TECHNICAL MANUAL

VOLTBOLT®

For Demanding Anchoring Applications

Version PEIKKO GROUP 11/2021

peikko®

VOLTBOLT®

For Demanding Anchoring Applications

Peikko is the European market leader in the development and supply of bolted connection systems. Peikko VOLTBOLT® is made of high strength steel and has metric thread on both ends.

- High load-bearing capacity
- Standardized diameters and thread lengths
- Variable length of bolt according to customer specification
- Predefined design parameters
- Ordering via product code
- Quick deliveries directly from stock
- Various application possibilities
- Possible surface treatments
- Accessories for quick and easy installation.

Peikko VOLTBOLT® can be used in demanding anchoring applications like wind turbine foundations, heavy reinforcement, and strengthening of existing structures. VOLTBOLT®s are grade 8.8 or 10.9 and they are offered in standardized models – available in lengths up to 11,900 mm and diameters between M30 and M60.

The bolts are preassembled using washers and nuts. Accessories like plastic protection caps for threads are available on request. VOLTBOLT® can be equipped with debonding sleeve for applications where preloading will be applied.

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About VOLTBOLT®

1. Product properties

VOLTBOLT® is a high-strength steel threaded bar that can be used as an anchor bolt (e.g., fixation of steel to concrete, concrete to concrete, steel to masonry and other material combinations), or as longitudinal or transversal reinforcement. VOLTBOLT® can be used in new structures or for strengthening of the existing structures, and can be applied in all types of buildings, warehouses, halls, bridges, dams, power plants, wind turbine foundations, and infrastructure objects.

VOLTBOLT® is available in a wide range of diameters and lengths, which allows different application, solutions, and loading conditions. VOLTBOLT® can be equipped with debonding sleeve and it can be preloaded.

The product range consists of

- 8.8 steel grade VOLTBOLT®
- 10.9 steel grade VOLTBOLT®
- Nuts and washers
- Debonding sleeve (optional)
- Protection plastic caps (optional)
- Installation templates (optional)

VOLTBOLT®s are readily available in steel grades 8.8 and 10.9 and in lengths up to 11,900 mm. Diameters can be chosen between M30 and M60. For other sizes, and for stainless-steel VOLTBOLT®s, please contact Peikko Technical Support.

Both ends of the bolt have a metric coarse thread. The standard thread length is 350 mm on each end of the bolt. For fine pitch thread and other thread lengths or full thread, please contact Peikko Technical Support.
VOLTBOLT® is assembled using nuts and washers in accordance with EN 14399-6, EN 14399-4, DASt 021, ISO 4032 and ISO 7089.

VOLTBOLT® can be ordered with a debonding sleeve. In this case, Peikko treats the bolt's surface with grease and equips it with a heat shrink plastic tube.

VOLTBOLT® can be preloaded.

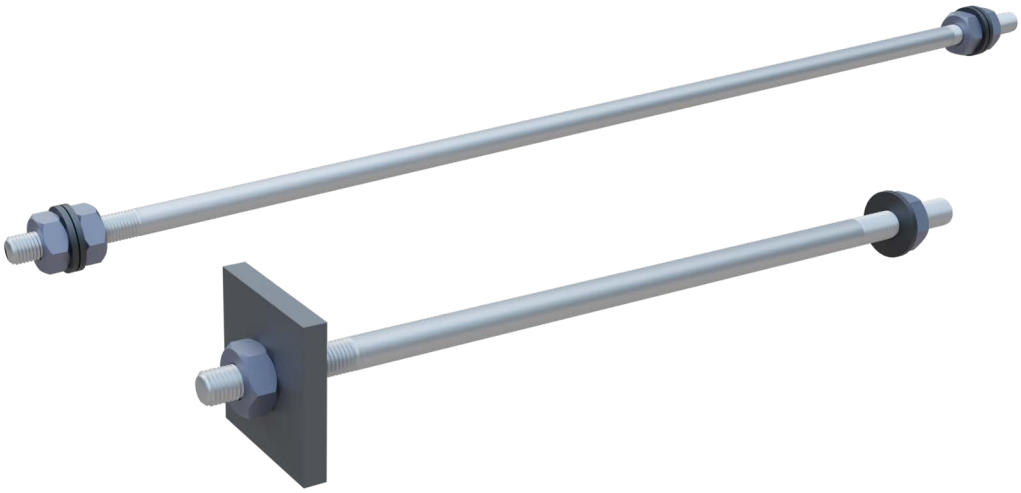


Figure 1. VOLTBOLT® examples.

1.1 Structural behavior

VOLTBOLT®s are intended to carry static loads and they can resist tension, shear, and compression, while being primarily designed to work in tension. Moment can be resisted by development of a tensile and compressive force couple. The selected size and number of VOLTBOLT®s should be sufficient for the load. VOLTBOLT® can be preloaded if needed.

VOLTBOLT® can be used in fatigue load applications provided that the design is done according to EN 1993-1-9 and detail category in *Table 8.1*. In general, it is recommended to use FATBAR® for fatigue load applications, due to its superior performance and fatigue strength. Preloading of VOLTBOLT® is advised for fatigue loads.

1.2 Application conditions

1.2.1 Loading and environmental conditions

VOLTBOLT®s are used in various applications, from dry indoor conditions to harsh industrial conditions, where additional protection against steel corrosion is needed. VOLTBOLT® is available with different protective coatings that can increase its lifetime. Standard coating and other protection options are described below. If other type of protection against corrosion is needed, please contact us for more information.

Grease, plastic tube, and caps.

The use of grease, plastic tube (debonding sleeve) and caps protects the bolt's surface against corrosion and can prevent water from infiltrating the concrete element. This solution is commonly applied when VOLTBOLT® is used as anchor bolt in concrete foundations (e.g., wind turbine foundations).

ECO Galvanizing.

Peikko's ECO Galvanizing is a cost-effective and ecological surface coating which allows bolts to be galvanized partly or completely. The maximum length of ECO Galvanizing is 0.7 m. Bolts with length higher than 4 m cannot be ECO galvanized. The coating method is thermally sprayed with zinc coating, according to ISO 2063. The minimum coating thickness is 100 µm, which corresponds to the performance of hot-dip galvanizing. The coating fulfils corrosion class C3 for a lifetime of minimum 50 years according to standard ISO 9223:2012. Hot-dip galvanized oversize nuts and hot-dip galvanized washers are supplied if the bolt's thread is treated.

Hot-Dip Galvanizing.

Hot-Dip Galvanized (HDG) bolts are completely dipped into galvanized material, according to ISO 1461. The maximum length of HDG is 11.9 m. Coating thickness average value is 55 µm, which fulfils corrosion class C3 for a lifetime of minimum 26 years according to standard ISO 9223:2012. HDG is only available for 8.8 grade bolts. Hot-dip galvanized oversize nuts and hot-dip galvanized washers are supplied if the bolt's thread is treated.

Other protection options are available upon delivery order:

Epoxy powder coating.

Epoxy powder coating is achieved by polymerizing a mixture of two compounds, resin and hardener, forming a thick, strongly bonded layer which protects the bolt's surface against abrasion, impact, corrosion and extreme temperatures. Powder coating film thickness can be specified between maximum and minimum value (between 100 µm and 250 µm), considering tolerance ± 50 µm. Nominal film thickness of 150 µm fulfils corrosion class C3 for a lifetime of minimum 25 years. The maximum length of epoxy coating is 11.9 m and can be applied only in the unthreaded region of the bolt. Epoxy application in the bolt is preceded by sandblasting. Epoxy powder coating cannot be applied in threaded region where nuts are to be tightened.

Xylan coating.

Xylan is a fluoropolymer-based industrial coating used to provide reduced friction, wear resistance, heat resistance, corrosion protection and non-stick properties to the bolt surface. Xylan is applied by spraying the bolt until a thin film is formed (25 ± 10 µm), which fulfils corrosion class C3 for a lifetime of minimum 25 years. The maximum length of Xylan coating is 11.9 m. The Xylan application is preceded by a pretreatment, which includes sandblasting, phosphating and heating the bolt, and is followed by a heat curing phase. Hot-dip galvanized nuts and hot-dip galvanized washers are supplied with Xylan treated bolts. Xylan coated threads do not require oversized nuts.

Stainless steel.

VOLTBOLT®s can also be manufactured from stainless steel. Stainless steel nuts and washers are supplied with stainless steel VOLTBOLT®. Please contact Peikko for more information.

1.3 Other properties

Standard delivery VOLTBOLT® is fabricated from steel bars with the following material properties:

Threaded bars 10.9	High strength steel	$f_{uk} \geq 1000$ MPa Material mechanical properties according to ISO 898-1
Threaded bars 8.8	High strength steel	$f_{uk} \geq 800$ MPa Material mechanical properties according to ISO 898-1

VOLTBOLT®s can also be manufactured from stainless steel upon delivery order. The stainless steel VOLTBOLT®s have ultimate strength $f_{uk} \geq 500$ MPa.

Standard delivery for each bolt includes hexagonal nuts and washers:

Nuts	Property class 10	Mechanical properties according to ISO 898-2
Washers	Hardness class 300 HV	Mechanical properties according to ISO 898-3

NOTE: Plate washers should be used for connections with slotted or oversized holes (as defined in EN 1090-2, *Table 11*).

Peikko Group's production units are externally controlled and periodically audited based on production certifications and product approvals by various organizations.

Manufacturing method	
Length	Cutting
Thread	Rolling

Manufacturing tolerances	
Length	± 10 mm
Thread length	+ 5,-0 mm
Thread tolerance	Class 6g in accordance with ISO 965-2

Table 1. Dimensions [mm] and weight [kg/m] of 8.8 steel grade VOLTBOLT®s.

VOLTBOLT® 8.8		M30	M36	M39		M45		M52	M60
M		30	36	39		45		52	60
l_{th}		350	350	350		350		350	350
Stress area of the thread		561	817	976		1306		1758	2362
$Ø$		28 – 30	33 – 35	36 – 40		42 – 45		48 – 50	58 – 60
l_{tot}	max	6000	6000	6000		6000		6000	6000
	min	1000	1000	1000		1000		1000	1000
Weight		5.5	8.0	9.4		12.5		16.7	22.2

Table 2. Dimensions [mm] and weight [kg/m] of 10.9 steel grade VOLTBOLT®s.

VOLTBOLT® 10.9		M30	M36	M39	M42	M45	M48	M52	M60
M		30	36	39	42	45	48	52	60
l_{th}		350	350	350	350	350	350	350	350
Stress area of the thread		561	817	976	1117	1306	1468	1758	2362
$Ø$		28 – 30	33 – 35	36 – 40	39 – 40	42 – 45	45 – 48	48 – 50	58 – 60
l_{tot}	max	11900	11900	11900	11900	11900	11900	11900	11900
	min	1000	1000	1000	1000	1000	1000	1000	1000
Weight		5.5	8.0	9.4	10.9	12.5	14.2	16.7	22.2

NOTE 1: If a non-standard thread length is required, please contact the customer engineering. The minimum thread length is 50 mm and the maximum thread length is 500 mm. Full thread can be offered under special terms.

NOTE 2: Standard VOLTBOLT® has metric coarse thread. Fine pitch thread can be offered under special terms.

NOTE 3: VOLTBOLT® is assembled using nuts and washers in accordance with EN 14399-6, EN 14399-4, DASt 021, ISO 4032 and ISO 7089.

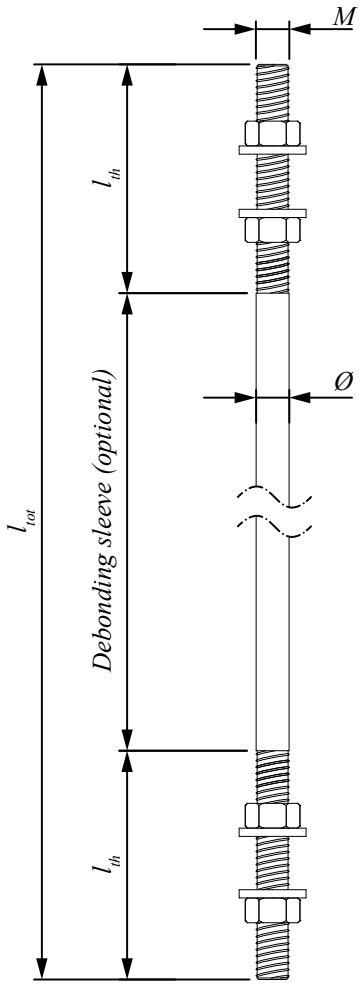


Figure 2. VOLTBOLT® dimensions.

2. Resistances

2.1 Axial resistance

The resistances of VOLTBOLT® are determined by a design concept that makes reference to the following standards:

- EN 1992-4:2018
- EN 1993-1-1:2005/AC:2009
- EN 1993-1-8:2005/AC:2005.

Table 3. Design values for tensile resistance of individual 8.8 steel grade VOLTBOLT®s. (Steel strength).

VOLTBOLT® 8.8		M30	M36	M39		M45		M52	M60
Steel ultimate strength f_u	N/mm^2	800	800	800		800		800	800
Stress area of the thread A_s	mm^2	561	817	976		1306		1758	2362
Design resistance according to EN 1992-4 $N_{Rd,s}$	kN	299.2	435.7	520.5		696.5		937.6	1259.7
Design resistance according to EN 1993-1-8 $F_{t,Rd}$	kN	323.1	470.6	562.2		752.3		1012.6	1360.5

Table 4. Design values for tensile resistance of individual 10.9 steel grade VOLTBOLT®s. (Steel strength).

VOLTBOLT® 10.9		M30	M36	M39	M42	M45	M48	M52	M60
Steel ultimate strength f_u	N/mm^2	1000	1000	1000	1000	1000	1000	1000	1000
Stress area of the thread A_s	mm^2	561	817	976	1117	1306	1468	1758	2362
Design resistance according to EN 1992-4 $N_{Rd,s}$	kN	400.7	583.6	697.1	797.9	932.9	1048.6	1255.7	1687.1
Design resistance according to EN 1993-1-8 $F_{t,Rd}$	kN	403.9	588.2	702.7	804.2	940.3	1057.0	1265.8	1700.6

NOTE 1: Resistances shown in *Tables 4* and *5* are without simultaneous action of axial and shear load. For combined resistance, see section 2.2 of this manual.
NOTE 2: Resistances shown in *Tables 4* and *5* are defined by bolt steel strength. Other failure modes may also need to be checked depending on the VOLTBOLT® application, such as fatigue, concrete failure, steel plate failure, and buckling of the bolt (in case of compression).
NOTE 3: If VOLTBOLT® is applied as fastening for use in concrete, tensile resistance must be defined according to EN 1992-4. If VOLTBOLT® is applied as a steel structural element, tensile resistance must be defined according to EN 1993-1-8.
NOTE 4: Resistances shown in *Tables 4* and *5* are applicable only to 8.8 and 10.9 grade steel bolts. Stainless steel bolts' resistances must be confirmed with Peikko.

2.2 Shear resistance

Table 5. Design values for shear resistance of individual 8.8 steel grade VOLTBOLT®s. (Steel strength).

VOLTBOLT® 8.8		M30	M36	M39		M45		M52	M60
Steel ultimate strength f_u	N/mm^2	800	800	800		800		800	800
Stress area of the thread A_s	mm^2	561	817	976		1306		1758	2362
Design resistance according to EN 1992-4 $V^0_{Rd,s}$	kN	179.5	261.4	312.3		417.9		562.6	755.8
Design resistance according to EN 1993-1-8 $F_{v,Rd}$	kN	215.4	313.7	374.8		501.5		675.1	907.0

Table 6. Design values for shear resistance of individual 10.9 steel grade VOLTBOLT®s. (Steel strength).

VOLTBOLT® 10.9		M30	M36	M39	M42	M45	M48	M52	M60
Steel ultimate strength f_u	N/mm^2	1000	1000	1000	1000	1000	1000	1000	1000
Stress area of the thread A_s	mm^2	561	817	976	1117	1306	1468	1758	2362
Design resistance according to EN 1992-4 $V^0_{Rd,s}$	kN	187.0	272.3	325.3	372.3	435.3	489.3	586.0	787.3
Design resistance according to EN 1993-1-8 $F_{v,Rd}$	kN	224.4	326.8	390.4	446.8	522.4	587.2	703.2	944.8

NOTE 1: Resistances shown in *Tables 6* and *7* are without simultaneous action of axial and shear load. For combined resistance, see section 2.2 of this manual.
NOTE 2: Resistances shown in *Tables 6* and *7* are defined by bolt steel strength. Other failure modes may also need to be checked depending on the VOLTBOLT® application, such as concrete failure, steel plate failure, and bending of the bolt, in case there is lever arm.
NOTE 3: If VOLTBOLT® is applied as fastening f-or use in concrete, tensile resistance must be defined according to EN 1992-4. If VOLTBOLT® is applied as a steel structural element, tensile resistance must be defined according to EN 1993-1-8.
NOTE 4: Resistances shown in *Tables 6* and *7* are applicable only to 8.8 and 10.9 grade steel bolts. Stainless steel bolts' resistances must be confirmed with Peikko.

2.3 Combined axial and shear load

When axial and shear forces strain the bolt simultaneously the interaction should be checked by additionally satisfying the equations below.

If VOLTBOLT® is applied as fastening for use in concrete:

$$\left(\frac{N_{Ed}}{N_{Rd,s}}\right)^2 + \left(\frac{V_{Ed}}{V_{Rd,s}}\right)^2 \leq 1.0$$

EN 1992-4, Eq. (7.54)

where

N_{Ed} is the design tension force of the fastener,
$N_{Rd,s}$ is the design value of steel resistance of the fastener under tension load (*Tables 5 and 6*),
V_{Ed} is the design shear force of the fastener,
$V_{Rd,s}$ is the design value of steel resistance of the fastener under shear load (*Tables 7 and 8*).

If VOLTBOLT® is applied as a steel structural element:

$$\frac{F_{v,Ed}}{F_{v,Rd}} + \frac{F_{t,Ed}}{1.4F_{t,Rd}} \leq 1.0$$

EN 1993-1-8, Table (3.4)

where

$F_{v,Ed}$ is the design shear force per bolt,
$F_{v,Rd}$ is the design shear resistance per bolt (*Tables 5 and 6*),
$F_{t,Ed}$ is the design tensile force per bolt,
$F_{t,Rd}$ is the design tension resistance per bolt (*Tables 7 and 8*).

2.4 Fire resistance

If the VOLTBOLT® is cast in concrete as an anchor bolt or structural reinforcement, the concrete cover of the bolt should be at least equivalent to the concrete cover of the reinforcement of the concrete element to ensure adequate fire protection. If the fire resistance is judged to be insufficient, the concrete cover of the bolt must be increased. Fire resistance should be checked according to EN 1992-1-2.

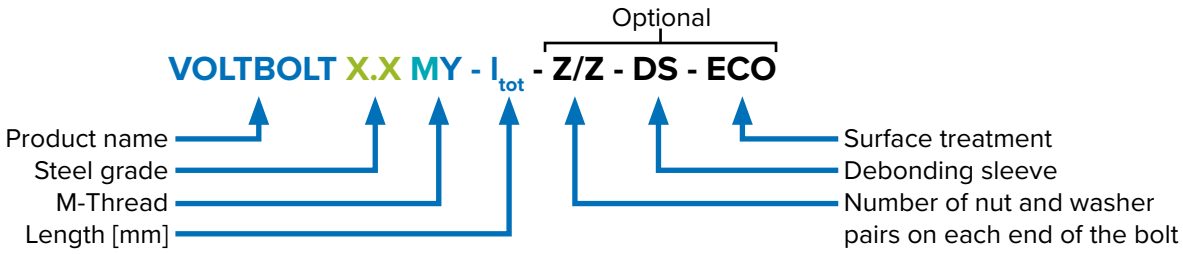
Selecting VOLTBOLT®

The following aspects must be considered when selecting the appropriate VOLTBOLT® to be used in the project:

- Design values of loads and resistances of the bolt
- Geometry of the structure and length of the bolt
- Interaction with structure along the bolt's length

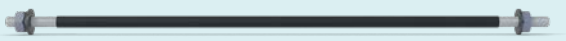
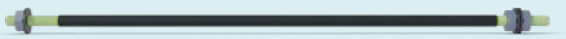
Product code

After selecting the VOLTBOLT®, a product code describing the product may be defined according to the description below. Please use this code in drawings and when ordering the product from Peikko's Sales Service.



NOTE: If the number of nut and washer pairs is not specified in product code then the standard assembly with two pairs of nuts and washers on each end of the bolt is supplied.

Table 7. Examples of product codes for different specifications.

Product code	Description
VOLTBOLT 10.9 M30 - 1000 - 1/1 - DS - ECO 	• VOLTBOLT® • Steel grade 10.9 • M thread: M30 • Total length of 1000 mm • One pair of nut and washer on each end • With debonding sleeve • Surface treatment: ECO Galvanizing.
VOLTBOLT 8.8 M36 - 4000 - 2/2 - HDG 	• VOLTBOLT® • Steel grade 8.8 • M thread: M36 • Total length of 4000 mm • Two pairs of nut and washer on each end • Without debonding sleeve • Surface treatment: Hot Dip Galvanizing.
VOLTBOLT 10.9 M52 - 5000 - 1/2 - DS - EPX 	• VOLTBOLT® • Steel grade 10.9 • M thread: M52 • Total length of 5000 mm • One pair of nut and washer on one end and two pairs on the other • With debonding sleeve • Surface treatment: Epoxy Powder Coating.
VOLTBOLT 8.8 M42 - 1000 - DS 	• VOLTBOLT® • Steel grade 8.8 • M thread: M42 • Total length of 1000 mm • Two pairs of nut and washer on each end • With debonding sleeve • Without surface treatment.
VOLTBOLT 10.9 M60 - 11900 - 0/0 - XYL	• VOLTBOLT® • Steel grade 10.9 • M thread: M60 • Total length of 11900 mm • Without nuts and washers • Without debonding sleeve • Surface treatment: Xylan Coating.

Annex A – Product Applications

As a steel threaded bar with high tensile capacity, VOLTBOLT® can have multiple applications in construction, such as:

1. Tie bar for strengthening existing structures, for temporary applications (e.g., formwork ties), or for permanent applications as part of the original structure.

2. Lifting and transporting heavy prefabricated concrete elements.

3. Strengthening structures with external post-tensioning bars. VOLTBOLT® can be attached to a structural member and preloaded, closing possible cracks in the existing structure and increasing its tensile or bending strength.

4. High strength bolt for precast joints. VOLTBOLT® can be used in heavy precast applications (e.g. infrastructure projects).

5. Shear reinforcement. VOLTBOLT® can be used for shear strengthening of existent structures or be applied in the structure's original layout in replacement of conventional rebars, typically in situations where heavy reinforcement is needed.

6. High strength anchor bar to connect structural steel to concrete elements (e.g., concrete foundations).

7. Applying normal force in a repairment joint to improve friction between old and new concrete. This is achieved by crossing VOLTBOLT® through the joint and preloading them.

8. High strength ground anchor bars for foundations and retaining walls.

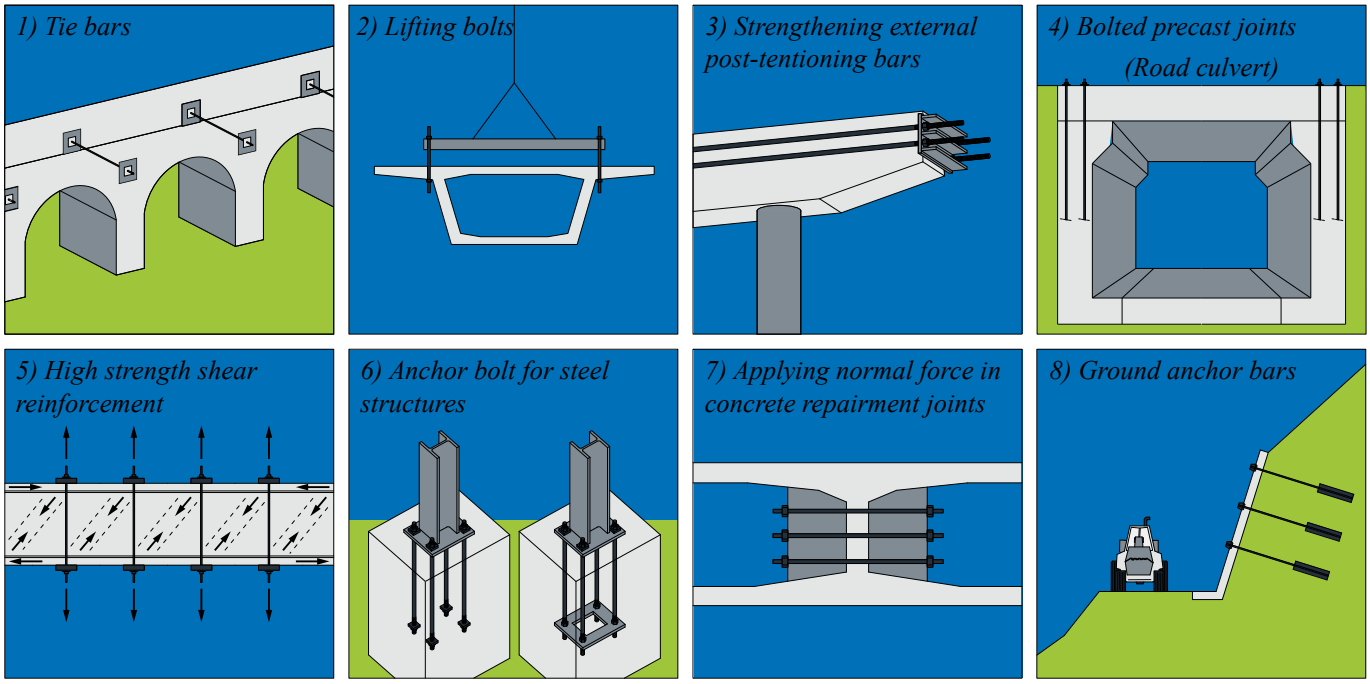


Figure 3. VOLTBOLT® application examples.

Annex B – Accessories

Installation template

In cases where VOLTBOLT®s are placed in vertical positions in groups, the correct position of the bolts can be secured using the PPL Installation Template. It enables groups of bolts to be centralized and the correct position to be assured in relation to the horizontal plate.

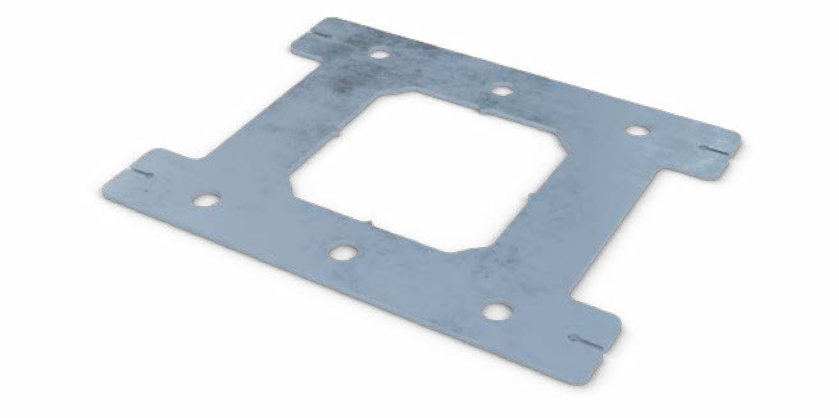


Figure 4. PPL installation template.

Debonding sleeve

For applications where VOLTBOLT® is cast in concrete and preloaded, debonding sleeves may be ordered. VOLTBOLT®s with debonding sleeve are treated with grease and equipped with a heat shrink plastic tube along the unthreaded length.

Figure 5. VOLTBOLT® and debonding sleeve.

Protection caps

Protection caps provide cover to the bolt's exposed threaded end in anchor bolt applications. Protection caps, together with the grease that is applied to the bolt's surface, protects the bolt against corrosion and the main structure against water infiltration. Protection caps also prevent accidental damage to the bolt's threads. Protection caps geometry depends on the bolt's diameter and its protruding length bolt above the nut. Therefore, these dimensions must be specified so that the correct protection caps are provided.

Figure 6. Protection caps for VOLTBOLT®.

Closed-cell foam tube

VOLTBOLT® can be equipped with closed-cell foam tube for anchor bolt applications. This accessory allows small on-site adjustment of the VOLTBOLT®'s top position and inclination by forming a clearance between the bolt and the concrete along a length which gives enough leverage for the bolt to be bent and offset.

Closed-cell foam tube can also function as debonding sleeve, though this is not its main purpose.

Figure 7. Closed-cell foam tube for VOLTBOLT®.

Coupler nut

Coupler nuts enable VOLTBOLT® to be spliced. It can be used for extending the bolt length or to create connections.

Figure 8. Coupler nuts for VOLTBOLT®

Annex C – Installing VOLTBOLT®

Identification of the product

VOLTBOLT® is available in standard models, which are identified by the steel grade (8.8 or 10.9) followed by the M-thread diameter of the bolt. The model of VOLTBOLT® can be identified by the name in the label on the product.

Forming a bolt group

When VOLTBOLT®s are applied as anchor bolts, they can be collected into bolt groups using the PPL Installation Template. The installation template enables bolt groups to be centralized on the horizontal plane in exactly the right place and easily adjusted to the correct casting level.

Ordering PPL Installation Templates

When PPL Installation Templates are ordered the thread diameter of bolts, the number of bolts and the center-to-center dimensions must be specified.

Examples of installation plates:

1. **PPL42-4** 360×360: 4 pieces M42 bolts in square form.
2. **PPL39-4** 500×400: 4 pieces M39 bolts in rectangular form.
3. **PPL60-6** 280×(190+190): 6 pieces M60 bolts rectangular form.
4. **PPL36-8** (190+190)×(190+190): 8 pieces M36 bolts in the form of a square.
5. **PPL52-3** 300×300: 3 pieces M52 bolts in the form of rectangular triangles.
6. **PPL30-8** D400: 8 pieces M30 bolts in the form of circles with diameter of 400 mm.

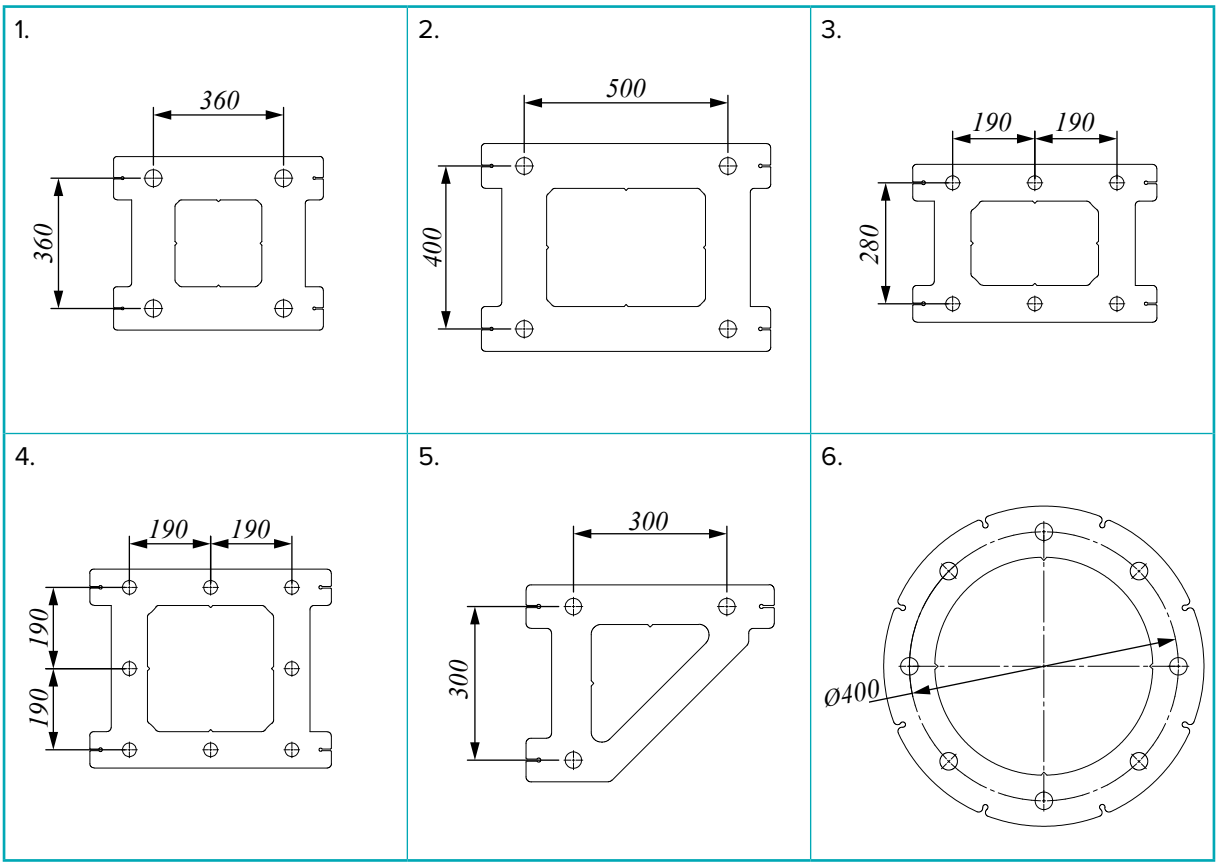


Figure 9. PPL Installation Templates – examples.

PPL Installation Templates can also be manufactured according to drawings that present the location of the bolts and thread diameters.

ANNEX C

Bending the bolts
VOLTBOLT® are intended to work always in straight position and cannot be bent.

Welding the bolts
10.9 grade steel VOLTBOLT®s are not weldable. Weldability of 8.8 grade steel VOLTBOLT®s must be confirmed with Peikko.

Securing the connection
To secure enough tightening of the nut in situations where preloading of the bolt is not needed, adequate torque can be achieved typically by 10 – 15 impacts of a slogging ring wrench (DIN 7444) or open-ended slogging wrench (DIN 133) and a 1.5 kg sledgehammer.

Preloading the bolt
VOLTBOLT®s may be preloaded to restrict structural movement due to bolt steel elongation, to achieve post-tensioning in a structural element, or to apply compression force in a structural element for repair and strengthening purposes. In situations where preloading is required due to cyclic or dynamic loads it is recommended to use FATBAR®, which has greater resistance to fatigue.

Table below shows the design preload specified according to EN 1993-1-8 for each VOLTBOLT®.

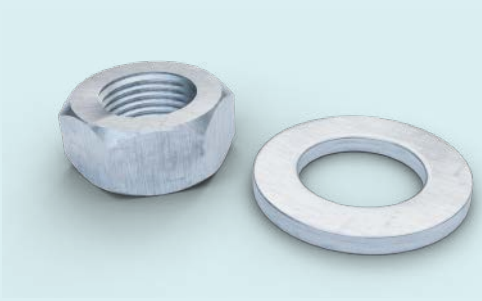
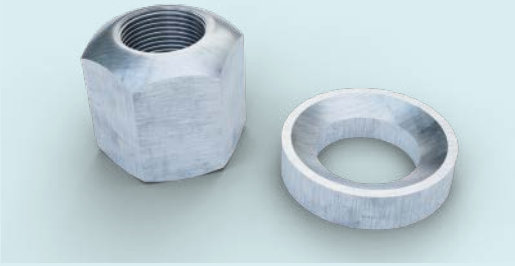
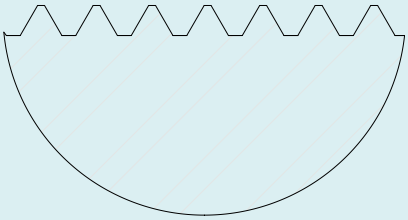
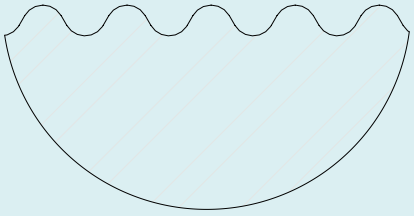
Table 8. Design preload [kN] for each VOLTBOLT® according to EN 1993-1-8

VOLTBOLT® 8.8							
M30	**M36**	**M39**		**M45**		**M52**	**M60**
285.6	415.9	496.9		664.9		895.0	1202.5
VOLTBOLT® 10.9							
M30	**M36**	**M39**	**M42**	**M45**	**M48**	**M52**	**M60**
357.0	519.9	621.1	710.8	831.1	934.2	1118.7	1503.1

Annex D – VOLTBOLT® and FATBAR®: Product comparison

VOLTBOLT® and FATBAR® are both steel threaded bars for demanding structural applications. The main difference between these products is related to fatigue design. FATBAR® has special threads and nut geometry that allows for reduced stress concentration at the anchoring ends and provides improved fatigue performance. VOLTBOLT® on the other hand has standard threads and nut geometry, i.e., not specifically designed for fatigue load.

Table 9. Comparison between VOLTBOLT® and FATBAR®.

		VOLTBOLT®	FATBAR®
Geometric properties	Nut and washer	 Regular flat nuts and washers.	 Special high nut and washer with spherical seat to allow 2-degree angle variation. Spherical seat reduces bolt bending due to misalignment. The nut height is 1.5 × bar diameter for improved fatigue performance.
	Thread geometry	 Metric thread	 Special thread
Fatigue strength		Fatigue resistance is calculated according to EN 1993-1-9. EN 1993-1-9: • Size reduction factor should be applied. • No mean stress correction. • No testing requirements. • No difference between rolled and cut threads.	FATBAR® has superior performance under fatigue loads due to thread, nut and washer design. FATBAR® is approved by European Technical Assessment for Post Tensioning kit for an internal unbonded or bonded tensioning system. According to EAD 160004-00-30, fatigue resistance has been tested with a constant upper load of 65 % of the characteristic force (Fpk) and with a stress variation of 80 N/mm^2 up to 2 × 10^6 load cycles for all sizes.

NOTES

Revision History

Version: PEIKKO GROUP 11/2021. Revision: 001

- First publication.

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