JTA-CE Anchor Channels

JORDAHL®
anchored in quality

A Century of Quality

JORDAHL® anchor channels are manufactured by Deutsche Kahneisen GmbH in Germany. The history begins in 1907 with an invention of Julius Kahn, 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.

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

- A century of **quality** “Made in Germany”, used in construction projects around the world
- **Made under strict quality control** according to German and European approval requirements
- **ISO 9001:2008** based internal QA/QC processes
- **Comprehensive range** of superior anchoring and connection products with accessories
- **State of the art** helping customers to build efficiently and to maintain quality standards
- **Eurocode-compatible** design concept and European Technical Approval (ETA-09/0338) across national borders

JORDAHL® provides well-engineered solutions for installation technology, in order to join structural components, to suspend loads or to connect elements. Quality and safety form the basis for selection of a fastening system. JORDAHL® offers the following services:

- **Professional support** for planning and design
- **Excellent technical know-how** from a team of internationally-experienced engineers
- **Customized solutions** and project-based consulting
- **Cost-effective planning** and support with engineering calculations
- **Just-in-time delivery** on site
- **Reliable partner**

Contents

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JORDAHL®
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Overview Anchor Channels JTA-CE

W-Profiles

- Hot rolled from a single block
- Free of residual stresses
- Optimized geometry with strengthened channel lips for high tightening torques
- Suitable for dynamic loads
- Resistant to fatigue up to the working load limit
- Verified against explosion- or shock-limit loads
- European Technical Approval (ETA-09/0338)

K-Profiles

- Cold formed profiles
- Constant material strength
- European Technical Approval (ETA-09/0338)

JORDAHL® Bolts

- Hammer or hook-head bolts – matched to JORDAHL® profiles
- Galvanized or from stainless steel
- Strong connections using high tightening torques

Round Anchors

are cold forged on the backs of the channels in a monitored production process. Welded anchors are also available for special applications.

work safety

reduces construction time

economical

simple assembly

fire prevention

sustainable

Proven Anchoring

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Advantages

For more than a century JORDAHL® anchor channels have been recognised as a secure way to anchor loads in concrete. Regardless of whether the concrete is reinforced or non-reinforced, cracked or non-cracked, JORDAHL® anchor channels always provide a load-carrying connection.

Planning
- The Reinforcement can be recognized in the design
- Highest cost-effectiveness in series-connection
- High bearing capacity even in delicate structural elements
- Independent of shrinkage and creep strain in the concrete element
- Suitable for pre-stressed structural elements
- Increased bearing capacity in the vicinity of reinforcement
- Small edge distances possible
- Simple, individual customisation

Assembly
- Connection on site reduces construction time
- Simple assembly of the attachment parts
- Suitable for heavily-reinforced concrete or filigree structural components
- Simple compensation for building tolerances

Safety
- Suitable for installation in structural components with fire prevention requirements
- High resistance to fatique as well as loads resulting from seismic activities and explosions
- Maintenance-free for years using corrosion-resistant types of stainless steel
- Transparent safety concept
- Optimum mechanical undercut
- Anchoring without damaging the concrete or the reinforcement
- Suitable without restrictions for cracked and non-cracked concrete

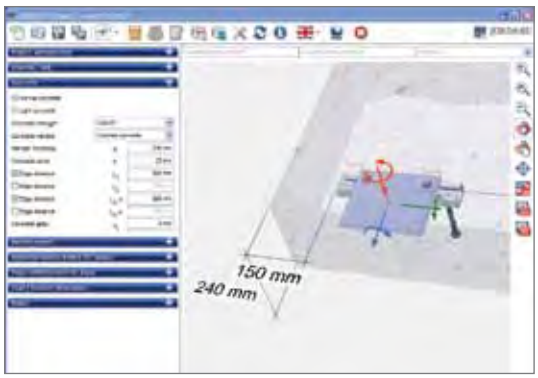
Innovative Design Concept

The introduction of the new European approval for JORDAHL® anchor channels JTA-CE represents state-of-the-art for anchoring in concrete and generally leads to an optimized utilization of anchor channels.

The design concept is based on the European partial safety concept CEN/TS 1992-4-3 (see page 20/21) and the European Technical Approval for JORDAHL® anchor channels (ETA-09/0338).

Optimized design taking into account:
- Edge distances
- Channel length
- Load distribution along the channels
- Concrete strength
- Additional reinforcement
- Thickness of the structural component

JORDAHL® Expert design software (see page 18/19):
- Efficient engineering design in accordance with CEN/TS
- Simple and quick to use
- Input with clear 3D graphics
- Easily-comprehensible monitor output
- Testable print-out



JORDAHL® Expert software

Applications

Connection of crane rails to prefabricated concrete elements

Connection of catenaries in tunnels and on railway lines

Connection of precast concrete elements

Connection of elevator guide rails

Connection of curtain-type façades

In industrial machine foundations

Connection of seats in stadium

Connection of pipe-work

Connection of cable support systems

Standard Product Range

JORDAHL®
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JTA W 72 / 48 JTA W 55 / 42		JTA K 72 / 48		JTA W 53 / 34 JTA K 53 / 34		JTA W 50 / 30 JTA K 50 / 30 JTA K 40/25		JTA W 40 / 22		JTA K 38 / 17 JTA K 28 / 15	
Length [mm]	Number of Anchors	Length [mm]	Number of Anchors	Length [mm]	Number of Anchors	Length [mm]	Number of Anchors	Length [mm]	Number of Anchors	Length [mm]	Number of Anchors
150	2	150	2	150	2	150	2	150	2	100	2
200	2	200	2	200	2	200	2	200	2	150	2
250	2	250	2	250	2	250	2	250	2	200	2
300	2	300	2	300	2	300	2	300	2	250	2
350	2	350	2	350	3	350	3	350	3	300	3
400	3	400	3	400	3	400	3	400	3	350	3
550	3	550	3	550	3	550	3	550	3	450	3
900	4	900	4	800	4	800	4	800	4	550	4
6000	21			1050	5	1050	5	1050	5	800	5
				6000	25	3000	13	1300 [1)]	6	1050	6
						6000	25	1550 [1)]	7	3000	16
								1800 [1)]	8	6000	31
								2050 [1)]	9		
								2300 [1)]	10		
								2550 [1)]	11		
								3000 [1)]	13		
								6000	25		
Anchor Spacing ≤ 300 mm		Anchor Spacing ≤ 300 mm		Anchor Spacing ≤ 250 mm		Anchor Spacing ≤ 250 mm		Anchor Spacing ≤ 250 mm		Anchor Spacing ≤ 200 mm	

[1)] only in hot-dip galvanized

Material and Design of Profile

- Hot-dip galvanized steel (HDG)
- Stainless steel (A4)
- Standard filler Polyethylene (PE) or Polystyrene (PS)

Stock lengths of JORDAHL® anchor channels

JTA W 53/34 – anchor separation 250 mm

Material and Identification

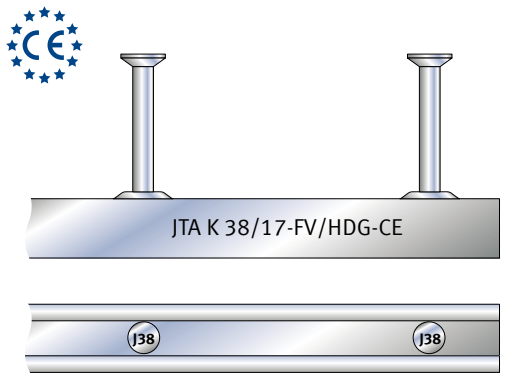
JORDAHL® product	Steel		Stainless Steel	
Profile	S235JR = 1.0038 S275JR = 1.0044	DIN EN 10025	1.4301 / 1.4541 (A2) [1] 1.4401 / 1.4404 / 1.4571 (A4) [2] 1.4529 / 1.4547 [3]	DIN EN 10088
Anchor	S235JR = 1.0038	DIN EN 10025 EN 10263	1.4401 / 1.4404 / 1.4571 (A4) [2] 1.4529 / 1.4547 [3]	DIN EN 10088
Bolts	Strength class 4.6 / 8.8	DIN EN ISO 898-1	A4-50; A4-70 [2] F4-70 [3]	DIN EN ISO 3506-1
Hexagon nuts	Strength class 8	DIN EN 20898-2	A4-50; A4-70 [2] 1.4529 [3]	DIN EN ISO 3506-2
Washers	St	DIN EN ISO 7089 DIN EN ISO 7093-1	1.4401 / 1.4404 / 1.4571 (A4) [2]	DIN EN 10088

[1] Corrosion resistance class II according to Z-30.3-6 (not part of the general technical approval)
[2] Categorie of Corrosion: C4 (ISO 12944-2)
[3] Categorie of Corrosion: C5 (ISO 12944-2)

Identification of JORDAHL® JTA-CE Anchor Channels

JORDAHL® anchor channels are permanently identified on the profile side with type of profile and material specification.

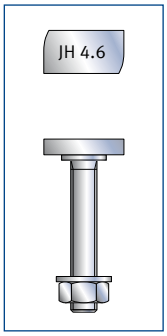
JORDAHL® anchor channels in compliance with the European Technical Approval (ETA) show the designation "-CE".



Profile type

JORDAHL® anchor channels with round anchors are additionally embossed with the profile designation on the rivet head on the inside chamber of the channel.

Identification of JORDAHL® Bolts



JORDAHL® bolts are embossed on the bolt head with type and strength class.

Corrosion prevention

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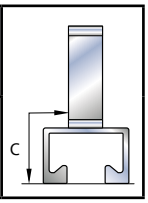
Categories of Corrosion: ISO 12944-2	Profile	Anchor	Bolt, Nut, Washer	Intended Use
C1 very low	mill finish	mill finish	mill finish without corrosion protection	Only possible when all the connection elements, depending on the ambient conditions, are protected by a minimum concrete cover in accordance with 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 structural 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 structural 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, areas exposed to weather, industrial atmosphere, close to the ocean and in inaccessible areas.
C5 severe	Stainless steel 1.44623) (F4) [4] 1.4529/ 1.4547 (HC)	Stainless steel 1.44623) (F4) [4] 1.4529 (HC) Weld-on anchor mill finish [2]	Stainless steel 1.4462 3) (F4-70) [4] 1.4529/ 1.4547 (HC-50, HC-70)	Applications with severe corrosion resistance and high corrosion loading by chlorides and sulphur-dioxide (including the concentration of 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 JTA W 50/30 are manufactured with round anchors from stainless steel. These anchor channels are not subject to any restrictions with respect to the concrete cover.

The anchor channel types JTA W 72/48, JTA K 72/48 and JTA W 53/34, JTA K 53/34 can be manufactured from stainless steel round anchors or welded-on mill-finish steel I-anchors. The static properties of the round anchors or welded-on I anchors are equivalent.

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

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

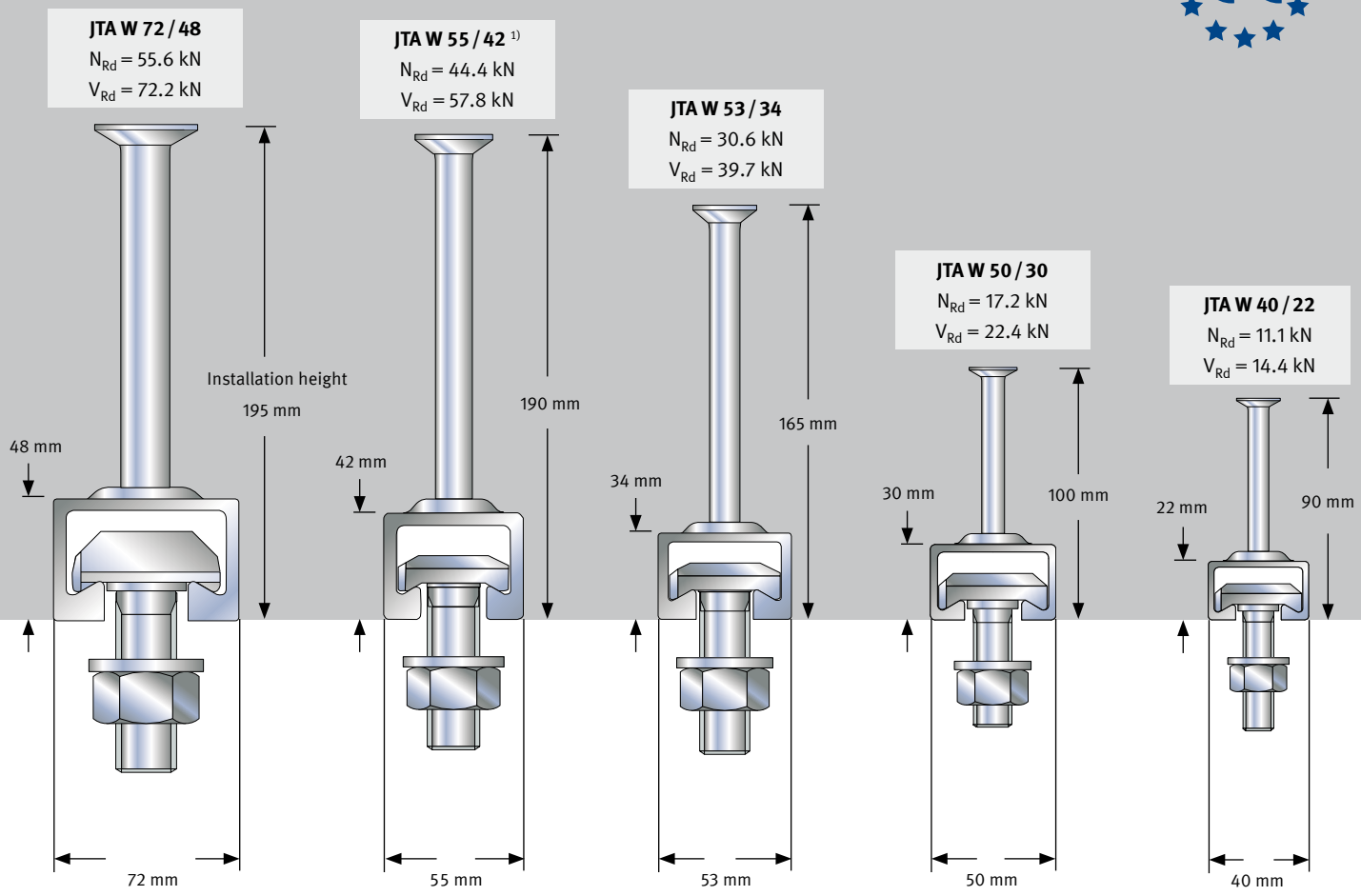
[3] Stainless steel 1.4462 is not approved for indoor swimming pool atmospheres in accordance with Z-30.3-6

[4] F4 is equivalent to FA

JORDAHL® JTA-CE Anchor Channels

European Technical Approval ETA-09/0338

Hot Rolled Anchor Channels



Bolts

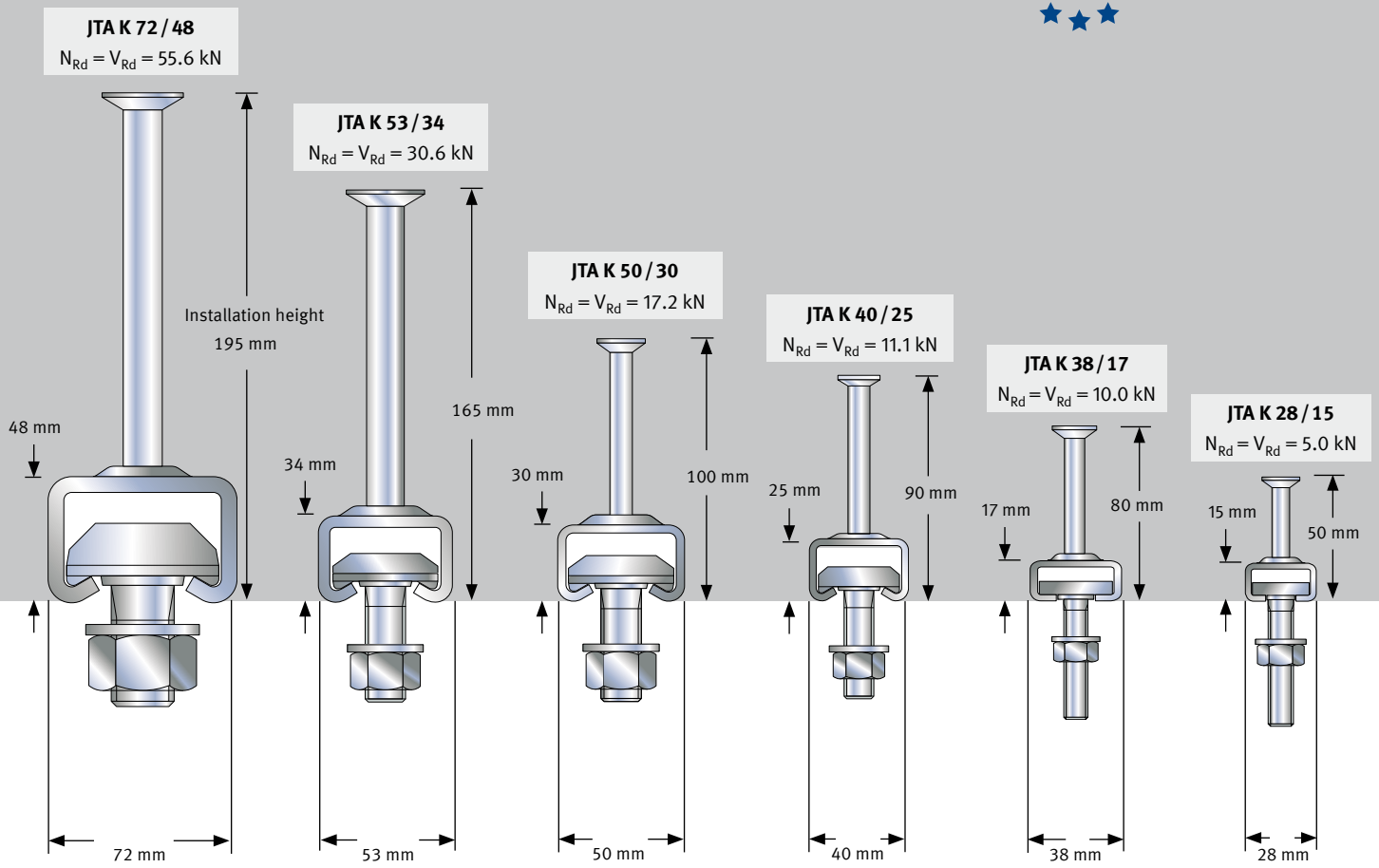
JA	JB	JB	JB	JC
M 20	M 16	M 10	M 10	M 10
M 24	M 20	M 12	M 12	M 12
M 27	M 24 2)	M 16	M 16	M 16
M 30		M 20	M 20	

1) Only in hot-dip galvanized (HDG)
2) JB M 24 is equivalent to JE M 24
Profile dimensions may exhibit tolerances.

Material and design of profile
- Hot-dip galvanized steel (HDG)
- Stainless steel (A4)
- Standard filler polyethylene (PE) or polystyrene (PS)

Material and design of bolts
- Electro zinc plated (ZP) or Hot-dip galvanized steel (HDG)
- Stainless steel

Cold Formed Anchor Channels



JA	JB	JB	JC	JH	JD
M 20	M 10	M 10	M 10	M 10	M 6
M 24	M 12	M 12	M 12	M 12	M 8
M 27	M 16	M 16	M 16	M 16	M 10
M 30	M 20	M 20			M 12

N_{Rd} = Design value for axial force
V_{Rd} = Design value for shear force

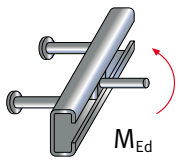
Design Resistances

Steel T-Bolts

Bolts ∅			M 6	M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
Channel Profile	JTA-CE	K 28 / 15	Hammer-head T-Bolts Type JD				–	–	–	–	–
		K 38 / 17	–	–	Hammer-head T-Bolts Type JH			–	–	–	–
		W 40 / 22 K 40 / 25	–	–	Hook-head T-Bolts Type JC			–	–	–	–
		W 50 / 30 K 50 / 30	–	–	Hook-head T-Bolts Type JB				–	–	–
		W 53 / 34 K 53 / 34	–	–	Hook-head T-Bolts Type JB				–	–	–
		W 55 / 42	–	–	Hook-head T-Bolts Type JB					–	–
		W 72 / 48 K 72 / 48	–	–	–	–	–	Hook-head T-Bolts Type JA			
T-Bolt Strength	4.6	Tension force N_{Rd} [kN]	4.0	7.3	11.6	16.9	31.4	49.0	70.6	91.8	112.2
		Shear force V_{Rd} [kN]	2.9	5.3	8.4	12.1	22.6	35.3	50.7	66.0	80.6
	8.8	Tension force N_{Rd} [kN]	–	19.5	30.9	44.9	83.7	130.7	188.3	–	–
		Shear force V_{Rd} [kN]	–	11.7	18.6	27.0	50.2	78.4	113.0	–	–

All specified values are design resistances. JORDAHL® bolts are supplied electro zinc plated (ZP) or hot-dip galvanized (HDG).

Design Bending Resistance of JORDAHL® T-Bolts

Bolts ∅		M 6	M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
clearance hole in the attachment part [mm]		7	9	12	14	18	22	26	30	33
Design Resistance Bending $M^{\circ}_{Rd,s}$ [Nm] 	4.6	3.8	9.0	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 stand-off installation, a connection is stressed by a bending moment as well as by tension and shear forces. The design bending moments specified above must be taken into consideration.

Note

Bolt capacity may be limited by the channel bearing. The smaller value is decisive. The specified values are design resistances. For permissible loads divide by 1.4 safety factor.

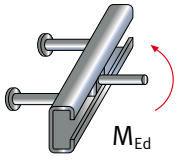
Stand-Off Installation

JORDAHL® Stainless Steel T-Bolts

Bolts ∅			M 8	M 10	M 12	M 16	M 20	M 24
Channel Profile	JTA-CE	K 28 / 15	Hammer-head T-Bolts Type type JD		–	–	–	–
		K 38 / 17	–	Hammer-head T-Bolts Type type JH			–	–
		W 40 / 22 K 40 / 25	–	Hammer-head T-Bolts Type type JC			–	–
		W 50 / 30 K 50 / 30	–	Hook-head T-Bolts Type Type JB				–
		W 53 / 34 K 53 / 34	–	Hook-head T-Bolts Type Type JB				–
		W 55 / 42	–	Hook-head T-Bolts Type Type JB				–
		W 72 / 48 K 72 / 48	–	–	–	–	–	Hook-head T-Bolts Type Type JA
T-Bolt Strength	A4-50	Tension Force N_{Rd} [kN]	–	10.1	14.8	27.4	42.8	61.7
		Shear Force V_{Rd} [kN]	–	7.3	10.6	19.8	30.9	44,5
	F4-70	Tension Force N_{Rd} [kN]	13.7	21.7	31.6	58.8	91.7	–
		Shear Force V_{Rd} [kN]	9.9	15.6	22.7	42.2	66.0	–

All specified values are design resistances. JORDAHL® stainless steel bolts are manufactured preferentially from stainless steel of corrosion category C4 (A4, L4) and C5 (F4, HC).

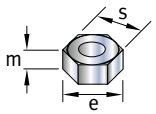
Design Bending Resistances of JORDAHL® T-Bolts

Bolts ∅		M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
clearance hole in the attachment 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	70.0	136.3	235.8	–	–
	A4-70 F4-70	16.8	33.5	58.8	149.4	291.3	503.7	–	–

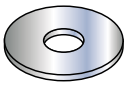
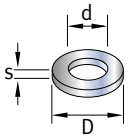
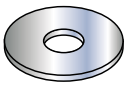
JORDAHL® bolts: electro zinc plated steel (ZP), hot-dip galvanized steel (HDG), stainless steel (A4)
Please select T-bolts according to corrosion prevention (page 9). High strength T-bolts 8.8 are generally HDG.

Nuts and Washers

Hexagon nuts to ISO 4032

Material gv, A4				
	Ø	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

Washers [1)]

Material gv, A4				
Washers	Ø	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

[1)] Washers for stand-off installation see table below

Dimensions of The Washers for Stand-Off Installation

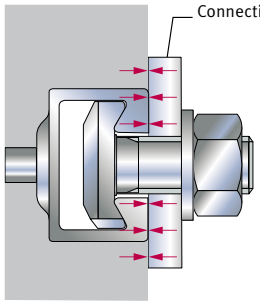
JORDAHL® Profile	Bolt Type	M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
K 28 / 15	JD	ISO 7093-1	ISO 7093-1	ISO 7089	–	–	–	–	–
K 38 / 17	JH	–	38 × 38 × 5	ISO 7093-1	ISO 7093-1	–	–	–	–
W 40 / 22	JC	–	38 × 38 × 5	ISO 7093-1	ISO 7093-1	–	–	–	–
K 40 / 25	JC	–	38 × 38 × 5	38 × 38 × 5	38 × 38 × 5	–	–	–	–
W 50 / 30 K 50 / 30	JB	–	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	–	–	–
W 53 / 34 K 53 / 34	JB	–	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	–	–	–
W 55 / 42	JB [2)]	–	–	–	50 × 50 × 6	50 × 50 × 6	50 × 50 × 6	–	–
W 72 / 48 K 72 / 48	JA	–	–	–	–	70 × 70 × 8	70 × 70 × 8	70 × 70 × 8	70 × 70 × 8

[2)] JB M 24 is identical to JE M 24

Recommended Tightening Torque T_{inst}

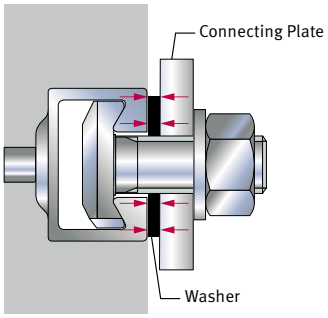
General

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 and Type of Bolt	Bolts ∅	Tightening Torque T_{inst}		
		General	Steel - Steel Contact	
		4.6 & 8.8 A4-50 A4-70 F4-70	4.6 A4-50	8.8 A4-70 F4-70
	[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 K 40 / 25 JC	M 10	15	15	40
	M 12	25	25	70
	M 16	45	65	180
W 50 / 30 K 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 K 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 K 72 / 48 JA	M 20	120	130	360
	M 24	200	230	620
	M 27	300	340	900
	M 30	380	460	1200

Prestressed Bolted Joints

Prestressing Forces of T-Bolts
In connection technology, for the applications

- **Direct Suspension and stand-off installation**
- **Stress in the channel longitudinal direction**

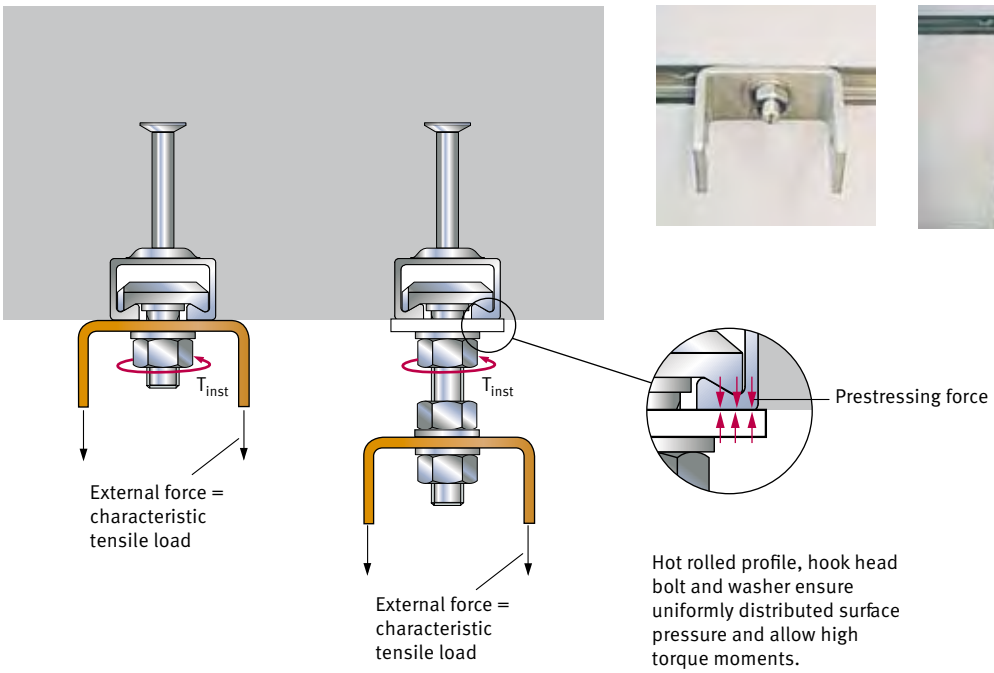
it is important to prestress the bolted connections in order to prevent undesired loosening or slippage of the bolted connections. Higher-strength bolts (8.8) are not absolutely necessary for this purpose. Grade 4.6 and A4-50 bolts are also adequate if the following points are taken into consideration:

- In the short term, the tightening torque generates a higher force in the bolt, than the externally applied loads.
- The applied prestressing force is dissipated down to about 30 % by relaxation.
- Bolts made of stainless steel exhibit higher friction than electro zinc plated or HDG bolts. Therefore prestressing forces are lower for stainless steel bolts.
- 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 casted below the concrete surface, then the connection must be shimmed by means of a suitable washer (see page 14).

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 zinc plated (ZP) bolts or stainless steel bolts, we recommend using the tightening torques according to page 15.



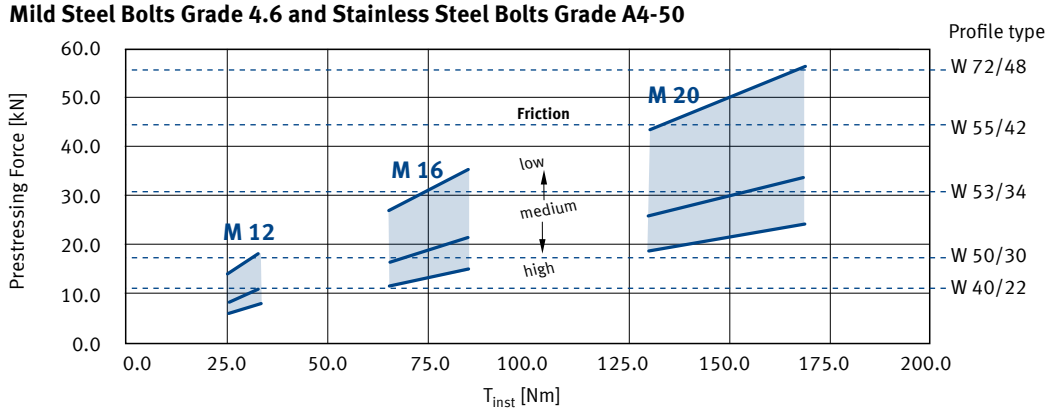
Hot rolled profile, hook head bolt and washer ensure uniformly distributed surface pressure and allow high torque moments.

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.

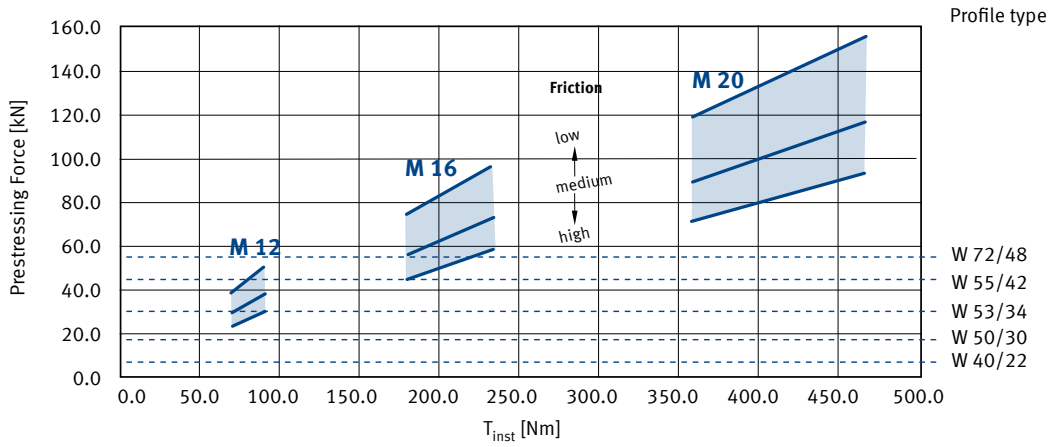
Friction is increased for clean galvanized (medium) and stainless steel (high) nuts and bolts. The recommended installation torque may be increased by 30 % without danger of reaching the yield strength of the bolts.

Relationship Between Prestressing Force and Installation Torque for:

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

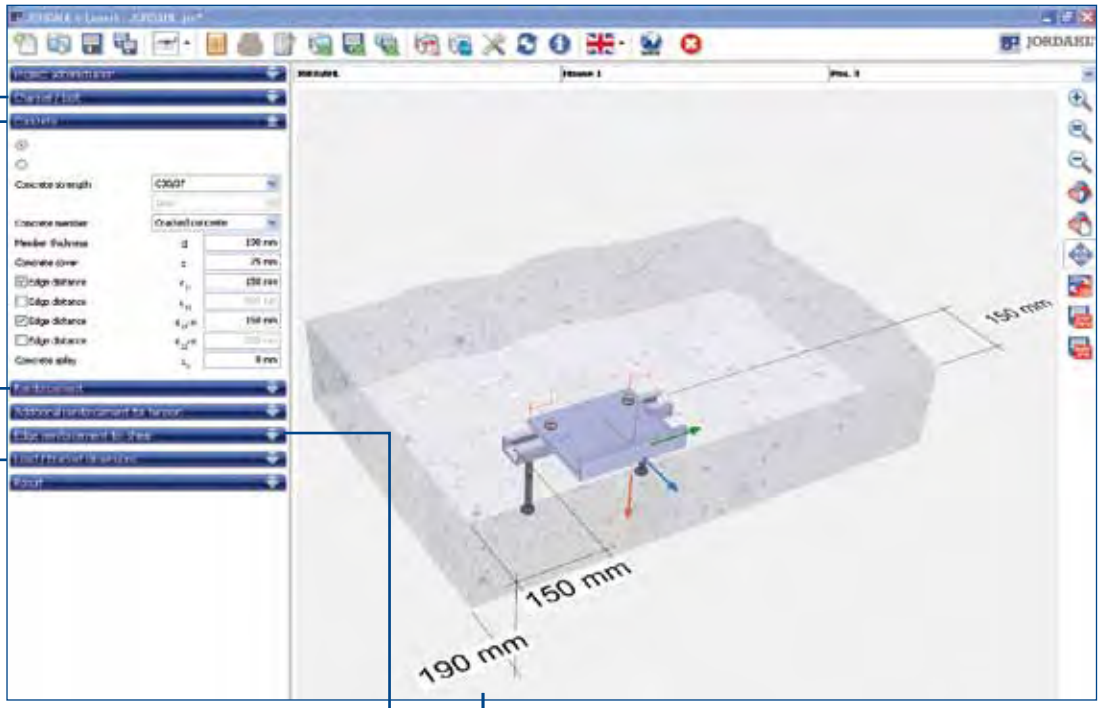


Mild Steel Bolts Grade 8.8 and Stainless Steel Bolts Grade A4-70



JORDAHL® Expert Software

The software facilitates a user friendly and reliable execution of verification for anchoring in concrete using JTA-CE anchor channels. A technical and economical optimization of the anchoring situation with anchor channels is achieved using a design adapted to the individual connection situation. Once the input and calculations are completed, the results of the manifold design for all of the available channel sizes are displayed. The design results are output on the monitor as well as in the form of a verifiable print-out. The basis of the programme is the European Technical Approval ETA-09/0338. The design software for JORDAHL® anchor channels is completely compatible with the Eurocode 2.



Anchors/bolt
- Length of the channel
- Galvanized or stainless steel
- Stand-off installation

Concrete
- Concrete quality
- Slab thickness
- Edge distances
- Concrete cover

Constructive reinforcement
- Normal or non-reinforced concrete
- Dense reinforcement

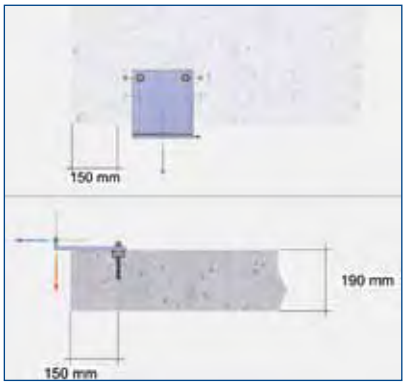
Loading/brackets
- 3 types of bracket are available for different applications

Graphics
The current input parameters are displayed interactively in a clear 3D graphic. The view can be intuitively rotated, displaced and magnified using the mouse.

Edge reinforcement
With the aid of JORDAHL® Expert it is possible to take into account the existing edge frame or specifically positioned reinforcement when designing the anchoring:

DXF/DWG export of the graphics into your CAD system

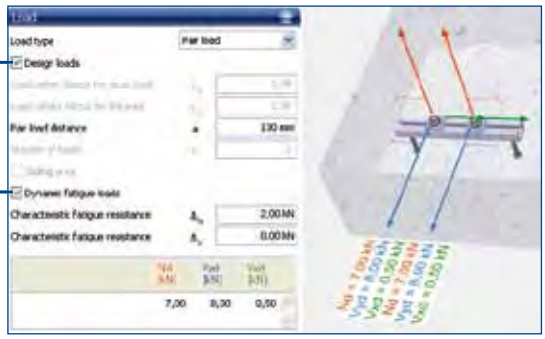
Optional switchover to a 2D view



Loading

- Single loads
- Pair loads
- Regular loads
- User-defined

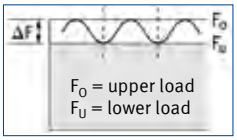
If no displacement range is specified, the least favourable load position on the channel is determined internally in the program. The load or load spectrum is displaced as a moving load over the total available channel length.



Load input with design loads or characteristic effects also in the longitudinal direction of the channel

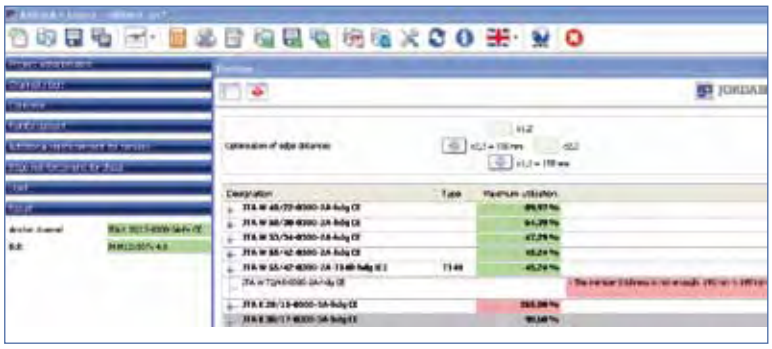
Dynamic loading

In addition to static loads, proof of operational stability can be carried out taking the load range into account.



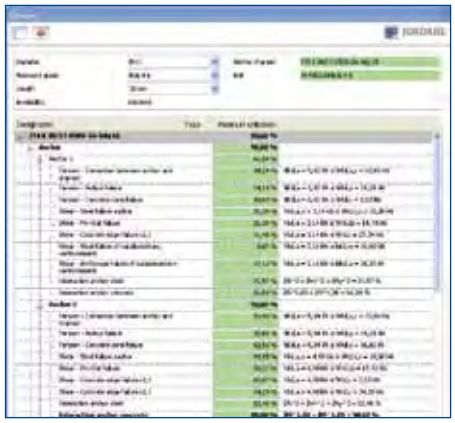
Results

In the result review there is a summary of the results for all potential channel sizes in a single view.



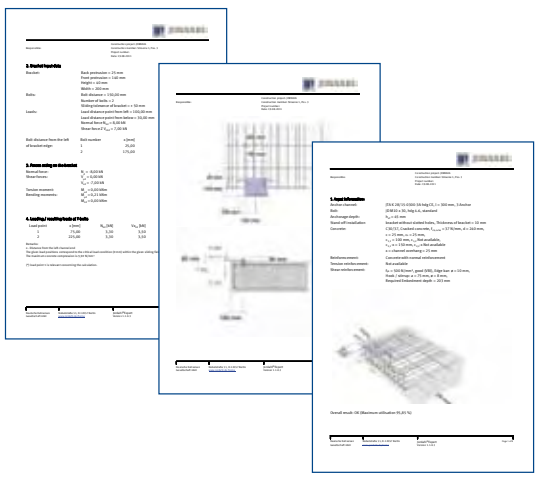
Detailed results

The maximum usage and proof details are displayed on the monitor



Print-out of the results

Comprehensible and clearly arranged print-out of the design with all data relevant to the test.



Free download at www.jordahl.de/home

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 [1] 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 engineering-design approach generally allows a higher capacity with JORDAHL® anchor channels and allows greater flexibility in design.

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

- Edge Distance
- Length of the channel
- Load positioning along the channel
- Concrete strength
- Additional reinforcement
- Thickness of the structural component

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

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

[1] CEN/TS 1992-4 is a pre-standard, which should be incorporated in the Eurocode Series as EC2-4. An abbreviated version including the paragraphs crucial for the design of the anchor channels can be downloaded from the internet at www.vbbf.de.

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 in accordance with EC2 (concrete) or EC3 (steel) takes place at the design level, i.e. the design loads F_{Ed} are compared with the design resistances F_{Rd}.

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:

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

If this proof is fulfilled, the design resistance is therefore larger than the design effect and the state of load-bearing safety is within limits.

Determination of the design effects and resistances requires more effort than the simplified and uneconomical design with permitted loads and stresses.

For the planner the process opens up the possibility in the design of a load bearing structure to take into account more realistically the various influences of the loads and the different properties of the material. With this design approach, therefore, a constant and reliable level of safety can be achieved.

The current state-of-the-art enables efficient and economical design of safe connections in concrete using anchor channels. However, it is imperative that the designer has all of the necessary data for dimensioning.

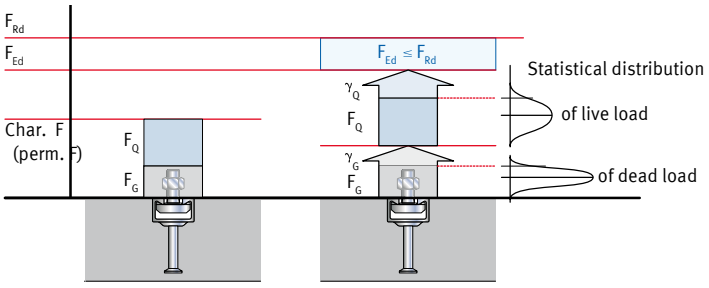
The calculation is based on the European Technical Approval (ETA-09/0338) and the design regulations of CEN/TS1992-4.

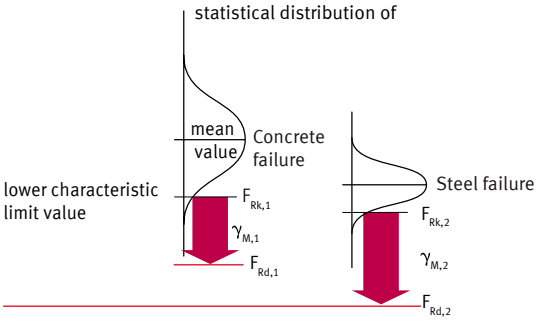
The approval from DIBt [German Institute for Structural Engineering], applicable Europe-wide, is based on numerous tests as well as statistical and numerical analyses and the Eurocode design concept.

Safety Factors in Conjunction with CEN/TS 1992 - Eurocode 2
All design resistances published in this brochure are based on the European partial safety concept and include the following partial safety factors:

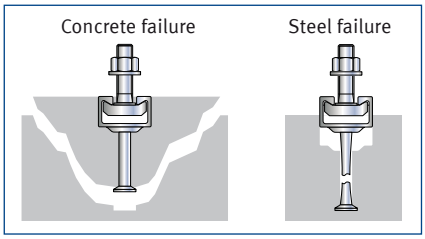
Steel	Factor γ_M	to find in CEN / TS 1992-4-1
Connection of anchor and anchor channel $\gamma_{M,ca}$	1,8	4.4.3.1.1
local flexure of the channel lip $\gamma_{Ms,l}$	1,8	4.4.3.1.1
supplementary reinforcement $\gamma_{Ms,re}$	1,15	4.4.3.1.1
Concrete, unreinforced		
Pull-out γ_{Mp}	1,5	4.4.3.1.3
Concrete 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.





$F_{Rk,\,i}$ = charateristic resistance of the material
$\gamma_{M,\,i}$ = 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



Installation

Efficient, Easy and Fast

JORDAHL® supplies anchor channels in any required lengths. In order to avoid fresh concrete flowing into the profile, JORDAHL® anchor channels are filled with either polystyrene (PS) or polyethylene (PE) foam.If self-thickening concrete and concretes of slump class F4/F6 (in accordance with DIN 1045-2) are used, the risk exists that concrete seeps behind the PE foam filling where it can contaminate the inside chamber of the profile. In these cases the anchor channels with polystyrene (PS) filling are suitable. After concreting, it is very easy to remove both PS and PE foam.

1. Making the connections

JORDAHL® anchor channels are installed according to the reinforcement/formwork drawings. In order to prevent displacement during concreting, the channels are held in place:

- On wooden formwork by nails through the nail holes in the back of the profile
- 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 the reinforcement or, if required, by means of special spacers spot welded to the anchors.

Nailing the anchor channels to the wooden formwork

2. Concrete

After the anchor channels have been connected to the formwork, the boarding is poured with concrete.

3. Removal of the Foam Filler

Once the concrete has set, the formwork is removed. The anchor channels are closed flush with the concrete. The foam filler can be removed easily using a hammer or other tools.

4. Mounting Connections

JORDAHL® T-bolts can now be inserted into the anchor channel slot at any desired point and after rotation through 90°, can be fixed by tightening using the appropriate torque. The control slot on the shank of the bolt must be at right angles to the direction of the channel.

Notes

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