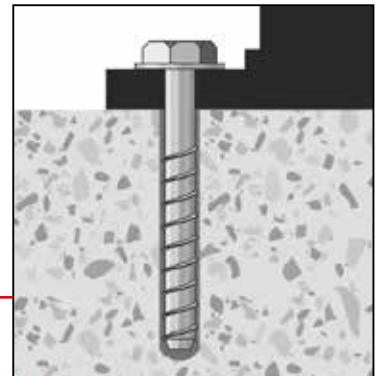


**W-FA  
Art. No. 5932..**



## TEMPORARY RAIL-TRACK

**WIT-BS Concrete Screw**  
Art. No. . 0905 450..



### Type of installation

Pre-positioned	In-place	Stand-off
-	✓	-

### Approvals and certificates\*



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING		RWS
										A4	HCR	
<b>WIT-BS 0905 450..</b>	✓	-	-	-	✓	-	✓	-	-	-	-	-
<b>W-BS Stud Screw 5929..</b>	✓	✓	✓	-	✓	-	✓	-	✓	-	-	-
<b>WIT-UH 300 5918 500..</b>	✓	✓	✓	-	✓	✓	✓	✓	✓	-	-	-

Also suitable:

**W-BS Stud Screw**  
Art. No. 5929..



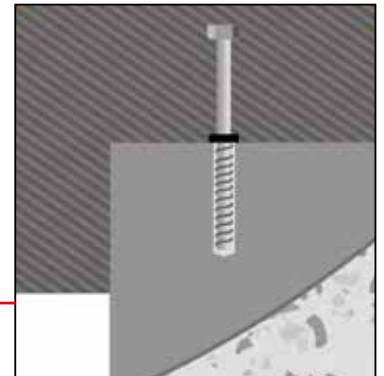
**WIT-UH 300**  
Art. No. 5918 500..



\* see page 26



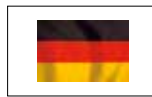
## EDGE BEAM



### Type of installation

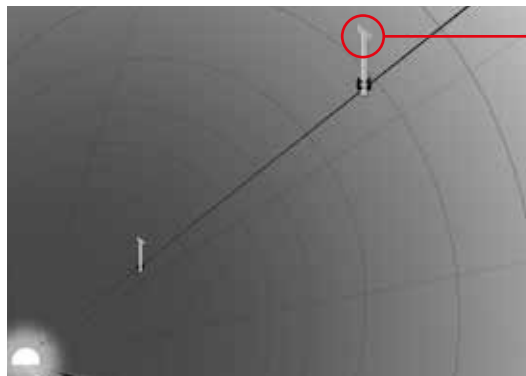
Pre-positioned	In-place	Stand-off
✓	-	-

### Approvals and certificates



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING A4	HCR	RWS
<b>Edge beam anchor 0905 450 ...</b>	✓	-	-	-	✓	-	✓	✓	✓	-	-	-

## COMMUNICATION ANTENNAS



### Type of installation

Pre-positioned	In-place	Stand-off
✓	✓	✓

### Approvals and certificates\*



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING A4	HCR	RWS
<b>WIT-VIZ 0905 440..</b>	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	-
<b>W-FAZ Pro 5930..</b>	✓	✓	✓	✓	✓	-	✓	✓	✓	-	✓	-
<b>WIT-UH 300 5918 500..</b>	✓	✓	✓	-	✓	✓	✓	✓	✓	-	-	-

### Also suitable:

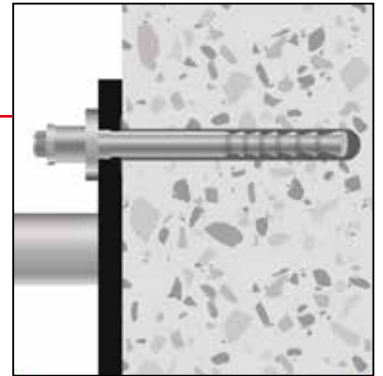
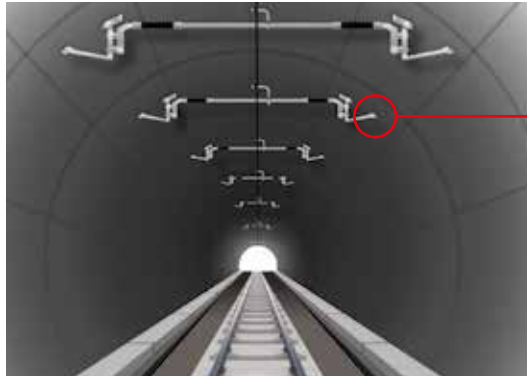
**W-FAZ Pro**  
Art. No. 5930..



**WIT-UH 300**  
Art. No. 5918 500..



## OVERHEAD LINES



### Type of installation

Pre-positioned	In-place	Stand-off
✓	✓	✓

### Approvals and certificates\*



Anchor/ Screw Art. No.	Load				Corrosion Resistance				Fire Resistance			
	Static	C1	C2	Fatigue	Galva- nized	Hot- dipped	A4	HCR	R 120	ZTV-ING A4	HCR	RWS
<b>WIT-VIZ Dyn. 0905 481..</b>	✓	-	-	✓	✓	-	✓	✓	-	-	✓	-
<b>W-FAZ Pro + Filling Washer WIT SHB 5930..</b>	✓	✓	✓	✓	✓	-	✓	✓	✓	-	✓	-

### Also suitable:

**W-FAZ Pro +  
Filling Washer WIT SHB  
Art. No. 5930..**



\* see page 26

# SYMBOLS



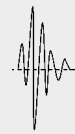
## ETA – European Technical Assessment

Key document for designing an anchorage. It contains the performance parameter of the anchor.



## German Technical Assessment

Key document for designing an anchorage. It contains the performance parameter of the anchor.



## Seismic actions

The seismic category (C1 or C2) of the fastener is stated in the relevant ETA



## Fire resistance classification



## For sprinkler systems



# REFERENCE PROJECTS

## Chengdu Metro Line 7, China (2017)



### Applications

#### Cable Trays



#### Utility Pipes



#### Anchor solution

**WIT-PE 500**  
Art. No. 0903 480



#### Related items

**Cordless application gun**  
Art. No. 0891 003 420



**Mixer nozzle**  
Art. No. 0903 488 101



**Infrared laser thermometer**  
Art. No. 0715 53 110



# REFERENCE PROJECTS

**Ursulabergtunnel, Pfullingen, Germany (2017)**



## Applications

### Cable Trays



### Lighting



### Anchor solutions

**W-FAZ**  
Art. No. 5928..



**W-FA**  
Art. No. 5932..



### Related items

**Cordless hammer drill**  
Art. No. 5700 801



**Hammer drill bit box**  
Art. No. 0648 050 001



**Setting tool**  
Art. No. 0904 908 016



## Terzo Valico Die Giovi, Italy (2019)

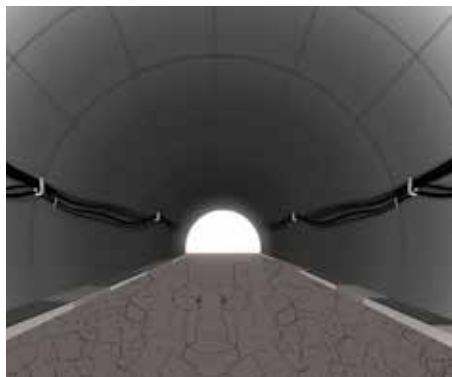


### Applications

#### Emergency Equipment



#### Power Cables



#### Anchor solutions

**W-FAZ**  
Art. No. 5928..



**W-BS**  
Art. No. 5929...



#### Related items

**Industrial  
vacuum cleaner**  
Art. No. 0701 143 0



**Vacuum drill set**  
Art. No. 0648 450 003





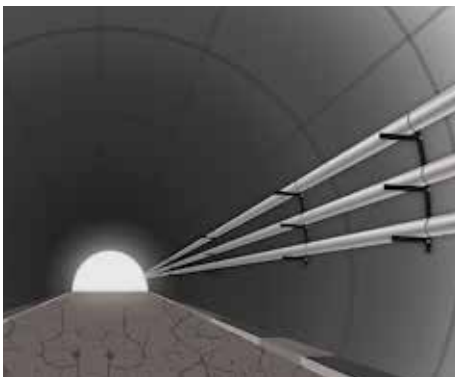
# REFERENCE PROJECTS

## Brenner Base Tunnel, Italy (2019)

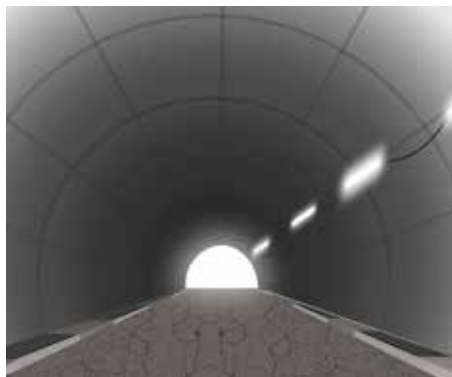


### Applications

#### Utility Pipes



#### Temporary Lighting



### Anchor solutions

#### W-FAZ

Art. No. 5932..



#### WIT-VM 250

Art. No.0903 450...



### Related items

#### Blow out pump

Art. No. 0903 990 001



#### Torque wrench

Art. No. 0714 71 23



#### Cleaning brush

Art. No. 0903 489 51



## Flirsch Tirol, Austria (2016)



### Applications

#### Jet Fans



#### Anchor solutions

WIT-VIZ Dynamic  
Art. No. 0905 481..



#### Related items

Safety goggles  
Art. No. 0899 102 270



Protective glove, multi-fit, nitrile  
Art. No. 0899 405 ...



Ear defenders, pocket  
Art. No. 0899 300 230



# FIXING APPLICATIONS IN TUNNELS

Adolf Würth GmbH & Co. KG  
74650 Künzelsau  
T +49 (0)7940 15-0  
F +49 (0)7940 15-1000  
info@wuerth.com  
www.wuerth.de

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Dept. IDB/Raseem Khouja  
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