Anchor Channels

Guide to ETA compatible Design

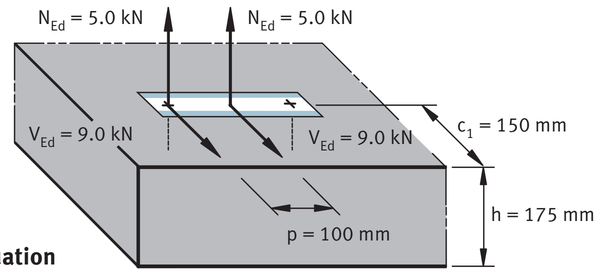
JORDAHL® Anchor Channels

Sample Calculation – Unreinforced Concrete

Example for Top Slab, Pair Load, Unreinforced; Slab Thickness h = 175 mm, Edge Distance c_1 = 150 mm

Given

- Concrete C30/37, $f_{ck,\,cube} = 37\ N/mm^2$, uncracked
- Pair load, distance p = 100 mm
- No supplementary reinforcement



Load Situation

Dead Load = 7.4 kN

→ Design tension load

$N_{Ed} = 1.35 \times 7.4 = 10.0$ kN

Wind Load = 12.0 kN

→ Design shear load

$V_{Ed} = 1.5 \times 12.0 = 18.0$ kN

(For load factors see EN 1990, Annex A)

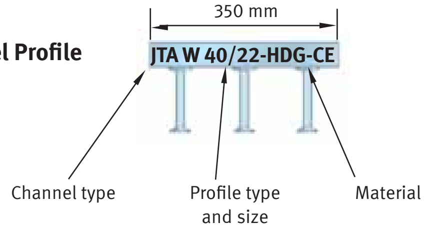
Per load point

$$N_{Ed} = \frac{10.0\ kN}{2} = 5.0\ kN$$

$$V_{Ed} = \frac{18.0\ kN}{2} = 9.0\ kN$$

Channel profile: JTA W 40/22
Channel length: 350 mm
Number of anchors: 3

Channel Profile



From pages 16/17 the design resistance without geometrical influence:

$\mathbf{N_{Rd} = V_{Rd} = 11.11\ kN}$

Example For Ordering a JORDAHL® Anchor Channel:

Type	Size	Length		# Anchors	Material		ETA Compliant
JTA W	40/22	350	–	3A	HDG	–	CE

Load Factors for Steel

Influence of channel length and load position:

steel: $S_N = 0.93$; $S_V = 0.93$

Pull-out resistance: 11.11 kN × 0.93 = **10.32 kN**
Shear resistance: 11.11 kN × 0.93 = **10.32 kN**

Part Number	Channel Length	Min. Load Distance	Steel* Strength-Factors Pull-out S_N	Steel* Strength-Factors Shear S_V	Concrete Unreinforced Strength-Factors [2)] Pull-out [4)] $C_{re,N}$	Concrete Unreinforced Strength-Factors [2)] Shear [5)] $C_{re,V}$
JTA W 40/22–150–2A	150 mm	none	1.00	1.00	2.88	2.89
JTA W 40/22–200–2A	200 mm				2.99	2.96
JTA W 40/22–250–2A	250 mm				2.99	2.99
JTA W 40/22–300–2A	300 mm				2.82	
JTA W 40/22–250–3A	250 mm	100 mm	1.00	1.00	1.61	1.53
JTA W 40/22–300–3A	300 mm		1.00	1.00	1.69	1.57
JTA W 40/22–350–3A	350 mm		0.93	0.93	1.75	1.60
JTA W 40/22–450–3A	450 mm		0.80	0.80	1.70	1.58

Load Factors for Unreinforced Concrete

Influence of concrete and channel-geometry:

concrete: $C_N = 1.75$; $C_V = 1.60$;

Pull-out resistance: 11.11 kN × 1.75 = **19.44 kN**
Shear resistance: 11.11 kN × 1.6 = **17.78 kN**

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Reduction factors for edge distance and member thickness/unreinforced concrete:

$\psi_{N,c_1} = 1.00$
$\psi_{V,c_1} = 0.61$

Edge Distance c_1 [mm]	Top Slab or Member Thickness h: 125 Pull-Out ψ_{N,c_1}	125 Shear ψ_{V,c_1}	175 Pull-Out ψ_{N,c_1}	175 Shear ψ_{V,c_1}	200 Pull-Out ψ_{N,c_1}	200 Shear ψ_{V,c_1}
50	0.58	0.19	0.58	0.21	0.58	0.21
75	0.71	0.26	0.71	0.33	0.71	0.36
400	-	-	1.22	1.44	1.22	1.54
50	0.58	0.20	0.58	0.23	0.58	0.23
75	0.71	0.27	0.71	0.34	0.71	0.37
100	0.82	0.35	0.82	0.43	0.82	0.48
150			1.00	0.61	1.00	0.63
200	1.07	0.63	1.07	0.78	1.07	0.82

Proofs for Steel and Concrete:

Steel:

Tension

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times 11.11\ \text{kN}}$$

$$= \frac{5.0\ \text{kN}}{0.93 \times 11.11\ \text{kN}} = \frac{5.0\ \text{kN}}{10.33\ \text{kN}} = 0.48 \leq 1.0 \rightarrow \text{OK}$$

Shear

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times 11.11\ \text{kN}}$$

$$= \frac{9.0\ \text{kN}}{0.93 \times 11.11\ \text{kN}} = \frac{9.0\ \text{kN}}{10.33\ \text{kN}} = 0.87 \leq 1.0 \rightarrow \text{OK}$$

Unreinforced Concrete:

Tension

$$\beta_{N,c} = \frac{N_{Ed}}{\psi_{N,c_1} \times C_N \times 11.11\ \text{kN}}$$

$$= \frac{5.0\ \text{kN}}{1.00 \times 1.75 \times 11.11\ \text{kN}} = \frac{5.0\ \text{kN}}{19.44\ \text{kN}} = 0.26 \leq 1.0 \rightarrow \text{OK}$$

Shear

$$\beta_{V,c} = \frac{V_{Ed}}{\psi_{V,c_1} \times C_V \times 11.11\ \text{kN}}$$

$$= \frac{9.0\ \text{kN}}{0.61 \times 1.60 \times 11.11\ \text{kN}} = \frac{9.0\ \text{kN}}{10.84\ \text{kN}} = 0.83 \leq 1.0 \rightarrow \text{OK}$$

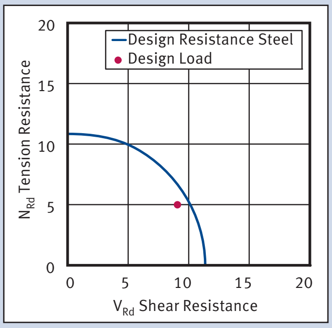
Combined Tension and Shear Interaction for Channel Profile:

$$\left(\frac{N_{Ed}}{S_N \times 11.11\ \text{kN}}\right)^2 + \left(\frac{V_{Ed}}{S_V \times 11.11\ \text{kN}}\right)^2 \leq 1.0$$

$$\beta_{N,s}^{\ 2} + \beta_{V,s}^{\ 2} \leq 1.0$$

$$0.48^2 + 0.87^2 \leq 1.0$$

$$0.23 + 0.75 = 0.98 \leq 1.0 \rightarrow \text{OK}$$

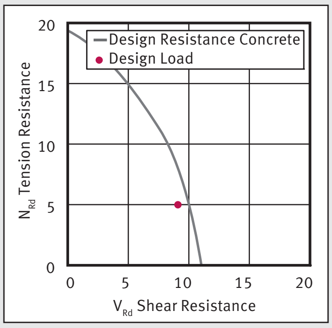


$$\left(\frac{N_{Ed}}{\psi_{N,c_1} \times C_N \times 11.11\ \text{kN}}\right)^{1.5} + \left(\frac{V_{Ed}}{\psi_{V,c_1} \times C_V \times 11.11\ \text{kN}}\right)^{1.5} \leq 1.0$$

$$\beta_{N,c}^{\ 1.5} + \beta_{V,c}^{\ 1.5} \leq 1.0$$

$$0.26^{1.5} + 0.83^{1.5} \leq 1.0$$

$$0.13 + 0.76 = 0.89 \leq 1.0 \rightarrow \text{OK}$$



T-Bolt: JC-M 12, Strength Grade 4.6 (T-Bolt Selection on Page 34)

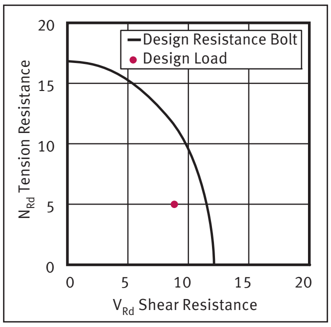
$N_{Ed} = 5.0$ kN; $V_{Ed} = 9.0$ kN

$N_{Rd} = 16.9$ kN; $V_{Rd} = 12.1$ kN

$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0; \qquad \beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0;$$

$$\frac{5.0\ \text{kN}}{16.9\ \text{kN}} = 0.31 \leq 1.0 \rightarrow \text{OK} \qquad \frac{9.0\ \text{kN}}{12.1\ \text{kN}} = 0.74 \leq 1.0 \rightarrow \text{OK}$$

Combined Tension and Shear Interaction for T-Bolt:



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

$$\beta_{N,sc}^{\ 2} + \beta_{V,sc}^{\ 2} \leq 1.0$$

$$\left(\frac{5.0\ \text{kN}}{16.9\ \text{kN}}\right)^2 + \left(\frac{9.0\ \text{kN}}{12.1\ \text{kN}}\right)^2 \leq 1.0$$

$$0.10 + 0.55 = 0.65 \leq 1.0 \rightarrow \text{OK}$$

For Front-Face Example and Reinforced Concrete See Page 10–11.

JORDAHL® Anchor Channels

Quality since 1907

JORDAHL® anchor channels are manufactured by Deutsche Kahneisen GmbH in Germany. The history of connecting steel to concrete begins in 1907 with an invention of Julius Kahn, member of a Chicago family of architects, whose "Kahn irons" opened up completely new possibilities for construction with reinforced concrete. In 1913 Anders Jordahl, a Norwegian engineer, who introduced Kahn's reinforcing technology in Germany, developed the Anchor Channel by designing a C-shaped profile which was used as reinforcement and connection device at the same time.

Today, with a century of experience in anchoring and connection technology "Deutsche Kahneisen GmbH" with its brand name JORDAHL® has developed into an internationally renowned company and a leader of research in anchoring technology, with a strong relationship to its customers.

JORDAHL® Products

- **Quality** made in Germany since 1907 and used in projects around the world
- **State of the art** and help customers build efficiently to maintain quality standards
- **Made under strict quality control** according to German and European approval requirements
- **Eurocode compatible** design & approved safety concept – ETA-09/0338 et al.
- **Comprehensive range** of superior anchoring and connection products with accessories
- **ISO 9001 based** internal QA / QC processes

Whichever type of construction is in progress, JORDAHL® provides fully developed solutions in installation technology: for joining components to one another, for suspending loads or for connecting devices. Irrespective of the product application, quality and safety are fundamental to the selection of a connection system. JORDAHL® offers the following services:

- **Creative support** for planning and design
- **Customized solutions** and project-based consulting
- **Cost effective planning** and support with engineering calculations
- **Excellent technical know-how** from a team of experienced engineers
- **Reliable partnership** focusing on a long term customer relationship
- **Just in time** delivery onsite
- **Boxed per floor** on customer request

JORDAHL® Shipping Department, Berlin, Germany

Preface

This design guide was specifically developed to allow a quick assessment of load capacities in agreement with latest design methods according to CEN and ETA. All published data for JTA channels and bolts is based upon safe assessments according to CEN/TS 1992-4 and ETA 09/0338. All data relating to JXA, JGB, JTB and other products are based upon German technical approvals or standards.

Content

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12057 Berlin, Germany

JORDAHL® Anchor Channels

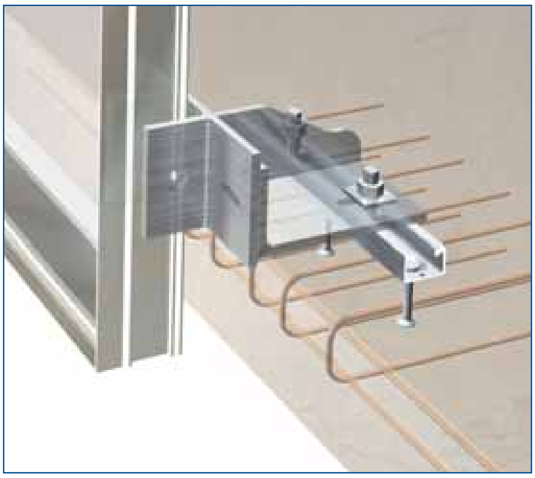
Easy Anchoring in Concrete

JORDAHL® anchor channels are a superior connection system for transferring loads in reinforced and unreinforced concrete components. Anchor channels are cast into concrete and support static and dynamic loads. They are especially designed for highly reinforced and slender concrete parts.

- **Anchoring without damaging** the concrete structure & reinforcement
- **Good integration** into heavily reinforced components
- **Suitable for** pre-stressed and post-tensioned structures
- **Increased load capacity** near reinforcement
- **High load capacity** for static and dynamic loads
- **Fatigue, seismic** and blast load resistant
- **Time efficient** on-site installation
- **Skilled labour not required** for installation
- **Installation with simple tools** like hammer and wrench
- **Small edge** distances
- **Easy** to customize
- **7+ different sizes** for the most economical solution
- **Adjustable** in three dimensions
- **No damage** of reinforcement and floor heating
- **Reinforcement** can be taken into account when planning

Our Support

Planning software to support structural engineers and technical assistance from internationally experienced engineers.



Greatest Safety Ensured

- Eurocode compatible design & approved safety concept: ETA-09/0338 et al.
- Installation without damaging the body of the structure
- Verified safety through building Approval of the products
- High load capacity even in delicate or highly reinforced components
- Independent of shrinkage and creep of the concrete component
- Suitable for installation in the compression and tension zone of the component
- Suitable for components with fire prevention requirements

No drilling ■ no noise ■ no dust ■ no electrical tools required
No welding ■ no risk of fire ■ no damage caused by sparks

Product Range

JORDAHL® offers a broad range of products:

- **JTA**, the standard anchor channel product group for tension, angled tension and shear load.
- **JXA**, the toothed channels accommodating loads in all directions.
- **JGB**, the anchor channels with welded rebar for installation in thin slabs.
- **JORDAHL® T-bolts**, available as hammer head, hook head and toothed bolts.
- **JTB**, the easy solution for corrugated metal siding and roof installation on concrete.
- **JRA**, the anchor channel with parallel welded rebar anchors for extremly high dynamic loads.

W-Profiles

Traditionally JORDAHL® profiles are hot rolled from a billet. Therefore they are particularly free of residual stresses. The geometry is optimized, well-suited for dynamic loads and high clamping forces from the T-bolts. Anchor channels made from hot rolled profiles are the preferred solution for curtain walls under high wind loads, elevators, heavy pipes under pre-stressed post-tensioned bridges, etc.

K-Profiles

The smaller JORDAHL® profiles are cold formed in a rolling mill which ensures dimensional consistency throughout the cross sectional area. Cold formed anchor channels can be used for connecting precast elements, taking the dead weight of facades or for attaching corrugated metal siding.

Steel grades

Most profiles are made from carbon steel material conforming to EN 10025 with a minimum yield strength of 235 N/mm². Stainless steel grade A4 conforming to EN 10088 is available upon request.

Round Anchors

Unless custom design is required, anchors are generally cold-headed in a fully automated and monitored production process.

Safety work

Time efficiency

Low cost

Simple to install

No risk of fire

JORDAHL® Anchor Channels

Curtain Wall

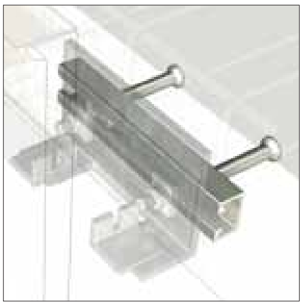
Modern facade systems provide protection for occupants of office and apartment buildings, as well as the means for architects to create attractive buildings on the metropolitan skyline. Complete facade elements can be pre-configured in the factory and lifted with a crane into position. They can consist of glass, metal, concrete and natural stone elements. Intelligent solar power and air conditioning systems can even be integrated. Curtain wall systems guarantee superior quality, a safe working environment, and fast on-site installation.

JORDAHL® anchor channels for glass and metal facades are used to connect the longitudinal and transverse profiles of curtain wall systems and transfer the loads into the concrete structure. They are adaptable to suit any application and formatted in accordance with the design requirements. The various individual solutions are based on two basic principles:

1. A top of slab connection to transmit horizontal forces (from wind) and vertical forces (from dead load) and the resulting moments into the floor slab
2. Edge of slab connection to transmit the tensile forces (from wind) into the end of the floor slab

The Advantages

- Easy installation and adjustability of the connection system
- Installation close to the slab edge
- Secure transfer of vertical and horizontal loads even into thin floor slabs. Individual factored loads up to 55.6 kN possible
- Dynamic load bearing ability as a result of the use of hot rolled channel profiles with an approved fatigue resistance of 7.0 kN
- Easy incorporation of the installation system into the various possible floor types, such as in ribbed reinforced concrete slabs or thin floor slabs with corrugated metal decking
- Fast, cost-effective and secure installation on-site



Other Applications


Mounting Channel


Concrete Precast Elements


Stadium Seats


Railing Anchored in a Thin Slab


Corrugated Metal Siding & Roofs


Brickwork Support


Overhead Crane Rails


Industrial Machine Foundations


Lateral Brick Wall Support


Water Pipeline and Other Supports


Overhead Electrical Lines

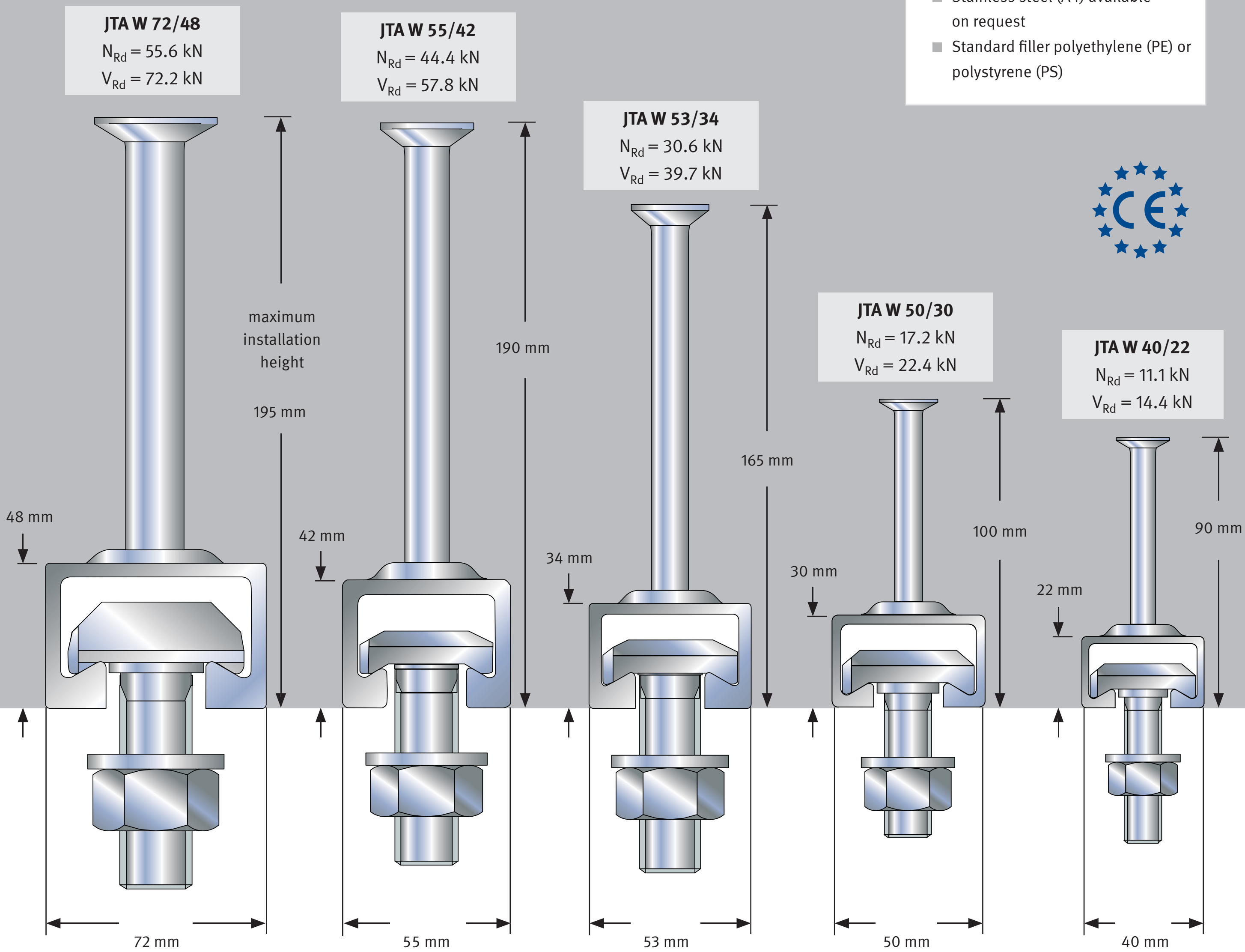

Elevators

Anchor Channel Overview

Material

- Hot dipped galvanized (HDG) carbon steel
- Stainless steel (A4) available on request
- Standard filler polyethylene (PE) or polystyrene (PS)

Hot Rolled Anchor Channels JTA-CE W



T-Bolts

JA	JB	JB	JB	JC
M 20 M 24 M 27 M 30	M 16 M 20 M 24	M 10 M 12 M 16 M 20	M 10 M 12 M 16 M 20	M 10 M 12 M 16

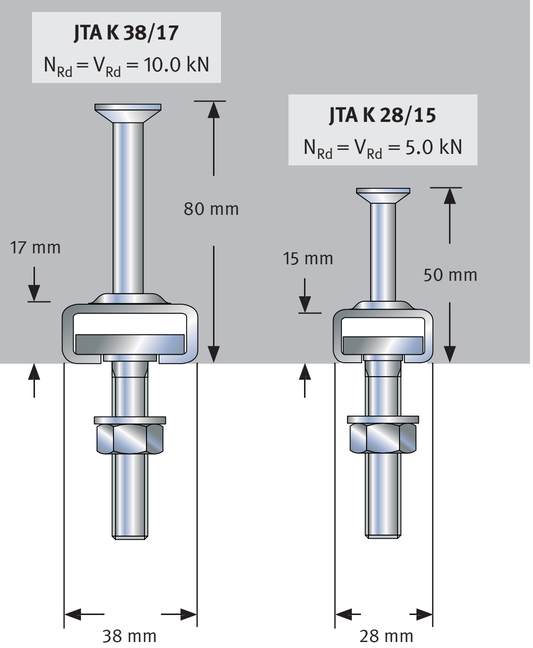
Material

- Zinc plated (ZP) or hot dipped galvanized (HDG) carbon steel
- Stainless steel (A4) available on request

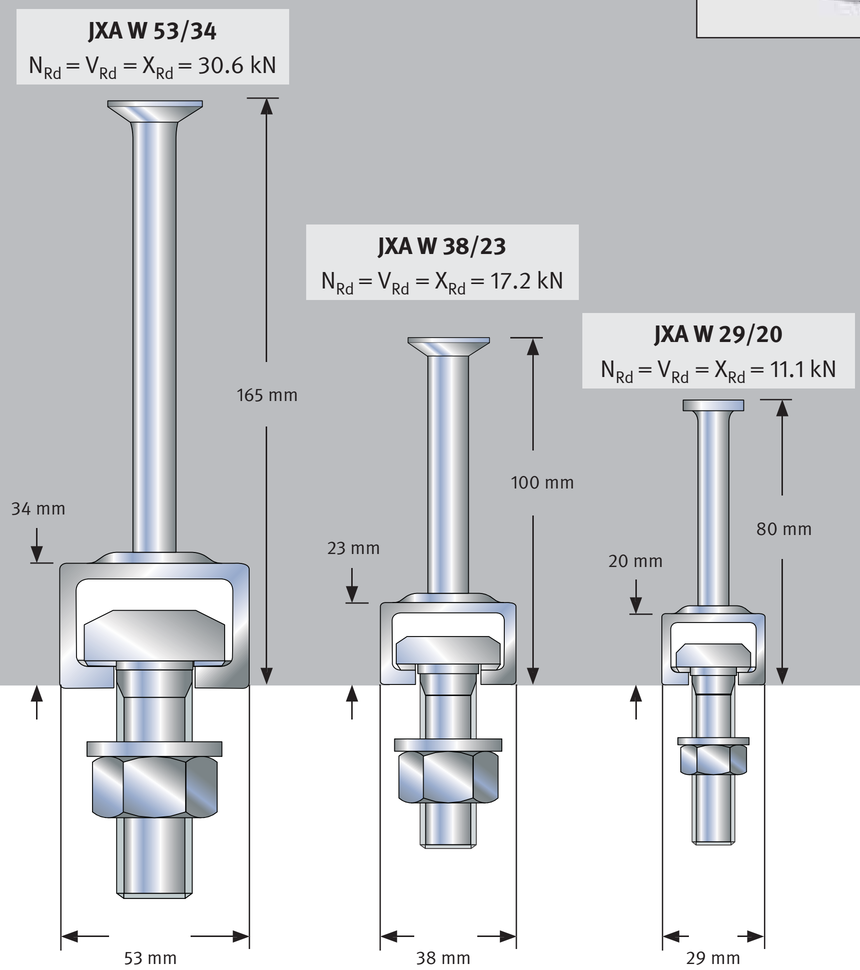
Hook Head T-Bolts and Hot Rolled Profile
metric thread sizes

JORDAHL®
anchored in quality

Cold Formed Anchor Channels JTA-CE K



Hot Rolled Toothed Anchor Channels JXA



JH	JD
M 10 M 12 M 16	M 6 M 8 M 10 M 12

Hammer Head T-Bolts and
Cold Formed Profile
metric thread sizes

Toothed T-Bolts

JXB	JXH	JXD
M 16 M 20	M 12 M 16	M 10 M 12

Toothed T-Bolts and Toothed
Hot Rolled Profile
metric thread sizes

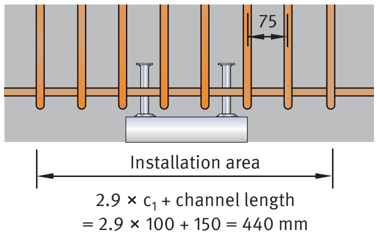
Sample Calculation – Reinforced Concrete

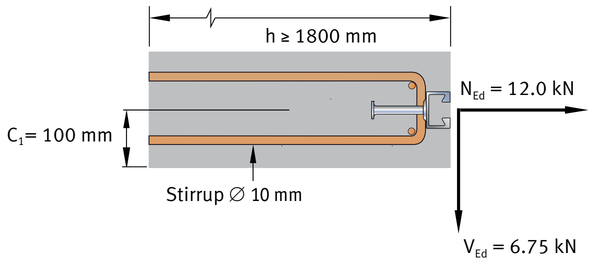
Example for Front Face Installation, Single Load, Additionally Reinforced; Component Depth – Thickness ≥ 1800 mm, Edge Distance c_1 = 100 mm

Given:

- Concrete C30/37, $f_{ck, cube}$ = 37 N/mm², cracked
- Single load, at any point of the channel
- Supplementary reinforcement, stirrups ∅ 10/75 mm, located in the area of the JORDAHL® anchor channel

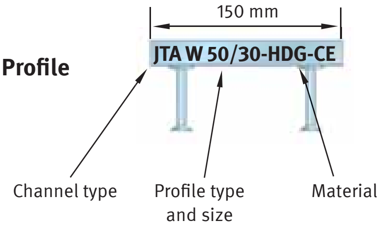
Wind Load = 8.0 kN
→ Design tensile load $N_{Ed} = 1.5 \times 8.0 = 12.0$ kN
Dead Load = 5.0 kN
→ Design shear load $V_{Ed} = 1.35 \times 5.0 = 6.75$ kN
(For load factors see EN 1990, Annex A)





Channel profile: JTA W 50/30
Channel length: 150 mm
Number of anchors: 2

Channel Profile



From pages 18/19 the design resistance without geometrical influence:

$N_{Rd} = V_{Rd}$ = **17.22 kN**

Example for Ordering a JORDAHL® Anchor Channel:

Type	Size	Length		# Anchors	Material		ETA Compliant
JTA W	50/30	150	–	2A	HDG	–	CE

Part Number	Channel Length	Min. Load Distance	Steel* Strength-Factors Pull-out S_N	Steel* Strength-Factors Shear S_V	Concrete Reinforced Strength-Factors ²⁾ Pull-out ⁴⁾ $C_{re,N}$	Concrete Reinforced Strength-Factors ²⁾ Shear ⁵⁾ $C_{re,V}$
JTA W 50/30–150–2A	150 mm	none	1.00	1.00	2.23	2.46
JTA W 50/30–150–2A	200 mm				2.31	3.04
JTA W 50/30–250–2A	250 mm				2.36	3.04
JTA W 50/30–300–2A	300 mm				2.36	3.52
JTA W 50/30–300–3A	300 mm	100 mm	1.00	1.00	1.24	1.35
JTA W 50/30–350–3A	350 mm		0.95	0.95	1.33	1.99
JTA W 50/30–450–3A	450 mm		0.82	0.82	1.32	1.98

Load Factors for steel
Influence of channel length and load position:

Steel: S_N = 1.00; S_V = 1.00

Pull-out resistance: 17.22 kN × 1.00 = **17.22 kN**
Shear resistance: 17.22 kN × 1.00 = **17.22 kN**

Load Factors for Reinforced Concrete
Influence of concrete and channel-geometry:

concrete: C_N = 2.23; C_V = 2.46
crackfactor tension: 1/1.4 = 0.71
crackfactor shear: 1/1.33 = 0.75

Pull-out resistance: 17.22 kN × 2.23 × 0.71 = **27.26 kN**
Shear resistance: 17.22 kN × 2.46 × 0.75 = **31.77 kN**

On page 26/27
Reduction factors for edge distance and member thickness/reinforced concrete:

Edge Distance c_1 [mm]	h = 125 Pull-Out ψ_{N,c_1}	h = 125 Shear ψ_{V,c_1}	h = 175 Pull-Out ψ_{N,c_1}	h = 175 Shear ψ_{V,c_1}	h = 200 Pull-Out ψ_{N,c_1}	h = 200 Shear ψ_{V,c_1}	h = 1000 Pull-Out ψ_{N,c,re_1}	h = 1000 Shear ψ_{V,c,re_1}
75	0.48	0.32	0.48	0.36	0.48	0.37	0.48	0.37
100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	82	65
150	1.00	0.84	1.00	0.86	1.00	0.85	1.00	1.00
200	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
300	-	-	1.00	0.68	1.00	0.68	1.00	0.88

$\psi_{N, c, re_1} = 0.82$
$\psi_{V, c, re_1} = 0.65$

Proofs for Steel and Concrete:

Steel:

Tension

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times 17.22\text{ kN}}$$

$$= \frac{12.0\text{ kN}}{1.00 \times 17.22\text{ kN}} = \frac{12.0\text{ kN}}{17.22\text{ kN}} = 0.70 = \leq 1.0 \rightarrow \text{OK}$$

Shear

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times 17.22\text{ kN}}$$

$$= \frac{6.75\text{ kN}}{1.00 \times 17.22\text{ kN}} = \frac{6.75\text{ kN}}{17.22\text{ kN}} = 0.39 \leq 1.0 \rightarrow \text{OK}$$

Reinforced Concrete:

Tension

$$\beta_{N,c} = \frac{N_{Ed}}{\psi_{N,c_1} \times C_N \times 0.71 \times 17.22\text{ kN}}$$

$$= \frac{12.0\text{ kN}}{0.82 \times 2.23 \times 0.71 \times 17.22\text{ KN}} = \frac{12.0\text{ kN}}{22.36\text{ kN}} = 0.54 \leq 1.0 \rightarrow \text{OK}$$

Shear

$$\beta_{V,c} = \frac{V_{Ed}}{\psi_{V,c,re_1} \times C_V \times 0.75 \times 17.22\text{ kN}}$$

$$= \frac{6.75\text{ kN}}{0.65 \times 2.46 \times 0.75 \times 17.22\text{ kN}} = \frac{6.75\text{ kN}}{20.65\text{ kN}} = 0.33 \leq 1.0 \rightarrow \text{OK}$$

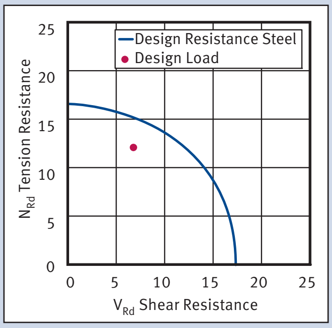
Combined Tension and Shear Interaction for Channel Profile:

$$\left(\frac{N_{Ed}}{S_N \times 17.22\text{ kN}}\right)^2 + \left(\frac{V_{Ed}}{S_V \times 17.22\text{ kN}}\right)^2 \leq 1.0$$

$$\beta_{N,s}{}^2 + \beta_{V,s}{}^2 \leq 1.0$$

$$0.70^2 + 0.39^2 \leq 1.0$$

$$0.49 + 0.15 = 0.64 \leq 1.0 \rightarrow \text{OK}$$

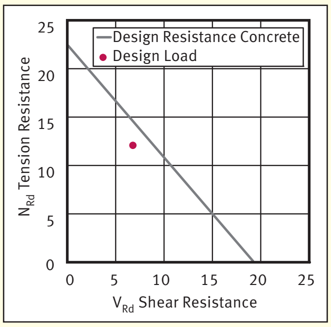


$$\left(\frac{N_{Ed}}{\psi_{N,c_1} \times C_N \times 0.71 \times 17.22\text{ kN}}\right)^1 + \left(\frac{V_{Ed}}{\psi_{V,c_1} \times C_V \times 0.75 \times 17.22\text{ kN}}\right)^1 \leq 1.0$$

$$\beta_{N,c}{}^1 + \beta_{V,c}{}^1 \leq 1.0$$

$$0.54^1 + 0.33^1 \leq 1.0$$

$$0.54 + 0.33 = 0.87 \leq 1.0 \rightarrow \text{OK}$$



T-Bolt: JB-M 16, Strength Grade 4.6 (T-Bolt Selection on Page 34)

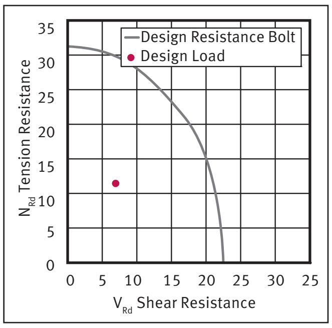
$N_{Ed} = 12.0$ kN; $V_{Ed} = 6.75$ kN

$N_{Rd} = 31.4$ kN; $V_{Rd} = 22.6$ kN

$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0; \qquad \beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0;$$

$$\frac{12.0\text{ kN}}{31.4\text{ kN}} = 0.38 \leq 1.0 \rightarrow \text{OK} \qquad \frac{6.75\text{ kN}}{22.6\text{ kN}} = 0.30 \leq 1.0 \rightarrow \text{OK}$$

Combined Tension and Shear Interaction for T-Bolt:



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

$$\beta_{N,sc}{}^2 + \beta_{V,sc}{}^2 \leq 1.0$$

$$\left(\frac{12.0\text{ kN}}{31.4\text{ kN}}\right)^2 + \left(\frac{6.75\text{ kN}}{22.6\text{ kN}}\right)^2 \leq 1.0$$

$$0.14 + 0.09 = 0.23 \leq 1.0 \rightarrow \text{OK}$$

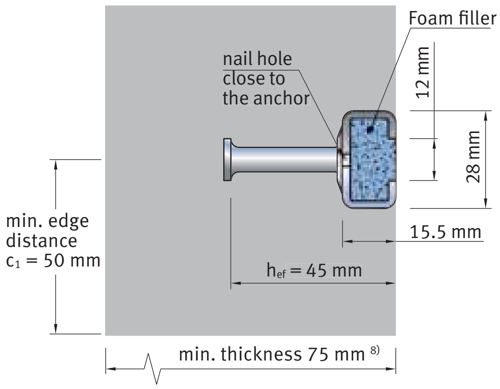
For Top-Slap Example and Unreinforced Concrete See Page 1.2–1.3.

JTA K 28/15

- **JTA K 28/15 – JD Bolts**
- JTA K 38/17 – JH Bolts
- JTA W 40/22 – JC Bolts
- JTA W 50/30 – JB Bolts
- JTA W 53/34 – JB Bolts
- JTA W 55/42 – JB Bolts
- JTA W 72/48 – JA Bolts

Design Resistance:

$N_{Rd} = V_{Rd} = 5.0$ kN [1) 7)]



The Following Partial Safety Factors are Included:

Steel: $\gamma_{Ms} = 1.8$

Concrete: $\gamma_{Mc} = 1.5$

The Following Equations Must be Checked:

Steel:

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times 5.0\,\text{kN}} \leq 1.0;$$

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times 5.0\,\text{kN}} \leq 1.0 \qquad \beta_{N,s}^{\ 2} + \beta_{V,s}^{\ 2} \leq 1.0$$

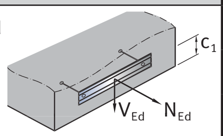
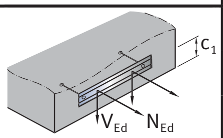
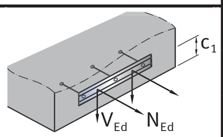
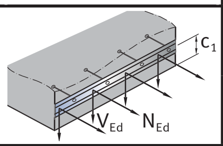
Concrete Unreinforced:

$$\beta_{N,c} = \frac{N_{Ed}}{\psi_{N,c_1} \times C_N \times 5.0\ \text{kN}} \leq 1.0;$$

$$\beta_{V,c} = \frac{V_{Ed}}{\psi_{V,c_1} \times C_V \times 5.0\ \text{kN}} \leq 1.0 \qquad \beta_{N,c}^{\ 1.5} + \beta_{V,c}^{\ 1.5} \leq 1.0$$

Example for Ordering a JORDAHL® Anchor Channel:

Type	Size	Length	# Anchors	Material	ETA Compliant
JTA K	28/15	– 150	– 2A	HDG	– CE

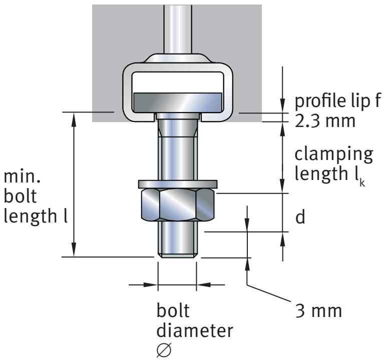
Load Configuration 3) For Top-Slab and Front-Face Concrete = C 30 / 37 Member Thickness = 1000 mm Edge Distance c_1 = 150 mm Resistance Given per Load Point	Part Number	Channel Length	Min. Load Distance	Steel* Strength-Factors Pull-out S_N	Steel* Strength-Factors Shear S_V
Single Load 2A 	JTA K 28/15–150–2A	150 mm	none	1.00	1.00
	JTA K 28/15–200–2A	200 mm		1.00	1.00
	JTA K 28/15–250–2A	250 mm		1.00	1.00
Pair Load 2A 	JTA K 28/15–150–2A	150 mm	100 mm	1.00	1.00
	JTA K 28/15–200–2A	200 mm		0.87	0.87
	JTA K 28/15–250–2A	250 mm		0.78	0.78
Pair Load 3A 	JTA K 28/15–250–3A	250 mm	100 mm	1.00	1.00
	JTA K 28/15–300–3A	300 mm		0.99	0.99
	JTA K 28/15–450–3A	450 mm		0.78	0.78
Continuous Load 	JTA K 28/15–650–4A	650 mm	200 mm	0.96	0.96
	JTA W K 28/15–6000–31A	6000 – 6050 mm	200 mm	0.96	0.96

■ Minimum of steel or concrete resistance governs.

JORDAHL®
anchored in quality

T-Bolt Selection Chart

Length (l) [mm]
15
20
25
30
40
50
60
80
100
125
150
200



Minimum Bolt Length:

- Add clamping length l_k
  plus bolt diameter d = ∅
  plus profile lip f
  plus 3 mm
- Select next longer length from the T-bolt selection chart

Bolt capacity may be limited by anchor channel capacity. Check combined loads using:

$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0$$

$$\beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

$$\beta_{N,sc}^{\;2} + \beta_{V,sc}^{\;2} \leq 1.0$$

For stainless steel bolts see page 36/37.

Metric Thread Size ∅ [mm]	Type JD			
	M 6	M 8	M 10	M 12
Strength Grade	4.6			
Tension Load N_{Rd} [kN]	4.0	7.3	11.6	16.9
Shear Load V_{Rd} [kN]	2.9	5.3	8.4	12.1

Example for Ordering a JORDAHL® Bolt Type JD:

Type	Diameter		Length [mm]		Strength		Coating
JD	M 10	×	40	–	4.6	–	ZP

Concrete**	
Unreinforced	
Strength-Factors 2)	
Pull-out 4) C_N	Shear 5) 6) C_V
2.94	5.35
3.05	5.45
3.01	5.47
1.68	2.79
1.81	2.88
1.82	2.93
1.78	2.84
1.89	2.90
1.82	2.93
2.16	2.35
2.14	1.84

- $\psi_{N,c_1} = \psi_{V,c_1} = 1$ for concrete member thickness & edge distance shown above.
For other dimensions and top-slab application see page 26/27.

Notes on Anchor Channels

1) Load values are design resistances. They are valid for mild and stainless steel. For permissible loads divide by 1.4 load safety factor.
2) Concrete strength is C 30 / 37. Resistance of unreinforced concrete may be adjusted for values between C 20 / 25 and C 50 / 60 by multiplying concrete strength by the factor below:

$$\sqrt{\frac{f_{ck,\,cube\ project}}{37\ N/mm^2}}$$

3) Loads can be positioned anywhere on the channel. Allow for 25 mm distance from the bolt center to the end of the profile.
4) Valid for uncracked concrete. For cracked concrete divide by 1.40.
5) Valid for uncracked concrete. For cracked concrete divide by 1.33.
6) When using rebar configuration according to CEN/TS 1992-4 shear resistance in cracked concrete can be improved up to the resistance of uncracked concrete.
7) The information given is intended to be used in conjunction with the design criteria of CEN/TS 1992-4 and factored loads according to EN 1990. –> Transmission of forces in the structure must be considered in the design.
8) Min. member thickness incl. 25 mm concrete cover over the anchor.

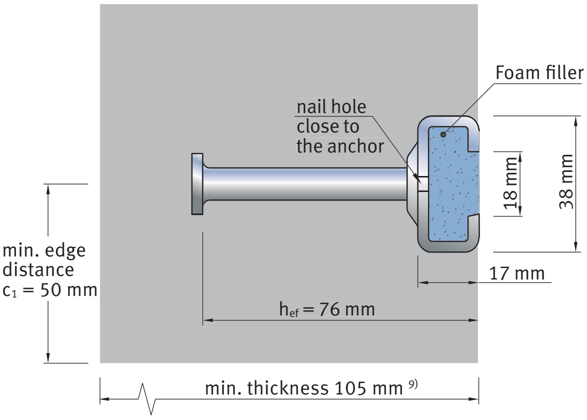
* S_N, S_V: steel strength reduction factor for channel length and load spacing

** C_N, C_V: concrete strength correction factor for channel length and load configuration

JTA K 38/17

Design Resistance:

$N_{Rd} = V_{Rd} = 10.0$ kN [1) 8)]



The Following Partial Safety Factors are Included:

Steel: $\gamma_{Ms} = 1.8$
Concrete: $\gamma_{Mc} = 1.5$; Reinforcement: $\gamma_{Ms,\,re} = 1.15$
Use either interaction for unreinforced or reinforced concrete.

The Following Equations Must be Checked:

Steel:

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times 10.0\text{ kN}} \leq 1.0;$$

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times 10.0\text{ kN}} \leq 1.0 \qquad \beta_{N,s}{}^2 + \beta_{V,s}{}^2 \leq 1.0$$

Concrete Unreinforced:

$$\beta_{N,c} = \frac{N_{Ed}}{\psi_{N,c_1} \times C_N \times 10.0\text{ kN}} \leq 1.0;$$

$$\beta_{V,c} = \frac{V_{Ed}}{\psi_{V,c_1} \times C_V \times 10.0\text{ kN}} \leq 1.0 \qquad \beta_{N,c}{}^{1.5} + \beta_{V,c}{}^{1.5} \leq 1.0$$

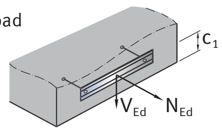
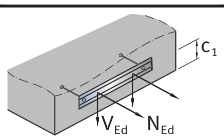
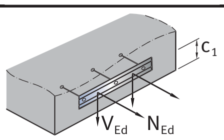
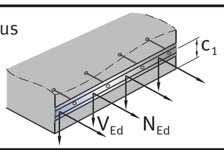
Concrete Reinforced (∅10/75 mm):

$$\beta_{N,c,re} = \frac{N_{Ed}}{\psi_{N,c,re_1} \times C_{re,N} \times 10.0\text{ kN}} \leq 1.0;$$

$$\beta_{V,c,re} = \frac{V_{Ed}}{\psi_{V,c,re_1} \times C_{re,V} \times 10.0\text{ kN}} \leq 1.0 \qquad \beta_{N,c,re}{}^{1} + \beta_{V,c,re}{}^{1} \leq 1.0$$

Example for Ordering a JORDAHL® Anchor Channel:

Type	Size		Length		# Anchors	Material		ETA Compliant
JTA K	38/17	–	150	–	2A	HDG	–	CE

Load Configuration [3)] **For Top-Slab and Front-Face** **Concrete = C 30 / 37** **Member Thickness = 1000 mm** **Edge Distance c_1 = 150 mm** Resistance Given per Load Point	Part Number	Channel Length	Min. Load Distance	Steel* Strength-Factors Pull-out S_N	Steel* Strength-Factors Shear S_V
Single Load 2A 	JTA K 38/17–150–2A	150 mm	none	1.00	1.00
	JTA K 38/17–200–2A	200 mm		1.00	1.00
	JTA K 38/17–250–2A	250 mm		1.00	1.00
Pair Load 2A 	JTA K 38/17–150–2A	150 mm	100 mm	1.00	1.00
	JTA K 38/17–200–2A	200 mm		0.88	0.88
	JTA K 38/17–250–2A	250 mm		0.79	0.79
Pair Load 3A 	JTA K 38/17–250–3A	250 mm	100 mm	1.00	1.00
	JTA K 38/17–300–3A	300 mm		1.00	1.00
	JTA K 38/17–450–3A	450 mm		0.79	0.79
Continuous Load 	JTA K 38/17–650–4A	650 mm	200 mm	0.96	0.96
	JTA K 38/17–6000–31A	6000 – 6050 mm	200 mm	0.96	0.96

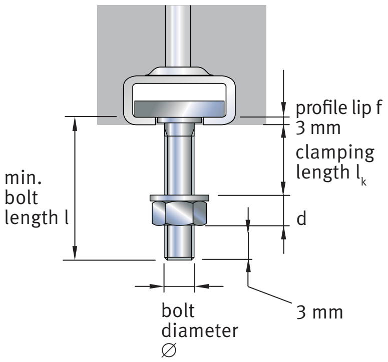
■ Minimum of steel or concrete resistance governs.

JH Bolts

JORDAHL®
anchored in quality

T-Bolt Selection Chart

Length (l) [mm]
20
30
40
50
60
80
100
125
150
200



For stainless steel bolts see page 36/37.

Metric Thread Size ∅ [mm]	Type JH			
	M 10	M 12	M 12	M 16
Strength Grade	4.6	4.6	8.8	4.6
Tension Load N_{Rd} [kN]	11.6	16.9	44.9	31.4
Shear Load V_{Rd} [kN]	8.4	12.1	27.0	22.6

Minimum Bolt Length:

- Add clamping length l_k
  plus bolt diameter d = ∅
  plus profile lip f
  plus 3 mm
- Select next larger length from the T-bolt selection chart

Bolt capacity may be limited by anchor channel capacity. Check combined loads using:

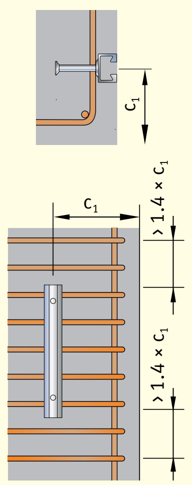
$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0$$

$$\beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

$$\beta_{N,sc}^{\;2} + \beta_{V,sc}^{\;2} \leq 1.0$$

Example for Ordering a JORDAHL® Bolt Type JH:

Type	Diameter		Length [mm]		Strength		Coating
JH	M 12	×	50	–	4.6	–	ZP

Concrete**		Concrete***			Channel Length
Unreinforced		Reinforced [7] Concrete	Reinforced		
Strength-Factors [2]			Strength-Factors [2]		
Pull-out [4] C_N	Shear [5] [6] C_V		Pull-out [4] $C_{re,N}$	Shear [5] $C_{re,V}$	
3.05	3.21	∅ 10 / 75 mm 	2.68	4.02	150 mm
3.15	3.27		2.77	4.16	200 mm
3.18	3.30		2.80	4.20	250 mm
1.65	1.67		1.45	2.18	150 mm
1.75	1.72		1.54	2.31	200 mm
1.80	1.75		1.58	2.38	250 mm
1.71	1.70		1.51	2.26	250 mm
1.79	1.74		1.58	2.31	300 mm
1.80	1.75		1.58	2.38	450 mm
1.73	1.39		1.53	2.29	650 mm
1.68	1.07		1.48	2.21	6000 – 6050 mm

- $\psi_{N,c_1} = \psi_{V,c_1} = 1$ for concrete member thickness & edge distance shown above.

For other dimensions and top-slab application see page 26/27.

Notes on Anchor Channels

1) Load values are design resistances. They are valid for mild and stainless steel. For permissible loads divide by 1.4 load safety factor.
2) Concrete strength is C 30 / 37. Resistance of unreinforced concrete may be adjusted for values between C 20 / 25 and C 50 / 60 by multiplying concrete strength by the factor below:

$$\sqrt{\frac{f_{ck,\,cube\ project}}{37\ N/mm^2}}$$

3) Loads can be positioned anywhere on the channel. Allow for 25 mm distance from the bolt center to the end of the profile.
4) Valid for uncracked concrete. For cracked concrete divide by 1.40.
5) Valid for uncracked concrete. For cracked concrete divide by 1.33.
6) When using rebar configuration according to CEN/TS 1992-4 shear resistance in cracked concrete can be improved up to the resistance of uncracked concrete.
7) Rebar configuration based upon a conservative assessment. Project specific design may be able to save rebar content. For front face installation stirrups are recommended.
8) The information given is intended to be used in conjunction with the design criteria of CEN/TS 1992-4 and factored loads according to EN 1990. –> Transmission of forces in the structure must be considered in the design.
9) Min. member thickness incl. 25 mm concrete cover over the anchor.

* S_N, S_V: steel strength reduction factor for channel length and load spacing

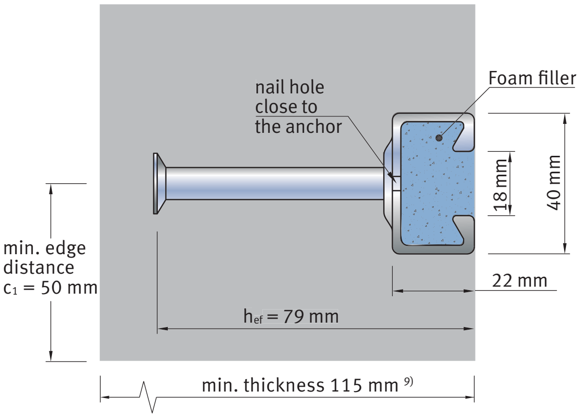
** C_N, C_V: concrete strength correction factor for channel length and load configuration

*** $C_{re,N}$, $C_{re,V}$: correction factor for channel length and load configuration in reinforced concrete

JTA W 40/22

Design Resistance:

$N_{Rd} = V_{Rd} = 11.1$ kN [1) 8)]



The Following Partial Safety Factors are Included:

Steel: $\gamma_{Ms} = 1.8$
Concrete: $\gamma_{Mc} = 1.5$; Reinforcement: $\gamma_{Ms,\,re} = 1.15$
Use either interaction for unreinforced or reinforced concrete.

The Following Equations Must be Checked:

Steel:

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times 11.1\ \text{kN}} \leq 1.0;$$

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times 11.1\ \text{kN}} \leq 1.0 \qquad \beta_{N,s}^{\ 2} + \beta_{V,s}^{\ 2} \leq 1.0$$

Concrete Unreinforced:

$$\beta_{N,c} = \frac{N_{Ed}}{\psi_{N,c_1} \times C_N \times 11.1\ \text{kN}} \leq 1.0;$$

$$\beta_{V,c} = \frac{V_{Ed}}{\psi_{V,c_1} \times C_V \times 11.1\ \text{kN}} \leq 1.0 \qquad \beta_{N,c}^{\ 1.5} + \beta_{V,c}^{\ 1.5} \leq 1.0$$

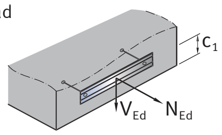
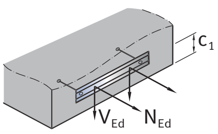
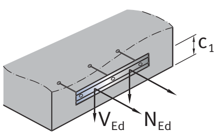
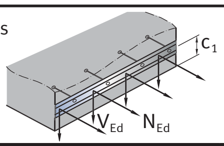
Concrete Reinforced (∅ 10/75 mm):

$$\beta_{N,c,re} = \frac{N_{Ed}}{\psi_{N,c,re_1} \times C_{re,N} \times 11.1\ \text{kN}} \leq 1.0;$$

$$\beta_{V,c,re} = \frac{V_{Ed}}{\psi_{V,c,re_1} \times C_{re,V} \times 11.1\ \text{kN}} \leq 1.0 \qquad \beta_{N,c,re}^{\ 1} + \beta_{V,c,re}^{\ 1} \leq 1.0$$

Example for Ordering a JORDAHL® Anchor Channel:

Type	Size		Length		# Anchors	Material		ETA Compliant
JTA W	40/22	–	150	–	2A	HDG	–	CE

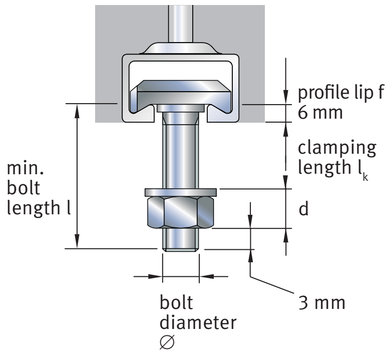
Load Configuration 3) For Top-Slab and Front-Face Concrete = C 30 / 37 Member Thickness = 1000 mm Edge Distance c_1 = 150 mm Resistance Given per Load Point	Part Number	Channel Length	Min. Load Distance	Steel* Strength-Factors Pull-out S_N	Steel* Strength-Factors Shear S_V
Single Load 2A 	JTA W 40/22–150–2A	150 mm	none	1.00	1.00
	JTA W 40/22–200–2A	200 mm		1.00	1.00
	JTA W 40/22–250–2A	250 mm		1.00	1.00
	JTA W 40/22–300–2A	300 mm		1.00	1.00
Pair Load 2A 	JTA W 40/22–150–2A	150 mm	100 mm	1.00	1.00
	JTA W 40/22–200–2A	200 mm		0.88	0.88
	JTA W 40/22–250–2A	250 mm		0.80	0.80
	JTA W 40/22–300–2A	300 mm		0.74	0.74
Pair Load 3A 	JTA W 40/22–250–3A	250 mm	100 mm	1.00	1.00
	JTA W 40/22–300–3A	300 mm		1.00	1.00
	JTA W 40/22–350–3A	350 mm		0.93	0.93
	JTA W 40/22–450–3A	450 mm		0.80	0.80
Continuous Load 	JTA W 40/22–550–3A	550 mm	250 mm	0.93	0.93
	JTA W 40/22–6000–25A	6000 – 6050 mm		0.97	0.97

■ Minimum of steel or concrete resistance governs.

JC Bolts

T-Bolt Selection Chart

Length (l) [mm]
20
30
40
50
60
80
100
125
150
200
250
300



For stainless steel bolts see page 36/37.

Metric Thread Size ∅ [mm]	Type JC				
	M 10	**M 12**	**M 12**	**M 16**	**M 16**
Strength Grade	4.6	4.6	8.8	4.6	8.8
Tension Load N_{Rd} [kN]	11.6	16.9	44.9	31.4	83.7
Shear Load V_{Rd} [kN]	8.4	12.1	27.0	22.6	50.2

Minimum Bolt Length:

- Add clamping length l_k
  plus bolt diameter d = ∅
  plus profile lip f
  plus 3 mm
- Select next larger length from the T-bolt selection chart

Bolt capacity may be limited by anchor channel capacity. Check combined loads using:

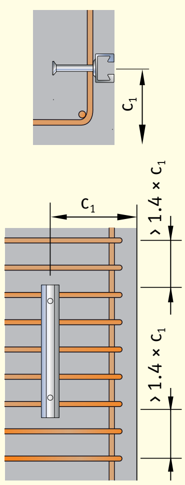
$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0$$

$$\beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

$$\beta_{N,sc}^{\ 2} + \beta_{V,sc}^{\ 2} \leq 1.0$$

Example for Ordering a JORDAHL® Bolt Type JC:

Type	Diameter		Length [mm]		Strength		Coating
JC	M 12	×	60	–	4.6	–	ZP

Concrete**		Concrete***			Channel Length
Unreinforced		Reinforced [7] Concrete	Reinforced		
Strength-Factors [2]			Strength-Factors [2]		
Pull-out [4] C_N	Shear [5] [6] C_V		Pull-out [4] $C_{re,N}$	Shear [5] $C_{re,V}$	
2.88	2.89	∅ 10 / 75 mm 	2.58	3.80	150 mm
2.99	2.96		2.68	4.02	200 mm
2.99	2.99		2.72	4.07	250 mm
2.82	2.99		2.69	4.04	300 mm
1.55	1.50		1.39	2.08	150 mm
1.65	1.55		1.47	2.21	200 mm
1.70	1.58		1.52	2.28	250 mm
1.65	1.60		1.53	2.30	300 mm
1.61	1.53		1.44	2.09	250 mm
1.69	1.57		1.51	2.09	300 mm
1.75	1.60		1.56	2.35	350 mm
1.70	1.58		1.53	2.29	450 mm
1.81	1.31		1.62	2.43	550 mm
1.85	1.17		1.66	2.49	6000 – 6050 mm

- $\psi_{N,c_1} = \psi_{V,c_1} = 1$ for concrete member thickness & edge distance shown above.
For other dimensions and top-slab application see page 26/27.

Notes on Anchor Channels

1) Load values are design resistances. They are valid for mild and stainless steel. For permissible loads divide by 1.4 load safety factor.
2) Concrete strength is C 30 / 37. Resistance of unreinforced concrete may be adjusted for values between C 20 / 25 and C 50 / 60 by multiplying concrete strength by the factor below:

$$\sqrt{\frac{f_{ck,\ cube\ project}}{37\ N/mm^2}}$$

3) Loads can be positioned anywhere on the channel. Allow for 25 mm distance from the bolt center to the end of the profile.
4) Valid for uncracked concrete. For cracked concrete divide by 1.40.
5) Valid for uncracked concrete. For cracked concrete divide by 1.33.
6) When using rebar configuration according to CEN/TS 1992-4 shear resistance in cracked concrete can be improved up to the resistance of uncracked concrete.
7) Rebar configuration based upon a conservative assessment. Project specific design may be able to save rebar content. For front face installation stirrups are recommended.
8) The information given is intended to be used in conjunction with the design criteria of CEN/TS 1992-4 and factored loads according to EN 1990. –> Transmission of forces in the structure must be considered in the design.
9) Min. member thickness incl. 25 mm concrete cover over the anchor.

* S_N, S_V: steel strength reduction factor for channel length and load spacing

** C_N, C_V: concrete strength correction factor for channel length and load configuration

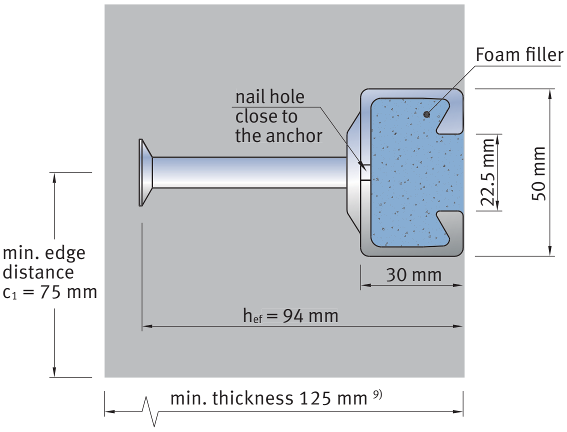
*** $C_{re,N}$, $C_{re,V}$: correction factor for channel length and load configuration in reinforced concrete

JTA W 50/30

JTA K 28/15 – JD Bolts
JTA K 38/17 – JH Bolts
JTA W 40/22 – JC Bolts
JTA W 50/30 – JB Bolts
JTA W 53/34 – JB Bolts
JTA W 55/42 – JB Bolts
JTA W 72/48 – JA Bolts

Design Resistance:

$N_{Rd} = V_{Rd} = 17.2\ \text{kN}$ 1) 8)



The Following Partial Safety Factors are Included:

Steel: $\gamma_{Ms} = 1.8$
Concrete: $\gamma_{Mc} = 1.5$; Reinforcement: $\gamma_{Ms,\,re} = 1.15$
Use either interaction for unreinforced or reinforced concrete.

The Following Equations Must be Checked:

Steel:

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times 17.2\ \text{kN}} \leq 1.0;$$

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times 17.2\ \text{kN}} \leq 1.0 \qquad \beta_{N,s}^{\ 2} + \beta_{V,s}^{\ 2} \leq 1.0$$

Concrete Unreinforced:

$$\beta_{N,c} = \frac{N_{Ed}}{\psi_{N,c_1} \times C_N \times 17.2\ \text{kN}} \leq 1.0;$$

$$\beta_{V,c} = \frac{V_{Ed}}{\psi_{V,c_1} \times C_V \times 17.2\ \text{kN}} \leq 1.0 \qquad \beta_{N,c}^{\ 1.5} + \beta_{V,c}^{\ 1.5} \leq 1.0$$

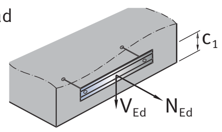
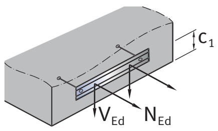
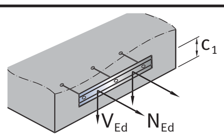
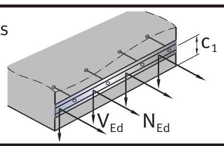
Concrete Reinforced (∅ 10/75 mm):

$$\beta_{N,c,re} = \frac{N_{Ed}}{\psi_{N,c,re_1} \times C_{re,N} \times 17.2\ \text{kN}} \leq 1.0;$$

$$\beta_{V,c,re} = \frac{V_{Ed}}{\psi_{V,c,re_1} \times C_{re,V} \times 17.2\ \text{kN}} \leq 1.0 \qquad \beta_{N,c,re}^{\ 1} + \beta_{V,c,re}^{\ 1} \leq 1.0$$

Example for Ordering a JORDAHL® Anchor Channel:

Type	Size		Length		# Anchors	Material		ETA Compliant
JTA W	50/30	–	150	–	2A	HDG	–	CE

Load Configuration 3) For Top-Slab and Front-Face Concrete = C 30 / 37 Member Thickness = 1000 mm Edge Distance c_1 = 150 mm Resistance Given per Load Point	Part Number	Channel Length	Min Load Distance	Steel* Strength-Factors Pull-out S_N	Steel* Strength-Factors Shear S_V
Single Load 2A 	JTA W 50/30–150–2A	150 mm	none	1.00	1.00
	JTA W 50/30–200–2A	200 mm		1.00	1.00
	JTA W 50/30–250–2A	250 mm		1.00	1.00
	JTA W 50/30–300–2A	300 mm		1.00	1.00
Pair Load 2A 	JTA W 50/30–150–2A	150 mm	100 mm	1.00	1.00
	JTA W 50/30–200–2A	200 mm		0.89	0.89
	JTA W 50/30–250–2A	250 mm		0.81	0.81
	JTA W 50/30–300–2A	300 mm		0.75	0.75
Pair Load 3A 	JTA W 50/30–300–3A	300 mm	100 mm	1.00	1.00
	JTA W 50/30–350–3A	350 mm		0.95	0.95
	JTA W 50/30–450–3A	450 mm		0.82	0.82
Continuous Load 	JTA W 50/30–550–3A	550 mm	250 mm	0.92	0.92
	JTA W 50/30–6000–25A	6000 – 6050 mm	250 mm	0.96	0.96

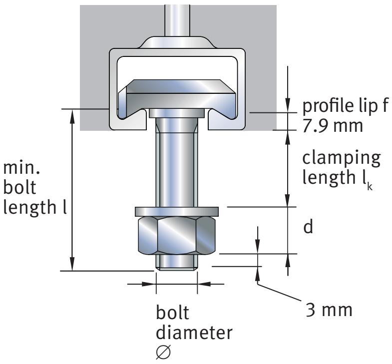
* Minimum of steel or concrete resistance governs.

JB Bolts

JORDAHL®
anchored in quality

T-Bolt Selection Chart

Length (l) [mm]
30
35
40
45
50
55
60
65
75
80
100
125
150
200
300



For stainless steel bolts see page 36/37.

Metric Thread Size ∅ [mm]	Type JB						
	M 10	M 12	M 12	M 16	M 16	M 20	M 20
Strength Grade	4.6	4.6	8.8	4.6	8.8	4.6	8.8
Tension Load N_{Rd} [kN]	11.6	16.9	44.9	31.4	83.7	49.0	130.7
Shear Load V_{Rd} [kN]	8.4	12.1	27.0	22.6	50.2	35.3	78.4

Minimum Bolt Length:

- Add clamping length l_k
  plus bolt diameter d = ∅
  plus profile lip f
  plus 3 mm
- Select next larger length from the T-bolt selection chart

Bolt capacity may be limited by anchor channel capacity. Check combined loads using:

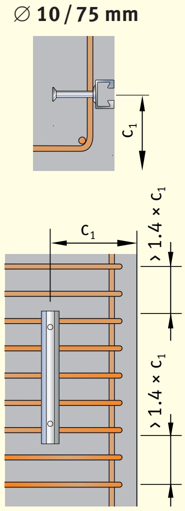
$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0$$

$$\beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

$$\beta_{N,sc}^{\ 2} + \beta_{V,sc}^{\ 2} \leq 1.0$$

Example for Ordering a JORDAHL® Bolt Type JB:

Type	Diameter		Length [mm]		Strength		Coating
JB	M 12	×	50	–	4.6	–	ZP

Concrete**		Concrete***			Channel Length
Unreinforced		Reinforced [7] Concrete	Reinforced		
Strength-Factors [2]			Strength-Factors [2]		
Pull-out [4] C_N	Shear [5][6] C_V		Pull-out [4] $C_{re,N}$	Shear [5] $C_{re,V}$	
2.30	2.18	∅ 10 / 75 mm 	2.23	2.46	150 mm
2.39	2.23		2.31	3.04	200 mm
2.43	2.26		2.36	3.04	250 mm
2.44	2.27		2.36	3.52	300 mm
1.22	1.13		1.18	1.77	150 mm
1.29	1.16		1.25	1.88	200 mm
1.34	1.19		1.30	1.95	250 mm
1.36	1.21		1.32	1.97	300 mm
1.32	1.18		1.24	1.35	300 mm
1.37	1.20		1.33	1.99	350 mm
1.36	1.20		1.32	1.98	450 mm
1.32	0.98		1.28	1.92	550 mm
1.35	0.86		1.31	1.96	6000 – 6050 mm

- $\psi_{N,c_1} = \psi_{V,c_1} = 1$ for concrete member thickness & edge distance shown above.

For other dimensions and top-slab application see page 26/27.

Notes on Anchor Channels

1) Load values are design resistances. They are valid for mild and stainless steel. For permissible loads divide by 1.4 load safety factor.
2) Concrete strength is C 30 / 37. Resistance of unreinforced concrete may be adjusted for values between C 20 / 25 and C 50 / 60 by multiplying concrete strength by the factor below:

$$\sqrt{\frac{f_{ck,\ cube\ project}}{37\ N/mm^2}}$$

3) Loads can be positioned anywhere on the channel. Allow for 25 mm distance from the bolt center to the end of the profile.
4) Valid for uncracked concrete. For cracked concrete divide by 1.40.
5) Valid for uncracked concrete. For cracked concrete divide by 1.33.
6) When using rebar configuration according to CEN/TS 1992-4 shear resistance in cracked concrete can be improved up to the resistance of uncracked concrete.
7) Rebar configuration based upon a conservative assessment. Project specific design may be able to save rebar content. For front face installation stirrups are recommended.
8) The information given is intended to be used in conjunction with the design criteria of CEN/TS 1992-4 and factored loads according to EN 1990. –> Transmission of forces in the structure must be considered in the design.
9) Min. member thickness incl. 25 mm concrete cover over the anchor.

* S_N, S_V: steel strength reduction factor for channel length and load spacing

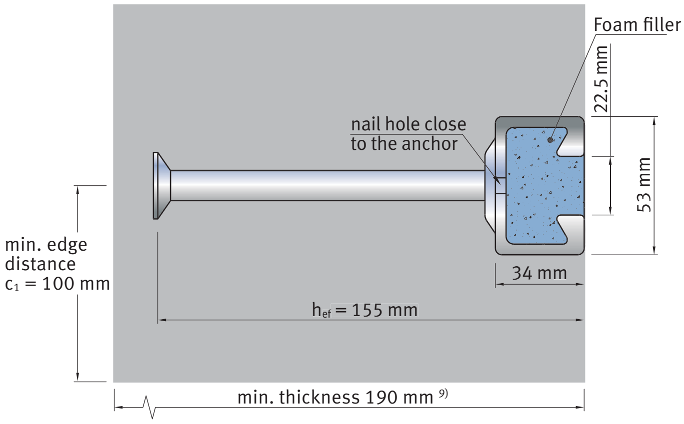
** C_N, C_V: concrete strength correction factor for channel length and load configuration

*** $C_{re,N}$, $C_{re,V}$: correction factor for channel length and load configuration in reinforced concrete

JTA W 53/34

Design Resistance:

$N_{Rd} = V_{Rd} = 30.6$ kN 1) 8)



The Following Partial Safety Factors are Included:

Steel: $\gamma_{Ms} = 1.8$
Concrete: $\gamma_{Mc} = 1.5$; Reinforcement: $\gamma_{Ms,\,re} = 1.15$
Use either interaction for unreinforced or reinforced concrete.

The Following Equations Must be Checked:

Steel:

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times 30.6\ \text{kN}} \le 1.0;$$

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times 30.6\ \text{kN}} \le 1.0 \qquad \beta_{N,s}^{\ 2} + \beta_{V,s}^{\ 2} \le 1.0$$

Concrete Unreinforced:

$$\beta_{N,c} = \frac{N_{Ed}}{\psi_{N,c_1} \times C_N \times 30.6\ \text{kN}} \le 1.0;$$

$$\beta_{V,c} = \frac{V_{Ed}}{\psi_{V,c_1} \times C_V \times 30.6\ \text{kN}} \le 1.0 \qquad \beta_{N,c}^{\ 1.5} + \beta_{V,c}^{\ 1.5} \le 1.0$$

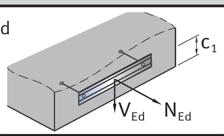
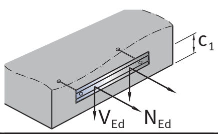
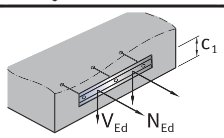
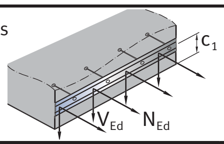
Concrete Reinforced (∅ 10/75 mm):

$$\beta_{N,c,re} = \frac{N_{Ed}}{\psi_{N,c,re_1} \times C_{re,N} \times 30.6\ \text{kN}} \le 1.0;$$

$$\beta_{V,c,re} = \frac{V_{Ed}}{\psi_{V,c,re_1} \times C_{re,V} \times 30.6\ \text{kN}} \le 1.0 \qquad \beta_{N,c,re}^{\ 1} + \beta_{V,c,re}^{\ 1} \le 1.0$$

Example for Ordering a JORDAHL® Anchor Channel:

Type	Size		Length	# Anchors		Material		ETA Compliant
JTA W	53/34	–	150	–	2A	HDG	–	CE

Load Configuration 3) For Top-Slab and Front-Face Concrete = C 30/37 Member Thickness = 1000 mm Edge Distance c_1 = 150 mm Resistance Given per Load Point	Part Number	Channel Length	Min. Load Distance	Steel* Strength-Factors Pull-out S_N	Steel* Strength-Factors Shear S_V
Single Load 2A 	JTA W 53/34–150–2A	150 mm	none	1.00	1.00
	JTA W 53/34–200–2A	200 mm		1.00	1.00
	JTA W 53/34–250–2A	250 mm		1.00	1.00
	JTA W 53/34–300–2A	300 mm		1.00	1.00
Pair Load 2A 	JTA W 53/34–200–2A	200 mm	150 mm	1.00	1.00
	JTA W 53/34–250–2A	250 mm		0.94	0.94
	JTA W 53/34–300–2A	300 mm		0.85	0.85
Pair Load 3A 	JTA W 53/34–350–3A	350 mm	150 mm	1.00	1.00
	JTA W 53/34–400–3A	400 mm		1.00	1.00
	JTA W 53/34–450–3A	450 mm		0.97	0.97
Continuous Load 	JTA W 53/34–550–3A	550 mm	240 mm	0.91	0.91
	JTA W 53/34–6000–25A	6000 – 6050 mm	250 mm	0.96	0.96

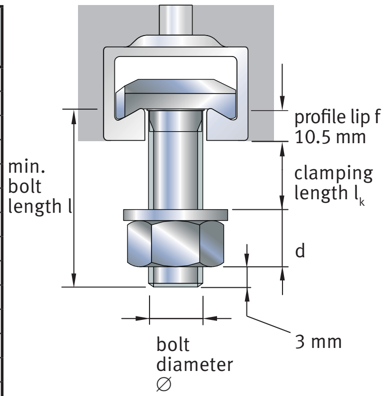
■ Minimum of steel or concrete resistance governs.

JB Bolts

JORDAHL®
anchored in quality

T-Bolt Selection Chart

Length (l) [mm]
30
35
40
45
50
55
60
65
75
80
100
125
150
200
300



For stainless steel bolts see page 36/37.

Minimum Bolt Length:

- Add clamping length l_k
  plus bolt diameter d = ∅
  plus profile lip f
  plus 3 mm
- Select next larger length from the T-bolt selection chart

Bolt capacity may be limited by anchor channel capacity. Check combined loads using:

$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0$$

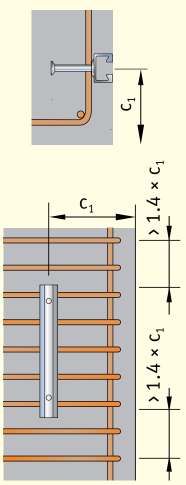
$$\beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

$$\beta_{N,sc}^{\ 2} + \beta_{V,sc}^{\ 2} \leq 1.0$$

Metric Thread Size ∅ [mm]	Type JB						
	M 10	M 12	M 12	M 16	M 16	M 20	M 20
Strength Grade	4.6	4.6	8.8	4.6	8.8	4.6	8.8
Tension Load N_{Rd} [kN]	11.6	16.9	44.9	31.4	83.7	49.0	130.7
Shear Load V_{Rd} [kN]	8.4	12.1	27.0	22.6	50.2	35.3	78.4

Example for Ordering a JORDAHL® Bolt Type JB:

Type	Diameter		Length [mm]		Strength		Coating
JB	M 16	×	60	–	4.6	–	ZP

Concrete**		Concrete***			Channel Length
Unreinforced		Reinforced 7) Concrete	Reinforced		
Strength-Factors 2)			Strength-Factors 2)		
Pull-out 4) C_N	Shear 5) 6) C_V		Pull-out 4) $C_{re,N}$	Shear 5) $C_{re,V}$	
2.47	1.21	∅ 10 / 75 mm 	2.47	1.67	150 mm
2.56	1.25		2.56	1.67	200 mm
2.63	1.27		2.63	1.87	250 mm
2.66	1.28		2.66	2.16	300 mm
1.37	0.66		1.37	1.52	200 mm
1.45	0.68		1.45	1.58	250 mm
1.49	0.70		1.49	1.62	300 mm
1.44	0.68		1.44	0.81	350 mm
1.48	0.69		1.48	1.61	400 mm
1.51	0.70		1.51	1.62	450 mm
1.22	0.54		1.22	1.25	550 mm
1.26	0.48		1.26	1.11	6000 – 6050 mm

- $\psi_{N,c_1} = \psi_{V,c_1} = 1$ for concrete member thickness & edge distance shown above.

For other dimensions and top-slab application see page 26/27.

Notes on Anchor Channels

1) Load values are design resistances. They are valid for mild and stainless steel. For permissible loads divide by 1.4 load safety factor.

2) Concrete strength is C 30 / 37. Resistance of unreinforced concrete may be adjusted for values between C 20 / 25 and C 50 / 60 by multiplying concrete strength by the factor below:

$$\sqrt{\frac{f_{ck,\,cube\ project}}{37\ N/mm^2}}$$

3) Loads can be positioned anywhere on the channel. Allow for 25 mm distance from the bolt center to the end of the profile.

4) Valid for uncracked concrete. For cracked concrete divide by 1.40.

5) Valid for uncracked concrete. For cracked concrete divide by 1.33.

6) When using rebar configuration according to CEN/TS 1992-4 shear resistance in cracked concrete can be improved up to the resistance of uncracked concrete.

7) Rebar configuration based upon a conservative assessment. Project specific design may be able to save rebar content. For front face installation stirrups are recommended.

8) The information given is intended to be used in conjunction with the design criteria of CEN/TS 1992-4 and factored loads according to EN 1990. –> Transmission of forces in the structure must be considered in the design.

9) Min. member thickness incl. 25 mm concrete cover over the anchor.

* S_N, S_V: steel strength reduction factor for channel length and load spacing

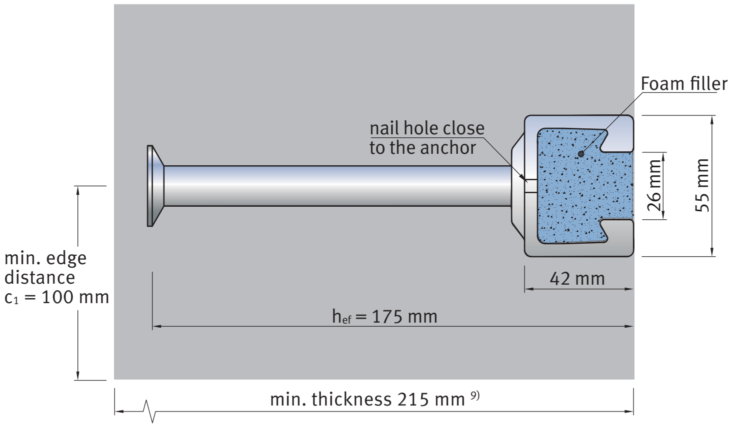
** C_N, C_V: concrete strength correction factor for channel length and load configuration

*** $C_{re,N}$, $C_{re,V}$: correction factor for channel length and load configuration in reinforced concrete

JTA W 55/42

Design Resistance:

$N_{Rd} = V_{Rd} = 44.4$ kN [1) 8)]



The Following Partial Safety Factors are Included:

Steel: $\gamma_{Ms} = 1.8$
Concrete: $\gamma_{Mc} = 1.5$; Reinforcement: $\gamma_{Ms,\,re} = 1.15$
Use either interaction for unreinforced or reinforced concrete.

The Following Equations Must be Checked:

Steel:

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times 44.4\ \text{kN}} \leq 1.0;$$

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times 44.4\ \text{kN}} \leq 1.0 \qquad \beta_{N,s}^{\ 2} + \beta_{V,s}^{\ 2} \leq 1.0$$

Concrete Unreinforced:

$$\beta_{N,c,re} = \frac{N_{Ed}}{\psi_{N,c,re_1} \times C_{re,N} \times 44.4\ \text{kN}} \leq 1.0;$$

$$\beta_{V,c,re} = \frac{V_{Ed}}{\psi_{V,c,re_1} \times C_{re,V} \times 44.4\ \text{kN}} \leq 1.0 \qquad \beta_{N,c}^{\ 1.5} + \beta_{V,c}^{\ 1.5} \leq 1.0$$

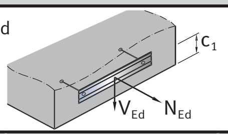
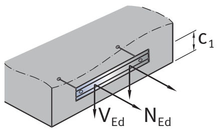
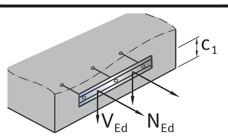
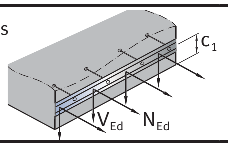
Concrete Reinforced (∅ 10/75 mm):

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times 44.4\ \text{kN}} \leq 1.0;$$

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times 44.4\ \text{kN}} \leq 1.0 \qquad \beta_{N,c,re}^{\ 1} + \beta_{V,c,re}^{\ 1} \leq 1.0$$

Example for Ordering a JORDAHL® Anchor Channel:

Type	Size		Length		# Anchors	Material		ETA Compliant
JTA W	55/42	–	150	–	2A	HDG	–	CE

Load Configuration [3)] For Top-Slab and Front-Face Concrete = C 30/37 Member Thickness = 1000 mm Edge Distance c_1 = 150 mm Resistance Given per Load Point	Part Number	Channel Length	Min. Load Distance	Steel* Strength-Factors Pull-out S_N	Steel* Strength-Factors Shear S_V
Single Load 2A 	JTA W 55/42–150–2A	150 mm	none	1.00	1.00
	JTA W 55/42–200–2A	200 mm		1.00	1.00
	JTA W 55/42–250–2A	250 mm		1.00	1.00
	JTA W 55/42–300–2A	300 mm		1.00	1.00
Pair Load 2A 	JTA W 55/42–200–2A	200 mm	150 mm	1.00	1.00
	JTA W 55/42–250–2A	250 mm		0.94	0.94
	JTA W 55/42–300–2A	300 mm		0.86	0.86
Pair Load 3A 	JTA W 55/42–350–3A	350 mm	150 mm	1.00	1.00
	JTA W 55/42–400–3A	400 mm		1.00	1.00
	JTA W 55/42–450–3A	450 mm		0.98	0.98
Continuous Load 	JTA W 55/42–600–3A	600 mm	265 mm	0.91	0.91
	JTA W 55/42–6000–21A	6000 – 6050 mm	300 mm	0.96	0.96

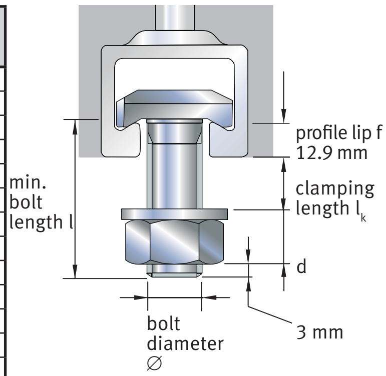
* Minimum of steel or concrete resistance governs.

JB Bolts

JORDAHL®
anchored in quality

T-Bolt Selection Chart

Length (l) [mm]
30
35
40
45
50
55
60
65
75
80
100
125
150
200
300



For stainless steel bolts see page 36/37.

Metric Thread Size ∅ [mm]	Type JB M 12	M 12	M 16	M 16	M 20	M 20	M 24
Strength Grade	4.6	8.8	4.6	8.8	4.6	8.8	4.6
Tension Load ϕN_n [kN]	16.9	44.9	31.4	83.7	49.0	130.7	70.6
Shear Load ϕV_n [kN]	12.1	27.0	22.6	50.2	35.3	78.4	50.7

Minimum Bolt Length:

- Add clamping length l_k
  plus bolt diameter d = ∅
  plus profile lip f
  plus 3 mm
- Select next larger length from the T-bolt selection chart

Bolt capacity may be limited by anchor channel capacity. Check combined loads using:

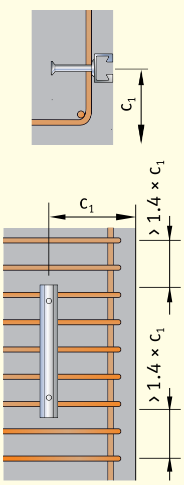
$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0$$

$$\beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

$$\beta_{N,sc}^{\ 2} + \beta_{V,sc}^{\ 2} \leq 1.0$$

Example for Ordering a JORDAHL® Bolt Type JB:

Type	Diameter		Length [mm]		Strength		Coating
JB	M 24	×	60	–	4.6	–	HDG

Concrete** Unreinforced Strength-Factors 2) Pull-out 4) C_N	Shear 5) 6) C_V	Concrete*** Reinforced 7) Concrete	Reinforced Strength-Factors 2) Pull-out 4) $C_{re,N}$	Shear 5) $C_{re,V}$	Channel Length
2.04	0.83	∅ 10 / 75 mm 	2.04	1.12	150 mm
2.12	0.86		2.12	1.12	200 mm
2.17	0.88		2.17	1.25	250 mm
2.20	0.89		2.20	1.44	300 mm
1.13	0.45		1.13	1.04	200 mm
1.19	0.47		1.19	1.09	250 mm
1.23	0.48		1.23	1.11	300 mm
1.18	0.47		1.18	0.54	350 mm
1.22	0.48		1.22	1.08	400 mm
1.25	0.49		1.25	1.08	450 mm
1.05	0.38		1.05	0.89	600 mm
1.16	0.39		1.16	0.90	6000 – 6050 mm

- $\psi_{N,c_1} = \psi_{V,c_1} = 1$ for concrete member thickness & edge distance shown above.

For other dimensions and top-slab application see page 26/27.

Notes on Anchor Channels

1) Load values are design resistances. They are valid for mild and stainless steel. For permissible loads divide by 1.4 load safety factor.
2) Concrete strength is C 30 / 37. Resistance of unreinforced concrete may be adjusted for values between C 20 / 25 and C 50 / 60 by multiplying concrete strength by the factor below:

$$\sqrt{\frac{f_{ck,\ cube\ project}}{37\ N/mm^2}}$$

3) Loads can be positioned anywhere on the channel. Allow for 25 mm distance from the bolt center to the end of the profile.
4) Valid for uncracked concrete. For cracked concrete divide by 1.40.
5) Valid for uncracked concrete. For cracked concrete divide by 1.33.
6) When using rebar configuration according to CEN/TS 1992-4 shear resistance in cracked concrete can be improved up to the resistance of uncracked concrete.
7) Rebar configuration based upon a conservative assessment. Project specific design may be able to save rebar content. For front face installation stirrups are recommended.
8) The information given is intended to be used in conjunction with the design criteria of CEN/TS 1992-4 and factored loads according to EN 1990. –> Transmission of forces in the structure must be considered in the design.
9) Min. member thickness incl. 25 mm concrete cover over the anchor.

* S_N, S_V: steel strength reduction factor for channel length and load spacing

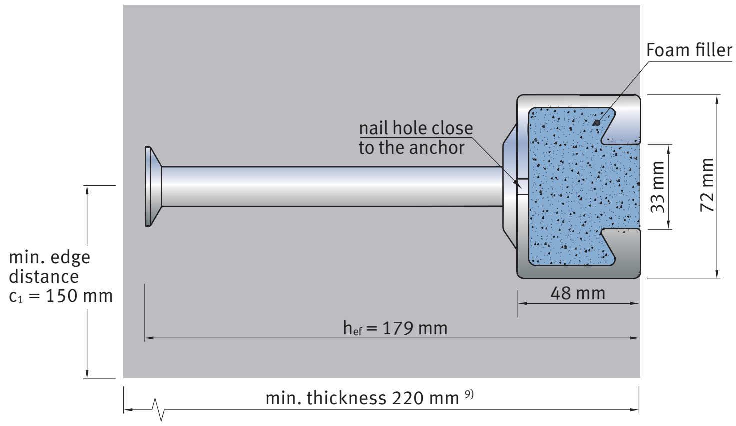
** C_N, C_V: concrete strength correction factor for channel length and load configuration

*** $C_{re,N}$, $C_{re,V}$: correction factor for channel length and load configuration in reinforced concrete

JTA W 72/48

Design Resistance:

$N_{Rd} = V_{Rd} = 55.6$ kN [1) 8)]



The Following Partial Safety Factors are Included:

Steel: $\gamma_{Ms} = 1.8$
Concrete: $\gamma_{Mc} = 1.5$; Reinforcement: $\gamma_{Ms,\,re} = 1.15$
Use either interaction for unreinforced or reinforced concrete.

The Following Equations Must be Checked:

Steel:

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times 55.6\ \text{kN}} \le 1.0;$$

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times 55.6\ \text{kN}} \le 1.0 \qquad \beta_{N,s}^{\,2} + \beta_{V,s}^{\,2} \le 1.0$$

Concrete Unreinforced:

$$\beta_{N,c} = \frac{N_{Ed}}{\psi_{N,c_1} \times C_N \times 55.6\ \text{kN}} \le 1.0;$$

$$\beta_{V,c} = \frac{V_{Ed}}{\psi_{V,c_1} \times C_V \times 55.6\ \text{kN}} \le 1.0 \qquad \beta_{N,c}^{\,1.5} + \beta_{V,c}^{\,1.5} \le 1.0$$

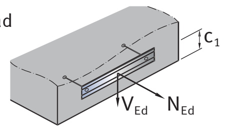
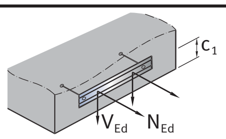
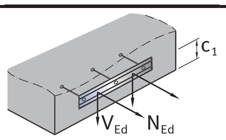
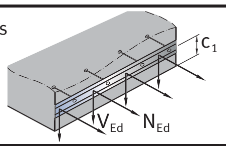
Concrete Reinforced (∅ 10/75 mm):

$$\beta_{N,c,re} = \frac{N_{Ed}}{\psi_{N,c,re_1} \times C_{re,N} \times 55.6\ \text{kN}} \le 1.0;$$

$$\beta_{V,c,re} = \frac{V_{Ed}}{\psi_{V,c,re_1} \times C_{re,V} \times 55.6\ \text{kN}} \le 1.0 \qquad \beta_{N,c,re}^{\,1} + \beta_{V,c,re}^{\,1} \le 1.0$$

Example for Ordering a JORDAHL® Anchor Channel:

Type	Size		Length		# Anchors	Material		ETA Compliant
JTA W	72/48	–	150	–	2A	HDG	–	CE

Load Configuration 3) For Top-Slab and Front-Face Concrete = C30/37 Member Thickness = 1000 mm Edge Distance c_1 = 150 mm Resistance Given per Load Point	Part Number	Channel Length	Min. Load Distance	Steel* Strength-Factors Pull-out S_N	Steel* Strength-Factors Shear S_V
Single Load 2A 	JTA W 72/48–150–2A	150 mm	none	1.00	1.00
	JTA W 72/48–200–2A	200 mm		1.00	1.00
	JTA W 72/48–250–2A	250 mm		1.00	1.00
	JTA W 72/48–300–2A	300 mm		1.00	1.00
Pair Load 2A 	JTA W 72/48–200–2A	200 mm	150 mm	1.00	1.00
	JTA W 72/48–250–2A	250 mm		0.94	0.94
	JTA W 72/48–300–2A	300 mm		0.87	0.87
Pair Load 3A 	JTA W 72/48–350–3A	350 mm	150 mm	1.00	1.00
	JTA W 72/48–400–3A	400 mm		1.00	1.00
	JTA W 72/48–450–3A	450 mm		0.99	0.99
Continuous Load 	JTA W 72/48–600–3A	600 mm	265 mm	0.91	0.91
	JTA W 72/48–6000–16A	6000 – 6050 mm	400 mm	0.98	0.98

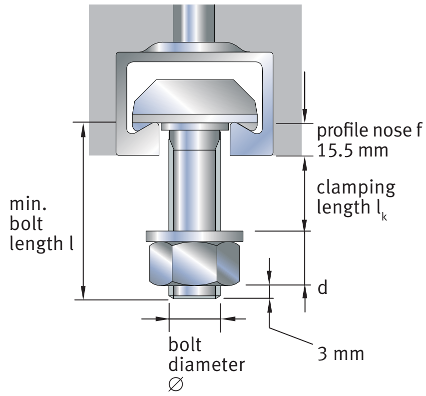
■ Minimum of steel or concrete resistance governs.

JA Bolts

JORDAHL®
anchored in quality

T-Bolt Selection Chart

Length (l) [mm]
50
75
100
125
150
200



For stainless steel bolts see page 36/37.

Metric Thread Size ∅ [mm]	Type JA					
	M 20	M 20	M 24	M 24	M 27	M 30
Strength Grade	4.6	8.8	4.6	8.8	4.6	4.6
Tension Load N_{Rd} [kN]	49.0	130.7	70.6	188.3	91.8	112.2
Shear Load V_{Rd} [kN]	35.3	78.4	50.7	113.0	66.0	80.6

Minimum Bolt Length:

- Add clamping length l_k
  plus bolt diameter d = ∅
  plus profile lip f
  plus 3 mm
- Select next larger length from the T-bolt selection chart

Bolt capacity may be limited by anchor channel capacity. Check combined loads using:

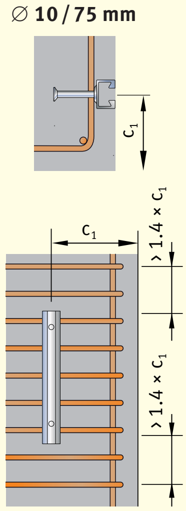
$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0$$

$$\beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

$$\beta_{N,sc}^{\ 2} + \beta_{V,sc}^{\ 2} \leq 1.0$$

Example for Ordering a JORDAHL® Bolt Type JA:

Type	Diameter		Length [mm]		Strength		Coating
JA	M 24	×	75	–	4.6	–	HDG

Concrete**		Concrete***			Channel Length
Unreinforced		Reinforced [7] Concrete	Reinforced		
Strength-Factors [2]			Strength-Factors [2]		
Pull-out [4] C_N	Shear [5] [6] C_V		Pull-out [4] $C_{re,N}$	Shear [5] $C_{re,V}$	
1.69	0.76	∅ 10 / 75 mm 	1.69	0.88	150 mm
1.76	0.78		1.76	0.88	200 mm
1.81	0.80		1.81	0.98	250 mm
1.84	0.81		1.84	1.15	300 mm
0.93	0.41		0.93	0.88	200 mm
0.99	0.43		0.99	0.92	250 mm
1.02	0.44		1.02	1.00	300 mm
0.98	0.42		0.98	0.42	350 mm
1.01	0.43		1.01	0.85	400 mm
1.04	0.44		1.04	0.85	450 mm
0.87	0.34		0.87	0.79	600 mm
1.21	0.43		1.21	0.99	6000 – 6050 mm

- $\psi_{N,c_1} = \psi_{V,c_1} = 1$ for concrete member thickness & edge distance shown above.

For other dimensions and top-slab application see page 26/27.

Notes on Anchor Channels

1) Load values are design resistances. They are valid for mild and stainless steel. For permissible loads divide by 1.4 load safety factor.
2) Concrete strength is C 30 / 37. Resistance of unreinforced concrete may be adjusted for values between C 20 / 25 and C 50 / 60 by multiplying concrete strength by the factor below:

$$\sqrt{\frac{f_{ck,\, cube\ project}}{37\ N/mm^2}}$$

3) Loads can be positioned anywhere on the channel. Allow for 25 mm distance from the bolt center to the end of the profile.
4) Valid for uncracked concrete. For cracked concrete divide by 1.40.
5) Valid for uncracked concrete. For cracked concrete divide by 1.33.
6) When using rebar configuration according to CEN/TS 1992-4 shear resistance in cracked concrete can be improved up to the resistance of uncracked concrete.
7) Rebar configuration based upon a conservative assessment. Project specific design may be able to save rebar content. For front face installation stirrups are recommended.
8) The information given is intended to be used in conjunction with the design criteria of CEN/TS 1992-4 and factored loads according to EN 1990. –> Transmission of forces in the structure must be considered in the design.
9) Min. member thickness incl. 25 mm concrete cover over the anchor.

* S_N, S_V: steel strength reduction factor for channel length and load spacing

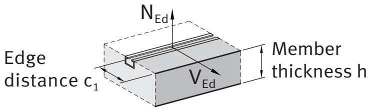
** C_N, C_V: concrete strength correction factor for channel length and load configuration

*** $C_{re,N}$, $C_{re,V}$: correction factor for channel length and load configuration in reinforced concrete

Ψ Edge Factors

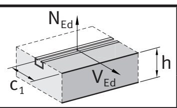
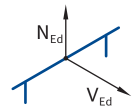
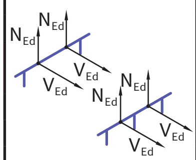
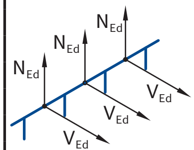
Considering Edge and Member Thickness

Ψ Edge Factors &
Ψ Corner Factors

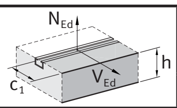
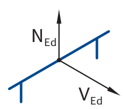
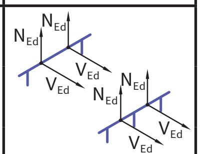
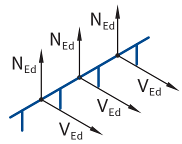


	Min. Edge Distance [mm]	Max. Allowable Factor [1)] [mm]	Min. Member Thickness [mm]
K 28/15	50	150	75 [3)] (× 0.75)
K 38/17	50	200	100 [4)] (× 0.86)
W 40/22	50	200	100 [4)] (× 0.86)
W 50/30	75	200	100 [4)] (× 0.86)
W 53/34	100	400	175
W 55/42	150	400	200
W 72/48	150	400	200

Unreinforced Concrete [2)]

	Top Slab or Member Thickness h [mm]												Load Configuration
	125		175		200		250		300		1000		
Edge Distance c_1 [mm]	Pull-Out ψ_{N,c_1}	Shear ψ_{V,c_1}	Pull-Out ψ_{N,c_1}	Shear ψ_{V,c_1}	Pull-Out ψ_{N,c_1}	Shear ψ_{V,c_1}	Pull-Out ψ_{N,c_1}	Shear ψ_{V,c_1}	Pull-Out ψ_{N,c_1}	Shear ψ_{V,c_1}	Pull-Out ψ_{N,c_1}	Shear ψ_{V,c_1}	
50	0.58	0.19	0.58	0.21	0.58	0.21	0.58	0.21	0.58	0.21	0.58	0.21	Single Load 
75	0.71	0.26	0.71	0.33	0.71	0.36	0.71	0.37	0.71	0.37	0.71	0.37	
100	0.82	0.34	0.82	0.42	0.82	0.46	0.82	0.53	0.82	0.56	0.82	0.56	
150	1.00	0.49	1.00	0.61	1.00	0.63	1.00	0.73	1.00	0.83	1.00	1.00	
200	1.00	0.64	1.00	0.79	1.00	0.83	1.00	0.96	1.00	1.09	1.00	1.51	
300	1.00	0.64	1.22	1.13	1.22	1.20	1.22	1.39	1.22	1.57	1.22	2.74	
400	1.00	0.64	1.22	1.44	1.22	1.54	1.22	1.79	1.22	2.02	1.22	4.19	
50	0.58	0.20	0.58	0.23	0.58	0.23	0.58	0.23	0.58	0.23	0.58	0.23	Load Pair 
75	0.71	0.27	0.71	0.34	0.71	0.37	0.71	0.38	0.71	0.38	0.71	0.38	
100	0.82	0.35	0.82	0.43	0.82	0.48	0.82	0.55	0.82	0.57	0.82	0.57	
150	1.00	0.49	1.00	0.61	1.00	0.63	1.00	0.73	1.00	0.83	1.00	1.00	
200	1.07	0.63	1.07	0.78	1.07	0.82	1.07	0.95	1.07	1.07	1.07	1.49	
300	1.07	0.63	1.32	1.09	1.32	1.16	1.32	1.34	1.32	1.52	1.32	2.65	
400	1.07	0.63	1.32	1.38	1.32	1.48	1.32	1.72	1.32	1.94	1.32	4.01	
50	0.58	0.35	0.58	0.39	0.58	0.39	0.58	0.39	0.58	0.39	0.58	0.39	Continuous Load 
75	0.71	0.39	0.71	0.48	0.71	0.53	0.71	0.55	0.71	0.55	0.71	0.55	
100	0.82	0.45	0.82	0.54	0.82	0.59	0.82	0.68	0.82	0.71	0.82	0.71	
150	1.00	0.49	1.00	0.61	1.00	0.63	1.00	0.73	1.00	0.83	1.00	1.00	
200	1.07	0.51	1.07	0.63	1.07	0.69	1.07	0.80	1.07	0.91	1.07	1.20	
300	–	–	1.32	0.65	1.32	0.71	1.32	0.82	1.32	0.93	1.32	1.58	
400	–	–	1.32	0.64	1.32	0.70	1.32	0.82	1.32	0.92	1.32	1.87	

Reinforced Concrete [2)]

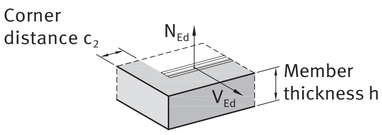
	Top Slab or Member Thickness h [mm]												Load Configuration
	125		175		200		250		300		1000		
Edge Distance c_1 [mm]	Pull-Out ψ_{N,c,re_1}	Shear ψ_{V,c,re_1}	Pull-Out ψ_{N,c,re_1}	Shear ψ_{V,c,re_1}	Pull-Out ψ_{N,c,re_1}	Shear ψ_{V,c,re_1}	Pull-Out ψ_{N,c,re_1}	Shear ψ_{V,c,re_1}	Pull-Out ψ_{N,c,re_1}	Shear ψ_{V,c,re_1}	Pull-Out ψ_{N,c,re_1}	Shear ψ_{V,c,re_1}	
100	0.82	0.64	0.82	0.60	0.82	0.62	0.82	0.65	0.82	0.65	0.82	0.65	
150	1.00	0.84	1.00	0.86	1.00	0.85	1.00	0.92	1.00	0.96	1.00	1.00	
200	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	
300	1.07	1.07	1.22	1.74	1.22	1.90	1.22	2.11	1.22	2.22	1.22	2.31	
400	1.07	1.07	1.22	2.16	1.22	2.36	1.22	2.73	1.22	2.91	1.22	2.91	
100	0.82	0.54	0.82	0.68	0.82	0.73	0.82	0.76	0.82	0.76	0.82	0.76	
150	1.00	0.73	1.00	0.86	1.00	0.65	1.00	0.75	1.00	0.85	1.00	1.00	
200	1.07	0.90	1.07	1.02	1.07	0.80	1.07	0.93	1.07	1.05	1.07	1.07	
300	1.07	0.90	1.32	1.04	1.32	1.02	1.32	1.10	1.32	1.16	1.32	1.21	
400	1.07	0.90	1.32	1.04	1.32	1.02	1.32	1.10	1.32	1.16	1.32	1.21	
100	0.82	0.49	0.82	0.56	0.82	0.61	0.82	0.71	0.82	0.75	0.82	0.75	
150	1.00	0.51	1.00	0.61	1.00	0.63	1.00	0.73	1.00	0.83	1.00	1.00	
200	1.07	0.51	1.07	0.61	1.07	0.67	1.07	0.78	1.07	0.88	1.07	1.07	
300	1.07	0.51	1.32	0.60	1.32	0.65	1.32	0.76	1.32	0.86	1.32	1.46	
400	1.07	0.51	1.32	0.57	1.32	0.63	1.32	0.73	1.32	0.82	1.32	1.67	

1) Greatest edge distance up to which a factor may be selected for this channel.
E. g. JTA K 28/15 with 300 mm edge distance is limited to the 150 mm factor in the table.
2) Values may be interpolated

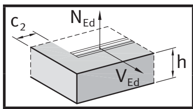
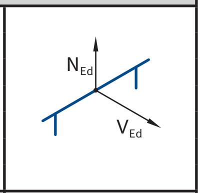
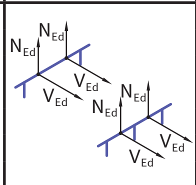
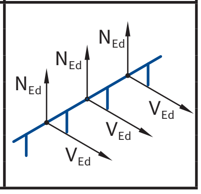
3) For use of 75 mm member thickness the tabulated factors ψ in the 125 mm column have to be reduced by a correction factor of 0.75.
4) For use of 100 mm member thickness the tabulated factors ψ in the 125 mm column have to be reduced by a correction factor of 0.86.

Ψ Corner Factors

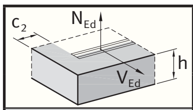
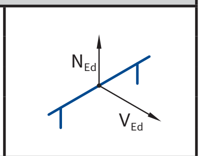
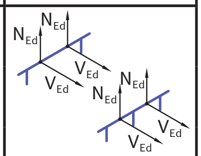
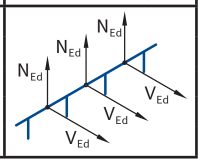
Considering Corner Influence and Member Thickness [5)]



Unreinforced Concrete [2)]

	Top Slab or Member Thickness h [mm]										Front Face or 1000		Load Configuration	
	125 [3)]		175		200		250		300					
Corner Distance c_2 [mm]	Pull-Out Ψ_{N,c_2}	Shear Ψ_{V,c_2}	Pull-Out Ψ_{N,c_2}	Shear Ψ_{V,c_2}	Pull-Out Ψ_{N,c_2}	Shear Ψ_{V,c_2}	Pull-Out Ψ_{N,c_2}	Shear Ψ_{V,c_2}	Pull-Out Ψ_{N,c_2}	Shear Ψ_{V,c_2}	Pull-Out Ψ_{N,c_2}	Shear Ψ_{V,c_2}		
50	0.53	0.60	0.53	0.60	0.53	0.60	0.53	0.60	0.53	0.60	0.53	0.60	Single Load	
75	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61		
100	0.71	0.63	0.62	0.63	0.62	0.63	0.62	0.63	0.62	0.63	0.62	0.63		
150	0.87	0.66	0.76	0.65	0.75	0.64	0.75	0.64	0.75	0.64	0.75	0.64		
200	1.00	0.67	0.88	0.66	0.86	0.65	0.86	0.65	0.86	0.65	0.86	0.65		
300	1.00	0.67	1.00	0.68	1.00	0.67	1.00	0.67	1.00	0.67	1.00	0.67		
400	1.00	0.67	1.00	0.68	1.00	0.68	1.00	0.68	1.00	0.68	1.00	0.68		
50	0.53	0.60	0.53	0.60	0.53	0.60	0.53	0.60	0.53	0.60	0.53	0.60	Load Pair	
75	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61		
100	0.71	0.63	0.62	0.63	0.61	0.63	0.61	0.63	0.61	0.63	0.61	0.63		
150	0.87	0.66	0.76	0.65	0.75	0.64	0.75	0.64	0.75	0.64	0.75	0.64		
200	1.00	0.67	0.88	0.66	0.86	0.65	0.86	0.65	0.86	0.65	0.86	0.65		
300	1.00	0.67	1.00	0.68	1.00	0.67	1.00	0.67	1.00	0.67	1.00	0.67		
400	1.00	0.67	1.00	0.68	1.00	0.68	1.00	0.68	1.00	0.68	1.00	0.68		
50	0.65	0.68	0.65	0.68	0.65	0.68	0.65	0.68	0.65	0.68	0.65	0.68	Continuous Load	
75	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77		
100	0.89	0.83	0.82	0.83	0.81	0.82	0.81	0.82	0.81	0.82	0.81	0.82		
150	1.00	0.93	1.00	0.91	0.99	0.79	0.99	0.79	0.99	0.79	0.99	0.79		
200	1.00	1.00	1.00	1.00	1.00	0.78	1.00	0.78	1.00	0.78	1.00	0.78		
300	1.00	1.00	1.00	1.00	1.00	0.85	1.00	0.85	1.00	0.85	1.00	0.85		
400	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		

Reinforced Concrete [2)]

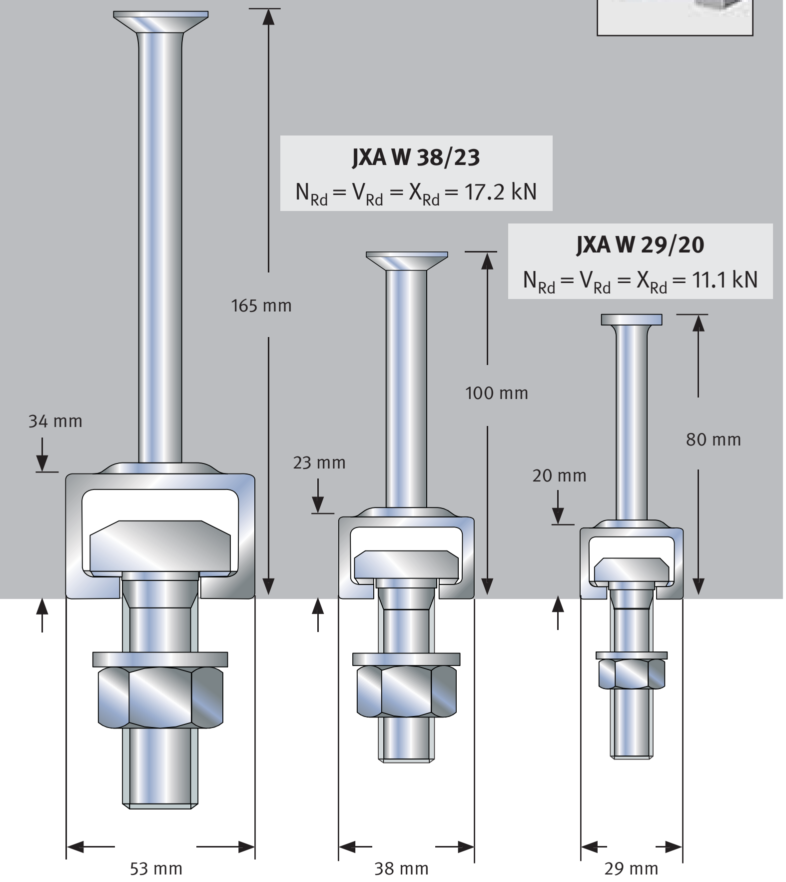
	Top Slab or Member Thickness h [mm]										Front Face or 1000		Load Configuration
	125		175		200		250		300				
Corner Distance c_2 [mm]	Pull-Out Ψ_{N,c,re_2}	Shear Ψ_{V,c,re_2}	Pull-Out Ψ_{N,c,re_2}	Shear Ψ_{V,c,re_2}	Pull-Out Ψ_{N,c,re_2}	Shear Ψ_{V,c,re_2}	Pull-Out Ψ_{N,c,re_2}	Shear Ψ_{V,c,re_2}	Pull-Out Ψ_{N,c,re_2}	Shear Ψ_{V,c,re_2}	Pull-Out Ψ_{N,c,re_2}	Shear Ψ_{V,c,re_2}	
100	0.71	0.65	0.62	0.71	0.62	0.76	0.62	0.79	0.62	0.79	0.62	0.79	
150	0.87	0.66	0.76	0.75	0.75	0.81	0.75	0.90	0.75	0.90	0.75	0.89	
200	1.00	0.67	0.88	0.72	0.86	0.76	0.86	0.84	0.86	0.91	0.86	0.93	
300	1.00	0.67	1.00	0.68	1.00	0.68	1.00	0.69	1.00	0.75	1.00	0.88	
400	1.00	0.67	1.00	0.68	1.00	0.68	1.00	0.68	1.00	0.68	1.00	0.95	
100	0.71	0.63	0.62	0.63	0.62	0.63	0.62	0.67	0.62	0.68	0.62	0.68	
150	0.87	0.66	0.76	0.66	0.75	0.64	0.75	0.64	0.75	0.64	0.75	0.65	
200	1.00	0.67	0.88	0.67	0.86	0.65	0.86	0.65	0.86	0.65	0.86	0.77	
300	1.00	0.67	1.00	1.00	1.00	0.68	1.00	0.73	1.00	0.79	1.00	1.00	
400	1.00	0.67	1.00	1.00	1.00	0.84	1.00	0.91	1.00	0.98	1.00	1.00	
100	0.89	0.83	0.82	0.83	0.82	0.83	0.82	0.83	0.82	0.83	0.82	0.83	
150	1.00	0.93	1.00	0.91	0.99	0.79	0.99	0.79	0.99	0.79	0.99	0.79	
200	1.00	1.00	1.00	1.00	1.00	0.78	1.00	0.78	1.00	0.78	1.00	0.78	
300	1.00	1.00	1.00	1.00	1.00	0.85	1.00	0.85	1.00	0.85	1.00	0.91	
400	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

[5)] Valid for symetrical corners $c_1 = c_2$

JORDAHL® Anchor Channels

JORDAHL® Toothed Channels JXA and Toothed T-Bolts

JXA Channel Strengths



	JXB	JXH	JXD
	M 16	M 12	M 10
	M 20	M 16	M 12

Toothed T-Bolts
metric thread sizes

Check the following equations:

Channel:

$$\beta_{X,s} = \frac{X_{Ed}}{X_{Rd}} \leq 1.0$$

$$\beta_{N,s} = \frac{N_{Ed}}{S_N \times N_{Rd}} \leq 1.0$$

$$\beta_{V,s} = \frac{V_{Ed}}{S_V \times V_{Rd}} \leq 1.0$$

$$\beta_{X,s}{}^2 + \beta_{N,s}{}^2 + \beta_{V,s}{}^2 \leq 1.0$$

T-Bolt:

$$\beta_{X,sc} = \frac{X_{Ed}}{X_{Rd}} \leq 1.0$$

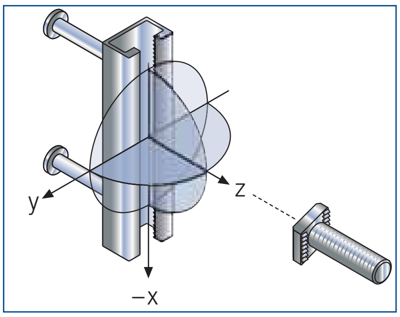
$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0$$

$$\beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

$$\beta_{X,sc}{}^2 + \beta_{N,sc}{}^2 + \beta_{V,sc}{}^2 \leq 1.0$$

JORDAHL® anchor channels JXA should be used with toothed bolts for loading in all directions.

T-Bolt Strengths		Bolt ∅			
		M 10	M 12	M 16	M 20
Channel Profile JXA	W 29/20	Toothed Type JXD			
	W 38/23		Toothed Type JXH		
	W 53/34			Toothed Type JXB	
T-Bolt Strength Grade 8.8	Tension Load N_{Rd} [kN]	30.9	44.9	83.7	130.7
	Shear Load $V_{Rd} = X_{Rd}$ [kN]	18.6	27.0	50.2	78.4



Example for Ordering a JORDAHL® Toothed Channel JXA and Toothed T-Bolt:

Type	Size		Length [mm]		# Anchors		Material
JXA	W 38/23		6000	–	25A	–	HDG

Type	Diameter		Length [mm]		Strength		Coating
JXH	M 16	×	80	–	8.8	–	HDG

The equations and interaction for steel and concrete or reinforced concrete have to be checked according to the corresponding JTA channel below.

Toothed Profile	Corresponding JTA Channel	For Factors S_N & S_V See Page
JXA W 29/20	JTA W 40/22	16–17
JXA W 38/23	JTA W 50/30	18–19
JXA W 53/34	JTA W 53/34	20–21

Dynamic Load Capacity

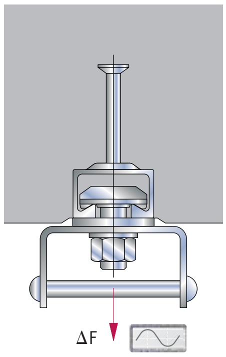
Fatigue Resistance of JORDAHL® Anchor Channels

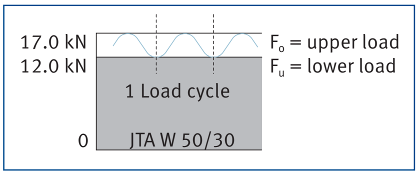
JORDAHL® hot rolled anchor channels have been tested under dynamic load and are fatigue rated according to European standard EC3. They may be used when cyclic loads are applied in addition to static loads. As long as the design steel resistance is not exceeded the range given in the diagram may be used to compare with the applied cyclic loads. The fatigue resistance is valid for all directions that can be used under static loading. A safety factor of 1.35 is already included in the diagram.

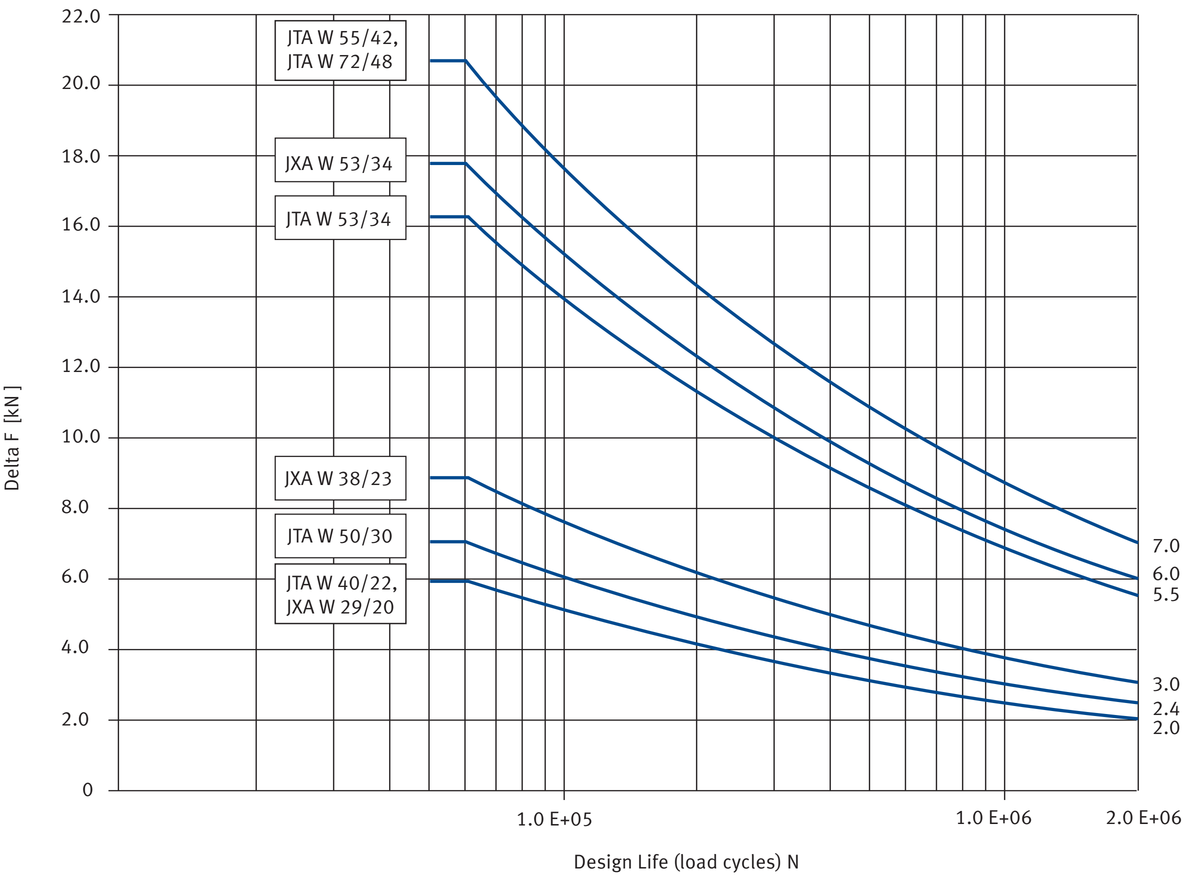
Calculation Example for Profile JTA W 50/30

Design Resistance: N_{Rd} = 17.2 kN
Design tension load: N_{Ed} = 12.0 kN
Fatigue load = Upper load – Lower load = 5.0 kN,
100 000 lifetime cycles expected
Fatigue resistance from the diagram:
6.0 kN > 5.0 kN → OK
Total static + fatigue =
12.0 kN + 5.0 kN = 17.0 kN < 17.2 kN → OK

Profile	Range at 2 000 000 cycles
JTA W 40/22	2.0
JXA W 29/20	
JTA W 50/30	2.4
JXA W 38/23	3.0
JTA W 53/34	5.5
JXA W 53/34	6.0
JTA W 55/42	7.0
JTA W 72/48	

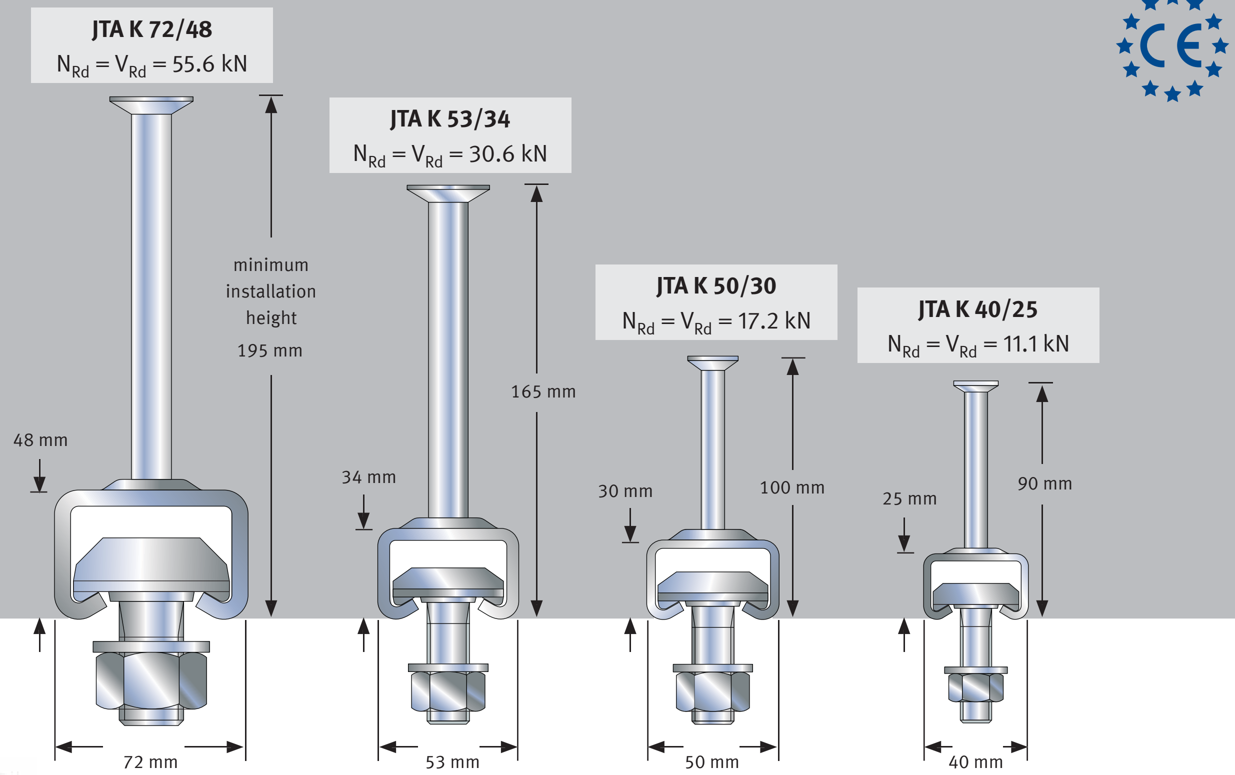






JORDAHL® Cold Formed Anchor Channels

Cold Formed Anchor Channels



	JA	JB	JB	JC
Hook Head T-Bolts metric thread sizes	M 20 M 24 M 27 M 30	M 10 M 12 M 16 M 20	M 10 M 12 M 16 M 20	M 10 M 12 M 16

The equations and interaction for steel and concrete or reinforced concrete have to be checked according to the corresponding JTA W channel below.

Profile	Corresponding JTA W Channel	For Factors S_N & S_V See Page
JTA K 40/25	JTA W 40/22	16 – 17
JTA K 50/30	JTA W 50/30	18 – 19
JTA K 53/34	JTA W 53/34	20 – 21
JTA K 72/48	JTA W 72/48	24 – 25

Example for Ordering a JORDAHL® Anchor Channel:

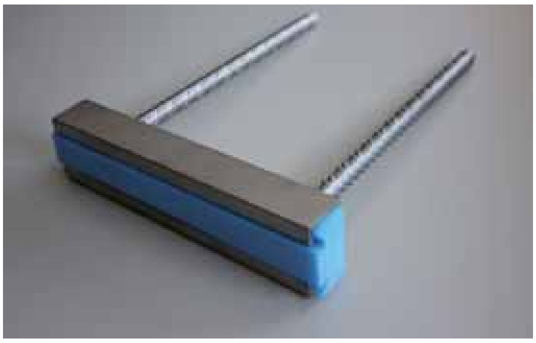
Type	Size	Length	# Anchors	Material	ETA Compliant
JTA K	40/25 – 150	–	2A	HDG –	CE

JORDAHL® cold formed anchor channels are suitable for all applications without any requirements for fatigue strengths. They are often used in constructions where only static loads have to be connected to the structure or in temporary constructions with a limited service life.

The suiting T-bolts are the same as for the corresponding hot rolled profiles, while the torque values have to be limited in order to avoid harming the channel lips. We generally recommend using 4.6 grade JORDAHL® T-bolts together with JORDAHL® JTA K cold formed anchor channels. If high torques are required or changing loads are applied, we recommend to use hot rolled anchor channels.

Customized Solutions

JGB Anchor Channels with Welded Rebar



JGB W 50/30-200 anchor channel with custom anchor made from welded rebar

Installation example for JGB W 50/30

JORDAHL® Modified Solutions:

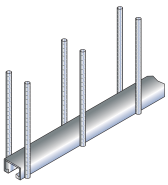
Short straight pieces with welded rebar anchors JGB:

- for profile K 38/17, W 40/22, W 50/30 and W 53/34
- strength and static design have to be determined individually.

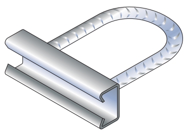
JTA W 50/30-300-3A with additional welded rebar for very small edge distances

Alternative types of anchors:

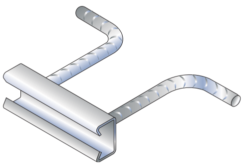
JRA with Double Anchors



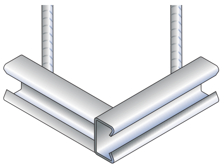
Stirrup-Anchors

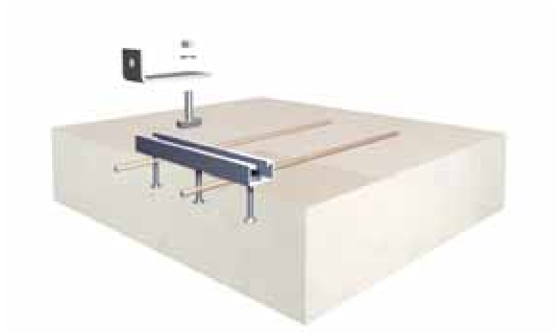


Bent-Anchors



Corner Piece





Installation example for JTA W 50/30-300-3A with additional welded rebar

JORDAHL® anchor channels JGB with rebar anchor provide high load capacity where adequate strength with standard anchors is not achievable. This can occur with high loaded connections in thin slabs, lightweight concrete, small edge-distances or a combination of these.

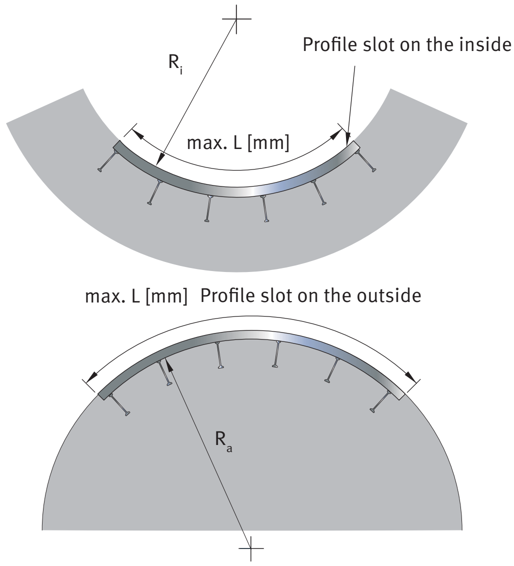
Note:
JORDAHL® can fabricate almost any custom assembly of anchor channels. Please contact us for other combinations of anchor channels not shown here.

Customized Solutions

Curved Anchor Channels

For curved structures, supply shafts, treatment plants or tunnels, JORDAHL® can supply pre-curved anchor channels. The anchor channels can be curved in a concave direction (profile slot on the inside) or in a convex direction (profile slot on the outside).

The maximum developed length of curved anchor channels is L = 5800 mm. Greater lengths and smaller bending radii than those specified in the table require additional effort and longer supply times.



Minimum Bending Radius							
Profile	W 72/48	W 55/42	W 53/34	W 50/30	W 40/22	K 38/17	K 28/15
min R_i or R_a [mm]	3000	3000	2500	2000	1500	800	800

Profile slot on the inside = R_i
Profile slot on the outside = R_a

Curved anchor channels are used world wide to hold overhead electric lines in train tunnels.

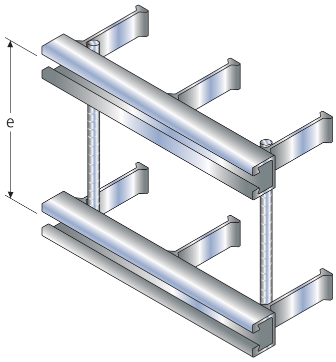
Example for Ordering Curved Anchor Channels:

Type	Profile		Stretched Length [mm]		# Anchor	Coating	Bending Radius [m]
JTA	W 53/34	–	1050	–	6A	HDG	R_i = 2.50

Anchor Channel Pairs and Corner Pieces

Anchor Channel Pairs

Typical applications for anchor channel pairs are for connecting glass or metal facades. Curved pairs of anchor channels are frequently used for connecting overhead lines in tunnel structures. JORDAHL® anchor channel pairs are customized for each project. Rebar is used as a spacer.

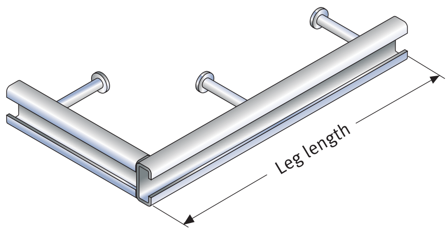


Example for Ordering Anchor Channel Pairs:

Type	Profile		Length [mm]		# Anchor	Coating	Lateral Spacing of the Channels [mm]
JTA	W 53/34	–	400	–	3A	HDG	pair e = 250

Anchor Channel Corner Pieces

Anchor channel corner pieces are used for connecting curtain wall brackets in facades. In addition to the standard corner pieces, special designs can also be supplied on request.



Standard corner piece

Standard Corner Piece	
Profile JTA	**Leg Length [mm]**
K 38/17	125 × 250 150 × 250 200 × 200
K 50/30 W 50/30	250 × 250 300 × 300
K 53/34 W 53/34	250 × 250 300 × 300

Ordering Example of Anchor Channel Corner Piece:

Type	Profile		Length [mm]		Material
JTA	K 38/17	–	125 × 250	–	A4

Design Resistances of JORDAHL® T-Bolts in Mild Steel

				Bolt ∅								
				M 6	**M 8**	**M 10**	**M 12**	**M 16**	**M 20**	**M 24**	**M 27**	**M 30**
Channel Profile	JTA	K 28/15		Hammer-head Type JD				–		–	–	–
		K 38/17		–	–	Hammer-head Type JH				–	–	–
		W 40/22		–	–	Hook-head Type JC			–		–	–
		W 50/30		–	–	Hook-head Type JB					–	–
		W 53/34		–	–	Hook-head Type JB					–	–
		W 55/42		–	–	Hook-head Type JB					–	–
		W 72/48		–	–	–		–	Hook-head Type JA			
	JXA	W 29/20		–	–	Toothed Type JXD		–	–		–	–
		W 38/23		–	–	–	Toothed Type JXH		–		–	–
		W 53/34		–	–	–	–	Toothed Type JXB			–	–
T-Bolt Strength	4.6	Tension Load N_{Rd}	[kN]	4.0	7.3	11.6	16.9	31.4	49.0	70.6	91.8	112.2
		Shear Load V_{Rd}	[kN]	2.9	5.3	8.4	12.1	22.6	35.3	50.7	66.0	80.6
	8.8	Tension Load N_{Rd}	[kN]	–	19.5	30.9	44.9	83.7	130.7	188.3	–	–
		Shear Load V_{Rd}	[kN]	–	11.7	18.6	27.0	50.2	78.4	113.0	–	–
		Shear Load X_{Rd}	See page 28.									

All values are design resistances.

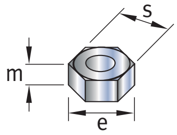
Check for tensile and shear:

$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0; \quad \beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

Check combined loads using:

$$\beta_{N,sc}^{\,2} + \beta_{V,sc}^{\,2} \leq 1.0$$

Hexagon Nuts to ISO 4032, Zinc Plated [1]

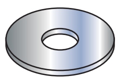


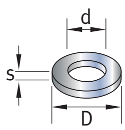
Thread	e [mm]	s [mm]	m [mm]
M 6	11.05	10.0	5.2
M 8	14.38	13.0	6.8
M 10	18.90	16.0	8.4
M 12	21.10	18.0	10.8
M 16	26.75	24.0	14.8
M 20	32.95	30.0	18.0
M 24	39.55	36.0	21.5
M 27	45.20	41.0	23.8
M 30	50.85	46.0	25.6

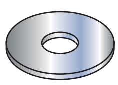
[1] For alternating loading we recommend self-locking nuts.

Notes:
Bolt capacity may be limited by anchor channel capacity. Values are design resistances. For permissible loads divide by 1.4 safety factor.

Washers [2]





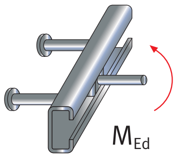


Washer Zinc Plated	Dimensions	d [mm]	D [mm]	s [mm]
ISO 7093-1 (DIN 9021)	M 6	6.4	18.0	1.6
	M 8	8.4	24.0	2.0
	M 10	10.5	30.0	2.5
	M 12	13.0	37.0	3.0
	M 16	17.0	50.0	3.0
	M 20	22.0	60.0	4.0
ISO 7089 (DIN 125)	M 6	6.4	12.0	1.6
	M 8	8.4	16.0	1.6
	M 10	10.5	20.0	2.0
	M 12	13.0	24.0	2.5
	M 16	17.0	30.0	3.0
	M 20	21.0	37.0	3.0
	M 24	25.0	44.0	4.0
ISO 7094 (DIN 440)	M 6	6.6	22.0	2.0
	M 10	11.0	34.0	3.0
	M 12	13.5	44.0	4.0
	M 16	17.5	56.0	5.0
	M 20	22.0	72.0	6.0

[2] Washers for stand-off installation see page 35.

JORDAHL®
anchored in quality

Design Resistances of JORDAHL® T-Bolts due to Bending Moments

Bolt ∅		M 6	M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
Through-Hole in Attaching Part [mm]		7	9	12	14	18	22	26	30	33
Design Resistance Bending $M^{\circ}_{Rd,s}$ [Nm] 	4.6	3.8	9	17.9	31.4	79.8	155.4	268.9	398.7	538.7
	8.8	9.8	24.0	47.8	83.8	213.1	415.4	718.4	1065.2	1439.4

Stand-Off Installation

In the case of a stand-off installation, a connection can be stressed by a bending moment as well as by tension and shear forces. The following checks have to be fulfilled:

1. The bending moment M_{Ed} is based on the outer edge of the profile and concrete.
2. Bending strength:

$$\beta_{V,sc} = \frac{M_{Ed}}{M^{\circ}_{Rd,s} \times \left(1-\beta_{N,sc}\right)}$$

3. Interaction check:

$$\beta_{N,sc}{}^{2} + \beta_{V,sc}{}^{2} \leq 1.0$$

For $\beta_{N,sc}$ see page 34.

Stand-Off Installation

Dimensions of the Washers for Stand-Off Installation

Profile	Bolt Type	M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
JTA K 28/15	JD	ISO 7093-1	ISO 7093-1	ISO 7089	–	–	–	–	–
JTA K 38/17	JH	–	38 × 38 × 5	ISO 7093-1	ISO 7093-1	–	–	–	–
JXA W 29/20	JXD	–	ISO 7093-1	ISO 7093-1	–	–	–	–	–
JTA W 40/22	JC	–	38 × 38 × 5	ISO 7093-1	ISO 7093-1	–	–	–	–
JTA K 40/25	JC	–	38 × 38 × 5	38 × 38 × 5	38 × 38 × 5	–	–	–	–
JZA K 41/22	JZS	–	–	38 × 38 × 5	38 × 38 × 5	–	–	–	–
JXA W 38/23	JXH	–	–	38 × 38 × 5	38 × 38 × 5	–	–	–	–
JTA W 50/30 **JTA K 50/30**	JB	–	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	–	–	–
JXA W 53/34	JXB	–	–	–	50 × 50 × 6	50 × 50 × 6	–	–	–
JTA W 53/34 **JTA K 53/34**	JB	–	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	–	–	–
JTA W 55/42	JB [3)]	–	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	–	–
JTA W 72/48 **JTA K 72/48**	JA	–	–	–	–	70 × 70 × 8	70 × 70 × 8	70 × 70 × 8	70 × 70 × 8

[3)] JB M 24 is equivalent to JE M 24.

Design Resistances of JORDAHL® T-Bolts in Stainless Steel

				Bolt ∅								
				M 6	M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
Channel Profile	JTA	K 28/15		–	Hammer-head Type JD		–	–		–	–	–
		K 38/17		–	–	Hammer-head Type JH				–	–	–
		W 40/22		–	–	Hook-head Type JC			–		–	–
		W 50/30		–	–	Hook-head Type JB					–	–
		W 53/34		–	–	Hook-head Type JB					–	–
		W 55/34		–	–	Hook-head Type JB					–	–
		W 72/48		–	–	–		–	–	Hook-head Type JA	–	–
	JXA	W 29/20		–	–		Toothed Type JXD	–	–		–	–
		W 38/23		–	–		Toothed Type JXH		–		–	–
		W 53/34		–	–			Toothed Type JXB			–	–
T-Bolt Strength	A4-50	Tension Load N_{Rd}	[kN]	–	–	10.1	14.8	27.4	42.8	61.7	–	–
		Shear Load V_{Rd}	[kN]	–	–	7.3	10.6	19.8	30.9	44.5	–	–
	A4-70	Tension Load N_{Rd}	[kN]	–	13.7	21.7	31.6	58.8	91.7	–	–	–
		Shear Load V_{Rd}	[kN]	–	16.8	15.6	22.7	42.2	66.0	–	–	–
		Shear Load X_{Rd}		See page 28.								

All values are design resistances.

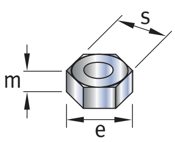
Check for tensile and shear:

$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0; \quad \beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

Check combined loads using:

$$\beta_{N,sc}^{2} + \beta_{V,sc}^{2} \leq 1.0$$

Hexagon Nuts to ISO 4032, A4 [1)]

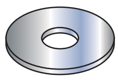


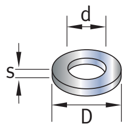
Thread	e [mm]	s [mm]	m [mm]
M 6	11.05	10.0	5.2
M 8	14.38	13.0	6.8
M 10	18.90	16.0	8.4
M 12	21.10	18.0	10.8
M 16	26.75	24.0	14.8
M 20	32.95	30.0	18.0
M 24	39.55	36.0	21.5
M 27	45.20	41.0	23.8
M 30	50.85	46.0	25.6

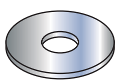
1) For alternating loading we recommend self-locking nuts.

Notes:
Bolt capacity may be limited by anchor channel capacity. Values are design resistances. For permissible loads divide by 1.4 safety factor.

Washers [2)]



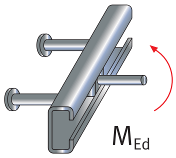




Washer A4	Dimensions	d [mm]	D [mm]	s [mm]
ISO 7093-1 (DIN 9021)	M 6	6.4	18.0	1.6
	M 8	8.4	24.0	2.0
	M 10	10.5	30.0	2.5
	M 12	13.0	37.0	3.0
	M 16	17.0	50.0	3.0
	M 20	22.0	60.0	4.0
ISO 7089 (DIN 125)	M 6	6.4	12.0	1.6
	M 8	8.4	16.0	1.6
	M 10	10.5	20.0	2.0
	M 12	13.0	24.0	2.5
	M 16	17.0	30.0	3.0
	M 20	21.0	37.0	3.0
	M 24	25.0	44.0	4.0
ISO 7094 (DIN 440)	M 6	6.6	22.0	2.0
	M 10	11.0	34.0	3.0
	M 12	13.5	44.0	4.0
	M 16	17.5	56.0	5.0
	M 20	22.0	72.0	6.0

2) Washers for stand-off installation see page 37.

Design Resistances of JORDAHL® T-Bolts due to Bending Moments

Bolt ∅		M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
Through-Hole in Attaching Part [mm]		9	12	14	18	22	26	30	33
Design Resistance Bending $M^{\circ}_{Rd,s}$ [Nm]	A4-50	7.9	15.7	27.5	6.91	136.3	235.8	–	–
	A4-50	16.8	33.5	58.8	149.4	291.3	503.7	–	–

Stand-Off Installation

In the case of a stand-off installation, a connection can be stressed by a bending moment as well as by tension and shear forces. The following checks have to be fulfilled:

1. The bending moment M_{Ed} is based on the outer edge of the profile and concrete.
2. Bending strength:

$$\beta_{V,sc} = \frac{M_{Ed}}{M^{\circ}_{Rd,s} \times (1-\beta_{N,sc})}$$

3. Interaction check:

$$\beta_{N,sc}^{2} + \beta_{V,sc}^{2} \leq 1.0$$

For $\beta_{N,sc}$ see page 36.

Stand-Off Installation

Dimensions of the Washers for Stand-Off Installation

Profile	Bolt Type	M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
JTA K 28/15	JD	ISO 7093-1	ISO 7093-1	–	–	–	–	–	–
JTA K 38/17	JH	–	38 × 38 × 5	ISO 7089	ISO 7089	–	–	–	–
JXA W 29/20	JXD	–	–	ISO 7089	–	–	–	–	–
JTA W 40/22	JC	–	38 × 38 × 5	ISO 7089	ISO 7089	–	–	–	–
JTA K 40/25	JC	–	38 × 38 × 5	38 × 38 × 5	38 × 38 × 5	–	–	–	–
JZA K 41/22	JZS	–	–	38 × 38 × 5	38 × 38 × 5	–	–	–	–
JXA W 38/23	JXH	–	–	38 × 38 × 5	38 × 38 × 5	–	–	–	–
JTA W 50/30 JTA K 50/30	JB	–	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	–	–	–
JTA W 53/34 JTA K 53/34	JB	–	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	–	–	–
JTA W 55/42	JE [3]	–	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	–	–
JTA W 72/48 JTA K 72/48	JA	–	–	–	–	–	70 × 70 × 8	–	–

[3] JE M 24 is equivalent to JB M 24.

JORDAHL® Anchor Channels

Prestressed Bolted Joints and Tightening Torque

Prestressing Forces of T-Bolts

In connection technology, for the applications

- **Suspended direct and stand-off installation**
- **Stress in the channel longitudinal direction**

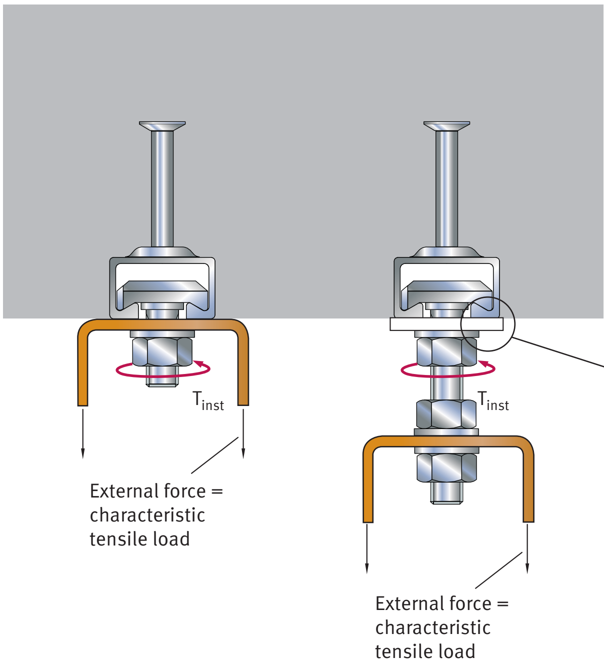
it is important to prestress the bolted connections in order to prevent undesired loosening or slippage of the bolted connections. Higher-strength bolts (8.8) are not absolutely necessary for this purpose. Grade 4.6 and A4-50 bolts are also adequate if the following points are taking into consideration:

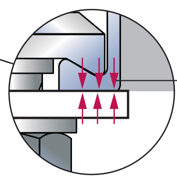
- In the short term, a force arising from prestressing with tightening torque is normally higher than the external load.
- The applied prestressing force is dissipated down to about 30 % by relaxation.
- Bolts made of stainless steel exhibit higher friction than zincplated or HDG bolts. Therefore, stainless steel bolts produce lower prestressing forces.
- JORDAHL® bolts are supplied ready for installation. They should not be additionally oiled or treated with lubricants before the tightening torque is applied.
- The bolted joint may be prestressed only when there is **steel to steel** contact.

If the channel is set back behind the concrete surface, then the connection must be shimmed by means of a suitable washer (see page 34).
If this is not followed and the attached part is prestressed against the concrete surface, it leads to residual stresses in the component. These can cause cracks or splitting of the concrete component.

Suspended Direct and Stand-Off Installation

For these applications, cold formed and hot rolled profiles can be used. In order to prestress a bolted joint with electro-galvanized (gv) bolts or stainless steel bolts, we recommend to use the tightening torques according to page 38.





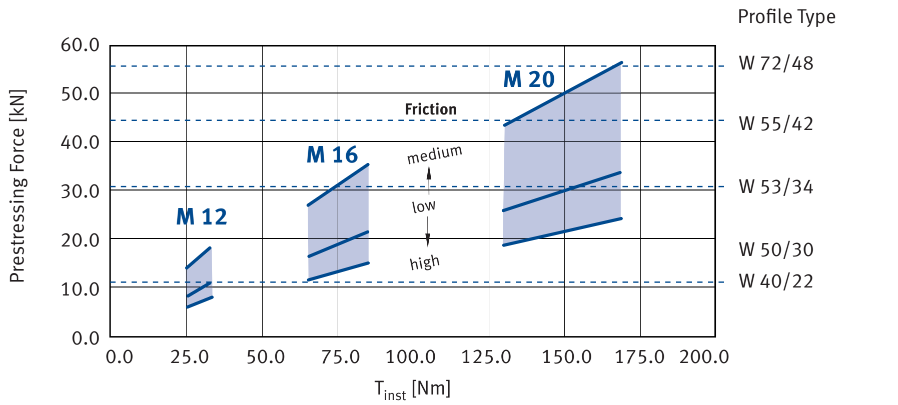
Hot rolled profile, hook head bolt and washer ensure uniformly distributed surface pressure and allow high torque moments.

The relationship between prestressing force and tightening torque can be seen from the graphs below. The prestressing forces vary strongly with the friction in the thread between the nut and the bolt. Low friction causes high pre-load, typical for hot-dip galvanized bolts with lubricated nuts.

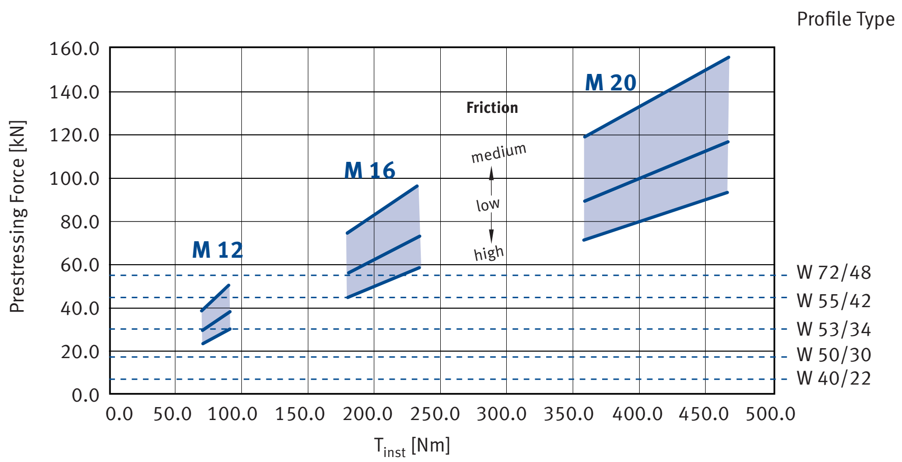
Friction is increased for clean galvanized (medium) and stainless steel (high) nuts and bolts. The recommended installation torque may be increased by 30 % without danger of reaching the yield strength of the bolts.

Relationship between Prestressing Force and Installation Torque for:

Mild Steel Bolts Grade 4.6 and Stainless Steel Bolts Grade A4-50



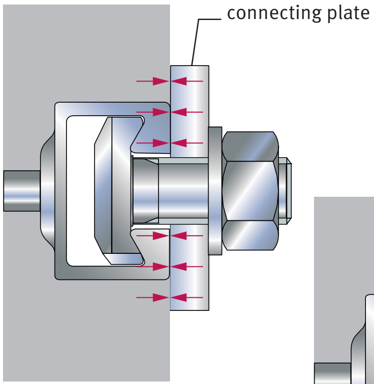
Mild Steel Bolts Grade 8.8 and Stainless Steel Bolts Grade A4-70

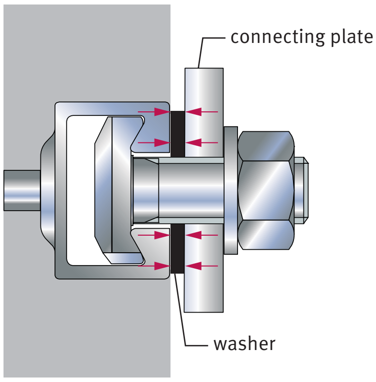


Recommended Tightening Torque T_{inst}

General
If the connecting plate is braced to the concrete or to the anchor channel respectively braced to concrete and anchor channel, the torque moments according to the following table shall be applied.

Steel-Steel-Contact
If the connecting plate is braced to the anchor channel by suitable washer, the torque moments according to the following table shall be applied. For bolts grade 8.8 and A4-70 higher torque moments may be applied.





Profile & T-Bolt Type	Bolt Diameter ∅	Torque Moment T_{inst}		
		General	Steel-Steel Contact	
		4.6 & 8.8	4.6	8.8
	[mm]	[Nm]	[Nm]	[Nm]
K 28/15 JD	M 6	–	3	–
	M 8	8	8	20
	M 10	13	15	40
	M 12	15	25	70
K 38/17 JH	M 10	15	15	40
	M 12	25	25	70
	M 16	40	65	180
W 40/22 JC	M 10	15	15	40
	M 12	25	25	70
	M 16	45	65	180
W 50/30 JB	M 10	15	15	40
	M 12	25	25	70
	M 16	60	65	180
	M 20	75	130	360
W 53/34 JB	M 10	15	15	40
	M 12	25	25	70
	M 16	60	65	180
	M 20	120	130	360
W 55/42 JB	M 10	15	15	40
	M 12	25	25	70
	M 16	60	65	180
	M 20	120	130	360
	M 24	200	230	620
W 72/48 JA	M 20	120	130	360
	M 24	200	230	620
	M 27	300	340	900
	M 30	380	460	1200

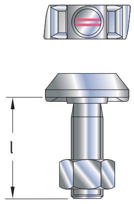
Double Toothed T-Bolt

The Solution for Longitudinal Shear Loads

The heads of JORDAHL® double-notch toothed bolts JKB are equipped with 2 hardened teeth. The high strength grade 8.8 of the bolts allow high installation torque and consequently high pre-stress of the connecting parts. The two teeth on either side bite into the massive lips of the hot rolled profiles.

The mechanism works well for the double toothed bolts M20 and M16 in the profiles W 50/30, W 53/34 and W 40/22. The bite creates a mechanical interlock that guarantees full load capacity even after years of relaxation of the initial torque. The lips of the hot rolled channels receive irreversible plastic deformations, about 3 mm deep notches.

Temporary application will leave marks behind. This does not affect the anchor channel performance or corrosion resistance.



Bolt type	Grade 8.8	Parallel Shear [1] X_{Rd} [kN]	Orthogonal Shear [1] V_{Rd} [kN]	Tensile Strength [1] N_{Rd} [kN]	Installation Torque T_{inst} [Nm]	Min. Connecting Plate Thickness t [mm]	Suitable Profile Type JTA
JKB	**M 20**	**10.5**	**78.4**	**130.7**	**400**	**8.0**	**W 53/34**
JKB	**M 16**	**7.0**	**50.2**	**78.4**	**200**	**6.0**	**W 50/30**
JKC	**M 16**	**7.0**	**50.2**	**78.4**	**200**	**6.0**	**W 40/22**

Bolt capacity may be limited by anchor channel capacity. Check combined loads using:

$$\beta_{N,sc} = \frac{N_{Ed}}{N_{Rd}} \leq 1.0$$

$$\beta_{V,sc} = \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

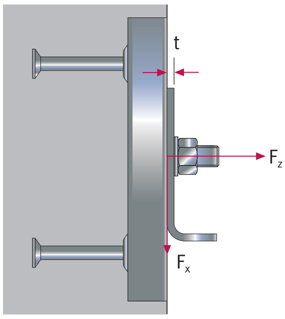
$$\beta_{X,sc} = \frac{X_{Ed}}{X_{Rd}} \leq 1.0$$

$$\beta_{X,sc}^{\ 2} + \beta_{N,sc}^{\ 2} + \beta_{V,sc}^{\ 2} \leq 1.0$$

[1] Values are design resistances. For permissible loads divide by 1.4 load safety factor.

Example for Ordering a Double Toothed T-Bolt:

Type	Diameter		Length [mm]		Coating
JKB	M 20	×	80	–	HDG



Available Lengths	
JKB	M 20 × 60 M 20 × 80 M 16 × 60
JKC	M 16 × 40 M 16 × 60

Mounting Channels JM

Plain Back Channels JM

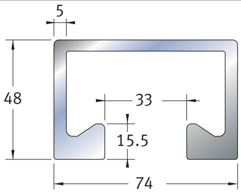
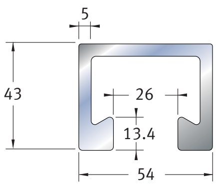
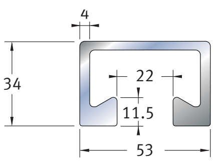
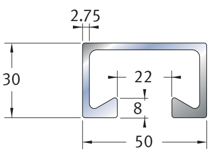
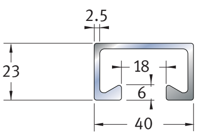
The JM-series, as mounting channels, are distinguished by

- solid channel lips, large contact areas and high tightening torques
- right-angled profile edges and low residual stresses of hot rolled profiles for good weldability

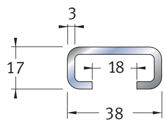
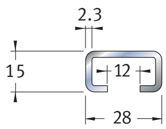
Material

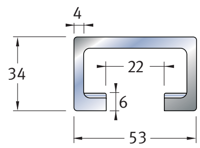
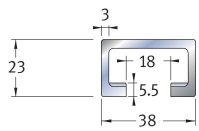
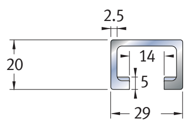
- carbon steel, mill finish
- hot dipped galvanized (HDG)
- stainless steel type 316 (A4)

Welded Channel Supporting Water Pipe

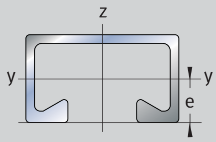
JM W	Profile Weight	T-Bolts
	JM W 72/48 8.85 kg/m	JA M 20–30
	JM W 55/42 6.57 kg/m	JB M 10–24
	JM W 53/34 4.96 kg/m	JB M 10–20
	JM W 50/30 3.25 kg/m	JB M 10–20
	JM W40/22 2.12 kg/m	JC M 10–16

Toothed Channels JM, Cold Formed

JM K	Profile Weight	T-Bolts
	JM K 38/17 1.77 kg/m	JH M 10–16
	JM K 28/15 1.08 kg/m	JD M 6–12

JXM W	Profile Weight	Toothed T-Bolts
	JXM W 53/34 4.65 kg/m	JXB M 16–20
	JXM W 38/23 2.42 kg/m	JXH M 12–16
	JXM W 29/20 1.55 kg/m	JXD M 10–12

Weights, Cross Section Properties, Point Load Bearing Capacity of Mounting Channels:

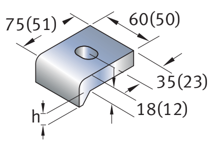


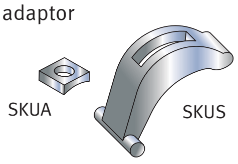
Profile	Weight [1]	Area	Center of Gravity	Moments of Inertia		Moments of Resistance			Yield Strength	Tensile Strength
	G	A	e	Iy	Iz	W_y	W_z	$W_{pl,y}$	f_y	f_u
	kg/m	[cm²]	[cm]	[cm⁴]	[cm⁴]	[cm³]	[cm³]	[cm³]	[N/mm²]	[N/mm²]
hot rolled channels										
JM W 72/48	8.84	11.27	2.40	34.97	83.27	14.28	23.13	18.28	235	390
JM W 55/42	6.76	8.61	2.21	18.75	36.27	8.49	13.31	11.72	275	420
JM W 53/34	4.98	6.34	1.74	9.33	23.70	5.35	9.03	7.18	235	360
JM W 50/30	3.23	4.12	1.60	5.19	13.89	3.24	5.67	4.34	235	360
JM W 40/22	2.10	2.68	1.22	1.97	5.87	1.62	2.97	2.15	250	380
cold formed channels										
JM K 38/17	1.81	2.30	1.05	0.85	4.29	0.82	2.26	1.24	260	360
JM K 28/15	1.11	1.42	0.89	0.41	1.47	0.46	1.05	0.68	235	360
toothed channels										
JXM W 53/34	4.64	5.91	1.85	9.25	23.19	5.01	8.83	6.86	350	450
JXM W 38/23	2.42	3.08	1.33	2.10	6.13	1.57	3.23	2.30	350	450
JXM W 29/20	1.55	1.97	1.12	1.01	2.39	0.90	1.65	1.21	350	450

Header "Cross Section Properties" spans Area through $W_{pl,y}$; "Material Strength" spans Yield Strength and Tensile Strength.

[1] All weights per m for mill finish steel. For galvanized profiles: weights per m × 1.10. For A4 profiles: weights per m × 1.02.

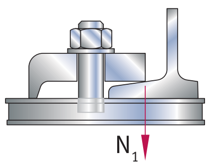
Clamping Plates

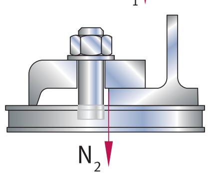
Clamping plates	Type	h [mm]	Bolt	Design Resistance [2] [kN]
	50/7 [1]	7	M 12	$F_{Rd} = 5.25$
	60/10	10	M 16	$F_{Rd_1} = 9.8$
	60/11	11		
	60/12	12		
	60/14	14		
	60/16	16		$F_{Rd_2} = 15.8$
	60/18	18		
	60/20	20		

Clamping claw with adaptor	Type	h [mm]	Bolt	Design Resistance [2] [kN]
	SKU	5 – 40	M 12	$F_{Rd} = 7$

[1] Dimension in brackets
[2] Values are design resistances. For permissible loads divide by 1.4 load safety factor.

JORDAHL® clamping plates HDG are suitable for connecting standard profiles.





for Corrugated Metal Siding & Roofs JTB

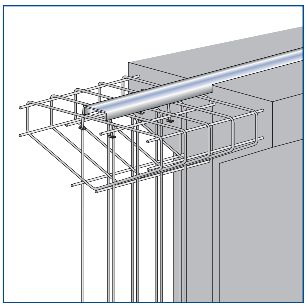
Anchor channels for corrugated metal siding & roofs permit fast, cost-effective installation on reinforced concrete components. The anchors on conventional connecting channels are often difficult to insert in the preformed rebar cages. The channels for corrugated metal sidings & roofs JTB-AR and JTB-UNI from JORDAHL® can be incorporated more easily in the existing reinforcement due to their thin anchor size.

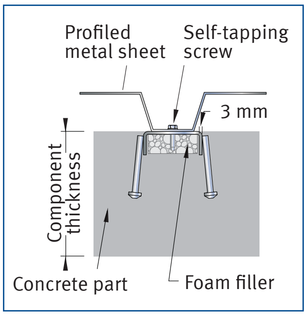
Channels with inserted foam filling are placed into the smooth concrete surface of the load bearing component, flush with the surface and in the correct alignment. End joints between two connecting channels should be about 25 mm apart. Following the removal of the formwork, the corrugated metal siding & roofs are connected to the channel by self-tapping screws or set screws. The siding must be connected in the middle third of the channel width.

The screw must be at least 25 mm from the end of the channel.

Material

Channels for corrugated metal siding & roofs from JORDAHL® are produced from steel according to EN 10 025, hot-dipped galvanized with ≥ 50 µm zinc layer or from stainless steel 1.4571 or 1.4401/ 1.4404 (A4).





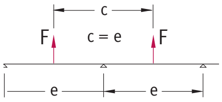
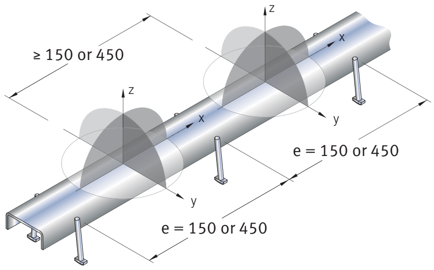
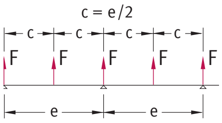
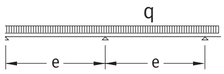
Application to a Wall

Application to a Roof

Storage of JTB-AR

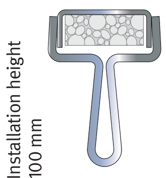
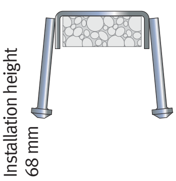
JTB-UNI with the Lowest Possible Storage Space Requirement

JORDAHL®
anchored in quality

Design Resistance F_{Rd} [1)]					
Profile	**JTB 60/24/3**		**JTB 60/22/6**		**Stress Ranges**
Anchor spacing e [mm]	150	450	150	450	$\sqrt{F_{Ed,x}^2 + F_{Ed,z}^2 + F_{Ed,y}^2} \le F_{Rd}$
Single loads F_{Rd} [kN] 	7	4	7	7	
	3.5	3.5	3.5	3.5	
Line loads q [kN/m] 	46.6	15.5	46.6	15.5	

The minimum edge distance is 100 mm.
The minimum lateral spacing between channels is 200 mm.

1) Values are design resistances. For permissible loads divide by 1.4 load safety factor.

Technical Data		
	JTB 60/24/3-AR	JTB 60/24/3-UNI
		
Profile (w/h/d) [mm]	JTB 60/24/3	
Anchor Spacing e [cm]	15	45
Cross Section A [cm²]	2.97	
Moment of Inertia I_y [cm⁴]	1.51	
Moments of Resistance W_y [cm³]	0.87	
Weight with Anchors [kg/m]	2.5	2.4
Embedment Depth [cm]	10	6.8
Effective Embed-ment Depth [cm]	6	6

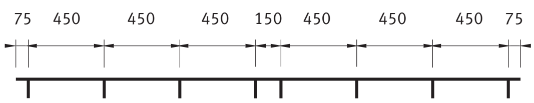
Example for Ordering a Anchor Channel for Corrugated Metal Siding:

Type	Size		Anchor		Anchor spacing [mm]		Material
JTB	60/24/3	×	UNI	–	450	–	A4

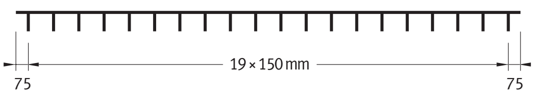
Forms Supplied

The profiled metal sheet fixing channels JTB-AR and JTB-UNI are supplied in two standard options (stock length 3 m in each case)

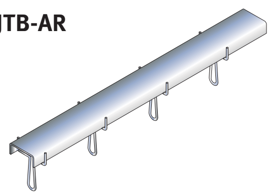
- centrally divisible, allows cutting in half, therefore often particularly cost-effective anchor spacing e: 75 mm; 3 × 450 mm; 1 × 150 mm; 3 × 450 mm; 75 mm = 3000 mm



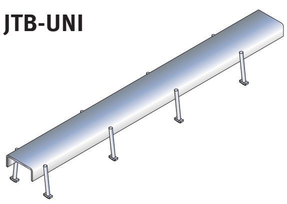
- divisible as required, can be cut to suit, anchor spacing e: 150 mm



JTB-AR



JTB-UNI



Edge Spacing for JTB Channels

	Minimum Spacing Requirements [mm]					
	a_a 1)	a_r 2)	a_e 3)	a_f 4)	d 5)	b 6)
Type JTB-AR	200	100	25	25	100 +c	200
Type JTB-UNI	200	125	25	25	75 + c	250

1) If adjacent channels are staggered so that their anchors are separated by at last 250 mm, the lateral spacing a_a may be reduced to 75 mm.

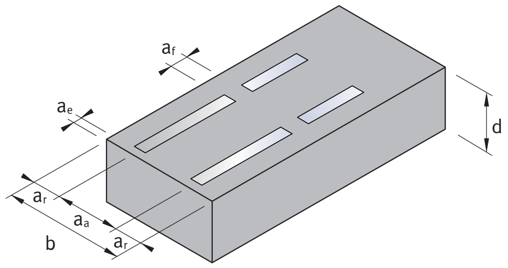
2) In the event that the permissible anchor force is not fully utilised, the edge spacing a_r in the case of exclusively central tensile loading may be reduced to:
reduced $a_r = N_{Ed}/N_{Rd} \times a_r \geq 5$ cm
where N_{Ed} = factored anchoring force,
N_{Rd} = design resistance.

3) If the anchor force is fully utilised, the last anchor must be at least 87.5 mm away from the edge.

4) If the anchor force is fully utilised, the two end anchors must have a mutual spacing of at least 150 mm.

5) This is given by the geometry of the anchor and the required concrete cover c.

6) Minimum component width when only one channel is provided.



Installation of a Multi-Layer Insulated Corrugated Metal Siding Wall

Corrosion Prevention

JORDAHL® anchored in quality

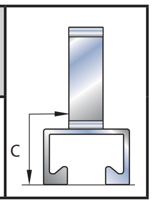
Category of Corrosion: ISO 12944-2	Profile	Anchor	Bolt, Nut, Washer	Intended Use
C1 harmless	mill finish	mill finish	mill finish without corrosion protection	Only possible when all the connection elements are protected, depending on the ambient conditions, by a minimum concrete cover according to Eurocode EC2.
C2 low	hot-dip galvanized (HDG), layer > 50 µm	hot-dip galvanized (HDG), layer > 50 µm	electro zinc plated (ZP) layer > 5 µm	Concrete components in interior rooms, for example dwellings, offices, schools, hospitals, retail premises – with the exception of wet rooms.
C3 medium	hot-dip galvanized (HDG), layer > 50 µm	hot-dip galvanized (HDG), layer > 50 µm	hot-dip galvanized (HDG), layer > 50 µm	Concrete components in interior rooms with normal atmospheric humidity (including kitchens, bathrooms and washrooms in dwellings) – with the exception of permanent moisture.
C4 high	stainless steel 1.4401/1.4404/ 1. 4571 (A4) 1.4362 (L4)	stainless steel 1.4401/1.4404/ 1.4571 (A4) [1] 1.4362 (L4) [1] weld-on anchor mill finish [2]	stainless steel 1.4401/1.4404/ 1.4571 (A4-50, A4-70) 1.4362 (L4-70)	Applications with medium corrosion resistance, for example in wet rooms, exposed to weather, industrial atmosphere, close to the ocean and inaccessible areas.
C5 servere	stainless steel 1.4462 (F4) [3] 1.4529/ 1.4547 (HC)	stainless steel 1.4462 (F4) 1.4529 (HC) weld-on anchor mill finish [2]	stainless steel 1.4462 (F4-70) [3] 1.4529/ 1.4547 (HC-50, HC-70)	Applications with severe corrosion resistance and high corrosion loading by chlorides and sulphur dioxide (including concentration of the pollutants, for example in the case of components in saltwater and road tunnels).

[1] JORDAHL® stainless steel anchor channels with round anchors:
The anchor channel types JTA K 28/15 to W 50/30 are produced as standard with stainless steel round anchors. These anchor channels are not subject to any restriction with respect to the concrete cover.

The anchor channel types JTA W 72/48, K 72/48 and W 53/34, K 53/34 can be produced with stainless steel round anchors or welded-on mild steel I-anchors. The static and dynamic properties of the round anchors or welded I-anchors are the same as each other.

[2] JORDAHL® stainless steel anchor channels with mill finish weld-on anchors: The following concrete cover c must be used for the corrosion protection of the welded anchors.

W 53/34 K 53/34 [mm]	W 72/48 K 72/48 [mm]
40	60



[3] Description of F4 also applies to FA (1.4462)

Planning

Anchor channels should be planned early in the design phase and incorporated into the reinforcement design or formwork drawings with specification of type, length and position. Ideally, not only the current loads but also the load of future extensions are taken into account. There is a complete profile library available for CAD users.

The Planning Guidelines

The criteria for the installation are governed by the approval requirements. These define:

- Load bearing capacities
- Edge spacings
- Minimum dimensions of the components
- Area of application with regards to corrosion prevention
- Anchor channels permit extremely high loadings even close to the edge

Software Support by JORDAHL®

Planning software to support structural engineers

- Easy to use
- Intuitive operation and handling
- Quickly installed
- Immediate results
- Use as a verifiable calculation

Support from JORDAHL® Technical Engineers

- Object-based consultancy
- Cost efficient planning
- Setting up static verifications
- Development of special solutions

Screenshot JTA Design Tool

Installation

Efficient, Easy and Fast

JORDAHL® supplies anchor channels in all desired lengths. To avoid fresh concrete from flowing into the profile, JORDAHL® anchor channels are filled with either polystyrene (PS) or polyethylene (PE) foam. Both types can be removed easily.

Connecting

JORDAHL® anchor channels are installed according to the reinforcement/formwork drawings. To prevent displacement during concrete pouring, the channels are held in place:

- on wooden formwork by nails through the nail holes in the back of the profile, or by lateral bonding with hot melt adhesives
- on steel formwork by bonding with hot melt adhesives, or by bolting on with JORDAHL® T-bolts, or with magnets
- on the surface of a concrete slab by wiring the anchors to reinforcement bars or, if required, by means of special spacers spot welded to the anchors.

Concrete

Concrete is poured, raked and vibrated into the formwork – around the anchor channel concrete has to be compacted using appropriate means.

Removal of Foam Filler

After the removal of the formwork the foam filler can be easily removed by means of a hammer or other tools.

Mounting Connections

JORDAHL® T-bolts can now be inserted into the anchor channel slot at any desired point and, following 90° rotation, can be fixed by tightening with the appropriate torque. The slot on the bottom of the bolt must be transverse in relation to the channel direction.

Safety of Design

for Fastenings in Concrete – Based on CEN/TS 1992-4-3: Anchor Channels

With the European countries officially introducing the CEN/TS 1992-4-3 standard for anchor channels, a completely new developed design concept is now available to calculate the strength of anchor channels cast in concrete. This concept is based on the European partial safety design and the European Technical Approval for JORDAHL® anchor channels (ETA-09/0338). It generally leads to an improved utilisation of connections with JORDAHL® anchor channels and offers more flexibility in the design.

The following individual conditions can be taken into account for the design of JTA anchor channels:

- Edge Distance
- Length of channel
- Load positioning along the channel
- Concrete Strength
- Additional reinforcement
- Thickness of concrete member

The consideration of the above mentioned influences allow to tailor-made the design for the specific needs of each project. The key-benefit of this design concept is to reach the optimum of economic and technical efficiency.

In order to keep the effort of the design as small as possible JORDAHL® has carried out thousands of calculations. Taking all theoretical failure modes into account the results have been summarized into 2 sets of influences: load configuration and geometry for steel and concrete. With the knowledge of the corresponding strength and reduction factors (see page 13 – 27) any static designer can do a hand calculation.

This state-of-the-art design for anchorage in concrete is now available as JTA-JORDAHL® anchor channel software.

THE EUROCODE DESIGN CONCEPT: $F_{Ed} \leq F_{Rd}$

Today's building structures are usually designed according to the concept with partial safety factors.

The concept is published in the Eurocodes (EC) and was adopted by all national standardization organizations in Europe.
The design verification according to EC2 (concrete) or EC3 (steel) takes place on the design level.

The design method according to the Eurocode concept is as follows: The design loads F_{Ed} are loads factored with various partial factors depending on the load characteristic (e.g. dead or live load) and probability of simultaneous occurrence (load combinations).

The design loads are compared with the design resistance $F_{Rd} = F_{Rk}/\gamma_M$ where F_{Rk} is the characteristic resistance and γ_M is a specific partial factor for the material property (e.g. concrete $\gamma_{Mc} = 1.5$, rebar steel: $\gamma_{Ms,re} = 1.15$).

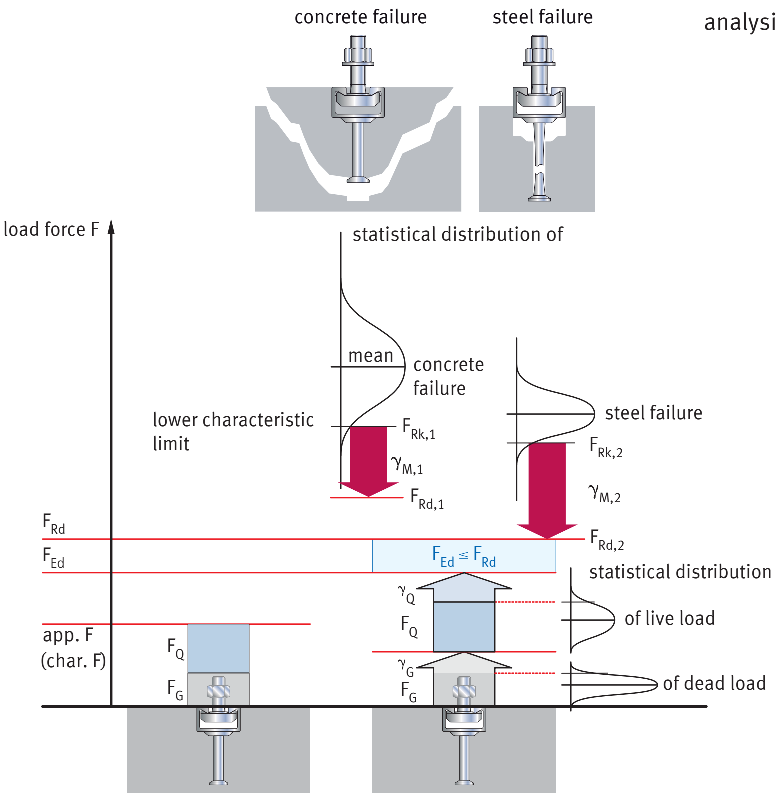
In general the proof according to this safety concept is stated as:

$$F_{Ed} \leq F_{Rd} \text{ or } \frac{F_{Ed}}{F_{Rd}} \leq 1$$

Both sides, load and resistance, require more effort from static designers than the simplified and more uneconomic permissible loads design, as you can see from the adjacent symbolic diagram. However, the procedure allows the designer to take different influences of load and material into account and achieve a more constant and reliable safety level.

With today's knowledge of potential failure modes it is possible to achieve an efficient and economic design. However, it is imperative that all data for such a detailed comparison is available.

The resistances of JORDAHL® anchor channels published in this catalogue are based on today's knowledge of anchoring in concrete as stated in CEN/TS1992-4 and the European Technical Approval for JORDAHL® anchor channels. This Approval is based on numerous tests, statistical and numerical analysis and the Eurocode design concept.



$F_{Rk,\,i}$ = charateristic resistance for material

$\gamma_{M,\,i}$ = are the individual partial safety factors for material i

F_{Rd} = design resistance

$F_{RD} = \min(F_{RD,\,1};\ F_{RD,\,2};\ F_{RD,\,i})$

$F_{RD,\,i} = F_{RK,\,i} / \gamma_{M,\,i}$

F_{Ed} = design load

$F_{Ed} = \gamma_G \times F_G + \gamma_Q \times F_Q$

F_Q = unfactored life load

γ_Q = load safety factor for life load

F_G = unfactored dead load

γ_Q = load factor for dead load

Safety Factors in conjunction with CEN/TS 1992 - Eurocode 2

All design resistances published in this brochure are based on the partial safety concept and include the following partial safety factors:

Steel	Factor γ_M	where to find in CEN/TS 1992-4-1
Connection anchor and channel $\gamma_{M,ca}$	1.8	4.4.3.1.1
local flexure of channel lip $\gamma_{Ms,l}$	1.8	4.4.3.1.1
Supplementary reinforcement $\gamma_{Ms,re}$	1.15	4.4.3.1.1
Concrete, unreinforced		
Pull-out γ_{Mp}	1.5	4.4.3.1.3
Concrete cone failure γ_{Mc}	1.5	4.4.3.1.2
Concrete edge failure γ_{Mc}	1.5	4.4.3.1.2
Concrete, reinforced		
Tension: Anchorage failure	1.5	4.4.3.1.2
Shear: Anchorage failure	1.5	4.4.3.1.2

For partial load safety-factors and combinations we recommend to use EN-1990 (Eurocode 0), Annex A

Disclaimer

The JORDAHL® anchor channel Guide to ETA compatible Design is a design aid intended for use by a qualified person or design team who takes full responsibility for the design of the structure. The connection resistances shown in this manual are based on tests performed according to CEN-TS 1992. The design method used in this manual is based on the partial safety concept. The design resistances in this guide must exceed the design loads determined by the structural engineer. The JORDAHL® anchor channel Installation Instructions must be followed on the jobsite to achieve the resistances shown in this guide.

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