

Installation Technical Manual

**Technical data** 

MQ System Light & Project



Data version 1.1 | Date 02.2017

# Terms of common cooperation / Legal disclaimer

The product loading capacities published in these Technical Data Sheets are only valid for the mentioned codes or technical data generation methods and the defined application conditions (e.g. ambient temperature load capacity not valid in case of fire, data not valid in support structures when mixed with third party products), assuming sufficient fastener, base material and building structure strength. Additional calculations, checks and releases by the responsible structural engineer might be needed to clarify the capacity of base material and building structure. Suitability of structures combining different products for specific applications needs to be verified by conducting a system design and calculation, using for example Hilti PROFIS software. In addition, it is crucial to fully respect the Instructions for Use and to assure clean, unaltered and undamaged state of all products at any time in order to achieve this loading capacity (e.g. misuse, modification, overload, corrosion). As products but also technical data generation methodologies evolve over time, technical data might change at any time without prior notice. We recommend to use the latest technical data sheets published by Hilti.

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MQ System L&	P parts and connec	tors - loading ca	apacity limits
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## Content and overview of this manual

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MQ System La	&P parts and connec	ctors - loading ca	pacity limits
J.	HHK 41 M8X40 HHK 41 M8X50 HHK 41 M8X60 HHK 41 M8X80 HHK 41 M8X100 HHK 41 M8X120 HHK 41 M8X150	312361 312362 312363 312365 312367 312368 312369	55
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MQ System L&P - Ch	annels	5		
Designation		Item number		Yield strength 1.1 Material safety factor
MQ-21 2m		2148545		1.4
MQ-21 3m MQ-21 6m		2148544 2148543	Charact	Permissible stress Recommended capacity limit
MQ-41-L 2m		2141966		Ser weight
MQ-41-L 3m		2141965		Live loads
MQ-41-L 6m		2141964		Action Resistance
Technical data			MQ-21	MQ-41-L
For girder MI / cross section including torsion				
Cross-sectional area	А	[mm <sup>2</sup> ]	182.12	199.57
Channel weight		[kg/m]	1.43	1.6
Wall thickness		[mm]	2.0	1.5
Material				
yield strength	$\mathbf{f}_{\mathbf{y},\mathbf{k}}$	[N/mm <sup>2</sup> ]	290	290
permissible stress*	$\sigma_{_{rec}}$	[N/mm <sup>2</sup> ]	188.3	188.3
E-module		[N/mm <sup>2</sup> ]	210000	210000
Surface				
hot dip galvanized		[µm]	approx. 20	approx. 10
Cross-section values Y-axis				
Axis of gravity A	e <sub>1</sub>	[mm]	11.13	21.44
Axis of gravity B	e <sub>2</sub>	[mm]	9.47	19.86
moment of inertia	l <sub>y</sub>	[cm <sup>4</sup> ]	0.99	4.48
Section modulus A	$W_{y1}$	[cm <sup>3</sup> ]	0.89	2.09
Section modulus B	$W_{y2}$	[cm <sup>3</sup> ]	1.05	2.25
Radius of gyration	i <sub>y</sub>	[cm]	0.74	1.50
Permissible moment	M <sub>y</sub>	[Nm]	168	394
Cross-section values Z-axis				
moment of inertia	l <sub>z</sub>	[cm <sup>4</sup> ]	4.63	5.90
Section modulus	$W_z$	[cm <sup>3</sup> ]	2.24	2.86
Radius of gyration	i <sub>z</sub>	[cm]	1.59	1.72
Data to the torsion				
torsional moment of inertia	lt	[mm <sup>4</sup> ]	151.17	112.13
torsional section modulus	W <sub>t</sub>	[mm <sup>3</sup> ]	75.59	75.76

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# **MQA-S Saddle nut**

Designation	Item number
MQA-S M8	2141906
MQA-S M10	2141907

#### **Corrosion protection:**

Electro galvanized

#### Weight:

M 8 - 53g M10 - 53g

#### Submittal text:

Part, combining channel nut with metric internal thread M8 or M10 and channel plate. Installation by mounting to open side of channel and rotation to 45°. Fixation by screwing in threaded rod ant tightening a counter nut to pre-defined installation torque. Typically used for fixing pipe-rings and other threaded rod connections to installation channel. Can transfer tension, compression and shear loads.

#### Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR -	6 - 005 N	$f_{\rm u} = 360 - \frac{N}{N}$	$E = 210000 - \frac{N}{10000}$	0 00700 N
DIN EN 10025	$T_y = 235 \frac{1}{\text{mm}^2}$	$n_u = 360 \frac{1}{mm^2}$	$E = 210000 \frac{mm^2}{mm^2}$	$G = 80769 \frac{1}{mm^2}$

#### Instruction For Use:



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## **MQA-S Saddle nut**

Possible loadi	ng cases	
Standard		

#### Design criteria used for loading capacity

#### Methodology:

• Finite element analysis

#### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
•	RAL-GZ 655	Pipe Supports	04.2008

#### Software:

- Ansys 16.0
- Microsoft Excel

#### **Environmental conditions:**

- static loads
- no fatigue loads

#### Simplified drawing:





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## **MQA-S Saddle nut**



Loading case: Standa	rd	Combinations covered by loading case
BOM: For fixation on M8 threa 1x MQA-S M8 1x M8 nut 1x AM8x1000 t-rod For fixation on M10 thre 1x MQA-S M10 1x M10 nut 1x AM10x1000 t-rod	2141906 216465 339793 or various	Saddle nut installed in all sizes of MQ channel opened up or down







# **MQA-S Saddle nut**

#### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10  $^{\circ}\,$  C), no high (> +100  $^{\circ}\,$  C) temperatures



## **Design loading capacity - 3D**

#### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.





+Fx,Rd	-Fx,Rd	+Fy,Rd	-Fy,Rd	+Fz,Rd	-Fz,Rd
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
2.10	2.10			4.2	
+Mx,Rd	-Mx,Rd	+My,Rd	-My,Rd	+Mz,Rd	-Mz,Rd
[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]

valid for edge distance  $\geq$  100mm

2. MQA-S-M10



[kN]	-Fx,Rd	+Fy,Rd	-Fy,Rd	+Fz,Rd	-Fz,Rd
	[kN]	[kN]	[kN]	[kN]	[kN]
3.00	3.00			4.2	
,	-Mx,Rd	+My,Rd	-My,Rd	+Mz,Rd	-Mz,Rd
	[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]

valid for edge distance ≥ 100mm

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# **MQZ-P** Bored plate

Designation	Item number
MQZ-P9	2141908
MQZ-P11	2141909

#### Corrosion protection:

Electro galvanized

Weight: MQZ-P9 - 35g MQZ-P11 - 35g

#### Submittal text:

Installation channel plate for fixation channels to threaded rods. Typically used in pairs to open side and back of channels in combination with counter nuts. Single piece usage for anchor fixation through the channel directly to base material. Geometry allows clamping of channel walls and high load transfer.

#### Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR -	f - 025 N	$f_{\rm u} = 360 \frac{N}{N}$	F = 210000 <u>N</u>	C = 80760 N
DIN EN 10025	$T_y = 235 \frac{1}{\text{mm}^2}$	$n_u = 300 \frac{mm^2}{mm^2}$	$E = 210000 \frac{mm^2}{mm^2}$	$G = 80769 \frac{10}{mm^2}$

#### Instruction For Use:

Simplified, not attached to the packaging Loading case "Both sides,,







## **MQZ-P Bored plate**

Possible loading cases		
Both sides		
· •		

#### Design criteria used for loading capacity

#### Methodology:

• Finite element analysis

#### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
•	RAL-GZ 655	Pipe Supports	04.2008

#### Software:

- Ansys 16.0
- Microsoft Excel

#### **Environmental conditions:**

- static loads
- no fatigue loads

#### Simplified drawing:



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# **MQZ-P Bored plate**

Possible loading cases		
Both sides		
Loading case: Both sides		Combinations covered by loading case
BOM: For fixation on M8 threaded rod 2x MQZ-P9 bored plate 2x M8 nut 1x AM8x1000 t-rod For fixation on M10 threaded rod 2x MQZ-P11 bored plate 2x M10 nut 1x AM10x1000 t-rod	2141908 216465 339793 or various 2141909 216466 339795 or various	Channel washer installed on all sizes of MQ channel opened up or down



Design loading capacity - 3D	1/2
Method	
Vield strongth Design boat 1.5 1.5 Live food Action Restance	
Limiting components of capacity evaluated	in following tables:
1. Bored plate	



# **MQZ-P Bored plate**

#### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures



## Design loading capacity - 3D

#### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

#### 1. MQZ-P9



+Fx,Rd	-Fx,Rd	+Fy,Rd	-Fy,Rd	+Fz,Rd	-Fz,Rd
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
				5.00	5.00
+Mx,Rd	-Mx,Rd	+My,Rd	-My,Rd	+Mz,Rd	-Mz,Rd
[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]

for MQ-41-L and MQ-41 channel

2. MQZ-P11



+Fx,Rd	-Fx,Rd	+Fy,Rd	-Fy,Rd	+Fz,Rd	-Fz,Rd
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
				5.00	5.00
+Mx,Rd	-Mx,Rd	+My,Rd	-My,Rd	+Mz,Rd	-Mz,Rd
[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]

for MQ-41-L and MQ-41 channel

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## **MQZ-TW Trapeze Wheel**

Designation	Item number
MQZ-TW-M8	2142030
MQZ-TW-M10	2142031

#### **Corrosion protection:**

Electro galvanized

#### Weight:

MQZ-TW-M8 - 37g MQZ-TW-M10 - 37g

#### Submittal text:

Part, combining 45x3 mm washer and a metric nut M8 or M10 in one element. Typically used for fixation of channels to threaded rods. Can be used in pairs to open and back side of channel. Version M10 can be used as single piece to back of the channel with nut fitting to channel long holes and securing untightening.

#### Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR -	6 - 005 N	t - 260 N	E = 010000 N	0 00700 N
DIN EN 10025	$T_y = 235 \frac{1}{\text{mm}^2}$	$f_u = 360 \frac{10}{mm^2}$	$E = 210000 \frac{10}{mm^2}$	$G = 80769 \frac{10}{mm^2}$

#### Instruction For Use:



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# **MQZ-TW Trapeze Wheel**

Possible loading cases				
Bottom s	side	Both sid	es	
	<b>₩</b>			

#### Design criteria used for loading capacity

#### Methodology:

Finite element analysis

#### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
•	RAL-GZ 655	Pipe Supports	04.2008

#### Software:

- Ansys 16.0
- Microsoft Excel

#### **Environmental conditions:**

- static loads
- no fatigue loads

#### Simplified drawing:





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# **MQZ-TW Trapeze Wheel**

Possible loadi	ng cases		
Bottom side	Both sides		
Loading case: Be	ottom side		Combinations covered by loading case
BOM: hex-head of the For fixation on M10 thi 1x MQZ-TW-M10 1x AM10x1000 t-rod M10 nut securing eithe 1x M10 nut	214 339	2031 795 or various	Integrated hexagon head of the TW locked in the slot of the channel - nut used for securing either TW or anchor



Design loading capacity - 3D	1/2
Method	
Veld sterugts     Design blad       Design blad     Logicoly init       Design blad     Logicoly init       Logicoly init     Logicoly init	
Limiting components of capacity evaluated	in following tables:
1. Trapeze wheel	



## **MQZ-TW Trapeze Wheel**

#### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures



## Design loading capacity - 3D

#### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



+Fx,Rd	-Fx,Rd	+Fy,Rd	-Fy,Rd	+Fz,Rd	-Fz,Rd
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
				0.0	4.20
+Mx,Rd	-Mx,Rd	+My,Rd	-My,Rd	+Mz,Rd	-Mz,Rd
[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]

for MQ-41-L and MQ-41 channel

Condition:

hex-head of the TW locked in the slot of the channel - nut used for securing either TW or anchor and hex nut used for securing either the TW or anchor

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# **MQZ-TW Trapeze Wheel**

Possible loading cases					
Bottom side Both sides					

Loading case: Both sides		Combinations covered by loading case		
BOM: For fixation on M8 threaded rod 2x MQZ-TW-M8 trapeze wheel 1x AM8x1000 t-rod For fixation on M10 threaded rod 1x MQZ-TW-M10 1x AM10x1000 t-rod	2142030 339793 or various 2142031 339795 or various	Integrated hexagon head should be heading out of the channels - for all sizes of the MQ system channels. For both orientations of the channel - open down or open up		

Recommended loading capacity - simplified for most common applications							
Method	♦ Z		±Fx,r ec.	±Fy,r ec.	±Fz,r ec.		
Yield strength			[kN]	[kN]	[kN]		
Permissible stress Recommended		M8			2.50		
Characteristic load Self weight capacity limit		M10			3.00		
Live loads Action Resistance		capacity limits	are individual o s. For any coml e design values mulas.	binations of m	ultiple		





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# **MQZ-TW Trapeze Wheel**

#### Conditions of the loading capacity tables:

- Just for static loads
- . No fatigue loads
- No low ( $< -10^{\circ}$  C), no high ( $> +100^{\circ}$  C) temperatures



## **Design loading capacity - 3D**

#### Summary of design loads\*

NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
				3.5	3.5
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]

for MQ-41-L and MQ-41 channel

2. MQ

1

QZ-TW-M10			
			+Fx [kl
			+M×
			+Mx [kNo
		L fr ∳ Z	or MG
Contraction of the second seco			
	X	У	
•			

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
				4.2	4.2
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]

Q-41-L and MQ-41 channel

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Package content

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## MQW-L-1/1 Angle

Designation MQW-L-1/1	Item number 2142020	ø12.5 21
<b>Corrosion protection:</b> Electro galvanized		6 57
<b>Weight:</b> 159g		40 41

#### Submittal text:

Basic angle for connecting installation channels at  $90^{\circ}$ . Usage with MQM-M10 channel wing nuts and screws M10x20 – one at each side. Material thickness of 6mm and asymmetrical length of the sides. Can be used also for fixation of threaded rods and anchors M10 and M12.

Material properties:				
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025 DD11 MOD - HN 555-1 2012.3	$F_y = 235 \frac{N}{mm^2}$	$F_{u} = 360  \frac{N}{mm^2}$	E = 210000 $\frac{N}{mm^2}$	G = 80769 $\frac{N}{mm^2}$

#### Instruction For Use:

Simplified, not attached to the packaging





## MQW-L-1/1 Angle

Possible loading cases				
Standard				

#### Design criteria used for loading capacity

#### Methodology:

Analytic calculation Hardware tests

#### Standards and codes:

EN 1990	Basics of structural design	03.2003
EN 1991-1-1	Eurocode 1: Actions on structures –Part 1-1: General	
	actions – densities, self-weight, imposed loads for buildings	03.2012
EN 1993-1-1	Eurocode 3: Design of steel structures –Part 1-1: General	
	rules and rules for buildings	03.2012
EN 1993-1-3	Eurocode 3: Design of steel structures –Part 1-3: General	
	rules-Supplementary rules for cold-formed members and	
	sheeting	09.2010
EN 1993-1-5	Eurocode 3: Design of steel structures –Part 1-5:Plated	
	structural elements	06.2012
EN 1993-1-8	Eurocode 3: Design of steel structures –Part 1-8: Design	
	of joints	03.2012
RAL-GZ 655	Pipe Support	04.2008
	EN 1990 EN 1991-1-1 EN 1993-1-1 EN 1993-1-3 EN 1993-1-5 EN 1993-1-8 RAL-GZ 655	EN 1991-1-1Eurocode 1: Actions on structures -Part 1-1: General actions - densities, self-weight, imposed loads for buildingsEN 1993-1-1Eurocode 3: Design of steel structures -Part 1-1: General rules and rules for buildingsEN 1993-1-3Eurocode 3: Design of steel structures -Part 1-3: General rules-Supplementary rules for cold-formed members and sheetingEN 1993-1-5Eurocode 3: Design of steel structures -Part 1-5:Plated structural elementsEN 1993-1-8Eurocode 3: Design of steel structures -Part 1-8: Design of joints

#### Software:

- Mathcad 15.0
- Microsoft Excel

#### **Environmental conditions:**

- static loads
- no fatigue loads

#### Simplified drawing:



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# MQW-L-1/1 Angle

Possible loading cases	
Standard	
Loading case: Standard	Combinations covered by loading case
BOM:           1x MQW-L-1/1         2142020           2x MQM-M10 wing nut         369626           2x M10x20 hexagon head screw         216453	Angle perpendicularly connecting two open sections of channels

Recommended loading capacity - simplified for most common applications				
Vield strength	∠ ±Fx,rec. ±Fy,rec. ±Fz,rec. [kN]			
Characteristic load Bell weight Live loads	Image: Note of the second se			





# MQW-L-1/1 Angle

#### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures

Possible loading cases		
Standard		

# Design loading capacity - 3D

#### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
3.15	5.84	0.00	0.00	4.85	4.45
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
0.00	0.00	0.00	0.00	0.00	0.00

#### Interaction:

$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} \le 1$$

2. Wing nut



+Fx,Rd	-Fx,Rd	+Fy,Rd	-Fy,Rd	+Fz,Rd	-Fz,Rd
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
3.55	4.88	0.00	0.00	7.00	7.00
+Mx,Rd	-Mx,Rd	+My,Rd	-My,Rd	+Mz,Rd	-Mz,Rd
[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]
0.00	0.00	0.00	0.00	0.00	0.00

#### Interaction:



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## MQW-L-2/1 Angle

Designation MQW-L-2/1	ltem number 2142021	19
<b>Corrosion protection:</b> Electro galvanized		Ø12.5
Weight: 241g		

#### Submittal text:

Basic angle for connecting installation channels at  $90^{\circ}$ . Usage with MQM-M10 channel wing nuts and screws M10x20 – two on the long side and one on the short side. Material thickness of 6mm. Can be used also for fixation of threaded rods and anchors M10 and M12.

#### Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR -	6 - 005 N	$f_{\rm u} = 360 \frac{N}{1000}$	F = 210000 <u>N</u>	G = 80769 <u>N</u>
DIN EN 10025	$I_y = 235 \frac{1}{\text{mm}^2}$	$n_u = 300 \frac{mm^2}{mm^2}$	$E = 210000 \frac{mm^2}{mm^2}$	$G = 80769 \frac{1}{mm^2}$

#### Instruction For Use:

Simplified, not attached to the packaging







## MQW-L-2/1 Angle

Possible loading cases		
Standard		

#### Design criteria used for loading capacity

#### Methodology:

- Analytic calculation
- Hardware tests

#### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures –Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	03.2012
•	EN 1993-1-1	Eurocode 3: Design of steel structures –Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures –Part 1-3: General	
		rules-Supplementary rules for cold-formed members and	
		sheeting	09.2010
•	EN 1993-1-5	Eurocode 3: Design of steel structures –Part 1-5:Plated	
		structural elements	06.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures –Part 1-8: Design	
		of joints	03.2012
•	RAL-GZ 655	Pipe Support	04.2008

#### Software:

- Mathcad 15.0
- Microsoft Excel

#### **Environmental conditions:**

- static loads
- no fatigue loads

#### Simplified drawing:



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# MQW-L-2/1 Angle

Possible loading cases		
Standard		
Loading case: Standard		Combinations covered by loading case
BOM: 1x MQW-L-2/1 3x MQM-M10 wing nut 3x M10x20 hexagon head screw	2142021 369626 216453	Angle perpendicularly connecting two open sections of channels



Design loading capacity - 3D	1/2
Method	
Ved strungth Capacity lind Capacity lind Design load Information Low lind Action Resistance	
Limiting components of capacity evaluated	in following tables:
1. Steel connector	2. Wing nut

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## MQW-L-2/1 Angle

#### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures

Possible loading cases		
Standard		

# Design loading capacity - 3D

#### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
3.75	5.84	1.55	1.55	4.85	4.45
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
5.84	5.84	0.00	0.00	0.00	0.00

Interac	tion:		
F <sub>x.Ed</sub>	Fy.Ed	F <sub>z.Ed</sub>	M <sub>x.Ed</sub>
F <sub>x.Rd</sub>	+ F <sub>y.Rd</sub> +	F <sub>z.Rd</sub>	M <sub>x.Rd</sub> ≤ 1

2. Wing nut



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
3.60	4.88	0.75	0.75	12.60	7.00
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
6.25	6.25	0.00	0.00	0.00	0.00
nteraction:					

Tension and shear parallel to channel



Fy.Ed Mx.Ed

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## **MQW-H2** Angle

Designation MQW-H2	Item number 2141929	75
<b>Corrosion protection:</b> Electro galvanized		4
Weight: 211g		8

#### Submittal text:

Angle for connecting two channels at 90° in combination with two channel connectors MQN. Angle geometry and integrated bends allows high stiffness and direct load transfer to the installation channel.

Material properties:				
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S275JR - DIN EN 10025-2	$F_y = 275 \frac{N}{mm^2}$	$F_{u} = 430  \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	G = 80769 $\frac{N}{mm^2}$

#### Instruction For Use:



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## **MQW-H2** Angle

Possible loadi	ng cases	
Standard		

#### Design criteria used for loading capacity

#### Methodology:

- · Finite element analysis
- Hardware tests

#### Standards and codes:

	•••••••••••••••••••••••••••••••••••••••		
•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
•	RAL-GZ 655	Pipe Supports	04.2008

#### Software:

- Ansys 16.0
- Microsoft Excel

#### **Environmental conditions:**

- static loads
- no fatigue loads

#### Simplified drawing:



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# **MQW-H2 Angle**

Possible loading cases	
Standard	
Loading case: Standard	Combinations covered by loading case
BOM: 1x MQW-H2 214192 2x MQN push button 369623	Angle perpendicularly connecting two open sections of channels

Recommended loading capacity - simplified for most common applications					
Method Vield strength I.4 Permissible stress Characteristic load Set recipit Live loads Action Resistance	y x	$ \begin{array}{c c} \pm Fx, rec. \\ \hline \  \  \  \  \  \  \  \  \  \  \  \  \$			

Design loading capacity - 3D				1/2
Method				
Visit strength Design hoad Capacity first Capacity first Capacity first Capacity first Capacity first Capacity first Capacity first Capacity first		in following to	black	
Limiting components of capa 1. Steel connector	2. MQN on horizontal channel (MQ-41-L)		3. MQN on vertical channel (MQ-41-L)	

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# **MQW-H2** Angle

#### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures

Possible loading cases				
Standard				

# Design loading capacity - 3D

#### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

onominin ino araning.						
1. Steel connector	+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
	5.48	8.40	2.60	2.60	8.40	5.48
z	+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
y x	11.20	11.20	0.00	0.00	0.00	0.00
	$\frac{\text{Interaction:}}{\frac{F_{x.Ed}}{F_{x.Rd}}} + \frac{F_{y.}}{F_{y.}}$		++	$\frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}}$	$\frac{M_{z.Ed}}{M_{z.Rd}} \le 1$	
2. MQN on horizontal channel (MQ-41-L)	+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
y z x	6.72	6.72	Not decisive	Not decisive	Not decisive	3.50
	+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
	Not decisive	Not decisive	Not decisive	Not decisive	Not decisive	Not decisive
	Interaction: Interaction i	s not neces	sary			
3. MQN on vertical channel (MQ-41-L)	+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
y x	3.50	Not decisive	Not decisive	Not decisive	6.72	6.72
	+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
	Not decisive	Not decisive	Not decisive	Not decisive	Not decisive	Not decisive
	Interaction: Interaction i	s not neces	sary			
	Installation T	a a la mila - l	N	<b>T</b> 1 1 1		0

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# MQW-L-6/2 Rail support

Designation MQW-L-6/2	Item number 2141928	-
<b>Corrosion protection:</b> Electro galvanized		27.5
Weight: 555g		27.5

#### Submittal text:

Base connector for installation channels at 90°. Usage with two MQM-M10 channel wing nuts and screws M10x20. Fixation holes at the three sides of the connector allowing rotation of channel open side - when used with 41x41 or 41x21D channels. Two anchor holes with dimensions 18x11mm.

# Material properties:MaterialYield strengthUltimate strengthE-modulusShear modulusS235JR -<br/>DIN EN 10025 $f_y = 235 \frac{N}{mm^2}$ $f_u = 360 \frac{N}{mm^2}$ $E = 210000 \frac{N}{mm^2}$ $G = 80769 \frac{N}{mm^2}$

#### Instruction For Use:

Simplified, not attached to the packaging

#### Loading case "Centric,,

#### Loading case "Eccentric,,







# MQW-L-6/2 Rail support



#### Design criteria used for loading capacity

#### Methodology:

- Analytic calculation
- Hardware tests

#### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	03.2012
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	09.2010
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	06.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
•	RAL-GZ 655	Pipe Supports	04.2008

#### Software:

- Mathcad 15.0
- Microsoft Excel

#### **Environmental conditions:**

- static loads
- no fatigue loads

#### Simplified drawing:





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# MQW-L-6/2 Rail support

Possible loading cases			
Centric	Eccentric		
Loading case: Centric			Combinations covered by loading case
BOM: 1x MQW-L-6/2	21	41928	Rail support connecting perpendicularly channel to base material

1x MQW-L-6/22141928Dase material2x MQM-M10 wing nut3696262x M10x20 hexagon head screw216453



Design loading capacity - 3D	1/2
Method	
Viel storyth Dengs bost 1.3 Live safe Actor Residence	
Limiting components of capacity evaluated	
1. Steel connector	2. Wing nuts

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# MQW-L-6/2 Rail support

#### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures



## Design loading capacity - 3D

#### Summary of design loads\*

NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



	Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
	4.09	4.09	1.25	1.25	12.99	7.00
	Mx,Rd (Ncm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
	5.13	5.13	8.47	8.47	3.34	3.34
Interaction:						

 $\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$ 

#### 2. Wing nuts



In MQ-41 -2mm thick channel profile					
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
0.88	0.88	4.91	5.91	12.60	12.60
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
35.00	35.00	9.38	9.38	22.40	22.40
Interaction: Shear transverse to channel: Shear parallel to channel: Pull-out:					
$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}}$	≤ 1	$\frac{F_{z,Ed}}{F_{z,Rd}} \leq 1 \qquad \qquad \frac{F_{y,Ed}}{F_{y,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} + \frac{M_{z,Ed}}{M_{z,Rd}} \leq 1$			$\frac{M_{\textbf{Z}.\textbf{Ed}}}{M_{\textbf{Z}.\textbf{Rd}}} \leq 1$
In MQ-41 - 1.5mm thick channel profile					
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
0.60	0.60	2.45	2.95	11.86	11.86
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
17.50	17.50	6.38	6.38	11.20	11.20
Interaction: Shear transverse to channel: Shear parallel to channel: Pull-out:					
$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}}$	≤ <b>1</b>	$\frac{F_{z,Ed}}{F_{z,Rd}} \le 1$		$\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$	

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# MQW-L-6/2 Rail support

Possible loading cases			
Centric	Eccentric		
Loading case: I	Eccentric		Combinations covered by loading case
BOM: 1x MQW-L-6/2 2x MQM-M10 wing 2x M10x20 hexagoi	nut 36	41928 9626 6453	Rail support connecting perpendicularly channel to base material

Recommended loading capacity - simplified for most common applications							
Method	Image: state stat						

Design loading capacity - 3D	1/2
Method	
Ved starup Design load Design load 1.3 Link land Link land Link land Link land Link land Link land Link land	
Limiting components of capacity evaluated	<b>^</b>
1. Steel connector	2. Wing nuts

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# MQW-L-6/2 Rail support

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads •
- No low (< -10 $^{\circ}\,$  C), no high (> +100 $^{\circ}\,$  C) temperatures



## **Design loading capacity - 3D**

### Summary of design loads\*

NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



	+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]	
	4.09	4.09	1.25	1.25	9.43	7.14	
	+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]	
	5.13	5.13	8.47	8.47	3.34	3.34	
I	Interaction:						
	$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}}$	- + + -	$\frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.E}}{M_{y.R}}$	_ + <	1		

### 2. Wing nuts



$\frac{x_{LG}}{F_{x,Rd}} + \frac{y_{LG}}{F_{y,Rd}} + \frac{z_{LG}}{F_{z,Rd}} + \frac{x_{LG}}{M_{x,Rd}} + \frac{y_{LG}}{M_{y,Rd}} + \frac{z_{LG}}{M_{z,Rd}} \le 1$								
In MQ-41 -2	2mm thick o	channel pro	ofile					
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]			
4.91	4.91	0.88	1.05	12.60	12.60			
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]			
6.25	6.25	35.00	35.00	22.40	22.40			
Interaction: Shear transverse		Shear parall	el to channel:	Puil-out.				
$\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}}$ In MQ-41 -	I	$rac{F_{z,Ed}}{F_{z,Rd}}$ ≤ 1 sk channel	profile	$\frac{F_{x.Ed}}{F_{x.Rd}}$ +	$\frac{M_{y,Ed}}{M_{y,Rd}} + \frac{M_{z,Ed}}{M_{z,Rd}}$	- < 1		
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]			
2.45	2.45	0.60	0.72	11.86	11.86			
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]			
4.25	4.25	17.50	17.50	11.20	11.20			
	Shear transverse to channel:     Shear parallel to channel:     Pull-out: $F_{y}$ .Ed $+ \frac{M_{x}$ .Ed}{E} + \frac{M_{y}.Ed $= 1$							

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# MQP-41 Rail support

Designation MQP-41	Item number 2141927	
Corrosion protection: Electro galvanized		105
Weight: 587g		5

### Submittal text:

Base connector for installation channels at 90°. Welded base plate gives stiffness and bending load capacity. Usage with two MQN channel connectors. Fixation holes at the three sides of the connector allowing rotation of channel open side - when used with 41x41 or 41x21D channels. Two anchor holes with dimensions 18x11mm.

### Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR -	6 - 005 N	f = 260 N	F = 210000 <u>N</u>	$G = 80769 \frac{N}{1000}$
DIN EN 10025	$n_y = 235 \frac{1}{mm^2}$	$n_u = 300 \frac{1}{\text{mm}^2}$	$E = 210000 \frac{mm^2}{mm^2}$	$G = 80769 \frac{1}{mm^2}$

### Instruction For Use:



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# **MQP-41** Rail support

Possible loading cases					
Centric Eccentric					

### Design criteria used for loading capacity

### Methodology:

• Finite element analysis

### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
•	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
•	RAL-GZ 655	Pipe Supports	04.2008

### Software:

- Ansys 16.0
- Microsoft Excel

### **Environmental conditions:**

- static loads
- no fatigue loads

### Simplified drawing:



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# **MQP-41** Rail support

Possible load	ing cases		
Centric	Eccentric		
Loading case: C	entric		Combinations covered by loading case
BOM: 1x MQP-41 2x MQN push buttor		41927 69623	Rail support connecting perpendicularly channel to base material

Recommended loading capacity - sir	plified for most common applications
Method	±Fx,rec. ±Fy,rec. ±Fz,rec.
Yield strength	[kN] [kN] [kN] [kN]
Permissible stress Recommended Characteristic load Live loads Action Resistance	These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.



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# **MQW-41 Rail support**

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}\,$  C), no high (> +100 $^{\circ}\,$  C) temperatures



### **Design loading capacity - 3D**

### Summary of design loads\*

NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



For MQ-41 - 1.5mm thick channel profile						
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]	
3.00 / 4.50*	3.00 / 4.50*	3.00	3.00	7.00	7.00	
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]	
14.00	14.00	20.00	20.00	6.00	6.00	

\* For MQ-41 - 2mm thick channel profile Interaction:  $\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$ 

### 2. Push buttons



### For MQ-41 - 1.5mm thick channel profile

+Fx,Rd	-Fx,Rd	+Fy,Rd	-Fy,Rd	+Fz,Rd	-Fz,Rd
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
Not decisive	Not decisive	7.00	7.00	11.86	11.86
+Mx,Rd	-Mx,Rd	+My,Rd	-My,Rd	+Mz,Rd	-Mz,Rd
[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]
24.50	24.50	Not decisive	Not decisive	11.20	11.20

### Interaction:

For local normal resistance

 $\frac{F_{z.Ed}}{F_{z.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$ 

For local shear resistance parallel to channel

 $\leq 1$ F<sub>z.Rd</sub>

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# **MQW-41 Rail support**

### **Design loading capacity - 3D**

### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



10.12         10.12         5.14         5.14         13.00         13.00           +Mx,Rd [kNcm]         -Mx,Rd [kNcm]         +My,Rd [kNcm]         -My,Rd [kNcm]         +Mz,Rd [kNcm]         -Mz,Rd [kNcm]	+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
	10.12	10.12	5.14	5.14	13.00	13.00
	, -	, -			, -	, -
28.45         28.45         38.00         38.00         8.89         8.89	28.45	28.45	38.00	38.00	8.89	8.89

 $\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$ 



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# **MQP-41** Rail support

Possible loadii	ng cases		
Centric	Eccentric		
Loading case: Ec			Combinations covered by loading case
BOM: 1x MQP-41 2x MQN push button	21	41927 69623	Rail support connecting perpendicularly channel to base material

Recommended loading capacity - simplified for most common applications						
Method		±Fx,rec.	$\pm$ Fy,rec.	±Fz,rec.		
Yield strength		[kN] 3.93	[kN] 1.21	[kN] 5.00		
Permissible stress     Recommended       Characteristic load     Self weight Live loads     Capacity limit       Action     Resistance	× × ×	These values are i capacity limits. For directions, use dee interaction formula	any combinations	of multiple		

Design loading capacity - 3D			1/	/3
Method				
Ved storyth Capacity lind Capa				
Limiting components of capa	acity evaluated	in following ta	bles:	
1. Steel connector	2. Push button		3. Welds	

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# **MQW-41 Rail support**

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low ( $< -10^{\circ}$  C), no high ( $> +100^{\circ}$  C) temperatures

Possible loading cases				
Centric	Eccentric			

### **Design loading capacity - 3D**

### Summary of design loads\*

NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



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# MQW-41 Rail support

### **Design loading capacity - 3D**

### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
12.92	12.92	5.03	5.03	16.60	16.60
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
14.23	14.23	38.00	38.00	8.89	8.89
Interaction.					

Interaction:

 $\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$ 



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# M8 Threaded rod channel through bolt

Designation M8 Threaded r	od channel throu	ah bolt	Item number		
Mornieadeur	AM8x1000 4.8 th AM8x2000 4.8 th AM8x3000 4.8 th A 8,4/40 washer	readed rod readed rod readed rod	339793 339794 216415 282856		
Corrosion pro Threaded rod Washer Nut Weight:	M8 nut tection: galvanized 5µm galvanized 5µm galvanized 5µm	ı	216465	M = 8 mm $DI = 8,4 mm$ $DA = 40 mm$ $H = 7 mm$ $W = 13 mm$ $Package conte$	nt
Threaded rod Washer Nut	- as per used le - 27g - 5g	ngth		Individ	ual items
Material propertie	s:				
Material		Yield strength	Ultimate strength	E-modulus	Shear modulus
Threaded rod Steel grade 4.8 DIN	N 976-1	$F_y = 320 \frac{N}{mm^2}$	$F_u = 400 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	G = 80769 $\frac{N}{mm^2}$

 $F_{u} = 360 \frac{N}{mm^{2}}$ 

 $F_{u} = 800 \frac{N}{mm^{2}}$ 

Instruction For Use:

Steel S235JR/DD11MOD

Washer

Nut

Steel grade 8

Simplified, not attached to the packaging Loading case "Both sides,,

DIN EN 10025-2 2005.4/HN 547 2004.10  $F_y = 235 \frac{N}{mm^2}$ 

 $F_y = 640 \frac{N}{mm^2}$ 



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 $E = 210000 \frac{N}{mm^2}$ 

 $E = 210000 \frac{N}{mm^2}$ 

G =  $80769 \frac{N}{mm^2}$ 

 $G = 80769 \frac{N}{mm}$ 

# M8 Threaded rod channel through bolt

Possible loading cases			
Both sides			
-9-25-			

### Design criteria used for loading capacity

### Methodology:

• Finite element analysis

### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
•	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
٠	RAL-GZ 655	Pipe Supports	04.2008

### Software:

- Ansys 16.0
- Microsoft Excel

### **Environmental conditions:**

- static loads
- no fatigue loads

### Simplified drawing:



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# M8 Threaded rod channel through bolt

Possible loading cases	
Both sides	
Loading case: Both sides	Combinations covered by loading case
BOM:	Threaded rod connection through bolting the channel -

 2x A 8,4/40 washer
 282856

 2x M8 nut
 216465

 1x AM8x1000 4.8 threaded rod
 339793

 Opened up or down secured by two large washers and nuts from both sides of the channel



Design loading capacity - 3D	1/2
Method	
Vind strength Design kond Capacity livit 1.5 Live lived Action Residues	
Limiting components of capacity evaluated	in following tables:
1. Washer and nut	



# M8 Threaded rod channel through bolt

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low ( $< -10^{\circ}$  C), no high ( $> +100^{\circ}$  C) temperatures

# Possible loading cases



## **Design loading capacity - 3D**

### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
				3.50	3.50
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]

Condition: valid for channel edge distance ≥ 100mm

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# M10 Threaded rod channel through bolt

Designation M10 Threaded Corrosion prot Threaded rod Washer Nut Weight: Threaded rod Washer Nut	rod channel thro AM10x1000 4.8 AM10x2000 4.8 AM10x3000 4.8 A 10,5/40 washe M10 nut ection: galvanized 5µr galvanized 5µr galvanized 5µr galvanized 5µr galvanized 5µr galvanized 5µr 10g	threaded rod threaded rod threaded rod er	ltem number 339795 339796 216418 282857 216466	M = 10 mm DI = 10,5 mm DA = 40 mm H = 8 mm W = 17 mm Package content Individua	
Material properties					
Material		Yield strength	Ultimate strength	E-modulus	Shear modulus
Threaded rod Steel grade 4.8 DIN Washer	976-1	$F_y = 320 \frac{N}{mm^2}$	$F_{u} = 400  \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	G = 80769 $\frac{N}{mm^2}$

 $F_{u} = 360 \frac{N}{mm^{2}}$ 

 $F_{u} = 800 \frac{N}{mm^{2}}$ 

Instruction	For	Use <sup>.</sup>
III SU UCUOII	1 01	USC.

Steel S235JR/DD11MOD

Washer

Nut

Steel grade 8

Simplified, not attached to the packaging Loading case "Both sides,,

DIN EN 10025-2 2005.4/HN 547 2004.10  $F_y = 235 \frac{N}{mm^2}$ 

 $F_y = 640 \frac{N}{mm^2}$ 



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 $E = 210000 \frac{N}{mm^2}$ 

 $E = 210000 \frac{N}{mm}$ 

G =  $80769 \frac{N}{mm^2}$ 

 $G = 80769 \frac{N}{mm}$ 

# M10 Threaded rod channel through bolt

Possible loading cases				
Both sides				
- 8 - 3				

### Design criteria used for loading capacity

### Methodology:

• Finite element analysis

### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
•	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
٠	RAL-GZ 655	Pipe Supports	04.2008

### Software:

- Ansys 16.0
- Microsoft Excel

### **Environmental conditions:**

- static loads
- no fatigue loads

### Simplified drawing:



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# M10 Threaded rod channel through bolt

Possible loadi	ng cases	
Both sides		
- <b>3</b> -3-5		
oading case: B	oth sides	Combinations covered by loading case

<b>J</b>		······································
BOM: 2x A 10,5/40 washer 2x M10 nut 1x AM10x1000 4.8 threaded rod	282857 216466 339795	Threaded rod connection through bolting the channel - opened up or down secured by two large washers and nuts from both sides of the channel
		9 9



Design loading capacity - 3D	1/2
Method	
Ved storyth Design load 1.0 Los sand Los sand Los sand Los sand	
Limiting components of capacity evaluated	in following tables:
1. Washer and nut	



2/2

# M10 Threaded rod channel through bolt

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low ( $< -10^{\circ}$  C), no high ( $> +100^{\circ}$  C) temperatures

# Possible loading cases



## **Design loading capacity - 3D**

### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
				4.20	4.20
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]

Condition: valid for channel edge distance ≥ 100mm



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# M8 T-bolt in the channel

Designation	Item number
HHK 41 M8X40	312361
HHK 41 M8X50	312362
HHK 41 M8X60	312363
HHK 41 M8X80	312365
HHK 41 M8X100	312367
HHK 41 M8X120	312368
HHK 41 M8X150	312369

### **Corrosion protection:**

Threaded rod	galvanized 5µm		
Washer	galvanized 5µm		
Nut	galvanized 5µm		
Weight:			
HHK 41 M8X40	- 73g		
HHK 41 M8X50	- 78g		
HHK 41 M8X60	- 82g		
HHK 41 M8X80	- 88g		
HHK 41 M8X100	- 94g		
HHK 41 M8X120	-100g		
HHK 41 M8X150	- 110g		



Material properties:				
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Threaded rod Steel grade 4.8 DIN 976-1 Washer	$F_y = 320 \frac{N}{mm^2}$	$F_{u} = 400  \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	G = 80769 $\frac{N}{mm^2}$
Steel S235JR/DD11MOD DIN EN 10025-2 2005.4/HN 547 2004.10 Nut	$F_{y} = 235 \frac{N}{mm^2}$	$F_{u} = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Steel grade 8	$F_y = 640 \ \frac{N}{mm^2}$	$F_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	G = 80769 $\frac{N}{mm^2}$

### Instruction For Use:

Simplified, not attached to the packaging



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# M8 T-bolt in the channel

Possible loadi	ng cases	
Standard		

### Design criteria used for loading capacity

### Methodology:

• Finite element analysis

### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
•	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
•	RAL-GZ 655	Pipe Supports	04.2008

### Software:

- Ansys 16.0
- Microsoft Excel

### **Environmental conditions:**

- static loads
- no fatigue loads

### Simplified drawing:



M = 8 mm L = see designation HHK 41 M8xL



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# M8 T-bolt in the channel

Possible loadir	ng cases		
Standard			
Loading case: St	andard	Combinations covered by loading	case

Loading case: Standard		Combinations covered by loading case
BOM: 1x HHK HHK 41 M8X40 HHK 41 M8X50 HHK 41 M8X60 HHK 41 M8X80 HHK 41 M8X100 HHK 41 M8X120 HHK 41 M8X150	312361 312362 312363 312365 312365 312367 312368	Threaded bolt connection into a channel using simple channel nut, large washer and nut



Design loading capacity - 3D	1/2
Method	
Ved sharps Copering Copering International Co	
Limiting components of capacity evaluated	in following tables:
1. T-bolt	



2/2

# M8 T-bolt in the channel

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures

# Possible loading cases Standard

# Design loading capacity - 3D

### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
				3.50	3.50
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]

Condition: valid for channel edge distance ≥ 100mm



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# M10 T-bolt in the channel

Designation	Item number
HHK 41 M10X40	312371
HHK 41 M10X60	312373
HHK 41 M10X80	312374
HHK 41 M10X100	312375
HHK 41 M10X150	312377

### **Corrosion protection:**

Threaded rod	galvanized 5µm
Washer	galvanized 5µm
Nut	galvanized 5µm
Weight:	
HHK 41 M10X40	- 77g
HHK 41 M10X60	- 92g
HHK 41 M10X80	- 105 g
HHK 41 M10X100	<b>0</b> - 116g
HHK 41 M10X150	<b>0</b> - 141g



Material properties:				
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Threaded rod				
Steel grade 4.8 DIN 976-1	$F_y = 320 \frac{N}{mm^2}$	$F_{u} = 400 \frac{N}{mm^{2}}$	$E = 210000 \frac{N}{mm^2}$	G = 80769 $\frac{N}{mm^2}$
Washer	- nini	ntitt	nun	mm
Steel S235JR/DD11MOD				
DIN EN 10025-2 2005.4/HN 547 2004.10	$F_{y} = 235 \frac{N}{mm^{2}}$	$F_{u} = 360 \frac{N}{mm^{2}}$	$E = 210000 \frac{N}{mm^2}$	G = $80769 \frac{N}{mm^2}$
Nut	, mm	mm	тт	nini
Steel grade 8	$F_y = 640 \ \frac{N}{mm^2}$	$F_{u} = 800 \frac{N}{mm^{2}}$	$E = 210000 \frac{N}{mm^2}$	G = 80769 $\frac{N}{mm^2}$

### Instruction For Use:

Simplified, not attached to the packaging



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# M10 T-bolt in the channel

Possible loadi	ng cases	
Standard		

### Design criteria used for loading capacity

### Methodology:

• Finite element analysis

### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
•	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
٠	RAL-GZ 655	Pipe Supports	04.2008

### Software:

- Ansys 16.0
- Microsoft Excel

### **Environmental conditions:**

- static loads
- no fatigue loads

### Simplified drawing:



L = see designation HHK 41 M10xL



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# M10 T-bolt in the channel

ossible loadi	ng cases	
Standard		
Loading case: St	andard	Combinations covered by loading case

Loading case: Standard Combinations covered by loading case		Combinations covered by loading case
BOM: 1x HHK HHK 41 M10X40 HHK 41 M10X60 HHK 41 M10X80 HHK 41 M10X100 HHK 41 M10X150	312371 312373 312374 312375 312377	Threaded bolt connection into a channel using simple channel nut, large washer and nut



Design loading capacity - 3D	1/2
Method	
Vind storegen Design koad Capacity kint T.3 Low land Action Resistance	
Limiting components of capacity evaluated	in following tables:
1. T-bolt	

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# M10 T-bolt in the channel

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low ( $< -10^{\circ}$  C), no high ( $> +100^{\circ}$  C) temperatures

# Possible loading cases Standard

# Design loading capacity - 3D

### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
				4.20	4.20
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]

Condition: valid for channel edge distance ≥ 100mm



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# MQK-L-21 Bracket

Designation	Item number
MQK-L-21/200	2141924
MQK-L-21/300	2141925
MQK-L-21/450	2141926

### **Corrosion protection:**

Sendzimir galvanized

### Weight: MQK-L-21/200 - 437g

MQK-L-21/200 - 437g MQK-L-21/300 - 581g MQK-L-21/450 - 797g



### Submittal text:

L-shape bent installation bracket with channel section 41x21x2mm. Two anchor holes 16x11mm on the short side and elongated holes with step 50mm on the long side. Direct fixation with anchors to base material or to other channels with two MQM-M10 wing nuts and M10x20 screws. Usage with open side up or down.

### Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR -	A DOL N	$f_{\rm u} = 360 - \frac{N}{N}$	F _ 010000 N	0 00700 N
DIN EN 10025	$f_y = 235 \frac{1}{mm^2}$	$T_u = 360 \frac{1}{mm^2}$	$E = 210000 \frac{10}{mm^2}$	$G = 80769 \frac{10}{mm^2}$

### **Instruction For Use:**

Simplified, not attached to the packaging



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# **MQK-L-21 Bracket**

Possible loading cases						
Bracket only	Fixed to the wall with HST3 - M10		Fixed on channel			
	A A A A A A A A A A A A A A A A A A A					

Design criteria used for loading capacity

### Methodology:

- Analytic calculation
- Hardware tests

### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	03.2012
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	09.2010
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	06.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
•	RAL-GZ 655	Pipe Supports	04.2008

### Software:

- Mathcad 15.0
- Microsoft Excel

### **Environmental conditions:**

- static loads
- no fatigue loads

### Simplified drawing:



L = see designation MQK-L21/L

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# **MQK-L-21 Bracket**





Design loading capacity - 3D	1/2
Method	
Ved sharps Copy load Design load 1.0 Low load Action Prestament	
Limiting components of capacity evaluated	in following tables:
1. Steel part of the bracket	

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# **MQK-L-21 Bracket**

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures



### **Design loading capacity - 3D**

### Summary of design loads\*

NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

### 1. Steel part of the bracket



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]		
1.66	2.41	4.35	4.35	10.58	10.58		
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]		
1.04	1.04	12.50	12.50	1.04	1.04		
$\label{eq:relation} \begin{array}{ c c c c }\hline 1.04 & 1.04 & 12.50 & 12.50 & 1.04 & 1.04 \\ \hline \\ \hline Interaction: \\\hline F_{x.Rd} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1 \\ \hline \end{array}$							



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# **MQK-L-21 Bracket**

Possible loading	g cases		
Bracket only	Fixed to the wall with HST3 - M10	Fixed on channel	
Loading case: Fix	The second secon	Combinations cover	ered by loading case
BOM: 1x MQK-L-21 MQK-L-21/200 MQK-L-21/300 MQK-L-21/450 2x HST3 M10x90 30/10 2x MQZ-E21 plastic er	) stud anchor		crete (B20/25) wall with two HST3



Design loading capacity - 3D			1/3
Method			
Vend storups Design hand 1.5 Line lead Action Resistance			
Limiting components of capa	acity evaluated	in following ta	bles:
1. Steel part of the bracket	2. Anchors		3. Local checks (bearing, friction)

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## MQK-L-21 Bracket

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures



### **Design loading capacity - 3D**

### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



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# **MQK-L-21 Bracket**

## **Design loading capacity - 3D**

### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

### 3. Local checks (bearing, friction)



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
Not decisive	Not decisive	0.57	0.57	4.32	7.92
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
2.29	2.29	Not deceive	Not decisive	Not decisive	Not decisive

Interaction:

 $\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$ 

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# **MQK-L-21 Bracket**

Possible loading	g cases				
Bracket only	Fixed to the wall with HST3 - M10				
	1 The second sec				
Loading case: Fixed to the wall with HUS3 - H8			Combinations covered by loading case		
BOM:         1x MQK-L-21         MQK-L-21/200       2141924         MQK-L-21/300       2141925         MQK-L-21/450       2141926         2x HUS3-H 8x55 5/-/- screw anchor       2079794         2x MQZ-E21 plastic end cap       370598		2141924 2141925 2141926 2079794	Bracket fixed to concrete (B20/25) wall with two HUS H 8 anchors		



Design loading capacity - 3D	)		1/3				
Method							
Vield starryth Design hoad Capacity kind 1.0 Live hoad Action Resistance							
Limiting components of capacity evaluated in following tables:							
1. Steel part of the bracket	2. Anchors		3. Local checks (bearing, friction)				

Installation Technical Manual - Technical Data - MQ system light & project



# **MQK-L-21 Bracket**

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures



### **Design loading capacity - 3D**

### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



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# **MQK-L-21 Bracket**

## **Design loading capacity - 3D**

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### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

### 3. Local checks (bearing, friction)



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
Not decisive	Not decisive	0.57	0.57	4.32	7.92
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
2.29	2.29	Not deceive	Not decisive	Not decisive	Not decisive

Interaction:

 $\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$


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# **MQK-L-21 Bracket**

Possible loading	g cases			
Bracket only	Fixed to the wall with HST3 - M10	Fixed to the wall with HUS3 - H8	Fixed on channel	
	A Contraction of the second se			
Loading case: Fix	Loading case: Fixed on channel			ered by loading case
BOM: 1x MQK-L-21 MQK-L-21/200 MQK-L-21/300 MQK-L-21/450 2x MQM-M10 wing nut 2x M10x20 hexagon h 2x MQZ-E21 plastic er	ead screw	2141924 2141925 2141926 369626 216453 370598	Bracket fixed to MQ	System channel



Design loading capacity - 3D	)		1/3
Method			
Design kond Design kond 1.5 Live lond Action Besistance			
Limiting components of capa	acity evaluated	in following ta	bles:
1. Steel part of the bracket	2. Wing nuts in the ch	nannel	3. Local checks (bearing, friction)

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# **MQK-L-21 Bracket**

#### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures



# **Design loading capacity - 3D**

#### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.66	2.41	4.35	4.35	10.58	10.58
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
1.04	1.04	12.50	12.50	1.04	1.04
$\frac{1.04}{\text{nteraction:}} = \frac{1.04}{F_{x.Rd}} + \frac{F_{z.Ed}}{F_{y.Rd}} + \frac{M_{x.Ed}}{F_{z.Rd}} + \frac{M_{y.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \le 1$					

2.1. Wing nuts in the channel



#### in MQ/2mm thick wall channel as base

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
4.35	12.64	0.69	0.69	7.00	7.00
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
6.25	6.25	46.11	44.01	11.13	11.13
nteraction:					

Pull-out

Transverse shear (perpendicular to channel)

 $\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$ 

 $\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$ 

**Note:** For load cases Fy and Mx, also the wing nut in the slotted hole parallel to force must be statically considered. Therefore additional deformation occur on connector to overcome slotted hole. Otherwise refer to values shown in 3) which consider friction between washer and channel.

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# **MQK-L-21 Bracket**

# **Design loading capacity - 3D**

3/3

### Summary of design loads\*

NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.



n MQ/1.5mm thick wall channel as base					
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.17	7.26	0.47	0.47	7.00	7.00
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
4.25	4.25	23.43	22.38	5.57	5.57

Interaction:

Pull-out

Transverse shear (perpendicular to channel)

 $\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$ 

 $I = \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \le 1$ 

**Note:** For load cases Fy and Mx, also the wing nut in the slotted hole parallel to force must be statically considered. Therefore additional deformation occur on connector to overcome slotted hole. Otherwise refer to values shown in 3) which consider friction between washer and channel.

3. Local checks (bearing, friction)



+Fx,Rd	-Fx,Rd	+Fy,Rd	-Fy,Rd	+Fz,Rd	-Fz,Rd
[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
Not decisive	Not decisive	0.57	0.57	4.32	7.92
+Mx,Rd	-Mx,Rd	+My,Rd	-My,Rd	+Mz,Rd	-Mz,Rd
[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]	[kNcm]
2.29	2.29	Not deceive	Not decisive	Not decisive	Not decisive

$$\frac{F_{y,Ed}}{F_{y,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} \le 1$$



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# HUS3-H8 Direct fixation to concrete

Designation		Item number	
Channel			
MQ-21 2m		2148545	
MQ-21 3m		2148544	
MQ-21 6m		2148543	
MQ-41-L 2m		2141966	
MQ-41-L 3m		2141965	
MQ-41-L 6m	2141964		
Screw anchor			
HUS3 - H8x55 5/-/- screw anchor	r	2079794	
Washer for loading case HUS-H	8&W in channel slot		
A 10.5/20 washer		282851	
Corrosion protection:Channelsendzimir galvaScrew anchorzinc plated min sender	nized average 10µm 5µm		
Weight: Channel MQ-21 1430 g/m Channel MQ-41-L 1600 g/m Anchor 32.9 g			
Material properties:			
Material	Yield strength	Ultimate strength	E-r
Channel Steel S250GD - DIN EN 10346	$F_y = 290 \frac{N}{mm^2}$	$F_{u} = 330 \frac{N}{mm^{2}}$	E=



Material properties: Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Channel Steel S250GD - DIN EN 10346 Anchor	$F_y = 290 \frac{N}{mm^2}$	$F_{u} = 330 \frac{N}{mm^{2}}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Carbon steel	$F_y = 695 \frac{N}{mm^2}$	$F_u = 810 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	G = $80769 \frac{N}{mm^2}$

### Instruction For Use:

Simplified, not attached to the packaging Loading case "HUS3-H8 in anchor hole,,





# HUS3-H8 Direct fixation to concrete



# Design criteria used for loading capacity

# Methodology:

• Finite element analysis

# Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
٠	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
•	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
•	RAL-GZ 655	Pipe Supports	04.2008

### Software:

- Ansys 16.0
- Microsoft Excel

### **Environmental conditions:**

- static loads
- no fatigue loads

### Simplified drawing:



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Design loading capacity - 3D	1/2
Method	
Ved strength     Design lead       Design lead     capacity lend       1.3     capacity lend       1.3     capacity lend       Action     Resolution	
Limiting components of capacity evaluated	in following tables:
1. Channel local pull through	



# HUS3-H8 Direct fixation to concrete

# Conditions of the loading capacity tables:

- Just for static loads
  No fatigue loads
- No fatigue loads
- No low (< -10 $^{\circ}\,$  C), no high (> +100 $^{\circ}\,$  C) temperatures



# **Design loading capacity - 3D**

#### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

1. Channel local pull through



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
					4.40
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]

Condition: valid for channel edge distance ≥ 100mm, min concrete quality C20/25, no edge influence, no other anchor distance influence, min concrete slab (base material) thickness 120mm



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# HUS3-H8 Direct fixation to concrete

Possible loadi	ng cases		
HUS3-H8 in rounded ,,anchor hole,,.	HUS3-H8&W in channel (oblong) slot		
Loading case: HL	JS3-H8&W in char	nnel (oblong) slot	Combinations covered by loading case
BOM: Channel MQ-21 2m MQ-21 3m MQ-21 6m MQ-41-L 2m MQ-41-L 3m MQ-41-L 6m Screw anchor HUS3 - H8x55 5/-/- A 10.5/20 washer		2148545 2148544 2148543 2141966 2141965 2141964 2079794 282851	Direct fixation of channel on concrete fixed by HUS3-H8 and M10 washer through (oblong) slot in the channel





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# HUS3-H8 Direct fixation to concrete

### Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures



### **Design loading capacity - 3D**

#### Summary of design loads\*

NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.





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# HST3-M10 Direct fixation to concrete

Designation		Item number
Channel		
MQ-21 2m		2148545
MQ-21 3m		2148544
MQ-21 6m		2148543
MQ-41-L 2m		2141966
MQ-41-L 3m		2141965
MQ-41-L 6m		2141964
Stud anchor		
HST3 M10x90 30	0/10 stud anchor	2105712
Corrosion prote	ection:	
Channel	sendzimir galvanized average 10µm	
Screw anchor	zinc plated min 5µm	
Weight: Channel MQ-2 <sup>,</sup>	<b>1</b> 1430 q/m	



Material properties:				
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Channel				
Steel S250GD - DIN EN 10346	$F_y = 290 \frac{N}{mm^2}$	$F_{u} = 330 \frac{N}{mm^{2}}$	$E = 210000 \frac{N}{mm^2}$	G = 80769 $\frac{N}{mm^2}$
Anchor	, mm	mit	mm	mm
Carbon steel	$F_{y} = 640 \frac{N}{mm^{2}}$	$F_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	G = 80769 $\frac{N}{mm^2}$

### Instruction For Use:

Channel MQ-41-L

Anchor

Simplified, not attached to the packaging

1600

g/m

58.0 g



# 

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# HST3-M10 Direct fixation to concrete



### Design criteria used for loading capacity

### Methodology:

· Finite element analysis

### Standards and codes:

•	EN 1990	Basics of structural design	03.2003
•	EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General	
		actions – densities, self-weight, imposed loads for buildings	09.2011
•	EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General	
		rules and rules for buildings	03.2012
•	EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General	
		rules- Supplementary rules for cold-formed members and	
		sheeting	03.2012
•	EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated	
		structural elements	03.2012
•	EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of	
		joints	03.2012
•	EN 10025-2	Hot rolled products of structural steels- Part 2: technical	
		delivery conditions for non-alloy structural steels	02.2005
•	RAL-GZ 655	Pipe Supports	04.2008

### Software:

- Ansys 16.0
- Microsoft Excel

### **Environmental conditions:**

- static loads
- no fatigue loads

# Simplified drawing:



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# HST3-M10 Direct fixation to concrete

Possible loadi	ng cases		
HST3-M10 in rounded ,,anchor hole,,.	HST3-M10 in channel (oblong) slot		
Loading case: St	andard		Combinations covered by loading case
BOM: Channel Channel MQ-21 2m MQ-21 3m MQ-21 6m MQ-41-L 2m MQ-41-L 3m MQ-41-L 6m Screw anchor HST3 M10x90 30/10		2148545 2148544 2148543 2141966 2141965 2141964 2105712	Direct fixation of channel on concrete fixed by HST3-M10 through ,,Anchor hole,, in the channel



Design loading capacity - 3D	1/2				
Method					
Vest strength     Design had       Design bad     copacity test       1.3     1.3       Live bad     Action					
Limiting components of capacity evaluated	in following tables:				
1. Channel local pull through					

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# HUS3-H8 Direct fixation to concrete

# Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low ( $< -10^{\circ}$  C), no high ( $> +100^{\circ}$  C) temperatures



# **Design loading capacity - 3D**

#### Summary of design loads\*

**NOTE:** all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

1. Channel local pull through



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
					4.60
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]

Condition: valid for channel edge distance ≥ 100mm, min concrete quality C20/25, no edge influence, no other anchor distance influence, min concrete slab (base material) thickness 120mm



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# HST3-M10 Direct fixation to concrete

Possible loadii	ng cases		
HST3-M10 in rounded ,,anchor hole,,.	HST3-M10 in channel (oblong) slot		
Loading case: St	andard		Combinations covered by loading case
BOM: Channel MQ-21 2m MQ-21 3m MQ-21 6m MQ-41-L 2m MQ-41-L 3m MQ-41-L 6m Screw anchor HST3 M10x90 30/10		2148545 2148544 2148543 2141966 2141965 2141964 2105712	Direct fixation of channel on concrete fixed by HST3-M10 through (oblong) slot in the channel



Design loading capacity - 3D	1/2
Method	
Design loss Design loss Low loss	
Limiting components of capacity evaluated	in following tables:
1. Channel local pull through	



# HUS3-H8 Direct fixation to concrete

# Conditions of the loading capacity tables:

- Just for static loads
- No fatigue loads
- No low (< -10 $^{\circ}$  C), no high (> +100 $^{\circ}$  C) temperatures



# **Design loading capacity - 3D**

#### Summary of design loads\*

NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

1. Channel local pull through	z	+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
	^						4.05
		+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
			20/25, no ed	•	no other and	chor distance	



Installation Technical Manual - Technical Data - MQ system light & project

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