Terms of common cooperation / Legal disclaimer

The product technical data 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, values only apply to static loading conditions). Technical data applies to the component only -- suitability and capacity of all other components must be checked separately by the responsible engineer (e.g., other assembly components, attachments, base materials, and building structures).

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 optimum performance (e.g. avoid 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, codes, and project specific requirements, prior to using them for any specific facility. This book only serves as an aid to interpret the capacity of the components listed, 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 need to be confirmed with a professional designer and/or structural engineers to ensure compliance with User’s specific jurisdiction and project requirements.
MIC-S120-CH-L Bracket - Steel

Designation Item number
MIC-S120-CH-500 2179522
MIC-S120-CH-750 2179528
MIC-S120-CH-1000 2179529
MIC-S120-CH-1500 2179530
MIC-S120-CH-2000 2179531

Corrosion protection:
Hot dipped galvanized per ASTM A123
  Girder - 2.95 mils (75 μm) minimum
  Plate - 3.94 mils (100 μm) minimum

Weight:
MIC-S120-CH-500 38.58 lb (17500g)
MIC-S120-CH-750 45.53 lb (20650g)
MIC-S120-CH-1000 52.47 lb (23800g)
MIC-S120-CH-1500 66.36 lb (30100g)
MIC-S120-CH-2000 80.25 lb (36400g)

Description:
Hilti Hot-dipped galvanized bracket, typically used for fixation to a steel beam. The bracket is connected with beam clamps or using threaded rods through the slotted holes. Comes in different plate sizes to fit various steel beam sizes and in different lengths depending on application needs.

Instruction For Use:
No IFU attached to the package

Material properties

<table>
<thead>
<tr>
<th>Material</th>
<th>Yield strength</th>
<th>Ultimate strength</th>
<th>E-modulus</th>
<th>Shear modulus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bracket</td>
<td>f_y = 36 ksi (250 N/mm²)</td>
<td>f_u = 58 ksi (400 N/mm²)</td>
<td>29000 ksi (200000 N/mm²)</td>
<td>11000 ksi (75845 N/mm²)</td>
</tr>
</tbody>
</table>

For clamped loading case

For boxed loading case (not attached to the packaging)
Approved loading cases

<table>
<thead>
<tr>
<th>Clamped</th>
<th>Boxed</th>
</tr>
</thead>
</table>

Governing Conditions

Methodology:
Connection strength values are determined with a combination of simulation (ANSYS®), calculation (Microsoft Excel and Mathcad) and testing.

Standards and codes:
- ANSI/AISC 360-10 Specification for Structural Steel Buildings
- ANSI/AISC 360-10– Inelastic analysis
- AISC Steel Design Guide Series 1 Column Base Plates
- EN 10025-2 Hot rolled products of structural steels-Part 2: technical delivery conditions for non-alloy structural steels

Validity:
Temperature limits: -22°F (-30°C) to 200°F (+93°C).
Published allowable loads for applications are based on static loading conditions. Non-static forces, including those resulting from thermal or other expansion must be taken into account during design.
Clamped | Boxed
---|---

**Loading case: Clamped**

**Bill of Material for this loading case:**
- Bracket
  - 1x MIC-S120-CH-500 2179527
  - MIC-S120-CH-750 2179528
  - MIC-S120-CH-1000 2179529
  - MIC-S120-CH-1500 2179530
  - MIC-S120-CH-2000 2179531

Hardware not included in packaging:
- Beam clamps
  - 4x MI-SGC M16 387398

Bracket used for a perpendicular connection to flange of structural steel profiles. For flange width 9.25” (235mm) - 11.81” (300mm).

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**Usage of Values for Design Strength and Allowable Strength**

The Design Strength and Allowable Strength tables on the following pages include strength reduction factors:

1. **ASD:** Safety Factor (omega) > 1.0 as per AISC specifications.
2. **LRFD:** Strength Reduction Factor (phi) < 1.0 as per AISC specifications. \[ \Omega = \frac{\omega}{\phi} \] (Reference AISC 360 C-B3-5)

Factored loads are required for input to the given interaction equations. Factored loads are the responsibility of the user. Factored loads are noted as P, V and M.

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**Limiting components of capacity evaluated in following tables:**

1. Bracket per FEA simulation
2. Welds – per analytical calculation
3. Beam Clamps - per analytical calculation
Values for Design Strength and Allowable Strength

NOTE: Calculate interaction separately for each group only using values from that group. Limiter is defined by highest interaction. Use absolute values. Values refer to the coordinate system shown.

<table>
<thead>
<tr>
<th></th>
<th>LRFD*</th>
<th>ASD*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11.02</td>
<td>30.73</td>
</tr>
</tbody>
</table>

Interaction for LRFD:
\[
\frac{P_{ax}}{F_x} + \frac{V_{ay}}{F_y} + \frac{V_{az}}{F_z} + \frac{M_{ax}}{M_x} + \frac{M_{ay}}{M_y} + \frac{M_{az}}{M_z} \leq 1
\]

Interaction for ASD:
\[
\frac{P_{ax}}{F_x} + \frac{V_{ay}}{F_y} + \frac{V_{az}}{F_z} + \frac{M_{ax}}{M_x} + \frac{M_{ay}}{M_y} + \frac{M_{az}}{M_z} \leq 1
\]

*Values already include LRFD strength reduction (Φ) or ASD safety (Ω) factors in accordance with AISC, and are based on nominal geometry.
## Values for Design Strength and Allowable Strength

**NOTE:** Calculate interaction separately for each group only using values from that group. Limiter is defined by highest interaction. Use absolute values. Values refer to the coordinate system shown.

### 2. Welds – per analytical calculation

<table>
<thead>
<tr>
<th></th>
<th>LRFD*</th>
<th></th>
<th>ASD*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$F_x$</td>
<td>$F_y$</td>
<td>$F_z$</td>
</tr>
<tr>
<td>Values</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>$F_x$ [kip]</td>
<td>70.43</td>
<td>70.43</td>
<td>46.95</td>
</tr>
<tr>
<td>$F_y$ [kip]</td>
<td>27.34</td>
<td>27.34</td>
<td>18.23</td>
</tr>
<tr>
<td>$F_z$ [kip]</td>
<td>39.06</td>
<td>39.06</td>
<td>26.04</td>
</tr>
<tr>
<td>$M_x$ [kip*ft]</td>
<td>10.28</td>
<td>7.95</td>
<td>6.85</td>
</tr>
<tr>
<td>$M_y$ [kip*ft]</td>
<td>9.5</td>
<td>7.95</td>
<td>5.30</td>
</tr>
<tr>
<td>$M_z$ [kip*ft]</td>
<td>6.86</td>
<td>6.86</td>
<td>4.57</td>
</tr>
</tbody>
</table>

### Interaction for LRFD

\[
\frac{P_{\text{ax}}}{F_x} + \frac{V_{\text{ax}}}{V_y} + \frac{M_{\text{ax}}}{M_z} + \frac{M_{\text{ax}}}{M_y} + \frac{M_{\text{ax}}}{M_z} \leq 1
\]

### Interaction for ASD:

\[
\frac{P_{\text{ax}}}{F_x} + \frac{V_{\text{ax}}}{V_y} + \frac{V_{\text{ax}}}{V_z} + \frac{M_{\text{ax}}}{M_y} + \frac{M_{\text{ax}}}{M_z} + \frac{M_{\text{ax}}}{M_z} \leq 1
\]

*Values already include LRFD strength reduction ($\Phi$) or ASD safety ($\Omega$) factors in accordance with AISC, and are based on nominal geometry.*
Values for Design Strength and Allowable Strength

3. Beam Clamps - per analytical calculation

<table>
<thead>
<tr>
<th></th>
<th>LRFD*</th>
<th></th>
<th>ASD*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21.58</td>
<td>2.32</td>
<td>2.32</td>
</tr>
<tr>
<td></td>
<td>1.04</td>
<td>1.04</td>
<td>5.10</td>
</tr>
</tbody>
</table>

Interaction for LRFD

Normal force interaction:

$$\frac{P_{ux}}{F_x} + \frac{M_{ux}}{M_y} + \frac{M_{uz}}{M_z} \leq 1$$

Shear force interaction:

- Shear Interaction Equation is only valid for TENSILE $P_{ux}$ loads ($P_{ux} > 0$). Equation is not valid for compressive $P_{ux}$ loads ($P_{ux} < 0$).
- For shear interaction, user must ADDITIONALLY verify: $P_{ux}/F_x < 1$.

$$\left(\frac{V_{uy}}{F_y \times (1 - \frac{P_{ux}}{F_x})}\right)^2 + \left(\frac{V_{ux}}{F_x \times (1 - \frac{P_{ux}}{F_x})}\right)^2 + \frac{M_{ux}}{M_x \times (1 - \frac{P_{ux}}{F_x})} \leq 1$$

Interaction for ASD

Normal force interaction:

$$\frac{P_{ax}}{F_x} + \frac{M_{ax}}{M_y} + \frac{M_{az}}{M_z} \leq 1$$

Shear force interaction:

- Shear Interaction Equation is only valid for TENSILE $P_{ax}$ loads ($P_{ax} > 0$). Equation is not valid for compressive $P_{ax}$ loads ($P_{ax} < 0$).
- For shear interaction, user must ADDITIONALLY verify: $P_{ax}/F_x < 1$.

$$\left(\frac{V_{ay}}{F_y \times (1 - \frac{P_{ax}}{F_x})}\right)^2 + \left(\frac{V_{ax}}{F_x \times (1 - \frac{P_{ax}}{F_x})}\right)^2 + \frac{M_{ax}}{M_x \times (1 - \frac{P_{ax}}{F_x})} \leq 1$$

*Values already include LRFD strength reduction ($\Phi$) or ASD safety ($\Omega$) factors in accordance with AISC, and are based on nominal geometry.
Clamped | Boxed
---|---
![Clamped Bracket](image1.png) | ![Boxed Bracket](image2.png)

### Loading case: Boxed

**Bill of Material for this loading case:**

- **Bracket**
  - 1x MIC-S120-CH-500 2179527
  - MIC-S120-CH-750 2179528
  - MIC-S120-CH-1000 2179529
  - MIC-S120-CH-1500 2179530
  - MIC-S120-CH-2000 2179531

- **Base plate**
  - 1x MIB-SCH 2174676

- **Threaded rods cut to particular length**
  - 4x AM16x1000 8.8 HDG…m 419104

- **Lock washer**
  - 8x LW M16 HDG plus washer 2185343

- **Nut**
  - 8x M16-F nut 304767

**Hardware not included in packaging:**

- **Bracket used for a perpendicular connection of MI-90 girder to flange of structural steel profiles.**
- **For flange width 9.25” (235mm) - 11.81” (300mm).**

**Usage of Values for Design Strength and Allowable Strength**

- The Design Strength and Allowable Strength tables on the following pages include strength reduction factors:
  1. **ASD:** Safety Factor (omega) > 1.0 as per AISC specifications.
  2. **LRFD:** Strength Reduction Factor (phi) < 1.0 as per AISC specifications. $\Omega = \frac{\omega}{\phi}$ (Reference AISC 360 C-B3-5)

Factored loads are required for input to the given interaction equations. Factored loads are the responsibility of the user. Factored loads are noted as P, V and M.

**Limiting components of capacity evaluated in following tables:**

1. Bracket per FEA simulation
2. Welds - per analytical calculation
3. Base plate and through bolts - per analytical calculation
NOTE: Calculate interaction separately for each group only using values from that group. Limiter is defined by highest interaction. Use absolute values. Values refer to the coordinate system shown.

1. Bracket per FEA simulation

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LRFD*</td>
<td>11.04</td>
<td>20.53</td>
<td>12.66</td>
<td>12.66</td>
<td>19.24</td>
<td>19.24</td>
<td>4.61</td>
<td>4.61</td>
<td>5.68</td>
<td>5.68</td>
<td>5.53</td>
<td>5.53</td>
</tr>
<tr>
<td>ASD*</td>
<td>7.34</td>
<td>13.66</td>
<td>8.42</td>
<td>8.42</td>
<td>12.80</td>
<td>12.80</td>
<td>3.07</td>
<td>3.07</td>
<td>3.78</td>
<td>3.78</td>
<td>3.68</td>
<td>3.68</td>
</tr>
</tbody>
</table>

Interaction for LRFD:
\[ \frac{P_{ay}}{F_x} + \frac{V_{ay}}{F_y} + \frac{V_{ax}}{F_z} + \frac{M_{ax}}{M_x} + \frac{M_{ax}}{M_y} + \frac{M_{ax}}{M_z} \leq 1 \]

Interaction for ASD:
\[ \frac{P_{ay}}{F_x} + \frac{V_{ay}}{F_y} + \frac{V_{ax}}{F_z} + \frac{M_{ax}}{M_x} + \frac{M_{ax}}{M_y} + \frac{M_{ax}}{M_z} \leq 1 \]

*Values already include LRFD strength reduction (Φ) or ASD safety (Ω) factors in accordance with AISC, and are based on nominal geometry.
### 2. Welds - per analytical calculation

#### Values for Design Strength and Allowable Strength

**NOTE:** Calculate interaction separately for each group only using values from that group. Limiter is defined by highest interaction. Use absolute values. Values refer to the coordinate system shown.

<table>
<thead>
<tr>
<th></th>
<th>Clamped</th>
<th>Boxed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>![Clamped Diagram]</td>
<td>![Boxed Diagram]</td>
</tr>
</tbody>
</table>

#### 2. Welds - per analytical calculation

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<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LRFD</strong></td>
<td>70.43</td>
<td>70.43</td>
<td>27.34</td>
<td>27.34</td>
<td>39.06</td>
<td>39.06</td>
<td>10.28</td>
<td>10.28</td>
<td>7.95</td>
<td>7.95</td>
<td>6.86</td>
<td>6.86</td>
</tr>
<tr>
<td><strong>ASD</strong></td>
<td>46.95</td>
<td>46.95</td>
<td>18.23</td>
<td>18.23</td>
<td>26.04</td>
<td>26.04</td>
<td>6.85</td>
<td>6.85</td>
<td>5.30</td>
<td>5.30</td>
<td>4.57</td>
<td>4.57</td>
</tr>
</tbody>
</table>

**Interaction for LRFD**

\[
\frac{P_{ax}}{F_{x}} + \frac{V_{ax}}{F_{y}} + \frac{V_{ay}}{F_{z}} + \frac{M_{ax}}{M_{x}} + \frac{M_{ay}}{M_{y}} + \frac{M_{az}}{M_{z}} \leq 1
\]

**Interaction for ASD:**

\[
\frac{P_{ax}}{F_{x}} + \frac{V_{ax}}{F_{y}} + \frac{V_{ay}}{F_{z}} + \frac{M_{ax}}{M_{x}} + \frac{M_{ay}}{M_{y}} + \frac{M_{az}}{M_{z}} \leq 1
\]

*Values already include LRFD strength reduction (Φ) or ASD safety (Ω) factors in accordance with AISC, and are based on nominal geometry.*

---

**MIC-S120-CH-L Bracket - Steel**

**Values for Design Strength and Allowable Strength**

2/3
3. Base plate and through bolts - per analytical calculation

<table>
<thead>
<tr>
<th></th>
<th>LRFD*</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>31.77</td>
<td>Not decisive</td>
<td>6.67</td>
<td>6.67</td>
<td>6.67</td>
<td>6.67</td>
</tr>
<tr>
<td></td>
<td>2.96</td>
<td>2.96</td>
<td>7.40</td>
<td>7.40</td>
<td>8.60</td>
<td>8.60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>ASD*</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21.18</td>
<td>Not decisive</td>
<td>4.45</td>
<td>4.45</td>
<td>4.45</td>
<td>4.45</td>
</tr>
<tr>
<td></td>
<td>1.97</td>
<td>1.97</td>
<td>4.93</td>
<td>4.93</td>
<td>5.73</td>
<td>5.73</td>
</tr>
</tbody>
</table>

Interaction for LRFD
Normal force interaction:
\[
\frac{P_{ux}}{F_x} + \frac{M_{ux}}{M_y} + \frac{M_{uz}}{M_z} \leq 1
\]

Shear force interaction:
- Shear Interaction Equation is only valid for TENSILE \( P_{ux} \) loads (\( P_{ux} > 0 \)). Equation is not valid for compressive \( P_{ux} \) loads (\( P_{ux} < 0 \)).
- For Shear interaction, user must ADDITIONALLY verify: \( P_{ux} / F_x < 1 \),

\[
\left( \frac{V_{uy}}{F_y \times (1 - \frac{P_{ux}}{F_x})} \right)^2 + \left( \frac{V_{ux}}{F_x \times (1 - \frac{P_{ux}}{F_x})} \right)^2 + \frac{M_{uz}}{M_z \times (1 - \frac{P_{ux}}{F_x})} \leq 1
\]

Interaction for ASD
Normal force interaction:
\[
\frac{P_{ux}}{F_x} + \frac{M_{ux}}{M_y} + \frac{M_{uz}}{M_z} \leq 1
\]

Shear force interaction:
- Shear Interaction Equation is only valid for TENSILE \( P_{ux} \) loads (\( P_{ux} > 0 \)). Equation is not valid for compressive \( P_{ux} \) loads (\( P_{ux} < 0 \)).
- For Shear interaction, user must ADDITIONALLY verify: \( P_{ux} / F_x < 1 \),

\[
\left( \frac{V_{uy}}{F_y \times (1 - \frac{P_{ux}}{F_x})} \right)^2 + \left( \frac{V_{ux}}{F_x \times (1 - \frac{P_{ux}}{F_x})} \right)^2 + \frac{M_{uz}}{M_z \times (1 - \frac{P_{ux}}{F_x})} \leq 1
\]

*Values already include LRFD strength reduction (\( \Phi \)) or ASD safety (\( \Omega \)) factors in accordance with AISC, and are based on nominal geometry.
Boundary conditions - Terms of common cooperation / Legal disclaimer and guidelines as defined at the beginning of this book need to be mandatorily respected.