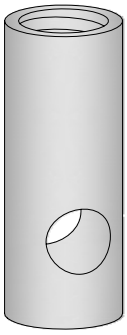
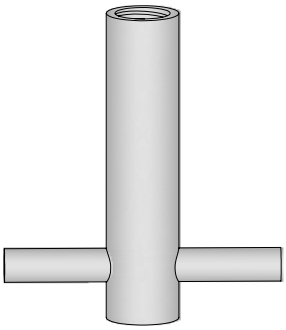
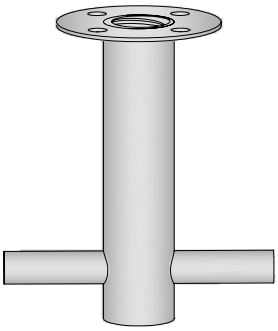
# Threaded Concrete Anchors

SALON TUKITUOTE

## Instructions of use

| | | |
|---|---|---|
|  |  |  |
| **Concrete Anchors**<br>**№ 300 and № 301**<br>(pages 2-9) | **Concrete Anchors**<br>**№ 310 and № 311**<br>(pages 10-17) | **Concrete Anchor**<br>**№ 410**<br>(pages 18-23) |

# Concrete Anchors №300 and №301

The Concrete Anchors are made for lifting and fastening of precast concrete products.

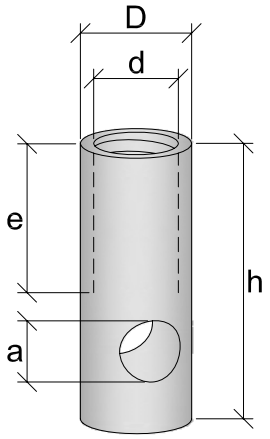
Concrete Anchors can be used in concrete C20/25 and the minimum necessary surface reinforcement.

Concrete Anchor with anchorage reinforcement is set into the concrete before the casting and serves a basis for Lifting Loops LL, Lifting Loops “Goliath”, Lifting Loops with Pressure Plate and LiftingEye.

There is the half-round metric thread Rd or a metric thread in the Concrete Anchors, which should be greased before the installation into the precast concrete unit. The fastening details equipped with normal metric standard thread can be fastened to the thread.

For fastening to a steel formwork, magnetic holders models HM4 are recommended. To prevent dirt and concrete from penetrating into the thread of the socket, external caps or holding discs are used. Holding discs are used to fasten anchors to a wooden formwork.

The cast-in concrete inserts are manufactured in accordance with the product declaration approved by the concrete Association of Finland, and the company has included a quality control contract with SFS-InspectaSertifiointiOy.




**Materials:**

- steel S355, bright
- zinc-plated
- stainless steel A2
- stainless steel A4

**Table 1: Concrete Anchor №300with metric thread (steel S355, bright)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] |
|---|---|---|---|---|---|---|
| **00101** | M10×45 | 10 | 45 | 15 | 18 | 8 |
| **00103** | M10×60 | 10 | 60 | 15 | 18 | 8 |
| **00104** | M12×50 | 12 | 50 | 18 | 22 | 10 |
| **00105** | M12×70 | 12 | 70 | 18 | 25 | 10 |
| **00106** | M16×50 | 16 | 50 | 22 | 22 | 10 |
| **00107** | M16×70 | 16 | 70 | 22 | 27 | 10 |
| **00108** | M16×90 | 16 | 90 | 22 | 27 | 10 |
| **00109** | M20×100 | 20 | 100 | 25 | 30 | 12 |
| **00110** | M20×120 | 20 | 120 | 25 | 30 | 12 |
| **00111** | M24×120 | 24 | 120 | 35 | 40 | 15 |
| **00112** | M24×150 | 24 | 150 | 35 | 40 | 15 |

**Table2: Concrete Anchor №301 with Rd thread (steel S355, bright)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] |
|---|---|---|---|---|---|---|
| **Rd104** | Rd12×50 | 12 | 50 | 18 | 22 | 10 |
| **Rd105** | Rd12×70 | 12 | 70 | 18 | 25 | 10 |
| **Rd106** | Rd16×50 | 16 | 50 | 22 | 22 | 10 |
| **Rd107** | Rd16×70 | 16 | 70 | 22 | 27 | 10 |
| **Rd108** | Rd16×90 | 16 | 90 | 22 | 27 | 10 |
| **Rd109** | Rd20×100 | 20 | 100 | 25 | 30 | 12 |
| **Rd110** | Rd20×120 | 20 | 120 | 25 | 30 | 12 |
| **Rd111** | Rd24×120 | 24 | 120 | 35 | 40 | 15 |
| **Rd112** | Rd24×150 | 24 | 150 | 35 | 40 | 15 |

**Table 3: Concrete Anchor №300S with metric thread (zinc-plated)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] |
|---|---|---|---|---|---|---|
| **00200** | M10×45 | 10 | 45 | 15 | 18 | 8 |
| **00201** | M10×60 | 10 | 60 | 15 | 18 | 8 |
| **00202** | M12×50 | 12 | 50 | 18 | 22 | 10 |
| **00203** | M12×70 | 12 | 70 | 18 | 25 | 10 |
| **00204** | M16×50 | 16 | 50 | 22 | 22 | 10 |
| **00205** | M16×70 | 16 | 70 | 22 | 27 | 10 |
| **00206** | M16×90 | 16 | 90 | 22 | 27 | 10 |
| **00207** | M20×100 | 20 | 100 | 25 | 30 | 12 |
| **00208** | M20×120 | 20 | 120 | 25 | 30 | 12 |
| **00209** | M24×120 | 24 | 120 | 35 | 40 | 15 |
| **00210** | M24×150 | 24 | 150 | 35 | 40 | 15 |

**Table 4: Concrete Anchor №301S with Rd thread (zinc-plated)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] |
|---|---|---|---|---|---|---|
| **Rd202** | Rd12×50 | 12 | 50 | 18 | 22 | 10 |
| **Rd203** | Rd12×70 | 12 | 70 | 18 | 25 | 10 |
| **Rd204** | Rd16×50 | 16 | 50 | 22 | 22 | 10 |
| **Rd205** | Rd16×70 | 16 | 70 | 22 | 27 | 10 |
| **Rd206** | Rd16×90 | 16 | 90 | 22 | 27 | 10 |
| **Rd207** | Rd20×100 | 20 | 100 | 25 | 30 | 12 |
| **Rd208** | Rd20×120 | 20 | 120 | 25 | 30 | 12 |
| **Rd209** | Rd24×120 | 24 | 120 | 35 | 40 | 15 |
| **Rd210** | Rd24×150 | 24 | 150 | 35 | 40 | 15 |

**Table 5: Concrete Anchor №300Rwith metric thread (stainless steel)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] |
|---|---|---|---|---|---|---|
| **00300** | M10×45 | 10 | 45 | 15 | 18 | 8 |
| **00301** | M10×60 | 10 | 60 | 15 | 18 | 8 |
| **00302** | M12×50 | 12 | 50 | 18 | 22 | 10 |
| **00303** | M12×70 | 12 | 70 | 18 | 25 | 10 |
| **00304** | M16×50 | 16 | 50 | 22 | 22 | 10 |
| **00305** | M16×70 | 16 | 70 | 22 | 27 | 10 |
| **00306** | M16×90 | 16 | 90 | 22 | 27 | 10 |
| **00307** | M20×100 | 20 | 100 | 25 | 30 | 12 |
| **00308** | M20×120 | 20 | 120 | 25 | 30 | 12 |
| **00309** | M24×120 | 24 | 120 | 35 | 40 | 15 |
| **00310** | M24×150 | 24 | 150 | 35 | 40 | 15 |

**Table 6: Concrete Anchor №301Rwith Rd thread (stainless steel)**

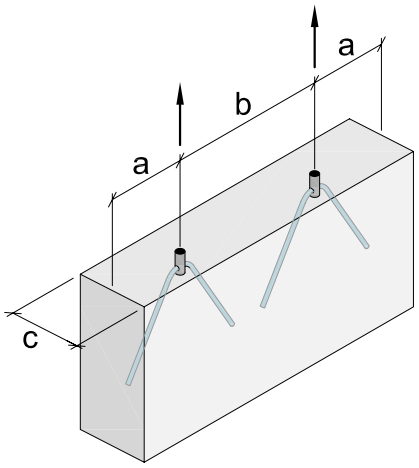
| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] |
|---|---|---|---|---|---|---|
| **Rd302** | Rd12×50 | 12 | 50 | 18 | 22 | 10 |
| **Rd303** | Rd12×70 | 12 | 70 | 18 | 25 | 10 |
| **Rd304** | Rd16×50 | 16 | 50 | 22 | 22 | 10 |
| **Rd305** | Rd16×70 | 16 | 70 | 22 | 27 | 10 |
| **Rd306** | Rd16×90 | 16 | 90 | 22 | 27 | 10 |
| **Rd307** | Rd20×100 | 20 | 100 | 25 | 30 | 12 |
| **Rd308** | Rd20×120 | 20 | 120 | 25 | 30 | 12 |
| **Rd309** | Rd24×120 | 24 | 120 | 35 | 40 | 15 |
| **Rd310** | Rd24×150 | 24 | 150 | 35 | 40 | 15 |

# Installation Instructions for Concrete Anchors

## 1. Spacing of Concrete Anchors and edge distances

**Table 7: Minimal dimensions**

| Type | $a_{min}$ [mm] | $b_{min}$ [mm] | $c_{min}$ [mm] |
|---|---|---|---|
| M10×45 | 400 | 200 | 65 |
| M10×60 | 400 | 200 | 90 |
| M/Rd12×50 | 400 | 200 | 75 |
| M/Rd12×70 | 400 | 200 | 105 |
| M/Rd16×50 | 400 | 200 | 75 |
| M/Rd16×70 | 400 | 200 | 105 |
| M/Rd16×90 | 400 | 200 | 135 |
| M/Rd20×100 | 400 | 200 | 150 |
| M/Rd20×120 | 480 | 240 | 180 |
| M/Rd24×120 | 480 | 240 | 180 |
| M/Rd24×150 | 600 | 300 | 225 |

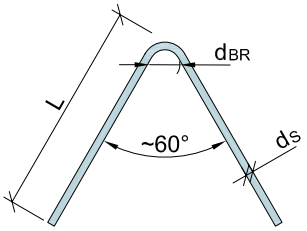


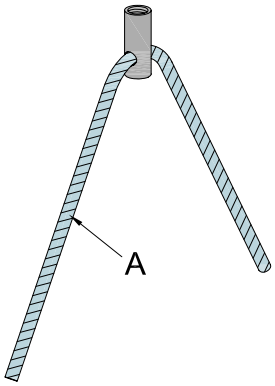

## 2. Anchorage reinforcement

**Table 8: Reinforcement bar A**

| Type | $d_S$ [mm] | $d_{BR}$ [mm] | L [mm] |
|---|---|---|---|
| M10 | 6 | 24 | 220 |
| M/Rd 12 | 6 | 24 | 220 |
| M/Rd 16 | 10 | 40 | 310 |
| M/Rd 20 | 12 | 48 | 430 |

A reinforcement bar :




The reinforcement bar must be tightly pressed!

Concrete Anchors with reinforcement bars can be used with **straight pull** without any further reinforcement.

## 3. Permissible loads

**Application as load transferring metal parts:**

Table 9 lists the calculated values of cast-in concrete inserts' tensile and shearing capacities, when the inserts are being used as load transferring metal parts other than lifting anchors. The calculated loads of the cast-in concrete inserts (the nominal load, indicated by the partial safety factor) must be smaller than the calculated value of the tensile or shearing capacities.
The established calculated capacity values presume that the attached structural fastening devices (threaded pins and screws) are screwed in the entire length of the thread.

The calculated capacity values provided in Table 9 have been obtained by dividing the nominal capacity by the coefficient depending on the fracturing pattern of the fastening. Since the fracture was caused by fracturing of the concrete in the fastening base, the value 1.5 (reinforced structure) should be taken for the safety factor. Furthermore, in case of brittle fracture of the insert anchoring, the additional safety factor 1.2 is applied.

The fastening shall be designed so as to ensure that failure of the fastening of one of the cast-in inserts does not lead to a successive collapse, and thus the disconnection of the structural part or equipment being fastened. At least two cast-in concrete inserts fails the load applied to the remaining inserts must be lower than their double calculated capacity.

The calculated values of the tensile and shearing capacities of the load transferring cast-in concrete inserts for the concrete type C20/25. Not used for lifting of elements.
Reference: *The measured values of the tensile and shearing capacities of cast-in concrete inserts are provided in VTT survey report No (Cast-in concrete inserts M10-M20) and RTE3328/05 9.9.2005 (Lifting Anchors M24)*

**Table 9: Cast-in concrete inserts**

| Type | Calculated tensile capacity value [kN] | Calculated shearing capacity value [kN] |
|---|---|---|
| M10×45 | 9.6 | - |
| M10×60 | 11.5 | - |
| M/Rd12×50 | 10.8 | 12.3 |
| M/Rd12×70 | 18.9 | 19.8 |
| M/Rd16×50 | 10.8 | 13.6 |
| M/Rd16×70 | 19.9 | 19.8 |
| M/Rd16×90 | 27.0 | 21.1 |
| M/Rd20×100 | 30.9 | 37.3 |
| M/Rd20×120 | 40.0 | 40.7 |
| M/Rd24×120 | 39.4 | 45.2 |
| M/Rd24×150 | 52.2 | 61.7 |

**Application of cast-in concrete inserts for lifting anchors:**

**VTT research report No RTE3261/04 8.10.2004** for cast-in concrete insert types No 310, 310R, 310H, 410, 410R, 410H (sizes M / Rd12—M / Rd20), applying the concrete strength class C20/25, and **RTE 3328/05 9.9.2005** for lifting anchors No 310, 310R, 310H, 410, 410R, 410H (sizes M / Rd24)

Pursuant to the Finnish National Building Code (Rak MK), Part B4, clause 2.6.1.5, the load, which is at least four times the load caused by the element, shall be applied as the calculated load for a lifting anchor and its fastening. Table 10 presents the permissible vertical load of a cast-in concrete insert (element's permitted weight) with the lifting angle value of 0° (vertical lift) 30° and 60°. The lifting angle 90° represents the permissible shear force of a cast-in concrete insert. The lifting angle means the angle between the lifting cable and a vertical line.

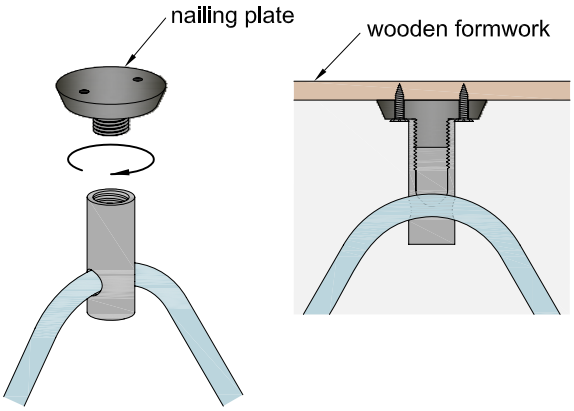
The permissible vertical load of a lifting anchor (permissible element weight) [kN] with the lifting angle values 0°, 30°, 60° and the permissible shear force of a cast-in concrete insert (lifting angle 90°) for reinforced concrete C20/25.
Reference: *The measured values of cast-in concrete inserts are provided in VTT survey report No (Cast-in concrete inserts M12-M20) and RTE3328/05 9.9.2005 (Lifting Anchors M24)*

**Table 10: Lifting Anchors**

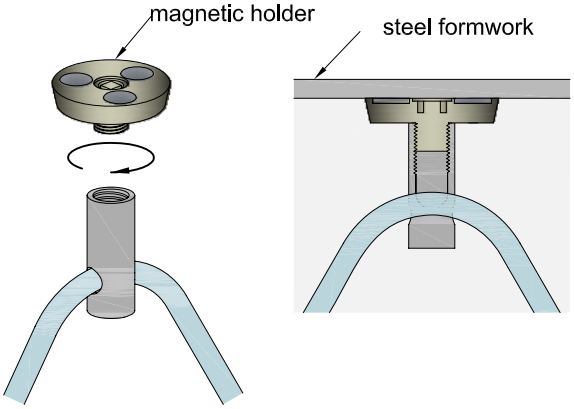
| Type | Permissible vertical load (element weight) [kN] | | | |
|---|---|---|---|---|
| | Lifting angle: | | | |
| | 0° (vertical lift) | 30° | 60° | 90° (permissible shear force) |
| M10×45 | 4.9 | 3.9 | 2.3 | 5.6 |
| M10×60 | 9.0 | 6.8 | 3.9 | 8.9 |
| M/Rd12×50 | 4.9 | 4.0 | 2.5 | 6.2 |
| M/Rd12×70 | 9.0 | 6.8 | 3.9 | 8.9 |
| M/Rd16×50 | 12.6 | 8.6 | 4.6 | 9.5 |
| M/Rd16×70 | 13.9 | 11.3 | 6.9 | 16.8 |
| M/Rd16×90 | 18.0 | 13.8 | 8.0 | 18.4 |
| M/Rd20×100 | 17.8 | 14.2 | 8.5 | 20.4 |
| M/Rd20×120 | 23.5 | 18.9 | 11.4 | 27.8 |
| M/Rd24×120 | 17.8 | 14.2 | 8.5 | 20.4 |
| M/Rd24×150 | 23.5 | 18.9 | 11.4 | 27.8 |

## 4. Accessories of Installation

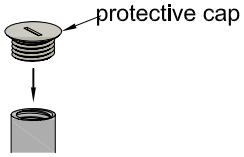
**Nailing Plate** (for more information, look at brochure “Threaded Lifting System”, page 5) are used when is necessary to fasten Concrete Anchors to a wooden formwork. They eliminate the possibility of getting concrete or pollution into the sockets.



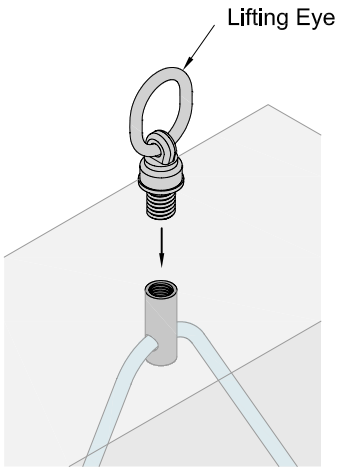

**Magnetic Holder – Type HM4** (for more information, look at brochure “Threaded Lifting System”, pages 2-4) are used when is necessary to fasten Concrete Anchors to a steel formwork

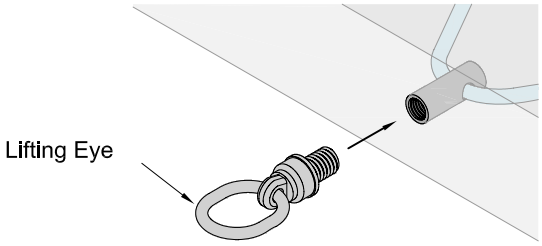



**Protective Caps** (for more information, look at brochure “Threaded Lifting System”, page 6) are used to seal Concrete Anchor and prevent various substances such as residual concrete, dust, snow etc. from penetrating into the Concrete Anchor, protecting the anchor thread from clogging up.



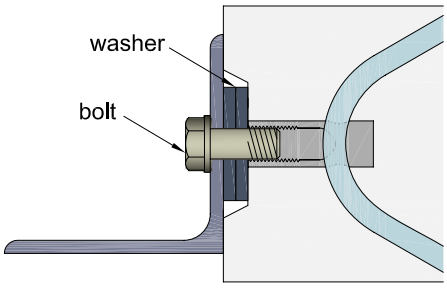
**Lifting Eye, TreadedLifting Loop LL, Threaded Lifting Loop with pressure plate and Lifting Loop "Goliath"** (for more information,look at brochure "Threaded System Accessories" page 8-15) are to be used as lifting devices of the Thread System. They must be completely screwed into the Concrete Anchor.




## 5. Fixing component

An element is attached to the Concrete Anchor with a standard metric thread fastening bolt and washer.



# Concrete Anchors № 310 and № 311

The Concrete Anchors are made for lifting and fastening of precast concrete products.

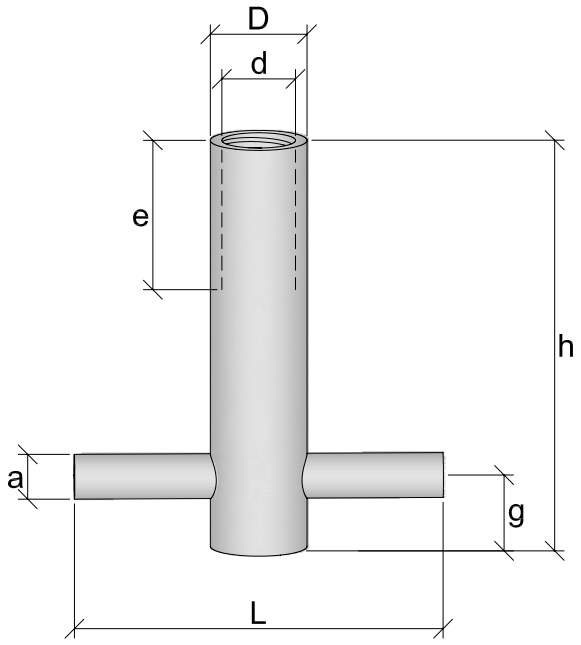
Concrete Anchors can be used in concrete C20/25 and the minimum necessary surface reinforcement.

Concrete Anchor with anchorage reinforcement is set into the concrete before the casting and serves a basis for Lifting Loops LL, Lifting Loops "Goliath", Lifting Loops with Pressure Plate and Lifting Eye.

There is the half-round metric thread Rd or a metric thread in the Concrete Anchors, which should be greased before the installation into the precast concrete unit. The fastening details equipped with normal metric standard thread can be fastened to the thread.

For fastening to a steel formwork, magnetic holders models HM4 are recommended. To prevent dirt and concrete from penetrating into the thread of the socket, protective caps or nailing plates are used. Holding discs are used to fasten anchors to a wooden formwork.

The cast-in concrete anchors are manufactured in accordance with the product declaration approved by the concrete Association of Finland, and the company has included a quality control contract with SFS-Inspecta Sertifiointi Oy.




**Materials:**

- steel S355, polished or
- zinc-plated or
- stainless steel A2
- stainless steel A4

**Table 1: Concrete Anchor № 310 with metric thread (steel S355, polished)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] | g [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| **00400** | M10×45 | 10 | 45 | 15 | 18 | 8 | 12 | 65 |
| **00401** | M10×60 | 10 | 60 | 15 | 18 | 8 | 15 | 65 |
| **00402** | M12×50 | 12 | 50 | 18 | 22 | 10 | 12 | 80 |
| **00403** | M12×70 | 12 | 70 | 18 | 25 | 10 | 15 | 80 |
| **00404** | M16×50 | 16 | 50 | 22 | 22 | 10 | 12 | 22 |
| **00405** | M16×70 | 16 | 70 | 22 | 27 | 10 | 15 | 22 |
| **00406** | M16×90 | 16 | 90 | 22 | 27 | 10 | 15 | 22 |
| **00407** | M20×100 | 20 | 100 | 25 | 30 | 12 | 25 | 25 |
| **00408** | M20×120 | 20 | 120 | 25 | 30 | 12 | 25 | 25 |
| **00409** | M24×120 | 24 | 120 | 35 | 40 | 15 | 30 | 35 |
| **00410** | M24×150 | 24 | 150 | 35 | 40 | 15 | 30 | 35 |

**Table 2: Concrete Anchor № 311 with Rd thread (steel S355, polished)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] | g [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| **Rd402** | Rd12×50 | 12 | 50 | 18 | 22 | 10 | 12 | 80 |
| **Rd403** | Rd12×70 | 12 | 70 | 18 | 25 | 10 | 15 | 80 |
| **Rd404** | Rd16×50 | 16 | 50 | 22 | 22 | 10 | 12 | 22 |
| **Rd405** | Rd16×70 | 16 | 70 | 22 | 27 | 10 | 15 | 22 |
| **Rd406** | Rd16×90 | 16 | 90 | 22 | 27 | 10 | 15 | 22 |
| **Rd407** | Rd20×100 | 20 | 100 | 25 | 30 | 12 | 25 | 25 |
| **Rd408** | Rd20×120 | 20 | 120 | 25 | 30 | 12 | 25 | 25 |
| **Rd409** | M24×120 | 24 | 120 | 35 | 40 | 15 | 30 | 35 |
| **Rd410** | M24×150 | 24 | 150 | 35 | 40 | 15 | 30 | 35 |

**Table 3: Concrete Anchor № 310ZN with metric thread (zinc-plated)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] | g [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| **00500** | M10×45 | 10 | 45 | 15 | 18 | 8 | 12 | 65 |
| **00501** | M10×60 | 10 | 60 | 15 | 18 | 8 | 15 | 65 |
| **00502** | M12×50 | 12 | 50 | 18 | 22 | 10 | 12 | 80 |
| **00503** | M12×70 | 12 | 70 | 18 | 25 | 10 | 15 | 80 |
| **00504** | M16×50 | 16 | 50 | 22 | 22 | 10 | 12 | 22 |
| **00505** | M16×70 | 16 | 70 | 22 | 27 | 10 | 15 | 22 |
| **00506** | M16×90 | 16 | 90 | 22 | 27 | 10 | 15 | 22 |
| **00507** | M20×100 | 20 | 100 | 25 | 30 | 12 | 25 | 25 |
| **00508** | M20×120 | 20 | 120 | 25 | 30 | 12 | 25 | 25 |
| **00509** | M24×120 | 24 | 120 | 35 | 40 | 15 | 30 | 35 |
| **00510** | M24×150 | 24 | 150 | 35 | 40 | 15 | 30 | 35 |

**Table 4: Concrete Anchor № 311ZN with Rd thread (zinc-plated)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] | g [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| **Rd502** | Rd12×50 | 12 | 50 | 18 | 22 | 10 | 12 | 80 |
| **Rd503** | Rd12×70 | 12 | 70 | 18 | 25 | 10 | 15 | 80 |
| **Rd504** | Rd16×50 | 16 | 50 | 22 | 22 | 10 | 12 | 22 |
| **Rd505** | Rd16×70 | 16 | 70 | 22 | 27 | 10 | 15 | 22 |
| **Rd506** | Rd16×90 | 16 | 90 | 22 | 27 | 10 | 15 | 22 |
| **Rd507** | Rd20×100 | 20 | 100 | 25 | 30 | 12 | 25 | 25 |
| **Rd508** | Rd20×120 | 20 | 120 | 25 | 30 | 12 | 25 | 25 |
| **Rd509** | M24×120 | 24 | 120 | 35 | 40 | 15 | 30 | 35 |
| **Rd510** | M24×150 | 24 | 150 | 35 | 40 | 15 | 30 | 35 |

**Table 5: Concrete Anchor № 310R with metric thread (stainless steel)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] | g [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| **0600** | M10×45 | 10 | 45 | 15 | 18 | 8 | 12 | 65 |
| **0601** | M10×60 | 10 | 60 | 15 | 18 | 8 | 15 | 65 |
| **0602** | M12×50 | 12 | 50 | 18 | 22 | 10 | 12 | 80 |
| **0603** | M12×70 | 12 | 70 | 18 | 25 | 10 | 15 | 80 |
| **0604** | M16×50 | 16 | 50 | 22 | 22 | 10 | 12 | 22 |
| **0605** | M16×70 | 16 | 70 | 22 | 27 | 10 | 15 | 22 |
| **0606** | M16×90 | 16 | 90 | 22 | 27 | 10 | 15 | 22 |
| **0607** | M20×100 | 20 | 100 | 25 | 30 | 12 | 25 | 25 |
| **0608** | M20×120 | 20 | 120 | 25 | 30 | 12 | 25 | 25 |
| **0609** | M24×120 | 24 | 120 | 35 | 40 | 15 | 30 | 35 |
| **0610** | M24×150 | 24 | 150 | 35 | 40 | 15 | 30 | 35 |

**Table 6: Concrete Anchor № 311R with Rd thread (stainless steel)**

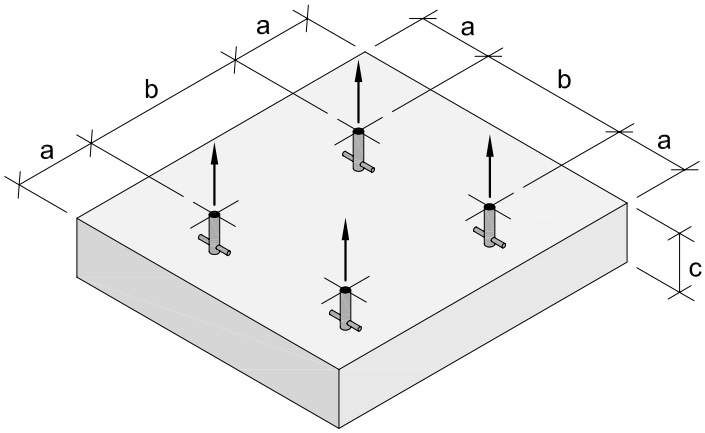
| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] | g [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| **Rd602** | Rd12×50 | 12 | 50 | 18 | 22 | 10 | 12 | 80 |
| **Rd603** | Rd12×70 | 12 | 70 | 18 | 25 | 10 | 15 | 80 |
| **Rd604** | Rd16×50 | 16 | 50 | 22 | 22 | 10 | 12 | 22 |
| **Rd605** | Rd16×70 | 16 | 70 | 22 | 27 | 10 | 15 | 22 |
| **Rd606** | Rd16×90 | 16 | 90 | 22 | 27 | 10 | 15 | 22 |
| **Rd607** | Rd20×100 | 20 | 100 | 25 | 30 | 12 | 25 | 25 |
| **Rd608** | Rd20×120 | 20 | 120 | 25 | 30 | 12 | 25 | 25 |
| **Rd609** | M24×120 | 24 | 120 | 35 | 40 | 15 | 30 | 35 |
| **Rd610** | M24×150 | 24 | 150 | 35 | 40 | 15 | 30 | 35 |

## Installation Instructions for Concrete Anchors

### 1. Spacing of Concrete Anchors and edge distances

**Table 7: Minimal dimensions**

| Type | $a_{min}$ [mm] | $b_{min}$ [mm] | $c_{min}$ [mm] |
|---|---|---|---|
| M10×45 | 400 | 200 | 65 |
| M10×60 | 400 | 200 | 90 |
| M/Rd12×50 | 400 | 200 | 75 |
| M/Rd12×70 | 400 | 200 | 105 |
| M/Rd16×50 | 400 | 200 | 75 |
| M/Rd16×70 | 400 | 200 | 105 |
| M/Rd16×90 | 400 | 200 | 135 |
| M/Rd20×100 | 400 | 200 | 150 |
| M/Rd20×120 | 480 | 240 | 180 |
| M/Rd24×120 | 480 | 240 | 180 |
| M/Rd24×150 | 600 | 300 | 225 |




### 2. Permissible loads

**Application as load transferring metal parts:**

Table 8 lists the calculated values of cast-in concrete inserts' tensile and shearing capacities, when the inserts are being used as load transferring metal parts other than lifting anchors. The calculated loads of the cast-in concrete inserts (the nominal load, indicated by the partial safety factor) must be smaller than the calculated value of the tensile or shearing capacities.
The established calculated capacity values presume that the attached structural fastening devices (threaded pins and screws) are screwed in the entire length of the thread.

The calculated capacity values provided in Table 8 have been obtained by dividing the nominal capacity by the coefficient depending on the fracturing pattern of the fastening. Since the fracture was caused by fracturing of the concrete in the fastening base, the value 1.5 (reinforced structure) should be taken for the safety factor. Furthermore, in case of brittle fracture of the insert anchoring, the additional safety factor 1.2 is applied.

The fastening shall be designed so as to ensure that failure of the fastening of one of the cast-in inserts does not lead to a successive collapse, and thus the disconnection of the structural part or equipment being fastened. At least two cast-in concrete inserts fails the load applied to the remaining inserts must be lower than their double calculated capacity.

The calculated values of the tensile and shearing capacities of the load transferring cast-in concrete inserts for the concrete type C20/25. Not used for lifting of elements.

Reference: *The measured values of the tensile and shearing capacities of cast-in concrete inserts are provided in VTT survey report No (Cast-in concrete inserts M10-M20) and RTE3328/05 9.9.2005 (Lifting Anchors M24)*

**Table 8: Cast-in concrete inserts**

| Type | Calculated tensile capacity value [kN] | Calculated shearing capacity value [kN] |
|---|---|---|
| M10×45 | 9.6 | - |
| M10×60 | 11.5 | - |
| M/Rd12×50 | 10.8 | 12.3 |
| M/Rd12×70 | 18.9 | 19.8 |
| M/Rd16×50 | 10.8 | 13.6 |
| M/Rd16×70 | 19.9 | 19.8 |
| M/Rd16×90 | 27.0 | 21.1 |
| M/Rd20×100 | 30.9 | 37.3 |
| M/Rd20×120 | 40.0 | 40.7 |
| M/Rd24×120 | 39.4 | 45.2 |
| M/Rd24×150 | 52.2 | 61.7 |

**Application of cast-in concrete inserts for lifting anchors:**

**VTT research report No RTE3261/04 8.10.2004** for cast-in concrete insert types No 310, 310R, 310H, 410, 410R, 410H (sizes M / Rd12—M / Rd20), applying the concrete strength class C20/25, and **RTE 3328/05 9.9.2005** for lifting anchors No 310, 310R, 310H, 410, 410R, 410H (sizes M / Rd24)

Pursuant to the Finnish National Building Code (Rak MK), Part B4, clause 2.6.1.5, the load, which is at least four times the load caused by the element, shall be applied as the calculated load for a lifting anchor and its fastening. Table 9 presents the permissible vertical load of a cast-in concrete insert (element's permitted weight) with the lifting angle value of 0° (vertical lift) 30° and 60°. The lifting angle 90° represents the permissible shear force of a cast-in concrete insert. The lifting angle means the angle between the lifting cable and a vertical line.

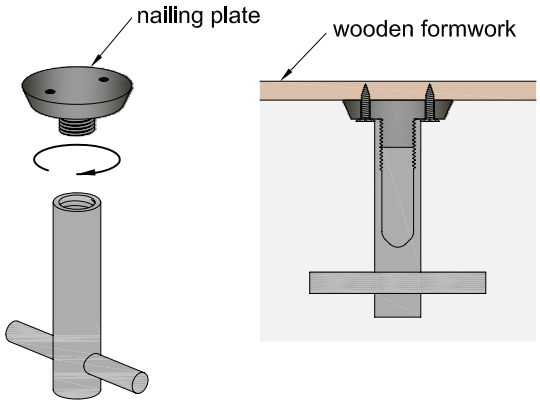
The permissible vertical load of a lifting anchor (permissible element weight) [kN] with the lifting angle values 0°, 30°, 60° and the permissible shear force of a cast-in concrete insert (lifting angle 90°) for reinforced concrete C20/25.
Reference: *The measured values of cast-in concrete inserts are provided in VTT survey report No (Cast-in concrete inserts M12-M20) and RTE3328/05 9.9.2005 (Lifting Anchors M24)*

**Table 9: Lifting Anchors**

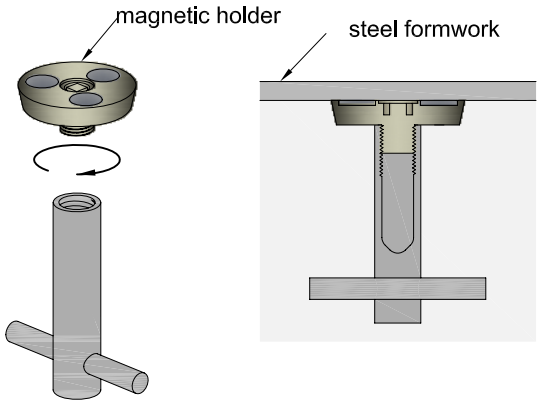
| Type | Permissible vertical load (element weight) [kN] | | | |
|---|---|---|---|---|
| | Lifting angle: | | | |
| | 0° (vertical lift) | 30° | 60° | 90° (permissible shear force) |
| M10×45 | 4.9 | 3.9 | 2.3 | 5.6 |
| M10×60 | 9.0 | 6.8 | 3.9 | 8.9 |
| M/Rd12×50 | 4.9 | 4.0 | 2.5 | 6.2 |
| M/Rd12×70 | 9.0 | 6.8 | 3.9 | 8.9 |
| M/Rd16×50 | 12.6 | 8.6 | 4.6 | 9.5 |
| M/Rd16×70 | 13.9 | 11.3 | 6.9 | 16.8 |
| M/Rd16×90 | 18.0 | 13.8 | 8.0 | 18.4 |
| M/Rd20×100 | 17.8 | 14.2 | 8.5 | 20.4 |
| M/Rd20×120 | 23.5 | 18.9 | 11.4 | 27.8 |
| M/Rd24×120 | 17.8 | 14.2 | 8.5 | 20.4 |
| M/Rd24×150 | 23.5 | 18.9 | 11.4 | 27.8 |

## 3. Accessories of Installation

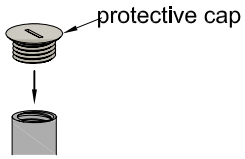
**Nailing Plate** (for more information, look at brochure “Threaded Lifting System”, page 5) are used when is necessary to fasten Concrete Anchors to a wooden formwork. They eliminate the possibility of getting concrete or pollution into the sockets.



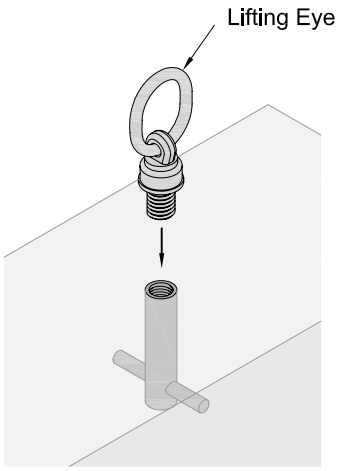

**Magnetic Holder – Type HM4** (for more information, look at brochure “Threaded Lifting System”, pages 2-4) are used when is necessary to fasten Concrete Anchors to a steel formwork

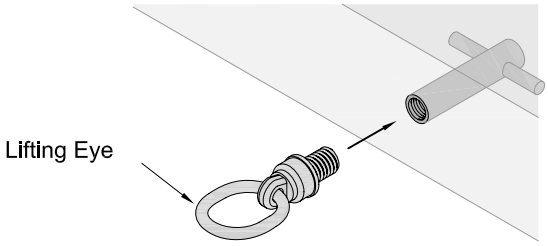



**Protective Caps** (for more information, look at brochure “Threaded Lifting System”, page 6) are used to seal Concrete Anchor and prevent various substances such as residual concrete, dust, snow etc. from penetrating into the Concrete Anchor, protecting the anchor thread from clogging up.



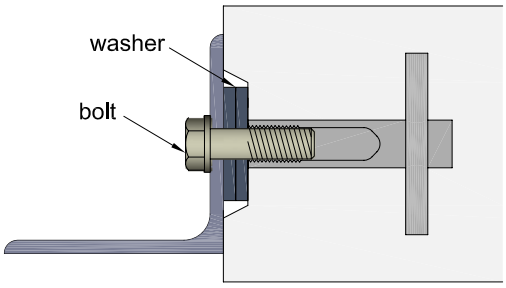
**Lifting Eye, Lifting Loop LL**, **Lifting Loop with pressure plate and Lifting Loop "Goliath"** (for more information, look at brochure "Threaded System Accessories" page 8-15) are to be used as lifting device of the Thread System. They must be completely screwed into the Concrete Anchors.




## 4. Fixing component

An element is attached to the Concrete Anchor with a standard metric thread fastening bolt and washer.



# Concrete Anchor № 410

The Concrete Anchors are made for lifting and fastening of precast concrete products.

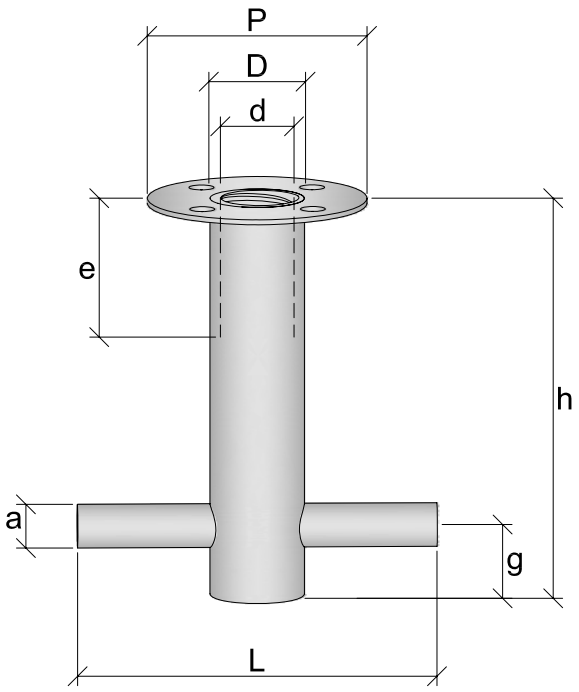
Concrete Anchors can be used in concrete C20/25 and the minimum necessary surface reinforcement.

Concrete Anchor with anchorage reinforcement is set into the concrete before the casting and serves a basis for Lifting Loops LL, Lifting Loops "Goliath", Lifting Loops with Pressure Plate and Lifting Eye.

There is the half-round metric thread Rd in the Concrete Anchor № 410, which should be greased before the installation into the precast concrete unit. The fastening details equipped with normal metric standard thread can be fastened to the thread.

Concrete Anchor № 410 has a nailing plate and can be simply and efficiently nailed to wooden formwork. To prevent dirt and concrete from penetrating into the thread of the socket, External Caps are used.

The cast-in concrete inserts are manufactured in accordance with the product declaration approved by the concrete Association of Finland, and the company has included a quality control contract with SFS-Inspecta Sertifiointi Oy.




**Materials:**

- steel S355, polished or
- zinc-plated or
- stainless steel A2

**Table 1: Concrete Anchor № 410 with metric thread (steel S355, polished)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] | g [mm] | L [mm] | P [mm] |
|---|---|---|---|---|---|---|---|---|---|
| **01001** | M12×50 | 12 | 50 | 18 | 22 | 10 | 12 | 80 | 45 |
| **01002** | M12×70 | 12 | 70 | 18 | 25 | 10 | 15 | 80 | 45 |
| **01003** | M16×50 | 16 | 50 | 22 | 22 | 10 | 12 | 22 | 54 |
| **01004** | M16×70 | 16 | 70 | 22 | 27 | 10 | 15 | 22 | 54 |
| **01005** | M16×90 | 16 | 90 | 22 | 27 | 10 | 15 | 22 | 54 |
| **01006** | M20×100 | 20 | 100 | 25 | 30 | 12 | 25 | 25 | 64 |
| **01007** | M20×120 | 20 | 120 | 25 | 30 | 12 | 25 | 25 | 64 |

**Table 2: Concrete Anchor № 410S with metric thread (zinc-plated)**

| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] | g [mm] | L [mm] | P [mm] |
|---|---|---|---|---|---|---|---|---|---|
| **01101** | M12×50 | 12 | 50 | 18 | 22 | 10 | 12 | 80 | 45 |
| **01102** | M12×70 | 12 | 70 | 18 | 25 | 10 | 15 | 80 | 45 |
| **01103** | M16×50 | 16 | 50 | 22 | 22 | 10 | 12 | 22 | 54 |
| **01104** | M16×70 | 16 | 70 | 22 | 27 | 10 | 15 | 22 | 54 |
| **01105** | M16×90 | 16 | 90 | 22 | 27 | 10 | 15 | 22 | 54 |
| **01106** | M20×100 | 20 | 100 | 25 | 30 | 12 | 25 | 25 | 64 |
| **01107** | M20×120 | 20 | 120 | 25 | 30 | 12 | 25 | 25 | 64 |

**Table 3: Concrete Anchor № 410R with metric thread (stainless steel)**

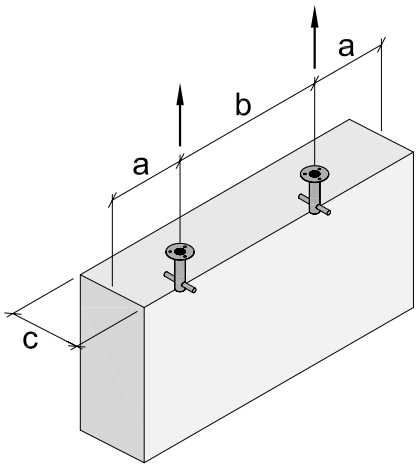
| Article | Type | d [mm] | h [mm] | D [mm] | e [mm] | a [mm] | g [mm] | L [mm] | P [mm] |
|---|---|---|---|---|---|---|---|---|---|
| **01201** | M12×50 | 12 | 50 | 18 | 22 | 10 | 12 | 80 | 45 |
| **01202** | M12×70 | 12 | 70 | 18 | 25 | 10 | 15 | 80 | 45 |
| **01203** | M16×50 | 16 | 50 | 22 | 22 | 10 | 12 | 22 | 54 |
| **01204** | M16×70 | 16 | 70 | 22 | 27 | 10 | 15 | 22 | 54 |
| **01205** | M16×90 | 16 | 90 | 22 | 27 | 10 | 15 | 22 | 54 |
| **01206** | M20×100 | 20 | 100 | 25 | 30 | 12 | 25 | 25 | 64 |
| **01207** | M20×120 | 20 | 120 | 25 | 30 | 12 | 25 | 25 | 64 |

# Installation Instructions for Concrete Anchors

## 1. Spacing of Concrete Anchors and edge distances

**Table 4: Minimal dimensions**

| Type | $a_{min}$ [mm] | $b_{min}$ [mm] | $c_{min}$ [mm] |
|---|---|---|---|
| M/Rd12×50 | 400 | 200 | 75 |
| M/Rd12×70 | 400 | 200 | 105 |
| M/Rd16×50 | 400 | 200 | 75 |
| M/Rd16×70 | 400 | 200 | 105 |
| M/Rd16×90 | 400 | 200 | 135 |
| M/Rd20×100 | 400 | 200 | 150 |
| M/Rd20×120 | 480 | 240 | 180 |




## 2. Permissible loads

**Application as load transferring metal parts:**

Table 5 lists the calculated values of cast-in concrete inserts' tensile and shearing capacities, when the inserts are being used as load transferring metal parts other than lifting anchors. The calculated loads of the cast-in concrete inserts (the nominal load, indicated by the partial safety factor) must be smaller than the calculated value of the tensile or shearing capacities.
The established calculated capacity values presume that the attached structural fastening devices (threaded pins and screws) are screwed in the entire length of the thread.

The calculated capacity values provided in Table 5 have been obtained by dividing the nominal capacity by the coefficient depending on the fracturing pattern of the fastening. Since the fracture was caused by fracturing of the concrete in the fastening base, the value 1.5 (reinforced structure) should be taken for the safety factor. Furthermore, in case of brittle fracture of the insert anchoring, the additional safety factor 1.2 is applied.

The fastening shall be designed so as to ensure that failure of the fastening of one of the cast-in inserts does not lead to a successive collapse, and thus the disconnection of the structural part or equipment being fastened. At least two cast-in concrete inserts fails the load applied to the remaining inserts must be lower than their double calculated capacity.

The calculated values of the tensile and shearing capacities of the load transferring cast-in concrete inserts for the concrete type C20/25. Not used for lifting of elements.
Reference: *The measured values of the tensile and shearing capacities of cast-in concrete inserts are provided in VTT survey report No (Cast-in concrete inserts M10-M20) and RTE3328/05 9.9.2005 (Lifting Anchors M24)*

**Table 5: Cast-in concrete inserts**

| Type | Calculated tensile capacity value [kN] | Calculated shearing capacity value [kN] |
|---|---|---|
| M10×45 | 9.6 | - |
| M10×60 | 11.5 | - |
| M/Rd12×50 | 10.8 | 12.3 |
| M/Rd12×70 | 18.9 | 19.8 |
| M/Rd16×50 | 10.8 | 13.6 |
| M/Rd16×70 | 19.9 | 19.8 |
| M/Rd16×90 | 27.0 | 21.1 |
| M/Rd20×100 | 30.9 | 37.3 |
| M/Rd20×120 | 40.0 | 40.7 |
| M/Rd24×120 | 39.4 | 45.2 |
| M/Rd24×150 | 52.2 | 61.7 |

**Application of cast-in concrete inserts for lifting anchors:**

**VTT research report No RTE3261/04 8.10.2004** for cast-in concrete insert types No 310, 310R, 310H, 410, 410R, 410H (sizes M / Rd12—M / Rd20), applying the concrete strength class C20/25, and **RTE 3328/05 9.9.2005** for lifting anchors No 310, 310R, 310H, 410, 410R, 410H (sizes M / Rd24)

Pursuant to the Finnish National Building Code (Rak MK), Part B4, clause 2.6.1.5, the load, which is at least four times the load caused by the element, shall be applied as the calculated load for a lifting anchor and its fastening. Table 6 presents the permissible vertical load of a cast-in concrete insert (element's permitted weight) with the lifting angle value of 0° (vertical lift) 30° and 60°. The lifting angle 90° represents the permissible shear force of a cast-in concrete insert. The lifting angle means the angle between the lifting cable and a vertical line.

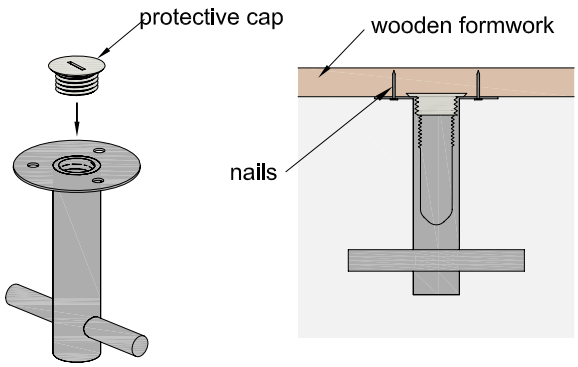
The permissible vertical load of a lifting anchor (permissible element weight) [kN] with the lifting angle values 0°, 30°, 60° and the permissible shear force of a cast-in concrete insert (lifting angle 90°) for reinforced concrete C20/25.
Reference: *The measured values of cast-in concrete inserts are provided in VTT survey report No (Cast-in concrete inserts M12-M20) and RTE3328/05 9.9.2005 (Lifting Anchors M24)*

**Table 6: Lifting Anchors**

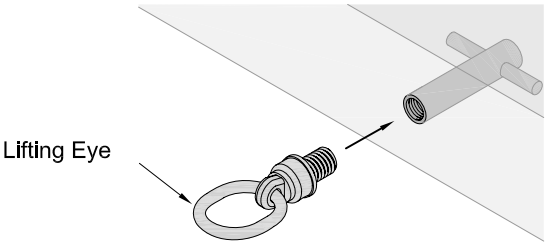
| Type | Permissible vertical load (element weight) [kN] | | | |
|---|---|---|---|---|
| | Lifting angle: | | | |
| | 0° (vertical lift) | 30° | 60° | 90° (permissible shear force) |
| M10×45 | 4.9 | 3.9 | 2.3 | 5.6 |
| M10×60 | 9.0 | 6.8 | 3.9 | 8.9 |
| M/Rd12×50 | 4.9 | 4.0 | 2.5 | 6.2 |
| M/Rd12×70 | 9.0 | 6.8 | 3.9 | 8.9 |
| M/Rd16×50 | 12.6 | 8.6 | 4.6 | 9.5 |
| M/Rd16×70 | 13.9 | 11.3 | 6.9 | 16.8 |
| M/Rd16×90 | 18.0 | 13.8 | 8.0 | 18.4 |
| M/Rd20×100 | 17.8 | 14.2 | 8.5 | 20.4 |
| M/Rd20×120 | 23.5 | 18.9 | 11.4 | 27.8 |
| M/Rd24×120 | 17.8 | 14.2 | 8.5 | 20.4 |
| M/Rd24×150 | 23.5 | 18.9 | 11.4 | 27.8 |

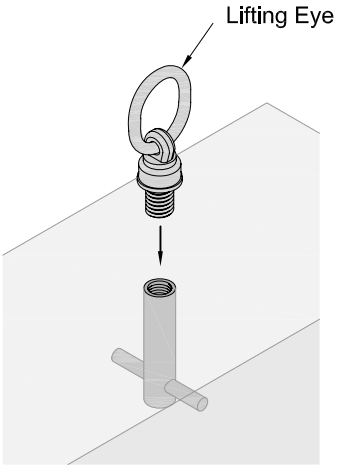
## 3. Accessories of Installation

**Protective Caps** (for more information, look at brochure “Threaded Lifting System”, page 6) are used to seal Concrete Anchor and prevent various substances such as residual concrete, dust, snow etc. from penetrating into the Concrete Anchor, protecting the anchor thread from clogging up.




**Lifting Eye, Treaded Lifting Loop**, **Threaded Lifting Loop with pressure plate and Lifting Loop “Goliath”** (for more information, look at brochure “Threaded System Accessories” page 8-15) are to be used as lifting devices of the Thread System. They must be completely screwed into the Concrete Anchors.




## 4. Fixing component

An element is attached to the Concrete Anchor with a standard metric thread fastening bolt and washer.