HILTI

MANUALE SISTEMI DI INSTALLAZIONE MEDIO-PESANTI.

Dati tecnici sistema MI / MIQ
ver. 01/2017

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Data version 1.3 I Date 12.2016

Content and overview of this manual

Content and overview of this manual

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Boundary conditions - **Terms of common cooperation / Legal disclaimer** and guidelines as defined at the beginning of this book need to be mandatorily respected.

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Content and overview of this manual

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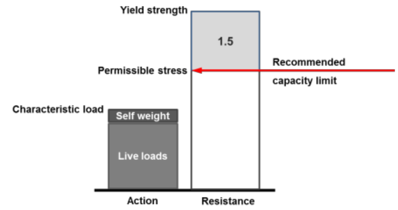
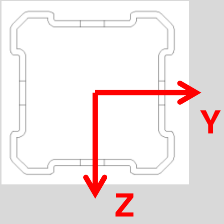
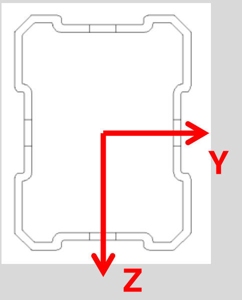
Content and overview of this manual

Data version 1.3 I Date 12.2016 | Page 1/1

MI-Girders

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

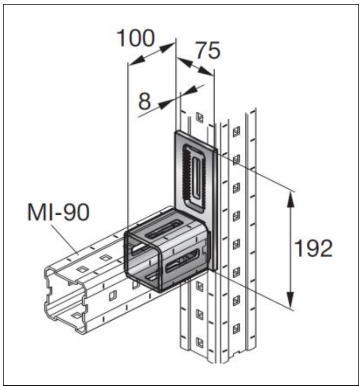


Technical data			**MI-90**	**MI-120**
For girder MI / cross section including torsion				
Cross-sectional area	A	[mm²]	1057.4	1456.24
Channel weight		[kg/m]	9.43	12.64
Material				
yield strength	$f_{y,k}$	[N/mm²]	235,0	235,0
permissible stress*	σ_{rec}	[N/mm²]	167.9	167.9
E-module		[N/mm²]	210000	210000
thrust-module		[N/mm²]	81000	81000
Surface				
hot dip galvanized		[µm]	75	75
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

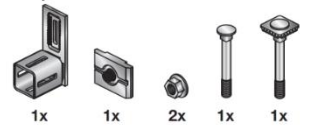
Material composition: DD11 MOD - HN 555, S235JR - EN 10025
Corrosion protection: Hot-dip galvanized, 75 µm - ASTM A123

MIC-90-U Connector

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



Package content



Corrosion protection:
Hot dipped galvanized:
Connector 55 µm - DIN EN ISO 1461
Backing plate, Tooth plate, Bolt, Nut 45 µm - DIN EN ISO 1461

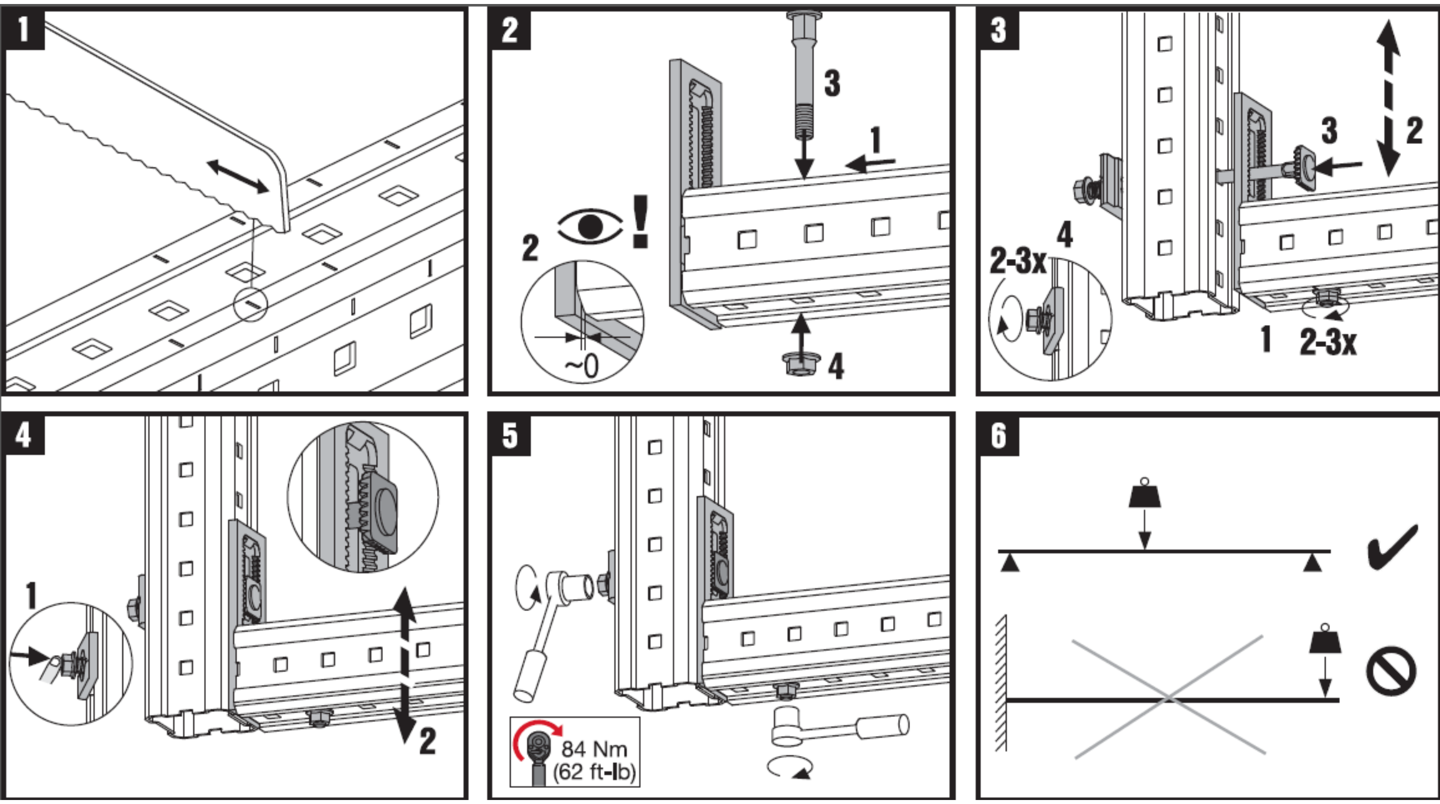
Weight:
2510 g incl. components

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.

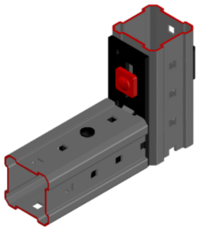
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235\ \frac{N}{mm^2}$	$f_u = 360\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$
Backing plate, Tooth plate: EN-GJMW-400-5 - DIN EN 1562, EN-GJMW-450-7 - DIN EN 1562	$f_y = 235\ \frac{N}{mm^2}$	$f_u = 360\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640\ \frac{N}{mm^2}$	$f_u = 800\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$

Instruction For Use:



MIC-90-U Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

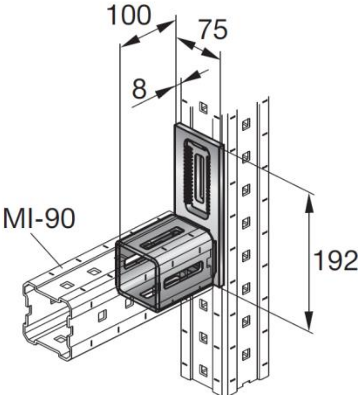
Standards and codes:

• 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

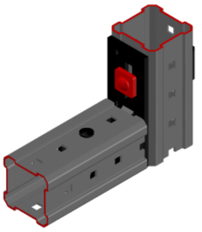
Software:
- Mathcad 15.0
- Microsoft Excel

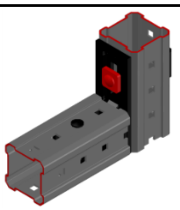
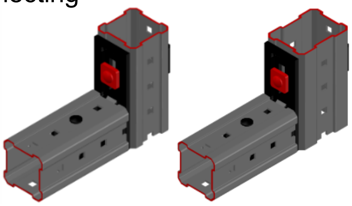
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



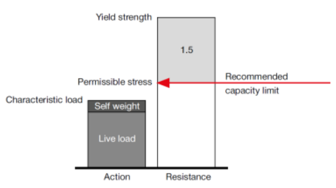
MIC-90-U Connector

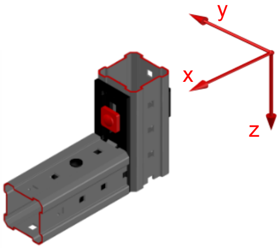
Standard		
		

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



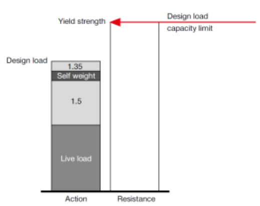


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
1.88	9.82	11.32

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

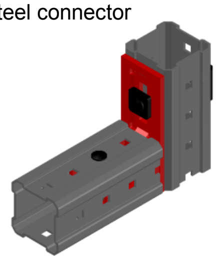
Design loading capacity - 3D 1/3

Method

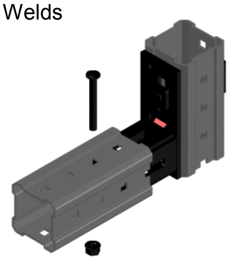


Limiting components of capacity evaluated in following tables:

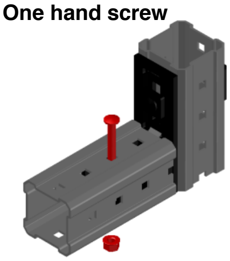
1. Steel connector



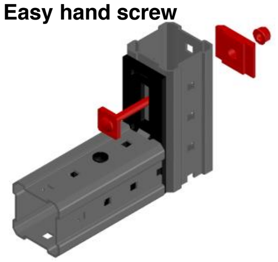
2. Welds



3. **One hand screw**



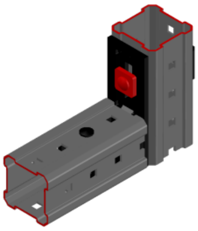
4. **Easy hand screw**



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

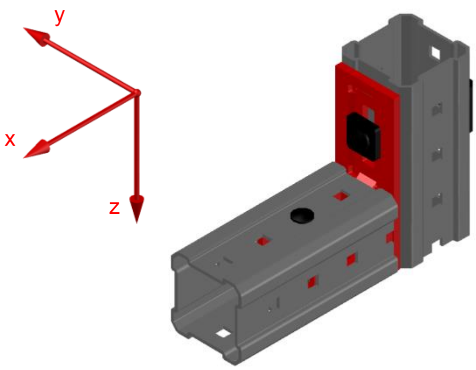
Standard		
		

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



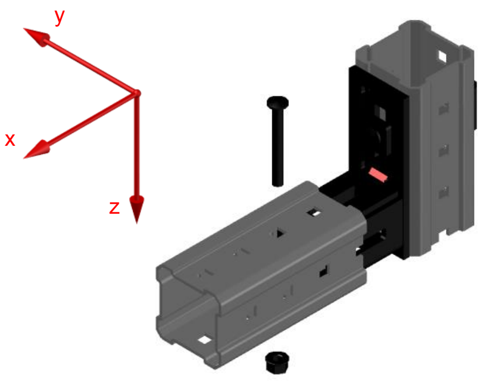
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.90	Not decisive	14.73	14.73	63.92	63.92
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.36	1.36	0.00	0.00	0.00	0.00

includes cross section resistance of steel plate and contact pressure

Interaction:

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

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	0.00	0.00	0.00	0.00

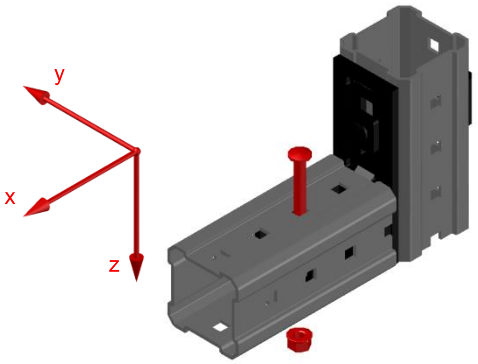
Interaction:

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

MIC-90-U Connector

Design loading capacity - 3D 3/3

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



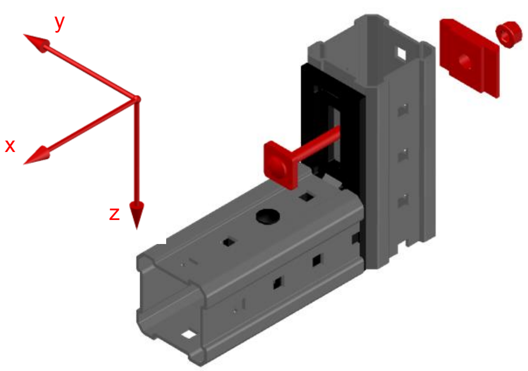
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
3.33	3.33	36.29	36.29	Not decisive	Not decisive
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.20	1.20	0.00	0.00	0.00	0.00

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 MI-90/120 and tooth plate, resistance of screw plate

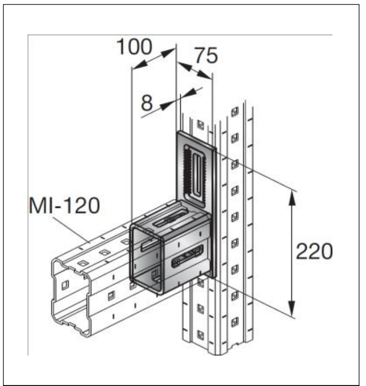
Interaction:

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

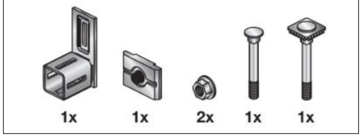
Data version 1.3 I Date 12.2016

MIC-120-U Connector

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



Package content



Corrosion protection:
Hot dipped galvanized:
Connector 55 µm - DIN EN ISO 1461
Backing plate, Tooth plate, Bolt, Nut 45 µm - DIN EN ISO 1461

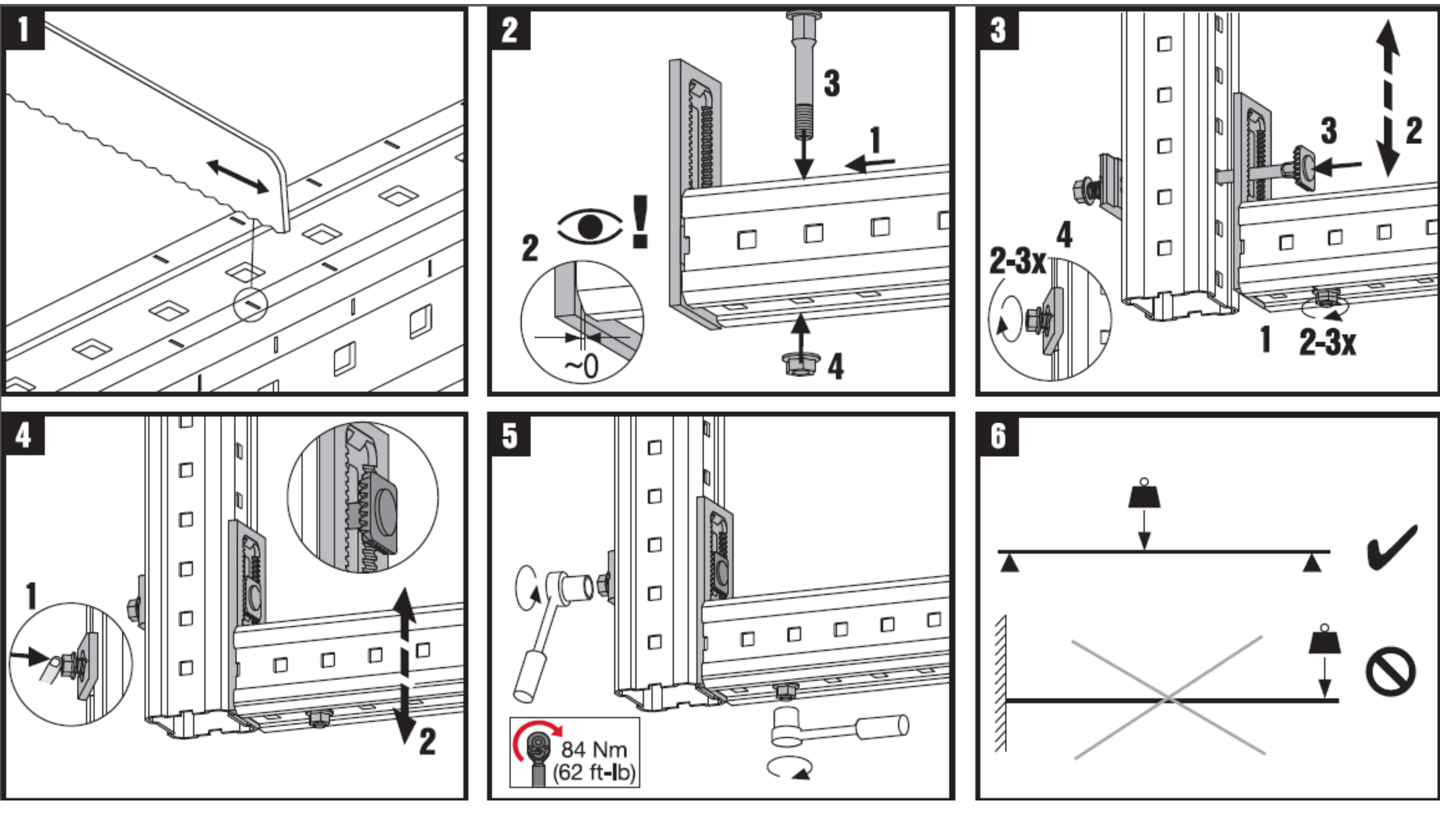
Weight:
2786 g incl. components

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.

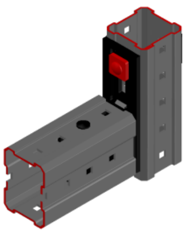
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Backing plate, Tooth plate: EN-GJMW-400-5 - DIN EN 1562, EN-GJMW-450-7 - DIN EN 1562	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-120-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

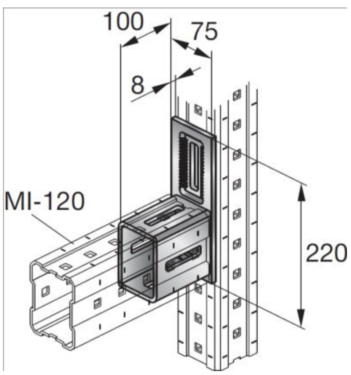
Software:

- Mathcad 15.0
- Microsoft Excel

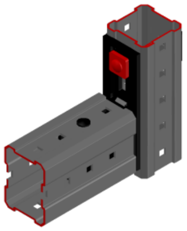
Environmental conditions:

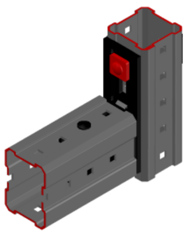
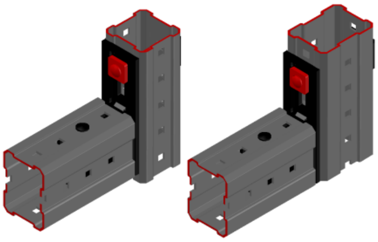
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



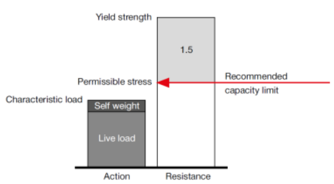
MIC-120-U Connector

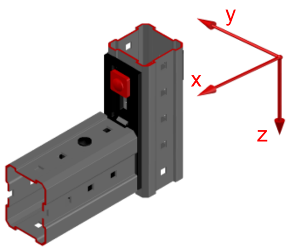
Standard		
		

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



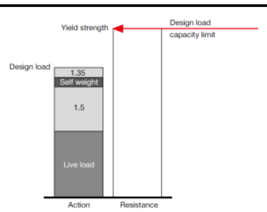


±Fx,rec [kN]	±Fy,rec [kN]	±Fz,rec [kN]
1.72	10.55	11.32

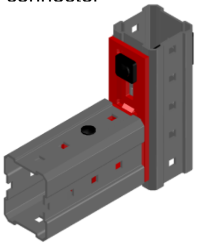
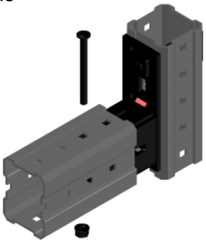
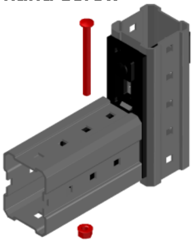
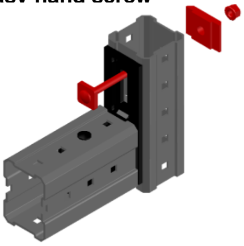
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



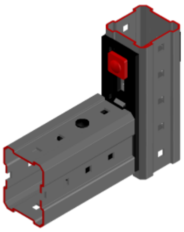
Limiting components of capacity evaluated in following tables:

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

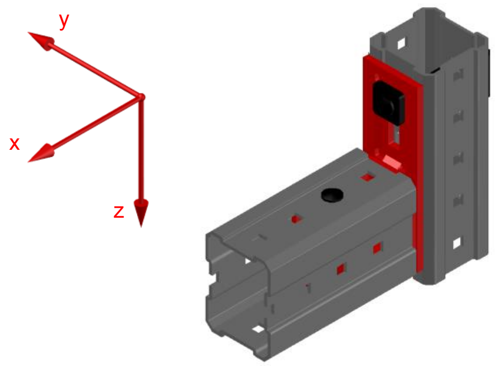
Standard		
		

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



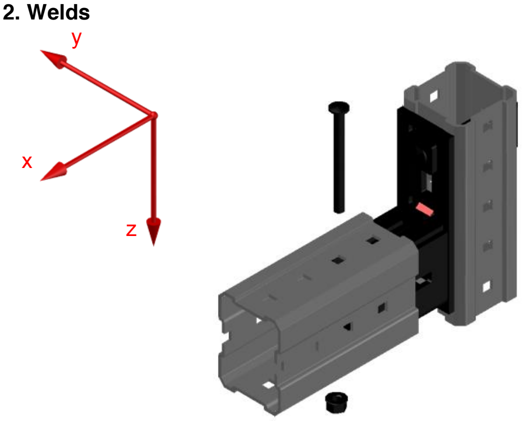
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.60	Not decisive	15.83	15.83	63.92	63.92
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.14	1.14	0.00	0.00	0.00	0.00

includes cross section resistance of steel plate and contact pressure

Interaction:

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

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	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

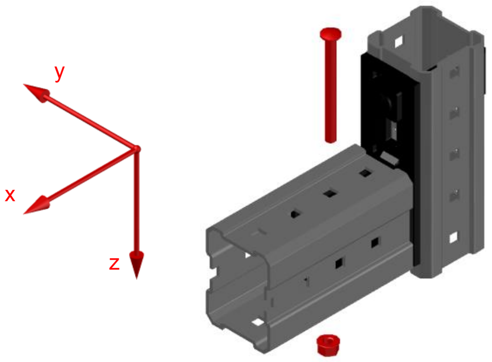
Interaction:

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

MIC-120-U Connector

Design loading capacity - 3D 3/3

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



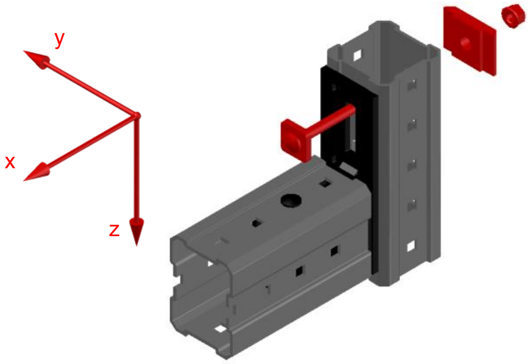
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
6.66	6.66	41.47	41.47	Not decisive	Not decisive
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.99	1.99	0.00	0.00	0.00	0.00

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

Interaction:

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

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]
2.59	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

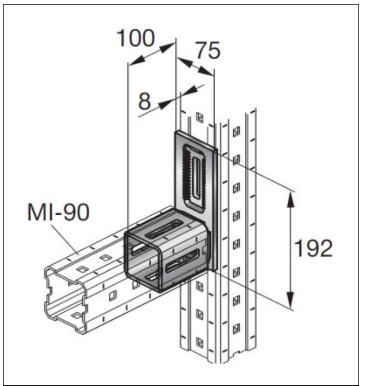
includes shear, bending and tension of the bolt, bearing resistance channel MI-90/120 and tooth plate, resistance of screw plate

Interaction:

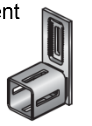
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} \leq 1$$

MIC-90-U-AP Connector

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



Package content



1x

Corrosion protection:
Hot dipped galvanized:
Connector 55 µm - DIN EN ISO 1461

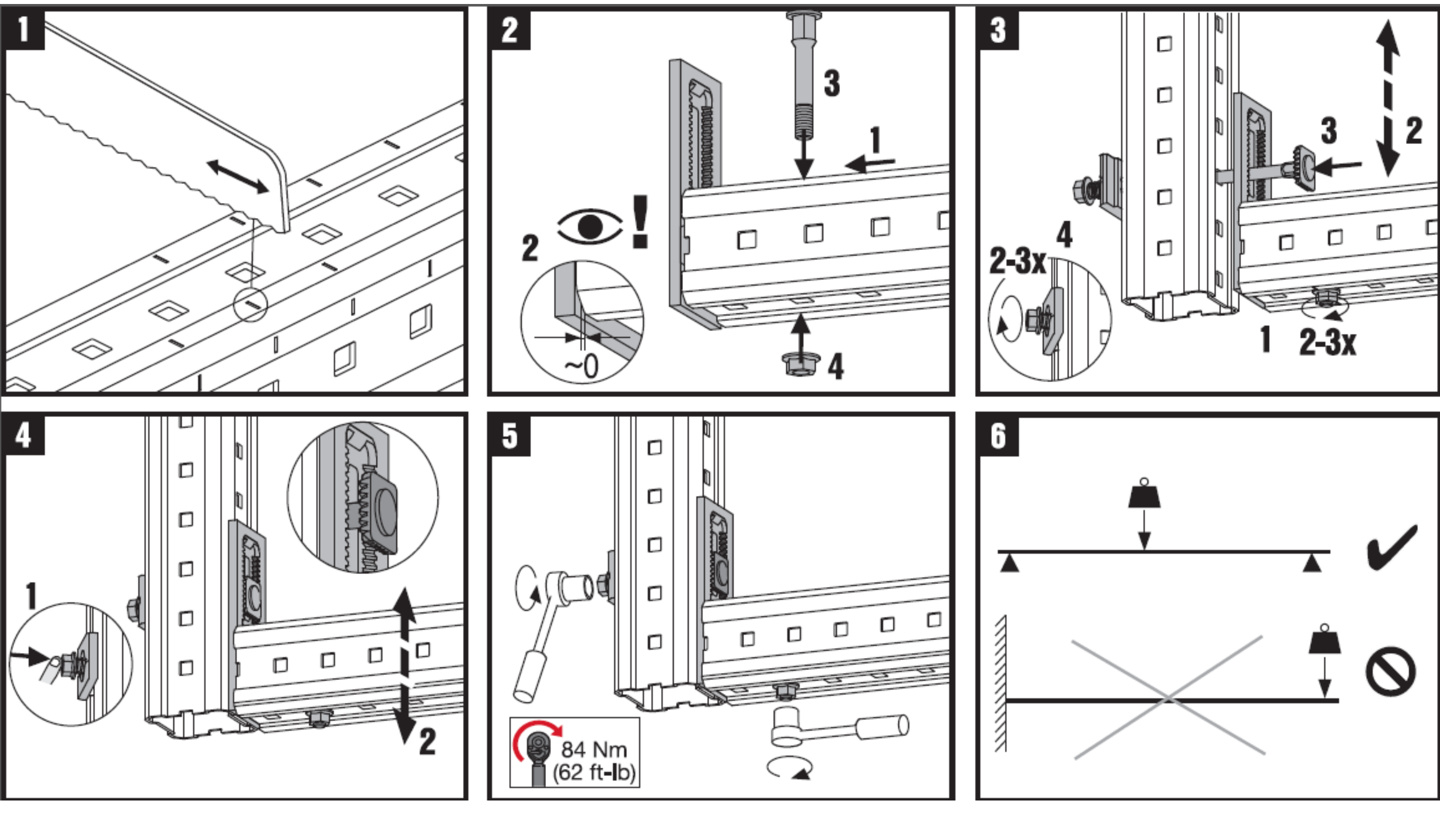
Weight:
1780 g

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.

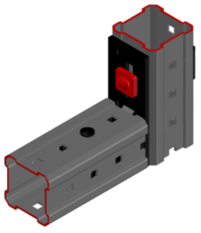
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, 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

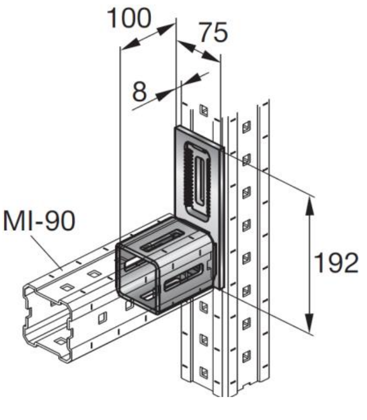
Standards and codes:

• 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

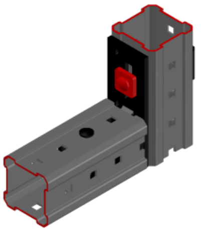
Software:
- Mathcad 15.0
- Microsoft Excel

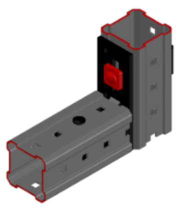
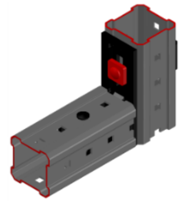
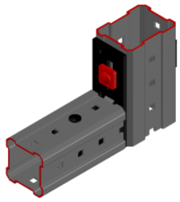
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



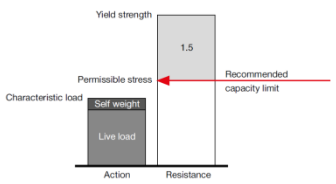
MIC-90-U-AP Connector

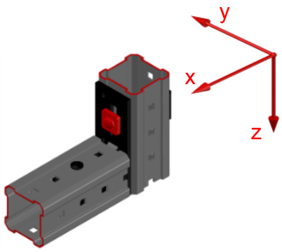
Standard		
		

Loading case: Standard	Combinations covered by loading case
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** 	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



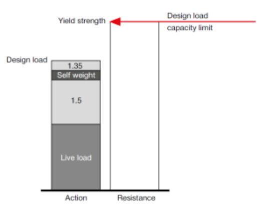


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
1.88	9.82	11.32

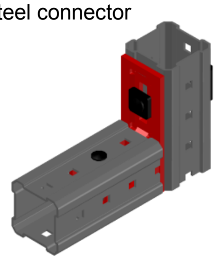
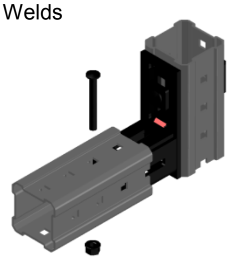
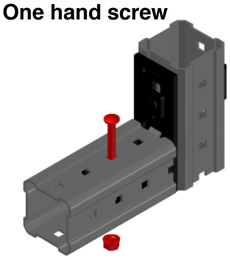
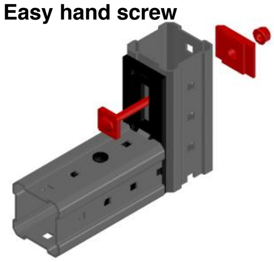
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



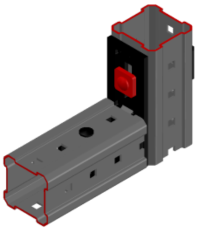
Limiting components of capacity evaluated in following tables:

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

MIC-90-U-AP Connector

Conditions of the loading capacity tables:

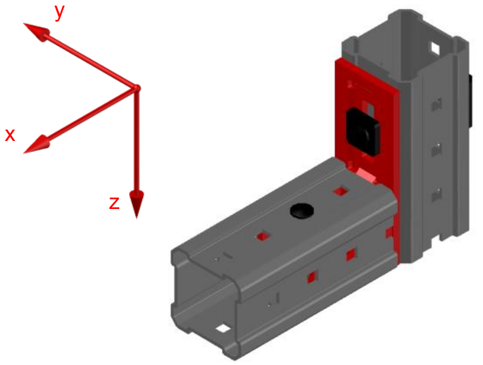
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

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



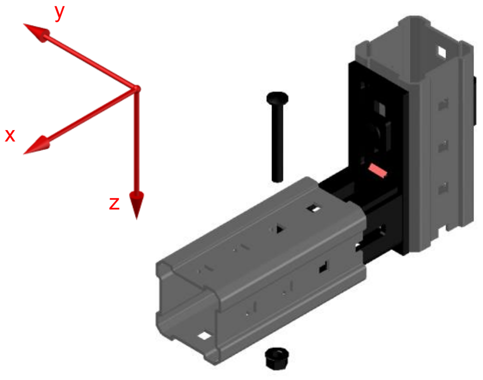
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.90	Not decisive	14.73	14.73	63.92	63.92
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.36	1.36	0.00	0.00	0.00	0.00

includes cross section resistance of steel plate and contact pressure

Interaction:

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

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	0.00	0.00	0.00	0.00

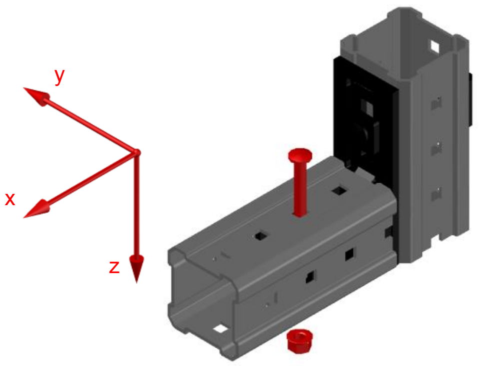
Interaction:

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

MIC-90-U-AP Connector

Design loading capacity - 3D 3/3

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



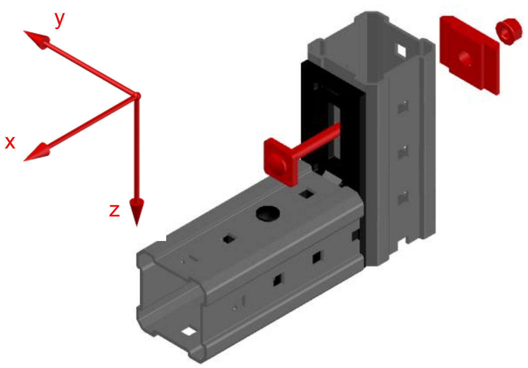
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
3.33	3.33	36.29	36.29	Not decisive	Not decisive
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.20	1.20	0.00	0.00	0.00	0.00

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

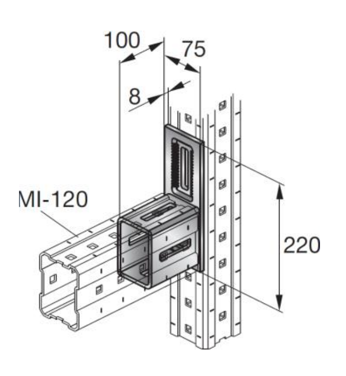
includes shear, bending and tension of the bolt, bearing resistance channel MI-90/120 and tooth plate, resistance of screw plate

Interaction:

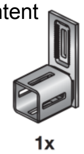
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} \leq 1$$

MIC-120-U-AP Connector

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



Package content



Corrosion protection:
Hot dipped galvanized:
Connector 55 µm - DIN EN ISO 1461

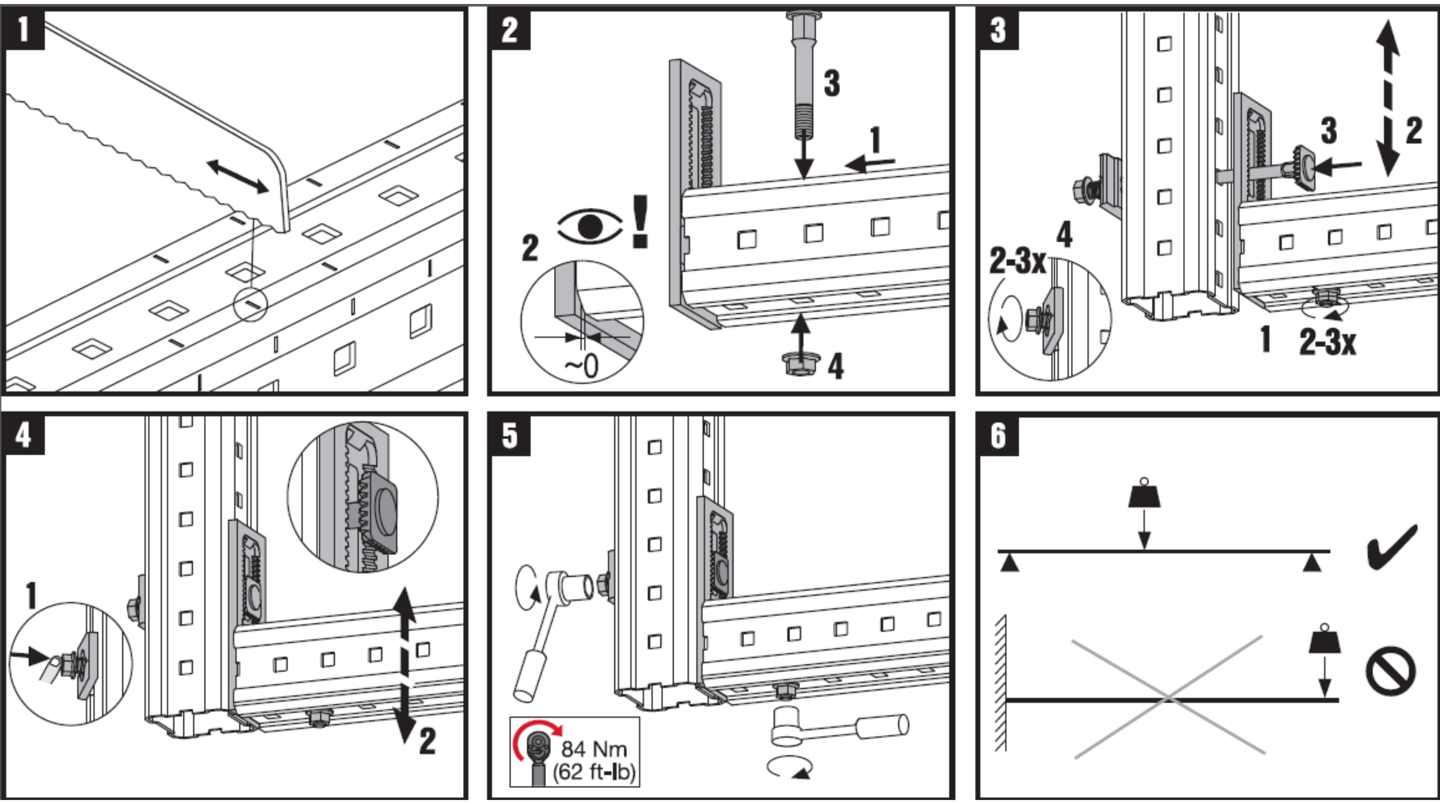
Weight:
2180 g

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.

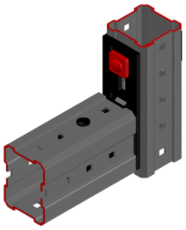
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, 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

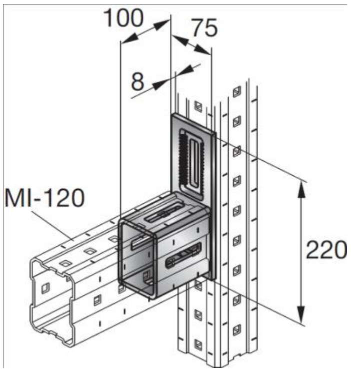
Standards and codes:

• 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

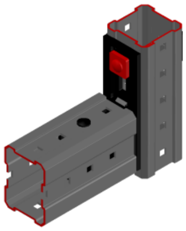
Software:
- Mathcad 15.0
- Microsoft Excel

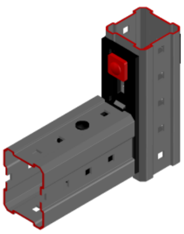
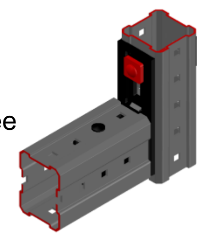
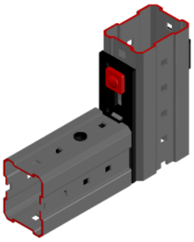
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



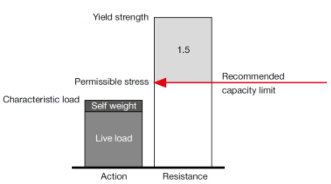
MIC-120-U-AP Connector

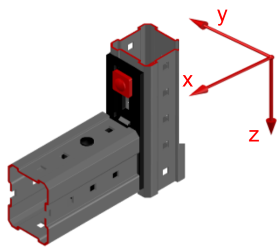
Standard		
		

Loading case: Standard	Combinations covered by loading case
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** 	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



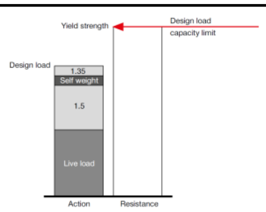


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
1.72	10.55	11.32

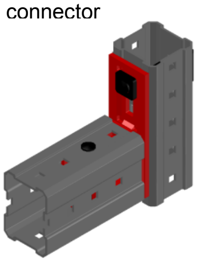
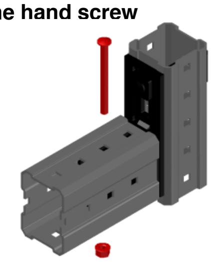
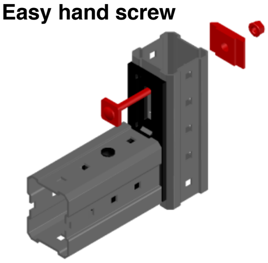
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



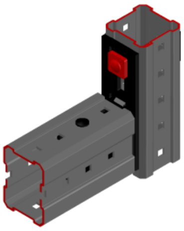
Limiting components of capacity evaluated in following tables:

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

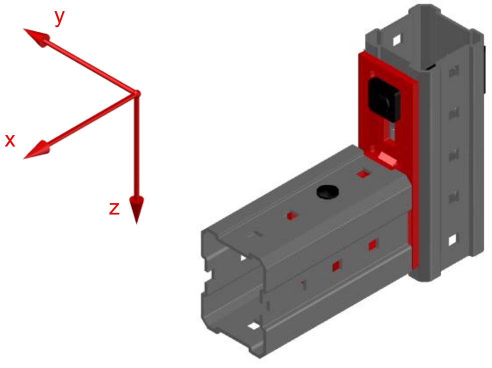
Standard		
		

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



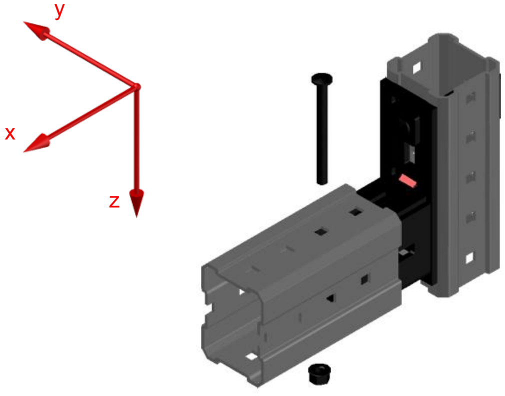
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.60	Not decisive	15.83	15.83	63.92	63.92
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.14	1.14	0.00	0.00	0.00	0.00

includes cross section resistance of steel plate and contact pressure

Interaction:

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

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	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

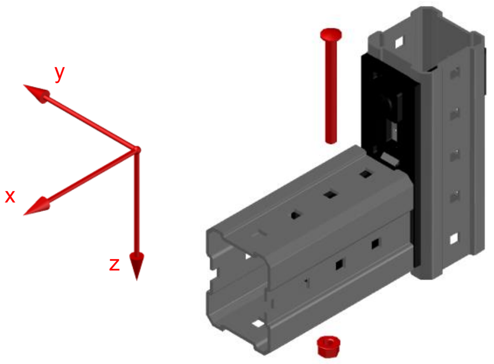
Interaction:

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

MIC-120-U-AP Connector

Design loading capacity - 3D 3/3

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



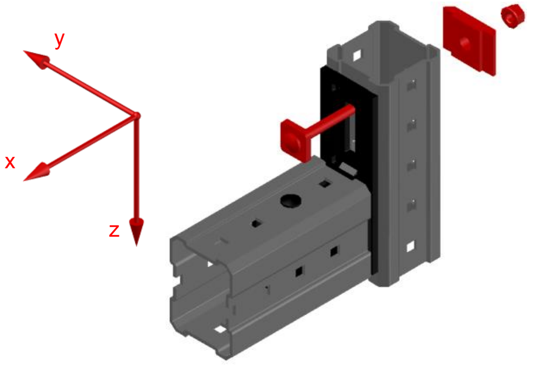
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
6.66	6.66	41.47	41.47	Not decisive	Not decisive
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.99	1.99	0.00	0.00	0.00	0.00

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

Interaction:

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

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]
2.59	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

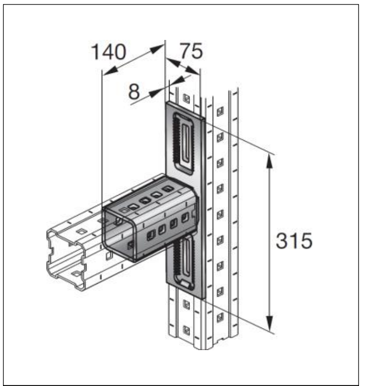
includes shear, bending and tension of the bolt, bearing resistance channel MI-90/120 and tooth plate, resistance of screw plate

Interaction:

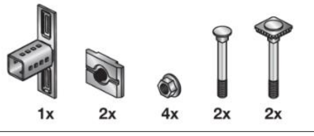
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} \leq 1$$

MIC-90-L Connector

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



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Backing plate, Tooth plate, Bolt, Nut 45 µm - DIN EN ISO 1461

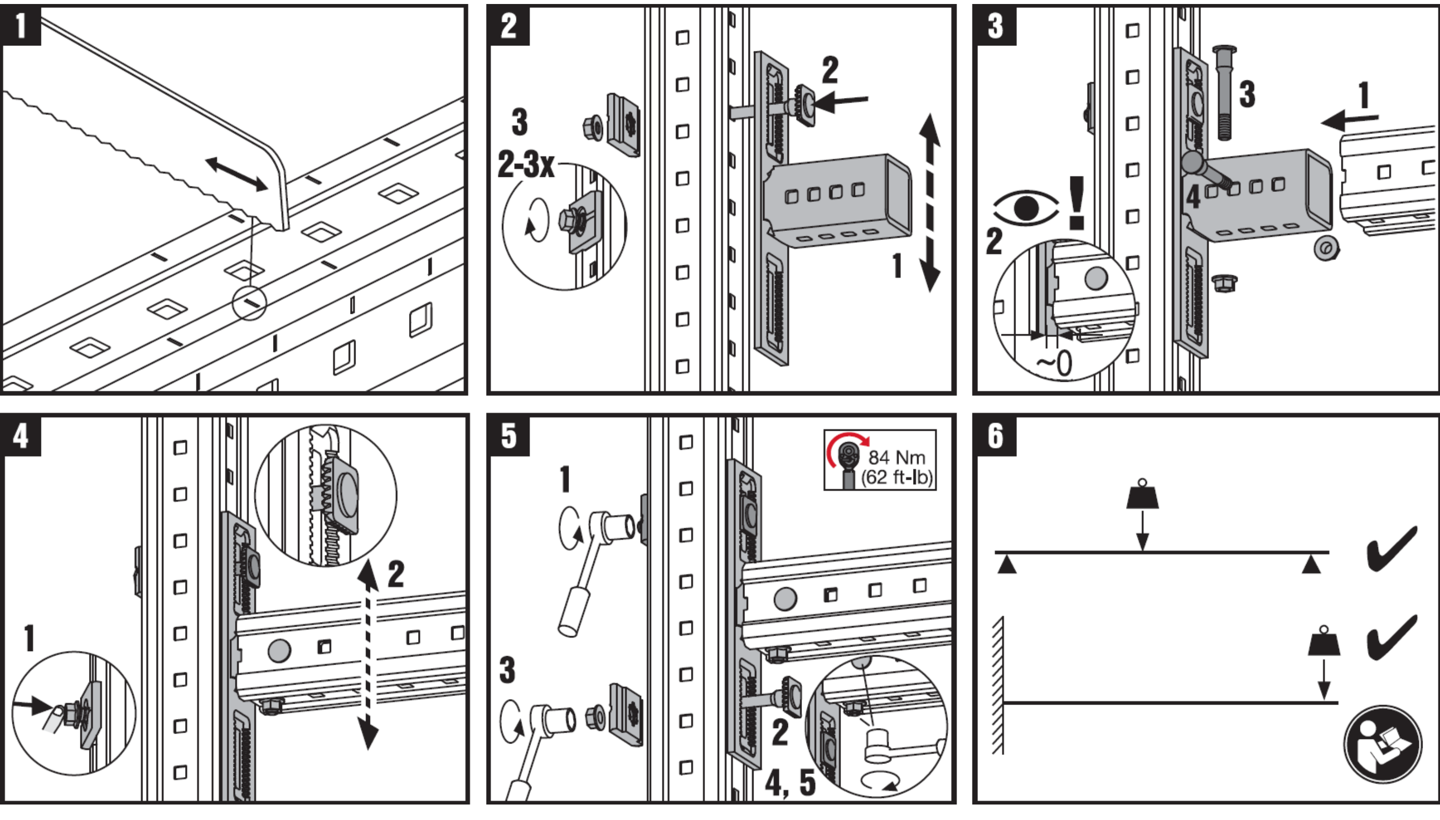
Weight:
4050 g incl. components

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.

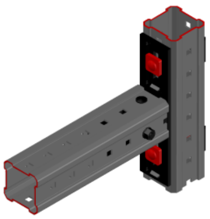
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Backing plate, Tooth plate: EN-GJMW-400-5 - DIN EN 1562, EN-GJMW-450-7 - DIN EN 1562	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-90-L Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

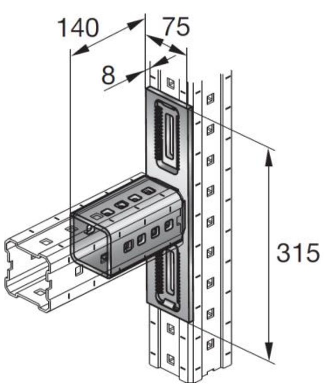
Standards and codes:

• 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

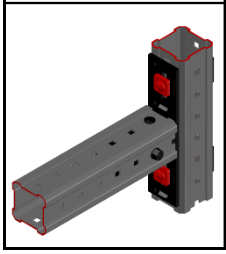
Software:
- Mathcad 15.0
- Microsoft Excel

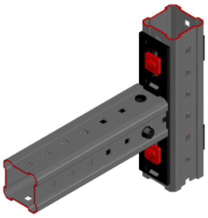
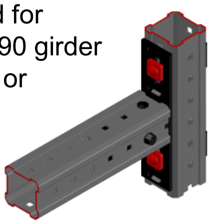
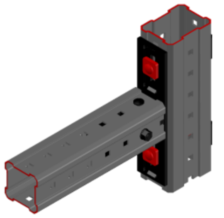
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



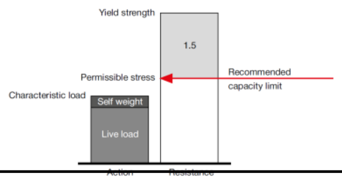
MIC-90-L Connector

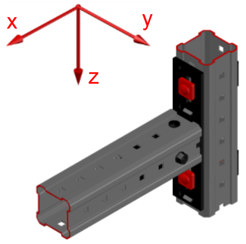
Standard		
		

Loading case: Standard	Combinations covered by loading case
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 	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



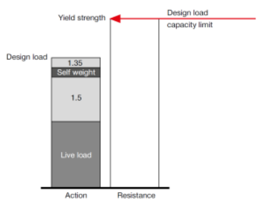


±Fx,rec. [kN]	±Fy,rec.[kN]	±Fz,rec. [kN]
6.08	10.86	22.66

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

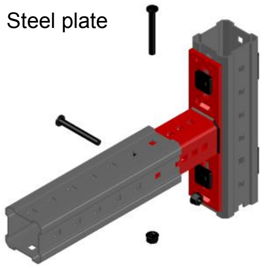
Design loading capacity - 3D 1/3

Method

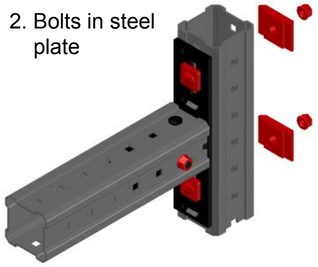


Limiting components of capacity evaluated in following tables:

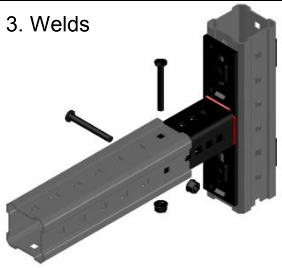
1. Steel plate



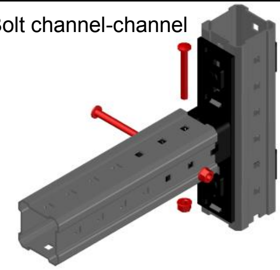
2. Bolts in steel plate



3. Welds

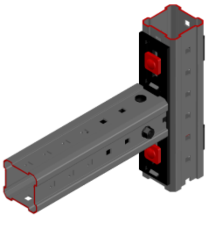


4. Bolt channel-channel



MIC-90-L Connector

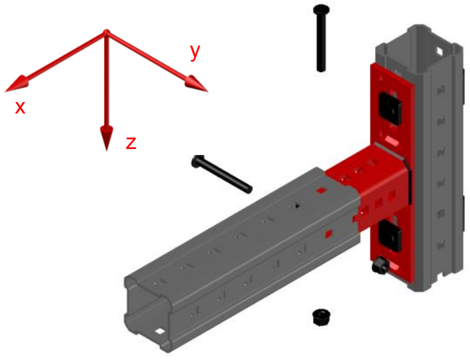
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

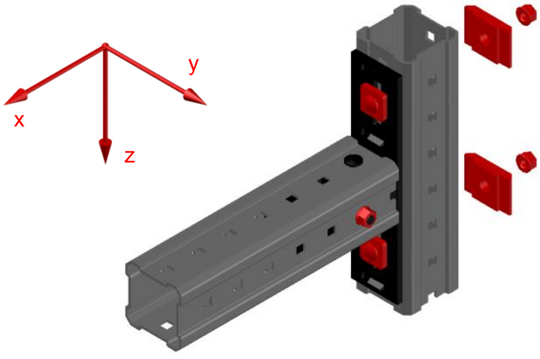


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
9.13	Not decisive	16.29	16.29	65.13	65.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.31	2.31	1.02	1.02	0.29	0.29

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

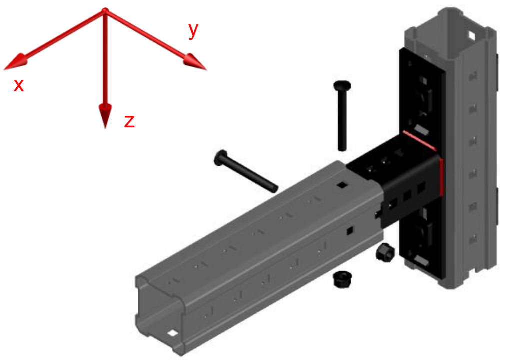
Interaction:

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

MIC-90-L Connector

Design loading capacity - 3D 3/3

3. Welds

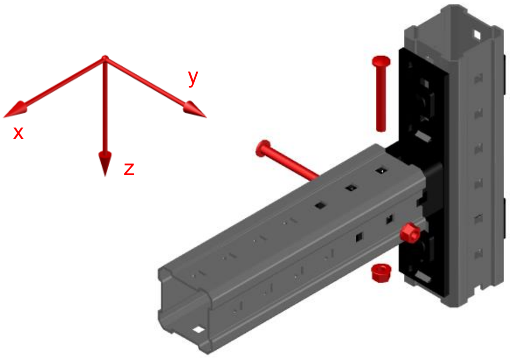


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.99	5.99	3.67	3.67	3.67	3.67

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



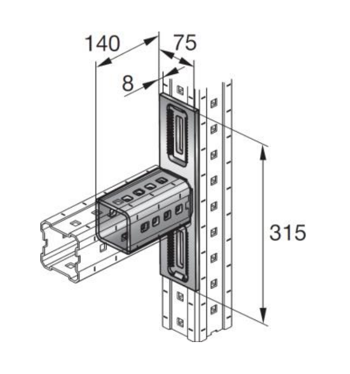
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.29	36.29	36.29	36.29
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

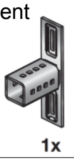
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-90-L-AP Connector

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



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461

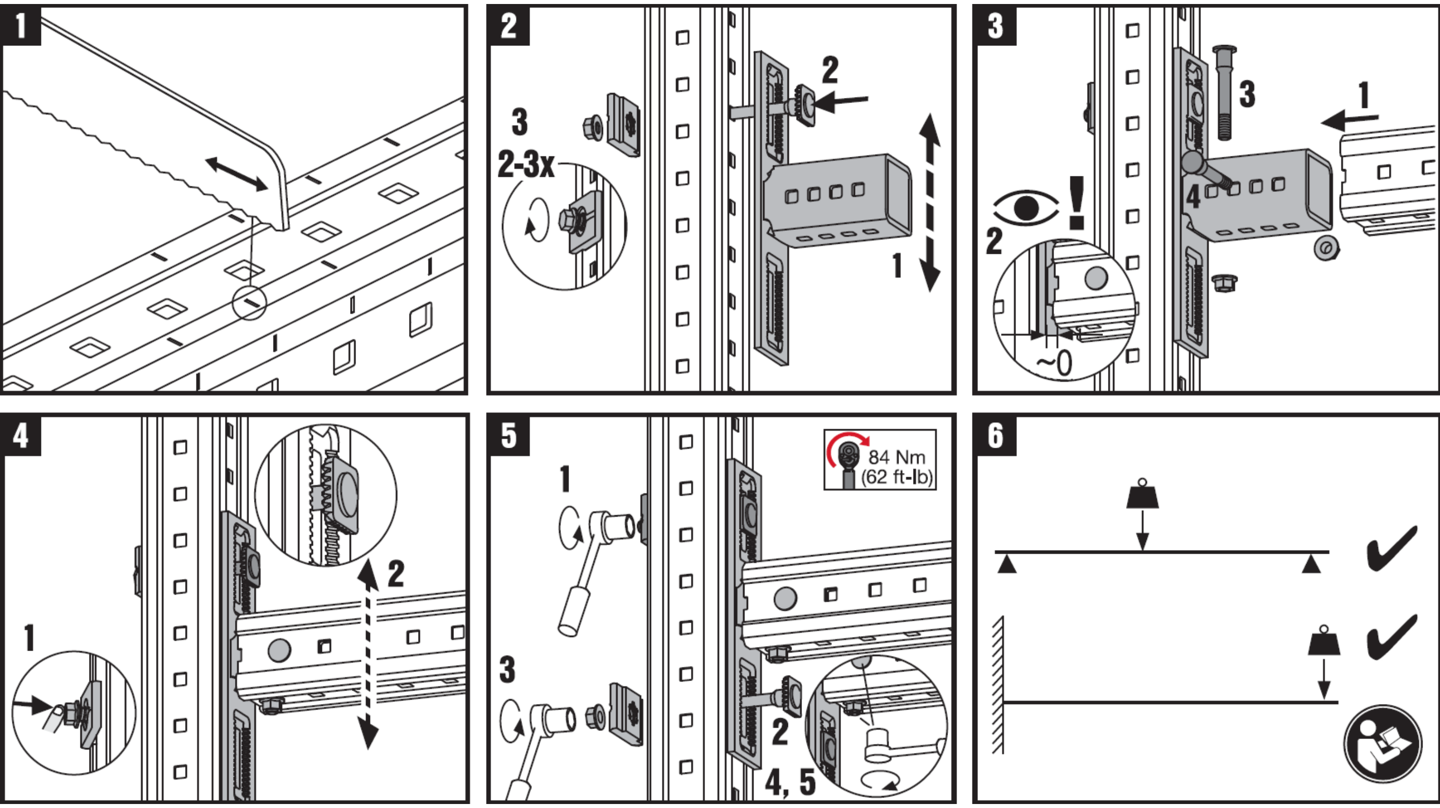
Weight:
3002 g

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.

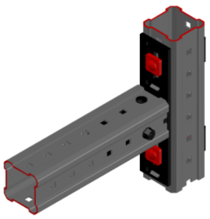
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, 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

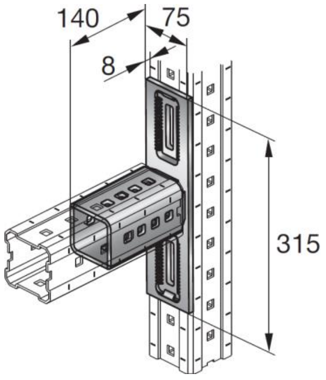
Standards and codes:

• 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

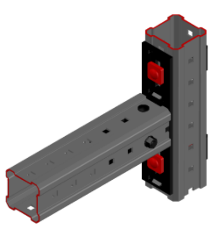
Software:
- Mathcad 15.0
- Microsoft Excel

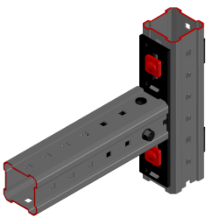
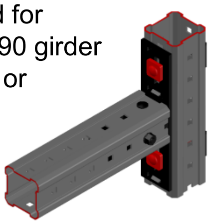
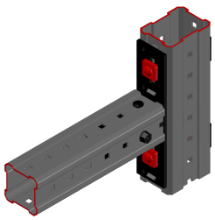
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



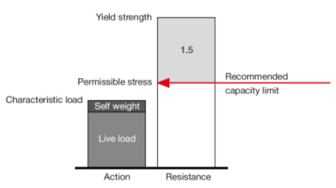
MIC-90-L-AP Connector

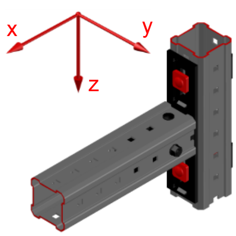
Standard		
		

Loading case: Standard	Combinations covered by loading case
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** 	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



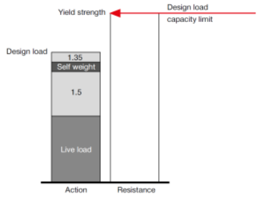


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec.[kN]
6.08	10.86	22.66

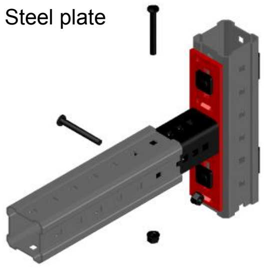
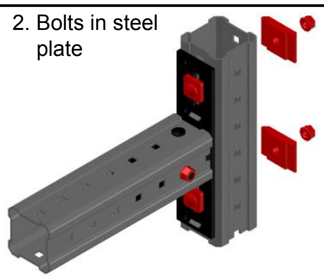
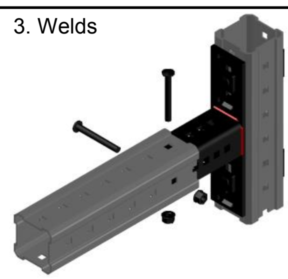
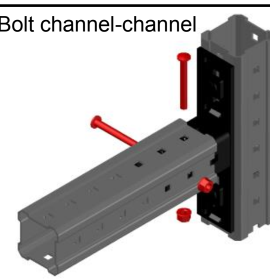
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



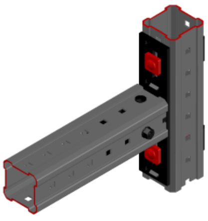
Limiting components of capacity evaluated in following tables:

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

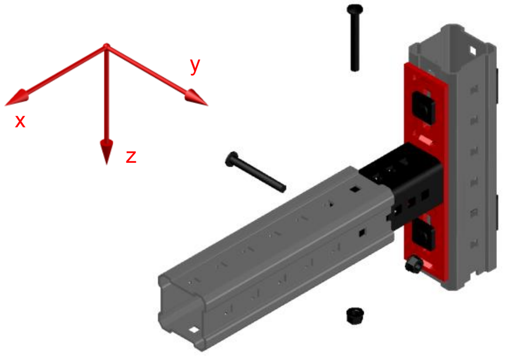
Standard		
		

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

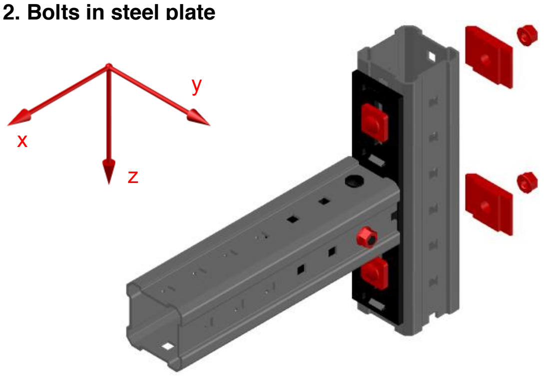


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
9.13	Not decisive	16.29	16.29	65.13	65.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.31	2.31	1.02	1.02	0.29	0.29

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

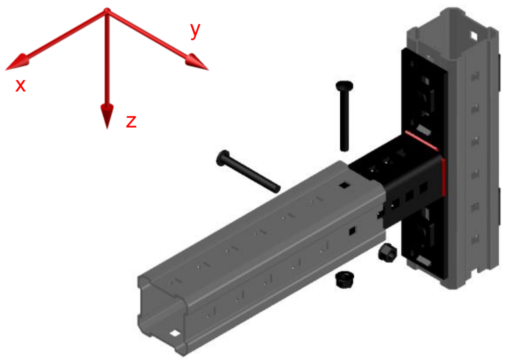
Interaction:

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

MIC-90-L-AP Connector

Design loading capacity - 3D 3/3

3. Welds

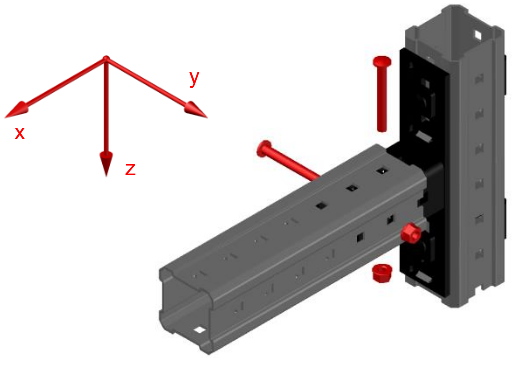


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
244.38	244.38	99.77	99.77	99.77	99.77
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.99	5.99	3.67	3.67	3.67	3.67

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

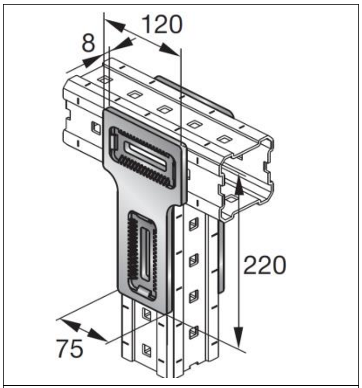
Interaction:

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

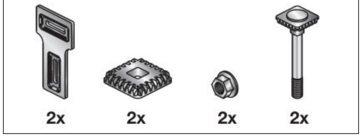
Data version 1.3 I Date 12.2016

MIC-T Connector

Designation	Item number
MIC-T	**304807**



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Backing plate, Tooth plate, Bolt, Nut 45 µm - DIN EN ISO 1461

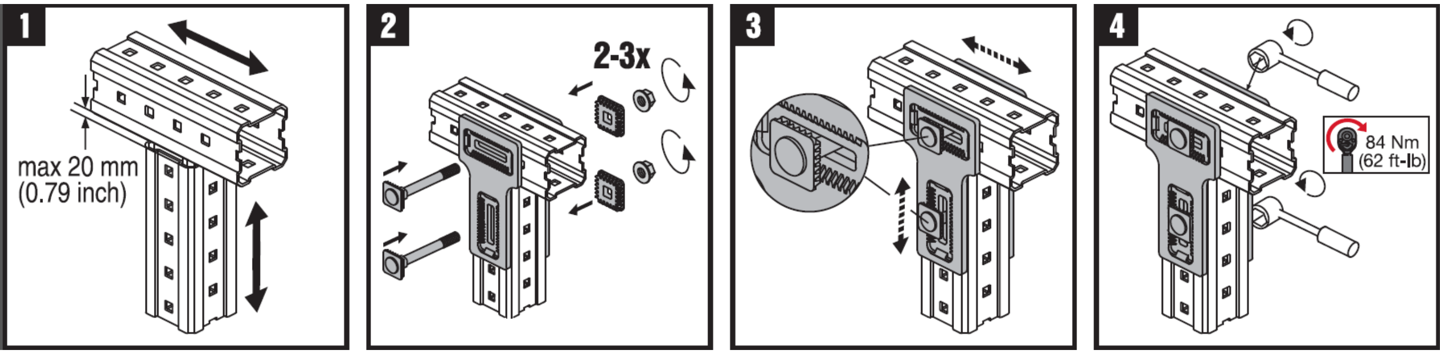
Weight:
2200 g incl. components

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.

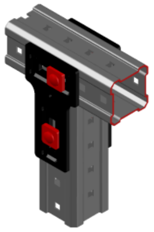
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Backing plate, Tooth plate: EN-GJMW-400-5 - DIN EN 1562, EN-GJMW-450-7 - DIN EN 1562	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-T Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

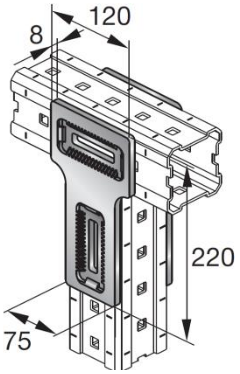
Standards and codes:

• 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

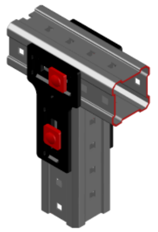
Software:
- Mathcad 15.0
- Microsoft Excel

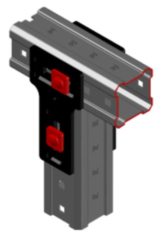
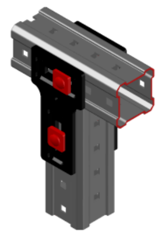
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



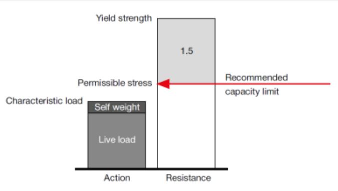
MIC-T Connector

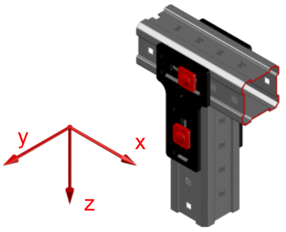
Standard		
		

Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all components **1x MIC-T** **304807** 	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



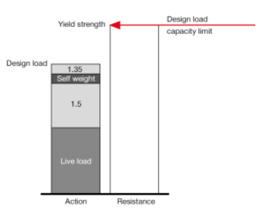


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
7.22	4.00	17.74

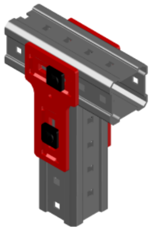
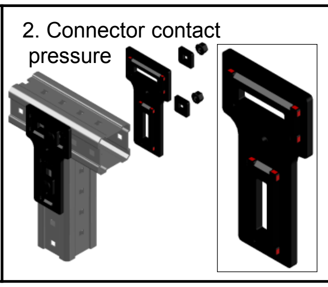
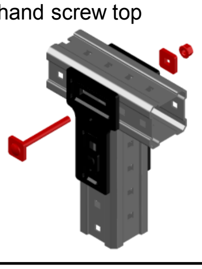
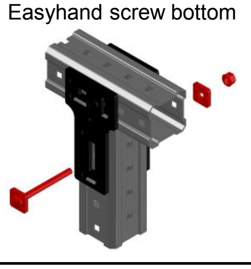
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



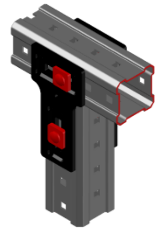
Limiting components of capacity evaluated in following tables:

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:

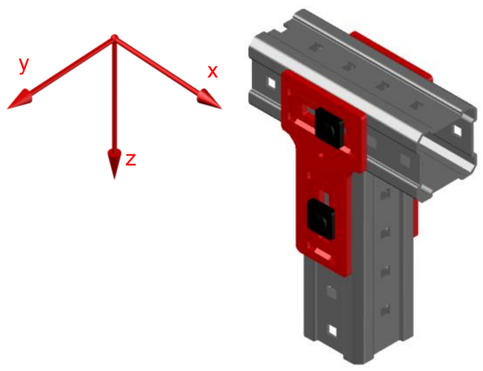
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

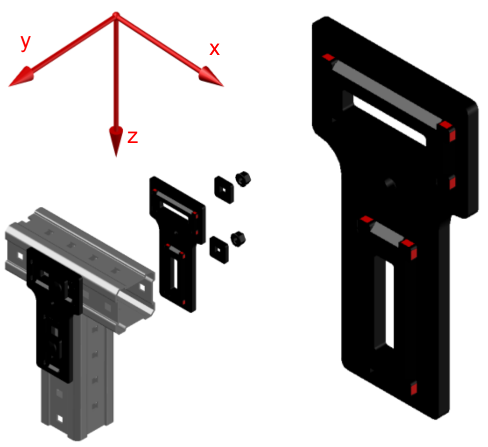


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
25.52	25.52	6.01	6.01	225.60	210.56
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.44	0.44	1.98	1.98	0.25	0.25

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. 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]
Not decisive	Not decisive	1.81	1.81	0.49	0.49

Interaction:

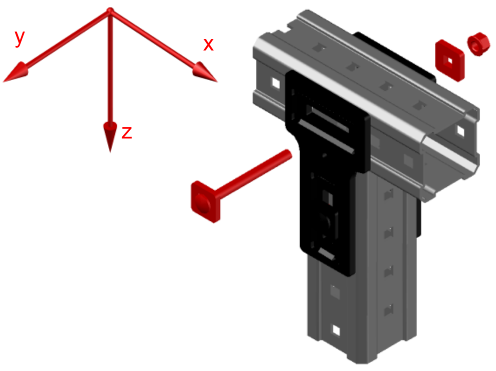
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-T Connector

Design loading capacity - 3D

3/3

3. Easyhand screw top



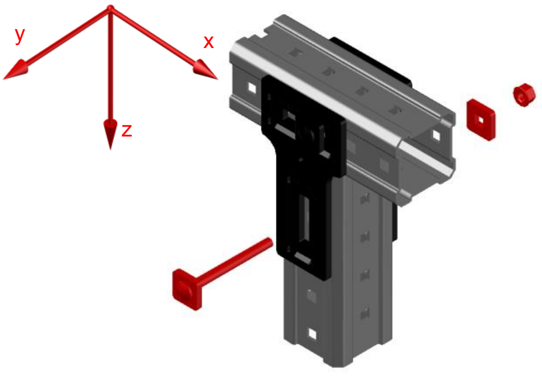
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.62	26.62	15.41	15.41	Not decisive	Not decisive
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.60	1.60	Not decisive	Not decisive	Not decisive	Not decisive

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

Interaction:

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

4. Easyhand screw bottom



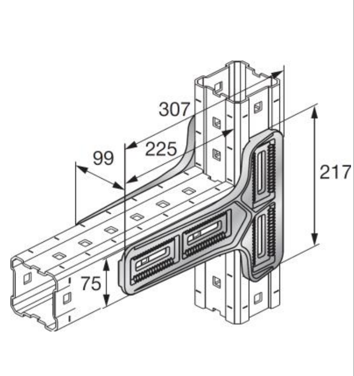
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
Not decisive	Not decisive	48.56	48.56	26.62	26.62
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.70	1.70	Not decisive	Not decisive	Not decisive	Not decisive

Interaction:

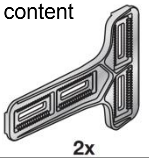
$$\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

MIC-90-LH Connector

Designation	Item number
MIC-90-LH	**2048107**



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461

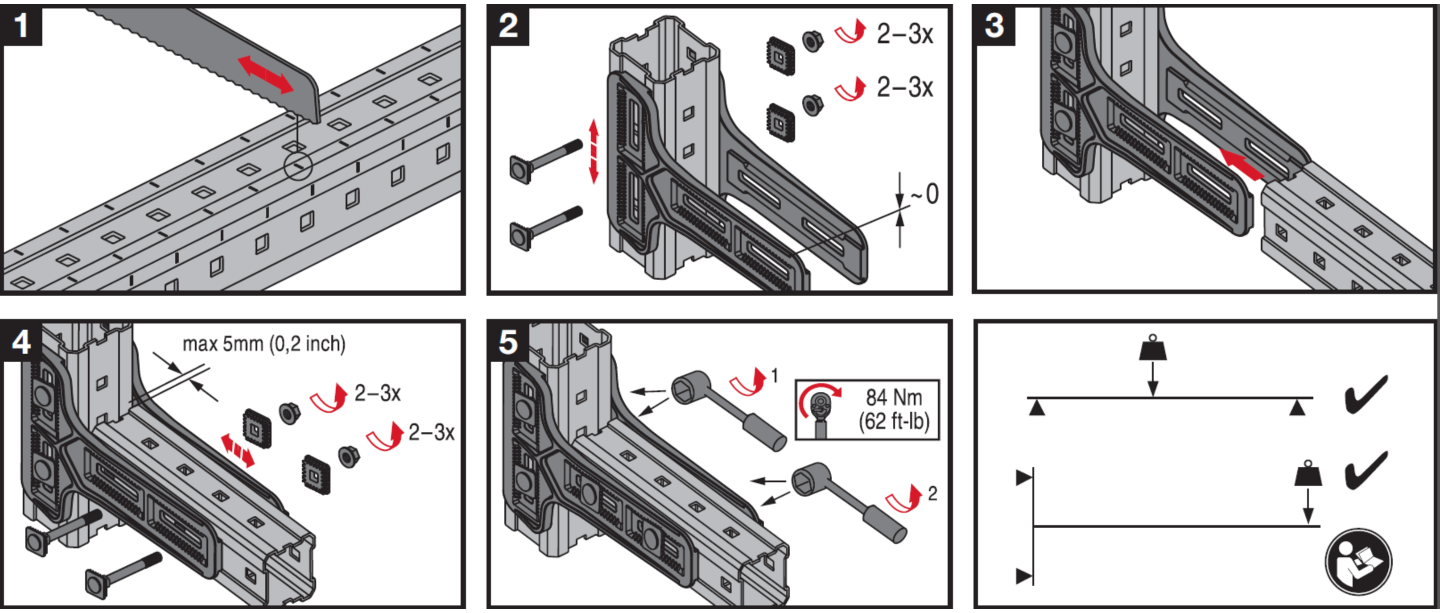
Weight:
3800 g

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

Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: C30-1.0528	$f_y = 250\ \frac{N}{mm^2}$	$f_u = 480\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$

Instruction For Use:



MIC-90-LH Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation
- Finite element analysis
- Hardware tests

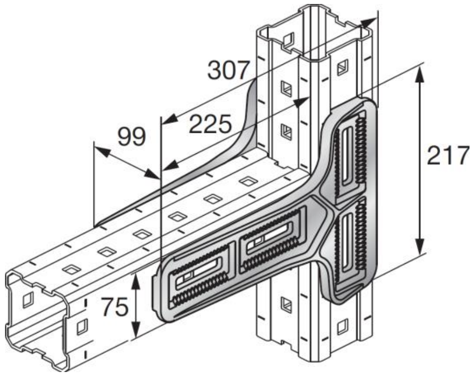
Standards and codes:

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

Software:
- Ansys 16.0
- Microsoft Excel

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

Simplified drawing:



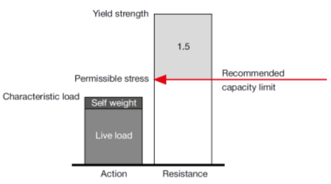
MIC-90-LH Connector

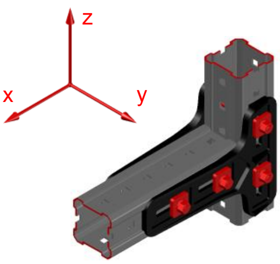
Standard

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

Recommended loading capacity - simplified for most common applications

Method



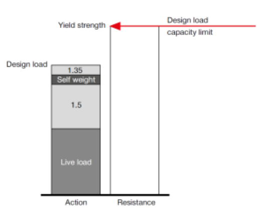


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
35.5	9.7	35.5
	±My,rec. [kNm]	
	3.83	

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

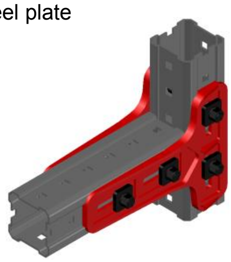
Design loading capacity - 3D 1/3

Method

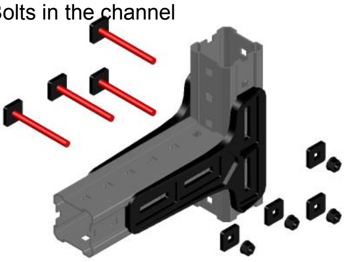


Limiting components of capacity evaluated in following tables:

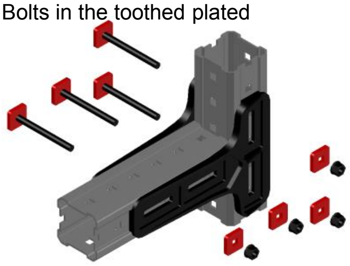
1. Connector steel plate



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

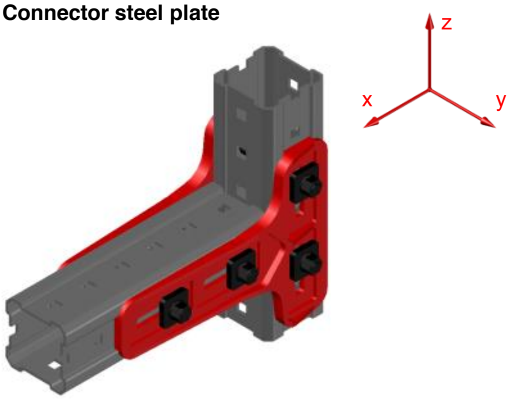
Standard		
		

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

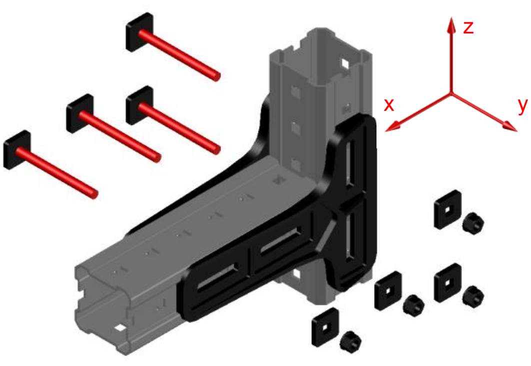


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.0	112.0	14.50	14.50	72.00	72.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.75	1.75	5.75	5.75	1.73	1.73

Interaction:

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

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

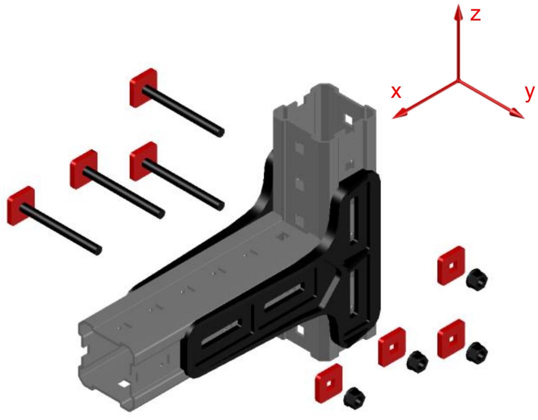
Interaction:

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

MIC-90-LH Connector

Design loading capacity - 3D 3/3

3. Bolts in the toothed plated



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

Interaction:

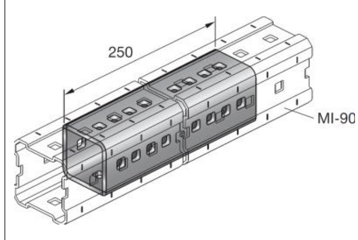
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} \leq 1$$

Data version 1.3 I Date 12.2016

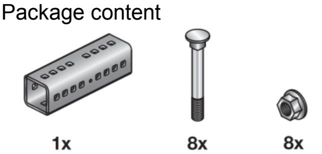
Data version 1.3 I Date 12.2016 | Page 1/4

MIC-90-E Connector

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



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

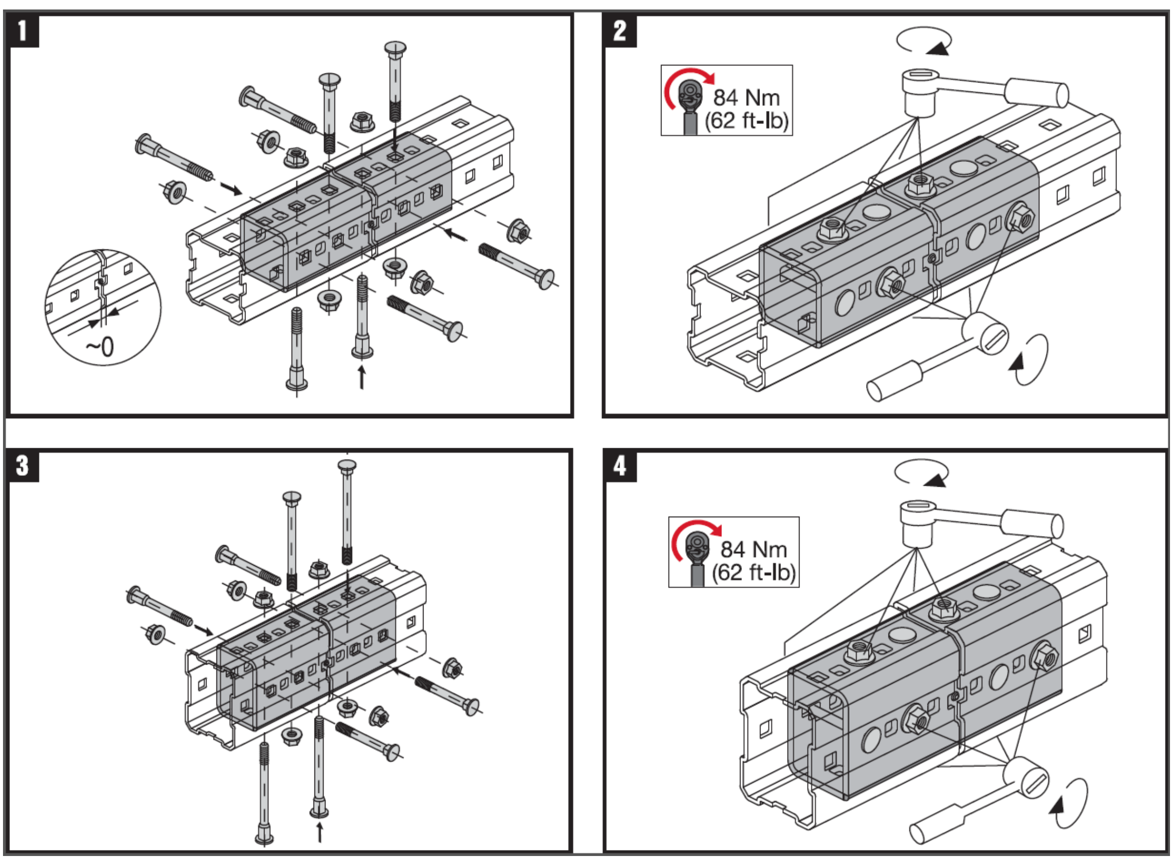
Weight:
3685 g incl. components

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.

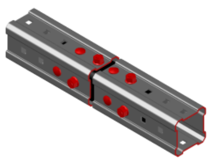
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-90-E Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

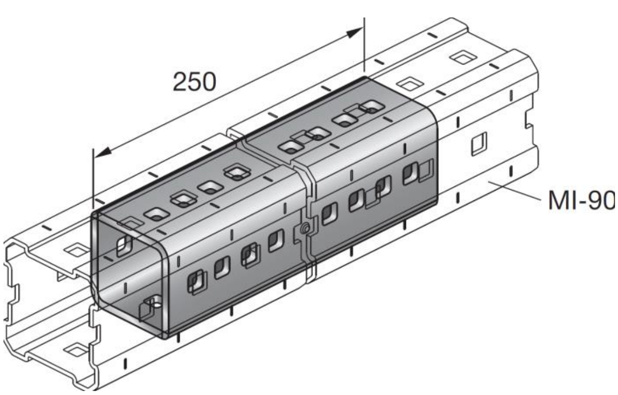
Standards and codes:

• 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

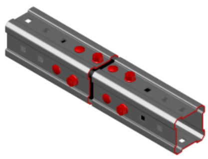
Software:
- Mathcad 15.0
- Microsoft Excel

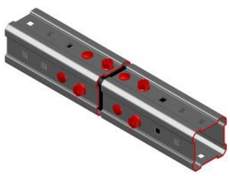
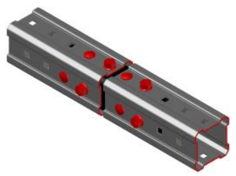
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



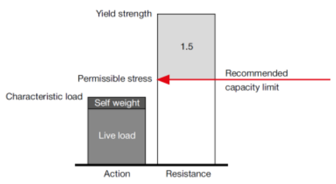
MIC-90-E Connector

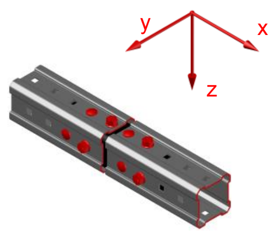
Standard		
		

Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all components **1x MIC-90-E** **304809** 	Connector used for extension of MI-90 girders 

Recommended loading capacity - simplified for most common applications

Method



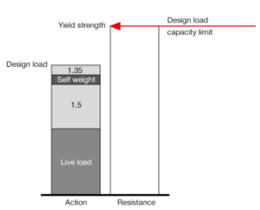


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
92.0	48.4	48.4
	±My,rec [kNm]	
	1.7	

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

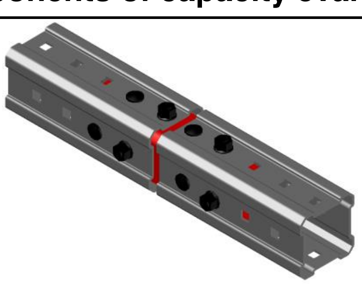
Design loading capacity - 3D 1/2

Method

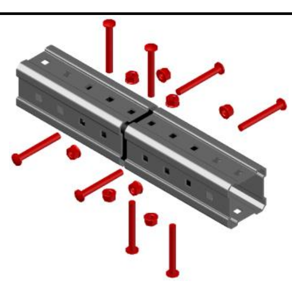


Limiting components of capacity evaluated in following tables:

1. Steel connector

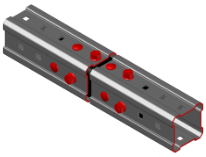


2. One hand bolts



MIC-90-E Connector

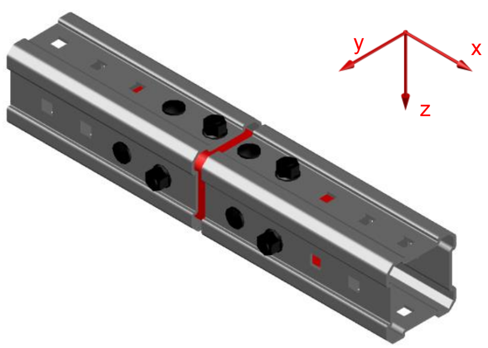
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

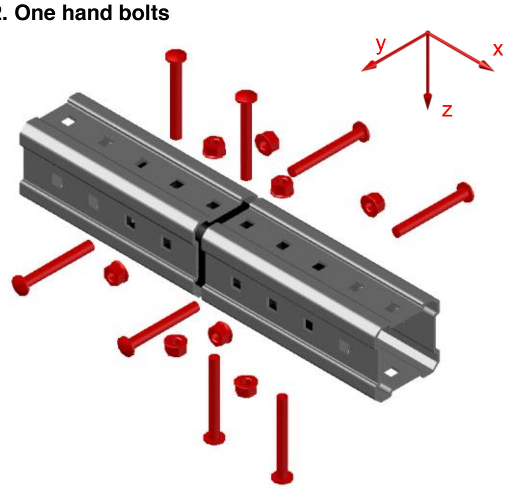


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
304.40	304.40	89.68	89.68	89.68	89.68
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.56	5.56	6.26	6.26	6.26	6.26

Interaction:

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

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:

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

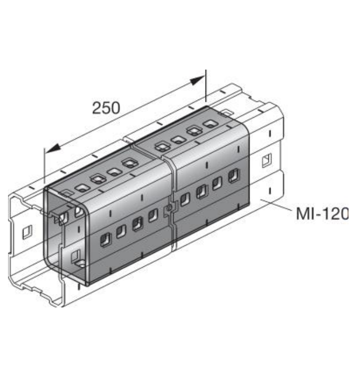
MIC-120-E Connector

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

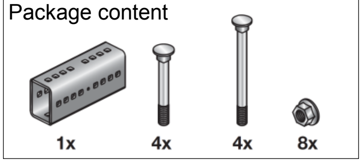
Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

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.



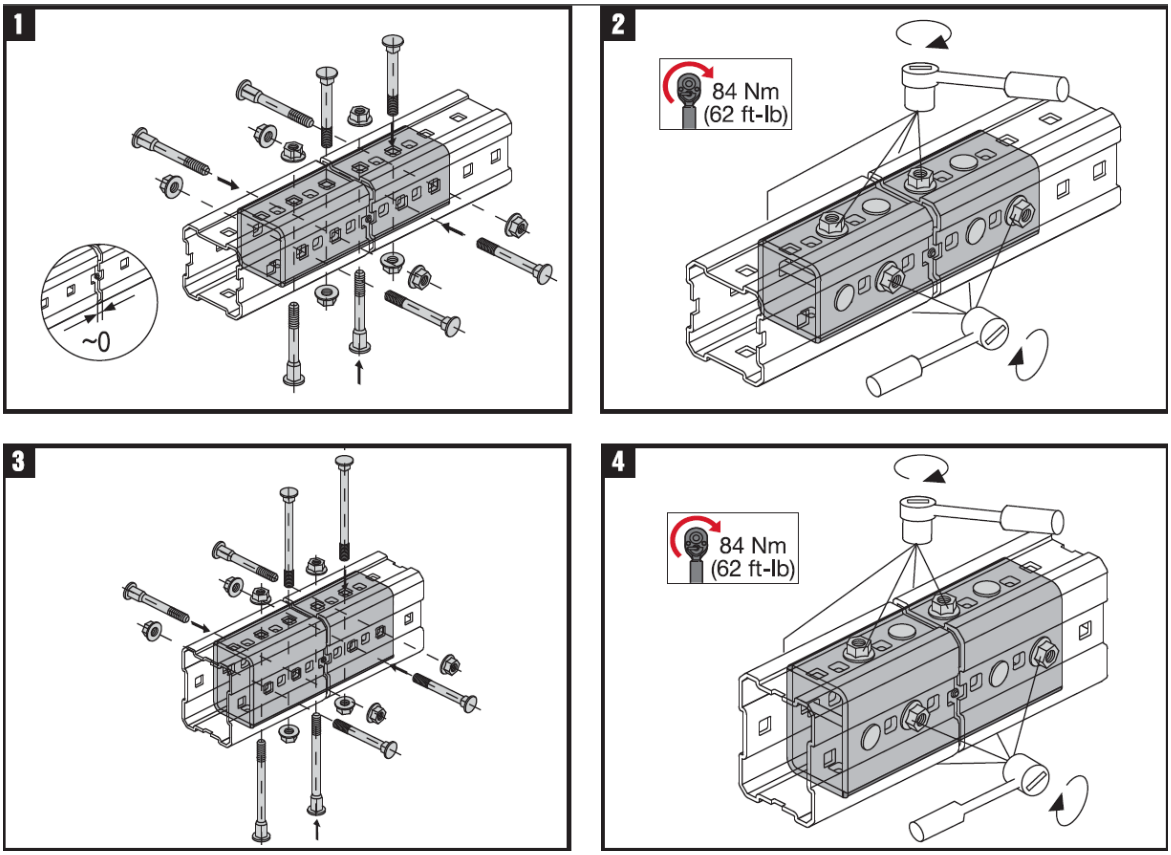
Package content



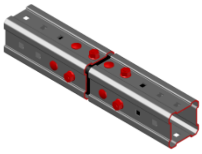
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-120-E Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

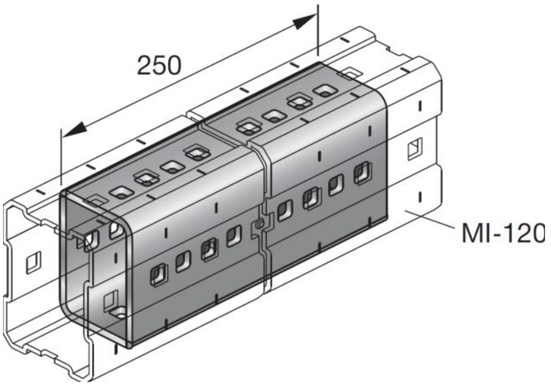
Standards and codes:

• 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

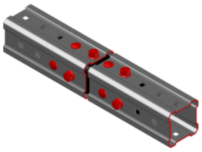
Software:
- Mathcad 15.0
- Microsoft Excel

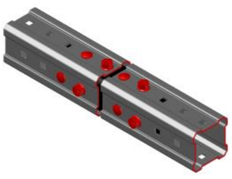
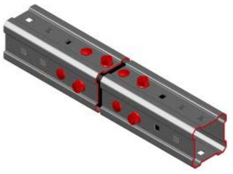
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



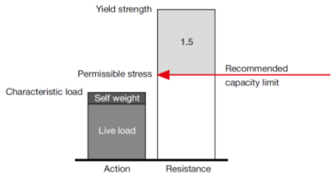
MIC-120-E Connector

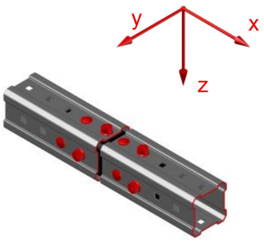
Standard		
		

Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all components **1x MIC-120-E 304810** 	Connector used for extension of MI-120 girder 

Recommended loading capacity - simplified for most common applications

Method



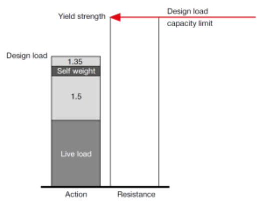


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
100.0	55.3	55.3
	±My,rec. [kNm]	
	2.5	

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

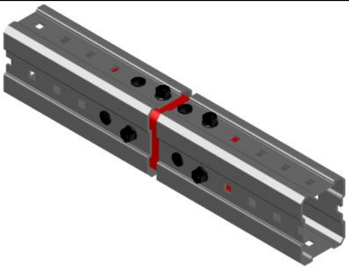
Design loading capacity - 3D 1/2

Method

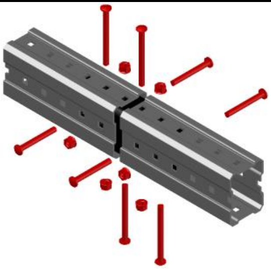


Limiting components of capacity evaluated in following tables:

1. Steel connector



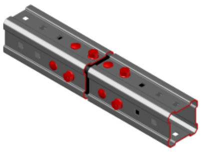
2. One hand bolts



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

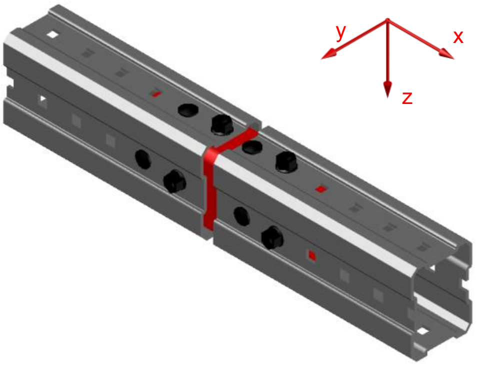
Standard		
		

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

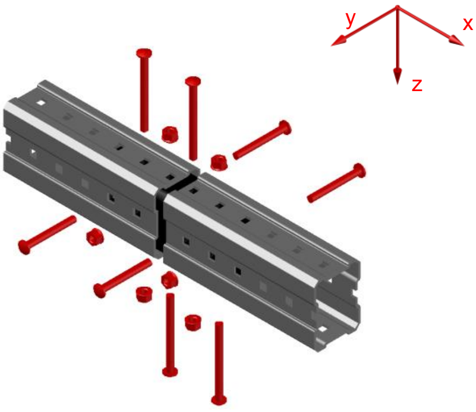


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
392.45	392.45	105.50	105.50	152.72	152.72
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
8.46	8.46	10.47	10.47	8.74	8.74

Interaction:

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

2. One hand bolts



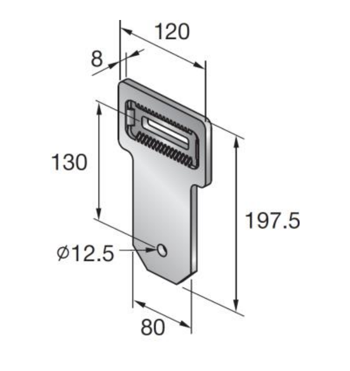
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
149.97	149.97	82.94	82.94	82.94	82.94
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
7.17	7.17	3.79	3.79	2.70	2.70

Interaction:

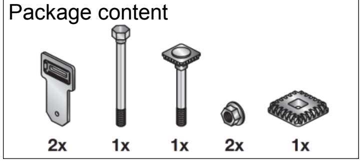
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-U-MA Connector

Designation	Item number
MIC-U-MA	**304806**



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Backing plate, Tooth plate, Bolt, Nut 45 µm - DIN EN ISO 1461

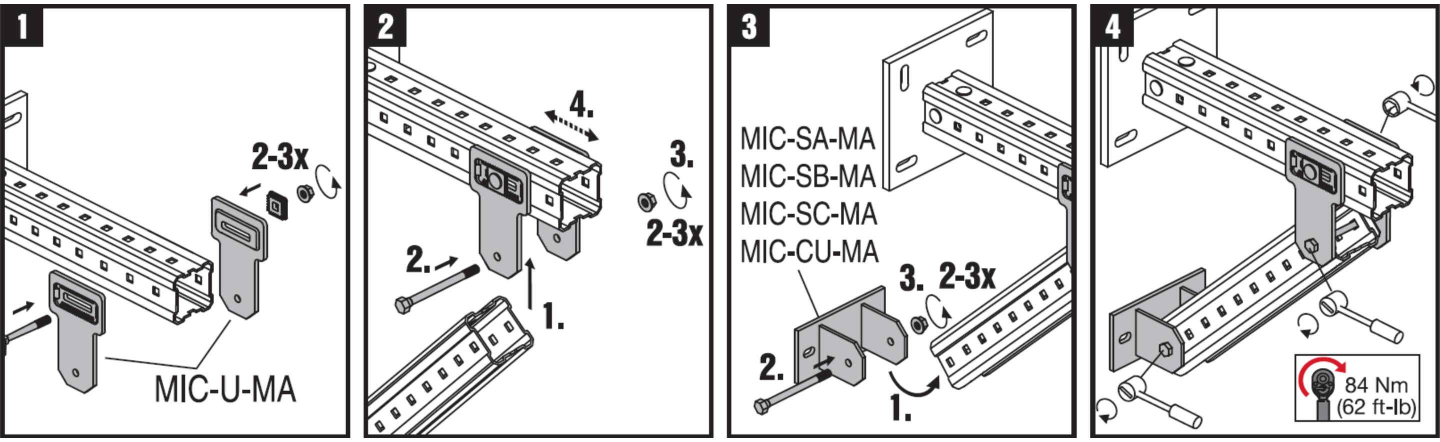
Weight:
2630 g incl. components

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
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Backing plate, Tooth plate: EN-GJMW-400-5 - DIN EN 1562, EN-GJMW-450-7 - DIN EN 1562	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-U-MA Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

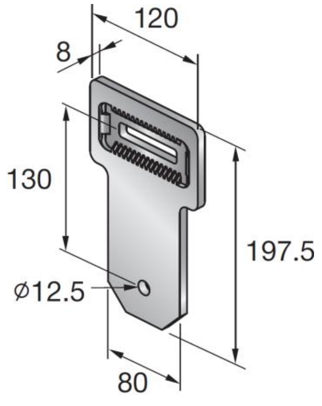
Standards and codes:

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

Software:
- Mathcad 15.0
- Microsoft Excel

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

Simplified drawing:



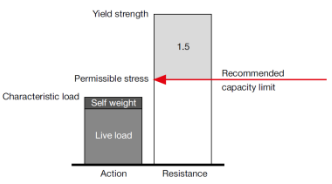
MIC-U-MA Connector

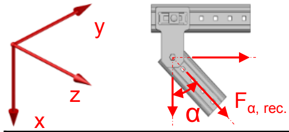
Standard		
		

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

Recommended loading capacity - simplified for most common applications

Method





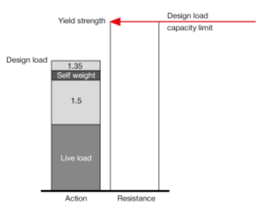
$\pm F_{y,rec.}$ [kN]
1.4

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [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:

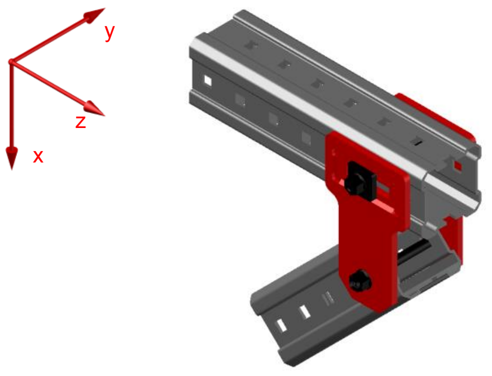
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

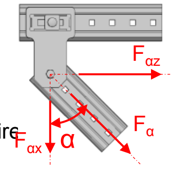


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
40.32	40.32	2.11	2.11	13.96	13.96
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.63	0.63	0.00	0.00	0.00	0.00

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

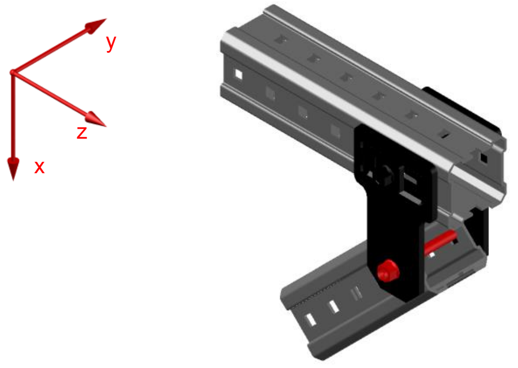
$F_{\alpha xEd}=F_\alpha * \cos\alpha$ and $F_{\alpha zEd}=F_\alpha * \sin\alpha$

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



Note: The torsional moment Mx is referred to the local x-dire
inclined profile.

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

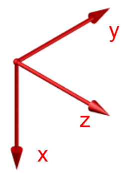
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$
includes shear and bending of the bolt, bearing resistance connector plate and channel MI90
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.
The normal force $F_{\alpha Ed}$ in the inclined strut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

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

MIC-U-MA Connector

Design loading capacity - 3D 3/3

3. 3. Easy hand screw on 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

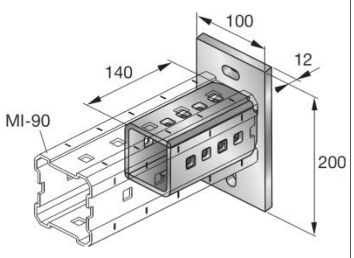
includes shear, tension and bending of the bolt, bearing resistance channel MI90 and tooth plate

Interaction:

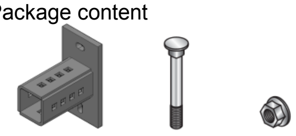
$$\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \le 1$$

MIC-C90-AA Base Material Connector - Concrete

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



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

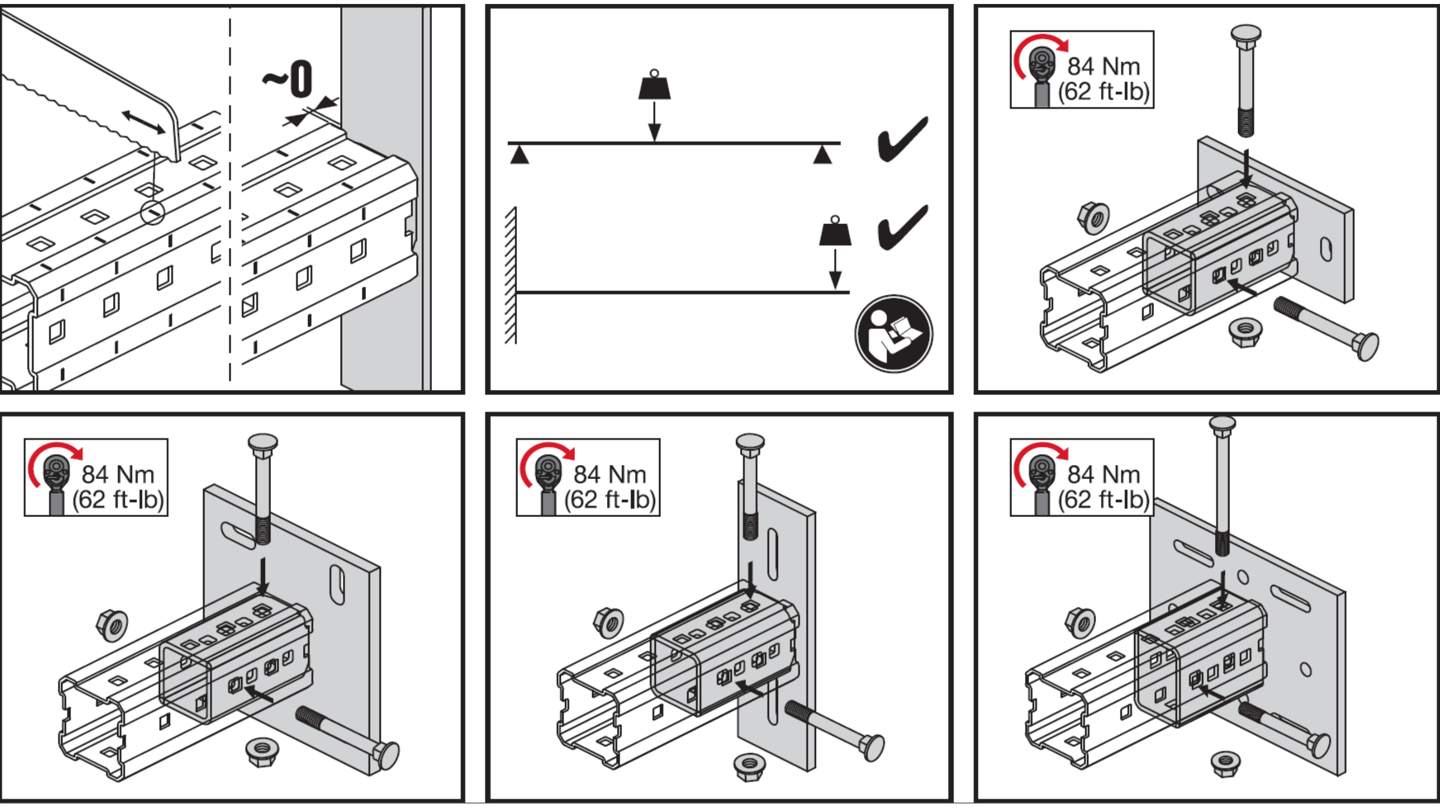
Weight:
3490 g incl. components

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.

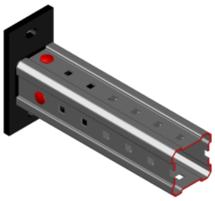
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235\ \frac{N}{mm^2}$	$f_u = 360\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640\ \frac{N}{mm^2}$	$f_u = 800\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$

Instruction For Use:



MIC-C90-AA Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

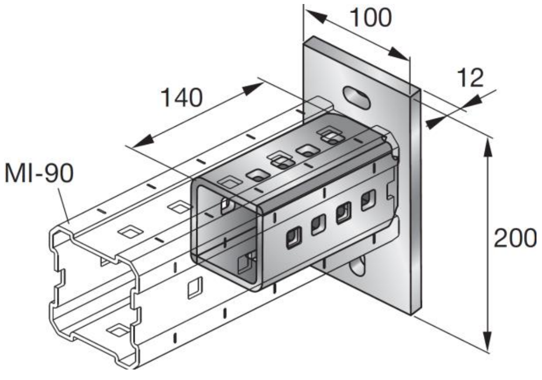
Methodology:
- Analytic calculation

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

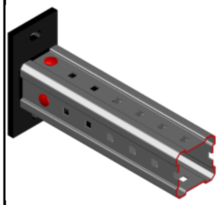
Software:
- Mathcad 15.0
- Microsoft Excel

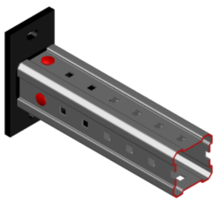
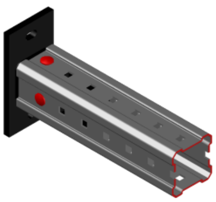
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



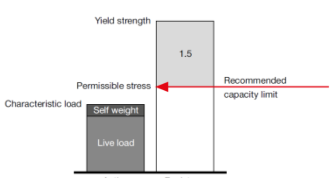
MIC-C90-AA Base Material Connector - Concrete

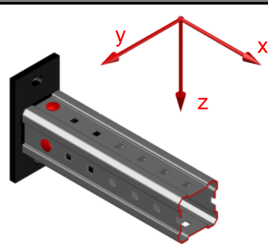
Standard		
		

Loading case: Standard	Combinations covered by loading case
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 	Baseplate connector used for a perpendicular connection of an MI-90 girder to concrete 

Recommended loading capacity - simplified for most common applications

Method



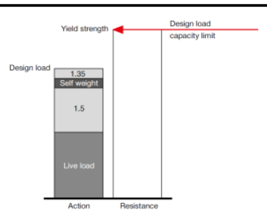


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
19.8	24.2	24.2

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

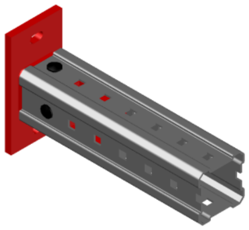
Design loading capacity - 3D 1/3

Method

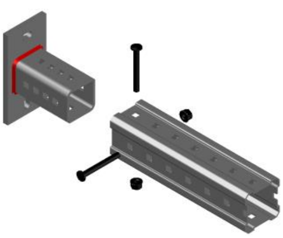


Limiting components of capacity evaluated in following tables:

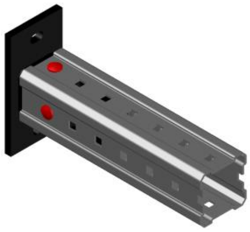
1. Steel connector



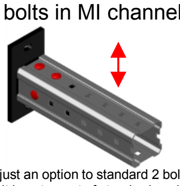
2. Welds



3. 2x bolts in MI channel



4. 3x bolts in MI channel

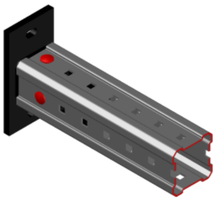


3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

MIC-C90-AA Base Material Connector - Concrete

Conditions of the loading capacity tables:

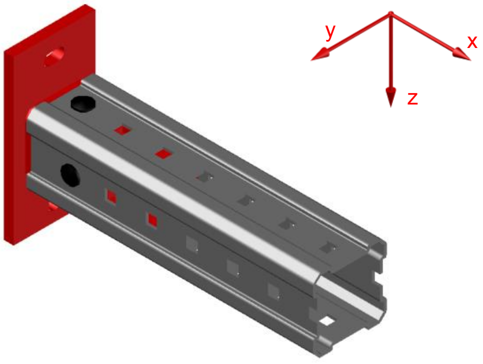
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

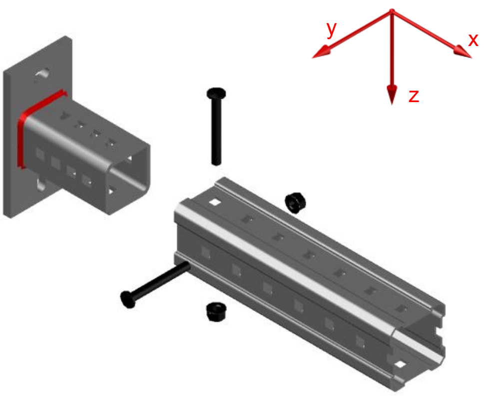


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
29.68	112.79	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
4.10	4.10	2.41	2.41	1.22	1.22

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

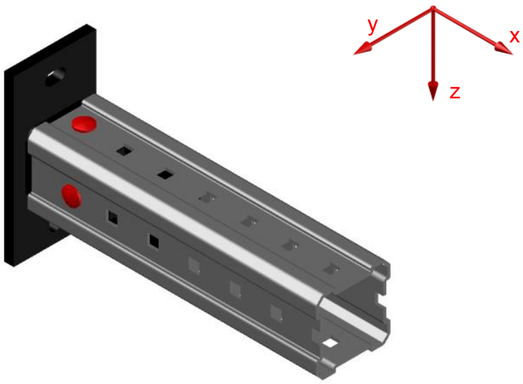
Interaction:

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

MIC-C90-AA Base Material Connector - Concrete

Design loading capacity - 3D 3/3

3. 2x bolts in MI channel

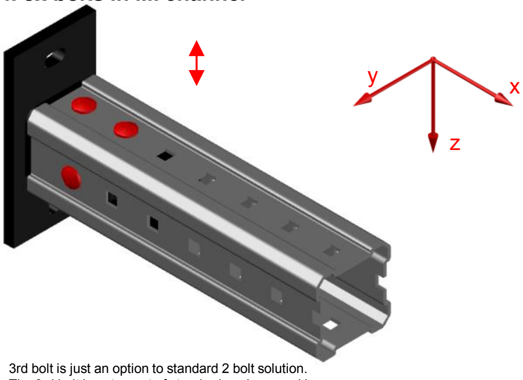


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.29	36.29	36.29	36.29
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.61	2.61	1.24	1.24	1.24	1.24

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.

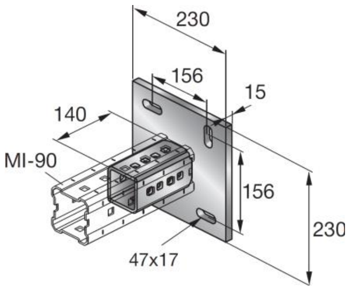
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
3.92	3.92	2.48	2.48	1.24	1.24

Interaction:

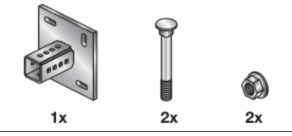
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-C90-D Base Material Connector - Concrete

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



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

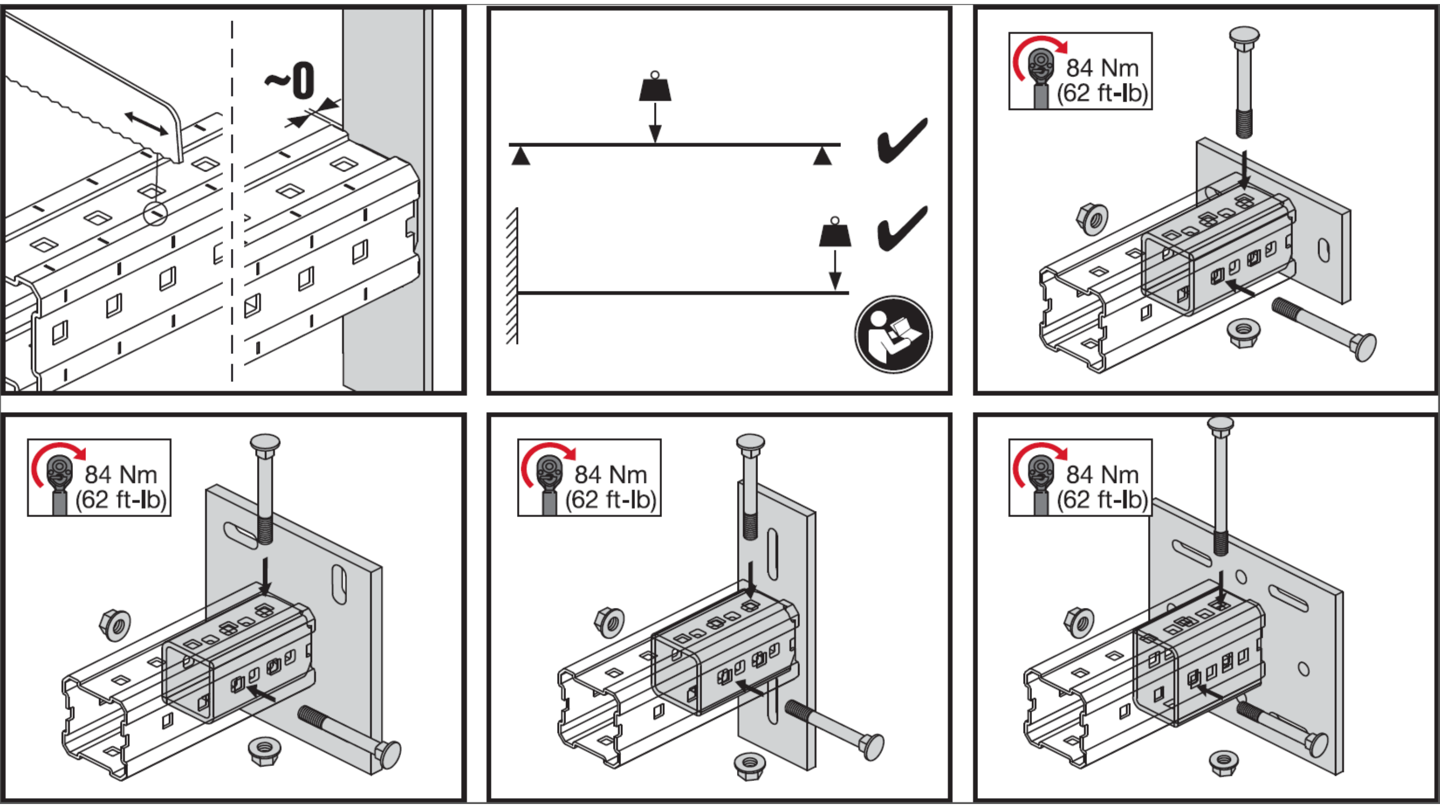
Weight:
7840 g incl. components

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.

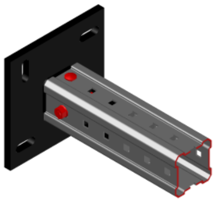
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-C90-D Base Material   Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

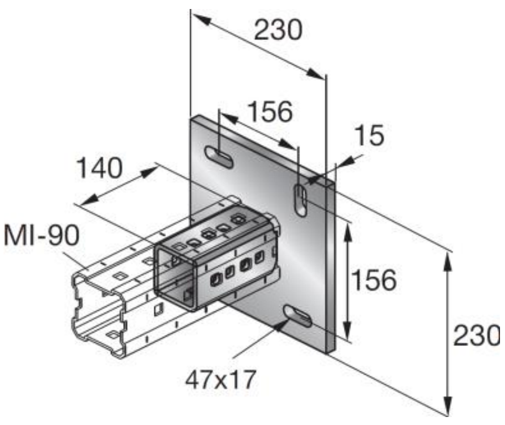
Standards and codes:

•	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

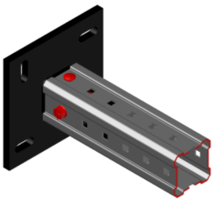
Software:
- Mathcad 15.0
- Microsoft Excel

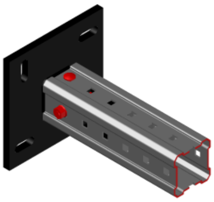
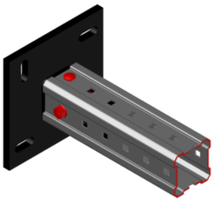
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



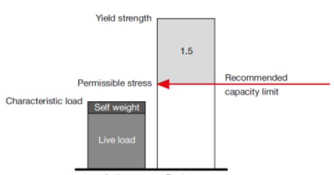
MIC-C90-D Base Material Connector - Concrete

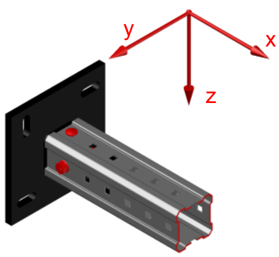
Standard		
		

Loading case: Standard	Combinations covered by loading case
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 	Baseplate connector used for a perpendicular connection of an MI-90 girder to concrete 

Recommended loading capacity - simplified for most common applications

Method



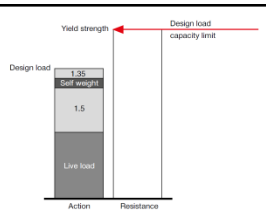


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
29.3	24.2	24.2

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

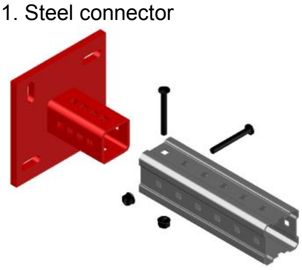
Design loading capacity - 3D 1/3

Method

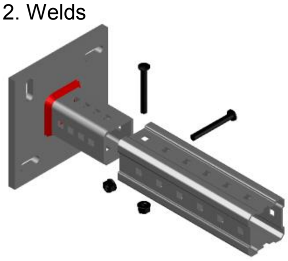


Limiting components of capacity evaluated in following tables:

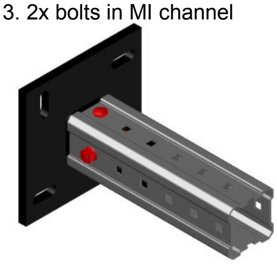
1. Steel connector



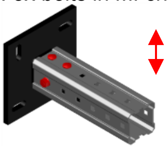
2. Welds



3. 2x bolts in MI channel



4. 3x bolts in MI channel

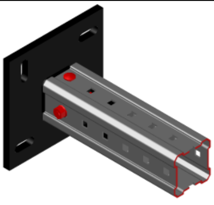


3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

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

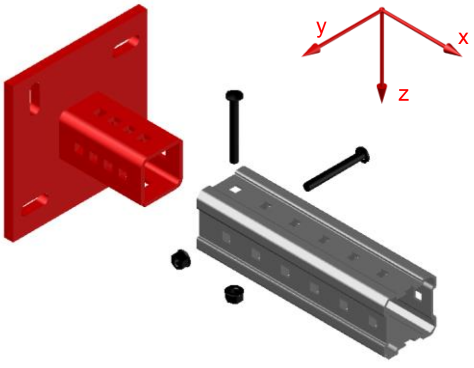
Standard		
		

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

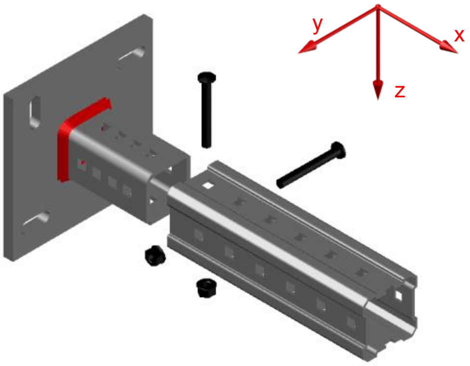


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
44.00	148.20	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.24	4.24	4.15	4.15	4.15	4.15

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

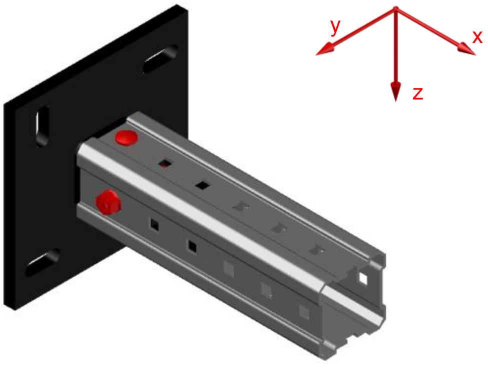
Interaction:

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

MIC-C90-D Base Material Connector - Concrete

Design loading capacity - 3D 3/3

3. 2x bolts in MI channel

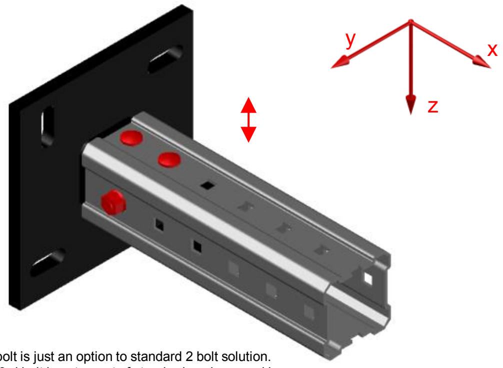


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.61	2.61	1.24	1.24	1.24	1.24

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



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:

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

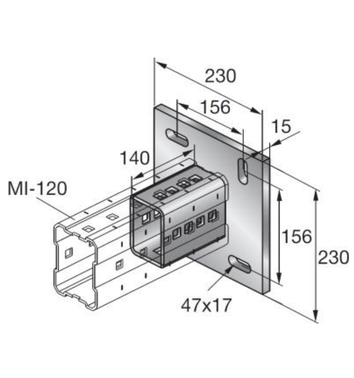
MIC-C120-D Base Material Connector - Concrete

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

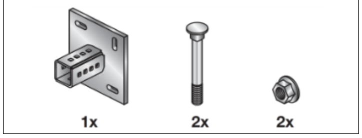
Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

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.



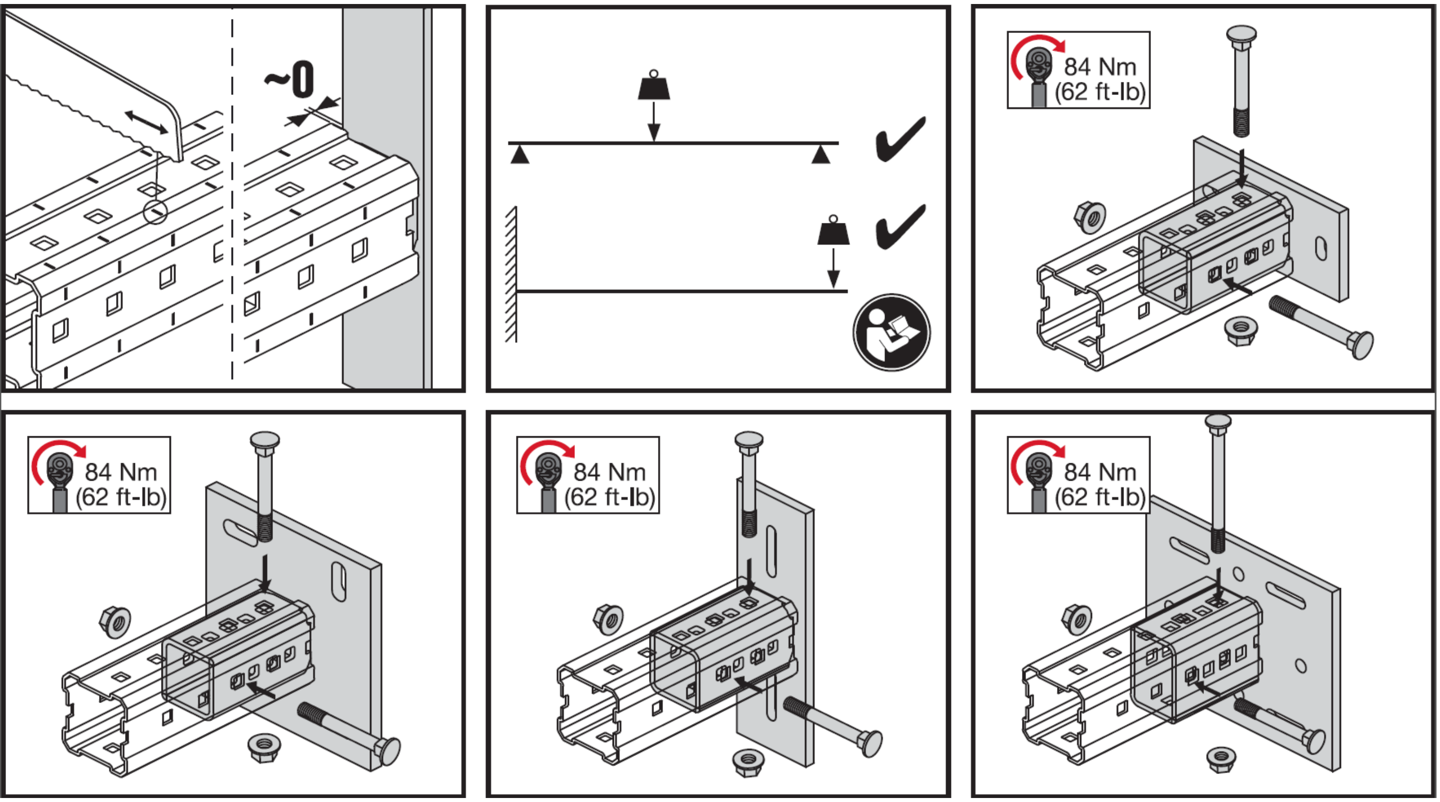
Package content



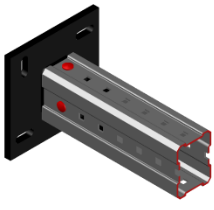
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-C120-D Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

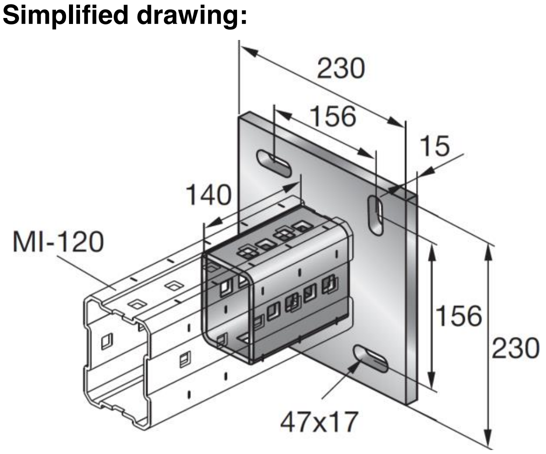
Standards and codes:

• 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

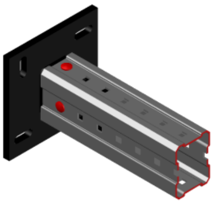
Software:
- Mathcad 15.0
- Microsoft Excel

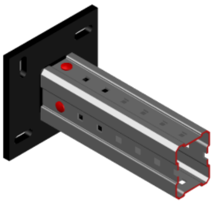
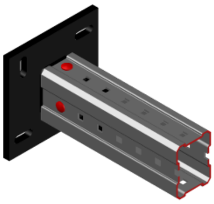
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



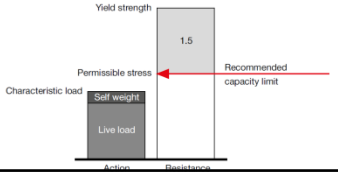
MIC-C120-D Base Material Connector - Concrete

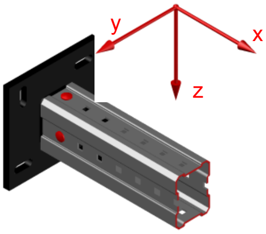
Standard		
		

Loading case: Standard	Combinations covered by loading case
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 	Baseplate connector used for a perpendicular connection of an MI-90 girder to concrete 

Recommended loading capacity - simplified for most common applications

Method



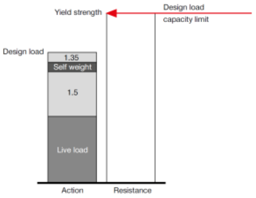


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
31.6	27.6	27.6

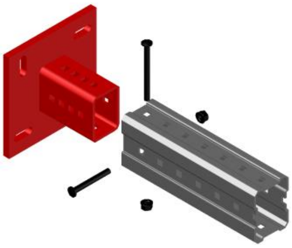
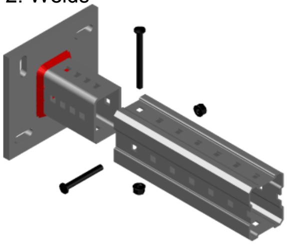
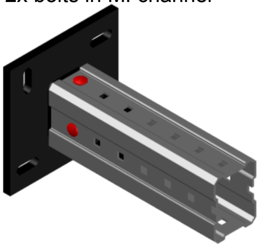
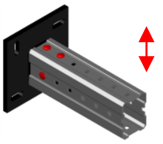
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



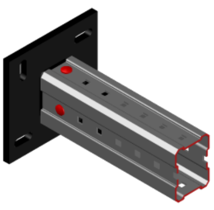
Limiting components of capacity evaluated in following tables:

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

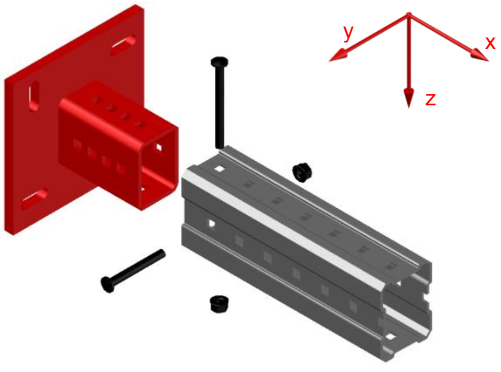
Standard		
		

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

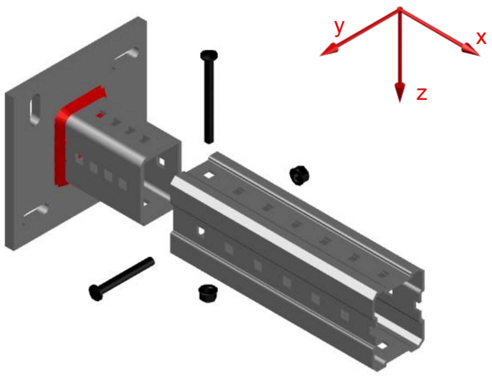


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
47.50	186.43	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
6.78	6.78	4.55	4.55	2.35	2.35

Interaction:

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

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

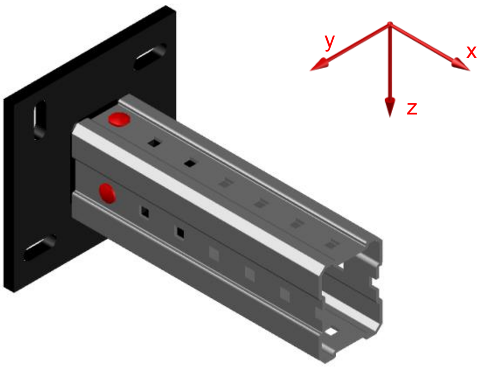
Interaction:

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

MIC-C120-D Base Material Connector - Concrete

Design loading capacity - 3D 3/3

3. 2x bolts in MI channel

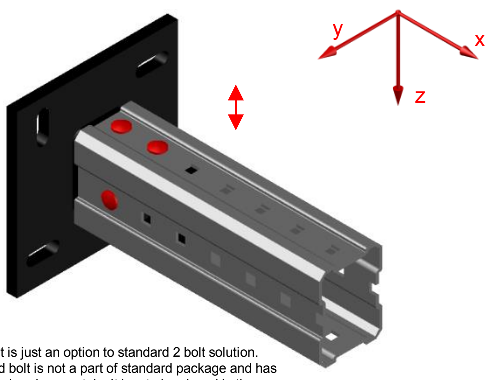


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
3.59	3.59	1.90	1.90	1.35	1.35

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.

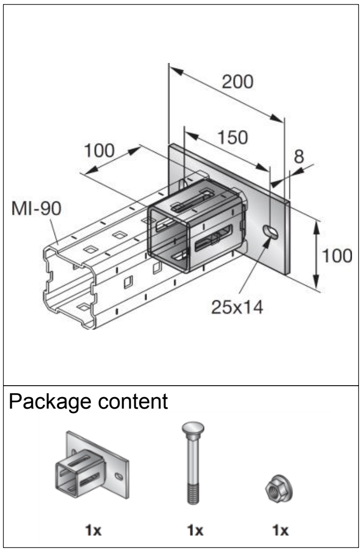
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.53	112.53	82.94	82.94	41.47	41.47
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.68	5.68	3.79	3.79	1.35	1.35

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:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

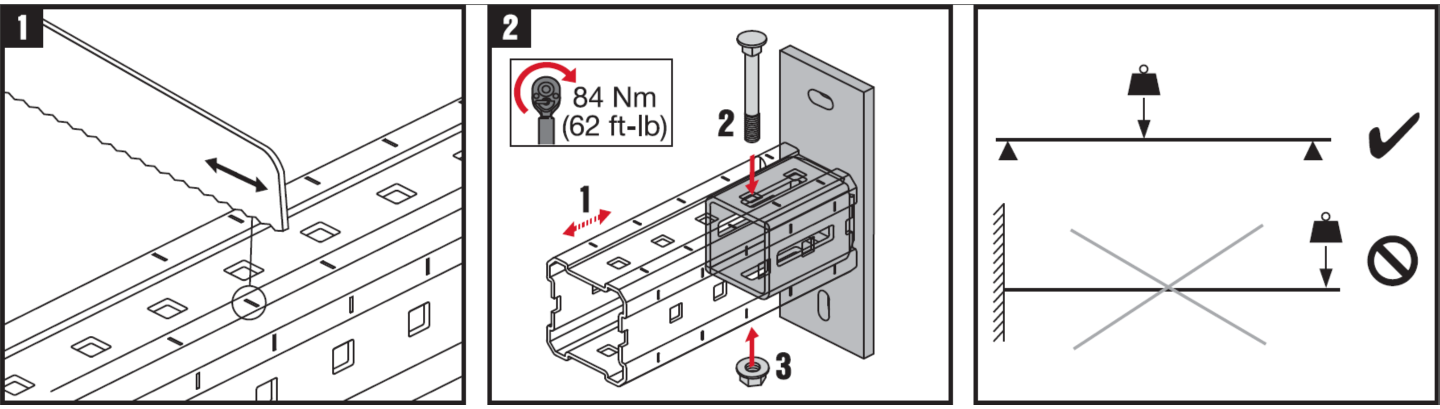
Weight:
2450 g incl. components

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.

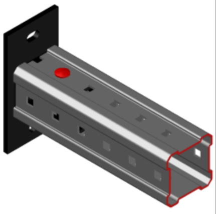
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-C90-U Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

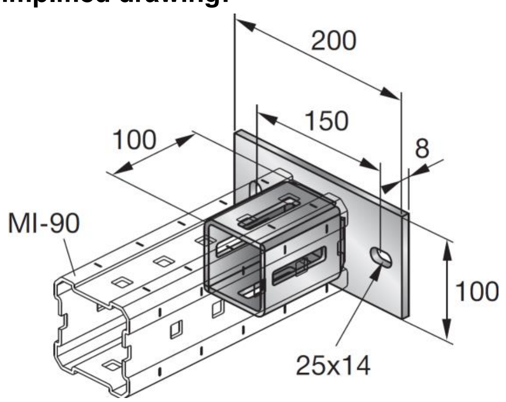
Standards and codes:

• 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

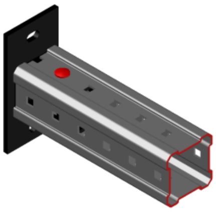
Software:
- Mathcad 15.0
- Microsoft Excel

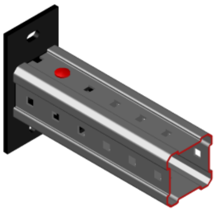
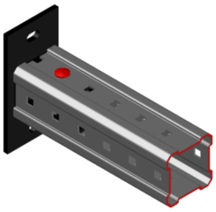
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



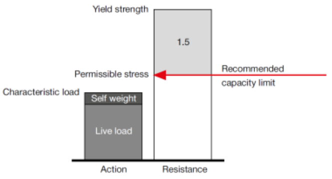
MIC-C90-U Base Material Connector - Concrete

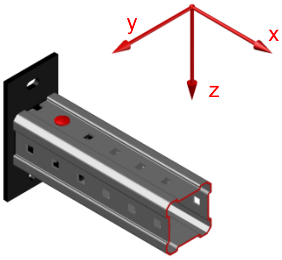
Standard		
		

Loading case: Standard	Combinations covered by loading case
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 	Baseplate connector used for a perpendicular connection of an MI-90 girder to concrete 

Recommended loading capacity - simplified for most common applications

Method



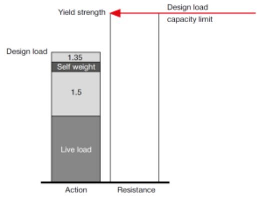


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
2.22	24.2	17.00

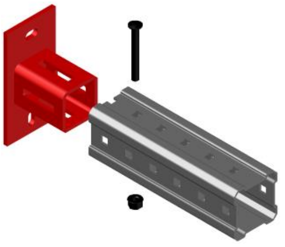
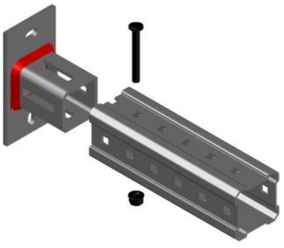
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



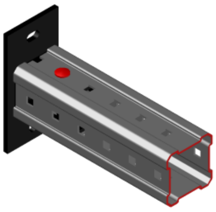
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. bolt in MI channel
		

MIC-C90-U Base Material Connector - Concrete

Conditions of the loading capacity tables:

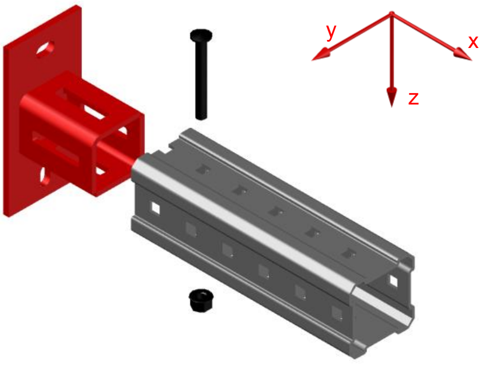
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

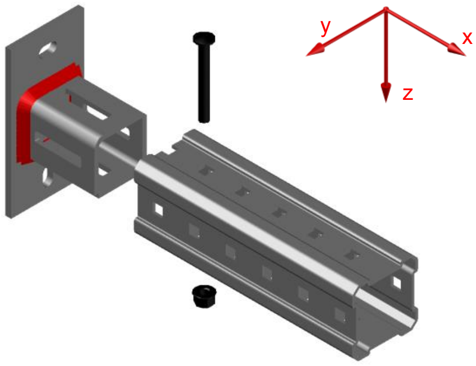


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
13.19	93.32	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.10	4.10	0.00	0.00	0.00	0.00

Interaction:

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

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	0.00	0.00	0.00	0.00

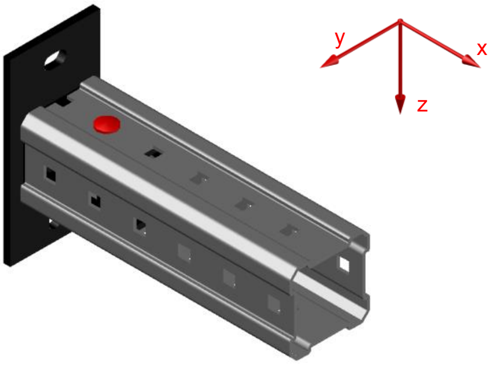
Interaction:

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

MIC-C90-U Base Material Connector - Concrete

Design loading capacity - 3D 3/3

3. bolt in MI channel



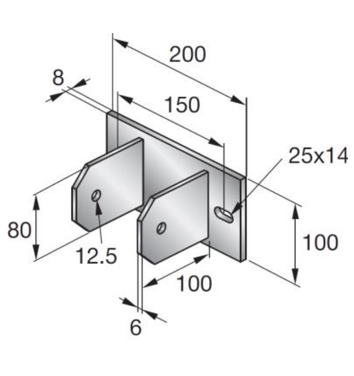
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
3.33	3.33	36.29	36.29	Not decisive	Not decisive
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.20	1.20	0.00	0.00	0.00	0.00

Interaction:

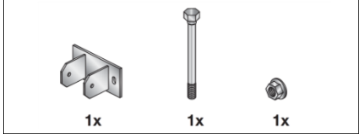
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

MIC-CU-MA Base Material Connector - Concrete

Designation	Item number
MIC-CU-MA	**304828**



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

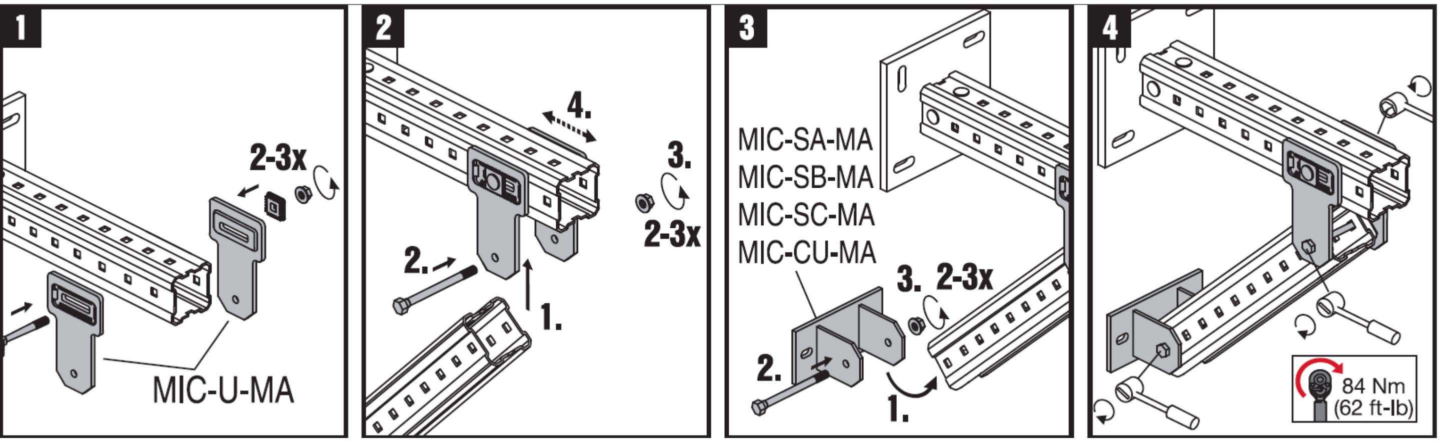
Weight:
2210 g incl. components

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.

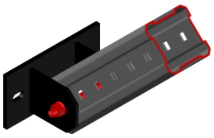
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235\ \frac{N}{mm^2}$	$f_u = 360\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640\ \frac{N}{mm^2}$	$f_u = 800\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$

Instruction For Use:



MIC-CU-MA Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

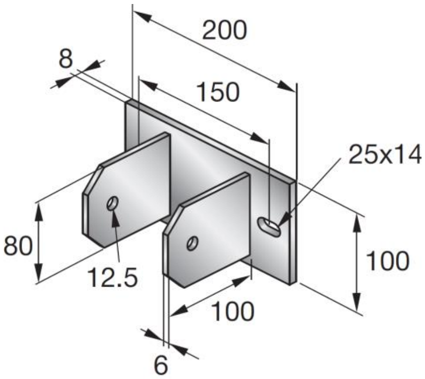
Standards and codes:

• 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

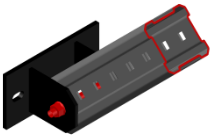
Software:
- Mathcad 15.0
- Microsoft Excel

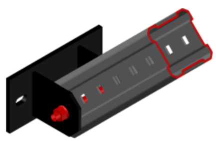
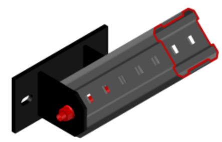
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



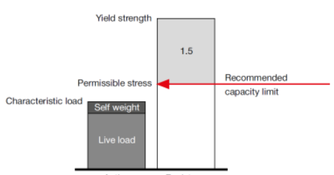
MIC-CU-MA Base Material Connector - Concrete

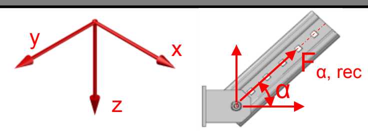
Standard		
		

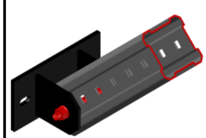
Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all components **1x MIC-CU-MA 304828** Associated anchors* for cracked concrete **2x HST3 M12x105 30/10 2105718** **HST2 M12x105/10 2107848** *Anchors not incl. in capacity limits 	Baseplate connector used for an angled connection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

Recommended loading capacity - simplified for most common applications

Method







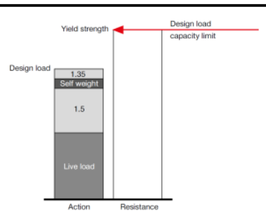
±Fy,rec. [kN]
2.1

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	16.93	8.76	7.64	7.21	7.93

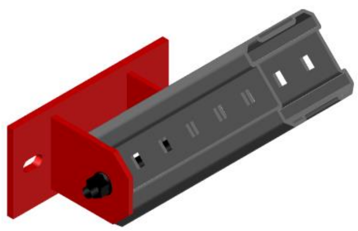
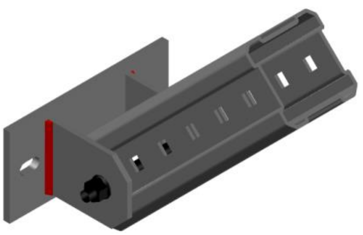
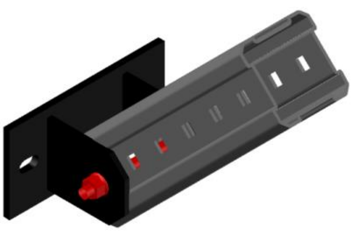
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



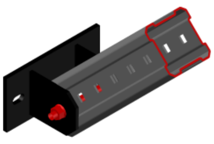
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. bolt in MI channel
		

MIC-CU-MA Base Material Connector - Concrete

Conditions of the loading capacity tables:

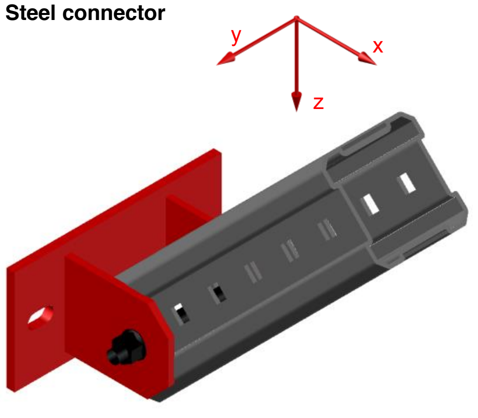
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

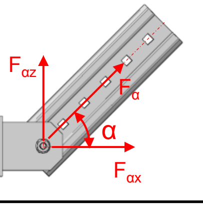


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
25.39	104.01	3.22	3.22	11.90	11.90
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.58	0.58	0.00	0.00	0.00	0.00

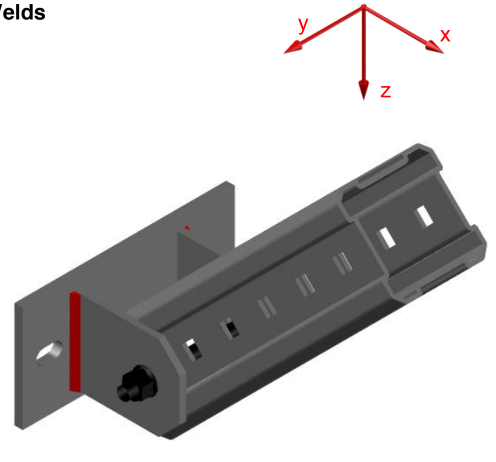
Interaction:

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

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



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:

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

with

ex=0.07m

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

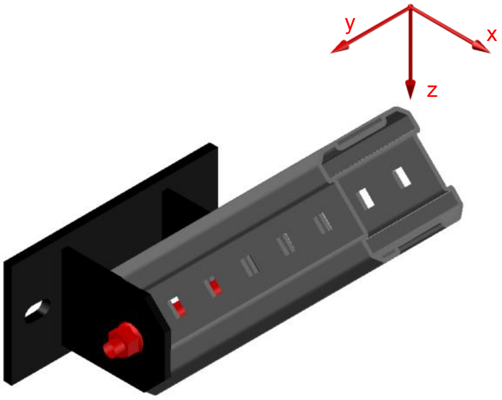
$F_{z.Ed.\alpha}=F_{\alpha}*\sin\alpha$ --> $\mathbf{M_{y.Ed.\alpha}=F_{z.Ed.\alpha}*e_x}$

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

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:

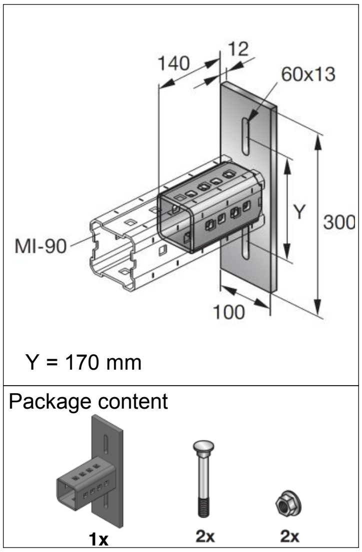
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

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 $F_{\alpha Rd}$.

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

MIC-S90-AA Base Material Connector - Steel

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



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

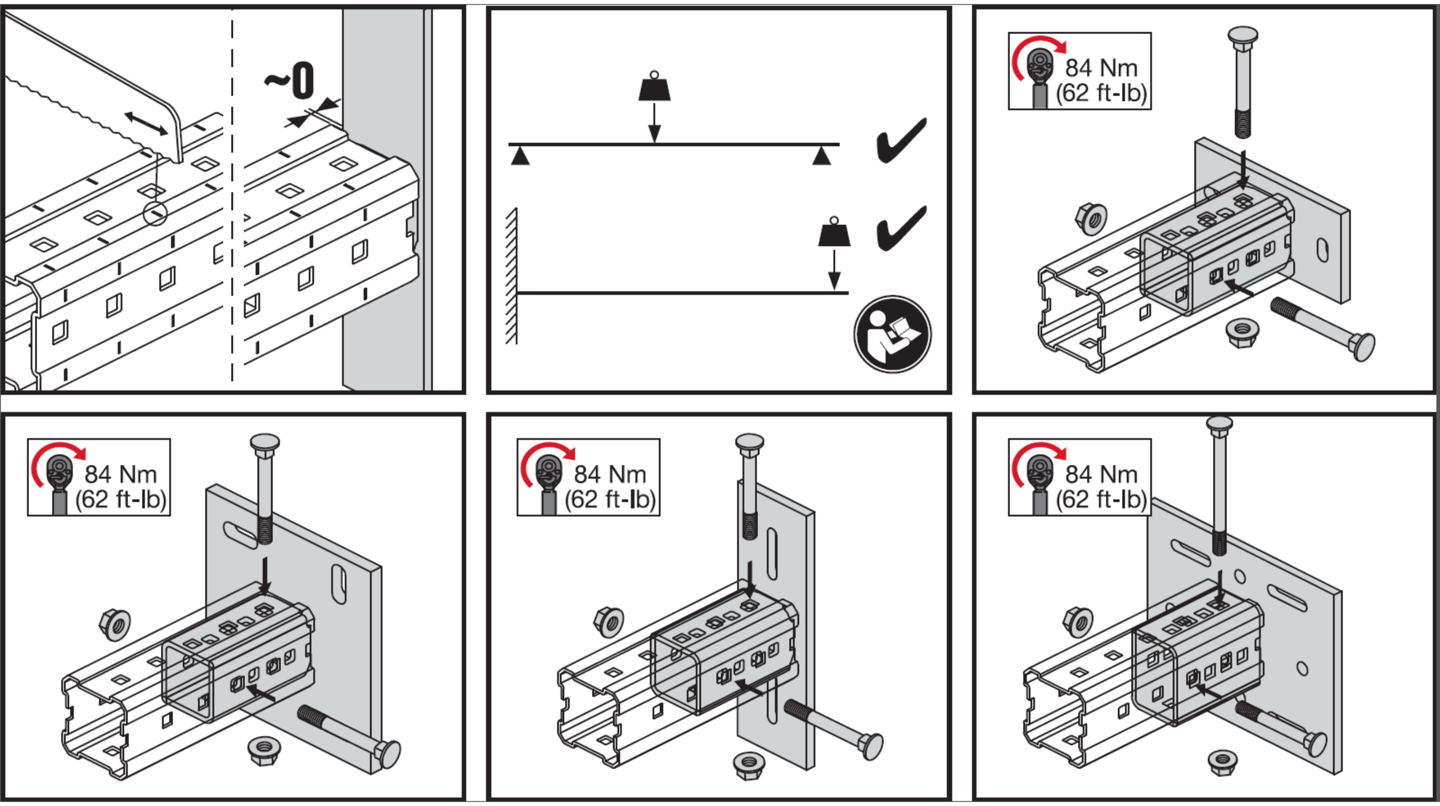
Weight:
4370 g incl. components

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.

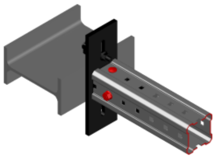
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-S90-AA Base Material Connector - Steel

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

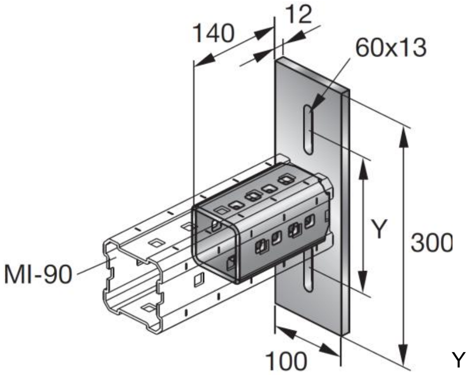
Standards and codes:

• 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

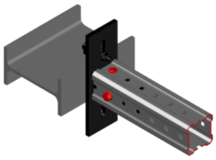
Simplified drawing:



Y = 170 mm

MIC-S90-AA Base Material Connector - Steel

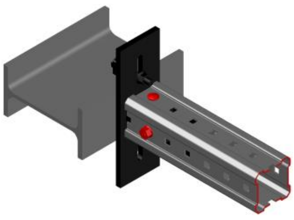
Standard



Loading case: Standard

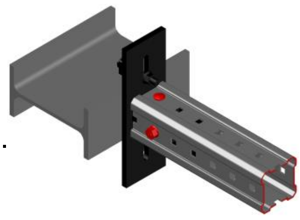
BOM:

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



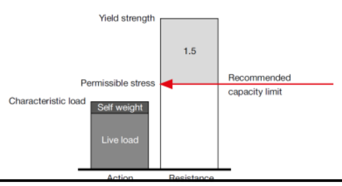
Combinations covered by loading case

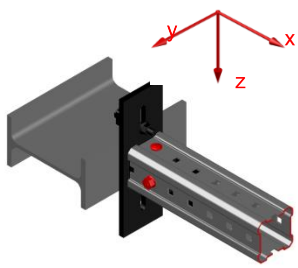
Connector used for a perpendicular connection of MI-90 girder to flange of structural steel profiles. For flange width 75-165mm.



Recommended loading capacity - simplified for most common applications

Method



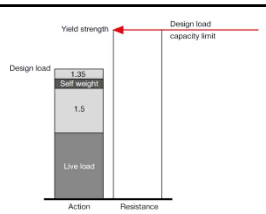


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
10.3	3.0	3.0

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

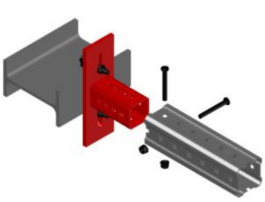
Design loading capacity - 3D 1/3

Method

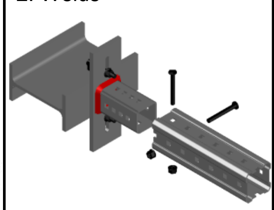


Limiting components of capacity evaluated in following tables:

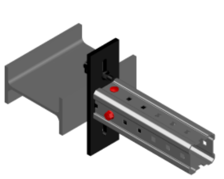
1. Steel connector



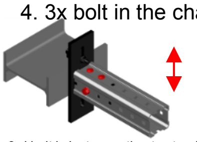
2. Welds



3. 2x bolt in the channel

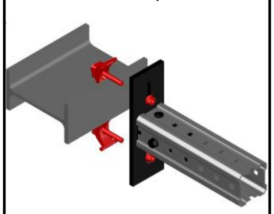


4. 3x bolt in the channel



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

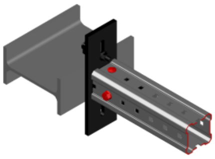


Boundary conditions - **Terms of common cooperation / Legal disclaimer** and guidelines as defined at the beginning of this book need to be mandatorily respected.

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

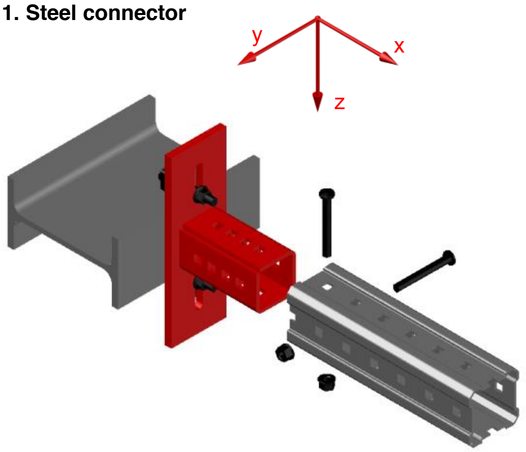
Standard		
		

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

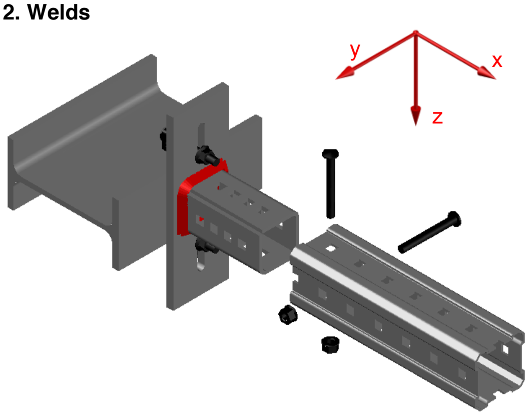


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
15.52	Not decisive	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.24	4.24	0.85	0.85	1.17	1.17

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

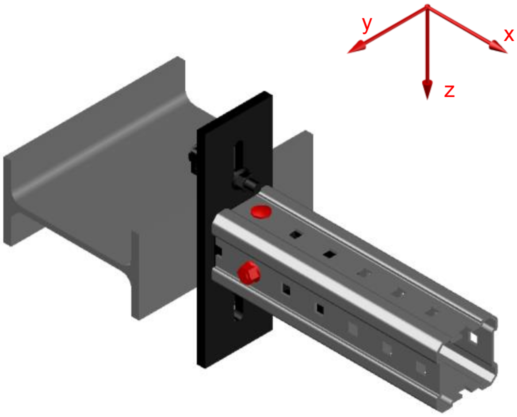
Interaction:

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

MIC-S90-AA Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolts in MI channel

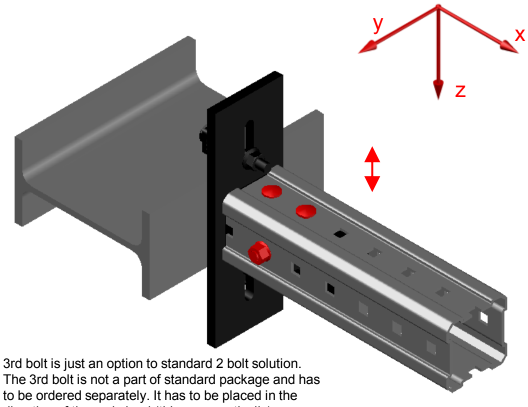


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.61	2.61	1.24	1.24	1.24	1.24

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



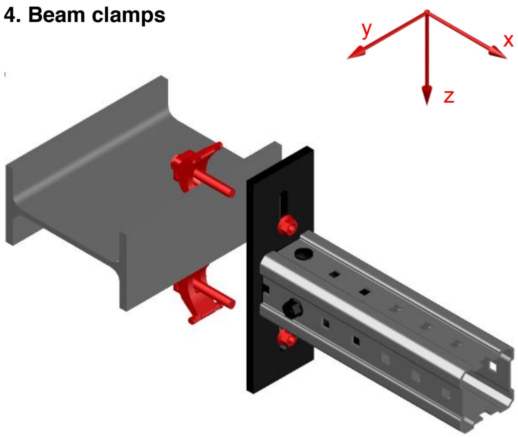
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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



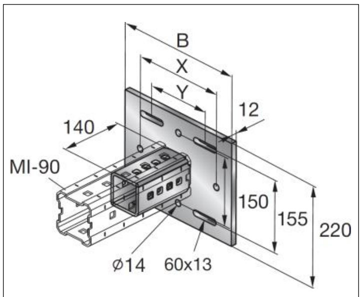
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
17.40	Not decisive	4.50	4.50	4.50	4.50
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.28	0.28	0.87	0.87	0.87	0.87

Interaction:

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

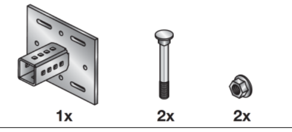
MIC-S90-A Base Material Connector - Steel

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



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

Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

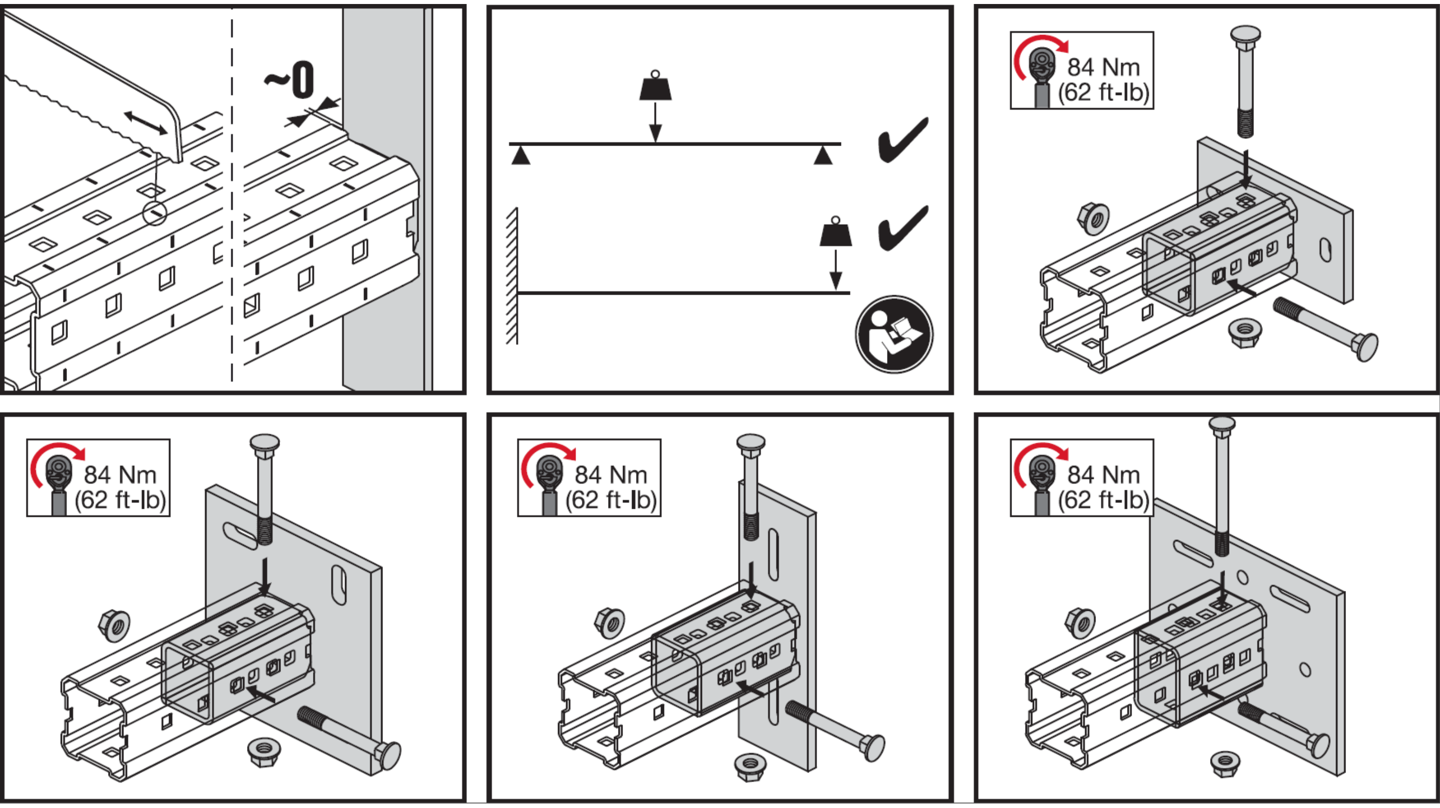
Weight:
7140 g incl. components

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.

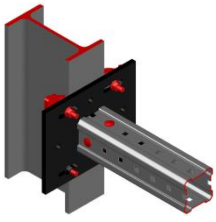
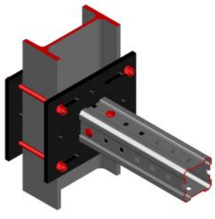
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-S90-A Base Material   Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

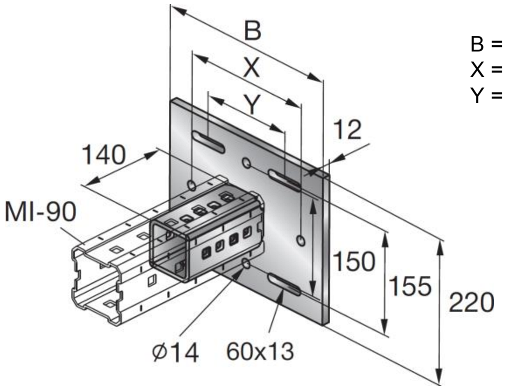
Methodology:
- Analytic calculation

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

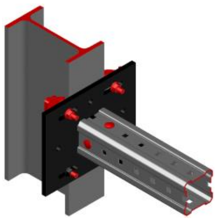
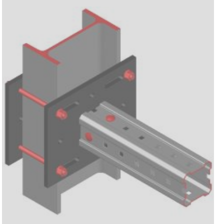
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

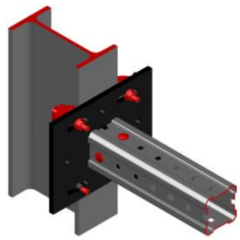
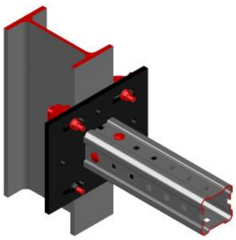
Simplified drawing:



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

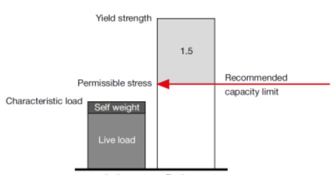
MIC-S90-A Base Material   Connector - Steel

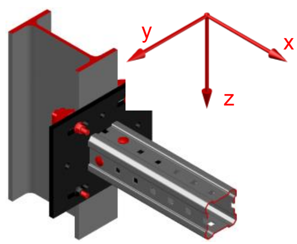
Clamped	Boxed	
		

Loading case: Clamped	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 a perpendicular connection of MI-90 girder to flange of structural steel profiles. For flange width 75-165mm. 

Recommended loading capacity - simplified for most common applications

Method



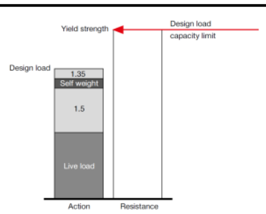


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
23.2	6.0	6.0

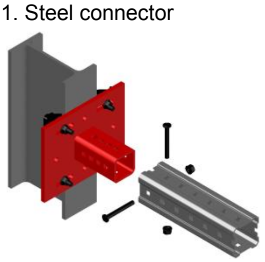
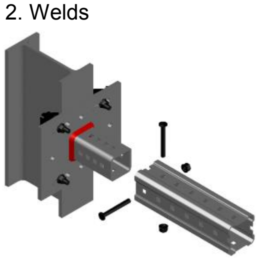
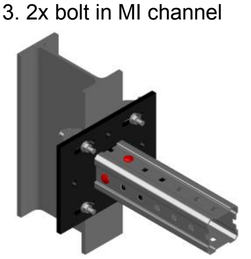
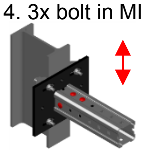
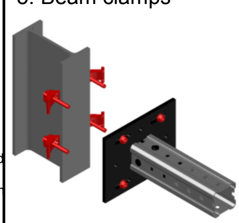
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



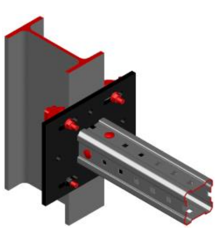
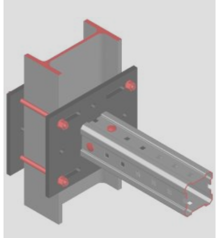
Limiting components of capacity evaluated in following tables:

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:

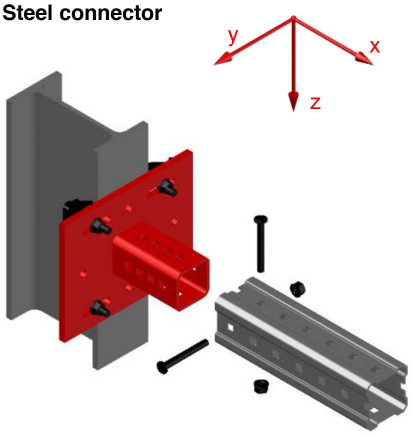
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

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

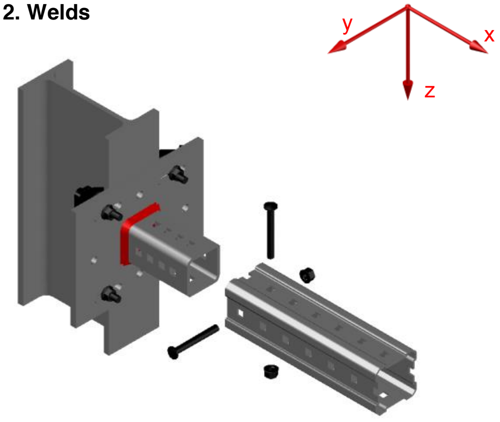


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.24	4.24	1.70	1.70	1.80	1.80

Interaction:

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

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

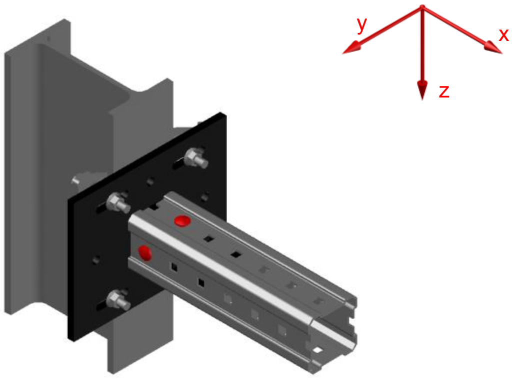
Interaction:

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

MIC-S90-A Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

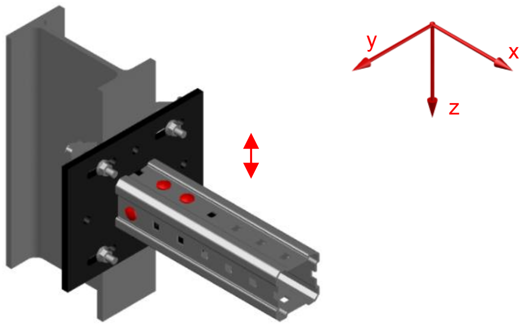


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.61	2.61	1.24	1.24	1.24	1.24

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



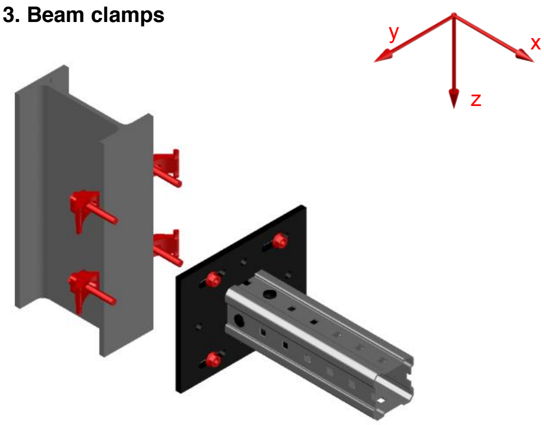
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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. Beam clamps

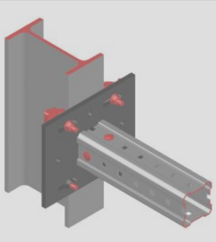
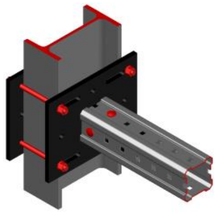


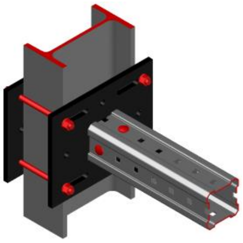
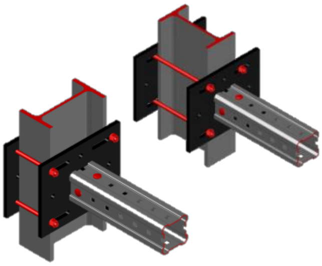
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.80	0.80	2.09	2.09	1.39	1.39

Interaction:

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

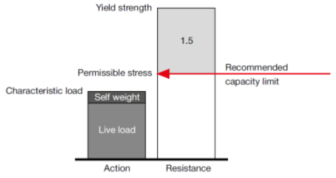
MIC-S90-A Base Material Connector - Steel

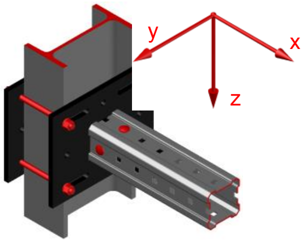
Clamped	Boxed	
		

Loading case: Boxed	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 8.8 HDG…m 419103** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for a perpendicular connection of MI-90 girder to flange of structural steel profiles. For flange width 75-165mm. 

Recommended loading capacity - simplified for most common applications

Method



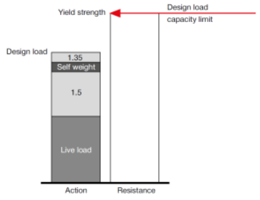


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
24.0	4.9	4.9

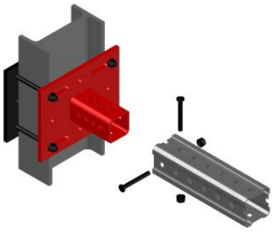
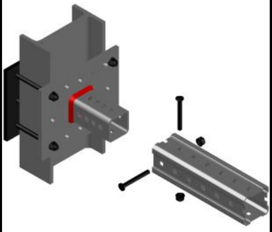
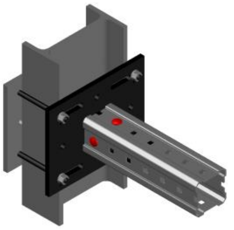
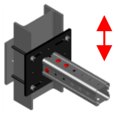
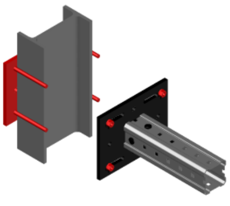
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



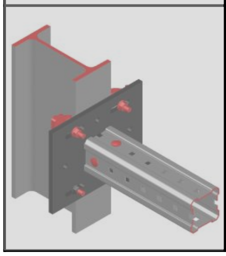
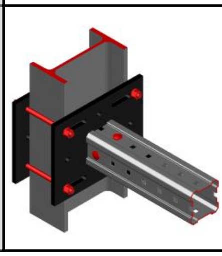
Limiting components of capacity evaluated in following tables:

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:

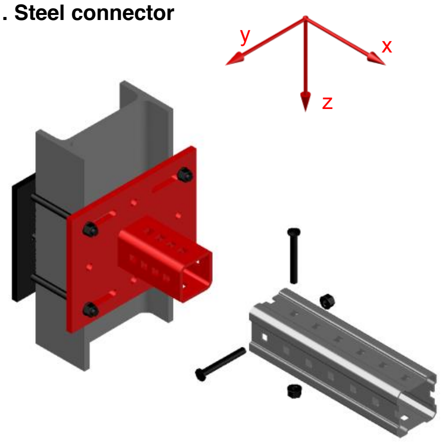
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

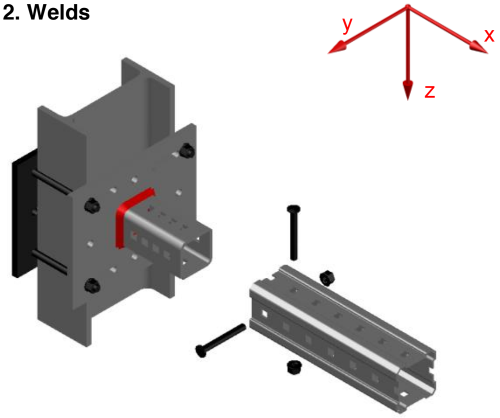


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.24	4.24	1.70	1.70	1.80	1.80

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

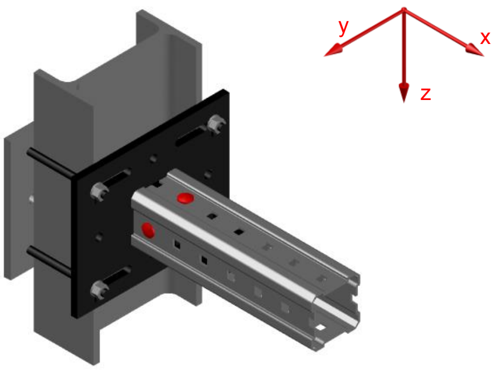
Interaction:

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

MIC-S90-A Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

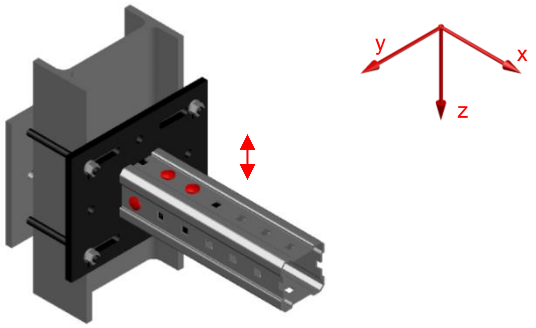


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.61	2.61	1.24	1.24	1.24	1.24

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



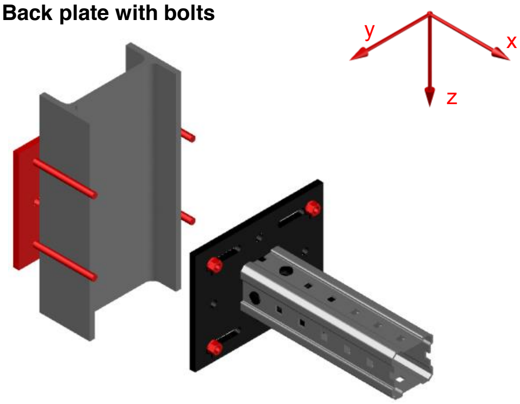
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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:

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

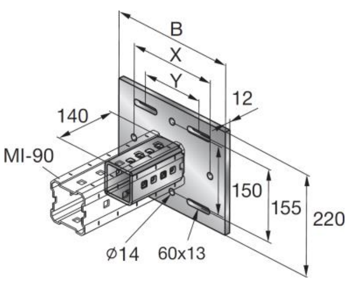
MIC-S90-B Base Material Connector - Steel

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

Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

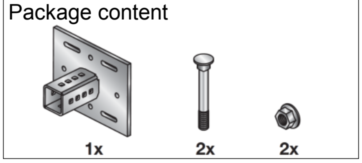
Weight:
8590 g incl. components

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.



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

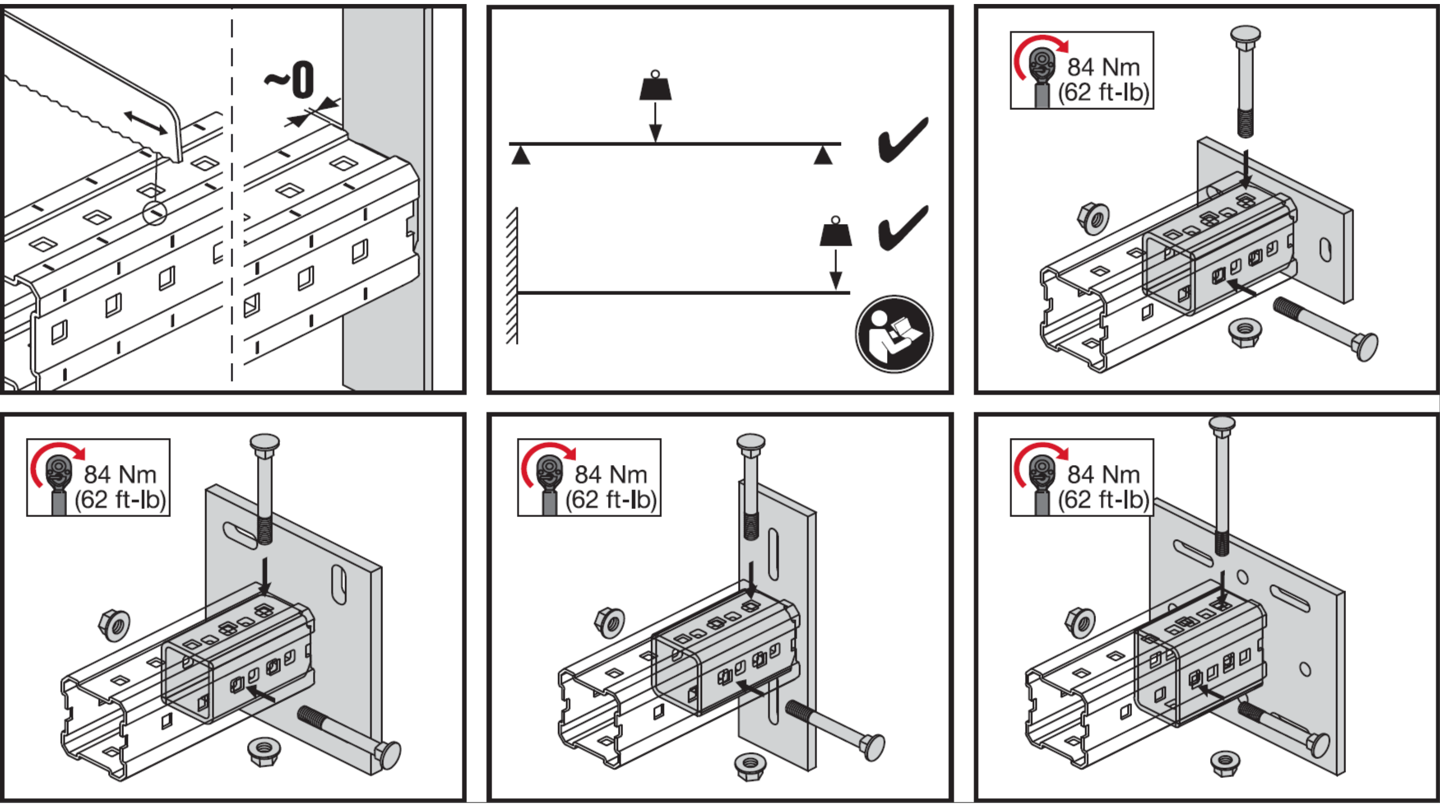
Package content



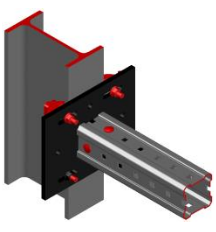
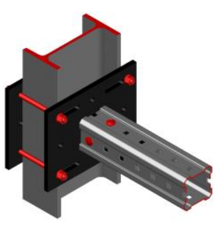
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-S90-B Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

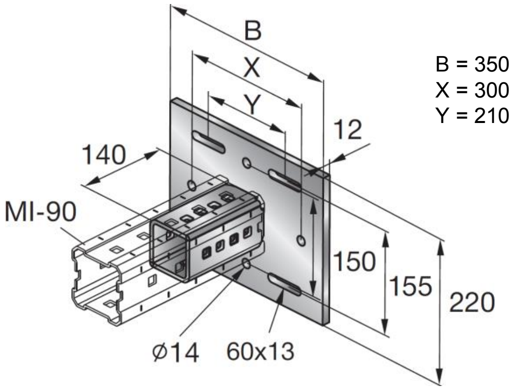
Standards and codes:

• 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

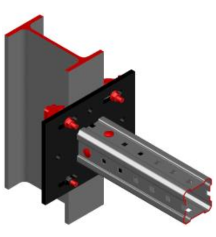
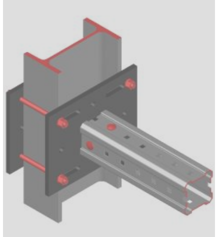
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

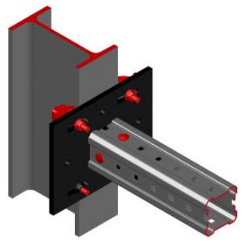
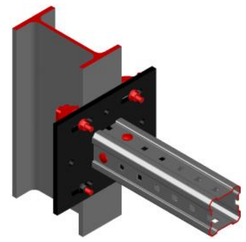
Simplified drawing:



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

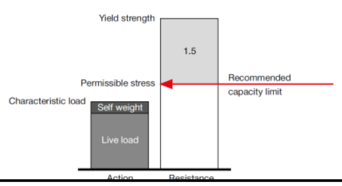
MIC-S90-B Base Material Connector - Steel

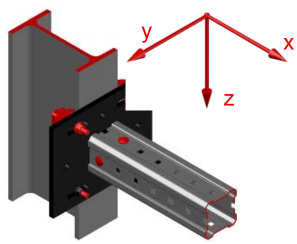
Clamped	Boxed	
		

Loading case: Clamped	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 a perpendicular connection of MI-90 girder to flange of structural steel profiles. For flange width 165-235mm. 

Recommended loading capacity - simplified for most common applications

Method



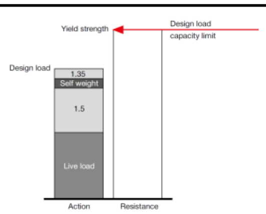


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.5	6.0	6.0

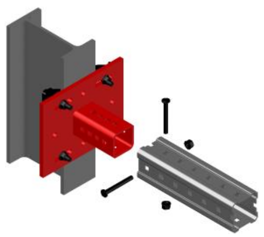
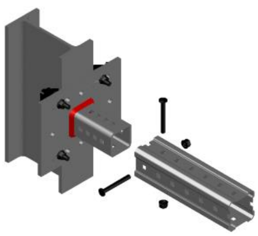
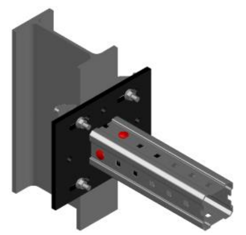
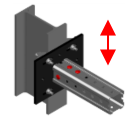
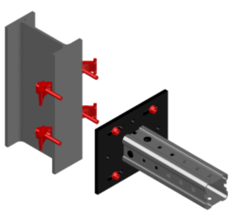
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method

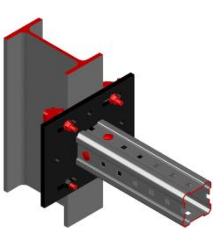
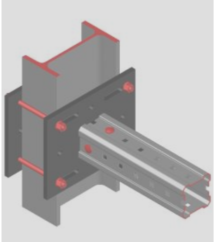


Limiting components of capacity evaluated in following tables:

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

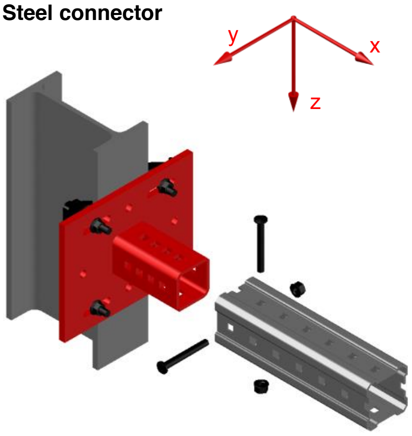
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

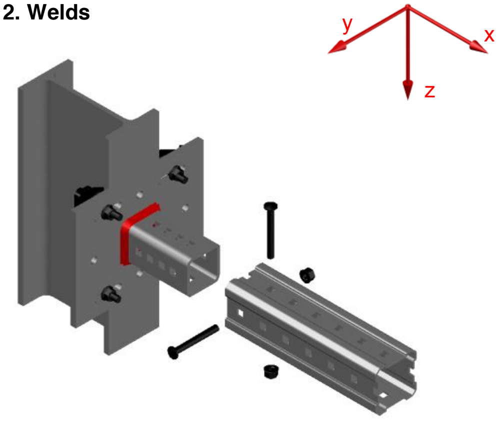


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.24	4.24	1.33	1.33	1.64	1.64

Interaction:

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

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

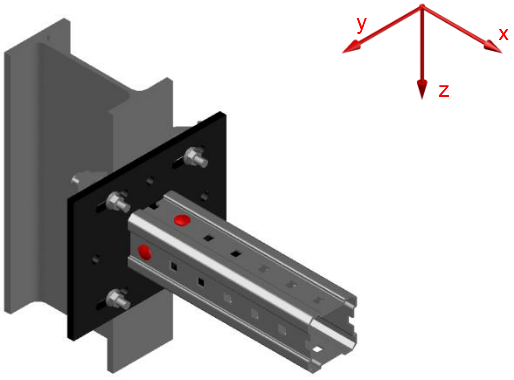
Interaction:

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

MIC-S90-B Base Material   Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

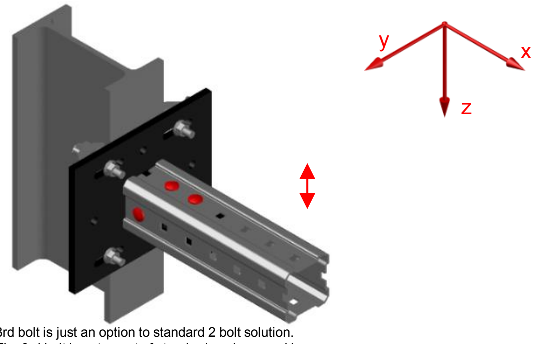


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.61	2.61	1.24	1.24	1.24	1.24

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



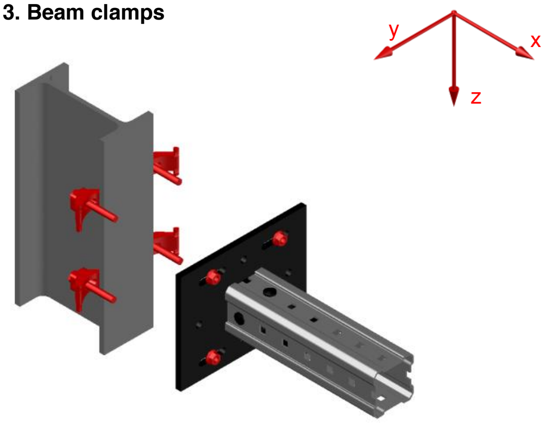
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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

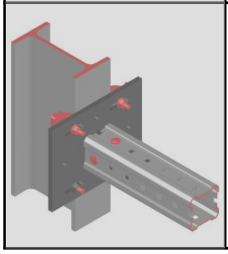
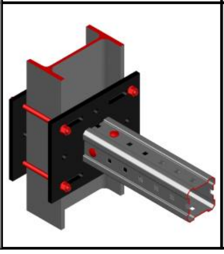


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.06	1.06	2.09	2.09	2.09	2.09

Interaction:

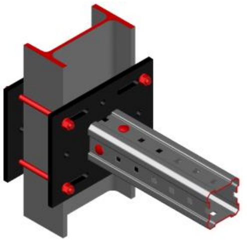
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-S90-B Base Material Connector - Steel

Clamped	Boxed	
		

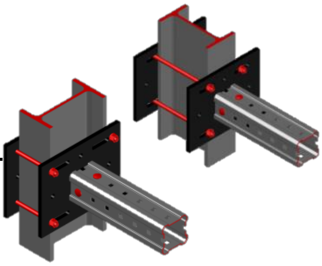
Loading case: Boxed

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 8.8 HDG…m 419103
Nut
8x M12-F-SL WS3⁄4 382897



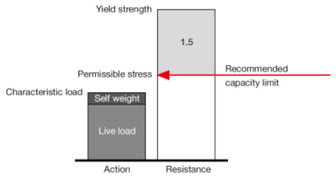
Combinations covered by loading case

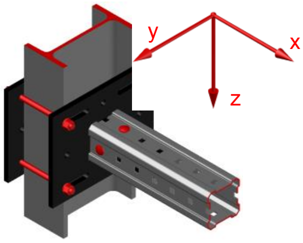
Connector used for a perpendicular connection of MI-90 girder to flange of structural steel profiles.
For flange width 165-235mm.



Recommended loading capacity - simplified for most common applications

Method



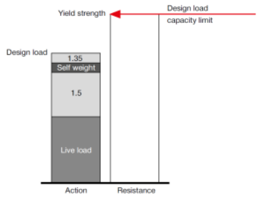


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.5	4.9	4.9

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

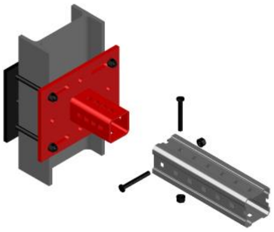
Design loading capacity - 3D 1/3

Method

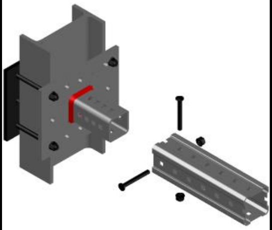


Limiting components of capacity evaluated in following tables:

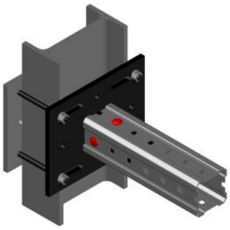
1. Steel connector



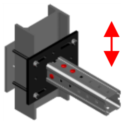
2. Welds



3. 2x bolt in MI channel

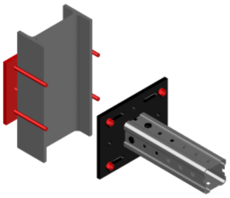


4. 3x bolt in MI channel



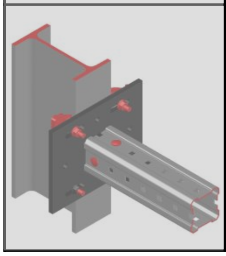
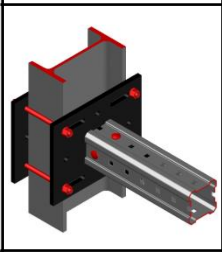
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

5. Back plate with bolts



MIC-S90-B Base Material Connector - Steel

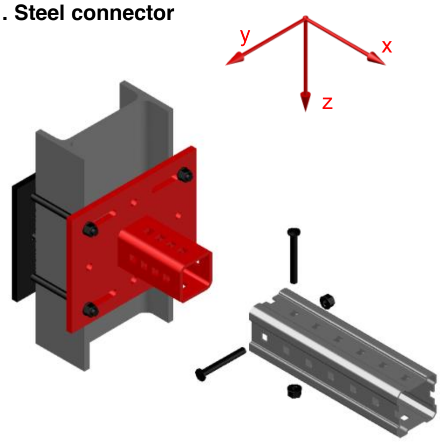
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

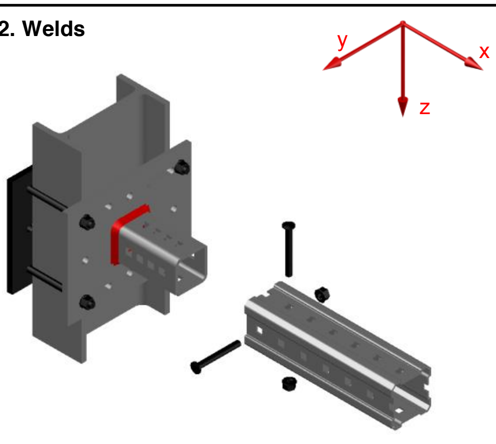


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.24	4.24	1.33	1.33	1.64	1.64

Interaction:

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

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

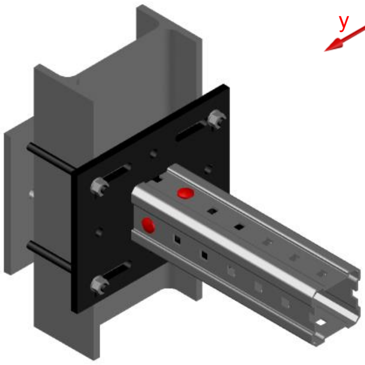
Interaction:

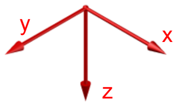
$$\frac{F_{x.Ed}}{F_{x.Rd}}+\frac{F_{y.Ed}}{F_{y.Rd}}+\frac{F_{z.Ed}}{F_{z.Rd}}+\frac{M_{x.Ed}}{M_{x.Rd}}+\frac{M_{y.Ed}}{M_{y.Rd}}+\frac{M_{z.Ed}}{M_{z.Rd}}\leq 1$$

MIC-S90-B Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel



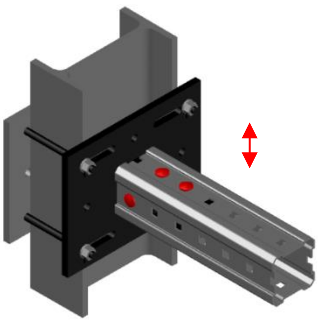


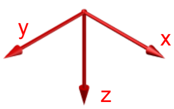
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.61	2.61	1.24	1.24	1.24	1.24

Interaction:

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

3. 3x bolt in MI channel





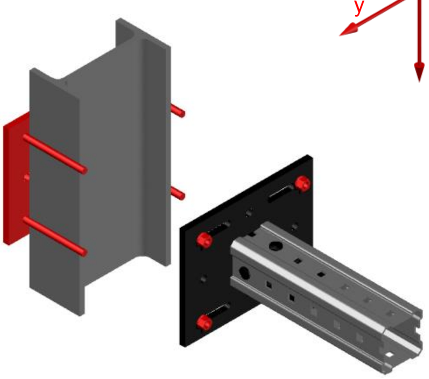
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
103.50	103.50	72.58	72.58	36.30	36.30
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
3.92	3.92	2.48	2.48	1.24	1.24

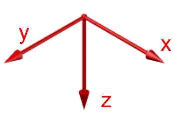
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

Interaction:

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

3. Back plate with bolts





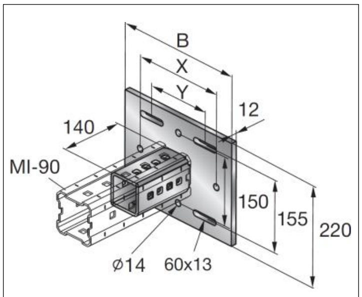
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	34.23	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.87	0.87	11.65	11.65	11.65	11.65

Interaction:

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

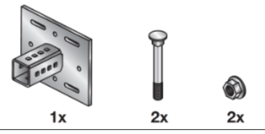
MIC-S90-C Base Material Connector - Steel

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



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

Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

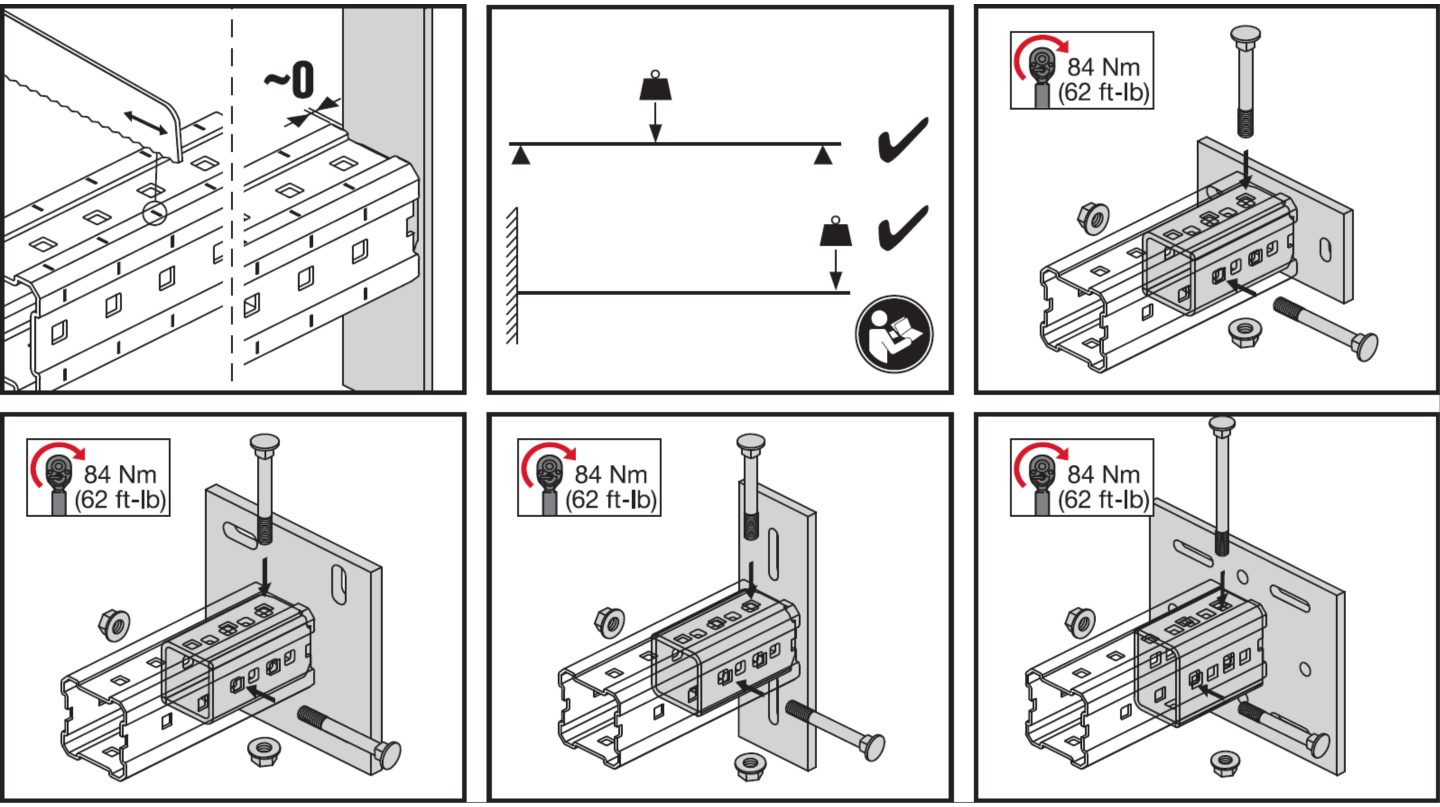
Weight:
8590 g incl. components

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:

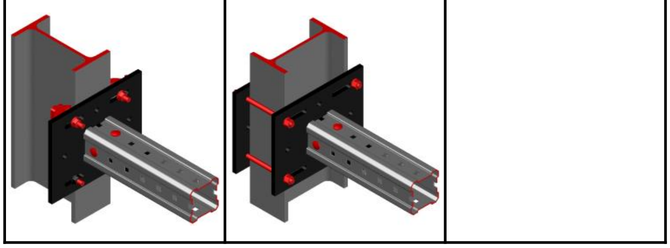
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



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

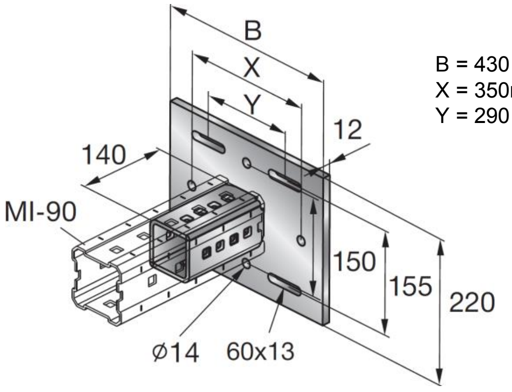
Software:

- Mathcad 15.0
- Microsoft Excel

Environmental conditions:

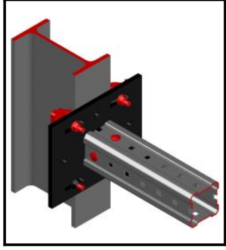
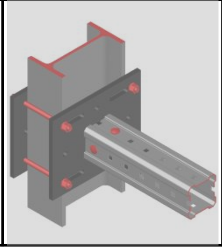
- indoors, outdoors
- static loads
- no fatigue loads

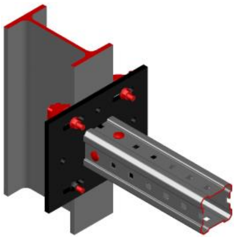
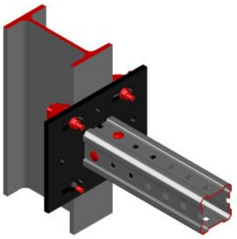
Simplified drawing:



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

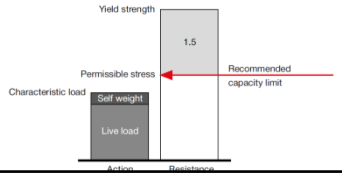
MIC-S90-C Base Material Connector - Steel

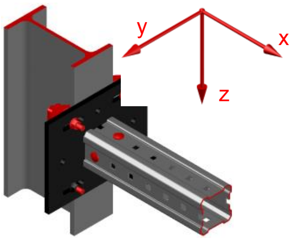
Clamped	Boxed	
		

Loading case: Clamped	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 a perpendicular connection of MI-90 girder to flange of structural steel profiles. For flange width 235-300mm. 

Recommended loading capacity - simplified for most common applications

Method



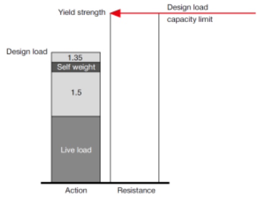


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
13.9	6.0	6.0

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

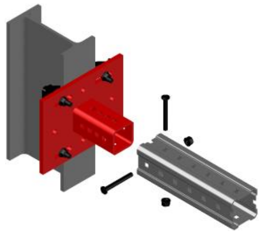
Design loading capacity - 3D 1/3

Method

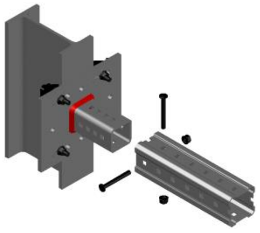


Limiting components of capacity evaluated in following tables:

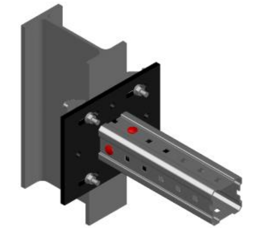
1. Steel connector



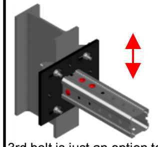
2. Welds



3. 2x bolt in MI channel

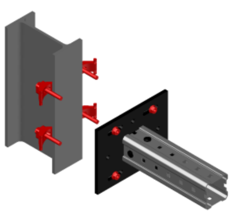


4. 3x bolt in MI channel



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

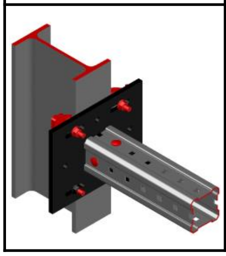
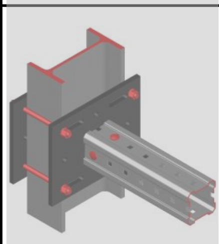


Boundary conditions - **Terms of common cooperation / Legal disclaimer** and guidelines as defined at the beginning of this book need to be mandatorily respected.

MIC-S90-C Base Material   Connector - Steel

Conditions of the loading capacity tables:

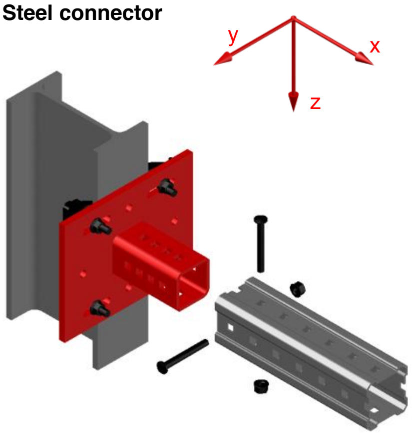
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

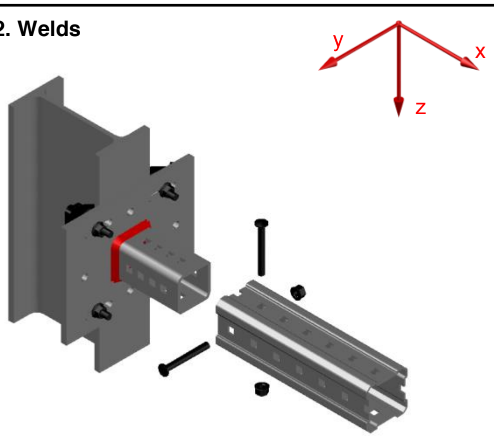


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.24	4.24	1.14	1.14	1.40	1.40

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

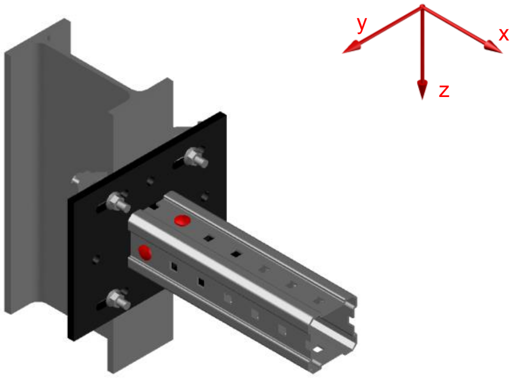
Interaction:

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

MIC-S90-C Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

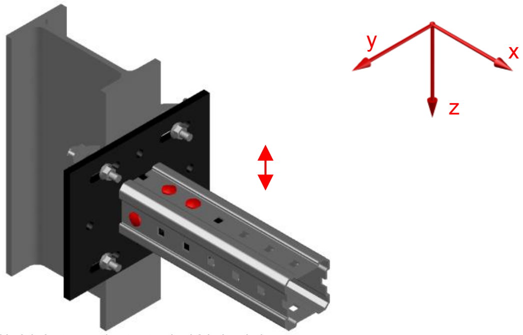


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
2.61	2.61	1.24	1.24	1.24	1.24

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



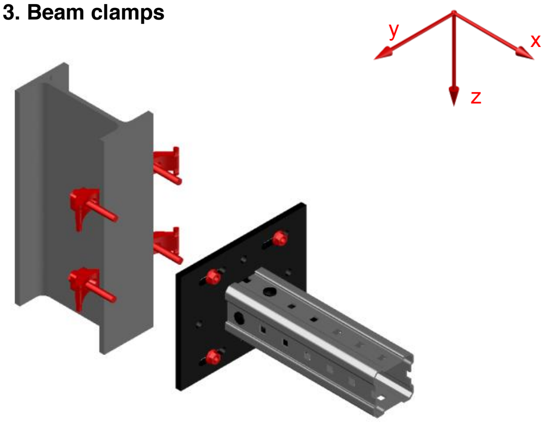
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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. Beam clamps

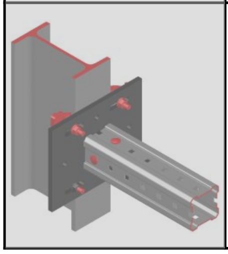
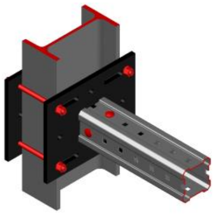


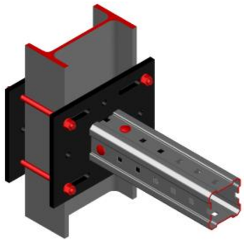
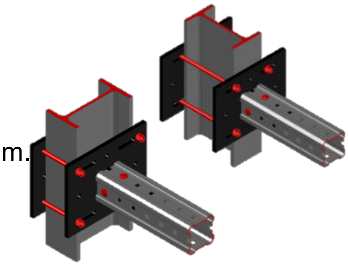
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.31	1.31	2.09	2.09	3.65	3.65

Interaction:

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

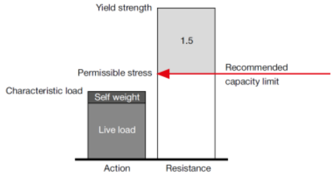
MIC-S90-C Base Material Connector - Steel

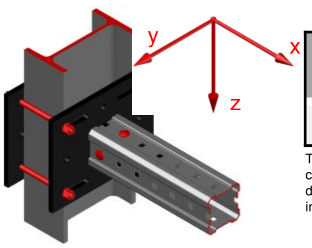
Clamped	Boxed	
		

Loading case: Boxed	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 8.8 HDG…m 419103** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for a perpendicular connection of MI-90 girder to flange of structural steel profiles. For flange width 235-300mm. 

Recommended loading capacity - simplified for most common applications

Method



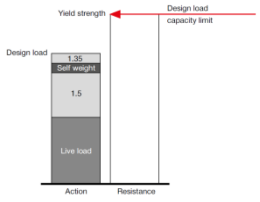


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
13.9	4.9	4.9

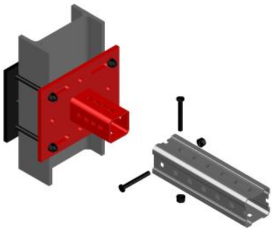
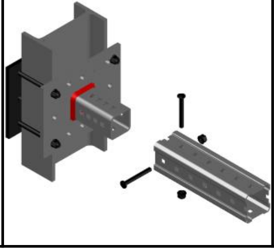
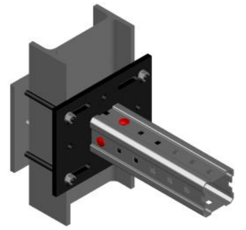
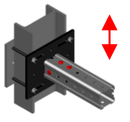
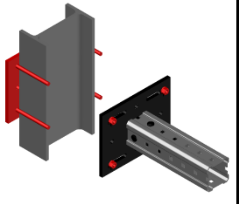
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method

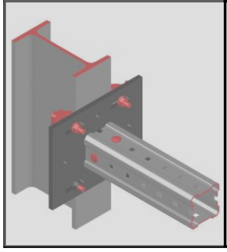
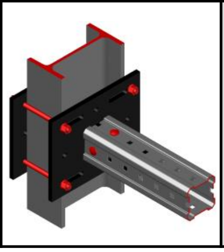


Limiting components of capacity evaluated in following tables:

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

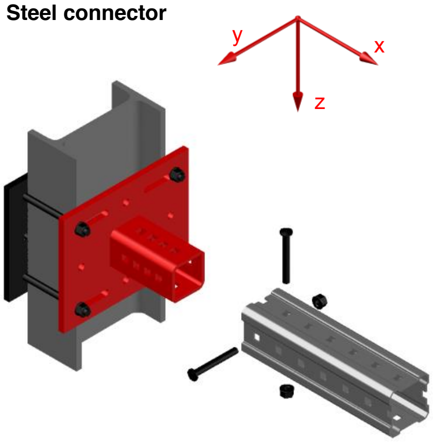
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

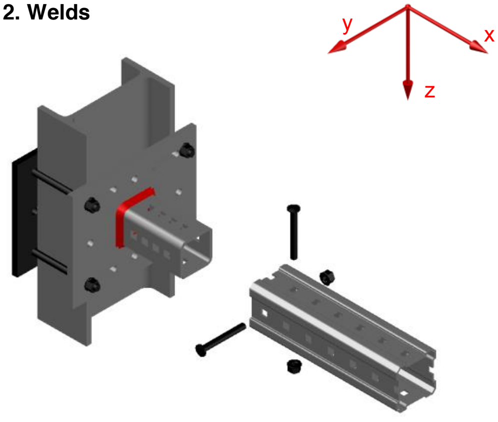


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	68.38	68.38	68.38	68.38
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
4.24	4.24	1.14	1.14	1.40	1.40

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

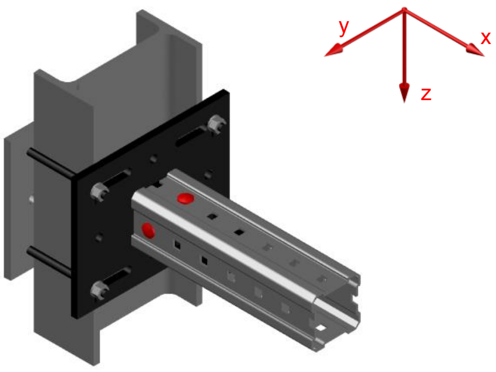
Interaction:

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

MIC-S90-C Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

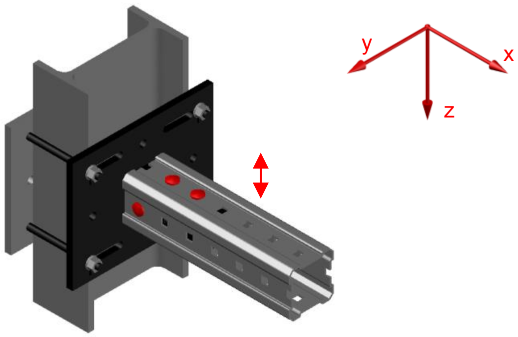


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
69.03	69.03	36.30	36.30	36.30	36.30
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
2.61	2.61	1.24	1.24	1.24	1.24

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



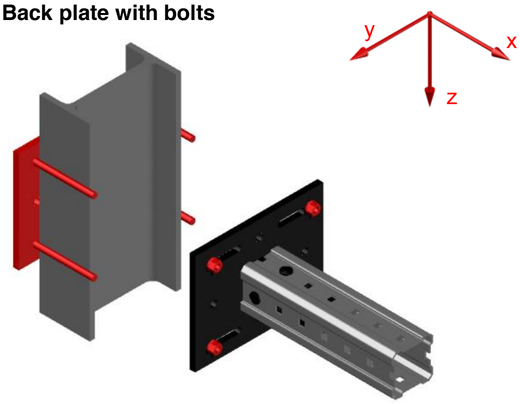
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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

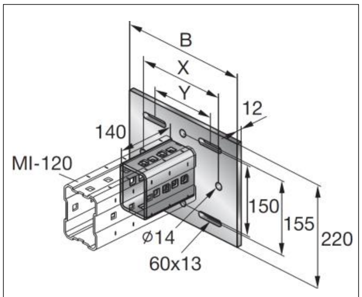
Interaction:

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

Data version 1.3 I Date 12.2016 | Page 1/8

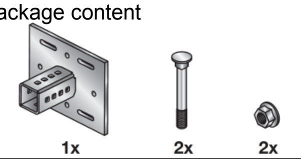
MIC-S120-A Base Material Connector - Steel

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



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

Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

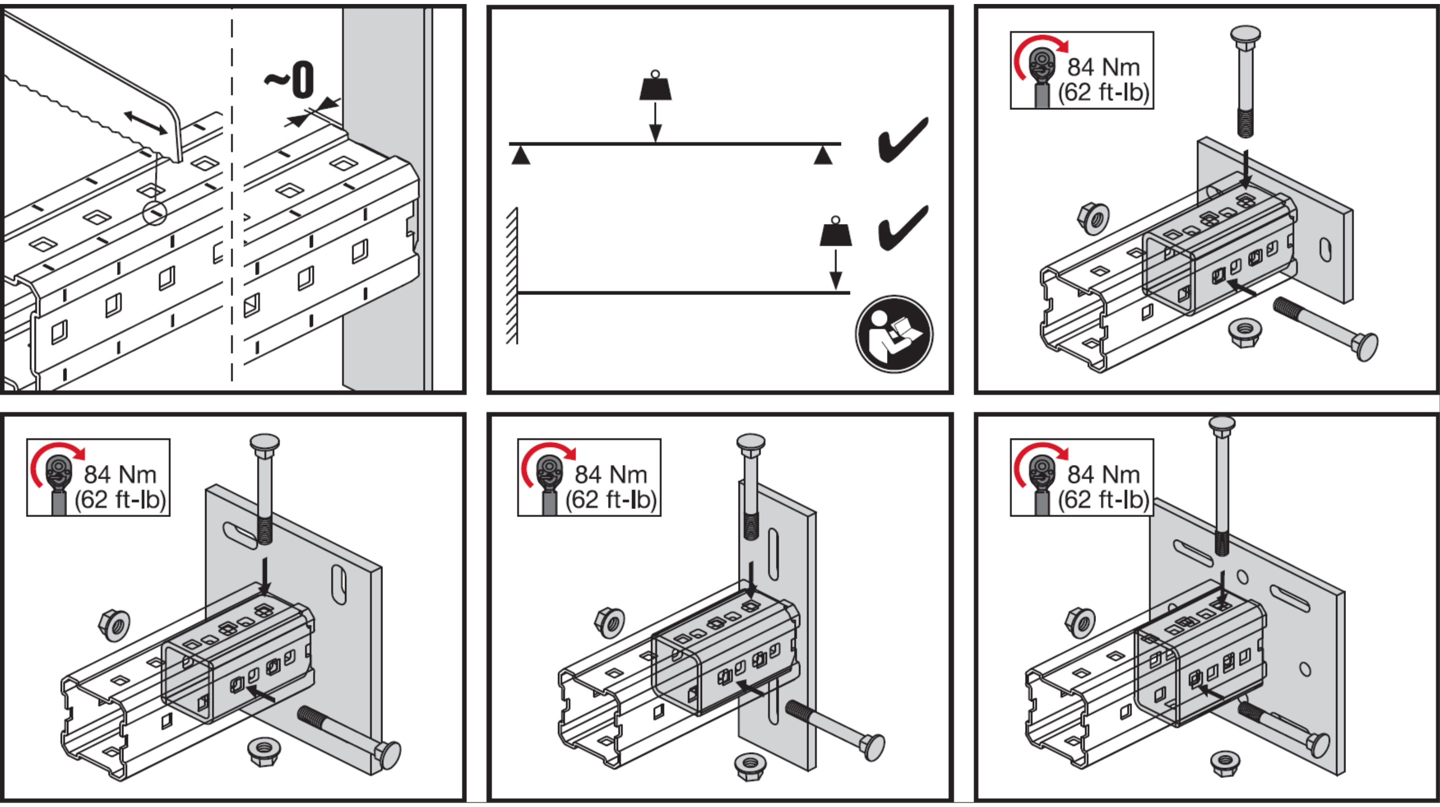
Weight:
7895 g incl. components

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.

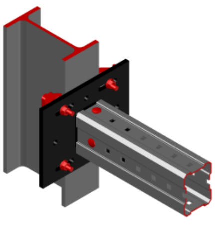
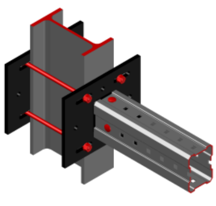
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-S120-A Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

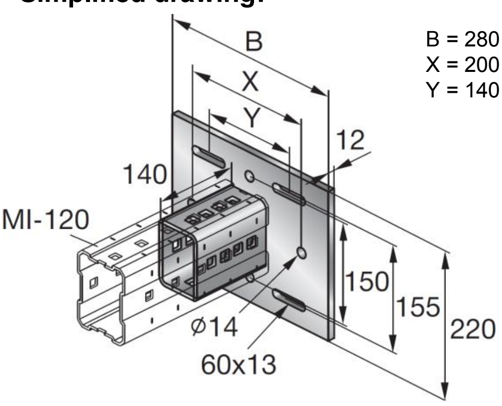
Standards and codes:

• 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

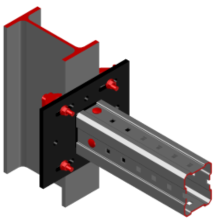
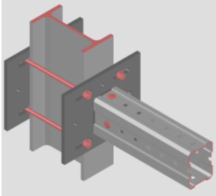
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



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

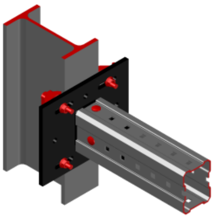
MIC-S120-A Base Material Connector - Steel

Clamped	Boxed	
		

Loading case: Clamped

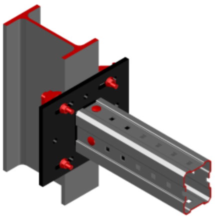
BOM:

Connector incl. all associated components
1x MIC-S120-A 304818
Bean clamps
4x MI-SGC M12 233859



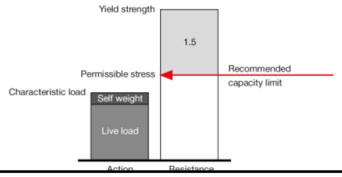
Combinations covered by loading case

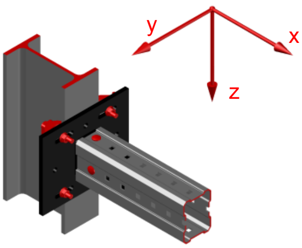
Connector used for a perpendicular connection of MI-120 girder to flange of structural steel profiles. For flange width 75-165mm.



Recommended loading capacity - simplified for most common applications

Method



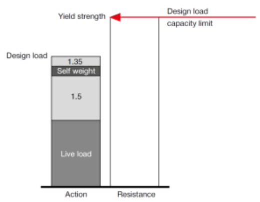


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
23.2	6.0	6.0

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

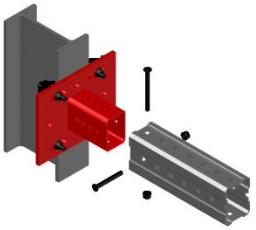
Design loading capacity - 3D 1/3

Method

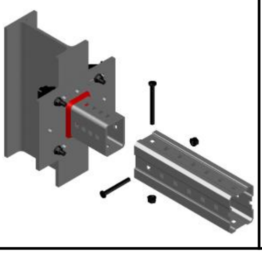


Limiting components of capacity evaluated in following tables:

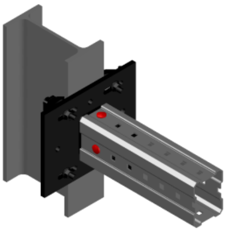
1. Steel connector



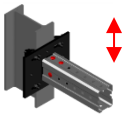
2. Welds



3. 2x bolt in MI channel

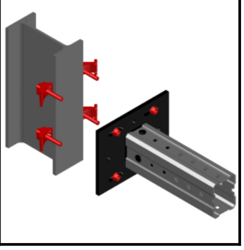


4. 3x bolt in MI channel



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.

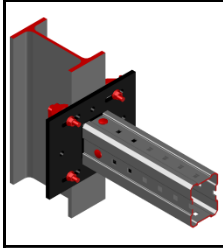
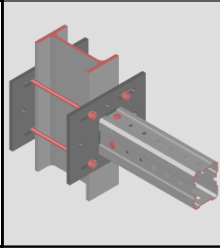
5. Beam clamps



MIC-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

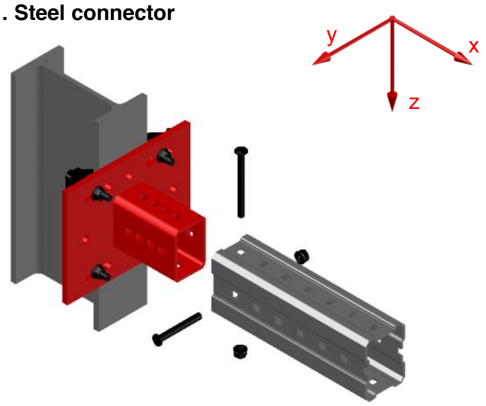
Clamped	Boxed	
		

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

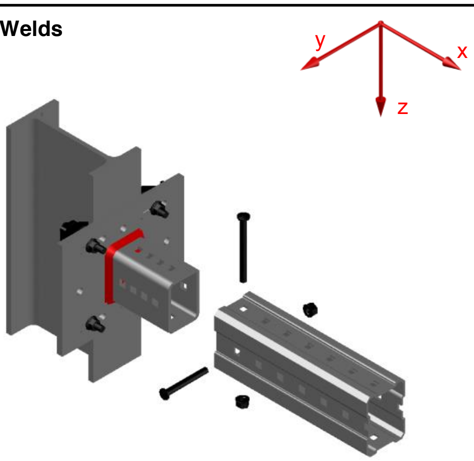


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
6.78	6.78	2.64	2.64	3.20	3.20

Interaction:

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

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

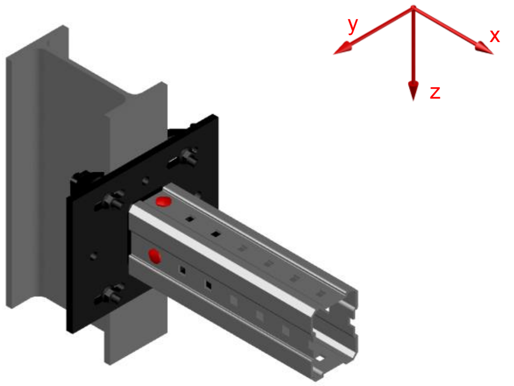
Interaction:

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

MIC-S120-A Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

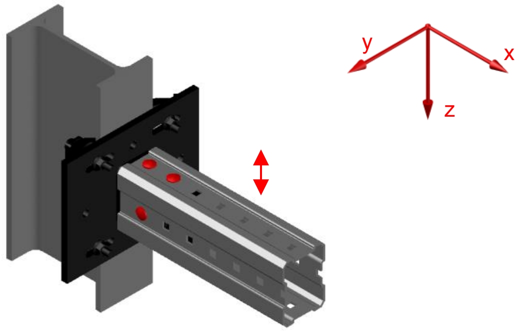


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
3.59	3.59	1.90	1.90	1.35	1.35

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



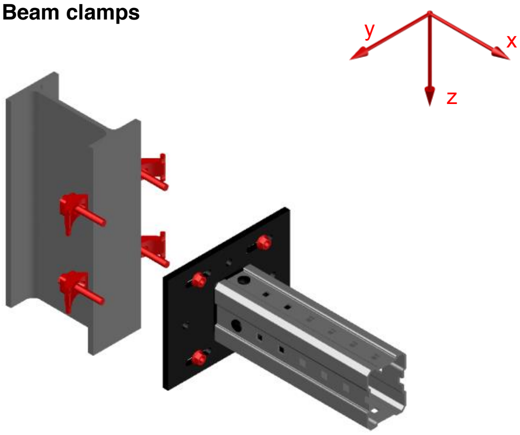
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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

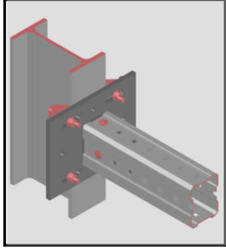
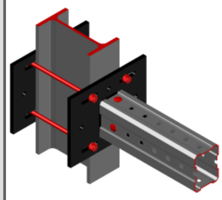


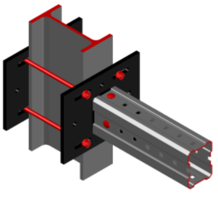
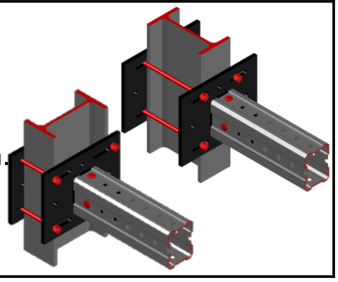
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.80	0.80	2.26	2.26	1.39	1.39

Interaction:

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

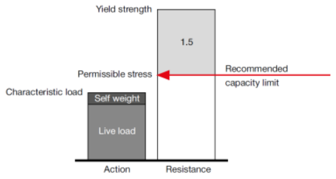
MIC-S120-A Base Material Connector - Steel

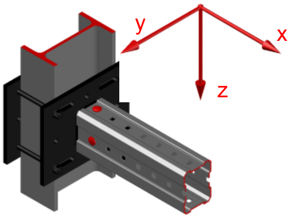
Clamped	Boxed	
		

Loading case: Boxed	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 8.8 HDG…m 419103** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for a perpendicular connection of MI-120 girder to flange of structural steel profiles. For flange width 75-165mm. 

Recommended loading capacity - simplified for most common applications

Method



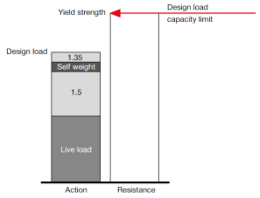


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
24.0	4.9	4.9

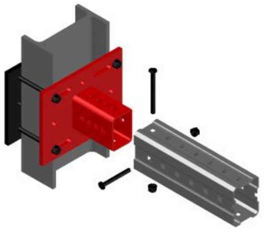
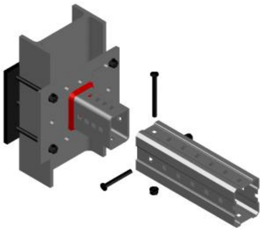
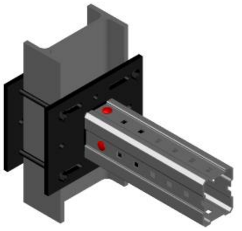
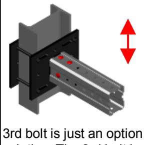
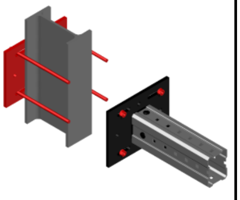
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



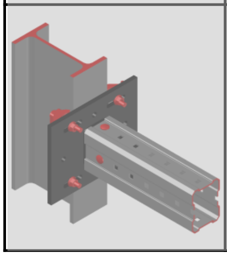
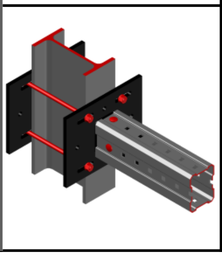
Limiting components of capacity evaluated in following tables:

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

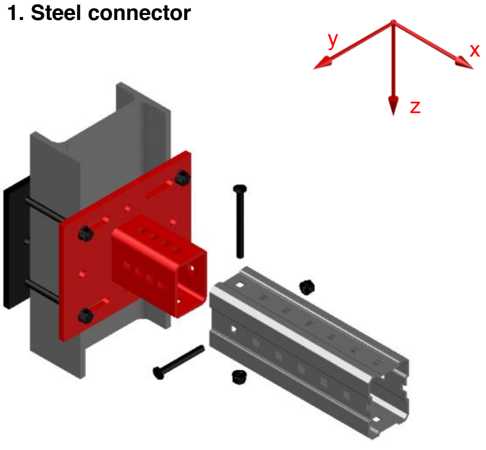
Clamped	Boxed	
		

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

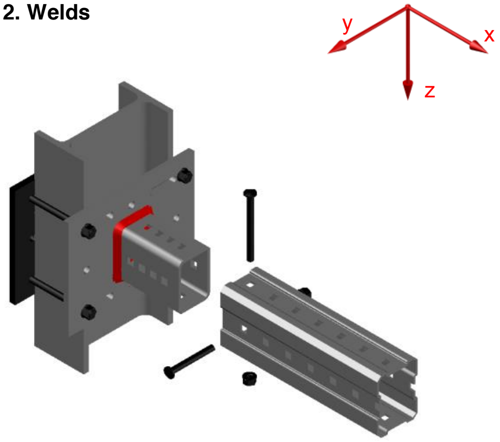


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
6.78	6.78	2.64	2.64	3.20	3.20

Interaction:

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

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

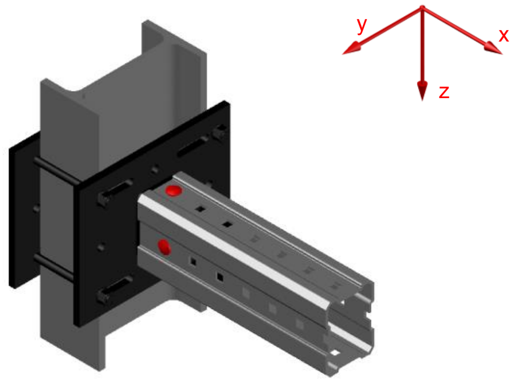
Interaction:

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

MIC-S120-A Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

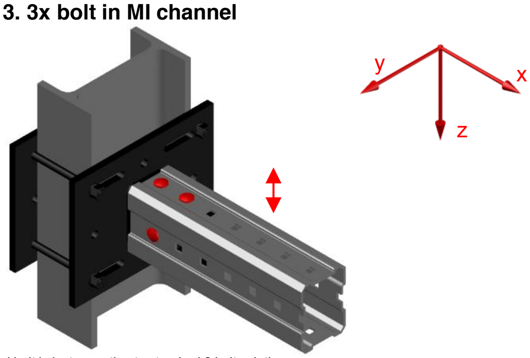


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
3.59	3.59	1.90	1.90	1.35	1.35

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



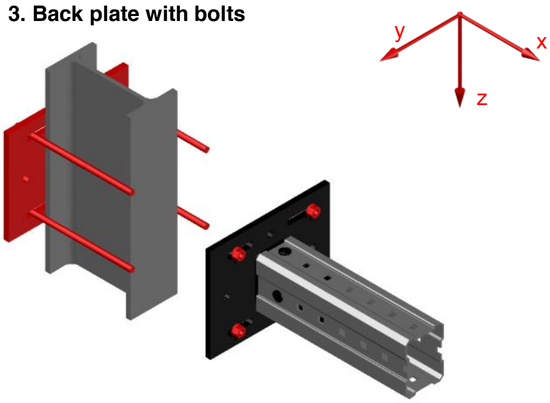
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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:

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

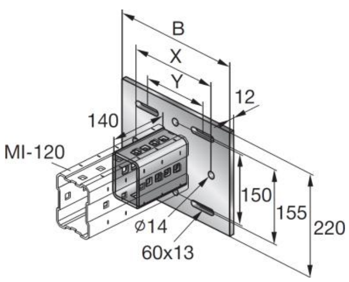
Data version 1.3 I Date 12.2016 | Page 1/8

MIC-S120-B Base Material Connector - Steel

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

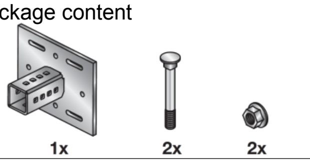
Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

Weight:
8990 g incl. components



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

Package content

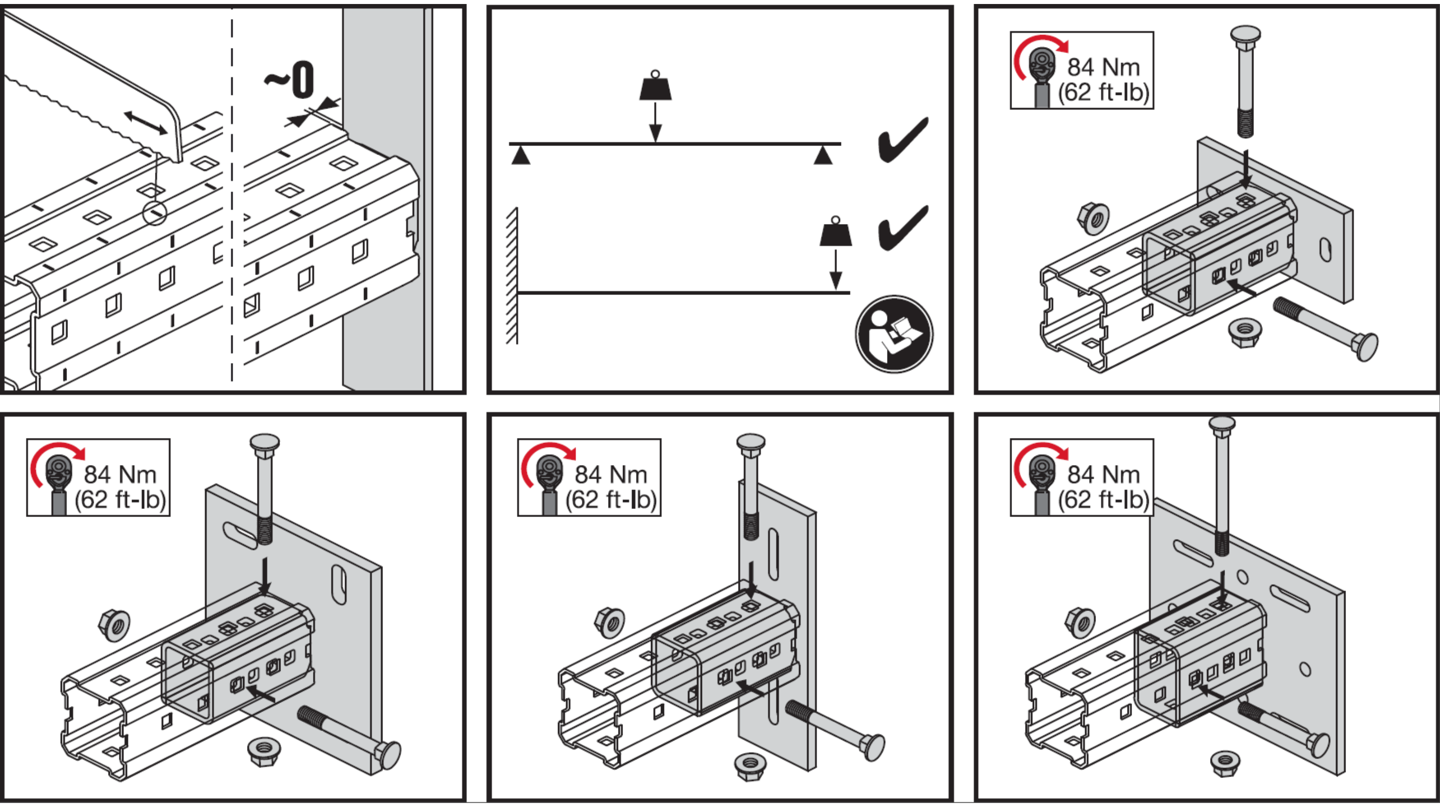


Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-120 girder to a steel beam. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using bolts through fixed holes. Comes in different sizes to fit various steel beam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

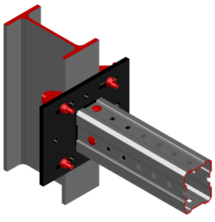
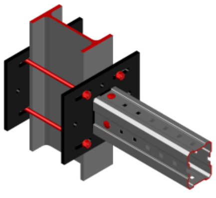
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-S120-B Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

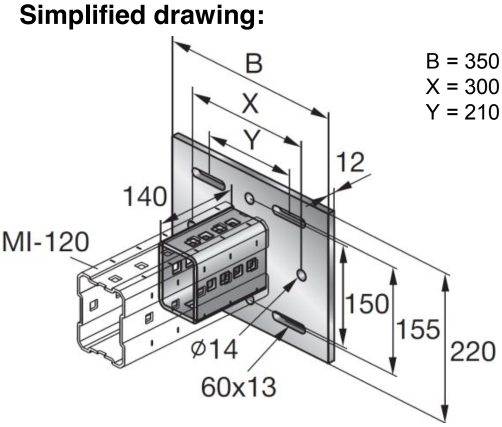
Standards and codes:

• 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

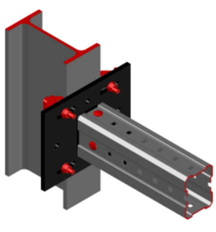
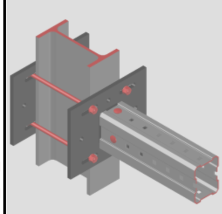
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



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

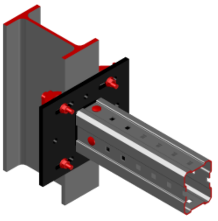
MIC-S120-B Base Material Connector - Steel

Clamped	Boxed	
		

Loading case: Clamped

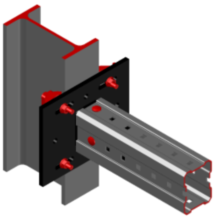
BOM:

Connector incl. all associated components
1x MIC-S120-B **304819**
Bean clamps
4x MI-SGC M12 **233859**



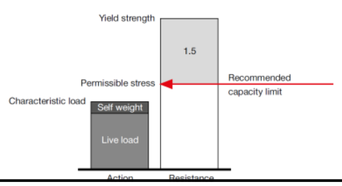
Combinations covered by loading case

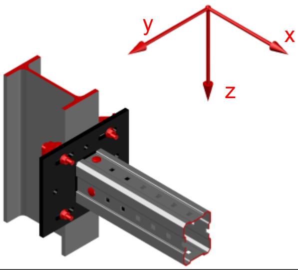
Connector used for a perpendicular connection of MI-120 girder to flange of structural steel profiles. For flange width 165-235mm.



Recommended loading capacity - simplified for most common applications

Method



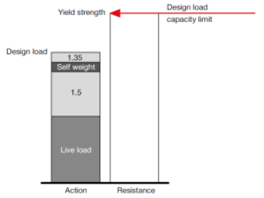


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.5	6.0	6.0

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

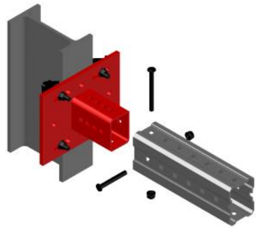
Design loading capacity - 3D 1/3

Method

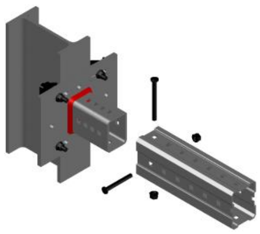


Limiting components of capacity evaluated in following tables:

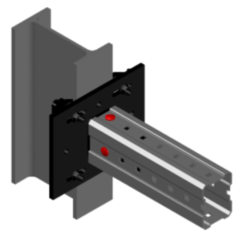
1. Steel connector



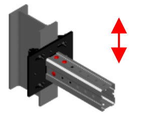
2. Welds



3. 2x bolt in MI channel

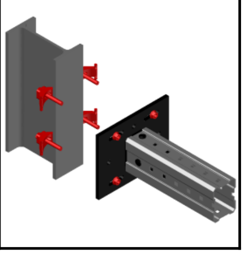


4. 3x bolt in MI channel



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

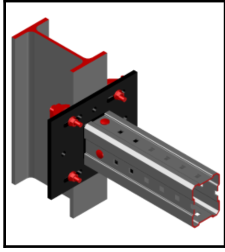


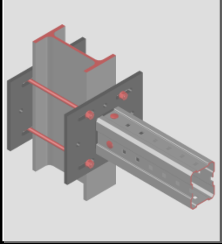
MIC-S120-B Base Material Connector - Steel

Conditions of the loading capacity tables:

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

Clamped	Boxed	



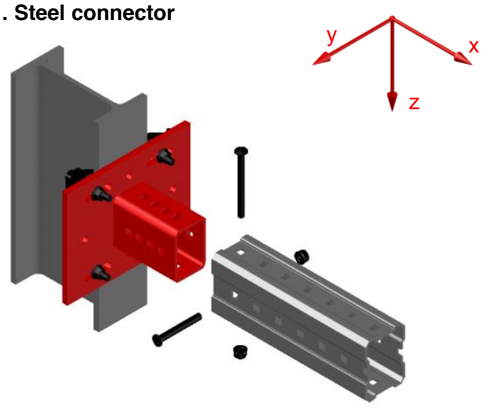


Design loading capacity - 3D 2/3

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

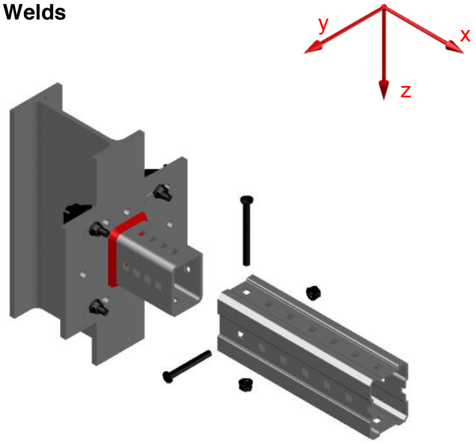


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
6.78	6.78	2.54	2.54	2.98	2.98

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

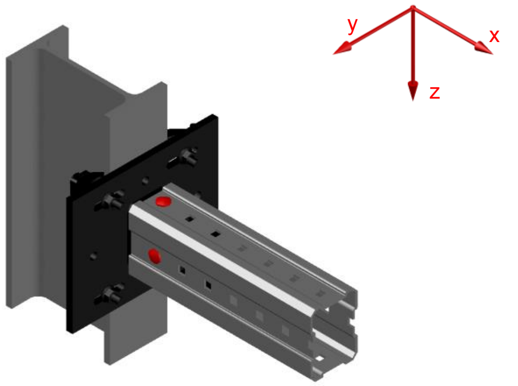
Interaction:

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

MIC-S120-B Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

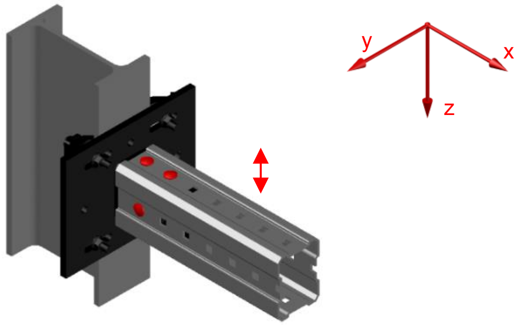


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.59	3.59	1.90	1.90	1.35	1.35

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



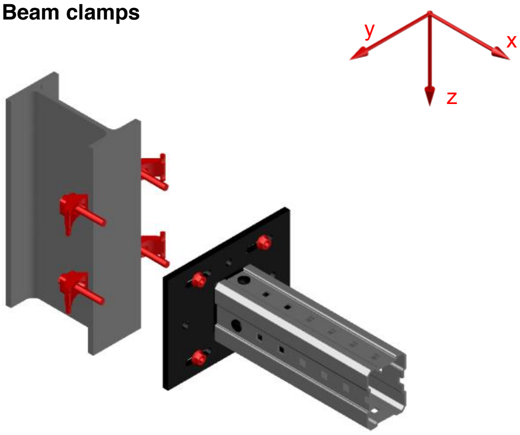
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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. Beam clamps

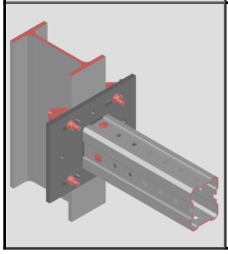
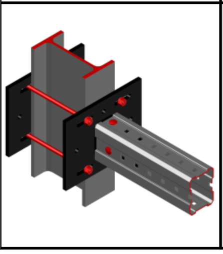


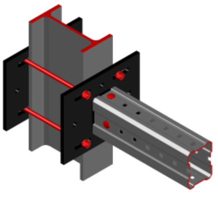
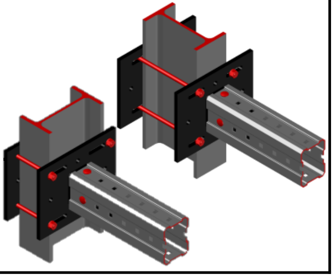
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.06	1.06	2.26	2.26	2.09	2.09

Interaction:

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

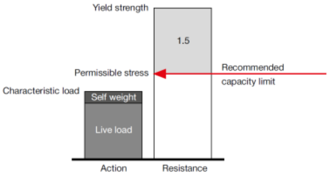
MIC-S120-B Base Material Connector - Steel

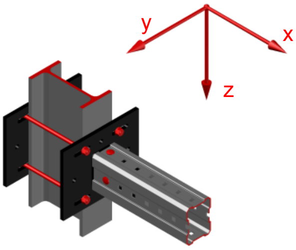
Clamped	Boxed	
		

Loading case: Boxed	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 8.8 HDG…m 419103** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for a perpendicular connection of MI-120 girder to flange of structural steel profiles. For flange width 165-235mm 

Recommended loading capacity - simplified for most common applications

Method



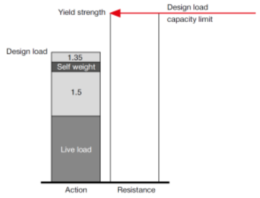


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.5	4.9	4.9

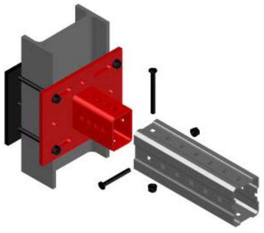
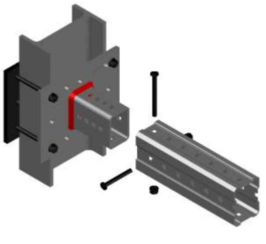
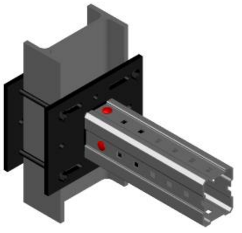
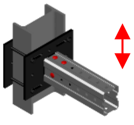
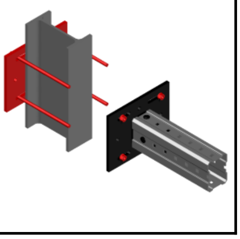
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method

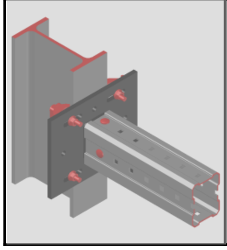
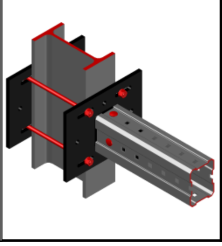


Limiting components of capacity evaluated in following tables:

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

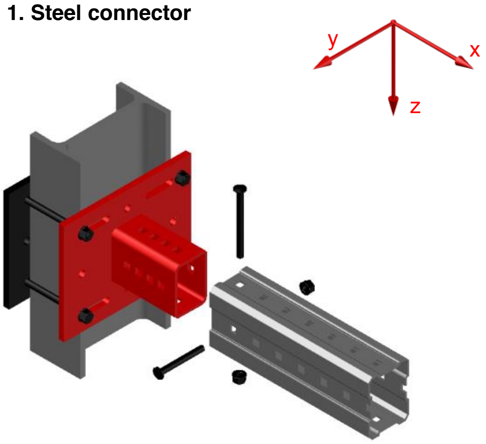
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

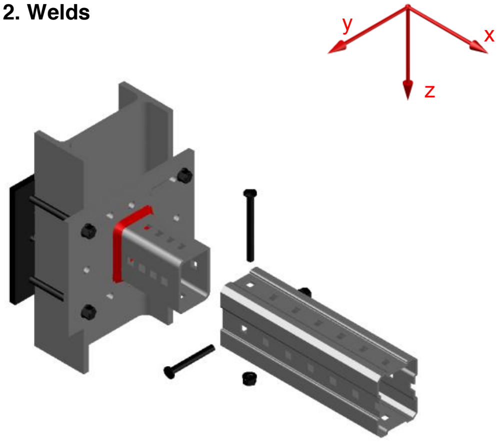


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
6.78	6.78	2.54	2.54	2.98	2.98

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

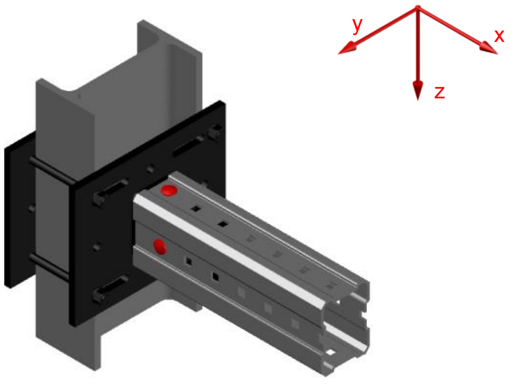
Interaction:

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

MIC-S120-B Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

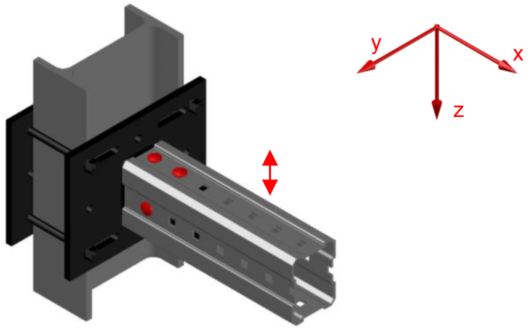


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
3.59	3.59	1.90	1.90	1.35	1.35

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



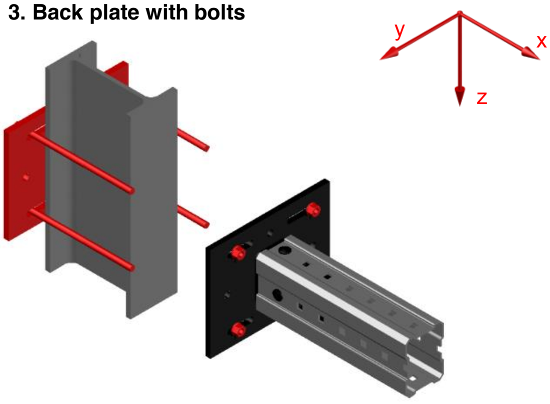
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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



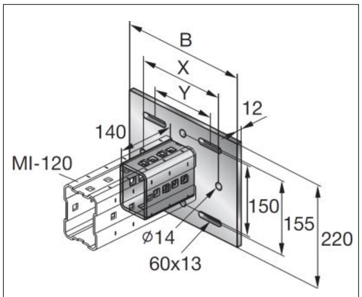
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	34.23	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.87	0.87	12.62	12.62	11.65	11.65

Interaction:

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

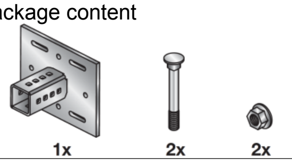
MIC-S120-C Base Material Connector - Steel

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



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

Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

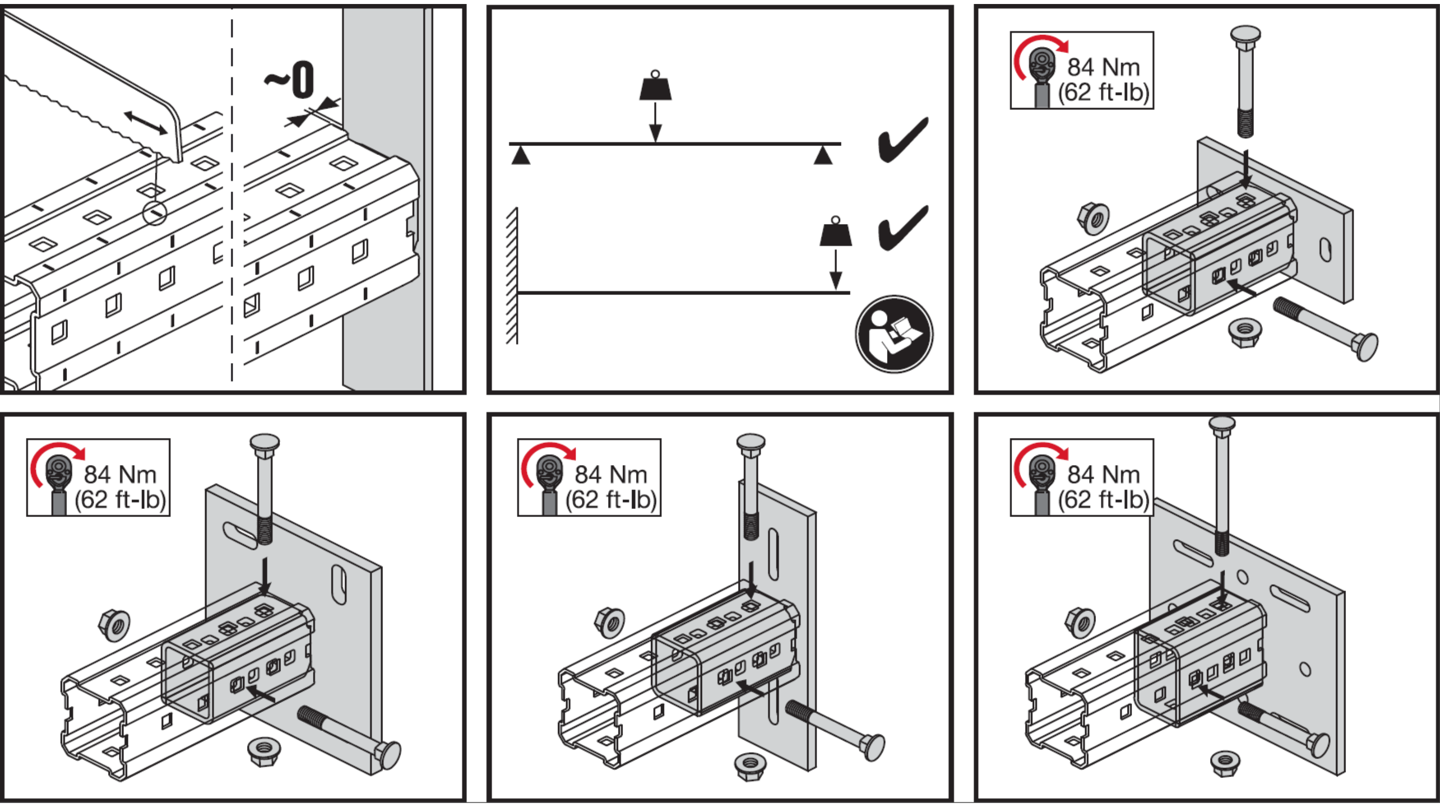
Weight:
10650 g incl. components

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.

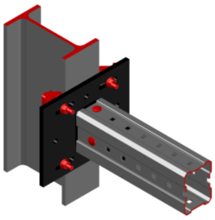
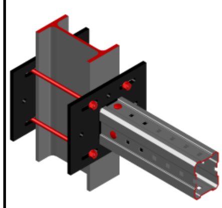
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-S120-C Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

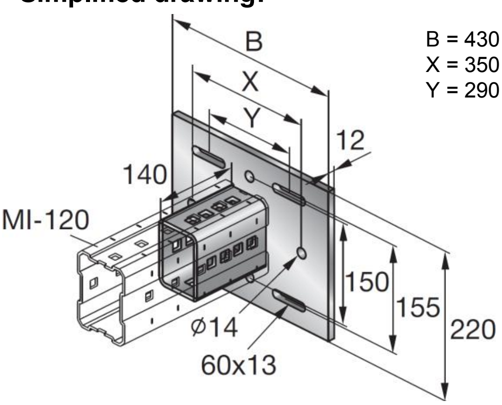
Standards and codes:

• 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

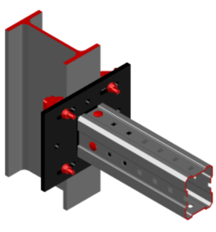
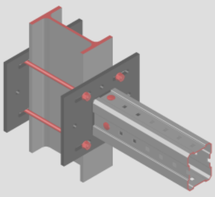
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



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

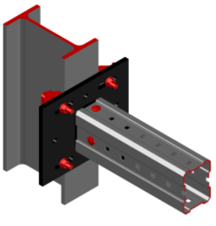
MIC-S120-C Base Material Connector - Steel

Clamped	Boxed	
		

Loading case: Clamped

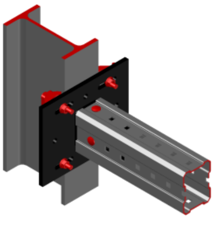
BOM:

Connector incl. all associated components
1x MIC-S120-C **304820**
Bean clamps
4x MI-SGC M12 **233859**



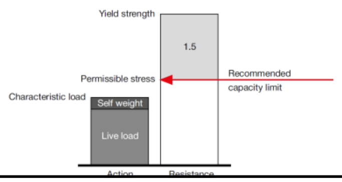
Combinations covered by loading case

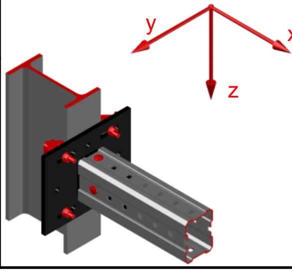
Connector used for a perpendicular connection of MI-120 girder to flange of structural steel profiles. For flange width 235-300mm.



Recommended loading capacity - simplified for most common applications

Method



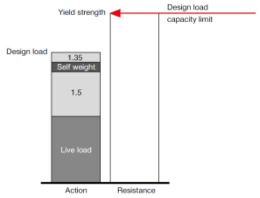


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
13.9	6.0	6.0

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

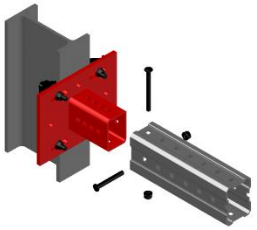
Design loading capacity - 3D 1/3

Method

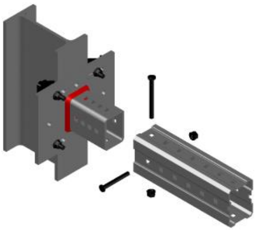


Limiting components of capacity evaluated in following tables:

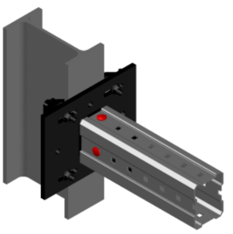
1. Steel connector



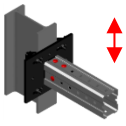
2. Welds



3. 2x bolt in MI channel

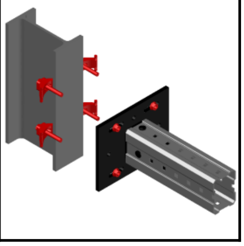


4. 3x bolt in MI channel



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.

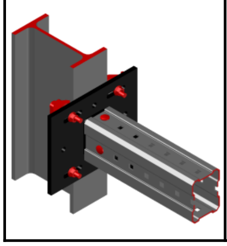
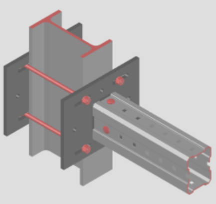
5. Beam clamps



MIC-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

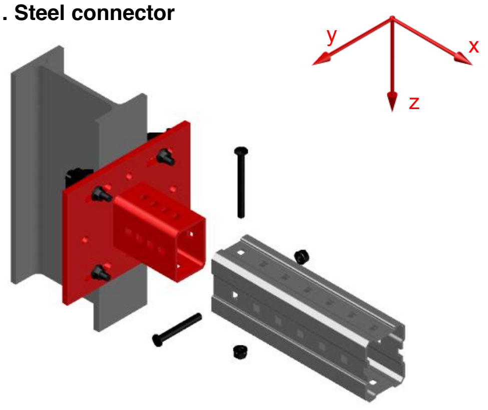
Clamped	Boxed	
		

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

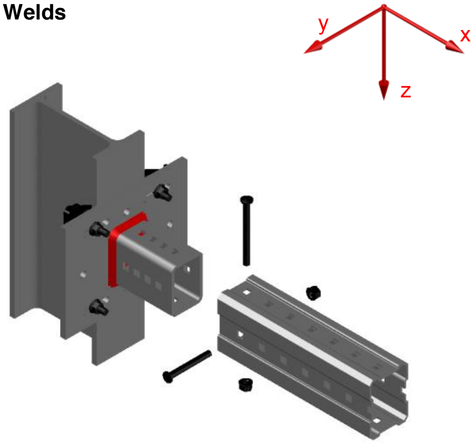


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	68.38	68.38	117.23	117.23
+Mx,Rd [kNcm]	**-Mx,Rd [kNcm]**	**+My,Rd [kNcm]**	**-My,Rd [kNcm]**	**+Mz,Rd [kNcm]**	**-Mz,Rd [kNcm]**
6.78	6.78	2.10	2.10	2.78	2.78

Interaction:

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

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 [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

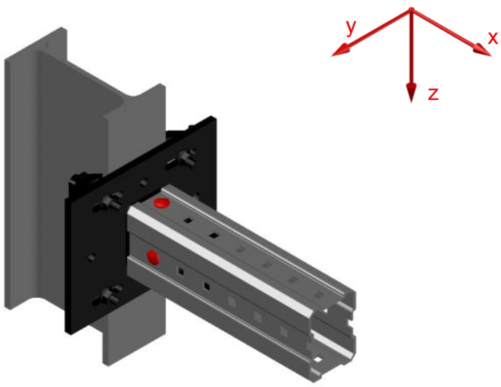
Interaction:

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

MIC-S120-C Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

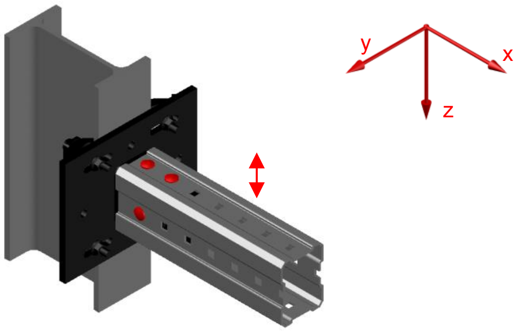


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
3.59	3.59	1.90	1.90	1.35	1.35

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



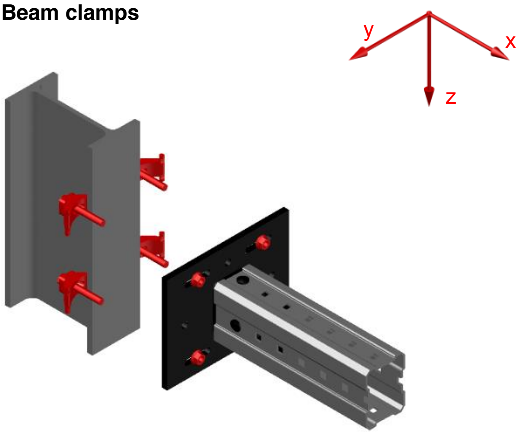
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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



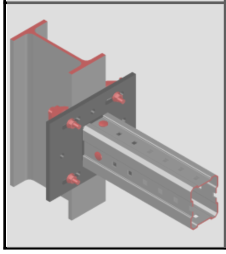
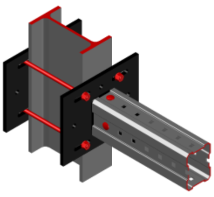
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.31	1.31	2.26	2.26	3.65	3.65

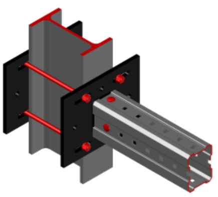
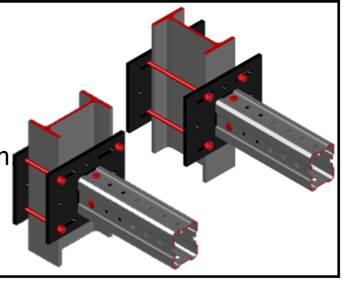
Interaction:

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

Boundary conditions - **Terms of common cooperation / Legal disclaimer** and guidelines as defined at the beginning of this book need to be mandatorily respected.

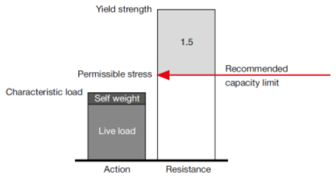
MIC-S120-C Base Material Connector - Steel

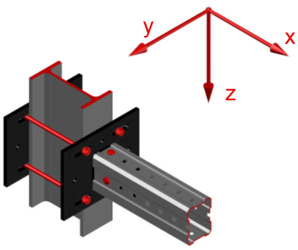
Clamped	Boxed	
		

Loading case: Boxed	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 8.8 HDG…m 419103** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for a perpendicular connection of MI-120 girder to flange of structural steel profiles. For flange width 235-300mm 

Recommended loading capacity - simplified for most common applications

Method



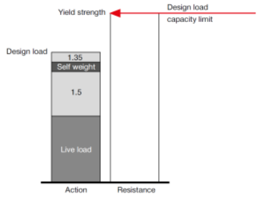


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
13.9	4.9	4.9

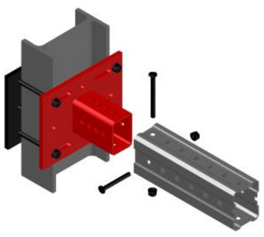
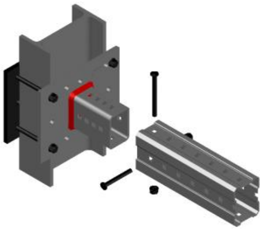
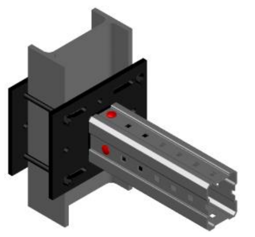
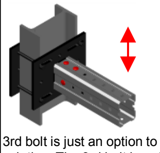
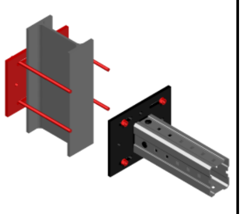
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



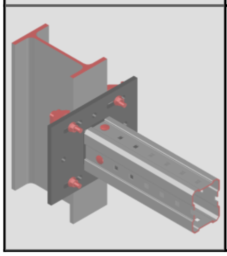
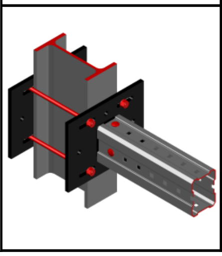
Limiting components of capacity evaluated in following tables:

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:

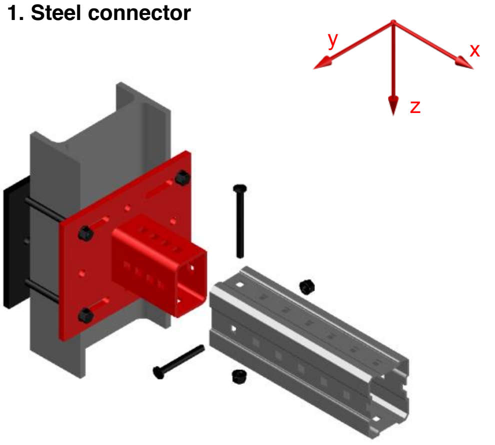
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

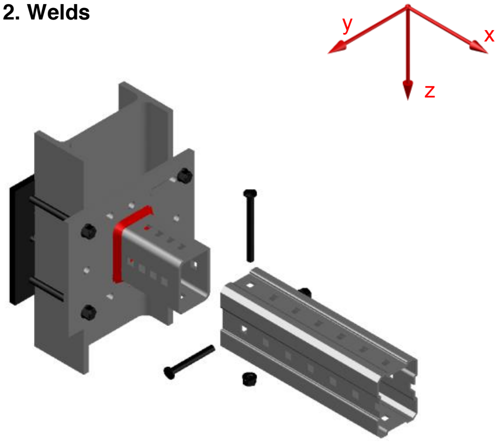


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	68.38	68.38	117.23	117.23
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
6.78	6.78	2.10	2.10	2.78	2.78

Interaction:

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

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

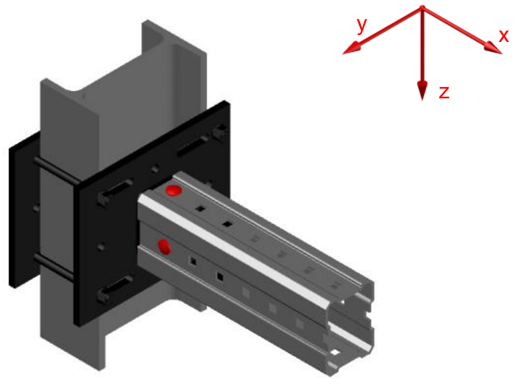
Interaction:

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

MIC-S120-C Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 2x bolt in MI channel

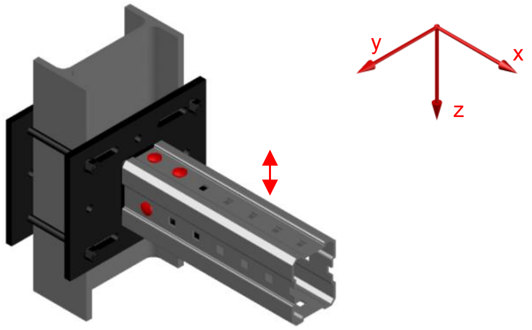


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
75.08	75.08	41.47	41.47	41.47	41.47
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
3.59	3.59	1.90	1.90	1.35	1.35

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



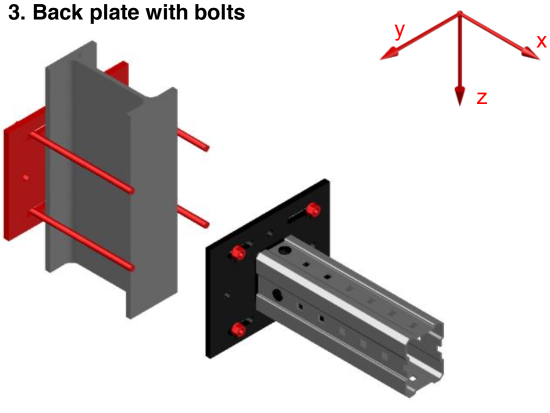
3rd bolt is just an option to standard 2 bolt solution. The 3rd bolt is not a part of standard package and has to be ordered separately. It has to be placed in the direction of the main load (this case vertically) as pictured in the next hole of connector and MI System girder connected to it.

+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



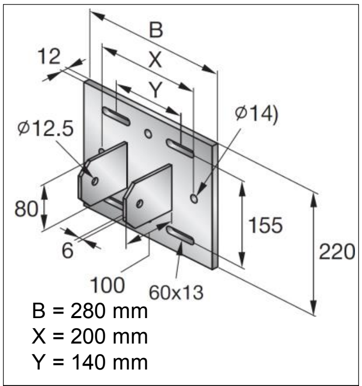
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	29.47	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.08	1.08	12.62	12.62	20.39	20.39

Interaction:

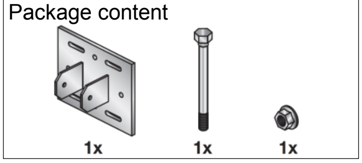
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-SA-MA Base Material Connector - Steel

Designation	Item number
MIC-SA-MA	**304815**



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

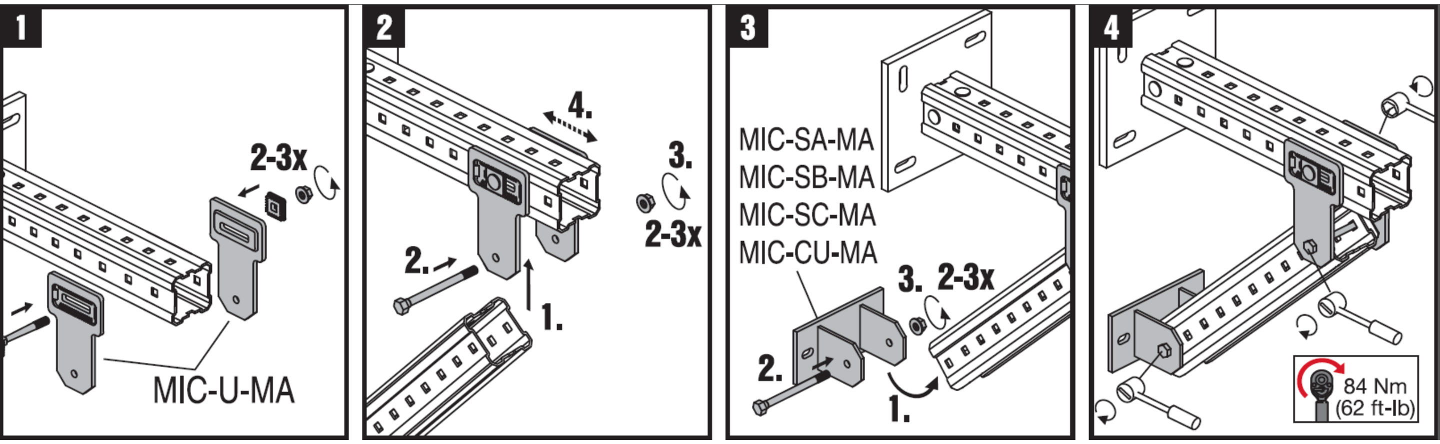
Weight:
6290 g incl. components

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.

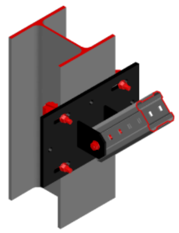
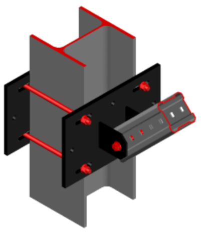
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-SA-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

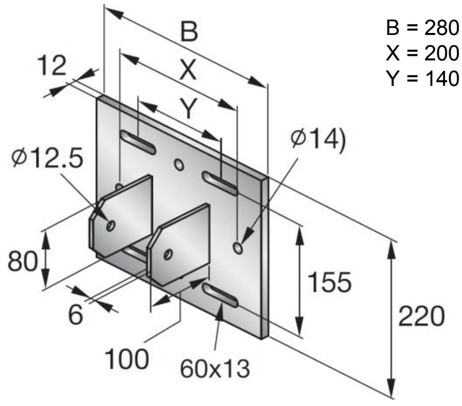
Standards and codes:

• 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

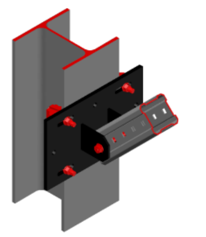
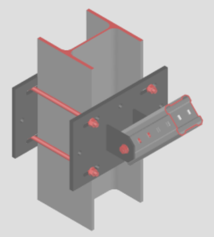
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

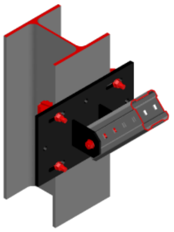
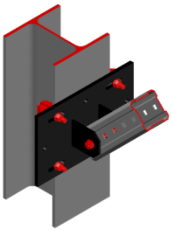
Simplified drawing:



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

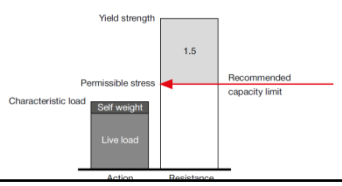
MIC-SA-MA Base Material Connector - Steel

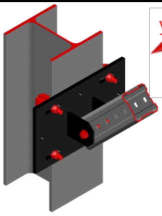
Clamped	Boxed	
		

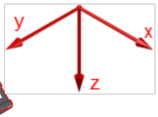
Loading case: Clamped	Combinations covered by loading case
BOM: Connector incl. all associated components **MIC-SA-MA** **304815** Beam clamps **4x MI-SGC M12** **233859** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 75-165mm. 

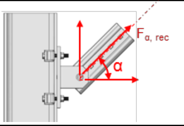
Recommended loading capacity - simplified for most common applications

Method









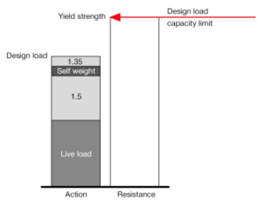
±Fy,rec. [kN]
2.15

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

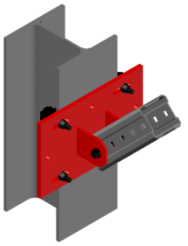
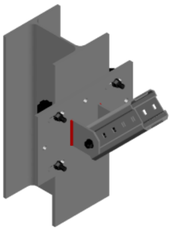
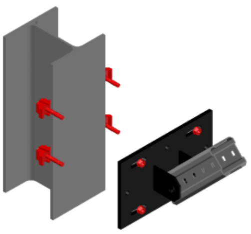
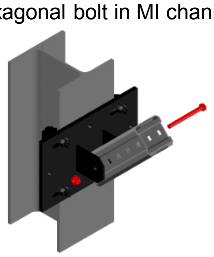
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



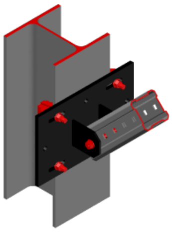
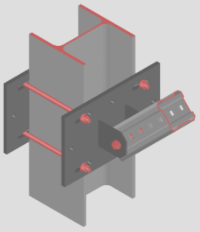
Limiting components of capacity evaluated in following tables:

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

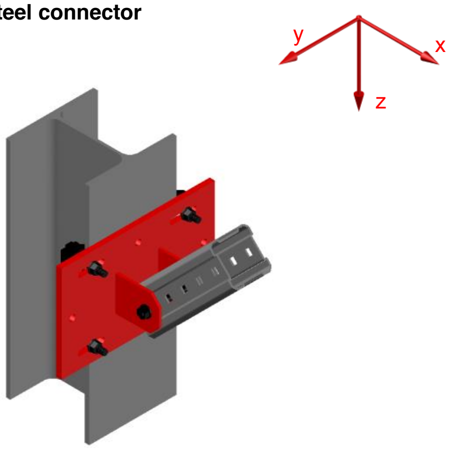
Clamped	**Boxed**	
		

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.

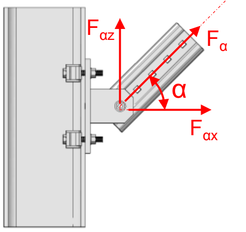
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
58.60	73.93	3.22	3.22	37.13	37.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.81	1.81	2.60	2.60	0.23	0.23

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



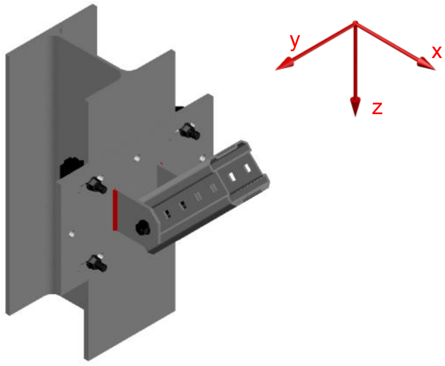
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

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

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

2. Welds



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

Interaction:

with: e_x= 0.07m

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

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

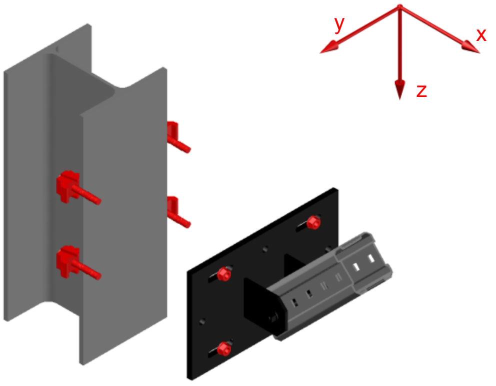
$M_{z.Ed} = F_{y.Ed} * e_x$

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

MIC-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: $e_x = 0.07m$

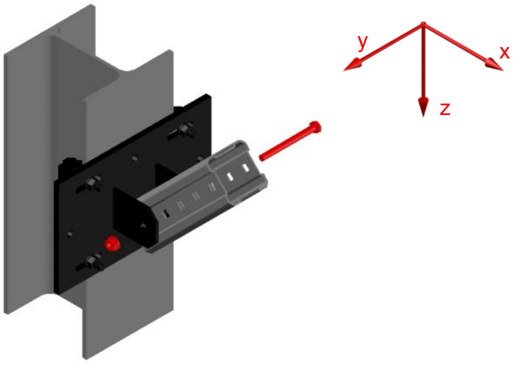
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

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

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

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:

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

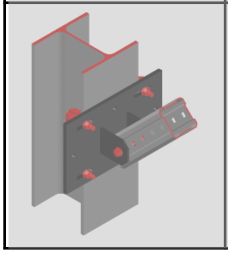
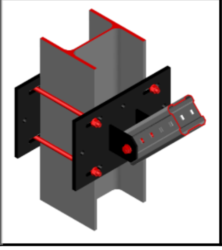
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

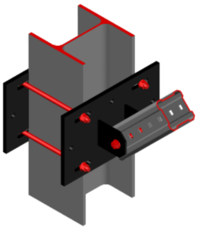
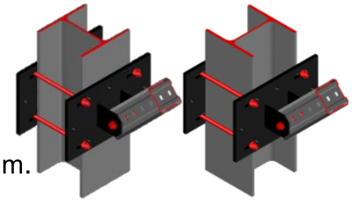
The normal force F_α in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

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

Boundary conditions - **Terms of common cooperation / Legal disclaimer** and guidelines as defined at the beginning of this book need to be mandatorily respected.

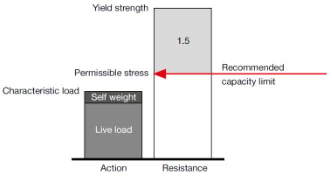
MIC-SA-MA Base Material Connector - Steel

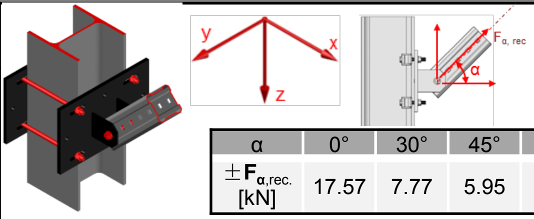
Clamped	Boxed	
		

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

Recommended loading capacity - simplified for most common applications

Method





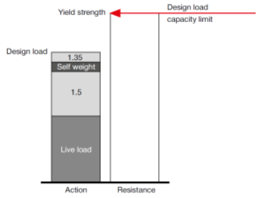
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
±**F**α,rec. [kN]	17.57	7.77	5.95	5.10	4.74

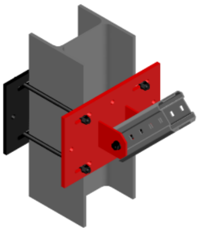
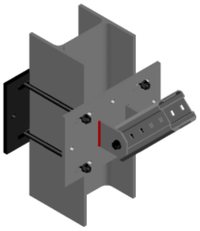
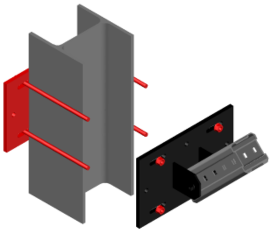
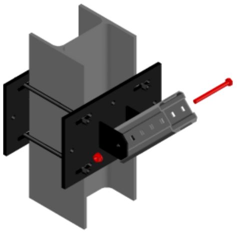
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



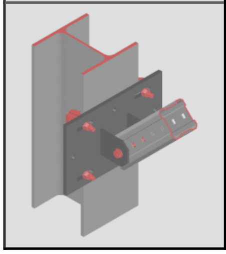
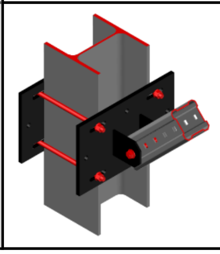
Limiting components of capacity evaluated in following tables:

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:

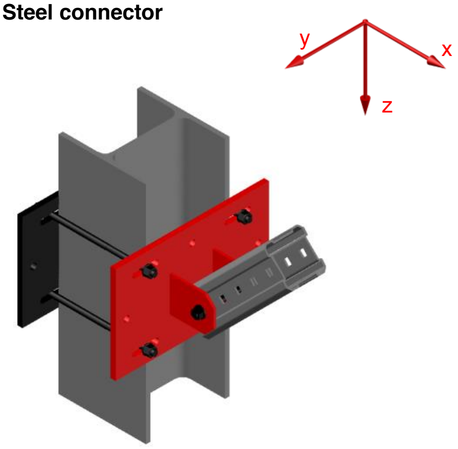
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

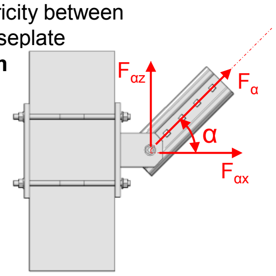


The values for Mx, My and Mz take into account the eccentricity between load application at hexagonal bolt axis and baseplate.

+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:

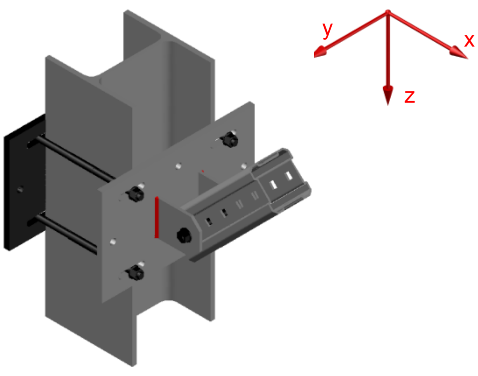
with ex = horizontal eccentricity between hexagonal bolt axis and baseplate
e_x=0.07m



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

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

2. Welds



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

Interaction: **with: e_x= 0.07m**

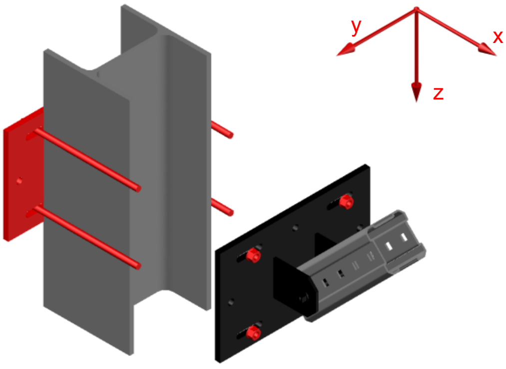
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$
$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$
$M_{z.Ed} = F_{y.Ed} * e_x$

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

MIC-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: $e_x = 0.07m$

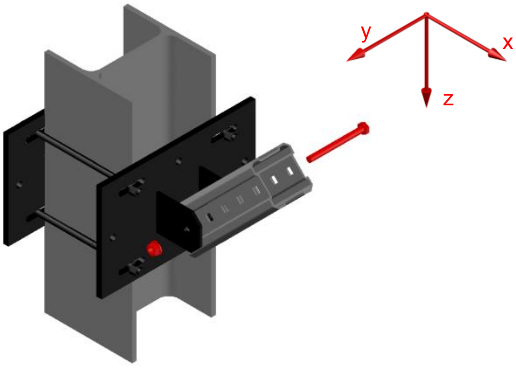
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

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

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

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:

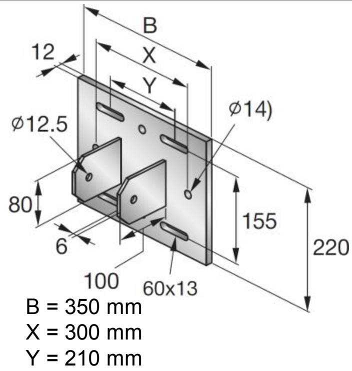
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

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 $F_{\alpha Rd}$.

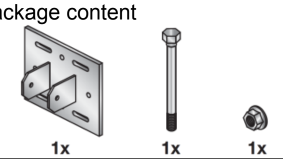
$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

MIC-SB-MA Base Material Connector - Steel

Designation	Item number
MIC-SB-MA	**304816**



Package content



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

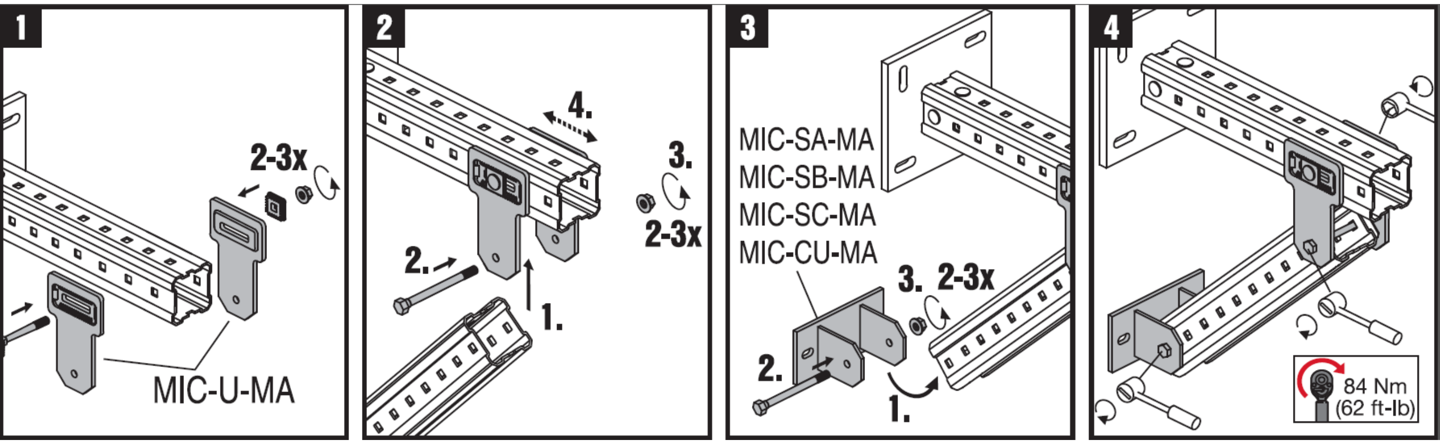
Weight:
7740 g incl. components

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.

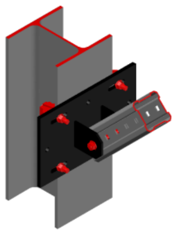
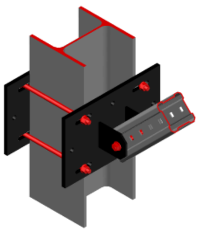
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-SB-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

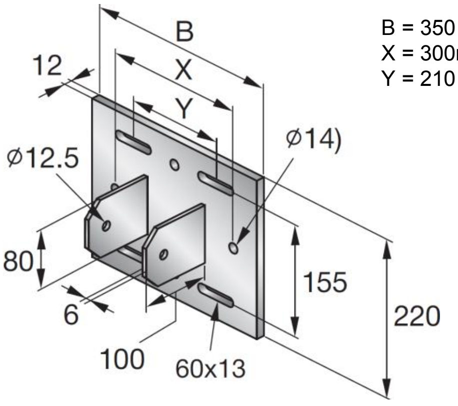
Standards and codes:

• 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

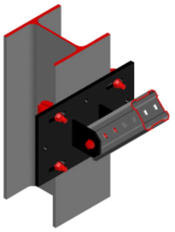
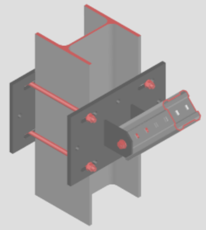
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

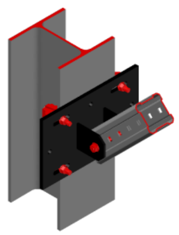
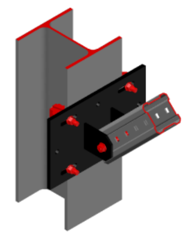
Simplified drawing:



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

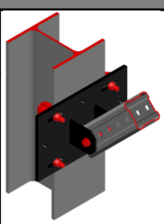
MIC-SB-MA Base Material Connector - Steel

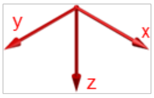
Clamped	Boxed	
		

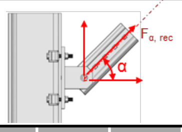
Loading case: Clamped	Combinations covered by loading case
BOM: Connector incl. all associated components **MIC-SB-MA** **304816** Beam clamps **4x MI-SGC M12** **233859** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 165-235mm. 

Recommended loading capacity - simplified for most common applications

Method







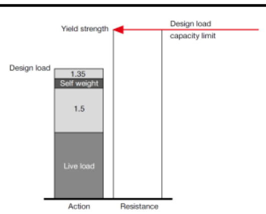
±Fy,rec. [kN]
2.15

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

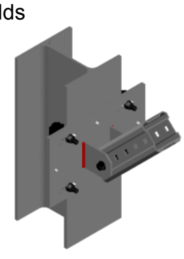
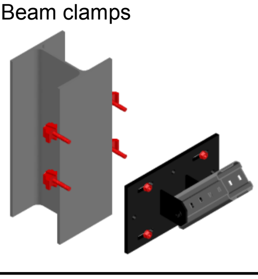
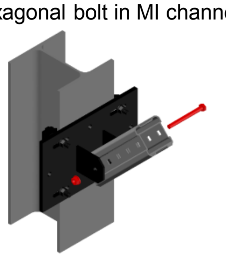
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



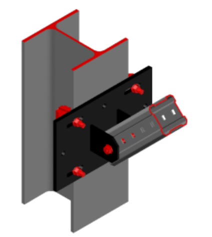
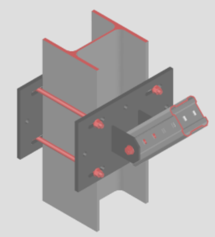
Limiting components of capacity evaluated in following tables:

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:

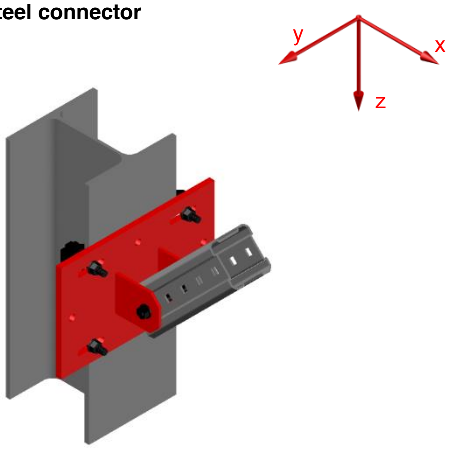
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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.

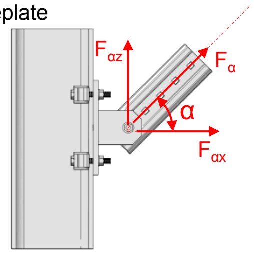
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
43.19	50.50	3.22	3.22	23.25	23.25
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.13	1.13	1.63	1.63	0.23	0.23

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



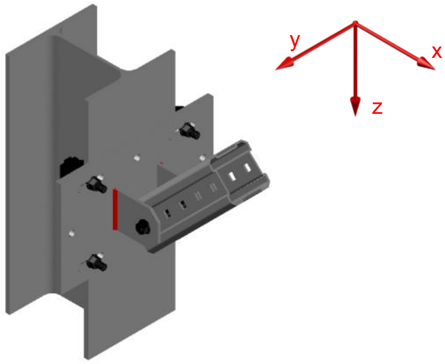
$F_{x.Ed.\alpha} = F_{\alpha} * \cos\alpha$

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

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

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

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**

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

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

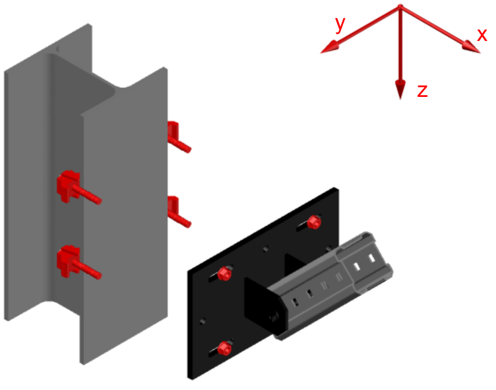
$M_{z.Ed} = F_{y.Ed} * e_x$

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

MIC-SB-MA Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 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: $e_x = 0.07m$

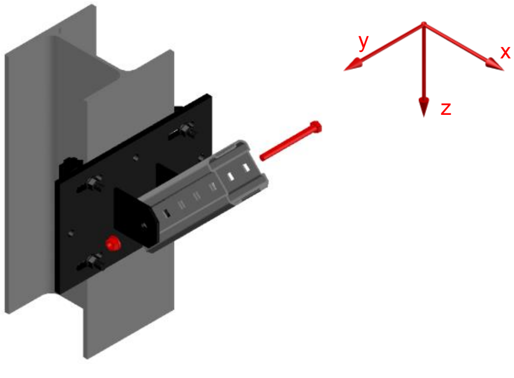
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

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

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

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:

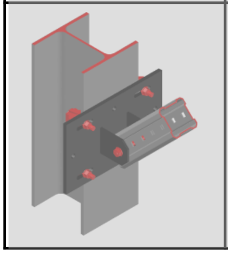
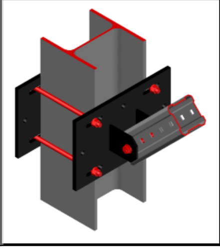
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

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 $F_{\alpha Rd.}$

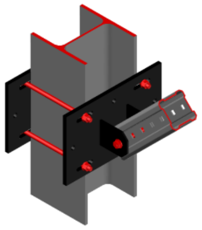
$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \le 1$$

MIC-SB-MA Base Material Connector - Steel

Clamped	Boxed	
		

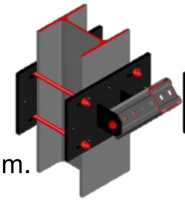
Loading case: Boxed

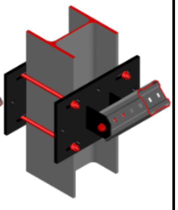
BOM:
Connector incl. all associated components
1x MIC-SB-MA 304816
Base plate
1x MIB-SB 304822
Threaded rods cut to particular length
4x AM12x1000 8.8 HDG…m 419103
Nut
8x M12-F-SL WS3⁄4 382897



Combinations covered by loading case

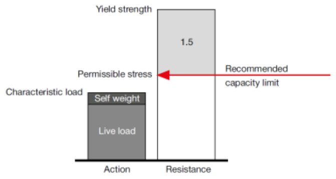
Connector used for an angled connection of MI-90 to structural steel profiles (bracing).
For flange width 165-235mm.

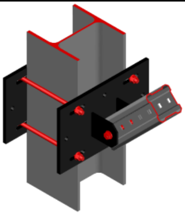


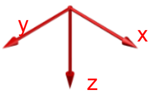


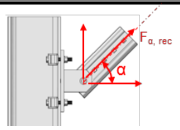
Recommended loading capacity - simplified for most common applications

Method









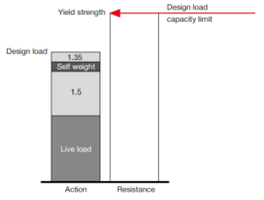
±Fy,rec. [kN]
2.15

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

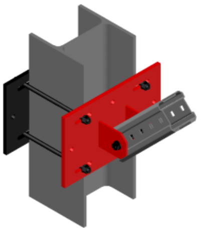
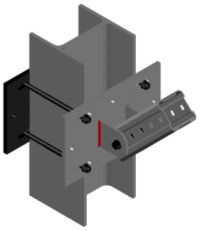
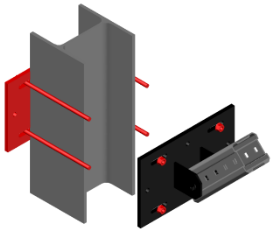
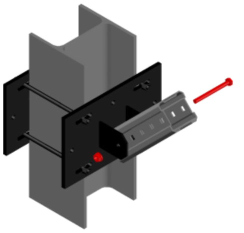
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



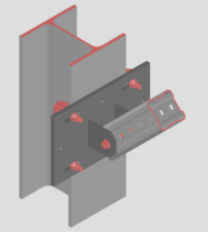
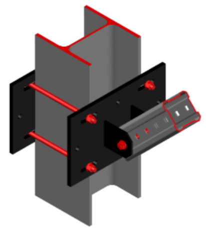
Limiting components of capacity evaluated in following tables:

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:

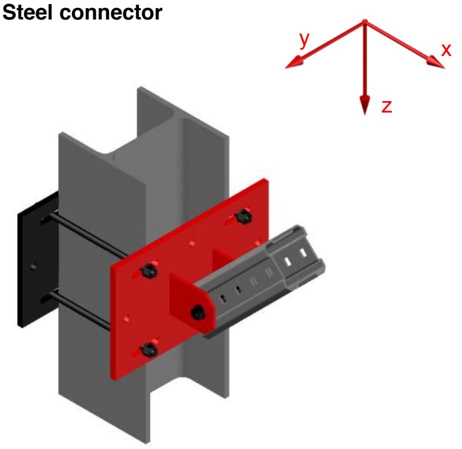
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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.

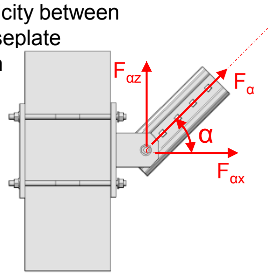
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
43.19	50.50	3.22	3.22	23.25	23.25
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.13	1.13	1.63	1.63	0.23	0.23

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



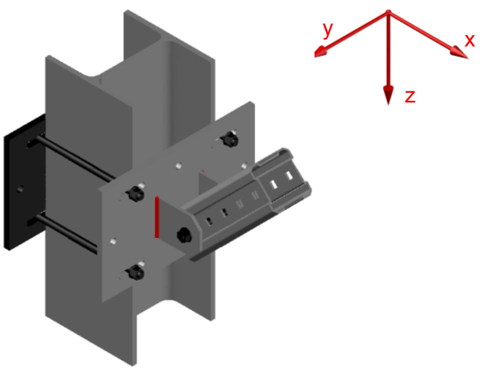
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

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

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

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**

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

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

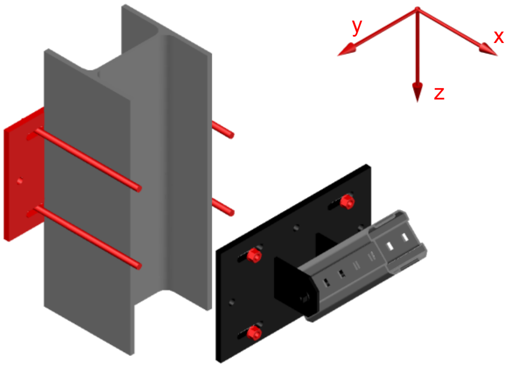
$M_{z.Ed} = F_{y.Ed} * e_x$

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

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

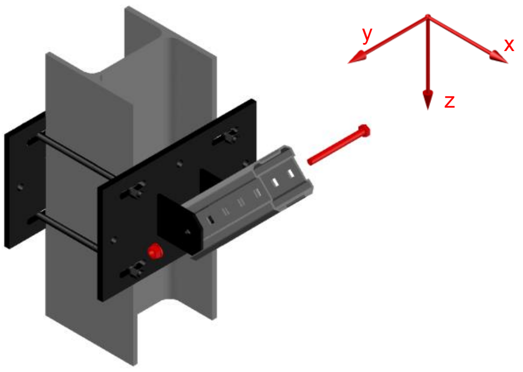
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

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

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

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:

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

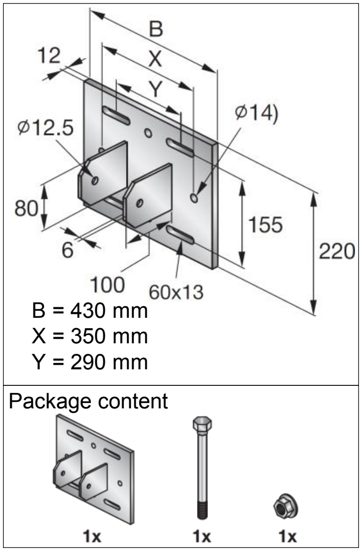
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

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

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

MIC-SC-MA Base Material Connector - Steel

Designation	Item number
MIC-SC-MA	**304817**



Corrosion protection:
Connector 55 µm - DIN EN ISO 1461
Bolt, Nut 45 µm - DIN EN ISO 1461

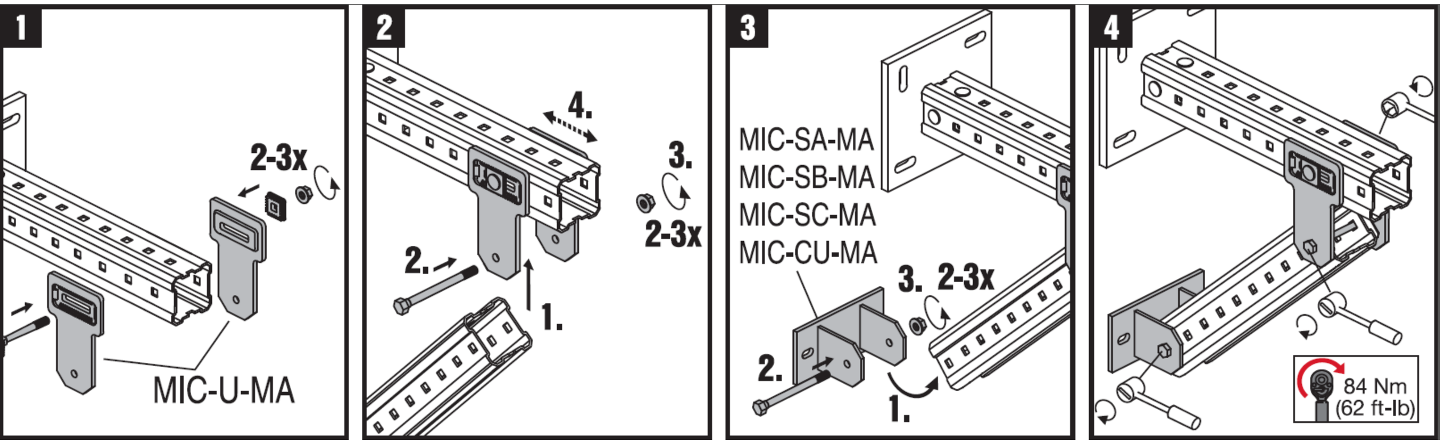
Weight:
9400 g incl. components

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.

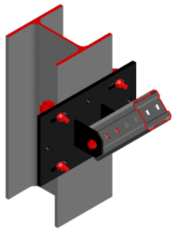
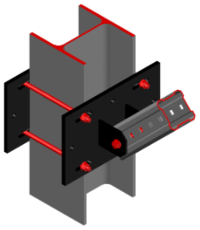
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



MIC-SC-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

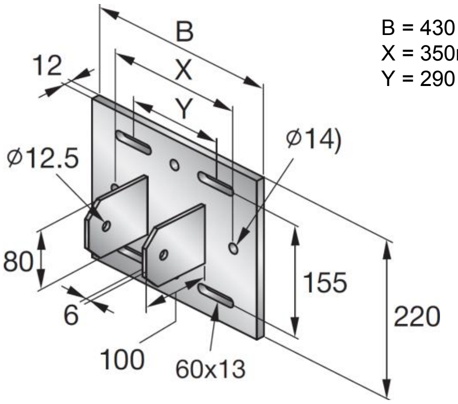
Standards and codes:

• 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

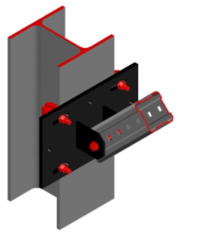
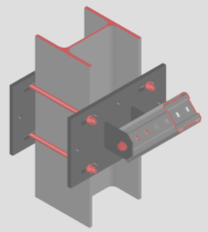
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



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

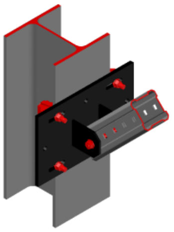
MIC-SC-MA Base Material Connector - Steel

Clamped	Boxed	
		

Loading case: Clamped

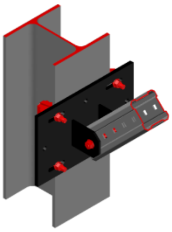
BOM:

Connector incl. all associated components
MIC-SC-MA **304817**
Beam clamps
4x MI-SGC M12 **233859**



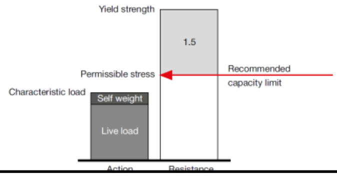
Combinations covered by loading case

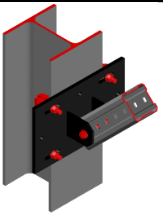
Connector used for an angled connection of MI-90 to structural steel profiles (bracing).
For flange width 235-300mm.

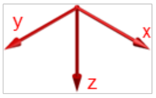


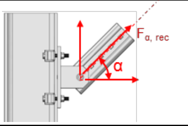
Recommended loading capacity - simplified for most common applications

Method









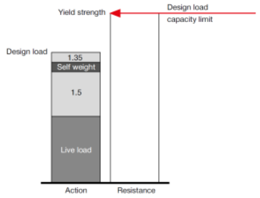
±Fy,rec. [kN]
2.15

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

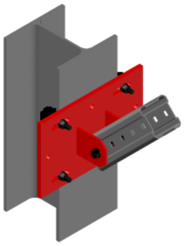
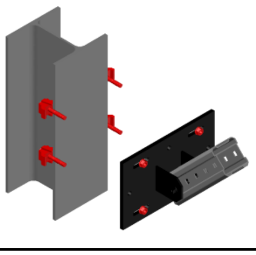
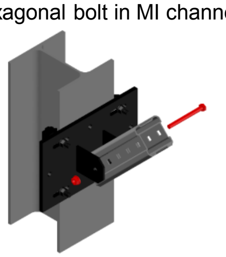
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



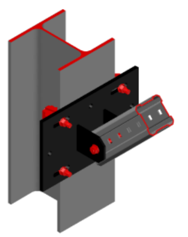
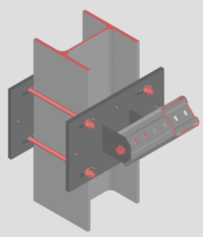
Limiting components of capacity evaluated in following tables:

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

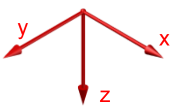
Clamped	Boxed	
		

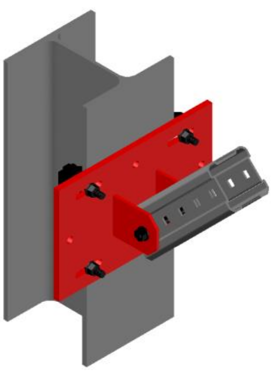
Design loading capacity - 3D 2/3

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.

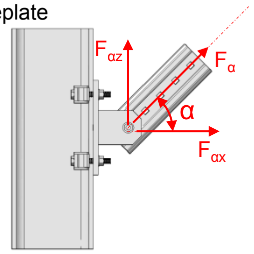
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.47	38.38	3.22	3.22	15.78	15.78
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.77	0.77	1.10	1.10	0.23	0.23

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



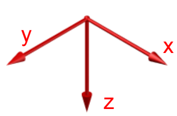
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

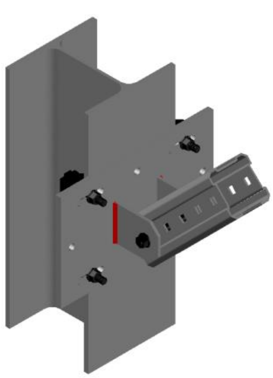
$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

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

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

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**

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

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

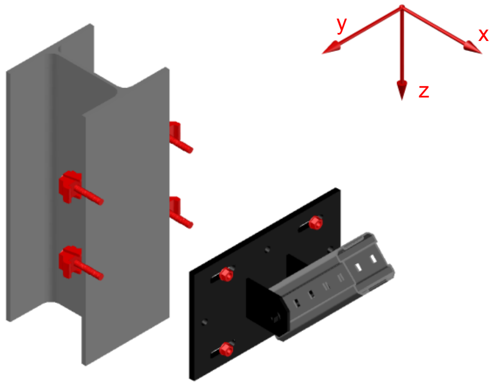
$M_{z.Ed} = F_{y.Ed} * e_x$

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

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: $e_x = 0.07\text{m}$

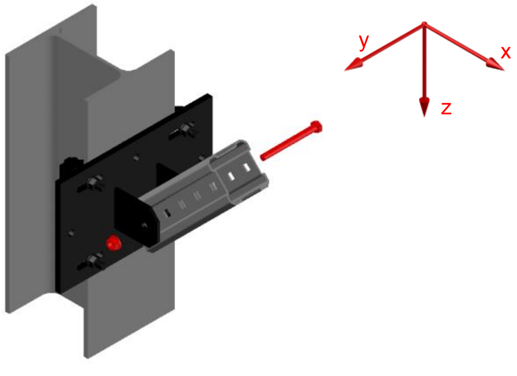
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

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

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

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:

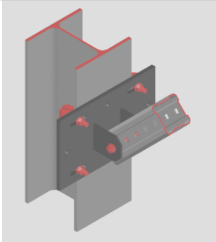
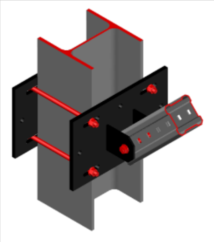
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

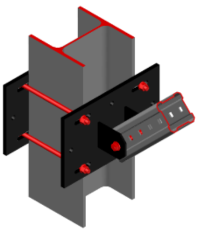
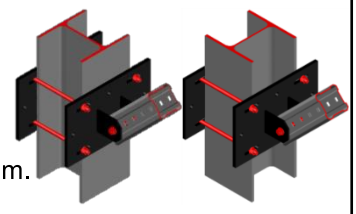
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

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

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

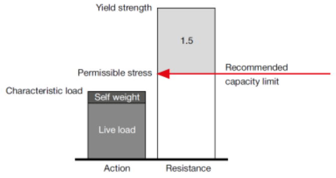
MIC-SC-MA Base Material Connector - Steel

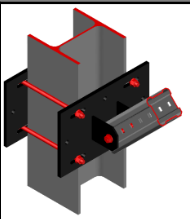
Clamped	Boxed	
		

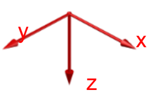
Loading case: Boxed	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-SC-MA 304817** **Base plate** **1x MIB-SC 304823** **Threaded rods cut to particular length** **4x AM12x1000 8.8 HDG…m 419103** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for an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

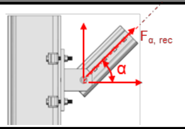
Recommended loading capacity - simplified for most common applications

Method









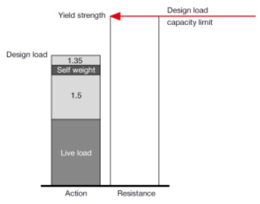
±Fy,rec. [kN]
2.15

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

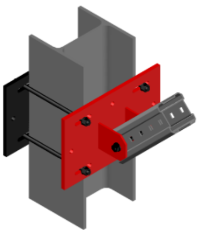
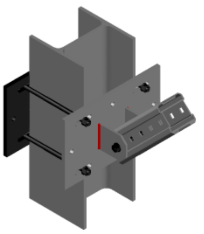
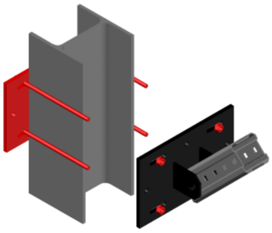
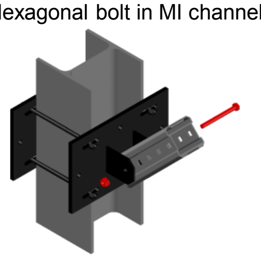
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



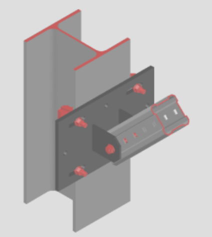
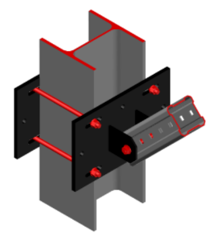
Limiting components of capacity evaluated in following tables:

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:

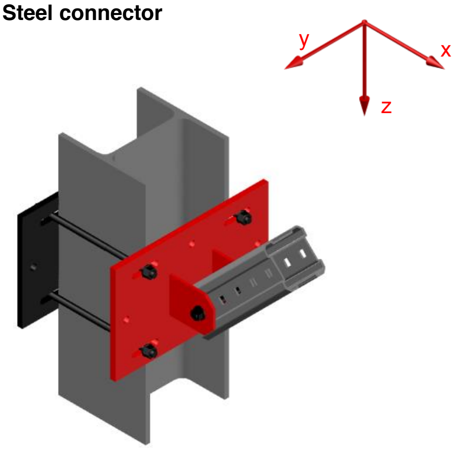
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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.

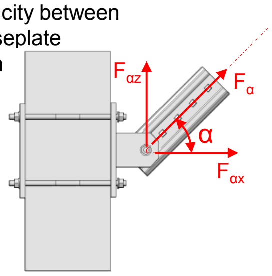
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.47	38.38	3.22	3.22	15.78	15.78
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.77	0.77	1.10	1.10	0.23	0.23

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



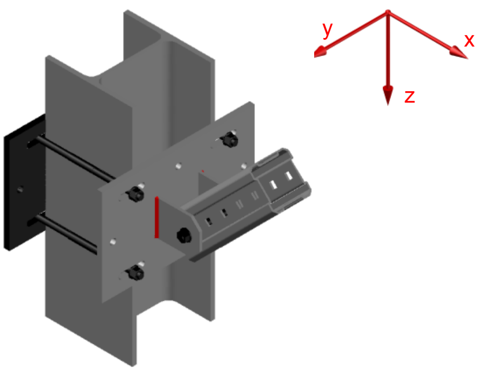
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

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

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

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**

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

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

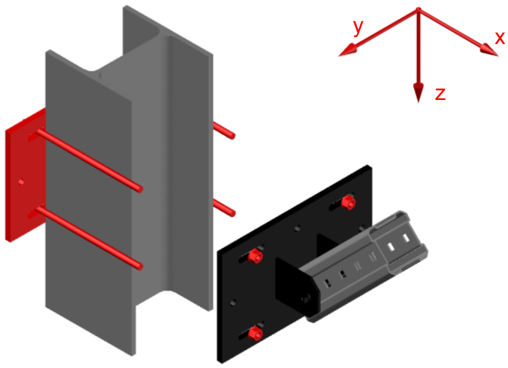
$M_{z.Ed} = F_{y.Ed} * e_x$

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

MIC-SC-MA Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 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: $e_x = 0.07m$

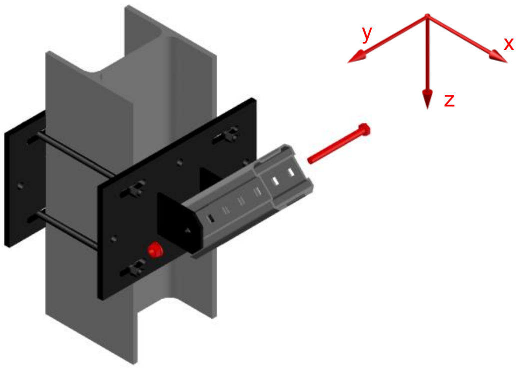
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

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

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

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

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:

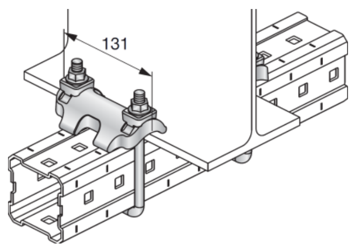
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

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 $F_{\alpha Rd}$.

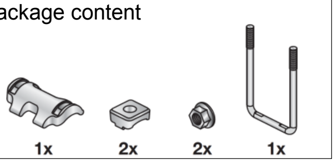
$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

MI-DGC 90 Base Material Connector - Steel

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



Package content



Corrosion protection:
Clamp 55 µm - DIN EN ISO 1461
U-Bolt, Nut 45 µm - DIN EN ISO 1461

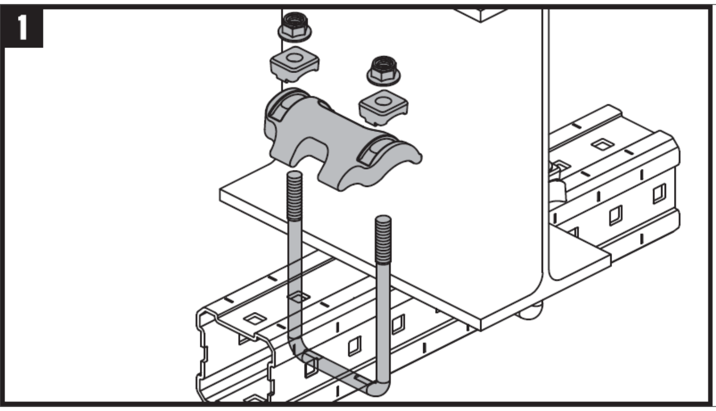
Weight:
1015.6 g incl. components

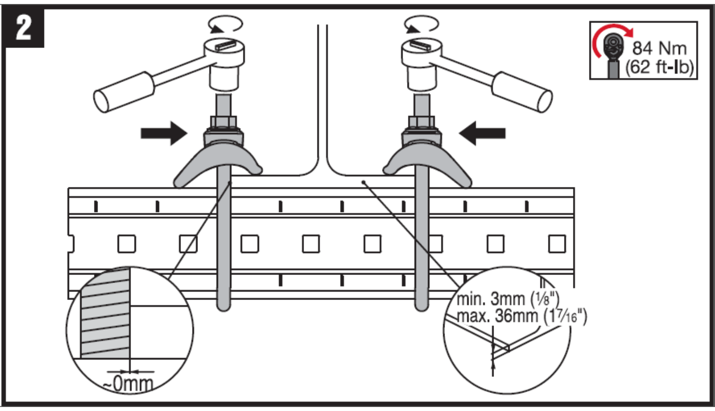
Submittal text:
Hilti Hot-dipped galvanized steel beam clamp, typically used to connect a horizontal MI-90 or MIQ-90 girder to steel beam. Two U-bolts carry the girder and are connected to the clamp with saddles and nuts.

Material properties:

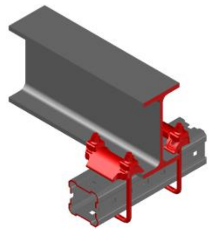
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Clamp: Steel EN-GJMB-350-10 - DIN EN 1562, Steel EN-GJMW-400-5 - DIN EN 1562 Steel EN-GJMB-450-6 - EN 1562	$f_y = 270 \frac{N}{mm^2}$	$f_u = 450 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640 \frac{N}{mm^2}$	$f_u = 800 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:





MI-DGC 90 Base Material Connector - Steel

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation
- Hardware tests

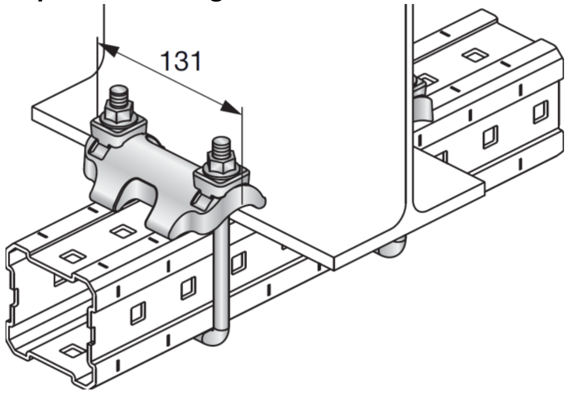
Standards and codes:

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

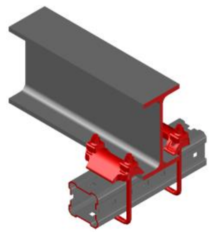
Software:
- Mathcad 15.0
- Microsoft Excel

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

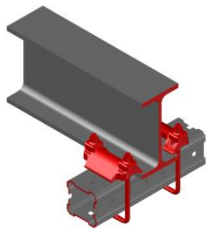
Simplified drawing:

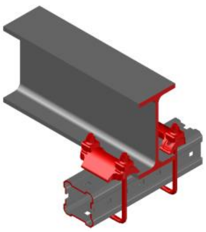


MI-DGC 90 Base Material Connector - Steel

Standard		
		

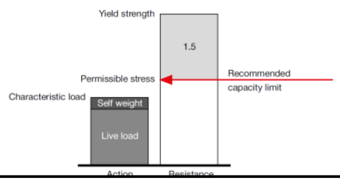
Loading case: Standard	Combinations covered by loading case
BOM: Connector incl. all associated components **MI-DGC 90** **233860** Associated MI System girders (channels) **MI-90 3m** **304799** **MI-90 6m** **304798**	Connector used for horizontal connection of MI-90 or MIQ-90 to the flanges of structural steel profiles. Flange thickness 3-36mm.

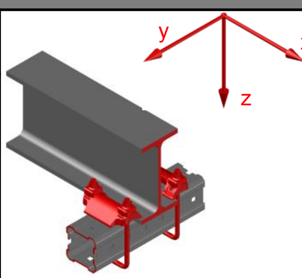




Recommended loading capacity - simplified for most common applications

Method



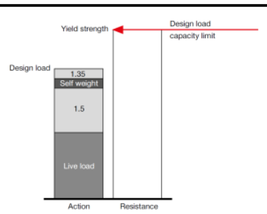


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
6.0	4.0	23.2

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

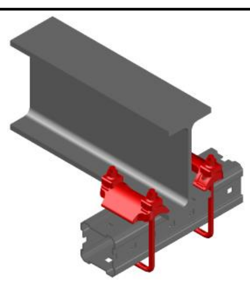
Design loading capacity - 3D 1/2

Method



Limiting components of capacity evaluated in following tables:

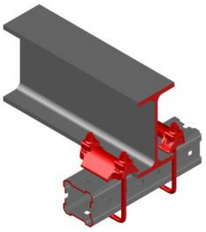
1. Steel connector



MI-DGC 90 Base Material Connector - Steel

Conditions of the loading capacity tables:

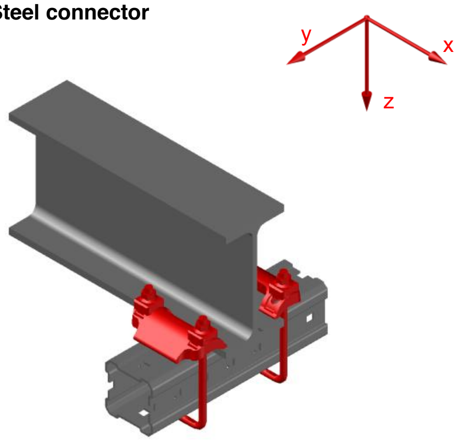
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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

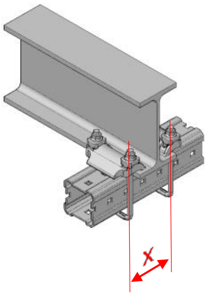
Interaction:

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

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

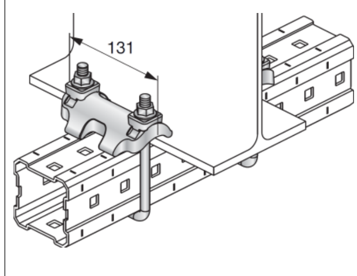


with x [m] = width of flange + 0,012m

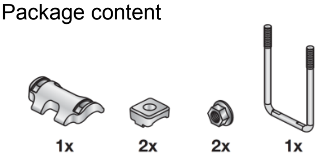
Data version 1.3 I Date 12.2016	Page 1/4

MI-DGC 120 Base Material Connector - Steel

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



Package content



Corrosion protection:
Clamp 55 µm - DIN EN ISO 1461
U-Bolt, Nut 45 µm - DIN EN ISO 1461

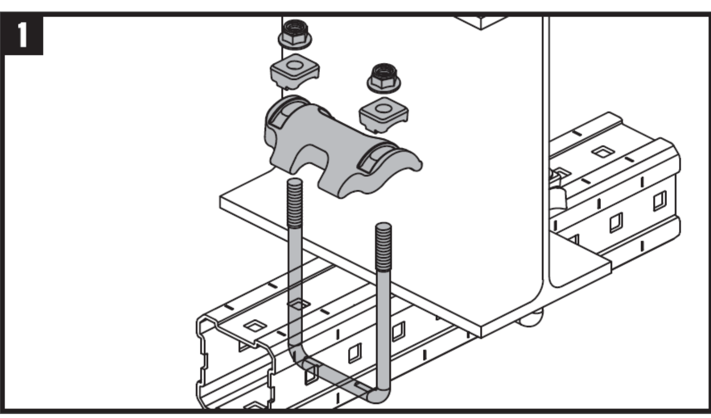
Weight:
1041.9 g incl. components

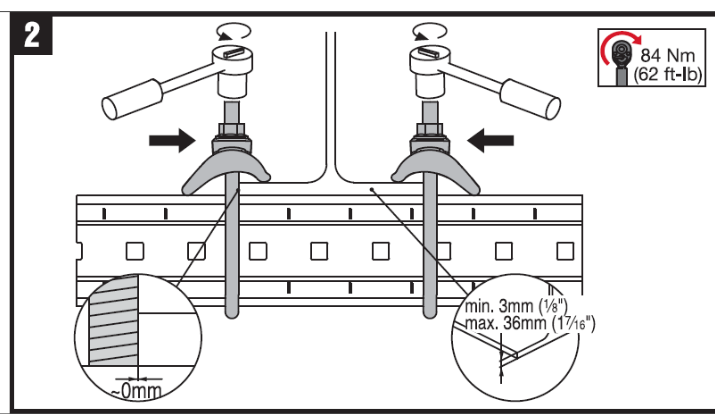
Submittal text:
Hilti Hot-dipped galvanized steel beam clamp, typically used to connect a horizontal MI-120 girder to a steel beam. Two U-bolts carry the girder and are connected to the clamp with saddles and nuts.

Material properties:

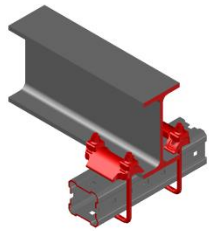
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Clamp: Steel EN-GJMB-350-10 - DIN EN 1562, Steel EN-GJMW-400-5 - DIN EN 1562 Steel EN-GJMB-450-6 - EN 1562	$f_y = 270\ \frac{N}{mm^2}$	$f_u = 450\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$
Bolt, Nut: Steel grade 8.8	$f_y = 640\ \frac{N}{mm^2}$	$f_u = 800\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$

Instruction For Use:





MI-DGC 120 Base Material Connector - Steel

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation
- Hardware tests

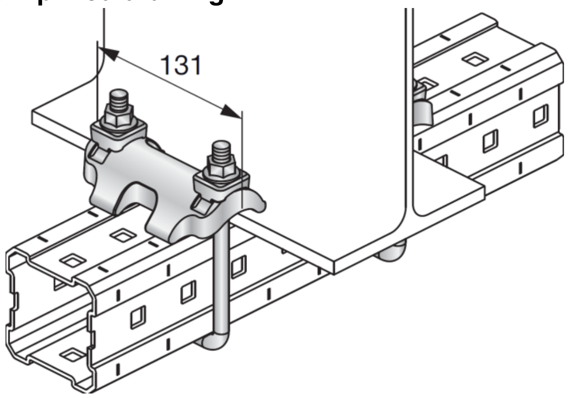
Standards and codes:

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

Software:
- Mathcad 15.0
- Microsoft Excel

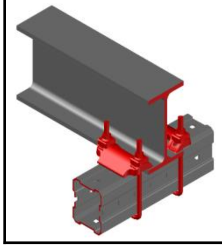
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MI-DGC 120 Base Material Connector - Steel

Standard

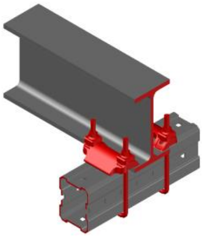


Loading case: Standard

BOM:

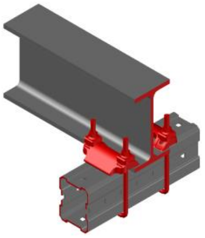
Connector incl. all associated components
MI-DGC 120 **233861**

Associated MI System girders (channels)
MI-120 3m **304800**
MI-120 6m **304801**



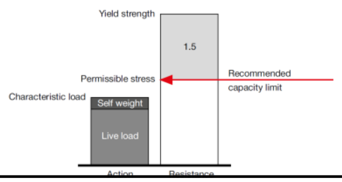
Combinations covered by loading case

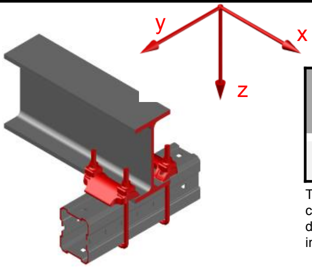
Connector used for horizontal connection of MI-120 to the flanges of structural steel profiles. Flange thickness 3-36mm.



Recommended loading capacity - simplified for most common applications

Method



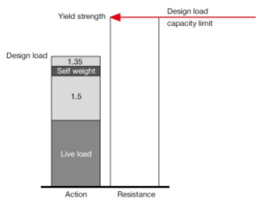


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
8.0	4.0	23.2

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

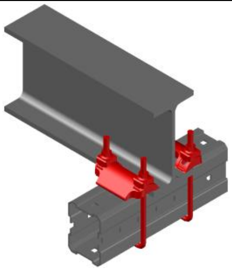
Design loading capacity - 3D 1/2

Method



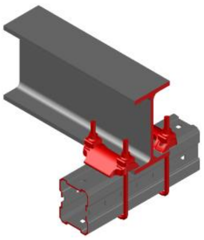
Limiting components of capacity evaluated in following tables:

1. Steel connector



MI-DGC 120 Base Material Connector - Steel

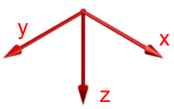
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

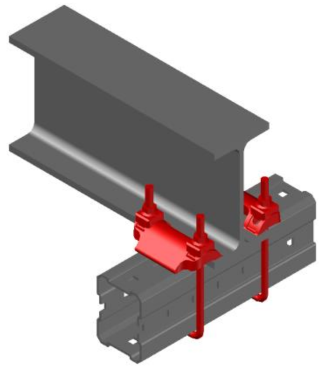
Standard		
		

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

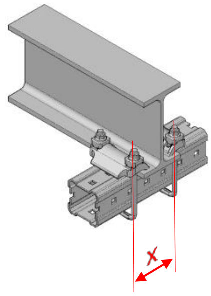
Interaction:

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

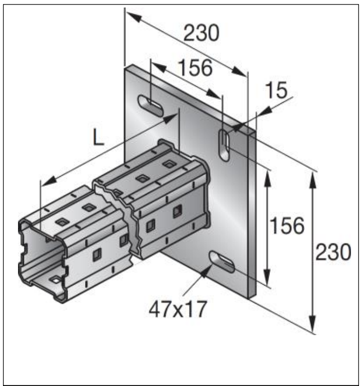
$$\sqrt{\left(\frac{F_{x.Ed}}{F_{x.Rd}}\right)^2 + \left(\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}}\right)^2} \le 1$$



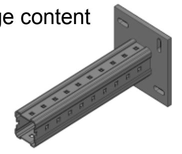
with x [m] = width of flange + 0,012m

MIC-C90-D-500-2000 Bracket - Concrete

Designation	Item number
MIC-C90-D- 500	**267789**
MIC-C90-D- 750	**267790**
MIC-C90-D-1000	**267791**
MIC-C90-D-1500	**267792**
MIC-C90-D-2000	**267793**



Package content



Designation	L[mm]
MIC-C90-D- 500	500
MIC-C90-D- 750	750
MIC-C90-D-1000	1000
MIC-C90-D-1500	1500
MIC-C90-D-2000	2000

Corrosion protection:
Hot dipped galvanized as per ASTM 123, thickness 75 microns

Weight:

MIC-C90-D- 500	10595g
MIC-C90-D- 750	12952g
MIC-C90-D-1000	15310g
MIC-C90-D-1500	20025g
MIC-C90-D-2000	24740g

Submittal text:
Hilti Hot-dipped galvanized bracket used as fixed to concrete. Four oblong anchor holes enable fine tuning of baseplate position, and girder is welded on the baseplate.

Material properties:

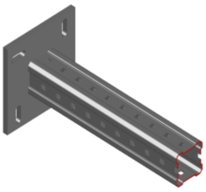
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Bracket: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:

No IFU attached to the packaging

Respect IFU from the used anchor

MIC-C90-D-500-2000 Bracket - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

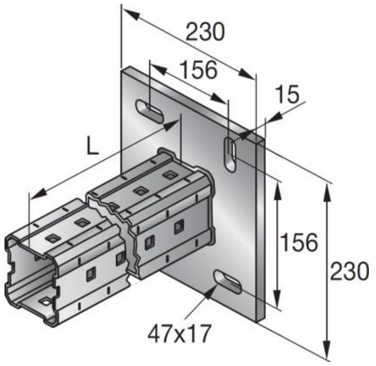
Standards and codes:

•	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

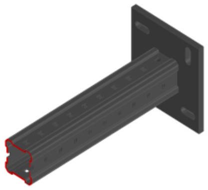
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



MIC-C90-D-500-2000 Bracket - Concrete

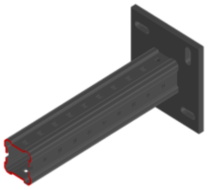
Standard



Loading case: Standard

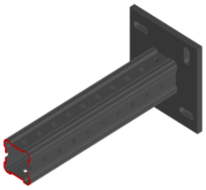
BOM:

Brackets:
MIC-C90-D- 500 **267789**
MIC-C90-D- 750 **267790**
MIC-C90-D-1000 **267791**
MIC-C90-D-1500 **267792**
MIC-C90-D-2000 **267793**
Associated anchors*
for cracked concrete
4x HST3 M16x135 35/15 **2105858**
*Anchors not incl. in capacity limits



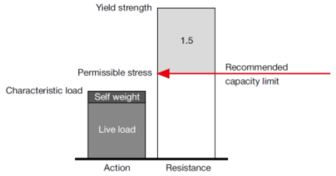
Combinations covered by loading case

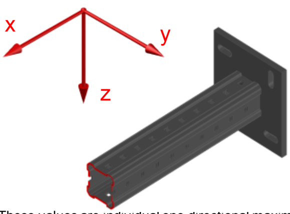
Pre-fab bracket for perpendicular connection to concrete.



Recommended loading capacity - simplified for most common applications

Method





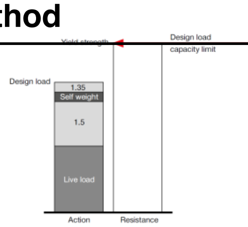
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
35.9	39.8	39.8

±My,rec. [kNm]
2.63

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

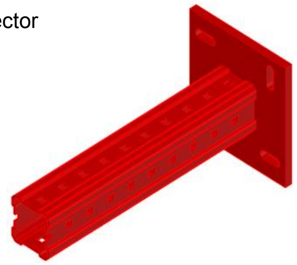
Design loading capacity - 3D 1/2

Method

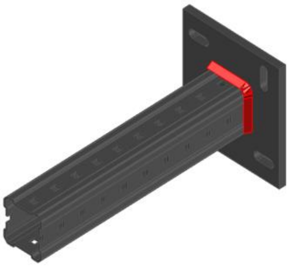


Limiting components of capacity evaluated in following tables:

1. Steel connector



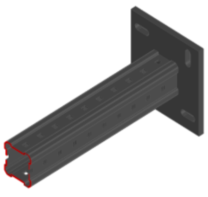
2. Welds



MIC-C90-D-500-2000 Bracket - Concrete

Conditions of the loading capacity tables:

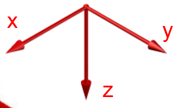
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

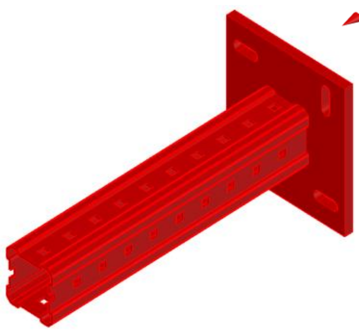
Standard		
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector





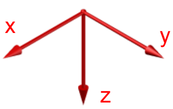
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
53.91	101.50	59.70	59.70	59.70	59.70
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.19	5.19	3.95	3.95	3.95	3.95

includes cross section resistance of steel base plate and channel

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



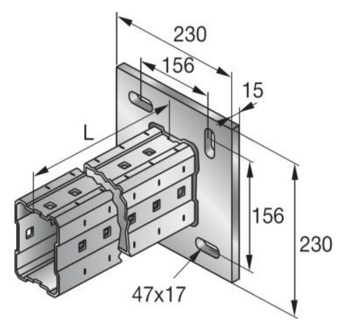
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
285.11	285.11	116.39	116.39	116.39	116.39
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
9.54	9.54	5.84	5.84	5.84	5.84

Interaction:

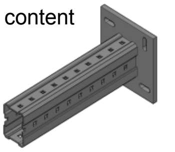
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-C120-D-500-2000 Bracket - Concrete

Designation	Item number
MIC-C120-D- 500	**270468**
MIC-C120-D- 750	**270469**
MIC-C120-D-1000	**270470**
MIC-C120-D-1500	**270471**
MIC-C120-D-2000	**270472**



Package content



Designation	L[mm]
MIC-C120-D- 500	500
MIC-C120-D- 750	750
MIC-C120-D-1000	1000
MIC-C120-D-1500	1500
MIC-C120-D-2000	2000

Corrosion protection:
Hot dipped galvanized as per ASTM 123, thickness 75 microns

Weight:

MIC-C120-D- 500	12180g
MIC-C120-D- 750	15210g
MIC-C120-D-1000	18480g
MIC-C120-D-1500	24780g
MIC-C120-D-2000	31080g

Submittal text:
Hilti Hot-dipped galvanized bracket used as fixed to concrete. Four oblong anchor holes enable fine tuning of baseplate position, and girder is welded on the baseplate.

Material properties:

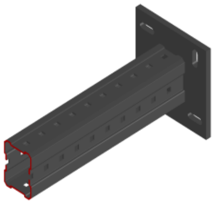
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Bracket: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:

No IFU attached to the packaging

Respect IFU from the used anchor

MIC-C120-D-500-2000 Bracket - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

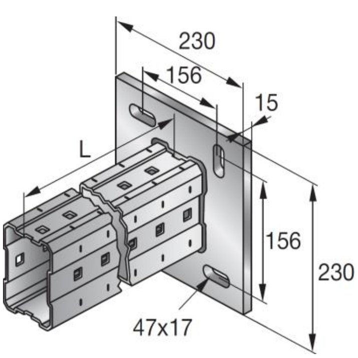
Standards and codes:

• 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

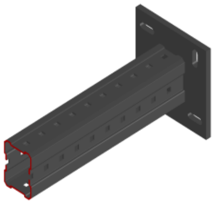
Software:
- Mathcad 15.0
- Microsoft Excel

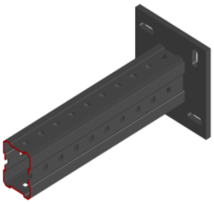
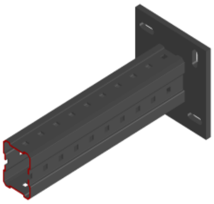
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



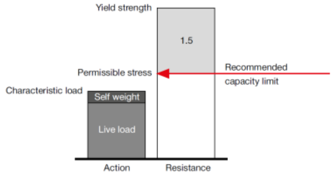
MIC-C120-D-500-2000 Bracket - Concrete

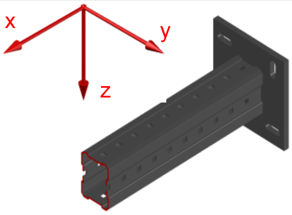
Standard		
		

Loading case: Standard	Combinations covered by loading case
BOM: Brackets: **MIC-C120-D- 500 270468** **MIC-C120-D- 750 270469** **MIC-C120-D-1000 270470** **MIC-C120-D-1500 270471** **MIC-C120-D-2000 270472** Associated anchors* for cracked concrete **4x HST3 M16x135 35/15 2105858** *Anchors not incl. in capacity limits 	Pre-fab bracket for perpendicular connection to concrete. 

Recommended loading capacity - simplified for most common applications

Method





±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
37.8	46.5	66.8

±My,rec. [kNm]
3.34

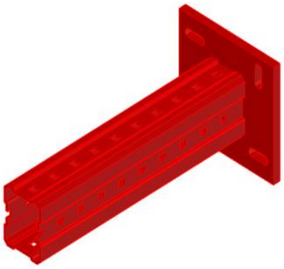
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/2

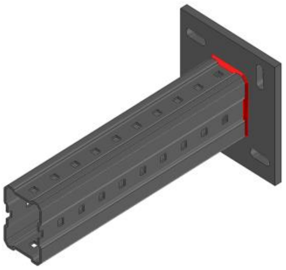
Method

Limiting components of capacity evaluated in following tables:

1. Steel connector



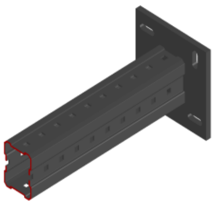
2. Welds



MIC-C120-D-500-2000 Bracket - Concrete

Conditions of the loading capacity tables:

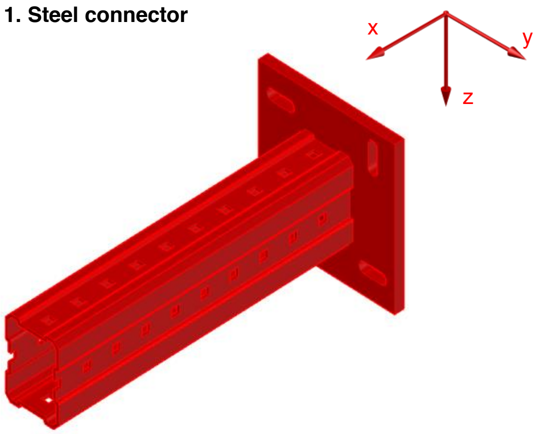
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

Standard		
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector

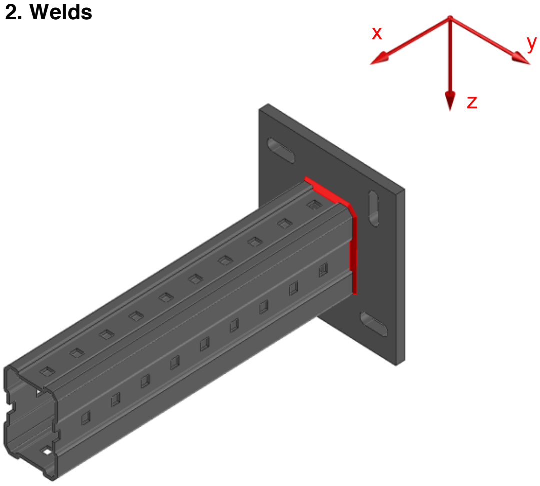


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
56.74	132.97	69.74	69.74	100.13	100.13
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
8.54	8.54	5.01	5.01	4.13	4.13

includes cross section resistance of steel base plate and channel
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



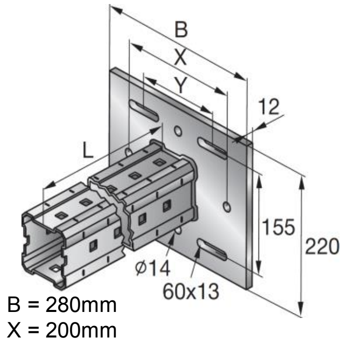
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
346.20	346.20	116.39	116.39	166.28	166.28
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
13.34	13.34	7.98	7.98	8.35	8.35

Interaction:

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

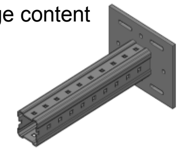
MIC-S90-A-500-2000 Bracket - Steel

Designation	Item number
MIC-S90-A- 500	**267774**
MIC-S90-A- 750	**267775**
MIC-S90-A-1000	**267776**
MIC-S90-A-1500	**267777**
MIC-S90-A-2000	**267778**



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

Package content



Designation	L[mm]
MIC-S90-A- 500	500
MIC-S90-A- 750	750
MIC-S90-A-1000	1000
MIC-S90-A-1500	1500
MIC-S90-A-2000	2000

Corrosion protection:
Hot dipped galvanized as per ASTM 123, thickness 75 microns

Weight:

MIC-S90-A- 500	10175g
MIC-S90-A- 750	12480g
MIC-S90-A-1000	14890g
MIC-S90-A-1500	19605g
MIC-S90-A-2000	24320g

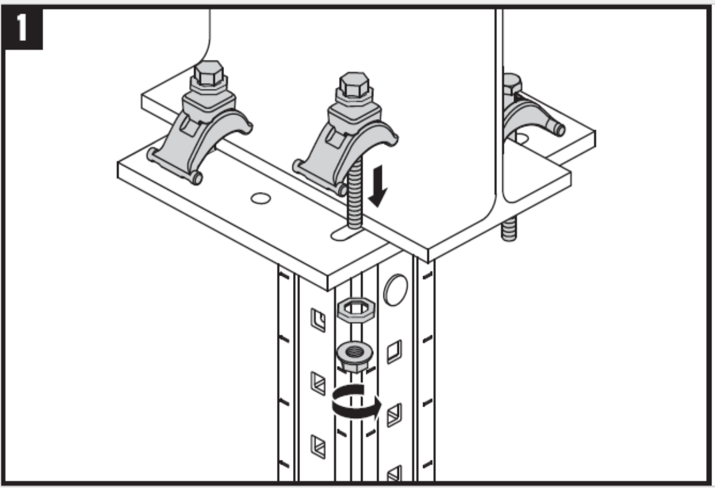
Submittal text:
Hilti Hot-dipped galvanized bracket used as fixed to structural steel profiles. The fixation could be done by two different principles.
First principle is clamping, using four beam clams clamped on flange of the structural steel profile.
Second principle is boxing using integrated baseplate of the bracket and the same sized base plate on the other side of the structural steel profile being tighten by four threaded rods around the structural steel profile.

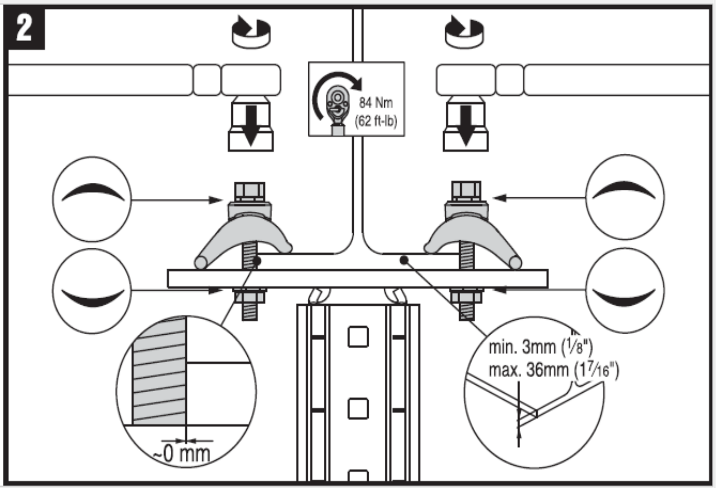
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Bracket: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

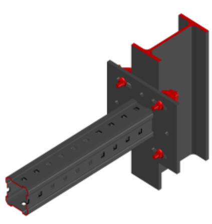
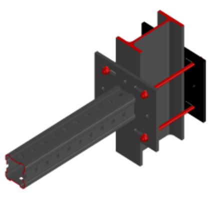
Instruction For Use:

No IFU attached to the packaging





MIC-S90-A-500-2000 Bracket - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

Standards and codes:

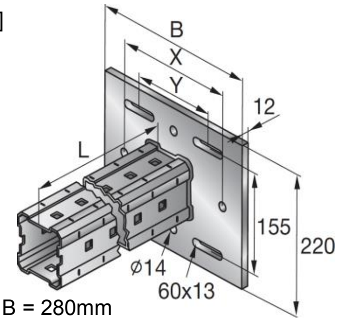
• EN 1990	Basics of structural design	03.2003
• EN 1991-1-1	Eurocode 1: Actions on structures –Part 1-1: General actions – densities, self-weight, imposed loads for buildings	03.2012
• EN 1993-1-1	Eurocode 3: Design of steel structures –Part 1-1: General rules and rules for buildings	03.2012
• EN 1993-1-3	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

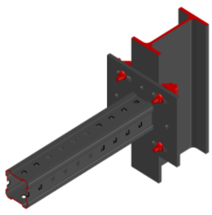
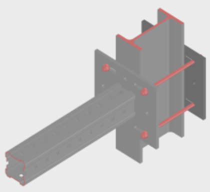
Simplified drawing:

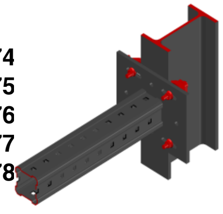
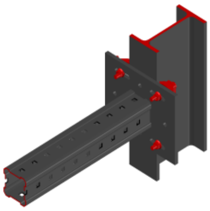
Designation	L[mm]
MIC-S90-A- 500	500
MIC-S90-A- 750	750
MIC-S90-A-1000	1000
MIC-S90-A-1500	1500
MIC-S90-A-2000	2000



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

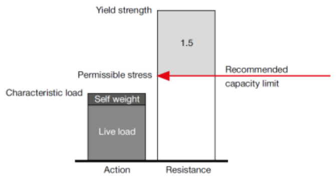
MIC-S90-A-500-2000 Bracket - Steel

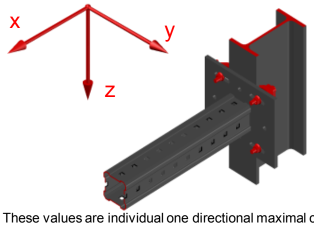
Clamped	Boxed	
		

Loading case: Clamped	Combinations covered by loading case
BOM: Brackets: **1x MIC-S90-A- 500 267774** **MIC-S90-A- 750 267775** **MIC-S90-A-1000 267776** **MIC-S90-A-1500 267777** **MIC-S90-A-2000 267778** Beam clamps **4x MI-SGC M12 233859** 	Pre-fab bracket for perpendicular connection to structural steel profiles flanges. Flange width 75-165mm. 

Recommended loading capacity - simplified for most common applications

Method





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

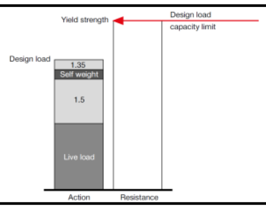
±My,rec. [kNm]
1.39

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

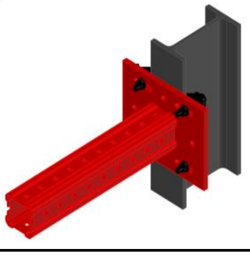
1/2

Method

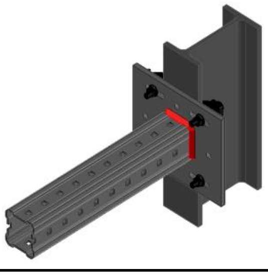


Limiting components of capacity evaluated in following tables:

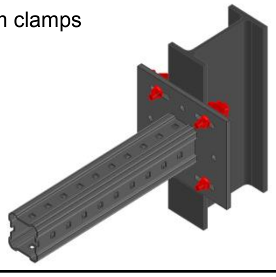
1. Steel connector



2. Welds

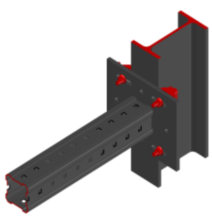
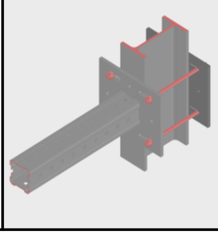


3. Beam clamps



MIC-S90-A-500-2000 Bracket - Steel

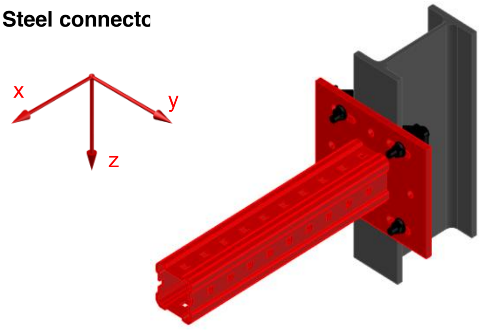
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connectc

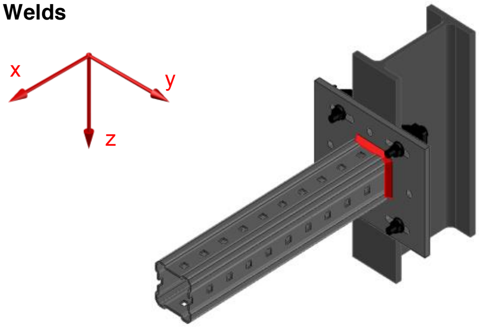


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	59.70	59.70	59.70	59.70
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.19	5.19	2.36	2.36	2.45	2.45

includes cross section resistance of steel base plate and channel
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

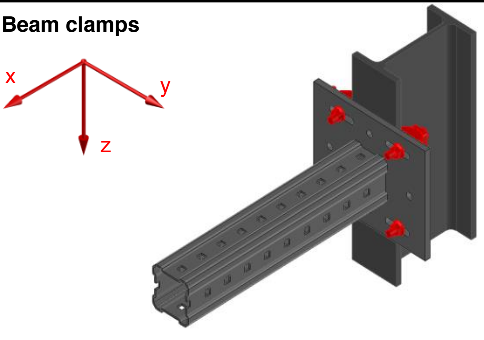


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
285.11	285.11	116.39	116.39	116.39	116.39
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
9.54	9.54	5.84	5.84	5.84	5.84

Interaction:

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

3. Beam clamps

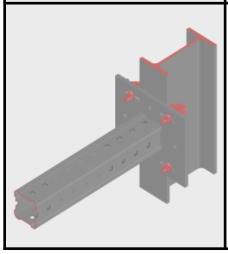
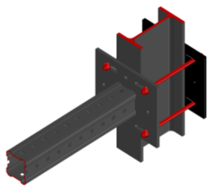


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.81	0.81	2.09	2.09	1.39	1.39

Interaction:

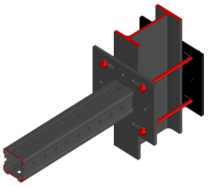
$$\frac{F_{x.Ed}}{F_{x.Rd}}+\frac{F_{y.Ed}}{F_{y.Rd}}+\frac{F_{z.Ed}}{F_{z.Rd}}+\frac{M_{x.Ed}}{M_{x.Rd}}+\frac{M_{y.Ed}}{M_{y.Rd}}+\frac{M_{z.Ed}}{M_{z.Rd}}\leq 1$$

MIC-S90-A-500-2000 Bracket - Steel

Clamped	Boxed	
		

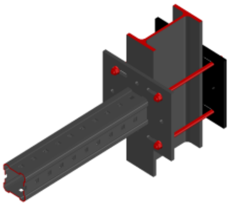
Loading case: Boxed

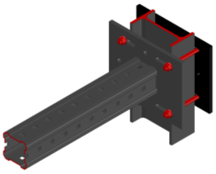
BOM:
Brackets:
1x MIC-S90-A- 500 — 267774
MIC-S90-A- 750 — 267775
MIC-S90-A-1000 — 267776
MIC-S90-A-1500 — 267777
MIC-S90-A-2000 — 267778
Base plate
1x MIB-SA — 304821
Threaded rods cut to particular length
4x AM12x1000 8.8 HDG…m — 419103
Lock nuts
8x M12-F-SL WS ¾ — 382897



Combinations covered by loading case

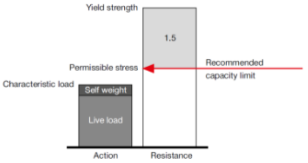
Pre-fab bracket for perpendicular connection to structural steel
Profiles boxing it with two base plates.
Flange width 75-165mm.

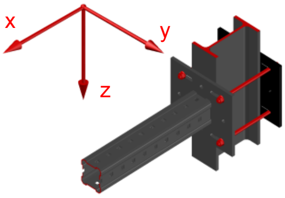




Recommended loading capacity - simplified for most common applications

Method





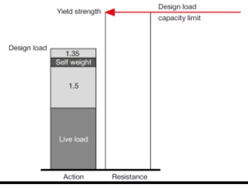
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
24.0	4.9	4.9

±My,rec. [kNm]
1.57

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

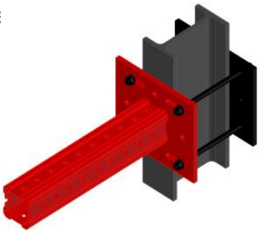
Design loading capacity - 3D 1/2

Method

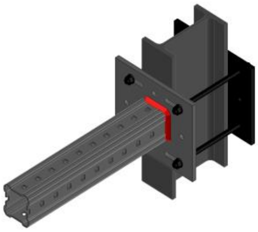


Limiting components of capacity evaluated in following tables:

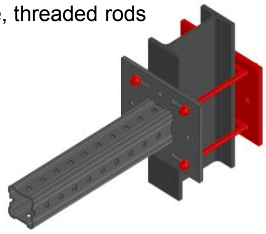
1. Steel conne



2. Welds



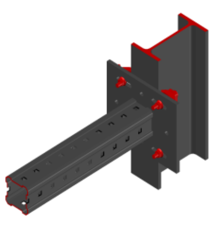
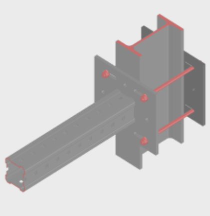
3. Base plate, threaded rods and nuts



MIC-S90-A-500-2000 Bracket - Steel

Conditions of the loading capacity tables:

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

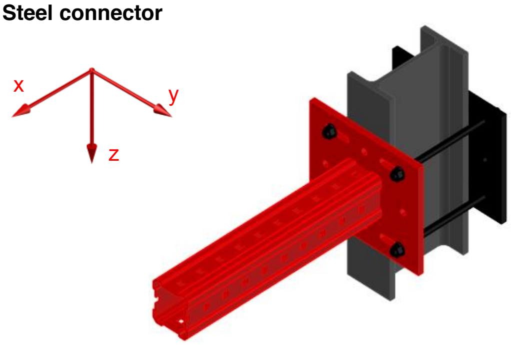
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector



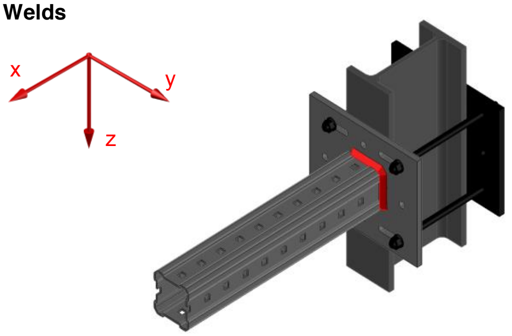
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	59.70	59.70	59.70	59.70
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.19	5.19	2.36	2.36	2.45	2.45

includes cross section resistance of steel base plate and channel

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

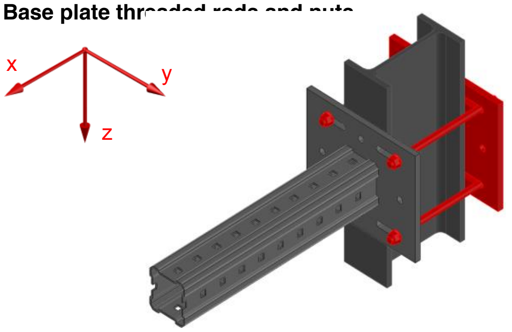


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
285.11	285.11	116.39	116.39	116.39	116.39
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
9.54	9.54	5.84	5.84	5.84	5.84

Interaction:

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

3. Base plate threaded rods and nuts



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

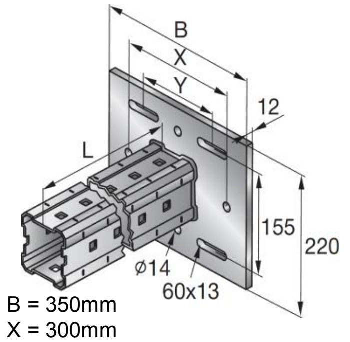
Interaction:

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

Data version 1.3 I Date 12.2016 | Page 1/6

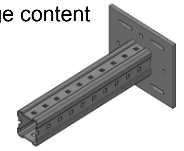
MIC-S90-B-500-2000 Bracket - Steel

Designation	Item number
MIC-S90-B- 500	**267779**
MIC-S90-B- 750	**267780**
MIC-S90-B-1000	**267781**
MIC-S90-B-1500	**267782**
MIC-S90-B-2000	**267783**



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

Package content



Designation	L[mm]
MIC-S90-B- 500	500
MIC-S90-B- 750	750
MIC-S90-B-1000	1000
MIC-S90-B-1500	1500
MIC-S90-B-2000	2000

Corrosion protection:
Hot dipped galvanized as per ASTM 123, thickness 75 microns

Weight:

MIC-S90-B- 500	11625g
MIC-S90-B- 750	13983g
MIC-S90-B-1000	16340g
MIC-S90-B-1500	21055g
MIC-S90-B-2000	25770g

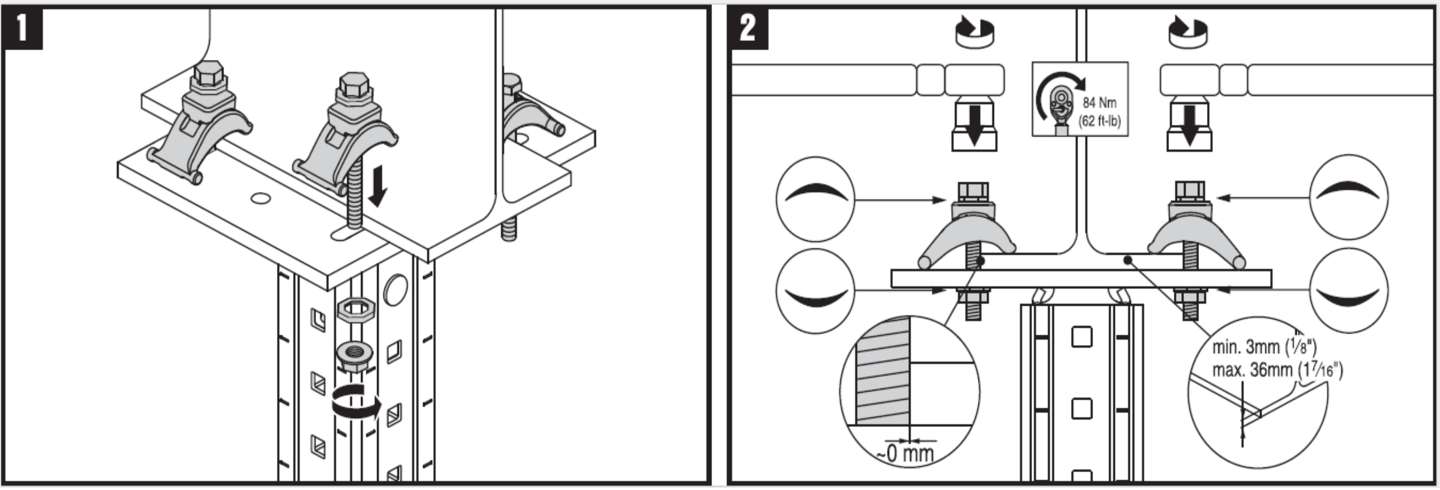
Submittal text:
Hilti Hot-dipped galvanized bracket used as fixed to structural steel profiles.
The fixation could be done by two different principles.
First principle is clamping, using four beam clams clamped on flange of the structural steel profile.
Second principle is boxing using integrated baseplate of the bracket and the same sized base plate on the other side of the structural steel profile being tighten by four threaded rods around the structural steel profile.

Material properties:

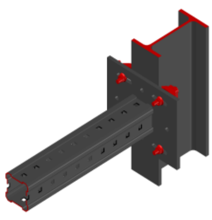
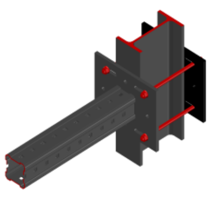
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Bracket: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:

No IFU attached to the packaging



MIC-S90-B-500-2000 Bracket - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

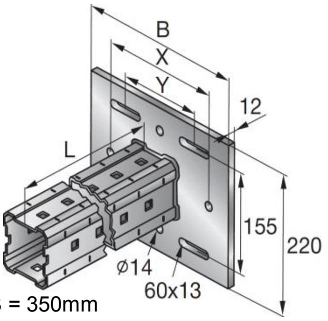
Standards and codes:

• 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

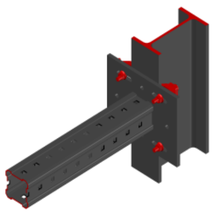
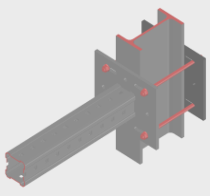
Simplified drawing:



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

Designation	L[mm]
MIC-S90-B- 500	500
MIC-S90-B- 750	750
MIC-S90-B-1000	1000
MIC-S90-B-1500	1500
MIC-S90-B-2000	2000

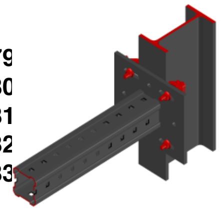
MIC-S90-B-500-2000 Bracket - Steel

Clamped	Boxed	
		

Loading case: Clamped

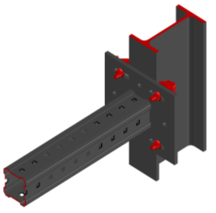
BOM:

Brackets:
1x MIC-S90-B- 500 267779
MIC-S90-B- 750 267780
MIC-S90-B-1000 267781
MIC-S90-B-1500 267782
MIC-S90-B-2000 267783
Beam clamps
4x MI-SGC M12 233859



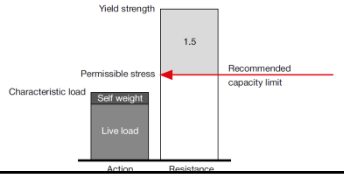
Combinations covered by loading case

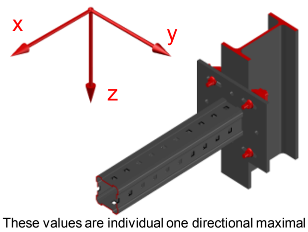
Pre-fab bracket for perpendicular connection to structural steel profiles flanges.
Flange width 165-235mm.



Recommended loading capacity - simplified for most common applications

Method





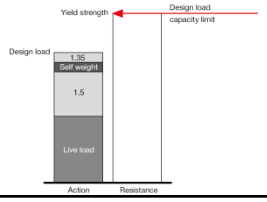
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.5	6.0	6.0

±My,rec. [kNm]
1.25

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

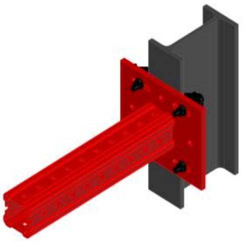
Design loading capacity - 3D 1/2

Method

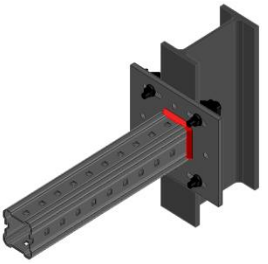


Limiting components of capacity evaluated in following tables:

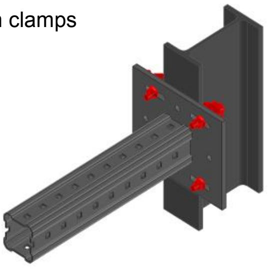
1. Steel connector



2. Welds



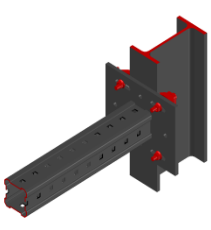
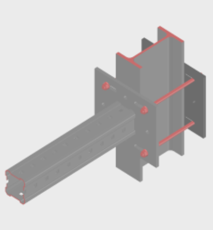
3. Beam clamps



MIC-S90-B-500-2000 Bracket - Steel

Conditions of the loading capacity tables:

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

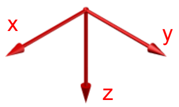
Clamped	Boxed	
		

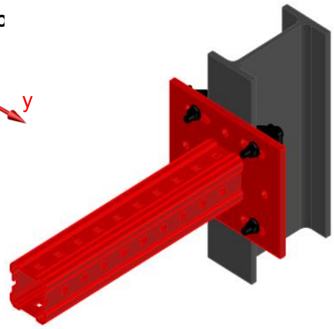
Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connectc





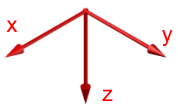
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	59.70	59.70	59.70	59.70
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.19	5.19	1.87	1.87	2.14	2.14

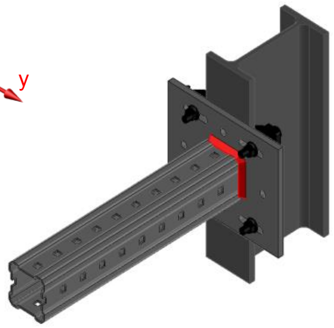
includes cross section resistance of steel base plate and channel

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



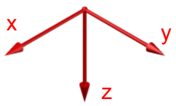


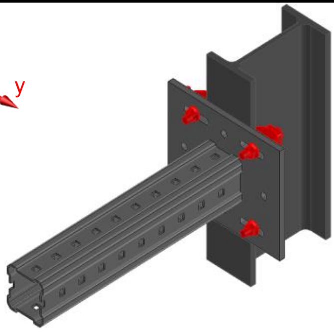
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
285.11	285.11	116.39	116.39	116.39	116.39
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
9.54	9.54	5.84	5.84	5.84	5.84

Interaction:

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

3. Beam clamps



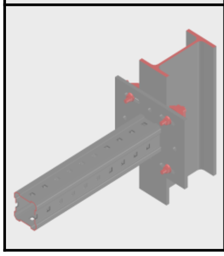
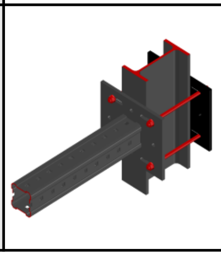


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.06	1.06	2.09	2.09	2.80	2.80

Interaction:

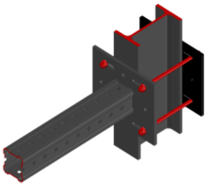
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-S90-B-500-2000 Bracket - Steel

Clamped	Boxed	
		

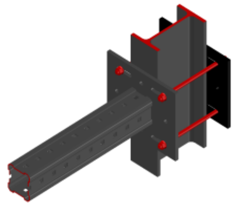
Loading case: Boxed

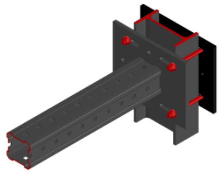
BOM:
Brackets:
1x MIC-S90-B- 500 267779
MIC-S90-B- 750 267780
MIC-S90-B-1000 267781
MIC-S90-B-1500 267782
MIC-S90-B-2000 267783
Base plate
1x MIB-SB 304822
Threaded rods cut to particular length
4x AM12x1000 8.8 HDG…m 419103
Lock nuts
8x M12-F-SL WS ¾ 382897



Combinations covered by loading case

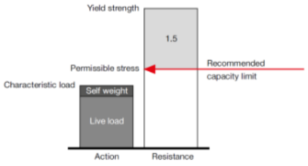
Pre-fab bracket for perpendicular connection to structural steel
Profiles boxing it with two base plates.
Flange width 165-235mm.

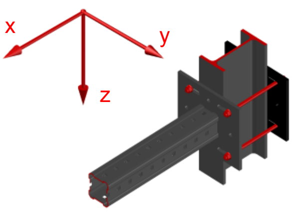




Recommended loading capacity - simplified for most common applications

Method





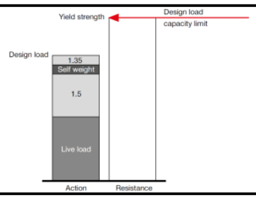
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.5	4.9	4.9

±My,rec. [kN]
1.25

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

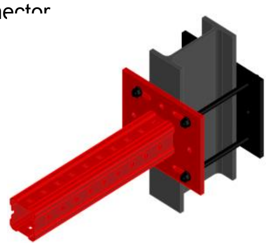
Design loading capacity - 3D 1/2

Method

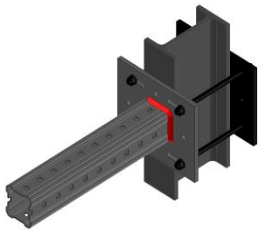


Limiting components of capacity evaluated in following tables:

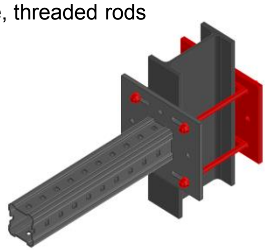
1. Steel connector



2. Welds



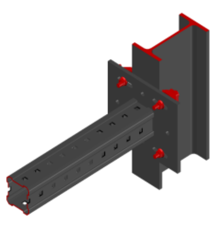
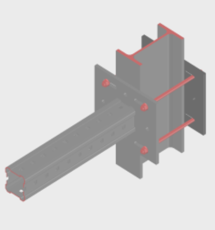
3. Base plate, threaded rods and nuts



MIC-S90-B-500-2000 Bracket - Steel

Conditions of the loading capacity tables:

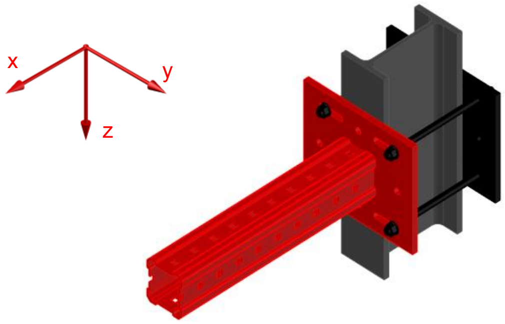
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector



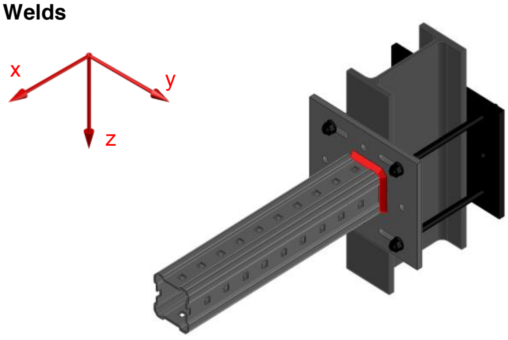
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	59.70	59.70	59.70	59.70
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.19	5.19	1.87	1.87	2.14	2.14

includes cross section resistance of steel base plate and channel

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

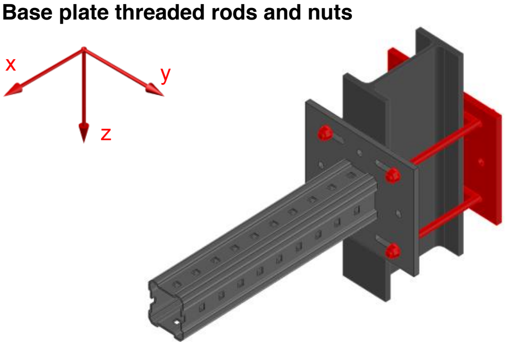


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
285.11	285.11	116.39	116.39	116.39	116.39
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
9.54	9.54	5.84	5.84	5.84	5.84

Interaction:

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

3. Base plate threaded rods and nuts



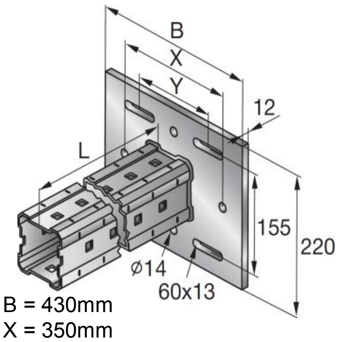
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	34.23	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.88	0.88	11.65	11.65	15.64	15.64

Interaction:

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

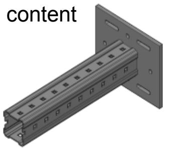
MIC-S90-C-500-2000 Bracket - Steel

Designation	Item number
MIC-S90-C- 500	**267784**
MIC-S90-C- 750	**267785**
MIC-S90-C-1000	**267786**
MIC-S90-C-1500	**267787**
MIC-S90-C-2000	**267788**



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

Package content



Designation	L[mm]
MIC-S90-C- 500	500
MIC-S90-C- 750	750
MIC-S90-C-1000	1000
MIC-S90-C-1500	1500
MIC-S90-C-2000	2000

Corrosion protection:
Hot dipped galvanized as per ASTM 123, thickness 75 microns

Weight:

MIC-S90-C- 500	13285g
MIC-S90-C- 750	15643g
MIC-S90-C-1000	18000g
MIC-S90-C-1500	22715g
MIC-S90-C-2000	27430g

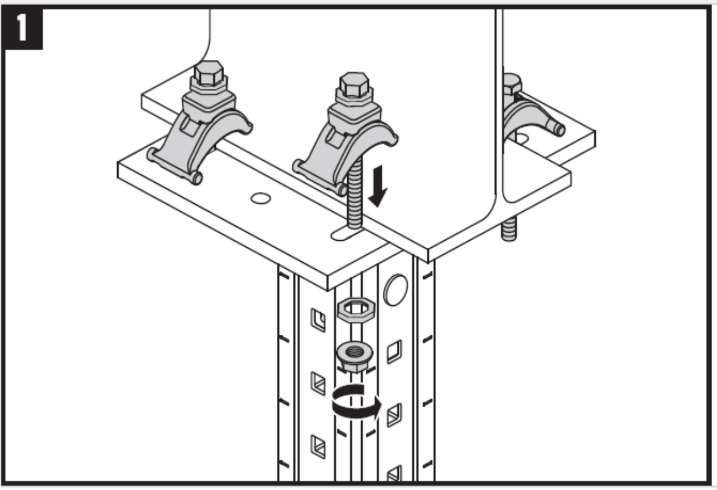
Submittal text:
Hilti Hot-dipped galvanized bracket used as fixed to structural steel profiles. The fixation could be done by two different principles.
First principle is clamping, using four beam clams clamped on flange of the structural steel profile.
Second principle is boxing using integrated baseplate of the bracket and the same sized base plate on the other side of the structural steel profile being tighten by four threaded rods around the structural steel profile.

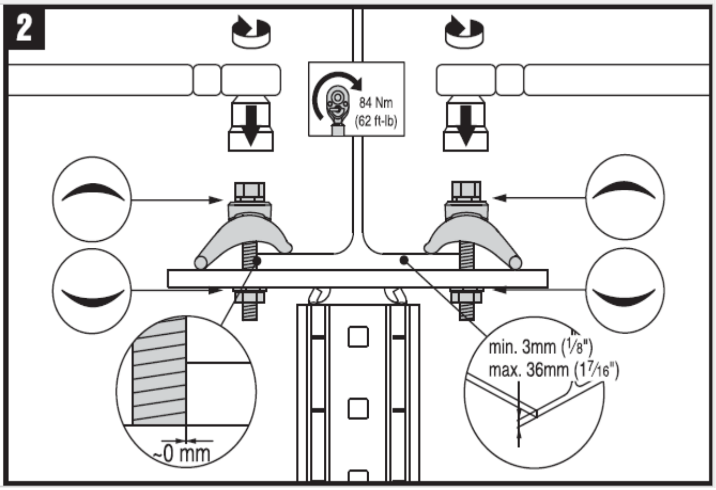
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Bracket: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

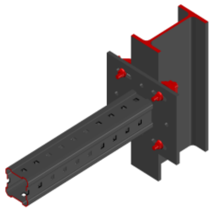
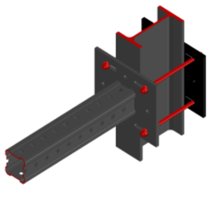
Instruction For Use:

No IFU attached to the packaging





MIC-S90-C-500-2000 Bracket - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

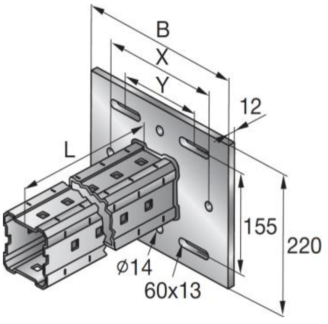
Standards and codes:

• 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

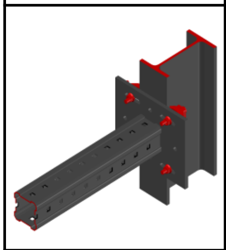
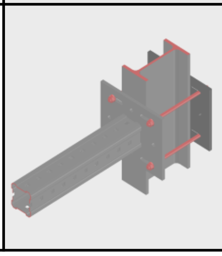
Simplified drawing:



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

Designation	L[mm]
MIC-S90-C- 500	500
MIC-S90-C- 750	750
MIC-S90-C-1000	1000
MIC-S90-C-1500	1500
MIC-S90-C-2000	2000

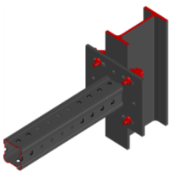
MIC-S90-C-500-2000 Bracket - Steel

Clamped	Boxed	
		

Loading case: Clamped

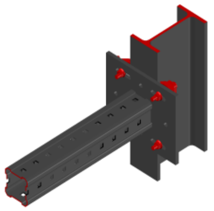
BOM:

Brackets:
1x MIC-S90-C- 500 — 267784
MIC-S90-C- 750 — 267785
MIC-S90-C-1000 — 267786
MIC-S90-C-1500 — 267787
MIC-S90-C-2000 — 267788
Beam clamps
4x MI-SGC M12 — 233859



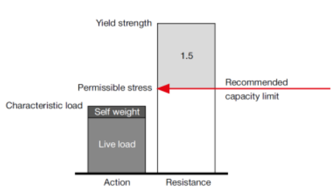
Combinations covered by loading case

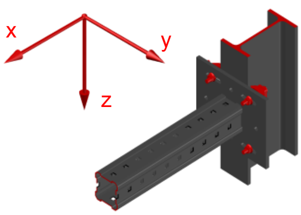
Pre-fab bracket for perpendicular connection to structural steel profiles flanges.
Flange width 235-300mm.



Recommended loading capacity - simplified for most common applications

Method





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

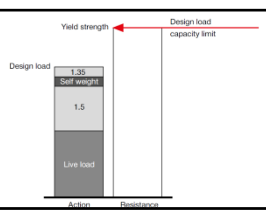
±My,rec. [kNm]
1.03

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

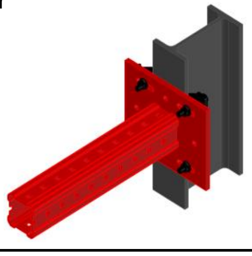
1/2

Method

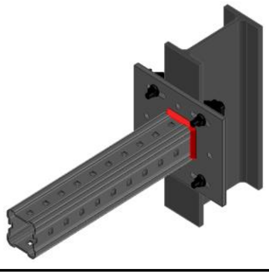


Limiting components of capacity evaluated in following tables:

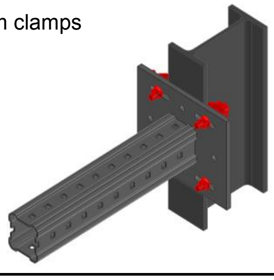
1. Steel connector



2. Welds



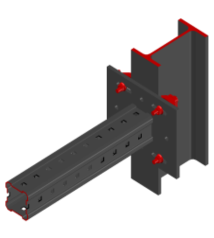
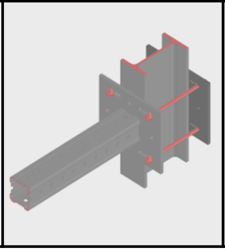
3. Beam clamps



MIC-S90-C-500-2000 Bracket - Steel

Conditions of the loading capacity tables:

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

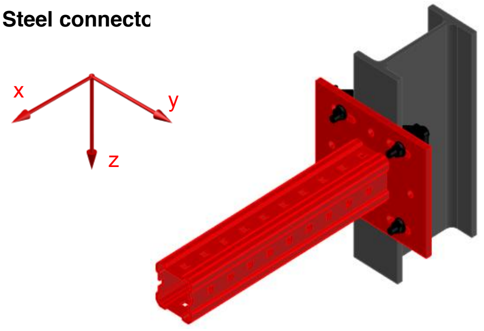
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connectc



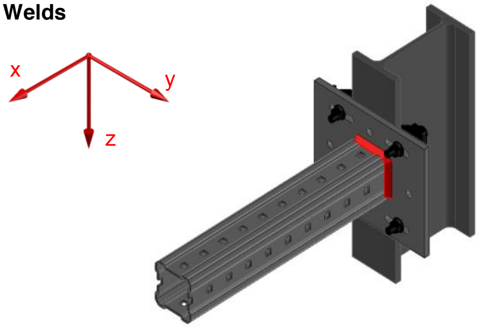
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	59.70	59.70	59.70	59.70
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
5.19	5.19	1.54	1.54	1.94	1.94

includes cross section resistance of steel base plate and channel

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

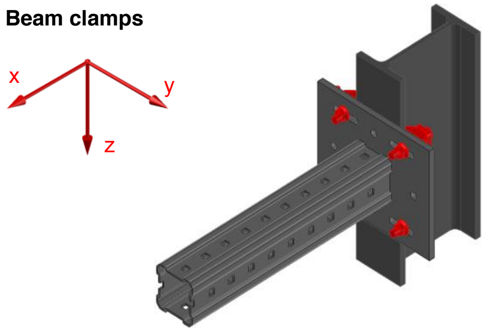


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
285.11	285.11	116.39	116.39	116.39	116.39
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
9.54	9.54	5.84	5.84	5.84	5.84

Interaction:

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

3. Beam clamps

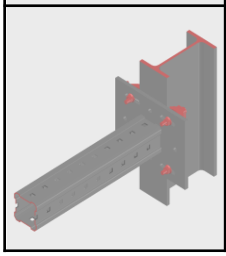
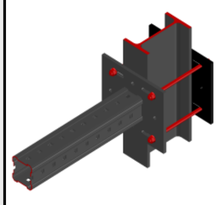


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.31	1.31	2.09	2.09	4.51	4.51

Interaction:

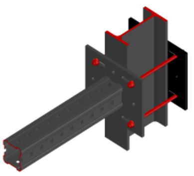
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-S90-C-500-2000 Bracket - Steel

Clamped	Boxed	
		

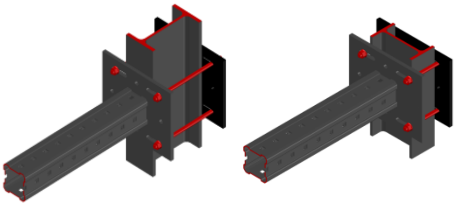
Loading case: Boxed

BOM:
Brackets:
1x MIC-S90-C- 500 267784
MIC-S90-C- 750 267785
MIC-S90-C-1000 267786
MIC-S90-C-1500 267787
MIC-S90-C-2000 267788
Base plate
1x MIB-SC 304823
Threaded rods cut to particular length
4x AM12x1000 8.8 HDG…m 419103
Lock nuts
8x M12-F-SL WS ¾ 382897



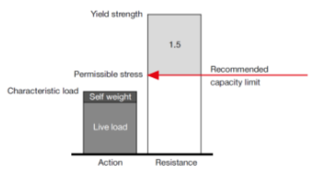
Combinations covered by loading case

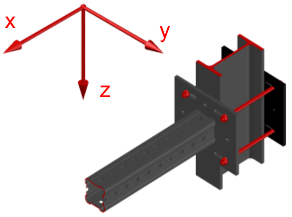
Pre-fab bracket for perpendicular connection to structural steel Profiles boxing it with two base plates. Flange width 235-300mm.



Recommended loading capacity - simplified for most common applications

Method





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

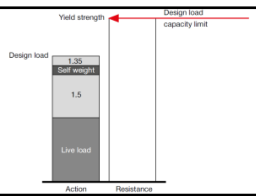
±My,rec. [kNm]
1.03

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

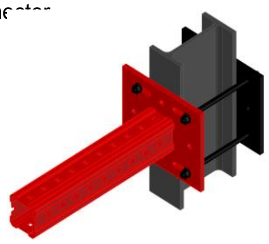
1/2

Method

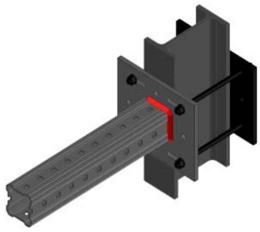


Limiting components of capacity evaluated in following tables:

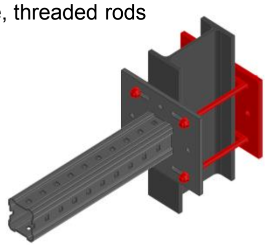
1. Steel conne



2. Welds



3. Base plate, threaded rods and nuts

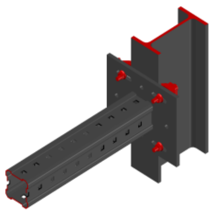
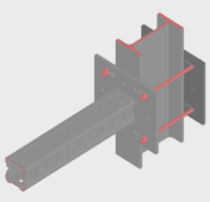


Boundary conditions - **Terms of common cooperation / Legal disclaimer** and guidelines as defined at the beginning of this book need to be mandatorily respected.

MIC-S90-C-500-2000 Bracket - Steel

Conditions of the loading capacity tables:

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

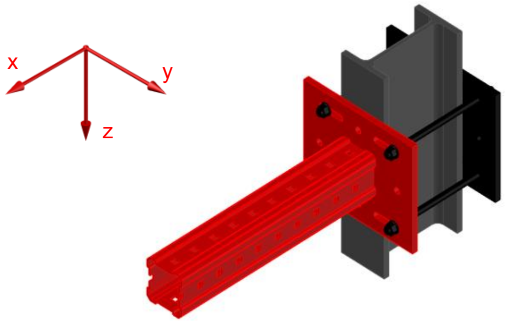
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector



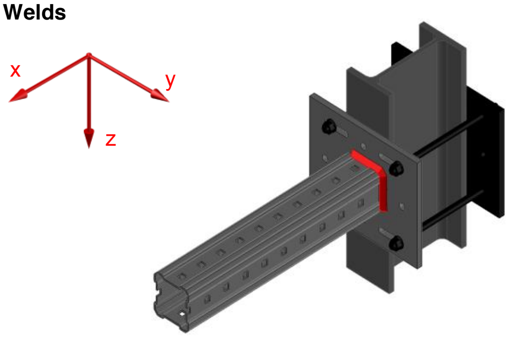
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	59.70	59.70	59.70	59.70
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
5.19	5.19	1.54	1.54	1.94	1.94

includes cross section resistance of steel base plate and channel

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

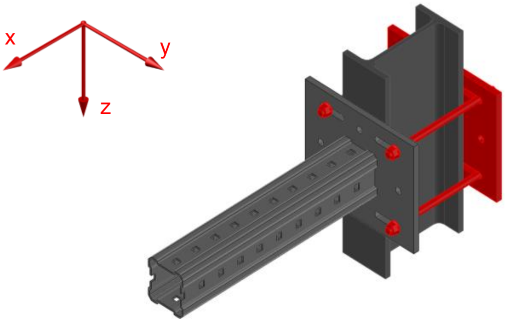


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
285.11	285.11	116.39	116.39	116.39	116.39
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
9.54	9.54	5.84	5.84	5.84	5.84

Interaction:

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

3. Base plate threaded rods and nuts



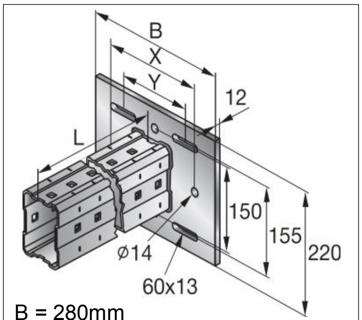
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	29.47	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.08	1.08	11.65	11.65	25.15	25.15

Interaction:

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

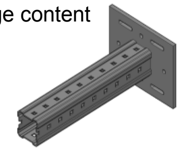
MIC-S120-A-500-2000 Bracket - Steel

Designation	Item number
MIC-S120-A- 500	**267794**
MIC-S120-A- 750	**267795**
MIC-S120-A-1000	**267796**
MIC-S120-A-1500	**267797**
MIC-S120-A-2000	**267798**



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

Package content



Designation	L[mm]
MIC-S120-A- 500	500
MIC-S120-A- 750	750
MIC-S120-A-1000	1000
MIC-S120-A-1500	1500
MIC-S120-A-2000	2000

Corrosion protection:
Hot dipped galvanized as per ASTM 123, thickness 75 microns

Weight:

MIC-S120-A- 500	11760g
MIC-S120-A- 750	14910g
MIC-S120-A-1000	18060g
MIC-S120-A-1500	24360g
MIC-S120-A-2000	30660g

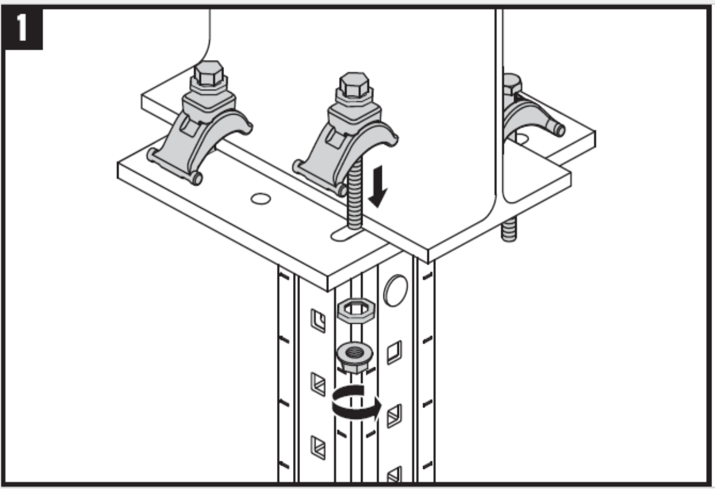
Submittal text:
Hilti Hot-dipped galvanized bracket used as fixed to structural steel profiles.
The fixation could be done by two different principles.
First principle is clamping, using four beam clams clamped on flange of the structural steel profile.
Second principle is boxing using integrated baseplate of the bracket and the same sized base plate on the other side of the structural steel profile being tighten by four threaded rods around the structural steel profile.

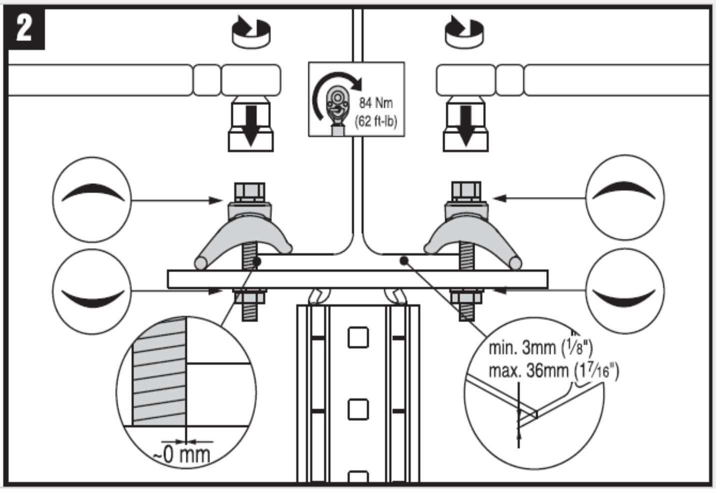
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Bracket: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

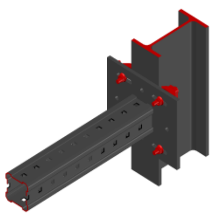
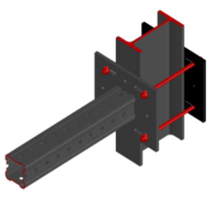
Instruction For Use:

No IFU attached to the packaging





MIC-S120-A-500-2000 Bracket - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

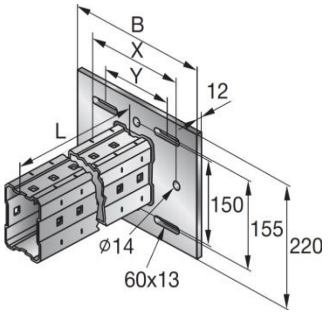
Standards and codes:

• 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

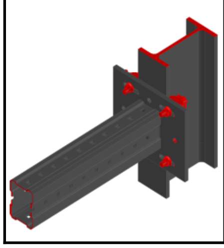
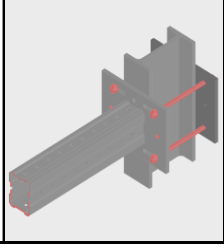
Simplified drawing:



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

Designation	L[mm]
MIC-S120-A- 500	500
MIC-S120-A- 750	750
MIC-S120-A-1000	1000
MIC-S120-A-1500	1500
MIC-S120-A-2000	2000

MIC-S120-A-500-2000 Bracket - Steel

Clamped	Boxed	
		

Loading case: Clamped

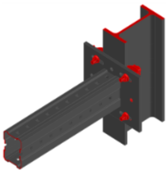
BOM:

Brackets:

1x MIC-S120-A- 500	**267794**
MIC-S120-A- 750	**267795**
MIC-S120-A-1000	**267796**
MIC-S120-A-1500	**267797**
MIC-S120-A-2000	**267798**

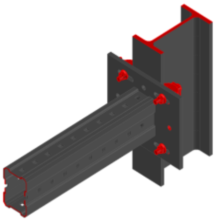
Beam clamps

4x MI-SGC M12	**233859**



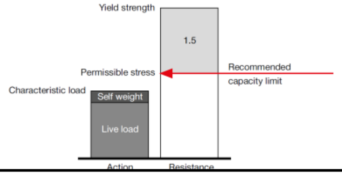
Combinations covered by loading case

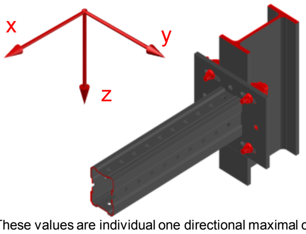
Pre-fab bracket for perpendicular connection to structural steel profiles flanges.
Flange width 75-165mm.



Recommended loading capacity - simplified for most common applications

Method





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

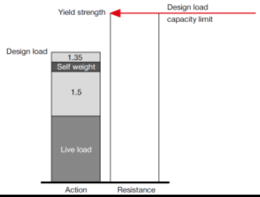
±My,rec. [kNm]
1.55

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

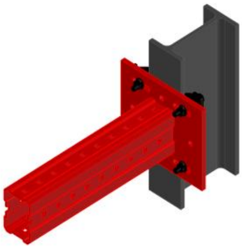
1/2

Method

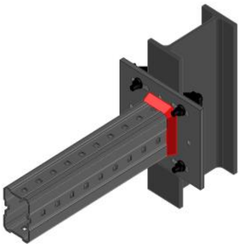


Limiting components of capacity evaluated in following tables:

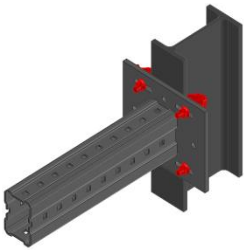
1. Steel connector



2. Welds

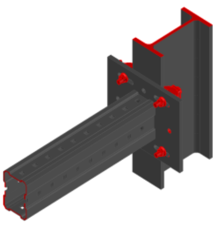
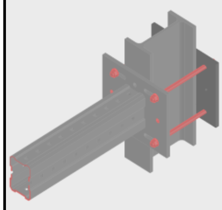


3. Beam clamps



MIC-S120-A-500-2000 Bracket - Steel

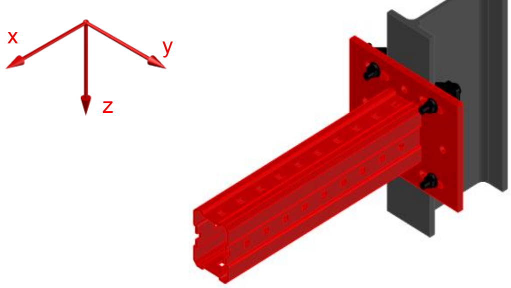
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector

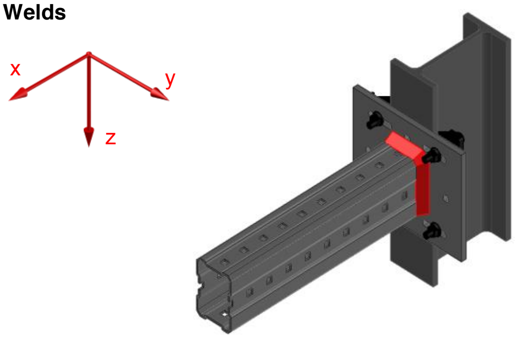


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	69.74	69.74	100.13	100.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
8.54	8.54	3.01	3.01	2.50	2.50

includes cross section resistance of steel base plate and channel
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

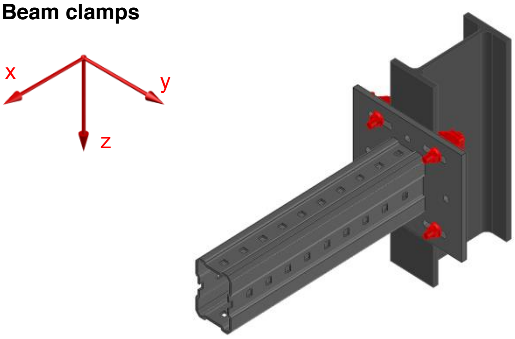


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
346.20	346.20	116.39	116.39	166.28	166.28
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
13.34	13.34	7.98	7.98	8.35	8.35

Interaction:

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

3. Beam clamps

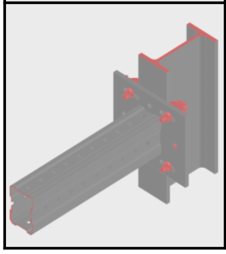
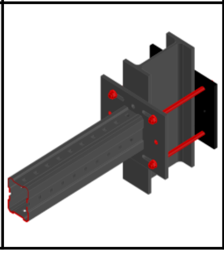


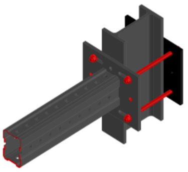
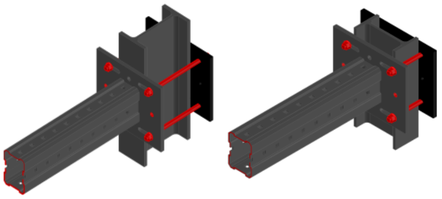
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.81	0.81	2.33	2.33	1.39	1.39

Interaction:

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

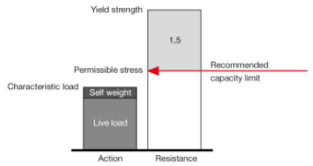
MIC-S120-A-500-2000 Bracket - Steel

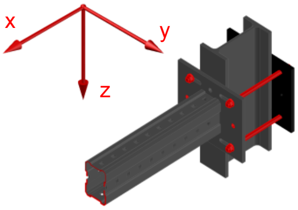
Clamped	Boxed	
		

Loading case: Boxed	Combinations covered by loading case
BOM: Brackets: **1x MIC-S120-A- 500 267794** **MIC-S120-A- 750 267795** **MIC-S120-A-1000 267796** **MIC-S120-A-1500 267797** **MIC-S120-A-2000 267798** Base plate **1x MIB-SA 304821** Threaded rods cut to particular length **4x AM12x1000 8.8 HDG…m 419103** Lock nuts **8x M12-F-SL WS ¾ 382897** 	Pre-fab bracket for perpendicular connection to structural steel Profiles boxing it with two base plates. Flange width 75-165mm. 

Recommended loading capacity - simplified for most common applications

Method





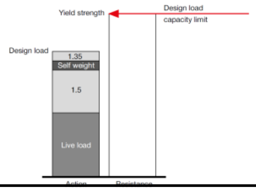
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
24.0	4.9	4.9

±My,rec. [kNm]
2.01

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

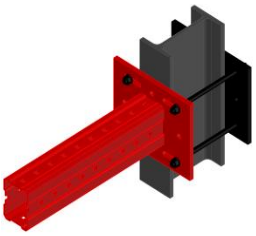
Design loading capacity - 3D 1/2

Method

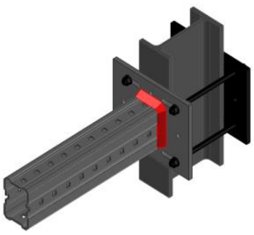


Limiting components of capacity evaluated in following tables:

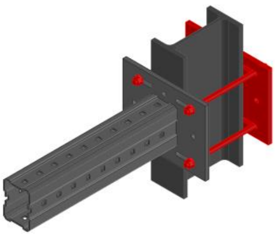
1. Steel connector



2. Welds



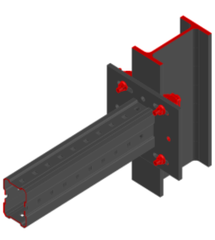
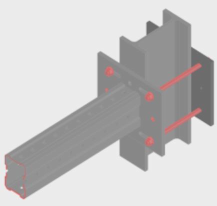
3. Base plate, threaded rods and nuts



MIC-S120-A-500-2000 Bracket - Steel

Conditions of the loading capacity tables:

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

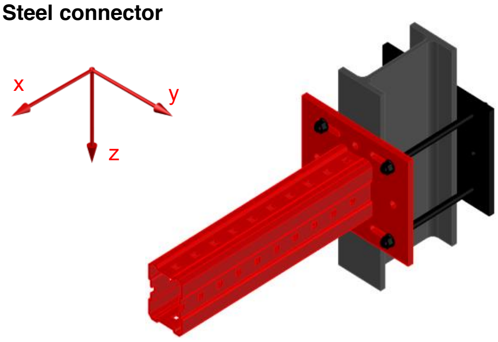
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector



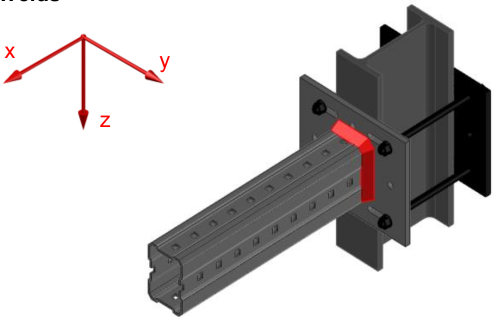
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.47	81.05	69.74	69.74	100.13	100.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
8.54	8.54	3.01	3.01	2.50	2.50

includes cross section resistance of steel base plate and channel

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

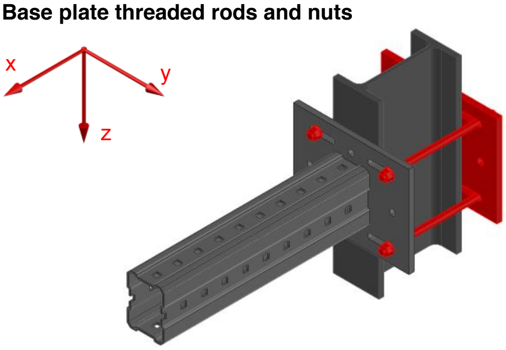


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
346.20	346.20	116.39	116.39	166.28	166.28
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
13.34	13.34	7.98	7.98	8.35	8.35

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. Base plate threaded rods and nuts



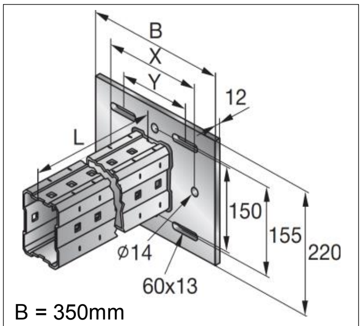
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	35.97	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.67	0.67	13.01	13.01	7.77	7.77

Interaction:

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

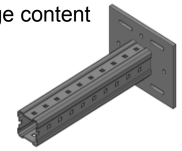
MIC-S120-B-500-2000 Bracket - Steel

Designation	Item number
MIC-S120-B- 500	**267799**
MIC-S120-B- 750	**270459**
MIC-S120-B-1000	**270460**
MIC-S120-B-1500	**270461**
MIC-S120-B-2000	**270462**



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

Package content



Designation	L[mm]
MIC-S120-B- 500	500
MIC-S120-B- 750	750
MIC-S120-B-1000	1000
MIC-S120-B-1500	1500
MIC-S120-B-2000	2000

Corrosion protection:
Hot dipped galvanized as per ASTM 123, thickness 75 microns

Weight:

MIC-S120-B- 500	12960g
MIC-S120-B- 750	16360g
MIC-S120-B-1000	19510g
MIC-S120-B-1500	25810g
MIC-S120-B-2000	32110g

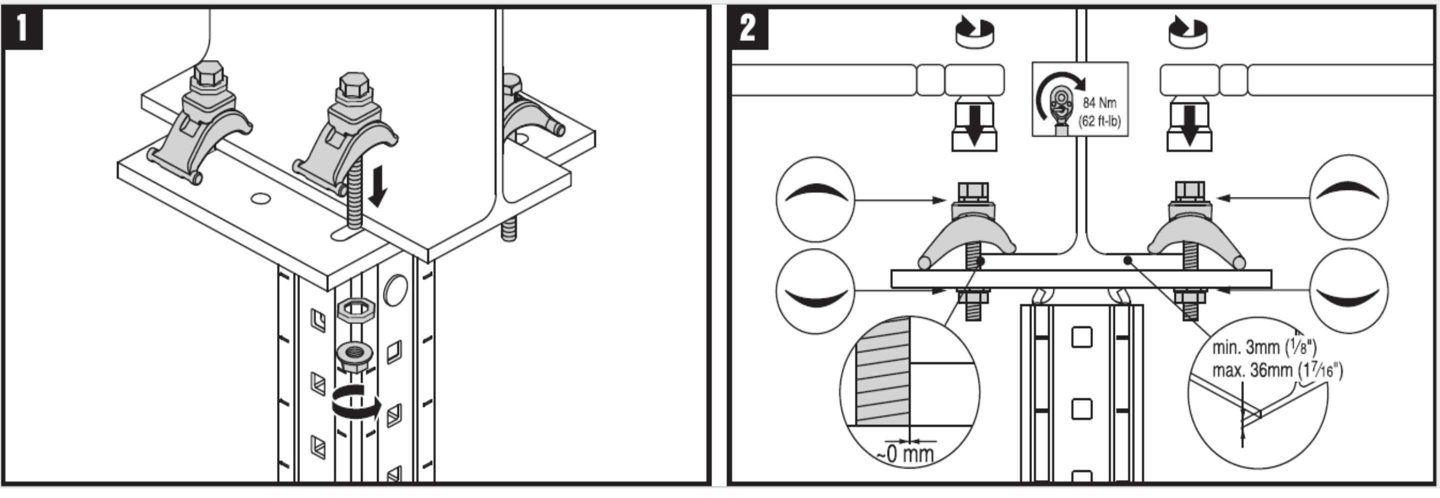
Submittal text:
Hilti Hot-dipped galvanized bracket used as fixed to structural steel profiles. The fixation could be done by two different principles.
First principle is clamping, using four beam clams clamped on flange of the structural steel profile.
Second principle is boxing using integrated baseplate of the bracket and the same sized base plate on the other side of the structural steel profile being tighten by four threaded rods around the structural steel profile.

Material properties:

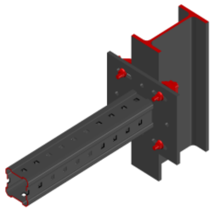
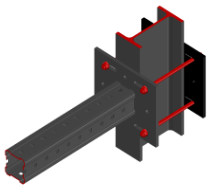
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Bracket: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:

No IFU attached to the packaging



MIC-S120-B-500-2000 Bracket - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

Standards and codes:

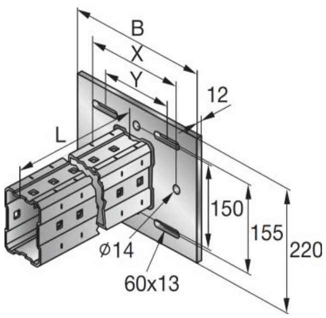
• EN 1990	Basics of structural design	03.2003
• EN 1991-1-1	Eurocode 1: Actions on structures –Part 1-1: General actions – densities, self-weight, imposed loads for buildings	03.2012
• EN 1993-1-1	Eurocode 3: Design of steel structures –Part 1-1: General rules and rules for buildings	03.2012
• EN 1993-1-3	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

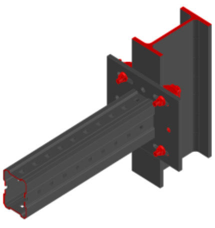
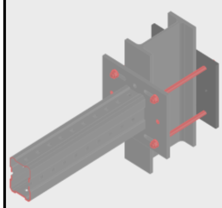
Simplified drawing:

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



Designation	L[mm]
MIC-S120-B- 500	500
MIC-S120-B- 750	750
MIC-S120-B-1000	1000
MIC-S120-B-1500	1500
MIC-S120-B-2000	2000

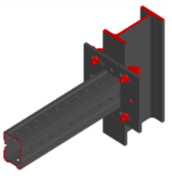
MIC-S120-B-500-2000 Bracket - Steel

Clamped	Boxed	
		

Loading case: Clamped

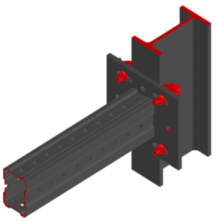
BOM:

Brackets:
1x MIC-S120-B- 500 — 267799
MIC-S120-B- 750 — 270459
MIC-S120-B-1000 — 270460
MIC-S120-B-1500 — 270461
MIC-S120-B-2000 — 270462
Beam clamps
4x MI-SGC M12 — 233859



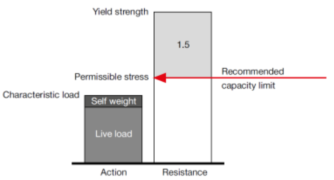
Combinations covered by loading case

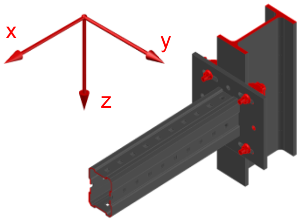
Pre-fab bracket for perpendicular connection to structural steel profiles flanges.
Flange width 165-235mm.



Recommended loading capacity - simplified for most common applications

Method





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

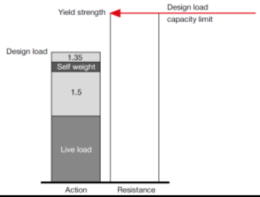
±My,rec. [kNm]
1.55

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

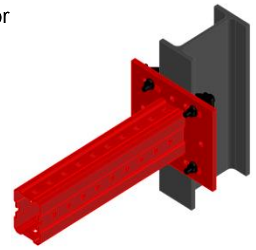
1/2

Method

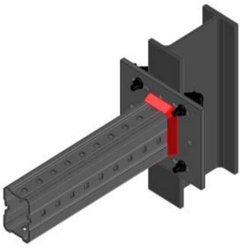


Limiting components of capacity evaluated in following tables:

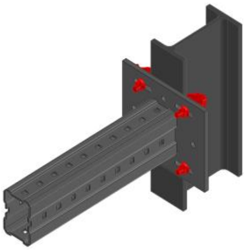
1. Steel connector



2. Welds



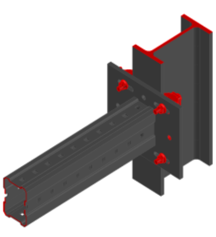
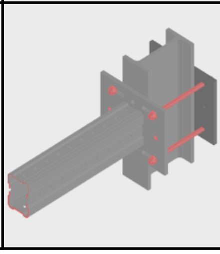
3. Beam clamps



MIC-S120-B-500-2000 Bracket - Steel

Conditions of the loading capacity tables:

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

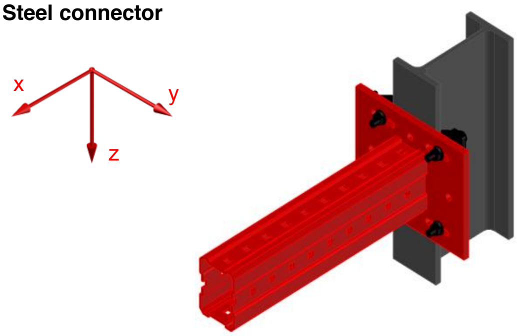
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector



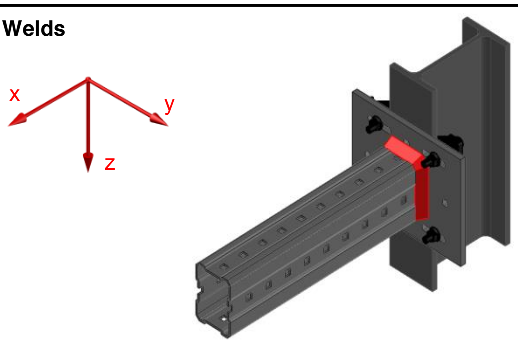
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	69.74	69.74	100.13	100.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
8.54	8.54	2.32	2.32	2.15	2.15

includes cross section resistance of steel base plate and channel

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

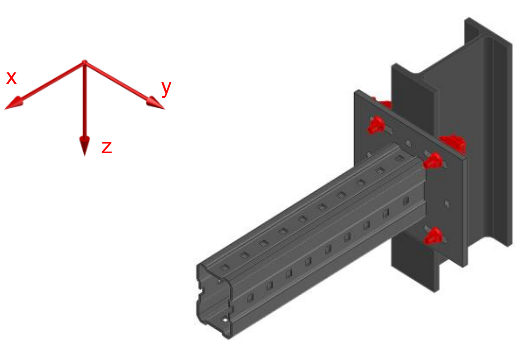


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
346.20	346.20	116.39	116.39	166.28	166.28
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
13.34	13.34	7.98	7.98	8.35	8.35

Interaction:

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

3. Beam clamps

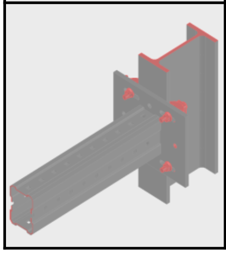
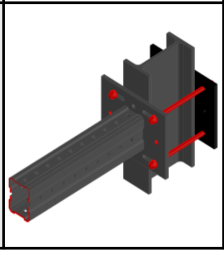


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.06	1.06	2.33	2.33	2.80	2.80

Interaction:

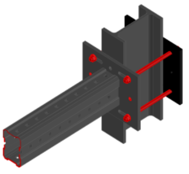
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \le 1$$

MIC-S120-B-500-2000 Bracket - Steel

Clamped	Boxed	
		

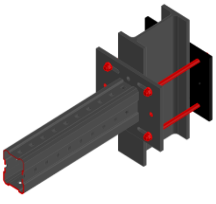
Loading case: Boxed

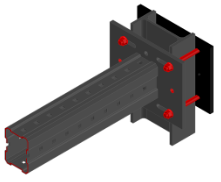
BOM:
Brackets:
1x MIC-S120-B- 500 267799
MIC-S120-B- 750 270459
MIC-S120-B-1000 270460
MIC-S120-B-1500 270461
MIC-S120-B-2000 270462
Base plate
1x MIB-SB 304822
Threaded rods cut to particular length
4x AM12x1000 8.8 HDG…m 419103 4774
Lock nuts
8x M12-F-SL WS ¾ 382897



Combinations covered by loading case

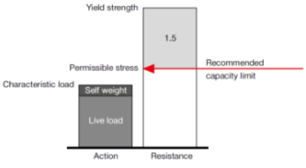
Pre-fab bracket for perpendicular connection to structural steel Profiles boxing it with two base plates. Flange width 165-235mm.

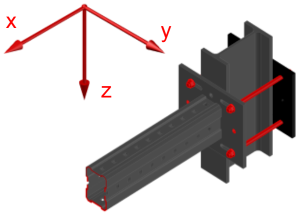




Recommended loading capacity - simplified for most common applications

Method





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

±My,rec. [kNm]
1.55

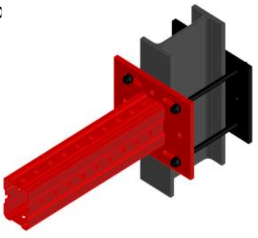
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/2

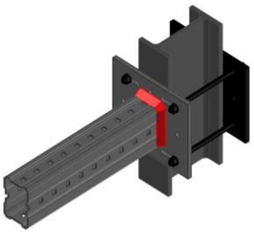
Method

Limiting components of capacity evaluated in following tables:

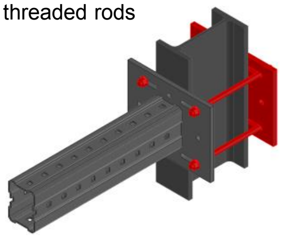
1. Steel connectc



2. Welds



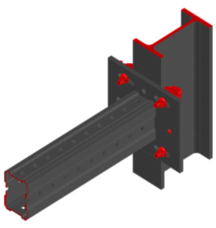
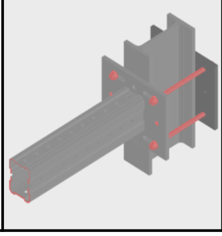
3. Base plate, threaded rods and nuts



MIC-S120-B-500-2000 Bracket - Steel

Conditions of the loading capacity tables:

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

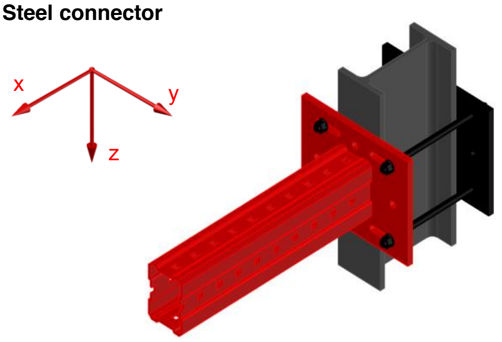
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector



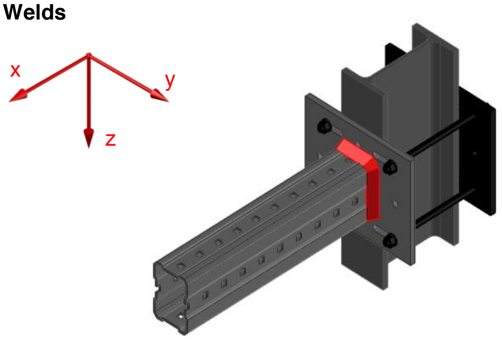
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.26	57.84	69.74	69.74	100.13	100.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
8.54	8.54	2.32	2.32	2.15	2.15

includes cross section resistance of steel base plate and channel

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

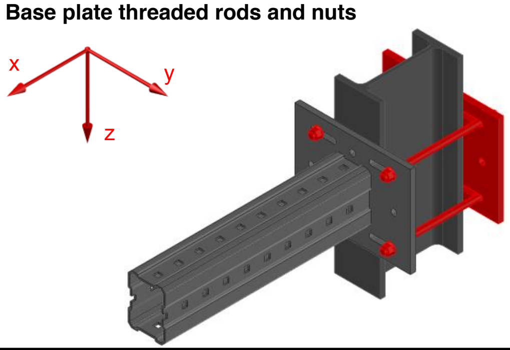


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
346.20	346.20	116.39	116.39	166.28	166.28
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
13.34	13.34	7.98	7.98	8.35	8.35

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. Base plate threaded rods and nuts



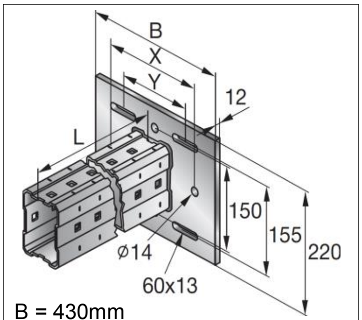
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	34.23	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.88	0.88	13.01	13.01	15.64	15.64

Interaction:

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

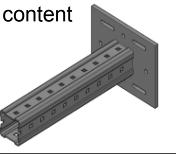
MIC-S120-C-500-2000 Bracket - Steel

Designation	Item number
MIC-S120-C- 500	**270463**
MIC-S120-C- 750	**270464**
MIC-S120-C-1000	**270465**
MIC-S120-C-1500	**270466**
MIC-S120-C-2000	**270467**



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

Package content



Designation	L[mm]
MIC-S120-C- 500	500
MIC-S120-C- 750	750
MIC-S120-C-1000	1000
MIC-S120-C-1500	1500
MIC-S120-C-2000	2000

Corrosion protection:
Hot dipped galvanized as per ASTM 123, thickness 75 microns

Weight:

MIC-S120-C- 500	14870g
MIC-S120-C- 750	18020g
MIC-S120-C-1000	21170g
MIC-S120-C-1500	27470g
MIC-S120-C-2000	33770g

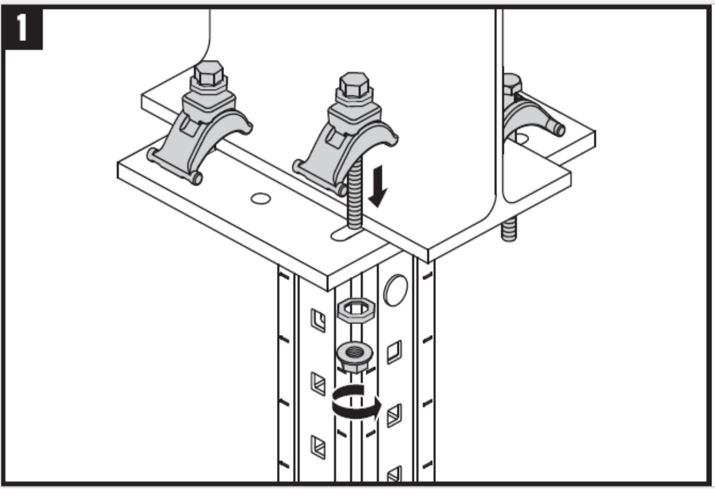
Submittal text:
Hilti Hot-dipped galvanized bracket used as fixed to structural steel profiles.
The fixation could be done by two different principles.
First principle is clamping, using four beam clams clamped on flange of the structural steel profile.
Second principle is boxing using integrated baseplate of the bracket and the same sized base plate on the other side of the structural steel profile being tighten by four threaded rods around the structural steel profile.

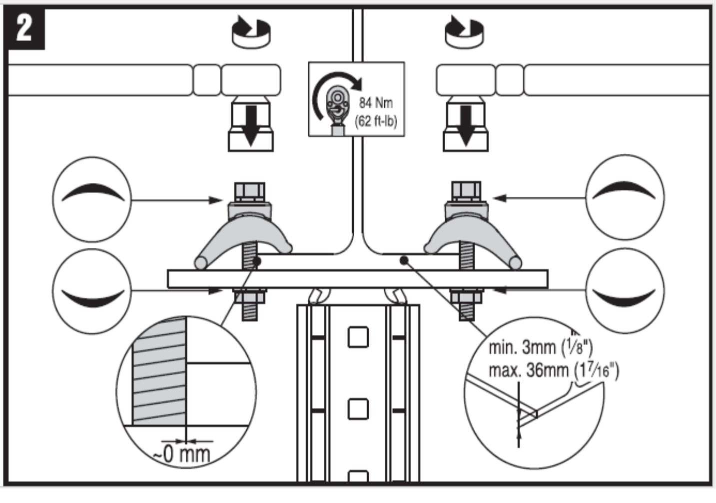
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Bracket: DD11 MOD - HN 547, S235JR - DIN EN 10025;	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

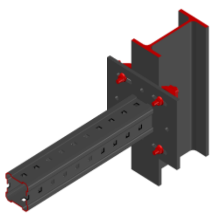
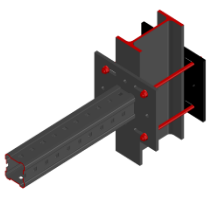
Instruction For Use:

No IFU attached to the packaging





MIC-S120-C-500-2000 Bracket - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

Standards and codes:

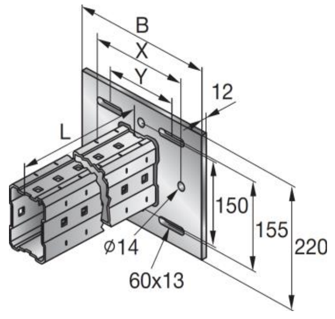
• EN 1990	Basics of structural design	03.2003
• EN 1991-1-1	Eurocode 1: Actions on structures –Part 1-1: General actions – densities, self-weight, imposed loads for buildings	03.2012
• EN 1993-1-1	Eurocode 3: Design of steel structures –Part 1-1: General rules and rules for buildings	03.2012
• EN 1993-1-3	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

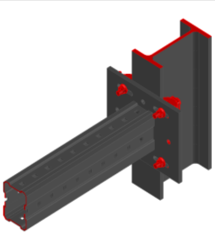
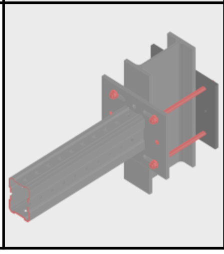
Simplified drawing:

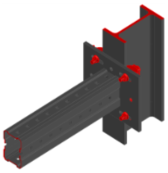
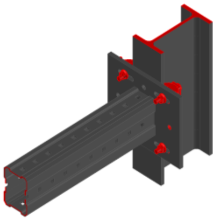
B = 430mm
X = 350mm
Y = 290mm



Designation	L[mm]
MIC-S120-C- 500	500
MIC-S120-C- 750	750
MIC-S120-C-1000	1000
MIC-S120-C-1500	1500
MIC-S120-C-2000	2000

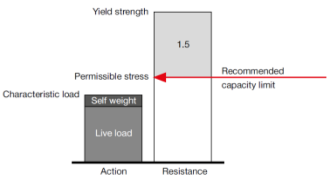
MIC-S120-C-500-2000 Bracket - Steel

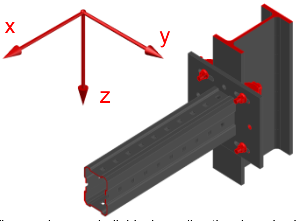
Clamped	Boxed	
		

Loading case: Clamped	Combinations covered by loading case
BOM: Brackets: **1x MIC-S120-C- 500 270463** **MIC-S120-C- 750 270464** **MIC-S120-C-1000 270465** **MIC-S120-C-1500 270466** **MIC-S120-C-2000 270467** Beam clamps **4x MI-SGC M12 233859** 	Pre-fab bracket for perpendicular connection to structural steel profiles flanges. Flange width 235-300mm. 

Recommended loading capacity - simplified for most common applications

Method





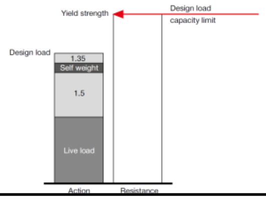
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
13.9	6.0	6.0

±My,rec. [kNm]
1.25

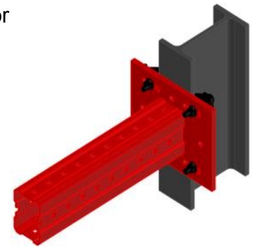
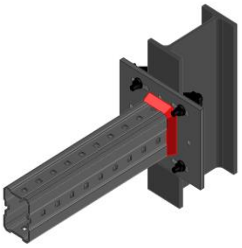
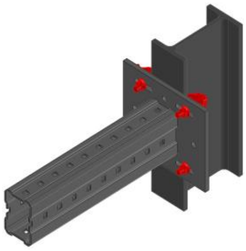
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/2

Method

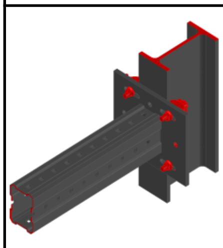
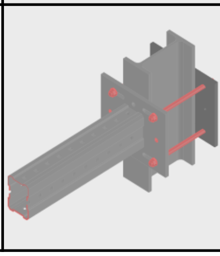


Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Beam clamps
		

MIC-S120-C-500-2000 Bracket - Steel

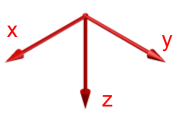
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

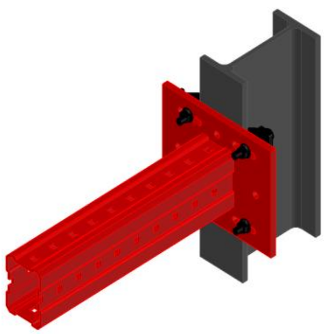
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector





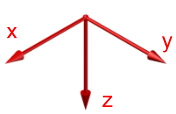
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	69.74	69.74	100.13	100.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
8.54	8.54	1.88	1.88	1.94	1.94

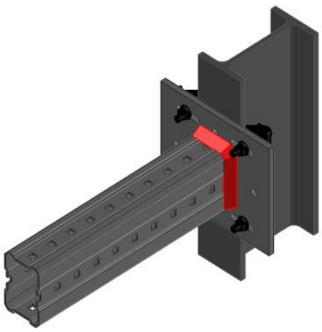
includes cross section resistance of steel base plate and channel

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



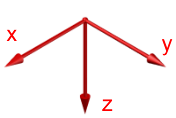


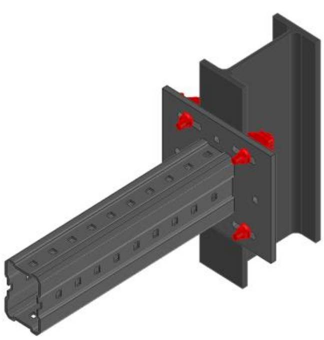
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
346.20	346.20	116.39	116.39	166.28	166.28
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
13.34	13.34	7.98	7.98	8.35	8.35

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



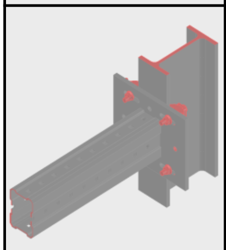
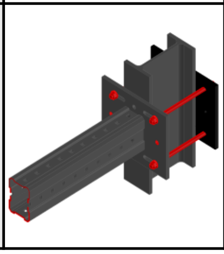


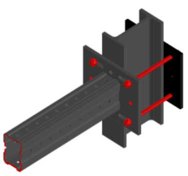
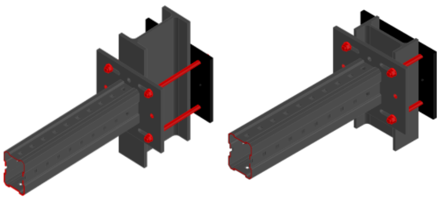
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	Not decisive	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.31	1.31	2.33	2.33	4.51	4.51

Interaction:

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

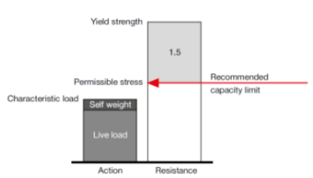
MIC-S120-C-500-2000 Bracket - Steel

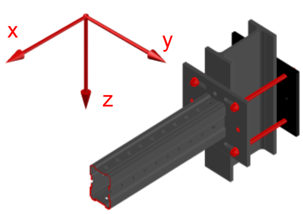
Clamped	Boxed	
		

Loading case: Boxed	Combinations covered by loading case
BOM: Brackets: **1x MIC-S120-C- 500 270463** **MIC-S120-C- 750 270464** **MIC-S120-C-1000 270465** **MIC-S120-C-1500 270466** **MIC-S120-C-2000 270467** Base plate **1x MIB-SC 304823** Threaded rods cut to particular length **4x AM12x1000 8.8 HDG…m 419103** **4** Lock nuts **8x M12-F-SL WS ¾ 382897** 	Pre-fab bracket for perpendicular connection to structural steel Profiles boxing it with two base plates. Flange width 235-300mm. 

Recommended loading capacity - simplified for most common applications

Method





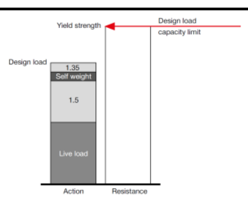
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
13.9	4.9	4.9

±My,rec. [kNm]
1.25

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

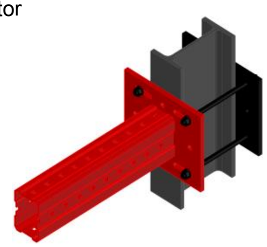
Design loading capacity - 3D 1/2

Method

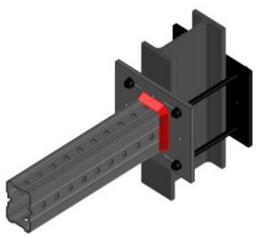


Limiting components of capacity evaluated in following tables:

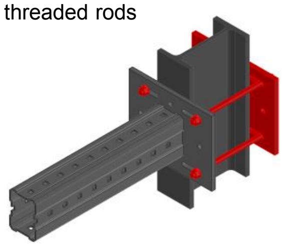
1. Steel connector



2. Welds

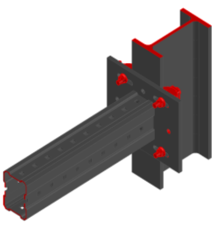
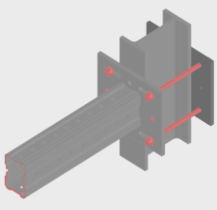


3. Base plate, threaded rods and nuts



MIC-S120-C-500-2000 Bracket - Steel

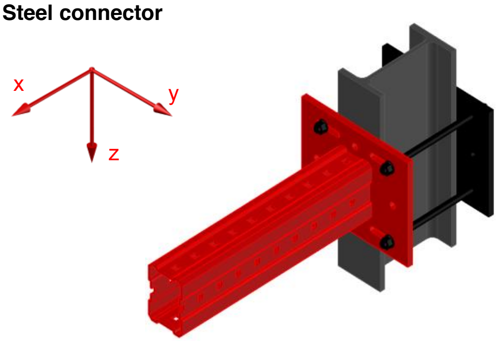
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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 and independent from the cantilever length. So they are valid equally for L=500, 750, 1000, 1500, 2000mm..

1. Steel connector



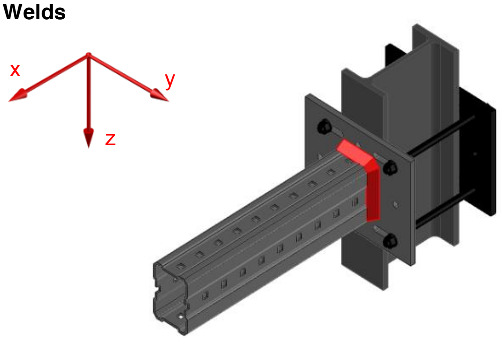
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
20.91	45.28	69.74	69.74	100.13	100.13
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
8.54	8.54	1.88	1.88	1.94	1.94

includes cross section resistance of steel base plate and channel

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

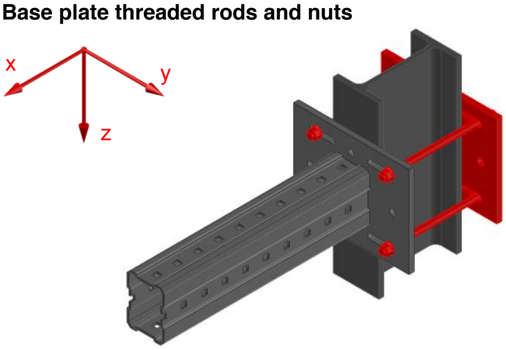


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
346.20	346.20	116.39	116.39	166.28	166.28
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
13.34	13.34	7.98	7.98	8.35	8.35

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. Base plate threaded rods and nuts



+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	13.01	13.01	25.15	25.15

Interaction:

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

Data version 1.3 I Date 12.2016

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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.

Data version 1.2 I Date 11.2016

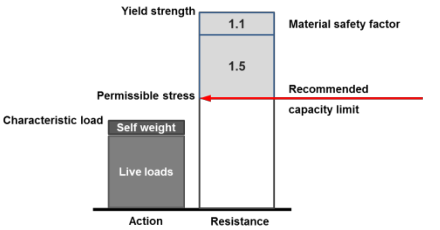
Content and overview of this manual

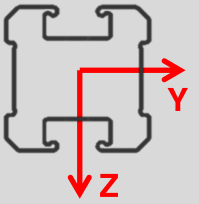
Data version 1.2 I Date 11.2016

Content and overview of this manual

MIQ System - Girders (Channels)

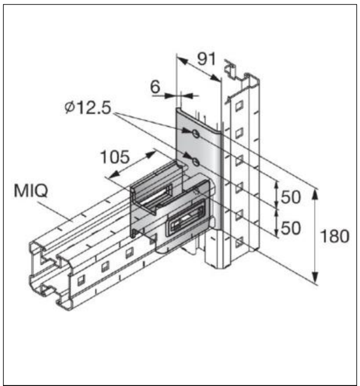
Designation	Item number
MIQ-90-3m	**2119866**
MIQ-90-6m	**2119867**



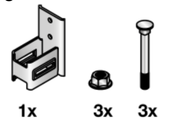
Technical data			**MIQ-90**
For girder MI / cross section including torsion			
Cross-sectional area	A	[mm²]	1093.51
Channel weight		[kg/m]	8.58
Wall thickness		[mm]	2.5
Material			
yield strength	$f_{y,k}$	[N/mm²]	275
permissible stress*	σ_{rec}	[N/mm²]	178.6
E-module		[N/mm²]	210000
Shear-modulus		[N/mm²]	81000
Surface			
hot dip galvanized		[µm]	65
Cross-section values Y-axis			
Axis of gravity A	e_1	[mm]	45
Axis of gravity B	e_2	[mm]	45
moment of inertia	I_y	[cm⁴]	121.65
Section modulus A	W_{y1}	[cm³]	27.03
Section modulus B	W_{y2}	[cm³]	27.03
Radius of gyration	i_y	[cm]	3.34
Permissible moment	M_y	[Nm]	4.83
Cross-section values Z-axis			
moment of inertia	I_z	[cm⁴]	101.29
Section modulus	W_z	[cm³]	22.51
Radius of gyration	i_z	[cm]	3.04
Data to the torsion			
torsional moment of inertia	It	[mm⁴]	54.35
torsional section modulus	W_t	[mm³]	9.1

MIQC-90-HS angle connector

Designation	Item number
MIQC-90-HS	**2123880**



Package content



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

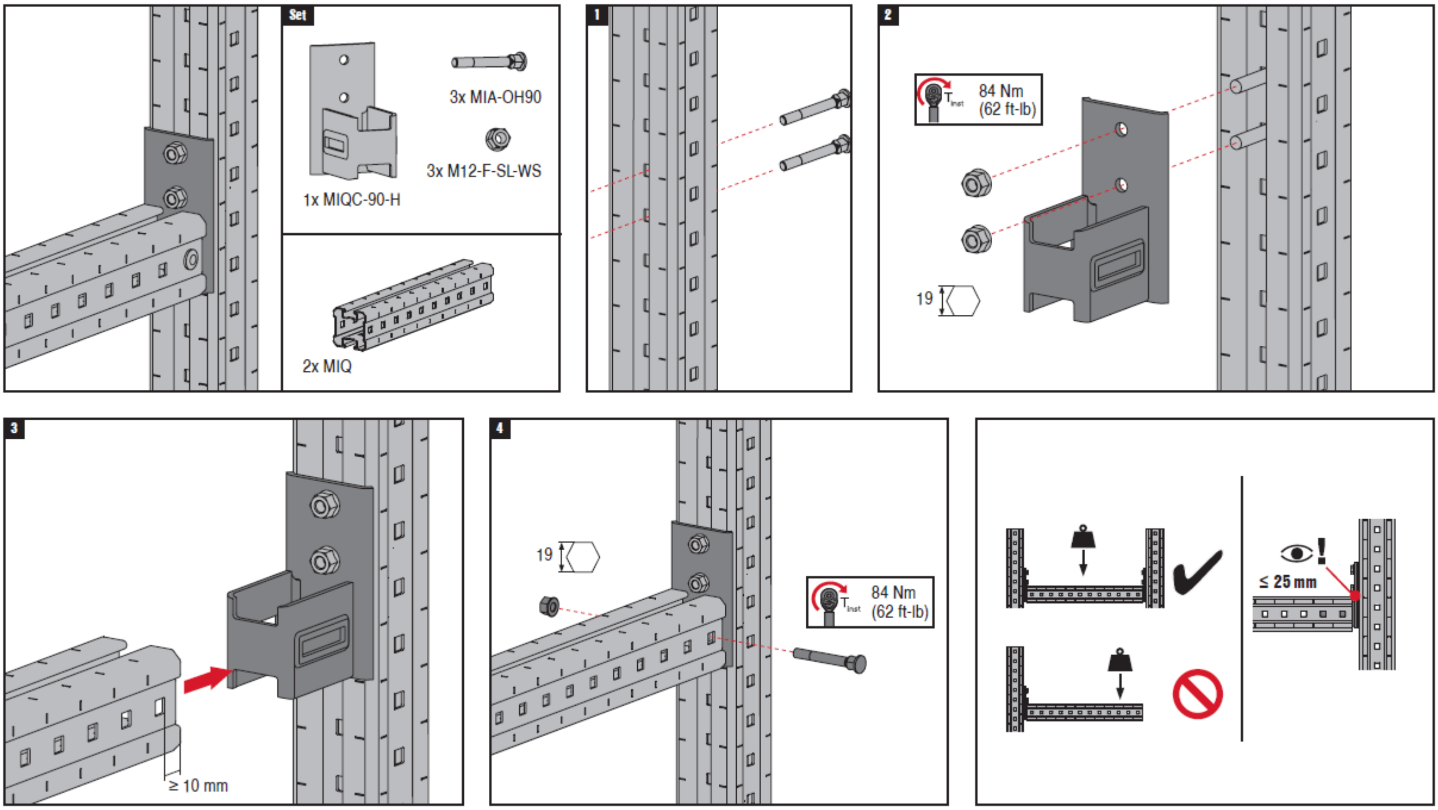
Weight:
1457.1g connector (1802g incl. accessories)

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

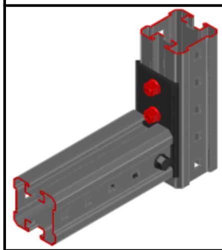
Material properties:

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

Instruction For Use:



MIQC-90-HS angle connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

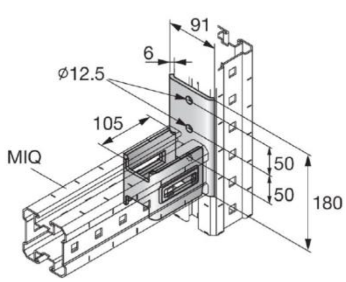
Standards and codes:

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

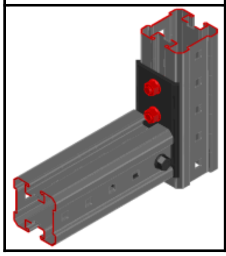
Software:
- Ansys 16.0
- Microsoft Excel

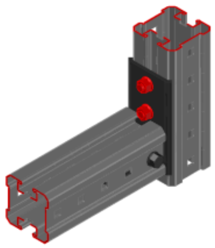
Environmental conditions:
- static loads
- no fatigue loads

Simplified drawing:



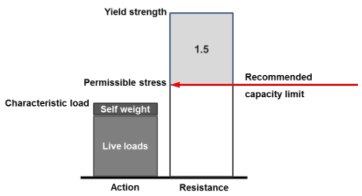
MIQC-90-HS angle connector

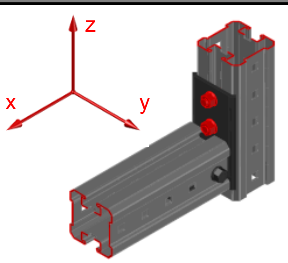
Standard		
		

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

Recommended loading capacity - simplified for most common applications

Method





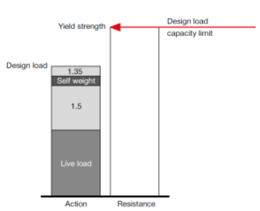
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
0.7	5.4	+10.2
		-18.7

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

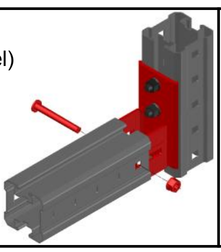
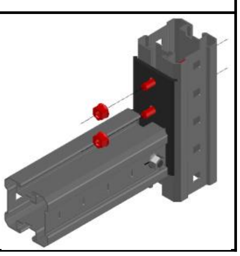
Design loading capacity - 3D

1/2

Method

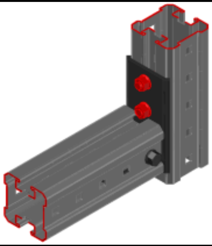


Limiting components of capacity evaluated in following tables:

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

MIQC-90-HS angle connector

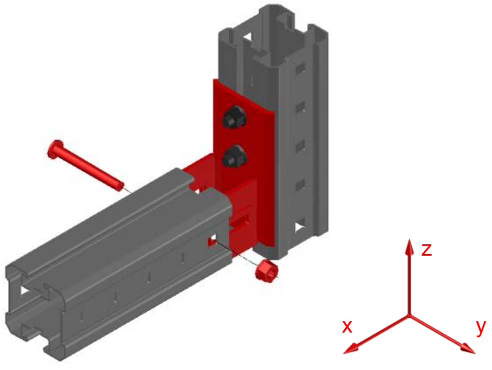
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Standard		
		

Design loading capacity - 3D 2/2

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

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

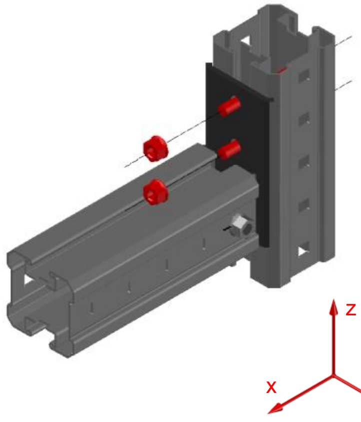


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.06	1.06	8.12	8.12	15.36	33.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.10	1.10	1.57	0.24	0.27	0.27

Interaction:

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

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

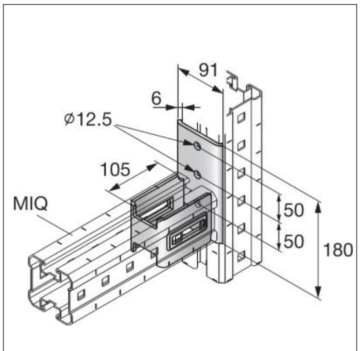


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
*	*	*	*	28.0	28.0
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.55	0.55	*	*	*	*

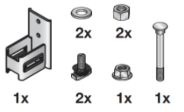
* not decisive

MIQC-90-HT angle connector

Designation	Item number
MIQC-90-HT angle connector	**2123881**



Package content



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

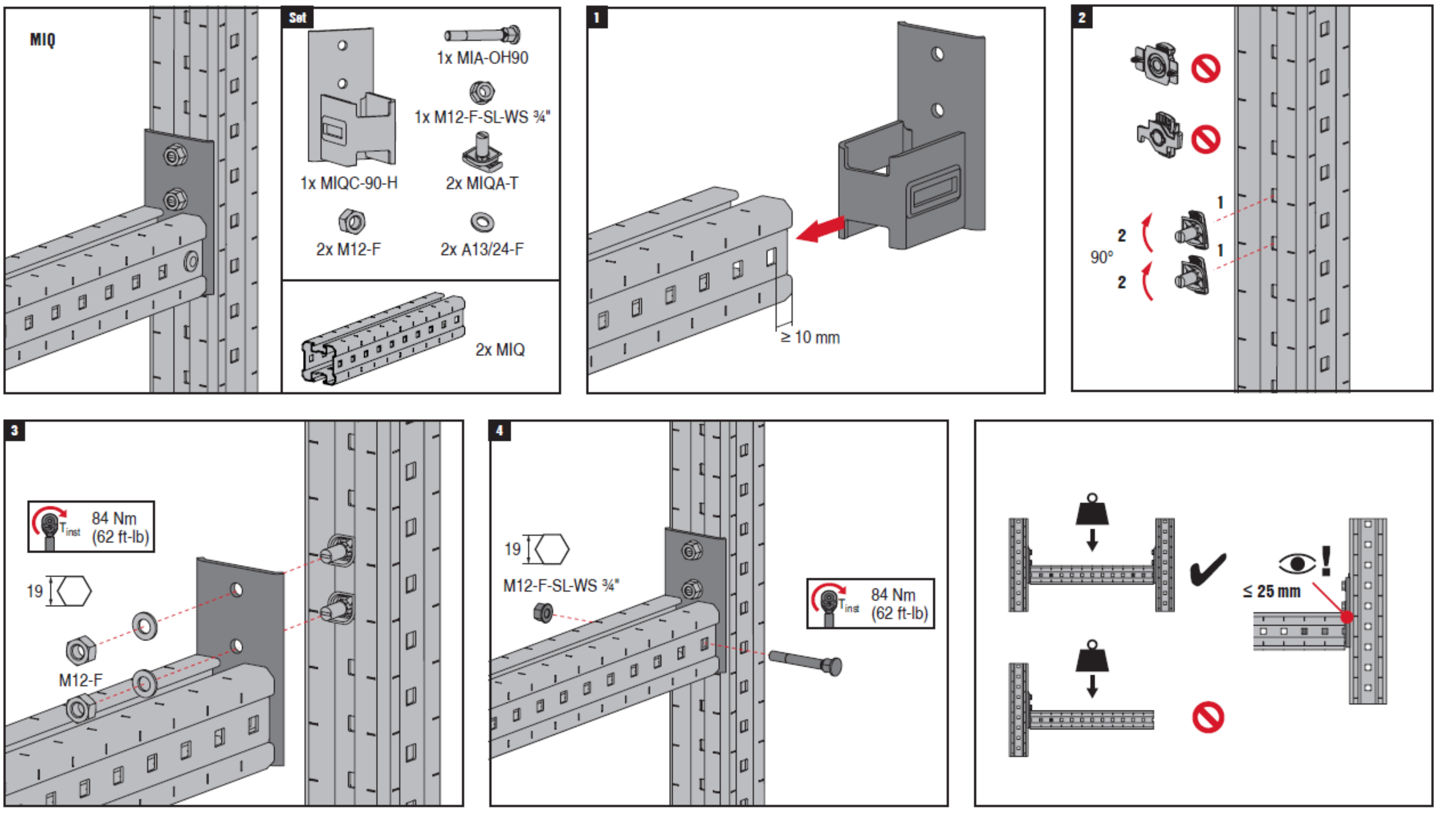
Weight:
1457.1g connector (1732g incl. accessories)

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

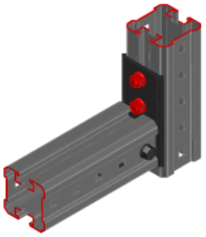
Material properties:

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

Instruction For Use:



MIQC-90-HT angle connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

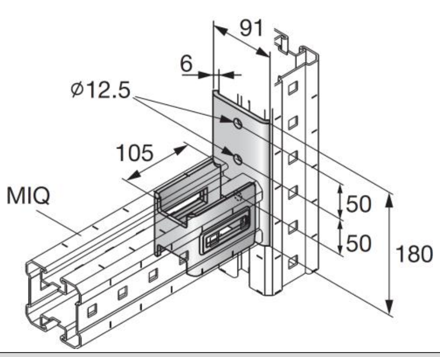
Standards and codes:

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

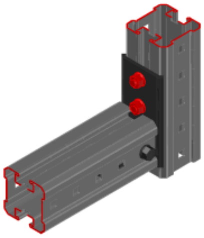
Software:
- Ansys 16.0
- Microsoft Excel

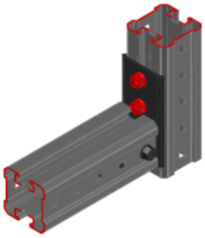
Environmental conditions:
- static loads
- no fatigue loads

Simplified drawing:



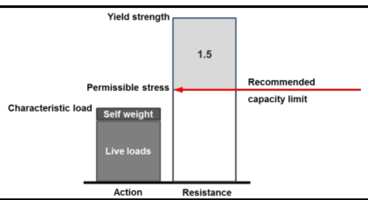
MIQC-90-HT angle connector

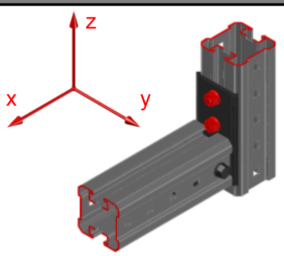
Possible loading cases		
Standard		
		

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

Recommended loading capacity - simplified for most common applications

Method



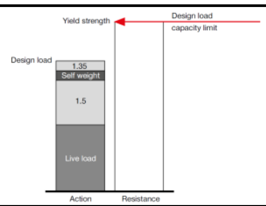


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
0.7	5.4	-12.4 +10.2

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

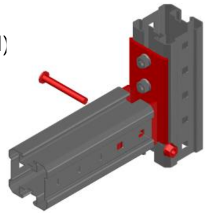
Design loading capacity - 3D 1/2

Method

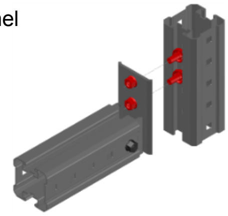


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-90-H (taken into account bolt on horizontal channel)

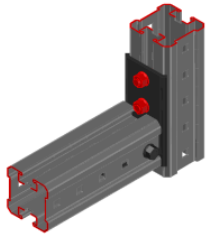


2. HT set with 2x MIQA-T on vertical channel



MIQC-90-HT angle connector

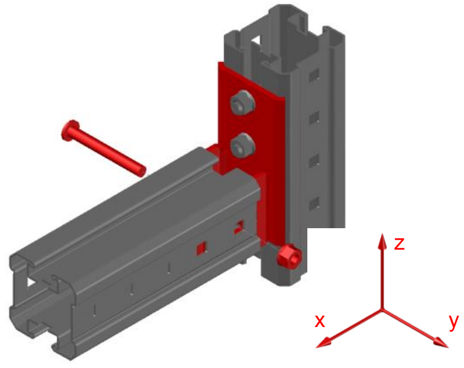
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

Possible loading cases		
Standard		
		

Design loading capacity - 3D 2/2

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

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

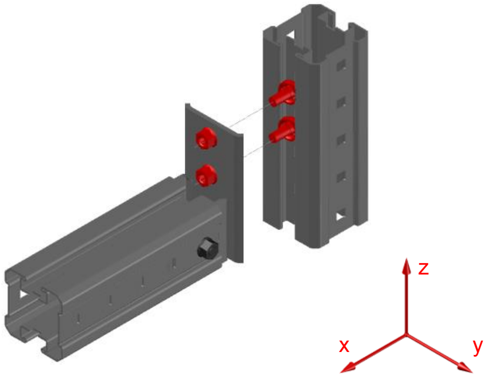


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.06	1.06	8.12	8.12	15.36	33.38
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.10	1.10	1.57	0.24	0.27	0.27

Interaction:

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

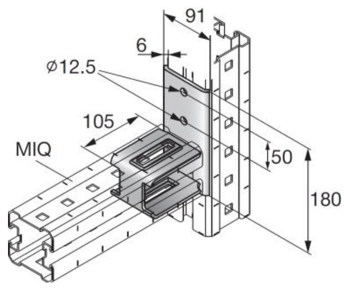
2. HT set with 2x MIQA-T on vertical channel (NOTE: interaction is not necessary)



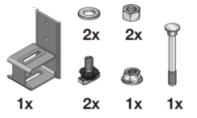
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
*	*	*	*	18.58	18.58
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
*	*	*	*	*	*

MIQC-90-HT-V angle connector

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



Package content



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

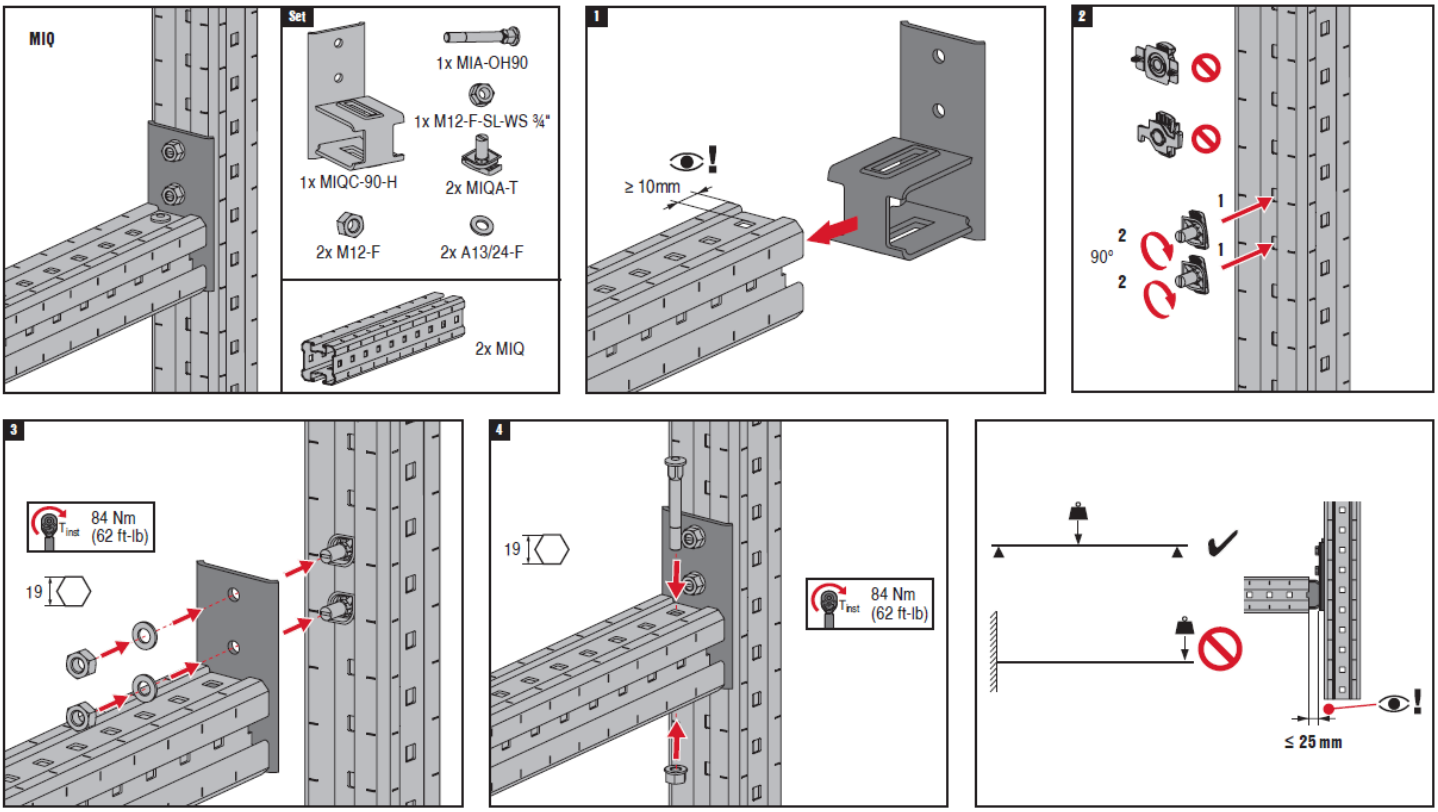
Weight:
1730g

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

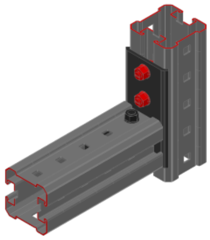
Material properties:

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

Instruction For Use:



MIQC-90-HT-V angle connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

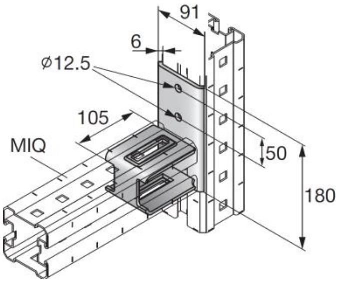
Standards and codes:
- EN 1990 Basics of structural design 03.2003
- EN 1991-1-1 Eurocode 1: Actions on structures – Part 1-1: General actions – densities, self-weight, imposed loads for buildings 09.2011
- EN 1993-1-1 Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings 03.2012
- EN 1993-1-3 Eurocode 3: Design of steel structures – Part 1-3: General rules- Supplementary rules for cold-formed members and sheeting 03.2012
- EN 1993-1-5 Eurocode 3: Design of steel structures – Part 1-5: Plated structural elements 03.2012
- EN 1993-1-8 Eurocode 3: Design of steel structures – Part 1-8: Design of joints 03.2012

  EN 10025-2 Hot rolled products of structural steels- Part 2: technical delivery conditions for non-alloy structural steels 02.2005
- RAL-GZ 655 Pipe Supports 04.2008

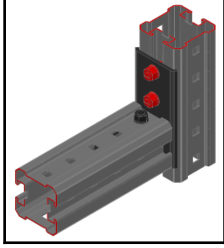
Software:
- Ansys 16.0
- Microsoft Excel

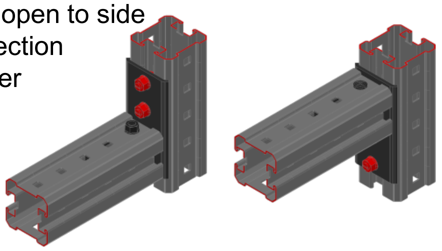
Environmental conditions:
- static loads
- no fatigue loads

Simplified drawing:



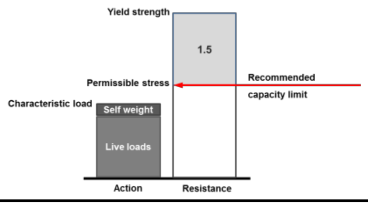
MIQC-90-HT-V angle connector

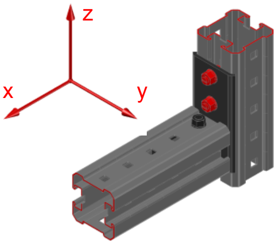
Standard		
		

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

Recommended loading capacity - simplified for most common applications

Method



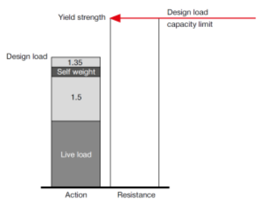


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
0.7	5.5	5.4

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

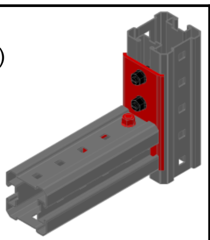
Design loading capacity - 3D 1/2

Method

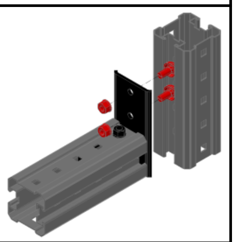


Limiting components of capacity evaluated in following tables:

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



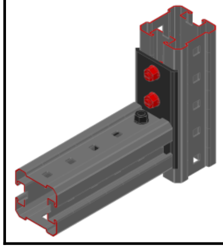
2. set with 2x MIQA-T on vertical channel



MIQC-90-HT-V angle connector

Conditions of the loading capacity tables:

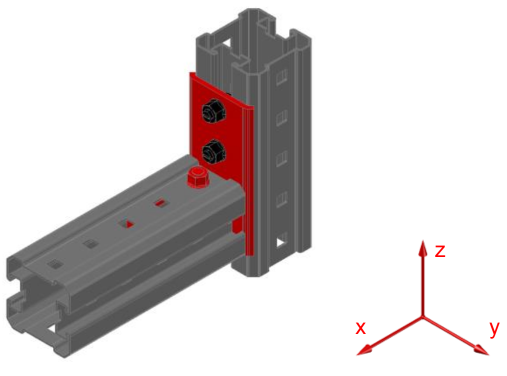
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Standard		
		

Design loading capacity - 3D 2/2

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

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

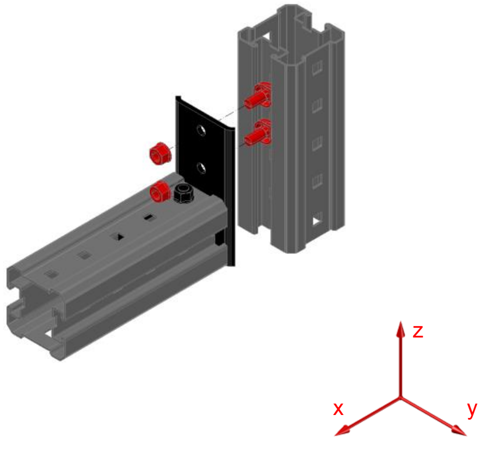


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.06	1.06	8.25	8.25	8.13	8.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.10	1.10	0.22	0.12	0.24	0.24

Interaction:

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

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

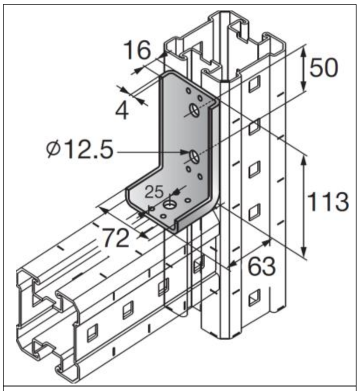


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
*	*	*	*	18.58	18.58
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
*	*	*	*	*	*

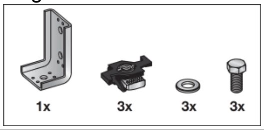
* not decisive

MIQC-90-L angle connector

Designation	Item number
MIQC-90-L angle connector	**2119868**



Package content



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

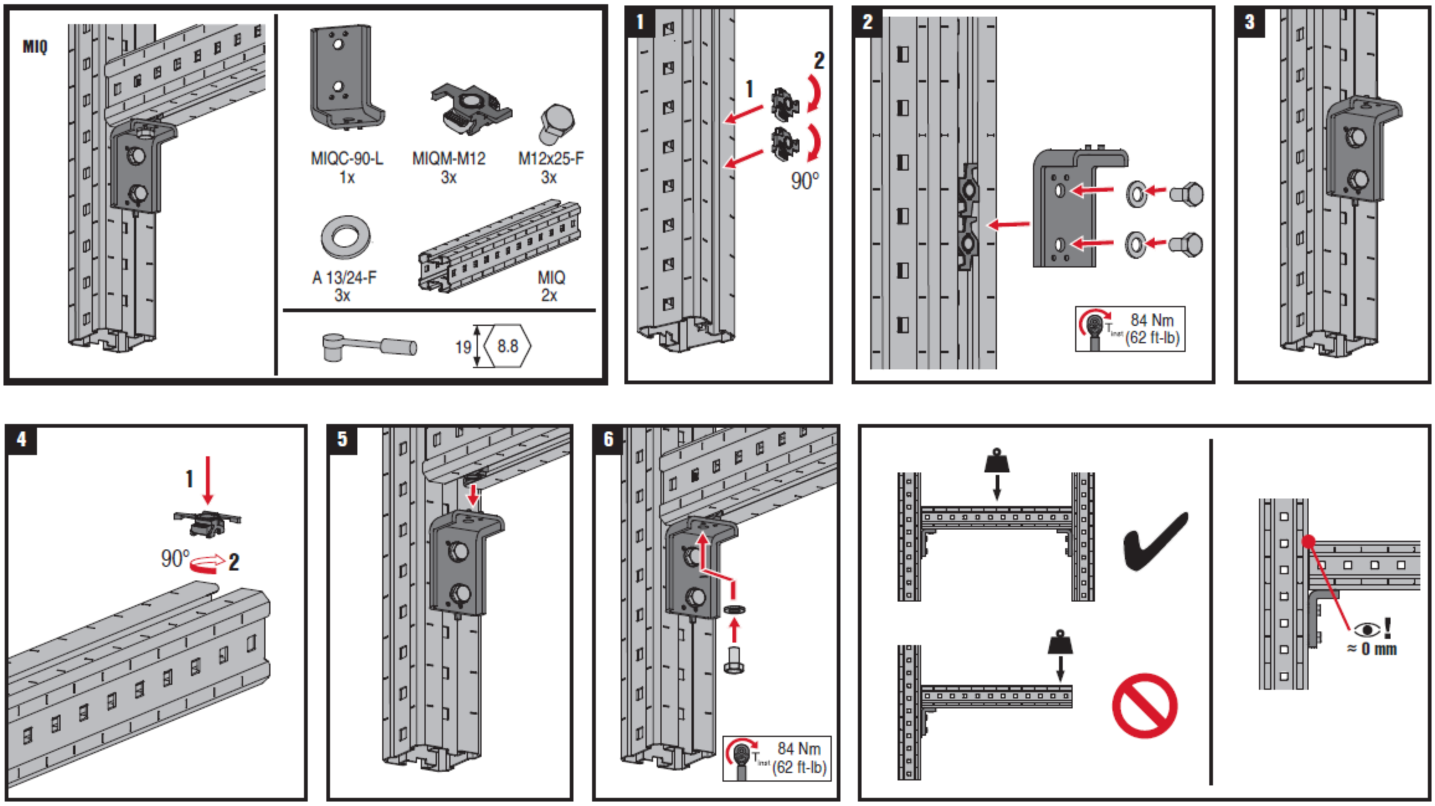
Weight:
450g connector (648g incl. accessories)

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

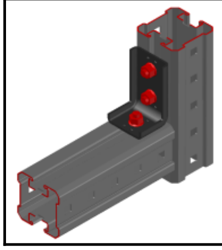
Material properties:

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

Instruction For Use:



MIQC-90-L angle connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

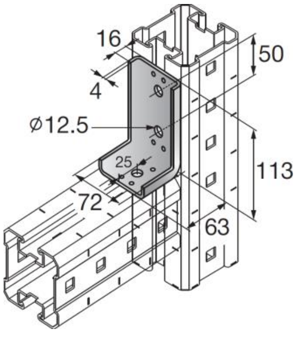
Standards and codes:

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

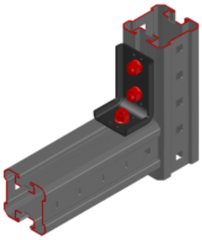
Software:
- Ansys 16.0
- Microsoft Excel

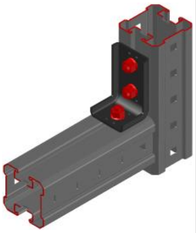
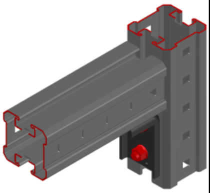
Environmental conditions:
- static loads
- no fatigue loads

Simplified drawing:



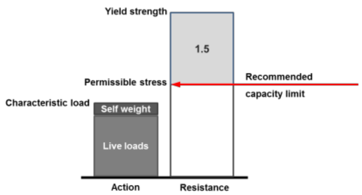
MIQC-90-L angle connector

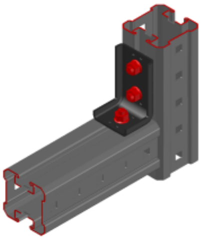
Possible loading cases		
Standard		
		

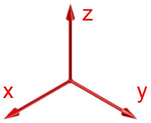
Loading case: Standard	Combinations covered by loading case	
BOM: Angle incl. all connectivity material **1x MIQC-90-L 2119868**	Connector used for fixing H-MIQ girder on grooved section of V-MIQ girder from top 	Connector used for fixing H-MIQ girder on grooved section of V-MIQ girder from bottom 

Recommended loading capacity - simplified for most common applications

Method





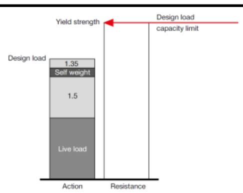


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
3.5	3.5	6.2

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

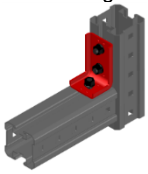
Design loading capacity - 3D 1/2

Method

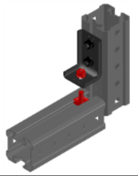


Limiting components of capacity evaluated in following tables:

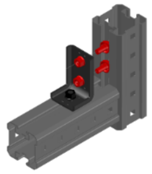
1. Steel connector angle MIQC-90-L



2. Wing nut on horizontal channel



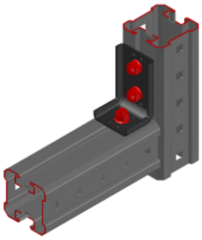
3. Wing nuts on vertical channel



MIQC-90-L angle connector

Conditions of the loading capacity tables:

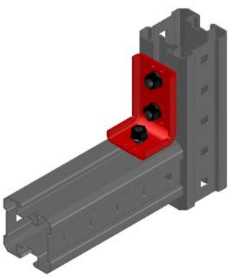
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

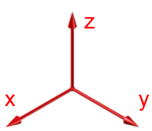
Possible loading cases		
Standard		
		

Design loading capacity - 3D 2/2

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

1. Steel connector angle MIQC-90-L



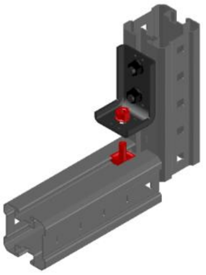


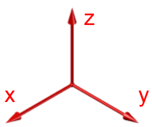
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
10.72	14.85	5.75	5.75	14.07	9.32
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.3	0.3	0.19	0.18	0.08	0.08

Interaction:

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

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

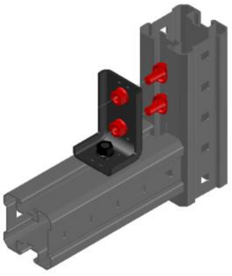




+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
5.21	5.21	5.20	5.20	*	12.89
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
*	*	*	*	*	*

* not decisive

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

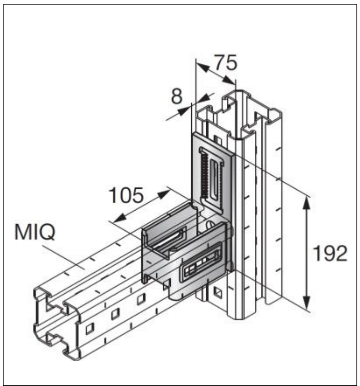


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
6.52	*	*	*	9.93	9.93
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
*	*	*	*	*	*

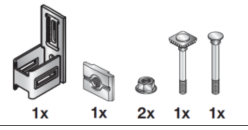
* not decisive

MIQC-90-MI angle connector

Designation	Item number
MIQC-90-MI angle connector	**2140257**



Package content



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

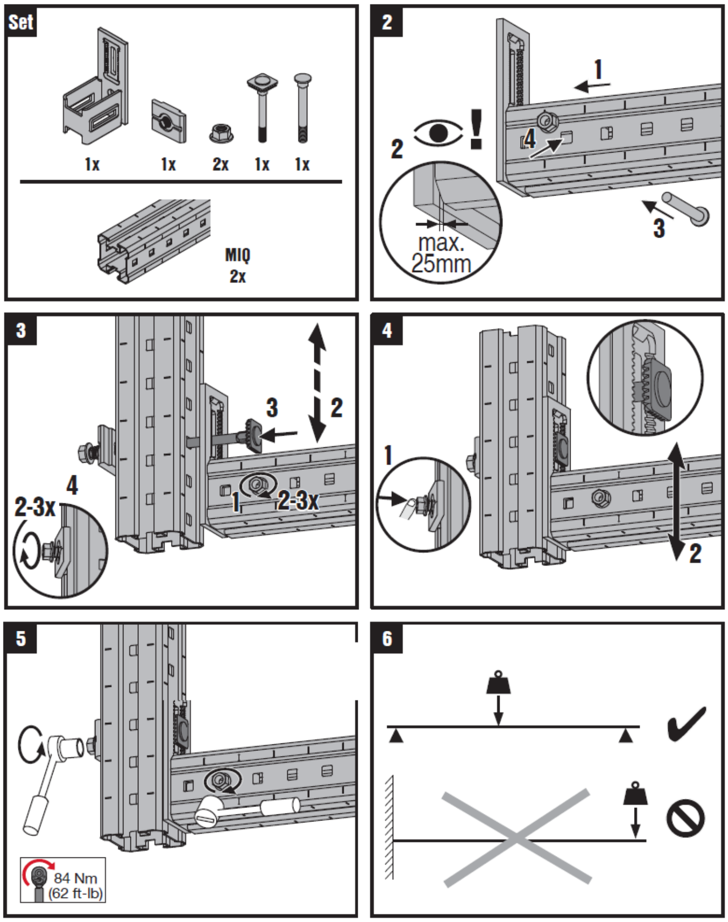
Weight:
2060 g

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

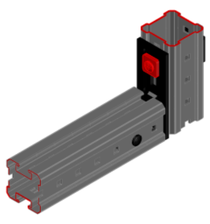
Material properties:

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

Instruction For Use:



MIQC-90-MI angle connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

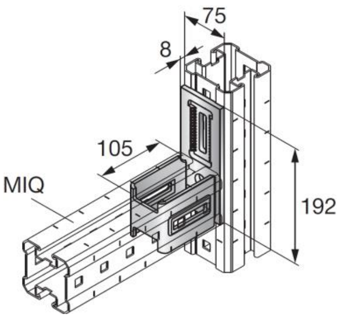
Standards and codes:

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

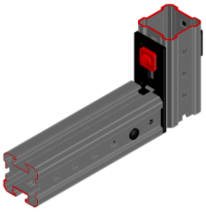
Software:
- Ansys 16.0
- Microsoft Excel
- Mathcad 15

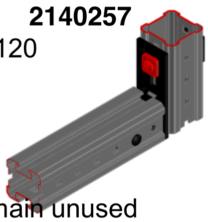
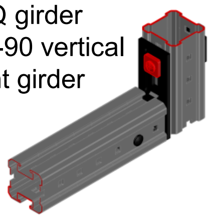
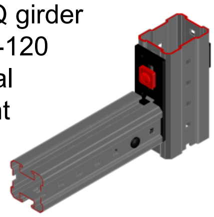
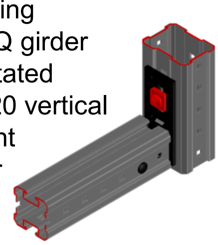
Environmental conditions:
- static loads
- no fatigue loads

Simplified drawing:



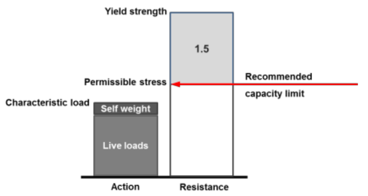
MIQC-90-MI angle connector

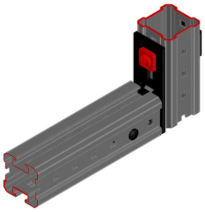
Possible loading cases		
Standard		
		

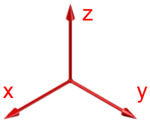
Loading case: Standard	Combinations covered by loading case		
BOM: Angle incl. all connectivity material **1x MIQC-90-MI 2140257** For fixation on MI-120 **1x MIQC-90-MI 2140257** **1x MIA-EH120 304888** The MIA-EH90 remain unused 	Connector used for fixing H-MIQ girder on MI-90 vertical upright girder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

Recommended loading capacity - simplified for most common applications

Method







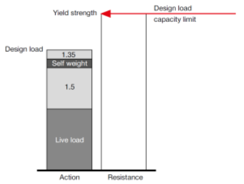
±Fx,rec. [kN]	±Fy,rec. [kN]	+Fz,rec. [kN]
0.7	5.0	10.2

−Fz,rec. [kN]
12.0

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

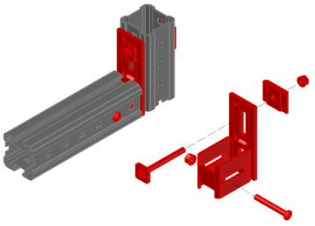
Design loading capacity - 3D 1/2

Method



Limiting components of capacity evaluated in following tables:

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

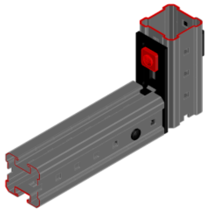


Boundary conditions - **Terms of common cooperation / Legal disclaimer** and guidelines as defined at the beginning of this book need to be mandatorily respected.

MIQC-90-MI angle connector

Conditions of the loading capacity tables:

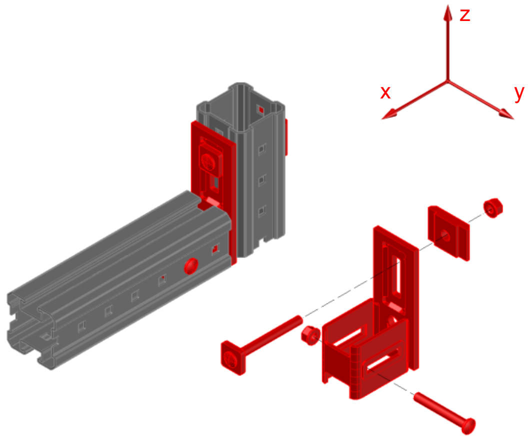
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

Possible loading cases		
Standard		
		

Design loading capacity - 3D 2/2

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

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



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

Interaction:

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

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

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

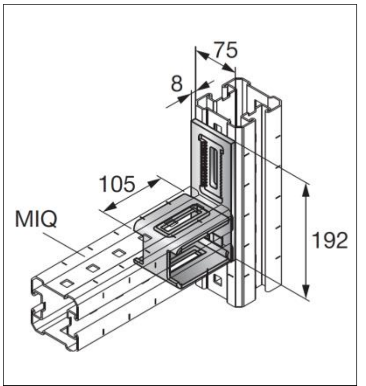
$$\frac{F_{xEd}}{F_{xRd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{\frac{F_{z.Rd}}{1.672}} + \frac{M_{xEd}}{M_{xRd}} \leq 1$$

Interaction for -Fz:

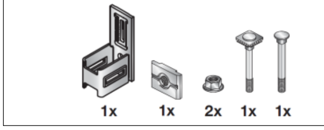
$$\frac{F_{xEd}}{F_{xRd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{\left|-F_{z.Ed}\right|}{\left|-F_{z.Rd}\right|} + \frac{M_{xEd}}{M_{xRd}} \leq 1$$

MIQC-90-MI-V angle connector

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



Package content



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

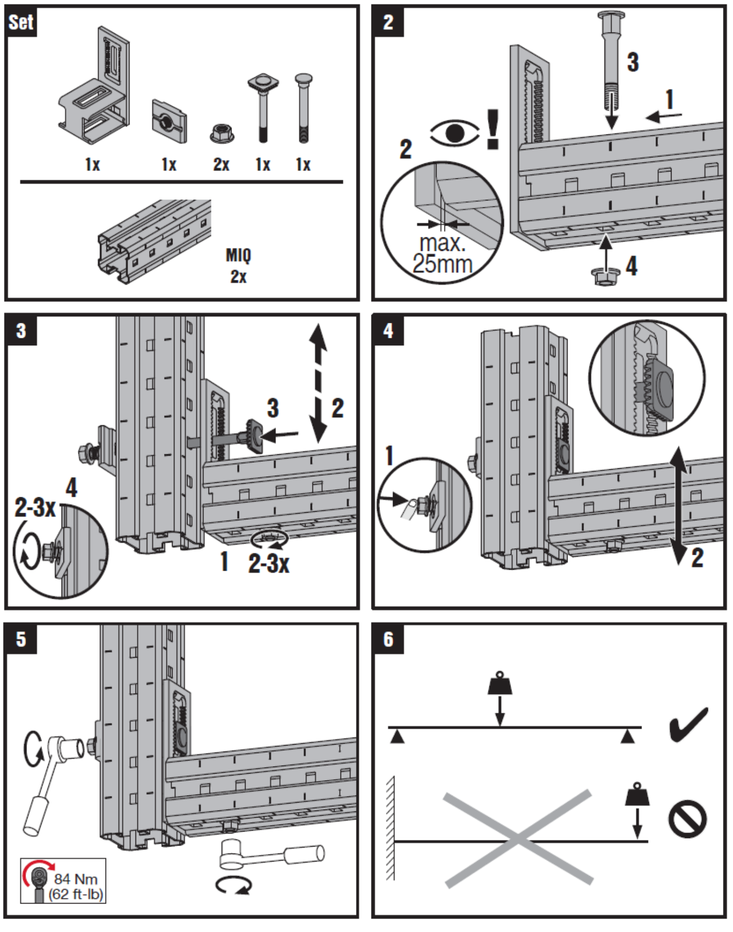
Weight:
2060 g

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

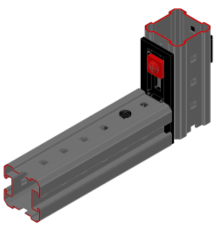
Material properties:

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

Instruction For Use:



MIQC-90-MI-V angle connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

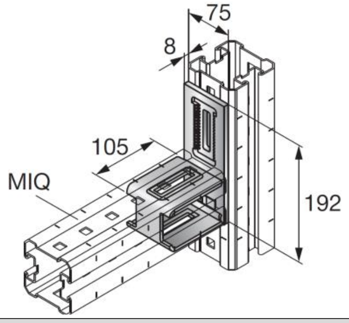
Standards and codes:

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

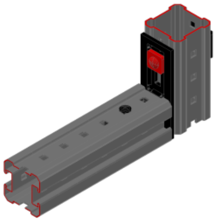
Software:
- Ansys 16.0
- Microsoft Excel
- Mathcad 15

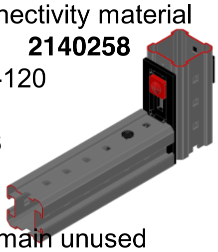
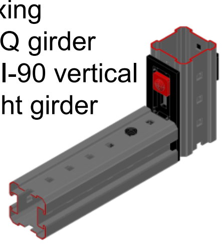
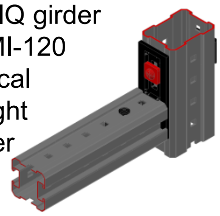
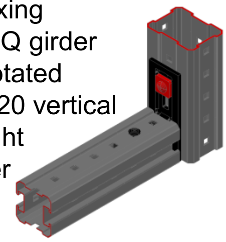
Environmental conditions:
- static loads
- no fatigue loads

Simplified drawing:



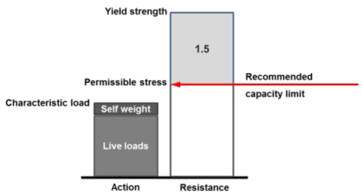
MIQC-90-MI-V angle connector

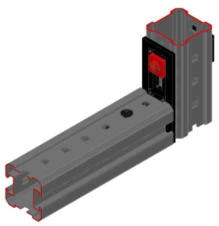
Possible loading cases		
Standard		
		

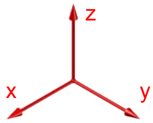
Loading case: Standard	Combinations covered by loading case		
BOM: Angle incl. all connectivity material **1x MIQC-90-MI-V 2140258** For fixation on MI-120 **1x MIQC-90-MI-V 2140258** **1x MIA-EH120 304888** The MIA-EH90 remain unused 	Connector used for fixing H-MIQ girder on MI-90 vertical upright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

Recommended loading capacity - simplified for most common applications

Method





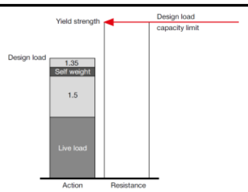


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
0.70	9.00	5.40

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

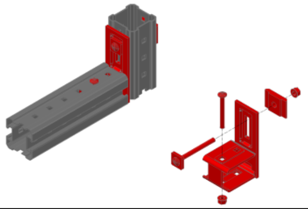
Design loading capacity - 3D 1/2

Method



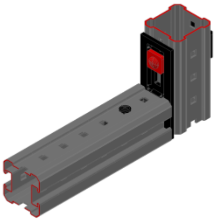
Limiting components of capacity evaluated in following tables:

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



MIQC-90-MI-V angle connector

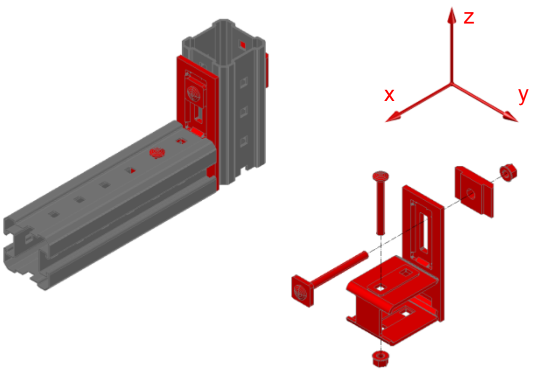
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Possible loading cases		
Standard		
		

Design loading capacity - 3D 2/2

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

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



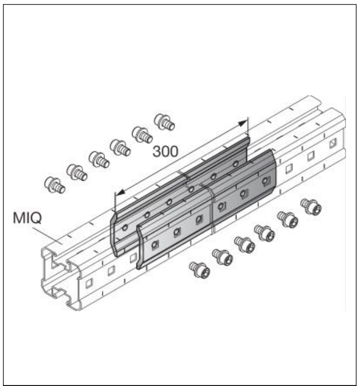
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
1.06	1.06	13.50	13.50	8.10	8.10
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.90	0.90	0.00	0.00	0.00	0.00

Interaction:

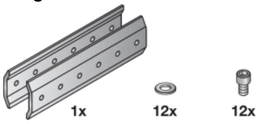
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \le 1$$

MIQC-90-E girder extension connector

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



Package content



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

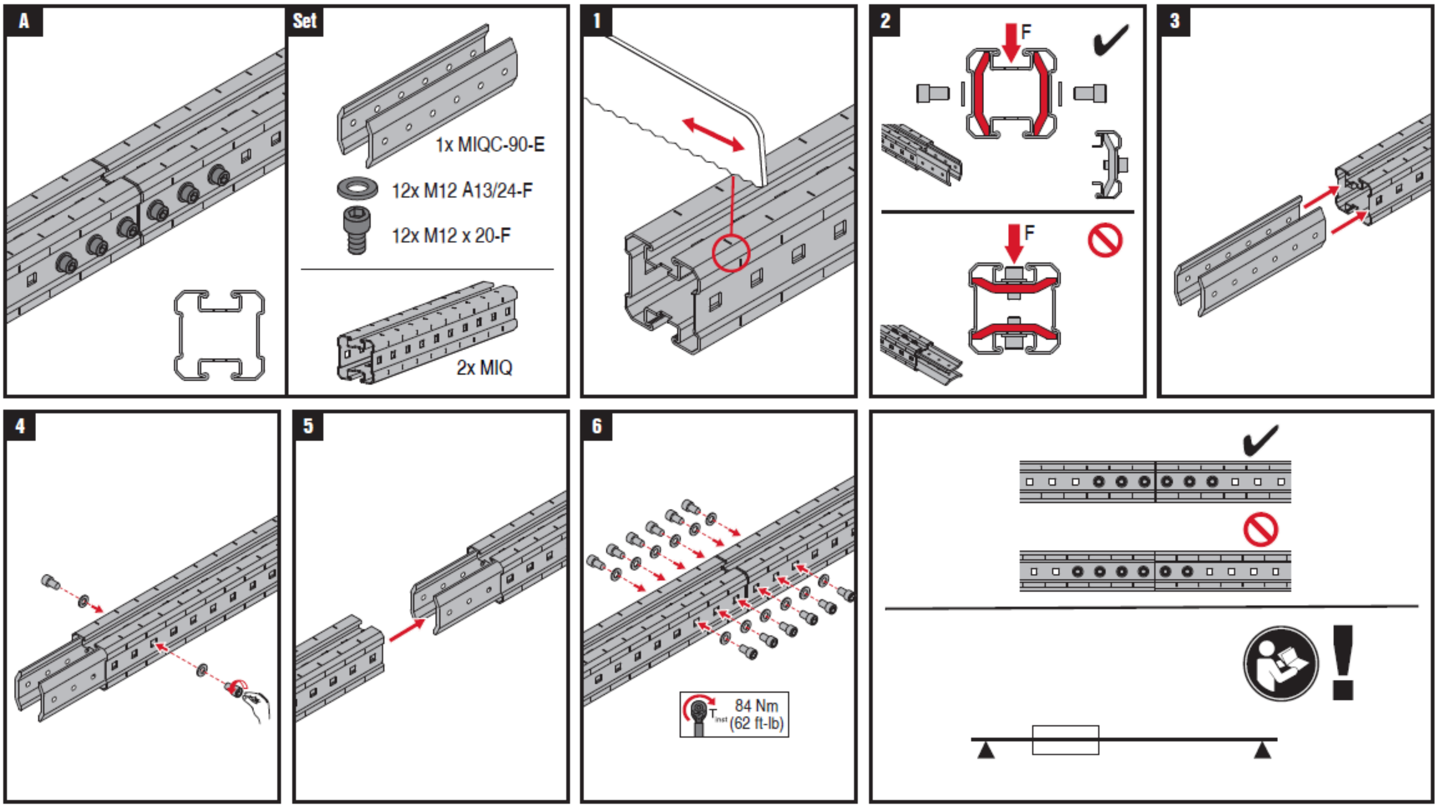
Weight:
3476 g

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

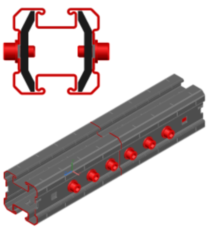
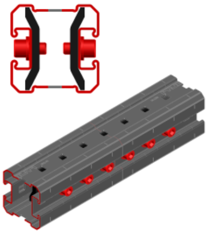
Material properties:

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

Instruction For Use:



MIQC-90-E girder extension connector

Possible loading cases		
Open up	Open to the side	
		

Design criteria used for loading capacity

Methodology:

- Finite element analysis
- Hardware tests

Standards and codes:

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

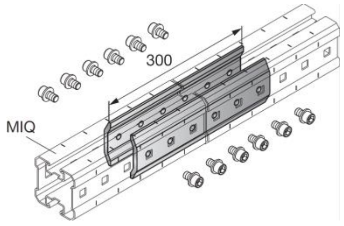
Software:

- Ansys 16.0
- Microsoft Excel

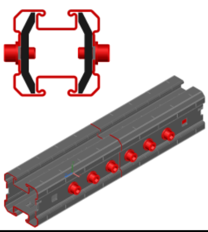
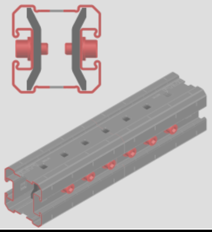
Environmental conditions:

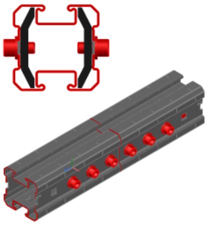
- static loads
- no fatigue loads

Simplified drawing:



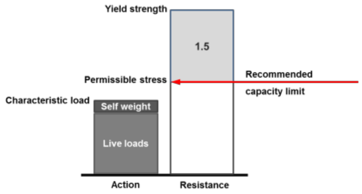
MIQC-90-E girder extension connector

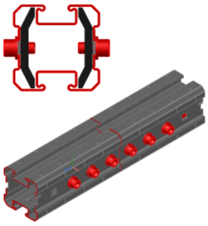
Possible loading cases		
Open up	Open to the side	
		

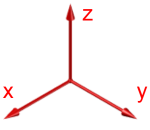
Loading case: Open up	Combinations covered by loading case
BOM: Angle incl. all connectivity material **1x MIQC-90-E** **2140259**	

Recommended loading capacity - simplified for most common applications

Method







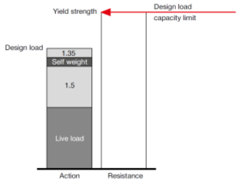
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
34.67	3.33	14.67

±My,rec. [kNm]
1.2

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

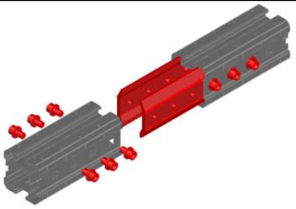
Design loading capacity - 3D 1/2

Method



Limiting components of capacity evaluated in following tables:

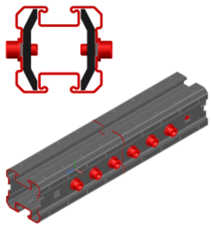
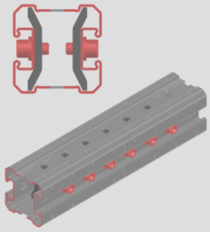
1. Steel connector MIQC-90-E incl. all screws



MIQC-90-E girder extension connector

Conditions of the loading capacity tables:

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

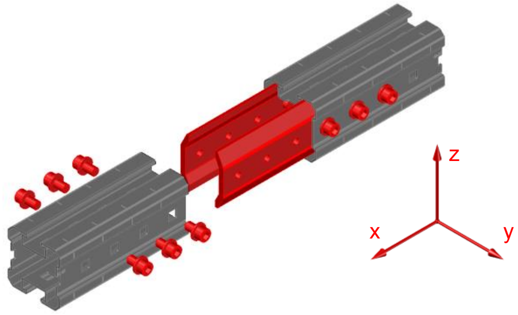
Possible loading cases		
Open up	Open to the side	
		

Design loading capacity - 3D 2/2

Summary of design loads*

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

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



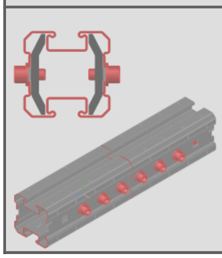
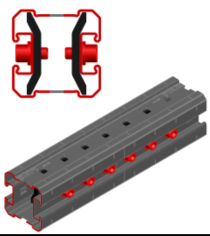
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
52.00	52.00	5.00	5.00	22.00	22.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.80	0.80	1.80	1.80	2.00	2.00

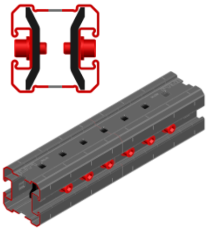
Interaction:

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

MIQC-90-E girder extension connector

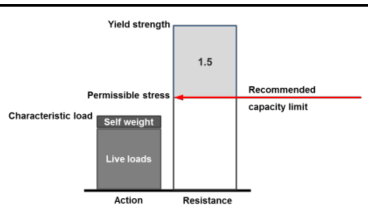
Possible loading cases

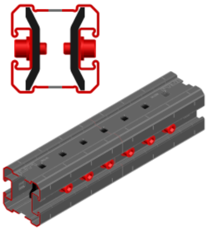
Open up	Open to the side	
		

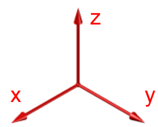
Loading case: Open to the side	Combinations covered by loading case
BOM: Angle incl. all connectivity material **1x MIQC-90-E** **2140259**	

Recommended loading capacity - simplified for most common applications

Method







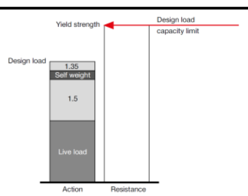
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
34.67	5.0	13.33

±My,rec. [kNm]
1.2

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

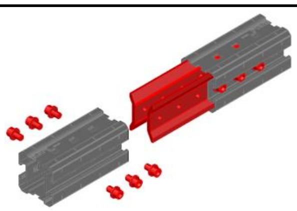
Design loading capacity - 3D 1/2

Method



Limiting components of capacity evaluated in following tables:

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

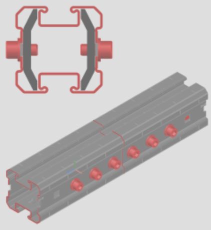
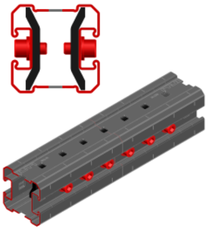


Boundary conditions - **Terms of common cooperation / Legal disclaimer** and guidelines as defined at the beginning of this book need to be mandatorily respected.

MIQC-90-E girder extension connector

Conditions of the loading capacity tables:

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

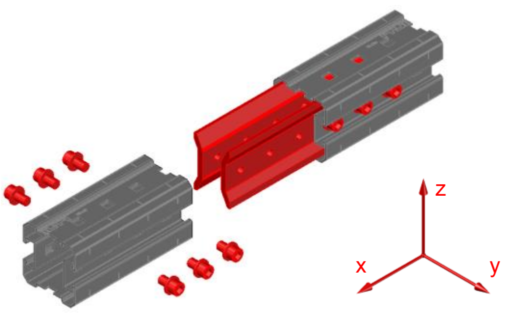
Possible loading cases		
Open up	Open to the side	
		

Design loading capacity - 3D 2/2

Summary of design loads*

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

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



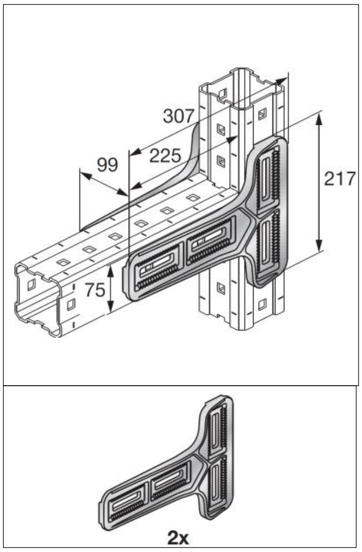
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
52.00	52.00	7.50	7.50	20.00	20.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.60	0.60	1.80	1.80	1.60	1.60

Interaction:

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

MIC-90-LH Connector

Designation	Item number
MIC-90-LH	**2048107**



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

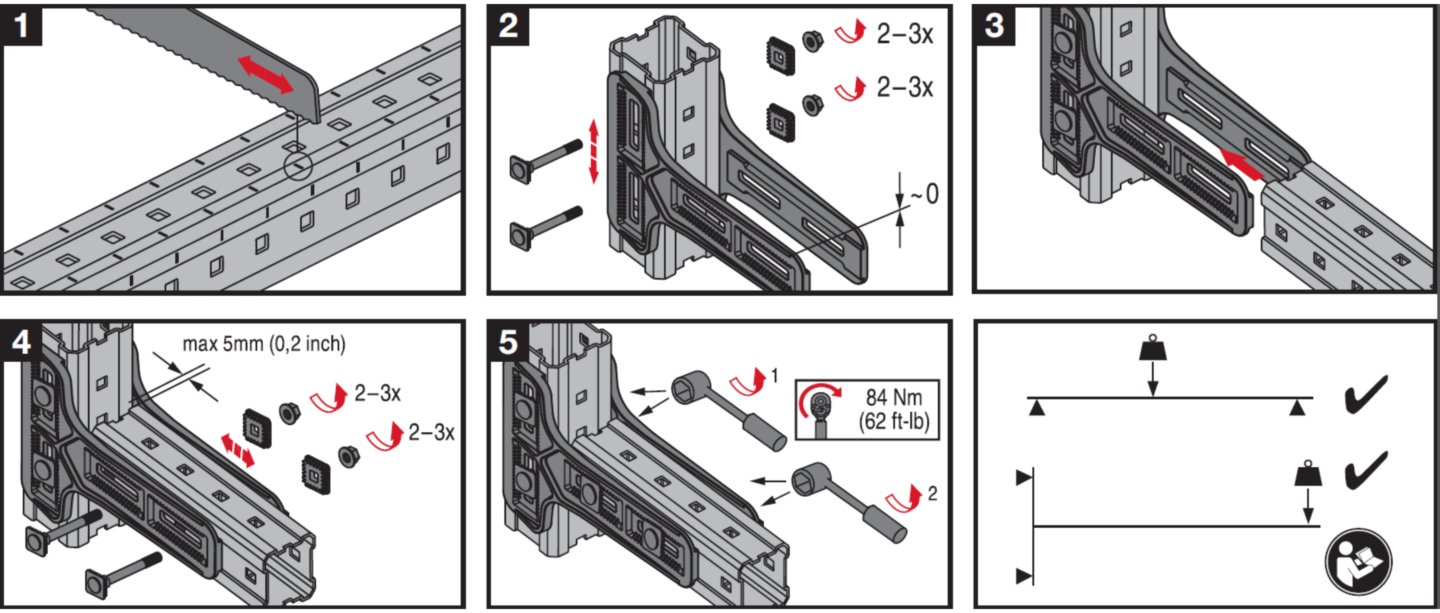
Weight:
3800 g

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

Material properties:

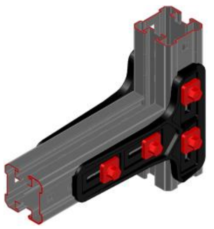
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
Connector: C30-1.0528	$F_y = 250\ \frac{N}{mm^2}$	$F_u = 480\ \frac{N}{mm^2}$	$E = 210000\ \frac{N}{mm^2}$	$G = 80769\ \frac{N}{mm^2}$
Toothed plate: S235 - EN 10250-2	$F_y = 235\ \frac{N}{mm^2}$	$F_u = 360\ \frac{N}{mm^2}$	$E = 210000\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

Instruction For Use:



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

MIC-90-LH Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

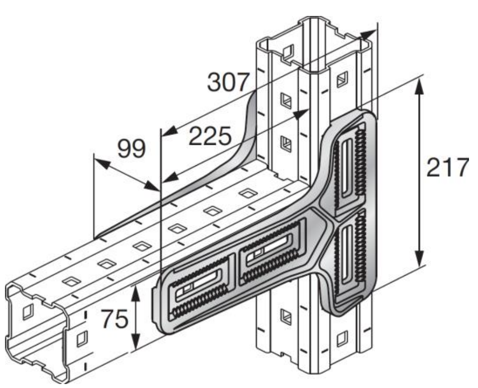
Standards and codes:

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

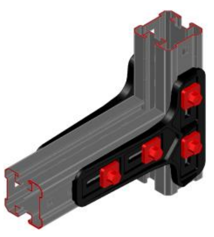
Software:
- Mathcad 15.0
- Microsoft Excel

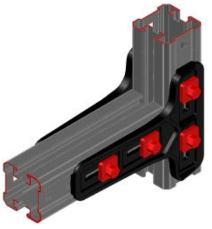
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



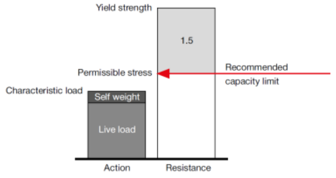
MIC-90-LH Connector

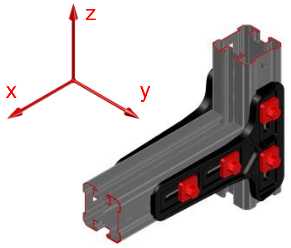
Standard		
		

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

Recommended loading capacity - simplified for most common applications

Method





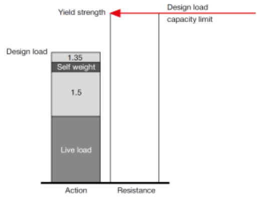
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
24.4	9.7	24.4

±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.

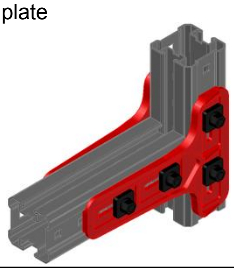
Design loading capacity - 3D 1/3

Method

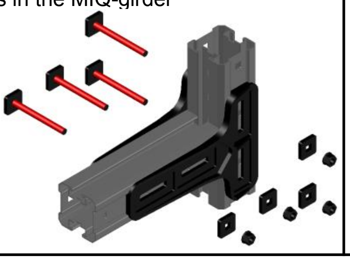


Limiting components of capacity evaluated in following tables:

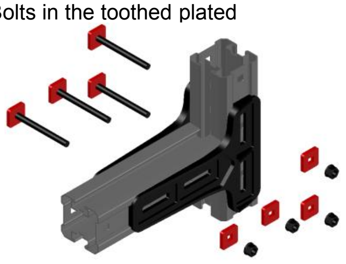
1. Connector steel plate



2. Bolts in the MIQ-girder



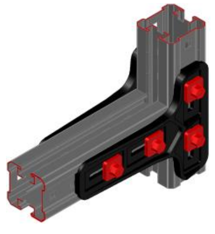
3. Bolts in the toothed plated



MIC-90-LH Connector

Conditions of the loading capacity tables:

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

Standard		
		

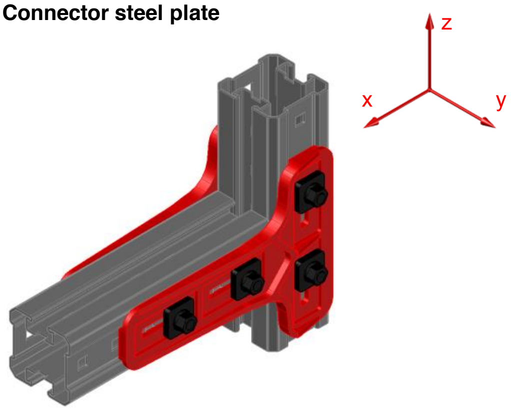
Design loading capacity - 3D

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

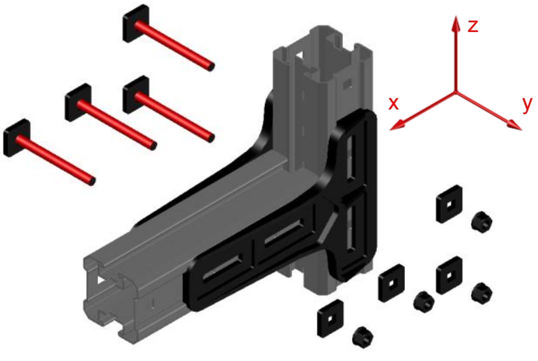


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
112.0	112.0	14.50	14.50	72.00	72.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.75	1.75	5.75	5.75	1.73	1.73

Interaction:

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

2. Bolts in the MIQ-girder



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

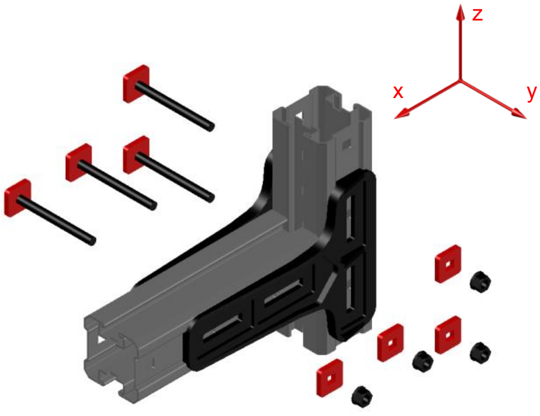
Interaction:

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

MIC-90-LH Connector

Design loading capacity - 3D 3/3

3. Bolts in the toothed plated



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

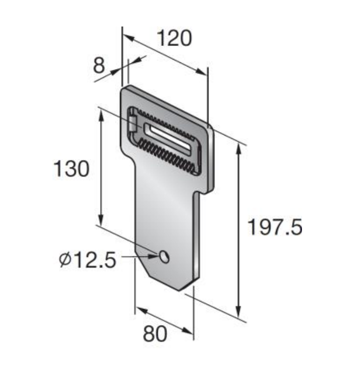
Interaction:

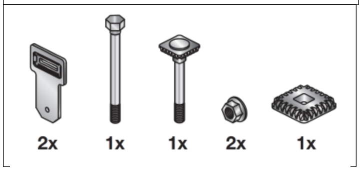
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} \leq 1$$

Data version 1.2 I Date 11.2016

MIC-U-MA Connector

Designation	Item number
MIC-U-MA	**304806**





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

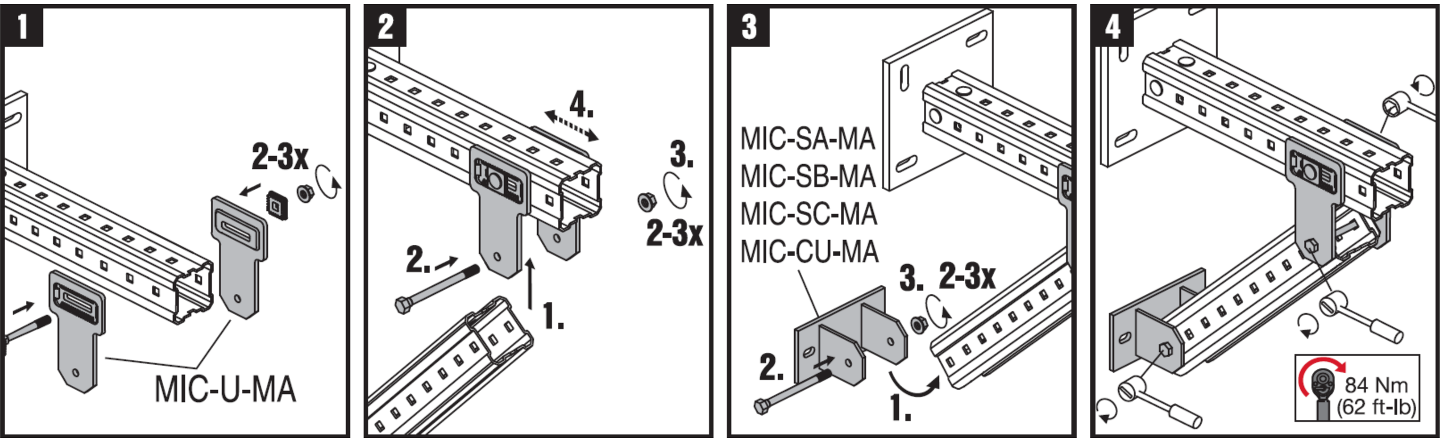
Weight:
2630 g incl. components

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

Material properties:

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

Instruction For Use:



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

MIC-U-MA Connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

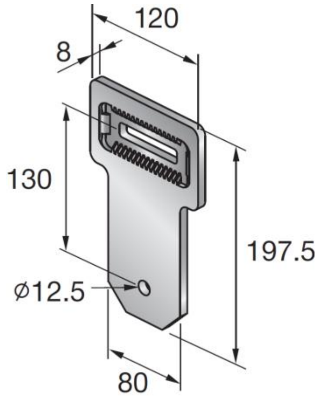
Standards and codes:

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

Software:
- Mathcad 15.0
- Microsoft Excel

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

Simplified drawing:



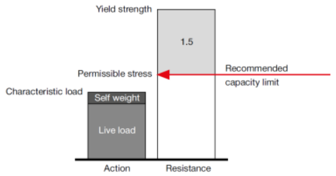
MIC-U-MA Connector

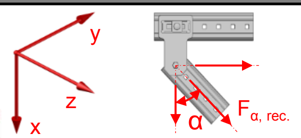
Standard

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

Recommended loading capacity - simplified for most common applications

Method





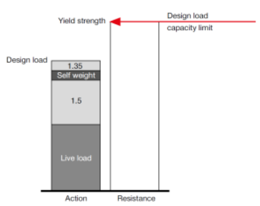
$\pm$Fy,rec. [kN]
1.4

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	18.31	11.63	9.77	8.95	9.30

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

Design loading capacity - 3D 1/3

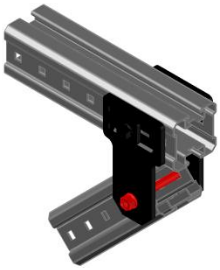
Method



Limiting components of capacity evaluated in following tables:

1. Steel connector

2. Hexagon bolt on MIQ-girder



3. Easy hand screw on MIQ-girder

MIC-U-MA Connector

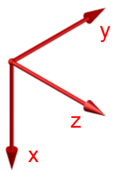
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

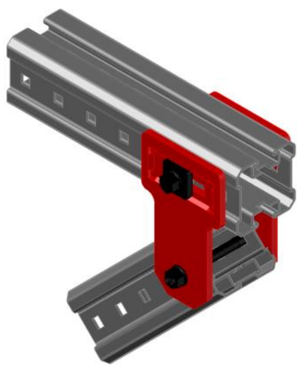
Standard		
		

Design loading capacity - 3D 2/3

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

1. Steel connector

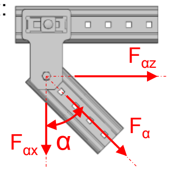




+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
40.32	40.32	2.11	2.11	13.96	13.96
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.63	0.63	0.00	0.00	0.00	0.00

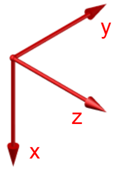
includes cross section resistance of steel plate and contact pressure
Interaction for a general force F_α with a certain inclination α:

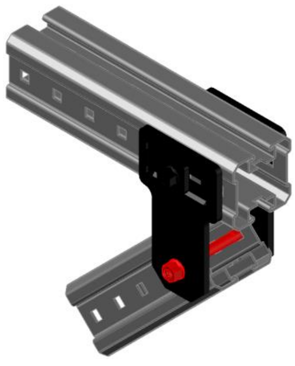
$F_{\alpha xEd}=F_\alpha{}^*\cos\alpha$ and $F_{\alpha zEd}=F_\alpha{}^*\sin\alpha$



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

2. Hexagon bolt on MIQ-girder





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

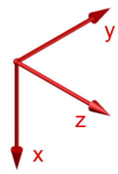
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$
includes shear and bending of the bolt, bearing resistance connector plate and channel MIQ-90
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.
The normal force $F_{\alpha Ed}$ in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.
Interaction:

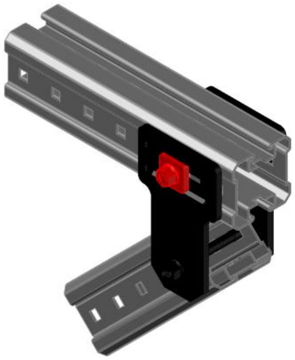
$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}}+\frac{M_{x.Ed}}{M_{x.Rd}}\le 1$$

MIC-U-MA Connector

Design loading capacity - 3D 3/3

3. 3. Easy hand screw on MIQ-girder





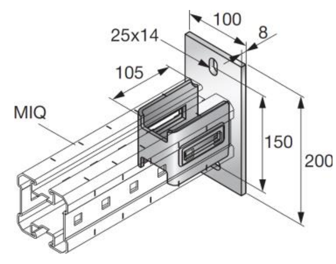
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
Not decisive	Not decisive	16.87	16.87	27.40	27.40
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.23	1.23	0.00	0.00	0.00	0.00

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

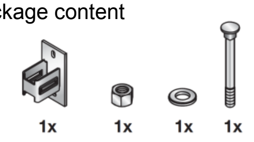
Interaction:

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

MIQC-C90-U base material connector



Package content



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

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

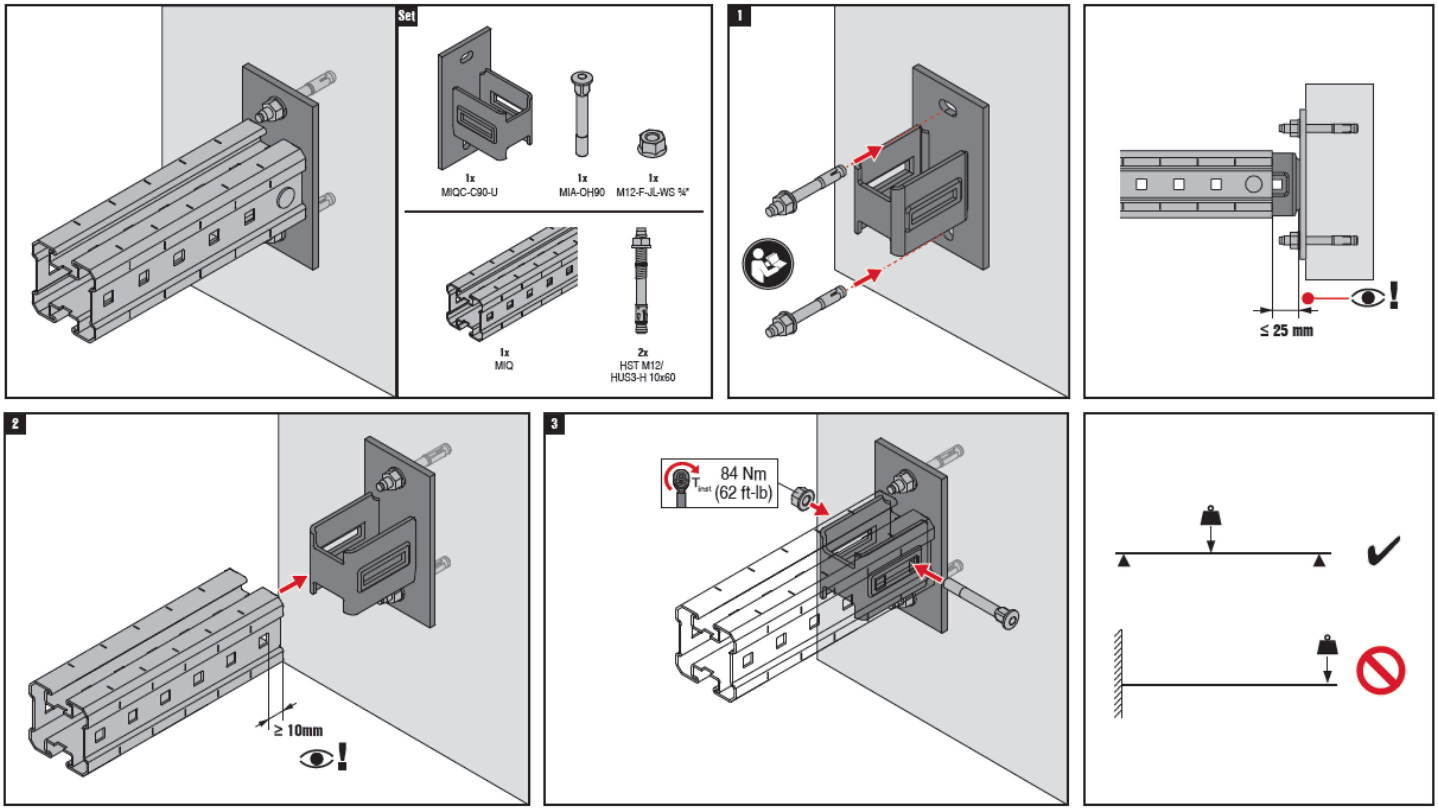
Weight:
2015 g

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

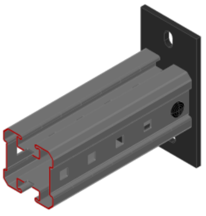
Material properties:

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

Instruction For Use:



MIQC-C90-U base material connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

Standards and codes:

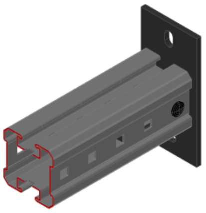
• EN 1990	Basics of structural design	03.2003
• EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General actions – densities, self-weight, imposed loads for buildings	09.2011
• EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings	03.2012
• EN 1993-1-3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

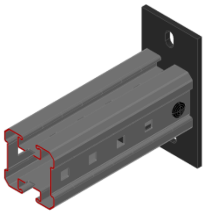
Software:
- Ansys 16.0
- Microsoft Excel

Environmental conditions:
- static loads
- no fatigue loads

Simplified drawing:

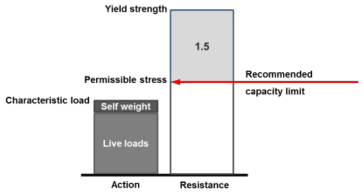
MIQC-C90-U base material connector

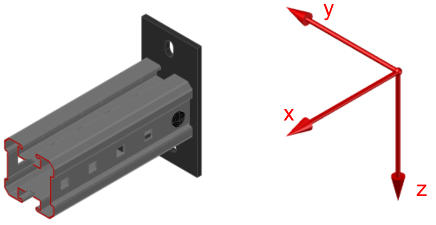
Possible loading cases		
Standard		
		

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

Recommended loading capacity - simplified for most common applications

Method



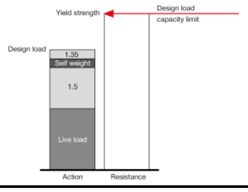


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
0.71	5.43	20.17

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

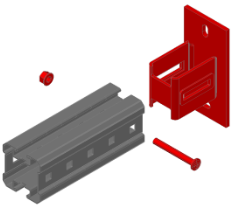
Design loading capacity - 3D 1/2

Method



Limiting components of capacity evaluated in following tables:

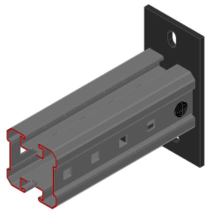
1. **Steel connector MIQC-C90-U**



MIQC-C90-U base material connector

Conditions of the loading capacity tables:

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

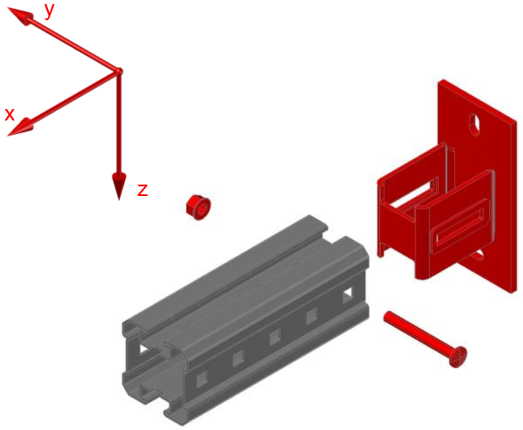
Possible loading cases		
Standard		
		

Design loading capacity - 3D 2/2

Summary of design loads*

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

1. Steel connector angle MIQC-90-L



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

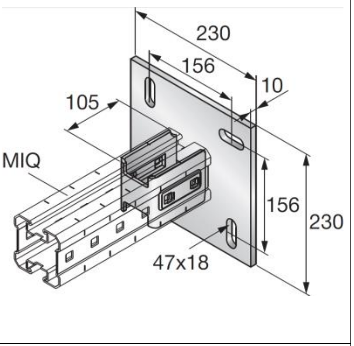
* the bending resistances are only valid with installation tolerance almost 0 mm

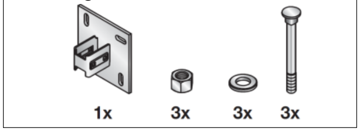
Interaction:

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

MIQC-C90 base material connector

Designation	Item number
MIQC-C90 base material connector	**2120144**





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

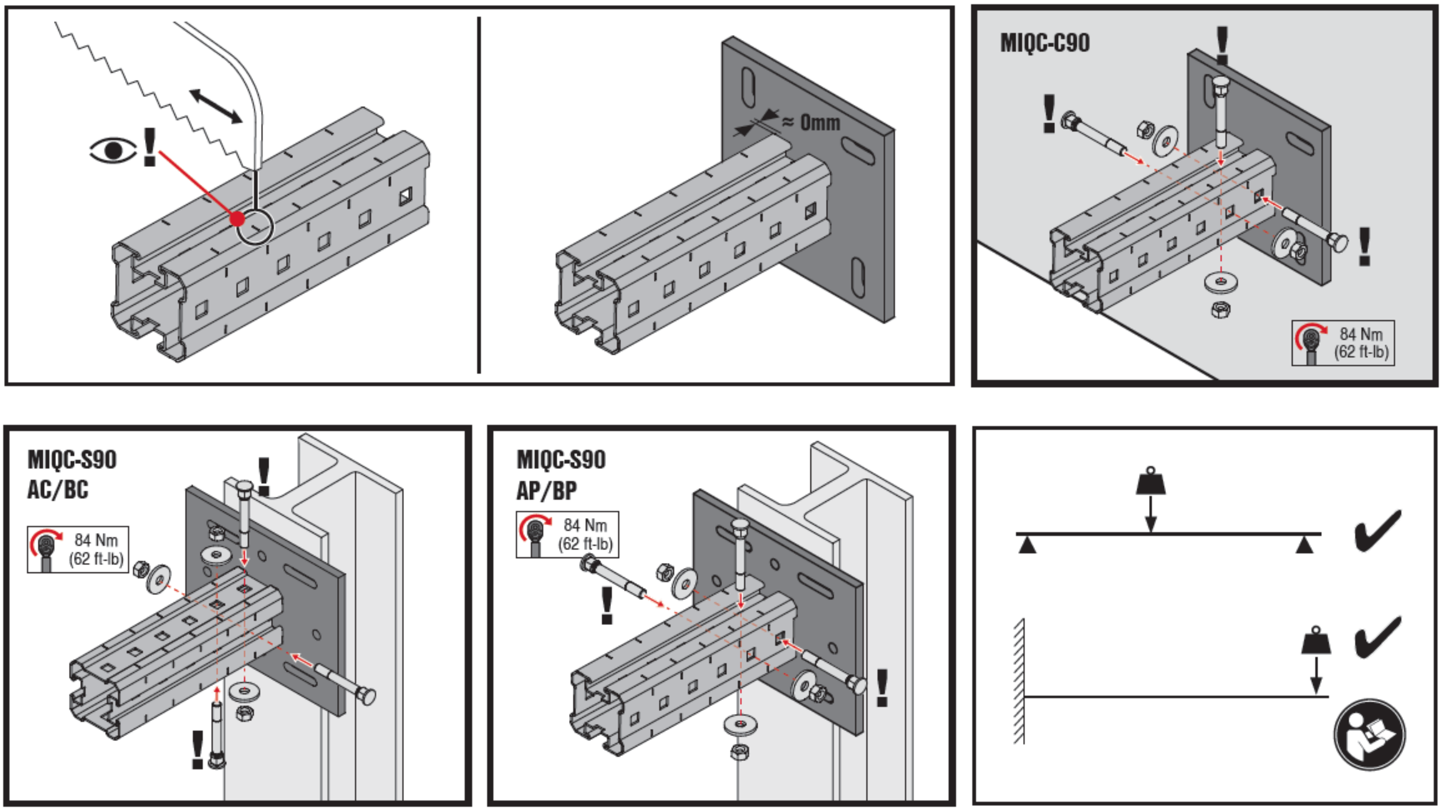
Weight:
4698g connector (4928g incl. accessories)

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

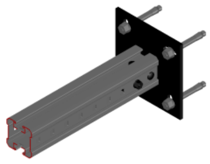
Material properties:

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

Instruction For Use:



MIQC-C90 base material connector

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

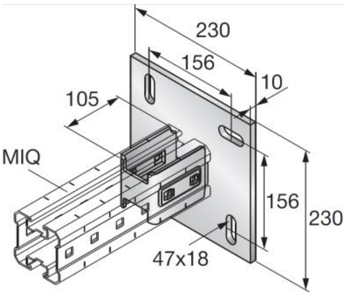
Standards and codes:

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

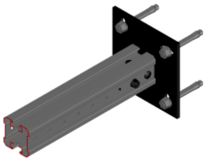
Software:
- Ansys 16.0
- Microsoft Excel

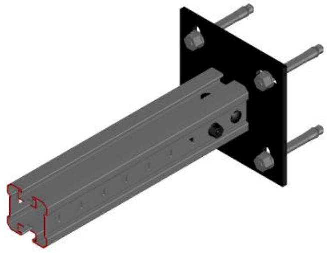
Environmental conditions:
- static loads
- no fatigue loads

Simplified drawing:



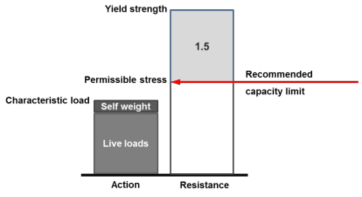
MIQC-C90 base material connector

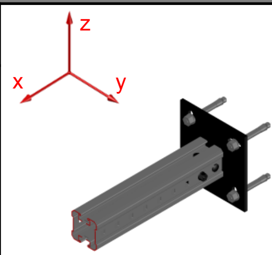
Possible loading cases		
Standard		
		

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

Recommended loading capacity - simplified for most common applications

Method



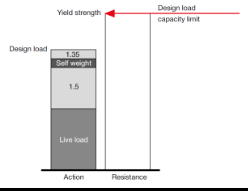


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
24.4	8.8	38.9

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

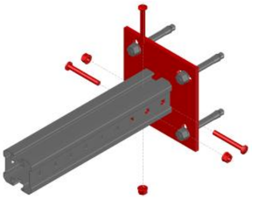
Design loading capacity - 3D

Method

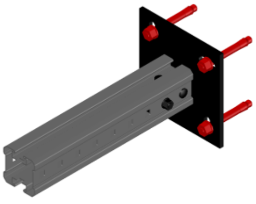


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-C90



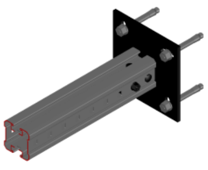
2. Anchors 4x HST M16



MIQC-C90 base material connector

Conditions of the loading capacity tables:

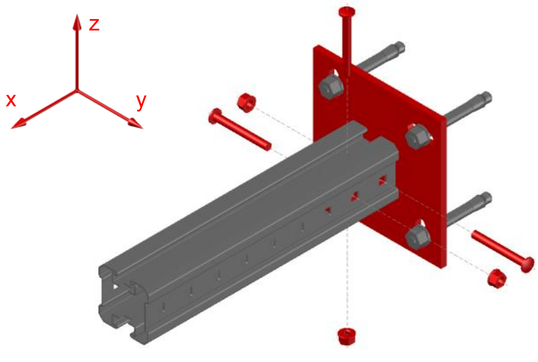
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

Possible loading cases		
Standard		
		

Design loading capacity - 3D 2/2

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

1. Steel connector MIQC-C90 (Including screws MIA-OH90 connecting channel and connector and welds)

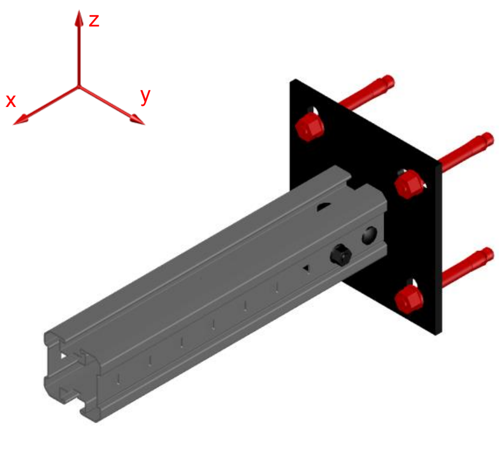


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	13.18	13.18	58.37	58.37
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.55	1.55	1.67	1.67	1.08	1.08

Interaction:

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

2. Anchors 4x HST M16



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

Interaction:

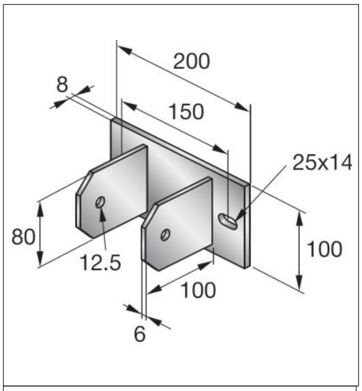
$$\frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} = \beta_V \leq 1$$

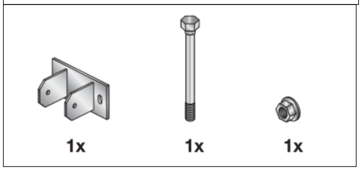
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} = \beta_N \leq 1$$

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

* not decisive

MIC-CU-MA Base Material Connector - Concrete





Designation	Item number
MIC-CU-MA	**304828**

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

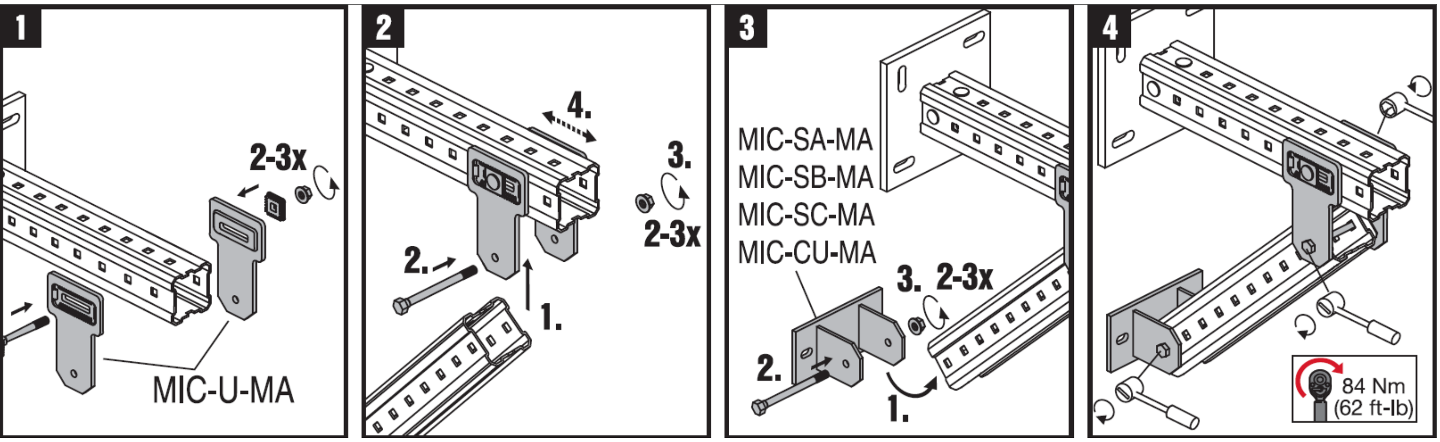
Weight:
2210 g incl. components

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

Material properties:

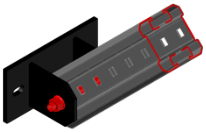
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



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

MIC-CU-MA Base Material Connector - Concrete

Possible loading cases		
Standard		
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

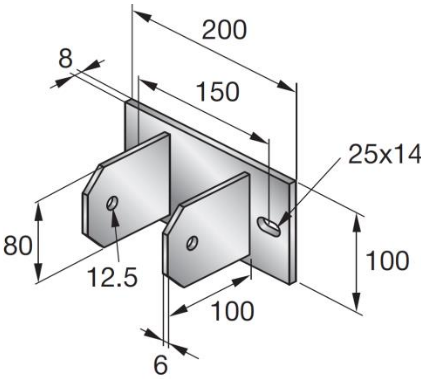
Standards and codes:

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

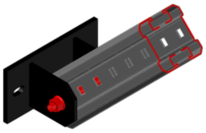
Software:
- Mathcad 15.0
- Microsoft Excel

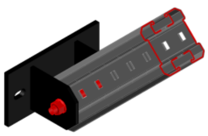
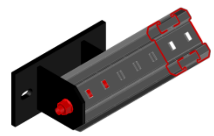
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

Simplified drawing:



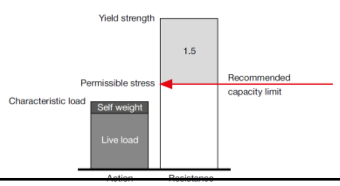
MIC-CU-MA Base Material Connector - Concrete

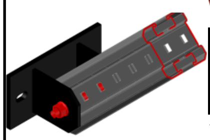
Standard		
		

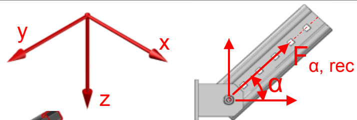
Loading case: Standard	Combinations covered by loading case
BOM: Angle incl. all components **1x MIC-CU-MA 304828** Associated anchors* for cracked concrete **2x HST3 M12x105 30/10 2105718** **HST2 M12x105/10 2107848** *Anchors not incl. in capacity limits 	Baseplate connector used for an angled connection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

Recommended loading capacity - simplified for most common applications

Method







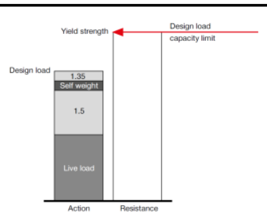
±Fy,rec. [kN]
2.1

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	16.93	8.76	7.64	7.21	7.93

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

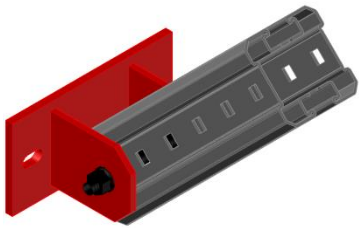
Design loading capacity - 3D 1/3

Method

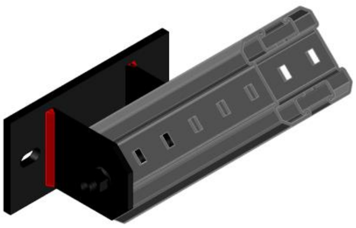


Limiting components of capacity evaluated in following tables:

1. Steel connector



2. Welds

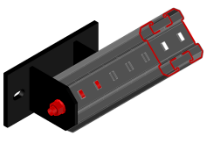


3. bolt in MIQ-girder

MIC-CU-MA Base Material Connector - Concrete

Conditions of the loading capacity tables:

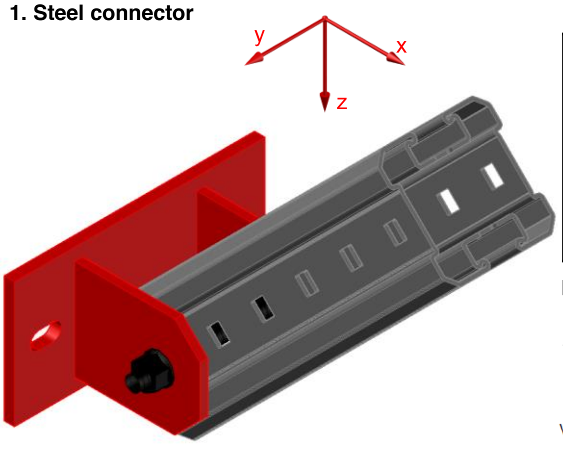
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

Standard		
		

Design loading capacity - 3D 2/3

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

1. Steel connector

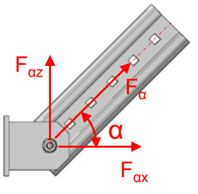


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
25.39	104.01	3.22	3.22	11.90	11.90
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.58	0.58	0.00	0.00	0.00	0.00

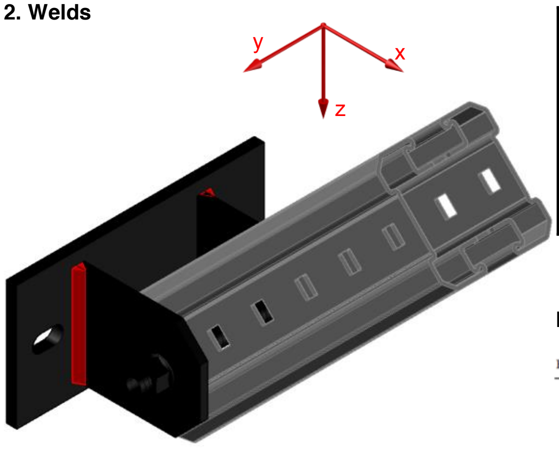
Interaction:

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

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

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

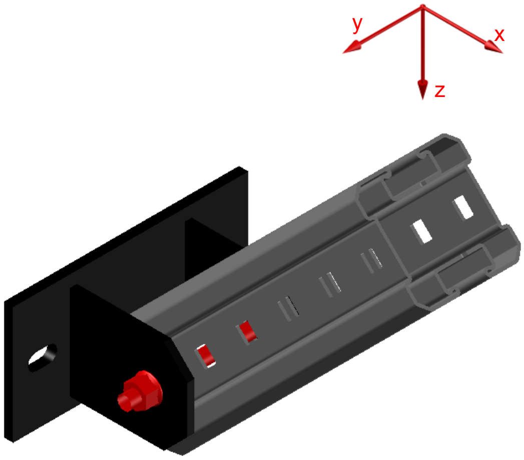
$F_{z.Ed.\alpha}=F_{\alpha}*\sin\alpha$ --> $\mathbf{M_{y.Ed.\alpha}=F_{z.Ed.\alpha}*e_x}$

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

MIC-CU-MA Base Material Connector - Concrete

Design loading capacity - 3D 3/3

3. bolt in MIQ-girder



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

Interaction:

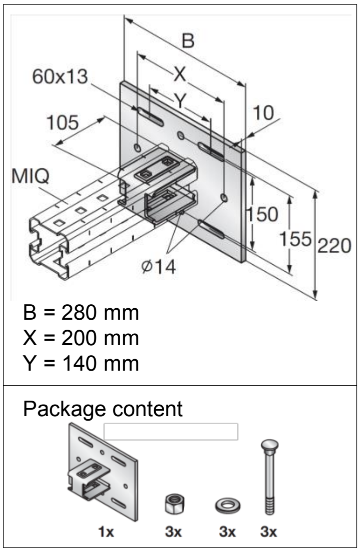
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction between F_x and F_z.
The normal force $F_{\alpha Ed}$ in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

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

MIQC-S90-AC base material connector

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



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

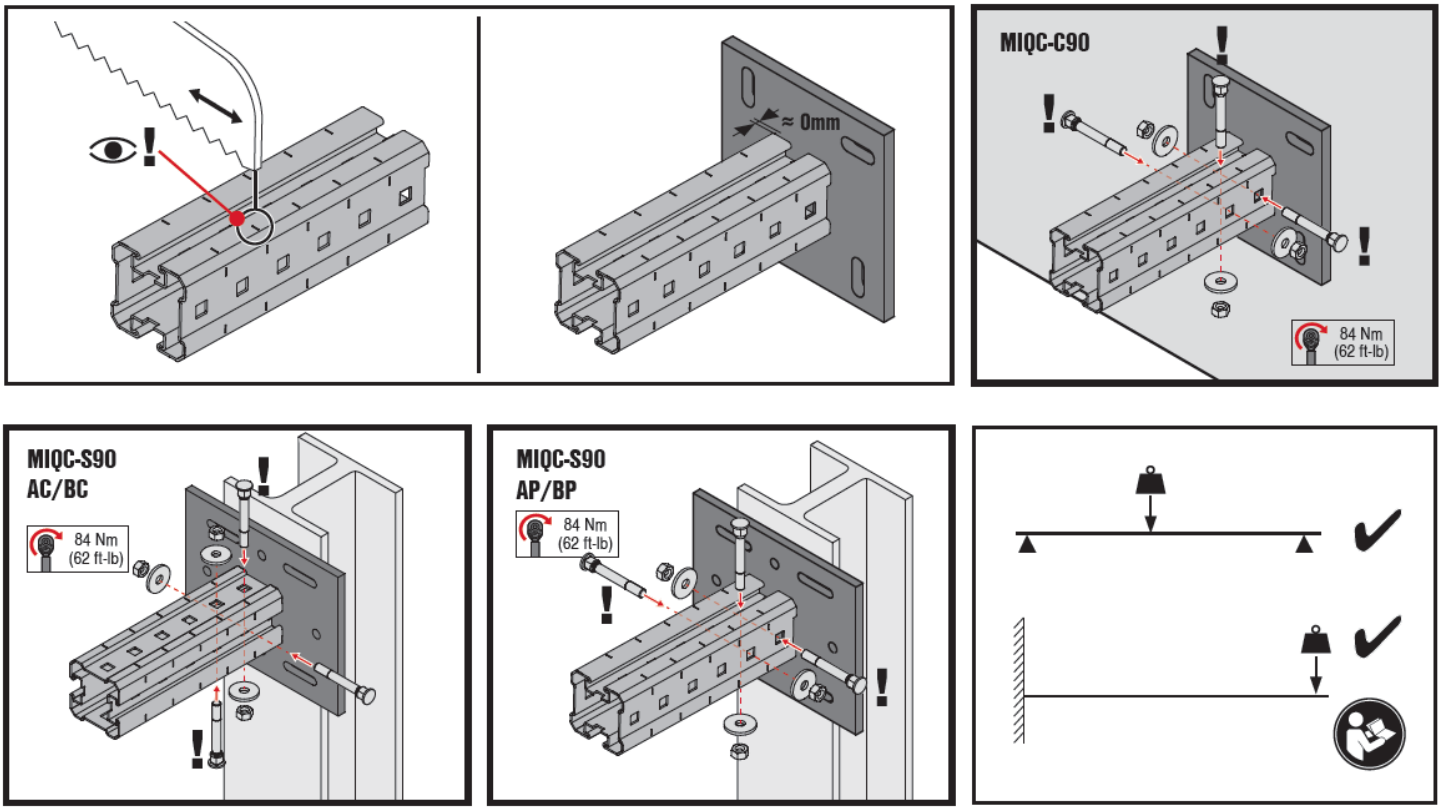
Weight:
5343g connector (5573g incl. accessories)

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

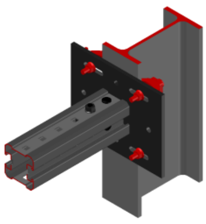
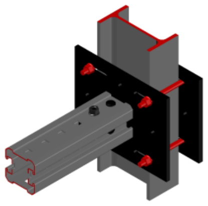
Material properties:

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

Instruction For Use:



MIQC-S90-AC base material connector

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

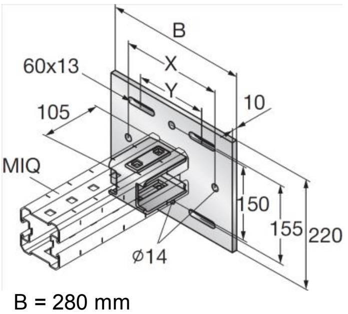
Standards and codes:

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

Software:
- Ansys 16.0
- Microsoft Excel

Environmental conditions:
- static loads
- no fatigue loads

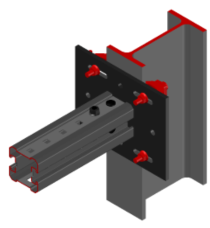
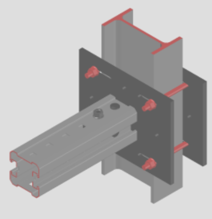
Simplified drawing:

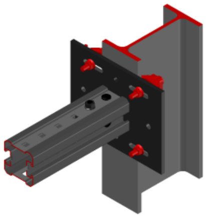


B = 280 mm
X = 200 mm
Y = 140 mm

MIQC-S90-AC base material connector

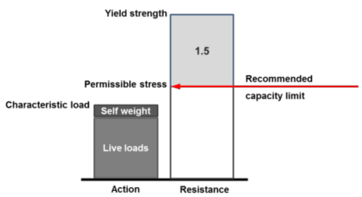
Possible loading cases

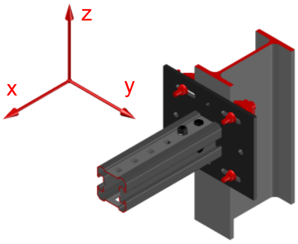
Clamped	Boxed	
		

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

Recommended loading capacity - simplified for most common applications

Method



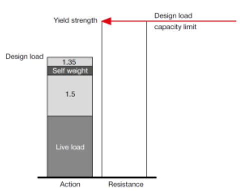


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
23.2	6.0	6.0

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

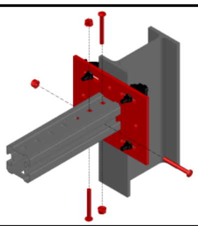
Design loading capacity - 3D 1/2

Method

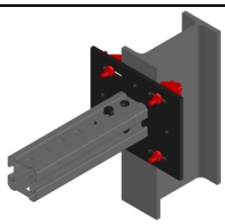


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-AC



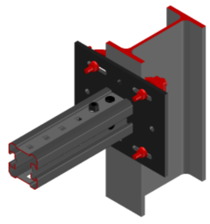
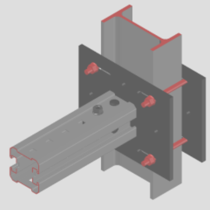
2. Beam clamps 4x MI-SGC M12



MIQC-S90-AC base material connector

Conditions of the loading capacity tables:

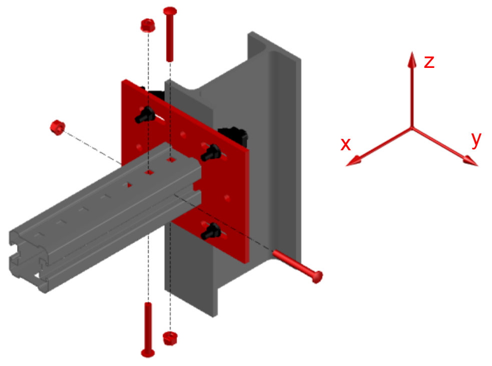
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

Possible loading cases		
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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

1. Steel connector MIQC-S90-AC (Including screws MIA-OH90 connecting channel and connector and welds)

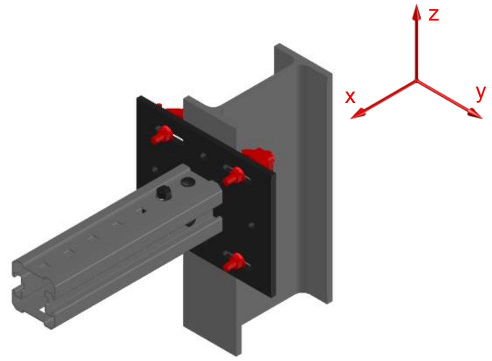


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	57.03	57.03	13.18	13.18
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	0.84	0.84	0.70	0.70

Interaction:

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

2. Clamps 4x MI-SGC M12



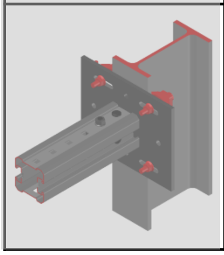
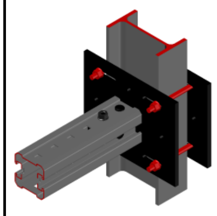
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	*	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.81	0.81	2.09	2.09	1.39	1.39

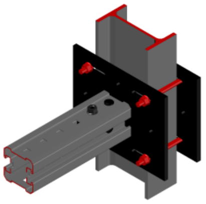
Interaction:

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

* not decisive

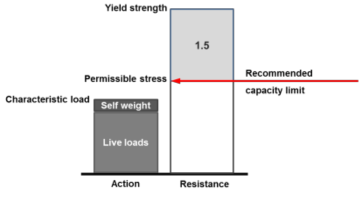
MIQC-S90-AC base material connector

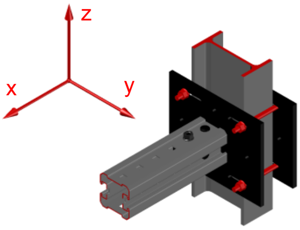
Possible loading cases		
Clamped	Boxed	
		

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

Recommended loading capacity - simplified for most common applications

Method





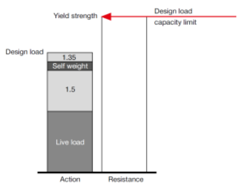
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
24.00	5.0	5.0

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

Design loading capacity - 3D

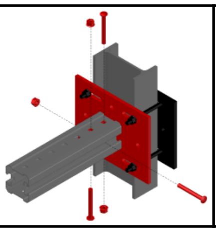
1/2

Method

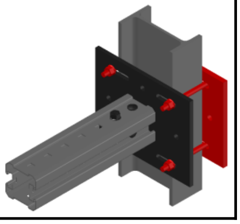


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-AC

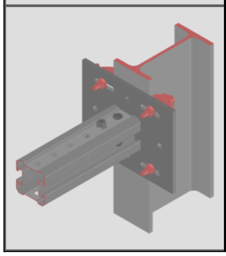
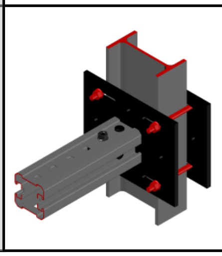


2. Threated rods M12 / 8.8 in connection with MIQB-SA plate



MIQC-S90-AC base material connector

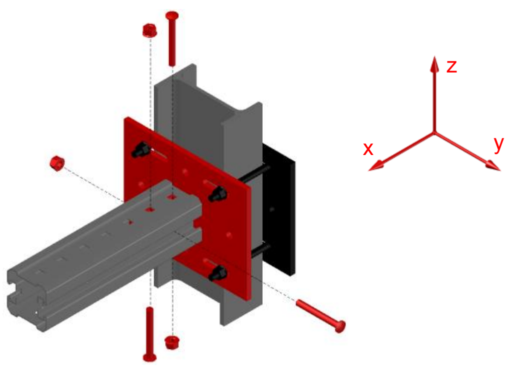
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

Possible loading cases		
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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

1. Steel connector MIQC-S90-AC (Including screws MIA-OH90 connecting channel and connector and welds)

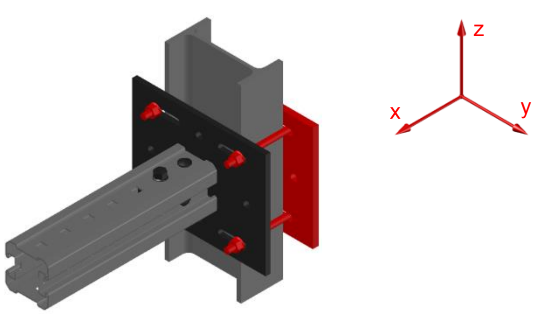


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	57.03	57.03	13.18	13.18
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	0.84	0.84	0.70	0.70

Interaction:

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

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



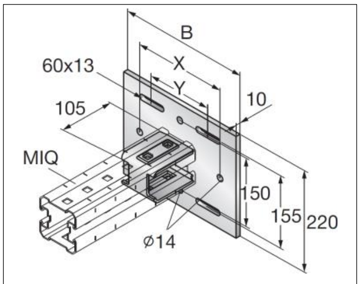
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	35.97	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.67	0.67	11.65	11.65	7.77	7.77

Interaction:

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

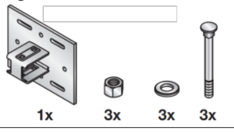
MIQC-S90-BC base material connector

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



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

Package content



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

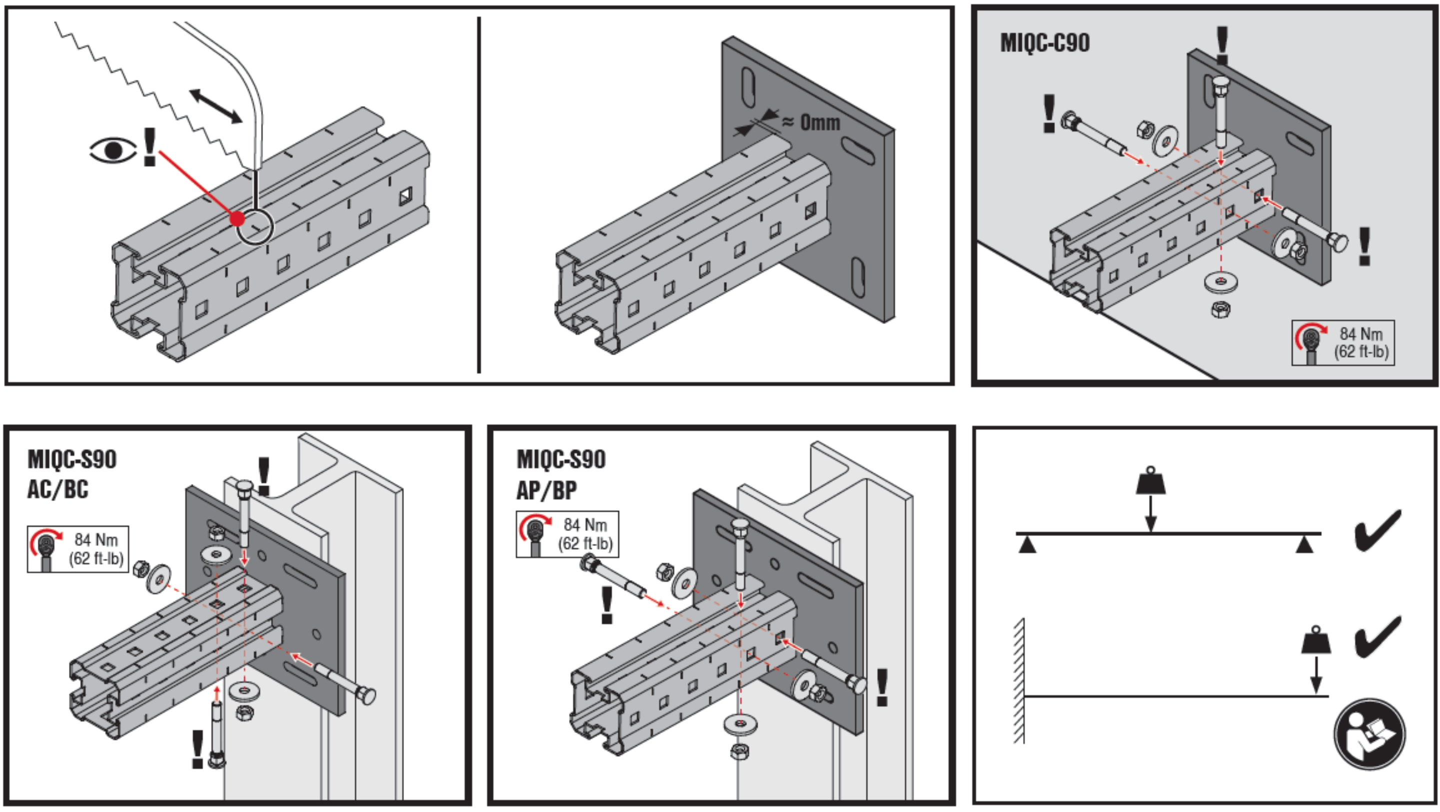
Weight:
6552g connector (6782g incl. accessories)

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

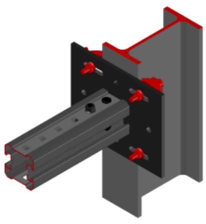
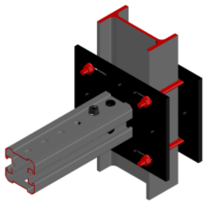
Material properties:

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

Instruction For Use:



MIQC-S90-BC base material connector

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

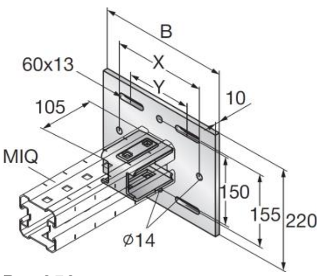
Standards and codes:

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

Software:
- Ansys 16.0
- Microsoft Excel

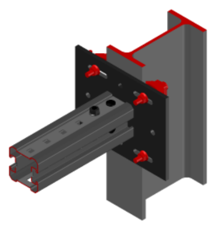
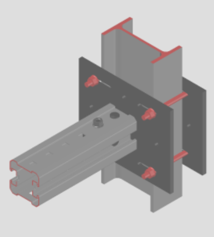
Environmental conditions:
- static loads
- no fatigue loads

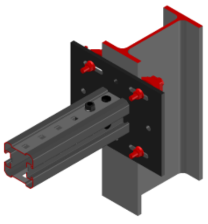
Simplified drawing:



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

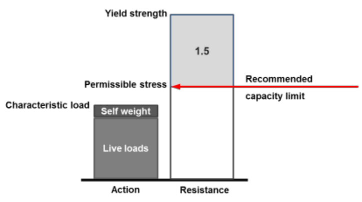
MIQC-S90-BC base material connector

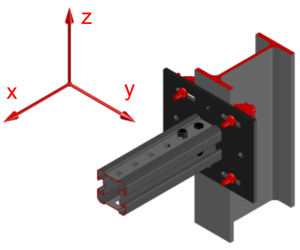
Possible loading cases		
Clamped	Boxed	
		

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

Recommended loading capacity - simplified for most common applications

Method



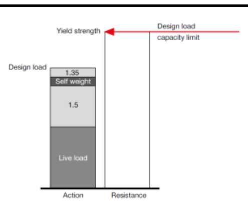


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.3	6.0	6.0

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

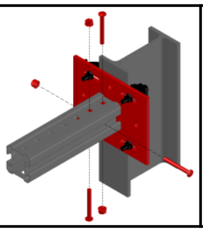
Design loading capacity - 3D 1/2

Method

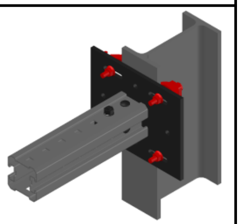


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-BC



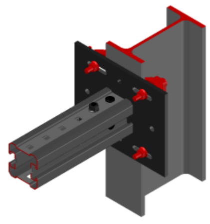
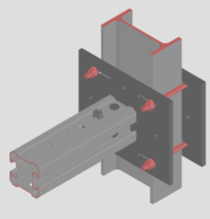
2. Beam clamps 4x MI-SGC M12



MIQC-S90-BC base material connector

Conditions of the loading capacity tables:

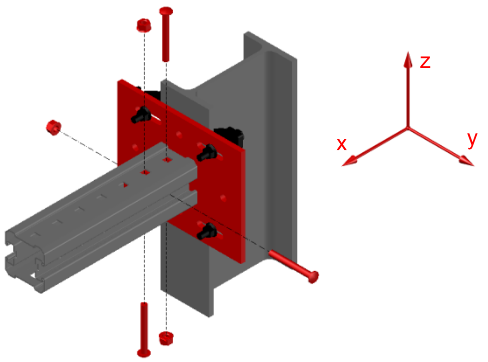
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Possible loading cases		
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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

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

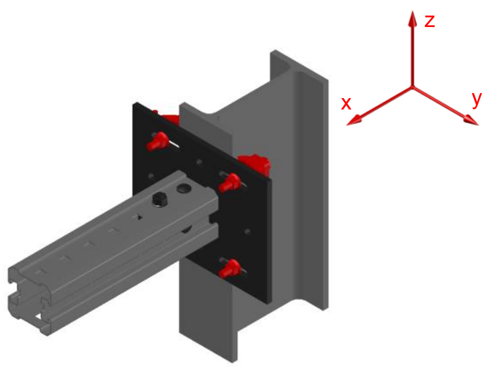


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.00	36.40	46.95	46.95	13.18	13.18
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	0.84	0.84	0.70	0.70

Interaction:

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

2. Clamps 4x MI-SGC M12



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

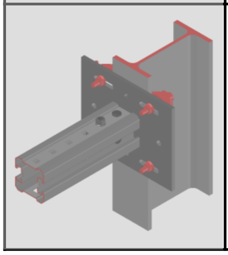
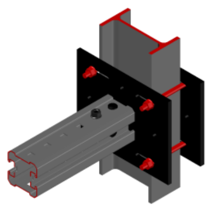
Interaction:

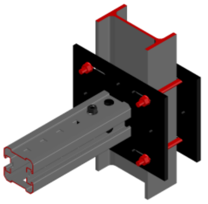
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

* not decisive

MIQC-S90-BC base material connector

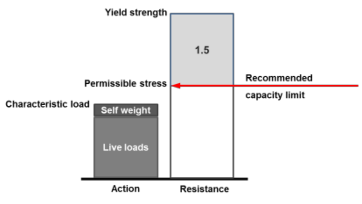
Possible loading cases

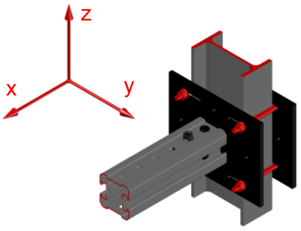
Clamped	Boxed	
		

Loading case: Boxed	Combinations covered by loading case
BOM: Base material connector incl. all connectivity material **1x MIQC-S90-BC** **2120272** Back (base) plate **1x MIQB-SB** **2123566** Threaded rods **4x AM12x1000 8.8 HDG…m** **419103** Self-locking nut **8x M12-F-SL WS3/4** **382897**	Connector used for fixing MIQ girder, perpendicularly to flange (width of 165-235mm) of structural steel open section, perpendicularly to structural steel beam 

Recommended loading capacity - simplified for most common applications

Method





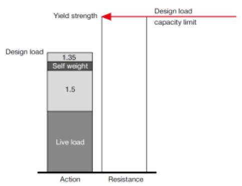
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.3	5.0	5.0

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

Design loading capacity - 3D

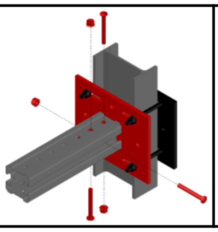
1/2

Method

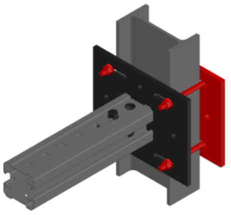


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-BC



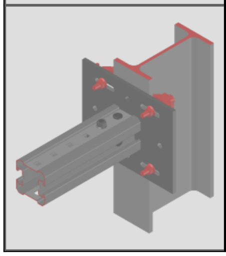
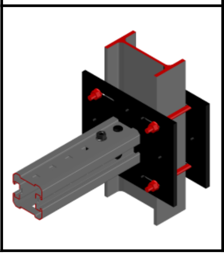
2. Threaded rods M12 / 8.8 in connection with MIQB-SB plate



MIQC-S90-BC base material connector

Conditions of the loading capacity tables:

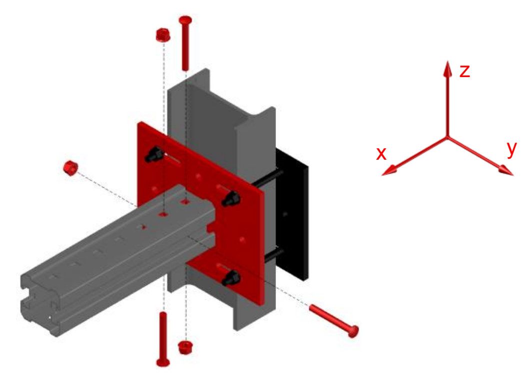
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Possible loading cases		
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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

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

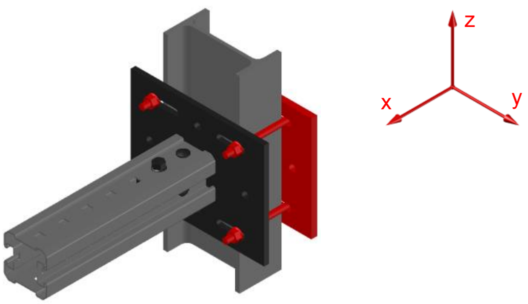


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.00	36.40	46.95	46.95	13.18	13.18
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	0.84	0.84	0.70	0.70

Interaction:

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

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



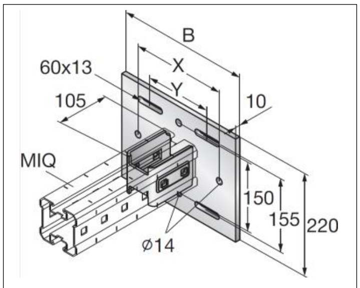
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	34.23	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.87	0.87	11.65	11.65	11.65	11.65

Interaction:

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

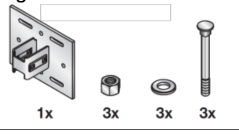
MIQC-S90-AP base material connector

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



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

Package content



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

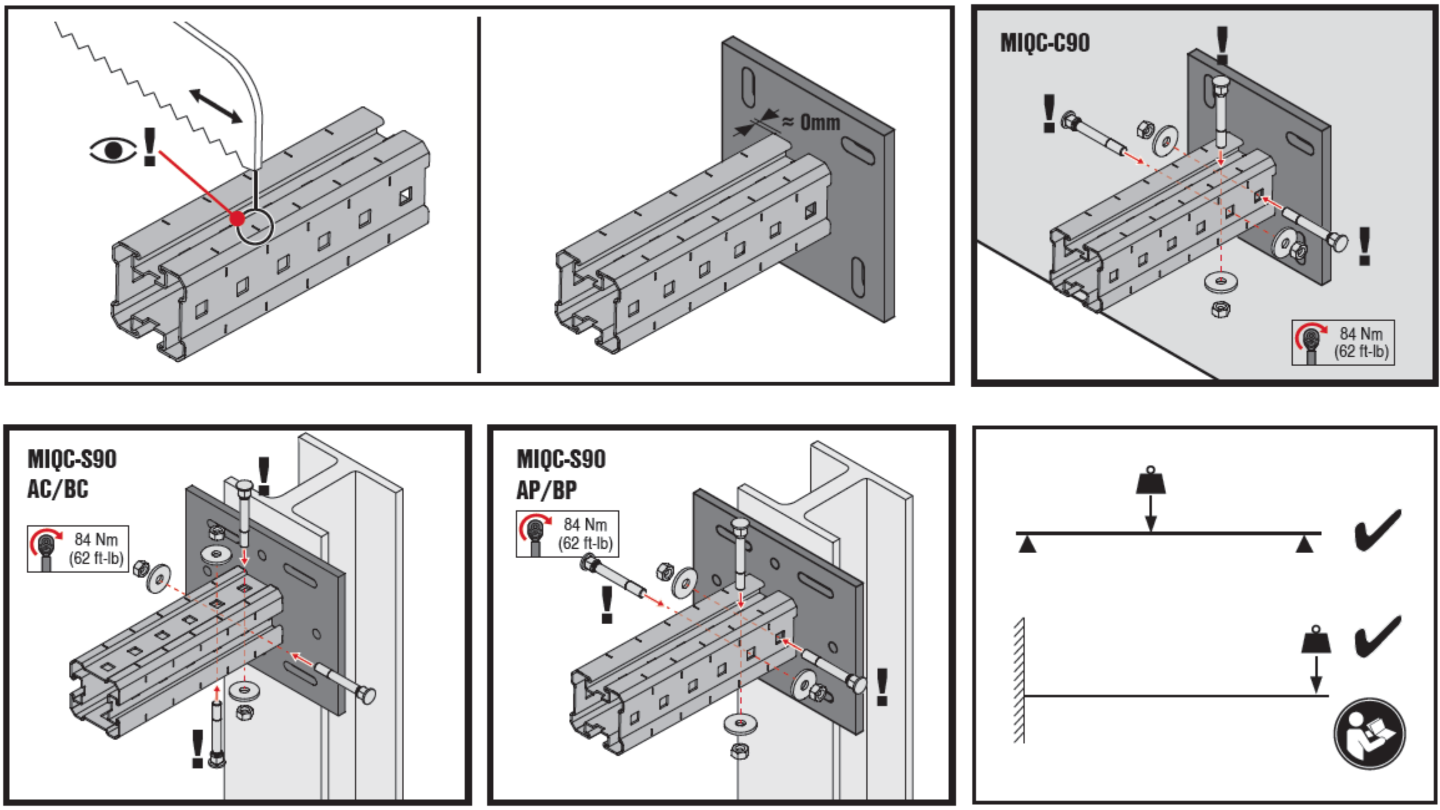
Weight:
5343g connector (5699g incl. accessories)

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

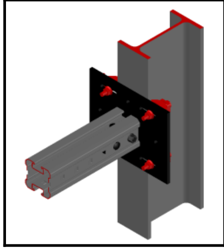
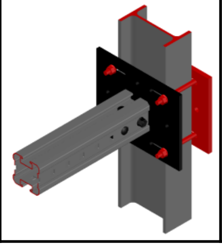
Material properties:

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

Instruction For Use:



MIQC-S90-AP base material connector

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

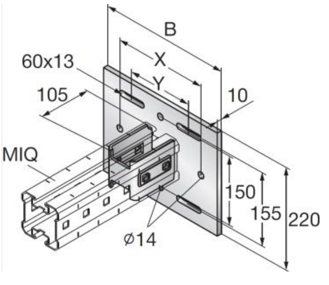
Standards and codes:

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

Software:
- Ansys 16.0
- Microsoft Excel

Environmental conditions:
- static loads
- no fatigue loads

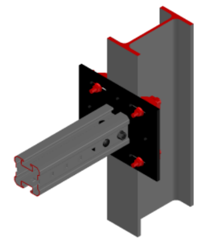
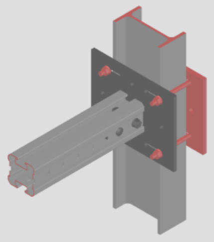
Simplified drawing:

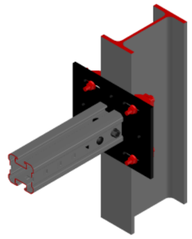


B = 280 mm
X = 200 mm
Y = 140 mm

MIQC-S90-AP base material connector

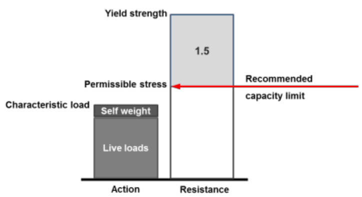
Possible loading cases

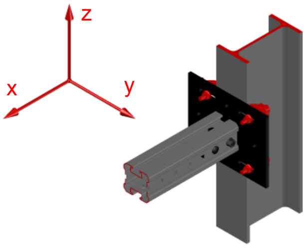
Clamped	Boxed	
		

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

Recommended loading capacity - simplified for most common applications

Method



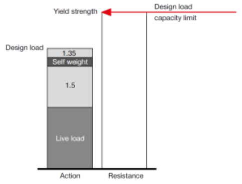


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
23.2	6.0	6.0

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

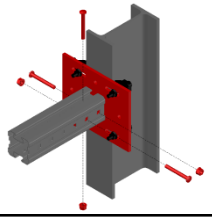
Design loading capacity - 3D 1/2

Method

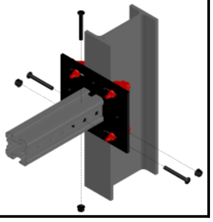


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-AP



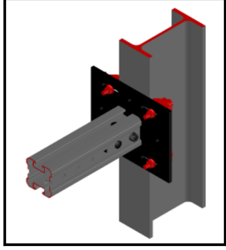
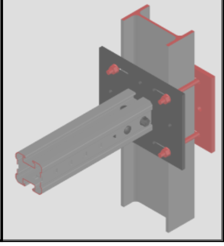
2. Beam clamps 4x MI-SGC M12



MIQC-S90-AP base material connector

Conditions of the loading capacity tables:

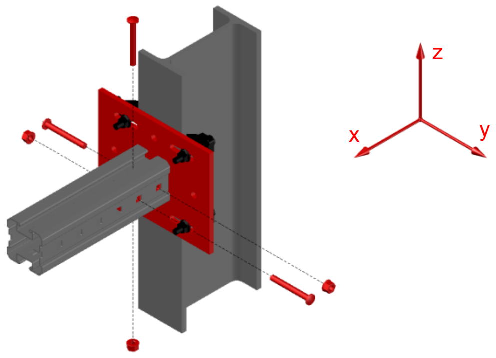
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Possible loading cases		
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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

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

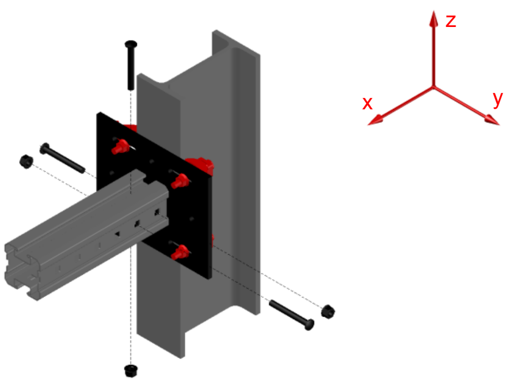


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	13.18	13.18	57.03	57.03
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	2.21	2.21	0.84	0.84

Interaction:

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

2. Clamps 4x MI-SGC M12



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

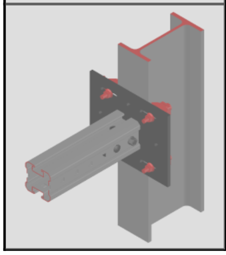
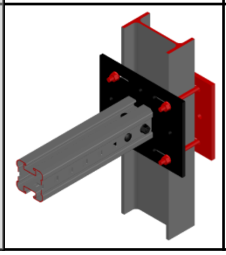
Interaction:

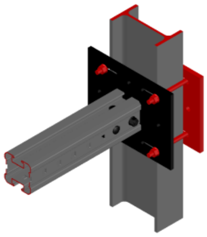
$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

* not decisive

MIQC-S90-AP base material connector

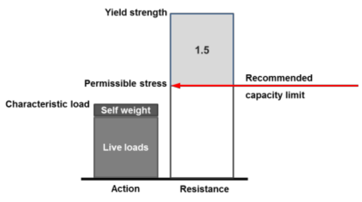
Possible loading cases

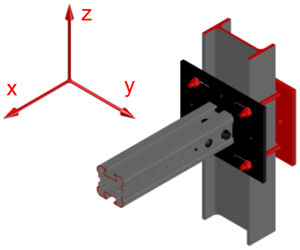
Clamped	Boxed	
		

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

Recommended loading capacity - simplified for most common applications

Method



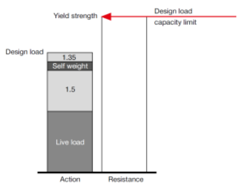


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
24.00	5.0	5.0

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

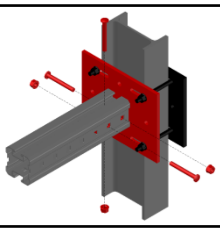
Design loading capacity - 3D 1/2

Method

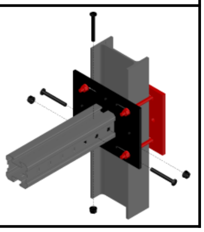


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-AP



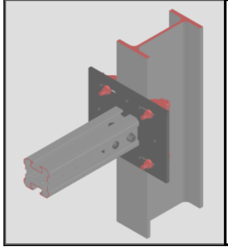
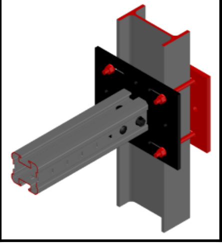
2. Threaded rods M12 / 8.8 in connection with MIQB-SA plate



MIQC-S90-AP base material connector

Conditions of the loading capacity tables:

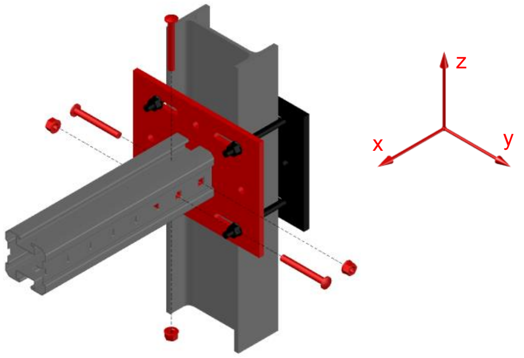
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Possible loading cases		
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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

1. Steel connector MIQC-S90-AP (Including screws MIA-OH90 connecting channel and connector and welds)

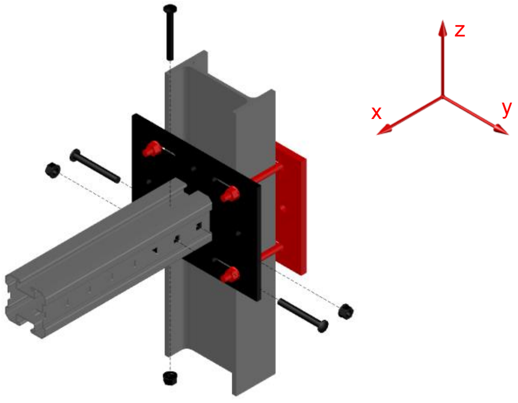


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
36.64	36.64	13.18	13.18	57.03	57.03
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
1.37	1.37	2.21	2.21	0.84	0.84

Interaction:

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

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



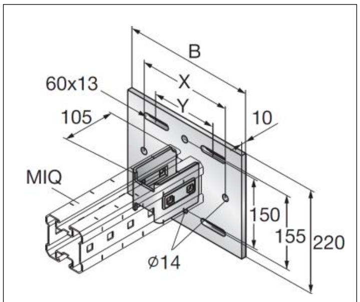
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	35.97	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.67	0.67	11.65	11.65	7.77	7.77

Interaction:

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

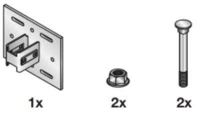
MIQC-S90-BP base material connector

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



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

Package content



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

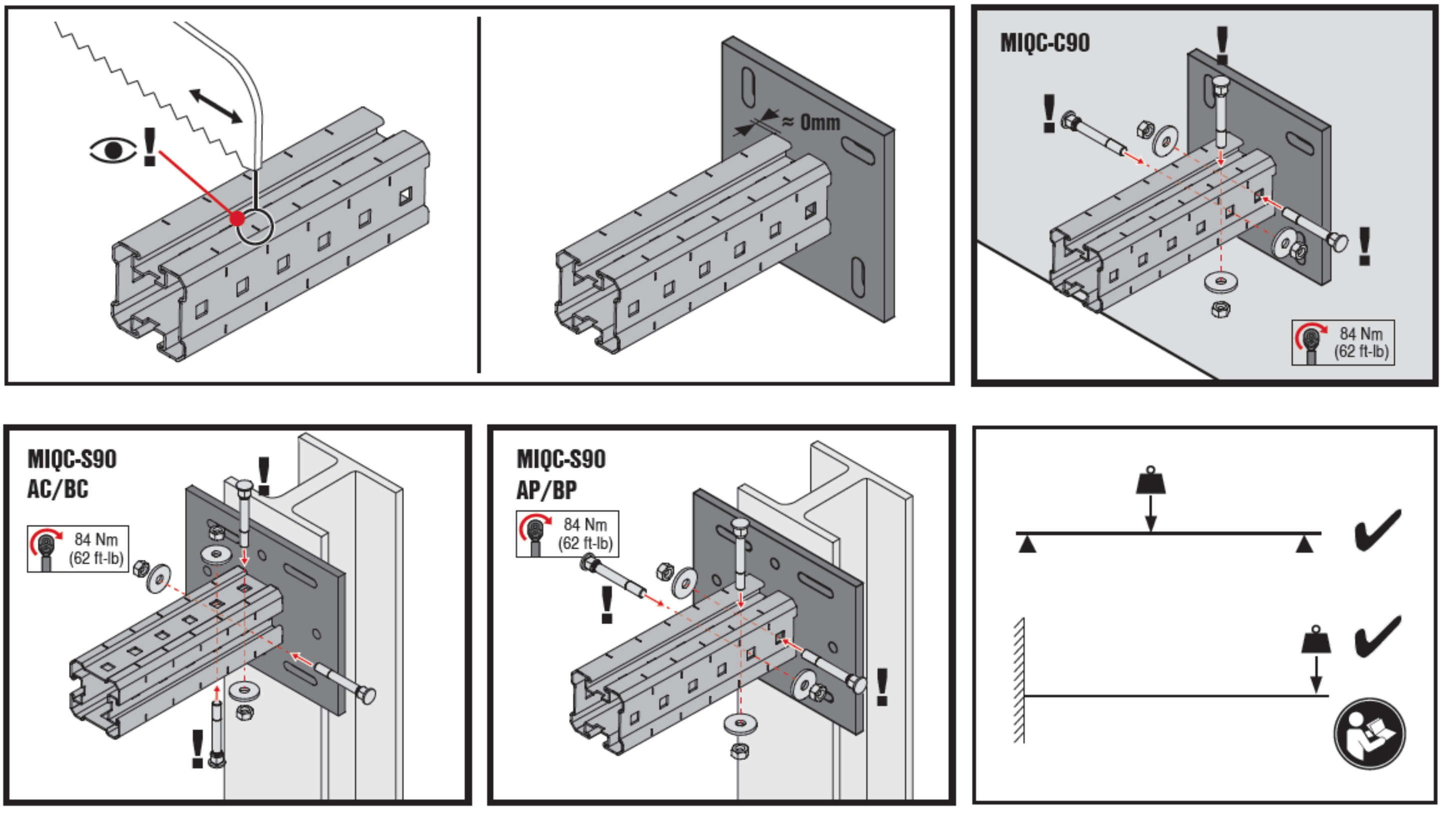
Weight:
6552g connector (6782g incl. accessories)

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

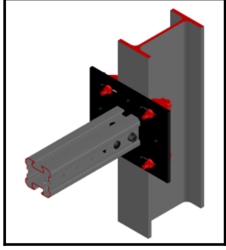
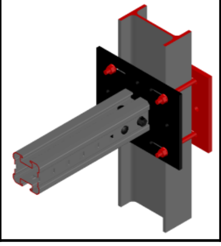
Material properties:

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

Instruction For Use:



MIQC-S90-BP base material connector

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Hardware tests

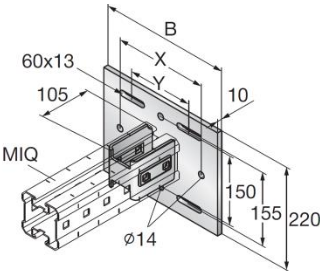
Standards and codes:

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

Software:
- Ansys 16.0
- Microsoft Excel

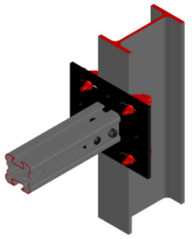
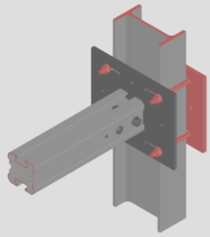
Environmental conditions:
- static loads
- no fatigue loads

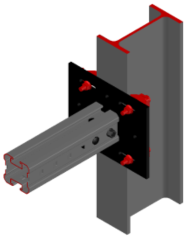
Simplified drawing:



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

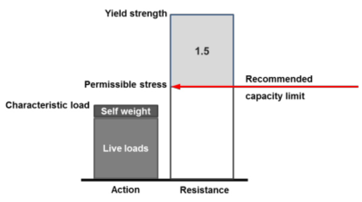
MIQC-S90-BP base material connector

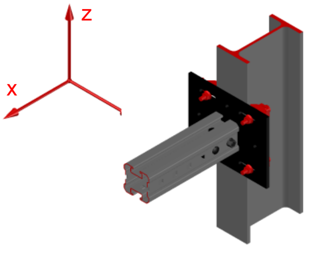
Possible loading cases		
Clamped	Boxed	
		

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

Recommended loading capacity - simplified for most common applications

Method



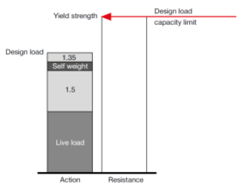


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.30	6.00	6.00

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

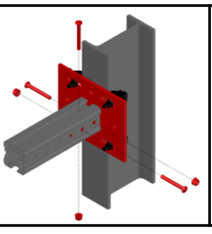
Design loading capacity - 3D 1/2

Method

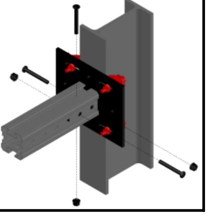


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-BP



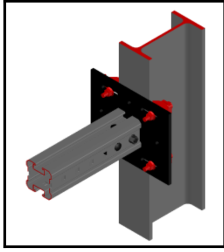
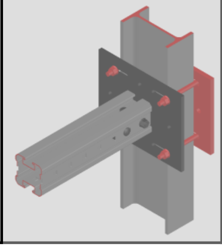
2. Beam clamps 4x MI-SGC M12



MIQC-S90-BP base material connector

Conditions of the loading capacity tables:

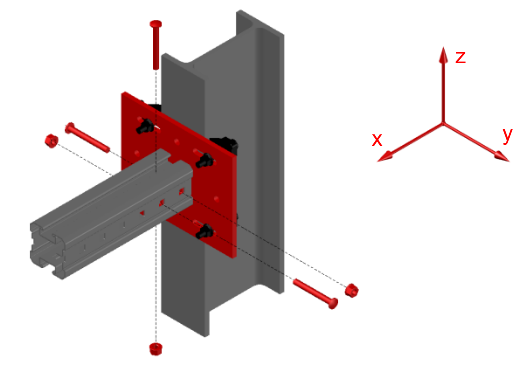
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Possible loading cases		
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

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

1. Steel connector MIQC-S90-BP (Including screws MIA-OH90 connecting channel and connector and welds)

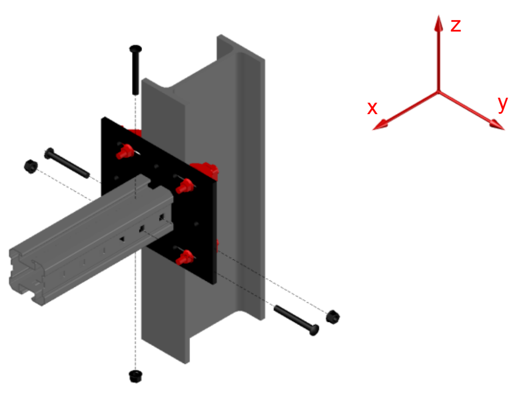


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.00	36.64	13.18	13.18	46.95	46.95
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.37	1.37	2.21	2.21	0.84	0.84

Interaction:

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

2. Clamps 4x MI-SGC M12



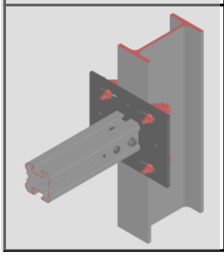
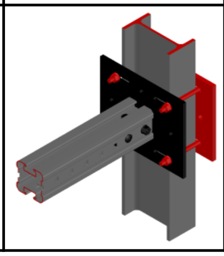
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.80	*	9.00	9.00	9.00	9.00
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.06	1.06	2.09	2.09	2.09	2.09

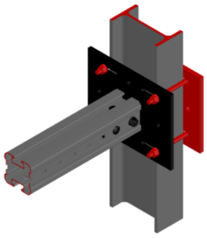
Interaction:

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

* not decisive

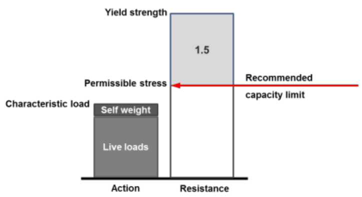
MIQC-S90-BP base material connector

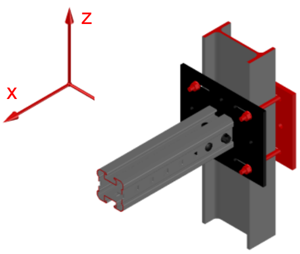
Possible loading cases		
Clamped	Boxed	
		

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

Recommended loading capacity - simplified for most common applications

Method



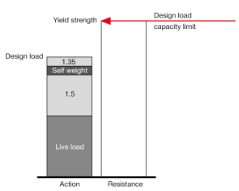


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
17.3	5.0	5.0

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

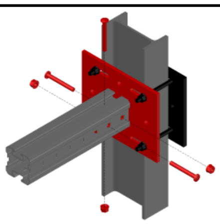
Design loading capacity - 3D 1/2

Method

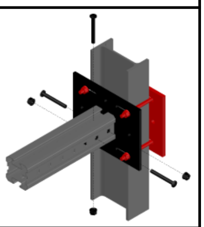


Limiting components of capacity evaluated in following tables:

1. Steel connector MIQC-S90-BP



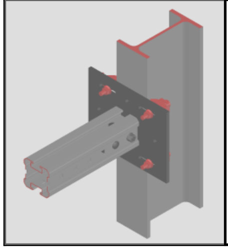
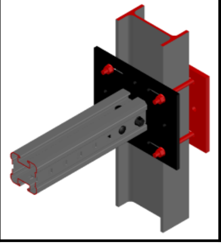
2. Threaded rods M12 / 8.8 in connection with MIQB-SB plate



MIQC-S90-BP base material connector

Conditions of the loading capacity tables:

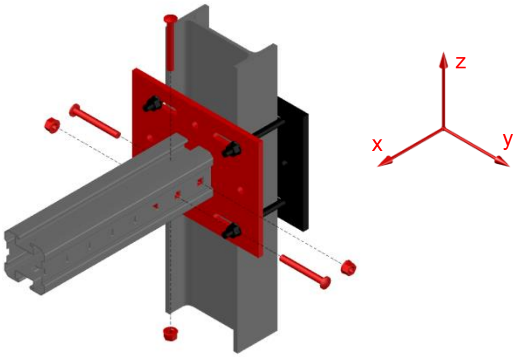
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

Possible loading cases		
Clamped	Boxed	
		

Design loading capacity - 3D 2/2

Summary of design loads*
NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

1. Steel connector MIQC-S90-BP (Including screws MIA-OH90 connecting channel and connector and welds)

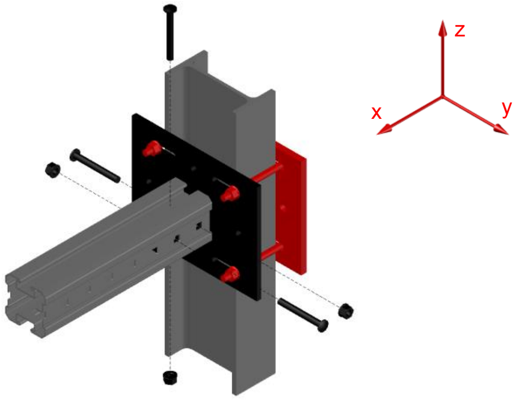


+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
26.00	36.64	13.18	13.18	46.95	46.95
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.37	1.37	2.21	2.21	0.84	0.84

Interaction:

$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

2. Threated rods M12 / 8.8 in connection with MIQB-SB plate



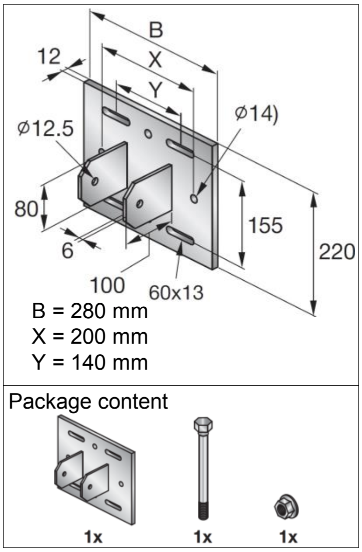
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
194.23	34.23	7.42	7.42	7.42	7.42
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.87	0.87	11.65	11.65	11.65	11.65

Interaction:

$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-SA-MA Base Material Connector - Steel

Designation	Item number
MIC-SA-MA	**304815**



Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

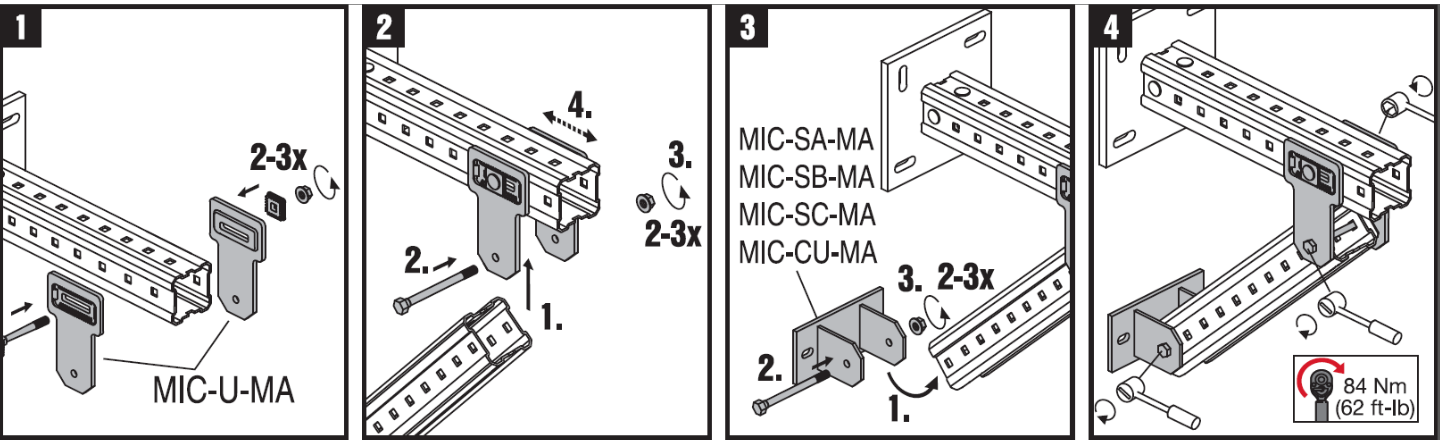
Weight:
6290 g incl. components

Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MIQ-90 girder to a steel beam in an angle, usually when it's used as a brace for another girder. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using one bolt through a hole, which enables various angles.

Material properties:

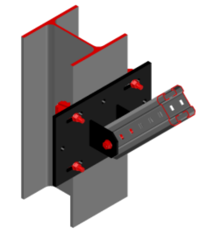
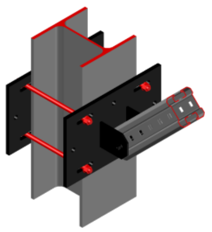
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



The same assembly principles and torque moments should be applied for MIQ girders

MIC-SA-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

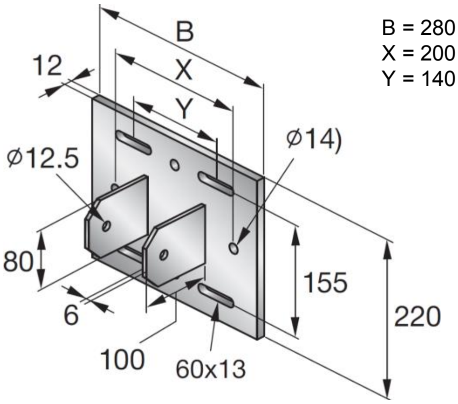
Methodology:
- Analytic calculation

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

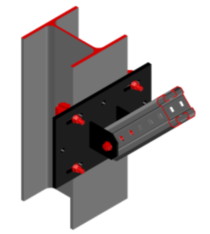
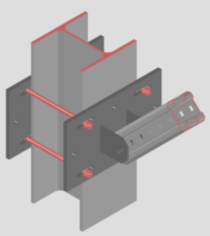
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

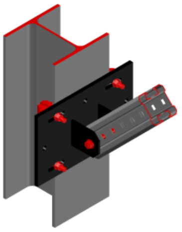
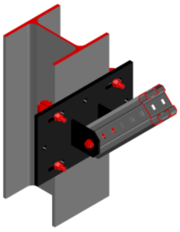
Simplified drawing:



B = 280 mm
X = 200 mm
Y = 140 mm

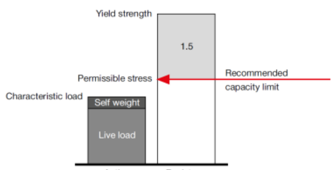
MIC-SA-MA Base Material Connector - Steel

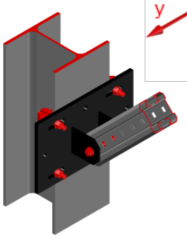
Clamped	Boxed	
		

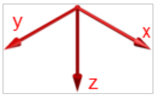
Loading case: Clamped	Combinations covered by loading case
BOM: Connector incl. all associated components **MIC-SA-MA** **304815** Beam clamps **4x MI-SGC M12** **233859** 	Connector used for an angled connection of MIQ-90 to structural steel profiles (bracing). For flange width 75-165mm. 

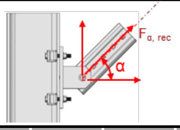
Recommended loading capacity - simplified for most common applications

Method









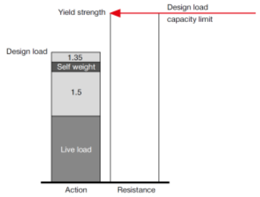
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	18.30	6.92	5.49	4.82	4.66

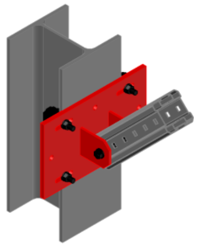
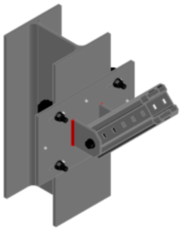
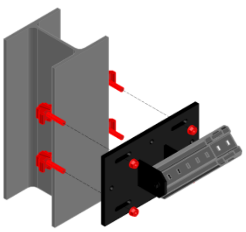
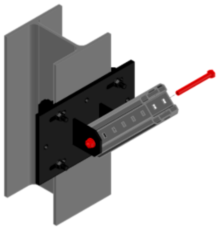
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method

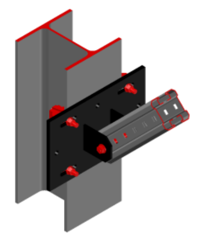
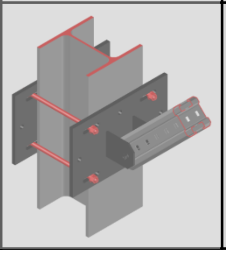


Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Beam clamps	4. Hexagonal bolt in MIQ-girder
			

MIC-SA-MA Base Material Connector - Steel

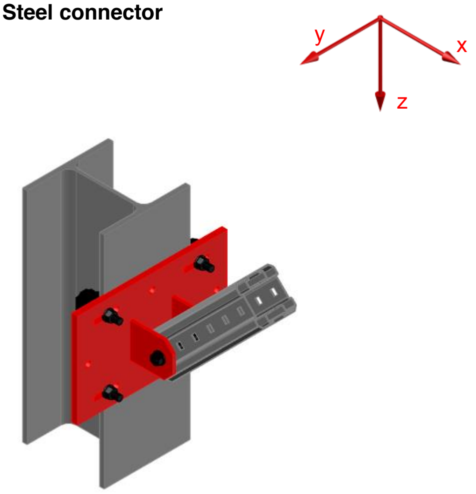
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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.

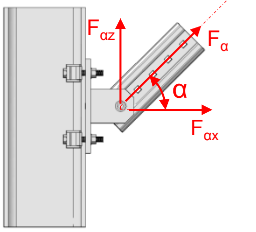
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
58.60	73.93	3.22	3.22	37.13	37.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.81	1.81	2.60	2.60	0.23	0.23

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



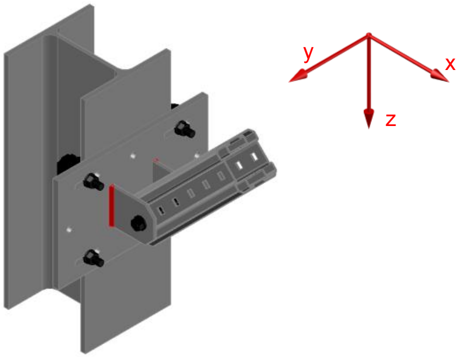
$F_{x.Ed.\alpha} = F_{\alpha} * \cos\alpha$

$F_{z.Ed.\alpha} = F_{\alpha} * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

2. Welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
274.92	274.92	224.47	224.47	224.47	224.47
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
10.89	10.89	3.09	3.09	13.33	13.33

Interaction:

with: e_x= 0.07m

$F_{x.Ed.\alpha} = F_{\alpha} * \cos\alpha$

$F_{z.Ed.\alpha} = F_{\alpha} * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

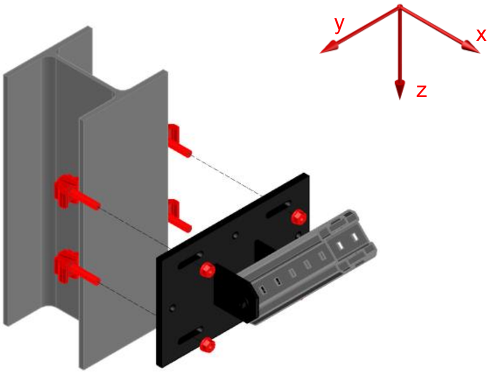
$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-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: $e_x = 0.07m$

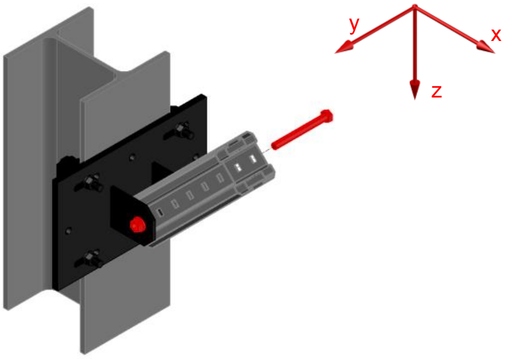
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

4. Hexagonal bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

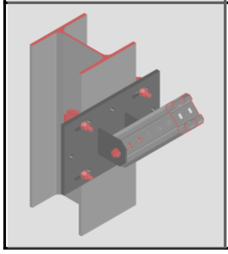
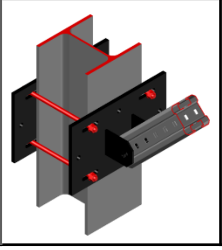
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

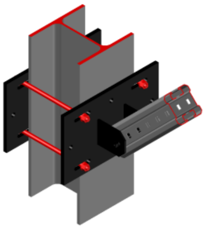
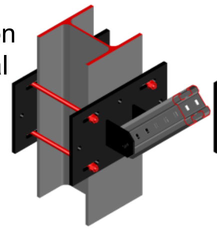
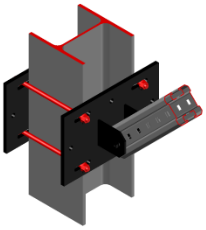
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

The normal force F_α in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

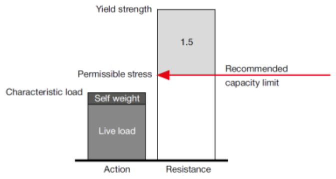
MIC-SA-MA Base Material Connector - Steel

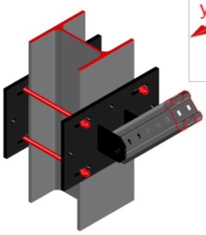
Clamped	Boxed	
		

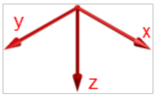
Loading case: Boxed	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-SA-MA 304815** **Base plate** **1x MIB-SA 304821** **Threaded rods cut to particular length** **4x AM12x1000 8.8 HDG…m 419103** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 75-165mm. 

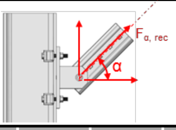
Recommended loading capacity - simplified for most common applications

Method









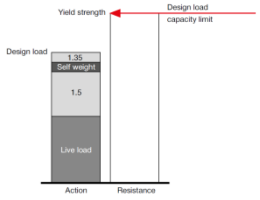
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	18.30	7.77	5.95	5.10	4.74

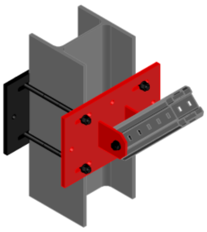
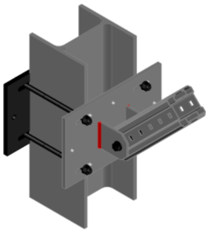
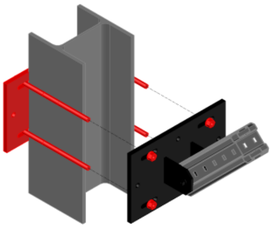
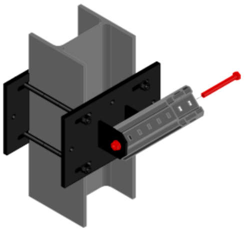
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



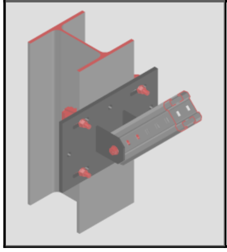
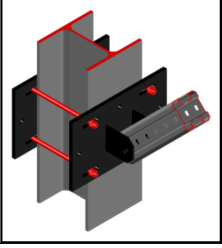
Limiting components of capacity evaluated in following tables:

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:

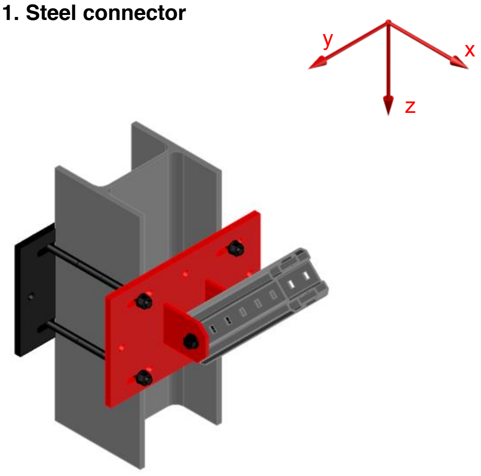
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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.

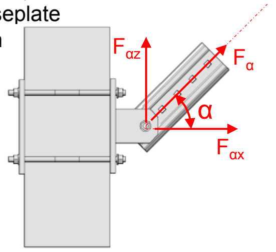
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
58.60	73.93	3.22	3.22	37.13	37.13
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.81	1.81	2.60	2.60	0.23	0.23

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



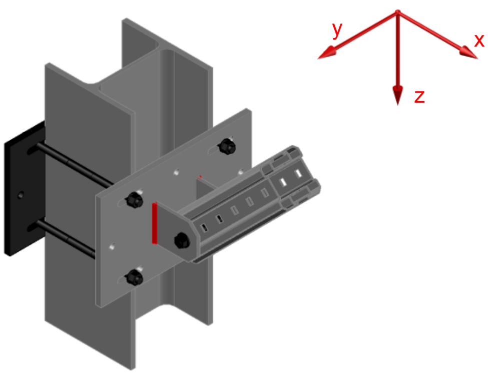
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \le 1$$

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**

$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

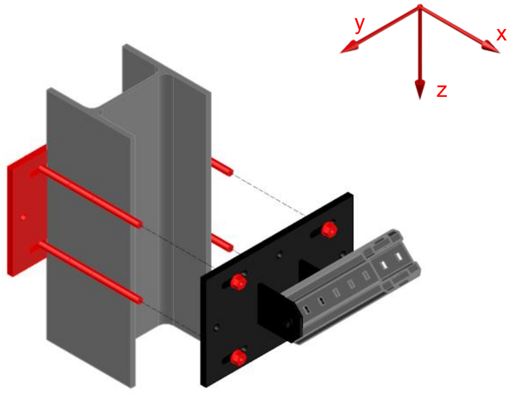
$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \le 1$$

MIC-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

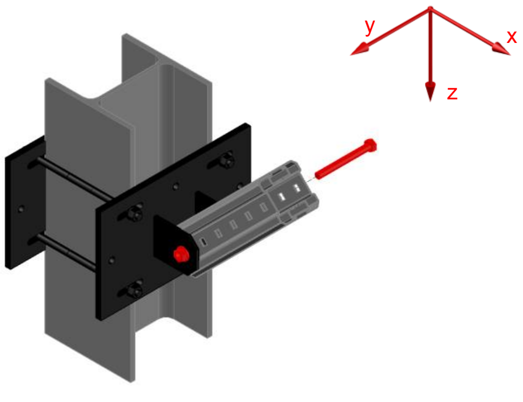
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha$ -> $M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \le 1$$

4. Hexagonal bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

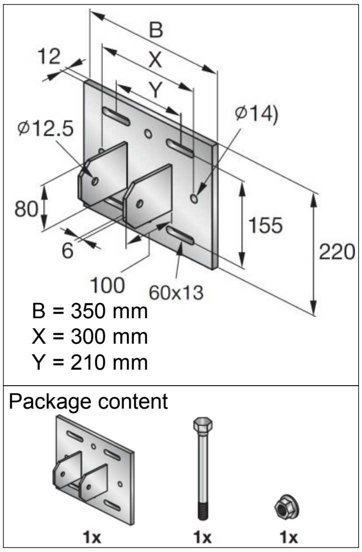
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.
The normal force F_α in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \le 1$$

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

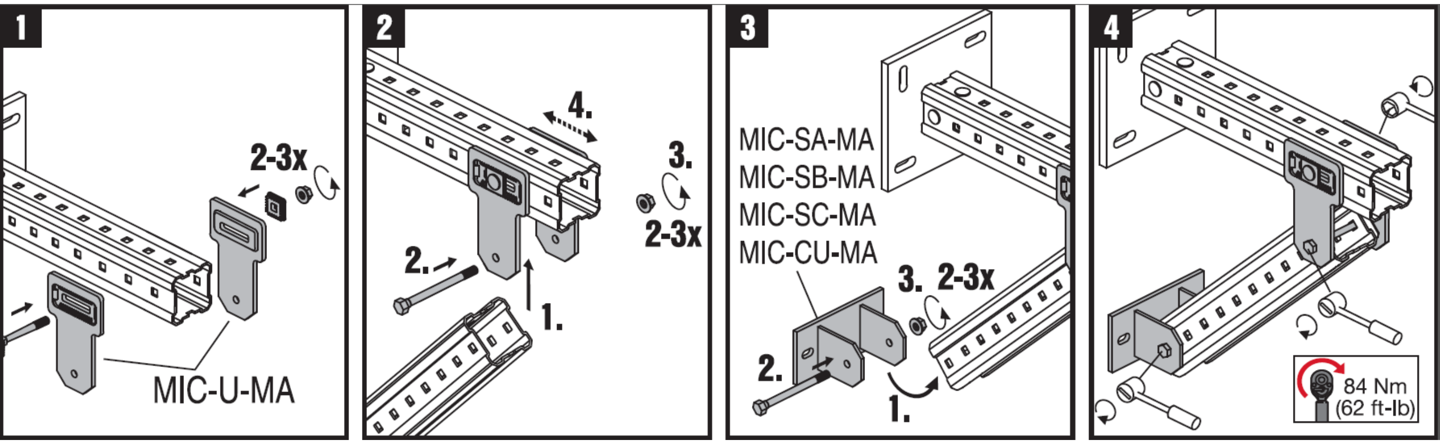
Weight:
7740 g incl. components

Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MIQ-90 girder to a steel beam in an angle, usually when it's used as a brace for another girder. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using one bolt through a hole, which enables various angles.

Material properties:

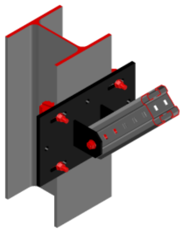
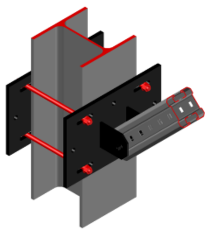
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



The same assembly principles and torque moments should be applied for MIQ girders

MIC-SB-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

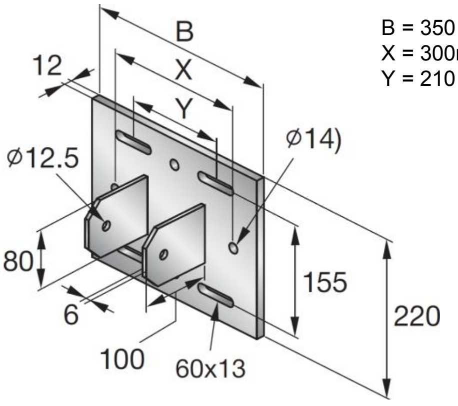
Standards and codes:

• 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

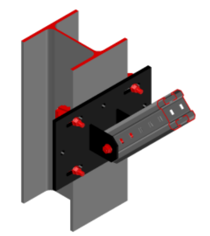
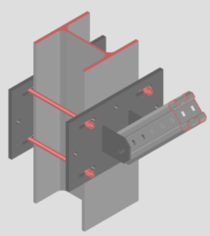
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

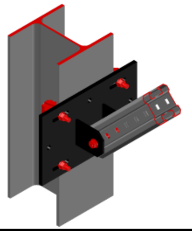
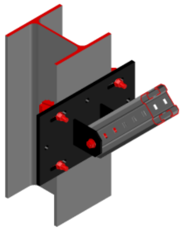
Simplified drawing:



B = 350 mm
X = 300mm
Y = 210 mm

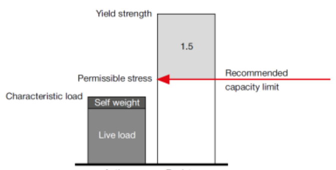
MIC-SB-MA Base Material Connector - Steel

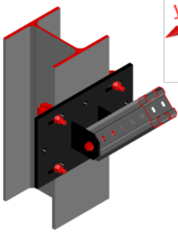
Clamped	Boxed	
		

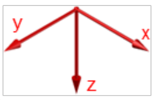
Loading case: Clamped	Combinations covered by loading case
BOM: Connector incl. all associated components **MIC-SB-MA** **304816** Beam clamps **4x MI-SGC M12** **233859** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 165-235mm. 

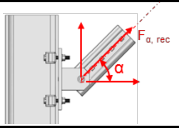
Recommended loading capacity - simplified for most common applications

Method









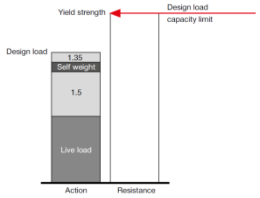
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	18.30	6.92	5.49	4.82	4.66

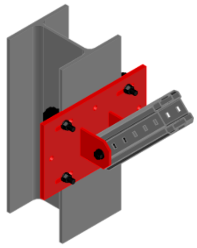
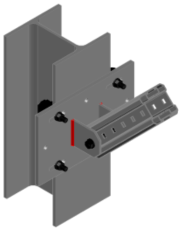
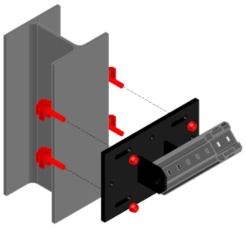
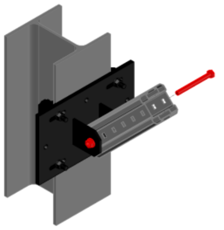
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



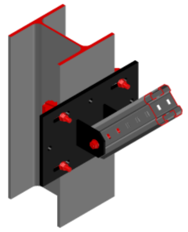
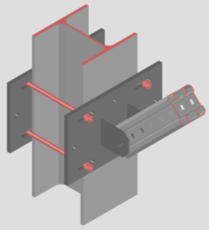
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Beam clamps	4. Hexagonal bolt in MIQ-girder
			

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

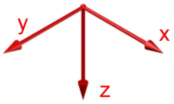
Clamped	Boxed	
		

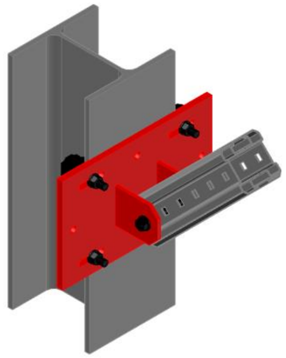
Design loading capacity - 3D 2/3

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.

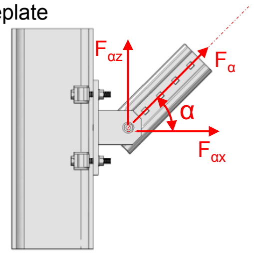
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
43.19	50.50	3.22	3.22	23.25	23.25
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.13	1.13	1.63	1.63	0.23	0.23

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



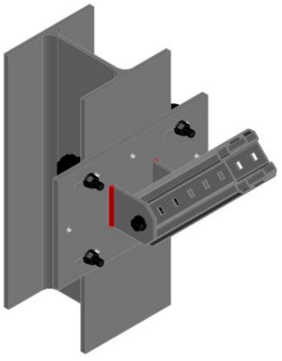
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

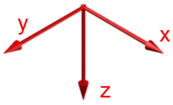
$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

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**

$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

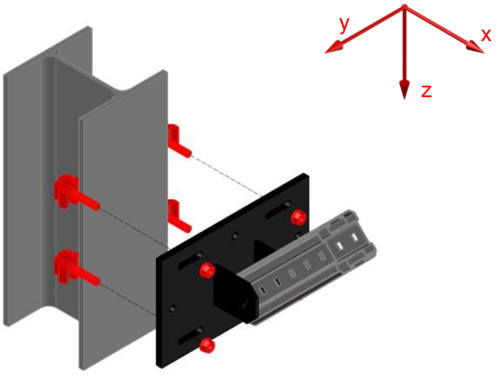
$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-SB-MA Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 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: $e_x = 0.07m$

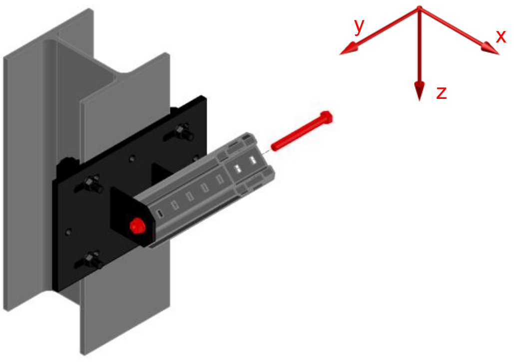
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

4. Hexagonal bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

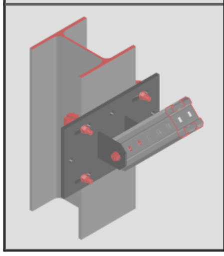
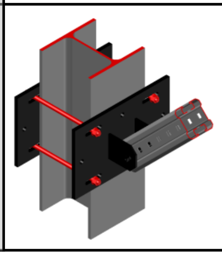
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

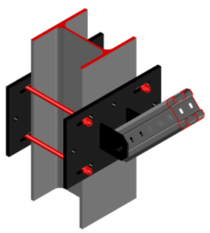
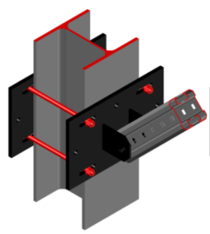
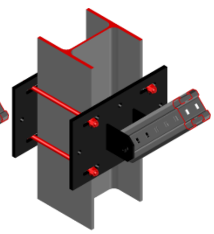
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

The normal force F_α in the inclined strut has to be compared with the resistance value $F_{\alpha Rd.}$

$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

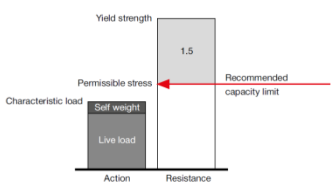
MIC-SB-MA Base Material Connector - Steel

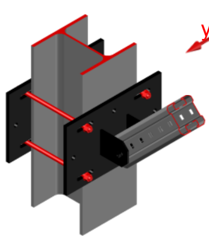
Clamped	Boxed	
		

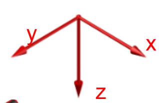
Loading case: Boxed	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-SB-MA 304816** **Base plate** **1x MIB-SB 304822** **Threaded rods cut to particular length** **4x AM12x1000 8.8 HDG…m 419103** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 165-235mm.  

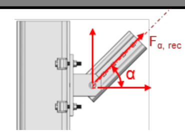
Recommended loading capacity - simplified for most common applications

Method









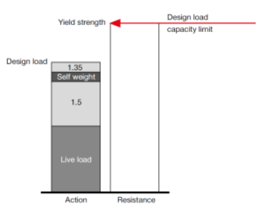
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	18.30	7.34	5.74	4.99	4.74

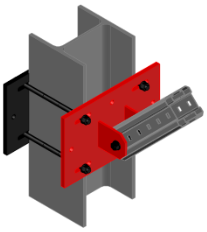
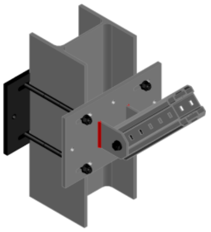
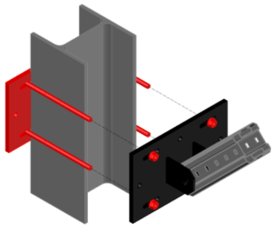
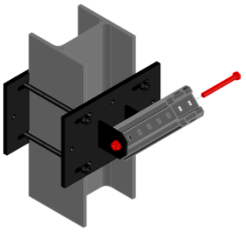
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method

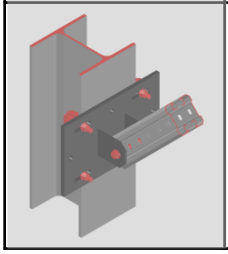
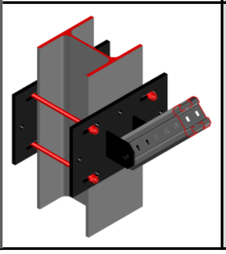


Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Back plate with bolts	4. Hexagonal bolt in MIQ-girder
			

MIC-SB-MA Base Material Connector - Steel

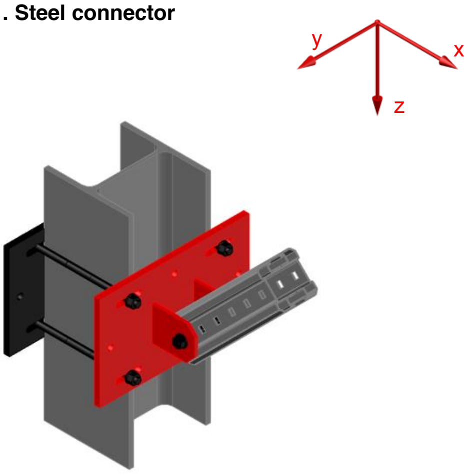
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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.

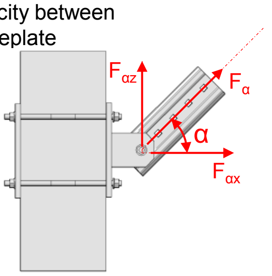
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
43.19	50.50	3.22	3.22	23.25	23.25
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.13	1.13	1.63	1.63	0.23	0.23

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

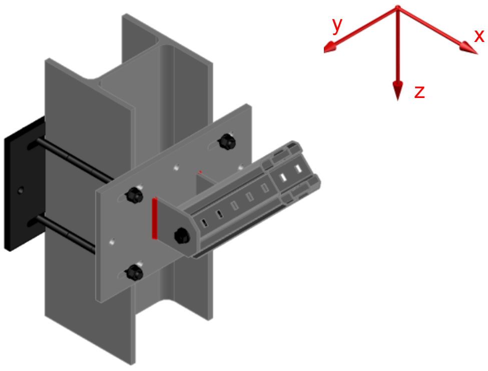
e_x=0.07m



$$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$$
$$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$$
$$M_{z.Ed} = F_{y.Ed} * e_x$$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

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**

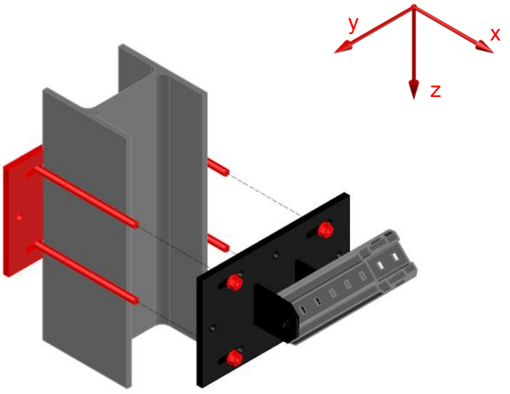
$$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$$
$$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$$
$$M_{z.Ed} = F_{y.Ed} * e_x$$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

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

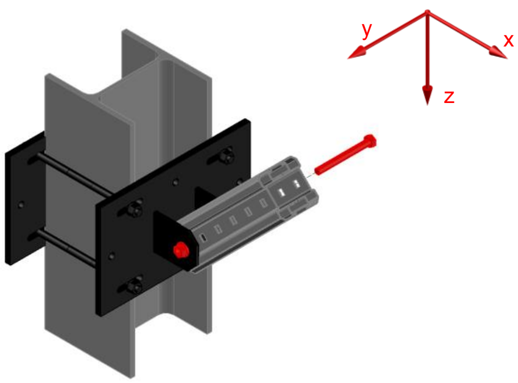
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

4. Hexagonal bolt in MI channel



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

The normal force F_α in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

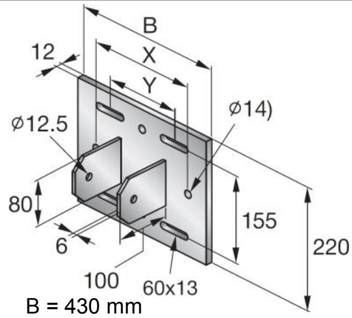
MIC-SC-MA Base Material Connector - Steel

Designation	Item number
MIC-SC-MA	**304817**

Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 microns

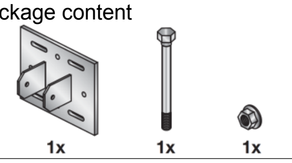
Weight:
9400 g incl. components

Submittal text:
Hilti Hot-dipped galvanized baseplate connector, typically used for anchoring an MI-90 and MIQ-90 girders to a steel beam in an angle, usually when it’s used as a brace for another girder. Four oblong anchor holes enable fine tuning of baseplate position, and girder is connected using one bolt through a hole, which enables various angles.



B = 430 mm
X = 350 mm
Y = 290 mm

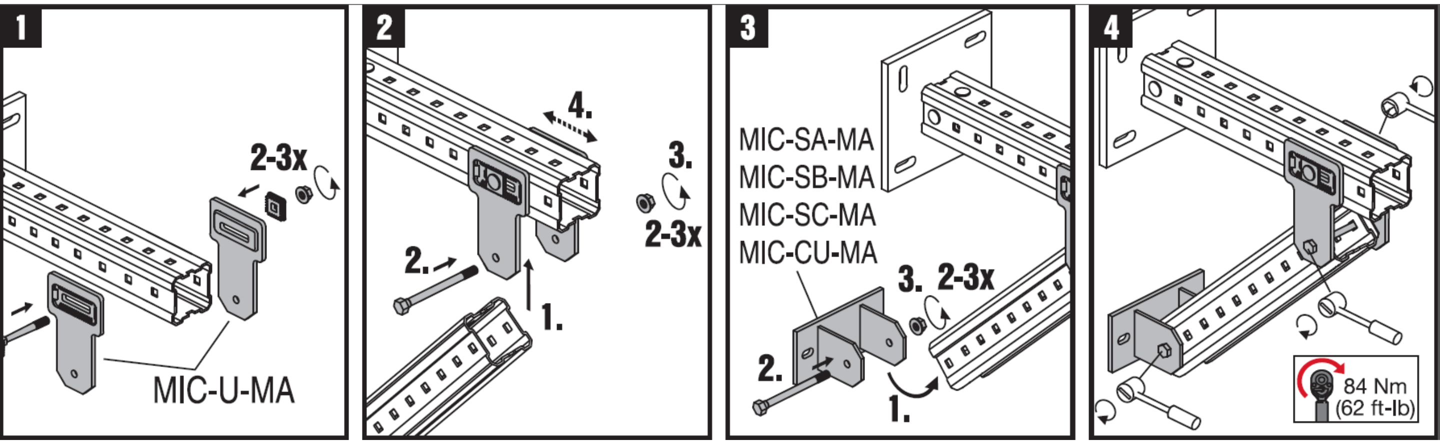
Package content



Material properties:

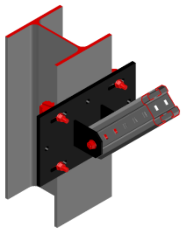
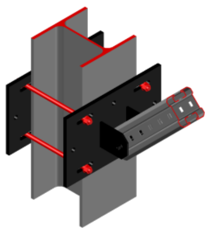
Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S235JR - DIN EN 10025	$f_y = 235 \frac{N}{mm^2}$	$f_u = 360 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

Instruction For Use:



The same assembly principles and torque moments should be applied for MIQ girders

MIC-SC-MA Base Material Connector - Steel

Possible loading cases		
Clamped	Boxed	
		

Design criteria used for loading capacity

Methodology:
- Analytic calculation

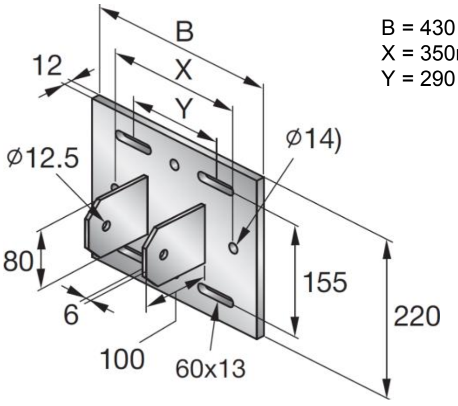
Standards and codes:

• EN 1990	Basics of structural design	03.2003
• EN 1991-1-1	Eurocode 1: Actions on structures –Part 1-1: General actions – densities, self-weight, imposed loads for buildings	03.2012
• EN 1993-1-1	Eurocode 3: Design of steel structures –Part 1-1: General rules and rules for buildings	03.2012
• EN 1993-1-3	Eurocode 3: Design of steel structures –Part 1-3: General rules-Supplementary rules for cold-formed members and sheeting	09.2010
• EN 1993-1-5	Eurocode 3: Design of steel structures –Part 1-5:Plated structural elements	06.2012
• EN 1993-1-8	Eurocode 3: Design of steel structures –Part 1-8: Design of joints	03.2012

Software:
- Mathcad 15.0
- Microsoft Excel

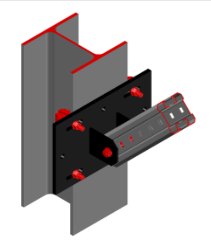
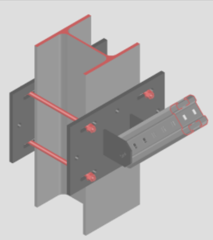
Environmental conditions:
- indoors, outdoors
- static loads
- no fatigue loads

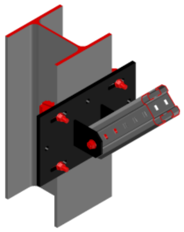
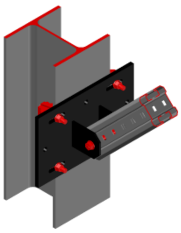
Simplified drawing:



B = 430 mm
X = 350mm
Y = 290 mm

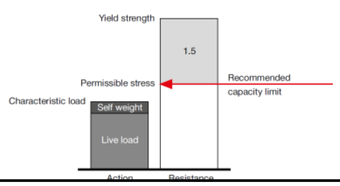
MIC-SC-MA Base Material Connector - Steel

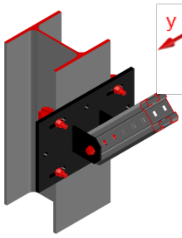
Clamped	Boxed	
		

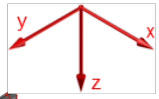
Loading case: Clamped	Combinations covered by loading case
BOM: Connector incl. all associated components **MIC-SC-MA** **304817** Beam clamps **4x MI-SGC M12** **233859** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 235-300mm. 

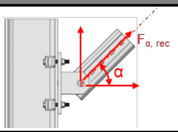
Recommended loading capacity - simplified for most common applications

Method









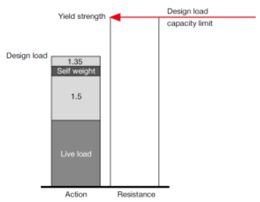
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
$\pm F_{\alpha,rec.}$ [kN]	18.30	6.92	5.49	4.82	4.66

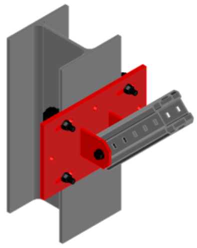
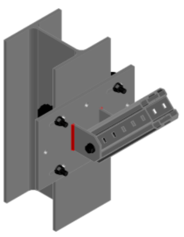
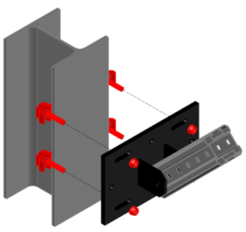
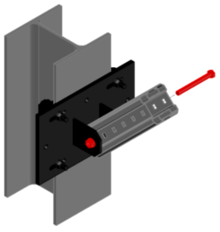
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



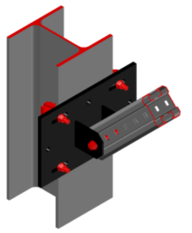
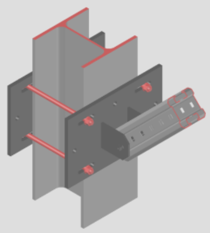
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Beam clamps	4. Hexagonal bolt in MIQ-girder
			

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

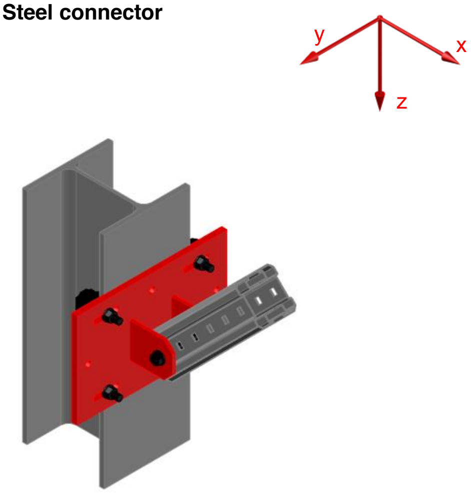
Clamped	Boxed	
		

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.

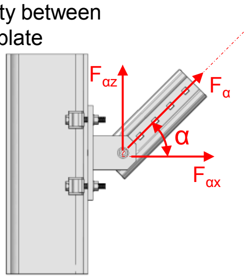
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.47	38.38	3.22	3.22	15.78	15.78
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.77	0.77	1.10	1.10	0.23	0.23

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



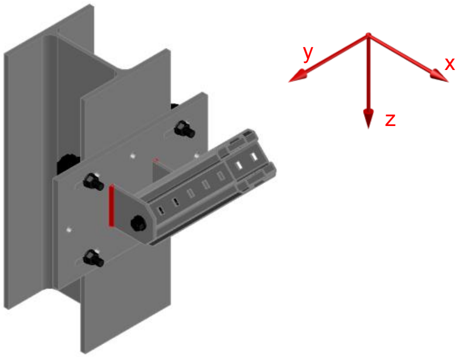
$$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$$

$$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$$

$$M_{z.Ed} = F_{y.Ed} * e_x$$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \le 1$$

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**

$$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$$

$$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$$

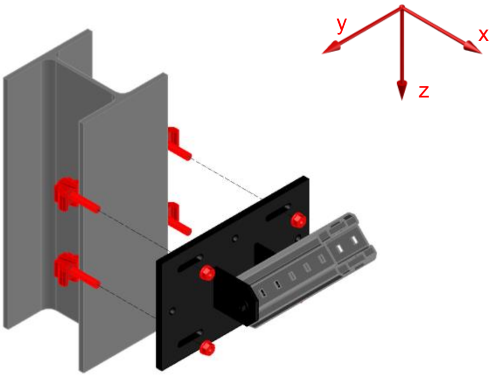
$$M_{z.Ed} = F_{y.Ed} * e_x$$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \le 1$$

MIC-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: $e_x = 0.07m$

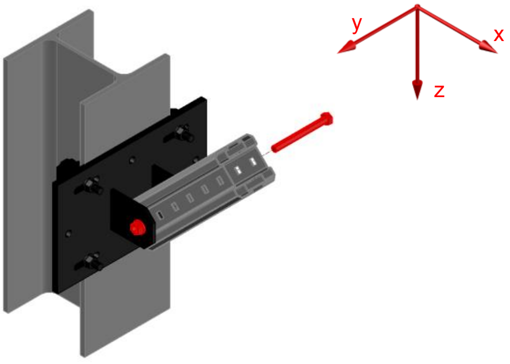
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

4. Hexagonal bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.34	1.34	0.00	0.00	0.00	0.00

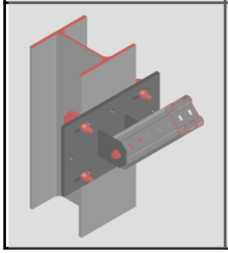
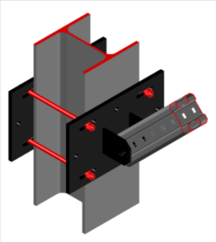
Interaction:

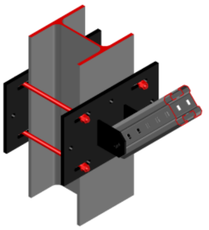
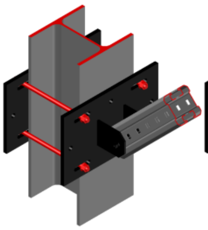
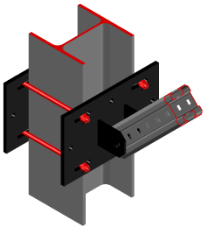
$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.
The normal force F_α in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

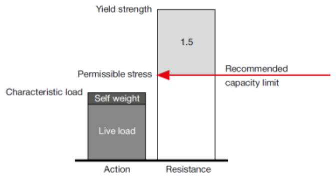
MIC-SC-MA Base Material Connector - Steel

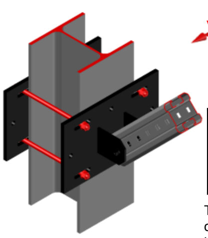
Clamped	Boxed	
		

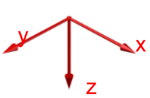
Loading case: Boxed	Combinations covered by loading case
BOM: Connector incl. all associated components **1x MIC-SC-MA 304817** **Base plate** **1x MIB-SC 304823** **Threaded rods cut to particular length** **4x AM12x1000 8.8 HDG…m 419103** **Nut** **8x M12-F-SL WS3⁄4 382897** 	Connector used for an angled connection of MI-90 to structural steel profiles (bracing). For flange width 235-300mm. 

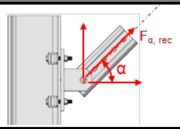
Recommended loading capacity - simplified for most common applications

Method









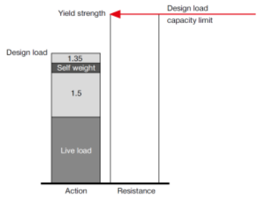
±Fy,rec. [kN]
2.15

α	0°	30°	45°	60°	90°
±$F_{\alpha,rec.}$ [kN]	18.30	6.91	5.51	4.87	4.74

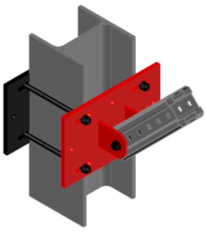
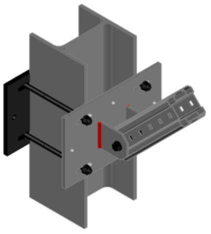
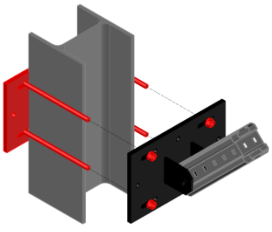
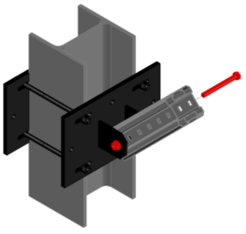
These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D 1/3

Method



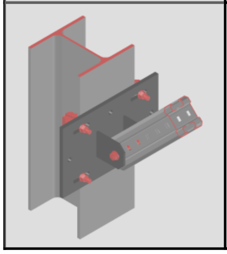
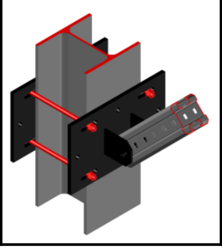
Limiting components of capacity evaluated in following tables:

1. Steel connector	2. Welds	3. Back plate with bolts	4. Hexagonal bolt in MI channel
			

MIC-SC-MA Base Material Connector - Steel

Conditions of the loading capacity tables:

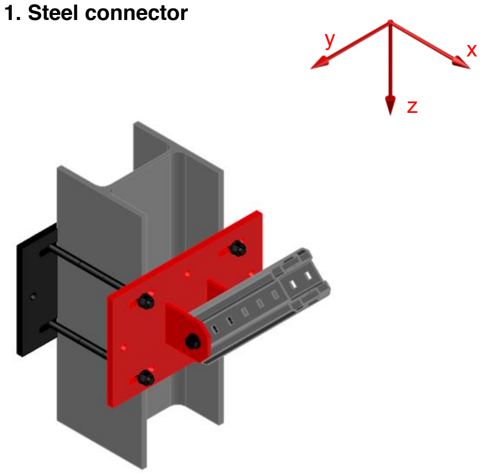
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

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.

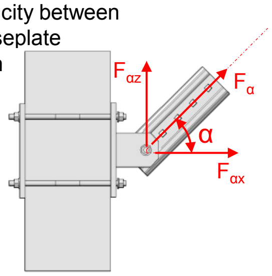
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
34.47	38.38	3.22	3.22	15.78	15.78
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
0.77	0.77	1.10	1.10	0.23	0.23

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



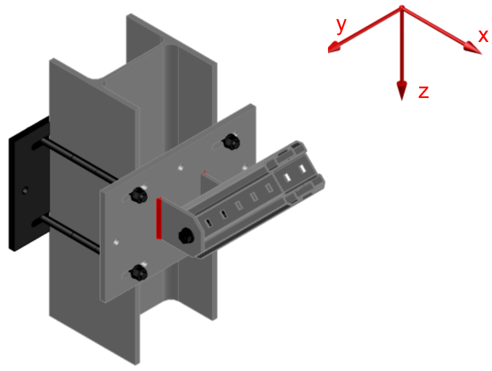
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

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

$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

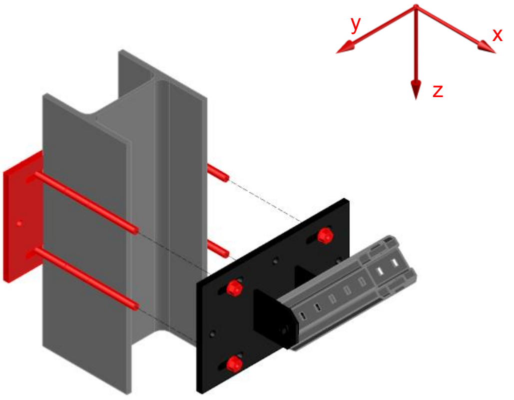
$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

MIC-SC-MA Base Material Connector - Steel

Design loading capacity - 3D 3/3

3. 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

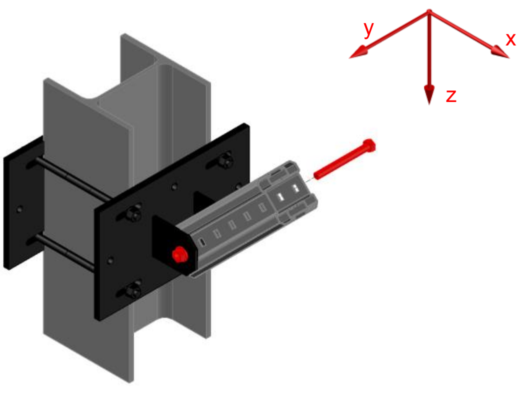
$F_{x.Ed.\alpha} = F_\alpha * \cos\alpha$

$F_{z.Ed.\alpha} = F_\alpha * \sin\alpha \rightarrow M_{y.Ed.\alpha} = F_{z.Ed.\alpha} * e_x$

$M_{z.Ed} = F_{y.Ed} * e_x$

$$\frac{F_{x.Ed.\alpha}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed.\alpha}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} + \frac{M_{y.Ed.\alpha}}{M_{y.Rd}} + \frac{M_{z.Ed}}{M_{z.Rd}} \leq 1$$

4. Hexagonal bolt in MIQ-girder



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
27.45	27.45	Not decisive	Not decisive	27.45	27.45
+Mx,Rd [kNm]	**-Mx,Rd [kNm]**	**+My,Rd [kNm]**	**-My,Rd [kNm]**	**+Mz,Rd [kNm]**	**-Mz,Rd [kNm]**
1.34	1.34	0.00	0.00	0.00	0.00

Interaction:

$F_{\alpha Rd} = F_{xRd} = F_{zRd}$

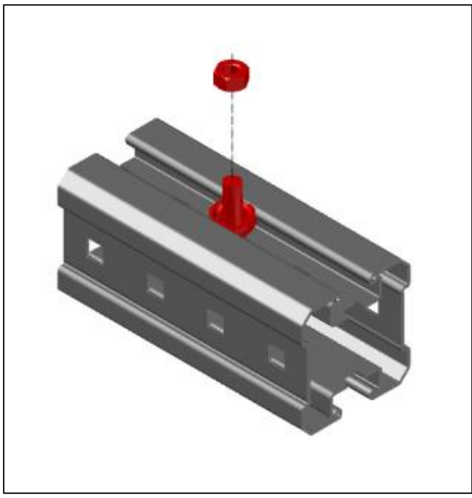
The resistance $F_{\alpha Rd}$ of the hexagon bolt is the same for each angle α in plane x/z, therefore no interaction.

The normal force F_α in the inclined strut has to be compared with the resistance value $F_{\alpha Rd}$.

$$\frac{F_{\alpha.Ed}}{F_{\alpha.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

MIQA-T T-head bolt - accessories

Designation	Item number
MIQA-T T-head bolt	**2120142**



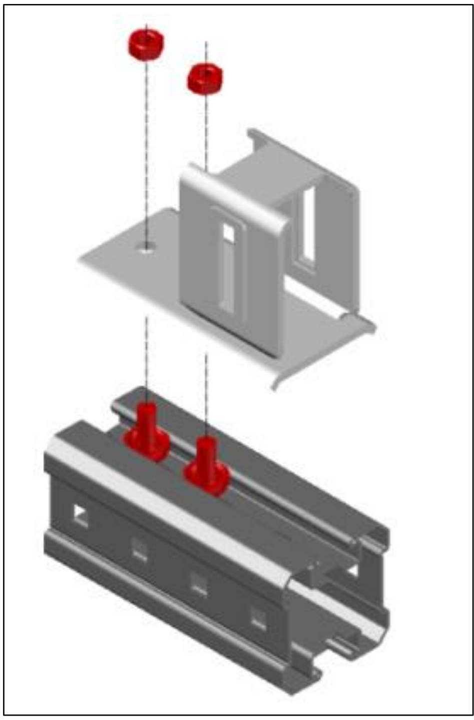
Recommended loading capacity

±Fx,rec. [kN]	±Fz,rec. [kN]
6.20	11.70

Design loading capacity

±Fx,Rd. [kN]	±Fz,Rd. [kN]
9.30	17.55

Designation	Item number
2x MIQA-T T-head bolt	**2120142**



Recommended loading capacity

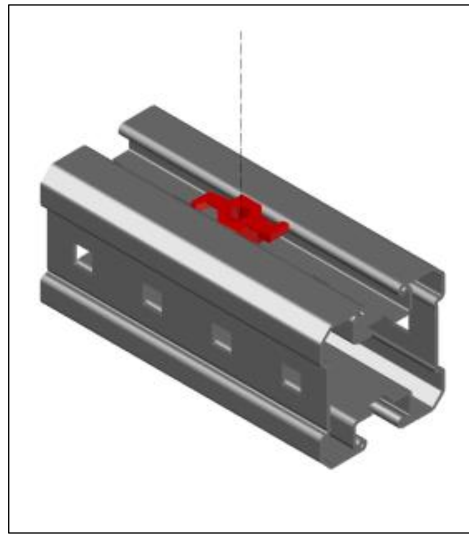
±Fx,rec. [kN]	±Fz,rec. [kN]
11.20	23.40

Design loading capacity

±Fx,Rd. [kN]	±Fz,Rd. [kN]
16.80	35.1

MIQM-M wing nut - accessories

Designation	Item number
MIQM-M10	**2120274**
MIQM-M12	**2120275**
MIQM-M16	**2120276**



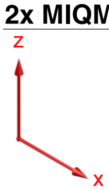
Recommended loading capacity

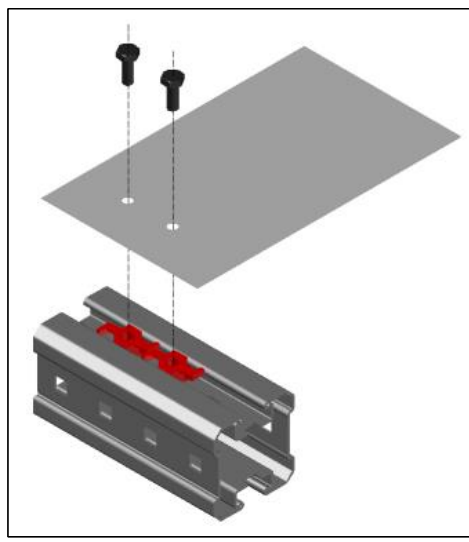
	±Fx,rec. [kN]	±Fz,rec. [kN]
M 10	3.00	8.50
M 12	3.50	8.50
M 16	3.50	8.50

Design loading capacity

	±Fx,Rd. [kN]	±Fz,Rd. [kN]
M 10	4.50	12.75
M 12	5.25	12.75
M 16	5.25	12.75

Designation	Item number
2x MIQM-M10	**2120274**
2x MIQM-M12	**2120275**
2x MIQM-M16	**2120276**





Recommended loading capacity

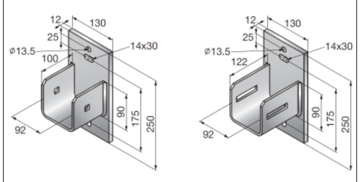
	±Fx,rec. [kN]	±Fz,rec. [kN]
M 10	5.40	17.00
M 12	6.30	17.00
M 16	6.30	17.00

Design loading capacity

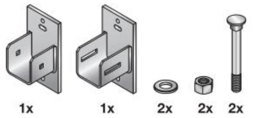
	±Fx,Rd. [kN]	±Fz,Rd. [kN]
M 10	8.10	25.50
M 12	9.45	25.50
M 16	9.45	25.50

MIC-C90-EDB elevator connector

Designation	Item number
MIC-C90-EDB elevator connector	**2149279**



Package content



Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 micr ons

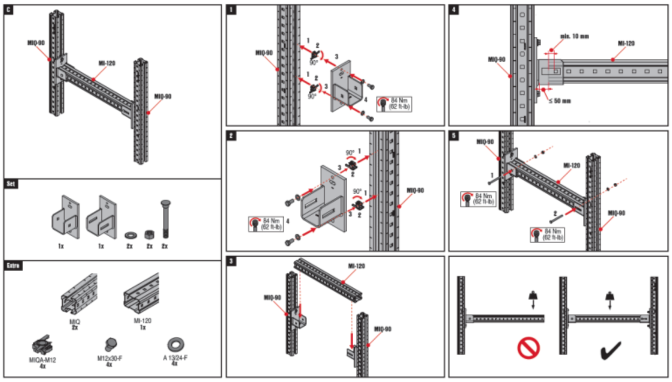
Weight:
9434g incl. accessories

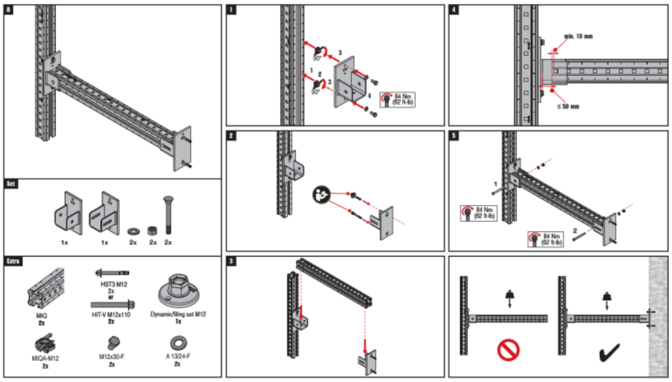
Submittal text:
Hot-dipped galvanised Hilti elevator connector, used primarily to connect an MI or MIQ girder to either a concrete wall or another girder. The baseplate of the connector is fastened to concrete through anchor holes with Hilti HST3 anchors or similar, and with MIA-OH bolts to another girder, secured with two self-locking nuts. Sold as a pair of connectors, one with a single hole and the other with an oblong hole, through which the connector is fastened to the girder with MIA-OH through-bolts. Material weight 9.43kg including all items.

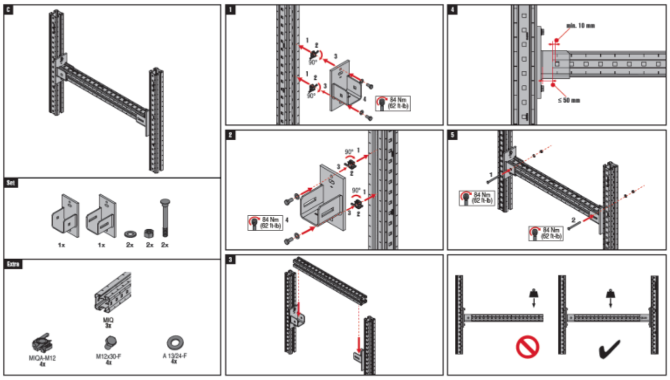
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S355 JR DIN EN 10025	$F_y = 355 \frac{N}{mm^2}$	$F_u = 490 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

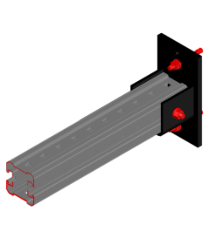
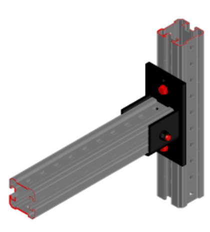
Instruction For Use:







MIC-C90-EDB elevator connector

Possible loading cases		
On concrete	On steel	
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Analytic calculation

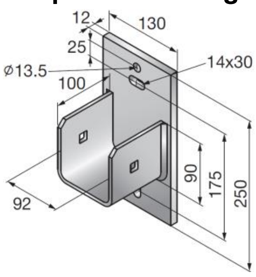
Standards and codes:

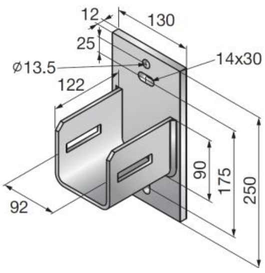
• EN 1990	Basics of structural design	03.2003
• EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General actions – densities, self-weight, imposed loads for buildings	09.2011
• EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings	03.2012
• EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General rules- Supplementary rules for cold-formed members and sheeting	03.2012
• EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated structural elements	03.2012
• EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of joints	03.2012
EN 10025-2	Hot rolled products of structural steels- Part 2: technical delivery conditions for non-alloy structural steels	02.2005
• RAL-GZ 655	Pipe Supports	04.2008

Software:
- Ansys 16.0
- Microsoft Excel
- Analytic calculation

Environmental conditions:
- static loads
- no fatigue loads

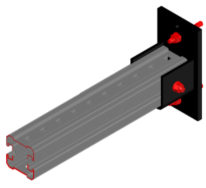
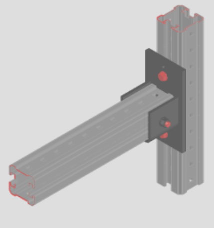
Simplified drawing:

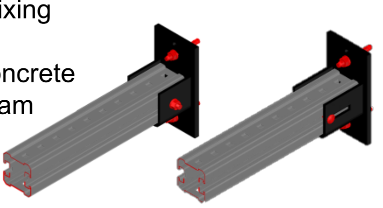




MIC-C90-EDB elevator connector

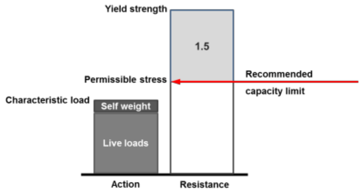
Possible loading cases

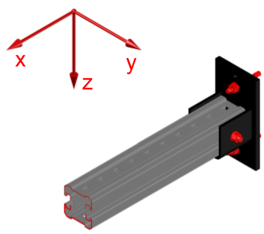
On concrete	On steel	
		

Loading case: On concrete	Combinations covered by loading case
BOM: Base material connector incl. all connectivity material **1x MIC-C90-EDB elevator connector 2149279**	Connector used for fixing MIQ girder, perpendicularly to concrete usually as divider beam (wall to wall) in elevator shaft 

Recommended loading capacity - simplified for most common applications

Method



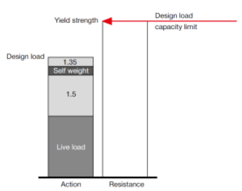


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
1.40	3.33	5.67

These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

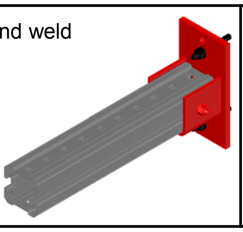
Design loading capacity - 3D 1/2

Method

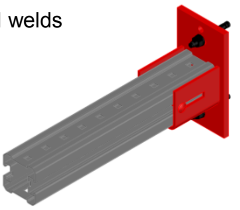


Limiting components of capacity evaluated in following tables:

1. Slotted connector incl. bolt, base plate and weld



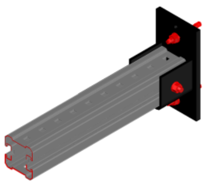
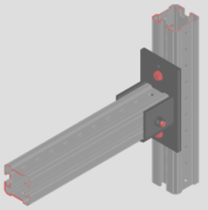
2. Connector with hole incl. bolt, plate and welds



MIC-C90-EDB elevator connector

Conditions of the loading capacity tables:

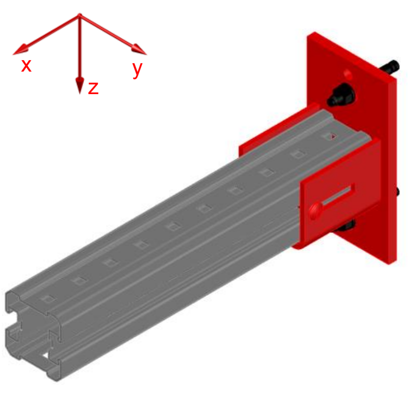
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

Possible loading cases		
On concrete	On steel	
		

Design loading capacity - 3D 2/2

Summary of design loads*
NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

1. MIC-C90-EDB Slotted connector incl. bolt, base plate and weld



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.10	2.10	5.00**	5.00**	5.00	5.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.07	0.07	0.00	0.00	0.00	0.00

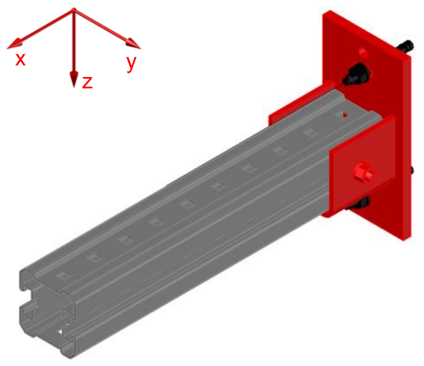
**Values are provided for 1mm local deflection on connector

Interaction:

$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above.

2. MIC-C90-EDB Connector with hole incl. bolt, plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
10.60	10.60	5.00**	5.00**	5.00	5.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.07	0.07	0.00	0.00	0.00	0.00

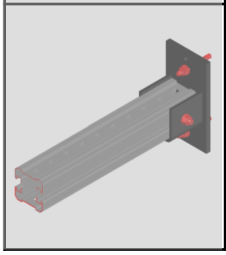
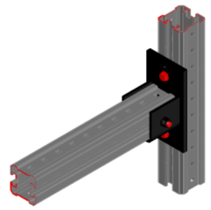
**Values are provided for 1mm local deflection on connector

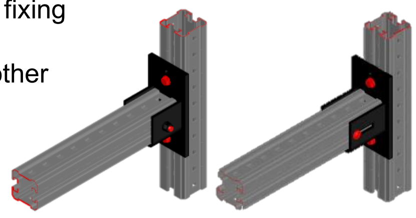
Interaction:

$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \leq 1$$

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

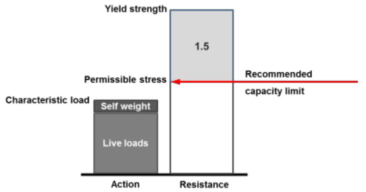
MIC-C90-EDB elevator connector

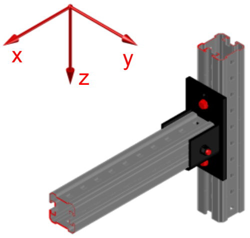
Possible loading cases		
On concrete	On steel	
		

Loading case: On steel	Combinations covered by loading case
BOM: Base material connector incl. all connectivity material **1x MIC-C90-EDB elevator connector 2149279** Connection to vertical MIQ girder **2x MIQM-M12 wing nut 2120275** **2x M12x30-F hex. Head screw 284387**	Connector used for fixing MIQ girder, perpendicularly to other MIQ vertical girder usually as divider beam (wall to wall) in elevator shaft 

Recommended loading capacity - simplified for most common applications

Method





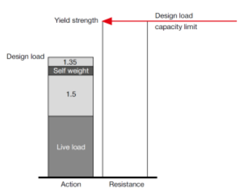
±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
1.4	3.33	5.67

These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

Design loading capacity - 3D

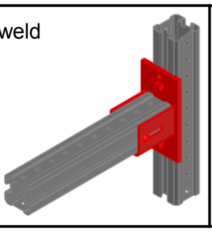
1/2

Method

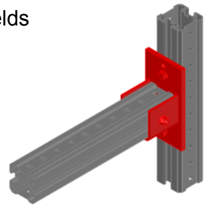


Limiting components of capacity evaluated in following tables:

1. Slotted connector incl. bolt, base plate and weld



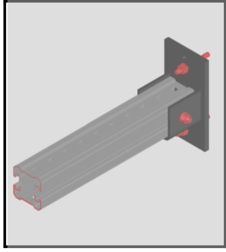
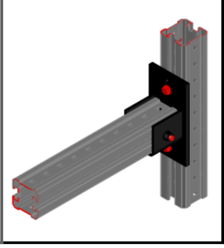
2. Connector with hole incl. bolt, plate and welds



MIQC-S90-BP base material connector

Conditions of the loading capacity tables:

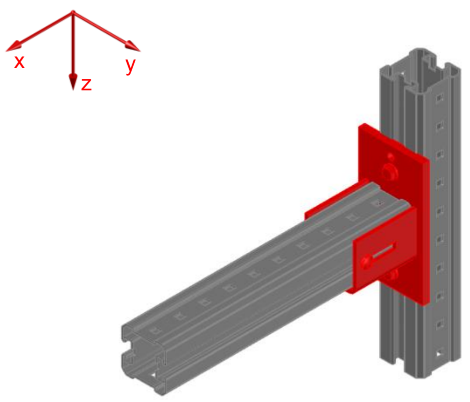
- Just for static loads
- No fatigue loads
- No low (＜ -10° C), no high (＞ +100° C) temperatures

Possible loading cases		
On concrete	On steel	
		

Design loading capacity - 3D 2/2

Summary of design loads*
NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

1. MIC-C90-EDB Slotted connector incl. bolt, base plate and weld



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.10	2.10	5.00**	5.00**	5.00	5.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.07	0.07	0.00	0.00	0.00	0.00

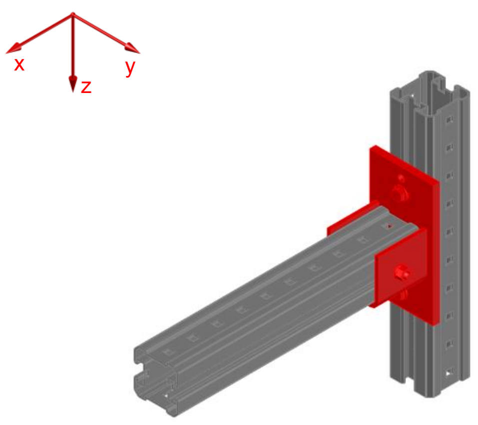
**Values are provided for 1mm local deflection on connector

Interaction:

$$\frac{F_{x.Ed}}{F_{x.Rd}}+\frac{F_{y.Ed}}{F_{y.Rd}}+\frac{F_{z.Ed}}{F_{z.Rd}}+\frac{M_{x.Ed}}{M_{x.Rd}}\le 1$$

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

2. MIC-C90-EDB Connector with hole incl. bolt, plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
10.60	10.60	5.00**	5.00**	5.00	5.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.07	0.07	0.00	0.00	0.00	0.00

**Values are provided for 1mm local deflection on connector

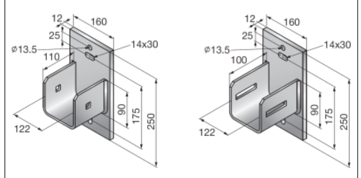
Interaction:

$$\frac{F_{x.Ed}}{F_{x.Rd}}+\frac{F_{y.Ed}}{F_{y.Rd}}+\frac{F_{z.Ed}}{F_{z.Rd}}+\frac{M_{x.Ed}}{M_{x.Rd}}\le 1$$

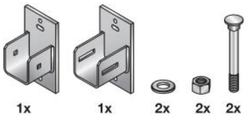
Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

MIC-C120-EDB elevator connector

Designation	Item number
MIC-C120-EDB elevator connector	**2149420**



Package content



Corrosion protection:
Hot dipped galvanized as per DIN EN ISO 1462, thickness 55 micr ons

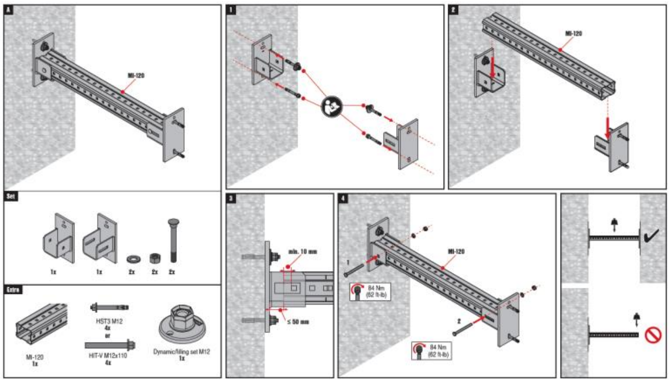
Weight:
11043g incl. accessories

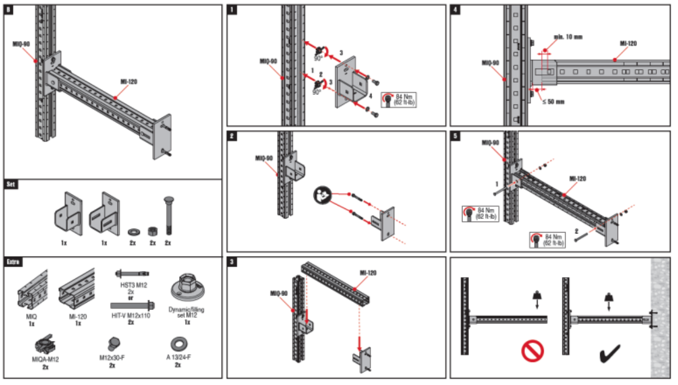
Submittal text:
Hot-dipped galvanised Hilti elevator connector, used primarily to connect an MI or MIQ girder to either a concrete wall or another girder. The baseplate of the connector is fastened to concrete through anchor holes with Hilti HST3 anchors or similar, and with MIA-OH bolts to another girder, secured with two self-locking nuts. Sold as a pair of connectors, one with a single hole and the other with an oblong hole, through which the connector is fastened to the girder with MIA-OH through-bolts. Material weight 11.04kg including all items.

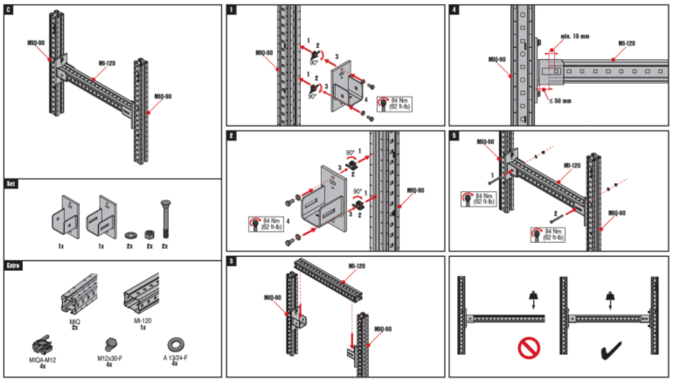
Material properties:

Material	Yield strength	Ultimate strength	E-modulus	Shear modulus
S355 JR DIN EN 10025	$F_y = 355 \frac{N}{mm^2}$	$F_u = 490 \frac{N}{mm^2}$	$E = 210000 \frac{N}{mm^2}$	$G = 80769 \frac{N}{mm^2}$

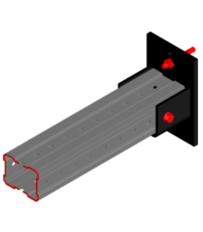
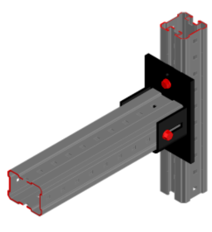
Instruction For Use:







MIC-C120-EDB elevator connector

Possible loading cases		
On concrete	On steel	
		

Design criteria used for loading capacity

Methodology:
- Finite element analysis
- Analytic calculation

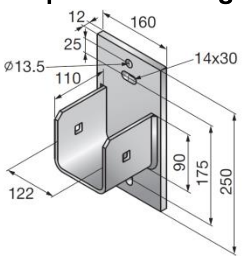
Standards and codes:

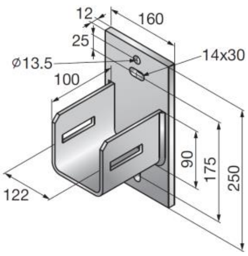
• EN 1990	Basics of structural design	03.2003
• EN 1991-1-1	Eurocode 1: Actions on structures – Part 1-1: General actions – densities, self-weight, imposed loads for buildings	09.2011
• EN 1993-1-1	Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings	03.2012
• EN 1993-1-3	Eurocode 3: Design of steel structures – Part 1-3: General rules- Supplementary rules for cold-formed members and sheeting	03.2012
• EN 1993-1-5	Eurocode 3: Design of steel structures – Part 1-5: Plated structural elements	03.2012
• EN 1993-1-8	Eurocode 3: Design of steel structures – Part 1-8: Design of joints	03.2012
EN 10025-2	Hot rolled products of structural steels- Part 2: technical delivery conditions for non-alloy structural steels	02.2005
• RAL-GZ 655	Pipe Supports	04.2008

Software:
- Ansys 16.0
- Microsoft Excel
- Analytic calculation

Environmental conditions:
- static loads
- no fatigue loads

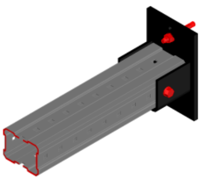
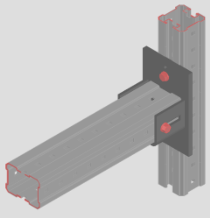
Simplified drawing:

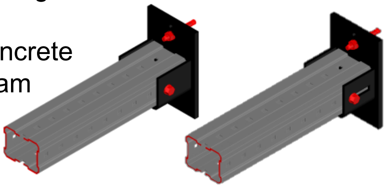




MIC-C120-EDB elevator connector

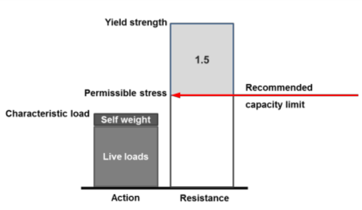
Possible loading cases

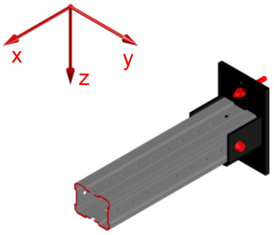
On concrete	On steel	
		

Loading case: On concrete	Combinations covered by loading case
BOM: Base material connector incl. all connectivity material **MIC-C120-EDB elevator connector 2149420**	Connector used for fixing MIQ girder, perpendicularly to concrete usually as divider beam (wall to wall) in elevator shaft 

Recommended loading capacity - simplified for most common applications

Method



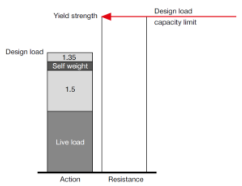


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
1.40	4.33	6.67

These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

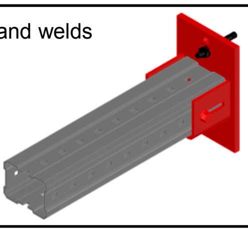
Design loading capacity - 3D 1/2

Method

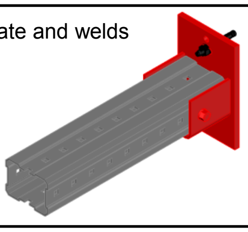


Limiting components of capacity evaluated in following tables:

1. Slotted connector incl. bolt, base plate and welds

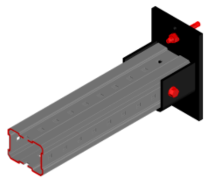
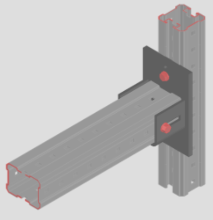


2. Connector with hole incl. bolt, base plate and welds



MIC-C120-EDB elevator connector

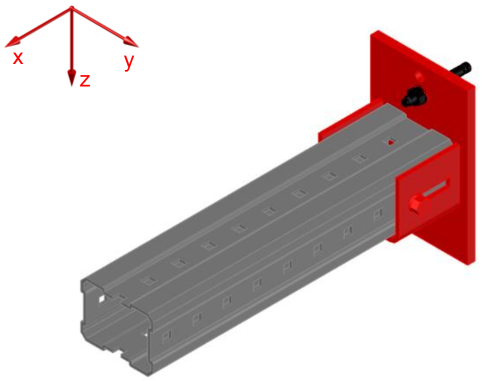
Conditions of the loading capacity tables:
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Possible loading cases		
On concrete	On steel	
		

Design loading capacity - 3D 2/2

Summary of design loads*
NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

1. Slotted connector incl. bolt, base plate and welds



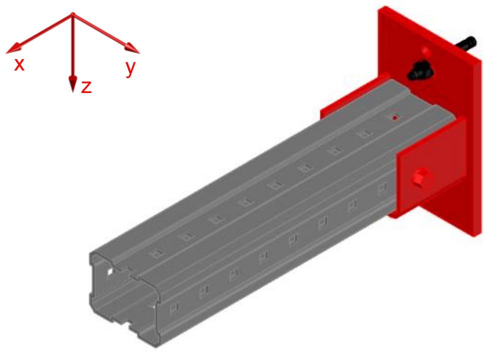
+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.10	2.10	6.50**	6.50**	10.00	10.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.10	0.10	0.00	0.00	0.00	0.00

**Values are provided for 1mm local deflection on connector
Interaction:

$$\frac{F_{x.Ed}}{F_{x.Rd}}+\frac{F_{y.Ed}}{F_{y.Rd}}+\frac{F_{z.Ed}}{F_{z.Rd}}+\frac{M_{x.Ed}}{M_{x.Rd}}\leq 1$$

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

2. Connector with hole incl. bolt, base plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
14.00	14.00	6.50**	6.50**	10.00	10.00
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.10	0.10	0.00	0.00	0.00	0.00

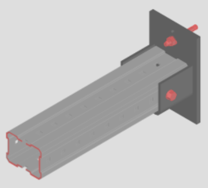
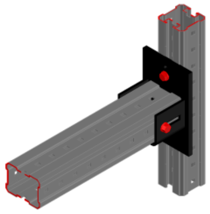
**Values are provided for 1mm local deflection on connector
Interaction:

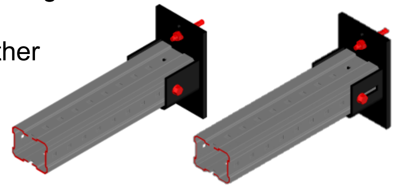
$$\frac{F_{x.Ed}}{F_{x.Rd}}+\frac{F_{y.Ed}}{F_{y.Rd}}+\frac{F_{z.Ed}}{F_{z.Rd}}+\frac{M_{x.Ed}}{M_{x.Rd}}\leq 1$$

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

MIC-C120-EDB elevator connector

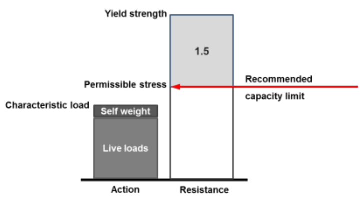
Possible loading cases

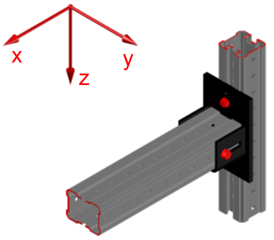
On concrete	On steel	
		

Loading case: On steel	Combinations covered by loading case
BOM: Base material connector incl. all connectivity material **MIC-C120-EDB elevator connector 2149420** Connection to vertical MIQ girder **2x MIQM-M12 wing nut 2120275** **2x M12x30-F hex. Head screw 284387**	Connector used for fixing MI-120 girder, perpendicularly to other MIQ vertical girder usually as divider beam (wall to wall) in elevator shaft 

Recommended loading capacity - simplified for most common applications

Method



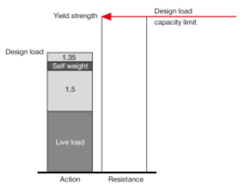


±Fx,rec. [kN]	±Fy,rec. [kN]	±Fz,rec. [kN]
1.40	4.33	6.67

These values are individual one directional maximal capacity limits. For any combinations of multiple directions, use design values and their corresponding interaction formulas.

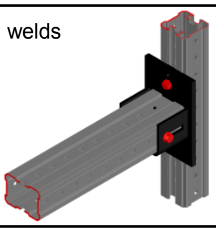
Design loading capacity - 3D 1/2

Method

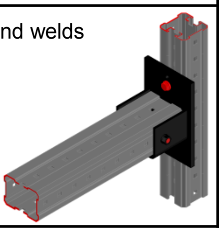


Limiting components of capacity evaluated in following tables:

1. Slotted connector incl. bolt, base plate and welds



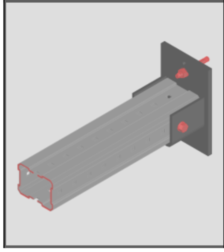
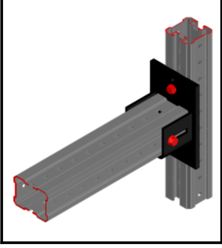
2. Connector with hole incl. bolt, base plate and welds



MIC-C120-EDB elevator connector

Conditions of the loading capacity tables:

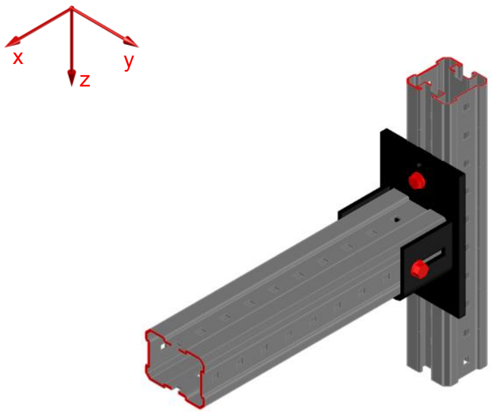
- Just for static loads
- No fatigue loads
- No low (< -10° C), no high (> +100° C) temperatures

Possible loading cases		
On concrete	On steel	
		

Design loading capacity - 3D 2/2

Summary of design loads*
NOTE: all values in interaction formulas should be used in absolute values! The values below are referred to the coordinate system shown in the drawing.

1. Slotted connector incl. bolt, base plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
2.10	2.10	5.00**	5.00**	8.50	8.50
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.10	0.10	0.00	0.00	0.00	0.00

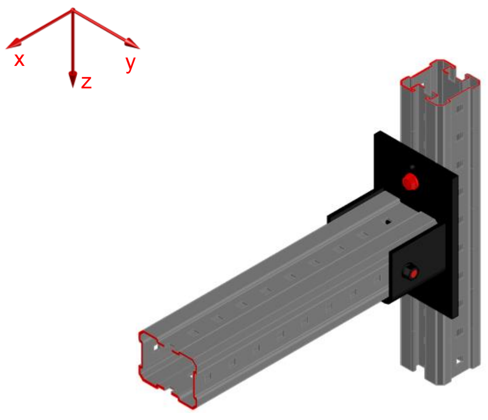
**Values are provided for 1mm local deflection on connector

Interaction:

$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \le 1$$

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

2. Connector with hole incl. bolt, base plate and welds



+Fx,Rd [kN]	-Fx,Rd [kN]	+Fy,Rd [kN]	-Fy,Rd [kN]	+Fz,Rd [kN]	-Fz,Rd [kN]
10.60	10.600	5.00**	5.00**	8.50	8.50
+Mx,Rd [kNm]	-Mx,Rd [kNm]	+My,Rd [kNm]	-My,Rd [kNm]	+Mz,Rd [kNm]	-Mz,Rd [kNm]
0.10	0.10	0.00	0.00	0.00	0.00

**Values are provided for 1mm local deflection on connector

Interaction:

$$\frac{F_{x.Ed}}{F_{x.Rd}} + \frac{F_{y.Ed}}{F_{y.Rd}} + \frac{F_{z.Ed}}{F_{z.Rd}} + \frac{M_{x.Ed}}{M_{x.Rd}} \le 1$$

Note: The welds and the one hand screw are modelled appropriately in the FE- calculation and are therefore included in the overall resistance for connector given above

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