MO

CHEMICAL ANCHORS
Technical Manual

INDEX
FIXING SYSTEMS
CHEMICAL ANCHOR
MAX. 6.600 KG
MAX. 115 KG
MO-PS
POLYESTER
410ml
Made in Europe
MO-VS
VINYLESTER
MO-PSP
POLYESTER
SCELLEMENT CHIMIQUE / BUCHA QUÍMICA
MAX. 13.650 KG
MOPURE
PURE EPOXY
600 ml
Cod. MOPURE600

INTRODUCTION

INDEX Fixing Systems puts new technical material at your disposal that will allow you to expand your knowledge in the world of fixing.

The fixing of elements using **chemical anchors** offers unlimited possibilities depending on what you need. Criteria such as quality, assessments or base material implies selecting one anchor or another to meet the required expectations.

With this manual we want to demonstrate the **basic operation principles of our chemical anchors,** both in mortar format and capsule format, allowing greater knowledge in order to choose the right solution for each situation. It has been designed to help planners, architects, civil engineers and building engineers in their daily work. Both for design and calculation of projects and for their correct installation. With the help of this information it is possible **to quickly and concisely respond to problems** which arise when undertaking daily work.

In addition, INDEX Fixing Systems wishes to highlight the importance and responsibility implicit in the calculation and installation of an anchor in a structure, bridge or other application. All the study processes must be carried out **as thoroughly as possible and based on technical knowledge.** We understand that it is the responsibility of all professionals to ensure that the right anchor is chosen for each particular situation.

All products must be installed in accordance with the information presented herein in order to meet the performance requirements of this document.

We would like to thank our customers, users and internal staff who, with their help and collaboration, have helped developing this new manual that we hope will be of great help in your professional life.

Technical Dept.
INDEX Fixing Systems


NYLESTER
HYBRID
BAJAS TEMPERATURAS / LOW TEMPERAT
ade in Europe

CONTENTS

INDEX FIXING SYSTEMS

COMPANY COMMITMENT

INDEX
FIXING SYSTEMS

INDEX Fixing Systems (Técnicas Expansivas, S.L.) is an industrial manufacturer and supplier of fixing systems, offering global solutions adapted to customer needs.

All of us who form part of INDEX Fixing Systems work to achieve satisfied customers, acting according to the "Customer's Voice" as the main driver in our daily activity.

We rely on the contribution of our customers, the fruit of mutual trust based on respect, professionalism and flexibility to adapt to changes based on their needs.

We make investments in new products, assessments, production processes and technological means, in order to fulfil our commitments and, if possible, improve them.

COMPANY COMMITMENT

Certified quality.
We guarantee quality through certifications and assessments from independent laboratories and the main official bodies.

Wide product range.
Anchors, screws, clamps, installation systems, etc.

We help our customers.
We create synergies with our customers, which allow us to expand the businesses of both.

Guaranteed stock.
We have a warehouse with the capacity to meet the needs of our customers.

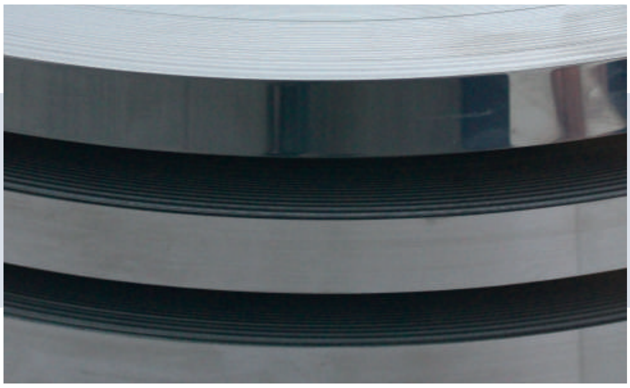
Adapted website.
Our website is a powerful tool designed for users and adapted to all mobile devices.

Reliable service.
We offer a delivery time of 24-48 hours.

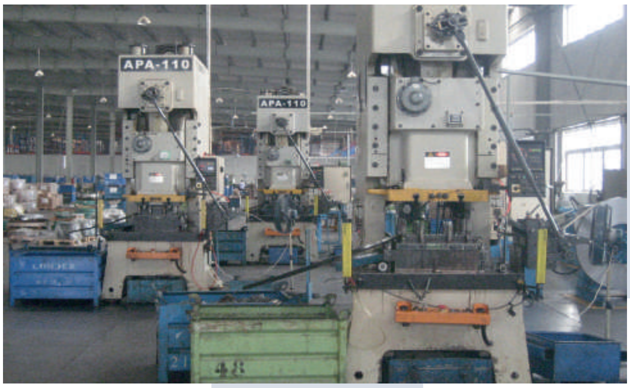
WE ARE MANUFACTURERS

WIRE

STRAPPING



PRESSES



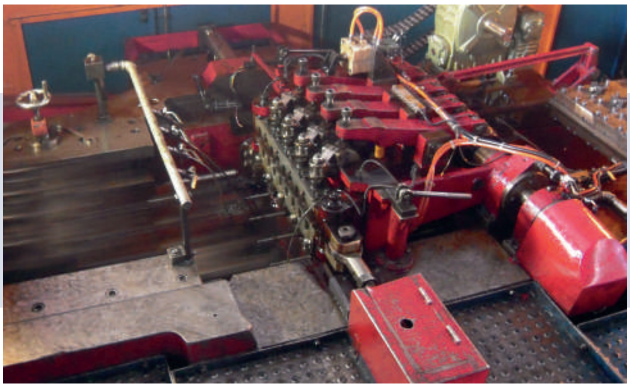
ZAMAK INJECTION

POLISHING MACHINES

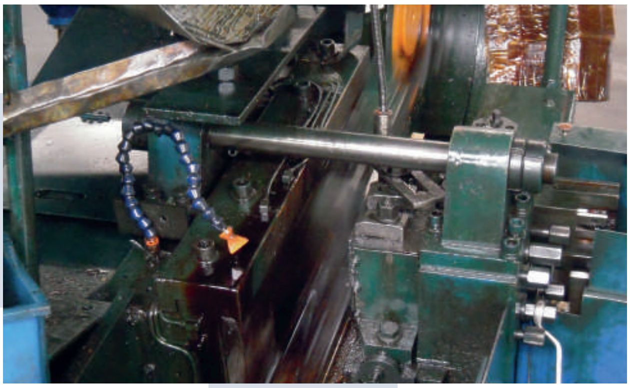
PACKING

WE ARE MANUFACTURERS

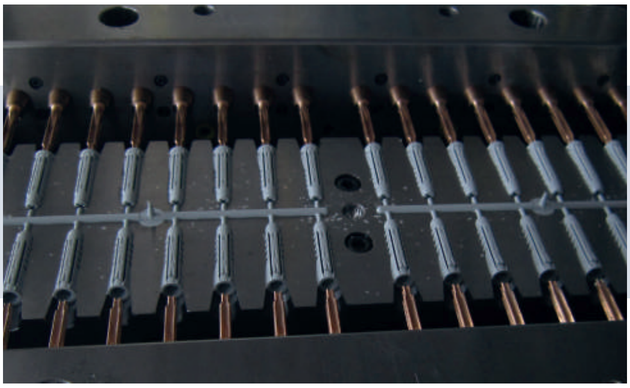
COLD STAMPING



THREADING MACHINE



NYLON INJECTION



AUTOMATED ASSEMBLIES

WE MAKE IT, WE BELIEVE IT.

We manufacture and control the production process of a wide range of products.
Only in this way are we able to guarantee maximum product quality and optimum service.
We are proud to be so and that's why it will be one of the ways of future work.
We believe in what we do.

TECHNICAL COMMITMENT

TECHNCIAL SUPPORT SERVICE TEAM READY

INDEX Fixing Systems offers comprehensive technical advice to all its customers through a team of specialist engineers. To contact the Team, you can use any of the following means:

Telephone: +34 941 272 137
Email: sat@indexfix.com

CUSTOMER TRAINING

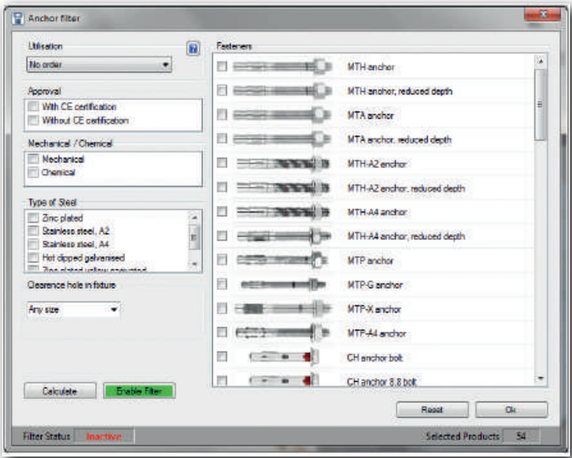
At INDEX Fixing Systems we offer our customers free training in anchor courses, bolting or anchor calculation. **We enable the technical training of your sales staff,** so that they can offer their products with the maximum possible knowledge to hand. If you are interested in this initiative, please contact the INDEX Fixing Systems sales agent in your area, who will provide you with all the necessary information.

TECHNICAL COMMITMENT

ANCHOR CALCULATION PROGRAM

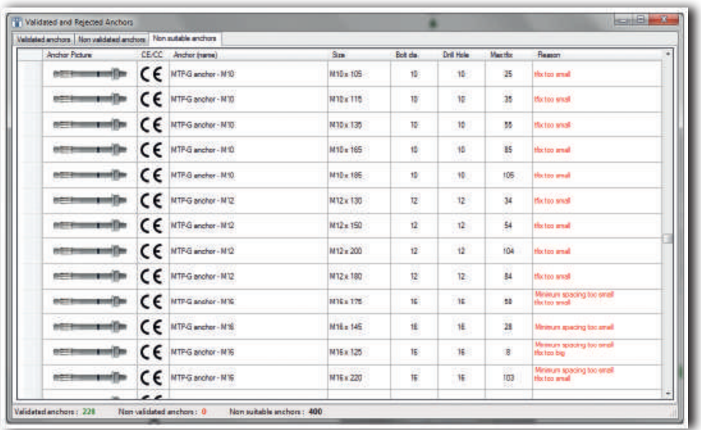
INDEXcal V4

The INDEXcal anchor calculation program is the right tool for designers of structural solutions to meet the requirements of Eurocode 2, part 4. INDEXcal checks in a fast and detailed way all the anchors in the catalogue based on the user's input parameters, indicating their suitability or not.



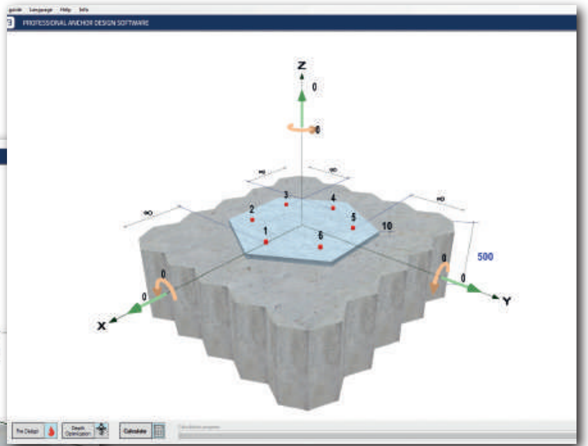
Features:

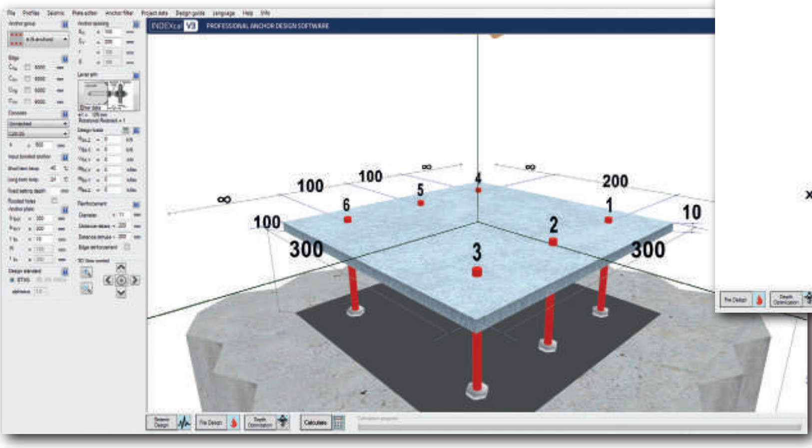
- Multilingual: Spanish, English, French, German, Dutch
- Direct access to technical data sheets and approvals from the actual software.
- Valid for cracked and non-cracked concrete of different resistances.
- Calculation for fire and/or seismic conditions.
- It indicates the reason for rejecting anchors that do not meet the structural requirements.
- Anchor filtering option.
- Customisation of anchor plates, including rectangular, circular, hexagonal, octagonal and irregular.
- It allows including standardised profiles in the design.
- Complete report in pdf, customisable.
- Can be updated online.
- 3D user interface.



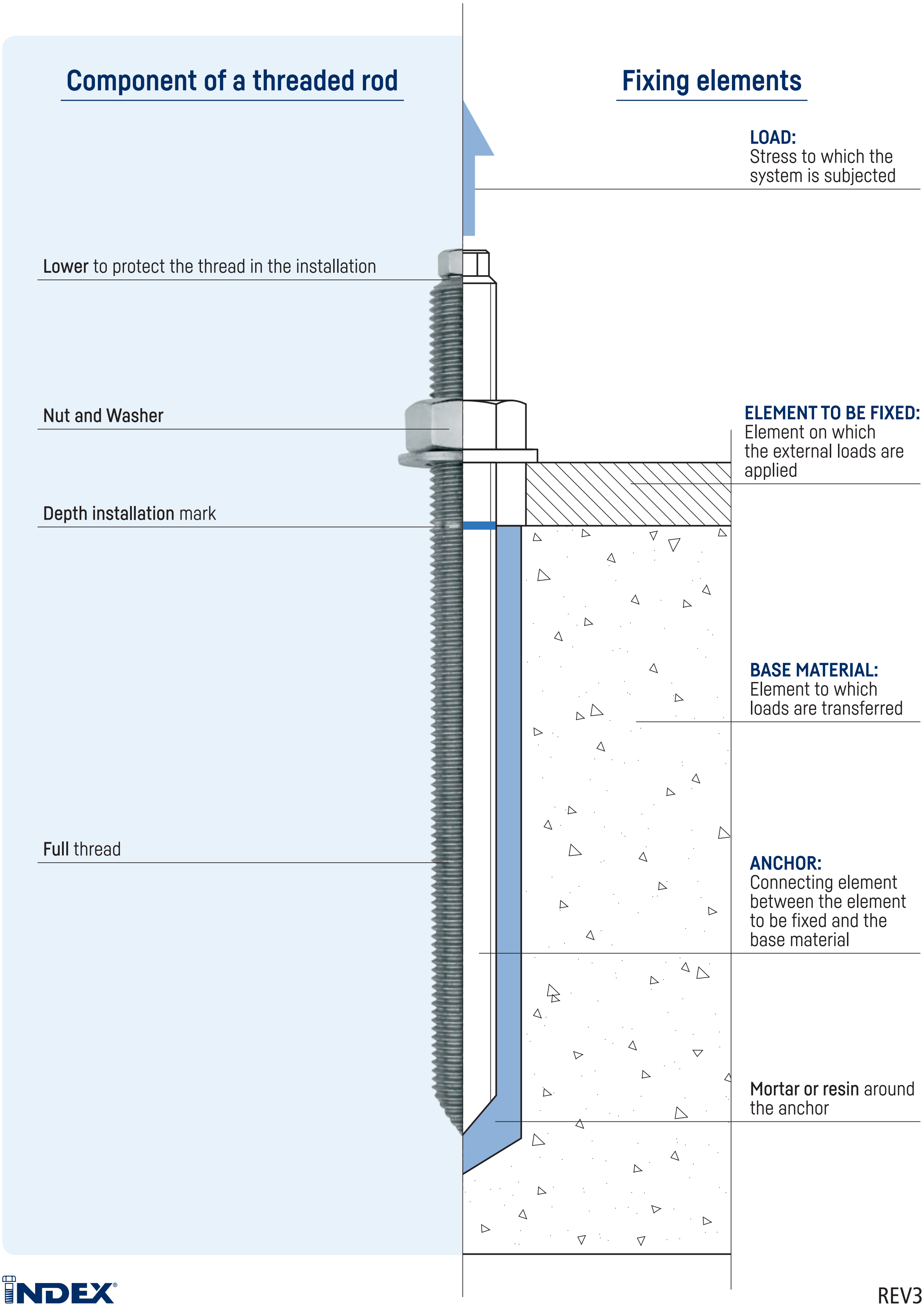
Download it FREE on the website

www.indexfix.com





Chemical anchor elements



Characteristics of a chemical anchor

Chemical anchors work by **load transfer through the bonding of the chemical to the base material and to a metal element** introduced in the hole to establish the union. The operation is based on the fact that the load is transferred to the base material by the union formed between the anchor, the mortar and the base material.

The product comes in two formats:

- In cartridges installed by injection in the drill.
- In glass capsules, inserted in the drill.

Both formats use a fixing element. This element can be a standard size threaded stud, a threaded rod or a rebar.

Anchors of this type can withstand higher loads because the base material does not have to withstand the stresses of point loads often associated with standard mechanical anchors.

Chemical anchors reach their load capacities based on the ability of the resin to adhere to the base material. These vary depending on the adhesive and the conditions of the base material.

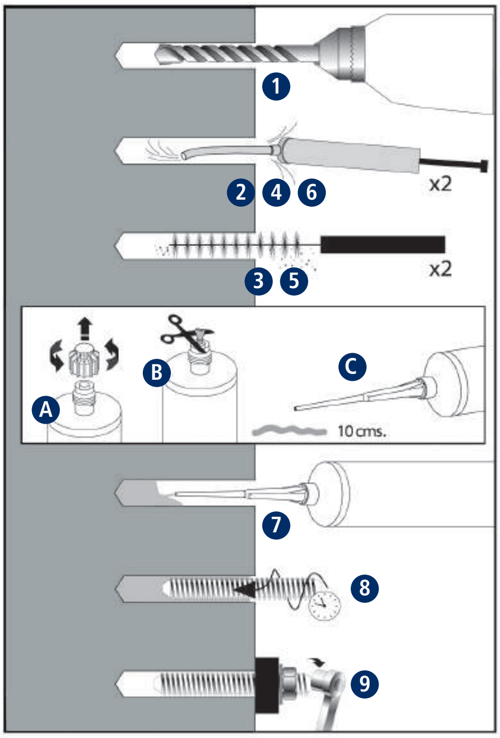
The main advantages of this type of anchor are:

- **Resistance** to the highest loads
- Ability to be used with a **variety of metal elements** (threaded rods or rebars) **and in different base materials** (concrete, bricks, rebar connections)
- A **smaller drill hole** compared with mechanical anchors
- Use of the **same product** for **different metrics**
- **Reduced distances** between anchors and from the edge
- Use of applications with **vibrations** (machinery)
- The mortar **protects** the rod or rebar from corrosion
- **No mechanical expansion forces** are exerted on the base material
- The **features** tend to be **greater** when these are subjected to dynamic or impact loads.
- **Flexibility of use** by being able to install at different depths, thereby enabling different resistances.

Critical aspects of this type of anchor:

- Resistance of the base material.
- Cleaning of the hole made by the drill.
- The mixture of the product during installation.
- The anchor installation depth.
- Observance of the product handling and curing times.

Installation in concrete



❶ DRILL

Ensure that:

- The concrete is well compacted and with no significant pores.
- The product is admissible in dry, wet or flooded drill holes.
- The temperature of the cartridges is adequate (see table).
- The temperature of the base material is adequate (see table).

Drill in the percussion or hammer position.

Drill to the diameter and depth specified in the data sheet for each product.

❷ - ❻ BLOW AND CLEAN

Clear the drill holes completely of dust and fragments by following the procedure shown in the picture. Use the air pump and brush.

If the product is not suitable for wet drill holes and the hole is flooded, the water inside must be removed before mortar is injected.

Ⓐ - Ⓑ*- Ⓒ OPEN CARTRIDGE

Screw the tube into the cartridge and position the assembly in the application gun. Squeeze on the trigger repeatedly until the mortar comes out of the nozzle in a uniform grey colour. Any iridescence indicates improper mixing. Always discard the first two doses of each cartridge: these are never to be used for fixing. * For 300 ml cartridges, cut the end of the bag, behind seal clip. ** Valid only for 300 ml and 410 ml cartridges. For MOPURE and MOPUR3 see technical data sheet.

❼ APPLY MORTAR

Insert the tube to the bottom of the drill hole and apply mortar: gradually remove the nozzle, ensuring there are no air bubbles.

Fill the hole to ½ and ¾ of its depth.

In the event of not fully using the cartridge, leave tube attached. Only change if using again and handling time has expired, remembering to discard the first two doses of mortar.

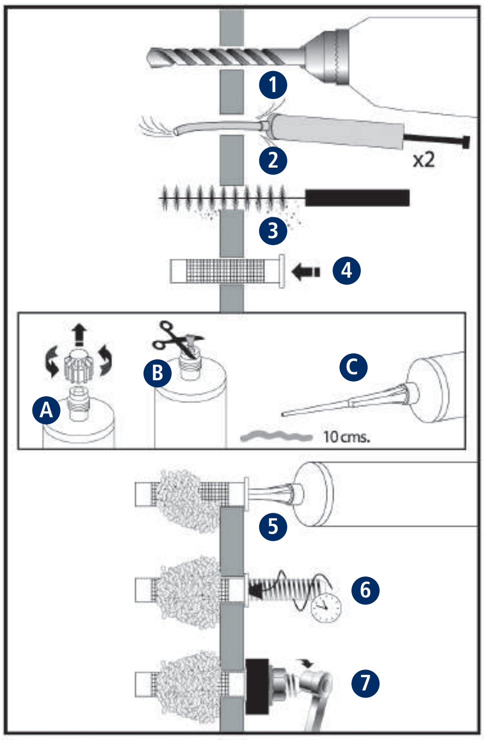
❽ INSTALL

Introduce the stud to be installed by screwing it lightly down to the installation depth value manually; ensuring the mortar covers the stud thread. The introduction of the anchor must take place within the handling time. The mortar must seep from the top of the drill hole to ensure it is completely full and there are no gaps between the stud and the drill hole.

❾ APPLY TIGHTENING TORQUE

Once the curing time has elapsed, apply torque, never exceeding the values indicated in the table.

Installation in bricks



1 DRILL

Check that the brick is in good condition and with no significant pores.
- The product is admissible in dry, wet or flooded drill holes.
- The temperature of the cartridges is adequate (see table).
- The temperature of the base material is adequate (see table).

Drill in the rotation position.
Drill to the diameter and depth specified in the data sheet for each product.

2 - 3 BLOW AND CLEAN

Clear the drill holes completely of dust and fragments by following the procedure shown in the picture.
If the drill hole is flooded, the water must be removed before resin is injected.

4 POSITION SLEEVE (S)

Insert the metal or plastic sleeve into the drill hole so it is level with the surface of the base material.

A - B*- C OPEN CARTRIDGE

Screw the tube into the cartridge and position the assembly in the application gun. Squeeze on the trigger repeatedly until the mortar comes out of the nozzle in a uniform grey colour. Any iridescence indicates improper mixing. Always discard the first two doses of each cartridge: these are never to be used for fixing. * For 170 ml and 300 ml cartridges, cut the end of the bag, behind seal clip. ** Valid only for 300 ml and 410 ml cartridges. For MOPURE and MOPUR3 see technical data sheet.

5 APPLY MORTAR

Insert the tube to the bottom of the sleeve and apply mortar: gradually remove the tube, ensuring there are no air bubbles. Fill the sleeve completely.
In the event of not fully using the cartridge, leave tube attached. Only change if using again and handling time has expired, remembering to discard the first two doses of mortar.

6 INSTALL

Introduce the stud to be installed by screwing it lightly down to the installation depth value manually; ensuring the mortar covers the stud thread. The introduction of the anchor must take place within the handling time. The mortar must seep from the top of the sleeve mouth to ensure it is completely full and there are no gaps between the stud and the drill hole.

7 APPLY TIGHTENING TORQUE

Once the curing time has elapsed, apply torque, never exceeding the values indicated in the table.

INSTALLATION WITH PLASTIC SLEEVE

METRIC	M8	M10	M12
OUTER SLEEVE DIAMETER	15	15	20
HOLE LENGTH	90	90	90
PLASTIC SLEEVE	MOTN15085	MOTN15085	MOTN20085

INSTALLATION WITH THREADED SLEEVE

METRIC	M8	M10	M12
OUTER SLEEVE DIAMETER	15	20	20
HOLE LENGTH	90	90	90
THREADED SLEEVE	MOTR008	MOTR010	MOTR012
PLASTIC SLEEVE	MOTN15085	MOTN20085	MOTN20085

Handling/curing times

Minutes			0 / 5	5 / 10	10 / 15	15 / 20	20 / 25	25, 30	30 / 35	35 / 40	+40
	MOPUR3	HANDLING	300	150	40	25	18	12	8	6	-
		CURING	1440	1440	1080	720	480	360	240	120	-
	MOPURE	HANDLING	-	20	20	15	11	8	6	4	3
		CURING	-	1440	720	480	420	360	300	240	180
	MO-H	HANDLING	-	10	8	6	5	4	-	-	-
		CURING	-	145	85	75	50	40	-	-	-
	MO-HW	HANDLING	10	5	5	5	100	-	-	-	-
		CURING	75	50	50	50	20	-	-	-	-
	MO-VS	HANDLING	18	10	6	6	5	4	4	-	-
		CURING	145	145	85	85	50	40	35	-	-
	MO-V	HANDLING	18	12	6	6	4	3	2	1.5	1.5
		CURING	120	120	80	80	40	30	20	15	10
	MO-PS	HANDLING	18	10	6	6	5	4	4	-	-
		CURING	145	145	85	85	40	35	35	-	-
	MO-PSP	HANDLING	18	10	6	6	5	4	4	-	-
		CURING	145	145	85	85	40	35	35	-	-
	MO-P	HANDLING	18	12	6	6	4	3	2	1.5	1.5
		CURING	120	120	80	80	40	30	20	15	10
	MO-B	HANDLING	18	12	6	6	4	3	2	1.5	1.5
		CURING	120	120	80	80	40	30	20	15	10

CHEMICAL RESISTANCE

Chemical environment	Concentration	Result						
		MOPUR3	MOPURE	MO-H	MO-VS	MO-V	MO-PS	MO-P
Aqueous acetic acid solution	10%	C	C	√	√	√	√	√
Acetone	100%	X	X	X	No data	No data	X	X
Aqueous solution aluminium chloride	Saturated	√	√	√	√	√	√	√
Aqueous solution aluminium nitrate	10%	√	√	√	√	√	√	√
Ammonia solution	5%	√	√	√	No data	No data	X	X
Aircraft fuel	100%	C	C	√	No data	No data	X	X
Benzene	100%	C	C	X	No data	No data	X	X
Benzoic acid	Saturated	√	√	√	√	√	√	√
Benzyl alcohol	100%	X	X	X	No data	No data	X	X
Sodium hypochlorite solution	5 - 15%	√	√	C	√	√	√	√
Butyl alcohol	100%	C	C	C	C	C	C	C
Aqueous solution of calcium sulphate	Saturated	√	√	√	√	√	√	√
Carbon monoxide	Gas	√	√	√	√	√	√	√
Carbon tetrachloride	100%	C	C	√	No data	No data	C	X
Chlorine water	Saturated	X	X	√	No data	No data	X	X
Chlorine benzene	100%	X	X	X	No data	No data	X	X
Aqueous solution of citric acid	Saturated	√	√	√	√	√	√	√
Cyclohexanol	100%	√	√	√	√	√	√	√
Diesel fuel	100%	C	C	√	C	C	√	C
Diethylene glycol	100%	√	√	√	√	√	√	√
Ethanol	95%	X	X	√	No data	No data	X	X
Aqueous solution of ethanol	20%	C	C	C	C	C	C	C
Heptane	100%	C	C	√	C	C	C	C
Hexane	100%	C	C	C	C	C	C	C
Hydrochloric acid	10%	√	√	√	√	√	√	√
	15%	√	√	√	√	√	√	√
	25%	C	C	C	C	C	C	C
Hydrogen sulphide gas	100%	√	√	√	√	√	√	√
Isopropyl alcohol	100%	X	X	C	No data	No data	X	X
Flaxseed oil	100%	√	√	√	√	√	√	√
Lubricant oil	100%	√	√	√	√	√	√	√
Mineral oil	100%	√	√	√	√	√	√	√
Paraffin / kerosene (domestic)	100%	C	C	√	C	C	C	C
Aqueous phenol solution	1%	C	C	X	No data	No data	X	X
Phosphoric acid	50%	√	√	√	√	√	√	√
Potassium hydroxide	10% / pH13	√	√	C	C	C	C	C
Sea water	100%	C	C	√	C	C	C	C
Styrene	100%	C	C	X	No data	No data	X	X
Sulphur dioxide solution	10%	√	√	√	√	√	√	√
Sulphur dioxide (40°C)	5%	√	√	√	√	√	√	√
Sulphuric acid	10%	√	√	√	√	√	√	√
	50%	√	√	√	√	√	√	√
Turpentine	100%	C	C	C	C	C	C	C
Solvent	100%	√	√	√	√	√	√	√
Xylene	100%	C	C	X	No data	No data	X	X

√ Resistant up to 75°C maintaining at least 80% of the physical properties. **C** Contact only up to a maximum of 25°C. **X** Not resistant.

REGULATIONS (Assessment)

CE MARKING

TÉCNICAS EXPANSIVAS, S.L.

EUROPEAN TECHNICAL ASSESSMENTS

The **CE marking** is the way through which the manufacturer declares that the products comply with the basic requirements of the works.

The regulations affecting construction products are set out in the **"Construction Products Regulation 305/2011 (CPR)"** which establishes the basic requirements that construction products must meet in relation to:

- Mechanical resistance and stability.
- Fire safety.
- Hygiene, health and the environment.
- Use safety and accessibility.
- Protection from noise.
- Energy saving and thermal insulation.
- Sustainable use of natural resources.

EOTA

European Organisation for Technical Assessment

The CPR establishes the European Assessment Document EAD 330499-00-0601 "Chemical Anchors for Use in Concrete", and the Eurocode 2 where the necessary tests and applicable assessment criteria are indicated in order to voluntarily obtain a **European Technical Assessment (ETA).**

The European Technical Assessment is carried out by a Technical Assessment Body belonging to EOTA (European Organization for Technical Approvals). On the basis of this **the manufacturer must, under their responsibility, issue the Declaration of Performance and apply the CE marking on construction products.**

EAD 330499-00-0601 and Eurocode 2 have recently replaced ETAG 001 part 5 and technical document TR029.

ETA

European Technical Assessment

Injection anchors are designed to be used for unions where mechanical resistance and stability, fire safety and safety in use are required according to the Basic Requirements for construction works indicated in Annex I of the CPR, where the failure of the fixings executed could cause risk to human life and/or give rise to considerable economic losses.

They can be used for structural fixings (which will contribute to the stability of the works) or for fixing non-structural elements.

Both documents also establish the methods for calculating anchors on the basis of 12 assessment options, taking into account the type of concrete, its resistance and distances from edges and to and from each other. This method for calculating anchors will soon be replaced by the standard EN 1992-4 "Calculation of fixings for use in concrete", belonging to Eurocode 2.

The most common assessment options on the market are:

Option 1 for use of anchors cracked and non-cracked concrete

European Technical Approval
Option 1

Option 7 for use of anchors in non-cracked concrete

European Technical Approval
Option 7

REGULATIONS (Assessment)

EUROPEAN TECHNICAL ASSESSMENT							
Option	Concrete type		Concrete resistance		Calculation method		
	Cracked	Non-cracked	C20/25	C50/60	A	B	C
1	•			•	•		
2	•		•		•		
3	•			•		•	
4	•		•			•	
5	•			•			•
6	•		•				•
7		•		•	•		
8		•	•		•		
9		•		•		•	
10		•	•			•	
11		•		•			•
12		•	•				•

EAD 330076-00-0604

ETA

European Technical Assessment

EAD 330076-00-0604

MASONRY

European Assessment Document EAD 330076-00-0604 "Metal Injection Anchors for Masonry Use" and Technical Reports TR053 and TR 054 have recently replaced guide ETAG 029 **"Metal injection anchors for use in masonry."** This ETAG covered the assessment of post-installed injection anchors in pre-drilled holes in masonry and fixed by bonding.

This new document and the technical reports are applicable to the following base materials: solid bricks, hollow bricks, perforated bricks, hollow blocks and lightweight concrete bricks.

REGULATIONS (Assessment)

EAD 330087-00-0601

ETA

European Technical Assessment

EAD 330087-00-0601023

REBAR CONNECTIONS

Technical report TR023 has recently been replaced by European Assessment Document EAD 330087-00-0601. This document covers post-installed rebar connections in non-carbonate concrete on the assumption that they are calculated according to Eurocode 2. Anchor systems consist of a metal rebar and connecting material.

Rebars are recessed straight, from class B and C according to Eurocode 2 Annex C. The bonding material may be synthetic mortar, cement mortar or a mixture of the two including fillers and/or additives.

Fire resistance and dynamic, fatigue or seismic loads for post-installed rebar connections are not covered by this Technical Report.

SEISMIC C2&C1

SEISMIC

Some anchors feature **assessment for seismic loads.** In applications where the existence of a seismic action is foreseen, the fixings are calculated according to the method established in the TR045. This technical calculation report sets forth two anchor categories on a seismic level: C1 and C2. Their application and the corresponding calculation will depend on the type of building, seismic level in the area, type of soil and characteristics of the element to be fixed (structural or non-structural).

FIRE RESISTANCE

FIRE RESISTANCE

For applications **exposed to fire,** the fixings are calculated according to the method set out in TR020 "Assessment of concrete fixings relating to fire resistance".

This assessment is applicable to standard concrete with a minimum resistance of C20/25 and maximum resistance of C50/60 used in normal structures exposed to fire.

The determination of the duration of fire resistance is established according to the conditions given in EN 1363-1 using the "Standard temperature/time curve."

In general, the duration of the fire resistance of the anchors depends fundamentally on the anchor material itself, rather than on the base material and the material to be fixed.

REGULATIONS (Assessment)

INDOOR AIR EMISSIONS

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

This certification of French origin was published following the obligation to label construction products installed in enclosed spaces, floors, wall coverings, paints and lacquers with their emission classes based on tests carried out on these emissions.

The regulation provides that any product placed on the market must be labelled with the **emission classes** based on the emissions it will produce as from 28 days, when tested with ISO 16000 and calculated for the European reference for a room.

The emission class may be assigned by the manufacturer or distributor under their own responsibility.

LEED SUSTAINABILITY CERTIFICATE

The LEED certification is named after its acronym (Leadership in Energy and Environmental Design), it is an **assessment system of a building's sustainability ratio** originating in the USA. It is increasingly required by architects in Europe, USA, Asia and Persian Gulf countries.

The U.S. and global versions are operated by the U.S. Green Building Council (USGBC), a non-profit organisation. Projects are certified by the Certified Green Building Institute (GBCI).

There are copies and modified versions of the assessment system that can be found in different regions of the planet. Some of these apply modified versions of the LEED.

DRINKING WATER CONTACT CERTIFICATE

In some countries, any accessory which, once installed, carries or receives water from the public water supply, must comply with the **water supply regulation.** These often require that a water accessory must not cause waste, misuse, improper consumption or contamination of the water supply and must be of an appropriate quality and standard.

The regulations vary in each country, however, the most accepted ones are the **NSF** (USA) and the **WRAS** (UK). Certification of the products according to these standards is the easiest way to demonstrate compliance, as it is granted directly by the representatives of water suppliers.

Products such as valves, boilers and showers are subjected to mechanical and water quality tests. This assessment type demonstrates full compliance with the requirements of regulations and by-laws, provided the installation is carried out in accordance with the conditions given with the approval.

Non-metal materials and components, such as rubber sheet material and rings, are tested solely for their effects on water quality. This assessment type demonstrates that the non-metal material/component does not itself pollute the water and therefore satisfies this particular requirement of the rules and regulations.

SELECTION TABLE

	Basic polyester	Polyester	Polyester Styrene-free	Polyester Styrene-free. Stone	Vinyl ester	Vinyl ester Styrene-free	Styrene-free hybrid resin	Styrene-free hybrid resin. Winter	Pure epoxy	Pure epoxy 3:1
ETA Option 1							■	■	■	■
ETA Option 7		■	■	■	■	■				
ETA post-installed rebars							■	■	■	■
ETA masonry			■	■			■	■		
SEISMIC C2&C1										■
SEISMIC C1							■	■	■	
FIRE							■			■
ICC ES									■	
A+		■	■			■	■		■	■
LEED		■	■	■			■			
WRAS							■	■		■
Styrene-free			■	■		■	■	■		
Non-cracked concrete	■	■	■	■	■	■	■	■	■	■
Cracked concrete							■	■	■	■
Reinforced concrete							■	■	■	■
Solid brick	■	■	■	■			■	■		
Hollow brick	■	■	■	■			■	■		
Thermal clay	■	■	■	■			■	■		
Dry	■	■	■	■	■	■	■	■	■	■
Wet	■	■	■	■	■	■	■	■	■	■
Flooded	■	■	■	■	■	■	■	■		■
Low temperature								■		
Normal temperature	■	■	■	■	■	■	■		■	■

Option 1 ASSESSED FOR CRACKED CONCRETE
Option 7 ASSESSED FOR NON-CRACKED CONCRETE
ASSESSED POST-INSTALLED REBARS
ASSESSED FOR USE IN MASONRY

SEISMIC C1 — SEISMIC ASSESSMENT
SEISMIC C2&C1 — SEISMIC ASSESSMENT
FIRE — FIRE RESISTANCE
ICC ES — ASSESSMENT REPORT ESR OF ICC

A+ — INDOOR AIR EMISSIONS CERTIFICATE
LEED SUSTAINABILITY CERTIFICATE
STYRENE-FREE
WRAS — DRINKING WATER CONTACT CERTIFICATE

NON-CRACKED CONCRETE
CRACKED CONCRETE
REINFORCED CONCRETE
SOLID BRICK
HOLLOW BRICK
THERMAL CLAY

DRILL HOLE CONDITION
Dry Wet Flooded

TEMPERATURE RANGE
Low Normal

NUEVA GAMA

Adapted to the customer's needs

Polyester range · Vinyl ester range · Hybrid resin range · Pure epoxy range

Quality, our commitment

ICC ES · A+ · FM APPROVED · SEISMIC C2&C1 · ETA · CE · UL · FIRE RESISTANCE · LEED TESTED · WRAS APPROVED MATERIAL

NEW DESIGN

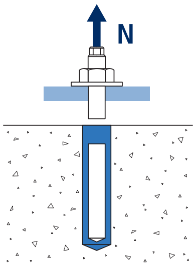
CHEMICAL ANCHOR FAILURE TYPES

This document presents different technical aspects of the specified anchor. It specifies different situations in which a correctly installed anchor may fail. The **main failures** which could arise **and their cause** are explained below.

A distinction is made according to the loads to which the anchors are subjected, the failures have been divided into those to which a tensile load is applied and those to which a shear load is applied.

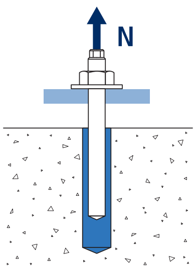
TENSILE FORCE

Steel failure



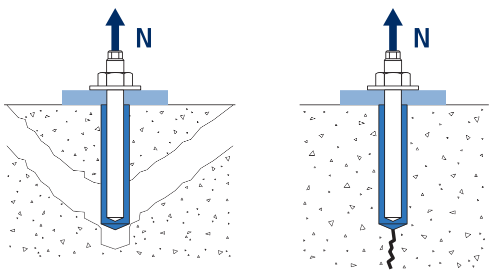
This occurs when an anchor is subjected to a tensile load greater than the resistance of the steel. The failure occurs in the threaded zone, part of the anchor will remain inside the installation hole splitting the threaded rod into 2 pieces.

Extraction failure



This occurs when the load applied to the anchor exceeds the resistance of the chemical anchor between the threaded rod and the internal face of the concrete, culminating in the complete removal of the anchor.

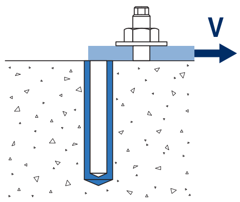
Concrete cone or cracking failure



This occurs when the load to which the anchor is subjected is greater than the concrete resistance, resulting in a breakage of the base material by way of an inverted cone. In certain cases, a crack occurs in the base material which suppresses the anchor capacity.

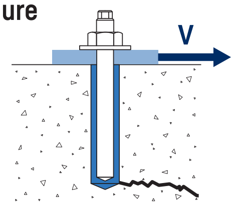
SHEAR

Steel failure without lever arm



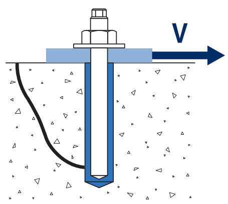
This occurs when an anchor is subjected to a shear load greater than the resistance of the steel. The failure occurs in the area at the surface level of the base material.

Concrete edge failure



This occurs when the load applied to the anchor is caused by the breakage of the concrete between the edge of the anchor and the anchor.

Spalling failure



This occurs when the load to which the anchor is subjected causes spalling in the neutral zone of the base material from where the shear force is applied.

Pure epoxy mortar anchor, for use in cracked and non-cracked concrete

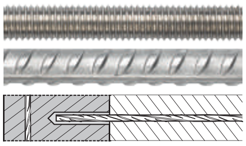
MOPUR3

ETA assessed Option 1 (cracked and non-cracked concrete).

PRODUCT INFORMATION

DESCRIPTION
Pure epoxy, chemical anchor.

OFFICIAL DOCUMENTATION
- ETA 17/0659 option 1, M8 to M30 for cracked and non-cracked concrete.
- ETA 17/0658 for post-installed rebar installation.
- Declaration features DoP MOPUR3.
- Certificate EVCP 1020-CPR-090-039159 for use in concrete.
- Certificate EVCP 1020-CPD-090-039161 for post-installed rebars.

VALID FOR


Stud
Rebar
Post-installed rebar

DIMENSIONS
Stud M8 - M30
Rebar as stud Ø8 - Ø32
Post-installed rebars Ø8 - Ø32

RANGE OF CACULATION LOADS
From 12.0 to 157.4 kN (non-cracked).
From 10.7 to 88.0 kN (cracked).

BASE MATERIAL
Concrete quality C20/25 to C50/60 cracked or non-cracked and masonry.

Concrete | Reinforced concrete | Cracked concrete | Thermal clay | Hollow brick

ASSESSMENTS
- ETA 17/0659 (ETAG 001-5) "Option 1: Cracked and non-cracked concrete."
- ETA 17/0658 (TR 023) "Post-installed rebars."

CE ETA OPTION 1 A+ WRAS SEISMIC C2&C1 FIRE

DRILL HOLE CONDITION


Dry | Wet | Flooded

CHARACTERISTICS AND BENEFITS
- Use in cracked and non-cracked concrete.
- Use for very high loads.
- Fire resistance certificate.
- Temperature range -40°C to +70°C (maximum long-term temperature +50°C).
- Variety of lengths and diameters: M8-M30-assessed studs, including M27. Use of rebars as anchor from Ø8 to Ø32, assembly flexibility.
- For static or quasi-static loads and category C1 and C2 seismic applications.
- Approved for use in contact with drinking water.
- Version in zinc plated steel, stainless steel A2 and A4.
- Available in INDEXcal.

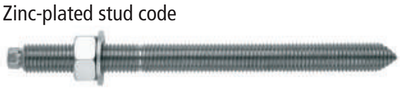
MATERIALS
Standard stud:
Carbon steel, zinc plated ≥ 5 µm.

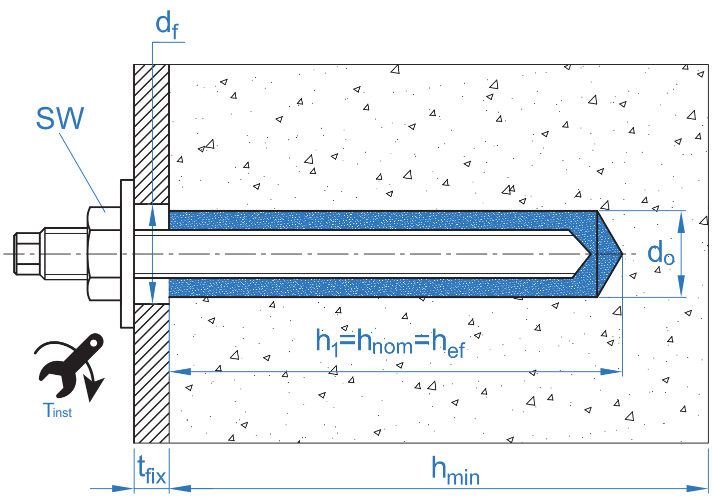
Stainless standard stud:
Stainless steel A2-70 and A4-70.

APPLICATIONS


- For indoor and outdoor use.
- Structural applications and elements subject to vibrations.
- Rebars and start rebars.
- Applications at high temperature.
- Safety barriers, retaining walls, heavy machinery, etc.
- Large metric sizes, retaining walls.
- Substructure fixing to the building.

CONCRETE INSTALLATION PARAMETERS

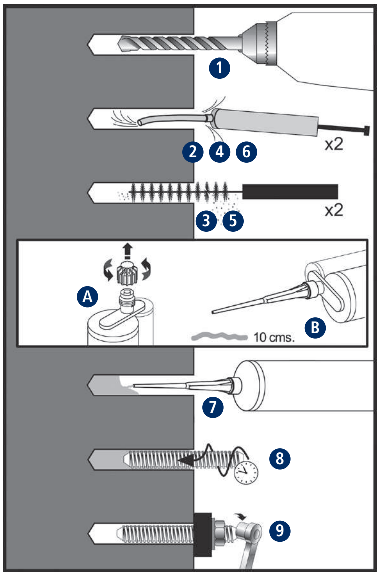
METRIC			M8	M10	M12	M16	M20	M24	M27	M30
d_0	nominal diameter	[mm]	10	12	14	18	22	26	30	35
d_f	diameter in anchor plate ≤	[mm]	9	12	14	18	22	26	30	33
T_{inst}	tightening torque ≤	[Nm]	10	20	40	80	120	160	180	200
Circular cleaning brush			Ø14		Ø20		Ø29		Ø40	
$h_{ef,min}$ = 8d										
h_1	depth of the drill hole	[mm]	60	60	70	80	90	96	108	120
$s_{cr,N}$	critical distance between anchors	[mm]	180	180	210	240	270	288	324	360
$c_{cr,N}$	critical distance from the edge	[mm]	90	90	105	120	135	144	162	180
c_{min}	minimum distance from the edge	[mm]	40	40	40	40	50	50	50	50
s_{min}	minimum distance between anchors	[mm]	40	40	40	40	50	50	50	50
h_{min}	minimum concrete thickness	[mm]	100	100	105	120	135	150	170	185
Standard stud										
h_1	depth of the drill hole	[mm]	80	90	110	128	170	210	-	280
$s_{cr,N}$	critical distance between anchors	[mm]	240	270	330	384	510	630	-	840
$c_{cr,N}$	critical distance from the edge	[mm]	120	135	165	192	255	315	-	420
c_{min}	minimum distance from the edge	[mm]	43	45	56	65	85	105	-	140
s_{min}	minimum distance between anchors	[mm]	43	45	56	65	85	105	-	140
h_{min}	minimum concrete thickness	[mm]	115	125	145	165	215	263	-	345
$h_{ef,max}$ = 20d										
h_1	depth of the drill hole	[mm]	160	200	240	320	400	480	540	600
$s_{cr,N}$	critical distance between anchors	[mm]	480	600	720	960	1200	1440	1620	1800
$c_{cr,N}$	critical distance from the edge	[mm]	240	300	360	480	600	720	810	900
c_{min}	minimum distance from the edge	[mm]	80	100	120	160	200	240	270	300
s_{min}	minimum distance between anchors	[mm]	80	100	120	160	200	240	270	300
h_{min}	minimum concrete thickness	[mm]	195	235	275	360	445	535	600	665
Zinc-plated stud code 			EQAC08110	EQAC10130	EQAC12160	EQAC16190	EQAC20260	EQAC24300	-	EQAC30330
Stainless steel stud code A2 / A4 			EQA208110 EQA408110	EQA210130 EQA410130	EQA212160 EQA412160	EQA216190 EQA416190	EQA220260 EQA420260	EQA224300 EQA424300	-	EQA230330 EQA430330



INSTALLATION ACCESSORIES		
CODE	PRODUCT	MATERIAL
MOPISSI	APPLICATION GUNS	Gun for 300 ml cartridges
MOPISTO		Guns for 410 ml cartridges, professional use
MOPISNEU		Pneumatic gun for 410 ml coaxial cartridges, professional use
EQ-AC **EQ-A2** **EQ-A4**	STUD	Studs threaded steel, class 5.8 ISO 898-1 Studs stainless steel A2-70 Studs stainless steel A4-70
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole
MORCANU	MIXING TUBE	Plastic. Static labyrinth mixture

INSTALLATION PROCEDURE

CONCRETE



MINIMUM CURING TIME			
TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [hours]
MOPUR3	+5	300	24
	+5 to +10	150	24
	+10 to +15	40	18
	+15 to +20	25	12
	+20 to +25	18	8
	+25 to +30	12	6
	+30 to +35	8	4
	+35 to +40	6	2

Resistance in concrete C20/25 for an insulated anchor, without effects of distance from the edge or spacing between anchors, with a standard stud EQ-AC, EQ-A2 or EQ-A4.

Characteristic tensile strength N_{Rk}										
Metric			M8	M10	M12	M16	M20	M24	M27	M30
N_{Rk}	Non-cracked concrete	[kN]	*18.0*	*29.0*	*42.0*	73,0*	111,7*	153,4*	-	236,1*
	Cracked concrete	[kN]	16.1	22.6	31.1	48.3	74.8	110.8	-	131.9
Calculated tensile strength N_{Rd}										
Metric			M8	M10	M12	M16	M20	M24	M27	M30
N_{Rd}	Non-cracked concrete	[kN]	*12.0*	*19.3*	*28.0*	48,7*	74,5*	102,3*	-	157,4*
	Cracked concrete	[kN]	10.7	15.1	20.7	32.2	49.8	73.9	-	88.0
Maximum recommended tensile load N_{rec}										
Metric			M8	M10	M12	M16	M20	M24	M27	M30
N_{rec}	Non-cracked concrete	[kN]	*8.6*	*13.8*	*20.0*	34,8*	53,2*	73,0*	-	112,4*
	Cracked concrete	[kN]	7.7	10.8	14.8	23.0	35.6	52.8	-	62.8
Characteristic resistance to shear stress V_{Rk}										
Metric			M8	M10	M12	M16	M20	M24	M27	M30
V_{Rk}	Zinc-plated stud	[kN]	*9.0*	*15.0*	*21.0*	*39.0*	*61.0*	*88.0*	*115.0*	*140.0*
	Stainless steel stud (A2/A4)	[kN]	*13.0*	*20.0*	*30.0*	*55.0*	*86.0*	*124.0*	*161.0*	*196.0*
Calculated resistance to shearing V_{Rd}										
Metric			M8	M10	M12	M16	M20	M24	M27	M30
V_{Rd}	Zinc-plated stud	[kN]	*7.2*	*12.0*	*16.8*	*31.2*	*48.8*	*70.4*	*92.0*	*112.0*
	Stainless steel stud (A2/A4)	[kN]	*8.3*	*12.8*	*19.2*	*35.3*	*55.1*	*79.5*	*103.2*	*125.6*
Maximum recommended load to shear stress V_{rec}										
Metric			M8	M10	M12	M16	M20	M24	M27	M30
V_{rec}	Zinc-plated stud	[kN]	*5.1*	*8.6*	*12.0*	*22.3*	*34.9*	*50.3*	*65.7*	*80.0*
	Stainless steel stud (A2/A4)	[kN]	*6.0*	*9.2*	*13.7*	*25.2*	*39.4*	*56.8*	*73.7*	*89.7*
Effective depth of studs EQ-AC / EQ-A2 / EQ-A4										
Metric			M8	M10	M12	M16	M20	M24	M27	M30
Effective depth		[mm]	80	90	110	128	170	210	-	280

The values underlined and in italics indicate steel failure. * The highlighted values indicate concrete failure.

Simplified calculation method. European Technical Assessment ETA 14/0138

Simplified version of the calculation method according to ETAG 001, technical report TR029. The resistance is calculated according to the data reflected in ETA assessment 14/0138.

- Influence of concrete resistance.
- Influence of the distance from the edge of the concrete.
- Influence of the spacing between anchors.
- Influence of rebars.
- Influence of the base material thickness.
- Influence of the load application angle.
- Influence of the effective depth.
- Valid for a group of two anchors.
- Valid for dry or wet drill holes.

The calculation method is based on the following simplification:
No different loads act on individual anchors, without eccentricity.

INDEXcal
For a more precise calculation and taking into account more constructive arrangements we recommend the use of our INDEXcal calculation program. It can be downloaded free from our website **www.indexfix.com**

TENSILE LOADS

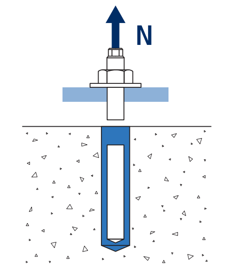
MOPUR3

- Calculated steel resistance: $N_{Rd,s}$
- Calculated extraction resistance: $N_{Rd,p} = N^{o}_{Rd,p} \cdot \Psi_{c} \cdot \Psi_{hef,p}$
- Calculated concrete cone resistance: $N_{Rd,c} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$
- Calculated concrete cracking resistance: $N_{Rd,sp} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Calculated steel resistance

$N_{Rd,s}$

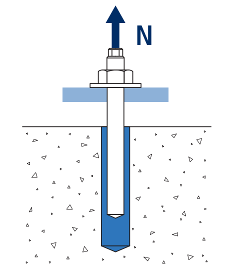
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$N^{o}_{Rd,s}$	Steel class 4.6	[kN]	7.5	11.5	17	31.5	49	70.5	92	112
	Steel class 5.8	[kN]	12	19.3	28	52.7	82	118	153.3	187.3
	Steel class 8.8	[kN]	19.3	30.7	44.7	84	130.7	188	244.7	299.3
	Steel class 10.9	[kN]	27.8	43.6	63.2	118	184.2	265.4	345.1	421.8
	Stainless steel class A2-70, A4-70	[kN]	13.9	21.9	31.6	58.8	92	132.1	171.7	210.2



Calculated extraction resistance

$N_{Rd,p} = N^{o}_{Rd,p} \cdot \Psi_{c} \cdot \Psi_{hef,p}$

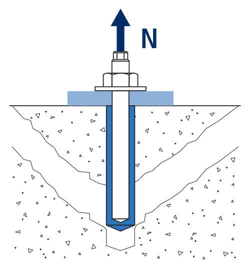
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$N^{o}_{Rd,p}$	Non-cracked concrete	[kN]	18.8	24.5	35.9	51.5	85.5	116.1	137.4	158.3
	Cracked concrete	[kN]	-	15.1	20.7	32.2	49.8	73.9	-	-



Calculated concrete cone resistance

$N_{Rd,c} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$

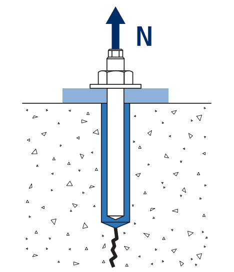
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$N^{o}_{Rd,c}$	Non-cracked concrete	[kN]	24.1	28.7	38.8	48.8	74.6	102.5	127.5	157.7
	Cracked concrete	[kN]	17.2	20.5	27.7	34.8	53.2	73.0	90.9	112.4



Calculated concrete cracking resistance

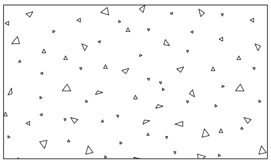
$N_{Rd,sp} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$N^{o}_{Rd,sp}$	Non-cracked concrete	[kN]	24.1	28.7	38.8	48.8	74.6	102.5	127.5	157.7



MOPUR3

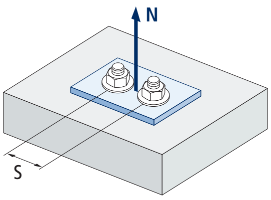
Influence coefficients



Influence of concrete resistance for extraction Ψ_c					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_c	Non-cracked concrete	1.0			
	Cracked concrete	1.00	1.04	1.07	1.09

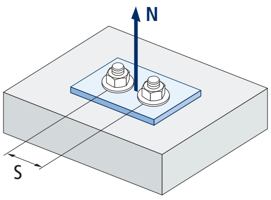
$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b		1.00	1.22	1.41	1.55



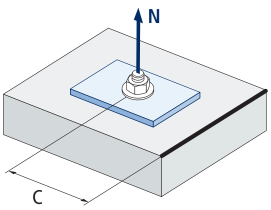
Influence of spacing between anchors (concrete cone) $\Psi_{s,N}$										
$s/s_{cr,N}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,N}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,N} = 0.5\left(1 + \frac{s}{s_{cr,N}}\right) \leq 1$$



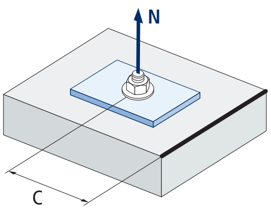
Influence of spacing between anchors (cracking) $\Psi_{s,N}$										
$s/s_{cr,sp}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,sp}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,sp} = 0.5\left(1 + \frac{s}{s_{cr,sp}}\right) \leq 1$$



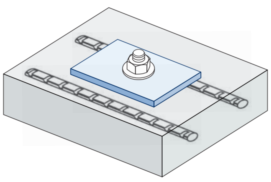
Influence of the distance from the edge of the concrete (concrete cone) $\Psi_{c,N}$												
$c/C_{cr,N}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,N}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,N} = 0.35 + \frac{0.5 \cdot c}{C_{cr,N}} + \frac{0.15 \cdot c^2}{C_{cr,N}^{\;2}} \leq 1$$



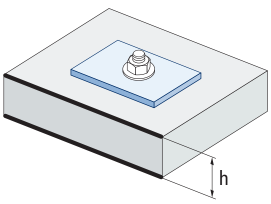
Influence of the distance from the edge of the concrete (cracking) $\Psi_{c,sp}$												
$c/C_{cr,sp}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,sp}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,sp} = 0.35 + \frac{0.5 \cdot c}{C_{cr,sp}} + \frac{0.15 \cdot c^2}{C_{cr,sp}^{\;2}} \leq 1$$



Influence of the rebars $\Psi_{re,N}$					
h_{ef} (mm)	64	70	80	90	100
$\Psi_{re,N}$	0.82	0.85	0.90	0.95	1.00

$$\Psi_{re,N} = 0.5 + \frac{h_{ef}}{200} \leq 1$$



Influence of the base material thickness $\Psi_{h,sp}$											
$\Psi_{h,sp}$	h/h_{ef}	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.68
	fh	1.00	1.07	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.50

$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1.5$$

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Influence of the effective depth for the extraction combination $\Psi_{hef,p}$								
Metric h_{ef}	M8	M10	M12	M16	M20	M24	M27	M30
64	0.80							
80	1.00	0.89						
90	1.13	1.00						
96	1.20	1.07	0.87					
110	1.38	1.22	1.00					
128	1.60	1.42	1.16	1.00				
160	2.00	1.78	1.45	1.25	0.94			
170		1.89	1.55	1.33	1.00			
192		2.13	1.75	1.50	1.13	0.91		
200		2.22	1.82	1.56	1.18	0.95		
210			1.91	1.64	1.24	1.00		
216			1.96	1.69	1.27	1.03	0.89	
240			2.18	1.88	1.41	1.14	0.99	0.86
243				1.90	1.43	1.16	1.00	0.87
280				2.19	1.65	1.33	1.15	1.00
320				2.50	1.88	1.52	1.32	1.14
400					2.35	1.90	1.65	1.43
480						2.29	1.98	1.71
540							2.22	1.93
600								2.14

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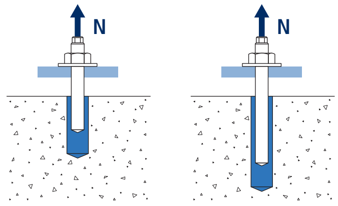
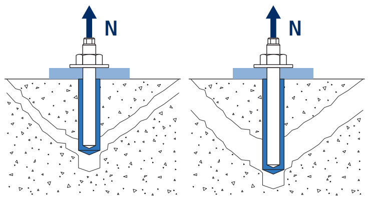


$$\Psi_{hef,p} = \frac{h_{ef}}{h_{stand}}$$

Influence of the effective depth for the concrete cone $\Psi_{hef,N}$								
Metric h_{ef}	M8	M10	M12	M16	M20	M24	M27	M30
64	0.72							
80	1.00	0.84						
90	1.19	1.00						
96	1.31	1.10	0.82					
110	1.61	1.35	1.00					
128	2.02	1.70	1.26	1.00				
160	2.83	2.37	1.75	1.40	0.91			
170		2.60	1.92	1.53	1.00			
192		3.12	2.31	1.84	1.20	0.87		
200		3.31	2.45	1.95	1.28	0.93		
210			2.64	2.10	1.37	1.00		
216			2.75	2.19	1.43	1.04	0.84	
240			3.22	2.57	1.68	1.22	0.98	0.79
243				2.62	1.71	1.24	1.00	0.81
280				3.24	2.11	1.54	1.24	1.00
320				3.95	2.58	1.88	1.51	1.22
400					3.61	2.63	2.11	1.71
480						3.46	2.78	2.24
540							3.31	2.68
600								3.14

Value not permitted (empty cells)



$$\Psi_{hef,N} = \left(\frac{h_{ef}}{h_{stand}}\right)^{1.5}$$

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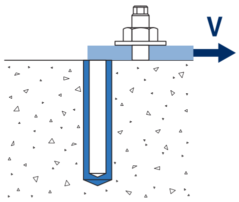
SHEARING LOADS

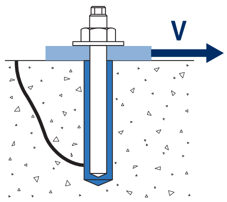
- Calculated steel resistance without lever arm: $V_{Rd,s}$
- Calculated spalling resistance: $V_{Rd,cp} = k \cdot N^o_{Rd,c}$
- Calculated concrete edge resistance: $V_{Rd,c} = V^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$



Calculated steel resistance to shearing

$V_{Rd,s}$

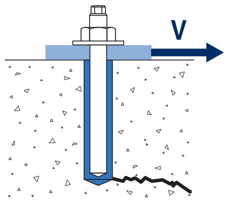
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$V^o_{Rd,s}$	Steel class 4.6	[kN]	4.2	7.2	10.2	18.6	29.3	42.5	55.1	67.1
	Steel class 5.8	[kN]	7.2	12.0	16.8	31.2	48.8	70.4	92.0	112.0
	Steel class 8.8	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	147.2	179.2
	Steel class 10.9	[kN]	12.0	19.3	28.0	52.7	82.0	118.0	153.3	187.3
	Stainless steel class A2-70, A4-70	[kN]	8.3	12.8	19.2	35.3	55.1	79.5	103.2	125.6



Calculated spalling resistance

$V_{Rd,cp} = k \cdot N^o_{Rd,c}$

Metric	M8	M10	M12	M16	M20	M24	M27	M30
k	2							

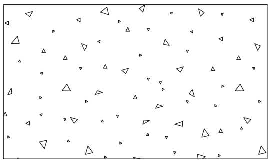


Calculated concrete edge resistance

$V_{Rd,c} = V^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$

	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$V^o_{Rd,c}$	Non-cracked concrete	[kN]	5.7	8.6	11.8	19.0	28.3	36.4	-	55.5
	Cracked concrete	[kN]	4.1	6.1	8.4	13.4	20.1	25.8	-	39.5

Influence coefficients



$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b

Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b	1.00	1.22	1.41	1.55

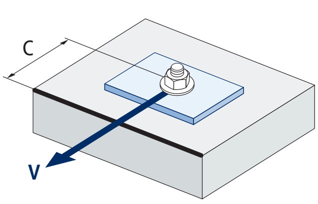
Influence of the distance from the edge and spacing between anchors $\Psi_{se,V}$

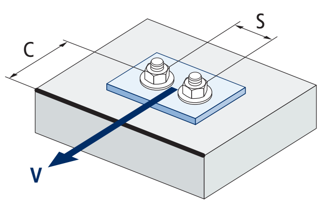
For one anchor

c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
Insulated	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18

For two anchors

	c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
s/c	1.0	0.24	0.43	0.67	0.93	1.22	1.54	1.89	2.25	2.64	3.04	3.46	3.91	4.37	4.84	5.33	6.36	7.45
	1.5	0.27	0.49	0.75	1.05	1.38	1.74	2.12	2.53	2.96	3.42	3.90	4.39	4.91	5.45	6.00	7.16	8.39
	2.0	0.29	0.54	0.83	1.16	1.53	1.93	2.36	2.81	3.29	3.80	4.33	4.88	5.46	6.05	6.67	7.95	9.32
	2.5	0.32	0.60	0.92	1.28	1.68	2.12	2.59	3.09	3.62	4.18	4.76	5.37	6.00	6.66	7.33	8.75	10.25
	≥ 3.0	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18





$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5}$$

$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0.5 \leq \left(\frac{c}{h_{ef}}\right)^{1.5}$$

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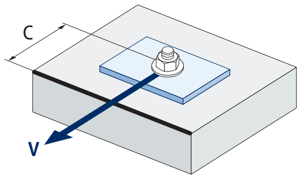
Influence of the distance from the edge of the concrete $\Psi_{c,V}$

c/d	4	5	7	10	15	20	25	30
$\Psi_{c,V}$	0.76	0.72	0.68	0.63	0.58	0.55	0.53	0.51

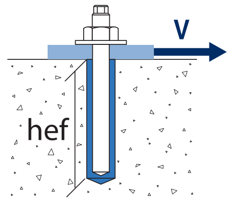
$$\Psi_{c,V} = \left(\frac{d}{c}\right)^{0.20}$$



Influence of the effective depth $\Psi_{hef,V}$

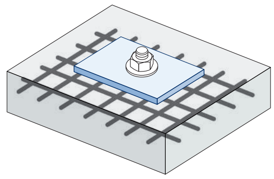
h_{ef}/d	8	9	10	11	12	13	14	15	16	17	18	19	20
$\Psi_{hef,V}$	1.65	2.04	2.47	2.93	3.42	3.94	4.50	5.10	5.72	6.38	7.06	7.78	8.53

$$\Psi_{hef,V} = 0.04 \cdot \left(\frac{h_{ef}}{d}\right)^{1.79}$$



Influence of the rebars $\Psi_{re,v}$

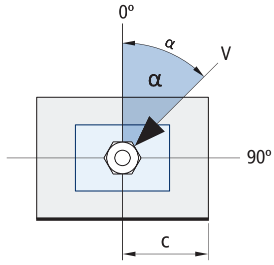
		Without perimeter rebar	Perimeter rebar ≥Ø12mm	Perimeter rebar with abutments at≤100mm
$\Psi_{re,v}$	Non-cracked concrete	1	1	1
	Cracked concrete	1	1.2	1.4



Influence of the load application angle $\Psi_{\alpha,v}$

Angle, α(º)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,v}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50

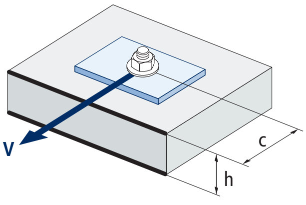
$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos\alpha_v)^2 + \left(\frac{\sin\alpha_v}{2.5}\right)^2}} \geq 1$$



Influence of the base material thickness $\Psi_{h,V}$

h/c	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	≥ 1.5
$\Psi_{h,v}$	0.32	0.45	0.55	0.63	0.71	0.77	0.84	0.89	0.95	1.00

$$\Psi_{h,V} = \left(\frac{h}{1.5 \cdot c}\right)^{0.5} \geq 1.0$$



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RETROFITTED REBAR CONNECTIONS

This technical document covers post-installed rebar connections in non-carbonate concrete under the assumption that post-installed rebar connections are generally calculated according to Eurocode 2. The rebar anchor system comprises the bonding of the material and a straight, recessed reinforcement rebar with the properties specified in Eurocode 2, Annex C; classes B and C.

Dynamic, fatigue or seismic loads on post-installed rebar connections are not covered by this technical document.

Intended use

This technical document covers application in non-carbonate concrete only from C12/15 to C50/60 (EN 206) for the following applications:

- Overlapping bond with an existing rebar in a building component **(Figures 1 and 4).**
- Fixing of rebar in a slab or in a support. Support at one end of a slab calculated as simply supported as well as its rebars for retention forces **(Figure 2).**
- Fixing of rebar of construction components mainly subjected to compression **(Figure 3).**
- Fixing of rebar to cover the action line of the tensile force **(Figure 5).**

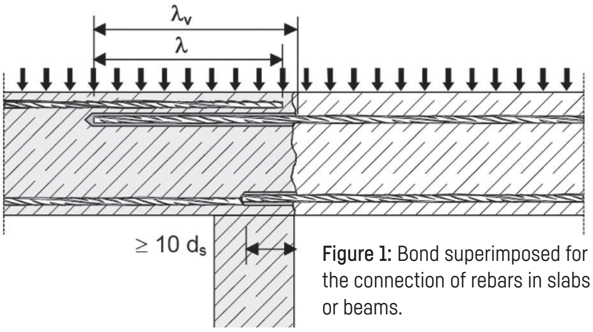

Figure 1: Bond superimposed for the connection of rebars in slabs or beams.

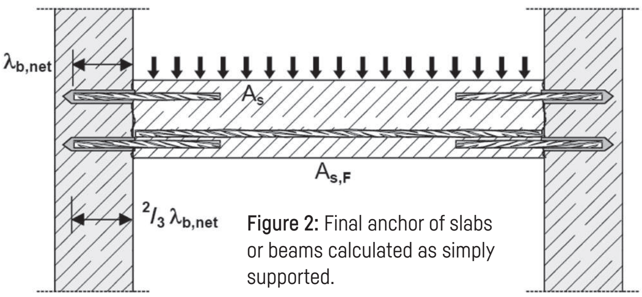

Figure 2: Final anchor of slabs or beams calculated as simply supported.

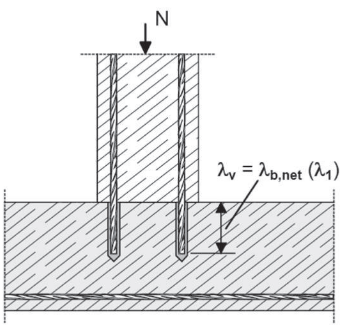

Figure 3: Rebar connections for items primarily subjected to compression. The rebars are subjected to compression.

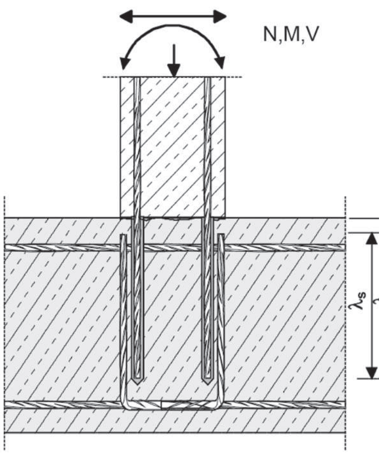

Figure 4: Bond superimposed to a foundation of a column or a wall where the rebars is subjected to tensile force.

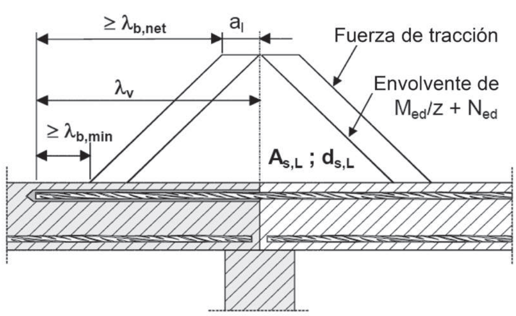

Figure 5: Reinforcement anchor to cover the action line of the tensile force.

* **Note for Figure 1 and 5:** In the figures the transversal reinforcements have not been represented, the transversal reinforcements as required by the Eurocode 2 must be present. The shear stress transferred between the anterior and posterior concrete must be calculated according to Eurocode 2.

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The tables shown below refer to Eurocode 2 Annex C, Table C.1 and C2N, rebar properties.

Properties of the start rebars			
Product form		Rebars and unwound rods	
Class		B	C
Characteristic yield stress f_{yk} or $f_{0.2k}$ (MPa)		400 to 600	
Minimum value of $k = (f_t / f_y)_k$		≥ 1.08	≥ 1.15 < 1.35
Characteristic maximum tensile deformation ε_{uk} (%)		≥ 5.0	≥ 7.5
Flexibility		Bending/folding test	
Maximum deviation from the nominal weight (individual bar or wire) (%)	Nominal size of the rebar (mm) ≤ 8 > 8	± 6.0 ± 4.5	
Bonding: Minimum relative corrugated area, $f_{R,min}$	Nominal size of the rebar (mm) 8 to 12 > 12	0.040 0.056	

Minimum / maximum installation length ℓ_{max}				
Corrugated bars		Minimum		Maximum
		Anchor $\ell_{b,min}$	Overlapped connection $\ell_{0,min}$	ℓ_{max}
$Ød_s$ [mm]	fy,k [N/mm²]	[mm]	[mm]	[mm]
8	500	113	200	400
10	500	142	200	500
12	500	170	200	600
14	500	198	210	700
16	500	227	240	800
20	500	284	300	1000
25	500	354	375	1000
28	500	397	420	1000
32	500	454	480	1000

Calculated bonding resistance [N/mm²] f_{bd}									
Bar Ø d_s [mm]	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 to 28	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
32	1.6	2.0	2.3	2.7	3.0	3.4	3.7	3.7	

$$N = f_{bd} \cdot \Phi \cdot L_b \cdot \pi$$

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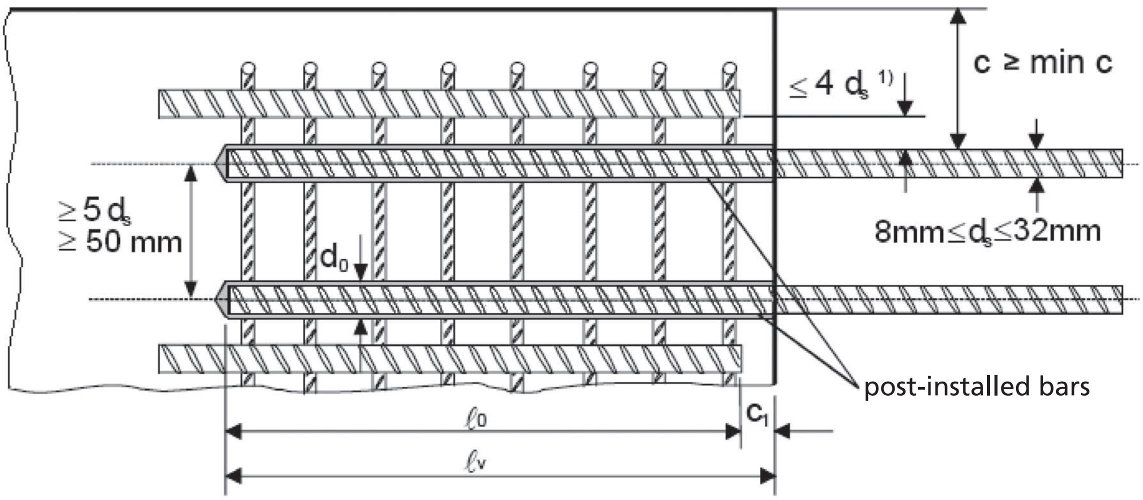
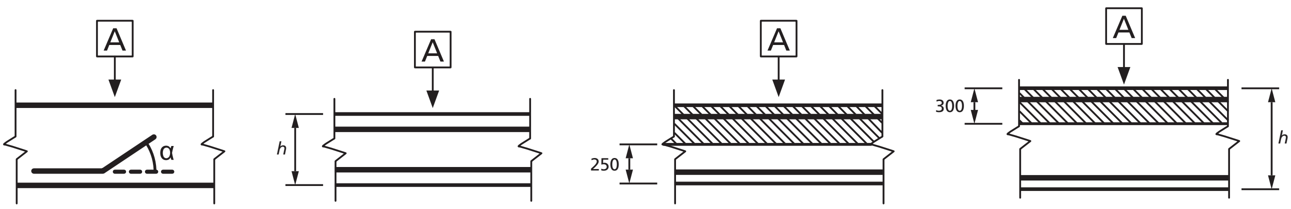
Calculated load values according to Eurocode 2 and EOTA technical report TR 023.

- Information according to ETA 17/0658.
- Non-cracked concrete, conditions in dry or wet conditions.
- Temperature range: -40°C to +80°C (maximum long-term temperature +50°C).
- Minimum spacing conditions between bars ≥5d_s, min. 50 mm:



- Minimum concrete coating:
  - drilling with compressed air ≥ 50 + 0.06 Lb
  - drilling in percussion mode ≥ 30 + 0.08 Lb ≥ 2Φ
- Good bonding conditions:



a) 45° ≤ α ≤ 90° b) *h* ≤ 250 mm c) *h* > 250 mm d) *h* > 600 mm

A Direction of the concreting

(a) and (b) "good" bonding conditions for all types of bars.
(c) and (d) without shaded area - "good" bonding conditions.
Shaded area- "poor" bonding conditions.

* In case of poor bonding conditions, multiply values by 0.7.

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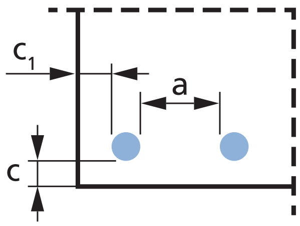
Resistance values may increase in the following situations:

- With transverse tension/compression pressure (α_2)
- In case of concrete coating (α_5)
- In case of overlapping rebars (α_6)

Values for α_2 , α_5 and α_6		
Influence factor	Reinforcement bar	
	A tension	A compression
Concrete coating	$\alpha_2 = 1 - 0.15\,(cd - Ø)/Ø$ ≥ 0.7 ≤ 1.0	$\alpha_2 = 1.0$
Transverse pressure confinement	$\alpha_5 = 1 - 0.004p$ ≥ 0.7 ≤ 1.0	$\alpha_5 = 1.0$
Overlapping length	$\alpha_6 = (p_1/25)^{0.25}$ ≥ 1.0 ≤ 1.5	

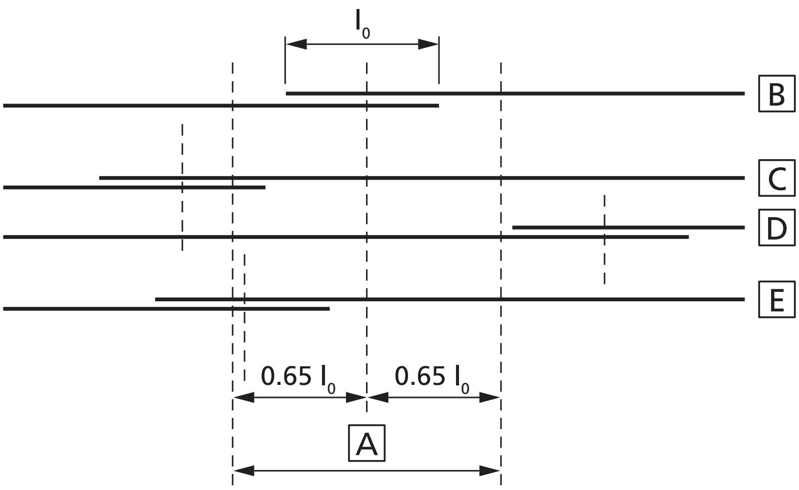
Where:

$c_d = \min(a/_2, c_1, c)$



p: transverse pressure [MPa] in the ultimate limit state l_{bd}

p_1 is the percentage of the overlapped reinforcement bar within $0.65 \cdot l_0$ from the centre of the length of the overlap considered



A Section considered B Bar I C Bar II D Bar III E Bar IV

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TABLES OF PRECALCULATED VALUES

Concrete class 20/25											
Resistance to concrete compression [$f_{ck,cube}$]: 25 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	50 + 0.06 L_b								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	30 + 0.08 L_b ≥ 2Φ								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
113			6.5								
142			8.2	10.3							
170			9.8	12.3	14.7			Area not permitted			
198			11.4	14.3	17.2	20.0					
200			11.6	14.5	17.3	20.2					
210			12.1	15.2	18.2	21.2					
227			13.1	16.4	19.7	23.0	26.2				
240			13.9	17.3	20.8	24.3	27.7				
284			16.4	20.5	24.6	28.7	32.8	41.0			
300			17.3	21.7	26.0	30.3	34.7	43.4			
354			20.5	25.6	30.7	35.8	40.9	51.2	63.9		
375			21.7	27.1	32.5	37.9	43.4	54.2	67.7		
397			**21.9**	28.7	34.4	40.2	45.9	57.4	71.7	80.3	
400			**21.9**	28.9	34.7	40.5	46.2	57.8	72.3	80.9	
420				30.3	36.4	42.5	48.6	60.7	75.9	85.0	
454				32.8	39.4	45.9	52.5	65.6	82.0	91.9	105.0
480				**34.1**	41.6	48.6	55.5	69.4	86.7	97.1	111.0
500				**34.1**	43.4	50.6	57.8	72.3	90.3	101.2	115.6
600					**49.2**	60.7	69.4	86.7	108.4	121.4	138.7
700						**66.9**	80.9	101.2	126.4	141.6	161.9
800			Yield stress area of the bar				**87.4**	**115.6**	144.5	161.9	185.0
1000								**136.6**	180.6	202.3	231.2
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			378	473	567	662	756	945	1,181	1,323	1,512

Values shaded in blue are not valid for overlap bonds

* Values valid for (α_2=α_5=α_6=1). In case of poor bonding conditions, multiply values by 0.7.

MOPUR3

TABLES OF PRECALCULATED VALUES

Concrete class 30/37											
Resistance to concrete compression [$f_{ck,cube}$]: 37 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.70
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
113			8.5								
142			10.7	13.4							
170			12.8	16.0	19.2			Area not permitted			
198			14.9	18.7	22.4	26.1					
200			15.1	18.8	22.6	26.4					
210			15.8	19.8	23.8	27.7					
227			17.1	21.4	25.7	30.0	34.2				
240			18.1	22.6	27.1	31.7	36.2				
284			21.4	26.8	32.1	37.5	42.8	53.5			
300			**21.9**	28.3	33.9	39.6	45.2	56.5			
354			**21.9**	33.4	40.0	46.7	53.4	66.7	83.4		
375			**21.9**	**34.1**	42.4	49.5	56.5	70.7	88.4		
397			**21.9**	**34.1**	44.9	52.4	59.9	74.8	93.5	104.8	
400			**21.9**	**34.1**	45.2	52.8	60.3	75.4	94.2	105.6	
420				**34.1**	47.5	55.4	63.3	79.2	99.0	110.8	
454				**34.1**	**49.2**	59.9	68.5	85.6	107.0	119.8	136.9
480				**34.1**	**49.2**	63.3	72.4	90.5	113.1	126.7	144.8
500				**34.1**	**49.2**	66.0	75.4	94.2	117.8	131.9	150.8
600					**49.2**	**66.9**	**87.4**	113.1	141.4	158.3	181.0
700						**66.9**	**87.4**	131.9	164.9	184.7	164.9
800			Yield stress area of the bar				**87.4**	**136.6**	188.5	211.1	188.5
1000								**136.6**	**213.4**	263.9	301.6
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			290	362	435	507	580	725	906	1,014	1,288

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

MOPUR3

TABLES OF PRECALCULATED VALUES

Concrete class 40/50											
Resistance to concrete compression [$f_{ck,cube}$]: 50 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	2.70
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\,L_b$								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\,L_b \geq 2\Phi$								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
113			10.5								
142			13.2	16.5							
170			15.8	19.8	23.7			Area not permitted			
198			18.4	23.0	27.6	32.2					
200			18.6	23.2	27.9	32.5					
210			19.5	24.4	29.3	34.2					
227			21.1	26.4	31.7	36.9	42.2				
240			**21.9**	27.9	33.5	39.1	44.6				
284			**21.9**	33.0	39.6	46.2	52.8	66.0			
300			**21.9**	**34.1**	41.8	48.8	55.8	69.7			
354			**21.9**	**34.1**	**49.2**	57.6	65.8	82.3	102.9		
375			**21.9**	**34.1**	**49.2**	61.0	69.7	87.2	109.0		
397			**21.9**	**34.1**	**49.2**	64.6	73.8	92.3	115.4	129.2	
400			**21.9**	**34.1**	**49.2**	65.1	74.4	93.0	116.2	130.2	
420				**34.1**	**49.2**	**66.9**	78.1	97.6	122.1	136.7	
454				**34.1**	**49.2**	**66.9**	84.4	105.5	131.9	147.8	168.9
480				**34.1**	**49.2**	**66.9**	**87.4**	111.6	139.5	156.2	178.5
500				**34.1**	**49.2**	**66.9**	**87.4**	116.2	145.3	162.7	186.0
600					**49.2**	**66.9**	**87.4**	**136.6**	174.4	195.3	223.2
700						**66.9**	**87.4**	**136.6**	203.4	227.8	260.4
800			Yield stress area of the bar				**87.4**	**136.6**	**213.4**	260.4	297.6
1000								**136.6**	**213.4**	**267.7**	**349.7**
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			235	294	352	411	470	587	734	822	940

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

MOPUR3

TABLES OF PRECALCULATED VALUES

Concrete class 50/60											
Resistance to concrete compression [$f_{ck,cube}$]: 60 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.70	2.70
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
113			12.2								
142			15.3	19.2							
170			18.4	23.0	27.6				Area not permitted		
198			21.4	26.7	32.1	37.4					
200			21.6	27.0	32.4	37.8					
210			**21.9**	28.4	34.0	39.7					
227			**21.9**	30.7	36.8	42.9	49.1				
240			**21.9**	32.4	38.9	45.4	51.9				
284			**21.9**	**34.1**	46.0	53.7	61.4	76.7			
300			**21.9**	**34.1**	48.6	56.7	64.8	81.1			
354			**21.9**	**34.1**	**49.2**	**66.9**	76.5	95.6	119.6		
375			**21.9**	**34.1**	**49.2**	**66.9**	81.1	101.3	126.6		
397			**21.9**	**34.1**	**49.2**	**66.9**	85.8	107.3	134.1	150.2	
400			**21.9**	**34.1**	**49.2**	**66.9**	86.5	108.1	135.1	151.3	
420				**34.1**	**49.2**	**66.9**	**87.4**	113.5	141.8	158.9	
454				**34.1**	**49.2**	**66.9**	**87.4**	122.7	153.3	171.7	168.9
480				**34.1**	**49.2**	**66.9**	**87.4**	129.7	162.1	181.6	178.5
500				**34.1**	**49.2**	**66.9**	**87.4**	135.1	168.9	189.1	186.0
600					**49.2**	**66.9**	**87.4**	**136.6**	202.6	226.9	223.2
700						**66.9**	**87.4**	**136.6**	**213.4**	264.8	260.4
800				Yield stress area of the bar			**87.4**	**136.6**	**213.4**	**267.7**	297.6
1000								**136.6**	**213.4**	**267.7**	**349.7**
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			202	253	303	354	404	505	632	708	940

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

MOPUR3

RANGE

PURE EPOXY 3:1

OPTION 1

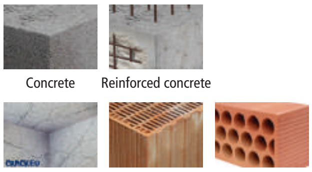
ÉMISSIONS DANS L'AIR INTÉRIEUR A+ A+ A B C

WRAS APPROVED MATERIAL

SEISMIC C2&C1

FIRE RESISTANCE

CODE	DIMENSION	
NORMAL		
MOPUR3385	385 ml	12
MOPUR3585	585 ml	12


Concrete
Reinforced concrete
Cracked concrete
Thermal clay
Hollow brick

Accessories for chemical anchor cartridges

MO-PIS Application guns

CODE	MODEL
MOPISP3385	Manual 385 ml
MOPISP3585	Manual 585 ml

MO-AC Mixing tubes and miscellaneous

CODE	MODEL
MOBOMBA	Blower pump
MORCANU	Tube 170 - 300 - 410 ml
MORCEPKIT	Kit 3 brushes

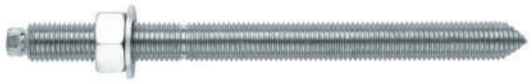

Hollow brick
Solid brick
Stone
Cellular concrete
Hollow concrete
Concrete
Reinforced concrete

Stud for chemical anchor with nut and washer

EQ-AC Zinc-plated

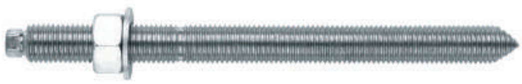
CODE	DIMENSION
EQAC08110	M8 x 110
EQAC10130	M10 x 130
EQAC12160	M12 x 160
EQAC16190	M16 x 190
EQAC20260	M20 x 260
EQAC24300	M24 x 300
EQAC30330	M30 x 330

EQ-A2 Stainless steel A2



CODE	DIMENSION
EQA208110	M8 x 110
EQA210130	M10 x 130
EQA212160	M12 x 160
EQA216190	M16 x 190
EQA220260	M20 x 260
EQA224300	M24 x 300
EQA230330	M30 x 330

EQ-A4 Stainless steel A4



CODE	DIMENSION
EQA408110	M8 x 110
EQA410130	M10 x 130
EQA412160	M12 x 160
EQA416190	M16 x 190
EQA420260	M20 x 260
EQA424300	M24 x 300
EQA430330	M30 x 330

Pure epoxy mortar anchor, for use in cracked and non-cracked concrete

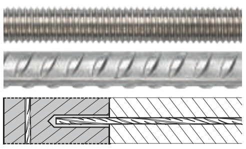
MOPURE

ETA assessed Option 1 (cracked and non-cracked concrete).

PRODUCT INFORMATION

DESCRIPTION
Pure epoxy, chemical anchor.

OFFICIAL DOCUMENTATION
- ETA 14/0156 option 1, M10 to M30 for cracked and non-cracked concrete.
- ETA 14/0325 for rebar installation.
- Declaration features DoP MOPURE.
- Certificate EVCP 1020-CPR-090-032368 for rebars.
- Certificate EVCP 1020-CPR-090-032497 for use in concrete.

VALID FOR

Stud
Rebar
Post-installed rebar

DIMENSIONS
Stud M10 - M30
Rebar as stud Ø8 - Ø32
Post-installed rebars Ø8 - Ø32

RANGE OF CACULATION LOADS
From 17.3 to 112.4 kN (non-cracked).
From 13.4 to 69.1 kN (cracked).

BASE MATERIAL
Concrete quality C20/25 to C50/60 cracked or non-cracked.


Concrete | Reinforced concrete | Cracked concrete

ASSESSMENTS
- ETA 14/0156 (ETAG 001-5) Option 1: Cracked and non-cracked concrete.
- ETA 14/0325 (TR 023) Post-installed rebars.

CE | ETA OPTION 1 | A+ | ICC ES | SEISMIC C1

DRILL HOLE CONDITION

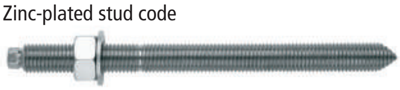
Dry | Wet

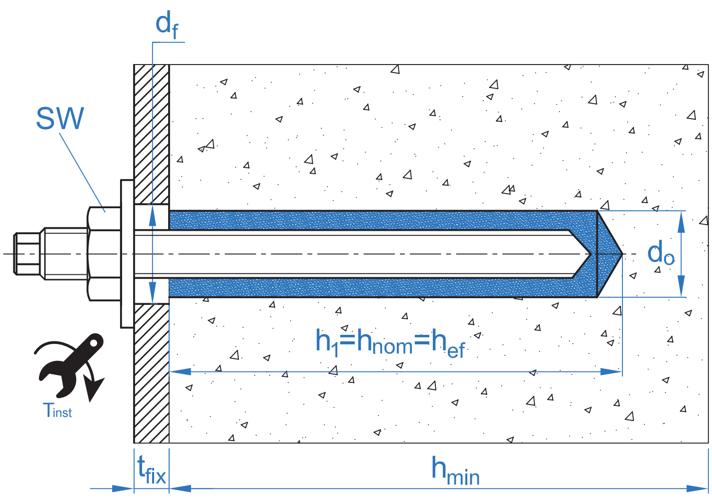
CHARACTERISTICS AND BENEFITS
- Use in cracked and non-cracked concrete.
- Pure epoxy, optimal for high temperatures and large diameter drill holes.
- Parallel cartridges of 300 + 300 ml.
- Used for high loads.
- For static or quasi-static loads and seismic applications C1.
- Temperature range -40°C to +80°C (maximum long-term temperature +40°C).
- Variety of lengths and diameter: M10-M30-assessed studs. Use of rebars as anchor from Ø8 to Ø32, assembly flexibility.
- Version in zinc plated steel, stainless steel A2 and A4.
- Available in INDEXcal.

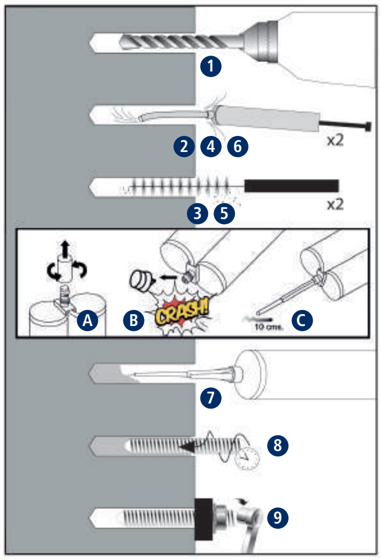
MATERIALS
Standard stud:
Carbon steel, zinc plated ≥ 5 μm. (ZINC)

Stainless standard stud:
Stainless steel A2-70 and A4-70. (A2 INOX AISI 304, A4 INOX AISI 316)

APPLICATIONS
- For indoor and outdoor use.
- Structural applications and elements subject to vibrations.
- Rebars and start rebars.
- Applications at high temperature.
- Safety barriers, retaining walls, heavy machinery, etc.
- Large metric sizes, retaining walls.

CONCRETE INSTALLATION PARAMETERS								
METRIC			M10	M12	M16	M20	M24	M30
d_0	nominal diameter	[mm]	12	14	18	22	26	35
d_f	diameter in anchor plate ≤	[mm]	12	14	18	22	26	33
T_{inst}	tightening torque ≤	[Nm]	20	40	80	135	200	270
Circular cleaning brush			Ø14	Ø20		Ø29		-
$h_{ef,min}$ = 8d								
h_1	depth of the drill hole	[mm]	60	70	80	90	96	120
$s_{cr,N}$	critical distance between anchors	[mm]	180	210	240	270	288	360
$c_{cr,N}$	critical distance from the edge	[mm]	90	105	120	135	144	180
c_{min}	minimum distance from the edge	[mm]	40	40	45	50	55	65
s_{min}	minimum distance between anchors	[mm]	40	40	45	50	55	65
h_{min}	minimum concrete thickness	[mm]	100	100	115	130	160	200
Standard stud								
h_1	depth of the drill hole	[mm]	90	110	128	170	210	280
$s_{cr,N}$	critical distance between anchors	[mm]	270	330	384	510	630	840
$c_{cr,N}$	critical distance from the edge	[mm]	135	165	192	255	315	420
c_{min}	minimum distance from the edge	[mm]	45	56	65	85	105	140
s_{min}	minimum distance between anchors	[mm]	45	56	65	85	105	140
h_{min}	minimum concrete thickness	[mm]	115	140	165	220	270	350
$h_{ef,max}$ = 20d								
h_1	depth of the drill hole	[mm]	200	240	320	400	480	600
$s_{cr,N}$	critical distance between anchors	[mm]	600	720	940	1200	1440	1800
$c_{cr,N}$	critical distance from the edge	[mm]	300	360	470	600	720	900
c_{min}	minimum distance from the edge	[mm]	40	40	45	50	55	65
s_{min}	minimum distance between anchors	[mm]	40	40	45	50	55	65
h_{min}	minimum concrete thickness	[mm]	224	268	336	444	532	670
Zinc-plated stud code 			EQAC10130	EQAC12160	EQAC16190	EQAC20260	EQAC24300	EQAC30330
Stainless steel stud code A2 / A4 			EQA210130 EQA410130	EQA212160 EQA412160	EQA216190 EQA416190	EQA220260 EQA420260	EQA224300 EQA424300	EQA230330 EQA430330



INSTALLATION ACCESSORIES			INSTALLATION PROCEDURE
CODE	PRODUCT	MATERIAL	CONCRETE
MOPISPUR6	APPLICATION GUNS	Gun for 600 ml parallel cartridges (300+300)	
EQ-AC **EQ-A2** **EQ-A4**	STUD	Studs threaded steel, class 5.8 ISO 898-1 Studs stainless steel A2-70 Studs stainless steel A4-70	
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm	
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole	
MORCAPU	MIXING TUBE	Plastic. Static labyrinth mixture	

MINIMUM CURING TIME			
TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [hours]
MOPURE	+5 to +10	20	24
	+10 to +15	20	12
	+15 to +20	15	8
	+20 to +25	11	7
	+25 to +30	8	6
	+30 to +35	6	5
	+35 to +40	4	4
	40	3	3

Resistance in concrete C20/25 for an insulated anchor, without effects of distance from the edge or spacing between anchors, with a standard stud EQ-AC, EQ-A2 or EQ-A4.

Characteristic tensile strength N_{Rk}

Metric			M10	M12	M16	M20	M24	M30
N_{Rk}	Non-cracked concrete	[kN]	31.1	45.6	69.1	111,7*	153,4*	236,1*
	Cracked concrete	[kN]	24.0	35.2	50,3*	58.7	87.1	145.1

Calculated tensile strength N_{Rd}

Metric			M10	M12	M16	M20	M24	M30
N_{Rd}	Non-cracked concrete	[kN]	17.3	21.7	32.9	53,2*	73,0*	112,4*
	Cracked concrete	[kN]	13.4	16.8	24,0*	28.0	41.5	69.1

Maximum recommended tensile load N_{rec}

Metric			M10	M12	M16	M20	M24	M30
N_{rec}	Non-cracked concrete	[kN]	12.3	15.5	23.5	38,0*	52,2*	80,3*
	Cracked concrete	[kN]	9.5	12.0	17,1*	20.0	29.6	49.4

Characteristic resistance to shear stress V_{Rk}

Metric			M10	M12	M16	M20	M24	M30
V_{Rk}	Zinc-plated stud	[kN]	*15.0*	*21.0*	*39.0*	*61.0*	*88.0*	*140.0*
	Stainless steel stud (A2/A4)	[kN]	*20.0*	*30.0*	*55.0*	*86.0*	*124.0*	*196.0*

Calculated resistance to shearing V_{Rd}

Metric			M10	M12	M16	M20	M24	M30
V_{Rd}	Zinc-plated stud	[kN]	*12.0*	*16.8*	*31.2*	*48.8*	*70.4*	*112.0*
	Stainless steel stud (A2/A4)	[kN]	*12.8*	*19.2*	*35.3*	*55.1*	*79.5*	*125.6*

Maximum recommended load to shear stress V_{rec}

Metric			M10	M12	M16	M20	M24	M30
V_{rec}	Zinc-plated stud	[kN]	*8.6*	*12.0*	*22.3*	*34.9*	*50.3*	*80.0*
	Stainless steel stud (A2/A4)	[kN]	*9.2*	*13.7*	*25.2*	*39.4*	*56.8*	*89.7*

Effective depth of studs EQ-AC / EQ-A2 / EQ-A4

Metric		M10	M12	M16	M20	M24	M30
Effective depth	[mm]	90	110	128	170	210	280

The values underlined and in italics indicate steel failure. * The highlighted values indicate concrete failure.

Simplified calculation method. European Technical Assessment ETA 14/0156

Simplified version of the calculation method according to ETAG 001, technical report TR029. The resistance is calculated according to the data reflected in the assessment ETA 14/0156.

- Influence of concrete resistance.
- Influence of the distance from the edge of the concrete.
- Influence of the spacing between anchors.
- Influence of rebars.
- Influence of the base material thickness.
- Influence of the load application angle.
- Influence of the effective depth.
- Valid for a group of two anchors.
- Valid for dry or wet drill holes.

The calculation method is based on the following simplification:
No different loads act on individual anchors, without eccentricity.

INDEXcal
For a more precise calculation and taking into account more constructive arrangements we recommend the use of our INDEXcal calculation program. It can be downloaded free from our website **www.indexfix.com**

MOPURE

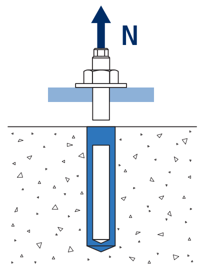
TENSILE LOADS

- Calculated steel resistance: $N_{Rd,s}$
- Calculated extraction resistance: $N_{Rd,p} = N^o_{Rd,p} \cdot \Psi_c \cdot \Psi_{hef,p}$
- Calculated concrete cone resistance: $N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$
- Calculated concrete cracking resistance: $N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Calculated steel resistance

$N_{Rd,s}$

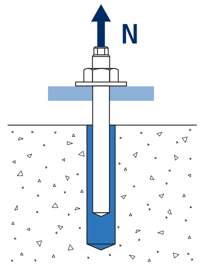
	Metric		M10	M12	M16	M20	M24	M30
$N^o_{Rd,s}$	Steel class 5.8	[kN]	19.3	28	52.7	82	118	187.3
	Steel class 8.8	[kN]	30.7	44.7	84	130.7	188	299.3
	Steel class 10.9	[kN]	43.6	63.2	118	184.2	265.4	421.8
	Stainless steel Class A2-70, A4-70	[kN]	21.9	31.6	58.8	92	132.1	210.2



Calculated extraction resistance

$N_{Rd,p} = N^o_{Rd,p} \cdot \Psi_c \cdot \Psi_{hef,p}$

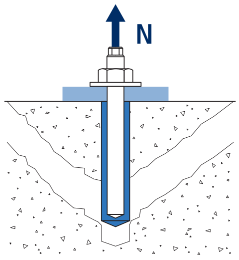
	Metric		M10	M12	M16	M20	M24	M30
$N^o_{Rd,p}$	Non-cracked concrete, -40 °C to +40 °C	[kN]	17.3	21.7	33.7	56.0	90.5	125.7
	Non-cracked concrete, -40 °C to +70 °C	[kN]	7.9	9.9	15.3	25.4	41.5	56.5
	Non-cracked concrete, -40 °C to +80 °C	[kN]	7.1	7.9	12.3	20.3	33.9	50.3
	Cracked concrete, -40 °C to +40 °C	[kN]	13.4	16.8	26.0	28.0	41.5	69.1
	Cracked concrete, -40 °C to +70 °C	[kN]	5.5	6.9	12.3	10.2	15.1	25.1
	Cracked concrete, -40 °C to +80 °C	[kN]	4.7	5.9	9.2	10.2	15.1	25.1



Calculated concrete cone resistance

$N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$

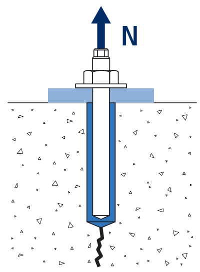
	Metric		M10	M12	M16	M20	M24	M30
$N^o_{Rd,c}$	Non-cracked concrete	[kN]	24.0	27.7	34.8	53.3	73.2	112.7
	(Cracked concrete)	[kN]	17.1	19.8	24.8	38.0	52.2	80.3



Calculated concrete cracking resistance

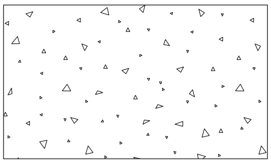
$N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Metric			M10	M12	M16	M20	M24	M30
$N^o_{Rd,sp}$	Non-cracked concrete	[kN]	24.0	27.7	34.8	53.3	73.2	112.7



MOPURE

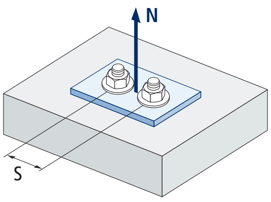
Influence coefficients



Influence of concrete resistance for extraction Ψ_c					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_c	Non-cracked concrete	1.00	1.04	1.07	1.09

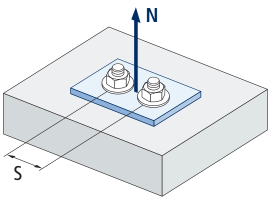
$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b		1.00	1.22	1.41	1.55



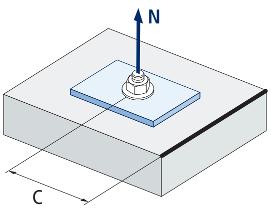
Influence of spacing between anchors (concrete cone) $\Psi_{s,N}$										
$s/s_{cr,N}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,N}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,N} = 0.5\left(1+\frac{s}{s_{cr,N}}\right) \leq 1$$



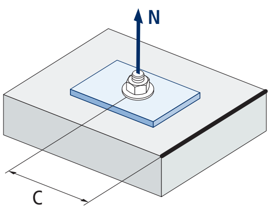
Influence of spacing between anchors (cracking) $\Psi_{s,N}$										
$s/s_{cr,sp}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,sp}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,sp} = 0.5\left(1+\frac{s}{s_{cr,sp}}\right) \leq 1$$



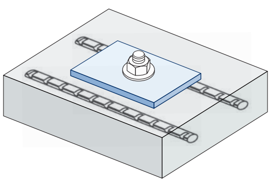
Influence of the distance from the edge of the concrete (concrete cone) $\Psi_{c,N}$												
$c/C_{cr,N}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,N}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,N} = 0.35 + \frac{0.5 \cdot c}{C_{cr,N}} + \frac{0.15 \cdot c^2}{C_{cr,N}^{\,2}} \leq 1$$



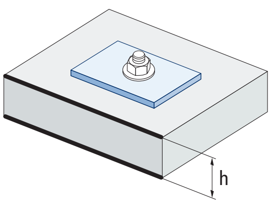
Influence of the distance from the edge of the concrete (cracking) $\Psi_{c,sp}$												
$c/C_{cr,sp}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,sp}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,sp} = 0.35 + \frac{0.5 \cdot c}{C_{cr,sp}} + \frac{0.15 \cdot c^2}{C_{cr,sp}^{\,2}} \leq 1$$



Influence of the rebars $\Psi_{re,N}$					
h_{ef} (mm)	64	70	80	90	100
$\Psi_{re,N}$	0.82	0.85	0.90	0.95	1.00

$$\Psi_{re,N} = 0.5 + \frac{h_{ef}}{200} \leq 1$$



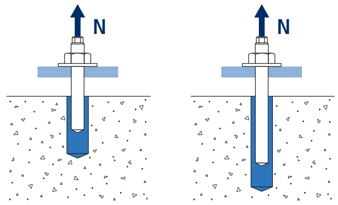
Influence of the base material thickness $\Psi_{h,sp}$											
$\Psi_{h,sp}$	h/h_{ef}	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.68
	fh	1.00	1.07	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.50

$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1.5$$

MOPURE

Influence of the effective depth for the extraction combination $\Psi_{hef,p}$

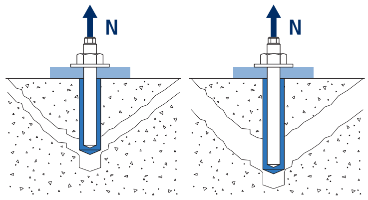
Metric h_{ef}	M10	M12	M16	M20	M24	M30
80	0.89					
90	1.00					
96	1.07	0.87		**Value not permitted**		
110	1.22	1.00				
128	1.42	1.16	1.00			
160	1.78	1.45	1.25	0.94		
170	1.89	1.55	1.33	1.00		
192	2.13	1.75	1.50	1.13	0.91	
200	2.22	1.82	1.56	1.18	0.95	
210		1.91	1.64	1.24	1.00	
240		2.18	1.88	1.41	1.14	0.86
280			2.19	1.65	1.33	1.00
320			2.50	1.88	1.52	1.14
400				2.35	1.90	1.43
480		**Value not permitted**			2.29	1.71
600						2.14



$$\Psi_{hef,p} = \frac{h_{ef}}{h_{stand}}$$

Influence of the effective depth for the concrete cone $\Psi_{hef,N}$

Metric h_{ef}	M10	M12	M16	M20	M24	M30
80	0.84					
90	1.00					
96	1.10	0.82		**Value not permitted**		
110	1.35	1.00				
128	1.70	1.26	1.00			
160	2.37	1.75	1.40	0.91		
170	2.60	1.92	1.53	1.00		
192	3.12	2.31	1.84	1.20	0.87	
200	3.31	2.45	1.95	1.28	0.93	
210		2.64	2.10	1.37	1.00	
240		3.22	2.57	1.68	1.22	0.79
280			3.24	2.11	1.54	1.00
320			3.95	2.58	1.88	1.22
400				3.61	2.63	1.71
480		**Value not permitted**			3.46	2.24
600						3.14

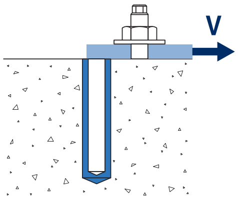


$$\Psi_{hef,N} = \left(\frac{h_{ef}}{h_{stand}}\right)^{1.5}$$

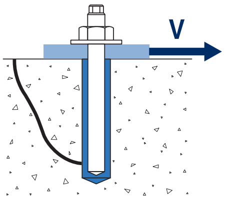
MOPURE

SHEARING LOADS

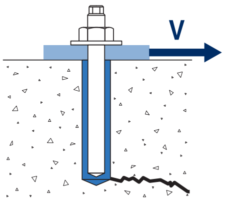
- Calculated steel resistance without lever arm: $V_{Rd,s}$
- Calculated spalling resistance: $V_{Rd,cp} = k \cdot N^o_{Rd,c}$
- Calculated concrete edge resistance: $V_{Rd,c} = V^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$



Calculated steel resistance to shearing								
$V_{Rd,s}$								
Metric			M10	M12	M16	M20	M24	M30
$V^o_{Rd,s}$	Steel class 5.8	[kN]	12	16.8	31.2	48.8	70.4	112
	Steel class 8.8	[kN]	18.4	27.2	50.4	78.4	112.8	179.2
	Steel class 10.9	[kN]	19.3	28	52.7	82	118	187.3
	Stainless steel Class A2-70, A4-70	[kN]	12.8	19.2	35.3	55.1	79.5	125.6

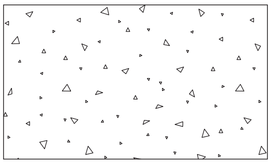


Calculated spalling resistance						
$V_{Rd,cp} = k \cdot N^o_{Rd,c}$						
Metric	M10	M12	M16	M20	M24	M30
k	2					



Calculated concrete edge resistance								
$V_{Rd,c} = V^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$								
Metric			M10	M12	M16	M20	M24	M30
$V^o_{Rd,c}$	Non-cracked concrete	[kN]	8.6	11.8	19.0	28.3	36.4	55.5
	Cracked concrete	[kN]	6.1	8.4	13.4	20.1	25.8	39.5

Influence coefficients



$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b				
Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b	1.00	1.22	1.41	1.55

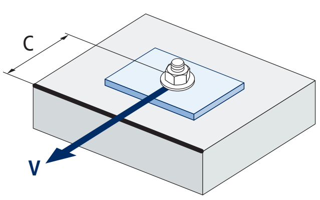
Influence of the distance from the edge and spacing between anchors $\Psi_{se,V}$

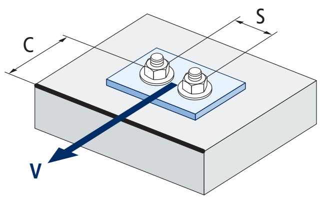
For one anchor

c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
Insulated	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18

For two anchors

s/c	c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
	1.0	0.24	0.43	0.67	0.93	1.22	1.54	1.89	2.25	2.64	3.04	3.46	3.91	4.37	4.84	5.33	6.36	7.45
	1.5	0.27	0.49	0.75	1.05	1.38	1.74	2.12	2.53	2.96	3.42	3.90	4.39	4.91	5.45	6.00	7.16	8.39
	2.0	0.29	0.54	0.83	1.16	1.53	1.93	2.36	2.81	3.29	3.80	4.33	4.88	5.46	6.05	6.67	7.95	9.32
	2.5	0.32	0.60	0.92	1.28	1.68	2.12	2.59	3.09	3.62	4.18	4.76	5.37	6.00	6.66	7.33	8.75	10.25
	≥ 3.0	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18



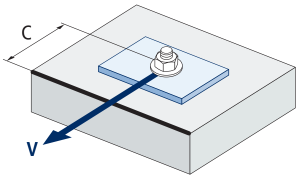


$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5}$$

$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0.5 \leq \left(\frac{c}{h_{ef}}\right)^{1.5}$$

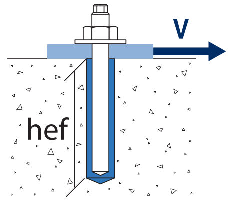
MOPURE

Influence of the distance from the edge of the concrete $\Psi_{c,V}$								
c/d	4	5	7	10	15	20	25	30
$\Psi_{c,V}$	0.76	0.72	0.68	0.63	0.58	0.55	0.53	0.51



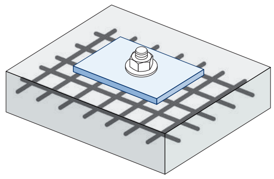
$$\Psi_{c,V} = \left(\frac{d}{c}\right)^{0.20}$$

Influence of the effective depth $\Psi_{hef,V}$													
h_{ef}/d	8	9	10	11	12	13	14	15	16	17	18	19	20
$\Psi_{hef,V}$	1.65	2.04	2.47	2.93	3.42	3.94	4.50	5.10	5.72	6.38	7.06	7.78	8.53

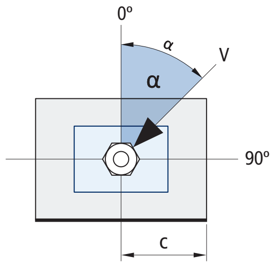


$$\Psi_{hef,V} = 0.04 \cdot \left(\frac{h_{ef}}{d}\right)^{1.79}$$

Influence of the rebars $\Psi_{re,v}$				
		Without perimeter rebar	Perimeter rebar ≥Ø12mm	Perimeter rebar with abutments at≤100mm
$\Psi_{re,v}$	Non-cracked concrete	1	1	1
	Cracked concrete	1	1.2	1.4

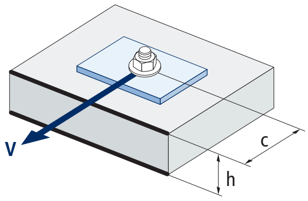


Influence of the load application angle $\Psi_{\alpha,v}$										
Angle, α(º)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,v}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50



$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos\alpha_v)^2 + \left(\frac{\sin\alpha_v}{2.5}\right)^2}} \geq 1$$

Influence of the base material thickness $\Psi_{h,V}$										
h/c	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	≥ 1.5
$\Psi_{h,v}$	0.32	0.45	0.55	0.63	0.71	0.77	0.84	0.89	0.95	1.00



$$\Psi_{h,V} = \left(\frac{h}{1.5 \cdot c}\right)^{0.5} \geq 1.0$$

MOPURE

RETROFITTED REBAR CONNECTIONS

This technical document covers post-installed rebar connections in non-carbonate concrete under the assumption that post-installed rebar connections are generally calculated according to Eurocode 2. The rebar anchor system comprises the bonding of the material and a straight, recessed reinforcement rebar with the properties specified in Eurocode 2, Annex C; classes B and C.

Dynamic, fatigue or seismic loads on post-installed rebar connections are not covered by this technical document.

Intended use

This technical document covers application in non-carbonate concrete only from C12/15 to C50/60 (EN 206) for the following applications:

- Overlapping bond with an existing rebar in a building component **(Figures 1 and 4).**
- Fixing of rebar in a slab or in a support. Support at one end of a slab calculated as simply supported as well as its rebars for retention forces **(Figure 2).**
- Fixing of rebar of construction components mainly subjected to compression **(Figure 3).**
- Fixing of rebar to cover the action line of the tensile force **(Figure 5).**

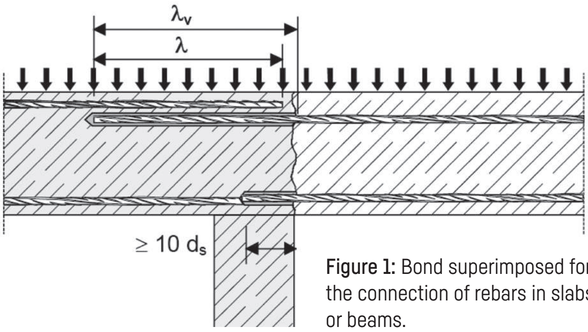


Figure 1: Bond superimposed for the connection of rebars in slabs or beams.

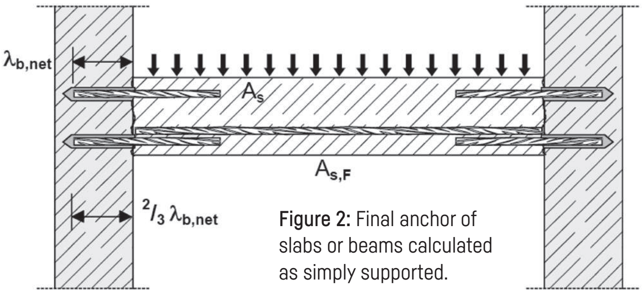
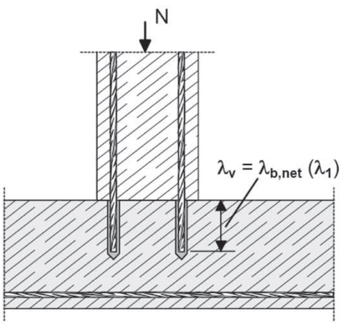
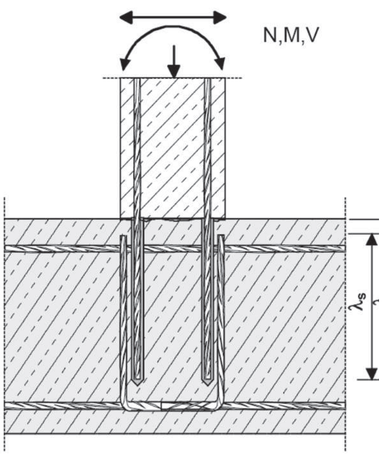


Figure 2: Final anchor of slabs or beams calculated as simply supported.





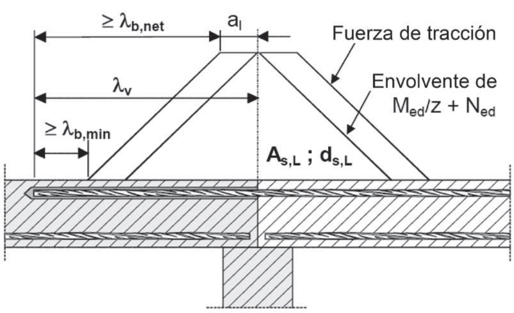


Figure 3: Rebar connections for items primarily subjected to compression. The rebars are subjected to compression.

Figure 4: Bond superimposed to a foundation of a column or a wall where the rebars is subjected to tensile force.

Figure 5: Reinforcement anchor to cover the action line of the tensile force.

* **Note for Figure 1 and 5:** In the figures the transversal reinforcements have not been represented, the transversal reinforcements as required by the Eurocode 2 must be present. The shear stress transferred between the anterior and posterior concrete must be calculated according to Eurocode 2.

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The tables shown below refer to the standard EN 1992-1-1 Anexo C, Table C.1 and C2N, rebar properties.

Properties of the start rebars			
Product form		Rebars and unwound rods	
Class		B	C
Characteristic yield stress f_{yk} or $f_{0.2k}$ (MPa)		400 to 600	
Minimum value of $k = (f_t / f_y)_k$		≥ 1.08	≥ 1.15 < 1.35
Characteristic maximum tensile deformation ε_{uk} (%)		≥ 5.0	≥ 7.5
Flexibility		Bending/folding test	
Maximum deviation from the nominal weight (individual bar or wire) (%)	Nominal size of the rebar (mm) ≤ 8 > 8	± 6.0 ± 4.5	
Bonding: Minimum relative corrugated area, $f_{R,min}$	Nominal size of the rebar (mm) 8 to 12 > 12	0.040 0.056	

Minimum / maximum installation length ℓ_{max}				
Corrugated bars		Minimum		Maximum
		Anchor $\ell_{b,min}$	Overlapped connection $\ell_{0,min}$	ℓ_{max}
$Ød_s$ [mm]	fy,k [N/mm²]	[mm]	[mm]	[mm]
8	500	170	300	400
10	500	212	300	500
12	500	255	300	600
14	500	298	315	700
16	500	340	360	800
20	500	425	450	1000
25	500	532	563	1000
28	500	595	630	1000
32	500	681	720	1000

<table>
<tr><th colspan="10">Calculated bonding resistance [N/mm²] f_{bd}</th></tr>
<tr><th rowspan="2">Bar Ø d_s [mm]</th><th colspan="9">Concrete class</th></tr>
<tr><th>C12/15</th><th>C16/20</th><th>C20/25</th><th>C25/30</th><th>C30/37</th><th>C35/45</th><th>C40/50</th><th>C45/55</th><th>C50/60</th></tr>
<tr><td>8 to 25</td><td rowspan="3">1.6</td><td rowspan="3">2.0</td><td rowspan="3">2.3</td><td rowspan="3">2.7</td><td rowspan="2">3.0</td><td rowspan="2">3.4</td><td rowspan="2">3.7</td><td>4.0</td><td>4.3</td></tr>
<tr><td>28</td><td colspan="2">3.7</td></tr>
<tr><td>30</td><td colspan="5">2.7</td></tr>
</table>

$$N = f_{bd} \cdot \Phi \cdot L_b \cdot \pi$$

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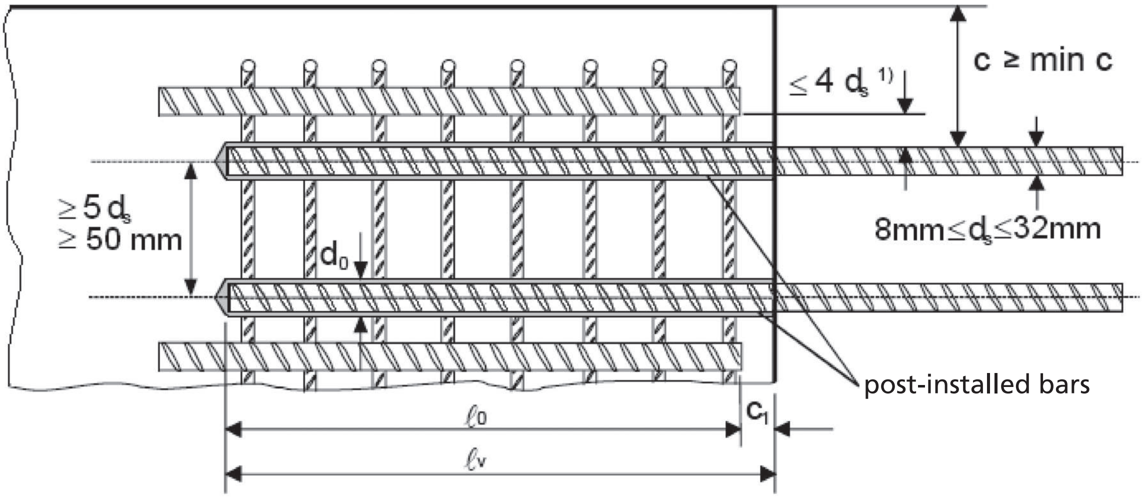
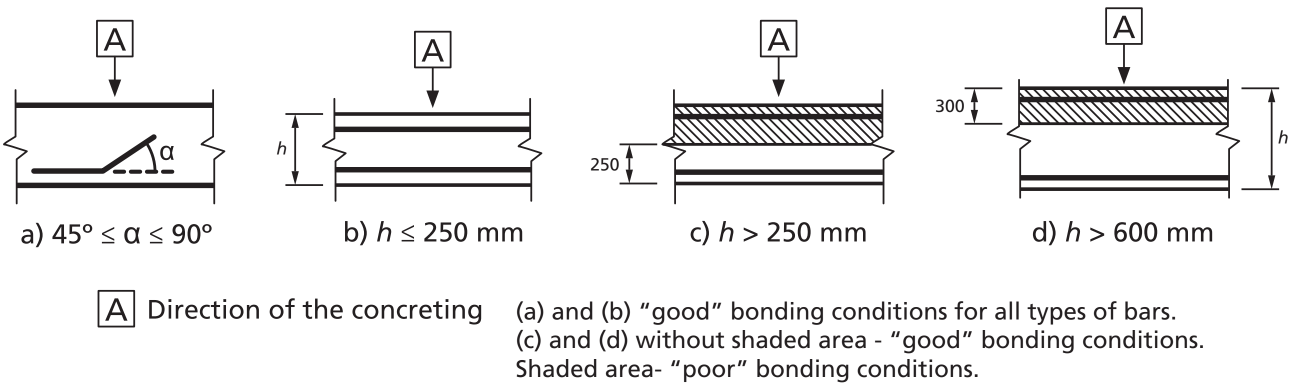
Calculated load values according to Eurocode 2 and EOTA technical report TR 023.

- Information according to ETA 14/0325.
- Non-cracked concrete, conditions in dry or wet conditions.
- Temperature range: -40°C to +80°C (maximum long-term temperature +50°C).
- Minimum spacing conditions between bars ≥5d_s, min. 50 mm:



- Minimum concrete coating:
  - drilling with compressed air ≥ 50 + 0.06 Lb
  - drilling in percussion mode ≥ 30 + 0.08 Lb ≥ 2Φ
- Good bonding conditions:



* In case of poor bonding conditions, multiply values by 0.7.

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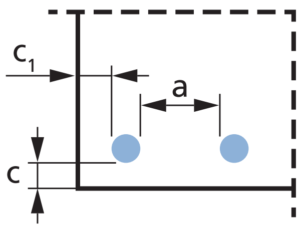
Resistance values may increase in the following situations:

- With transverse tension/compression pressure (α_2)
- In case of concrete coating (α_5)
- In case of overlapping rebars (α_6)

Values for α_2 , α_5 and α_6		
Influence factor	Reinforcement bar	
	A tension	A compression
Concrete coating	$\alpha_2 = 1 - 0.15\,(cd - Ø)/Ø$ ≥ 0.7 ≤ 1.0	$\alpha_2 = 1.0$
Transverse pressure confinement	$\alpha_5 = 1 - 0.004p$ ≥ 0.7 ≤ 1.0	$\alpha_5 = 1.0$
Overlapping length	$\alpha_6 = (p_1/25)^{0.25}$ ≥ 1.0 ≤ 1.5	

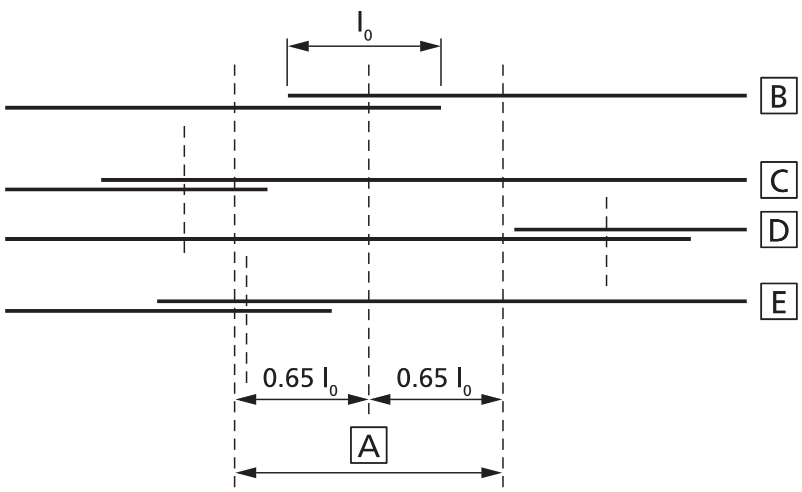
Where:

$c_d = \min(a/_2, c_1, c)$



p: transverse pressure [MPa] in the ultimate limit state l_{bd}

p_1 is the percentage of the overlapped reinforcement bar within $0.65 \cdot l_0$ from the centre of the length of the overlap considered



A Section considered B Bar I C Bar II D Bar III E Bar IV

MOPURE

TABLES OF PRECALCULATED VALUES

Concrete class 20/25											
Resistance to concrete compression [$f_{ck,cube}$]: 25 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
170			9.8								
212			12.3	15.3							
255			14.7	18.4	22.1				Area not permitted		
298			17.2	21.5	25.8	30.1					
300			17.3	21.7	26.0	30.3					
315			18.2	22.8	27.3	31.9					
340			19.7	24.6	29.5	34.4	39.3				
360			20.8	26.0	31.2	36.4	41.6				
400			**21.9**	28.9	34.7	40.5	46.2				
425				30.7	36.9	43.0	49.1	61.4			
450				32.5	39.0	45.5	52.0	65.0			
500				**34.1**	43.4	50.6	57.8	72.3			
532					46.1	53.8	61.5	76.9	96.1		
563					48.8	57.0	65.1	81.4	101.7		
595					**49.2**	60.2	68.8	86.0	107.5	120.4	
600					**49.2**	60.7	69.4	86.7	108.4	121.4	
630						63.7	72.8	91.0	113.8	127.5	
681						**66.9**	78.7	98.4	123.0	137.8	157.5
700						**66.9**	80.9	101.2	126.4	141.6	161.9
720							83.2	104.0	130.1	145.7	166.5
800					Yield stress area of the bar		**87.4**	115.6	144.5	161.9	185.0
1000								**136.6**	180.6	202.3	231.2
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			378	473	567	662	756	945	1,181	1,323	1,512

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

MOPURE

TABLES OF PRECALCULATED VALUES

Concrete class 30/37											
Resistance to concrete compression [$f_{ck,cube}$]: 37 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	3	3	3	3	3	3	2.7	2.7	2.7
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
113			8.5								
142			10.7	13.4							
170			12.8	16	19.2				Area not permitted		
198			14.9	18.7	22.4	26.1					
200			15.1	18.8	22.6	26.4					
210			15.8	19.8	23.8	27.7					
227			17.1	21.4	25.7	30	34.2				
24			18.1	22.6	27.1	31.7	36.2				
284			21.4	26.8	32.1	37.5	42.8				
300			**21.9**	28.3	33.9	39.6	45.2	56.5			
354			**21.9**	33.4	40.0	46.7	53.4	66.7			
375			**21.9**	**34.1**	42.4	49.5	56.5	70.7			
397			**21.9**	**34.1**	44.9	52.4	59.9	74.8	84.2		
400			**21.9**	**34.1**	45.2	52.8	60.3	75.4	84.8		
420				**34.1**	47.5	55.4	63.3	79.2	89.1	99.8	
453				**34.1**	**49.2**	59.8	68.3	85.4	96.1	107.6	
480				**34.1**	**49.2**	63.3	72.4	90.5	101.8	114.0	
500					**49.2**	**66.9**	75.4	94.2	106.0	118.8	135.7
600					**49.2**	**66.9**	**87.4**	113.1	127.2	142.5	162.9
700						**66.9**	**87.4**	131.9	148.4	166.3	190.0
800			Yield stress area of the bar				**87.4**	**136.6**	169.6	190	169.6
1000								**136.6**	212.1	237.5	271.4
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			290	362	435	507	580	725	1,006	1,127	1,288

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

MOPURE

TABLES OF PRECALCULATED VALUES

Concrete class 40/50											
Resistance to concrete compression [$f_{ck,cube}$]: 50 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	3.7	3.7	3.7	3.7	3.7	3.4	2.7	2.7	2.7
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
113			10.5								
142			13.2	16.5							
170			15.8	19.8	23.7				Area not permitted		
198			18.4	23.0	27.6	32.2					
200			18.6	23.2	27.9	32.5					
210			19.5	24.4	29.3	34.2					
227			21.1	26.4	31.7	36.9	42.2				
24			**21.9**	27.9	33.5	39.1	44.6				
284			**21.9**	33.0	39.6	46.2	52.8				
300			**21.9**	**34.1**	41.8	48.8	55.8	64.1			
354			**21.9**	**34.1**	**49.2**	57.6	65.8	75.6			
375			**21.9**	**34.1**	**49.2**	61.0	69.7	80.1			
397			**21.9**	**34.1**	**49.2**	64.6	73.8	84.8	84.2		
400			**21.9**	**34.1**	**49.2**	65.1	74.4	85.5	84.8		
420				**34.1**	**49.2**	**66.9**	78.1	89.7	89.1	99.8	
453				**34.1**	**49.2**	**66.9**	84.2	96.8	96.1	107.6	
480				**34.1**	**49.2**	**66.9**	**87.4**	102.5	101.8	114.0	
500					**49.2**	**66.9**	**87.4**	106.8	106.0	118.8	135.7
600					**49.2**	**66.9**	**87.4**	128.2	127.2	142.5	162.9
700						**66.9**	**87.4**	**136.6**	148.4	166.3	190.0
800			Yield stress area of the bar				**87.4**	**136.6**	169.6	190.0	217.1
1000								**136.6**	212.1	237.5	271.4
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			235	294	352	411	470	639	1,006	1,127	1,288

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

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TABLES OF PRECALCULATED VALUES

Concrete class 50/60											
Resistance to concrete compression [$f_{ck,cube}$]: 60 N/mm²											
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Bar size	d_s	[mm]	8	10	12	14	16	20	25	28	32
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9	615.8	804.2
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4	267.7	349.7
Calculated bonding resistance	f_{bd}	[N/mm²]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.70	2.70
Diameter of the drilled hole	d_h	[mm]	12	14	16	18	20	25	32	35	40
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125	140	160
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$								
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$								
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]								
170			17.1								
212			21.3	26.6							
255			**21.9**	32.0	38.5				Area not permitted		
298			**21.9**	**34.1**	44.9	52.4					
300			**21.9**	**34.1**	45.2	52.8					
315			**21.9**	**34.1**	47.5	55.4					
340			**21.9**	**34.1**	**49.2**	59.8	68.4				
360			**21.9**	**34.1**	**49.2**	63.3	72.4				
400			**21.9**	**34.1**	**49.2**	**66.9**	80.4				
425				**34.1**	**49.2**	**66.9**	85.5	106.8			
450				**34.1**	**49.2**	**66.9**	**87.4**	113.1			
500				**34.1**	**49.2**	**66.9**	**87.4**	125.7			
532					**49.2**	**66.9**	**87.4**	133.7	167.1		
563					**49.2**	**66.9**	**87.4**	**136.6**	176.9		
595					**49.2**	**66.9**	**87.4**	**136.6**	186.9	193.7	
600					**49.2**	**66.9**	**87.4**	**136.6**	188.5	195.3	
630						**66.9**	**87.4**	**136.6**	197.9	205.0	
681						**66.9**	**87.4**	**136.6**	**213.4**	221.6	184.8
700						**66.9**	**87.4**	**136.6**	**213.4**	227.8	190.0
720							**87.4**	**136.6**	**213.4**	234.3	195.4
800				Yield stress area of the bar			**87.4**	**136.6**	**213.4**	260.4	217.1
1000								**136.6**	**213.4**	**267.7**	271.4
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			217	272	326	380	435	543	679	822	1,288

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

MOPURE

RANGE

PURE EPOXY

OPTION 1

CODE	DIMENSION	
NORMAL		
MOPURE600	600 ml.	12


Concrete


Reinforced concrete


Cracked concrete

Accessories for chemical anchor cartridges

MO-PIS Application guns

CODE	MODEL
MOPISPUR6	MOPURE600 600 ml

MO-AC Mixing tubes and miscellaneous


MORCEPKIT
Kit 3 brushes (ø15, ø20, ø30)


MORCAPU


MOBOMBA

CODE	MODEL
MOBOMBA	Blower pump
MORCAPU	Tube 600 ml
MORCEPKIT	Kit 3 brushes

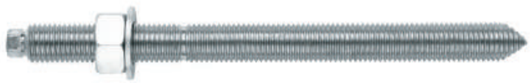
EQ-AC Zinc-plated

Z ZINC

CODE	DIMENSION
EQAC08110	M8 x 110
EQAC10130	M10 x 130
EQAC12160	M12 x 160
EQAC16190	M16 x 190
EQAC20260	M20 x 260
EQAC24300	M24 x 300
EQAC30330	M30 x 330

EQ-A2 Stainless steel A2

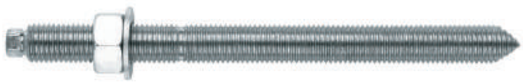
A2 INOX



CODE	DIMENSION
EQA208110	M8 x 110
EQA210130	M10 x 130
EQA212160	M12 x 160
EQA216190	M16 x 190
EQA220260	M20 x 260
EQA224300	M24 x 300
EQA230330	M30 x 330

EQ-A4 Stainless steel A4

A4 INOX



CODE	DIMENSION
EQA408110	M8 x 110
EQA410130	M10 x 130
EQA412160	M12 x 160
EQA416190	M16 x 190
EQA420260	M20 x 260
EQA424300	M24 x 300
EQA430330	M30 x 330

Epoxy vinyl ester styrene-free mortar anchor, for use in cracked, non-cracked concrete and masonry

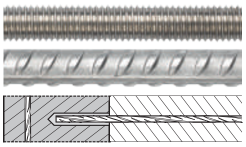
MO-H

ETA assessed Option 1 (cracked and non-cracked concrete).

PRODUCT INFORMATION

DESCRIPTION
Epoxy vinyl ester styrene-free chemical anchor. STYRENE FREE

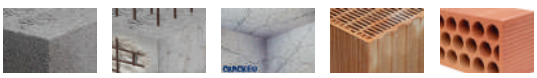
OFFICIAL DOCUMENTATION
- ETA 14/0138 option 1, M8 to M30 for non-cracked concrete and M10 to M24 for cracked concrete.
- ETA 13/0780 for post-installed rebar installation.
- ETA 16/0814 for installation in masonry.
- Declaration features DoP MO-H.
- Certificate EVCP 1020-CPR-090-032411 for use in concrete.
- Certificate EVCP 1020-CPD-090-030058 for post-installed rebars.
- Certificate EVCP 1020-CPR-090-036865 for use in masonry.

VALID FOR

Stud
Rebar
Post-installed rebar

DIMENSIONS
Stud M8 - M30
Rebar as stud Ø8 - Ø32
Post-installed rebars Ø8 - Ø25

RANGE OF CACULATION LOADS
From 11.1 to 69.1 kN (non-cracked).
From 7.0 to 35.1 kN (cracked).

BASE MATERIAL
Concrete quality C20/25 to C50/60 cracked, non-cracked and masonry.


Concrete | Reinforced concrete | Cracked concrete | Thermal clay | Hollow brick

ASSESSMENTS
- ETA 14/0138 (ETAG 001-5) "Option 1: Cracked and non-cracked concrete.
- ETA 16/0841 (ETAG 029) "Masonry."
- ETA 13/0780 (TR 023) "Post-installed rebars."

CE | ETA OPTION 1 | A+ | LEED | WRAS APPROVED MATERIAL | SEISMIC C1 | FIRE RESISTANCE

DRILL HOLE CONDITION

Dry | Wet | Flooded

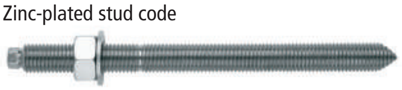
CHARACTERISTICS AND BENEFITS
- Use in cracked and non-cracked concrete.
- Used for high loads.
- Temperature range -40°C to +80°C (maximum long-term temperature +50°C).
- Two versions, standard and low temperatures.
- Variety of lengths and diameters: M8-M30-assessed studs, including M27. Use of rebars as anchor from Ø8 to Ø32, assembly flexibility.
- For static or quasi-static loads and category C1 seismic applications.
- Approved for use in contact with drinking water.
- Fire resistance certificate for studs.
- Version in zinc plated steel, stainless steel A2 and A4.
- Available in INDEXcal.

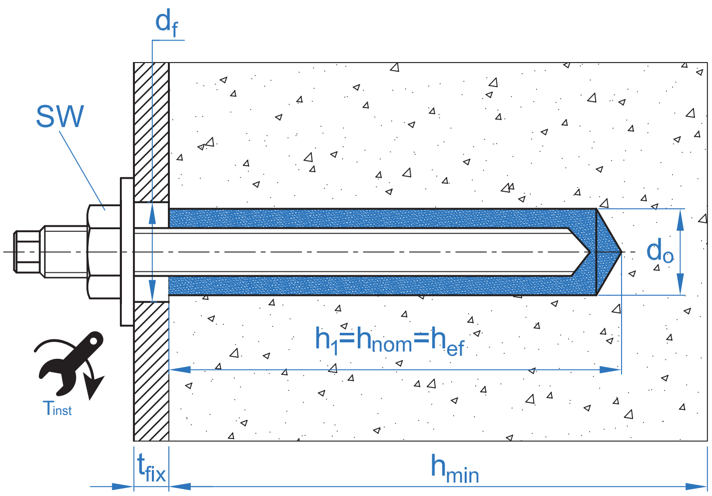
MATERIALS
Standard stud:
Carbon steel, zinc plated ≥ 5 µm. (ZINC)

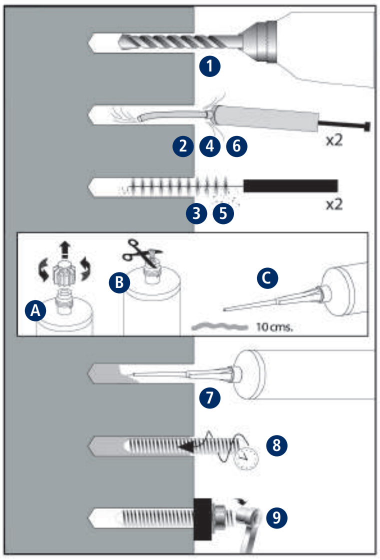
Stainless standard stud:
Stainless steel A2-70 and A4-70. (A2 INOX AISI 304, A4 INOX AISI 316)

APPLICATIONS
- For indoor and outdoor use.
- Structural applications.
- Substructure fixing to the building.
- Rebars and start rebars.
- For fixing machinery, balconies, awnings, shelving units, billboards, catenaries, safety barriers, railings, handrails, etc.
- Large metric sizes, retaining walls.

CONCRETE INSTALLATION PARAMETERS

METRIC			M8	M10	M12	M16	M20	M24	M27	M30
d_0	nominal diameter	[mm]	10	12	14	18	22	26	30	35
d_f	diameter in anchor plate ≤	[mm]	9	12	14	18	22	26	30	33
T_{inst}	tightening torque ≤	[Nm]	10	20	40	80	150	200	240	275
Circular cleaning brush			Ø14		Ø20		Ø29		Ø40	
$h_{ef,min}$ = 8d										
h_1	depth of the drill hole	[mm]	64	80	96	128	160	192	216	240
$s_{cr,N}$	critical distance between anchors	[mm]	192	240	288	384	480	576	648	720
$c_{cr,N}$	critical distance from the edge	[mm]	96	120	144	192	240	288	324	360
c_{min}	minimum distance from the edge	[mm]	35	40	50	65	80	96	110	120
s_{min}	minimum distance between anchors	[mm]	35	40	50	65	80	96	110	120
h_{min}	minimum concrete thickness	[mm]	100	110	126	158	204	244	276	310
Standard stud										
h_1	depth of the drill hole	[mm]	80	90	110	128	170	210	-	280
$s_{cr,N}$	critical distance between anchors	[mm]	240	270	330	384	510	630	-	840
$c_{cr,N}$	critical distance from the edge	[mm]	120	135	165	192	255	315	-	420
c_{min}	minimum distance from the edge	[mm]	43	45	56	65	85	105	-	140
s_{min}	minimum distance between anchors	[mm]	43	45	56	65	85	105	-	140
h_{min}	minimum concrete thickness	[mm]	110	120	140	158	214	262	-	350
$h_{ef,max}$ = 20d										
h_1	depth of the drill hole	[mm]	160	200	240	320	400	480	540	600
$s_{cr,N}$	critical distance between anchors	[mm]	480	600	720	960	1200	1440	1620	1800
$c_{cr,N}$	critical distance from the edge	[mm]	240	300	360	480	600	720	810	900
c_{min}	minimum distance from the edge	[mm]	80	100	120	160	200	240	270	300
s_{min}	minimum distance between anchors	[mm]	80	100	120	160	200	240	270	300
h_{min}	minimum concrete thickness	[mm]	176	220	264	352	444	532	600	730
Zinc-plated stud code 			EQAC08110	EQAC10130	EQAC12160	EQAC16190	EQAC20260	EQAC24300	-	EQAC30330
Stainless steel stud code A2 / A4 			EQA208110 EQA408110	EQA210130 EQA410130	EQA212160 EQA412160	EQA216190 EQA416190	EQA220260 EQA420260	EQA224300 EQA424300	-	EQA230330 EQA430330



INSTALLATION ACCESSORIES			INSTALLATION PROCEDURE
CODE	PRODUCT	MATERIAL	CONCRETE
MOPISSI	APPLICATION GUNS	Gun for 300 ml cartridges	
MOPISTO		Guns for 410 ml cartridges, professional use	
MOPISNEU		Pneumatic gun for 410 ml coaxial cartridges, professional use	
EQ-AC **EQ-A2** **EQ-A4**	STUD	Studs threaded steel, class 5.8 ISO 898-1 Studs stainless steel A2-70 Studs stainless steel A4-70	
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm	
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole	
MORCANU	MIXING TUBE	Plastic. Static labyrinth mixture	

MINIMUM CURING TIME			
TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [min]
MO-H	+5 to +10	10	145
	+10 to +15	8	85
	+15 to +20	6	75
	+20 to +25	5	50
	+25 to +30	4	40
MO-HW	-10 to -5	50	12 hours
	-5 to 0	15	100
	0 to +5	10	75
	+5 to +20	5	50
	+20	100 seconds	20

Resistance in concrete C20/25 for an insulated anchor, without effects of distance from the edge or spacing between anchors, with a standard stud EQ-AC, EQ-A2 or EQ-A4.

Characteristic tensile strength N_{Rk}										
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
N_{Rk}	Non-cracked concrete	[kN]	20.1	26.9	39.4	57.9	90.8	126.7	-	145.1
	Cracked concrete	[kN]	-	12.7	18.7	29.0	42.7	63.3	-	-
Calculated tensile strength N_{Rd}										
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
N_{Rd}	Non-cracked concrete	[kN]	11.2	14.9	21.9	32.2	50.4	70.4	-	69.1
	Cracked concrete	[kN]	-	7.1	10.4	16.1	23.7	35.2	-	-
Maximum recommended tensile load N_{rec}										
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
N_{rec}	Non-cracked concrete	[kN]	8.0	10.7	15.6	23.0	36.0	50.3	-	49.4
	Cracked concrete	[kN]	-	5.0	7.4	11.5	17.0	25.1	-	-
Characteristic resistance to shear stress V_{Rk}										
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
V_{Rk}	Zinc-plated stud	[kN]	*9.0*	*15.0*	*21.0*	*39.0*	*61.0*	*88.0*	*115.0*	*140.0*
	Stainless steel stud (A2/A4)	[kN]	*13.0*	*20.0*	*30.0*	*55.0*	*86.0*	*124.0*	*161.0*	*196.0*
Calculated resistance to shearing V_{Rd}										
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
V_{Rd}	Zinc-plated stud	[kN]	*7.2*	*12.0*	*16.8*	*31.2*	*48.8*	*70.4*	*92.0*	*112.0*
	Stainless steel stud (A2/A4)	[kN]	*8.3*	*12.8*	*19.2*	*35.3*	*55.1*	*79.5*	*103.2*	*125.6*
Maximum recommended load to shear stress V_{rec}										
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
V_{rec}	Zinc-plated stud	[kN]	*5.1*	*8.6*	*12.0*	*22.3*	*34.9*	*50.3*	*65.7*	*80.0*
	Stainless steel stud (A2/A4)	[kN]	*6.0*	*9.2*	*13.7*	*25.2*	*39.4*	*56.8*	*73.7*	*89.7*
Effective depth of studs EQ-AC / EQ-A2 / EQ-A4										
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
	Effective depth	[mm]	80	90	110	128	170	210	-	280

The values underlined and in italics indicate steel failure

Simplified calculation method. European Technical Assessment ETA 14/0138

Simplified version of the calculation method according to ETAG 001, technical report TR029. The resistance is calculated according to the data reflected in ETA assessment 14/0138.

- Influence of concrete resistance.
- Influence of the distance from the edge of the concrete.
- Influence of the spacing between anchors.
- Influence of rebars.
- Influence of the base material thickness.
- Influence of the load application angle.
- Influence of the effective depth.
- Valid for a group of two anchors.
- Valid for dry or wet drill holes.

The calculation method is based on the following simplification:
No different loads act on individual anchors, without eccentricity.

INDEXcal
For a more precise calculation and taking into account more constructive arrangements we recommend the use of our INDEXcal calculation program. It can be downloaded free from our website **www.indexfix.com**

TENSILE LOADS

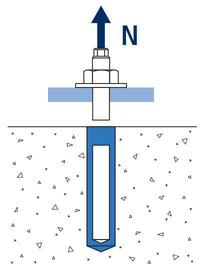
MO-H

- Calculated steel resistance: $N_{Rd,s}$
- Calculated extraction resistance: $N_{Rd,p} = N^{o}_{Rd,p} \cdot \Psi_{c} \cdot \Psi_{hef,p}$
- Calculated concrete cone resistance: $N_{Rd,c} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$
- Calculated concrete cracking resistance: $N_{Rd,sp} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Calculated steel resistance

$N_{Rd,s}$

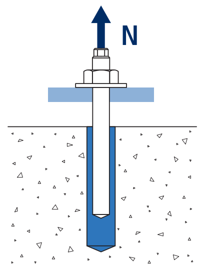
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$N^{o}_{Rd,s}$	Steel class 4.6	[kN]	7.5	11.5	17.0	31.5	49.0	70.5	92.0	112.0
	Steel class 5.8	[kN]	12.0	19.3	28.0	52.7	82.0	118.0	153.3	187.3
	Steel class 8.8	[kN]	19.3	30.7	44.7	84.0	130.7	188.0	244.7	299.3
	Steel class 10.9	[kN]	27.8	43.6	63.2	118.0	184.2	265.4	345.1	421.8
	Stainless steel class A2-70, A4-70	[kN]	13.9	21.9	31.6	58.8	92.0	132.1	171.7	210.2



Calculated extraction resistance

$N_{Rd,p} = N^{o}_{Rd,p} \cdot \Psi_{c} \cdot \Psi_{hef,p}$

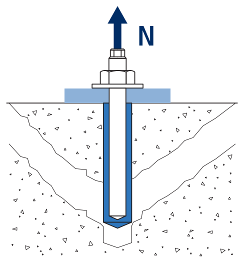
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$N^{o}_{Rd,p}$	Non-cracked concrete	[kN]	11.2	14.9	21.9	32.2	50.4	70.4	63.8	69.1
	Cracked concrete	[kN]	-	7.1	10.4	16.1	23.7	35.2	-	-



Calculated concrete cone resistance

$N_{Rd,c} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$

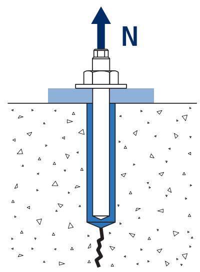
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$N^{o}_{Rd,c}$	Non-cracked concrete	[kN]	20.1	24.0	32.4	40.6	62.2	85.4	91.1	112.7
	Cracked concrete	[kN]	14.3	17.1	23.1	29.0	44.3	60.9	75.8	93.7



Calculated concrete cracking resistance

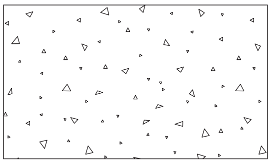
$N_{Rd,sp} = N^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$N^{o}_{Rd,sp}$	Non-cracked concrete	[kN]	20.1	24.0	32.4	40.6	62.2	85.4	91.1	112.7



MO-H

Influence coefficients



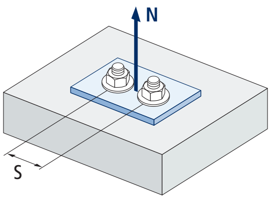
Influence of concrete resistance for extraction Ψ_c

	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_c	Non-cracked concrete	1.0			
	Cracked concrete	1.00	1.12	1.23	1.30

$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b

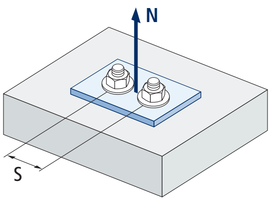
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b		1.00	1.22	1.41	1.55



Influence of spacing between anchors (concrete cone) $\Psi_{s,N}$

$s/s_{cr,N}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,N}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

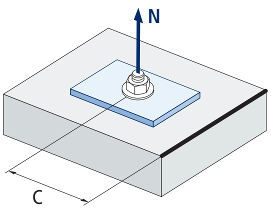
$$\Psi_{s,N} = 0.5\left(1 + \frac{s}{s_{cr,N}}\right) \leq 1$$



Influence of spacing between anchors (cracking) $\Psi_{s,N}$

$s/s_{cr,sp}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,sp}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

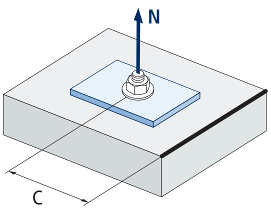
$$\Psi_{s,sp} = 0.5\left(1 + \frac{s}{s_{cr,sp}}\right) \leq 1$$



Influence of the distance from the edge of the concrete (concrete cone) $\Psi_{c,N}$

$c/C_{cr,N}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,N}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

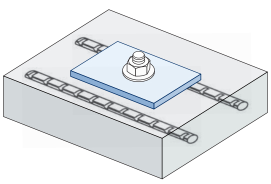
$$\Psi_{c,N} = 0.35 + \frac{0.5 \cdot c}{C_{cr,N}} + \frac{0.15 \cdot c^2}{C_{cr,N}^{\ 2}} \leq 1$$



Influence of the distance from the edge of the concrete (cracking) $\Psi_{c,sp}$

$c/C_{cr,sp}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,sp}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

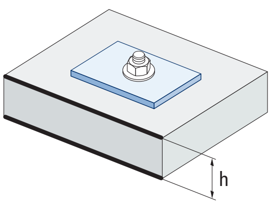
$$\Psi_{c,sp} = 0.35 + \frac{0.5 \cdot c}{C_{cr,sp}} + \frac{0.15 \cdot c^2}{C_{cr,sp}^{\ 2}} \leq 1$$



Influence of the rebars $\Psi_{re,N}$

h_{ef} (mm)	64	70	80	90	100
$\Psi_{re,N}$	0.82	0.85	0.90	0.95	1.00

$$\Psi_{re,N} = 0.5 + \frac{h_{ef}}{200} \leq 1$$



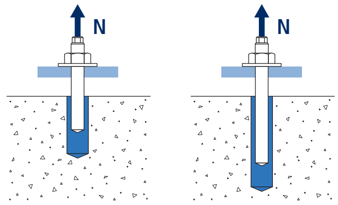
Influence of the base material thickness $\Psi_{h,sp}$

$\Psi_{h,sp}$	h/h_{ef}	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.68
	fh	1.00	1.07	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.50

$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1.5$$

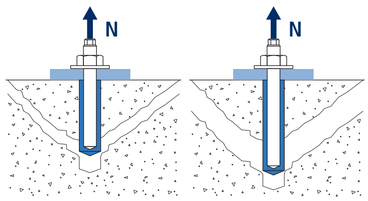
MO-H

Influence of the effective depth for the extraction combination $\Psi_{hef,p}$								
Metric h_{ef}	M8	M10	M12	M16	M20	M24	M27	M30
64	0.80							
80	1.00	0.89						
90	1.13	1.00						
96	1.20	1.07	0.87			**Value not permitted**		
110	1.38	1.22	1.00					
128	1.60	1.42	1.16	1.00				
160	2.00	1.78	1.45	1.25	0.94			
170		1.89	1.55	1.33	1.00			
192		2.13	1.75	1.50	1.13	0.91		
200		2.22	1.82	1.56	1.18	0.95		
210			1.91	1.64	1.24	1.00		
216			1.96	1.69	1.27	1.03	0.89	
240			2.18	1.88	1.41	1.14	0.99	0.86
243				1.90	1.43	1.16	1.00	0.87
280				2.19	1.65	1.33	1.15	1.00
320				2.50	1.88	1.52	1.32	1.14
400					2.35	1.90	1.65	1.43
480			**Value not permitted**			2.29	1.98	1.71
540							2.22	1.93
600								2.14



$$\Psi_{hef,p} = \frac{h_{ef}}{h_{stand}}$$

Influence of the effective depth for the concrete cone $\Psi_{hef,N}$								
Metric h_{ef}	M8	M10	M12	M16	M20	M24	M27	M30
64	0.72							
80	1.00	0.84						
90	1.19	1.00						
96	1.31	1.10	0.82			**Value not permitted**		
110	1.61	1.35	1.00					
128	2.02	1.70	1.26	1.00				
160	2.83	2.37	1.75	1.40	0.91			
170		2.60	1.92	1.53	1.00			
192		3.12	2.31	1.84	1.20	0.87		
200		3.31	2.45	1.95	1.28	0.93		
210			2.64	2.10	1.37	1.00		
216			2.75	2.19	1.43	1.04	0.84	
240			3.22	2.57	1.68	1.22	0.98	0.79
243				2.62	1.71	1.24	1.00	0.81
280				3.24	2.11	1.54	1.24	1.00
320				3.95	2.58	1.88	1.51	1.22
400					3.61	2.63	2.11	1.71
480			**Value not permitted**			3.46	2.78	2.24
540							3.31	2.68
600								3.14

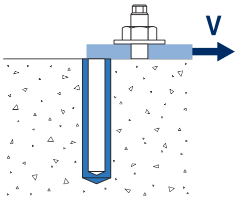


$$\Psi_{hef,N} = \left(\frac{h_{ef}}{h_{stand}}\right)^{1.5}$$

MO-H

SHEARING LOADS

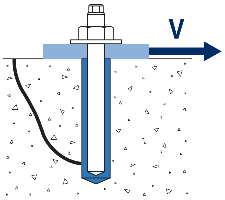
- Calculated steel resistance without lever arm: $V_{Rd,s}$
- Calculated spalling resistance: $V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$
- Calculated concrete edge resistance: $V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$



Calculated steel resistance to shearing

$V_{Rd,s}$

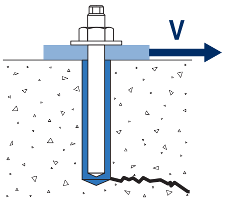
	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$V^{o}_{Rd,s}$	Steel class 4.6	[kN]	4.2	7.2	10.2	18.6	29.3	42.5	55.1	67.1
	Steel class 5.8	[kN]	7.2	12.0	16.8	31.2	48.8	70.4	92.0	112.0
	Steel class 8.8	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	147.2	179.2
	Steel class 10.9	[kN]	12.0	19.3	28.0	52.7	82.0	118.0	153.3	187.3
	Stainless steel class A2-70, A4-70	[kN]	8.3	12.8	19.2	35.3	55.1	79.5	103.2	125.6



Calculated spalling resistance

$V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$

Metric	M8	M10	M12	M16	M20	M24	M27	M30
k	2							

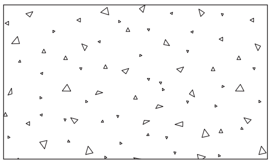


Calculated concrete edge resistance

$V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$

	Metric		M8	M10	M12	M16	M20	M24	M27	M30
$V^{o}_{Rd,c}$	Non-cracked concrete	[kN]	5.7	8.6	11.8	19.0	28.3	36.4	-	55.5
	Cracked concrete	[kN]	4.1	6.1	8.4	13.4	20.1	25.8	-	39.5

Influence coefficients



$$\Psi_{b} = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_{b}

Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_{b}	1.00	1.22	1.41	1.55

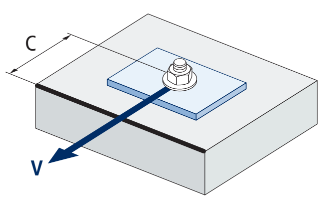
Influence of the distance from the edge and spacing between anchors $\Psi_{se,V}$

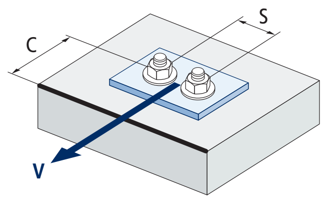
For one anchor

c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
Insulated	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18

For two anchors

	c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
s/c	1.0	0.24	0.43	0.67	0.93	1.22	1.54	1.89	2.25	2.64	3.04	3.46	3.91	4.37	4.84	5.33	6.36	7.45
	1.5	0.27	0.49	0.75	1.05	1.38	1.74	2.12	2.53	2.96	3.42	3.90	4.39	4.91	5.45	6.00	7.16	8.39
	2.0	0.29	0.54	0.83	1.16	1.53	1.93	2.36	2.81	3.29	3.80	4.33	4.88	5.46	6.05	6.67	7.95	9.32
	2.5	0.32	0.60	0.92	1.28	1.68	2.12	2.59	3.09	3.62	4.18	4.76	5.37	6.00	6.66	7.33	8.75	10.25
	≥ 3.0	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18





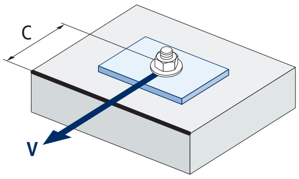
$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5}$$

$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0.5 \leq \left(\frac{c}{h_{ef}}\right)^{1.5}$$

MO-H

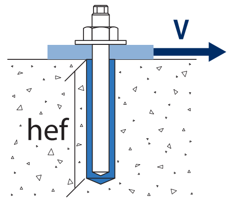
Influence of the distance from the edge of the concrete $\Psi_{c,V}$								
c/d	4	5	7	10	15	20	25	30
$\Psi_{c,V}$	0.76	0.72	0.68	0.63	0.58	0.55	0.53	0.51

$$\Psi_{c,V} = \left(\frac{d}{c}\right)^{0.20}$$

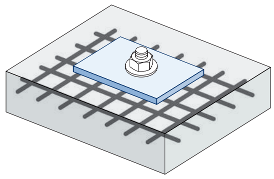


Influence of the effective depth $\Psi_{hef,V}$													
h_{ef}/d	8	9	10	11	12	13	14	15	16	17	18	19	20
$\Psi_{hef,V}$	1.65	2.04	2.47	2.93	3.42	3.94	4.50	5.10	5.72	6.38	7.06	7.78	8.53

$$\Psi_{hef,V} = 0.04 \cdot \left(\frac{h_{ef}}{d}\right)^{1.79}$$

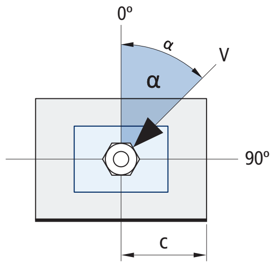


Influence of the rebars $\Psi_{re,v}$				
		Without perimeter rebar	Perimeter rebar ≥Ø12mm	Perimeter rebar with abutments at≤100mm
$\Psi_{re,v}$	Non-cracked concrete	1	1	1
	Cracked concrete	1	1.2	1.4



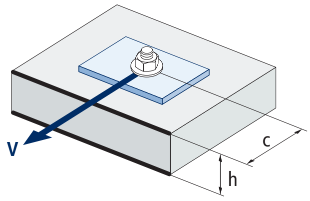
Influence of the load application angle $\Psi_{\alpha,v}$										
Angle, α(º)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,v}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50

$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos\alpha_v)^2 + \left(\frac{\sin\alpha_v}{2.5}\right)^2}} \geq 1$$



Influence of the base material thickness $\Psi_{h,V}$										
h/c	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	≥ 1.5
$\Psi_{h,V}$	0.32	0.45	0.55	0.63	0.71	0.77	0.84	0.89	0.95	1.00

$$\Psi_{h,V} = \left(\frac{h}{1.5 \cdot c}\right)^{0.5} \geq 1.0$$

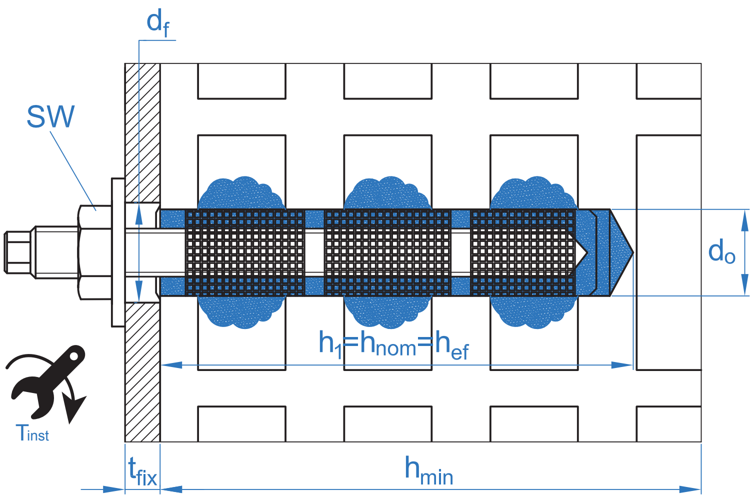


MO-H

FIXING IN BRICKS

INSTALLATION PARAMETERS IN BRICKS. PLASTIC SLEEVE					
DIMENSION			M8	M10	M12
Plastic sleeve		ls	85	85	85
		d_o	16	16	20
Mortar volume per sleeve		[ml]	15	15	27
h_1	drill hole depth ≥	[mm]	90	90	90
h_{nom}	sleeve installation depth	[mm]	85	85	85
h_{ef}	stud depth ≥	[mm]	80	80	80
t_{fix}	thickness material to be fixed ≤	[mm]	22	25	18
h_{min}	base material thickness ≥	[mm]	110	110	110
d_f	diameter in metal sheet ≤	[mm]	9	12	14
T_{ins}	tightening torque ≤	[Nm]	2	2	2
Circular brush			ø20		
Stud code 			MOES08110	MOES10115	MOES12110
Sleeve code			MOTN15085	MOTN15085	MOTN20085

Base material		Plastic sleeve					
		M8, M10			M12		
Minimum distances and from the edge		$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min}$	$s_{cr}\perp = s_{min}\perp$	$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min}$	$s_{cr}\perp = s_{min}\perp$
Brick number 1	[mm]	100	245	110	120	245	110
Brick number 2	[mm]	100	373	238	120	373	238

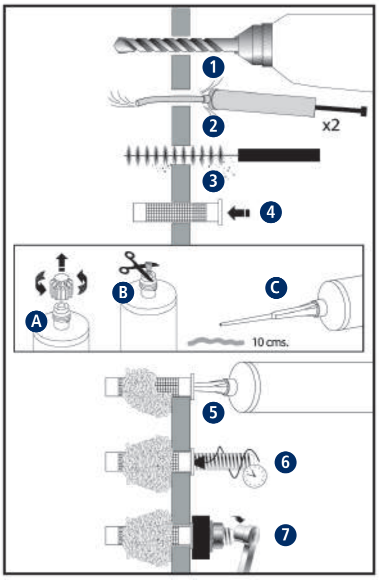


MO-H

INSTALLATION ACCESSORIES		
CODE	PRODUCT	MATERIAL
MOPISSI	APPLICATION GUNS	Gun for 300 ml cartridges
MOPISTO		Guns for 410 ml cartridges, professional use
MOPISNEU		Pneumatic gun for 410 ml coaxial cartridges, professional use
MO-ES	STUD	Threaded stud
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole
MORCANU	MIXING TUBE	Plastic. Static labyrinth mixture
MO-TN	NYLON SLEEVE	Plastic white or grey
MO-TR	THREADED METAL SLEEVE	Threaded metal sleeve M8, M10, M12, zinc-plated
MO-TM	METAL SLEEVE	Metal sleeve ø12, ø16 and ø22 mm

INSTALLATION PROCEDURE

BRICK



MINIMUM CURING TIME			
TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [min]
MO-H	+5 to +10	10	145
	+10 to +15	8	85
	+15 to +20	6	75
	+20 to +25	5	50
	+25 to +30	4	40
MO-HW	-10 to -5	50	12 hours
	-5 to 0	15	100
	0 to +5	10	75
	+5 to +20	5	50
	+20	100 seconds	20

MO-H

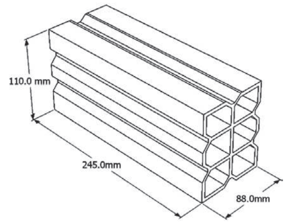
Characteristic resistances (F_{Rk})			
Base material	Threaded studs Tensile and shear force [kN]		
	M8	M10	M12
Brick number 1	0.9	1.5	1.5
Brick number 2	2.0	2.0	2.5

Calculated resistances (F_{Rd})			
Base material	Threaded studs Tensile and shear force [kN]		
	M8	M10	M12
Brick number 1	0.36	0.60	0.60
Brick number 2	0.80	0.80	1.00

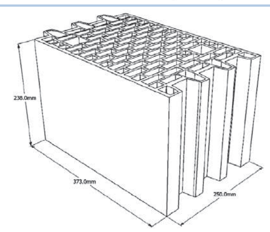
Recommended maximum loads (F_{recom}) (with andF= 1.4)			
Base material	Threaded studs Tensile and shear force [kN]		
	M8	M10	M12
Brick number 1	0.26	0.43	0.43
Brick number 2	0.57	0.57	0.71

BRICK TYPES

Brick no. 1
Double hollow clay brick EN 771-1
Length / width / height: 245 mm / 110 mm / 88 mm
fb ≥ 2.5 N/mm² / ρ ≥ 0.74 kg/dm³



Brick no. 2
Hollow clay brick Porotherm P+W according to EN 771-1
Length / width / height: 373 mm / 250 mm / 238 mm
fb ≥ 12 N/mm² / ρ ≥ 0.9 kg/dm³



MO-H

RETROFITTED REBAR CONNECTIONS

This technical document covers post-installed rebar connections in non-carbonate concrete under the assumption that post-installed rebar connections are generally calculated according to Eurocode 2. The rebar anchor system comprises the bonding of the material and a straight, recessed reinforcement rebar with the properties specified in Eurocode 2, Annex C; classes B and C.

Dynamic, fatigue or seismic loads on post-installed rebar connections are not covered by this technical document.

Intended use

This technical document covers application in non-carbonate concrete only from C12/15 to C50/60 (EN 206) for the following applications:

- Overlapping bond with an existing rebar in a building component **(Figures 1 and 4).**
- Fixing of rebar in a slab or in a support. Support at one end of a slab calculated as simply supported as well as its rebars for retention forces **(Figure 2).**
- Fixing of rebar of construction components mainly subjected to compression **(Figure 3).**
- Fixing of rebar to cover the action line of the tensile force **(Figure 5).**

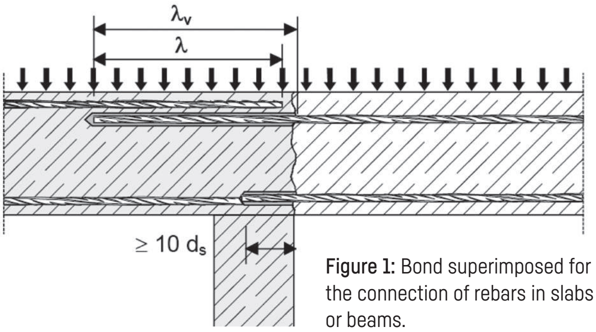


Figure 1: Bond superimposed for the connection of rebars in slabs or beams.

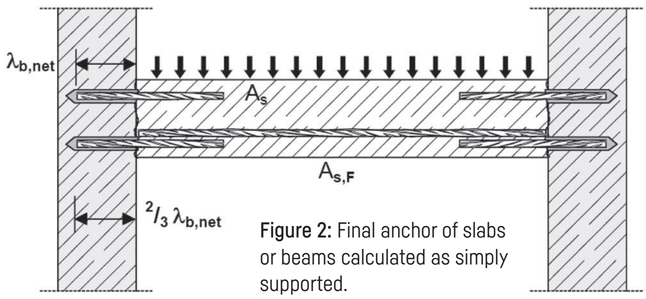


Figure 2: Final anchor of slabs or beams calculated as simply supported.

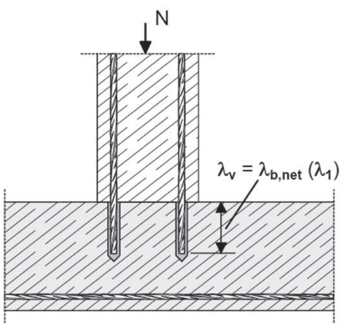


Figure 3: Rebar connections for items primarily subjected to compression. The rebars are subjected to compression.

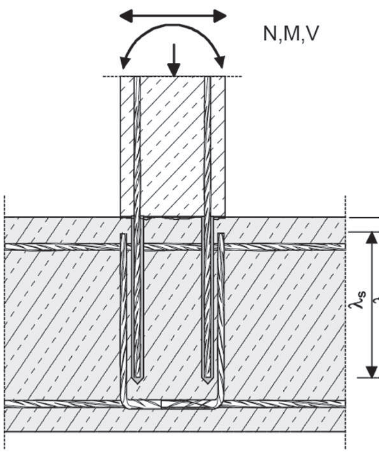


Figure 4: Bond superimposed to a foundation of a column or a wall where the rebars is subjected to tensile force.

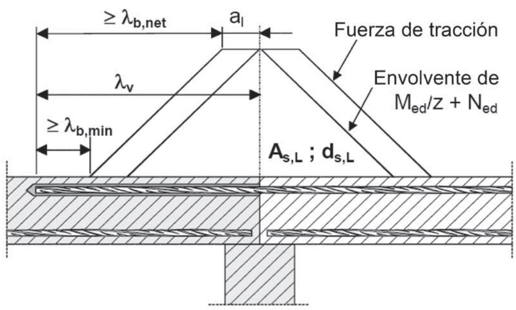


Figure 5: Reinforcement anchor to cover the action line of the tensile force.

* **Note for Figure 1 and 5:** In the figures the transversal reinforcements have not been represented, the transversal reinforcements as required by the Eurocode 2 must be present. The shear stress transferred between the anterior and posterior concrete must be calculated according to Eurocode 2.

MO-H

The tables shown below refer to Eurocode 2 Annex C, Table C.1 and C2N, rebar properties.

Properties of the start rebars			
Product form		Rebars and unwound rods	
Class		B	C
Characteristic yield stress f_{yk} or $f_{0.2k}$ (MPa)		400 to 600	
Minimum value of $k = (f_t / f_y)_k$		≥ 1.08	≥ 1.15 < 1.35
Characteristic maximum tensile deformation ε_{uk} (%)		≥ 5.0	≥ 7.5
Flexibility		Bending/folding test	
Maximum deviation from the nominal weight (individual bar or wire) (%)	Nominal size of the rebar (mm) ≤ 8 > 8	± 6.0 ± 4.5	
Bonding: Minimum relative corrugated area, $f_{R,min}$	Nominal size of the rebar (mm) 8 to 12 > 12	0.040 0.056	

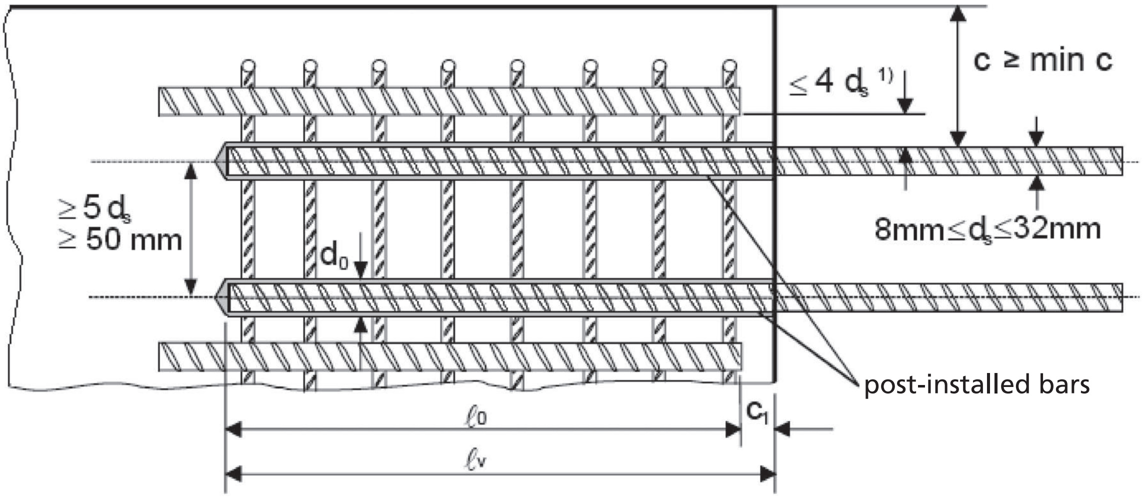
Minimum / maximum installation length ℓ_{max}				
Corrugated bars		Minimum		Maximum
		Anchor $\ell_{b,min}$	Overlapped connection $\ell_{0,min}$	ℓ_{max}
$Ød_s$ [mm]	fy,k [N/mm²]	[mm]	[mm]	[mm]
8	500	114	200	400
10	500	142	200	500
12	500	171	200	600
14	500	199	210	700
16	500	227	240	800
20	500	284	300	1000
25	500	355	375	1000

<table>
<tr><th colspan="10">Calculated bonding resistance [N/mm²] f_{bd}</th></tr>
<tr><th rowspan="2">Bar Ø d_s [mm]</th><th colspan="9">Concrete class</th></tr>
<tr><th>C12/15</th><th>C16/20</th><th>C20/25</th><th>C25/30</th><th>C30/37</th><th>C35/45</th><th>C40/50</th><th>C45/55</th><th>C50/60</th></tr>
<tr><td>8 to 16</td><td rowspan="3">1.6</td><td rowspan="3">2.0</td><td rowspan="3">2.3</td><td rowspan="3">2.7</td><td rowspan="3">3.0</td><td rowspan="2">3.4</td><td rowspan="2">3.7</td><td>4.0</td><td>4.3</td></tr>
<tr><td>20</td><td colspan="2">3.7</td></tr>
<tr><td>25</td><td colspan="4">3.0</td></tr>
</table>

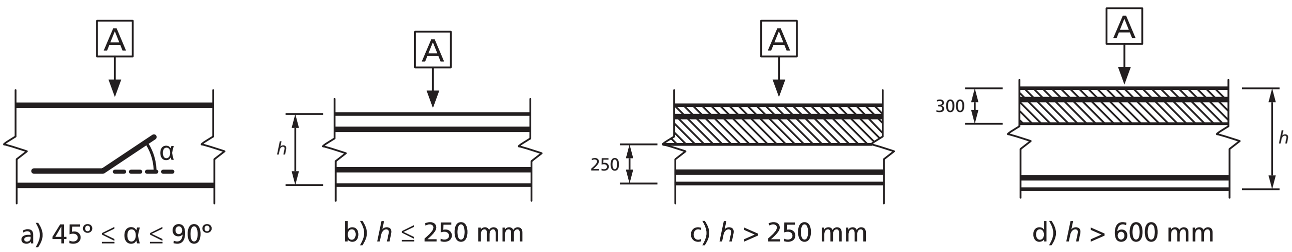
$$N = f_{bd} \cdot \Phi \cdot L_b \cdot \pi$$

MO-H

- Calculated load values according to Eurocode 2 and EOTA technical report TR 023.
- Information according to ETA 13/0780.
- Non-cracked concrete, conditions in dry or wet conditions.
- Temperature range: -40°C to +80°C (maximum long-term temperature +50°C).
- Minimum spacing conditions between bars ≥5d_s, min. 50 mm:



- Minimum concrete coating:
  - drilling with compressed air ≥ 50 + 0.06 Lb
  - drilling in percussion mode ≥ 30 + 0.08 Lb ≥ 2Φ
- Good bonding conditions:



A Direction of the concreting

(a) and (b) “good” bonding conditions for all types of bars.
(c) and (d) without shaded area - “good” bonding conditions.
Shaded area- “poor” bonding conditions.

* In case of poor bonding conditions, multiply values by 0.7.

MO-H

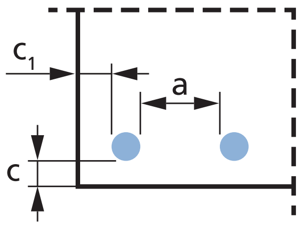
Resistance values may increase in the following situations:

- With transverse tension/compression pressure (α_2)
- In case of concrete coating (α_5)
- In case of overlapping rebars (α_6)

Values for α_2 , α_5 and α_6		
Influence factor	Reinforcement bar	
	A tension	A compression
Concrete coating	$\alpha_2 = 1 - 0.15\,(cd - Ø)/Ø$ ≥ 0.7 ≤ 1.0	$\alpha_2 = 1.0$
Transverse pressure confinement	$\alpha_5 = 1 - 0.004p$ ≥ 0.7 ≤ 1.0	$\alpha_5 = 1.0$
Overlapping length	$\alpha_6 = (p_1/25)^{0.25}$ ≥ 1.0 ≤ 1.5	

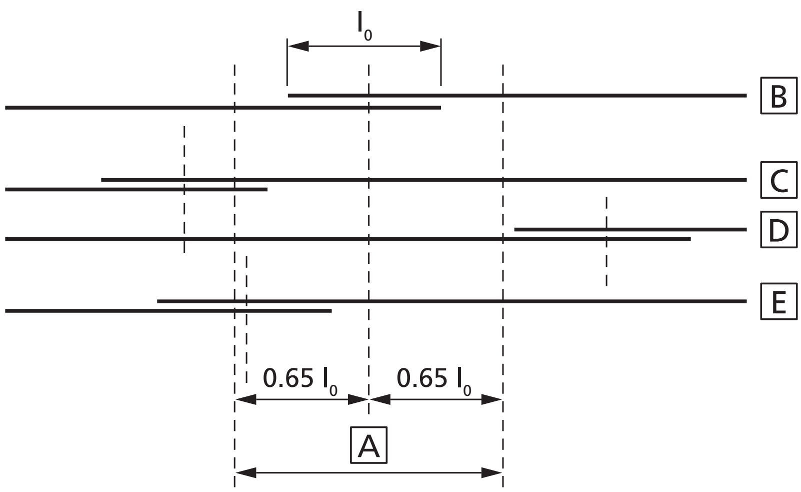
Where:

$c_d = \min(a/_2, c_1, c)$



p: transverse pressure [MPa] in the ultimate limit state l_{bd}

p_1 is the percentage of the overlapped reinforcement bar within $0.65 \cdot l_0$ from the centre of the length of the overlap considered



A Section considered B Bar I C Bar II D Bar III E Bar IV

MO-H

TABLES OF PRECALCULATED VALUES

Concrete class 20/25									
Resistance to concrete compression [$f_{ck,cube}$]: 25 N/mm²									
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25
Bar size	d_s	[mm]	8	10	12	14	16	20	25
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4
Calculated bonding resistance	f_{bd}	[N/mm²]	2.30	2.30	2.30	2.30	2.30	2.30	2.30
Diameter of the drilled hole	d_h	[mm]	10 ~ 12	12 ~ 14	16	18	20	25	32
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$						
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$						
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]						
114			6.6	Area not permitted					
142			8.2	10.3					
171			9.9	12.4	14.8				
200			11.6	14.5	17.3	20.2			
210			12.1	15.2	18.2	21.2			
227			13.1	16.4	19.7	23.0	26.2		
240			13.9	17.3	20.8	24.3	27.7		
284			16.4	20.5	24.6	28.7	32.8	41.0	
300			17.3	21.7	26.0	30.3	34.7	43.4	
355			20.5	25.7	30.8	35.9	41.0	51.3	64.1
375			21.7	27.1	32.5	37.9	43.4	54.2	67.7
400			**21.9**	28.9	34.7	40.5	46.2	57.8	72.3
500				**34.1**	43.4	50.6	57.8	72.3	90.3
600					**49.2**	60.7	69.4	86.7	108.4
700						**66.9**	80.9	101.2	126.4
800							**87.4**	115.6	144.5
900			Yield stress area of the bar					130.1	162.6
1000								**136.6**	180.6
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			378	473	567	662	756	945	1181

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

MO-H

TABLES OF PRECALCULATED VALUES

Concrete class 30/37										
Resistance to concrete compression [$f_{ck,cube}$]: 37 N/mm²										
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25
Bar size	d_s	[mm]	8	10	12	14	16	20	25
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4
Calculated bonding resistance	f_{bd}	[N/mm²]	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Diameter of the drilled hole	d_h	[mm]	10 ~ 12	12 ~ 14	16	18	20	25	32
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$						
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$						

Anchor length, L_b [mm]	Calculated extraction resistance by bonding*, N_{Rd} [kN]						
	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25
114	8.6						
142	10.7	13.4	Area not permitted				
171	12.9	16.1	19.3				
200	15.1	18.8	22.6	26.4			
210	15.8	19.8	23.8	27.7			
227	17.1	21.4	25.7	30.0	34.2		
240	18.1	22.6	27.1	31.7	36.2		
284	21.4	26.8	32.1	37.5	42.8	53.5	
300	**21.9**	28.3	33.9	39.6	45.2	56.5	
355	**21.9**	33.5	40.1	46.8	53.5	66.9	83.6
375	**21.9**	**34.1**	42.4	49.5	56.5	70.7	88.4
400	**21.9**	**34.1**	45.2	52.8	60.3	75.4	94.2
500		**34.1**	**49.2**	66.0	75.4	94.2	117.8
600			**49.2**	**66.9**	**87.4**	113.1	141.4
700				**66.9**	**87.4**	131.9	164.9
800					**87.4**	**136.6**	188.5
900	Yield stress area of the bar					**136.6**	212.1
1000						**136.6**	**213.4**
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]	290	362	435	507	580	725	906

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

MO-H

TABLES OF PRECALCULATED VALUES

Concrete class 40/50									
Resistance to concrete compression [$f_{ck,cube}$]: 50 N/mm²									
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25
Bar size	d_s	[mm]	8	10	12	14	16	20	25
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	201.1	314.2	314.2	490.9
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	87.4	136.6	136.6	213.4
Calculated bonding resistance	f_{bd}	[N/mm²]	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Diameter of the drilled hole	d_h	[mm]	10 ~ 12	12 ~ 14	16	18	20	25	32
Spacing between bars ≥	s	[mm]	50	50	60	80	100	100	125
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\ L_b$						
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\ L_b \geq 2\Phi$						
Anchor length, L_b [mm]			Calculated extraction resistance by bonding*, N_{Rd} [kN]						
114			10.6						
142			13.2	16.5	Area not permitted				
171			15.9	19.9	23.9				
200			18.6	23.2	27.9	32.5			
210			19.5	24.4	29.3	34.2			
227			21.1	26.4	31.7	36.9	42.2		
240			**21.9**	27.9	33.5	39.1	44.6		
284			**21.9**	33.0	39.6	46.2	52.8	66.0	
300			**21.9**	**34.1**	41.8	48.8	55.8	69.7	
355			**21.9**	**34.1**	**49.2**	57.8	66.0	82.5	83.6
375			**21.9**	**34.1**	**49.2**	61.0	69.7	87.2	88.4
400			**21.9**	**34.1**	**49.2**	65.1	74.4	93.0	94.2
500				**34.1**	**49.2**	**66.9**	**87.4**	116.2	117.8
600					**49.2**	**66.9**	**87.4**	**136.6**	141.4
700						**66.9**	**87.4**	**136.6**	164.9
800							**87.4**	**136.6**	188.5
900			Yield stress area of the bar					**136.6**	212.1
1000								**136.6**	**213.4**
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]			235	294	352	411	470	587	906

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

MO-H

TABLES OF PRECALCULATED VALUES

Concrete class 50/60										
Resistance to concrete compression [$f_{ck,cube}$]: 60 N/mm²										
Bar Ø	d_s	[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25
Bar size	d_s	[mm]	8	10	12	14	16	20	25
Cross-sectional area	A_s	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	490.9
Yield stress of the steel	f_{yd}	[kN]	500	500	500	500	500	500	500
Safety factor	$\gamma_{M,s}$	[mm²]	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Calculated steel resistance	$N_{Rd,s}$	[kN]	21.9	34.1	49.2	66.9	87.4	136.6	213.4
Calculated bonding resistance	f_{bd}	[N/mm²]	4.30	4.30	4.30	4.30	4.30	3.70	3.00
Diameter of the drilled hole	d_h	[mm]	10 ~ 12	12 ~ 14	16	18	20	25	32
Spacing between bars ≥	s	[mm]	50	50	60	70	80	100	125
Distance from the edge (drilled using compressed air) ≥	c	[mm]	$50 + 0.06\,L_b$						
Distance from the edge (drilled in percussion mode) ≥	c	[mm]	$30 + 0.08\,L_b \geq 2\Phi$						

Anchor length, L_b [mm]	Calculated extraction resistance by bonding*, N_{Rd} [kN]						
	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25
114	12.3						
142	15.3	19.2			Area not permitted		
171	18.5	23.1	27.7				
200	21.6	27.0	32.4	37.8			
210	**21.9**	28.4	34.0	39.7			
227	**21.9**	30.7	36.8	42.9	49.1		
240	**21.9**	32.4	38.9	45.4	51.9		
284	**21.9**	**34.1**	46.0	53.7	61.4	66.0	
300	**21.9**	**34.1**	48.6	56.7	64.8	69.7	
355	**21.9**	**34.1**	**49.2**	**66.9**	76.7	82.5	83.6
375	**21.9**	**34.1**	**49.2**	**66.9**	81.1	87.2	88.4
400	**21.9**	**34.1**	**49.2**	**66.9**	86.5	93.0	94.2
500		**34.1**	**49.2**	**66.9**	**87.4**	116.2	117.8
600			**49.2**	**66.9**	**87.4**	**136.6**	141.4
700				**66.9**	**87.4**	**136.6**	164.9
800					**87.4**	**136.6**	188.5
900	Yield stress area of the bar					**136.6**	212.1
1000						**136.6**	**213.4**
Length for reaching the yield stress of the steel, $L_{b,rqd}$ [mm]	202	253	303	354	404	587	906

Values shaded in blue are not valid for overlap bonds

* Values valid for ($\alpha_2=\alpha_5=\alpha_6=1$). In case of poor bonding conditions, multiply values by 0.7.

RANGE

MO-H

EPOXY VINYLESTER WITHOUT STYRENE

OPTION 1

CODE	DIMENSION	
NORMAL		
MO-H300	300 ml	12
MO-H410	410 ml	12
COLOUR STONE		
MO-HW300	300 ml	12
MO-HW410	410 ml	12

SEISMIC C1

Accessories for chemical anchor cartridges

MO-PIS Application guns

CODE	MODEL
MOPISTO	Manual
MOPISPR	Professional 410 ml
MOPISSI	Silicone 300 ml
MOPISNEU	Pneumatic

MO-TN Plastic sleeve

CODE	DIMENSION
MOTN12050	12 x 50
MOTN15085	15 x 85
MOTN15130	15 x 130
MOTN20085	20 x 85

MO-AC Mixing tubes and miscellaneous

MORCEPKIT
Kit 3 brushes (ø15, ø20, ø30)

MORCANU

MOBOMBA

CODE	MODEL
MOBOMBA	Blower pump
MORCANU	Tube 170 - 300 - 410 ml
MORCEPKIT	Kit 3 brushes

MO-ES Threaded stud

CODE	DIMENSION
MOES06070	M6 x 70
MOES08110	M8 x 110
MOES10115	M10 x 115
MOES12110	M12 x 110

MO-TM Metal sleeve

CODE	DIMENSION
MOTM12100	12 x 1000
MOTM16100	16 x 1000
MOTM22100	22 x 1000

MO-TR Threaded sleeve

CODE	DIMENSION
MOTRO08	M8/12 x 80
MOTRO10	M10/14 x 80
MOTRO12	M12/16 x 80

MO-H

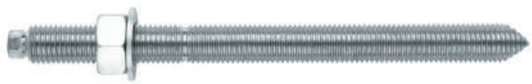
Accessories for chemical anchor cartridges

Stud for chemical anchor with nut and washer

EQ-AC Zinc-plated

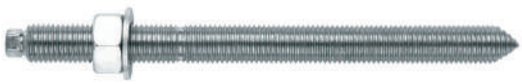
CODE	DIMENSION
EQAC08110	M8 x 110
EQAC10130	M10 x 130
EQAC12160	M12 x 160
EQAC16190	M16 x 190
EQAC20260	M20 x 260
EQAC24300	M24 x 300
EQAC30330	M30 x 330

EQ-A2 Stainless steel A2



CODE	DIMENSION
EQA208110	M8 x 110
EQA210130	M10 x 130
EQA212160	M12 x 160
EQA216190	M16 x 190
EQA220260	M20 x 260
EQA224300	M24 x 300
EQA230330	M30 x 330

EQ-A4 Stainless steel A4



CODE	DIMENSION
EQA408110	M8 x 110
EQA410130	M10 x 130
EQA412160	M12 x 160
EQA416190	M16 x 190
EQA420260	M20 x 260
EQA424300	M24 x 300
EQA430330	M30 x 330

Vinyl ester styrene-free mortar anchor, for use in non-cracked concrete

MO-VS

Assessed ETA Option 7 (non-cracked concrete).

PRODUCT INFORMATION

DESCRIPTION
Vinyl ester styrene-free, chemical anchor.

OFFICIAL DOCUMENTATION
- ETA 13/0753 option 7, M8 to M24 for non-cracked concrete.
- Declaration features DoP MO-VS.
- Certificate 1020-CPD-090-029883 for use in concrete.

VALID FOR

Stud

DIMENSIONS
Stud M8 - M24

RANGE OF CACULATION LOADS
From 11.2 to 81.0 kN (non-cracked).

BASE MATERIAL
Concrete quality C20/25 to C50/60 non-cracked.


Concrete

ASSESSMENTS
- ETA 13/0753 (ETAG 001-5) Option 7: non-cracked concrete.

OPTION 7

DRILL HOLE CONDITION

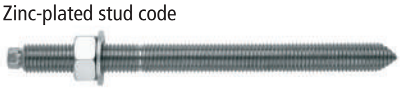

CHARACTERISTICS AND BENEFITS
- Easy installation.
- For use in non-cracked concrete,
- Used for high loads.
- Temperature range -40°C to +80°C (maximum long-term temperature +50°C).
- Variety of lengths and diameters: M8-M24-assessed studs, flexible assembly.
- For static or quasi-static loads.
- Version in zinc-plated steel and stainless steel A4.
- Available in INDEXcal.

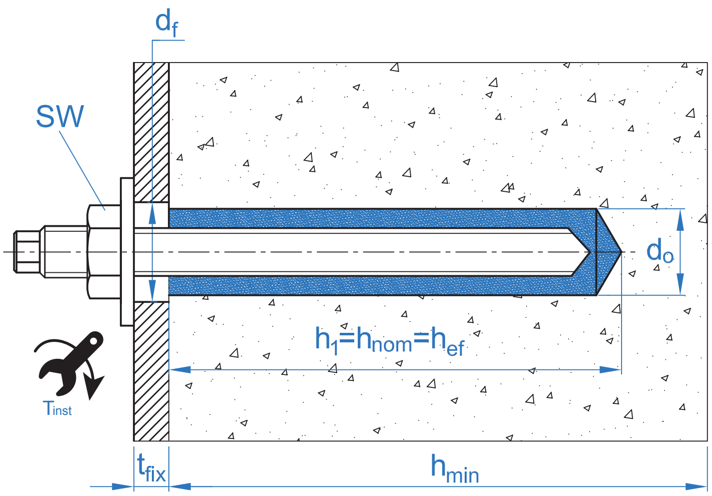
MATERIALS
Standard stud:
Carbon steel, zinc plated ≥ 5 µm.

Stainless standard stud:
Stainless steel A2-70 and A4-70.

APPLICATIONS
- For indoor and outdoor use.
- Structural applications.
- Safety barriers.
- Fixing of road fences.
- Fixing of posters, machinery, boilers, signs, billboards, etc.

CONCRETE INSTALLATION PARAMETERS

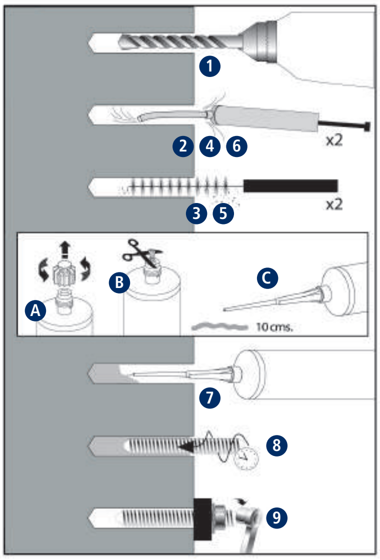
METRIC			M8	M10	M12	M16	M20	M24
d_0	nominal diameter	[mm]	10	12	14	18	22	26
d_f	diameter in anchor plate ≤	[mm]	9	12	14	18	22	26
T_{inst}	tightening torque ≤	[Nm]	10	20	40	80	150	200
Circular cleaning brush			Ø14		Ø20		Ø29	
$h_{ef,min}$ = 8d								
h_1	depth of the drill hole	[mm]	64	80	96	128	160	192
$s_{cr,N}$	critical distance between anchors	[mm]	192	240	288	384	480	576
$c_{cr,N}$	critical distance from the edge	[mm]	96	120	144	192	240	288
c_{min}	minimum distance from the edge	[mm]	35	40	50	65	80	96
s_{min}	minimum distance between anchors	[mm]	35	40	50	65	80	96
h_{min}	minimum concrete thickness	[mm]	100	110	126	158	204	244
Standard stud								
h_1	depth of the drill hole	[mm]	80	90	110	128	170	210
$s_{cr,N}$	critical distance between anchors	[mm]	240	270	330	384	510	630
$c_{cr,N}$	critical distance from the edge	[mm]	120	135	165	192	255	315
c_{min}	minimum distance from the edge	[mm]	43	45	56	65	85	105
s_{min}	minimum distance between anchors	[mm]	43	45	56	65	85	105
h_{min}	minimum concrete thickness	[mm]	110	120	140	158	214	262
$h_{ef,max}$ = 12d								
h_1	depth of the drill hole	[mm]	96	120	144	192	240	288
$s_{cr,N}$	critical distance between anchors	[mm]	288	360	432	576	720	864
$c_{cr,N}$	critical distance from the edge	[mm]	144	180	216	288	360	432
c_{min}	minimum distance from the edge	[mm]	50	60	70	95	120	145
s_{min}	minimum distance between anchors	[mm]	50	60	70	95	120	145
h_{min}	minimum concrete thickness	[mm]	126	150	174	222	284	340
Zinc-plated stud code 			EQAC08110	EQAC10130	EQAC12160	EQAC16190	EQAC20260	EQAC24300
Stainless steel stud code A2 / A4 			EQA208110 EQA408110	EQA210130 EQA410130	EQA212160 EQA412160	EQA216190 EQA416190	EQA220260 EQA420260	EQA224300 EQA424300



INSTALLATION ACCESSORIES		
CODE	PRODUCT	MATERIAL
MOPISSI	APPLICATION GUNS	Gun for 300 ml cartridges
MOPISTO		Guns for 410 ml cartridges, professional use
MOPISNEU		Pneumatic gun for 410 ml coaxial cartridges, professional use
EQ-AC **EQ-A2** **EQ-A4**	STUD	Studs threaded steel, class 5.8 ISO 898-1 Studs stainless steel A2-70 Studs stainless steel A4-70
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole
MORCANU	MIXING TUBE	Plastic. Static labyrinth mixture

INSTALLATION PROCEDURE

CONCRETE



MINIMUM CURING TIME			
TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [min]
MO-VS	min +5	18	120
	+5 to +10	12	120
	+10 to +20	6	80
	+20 to +25	4	40
	+25 to +30	3	30
	+30 to +35	2	20
	+35 to +40	1.5	15
	40	1.5	10

Resistance in concrete C20/25 for an insulated anchor, without effects of distance from the edge or spacing between anchors, with a standard stud EQ-AC, EQ-A2 or EQ-A4.

Characteristic tensile strength N_{Rk}								
Metric			M8	M10	M12	M16	M20	M24
N_{Rk}	Non-cracked concrete	[kN]	*18.0*	28.3	49.8	64.3	90.8	118.8
Calculated tensile strength N_{Rd}								
Metric			M8	M10	M12	M16	M20	M24
N_{Rd}	Non-cracked concrete	[kN]	*12.0*	15.7	27.6	35.7	50.4	66.0
Maximum recommended tensile load N_{rec}								
Metric			M8	M10	M12	M16	M20	M24
N_{rec}	Non-cracked concrete	[kN]	*8.6*	11.2	19.7	25.5	36.0	47.1
Characteristic resistance to shear stress V_{Rk}								
Metric			M8	M10	M12	M16	M20	M24
V_{Rk}	Zinc-plated stud	[kN]	*9.0*	*15.0*	*21.0*	*39.0*	*61.0*	*88.0*
	Stainless steel stud (A2/A4)	[kN]	*13.0*	*20.0*	*30.0*	*55.0*	*86.0*	*124.0*
Calculated resistance to shearing V_{Rd}								
Metric			M8	M10	M12	M16	M20	M24
V_{Rd}	Zinc-plated stud	[kN]	*7.2*	*12.0*	*16.8*	*31.2*	*48.8*	*70.4*
	Stainless steel stud (A2/A4)	[kN]	*8.3*	*12.8*	*19.2*	*35.3*	*55.1*	*79.5*
Maximum recommended load to shear stress V_{rec}								
Metric			M8	M10	M12	M16	M20	M24
V_{rec}	Zinc-plated stud	[kN]	*5.1*	*8.6*	*12.0*	*22.3*	*34.9*	*50.3*
	Stainless steel stud (A2/A4)	[kN]	*6.0*	*9.2*	*13.7*	*25.2*	*39.4*	*56.8*
Effective depth of studs EQ-AC / EQ-A2 / EQ-A4								
Metric			M8	M10	M12	M16	M20	M24
Effective depth		[mm]	80	90	110	128	170	210

The values underlined and in italics indicate steel failure

Simplified calculation method. European Technical Assessment ETA 13/0753

Simplified version of the calculation method according to ETAG 001, technical report TR029. The resistance is calculated according to the data reflected in the assessment ETA 13/0753.

- Influence of concrete resistance.
- Influence of the distance from the edge of the concrete.
- Influence of the spacing between anchors.
- Influence of rebars.
- Influence of the base material thickness.
- Influence of the load application angle.
- Influence of the effective depth.
- Valid for a group of two anchors.
- Valid for dry or wet drill holes.

The calculation method is based on the following simplification:
No different loads act on individual anchors, without eccentricity.

INDEXcal
For a more precise calculation and taking into account more constructive arrangements we recommend the use of our INDEXcal calculation program. It can be downloaded free from our website **www.indexfix.com**

TENSILE LOADS

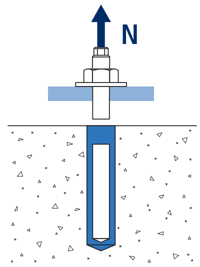
MO-VS

- Calculated steel resistance: $N_{Rd,s}$
- Calculated extraction resistance: $N_{Rd,p} = N^o_{Rd,p} \cdot \Psi_c \cdot \Psi_{hef,p}$
- Calculated concrete cone resistance: $N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$
- Calculated concrete cracking resistance: $N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Calculated steel resistance

$N_{Rd,s}$

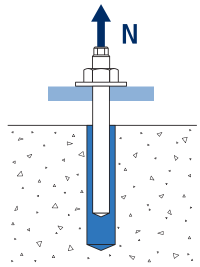
	Metric		M8	M10	M12	M16	M20	M24
$N^o_{Rd,s}$	Steel class 5.8	[kN]	12.0	19.3	28.0	52.7	82.0	118.0
	Steel class 8.8	[kN]	19.3	30.7	44.7	84.0	130.7	188.0
	Steel class 10.9	[kN]	27.8	43.6	63.2	118.0	184.2	265.4
	Stainless steel Class A2-70, A4-70	[kN]	13.9	21.9	31.6	58.8	92.0	132.1



Calculated extraction resistance

$N_{Rd,p} = N^o_{Rd,p} \cdot \Psi_c \cdot \Psi_{hef,p}$

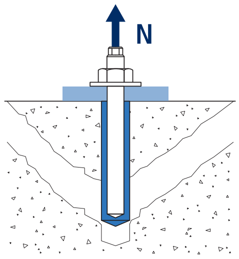
	Metric		M8	M10	M12	M16	M20	M24
$N^o_{Rd,p}$	Non-cracked concrete	[kN]	13.4	15.7	27.6	35.7	50.4	66.0



Calculated concrete cone resistance

$N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$

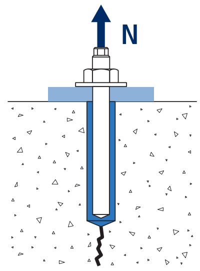
	Metric		M8	M10	M12	M16	M20	M24
$N^o_{Rd,c}$	Non-cracked concrete	[kN]	20.1	24.0	32.4	40.6	62.2	85.4



Calculated concrete cracking resistance

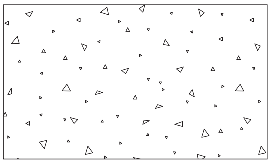
$N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Metric			M8	M10	M12	M16	M20	M24
$N^o_{Rd,sp}$	Non-cracked concrete	[kN]	20.1	24.0	32.4	40.6	62.2	85.4



MO-VS

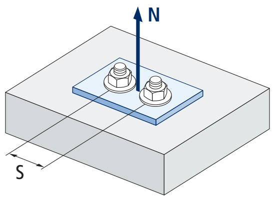
Influence coefficients



Influence of concrete resistance for extraction Ψ_c					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_c	Non-cracked concrete	1.00	1.12	1.19	1.30

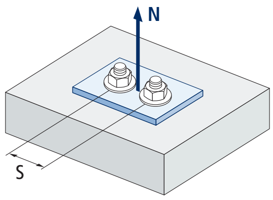
$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b		1.00	1.22	1.41	1.55



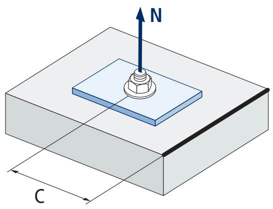
Influence of spacing between anchors (concrete cone) $\Psi_{s,N}$										
$s/s_{cr,N}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,N}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,N} = 0.5\left(1 + \frac{s}{s_{cr,N}}\right) \leq 1$$



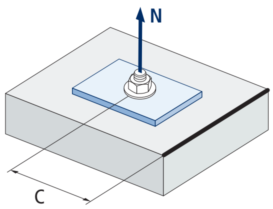
Influence of spacing between anchors (cracking) $\Psi_{s,N}$										
$s/s_{cr,sp}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,sp}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,sp} = 0.5\left(1 + \frac{s}{s_{cr,sp}}\right) \leq 1$$



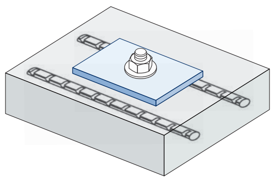
Influence of the distance from the edge of the concrete (concrete cone) $\Psi_{c,N}$												
$c/C_{cr,N}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,N}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,N} = 0.35 + \frac{0.5 \cdot c}{C_{cr,N}} + \frac{0.15 \cdot c^2}{C_{cr,N}^{\,2}} \leq 1$$



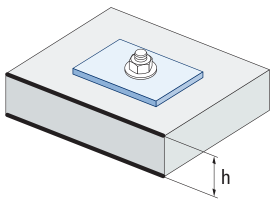
Influence of the distance from the edge of the concrete (cracking) $\Psi_{c,sp}$												
$c/C_{cr,sp}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,sp}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,sp} = 0.35 + \frac{0.5 \cdot c}{C_{cr,sp}} + \frac{0.15 \cdot c^2}{C_{cr,sp}^{\,2}} \leq 1$$



Influence of the rebars $\Psi_{re,N}$					
h_{ef} (mm)	64	70	80	90	100
$\Psi_{re,N}$	0.82	0.85	0.90	0.95	1.00

$$\Psi_{re,N} = 0.5 + \frac{h_{ef}}{200} \leq 1$$

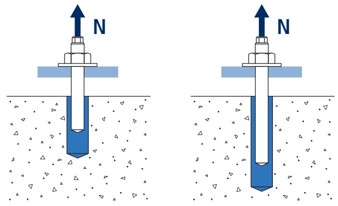


Influence of the base material thickness $\Psi_{h,sp}$											
$\Psi_{h,sp}$	h/h_{ef}	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.68
	fh	1.00	1.07	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.50

$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1.5$$

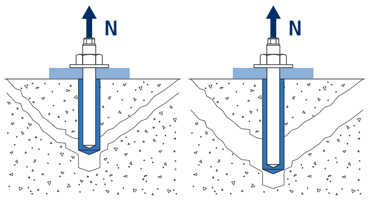
MO-VS

Influence of the effective depth for the extraction combination $\Psi_{hef,p}$						
Metric h_{ef}	M8	M10	M12	M16	M20	M24
64	0.80					
80	1.00	0.89				
90	1.13	1.00	0.82		**Value not permitted**	
96	1.20	1.07	0.87			
110		1.22	1.00			
120		1.33	1.09			
128			1.16	1.00		
144			1.31	1.13		
160				1.25	0.94	
170				1.33	1.00	
192		**Value not permitted**		1.50	1.13	0.91
210					1.24	1.00
240					1.41	1.14
288						1.37



$$\Psi_{hef,p} = \frac{h_{ef}}{h_{stand}}$$

Influence of the effective depth for the concrete cone $\Psi_{hef,N}$						
Metric h_{ef}	M8	M10	M12	M16	M20	M24
64	0.72					
80	1.00	0.84				
90	1.19	1.00			**Value not permitted**	
96	1.31	1.10	0.82			
110	1.61	1.35	1.00			
120	1.84	1.54	1.14	0.91		
128	2.02	1.70	1.26	1.00	0.65	
144		2.02	1.50	1.19	0.78	
160		2.37	1.75	1.40	0.91	0.67
170		2.60	1.92	1.53	1.00	0.73
192			2.31	1.84	1.20	0.87
210			2.64	2.10	1.37	1.00
240	**Value not permitted**		3.22	2.57	1.68	1.22
288				3.38	2.21	1.61

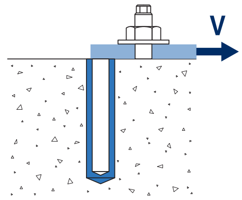


$$\Psi_{hef,N} = \left(\frac{h_{ef}}{h_{stand}}\right)^{1.5}$$

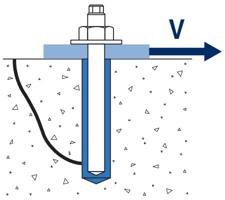
MO-VS

SHEARING LOADS

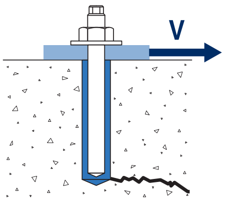
- Calculated steel resistance without lever arm: $V_{Rd,s}$
- Calculated spalling resistance: $V_{Rd,cp} = k \cdot N^o_{Rd,c}$
- Calculated concrete edge resistance: $V_{Rd,c} = V^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$



Calculated steel resistance to shearing								
$V_{Rd,s}$								
	Metric		M8	M10	M12	M16	M20	M24
$V^o_{Rd,s}$	Steel class 5.8	[kN]	7.2	12	16.8	31.2	48.8	70.4
	Steel class 8.8	[kN]	12	18.4	27.2	50.4	78.4	112.8
	Steel class 10.9	[kN]	12	19.3	28	52.7	82	118
	Stainless steel Class A2-70, A4-70	[kN]	8.3	12.8	19.2	35.3	55.1	79.5

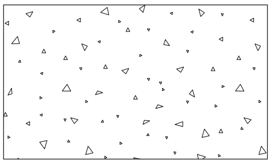


Calculated spalling resistance						
$V_{Rd,cp} = k \cdot N^o_{Rd,c}$						
Metric	M8	M10	M12	M16	M20	M24
k	2					



Calculated concrete edge resistance								
$V_{Rd,c} = V^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$								
Metric			M8	M10	M12	M16	M20	M24
$V^o_{Rd,c}$	Non-cracked concrete	[kN]	5.7	8.6	11.8	19.0	28.3	36.4

Influence coefficients



$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b				
Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b	1.00	1.22	1.41	1.55

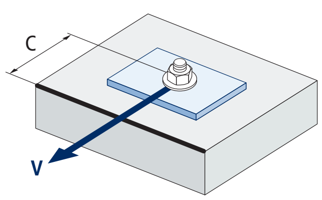
Influence of the distance from the edge and spacing between anchors $\Psi_{se,V}$

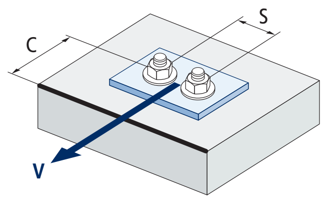
For one anchor

c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
Insulated	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18

For two anchors

s/c	c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
	1.0	0.24	0.43	0.67	0.93	1.22	1.54	1.89	2.25	2.64	3.04	3.46	3.91	4.37	4.84	5.33	6.36	7.45
	1.5	0.27	0.49	0.75	1.05	1.38	1.74	2.12	2.53	2.96	3.42	3.90	4.39	4.91	5.45	6.00	7.16	8.39
	2.0	0.29	0.54	0.83	1.16	1.53	1.93	2.36	2.81	3.29	3.80	4.33	4.88	5.46	6.05	6.67	7.95	9.32
	2.5	0.32	0.60	0.92	1.28	1.68	2.12	2.59	3.09	3.62	4.18	4.76	5.37	6.00	6.66	7.33	8.75	10.25
	≥ 3.0	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18





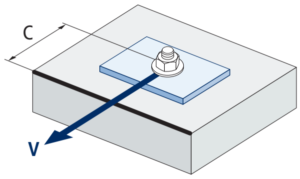
$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5}$$

$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0.5 \leq \left(\frac{c}{h_{ef}}\right)^{1.5}$$

MO-VS

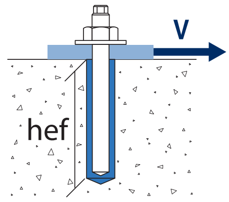
Influence of the distance from the edge of the concrete $\Psi_{c,V}$								
c/d	4	5	7	10	15	20	25	30
$\Psi_{c,V}$	0.76	0.72	0.68	0.63	0.58	0.55	0.53	0.51

$$\Psi_{c,V} = \left(\frac{d}{c}\right)^{0.20}$$

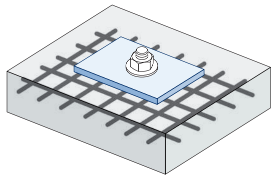


Influence of the effective depth $\Psi_{hef,V}$					
h_{ef}/d	8	9	10	11	12
$\Psi_{hef,V}$	1.65	2.04	2.47	2.93	3.42

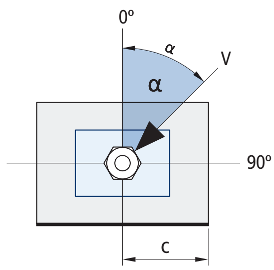
$$\Psi_{hef,V} = 0.04 \cdot \left(\frac{h_{ef}}{d}\right)^{1.79}$$



Influence of the rebars $\Psi_{re,v}$				
		Without perimeter rebar	Perimeter rebar ≥Ø12mm	Perimeter rebar with abutments at≤100mm
$\Psi_{re,v}$	Non-cracked concrete	1	1	1

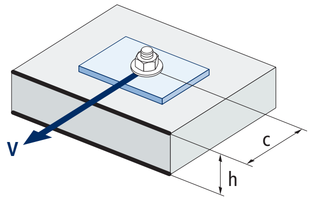


Influence of the load application angle $\Psi_{\alpha,v}$										
Angle, α(º)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,v}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50



$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos \alpha_v)^2 + \left(\frac{\sin \alpha_v}{2.5}\right)^2}} \geq 1$$

Influence of the base material thickness $\Psi_{h,V}$										
h/c	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	≥ 1.5
$\Psi_{h,V}$	0.32	0.45	0.55	0.63	0.71	0.77	0.84	0.89	0.95	1.00



$$\Psi_{h,V} = \left(\frac{h}{1.5 \cdot c}\right)^{0.5} \geq 1.0$$

MO-VS

RANGE

EPOXY VINYL ESTER

OPTION 7

ÉMISSIONS DANS L'AIR INTÉRIEUR A+

CODE	DIMENSION	
NORMAL		
MO-VS300	300 ml	12
MO-VS410	410 ml	12

Concrete

Accessories for chemical anchor cartridges

MO-PIS Application guns


MOPISTO

MOPISSI

MOPISNEU

CODE	MODEL
MOPISTO	Manual
MOPISPR	Professional 410 ml
MOPISSI	Silicone 300 ml
MOPISNEU	Pneumatic

MO-AC Mixing tubes and miscellaneous


MORCEPKIT
Kit 3 brushes (ø15, ø20, ø30)

MORCANU

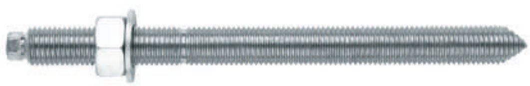
MOBOMBA

CODE	MODEL
MOBOMBA	Blower pump
MORCANU	Tube 170 - 300 - 410 ml
MORCEPKIT	Kit 3 brushes

EQ-AC Zinc-plated

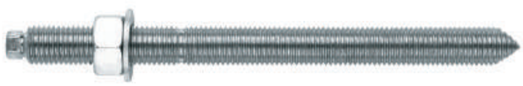
CODE	DIMENSION
EQAC08110	M8 x 110
EQAC10130	M10 x 130
EQAC12160	M12 x 160
EQAC16190	M16 x 190
EQAC20260	M20 x 260
EQAC24300	M24 x 300
EQAC30330	M30 x 330

EQ-A2 Stainless steel A2



CODE	DIMENSION
EQA208110	M8 x 110
EQA210130	M10 x 130
EQA212160	M12 x 160
EQA216190	M16 x 190
EQA220260	M20 x 260
EQA224300	M24 x 300
EQA230330	M30 x 330

EQ-A4 Stainless steel A4



CODE	DIMENSION
EQA408110	M8 x 110
EQA410130	M10 x 130
EQA412160	M12 x 160
EQA416190	M16 x 190
EQA420260	M20 x 260
EQA424300	M24 x 300
EQA430330	M30 x 330

Epoxy vinyl ester mortar anchor, for use in non-cracked concrete

MO-V

Assessed ETA Option 7 (non-cracked concrete).

PRODUCT INFORMATION

DESCRIPTION
Epoxy vinyl ester chemical anchor.

OFFICIAL DOCUMENTATION
- ETA 13/0753 option 7, M8 to M24 for non-cracked concrete.
- Declaration features DoP MO-V.
- Certificate EVCP 1020-CPR-090-041424 for use in concrete.

VALID FOR

Stud

DIMENSIONS
Stud M8 - M24

RANGE OF CACULATION LOADS
From 13.4 to 66.0 kN (non-cracked).

BASE MATERIAL
Concrete quality C20/25 to C50/60 non-cracked.


Concrete

ASSESSMENTS
- ETA 13/0753 (ETAG 001-5) Option 7: non-cracked concrete.

OPTION 7

DRILL HOLE CONDITION

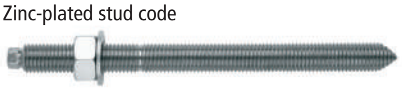
Dry Wet Flooded

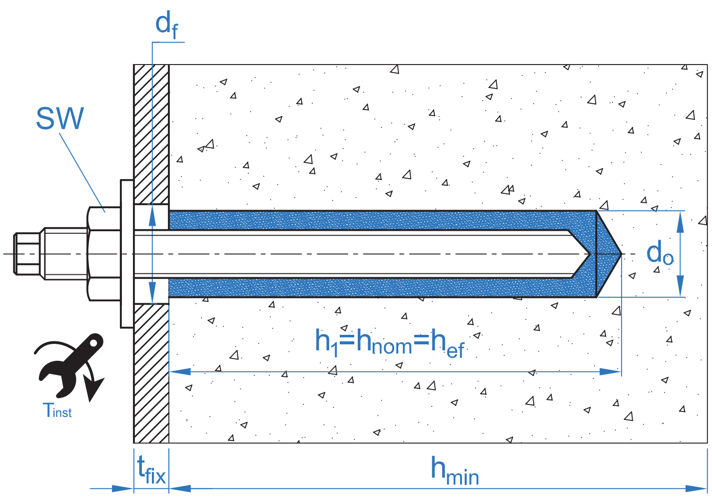
CHARACTERISTICS AND BENEFITS
- Easy installation.
- For use in non-cracked concrete,
- Used for high loads.
- Temperature range -40°C to +80°C (maximum long-term temperature +50°C).
- Variety of lengths and diameters: M8-M24-assessed studs, flexible assembly.
- For static or quasi-static loads.
- Version in zinc plated steel, stainless steel A2 and A4.
- Available in INDEXcal.

MATERIALS
Standard stud:
Carbon steel, zinc plated ≥ 5 µm.

Stainless standard stud:
Stainless steel A2-70 and A4-70.

APPLICATIONS
- For indoor and outdoor use.
- Structural applications.
- Safety barriers.
- Fixing of road fences.
- Fixing of posters, machinery, boilers, signs, billboards, etc.

CONCRETE INSTALLATION PARAMETERS								
METRIC			M8	M10	M12	M16	M20	M24
d_0	nominal diameter	[mm]	10	12	14	18	22	26
d_f	diameter in anchor plate ≤	[mm]	9	12	14	18	22	26
T_{inst}	tightening torque ≤	[Nm]	10	20	40	80	150	200
Circular cleaning brush			Ø14		Ø20		Ø29	
$h_{ef,min}$ = 8d								
h_1	depth of the drill hole	[mm]	64	80	96	128	160	192
$s_{cr,N}$	critical distance between anchors	[mm]	192	240	288	384	480	576
$c_{cr,N}$	critical distance from the edge	[mm]	96	120	144	192	240	288
c_{min}	minimum distance from the edge	[mm]	35	40	50	65	80	96
s_{min}	minimum distance between anchors	[mm]	35	40	50	65	80	96
h_{min}	minimum concrete thickness	[mm]	100	110	126	158	204	244
Standard stud								
h_1	depth of the drill hole	[mm]	80	90	110	128	170	210
$s_{cr,N}$	critical distance between anchors	[mm]	240	270	330	384	510	630
$c_{cr,N}$	critical distance from the edge	[mm]	120	135	165	192	255	315
c_{min}	minimum distance from the edge	[mm]	43	45	56	65	85	105
s_{min}	minimum distance between anchors	[mm]	43	45	56	65	85	105
h_{min}	minimum concrete thickness	[mm]	110	120	140	158	214	262
$h_{ef,max}$ = 12d								
h_1	depth of the drill hole	[mm]	96	120	144	192	240	288
$s_{cr,N}$	critical distance between anchors	[mm]	288	360	432	576	720	864
$c_{cr,N}$	critical distance from the edge	[mm]	144	180	216	288	360	432
c_{min}	minimum distance from the edge	[mm]	50	60	70	95	120	145
s_{min}	minimum distance between anchors	[mm]	50	60	70	95	120	145
h_{min}	minimum concrete thickness	[mm]	126	150	174	222	284	340
Zinc-plated stud code 			EQAC08110	EQAC10130	EQAC12160	EQAC16190	EQAC20260	EQAC24300
Stainless steel stud code A2 / A4 			EQA208110 EQA408110	EQA210130 EQA410130	EQA212160 EQA412160	EQA216190 EQA416190	EQA220260 EQA420260	EQA224300 EQA424300

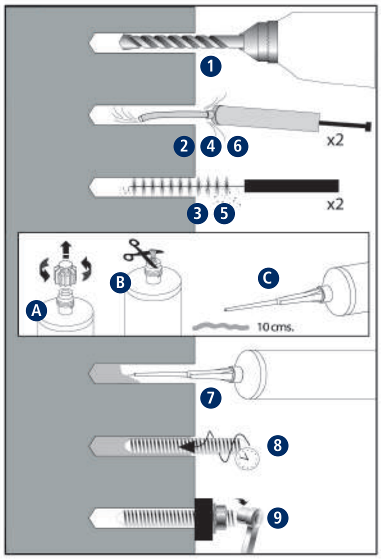


INSTALLATION ACCESSORIES

CODE	PRODUCT	MATERIAL
MOPISSI	APPLICATION GUNS	Gun for 300 ml cartridges
MOPISTO		Guns for 410 ml cartridges, professional use
MOPISNEU		Pneumatic gun for 410 ml coaxial cartridges, professional use
EQ-AC **EQ-A2** **EQ-A4**	STUD	Studs threaded steel, class 5.8 ISO 898-1 Studs stainless steel A2-70 Studs stainless steel A4-70
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole
MORCANU	MIXING TUBE	Plastic. Static labyrinth mixture

INSTALLATION PROCEDURE

CONCRETE



MINIMUM CURING TIME

TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [min]
MO-V	min +5	18	120
	+5 to +10	12	120
	+10 to +20	6	80
	+20 to +25	4	40
	+25 to +30	3	30
	+30 to +35	2	20
	+35 to +40	1.5	15
	40	1.5	10

Resistance in concrete C20/25 for an insulated anchor, without effects of distance from the edge or spacing between anchors, with a standard stud EQ-AC, EQ-A2 or EQ-A4.

Characteristic tensile strength N_{Rk}								
Metric			M8	M10	M12	M16	M20	M24
N_{Rk}	Non-cracked concrete	[kN]	*18.0*	28.3	49.8	64.3	90.8	118.8
Calculated tensile strength N_{Rd}								
Metric			M8	M10	M12	M16	M20	M24
N_{Rd}	Non-cracked concrete	[kN]	*12.0*	15.7	27.6	35.7	50.4	66.0
Maximum recommended tensile load N_{rec}								
Metric			M8	M10	M12	M16	M20	M24
N_{rec}	Non-cracked concrete	[kN]	*8.6*	11.2	19.7	25.5	36.0	47.1
Characteristic resistance to shear stress V_{Rk}								
Metric			M8	M10	M12	M16	M20	M24
V_{Rk}	Zinc-plated stud	[kN]	*9.0*	*15.0*	*21.0*	*39.0*	*61.0*	*88.0*
	Stainless steel stud (A2/A4)	[kN]	*13.0*	*20.0*	*30.0*	*55.0*	*86.0*	*124.0*
Calculated resistance to shearing V_{Rd}								
Metric			M8	M10	M12	M16	M20	M24
V_{Rd}	Zinc-plated stud	[kN]	*7.2*	*12.0*	*16.8*	*31.2*	*48.8*	*70.4*
	Stainless steel stud (A2/A4)	[kN]	*8.3*	*12.8*	*19.2*	*35.3*	*55.1*	*79.5*
Maximum recommended load to shear stress V_{rec}								
Metric			M8	M10	M12	M16	M20	M24
V_{rec}	Zinc-plated stud	[kN]	*5.1*	*8.6*	*12.0*	*22.3*	*34.9*	*50.3*
	Stainless steel stud (A2/A4)	[kN]	*6.0*	*9.2*	*13.7*	*25.2*	*39.4*	*56.8*
Effective depth of studs EQ-AC / EQ-A2 / EQ-A4								
Metric			M8	M10	M12	M16	M20	M24
Effective depth		[mm]	80	90	110	128	170	210

The values underlined and in italics indicate steel failure

Simplified calculation method. European Technical Assessment ETA 13/0753

Simplified version of the calculation method according to ETAG 001, technical report TR029. The resistance is calculated according to the data reflected in the assessment ETA 13/0753.

- Influence of concrete resistance.
- Influence of the distance from the edge of the concrete.
- Influence of the spacing between anchors.
- Influence of rebars.
- Influence of the base material thickness.
- Influence of the load application angle.
- Influence of the effective depth.
- Valid for a group of two anchors.
- Valid for dry or wet drill holes.

The calculation method is based on the following simplification:
No different loads act on individual anchors, without eccentricity.

INDEXcal
For a more precise calculation and taking into account more constructive arrangements we recommend the use of our INDEXcal calculation program. It can be downloaded free from our website **www.indexfix.com**

TENSILE LOADS

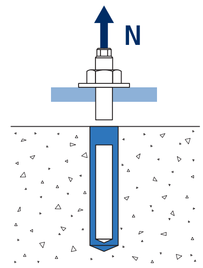
MO-V

- Calculated steel resistance: $N_{Rd,s}$
- Calculated extraction resistance: $N_{Rd,p} = N^o_{Rd,p} \cdot \Psi_c \cdot \Psi_{hef,p}$
- Calculated concrete cone resistance: $N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$
- Calculated concrete cracking resistance: $N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Calculated steel resistance

$N_{Rd,s}$

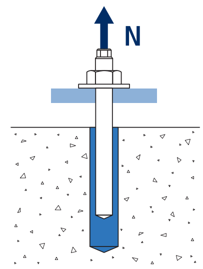
	Metric		M8	M10	M12	M16	M20	M24
$N^o_{Rd,s}$	Steel class 5.8	[kN]	12.0	19.3	28.0	52.7	82.0	118.0
	Steel class 8.8	[kN]	19.3	30.7	44.7	84.0	130.7	188.0
	Steel class 10.9	[kN]	27.8	43.6	63.2	118.0	184.2	265.4
	Stainless steel Class A2-70, A4-70	[kN]	13.9	21.9	31.6	58.8	92.0	132.1



Calculated extraction resistance

$N_{Rd,p} = N^o_{Rd,p} \cdot \Psi_c \cdot \Psi_{hef,p}$

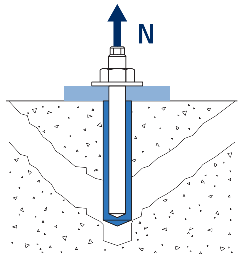
	Metric		M8	M10	M12	M16	M20	M24
$N^o_{Rd,p}$	Non-cracked concrete	[kN]	13.4	15.7	27.6	35.7	50.4	66.0



Calculated concrete cone resistance

$N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$

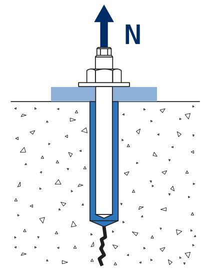
	Metric		M8	M10	M12	M16	M20	M24
$N^o_{Rd,c}$	Non-cracked concrete	[kN]	20.1	24.0	32.4	40.6	62.2	85.4



Calculated concrete cracking resistance

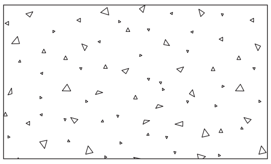
$N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Metric			M8	M10	M12	M16	M20	M24
$N^o_{Rd,sp}$	Non-cracked concrete	[kN]	20.1	24.0	32.4	40.6	62.2	85.4



MO-V

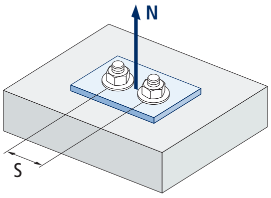
Influence coefficients



Influence of concrete resistance for extraction Ψ_c					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_c	Non-cracked concrete	1.00	1.12	1.19	1.30

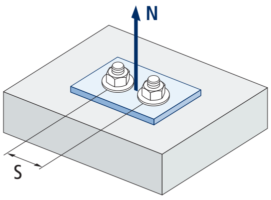
$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b		1.00	1.22	1.41	1.55



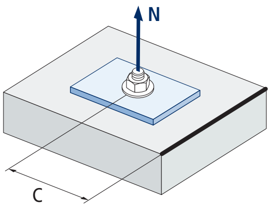
Influence of spacing between anchors (concrete cone) $\Psi_{s,N}$										
$s/s_{cr,N}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,N}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,N} = 0.5\left(1 + \frac{s}{s_{cr,N}}\right) \leq 1$$



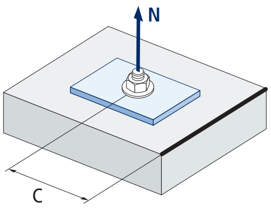
Influence of spacing between anchors (cracking) $\Psi_{s,N}$										
$s/s_{cr,sp}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,sp}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,sp} = 0.5\left(1 + \frac{s}{s_{cr,sp}}\right) \leq 1$$



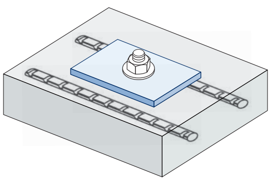
Influence of the distance from the edge of the concrete (concrete cone) $\Psi_{c,N}$												
$c/C_{cr,N}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,N}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,N} = 0.35 + \frac{0.5 \cdot c}{C_{cr,N}} + \frac{0.15 \cdot c^2}{C_{cr,N}^{\;2}} \leq 1$$



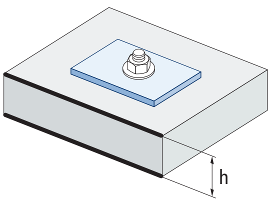
Influence of the distance from the edge of the concrete (cracking) $\Psi_{c,sp}$												
$c/C_{cr,sp}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,sp}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,sp} = 0.35 + \frac{0.5 \cdot c}{C_{cr,sp}} + \frac{0.15 \cdot c^2}{C_{cr,sp}^{\;2}} \leq 1$$



Influence of the rebars $\Psi_{re,N}$					
h_{ef} (mm)	64	70	80	90	100
$\Psi_{re,N}$	0.82	0.85	0.90	0.95	1.00

$$\Psi_{re,N} = 0.5 + \frac{h_{ef}}{200} \leq 1$$

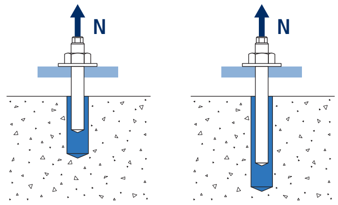


Influence of the base material thickness $\Psi_{h,sp}$											
$\Psi_{h,sp}$	h/h_{ef}	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.68
	fh	1.00	1.07	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.50

$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1.5$$

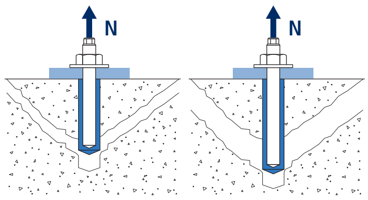
MO-V

Influence of the effective depth for the extraction combination $\Psi_{hef,p}$						
Metric h_{ef}	M8	M10	M12	M16	M20	M24
64	0.80					
80	1.00	0.89				
90	1.13	1.00	0.82		**Value not permitted**	
96	1.20	1.07	0.87			
110		1.22	1.00			
120		1.33	1.09			
128			1.16	1.00		
144			1.31	1.13		
160				1.25	0.94	
170				1.33	1.00	
192		**Value not permitted**		1.50	1.13	0.91
210					1.24	1.00
240					1.41	1.14
288						1.37



$$\Psi_{hef,p} = \frac{h_{ef}}{h_{stand}}$$

Influence of the effective depth for the concrete cone $\Psi_{hef,N}$						
Metric h_{ef}	M8	M10	M12	M16	M20	M24
64	0.72					
80	1.00	0.84				
90	1.19	1.00			**Value not permitted**	
96	1.31	1.10	0.82			
110	1.61	1.35	1.00			
120	1.84	1.54	1.14	0.91		
128	2.02	1.70	1.26	1.00	0.65	
144		2.02	1.50	1.19	0.78	
160		2.37	1.75	1.40	0.91	0.67
170		2.60	1.92	1.53	1.00	0.73
192			2.31	1.84	1.20	0.87
210			2.64	2.10	1.37	1.00
240	**Value not permitted**		3.22	2.57	1.68	1.22
288				3.38	2.21	1.61

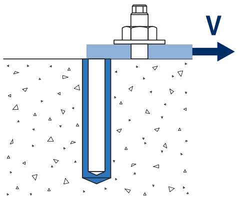


$$\Psi_{hef,N} = \left(\frac{h_{ef}}{h_{stand}}\right)^{1.5}$$

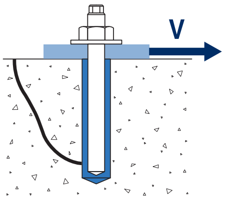
MO-V

SHEARING LOADS

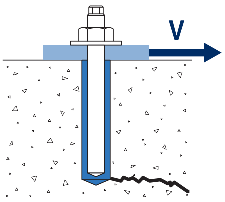
- Calculated steel resistance without lever arm: $V_{Rd,s}$
- Calculated spalling resistance: $V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$
- Calculated concrete edge resistance: $V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_b \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$



Calculated steel resistance to shearing								
$V_{Rd,s}$								
	Metric		M8	M10	M12	M16	M20	M24
$V^{o}_{Rd,s}$	Steel class 5.8	[kN]	7.2	12	16.8	31.2	48.8	70.4
	Steel class 8.8	[kN]	12	18.4	27.2	50.4	78.4	112.8
	Steel class 10.9	[kN]	12	19.3	28	52.7	82	118
	Stainless steel Class A2-70, A4-70	[kN]	8.3	12.8	19.2	35.3	55.1	79.5

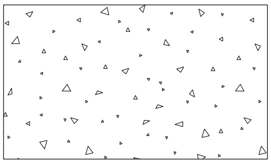


Calculated spalling resistance						
$V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$						
Metric	M8	M10	M12	M16	M20	M24
k	2					



Calculated concrete edge resistance								
$V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_b \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$								
Metric			M8	M10	M12	M16	M20	M24
$V^{o}_{Rd,c}$	Non-cracked concrete	[kN]	5.7	8.6	11.8	19.0	28.3	36.4

Influence coefficients



$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b				
Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b	1.00	1.22	1.41	1.55

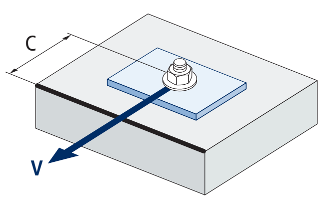
Influence of the distance from the edge and spacing between anchors $\Psi_{se,V}$

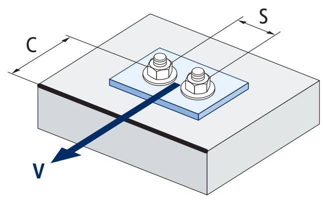
For one anchor

c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
Insulated	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18

For two anchors

s/c	c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
s/c	1.0	0.24	0.43	0.67	0.93	1.22	1.54	1.89	2.25	2.64	3.04	3.46	3.91	4.37	4.84	5.33	6.36	7.45
	1.5	0.27	0.49	0.75	1.05	1.38	1.74	2.12	2.53	2.96	3.42	3.90	4.39	4.91	5.45	6.00	7.16	8.39
	2.0	0.29	0.54	0.83	1.16	1.53	1.93	2.36	2.81	3.29	3.80	4.33	4.88	5.46	6.05	6.67	7.95	9.32
	2.5	0.32	0.60	0.92	1.28	1.68	2.12	2.59	3.09	3.62	4.18	4.76	5.37	6.00	6.66	7.33	8.75	10.25
	≥ 3.0	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18





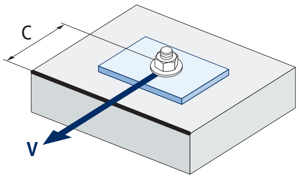
$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5}$$

$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0.5 \leq \left(\frac{c}{h_{ef}}\right)^{1.5}$$

MO-V

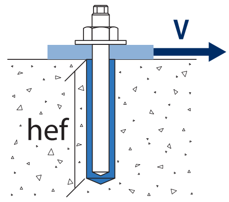
Influence of the distance from the edge of the concrete $\Psi_{c,V}$								
c/d	4	5	7	10	15	20	25	30
$\Psi_{c,V}$	0.76	0.72	0.68	0.63	0.58	0.55	0.53	0.51

$$\Psi_{c,V} = \left(\frac{d}{c}\right)^{0.20}$$

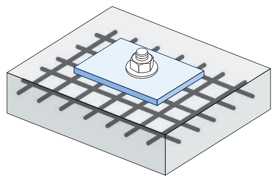


Influence of the effective depth $\Psi_{hef,V}$					
h_{ef}/d	8	9	10	11	12
$\Psi_{hef,V}$	1.65	2.04	2.47	2.93	3.42

$$\Psi_{hef,V} = 0.04 \cdot \left(\frac{h_{ef}}{d}\right)^{1.79}$$

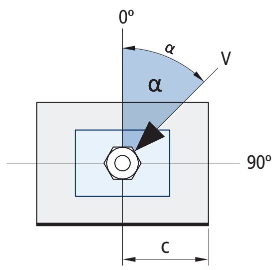


Influence of the rebars $\Psi_{re,v}$				
		Without perimeter rebar	Perimeter rebar ≥Ø12mm	Perimeter rebar with abutments at≤100mm
$\Psi_{re,v}$	Non-cracked concrete	1	1	1



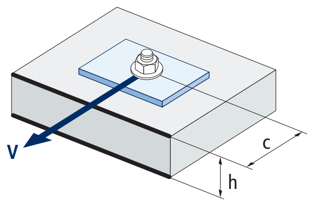
Influence of the load application angle $\Psi_{\alpha,v}$										
Angle, α(°)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,v}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50

$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos \alpha_V)^2 + \left(\frac{\sin \alpha_V}{2.5}\right)^2}} \geq 1$$



Influence of the base material thickness $\Psi_{h,V}$										
h/c	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	≥ 1.5
$\Psi_{h,V}$	0.32	0.45	0.55	0.63	0.71	0.77	0.84	0.89	0.95	1.00

$$\Psi_{h,V} = \left(\frac{h}{1.5 \cdot c}\right)^{0.5} \geq 1.0$$



MO-V

RANGE

EPOXY VINYL ESTER

CE ETA OPTION 7

CODE	DIMENSION	
NORMAL		
MO-V300	300 ml	12
MO-V410	410 ml	12


Concrete

Accessories for chemical anchor cartridges

MO-PIS Application guns


MOPISTO

MOPISSI

MOPISNEU

CODE	MODEL
MOPISTO	Manual
MOPISPR	Professional 410 ml
MOPISSI	Silicone 300 ml
MOPISNEU	Pneumatic

MO-AC Mixing tubes and miscellaneous


MORCEPKIT
Kit 3 brushes (ø15, ø20, ø30)

MORCANU

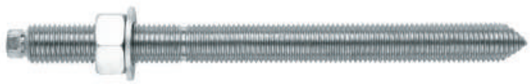
MOBOMBA

CODE	MODEL
MOBOMBA	Blower pump
MORCANU	Tube 170 - 300 - 410 ml
MORCEPKIT	Kit 3 brushes

EQ-AC Zinc-plated

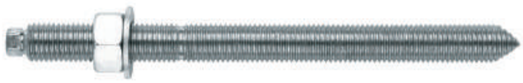
CODE	DIMENSION
EQAC08110	M8 x 110
EQAC10130	M10 x 130
EQAC12160	M12 x 160
EQAC16190	M16 x 190
EQAC20260	M20 x 260
EQAC24300	M24 x 300
EQAC30330	M30 x 330

EQ-A2 Stainless steel A2



CODE	DIMENSION
EQA208110	M8 x 110
EQA210130	M10 x 130
EQA212160	M12 x 160
EQA216190	M16 x 190
EQA220260	M20 x 260
EQA224300	M24 x 300
EQA230330	M30 x 330

EQ-A4 Stainless steel A4



CODE	DIMENSION
EQA408110	M8 x 110
EQA410130	M10 x 130
EQA412160	M12 x 160
EQA416190	M16 x 190
EQA420260	M20 x 260
EQA424300	M24 x 300
EQA430330	M30 x 330

Styrene-free polyester mortar anchor, for use in non-cracked concrete and masonry

MO-PS

Assessed ETA Option 7 (non-cracked concrete).

PRODUCT INFORMATION

DESCRIPTION
Styrene-free polyester chemical anchor. STYRENE FREE

OFFICIAL DOCUMENTATION
- ETA 13/0751 option 7, M8 to M24 for non-cracked concrete.
- ETA 17/0096 for installation in masonry.
- Declaration features DoP MO-PS.
- Certificate EVCP 1020-CPR-090-041428 for use in concrete.
- Certificate EVCP 1020-CPR-090-037484 for use in masonry.

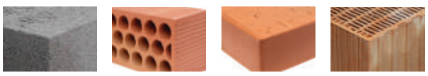
VALID FOR

Stud

DIMENSIONS
Stud M8 - M24

RANGE OF CACULATION LOADS
From 9.5 to 66.6 kN (non-cracked).

BASE MATERIAL
Concrete quality C20/25 to C50/60 non-cracked.


Concrete Hollow brick Solid brick Thermal clay

ASSESSMENTS
- ETA 13/0752 (ETAG 001-5) Option 7: non-cracked concrete.
- ETA 17/0096 (ETAG 029) Masonry.

CE ETA OPTION 7 ÉMISSIONS DANS L'AIR INTÉRIEUR A+ LEED TESTED

DRILL HOLE CONDITION

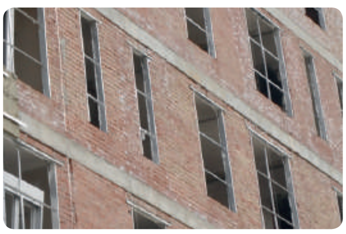
Dry Wet Flooded

CHARACTERISTICS AND BENEFITS
- Easy installation.
- Use in non-cracked concrete, hollow and solid plasterboard.
- Used for medium-high loads.
- Temperature range -40°C to +80°C (maximum long-term temperature +50°C).
- Two versions, standard and stone colour.
- Variety of lengths and diameters: M8-M24-assessed studs, flexible assembly.
- For static or quasi-static loads.
- Version in zinc plated steel, stainless steel A2 and A4.
- Styrene-free polyester resin for all types of materials
- Available in INDEXcal.

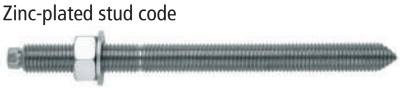
MATERIALS
Standard stud:
Carbon steel, zinc plated ≥ 5 µm. Z ZINC

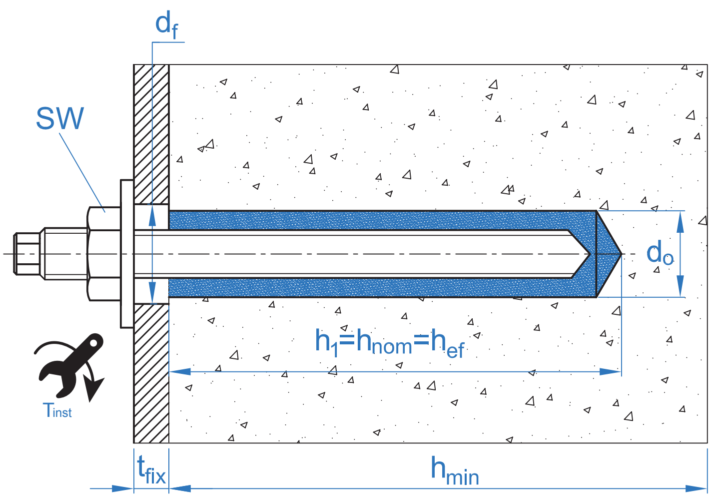
Stainless standard stud:
Stainless steel A2-70 and A4-70. A2 INOX AISI 304 A4 INOX AISI 316

APPLICATIONS
- For indoor and outdoor use.
- Fixing of building substructures.
- Rehabilitation of facades. For fixing air-conditioning supports, boilers, awnings, signs, balconies, shelving units, railings, etc.
- Large metric sizes, retaining walls.
- Structural applications.



CONCRETE INSTALLATION PARAMETERS

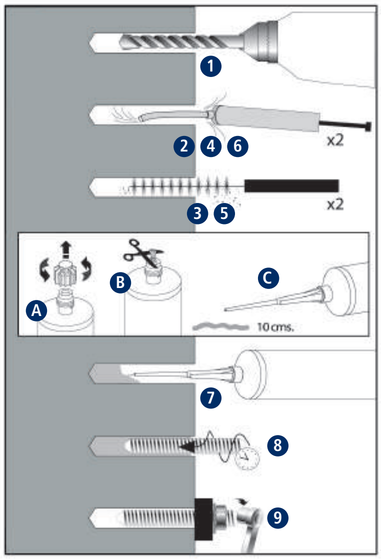
METRIC			M8	M10	M12	M16	M20	M24
d_0	nominal diameter	[mm]	10	12	14	18	22	26
d_f	diameter in anchor plate ≤	[mm]	9	12	14	18	22	26
T_{inst}	tightening torque ≤	[Nm]	10	20	40	80	150	200
Circular cleaning brush			Ø14		Ø20		Ø29	
$h_{ef,min}$ = 8d								
h_1	depth of the drill hole	[mm]	64	80	96	128	160	192
$s_{cr,N}$	critical distance between anchors	[mm]	192	240	288	384	480	576
$c_{cr,N}$	critical distance from the edge	[mm]	96	120	144	192	240	288
c_{min}	minimum distance from the edge	[mm]	35	40	50	65	80	96
s_{min}	minimum distance between anchors	[mm]	35	40	50	65	80	96
h_{min}	minimum concrete thickness	[mm]	100	110	126	158	204	244
Standard stud								
h_1	depth of the drill hole	[mm]	80	90	110	128	170	210
$s_{cr,N}$	critical distance between anchors	[mm]	240	270	330	384	510	630
$c_{cr,N}$	critical distance from the edge	[mm]	120	135	165	192	255	315
c_{min}	minimum distance from the edge	[mm]	43	45	56	65	85	105
s_{min}	minimum distance between anchors	[mm]	43	45	56	65	85	105
h_{min}	minimum concrete thickness	[mm]	110	120	140	158	214	262
$h_{ef,max}$ = 12d								
h_1	depth of the drill hole	[mm]	96	120	144	192	240	288
$s_{cr,N}$	critical distance between anchors	[mm]	288	360	432	576	720	864
$c_{cr,N}$	critical distance from the edge	[mm]	144	180	216	288	360	432
c_{min}	minimum distance from the edge	[mm]	50	60	70	95	120	145
s_{min}	minimum distance between anchors	[mm]	50	60	70	95	120	145
h_{min}	minimum concrete thickness	[mm]	126	150	174	222	284	340
Zinc-plated stud code 			EQAC08110	EQAC10130	EQAC12160	EQAC16190	EQAC20260	EQAC24300
Stainless steel stud code A2 / A4 			EQA208110 EQA408110	EQA210130 EQA410130	EQA212160 EQA412160	EQA216190 EQA416190	EQA220260 EQA420260	EQA224300 EQA424300



INSTALLATION ACCESSORIES		
CODE	PRODUCT	MATERIAL
MOPISSI	APPLICATION GUNS	Gun for 300 ml cartridges
MOPISTO	APPLICATION GUNS	Guns for 410 ml cartridges, professional use
MOPISNEU	APPLICATION GUNS	Pneumatic gun for 410 ml coaxial cartridges, professional use
EQ-AC **EQ-A2** **EQ-A4**	STUD	Studs threaded steel, class 5.8 ISO 898-1 Studs stainless steel A2-70 Studs stainless steel A4-70
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole
MORCANU	MIXING TUBE	Plastic. Static labyrinth mixture

INSTALLATION PROCEDURE

CONCRETE



MINIMUM CURING TIME			
TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [min]
MO-PS / MO-PSP	min +5	18	145
	+5 to +10	10	145
	+10 to +20	6	85
	+20 to +25	5	50
	+25 to +30	4	40
	+30	4	35

Resistance in concrete C20/25 for an insulated anchor, without effects of distance from the edge or spacing between anchors, with a standard stud EQ-AC, EQ-A2 or EQ-A4.

Characteristic tensile strength N_{Rk}								
Metric			M8	M10	M12	M16	M20	M24
N_{Rk}	Non-cracked concrete	[kN]	17.1	22.6	37.3	57.9	85.5	118.8
Calculated tensile strength N_{Rd}								
Metric			M8	M10	M12	M16	M20	M24
N_{Rd}	Non-cracked concrete	[kN]	9.5	12.6	20.7	32.2	47.5	66.0
Maximum recommended tensile load N_{rec}								
Metric			M8	M10	M12	M16	M20	M24
N_{rec}	Non-cracked concrete	[kN]	6.8	9.0	14.8	23.0	33.9	47.1
Characteristic resistance to shear stress V_{Rk}								
Metric			M8	M10	M12	M16	M20	M24
V_{Rk}	Zinc-plated stud	[kN]	*9.0*	*15.0*	*21.0*	*39.0*	*61.0*	*88.0*
	Stainless steel stud (A2/A4)	[kN]	*13.0*	*20.0*	*30.0*	*55.0*	*86.0*	*124.0*
Calculated resistance to shearing V_{Rd}								
Metric			M8	M10	M12	M16	M20	M24
V_{Rd}	Zinc-plated stud	[kN]	*7.2*	*12.0*	*16.8*	*31.2*	*48.8*	*70.4*
	Stainless steel stud (A2/A4)	[kN]	*8.3*	*12.8*	*19.2*	*35.3*	*55.1*	*79.5*
Maximum recommended load to shear stress V_{rec}								
Metric			M8	M10	M12	M16	M20	M24
V_{rec}	Zinc-plated stud	[kN]	*5.1*	*8.6*	*12.0*	*22.3*	*34.9*	*50.3*
	Stainless steel stud (A2/A4)	[kN]	*6.0*	*9.2*	*13.7*	*25.2*	*39.4*	*56.8*
Effective depth of studs EQ-AC / EQ-A2 / EQ-A4								
Metric			M8	M10	M12	M16	M20	M24
Effective depth		[mm]	80	90	110	128	170	210

The values underlined and in italics indicate steel failure

Simplified calculation method. European Technical Assessment ETA 13/0751

Simplified version of the calculation method according to ETAG 001, technical report TR029. The resistance is calculated according to the data reflected in the assessment ETA 13/0751.

- Influence of concrete resistance.
- Influence of the distance from the edge of the concrete.
- Influence of the spacing between anchors.
- Influence of rebars.
- Influence of the base material thickness.
- Influence of the load application angle.
- Influence of the effective depth.
- Valid for a group of two anchors.
- Valid for dry or wet drill holes.

The calculation method is based on the following simplification:
No different loads act on individual anchors, without eccentricity.

INDEXcal
For a more precise calculation and taking into account more constructive arrangements we recommend the use of our INDEXcal calculation program. It can be downloaded free from our website **www.indexfix.com**

TENSILE LOADS

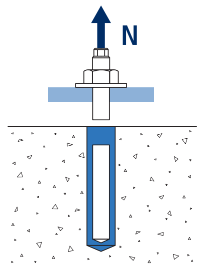
MO-PS

- Calculated steel resistance: $N_{Rd,s}$
- Calculated extraction resistance: $N_{Rd,p} = N^o_{Rd,p} \cdot \Psi_c \cdot \Psi_{hef,p}$
- Calculated concrete cone resistance: $N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$
- Calculated concrete cracking resistance: $N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Calculated steel resistance

$N_{Rd,s}$

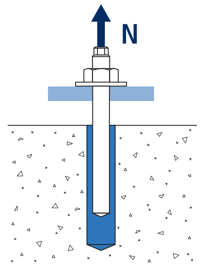
Metric			M8	M10	M12	M16	M20	M24
$N^o_{Rd,s}$	Steel class 5.8	[kN]	12.0	19.3	28.0	52.7	82.0	118.0
	Steel class 8.8	[kN]	19.3	30.7	44.7	84.0	130.7	188.0
	Steel class 10.9	[kN]	27.8	43.6	63.2	118.0	184.2	265.4
	Stainless steel Class A2-70, A4-70	[kN]	13.9	21.9	31.6	58.8	92.0	132.1



Calculated extraction resistance

$N_{Rd,p} = N^o_{Rd,p} \cdot \Psi_c \cdot \Psi_{hef,p}$

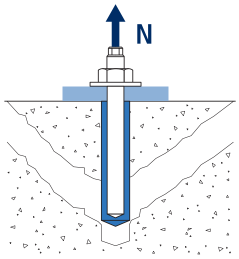
Metric			M8	M10	M12	M16	M20	M24
$N^o_{Rd,p}$	Non-cracked concrete	[kN]	9.5	12.6	20.7	32.2	47.5	66.0



Calculated concrete cone resistance

$N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$

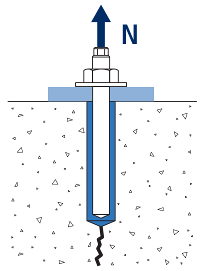
Metric			M8	M10	M12	M16	M20	M24
$N^o_{Rd,c}$	Non-cracked concrete	[kN]	20.1	24.0	32.4	40.6	62.2	85.4



Calculated concrete cracking resistance

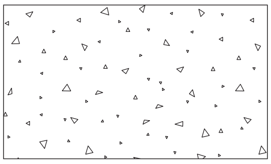
$N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Metric			M8	M10	M12	M16	M20	M24
$N^o_{Rd,sp}$	Non-cracked concrete	[kN]	20.1	24.0	32.4	40.6	62.2	85.4



MO-PS

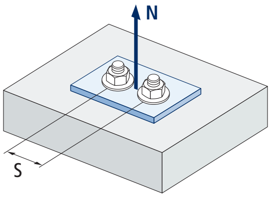
Influence coefficients



Influence of concrete resistance for extraction Ψ_c					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_c	Non-cracked concrete	1.00	1.12	1.19	1.30

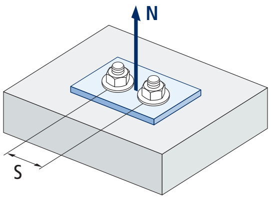
$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b		1.00	1.22	1.41	1.55



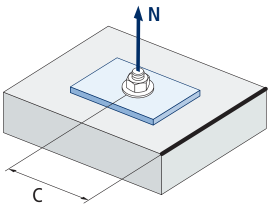
Influence of spacing between anchors (concrete cone) $\Psi_{s,N}$										
$s/s_{cr,N}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,N}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,N} = 0.5\left(1 + \frac{s}{s_{cr,N}}\right) \leq 1$$



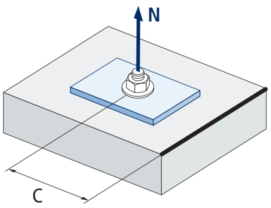
Influence of spacing between anchors (cracking) $\Psi_{s,N}$										
$s/s_{cr,sp}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,sp}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,sp} = 0.5\left(1 + \frac{s}{s_{cr,sp}}\right) \leq 1$$



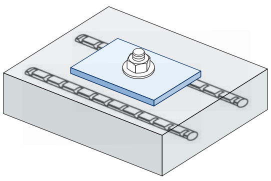
Influence of the distance from the edge of the concrete (concrete cone) $\Psi_{c,N}$												
$c/C_{cr,N}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,N}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,N} = 0.35 + \frac{0.5 \cdot c}{C_{cr,N}} + \frac{0.15 \cdot c^2}{C_{cr,N}^{\ 2}} \leq 1$$



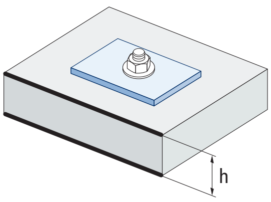
Influence of the distance from the edge of the concrete (cracking) $\Psi_{c,sp}$												
$c/C_{cr,sp}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,sp}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,sp} = 0.35 + \frac{0.5 \cdot c}{C_{cr,sp}} + \frac{0.15 \cdot c^2}{C_{cr,sp}^{\ 2}} \leq 1$$



Influence of the rebars $\Psi_{re,N}$					
h_{ef} (mm)	64	70	80	90	100
$\Psi_{re,N}$	0.82	0.85	0.90	0.95	1.00

$$\Psi_{re,N} = 0.5 + \frac{h_{ef}}{200} \leq 1$$



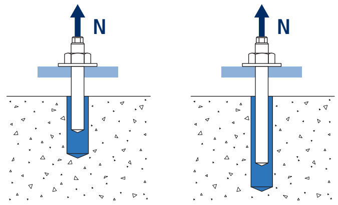
• Influence of the base material thickness $\Psi_{h,sp}$											
$\Psi_{h,sp}$	h/h_{ef}	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.68
	fh	1.00	1.07	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.50

$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1.5$$

MO-PS

• Influence of the effective depth for the extraction combination $\Psi_{hef,p}$

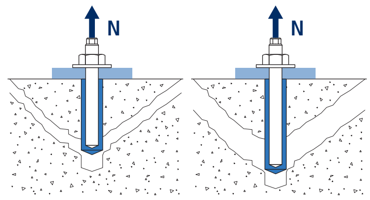
Metric h_{ef}	M8	M10	M12	M16	M20	M24
64	0.80					
80	1.00	0.89				
90	1.13	1.00	0.82		Value not permitted	
96	1.20	1.07	0.87			
110		1.22	1.00			
120		1.33	1.09			
128			1.16	1.00		
144			1.31	1.13		
160				1.25	0.94	
170				1.33	1.00	
192		Value not permitted		1.50	1.13	0.91
210					1.24	1.00
240					1.41	1.14
288						1.37



$$\Psi_{hef,p} = \frac{h_{ef}}{h_{stand}}$$

• Influence of the effective depth for the concrete cone $\Psi_{hef,N}$

Metric h_{ef}	M8	M10	M12	M16	M20	M24
64	0.72					
80	1.00	0.84				
90	1.19	1.00			Value not permitted	
96	1.31	1.10	0.82			
110	1.61	1.35	1.00			
120	1.84	1.54	1.14	0.91		
128	2.02	1.70	1.26	1.00	0.65	
144		2.02	1.50	1.19	0.78	
160		2.37	1.75	1.40	0.91	0.67
170		2.60	1.92	1.53	1.00	0.73
192			2.31	1.84	1.20	0.87
210			2.64	2.10	1.37	1.00
240	Value not permitted		3.22	2.57	1.68	1.22
288				3.38	2.21	1.61

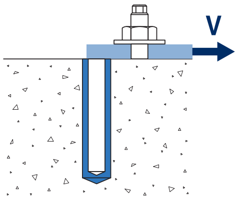


$$\Psi_{hef,N} = \left(\frac{h_{ef}}{h_{stand}}\right)^{1.5}$$

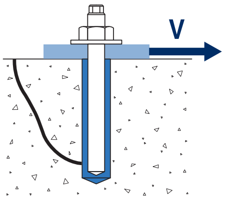
MO-PS

SHEARING LOADS

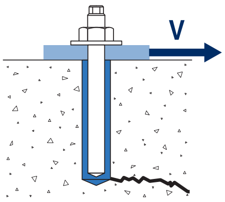
- Calculated steel resistance without lever arm: $V_{Rd,s}$
- Calculated spalling resistance: $V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$
- Calculated concrete edge resistance: $V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$



Calculated steel resistance to shearing								
$V_{Rd,s}$								
	Metric		M8	M10	M12	M16	M20	M24
$V^{o}_{Rd,s}$	Steel class 5.8	[kN]	7.2	12	16.8	31.2	48.8	70.4
	Steel class 8.8	[kN]	12	18.4	27.2	50.4	78.4	112.8
	Steel class 10.9	[kN]	12	19.3	28	52.7	82	118
	Stainless steel Class A2-70, A4-70	[kN]	8.3	12.8	19.2	35.3	55.1	79.5

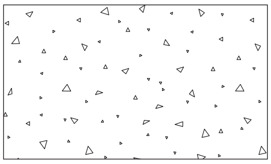


Calculated spalling resistance						
$V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$						
Metric	M8	M10	M12	M16	M20	M24
k	2					



Calculated concrete edge resistance								
$V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$								
Metric			M8	M10	M12	M16	M20	M24
$V^{o}_{Rd,c}$	Non-cracked concrete	[kN]	5.7	8.6	11.8	19.0	28.3	36.4

Influence coefficients



$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b				
Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b	1.00	1.22	1.41	1.55

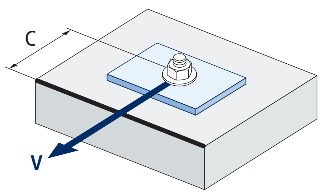
Influence of the distance from the edge and spacing between anchors $\Psi_{se,V}$

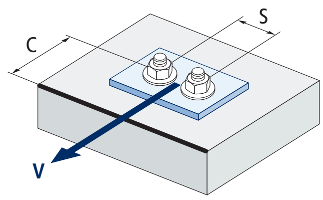
For one anchor

c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
Insulated	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18

For two anchors

s/c	c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
	1.0	0.24	0.43	0.67	0.93	1.22	1.54	1.89	2.25	2.64	3.04	3.46	3.91	4.37	4.84	5.33	6.36	7.45
	1.5	0.27	0.49	0.75	1.05	1.38	1.74	2.12	2.53	2.96	3.42	3.90	4.39	4.91	5.45	6.00	7.16	8.39
	2.0	0.29	0.54	0.83	1.16	1.53	1.93	2.36	2.81	3.29	3.80	4.33	4.88	5.46	6.05	6.67	7.95	9.32
	2.5	0.32	0.60	0.92	1.28	1.68	2.12	2.59	3.09	3.62	4.18	4.76	5.37	6.00	6.66	7.33	8.75	10.25
	≥ 3.0	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18



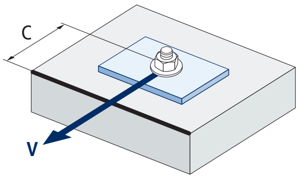


$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5}$$

$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0.5 \leq \left(\frac{c}{h_{ef}}\right)^{1.5}$$

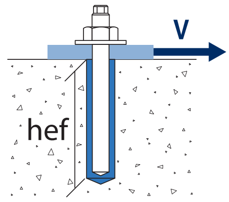
MO-PS

Influence of the distance from the edge of the concrete $\Psi_{c,V}$								
c/d	4	5	7	10	15	20	25	30
$\Psi_{c,V}$	0.76	0.72	0.68	0.63	0.58	0.55	0.53	0.51



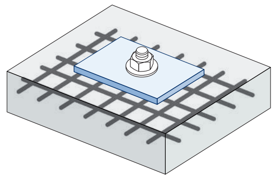
$$\Psi_{c,V} = \left(\frac{d}{c}\right)^{0.20}$$

Influence of the effective depth $\Psi_{hef,V}$					
h_{ef}/d	8	9	10	11	12
$\Psi_{hef,V}$	1.65	2.04	2.47	2.93	3.42

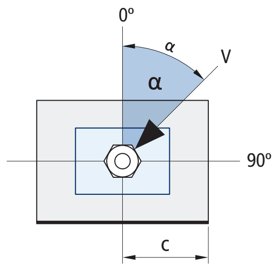


$$\Psi_{hef,V} = 0.04 \cdot \left(\frac{h_{ef}}{d}\right)^{1.79}$$

Influence of the rebars $\Psi_{re,V}$				
		Without perimeter rebar	Perimeter rebar ≥Ø12mm	Perimeter rebar with abutments at≤100mm
$\Psi_{re,V}$	Non-cracked concrete	1	1	1

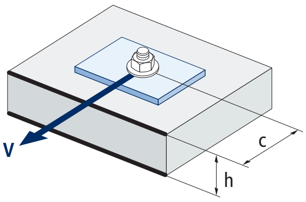


Influence of the load application angle $\Psi_{\alpha,V}$										
Angle, α(º)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,V}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50



$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos \alpha_V)^2 + \left(\frac{\sin \alpha_V}{2.5}\right)^2}} \geq 1$$

Influence of the base material thickness $\Psi_{h,V}$										
h/c	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	≥ 1.5
$\Psi_{h,V}$	0.32	0.45	0.55	0.63	0.71	0.77	0.84	0.89	0.95	1.00



$$\Psi_{h,V} = \left(\frac{h}{1.5 \cdot c}\right)^{0.5} \geq 1.0$$

MO-PS

FIXING IN BRICKS

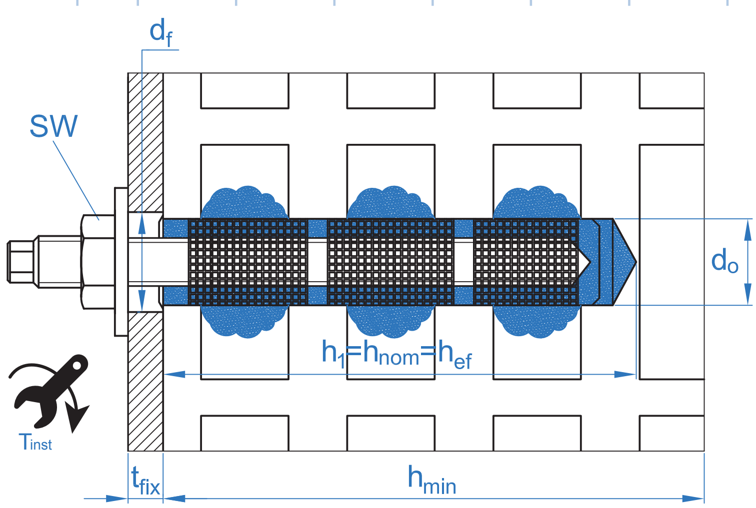
INSTALLATION PARAMETERS IN BRICKS. PLASTIC SLEEVE				
DIMENSION		M8	M10	M12
Plastic sleeve	ls		85	
	d_o	15	15	20
Mortar volume per sleeve	[ml]	15	15	27
h_1 drill hole depth ≥	[mm]	90	90	90
h_{nom} sleeve installation depth	[mm]	85	85	85
h_{ef} stud depth ≥	[mm]	80	80	80
t_{fix} thickness material to be fixed ≤	[mm]	22	25	18
h_{min} base material thickness ≥	[mm]	110	110	110
d_f diameter in metal sheet ≤	[mm]	9	12	14
T_{ins} tightening torque ≤	[Nm]	2	2	2
Circular brush			ø20	
Stud code 		MOES08110	MOES10115	MOES12110
Sleeve code		MOTN15085	MOTN15085	MOTN20085

BASE MATERIAL		PLASTIC SLEEVE								
		M8			M10			M12		
Minimum distances and from the edge		$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min\,II}$	$s_{min\perp} = c_{min\perp}$	$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min\,II}$	$s_{min\perp} = c_{min\perp}$	$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min\,II}$	$s_{min\perp} = c_{min\perp}$
Brick number 1	[mm]	100	235	115	100	235	115	120	235	115
Brick number 2	[mm]	100	240	113	100	240	113	120	240	113
Brick number 3	[mm]	100	237	237	100	237	237	120	250	237
Brick number 4	[mm]	128	255	255	128	255	255	128	255	255
Brick number 5	[mm]	128	255	255	128	255	255	128	255	255
Brick number 6	[mm]	100	250	240	100	250	240	120	250	240
Brick number 7	[mm]	100	250	248	100	250	248	-	-	-
Brick number 8	[mm]	100	250	248	100	250	248	120	250	248
Brick number 9	[mm]	100	370	238	100	370	238	120	370	238

MO-PS

INSTALLATION PARAMETERS IN BRICKS. METAL SLEEVE				
DIMENSION		M8	M10	M12
Plastic sleeve	ls	85		
	d_o	15	20	20
Mortar volume per sleeve	[ml]	15	15	20
h_1 drill hole depth ≥	[mm]	90	90	90
h_{nom} inst. depth plastic sleeve	[mm]	85	85	85
h_{ef} stud depth ≥	[mm]	80	80	80
t_{fix} thickness material to be fixed ≤	[mm]	22	25	18
h_{min} base material thickness ≥	[mm]	110	110	110
d_f diameter in metal sheet ≤	[mm]	9	12	14
T_{ins} tightening torque ≤	[Nm]	2	2	2
Circular brush		ø20		
Stud code		MOES08110	MOES10115	MOES12110
Sleeve code		MOTN15085	MOTN15085	MOTN20085
Threaded sleeve code		MOTRO08	MOTRO10	MOTRO12

BASE MATERIAL		PLASTIC SLEEVE								
		M8			M10			M12		
Minimum distances and from the edge		$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min\,II}$	$s_{min\,\perp} = c_{min\,\perp}$	$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min\,II}$	$s_{min\,\perp} = c_{min\,\perp}$	$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min\,II}$	$s_{min\,\perp} = c_{min\,\perp}$
Brick number 1	[mm]	100	235	115	120	235	115	120	235	115
Brick number 2	[mm]	100	240	113	120	240	113	120	240	113
Brick number 3	[mm]	-	-	-	120	250	237	120	250	237
Brick number 4	[mm]	128	255	255	128	255	255	128	255	255
Brick number 5	[mm]	128	255	255	128	255	255	128	255	255
Brick number 6	[mm]	100	250	240	120	250	240	120	250	240
Brick number 7	[mm]	100	250	248	120	250	248	120	250	248
Brick number 8	[mm]	-	-	-	120	250	248	120	250	248
Brick number 9	[mm]	100	370	238	120	370	238	120	370	238

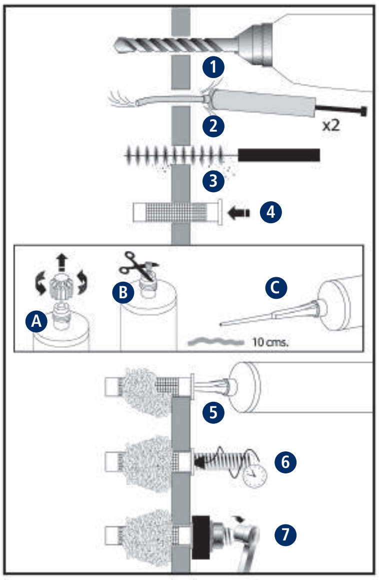


MO-PS

INSTALLATION ACCESSORIES		
CODE	PRODUCT	MATERIAL
MOPISSI	APPLICATION GUNS	Gun for 300 ml cartridges
MOPISTO		Guns for 410 ml cartridges, professional use
MOPISNEU		Pneumatic gun for 410 ml coaxial cartridges, professional use
MO-ES	STUD	Threaded stud
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole
MORCANU	MIXING TUBE	Plastic. Static labyrinth mixture
MO-TN	NYLON SLEEVE	Plastic white or grey
MO-TR	THREADED METAL SLEEVE	Threaded metal sleeve M8, M10, M12, zinc-plated
MO-TM	METAL SLEEVE	Metal sleeve ø12, ø16 and ø22 mm

INSTALLATION PROCEDURE

BRICK



MINIMUM CURING TIME			
TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [min]
MO-PS / MO-PSP	min +5	18	145
	+5 to +10	10	145
	+10 to +20	6	85
	+20 to +25	5	50
	+25 to +30	4	40
	+30	4	35

MO-PS

Characteristic resistances (F_{Rk})						
Base material	Threaded studs Tensile and shear force [kN]			Threaded metal sleeve Tensile and shear force [kN]		
	M8	M10	M12	M8	M10	M12
Brick number 1	2.50	2.0	2.0	1.5	2.50	2.50
Brick number 2	0.75	1.2	0.5	0.6	0.75	0.90
Brick number 3	0.75	1.2	0.5	-	0.75	0.40
Brick number 4	1.50	1.5	3.0	2.0	3.00	4.00
Brick number 5	0.75	0.9	1.5	2.0	1.50	0.90
Brick number 6	1.20	1.2	0.9	0.9	1.50	0.60
Brick number 7	0.60	0.2	-	0.5	0.30	0.75
Brick number 8	0.60	1.5	1.2	-	0.40	0.60
Brick number 9	2.50	1.5	2.5	0.6	1.20	0.90

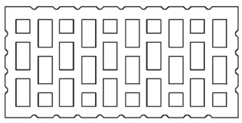
Calculated resistances (F_{Rd})						
Base material	Threaded studs Tensile and shear force [kN]			Threaded metal sleeve Tensile and shear force [kN]		
	M8	M10	M12	M8	M10	M12
Brick number 1	1.00	0.80	0.80	0.60	1.00	1.00
Brick number 2	0.30	0.48	0.20	0.24	0.30	0.36
Brick number 3	0.30	0.48	0.20	-	0.30	0.16
Brick number 4	0.60	0.60	1.20	0.80	1.20	1.60
Brick number 5	0.30	0.36	0.60	0.80	0.60	0.36
Brick number 6	0.48	0.48	0.36	0.36	0.60	0.24
Brick number 7	0.24	0.08	-	0.20	0.12	0.30
Brick number 8	0.24	0.60	0.48	-	0.16	0.24
Brick number 9	1.00	0.60	1.00	0.24	0.48	0.36

Recommended maximum loads (F_{recom}) (with andF= 1.4)						
Base material	Threaded studs Tensile and shear force [kN]			Threaded metal sleeve Tensile and shear force [kN]		
	M8	M10	M12	M8	M10	M12
Brick number 1	0.71	0.57	0.57	0.43	0.71	0.71
Brick number 2	0.21	0.34	0.14	0.17	0.21	0.26
Brick number 3	0.21	0.34	0.14	-	0.21	0.11
Brick number 4	0.43	0.43	0.86	0.57	0.86	1.14
Brick number 5	0.21	0.26	0.43	0.57	0.43	0.26
Brick number 6	0.34	0.34	0.26	0.26	0.43	0.17
Brick number 7	0.17	0.06	-	0.14	0.09	0.21
Brick number 8	0.17	0.43	0.34	-	0.11	0.17
Brick number 9	0.71	0.43	0.71	0.17	0.34	0.26

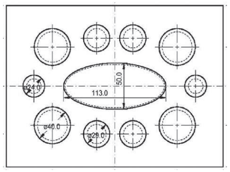
MO-PS

BRICK TYPES

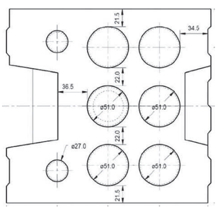
Brick no. 1
Hollow clay brick HLz
12-1,0-2DF according to EN 771-1
Length / width / height:
235 mm / 112 mm / 115 mm
fb ≥ 12 N/mm^2 / ρ ≥ 1.0 kg/dm^3



Brick no. 2
Silico-calcareous hollow brick KSL 12-1,
4-3DF according to EN 771-2
Length / width / height:
240 mm / 175 mm / 113 mm
fb ≥ 12 N/mm^2 / ρ ≥ 1.4 kg/dm^3



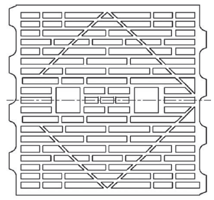
Brick no. 3
Silico-calcareous hollow brick KSL 12-1,
4-2DF according to EN 771-2
Length / width / height:
250 mm / 240 mm / 237 mm
fb ≥ 12 N/mm^2 / ρ ≥ 1.4 kg/dm^3



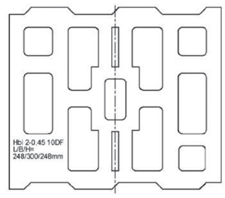
Brick no. 4
Fired clay solid brick Mz 12-2, 0-NF
according to EN 771-1
Length / width / height:
240 mm / 116 mm / 71 mm
fb ≥ 12 N/mm^2 / ρ ≥ 2.0 kg/dm^3

Brick no. 5
Silico-calcareous solid brick KS 12-2,
0-NF according to EN 771-2
Length / width / height:
240 mm / 115 mm / 70 mm
fb ≥ 12 N/mm^2 / ρ ≥ 2.0 kg/dm^3

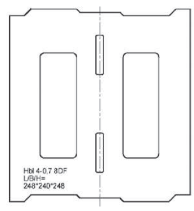
Brick no. 6
Fired clay hollow brick HLzW 6-0,7-8DF
according to EN 771-1
Length / width / height:
250 mm / 240 mm / 240 mm
fb ≥ 6 N/mm^2 / ρ ≥ 0.8 kg/dm^3



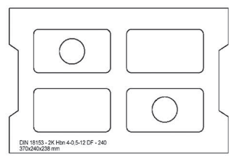
Brick no. 7
Lightweight concrete hollow block Hbl
2-0,45-10DF according to EN 771-3
Length / width / height:
250 mm / 300 mm / 248 mm
fb ≥ 2.0 N/mm^2 / ρ ≥ 0.45 kg/dm^3



Brick no. 8
Lightweight concrete hollow block Hbl
4-0, 7-8DF according to EN 771-3
Length / width / height:
250 mm / 240 mm / 248 mm
fb ≥ 4.0 N/mm^2 / ρ ≥ 0.7 kg/dm^3



Brick no. 9
Concrete block Hbn 4-12DF according
to EN 771-3
Length / width / height:
370 mm / 240 mm / 238 mm
fb b ≥ 4 N/mm^2 / ρ ≥ 1.2 kg/dm^3



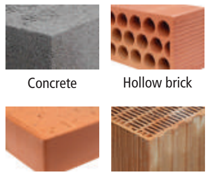
RANGE

MO-PS

STYRENE-FREE POLYESTER

OPTION 7
ÉMISSIONS DANS L'AIR INTÉRIEUR
LEED
STYRENE FREE

CODE	DIMENSION	
NORMAL		
MO-PS300	300 ml	12
MO-PS410	410 ml	12
LOW TEMPERATURES		
MO-PSP300	300 ml	12
MO-PSP410	410 ml	12



Accessories for chemical anchor cartridges

MO-PIS Application guns

CODE	MODEL
MOPISTO	Manual
MOPISPR	Professional 410 ml
MOPISSI	Silicone 300 ml
MOPISNEU	Pneumatic

MO-TN Plastic sleeve

Ny NYLON

CODE	DIMENSION
MOTN12050	12 x 50
MOTN15085	15 x 85
MOTN15130	15 x 130
MOTN20085	20 x 85

MO-AC Mixing tubes and miscellaneous

MORCEPKIT
Kit 3 brushes (ø15, ø20, ø30)

CODE	MODEL
MOBOMBA	Blower pump
MORCANU	Tube 170 - 300 - 410 ml
MORCEPKIT	Kit 3 brushes

MO-ES Threaded stud

Z ZINC

CODE	DIMENSION
MOES06070	M6 x 70
MOES08110	M8 x 110
MOES10115	M10 x 115
MOES12110	M12 x 110

MO-TM Metal sleeve

Z ZINC

CODE	DIMENSION
MOTM12100	12 x 1000
MOTM16100	16 x 1000
MOTM22100	22 x 1000

MO-TR Threaded sleeve

Z ZINC

CODE	DIMENSION
MOTRO08	M8/12 x 80
MOTRO10	M10/14 x 80
MOTRO12	M12/16 x 80

MO-PS

Accessories for chemical anchor cartridges

Stud for chemical anchor with nut and washer

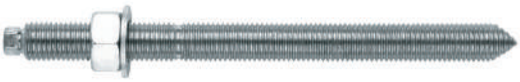
EQ-AC Zinc-plated

CODE	DIMENSION
EQAC08110	M8 x 110
EQAC10130	M10 x 130
EQAC12160	M12 x 160
EQAC16190	M16 x 190
EQAC20260	M20 x 260
EQAC24300	M24 x 300
EQAC30330	M30 x 330

EQ-A2 Stainless steel A2

CODE	DIMENSION
EQA208110	M8 x 110
EQA210130	M10 x 130
EQA212160	M12 x 160
EQA216190	M16 x 190
EQA220260	M20 x 260
EQA224300	M24 x 300
EQA230330	M30 x 330

EQ-A4 Stainless steel A4



CODE	DIMENSION
EQA408110	M8 x 110
EQA410130	M10 x 130
EQA412160	M12 x 160
EQA416190	M16 x 190
EQA420260	M20 x 260
EQA424300	M24 x 300
EQA430330	M30 x 330

Polyester mortar anchor, for use in non-cracked concrete and masonry

MO-P

Assessed ETA Option 7 (non-cracked concrete).

PRODUCT INFORMATION

DESCRIPTION
Chemical anchor, polyester.

OFFICIAL DOCUMENTATION
- ETA 13/0752 option 7, M8 to M24 for non-cracked concrete.
- Declaration features DoP MO-P.
- Certificate EVCP 1020-CPR-090-041426 for use in concrete.

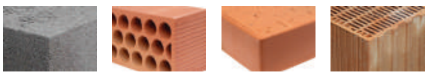
VALID FOR

Stud

DIMENSIONS
Stud M8 - M24

RANGE OF CACULATION LOADS
From 10.6 to 61.6 kN (non-cracked).

BASE MATERIAL
Concrete quality C20/25 to C50/60 non-cracked.



ASSESSMENTS
- ETA 13/0752 (ETAG 001-5) Option 7: non-cracked concrete.

CE ETA OPTION 7 ÉMISSIONS DANS L'AIR INTÉRIEUR A+ LEED

DRILL HOLE CONDITION

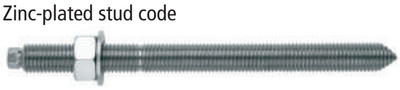

CHARACTERISTICS AND BENEFITS
- Easy installation.
- Use in non-cracked concrete, hollow and solid plasterboard.
- Used for medium-high loads.
- Temperature range -40°C to +80°C (maximum long-term temperature +50°C).
- Variety of lengths and diameters: M8-M24-assessed studs, flexible assembly.
- For static or quasi-static loads.
- Version in zinc plated steel, stainless steel A2 and A4.
- Available in INDEXcal.

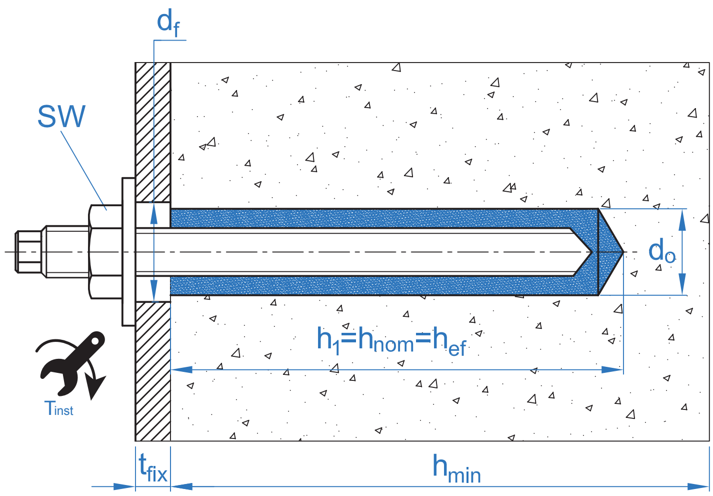
MATERIALS
Standard stud:
Carbon steel, zinc plated ≥ 5 µm. (ZINC)

Stainless standard stud:
Stainless steel A2-70 and A4-70. (A2 INOX AISI 304, A4 INOX AISI 316)

APPLICATIONS
- For indoor and outdoor use.
- Fixing of building substructures.
- Rehabilitation of facades. For fixing air-conditioning supports, boilers, awnings, signs, balconies, shelving units, railings, etc.
- Large metric sizes, retaining walls.
- Structural applications.

CONCRETE INSTALLATION PARAMETERS

METRIC			M8	M10	M12	M16	M20	M24
d_0	nominal diameter	[mm]	10	12	14	18	22	26
d_f	diameter in anchor plate ≤	[mm]	9	12	14	18	22	26
T_{inst}	tightening torque ≤	[Nm]	10	20	40	80	150	200
Circular cleaning brush			Ø14		Ø20		Ø29	
$h_{ef,min}$ = 8d								
h_1	depth of the drill hole	[mm]	64	80	96	128	160	192
$s_{cr,N}$	critical distance between anchors	[mm]	192	240	288	384	480	576
$c_{cr,N}$	critical distance from the edge	[mm]	96	120	144	192	240	288
c_{min}	minimum distance from the edge	[mm]	35	40	50	65	80	96
s_{min}	minimum distance between anchors	[mm]	35	40	50	65	80	96
h_{min}	minimum concrete thickness	[mm]	100	110	126	158	204	244
Standard stud								
h_1	depth of the drill hole	[mm]	80	90	110	128	170	210
$s_{cr,N}$	critical distance between anchors	[mm]	240	270	330	384	510	630
$c_{cr,N}$	critical distance from the edge	[mm]	120	135	165	192	255	315
c_{min}	minimum distance from the edge	[mm]	43	45	56	65	85	105
s_{min}	minimum distance between anchors	[mm]	43	45	56	65	85	105
h_{min}	minimum concrete thickness	[mm]	110	120	140	158	214	262
$h_{ef,max}$ = 12d								
h_1	depth of the drill hole	[mm]	96	120	144	192	240	288
$s_{cr,N}$	critical distance between anchors	[mm]	288	360	432	576	720	864
$c_{cr,N}$	critical distance from the edge	[mm]	144	180	216	288	360	432
c_{min}	minimum distance from the edge	[mm]	50	60	70	95	120	145
s_{min}	minimum distance between anchors	[mm]	50	60	70	95	120	145
h_{min}	minimum concrete thickness	[mm]	126	150	174	222	284	340
Zinc-plated stud code 			EQAC08110	EQAC10130	EQAC12160	EQAC16190	EQAC20260	EQAC24300
Stainless steel stud code A2 / A4 			EQA208110 EQA408110	EQA210130 EQA410130	EQA212160 EQA412160	EQA216190 EQA416190	EQA220260 EQA420260	EQA224300 EQA424300

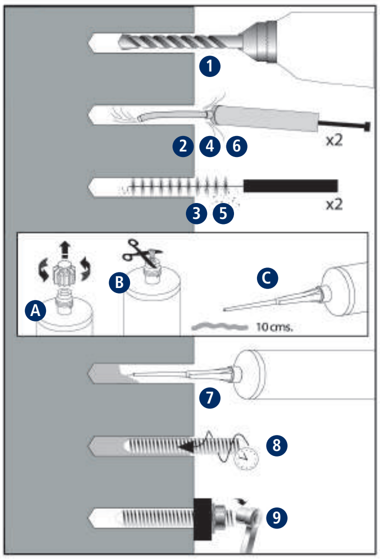


INSTALLATION ACCESSORIES

CODE	PRODUCT	MATERIAL
MOPISSI	APPLICATION GUNS	Gun for 300 ml cartridges
MOPISTO	APPLICATION GUNS	Guns for 410 ml cartridges, professional use
MOPISNEU	APPLICATION GUNS	Pneumatic gun for 410 ml coaxial cartridges, professional use
EQ-AC **EQ-A2** **EQ-A4**	STUD	Studs threaded steel, class 5.8 ISO 898-1 Studs stainless steel A2-70 Studs stainless steel A4-70
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole
MORCANU	MIXING TUBE	Plastic. Static labyrinth mixture

INSTALLATION PROCEDURE

CONCRETE



MINIMUM CURING TIME

TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [min]
MO-P	min +5	18	120
	+5 to +10	12	120
	+10 to +20	6	80
	+20 to +25	4	40
	+25 to +30	3	30
	+30 to +35	2	20
	+35 to +40	1.5	15
	40	1.5	10

Resistance in concrete C20/25 for an insulated anchor, without effects of distance from the edge or spacing between anchors, with a standard stud EQ-AC, EQ-A2 or EQ-A4.

Characteristic tensile strength N_{Rk}								
Metric			M8	M10	M12	M16	M20	M24
N_{Rk}	Non-cracked concrete	[kN]	19.1	25.4	35.2	51.5	80.1	110.8
Calculated tensile strength N_{Rd}								
Metric			M8	M10	M12	M16	M20	M24
N_{Rd}	Non-cracked concrete	[kN]	10.6	14.1	19.6	28.6	44.5	61.6
Maximum recommended tensile load N_{rec}								
Metric			M8	M10	M12	M16	M20	M24
N_{rec}	Non-cracked concrete	[kN]	7.6	10.1	14.0	20.4	31.8	44.0
Characteristic resistance to shear stress V_{Rk}								
Metric			M8	M10	M12	M16	M20	M24
V_{Rk}	Zinc-plated stud	[kN]	*9.0*	*15.0*	*21.0*	*39.0*	*61.0*	*88.0*
	Stainless steel stud (A2/A4)	[kN]	*13.0*	*20.0*	*30.0*	*55.0*	*86.0*	*124.0*
Calculated resistance to shearing V_{Rd}								
Metric			M8	M10	M12	M16	M20	M24
V_{Rd}	Zinc-plated stud	[kN]	*7.2*	*12.0*	*16.8*	*31.2*	*48.8*	*70.4*
	Stainless steel stud (A2/A4)	[kN]	*8.3*	*12.8*	*19.2*	*35.3*	*55.1*	*79.5*
Maximum recommended load to shear stress V_{rec}								
Metric			M8	M10	M12	M16	M20	M24
V_{rec}	Zinc-plated stud	[kN]	*5.1*	*8.6*	*12.0*	*22.3*	*34.9*	*50.3*
	Stainless steel stud (A2/A4)	[kN]	*6.0*	*9.2*	*13.7*	*25.2*	*39.4*	*56.8*
Effective depth of studs EQ-AC / EQ-A2 / EQ-A4								
Metric			M8	M10	M12	M16	M20	M24
Effective depth		[mm]	80	90	110	128	170	210

The values underlined and in italics indicate steel failure

Simplified calculation method. European Technical Assessment ETA 13/0752

Simplified version of the calculation method according to ETAG 001, technical report TR029. The resistance is calculated according to the data reflected in the assessment ETA 13/0752.

- Influence of concrete resistance.
- Influence of the distance from the edge of the concrete.
- Influence of the spacing between anchors.
- Influence of rebars.
- Influence of the base material thickness.
- Influence of the load application angle.
- Influence of the effective depth.
- Valid for a group of two anchors.
- Valid for dry or wet drill holes.

The calculation method is based on the following simplification:
No different loads act on individual anchors, without eccentricity.

INDEXcal
For a more precise calculation and taking into account more constructive arrangements we recommend the use of our INDEXcal calculation program. It can be downloaded free from our website **www.indexfix.com**

TENSILE LOADS

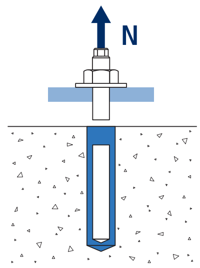
MO-P

- Calculated steel resistance: $N_{Rd,s}$
- Calculated extraction resistance: $N_{Rd,p} = N^o_{Rd,p} \cdot \Psi_c \cdot \Psi_{hef,p}$
- Calculated concrete cone resistance: $N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$
- Calculated concrete cracking resistance: $N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Calculated steel resistance

$N_{Rd,s}$

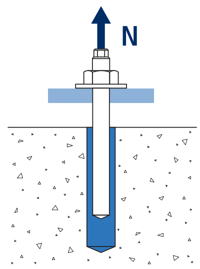
	Metric		M8	M10	M12	M16	M20	M24
$N^o_{Rd,s}$	Steel class 5.8	[kN]	12	19.3	28	52.7	82	118
	Steel class 8.8	[kN]	19.3	30.7	44.7	84	130.7	188
	Steel class 10.9	[kN]	27.8	43.6	63.2	118	184.2	265.4
	Stainless steel Class A2-70, A4-70	[kN]	13.9	21.9	31.6	58.8	92	132.1



Calculated extraction resistance

$N_{Rd,p} = N^o_{Rd,p} \cdot \Psi_c \cdot \Psi_{hef,p}$

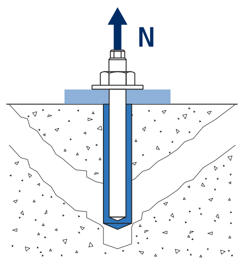
	Metric		M8	M10	M12	M16	M20	M24
$N^o_{Rd,p}$	Non-cracked concrete	[kN]	10.6	14.1	19.6	28.6	44.5	61.6



Calculated concrete cone resistance

$N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N} \cdot \Psi_{hef,N}$

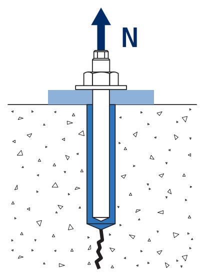
	Metric		M8	M10	M12	M16	M20	M24
$N^o_{Rd,c}$	Non-cracked concrete	[kN]	20.1	24.0	32.4	40.6	62.2	85.4



Calculated concrete cracking resistance

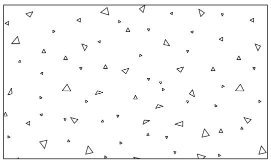
$N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_b \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp} \cdot \Psi_{hef,N}$

Metric			M8	M10	M12	M16	M20	M24
$N^o_{Rd,sp}$	Non-cracked concrete	[kN]	20.1	24.0	32.4	40.6	62.2	85.4



MO-P

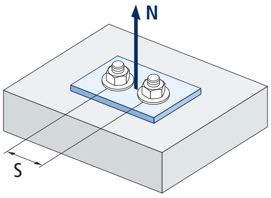
Influence coefficients



Influence of concrete resistance for extraction Ψ_c					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_c	Non-cracked concrete	1.00	1.12	1.19	1.30

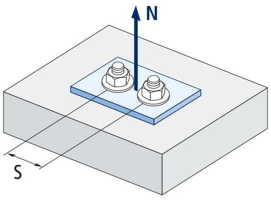
$$\Psi_b = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_b					
	Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_b		1.00	1.22	1.41	1.55



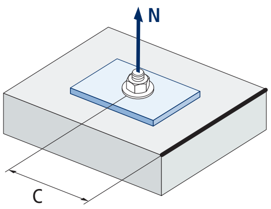
Influence of spacing between anchors (concrete cone) $\Psi_{s,N}$										
$s/s_{cr,N}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,N}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,N} = 0.5\left(1 + \frac{s}{s_{cr,N}}\right) \leq 1$$



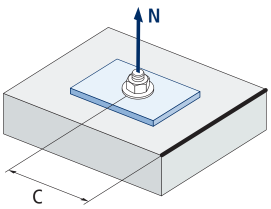
Influence of spacing between anchors (cracking) $\Psi_{s,N}$										
$s/s_{cr,sp}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$\Psi_{s,sp}$	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

$$\Psi_{s,sp} = 0.5\left(1 + \frac{s}{s_{cr,sp}}\right) \leq 1$$



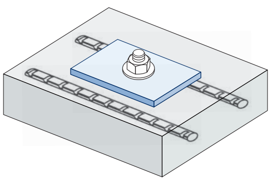
Influence of the distance from the edge of the concrete (concrete cone) $\Psi_{c,N}$												
$c/C_{cr,N}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,N}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,N} = 0.35 + \frac{0.5 \cdot c}{C_{cr,N}} + \frac{0.15 \cdot c^2}{C_{cr,N}^{\ 2}} \leq 1$$



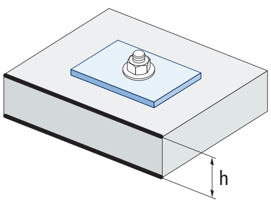
Influence of the distance from the edge of the concrete (cracking) $\Psi_{c,sp}$												
$c/C_{cr,sp}$	0.1	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6
$\Psi_{c,sp}$	0.40	0.46	0.51	0.45	0.49	0.55	0.61	0.67	0.75	0.83	0.91	1.00

$$\Psi_{c,sp} = 0.35 + \frac{0.5 \cdot c}{C_{cr,sp}} + \frac{0.15 \cdot c^2}{C_{cr,sp}^{\ 2}} \leq 1$$



Influence of the rebars $\Psi_{re,N}$					
h_{ef} (mm)	64	70	80	90	100
$\Psi_{re,N}$	0.82	0.85	0.90	0.95	1.00

$$\Psi_{re,N} = 0.5 + \frac{h_{ef}}{200} \leq 1$$

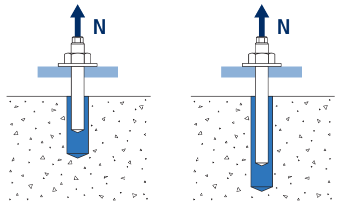


Influence of the base material thickness $\Psi_{h,sp}$											
$\Psi_{h,sp}$	h/h_{ef}	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.68
	fh	1.00	1.07	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.50

$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1.5$$

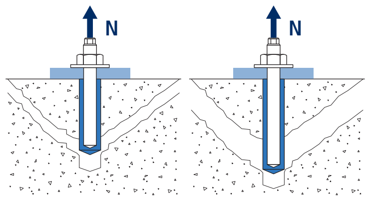
MO-P

Influence of the effective depth for the extraction combination $\Psi_{hef,p}$						
Metric h_{ef}	M8	M10	M12	M16	M20	M24
64	0.80					
80	1.00	0.89				
90	1.13	1.00	0.82		**Value not permitted**	
96	1.20	1.07	0.87			
110		1.22	1.00			
120		1.33	1.09			
128			1.16	1.00		
144			1.31	1.13		
160				1.25	0.94	
170				1.33	1.00	
192		**Value not permitted**		1.50	1.13	0.91
210					1.24	1.00
240					1.41	1.14
288						1.37



$$\Psi_{hef,p} = \frac{h_{ef}}{h_{stand}}$$

Influence of the effective depth for the concrete cone $\Psi_{hef,N}$						
Metric h_{ef}	M8	M10	M12	M16	M20	M24
64	0.72					
80	1.00	0.84				
90	1.19	1.00			**Value not permitted**	
96	1.31	1.10	0.82			
110	1.61	1.35	1.00			
120	1.84	1.54	1.14	0.91		
128	2.02	1.70	1.26	1.00	0.65	
144		2.02	1.50	1.19	0.78	
160		2.37	1.75	1.40	0.91	0.67
170		2.60	1.92	1.53	1.00	0.73
192			2.31	1.84	1.20	0.87
210			2.64	2.10	1.37	1.00
240	**Value not permitted**		3.22	2.57	1.68	1.22
288				3.38	2.21	1.61

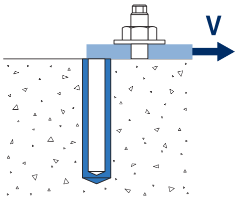


$$\Psi_{hef,N} = \left(\frac{h_{ef}}{h_{stand}}\right)^{1.5}$$

MO-P

SHEARING LOADS

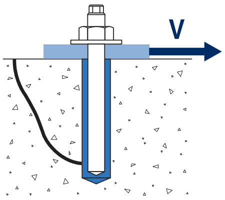
- Calculated steel resistance without lever arm: $V_{Rd,s}$
- Calculated spalling resistance: $V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$
- Calculated concrete edge resistance: $V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$



Calculated steel resistance to shearing

$V_{Rd,s}$

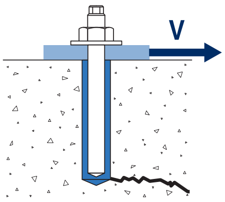
	Metric		M8	M10	M12	M16	M20	M24
$V^{o}_{Rd,s}$	Steel class 5.8	[kN]	7.2	12	16.8	31.2	48.8	70.4
	Steel class 8.8	[kN]	12	18.4	27.2	50.4	78.4	112.8
	Steel class 10.9	[kN]	12	19.3	28	52.7	82	118
	Stainless steel Class A2-70, A4-70	[kN]	8.3	12.8	19.2	35.3	55.1	79.5



Calculated spalling resistance

$V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$

Metric	M8	M10	M12	M16	M20	M24
k	2					

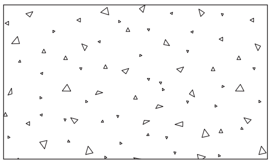


Calculated concrete edge resistance

$V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{b} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$

Metric			M8	M10	M12	M16	M20	M24
$V^{o}_{Rd,c}$	Non-cracked concrete	[kN]	5.7	8.6	11.8	19.0	28.3	36.4

Influence coefficients



$$\Psi_{b} = \sqrt{\frac{f_{ck,cube}}{25}} \geq 1$$

Influence of concrete resistance for concrete cone and concrete cracking Ψ_{b}

Concrete type	C20/25	C30/37	C40/50	C50/60
Ψ_{b}	1.00	1.22	1.41	1.55

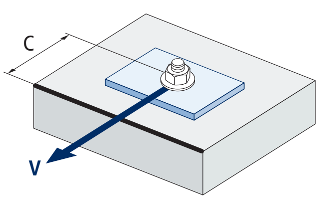
Influence of the distance from the edge and spacing between anchors $\Psi_{se,V}$

For one anchor

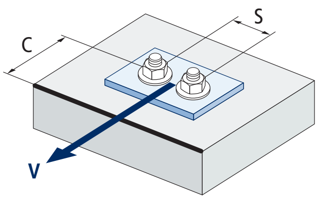
c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
Insulated	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18

For two anchors

s/c	c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
	1.0	0.24	0.43	0.67	0.93	1.22	1.54	1.89	2.25	2.64	3.04	3.46	3.91	4.37	4.84	5.33	6.36	7.45
	1.5	0.27	0.49	0.75	1.05	1.38	1.74	2.12	2.53	2.96	3.42	3.90	4.39	4.91	5.45	6.00	7.16	8.39
	2.0	0.29	0.54	0.83	1.16	1.53	1.93	2.36	2.81	3.29	3.80	4.33	4.88	5.46	6.05	6.67	7.95	9.32
	2.5	0.32	0.60	0.92	1.28	1.68	2.12	2.59	3.09	3.62	4.18	4.76	5.37	6.00	6.66	7.33	8.75	10.25
	≥ 3.0	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18



$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5}$$

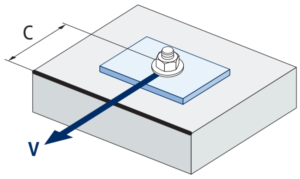


$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0.5 \leq \left(\frac{c}{h_{ef}}\right)^{1.5}$$

MO-P

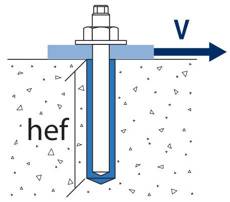
Influence of the distance from the edge of the concrete $\Psi_{c,V}$								
c/d	4	5	7	10	15	20	25	30
$\Psi_{c,V}$	0.76	0.72	0.68	0.63	0.58	0.55	0.53	0.51

$$\Psi_{c,V} = \left(\frac{d}{c}\right)^{0.20}$$

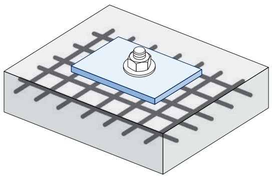


Influence of the effective depth $\Psi_{hef,V}$					
h_{ef}/d	8	9	10	11	12
$\Psi_{hef,V}$	1.65	2.04	2.47	2.93	3.42

$$\Psi_{hef,V} = 0.04 \cdot \left(\frac{h_{ef}}{d}\right)^{1.79}$$

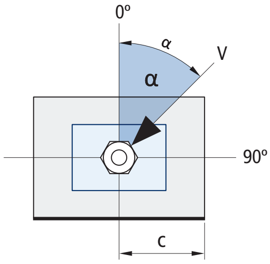


Influence of the rebars $\Psi_{re,v}$				
		Without perimeter rebar	Perimeter rebar ≥Ø12mm	Perimeter rebar with abutments at≤100mm
$\Psi_{re,v}$	Non-cracked concrete	1	1	1



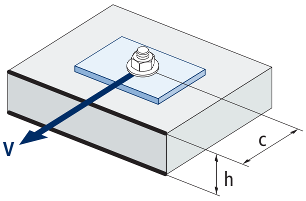
Influence of the load application angle $\Psi_{\alpha,v}$										
Angle, α(º)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,v}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50

$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos\alpha_v)^2 + \left(\frac{\sin\alpha_v}{2.5}\right)^2}} \geq 1$$



Influence of the base material thickness $\Psi_{h,V}$										
h/c	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	≥ 1.5
$\Psi_{h,V}$	0.32	0.45	0.55	0.63	0.71	0.77	0.84	0.89	0.95	1.00

$$\Psi_{h,V} = \left(\frac{h}{1.5 \cdot c}\right)^{0.5} \geq 1.0$$



MO-P

FIXING IN BRICKS

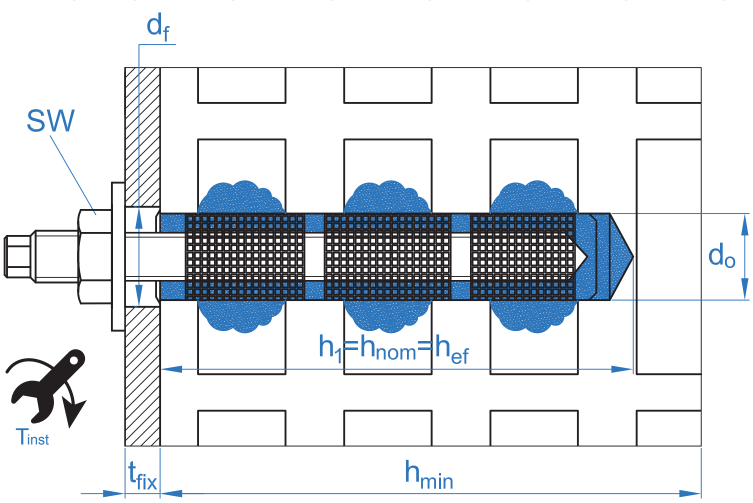
INSTALLATION PARAMETERS IN BRICKS. PLASTIC SLEEVE					
DIMENSION			M8	M10	M12
Plastic sleeve		ls		85	
		d_o	15	15	20
Mortar volume per sleeve		[ml]	15	15	27
h_1	drill hole depth ≥	[mm]	90	90	90
h_{nom}	sleeve installation depth	[mm]	85	85	85
h_{ef}	stud depth ≥	[mm]	80	80	80
t_{fix}	thickness material to be fixed ≤	[mm]	22	25	18
h_{min}	base material thickness ≥	[mm]	110	110	110
d_f	diameter in metal sheet ≤	[mm]	9	12	14
T_{ins}	tightening torque ≤	[Nm]	2	2	2
Circular brush				ø20	
Stud code			MOES08110	MOES10115	MOES12110
Sleeve code			MOTN15085	MOTN15085	MOTN20085

BASE MATERIAL		PLASTIC SLEEVE								
		M8			M10			M12		
Minimum distances and from the edge		$c_{cr} = c_{min}$	$s_{cr II} = s_{min II}$	$s_{min \perp} = c_{min \perp}$	$c_{cr} = c_{min}$	$s_{cr II} = s_{min II}$	$s_{min \perp} = c_{min \perp}$	$c_{cr} = c_{min}$	$s_{cr II} = s_{min II}$	$s_{min \perp} = c_{min \perp}$
Brick number 1	[mm]	100	235	115	100	235	115	120	235	115
Brick number 2	[mm]	100	240	113	100	240	113	120	240	113
Brick number 3	[mm]	100	237	237	100	237	237	120	250	237
Brick number 4	[mm]	128	255	255	128	255	255	128	255	255
Brick number 5	[mm]	128	255	255	128	255	255	128	255	255
Brick number 6	[mm]	100	250	240	100	250	240	120	250	240
Brick number 7	[mm]	100	250	248	100	250	248	-	-	-
Brick number 8	[mm]	100	250	248	100	250	248	120	250	248
Brick number 9	[mm]	100	370	238	100	370	238	120	370	238

MO-P

INSTALLATION PARAMETERS IN BRICKS. METAL SLEEVE					
DIMENSION			M8	M10	M12
Plastic sleeve		ls	85		
		d_o	15	20	20
Mortar volume per sleeve		[ml]	15	15	20
h_1	drill hole depth ≥	[mm]	90	90	90
h_{nom}	inst. depth plastic sleeve	[mm]	85	85	85
h_{ef}	stud depth ≥	[mm]	80	80	80
t_{fix}	thickness material to be fixed ≤	[mm]	22	25	18
h_{min}	base material thickness ≥	[mm]	110	110	110
d_f	diameter in metal sheet ≤	[mm]	9	12	14
T_{ins}	tightening torque ≤	[Nm]	2	2	2
Circular brush			ø20		
Stud code			MOES08110	MOES10115	MOES12110
Sleeve code			MOTN15085	MOTN15085	MOTN20085
Threaded sleeve code			MOTRO08	MOTRO10	MOTRO12

BASE MATERIAL		PLASTIC SLEEVE								
		M8			M10			M12		
Minimum distances and from the edge		$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min\,II}$	$s_{min\perp} = c_{min\perp}$	$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min\,II}$	$s_{min\perp} = c_{min\perp}$	$c_{cr} = c_{min}$	$s_{cr\,II} = s_{min\,II}$	$s_{min\perp} = c_{min\perp}$
Brick number 1	[mm]	100	235	115	120	235	115	120	235	115
Brick number 2	[mm]	100	240	113	120	240	113	120	240	113
Brick number 3	[mm]	-	-	-	120	250	237	120	250	237
Brick number 4	[mm]	128	255	255	128	255	255	128	255	255
Brick number 5	[mm]	128	255	255	128	255	255	128	255	255
Brick number 6	[mm]	100	250	240	120	250	240	120	250	240
Brick number 7	[mm]	100	250	248	120	250	248	120	250	248
Brick number 8	[mm]	-	-	-	120	250	248	120	250	248
Brick number 9	[mm]	100	370	238	120	370	238	120	370	238

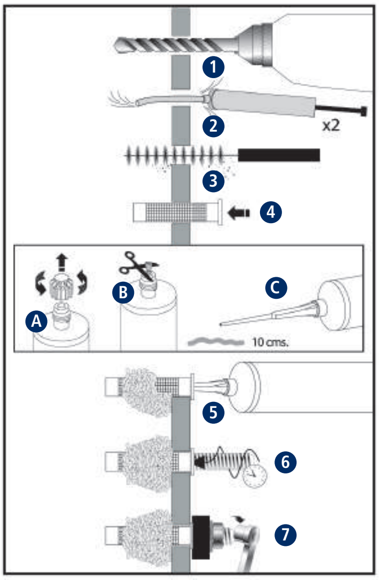


MO-P

INSTALLATION ACCESSORIES		
CODE	PRODUCT	MATERIAL
MOPISSI	APPLICATION GUNS	Gun for 300 ml cartridges
MOPISTO	APPLICATION GUNS	Guns for 410 ml cartridges, professional use
MOPISNEU	APPLICATION GUNS	Pneumatic gun for 410 ml coaxial cartridges, professional use
MO-ES	STUD	Threaded stud
MORCEPKIT	CLEANING BRUSHES	Kit with 3 cleaning brushes measuring ø14, ø20 and ø29 mm
MOBOMBA	CLEANING PUMP	Pump for cleaning leftover dust and fragments in the drill hole
MORCANU	MIXING TUBE	Plastic. Static labyrinth mixture
MO-TN	NYLON SLEEVE	Plastic white or grey
MO-TR	THREADED METAL SLEEVE	Threaded metal sleeve M8, M10, M12, zinc-plated
MO-TM	METAL SLEEVE	Metal sleeve ø12, ø16 and ø22 mm

INSTALLATION PROCEDURE

BRICK



MINIMUM CURING TIME			
TYPE	BASE MATERIAL TEMPERATURE [ºC]	HANDLING TIME [min]	CURING TIME [min]
MO-P	min +5	12	180
	+5 to +10	8	100
	+10 to +20	4	70
	+20 to +25	3	40
	+25 to +30	2	40
	30	1	40

MO-P

Characteristic resistances (F_{Rk})

Base material	Threaded studs Tensile and shear force [kN]			Threaded metal sleeve Tensile and shear force [kN]		
	M8	M10	M12	M8	M10	M12
Brick number 1	2.50	2.0	2.0	1.5	2.50	2.50
Brick number 2	0.75	1.2	0.5	0.6	0.75	0.90
Brick number 3	0.75	1.2	0.5	-	0.75	0.40
Brick number 4	1.50	1.5	3.0	2.0	3.00	4.00
Brick number 5	0.75	0.9	1.5	2.0	1.50	0.90
Brick number 6	1.20	1.2	0.9	0.9	1.50	0.60
Brick number 7	0.60	0.2	-	0.5	0.30	0.75
Brick number 8	0.60	1.5	1.2	-	0.40	0.60
Brick number 9	2.50	1.5	2.5	0.6	1.20	0.90

Calculated resistances (F_{Rd})

Base material	Threaded studs Tensile and shear force [kN]			Threaded metal sleeve Tensile and shear force [kN]		
	M8	M10	M12	M8	M10	M12
Brick number 1	1.00	0.80	0.80	0.60	1.00	1.00
Brick number 2	0.30	0.48	0.20	0.24	0.30	0.36
Brick number 3	0.30	0.48	0.20	-	0.30	0.16
Brick number 4	0.60	0.60	1.20	0.80	1.20	1.60
Brick number 5	0.30	0.36	0.60	0.80	0.60	0.36
Brick number 6	0.48	0.48	0.36	0.36	0.60	0.24
Brick number 7	0.24	0.08	-	0.20	0.12	0.30
Brick number 8	0.24	0.60	0.48	-	0.16	0.24
Brick number 9	1.00	0.60	1.00	0.24	0.48	0.36

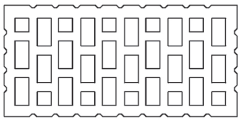
Recommended maximum loads (F_{recom}) (with andF= 1.4)

Base material	Threaded studs Tensile and shear force [kN]			Threaded metal sleeve Tensile and shear force [kN]		
	M8	M10	M12	M8	M10	M12
Brick number 1	0.71	0.57	0.57	0.43	0.71	0.71
Brick number 2	0.21	0.34	0.14	0.17	0.21	0.26
Brick number 3	0.21	0.34	0.14	-	0.21	0.11
Brick number 4	0.43	0.43	0.86	0.57	0.86	1.14
Brick number 5	0.21	0.26	0.43	0.57	0.43	0.26
Brick number 6	0.34	0.34	0.26	0.26	0.43	0.17
Brick number 7	0.17	0.06	-	0.14	0.09	0.21
Brick number 8	0.17	0.43	0.34	-	0.11	0.17
Brick number 9	0.71	0.43	0.71	0.17	0.34	0.26

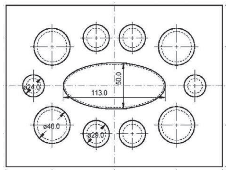
MO-P

BRICK TYPES

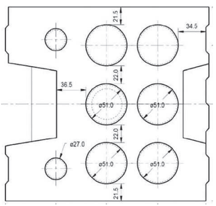
Brick no. 1
Hollow clay brick HLz
12-1,0-2DF according to EN 771-1
Length / width / height:
235 mm / 112 mm / 115 mm
fb ≥ 12 N/mm^2 / ρ ≥ 1.0 kg/dm^3



Brick no. 2
Calcareous silico hollow brick KSL 12-1,
4-3DF according to EN 771-2
Length / width / height:
240 mm / 175 mm / 113 mm
fb ≥ 12 N/mm^2 / ρ ≥ 1.4 kg/dm^3



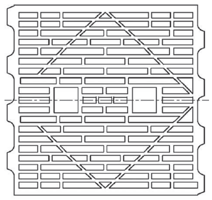
Brick no. 3
Silico-calcareous hollow brick KSL 12-1,
4-2DF in accordance with EN 771-2
Length / width / height:
250 mm / 240 mm / 237 mm
fb ≥ 12 N/mm^2 / ρ ≥ 1.4 kg/dm^3



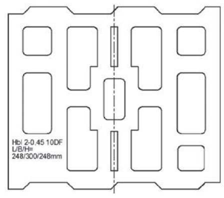
Brick no. 4
Fired clay solid brick Mz 12-2, 0-NF
according to EN 771-1
Length / width / height:
240 mm / 116 mm / 71 mm
fb ≥ 12 N/mm^2 / ρ ≥ 2.0 kg/dm^3

Brick no. 5
Silico-calcareous solid brick KS 12-2,
0-NF according to EN 771-2
Length / width / height:
240 mm / 115 mm / 70 mm
fb ≥ 12 N/mm^2 / ρ ≥ 2.0 kg/dm^3

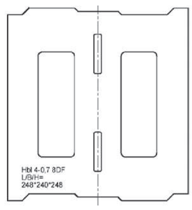
Brick no. 6
Fired clay hollow brick HLzW 6-0,7-8DF
according to EN 771-1
Length / width / height:
250 mm / 240 mm / 240 mm
fb ≥ 6 N/mm^2 / ρ ≥ 0.8 kg/dm^3



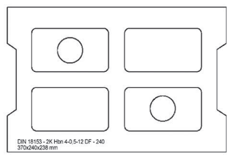
Brick no. 7
Lightweight concrete hollow block Hbl
2-0,45-10DF according to EN 771-3
Length / width / height:
250 mm / 300 mm / 248 mm
fb ≥ 2.0 N/mm^2 / ρ ≥ 0.45 kg/dm^3



Brick no. 8
Lightweight concrete hollow block Hbl
4-0, 7-8DF according to EN 771-3
Length / width / height:
250 mm / 240 mm / 248 mm
fb ≥ 4.0 N/mm^2 / ρ ≥ 0.7 kg/dm^3



Brick no. 9
Concrete block Hbn 4-12DF according
to EN 771-3
Length / width / height:
370 mm / 240 mm / 238 mm
fb b ≥ 4 N/mm^2 / ρ ≥ 1.2 kg/dm^3



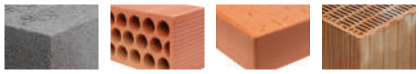
RANGE

MO-P

POLYESTER

OPTION 7

CODE	DIMENSION	
NORMAL		
MO-P300	300 ml	12
MO-P410	410 ml	12



Concrete | Hollow brick | Solid brick | Thermal clay

Accessories for chemical anchor cartridges

MO-PIS Application guns

CODE	MODEL
MOPISTO	Manual
MOPISPR	Professional 410 ml
MOPISSI	Silicone 300 ml
MOPISNEU	Pneumatic

MO-TN Plastic sleeve

Ny NYLON

CODE	DIMENSION
MOTN12050	12 x 50
MOTN15085	15 x 85
MOTN15130	15 x 130
MOTN20085	20 x 85

MO-AC Mixing tubes and miscellaneous

MORCEPKIT
Kit 3 brushes (ø15, ø20, ø30)

CODE	MODEL
MOBOMBA	Blower pump
MORCANU	Tube 170 - 300 - 410 ml
MORCEPKIT	Kit 3 brushes

MO-ES Threaded stud

Z ZINC

CODE	DIMENSION
MOES06070	M6 x 70
MOES08110	M8 x 110
MOES10115	M10 x 115
MOES12110	M12 x 110

MO-TM Metal sleeve

Z ZINC

CODE	DIMENSION
MOTM12100	12 x 1000
MOTM16100	16 x 1000
MOTM22100	22 x 1000

MO-TR Threaded sleeve

Z ZINC

CODE	DIMENSION
MOTRO08	M8/12 x 80
MOTRO10	M10/14 x 80
MOTRO12	M12/16 x 80

MO-P

Accessories for chemical anchor cartridges

Stud for chemical anchor with nut and washer

Hollow brick | Solid brick | Stone | Cellular concrete | Hollow concrete | Concrete | Reinforced concrete

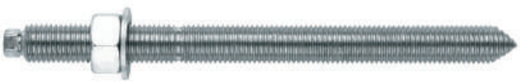
EQ-AC Zinc-plated

CODE	DIMENSION
EQAC08110	M8 x 110
EQAC10130	M10 x 130
EQAC12160	M12 x 160
EQAC16190	M16 x 190
EQAC20260	M20 x 260
EQAC24300	M24 x 300
EQAC30330	M30 x 330

EQ-A2 Stainless steel A2

CODE	DIMENSION
EQA208110	M8 x 110
EQA210130	M10 x 130
EQA212160	M12 x 160
EQA216190	M16 x 190
EQA220260	M20 x 260
EQA224300	M24 x 300
EQA230330	M30 x 330

EQ-A4 Stainless steel A4



CODE	DIMENSION
EQA408110	M8 x 110
EQA410130	M10 x 130
EQA412160	M12 x 160
EQA416190	M16 x 190
EQA420260	M20 x 260
EQA424300	M24 x 300
EQA430330	M30 x 330

Chemical anchor capsule, for use in non-cracked concrete

CA-QU

ETA assessed Option 8 (non-cracked concrete).

PRODUCT INFORMATION

DESCRIPTION
Chemical anchor, epoxy acrylate resin, quartz and catalyst.

OFFICIAL DOCUMENTATION
- ETA 08/0350 option 8, M8 to M24 for non-cracked concrete.
- Declaration features DoP CA-QU
- Certificate EVCP 1109-BPR-0044 for use in concrete.

VALID FOR

Stud

DIMENSIONS
Stud M8 - M24

RANGE OF CACULATION LOADS
From 11.1 to 50.0 kN (non-cracked).

BASE MATERIAL
Non-cracked concrete quality C20/25.


Concrete


Solid brick

ASSESSMENTS
- ETA 08/0350 (ETAG 001-5) Option 8: non-cracked concrete.

CE ETA OPTION 8

DRILL HOLE CONDITION

Dry Wet

CHARACTERISTICS AND BENEFITS
- Easy installation.
- For use in non-cracked concrete.
- Used for medium-high loads.
- Temperature range -40°C to +80°C (maximum long-term temperature +50°C).
- Variety of lengths and diameters: M8-M24-assessed studs, flexible assembly.
- For static or quasi-static loads.
- Version in zinc plated steel, stainless steel A2 and A4.
- Available in INDEXcal.

MATERIALS
Standard stud:
Carbon steel, zinc plated ≥ 5 μm.

Stainless standard stud:
Stainless steel A2-70 and A4-70.

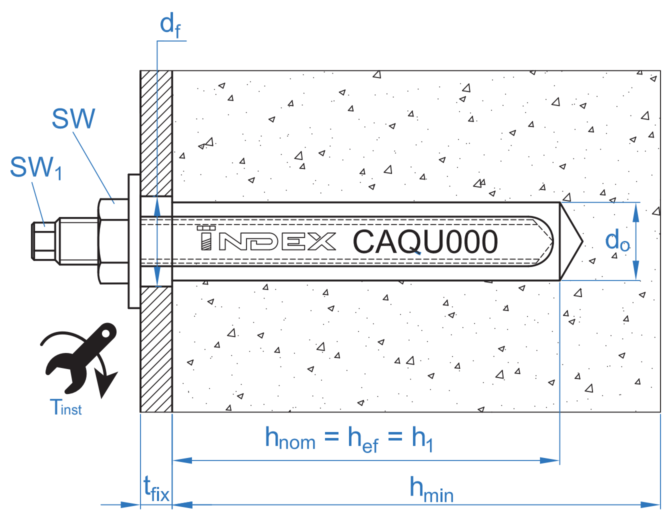
APPLICATIONS
- For indoor and outdoor use.
- Fixing machinery and elements with vibrations.
- Not suitable for ceiling installation.
- Structural applications.

MATERIALS

Item	Component	Zinc-plated	Stainless steel A2/A4
1	Capsule	Glass ampoule with base component, cold curing resin and hardener	
2	Stud	Steel class 5.8 ISO 898-1, zinc-plated ≤ 5 µm	A2-70 (AISI 304) A4-70 (AISI 316)
3	Washer DIN 125	Zinc-plated ≤ 5 µm	A2-70 (AISI 304) A4-70 (AISI 316)
4	Nut DIN 934	Class resistance 5 according to DIN 934, zinc-plated ≤ 5 µm	A2-70 (AISI 304) A4-70 (AISI 316)

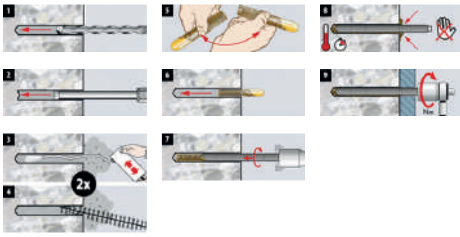
INSTALLATION INFORMATION

METRIC			M8	M10	M12	M16	M20	M24
Chemical capsule			CAQU008	CAQU010	CAQU012	CAQU016	CAQU020	CAQU024
Zinc-plated stud			EQAC08110	EQAC10130	EQAC12160	EQAC16190	EQAC20260	EQAC24300
Stainless steel stud A2			EQA208110	EQA210130	EQA212160	EQA216190	EQA220260	EQA224300
Stainless steel stud A2			EQA408110	EQA410130	EQA412160	EQA416190	EQA420260	EQA424300
d_0	Bit diameter	[mm]	10	12	14	18	25	28
T_{inst}	Installation tightening torque	[Nm]	10	20	40	80	120	180
d_p	capsule diameter	[mm]	9	11	13	17	22	24
l_p	capsule length	[mm]	80	80	95	95	175	210
d_f	pitch diameter at the plate to be fixed	[mm]	9	12	14	18	22	26
$h_1 = h_{nom} = h_{ef}$	depth of the drill hole	[mm]	80	90	110	125	170	210
h_{min}	minimum base material thickness	[mm]	110	120	140	160	220	260
t_{fix}	minimum fixture thickness	[mm]	17	25	32	44	66	62
$s_{cr,N}$	critical distance between anchors	[mm]	240	180	220	250	340	420
$c_{cr,N}$	critical distance from the edge	[mm]	120	90	110	125	170	210
$s_{cr,sp}$	critical distance from cracking	[mm]	240	180	220	250	340	420
$c_{cr,sp}$	critical distance from the edge	[mm]	120	90	110	125	170	210
s_{min}	minimum distance between anchors	[mm]	40	45	55	65	85	105
c_{min}	cmin: Minimum distance from the edge	[mm]	40	45	55	65	85	105
SW	SW: Installation key		13	17	19	24	30	36
SW_1	SW1: nut stud key		5	7	7	12	13	13



Code	INSTALLATION PRODUCTS
	Percussion drill
BHDSXXXXX	Concrete drill bits
MOBOMBA	Blower pump
MORCEPKIT	Cleaning brush
	Torque wrench
	Hexagon socket

INSTALLATION



CA-QU

Concrete resistances of C20/25 for insulated anchor, without edge distance or anchor spacing effects

Characteristic resistance N_{Rk} and V_{Rk}

TENSILE FORCE

Metric			M8	M10	M12	M16	M20	M24
N_{Rk}	Non-cracked concrete	[kN]	20	30	40	50	75	90

SHEARING

Metric			M8	M10	M12	M16	M20	M24
V_{Rk}	Steel class 5.8	[kN]	9	14	21	39	61	88
	Steel class 8.8		15	23	33	63	98	141
	Stainless steel Class A4-70		13	20	29	55	86	124
	Stainless steel Class A4-80		15	23	33	62	98	141

Calculated resistance N_{Rd} and V_{Rd}

TENSILE FORCE

Metric			M8	M10	M12	M16	M20	M24
N_{Rd}	Non-cracked concrete	[kN]	11.1	16.7	22.2	27.8	41.7	50.0

SHEARING

Metric			M8	M10	M12	M16	M20	M24
V_{Rd}	Steel class 5.8	[kN]	7.2	11.2	16.8	31.2	48.8	70.4
	Steel class 8.8		12.0	18.4	26.4	50.4	78.4	112.8
	Stainless steel Class A4-70		8.3	12.8	18.6	35.3	55.1	79.5
	Stainless steel Class A4-80		11.3	17.3	24.8	46.6	73.7	106.0

Maximum recommended load N_{rec} and V_{rec}

TENSILE FORCE

Metric			M8	M10	M12	M16	M20	M24
N_{rec}	Non-cracked concrete	[kN]	7.9	11.9	15.9	30	29.8	35.7

SHEARING

Metric			M8	M10	M12	M16	M20	M24
V_{rec}	Steel class 5.8	[kN]	5.1	8.0	12.0	22.3	34.9	50.3
	Steel class 8.8		8.6	13.1	18.9	36.0	56.0	80.6
	Stainless steel Class A4-70		6.0	9.2	13.3	25.2	39.4	56.8
	Stainless steel Class A4-80		8.1	12.4	17.7	33.3	52.6	75.7

Simplified calculation method. European Technical Assessment ETA 08/0350

Simplified version of the calculation method according to ETAG 001, Annex C. The resistance is calculated according to the data reflected in ETA assessment 08/0350.

- Influence of concrete resistance.
- Influence of the distance from the edge of the concrete.
- Influence of the spacing between anchors.
- Influence of rebars.
- Influence of the base material thickness.
- Influence of the load application angle.
- Influence of the effective depth.
- Valid for a group of two anchors.
- Valid for dry or wet drill holes.

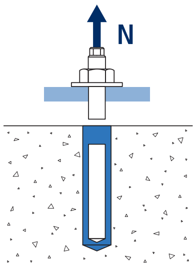
The calculation method is based on the following simplification:
No different loads act on individual anchors, without eccentricity.

INDEXcal
For a more precise calculation and taking into account more constructive arrangements we recommend the use of our INDEXcal calculation program. It can be downloaded free from our website **www.indexfix.com**

CA-QU

TENSILE LOADS

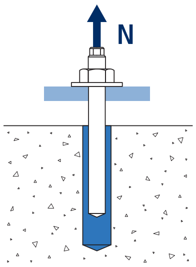
- Calculated steel resistance: $N_{Rd,s}$
- Calculated extraction resistance: $N_{Rd,p} = N^o_{Rd,p}$
- Calculated concrete cone resistance: $N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N}$
- Calculated concrete cracking resistance: $N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp}$



Calculated steel resistance

$N_{Rd,s}$

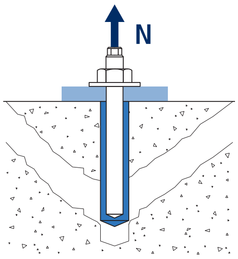
Metric			M8	M10	M12	M16	M20	M24
N^o_{Rd}	Steel class 5.8	[kN]	12.0	19.3	28.0	52.0	82.0	118.0
	Steel class 8.8		19.3	30.7	44.7	84.0	130.7	188.0
	Stainless steel Class A4-70		13.9	21.4	31.6	58.8	92.0	132.1
	Stainless steel Class A4-80		18.1	28.8	41.9	78.8	122.5	176.3

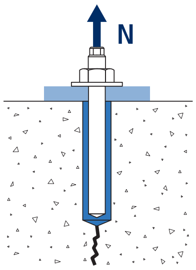


Calculated extraction resistance

$N_{Rd,p} = N^o_{Rd,p}$

Metric			M8	M10	M12	M16	M20	M24
$N^o_{Rd,p}$	Steel class 5.8	[kN]	11.1	16.7	22.2	27.8	41.7	50.0





Calculated concrete cone resistance

$N_{Rd,c} = N^o_{Rd,c} \cdot \Psi_{s,N} \cdot \Psi_{c,N} \cdot \Psi_{re,N}$

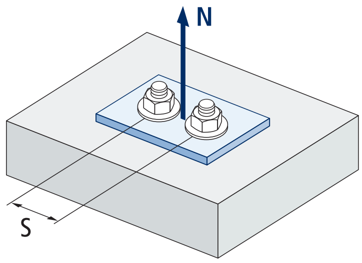
Calculated concrete cracking resistance*

$N_{Rd,sp} = N^o_{Rd,c} \cdot \Psi_{s,sp} \cdot \Psi_{c,sp} \cdot \Psi_{re,N} \cdot \Psi_{h,sp}$

Metric			M8	M10	M12	M16	M20	M24
$N^o_{Rd,c}$	Steel class 5.8	[kN]	20.1	24.0	32.4	39.2	62.2	85.4

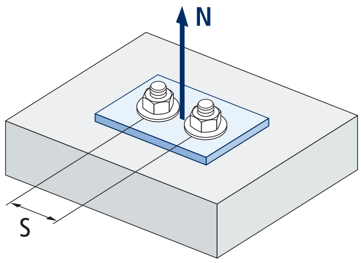
CA-QU

Influence of spacing between anchors (concrete cone) $\Psi_{s,N}$						
s [mm]	CA-QU					
	M8	M10	M12	M16	M20	M24
40	0.58					
45	0.59	0.63				
50	0.60	0.64			Value not permitted	
55	0.61	0.65	0.63			
60	0.63	0.67	0.64			
65	0.64	0.68	0.65	0.63		
70	0.65	0.69	0.66	0.64		
75	0.66	0.71	0.67	0.65		
80	0.67	0.72	0.68	0.66		
85	0.68	0.74	0.69	0.67	0.63	
90	0.69	0.75	0.70	0.68	0.63	
95	0.70	0.76	0.72	0.69	0.64	
100	0.71	0.78	0.73	0.70	0.65	
105	0.72	0.79	0.74	0.71	0.65	0.63
110	0.73	0.81	0.75	0.72	0.66	0.63
120	0.75	0.83	0.77	0.74	0.68	0.64
140	0.79	0.89	0.82	0.78	0.71	0.67
160	0.83	0.94	0.86	0.82	0.74	0.69
180	0.88	1.00	0.91	0.86	0.76	0.71
200	0.92		0.95	0.90	0.79	0.74
220	0.96		1.00	0.94	0.82	0.76
240	1.00			0.98	0.85	0.79
250				1.00	0.87	0.80
260					0.88	0.81
280					0.91	0.83
300					0.94	0.86
320					0.97	0.88
340			Value without reduction = 1		1.00	0.90
360						0.93
380						0.95
400						0.98
420						1.00



$$\Psi_{s,N} = 0.5 + \frac{s}{2 \cdot S_{cr,N}} \leq 1$$

CA-QU



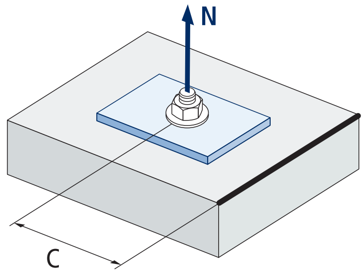
$$\Psi_{s,sp} = 0.5 + \frac{s}{2 \cdot s_{cr,sp}} \leq 1$$

Influence of spacing between anchors (cracking) $\Psi_{s,N}$

s [mm]	CA-QU					
	M8	M10	M12	M16	M20	M24
40	0.58					
45	0.59	0.63				
50	0.60	0.64			**Value not permitted**	
55	0.61	0.65	0.63			
60	0.63	0.67	0.64			
65	0.64	0.68	0.65	0.63		
70	0.65	0.69	0.66	0.64		
75	0.66	0.71	0.67	0.65		
80	0.67	0.72	0.68	0.66		
85	0.68	0.74	0.69	0.67	0.63	
90	0.69	0.75	0.70	0.68	0.63	
95	0.70	0.76	0.72	0.69	0.64	
100	0.71	0.78	0.73	0.70	0.65	
105	0.72	0.79	0.74	0.71	0.65	0.63
110	0.73	0.81	0.75	0.72	0.66	0.63
120	0.75	0.83	0.77	0.74	0.68	0.64
140	0.79	0.89	0.82	0.78	0.71	0.67
160	0.83	0.94	0.86	0.82	0.74	0.69
180	0.88	1.00	0.91	0.86	0.76	0.71
200	0.92		0.95	0.90	0.79	0.74
220	0.96		1.00	0.94	0.82	0.76
240	1.00			0.98	0.85	0.79
250				1.00	0.87	0.80
260					0.88	0.81
280					0.91	0.83
300					0.94	0.86
320					0.97	0.88
340		**Value without reduction = 1**			1.00	0.90
360						0.93
380						0.95
400						0.98
420						1.00

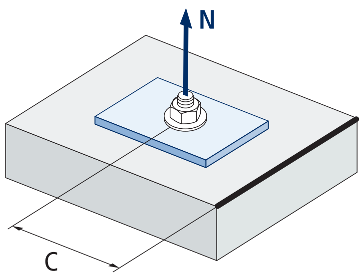
CA-QU

Influence of the distance from the edge of the concrete (cracking) $\Psi_{c,sp}$						
s [mm]	CA-QU					
	M8	M10	M12	M16	M20	M24
40	0.53					
45	0.56	0.64				
50	0.58	0.67			**Value not permitted**	
55	0.61	0.71	0.64			
60	0.64	0.75	0.67			
65	0.66	0.79	0.70	0.65		
70	0.69	0.83	0.73	0.68		
75	0.72	0.87	0.76	0.70		
80	0.75	0.91	0.79	0.73		
85	0.78	0.96	0.83	0.76	0.64	
90	0.81	1.00	0.86	0.79	0.66	
95	0.84		0.89	0.82	0.68	
100	0.87		0.93	0.85	0.70	
105	0.90		0.96	0.88	0.72	0.64
110	0.93		1.00	0.91	0.74	0.65
115	0.97			0.94	0.76	0.67
120	1.00			0.97	0.78	0.68
125				1.00	0.80	0.70
130					0.82	0.72
140					0.86	0.75
150					0.91	0.78
160		**Value without reduction = 1**			0.95	0.82
170					1.00	0.85
190						0.93
210						1.00



$$\Psi_{c,sp} = 0.35 + \frac{0.5 \cdot c}{C_{cr,sp}} + \frac{0.15 \cdot c^2}{C_{cr,sp}^{\ 2}} \leq 1$$

CA-QU

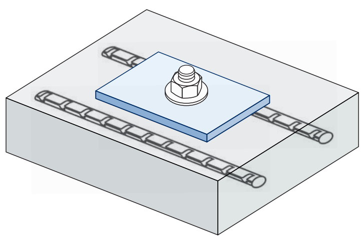


$$\Psi_{c,N} = 0.35 + \frac{0.5 \cdot c}{C_{cr,N}} + \frac{0.15 \cdot c^2}{C_{cr,N}^{\ 2}} \leq 1$$

Influence of the distance from the edge of the concrete (concrete cone) $\Psi_{c,N}$

s [mm]	CA-QU					
	M8	M10	M12	M16	M20	M24
40	0.53					
45	0.56	0.64				
50	0.58	0.67				
55	0.61	0.71	0.64			
60	0.64	0.75	0.67			
65	0.66	0.79	0.70	0.65		
70	0.69	0.83	0.73	0.68		
75	0.72	0.87	0.76	0.70		
80	0.75	0.91	0.79	0.73		
85	0.78	0.96	0.83	0.76	0.64	
90	0.81	1.00	0.86	0.79	0.66	
95	0.84		0.89	0.82	0.68	
100	0.87		0.93	0.85	0.70	
105	0.90		0.96	0.88	0.72	0.64
110	0.93		1.00	0.91	0.74	0.65
115	0.97			0.94	0.76	0.67
120	1.00			0.97	0.78	0.68
125				1.00	0.80	0.70
130					0.82	0.72
140					0.86	0.75
150					0.91	0.78
170					1.00	0.85
190						0.93
210						1.00

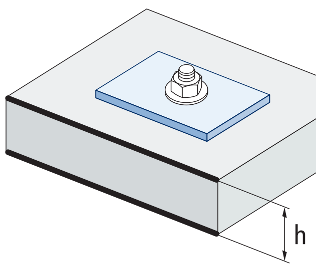
*The critical distance from the edge of the concrete coincides with the minimum distance from the edge of the concrete



$$\Psi_{re,N} = 0.5 + \frac{h_{ef}}{200} \leq 1$$

Influence of rebars $\Psi_{re,N}$

	M8	M10	M12	M16	M20	M24
$\Psi_{re,N}$	0.9	0.95	1.00	1.00	1.00	1.00



• Influence of the base material thickness $\Psi_{h,sp}$

$\Psi_{h,sp}$	h/hef	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.68
	fh	1.00	1.07	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.50

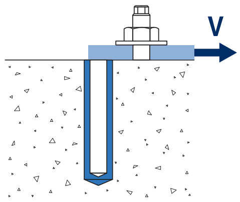
$$\Psi_{h,sp} = \left(\frac{h}{2 \cdot h_{ef}}\right)^{2/3} \leq 1.5$$

CA-QU

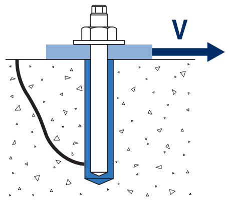
SHEARING LOADS

- Calculated steel resistance without lever arm: $V_{Rd,s}$
- Calculated spalling resistance: $V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$
- Calculated concrete edge resistance: $V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$

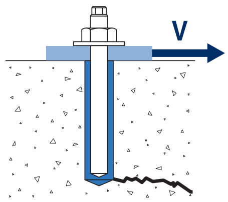
Calculated steel resistance to shearing								
$V_{Rd,s}$								
Metric			M8	M10	M12	M16	M20	M24
$V^{o}_{Rd,s}$	Steel class 5.8	[kN]	7.2	11.2	16.8	31.2	48.8	70.4
	Steel class 8.8		12.0	18.4	26.4	50.4	78.4	112.8
	Stainless steel Class A4-70		8.3	12.8	18.6	35.3	55.1	79.5
	Stainless steel Class A4-80		11.3	17.3	24.8	46.6	73.7	106.0



Calculated spalling resistance						
$V_{Rd,cp} = k \cdot N^{o}_{Rd,c}$						
Metric	M8	M10	M12	M16	M20	M24
K	2	2	2	2	2	2

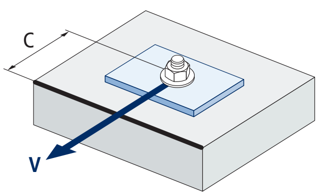


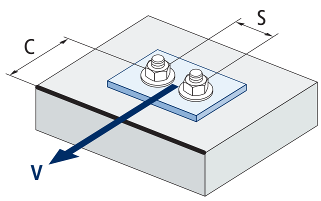
Calculated concrete edge resistance								
$V_{Rd,c} = V^{o}_{Rd,c} \cdot \Psi_{se,V} \cdot \Psi_{c,V} \cdot \Psi_{re,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{h,V}$								
Metric			M8	M10	M12	M16	M20	M24
$V^{o}_{Rd,c}$	Non-cracked concrete	[kN]	5.7	8.6	11.8	19.0	28.3	36.4



Influence coefficients

Influence of the distance from the edge and spacing between anchors $\Psi_{se,V}$																		
For one anchor																		
	c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
	Insulated	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18
For two anchors																		
	c/h_{ef}	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.50	5.00
s/c	1.0	0.24	0.43	0.67	0.93	1.22	1.54	1.89	2.25	2.64	3.04	3.46	3.91	4.37	4.84	5.33	6.36	7.45
	1.5	0.27	0.49	0.75	1.05	1.38	1.74	2.12	2.53	2.96	3.42	3.90	4.39	4.91	5.45	6.00	7.16	8.39
	2.0	0.29	0.54	0.83	1.16	1.53	1.93	2.36	2.81	3.29	3.80	4.33	4.88	5.46	6.05	6.67	7.95	9.32
	2.5	0.32	0.60	0.92	1.28	1.68	2.12	2.59	3.09	3.62	4.18	4.76	5.37	6.00	6.66	7.33	8.75	10.25
	≥ 3.0	0.35	0.65	1.00	1.40	1.84	2.32	2.83	3.38	3.95	4.56	5.20	5.86	6.55	7.26	8.00	9.55	11.18

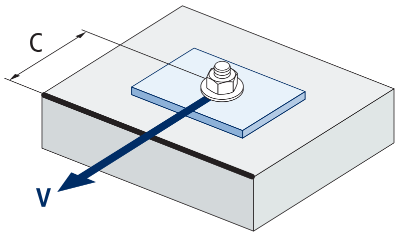




$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5}$$

$$\Psi_{se,V} = \left(\frac{c}{h_{ef}}\right)^{1.5} \cdot \left(1 + \frac{s}{3 \cdot c}\right) \cdot 0.5 \leq \left(\frac{c}{h_{ef}}\right)^{1.5}$$

CA-QU



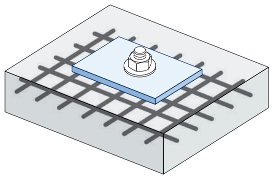
$$\Psi_{c,V} = \left(\frac{d}{c}\right)^{0.20}$$

• Influence of the distance from the edge of the concrete $\Psi_{c,V}$

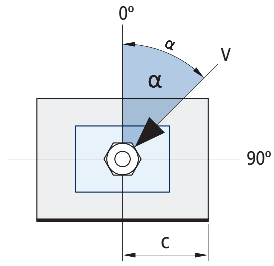
c [mm]	CA-QU					
	M8	M10	M12	M16	M20	M24
40	0.72					
45	0.71	0.74				
50	0.69	0.72			**Value not permitted**	
55	0.68	0.71	0.74			
60	0.67	0.70	0.72			
65	0.66	0.69	0.71	0.76		
70	0.65	0.68	0.70	0.74		
80	0.63	0.66	0.68	0.72		
85	0.62	0.65	0.68	0.72	0.75	
90	0.62	0.64	0.67	0.71	0.74	
100	0.60	0.63	0.65	0.69	0.72	
105	0.60	0.62	0.65	0.69	0.72	0.74
110	0.59	0.62	0.64	0.68	0.71	0.74
120	0.58	0.61	0.63	0.67	0.70	0.72
125	0.58	0.60	0.63	0.66	0.69	0.72
130	0.57	0.60	0.62	0.66	0.69	0.71
135	0.57	0.59	0.62	0.65	0.68	0.71
140	0.56	0.59	0.61	0.65	0.68	0.70
150	0.56	0.58	0.60	0.64	0.67	0.69
160	0.55	0.57	0.60	0.63	0.66	0.68
170	0.54	0.57	0.59	0.62	0.65	0.68
175	0.54	0.56	0.59	0.62	0.65	0.67
180	0.54	0.56	0.58	0.62	0.64	0.67
190	0.53	0.55	0.58	0.61	0.64	0.66
200	0.53	0.55	0.57	0.60	0.63	0.65
210	0.52	0.54	0.56	0.60	0.62	0.65
220	0.52	0.54	0.56	0.59	0.62	0.64
230	0.51	0.53	0.55	0.59	0.61	0.64
240	0.51	0.53	0.55	0.58	0.61	0.63
250	0.50	0.53	0.54	0.58	0.60	0.63
260	0.50	0.52	0.54	0.57	0.60	0.62
270	0.49	0.52	0.54	0.57	0.59	0.62
280	0.49	0.51	0.53	0.56	0.59	0.61
290	0.49	0.51	0.53	0.56	0.59	0.61
300	0.48	0.51	0.53	0.56	0.58	0.60

CA-QU

Influence of the rebars $\Psi_{re,v}$				
		Without perimeter rebar	Perimeter rebar ≥Ø12mm	Perimeter rebar with abutments at≤100mm
$\Psi_{re,v}$	Non-cracked concrete	1	1	1

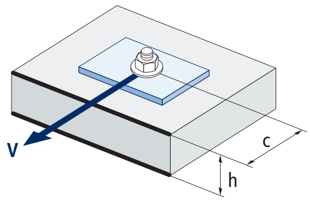


Influence of the load application angle $\Psi_{\alpha,v}$										
Angle, α(º)	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$\Psi_{\alpha,v}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50



$$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos\alpha_v)^2 + \left(\frac{\sin\alpha_v}{2.5}\right)^2}} \geq 1$$

Influence of the base material thickness $\Psi_{h,V}$										
h/c	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	≥ 1.5
$\Psi_{h,V}$	0.32	0.45	0.55	0.63	0.71	0.77	0.84	0.89	0.95	1.00



$$\Psi_{h,V} = \left(\frac{h}{1.5 \cdot c}\right)^{0.5} \geq 1.0$$

CA-QU

RANGE

CHEMICAL ANCHOR CAPSULE

OPTION 8

Concrete   Solid brick

Code	Dimension	Capsule length		
CAQU008	8 x 80 Ø10	80	10	500
CAQU010	10 x 90 Ø12	80	10	500
CAQU012	12 x 110 Ø14	95	10	200
CAQU016	16 x 125 Ø18	95	10	200
CAQU020	20 x 170 Ø25	175	6	60
CAQU024	24 x 210 Ø28	210	6	60
• CAQU030	30 x 280 Ø35	265	6	30

• Dimensions not assessed. The resistance values and installation data are not applicable for these references. Contact the Technical Dept. for further information.

Accessories for chemical anchor cartridges

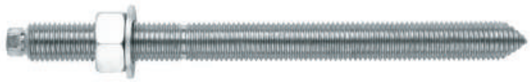
Stud for chemical anchor with nut and washer

Hollow brick   Solid brick   Stone   Cellular concrete   Hollow concrete   Concrete   Reinforced concrete

EQ-AC Zinc-plated

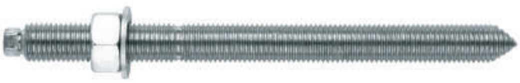
CODE	DIMENSION
EQAC08110	M8 x 110
EQAC10130	M10 x 130
EQAC12160	M12 x 160
EQAC16190	M16 x 190
EQAC20260	M20 x 260
EQAC24300	M24 x 300
EQAC30330	M30 x 330

EQ-A2 Stainless steel A2



CODE	DIMENSION
EQA208110	M8 x 110
EQA210130	M10 x 130
EQA212160	M12 x 160
EQA216190	M16 x 190
EQA220260	M20 x 260
EQA224300	M24 x 300
EQA230330	M30 x 330

EQ-A4 Stainless steel A4



CODE	DIMENSION
EQA408110	M8 x 110
EQA410130	M10 x 130
EQA412160	M12 x 160
EQA416190	M16 x 190
EQA420260	M20 x 260
EQA424300	M24 x 300
EQA430330	M30 x 330

MO-AC Mixing tubes and miscellaneous

MORCEPKIT

MOBOMBA

CODE	MODEL
MOBOMBA	Blower pump
MORCEPKIT Kit 3 brushes (ø15, ø20, ø30)	Kit 3 brushes

Notes

FOTEQUIEN19
REV3

INDEX Fixing Systems
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