Installation Technical Manual

Technical data

MI System

Version 1.1 I 05.2016

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

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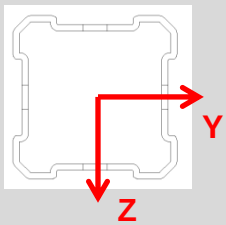
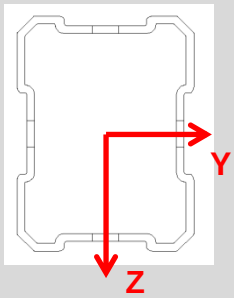
MI-Girders

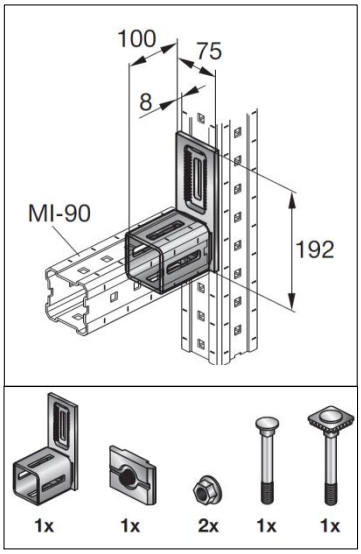
Designation	Item number
MI-90 3m	**304798**
MI-90 6m	**304799**
MI-120 3m	**304800**
MI-120 6m	**304801**

Technical data			**MI-90**	**MI-120**
For girder MI / cross section including torsion				
Cross-sectional area	A	[mm²]	1057.4	1456.24
Channel weight		[kg/m]	9.43	12.64
Material				
yield strength	$f_{y,k}$	[N/mm²]	235,0	235,0
permissible stress*	σ_{rec}	[N/mm²]	167.9	167.9
E-module		[N/mm²]	210000	210000
thrust-module		[N/mm²]	81000	81000
Surface				
hot dip galvanized		[µm]	70	70
Cross-section values Y-axis				
Axis of gravity	e_y	[mm]	45,0	60,0
moment of inertia	I_y	[cm⁴]	120.75	280.72
Section modulus	W_y	[cm³]	26.83	46.79
Radius of gyration	i_y	[cm]	3.38	4.39
Cross-section values Z-axis				
Axis of gravity	e_z	[mm]	45,00	45,00
moment of inertia	I_z	[cm⁴]	120.75	181.65
Section modulus	W_z	[cm³]	26.83	40.37
Radius of gyration	i_z	[cm]	3.38	3.53
Data to the torsion				
torsional moment of inertia	It	[cm⁴]	164.82	314.97
torsional section modulus	W_t	[cm³]	38.82	71.69

1

MIC-90-U Connector

Designation	Item number
MIC-90-U	**304803**



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

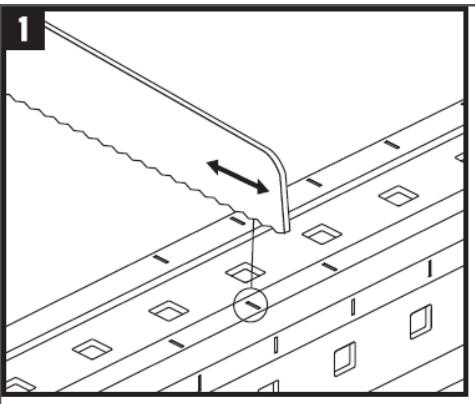
Weight:
3490 g incl. components

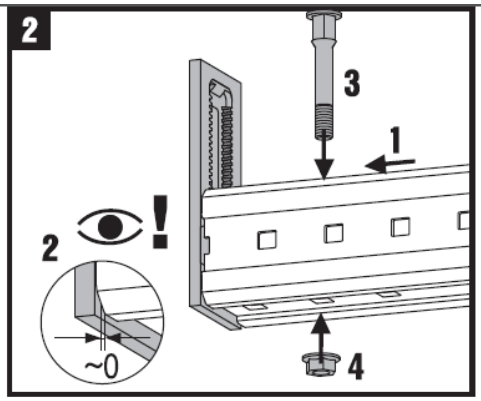
Submittal text:
Hot dipped galvanized, 90° Hilti MI angle connector, typically used for connecting two perpendicular MI girders. The baseplate has a serrated slot for improved shear loads, and the connector is fixed with an oblong hole to enable fine adjustment. Not for cantilever applications.

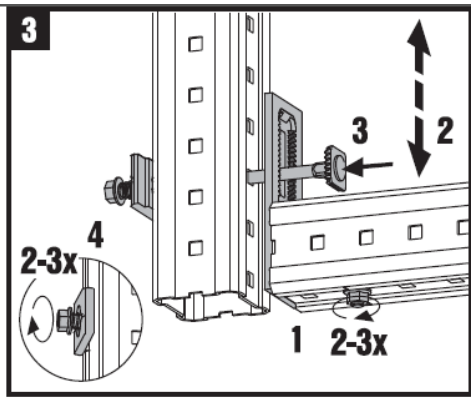
Material properties:

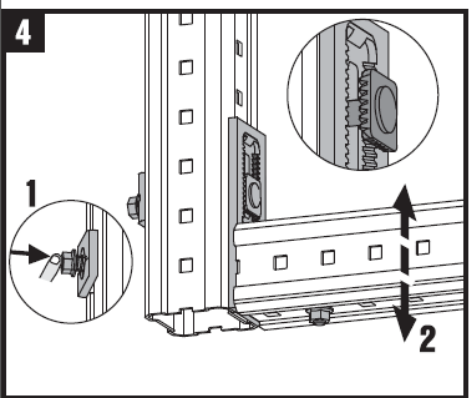
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

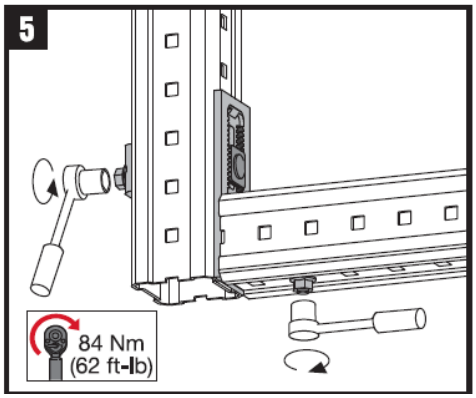
Instruction For Use:

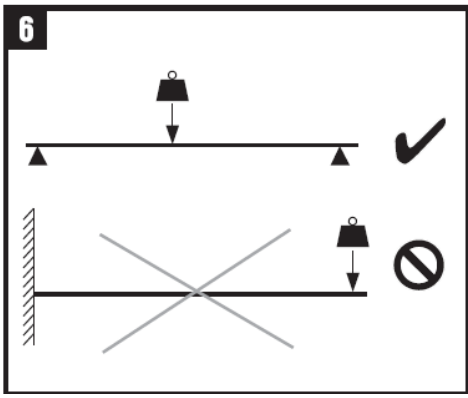




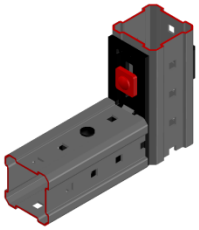








MIC-90-U Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

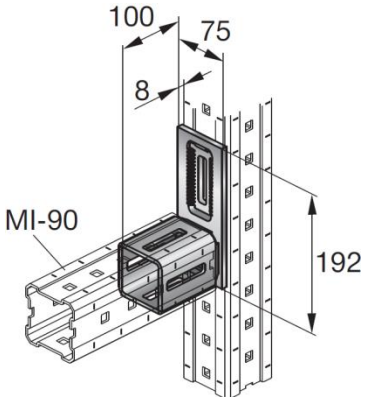
Standards and codes:

• 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

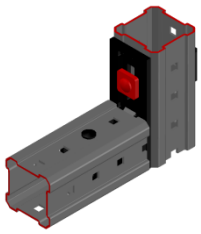
Software:
- Mathcad 15.0
- Microsoft Excel

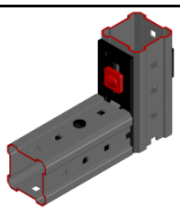
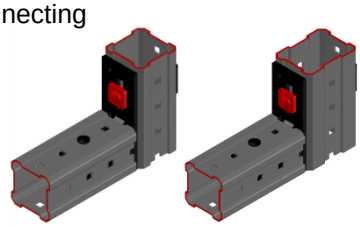
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



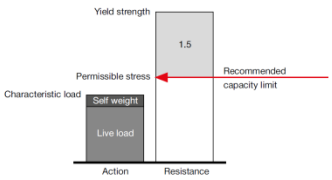
MIC-90-U Connector

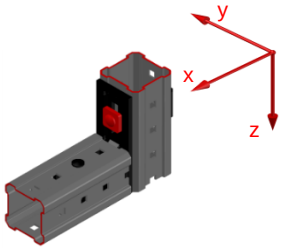
Standard		
		

Loading case: Standard	Combinations covered by loading case
BOM: For fixation on MI-90 girder Angle incl. all components **1x MIC-90-U** **304803** For fixation on MI-120 **1x MIC-90-U** **304803** **1x MIA-EH120** **304888** The MIA-EH90 remain unused 	Connector used for connecting MI-90 girder on either MI-90 or MI-120 girder in a 90-degree angle 

Recommended loading capacity - simplified for most common applications

Method



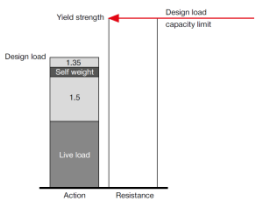


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
1.88	9.82	11.32

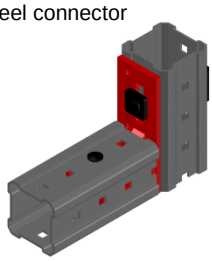
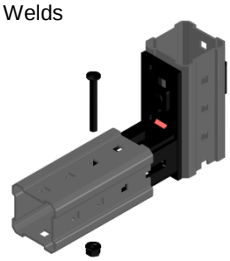
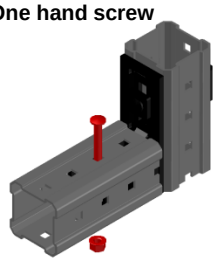
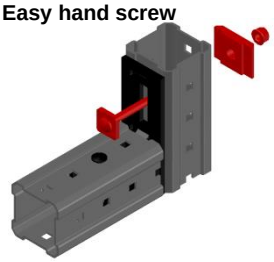
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



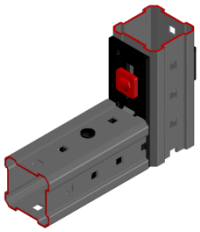
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. **One hand screw**	4. **Easy hand screw**
			

MIC-90-U Connector

Conditions of the loading capacity tables:

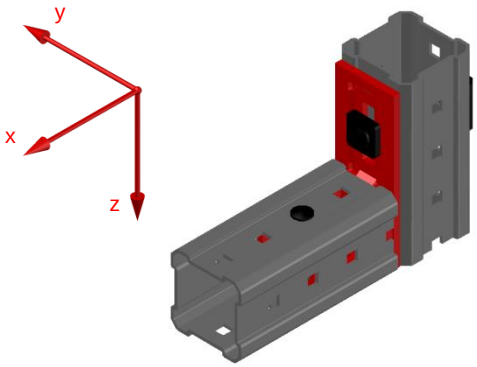
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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



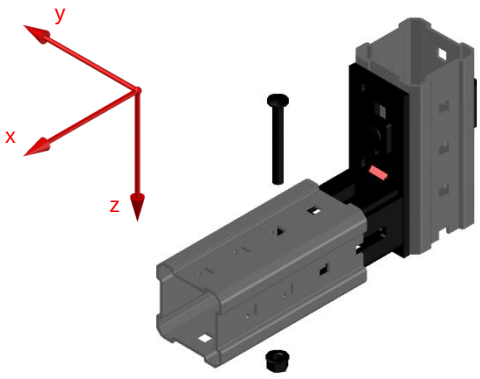
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.90	Not decisive	14.73	14.73	63.92	63.92
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.36	1.36	0.00	0.00	0.00	0.00

includes cross section resistance of steel plate and contact pressure

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.99	5.99	0.00	0.00	0.00	0.00

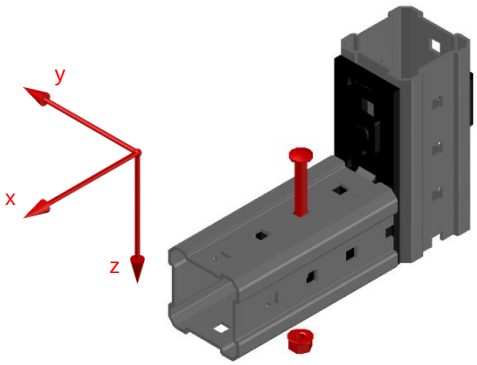
Interaction:

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

MIC-90-U Connector

Design loading capacity - 3D 3/3

3. One hand screw -in connection to MIC-90-U and MI90-channel



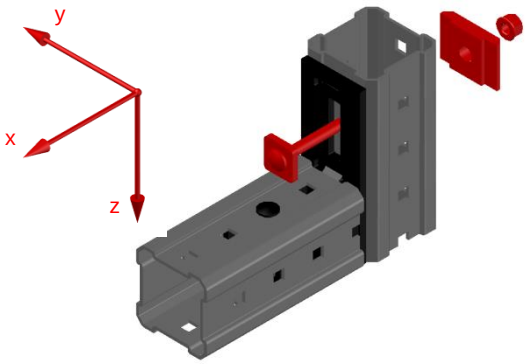
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
3.33	3.33	36.29	36.29	Not decisive	Not decisive
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.20	1.20	0.00	0.00	0.00	0.00

includes shear of the bolt, friction resistance, bearing resistance at connector plate and at channel MI90

Interaction:

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

4. Easy hand screw- in connection MIC-90-U to MI90/120-channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.82	Not decisive	Not decisive	Not decisive	16.99	16.99
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
Note decisive	Not decisive	0.00	0.00	0.00	0.00

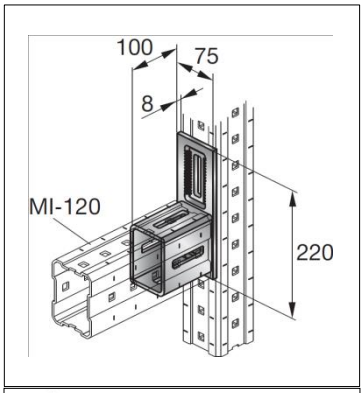
includes shear, bending and tension of the bolt, bearing resistance channel MI90/120 and tooth plate, resistance of screw plate

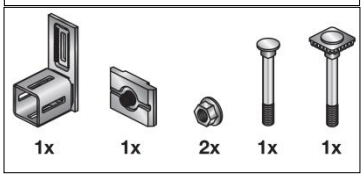
Interaction:

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

MIC-120-U Connector

Designation	Item number
MIC-120-U	**304804**





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

Weight:
2786 g incl. components

Submittal text:
Hot dipped galvanized, 90° Hilti MI angle connector, typically used for connecting two perpendicular MI girders. The baseplate has a serrated slot for improved shear loads, and the connector is fixed with an oblong hole to enable fine adjustment. Not for cantilever applications.

Material properties:

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

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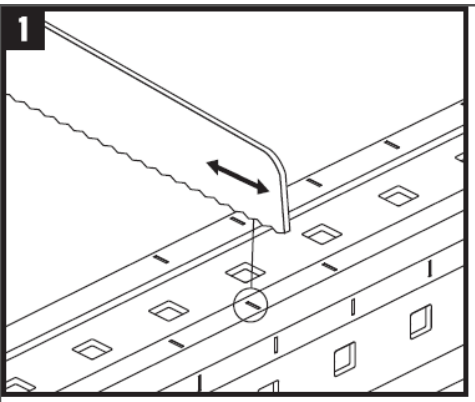
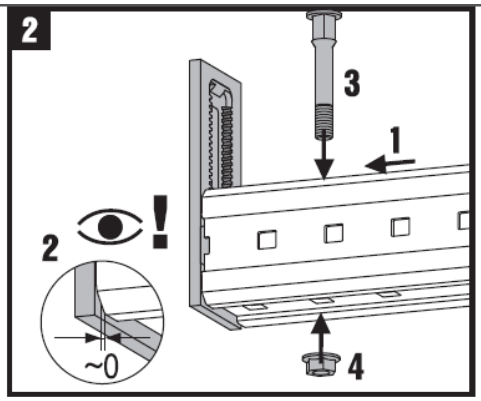
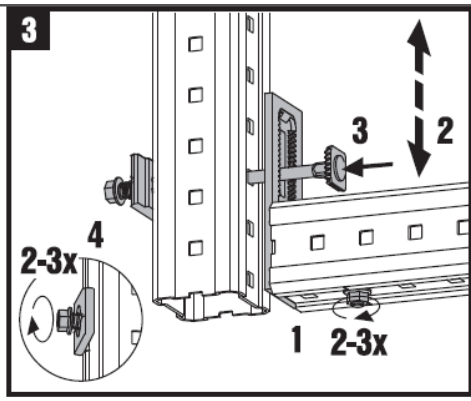
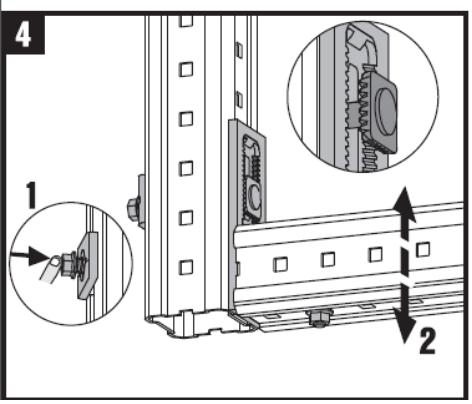
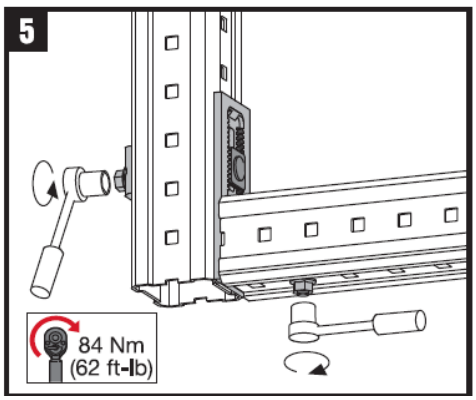
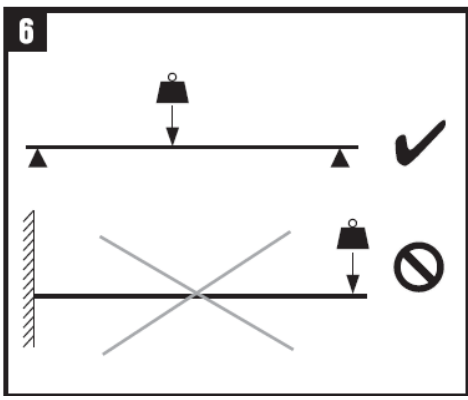




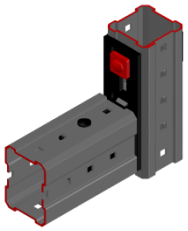








MIC-120-U Connector

Possible loading cases		
Standard		
		

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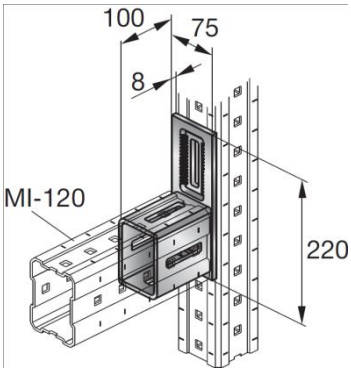
• EN 1993-1-8	Eurocode 3: Design of steel structures –Part 1-8: Design of joints	03.2012

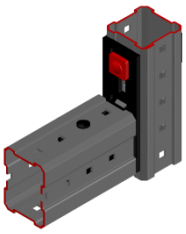
Software:
- Mathcad 15.0
- Microsoft Excel

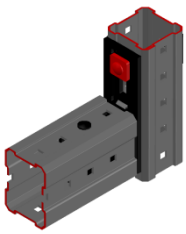
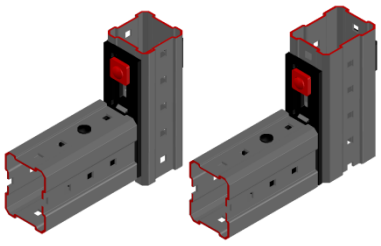
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



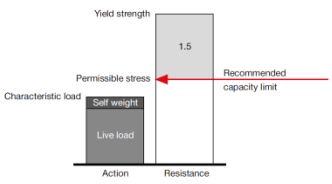
MIC-120-U Connector

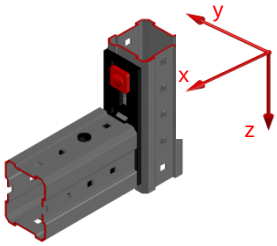
Standard		
		

Loading case: Standard	Combinations covered by loading case
BOM: For fixation on MI-90 girder Angle incl. all components **1x MIC-120-U** **304804** For fixation on MI-120 **1x MIC-120-U** **304804** **1x MIA-EH120** **304888** The MIA-EH90 remain unused 	Connector used for Connecting MI-120 girder on either MI-90 or MI-120 girder in a 90-degree angle 

Recommended loading capacity - simplified for most common applications

Method



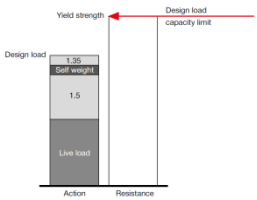


±Fx,rec [kN]	±Fy,rec [kN]	±Fz,rec [kN]
1.72	10.55	11.32

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

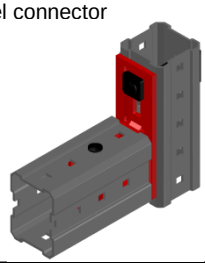
Design loading capacity - 3D 1/3

Method



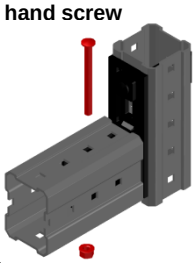
Limiting components of capacity evaluated in following tables:

1. Steel connector

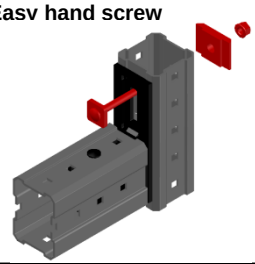


2. Welds

3. **One hand screw**



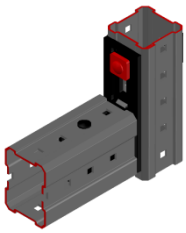
4. **Easy hand screw**



MIC-120-U Connector

Conditions of the loading capacity tables:

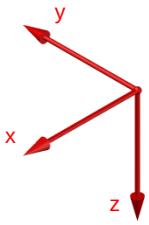
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

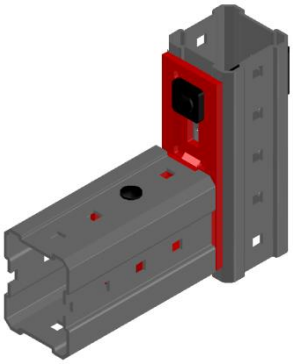
Standard		
		

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





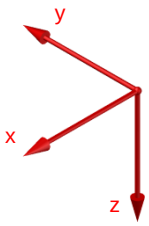
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.60	Not decisive	15.83	15.83	63.92	63.92
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.14	1.14	0.00	0.00	0.00	0.00

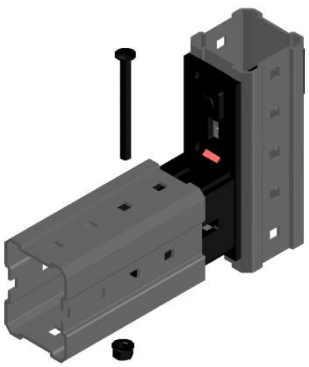
includes cross section resistance of steel plate and contact pressure

Interaction:

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

2. Welds





+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
336.02	336.02	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
9.73	9.73	0.00	0.00	0.00	0.00

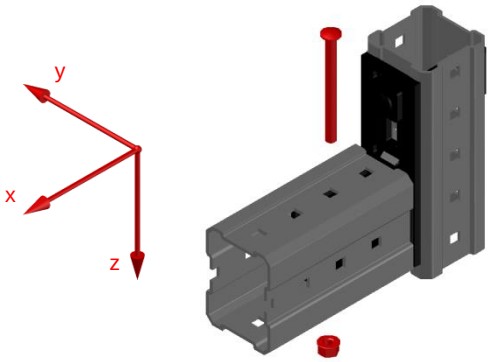
Interaction:

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

MIC-120-U Connector

Design loading capacity - 3D 3/3

3. One hand screw -in connection to MIC-90-U and MI90-channel



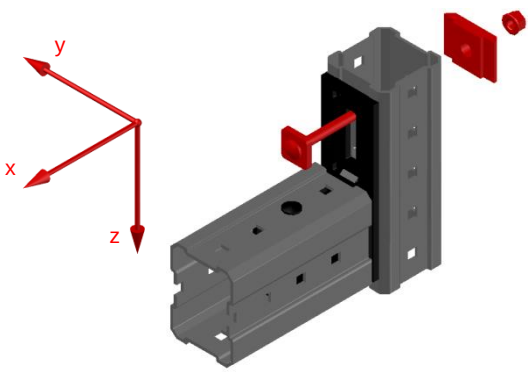
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
6.66	6.66	41.47	41.47	Not decisive	Not decisive
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.99	1.99	0.00	0.00	0.00	0.00

includes shear of the bolt, friction resistance, bearing resistance at connector plate and at channel MI120

Interaction:

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

4. Easy hand screw- in connection MIC-90-U to MI90/120-channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.59	Not decisive	Not decisive	Not decisive	16.99	16.99
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
Note decisive	Not decisive	0.00	0.00	0.00	0.00

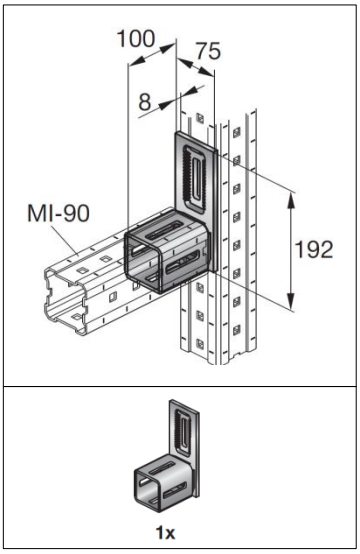
includes shear, bending and tension of the bolt, bearing resistance channel MI90/120 and tooth plate, resistance of screw plate

Interaction:

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

MIC-90-U-AP Connector

Designation	Item number
MIC-90-U-AP	**305708**



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

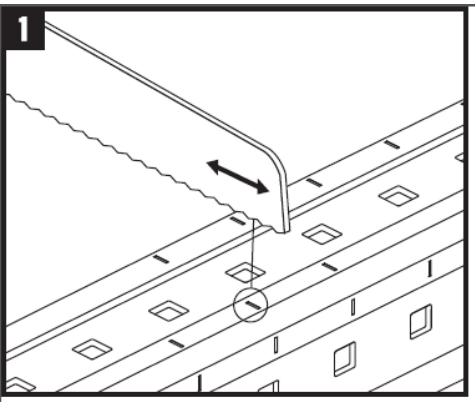
Weight:
1780 g

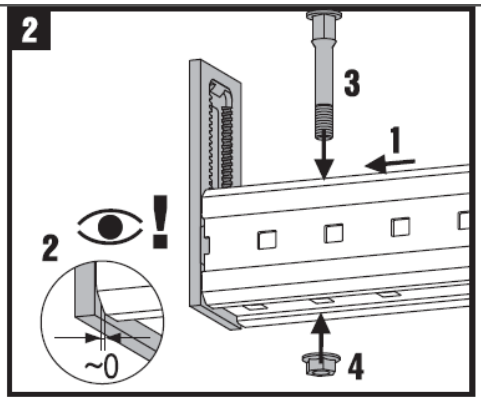
Submittal text:
Hot dipped galvanized, 90° Hilti MI angle connector, typically used for connecting two perpendicular MI girders. The baseplate has a serrated slot for improved shear loads, and the connector is fixed with an oblong hole to enable fine adjustment. Not for cantilever applications.

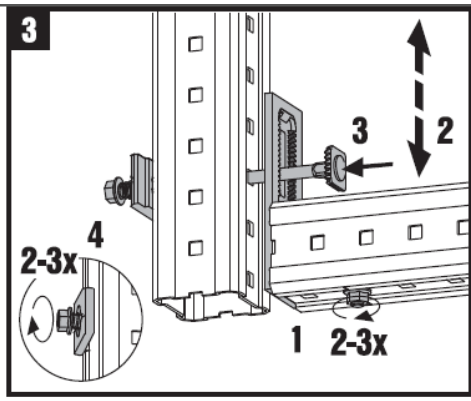
Material properties:

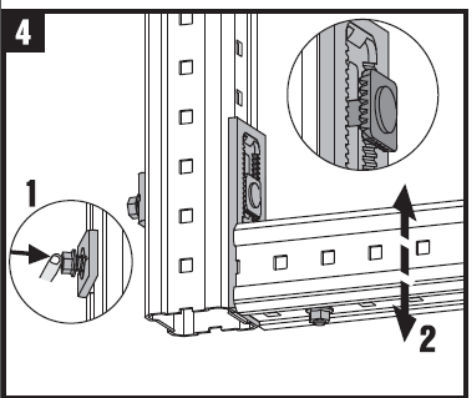
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

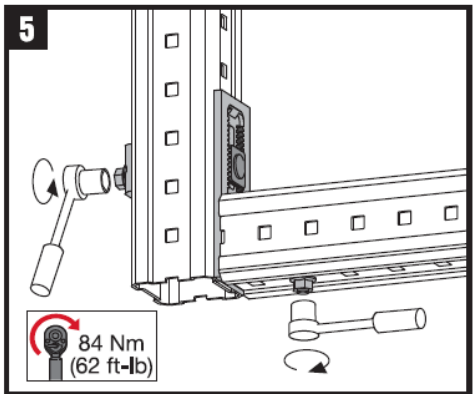
Instruction For Use:

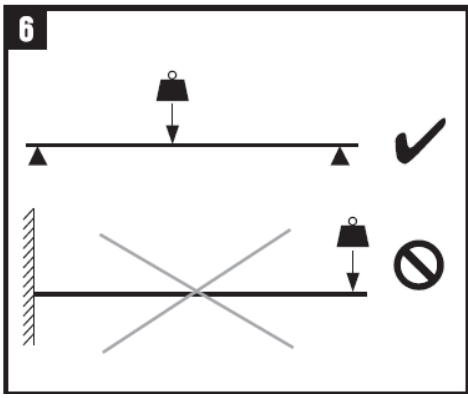




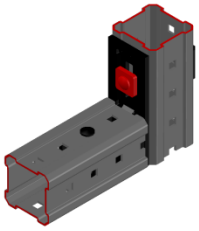








MIC-90-U-AP Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

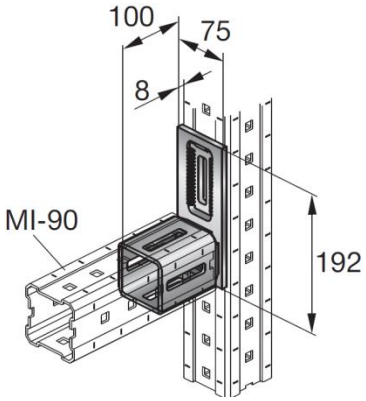
Standards and codes:

• 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

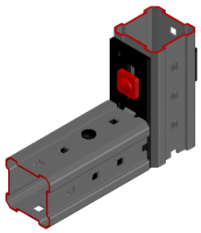
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-90-U-AP Connector

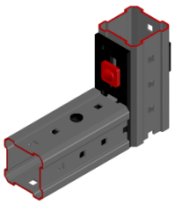
Standard



Loading case: Standard

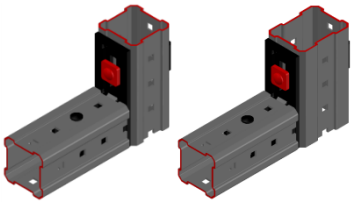
BOM:

1x MIC-90-U-AP	**305708**
Components not included	
1x MIA-EH-P	**304891**
1x M12-F-SL WS3⁄4	**382897**
1x MIA-OH90	**304889**
For fixation on MI-90 girder	
1x MIA-EH90	**304887**
For fixation on MI-120	
1x MIA-EH120	**304888**



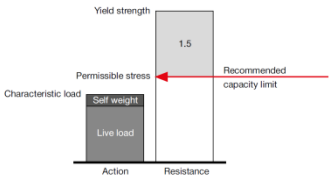
Combinations covered by loading case

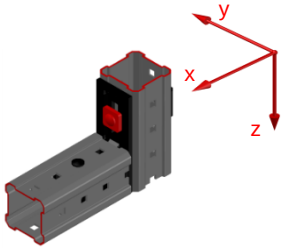
Connector used for connecting MI-90 girder on either MI-90 or MI-120 girder in a 90-degree angle



Recommended loading capacity - simplified for most common applications

Method



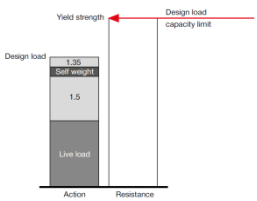


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
1.88	9.82	11.32

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

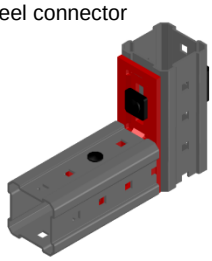
Design loading capacity - 3D 1/3

Method

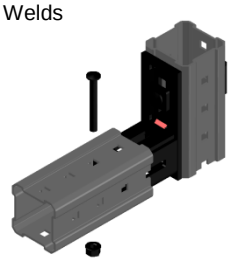


Limiting components of capacity evaluated in following tables:

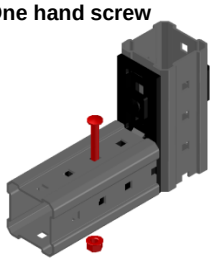
1. Steel connector



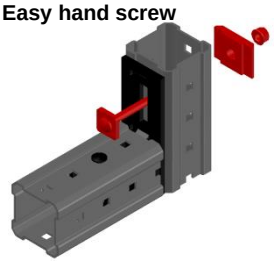
2. Welds



3. **One hand screw**



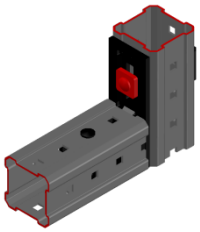
4. **Easy hand screw**



MIC-90-U-AP Connector

Conditions of the loading capacity tables:

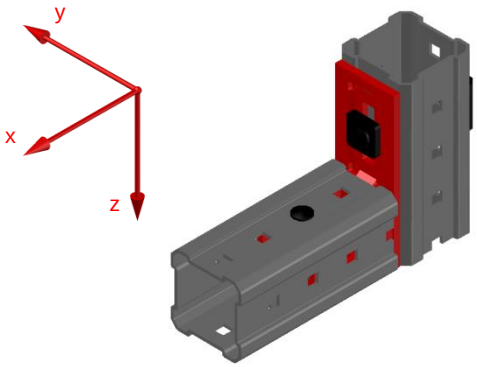
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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



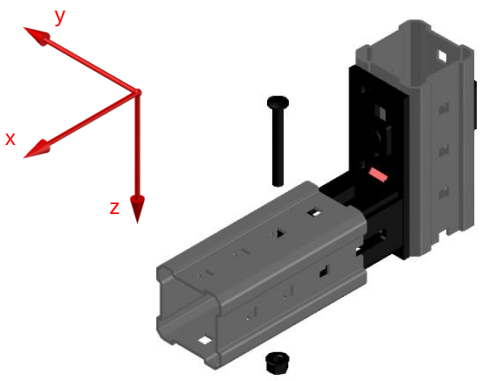
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.90	Not decisive	14.73	14.73	63.92	63.92
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.36	1.36	0.00	0.00	0.00	0.00

includes cross section resistance of steel plate and contact pressure

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.99	5.99	0.00	0.00	0.00	0.00

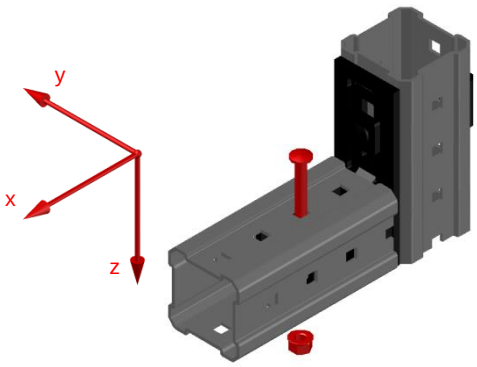
Interaction:

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

MIC-90-U-AP Connector

Design loading capacity - 3D 3/3

3. One hand screw -in connection to MIC-90-U and MI90-channel



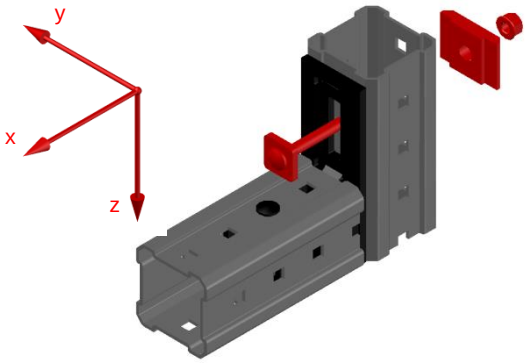
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
3.33	3.33	36.29	36.29	Not decisive	Not decisive
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.20	1.20	0.00	0.00	0.00	0.00

includes shear of the bolt, friction resistance, bearing resistance at connector plate and at channel MI90

Interaction:

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

4. Easy hand screw- in connection MIC-90-U to MI90/120-channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.82	Not decisive	Not decisive	Not decisive	16.99	16.99
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
Note decisive	Not decisive	0.00	0.00	0.00	0.00

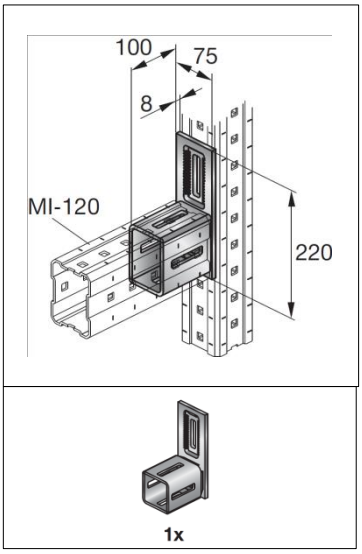
includes shear, bending and tension of the bolt, bearing resistance channel MI90/120 and tooth plate, resistance of screw plate

Interaction:

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

MIC-120-U-AP Connector

Designation	Item number
MIC-120-U-AP	**305709**



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

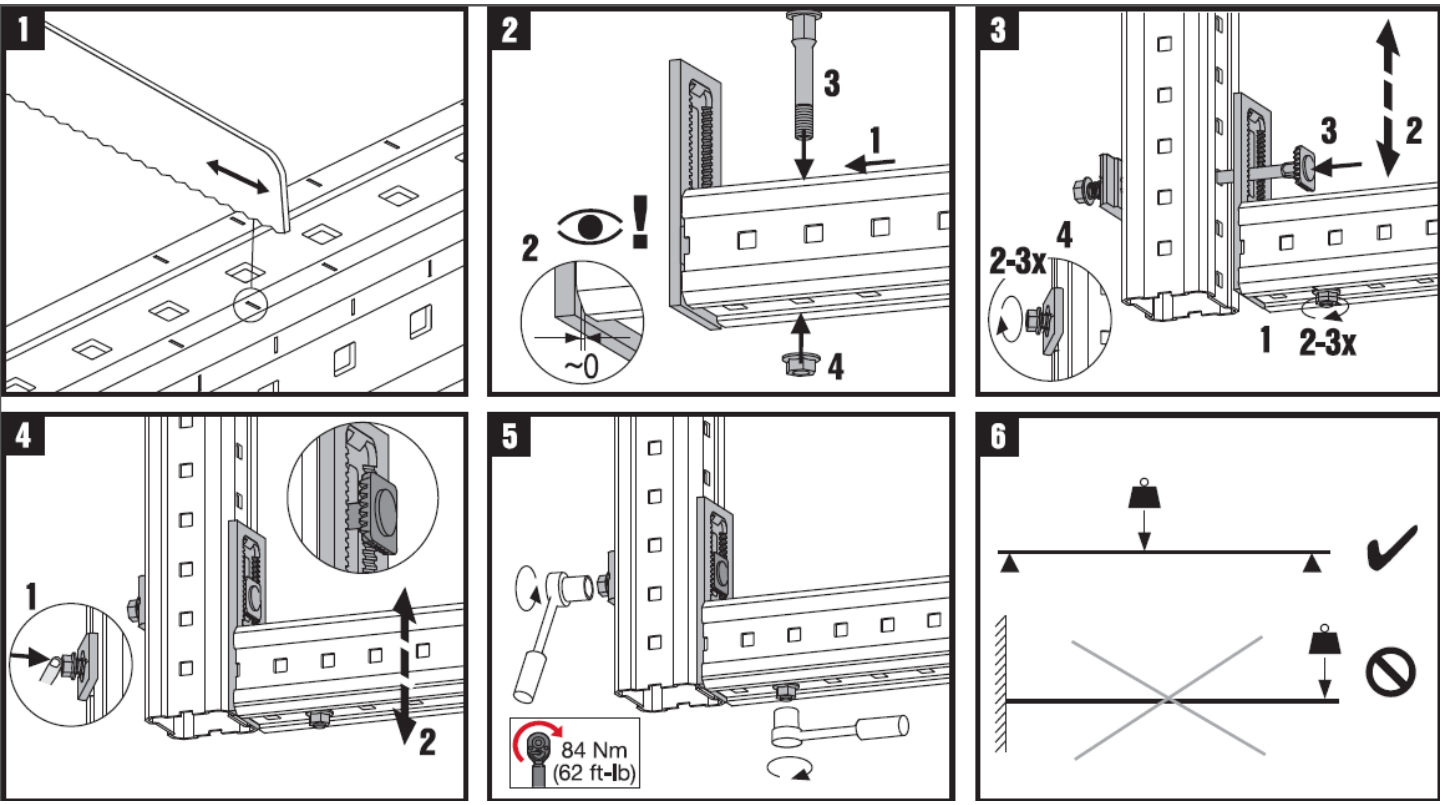
Weight:
2180 g

Submittal text:
Hot dipped galvanized, 90° Hilti MI angle connector, typically used for connecting two perpendicular MI girders. The baseplate has a serrated slot for improved shear loads, and the connector is fixed with an oblong hole to enable fine adjustment. Not for cantilever applications.

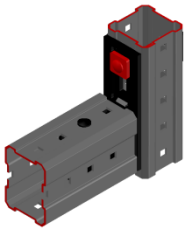
Material properties:

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:



MIC-120-U-AP Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

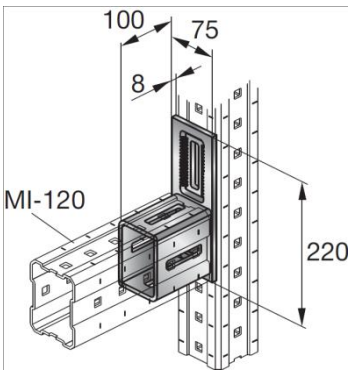
Standards and codes:

• 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

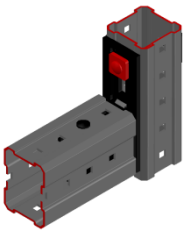
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-120-U-AP Connector

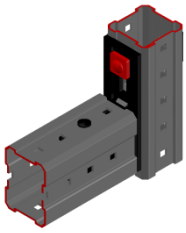
Standard



Loading case: Standard

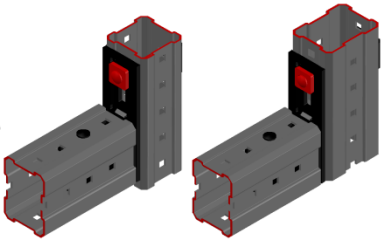
BOM:

1x MIC-120-U-AP	**305709**
Components not included	
1x MIA-EH-P	**304891**
1x M12-F-SL WS3⁄4	**382897**
1x MIA-OH120	**304890**
For fixation on MI-90 girder	
1x MIA-EH90	**304887**
For fixation on MI-120	
1x MIA-EH120	**304888**



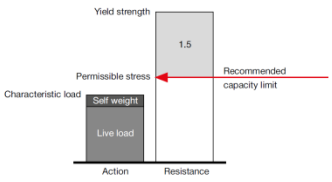
Combinations covered by loading case

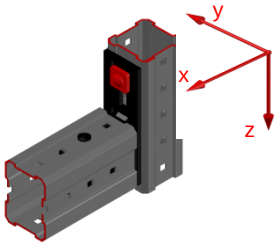
Connector used for Connecting MI-120 girder on either MI-90 or MI-120 girder in a 90-degree angle



Recommended loading capacity - simplified for most common applications

Method



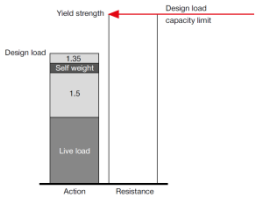


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
1.72	10.55	11.32

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

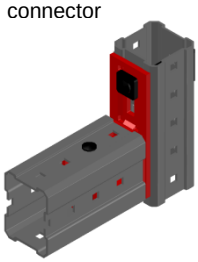
Design loading capacity - 3D 1/3

Method



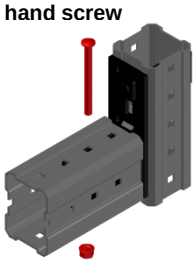
Limiting components of capacity evaluated in following tables:

1. Steel connector

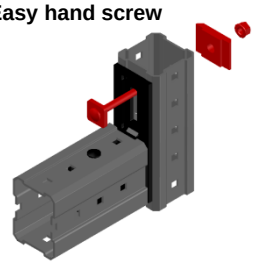


2. Welds

3. **One hand screw**



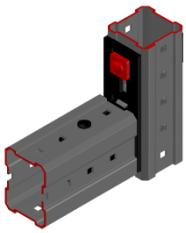
4. **Easy hand screw**



MIC-120-U-AP Connector

Conditions of the loading capacity tables:

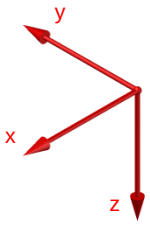
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

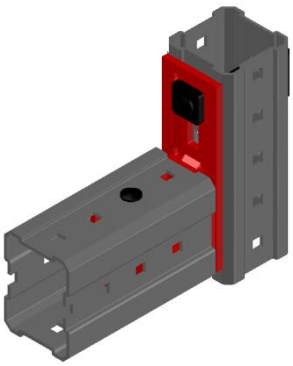
Standard		
		

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





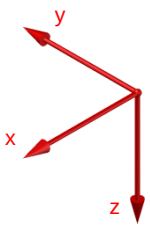
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.60	Not decisive	15.83	15.83	63.92	63.92
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.14	1.14	0.00	0.00	0.00	0.00

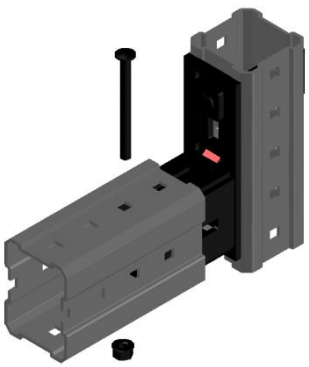
includes cross section resistance of steel plate and contact pressure

Interaction:

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

2. Welds





+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
336.02	336.02	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
9.73	9.73	0.00	0.00	0.00	0.00

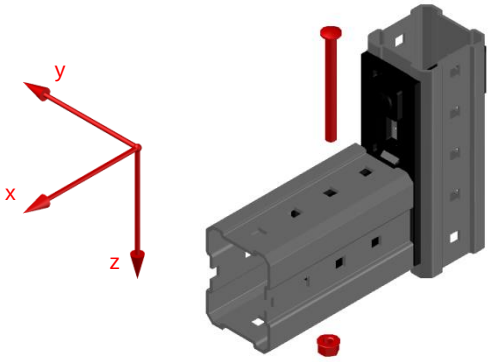
Interaction:

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

MIC-120-U-AP Connector

Design loading capacity - 3D 3/3

3. One hand screw -in connection to MIC-90-U and MI90-channel



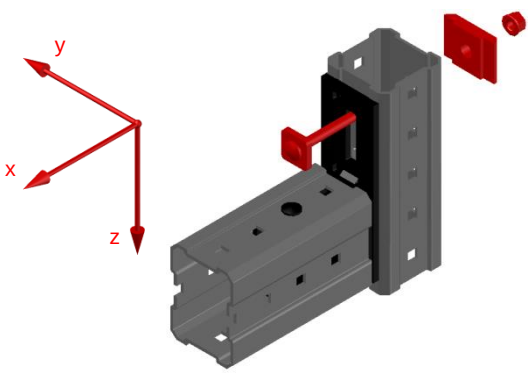
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
6.66	6.66	41.47	41.47	Not decisive	Not decisive
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.99	1.99	0.00	0.00	0.00	0.00

includes shear of the bolt, friction resistance, bearing resistance at connector plate and at channel MI120

Interaction:

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

4. Easy hand screw- in connection MIC-90-U to MI90/120-channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.59	Not decisive	Not decisive	Not decisive	16.99	16.99
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
Note decisive	Not decisive	0.00	0.00	0.00	0.00

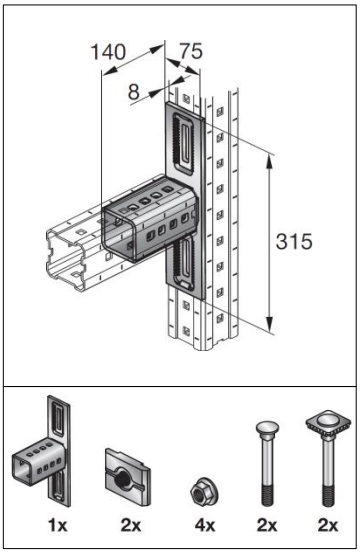
includes shear, bending and tension of the bolt, bearing resistance channel MI90/120 and tooth plate, resistance of screw plate

Interaction:

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

MIC-90-L Connector

Designation	Item number
MIC-90-L	**304805**



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

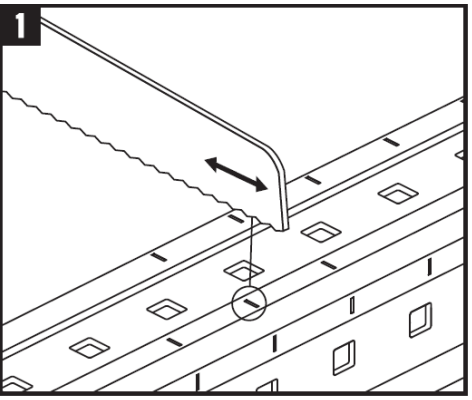
Weight:
4050 g incl. components

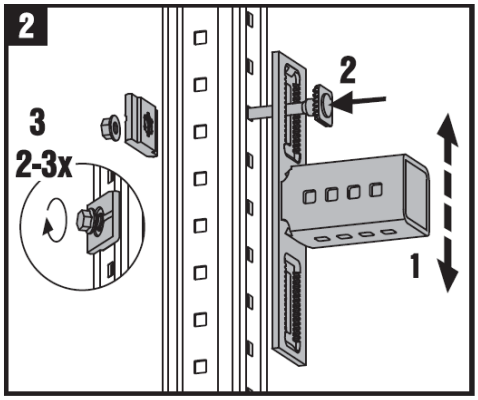
Submittal text:
Hot dipped galvanized, 90° Hilti MI angle connector, typically used for connecting two perpendicular MI girders. The baseplate has a serrated slot for improved shear loads and fine adjustment, and the connector is connected with fixed holes instead of an oblong hole. Suitable for cantilever applications.

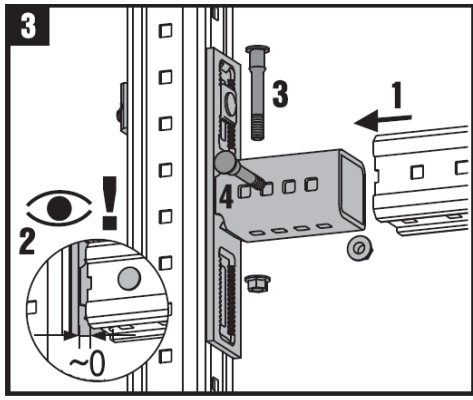
Material properties:

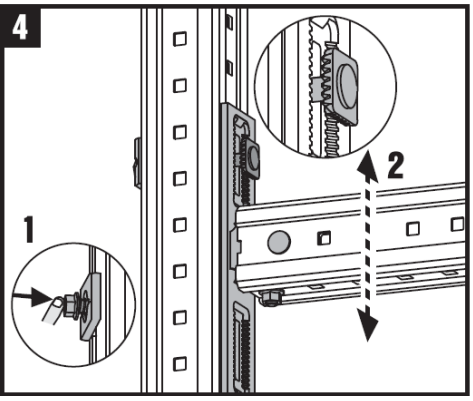
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

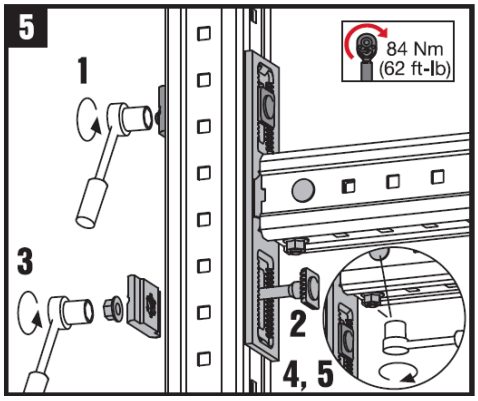
Instruction For Use:

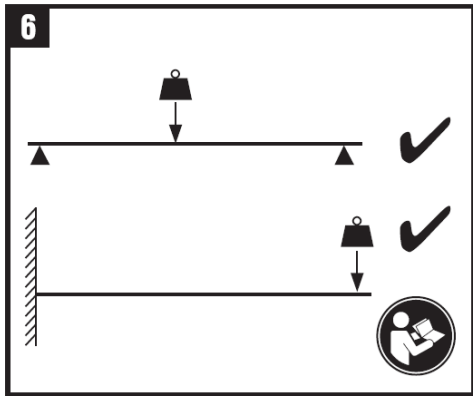




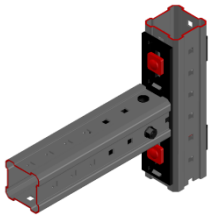








MIC-90-L Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

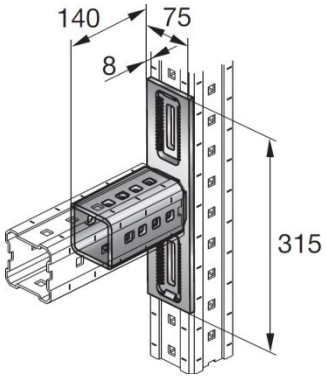
Standards and codes:

• 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

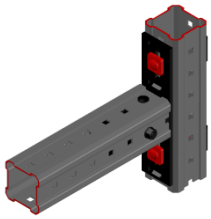
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



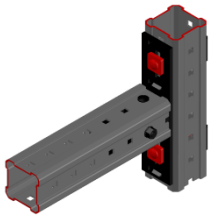
MIC-90-L Connector

Standard



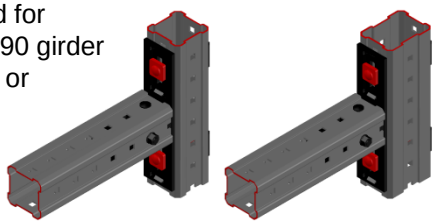
Loading case: Standard

BOM:
For fixation on MI-90 girder
Angle incl. all components
1x MIC-90-L **304805**
For fixation on MI-120
1x MIC-90-L **304804**
2x MIA-EH120 **304888**
The MIA-EH90 remain unused



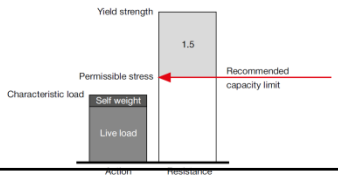
Combinations covered by loading case

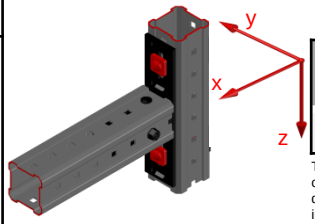
Connector used for Connecting MI-90 girder on either MI-90 or MI-120 girder in a 90-degree angle



Recommended loading capacity - simplified for most common applications

Method



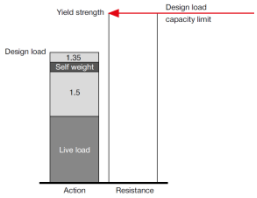


±Fx,rec. [kN]	±Fy,rec.[kN]	±Fz,rec. [kN]
6.08	10.86	22.66

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

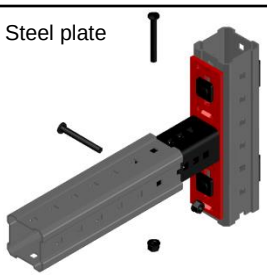
Design loading capacity - 3D 1/3

Method

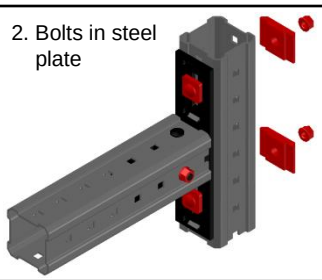


Limiting components of capacity evaluated in following tables:

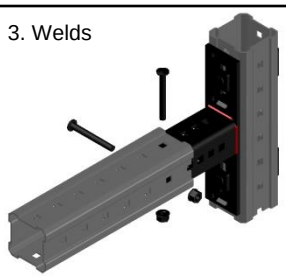
1. Steel plate



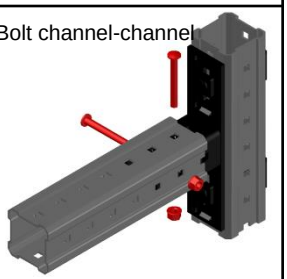
2. Bolts in steel plate



3. Welds



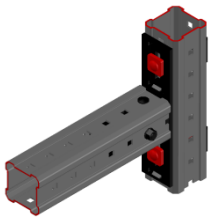
4. Bolt channel-channel



MIC-90-L Connector

Conditions of the loading capacity tables:

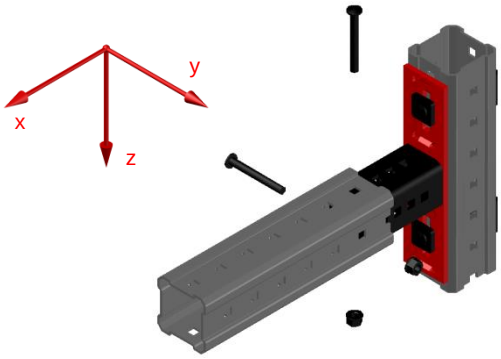
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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 plate

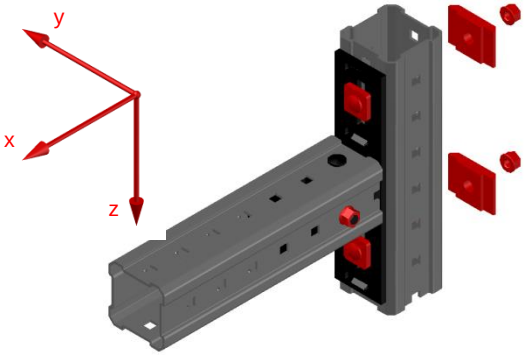


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
9.13	Not decisive	16.29	16.29	65.13	65.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.31	2.31	1.02	1.02	0.29	0.29

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 steel plate



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
24.18	Not decisive	Not decisive	Not decisive	33.99	33.99
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
Not decisive	Not decisive	1.26	1.26	0.85	0.85

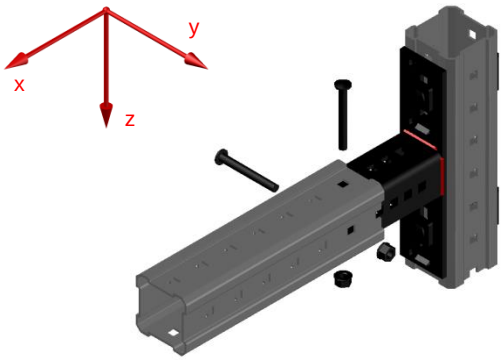
Interaction:

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

MIC-90-L Connector

Design loading capacity - 3D 3/3

3. Welds

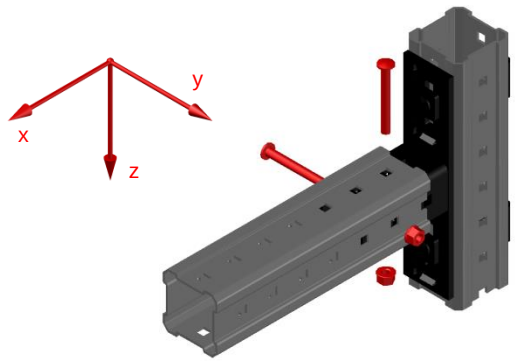


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	3.67	3.67	3.67	3.67

Interaction:

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

4. Bolt channel-channel



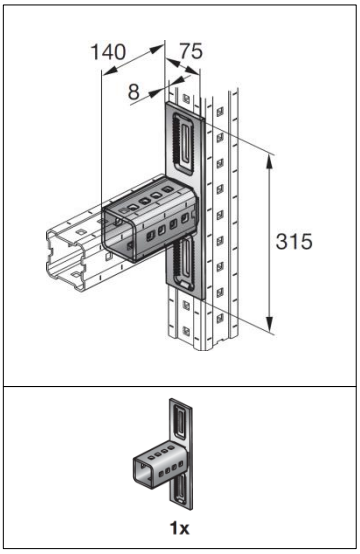
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.29	36.29	36.29	36.29
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

MIC-90-L-AP Connector

Designation	Item number
MIC-90-L-AP	**305710**



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

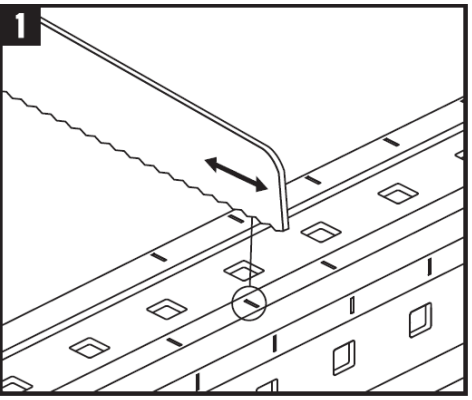
Weight:
3002 g

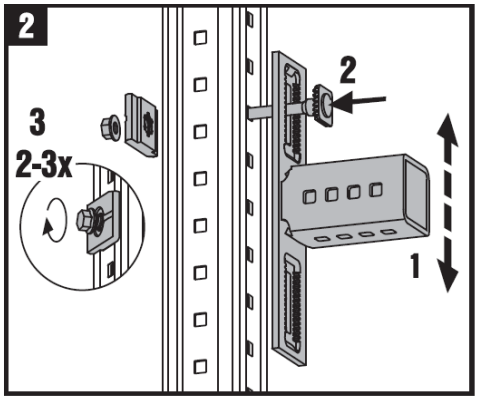
Submittal text:
Hot dipped galvanized, 90° Hilti MI angle connector, typically used for connecting two perpendicular MI girders. The baseplate has a serrated slot for improved shear loads and fine adjustment, and the connector is connected with fixed holes instead of an oblong hole. Suitable for cantilever applications.

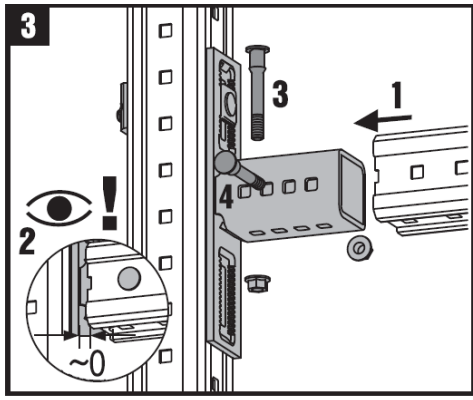
Material properties:

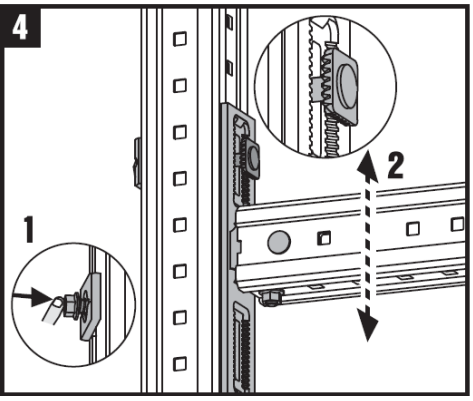
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

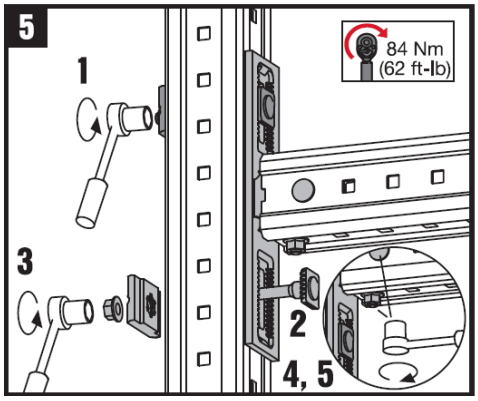
Instruction For Use:

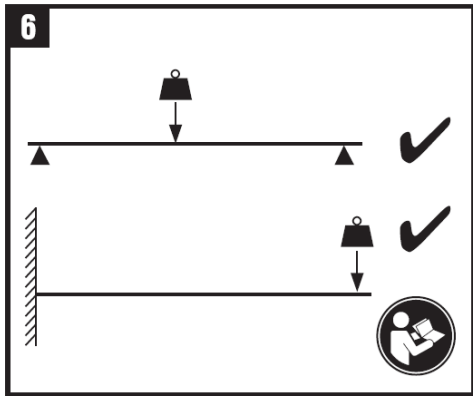




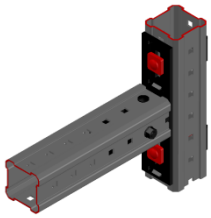








MIC-90-L-AP Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

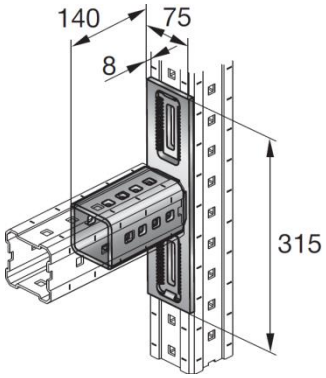
Standards and codes:

• 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

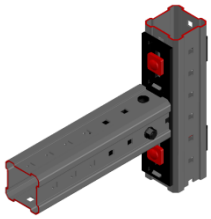
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-90-L-AP Connector

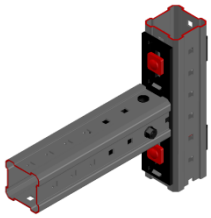
Standard



Loading case: Standard

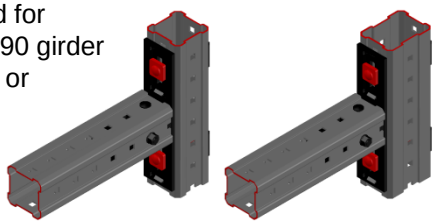
BOM:

1x MIC-90-L-AP	**305710**
Components not included	
2x MIA-EH-P	**304891**
2x M12-F-SL WS3⁄4	**382897**
2x MIA-OH90	**304889**
For fixation on MI-90 girder	
2x MIA-EH90	**304887**
For fixation on MI-120	
2x MIA-EH120	**304888**



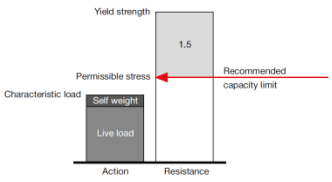
Combinations covered by loading case

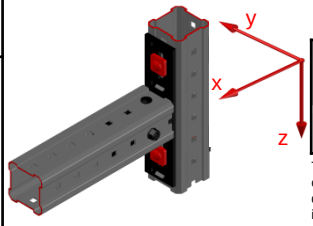
Connector used for Connecting MI-90 girder on either MI-90 or MI-120 girder in a 90-degree angle



Recommended loading capacity - simplified for most common applications

Method



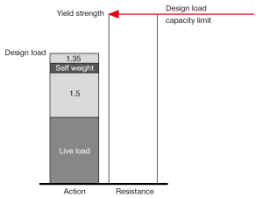


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec.[kN]
6.08	10.86	22.66

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

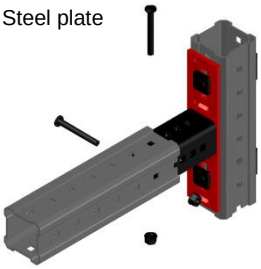
Design loading capacity - 3D 1/3

Method

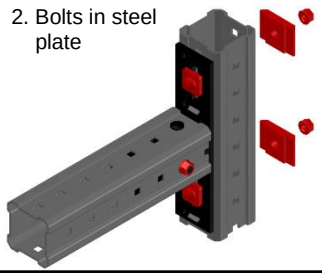


Limiting components of capacity evaluated in following tables:

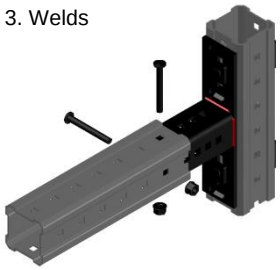
1. Steel plate



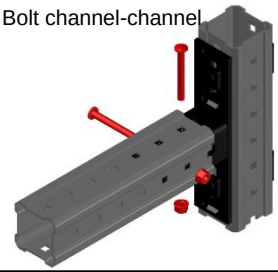
2. Bolts in steel plate



3. Welds



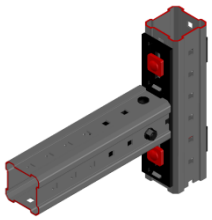
4. Bolt channel-channel



MIC-90-L-AP Connector

Conditions of the loading capacity tables:

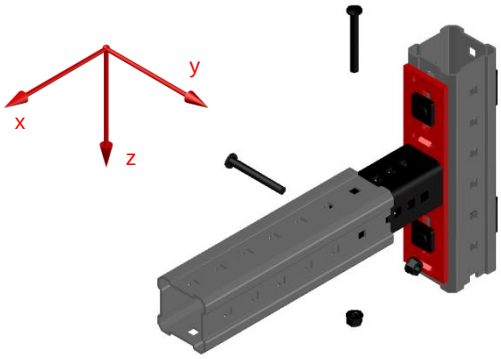
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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 plate

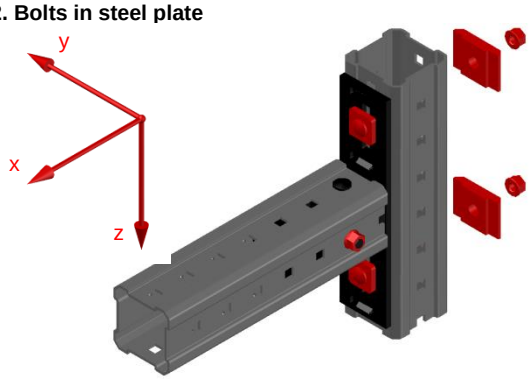


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
9.13	Not decisive	16.29	16.29	65.13	65.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.31	2.31	1.02	1.02	0.29	0.29

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 steel plate



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
24.18	Not decisive	Not decisive	Not decisive	33.99	33.99
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
Not decisive	Not decisive	1.26	1.26	0.85	0.85

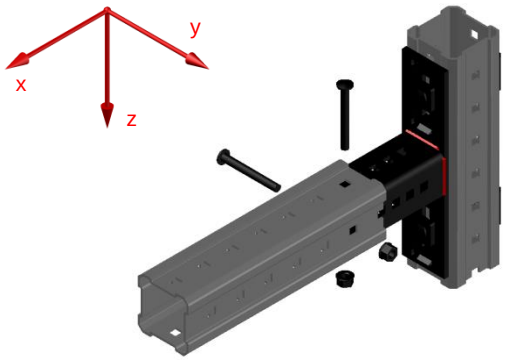
Interaction:

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

MIC-90-L-AP Connector

Design loading capacity - 3D 3/3

3. Welds

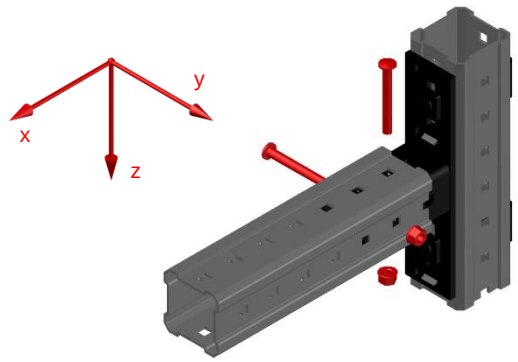


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	3.67	3.67	3.67	3.67

Interaction:

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

4. Bolt channel-channel



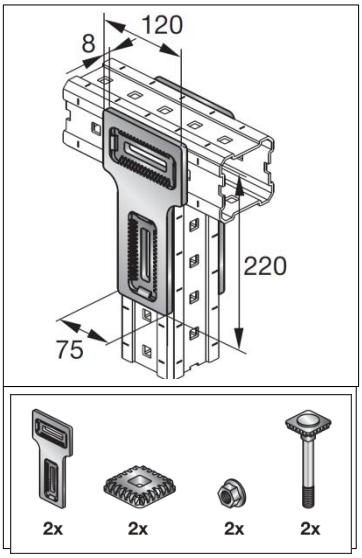
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.29	36.29	36.29	36.29
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

MIC-T Connector

Designation	Item number
MIC-T	**304807**



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

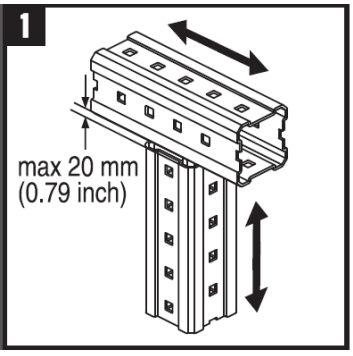
Weight:
2200 g incl. components

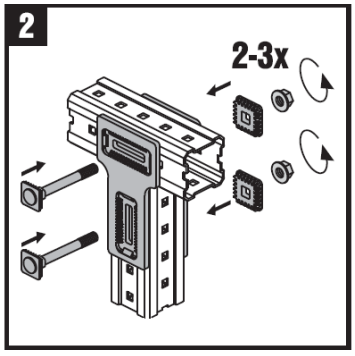
Submittal text:
Hot dipped galvanized, 90° Hilti MI angle connector, typically used for connecting two perpendicular MI or MIQ girders, where the horizontal girder sits on top of the vertical girder. Oblong holes enable fine adjustment and are serrated to improve holding and load values. Connector is used on the side of the girders. Not suitable for cantilever applications.

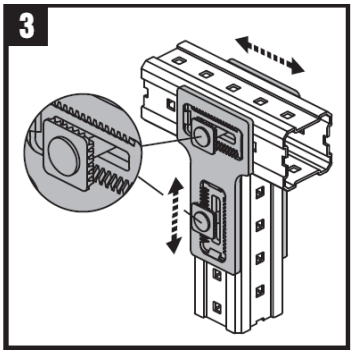
Material properties:

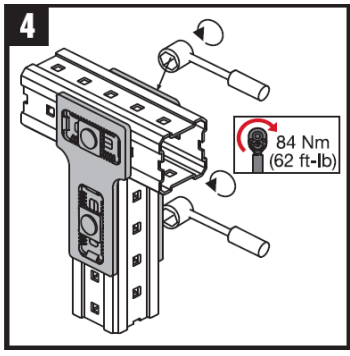
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:









MIC-T Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

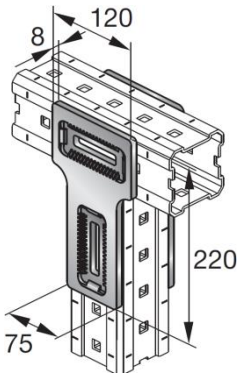
Standards and codes:

• 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

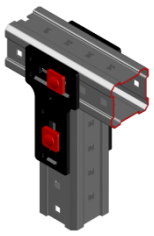
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-T Connector

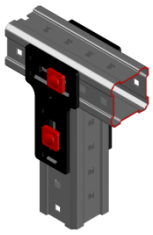
Standard



Loading case: Standard

BOM:

Angle incl. all components
1x MIC-T **304807**

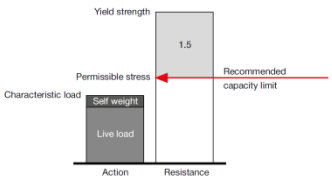


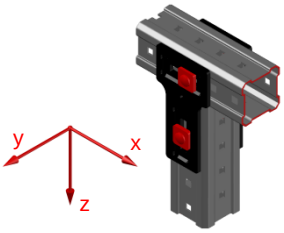
Combinations covered by loading case

Connector used for perpendicular connections of two MI-90 girders, where Horizontal girder sits on top of the vertical girder

Recommended loading capacity - simplified for most common applications

Method



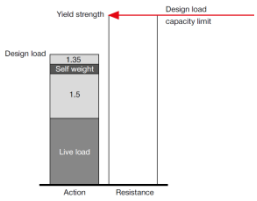


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
7.22	4.00	17.74

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

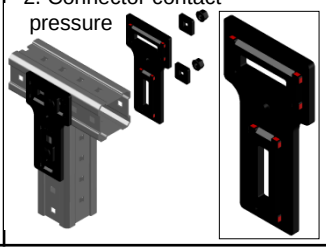
Method



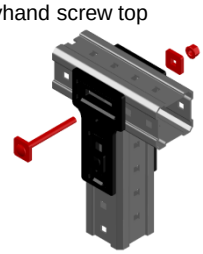
Limiting components of capacity evaluated in following tables:

1. Connector steel plate

2. Connector contact pressure



3. Easyhand screw top



4. Easyhand screw bottom

MIC-T Connector

Conditions of the loading capacity tables:

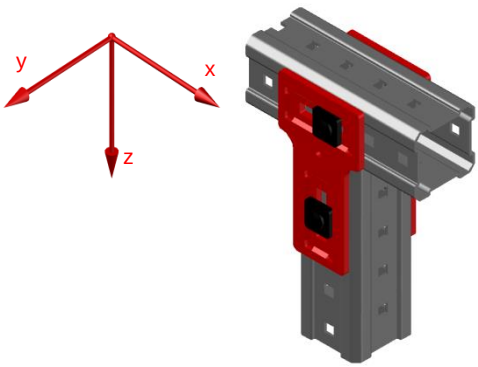
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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. Connector steel plate

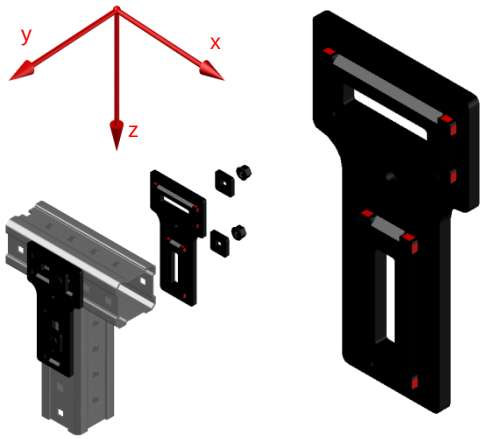


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
25.52	25.52	6.01	6.01	225.60	210.56
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.00	0.00	1.98	1.98	0.00	0.00

Interaction:

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

2. Connector contact pressure



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
10.83	10.83	Not decisive	Not decisive	40.32	40.32
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.00	0.00	1.81	1.81	0.00	0.00

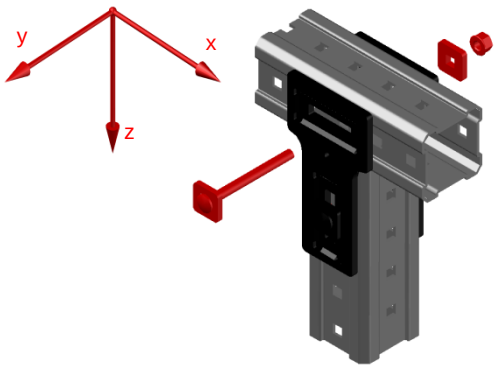
Interaction:

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

MIC-T Connector

Design loading capacity - 3D 3/3

3. Easyhand screw top



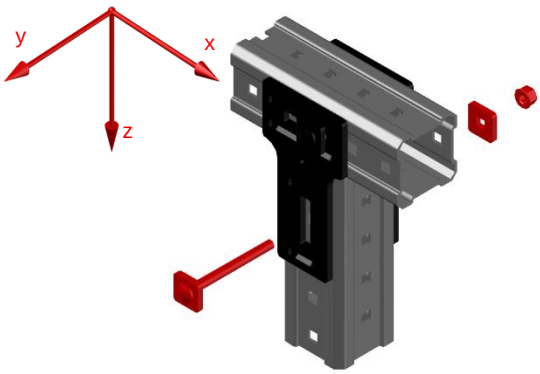
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.62	26.62	15.41	15.41	Not decisive	Not decisive
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.00	0.00	Not decisive	Not decisive	0.00	0.00

includes shear, bending and tension of the bolt, bearing resistance channel MI90/MI120 and tooth plate

Interaction:

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

4. Easyhand screw bottom



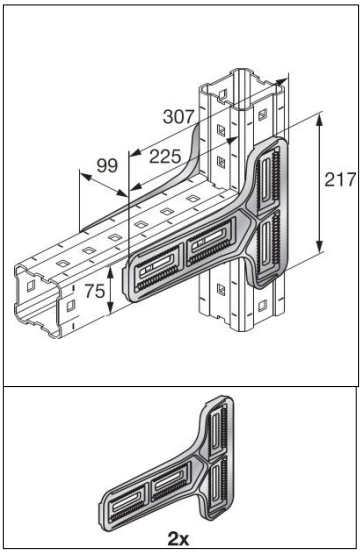
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
Not decisive	Not decisive	48.56	48.56	26.62	26.62
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.00	0.00	Not decisive	Not decisive	0.00	0.00

Interaction:

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

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

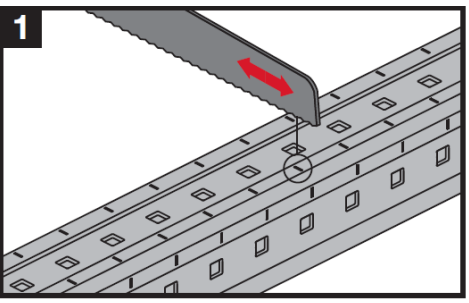
Weight:
2200 g

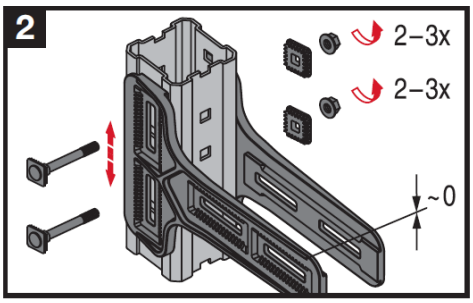
Submittal text:
Hot dipped galvanized, 90° Hilti MI angle connector, typically used for connecting two perpendicular MI or MIQ girders, where the horizontal girder is connected to the side of the vertical girder. Oblong holes enable fine adjustment and are serrated to improve holding and load values.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

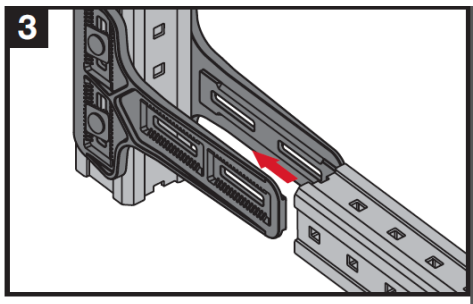
Material properties:

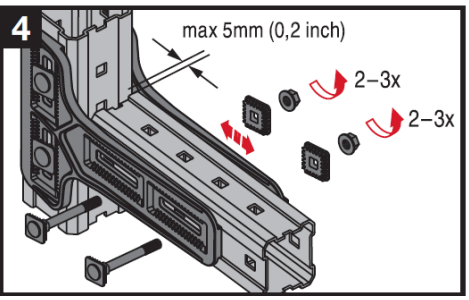
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: C30-1.0528	$F_y = 250 \frac{N}{mm^2}$	$F_u = 480 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Toothed plate: S235 - EN 10250-2	$F_y = 235 \frac{N}{mm^2}$	$F_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$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

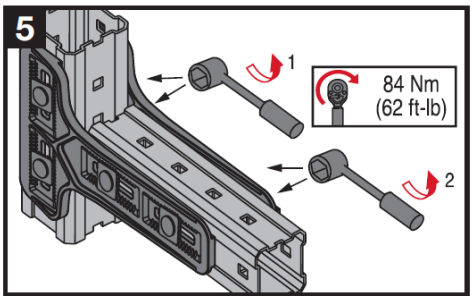
Instruction For Use:

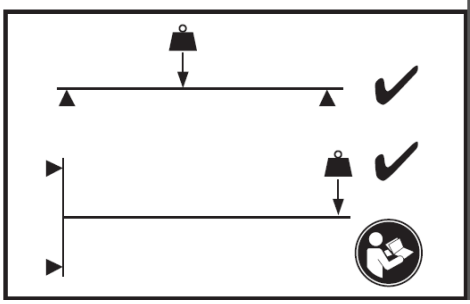












MIC-90-LH Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

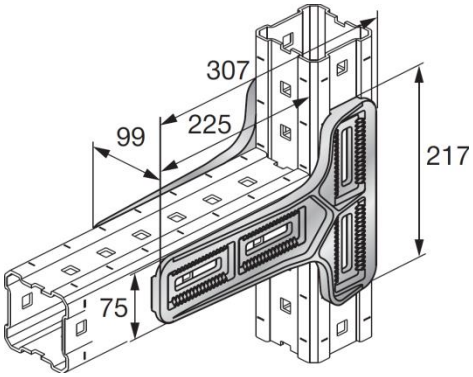
Standards and codes:

• 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

BOM:

Angle does not include all components

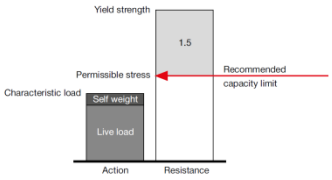
1x MIC-90-LH connector	**2048107**
Connectivity material ordered separately	
4x MIA-EH90 easy hand screw	**304887**
4x MIA-TP serrated plate	**305707**
M12-F-SL-WS ¾'' lock nut	**382897**

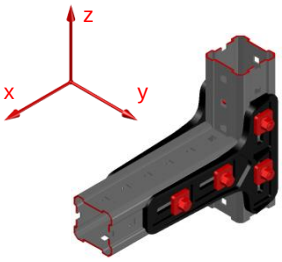
Combinations covered by loading case

Connector used for perpendicular connections of two MI-90 girders, to enable a cantilever arm

Recommended loading capacity - simplified for most common applications

Method



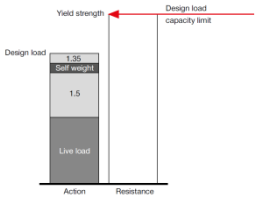


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
35.5	9.7	35.5
	±My,rec. [kNm]	
	3.83	

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

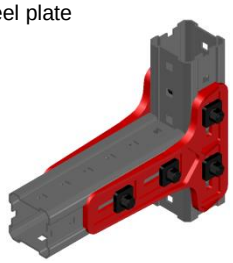
Design loading capacity - 3D 1/3

Method

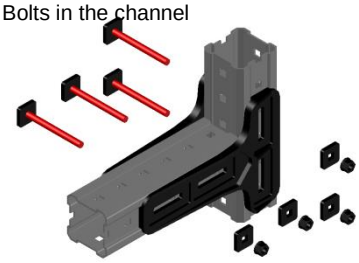


Limiting components of capacity evaluated in following tables:

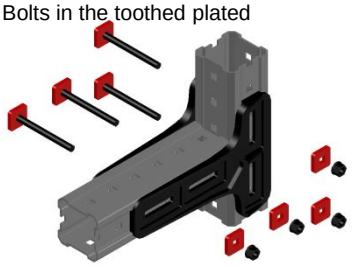
1. Connector steel plate



2. Bolts in the channel



3. Bolts in the toothed plated



MIC-90-LH Connector

Conditions of the loading capacity tables:

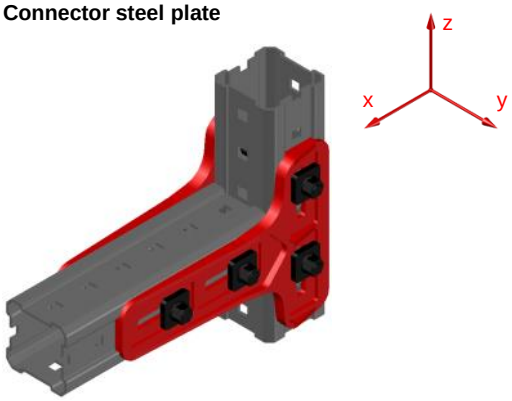
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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. Connector steel plate

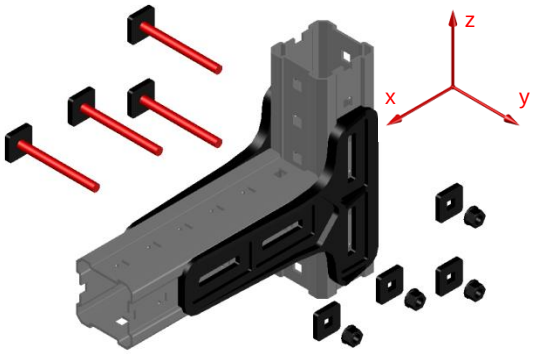


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.0	112.0	14.50	14.50	72.00	72.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.75	1.75	5.75	5.75	1.73	1.73

Interaction:

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

2. Bolts in the channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
53.24	53.24	Not decisive	Not decisive	53.24	53.24
+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

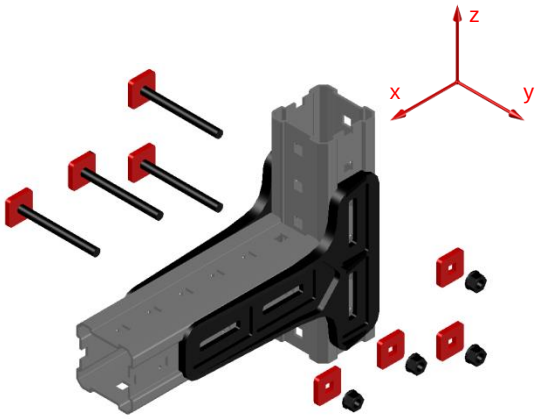
Interaction:

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

MIC-90-LH Connector

Design loading capacity - 3D 3/3

3. Bolts in the toothed plated



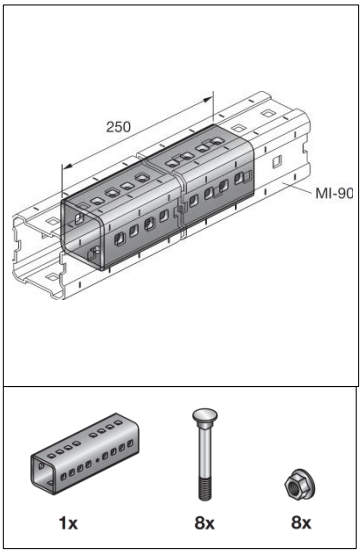
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
113.0	113.0	Not decisive	Not decisive	113.0	113.0
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
Not decisive	Not decisive	Not decisive	Not decisive	Not decisive	Not decisive

Interaction:

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

MIC-90-E Connector

Designation	Item number
MIC-90-E	**304809**



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

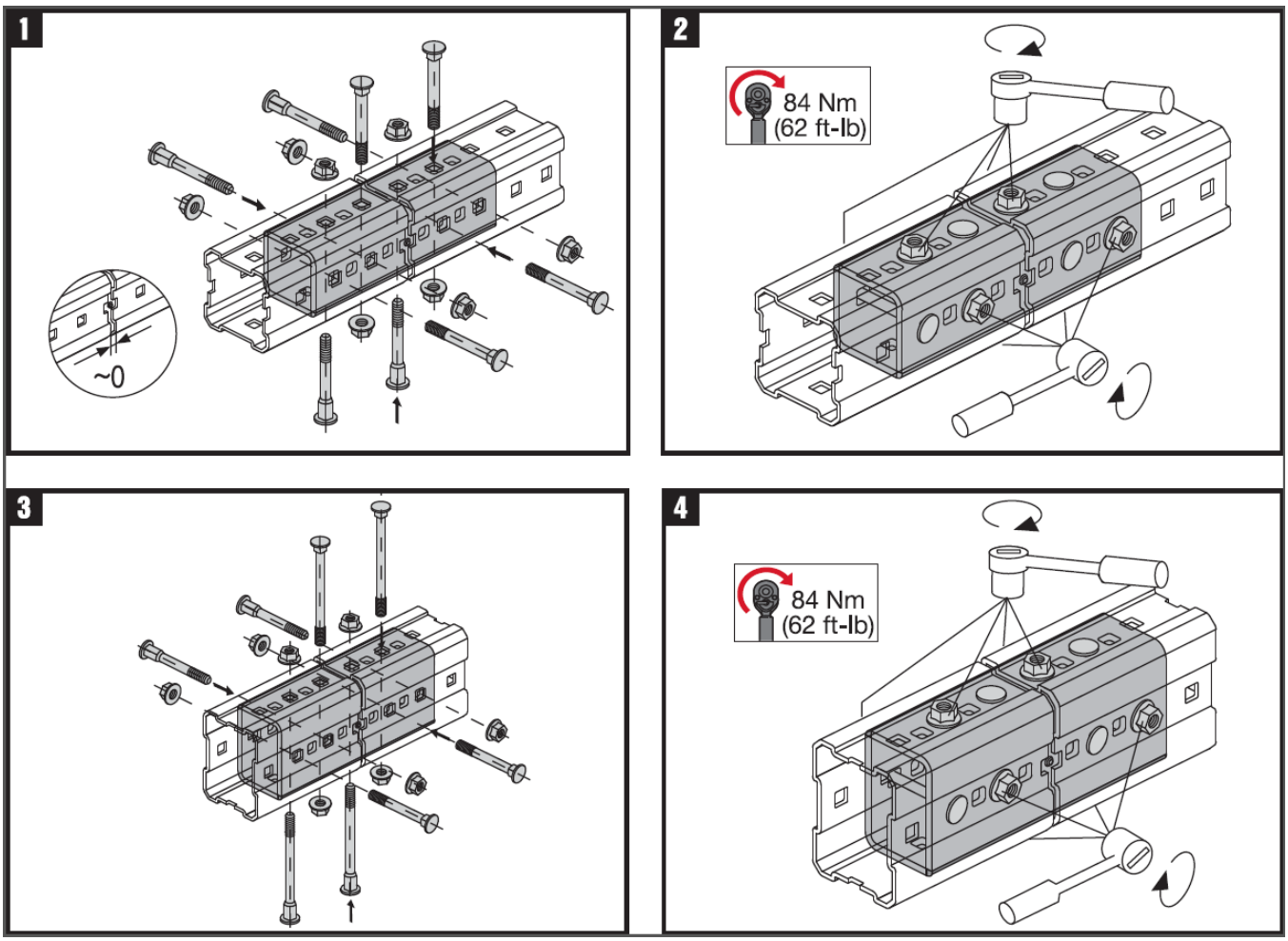
Weight:
3685 g incl. components

Submittal text:
Hot dipped galvanized, Hilti MI extension connector typically used for connecting two MI-90 girders together to form a continuous girder. Fixed with 8 bolts and lock-nuts through the girder to enable a strong hold and vibration resistance.

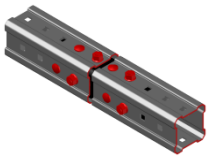
Material properties:

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:



MIC-90-E Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

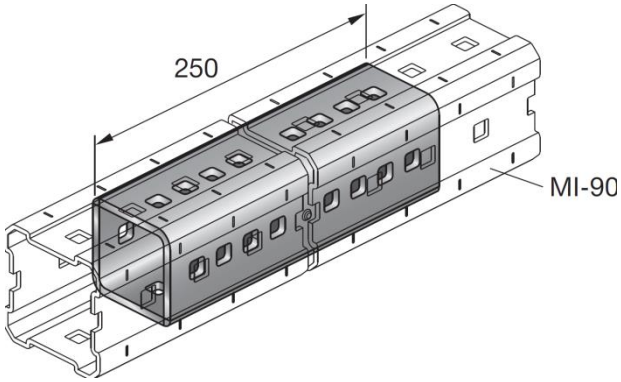
Standards and codes:

• 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

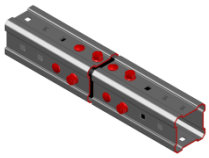
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-90-E Connector

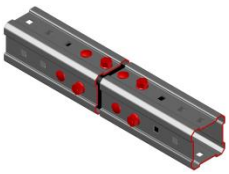
Standard



Loading case: Standard

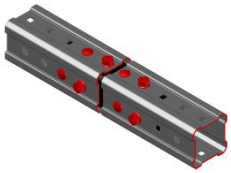
BOM:

Angle incl. all components
1x MIC-90-E **304809**



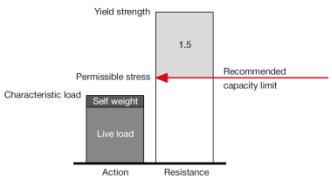
Combinations covered by loading case

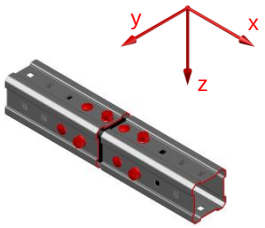
Connector used for
extension of MI-90 girders



Recommended loading capacity - simplified for most common applications

Method



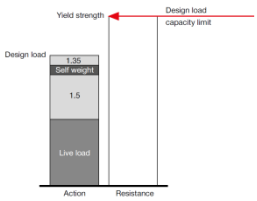


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
92.0	48.4	48.4
	±My,rec [kNm]	
	1.7	

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

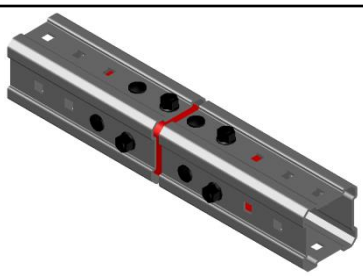
Design loading capacity - 3D 1/2

Method

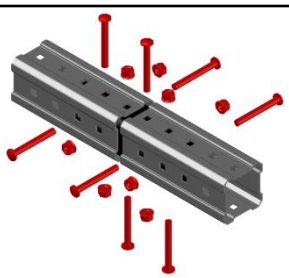


Limiting components of capacity evaluated in following tables:

1. Steel connector



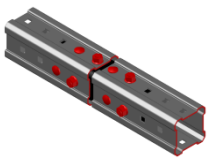
2. One hand bolts



MIC-90-E Connector

Conditions of the loading capacity tables:

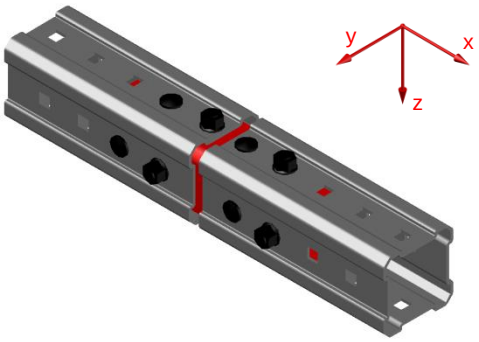
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

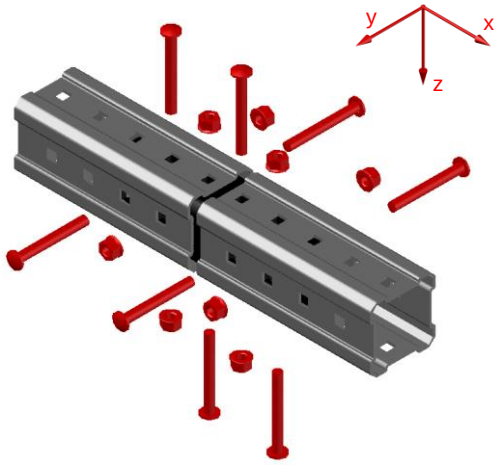


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
304.40	304.40	89.68	89.68	89.68	89.68
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.56	5.56	6.26	6.26	6.26	6.26

Interaction:

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

2. One hand bolts



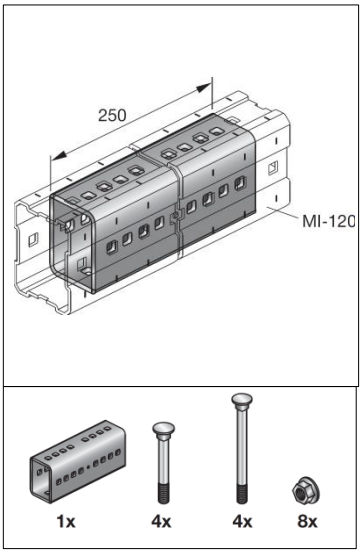
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
138.05	138.05	72.58	72.58	72.58	72.58
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.52	5.52	2.62	2.62	2.62	2.62

Interaction:

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

MIC-120-E Connector

Designation	Item number
MIC-120-E	**304810**



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

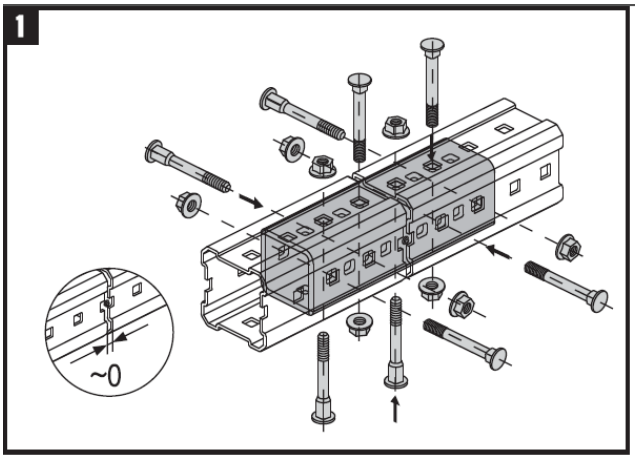
Weight:
4490 g incl. components

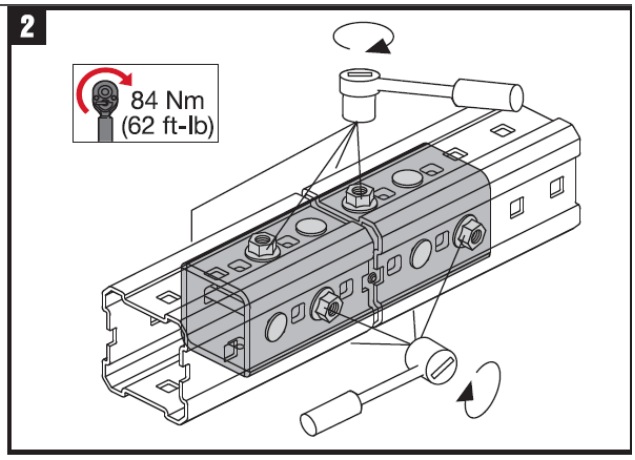
Submittal text:
Hot dipped galvanized, Hilti MI extension connector typically used for connecting two MI-120 girders together to form a continuous girder. Fixed with 8 bolts and lock-nuts through the girder to enable a strong hold and vibration resistance.

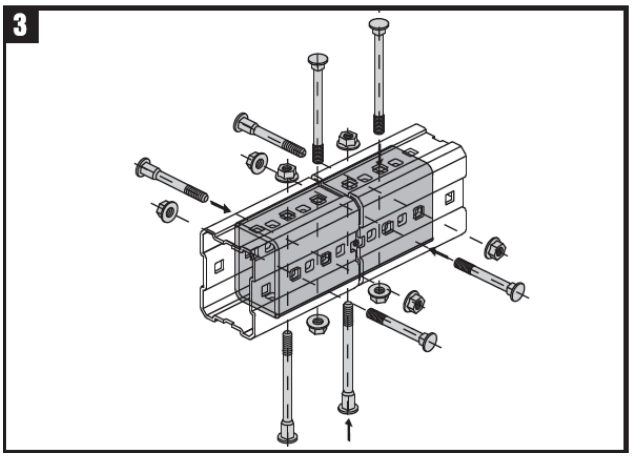
Material properties:

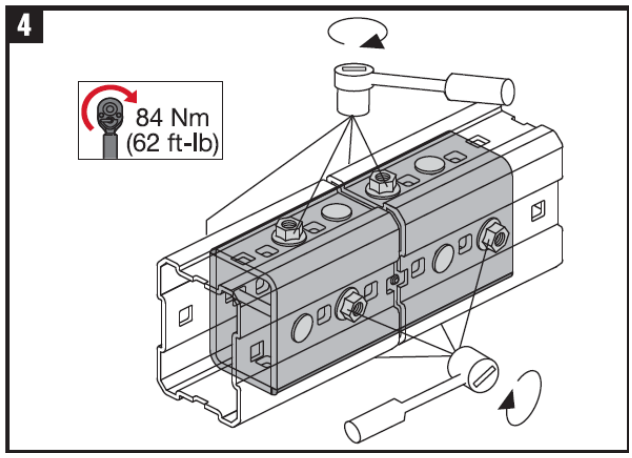
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:

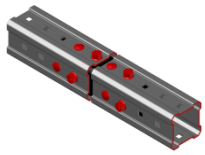








MIC-120-E Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

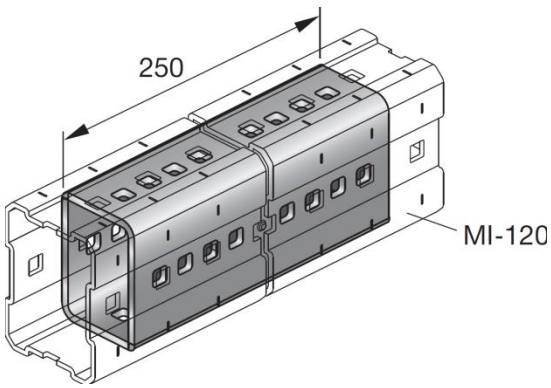
Standards and codes:

• 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

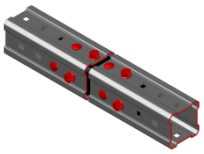
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-120-E Connector

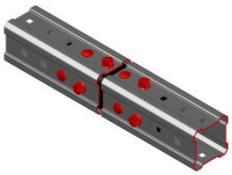
Standard



Loading case: Standard

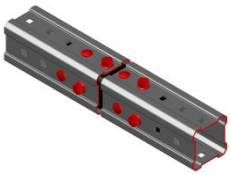
BOM:

Angle incl. all components
1x MIC-120-E **304810**



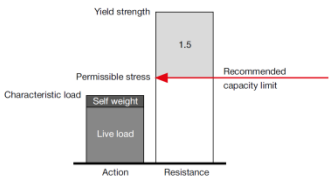
Combinations covered by loading case

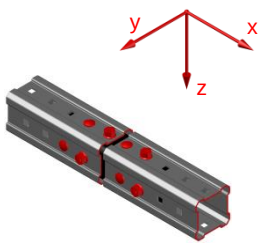
Connector used for
extension of MI-120 girder



Recommended loading capacity - simplified for most common applications

Method



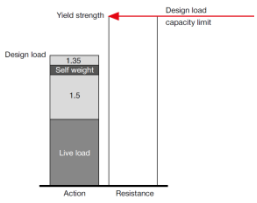


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
100.0	55.3	55.3
	±My,rec. [kNm]	
	2.5	

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

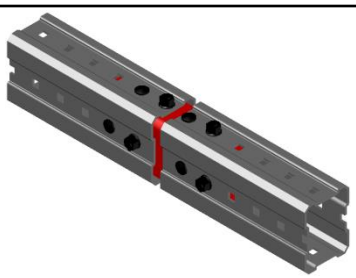
Design loading capacity - 3D 1/2

Method

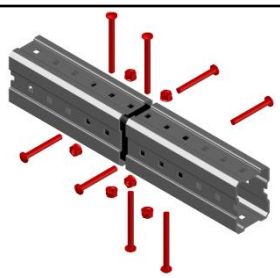


Limiting components of capacity evaluated in following tables:

1. Steel connector



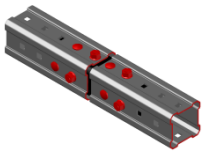
2. One hand bolts



MIC-120-E Connector

Conditions of the loading capacity tables:

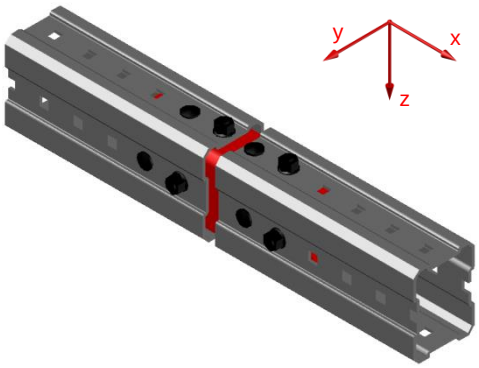
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

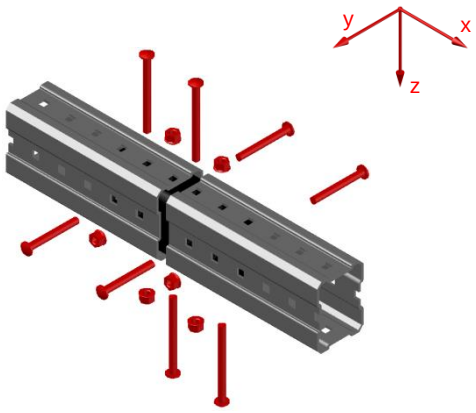


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
392.45	392.45	105.50	105.50	152.72	152.72
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
8.46	8.46	10.47	10.47	8.74	8.74

Interaction:

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

2. One hand bolts



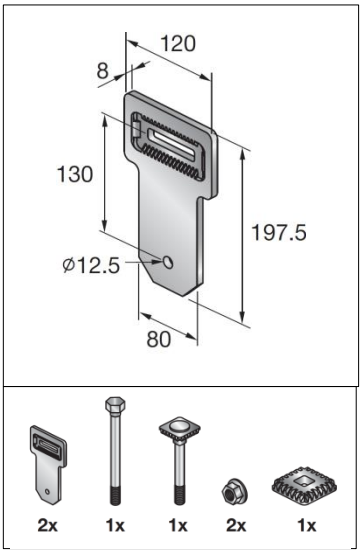
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
149.97	149.97	82.94	82.94	82.94	82.94
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
7.17	7.17	3.79	3.79	2.70	2.70

Interaction:

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

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

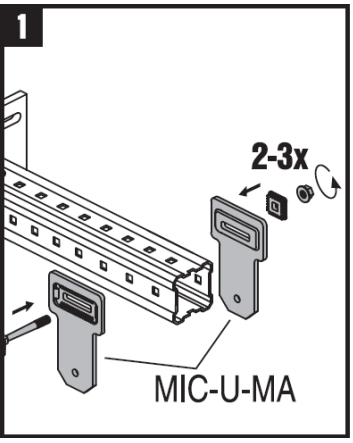
Weight:
2630 g incl. components

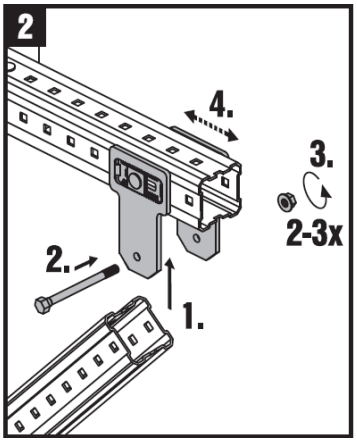
Submittal text:
Hot dipped galvanized Hilti MI connector, typically used for connecting two MI or MIQ girders, where one girder is braced / supported by the other in an angle, to improve total load capacity of the structure. One oblong hole enables fine adjustment and is serrated to improve holding.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

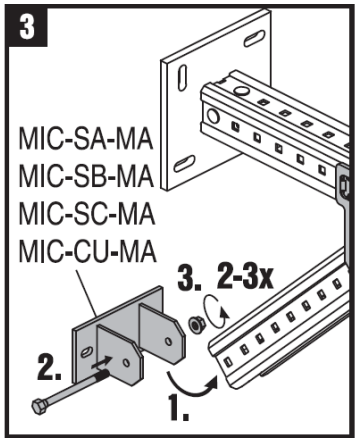
Material properties:

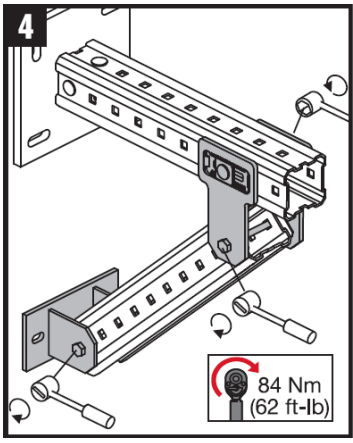
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:









MIC-U-MA Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

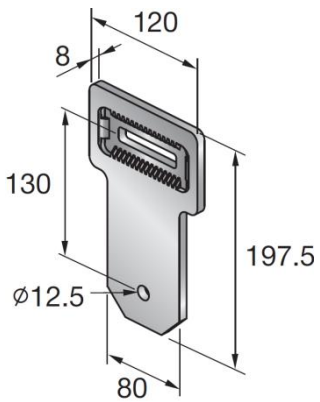
Standards and codes:

• 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

BOM:

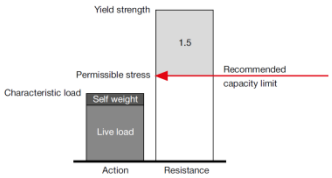
Angle incl. all components
1x MIC-U-MA **304806**

Combinations covered by loading case

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



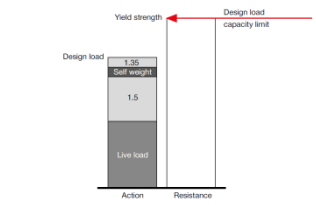
±Fy,rec. [kN]
1.4

α	0°	30°	45°	60°	90°
±$F_{α,rec.}$ [kN]	17.60	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 MI-channel

3. Easy hand screw on MI channel

MIC-U-MA Connector

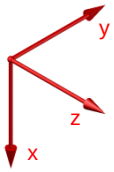
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

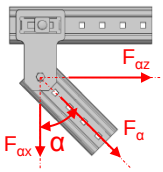


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
40.32	40.32	2.11	2.11	13.96	13.96
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.63	0.63	0.00	0.00	0.00	0.00

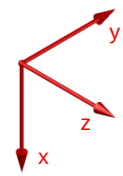
includes cross section resistance of steel plate and contact pressure
Interaction for a general force F_α with a certain inclination α:

$F_{\alpha xEd}=F_\alpha*\cos\alpha$ and $F_{\alpha zEd}=F_\alpha*\sin\alpha$

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



2. Hexagon bolt on MI-channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.38	26.38	Not decisive	Not decisive	26.38	26.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.19	1.19	0.00	0.00	0.00	0.00

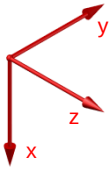
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$
includes shear and bending of the bolt, bearing resistance connector plate and channel MI90
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.
The normal force $F_{\alpha Ed}$ in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.
Interaction:

$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}}\le 1$$

MIC-U-MA Connector

Design loading capacity - 3D 3/3

3. 3. Easy hand screw on MI channel



+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	26.62	26.62
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.20	1.20	0.00	0.00	0.00	0.00

includes shear, tension and bending of the bolt, bearing resistance channel MI90 and tooth plate

Interaction:

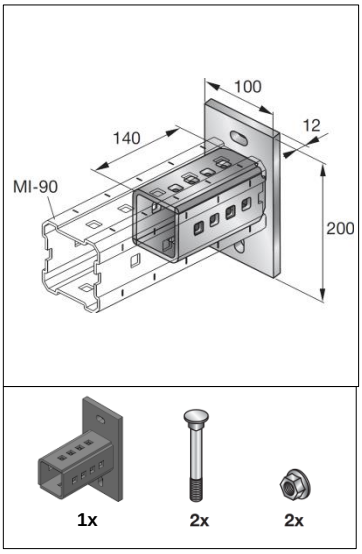
$$\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} \leq 1$$

MIC-C90-AA Base Material Connector - Concrete

Designation	Item number
MIC-C90-AA	**304825**

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

Weight:
3490 g incl. components

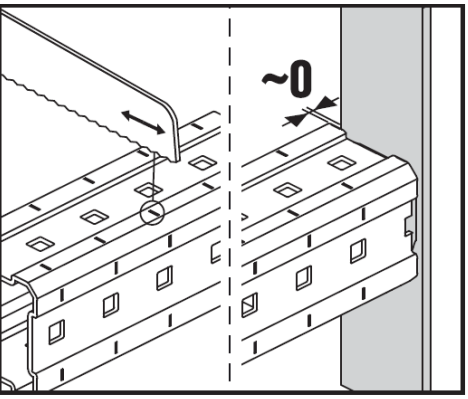


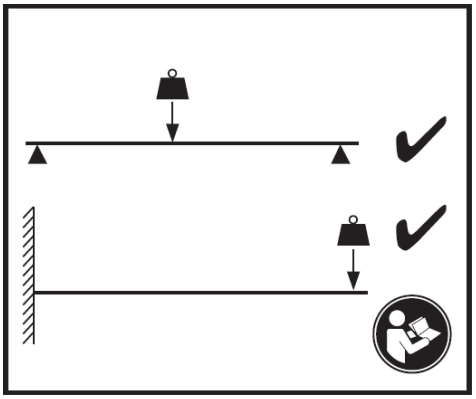
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to concrete. Two oblong anchor holes in perpendicular positions enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes.

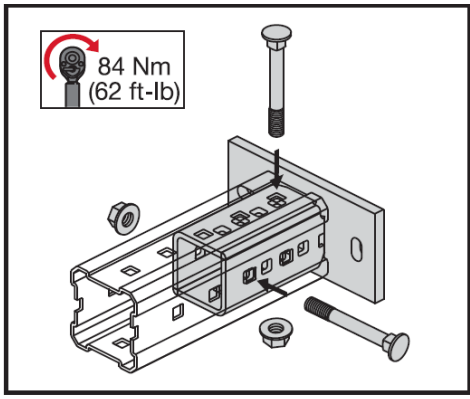
Material properties:

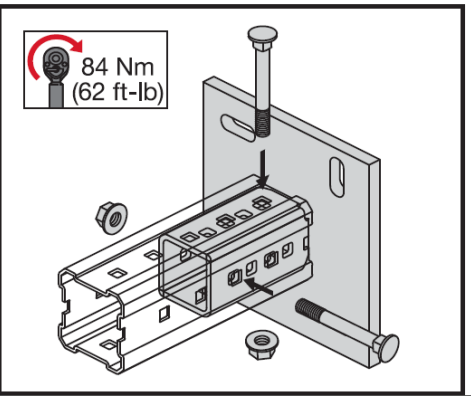
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

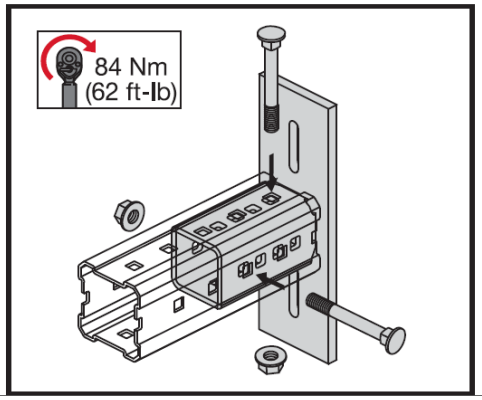
Instruction For Use:

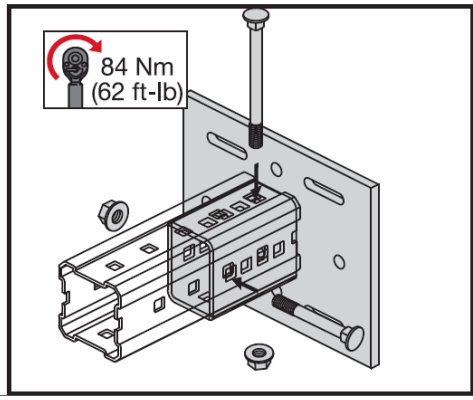




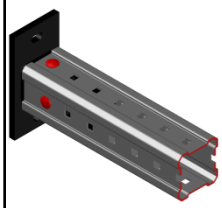








MIC-C90-AA Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

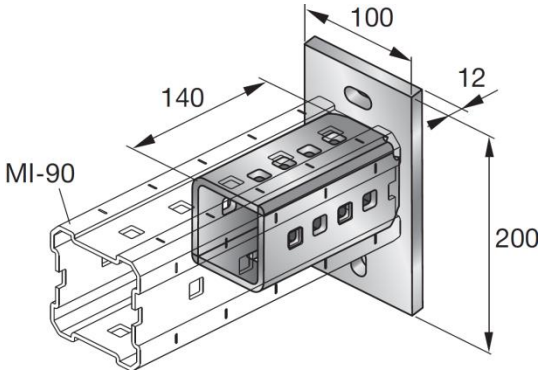
Standards and codes:

• 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

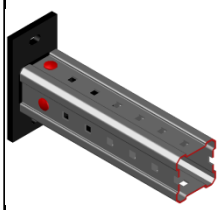
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-C90-AA Base Material Connector - Concrete

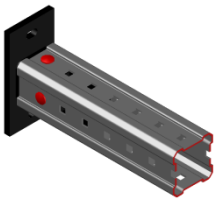
Standard



Loading case: Standard

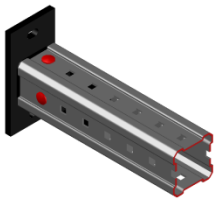
BOM:

Angle incl. all components
1x MIC-C90-AA **304825**
Associated anchors*
for cracked concrete
2x HST3 M12x115 40/20 **2105719**
HST2 M12x115/20 **2107849**
*Anchors not incl. in capacity limits



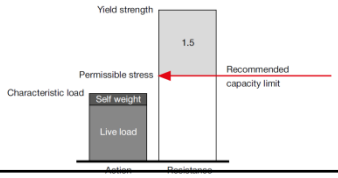
Combinations covered by loading case

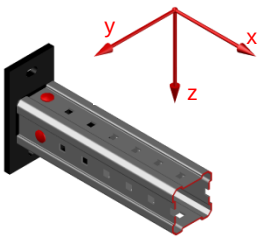
Baseplate connector used for a perpendicular connection of an MI-90 girder to concrete



Recommended loading capacity - simplified for most common applications

Method



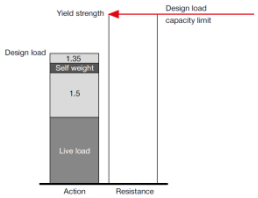


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
19.8	24.2	24.2

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

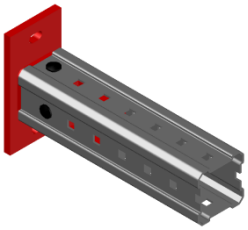
Design loading capacity - 3D 1/3

Method

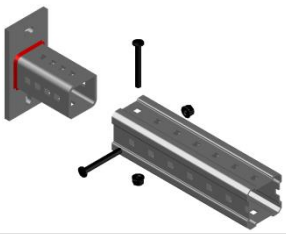


Limiting components of capacity evaluated in following tables:

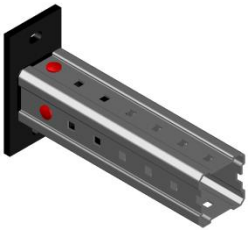
1. Steel connector



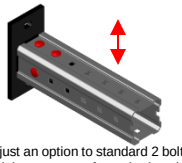
2. Welds



3. 2x bolts in MI channel



4. 3x bolts in MI channel

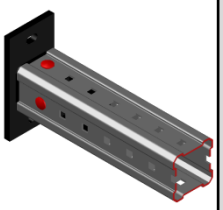


3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

MIC-C90-AA Base Material Connector - Concrete

Conditions of the loading capacity tables:

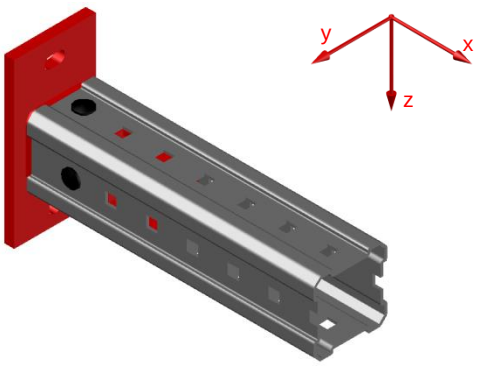
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

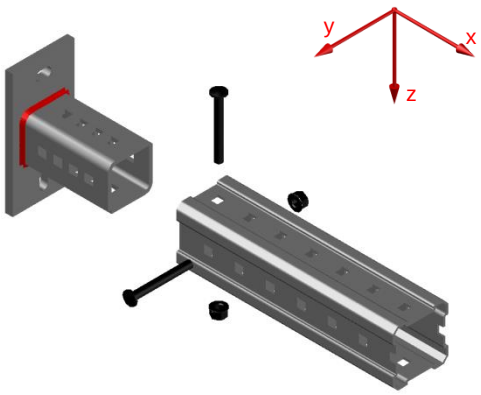


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
29.68	112.79	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
4.10	4.10	2.41	2.41	1.22	1.22

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. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	3.67	3.67	3.67	3.67

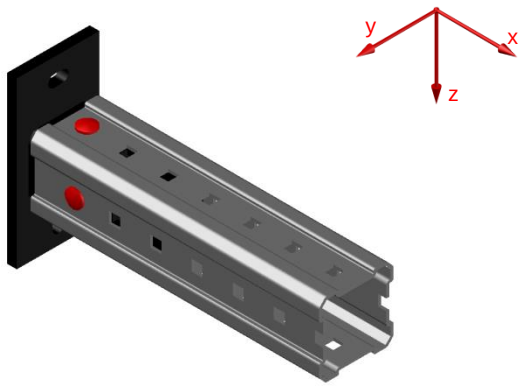
Interaction:

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

MIC-C90-AA Base Material Connector - Concrete

Design loading capacity - 3D 3/3

3. 2x bolts in MI channel

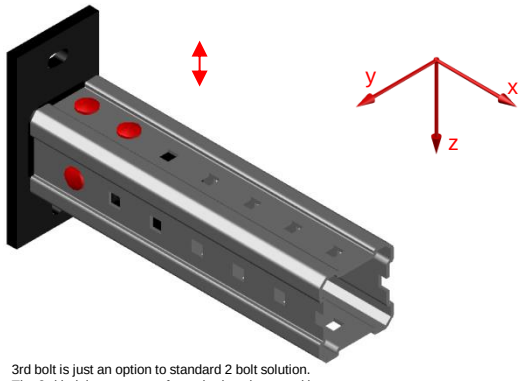


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.29	36.29	36.29	36.29
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

4. 3x bolts in MI channel



3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

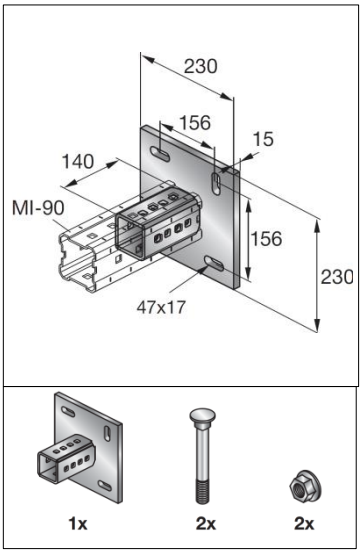
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.92	3.92	2.48	2.48	1.24	1.24

Interaction:

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

MIC-C90-D Base Material Connector - Concrete

Designation	Item number
MIC-C90-D	**304827**



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

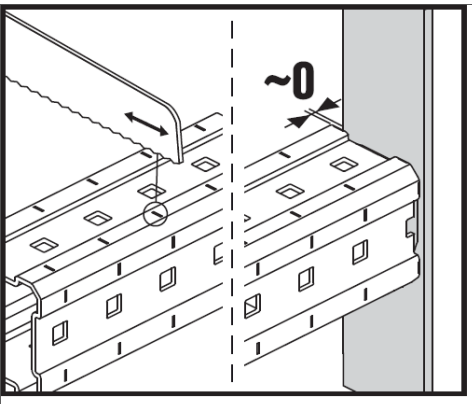
Weight:
7840 g incl. components

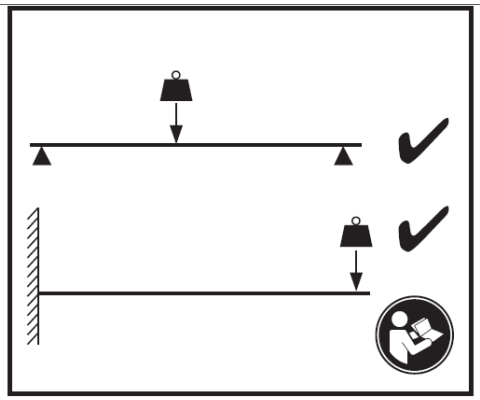
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to concrete. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes.

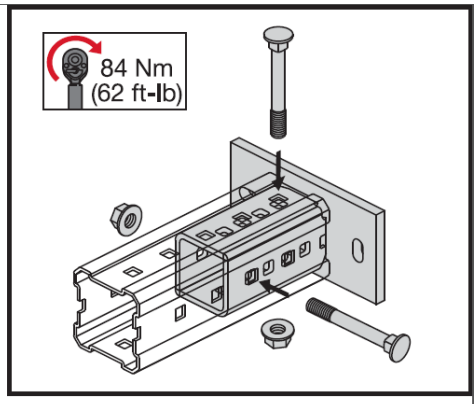
Material properties:

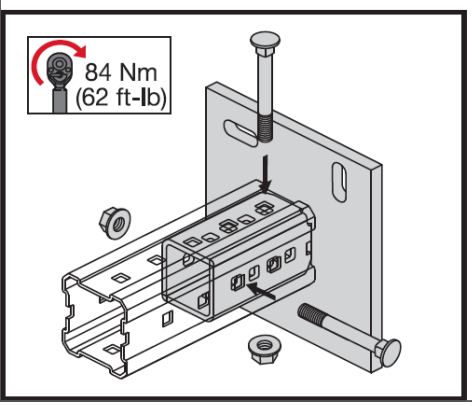
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

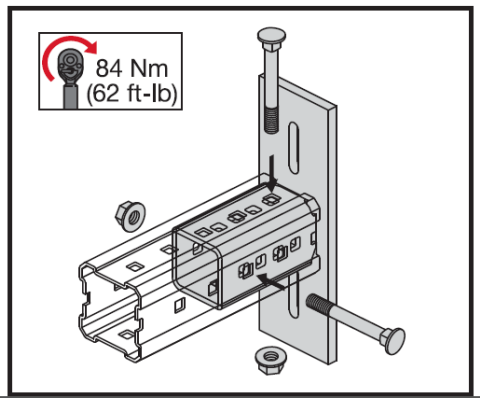
Instruction For Use:

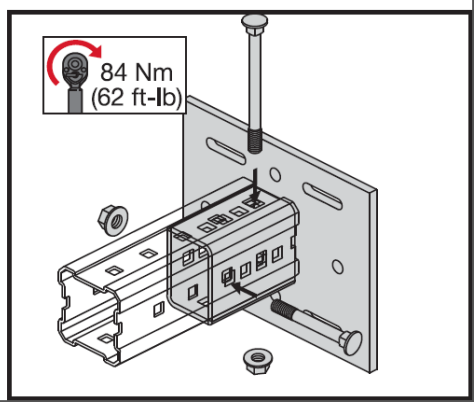




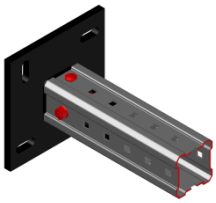








MIC-C90-D Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

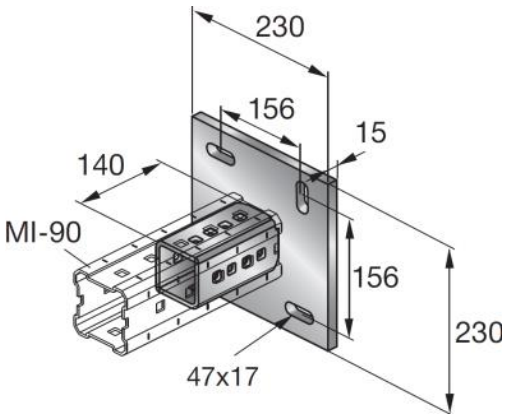
Standards and codes:

• 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

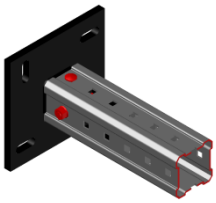
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-C90-D Base Material Connector - Concrete

Standard

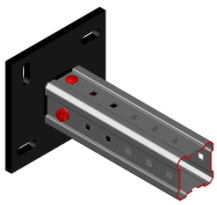


Loading case: Standard

BOM:

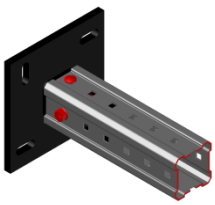
Angle incl. all components
1x MIC-C90-D **304827**

Associated anchors*
for cracked concrete
4x HST3 M16x135 35/15 **2105858**
*Anchors not incl. in capacity limits



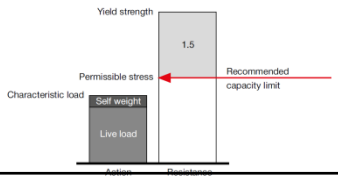
Combinations covered by loading case

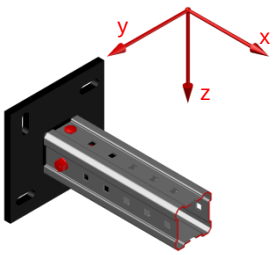
Baseplate connector used for a perpendicular connection of an MI-90 girder to concrete



Recommended loading capacity - simplified for most common applications

Method



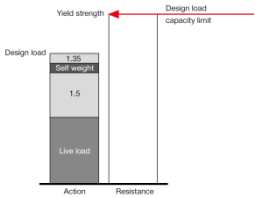


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
29.3	24.2	24.2

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

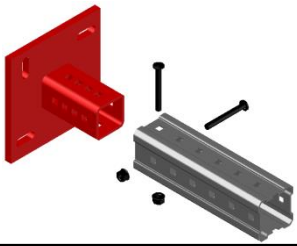
Design loading capacity - 3D 1/3

Method

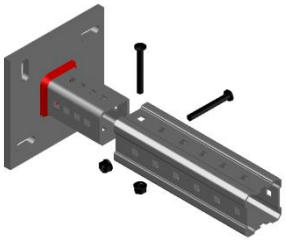


Limiting components of capacity evaluated in following tables:

1. Steel connector

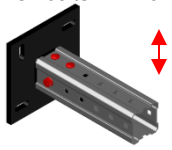


2. Welds



3. 2x bolts in MI channel

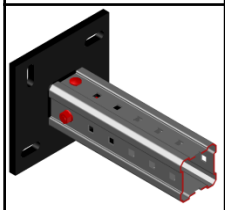
4. 3x bolts in MI channel



3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

MIC-C90-D Base Material Connector - Concrete

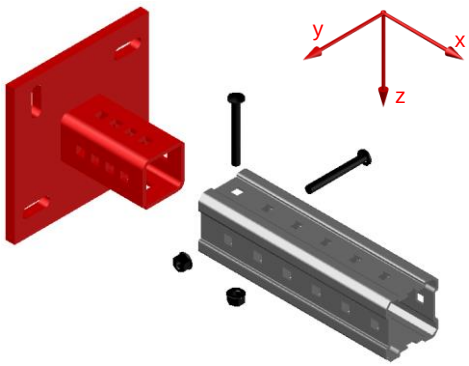
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

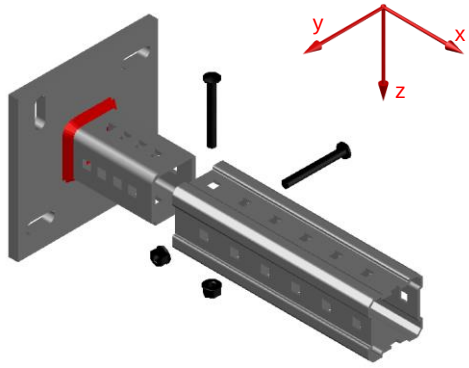


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
44.00	148.20	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.24	4.24	4.15	4.15	4.15	4.15

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. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.99	5.99	3.67	3.67	3.67	3.67

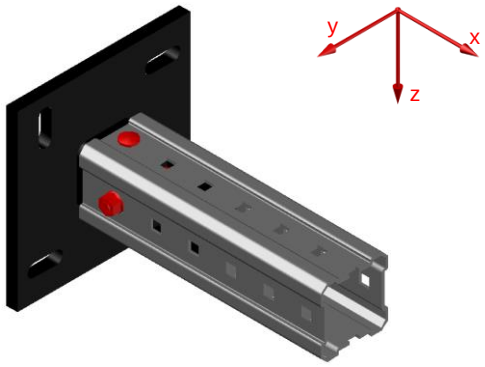
Interaction:

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

MIC-C90-D Base Material Connector - Concrete

Design loading capacity - 3D 3/3

3. 2x bolts in MI channel

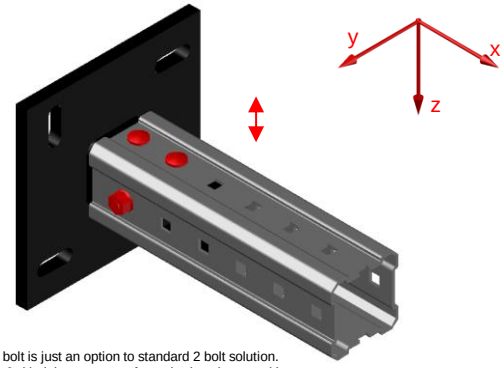


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

4. 3x bolts in MI channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.92	3.92	2.48	2.48	1.24	1.24

Interaction:

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

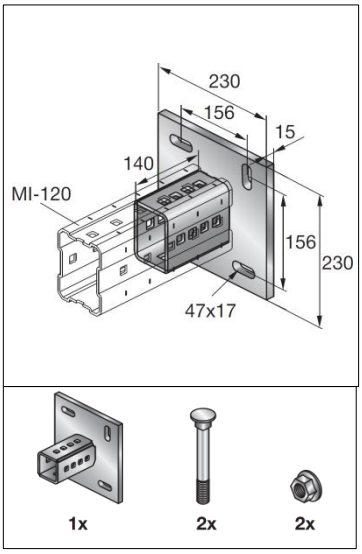
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

MIC-C120-D Base Material Connector - Concrete

Designation	Item number
MIC-C120-D	**304829**

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

Weight:
7960 g incl. components

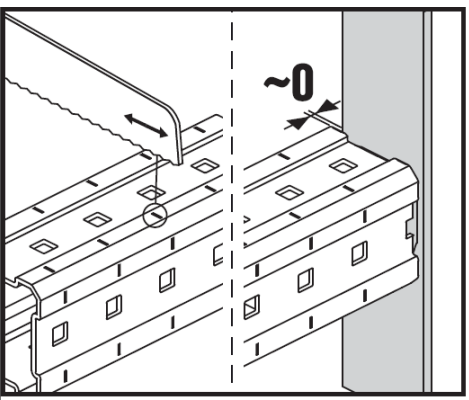


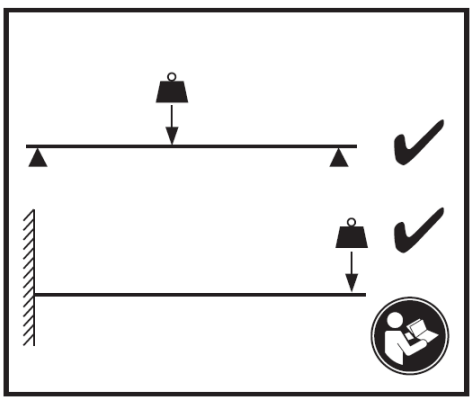
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-120 girder to concrete. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes.

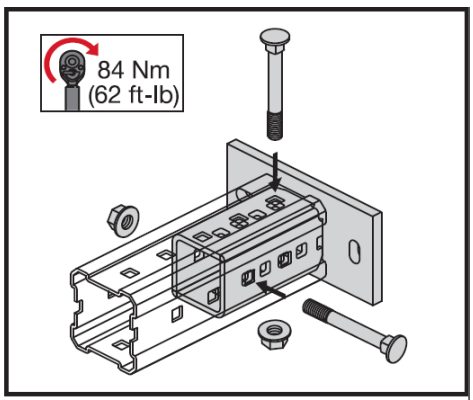
Material properties:

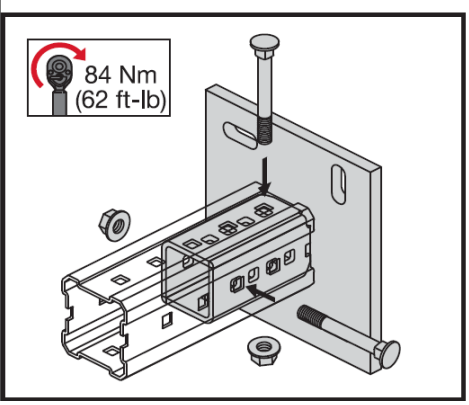
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

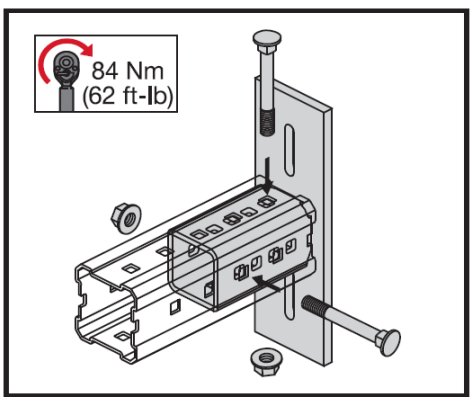
Instruction For Use:

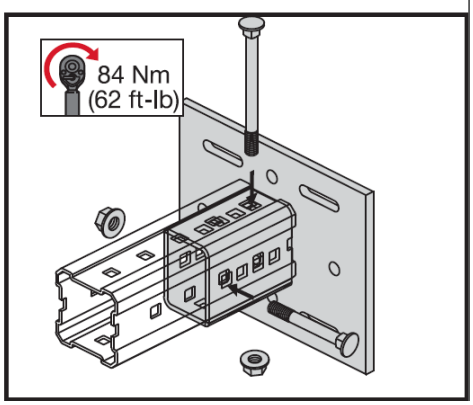




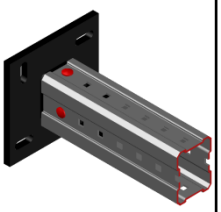








MIC-C120-D Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

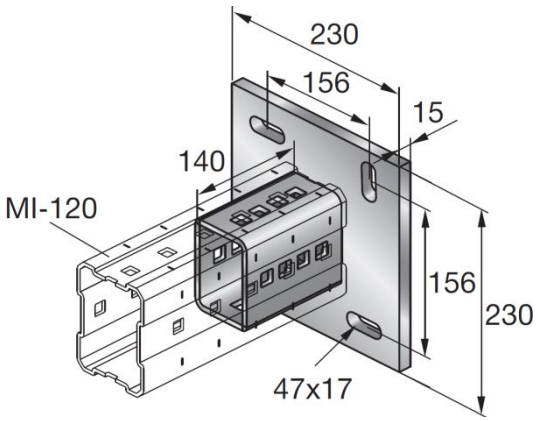
Standards and codes:

• 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

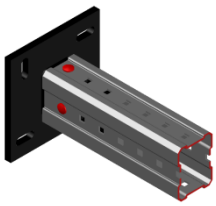
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-C120-D Base Material Connector - Concrete

Standard

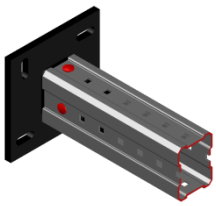


Loading case: Standard

BOM:

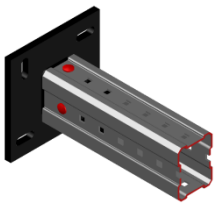
Angle incl. all components
1x MIC-C120-D **304829**

Associated anchors*
for cracked concrete
4x HST3 M16x135 35/15 **2105858**
*Anchors not incl. in capacity limits



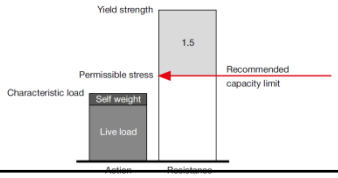
Combinations covered by loading case

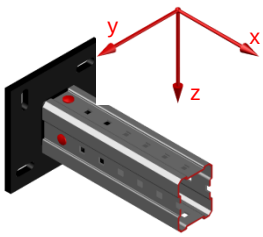
Baseplate connector used for a perpendicular connection of an MI-90 girder to concrete



Recommended loading capacity - simplified for most common applications

Method



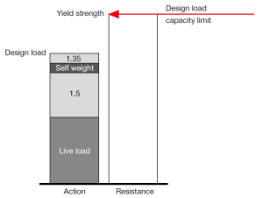


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
31.6	27.6	27.6

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

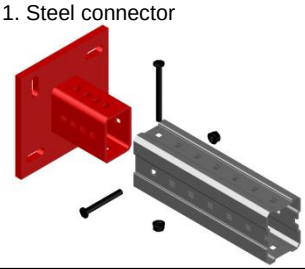
Design loading capacity - 3D 1/3

Method

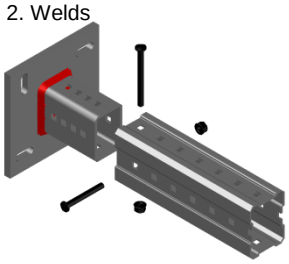


Limiting components of capacity evaluated in following tables:

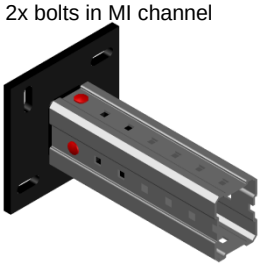
1. Steel connector



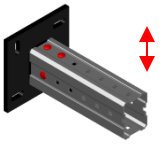
2. Welds



3. 2x bolts in MI channel



4. 3x bolts in MI channel

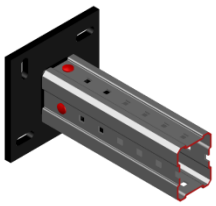


3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

MIC-C120-D Base Material Connector - Concrete

Conditions of the loading capacity tables:

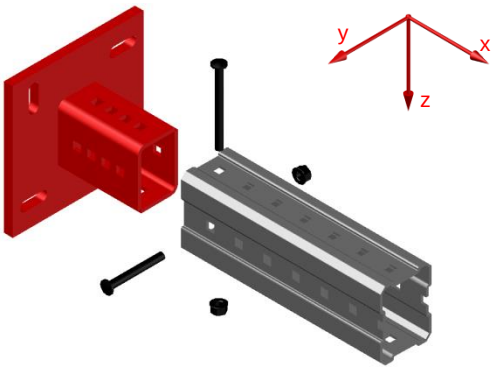
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

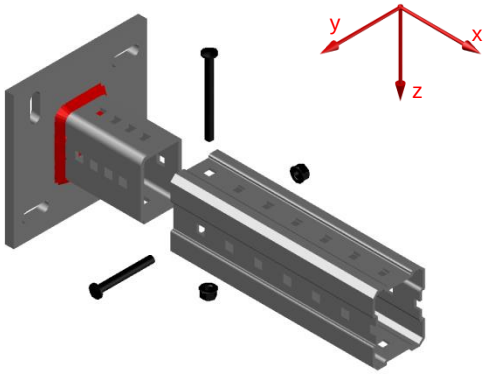


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
47.50	186.43	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
6.78	6.78	4.55	4.55	2.35	2.35

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
336.02	336.02	99.77	99.77	174.59	174.59
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.55	10.55	5.87	5.87	7.06	7.06

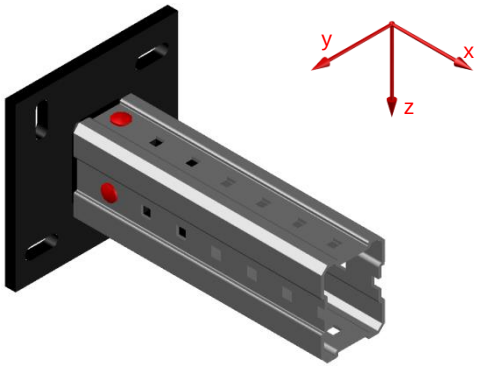
Interaction:

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

MIC-C120-D Base Material Connector - Concrete

Design loading capacity - 3D 3/3

3. 2x bolts in MI channel

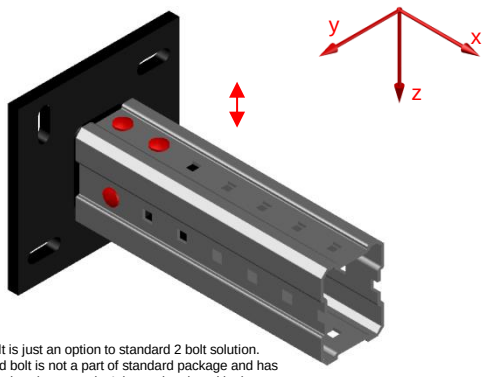


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.59	3.59	1.90	1.90	1.35	1.35

Interaction:

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

4. 3x bolts in MI channel



3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

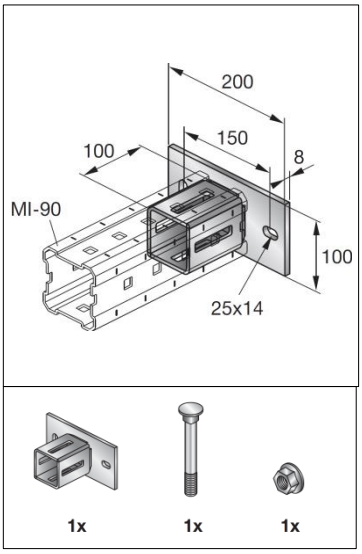
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.53	112.53	82.94	82.94	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.68	5.68	3.79	3.79	1.35	1.35

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-C90-U Base Material Connector - Concrete

Designation	Item number
MIC-C90-U	**304826**



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

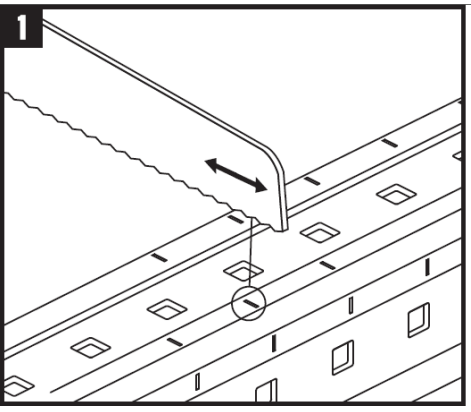
Weight:
2450 g incl. components

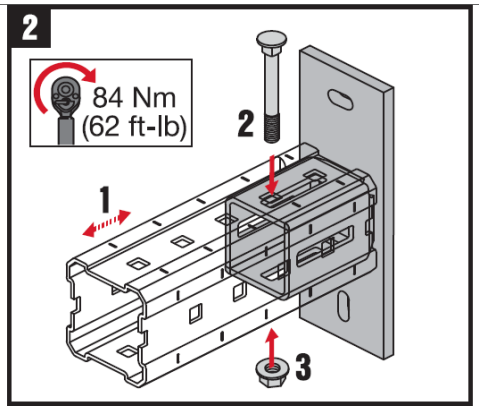
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to concrete. Two oblong anchor holes in perpendicular positions enable fine tuning of baseplate position, and girder is connected using bolts through an oblong hole that enables fine tuning of girder position.

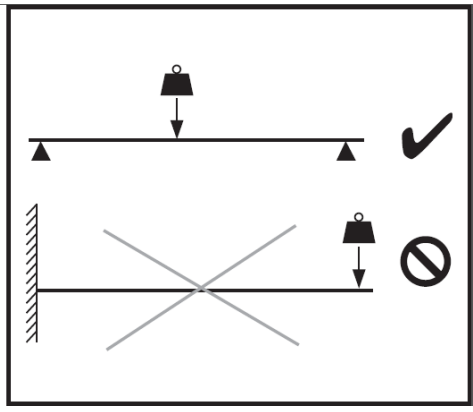
Material properties:

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

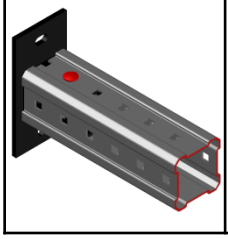
Instruction For Use:







MIC-C90-U Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

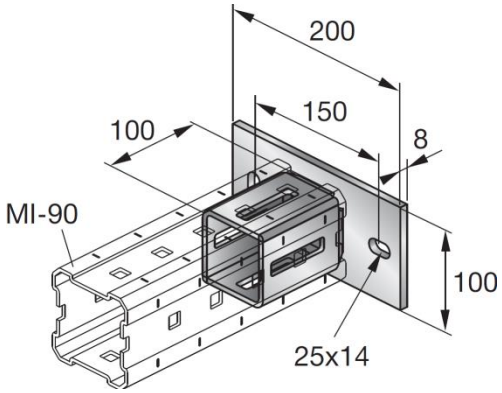
Standards and codes:

• 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

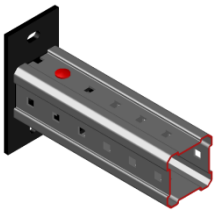
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-C90-U Base Material Connector - Concrete

Standard

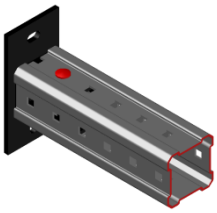


Loading case: Standard

BOM:

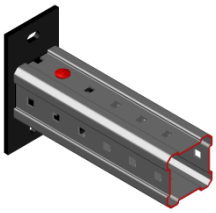
Angle incl. all components
1x MIC-C90-U **304826**

Associated anchors*
for cracked concrete
2x HST3 M12x115 40/20 **2105719**
HST2 M12x115/20 **2107849**
*Anchors not incl. in capacity limits



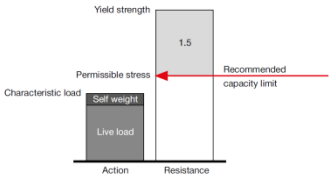
Combinations covered by loading case

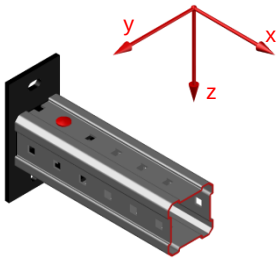
Baseplate connector used for a perpendicular connection of an MI-90 girder to concrete



Recommended loading capacity - simplified for most common applications

Method



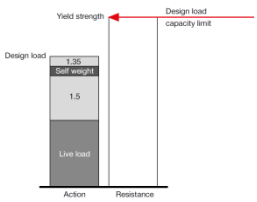


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
2.22	24.2	17.00

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

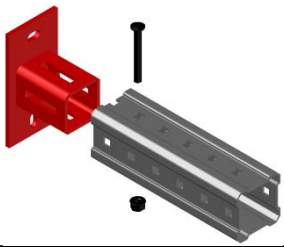
Design loading capacity - 3D 1/3

Method

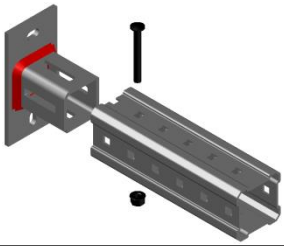


Limiting components of capacity evaluated in following tables:

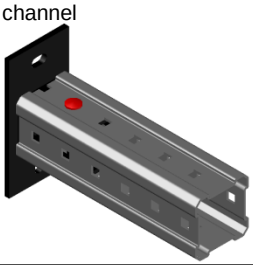
1. Steel connector



2. Welds

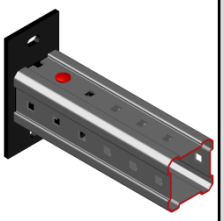


3. bolt in MI channel



MIC-C90-U Base Material Connector - Concrete

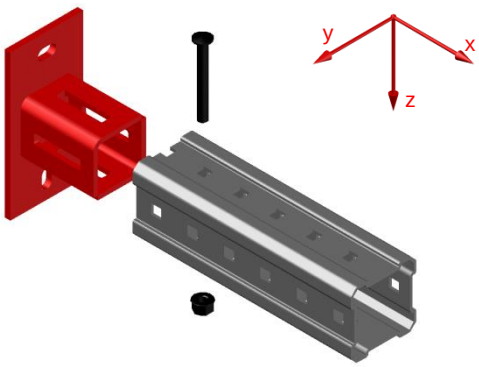
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

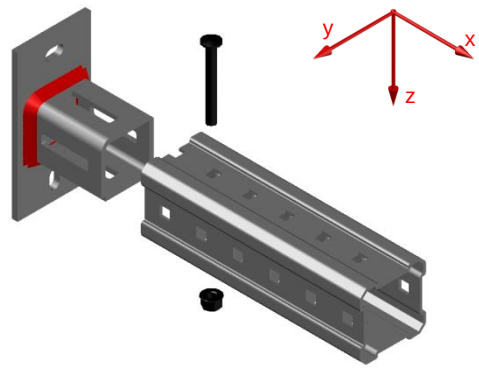


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
13.19	93.32	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
4.10	4.10	0.00	0.00	0.00	0.00

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	0.00	0.00	0.00	0.00

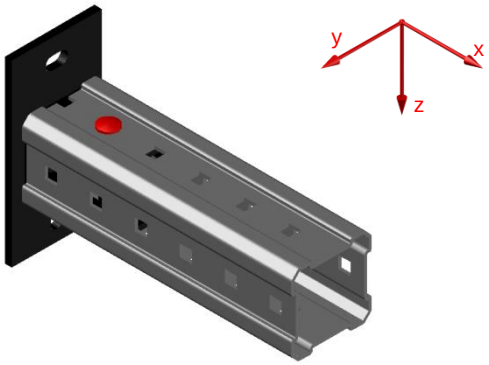
Interaction:

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

MIC-C90-U Base Material Connector - Concrete

Design loading capacity - 3D 3/3

3. bolt in MI channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
3.33	3.33	36.29	36.29	Not decisive	Not decisive
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.20	1.20	0.00	0.00	0.00	0.00

Interaction:

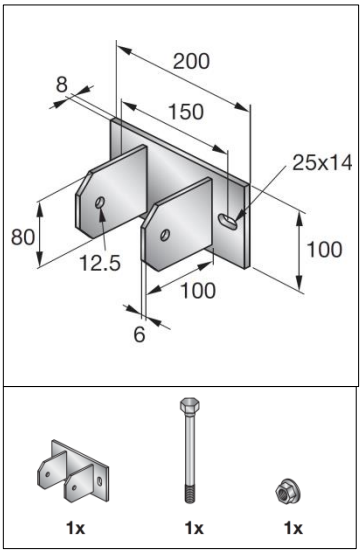
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

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

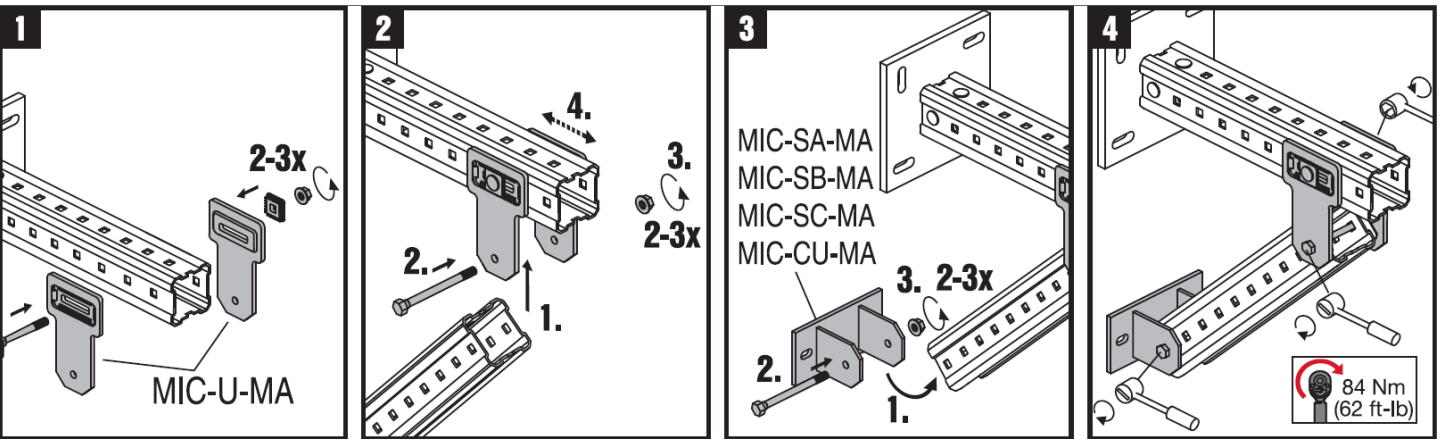


Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to concrete in an angle, usually when it's used as a brace for another girder. Two oblong anchor holes in perpendicular positions enable fine tuning of baseplate position, and girder is connected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

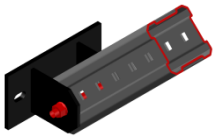
Material properties:

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:



MIC-CU-MA Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

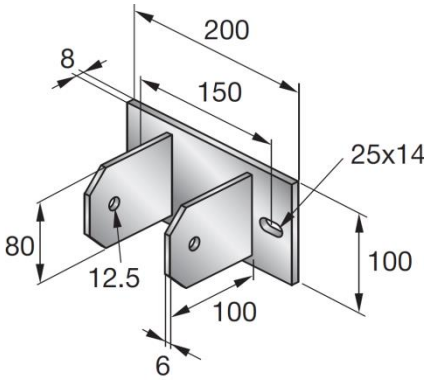
Standards and codes:

• 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

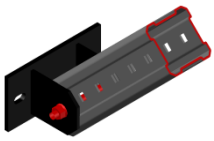
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

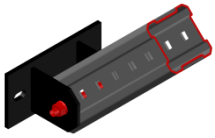
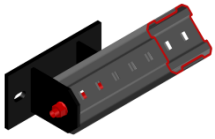
Simplified drawing:



MIC-CU-MA Base Material Connector - Concrete

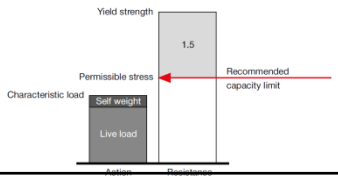
Standard

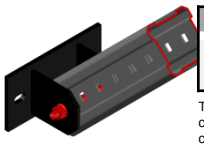


Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all components **1x MIC-CU-MA** **304828** Associated anchors* for cracked concrete **2x HST3 M12x105 30/10** **2105718** **HST2 M12x105/10** **2107848** *Anchors not incl. in capacity limits 	Baseplate connector used for an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

Recommended loading capacity - simplified for most common applications

Method





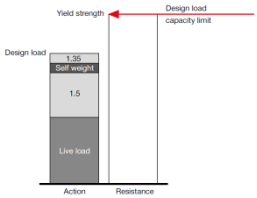
±Fy,rec. [kN]
2.1

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	16.93	8.42	7.28	6.82	7.39

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

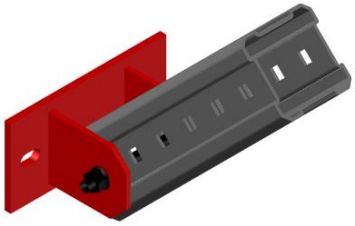
Design loading capacity - 3D 1/3

Method

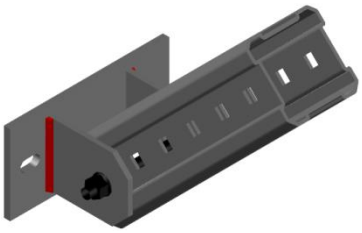


Limiting components of capacity evaluated in following tables:

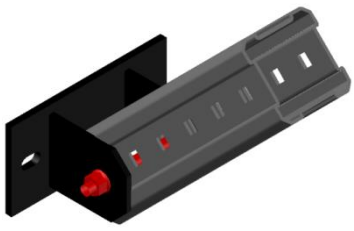
1. Steel connector



2. Welds



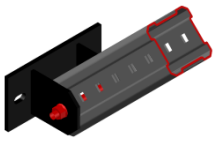
3. bolt in MI channel



MIC-CU-MA Base Material Connector - Concrete

Conditions of the loading capacity tables:

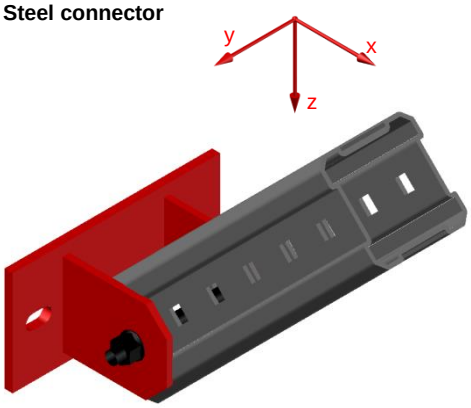
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

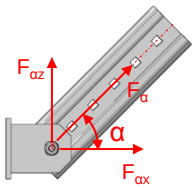


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
25.39	104.01	3.22	3.22	11.09	11.09
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.58	0.58	0.00	0.00	0.00	0.00

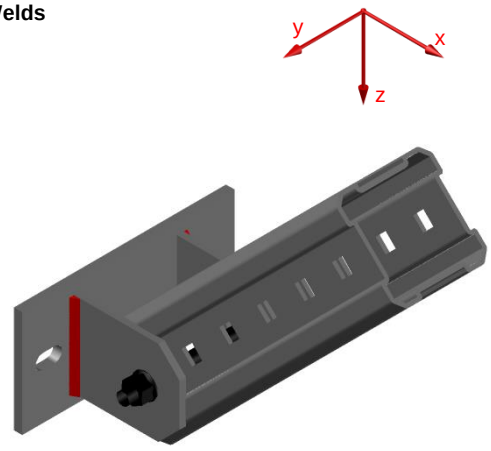
Interaction:

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

with $F_{x.Ed.\alpha}=F_{\alpha}*\cos\alpha$ $F_{z.Ed.\alpha}=F_{\alpha}*\sin\alpha$



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:

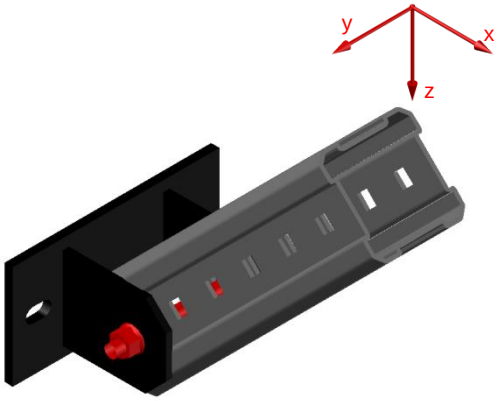
$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \le 1$$

with
ex=0.07m
$F_{x.Ed.\alpha}=F_{\alpha}*\cos\alpha$
$F_{z.Ed.\alpha}=F_{\alpha}*\sin\alpha$ --> $M_{y.Ed.\alpha}=F_{z.Ed.\alpha}*e_x$
$M_{z.Ed}=F_{y.Ed}*e_x$

MIC-CU-MA Base Material Connector - Concrete

Design loading capacity - 3D 3/3

3. bolt in MI channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.39	26.39	Not decisive	Not decisive	26.39	26.39
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.28	1.28	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 $F_{\alpha Rd}$.

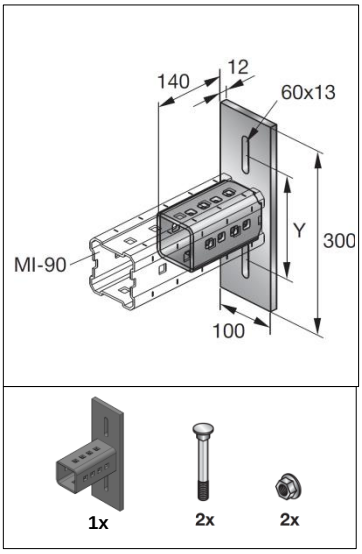
$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

MIC-S90-AA Base Material Connector - Steel

Designation	Item number
MIC-S90-AA	**304811**

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

Weight:
4370 g incl. components

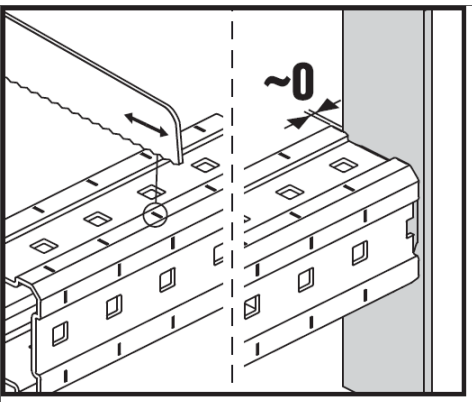


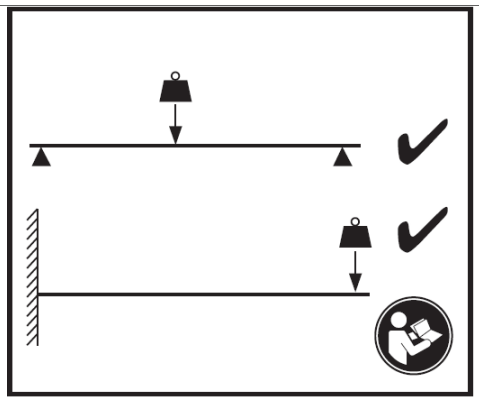
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to a steel beam. Two oblong anchor holes in perpendicular positions enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes.

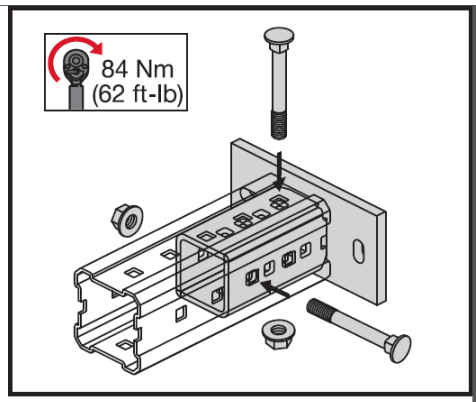
Material properties:

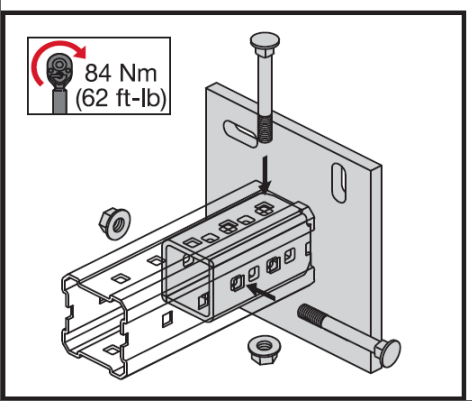
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

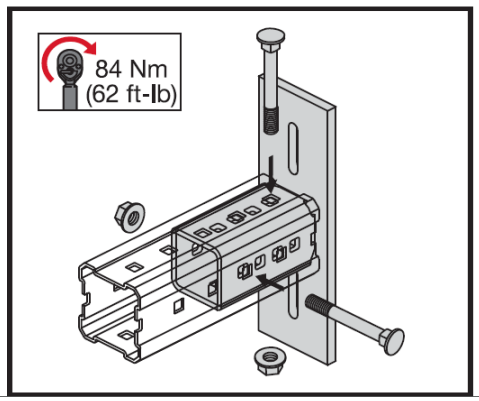
Instruction For Use:

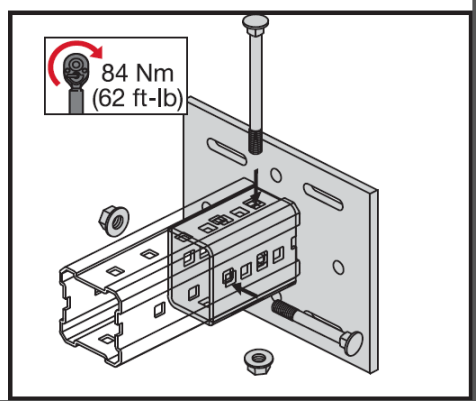




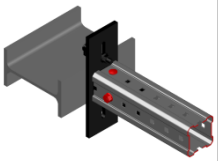








MIC-S90-AA Base Material Connector - Steel

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

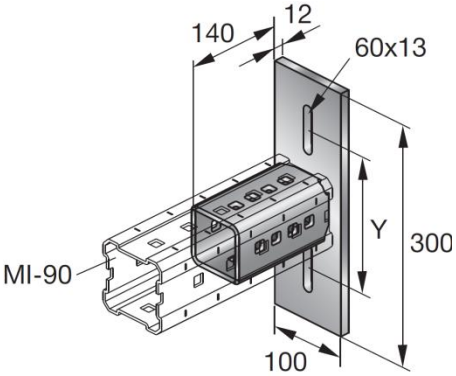
Standards and codes:

• 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

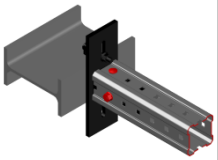
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-S90-AA Base Material Connector - Steel

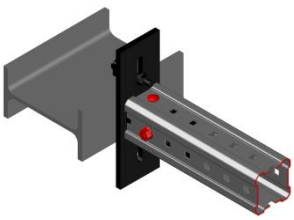
Standard



Loading case: Standard

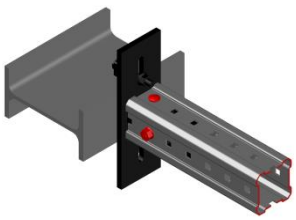
BOM:

Connector incl. all associated components
1x MIC-S90-AA **304811**
Beam clamps
2x MI-SGC M12 **233859**



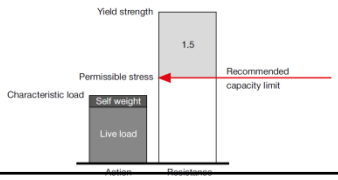
Combinations covered by loading case

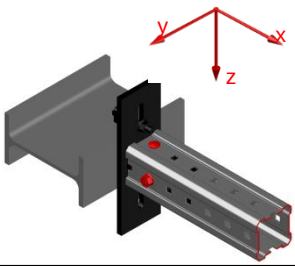
Connector used for a perpendicular connection of MI-90 girder to structural steel profiles



Recommended loading capacity - simplified for most common applications

Method



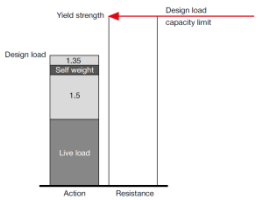


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
10.3	3.0	3.0

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

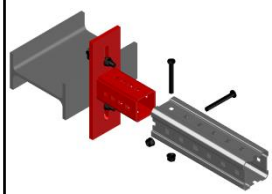
Design loading capacity - 3D 1/3

Method

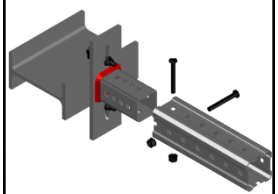


Limiting components of capacity evaluated in following tables:

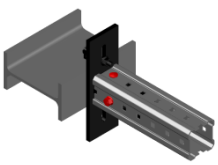
1. Steel connector



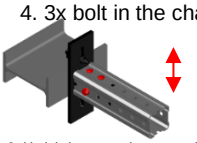
2. Welds



3. 2x bolt in the channel

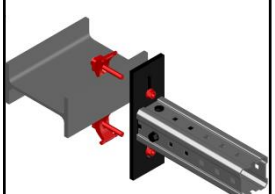


4. 3x bolt in the channel



3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

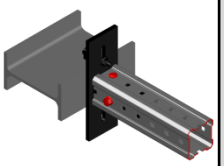
5. Beam clamps



MIC-S90-AA Base Material Connector - Steel

Conditions of the loading capacity tables:

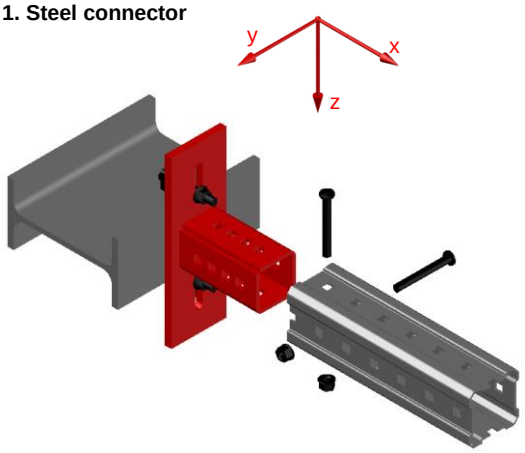
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

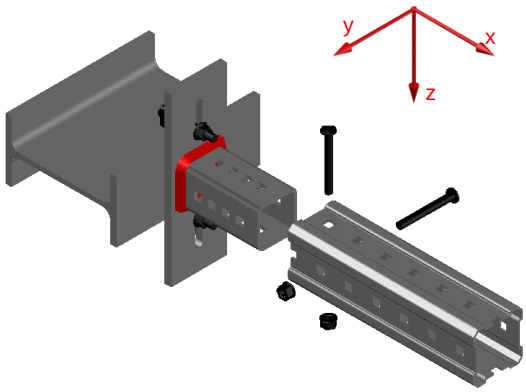


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
15.52	Not decisive	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.24	4.24	0.85	0.85	1.17	1.17

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. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.99	5.99	3.67	3.67	3.67	3.67

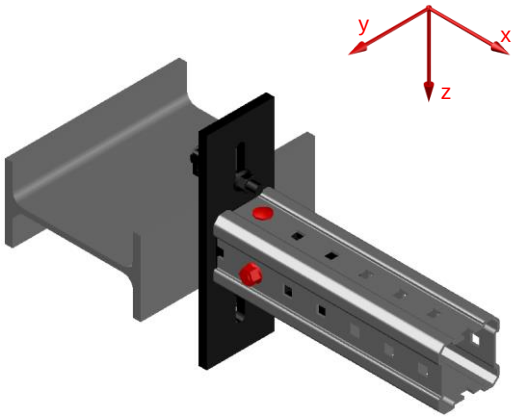
Interaction:

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

MIC-S90-AA Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolts in MI channel

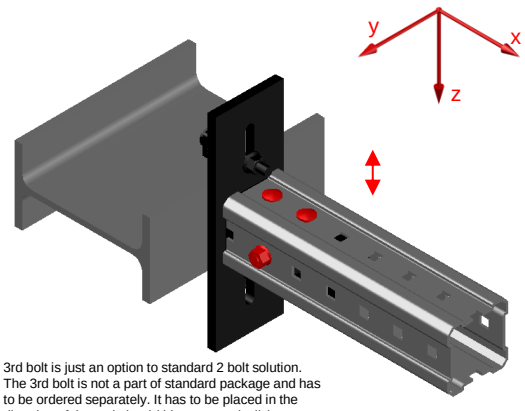


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

3. 3x bolts in MI channel



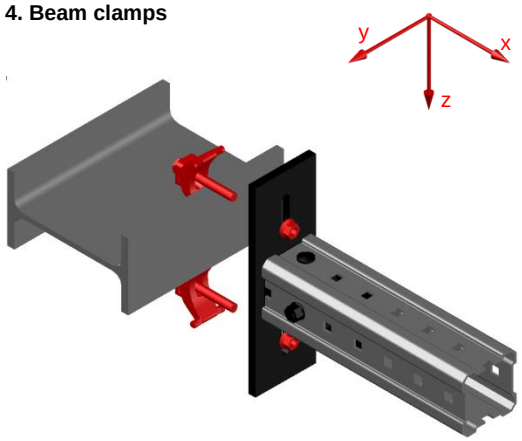
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.92	3.92	2.48	2.48	1.24	1.24

Interaction:

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

4. Beam clamps



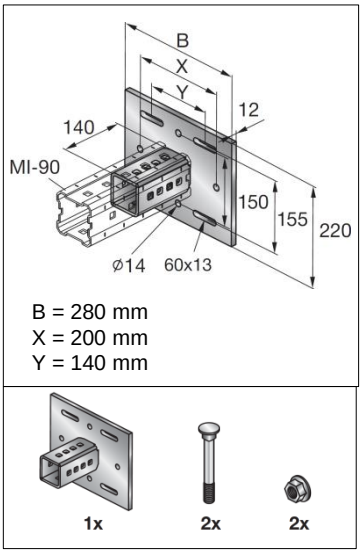
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
17.40	Not decisive	4.50	4.50	4.50	4.50
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.28	0.28	0.87	0.87	0.87	0.87

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-S90-A Base Material Connector - Steel

Designation	Item number
MIC-S90-A	**304812**



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

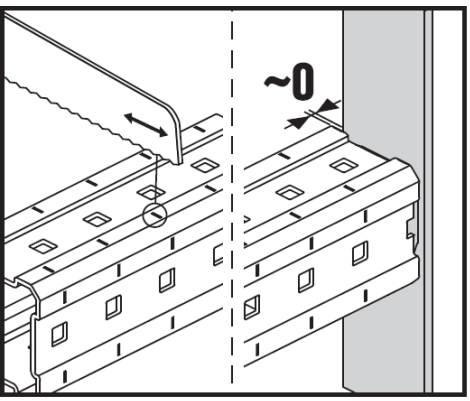
Weight:
7140 g incl. components

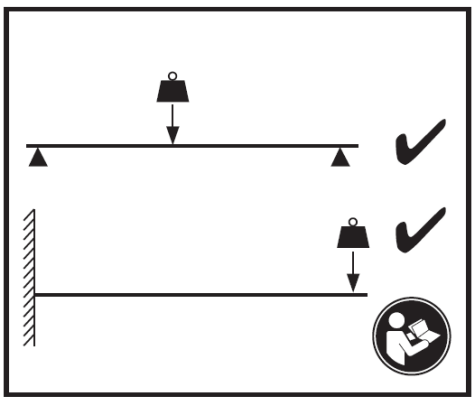
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to a steel beam. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes. Comes in different sizes to fit various steel beam sizes.

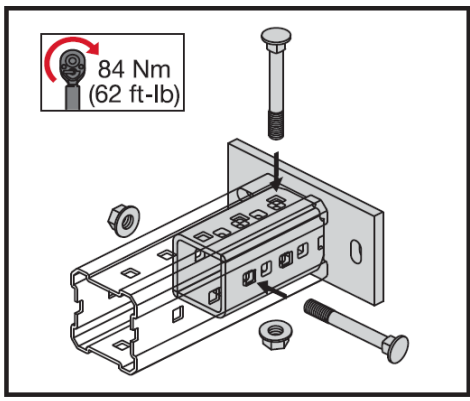
Material properties:

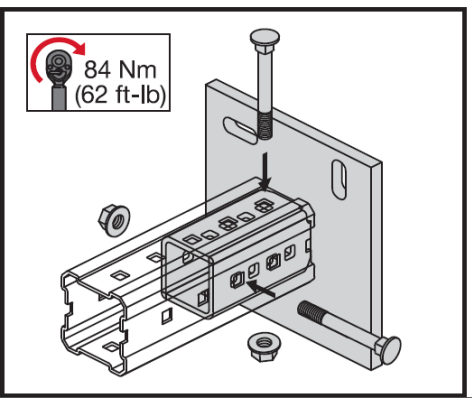
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

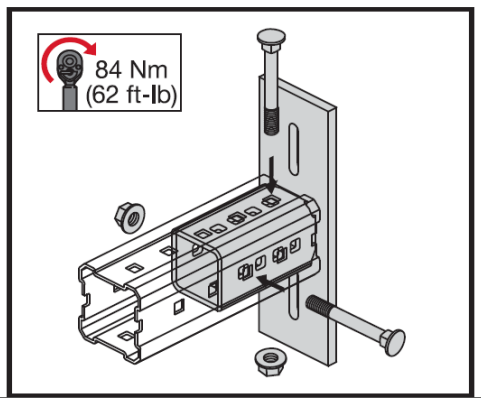
Instruction For Use:

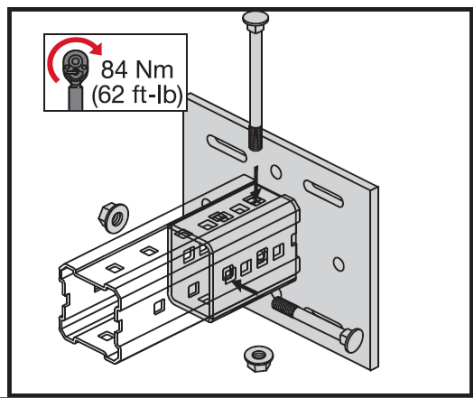




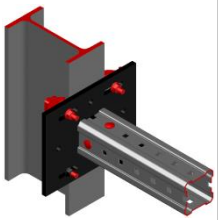
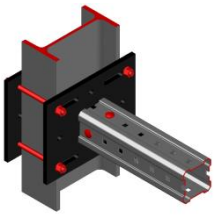








MIC-S90-A Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

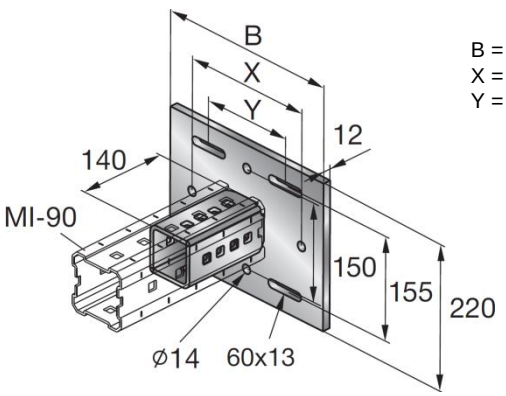
Standards and codes:

•	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

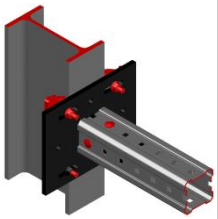
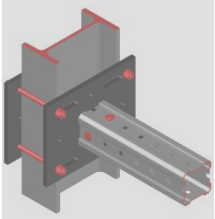
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

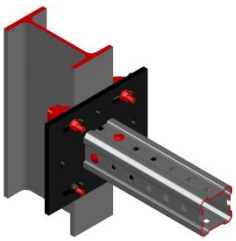
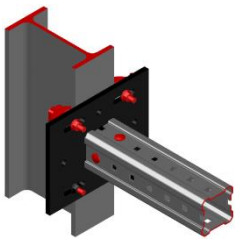
Simplified drawing:



B = 280 mm
X = 200 mm
Y = 140 mm

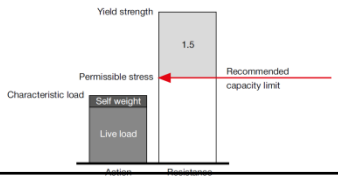
MIC-S90-A Base Material Connector - Steel

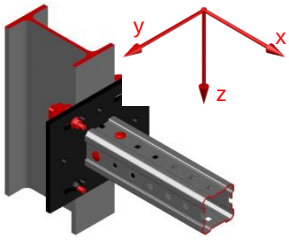
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S90-A** **304812** **Bean clamps** **4x MI-SGC M12** **233859** 	Connector used for perpendicular connection of MI-90 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



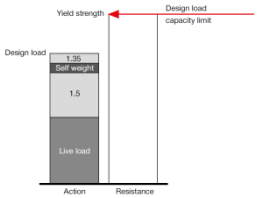


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
23.2	6.0	6.0

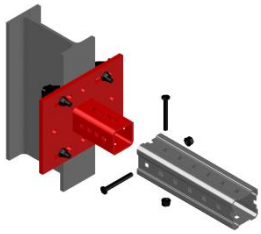
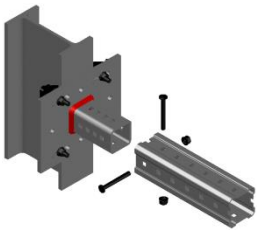
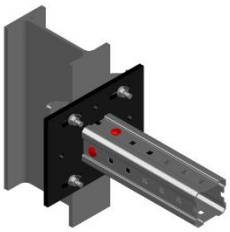
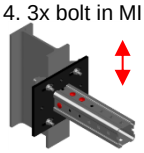
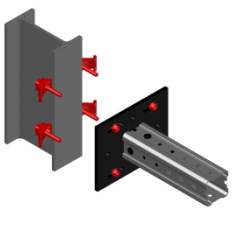
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



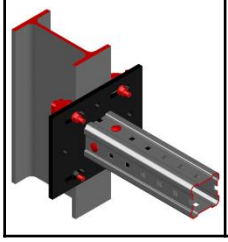
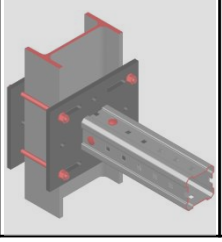
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Beam clamps
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S90-A Base Material Connector - Steel

Conditions of the loading capacity tables:

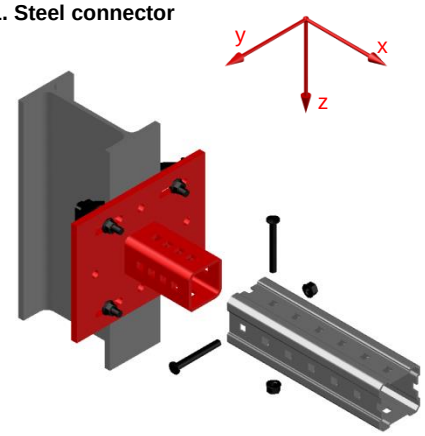
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

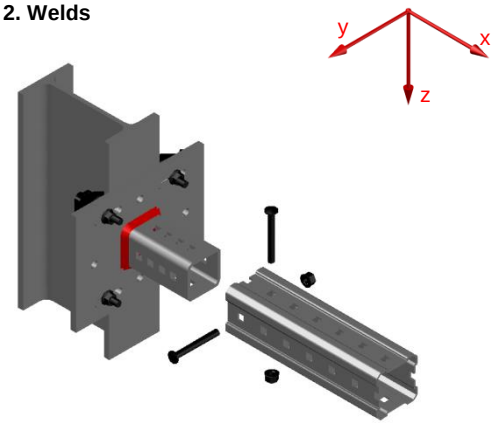


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
4.24	4.24	1.70	1.70	1.80	1.80

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	3.67	3.67	3.67	3.67

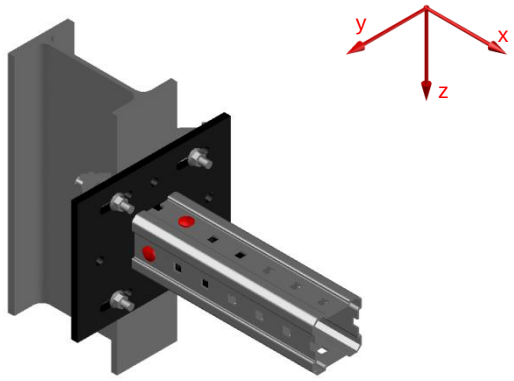
Interaction:

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

MIC-S90-A Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

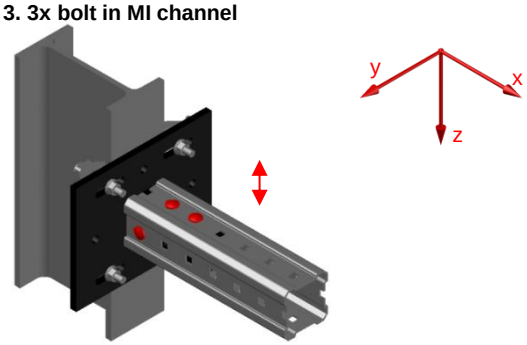


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

3. 3x bolt in MI channel



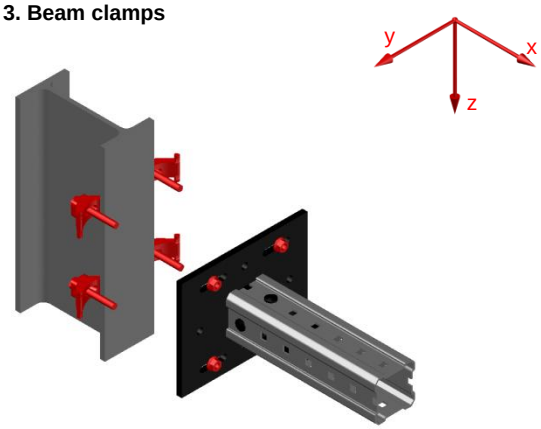
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.92	3.92	2.48	2.48	1.24	1.24

Interaction:

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

3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

3. Beam clamps

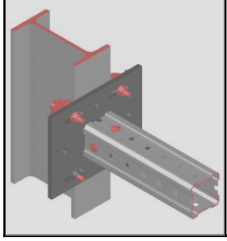
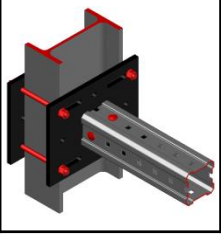


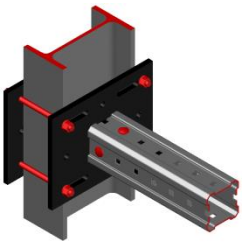
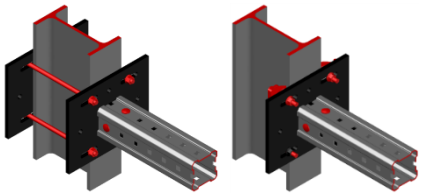
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.80	0.80	2.09	2.09	1.39	1.39

Interaction:

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

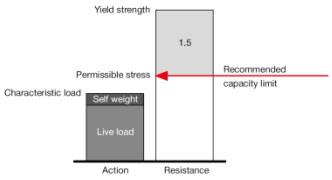
MIC-S90-A Base Material Connector - Steel

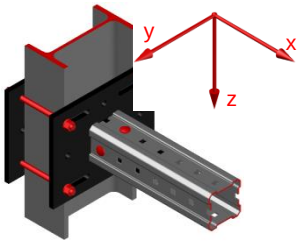
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S90-A** **304812** **Base plate** **1x MIB-SA** **304821** **Threaded rods cut to particular length** **4x AM12x1000-F 4.8** **304774** **Nut** **8x M12-F-SL WS3⁄4** **382897** 	Connector used for perpendicular connection of MI-90 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



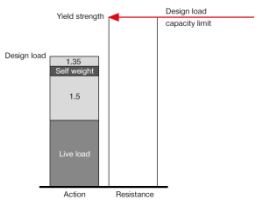


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
24.0	4.9	4.9

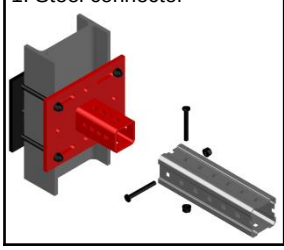
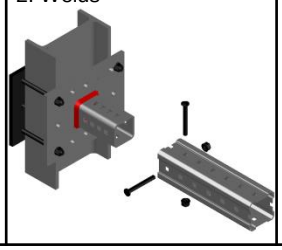
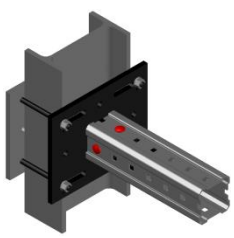
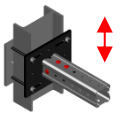
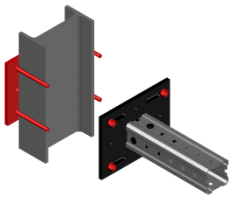
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



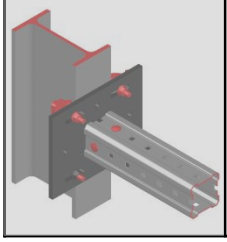
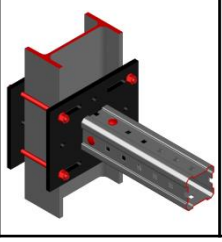
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Back plate with bolts
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S90-A Base Material Connector - Steel

Conditions of the loading capacity tables:

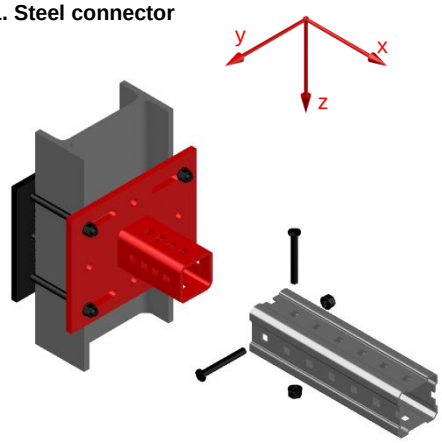
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

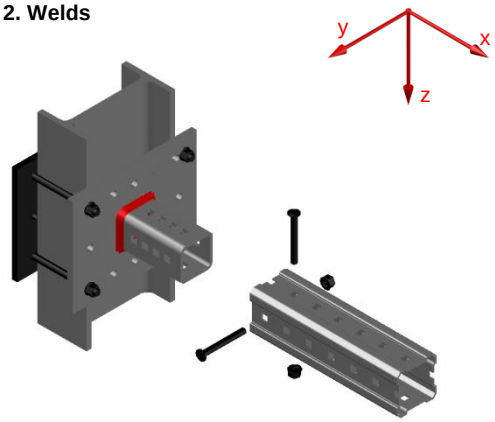


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
4.24	4.24	1.70	1.70	1.80	1.80

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. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	3.67	3.67	3.67	3.67

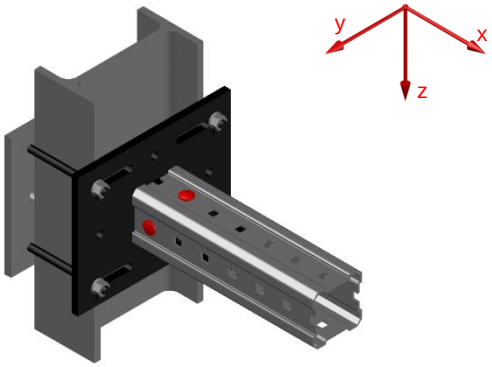
Interaction:

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

MIC-S90-A Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

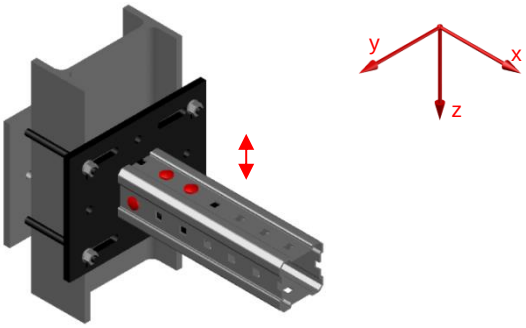


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

3. 3x bolt in MI channel



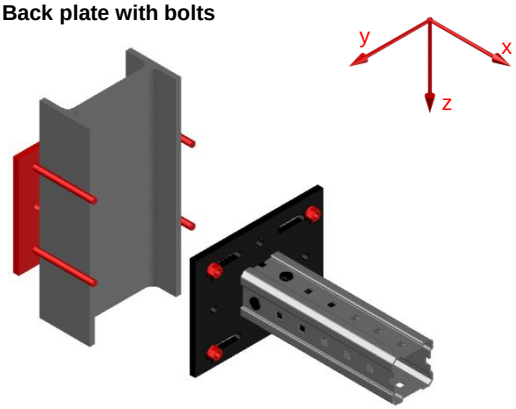
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.92	3.92	2.48	2.48	1.24	1.24

Interaction:

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

3. Back plate with bolts



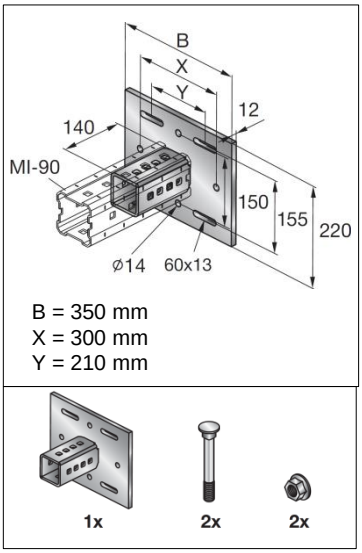
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	35.97	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.66	0.66	11.65	11.65	7.77	7.77

Interaction:

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

MIC-S90-B Base Material Connector - Steel

Designation	Item number
MIC-S90-B	**304813**



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

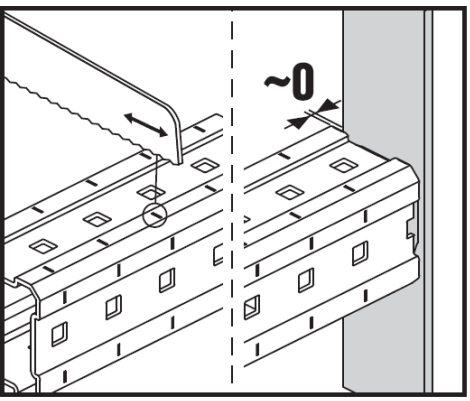
Weight:
8590 g incl. components

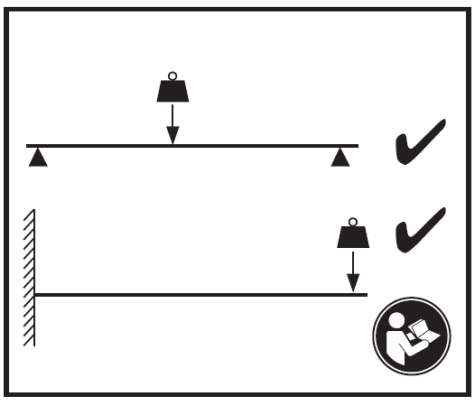
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to a steel beam. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes. Comes in different sizes to fit various steel beam sizes.

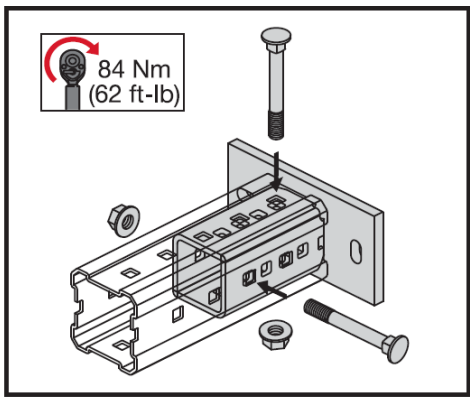
Material properties:

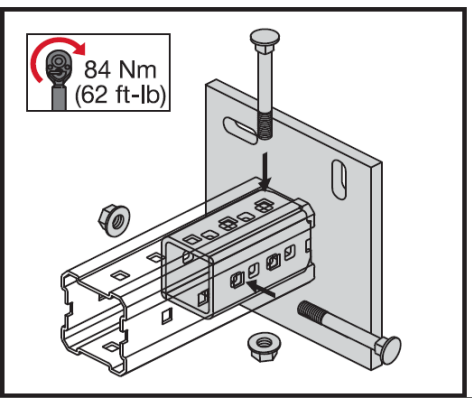
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

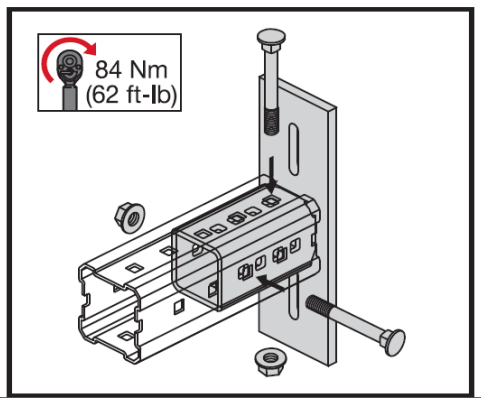
Instruction For Use:

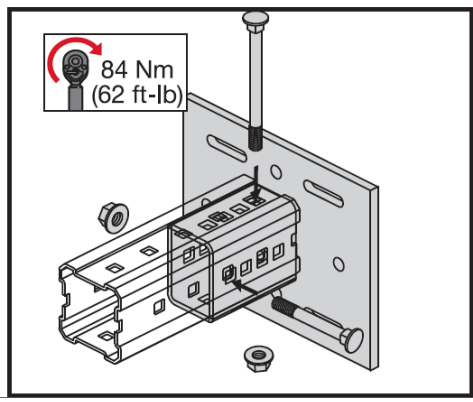




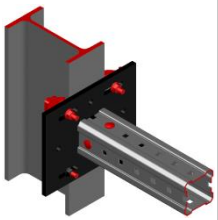
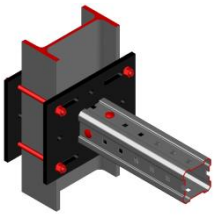








MIC-S90-B Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

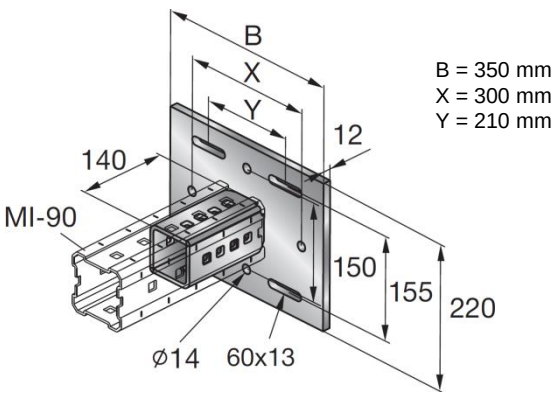
Standards and codes:

• 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

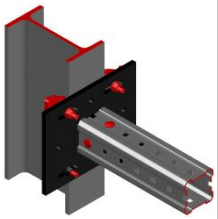
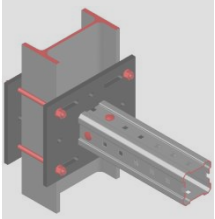
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

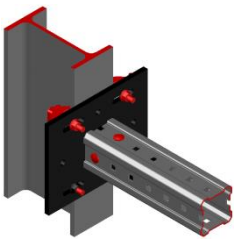
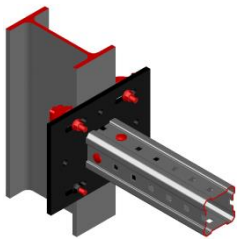
Simplified drawing:



B = 350 mm
X = 300 mm
Y = 210 mm

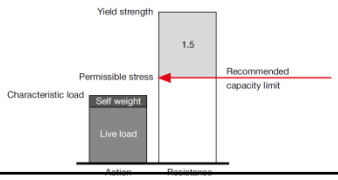
MIC-S90-B Base Material Connector - Steel

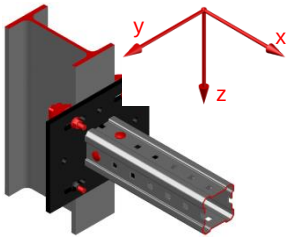
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S90-B** **304813** **Bean clamps** **4x MI-SGC M12** **233859** 	Connector used for perpendicular connection of MI-90 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



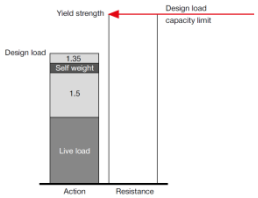


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.5	6.0	6.0

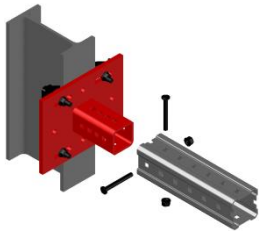
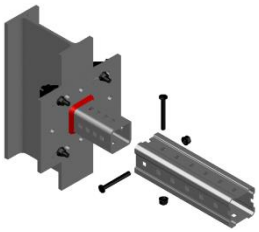
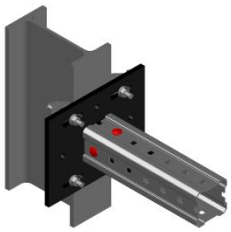
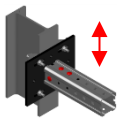
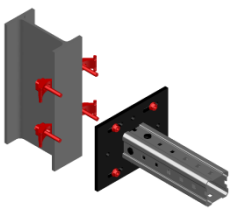
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



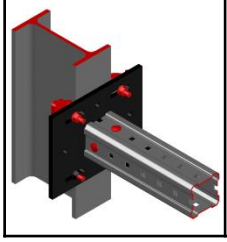
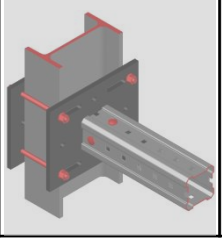
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Beam clamps
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S90-B Base Material Connector - Steel

Conditions of the loading capacity tables:

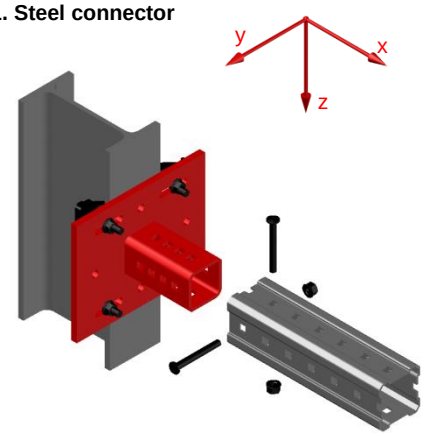
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

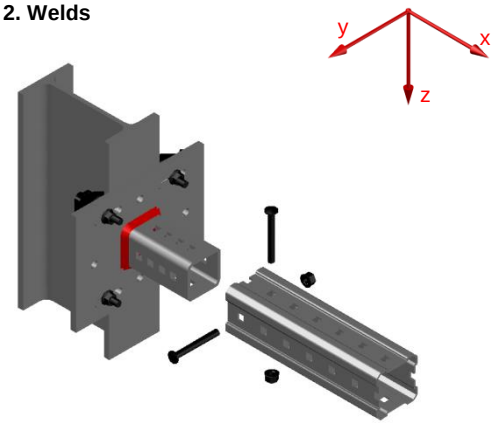


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
4.24	4.24	1.33	1.33	1.64	1.64

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	3.67	3.67	3.67	3.67

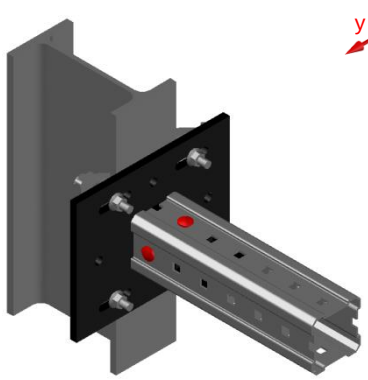
Interaction:

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

MIC-S90-B Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

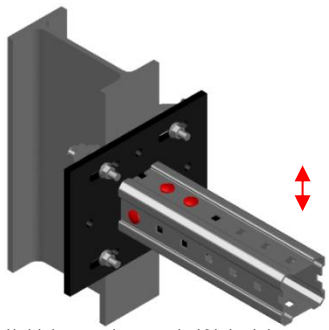


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

3. 3x bolt in MI channel



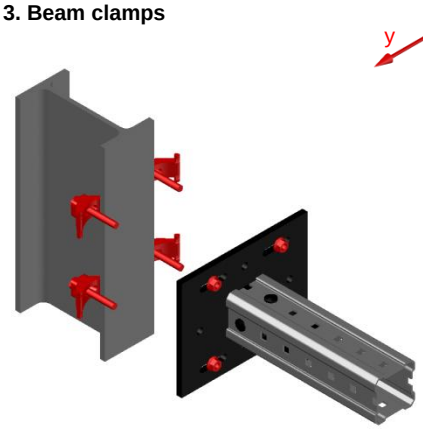
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.92	3.92	2.48	2.48	1.24	1.24

Interaction:

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

3. Beam clamps

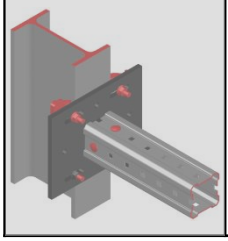
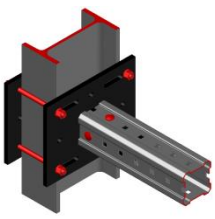


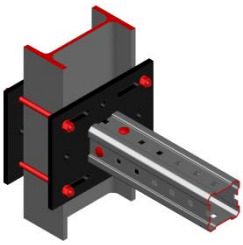
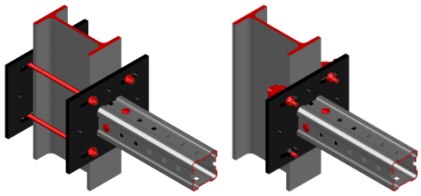
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.06	1.06	2.09	2.09	2.09	2.09

Interaction:

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

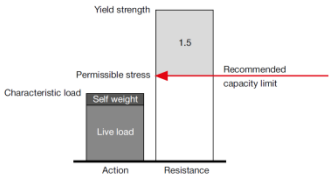
MIC-S90-B Base Material Connector - Steel

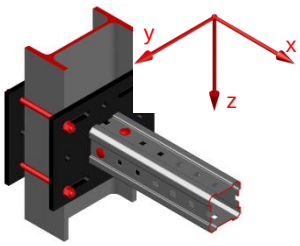
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S90-B 304813** **Base plate** **1x MIB-SB 304822** **Threaded rods cut to particular length** **4x AM12x1000-F 4.8 304774** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for perpendicular connection of MI-90 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



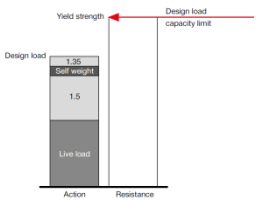


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.5	4.9	4.9

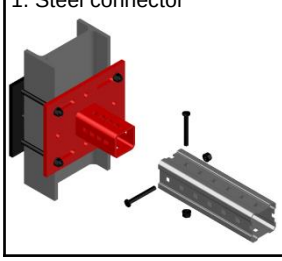
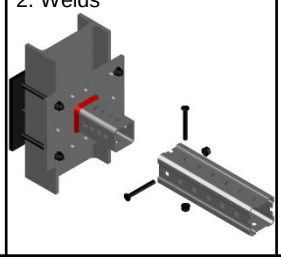
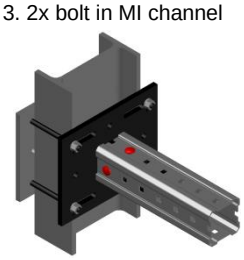
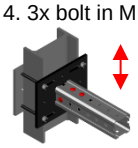
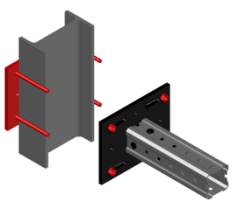
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



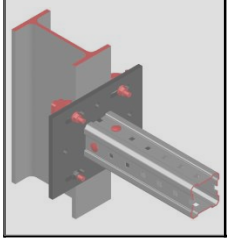
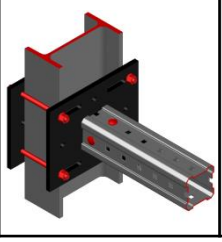
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Back plate with bolts
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S90-B Base Material Connector - Steel

Conditions of the loading capacity tables:

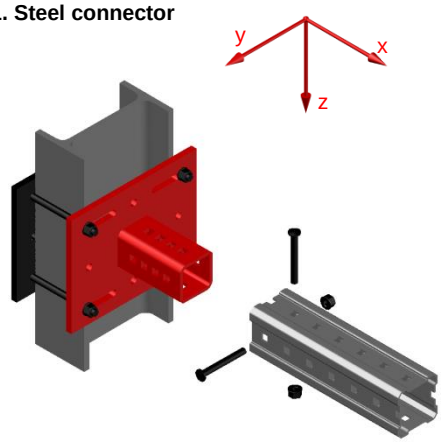
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

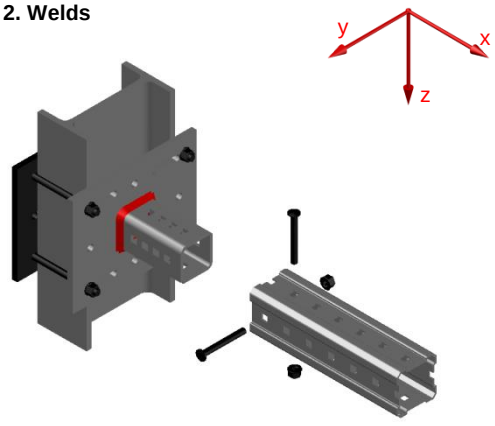


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
4.24	4.24	1.33	1.33	1.64	1.64

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	3.67	3.67	3.67	3.67

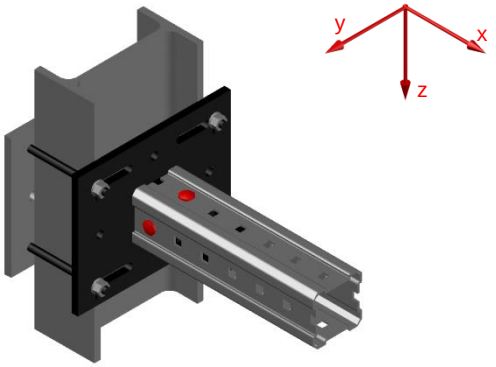
Interaction:

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

MIC-S90-B Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

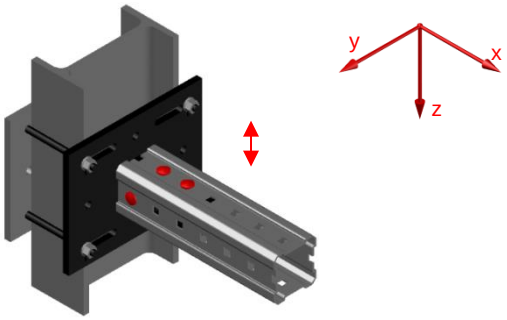


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

3. 3x bolt in MI channel



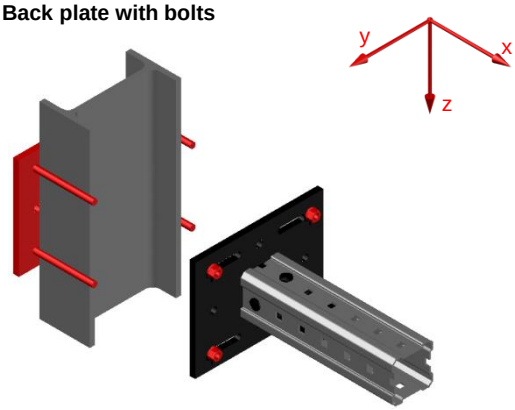
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.92	3.92	2.48	2.48	1.24	1.24

Interaction:

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

3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

3. Back plate with bolts



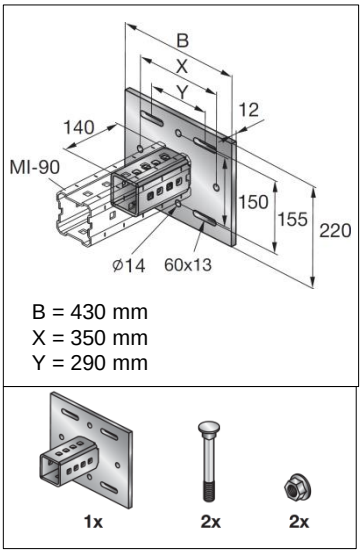
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	34.23	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.87	0.87	11.65	11.65	11.65	11.65

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-S90-C Base Material Connector - Steel

Designation	Item number
MIC-S90-C	**304814**



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

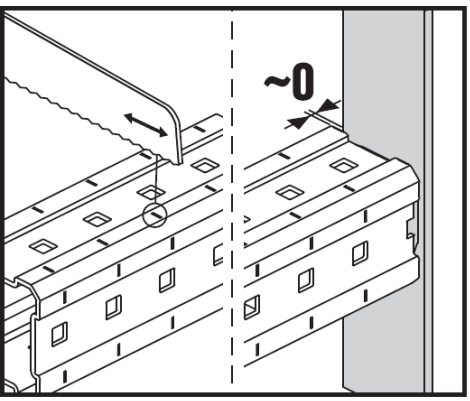
Weight:
8590 g incl. components

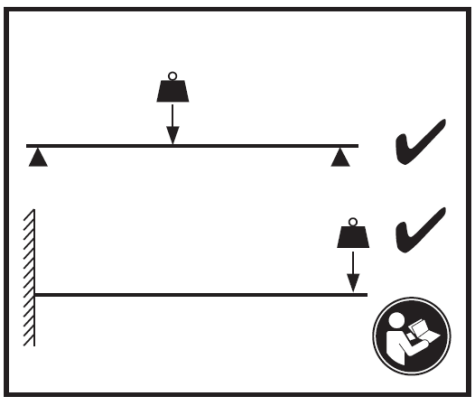
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to a steel beam. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes. Comes in different sizes to fit various steel beam sizes.

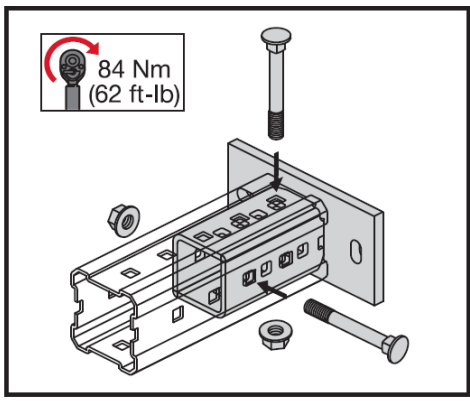
Material properties:

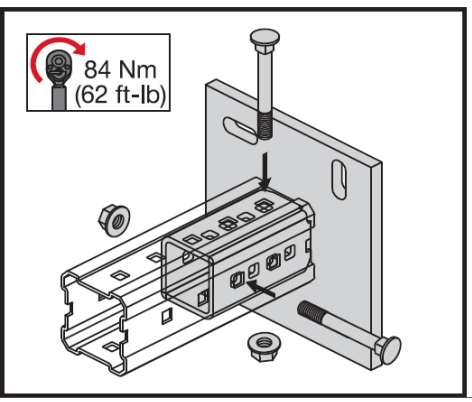
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

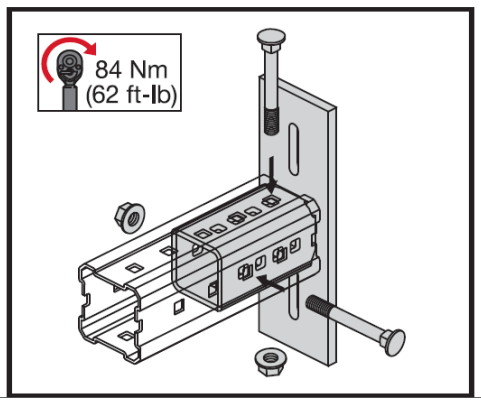
Instruction For Use:

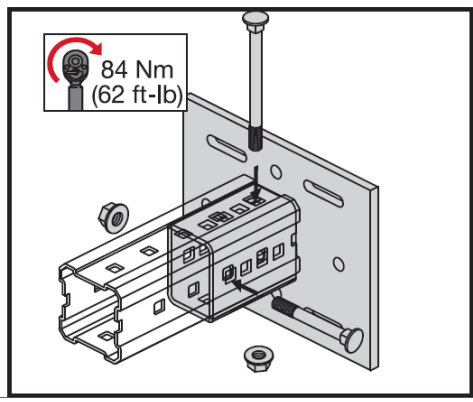




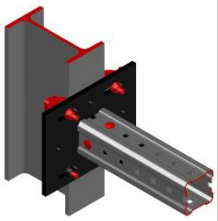
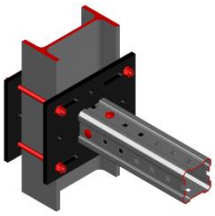








MIC-S90-C Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

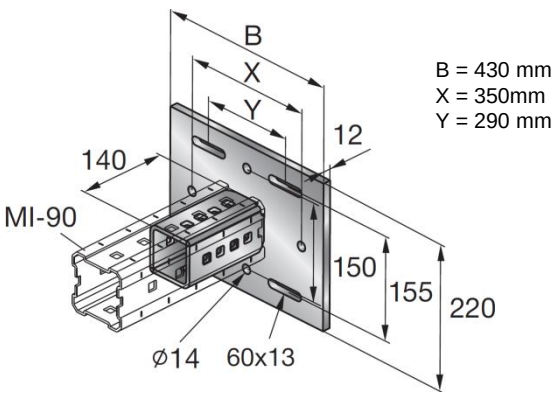
Standards and codes:

• 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

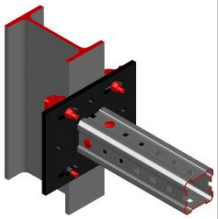
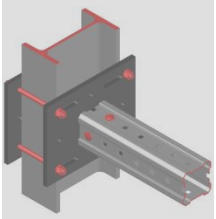
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

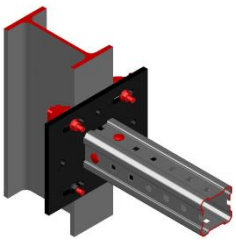
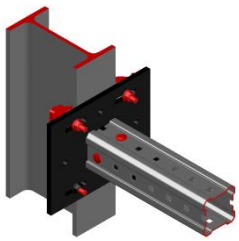
Simplified drawing:



B = 430 mm
X = 350mm
Y = 290 mm

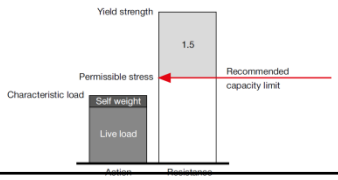
MIC-S90-C Base Material Connector - Steel

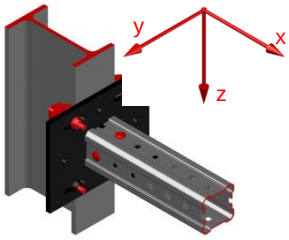
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S90-C** **304814** **Bean clamps** **4x MI-SGC M12** **233859** 	Connector used for perpendicular connection of MI-90 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



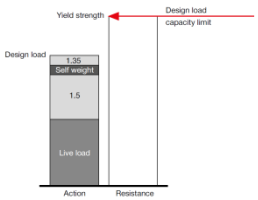


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
13.9	6.0	6.0

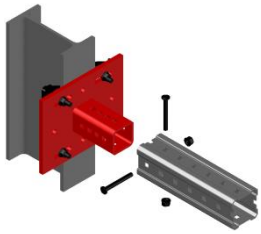
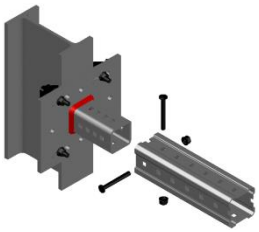
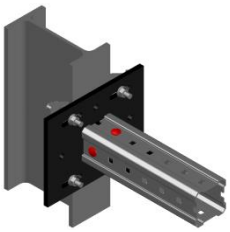
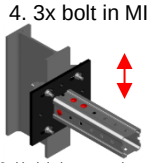
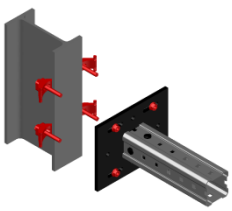
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



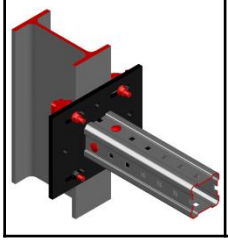
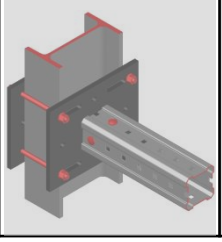
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Beam clamps
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S90-C Base Material Connector - Steel

Conditions of the loading capacity tables:

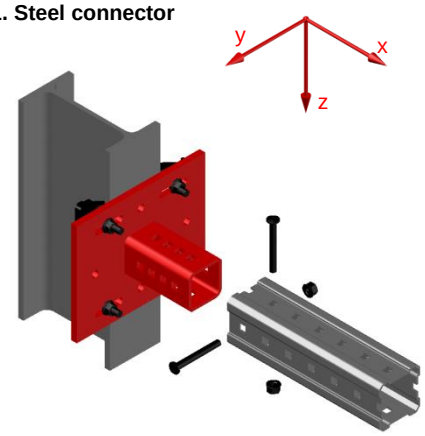
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

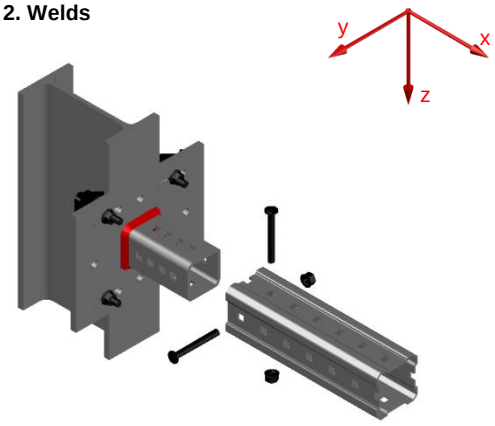


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
4.24	4.24	1.14	1.14	1.40	1.40

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	3.67	3.67	3.67	3.67

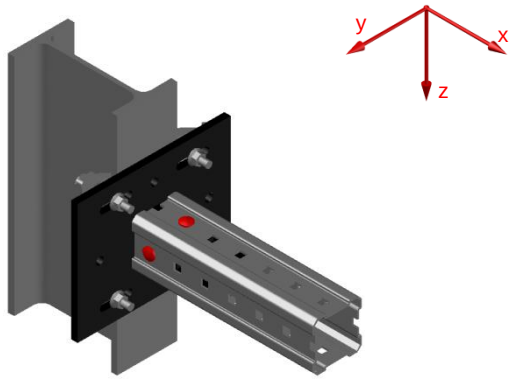
Interaction:

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

MIC-S90-C Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

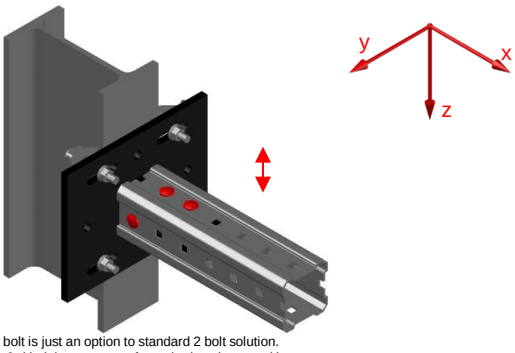


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

3. 3x bolt in MI channel



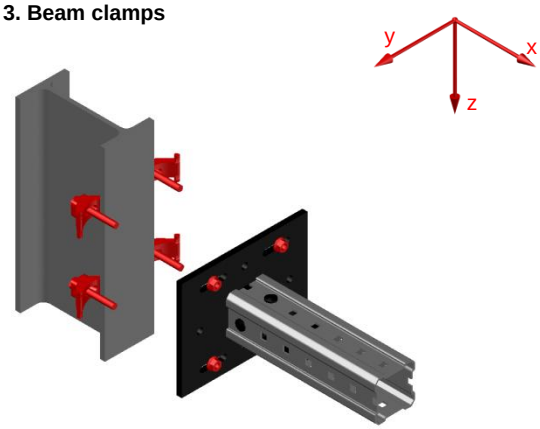
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.92	3.92	2.48	2.48	1.24	1.24

Interaction:

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

3. Beam clamps

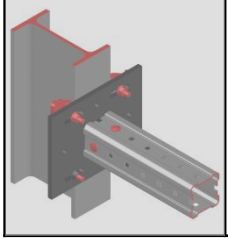
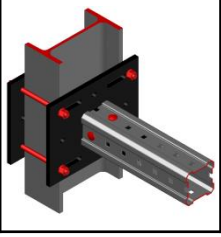


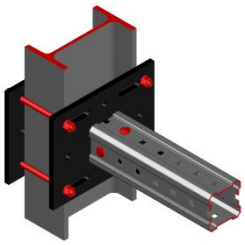
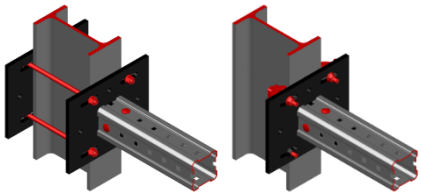
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.31	1.31	2.09	2.09	3.65	3.65

Interaction:

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

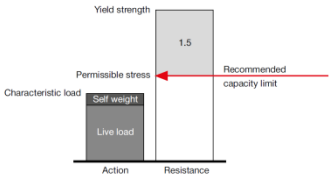
MIC-S90-C Base Material Connector - Steel

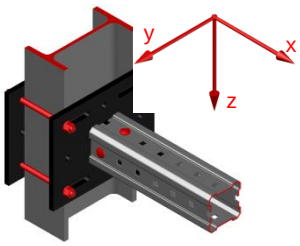
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S90-C 304814** **Base plate** **1x MIB-SC 304823** **Threaded rods cut to particular length** **4x AM12x1000-F 4.8 304774** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for perpendicular connection of MI-90 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



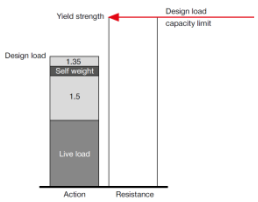


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
13.9	4.9	4.9

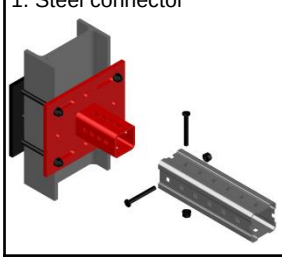
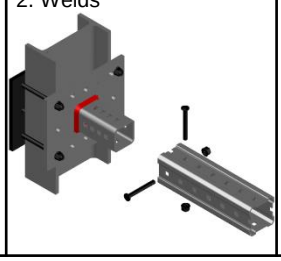
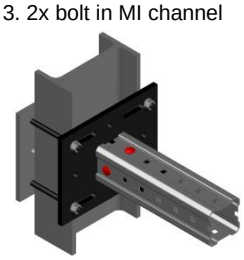
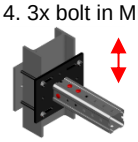
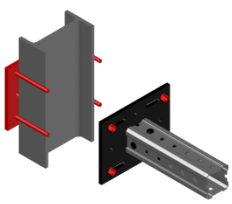
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



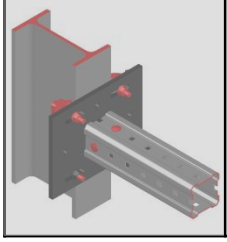
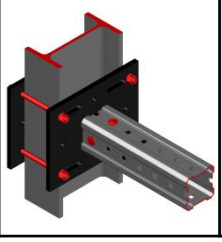
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Back plate with bolts
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S90-C Base Material Connector - Steel

Conditions of the loading capacity tables:

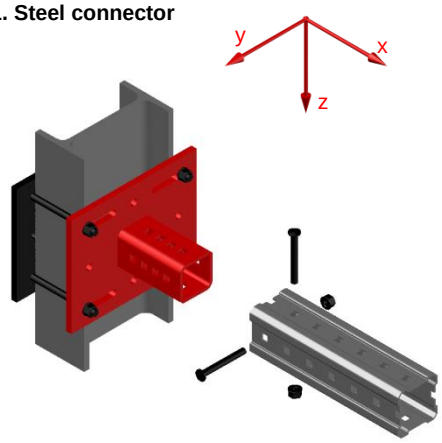
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

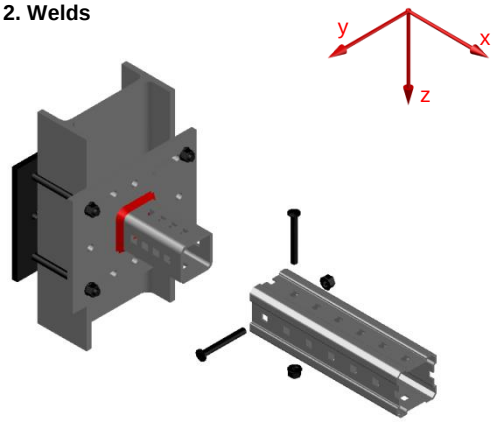


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
4.24	4.24	1.14	1.14	1.40	1.40

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. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	3.67	3.67	3.67	3.67

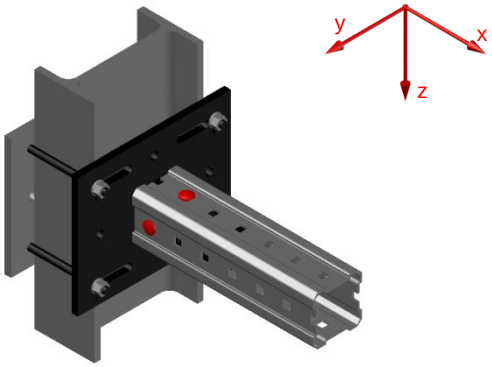
Interaction:

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

MIC-S90-C Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

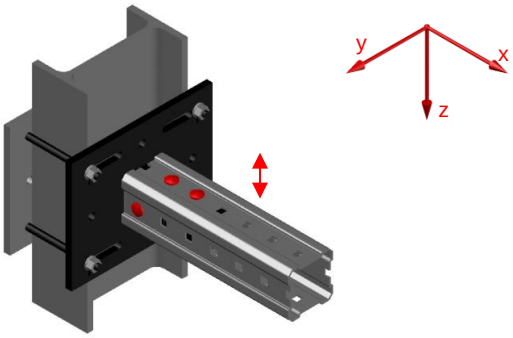


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

3. 3x bolt in MI channel



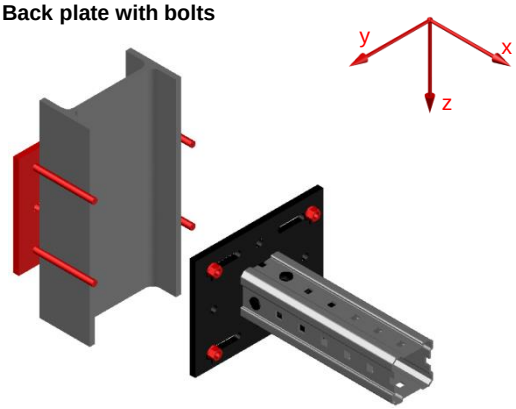
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.92	3.92	2.48	2.48	1.24	1.24

Interaction:

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

3. Back plate with bolts



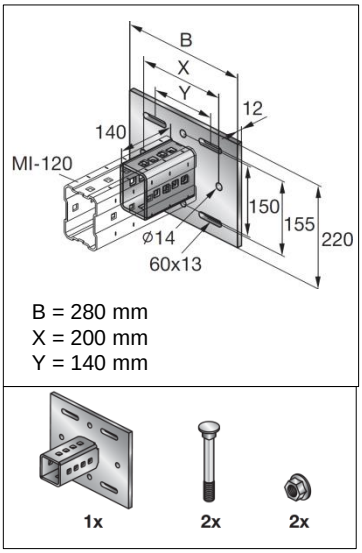
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	29.47	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.08	1.08	11.65	11.65	20.39	20.39

Interaction:

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

MIC-S120-A Base Material Connector - Steel

Designation	Item number
MIC-S120-A	**304818**



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

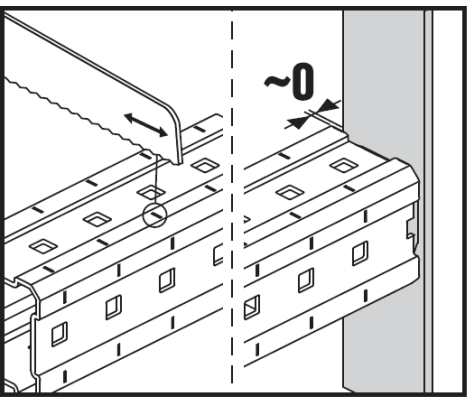
Weight:
7895 g incl. components

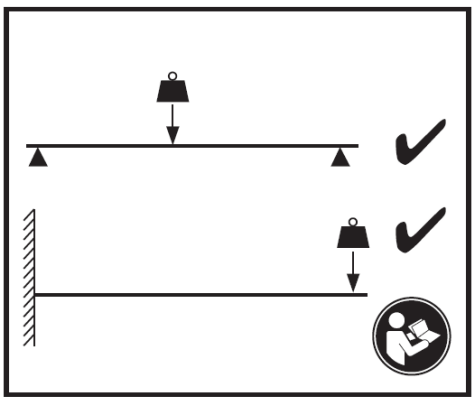
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-120 girder to a steel beam. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes. Comes in different sizes to fit various steel beam sizes.

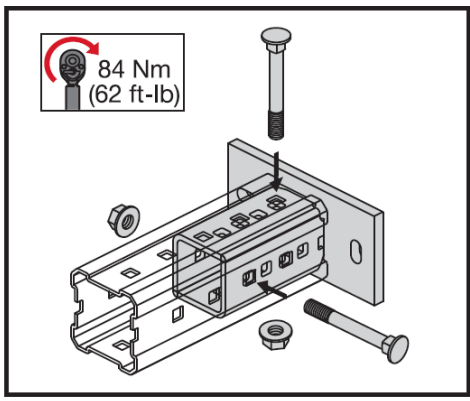
Material properties:

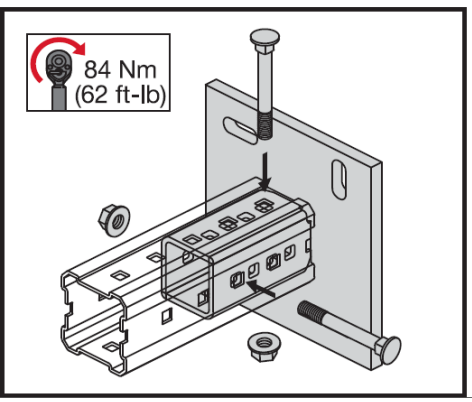
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

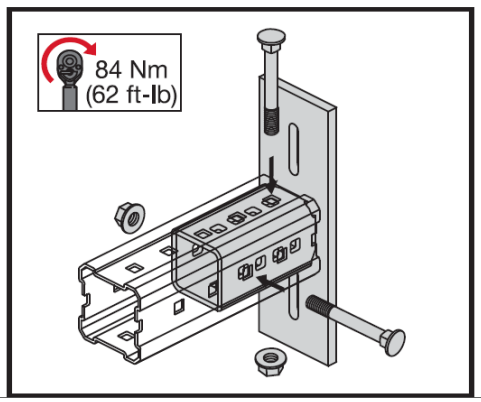
Instruction For Use:

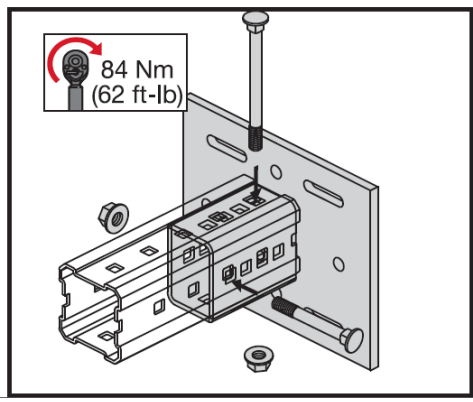




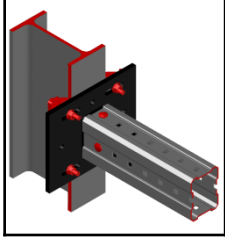
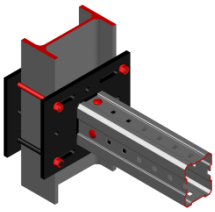








MIC-S120-A Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

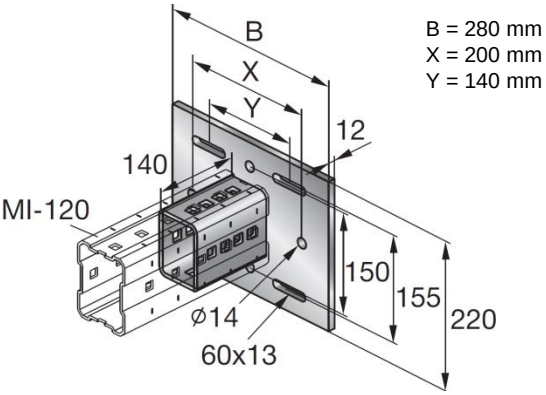
Standards and codes:

• 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

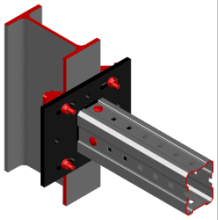
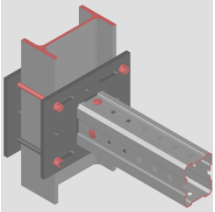
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

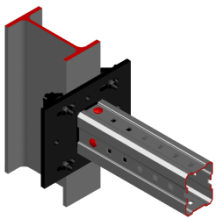
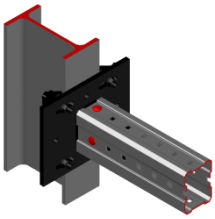
Simplified drawing:



B = 280 mm
X = 200 mm
Y = 140 mm

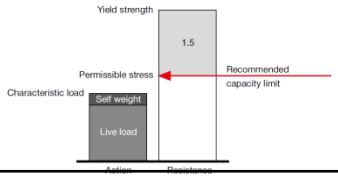
MIC-S120-A Base Material Connector - Steel

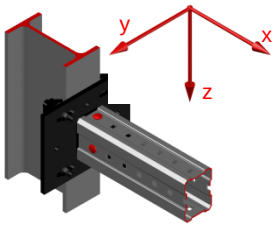
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S120-A** **304818** **Bean clamps** **4x MI-SGC M12** **233859** 	Connector used for perpendicular connection of MI-120 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



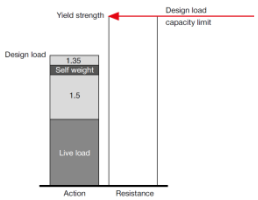


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
23.2	6.0	6.0

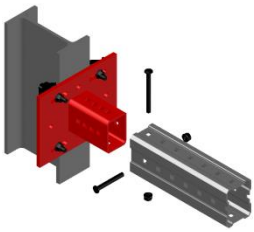
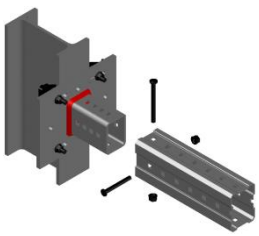
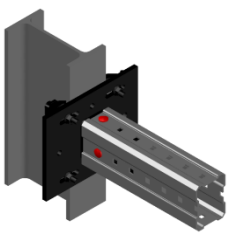
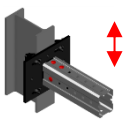
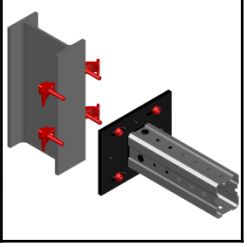
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



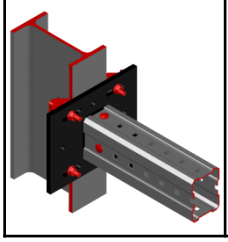
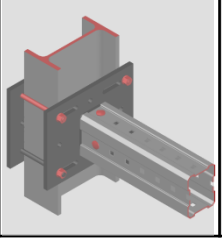
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Beam clamps
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S120-A Base Material Connector - Steel

Conditions of the loading capacity tables:

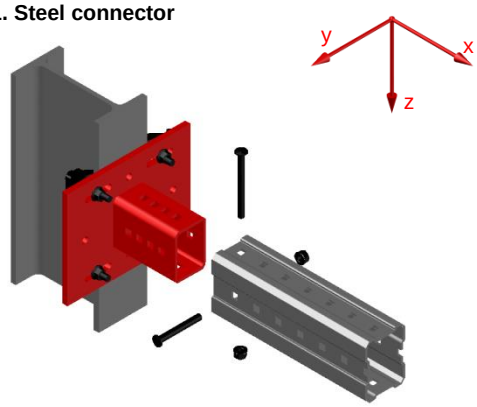
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

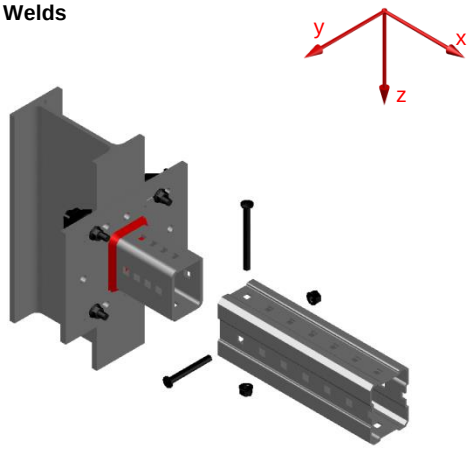


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
6.78	6.78	2.64	2.64	3.20	3.20

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
336.02	336.02	99.77	99.77	174.59	174.59
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.55	10.55	5.87	5.87	7.06	7.06

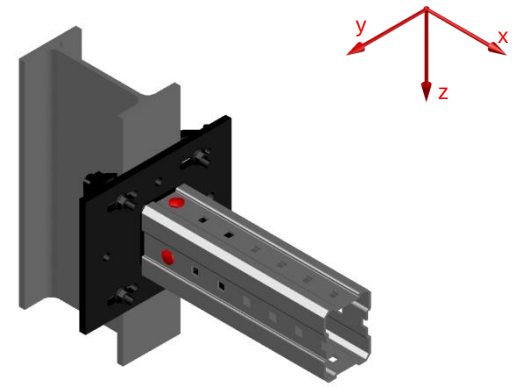
Interaction:

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

MIC-S120-A Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

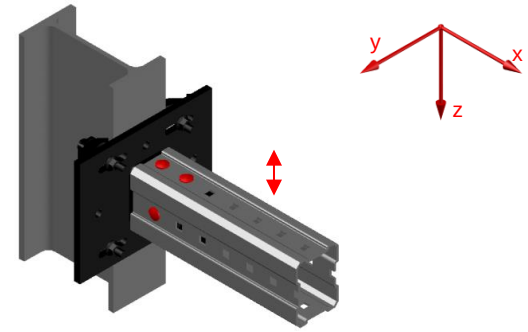


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.59	3.59	1.90	1.90	1.35	1.35

Interaction:

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

3. 3x bolt in MI channel



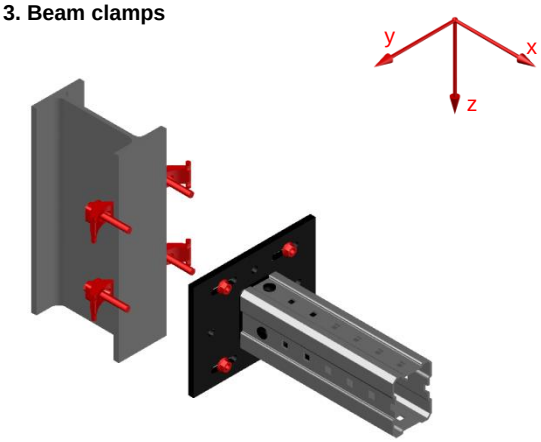
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.53	112.53	82.94	82.94	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.68	5.68	3.79	3.79	1.35	1.35

Interaction:

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

3. Beam clamps

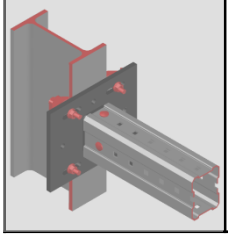
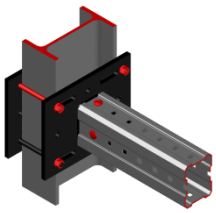


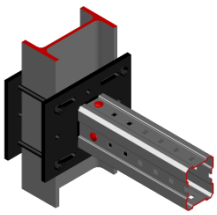
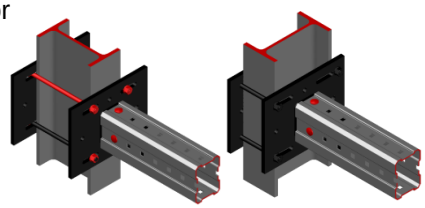
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.80	0.80	2.26	2.26	1.39	1.39

Interaction:

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

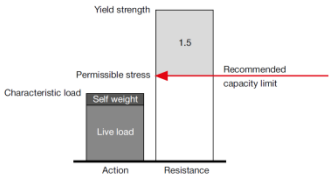
MIC-S120-A Base Material Connector - Steel

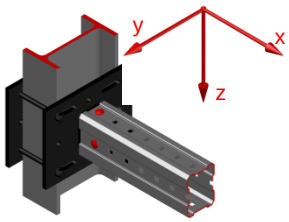
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S120-A 304818** **Base plate** **1x MIB-SA 304821** **Threaded rods cut to particular length** **4x AM12x1000-F 4.8 304774** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for perpendicular connection of MI-120 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



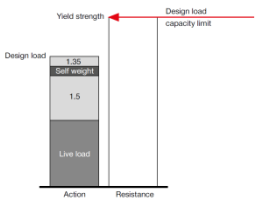


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
24.0	4.9	4.9

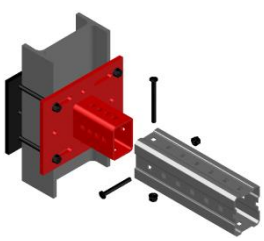
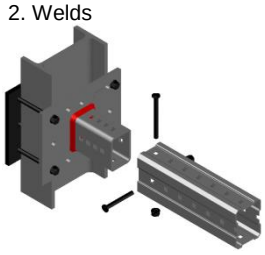
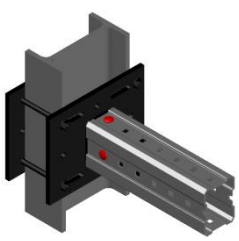
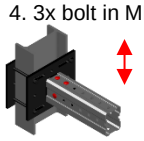
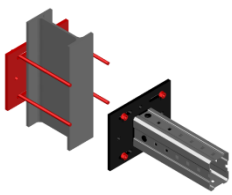
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



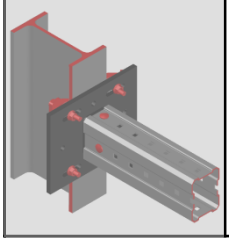
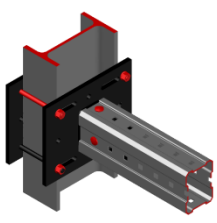
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Back plate with bolts
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S120-A Base Material Connector - Steel

Conditions of the loading capacity tables:

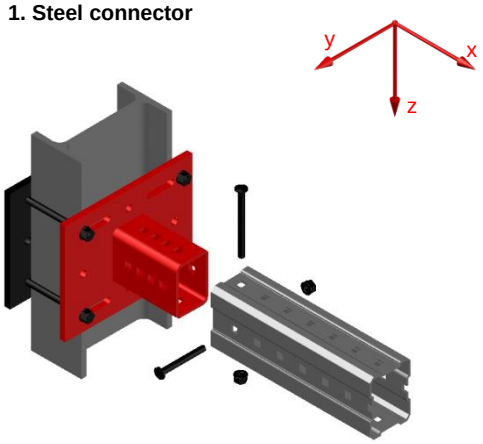
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

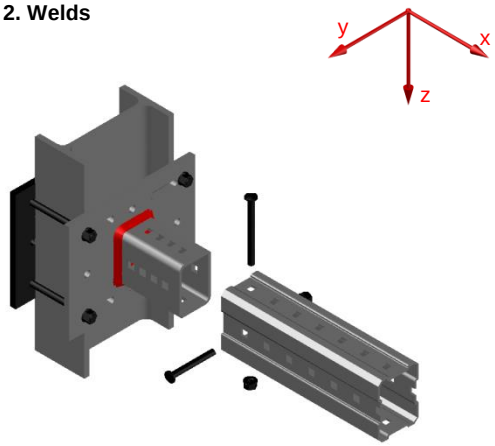


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
6.78	6.78	2.64	2.64	3.20	3.20

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
336.02	336.02	99.77	99.77	174.59	174.59
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.55	10.55	5.87	5.87	7.06	7.06

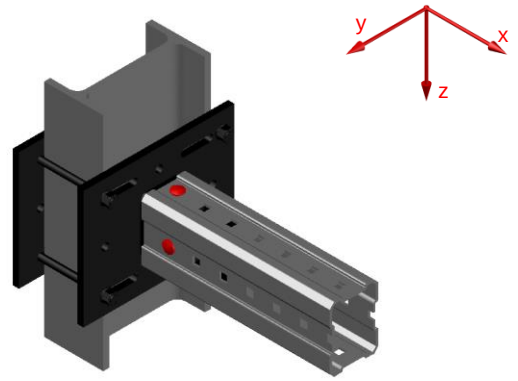
Interaction:

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

MIC-S120-A Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

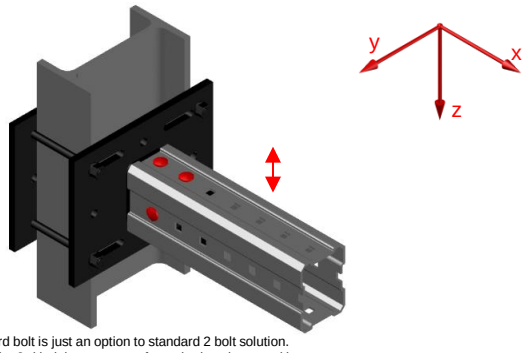


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.59	3.59	1.90	1.90	1.35	1.35

Interaction:

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

3. 3x bolt in MI channel



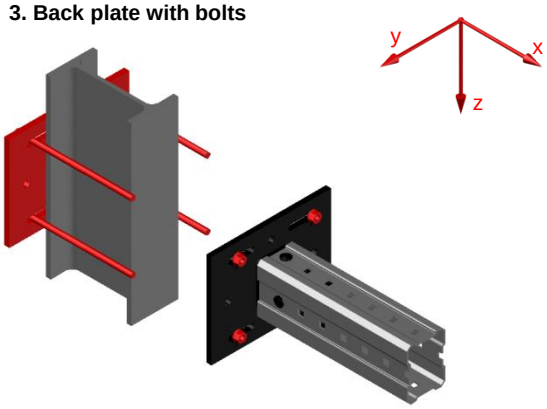
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.53	112.53	82.94	82.94	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.68	5.68	3.79	3.79	1.35	1.35

Interaction:

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

3. Back plate with bolts



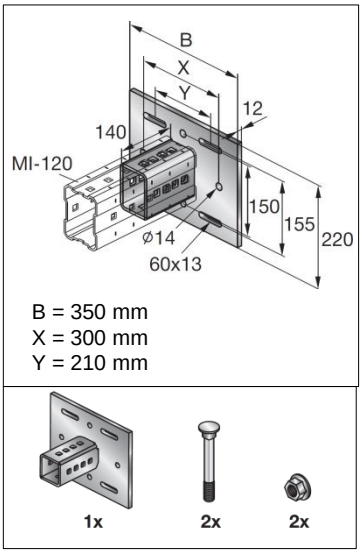
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	35.97	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.66	0.66	12.62	12.62	7.77	7.77

Interaction:

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

MIC-S120-B Base Material Connector - Steel

Designation	Item number
MIC-S120-B	**304819**



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

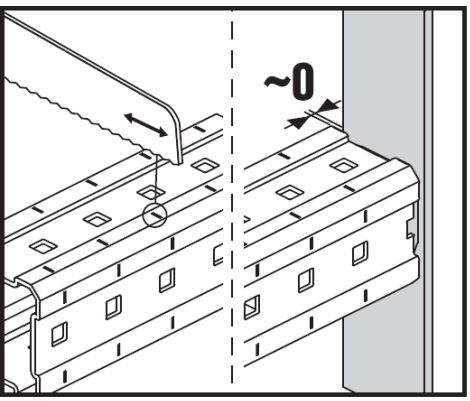
Weight:
8990 g incl. components

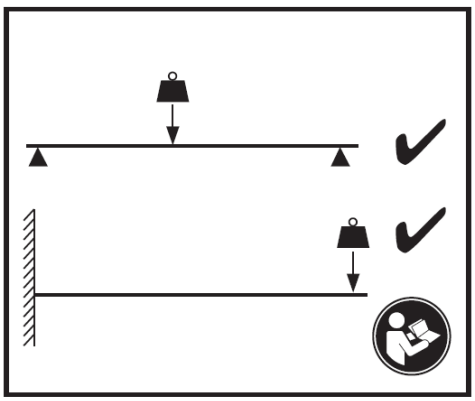
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-120 girder to a steel beam. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes. Comes in different sizes to fit various steel beam sizes.

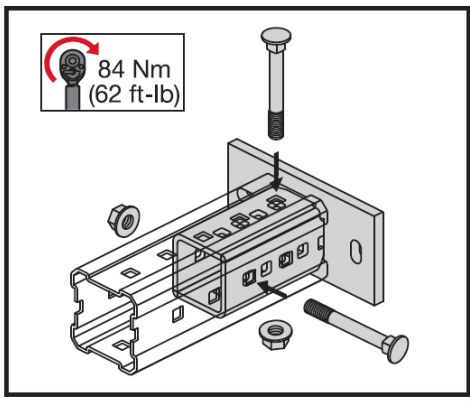
Material properties:

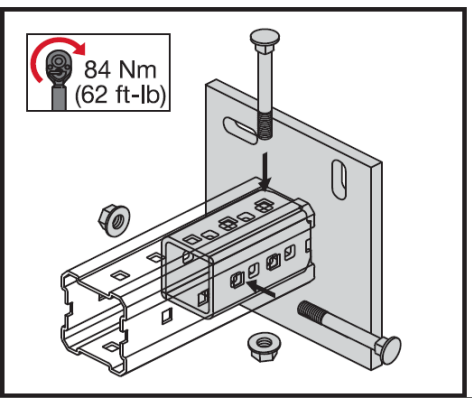
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

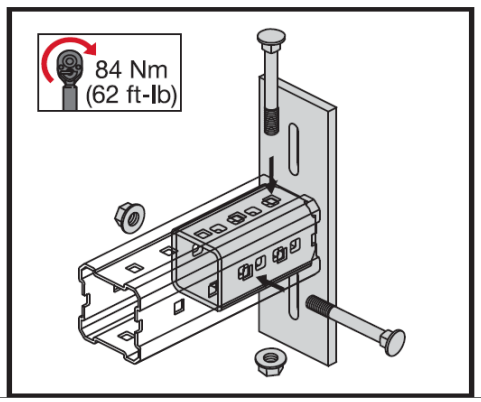
Instruction For Use:

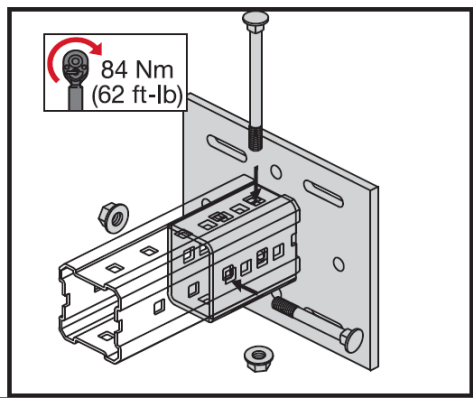




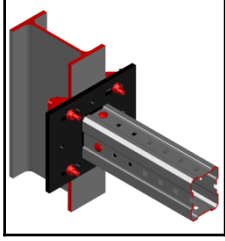
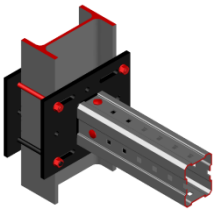








MIC-S120-B Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

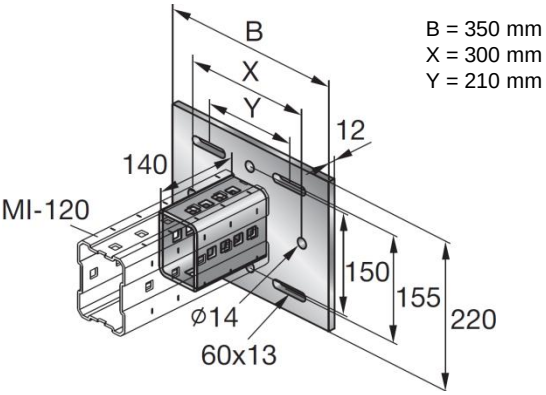
Standards and codes:

• 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

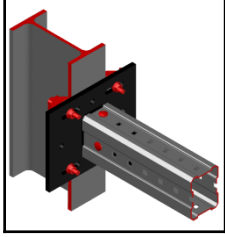
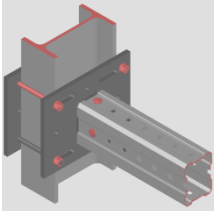
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

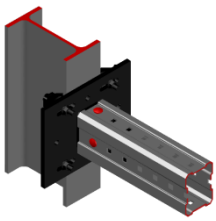
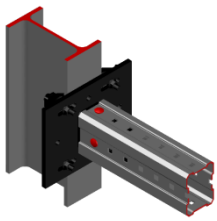
Simplified drawing:



B = 350 mm
X = 300 mm
Y = 210 mm

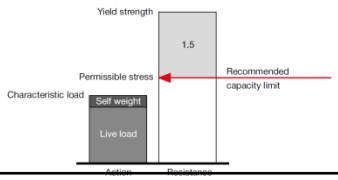
MIC-S120-B Base Material Connector - Steel

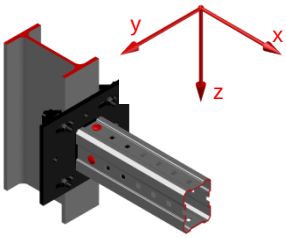
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S120-B** **304819** **Bean clamps** **4x MI-SGC M12** **233859** 	Connector used for perpendicular connection of MI-120 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



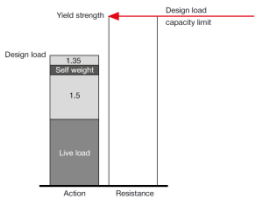


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.5	6.0	6.0

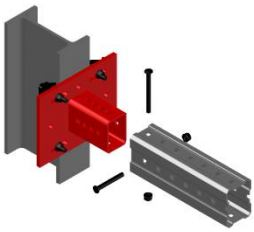
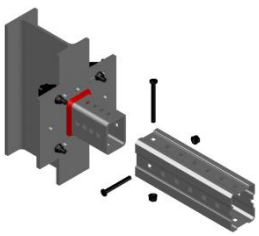
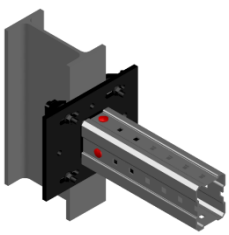
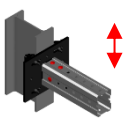
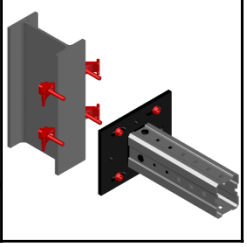
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



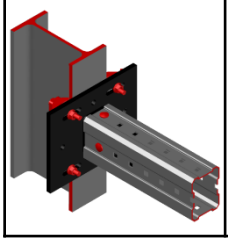
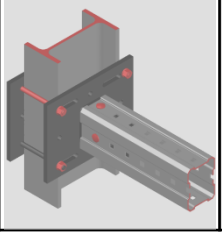
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Beam clamps
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S120-B Base Material Connector - Steel

Conditions of the loading capacity tables:

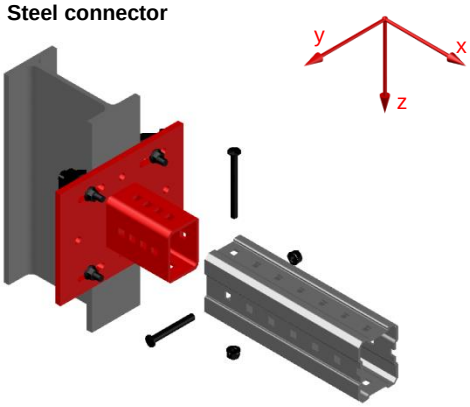
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

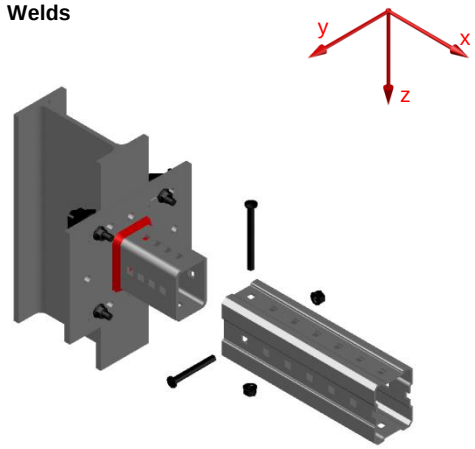


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
6.78	6.78	2.54	2.54	2.98	2.98

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
336.02	336.02	99.77	99.77	174.59	174.59
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.55	10.55	5.87	5.87	7.06	7.06

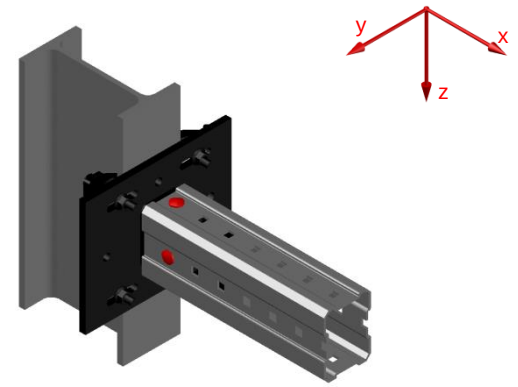
Interaction:

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

MIC-S120-B Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

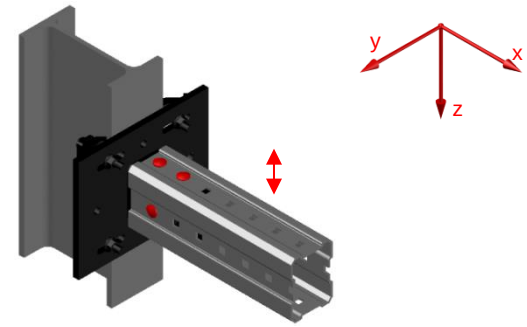


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.59	3.59	1.90	1.90	1.35	1.35

Interaction:

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

3. 3x bolt in MI channel



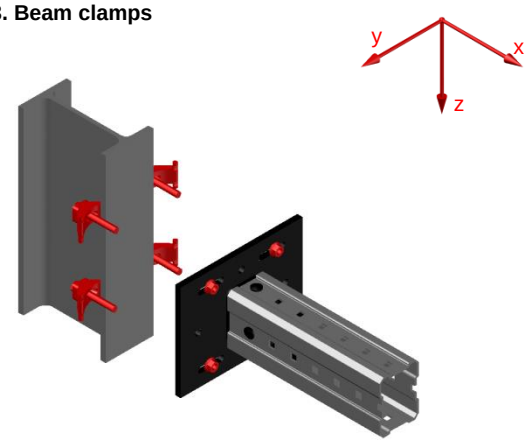
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.53	112.53	82.94	82.94	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.68	5.68	3.79	3.79	1.35	1.35

Interaction:

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

3. Beam clamps

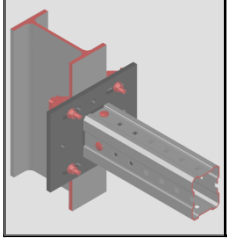
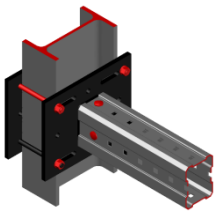


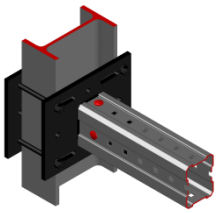
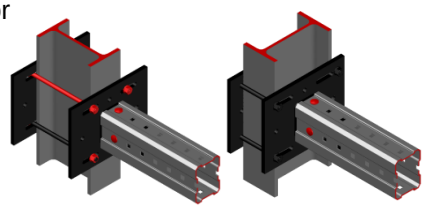
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.06	1.06	2.26	2.26	2.09	2.09

Interaction:

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

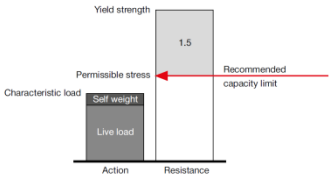
MIC-S120-B Base Material Connector - Steel

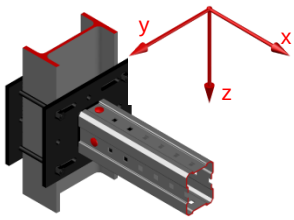
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S120-B 304819** **Base plate** **1x MIB-SB 304822** **Threaded rods cut to particular length** **4x AM12x1000-F 4.8 304774** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for perpendicular connection of MI-120 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



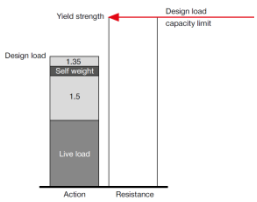


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.5	4.9	4.9

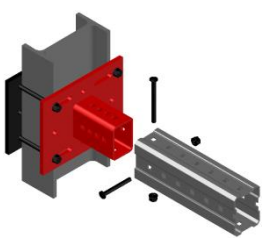
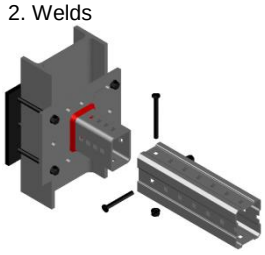
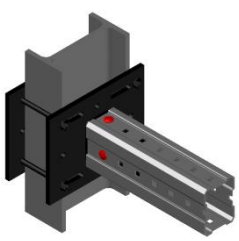
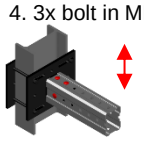
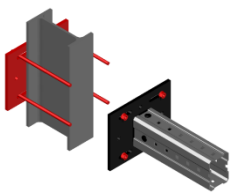
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



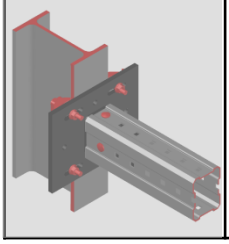
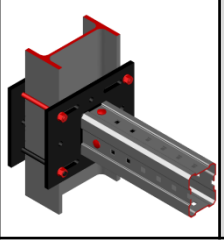
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Back plate with bolts
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S120-B Base Material Connector - Steel

Conditions of the loading capacity tables:

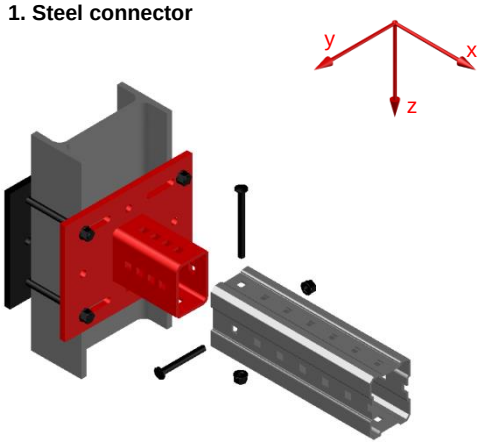
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

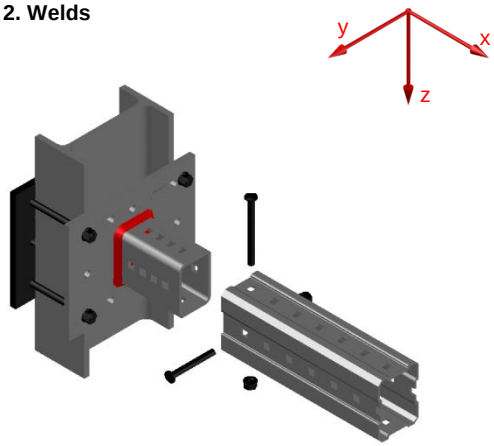


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
6.78	6.78	2.54	2.54	2.98	2.98

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. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
336.02	336.02	99.77	99.77	174.59	174.59
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.55	10.55	5.87	5.87	7.06	7.06

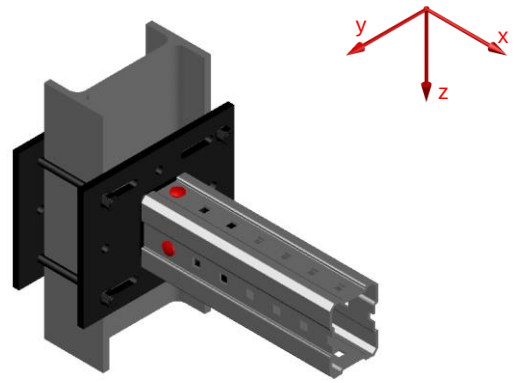
Interaction:

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

MIC-S120-B Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

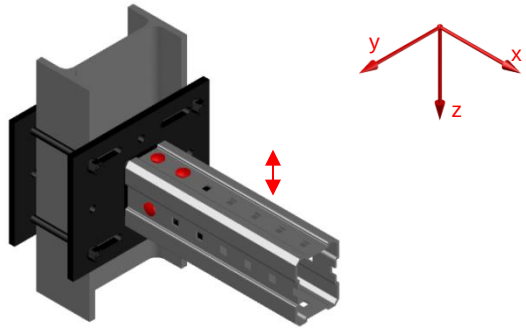


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.59	3.59	1.90	1.90	1.35	1.35

Interaction:

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

3. 3x bolt in MI channel



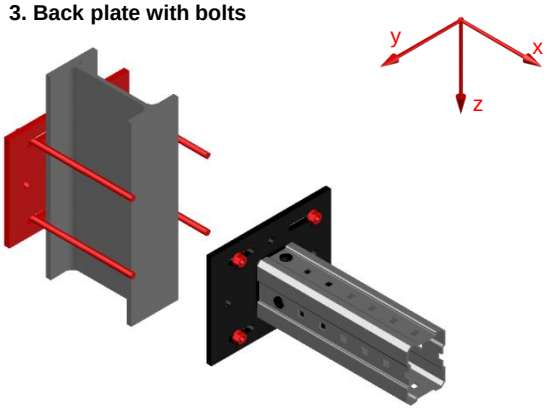
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.53	112.53	82.94	82.94	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.68	5.68	3.79	3.79	1.35	1.35

Interaction:

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

3. Back plate with bolts



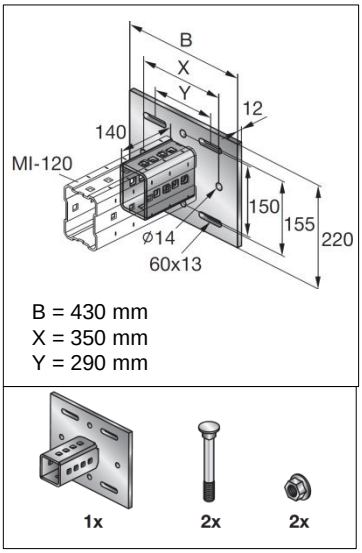
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	34.23	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.87	0.87	12.62	12.62	11.65	11.65

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-S120-C Base Material Connector - Steel

Designation	Item number
MIC-S120-C	**304820**



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

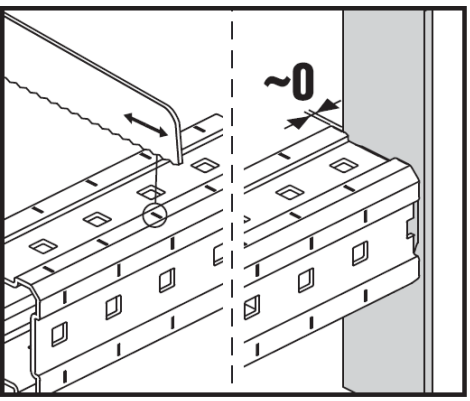
Weight:
10650 g incl. components

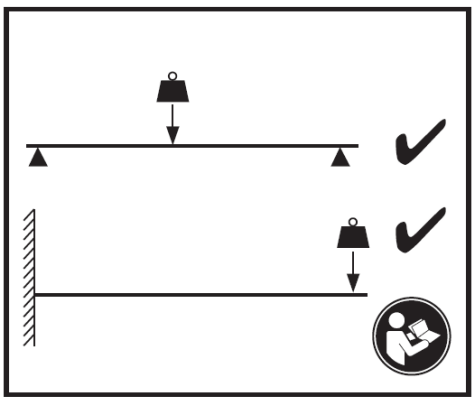
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-120 girder to a steel beam. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes. Comes in different sizes to fit various steel beam sizes.

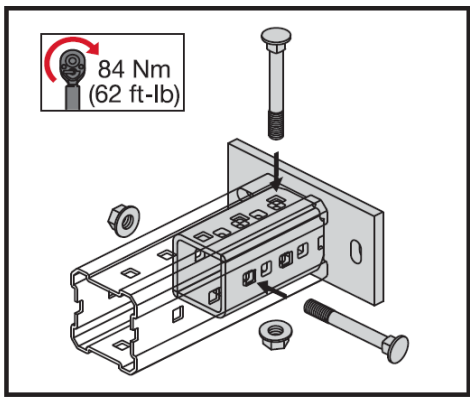
Material properties:

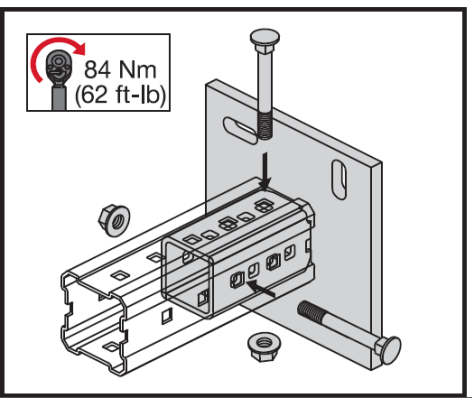
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

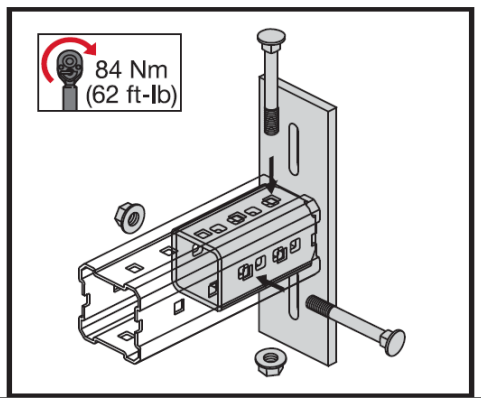
Instruction For Use:

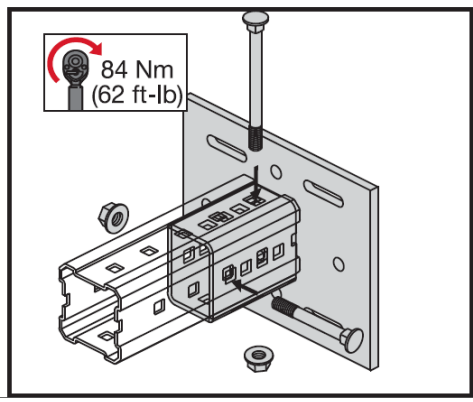




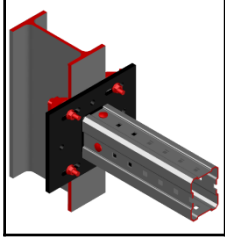
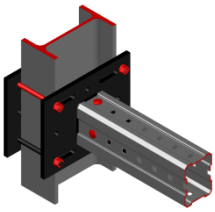








MIC-S120-C Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

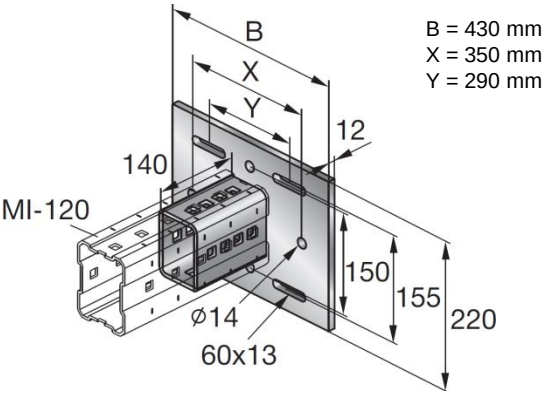
Standards and codes:

• 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

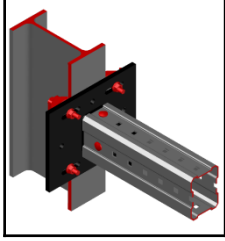
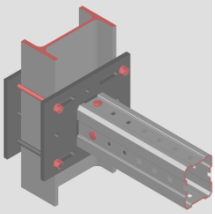
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

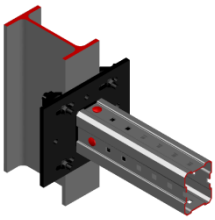
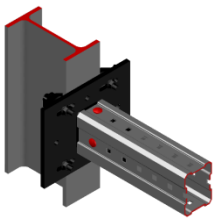
Simplified drawing:



B = 430 mm
X = 350 mm
Y = 290 mm

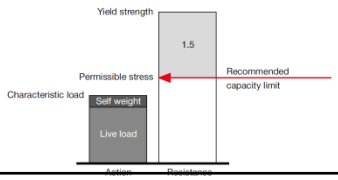
MIC-S120-C Base Material Connector - Steel

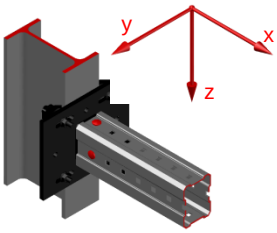
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S120-C** **304820** **Bean clamps** **4x MI-SGC M12** **233859** 	Connector used for perpendicular connection of MI-120 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



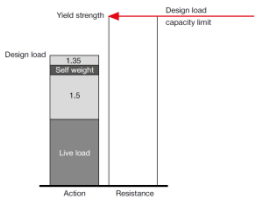


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
13.9	6.0	6.0

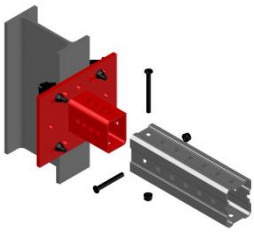
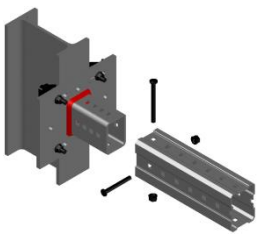
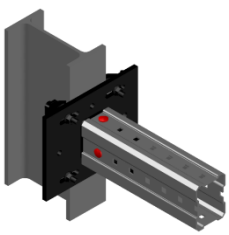
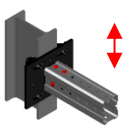
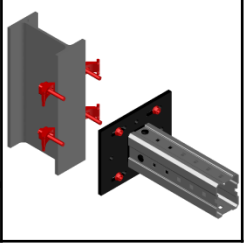
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



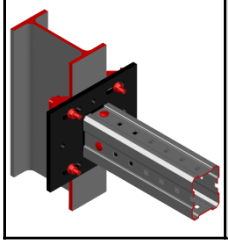
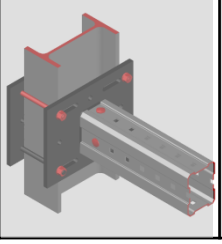
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Beam clamps
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S120-C Base Material Connector - Steel

Conditions of the loading capacity tables:

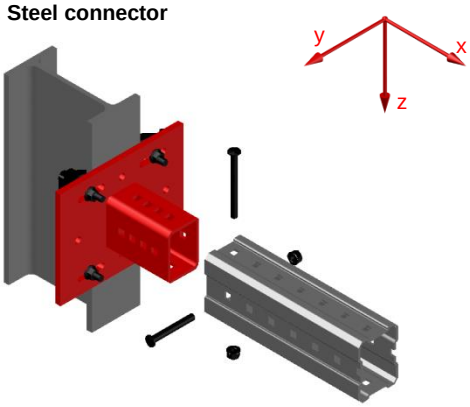
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

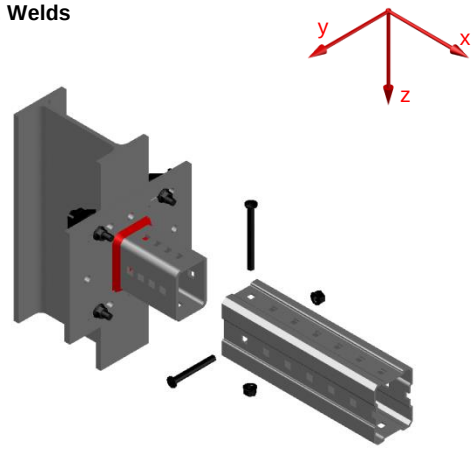


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	68.38	68.38	117.23	117.23
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
6.78	6.78	2.10	2.10	2.78	2.78

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
336.02	336.02	99.77	99.77	174.59	174.59
+Mx,Rd [kNcm]	-Mx,Rd [kNcm]	+My,Rd [kNcm]	-My,Rd [kNcm]	+Mz,Rd [kNcm]	-Mz,Rd [kNcm]
10.55	10.55	5.87	5.87	7.06	7.06

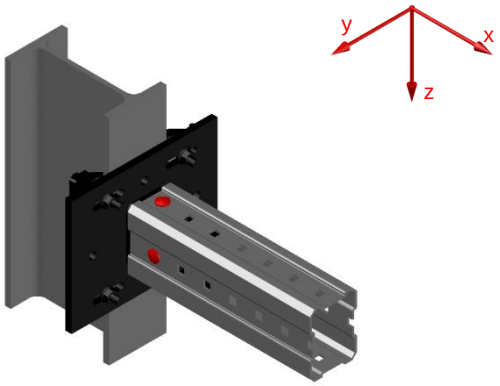
Interaction:

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

MIC-S120-C Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

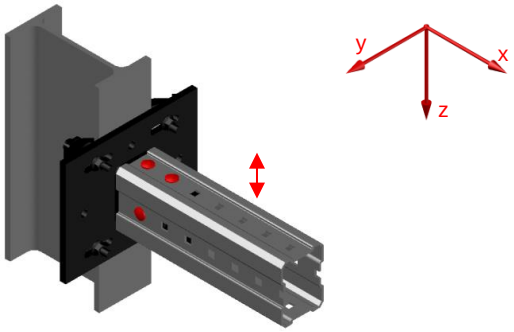


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.59	3.59	1.90	1.90	1.35	1.35

Interaction:

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

3. 3x bolt in MI channel



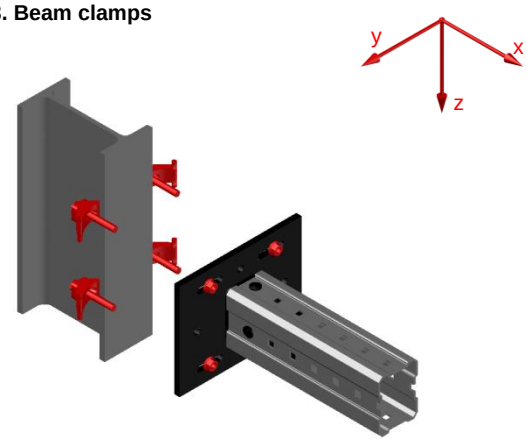
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.53	112.53	82.94	82.94	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.68	5.68	3.79	3.79	1.35	1.35

Interaction:

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

3. Beam clamps

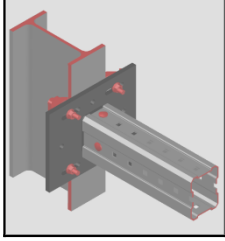
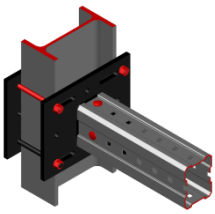


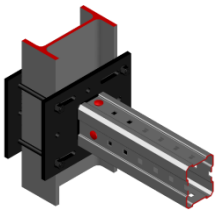
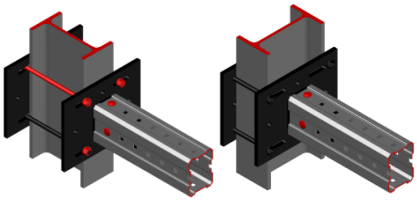
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.31	1.31	2.26	2.26	3.65	3.65

Interaction:

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

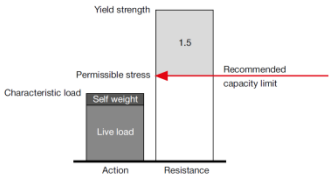
MIC-S120-C Base Material Connector - Steel

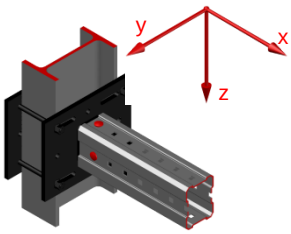
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-S120-C 304820** **Base plate** **1x MIB-SC 304823** **Threaded rods cut to particular length** **4x AM12x1000-F 4.8 304774** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for perpendicular connection of MI-120 to structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



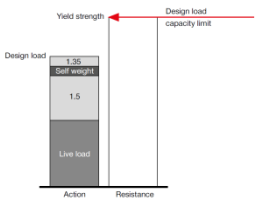


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
13.9	4.9	4.9

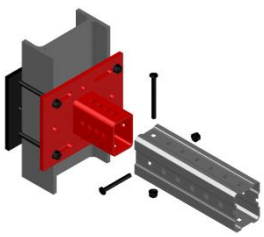
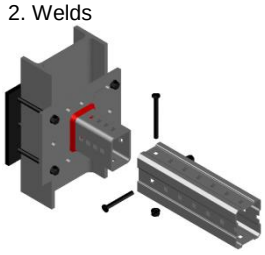
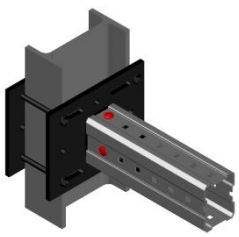
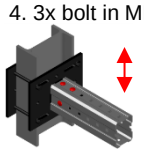
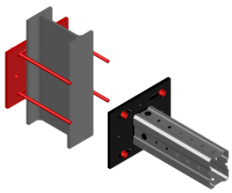
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



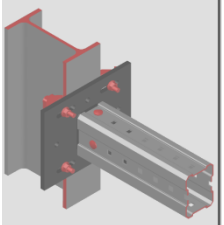
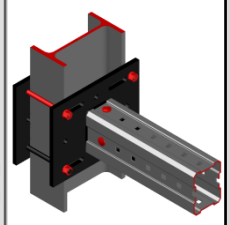
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. 2x bolt in MI channel	4. 3x bolt in MI channel	5. Back plate with bolts
			 3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.	

MIC-S120-C Base Material Connector - Steel

Conditions of the loading capacity tables:

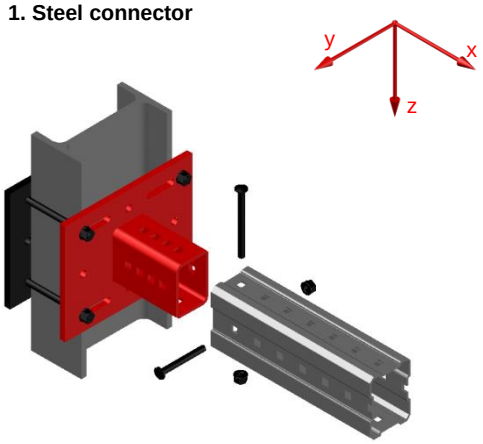
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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

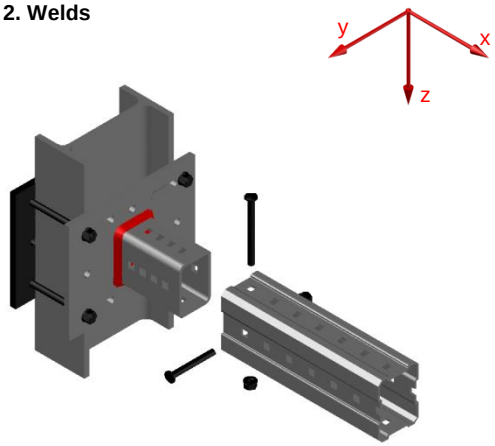


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
6.78	6.78	2.10	2.10	2.78	2.78

Interaction:

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

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
336.02	336.02	99.77	99.77	174.59	174.59
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
10.55	10.55	5.87	5.87	7.06	7.06

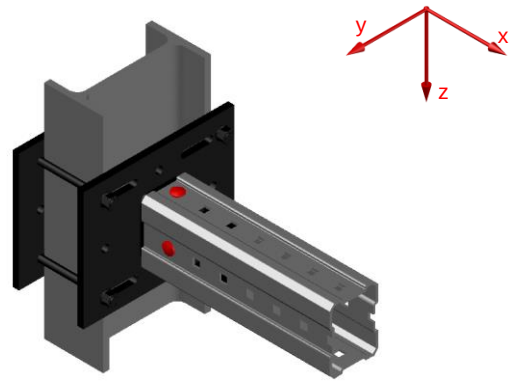
Interaction:

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

MIC-S120-C Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

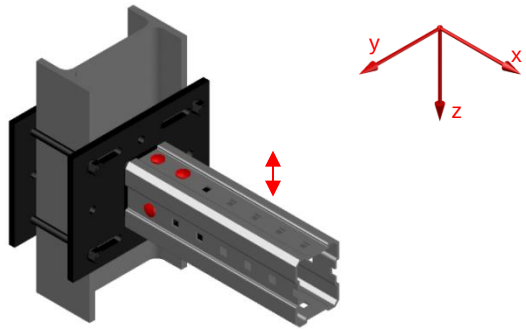


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.59	3.59	1.90	1.90	1.35	1.35

Interaction:

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

3. 3x bolt in MI channel



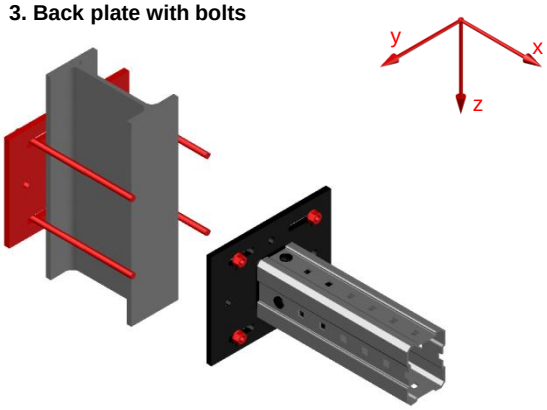
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.53	112.53	82.94	82.94	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.68	5.68	3.79	3.79	1.35	1.35

Interaction:

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

3. Back plate with bolts



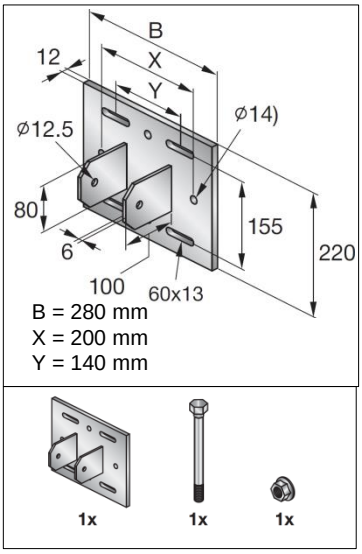
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	29.47	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.08	1.08	12.62	12.62	20.39	20.39

Interaction:

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

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

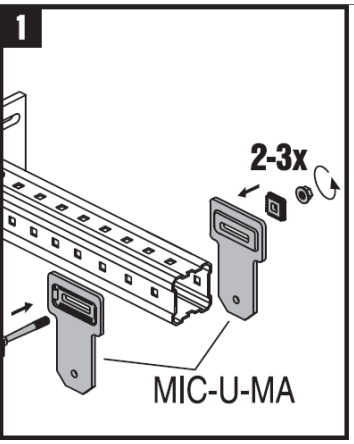
Weight:
6290 g incl. components

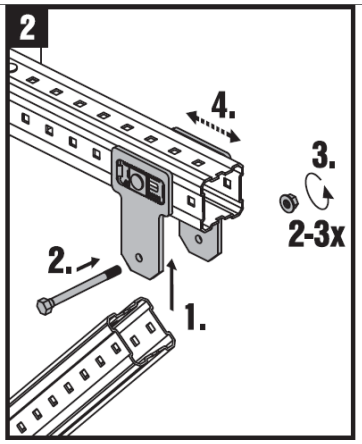
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to a steel beam in an angle, usually when it's used as a brace for another girder. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using one bolt through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

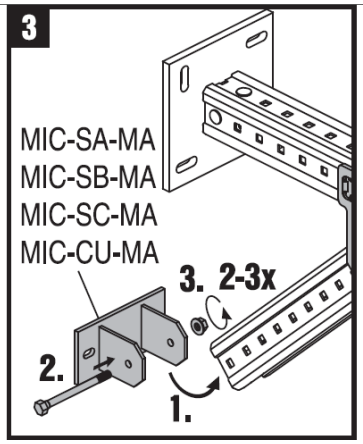
Material properties:

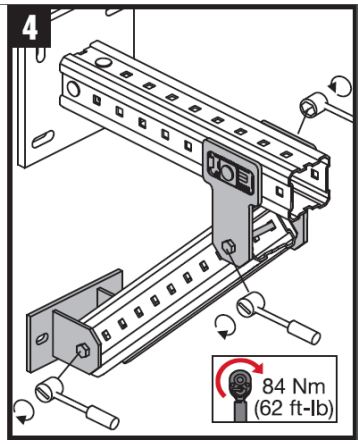
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:

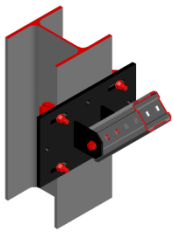
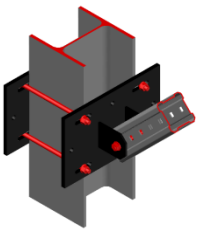








MIC-SA-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

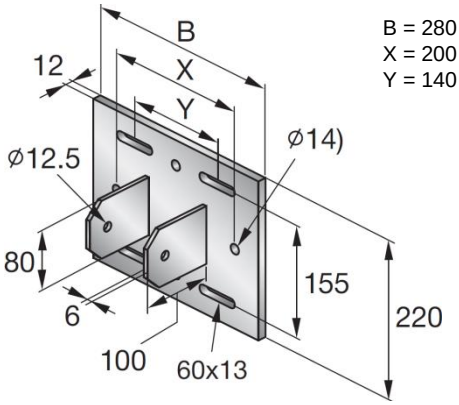
Standards and codes:

• 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

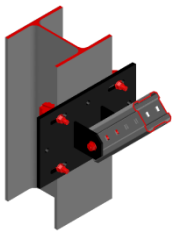
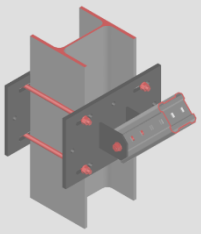
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

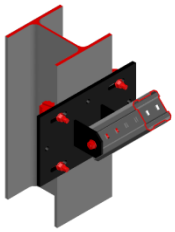
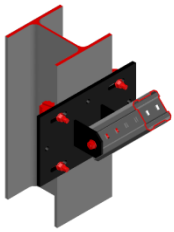
Simplified drawing:



B = 280 mm
X = 200 mm
Y = 140 mm

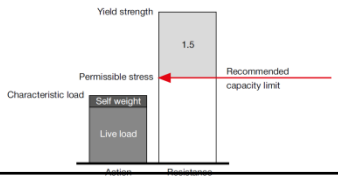
MIC-SA-MA Base Material Connector - Steel

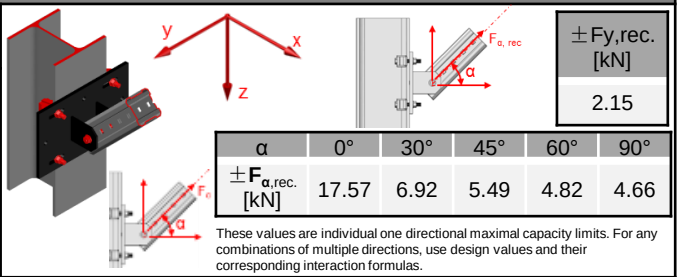
Clamped	Boxed	
		

Loading case: Standard	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 MI-90 to structural steel profiles (bracing) 

Recommended loading capacity - simplified for most common applications

Method





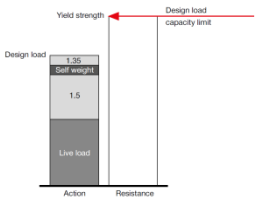
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	17.57	6.92	5.49	4.82	4.66

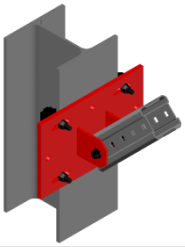
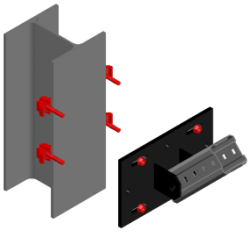
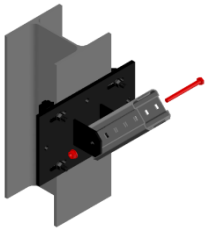
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



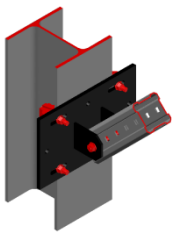
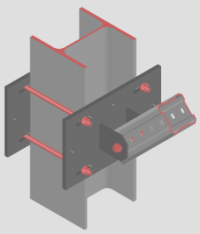
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Beam clamps	4. Hexagonal bolt in MI channel
			

MIC-SA-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

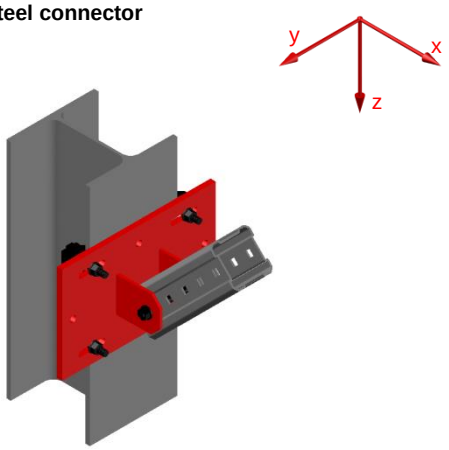
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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.

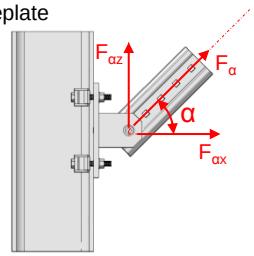
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
58.60	73.93	3.22	3.22	37.13	37.13
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.81	1.81	2.60	2.60	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fα 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

e_x=0.07m



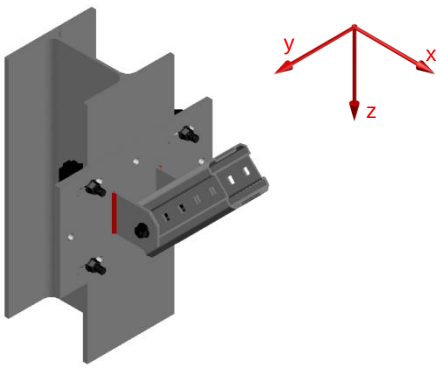
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

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

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

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

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

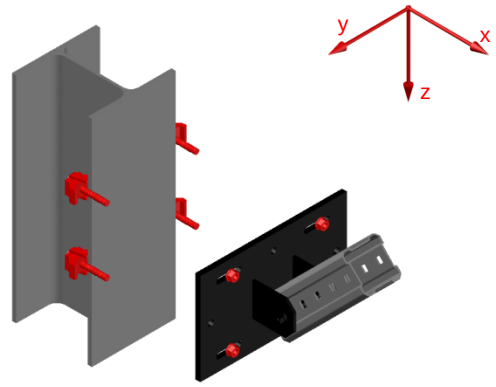
$M_{z.Ed} = F_{y.Ed} * e_x$

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

MIC-SA-MA Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. Beam clamps



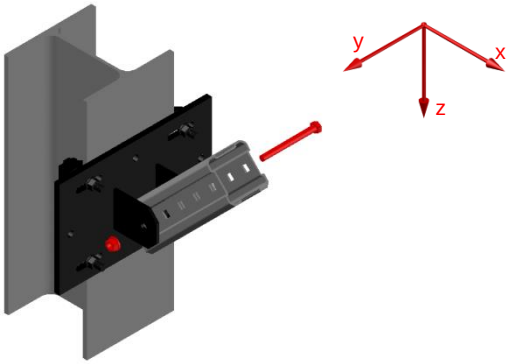
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.81	0.81	2.07	2.07	1.39	1.39

Interaction:

with: e_x= 0.07m
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$
$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$
$M_{z.Ed} = F_{y.Ed} * e_x$

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

4. Hexagonal bolt in MI channel

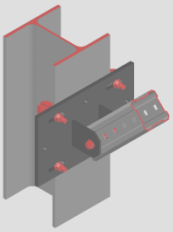
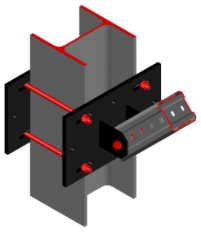


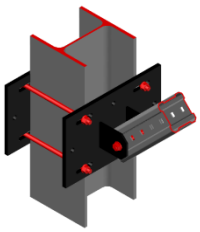
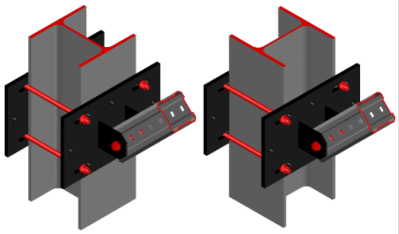
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.36	26.36	Not decisive	Not decisive	26.36	26.36
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.29	1.29	0.00	0.00	0.00	0.00

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 $F_{\alpha Rd.}$

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

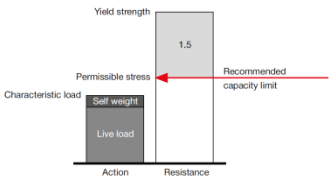
MIC-SA-MA Base Material Connector - Steel

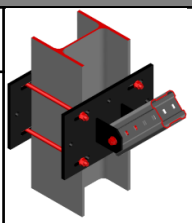
Clamped	Boxed	
		

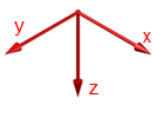
Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-SA-MA 304815** **Base plate** **1x MIB-SA 304821** **Threaded rods cut to particular length** **4x AM12x1000-F 4.8 304774** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing) 

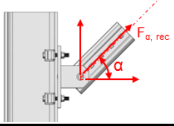
Recommended loading capacity - simplified for most common applications

Method









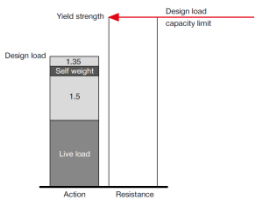
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
±$F_{α,rec.}$ [kN]	17.57	7.77	5.95	5.10	4.74

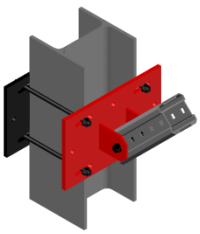
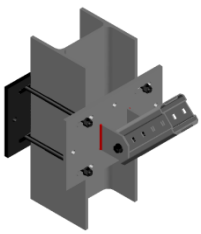
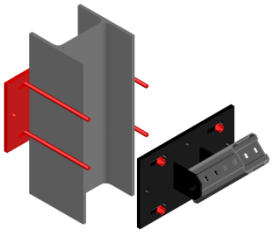
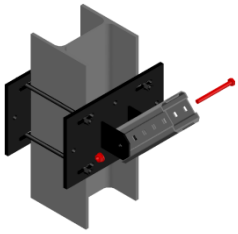
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



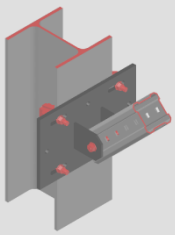
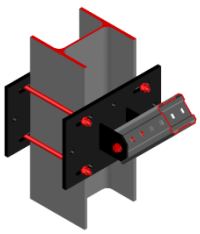
Limiting components of capacity evaluated in following tables:

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

MIC-SA-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

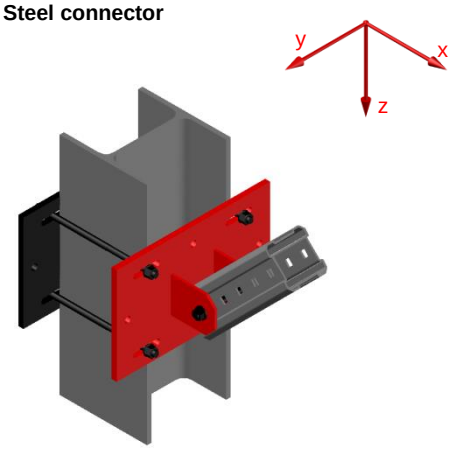
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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.

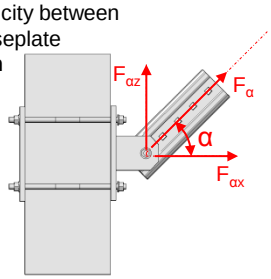
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
58.60	73.93	3.22	3.22	37.13	37.13
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.81	1.81	2.60	2.60	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fα 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

e_x=0.07m



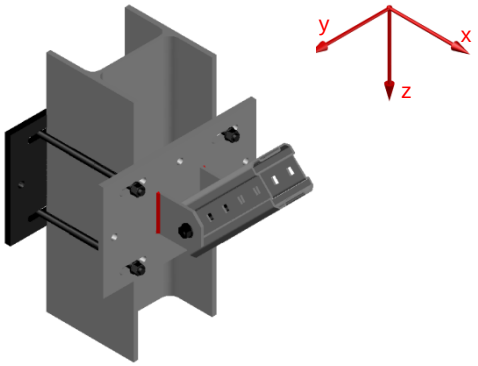
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

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

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**

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

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

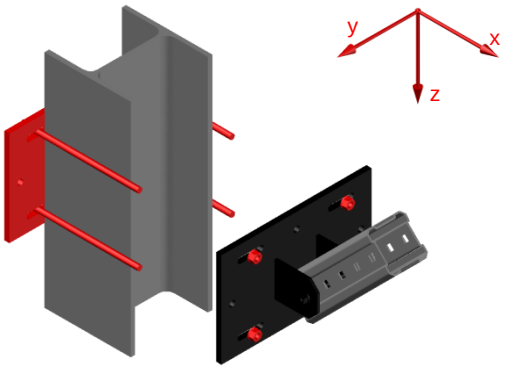
$M_{z.Ed} = F_{y.Ed} * e_x$

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

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

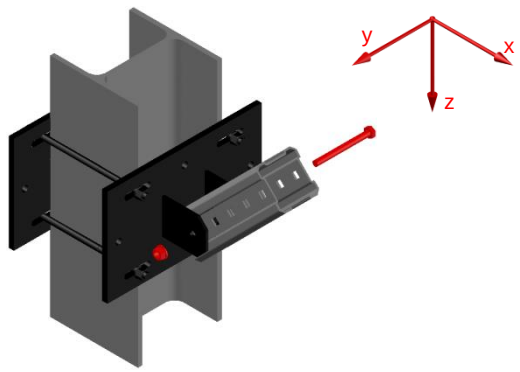
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

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

4. Hexagonal bolt in MI channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.36	26.36	Not decisive	Not decisive	26.36	26.36
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.29	1.29	0.00	0.00	0.00	0.00

Interaction:

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

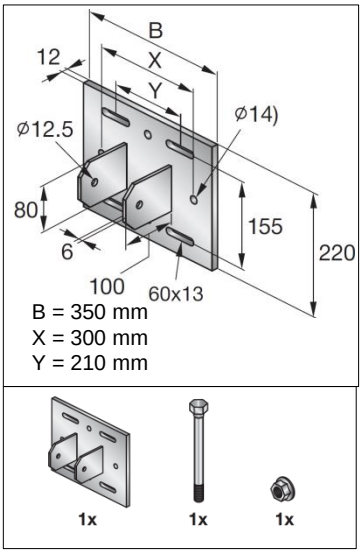
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

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

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

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

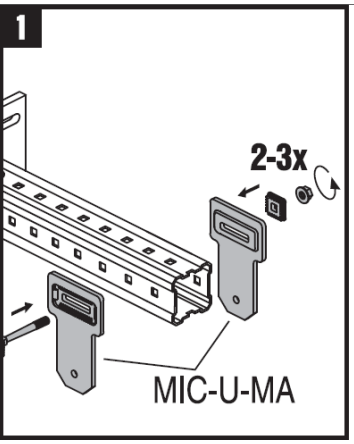
Weight:
7740 g incl. components

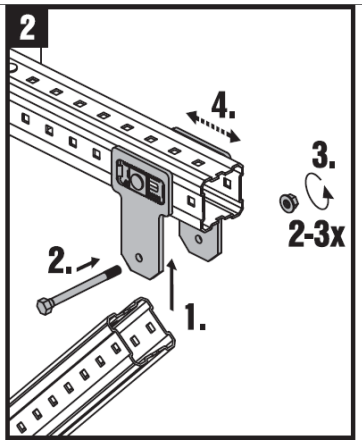
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to a steel beam in an angle, usually when it's used as a brace for another girder. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using one bolt through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

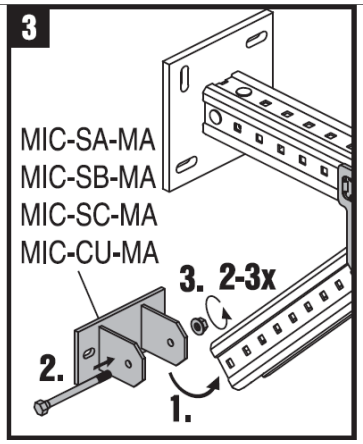
Material properties:

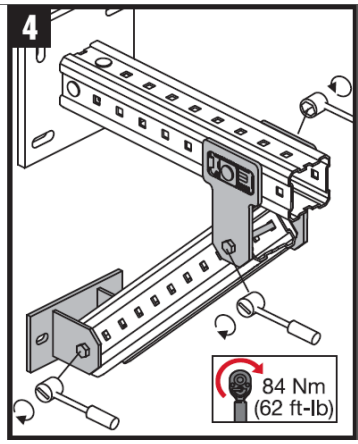
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:

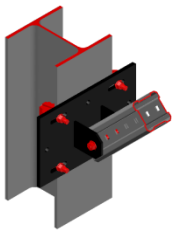
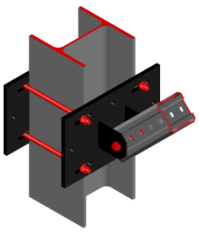








MIC-SB-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

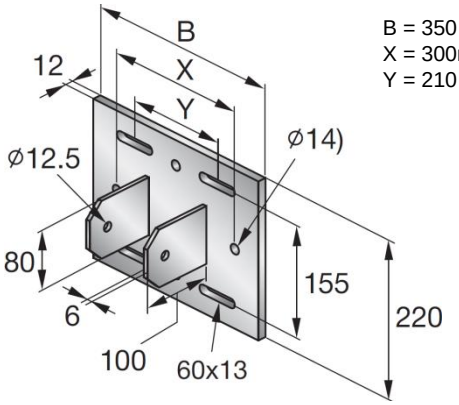
Standards and codes:

• 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

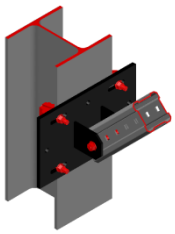
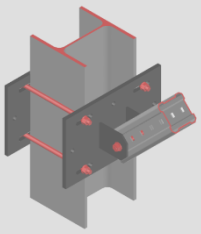
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

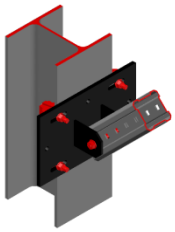
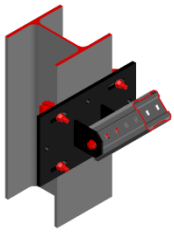
Simplified drawing:



B = 350 mm
X = 300mm
Y = 210 mm

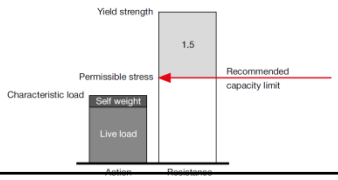
MIC-SB-MA Base Material Connector - Steel

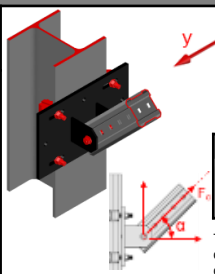
Clamped	Boxed	
		

Loading case: Standard	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) 

Recommended loading capacity - simplified for most common applications

Method





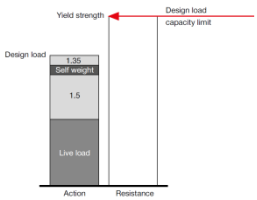
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	17.57	6.92	5.49	4.82	4.66

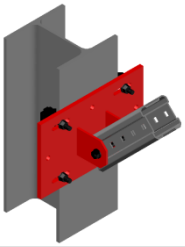
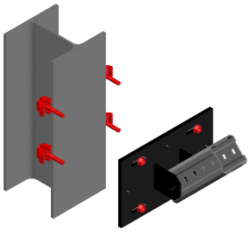
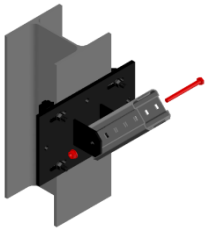
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



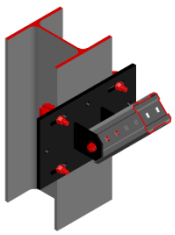
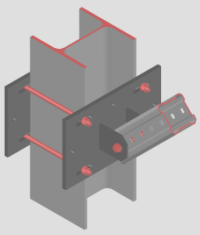
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Beam clamps	4. Hexagonal bolt in MI channel
			

MIC-SB-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

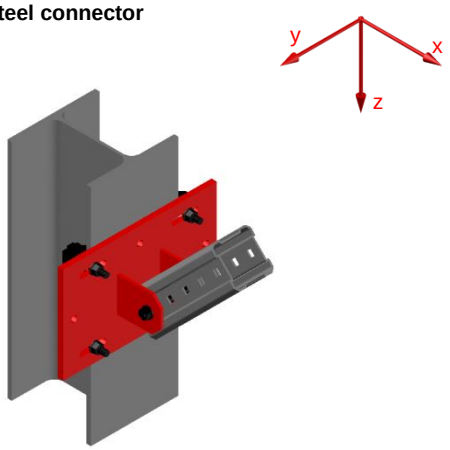
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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.

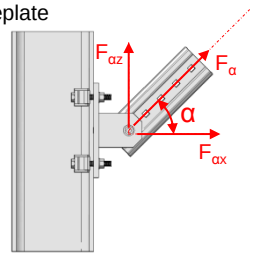
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
43.19	50.50	3.22	3.22	23.25	23.25
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.13	1.13	1.63	1.63	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fα 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

e_x=0.07m



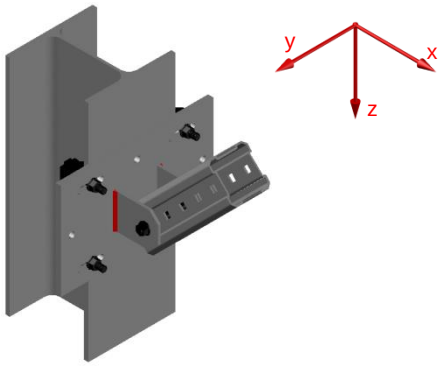
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

$M_{z.Ed} = F_{y.Ed} * e_x$

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

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

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

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

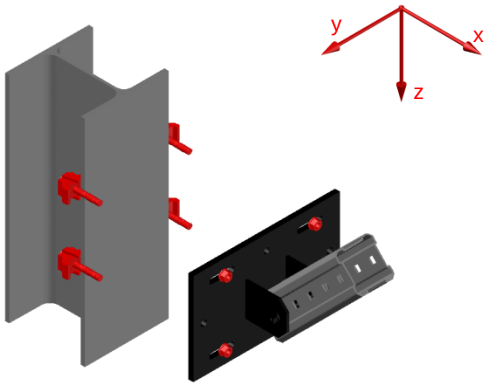
$M_{z.Ed} = F_{y.Ed} * e_x$

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

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

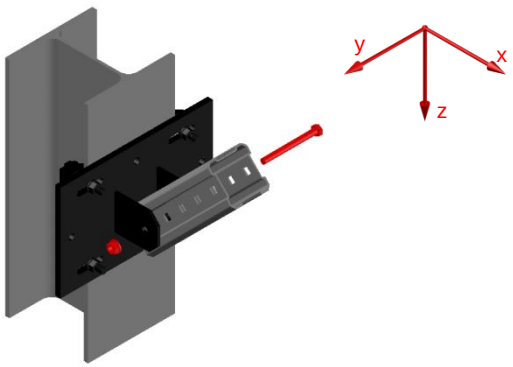
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

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

4. Hexagonal bolt in MI channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.36	26.36	Not decisive	Not decisive	26.36	26.36
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.29	1.29	0.00	0.00	0.00	0.00

Interaction:

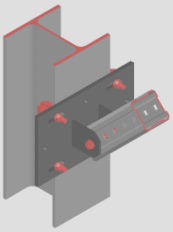
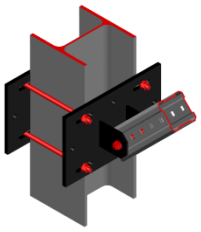
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

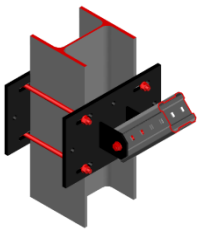
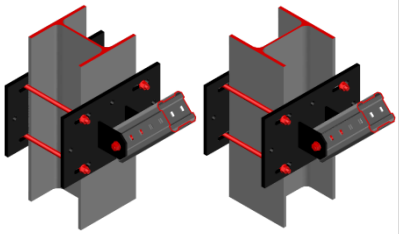
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

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

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

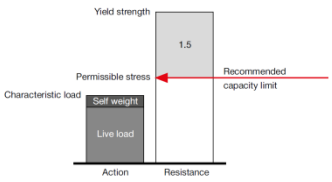
MIC-SB-MA Base Material Connector - Steel

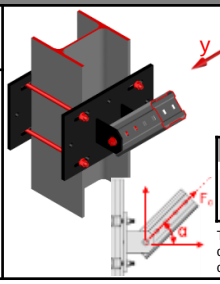
Clamped	Boxed	
		

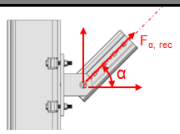
Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-SB-MA 304816** **Base plate** **1x MIB-SB 304822** **Threaded rods cut to particular length** **4x AM12x1000-F 4.8 304774** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing) 

Recommended loading capacity - simplified for most common applications

Method







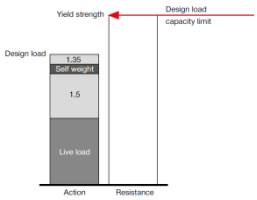
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
±$F_{α,rec.}$ [kN]	17.57	7.34	5.74	4.99	4.74

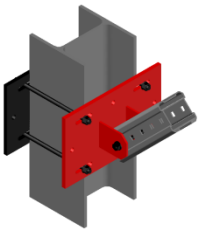
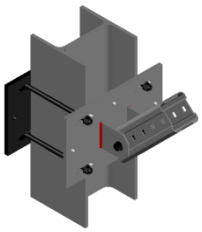
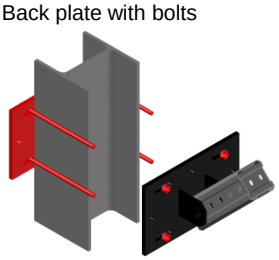
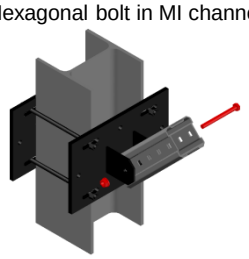
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



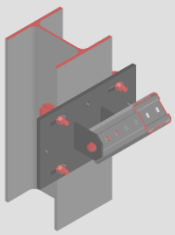
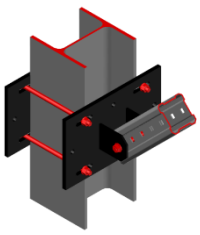
Limiting components of capacity evaluated in following tables:

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

MIC-SB-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

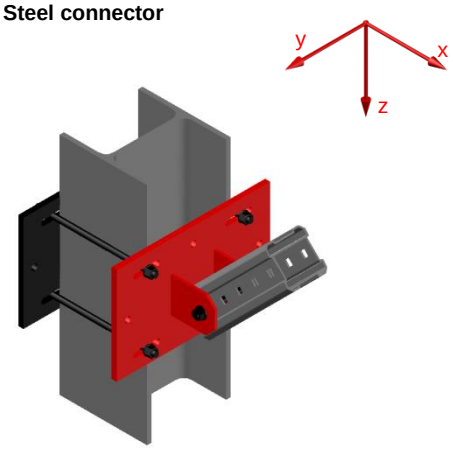
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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.

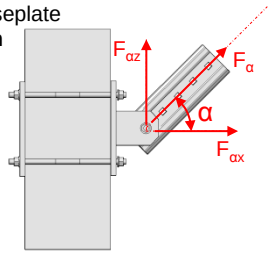
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
43.19	50.50	3.22	3.22	23.25	23.25
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.13	1.13	1.63	1.63	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fα 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

e_x=0.07m



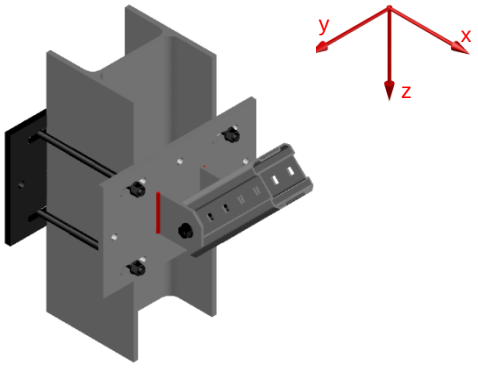
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

$M_{z.Ed} = F_{y.Ed} * e_x$

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

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: e_x= 0.07m**

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

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

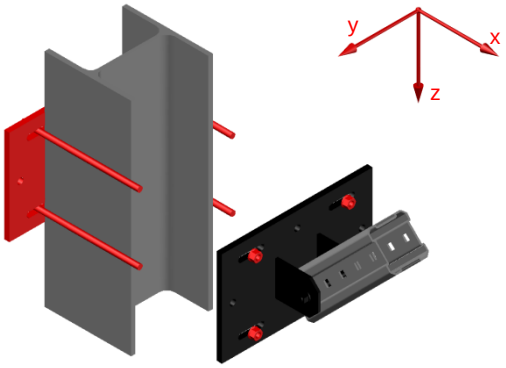
$M_{z.Ed} = F_{y.Ed} * e_x$

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

MIC-SB-MA Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. Back plate with bolts



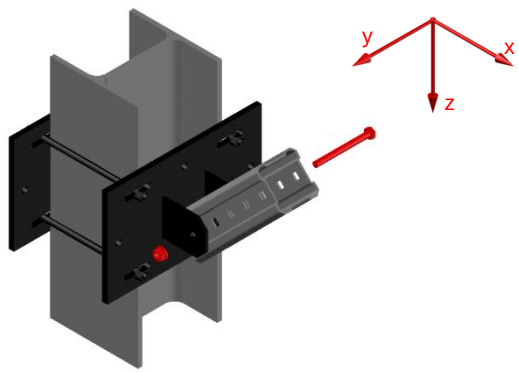
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	42.26	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.88	0.88	11.56	11.56	15.64	15.64

Interaction::

with: e_x= 0.07m
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$
$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$
$M_{z.Ed} = F_{y.Ed} * e_x$

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

4. Hexagonal bolt in MI channel



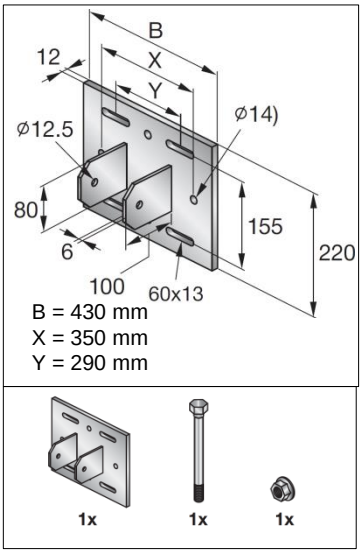
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.36	26.36	Not decisive	Not decisive	26.36	26.36
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.29	1.29	0.00	0.00	0.00	0.00

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 $F_{\alpha Rd.}$

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

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

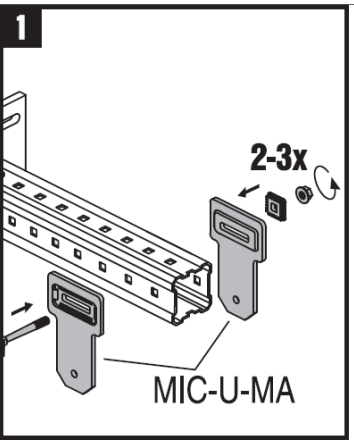
Weight:
9400 g incl. components

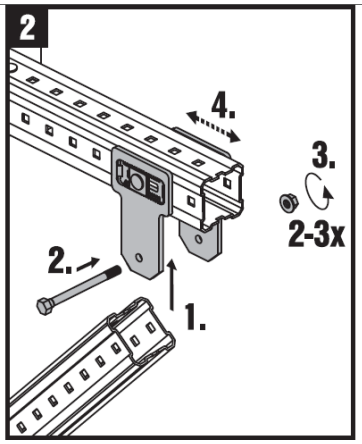
Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 girder to a steel beam in an angle, usually when it's used as a brace for another girder. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using one bolt through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

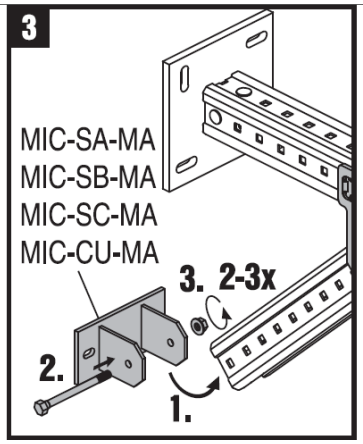
Material properties:

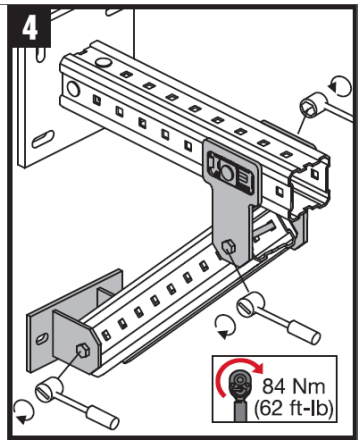
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:

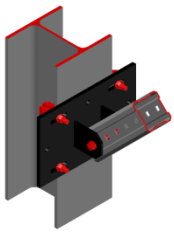
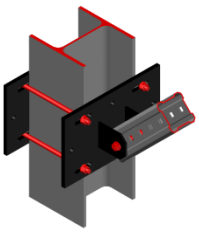








MIC-SC-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

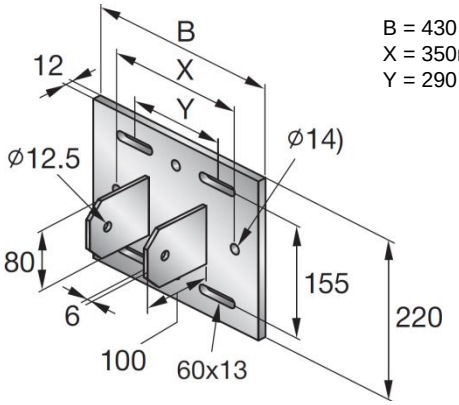
Standards and codes:

• 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

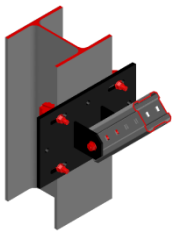
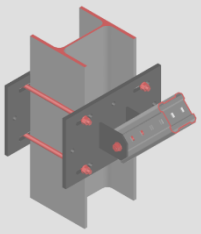
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

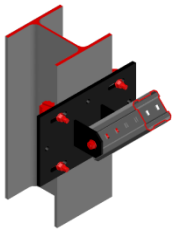
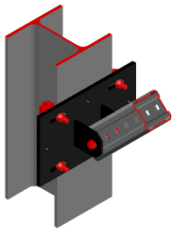
Simplified drawing:



B = 430 mm
X = 350mm
Y = 290 mm

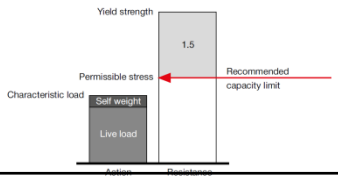
MIC-SC-MA Base Material Connector - Steel

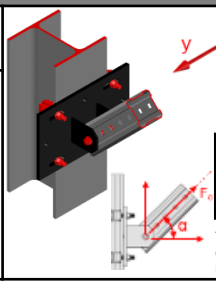
Clamped	Boxed	
		

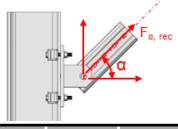
Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **MIC-SC-MA** **304817** Beam clamps **4x MI-SGC M12** **233859** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing) 

Recommended loading capacity - simplified for most common applications

Method







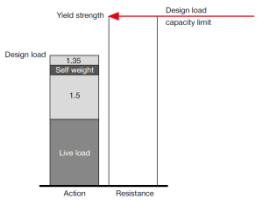
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	17.57	6.92	5.49	4.82	4.66

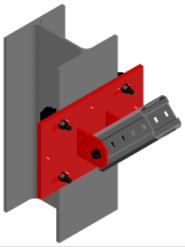
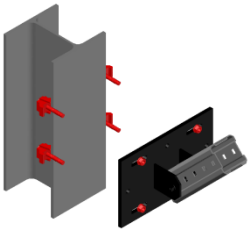
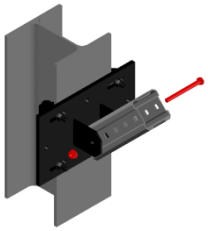
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



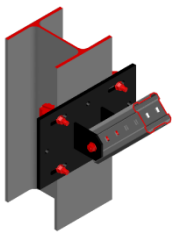
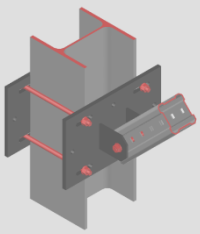
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Beam clamps	4. Hexagonal bolt in MI channel
			

MIC-SC-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

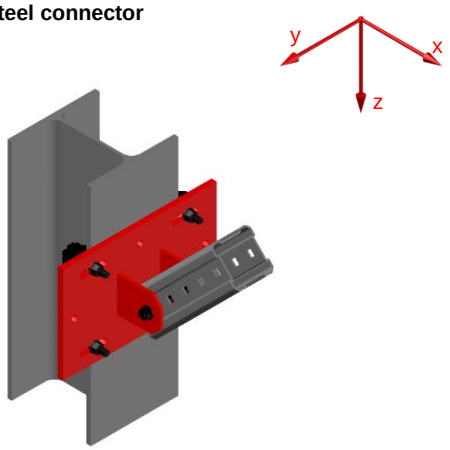
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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.

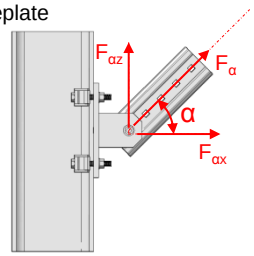
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.47	38.38	3.22	3.22	15.78	15.78
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.77	0.77	1.10	1.10	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fα 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

e_x=0.07m



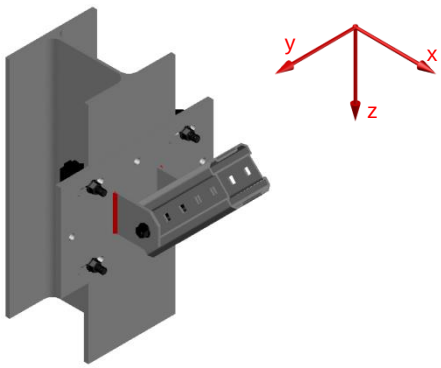
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

$M_{z.Ed} = F_{y.Ed} * e_x$

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

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: e_x= 0.07m

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

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

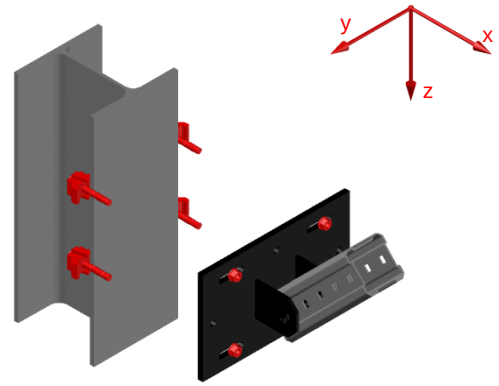
$M_{z.Ed} = F_{y.Ed} * e_x$

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

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

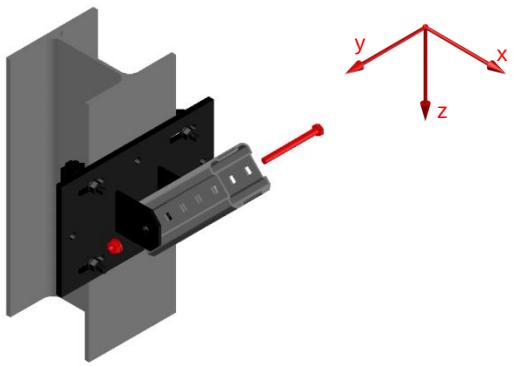
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

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

4. Hexagonal bolt in MI channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.36	26.36	Not decisive	Not decisive	26.36	26.36
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.29	1.29	0.00	0.00	0.00	0.00

Interaction:

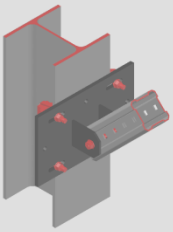
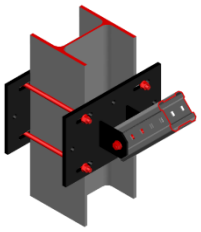
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

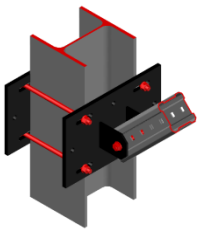
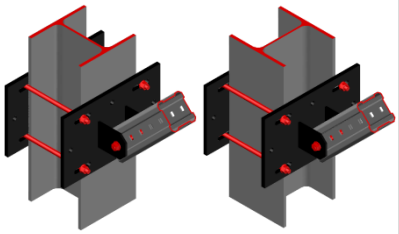
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

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

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

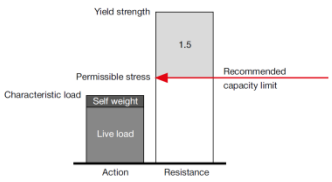
MIC-SC-MA Base Material Connector - Steel

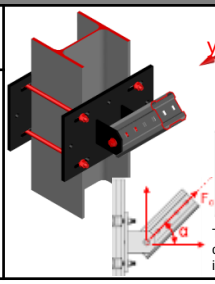
Clamped	Boxed	
		

Loading case: Standard	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-F 4.8 304774** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing) 

Recommended loading capacity - simplified for most common applications

Method





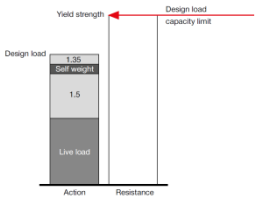
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
±$F_{\alpha,rec.}$ [kN]	17.57	6.91	5.51	4.87	4.74

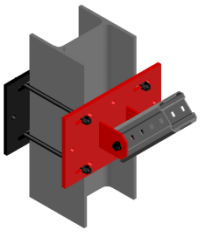
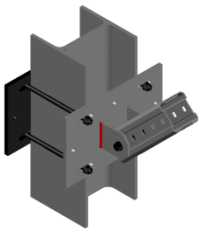
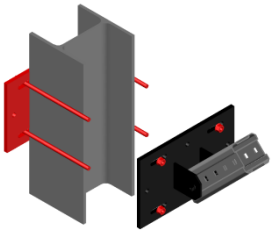
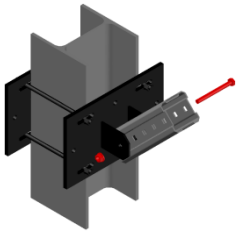
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method

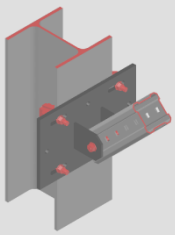
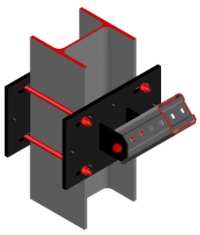


Limiting components of capacity evaluated in following tables:

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

MIC-SC-MA Base Material Connector - Steel

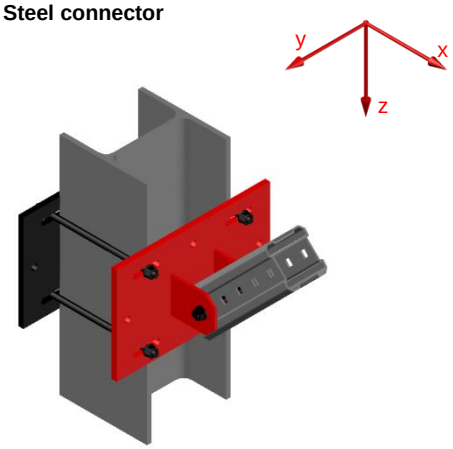
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

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.

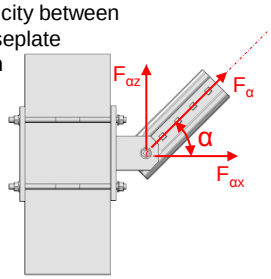
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.47	38.38	3.22	3.22	15.78	15.78
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.77	0.77	1.10	1.10	0.23	0.23

includes cross section resistance of steel base plate and the two flange plates Interaction for a general force Fα 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

e_x=0.07m



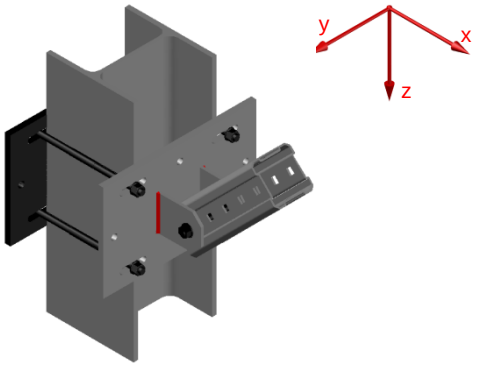
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

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

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**

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

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

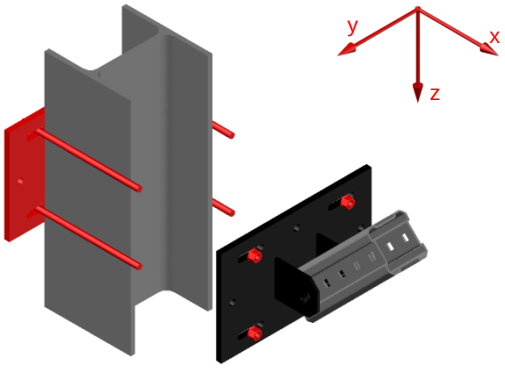
$M_{z.Ed} = F_{y.Ed} * e_x$

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

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

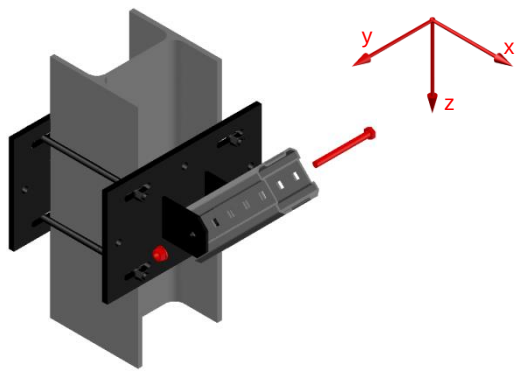
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

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

4. Hexagonal bolt in MI channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.36	26.36	Not decisive	Not decisive	26.36	26.36
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.29	1.29	0.00	0.00	0.00	0.00

Interaction:

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

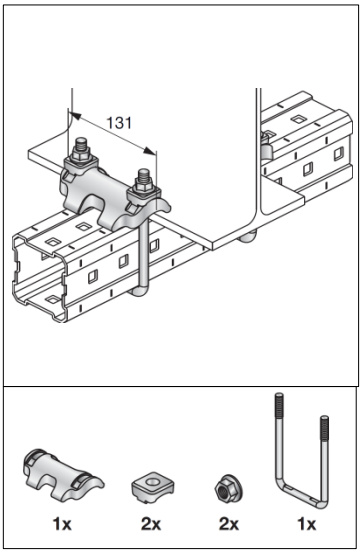
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

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

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

MI-DGC 90 Base Material Connector - Steel

Designation	Item number
MI-DGC 90	**233860**



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

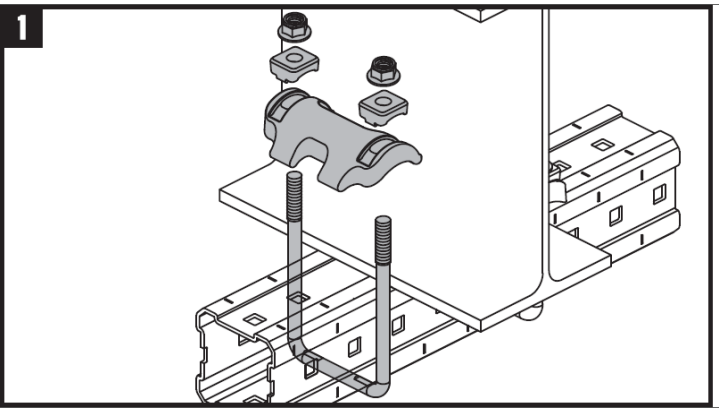
Weight:
1015.6 g incl. components

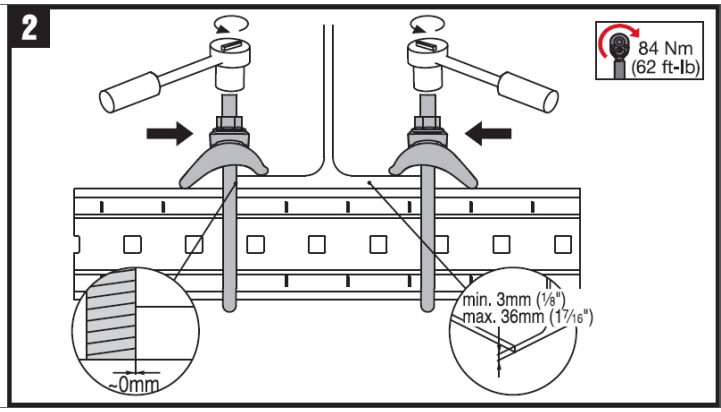
Submittal text:
Hilti Hot-dipped galvanized steel beam clamp, typically used to connect a horizontal MI-90 or MIQ-90 girder to steel beam. Two U-bolts carry the girder and are connected to the clamp with saddles and nuts.

Material properties:

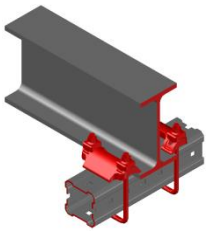
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Steel EN-GJMB-450-6 - EN 1562	$F_y = 270 \frac{N}{mm^2}$	$F_u = 450 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:





MI-DGC 90 Base Material Connector - Steel

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

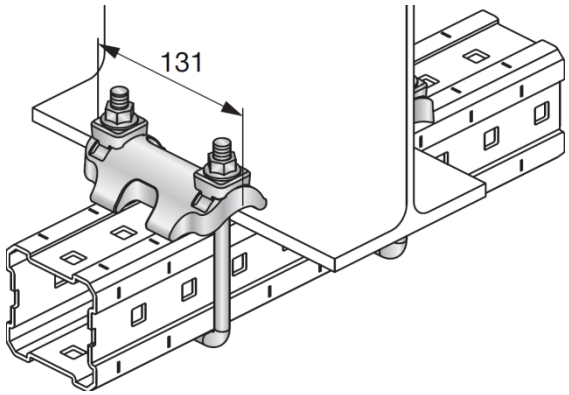
Standards and codes:

• 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

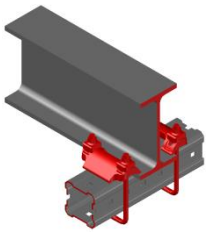
Software:
- Mathcad 15.0
- Microsoft Excel

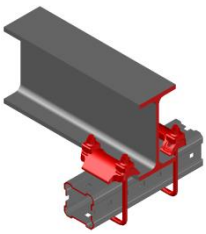
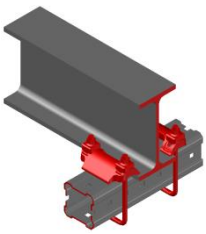
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



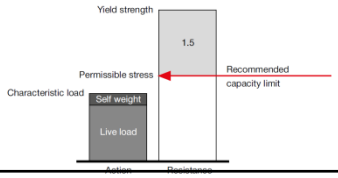
MI-DGC 90 Base Material Connector - Steel

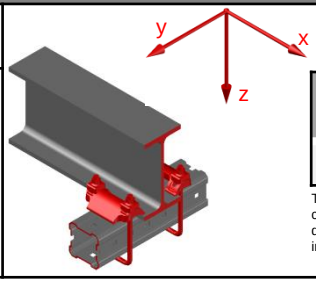
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **MI-DGC 90** **233860** Associated MI System girders (channels) **MI-90 3m** **304799** **MI-90 6m** **304798** 	Connector used for horizontal connection of MI-90 or MIQ-90 to the flanges of structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



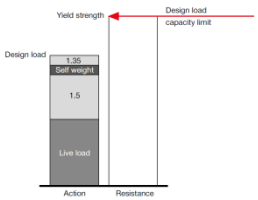


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
6.0	4.0	23.2

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

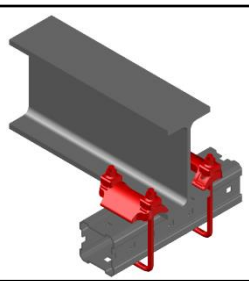
Design loading capacity - 3D 1/2

Method



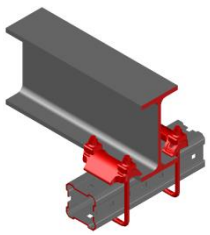
Limiting components of capacity evaluated in following tables:

1. Steel connector



MI-DGC 90 Base Material Connector - Steel

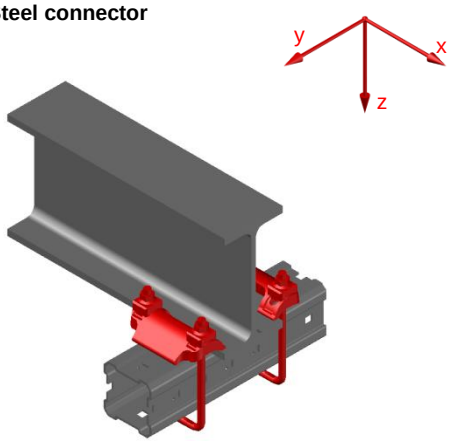
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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



valid only for pairwise use

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
8.93	8.93	6.09	6.09	34.80	34.80
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.76	1.76	17.4*x	17.4*x	3.04*x	3.04*x

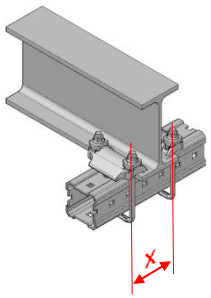
Interaction:

for tension forces

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

for shear forces

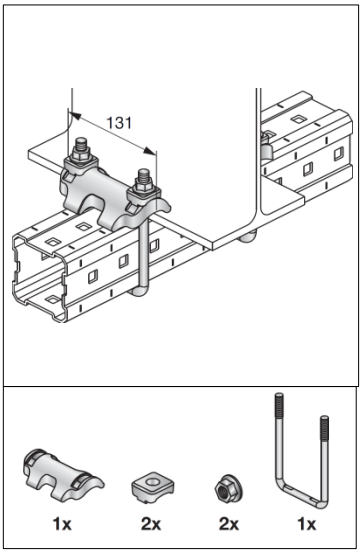
$$\sqrt{\left(\frac{F_{x.Ed}}{F_{x.Rd}}\right)^2 + \left(\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}}\right)^2} \le 1$$



with x [m] = width of flange + 0,012m

MI-DGC 120 Base Material Connector - Steel

Designation	Item number
MI-DGC 120	**233861**



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

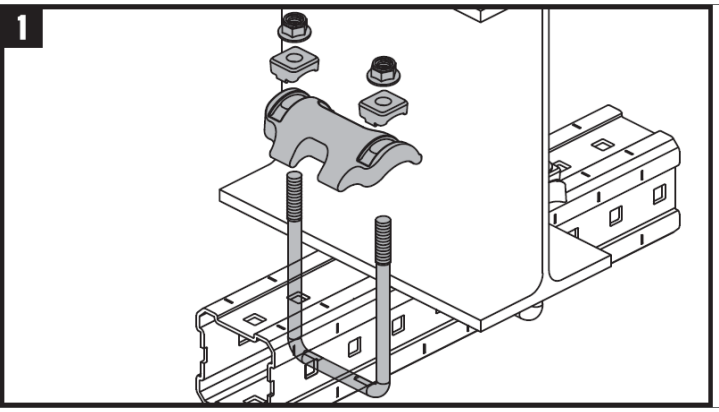
Weight:
1041.9 g incl. components

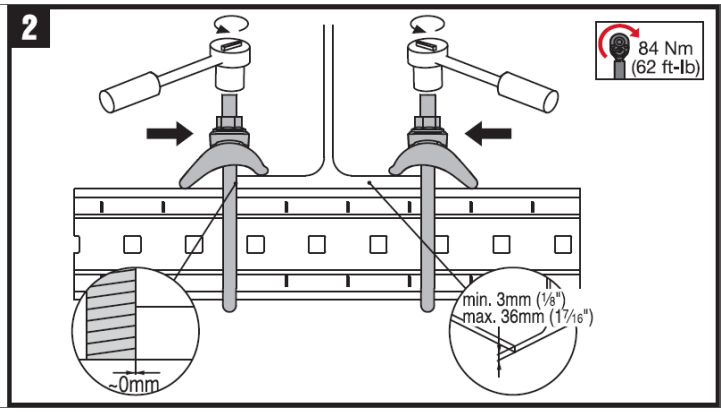
Submittal text:
Hilti Hot-dipped galvanized steel beam clamp, typically used to connect a horizontal MI-120 girder to a steel beam. Two U-bolts carry the girder and are connected to the clamp with saddles and nuts.

Material properties:

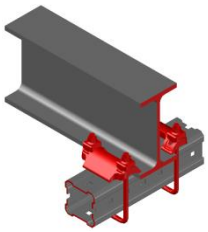
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Steel EN-GJMB-450-6 - EN 1562	$F_y = 270 \frac{N}{mm^2}$	$F_u = 450 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:





MI-DGC 120 Base Material Connector - Steel

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

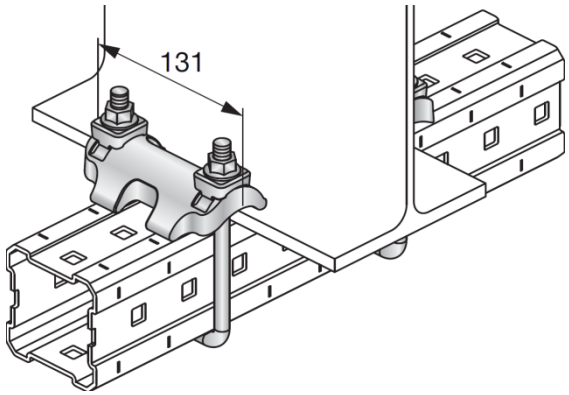
Standards and codes:

• 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

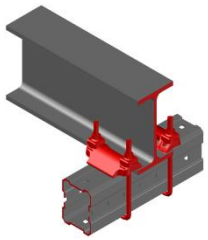
Software:
- Mathcad 15.0
- Microsoft Excel

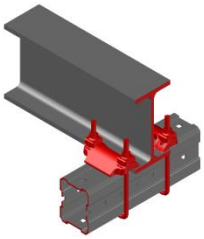
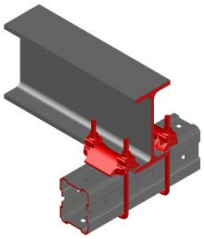
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



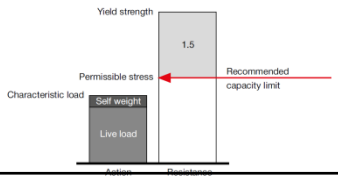
MI-DGC 120 Base Material Connector - Steel

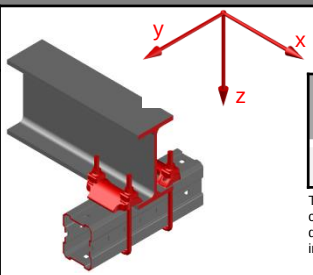
Clamped	Boxed	
		

Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **MI-DGC 120** **233861** Associated MI System girders (channels) **MI-120 3m** **304800** **MI-120 6m** **304801** 	Connector used for horizontal connection of MI-120 to the flanges of structural steel profiles 

Recommended loading capacity - simplified for most common applications

Method



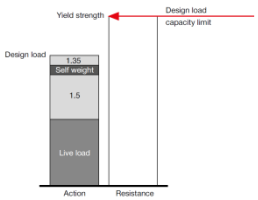


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
8.0	4.0	23.2

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

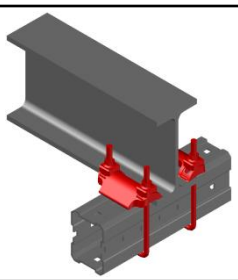
Design loading capacity - 3D 1/2

Method



Limiting components of capacity evaluated in following tables:

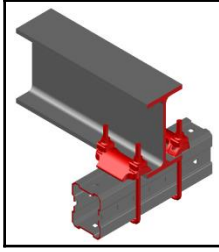
1. Steel connector



MI-DGC 120 Base Material Connector - Steel

Conditions of the loading capacity tables:

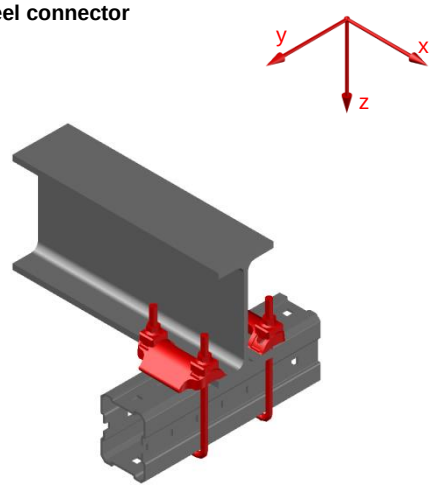
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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



valid only for pairwise use

+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
8.93	8.93	6.09	6.09	34.80	34.80
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.76	1.76	17.4*x	17.4*x	3.04*x	3.04*x

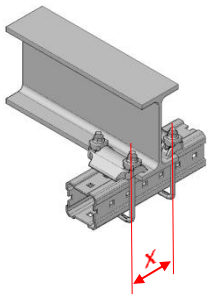
Interaction:

for tension forces

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

for shear forces

$$\sqrt{\left(\frac{F_{x.Ed}}{F_{x.Rd}}\right)^2 + \left(\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}}\right)^2} \le 1$$



with x [m] = width of flange + 0,012m

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