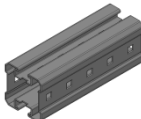
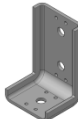
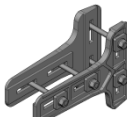


Terms of common cooperation / Legal disclaimer

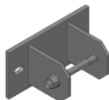
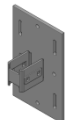
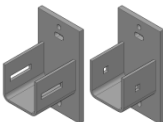
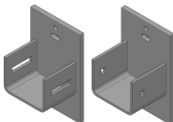
The product loading capacities published in these Technical Data Sheets are only valid for the mentioned codes or technical data generation methods and the defined application conditions (e.g. ambient temperature load capacity not valid in case of fire, data not valid in support structures when mixed 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.

In any case the suitability of structures combining different products for specific applications need to be checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for any specific facility. This book only serves as an aid to interpret the suitability of structures combining different products for specific applications without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application. User must take all necessary and reasonable steps to prevent or limit damage. The suitability of structures combining different products for specific applications are only recommendations that need to be confirmed with a professional designer and/or structural engineers to ensure compliance with User's specific jurisdiction and project requirements.

Content and overview of this manual

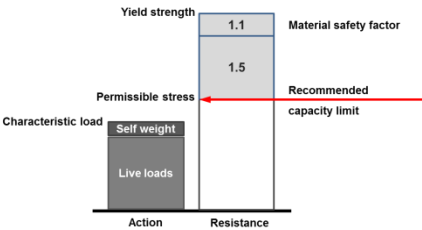
Product	Designation	Item number	Page
MIQ System girders (channels) - section properties			
	MIQ-90-3m	2119866	5
	MIQ-90-6m	2119867	
MIQ System angle connectors - loading capacity limits			
	MIQC-90-HS	2123880	7
	MIQC-90-HT	2123881	11
	MIQC-90-HT-V	2134818	15
	MIQC-90-L	2119868	19
	MIQC-90-MI	2140257	23
	MIQC-90-MI-V	2140258	27
	MIQC-90-E	2140259	31
	MIC-90-LH	2048107	37
	MIC-U-MA	304806	43
MIQ System concrete connectors - loading capacity limits			
	MIQC-C90-U	2134819	49

Content and overview of this manual

Product	Designation	Item number	Page
MIQ System concrete connectors - loading capacity limits			
	MIQC-C90	2120144	53
	MIC-CU-MA	304828	57
MIQ System steel connectors - loading capacity limits			
	MIQC-S90-AC	2120270	63
	MIQC-S90-BC	2120272	69
	MIQC-S90-AP	2120271	75
	MIQC-S90-BP	2120273	81
	MIC-SA-MA MIC-SB-MA MIC-SC-MA	304815 304816 304817	87 95 103
MIQ System accessories - loading capacity limits			
	MIQA-T M12	2120142	111
	MIQC-M10 MIQC-M12 MIQC-M16	2120274 2120275 2120276	112 112 112
MIQ Elevator connectors			
	MIC-C90-EDB	2149279	113
	MIC-C120-EDB	2149420	119

MIQ System - Girders (Channels)

Designation	Item number
MIQ-90-3m	2119866
MIQ-90-6m	2119867



Technical data				MIQ-90
For girder MI / cross section including torsion				
Cross-sectional area	A	[mm ²]		1093.51
Channel weight		[kg/m]		8.58
Wall thickness		[mm]		2.5
Material				
yield strength	f _{y,k}	[N/mm ²]		275
permissible stress*	σ _{rec}	[N/mm ²]		178.6
E-module		[N/mm ²]		210000
Shear-modulus		[N/mm ²]		81000
Surface				
hot dip galvanized		[μm]		65
Cross-section values Y-axis				
Axis of gravity A	e ₁	[mm]		45
Axis of gravity B	e ₂	[mm]		45
moment of inertia	I _y	[cm ⁴]		121.65
Section modulus A	W _{y1}	[cm ³]		27.03
Section modulus B	W _{y2}	[cm ³]		27.03
Radius of gyration	i _y	[cm]		3.34
Permissible moment	M _y	[Nm]		4.83
Cross-section values Z-axis				
moment of inertia	I _z	[cm ⁴]		101.29
Section modulus	W _z	[cm ³]		22.51
Radius of gyration	i _z	[cm]		3.04
Data to the torsion				
torsional moment of inertia	I _t	[mm ⁴]		54.35
torsional section modulus	W _t	[mm ³]		9.1

MIQC-90-HS angle connector

Designation	Item number
MIQC-90-HS	2123880

Corrosion protection:

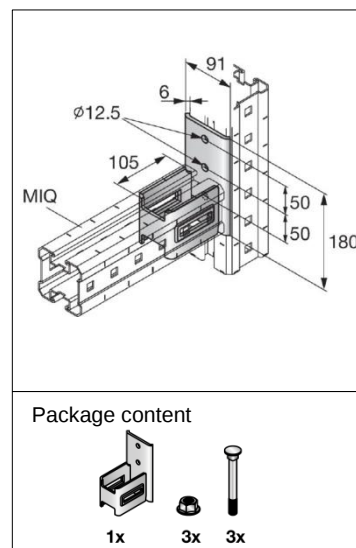
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:

1457.1g connector (1802g incl. accessories)

Submittal text:

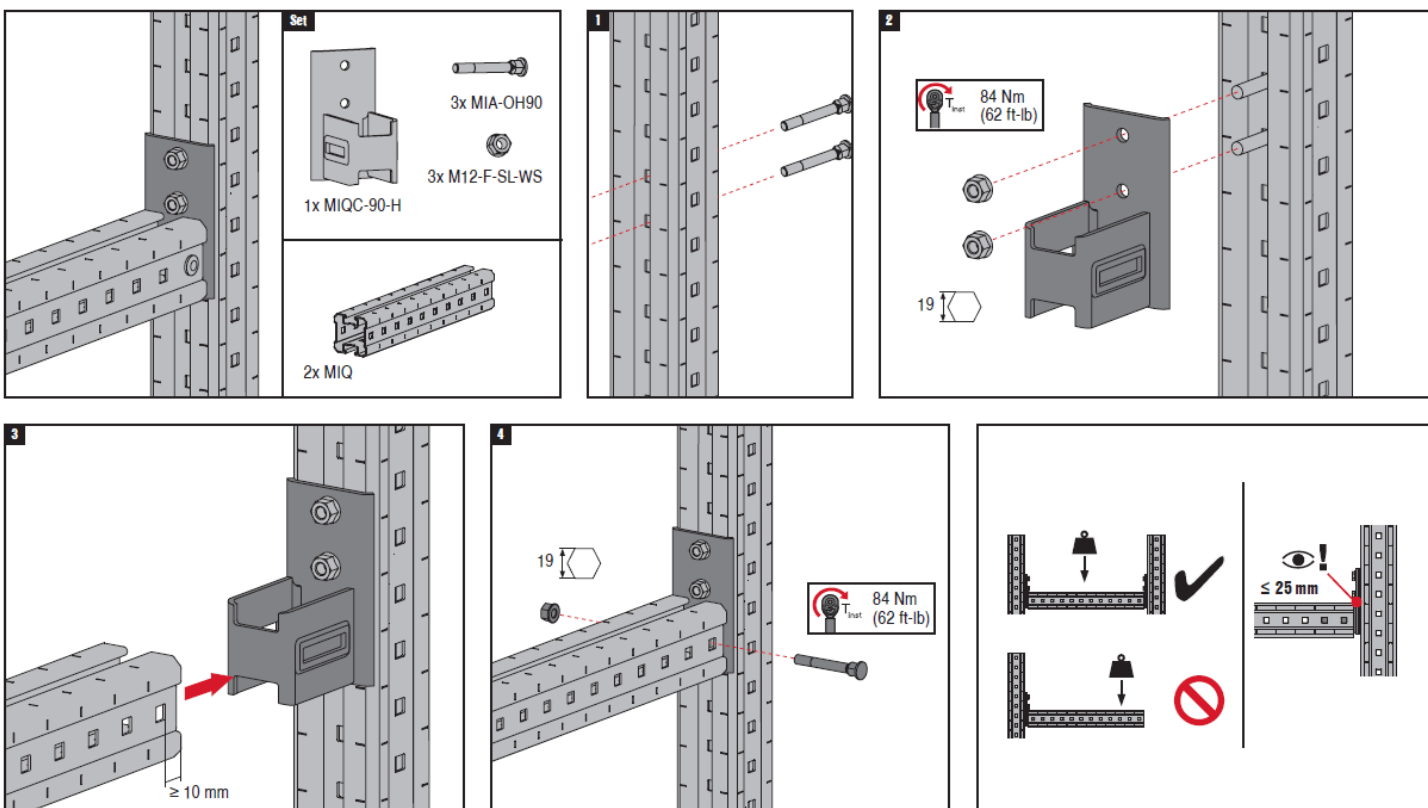
Hilti angle, 90°, MIQ system, MIQC-90-HS, Hot dipped galvanized, angle typically used for connection of two perpendicular Hilti MIQ girders, angle connector with two hole base plate fitted for connection on surface of other MIQ girder through bolted by two MIA-OH 90 (included in the pack) from back side of the girder and secured by two self locking nuts. The connected girder is stuck on connectivity part of the angle and through bolted by 3 pieces of MIA-OH and self locking nut in the first hole closest to the end of the girder, material weight 1802 grams incl. all connectivity material.



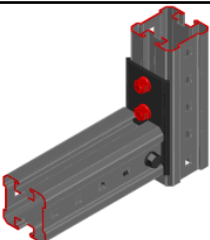
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



MIQC-90-HS angle connector

Possible loading 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

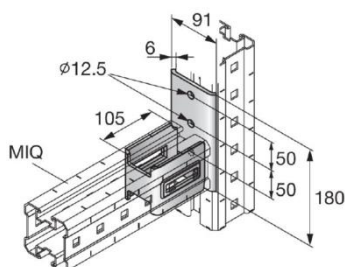
Software:

- Ansys 16.0
- Microsoft Excel

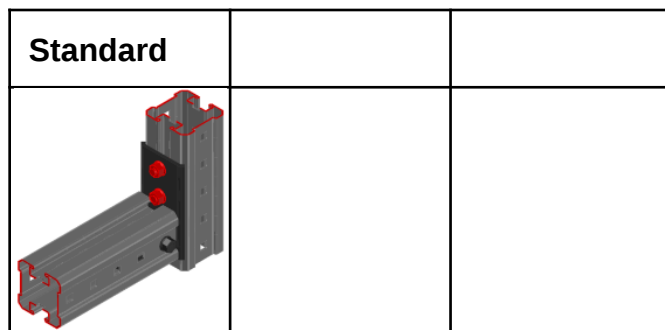
Environmental conditions:

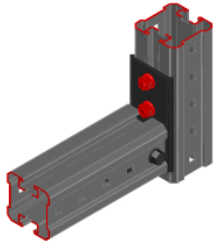
- static loads
- no fatigue loads

Simplified drawing:

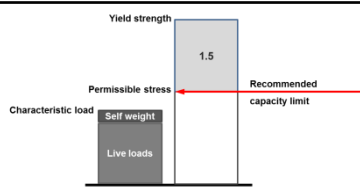


MIQC-90-HS angle connector



Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all connectivity material 1x MIQC-90-HS 2123880	Connector used for fixing H-MIQ girder on grooved section of V-MIQ girder 

Recommended loading capacity - simplified for most common applications

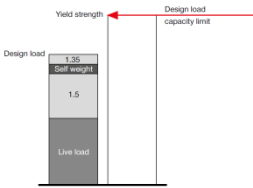
Method	
	

$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
0.7	5.4	+10.2
		-18.7

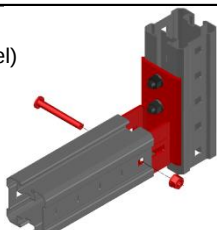
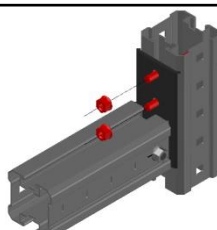
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D

1/2

Method	
	

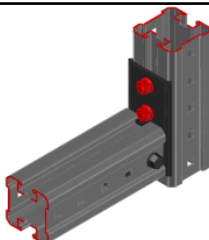
Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-90-H (taken into account bolt on horizontal channel) 	2. 2x Bolt MIA-OH90 on vertical channel 
---	---

MIQC-90-HS angle connector

Conditions of the loading capacity tables:

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

Standard		
		

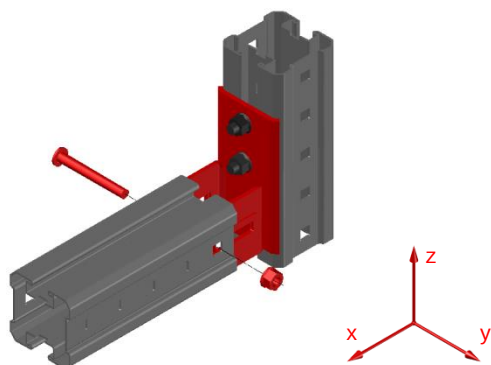
Design loading capacity - 3D

2/2

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 connector MIQC-90-H (taken into account bolt on horizontal channel and welds)

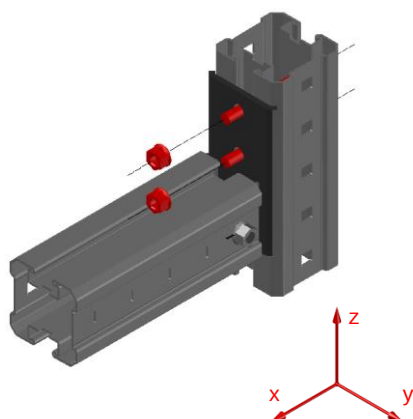


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.06	1.06	8.12	8.12	15.36	33.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.10	1.10	1.57	0.24	0.27	0.27

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. 2x Bolt MIA-OH90 on vertical channel (NOTE: interaction is not necessary)



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
*	*	*	*	28.0	28.0
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.55	0.55	*	*	*	*

* not decisive

MIQC-90-HT angle connector

Designation	Item number
MIQC-90-HT angle connector	2123881

Corrosion protection:

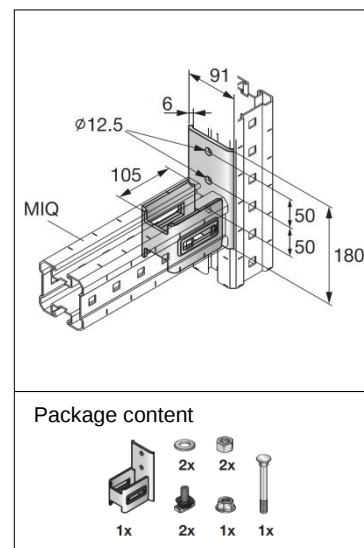
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:

1457.1g connector (1732g incl. accessories)

Submittal text:

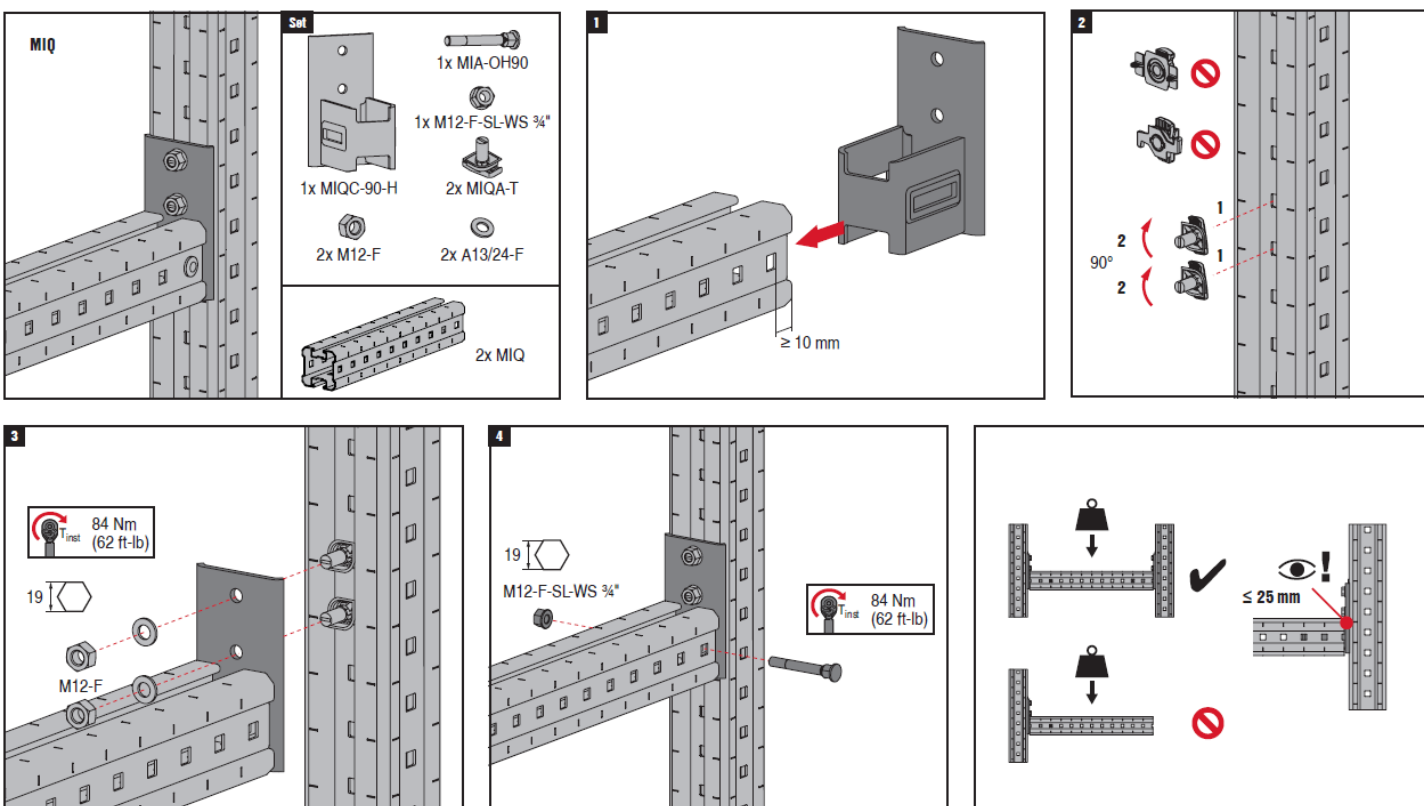
Hilti angle, 90°, MIQ system, MIQC-90-HT, hot dipped galvanized, angle typically used for connection of two perpendicular Hilti MIQ girders, angle connector with two hole base plate fitted for connection in groove of other MIQ girder with two t-bolts and self locking nuts (both included in the pack). The connected girder is slid onto connection interface of the angle and through bolted by 1 piece of MIA-OH and self locking nut (both included in the pack) in the first hole closest to the end of the girder, material weight 1732 grams incl. all connectivity material.



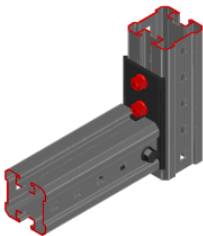
Material properties:

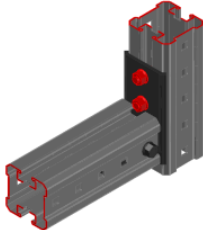
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

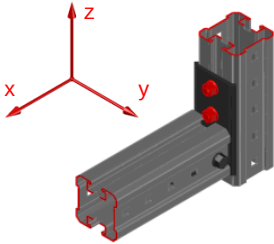
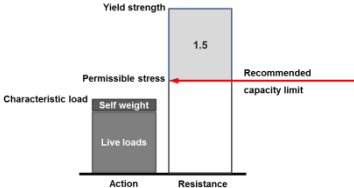
Instruction For Use:

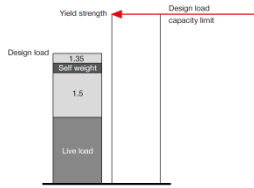
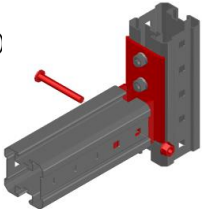
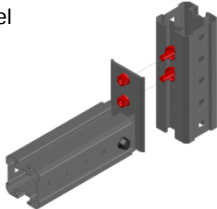


MIQC-90-HT angle connector

Possible loading cases		
Standard		
		

Loading case: Standard		Combinations covered by loading case
BOM: Angle incl. all connectivity material 1x MIQC-90-HT 2123881		Connector used for fixing H-MIQ girder on grooved section of V-MIQ girder 

Recommended loading capacity - simplified for most common applications								
Method								
	<table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>0.7</td><td>5.4</td><td>-12.4 +10.2</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.		$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	0.7	5.4	-12.4 +10.2
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]						
0.7	5.4	-12.4 +10.2						

Design loading capacity - 3D		1/2
Method		
		
Limiting components of capacity evaluated in following tables:		
1. Steel connector MIQC-90-H (taken into account bolt on horizontal channel)		
2. HT set with 2x MIQA-T on vertical channel		
		

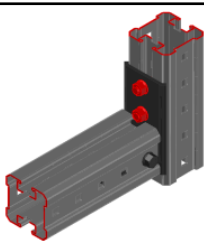
MIQC-90-HT angle connector

Conditions of the loading capacity tables:

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

Possible loading cases

Standard



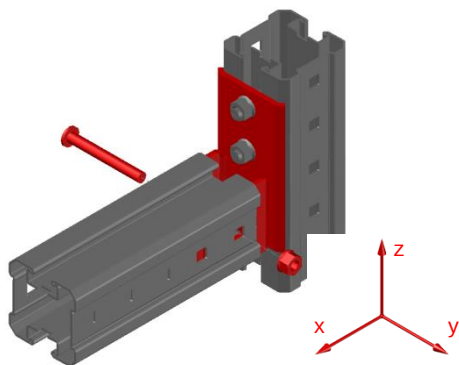
Design loading capacity - 3D

2/2

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 connector MIQC-90-H (taken into account bolt on horizontal channel and welds)

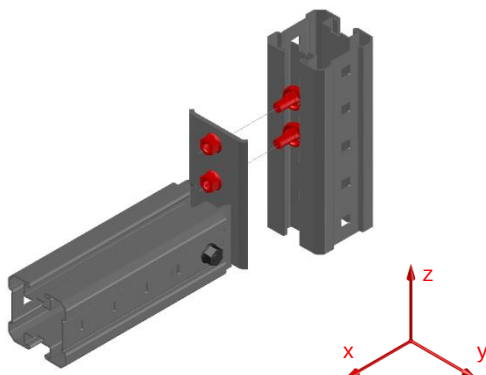


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.06	1.06	8.12	8.12	15.36	33.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.10	1.10	1.57	0.24	0.27	0.27

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. HT set with 2x MIQA-T on vertical channel (NOTE: interaction is not necessary)



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
*	*	*	*	18.58	18.58
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
*	*	*	*	*	*

MIQC-90-HT-V angle connector

Designation	Item number
MIQC-90-HT-V angle connector	2134818

Corrosion protection:

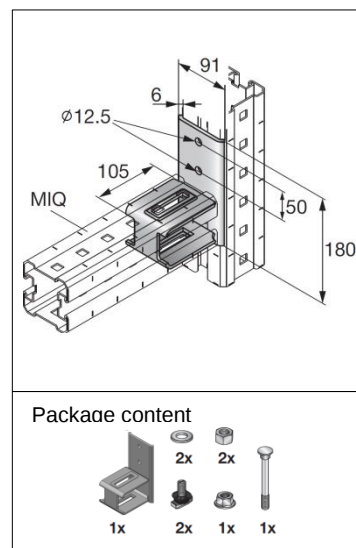
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:

1730g

Submittal text:

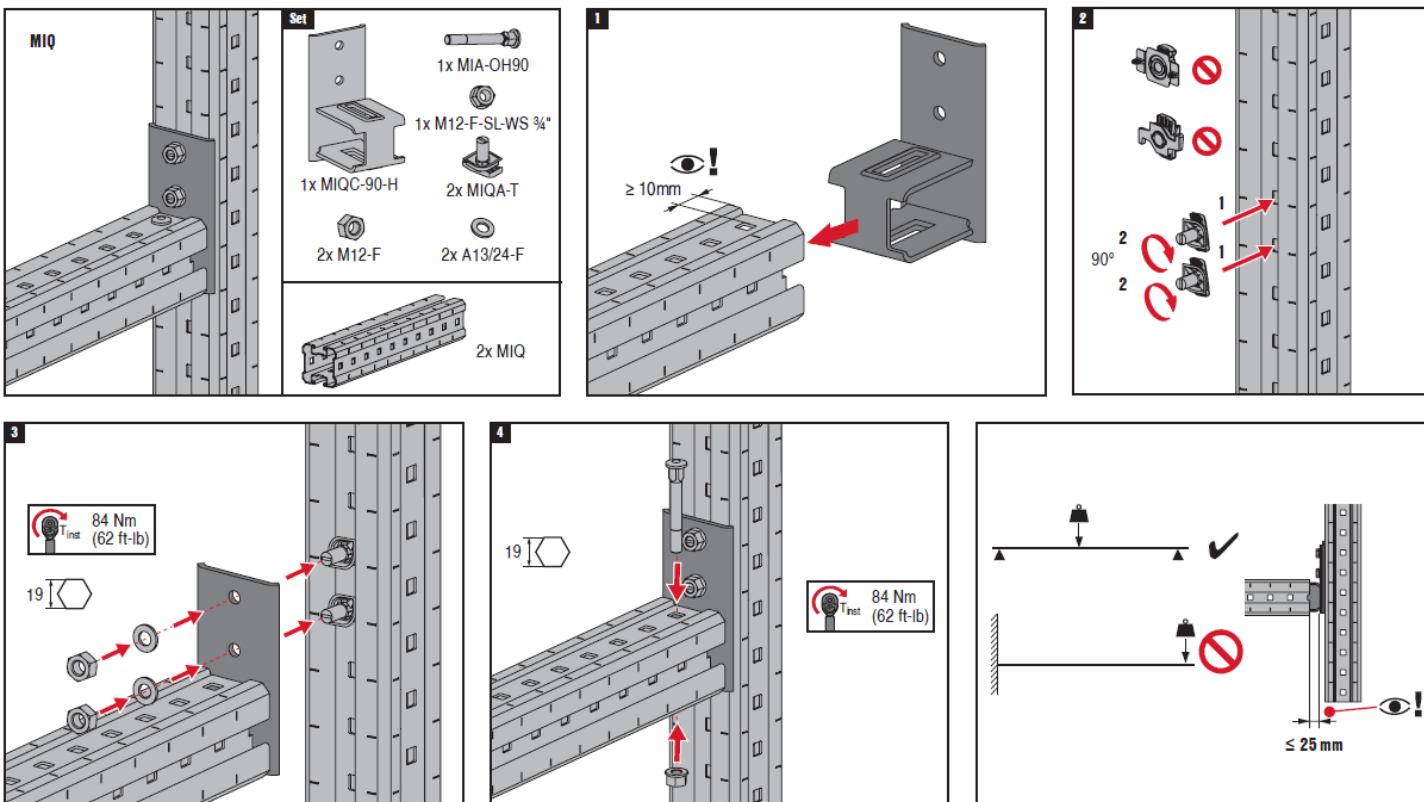
Hilti angle, 90°, MIQ system, MIQC-90-HT-V, hot dipped galvanized, angle typically used for connection of two perpendicular Hilti MIQ girders, angle connector with two hole base plate fitted for connection in groove of other MIQ girder with two t-bolts and self locking nuts (both included in the pack). The connected girder is slid onto connection interface of the angle and through bolted by 1 piece of MIA-OH and self locking nut (both included in the pack) in the first hole closest to the end of the girder, material weight 1732 grams incl. all connectivity material.



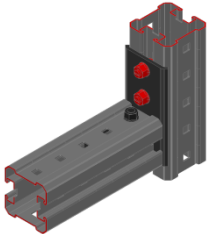
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{\text{N}}{\text{mm}^2}$	$f_u = 360 \frac{\text{N}}{\text{mm}^2}$	$E = 210000 \frac{\text{N}}{\text{mm}^2}$	$G = 80769 \frac{\text{N}}{\text{mm}^2}$

Instruction For Use:



MIQC-90-HT-V angle connector

Possible loading 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

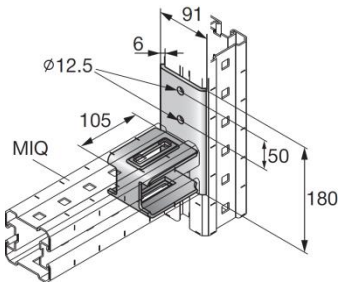
Software:

- Ansys 16.0
- Microsoft Excel

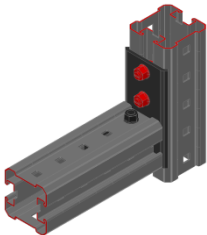
Environmental conditions:

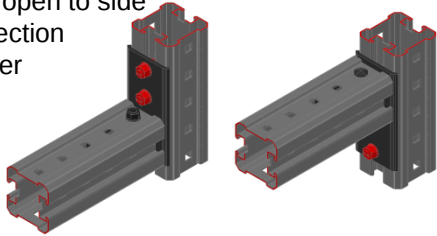
- static loads
- no fatigue loads

Simplified drawing:

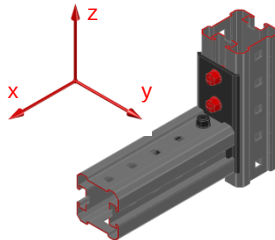
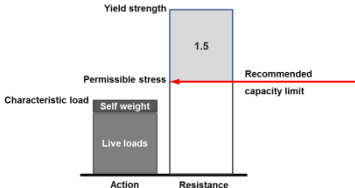


MIQC-90-HT-V angle connector

Standard		
		

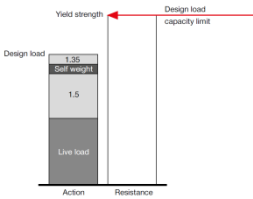
Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all connectivity material MIQC-90-HT-V 2134818	Connector used for fixing H-MIQ girder open to side on grooved section of V-MIQ girder 

Recommended loading capacity - simplified for most common applications

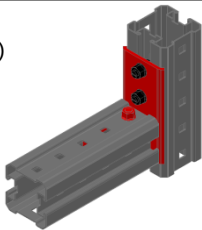
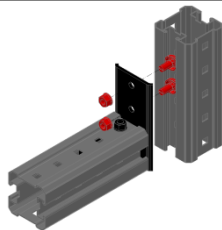
Method							
	<table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>0.7</td><td>5.5</td><td>5.4</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	0.7	5.5	5.4
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]					
0.7	5.5	5.4					

Design loading capacity - 3D

1/2

Method	
	

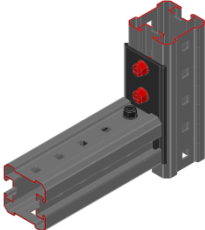
Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-90-HT-V (taken into account bolt on horizontal channel) 	2. set with 2x MIQA-T on vertical channel 
--	---

MIQC-90-HT-V angle connector

Conditions of the loading capacity tables:

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

Standard		
		

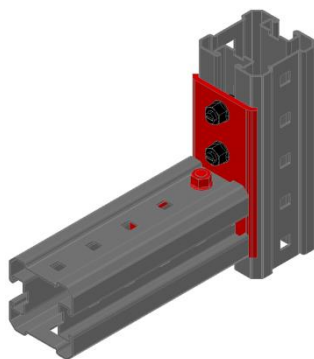
Design loading capacity - 3D

2/2

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 connector MIQC-90-HT-V (taken into account bolt on horizontal channel)

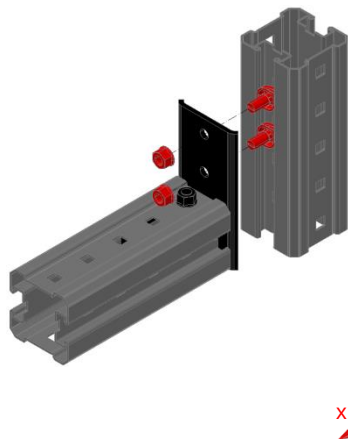


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.06	1.06	8.25	8.25	8.13	8.13
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.10	1.10	0.22	0.12	0.24	0.24

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. Set with 2x MIQA-T on vertical channel (NOTE: interaction is not necessary)



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
*	*	*	*	18.58	18.58
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
*	*	*	*	*	*

* not decisive

MIQC-90-L angle connector

Designation	Item number
MIQC-90-L angle connector	2119868

Corrosion protection:

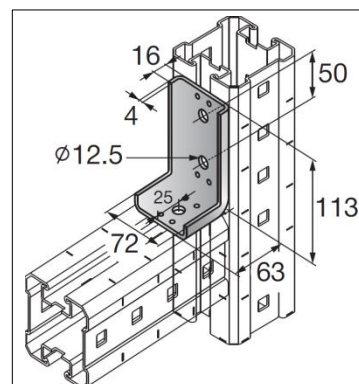
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:

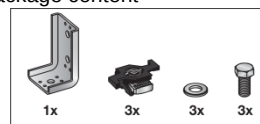
450g connector (648g incl. accessories)

Submittal text:

Hilti angle, 90°, MIQ system, MIQC-90-L, Hot dipped galvanized, angle typically used for connection of two perpendicular Hilti MIQ girders, angle connector with two hole base plate fitted for connection in groove of other MIQ girder with two wing nuts, washers and self locking nuts (both included in the pack) on one side and with one hole fixed the same way on the other side, material weight 648 grams incl. all connectivity material.



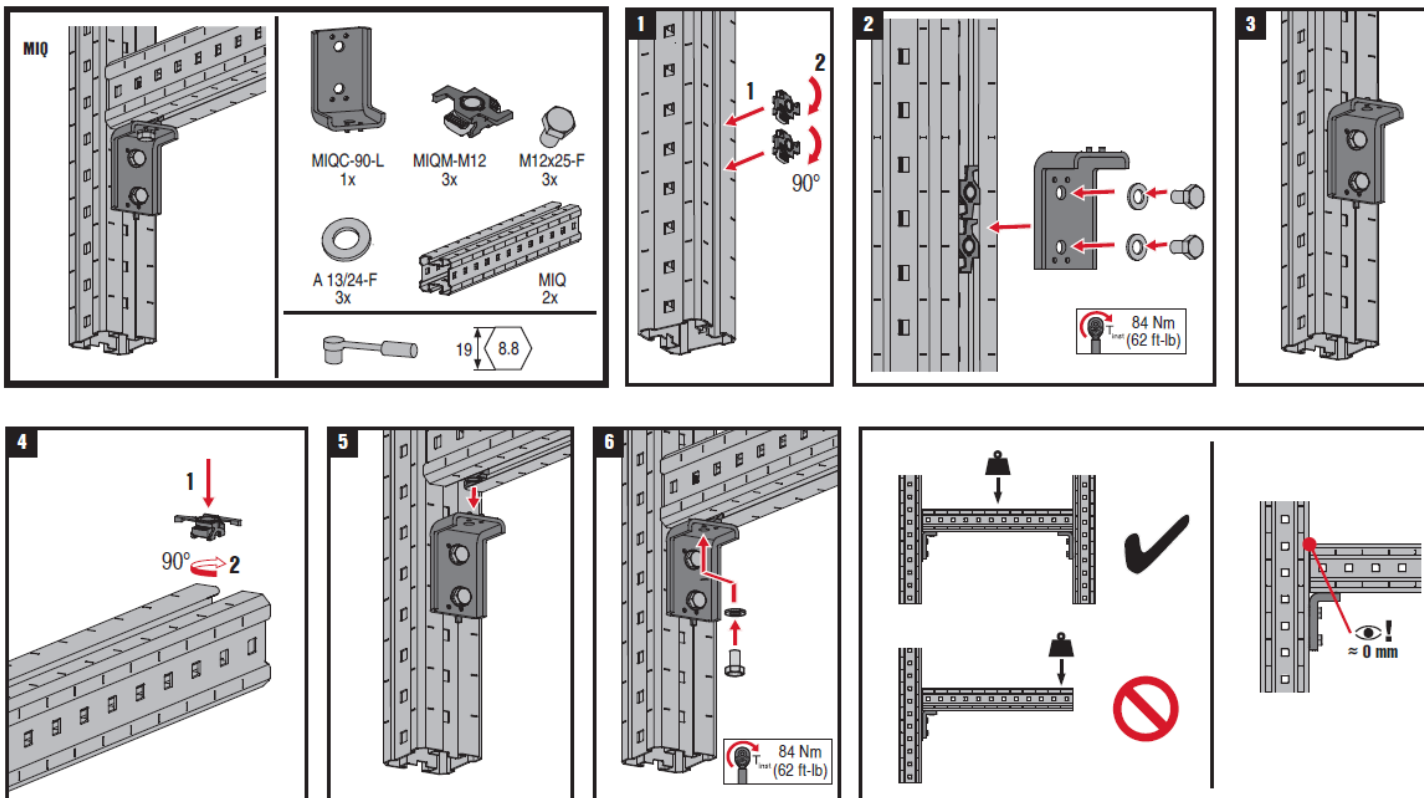
Package content



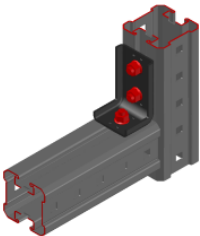
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{\text{N}}{\text{mm}^2}$	$f_u = 360 \frac{\text{N}}{\text{mm}^2}$	$E = 210000 \frac{\text{N}}{\text{mm}^2}$	$G = 80769 \frac{\text{N}}{\text{mm}^2}$

Instruction For Use:



MIQC-90-L angle connector

Possible loading 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

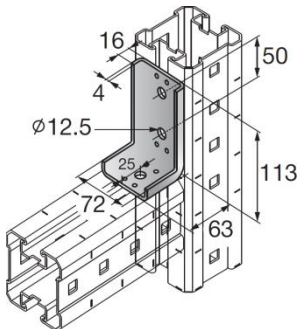
Software:

- Ansys 16.0
- Microsoft Excel

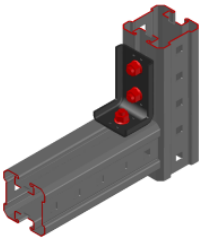
Environmental conditions:

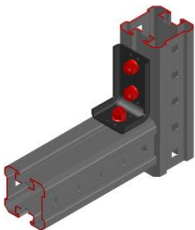
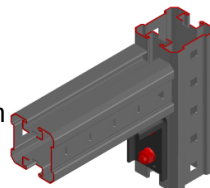
- static loads
- no fatigue loads

Simplified drawing:

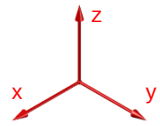
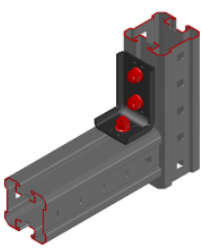
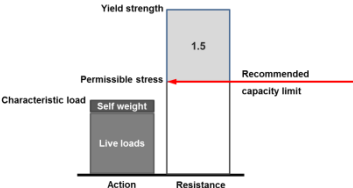


MIQC-90-L angle connector

Possible loading cases		
Standard		
		

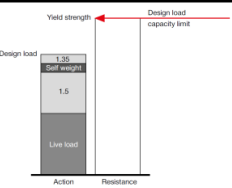
Loading case: Standard	Combinations covered by loading case	
BOM: Angle incl. all connectivity material 1x MIQC-90-L 2119868	Connector used for fixing H-MIQ girder on grooved section of V-MIQ girder from top 	Connector used for fixing H-MIQ girder on grooved section of V-MIQ girder from bottom 

Recommended loading capacity - simplified for most common applications

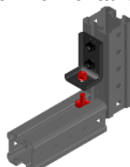
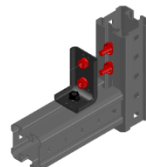
Method	<table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>3.5</td><td>3.5</td><td>6.2</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.			$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	3.5	3.5	6.2
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]							
3.5	3.5	6.2							
									

Design loading capacity - 3D

1/2

Method			
			

Limiting components of capacity evaluated in following tables:

1. Steel connector angle MIQC-90-L 	2. Wing nut on horizontal channel 	3. Wing nuts on vertical channel 
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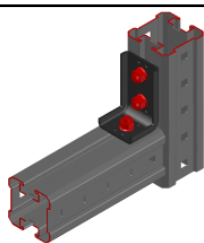
MIQC-90-L angle connector

Conditions of the loading capacity tables:

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

Possible loading cases

Standard



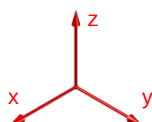
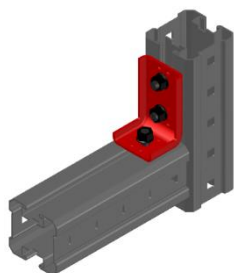
Design loading capacity - 3D

2/2

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 connector angle MIQC-90-L

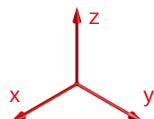
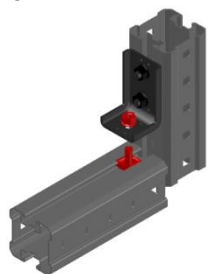


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
10.72	14.85	5.75	5.75	14.07	9.32
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.3	0.3	0.19	0.18	0.08	0.08

Interaction:

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

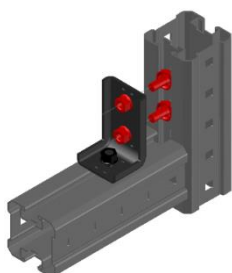
2. Wing nut on horizontal channel (Note: Interaction is not necessary.)



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
5.21	5.21	5.20	5.20	*	12.89
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
*	*	*	*	*	*

* not decisive

3. Wing nuts on vertical channel (Note: Interaction is not necessary.)



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
6.52	*	*	*	9.93	9.93
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
*	*	*	*	*	*

* not decisive

MIQC-90-MI angle connector

Designation	Item number
MIQC-90-MI angle connector	2140257

Corrosion protection:

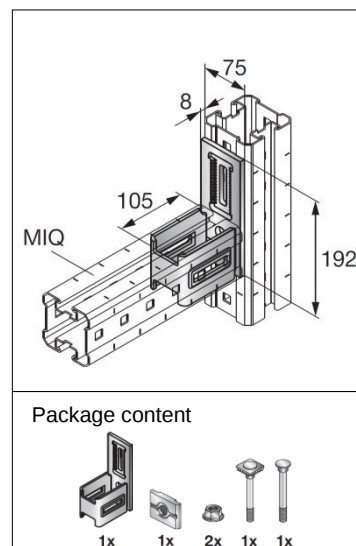
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:

2060 g

Submittal text:

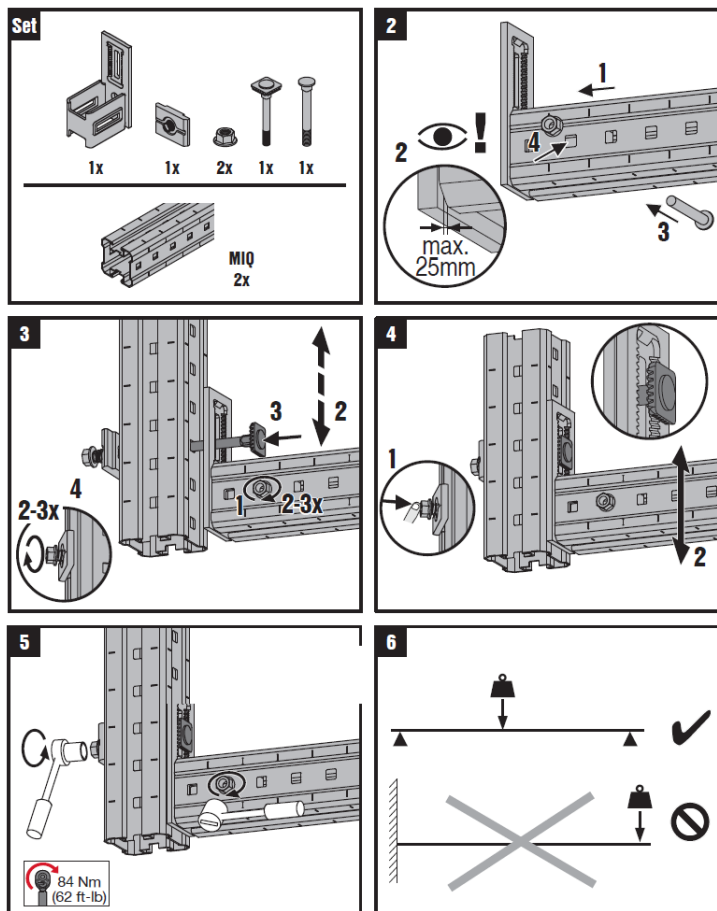
Hilti angle, 90°, MIQ system, MIQC-90-MI, Hot dipped galvanized, angle typically used for connection of one MIQ and one MI perpendicular girders, angle connector with oblong serrated holed base plate fitted for connection on MI girder with MIA-EH easy hand screw, back plate and self locking nut (all included in the pack) on one side and the other side of the angle is shaped to accommodate MIQ girder, material weight 2060 grams incl. all connectivity material.



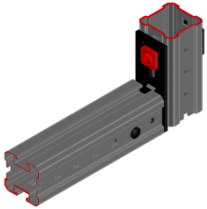
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



MIQC-90-MI angle connector

Possible loading 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

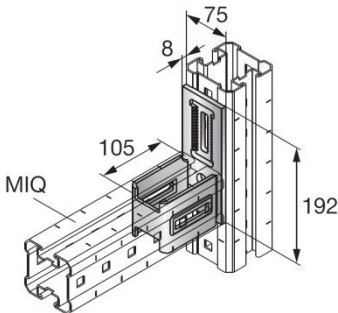
Software:

- Ansys 16.0
- Microsoft Excel
- Mathcad 15

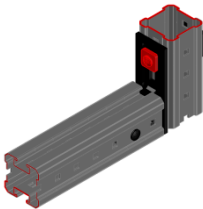
Environmental conditions:

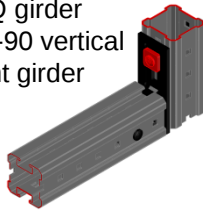
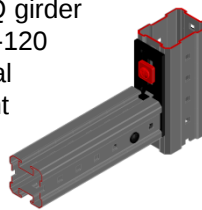
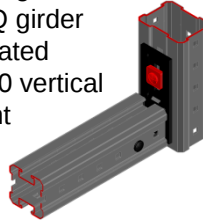
- static loads
- no fatigue loads

Simplified drawing:

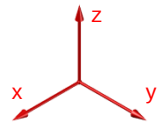
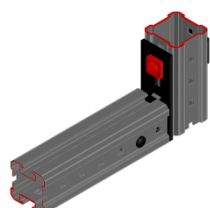


MIQC-90-MI angle connector

Possible loading cases		
Standard		
		

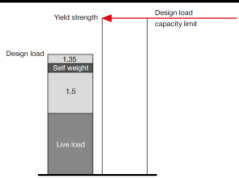
Loading case: Standard		Combinations covered by loading case		
BOM: Angle incl. all connectivity material 1x MIQC-90-MI 2140257 For fixation on MI-120 1x MIQC-90-MI 2140257 1x MIA-EH120 304888 The MIA-EH90 remain unused		Connector used for fixing H-MIQ girder on MI-90 vertical upright girder 	Connector used for fixing H-MIQ girder on MI-120 vertical upright girder 	Connector used for fixing H-MIQ girder on rotated MI-120 vertical upright girder 

Recommended loading capacity - simplified for most common applications

Method													
	<table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$+F_{z,rec.}$ [kN]</th></tr><tr><td>0.7</td><td>5.0</td><td>10.2</td></tr><tr><td></td><td></td><td>$-F_{z,rec.}$ [kN]</td></tr><tr><td></td><td></td><td>12.0</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$+F_{z,rec.}$ [kN]	0.7	5.0	10.2			$-F_{z,rec.}$ [kN]			12.0
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$+F_{z,rec.}$ [kN]											
0.7	5.0	10.2											
		$-F_{z,rec.}$ [kN]											
		12.0											

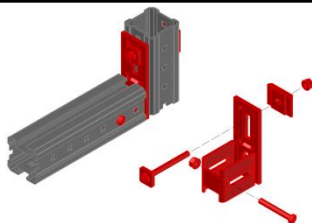
Design loading capacity - 3D

1/2

Method	
	

Limiting components of capacity evaluated in following tables:

1. Steel connector angle MIQC-90-MI incl. bolts, welds



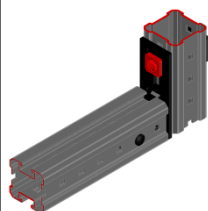
MIQC-90-MI angle connector

Conditions of the loading capacity tables:

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

Possible loading cases

Standard



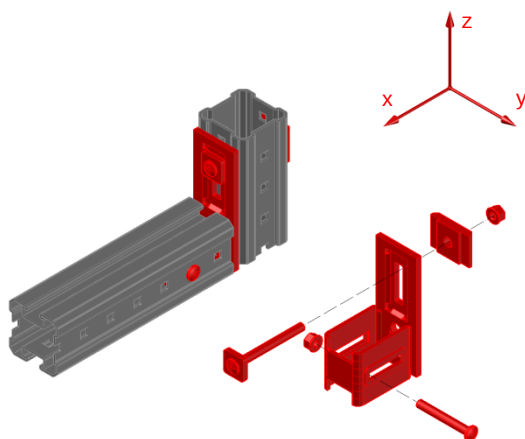
Design loading capacity - 3D

2/2

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 connector angle MIQC-90-MI incl. bolts, welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.06	1.06	7.50	7.50	15.30	18.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.90	0.90	0.00	0.00	0.00	0.00

Interaction:

Interaction for +Fz if FyEd ≤ 0.6 kN and Mx ≤ 0.07 kNm:

$$\frac{F_{xEd}}{F_{xRd}} + \frac{F_{yEd}}{F_{yRd}} + \frac{F_{zEd}}{F_{zRd}} + \frac{M_{xEd}}{M_{xRd}} \leq 1$$

Interaction for +Fz if FyEd > 0.6 kN and Mx > 0.07 kNm:

$$\frac{F_{xEd}}{F_{xRd}} + \frac{F_{yEd}}{F_{yRd}} + \frac{F_{zEd}}{\frac{F_{zRd}}{1.672}} + \frac{M_{xEd}}{M_{xRd}} \leq 1$$

Interaction for -Fz:

$$\frac{F_{xEd}}{F_{xRd}} + \frac{F_{yEd}}{F_{yRd}} + \frac{|-F_{zEd}|}{|-F_{zRd}|} + \frac{M_{xEd}}{M_{xRd}} \leq 1$$

MIQC-90-MI-V angle connector

Designation	Item number
MIQC-90-MI-V angle connector	2140258

Corrosion protection:

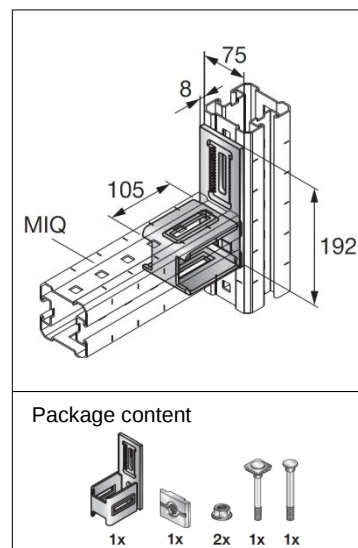
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:

2060 g

Submittal text:

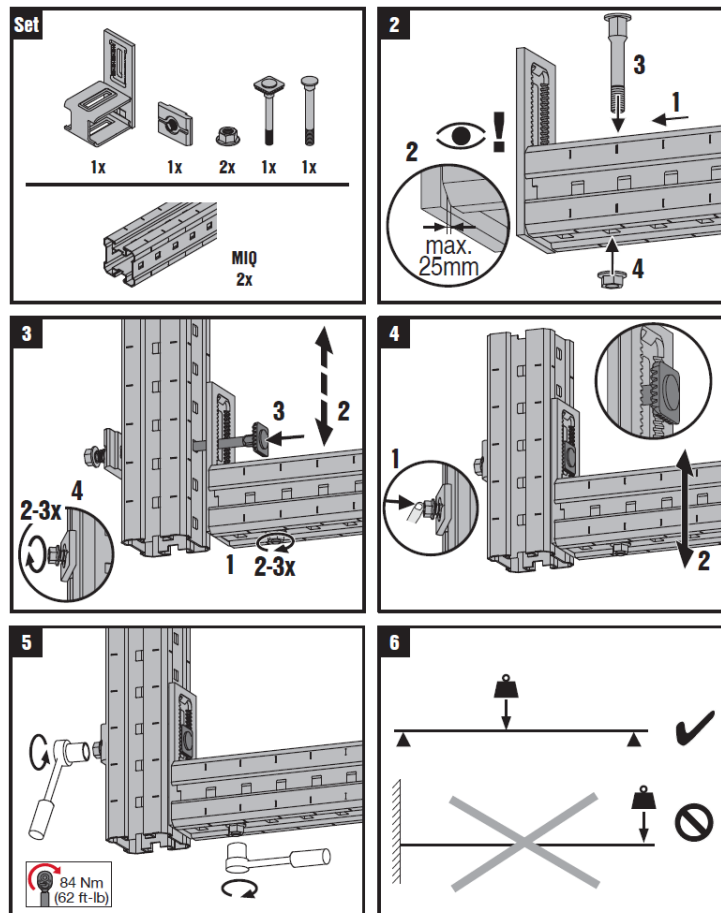
Hilti angle, 90°, MIQ system, MIQC-90-MI-V, Hot dipped galvanized, angle typically used for connection of one MIQ and one MI perpendicular girders, angle connector with oblong serrated holed base plate fitted for connection on MI girder with MIA-EH easy hand screw, back plate and self locking nut (all included in the pack) on one side and the other side of the angle is shaped to accommodate rotated MIQ girder, material weight 2060 grams incl. all connectivity material.



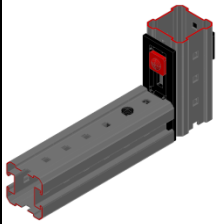
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



MIQC-90-MI-V angle connector

Possible loading 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

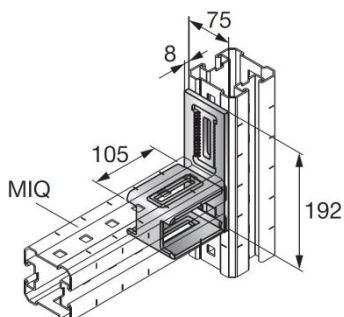
Software:

- Ansys 16.0
- Microsoft Excel
- Mathcad 15

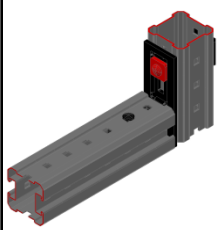
Environmental conditions:

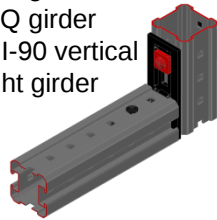
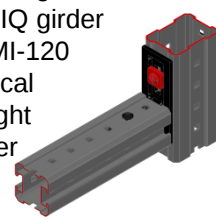
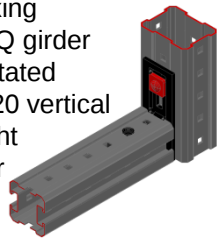
- static loads
- no fatigue loads

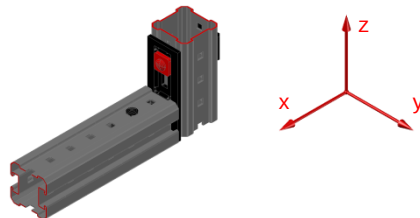
Simplified drawing:

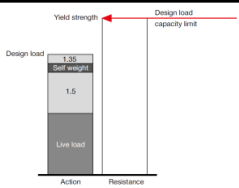


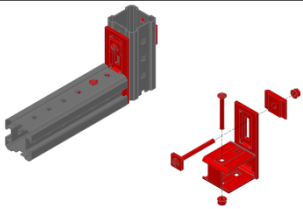
MIQC-90-MI-V angle connector

Possible loading cases		
Standard		
		

Loading case: Standard		Combinations covered by loading case		
BOM: Angle incl. all connectivity material 1x MIQC-90-MI-V 2140258 For fixation on MI-120 1x MIQC-90-MI-V 2140258 1x MIA-EH120 304888 The MIA-EH90 remain unused		Connector used for fixing H-MIQ girder on MI-90 vertical upright girder 	Connector used for fixing H-MIQ girder on MI-120 vertical upright girder 	Connector used for fixing H-MIQ girder on rotated MI-120 vertical upright girder 

Recommended loading capacity - simplified for most common applications							
Method							
	 <table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>0.70</td><td>9.00</td><td>5.40</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	0.70	9.00	5.40
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]					
0.70	9.00	5.40					

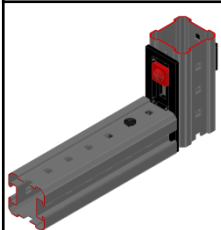
Design loading capacity - 3D		1/2
Method		
		

Limiting components of capacity evaluated in following tables:	
1. Steel connector angle MIQC-90-MI-V incl. bolts, welds 	

MIQC-90-MI-V angle connector

Conditions of the loading capacity tables:

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

Possible loading cases		
Standard		
		

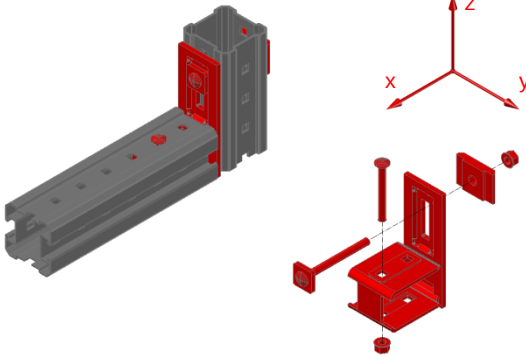
Design loading capacity - 3D

2/2

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 connector angle MIQC-90-MI-V incl. bolts, welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.06	1.06	13.50	13.50	8.10	8.10
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.90	0.90	0.00	0.00	0.00	0.00

Interaction:

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

MIQC-90-E girder extension connector

Designation	Item number
MIQC-90-E girder extension connector	2140259

Corrosion protection:

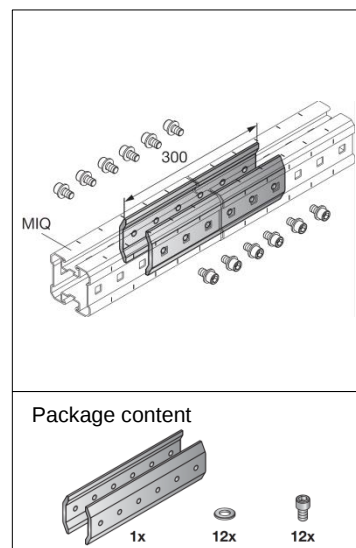
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:

3476 g

Submittal text:

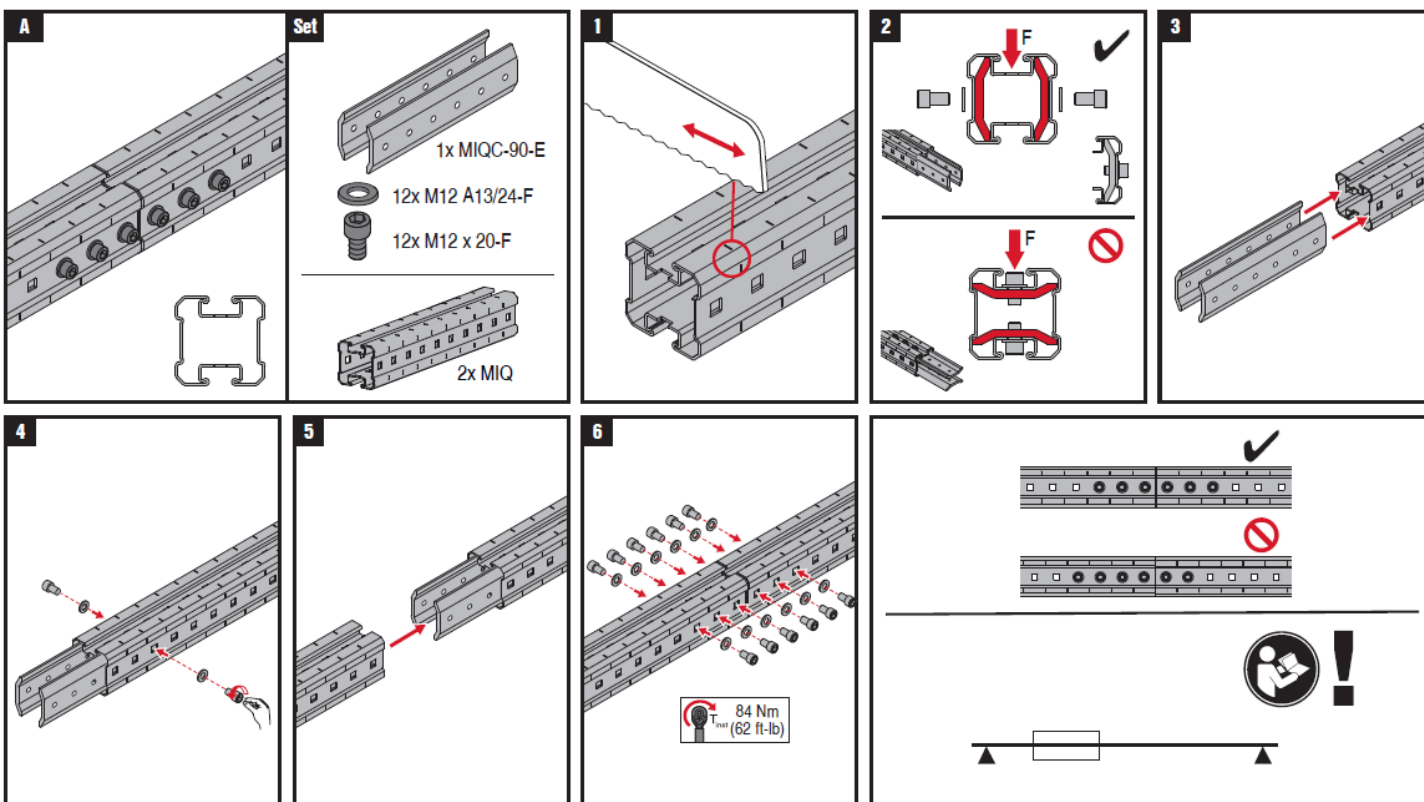
Hilti girder extension connector, MIQ system, MIQC-90-E, Hot dipped galvanized, angle typically used for extension of Hilti MIQ girder, Extension either connected to MI side of the girder or to MIQ groove of the MIQ girder. Both through bolting the girder to inner placed extension with 12 screws and washers (included in the packaging). material weight 3476 grams incl. all connectivity material.



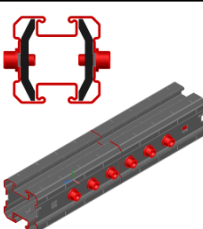
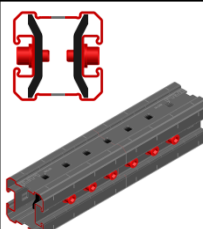
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



MIQC-90-E girder extension connector

Possible loading cases		
Open up	Open to the side	
		

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

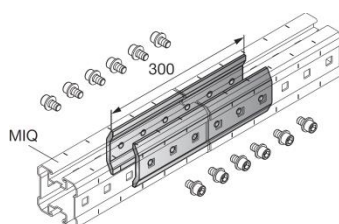
Software:

- Ansys 16.0
- Microsoft Excel

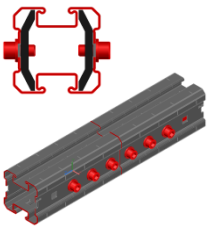
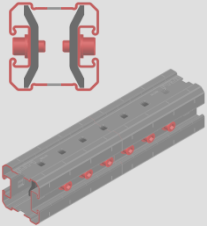
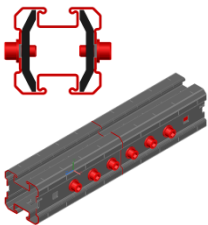
Environmental conditions:

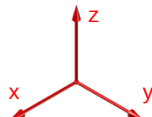
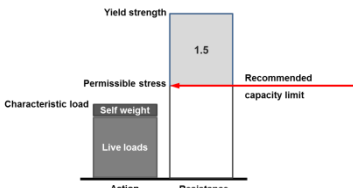
- static loads
- no fatigue loads

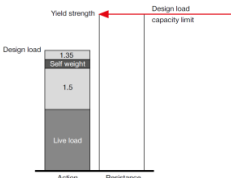
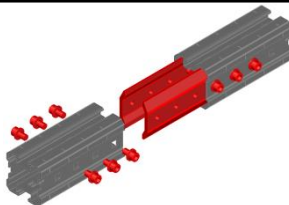
Simplified drawing:



MIQC-90-E girder extension connector

Possible loading cases		
Open up	Open to the side	
		
Loading case: Open up		Combinations covered by loading case
BOM: Angle incl. all connectivity material 1x MIQC-90-E 2140259		

Recommended loading capacity - simplified for most common applications													
Method													
	<table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>34.67</td><td>3.33</td><td>14.67</td></tr><tr><td colspan="3"><table><tr><th>$\pm M_{y,rec.}$ [kNm]</th></tr><tr><td>1.2</td></tr></table></td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.		$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	34.67	3.33	14.67	<table><tr><th>$\pm M_{y,rec.}$ [kNm]</th></tr><tr><td>1.2</td></tr></table>			$\pm M_{y,rec.}$ [kNm]	1.2
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]											
34.67	3.33	14.67											
<table><tr><th>$\pm M_{y,rec.}$ [kNm]</th></tr><tr><td>1.2</td></tr></table>			$\pm M_{y,rec.}$ [kNm]	1.2									
$\pm M_{y,rec.}$ [kNm]													
1.2													

Design loading capacity - 3D		1/2
Method		
		
Limiting components of capacity evaluated in following tables:		
1. Steel connector MIQC-90-E incl. all screws		
		

MIQC-90-E girder extension connector

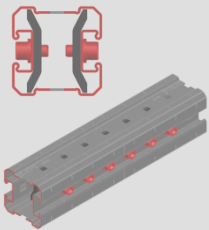
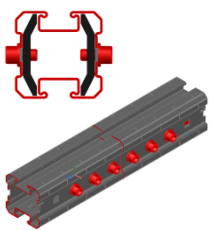
Conditions of the loading capacity tables:

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

Possible loading cases

Open up

Open to the side



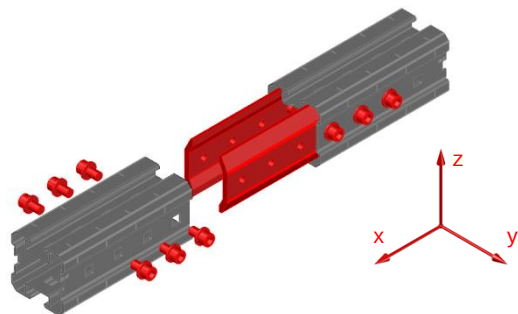
Design loading capacity - 3D

2/2

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 connector MIQC-90-E incl. all screws (MIQ girder open up)

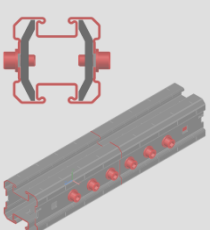
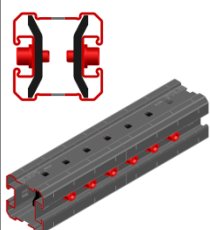
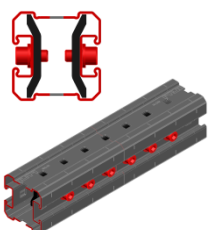


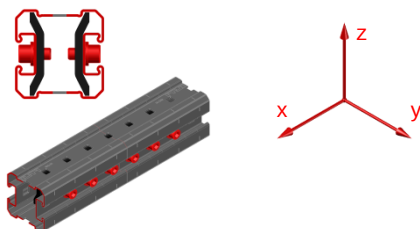
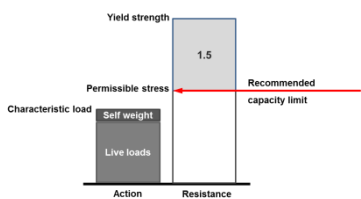
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
52.00	52.00	5.00	5.00	22.00	22.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.80	0.80	1.80	1.80	2.00	2.00

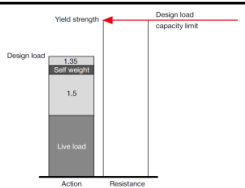
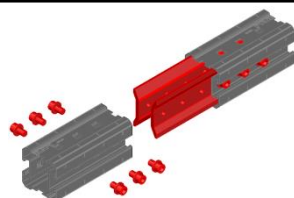
Interaction:

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

MIQC-90-E girder extension connector

Possible loading cases		
Open up	Open to the side	
		
Loading case: Open to the side		Combinations covered by loading case
BOM: Angle incl. all connectivity material 1x MIQC-90-E 2140259		

Recommended loading capacity - simplified for most common applications														
Method														
	<table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>34.67</td><td>5.0</td><td>13.33</td></tr><tr><th colspan="3">$\pm M_{y,rec.}$ [kNm]</th></tr><tr><td colspan="3">1.2</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.		$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	34.67	5.0	13.33	$\pm M_{y,rec.}$ [kNm]			1.2		
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]												
34.67	5.0	13.33												
$\pm M_{y,rec.}$ [kNm]														
1.2														

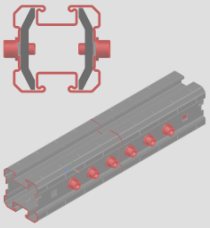
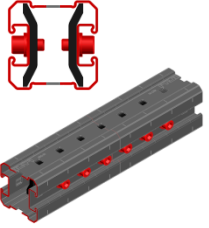
Design loading capacity - 3D		1/2
Method		
		
Limiting components of capacity evaluated in following tables:		
1. Steel connector MIQC-90-E incl. all screws (MIQ girder open to side) 		

MIQC-90-E girder extension connector

Conditions of the loading capacity tables:

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

Possible loading cases

Open up	Open to the side	
		

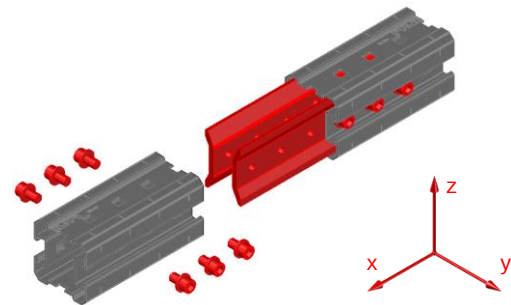
Design loading capacity - 3D

2/2

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 connector MIQC-90-E incl. all screws (MIQ girder open to side)



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
52.00	52.00	7.50	7.50	20.00	20.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.60	0.60	1.80	1.80	1.60	1.60

Interaction:

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

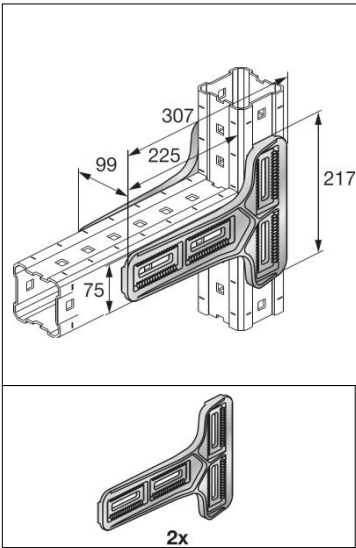
MIC-90-LH Connector

Designation	Item number
MIC-90-LH	2048107

Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:
3800 g

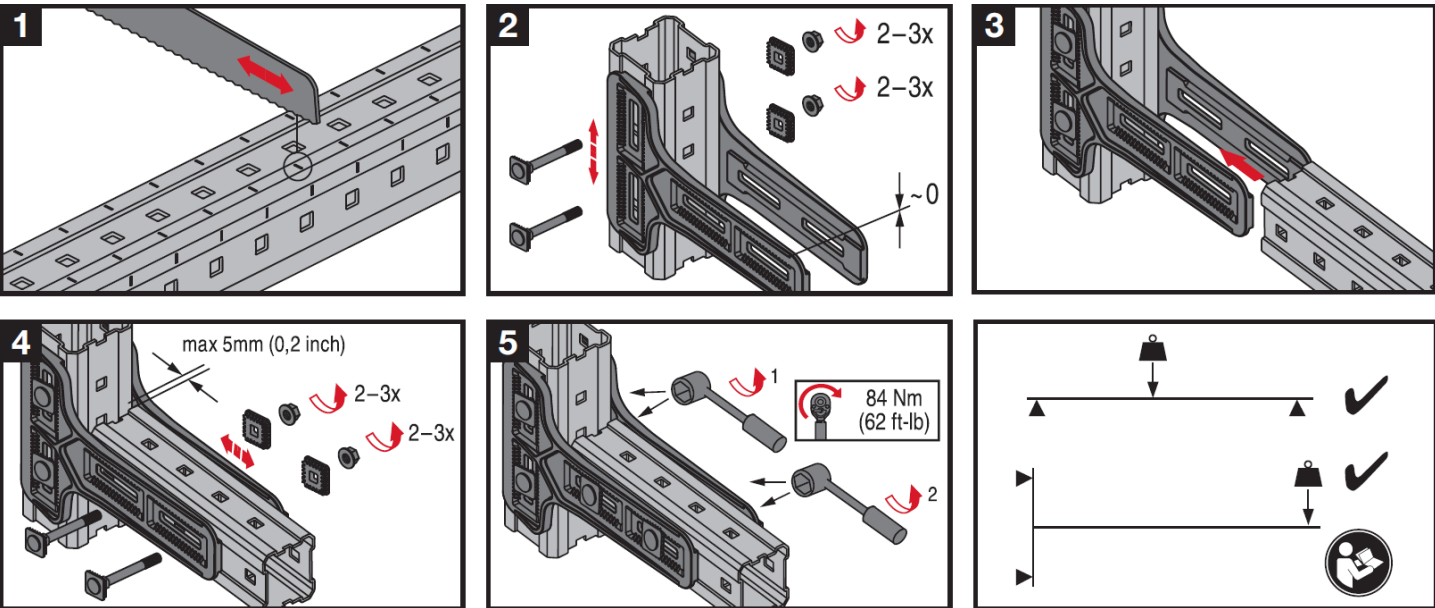
Submittal text:
Hot dipped galvanized, 90° Hilti MI angle connector, typically used for connecting two perpendicular MI or MIQ girders, where the horizontal girder is connected to the side of the vertical girder. Oblong holes enable fine adjustment and are serrated to improve holding and load values. Connector is used on the sides of the girders. Suitable for cantilever applications.



Material properties:

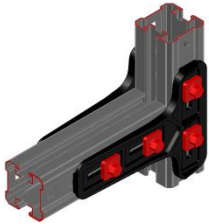
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: C30-1.0528	$F_y = 250 \frac{N}{mm^2}$	$F_u = 480 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Toothed plate: S235 - EN 10250-2	$F_y = 235 \frac{N}{mm^2}$	$F_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



The same assembly principles and torque moments should be applied for MIQ girders

MIC-90-LH Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:

- Analytic calculation

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

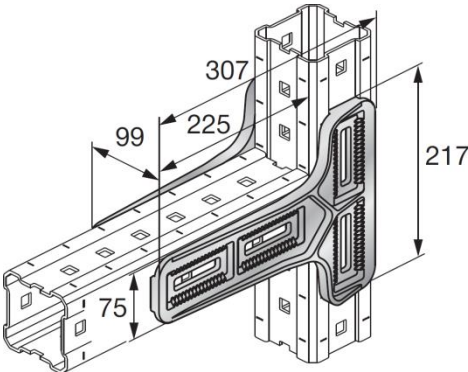
Software:

- Mathcad 15.0
- Microsoft Excel

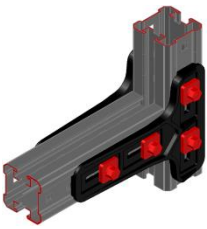
Environmental conditions:

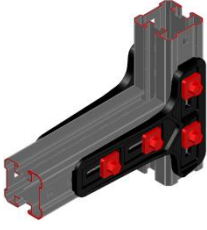
- indoors, outdoors
- static loads
- no fatigue loads

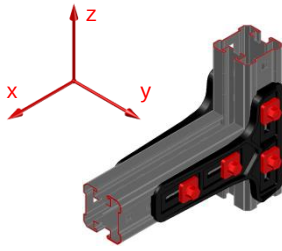
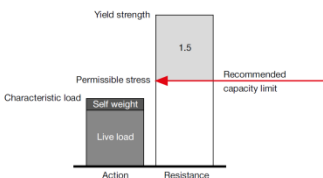
Simplified drawing:

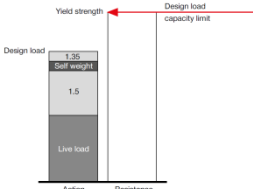
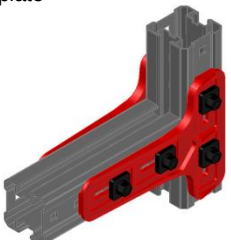
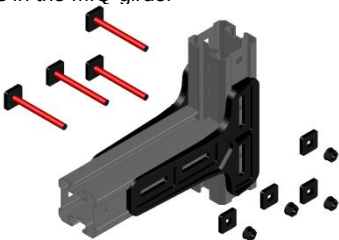
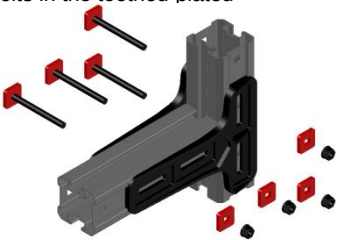


MIC-90-LH Connector

Standard		
		

Loading case: Standard	Combinations covered by loading case
BOM: Angle does not include all components 1x MIC-90-LH connector 2048107 Connectivity material ordered separately 4x MIA-EH90 easy hand screw 304887 4x MIA-TP serrated plate 305707 M12-F-SL-WS ¾" lock nut 382897	Connector used for perpendicular connections of two MIQ-90 girders, to enable a cantilever arm 

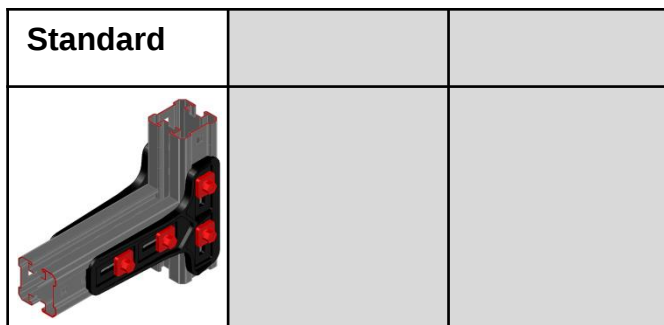
Recommended loading capacity - simplified for most common applications										
Method		<table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>24.4</td><td>9.7</td><td>24.4</td></tr></table> <table><tr><th>$\pm M_{y,rec.}$ [kNm]</th></tr><tr><td>3.83</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	24.4	9.7	24.4	$\pm M_{y,rec.}$ [kNm]	3.83
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]								
24.4	9.7	24.4								
$\pm M_{y,rec.}$ [kNm]										
3.83										
										

Design loading capacity - 3D			1/3
Method			
			
Limiting components of capacity evaluated in following tables:			
1. Connector steel plate 	2. Bolts in the MIQ-girder 	3. Bolts in the toothed plated 	

MIC-90-LH Connector

Conditions of the loading capacity tables:

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



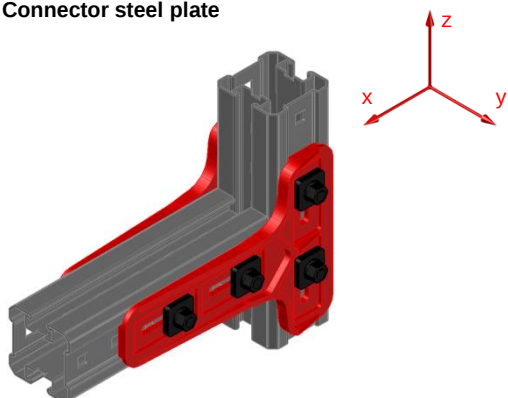
Design loading capacity - 3D

2/3

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.

1. Connector steel plate

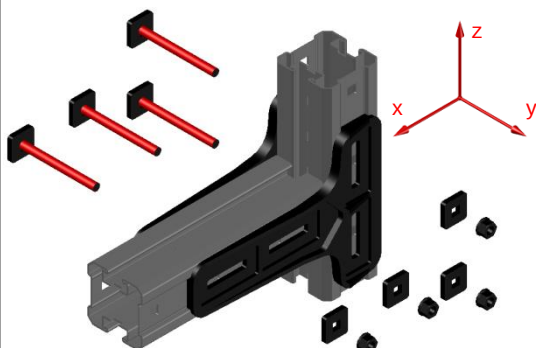


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.0	112.0	14.50	14.50	72.00	72.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.75	1.75	5.75	5.75	1.73	1.73

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. Bolts in the MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	Not decisive	Not decisive	36.64	36.64
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
Not decisive	Not decisive	Not decisive	Not decisive	Not decisive	Not decisive

Interaction:

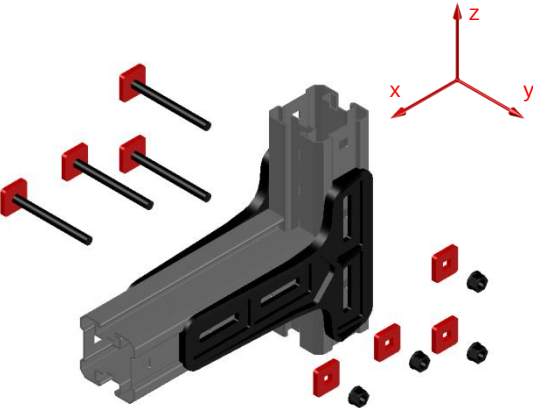
$$\frac{F_{x,Ed}}{F_{x,Rd}} + \frac{F_{z,Ed}}{F_{z,Rd}} \leq 1$$

MIC-90-LH Connector

Design loading capacity - 3D

3/3

3. Bolts in the toothed plated



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
113.0	113.0	Not decisive	Not decisive	113.0	113.0
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
Not decisive	Not decisive	Not decisive	Not decisive	Not decisive	Not decisive

Interaction:

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

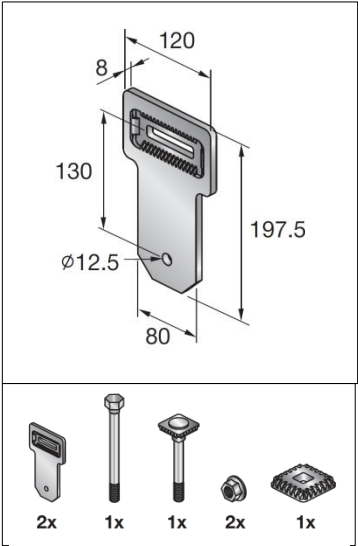
MIC-U-MA Connector

Designation	Item number
MIC-U-MA	304806

Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:
2630 g incl. components

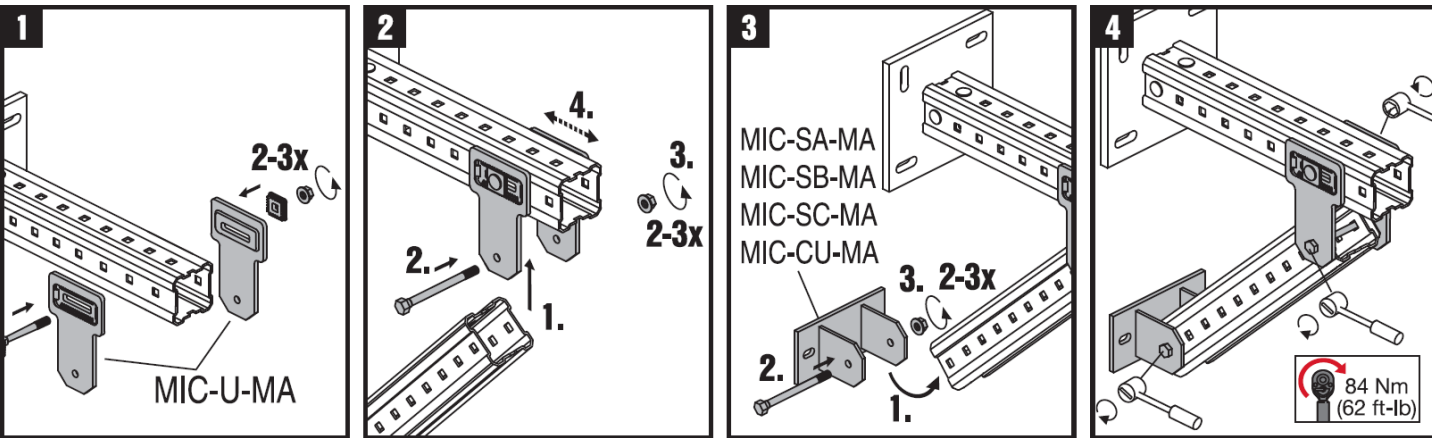
Submittal text:
Hot dipped galvanized Hilti MI connector, typically used for connecting two MI or MIQ girders, where one girder is braced / supported by the other in an angle, to improve total load capacity of the structure. One oblong hole enables fine adjustment and is serrated to improve holding. Connector is used on the sides of the girders.



Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



The same assembly principles and torque moments should be applied for MIQ girders

MIC-U-MA Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:

- Analytic calculation

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

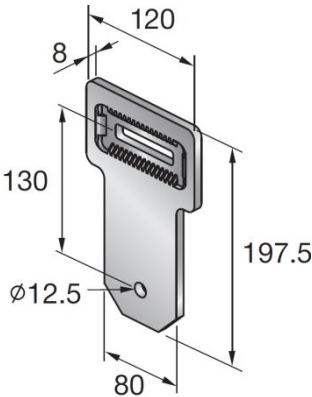
Software:

- Mathcad 15.0
- Microsoft Excel

Environmental conditions:

- indoors, outdoors
- static loads
- no fatigue loads

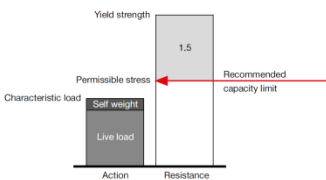
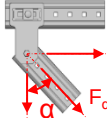
Simplified drawing:

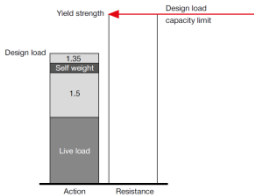
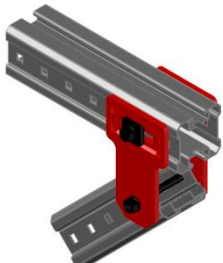
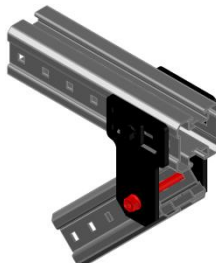


MIC-U-MA Connector

Standard		
		

Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all components 1x MIC-U-MA 304806 	Connector used for an angular connection of two MI-90 Or MIQ-90 girders (bracket brace) 

Recommended loading capacity - simplified for most common applications																				
Method																				
																				
		<table><tr><td></td><td colspan="6">$\pm F_{y,rec.}$ [kN]</td></tr><tr><td colspan="7">1.4</td></tr></table>						$\pm F_{y,rec.}$ [kN]						1.4						
	$\pm F_{y,rec.}$ [kN]																			
1.4																				
		<table><tr><td>α</td><td>0°</td><td>30°</td><td>45°</td><td>60°</td><td>90°</td><td></td></tr><tr><td>$\pm F_{\alpha,rec.}$ [kN]</td><td>18.31</td><td>11.63</td><td>9.77</td><td>8.95</td><td>9.30</td><td></td></tr></table>					α	0°	30°	45°	60°	90°		$\pm F_{\alpha,rec.}$ [kN]	18.31	11.63	9.77	8.95	9.30	
α	0°	30°	45°	60°	90°															
$\pm F_{\alpha,rec.}$ [kN]	18.31	11.63	9.77	8.95	9.30															
		These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.																		

Design loading capacity - 3D		1/3
Method		
		
Limiting components of capacity evaluated in following tables:		
1. Steel connector 	2. Hexagon bolt on MIQ-girder 	3. Easy hand screw on MIQ-girder 

MIC-U-MA Connector

Conditions of the loading capacity tables:

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

Standard		
		

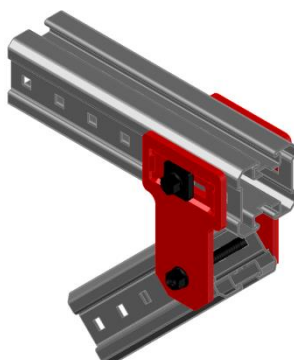
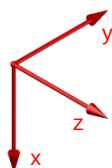
Design loading capacity - 3D

2/3

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.

1. Steel connector

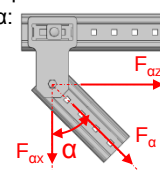


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
40.32	40.32	2.11	2.11	13.96	13.96
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.63	0.63	0.00	0.00	0.00	0.00

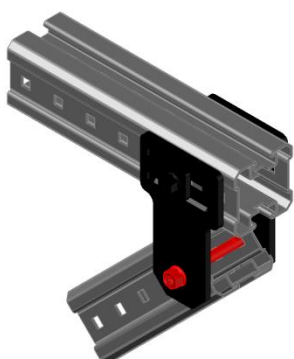
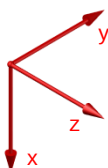
includes cross section resistance of steel plate and contact pressure interaction for a general force F_a with a certain inclination α :

$$F_{\alpha x,Ed} = F_a \cdot \cos \alpha \quad \text{and} \quad F_{\alpha z,Ed} = F_a \cdot \sin \alpha$$

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



2. Hexagon bolt on MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.47	27.47	Not decisive	Not decisive	27.47	27.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.24	1.24	0.00	0.00	0.00	0.00

$$F_{aRd} = F_{xRd} = F_{zRd}$$

includes shear and bending of the bolt, bearing resistance connector plate and channel MIQ-90

The resistance F_{aRd} of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

The normal force F_{aEd} in the inclined strut has to be compared with the resistance value F_{aRd} .

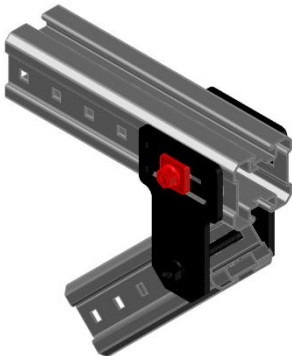
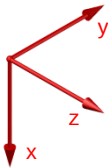
Interaction:

$$\frac{F_{a,Ed}}{F_{a,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} \leq 1$$

MIC-U-MA Connector

Design loading capacity - 3D 3/3

3. 3. Easy hand screw on MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
Not decisive	Not decisive	16.87	16.87	27.40	27.40
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.23	1.23	0.00	0.00	0.00	0.00

includes shear, tension and bending of the bolt, bearing resistance channel MIQ90 and tooth plate

Interaction:

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

MIQC-C90-U base material connector

Designation	Item number
MIQC-C90-U base material connector	2134819

Corrosion protection:

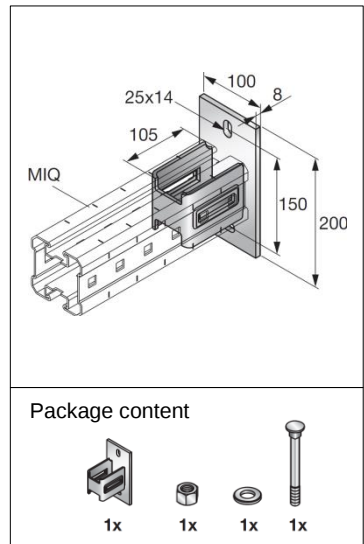
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:

2015 g

Submittal text:

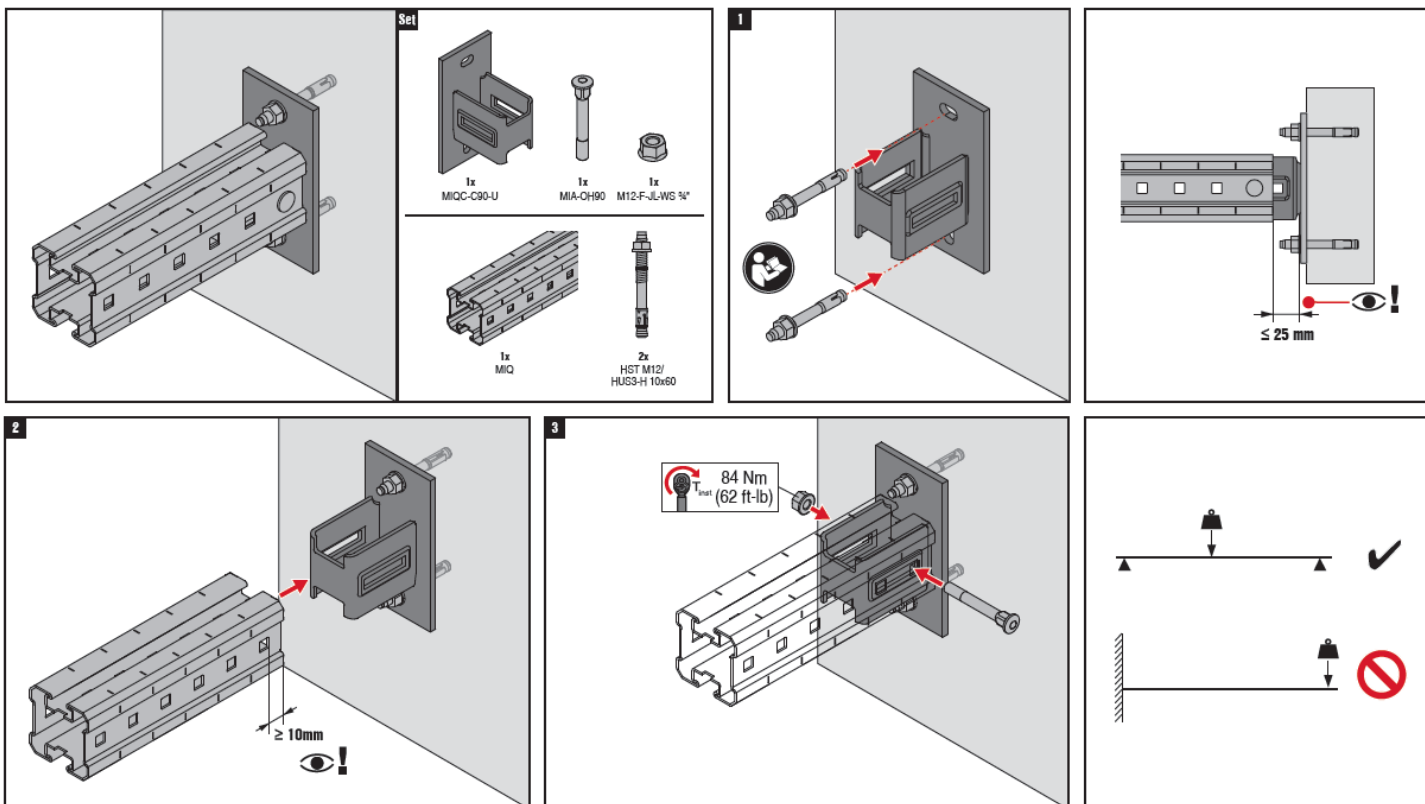
Hilti angle, 90°, MIQ system, MIQC-C90-U, Hot dipped galvanized, concrete base material connector typically used for perpendicular of perpendicular Hilti MIQ girder to concrete, base plate with two holes fitting to two M12 sized anchors. Connection part accommodating MIQ girder through bolted by MIA-OH90 screw with washer and lock nut (included in the pack) material weight 2015 grams incl. all connectivity material.



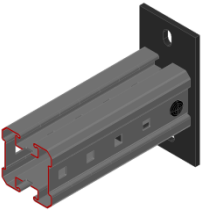
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{\text{N}}{\text{mm}^2}$	$f_u = 360 \frac{\text{N}}{\text{mm}^2}$	$E = 210000 \frac{\text{N}}{\text{mm}^2}$	$G = 80769 \frac{\text{N}}{\text{mm}^2}$

Instruction For Use:



MIQC-C90-U base material connector

Possible loading 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:

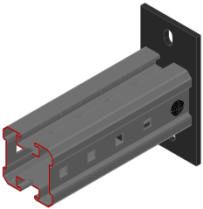
- Ansys 16.0
- Microsoft Excel

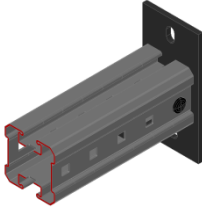
Environmental conditions:

- static loads
- no fatigue loads

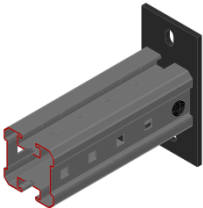
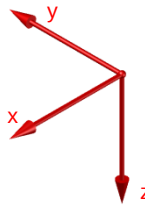
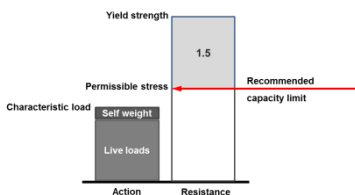
Simplified drawing:

MIQC-C90-U base material connector

Possible loading cases		
Standard		
		

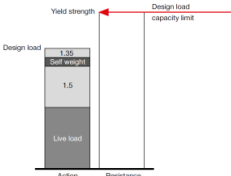
Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all connectivity material 1x MIQC-C90-U base material connector 2134819	Connector used for fixing perpendicular MIQ girder on base material- concrete 

Recommended loading capacity - simplified for most common applications

Method	 								
	<table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>0.71</td><td>5.43</td><td>20.17</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.			$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	0.71	5.43	20.17
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]							
0.71	5.43	20.17							

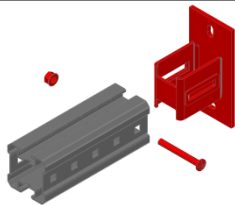
Design loading capacity - 3D

1/2

Method	
	

Limiting components of capacity evaluated in following tables:

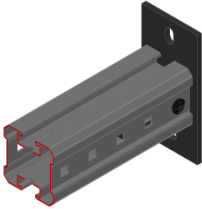
1. Steel connector MIQC-C90-U



MIQC-C90-U base material connector

Conditions of the loading capacity tables:

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

Possible loading cases		
Standard		
		

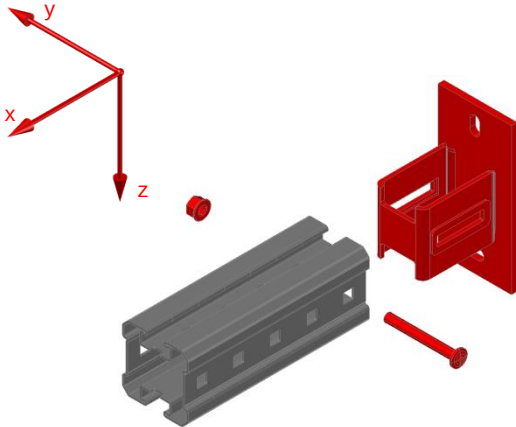
Design loading capacity - 3D

2/2

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 connector angle MIQC-90-L



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.06	1.06	8.14	8.14	30.25	30.25
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.90	0.90	0.56*	1.56*	0.24*	0.24*

* the bending resistances are only valid with installation tolerance almost 0 mm

Interaction:

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

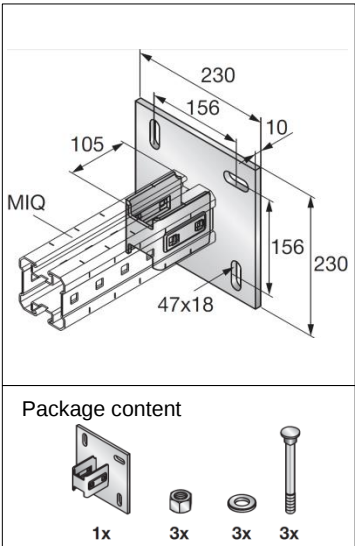
MIQC-C90 base material connector

Designation	Item number
MIQC-C90 base material connector	2120144

Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 micr ons

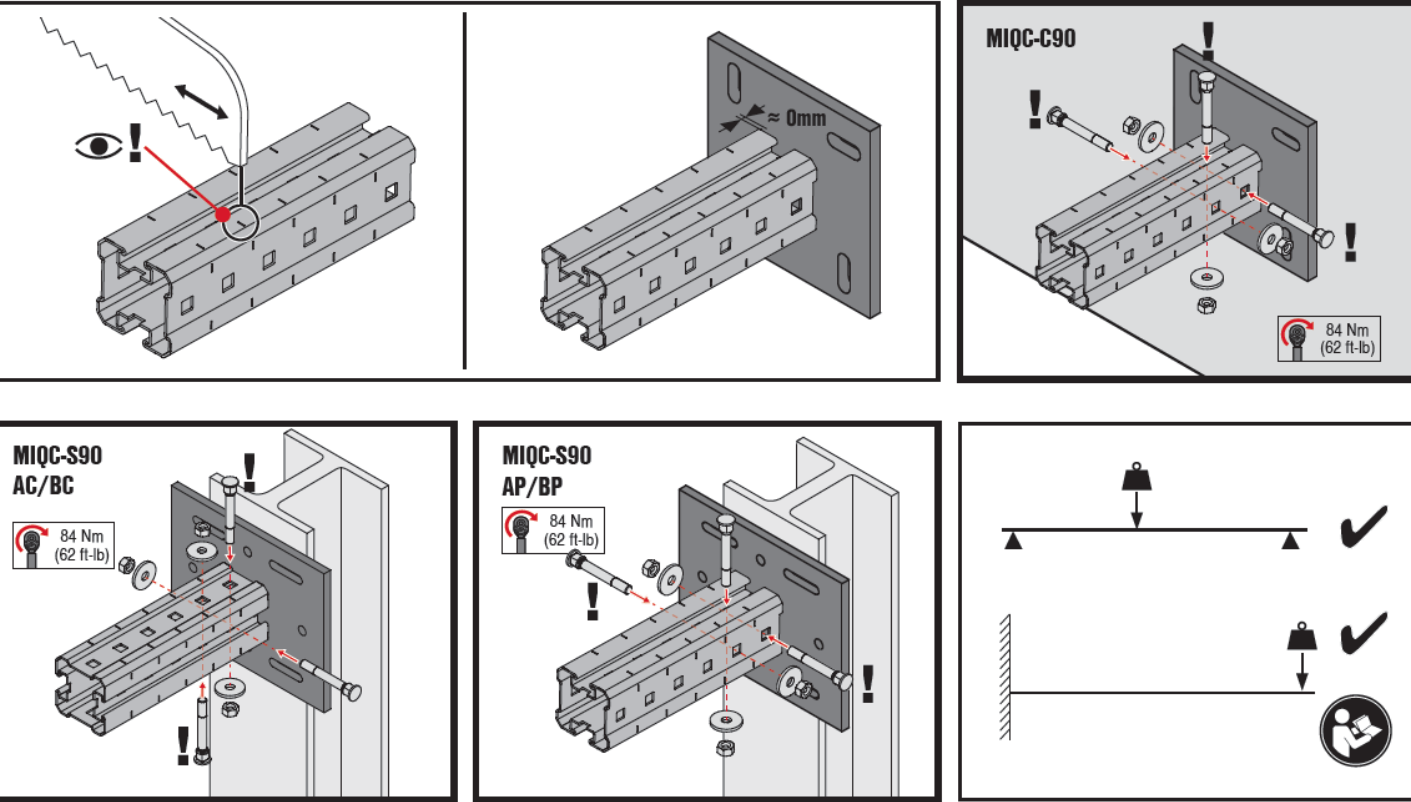
Weight:
4698g connector (4928g incl. accessories)

Submittal text:
Hilti base material connector, 90°, MIQ system, MIQC-C90, Hot dipped galvanized, base material connector typically used for connection of perpendicular Hilti MIQ girder to concrete. The connected girder is slid onto connection interface of the connector and through bolted by 2 pieces of MIA-OH and self locking nut (both included in the pack) in the first and second hole closest to the end of the girder, the base plate is connected to concrete by Hilti anchor 4x HST M16 (not in pack) material weight 4928 grams incl. all connectivity material.

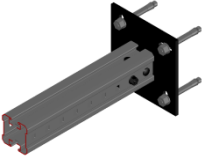


Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIQC-C90 base material connector

Possible loading 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

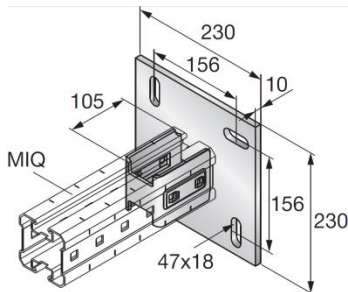
Software:

- Ansys 16.0
- Microsoft Excel

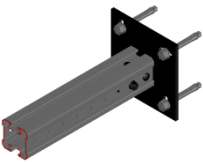
Environmental conditions:

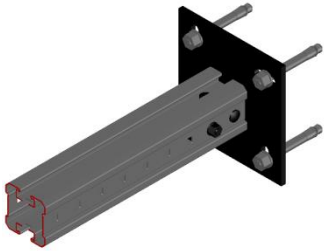
- static loads
- no fatigue loads

Simplified drawing:

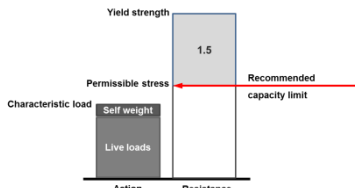
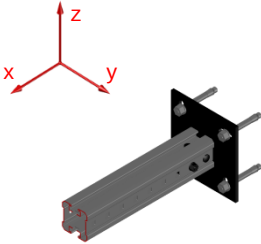


MIQC-C90 base material connector

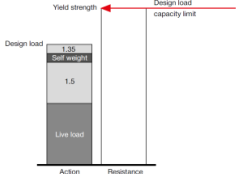
Possible loading cases		
Standard		
		

Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all connectivity material 1x MIQC-C90 4x HST-R M16x130/10	Connector used for fixing H-MIQ girder, perpendicularly to concrete 
2120144 2085454	

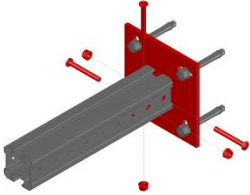
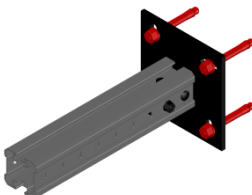
Recommended loading capacity - simplified for most common applications

Method							
	 <table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>24.4</td><td>8.8</td><td>38.9</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	24.4	8.8	38.9
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]					
24.4	8.8	38.9					

Design loading capacity - 3D

Method	
	

Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-C90 	2. Anchors 4x HST M16 
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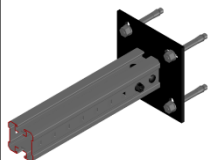
MIQC-C90 base material connector

Conditions of the loading capacity tables:

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

Possible loading cases

Standard



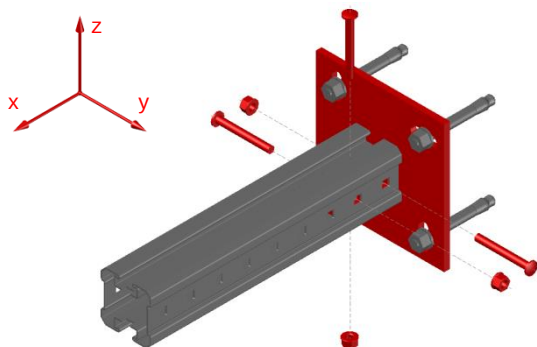
Design loading capacity - 3D

2/2

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 connector MIQC-C90 (Including screws M1A-OH90 connecting channel and connector and welds)

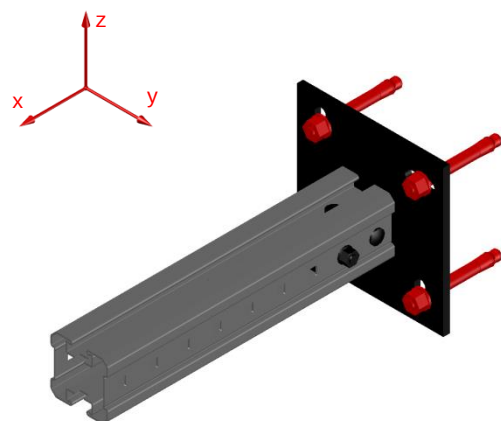


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	13.18	13.18	58.37	58.37
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.55	1.55	1.67	1.67	1.08	1.08

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. Anchors 4x HST M16



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
47.50	*	66.00	66.00	66.00	66.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
7.30	7.30	4.70	4.70	4.70	4.70

Interaction:

$$\frac{F_{y,Ed}}{F_{y,Rd}} + \frac{F_{z,Ed}}{F_{z,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} = \beta_V \leq 1$$

$$\frac{F_{x,Ed}}{F_{x,Rd}} + \frac{M_{y,Ed}}{M_{y,Rd}} + \frac{M_{z,Ed}}{M_{z,Rd}} = \beta_N \leq 1$$

$$\beta_N + \beta_V \leq 1.2$$

* not decisive

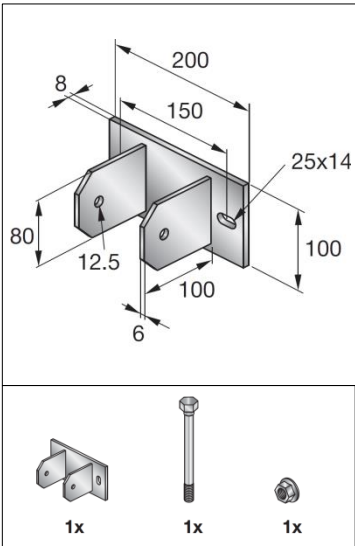
MIC-CU-MA Base Material Connector - Concrete

Designation	Item number
MIC-CU-MA	304828

Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:
2210 g incl. components

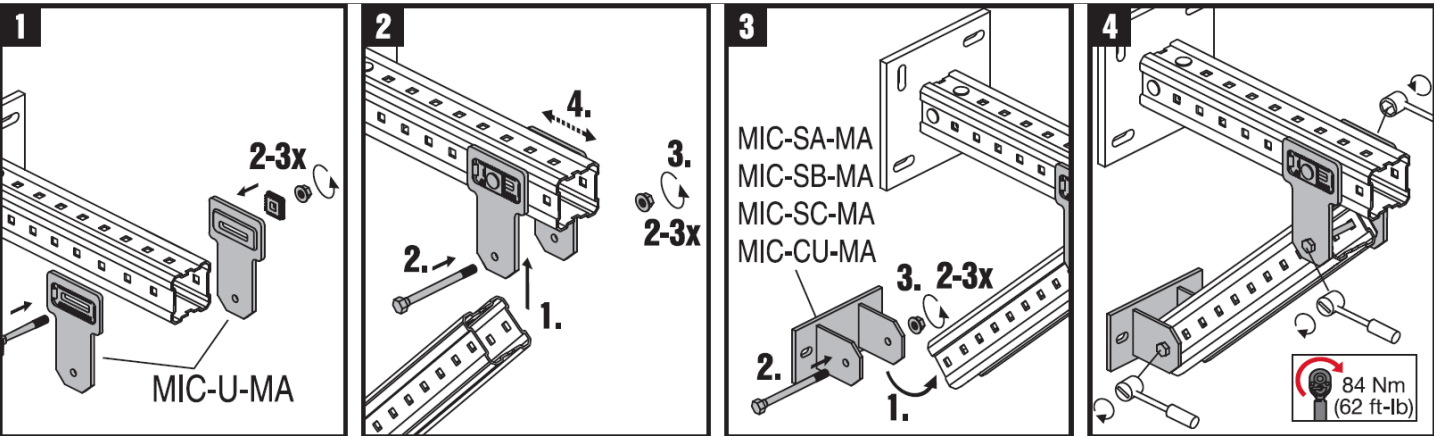
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 and MIQ girder to concrete in an angle, usually when it's used as a brace for another girder. Two oblong anchor holes in perpendicular positions enable fine tuning of baseplate position, and girder is connected using one bolt through a hole, which enables various angles.



Material properties:

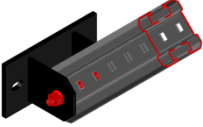
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



The same assembly principles and torque moments should be applied for MIQ girders

MIC-CU-MA Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:

- Analytic calculation

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

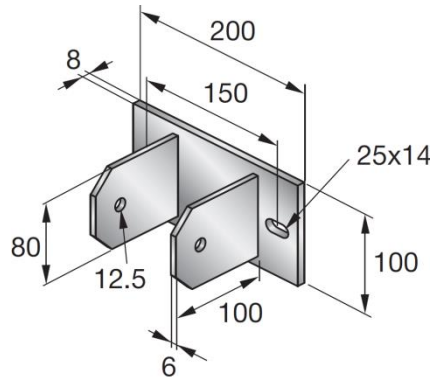
Software:

- Mathcad 15.0
- Microsoft Excel

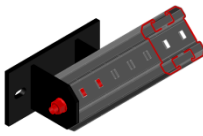
Environmental conditions:

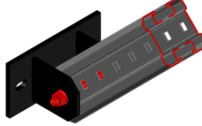
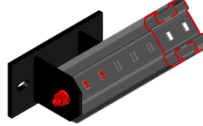
- indoors, outdoors
- static loads
- no fatigue loads

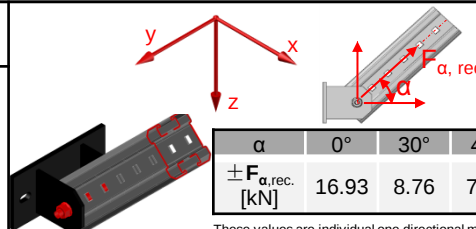
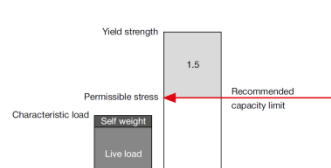
Simplified drawing:

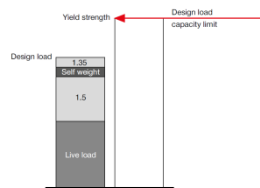
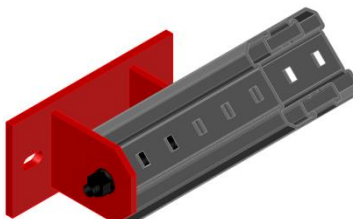
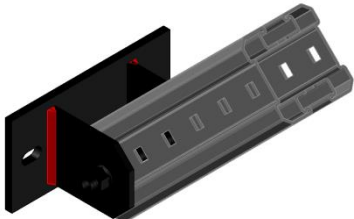
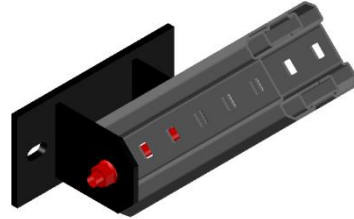


MIC-CU-MA Base Material Connector - Concrete

Standard		
		

Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all components 1x MIC-CU-MA 304828 Associated anchors* for cracked concrete 2x HST3 M12x105 30/10 2105718 HST2 M12x105/10 2107848 *Anchors not incl. in capacity limits 	Baseplate connector used for an angled connection of an MIQ-90 girder to concrete (bracing) 

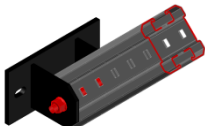
Recommended loading capacity - simplified for most common applications													
Method	<table><tr><th>α</th><th>0°</th><th>30°</th><th>45°</th><th>60°</th><th>90°</th></tr><tr><th>± Fa,rec. [kN]</th><td>16.93</td><td>8.76</td><td>7.64</td><td>7.21</td><td>7.93</td></tr></table> ± Fy,rec. [kN] 2.1 These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	α	0°	30°	45°	60°	90°	± Fa,rec. [kN]	16.93	8.76	7.64	7.21	7.93
α	0°	30°	45°	60°	90°								
± Fa,rec. [kN]	16.93	8.76	7.64	7.21	7.93								
													

Design loading capacity - 3D			1/3
Method			
			
Limiting components of capacity evaluated in following tables:			
1. Steel connector	2. Welds	3. bolt in MIQ-girder	
			

MIC-CU-MA Base Material Connector - Concrete

Conditions of the loading capacity tables:

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

Standard		
		

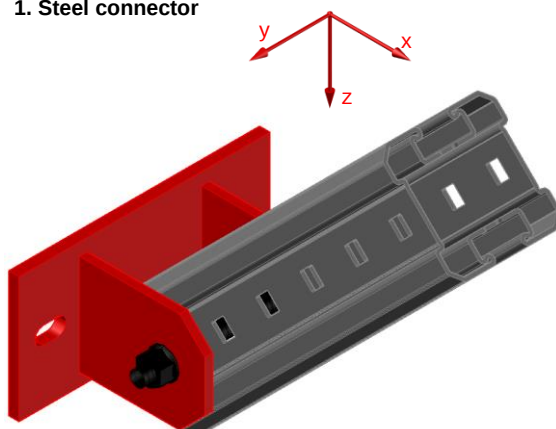
Design loading capacity - 3D

2/3

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.

1. Steel connector

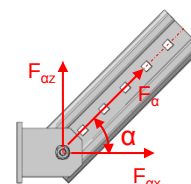


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
25.39	104.01	3.22	3.22	11.90	11.90
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.58	0.58	0.00	0.00	0.00	0.00

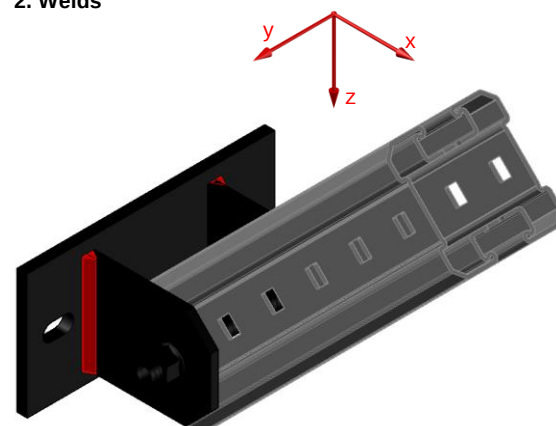
Interaction:

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

with $F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos \alpha$ $F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin \alpha$



2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
325.83	325.83	266.04	266.04	266.04	266.04
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
12.90	12.90	4.34	4.34	15.80	15.80

Interaction:

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

with

$$e_x = 0.07m$$

$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos \alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin \alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

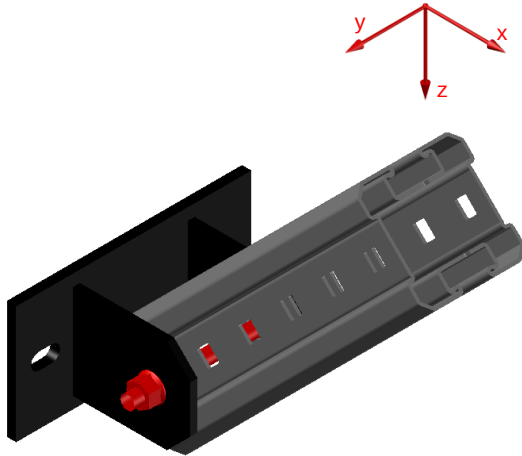
$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

MIC-CU-MA Base Material Connector - Concrete

Design loading capacity - 3D

3/3

3. bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.33	1.33	0.00	0.00	0.00	0.00

Interaction:

$$F_{\alpha Rd} = F_{xRd} = F_{zRd}$$

The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction between F_x and F_z .

The normal force $F_{\alpha Ed}$ in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

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

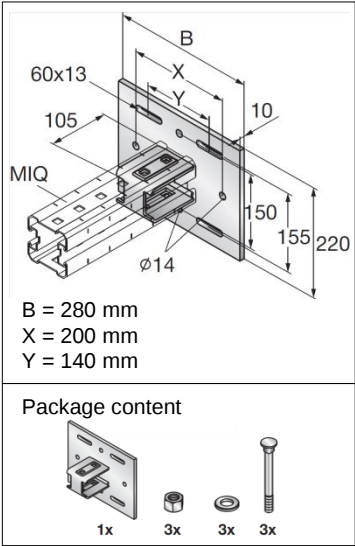
MIQC-S90-AC base material connector

Designation	Item number
MIQC-S90-AC base material connector	2120270

Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:
5343g connector (5573g incl. accessories)

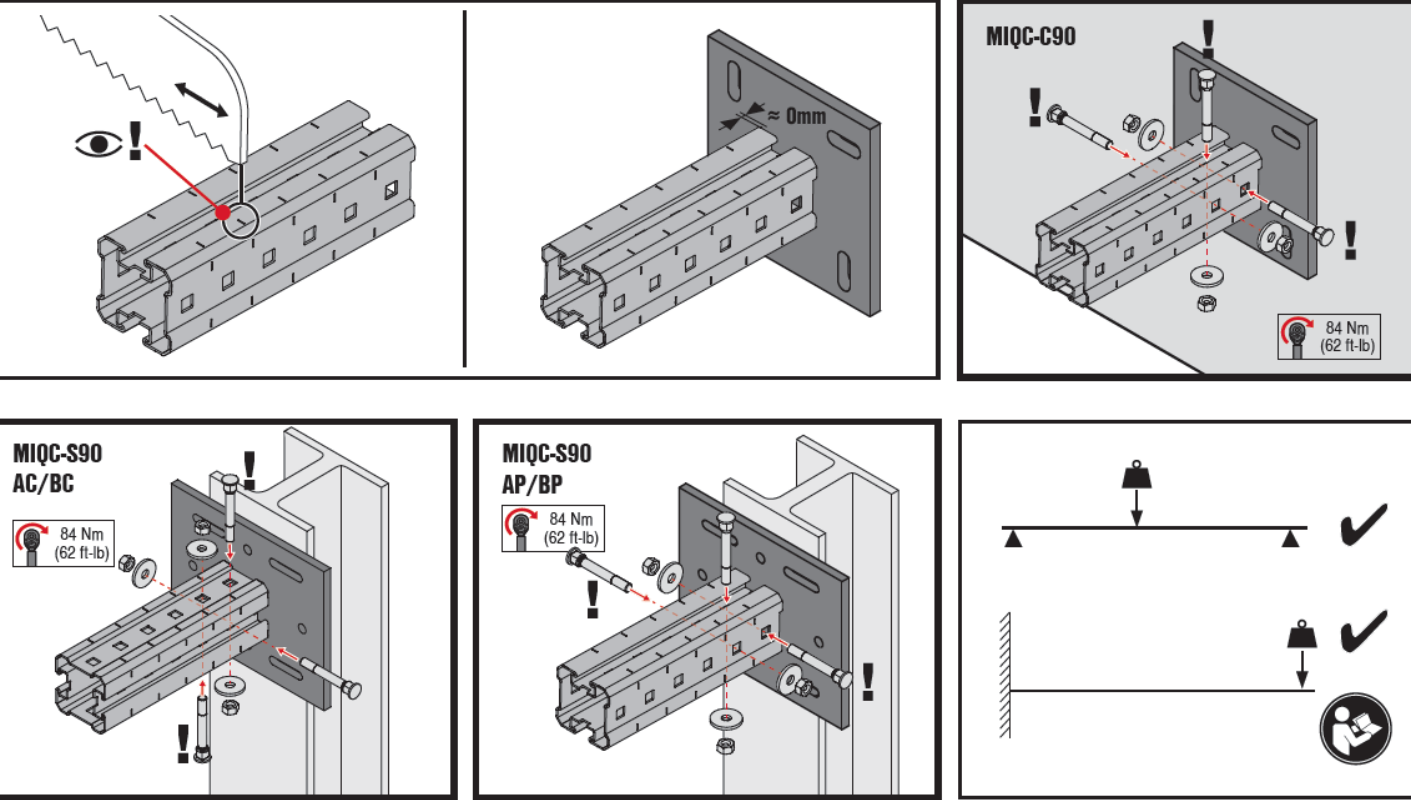
Submittal text:
Hilti base material connector, 90°, MIQ system, MIQC-S90-AC, Hot dipped galvanized, base material connector typically used for connection of perpendicular Hilti MIQ girder to structural steel with open section perpendicular to structural steel beam, The connected girder is slid onto connection interface of the connector and through bolted by 2 pieces of MIA-OH and self locking nut (both included in the pack) in the first and second hole closest to the end of the girder, the connection to structural steel could be done either by 4 pcs of Hilti MI-SGC M12(not in pack) beam clamps to flange (width 75-165mm width) of I-beam or by boxing any structural steel profile (width 75-165mm) using Hilti backing plate MIQB-SA (not in pack) and 4x M12 Hilti threaded rods and 4x M12-F-SL WS3/4 self locking nuts (both not in pack) material weight 5573 grams incl. all connectivity material.



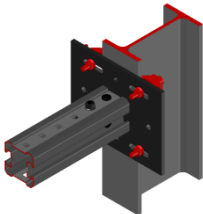
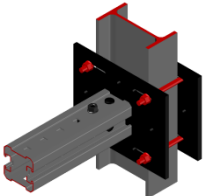
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



MIQC-S90-AC base material connector

Possible loading cases		
Clamped	Boxed	
		

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

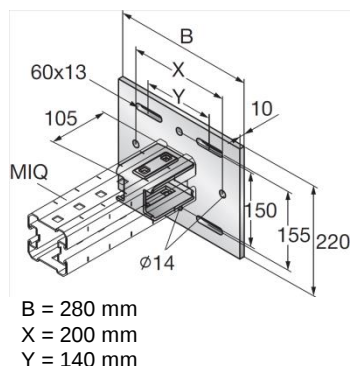
Software:

- Ansys 16.0
- Microsoft Excel

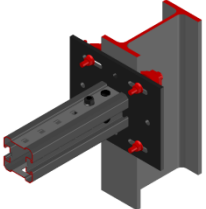
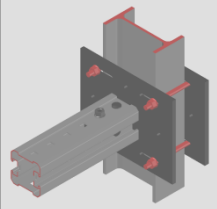
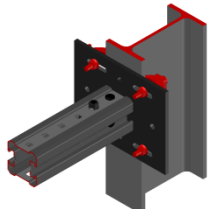
Environmental conditions:

- static loads
- no fatigue loads

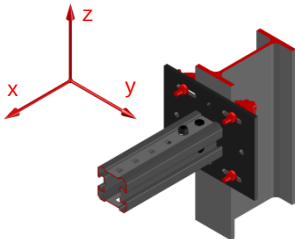
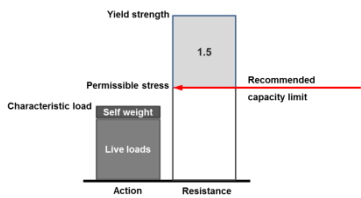
Simplified drawing:



MIQC-S90-AC base material connector

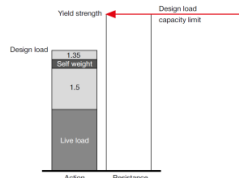
Possible loading cases		
Clamped	Boxed	
		
Loading case: Clamped BOM: Base material connector incl. all connectivity material 1x MIQC-S90-AC 2120270 Beam clamp 4x MI-SGC M12 233859		Combinations covered by loading case MIQ girder, perpendicularly to flange (width of 75-165mm) of structural steel open section, perpendicularly to structural steel beam 

Recommended loading capacity - simplified for most common applications

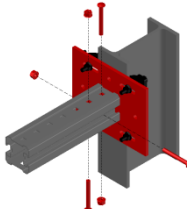
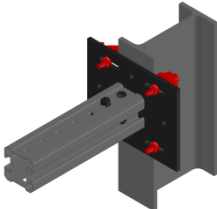
Method			
	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
	23.2	6.0	6.0
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.			

Design loading capacity - 3D

1/2

Method	
	

Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-AC		2. Beam clamps 4x MI-SGC M12	
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MIQC-S90-AC base material connector

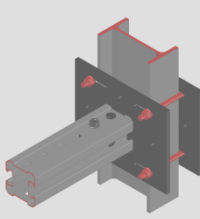
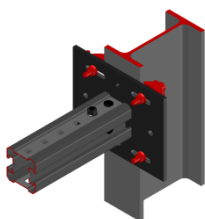
Conditions of the loading capacity tables:

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

Possible loading cases

Clamped

Boxed



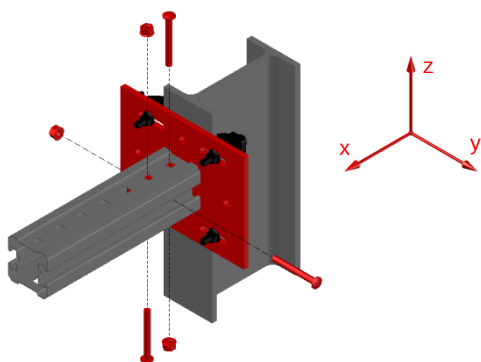
Design loading capacity - 3D

2/2

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 connector MIQC-S90-AC (Including screws M1A-OH90 connecting channel and connector and welds)

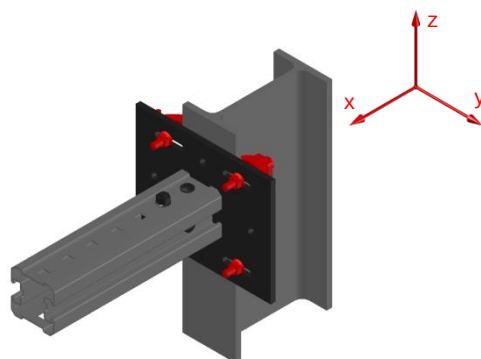


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	57.03	57.03	13.18	13.18
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	0.84	0.84	0.70	0.70

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. Clamps 4x MI-SGC M12



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	*	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.81	0.81	2.09	2.09	1.39	1.39

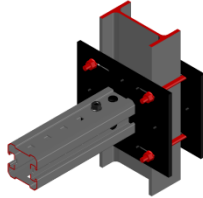
Interaction:

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

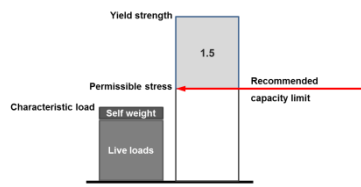
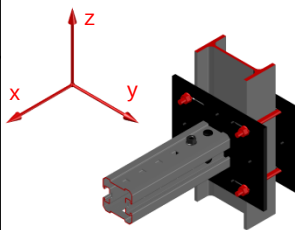
* not decisive

MIQC-S90-AC base material connector

Possible loading cases		
Clamped	Boxed	

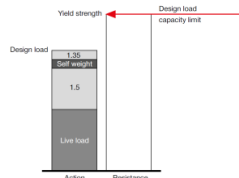
Loading case: Boxed	Combinations covered by loading case
BOM: Base material connector incl. all connectivity material 1x MIQC-S90-AC 2120270 Back (base) plate 1x MIQB-SA 2123565 Threaded rods 4x AM12x1000 8.8 HDG...m 419103 Self-locking nut 8x M12-F-SL WS3/4 382897	Connector used for fixing MIQ girder, perpendicularly to flange (width of 75-165mm) of structural steel open section, perpendicularly to structural steel beam 

Recommended loading capacity - simplified for most common applications

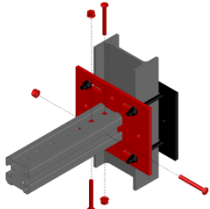
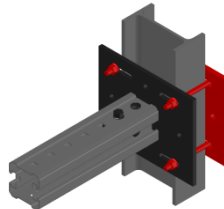
Method							
	 <table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>24.00</td><td>5.0</td><td>5.0</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	24.00	5.0	5.0
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]					
24.00	5.0	5.0					

Design loading capacity - 3D

1/2

Method	
	

Limiting components of capacity evaluated in following tables:

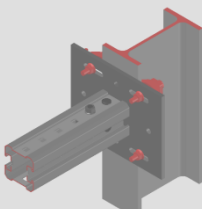
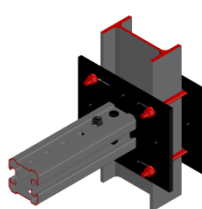
1. Steel connector MIQC-S90-AC 	2. Threaded rods M12 / 8.8 in connection with MIQB-SA plate 
---	--

MIQC-S90-AC base material connector

Conditions of the loading capacity tables:

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

Possible loading cases

Clamped	Boxed	
		

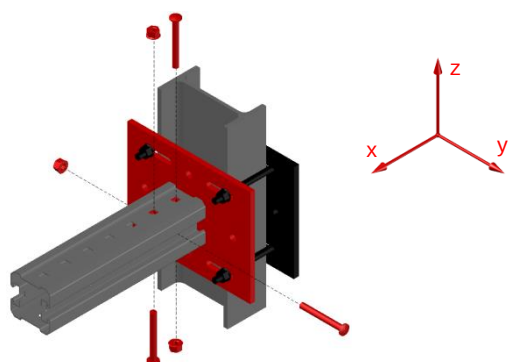
Design loading capacity - 3D

2/2

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 connector MIQC-S90-AC (Including screws M1A-OH90 connecting channel and connector and welds)

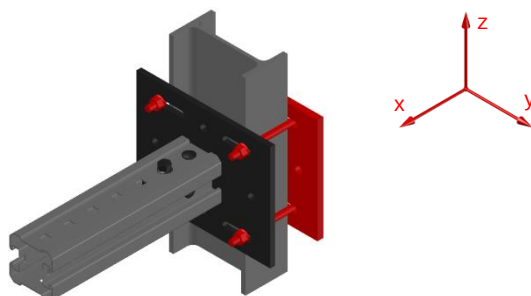


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	57.03	57.03	13.18	13.18
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	0.84	0.84	0.70	0.70

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. Threaded rods M12 / 8.8 in connection with MIQB-SA plate



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	35.97	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.67	0.67	11.65	11.65	7.77	7.77

Interaction:

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

MIQC-S90-BC base material connector

Designation	Item number
MIQC-S90-BC base material connector	2120272

Corrosion protection:

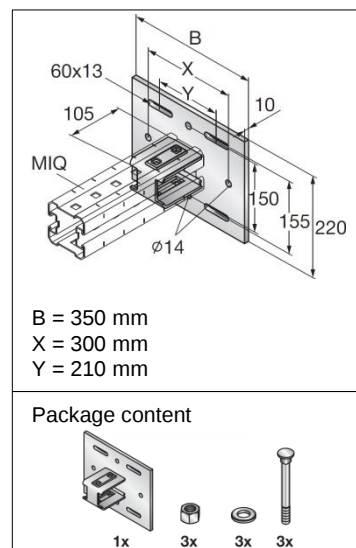
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:

6552g connector (6782g incl. accessories)

Submittal text:

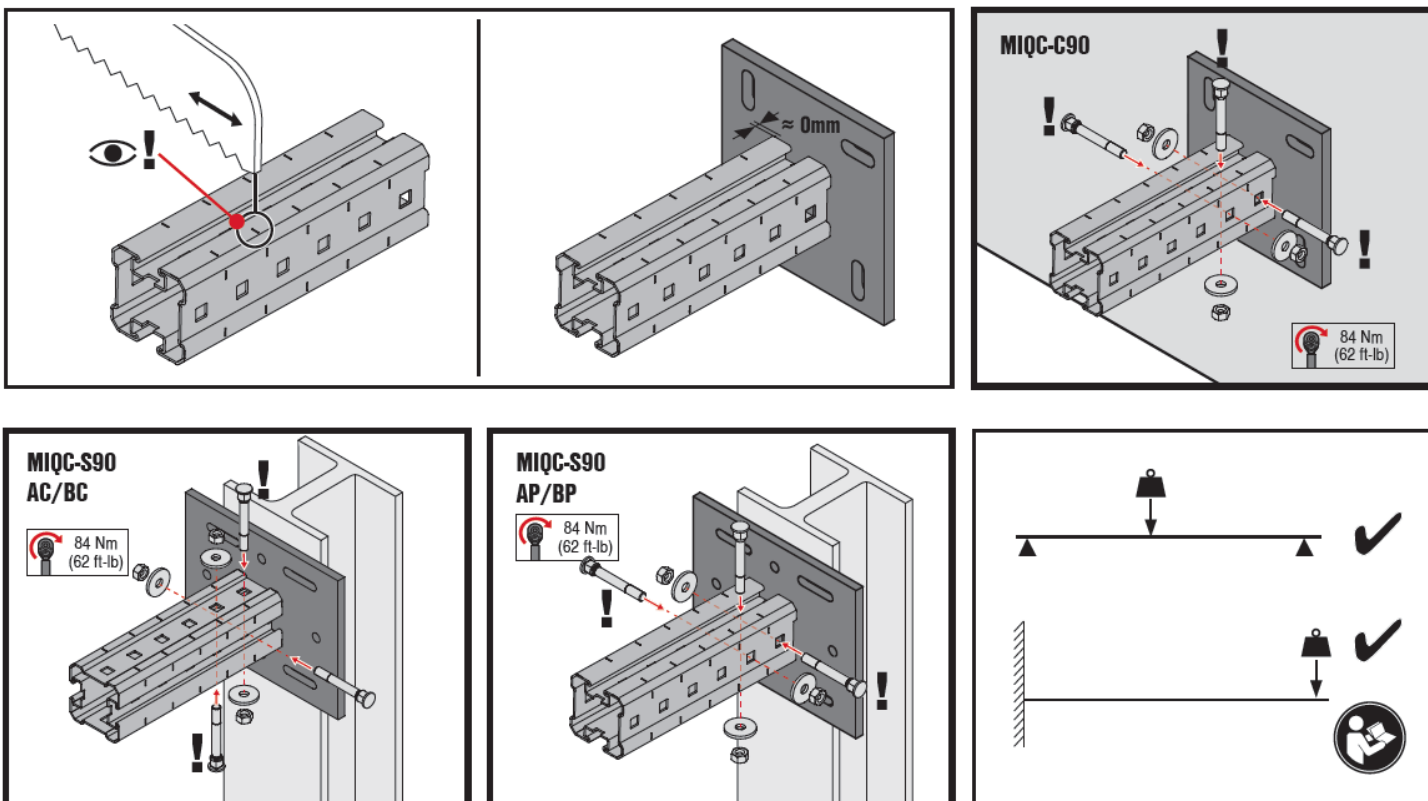
Hilti base material connector, 90°, MIQ system, MIQC-S90-BC, Hot dipped galvanized, base material connector typically used for connection of perpendicular Hilti MIQ girder to structural steel with open section perpendicular to structural steel beam. The connected girder is slid onto connection interface of the connector and through bolted by 2 pieces of MIA-OH and self locking nut (both included in the pack) in the first and second hole closest to the end of the girder, the connection to structural steel could be done either by 4 pcs of Hilti MI-SGC M12 (not in pack) beam clamps to flange (width 165-235mm width) of I-beam or by boxing any structural steel profile (width 165-235mm) using Hilti backing plate MIQB-SB (not in pack) and 4x M12 Hilti threaded rods and 4x M12-F-SL WS3/4 self locking nuts (both not in pack) material weight 6782 grams incl. all connectivity material.



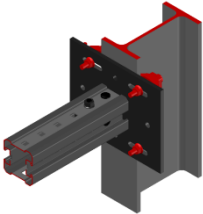
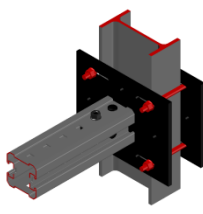
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



MIQC-S90-BC base material connector

Possible loading cases		
Clamped	Boxed	
		

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

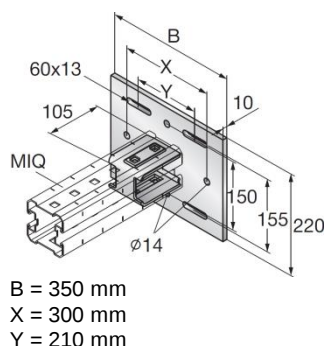
Software:

- Ansys 16.0
- Microsoft Excel

Environmental conditions:

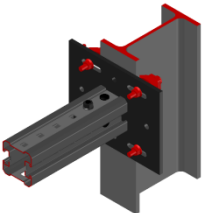
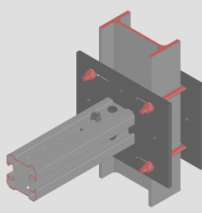
- static loads
- no fatigue loads

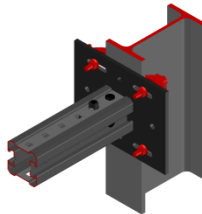
Simplified drawing:



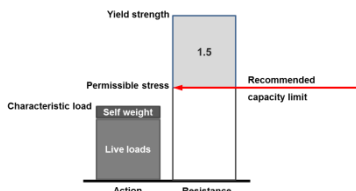
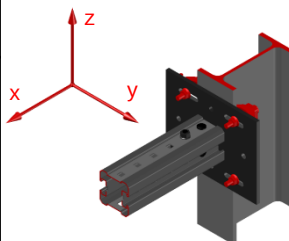
MIQC-S90-BC base material connector

Possible loading cases

Clamped	Boxed	
		

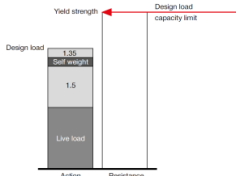
Loading case: Clamped	Combinations covered by loading case
BOM: Base material connector incl. all connectivity material 1x MIQC-S90-BC 2120272 Beam clamp 4x MI-SGC M12 233859	Connector used for fi xing MIQ girder, perpendicularly to fl ange (width of 165-235mm) of structural steel open section, perpendicularly to structural steel beam 

Recommended loading capacity - simplified for most common applications

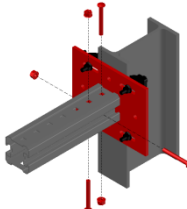
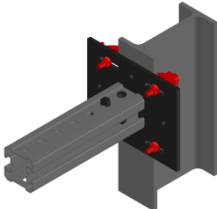
Method							
 The diagram illustrates the relationship between Action and Resistance. On the left, under 'Action', are 'Characteristic load', 'Self weight', and 'Live loads'. On the right, under 'Resistance', is 'Yield strength' with a value of 1.5. A red arrow points from the 'Yield strength' bar to the 'Permissible stress' bar, labeled 'Recommended capacity limit'.	 <table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>17.3</td><td>6.0</td><td>6.0</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	17.3	6.0	6.0
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]					
17.3	6.0	6.0					

Design loading capacity - 3D

1/2

Method	
	

Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-BC		2. Beam clamps 4x MI-SGC M12	
--------------------------------	---	------------------------------	---

MIQC-S90-BC base material connector

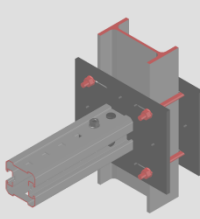
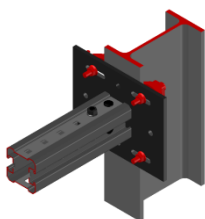
Conditions of the loading capacity tables:

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

Possible loading cases

Clamped

Boxed



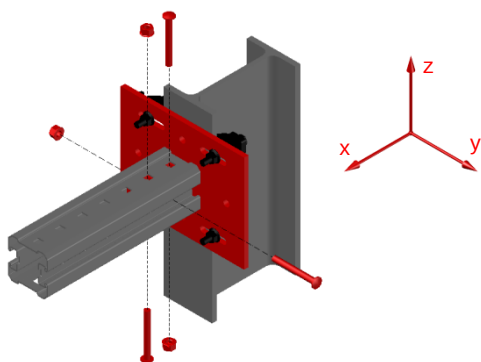
Design loading capacity - 3D

2/2

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 connector MIQC-S90-BC (Including screws MIA-OH90 connecting channel and connector and welds)

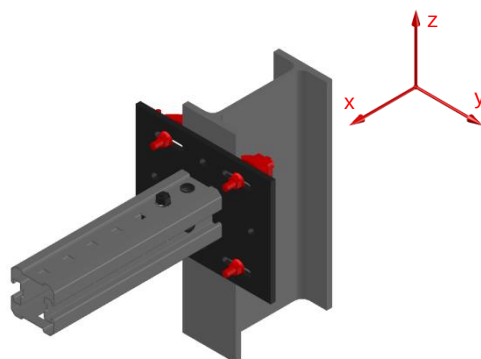


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.00	36.40	46.95	46.95	13.18	13.18
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	0.84	0.84	0.70	0.70

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. Clamps 4x MI-SGC M12



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	*	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.06	1.06	2.09	2.09	2.09	2.09

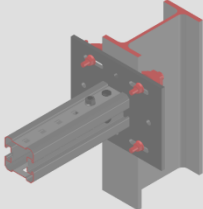
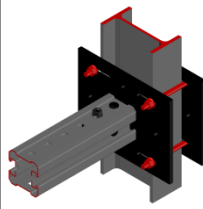
Interaction:

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

* not decisive

MIQC-S90-BC base material connector

Possible loading cases

Clamped	Boxed	
		

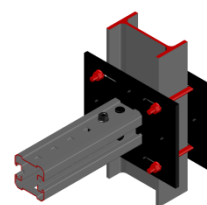
Loading case: Boxed

BOM:

Base material connector incl. all connectivity material	
1x MIQC-S90-BC	2120272
Back (base) plate	
1x MIQB-SB	2123566
Threaded rods	
4x AM12x1000 8.8 HDG...m	419103
Self-locking nut	
8x M12-F-SL WS3/4	382897

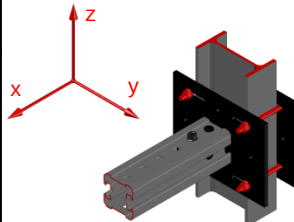
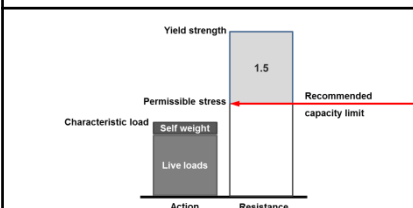
Combinations covered by loading case

Connector used for fixing MIQ girder, perpendicularly to flange (width of 165-235mm) of structural steel open section, perpendicularly to structural steel beam



Recommended loading capacity - simplified for most common applications

Method



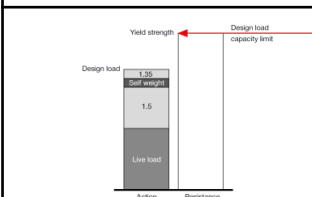
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
17.3	5.0	5.0

These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D

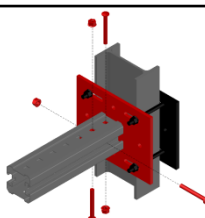
1/2

Method

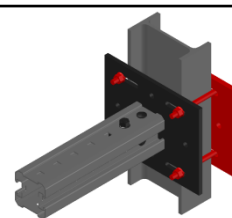


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-BC



2. Threaded rods M12 / 8.8 in connection with MIQB-SB plate

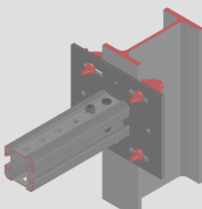
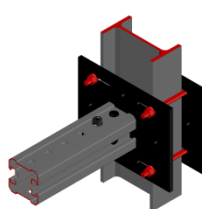


MIQC-S90-BC base material connector

Conditions of the loading capacity tables:

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

Possible loading cases

Clamped	Boxed	
		

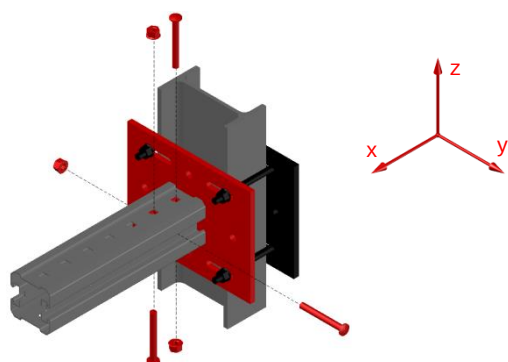
Design loading capacity - 3D

2/2

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 connector MIQC-S90-BC (Including screws M1A-OH90 connecting channel and connector and welds)

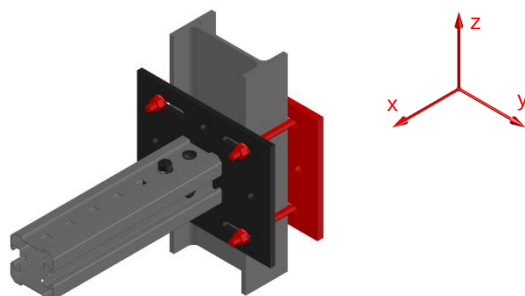


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.00	36.40	46.95	46.95	13.18	13.18
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	0.84	0.84	0.70	0.70

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. Threaded rods M12 / 8.8 in connection with MIQB-SB plate



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	34.23	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.87	0.87	11.65	11.65	11.65	11.65

Interaction:

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

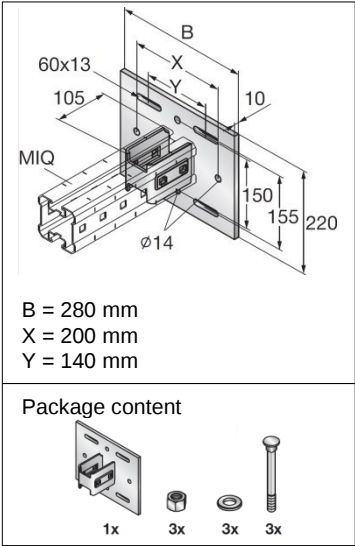
MIQC-S90-AP base material connector

Designation	Item number
MIQC-S90-AP base material connector	2120271

Corrosion protection:
 Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 micr ons

Weight:
 5343g connector (5699g incl. accessories)

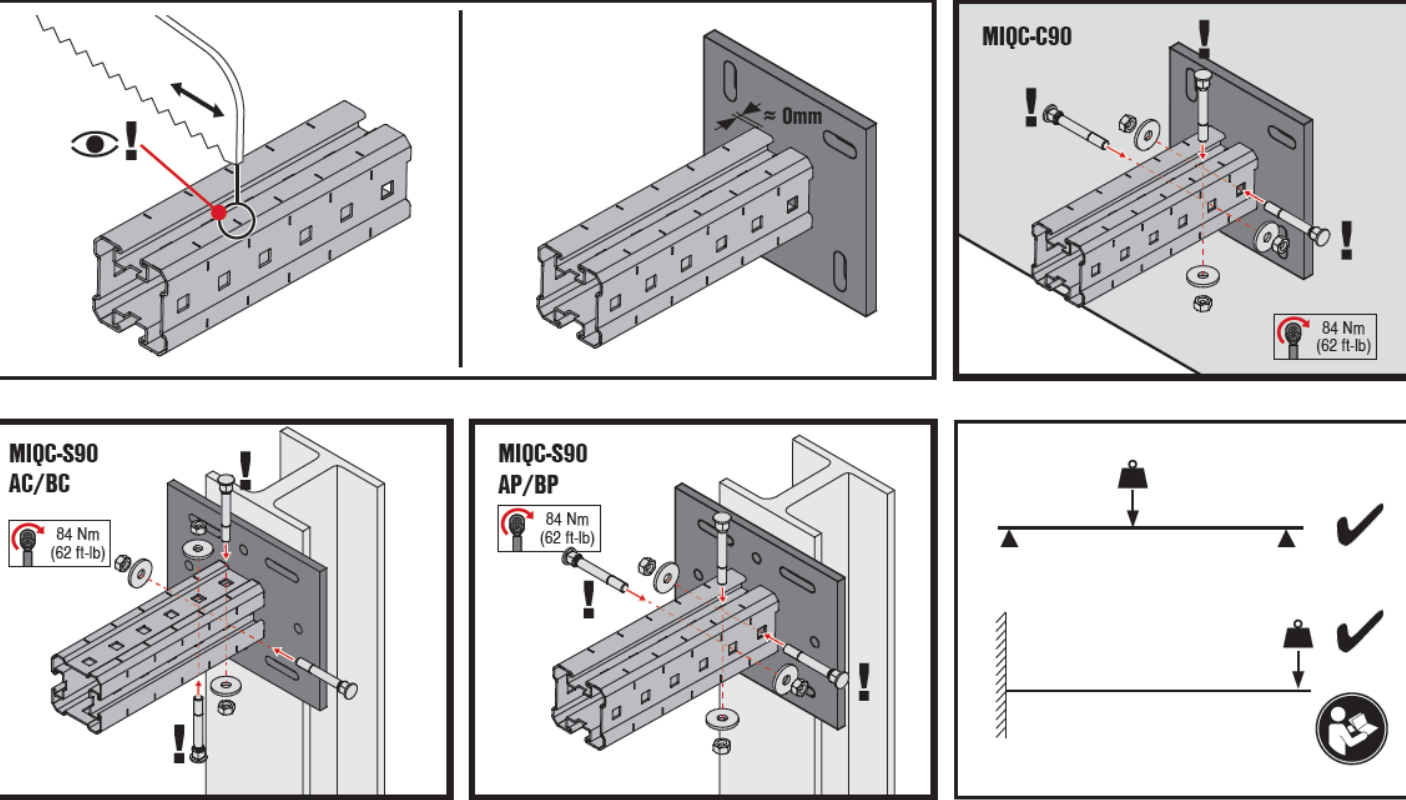
Submittal text:
 Hilti base material connector, 90°, MIQ system, MIQC-S90-AP, Hot dipped galvanized, base material connector typically used for connection of perpendicular Hilti MIQ girder to structural steel with open section parallel to structural steel beam. The connected girder is slid onto connection interface of the connector and through bolted by 2 pieces of MIA-OH and self locking nut (both included in the pack) in the first and second hole closest to the end of the girder, the connection to structural steel could be done either by 4 pcs of Hilti MI-SGC M12 (not in pack) beam clamps to flange (75-165mm width) of I-beam or by boxing any structural steel profile (width 75-165mm) using Hilti backing plate MIQB-SA (not in pack) and 4x M12 Hilti threaded rods and 4x M12-F-SL WS3/4 self locking nuts (both not in pack), material weight 5699 grams incl. all connectivity material.



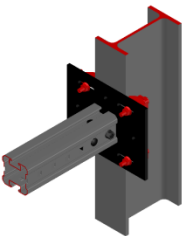
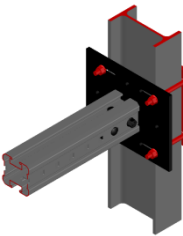
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



MIQC-S90-AP base material connector

Possible loading cases		
Clamped	Boxed	
		

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

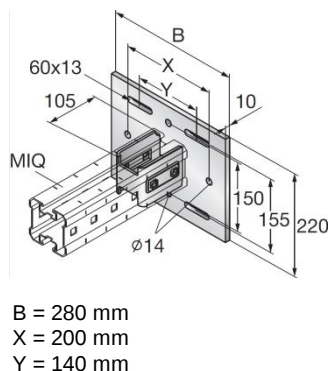
Software:

- Ansys 16.0
- Microsoft Excel

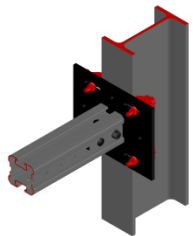
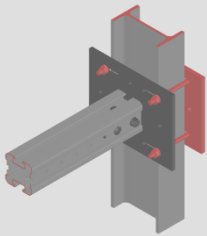
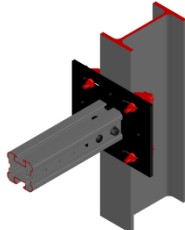
Environmental conditions:

- static loads
- no fatigue loads

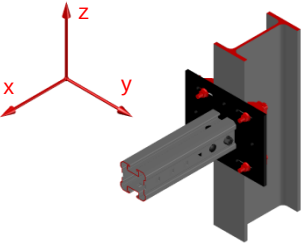
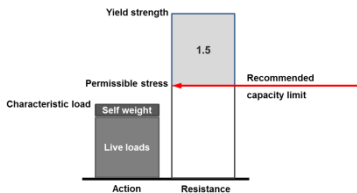
Simplified drawing:



MIQC-S90-AP base material connector

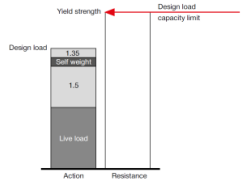
Possible loading cases		
Clamped	Boxed	
		
Loading case: Clamped BOM: 1x MIQC-S90-AP 2120271 Base material connector incl. all connectivity material 4x MI-SGC M12 233859 Beam clamp		Combinations covered by loading case Connector used for fixing MIQ girder, perpendicularly to flange (width of 75-165mm) of structural steel open section, perpendicularly to structural steel beam 

Recommended loading capacity - simplified for most common applications

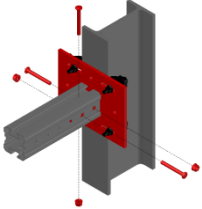
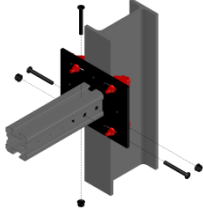
Method			
	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
	23.2	6.0	6.0
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.			

Design loading capacity - 3D

1/2

Method	
	

Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-AP 	2. Beam clamps 4x MI-SGC M12 
---	---

MIQC-S90-AP base material connector

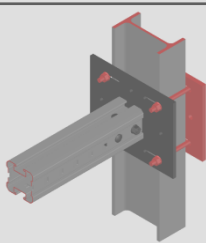
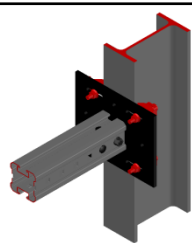
Conditions of the loading capacity tables:

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

Possible loading cases

Clamped

Boxed



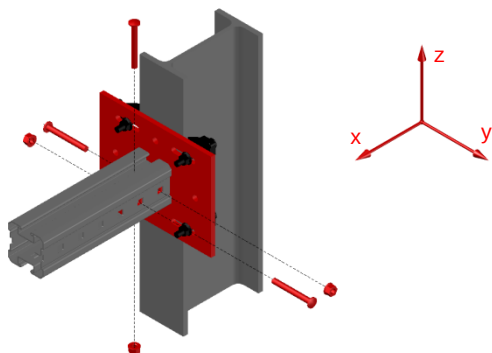
Design loading capacity - 3D

2/2

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 connector MIQC-S90-BC (Including screws MIA-OH90 connecting channel and connector and welds)

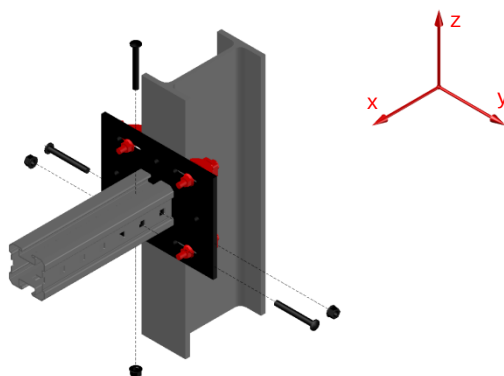


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	13.18	13.18	57.03	57.03
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	2.21	2.21	0.84	0.84

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. Clamps 4x MI-SGC M12



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	*	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.81	0.81	2.09	2.09	1.39	1.39

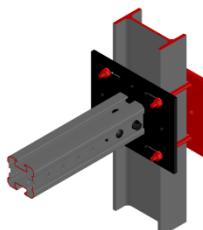
Interaction:

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

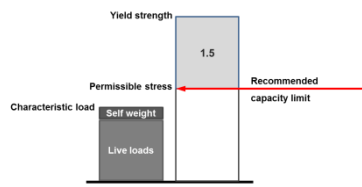
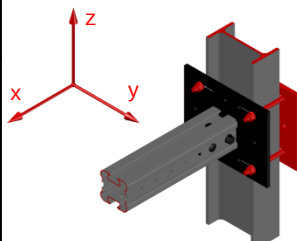
* not decisive

MIQC-S90-AP base material connector

Possible loading cases		
Clamped	Boxed	

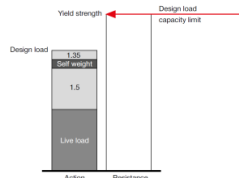
Loading case: Boxed	Combinations covered by loading case
BOM: Base material connector incl. all connectivity material 1x MIQC-S90-AP 2120271 Back (base) plate 1x MIQB-SB 2123566 Threaded rods 4x AM12x1000 8.8 HDG...m 419103 Self-locking nut 8x M12-F-SL WS3/4 382897	Connector used for fixing MIQ girder, perpendicularly to flange (width of 75-165mm) of structural steel open section, perpendicularly to structural steel beam 

Recommended loading capacity - simplified for most common applications

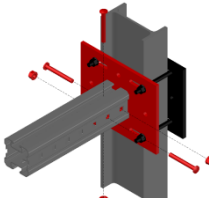
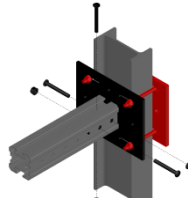
Method							
	 <table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>24.00</td><td>5.0</td><td>5.0</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	24.00	5.0	5.0
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]					
24.00	5.0	5.0					

Design loading capacity - 3D

1/2

Method	
	

Limiting components of capacity evaluated in following tables:

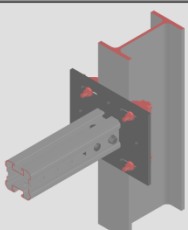
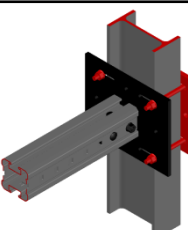
1. Steel connector MIQC-S90-AP 	2. Threaded rods M12 / 8.8 in connection with MIQB-SA plate 
---	--

MIQC-S90-AP base material connector

Conditions of the loading capacity tables:

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

Possible loading cases

Clamped	Boxed	
		

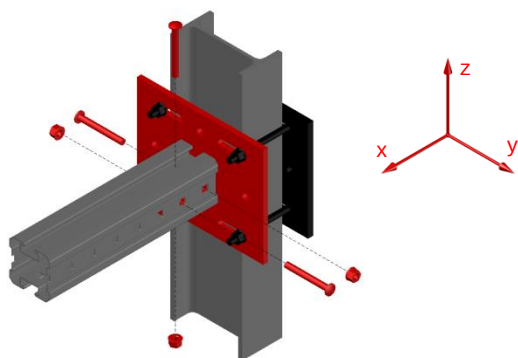
Design loading capacity - 3D

2/2

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 connector MIQC-S90-AP (Including screws M1A-OH90 connecting channel and connector and welds)

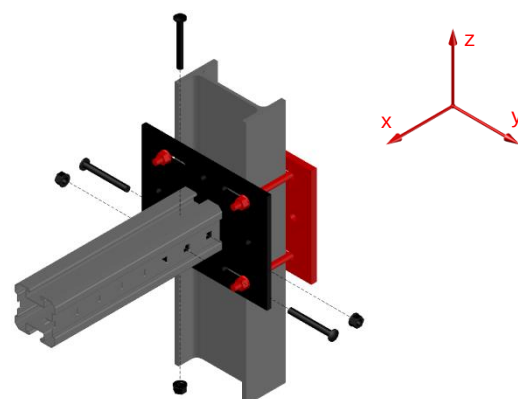


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	13.18	13.18	57.03	57.03
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	2.21	2.21	0.84	0.84

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. Threaded rods M12 / 8.8 in connection with MIQB-SA plate



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	35.97	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.67	0.67	11.65	11.65	7.77	7.77

Interaction:

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

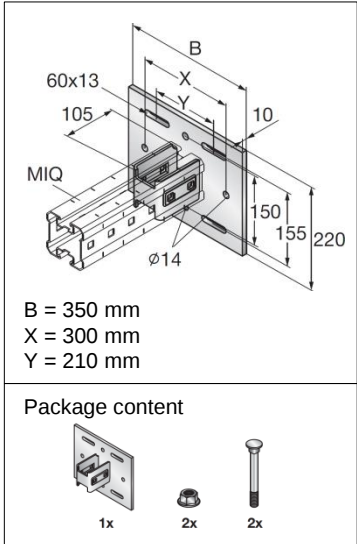
MIQC-S90-BP base material connector

Designation	Item number
MIQC-S90-BP base material connector	2120273

Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 micr ons

Weight:
6552g connector (6782g incl. accessories)

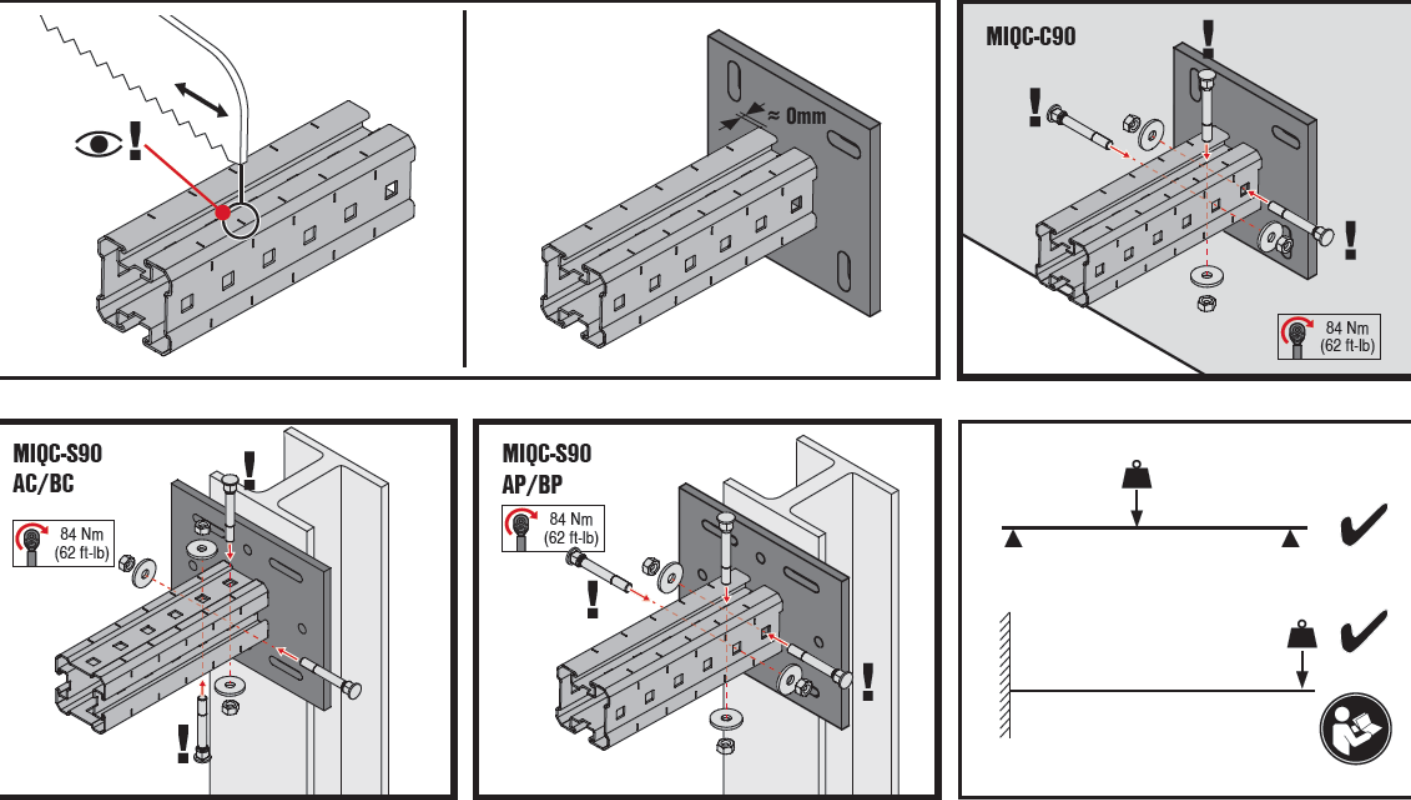
Submittal text:
Hilti base material connector, 90°, MIQ system, MIQC-S90-BP, hot dipped galvanized, base material connector typically used for connection of perpendicular Hilti MIQ girder to structural steel with open section parallel to structural steel beam. The connected girder is slid onto connection interface of the connector and through bolted by 2 pieces of MIA-OH and self locking nut (both included in the pack) in the first and second hole closest to the end of the girder, the connection to structural steel could be done either by 4 pcs of Hilti MI-SGC M12 (not in pack) beam clamps to flange (width165-235mm width) of I-beam or by boxing any structural steel profile (width 165-235mm) using Hilti backing plate MIQB-SB (not in pack) and 4x M12 Hilti threaded rods and 4x M12-F-SL WS3/4 self locking nuts (both not in pack), material weight 6782 grams incl. all connectivity material.



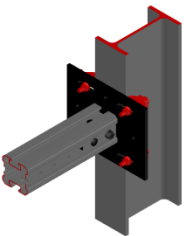
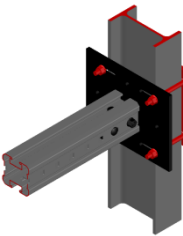
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



MIQC-S90-BP base material connector

Possible loading cases		
Clamped	Boxed	
		

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

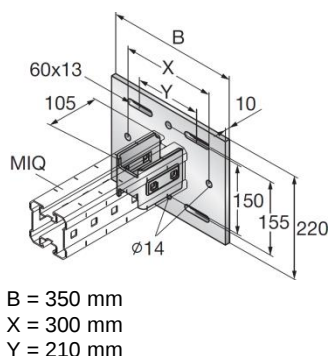
Software:

- Ansys 16.0
- Microsoft Excel

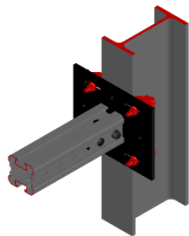
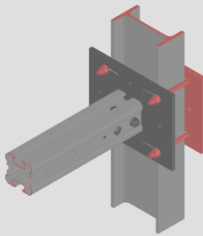
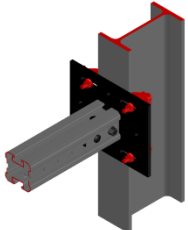
Environmental conditions:

- static loads
- no fatigue loads

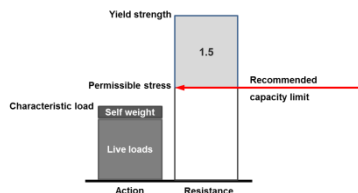
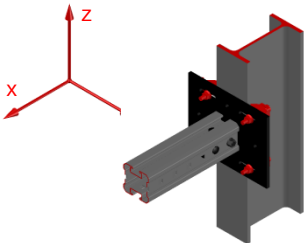
Simplified drawing:



MIQC-S90-BP base material connector

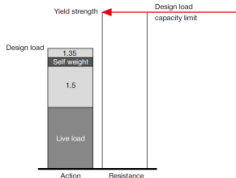
Possible loading cases		
Clamped	Boxed	
		
Loading case: Clamped BOM: Base material connector incl. all connectivity material 1x MIQC-S90-BP 2120273 Beam clamp 4x MI-SGC M12 233859		Combinations covered by loading case Connector used for fixing MIQ girder, perpendicularly to flange (width of 75-165mm) of structural steel open section, perpendicularly to structural steel beam 

Recommended loading capacity - simplified for most common applications

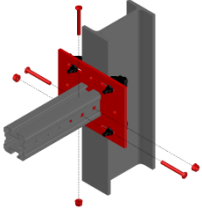
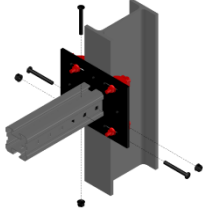
Method							
	 <table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>17.30</td><td>6.00</td><td>6.00</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	17.30	6.00	6.00
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]					
17.30	6.00	6.00					

Design loading capacity - 3D

1/2

Method	
	

Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-BP 	2. Beam clamps 4x MI-SGC M12 
---	---

MIQC-S90-BP base material connector

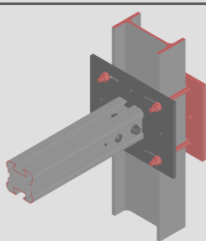
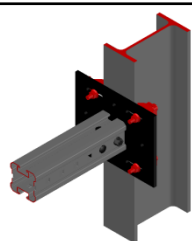
Conditions of the loading capacity tables:

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

Possible loading cases

Clamped

Boxed



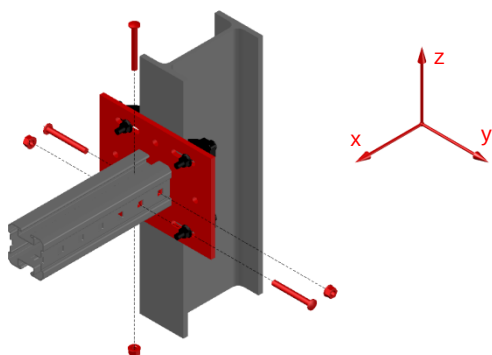
Design loading capacity - 3D

2/2

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 connector MIQC-S90-BP (Including screws M1A-OH90 connecting channel and connector and welds)

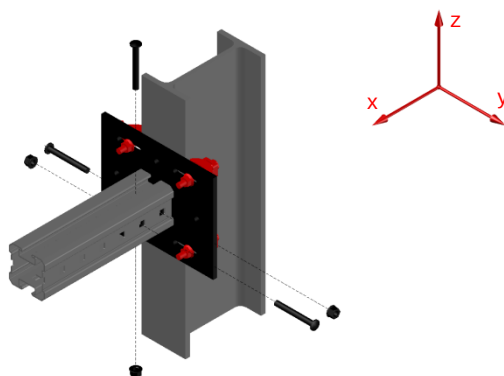


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.00	36.64	13.18	13.18	46.95	46.95
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	2.21	2.21	0.84	0.84

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. Clamps 4x MI-SGC M12



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	*	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.06	1.06	2.09	2.09	2.09	2.09

Interaction:

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

* not decisive

MIQC-S90-BP base material connector

Possible loading cases

Clamped	Boxed	

Loading case: Boxed	Combinations covered by loading case
BOM: Base material connector incl. all connectivity material 1x MIQC-S90-BP 2120273 Back (base) plate 1x MIQB-SB 2123566 Threaded rods 4x AM12x1000 8.8 HDG...m 419103 Self-locking nut 8x M12-F-SL WS3/4 382897	Connector used for fixing MIQ girder, perpendicularly to flange (width of 165-235mm) of structural steel open section, perpendicularly to structural steel beam

Recommended loading capacity - simplified for most common applications

Method							
Yield strength 1.5 Permissible stress Recommended capacity limit Characteristic load Self weight Live loads Action Resistance	<table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>17.3</td><td>5.0</td><td>5.0</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	17.3	5.0	5.0
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]					
17.3	5.0	5.0					

Design loading capacity - 3D

1/2

Method	

Limiting components of capacity evaluated in following tables:

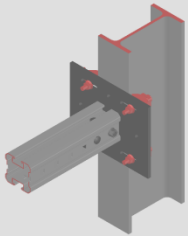
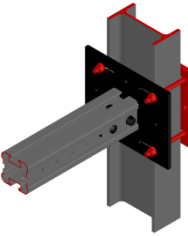
1. Steel connector MIQC-S90-BP	2. Threaded rods M12 / 8.8 in connection with MIQB-SB plate
--------------------------------	---

MIQC-S90-BP base material connector

Conditions of the loading capacity tables:

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

Possible loading cases

Clamped	Boxed	
		

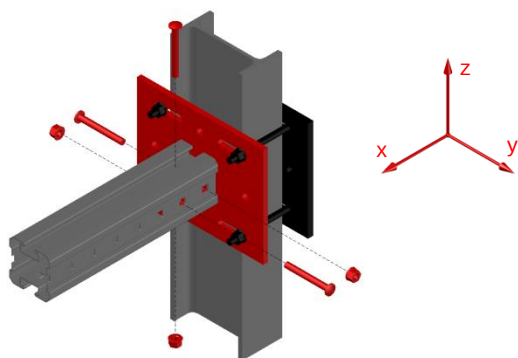
Design loading capacity - 3D

2/2

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 connector MIQC-S90-BP (Including screws M1A-OH90 connecting channel and connector and welds)

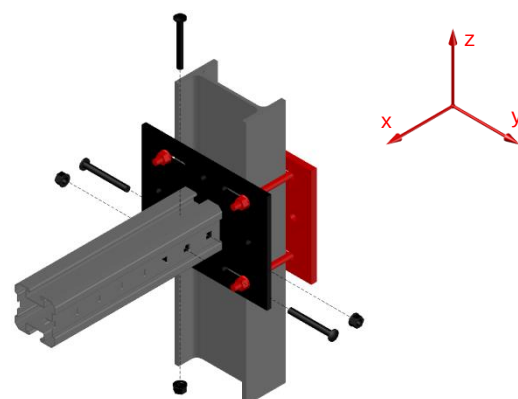


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.00	36.64	13.18	13.18	46.95	46.95
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	2.21	2.21	0.84	0.84

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. Threaded rods M12 / 8.8 in connection with MIQB-SB plate



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	34.23	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.87	0.87	11.65	11.65	11.65	11.65

Interaction:

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

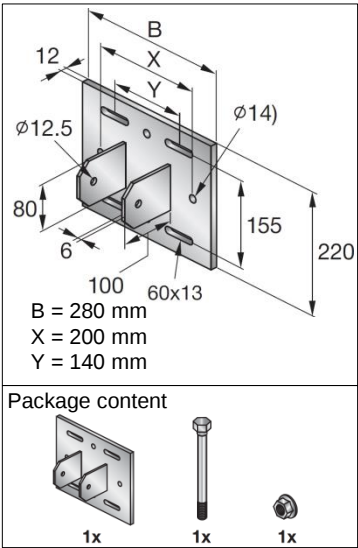
MIC-SA-MA Base Material Connector - Steel

Designation	Item number
MIC-SA-MA	304815

Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

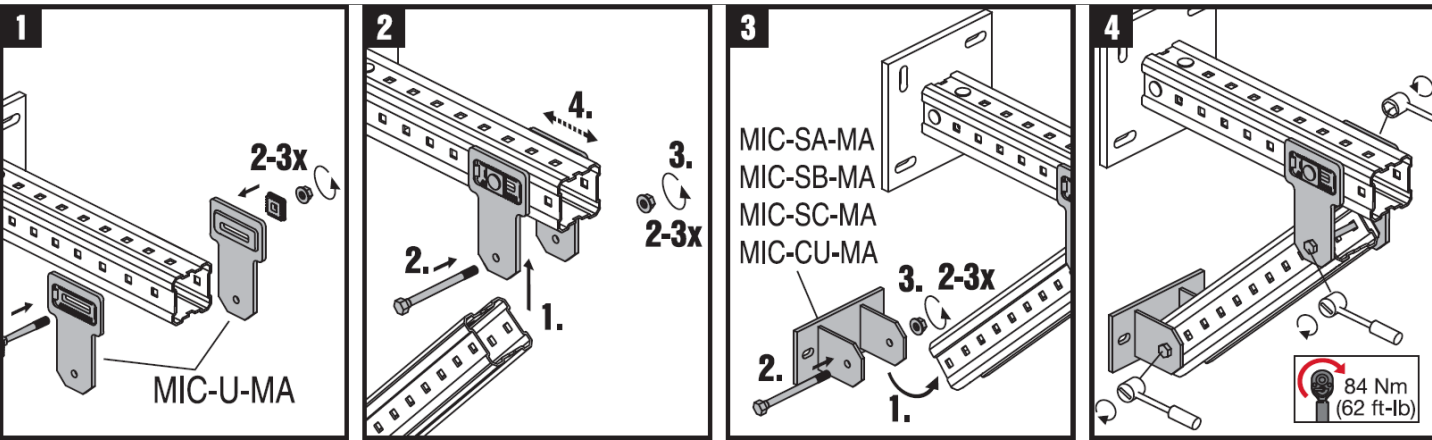
Weight:
6290 g incl. components

Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MIQ-90 girder to a steel beam in an angle, usually when it's used as a brace for another girder. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using one bolt through a hole, which enables various angles.



Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



The same assembly principles and torque moments should be applied for MIQ girders

MIC-SA-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	

Design criteria used for loading capacity

Methodology:

- Analytic calculation

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

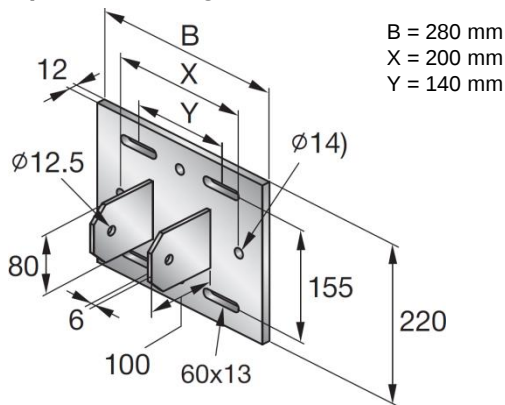
Software:

- Mathcad 15.0
- Microsoft Excel

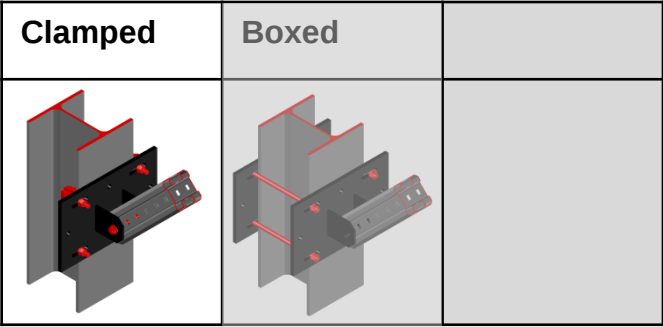
Environmental conditions:

- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



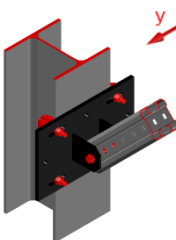
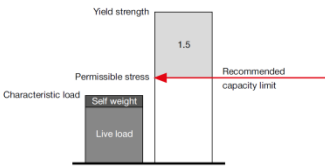
MIC-SA-MA Base Material Connector - Steel



Loading case: Clamped		Combinations covered by loading case	
BOM: Connector incl. all associated components MIC-SA-MA 304815 Beam clamps 4x MI-SGC M12 233859		Connector used for an angled connection of MIQ-90 to structural steel profiles (bracing). For flange width 75-165mm.	

Recommended loading capacity - simplified for most common applications

Method



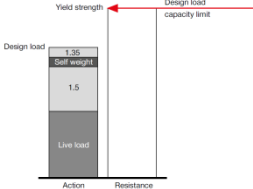
$\pm F_{y,rec.}$ [kN]					
2.15					

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	18.30	6.92	5.49	4.82	4.66

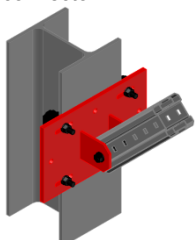
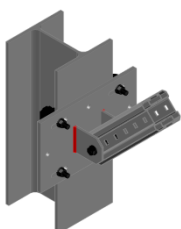
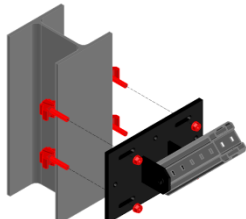
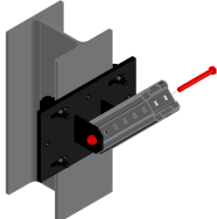
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



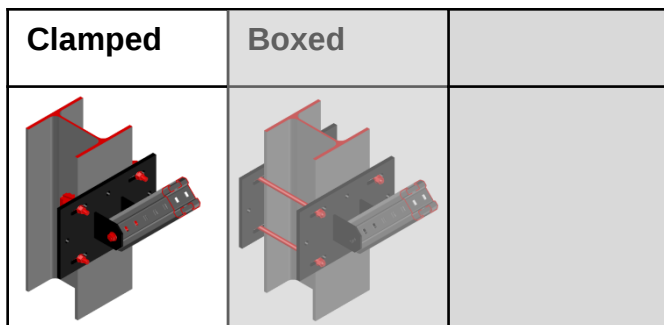
Limiting components of capacity evaluated in following tables:

1. Steel connector 	2. Welds 	3. Beam clamps 	4. Hexagonal bolt in MIQ-girder 
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MIC-SA-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

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



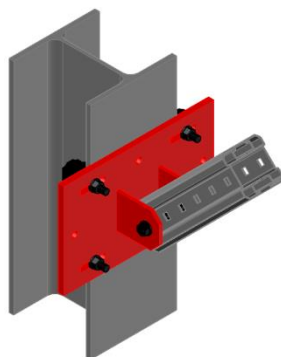
Design loading capacity - 3D

2/3

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.

1. Steel connector



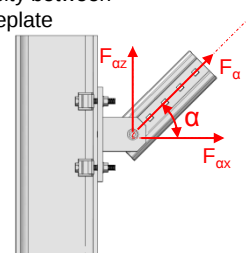
The values for M_x , M_y and M_z take into account the eccentricity between load application at hexagonal bolt axis and baseplate.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
58.60	73.93	3.22	3.22	37.13	37.13
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.81	1.81	2.60	2.60	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force F_α in plain x/z with a certain inclination α and a force F_y considering their eccentricities:

Interaction:

with e_x = horizontal eccentricity between hexagonal bolt axis and baseplate
 $e_x = 0.07m$



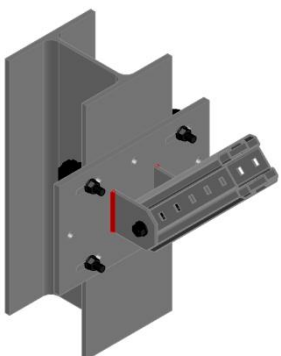
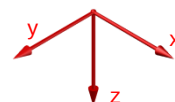
$$F_{x,Ed,\alpha} = F_\alpha \cdot \cos\alpha$$

$$F_{z,Ed,\alpha} = F_\alpha \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{x,Ed,\alpha} = F_{x,Ed,\alpha} \cdot e_x$$

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
274.92	274.92	224.47	224.47	224.47	224.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.89	10.89	3.09	3.09	13.33	13.33

Interaction:

with: $e_x = 0.07m$

$$F_{x,Ed,\alpha} = F_\alpha \cdot \cos\alpha$$

$$F_{z,Ed,\alpha} = F_\alpha \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{x,Ed,\alpha} = F_{x,Ed,\alpha} \cdot e_x$$

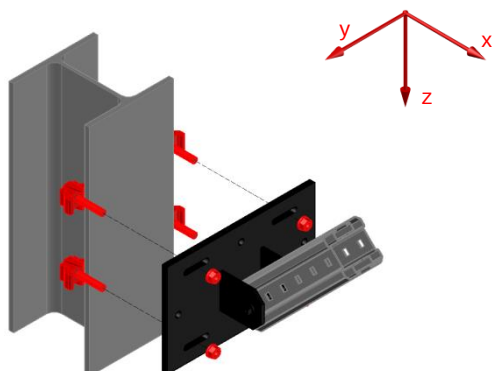
$$\frac{F_{x,Ed,\alpha}}{F_{x,Rd}} + \frac{F_{y,Ed,\alpha}}{F_{y,Rd}} + \frac{F_{z,Ed,\alpha}}{F_{z,Rd}} + \frac{M_{x,Ed,\alpha}}{M_{x,Rd}} + \frac{M_{y,Ed,\alpha}}{M_{y,Rd}} + \frac{M_{z,Ed,\alpha}}{M_{z,Rd}} \leq 1$$

MIC-SA-MA Base Material Connector - Steel

Design loading capacity - 3D

3/3

3. Beam clamps



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.81	0.81	2.07	2.07	1.39	1.39

Interaction:

with: $e_x = 0.07m$

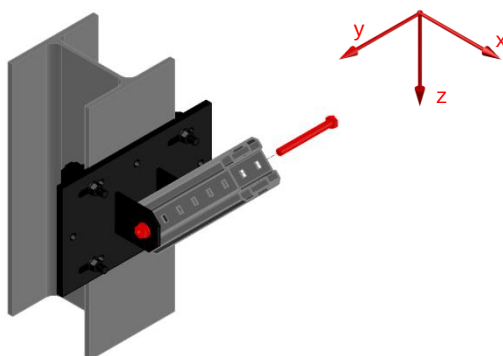
$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos \alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin \alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

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

4. Hexagonal bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

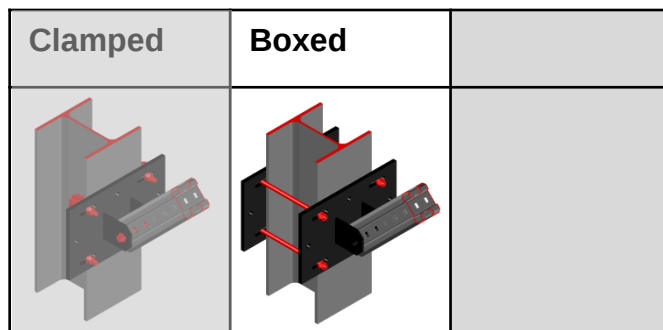
$$F_{\alpha Rd} = F_{xRd} = F_{zRd}$$

The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

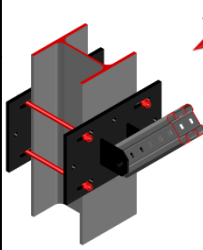
The normal force F_{α} in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

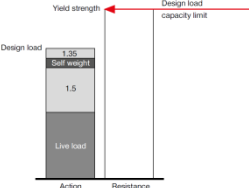
$$\frac{F_{\alpha,Ed}}{F_{\alpha,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} \leq 1$$

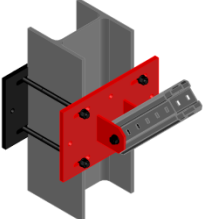
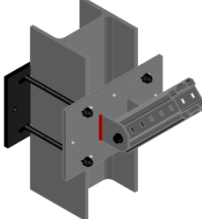
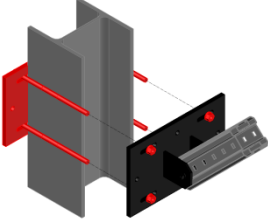
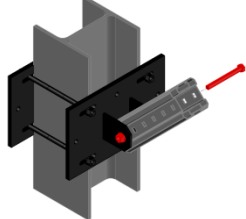
MIC-SA-MA Base Material Connector - Steel



Loading case: Boxed	Combinations covered by loading case
BOM: Connector incl. all associated components 1x MIC-SA-MA 304815 Base plate 1x MIB-SA 304821 Threaded rods cut to particular length 4x AM12x1000 8.8 HDG...m 419103 Nut 8x M12-F-SL WS3/4 382897	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 75-165mm.

Recommended loading capacity - simplified for most common applications																				
Method		 <table><tr><td>$\pm F_{y,rec.}$ [kN]</td></tr><tr><td>2.15</td></tr></table><table><tr><td>α</td><td>0°</td><td>30°</td><td>45°</td><td>60°</td><td>90°</td></tr><tr><td>$\pm F_{\alpha,rec.}$ [kN]</td><td>18.30</td><td>7.77</td><td>5.95</td><td>5.10</td><td>4.74</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.					$\pm F_{y,rec.}$ [kN]	2.15	α	0°	30°	45°	60°	90°	$\pm F_{\alpha,rec.}$ [kN]	18.30	7.77	5.95	5.10	4.74
$\pm F_{y,rec.}$ [kN]																				
2.15																				
α	0°	30°	45°	60°	90°															
$\pm F_{\alpha,rec.}$ [kN]	18.30	7.77	5.95	5.10	4.74															

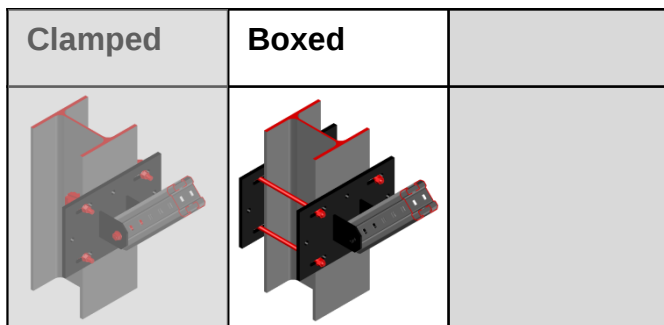
Design loading capacity - 3D		1/3
Method		
 Yield strength Design load capacity limit Design load Self weight 1.35 1.5 Live load Action Resistance		

Limiting components of capacity evaluated in following tables:			
1. Steel connector	2. Welds	3. Back plate with bolts	4. Hexagonal bolt in MI channel
			

MIC-SA-MA Base Material Connector - Steel

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

2/3

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.

1. Steel connector



The values for Mx, My and Mz take into account the eccentricity between load application at hexagonal bolt axis and baseplate.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
58.60	73.93	3.22	3.22	37.13	37.13
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.81	1.81	2.60	2.60	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fa in plain x/z with a certain inclination α and a force Fy considering their eccentricities:

Interaction:

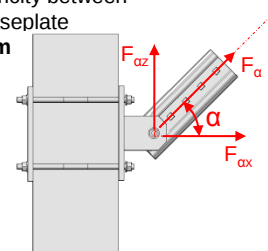
with ex = horizontal eccentricity between hexagonal bolt axis and baseplate
ex=0.07m

$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

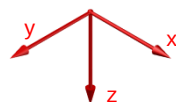
$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

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



2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
274.92	274.92	224.47	224.47	224.47	224.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.89	10.89	3.09	3.09	13.33	13.33

Interaction:

with: **ex= 0.07m**

$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

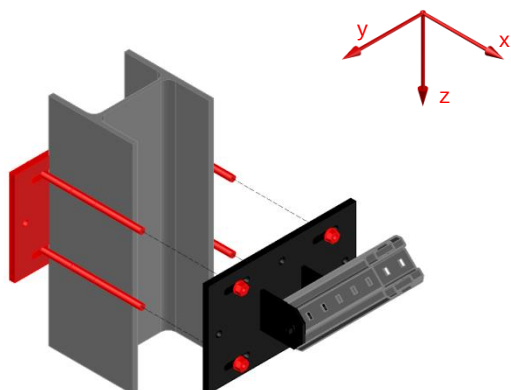
$$\frac{F_{x,Ed,\alpha}}{F_{x,Rd}} + \frac{F_{y,Ed}}{F_{y,Rd}} + \frac{F_{z,Ed,\alpha}}{F_{z,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} + \frac{M_{y,Ed,\alpha}}{M_{y,Rd}} + \frac{M_{z,Ed}}{M_{z,Rd}} \leq 1$$

MIC-SA-MA Base Material Connector - Steel

Design loading capacity - 3D

3/3

3. Back plate with bolts



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	56.07	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.67	0.67	11.56	11.56	7.77	7.77

Interaction::

with: $e_x = 0.07m$

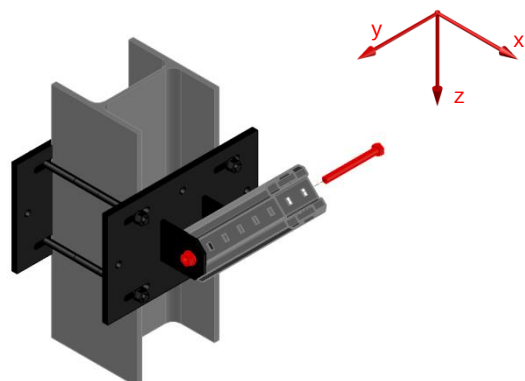
$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos \alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin \alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

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

4. Hexagonal bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

$$F_{\alpha Rd} = F_{xRd} = F_{zRd}$$

The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

The normal force F_{α} in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

$$\frac{F_{\alpha,Ed}}{F_{\alpha,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} \leq 1$$

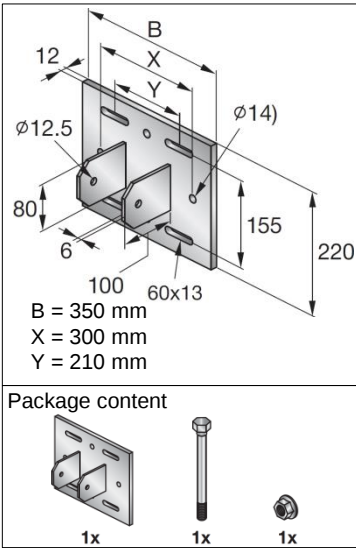
MIC-SB-MA Base Material Connector - Steel

Designation	Item number
MIC-SB-MA	304816

Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

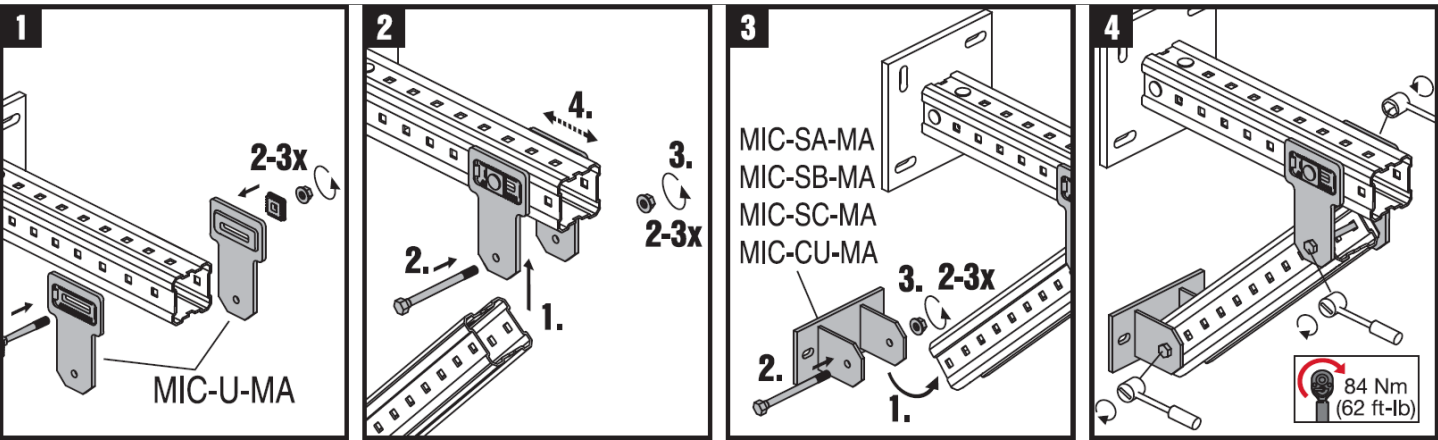
Weight:
7740 g incl. components

Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MIQ-90 girder to a steel beam in an angle, usually when it's used as a brace for another girder. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using one bolt through a hole, which enables various angles.



Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



The same assembly principles and torque moments should be applied for MIQ girders

MIC-SB-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	

Design criteria used for loading capacity

Methodology:

- Analytic calculation

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

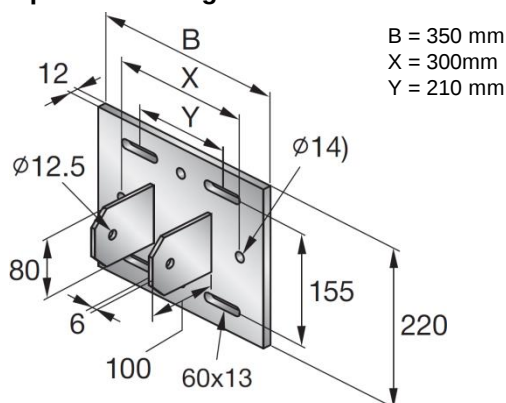
Software:

- Mathcad 15.0
- Microsoft Excel

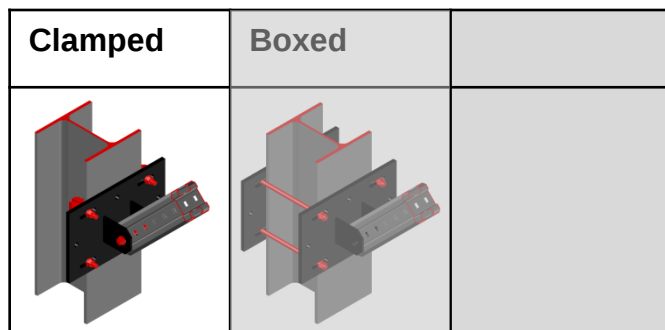
Environmental conditions:

- indoors, outdoors
- static loads
- no fatigue loads

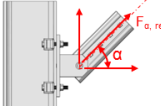
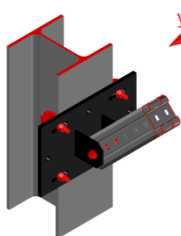
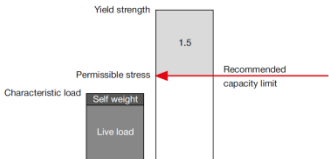
Simplified drawing:



MIC-SB-MA Base Material Connector - Steel



Loading case: Clamped	Combinations covered by loading case
BOM: Connector incl. all associated components MIC-SB-MA 304816 Beam clamps 4x MI-SGC M12 233859	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 165-235mm.

Recommended loading capacity - simplified for most common applications													
Method	<table><tr><td>$\pm F_{y,rec.}$ [kN]</td><td>2.15</td></tr></table>	$\pm F_{y,rec.}$ [kN]	2.15										
$\pm F_{y,rec.}$ [kN]	2.15												
	<table><tr><th>α</th><th>0°</th><th>30°</th><th>45°</th><th>60°</th><th>90°</th></tr><tr><td>$\pm F_{\alpha,rec.}$ [kN]</td><td>18.30</td><td>6.92</td><td>5.49</td><td>4.82</td><td>4.66</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	α	0°	30°	45°	60°	90°	$\pm F_{\alpha,rec.}$ [kN]	18.30	6.92	5.49	4.82	4.66
α	0°	30°	45°	60°	90°								
$\pm F_{\alpha,rec.}$ [kN]	18.30	6.92	5.49	4.82	4.66								

Design loading capacity - 3D		1/3
Method		

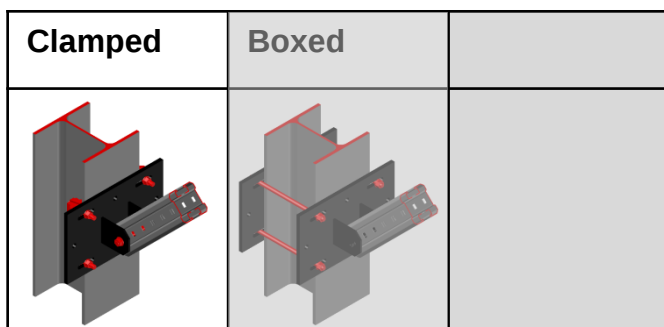
Limiting components of capacity evaluated in following tables:

1. Steel connector 	2. Welds 	3. Beam clamps 	4. Hexagonal bolt in MIQ-girder
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MIC-SB-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

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



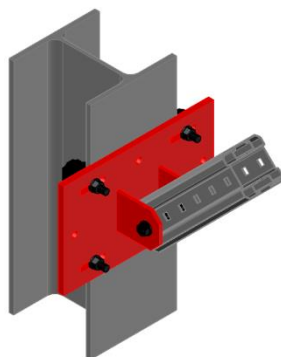
Design loading capacity - 3D

2/3

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.

1. Steel connector



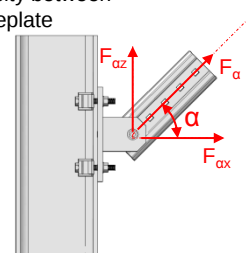
The values for Mx, My and Mz take into account the eccentricity between load application at hexagonal bolt axis and baseplate.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
43.19	50.50	3.22	3.22	23.25	23.25
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.13	1.13	1.63	1.63	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fa in plain x/z with a certain inclination α and a force Fy considering their eccentricities:

Interaction:

with ex = horizontal eccentricity between hexagonal bolt axis and baseplate
ex=0.07m



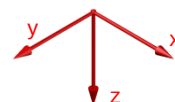
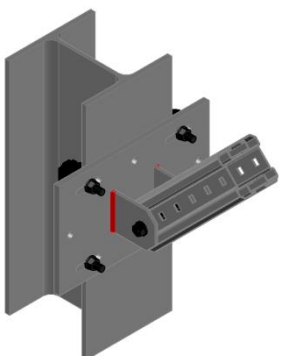
$$F_{x.Ed.\alpha} = F_{\alpha} \cdot \cos\alpha$$

$$F_{z.Ed.\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} \cdot e_x$$

$$M_{z.Ed} = F_{y.Ed} \cdot e_x$$

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
274.92	274.92	224.47	224.47	224.47	224.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.89	10.89	3.09	3.09	13.33	13.33

Interaction:

with: **ex= 0.07m**

$$F_{x.Ed.\alpha} = F_{\alpha} \cdot \cos\alpha$$

$$F_{z.Ed.\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} \cdot e_x$$

$$M_{z.Ed} = F_{y.Ed} \cdot e_x$$

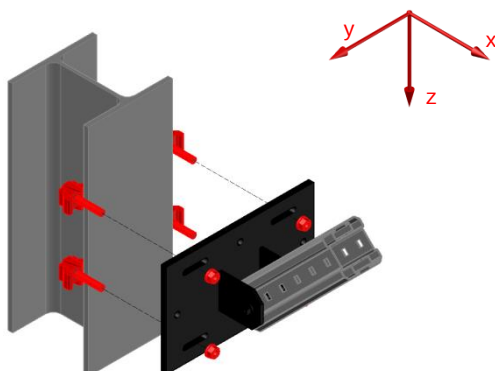
$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-SB-MA Base Material Connector - Steel

Design loading capacity - 3D

3/3

3. Beam clamps



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.06	1.06	2.07	2.07	2.80	2.80

Interaction:

with: $e_x = 0.07m$

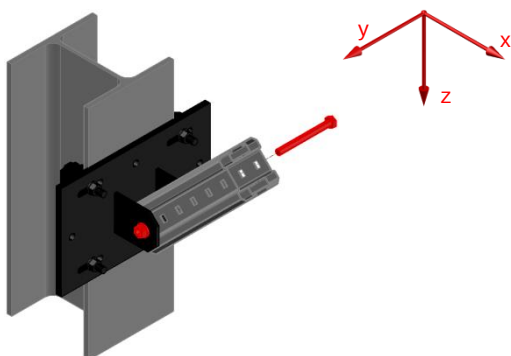
$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

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

4. Hexagonal bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

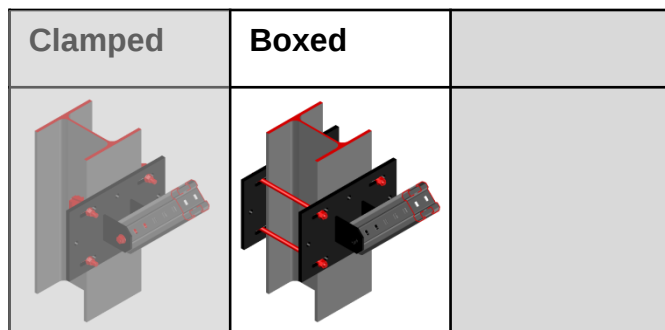
$$F_{\alpha Rd} = F_{xRd} = F_{zRd}$$

The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

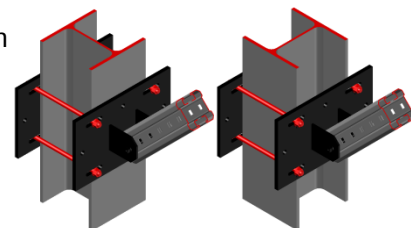
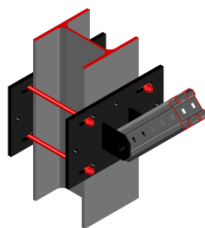
The normal force F_{α} in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

$$\frac{F_{\alpha,Ed}}{F_{\alpha,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} \leq 1$$

MIC-SB-MA Base Material Connector - Steel

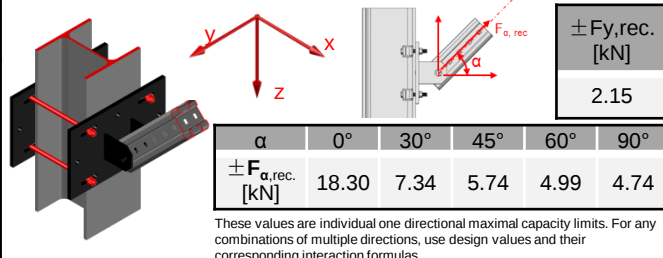
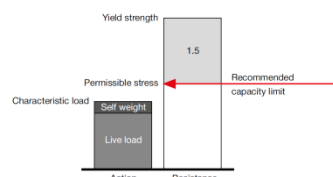


Loading case: Boxed	Combinations covered by loading case
BOM: Connector incl. all associated components 1x MIC-SB-MA 304816 Base plate 1x MIB-SB 304822 Threaded rods cut to particular length 4x AM12x1000 8.8 HDG...m 419103 Nut 8x M12-F-SL WS3/4 382897	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 165-235mm.



Recommended loading capacity - simplified for most common applications

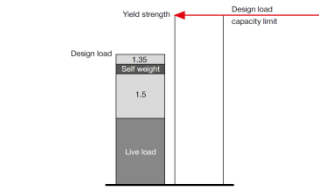
Method



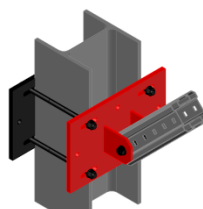
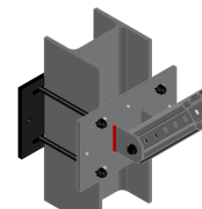
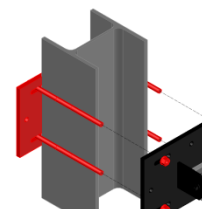
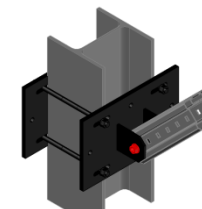
Design loading capacity - 3D

1/3

Method



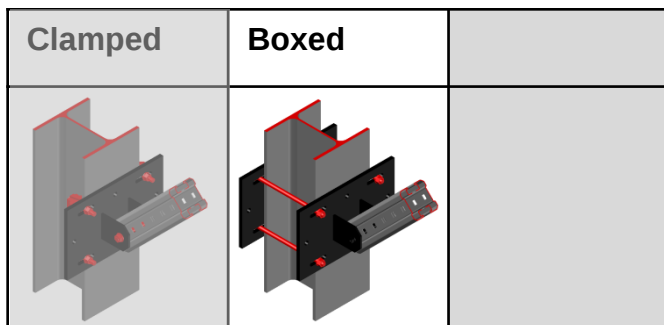
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Back plate with bolts	4. Hexagonal bolt in MIQ-girder
			

MIC-SB-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

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



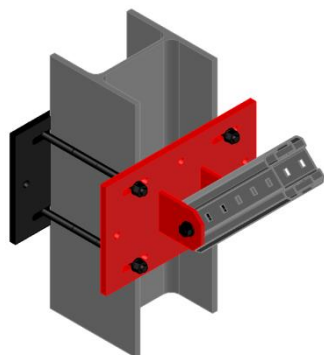
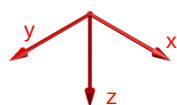
Design loading capacity - 3D

2/3

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.

1. Steel connector



The values for Mx, My and Mz take into account the eccentricity between load application at hexagonal bolt axis and baseplate.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
43.19	50.50	3.22	3.22	23.25	23.25
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.13	1.13	1.63	1.63	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fa in plain x/z with a certain inclination α and a force Fy considering their eccentricities:

Interaction:

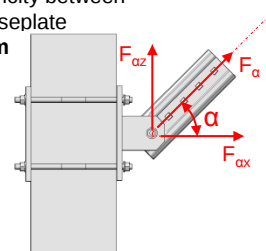
with ex = horizontal eccentricity between hexagonal bolt axis and baseplate
ex=0.07m

$$F_{x.Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

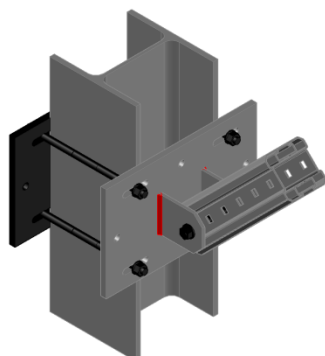
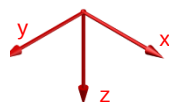
$$F_{z.Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y.Ed,\alpha} = F_{z.Ed,\alpha} \cdot e_x$$

$$M_{z.Ed} = F_{y.Ed} \cdot e_x$$

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



2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
274.92	274.92	224.47	224.47	224.47	224.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.89	10.89	3.09	3.09	13.33	13.33

Interaction:

with: **ex= 0.07m**

$$F_{x.Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

$$F_{z.Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y.Ed,\alpha} = F_{z.Ed,\alpha} \cdot e_x$$

$$M_{z.Ed} = F_{y.Ed} \cdot e_x$$

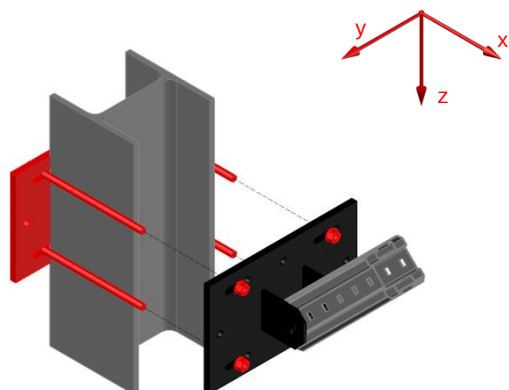
$$\frac{F_{x.Ed,\alpha}}{F_{x,Rd}} + \frac{F_{y.Ed}}{F_{y,Rd}} + \frac{F_{z.Ed,\alpha}}{F_{z,Rd}} + \frac{M_{x.Ed}}{M_{x,Rd}} + \frac{M_{y.Ed,\alpha}}{M_{y,Rd}} + \frac{M_{z.Ed}}{M_{z,Rd}} \leq 1$$

MIC-SB-MA Base Material Connector - Steel

Design loading capacity - 3D

3/3

3. Back plate with bolts



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	42.26	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.88	0.88	11.56	11.56	15.64	15.64

Interaction::

with: $e_x = 0.07m$

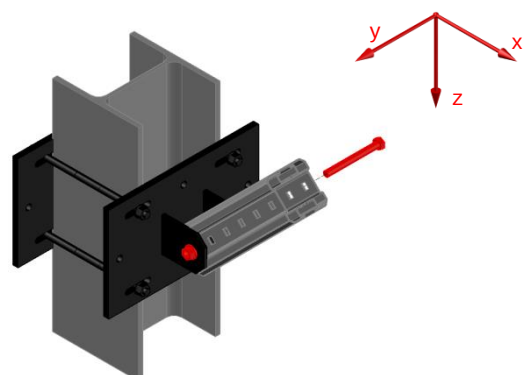
$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos \alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin \alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

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

4. Hexagonal bolt in MI channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

$$F_{\alpha Rd} = F_{xRd} = F_{zRd}$$

The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

The normal force F_{α} in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

$$\frac{F_{\alpha,Ed}}{F_{\alpha,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} \leq 1$$

MIC-SC-MA Base Material Connector - Steel

Designation	Item number
MIC-SC-MA	304817

Corrosion protection:

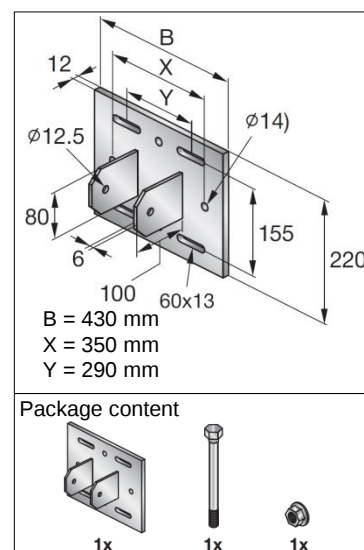
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

Weight:

9400 g incl. components

Submittal text:

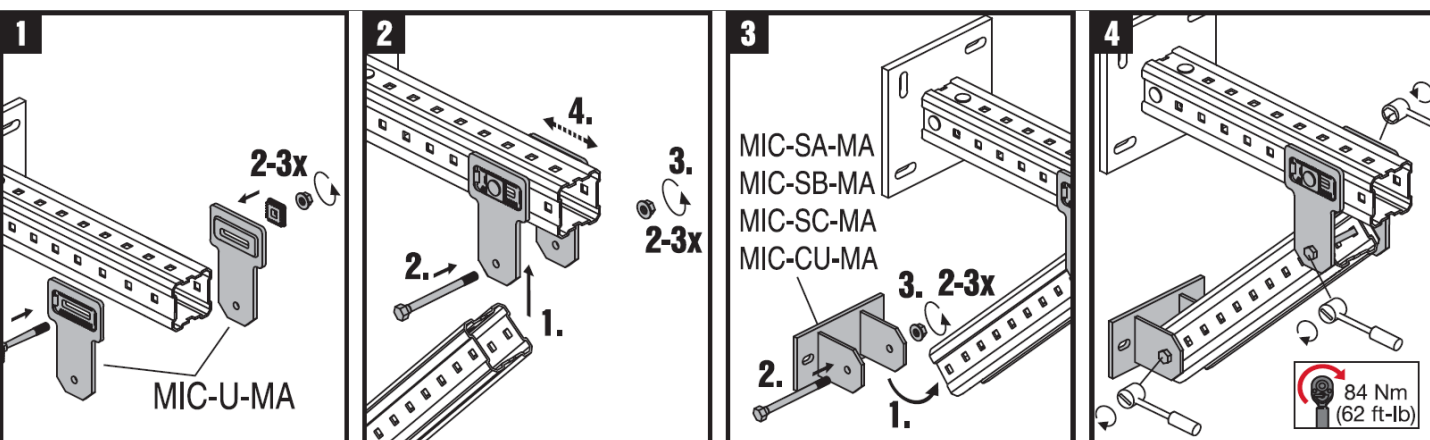
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 and MIQ-90 girders to a steel beam in an angle, usually when it's used as a brace for another girder. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using one bolt through a hole, which enables various angles.



Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - 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:



The same assembly principles and torque moments should be applied for MIQ girders

MIC-SC-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	

Design criteria used for loading capacity

Methodology:

- Analytic calculation

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

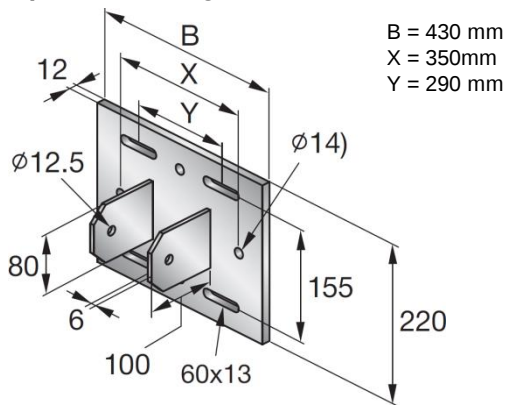
Software:

- Mathcad 15.0
- Microsoft Excel

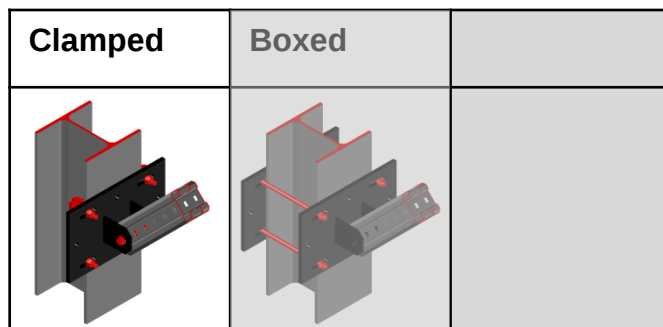
Environmental conditions:

- indoors, outdoors
- static loads
- no fatigue loads

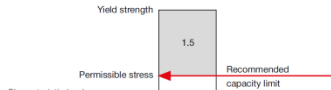
Simplified drawing:



MIC-SC-MA Base Material Connector - Steel



Loading case: Clamped	Combinations covered by loading case
BOM: Connector incl. all associated components MIC-SC-MA 304817 Beam clamps 4x MI-SGC M12 233859	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 235-300mm.

Recommended loading capacity - simplified for most common applications															
Method	<table><tr><td>$\pm F_{y,rec.}$ [kN]</td><td>2.15</td></tr></table><table><tr><td>α</td><td>0°</td><td>30°</td><td>45°</td><td>60°</td><td>90°</td></tr><tr><td>$\pm F_{\alpha,rec.}$ [kN]</td><td>18.30</td><td>6.92</td><td>5.49</td><td>4.82</td><td>4.66</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{y,rec.}$ [kN]	2.15	α	0°	30°	45°	60°	90°	$\pm F_{\alpha,rec.}$ [kN]	18.30	6.92	5.49	4.82	4.66
$\pm F_{y,rec.}$ [kN]	2.15														
α	0°	30°	45°	60°	90°										
$\pm F_{\alpha,rec.}$ [kN]	18.30	6.92	5.49	4.82	4.66										
															

Design loading capacity - 3D		1/3
Method		

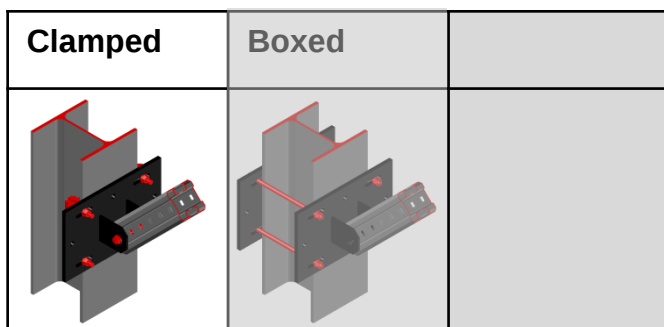
Limiting components of capacity evaluated in following tables:

1. Steel connector 	2. Welds 	3. Beam clamps 	4. Hexagonal bolt in MIQ-girder
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MIC-SC-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

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



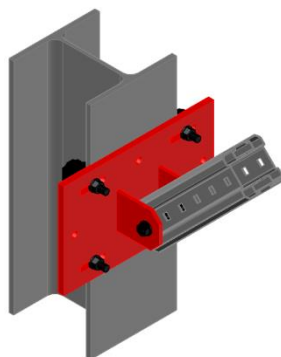
Design loading capacity - 3D

2/3

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.

1. Steel connector



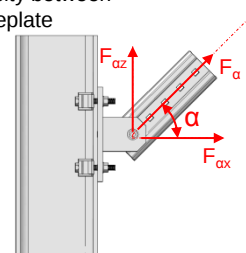
The values for Mx, My and Mz take into account the eccentricity between load application at hexagonal bolt axis and baseplate.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.47	38.38	3.22	3.22	15.78	15.78
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.77	0.77	1.10	1.10	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fa in plain x/z with a certain inclination α and a force Fy considering their eccentricities:

Interaction:

with ex = horizontal eccentricity between hexagonal bolt axis and baseplate
ex=0.07m



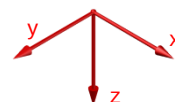
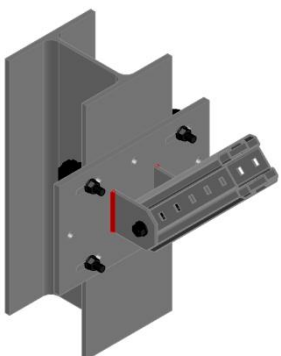
$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
274.92	274.92	224.47	224.47	224.47	224.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.89	10.89	3.09	3.09	13.33	13.33

Interaction:

with: ex= 0.07m

$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

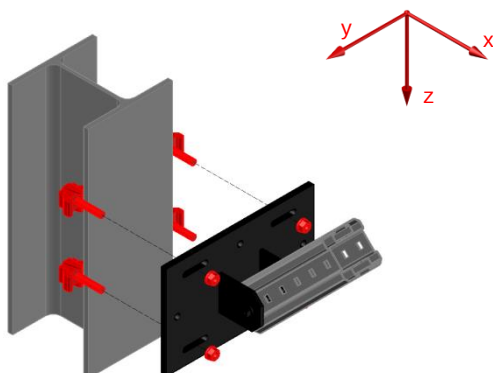
$$\frac{F_{x,Ed,\alpha}}{F_{x,Rd}} + \frac{F_{y,Ed}}{F_{y,Rd}} + \frac{F_{z,Ed,\alpha}}{F_{z,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} + \frac{M_{y,Ed,\alpha}}{M_{y,Rd}} + \frac{M_{z,Ed}}{M_{z,Rd}} \leq 1$$

MIC-SC-MA Base Material Connector - Steel

Design loading capacity - 3D

3/3

3. Beam clamps



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.31	1.31	2.07	2.07	4.51	4.51

Interaction:

with: $e_x = 0.07m$

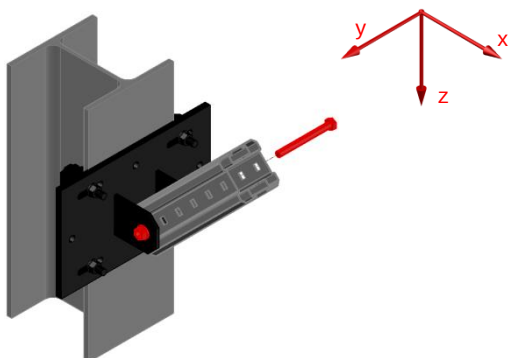
$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

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

4. Hexagonal bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

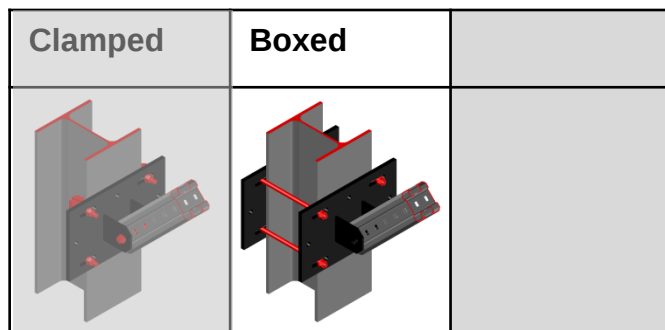
$$F_{\alpha,Rd} = F_{x,Rd} = F_{z,Rd}$$

The resistance $F_{\alpha,Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

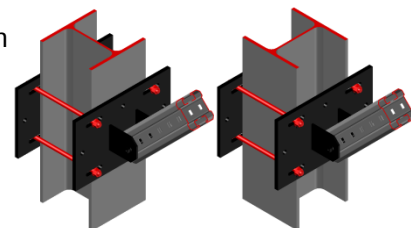
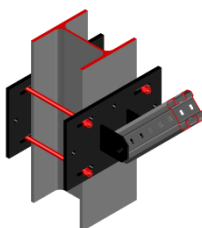
The normal force F_{α} in the inclined strut has to be compared with the resistance value $F_{\alpha,Rd}$.

$$\frac{F_{\alpha,Ed}}{F_{\alpha,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} \leq 1$$

MIC-SC-MA Base Material Connector - Steel



Loading case: Boxed		Combinations covered by loading case	
BOM: Connector incl. all associated components 1x MIC-SC-MA 304817 Base plate 1x MIB-SC 304823 Threaded rods cut to particular length 4x AM12x1000 8.8 HDG...m 419103 Nut 8x M12-F-SL WS3/4 382897		Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 235-300mm.	



Recommended loading capacity - simplified for most common applications

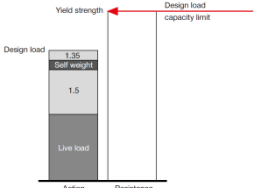
Method

The diagram illustrates the relationship between different types of loads and the resulting resistance. On the left, under 'Action', are 'Self weight' and 'Live load'. On the right, under 'Resistance', is a bar representing 'Yield strength' with a value of '1.5'. A red arrow labeled 'Recommended capacity limit' points from the 'Yield strength' bar to the 'Permissible stress' level, which is indicated by a horizontal line between the 'Action' and 'Resistance' sections.

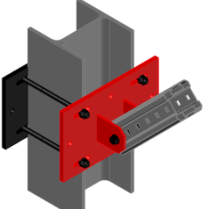
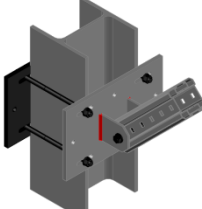
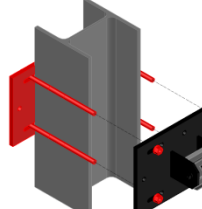
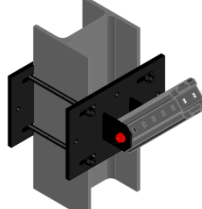
The 3D isometric view shows the MIC-SC-MA connector, a black metal plate with four threaded rods passing through it. The coordinate system (X, Y, Z) is shown with X pointing right, Y pointing up, and Z pointing down. The angle alpha is shown between the vertical Y-axis and the direction of the applied force F_{a, rec}.

α	0°	30°	45°	60°	90°
$\pm F_{a,rec.}$ [kN]	18.30	6.91	5.51	4.87	4.74

These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D		1/3
Method		
		

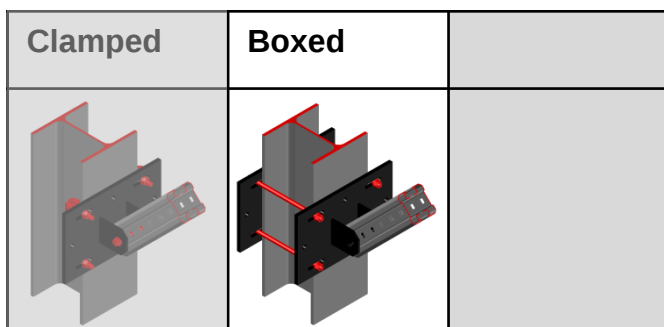
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Back plate with bolts	4. Hexagonal bolt in MI channel
			

MIC-SC-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

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



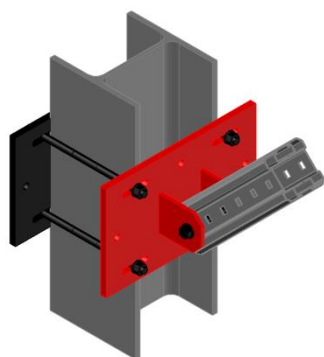
Design loading capacity - 3D

2/3

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.

1. Steel connector



The values for Mx, My and Mz take into account the eccentricity between load application at hexagonal bolt axis and baseplate.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.47	38.38	3.22	3.22	15.78	15.78
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.77	0.77	1.10	1.10	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fa in plain x/z with a certain inclination α and a force Fy considering their eccentricities:

Interaction:

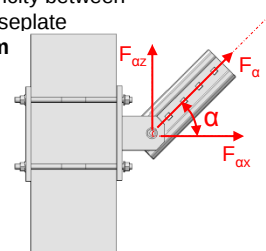
with ex = horizontal eccentricity between hexagonal bolt axis and baseplate
ex=0.07m

$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

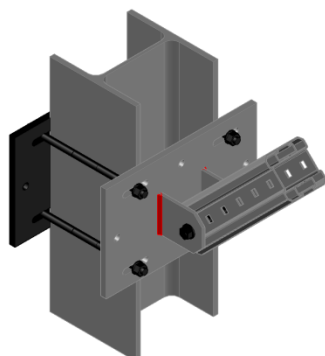
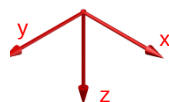
$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

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



2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
274.92	274.92	224.47	224.47	224.47	224.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.89	10.89	3.09	3.09	13.33	13.33

Interaction:

with: **ex= 0.07m**

$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

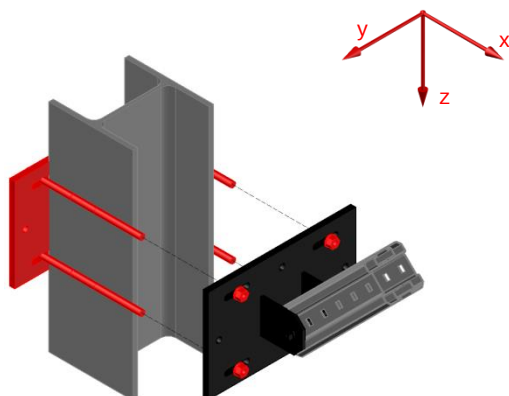
$$\frac{F_{x,Ed,\alpha}}{F_{x,Rd}} + \frac{F_{y,Ed}}{F_{y,Rd}} + \frac{F_{z,Ed,\alpha}}{F_{z,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} + \frac{M_{y,Ed,\alpha}}{M_{y,Rd}} + \frac{M_{z,Ed}}{M_{z,Rd}} \leq 1$$

MIC-SC-MA Base Material Connector - Steel

Design loading capacity - 3D

3/3

3. Back plate with bolts



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	33.10	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.08	1.08	11.56	11.56	25.15	25.15

Interaction::

with: $e_x = 0.07m$

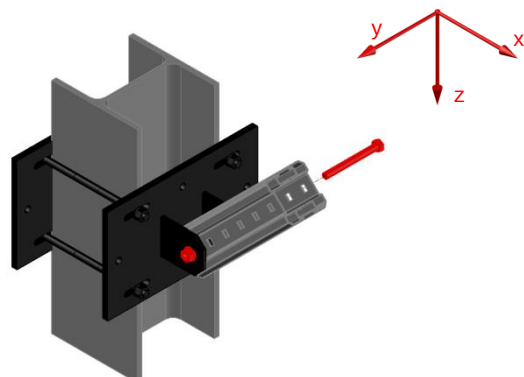
$$F_{x,Ed,\alpha} = F_{\alpha} \cdot \cos\alpha$$

$$F_{z,Ed,\alpha} = F_{\alpha} \cdot \sin\alpha \rightarrow M_{y,Ed,\alpha} = F_{z,Ed,\alpha} \cdot e_x$$

$$M_{z,Ed} = F_{y,Ed} \cdot e_x$$

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

4. Hexagonal bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

$$F_{\alpha Rd} = F_{xRd} = F_{zRd}$$

The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

The normal force F_{α} in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

$$\frac{F_{\alpha,Ed}}{F_{\alpha,Rd}} + \frac{M_{x,Ed}}{M_{x,Rd}} \leq 1$$

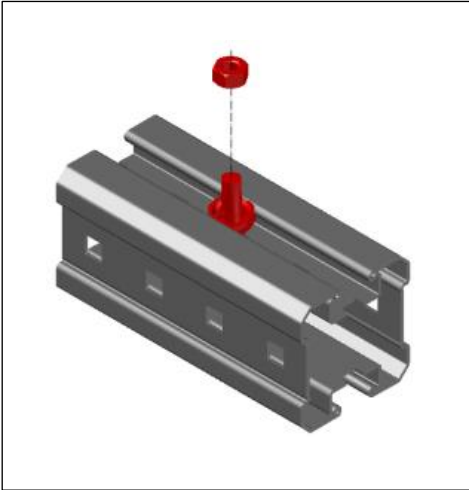
MIQA-T T-head bolt - accessories

Designation	Item number
MIQA-T T-head bolt	2120142



Recommended loading capacity	$\pm F_{x,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
	6.20	11.70

Design loading capacity	$\pm F_{x,Rd.}$ [kN]	$\pm F_{z,Rd.}$ [kN]
	9.30	17.55

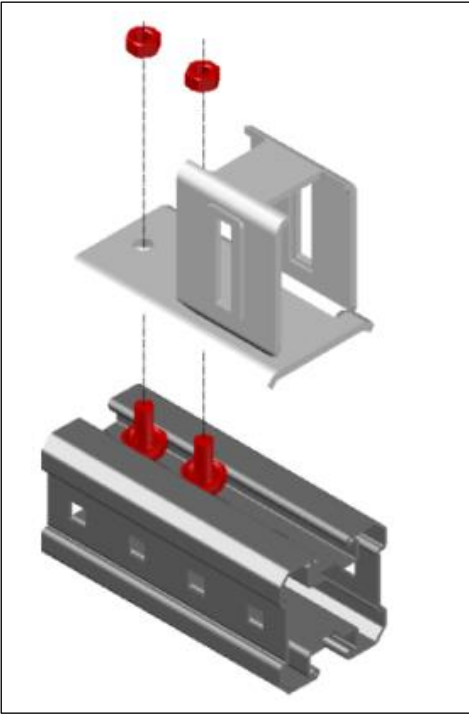


Designation	Item number
2x MIQA-T T-head bolt	2120142



Recommended loading capacity	$\pm F_{x,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
	11.20	23.40

Design loading capacity	$\pm F_{x,Rd.}$ [kN]	$\pm F_{z,Rd.}$ [kN]
	16.80	35.1



MIQM-M wing nut - accessories

Designation	Item number
MIQM-M10	2120274
MIQM-M12	2120275
MIQM-M16	2120276

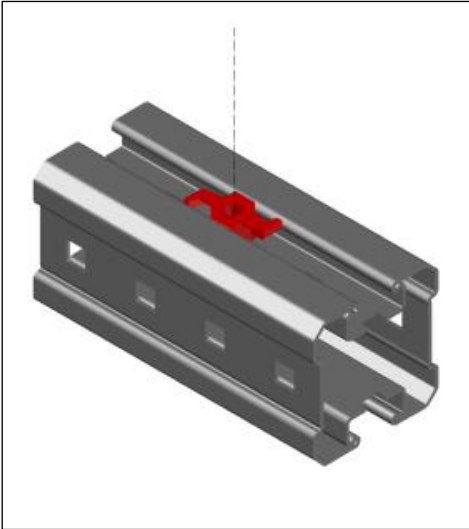


Recommended loading capacity

	$\pm F_{x,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
M 10	3.00	8.50
M 12	3.50	8.50
M 16	3.50	8.50

Design loading capacity

	$\pm F_{x,Rd.}$ [kN]	$\pm F_{z,Rd.}$ [kN]
M 10	4.50	12.75
M 12	5.25	12.75
M 16	5.25	12.75



Designation	Item number
2x MIQM-M10	2120274
2x MIQM-M12	2120275
2x MIQM-M16	2120276

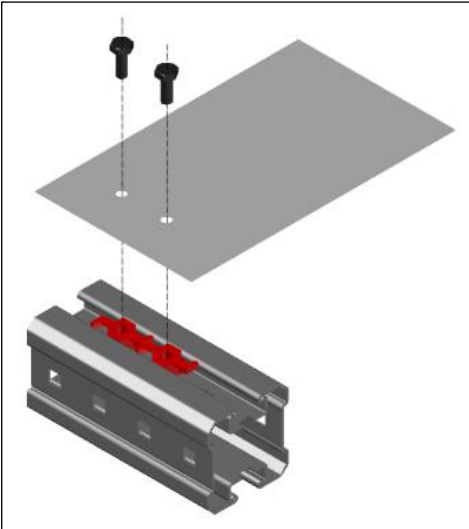


Recommended loading capacity

	$\pm F_{x,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
M 10	5.40	17.00
M 12	6.30	17.00
M 16	6.30	17.00

Design loading capacity

	$\pm F_{x,Rd.}$ [kN]	$\pm F_{z,Rd.}$ [kN]
M 10	8.10	25.50
M 12	9.45	25.50
M 16	9.45	25.50



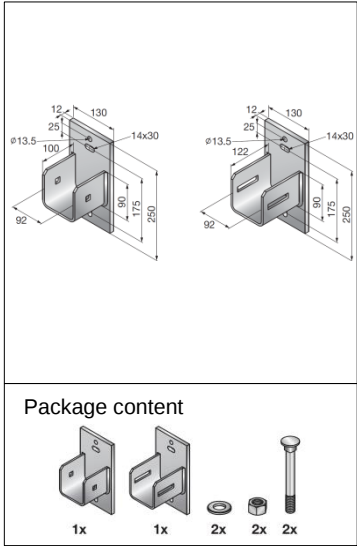
MIC-C90-EDB elevator connector

Designation	Item number
MIC-C90-EDB elevator connector	2149279

Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 micr ons

Weight:
9434g incl. accessories

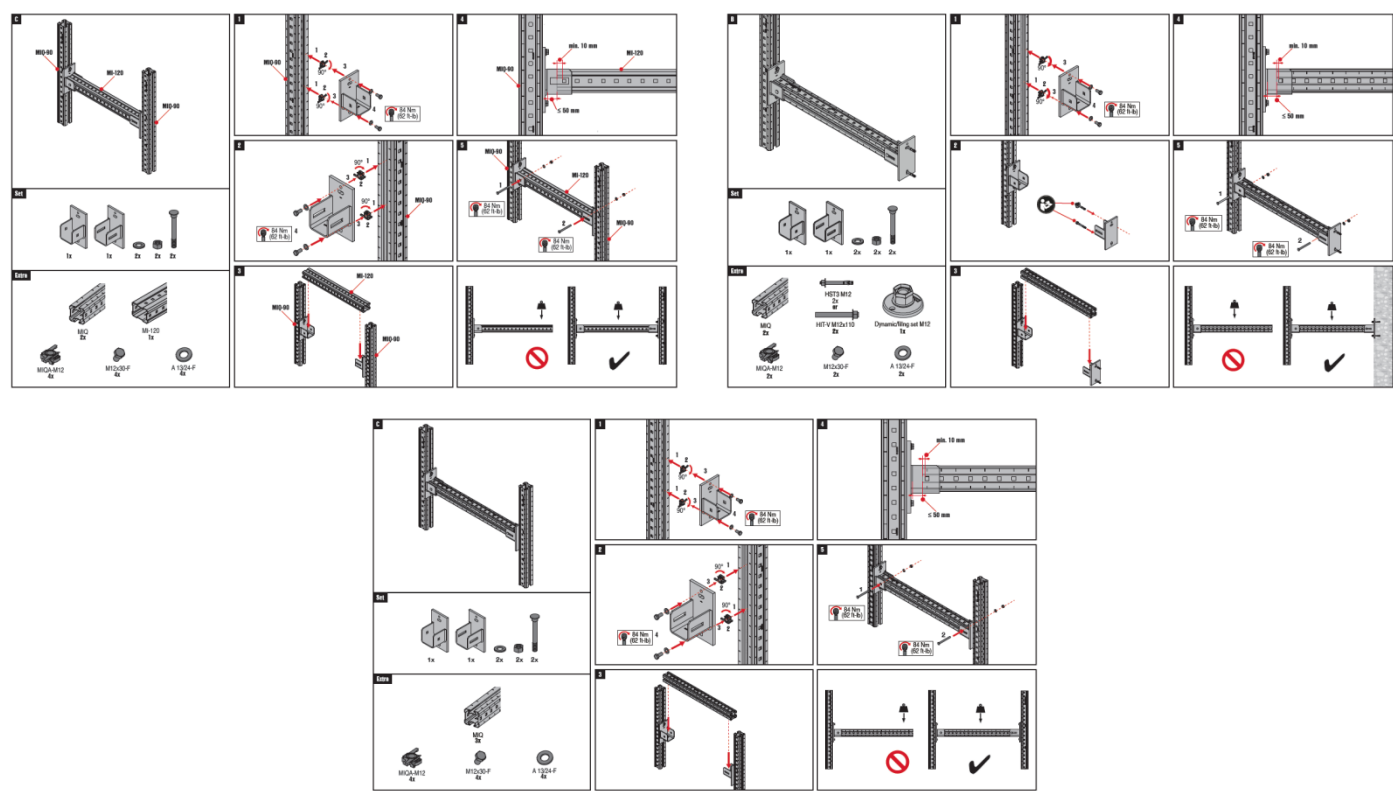
Submittal text:
Hot-dipped galvanised Hilti elevator connector, used primarily to connect an MI or MIQ girder to either a concrete wall or another girder. The baseplate of the connector is fastened to concrete through anchor holes with Hilti HST3 anchors or similar, and with MIA-OH bolts to another girder, secured with two self-locking nuts. Sold as a pair of connectors, one with a single hole and the other with an oblong hole, through which the connector is fastened to the girder with MIA-OH through-bolts. Material weight 9.43kg including all items.



Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S355 JR DIN EN 10025	$F_y = 355 \frac{N}{mm^2}$	$F_u = 490 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-C90-EDB elevator connector

Possible loading cases		
On concrete	On steel	

Design criteria used for loading capacity

Methodology:

- Finite element analysis
- Analytic calculation

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

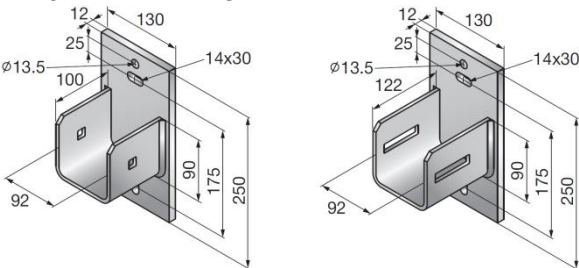
Software:

- Ansys 16.0
- Microsoft Excel
- Analytic calculation

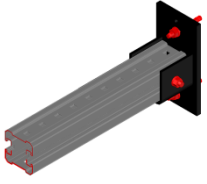
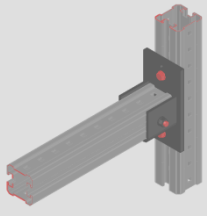
Environmental conditions:

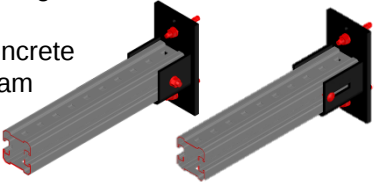
- static loads
- no fatigue loads

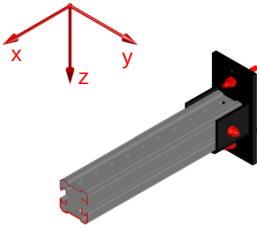
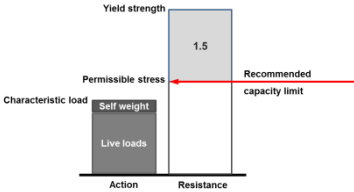
Simplified drawing:

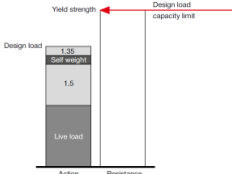
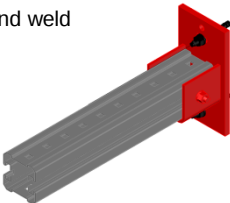
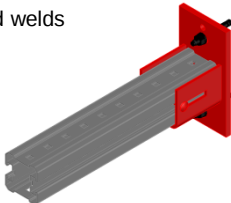


MIC-C90-EDB elevator connector

Possible loading cases		
On concrete	On steel	
		

Loading case: On concrete	Combinations covered by loading case
BOM: Base material connector incl. all connectivity material 1x MIC-C90-EDB elevator connector 2149279	Connector used for fixing MIQ girder, perpendicularly to concrete usually as divider beam (wall to wall) in elevator shaft 

Recommended loading capacity - simplified for most common applications								
Method		<table><tr><th>$\pm F_{x,rec.}$ [kN]</th><th>$\pm F_{y,rec.}$ [kN]</th><th>$\pm F_{z,rec.}$ [kN]</th></tr><tr><td>1.40</td><td>3.33</td><td>5.67</td></tr></table> These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]	1.40	3.33	5.67
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]						
1.40	3.33	5.67						
								

Design loading capacity - 3D		1/2
Method		
		
Limiting components of capacity evaluated in following tables:		
1. Slotted connector incl. bolt, base plate and weld		2. Connector with hole incl. bolt, plate and welds
		

MIC-C90-EDB elevator connector

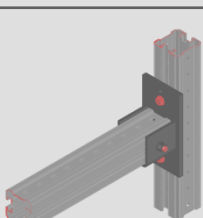
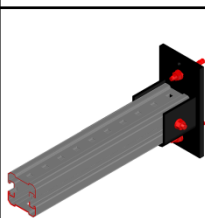
Conditions of the loading capacity tables:

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

Possible loading cases

On concrete

On steel



Design loading capacity - 3D

2/2

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. MIC-C90-EDB Slotted connector incl. bolt, base plate and weld



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.10	2.10	5.00**	5.00**	5.00	5.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.07	0.07	0.00	0.00	0.00	0.00

**Values are provided for 1mm local deflection on connector

Interaction:

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

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above.

2. MIC-C90-EDB Connector with hole incl. bolt, plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
10.60	10.60	5.00**	5.00**	5.00	5.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.07	0.07	0.00	0.00	0.00	0.00

**Values are provided for 1mm local deflection on connector

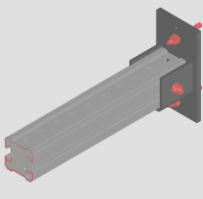
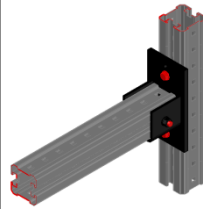
Interaction:

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

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

MIC-C90-EDB elevator connector

Possible loading cases

On concrete	On steel	
		

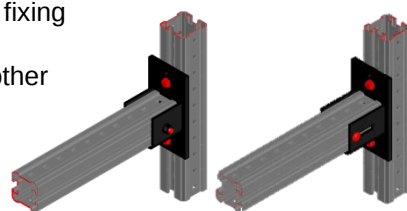
Loading case: On steel

BOM:

Base material connector incl. all connectivity material
1x MIC-C90-EDB elevator connector 2149279
 Connection to vertical MIQ girder
2x MIQM-M12 wing nut 2120275
2x M12x30-F hex. Head screw 284387

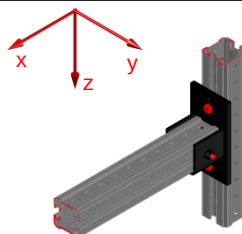
Combinations covered by loading case

Connector used for fixing MIQ girder, perpendicularly to other MIQ vertical girder usually as divider beam (wall to wall) in elevator shaft



Recommended loading capacity - simplified for most common applications

Method



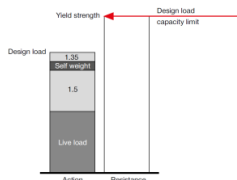
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
1.4	3.33	5.67

These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D

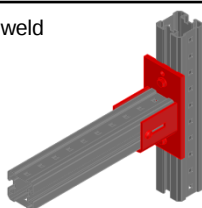
1/2

Method

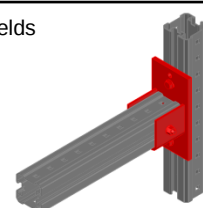


Limiting components of capacity evaluated in following tables:

1. Slotted connector incl. bolt, base plate and weld



2. Connector with hole incl. bolt, plate and welds

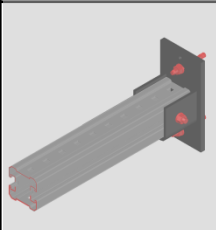
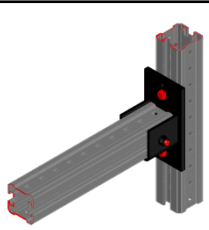


MIQC-S90-BP base material connector

Conditions of the loading capacity tables:

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

Possible loading cases

On concrete	On steel	
		

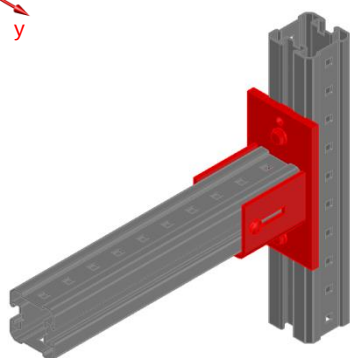
Design loading capacity - 3D

2/2

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. MIC-C90-EDB Slotted connector incl. bolt, base plate and weld



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.10	2.10	5.00**	5.00**	5.00	5.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.07	0.07	0.00	0.00	0.00	0.00

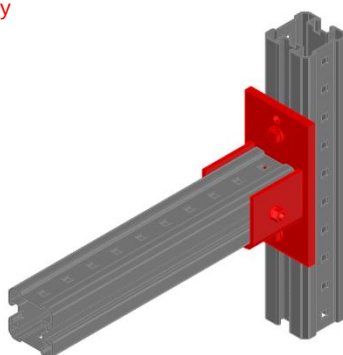
**Values are provided for 1mm local deflection on connector

Interaction:

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

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

2. MIC-C90-EDB Connector with hole incl. bolt, plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
10.60	10.60	5.00**	5.00**	5.00	5.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.07	0.07	0.00	0.00	0.00	0.00

**Values are provided for 1mm local deflection on connector

Interaction:

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

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

MIC-C120-EDB elevator connector

Designation	Item number
MIC-C120-EDB elevator connector	2149420

Corrosion protection:

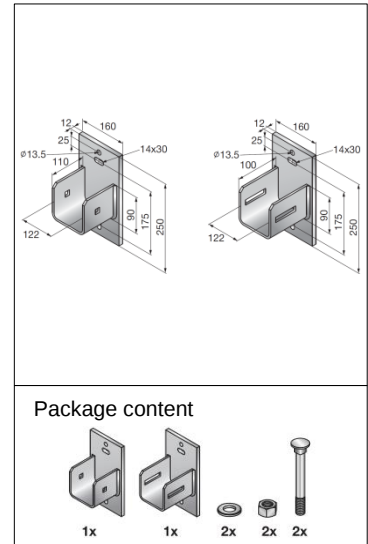
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 micr ons

Weight:

11043g incl. accessories

Submittal text:

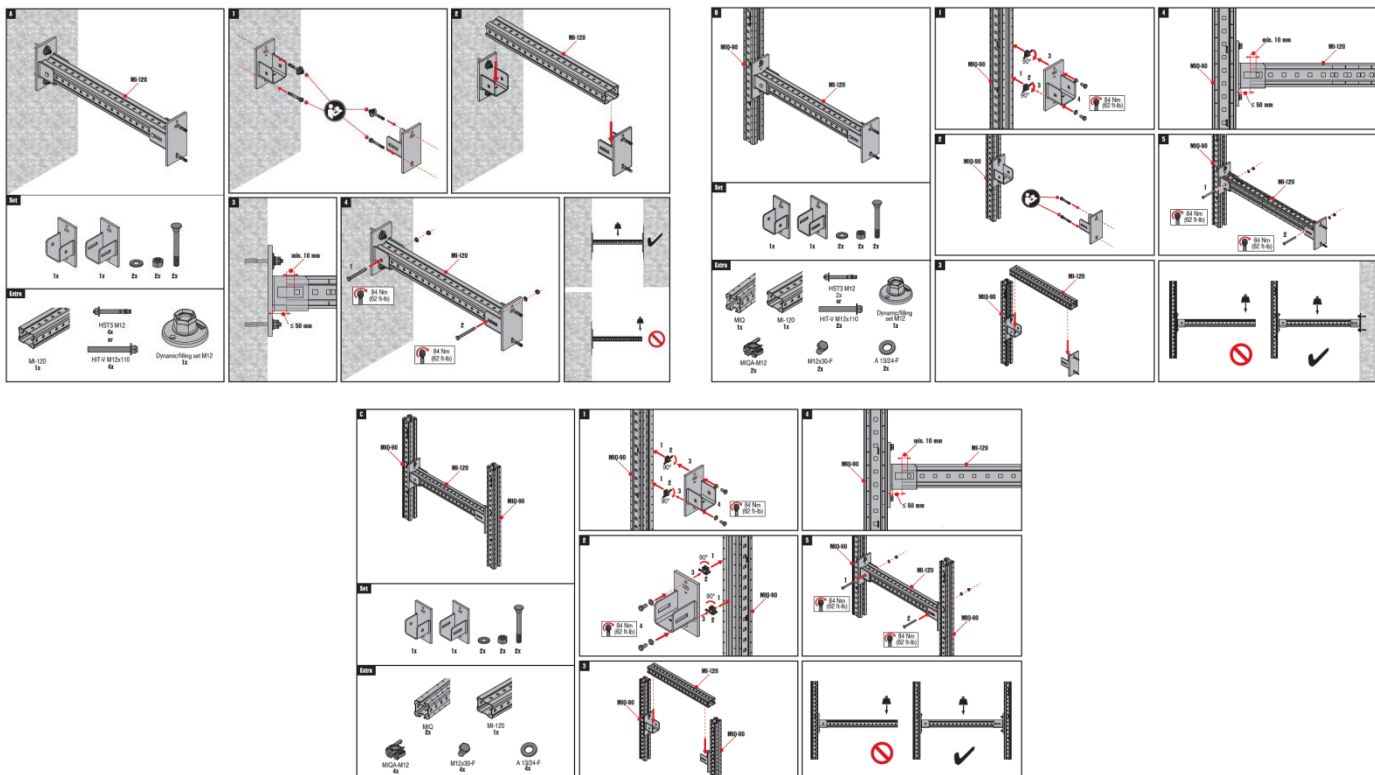
Hot-dipped galvanised Hilti elevator connector, used primarily to connect an MI or MIQ girder to either a concrete wall or another girder. The baseplate of the connector is fastened to concrete through anchor holes with Hilti HST3 anchors or similar, and with MIA-OH bolts to another girder, secured with two self-locking nuts. Sold as a pair of connectors, one with a single hole and the other with an oblong hole, through which the connector is fastened to the girder with MIA-OH through-bolts. Material weight 11.04kg including all items.



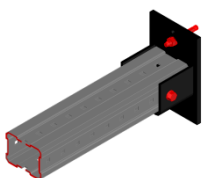
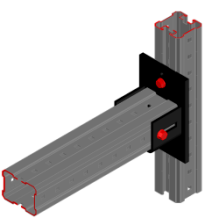
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S355 JR DIN EN 10025	$F_y = 355 \frac{N}{mm^2}$	$F_u = 490 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-C120-EDB elevator connector

Possible loading cases		
On concrete	On steel	
		

Design criteria used for loading capacity

Methodology:

- Finite element analysis
- Analytic calculation

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

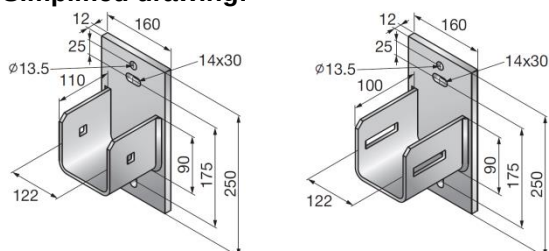
Software:

- Ansys 16.0
- Microsoft Excel
- Analytic calculation

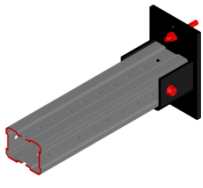
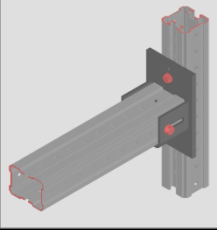
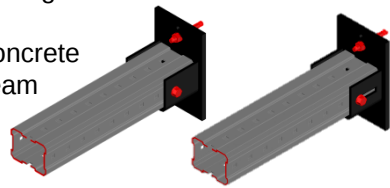
Environmental conditions:

- static loads
- no fatigue loads

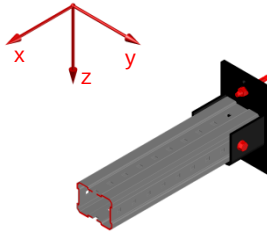
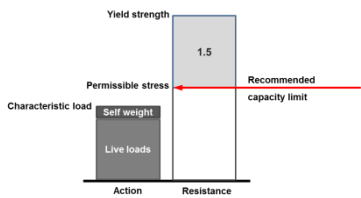
Simplified drawing:



MIC-C120-EDB elevator connector

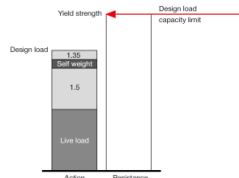
Possible loading cases		
On concrete	On steel	
		
Loading case: On concrete		Combinations covered by loading case
BOM: Base material connector incl. all connectivity material MIC-C120-EDB elevator connector 2149420		Connector used for fixing MIQ girder, perpendicularly to concrete usually as divider beam (wall to wall) in elevator shaft 

Recommended loading capacity - simplified for most common applications

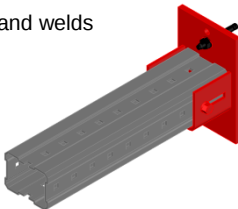
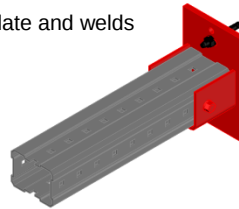
Method			
	$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
	1.40	4.33	6.67
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.			

Design loading capacity - 3D

1/2

Method	
	

Limiting components of capacity evaluated in following tables:

1. Slotted connector incl. bolt, base plate and welds 	2. Connector with hole incl. bolt, base plate and welds 
--	--

MIC-C120-EDB elevator connector

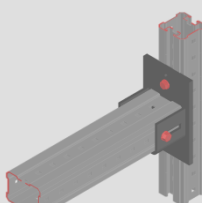
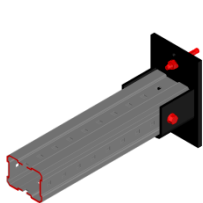
Conditions of the loading capacity tables:

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

Possible loading cases

On concrete

On steel



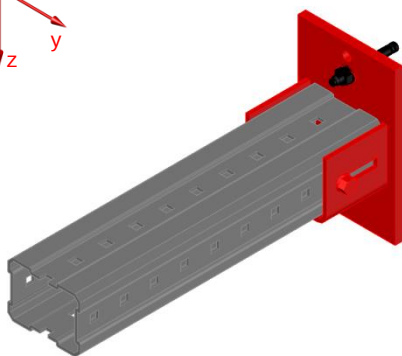
Design loading capacity - 3D

2/2

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. Slotted connector incl. bolt, base plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.10	2.10	6.50**	6.50**	10.00	10.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.10	0.10	0.00	0.00	0.00	0.00

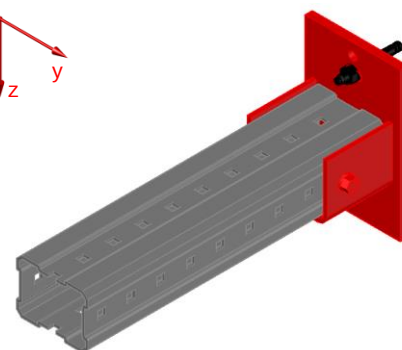
**Values are provided for 1mm local deflection on connector

Interaction:

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

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

2. Connector with hole incl. bolt, base plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
14.00	14.00	6.50**	6.50**	10.00	10.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.10	0.10	0.00	0.00	0.00	0.00

**Values are provided for 1mm local deflection on connector

Interaction:

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

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

MIC-C120-EDB elevator connector

Possible loading cases

On concrete	On steel	

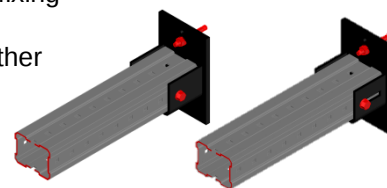
Loading case: On steel

BOM:

Base material connector incl. all connectivity material
MIC-C120-EDB elevator connector **2149420**
 Connection to vertical MIQ girder
2x MIQM-M12 wing nut **2120275**
2x M12x30-F hex. Head screw **284387**

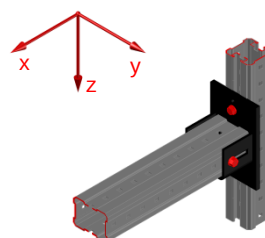
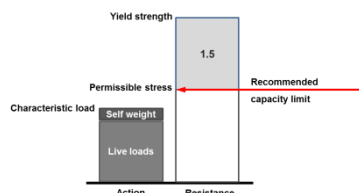
Combinations covered by loading case

Connector used for fixing MI-120 girder, perpendicularly to other MIQ vertical girder usually as divider beam (wall to wall) in elevator shaft



Recommended loading capacity - simplified for most common applications

Method



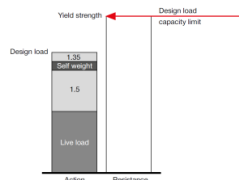
$\pm F_{x,rec.}$ [kN]	$\pm F_{y,rec.}$ [kN]	$\pm F_{z,rec.}$ [kN]
1.40	4.33	6.67

These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D

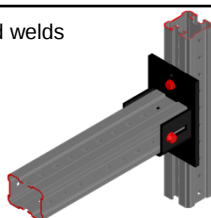
1/2

Method

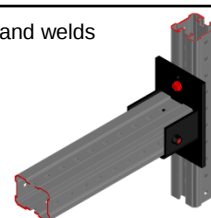


Limiting components of capacity evaluated in following tables:

1. Slotted connector incl. bolt, base plate and welds



2. Connector with hole incl. bolt, base plate and welds



MIC-C120-EDB elevator connector

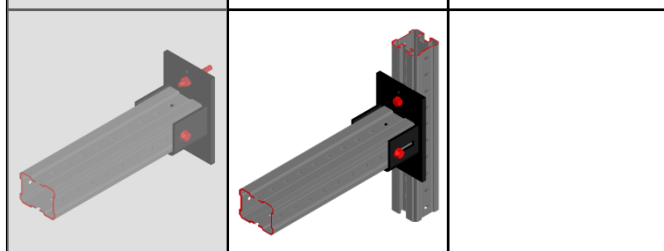
Conditions of the loading capacity tables:

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

Possible loading cases

On concrete

On steel



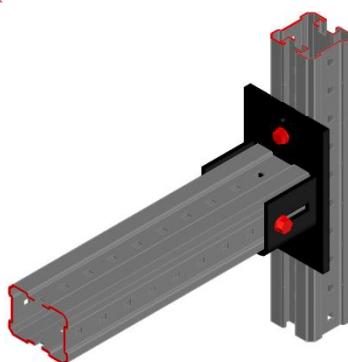
Design loading capacity - 3D

2/2

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. Slotted connector incl. bolt, base plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.10	2.10	5.00**	5.00**	8.50	8.50
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.10	0.10	0.00	0.00	0.00	0.00

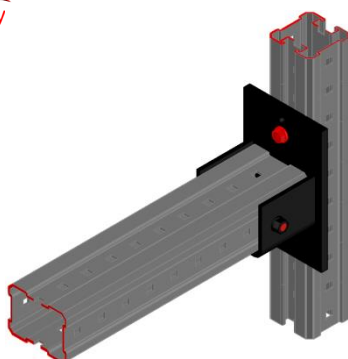
**Values are provided for 1mm local deflection on connector

Interaction:

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

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

2. Connector with hole incl. bolt, base plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
10.60	10.600	5.00**	5.00**	8.50	8.50
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.10	0.10	0.00	0.00	0.00	0.00

**Values are provided for 1mm local deflection on connector

Interaction:

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

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

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