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Date: 24<sup>th</sup> March 2010

### General Building Approval

**Approval number:** Z-21.4-1690

**Client:** Deutsche Kahneisen Gesellschaft mbH  
Nobelstrasse 51  
12057 Berlin

**Subject of the Approval:** Jordahl anchor rails type JXA-W 29/20,  
JXA-W 38/23  
JXA-W 53/34

**Applicable until:** 31.März 2015

The subject of the Approval mentioned above is hereby granted General Building Approval.\*

This General Building Approval comprises ten pages and twelve annexes.

*Note:*

*Translation of the German original version not checked by the German Institute for Structural Engineering*

*Every page of the German original bears the official stamp of the German Institute for Structural Engineering*

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## I. GENERAL PROVISIONS

- 1 The General Building Approval demonstrates the ability to use and apply the subject of the Approval in the sense of the German regional building regulations.
- 2 Insofar as requirements are made within the General Building Approval on the special expertise and experience of the persons entrusted with the manufacture of construction products and methods in accordance with the State regulations corresponding to § 17, Para. 5 of the model building regulations, it is to be observed that this expertise and knowledge can also be substantiated by equivalent evidence from other member states of the European Union. This is also valid, where appropriate, for equivalent supporting evidence provided within the framework of the Treaty on the European Economic Area (EEA) or other bilateral treaties.
- 3 The General Building Approval does not replace the approvals, agreements and certificates prescribed by law for the implementation of building projects.
- 4 The General Building Approval is granted regardless of the rights of third parties, in particular private protective rights.
- 5 Parties manufacturing and marketing the subject of the Approval must, irrespective of further-reaching regulations in the "Special Provisions", make copies of the General Building Approval available to those using or applying the subject of the Approval and point out that the General Building Approval must be present at the point of use. If required, copies of the General Building Approval must be made available to the authorities involved.
- 6 The General Building Approval may be copied only in full. Any publication of an extract requires the agreement of the German Institute for Structural Engineering. Texts and drawings in advertisements must not contradict the General Building Approval. Translations of the General Building Approval must contain the note "Translation of the German original version not checked by the German Institute for Structural Engineering".
- 7 The General Building Approval is granted until revoked. The provisions of the General Building Approval can subsequently be supplemented and changed, in particular when new technical findings require this.

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## II. SPECIAL PROVISIONS

### 1. Subject of the Approval and area of application

#### 1.1 Subject of the Approval

The JORDAHL anchor rail type JXA (type W 29/20, type W 38/23 and type W 53/34) comprises a C-shaped rail with tothing and with at least two anchors welded onto the back of the profile or steel round anchors pressed on, made of steel in the rolled blank or hot-dip galvanized form, and made of stainless steel.

Hammer-shaped or hooked head-shaped bolts are inserted into the rail, to which any desired constructional parts can be fixed.

The anchor rail is concreted in flush with the surface.

The anchor rail is illustrated in the installed state in Annex 1.

#### 1.2 Area of application

The anchor rail may be used for anchoring means under predominantly steady loading in reinforced or non-reinforced standard concrete and under a predominantly unsteady central tensile load up to  $2 \times 10^6$  load cycles in reinforced standard concrete of strength class of at least C12/15 to DIN 1045:1988-07 "Concrete and reinforced concrete, dimensioning and execution"; it may also be used in concrete of strength class of at least C12/15 to DIN EN 206-1:2001-07 "Concrete; Part 1: Definition, properties, production and conformity" in conjunction with DIN 1045-2:2001-07 "Load-bearing structures of concrete, reinforced concrete and prestressed concrete, Part 2: Concrete - Definition, properties, production and conformity". In the event of requirements on the fire resistance of the concrete components in which the anchor rails are anchored, the restrictions according to Section 3.2.7 must be noted. In the event of fire stress, the anchor rail may be loaded only at right angles to the rail longitudinal axis.

The anchor rail may also be used for anchoring under predominantly steady loading in closed-structure lightweight concrete with strength class of at least  $\geq$  LC25/28 (aggregate of expanded clay, expanded shale or pumice stone) in accordance with DIN EN 206-1, provided that no requirements are stipulated in regard to the fire resistance of the total structure including the anchor rail.

In the case of anchoring in the tension zone of the concrete produced by load stresses or if the minimum spacings of the anchor rails are used, the local transverse tensile stresses occurring as a result of the springing action must be absorbed by additional reinforcement, if constructive measures or other beneficial influences (e.g. transverse pressure) do not prevent the concrete splitting.

The application areas of the anchor rail (rail profile, anchor, bolts, nuts and washers) in regard to corrosion are given in relation to the selected materials in Annex 5, Table 7.

A galvanized anchor rail (rail and anchor) may be connected to reinforcement only when the temperature of the contact points between the reinforcement and the galvanized steel parts does not exceed 40°C.

In the case of prestressed concrete components, the spacing of a galvanized anchor rail (rail and anchor) from the enveloping tubes of the stressing element or the stressing wire with immediate composite action must be at least 2 cm.

If hot-dip galvanized rails with stainless steel anchor bolts are used, the tendon ducts or the tensioning wires may have immediate contact with the stainless steel bolts – not however the hot-dip galvanized rails.

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## **2 Provisions for the structural product**

### **2.1 Properties and composition**

The constructional parts of the anchor rails (rail, anchor, bolt, nut and washer) must correspond to the drawings and specifications in the Annexes.

The material characteristics, dimensions and tolerances of the anchor rails and bolts not specified in this General Building Approval must correspond with the specifications deposited at the German Institute for Structural Engineering, at the certification office and at the third-party monitoring office. In addition, the provisions of the General Building Approval Z-30.3-6 "Products, fasteners and structural elements made from stainless steel" must be observed.

### **2.2 Manufacture and identification**

#### **2.2.1 Manufacture (connection between rail and anchor)**

The production of the connections (welding on, pressing) between anchor and rail is to be performed in the factory.

DIN 18 800-7:2008-11 "Steel Constructions, Part 7: Qualification of Design and Manufacture" applies with regard to proof of suitability of the welding operation.

The round anchors are plugged through a hole prefabricated in the rear of the rail and pressed at the factory.

#### **2.2.2 Marking**

The packaging, enclosed label or delivery note for the anchor rails and bolts must be marked by the manufacturer with the compliance symbol (Ü-Symbol) in accordance with the State Compliance Mark Regulation. In addition, the work's identification mark, the approval number and the complete description of the anchor rails and bolts must be stated on the delivery note.

The marking may only take place once the prerequisites of Section 2.3 have been fulfilled.

The anchor rail is identified according to the rounded profile external dimensions of the rail (width/height in mm), e.g. profile JXA-W 38/23.

The bolts are identified by the type of bolt (toothed bolt types JXD, JXH or JXB, hammerhead bolt types JD or JH) and the thread size, and assigned to the profile dimensions.

Each anchor rail is to be marked in accordance with Annex 5.

The bolts are to be marked and embossed in accordance with Annexes 3 and 4.

The bolts must be marked and stamped in accordance with Annexes 3 and 4

### **2.3 Verification of compliance**

#### **2.3.1 General**

The confirmation of the compliance of the anchor rails and bolts with the provisions of this General Building Approval must be carried out for each factory with a certificate of compliance on the basis of in-house production control and regular third-party monitoring, including initial testing of the anchor rails and bolts in accordance with the following provisions.

In order to grant the certificate of compliance and the third-party monitoring, including the product tests to be carried out in the process, the manufacturer of the anchor rails and bolts has to involve a certification authority recognized for this purpose and also a monitoring authority recognized for this purpose.

The manufacturer declares that a compliance certificate has been issued by marking the construction products with the compliance mark (C-mark) and noting the intended purpose.

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The German Institute for Structural Engineering must be provided by the certification authority with a copy of the certificate of compliance granted by them, for information.

The German Institute for Structural Engineering must additionally be provided with a copy of the initial testing report, for information.

### 2.3.2 In-house production control

In each factory, in-house production control must be set up and carried out. In-house production control is understood to mean the continuous monitoring of the production to be performed by the manufacturer, with which it is ensured that the structural products produced by it correspond with the provisions of this General Building Approval.

The test plan deposited with the Deutsche Institut für Bautechnik [German Institute for Structural Engineering] and the third party monitoring authority is decisive for the scope, type and frequency of the in-house production control.

The results of the in-house production control must be recorded and evaluated. The recordings must contain at least the following information:

- Designation of the structural product or of the raw material and the constituent parts
- Type of inspection or testing
- Date of manufacture and testing of the structural product or the raw material or the constituent parts
- Result of the inspection and tests and, if relevant, comparison with the requirements
- Signature of the person responsible for the in-house production control.

The records must be kept for at least five years and presented to the monitoring authority involved in the third-party monitoring. They must be presented to the German Institute for Structural Engineering and the responsible highest building inspection authorities on demand.

In the event of an inadequate testing result, the requisite measures for rectifying the deficiency must be taken by the manufacturer without delay. Structural products which do not meet the requirements must be handled in such a way that confusion with compliant parts is ruled out. After the deficiency has been rectified - to the extent technically possible and required in order to verify the elimination of the deficiency - the existing testing must be repeated without delay.

### 2.3.3 Third-party monitoring

In each factory, the in-house production control must be checked regularly, but at least twice per year, by a third-party monitoring authority.

Within the context of the third-party monitoring, initial testing of the anchor rails and bolts must be carried out, and samples must also be taken for random sample tests. Sampling and testing is in each case the responsibility of the recognized monitoring authority.

The test plan deposited with the Deutsche Institut für Bautechnik [German Institute for Structural Engineering] is decisive for the scope, type and frequency of the Third-party monitoring.

The results of the certification and third-party monitoring must be kept for at least five years. They must be presented by the certification authority or the monitoring authority to the German Institute for Structural Engineering and the responsible highest building inspection authorities on demand.

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### 3 Provisions for design and dimensioning

#### 3.1 Design

The anchoring must be planned by engineers. Taking account of the loads to be anchored, checkable calculations and design drawings must be prepared.

The design drawings must contain precise specifications relating to position, size and length of the anchor rails and the bolt type and the size of the associated bolts.

#### 3.2 Dimensioning

##### 3.2.1 General

The anchoring must be dimensioned by engineers. The verification of the immediate local introduction of force into the concrete is adduced.

From the verification of the anchor rail in accordance with the partial safety factor concept, the rated value of the resistance  $F_{Rd}$  is  $1.4 \cdot$  permitted  $F$ .

The passing on of the loads to be anchored in the component must be verified.

The weakening of the concrete cross section by the installation of anchor rails must be taken into account in the static verification, if appropriate.

Additional stresses which arise in the anchor rail, in the component to be connected or in the component in which the anchor rail is anchored as a result of a shape change being prevented (e.g. when the temperature changes) must be taken into account.

The action of the individual load or the pair of loads can take place at any arbitrary point on the anchor rails. The axial and end spacings of the load action points (bolts) are specified in Annex 7 and 8. The axis of the bolt must be at least 25 mm away from the end of the rail.

The spacings of the anchor rails (axial, edge and corner spacings) and component dimensions (component width and thickness) must not fall below the minimum according to Annex 6.

##### 3.2.2 Permissible loads

The permissible loads are specified in Table 11, Annex 8 as a function of the rail length, the load spacings and the associated bolts for the concrete strength classes  $\geq B25$  and  $\geq C20/25$ .

When anchoring in concrete of strength class C12/15 the permissible loads for C20/25 are to be reduced by the factor 0.7, and with closed-structure light-weight concrete of  $\geq LC25/28$  reduced by the factor 2/3.

The permitted load directions (stress ranges) for the anchor rails are represented in Annex 7 relative to bolt type. If hammerhead bolts are used (types JD and JH) the anchor rail may only be stressed at right angles to the longitudinal axis of the rail (transverse and centric load). When using toothed bolts (types JXD, JXH and JXB) the anchor rail may be stressed in all directions (longitudinal, transverse and centric stress).

For simultaneous stress in several directions, the resultant load must not exceed the permissible load in accordance with Annex 8, Table 11.

The permissible loads on the bolts are specified in Annexes 3 and 4.

The smaller value (of the anchor rail or bolt) is critical.

##### 3.2.3 Flexural stressing of the bolts

The permissible bending moments are specified in Annexes 3 and 4. The computational clamping point is the upper edge of the anchor rail.

The flexural stressing can only be disregarded if

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- the structural component to be attached is made of metal and is to be braced against the rails with no spacer, and
- the through-hole in the structural component to be attached does not exceed the values given in Annexes 3 and 4, Tables 4 and 6.

In the case of bending with an additional central tension or oblique tension, the stresses must be superimposed:

$$F_z \leq \text{perm. } F (1 - M/\text{perm. } M)$$

- perm. F = permissible central tensile load on the bolt according to Annex 3 or 4
- perm. M = permissible bending moment on the bolt according to Annex 3 or 4
- $F_z$  = existing tensile load component  $\leq$  permissible load on the anchor rail (Annex 8)
- M = existing bending moment.

In the case of façade cladding with variable flexural stresses (e.g. as a result of temperature changes), the alternating stress amplitude  $\sigma_A = \pm 50 \text{ N/mm}^2$  about the average  $\sigma_M$ , based on the computational stress cross section of the bolt, must not be exceeded.

- 3.2.4 Non-predominantly stable central tensile loads in reinforced standard concrete  $\geq \text{C12/15}$   
 For stress resulting from non-predominantly stable central tensile loads with a load cycle  $N \leq 2 \cdot 10^6$ , the anchor rails JXA-W 29/20, JXA-W 38/23 and JXA-W53/34 in the design with transversely welded-on I anchors and with round anchors type R1 or R3 may be used. The permissible cycle size with a load cycle of  $N = 2 \cdot 10^6$  can be taken from Table 12 of Annex 8. The rails may be anchored only in reinforced standard concrete of at least C12/15. Only the associated bolts according to Table 12, Annex 8 are permissible.
- 3.2.5 Special case of narrow reinforced concrete components  
 An anchor rail arranged in the end of at least 10 cm thick, lightly loaded reinforced concrete components (e.g. façade panels, weakly stressed walls) may be stressed with central tension with the permissible load according to Table 11, Annex 8 if additional reinforcement according to Annex 9 is provided.
- 3.2.6 Displacement behaviour  
 Given a loading at the level of the permissible load, displacements of  $\leq 0.6 \text{ mm}$  in the direction of the load may be expected:  
  
 In the case of transverse loads, the hole play present between bolt and fitted part must be taken into account.
- 3.2.7 Fire protection  
 In the event of requirements on the fire resistance of the concrete components, the anchor rails may be stressed under predominantly stable loading only at right angles to the rail axis (central tension, oblique tension and transverse tension) in reinforced and unreinforced standard concrete of strength class of at least C12/15. The permissible loads for the individual anchor rails are specified as a function of the bolt size for the fire resistance period of 90 minutes (F90) and 60 minutes (F60) in Table 13, Annex 10, and must not be exceeded.

The anchor rails may be used for reinforced concrete floors stressed by fire on one side, reinforced concrete beams stressed by fire on three sides and for reinforced concrete columns stressed by fire on four sides. In the case of reinforced concrete floors stressed by fire on one side, the minimum axial spacing of the tensile reinforcement in the region in the anchor rails according to Table 14, Annex 10 must be maintained. For reinforced concrete beams stressed on three sides and reinforced concrete columns stressed on four sides, the axial spacing "u" required by DIN 4102-4 for the reinforcement must be increased by the dimension " $\Delta u$ " specified in Tables 15 and 16 of Annexes 11 and 12.

If the anchor rails are incorporated in concrete components (reinforced concrete floors, beams and columns) in fire resistance class F60 or F90, and if the conditions specified in Annexes 10 to 12 are met, the fire resistance class of the concrete component is maintained.

The assessment of the fire resistance period for the construction to be connected is not the subject of this Approval.

## **4 Provisions for the implementation**

### **4.1 Installation of the anchor rails**

No anchors may be fixed to the anchor rail, nor other changes made.

The installation of the anchor rail is to be performed in accordance with the design drawings produced in accordance with Section 3.1.1.

The anchor rails are to be fixed to the shuttering in such a way that they are not displaced when the reinforcement is laid or during the introduction and compaction of the concrete. The concrete in the area of the rails and under the head of the anchor must be perfectly sealed. The anchor rails must be protected against the ingress of concrete into the interior space of the rails.

### **4.2 Fixing the connecting construction (bolt mounting)**

The required bolt type and size must be taken from the design drawings. In the event of loading in the rail longitudinal direction, only the toothed bolt type JXD, JXH and JXB may be used. This bolt is identified at the shank end by two marking slots.

If, as a result of improper concreting or the like, the front edge of the anchor rail is not flush with the surface of the concrete, then this interspace must be lined completely during the mounting of the connecting construction.

The heads of the bolts are inserted into the slot in the rail, following clockwise rotation through 90° must rest completely on both legs of the anchor rail and must be locked by tightening the nut with the torque wrench. The tightening torques specified in Annexes 3 and 4 must be complied with.

Following the mounting, correct seating of the bolt must be checked; the marking slot (marking slots) at the shank end of the bolt must lie transversely with respect to the longitudinal direction of the rail. The axial spacing of the bolts (load spacing) must not fall below the specifications in Annexes 7 and 8.

### **4.3 Monitoring the implementation**

During the installation of the anchor rails and during the mounting of the bolts (fixing of connecting constructions), the contractor entrusted with the anchoring of anchor rails or the construction manager commissioned by him or a specialist representative of the construction manager must be present on the building site. He must ensure the proper implementation of the work.

In particular, he must monitor the implementation and position of the anchor rails and any possible rear-suspended reinforcement.

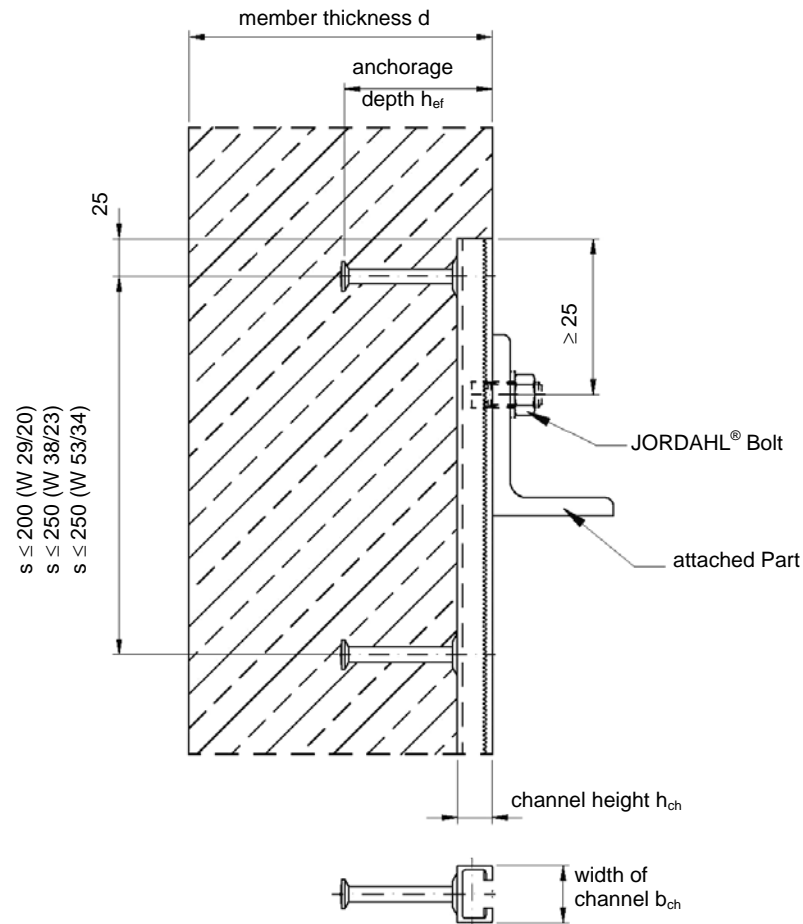
The records must be available during the construction period on the building site and must be presented to those entrusted with the supervision on demand. Just like the delivery notes, they must be kept for at least five years by the contractor after the work has been completed.

Kummerow

Certified  
[signature]

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**Table 1: Anchor Arrangement**

Channel Length [mm]		Axial and End Spacing of Anchors <sup>1)</sup> [mm]	
100			
150			
200			
250			
>250	W 29/20		
	W 38/23 W 53/34		

1) The end spacing may be increased from 25mm to 35mm in the case of round anchors



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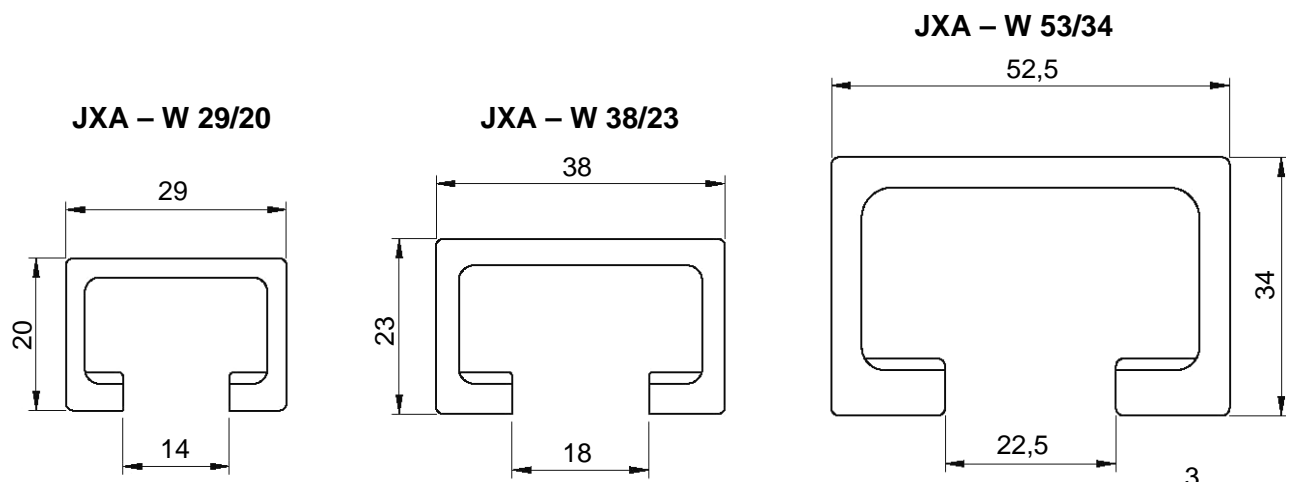
**JORDAHL® Anchor Channel  
Type JXA  
W 29/20, W 38/23, W 53/34**

Installed Anchor Channel  
Anchor Arrangement

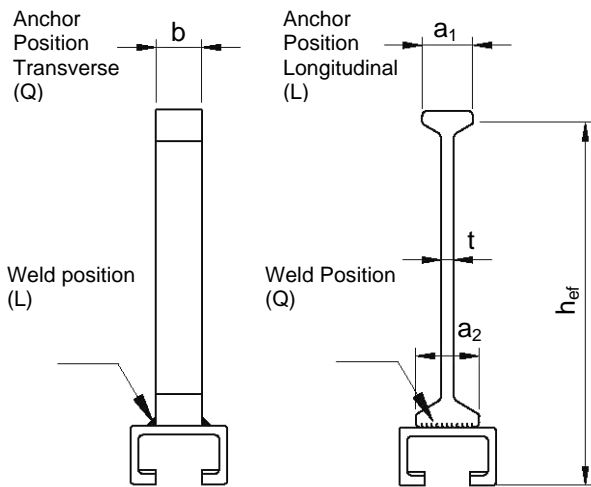
**Annex 1**

to the General Building Approval  
**Z- 21.4-1690**

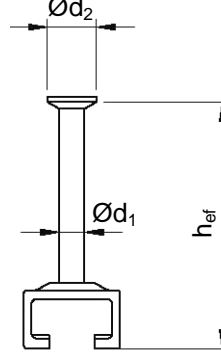
dated 24th March 2010



### Weld-on Anchors Type I



### Round Anchor Type



Profiles:  
Steel S275JR (1.0044) to DIN EN 10025 or stainless steel to DIN EN 10088 and approval Z-30.3-6

Anchor:  
T-anchor: Steel in accordance with DIN EN 10025, stainless steel in accordance with DIN EN 10088 and according to Z-30.3-6 (1.4401/1.4404/1.4571)  
Round anchor: Steel in accordance with DIN EN 10263, stainless steel in accordance with DIN EN 10088 and according to Z-30.3-6 (1.4401/1.4404/1.4462/1.4571/1.4578)

**Table 2: Anchor**

Profile	Type		Weld-on Anchors						Round Anchor	
	Anchoring Depth		min. Cut Length b	Top/Bottom-Width a <sub>1</sub> /a <sub>2</sub>	Web Thickness t	Anchor Position	Weld Position	min Weld a/l	Shank Diameter min d <sub>1</sub>	Head Diameter in d <sub>2</sub>
	min h <sub>ef</sub>	h <sub>ef</sub>								
	[mm]		[mm]				[mm]	[mm]		
W 29/20	R1	75	—	—	—	—	—	9	17	
	I60	—	75	12	18,5/18,5	5	Q/L	3/12	—	
W 38/23	R3	90	—	—	—	—	—	10	19,5	
	I125	—	143	18	20/25	5	Q/L	3/18	—	
	I128	—	146	15	17/25	6	Q/L	3/14	—	
W 53/34	R3	155	—	—	—	—	—	11,5	23,5	
	I128	—	157	28	17/25	6	Q/L	4/19	—	
	I140	—	164	24	20/40	7,1	Q/L	4/19	—	



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W 29/20, W 38/23, W 53/34**

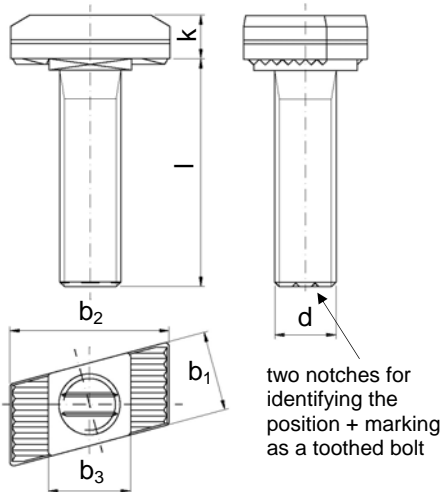
Profile Dimensions  
Anchor Designs

**Annex 2**  
to the General Building Approval  
**Z- 21.4-1690**  
dated 24th March 2010

## Toothed Bolts Type JXD, JXH und JXB — for loading in all directions

Embossing Head: minimum requirements works symbol „J“; material short code e.g.: „JXD 8.8 and JXD A4-70“

**Table 3: Bolt Dimension**



Profile	Type [mm]	d [mm]	b <sub>1</sub> [mm]	b <sub>2</sub> [mm]	b <sub>3</sub> [mm]	k [mm]	min l [mm]
JXA W 29/20	JXD	M10	13,4	20,9	11,8	6,5	≥ 15
		M12	13,4	20,9	11,8	6,5	≥ 20
JXA W 38/23	JXH	M12	17,2	28,9	16,9	8,0	≥ 20
		M16	17,2	28,9	16,9	8,0	≥ 30
JXA W 53/34	JXB	M16	21,0	41,6	21,5	11,5	≥ 30
		M20	21,0	41,6	21,5	13,0	≥ 35

### Bolts:

- Shank and thread design to DIN EN ISO 4018,
- Material steel, strength class 8.8 to DIN EN ISO 898-1

or

Stainless steel 1.4401/1.4404/1.4571/1.4578;1.4462, strength class 70 to DIN EN ISO 3506-1 and Z-30.3-6

### Hexagon nuts:

- Design to DIN EN ISO 4032 or DIN EN ISO 4034
- Strength class 8 to DIN EN 20898-2

or

stainless steel, strength class 70 to DIN EN ISO 3506-2

### Washers:

- Design to DIN EN ISO 7089, DIN EN ISO 7093-1 product class A,
- Steel to DIN EN 10025 or stainless steel 1.4401/1.4404/1.4571/1.4578 to DIN EN 10088 and Z-30.3-6

**Table 4: Permissible loads, tightening torques and permissible bending moments of the toothed bolts**

Type	Bolt Diameter d [mm]	Clearance hole in components to be attached [mm]	Tightening Torque [Nm]	Permissible Bending moments on the bolts <sup>2)</sup> [Nm]		Permissible loads F [kN] <sup>1)3)</sup> (tensile and shear) $\sqrt{Fx^2 + Fz^2 + Fy^2} \leq_{zul} F$	
				8.8	stainless steel strength class. 70	8.8	stainless steel strength class. 70
JXD JXH	M10	12	40	24,9	18,7	13,3	8,7
	M12	14	80	43,7	32,8	19,4	12,6
	M16	18	120	111,0	83,3	36,1	23,6
JXB	M16	18	200	111,0	83,3	36,1	23,6
	M20	22	350	216,4	162,3	56,4	36,8

1) For stress ranges see Annex 7. If there is simultaneous stress in all directions (longitudinal stress x, transverse stress y, central stress z) the resultant of the permissible loads must not exceed the load in accordance with the table 4

2) Based on the upper edge of rail or concrete

3) The permissible loads on the anchor channel according to Annex 8 must not be exceeded



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**JORDAHL® Anchor Channel  
Type JXA  
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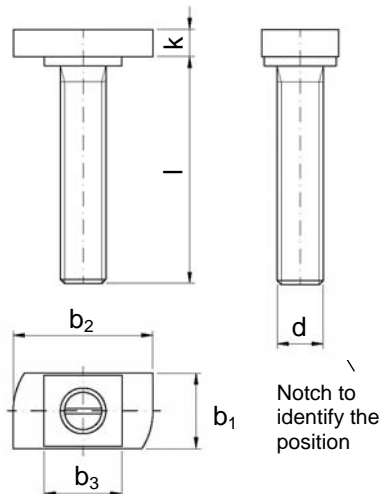
Toothed Bolts  
JXD, JXH, JXB

### Annex 3

to the General Building Approval  
**Z- 21.4-1690**  
dated 24th March 2010

## Hammerhead bolts Type JD and JH - for loading under tension, transverse tension, inclined tension

Embossing Head: minimum requirements works  
symbol „J“; material short code  
e.g.: „JD 4.6 or JD A4“



**Table 5: Bolt Dimensions**

Profile	Type [mm]	d [mm]	b <sub>1</sub> [mm]	b <sub>2</sub> [mm]	b <sub>3</sub> [mm]	k [mm]	min l [mm]
JXA W 29/20	JD	M6	11,2	22,4	11,0	4,5	≥ 15
		M8	11,2	22,4	11,0	4,5	≥ 15
		M10	11,2	22,4	11,0	5,0	≥ 20
		M12	11,2	22,4	11,0	6,5	≥ 20
JXA W 38/23	JH	M10	16,5	30,5	17,0	6,0	≥ 20
		M12	16,5	30,5	17,0	7,0	≥ 20
		M16	16,5	30,5	17,0	8,0	≥ 30

### Bolts:

- Shank and thread design to DIN EN ISO 4018,
- Material steel, strength class 4,6 or 8.8 to DIN EN ISO 898-1

or

Stainless steel 1.4401/1.4404/1.4571/1.4578;1.4462, strength class A4-50 or A-70 to DIN EN ISO 3506-1 and Z-30.3-6

### Hexagon nuts:

- Design to DIN EN ISO 4032 or DIN EN ISO 4034
- Strength class 5/8 to DIN EN 20898-2

or

stainless steel, strength class 50/70 to DIN EN ISO 3506-2

### Washers:

- Design to DIN EN ISO 7089, DIN EN ISO 7093-1 product class A,
- Steel to DIN EN 10025 or stainless steel 1.4401/1.4404/1.4571/1.4578 to DIN EN 10088 and Z-30.3-6

**Table 6: Permissible loads, tightening torques and permissible bending moments of the hammerhead bolts**

Type	Bolt Diameter d [mm]	Clearance hole in components to be attached [mm]	Tightening Torque [Nm]	Permissible Bending moments on the bolts <sup>2)</sup> [Nm]			Permissible loads F [kN] <sup>1) 3)</sup> (tensile and shear) $\sqrt{F_z^2 + F_y^2} \leq_{zul} F$		
				4.6	A4-50	A4-70	4.6	A4-50	A4-70
JD JH	M6	7	3	2,0	1,8	3,8	2,2	2,2	3,0
	M8	9	8	5,0	4,4	9,4	4,0	4,0	5,5
	M10	12	15	10,0	8,7	18,7	6,4	6,4	8,7
	M12	14	25	17,5	15,3	32,8	9,3	9,3	12,6
	M16	18	60	44,0	38,8	83,3	17,3	17,3	23,6

1) For stress ranges see Annex 7. If there is simultaneous stress in all directions (longitudinal stress x, transverse stress y, central stress z) the resultant of the permissible loads must not exceed the load in accordance with the table 6

2) Based on the upper edge of rail or concrete

3) The permissible loads on the anchor channel according to Annex 8 must not be exceeded



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**JORDAHL®-Anchor Channels  
Type JXA  
W 29/20, W 38/23, W 53/34**

Hammerhead Bolts  
JD and JH

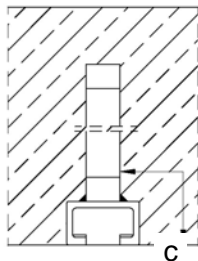
### Annex 4

to the General Building Approval  
**Z- 21.4-1690**  
dated 24th March 2010

**Table 7: Material and Areas of Use**

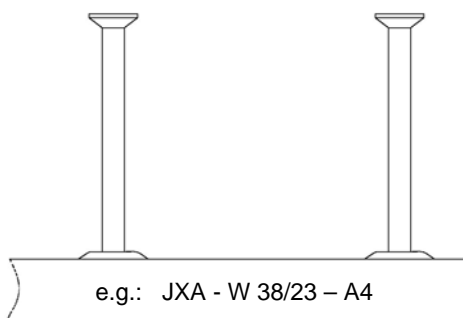
	Constructional Parts			Intended Use
	Channel	Anchor	Bolt, Nut, Washer	
1	plain rolled	plain rolled	no corrosion protection	use only possible if all fixing elements are protected, depending on the ambient conditions, by a minimum concrete covering to DIN 1045-1:2008-08 Tab 4
2	hot dip galvanized ( $\geq 50 \mu\text{m}$ )	hot galvanized ( $\geq 50 \mu\text{m}$ )	galvanized ( $\geq 5 \mu\text{m}$ )	concrete components in closed rooms, e.g. dwelling, offices, schools, hospitals, retail premises, except wet rooms
3	hot dip galvanized ( $\geq 50 \mu\text{m}$ )	hot galvanized ( $\geq 50 \mu\text{m}$ )	hot dip galvanized ( $\geq 40 \mu\text{m}$ )	concrete components in interior rooms with normal humidity (including kitchen, bathroom and washroom in dwellings)
		Stainless steel 1.4401/ 1.4404/ 1.4571		
4	stainless steel 1.4571 1.4401 1.4404	plain rolled weld-on anchor <sup>1)</sup>	stainless steel strength class 50 or 70	structural components corresponding to corrosion resistance class III/average in accordance with Z-30.3-6, e.g. in humid locations, in the open air, industrial atmosphere, in proximity to the ocean and inaccessible constructions
		stainless steel 1.4571 1.4462 1.4578 1.4401 1.4404		

1) Only permissible for profile 38/23 and 53/34. With regard to the corrosion protection for the weld-on anchors, the concrete covering *c* according to table 8 may be used as a basis.



**Table 8: Concrete Covering of the Welded Anchors**

Profile JXA	existing concrete covering <i>c</i> of the welded Anchor [mm]
W 38/23	30
W 53/34	40



**Identification**

The identification is to be made permanently on the rear of the channel (inside or outside), on the channel web or on the anchor. It can be made by means of a sticker, imprint, embossing or other suitable measures.

Minimum requirement: profile information; additional material data for construction using stainless steel.



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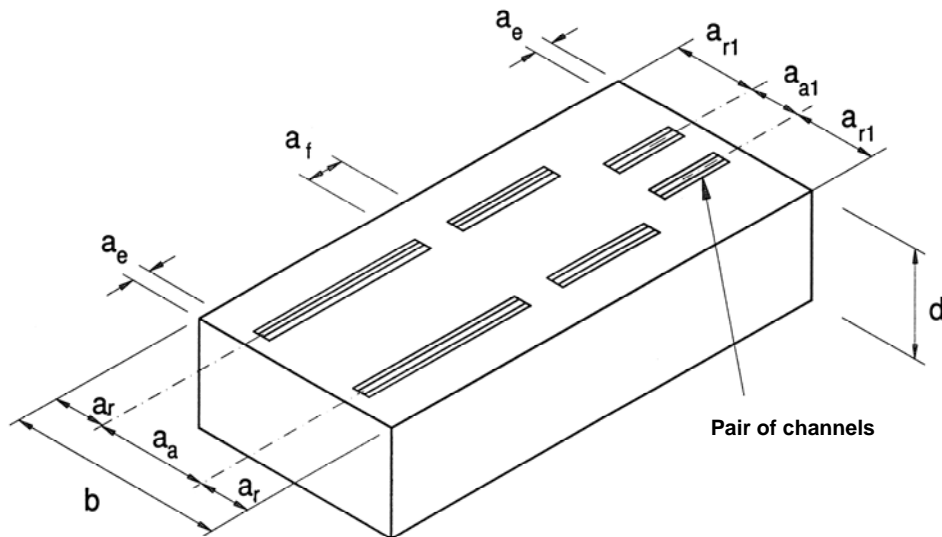
**JORDAHL® Anchor Channel  
Type JXA  
W 29/20, W 38/23, W 53/34**  
Material, Areas of Use and  
Identification

**Annex 5**  
to the General Building Approval  
**Z- 21.4-1690**  
dated 24th March 2010

**Table 9:**  
**Minimum Spacings and Minimum Component Dimensions of all Concrete Strength Classes**

Minimum Spacings and Minimum Component Dimensions [mm] <sup>1)</sup>								
Profile JXA	$a_r$	$a_a$	$a_e$	$a_f$	$b$ <sup>2)</sup>	$h$ <sup>3)</sup>	Pair of channels <sup>4)</sup>	
							$a_{r1}$	$a_{a1}$
W 29/20	100	200	80	200	200		140	125
W 38/23	150	300	130	250	300		225	150
W 53/34	200	400	175	350	400		—	—

- 1) The minimum spacings specified in the table apply to reinforced concrete. If the spacings are increased by 30%, no requirements are placed on the reinforcement.
- 2) Applies when arranging a channel
- 3) Results from the length of the anchor and the required concrete covering in accordance with DIN 1045-1:2008-08.
- 4) Only permissible for central tensions



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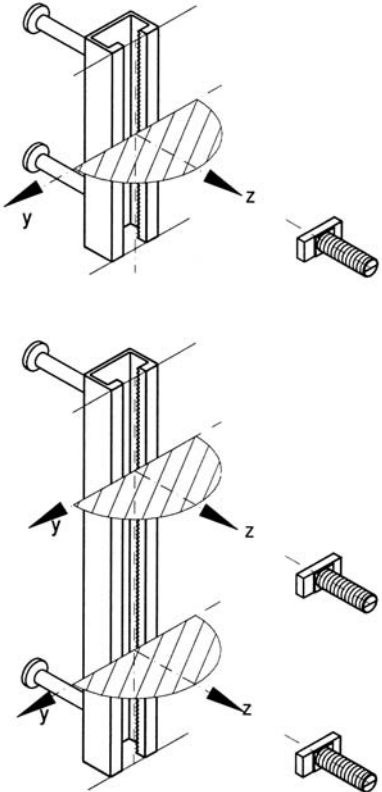
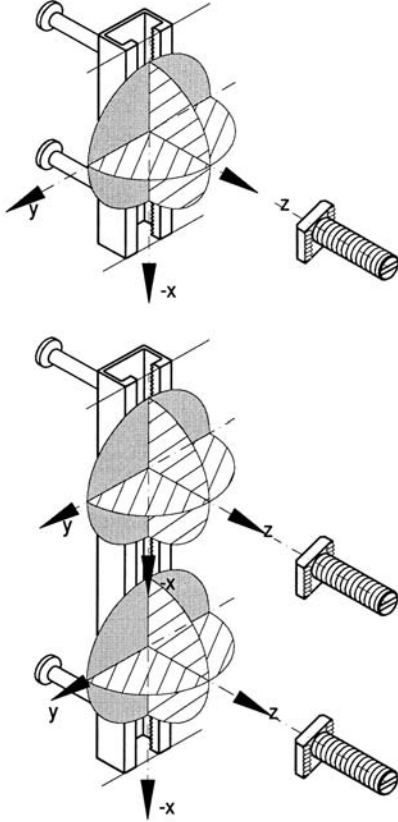
**JORDAHL® Anchor Channel**  
**Type JXA**  
**W 29/20, W 38/23, W 53/34**

Axial and Edge Spacings

**Annex 6**

to the General Building Approval  
**Z- 21.4-1690**  
 dated 24th March 2010

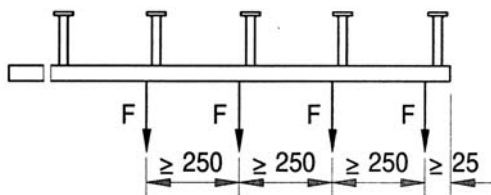
**Table 10: Stress Ranges** depending on the bolt type

<b>Hammerhead Bolt types Typ JD and JH</b> Stress at Right Angles to the Channel Longitudinal Axis (transverse tension y, central tension z)	<b>Toothed Bolt Types JXD, JXH and JXB</b> Stress in all directions (longitudinal tension x, transverse tension y, central tension z)
	
$\sqrt{Fz^2 + Fy^2} \leq_{zul} F$	$\sqrt{Fx^2 + Fz^2 + Fy^2} \leq_{zul} F$

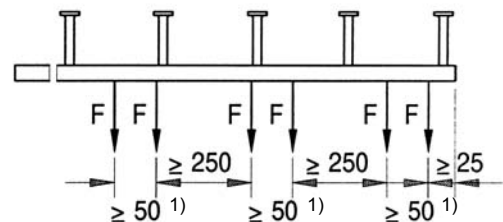
The resultant load must not exceed the permitted loads according to Annex 8, Table 11.

**Load Arrangement**

**Individual Loads**



**Pairs of Loads**



1)  $\geq 100\text{mm}$  bei Profil JXA W53/34



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**Type JXA**  
**W 29/20, W 38/23, W 53/34**

Stress Ranges  
Load Arrangement

**Annex 7**

to the General Building Approval  
**Z- 21.4-1690**  
dated 24th March 2010

**Table 11:****Permissible Loads on the Anchor Channel** for all concrete strength classes  $\geq$  C20/25 <sup>1)</sup>

Profile JXA	Associated Bolt		Permissible Loads F [kN] <sup>2)</sup> Stress Range in all directions <sup>3)</sup>		
	Hammerhead Bolt <sup>4)</sup>	Toothed Bolt	Individual Load	Paired Loads	
	Profile length [mm]		$\geq 100$	$\geq 200$	
	Load Spacing [mm]		$\geq 250$	$\geq 50$	$\geq 150$
W 29/20	JD M12	JXD M10	8	4,5 <sup>5)</sup>	6,4 <sup>5)</sup>
		JXD M12			
W 38/23	JH M16	JXH M12	12	6,7 <sup>5)</sup>	8,6 <sup>5)</sup>
		JXH M16			
W 53/34	—	JXB M16	22 (19) <sup>6)</sup>	—	13,75 <sup>7)</sup>
		JXB M20			

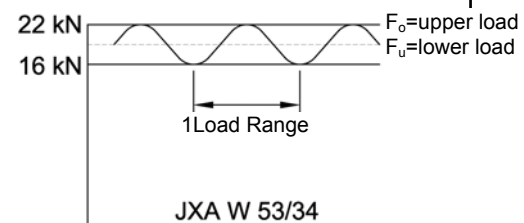
- 1) When anchoring in concrete of strength class C12/15 the permissible loads for C20/25 are to be reduced by the factor 0.7 and with lightweight concrete of closed structure  $\geq$  LC25/28 reduced by the factor 2/3.
- 2) In the event of simultaneous stressing in a number of directions (see Annex 7, Table 10), the resultant load must not exceed the permissible loads according to table 11
- 3) For stress ranges, see Annex 7, Table 10.
- 4) Hammerhead bolts type JD and JH are not permitted for loads in the channel longitudinal direction (x-x). If smaller bolts type JD and JH according to Annex 4 are used, the permissible load on the bolts according to Annex 4, Table 6 must not be exceeded.
- 5) Intermediate values may be interpolated
- 6) The value in brackets applies to profiles made from A4.
- 7) The minimum load distance is 100 mm.

**Table 12:****Predominantly unsteady central tensile loads permissible cycle sized for a load cycle number  $N = 2 \times 10^6$** 

Profile JXA	Permissible Cycle Size $\Delta F$ under Tensile Stress $\Delta F = F_o - F_u$ [kN]		Permissible Bolt
	Steel, fv	Stainless Steel (A4)	
W 29/20	2	1,8	JXD M12
			JD M12
W 38/23	3	2,4	JXH M16
			JH M16
W 53/34	6	4	JXB M16
			JXB M20

The specified load cycle ranges apply to profiles with round anchors or T-anchors welded on laterally.

Use is permitted only in reinforced components. In the event of installation in the tensile zone of reinforced concrete components produced by the load stress, it is necessary to verify that the forces are passed on.

**Example: JXA W 53/34 (St)**

zul. F (perm static load) = 22,0 kN  
 zul.  $\Delta F$  (threshold stress) = - 6,0 kN  
 remaining tensile stress = 16,0 kN



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 Type JXA  
 W 29/20, W 38/23, W 53/34**

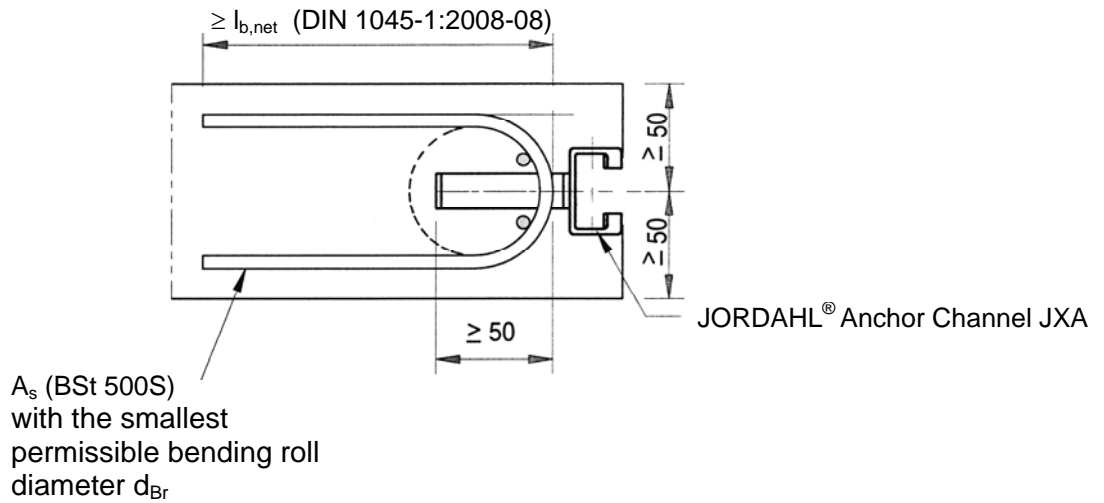
Permissible Loads  
 Permissible Cycle Sizes

**Annex 8**

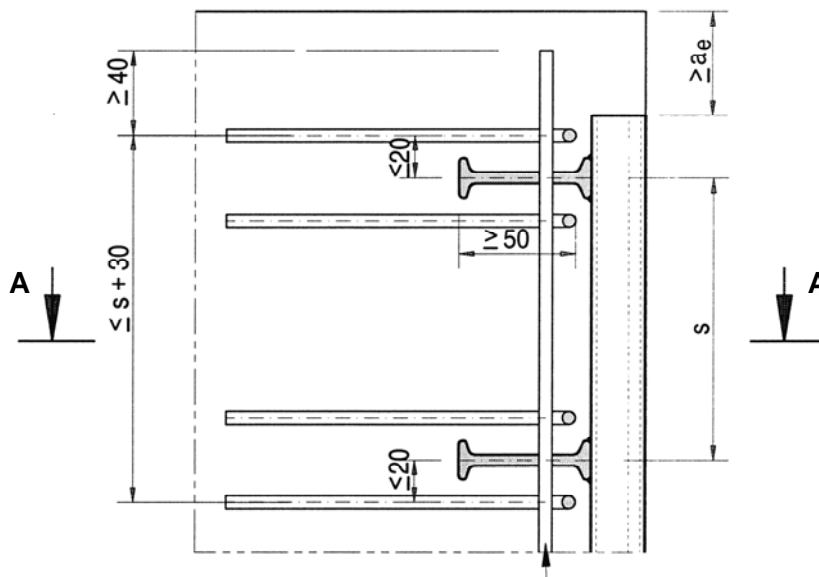
to the General Building Approval  
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 dated 24th March 2010

**Reduced Edge Spacings under Tensile Stress and Arrangement of Additional Reinforcements to Section 3.2.5 for Profiles 29/20 and W 38/23**

**Section A-A**



**Plan View**



$2x \geq \text{Ø}6$  BSt 500 S

applicable steel stress  $\sigma_s = 8 \text{ kN/cm}^2$

$A_s [\text{cm}^2]$  = reinforcement cross section of one leg of a loop

perm F = max load according to Annex 8, table 11,  
(for designations, see Annexes 1 and 6)s

$\text{found } A_s = \frac{\text{Perm. F}}{4 \cdot \sigma_s}$
---



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**JORDAHL® Anchor Channel  
Type JXA  
W 29/20, W 38/23, W 53/34**

Rear-Suspended Reinforcement  
with Reduced Edge Spacing

**Annex 9**  
to the General Building Approval  
**Z- 21.4-1690**  
dated 24th March 2010

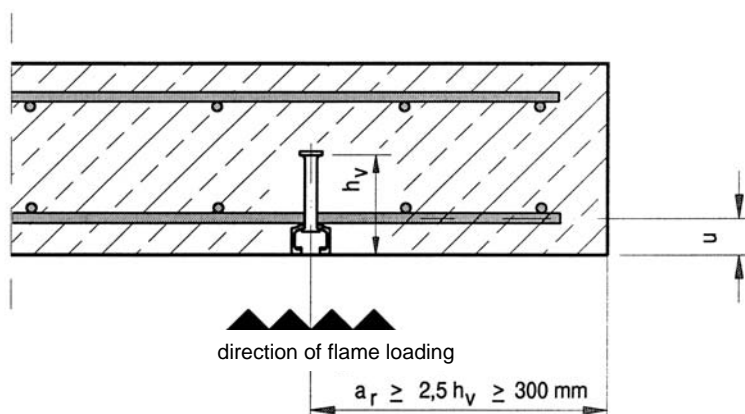
**Table 13: Permissible Load of Bolts**

for stresses at right-angles to the longitudinal axis of the rail (centric and transverse stresses) and fire loading according to fire resistance class F90 or F60 (values in brackets) for JORDAHL® anchor rails set in concrete, taking into account the associated bolts.

Profile <sup>2)</sup> JXA	Permissible Load <sup>1)</sup> JORDAHL® Hammerhead Bolts Strength class 4.6 / 8.8 or A4-50 / A4-70 [kN]				
	M8	M10	M12	M16	M20
W 29/20	0,5 (0,7)	1,3	1,8	—	—
W 38/23	—	1,3	1,8	4,0	—
W 53/34	—	—	—	4,0	4,0

- 1) Only for a load direction at the right angles to the rail longitudinal axis for central tension and transverse according to Annex 7.
- 2) Profiles of plain rolled or galvanized steel and stainless steel

**Reinforced Concrete Ceilings of Normal Concrete with JORDAHL® Anchor Channels concreted in, with fire loading on one side**



**Table 14: Required Axial Spacing u [mm] with Fire Resistance Period F60 and F90 in the Area of the JORDAHL® Anchor Channels**

Profile <sup>2)</sup> JXA	Required Axial Spacing u [mm] with Fire Resistance Period	
	60 minutes	90 minutes
W 29/20	35	45
W 38/23	35	45
W 53/34	50	50



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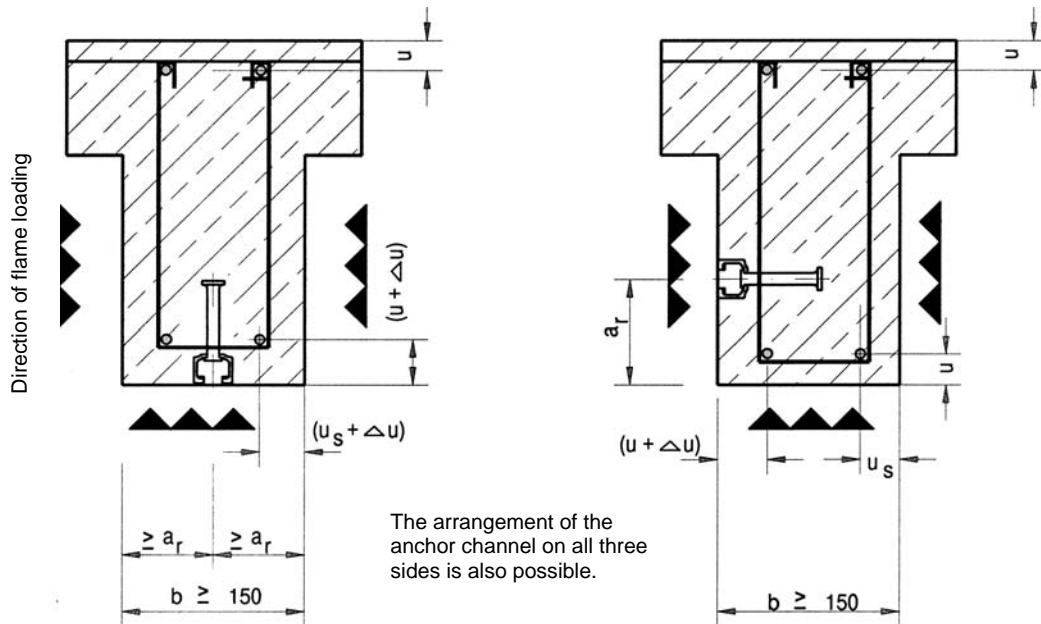
**JORDAHL® Anchor Channel  
Type JXA  
W 29/20, W 38/23, W 53/34**

Fire Loading: Permissible Loads  
on the Bolts, Anchor Channels in  
Reinforced concrete Ceilings

**Annex 10**  
to the General Building Approval  
**Z- 21.4-1690**  
dated 24th March 2010

## Reinforced Standard Concrete Beams Stressed by Fire on Three Sides

Loading of the Anchor Channels permissible only at right Angles to the Channels longitudinal Axis for Central Tension and Transverse Tension According to Annex 7



**Table 15:**

### Increasing the Axial Spacing $u$ [mm] of the Tensile Reinforcement

The axial spacings  $u$  and  $u_s$  required in accordance with 4102-4:1994-03 must be increased by the amount  $\Delta u$  when anchor channels are installed

Profile JXA	$\Delta u$ <sup>1)</sup> [mm] for F90 based on Beam Width			
	$b = 150$ mm	$b = 250$ mm	$b = 300$ mm	$b \geq 400$ mm
W 29/20	15	10	10	10
W 38/23	15	10	10	10
W 53/34	20	15	15	15

1) Intermediate Values may be interpolated linearly.



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Type JXA  
W 29/20, W 38/23, W 53/34**

Fire Loading, Anchor Channels in  
Reinforced Concrete Beams

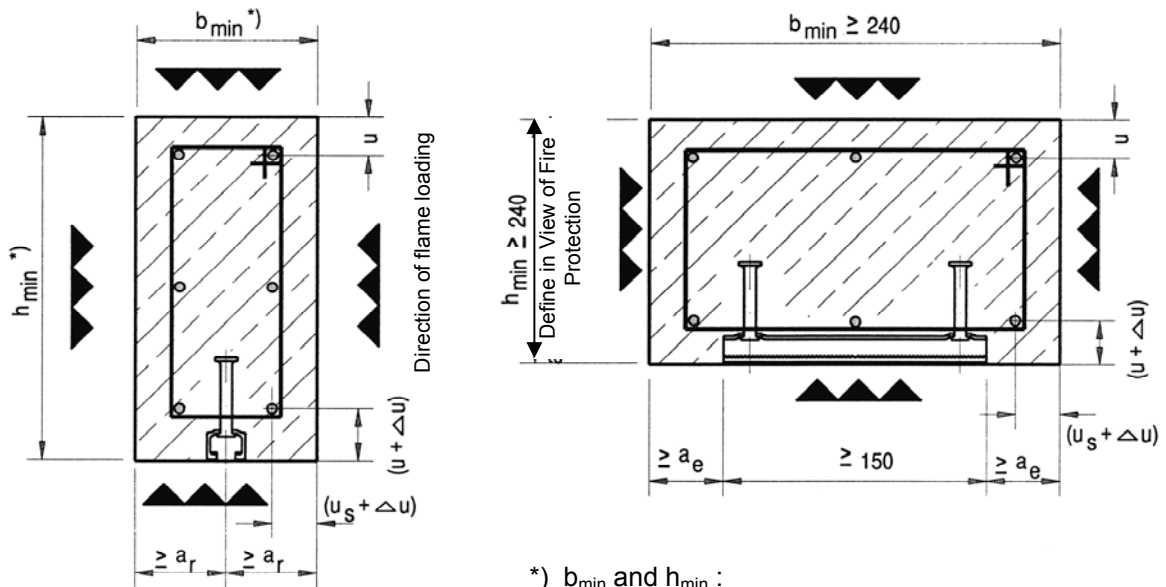
**Annex 11**

to the General Building Approval

**Z- 21.4-1690**

dated 24th March 2010

**Reinforced Standard Concrete Columns Stressed by Fire on Four Sides**  
 Loading of the Anchor Channels permissible only at right Angles to the Channels Longitudinal Axis for  
 Central Tension and Transverse Tension According to Annex 7



\*)  $b_{min}$  and  $h_{min}$  :

- ≥ 180 mm with  $\alpha_1 < 0,3$
- ≥ 210 mm with  $\alpha_1 < 0,7$
- ≥ 240 mm with  $\alpha_1 < 1,0$
- $\alpha_1$  according DIN 4102-4:1994-03, Table 31

**Table 16:**  
**Increasing the Axial Spacing  $u$  [mm] of the Tensile Reinforcement**

The axial spacings  $u$  and  $u_s$  required in accordance with 4102-4:1994-03 must be increased by the amount  $\Delta u$  when anchor channels are installed

Profile JXA	$\Delta u$ <sup>1)</sup> [mm] for F90 based on column cross section of				
	$b = 180 \text{ mm}$ <sup>2)</sup>	$b = 210 \text{ mm}$ <sup>3)</sup>	$b = 240 \text{ mm}$	$b = 300 \text{ mm}$	$b \geq 400 \text{ mm}$
W 29/20	15	10	10	10	10
W 38/23	15	10	10	10	10
W 53/34	20	15	15	15	15

- 1) Intermediate Values may be interpolated linearly.
- 2) Utilization  $\alpha_1$  according to Section 3.13.2.2 DIN 4102-4  $\leq 0,3$
- 3) Utilization  $\alpha_1$  according to Section 3.13.2.2 DIN 4102-4  $\leq 0,73$



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**JORDAHL® Anchor Channel  
 Type JXA  
 W 29/20, W 38/23, W 53/34**

Fire Loading: Anchor Channels in  
 Reinforced Concrete Columns

**Annex 12**  
 to the General Building Approval  
**Z- 21.4-1690**  
 dated 24th March 2010