

**fischer** 

**FIS EM Plus.**  
High-performance  
bonding in wood.



# Strong Bond: FIS EM Plus in wood.

Maximum, long-lasting load capacity, flexible application and invisible anchoring - FIS EM Plus takes wood connections to a new level. Whether wood-wood, wood-concrete or wood-steel: the injection adhesive makes connections not only strong, but also architecturally appealing - regulated and approved in accordance with the European Technical Assessment (ETA) and national technical approval.



FIS EM Plus 585 S

FIS EM Plus 390 S

FIS EM Plus 1500 S

FIS EM Plus 300 T

## The advantages at a glance

- High-performance and visually appealing wood-wood, wood-concrete and wood-steel connections
- Flexible application indoors and outdoors thanks to a wide range of anchors in various steel grades
- Robust cartridge system with optimised flow behaviour for clean, drip-free work
- Standardised and precise centring of the anchor rods in the drill hole with fischer DD-E and DD-S centring clips
- Safe component transport with internal thread solution without protruding anchor rods

### Approved for



Glued laminated or glued solid timber made of spruce, fir, pine

### Performance features



ETA-19/0657, glued-in steel rods for timber connections



Bonding steel rods in timber construction materials



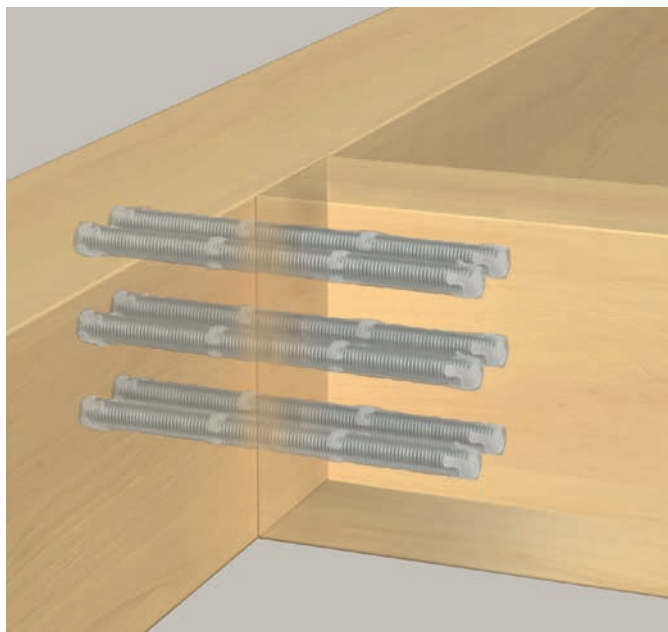
Approved installation temperatures of 17°-40°C

# Timber connections on a new level.

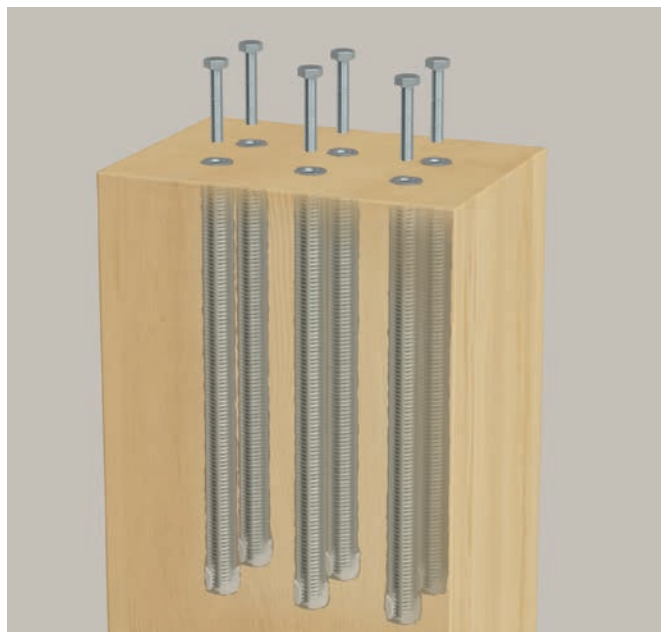


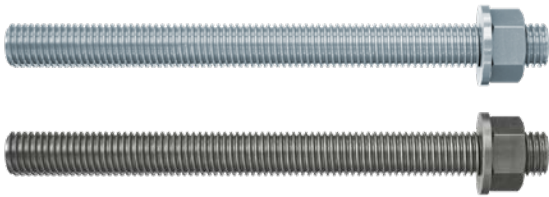
# Flexible application.

Wood-wood connection with anchor rod FIS A



Connection with internal threaded anchor FIS IG and hexagon head screw

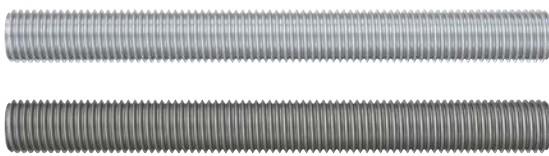




Made of galvanised or stainless steel R or HCR.

### Anchor rod FIS A

- The FIS A anchor rod is approved in sizes M6-M30 for use with FIS EM Plus.
- Variable anchoring depths enable optimum adaptation to the respective application, component thickness and load requirements.



Made of galvanised or stainless steel R.



### Internal threaded anchor FIS IG

- The internal threaded anchor FIS IG is available in internal thread sizes M8-M20 and is approved in accordance with the general technical approval (aBG).
- In combination with metric screws or anchor rods, FIS IG internal threaded anchors can be used to create flush, detachable connections.



### Reinforcing bar (on site)

- Standard reinforcing bar according to EN 1008 with diameters from 6 to 32 mm is approved for use with FIS EM Plus.
- Variable anchorage depths allow for optimal adaptation to the specific application, component thickness, and load requirements.



# Easy processing.

The FIS EM Plus epoxy resin adhesive system is approved with the FIS A anchor rod for pre-positioned and push-through installation and with the FIS IG internal threaded anchor for pre-positioned installation in accordance with the European Technical Assessment (ETA) and national technical approval.

The adhesive bonds the fixing element to the entire surface of the drill hole wall. fischer DD-E and DD-S centring clips ensure the prescribed centring of the fixing element. The adhesive is injected bubble-free from the base of the drill hole. The fixing element is then inserted by hand with a slight twisting movement up to the base of the drill hole. When working with a by-pass injection hole, the first step is to insert the anchor rod into the empty drill hole. The adhesive is then injected via the side injection hole from the bottom of the drill hole until the adhesive emerges at the entrance of the drill hole. The resin and hardener are stored in two separate chambers and are only mixed and activated in the static mixer when the injection cartridge is pressed out. The timber components that are glued in must be made of glued laminated timber or glued solid timber in accordance with DIN EN 14080. The regulated wood species are spruce, pine and fir. Load-bearing timber

connections with glued-in steel bars may be used in service classes 1 and 2 in accordance with DIN EN 1995-1-1. The following components may be bonded: fischer threaded rods FIS A, fischer internal threaded anchors FIS IG, and reinforcing steel bars according to DIN EN 10080 or DIN 488-2 with a nominal diameter  $d$  of  $6 \text{ mm} \leq d \leq 32 \text{ mm}$ .

The timber components must have a moisture content of 6–18%. During bonding, both the room temperature and the temperature of the timber components must be between 17°C and 40°C.

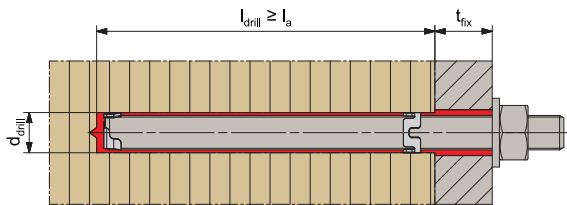
**Note:** In order for the work to be carried out in Germany in accordance with the approval, the company carrying out the work must be in possession of the necessary certificates for proof of suitability for bonding load-bearing timber components in accordance with DIN 1052-10.

## Installation options.

### Direct injection (DI)

#### Push-through installation

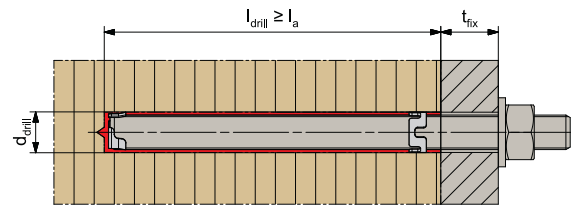
(Installation of the fastening element through the positioned attachment part)



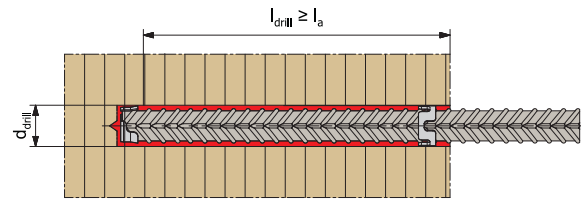
fischer anchor rod FIS A

#### Pre-positioned installation

(Installation of the fastening element before mounting the attachment part)



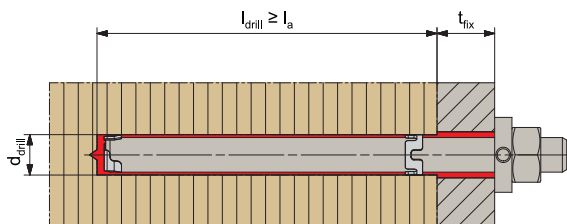
fischer anchor rod FIS A



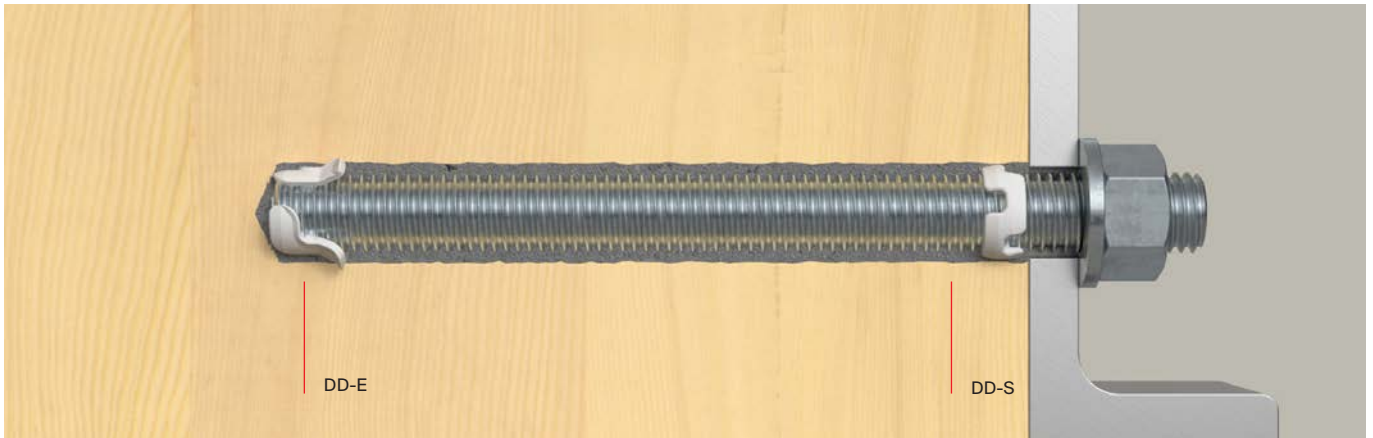
Reinforcing bar

#### Subsequent filling of the annular gap in the attachment part

(optional)



Pre-positioned installation or push-through installation with subsequently pressed fischer FFD filling disc (annular gap filled with adhesive)



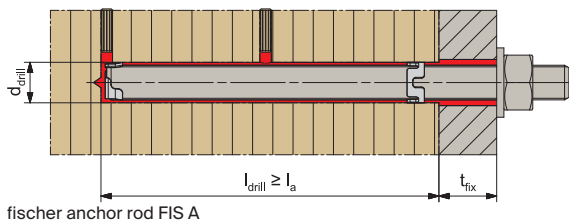
FIS EM Plus adhesive system in wood with FIS A anchor rod and DD-E and DD-S centring clips. The DD-E is used for centring at the bottom of the drill hole and securing in the drill hole against falling out during overhead installation, while the

DD-S is distributed on the steel rod at the required intervals for centring. For pure centering, the use of two or more DD-S is also suitable.

### By-pass injection (BPI)

#### Push-through installation

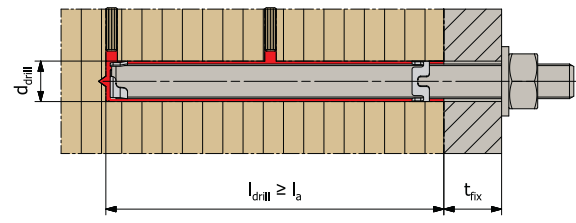
(Installation of the fastening element through the positioned attachment part)



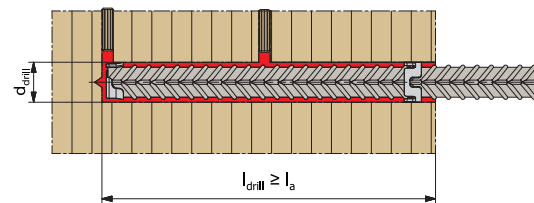
fischer anchor rod FIS A

#### Pre-positioned installation

(Installation of the fastening element before mounting the attachment part)

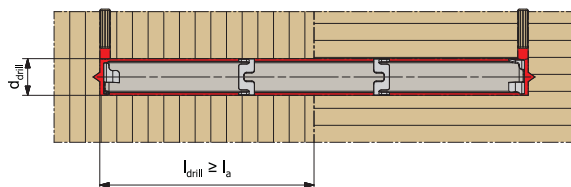


fischer anchor rod FIS A

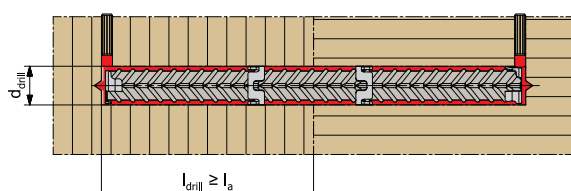


Reinforcing bar

#### Invisible assembly, connecting timber components (horizontal)

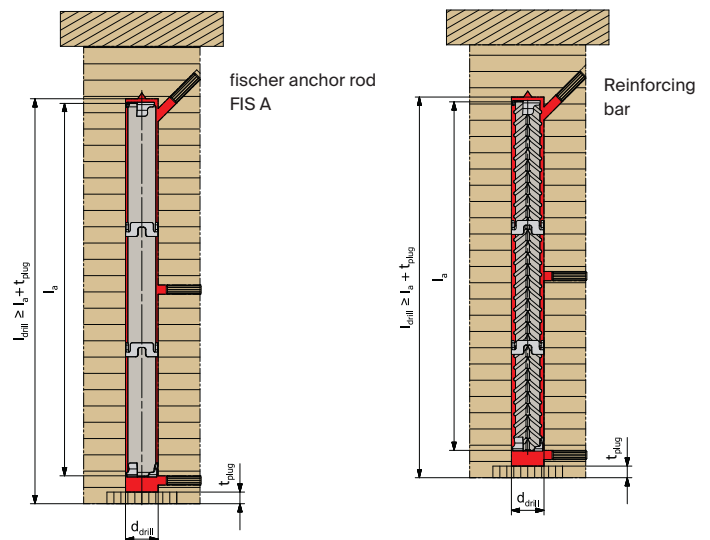


fischer anchor rod FIS A



Reinforcing bar

#### Invisible installation, reinforcement of timber components (vertical)



# Drill hole diameter.

d = Nominal diameter of the steel bars in mm  
 $I_{glue}$  = Total glued length of the steel bars  
 $I_a$  = Nominal bond length of the bonded bars  
 $I_a/d$  = Slimness ratio of the anchor rod

Connection	Nominal diameter d in mm	Drill hole diameter in mm
Reinforcing bars	$6 \leq d \leq 16$	$d + 3 \text{ mm} -0,5/+1$
	$16 < d \leq 20$	$d + 3,5 \text{ mm} \pm 0,5$
	$20 < d \leq 27$	$d + 4,5 \text{ mm} \pm 0,5$
	$27 < d \leq 32$	$d + 5,5 \text{ mm}$
Anchor rods and fischer internal threaded anchors (FIS IG)	M6 - M30	$d + 2,0 \text{ mm to } + 4,0 \text{ mm}$

## Guidelines for slimness of the threaded rod

### Drill hole diameter:

From a slimness of the threaded rod of  $I_a/d > 30$ , the diameter of the drill hole shall be at least 3 mm but no more than 4 mm larger than the nominal diameter of the steel rods.

## Maximum gluing length of the steel bars

Maximum effective glue-in length:  $I_{a,max} = \min. (40 \times d; 1,000 \text{ mm})$

Minimum glue-in length:  $I_{a,min} = \max. (10 \times d; 100 \text{ mm})$

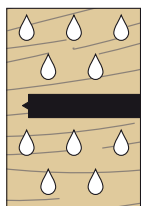
Maximum total glue-in length  $I_{glue}$ : 3,000 mm

Slimness of steel bars: The slimness ratio must result in  $I_{glue}/d < 110$



# Installation instructions.

## Check wood moisture content



6 - 18%

The wood moisture must be between 6 % and 18 %



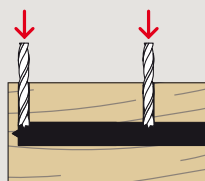
## Step 1: Drill hole construction and cleaning

### A) By-pass injection (BPI)



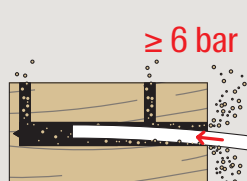
#### 1. Create drill hole:

Drill hole depth  $l_{\text{drill}} \geq l_a$ .  
When using the DD-E centring clips, increase the drill hole depth accordingly.



#### 2. Create injection holes:

Adapt the drill hole diameter  $d_{\text{drill,BPI}}$  to the static mixer:  
FIS MR Plus: 8 mm  
FIS UMR: 10 mm  
Use of the static mixer FIS MR Plus is recommended, as the conical tip achieves a better seal to the injection hole.



#### 3. Clean the drill hole:

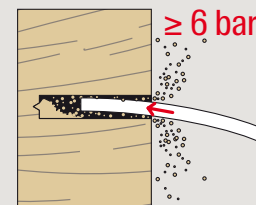
Blow out the drill hole using oil-free compressed air ( $p \geq 6 \text{ bar}$ ) until no more drilling dust escapes.  
If necessary, use a cleaning hose with a compressed air gun. Optionally, the drill hole can also be cleaned by brushing out and then blowing out.

### B) Direct injection (DI)



#### 1. Create drill hole:

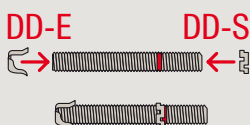
Drill hole depth  $l_{\text{drill}} \geq l_a$ .  
When using the DD-E centring clips, increase the drill hole depth accordingly.



#### 2. Clean the drill hole:

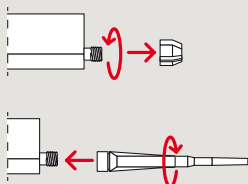
Blow out the drill hole using oil-free compressed air ( $p \geq 6 \text{ bar}$ ) until no more drilling dust escapes.  
If necessary, use a cleaning hose with a compressed air gun. Optionally, the drill hole can also be cleaned by brushing out and then blowing out.

## Step 2: Preparing the cartridge and the steel rods



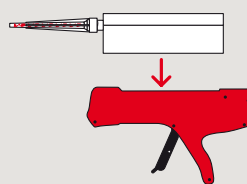
### 1. Prepare the steel rod:

Only use clean and oil-free steel rods. Remove dirt mechanically or chemically if necessary. Mark the target gluing length, taking into account the component thickness  $t_{\text{ix}}$  for push-through installation. Attach centring aids, e.g. fischer centring clip DD-S / DD-E.

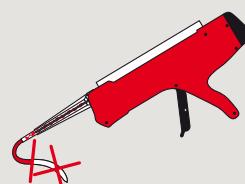


### 2. Remove the sealing cap:

Screw on static mixer (the mixing element in the static mixer must be clearly visible).



### 3. Place the cartridge in the dispenser.



### 4. Squeeze out a strand:

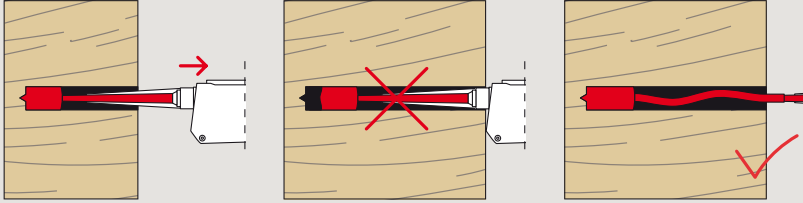
Squeeze out some mortar of about 10 cm in length, until the adhesive is an even grey colour. Adhesive that is not uniformly grey must be disposed of.

### Continue with:

- Direct injection (p. 10)
- Direct injection with internal threaded anchor FIS IG (p. 11)
- By-pass injection, steel/timber bonding (p. 12)
- By-pass injection, timber/timber bonding (p. 13)

## Step 3a: Direct injection (DI)

### Adhesive injection



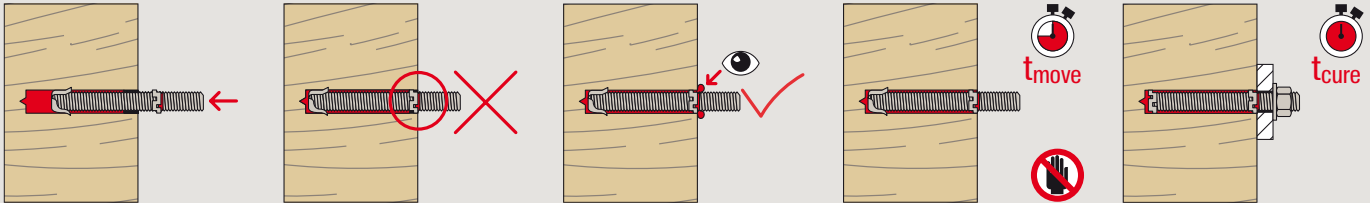
#### 1. Fill the drill hole with adhesive:

Fill approx. 2/3 of the drill hole with adhesive (the amount of adhesive required depends on the width of the annular gap). Always start at the bottom of the drill hole and avoid bubbles.

#### Caution!

If the length of the static mixer is insufficient, a suitable extension hose must be used. For overhead installation, deep drill holes ( $l_{\text{drill}} > 250 \text{ mm}$ ) or large drill hole diameters ( $d_{\text{drill}} \geq 30 \text{ mm}$ ) use an injection aid.

### Pre-positioned installation



#### 2. Pre-positioned installation:

Do not exceed the processing time according to the processing and waiting times table (p. 12). Insert the steel part into the drilled hole until the target gluing length is reached.

#### Caution!

After setting the steel rods, excess adhesive must have escaped from the mouth of the drill hole. If not, pull out the steel part immediately and inject additional adhesive.

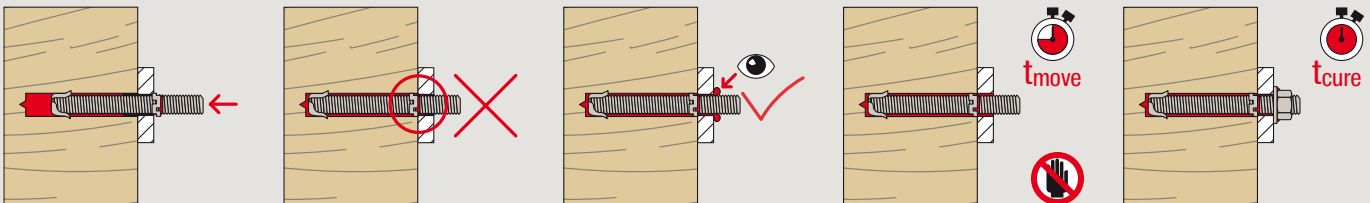
#### 3. Don't move:

Observe the period of time during which the components with glued-in steel rods must not be moved ( $t_{\text{move}}$ ) according to the table **processing and waiting times** (p. 12).

#### 4. Assembly:

Mount the attachment part after the time has elapsed until the final adhesive joint strength is reached at  $T \leq 60 \text{ °C}$  ( $t_{\text{cure}}$ ) according to the **curing time table** (p. 13).

### Push-through installation



#### 2. Push-through installation:

Do not exceed the processing time according to the processing and waiting times table (p. 12). Insert the steel part into the drilled hole until the target gluing length is reached.

#### Caution!

After setting the steel rods, excess adhesive must have escaped from the annular gap. If not, pull out the steel part immediately and inject additional adhesive.

#### 3. Don't move:

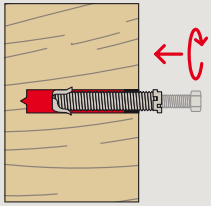
Observe the period of time during which the components with glued-in steel rods must not be moved ( $t_{\text{move}}$ ) according to the table **processing and waiting times** (p. 12).

#### 4. Assembly:

Mount the attachment part after the time has elapsed until the final adhesive joint strength is reached at  $T \leq 60 \text{ °C}$  ( $t_{\text{cure}}$ ) according to the **curing time table** (p. 13).

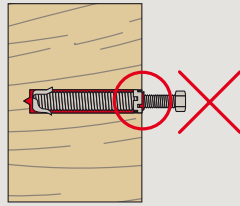
## Step 3b: Direct injection with internal threaded anchor FIS IG

### Pre-positioned installation



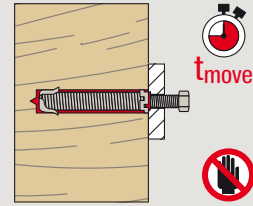
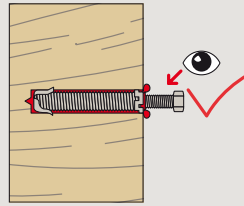
#### 1. Pre-positioned installation:

Do not exceed the processing time according to the processing and **waiting times table (p. 12)**. Insert the internal threaded anchor into the drill hole until the anchor is flush with the surface at the mouth of the drill hole. To simplify the setting process and to protect the internal thread from soiling, an anchor rod can be used already screwed in.



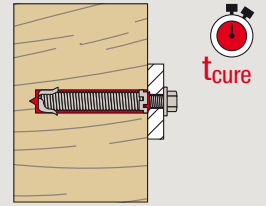
#### Caution!

After setting the steel rods, excess adhesive must have escaped from the mouth of the drill hole. If not, pull out the steel part immediately and inject additional adhesive.



#### 3. Don't move:

Observe the period of time during which the components with glued-in steel rods must not be moved ( $t_{\text{move}}$ ) according to the table **processing and waiting times (p. 12)**.



#### 4. Assembly:

Mount the attachment part after the time has elapsed until the final adhesive joint strength is reached at  $T \leq 60^\circ\text{C}$  ( $t_{\text{cure}}$ ) according to the **curing time table (p. 13)**. To do this, screw a hexagon head screw or anchor rod into the internal thread.

### Step 3c: By-pass injection (BPI), steel/timber bonding

#### Pre-positioned installation

**1. Pre-positioned installation:** Insert the steel part into the drilled hole until the target embedment depth is reached.

**2. Insert the static mixer:** Insert the static mixer sufficiently deep and firmly into the injection hole to prevent adhesive from escaping. Start injecting from the bottom of the drill hole. Continue injecting until adhesive emerges at the next injection hole or at the mouth of the drillhole (if only one injection hole is used). Do not exceed the processing time according to the **processing and waiting times table (p 12)**.

**3. Seal the injection hole:** Close the last injection hole used with a suitable wooden plug / wooden cross plate and continue injecting at the next injection hole. Closing the last injection hole is optional. At the end of the injection process, adhesive must have escaped from the mouth of the drill hole.

**4. Don't move:** Observe the period of time during which the components with glued-in steel rods must not be moved ( $t_{move}$ ) according to the table **processing and waiting times (p. 12)**.

**5. Assembly:** Mount the attachment part after the time has elapsed until the final adhesive joint strength is reached at  $T \leq 60^\circ\text{C}$  ( $t_{cure}$ ) according to the **curing time table (p. 13)**.

#### Push-through installation

**1. Push-through installation:** Insert the steel part into the drilled hole until the embedment depth length is reached.

**2. Insert the static mixer:** Insert the static mixer sufficiently deep and firmly into the injection hole to prevent adhesive from escaping. Start injecting from the bottom of the drill hole. Continue injecting until adhesive emerges at the next injection hole or at the annular gap (if only one injection hole is used). Do not exceed the processing time according to the **processing and waiting times table (p 12)**.

**3. Seal the injection hole:** Close the last injection hole used with a suitable wooden plug / wooden cross plate and continue injecting at the next injection hole. Closing the last injection hole is optional. At the end of the injection process, adhesive must have escaped from the mouth of the drill hole.

**4. Don't move:** Observe the period of time during which the components with glued-in steel rods must not be moved ( $t_{move}$ ) according to the table **processing and waiting times (p. 12)**.

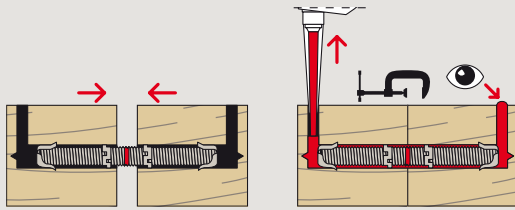
**5. Assembly:** Mount the attachment part after the time has elapsed until the final adhesive joint strength is reached at  $T \leq 60^\circ\text{C}$  ( $t_{cure}$ ) according to the **curing time table (p. 13)**.

### Processing and waiting times

Room temperature and temperature of the timber members with glued-in steel rods during installation	17 to <20 °C	20 to <30 °C	30 to <40 °C
Maximum period of time for introducing the steel rod into the borehole filled with adhesive and aligning it after filling of the borehole has been started	30 min	14 min	7 min
Period of time during which the members with the glued-in steel rods must not be moved ( $t_{move}$ )	8,5 h	4,75 h	3,15 h

### Step 3d: By-pass injection (BPI), timber/timber bonding

#### Connecting timber components

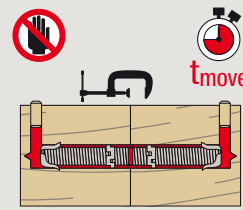


**1. Insert steel part:**

Insert the steel component into the drilled hole until the required glue-in length is reached. Position the second timber component and join the components. Clamp / fix the components together. Prevent adhesive from escaping at the joint gap, additionally seal the joint gap if necessary.

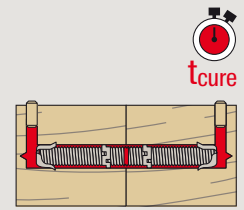
**2. Injection:**

Insert the static mixer sufficiently deep and firmly into the injection hole to prevent adhesive from escaping. Start injecting from the bottom of the drill hole. Continue injecting until adhesive emerges from the next or opposite injection hole (if only one injection hole is used). If several injection holes are used, close the last injection hole used with a suitable wooden dowel/cross-tie and continue injecting at the next hole. Sealing the last injection hole is optional. Do not exceed the processing time according to the **processing and waiting times table (p. 12)**.



**4. Don't move:**

Observe the period of time during which the components with glued-in steel rods must not be moved ( $t_{move}$ ) according to the table **processing and waiting times (p. 12)**. Do not remove the component fixation until  $t_{move}$  has been reached.

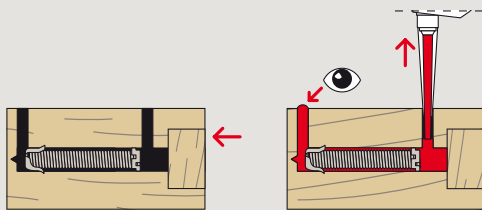


**4. Assembly:**

After the period of time until the adhesive has reached its final joint strength at  $T \leq 60^\circ C$  ( $t_{cure}$ ), the assembled structural component may be fully loaded.

### Step 3e: By-pass injection (BPI), timber reinforcement

#### Reinforcement of wooden components

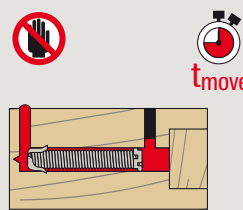


**1. Insert steel part:**

Insert the steel component into the drill hole until the bottom of the drill hole is reached. For overhead installation, fix the steel bars in place with wedges (e.g. fischer centring wedges) or by hammering in a sealing plug or small wooden plate.

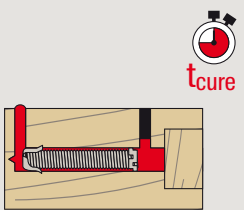
**2. Injection:**

For vertical installation, the injection direction from bottom to top is preferable. Insert the static mixer sufficiently deep and firmly into the injection hole to prevent adhesive from escaping. Continue injecting until adhesive emerges from the next injection hole. Close the last injection hole used with a suitable wooden dowel/cross-tie and continue injecting at the next injection hole. Sealing the last injection hole is optional. Do not exceed the processing time according to the **processing and waiting times table (p. 12)**.



**3. Don't move:**

Observe the period of time during which the components with glued-in steel rods must not be moved ( $t_{move}$ ) according to the table **processing and waiting times (p. 12)**. Do not remove the component fixation until  $t_{move}$  has been reached.



**4. Assembly:**

After the period of time until the adhesive has reached its final joint strength at  $T \leq 60^\circ C$  ( $t_{cure}$ ), the assembled structural component may be fully loaded.

### Curing times

Room temperature and temperature of the timber members with glued-in steel rods during installation	17 to < 20 °C	20 to < 30 °C	30 to < 40 °C
Time until the final adhesive joint strength is reached at $T \leq 60^\circ C$ <sup>1)</sup> ( $t_{cure}$ )	36 h	18 h	12 h

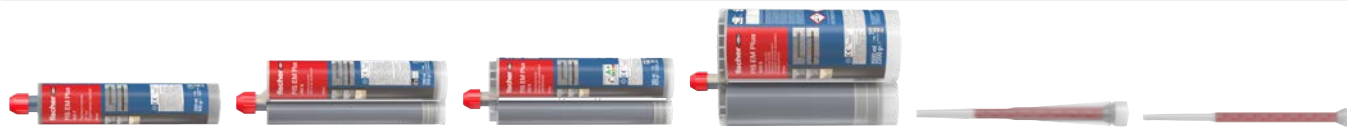
<sup>1)</sup> The load-bearing connections with glued-in steel bars may be exposed to a maximum component temperature of 60 °C after this period.



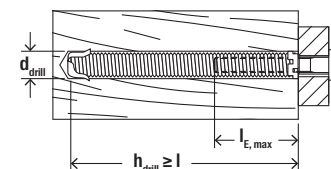


# Assortment and technical data.

## Epoxy mortar FIS EM Plus



Item	Item no.	Approval		Language on label	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt				
FIS EM Plus 300 T	575313	●	●	DE, IT	150	1 x Cartridge 300 ml, 2 x Static mixer FIS MR Plus	1
FIS EM Plus 300 T	575314	●	●	AR, EN, PT	150	1 x Cartridge 300 ml, 2 x Static mixer FIS MR Plus	1
FIS EM Plus 390 S	544154	●	●	EN, FR, NL	180	1 x Cartridge 390 ml, 2 x Static mixer FIS MR Plus	1
FIS EM Plus 390 S	544176	●	●	CS, RO, SK	180	1 x Cartridge 390 ml, 2 x Static mixer FIS MR Plus	1
FIS EM Plus 390 S	544171	●	●	DE, FR	180	1 x Cartridge 390 ml, 2 x static mixer FIS MR Plus	1
FIS EM Plus 390 S	544159	●	●	KK, RU, UK	180	1 x Cartridge 390 ml, 2 x Static mixer FIS MR Plus	1
FIS EM Plus 390 S	567987	●	●	EL, HU, KO	180	1 x Cartridge 390 ml, 2 x Static mixer FIS MR Plus	1
FIS EM Plus 585 S	544165	●	●	CS, KO, PL, SK	270	1 x Cartridge 585 ml, 2 x Static mixer FIS UMR	1
FIS EM Plus 585 S	544166	●	●	EL, EN, ES, PT	270	1 x Cartridge 585 ml, 2 x Static mixer FIS UMR	1
FIS EM Plus 585 S	567989	●	●	DE, FR, NL	270	1 x Cartridge 585 ml, 2 x Static mixer FIS UMR	1
FIS EM Plus 585 S	544175	●	●	EN, KO, ZH	270	1 x Cartridge 585 ml, 1 x Static mixer FIS UMR, 1 x Extension tube $\varnothing 9 \times 250$ mm	1
FIS EM Plus 1500 S	544167	●	●	DE, EN, ES, FR, IT	670	1 x Cartridge 1500 ml, 2 x Static mixer FIS UMR	1
FIS MR Plus	545853	-	-	-	-	10 x Static mixer FIS MR Plus for all cartridge sizes from 100 ml to 410 ml	10
FIS UMR	520593	-	-	-	-	10 x static mixer FIS UMR for 585 & 1500 ml cartridges	10



## Technical data

### Internal threaded anchor FIS IG

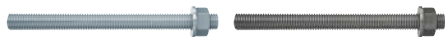


Item	Galvanised steel		Ap- pro- val	Internal thread	External thread	Drill hole diameter in wood $d_{drill}$ [mm]	Min. drill hole depth $h_{drill}$ [mm]	Anchor length $l$ [mm]	Min. screw-in depth screw 5.8 / 8.8 / R / HCR $L_{E,min}$ [mm]	Max. bolt penetration $L_{E,max}$ [mm]	Min. / max. filling quantity [scale units]	Sales unit [pcs]
	Item no.	Item no.										
FIS IG 8	572992	572997	●	M8	M12	14 / 16	120	120	7 / 10 / 6 / 6	20	5 / 7	10
FIS IG 10	572993	572998	●	M10	M16	18 / 20	160	160	9 / 12 / 8 / 8	25	8 / 13	10
FIS IG 12	572994	572999	●	M12	M20	22 / 24	200	200	11 / 14 / 9 / 9	30	14 / 22	10
FIS IG 16	572995	573000	●	M16	M24	26 / 28	240	240	14 / 19 / 12 / 12	40	22 / 34	5
FIS IG 20	572996	573001	●	M20	M30	32 / 34	300	300	17 / 23 / 15 / 15	50	39 / 54	5



## Technical data

### Threaded rod FIS A



FIS A

FIS A R

Item	Galvani- sed steel, steel grade 5.8	Galvani- sed steel, steel grade 8.8	Stainless steel	Ap- pro- val	Drill hole diameter in wood	Min. / Max. embedment depth in wood	Filling quantity min. / max. drill diameter per 100 mm embed- ment depth in wood	Sales unit
	Item no. gvz 5.8	Item no. gvz 8.8	Item no. R	ETA	$d_{\text{drill}}$ [mm]	$l_a = l_{\text{drill}}$ [mm]	[scale units]	[pcs]
FIS A M8 x 130	090276	519392	090442	●	10 / 12	100 / 130	3 / 4	10
FIS A M8 x 140	553763	-	-	●	10 / 12	100 / 140	3 / 4	10
FIS A M8 x 150	-	553627	-	●	10 / 12	100 / 150	3 / 4	10
FIS A M8 x 175	090277	519393	090443	●	10 / 12	100 / 175	3 / 4	10
FIS A M10 x 130	090279	524170	090447	●	12 / 14	100 / 130	3 / 5	10
FIS A M10 x 135	-	-	562856	●	12 / 14	100 / 135	3 / 5	10
FIS A M10 x 150	090281	517935	090448	●	12 / 14	100 / 150	3 / 5	10
FIS A M10 x 160	-	-	562855	●	12 / 14	100 / 160	3 / 5	10
FIS A M10 x 170	044969	519395	044973	●	12 / 14	100 / 170	3 / 5	10
FIS A M10 x 190	-	517936	-	●	12 / 14	100 / 190	3 / 5	10
FIS A M10 x 200	090282	519396	090449	●	12 / 14	100 / 200	3 / 5	10
FIS A M12 x 140	090283	519398	090450	●	14 / 16	120 / 140	4 / 6	10
FIS A M12 x 160	090284	517937	090451	●	14 / 16	120 / 160	4 / 6	10
FIS A M12 x 180	090285	519399	090452	●	14 / 16	120 / 180	4 / 6	10
FIS A M12 x 200	-	517938	519421	●	14 / 16	120 / 200	4 / 6	10
FIS A M12 x 210	090286	-	090453	●	14 / 16	120 / 210	4 / 6	10
FIS A M12 x 260	090287	-	-	●	14 / 16	120 / 260	4 / 6	10
FIS A M12 x 260	-	-	090454	●	14 / 16	120 / 260	4 / 6	10
FIS A M12 x 280	-	-	547703	●	14 / 16	120 / 280	4 / 6	10
FIS A M16 x 200	090289	517939	090456	●	18 / 20	160 / 200	5 / 8	10
FIS A M16 x 250	090290	517940	090457	●	18 / 20	160 / 250	5 / 8	10
FIS A M16 x 300	090291	519402	090458	●	18 / 20	160 / 300	5 / 8	10
FIS A M16 x 350	-	558865	-	●	18 / 20	160 / 350	5 / 8	10
FIS A M20 x 245	090292	519404	090459	●	22 / 24	200 / 245	7 / 11	10
FIS A M20 x 290	090293	519406	090460	●	22 / 24	200 / 290	7 / 11	10
FIS A M20 x 350	-	559627	-	●	22 / 24	200 / 350	7 / 11	10
FIS A M20 x 400	-	558866	-	●	22 / 24	200 / 400	7 / 11	10
FIS A M24 x 290	090294	-	090461	●	26 / 28	240 / 290	9 / 14	5
FIS A M24 x 380	090295	-	090462	●	26 / 28	240 / 380	9 / 14	5
FIS A M24 x 450	-	558867	-	●	26 / 28	240 / 450	9 / 14	5
FIS A M24 x 650	-	558868	-	●	26 / 28	240 / 650	9 / 14	5
FIS A M30 x 430	090297	-	090464	●	32 / 34	300 / 430	13 / 18	5
FIS A M30 x 550	-	558869	-	●	32 / 34	300 / 550	13 / 18	5
FIS A M30 x 650	-	566677	-	●	32 / 34	300 / 650	13 / 18	4
FIS A M30 x 750	-	566676	-	●	32 / 34	300 / 750	13 / 18	4

From a slimmness of the threaded rod of  $l_a/d > 30$ , the diameter of the drill hole shall be at least 3 mm but no more than 4 mm larger than the nominal diameter of the steel rods.  
Embedment depth  $l_a = \text{Drill hole depth } l_{\text{drill}}$

# Assortment and technical data.



## Threaded rod FIS A - By the meter

Item	FIS A		FIS A R		FIS A HCR		Diameter d [mm]	Drill hole diameter in wood d <sub>drill</sub> [mm]	Min. / Max. embed- ment depth in wood l <sub>a</sub> =l <sub>drill</sub> [mm]	Filling quantity min. / max. drill diameter per 100 mm embedment depth in wood [scale units]	Sales unit [pcs]
	Galvani- sed steel, steel grade 5.8	Galvani- sed steel, steel grade 8.8	Stainless steel	Highly corrosion- resistant steel	Ap- pro- val ETA	Ap- pro- val ETA					
	Item no. gvz 5.8	Item no. gvz 8.8	Item no. R	Item no. HCR							
FIS A M8 x 1,000	509214 <sup>1)</sup>	509222 <sup>1)</sup>	509230 <sup>1)</sup>	-	●	8	10 / 12	100 / 1000	3 / 4	10	
FIS A M10 x 1,000	509215 <sup>1)</sup>	509223 <sup>1)</sup>	509231 <sup>1)</sup>	-	●	10	12 / 14	100 / 1000	3 / 5	10	
FIS A M12 x 1,000	509216 <sup>1)</sup>	509224 <sup>1)</sup>	509232 <sup>1)</sup>	571885 <sup>1)</sup>	●	12	14 / 16	120 / 1000	4 / 6	10	
FIS A M16 x 1,000	509217 <sup>1)</sup>	509225 <sup>1)</sup>	509233 <sup>1)</sup>	571886 <sup>1)</sup>	●	16	18 / 20	160 / 1000	5 / 8	10	
FIS A M20 x 1,000	-	519410 <sup>1)</sup>	519427 <sup>1)</sup>	-	●	20	22 / 24	200 / 1000	7 / 11	10	
FIS A M20 x 1,000	-	-	-	571887 <sup>1)</sup>	●	20	22 / 24	200 / 1000	7 / 11	3	
FIS A M24 x 1,000	-	551771 <sup>1)</sup>	-	-	●	24	26 / 28	240 / 1000	9 / 14	5	
FIS A M24 x 1,000	-	-	568801 <sup>1)</sup>	571888 <sup>1)</sup>	●	24	26 / 28	240 / 1000	9 / 14	3	
FIS A M30 x 1,000	-	568800 <sup>1)</sup>	568802 <sup>1)</sup>	571889 <sup>1)</sup>	●	30	32 / 34	300 / 1000	13 / 18	3	

1) Order washer and nut separately.

## Hexagonal nut and washer



Nuts & Washers

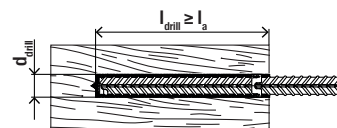


Nut HCR



Washer HCR

Item	Galvani- sed steel, steel grade 8.8	Stainless steel	Highly corrosion- resistant steel	Thread M	Washer (outer diameter x thickness) [mm]	Match	Width across nut SW [mm]	Sales unit [pcs]
	Item no. gvz 8.8	Item no. R	Item no. HCR					
Nut & Washer M8	510509	-	-	M8	16 x 1.6	FIS A M8	13	50
Nut & Washer M8	-	510513	-	M8	16 x 1.6	FIS A M8 R	13	50
Nut & Washer M10	510510	-	-	M10	20 x 2.0	FIS A M10	17	50
Nut & Washer M10	-	510514	-	M10	20 x 2.0	FIS A M10 R	17	50
Nut & Washer M12	510511	-	-	M12	24 x 2.5	FIS A M12	19	25
Nut & Washer M12	-	510515	-	M12	24 x 2.5	FIS A M12 R	19	25
Nut & Washer M12	-	-	573788	M12	24 x 2.5	FIS A M12 HCR	19	25
Nut & Washer M16	510512	-	-	M16	30 x 3.0	FIS A M16	24	20
Nut & Washer M16	-	510516	-	M16	30 x 3.0	FIS A M16 R	24	20
Nut & Washer M16	-	-	573789	M16	30 x 3.0	FIS A M16 HCR	24	20
Nut & Washer M20	519737	-	-	M20	37 x 3.0	FIS A M 20	30	10
Nut & Washer M20	-	519738	-	M20	37 x 3.0	FIS A M20 R	30	10
Nut & Washer M20	-	-	573790	M20	37 x 3.0	FIS A M20 HCR	30	10
Nut & Washer M24	552110	-	-	M24	44 x 4.0	FIS A M 24	36	5
Nut & Washer M24	-	552111	-	M24	44 x 4.0	FIS A M24 R	36	5
Nut & Washer M24	-	-	573791	M24	44 x 4.0	FIS A M24 HCR	36	3
Nut & Washer M30	559124	-	-	M30	56 x 4.0	FIS A M30	46	5
Nut & Washer M30	-	573787	-	M30	56 x 4.0	FIS A M30 R	46	5
Washer M30	-	-	575203	-	56 x 4	FIS A M30 HCR	-	3
Nut M30	-	-	575202	M30	-	FIS A M30 HCR	46	3



Reinforcing bar (supplied by the customer)			
Outer diameter d (mm) <sup>1)</sup>	Min. / max. drill diameter d <sub>drill</sub> (mm)	Min. / Max. embedment depth l <sub>a</sub> = drill hole depth l <sub>drill</sub> (mm)	Filling quantity for the specified drill diameter d <sub>drill</sub> per 100 mm embedment depth (in scale units Sk)
6	8,5 / 10	100 / 665	2 / 3
8	10,5 / 12	100 / 879	3 / 4
10	12,5 / 14	100 / 1.099	3 / 4
12	14,5 / 16	120 / 1.319	4 / 5
14	16,5 / 18	140 / 1.539	4 / 5
16	18,5 / 20	160 / 1.759	4 / 6
20	23 / 24	200 / 2.199	5 / 7
24	28 / 29	240 / 2.639	8 / 11
25	29 / 30	250 / 2.749	9 / 11
26	30 / 31	260 / 2.859	9 / 12
28	33,5	280 / 3.000	14
30	35,5	300 / 3.000	14
32	37,5	320 / 3.000	15

<sup>1)</sup> If the reinforcing bar has a smaller outer diameter d, the drill diameter must be d + 2.0 mm to d + 4.0 mm; for reinforcing bar with d > 25 mm, the drill diameter must be d + 5.5 mm

**Centring clip DD-E**



Centring clip DD-E

Item	Item no.	Thread M	Sales unit [pcs]
DD-E M12	563722	M12	100
DD-E M16	563724	M16	100
DD-E M20	563726	M20	100
DD-E M24	563728	M24	100
DD-E M27	563730	M27	100
DD-E M30	563732	M30	100

Used in combination with the centring clip DD-S for centring in the drill hole or overhead installation.

**Centring clip DD-S**



Centring clip DD-S

Item	Item no.	Thread M	Sales unit [pcs]
DD-S M12	563721	M12	100
DD-S M16	563723	M16	100
DD-S M20	563725	M20	100
DD-S M24	563727	M24	100
DD-S M27	563729	M27	100
DD-S M30	563731	M30	100

Used for centring in the drill hole.

# Accessories.

## Injection adapter



Injection adapter for drill Ø  
12 - 25 mm



Injection adapter for drill Ø  
30 - 55 mm



Extension tube FIS EXT  
Ø 15 mm

Item	Item no.	Colour	Length l [mm]	Sales unit [pcs]
Injection-adapter (Ø 9) for drill-Ø 12 mm	001497	ecru	-	10
Injection-adapter (Ø 9) for drill-Ø 14 mm	001498	blue	-	10
Injection-adapter (Ø 9) for drill-Ø 16 mm	001499	red	-	10
Injection-adapter (Ø 9) for drill-Ø 18 mm	001483	yellow	-	10
Injection-adapter (Ø 9) for drill-Ø 20 mm	001506	green	-	10
Injection-adapter (Ø 9) for drill-Ø 25 mm	001507	black	-	10
Injection-adapter (Ø 9) for drill-Ø 30 mm	090689	grey	-	10
Injection-adapter (Ø 9) for drill-Ø 35 mm	090699	brown	-	10
Injection-adapter (Ø 15) for drill-Ø 20 mm	001508	green	-	10
Injection-adapter (Ø 15) for drill-Ø 25 mm	001509	black	-	10
Injection-adapter (Ø 15) for drill-Ø 30 mm	090700	grey	-	10
Injection-adapter (Ø 15) for drill-Ø 35 mm	090701	brown	-	10
Extension tube FIS Ø 9	48983	transparent	1,000	10
Extension tube FIS EXT Ø15	530800	transparent	10,000	1

Borehole cleaning (air)



Item	Item no.	Match	Sales unit [pcs]
Compressed-air cleaning gun ABP	059456	-	1
Compressed-air cleaning gun with cleaning tube	519527	-	1
Compressed air nozzle D12-D15	511956	Drill diameter $\phi$ 12 - 15 mm	2
Compressed air nozzle D16-D19	511957	Drill diameter $\phi$ 16 - 19 mm	2
Compressed air nozzle D20-D25	511958	Drill diameter $\phi$ 20 - 25 mm	2
Compressed air nozzle D30-D35	511959	Drill diameter $\phi$ 30 - 35 mm	2
Blow-out pump AB G	567792	-	1

Borehole cleaning



Item	Item no.	Length $L_1$ [mm]	Length $L_2$ [mm]	Brush diameter [mm]	For drill diameter [mm]	Sales unit [pcs]
BS $\phi$ 8	078177	120	50	9	8	1
BS $\phi$ 10	078178	120	50	11	10	1
BS $\phi$ 12	078179	150	80	14	12	1
BS $\phi$ 14	078180	250	80	16	14	1
BS $\phi$ 16/18	078181	250	80	20	16 / 18	1
BS $\phi$ 20/22	052277	300	80	25	20 / 22	1
BS $\phi$ 24	078182	300	100	26	24	1
BS $\phi$ 25	097806	300	100	27	25	1
BS $\phi$ 28	078183	350	100	30	28	1
BS $\phi$ 30/32/35	078184	400	100	40	30 / 32 / 35	1
FIS brush extension	508791	410	-	-	-	1
SDS socket M8	530332	-	-	-	-	1

Dispenser / Battery Pack



Item	Item-No.	Description	Sales unit [pcs]
FIS DM S Pro	563337	Manual dispenser for 360 ml- and 390 ml cartridges	1
FIS AM	058000	Manual dispenser for 300 ml, 360 ml- and 390 ml cartridges	1
FIS DM SL Pro	577080	Manual dispenser for 585 ml cartridges	1
FIS DB S Pro	558955	Battery operated dispenser for 360 ml- and 390 ml-cartridges with 1x charger 12-36V EU, 1x battery pack 18V 2,0 Ah, 1x screw off handle, 1x belt hook, 1x hard case	1
FIS DB SL Pro	562004	Battery operated dispenser for 585 ml and 825 ml-cartridges with 1x charger 12-36V EU, 1x battery pack 18V 2,0 Ah, 1x screw off handle, 1x belt hook, 1x hard case	1
FSS-B 18V 2,0Ah	563787	Battery Pack 2,0 Ah FIS DB S Pro, FIS DB SL Pro	1
FSS-B 18V 4,0Ah	552930	Battery Pack 4,0 Ah FIS DB S Pro, FIS DB SL Pro	1
FIS DP S-XL	512401	Pneumatic dispenser for 1,500 ml cartridges	1

# Accessories.

## Auger bit D-WL



D-WL

Item	Item no.	Drill diameter $d_0$ [mm]	Working length [mm]	Total length $l$ [mm]	Packaging	Contents [pcs]	Sales unit [pcs]
D-WL 6,0 x 155/230	551330	6	155	230	Plastic tube	1	1
D-WL 6,0 x 385/460	551050	6	385	460	Plastic tube	1	1
D-WL 8,0 x 155/230	551331	8	155	230	Plastic tube	1	1
D-WL 8,0 x 385/460	551402	8	385	460	Plastic tube	1	1
D-WL 10,0 x 155/230	551332	10	155	230	Plastic tube	1	1
D-WL 10,0 x 385/460	551403	10	385	460	Plastic tube	1	1
D-WL 12,0 x 155/230	549997	12	155	230	Plastic tube	1	1
D-WL 12,0 x 385/460	551333	12	385	460	Plastic tube	1	1
D-WL 16,0 x 155/230	549999	16	155	230	Plastic tube	1	1
D-WL 18,0 x 155/230	551000	18	155	230	Plastic tube	1	1
D-WL 20,0 x 155/230	551001	20	155	230	Plastic tube	1	1

## Auger bit D-WL Set



D-WL Set 230

D-WL Set 320

D-WL Set 460

D-WL Set 600

Item	Item no.	Packaging	Contents	Sales unit [pcs]
D-WL Set 230 mm	551424	Assortment box	6 pcs: 10/155/230, 12/155/230, 14/155/230, 16/155/230, 18/155/230, 20/155/230	1
D-WL Set 320 mm	551425	Assortment box	6 pcs: 10/245/320, 12/245/320, 14/245/320, 16/245/320, 18/245/320, 20/245/320	1
D-WL Set 460 mm	551426	Assortment box	6 pcs: 10/385/460, 12/385/460, 14/385/460, 16/385/460, 18/385/460, 20/385/460	1
D-WL Set 600 mm	551427	Assortment box	6 pcs: 10/530/600, 12/530/600, 14/530/600, 16/530/600, 18/530/600, 20/530/600	1

# The battery dispenser for professionals.



## The advantages at a glance

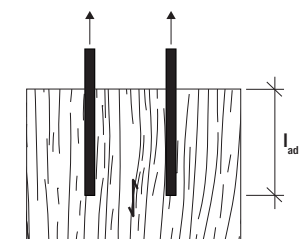
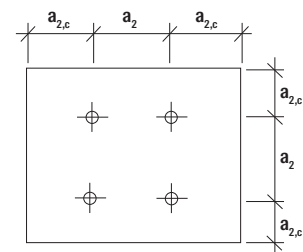
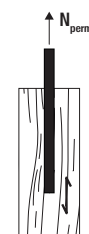
- The dosing function enables the efficient adjustment of the mortar quantity to match the drill hole size.
- The dispensing speed can be adjusted to the application via a controller.
- The detachable handle and belt hook ensure particularly ergonomic use.
- The sturdy design of the device guarantees reliable and long-lasting processing under demanding building site conditions.
- The 18V technology provides for the necessary dispensing power. Furthermore, the battery is compatible with all Cordless Alliance System (CAS) power tools and chargers worldwide.

## More information:

[www.fischer-international.com/dispenser](http://www.fischer-international.com/dispenser)

# Loads FIS EM Plus with FIS A under tensile stress.

Bonding parallel to the grain



## Injection system FIS EM Plus with anchor rod FIS A

Permissible tensile loads of a single anchor rod in glued laminated timber components  $\geq$  GL24h

Anchor rods glued in parallel to the grain direction of the timber component

For the design, the entire approval ETA-19/0657 / Z-9.1-914 and DIN EN 1995-1-1:2010-12 / NA must be observed.

Type	Material/surface	Gluing length in timber component $l_{ad}$ [mm]	Permissible tensile load $N_{perm}$ [kN]	Minimum spacing $a_2$ [mm]	Minimum edge distance $a_{2,c}$ [mm]	Minimum component dimensions $b = d$ [mm]
FIS A M6	5.8	100	3.7	30	15	30
	5.8	240	4.8	30	15	30
	8.8	100	3.7	30	15	30
	8.8	240	7.4	30	15	30
	R-70	100	3.7	30	15	30
	R-70	240	5.2	30	15	30
FIS A M8	5.8	100	5.0	40	20	40
	5.8	320	8.8	40	20	40
	8.8	100	5.0	40	20	40
	8.8	320	13.4	40	20	40
	R-70	100	5.0	40	20	40
	R-70	320	9.4	40	20	40
FIS A M10	5.8	100	6.2	50	25	50
	5.8	400	13.9	50	25	50
	8.8	100	6.2	50	25	50
	8.8	400	20.2	50	25	50
	R-70	100	6.2	50	25	50
	R-70	400	14.9	50	25	50
FIS A M12	5.8	120	8.9	60	30	60
	5.8	480	20.2	60	30	60
	8.8	120	8.9	60	30	60
	8.8	480	25.5	60	30	60
	R-70	120	8.9	60	30	60
	R-70	480	21.7	60	30	60

Type	Material/surface [-]	Gluing length in timber component $l_{ad}$ [mm]	Permissible tensile load $N_{perm}$ [kN]	Minimum spacing $a_z$ [mm]	Minimum edge distance $a_{2,c}$ [mm]	Minimum component dimensions $b = d$ [mm]
FIS A M16	5.8	160	15.9	80	40	80
	5.8	640	37.7	80	40	80
	8.8	160	15.9	80	40	80
	8.8	640	40.4	80	40	80
	R-70	160	15.9	80	40	80
	R-70	640	40.4	80	40	80
FIS A M20	5.8	200	24.9	100	50	100
	5.8	800	57.2	100	50	100
	8.8	200	24.9	100	50	100
	8.8	800	57.2	100	50	100
	R-70	200	24.9	100	50	100
	R-70	800	57.2	100	50	100
FIS A M24	5.8	240	35.8	120	60	120
	5.8	960	73.7	120	60	120
	8.8	240	35.8	120	60	120
	8.8	960	73.7	120	60	120
	R-70	240	35.8	120	60	120
	R-70	960	73.7	120	60	120
FIS A M30	5.8	300	52.4	150	75	150
	5.8	1000	93.2	150	75	150
	8.8	300	52.4	150	75	150
	8.8	1000	93.2	150	75	150
	R-70	300	52.4	150	75	150
	R-70	1000	93.2	150	75	150

## Notes:

Drill diameter in the wood 4 mm larger than the outer diameter of the steel rods.

Steel failure in the stress cross-section against the yield strength, composite failure in the lateral surface and tensile failure of the net timber cross-section are taken into account.

Partial safety factors  $\gamma_{M,N} = 1.3$ ;  $\gamma_{M,S} = 1.25$ ;  $\gamma_{F,global} = 1.4$  and  $k_{mod} = 0.9$  from KLED short and NKL 1+2 taken into account.

Values valid for glued laminated timber  $\geq$  GL24h. Higher load-bearing capacities may be possible for higher strength classes. For

groups of steel bars, as well as for combined loading from tensile and shear loads, as well as for bending stress, see Z-9.1-914 and DIN EN 1995-1-1 / NA.

For groups of steel bars glued in parallel to the grain of the timber components, which are subjected to tensile stress in the grain direction, a verification of the connection for block shear failure according to EOTA Technical Report TR 070, Section 4.1.7., is required.

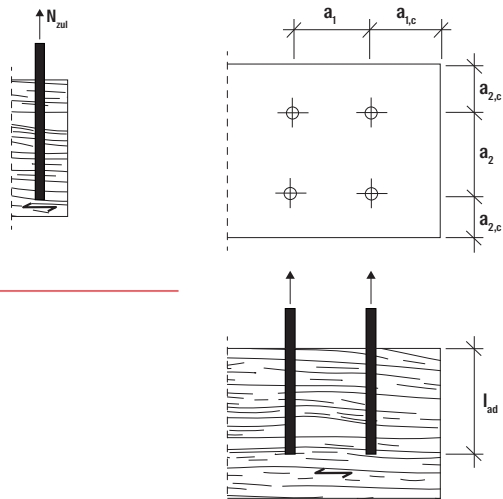
All mechanical values given must be considered in relation to the assumptions made and are examples of dimensioning.

This is a planning aid. Projects must be dimensioned exclusively by structural engineers!

All values are subject to typesetting and printing errors.

# Loads FIS EM Plus with FIS A under tensile stress.

Bonding perpendicular to the grain direction



**Injection system FIS EM Plus with anchor rod FIS A**

Permissible tensile loads of a single anchor rod in glued laminated timber components  $\geq$  GL24h  
 Anchor rods glued in perpendicular to the grain direction of the timber component

For the design, the entire approval ETA-19/0657 / Z-9.1-914 and DIN EN 1995-1-1:2010-12 / NA must be observed.

Type	Material/surface	Gluing length in timber component $l_{ad}$ [mm]	Permissible tensile load $N_{perm}$ [kN]	Minimum spacing $a_1 = a_2$ [mm]	Minimum edge distance $a_{1,c} = a_{2,c}$ [mm]	Minimum component width $b$ [mm]	Minimum component height $h$ [mm]
FIS A M6	5.8	100	3.7	24	15	30	120
	5.8	240	4.8	24	15	30	260
	8.8	100	3.7	24	15	30	120
	8.8	240	7.4	24	15	30	260
	R-70	100	3.7	24	15	30	120
	R-70	240	5.2	24	15	30	260
FIS A M8	5.8	100	5.0	32	20	40	120
	5.8	320	8.8	32	20	40	340
	8.8	100	5.0	32	20	40	120
	8.8	320	13.4	32	20	40	340
	R-70	100	5.0	32	20	40	120
	R-70	320	9.4	32	20	40	340
FIS A M10	5.8	100	6.2	40	25	50	120
	5.8	400	13.9	40	25	50	420
	8.8	100	6.2	40	25	50	120
	8.8	400	20.2	40	25	50	420
	R-70	100	6.2	40	25	50	120
	R-70	400	14.9	40	25	50	420
FIS A M12	5.8	120	8.9	48	30	60	140
	5.8	480	20.2	48	30	60	500
	8.8	120	8.9	48	30	60	140
	8.8	480	25.5	48	30	60	500
	R-70	120	8.9	48	30	60	140
	R-70	480	21.7	48	30	60	500

Type	Material/surface [-]	Gluing length in timber component $l_{ad}$ [mm]	Permissible tensile load $N_{perm}$ [kN]	Minimum spacing $a_1 = a_2$ [mm]	Minimum edge distance $a_{1,c} = a_{2,c}$ [mm]	Minimum component width $b$ [mm]	Minimum component height $h$ [mm]
FIS A M16	5.8	160	15.9	64	40	80	180
	5.8	640	37.7	64	40	80	660
	8.8	160	15.9	64	40	80	180
	8.8	640	40.4	64	40	80	660
	R-70	160	15.9	64	40	80	180
	R-70	640	40.4	64	40	80	660
FIS A M20	5.8	200	24.9	80	50	100	220
	5.8	800	57.2	80	50	100	820
	8.8	200	24.9	80	50	100	220
	8.8	800	57.2	80	50	100	820
	R-70	200	24.9	80	50	100	220
	R-70	800	57.2	80	50	100	820
FIS A M24	5.8	240	35.8	96	60	120	260
	5.8	960	73.7	96	60	120	980
	8.8	240	35.8	96	60	120	260
	8.8	960	73.7	96	60	120	980
	R-70	240	35.8	96	60	120	260
	R-70	960	73.7	96	60	120	980
FIS A M30	5.8	300	52.4	120	75	150	320
	5.8	1000	93.2	120	75	150	1020
	8.8	300	52.4	120	75	150	320
	8.8	1000	93.2	120	75	150	1020
	R-70	300	52.4	120	75	150	320
	R-70	1000	93.2	120	75	150	1020

## Notes:

Drill diameter in the wood 4 mm larger than the outer diameter of the steel rods.

Steel failure in the stress cross-section against the yield point and composite failure in the lateral surface are taken into account.

Any failure of the timber cross-section such as transverse tensile failure and block shear failure must be checked separately!

Partial safety factors  $\gamma_{M,H} = 1.3$ ;  $\gamma_{M,S} = 1.25$ ;  $\gamma_{F,global} = 1.4$  and  $k_{mod} = 0.9$  from KLED short and NKL 1+2 taken into account.

Values valid for glued laminated timber  $\geq$  GL24h. Higher load-bearing capacities may be possible for higher strength classes.

For groups of steel bars, as well as for combined loading from tensile and shear loads, as well as for bending stress, see Z-9.1-914 and DIN EN 1995-1-1 / NA.

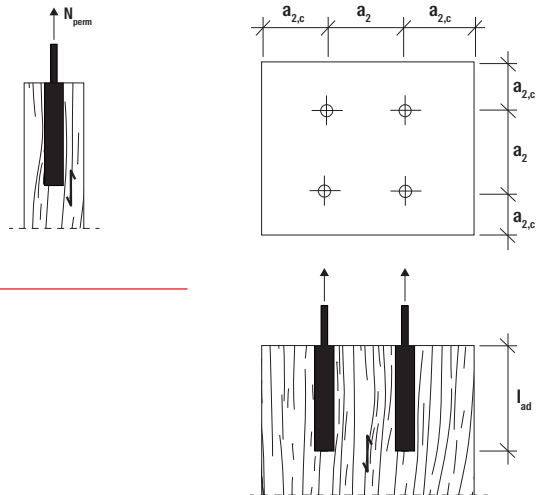
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# Loads FIS EM Plus with FIS IG under tensile stress.

## Bonding parallel to the grain



### Injection system FIS EM Plus with internal threaded anchor FIS IG

Permissible tensile loads of a single internally threaded anchor in glued laminated timber components  $\geq$  GL24h

Internally threaded anchor glued in parallel to the grain direction of the timber component

For the design, the entire approval ETA-19/0657 / Z-9.1-914 and DIN EN 1995-1-1:2010-12 / NA must be observed.

Type	Steel grade of the screw	Gluing length in timber component $l_{ad}$ [mm]	Permissible tensile load $N_{perm}$ [kN]	Minimum spacing $a_2$ [mm]	Minimum edge distance $a_{2,c}$ [mm]	Minimum component dimensions $b = d$ [mm]
FIS IG M8	5.8	120	8.8	60	30	60
	8.8	120	8.9	60	30	60
	R-70	120	8.9	60	30	60
FIS IG M10	5.8	160	13.9	80	40	80
	8.8	160	15.9	80	40	80
	R-70	160	14.9	80	40	80
FIS IG M12	5.8	200	20.2	100	50	100
	8.8	200	24.9	100	50	100
	R-70	200	21.7	100	50	100
FIS IG M16	5.8	240	35.8	120	60	120
	8.8	240	35.8	120	60	120
	R-70	240	35.8	120	60	120
FIS IG M20	5.8	300	52.4	150	75	150
	8.8	300	52.4	150	75	150
	R-70	300	52.4	150	75	150

Notes:

Drill diameter in the wood 4 mm larger than the outer diameter of the internal threaded anchor FIS IG.

Steel failure in the stress cross-section of the FIS IG and the bolt against the yield strength, composite failure in the lateral surface and tensile failure of the net timber cross-section are taken into account.

Only use non-corroding FIS IG with non-corroding screws and FIS IG made of gvz. with screws made of gvz..

Minimum screw-in depth of the screws in the FIS IG in accordance with Z-9.1-914.

Partial safety factors  $\gamma_{M,H} = 1.3$ ;  $\gamma_{M,S} = 1.25$ ;  $\gamma_{F,global} = 1.4$  and  $k_{mod} = 0.9$  from KLED short and NKL 1+2 taken into account.

Values valid for glued laminated timber  $\geq$  GL24h. Higher load-bearing capacities may be possible for higher strength classes.

For groups of steel bars, as well as for combined loading from tensile and shear loads, as well as for bending stress, see Z-9.1-914 and DIN EN 1995-1-1 / NA.

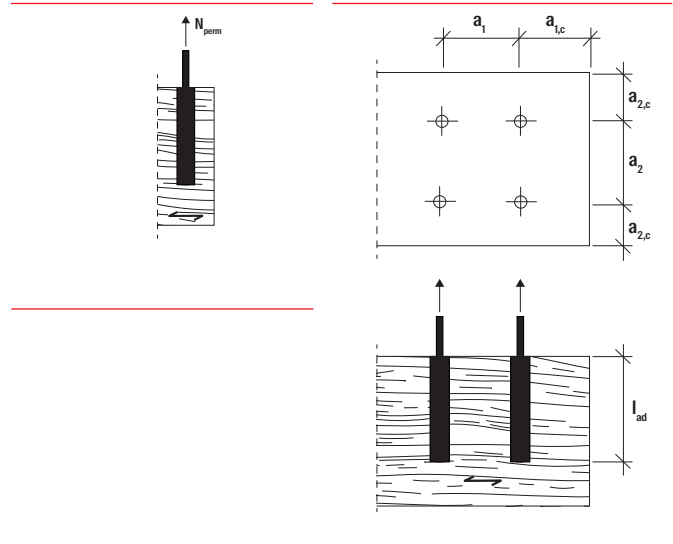
For groups of FIS IG glued in parallel to the grain of the timber components, which are subjected to tensile stress in the direction of the grain, the connection must be verified for block shear failure in accordance with EOTA Technical Report TR 070, Section 4.1.7.

All mechanical values given must be considered in relation to the assumptions made and are examples of dimensioning.

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## Bonding perpendicular to the grain



### Injection system FIS EM Plus with internally threaded anchors FIS IG

Permissible tensile loads of a single internally threaded anchor in glued laminated timber components  $\geq$  GL24h  
Internally threaded anchor glued in perpendicular to the grain direction of the timber component

For the design, the entire approval ETA-19/0657 / Z-9.1-914 and DIN EN 1995-1-1:2010-12 / NA must be observed.

Type	Steel grade of the screw [-]	Gluing length in timber component $l_{ad}$ [mm]	Permissible tensile load $N_{perm}$ [kN]	Minimum spacing $a_1 = a_2$ [mm]	Minimum edge distance $a_{1,c} = a_{2,c}$ [mm]	Minimum component width $b$ [mm]	Minimum component height $h$ [mm]
FIS IG M8	5.8	120	8.8	48	30	60	140
	8.8	120	8.9	48	30	60	140
	R-70	120	8.9	48	30	60	140
FIS IG M10	5.8	160	13.9	64	40	80	180
	8.8	160	15.9	64	40	80	180
	R-70	160	14.9	64	40	80	180
FIS IG M12	5.8	200	20.2	80	50	100	220
	8.8	200	24.9	80	50	100	220
	R-70	200	21.7	80	50	100	220
FIS IG M16	5.8	240	35.8	96	60	120	260
	8.8	240	35.8	96	60	120	260
	R-70	240	35.8	96	60	120	260
FIS IG M20	5.8	300	52.4	120	75	150	320
	8.8	300	52.4	120	75	150	320
	R-70	300	52.4	120	75	150	320

**Notes:**

Drill diameter in the wood 4 mm larger than the outer diameter of the internal threaded anchor FIS IG.

Steel failure in the stress cross-section of the FIS IG and the bolt against the yield point and composite failure in the lateral surface are taken into account.

Any failure of the timber cross-section, e.g. transverse tensile failure, must be checked separately.

Only use non-corroding FIS IG with non-corroding screws and FIS IG made of gvz. with screws made of gvz.

Minimum screw-in depth of the screws in the FIS IG in accordance with Z-9.1-914.

Partial safety factors  $\gamma_{M,H} = 1.3$ ;  $\gamma_{M,S} = 1.25$ ;  $\gamma_{F,global} = 1.4$  and  $k_{mod} = 0.9$  from KLED short and NKL 1+2 taken into account.

Values valid for glued laminated timber  $\geq$  GL24h. Higher load-bearing capacities may be possible for higher strength classes.

For groups of steel bars, as well as for combined loading from tensile and shear loads, as well as for bending stress, see Z-9.1-914 and DIN EN 1995-1-1 / NA.

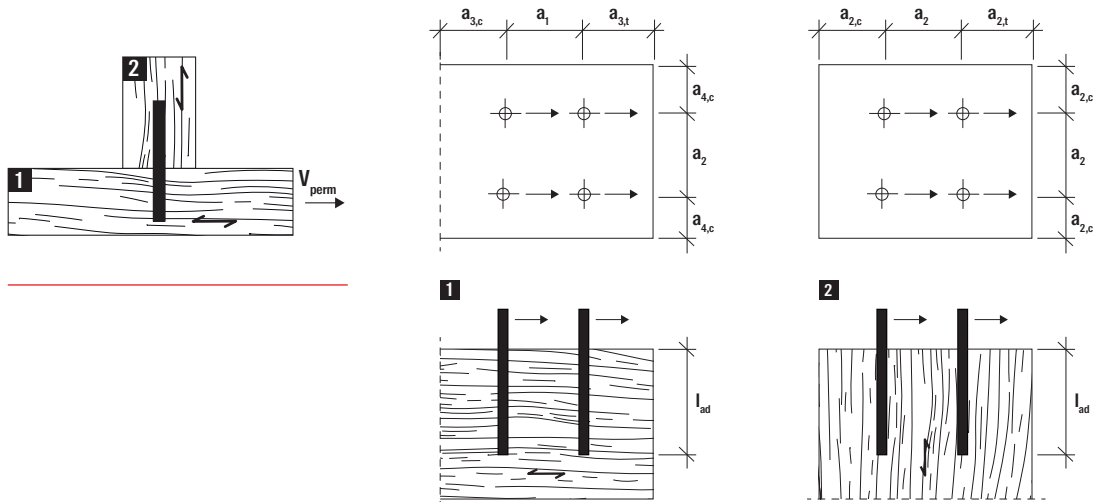
All mechanical values given must be considered in relation to the assumptions made and are examples of dimensioning.

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# Loads FIS EM Plus with FIS A under shear load.

## Wood-wood-connection



### Injection system FIS EM Plus with anchor rod FIS A

Permissible shear loads of a single anchor rod in glued laminated timber components  $\geq$  GL24h in a wood-/wood-connection  
 Anchor rods glued in parallel on one side (component 2) and perpendicular to the grain direction of the timber component (component 1) on the other side  
 For the design, the entire approval ETA-19/0657 / Z-9.1-914 and DIN EN 1995-1-1:2010-12 / NA must be observed.

Type	Material/surface	Gluing length in component 1 (perpendicular to the fiber) $l_{ad,1}$ [mm]	Gluing length in component 2 (parallel to the fiber) $l_{ad,2}$ [mm]	Permissible shear load $V_{perm}$ [kN]	Minimum spacing $a_1 = a_2$ [mm]	Minimum edge distance (unloaded) Component 2 $a_{2,c}$ [mm]	Minimum edge distance (loaded) Component 2 $a_{2,t}$ [mm]	Minimum lateral edge distance (unloaded) Component 1 $a_{4,c}$ [mm]	Minimum endgrain edge distance (unloaded) Component 1 $a_{3,c}$ [mm]	Minimum endgrain edge distance (loaded) Component 1 $a_{3,t}$ [mm]	Minimum component dimensions Component 1 $b_1 / d_1$ [mm]	Minimum component dimensions Component 2 $b_2 / d_2$ [mm]
FIS A M6	5.8	100	240	0.7	30	15	24	18	40	80	36 / 120	30 / 39
	8.8	100	240	0.9	30	15	24	18	40	80	36 / 120	30 / 39
	R-70	100	240	0.8	30	15	24	18	40	80	36 / 120	30 / 39
FIS A M8	5.8	100	320	1.1	40	20	32	24	40	80	40 / 120	40 / 52
	8.8	100	320	1.4	40	20	32	24	40	80	40 / 120	40 / 52
	R-70	100	320	1.3	40	20	32	24	40	80	40 / 120	40 / 52
FIS A M10	5.8	100	400	1.7	50	25	40	30	40	80	50 / 120	50 / 65
	8.8	100	400	2.1	50	25	40	30	40	80	50 / 120	50 / 65
	R-70	100	400	1.9	50	25	40	30	40	80	50 / 120	50 / 65
FIS A M12	5.8	120	480	2.3	60	30	48	36	42	84	60 / 140	60 / 78
	8.8	120	480	2.8	60	30	48	36	42	84	60 / 140	60 / 78
	R-70	120	480	2.6	60	30	48	36	42	84	60 / 140	60 / 78

Type	Material/ surface [-]	Gluing length in compo- nent 1 (perpen- dicular to the fiber)	Gluing length in compo- nent 2 (parallel to the fiber)	Permissi- ble shear load $V_{perm}$ [kN]	Minimum spacing $a_1 = a_2$ [mm]	Minimum edge distance (unloa- ded) Compo- nent 2 $a_{2,c}$ [mm]	Minimum edge distance (loaded) Compo- nent 2 $a_{2,t}$ [mm]	Minimum lateral edge distance (unloa- ded) Com- ponent 1 $a_{4,c}$ [mm]	Minimum endgrain edge distance (unloa- ded) Com- ponent 1 $a_{3,c}$ [mm]	Minimum endgrain edge distance (loaded) Compo- nent 1 $a_{3,t}$ [mm]	Minimum compo- nent di- mensions Compo- nent 1 $b_1 / d_1$ [mm]	Minimum compo- nent di- mensions Compo- nent 2 $b_2 / d_2$ [mm]
		$l_{ad,1}$ [mm]	$l_{ad,2}$ [mm]									
FIS A M16	5.8	160	640	3.7	80	40	64	48	56	112	80 / 180	80 / 104
	8.8	160	640	4.5	80	40	64	48	56	112	80 / 180	80 / 104
	R-70	160	640	4.2	80	40	64	48	56	112	80 / 180	80 / 104
FIS A M20	5.8	200	800	5.2	100	50	80	60	70	140	100 / 220	100 / 130
	8.8	200	800	6.5	100	50	80	60	70	140	100 / 220	100 / 130
	R-70	200	800	6.1	100	50	80	60	70	140	100 / 220	100 / 130
FIS A M24	5.8	240	960	7.0	120	60	96	72	84	168	120 / 260	120 / 156
	8.8	240	960	8.6	120	60	96	72	84	168	120 / 260	120 / 156
	R-70	240	960	8.1	120	60	96	72	84	168	120 / 260	120 / 156
FIS A M30	5.8	300	1000	9.8	150	75	120	90	105	210	150 / 320	150 / 195
	8.8	300	1000	12.1	150	75	120	90	105	210	150 / 320	150 / 195
	R-70	300	1000	11.3	150	75	120	90	105	210	150 / 320	150 / 195

## Notes:

Drill diameter in the wood 4 mm larger than the outer diameter of the steel rods.

Partial safety factors  $\gamma_{M,H} = 1.3$ ;  $\gamma_{M,S} = 1.25$ ;  $\gamma_{F,global} = 1.4$  and  $k_{mod} = 0.9$  from KLED short and NKL 1+2 taken into account.

Values valid for glued laminated timber  $\geq$  GL24h. Higher load-bearing capacities may be possible for higher strength classes.

Possible failure of the timber cross-section such as transverse tensile failure and block shear failure must be checked separately!

For groups of steel bars, as well as for combined loading from tensile and shear loads, as well as for bending loads, see Z-9.1-914 and DIN EN 1995-1-1 / NA.

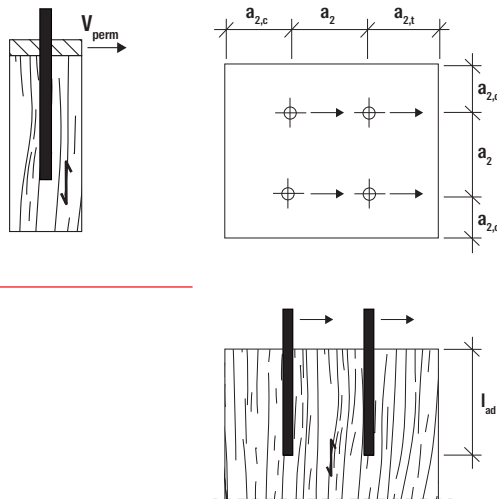
All specified mechanical values must be considered depending on the assumptions made and represent design examples.

This is a planning aid. Projects must be dimensioned exclusively by structural engineers!

All values are subject to typesetting and printing errors.

# Loads FIS EM Plus with FIS A under shear load.

Steel / timber connection; bonding parallel to the grain



**Injection system FIS EM Plus with anchor rod FIS A**

Permissible shear loads of a single anchor rod in glued laminated timber components  $\geq$  GL24h in a steel / timber connection  
 Anchor rods glued in parallel to the grain direction of the timber component  
 For the design, the entire approval ETA-19/0657 / Z-9.1-914 and DIN EN 1995-1-1:2010-12 / NA must be observed.

Type	Material/surface	Gluing length		Permissible shear load		Minimum spacing		Minimum edge distance		Minimum component dimensions
		$l_{ad}$ [mm]	$t \leq 0,5 \cdot d$	$t \geq d^{(1)}$	$a_2$ [mm]	$a_{2,c}$ [mm]	$a_{2,t}$ [mm]	$b / d$ [mm]		
FIS A M6	5.8	100	0.4	0.7	30	15	24	30 / 39		
	5.8	240	0.6	0.9	30	15	24	30 / 39		
	8.8	100	0.4	0.8	30	15	24	30 / 39		
	8.8	240	0.8	1.1	30	15	24	30 / 39		
	R-70	100	0.4	0.8	30	15	24	30 / 39		
	R-70	240	0.7	1.0	30	15	24	30 / 39		
FIS A M8	5.8	100	0.6	1.0	40	20	32	40 / 52		
	5.8	320	1.0	1.4	40	20	32	40 / 52		
	8.8	100	0.6	1.2	40	20	32	40 / 52		
	8.8	320	1.3	1.8	40	20	32	40 / 52		
	R-70	100	0.6	1.1	40	20	32	40 / 52		
	R-70	320	1.2	1.7	40	20	32	40 / 52		
FIS A M10	5.8	100	0.7	1.4	50	25	40	50 / 65		
	5.8	400	1.5	2.1	50	25	40	50 / 65		
	8.8	100	0.7	1.7	50	25	40	50 / 65		
	8.8	400	1.9	2.7	50	25	40	50 / 65		
	R-70	100	0.7	1.6	50	25	40	50 / 65		
	R-70	400	1.8	2.5	50	25	40	50 / 65		
FIS A M12	5.8	120	1.0	2.0	60	30	48	60 / 78		
	5.8	480	2.1	3.0	60	30	48	60 / 78		
	8.8	120	1.0	2.4	60	30	48	60 / 78		
	8.8	480	2.6	3.7	60	30	48	60 / 78		
	R-70	120	1.0	2.2	60	30	48	60 / 78		
	R-70	480	2.4	3.5	60	30	48	60 / 78		

Type	Material/surface [-]	Gluing length $l_{ad}$ [mm]	Permissible shear load (thin steel attachment part) $t \leq 0,5 \cdot d$ $V_{perm}$ [kN]	Permissible shear load (thick steel attachment part) $t \geq d^{1)}$ $V_{perm}$ [kN]	Minimum spacing $a_2$ [mm]	Minimum edge distance (unloaded) $a_{2,c}$ [mm]	Minimum edge distance (loaded) $a_{2,t}$ [mm]	Minimum component dimensions $b / d$ [mm]
FIS A M16	5.8	160	1.8	3.4	80	40	64	80 / 104
	5.8	640	3.5	4.9	80	40	64	80 / 104
	8.8	160	1.8	3.9	80	40	64	80 / 104
	8.8	640	4.3	6.1	80	40	64	80 / 104
	R-70	160	1.8	3.8	80	40	64	80 / 104
	R-70	640	4.0	5.7	80	40	64	80 / 104
FIS A M20	5.8	200	2.7	5.0	100	50	80	100 / 130
	5.8	800	5.1	7.2	100	50	80	100 / 130
	8.8	200	2.7	5.8	100	50	80	100 / 130
	8.8	800	6.3	9.0	100	50	80	100 / 130
	R-70	200	2.7	5.6	100	50	80	100 / 130
	R-70	800	5.9	8.4	100	50	80	100 / 130
FIS A M24	5.8	240	3.7	6.9	120	60	96	120 / 156
	5.8	960	6.9	9.8	120	60	96	120 / 156
	8.8	240	3.8	8.0	120	60	96	120 / 156
	8.8	960	8.6	12.2	120	60	96	120 / 156
	R-70	240	3.8	7.6	120	60	96	120 / 156
	R-70	960	8.1	11.4	120	60	96	120 / 156
FIS A M30	5.8	300	5.5	10.0	150	75	120	150 / 195
	5.8	1000	10.0	14.2	150	75	120	150 / 195
	8.8	300	5.5	11.5	150	75	120	150 / 195
	8.8	1000	12.5	17.6	150	75	120	150 / 195
	R-70	300	5.5	11.0	150	75	120	150 / 195
	R-70	1000	11.7	16.5	150	75	120	150 / 195

<sup>1)</sup> Tolerance of the hole diameter in the steel part must be  $\leq 0.1 \cdot d$  in accordance with DIN EN 1995-1-1

Notes:

Drill diameter in the wood 4 mm larger than the outer diameter of the steel rods.

Partial safety factors  $\gamma_{M,H} = 1.3$ ;  $\gamma_{M,S} = 1.25$ ;  $\gamma_{F,global} = 1.4$  and  $k_{mod} = 0.9$  from KLED short and NKL 1+2 taken into account.

Values valid for glued laminated timber  $\geq$  GL24h. Higher load-bearing capacities may be possible for higher strength classes.

Possible failure of the timber cross-section such as transverse tensile failure and block shear failure must be checked separately!

For groups of steel bars, as well as for combined loading from tensile and shear loads, as well as for bending loads, see Z-9.1-914 and DIN EN 1995-1-1 / NA.

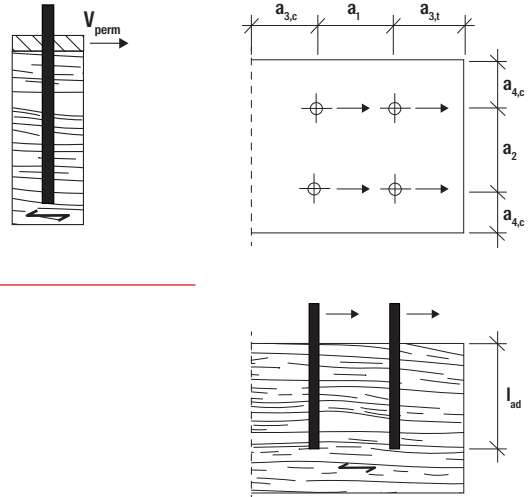
All specified mechanical values must be considered depending on the assumptions made and represent design examples.

This is a planning aid. Projects must be dimensioned exclusively by structural engineers!

All values are subject to typesetting and printing errors.

# Loads FIS EM Plus with FIS A under shear load.

Steel / timber connection; bonding perpendicular to the grain



**Injection system FIS EM Plus with anchor rod FIS A**

Permissible shear loads of a single anchor rod in glued laminated timber components  $\geq$  GL24h in a steel / timber connection  
 Anchor rods bonded perpendicular to the grain direction of the timber component  
 For the design, the entire approval ETA-19/0657 / Z-9.1-914 and DIN EN 1995-1-1:2010-12 / NA must be observed.

Type	Material/surface	Gluing length $l_{ad}$ [mm]	Permissible shear load (thin steel attachment part) $t \leq 0,5 \cdot d$ $V_{perm}$ [kN]	Permissible shear load (thick steel attachment) $t \geq d^1$ $V_{perm}$ [kN]	Minimum spacing in fiber direction $a_1$ [mm]	Minimum spacing perpendicular to the fiber $a_2$ [mm]	Minimum lateral edge distance (unloaded) $a_{4,c}$ [mm]	Minimum edge distance end grain (loaded) $a_{3,t}$ [mm]	Minimum edge distance end grain (unloaded) $a_{3,ct}$ [mm]	Minimum component dimensions $b / d$ [mm]
FIS A M6	5.8	100	1.9	2.7	30	30	18	80	40	36 / 120
	5.8	240	1.9	2.7	30	30	18	80	40	36 / 260
	8.8	100	2.4	3.4	30	30	18	80	40	36 / 120
	8.8	240	2.4	3.4	30	30	18	80	40	36 / 260
	R-70	100	2.2	3.2	30	30	18	80	40	36 / 120
	R-70	240	2.2	3.2	30	30	18	80	40	36 / 260
FIS A M8	5.8	100	3.2	4.6	40	36	24	80	40	48 / 120
	5.8	320	3.2	4.6	40	36	24	80	40	48 / 340
	8.8	100	4.0	5.7	40	36	24	80	40	48 / 120
	8.8	320	4.0	5.7	40	36	24	80	40	48 / 340
	R-70	100	3.8	5.3	40	36	24	80	40	48 / 120
	R-70	320	3.8	5.3	40	36	24	80	40	48 / 340
FIS A M10	5.8	100	4.8	6.8	50	42	30	80	40	60 / 120
	5.8	400	4.8	6.8	50	42	30	80	40	60 / 420
	8.8	100	6.0	8.3	50	42	30	80	40	60 / 120
	8.8	400	6.0	8.4	50	42	30	80	40	60 / 420
	R-70	100	5.6	7.9	50	42	30	80	40	60 / 120
	R-70	400	5.6	7.9	50	42	30	80	40	60 / 420
FIS A M12	5.8	120	6.6	9.4	60	48	36	84	42	72 / 140
	5.8	480	6.6	9.4	60	48	36	84	42	72 / 500
	8.8	120	8.2	11.6	60	48	36	84	42	72 / 140
	8.8	480	8.3	11.7	60	48	36	84	42	72 / 500
	R-70	120	7.7	10.9	60	48	36	84	42	72 / 140
	R-70	480	7.7	10.9	60	48	36	84	42	72 / 500

Type	Material/ surface [-]	Gluing length $l_{ad}$ [mm]	Permissible shear load (thin steel attachment part) $t \leq 0,5 \cdot d$	Permissible shear load (thick steel attachment) $t \geq d^1)$	Minimum spacing in fiber direction	Minimum center distance perpendicular to the fiber	Minimum lateral edge distance (unloaded)	Minimum edge distance end grain (loaded)	Minimum edge distance end grain (unloaded)	Minimum component dimensions
			$V_{perm}$ [kN]	$V_{perm}$ [kN]	$a_1$ [mm]	$a_2$ [mm]	$a_{4,c}$ [mm]	$a_{3,t}$ [mm]	$a_{3,ct}$ [mm]	$b/d$ [mm]
FIS A M16	5.8	160	11.0	15.5	80	60	48	112	56	96 / 180
	5.8	640	11.0	15.5	80	60	48	112	56	96 / 660
	8.8	160	13.6	19.3	80	60	48	112	56	96 / 180
	8.8	640	13.6	19.3	80	60	48	112	56	96 / 660
	R-70	160	12.8	18.1	80	60	48	112	56	96 / 180
	R-70	640	12.8	18.1	80	60	48	112	56	96 / 660
FIS A M20	5.8	200	16.1	22.8	100	72	60	140	70	120 / 220
	5.8	800	16.1	22.8	100	72	60	140	70	120 / 820
	8.8	200	20.0	28.3	100	72	60	140	70	120 / 220
	8.8	800	20.0	28.3	100	72	60	140	70	120 / 820
	R-70	200	18.8	26.5	100	72	60	140	70	120 / 220
	R-70	800	18.8	26.6	100	72	60	140	70	120 / 820
FIS A M24	5.8	240	21.9	31.0	120	84	72	168	84	144 / 260
	5.8	960	22.0	31.1	120	84	72	168	84	144 / 980
	8.8	240	27.3	38.6	120	84	72	168	84	144 / 260
	8.8	960	27.3	38.6	120	84	72	168	84	144 / 980
	R-70	240	25.6	36.2	120	84	72	168	84	144 / 260
	R-70	960	25.6	36.2	120	84	72	168	84	144 / 980
FIS A M30	5.8	300	31.7	44.8	150	102	90	210	105	180 / 320
	5.8	1000	31.7	44.9	150	102	90	210	105	180 / 1020
	8.8	300	39.4	55.7	150	102	90	210	105	180 / 320
	8.8	1000	39.4	55.8	150	102	90	210	105	180 / 1020
	R-70	300	36.9	52.2	150	102	90	210	105	180 / 320
	R-70	1000	37.0	52.3	150	102	90	210	105	180 / 1020

<sup>1)</sup> Tolerance of the hole diameter in the steel part must be  $\leq 0.1 \cdot d$  in accordance with DIN EN 1995-1-1

Notes:

Drill diameter in the wood 4 mm larger than the outer diameter of the steel rods.

Partial safety factors  $\gamma_{M,M} = 1.3$ ;  $\gamma_{M,S} = 1.25$ ;  $\gamma_{F,global} = 1.4$  and  $k_{mod} = 0.9$  from KLED short and NKL 1+2 taken into account.

Values valid for glued laminated timber  $\geq$  GL24h. Higher load-bearing capacities may be possible for higher strength classes.

Possible failure of the timber cross-section such as transverse tensile failure and block shear failure must be checked separately!

For groups of steel bars, as well as for combined loading from tensile and shear loads, as well as for bending loads, see Z-9.1-914 and DIN EN 1995-1-1 / NA.

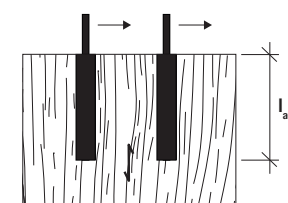
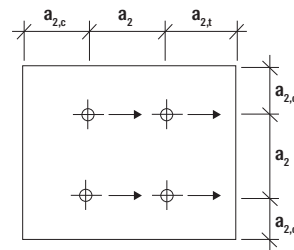
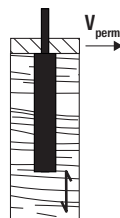
All specified mechanical values must be considered depending on the assumptions made and represent design examples.

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All values are subject to typesetting and printing errors.

# Loads FIS EM Plus with FIS IG under shear load.

Steel / timber connection; bonding parallel to the grain



**Injection system FIS EM Plus with internally threaded anchors FIS IG**

Permissible shear loads of a single internally threaded anchor in glued laminated timber components  $\geq$  GL24h in a wood-/wood-connection  
Internally threaded anchor glued in parallel to the grain direction of the timber component

For the design, the entire approval ETA-19/0657 / Z-9.1-914 and DIN EN 1995-1-1:2010-12 / NA must be observed.

Specialities for internally threaded anchors according to the design proposal of FITT gGmbH, Prof. Dr.-Ing. Enders-Comberg

Type	Steel grade of the screw [-]	Gluing length $l_{ad}$ [mm]	Permissible shear load (thin steel attachment part) $t \leq 0,5 \cdot d$	Permissible shear load (thick steel attachment part) $t \geq d^{1)}$	Minimum spacing $a_2$ [mm]	Minimum edge distance (unloaded)	Minimum edge distance (loaded)	Minimum component dimensions $b / d$ [mm]
			$V_{perm}$ [kN]	$V_{perm}$ [kN]		$a_{2,c}$ [mm]	$a_{2,t}$ [mm]	
FIS IG M8	5.8	120	0.6	1.1	60	30	48	60 / 78
	8.8	120	0.6	1.2	60	30	48	60 / 78
	R-70	120	0.6	1.2	60	30	48	60 / 78
FIS IG M10	5.8	160	1.1	1.7	80	40	64	80 / 104
	8.8	160	1.1	1.9	80	40	64	80 / 104
	R-70	160	1.1	1.8	80	40	64	80 / 104
FIS IG M12	5.8	200	1.5	2.4	100	50	80	100 / 130
	8.8	200	1.5	2.6	100	50	80	100 / 130
	R-70	200	1.5	2.5	100	50	80	100 / 130
FIS IG M16	5.8	240	2.0	3.3	120	60	96	120 / 156
	8.8	240	2.0	3.7	120	60	96	120 / 156
	R-70	240	2.0	3.6	120	60	96	120 / 156
FIS IG M20	5.8	300	2.7	4.6	150	75	120	150 / 195
	8.8	300	2.7	5.1	150	75	120	150 / 195
	R-70	300	2.7	4.9	150	75	120	150 / 195

<sup>1)</sup> Tolerance of the hole diameter in the steel part must be  $\leq 0.1 \cdot d$  in accordance with DIN EN 1995-1-1

Notes:

Drill diameter in the wood 4 mm larger than the outer diameter of the steel rods.

Partial safety factors  $\gamma_{M,H} = 1,3$ ;  $\gamma_{M,S} = 1,25$ ;  $\gamma_{F,global} = 1,4$  and  $k_{mod} = 0,9$  from KLED short and NKL 1+2 taken into account.

Values valid for glued laminated timber  $\geq$  GL24h. Higher load-bearing capacities may be possible for higher strength classes.

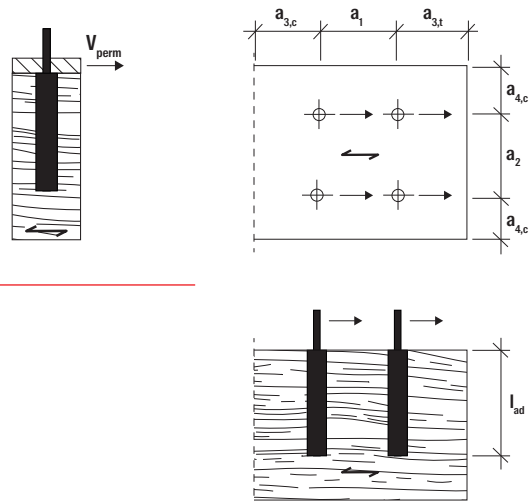
For groups of steel bars, as well as for combined loading from tensile and shear loads, as well as for bending loads, see Z-9.1-914 and DIN EN 1995-1-1 / NA.

All specified mechanical values must be considered depending on the assumptions made and are examples of dimensioning.

This is a planning aid. Projects must be dimensioned exclusively by structural engineers!

All values are subject to typesetting and printing errors.

Steel / timber connection; bonding perpendicular to the grain



Injection system FIS EM Plus with internally threaded anchors FIS IG

Permissible shear loads of a single internally threaded anchor in glued laminated timber components  $\geq$  GL24h in a wood-/wood-connection  
 Internally threaded anchor glued in perpendicular to the grain direction of the timber component

For the design, the entire approval ETA-19/0657 / Z-9.1-914 and DIN EN 1995-1-1:2010-12 / NA must be observed.  
 Specialities for internally threaded anchors according to the design proposal of FITT gGmbH, Prof. Dr.-Ing. Enders-Comberg

Type	Steel grade of the screw [-]	Gluing length in timber component $l_{ad}$ [mm]	Permissible shear load (thin steel attachment part) $V_{perm}$ [kN] $t \leq 0,5 \cdot d$	Permissible shear load (thick steel attachment part) $V_{perm}$ [kN] $t \geq d^0$	Minimum spacing $a_1$ [mm]	Minimum spacing $a_2$ [mm]	Minimum edge distance end grain (unloaded) $a_{3,c}$ [mm]	Minimum endgrain edge distance end grain (loaded) $a_{3,t}$ [mm]	Minimum endgrain edge distance lateral (unloaded) $a_{4,c}$ [mm]	Minimum component dimensions $b / d$ [mm]
FIS IG M8	5.8	120	5.3	6.5	60	36	42	84	36	72 / 140
	8.8	120	5.3	7.1	60	36	42	84	36	72 / 140
	R-70	120	5.5	7.1	60	36	42	84	36	72 / 140
FIS IG M10	5.8	160	9.7	11.3	80	48	56	112	48	96 / 180
	8.8	160	9.7	12.0	80	48	56	112	48	96 / 180
	R-70	160	10.0	12.0	80	48	56	112	48	96 / 180
FIS IG M12	5.8	200	14.7	16.8	100	60	70	140	60	120 / 220
	8.8	200	14.7	17.8	100	60	70	140	60	120 / 220
	R-70	200	15.3	17.8	100	60	70	140	60	120 / 220
FIS IG M16	5.8	240	20.7	24.1	120	72	84	168	72	144 / 260
	8.8	240	20.7	25.8	120	72	84	168	72	144 / 260
	R-70	240	21.4	25.8	120	72	84	168	72	144 / 260
FIS IG M20	5.8	300	31.6	36.2	150	90	105	210	90	180 / 320
	8.8	300	31.6	38.5	150	90	105	210	90	180 / 320
	R-70	300	32.7	38.6	150	90	105	210	90	180 / 320

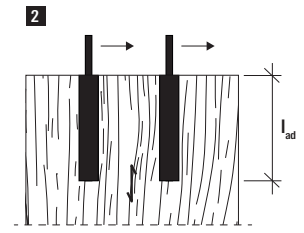
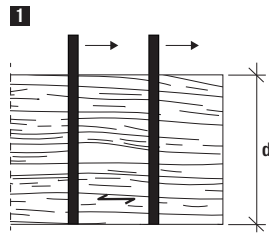
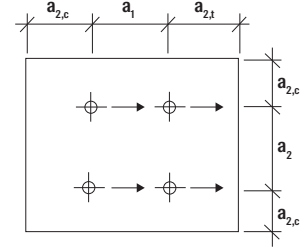
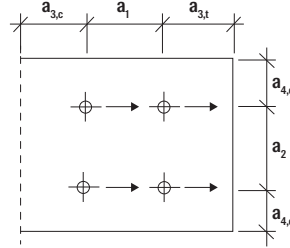
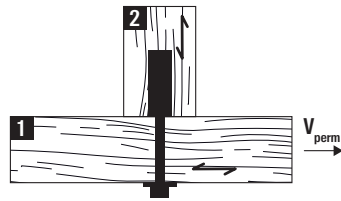
<sup>0</sup> Tolerance of the hole diameter in the steel part must be  $\leq 0.1 \cdot d$  in accordance with DIN EN 1995-1-1

Notes:

Drill diameter in the wood 4 mm larger than the outer diameter of the steel rods.  
 Partial safety factors  $\gamma_{M,H} = 1,3$ ;  $\gamma_{M,S} = 1,25$ ;  $\gamma_{F,global} = 1,4$  and  $k_{mod} = 0,9$  from KLED short and NKL 1+2 taken into account.  
 Values valid for glued laminated timber  $\geq$  GL24h. Higher load-bearing capacities may be possible for higher strength classes.  
 For groups of steel bars, as well as for combined loading from tensile and shear loads, as well as for bending loads, see Z-9.1-914 and DIN EN 1995-1-1 / NA.  
 All specified mechanical values must be considered depending on the assumptions made and are examples of dimensioning.  
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 All values are subject to typesetting and printing errors.

# Loads FIS EM Plus with FIS IG under shear load.

## Wood-wood-connection



### Injection system FIS EM Plus with internally threaded anchors FIS IG

Permissible shear loads of a single internally threaded anchor in glued laminated timber components  $\geq$  GL24h in a wood-/wood-connection  
 Internally threaded anchor glued in parallel on one side (component 2) and perpendicular to the grain direction of the timber component (component 1) screwed through as a threaded bolt on the other side

For the design, the entire approval ETA-19/0657 / Z-9.1-914 and DIN EN 1995-1-1:2010-12 / NA must be observed.  
 Specialities for internally threaded anchors according to the design proposal of FITT gGmbH, Prof. Dr.-Ing. Enders-Comberg

Type	Steel grade of the screw	Gluing length in component 1 (perpendicular to the fiber)	Gluing length in component 2 (parallel to the fiber)	Permissible shear load	Washers diameter on component 1	Minimum spacing	Minimum edge distance (unloaded) Component 2	Minimum edge distance (loaded) Component 2	Minimum edge distance lateral (unloaded) Component 1	Minimum edge distance end grain (unloaded) Component 1	Minimum edge distance end grain (loaded) Component 1	Minimum component dimensions Component 1	Minimum component dimensions Component 2
	[-]	$d_1$ [mm]	$l_{ad,2}$ [mm]	$V_{perm}$ [kN]	$d_u$ [mm]	$a_1 = a_2$ [mm]	$a_{2,c}$ [mm]	$a_{2,t}$ [mm]	$a_{4,c}$ [mm]	$a_{3,c}$ [mm]	$a_{3,t}$ [mm]	$b_1 / d_1$ [mm]	$b_2 / d_2$ [mm]
FIS IG M8	5.8	60	120	1.1	28	60	30	48	24	32	80	48 / 60	60 / 78
	8.8	60	120	1.2	28	60	30	48	24	32	80	48 / 60	60 / 78
	R-70	60	120	1.2	28	60	30	48	24	32	80	48 / 60	60 / 78
FIS IG M10	5.8	60	160	1.7	34	80	40	64	30	40	80	60 / 60	80 / 104
	8.8	60	160	1.9	34	80	40	64	30	40	80	60 / 60	80 / 104
	R-70	60	160	1.8	34	80	40	64	30	40	80	60 / 60	80 / 104
FIS IG M12	5.8	60	200	2.4	58	100	50	80	36	48	84	72 / 60	100 / 130
	8.8	60	200	2.6	58	100	50	80	36	48	84	72 / 60	100 / 130
	R-70	60	200	2.6	58	100	50	80	36	48	84	72 / 60	100 / 130
FIS IG M16	5.8	60	240	3.3	68	120	60	96	48	64	112	96 / 60	120 / 156
	8.8	60	240	3.3	68	120	60	96	48	64	112	96 / 60	120 / 156
	R-70	60	240	3.3	68	120	60	96	48	64	112	96 / 60	120 / 156
FIS IG M20	5.8	100	300	4.7	80	150	75	120	60	80	140	120 / 100	150 / 195
	8.8	100	300	5.2	80	150	75	120	60	80	140	120 / 100	150 / 195
	R-70	100	300	5.0	80	150	75	120	60	80	140	120 / 100	150 / 195

Notes:  
 Drill diameter in timber component 1: 1 mm larger than the outer diameter of the bolts.  
 Drill diameter in timber component 2: 4 mm larger than the outer diameter of the internally threaded anchor.  
 Partial safety factors  $\gamma_{M,H} = 1,3$ ;  $\gamma_{M,S} = 1,25$ ;  $\gamma_{F,global} = 1,4$  and  $k_{mod} = 0,9$  from KLED short and NKL 1+2 taken into account.  
 Values valid for glued laminated timber  $\geq$  GL24h. Higher load-bearing capacities may be possible for higher strength classes.  
 For groups of steel bars, as well as for combined loading from tensile and shear loads, as well as for bending loads, see Z-9.1-914 and DIN EN 1995-1-1 / NA.  
 All specified mechanical values must be considered depending on the assumptions made and are examples of dimensioning.  
 This is a planning aid. Projects must be dimensioned exclusively by structural engineers!  
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